



## ***Surface Water and Groundwater Data Collection Efforts in Louisiana***

**Aub Ward**

**USGS Data Chief, Ruston, LA**

**Lower Mississippi Gulf Water Science Center**

**Maxwell Lindaman**

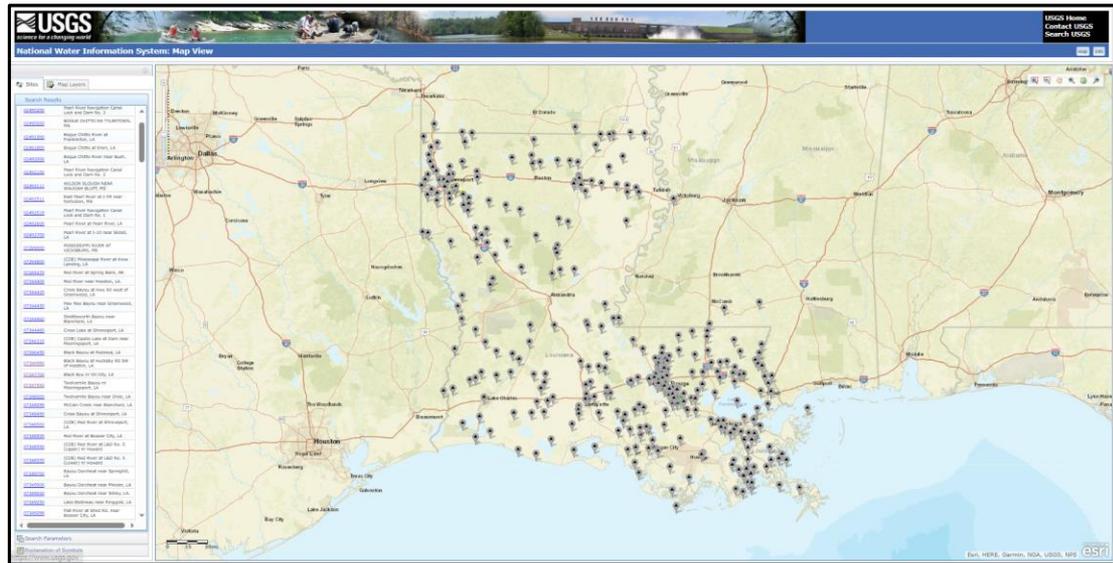
**USGS Hydrogeologist, Baton Rouge, LA**

**Lower Mississippi Gulf Water Science Center**

# USGS Real-Time Streamgaging Stations

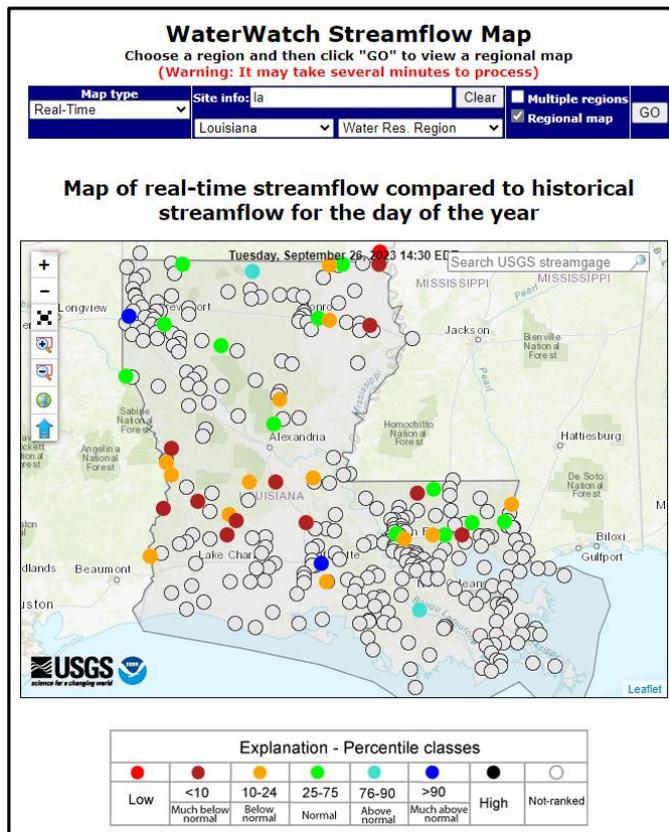
## Current Surface Water Network

- Collaborative effort with partners including local, state, and federal agencies
- Available real-time data include stage, flow, and water quality
- Historical data available for many more sites
- By next year, we will have more sites through the Louisiana Watershed Initiative

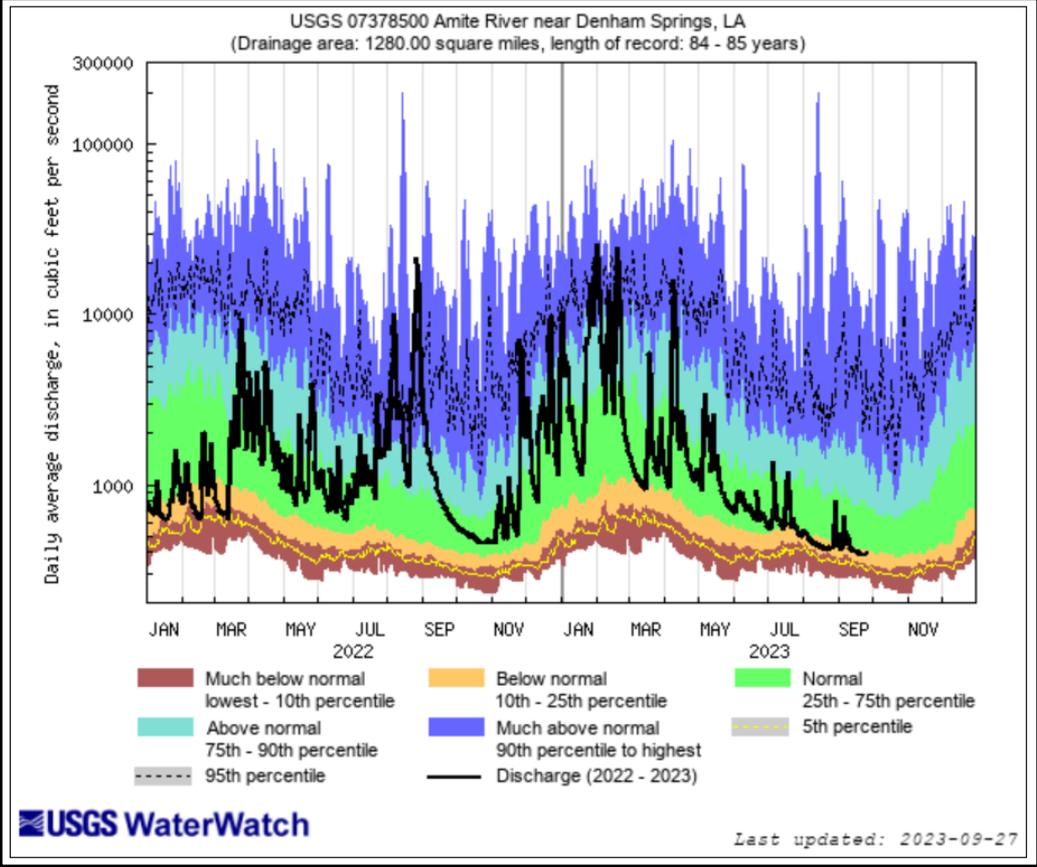


# USGS Real-Time Streamgaging Stations

- More than 40 sites in LA with >30 years of continuous flow data
- USGS WaterWatch and other websites provide 1-, 7-, 14-, and 28-day average streamflow conditions
- Numerous other statistical comparison tools

