Predicted Water Trends and Impacts to Grasslands

Missouri Native Grasslands Summit, April 11, 2024

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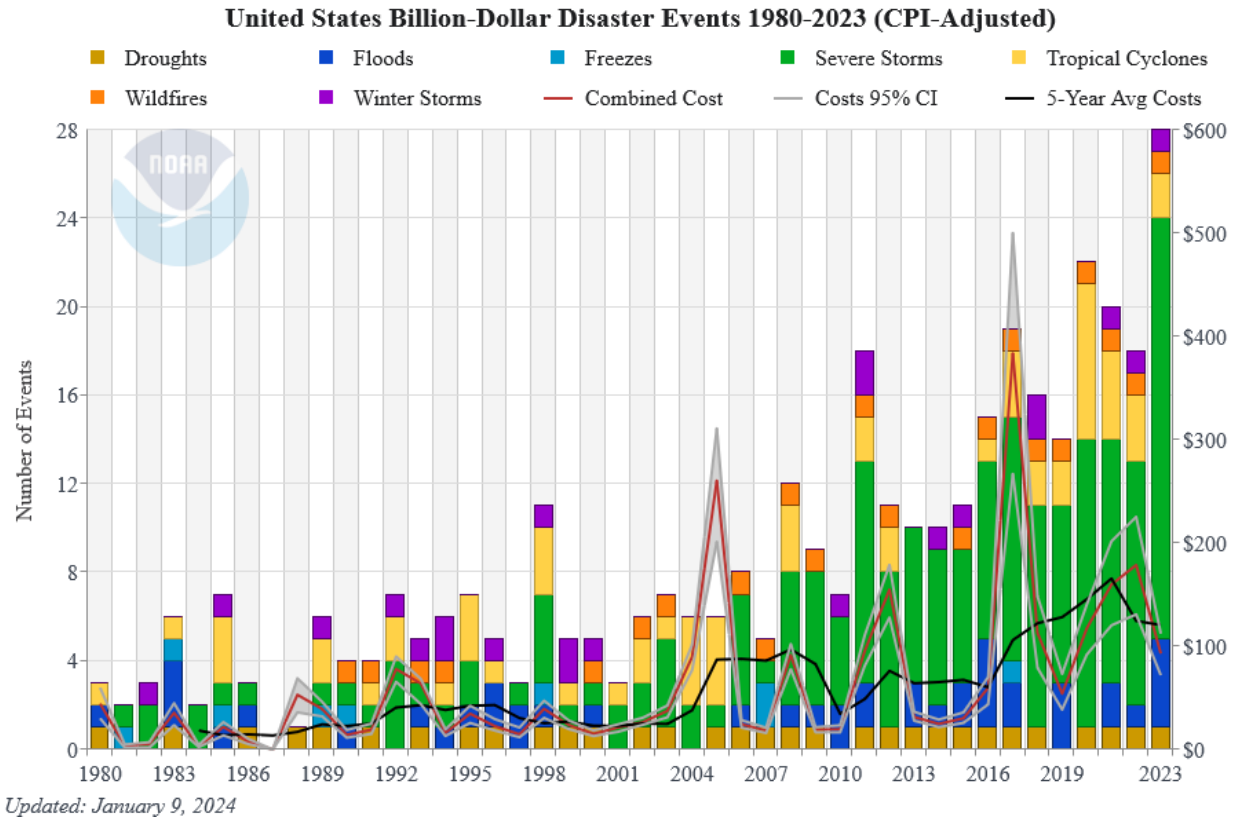
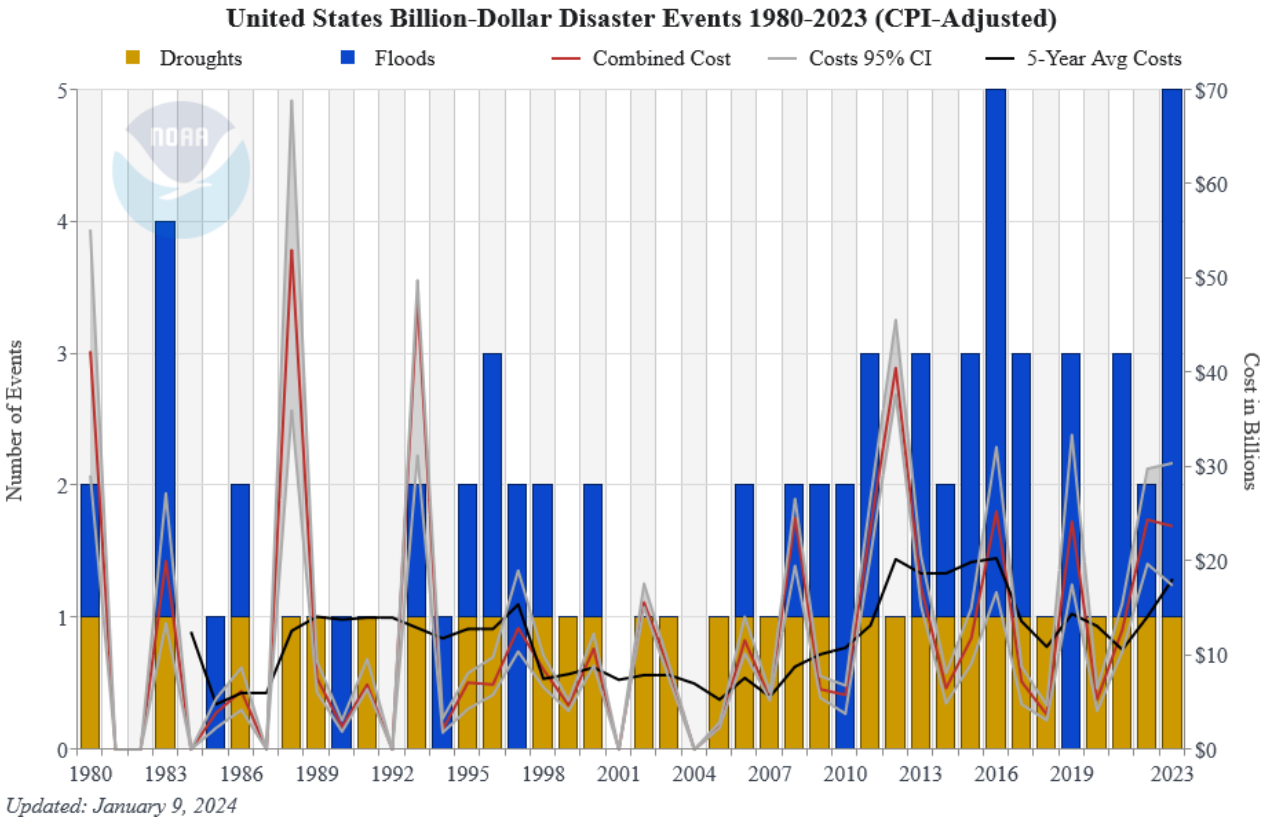
Hydroclimatic Extremes





NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2024). https://www.ncei.noaa.gov/access/billions/, DOI: 10.25921/stkw-7w73

Hydroclimatic Extremes

Billion-dollar events to affect Missouri from 1980 to 2023 (CPI-Adjusted)

Disaster Type	Events	Events/Year	Percent Frequency	Total Costs	Percent of Total Costs
Drought	15	0.3	13.6%	$10.0B-$20.0B	22.2%
Flooding	9	0.2	8.2%	$10.0B-$20.0B	28.9%
Freeze	2	0.0	1.8%	$500M-$1.0B	1.2%
Severe Storm	75	1.7	68.2%	$20.0B-$50.0B	45.3%
Tropical Cyclone	1	0.0	0.9%	$250M-$500M	0.9%
Wildfire	--	--	--	--	--
Winter Storm	8	0.2	7.3%	$500M-$1.0B	1.5%
All Disasters	**110**	**2.5**	**100.0%**	**$50.0B-$100.0B**	**100.0%**

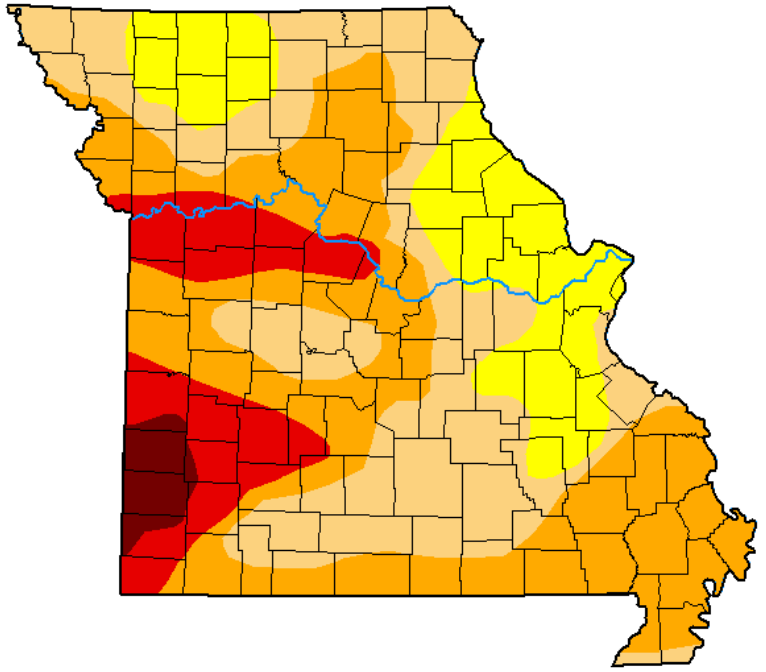
†Deaths associated with drought are the result of heat waves. (Not all droughts are accompanied by extreme heat waves.)

Flooding events (river basin or urban flooding from excessive rainfall) are separate from inland flood damage caused by tropical cyclone events.

Hydroclimatic Extremes

U.S. Drought Monitor

Missouri



October 18, 2022

(Released Thursday, Oct. 20, 2022)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	82.40	50.40	14.28	2.55
Last Week *10-11-2022*	0.00	100.00	72.86	37.22	13.38	2.55
3 Months Ago *07-19-2022*	26.36	73.64	50.72	33.13	2.08	0.00
Start of Calendar Year *01-04-2022*	64.36	35.64	0.43	0.00	0.00	0.00
Start of Water Year *09-27-2022*	18.48	81.52	56.59	15.39	4.83	1.92
One Year Ago *10-19-2021*	74.39	25.61	0.78	0.00	0.00	0.00

Intensity:

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

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droughtmonitor.unl.edu

Hydroclimatic Extremes

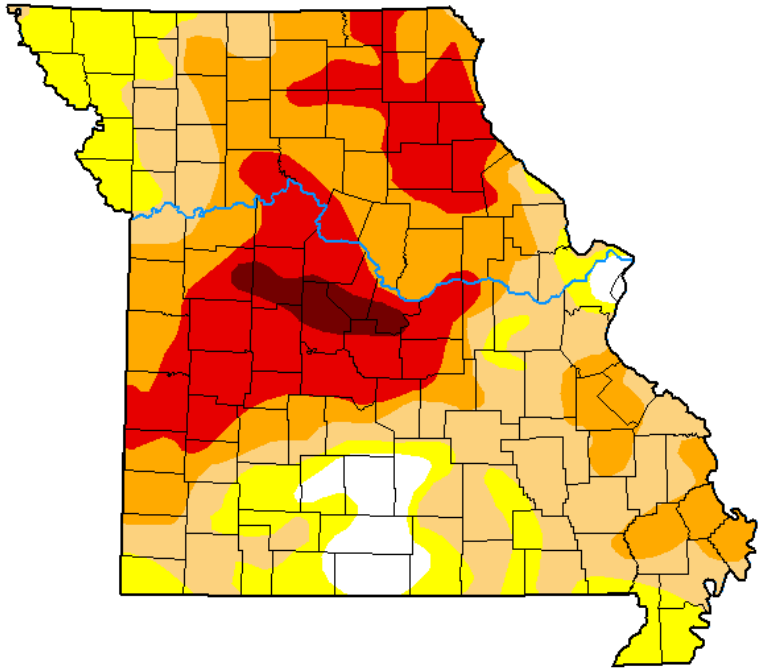
Extremely Wet Summer!

