Drought Indicators Report

Georgia Environmental Protection Division

June 2022

Background

Pursuant to the Rules for Drought Management, <u>Section 391-3-3-.04 Drought Indicators and Triggers</u>, the Director of EPD monitors climatic indicators and water supply conditions to assess drought occurrence and severity, and its impact upon the ability of public water systems to provide adequate supplies of water. These indicators and conditions May include, but not be limited, to the following:

- U.S. Drought Monitor;
- Precipitation;
- Streamflow;
- Groundwater;
- Reservoir levels;
- Short term climate predictions;
- Soil moisture; and
- Water supply conditions.

Background

- The Rules require EPD to report on current climatic indicators at least semi-annually or monthly when any part of the state has experienced at least two consecutive months of severe drought.
- This reports compare current conditions to historical levels (and/or reservoir rule curves) for each of the following indicators:
 - Precipitation during the prior 3, 6, and 12 months;
 - Streamflow at the select United States Geological Survey gages;
 - Groundwater levels at select United States Geological Survey monitoring wells; and
 - Reservoir levels at Allatoona Lake, Lake Hartwell, Clarks Hill Lake, and Lake Lanier.
- The following sections of this presentation provide the data and information sources analyzed by EPD in developing this drought indicators report for conditions as of June 23, 2022.

Drought Indicator Analysis Summary (slide 1 of 2)

- U.S. Drought Monitor Abnormally Dry (D0, the least intense level) exists in most areas except southeast corner of GA. Moderate Drought (D1) exists in most areas of Lower Flint Basin, part of Suwannee Basin, Satilla Basin, and Upper Savannah Basin. Severe Drought (D2) exists in Lower Savannah-Ogeechee Basin (Effingham, Chatham, Bryan, Liberty, Long, and McIntosh Counties).
- Precipitation Three-month precipitation is slightly below normal in Lower Savannah Basin, Ogeechee Basin and few Counties in other areas. Six-month precipitation is slightly below normal in Lower Savannah Basin, Ogeechee Basin and Lower Flint Basin. Twelve-month precipitation is above or near normal statewide except Rabun County.
- Soil Moisture Soil moisture conditions are below normal in areas near Fall Line and in northwest corner and southeast corner of GA.

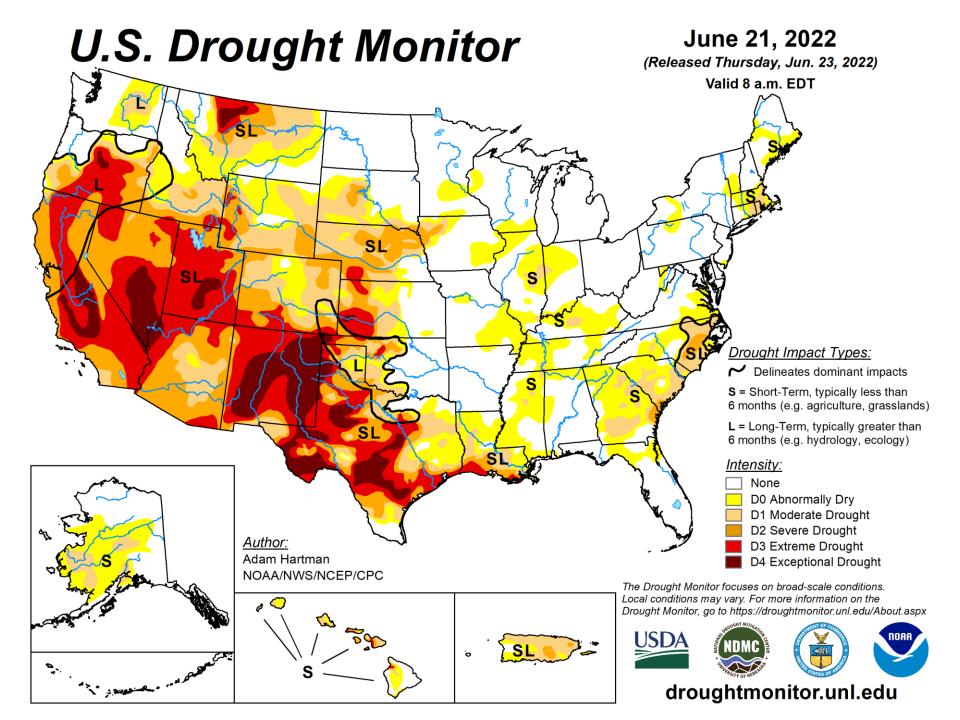
Drought Indicator Analysis Summary (slide 2 of 2)

- Streamflow Stream flows at majority of selected USGS gages (18 out of 34) are between the lowest 20th percentile and median. Five gages are between the lowest 10th and 20th percentiles. Other gages are above or near normal.
- Groundwater Level Groundwater levels are between the lowest 20th percentile and median in most selected wells (12 out of 17). One well level is between the lowest 10th percentile and 5th percentile (Surficial aquifer in Ogeechee Basin). Another well level is between the lowest 10th percentile and 20th percentile (Floridan Aquifer in Flint Basin). Other wells are above or near normal.
- Reservoir Levels At the end of May, Carters, West Point, and W. F. George are in Zone 1. Other federal reservoirs in Georgia (ACF, ACT, and Savannah River Basins) are at levels above or near their respective top of conservation (normal) pools. ACF composite storage is in Zone 1.
- Short-term Climate Prediction National Climatic Prediction Center projects above normal temperature statewide and slightly above normal precipitation statewide in July – September 2022. U.S. Drought Outlook predicts drought removal likely in most areas and drought remains but improves in Lower Ogeechee in July-September 2022.
- Water Supply Lee County to encourage voluntary water conservation

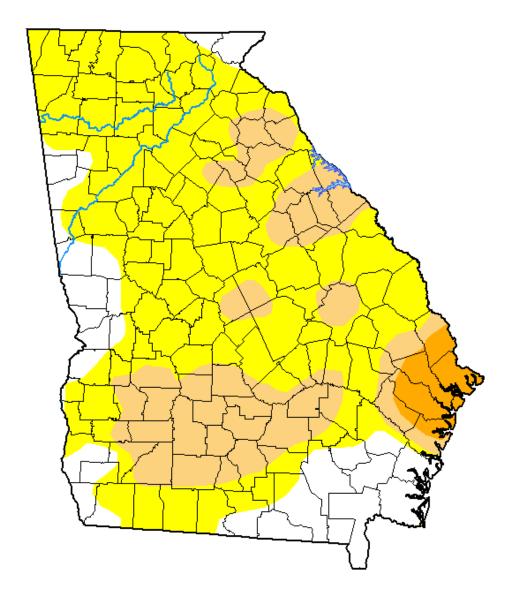
US Drought Monitor

Data Source:

http://droughtmonitor.unl.edu/



U.S. Drought Monitor Georgia



June 21, 2022

(Released Thursday, Jun. 23, 2022)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	16.51	83.49	25.92	3.31	0.00	0.00
Last Week 06-14-2022	50.14	49.86	15.93	3.31	0.00	0.00
3 Month's Ago 03-22-2022	39.27	60.73	16.94	0.00	0.00	0.00
Start of Calendar Year 01-04-2022	97.01	2.99	0.00	0.00	0.00	0.00
Start of Water Year 09-28-2021	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 06-22-2021	94.29	5.71	0.00	0.00	0.00	0.00

Intensity:

None D2 Severe Drought
D0 Abnormally Dry D3 Extreme Drought
D1 Moderate Drought D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions.
Local conditions may vary. For more information on the
Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:

Adam Hartman NOAA/NWS/NCEP/CPC









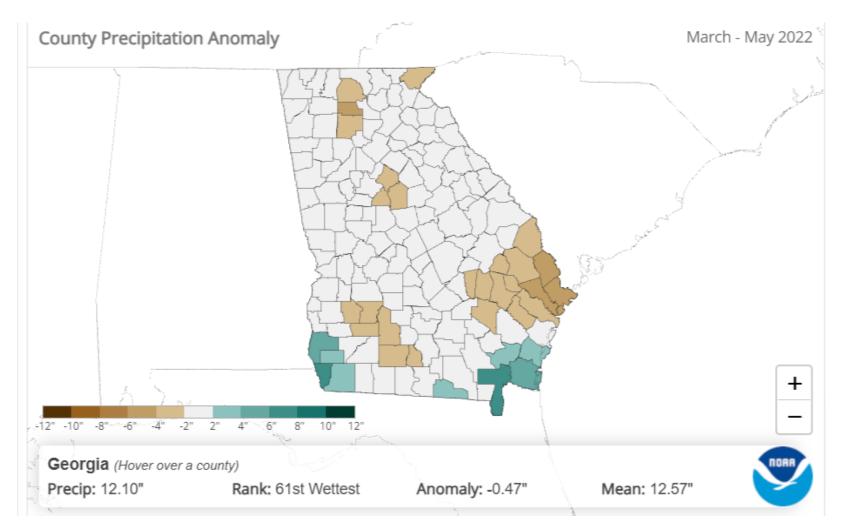
droughtmonitor.unl.edu

3, 6, and 12 Month Precipitation Anomaly

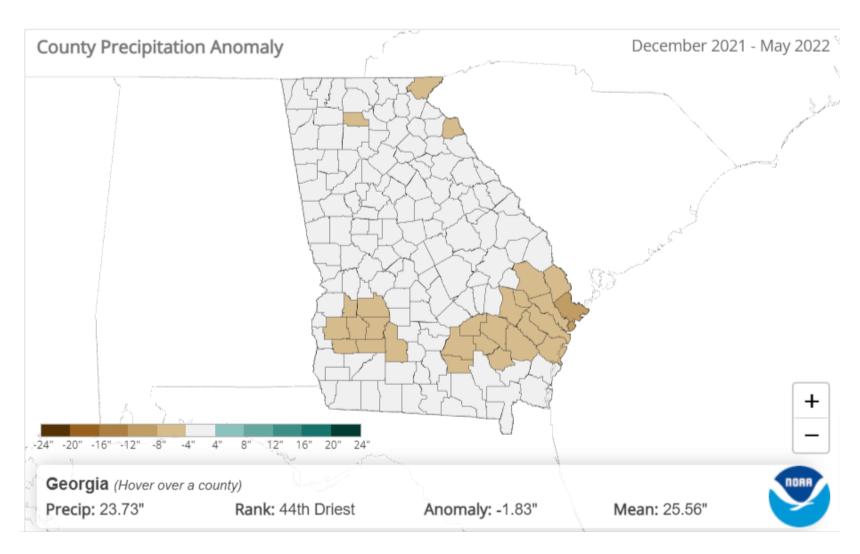
Data Source:

https://www.ncdc.noaa.gov/cag/county/mapping/

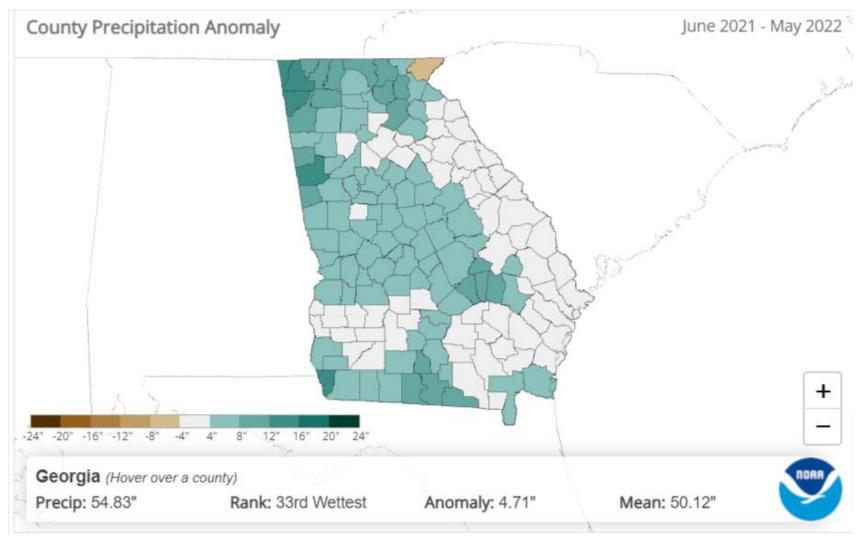
3 Month Precipitation Anomaly



6 Month Precipitation Anomaly



12 Month Precipitation Anomaly

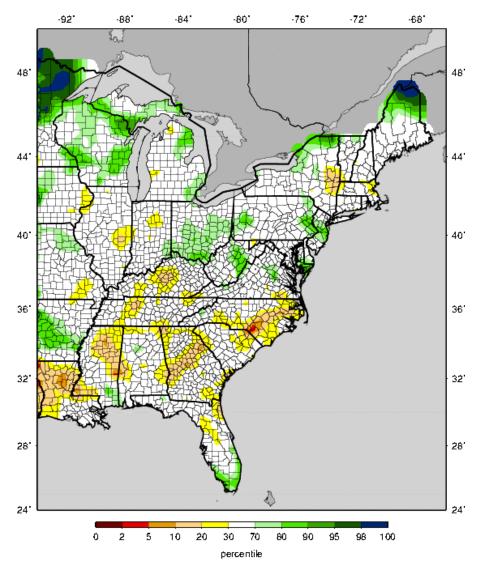


Soil Moisture Conditions

Data Source:

http://www.hydro.ucla.edu/SurfaceWaterGroup/forecast/monitor/curr/conus.mexico/east.vic.sm_qnt.gif

VIC Soil Moisture Percentiles (wrt/1916-2004) Eastern United States - 20220621



Current (Daily updated) percentiles for soil moisture (SWE) with respect to the climatological period (1916-2004).

Streamflow Conditions

Data Source: USGS

Streamflow Monitoring

- As shown on the following slide, EPD Monitors 34 USGS stream gages in 13 of the State's major river basins to assess drought conditions.
- These gages were selected because each has:
 - Long-term and relatively complete records for recent decades; and
 - Relatively low consumptive water use implications and streamflows are not heavily influenced by dams.
- Note: Hydrologic conditions of major rivers with streamflows that are heavily influenced by dams can be assessed by reviewing status of major storage reservoirs

Georgia's 14 River Basins Tallapoosa, Chattahoochee Suwanee

USGS Stream Gages Monitored by EPD to Assess Drought Conditions

GAGE#	BASIN	GAGE NAME
1	TENNESSEE	LOOKOUT CREEK NEAR NEW ENGLAND
2	TENNESSEE	NOTTELY RIVER NEAR BLAIRSVILLE
3	COOSA	CHATTOOGA RIVER AT SUMMERVILLE
4	COOSA	TALKING ROCK CREEK NEAR HINTON
5	COOSA	ETOWAH RIVER AT CANTON
6	CHATTAHOOCHEE	CHATTAHOOCHEE RIVER AT CORNELIA
7	CHATTAHOOCHEE	CHESTATEE RIVER NEAR DAHLONEGA
8	CHATTAHOOCHEE	NEW RIVER AT GA 100 NEAR CORINTH
9	CHATTAHOOCHEE	UPATOI CREEK AT COLUMBUS
10	FLINT	FLINT RIVER AT GA26 NEAR MONTEZUMA
11	FLINT	FLINT RIVER AT ALBANY
12	FLINT	ICHAWAYNOCHAWAY CREEK AT MILFORD
13	FLINT	SPRING CREEK NEAR IRON CITY
14	OCMULGEE	ALCOVY RIVER ABOVE COVINGTON
15	OCMULGEE	OCMULGEE RIVER AT MACON
16	OCMULGEE	TOBESOFKEE CREEK NEAR MACON
17	OCMULGEE	TUCSAWHATCHEE CREEK NEAR
		HAWKINSVILLE
18	OCONEE	MIDDLE OCONEE RIVER NEAR ATHENS
19	OCONEE	LITTLE RIVER NEAR EATONTON
20	OCONEE	OCONEE RIVER AT DUBLIN
21	ALTAMAHA	OHOOPEE RIVER NEAR REIDSVILLE
22	SAVANNAH	CHATTOOGA RIVER NEAR CLAYTON
23	SAVANNAH	BROAD RIVER NEAR BELL
24	SAVANNAH	BEAVERDAM CREEK NEAR SARDIS
25	SAVANNAH	BRIER CREEK AT MILLHAVEN
26	OGEECHEE	CANOOCHEE RIVER NEAR CLAXTON
27	OGEECHEE	OGEECHEE RIVER NEAR EDEN
28	OCHLOCKONEE	OCHLOCKONEE RIVER NEAR THOMASVILLE
29	SUWANEE	WITHLACOOCHEE RIVER NEAR PINETTA FL
30	SUWANEE	ALAPAHA RIVER AT STATENVILLE
31	SUWANEE	SUWANNEE RIVER AT US 441, AT FARGO
32	SATILLA	SATILLA RIVER NEAR WAYCROSS
33	SATILLA	LITTLE SATILLA RIVER NEAR OFFERMAN
34	ST MARY	ST MARYS RIVER NEAR MACCLENNY FL

Streamflow Graphs

- For each of the 34 gages, EPD has prepared a graph that shows monthly average streamflow from January 2022 through May 2022;
- To help put these streamflow conditions into perspective, for comparison purposes, each graph also shows:
 - Monthly average streamflows for the years 2007 and 2011 when streamflows were at or near recorded low levels across much of the state; and
 - A statistical composite of historical conditions showing the "driest" 50, 20, 10, and 5 percent of all recorded monthly average stream flows at the same gage.