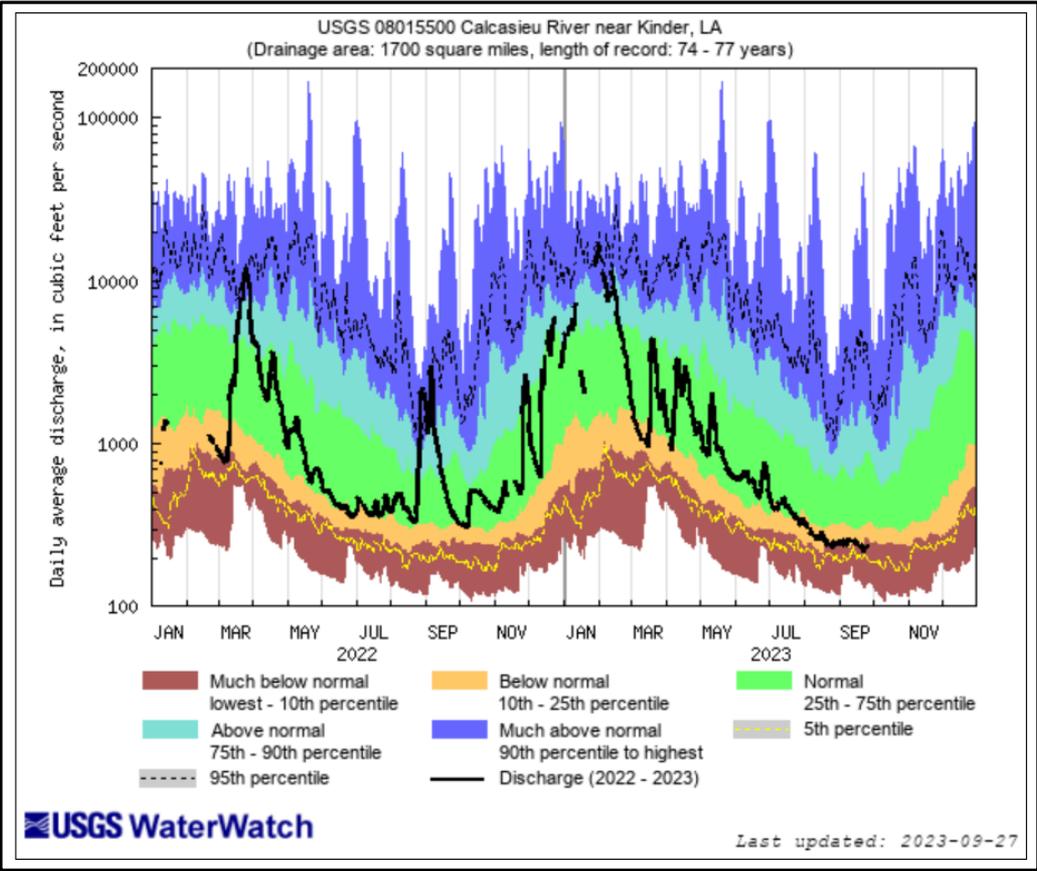


# USGS Real-Time Streamgaging Stations



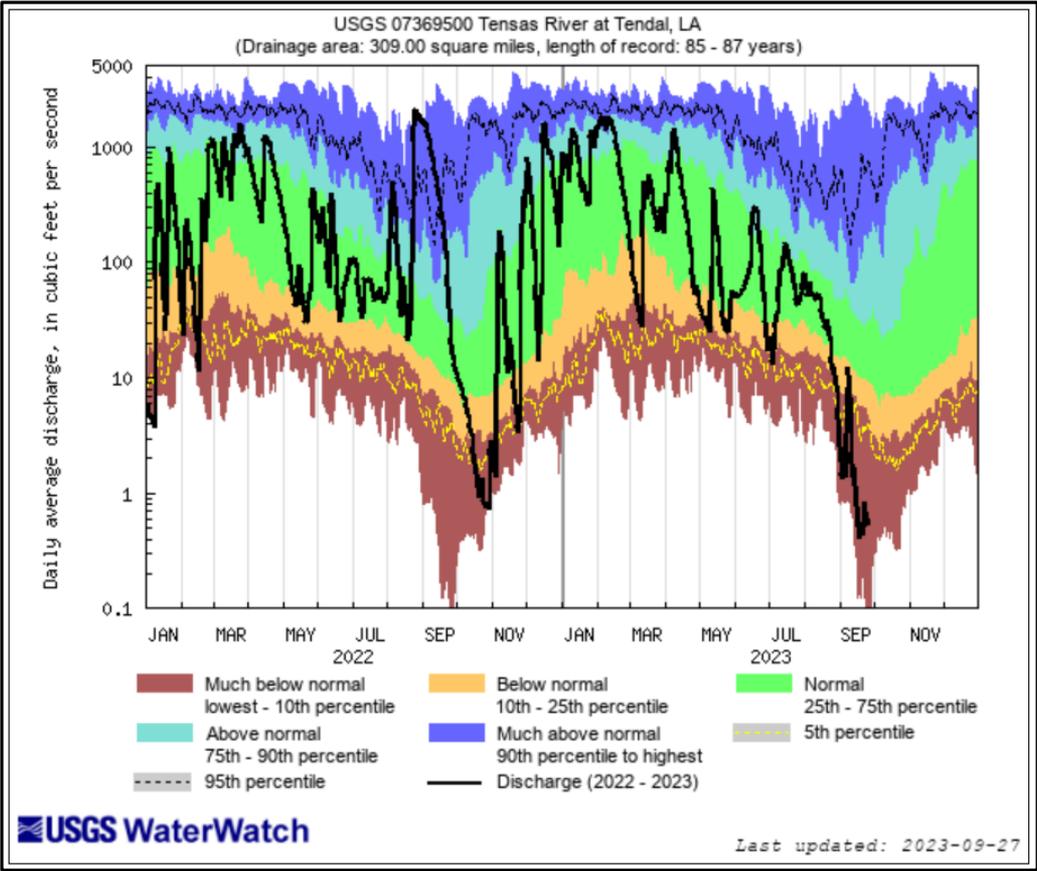
<https://waterwatch.usgs.gov>

# USGS Real-Time Streamgaging Stations



<https://waterwatch.usgs.gov>

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<https://waterwatch.usgs.gov>

# National Integrated Drought Information System

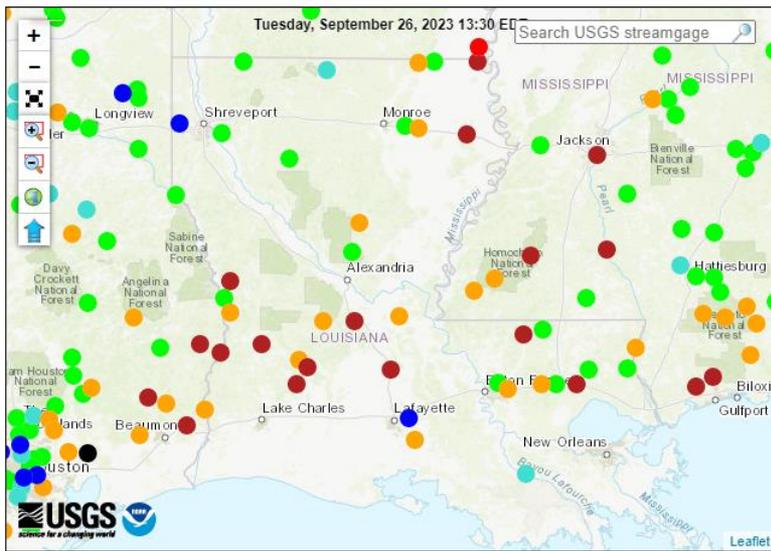
## WaterWatch Streamflow Map

Choose a region and then click "GO" to view a regional map

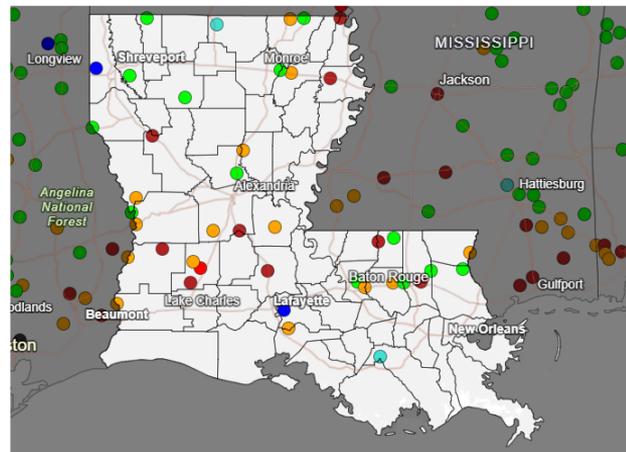
(Warning: It may take several minutes to process)

Map type	Site info: la	Clear	<input type="checkbox"/> Multiple regions	GO
Real-Time	Louisiana	Water Res. Region	<input type="checkbox"/> Regional map	

Map of real-time streamflow compared to historical streamflow for the day of the year



## Real-Time Streamflow Conditions



### Streamflow Conditions



### U.S. Drought Monitor



Source(s): U.S. Geological Survey

Data Valid: 09/26/23

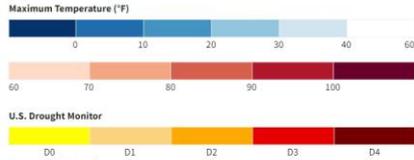
[Drought.gov](https://www.drought.gov)



[www.drought.gov](https://www.drought.gov)

# National Integrated Drought Information System

7-Day Average Maximum Temperature (°F)

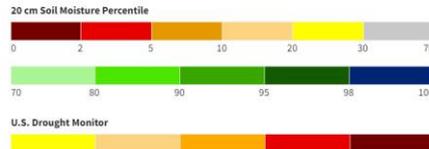
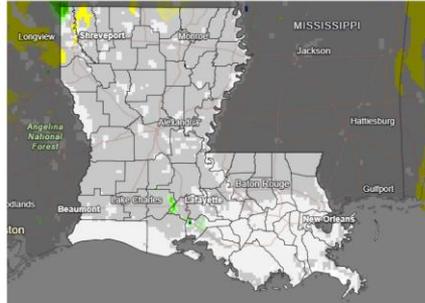


Source(s): UC Merced  
Data Valid: 09/23/23

[Drought.gov](http://Drought.gov)

Temperature

20 cm Soil Moisture Percentile

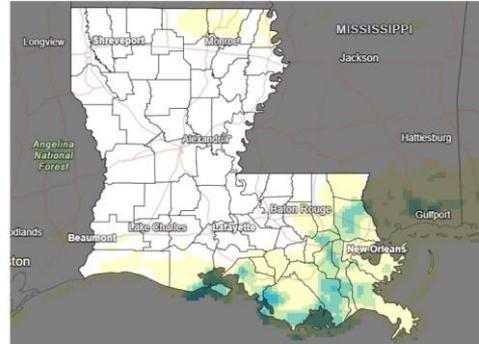


Source(s): NationalSoilMoisture.com  
Data Valid: 09/24/23

[Drought.gov](http://Drought.gov)

Soil Moisture

7-Day Total Precipitation (Inches)

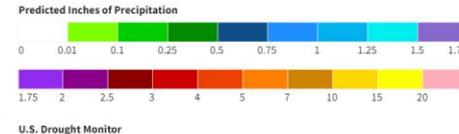


Source(s): UC Merced  
Data Valid: 09/23/23

[Drought.gov](http://Drought.gov)

Observed  
Precipitation

7-Day Quantitative Precipitation Forecast



Source(s): National Weather Service Weather Prediction Center  
Data Valid: 09/26/23

[Drought.gov](http://Drought.gov)

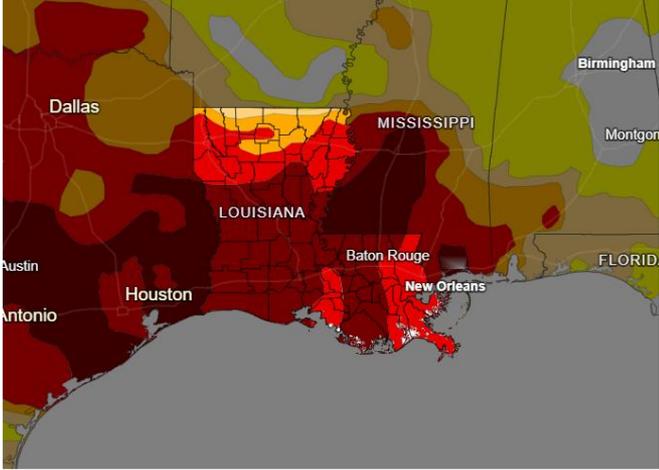
Forecast  
Precipitation



[www.drought.gov](http://www.drought.gov)

# National Integrated Drought Information System

U.S. Drought Monitor: Louisiana



Drought & Dryness Categories	% of LA
D0 - Abnormally Dry	0.1%
D1 - Moderate Drought	2.3%
D2 - Severe Drought	7.8%
D3 - Extreme Drought	33.7%
D4 - Exceptional Drought	56.1%
Total Area in Drought (D1-D4)	99.9%