These locations finished in their Top 5 wettest Summer's on record:

Location	Precip	Ranking	Wettest	Period of Record
Mayfield, KY COOP	26.92"	1st	26.92" (2023)	1982-2023
Murray, KY COOP	24.83"	2nd	26.29" (2016)	1926-2023
Olmsted, IL COOP	23.14"	1st	23.14" (2023)	1923-2023
Marble Hill, MO COOP	22.20"	4th	27.95" (1928)	1894-2023
Cape Girardeau, MO Airport	19.25"	1st	19.25" (2023)	1960-2023
Paducah, KY Airport	18.90"	5th	22.45" (1958)	1938-2023
Sikeston, MO COOP	18.47"	2nd	19.70" (1957)	1951-2023

YouTube @NWSPaducah weather.gov/pah National Weather Service Paducah, KY

U.S. Drought Monitor
Missouri



July 18, 2023
(Released Thursday, Jul. 20, 2023)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	4.66	95.34	78.95	51.13	23.18	2.15
Last Week 07-11-2023	0.24	99.76	81.76	58.20	25.76	3.25
3 Months Ago 04-18-2023	86.13	13.87	1.79	0.21	0.00	0.00
Start of Calendar Year 01-03-2023	50.31	49.69	12.51	1.61	0.00	0.00
Start of Water Year 09-27-2022	18.48	81.52	56.59	15.39	4.83	1.92
One Year Ago 07-19-2022	26.36	73.64	50.72	33.13	2.08	0.00

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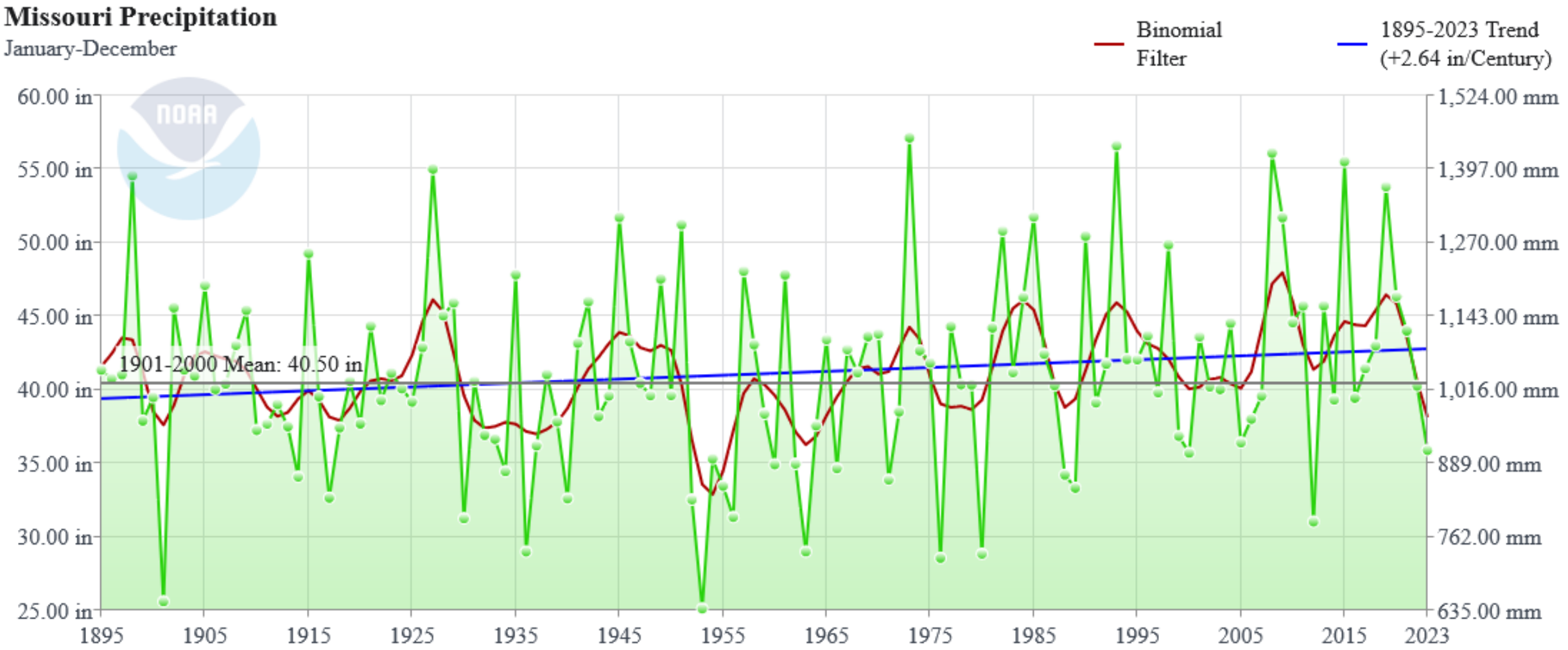
Missouri precipitation has been trending wetter all four seasons



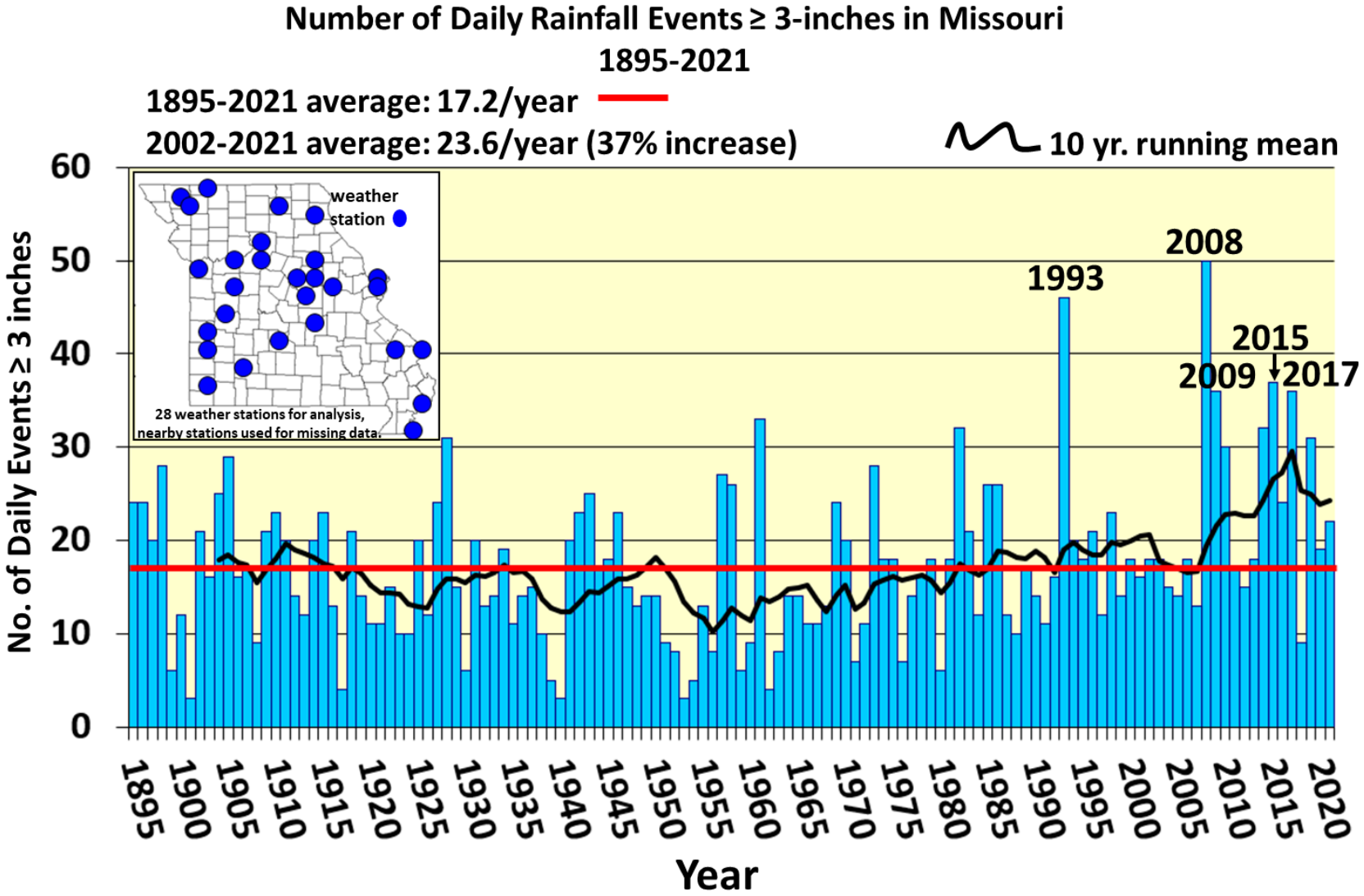
NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Climate at a Glance

https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/statewide/time-series

What are the climatic impacts of wetter precipitation trends?

More extreme precipitation events, more flooding.

