

Drought Indicators Report

Georgia Environmental Protection Division

August 2021

Background

Pursuant to the Rules for Drought Management, Section 391-3-3-.04 Drought Indicators and Triggers, 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 July 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 August 12, 2021.

Drought Indicator Analysis Summary (slide 1 of 2)

- U.S. Drought Monitor – Abnormally Dry (D0, the least intense level) does not exist in any areas in GA.
- Precipitation – Three-month precipitation is normal or above normal across the state. Six-month precipitation is normal or above normal in all but five Counties (Butts, Newton, Morgan, Jasper, and Putnam). Twelve-month precipitation is normal or above normal in all counties but Jasper County.
- Soil Moisture – Soil moisture conditions are normal or above normal except in Southwest corner of GA, which is slightly below normal.

Drought Indicator Analysis Summary (slide 2 of 2)

- **Streamflow** – Stream flows at most selected USGS gages (32 out of 34) are near or above normal. Two gages are between the lowest 20th percentile and median (one in Chattooga River, the other in Tobesofkee Creek near Macon).
- **Groundwater Level** – Groundwater levels are above or near normal in all selected wells (17 out of 17).
- **Reservoir Levels** – At the end of July, all federal reservoirs in ACF and ACT Basins are in Zone 1. Federal reservoirs in Savannah River Basins are above 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 above normal precipitation statewide in August – October 2021. U.S. Drought Outlook predicts no drought development likely in GA in August – October 2021.
- **Water Supplies** – No issues with water availability to water supply providers were reported.

US Drought Monitor

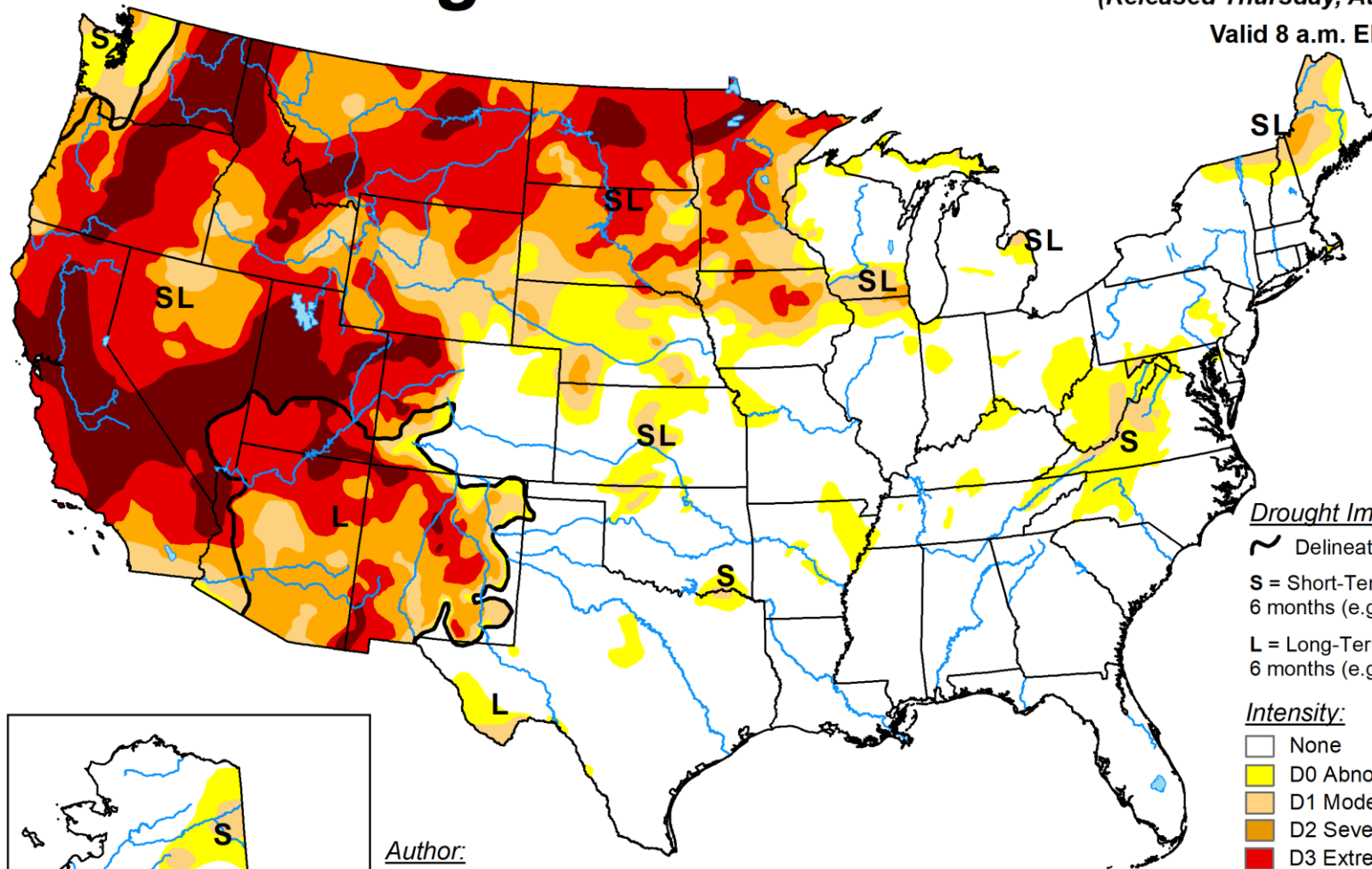
Data Source:

<http://droughtmonitor.unl.edu/>

U.S. Drought Monitor

August 10, 2021
(Released Thursday, Aug. 12, 2021)

Valid 8 a.m. EDT



Drought Impact Types:

~ Delineates dominant impacts

S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

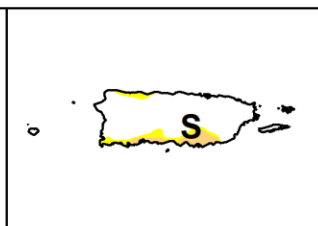
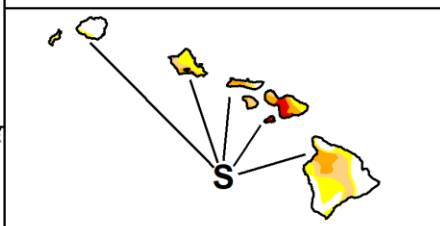
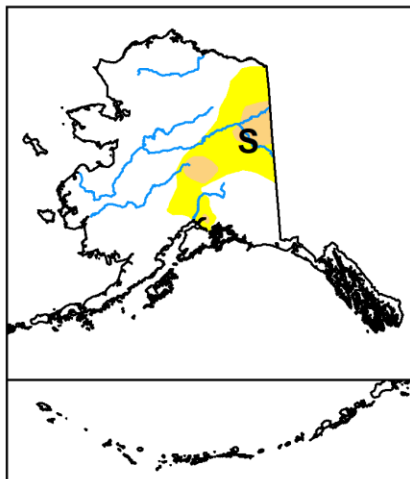
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

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

Author:

Richard Tinker
CPC/NOAA/NWS/NCEP



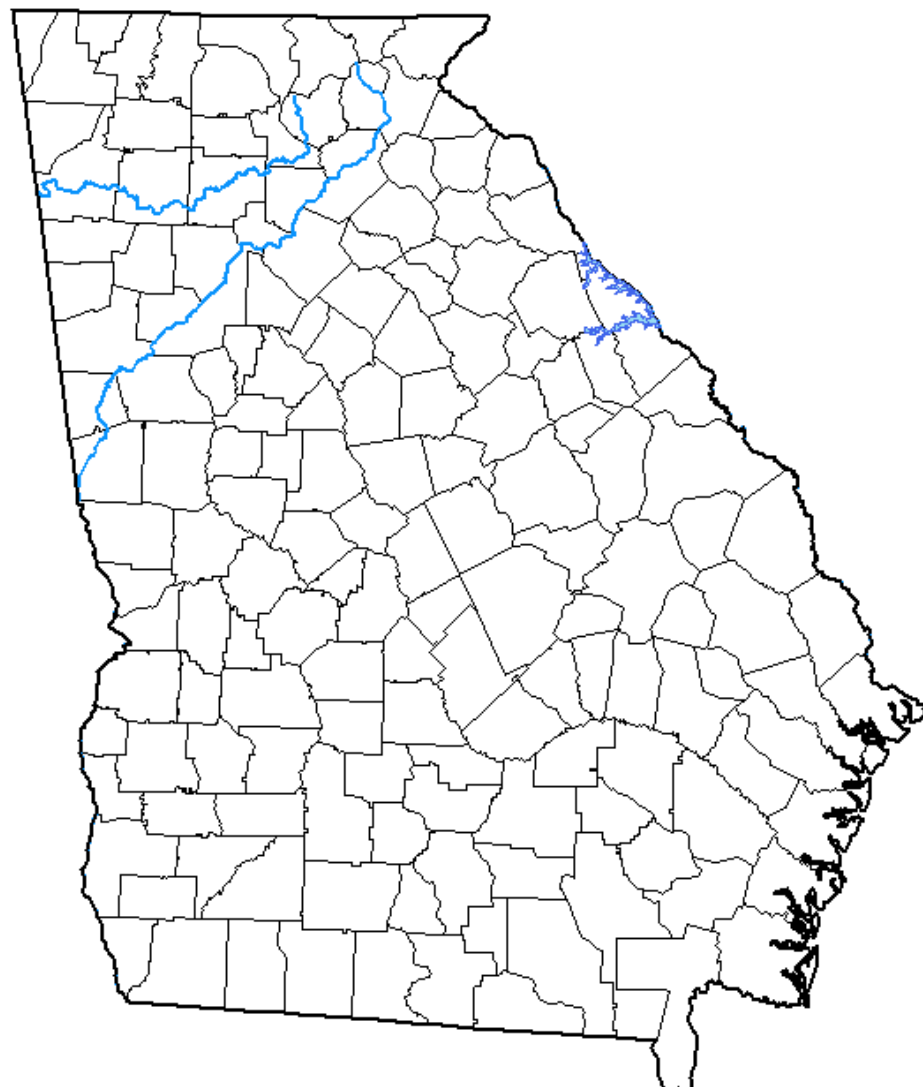
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>



droughtmonitor.unl.edu

U.S. Drought Monitor

Georgia



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Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	100.00	0.00	0.00	0.00	0.00	0.00
Last Week 08-03-2021	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago 05-11-2021	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 12-29-2020	65.78	34.22	0.00	0.00	0.00	0.00
Start of Water Year 09-29-2020	97.20	2.80	0.00	0.00	0.00	0.00
One Year Ago 08-11-2020	56.89	43.11	0.71	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>

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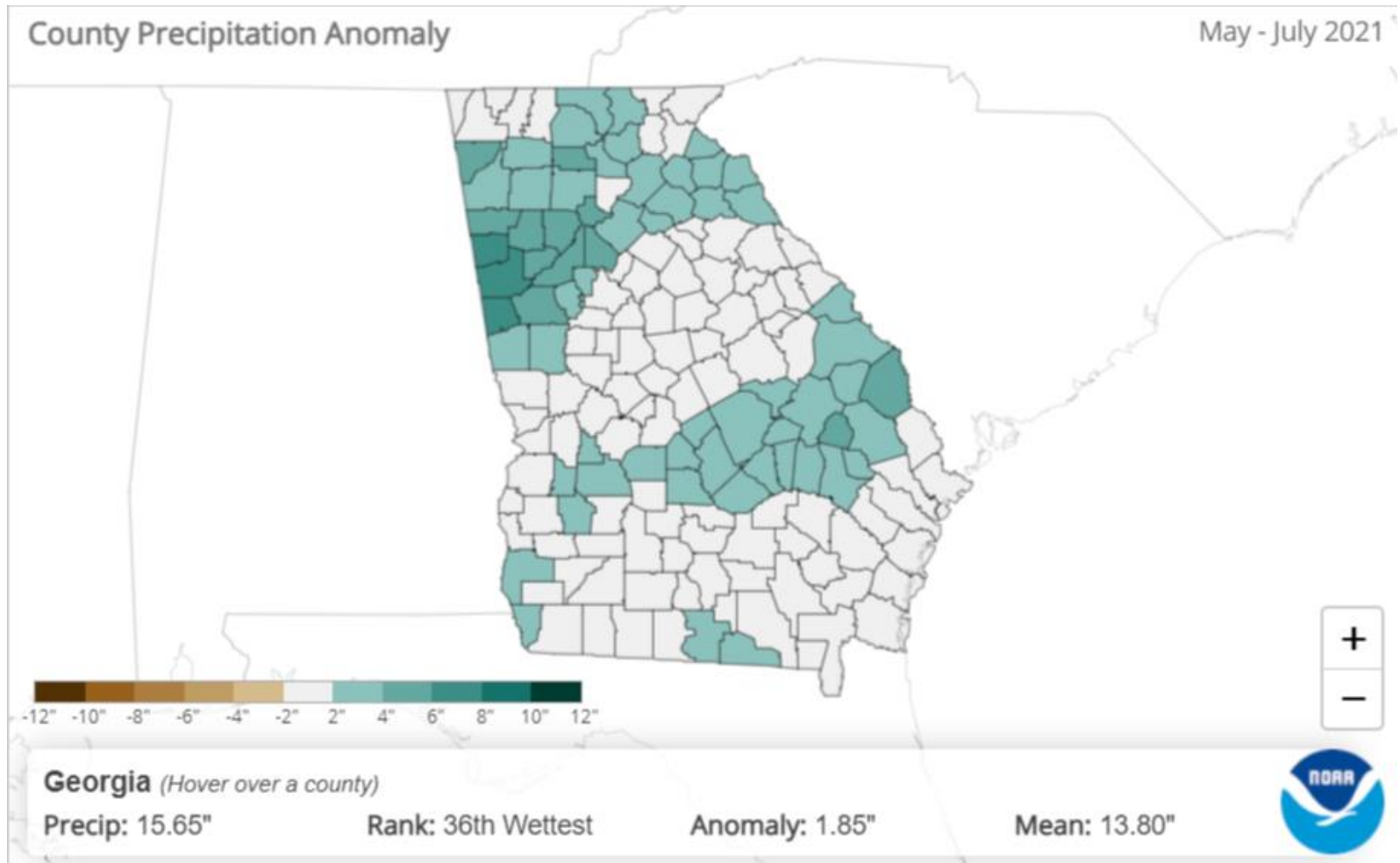
droughtmonitor.unl.edu

3, 6, and 12 Month Precipitation Anomaly

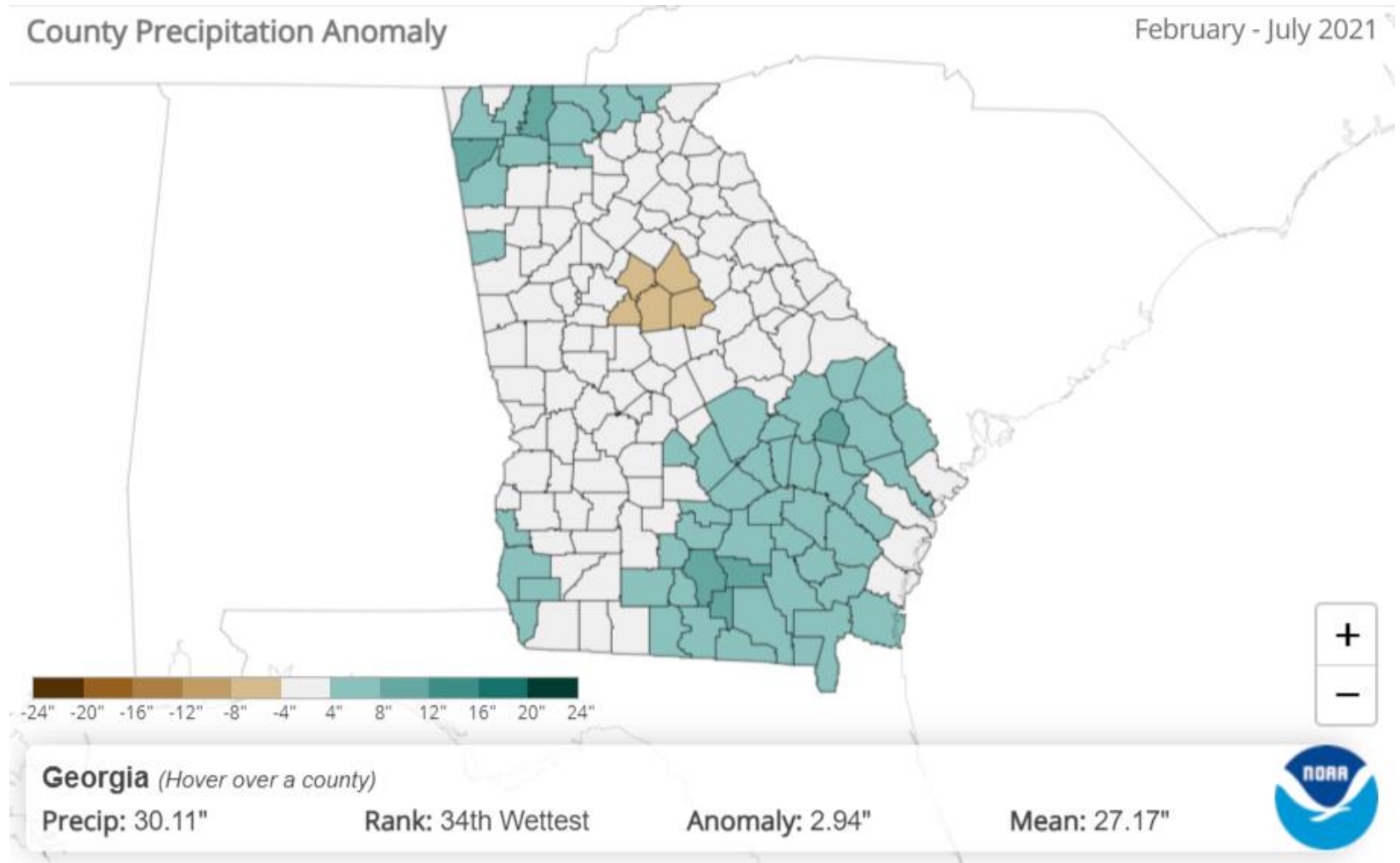
Data Source:

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

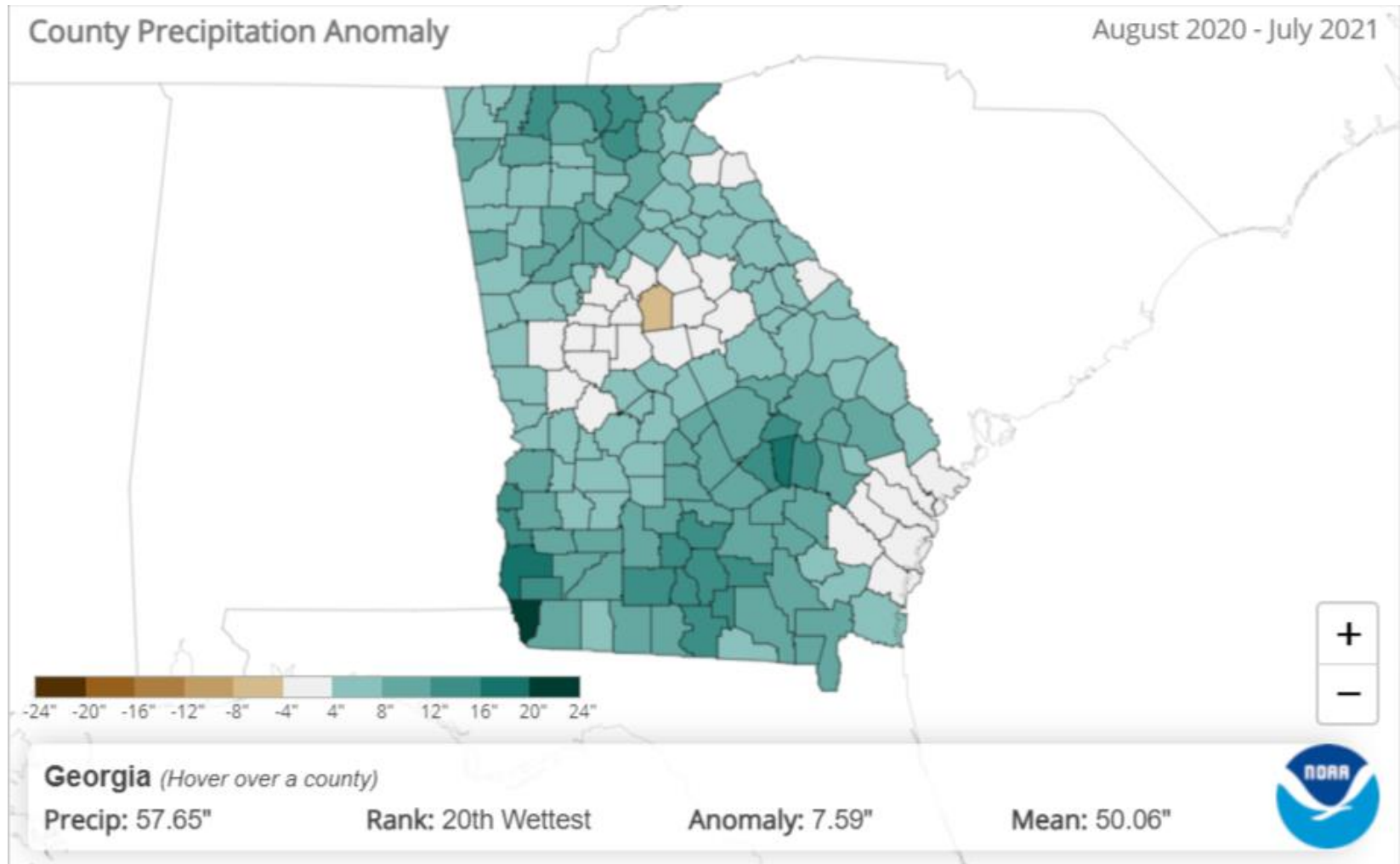
3 Month Precipitation Anomaly



6 Month Precipitation Anomaly



12 Month Precipitation Anomaly

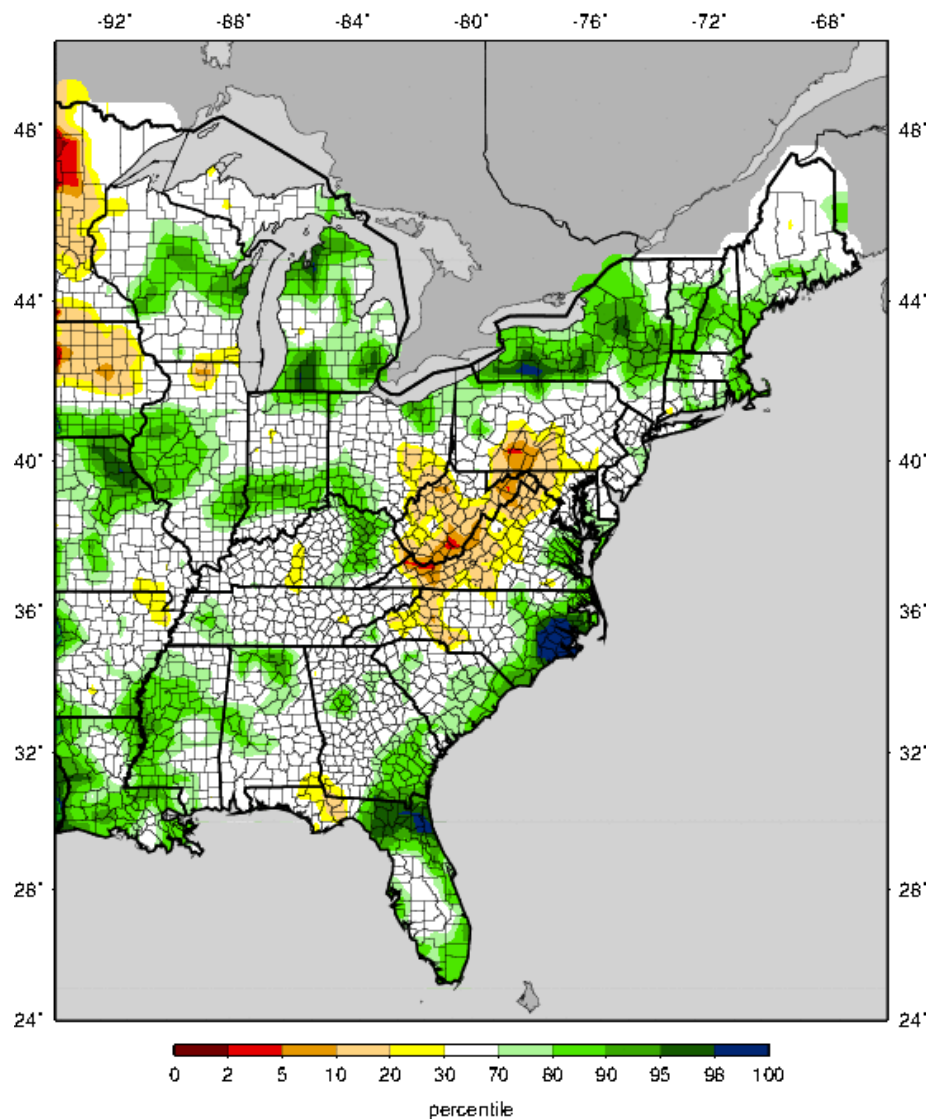


Soil Moisture Conditions

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 - 20210811



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

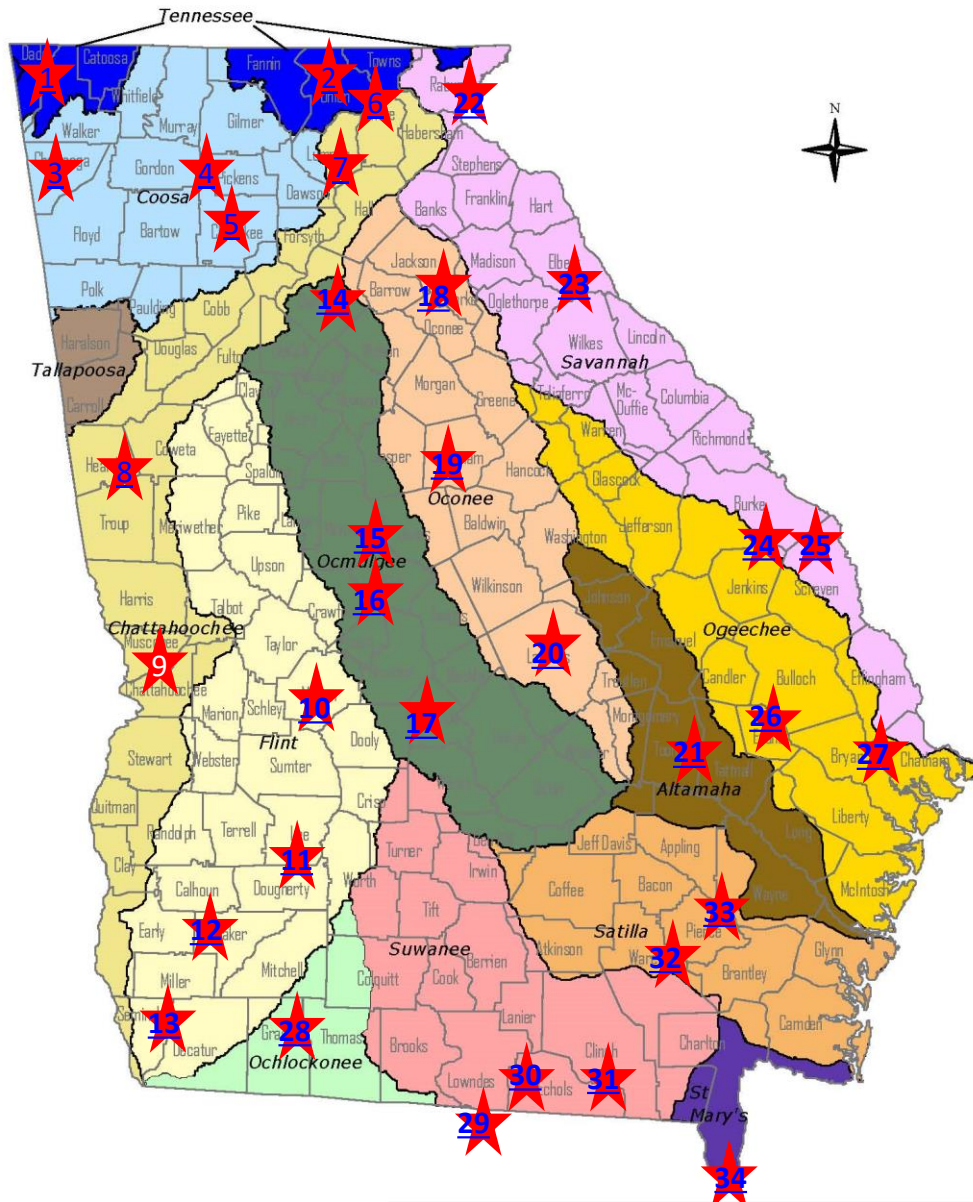
Streamflow Conditions

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



USGS Stream Gages Monitored by EPD to Assess Drought Conditions

<u>GAGE#</u>	<u>BASIN</u>	<u>GAGE NAME</u>
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	TUBESOFKEE 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 2021 through July 2021;
- 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, [USGS Etowah River gage at Canton](#) shows :

- Average stream flow in July 2021 was 1246 cfs. The statistical composite of all historical data for this gage shows that average streamflow in July has historically been lower than July 2021 about 91% of the time; 9% of the time in July it has been higher.
- Average stream flow in July 2011 was 337 cfs. The statistical composite of all historical data for this gage shows that average streamflow in July has historically been lower than July 2011 about 5~10% of the time; 90-95% of the time in July it has been higher.
- Average stream flow in July 2007 was 370 cfs. The statistical composite of all historical data for this gage shows that average streamflow in July has historically been lower than July 2007 about 10 % of the time; 90% of the time in July it has been higher.

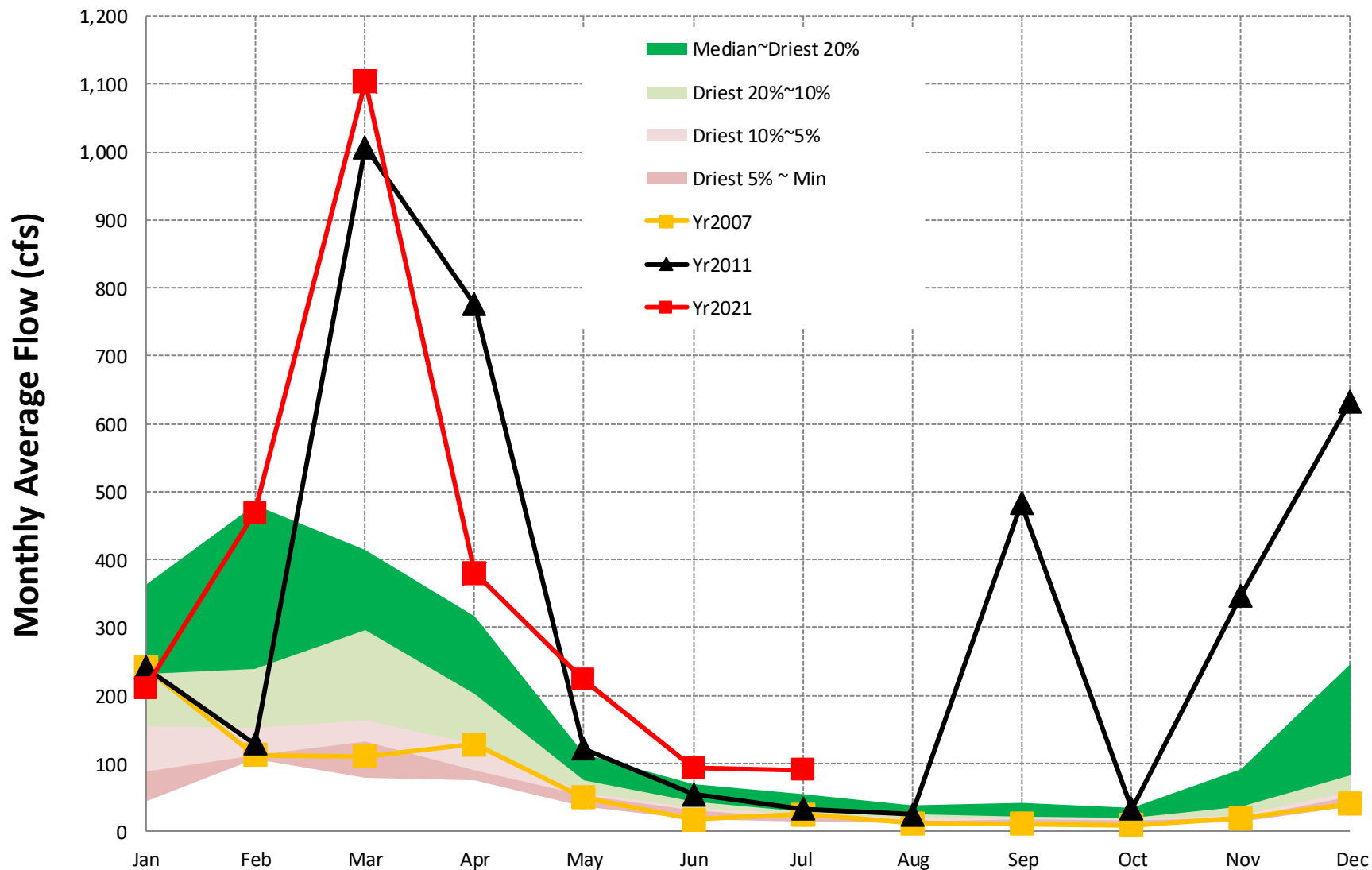
How to Read the Streamflow Graphs

Example #2: [Flint River at Albany](#)

The streamflow graph for Gage #11, [USGS Flint River gage at Albany](#) shows:

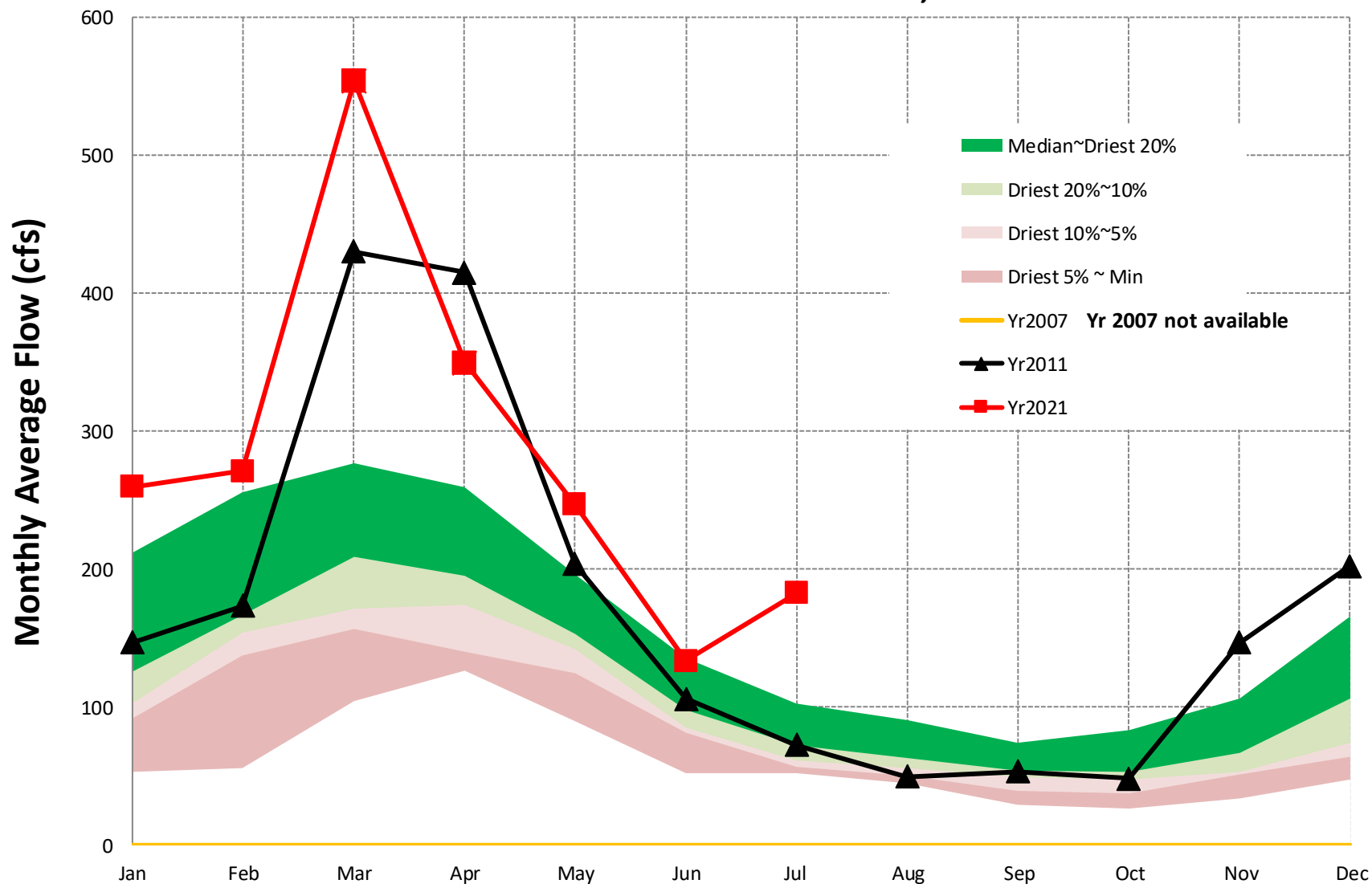
- Average stream flow in July 2021 was 3846 cfs. The statistical composite of all historical data for this gage shows that average streamflow in July has historically been lower than July 2021 about 59% of the time; about 41% of the time in July it has been higher.
- Average stream flow in July 2011 was 1283 cfs. The statistical composite of all historical data for this gage shows that average streamflow in July has historically been lower than July 2011 about 5~10% of the time; about 90~95% of the time in July it has been higher.
- Average stream flow in July 2007 was 1325 cfs. The statistical composite of all historical data for this gage shows that average streamflow in July has historically been lower than July 2007 about 5~10% of the time; about 90~95% of the time in July it has been higher.