Source(s): NDMC, NOAA, USDA  
Data Valid: 09/19/23

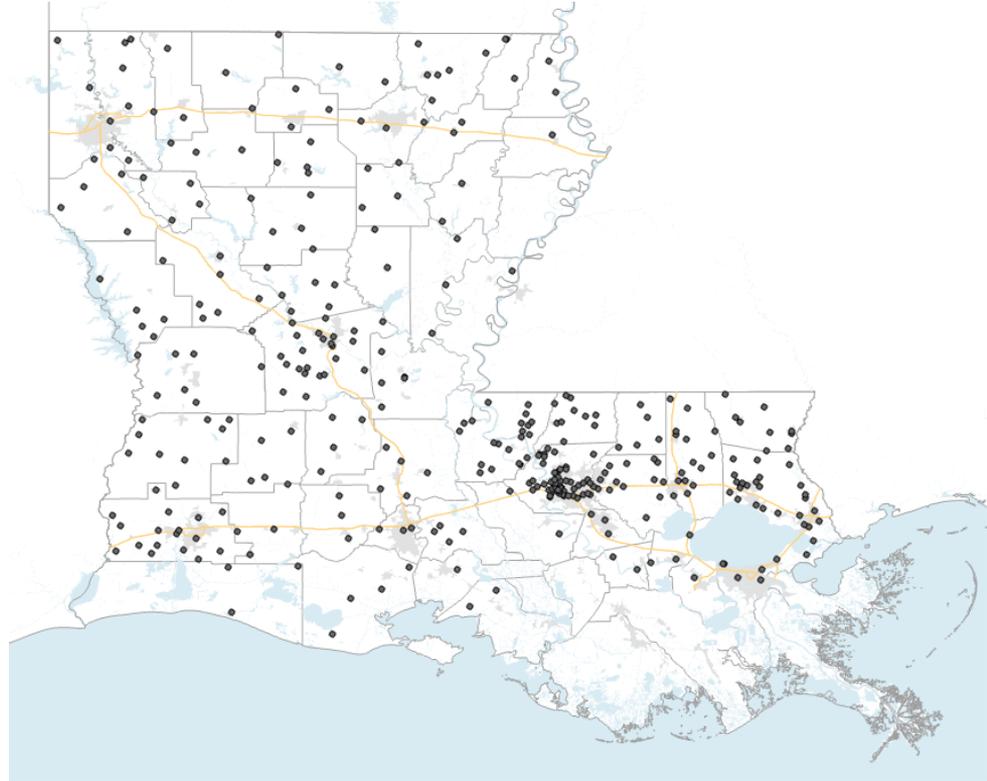
Drought.gov



[www.drought.gov](http://www.drought.gov)

# USGS Quarterly Groundwater Level Network

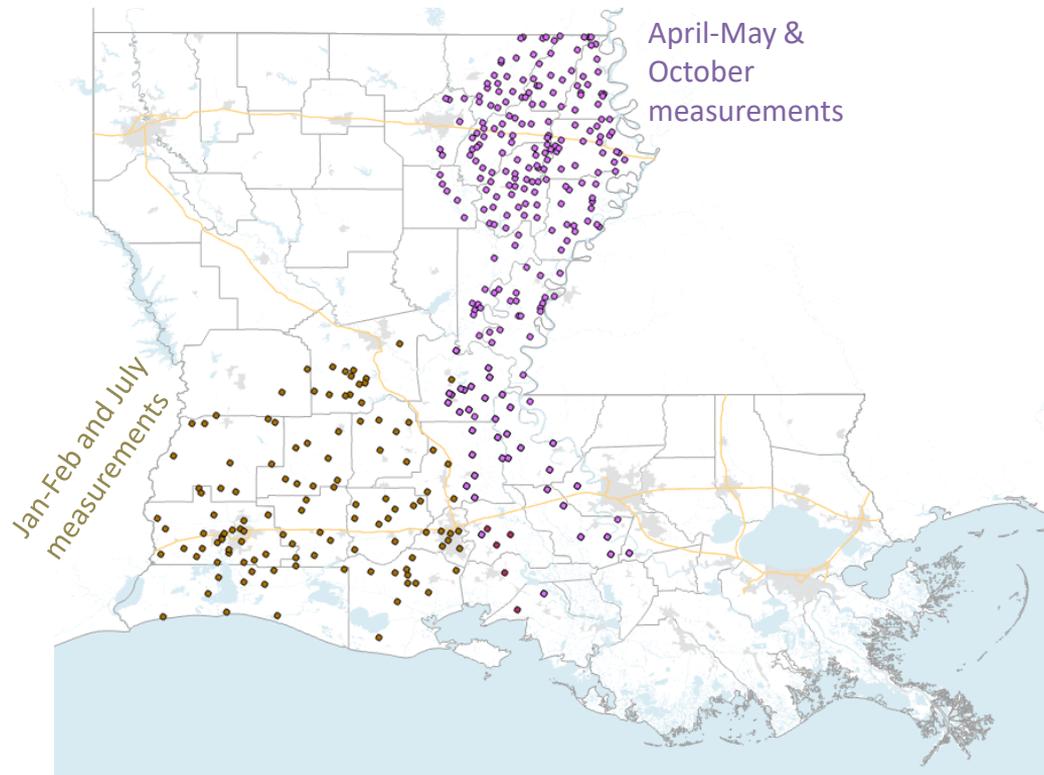
- ~385 wells
- Four measurements per year at each well.
- Mix of public and privately owned wells.
- Funded by LDOTD, CAGWCC, and USGS.
- Covers multiple aquifers.



• Quarterly groundwater level site

# USGS Groundwater Level Synoptics

- Measurements collected over the course of ~2 weeks, twice annually.
- Focus on agricultural areas; measurements taken before and after main pumping seasons.
- Chicot aquifer system (~143 wells) and Mississippi River alluvial aquifer (~240 wells)



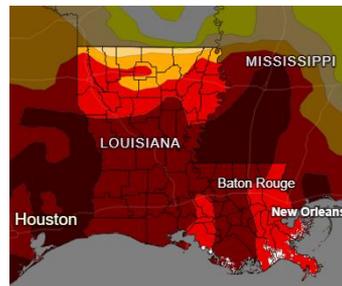
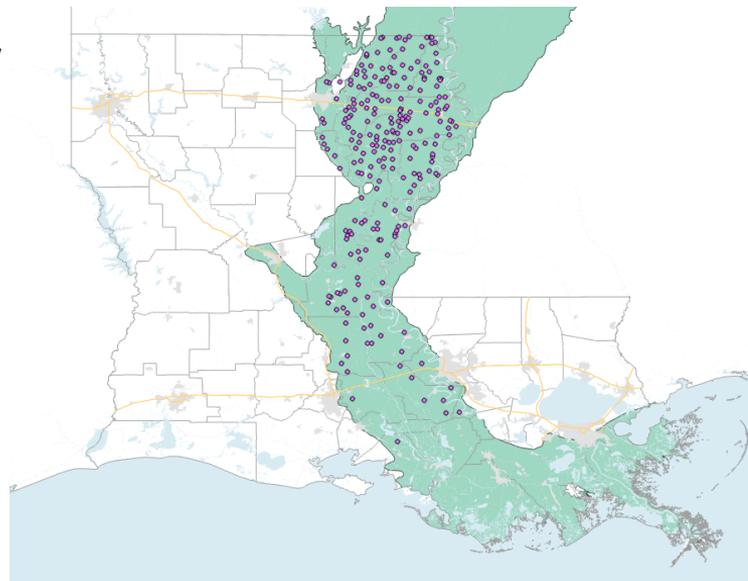
- Chicot aquifer water level synoptic site
- Mississippi River alluvial aquifer water level synoptic site

# How does drought affect groundwater levels?

- Lag time between time of reduced infiltration of surface water (recharge) and groundwater level decline. Lag time can be months to years, depending on geography, aquifer properties, and drought intensity.
- Anthropogenic responses to surface drought (i.e., pumping more water) has immediate effect.
- Interpretation of water levels measured at any one well must consider withdrawal rates of surrounding wells. Changes in pumping are not always related to drought.

# Mississippi River alluvial aquifer

- Used for irrigation in Louisiana, Mississippi, and Arkansas (corn, soybeans, cotton, rice, aquaculture, etc.).
- Spans multiple climate zones.
- Synoptic water levels measured in October (post-irrigation, and when stream flows are lowest) and in April-May before irrigation ramps up.

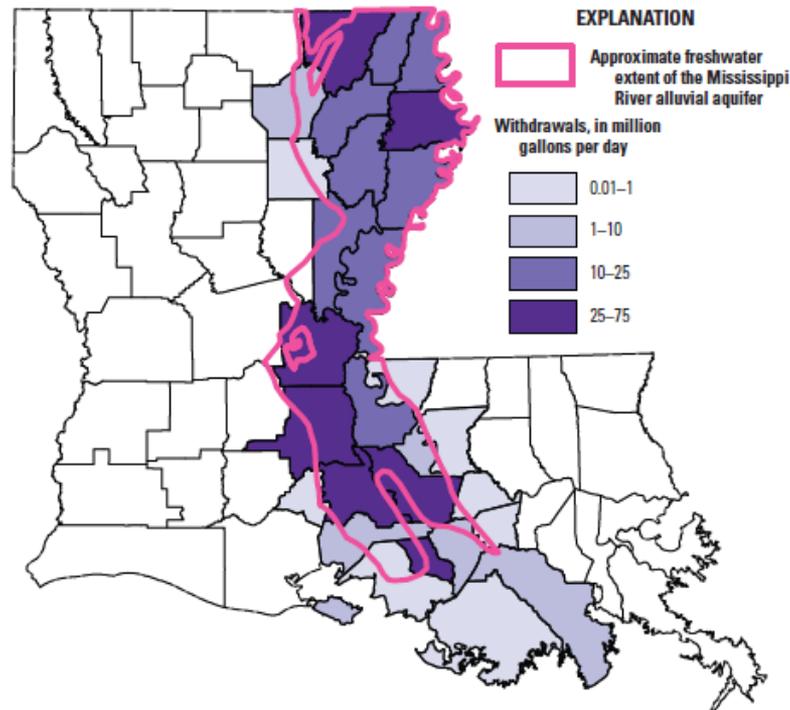


Legend	
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 Total Area in Drought (D1-D4)	99.9%

# Mississippi River alluvial aquifer

## Water use, 2015

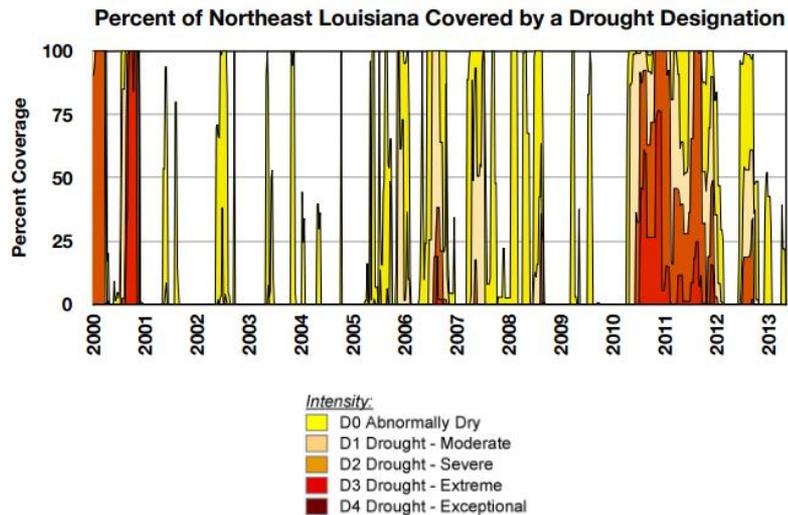
Withdrawals, in million gallons per day (Mgal/d)	
Public supply	8.65
Industry	33.60
Power generation	0.99
Rural domestic	3.05
Livestock	0.77
Rice irrigation	121.87
General irrigation	138.39
Aquaculture	77.28
<b>Total</b>	<b>384.60</b>