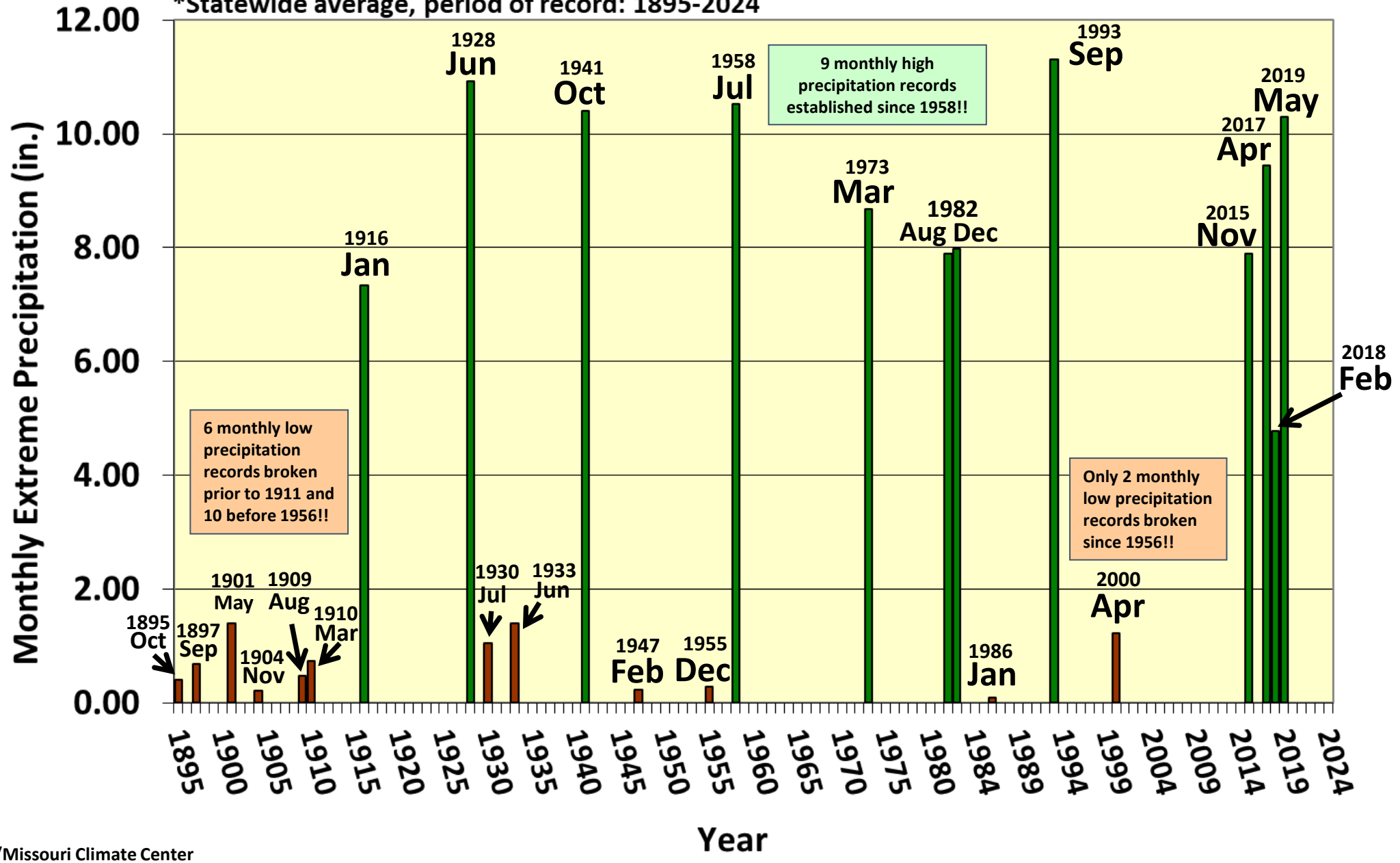


Source: NOAA/Missouri Climate Center

Courtesy: Pat Guinan, Associate Professor Emeritus

Missouri Extreme Monthly Precipitation*

*Statewide average, period of record: 1895-2024

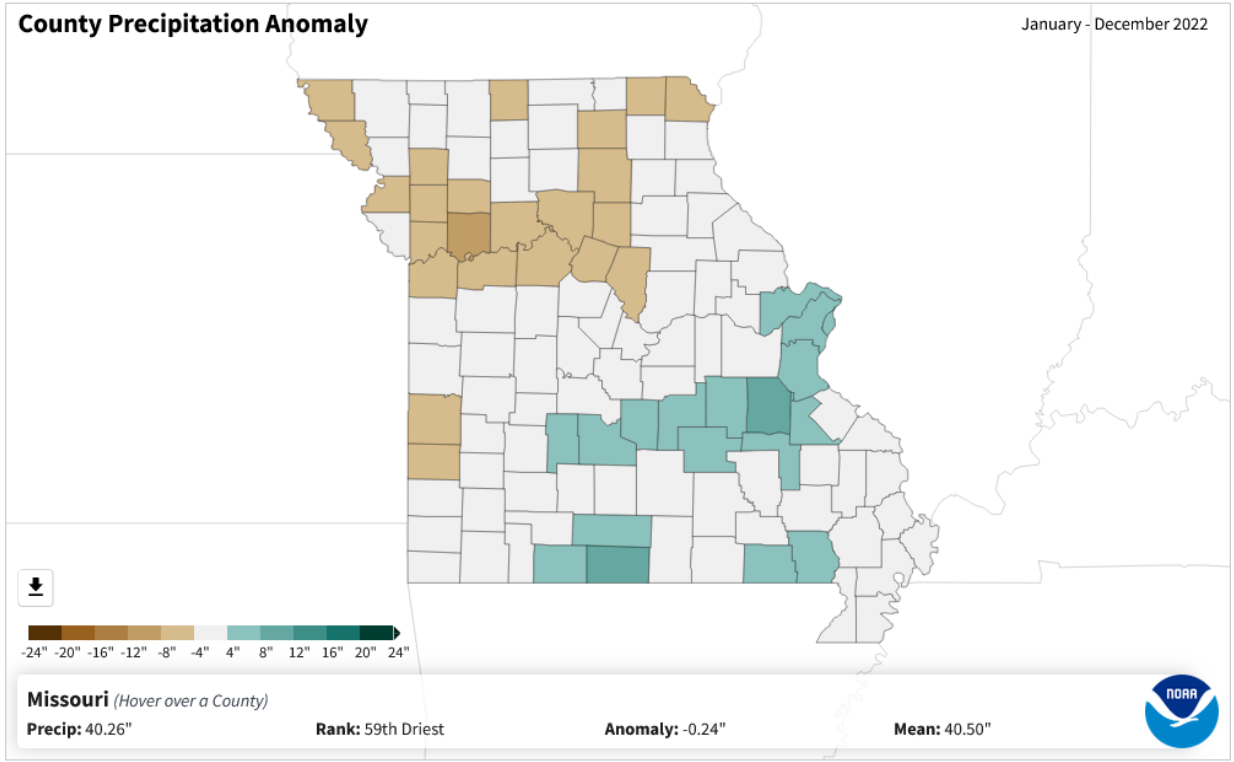


Source: NOAA/Missouri Climate Center

How do 2022 and 2023 compare to climate trends?

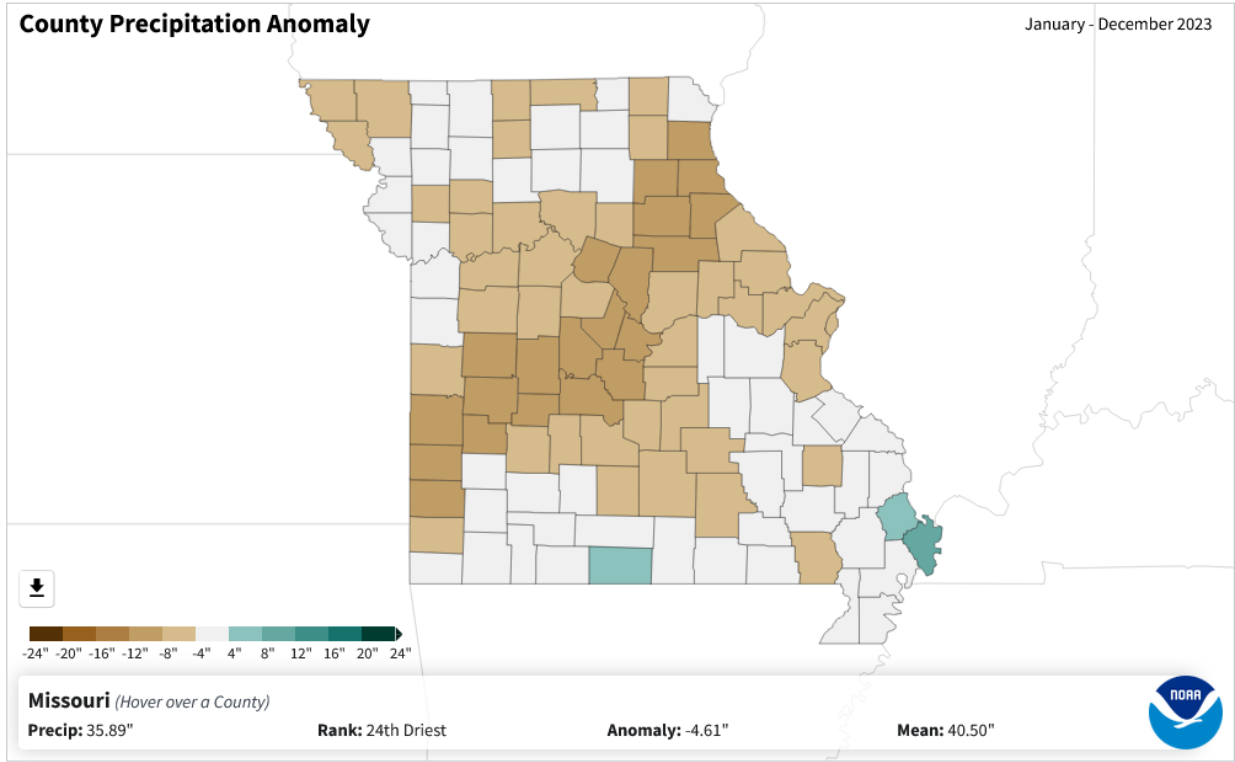
2022 Statistics for Missouri

- Max Temp: 40th Warmest (+ 0.8 °F)
- Min Temp: 54th Warmest (+ 0.3 °F)
- Avg Temp: 44th Warmest (+ 0.5 °F)
- Precipitation: 58th Driest (-0.22”)



2023 Statistics for Missouri

- Max Temp: 5th Warmest (+ 3.2 °F)
- Min Temp: 7th Warmest (+ 2.6 °F)
- Avg Temp: 3rd Warmest (+2.9 °F)
- Precipitation: 24th Driest (-4.61”)



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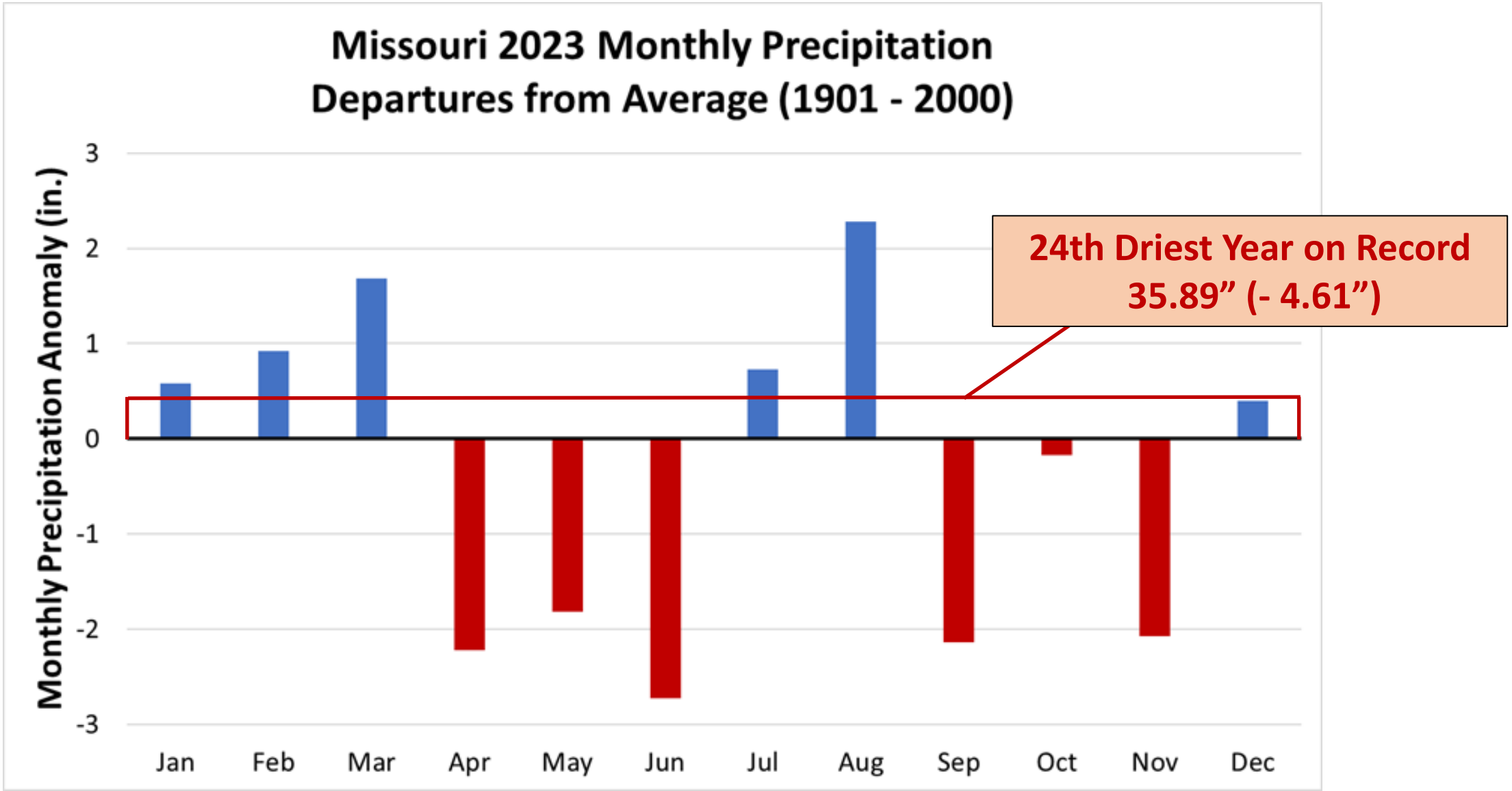
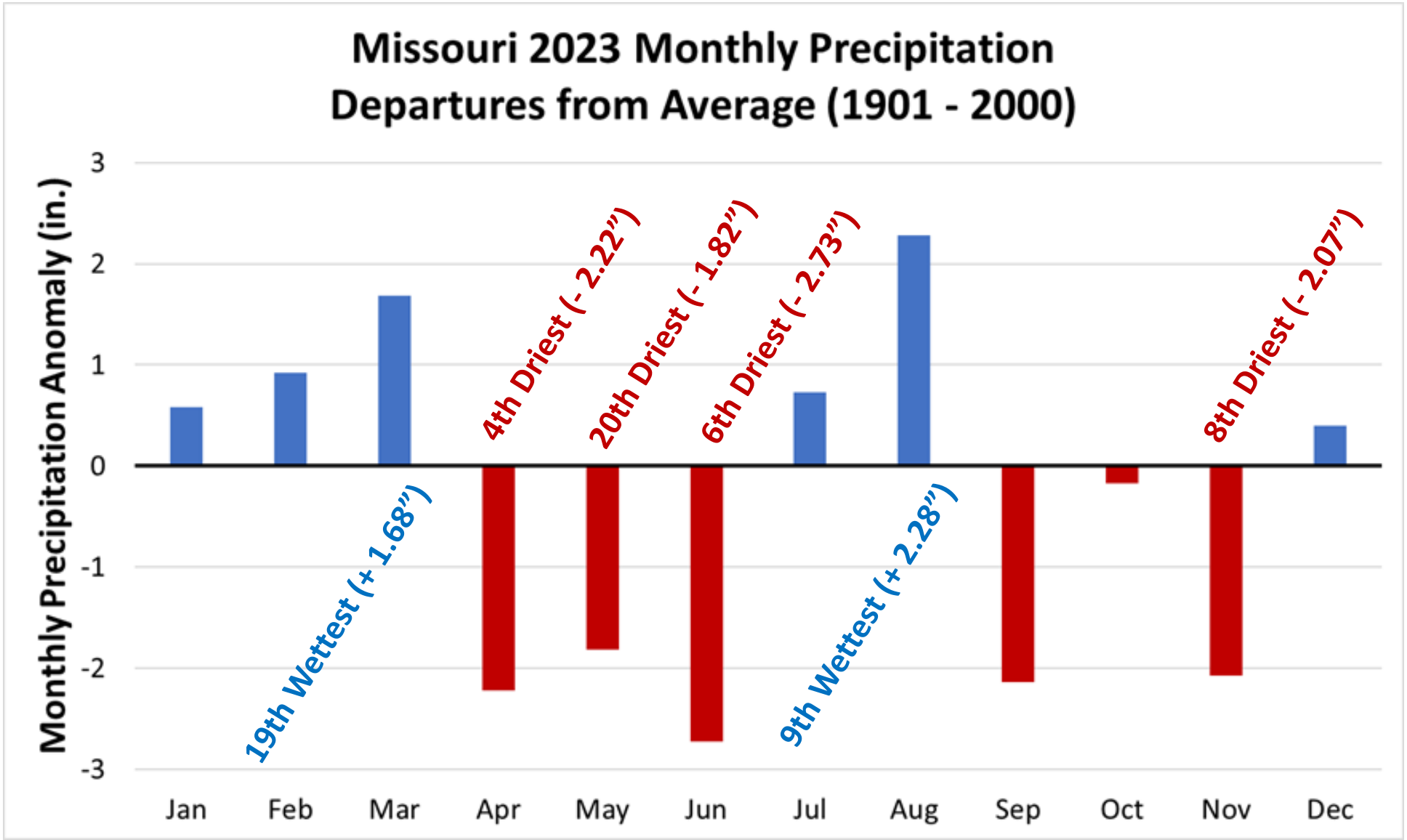