How to Read the Streamflow Graphs Example #1: Etowah River at Canton

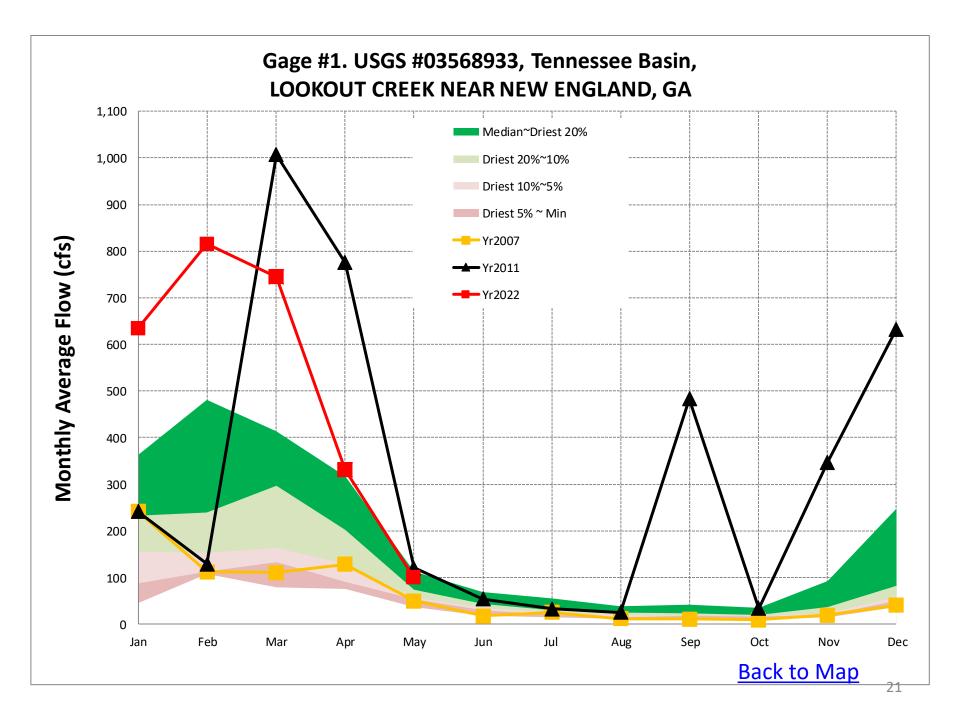
The streamflow graph for Gage #5, <u>USGS Etowah River gage at Canton</u> shows:

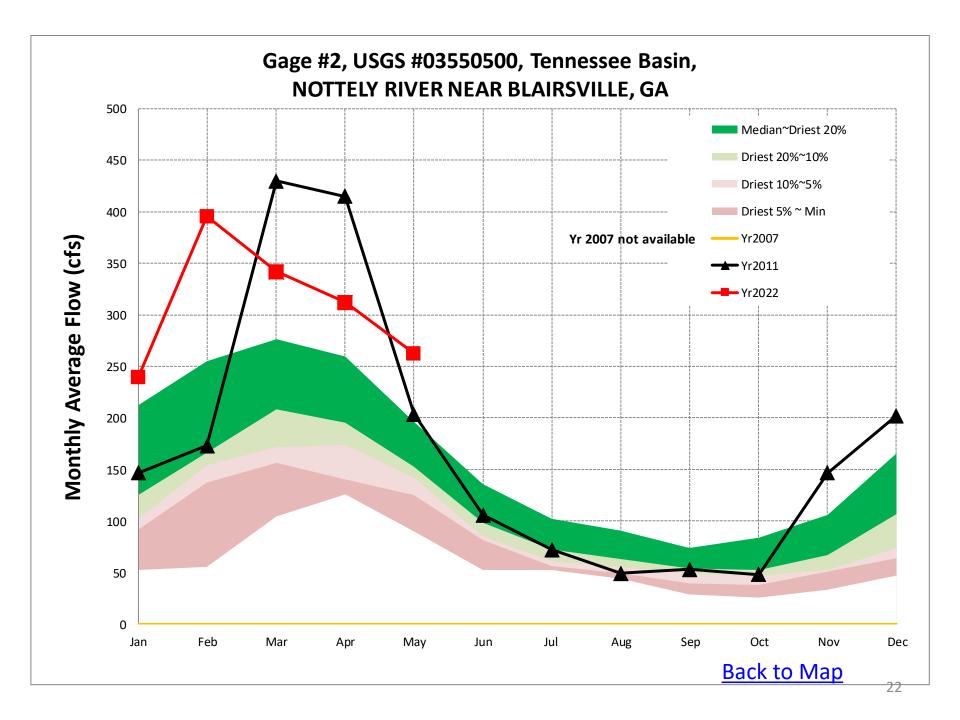
- Average stream flow in May 2022 was 1217 cfs. The statistical composite of all historical data for this gage shows that average streamflow in May has historically been lower than May 2022 about 47% of the time; 53% of the time in May it has been higher.
- Average stream flow in May 2011 was 726 cfs. The statistical composite of all historical data for this gage shows that average streamflow in May has historically been lower than May 2011 about 5~10% of the time; 90~95% of the time in May it has been higher.
- Average stream flow in May 2007 was 512 cfs. The statistical composite of all historical data for this gage shows that average streamflow in May has historically been lower than May 2007 about 5 % of the time; 95% of the time in May it has been higher.

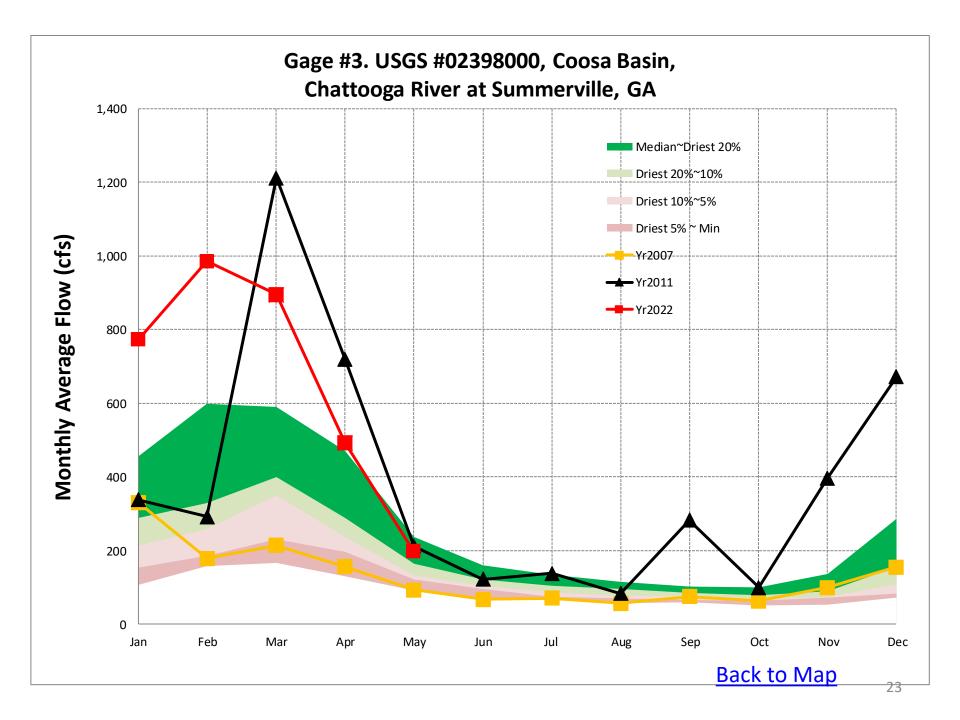
How to Read the Streamflow Graphs Example #2: Flint River at Albany

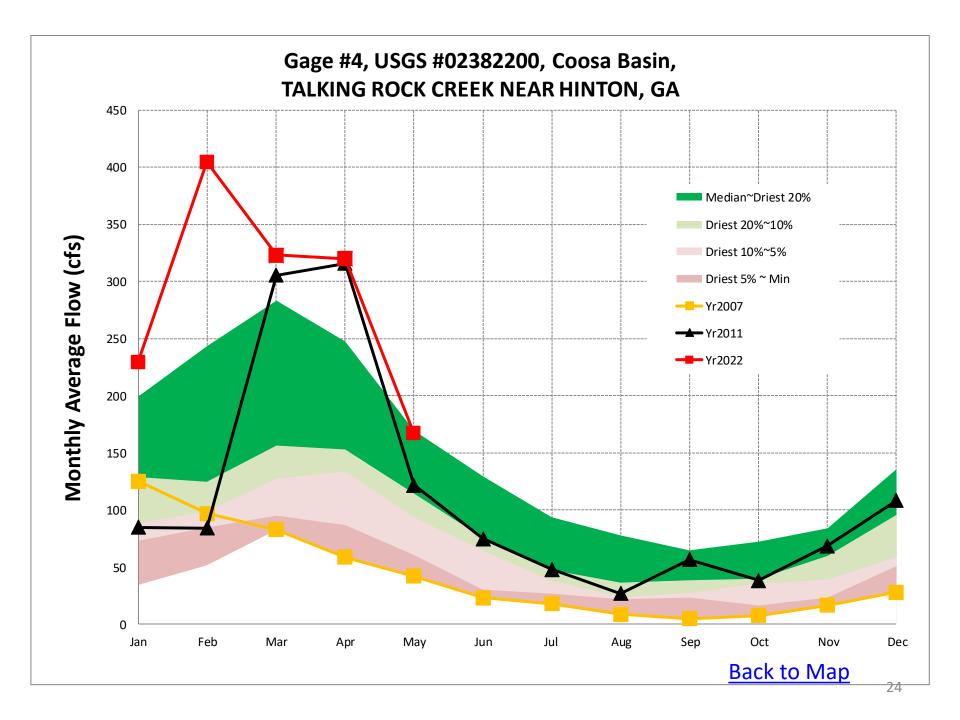
The streamflow graph for Gage #11, <u>USGS Flint River gage at Albany</u> shows:

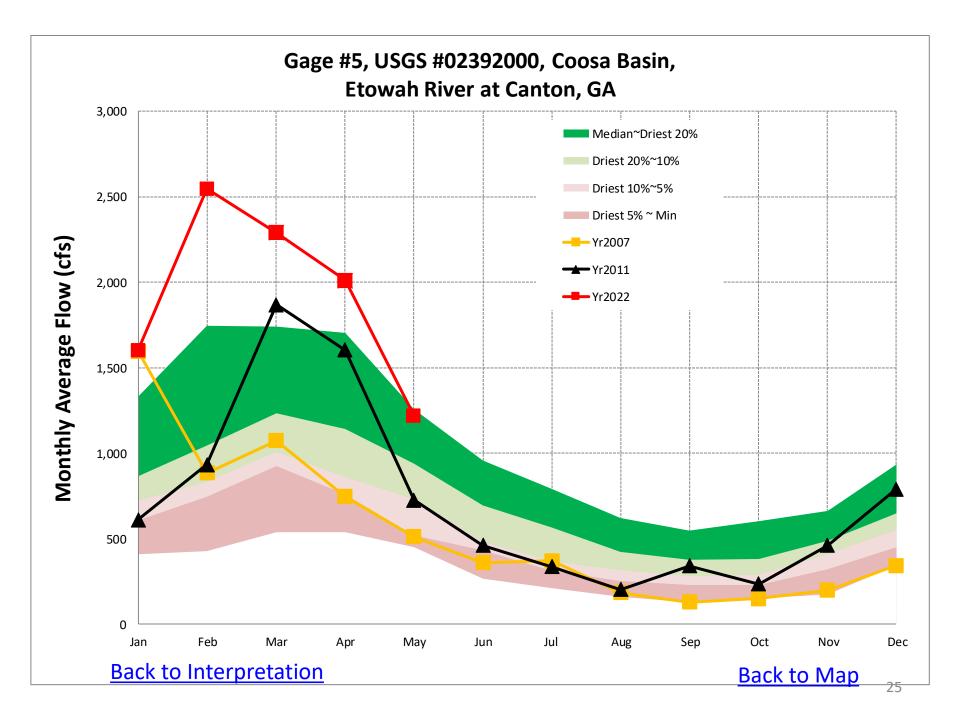
- Average stream flow in May 2022 was 3154 cfs. The statistical composite of all historical data for this gage shows that average streamflow in May has historically been lower than May 2022 about 23% of the time; about 77% of the time in May it has been higher.
- Average stream flow in May 2011 was 1575 cfs. The statistical composite of all historical data for this gage shows that average streamflow in May has historically been lower than May 2011 about 2~5% of the time; about 95~98% of the time in May it has been higher.
- Average stream flow in May 2007 was 1291 cfs. The statistical composite of all historical data for this gage shows that average streamflow in May has historically been lower than May 2007 about 1% of the time; about 99% of the time in May it has been higher.