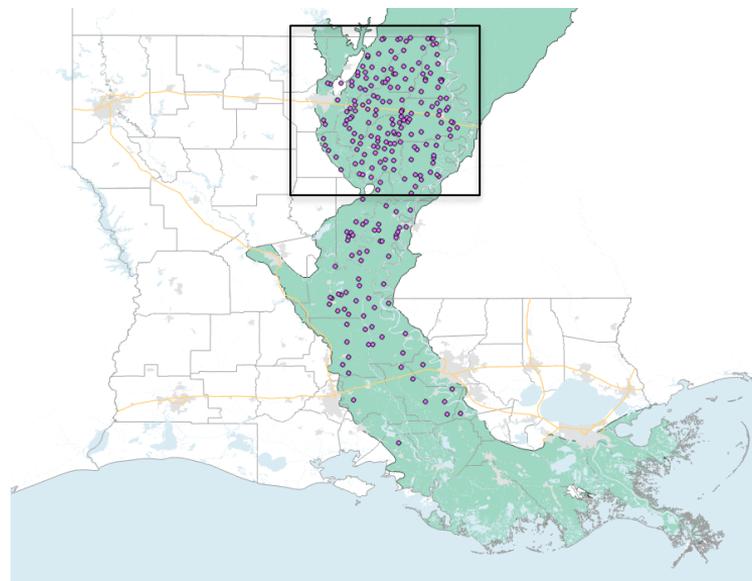
**Source:** Collier, A.L. and Sargent, B.P., 2015, Water use in Louisiana, 2015: LDOTD Water Resources Special Report 18

# Mississippi River alluvial aquifer

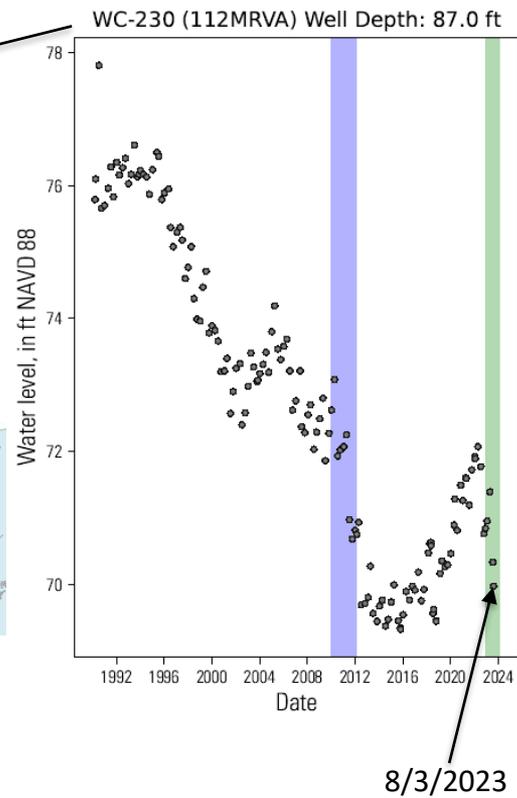
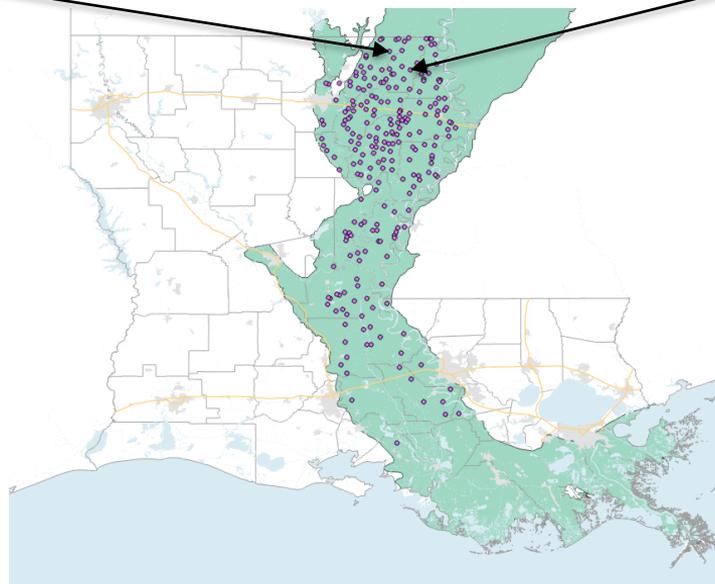
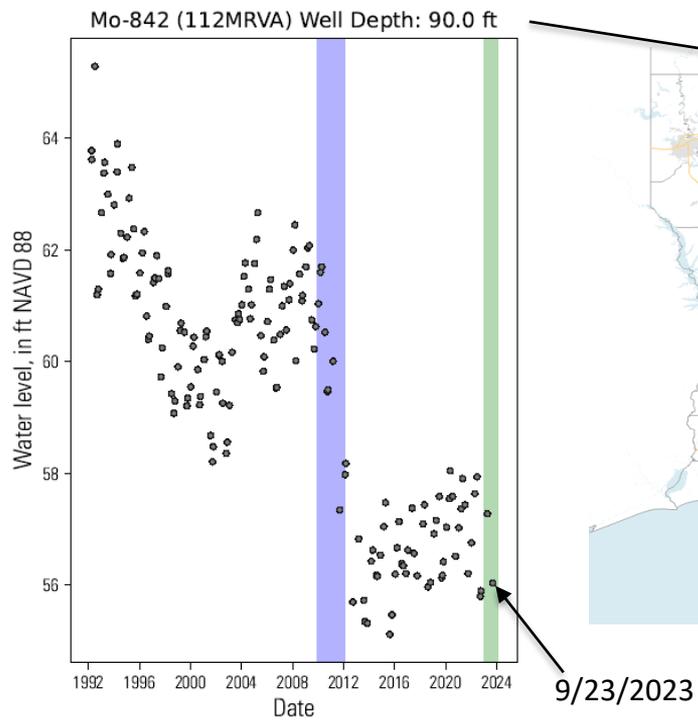
## *Northeast climate zone*



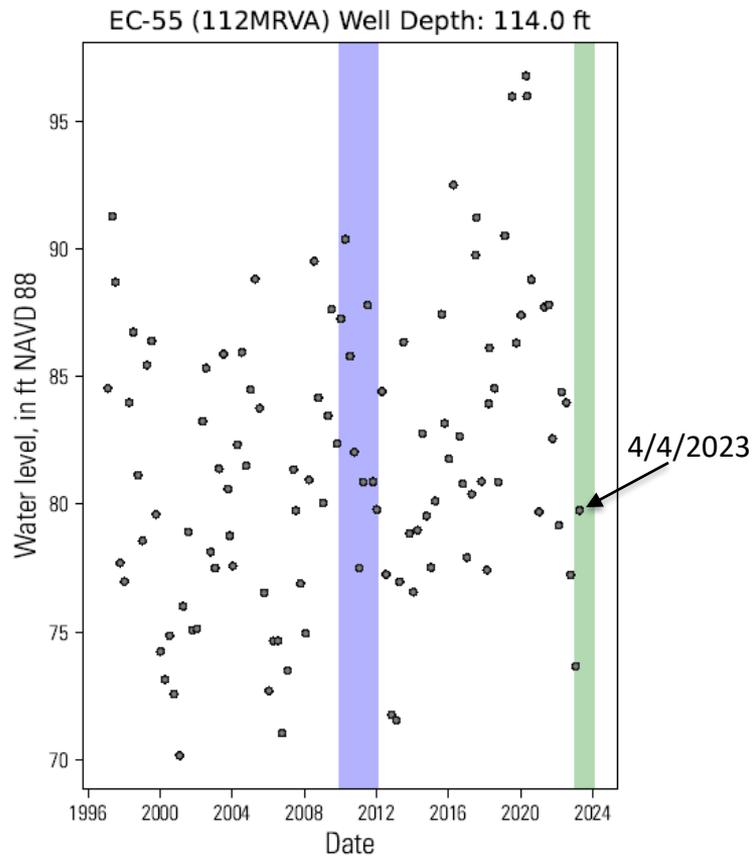
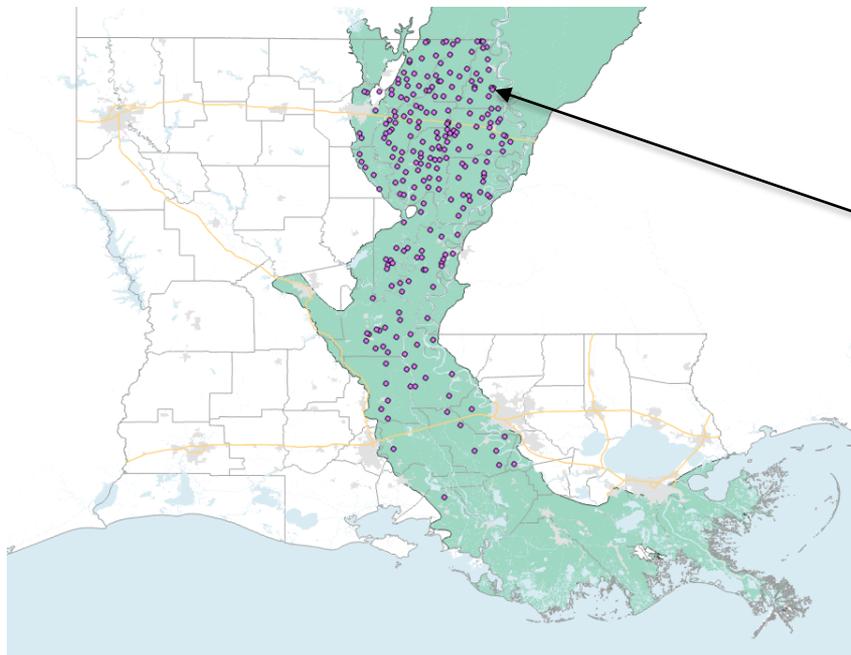
Source: <https://southcentralclimate.org/wp-content/uploads/2021/04/Drought-History-for-Louisianas-9-Regions-UPDATED-.pdf>