Ranks based on data from 1895 to 2023 (129 years) https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/



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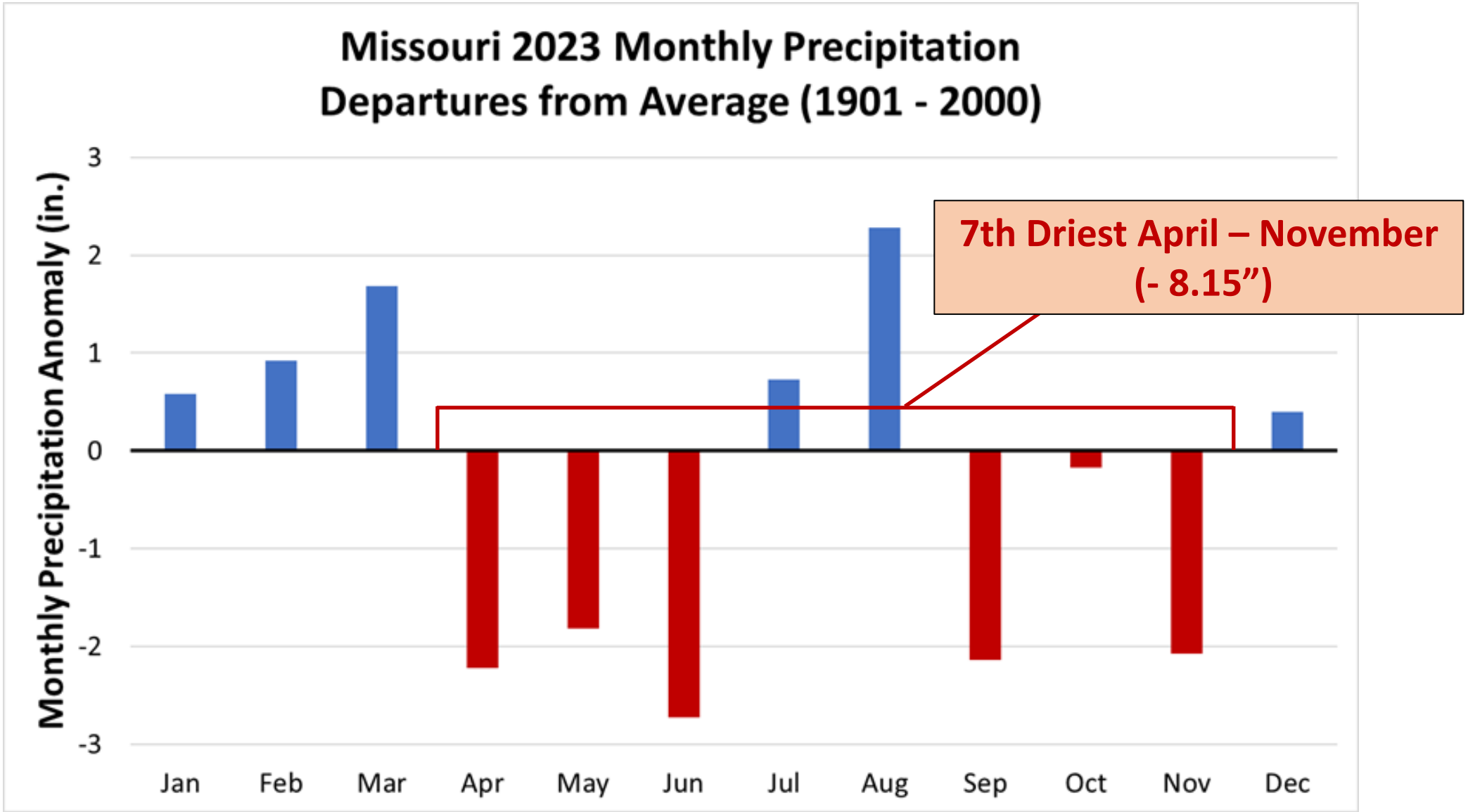

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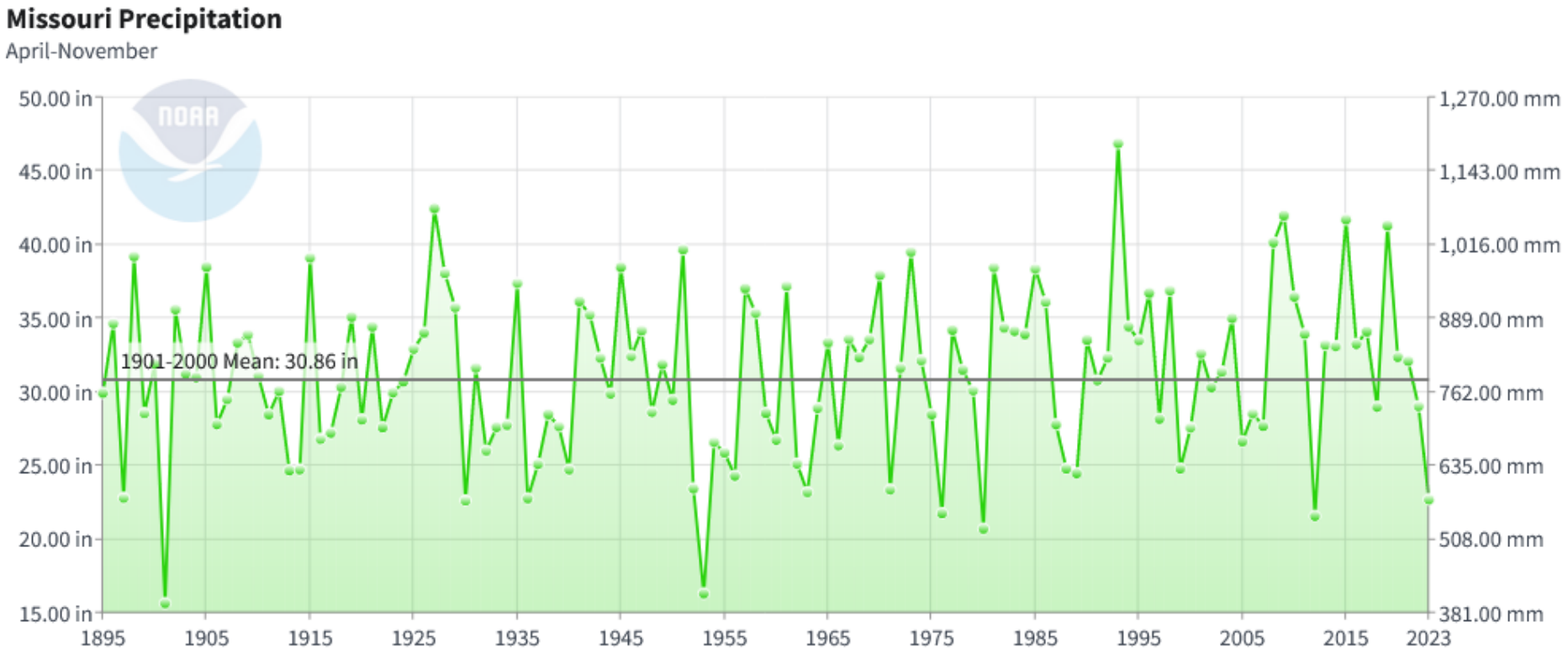
How does 2023 compare to previous drought events?

- ***Missouri's 7th driest April – November period (- 8.15") going back to 1895***



- *The 2023 drought is **a one-in-20-year drought event** (return period = 18.4 years)*

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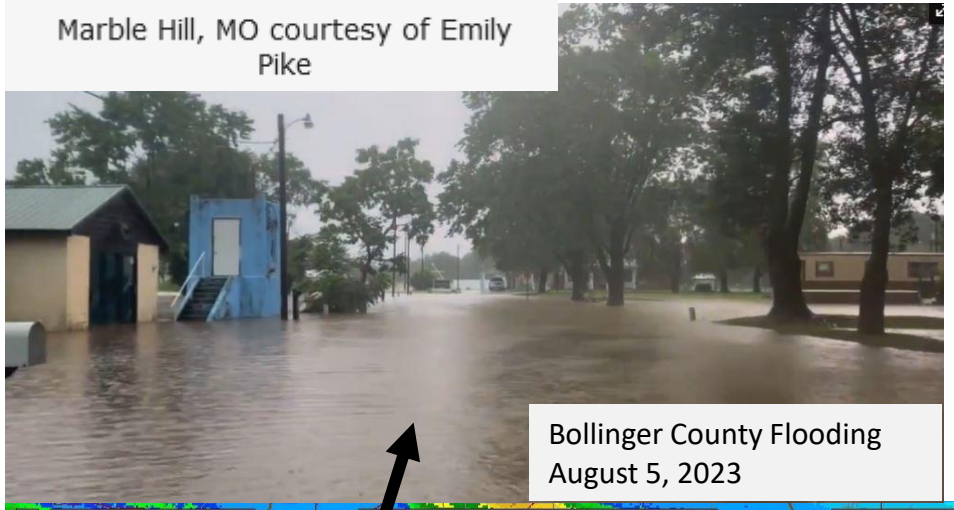
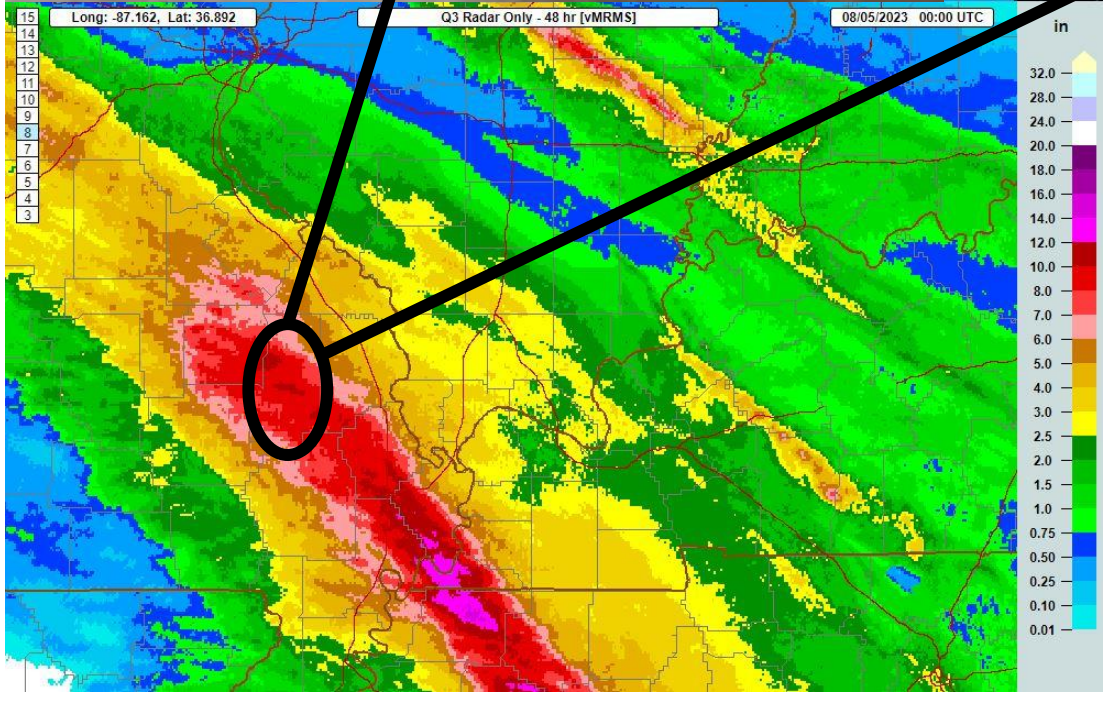
Hydroclimatic Extremes

