



United States Department of Agriculture  
Midwest Climate Hub

# Central Region Climate & Drought Outlook

July 20, 2023

**TRENT FORD**

ILLINOIS STATE CLIMATOLOGIST

ILLINOIS STATE WATER SURVEY | PRAIRIE RESEARCH INSTITUTE

UNIVERSITY OF ILLINOIS, URBANA-CHAMPAIGN



Tornado near Elgin, Illinois on July 12<sup>th</sup>

Source: Matt Zuro



**I ILLINOIS**

Illinois State Water Survey

PRAIRIE RESEARCH INSTITUTE

# General Information

## Providing Climate Services to the Central Region

- Collaboration Activity Between:
  - USDA Climate Hubs
  - American Association of State Climatologists
  - Midwest and High Plains Regional Climate Centers
  - NOAA NCEI/NWS/OAR/NIDIS
  - National Drought Mitigation Center

**\*\*Open Questions at the End\*\***

Access to Future Climate Webinars & Past Recordings can be found:

<https://mrcc.purdue.edu/multimedia/webinars.jsp>

<http://www.hprcc.unl.edu/webinars.php>

Next Climate/Drought Outlook Webinar

**August 17<sup>th</sup>**

**Pete Boulay**

**Minnesota State Climatologist Office | MDNR**



# Outline

## Recent Climate Conditions

- June review
- Last 30-, 60-, 90-days

## Events & Impacts

- Drought: agriculture, water, and fire
- Severe Weather: derecho, tornadoes, hail
- Flooding
- Air Quality