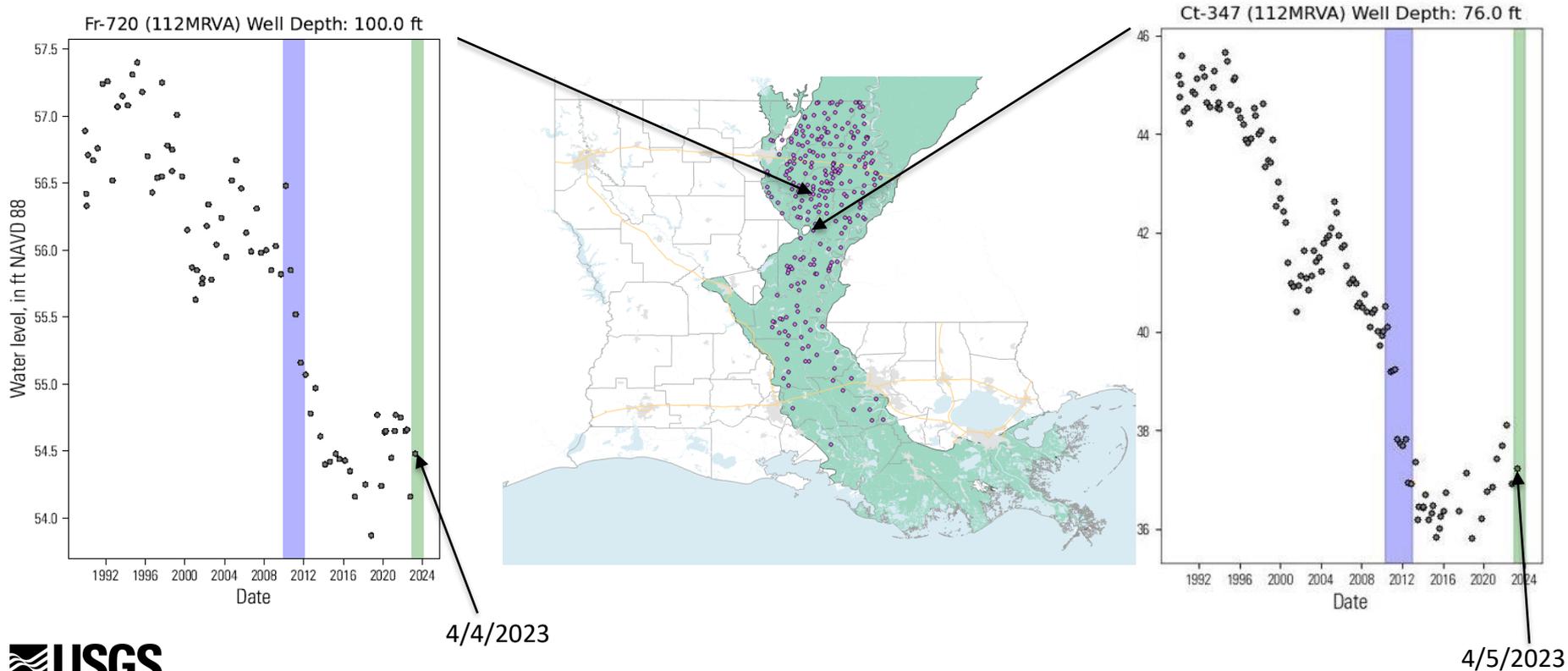
# Mississippi River alluvial aquifer (Northeast climate zone)



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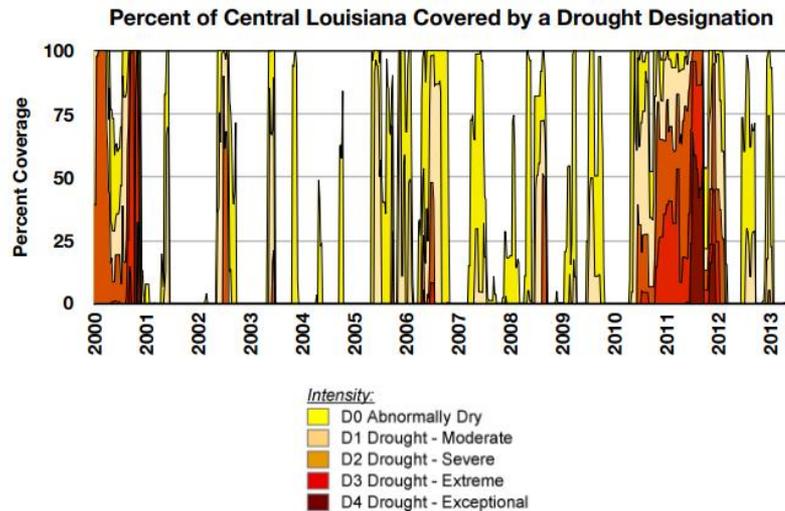


# Mississippi River alluvial aquifer (Northeast climate zone)

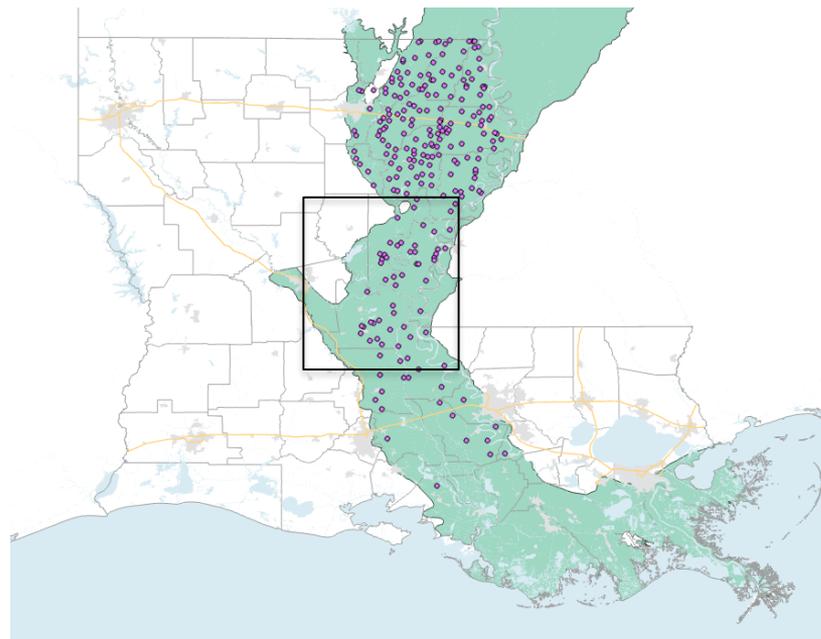


# Mississippi River alluvial aquifer

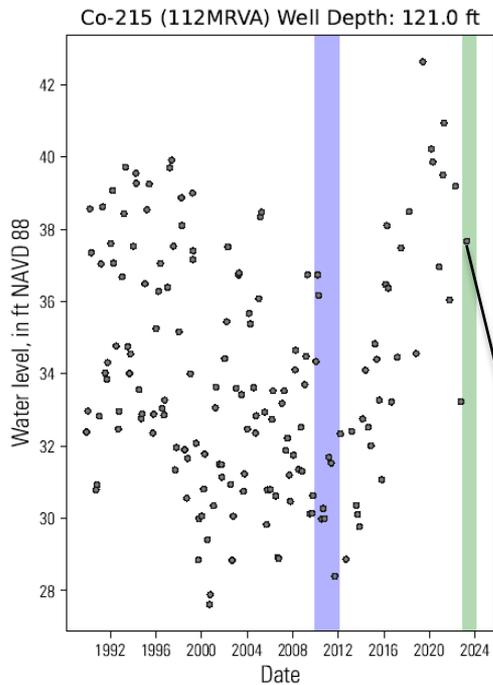
## *Central climate zone*



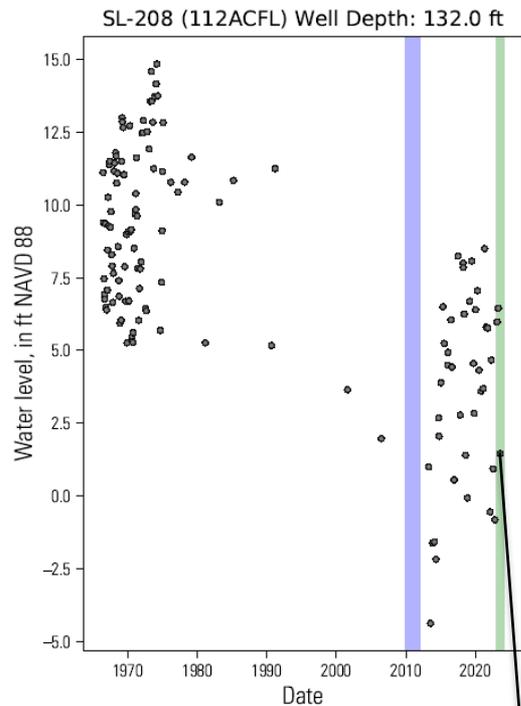
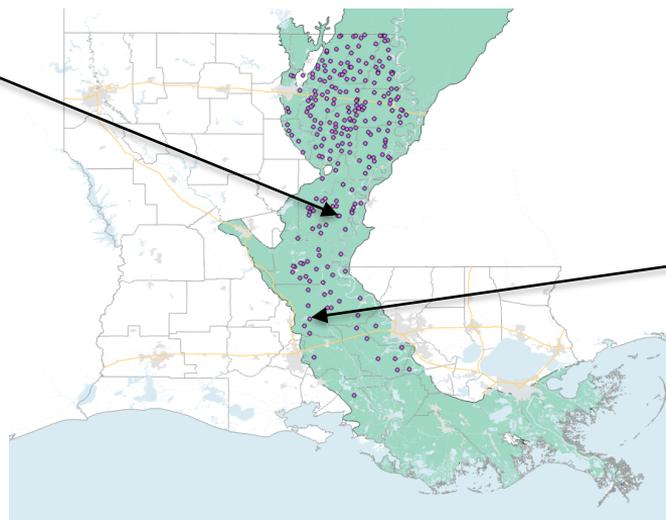
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# Mississippi River alluvial aquifer (Central climate zone)