Marble Hill, MO courtesy of Emily Pike



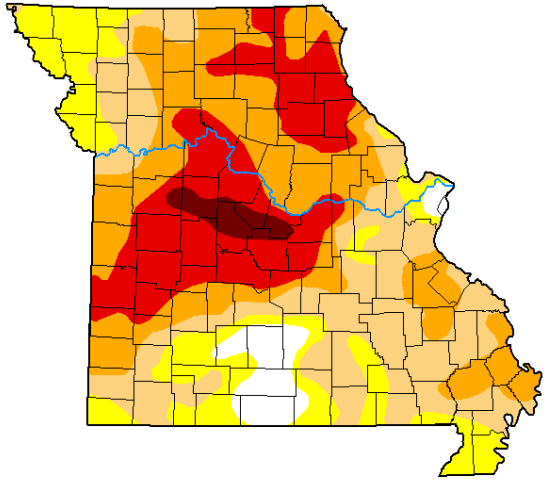
Bollinger County Flooding
August 5, 2023



Bollinger County, MO
CMOR July, 2023

U.S. Drought Monitor

Missouri



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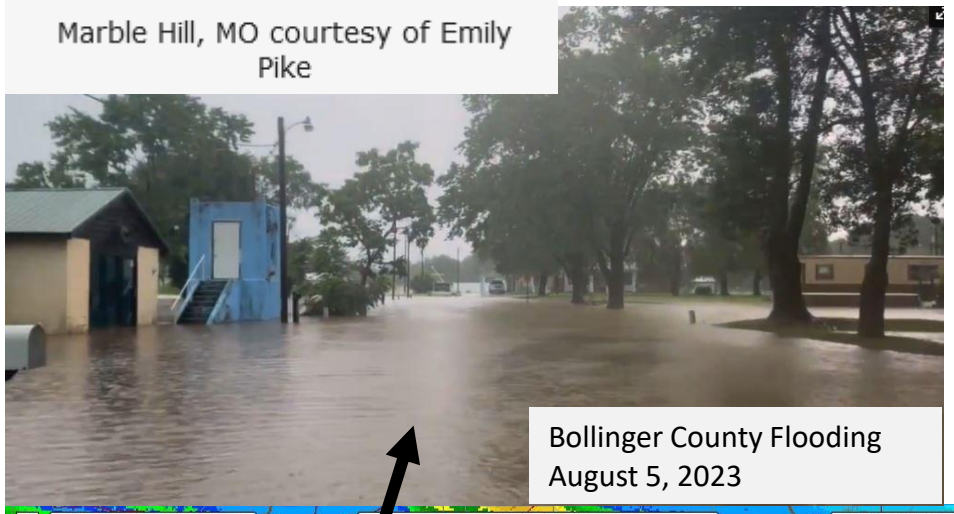

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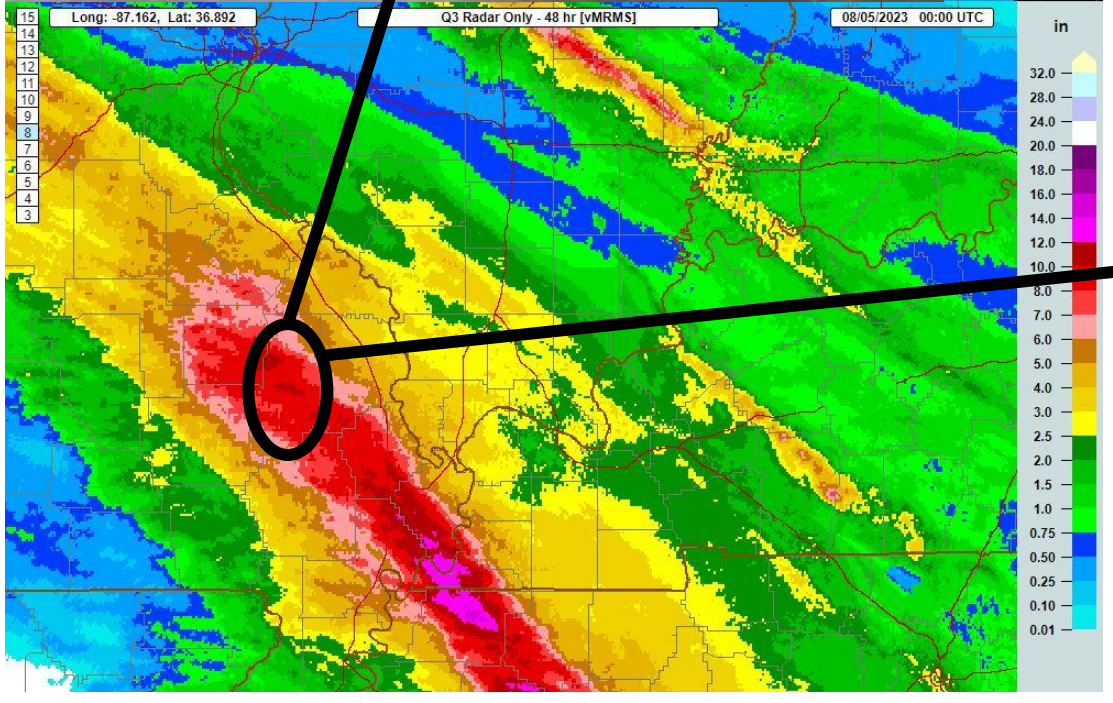
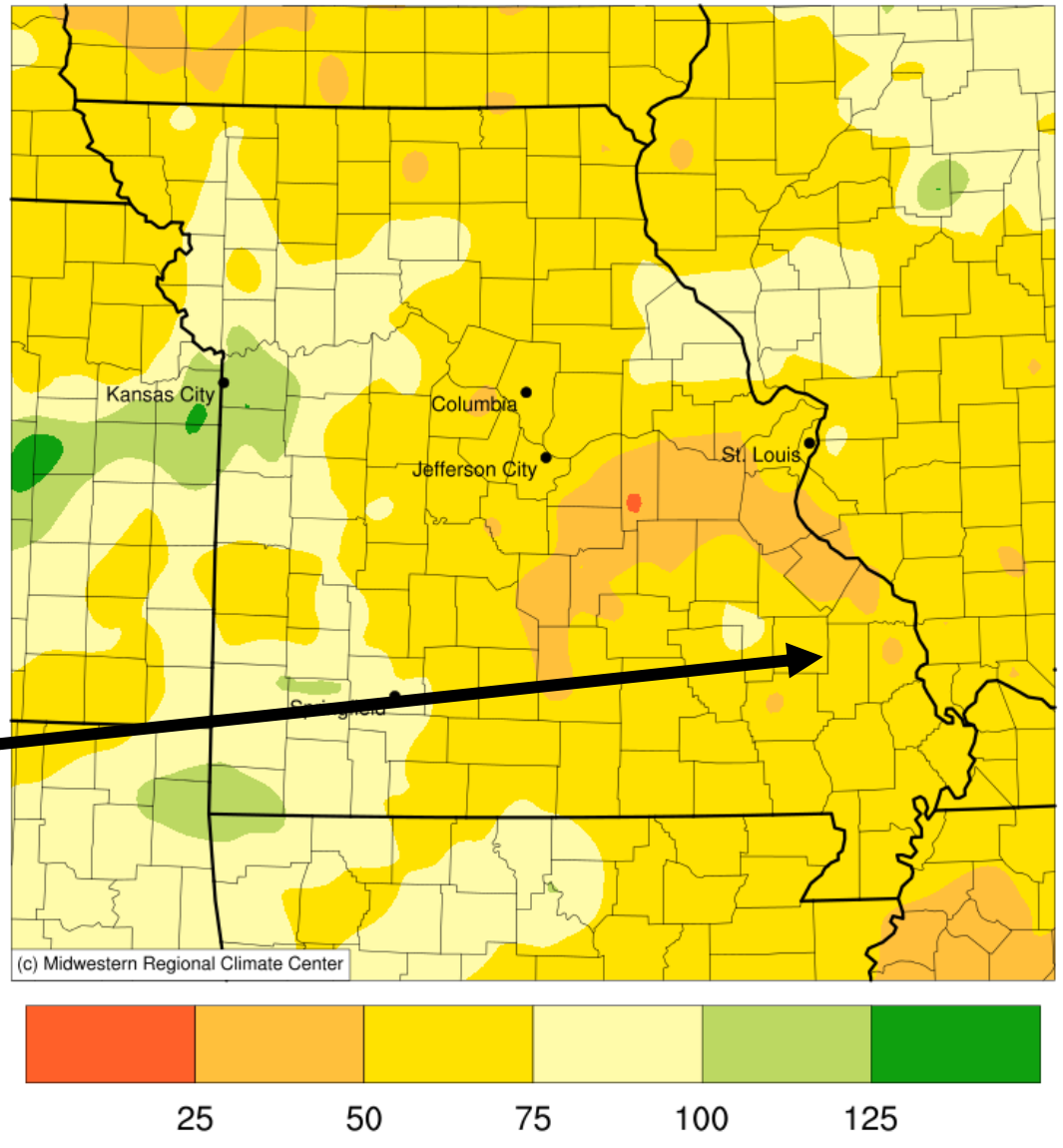




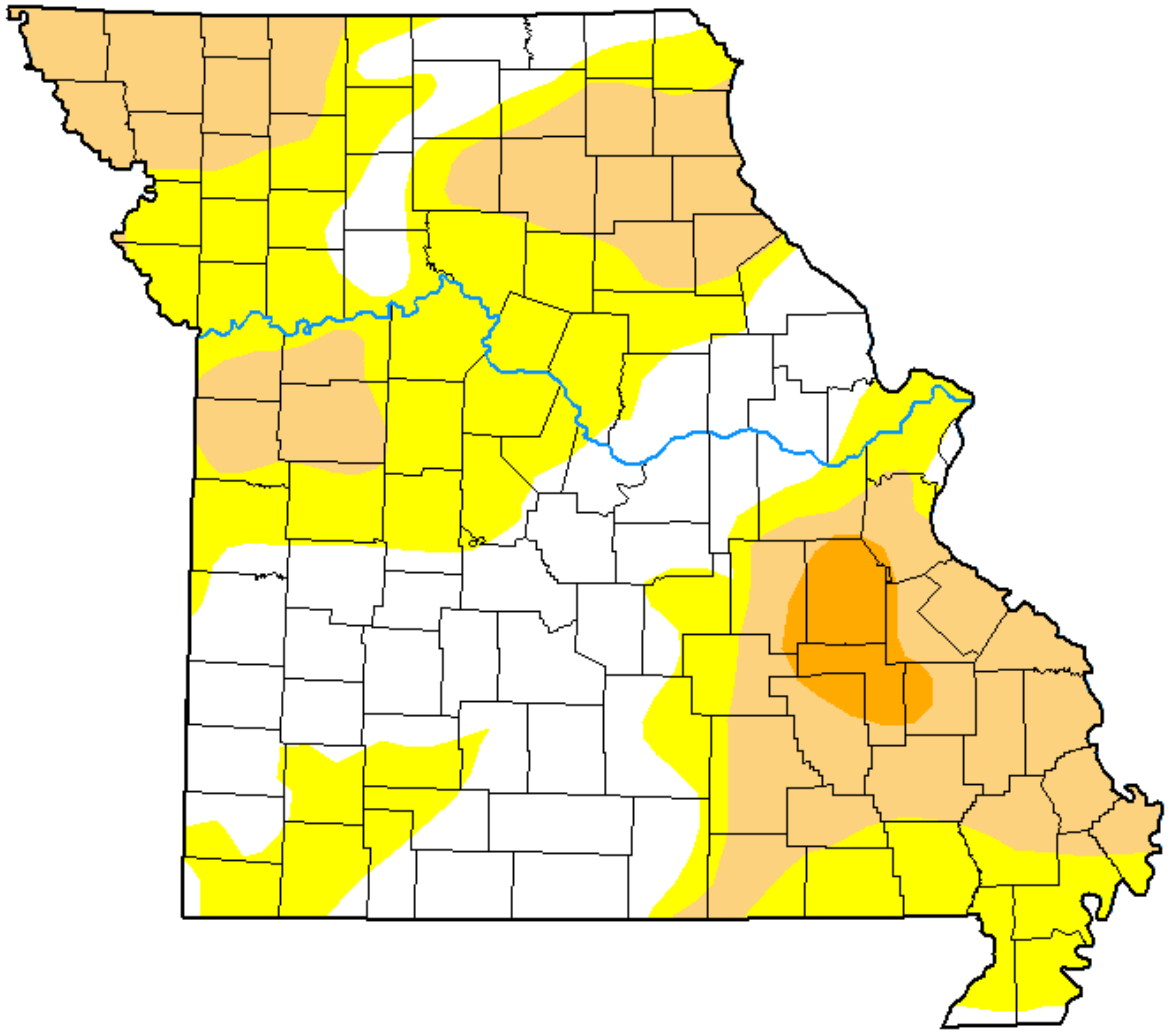
U.S. Drought Monitor

Missouri

April 2, 2024

(Released Thursday, Apr. 4, 2024)