Gage #1. USGS #03568933, Tennessee Basin, LOOKOUT CREEK NEAR NEW ENGLAND, GA



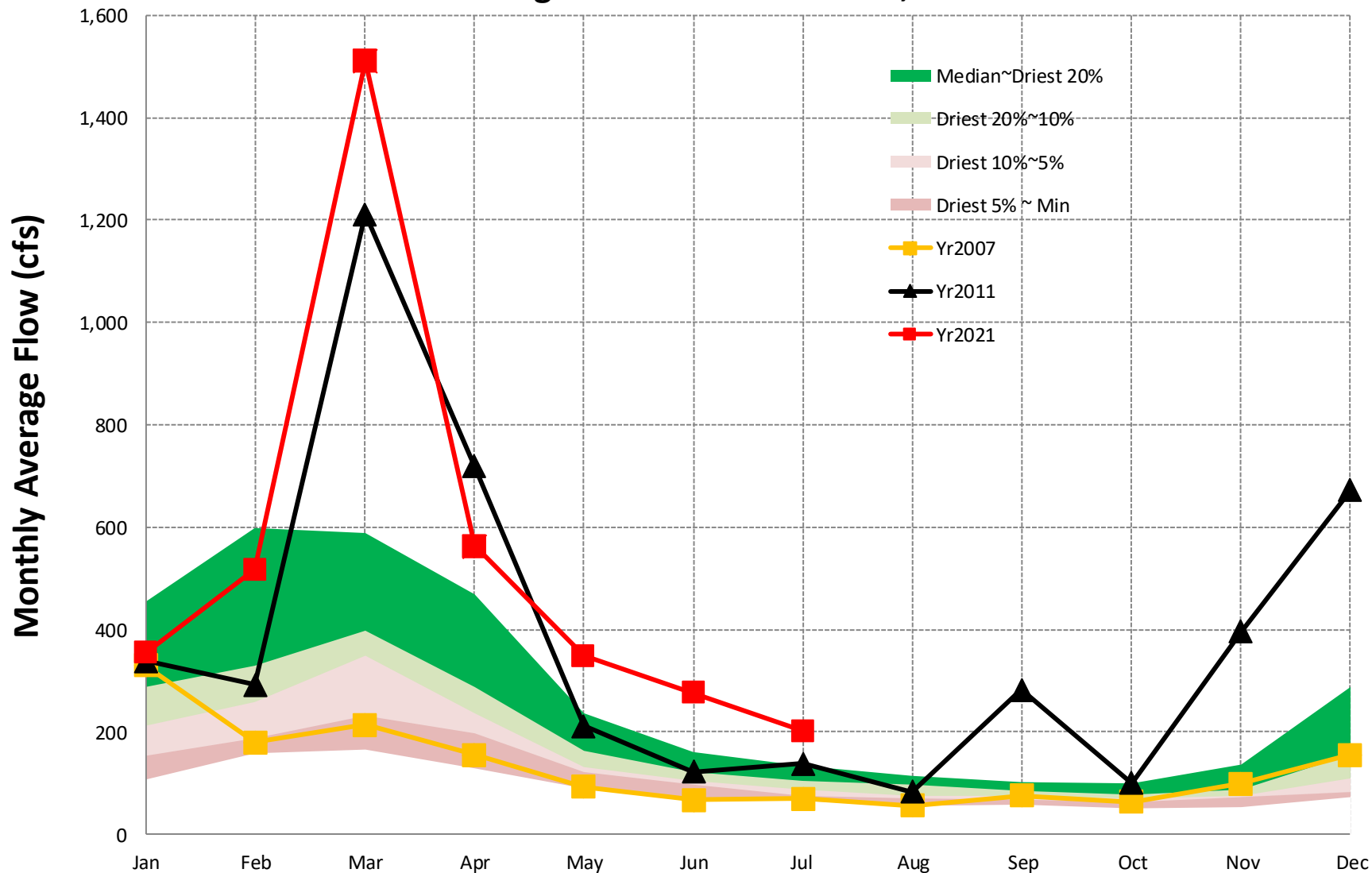
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Gage #2, USGS #03550500, Tennessee Basin, NOTTELY RIVER NEAR BLAIRSVILLE, GA



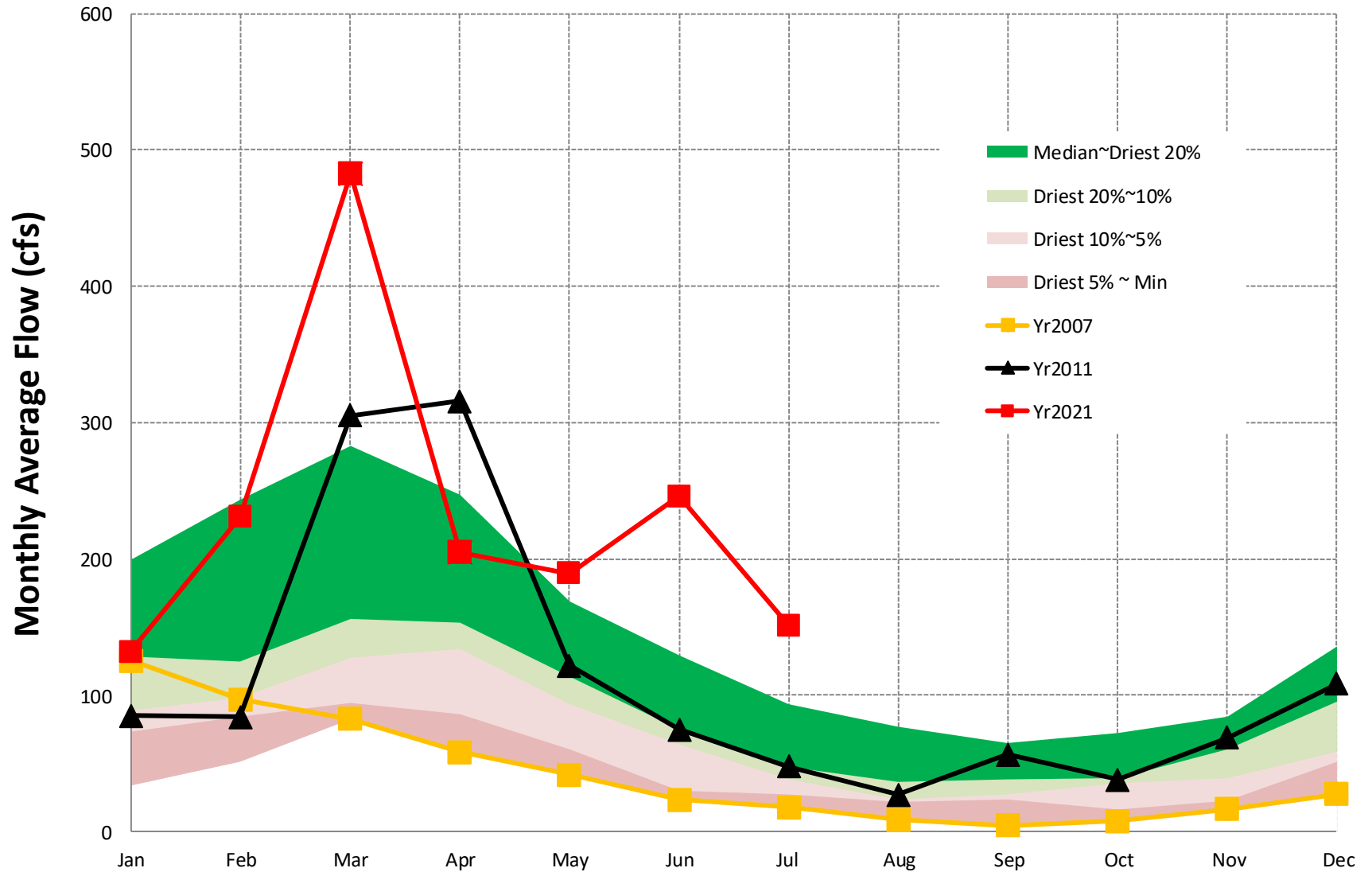
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Gage #3. USGS #02398000, Coosa Basin, Chattooga River at Summerville, GA



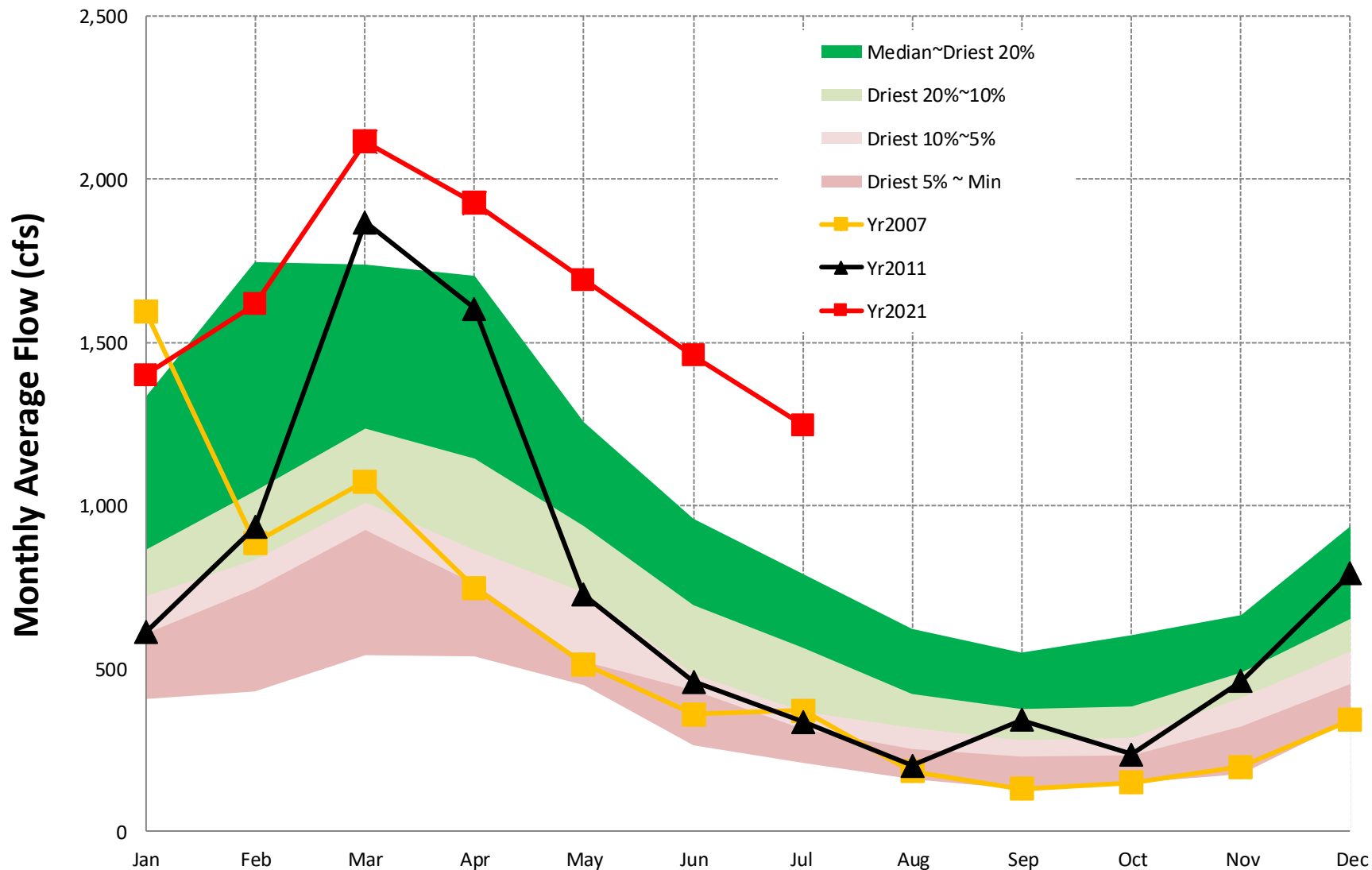
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Gage #4, USGS #02382200, Coosa Basin, TALKING ROCK CREEK NEAR HINTON, GA



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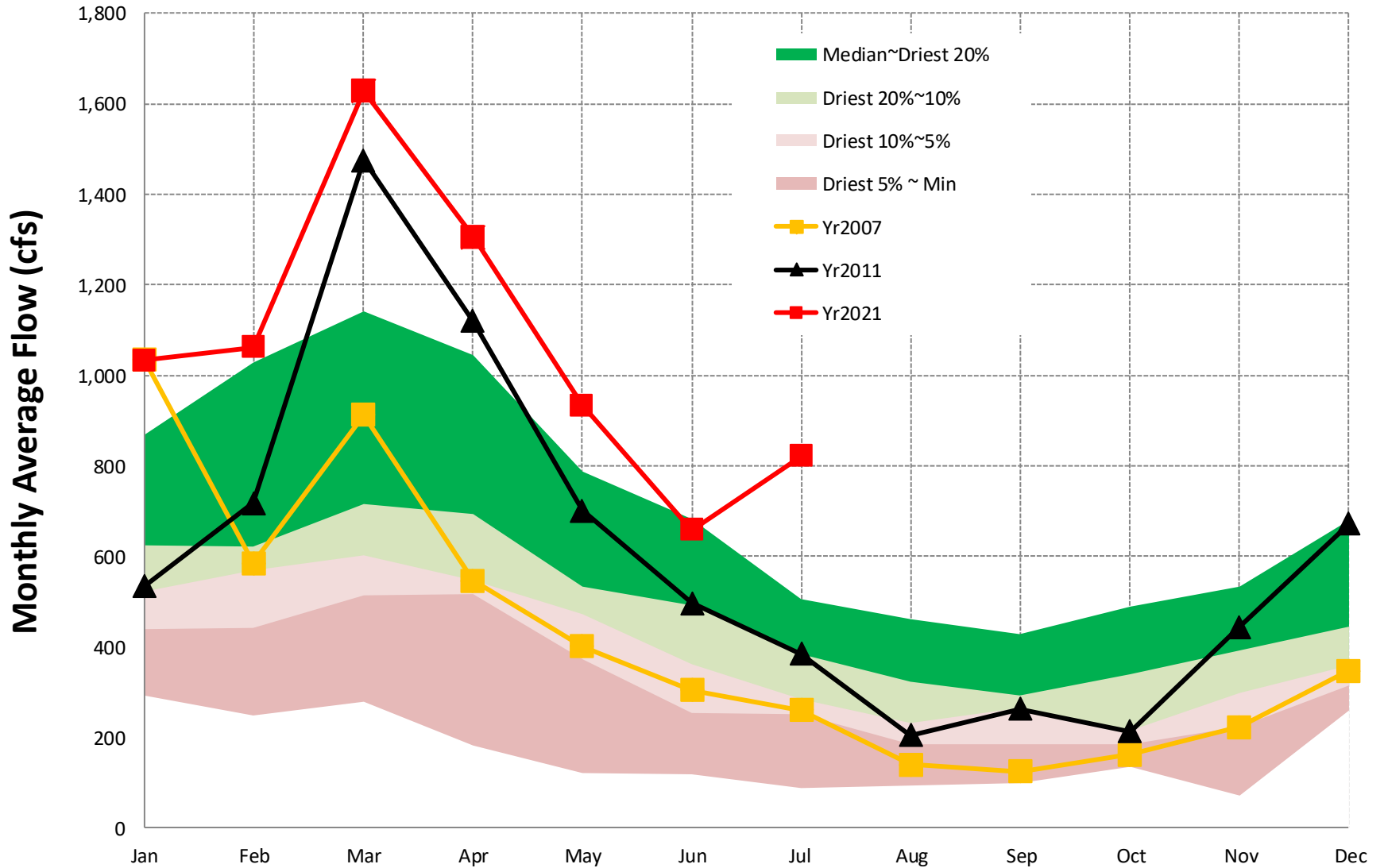
Gage #5, USGS #02392000, Coosa Basin, Etowah River at Canton, GA



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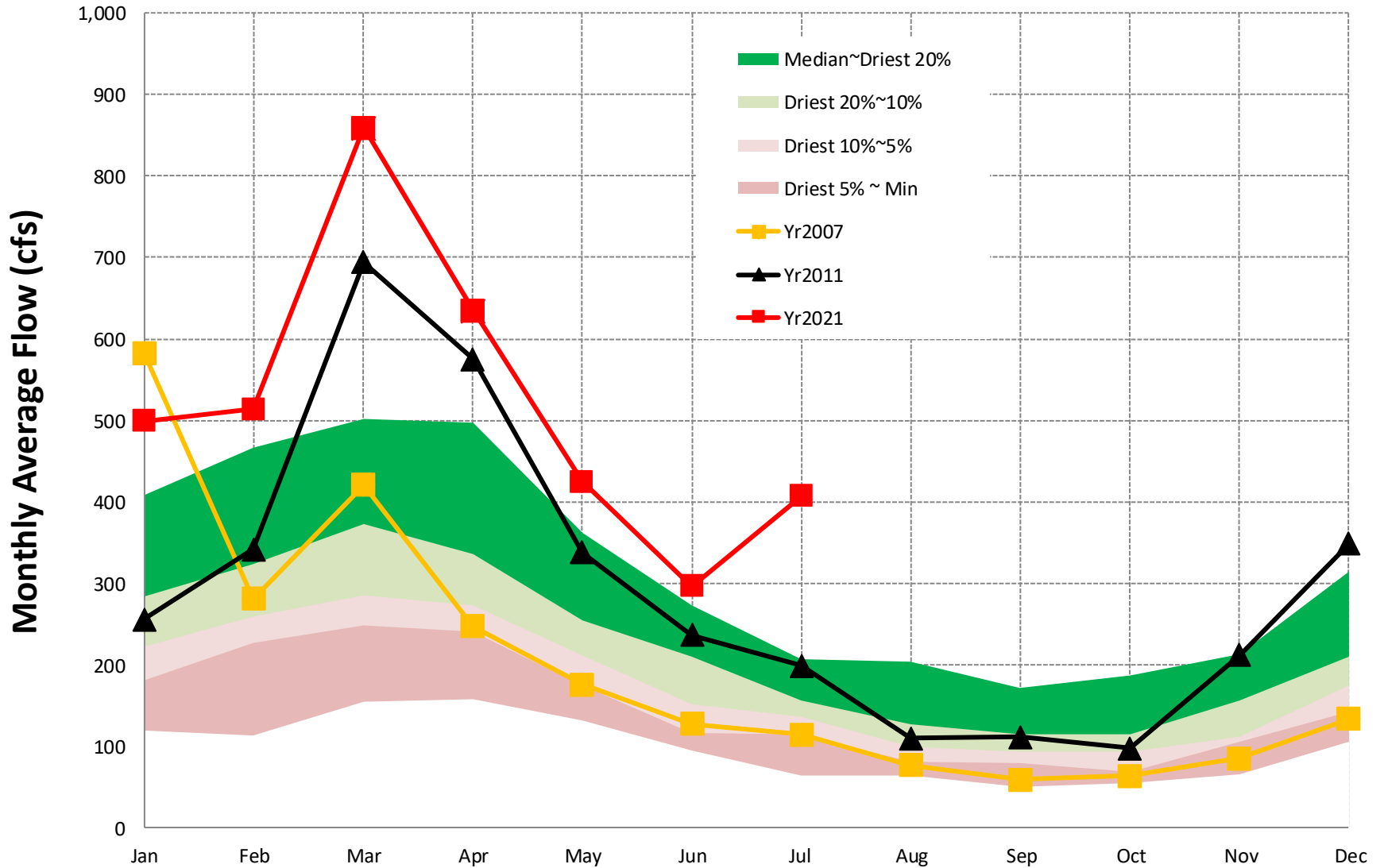
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Gage #6, USGS #02331600, Chatthoochee Basin, CHATTAHOOCHEE RIVER AT CORNELIA, GA



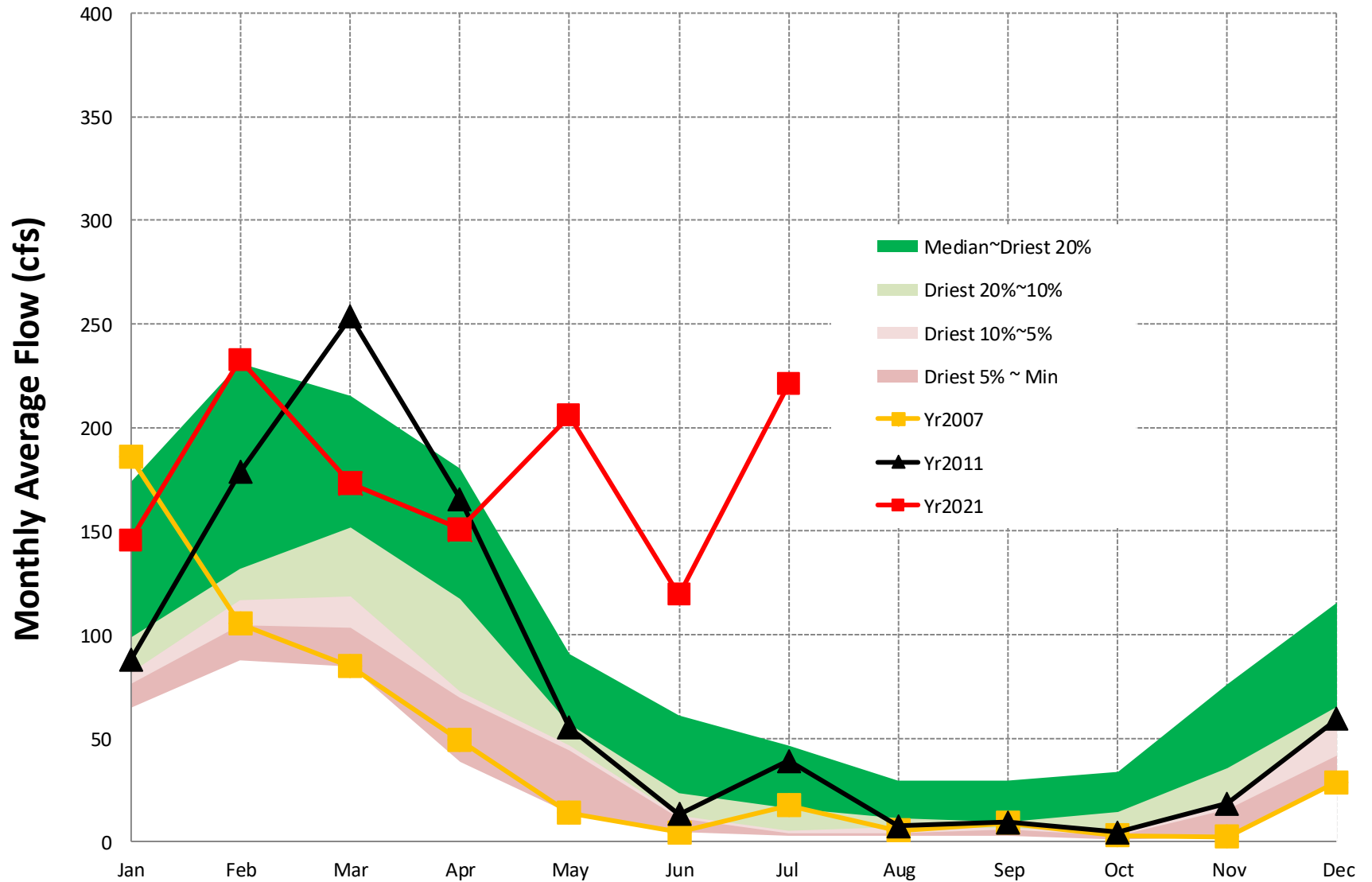
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Gage #7, USGS #02333500, Chatahoochee Basin, CHESTATEE RIVER NEAR DAHLONEGA, GA



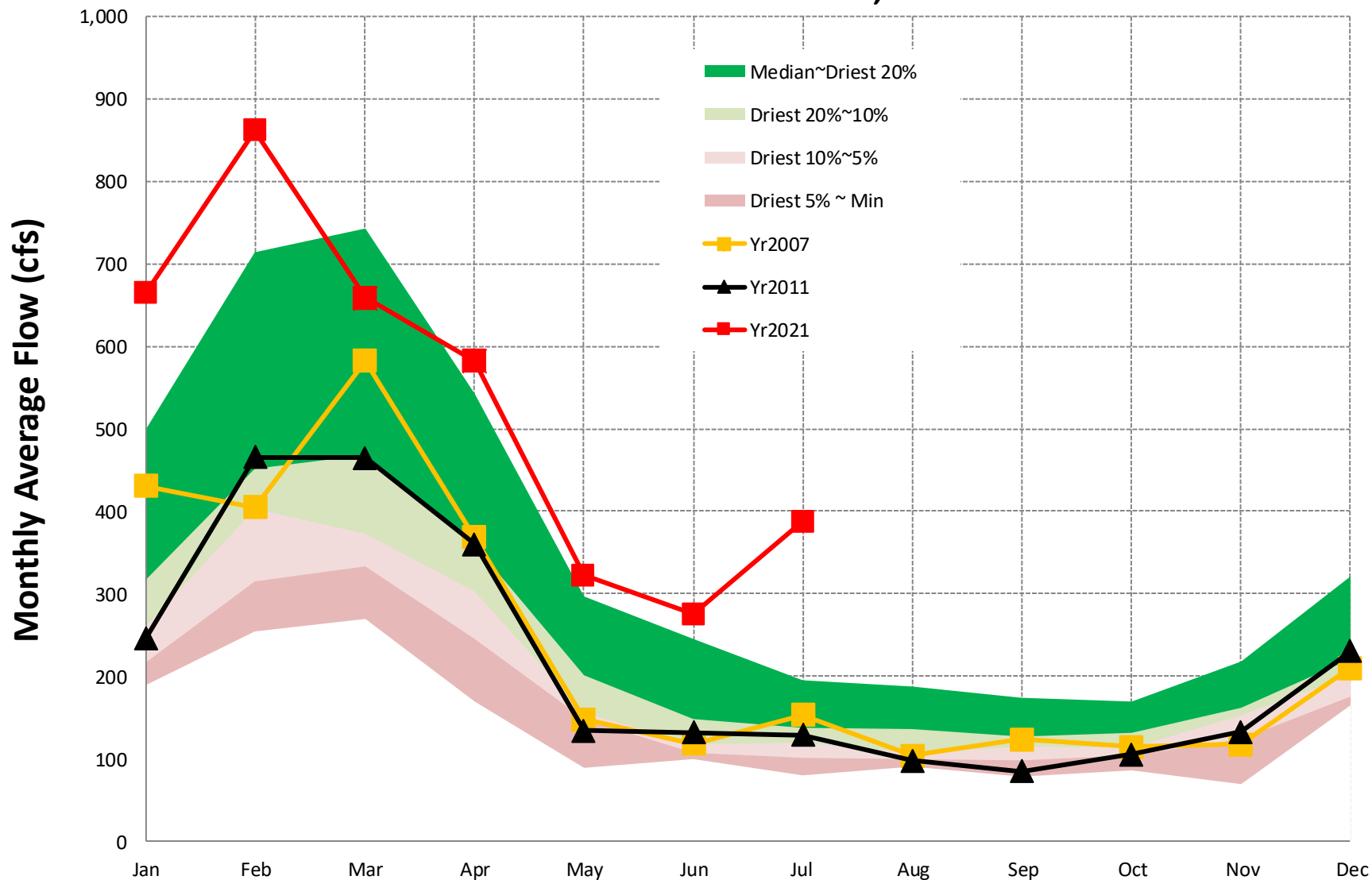
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**Gage #8, USGS #02338660, Chattahoochee Basin,
NEW RIVER AT GA 100, NEAR CORINTH**



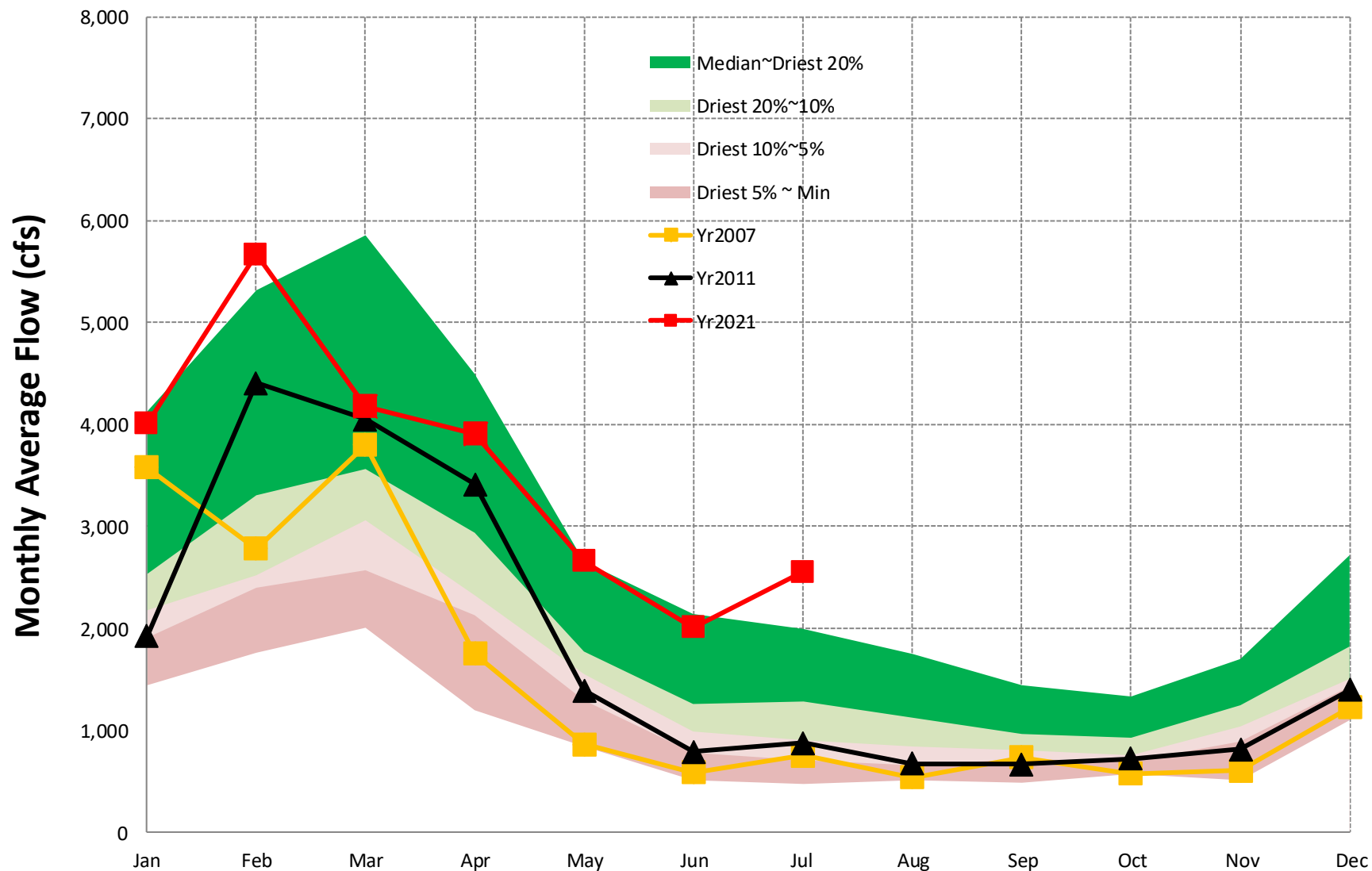
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Gage #9, USGS #02341800, Chattahoochee Basin, UPATOI CREEK NEAR COLUMBUS, GA