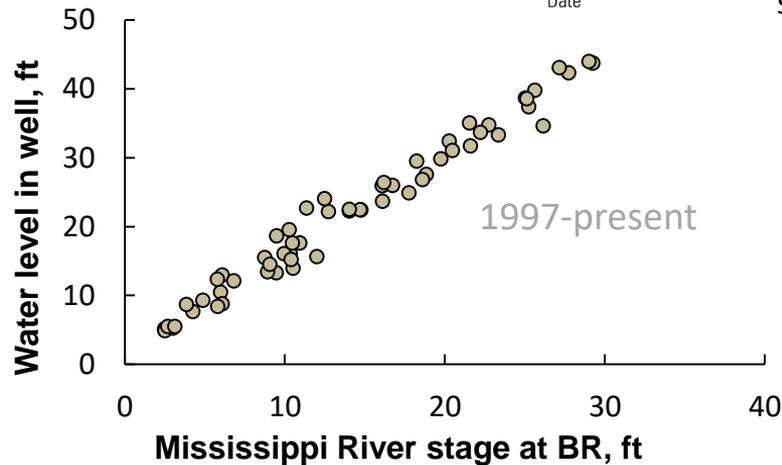
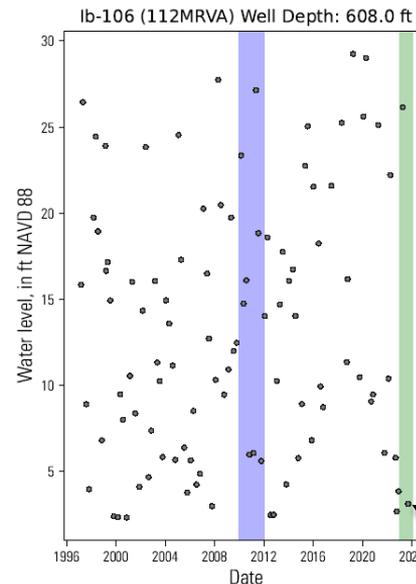
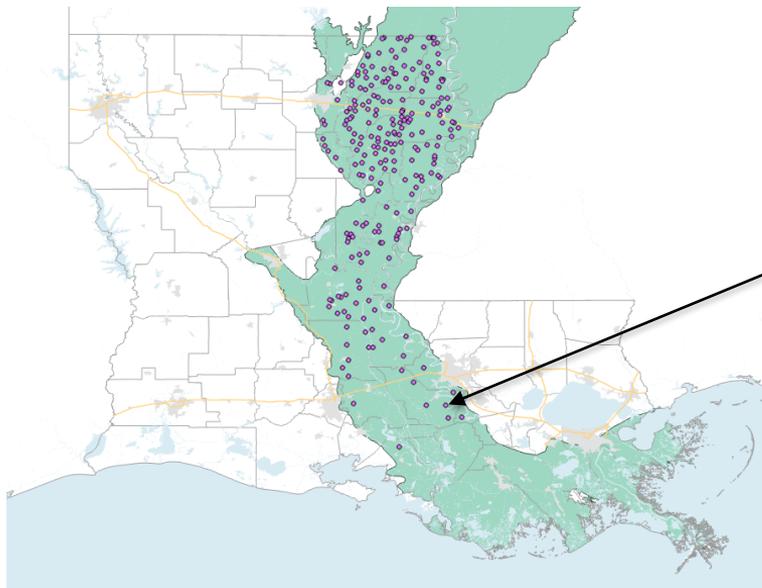


4/11/2023



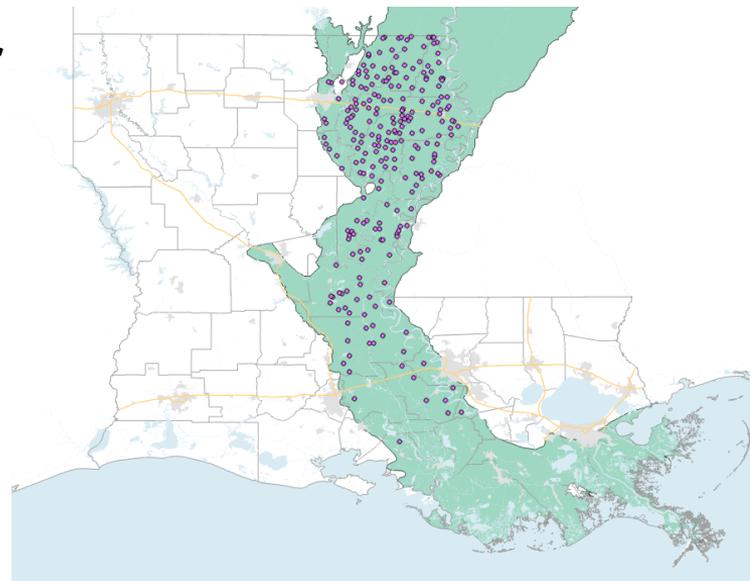
4/11/2023

# Mississippi River alluvial aquifer



# Mississippi River alluvial aquifer

- In the Northeast zone, drought periods define water level inflection points. Wells that are away from the Mississippi River generally show decline of ~7 ft between the early 1990's and the present.
- Farther south, water levels are strongly tied to the stage of the Mississippi and Atchafalaya Rivers, which recharge the aquifer.
- Upcoming October 2023 water level synoptic will reflect recent drought conditions.



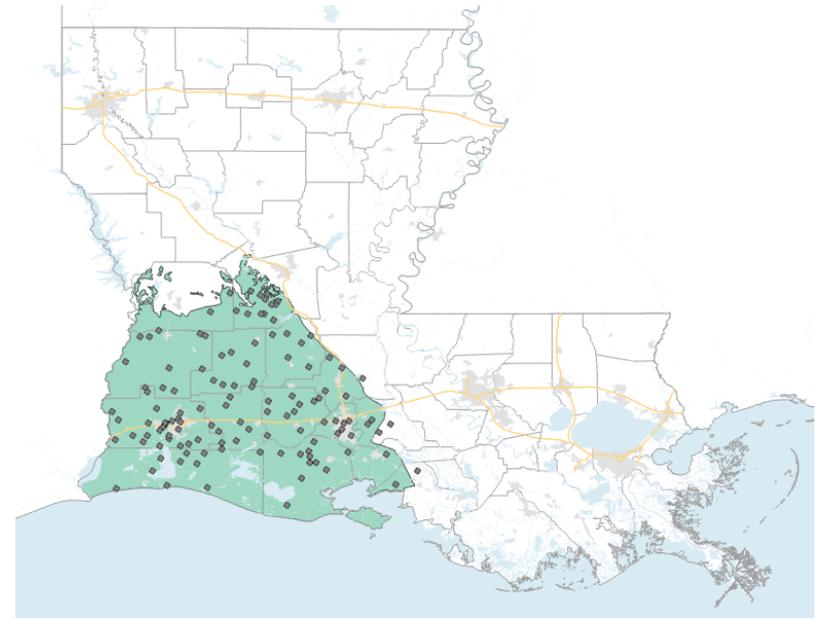
Legend	
Drought & Dryness Categories	% of LA
D0 - Abnormally Dry	0.1%
D1 - Moderate Drought	2.3%
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D3 - Extreme Drought	33.7%
D4 - Exceptional Drought	56.1%
Total Area in Drought (D1-D4)	99.9%

Source: <https://www.drought.gov/states/louisiana>

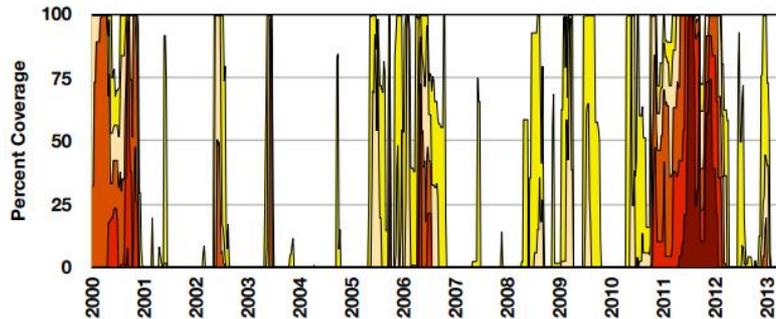
Data valid: 9/19/2023

# Chicot aquifer system

- Withdrawals primarily for irrigation (especially rice), aquaculture, public supply, and industrial uses.
- Surface-water sources near the coast are affected by upstream saltwater migration during drought periods.
- Water levels measured for synoptics in July (after rice irrigation peak), and in Jan-Feb.



Percent of Southwest Louisiana Covered by a Drought Designation



## Legend

### Drought & Dryness Categories

	D0 - Abnormally Dry	0.1%
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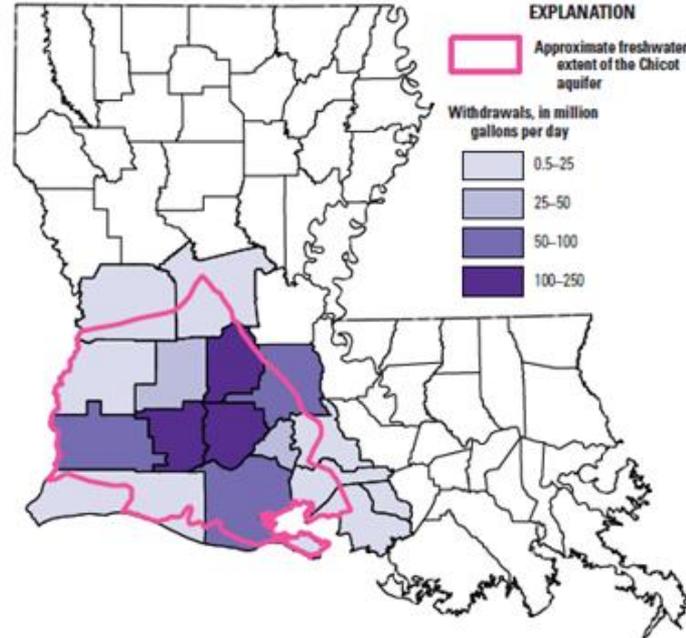
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# Chicot aquifer system

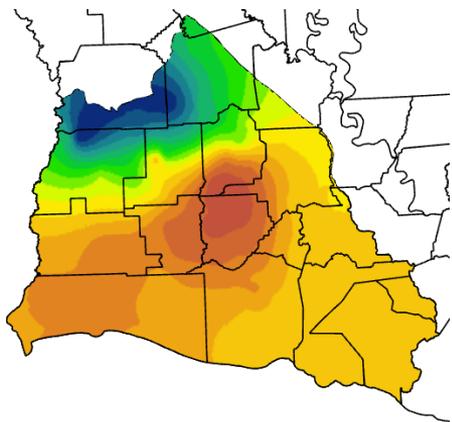
## *Water use, 2015*

Withdrawals, in million gallons per day (Mgal/d)	
Public supply	95.60
Industry	58.69
Power generation	11.37
Rural domestic	11.73
Livestock	0.87
Rice irrigation	412.58
General irrigation	14.74
Aquaculture	244.31
<b>Total</b>	<b>849.90</b>