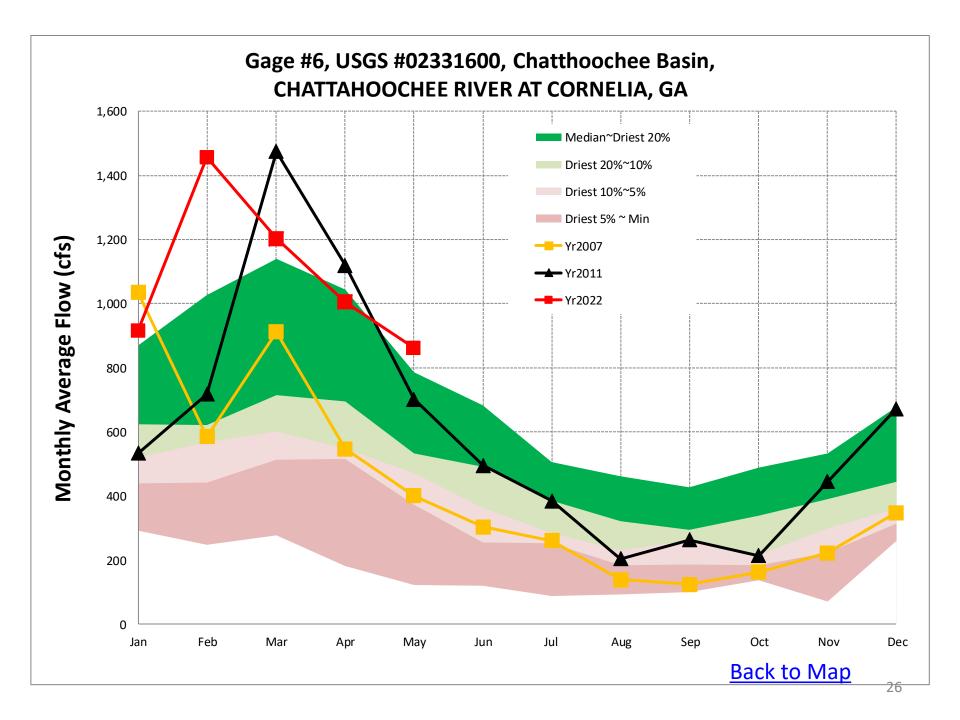


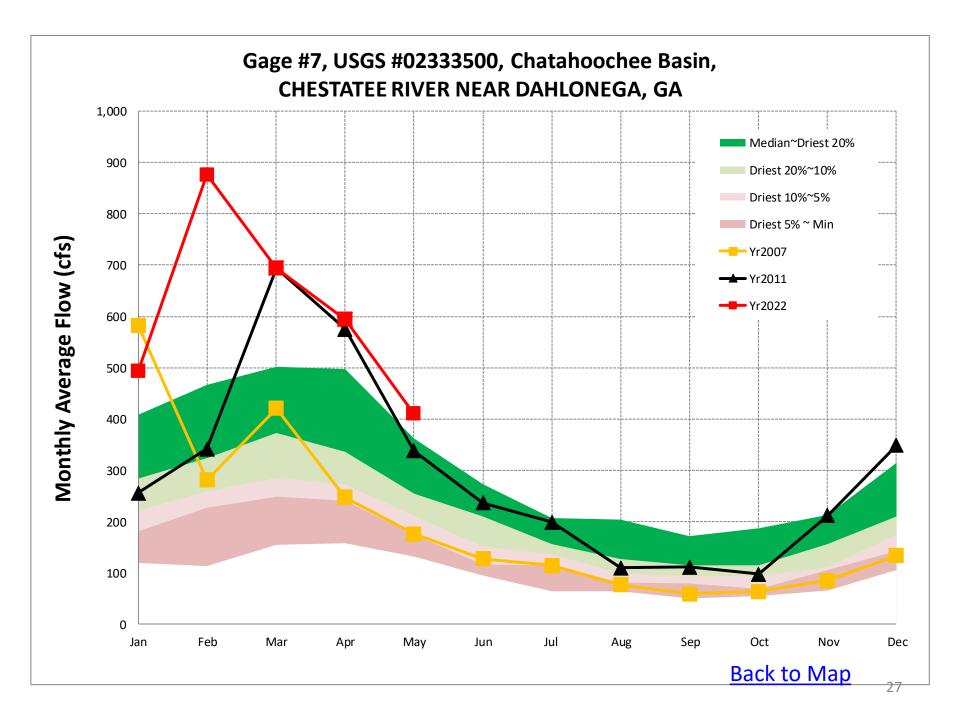


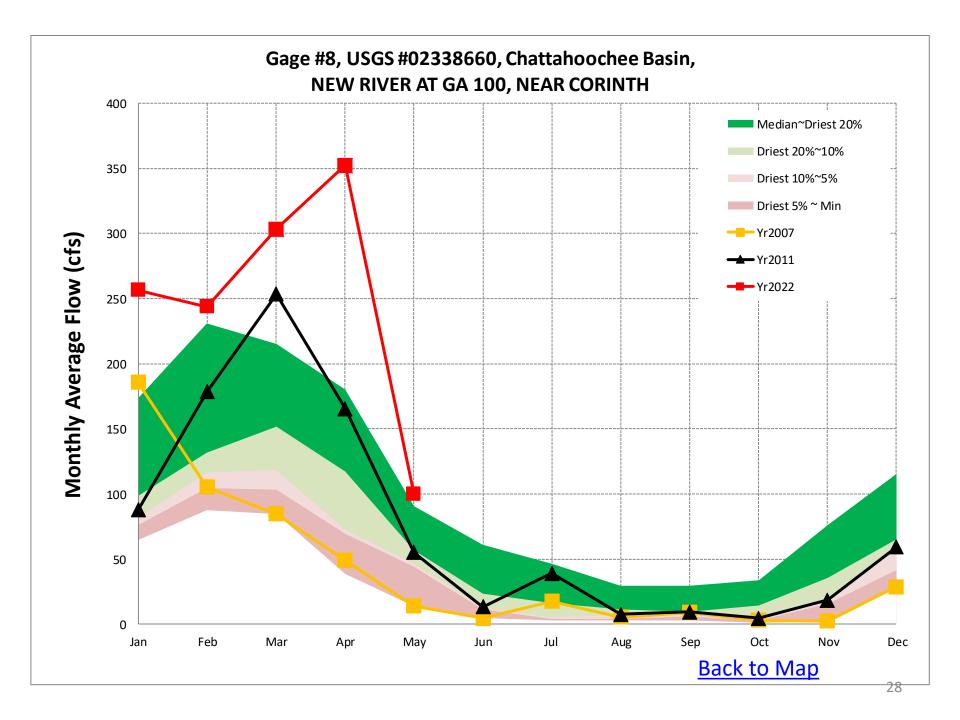


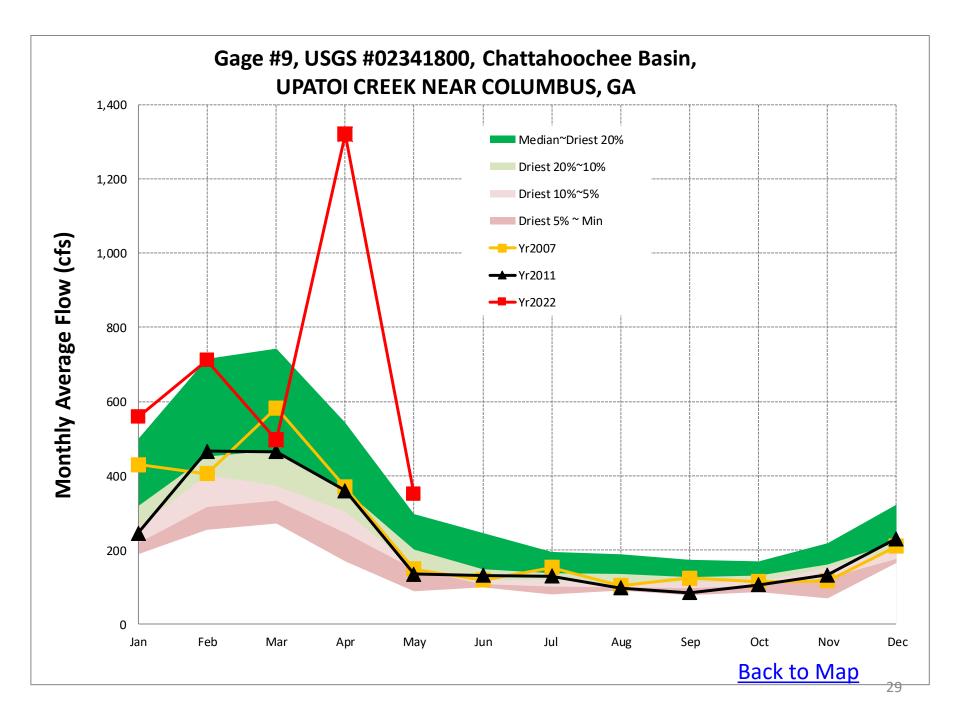


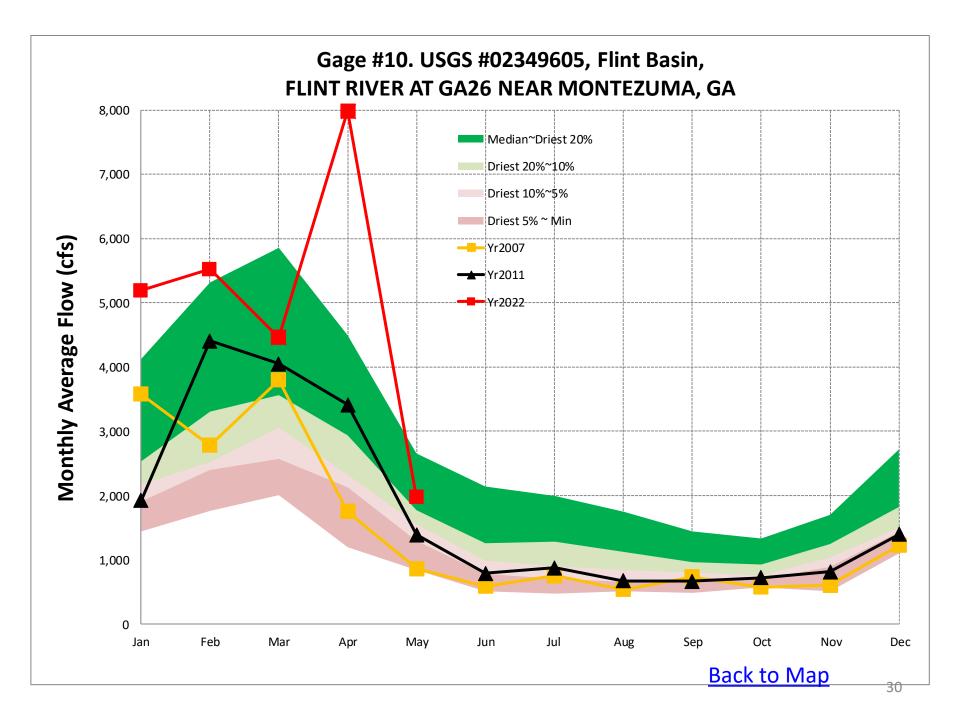


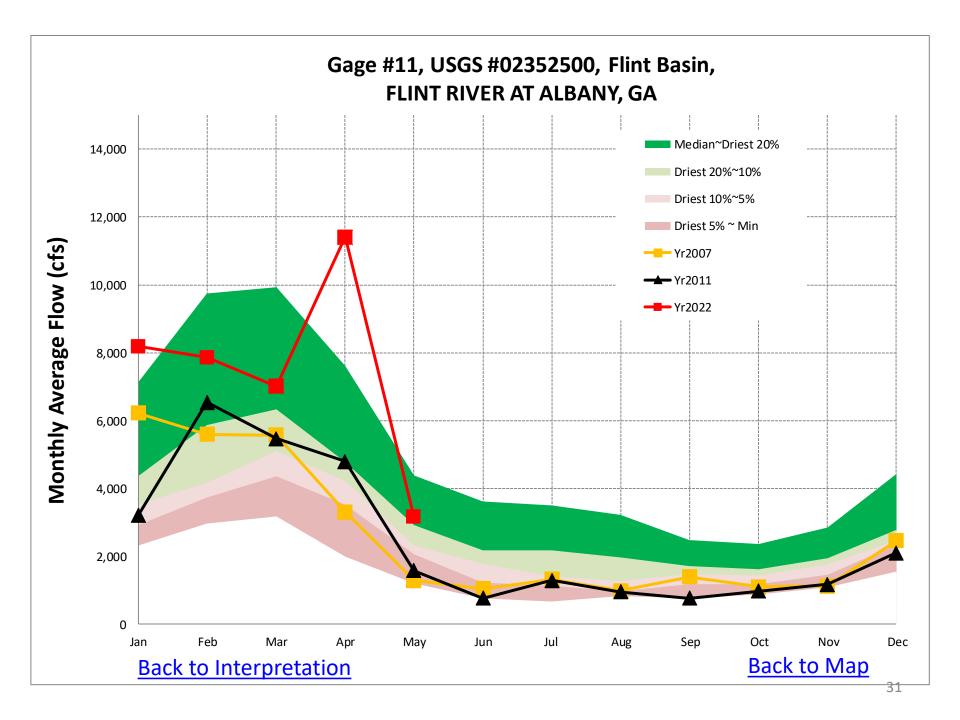


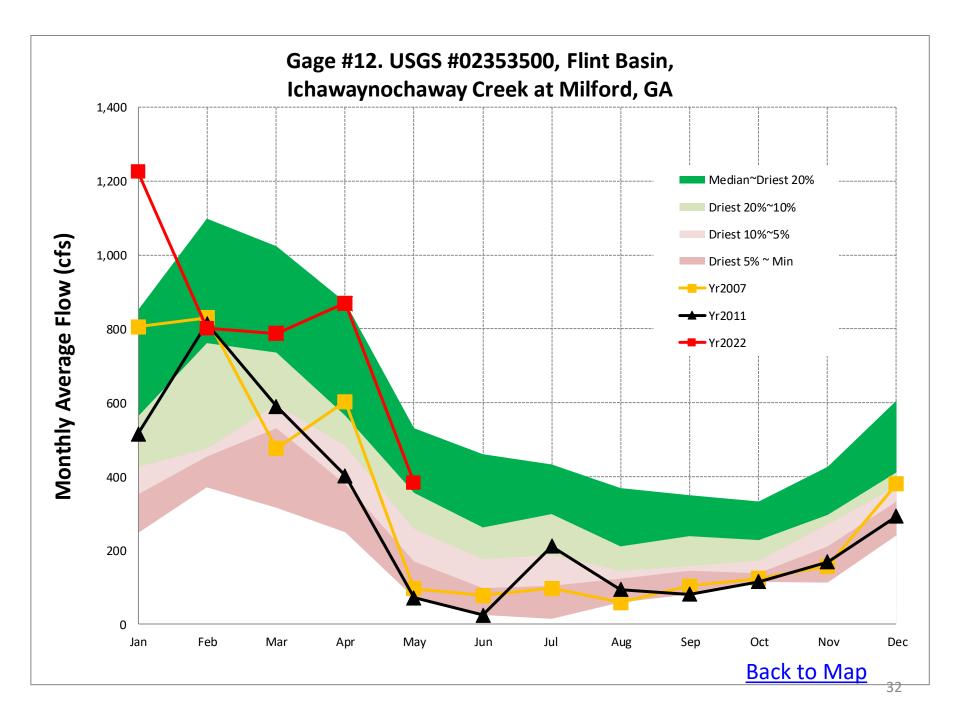


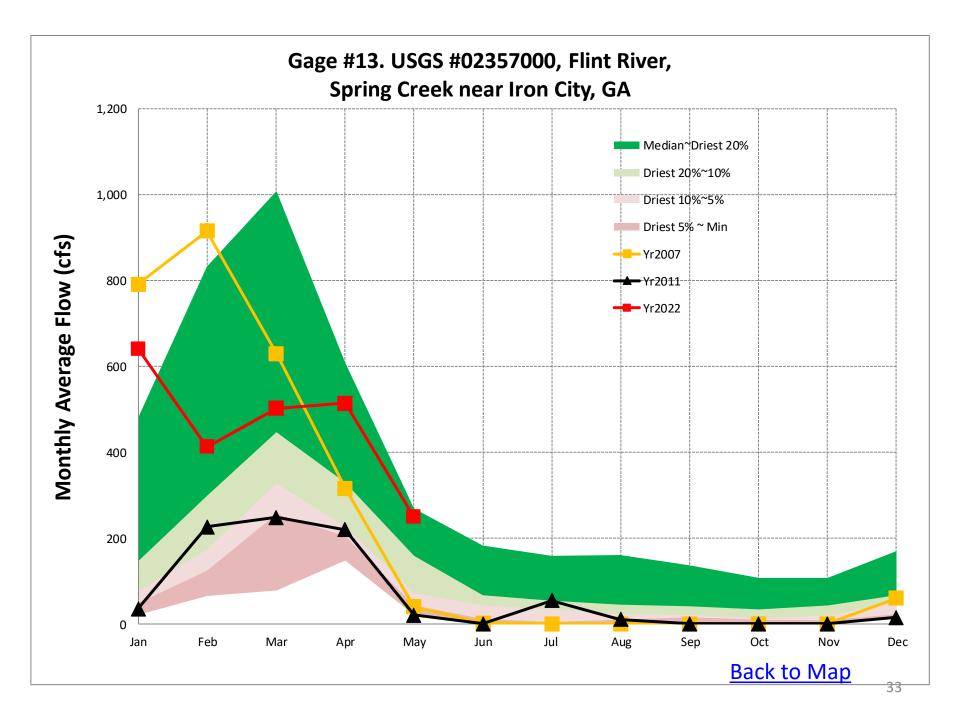


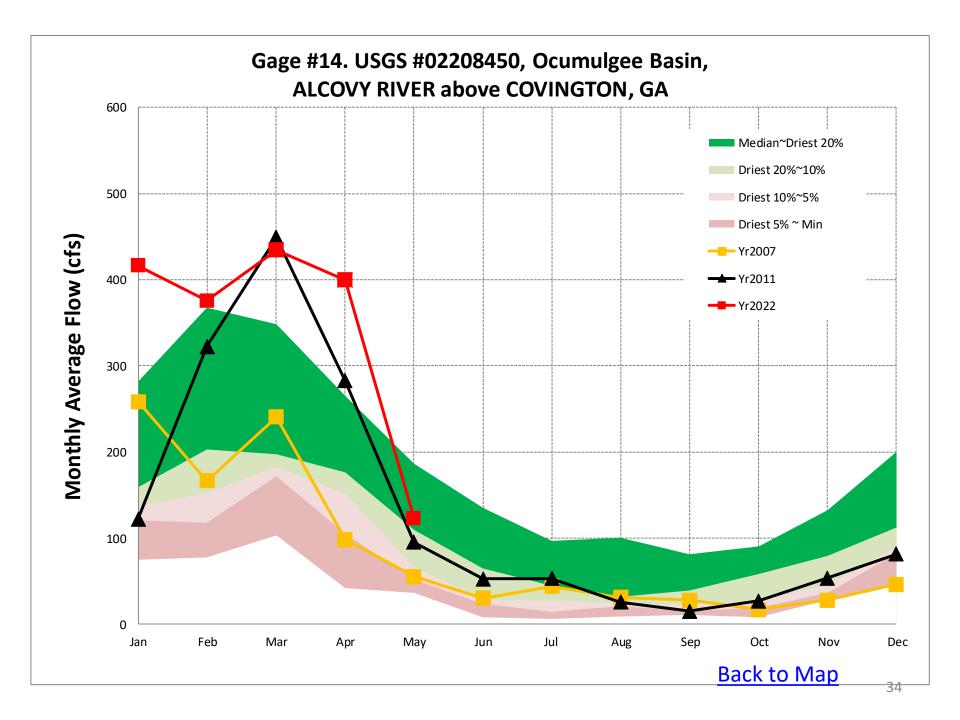


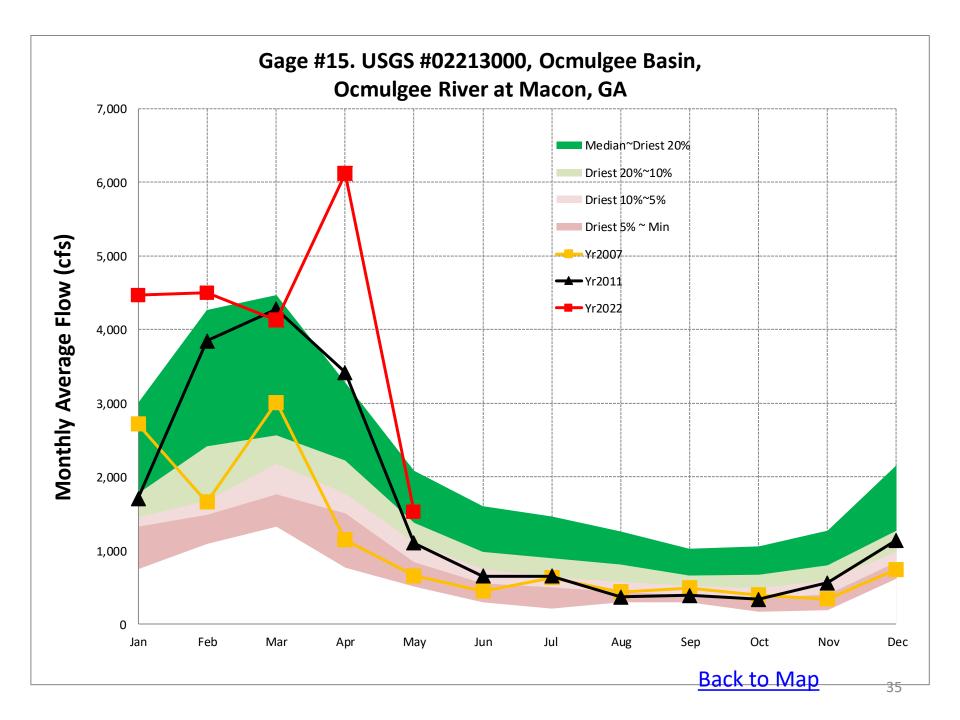


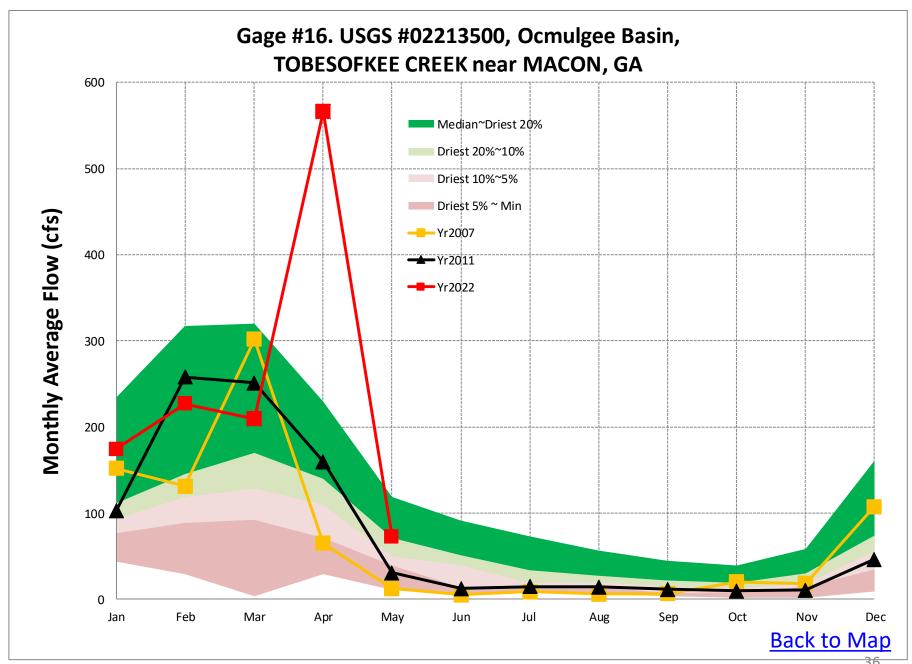


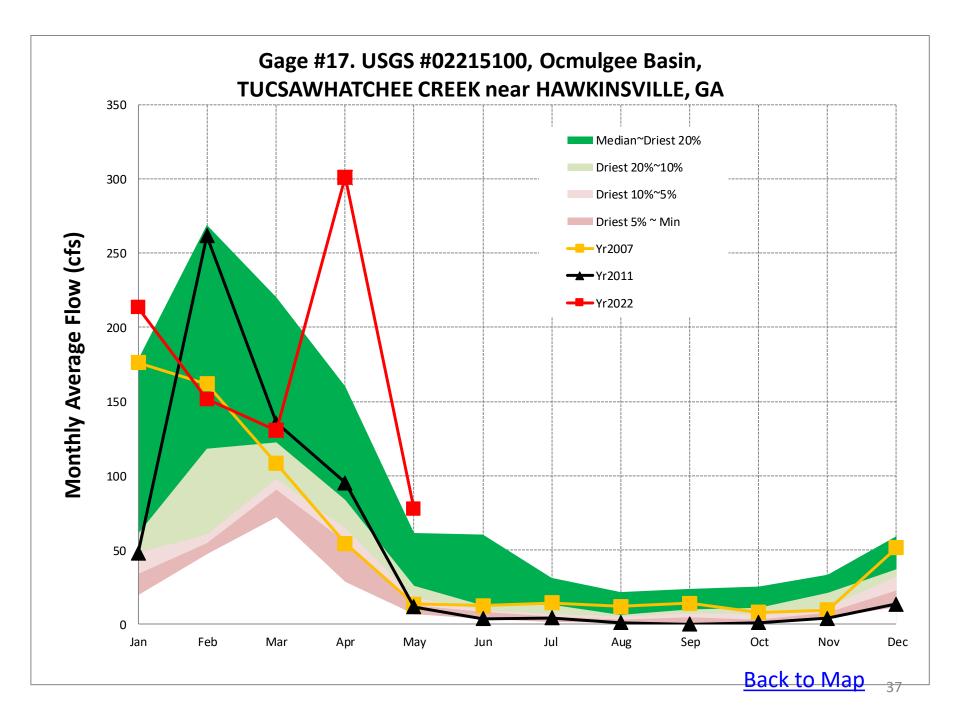


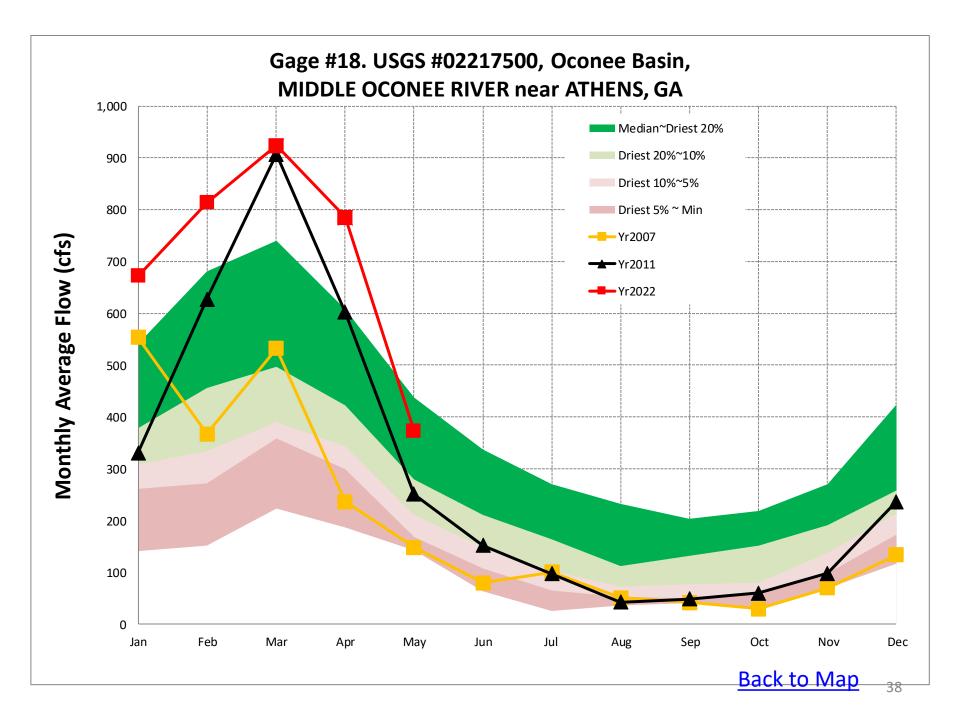


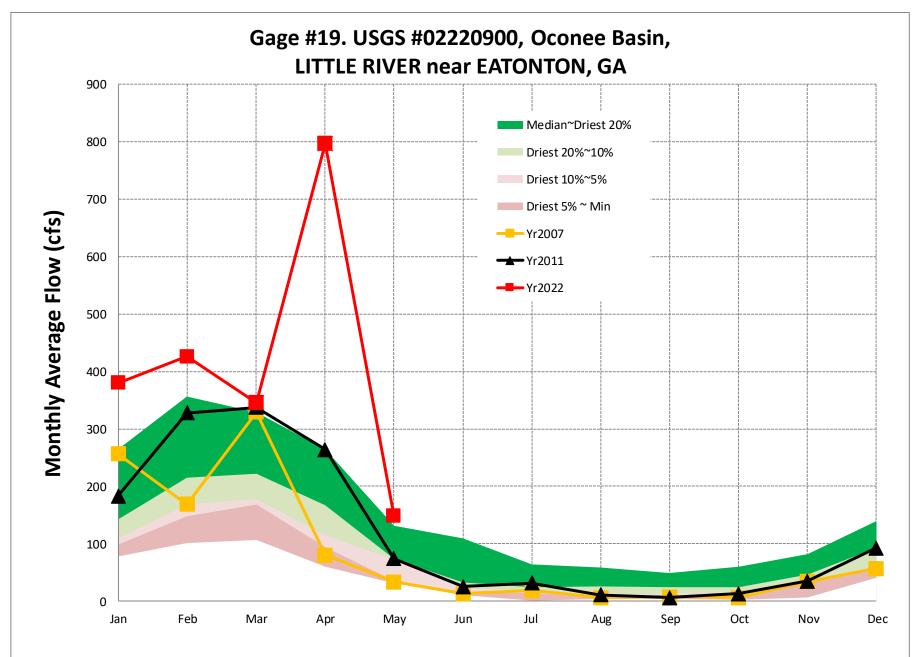


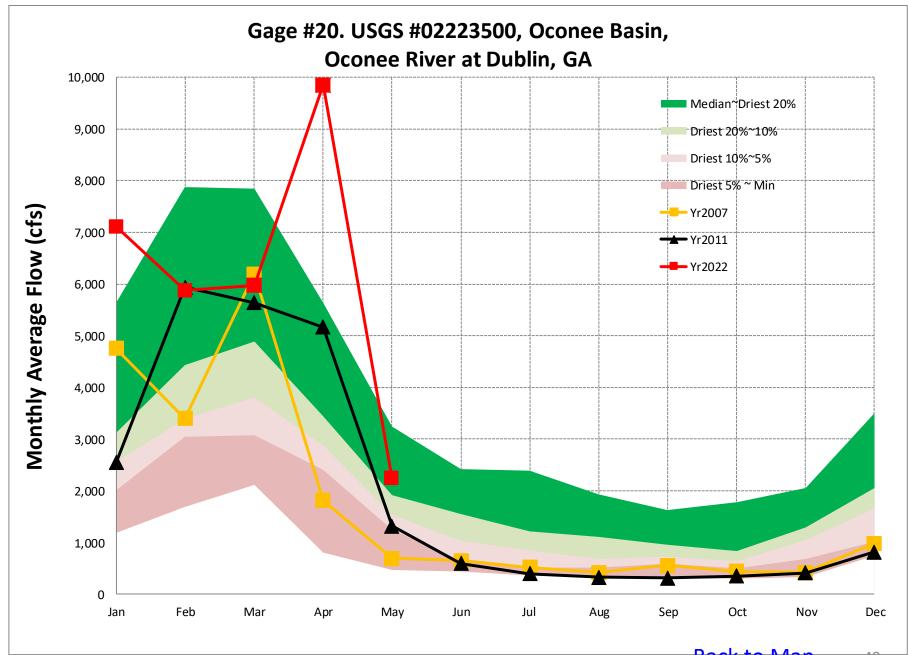


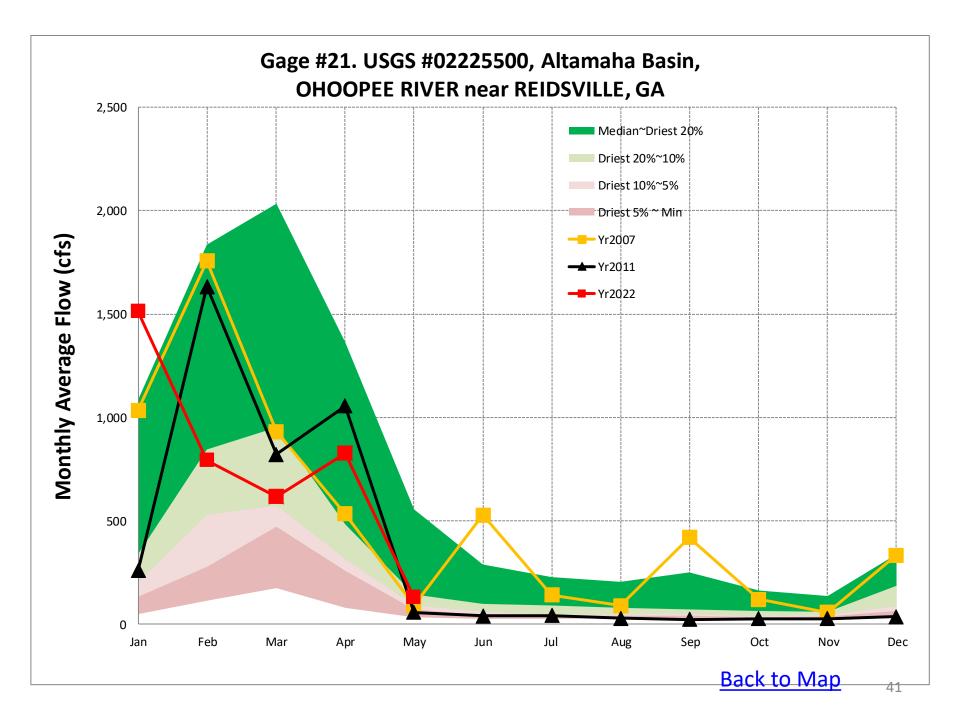


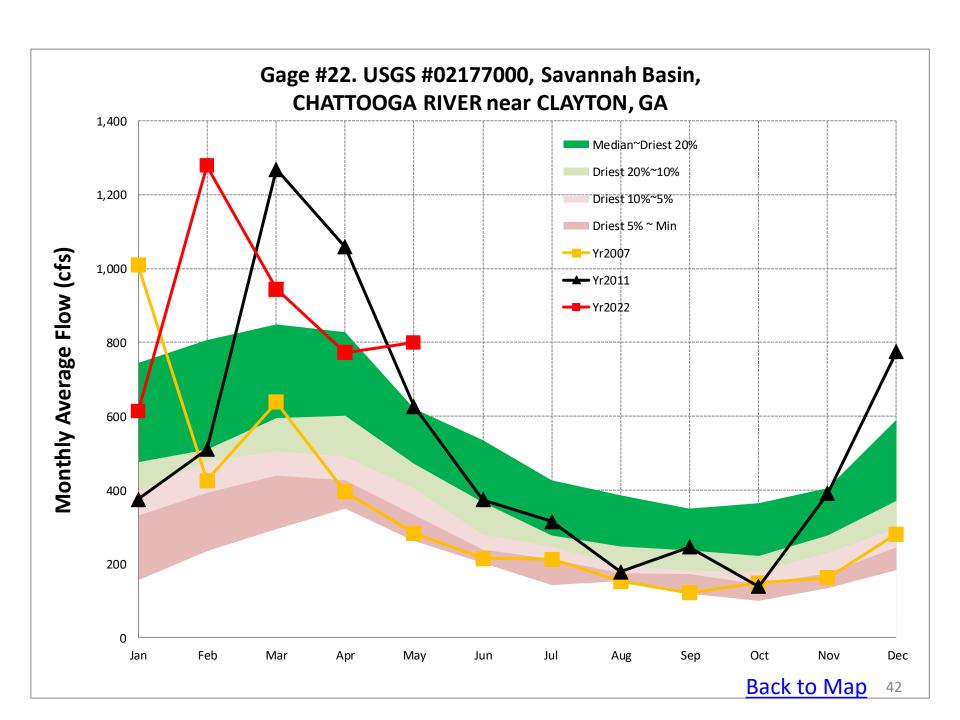