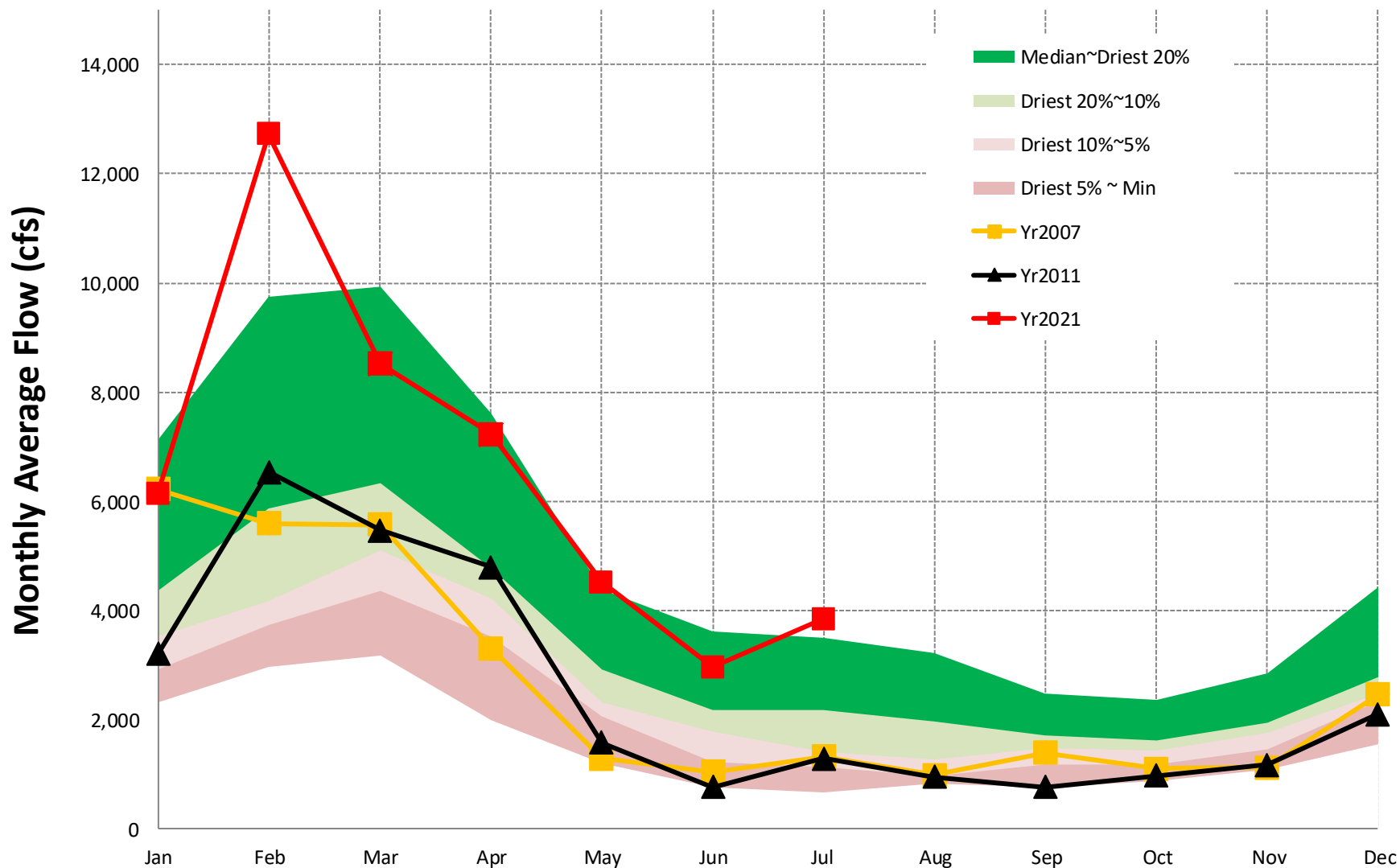
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Gage #10. USGS #02349605, Flint Basin, FLINT RIVER AT GA26 NEAR MONTEZUMA, GA



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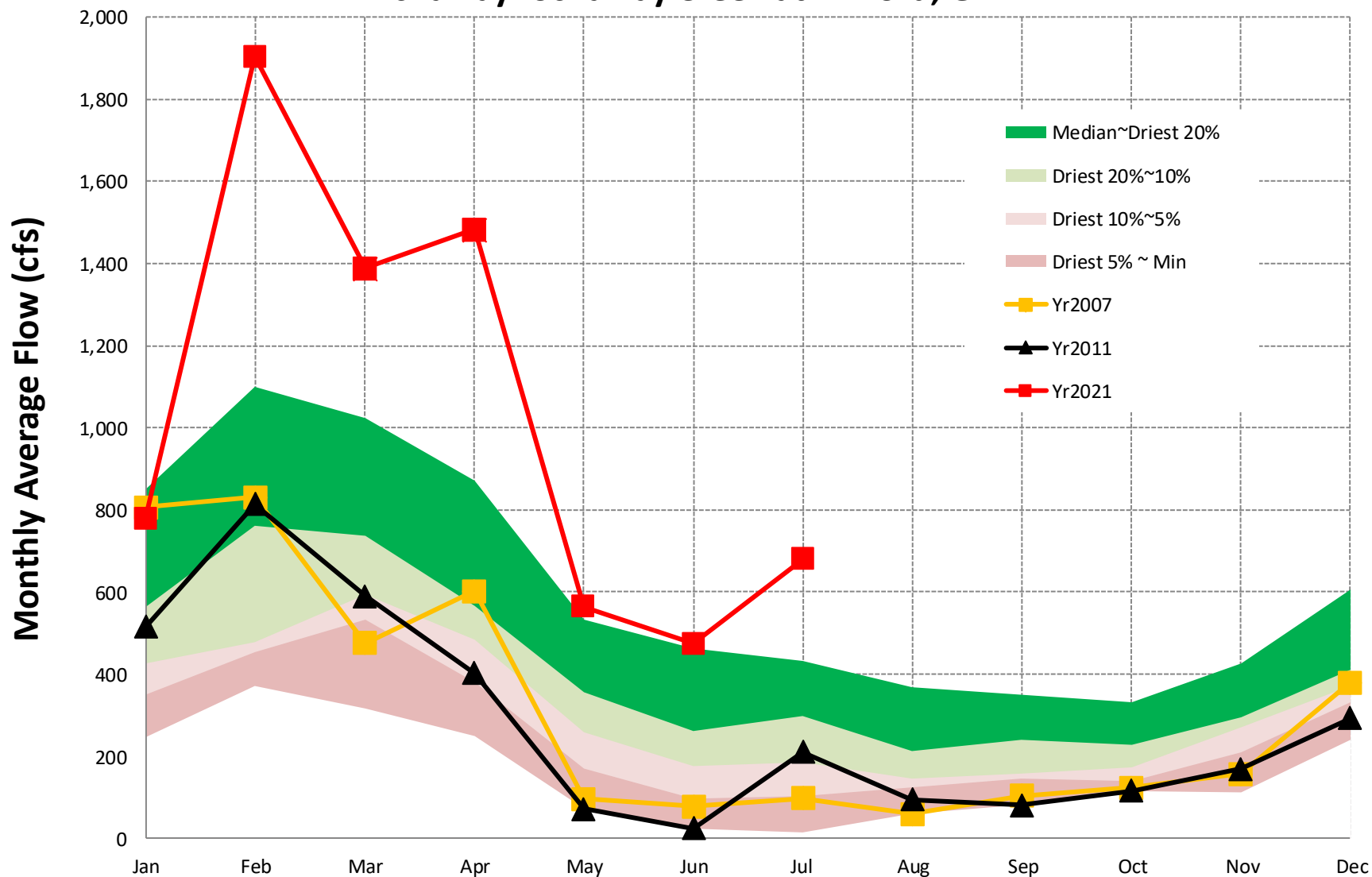
Gage #11, USGS #02352500, Flint Basin, FLINT RIVER AT ALBANY, GA



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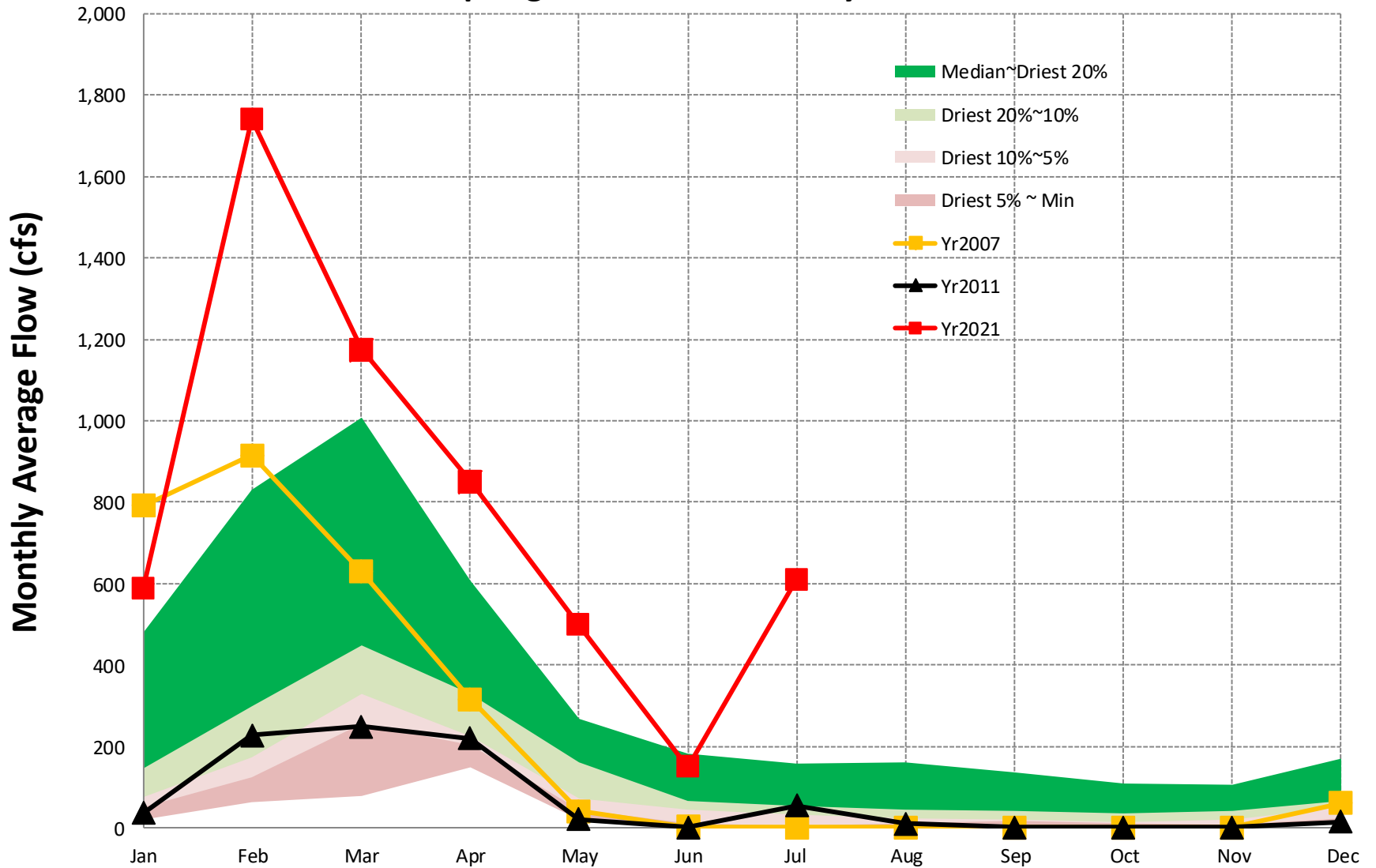
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Gage #12. USGS #02353500, Flint Basin, Ichawaynochaway Creek at Milford, GA



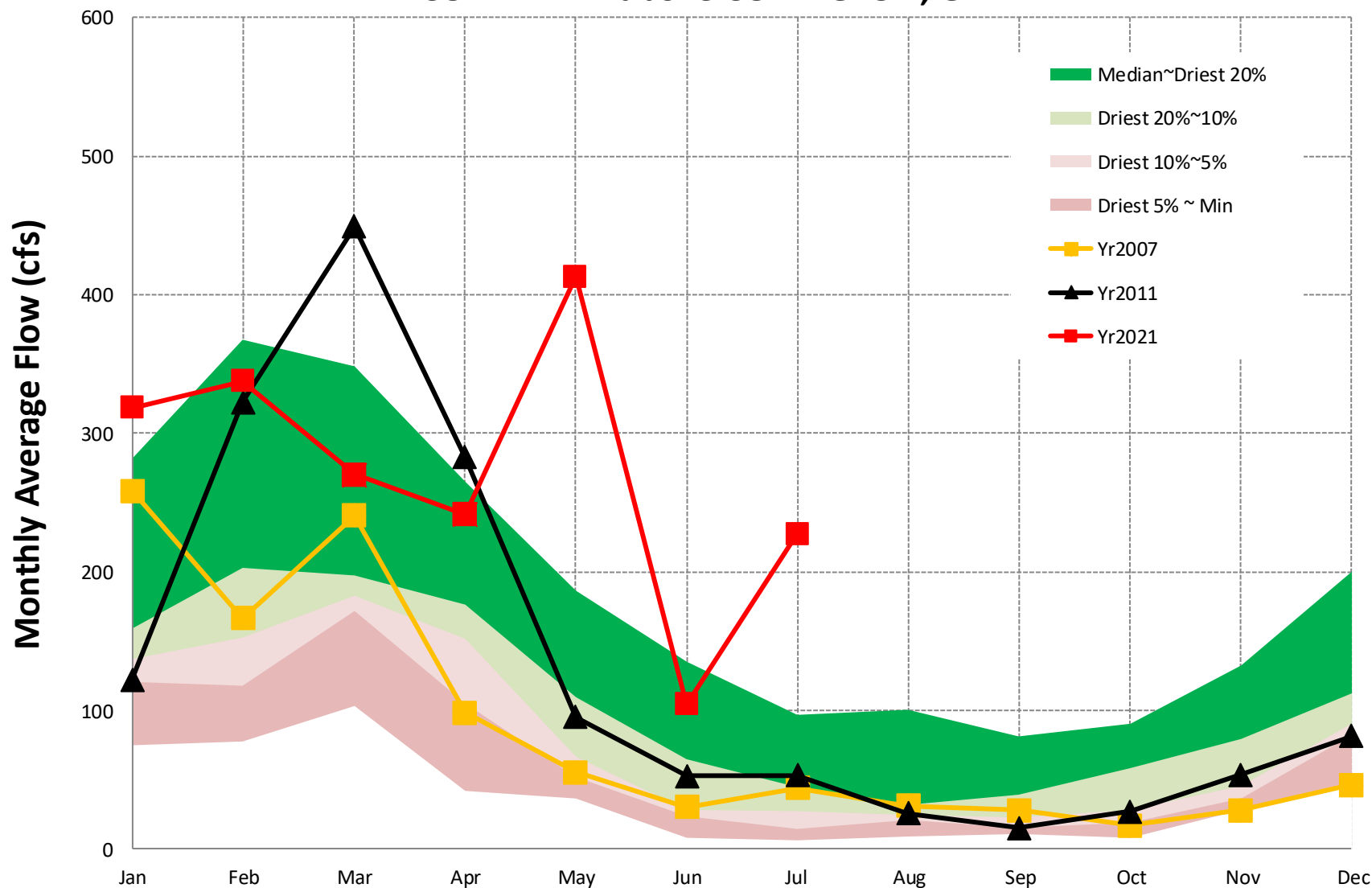
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Gage #13. USGS #02357000, Flint River, Spring Creek near Iron City, GA



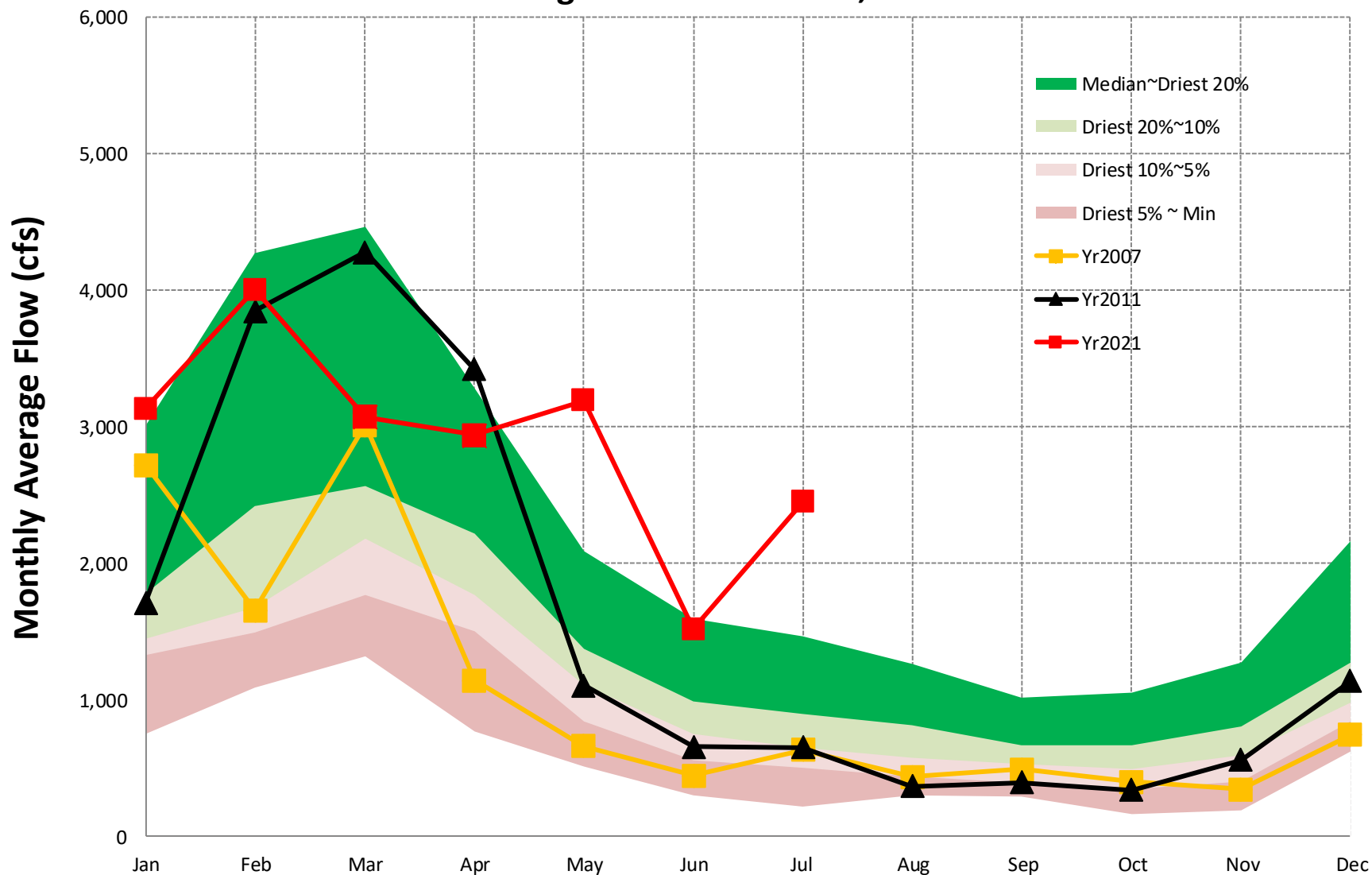
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Gage #14. USGS #02208450, Ocumulgee Basin, ALCOVY RIVER above COVINGTON, GA



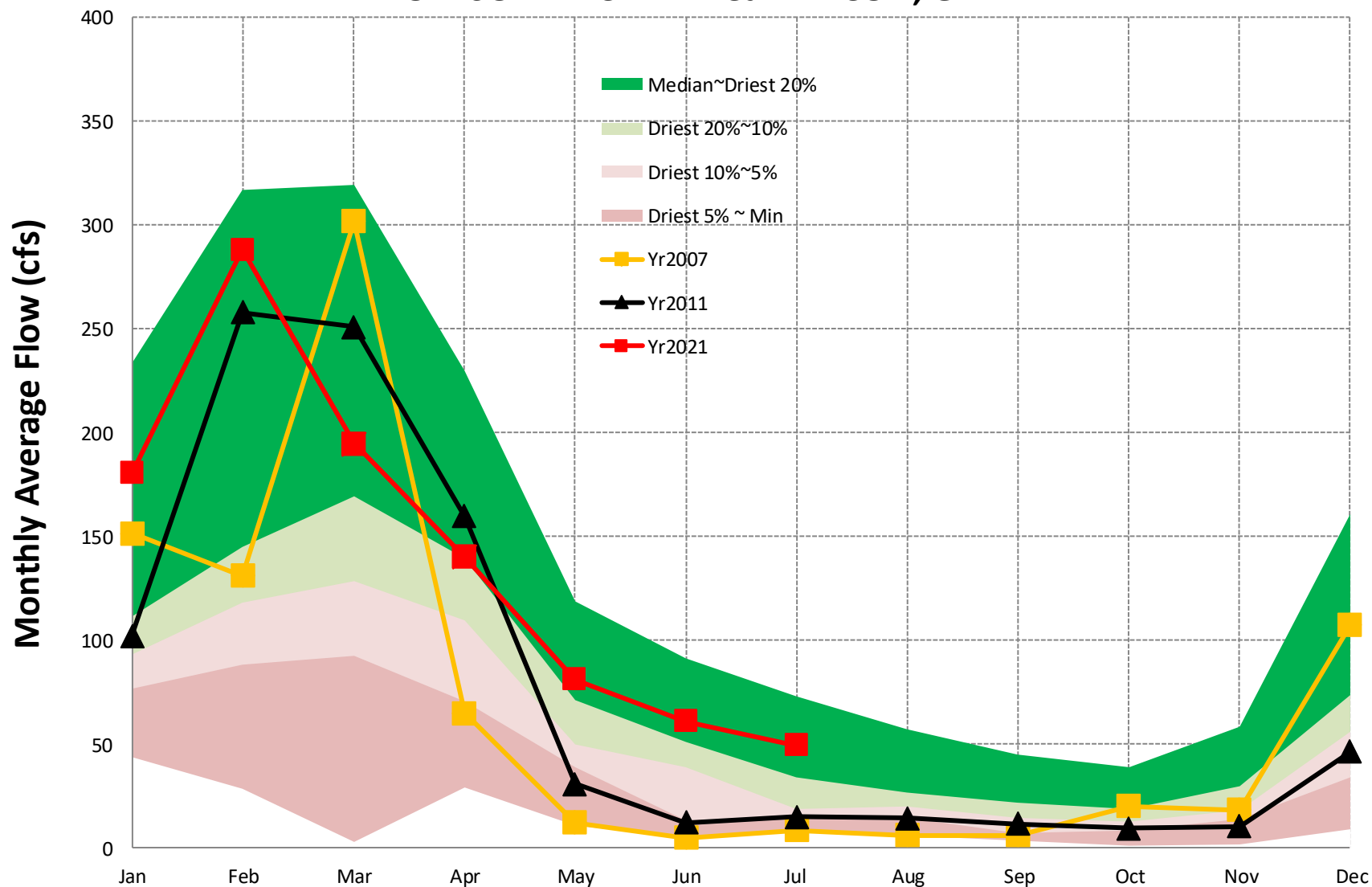
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Gage #15. USGS #02213000, Ocmulgee Basin, Ocmulgee River at Macon, GA



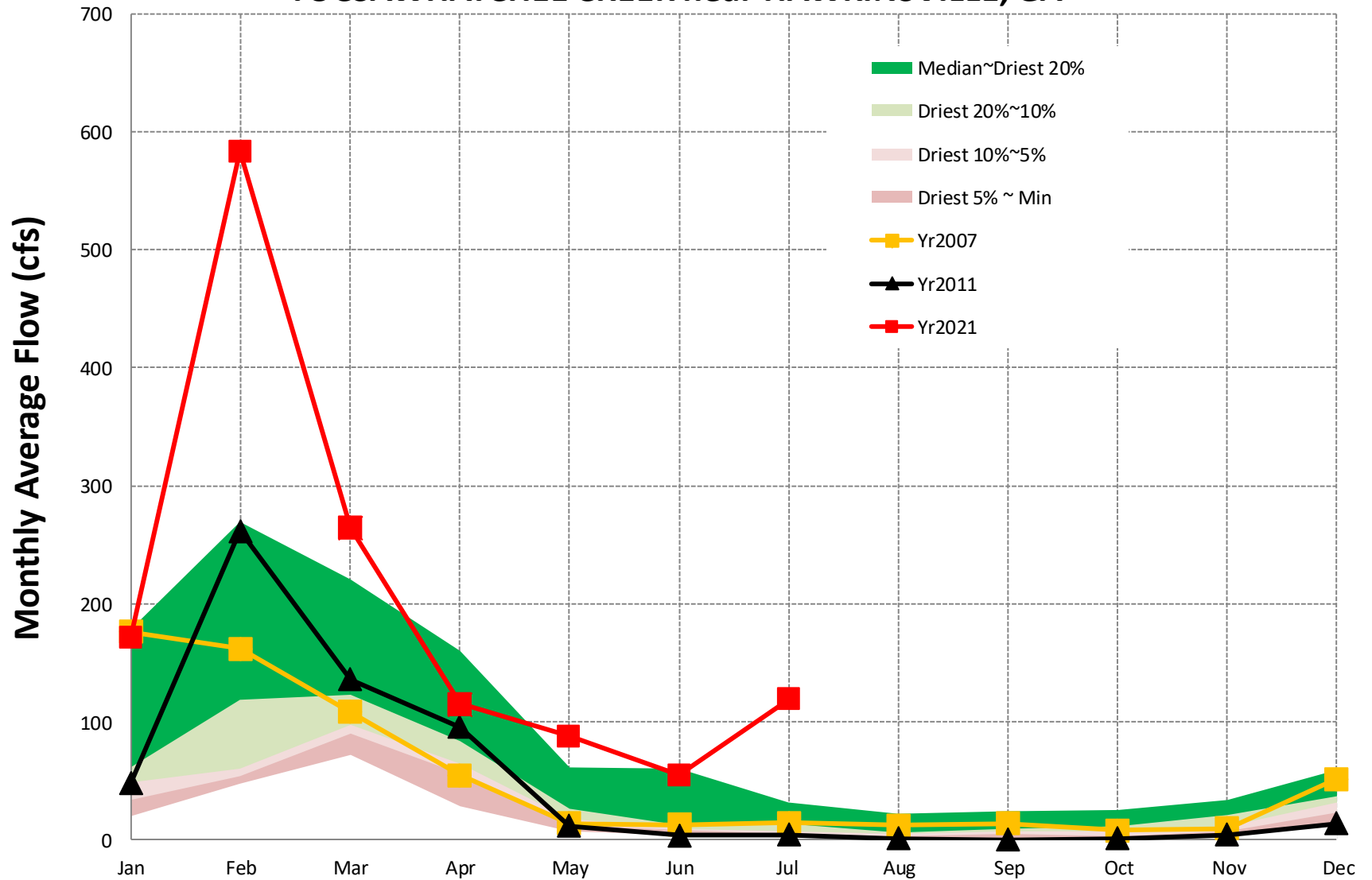
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Gage #16. USGS #02213500, Ocmulgee Basin, TOBESOFKEE CREEK near MACON, GA



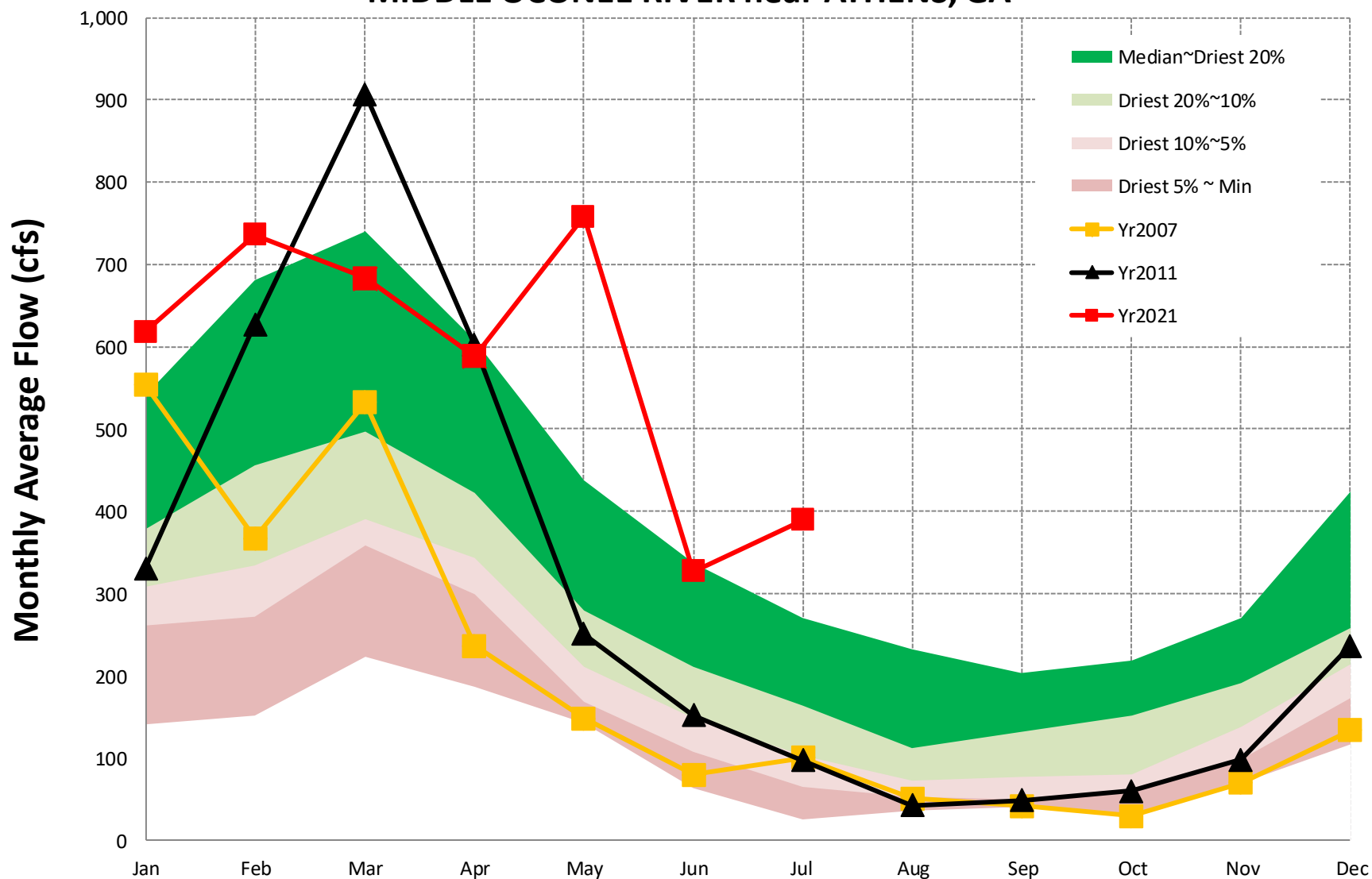
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Gage #17. USGS #02215100, Ocmulgee Basin, TUCSAWHATCHEE CREEK near HAWKINSVILLE, GA



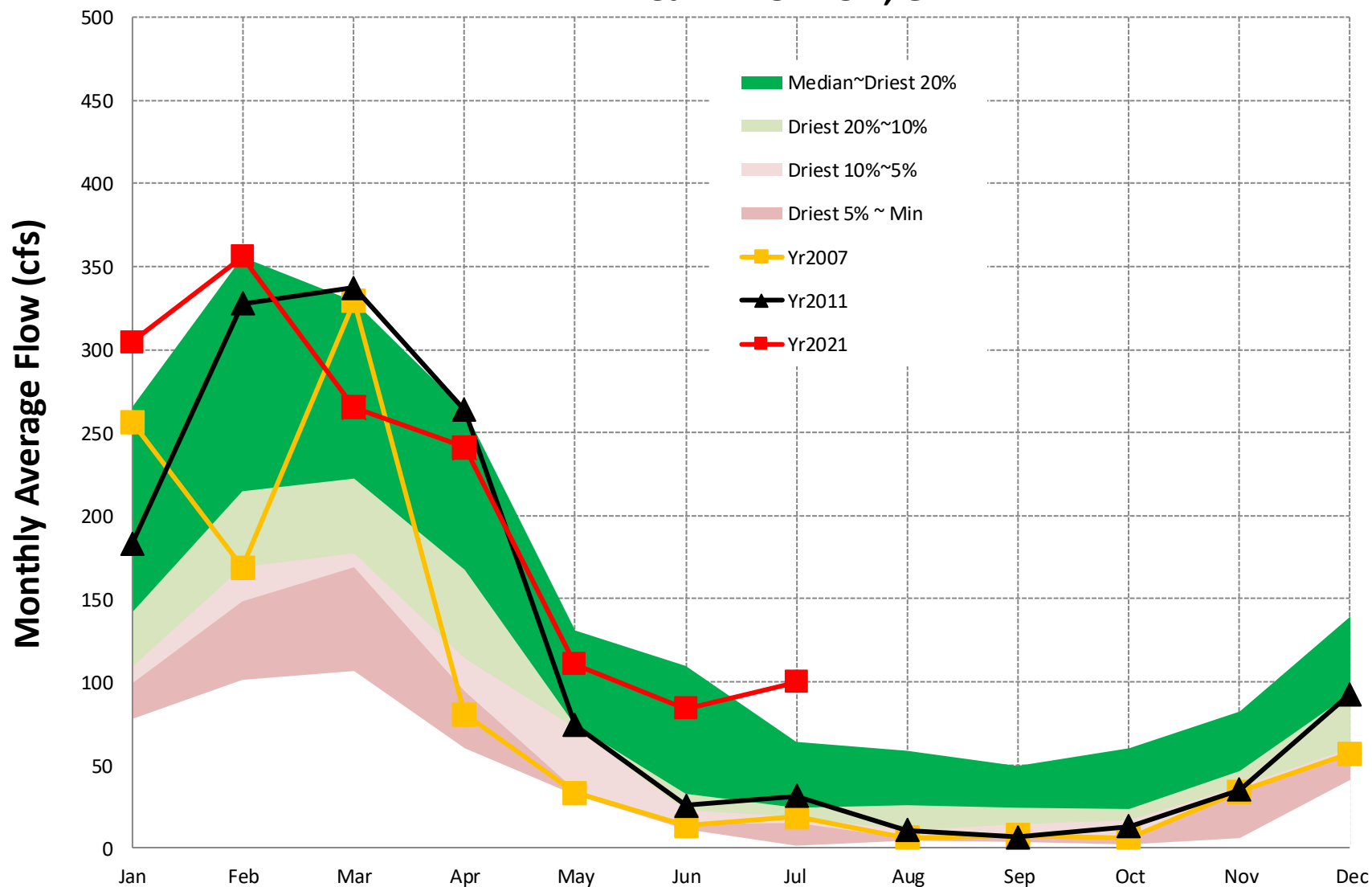
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Gage #18. USGS #02217500, Oconee Basin, MIDDLE OCONEE RIVER near ATHENS, GA