Valid 8 a.m. EDT



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Brad Pugh
CPC/NOAA

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Future possibilities for Missouri…

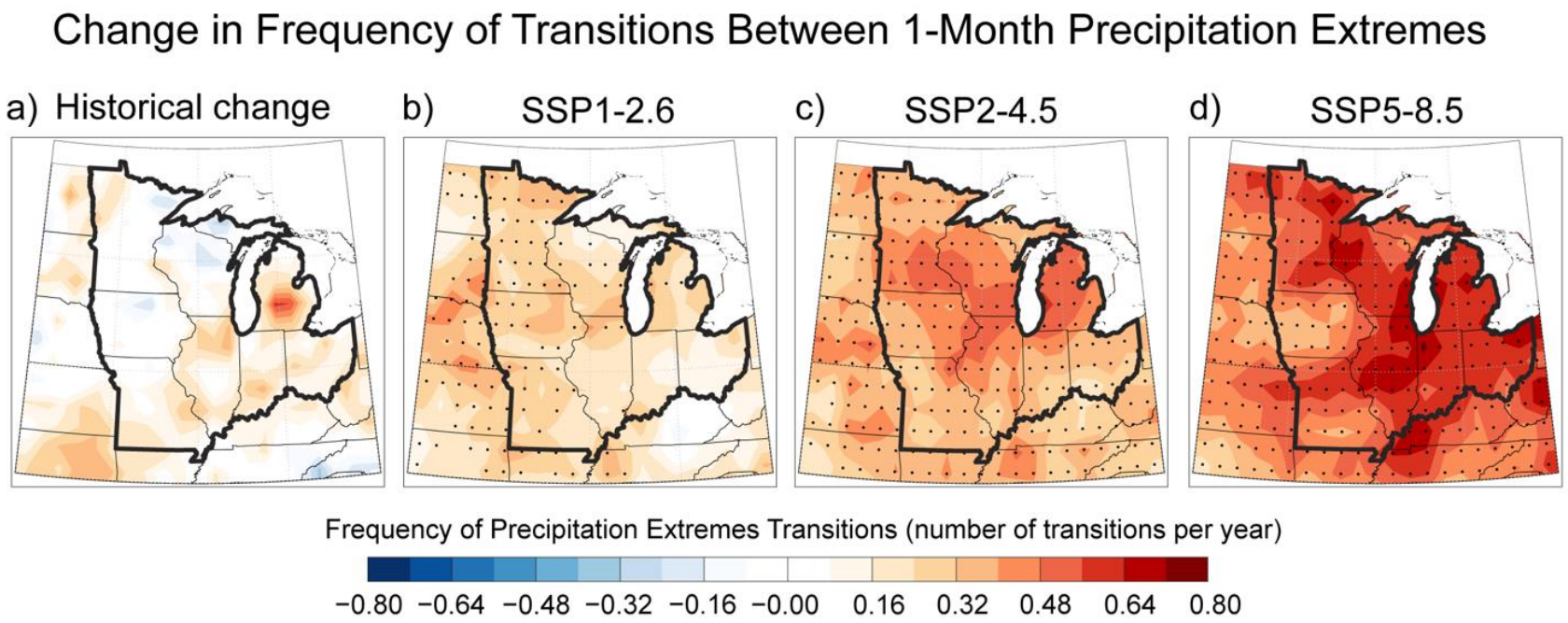


Figure 24.1. The frequency of wet–dry and dry-wet transitions across the Midwest is projected to increase by late century (2071–2100).

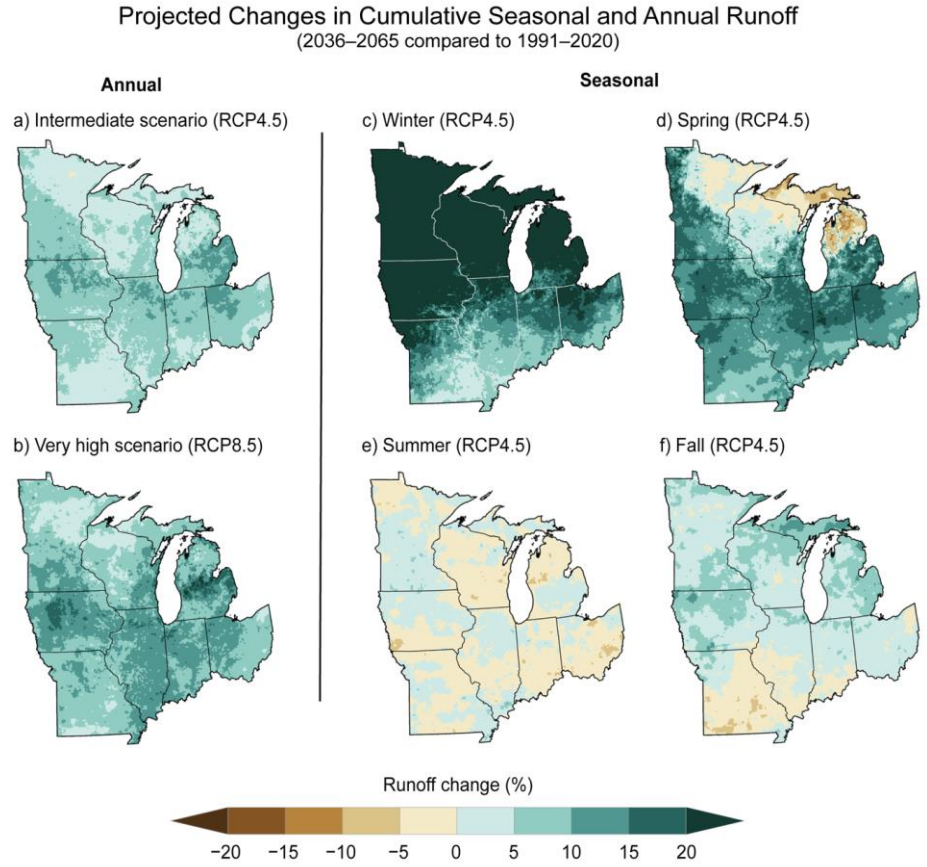
Key Message 25.1

Climate Change Is Compounding the Impacts of Extreme Events

The Northern Great Plains region is experiencing unprecedented extremes related to changes in climate, including severe droughts (*likely, high confidence*), increases in hail frequency and size (*medium confidence*), floods (*very likely, high confidence*), and wildfire (*likely, high confidence*). Rising temperatures across the region are expected to lead to increased evapotranspiration (*very likely, very high confidence*), as well as greater variability in precipitation (*very likely, high confidence*).

Future possibilities for Missouri…

Figure 24.11. Projected changes in cumulative local runoff will lead to increased flooding susceptibility in winter and spring with, increased flash drought potential in summer.



Key Message 24.5

Managing Extremes Is Necessary to Minimize Impacts on Water Quality and Quantity

Climate-related changes to water quantity and quality are increasing the risks to ecosystem health, adequate food production, surface water and groundwater uses, and recreation (*high confidence*). Projected increases in droughts, floods, and runoff events across the Mississippi River basin and the Great Lakes will adversely impact ecosystems through increased erosion, harmful algal blooms, and expansion of invasive species (*likely, high confidence*). Federal and state agencies and nongovernmental organizations are cooperating on adaptation efforts related to streamflow, water quality, and other water issues (*high confidence*).

Future possibilities for Missouri…

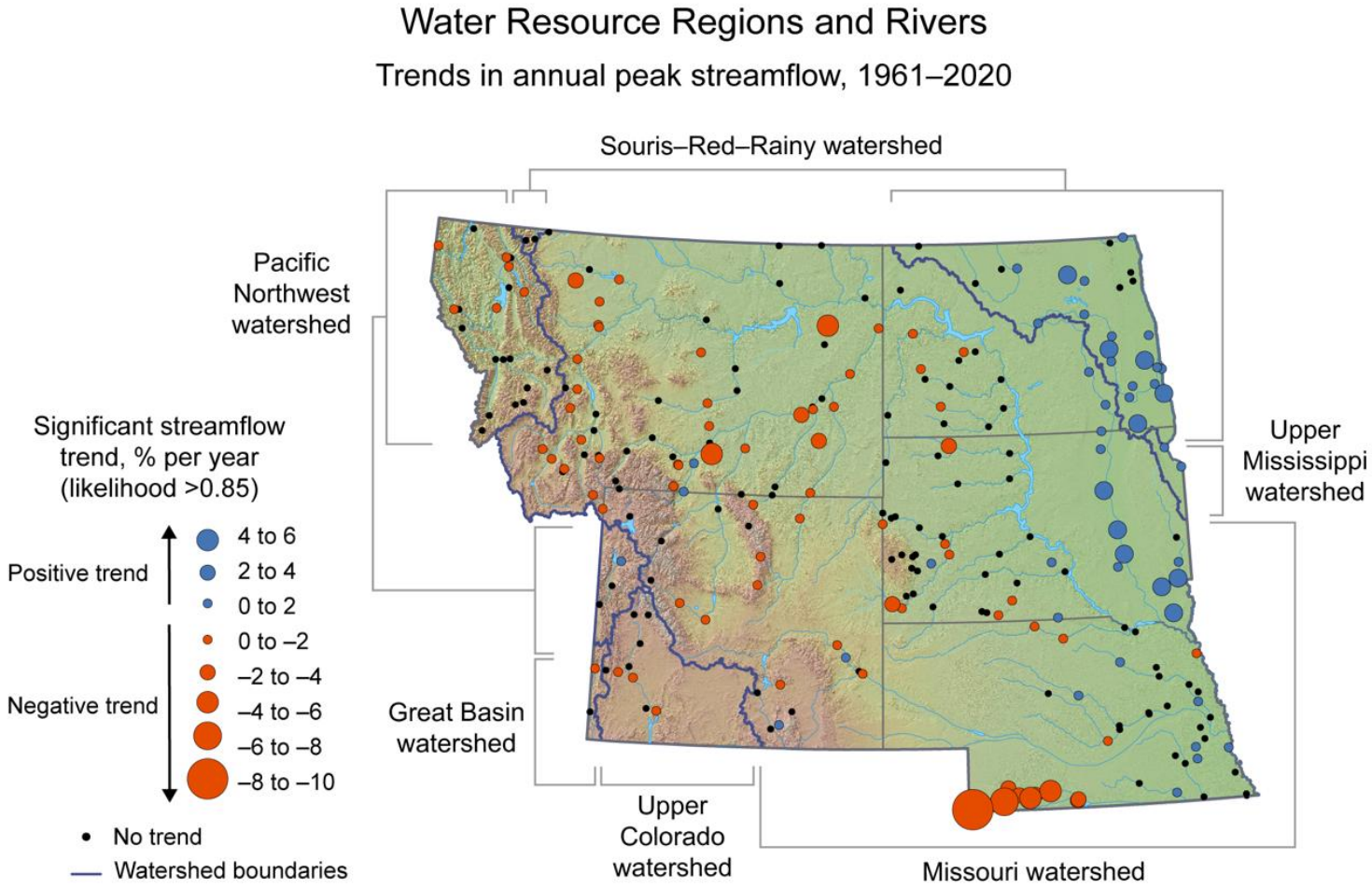


Figure 25.4. Annual peak streamflow—a proxy for flooding—has been rising in eastern portions of the region and declining in the west.