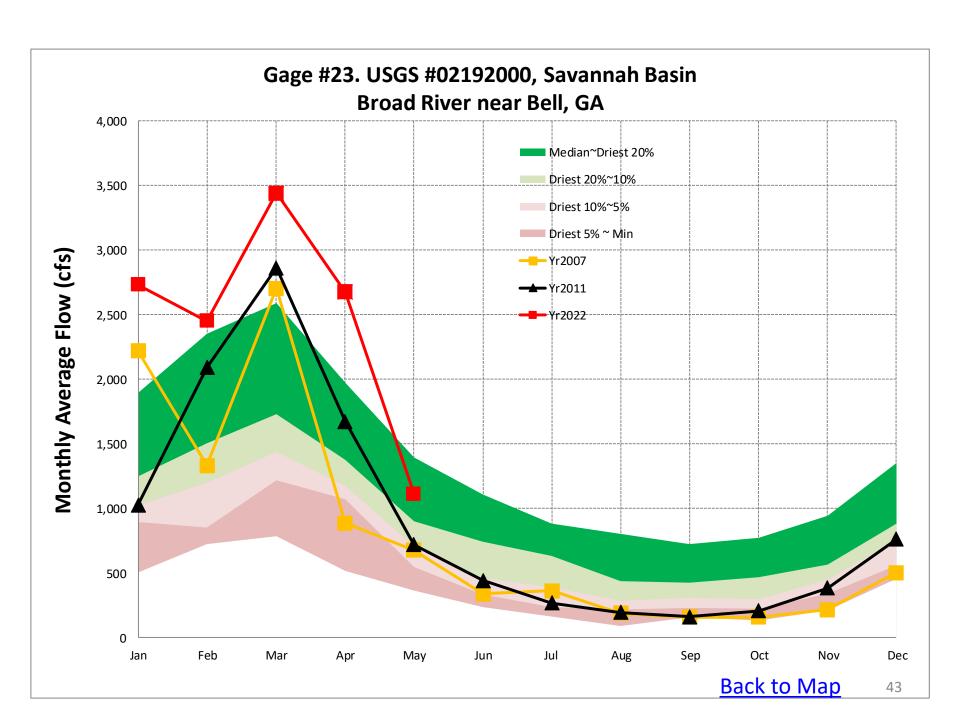


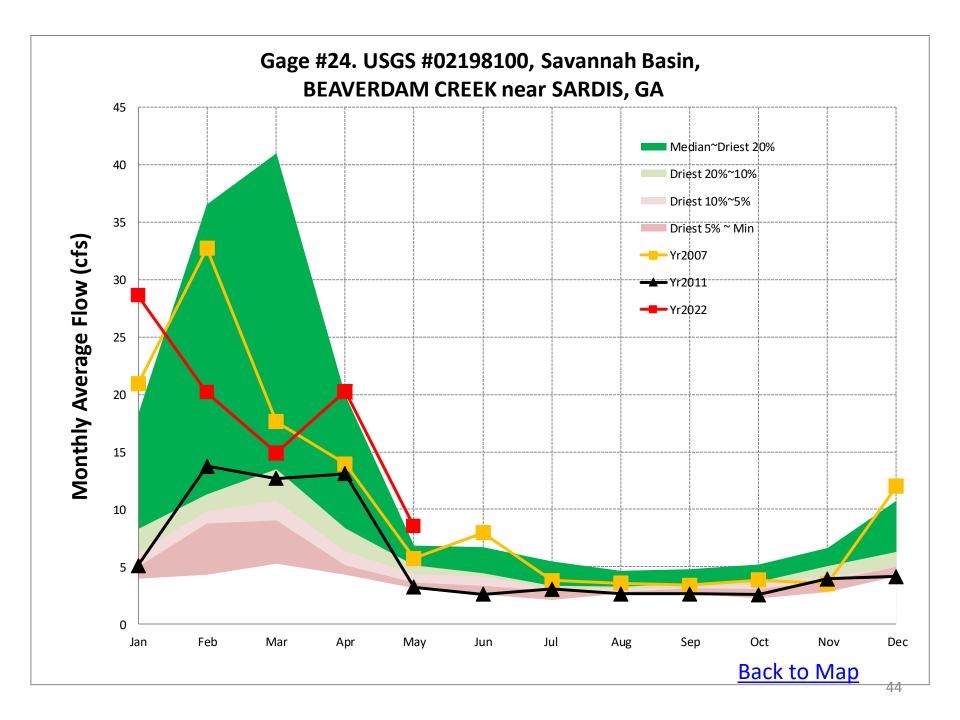


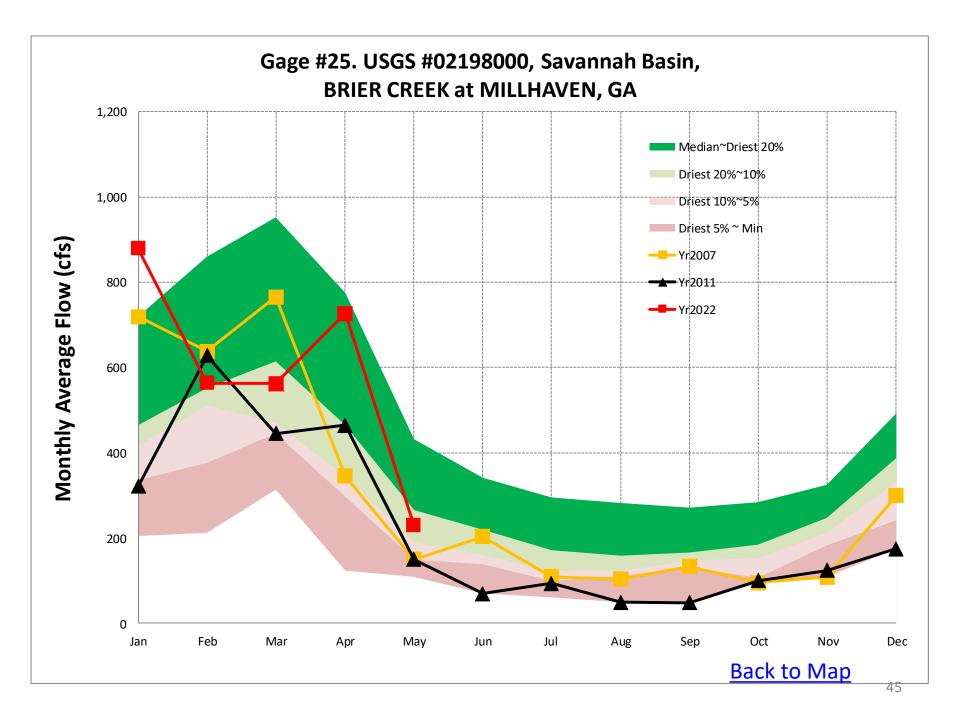


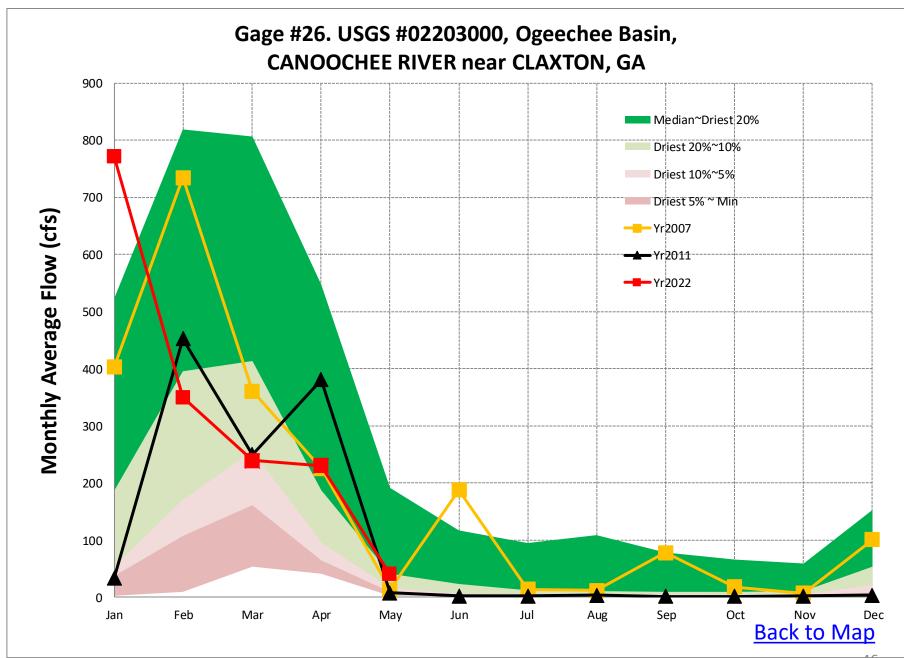


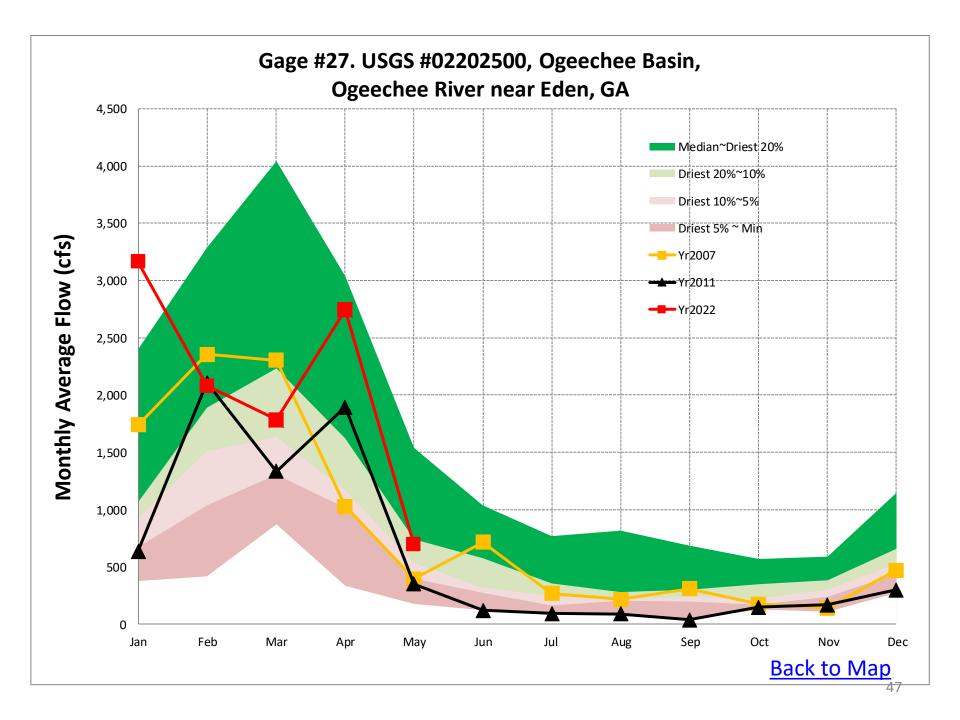


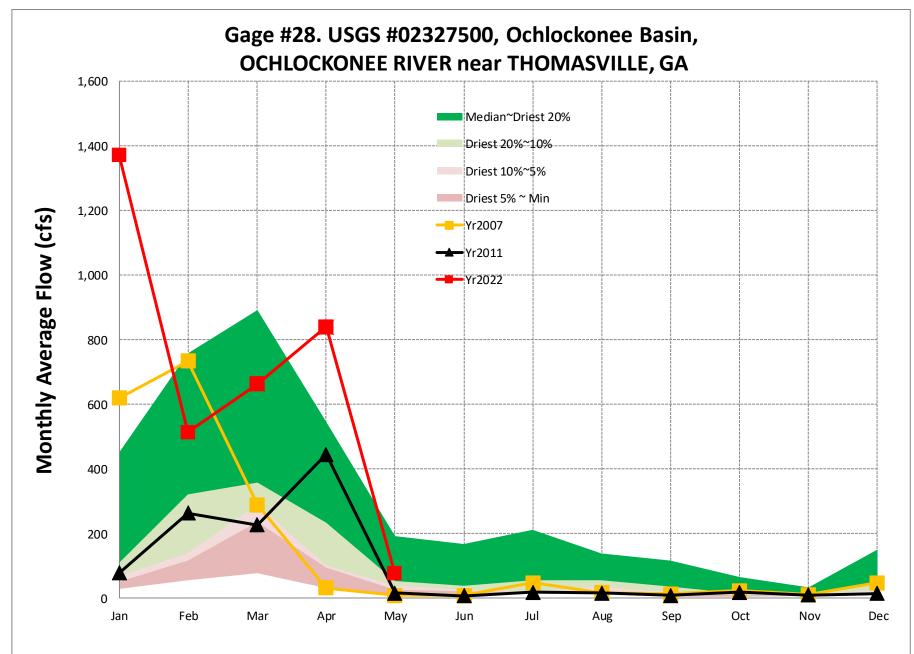


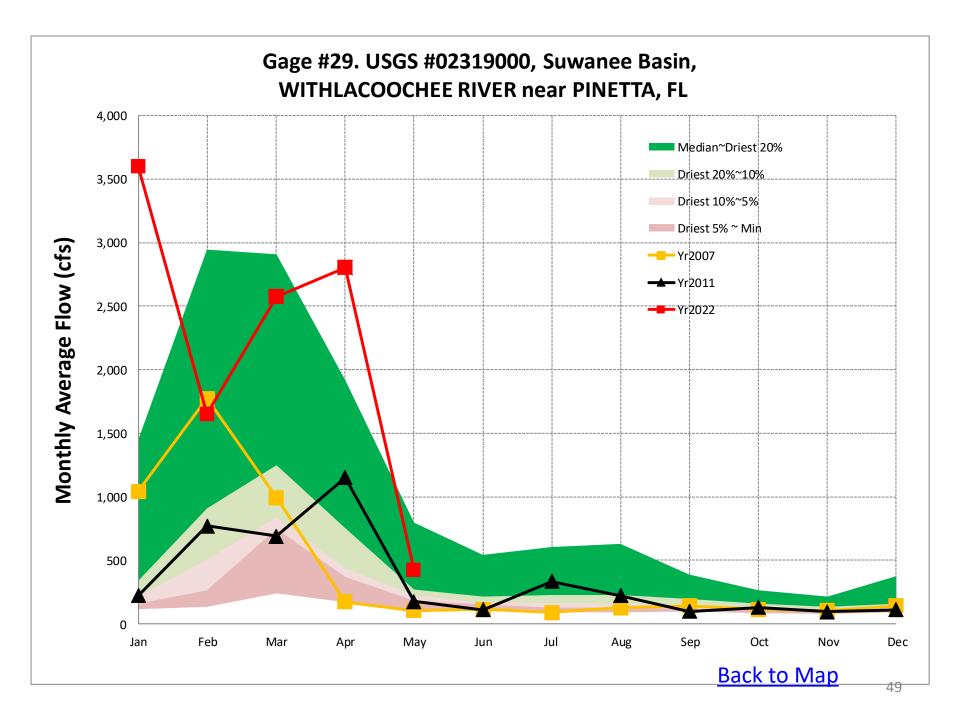


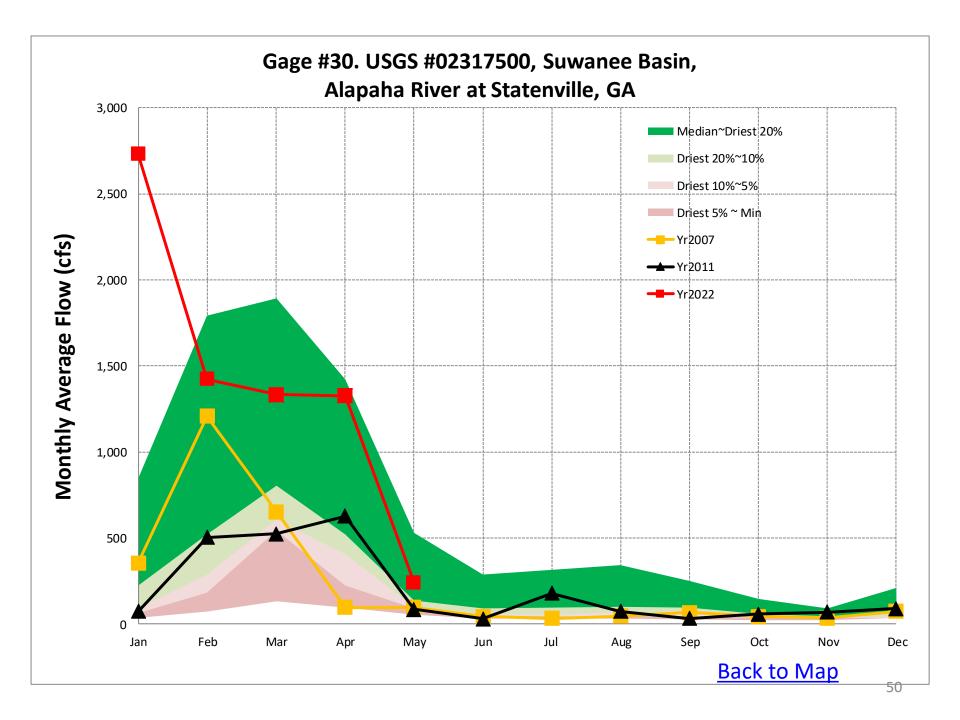


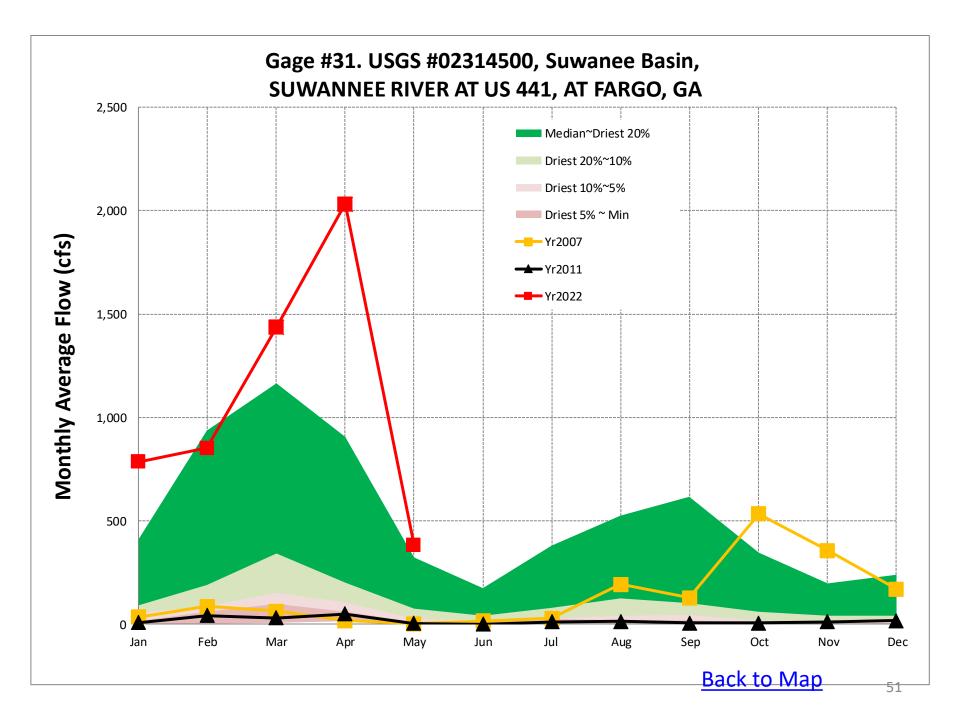


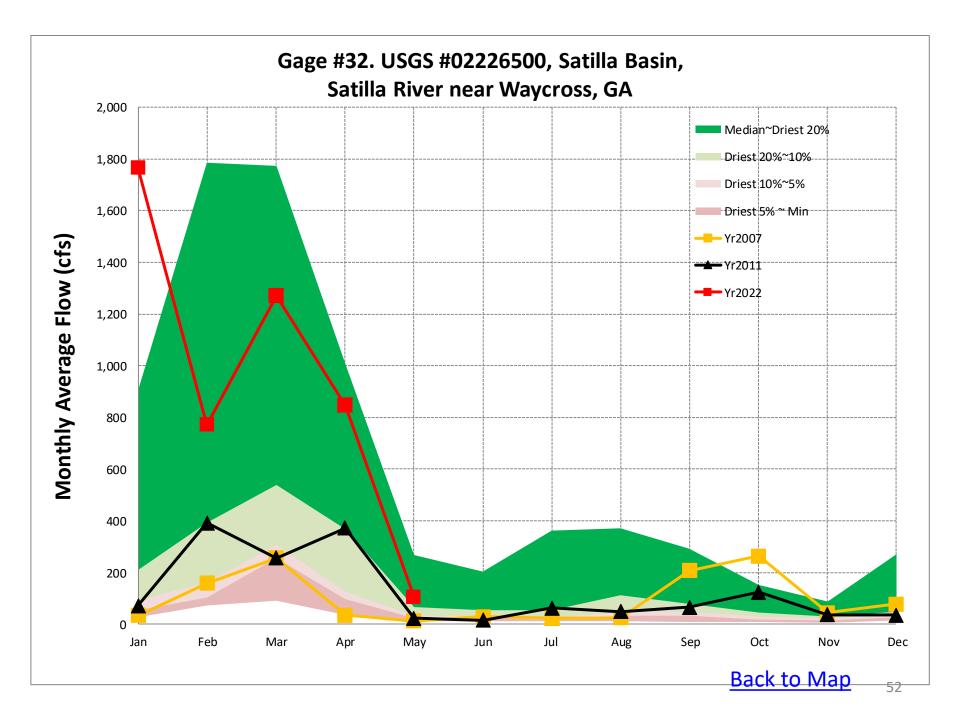


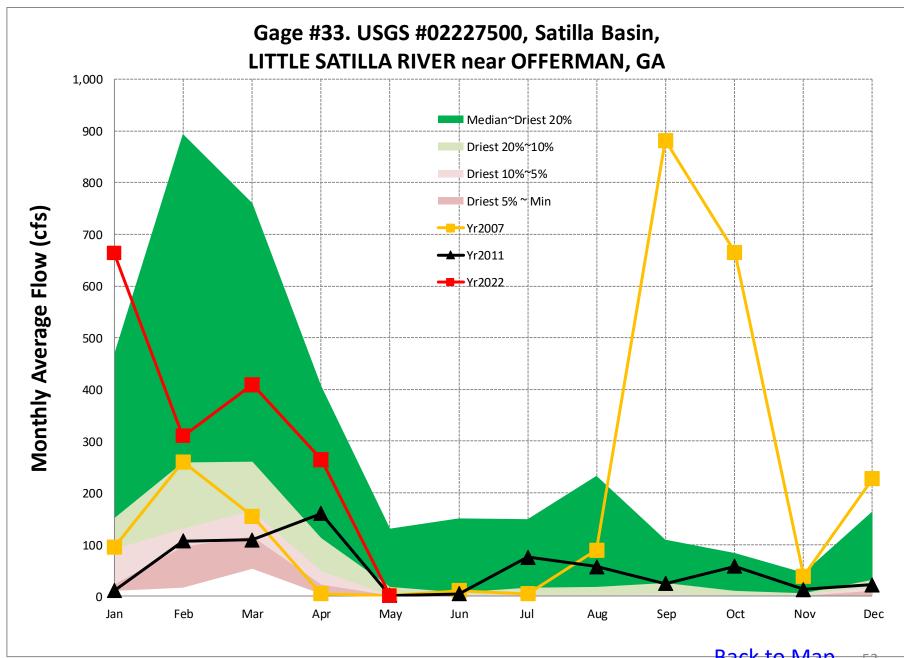


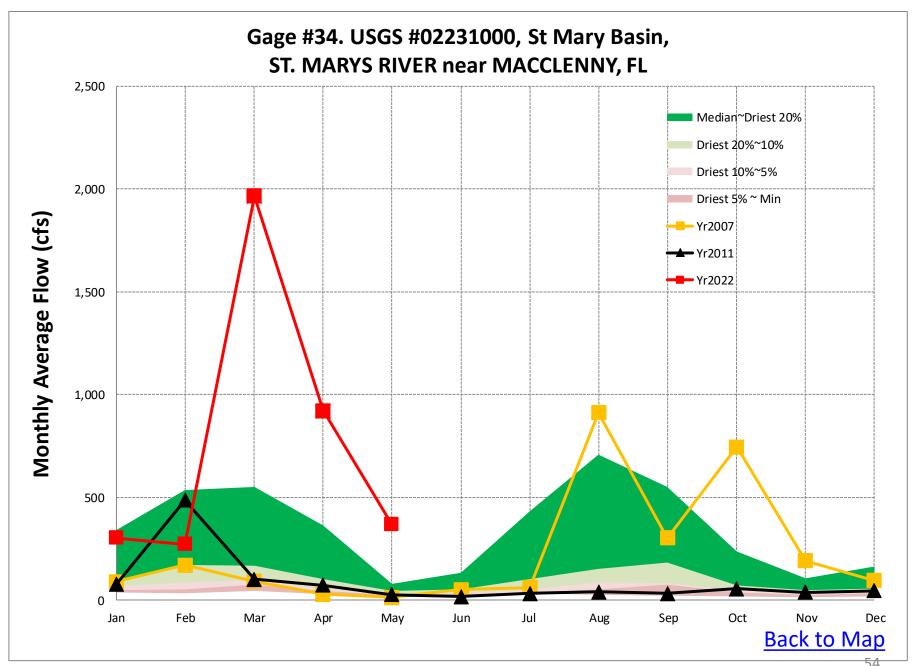












Groundwater Levels

Data Source: USGS

Rationale for Choosing USGS Monitoring Wells

EPD monitors 17 groundwater USGS monitoring wells shown on the following slide to assess drought conditions. These wells were selected for monitoring because they have:

- Long-term monitoring records consisting of three decades or more of data; and
- Real-time monitoring that represents the most up-to-date conditions.

USGS Wells Monitored

Chattahoochee Basin

1. 16MM03

Flint Basin

- 2. 11AA01
- 3. 13L180
- 4. 12M017
- 5. 08K001
- 6. 11K003
- 7. 12K014
- 8. 13J004
- 9. 08G001
- 10. 10G313
- 11.09F520
- 16. 11J011

Oconee Basin

12. 21T001

Tennessee Basin

13.03PP01

Suwanee Basin

- 14. 19E009
- 17. 27E004

Ogeechee Basin

15. 35P094

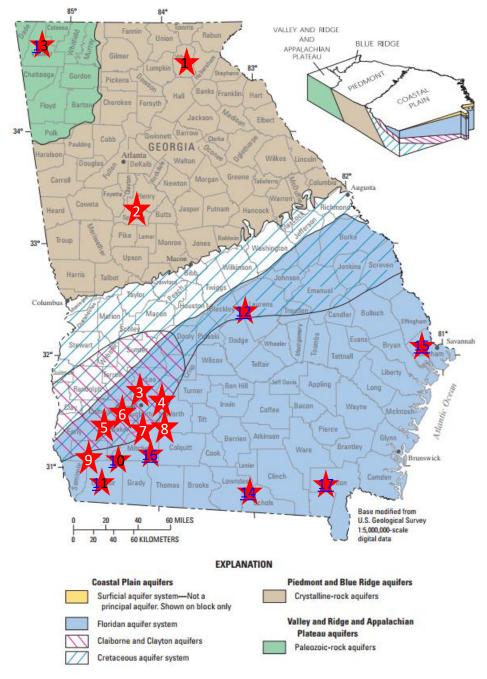


Figure 2. Area of use of principal aquifers and physiographic provinces in Georgia (modified from U.S. Geological Survey, 2006).