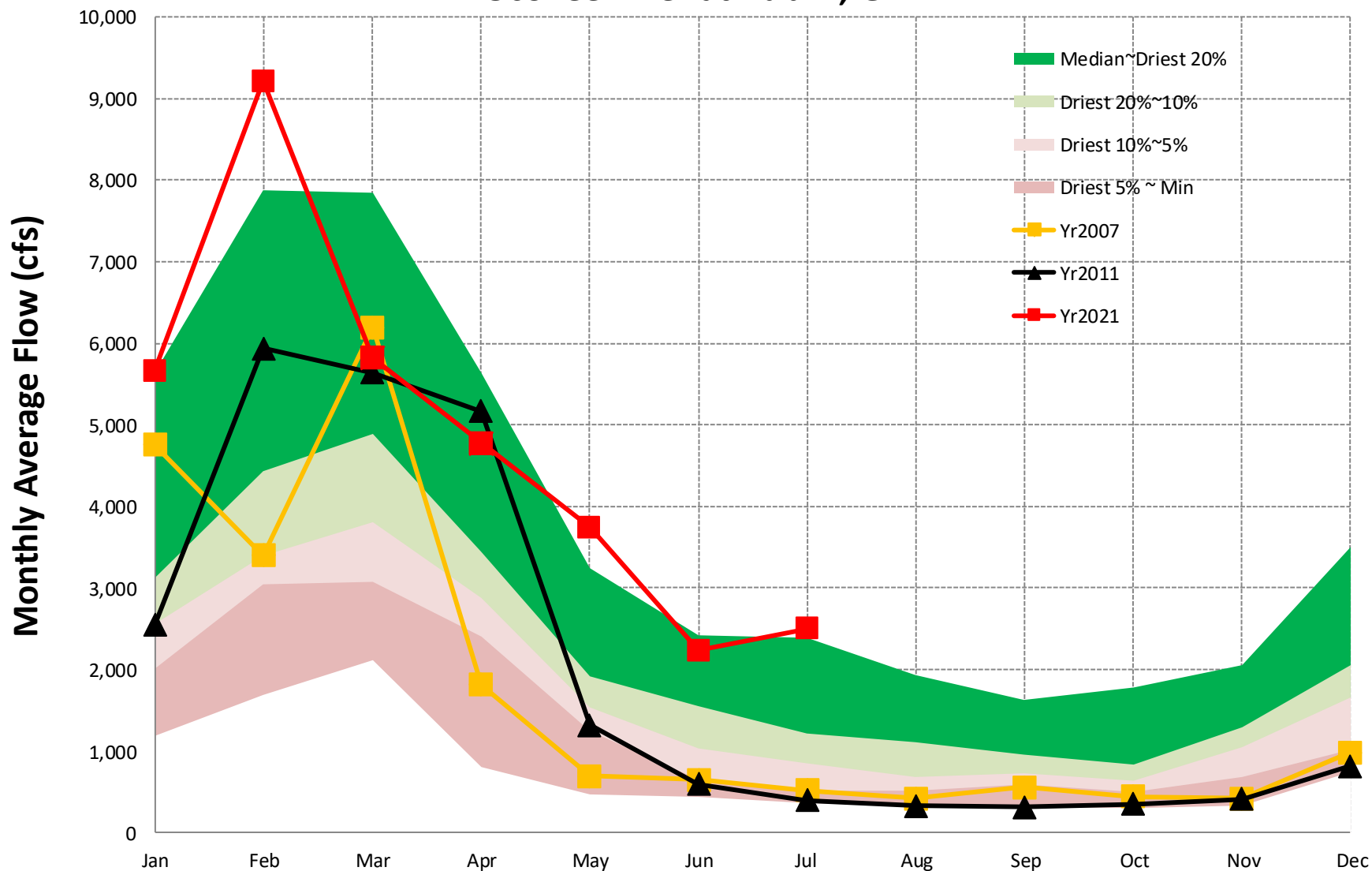


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Gage #19. USGS #02220900, Oconee Basin, LITTLE RIVER near EATONTON, GA

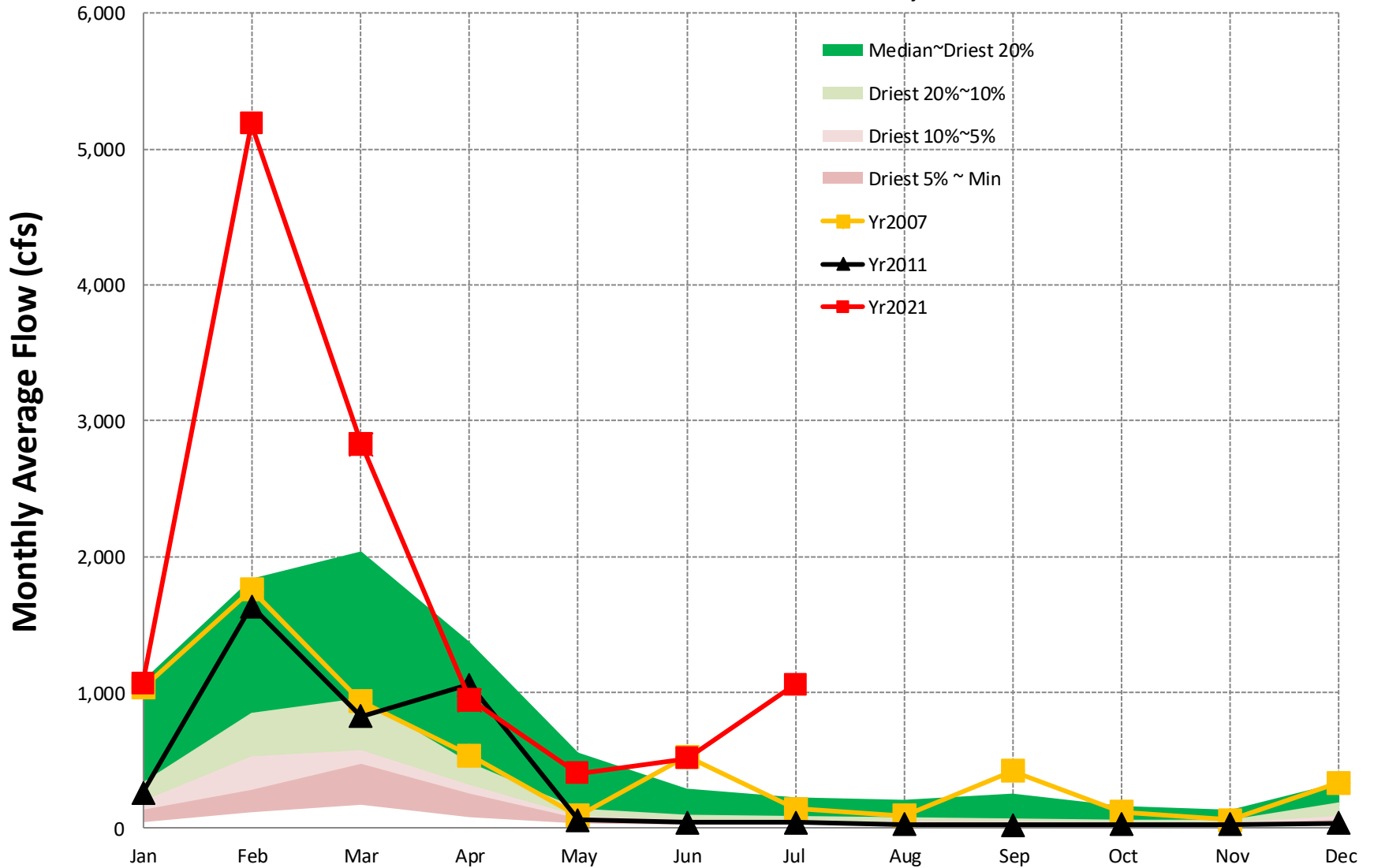


Gage #20. USGS #02223500, Oconee Basin, Oconee River at Dublin, GA



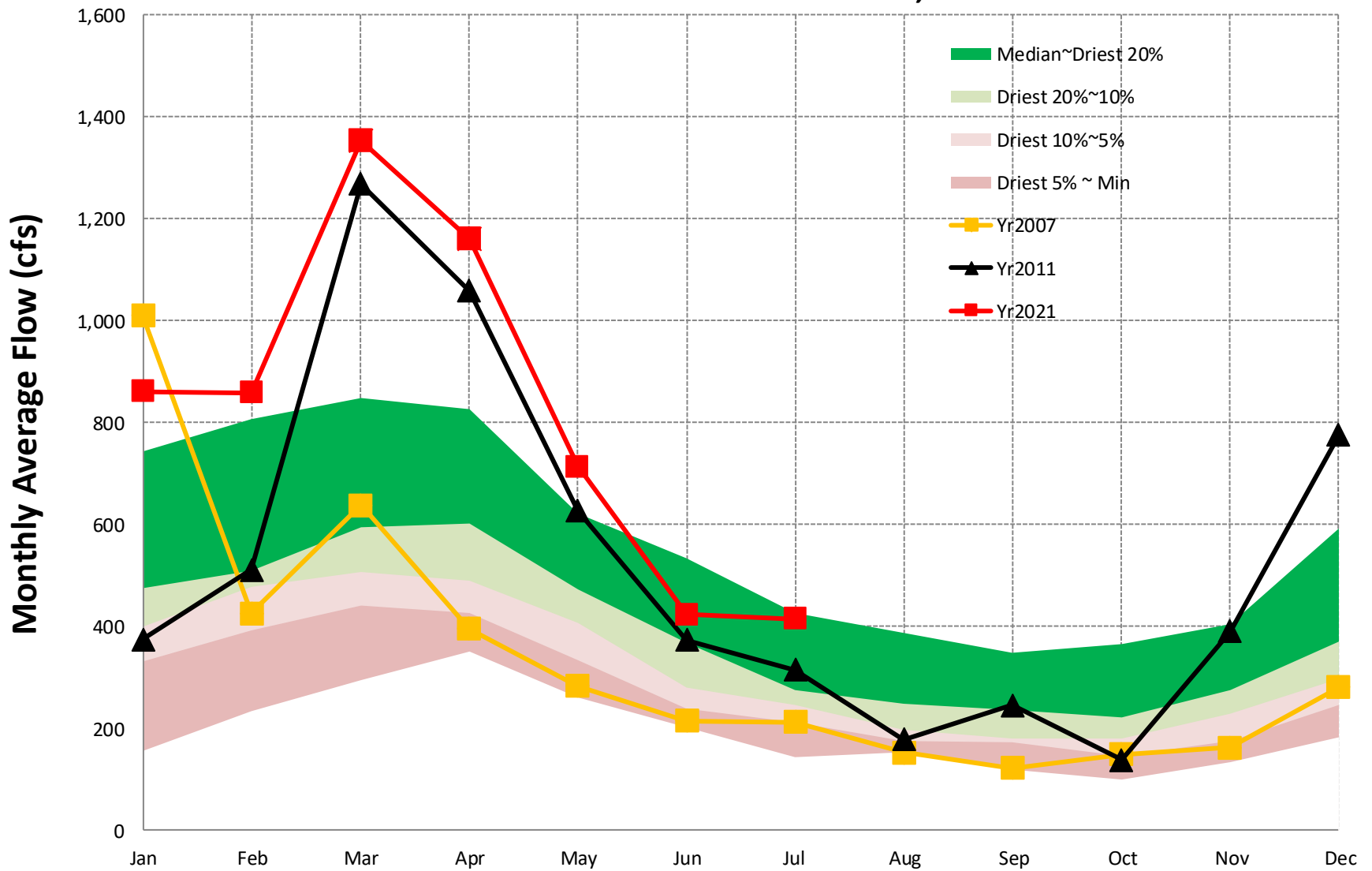
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Gage #21. USGS #02225500, Altamaha Basin, OHOOPEE RIVER near REIDSVILLE, GA

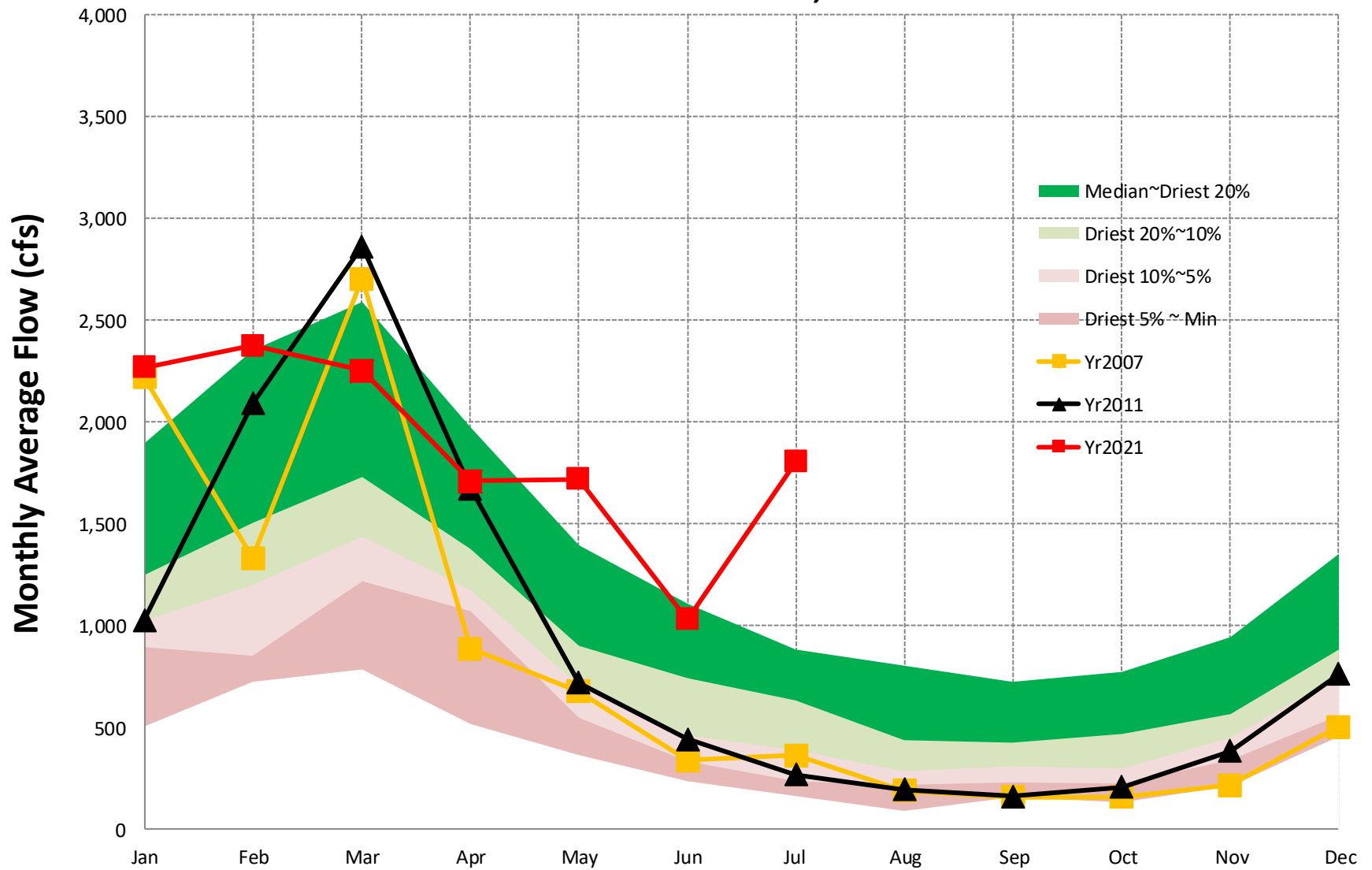


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**Gage #22. USGS #02177000, Savannah Basin,
CHATTOOGA RIVER near CLAYTON, GA**

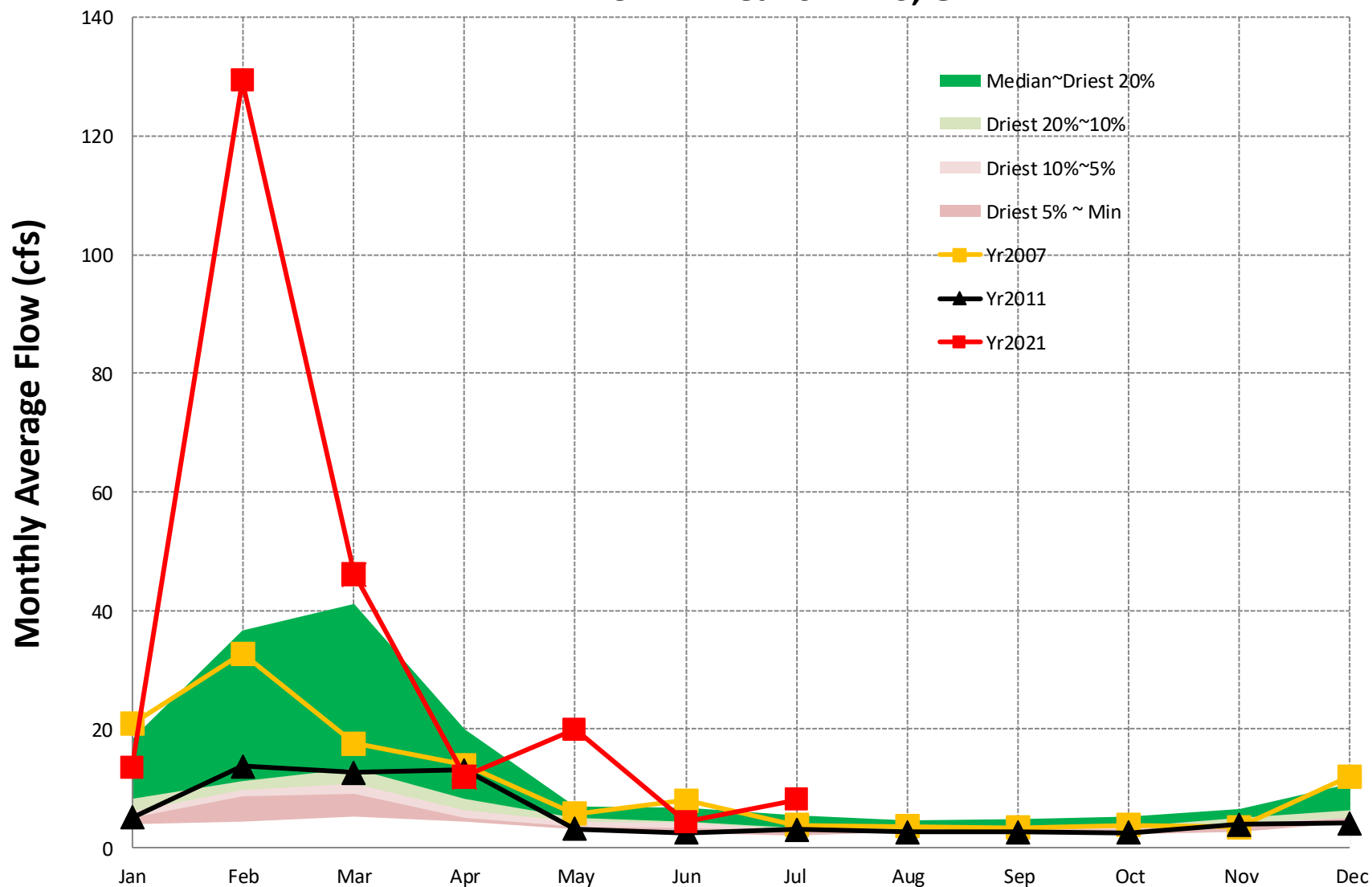


Gage #23. USGS #02192000, Savannah Basin Broad River near Bell, GA



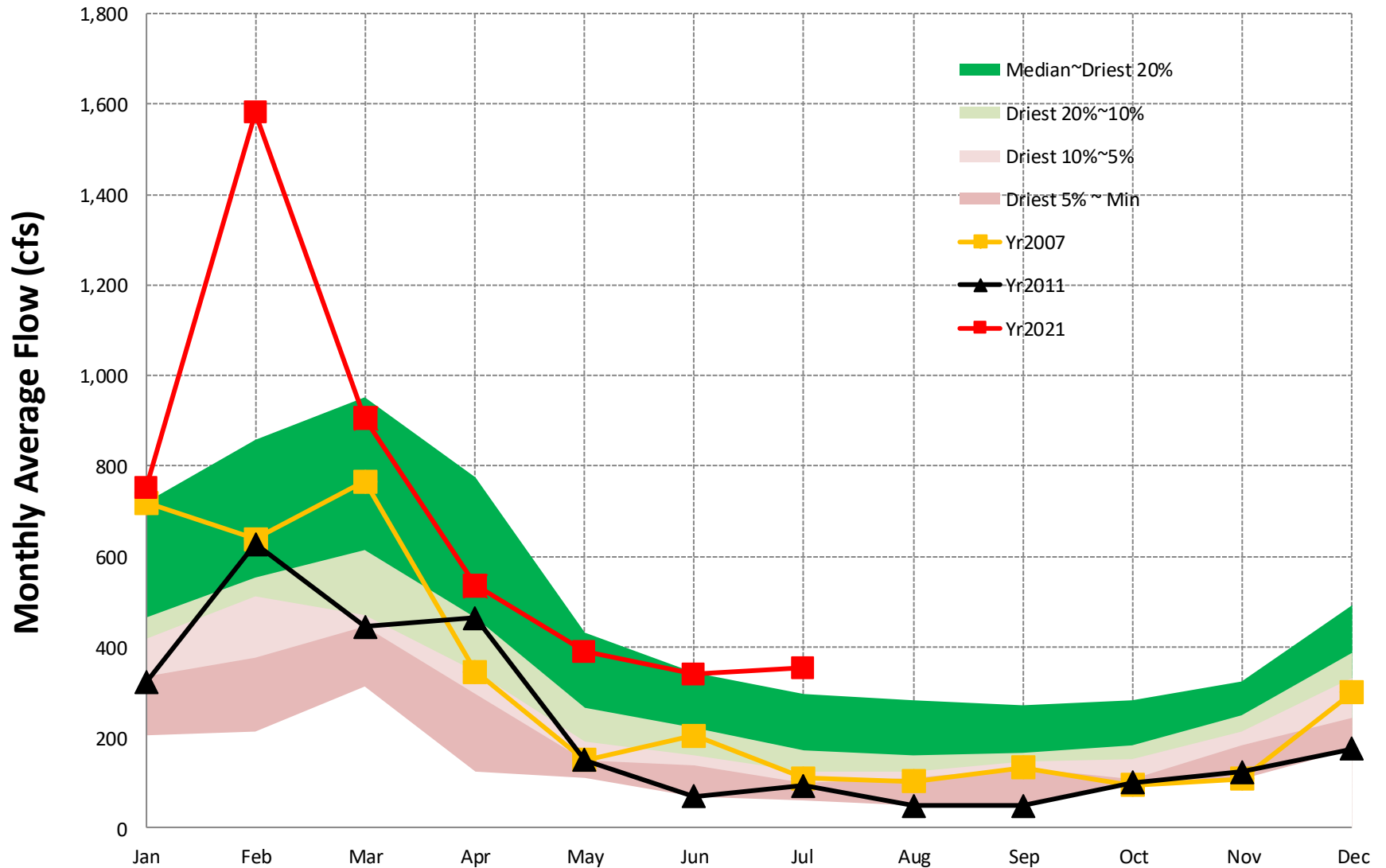
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Gage #24. USGS #02198100, Savannah Basin, BEAVERDAM CREEK near SARDIS, GA



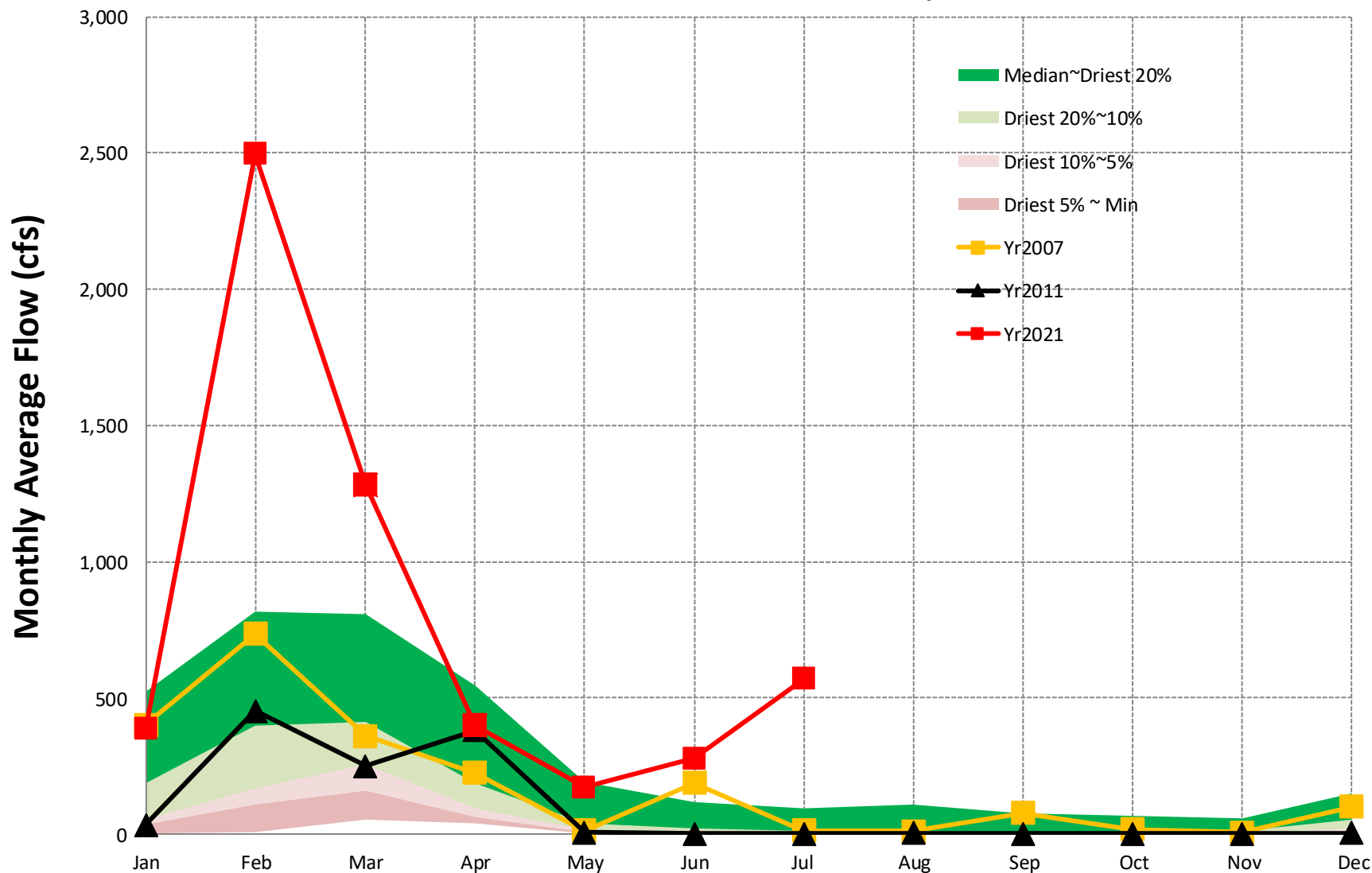
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Gage #25. USGS #02198000, Savannah Basin, BRIER CREEK at MILLHAVEN, GA



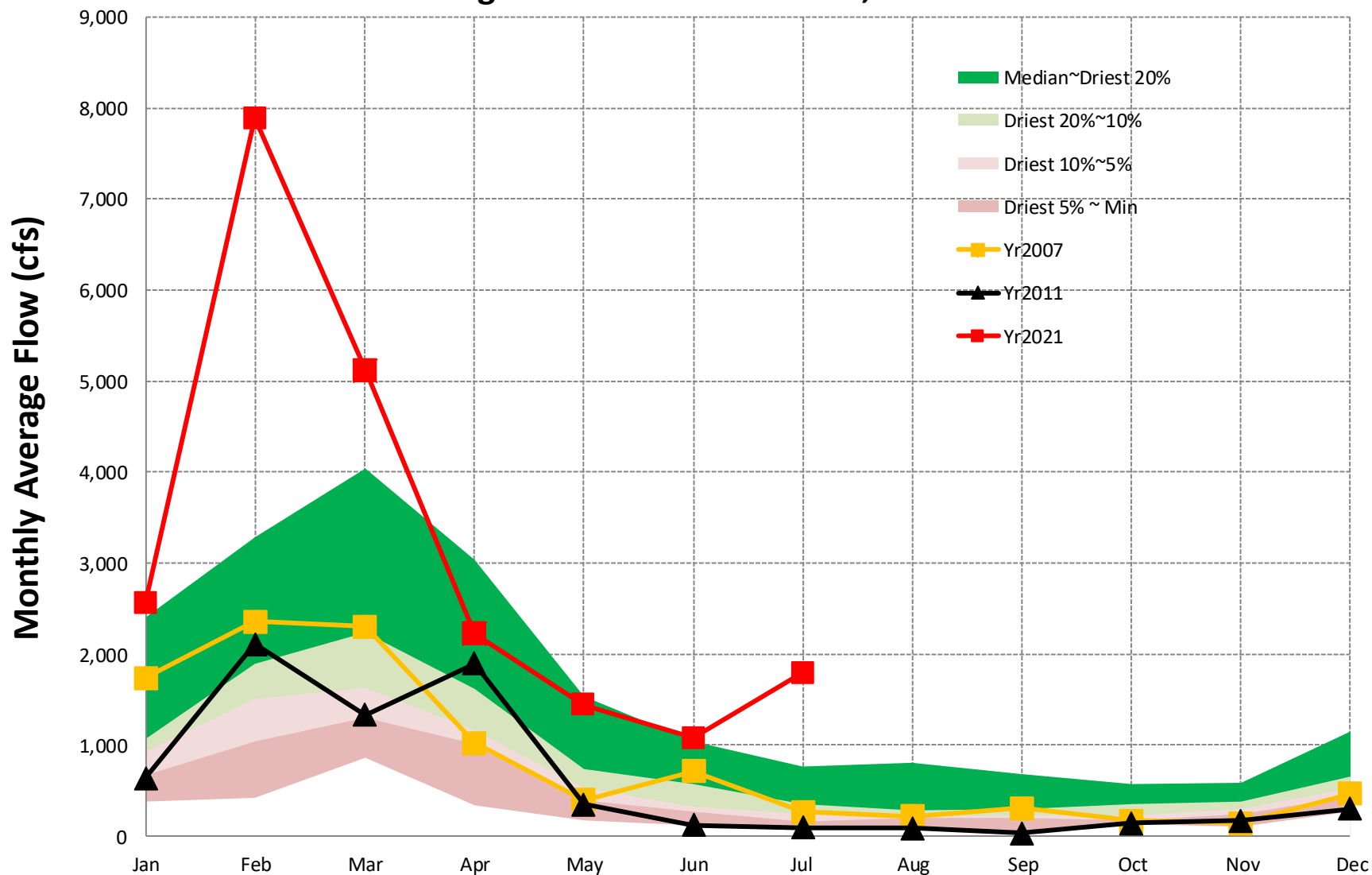
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Gage #26. USGS #02203000, Ogeechee Basin, CANOOCHEE RIVER near CLAXTON, GA



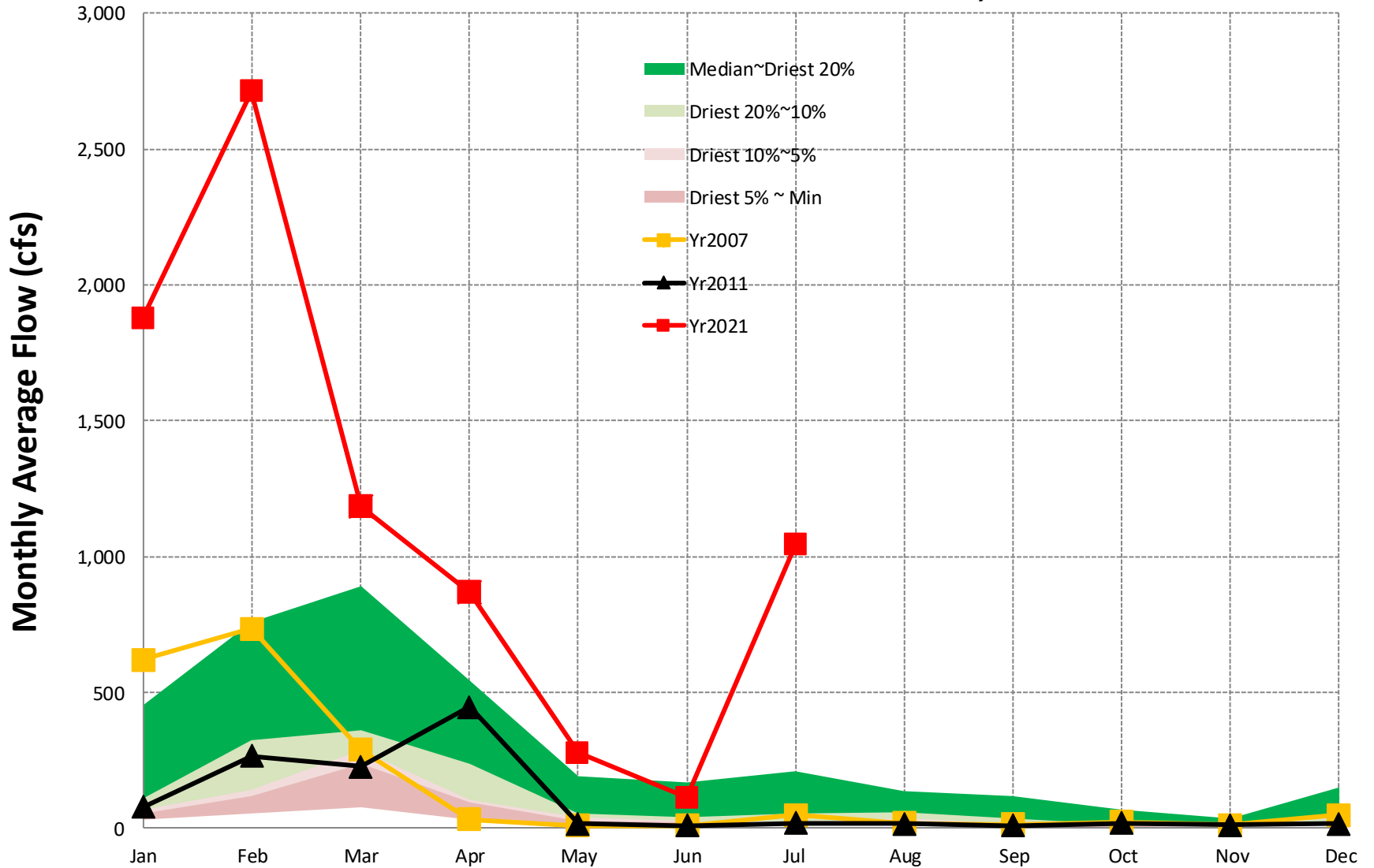
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Gage #27. USGS #02202500, Ogeechee Basin, Ogeechee River near Eden, GA