Future possibilities for Missouri…

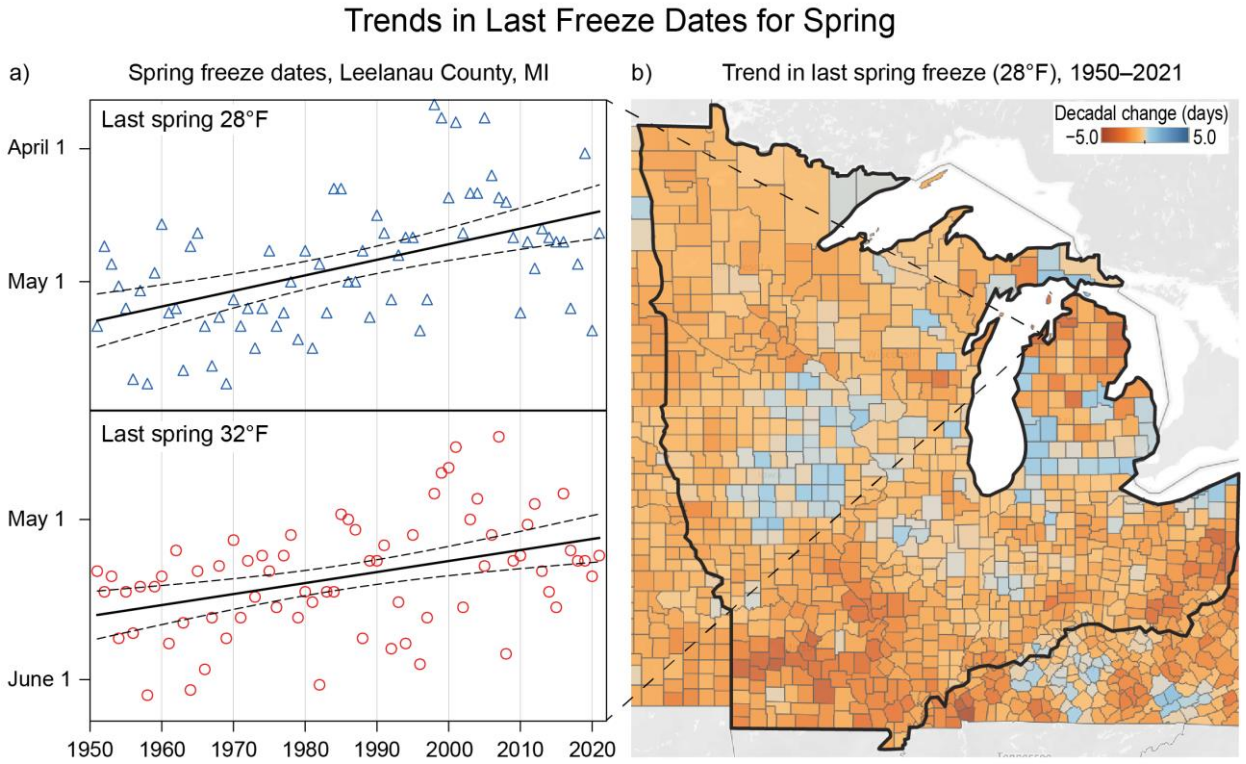


Figure 24.3. Last spring freezes are occurring earlier over most of the Midwest region.

Key Message 11.2

Climate Change Disrupts Our Food Systems in Uneven Ways

Climate change is projected to disrupt food systems in ways that reduce the availability and affordability of nutritious food, with uneven economic impacts across society (*likely, medium confidence*). Impacts of climate change on other measures of human well-being are also distributed unevenly, such as worsening heat stress among farmworkers (*high confidence*) and disruptions to the ability of subsistence-based peoples to access food through hunting, fishing, and foraging (*high confidence*).

Future possibilities for Missouri…

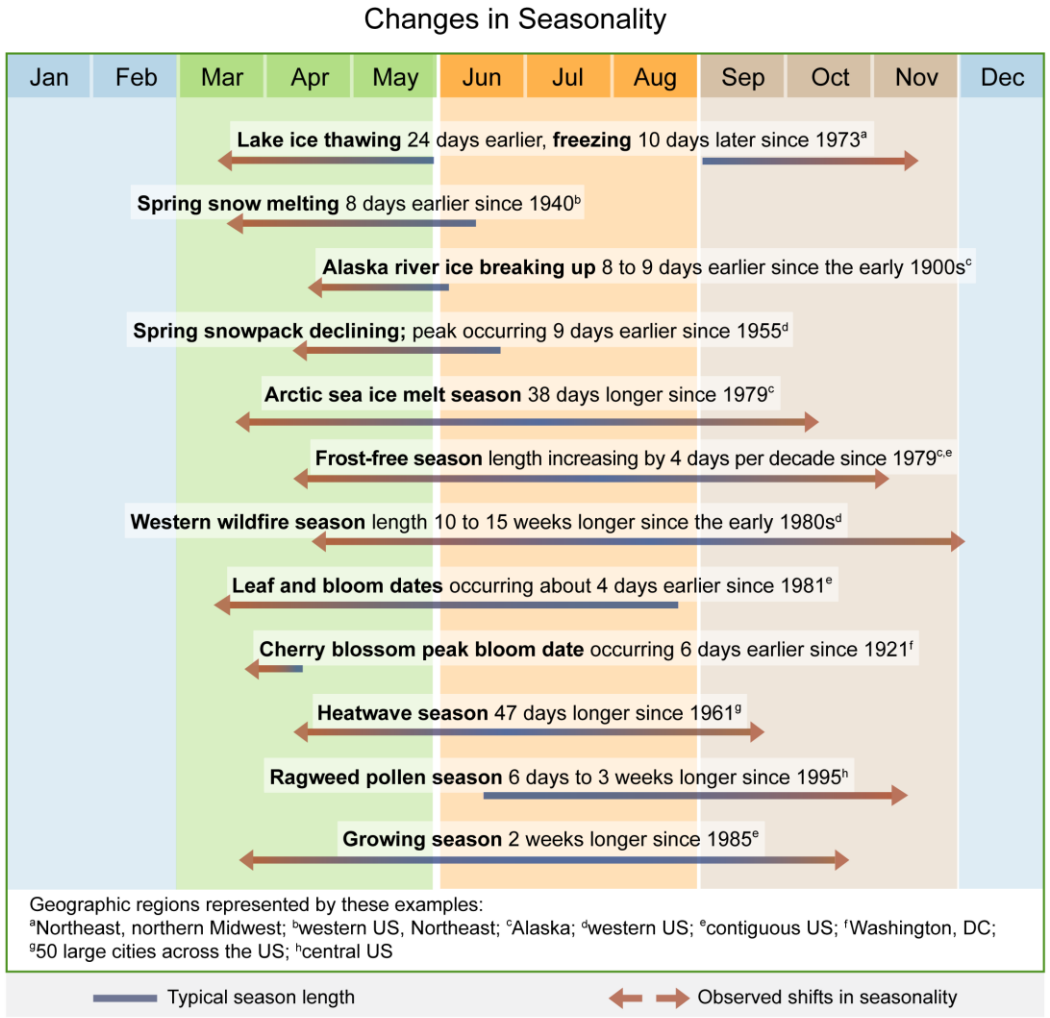


Figure A4.13. Observed evidence of changes in seasonality reflect a warming climate.

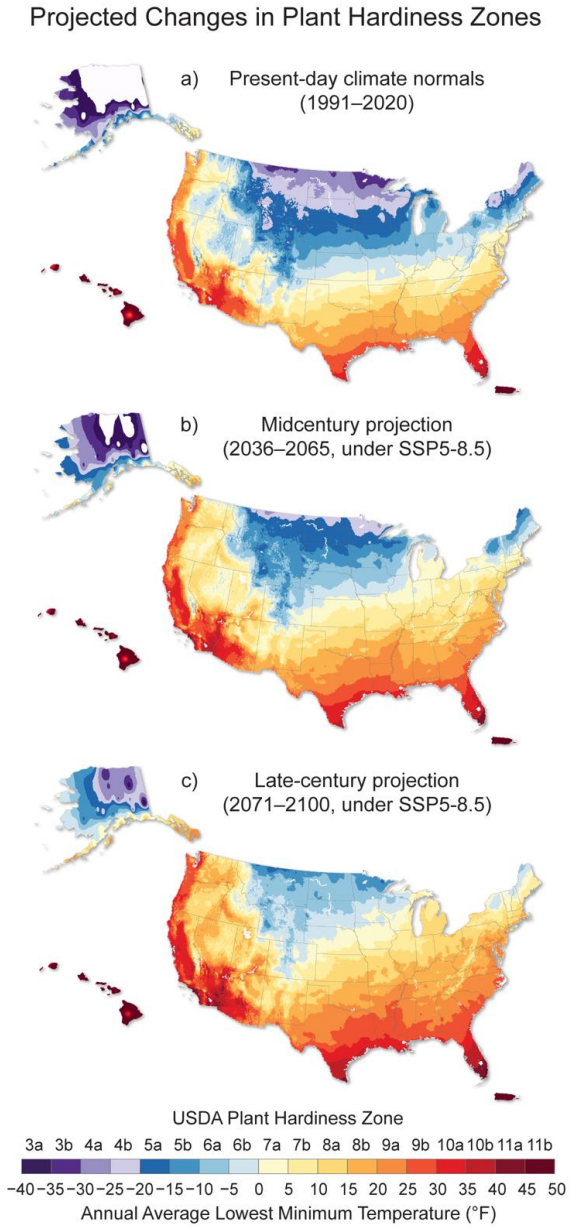


Figure 11.3. Plant hardiness zones are projected to shift northward throughout this century.

Future possibilities for Missouri…

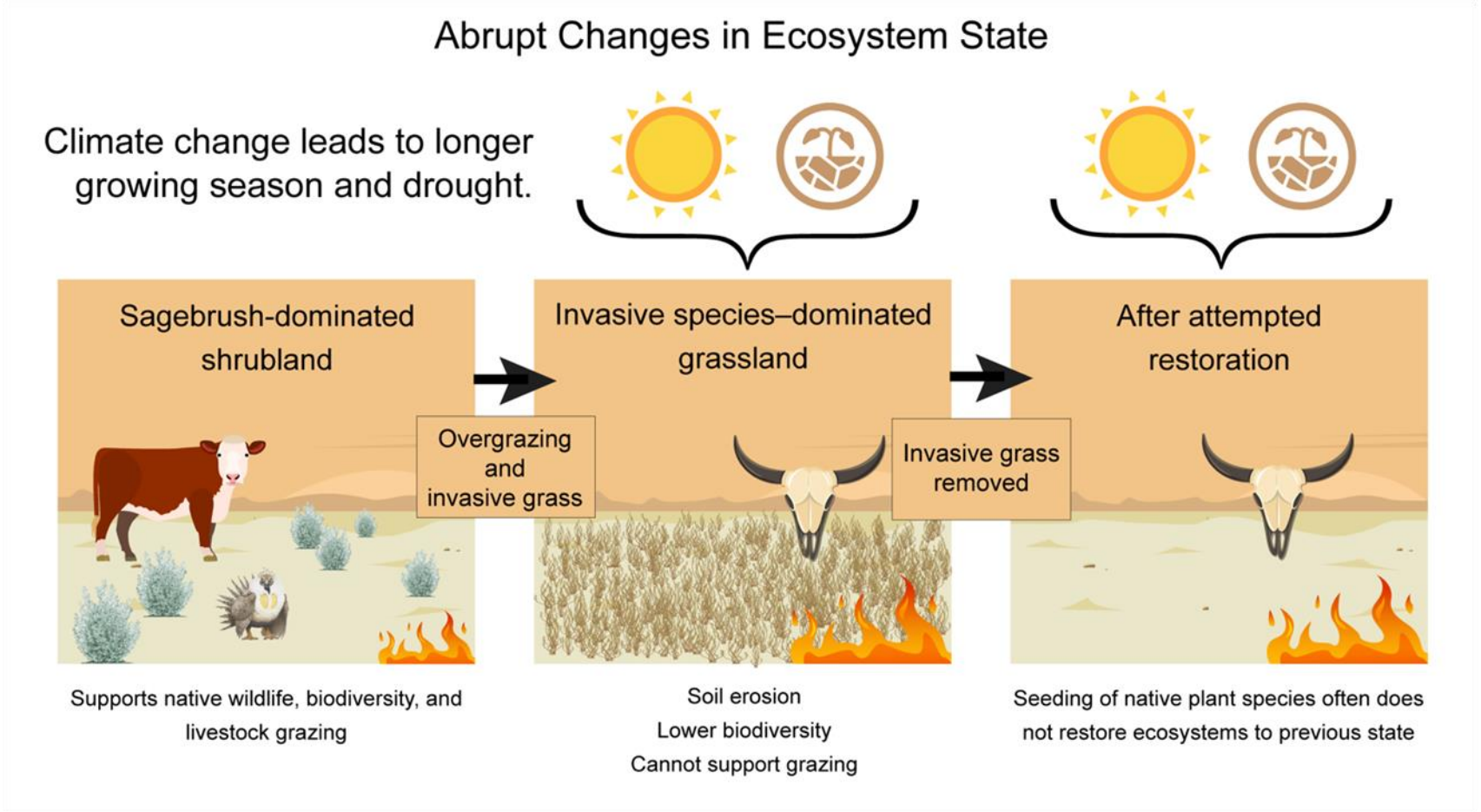


Figure 8.6. Climate change interacts with other stressors to cause synergistic effects, and resulting ecosystem changes can be abrupt and difficult to reverse.