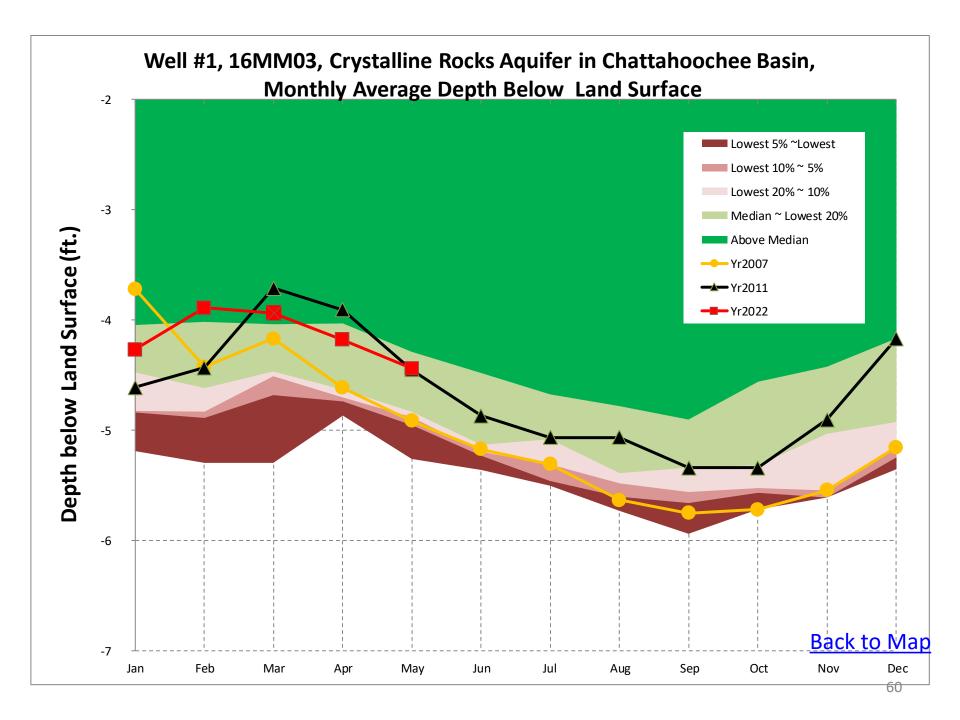
Groundwater Level Graphs

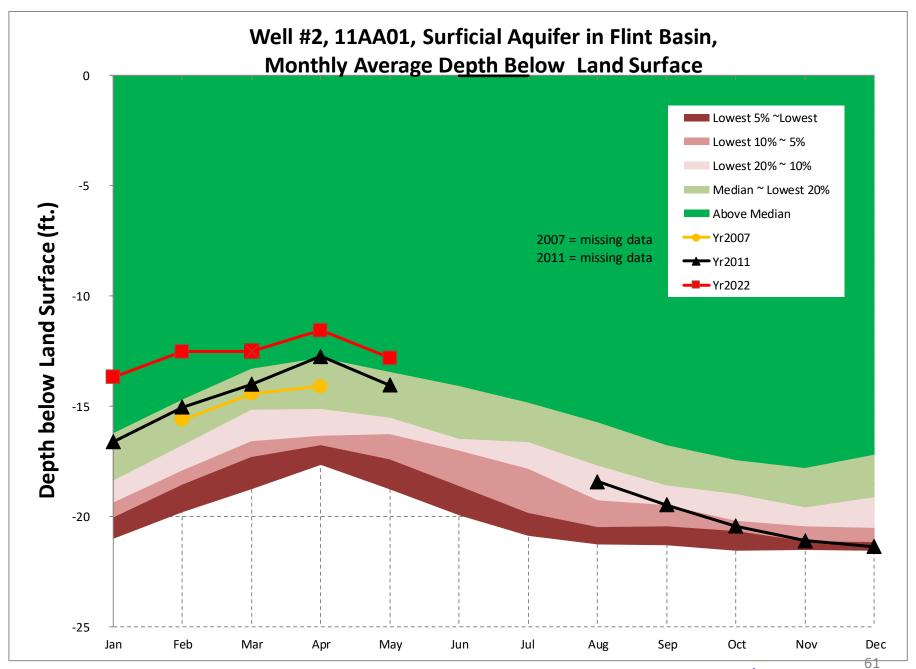
- For each of the 17 groundwater wells, EPD has prepared a graph that shows monthly average groundwater levels from January 2022 through May 2022;
- To help put these levels into perspective, for comparison purposes, each graph also shows:
 - Monthly average levels at that same well for the years 2007 and 2011 when groundwater levels were at or near recorded low levels across much of the state; and
 - And a statistical composite of historical conditions at that same gage showing the "lowest" 50, 20, 10, and 5 percent of all recorded monthly average levels at the same well.

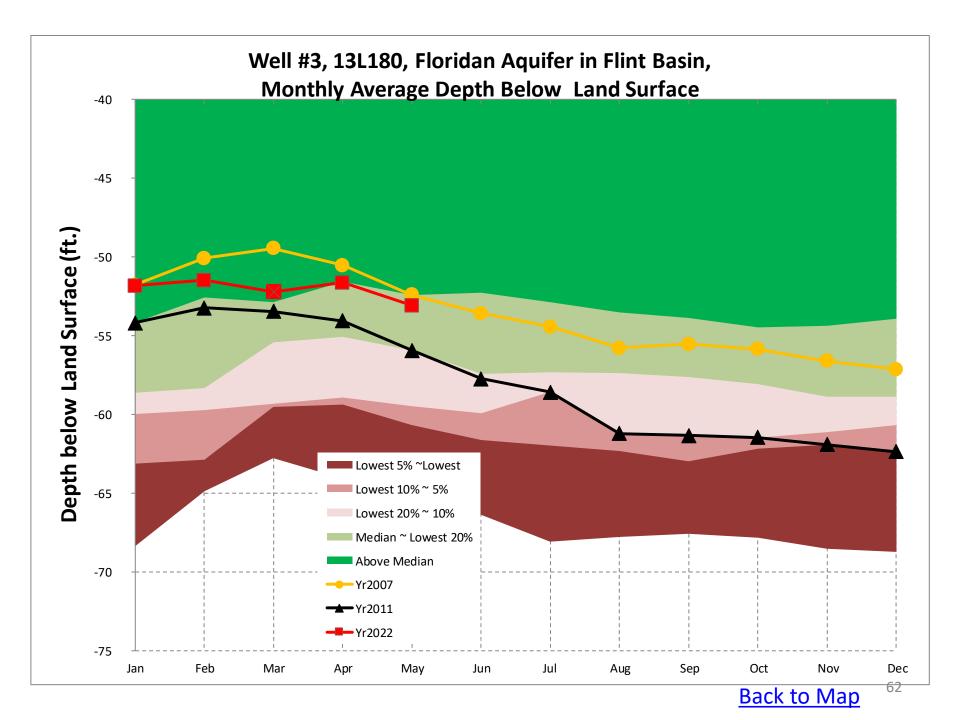
How to Read the Groundwater Level Graphs Example: Well #11, 09F520, Flint River Basin

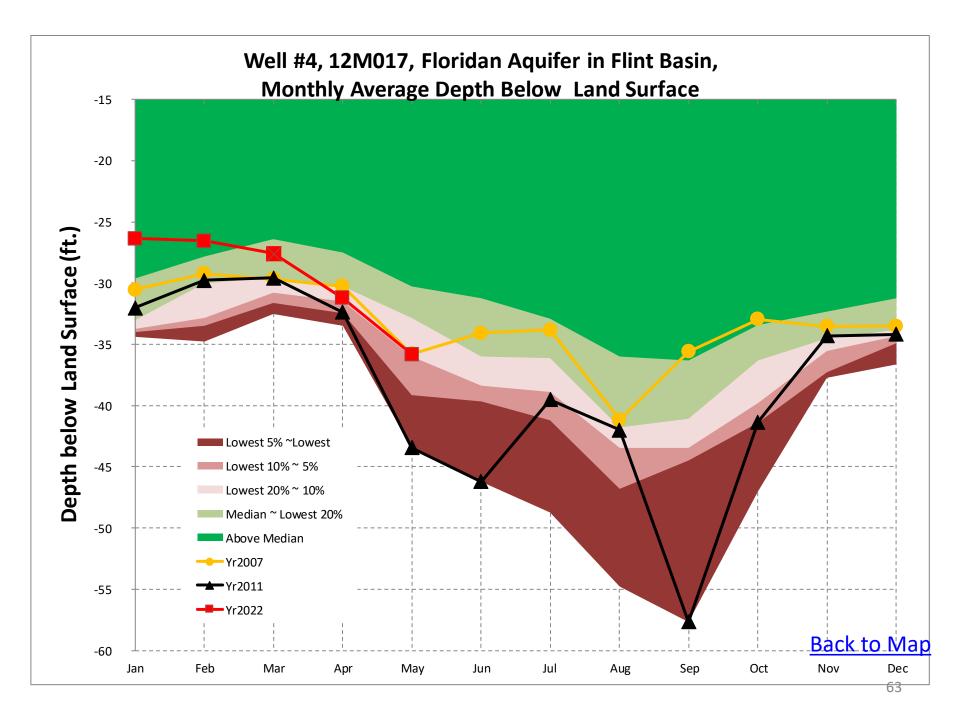
The groundwater level graph for Well #11, USGS 09F520 shows:

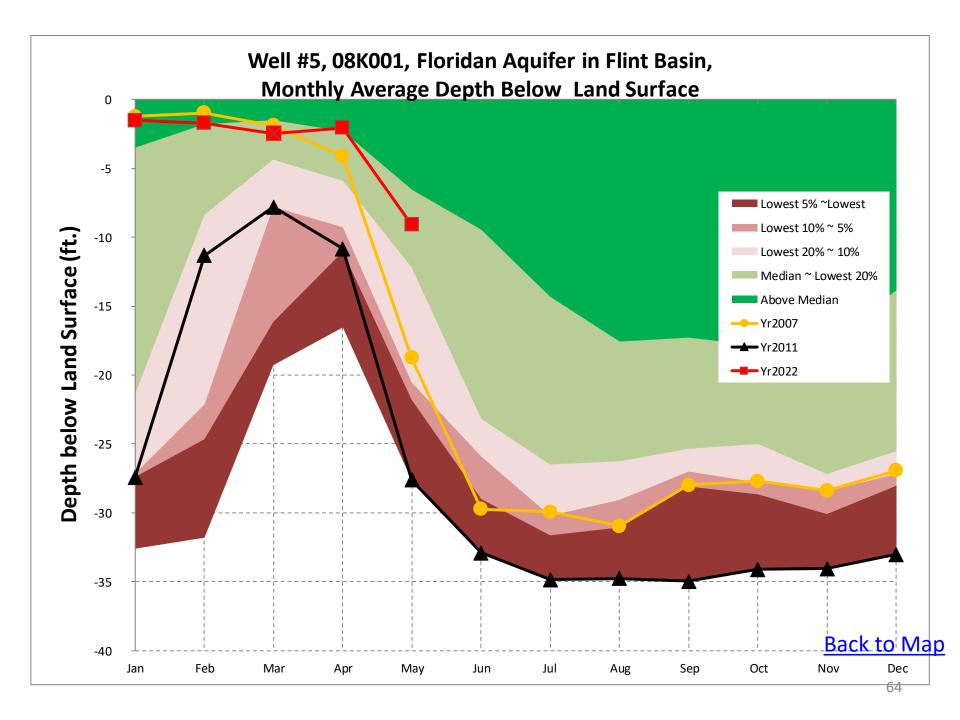
- The average monthly groundwater level in May 2022 was 47 ft below land surface. The statistical composite of all historical data for this well shows that monthly average groundwater levels in May have historically been lower than May 2022 about 42% of the time; about 58% of the time in May they have been higher.
- The average monthly groundwater level in May 2011 was 52 ft below land surface. The statistical composite of all historical data for this well shows that monthly average groundwater levels in May have historically been lower than May 2011 about 2% of the time; about 98% of the time in May they have been higher.
- The average monthly groundwater level in May 2007 was 53.4 ft below land surface. The statistical composite of all historical data for this well shows that monthly average groundwater levels in May have historically been lower than May 2007 about 0.1% of the time; about 99.9% of the time in May they have been higher.