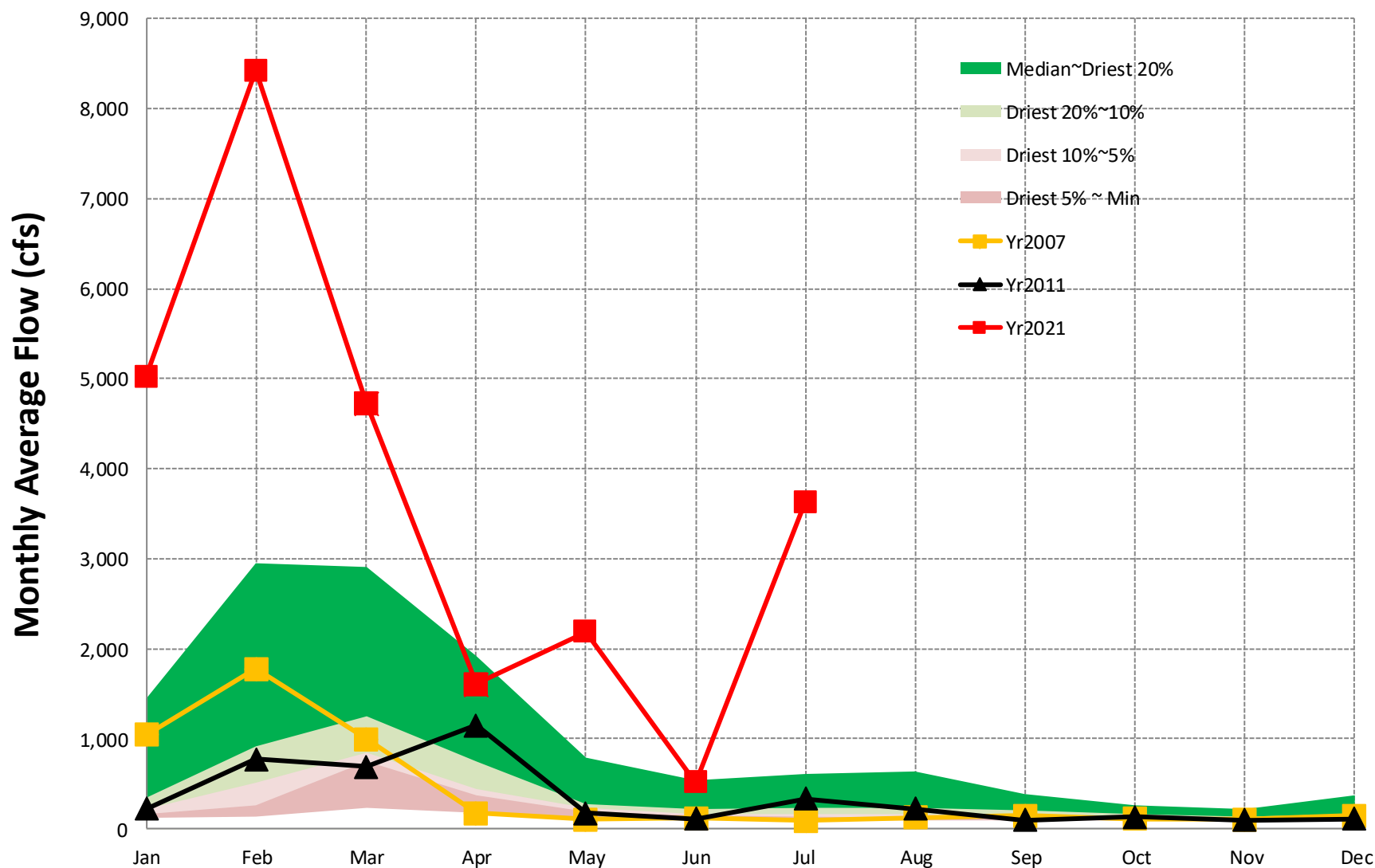


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Gage #28. USGS #02327500, Ochlockonee Basin, OCHLOCKONEE RIVER near THOMASVILLE, GA

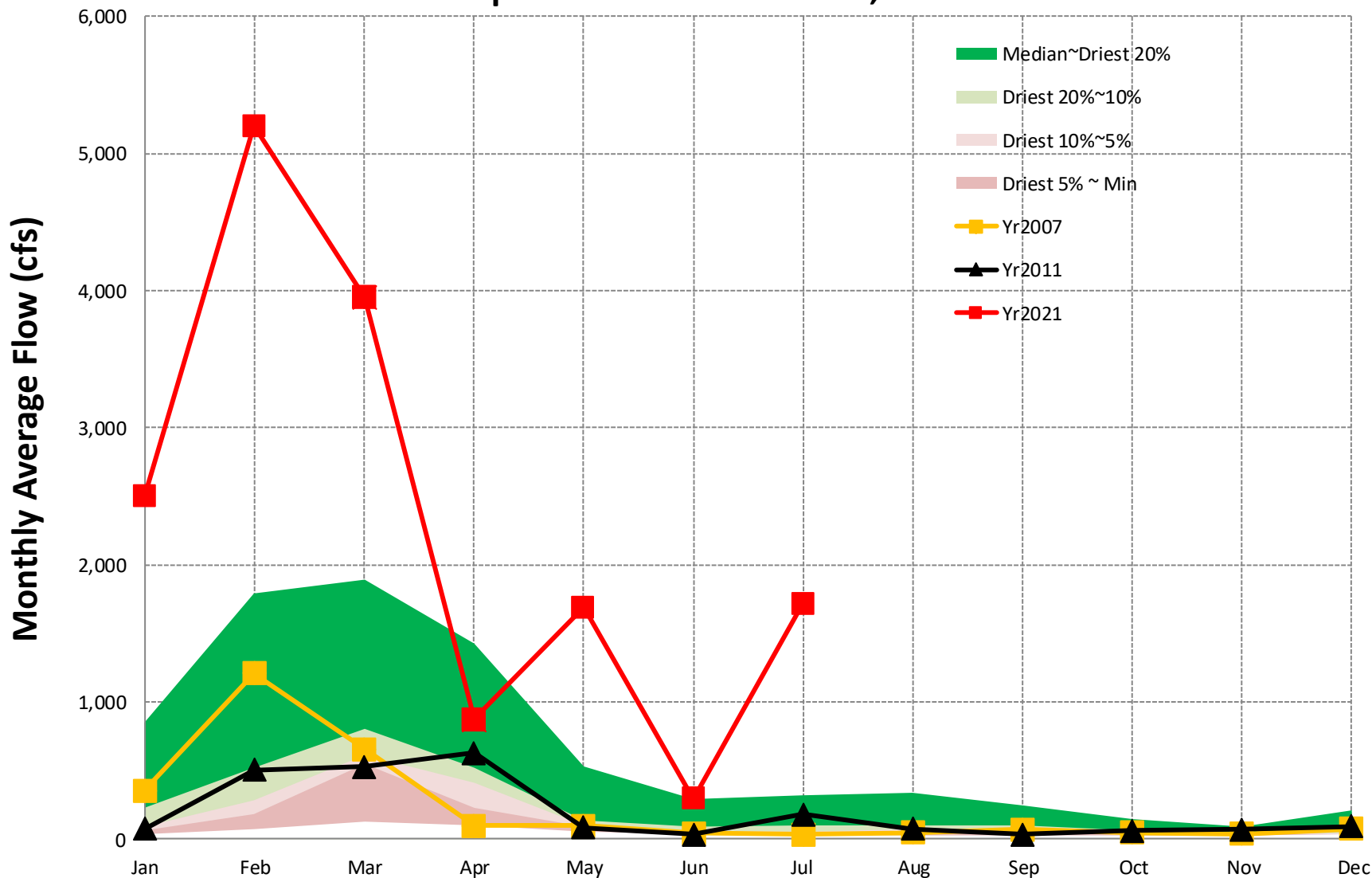


Gage #29. USGS #02319000, Suwannee Basin, WITHLACOOCHEE RIVER near PINETTA, FL



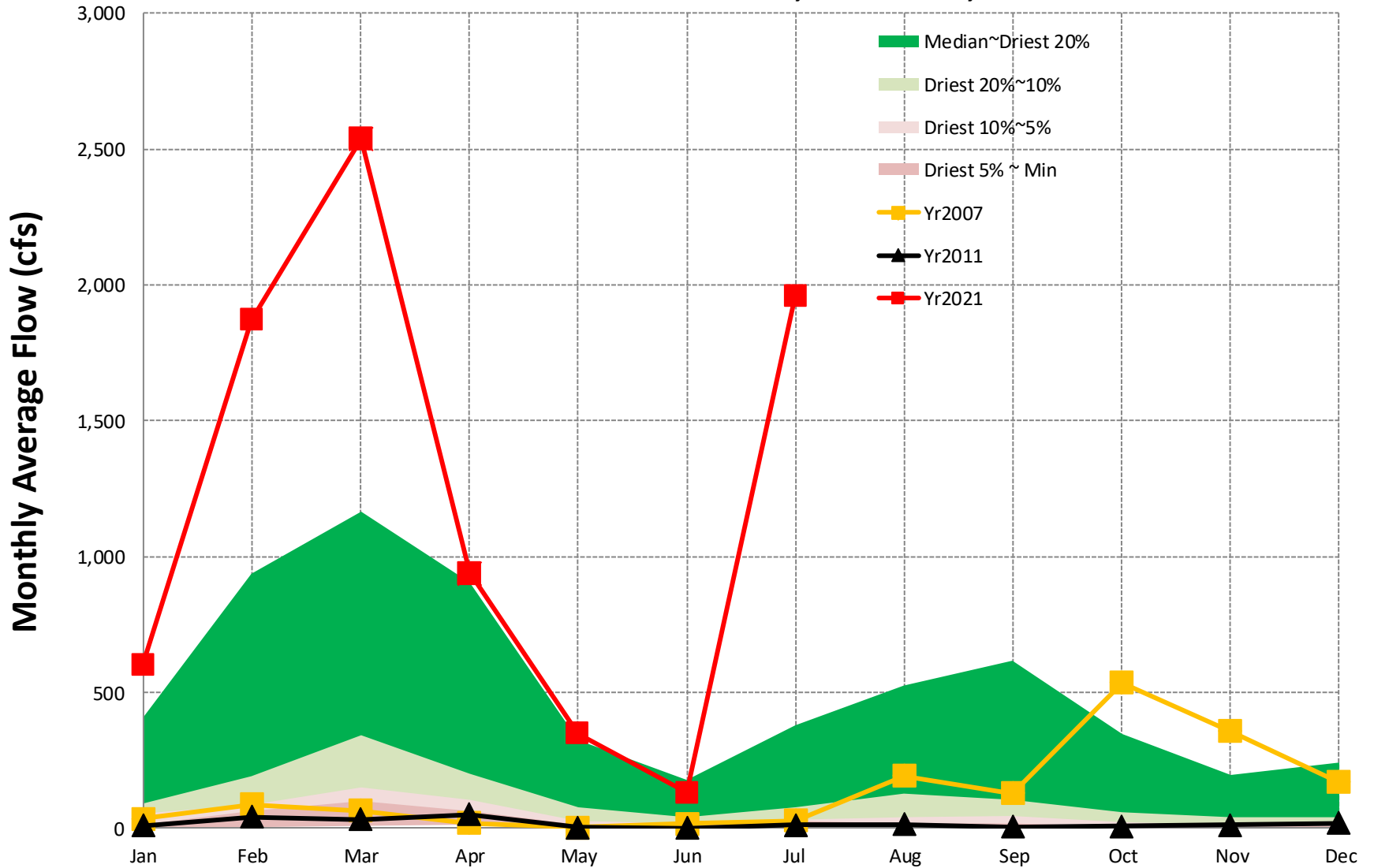
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Gage #30. USGS #02317500, Suwannee Basin, Alapaha River at Statenville, GA



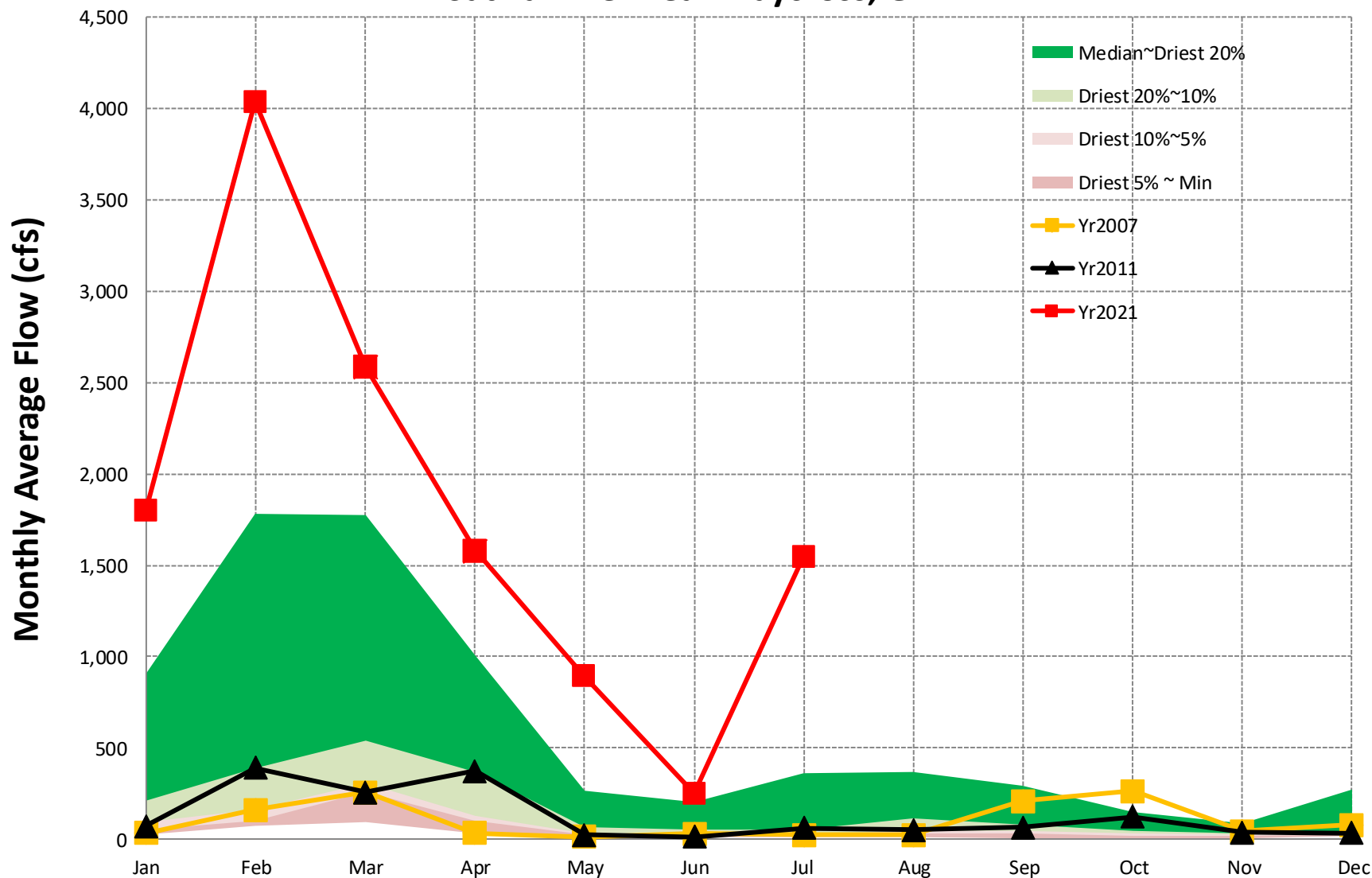
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Gage #31. USGS #02314500, Suwannee Basin, SUWANNEE RIVER AT US 441, AT FARGO, GA



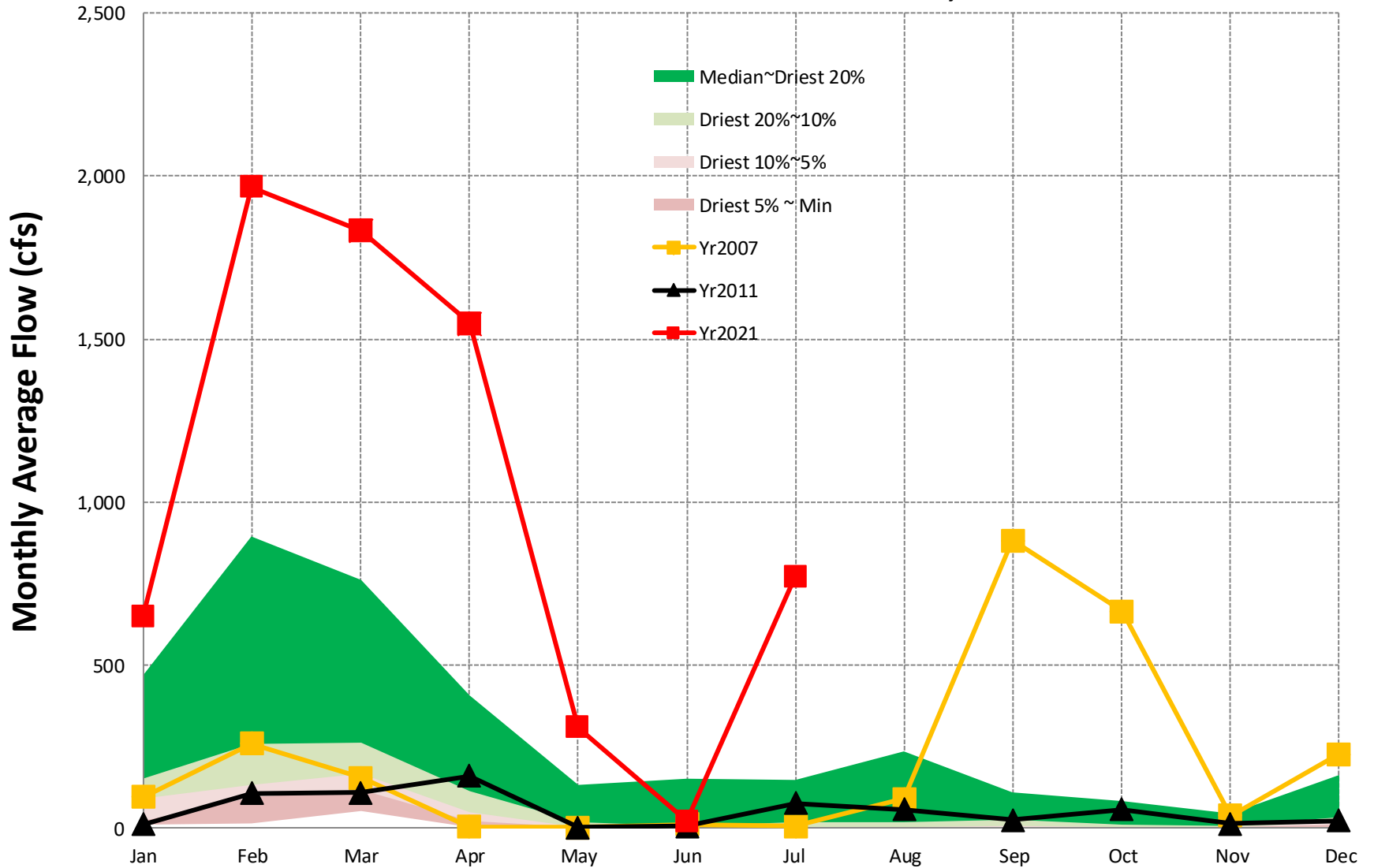
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Gage #32. USGS #02226500, Satilla Basin, Satilla River near Waycross, GA

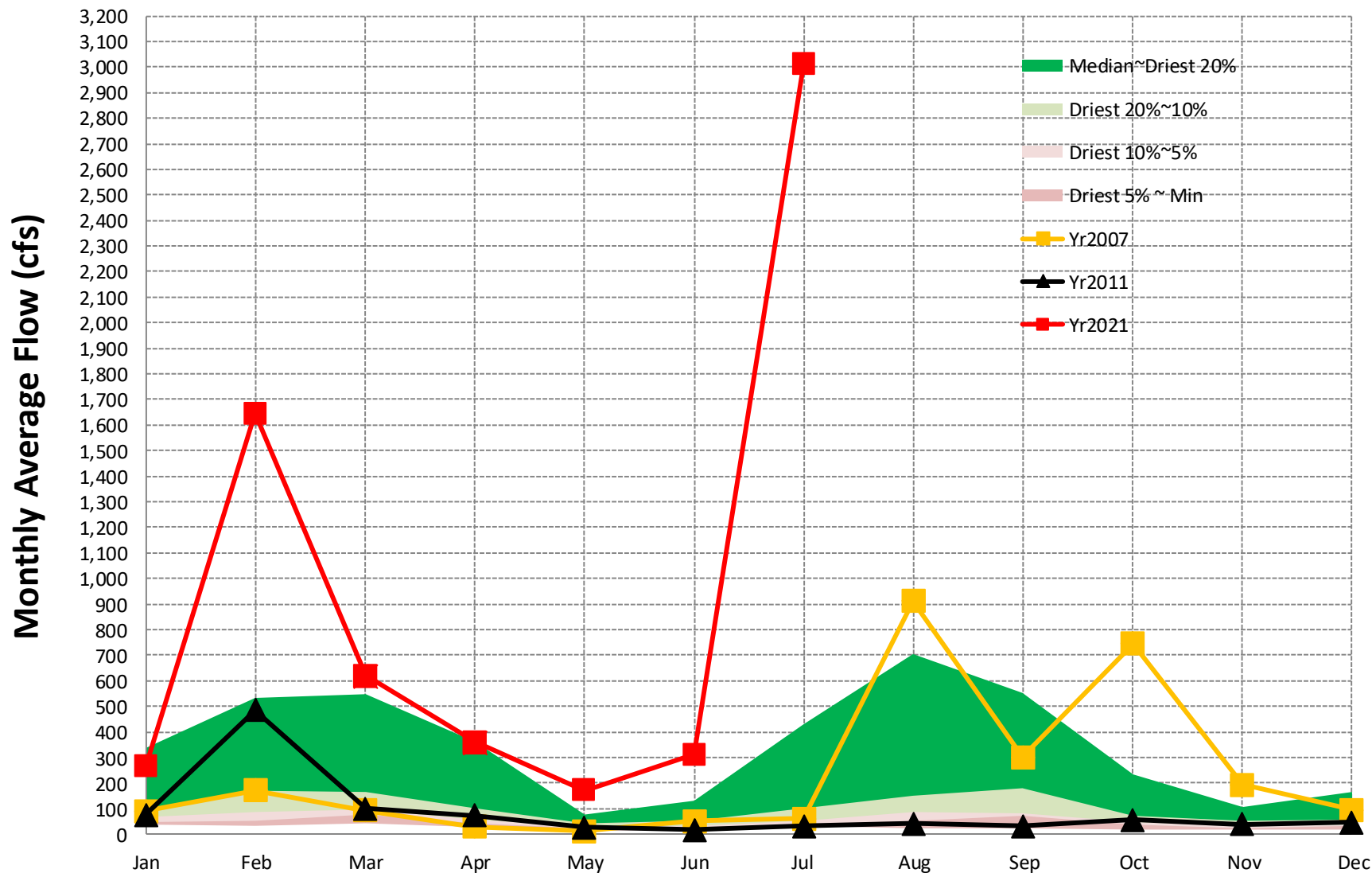


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Gage #33. USGS #02227500, Satilla Basin, LITTLE SATILLA RIVER near OFFERMAN, GA



Gage #34. USGS #02231000, St Mary Basin, ST. MARYS RIVER near MACCLENNY, FL



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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

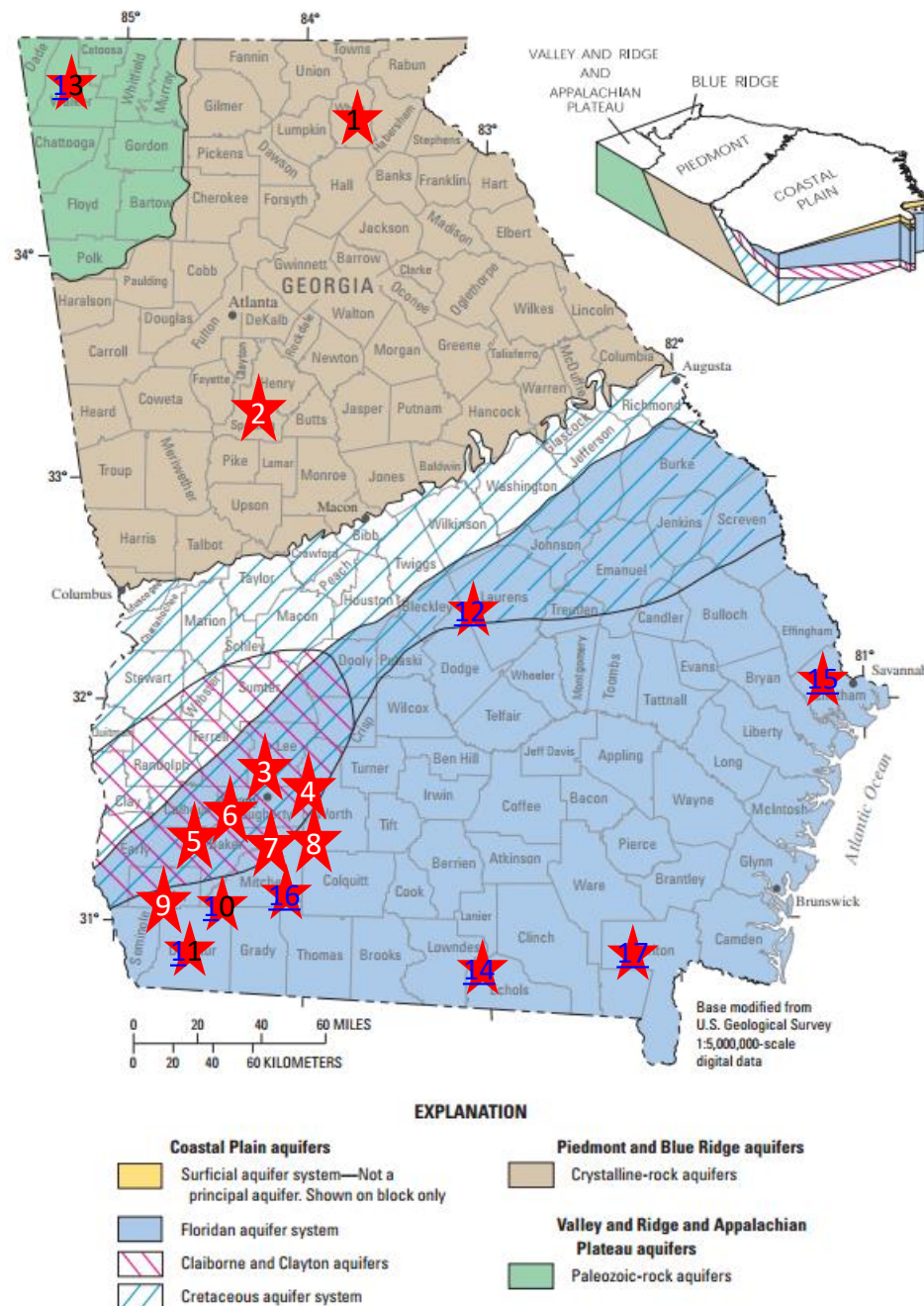


Figure 2. Area of use of principal aquifers and physiographic provinces in Georgia (modified from U.S. Geological Survey, 2006).

Groundwater Level Graphs

- For each of the 17 groundwater wells, EPD has prepared a graph that shows monthly average groundwater levels from January 2021 through July 2021;
- 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.

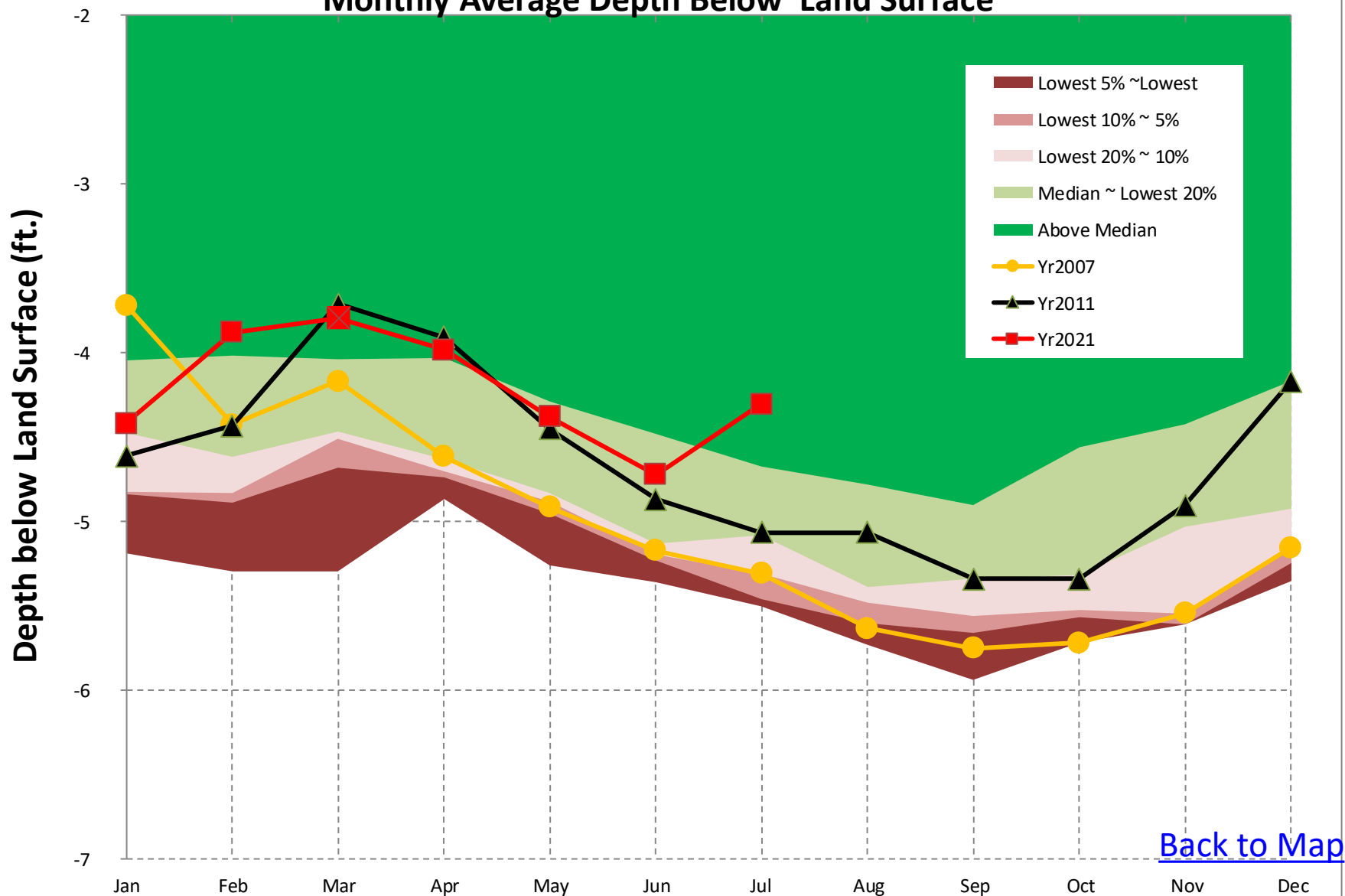
How to Read the Groundwater Level Graphs

Example: [Well #11, 09F520, Flint River Basin](#)

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

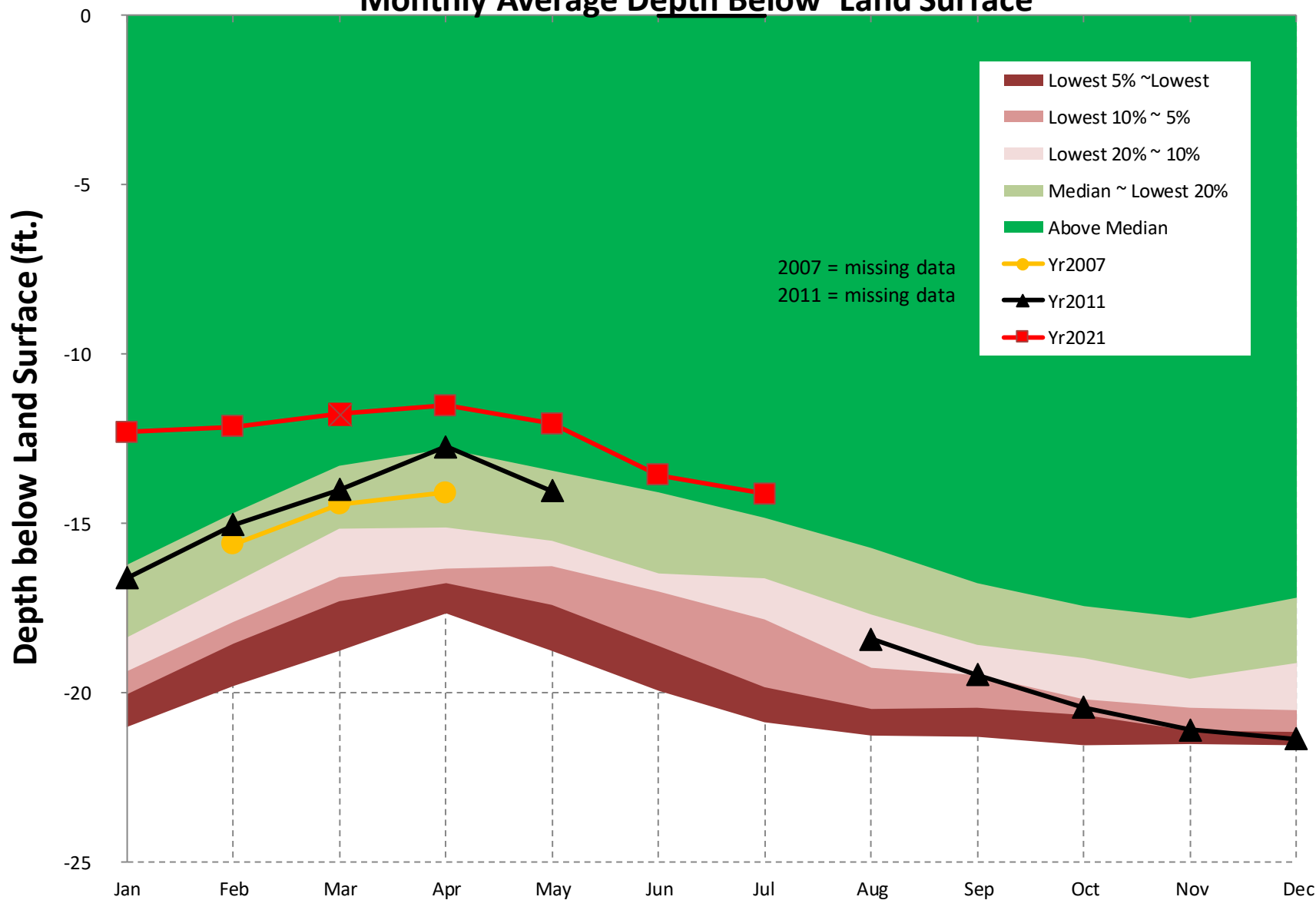
- The average monthly groundwater level in July 2021 was 45 ft below land surface. The statistical composite of all historical data for this well shows that monthly average groundwater levels in July have historically been lower than July 2021 about 70~80% of the time; about 20~30% of the time in July they have been higher.
- The average monthly groundwater level in July 2011 was 52 ft below land surface. The statistical composite of all historical data for this well shows that monthly average groundwater levels in July have historically been lower than July 2011 about 5% of the time; about 95% of the time in July they have been higher.
- The average monthly groundwater level in July 2007 was 52.2 ft below land surface. The statistical composite of all historical data for this well shows that monthly average groundwater levels in July have historically been lower than July 2007 about 2% of the time; about 98% of the time in July they have been higher.