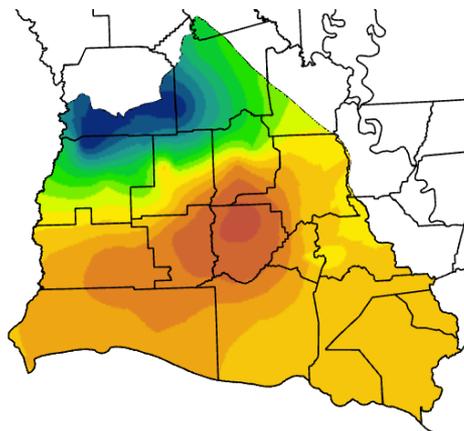


Source: Collier, A.L. and Sargent, B.P., 2015, Water use in Louisiana, 2015: LDOTD Water Resources Special Report 18

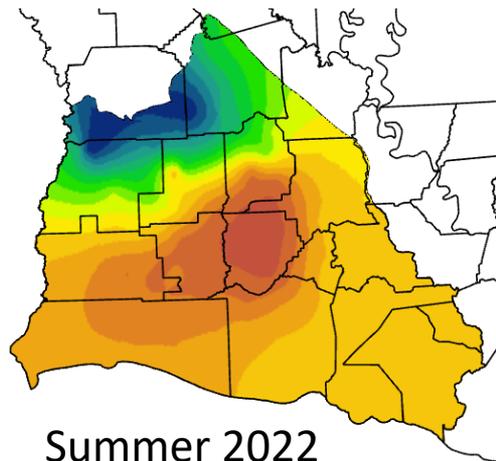
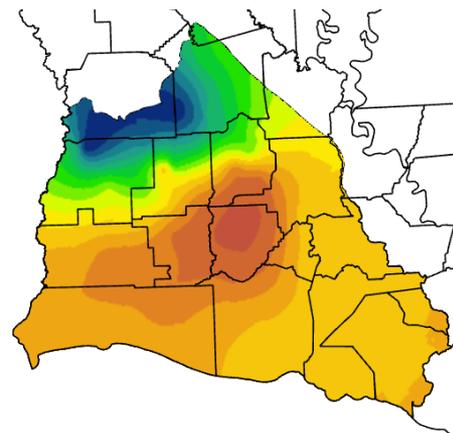
Winter 2021



Summer 2021

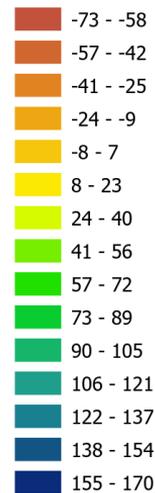
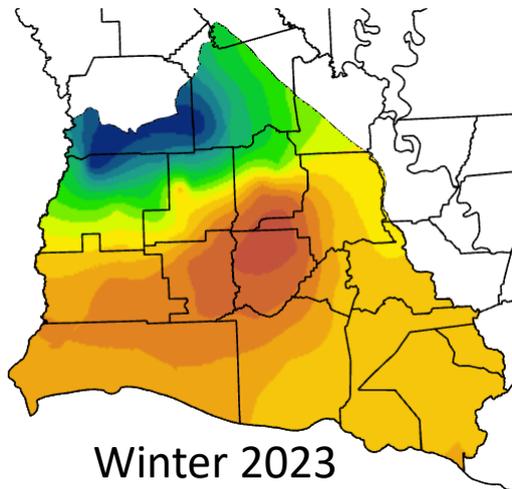


Winter 2022



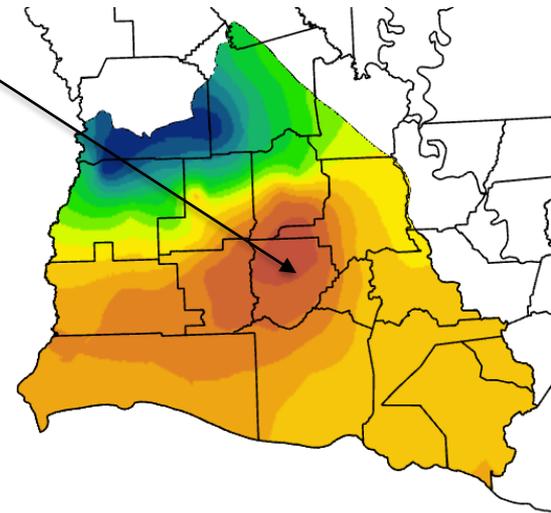
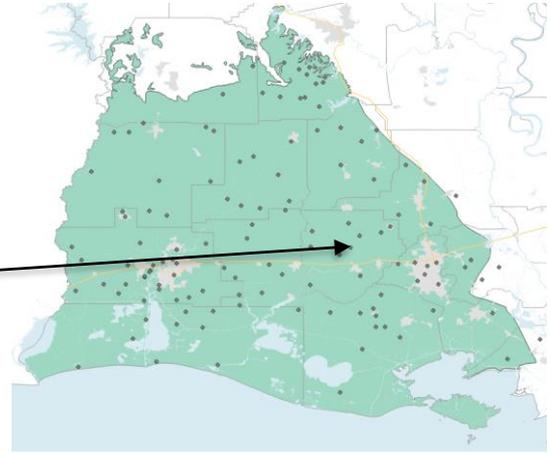
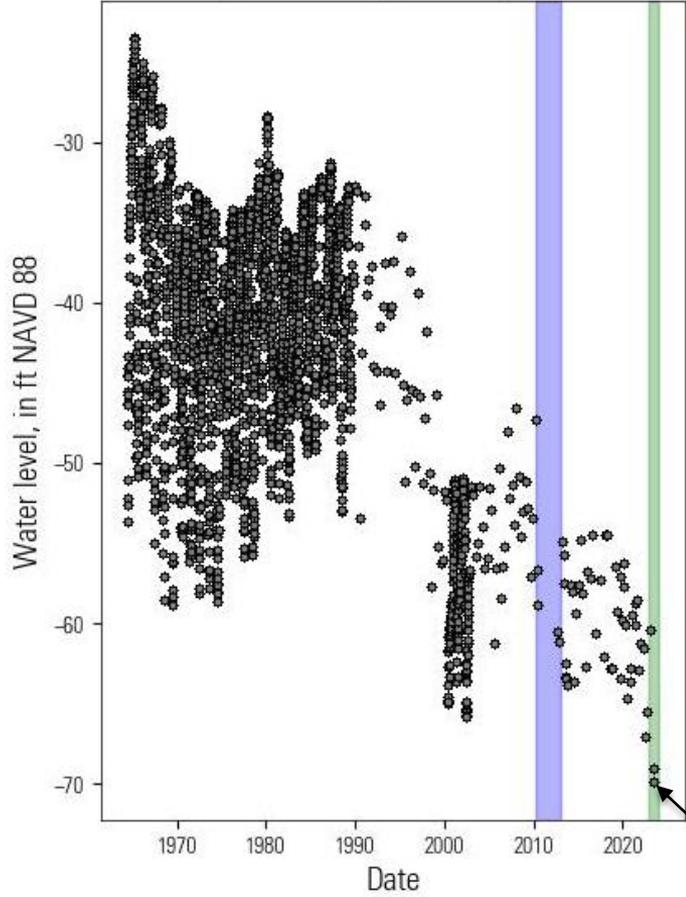
Summer 2022

Winter 2023

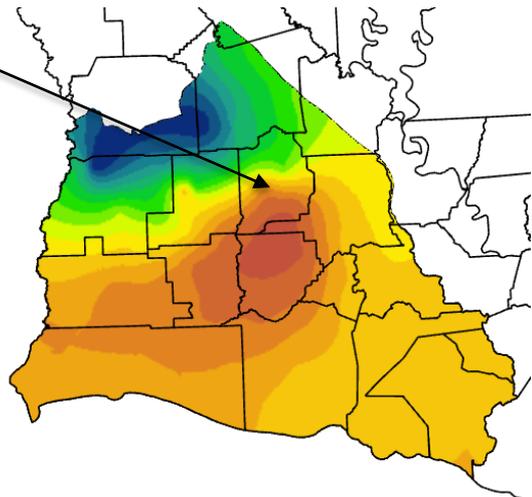
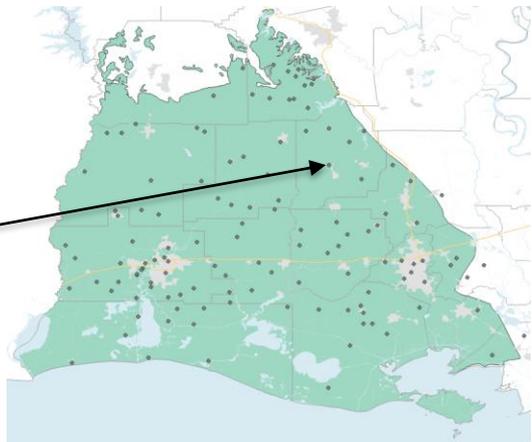
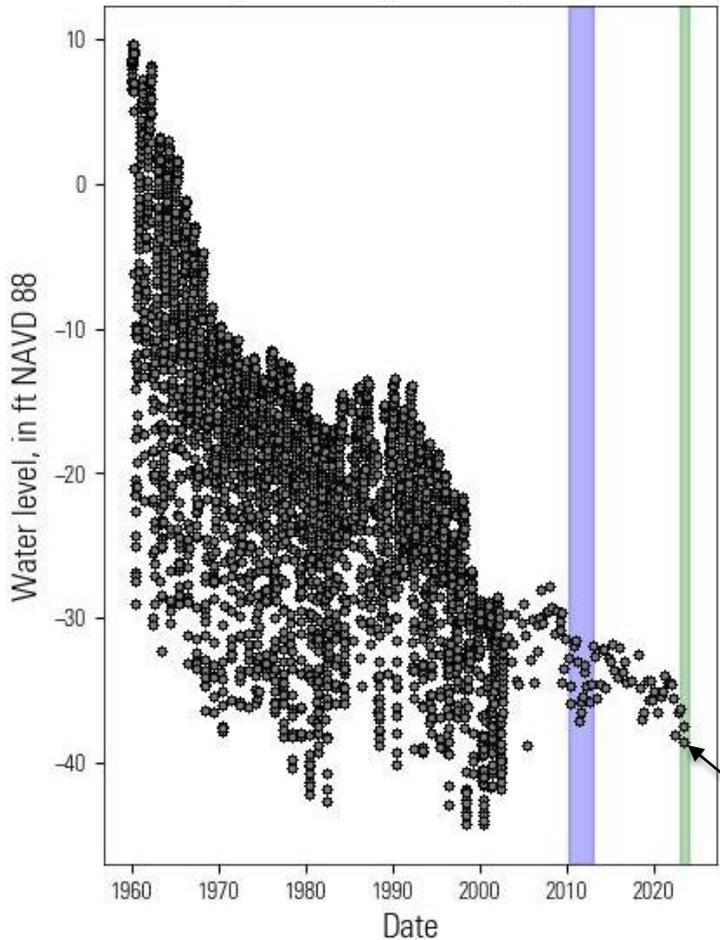