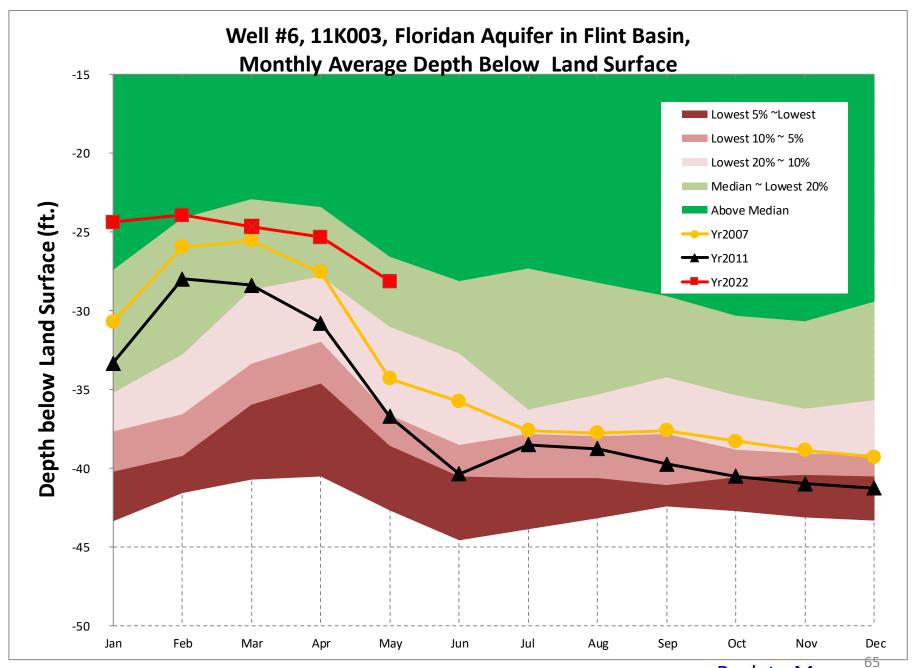


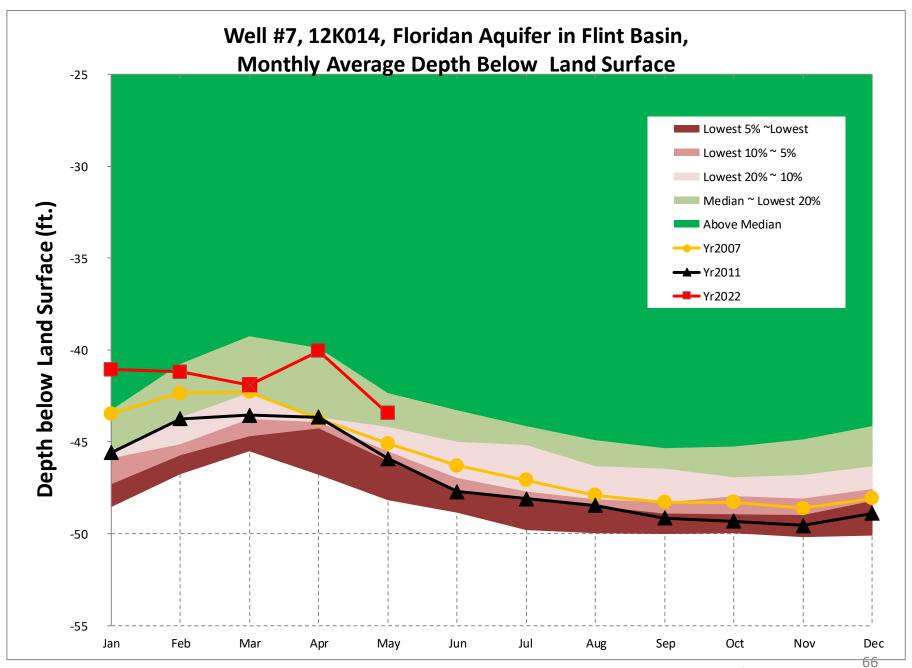


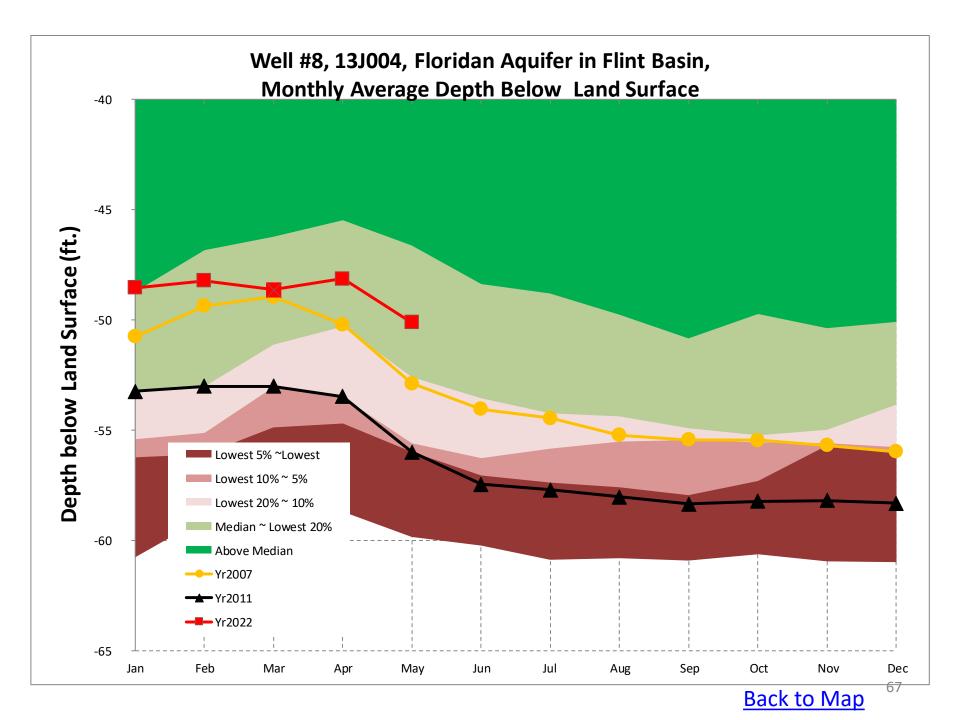


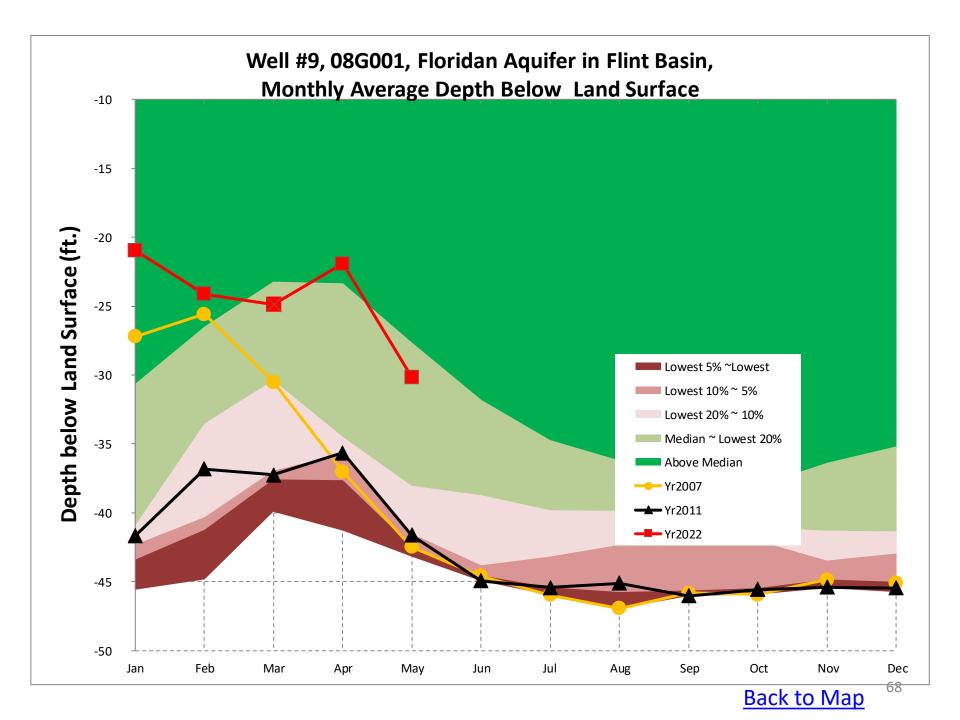


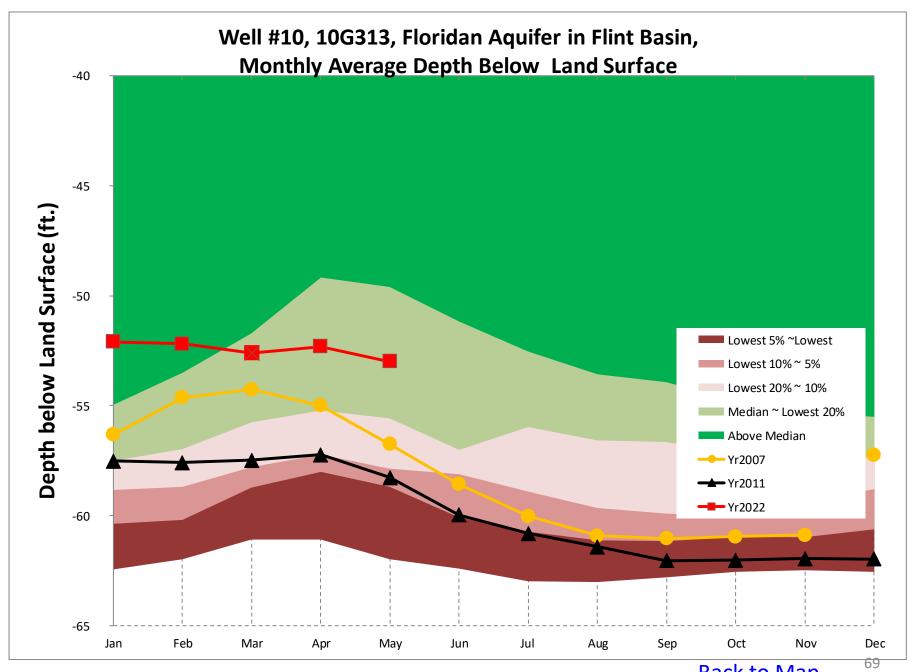


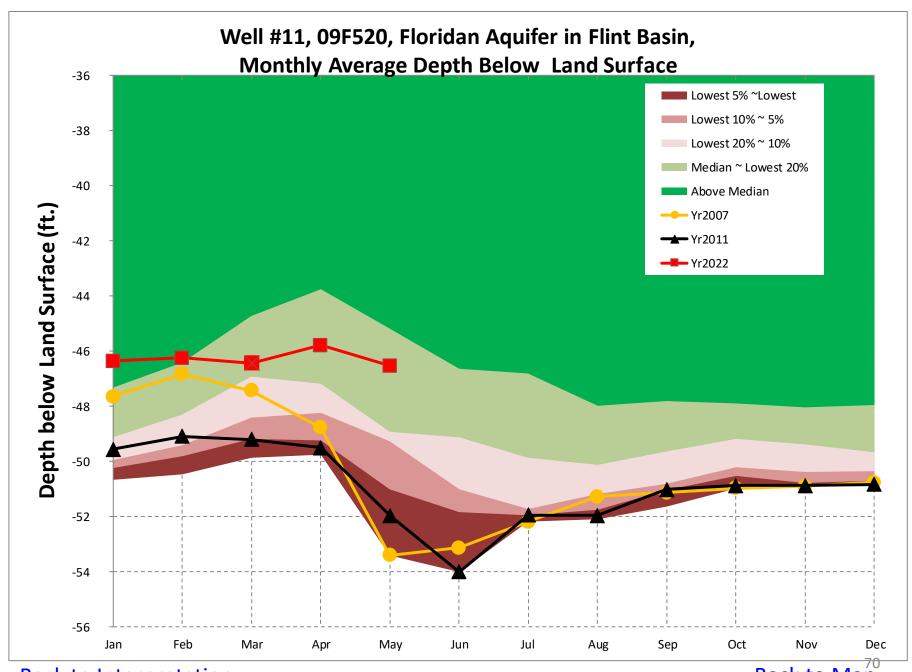


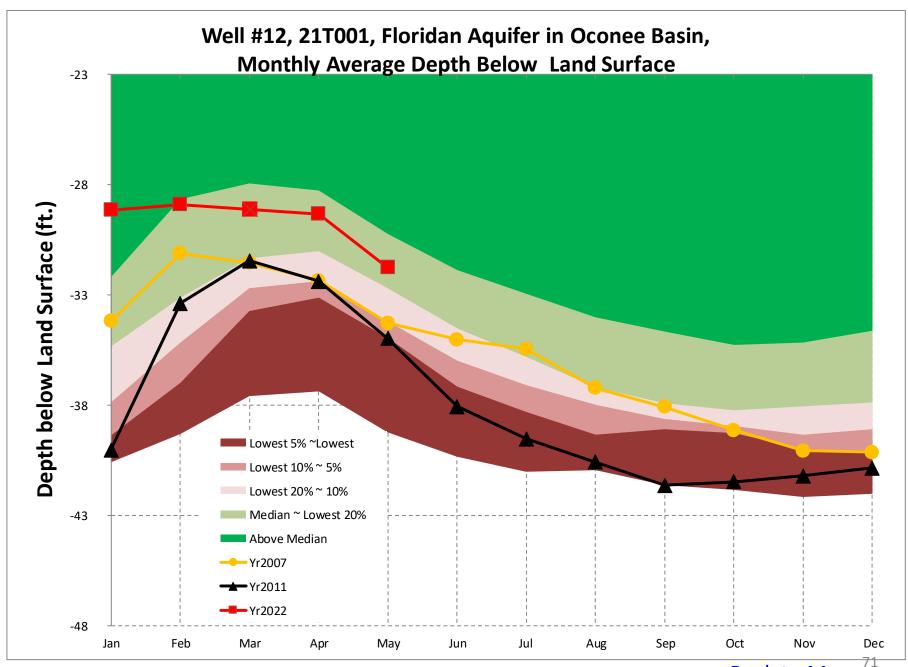


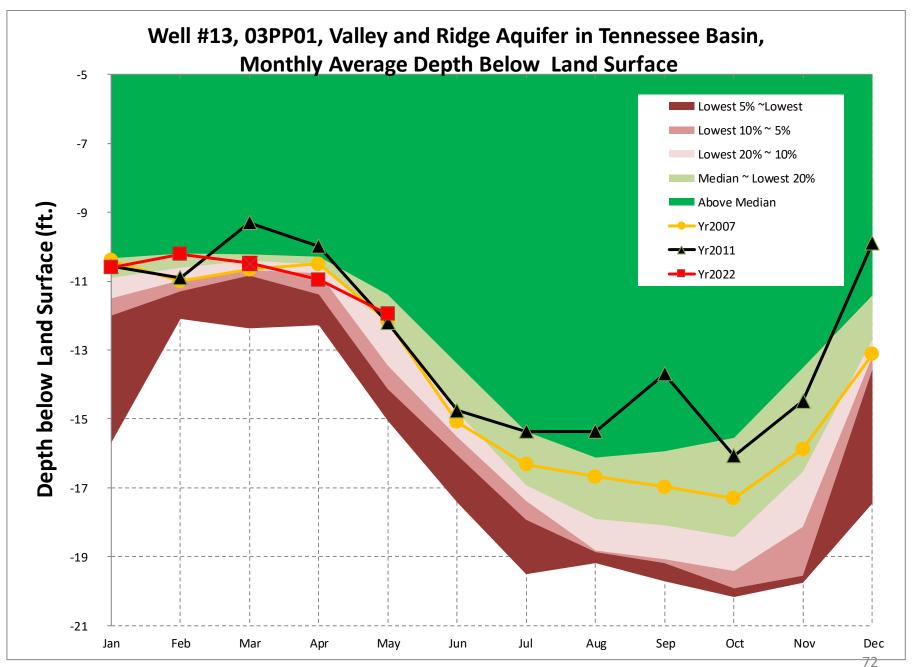


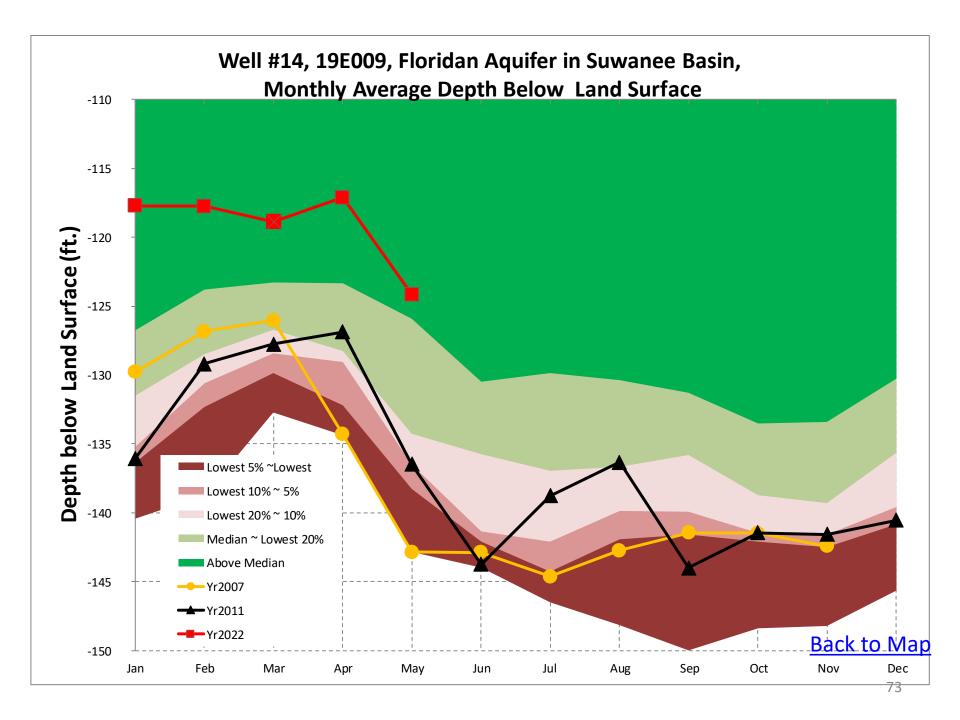


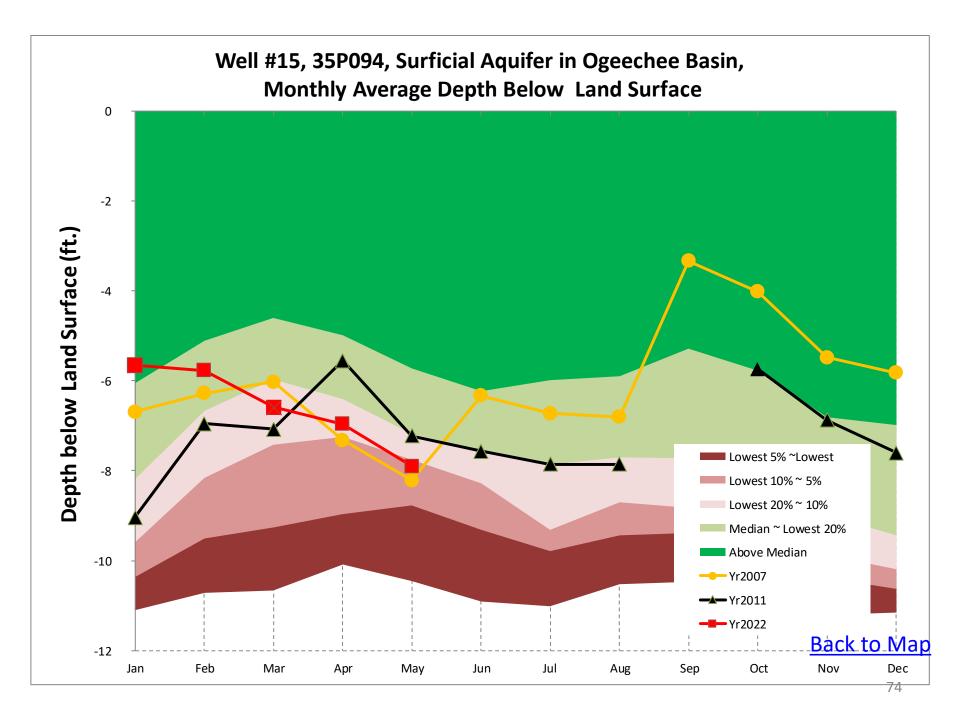


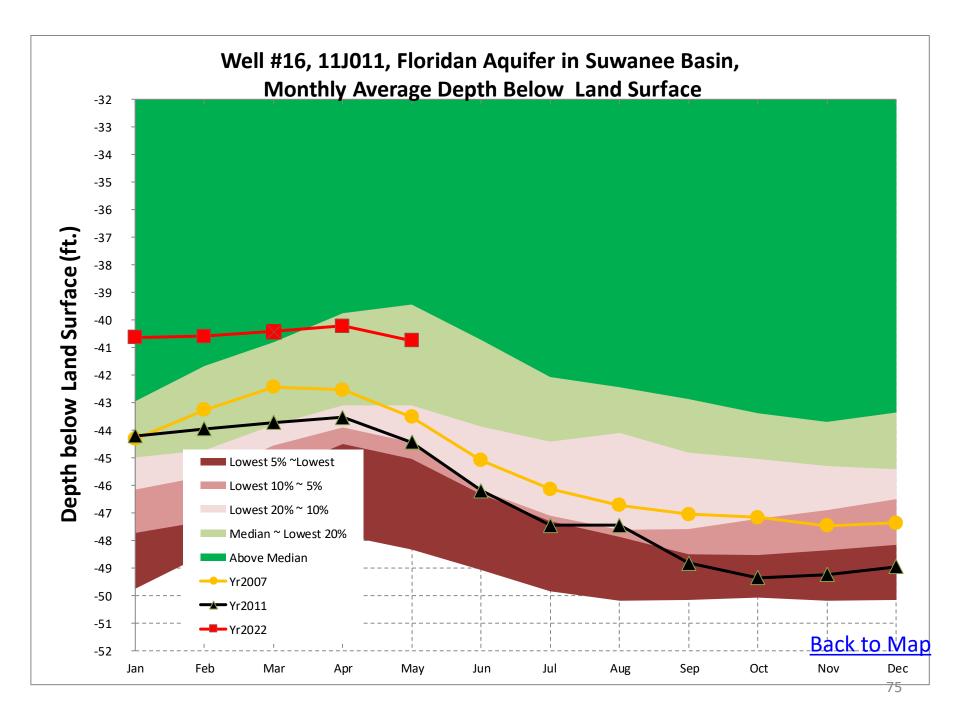


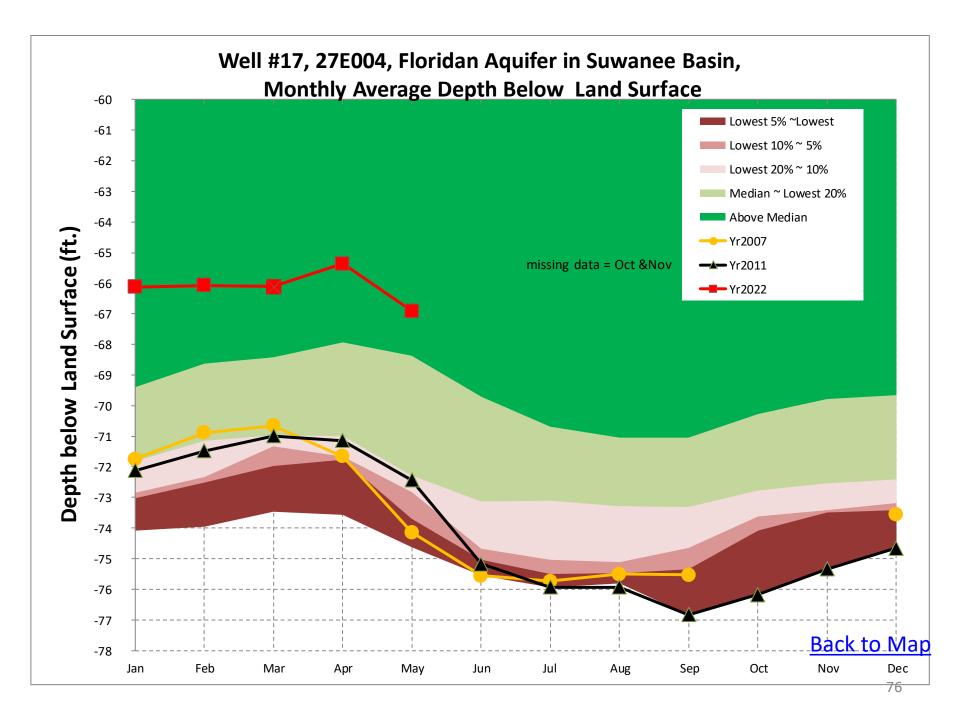












Reservoir Levels

Data Source: US Army Corps of Engineers

Coosa Basin

- 1. Carters
- 2. Allatoona

Chattahoochee Basin

- 3. Lanier
- 4. West Point
- 5. W.F. George

Savannah Basin

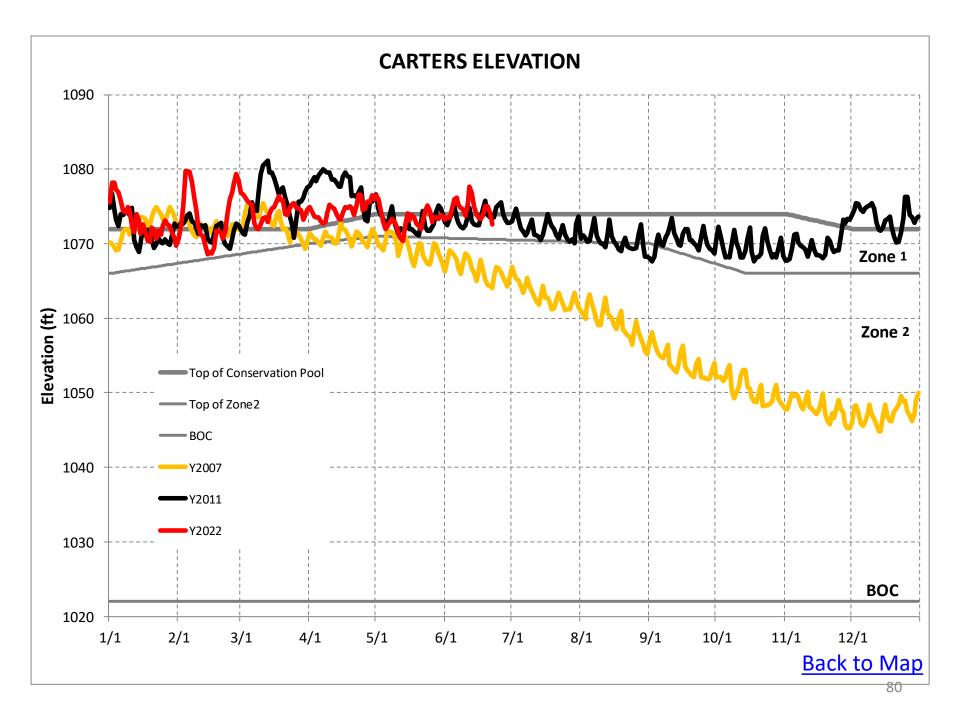
- 6. Hartwell
- 7. Thurmond

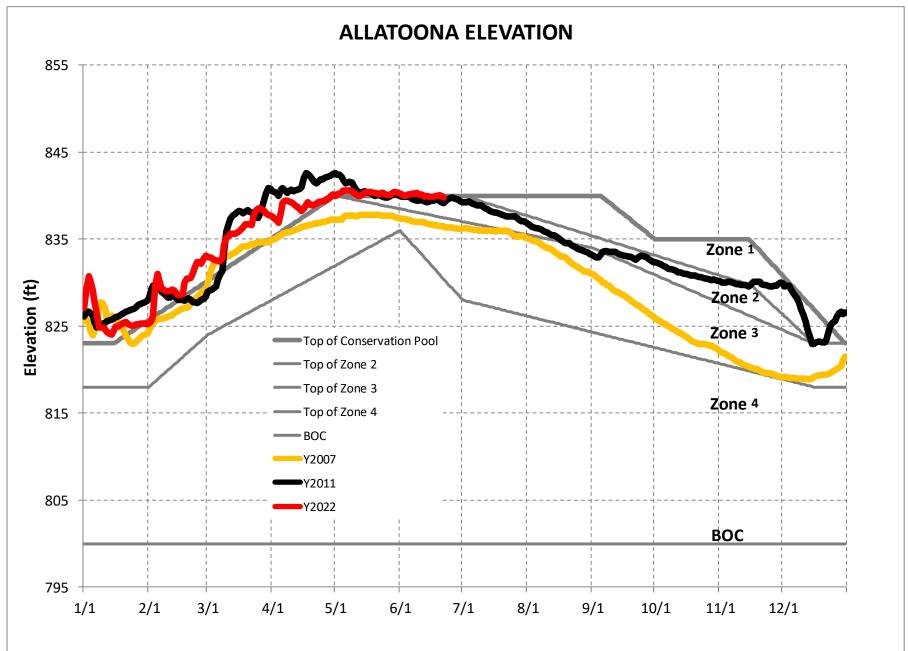


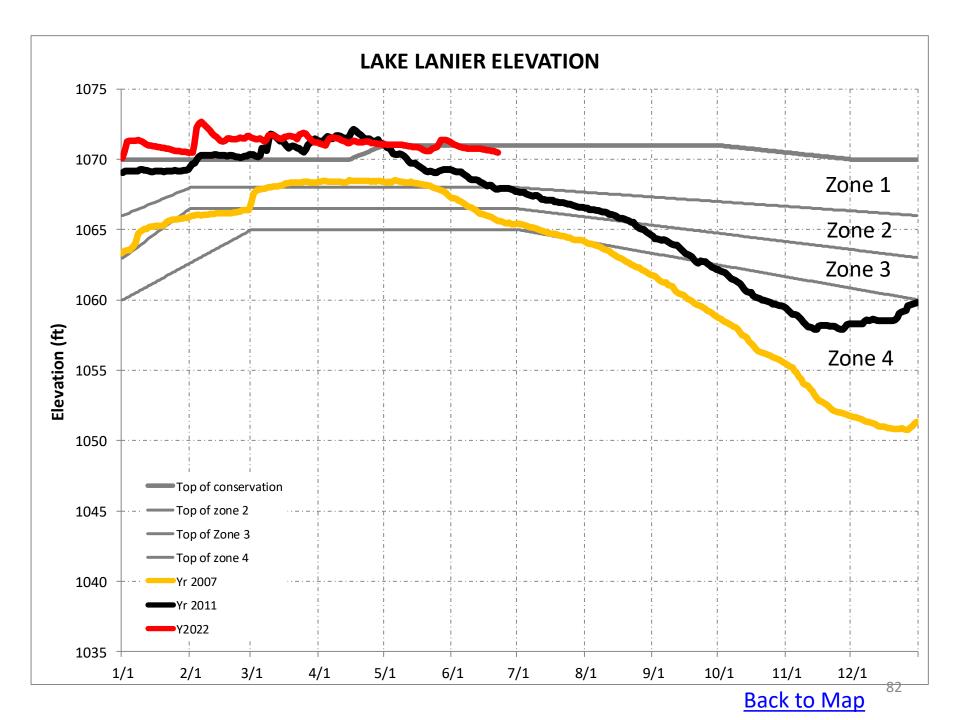
EPD monitors the water levels of seven reservoirs to assess drought conditions.

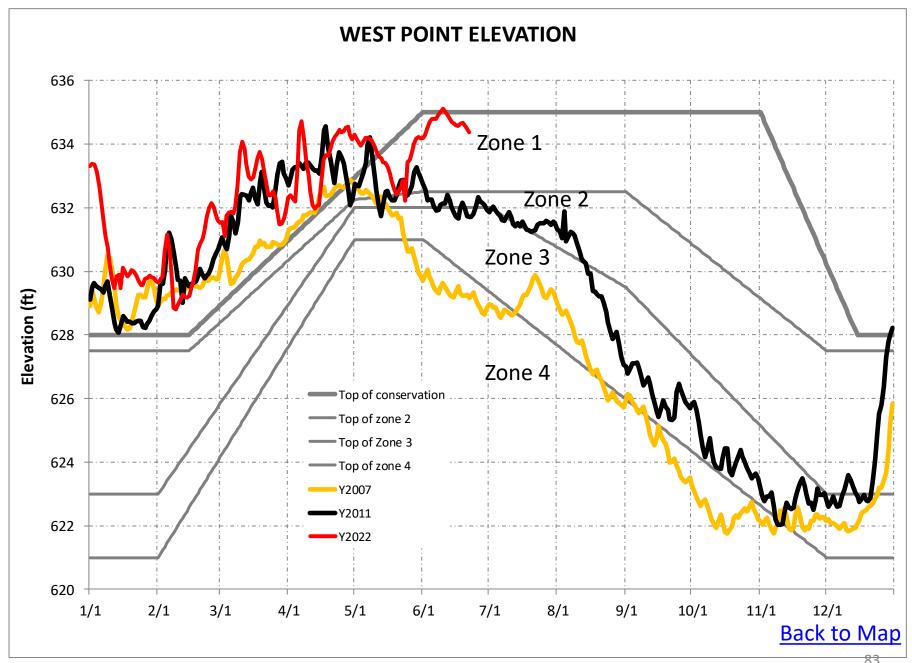
Reservoir Elevation Graphs

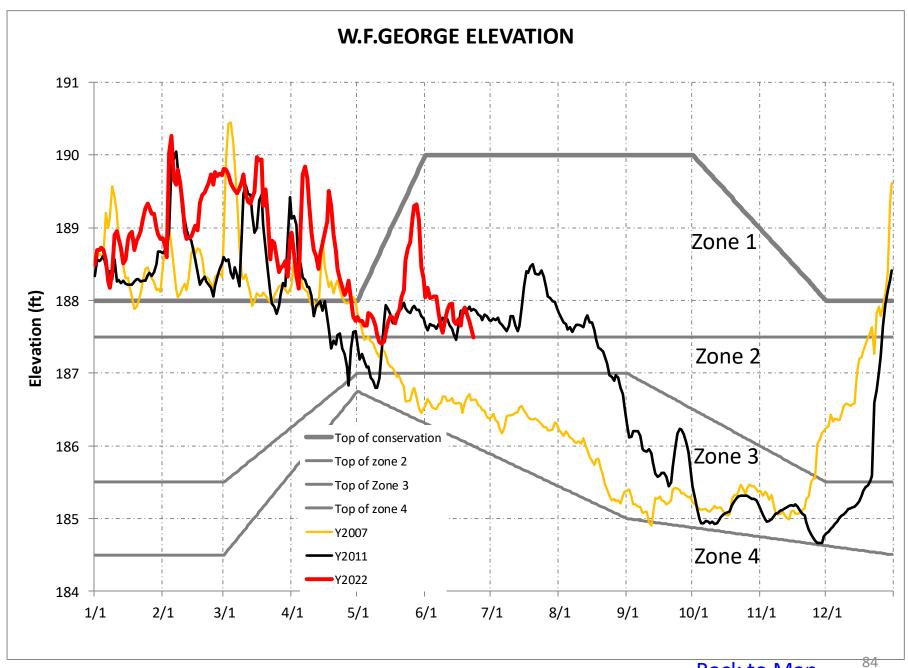