Well #1, 16MM03, Crystalline Rocks Aquifer in Chattahoochee Basin, Monthly Average Depth Below Land Surface

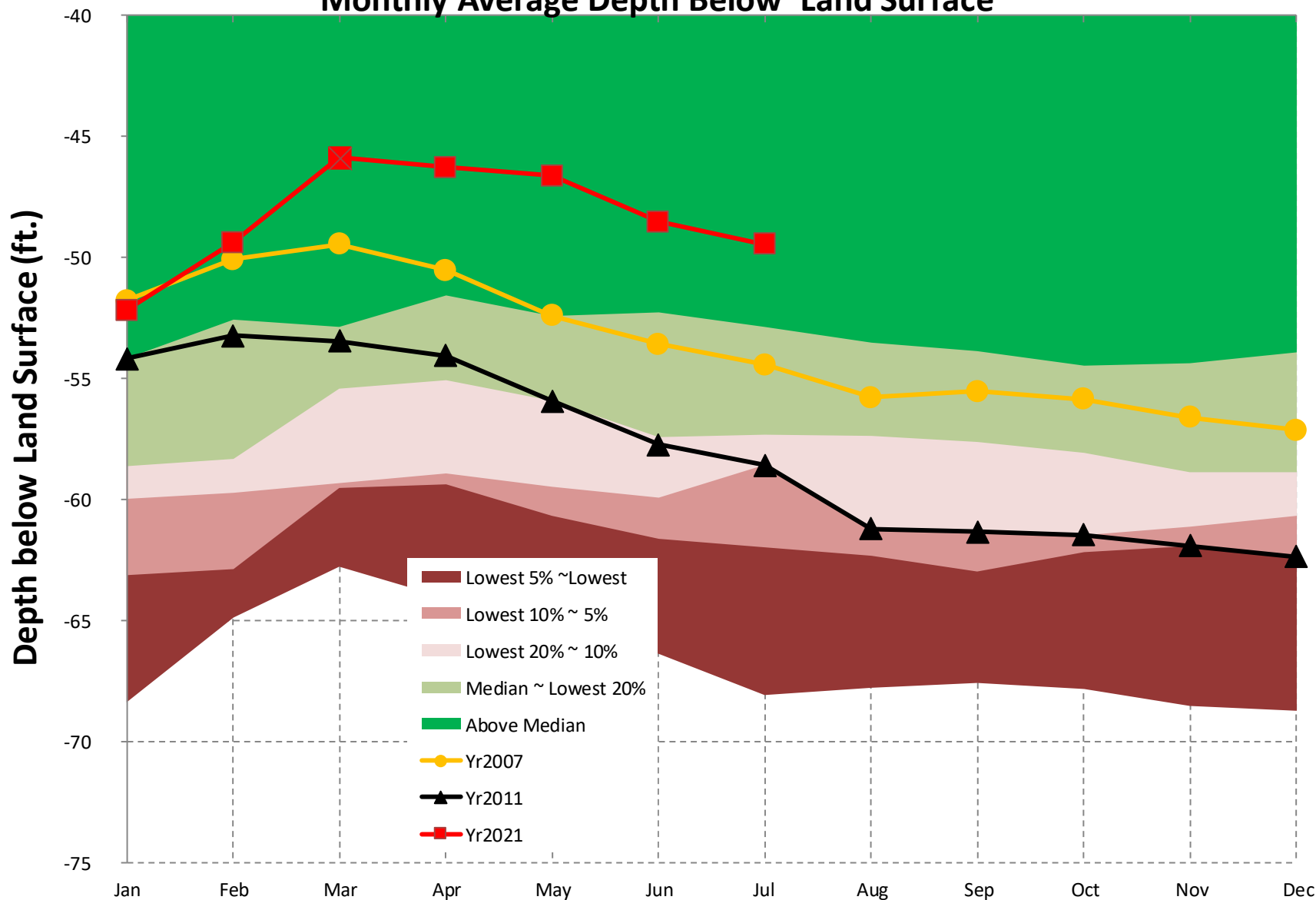


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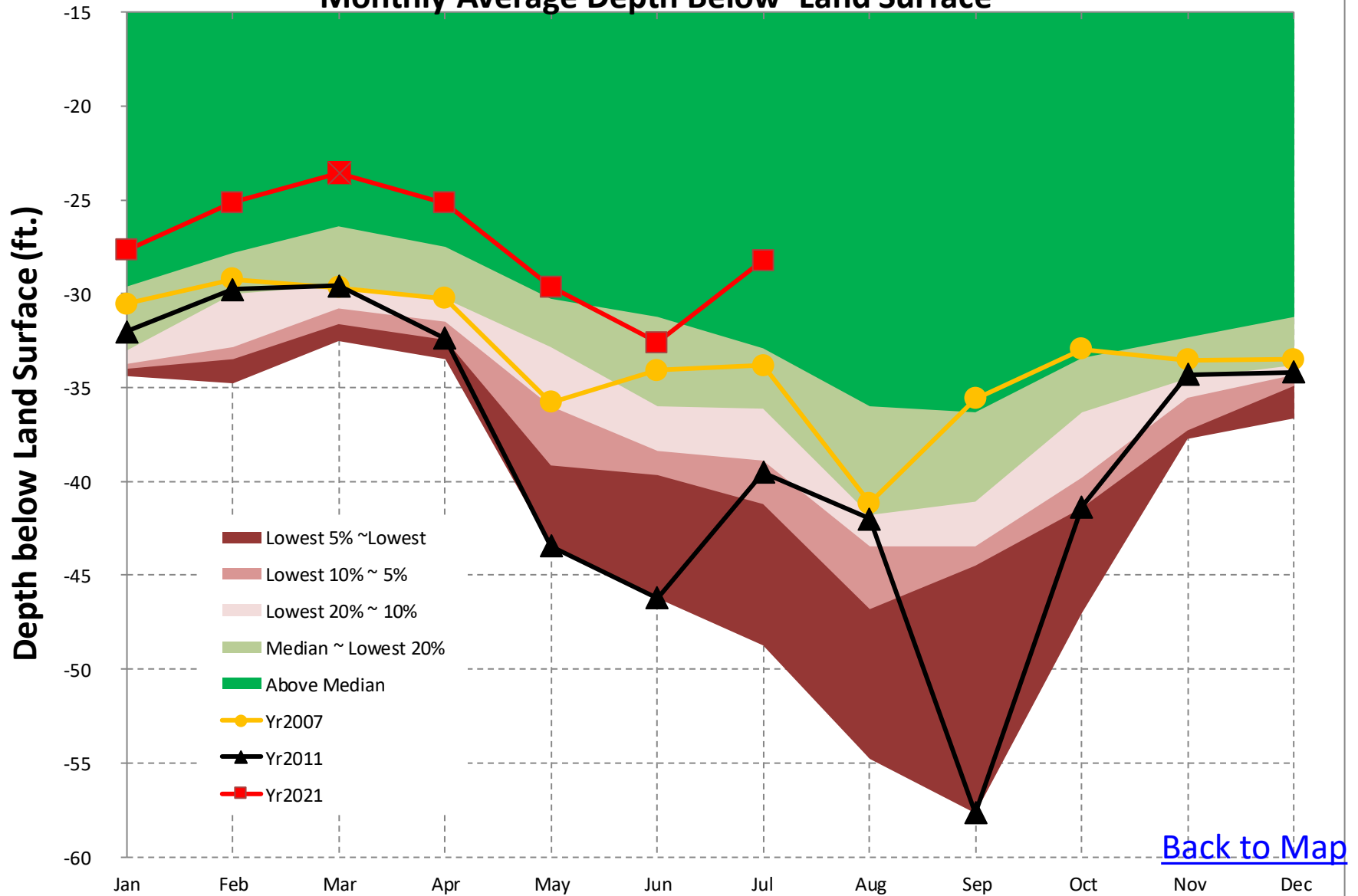
Well #2, 11AA01, Surficial Aquifer in Flint Basin, Monthly Average Depth Below Land Surface



Well #3, 13L180, Floridan Aquifer in Flint Basin, Monthly Average Depth Below Land Surface

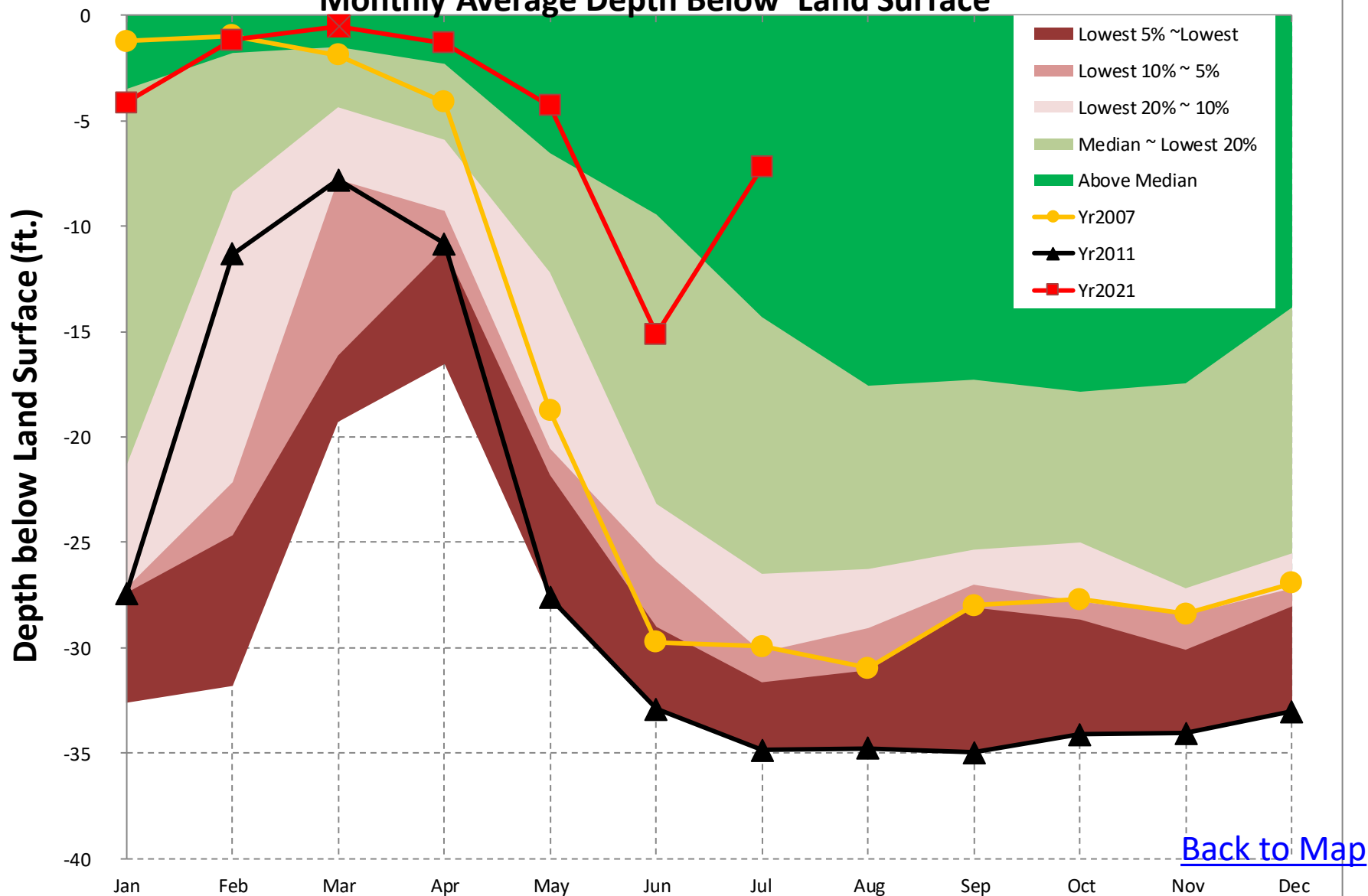


Well #4, 12M017, Floridan Aquifer in Flint Basin, Monthly Average Depth Below Land Surface



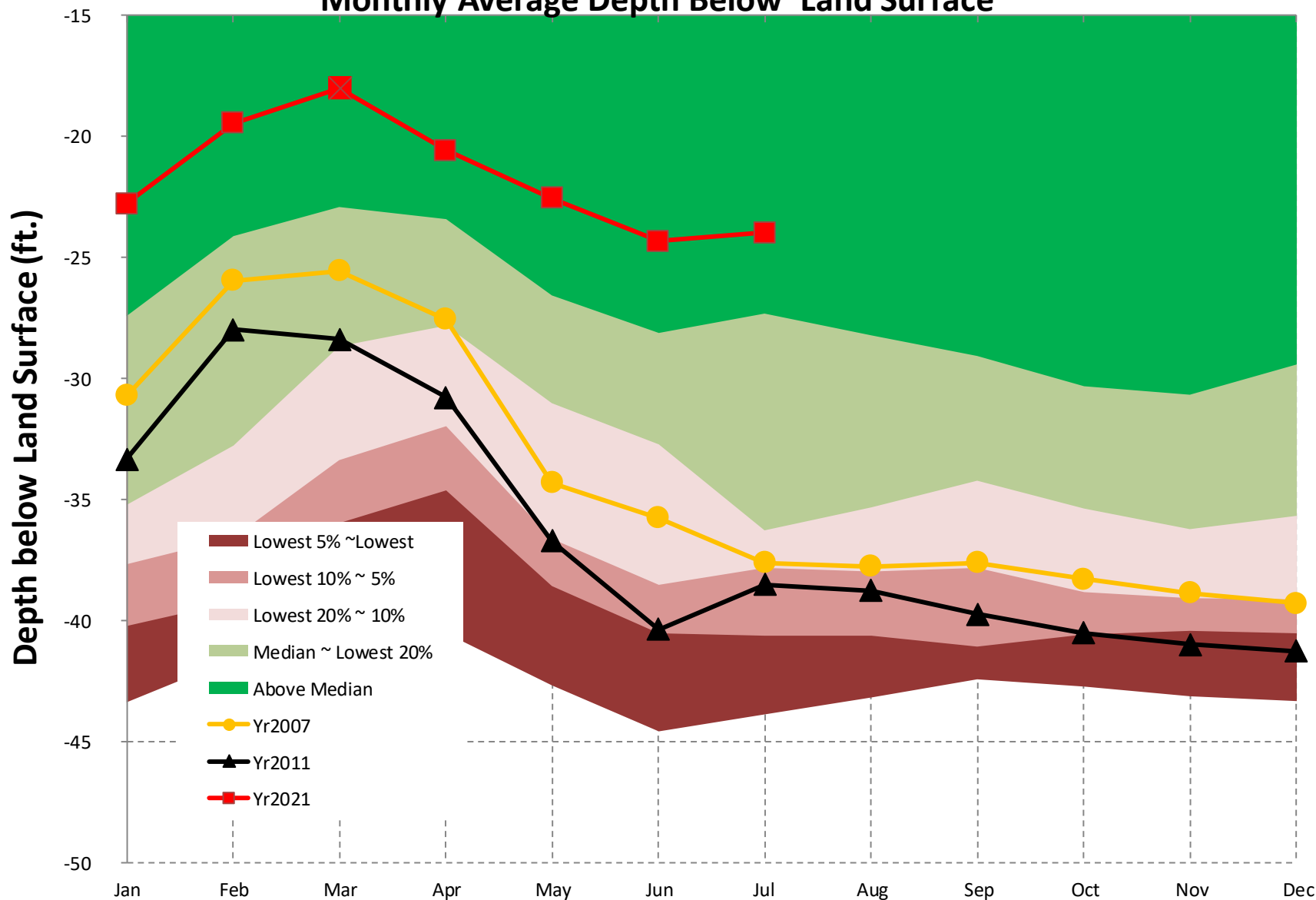
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Well #5, 08K001, Floridan Aquifer in Flint Basin, Monthly Average Depth Below Land Surface

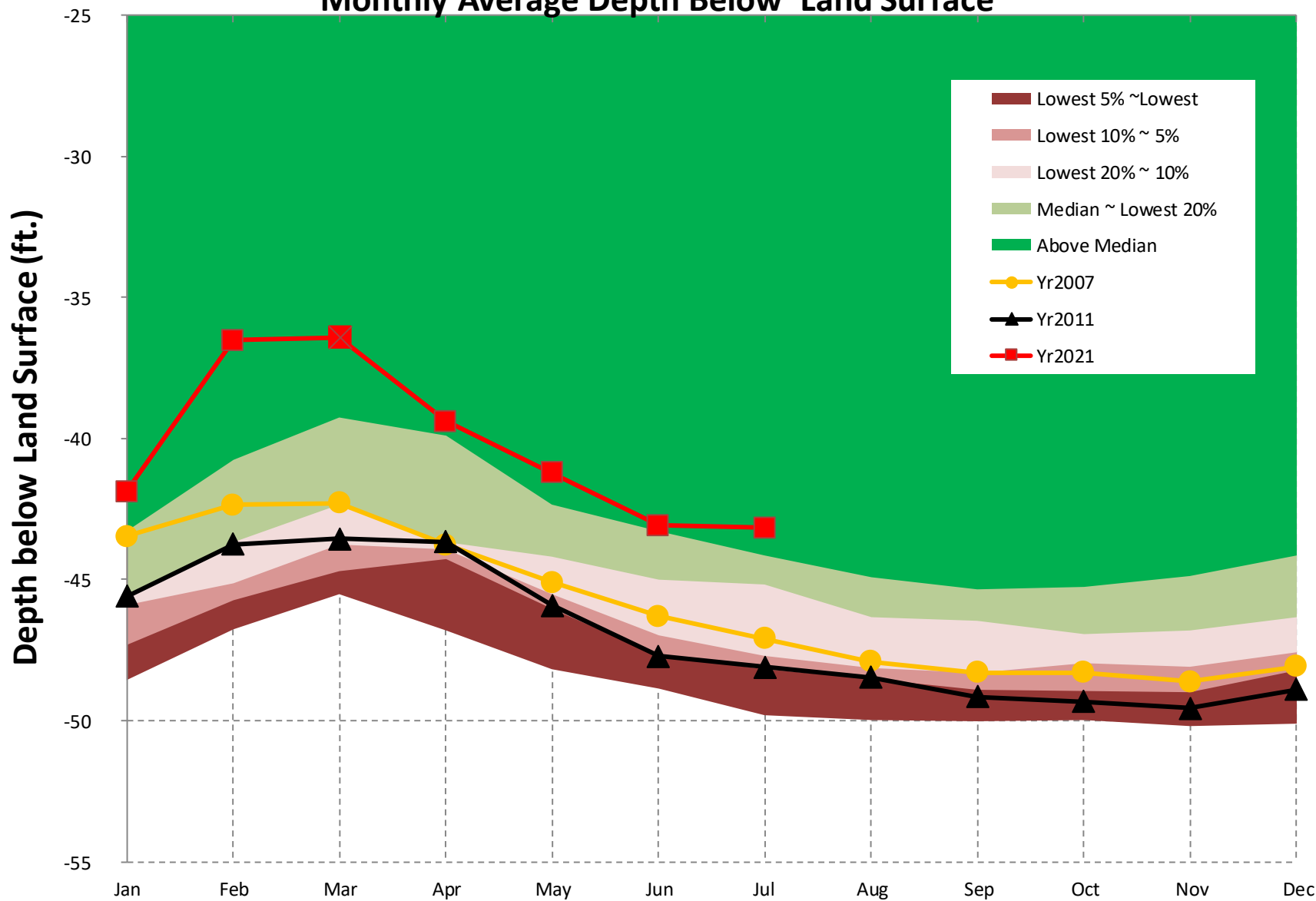


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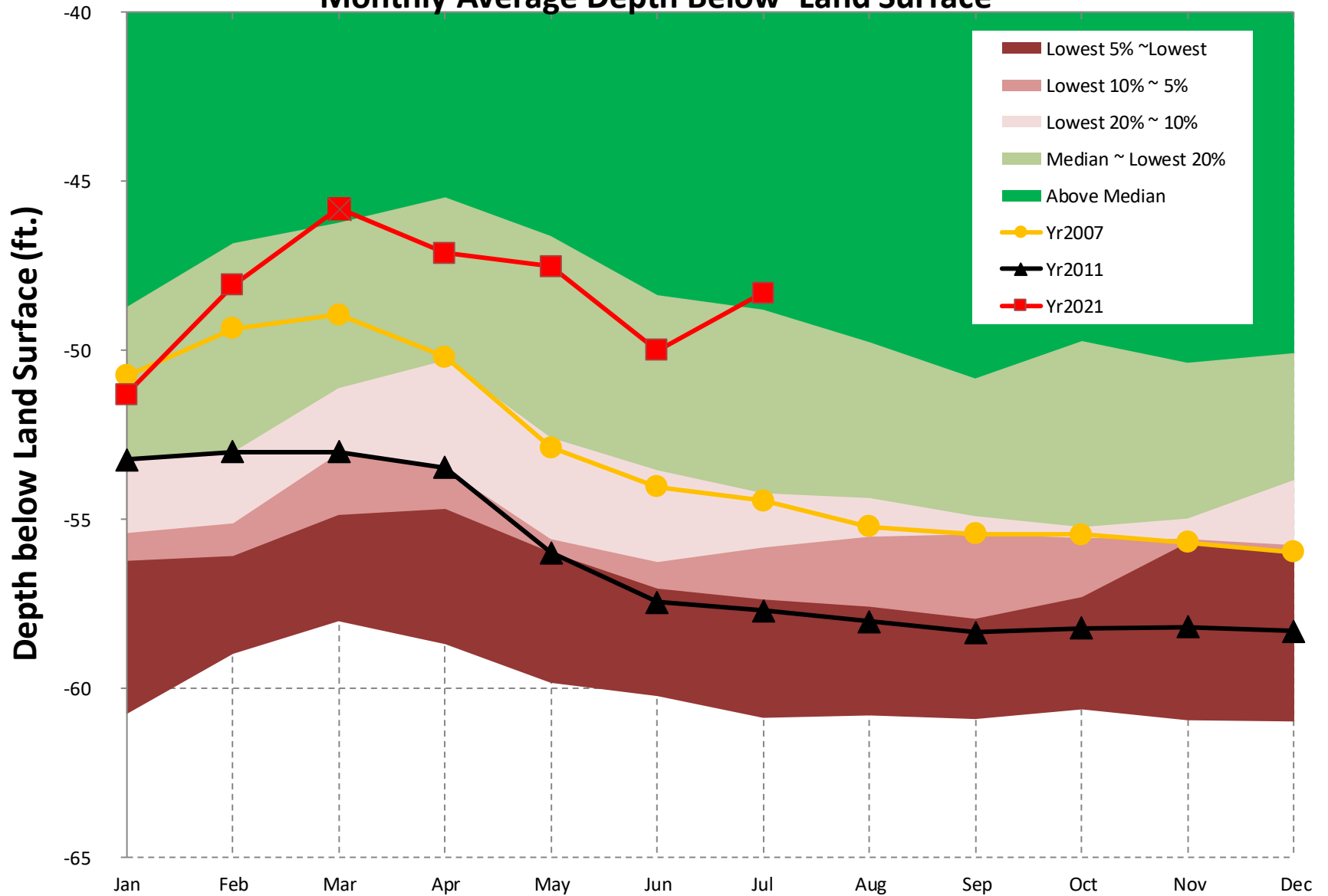
Well #6, 11K003, Floridan Aquifer in Flint Basin, Monthly Average Depth Below Land Surface



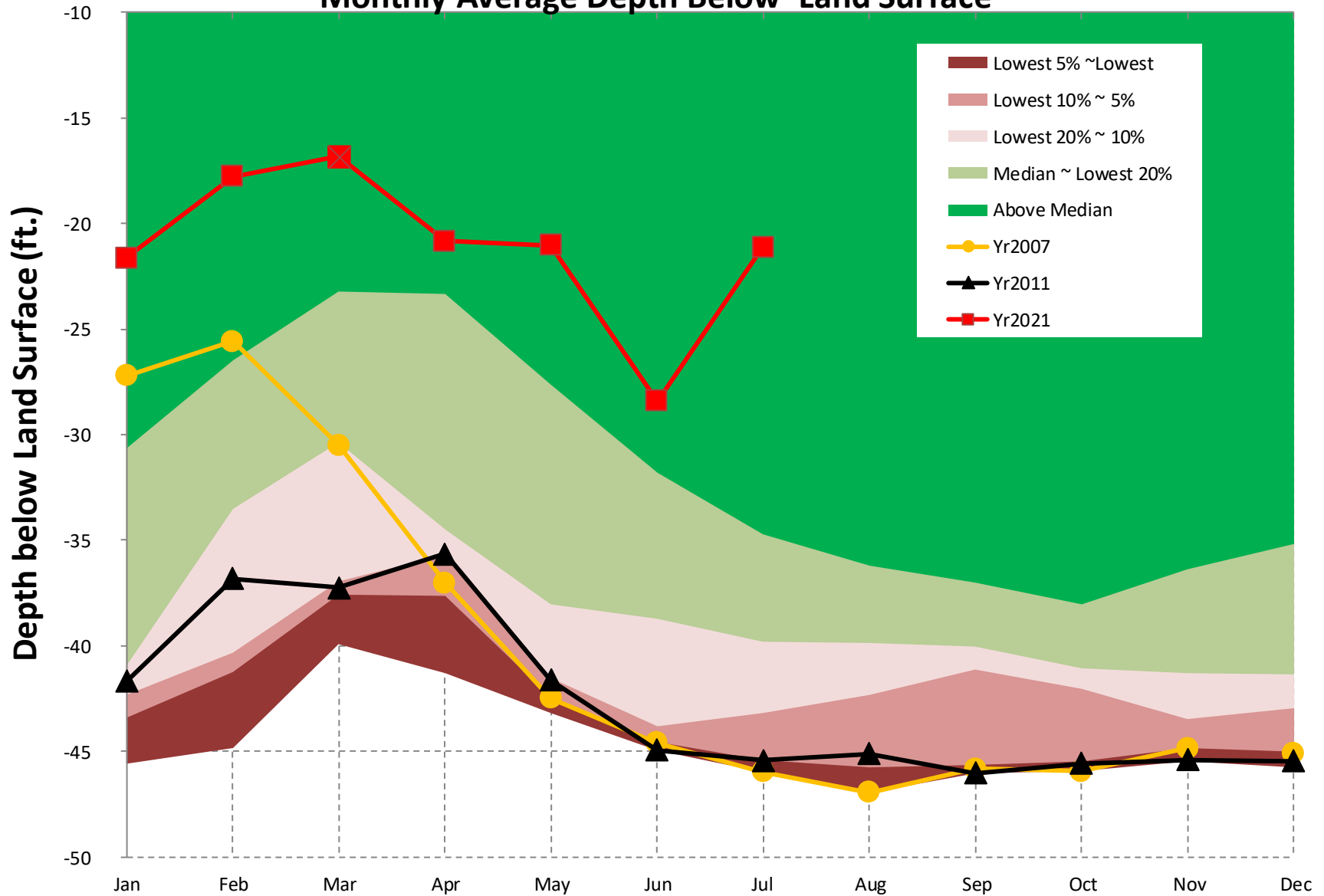
Well #7, 12K014, Floridan Aquifer in Flint Basin, Monthly Average Depth Below Land Surface



Well #8, 13J004, Floridan Aquifer in Flint Basin, Monthly Average Depth Below Land Surface

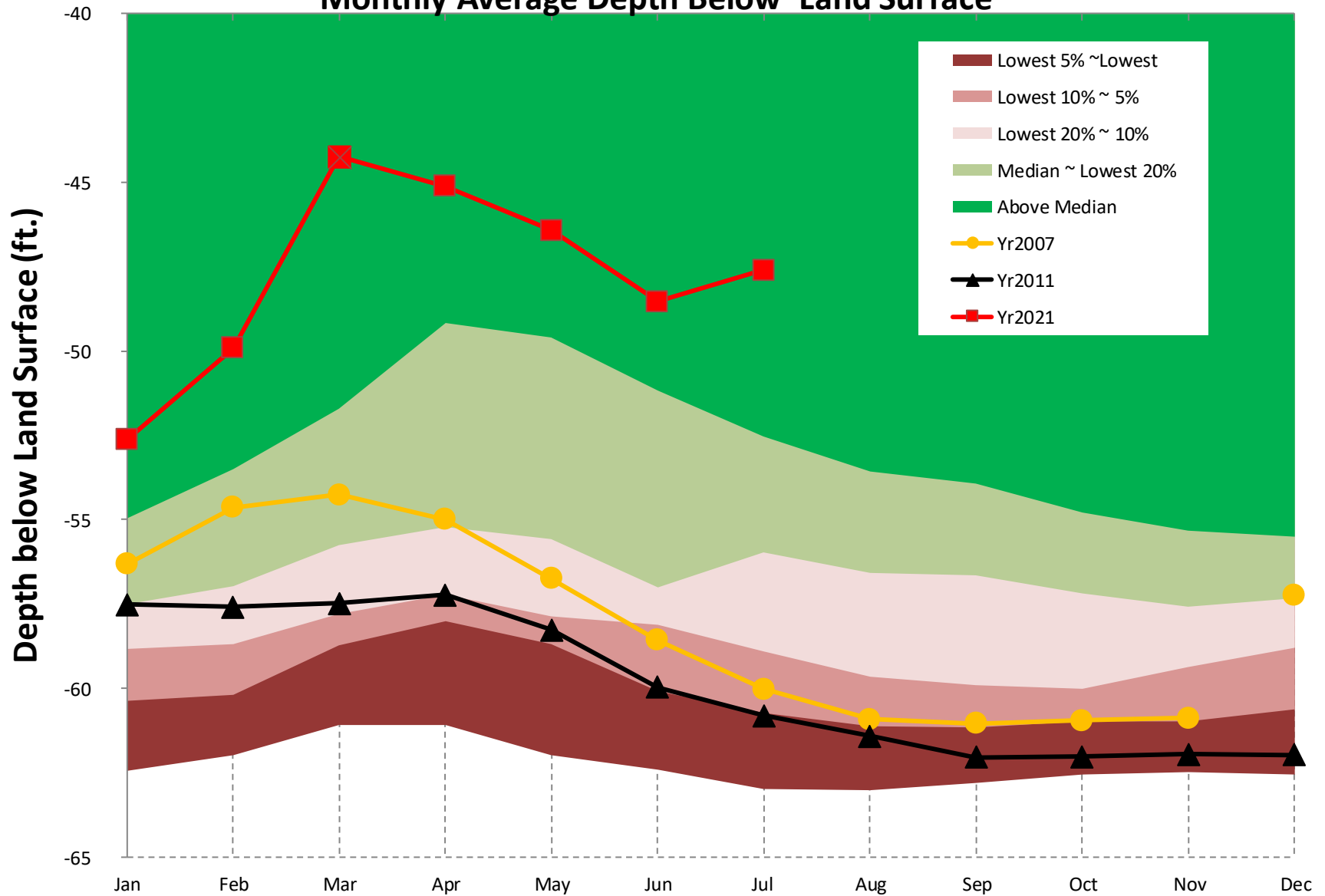


Well #9, 08G001, Floridan Aquifer in Flint Basin, Monthly Average Depth Below Land Surface