Water level in wells screened in the Chicot aquifer system, in ft above NAVD 88

Ac-326 (112CHCTU) Well Depth: 202.0 ft

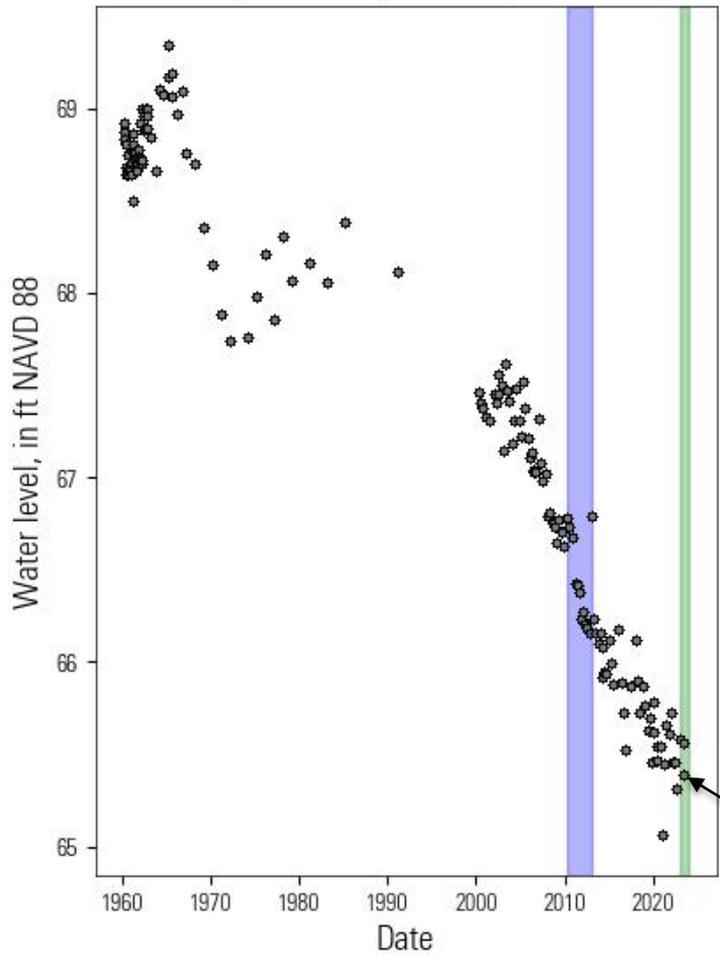


Ev-229 (112CHCT) Well Depth: 231.0 ft

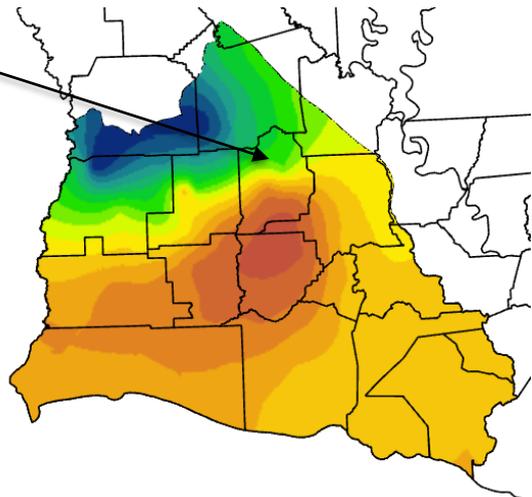
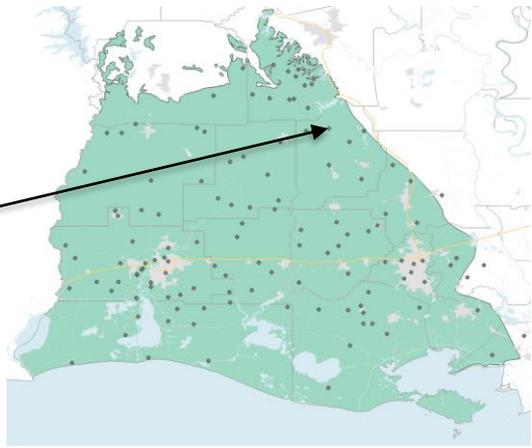


7/11/2023

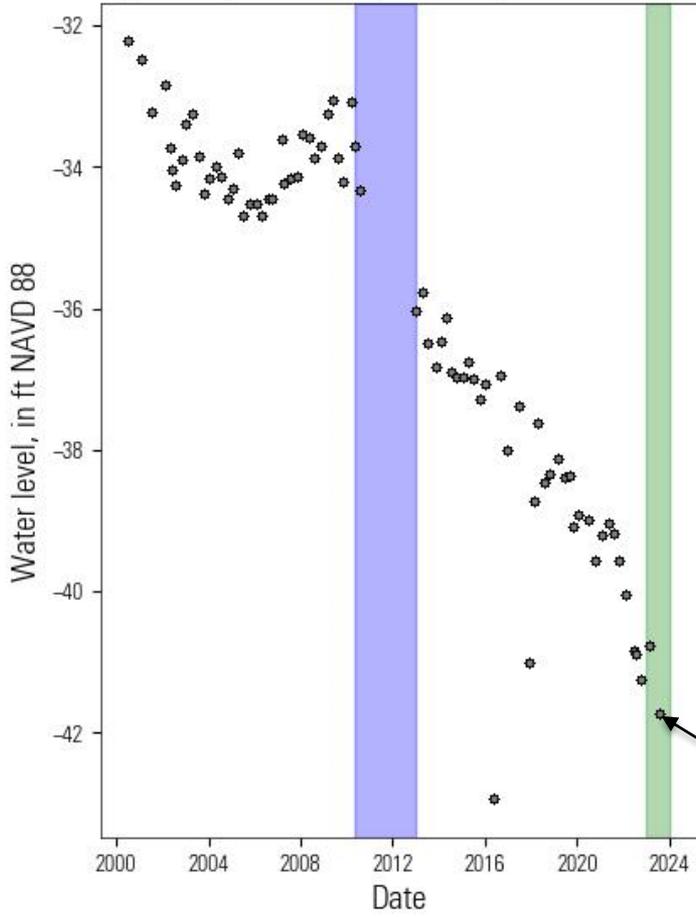
Ev-500 (112CHCT) Well Depth: 120.0 ft



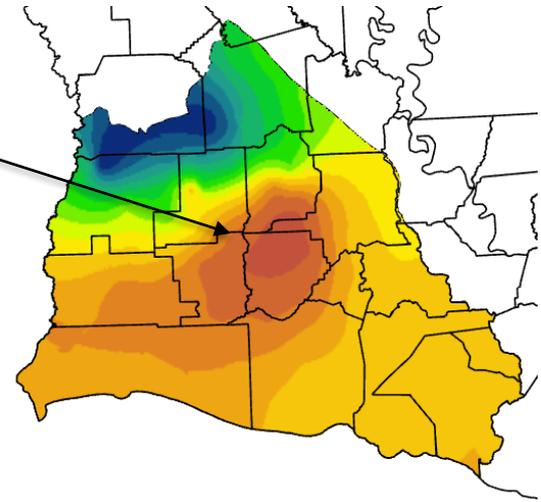
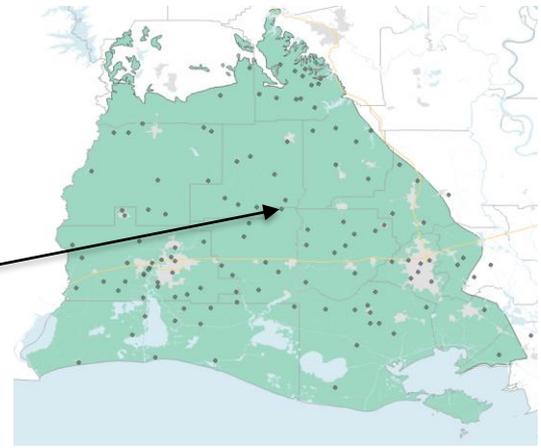
7/11/2023



JD-406 (112CHCT) Well Depth: 450.0 ft

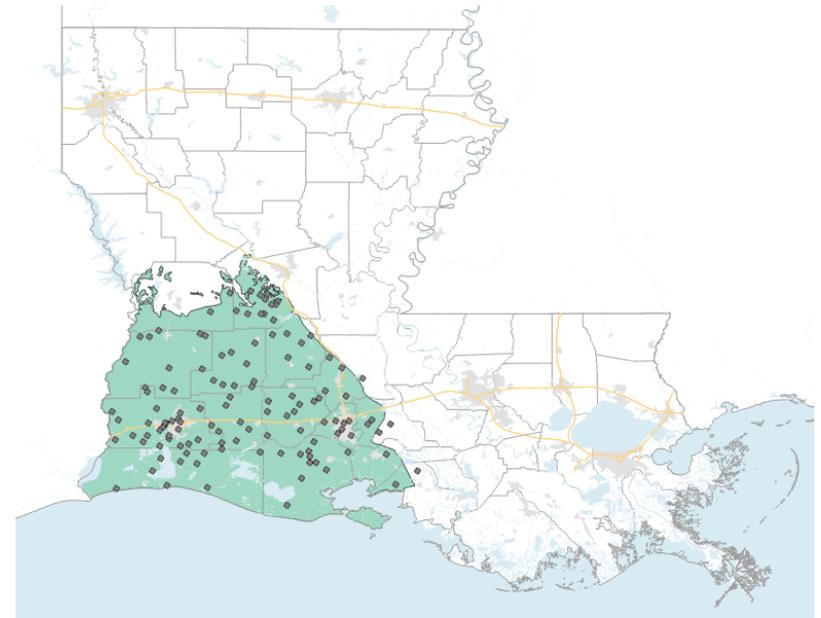


7/17/2023



# Chicot aquifer system

- Water level cone of depression within the agricultural area between Lake Charles and Lafayette is generally deepening and has reached historical lows in some localized places. Wells with shallower, older, or lower capacity pumps within this area may be affected.
- Winter 2024 synoptic will help determine drought effects.
- Continued pumping into the fall to maintain sufficient soil moisture for crawfish burrows may cause additional water level decline.



Legend	
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Source: <https://www.drought.gov/states/louisiana>

Data valid: 9/19/2023

# Questions?

<https://maps.waterdata.usgs.gov>

<https://waterwatch.usgs.gov>

[www.drought.gov](http://www.drought.gov)