Future possibilities for Missouri…

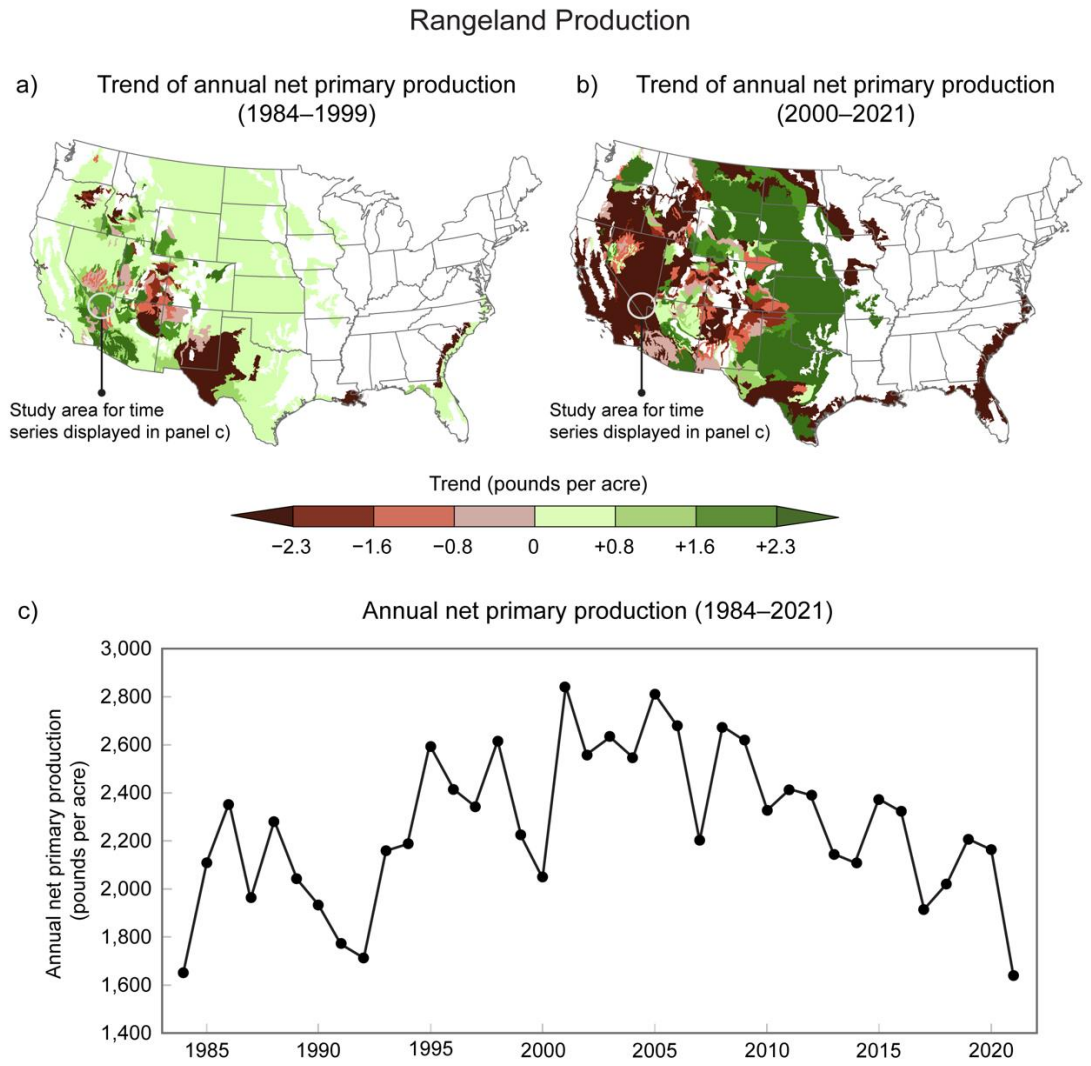
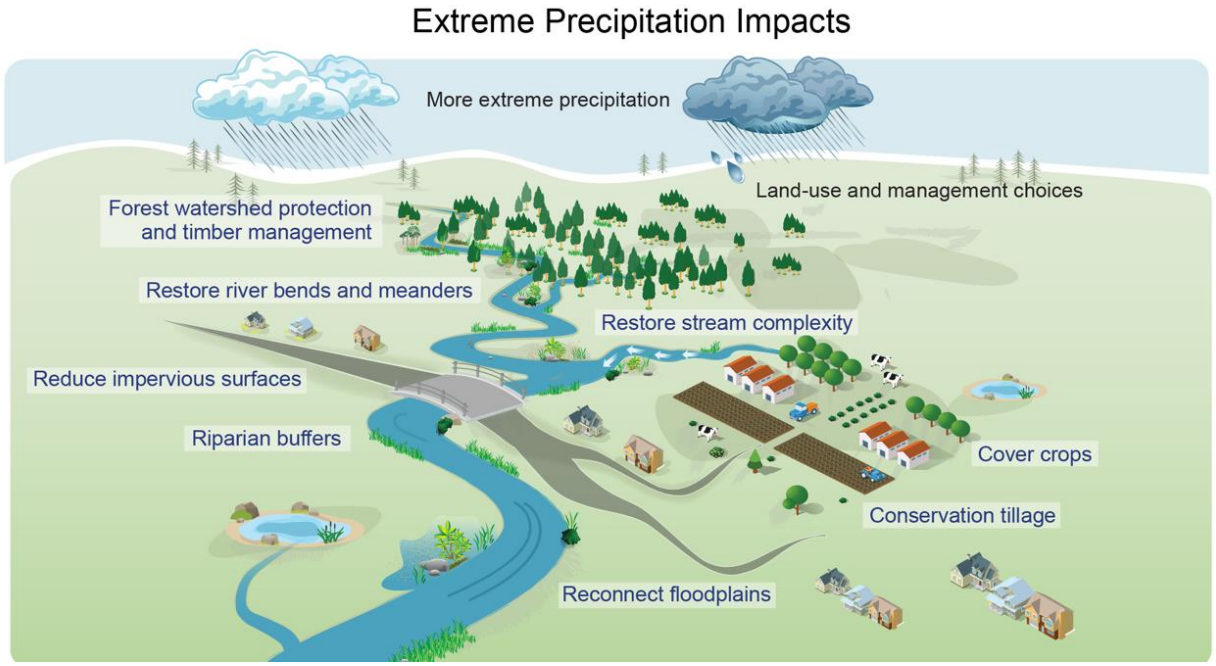


Figure A4.15. Rangeland vegetation production has severely declined in some areas and increased in others.

Future possibilities for Missouri…



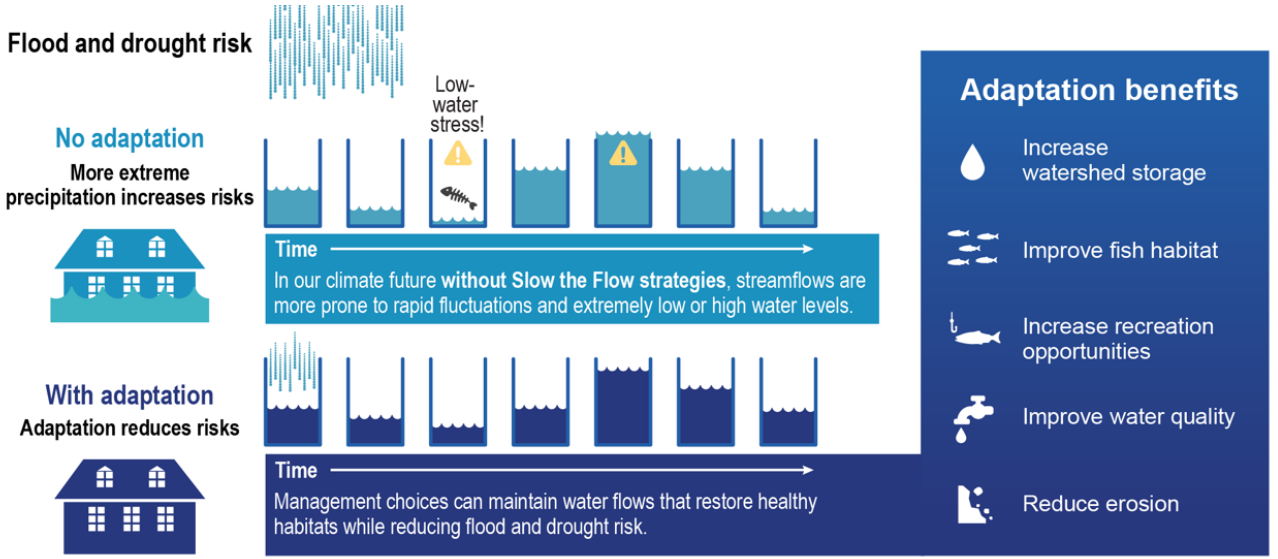


Figure 24.5. Extreme precipitation events have adverse impacts on aquatic and terrestrial ecosystems, human health, infrastructure, and economies. Conservation and management strategies can help moderate these impacts.

Key Message 24.2

Adaptation May Ease Disruptions to Ecosystems and Their Services

Ecosystems are already being affected by changes in extreme weather and other climate-related changes, with negative impacts on a wide range of species (*likely, high confidence*). Increasing incidence of flooding and drought is expected to further alter aquatic ecosystems (*likely, medium confidence*), while terrestrial ecosystems are being reshaped by rising temperatures and decreasing snow and ice cover (*very likely, high confidence*). Loss of ecosystem services is undermining human well-being, causing the loss of economic, cultural, and health benefits (*medium confidence*). In response, communities are adapting their cultural practices and the ways they manage the landscape, preserving and protecting ecosystems and the services they provide (*low confidence*).

Thank you!

Questions?

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Missouri Climate Center:
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http://agebb.missouri.edu/weather/stations/

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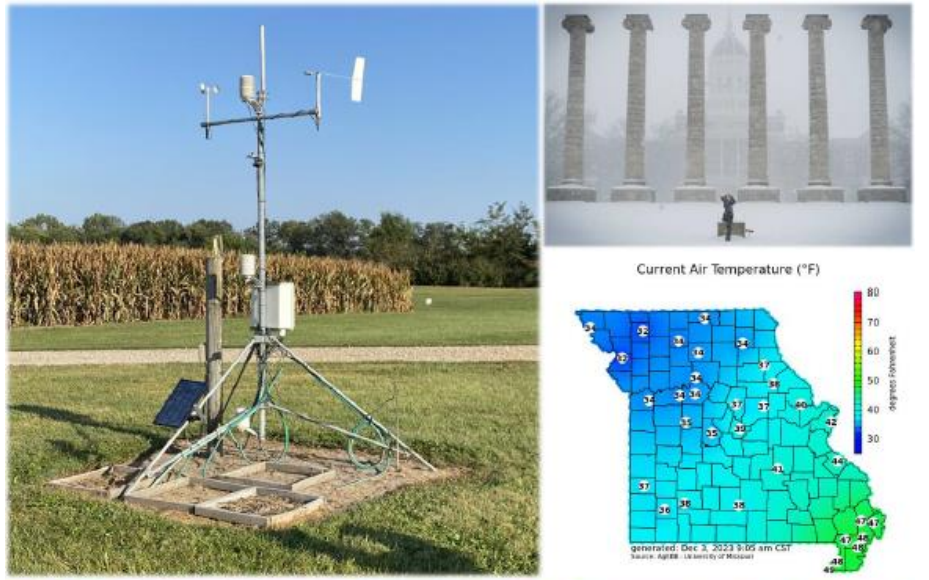

MISSOURI CLIMATE CENTER

http://climate.missouri.edu/

The Missouri Climate Center was established in 1995 and is an integrated unit for atmospheric and climate science research and extension in the University of Missouri's College of Agriculture, Food and Natural Resources, the School of Natural Resources, and the School's Atmospheric Science Program. The Center's primary mission is to monitor and document Missouri's climate and to produce value-added products and tools from available weather data. These climate tools provide needed information for effective planning and management of state agriculture, industry, and natural resources. The Missouri Climate Center is an institutional associate member of the American Association of State Climatologists (AASC) with an AASC recognized state climate office designation.

LEARN MORE

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