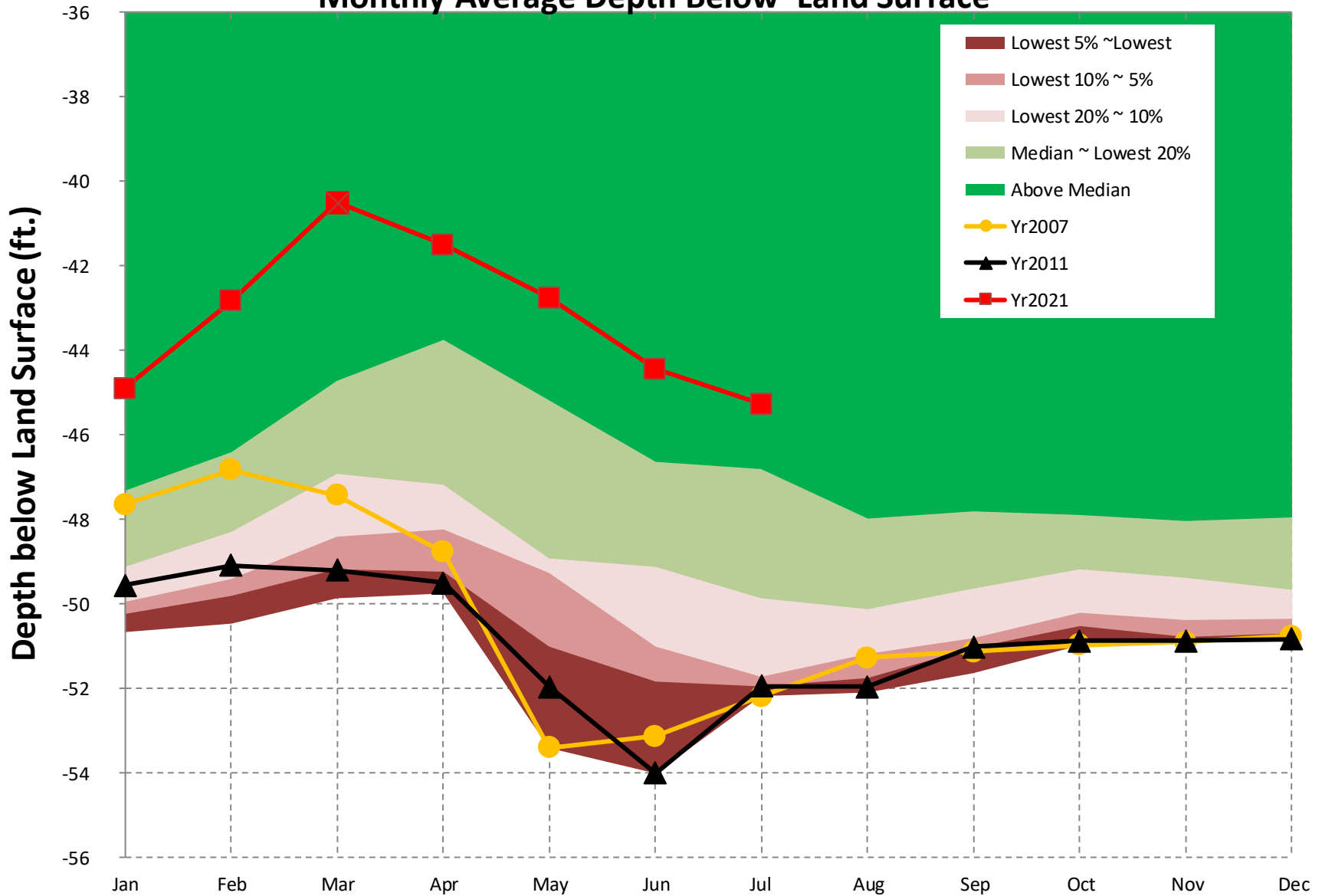
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Well #10, 10G313, Floridan Aquifer in Flint Basin, Monthly Average Depth Below Land Surface

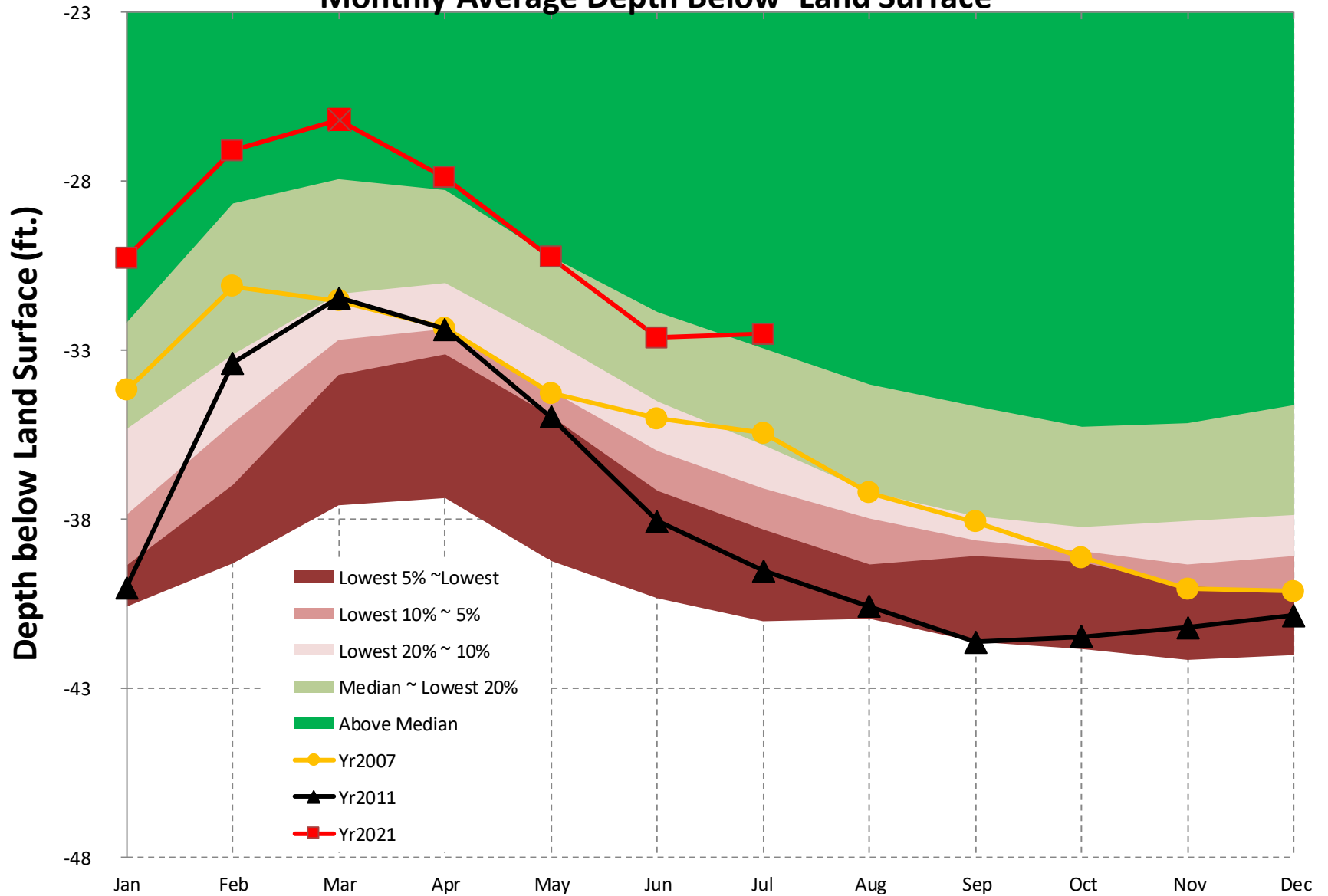


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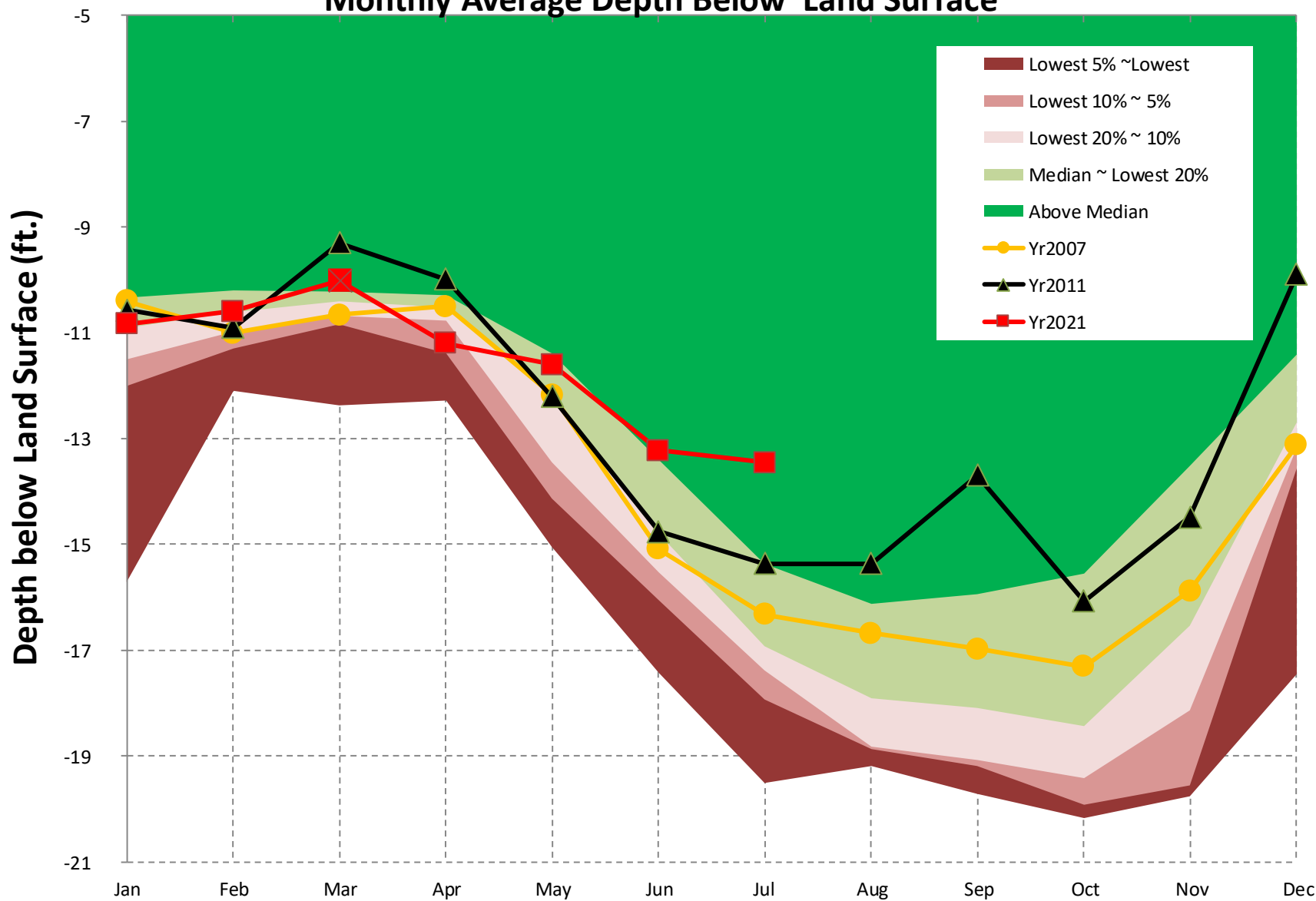
Well #11, 09F520, Floridan Aquifer in Flint Basin, Monthly Average Depth Below Land Surface



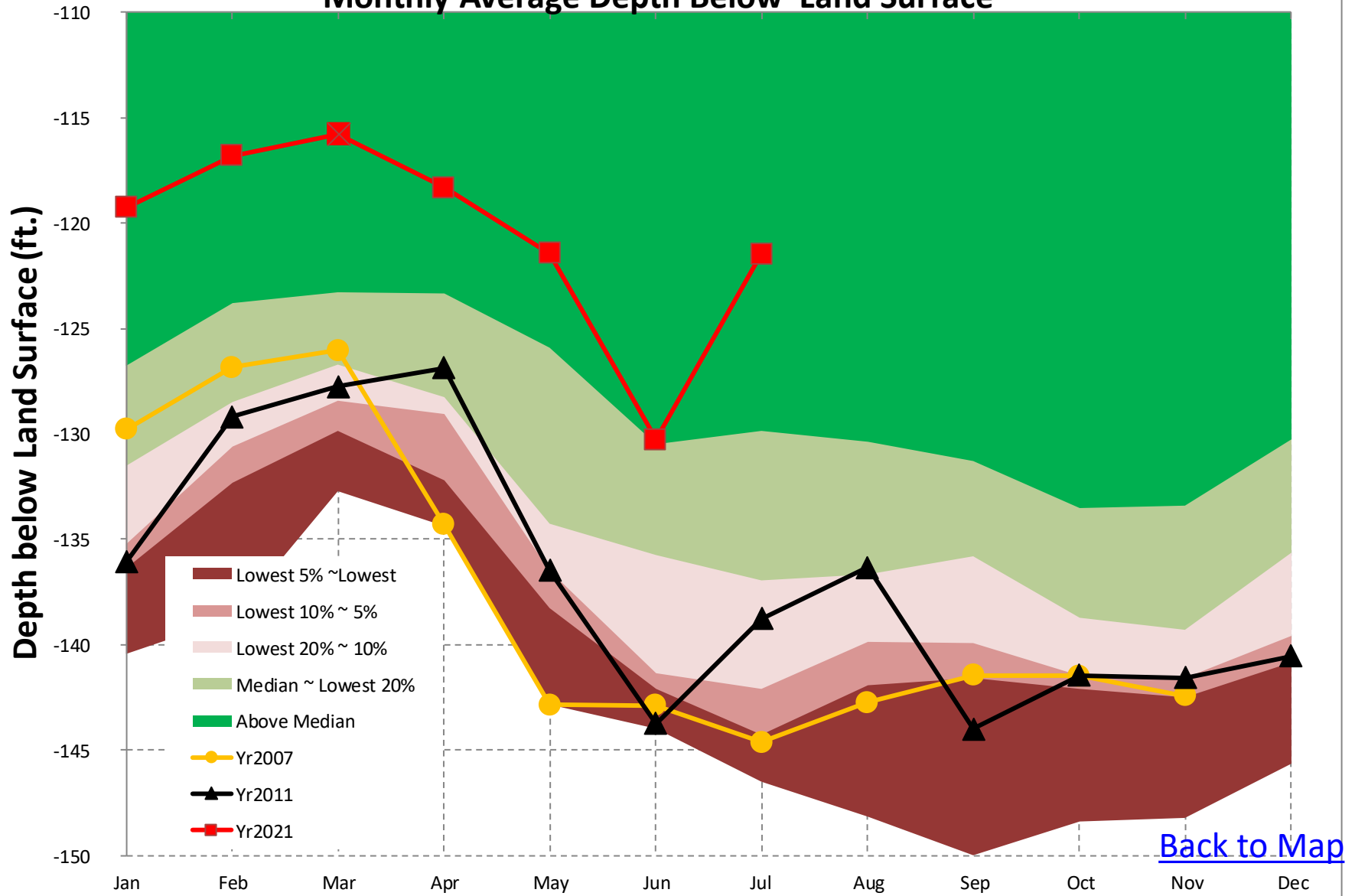
Well #12, 21T001, Floridan Aquifer in Oconee Basin, Monthly Average Depth Below Land Surface



Well #13, 03PP01, Valley and Ridge Aquifer in Tennessee Basin, Monthly Average Depth Below Land Surface

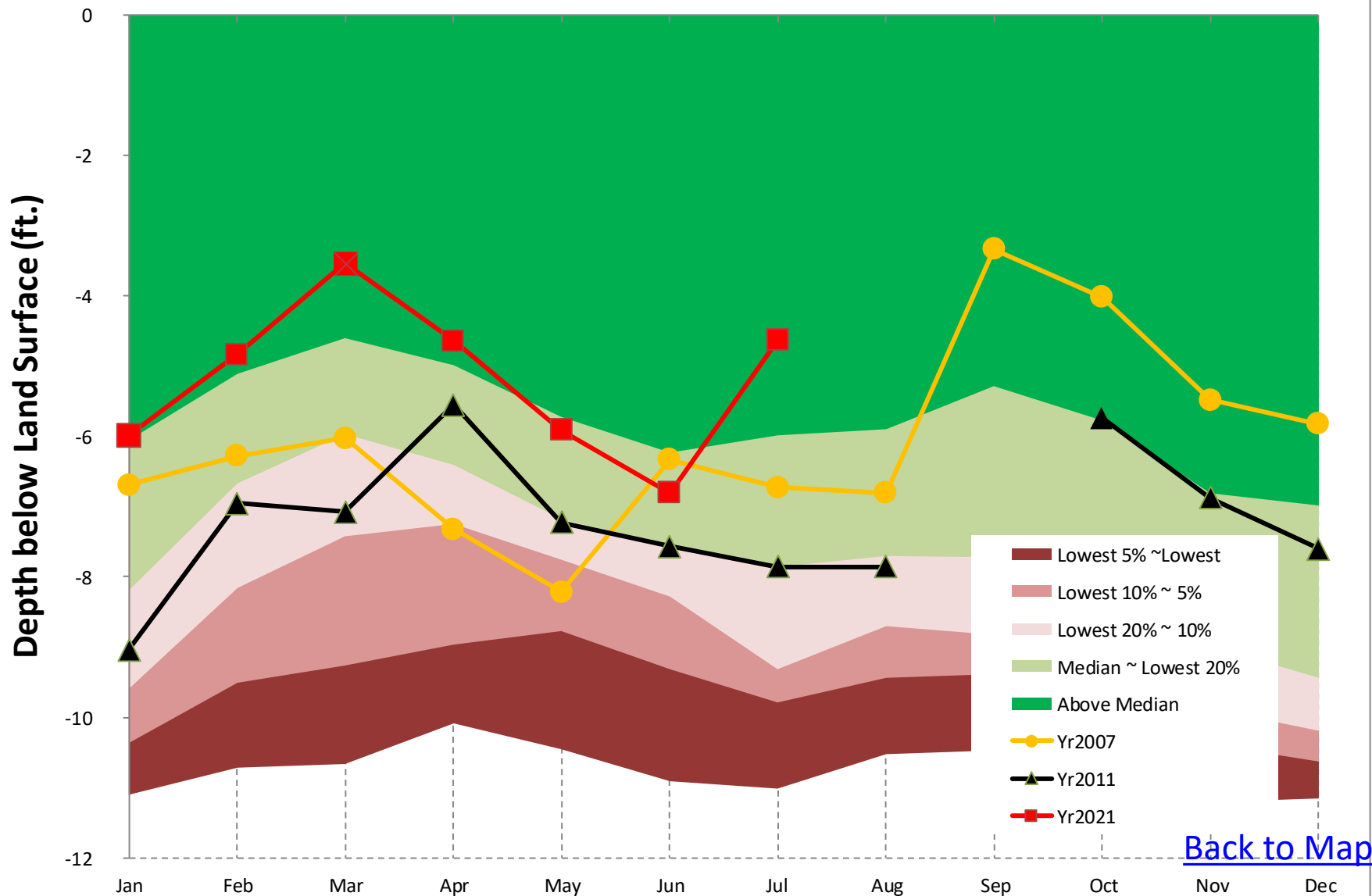


Well #14, 19E009, Floridan Aquifer in Suwannee Basin, Monthly Average Depth Below Land Surface



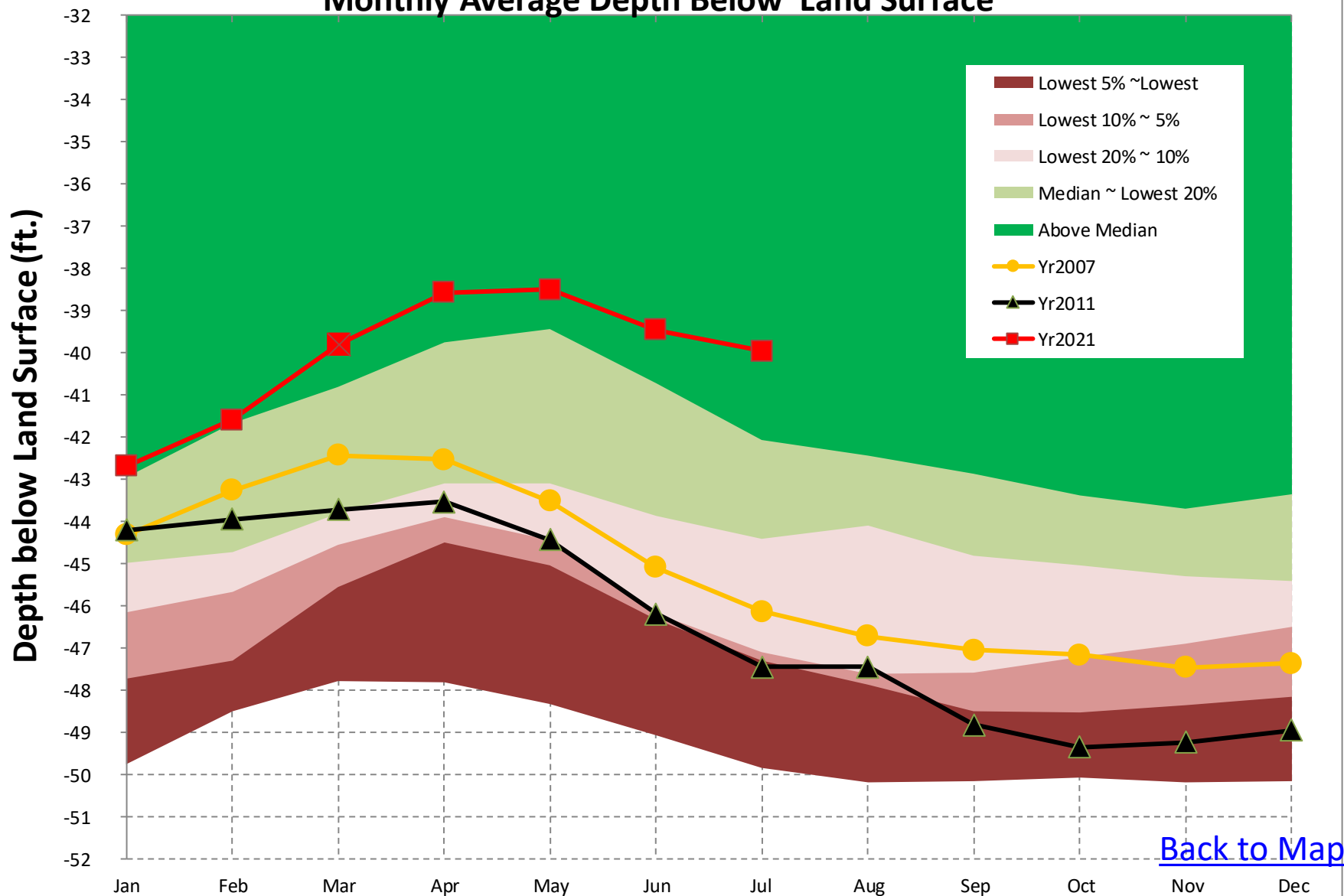
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Well #15, 35P094, Surficial Aquifer in Ogeechee Basin, Monthly Average Depth Below Land Surface



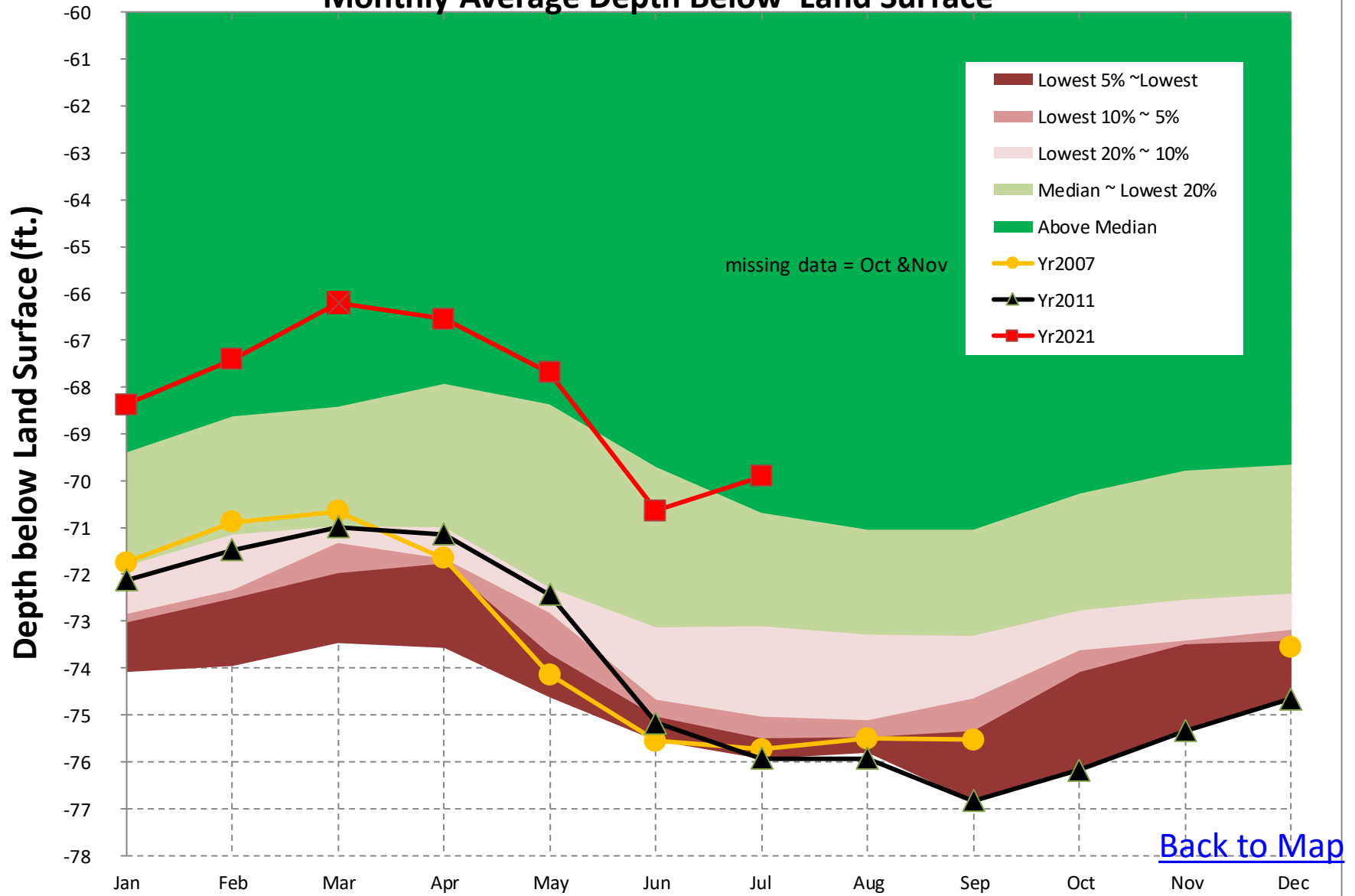
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Well #16, 11J011, Floridan Aquifer in Suwannee Basin, Monthly Average Depth Below Land Surface



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Well #17, 27E004, Floridan Aquifer in Suwannee Basin, Monthly Average Depth Below Land Surface



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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

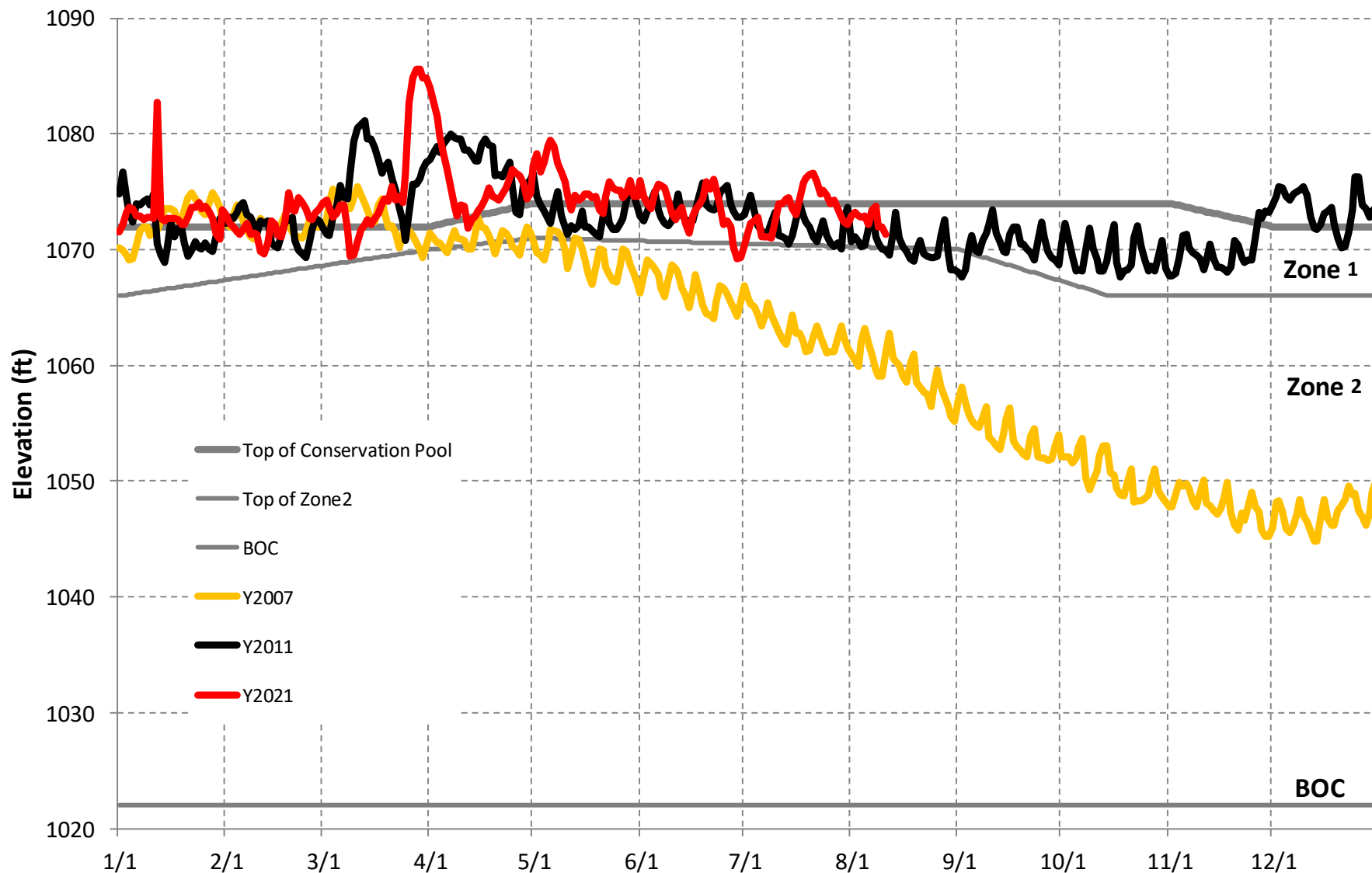


EPD monitors the water levels of seven reservoirs to assess drought conditions.

Reservoir Elevation Graphs

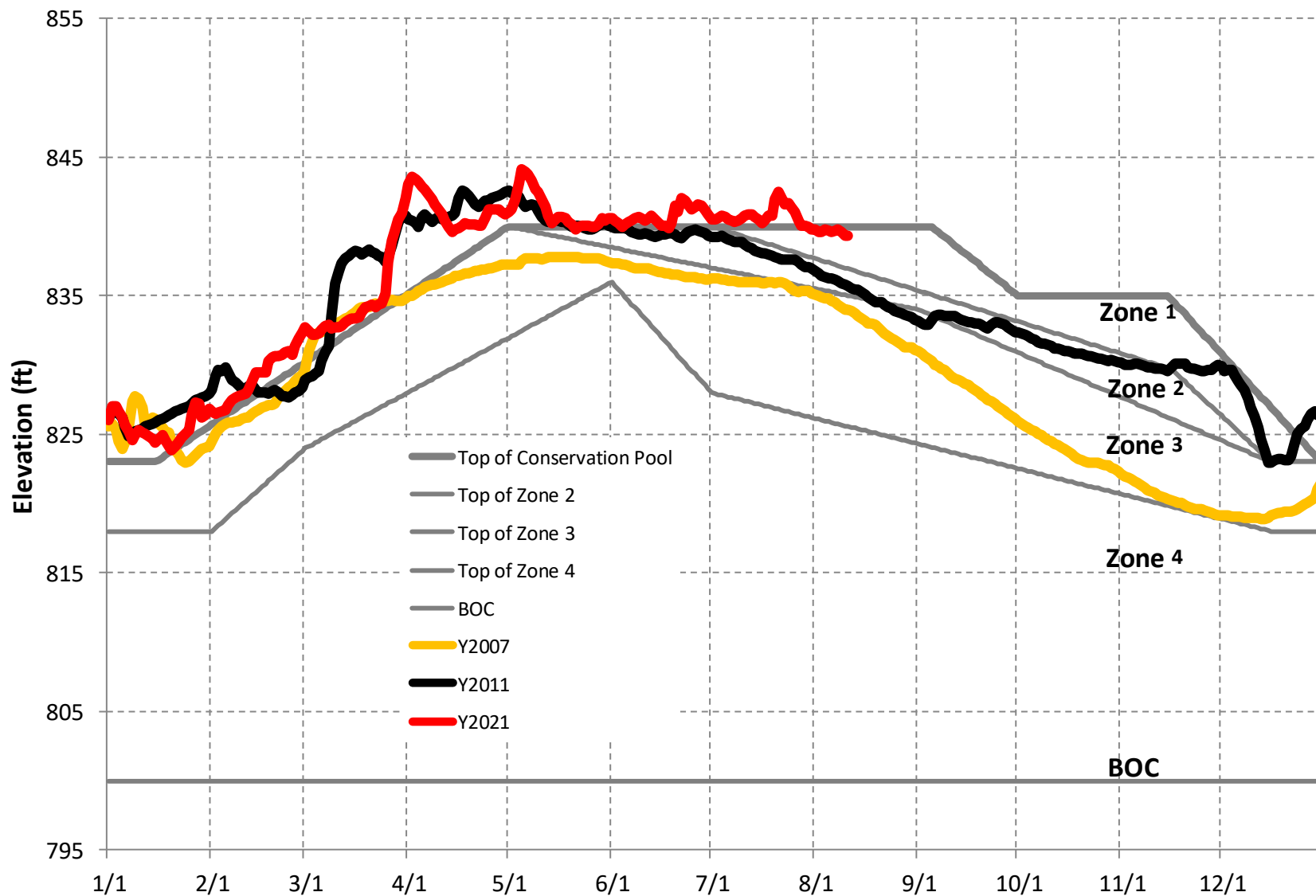
- The following graphs show the reservoir elevation curves for January 2021 through July 2021.
- Each graph also shows the Action Zone Divides (or Levels) for each reservoir
 - Zone 1 is the top layer of the conservation pool
 - Zone 2 is the layer below Zone 1
 - Zone 4 is the lowest layer in the conservation pool
 - There is no conservation storage below the bottom of Zone 4
- To put 2021 reservoir elevations into perspective, elevations for 2007 and 2011 are also shown.