- The following graphs show the reservoir elevation curves for January 2022 through May 2022.
- Each graph also shows the Action Zone Divides (or Levels) for each reservoir
 - Zone 1 is the top layer of the conservation pool
 - Zone 2 is the layer below Zone 1
 - Zone 4 is the lowest layer in the conservation pool
 - There is no conservation storage below the bottom of Zone 4
- To put 2022 reservoir elevations into perspective, elevations for 2007 and 2011 are also shown.



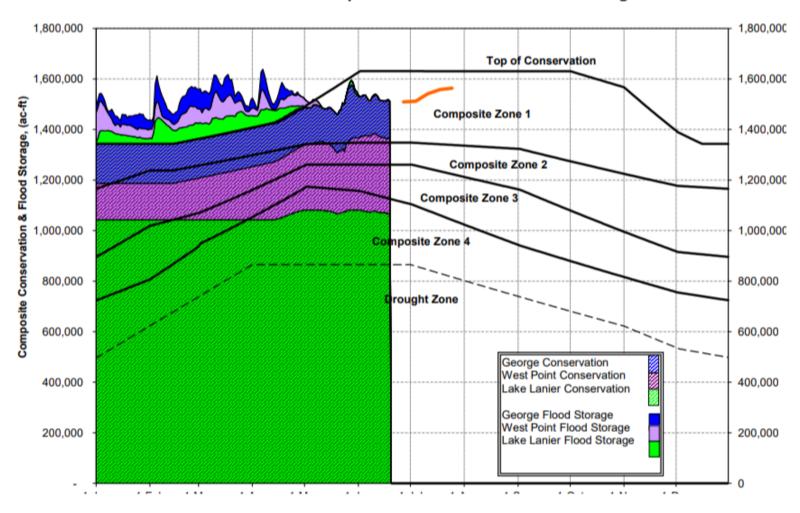


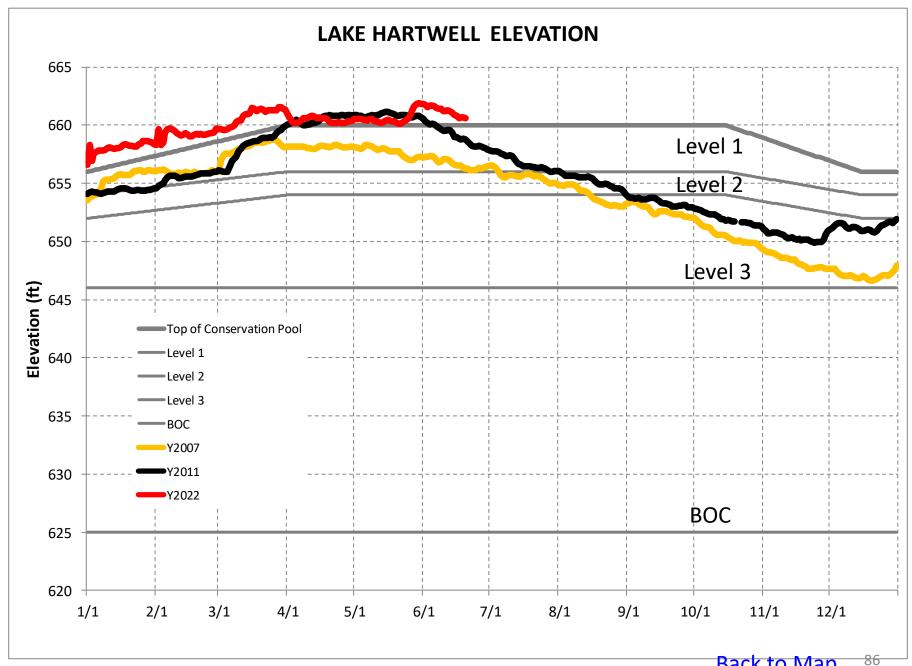


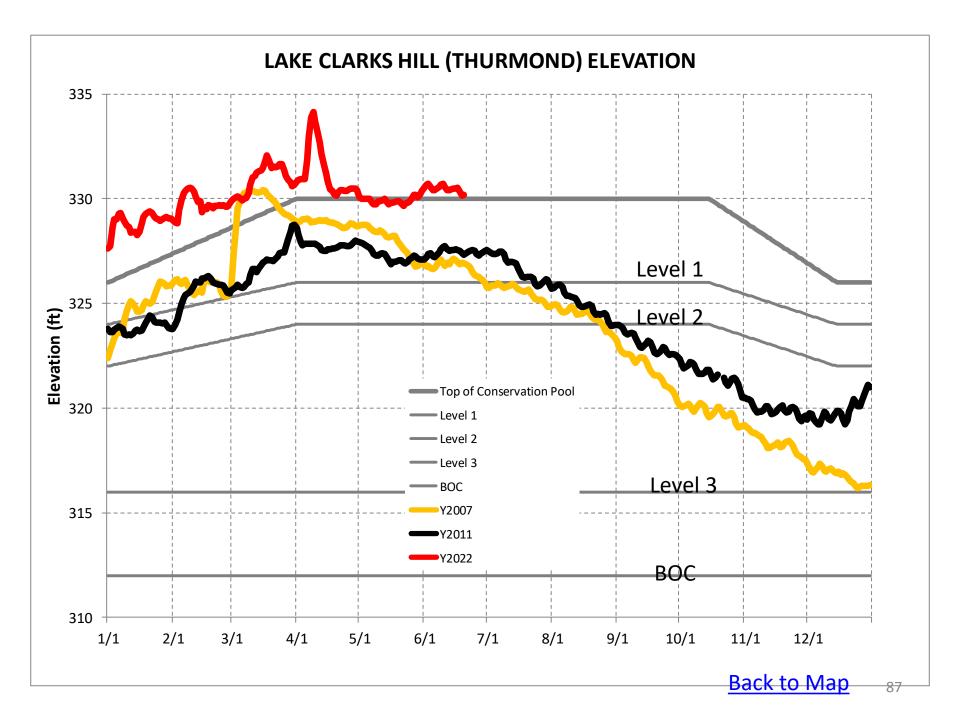




2022 ACF Basin Composite Conservation and Flood Storage







Climate Prediction Center 3-month Temperature and Precipitation Probability Outlook and Seasonal Drought Outlook

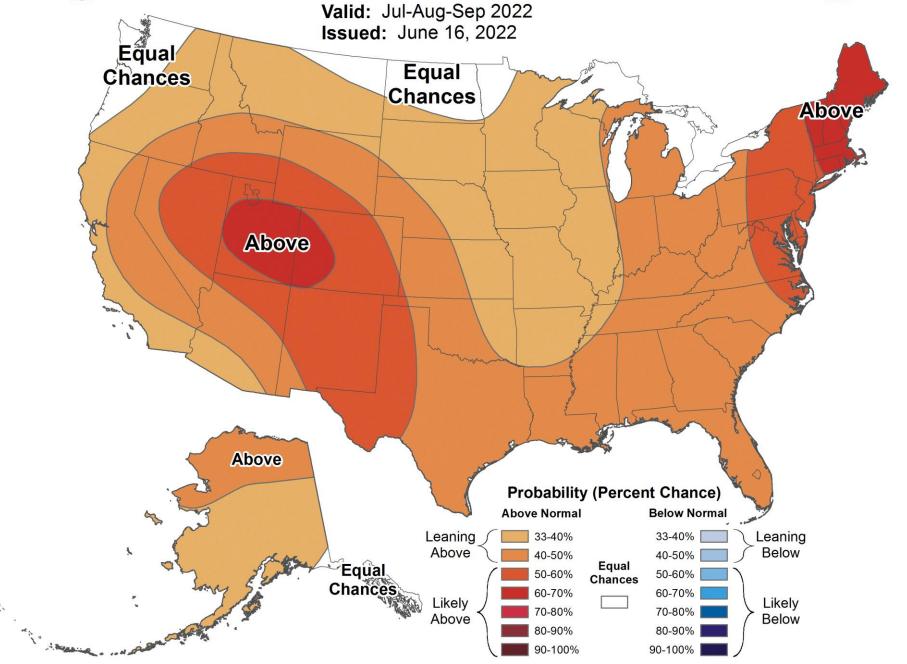
Data Source:

http://www.cpc.ncep.noaa.gov/



Seasonal Temperature Outlook

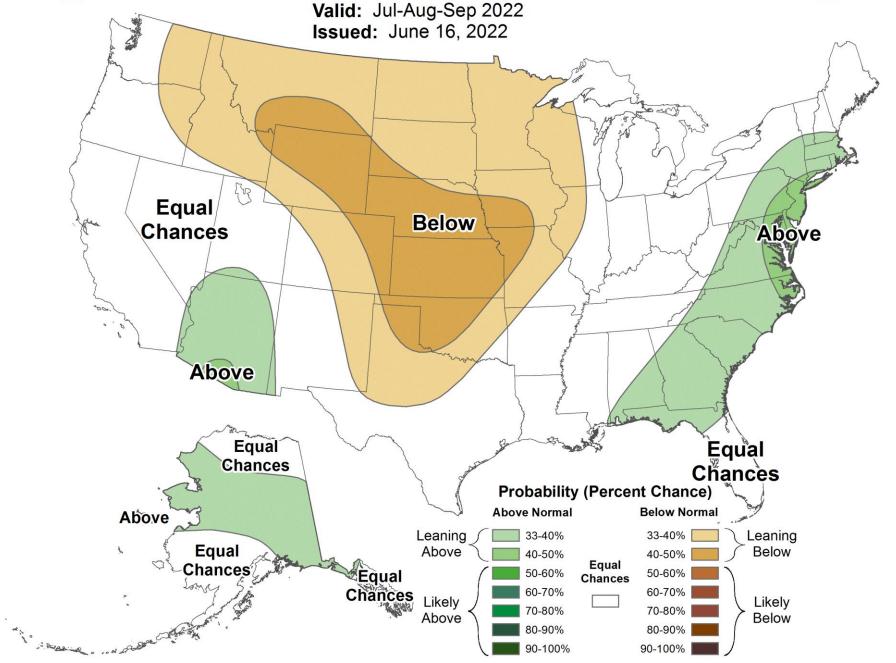






Seasonal Precipitation Outlook





U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for June 16 - September 30, 2022 Released June 16