CARTERS ELEVATION

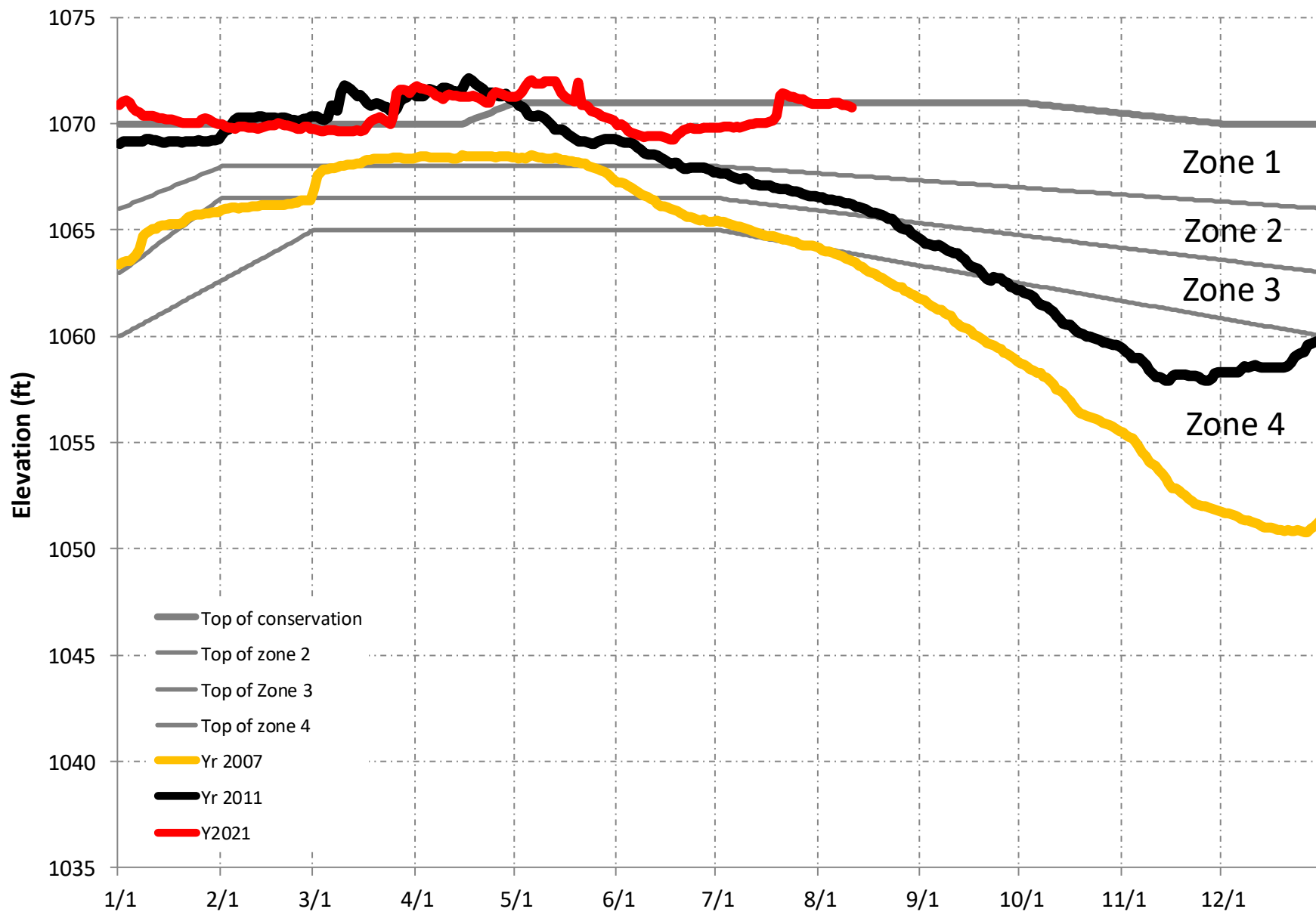


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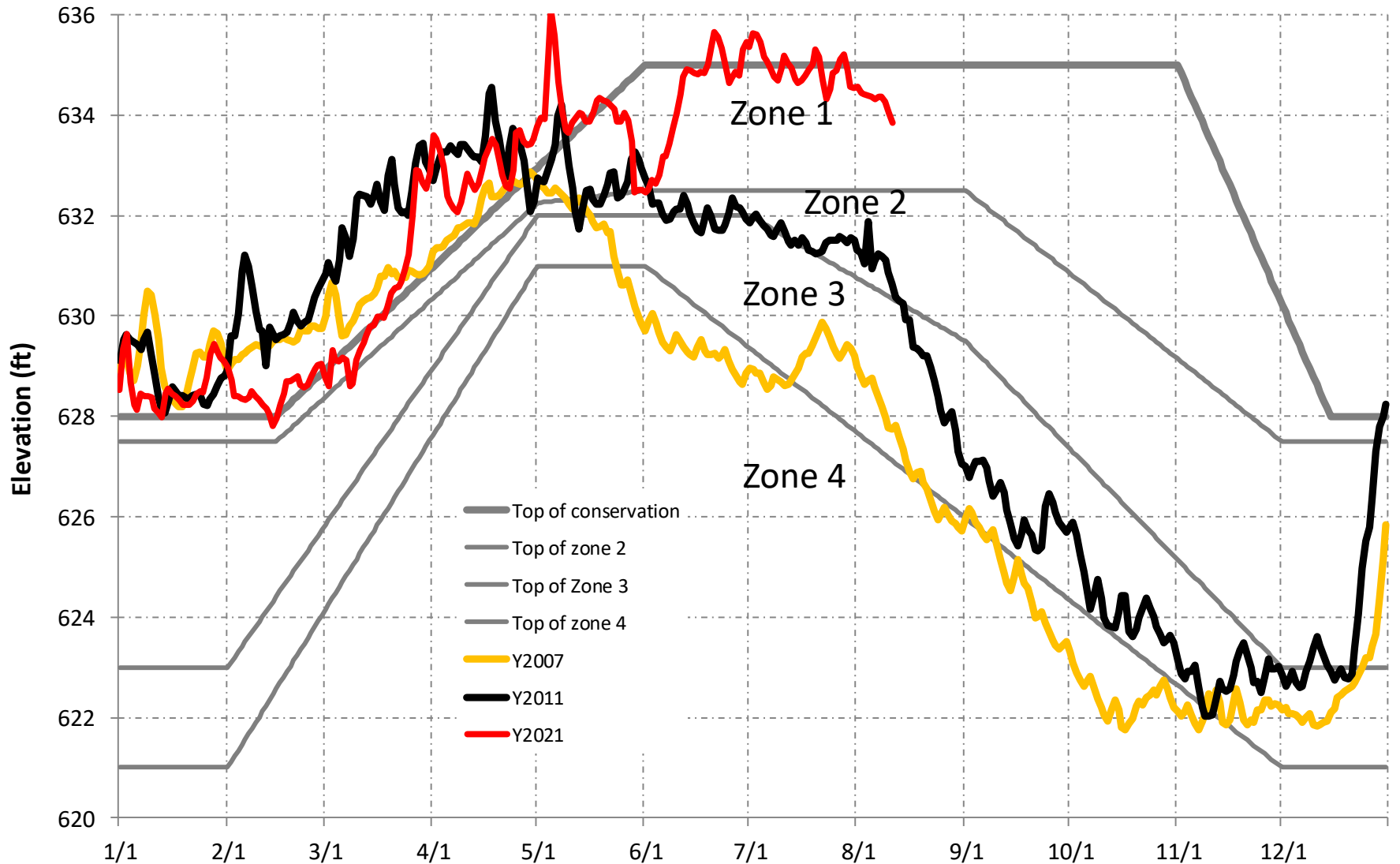
ALLATOONA ELEVATION



LAKE LANIER ELEVATION

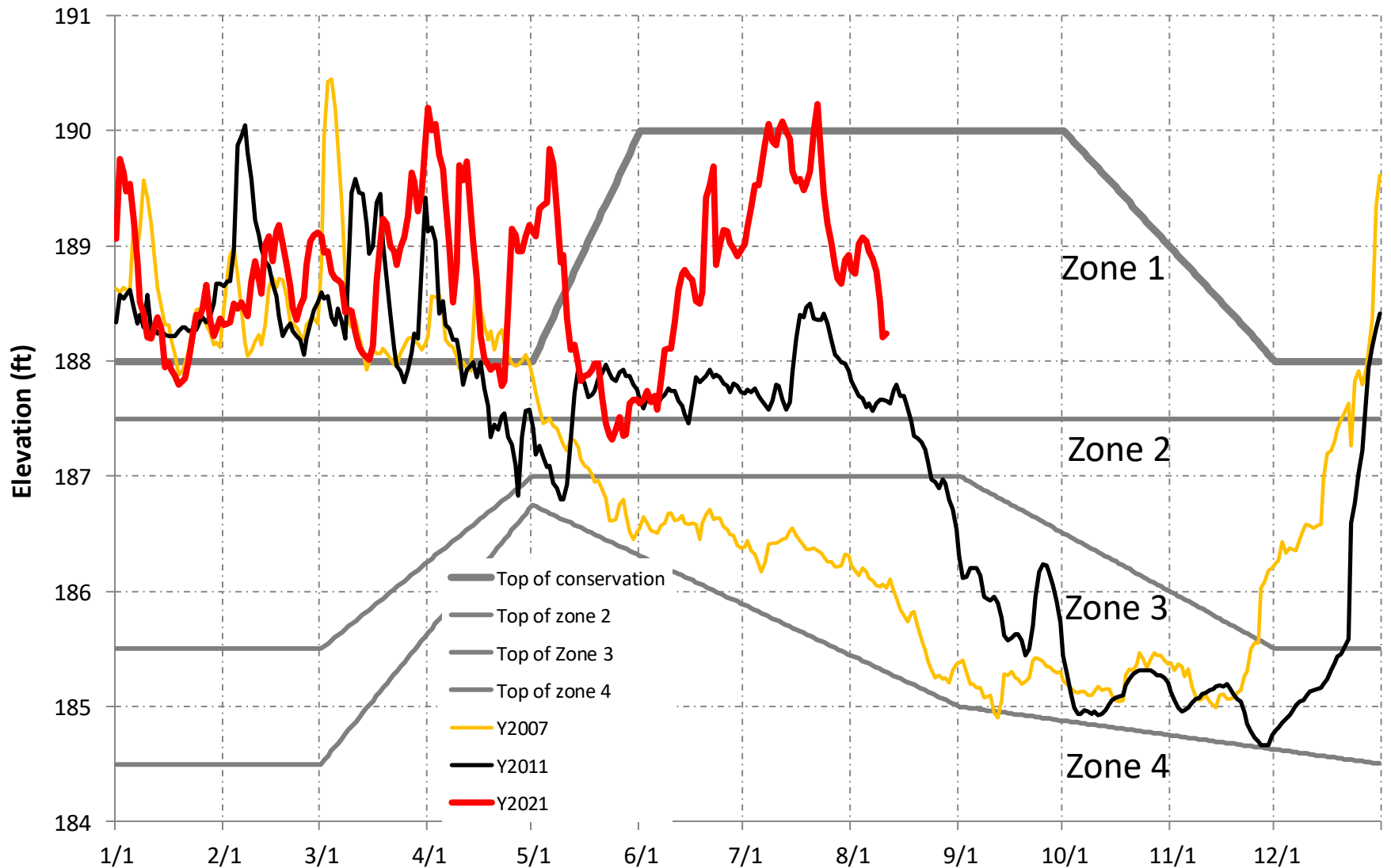


WEST POINT ELEVATION

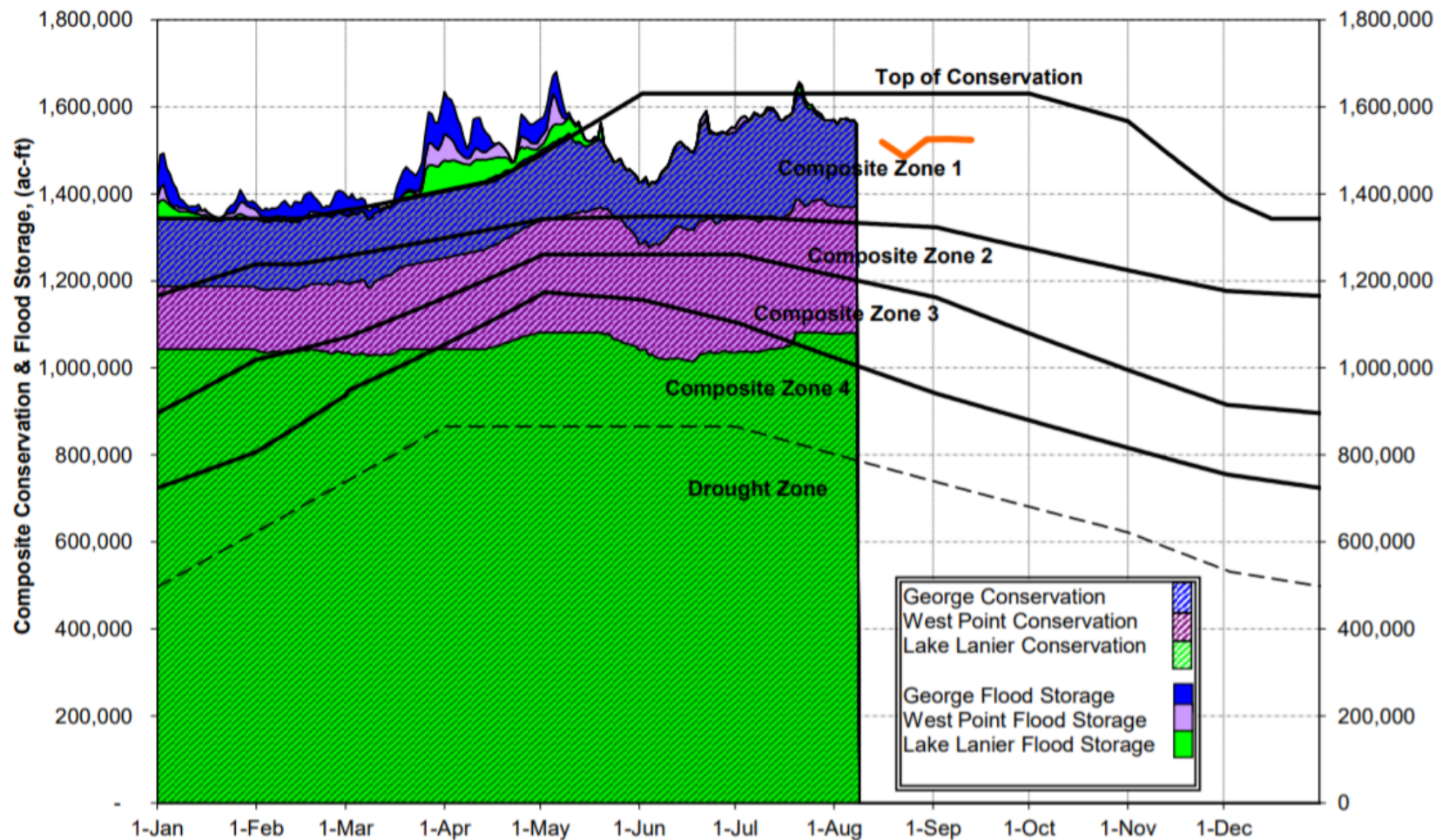


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W.F.GEORGE ELEVATION



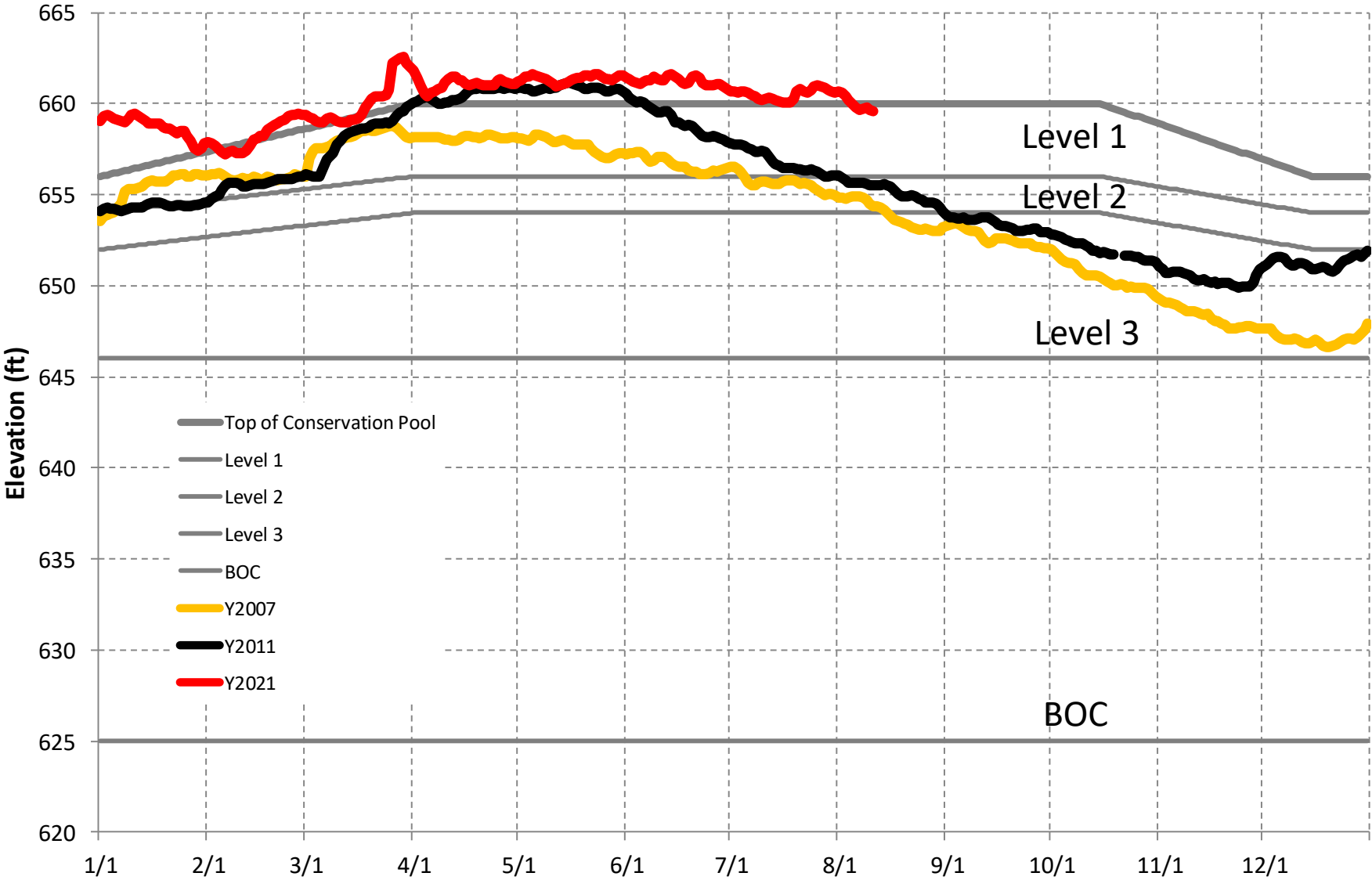
2021 ACF Basin Composite Conservation and Flood Storage



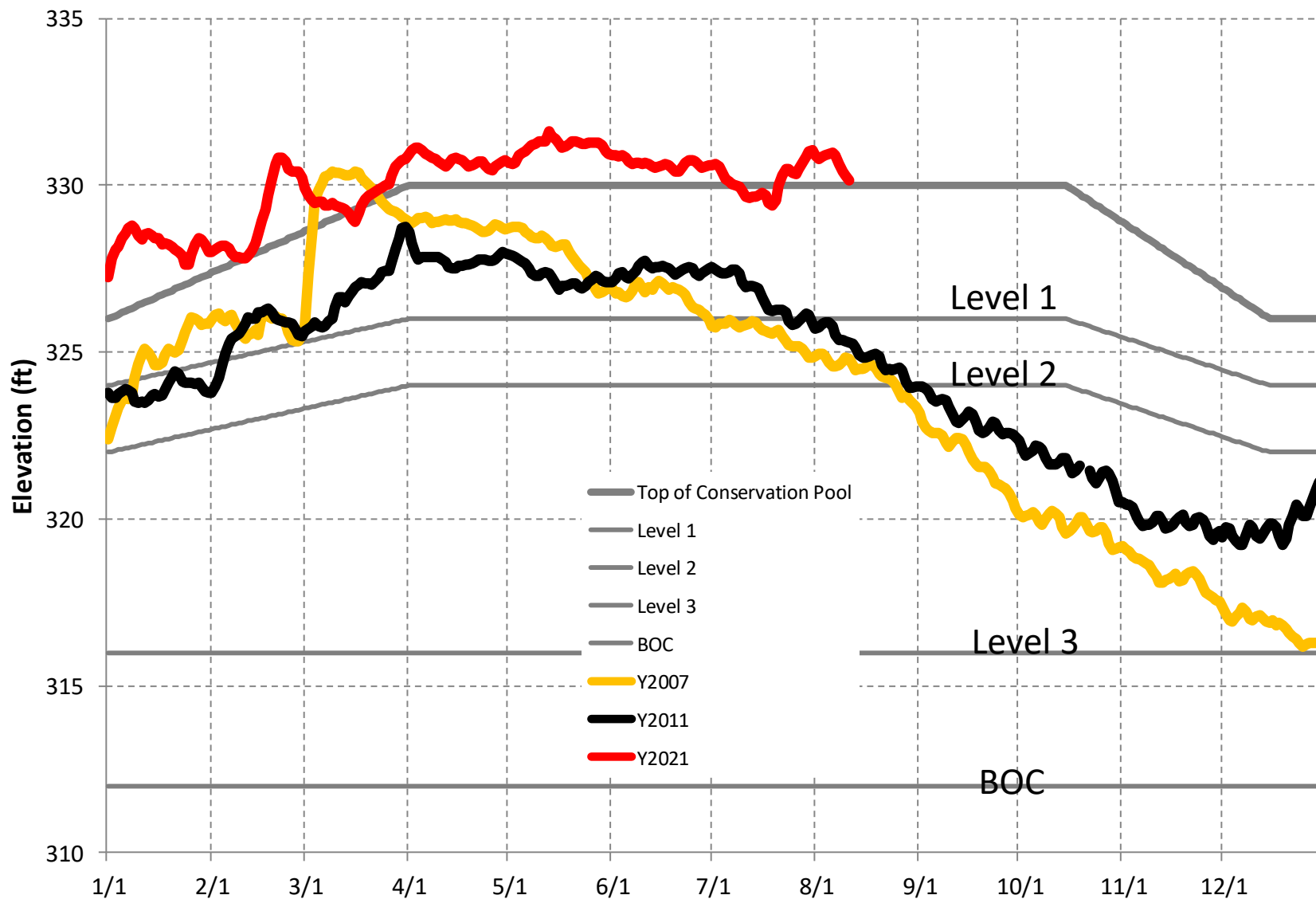
Actual data thru 8-09-2021

Add value of 1,856,000 acre-ft to include inactive storage.

LAKE HARTWELL ELEVATION



LAKE CLARKS HILL (THURMOND) ELEVATION

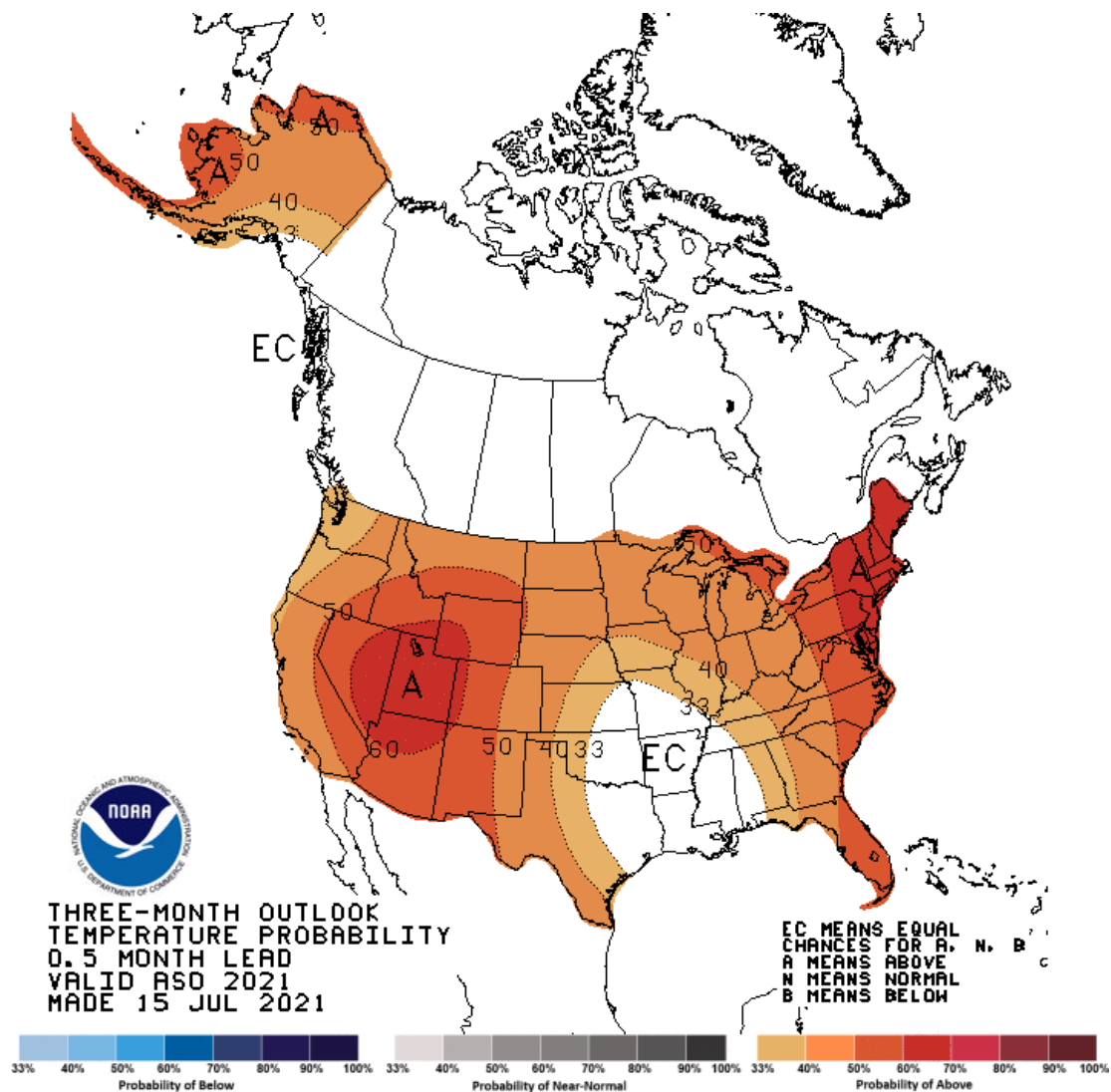


Climate Prediction Center 3-month Temperature and Precipitation Probability Outlook and Seasonal Drought Outlook

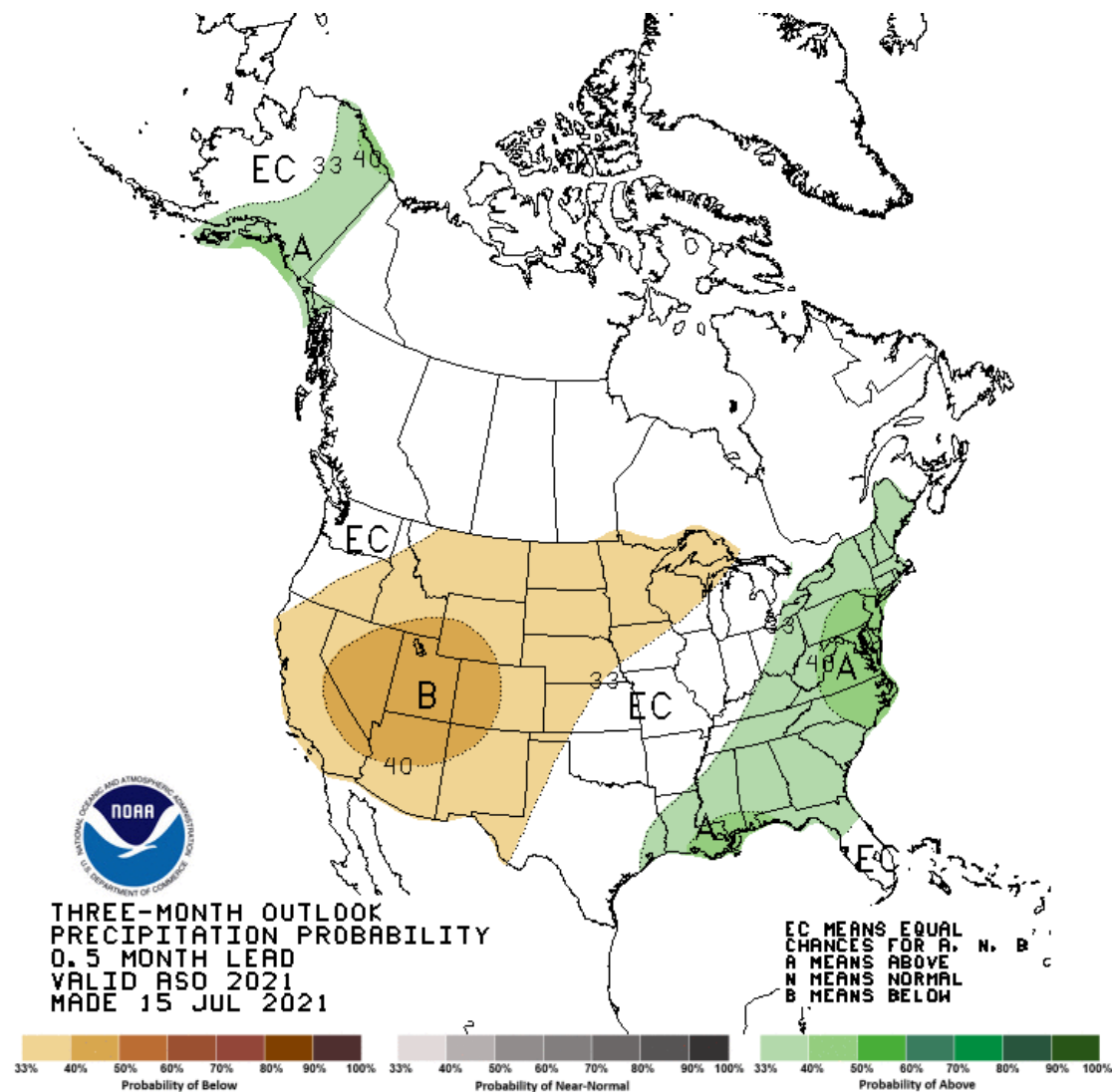
Data Source:

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

Temperature Outlook



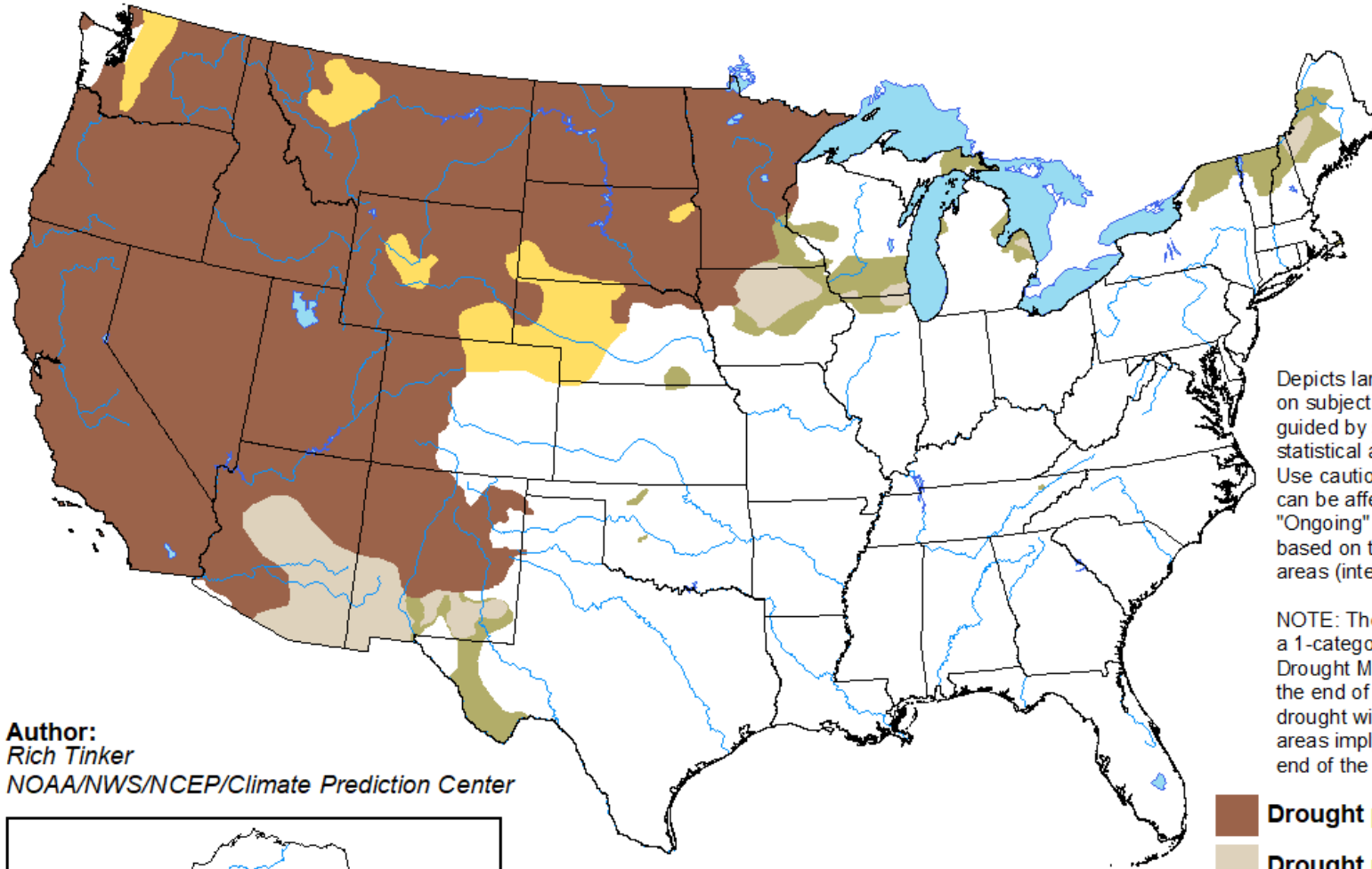
Precipitation Outlook



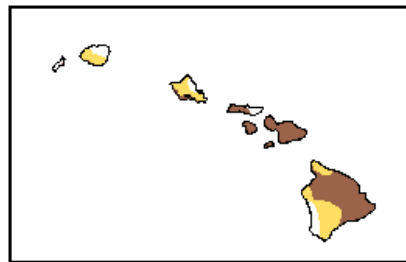
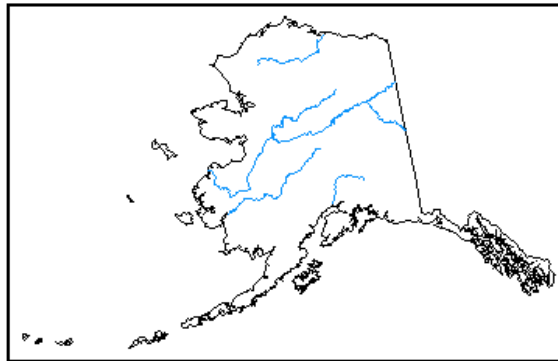
U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for July 15 - October 31, 2021
Released July 15



Author:
Rich Tinker
NOAA/NWS/NCEP/Climate Prediction Center



<http://go.usa.gov/3eZ73>