## Outlooks

- Next 2 – 4 weeks
- El Niño, rest of Summer, and Fall



Drought recovery in Indiana from June to July.  
Source: Melissa Widhalm

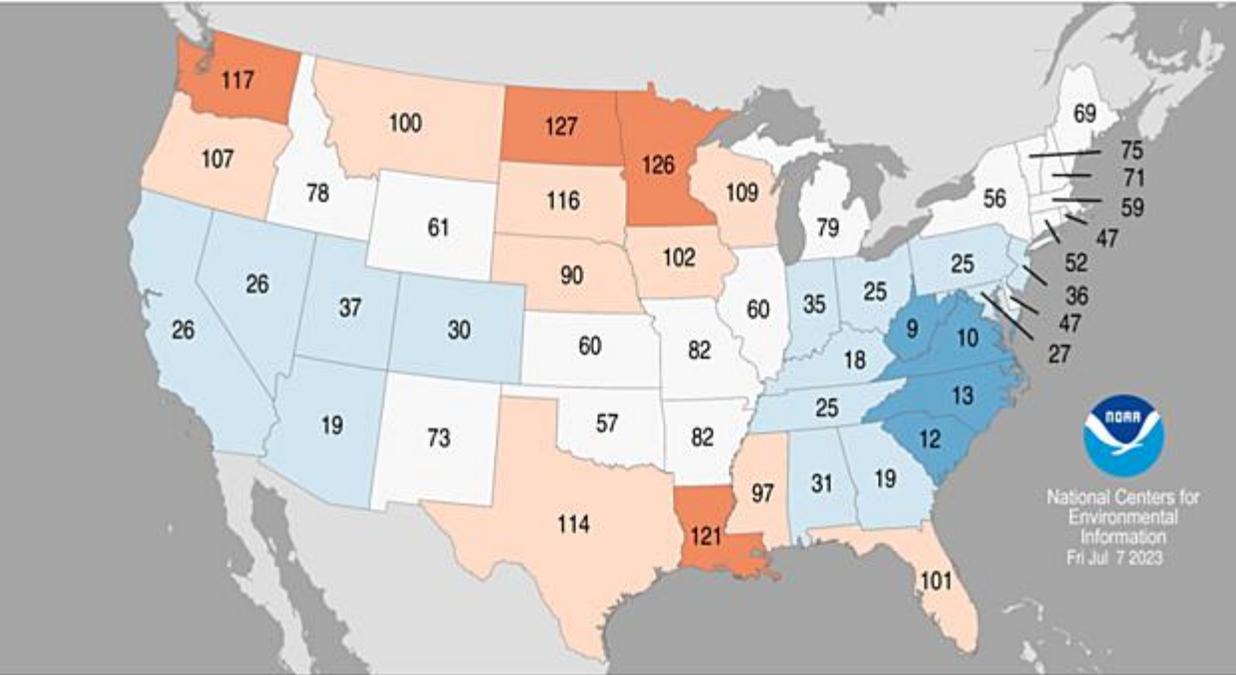
# Recent Climate Conditions

Remnants of hail at Red Rocks  
in Colorado  
Source: West Metro Fire

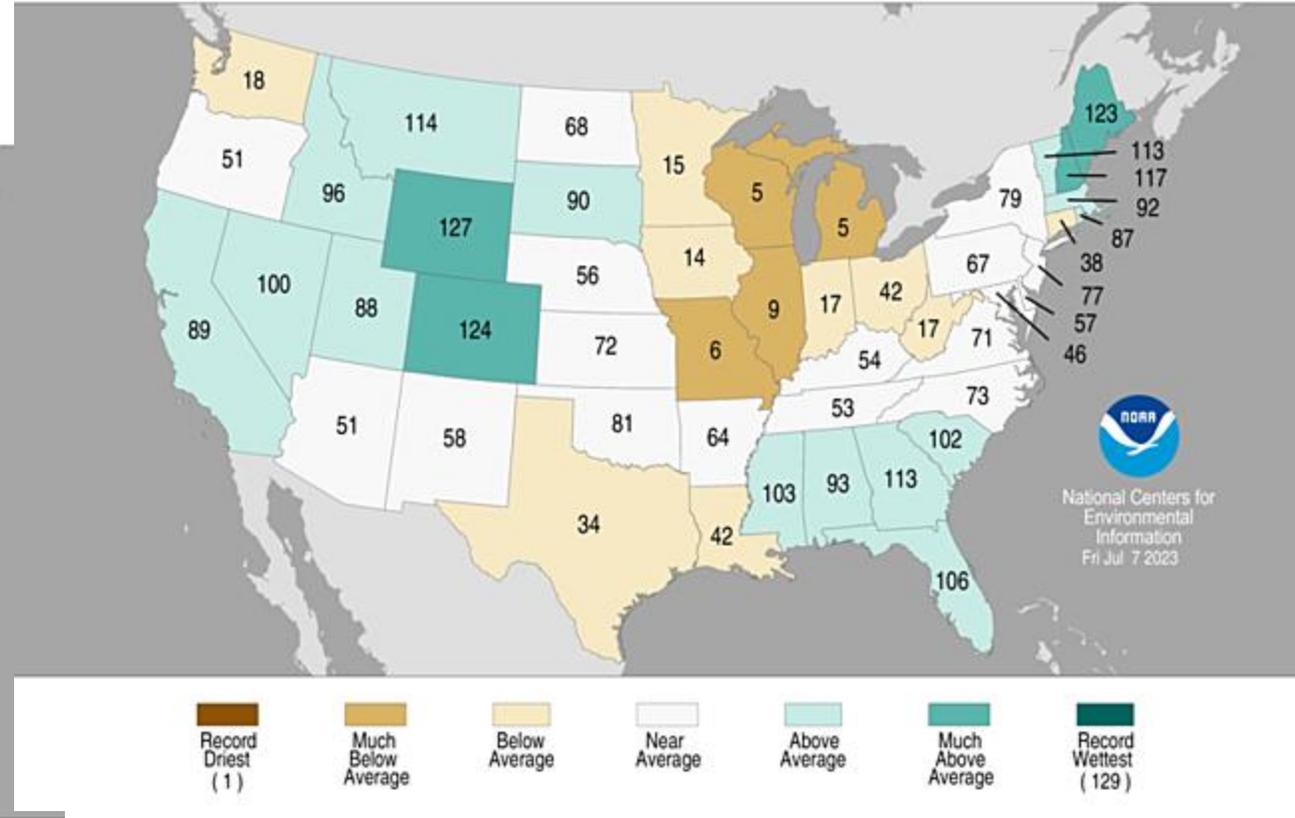


# June Climate Review

Statewide Average Temperature Ranks  
June 2023  
Period: 1895–2023



Statewide Precipitation Ranks  
June 2023  
Period: 1895–2023



- Warmer northwest, cooler southeast
- Top 5 warmest June in North Dakota & Minnesota

- Wet-dry dipole from west to east in region
- Top 5 driest June in Wisconsin & Michigan
- Top 5 wettest June in Wyoming & Colorado

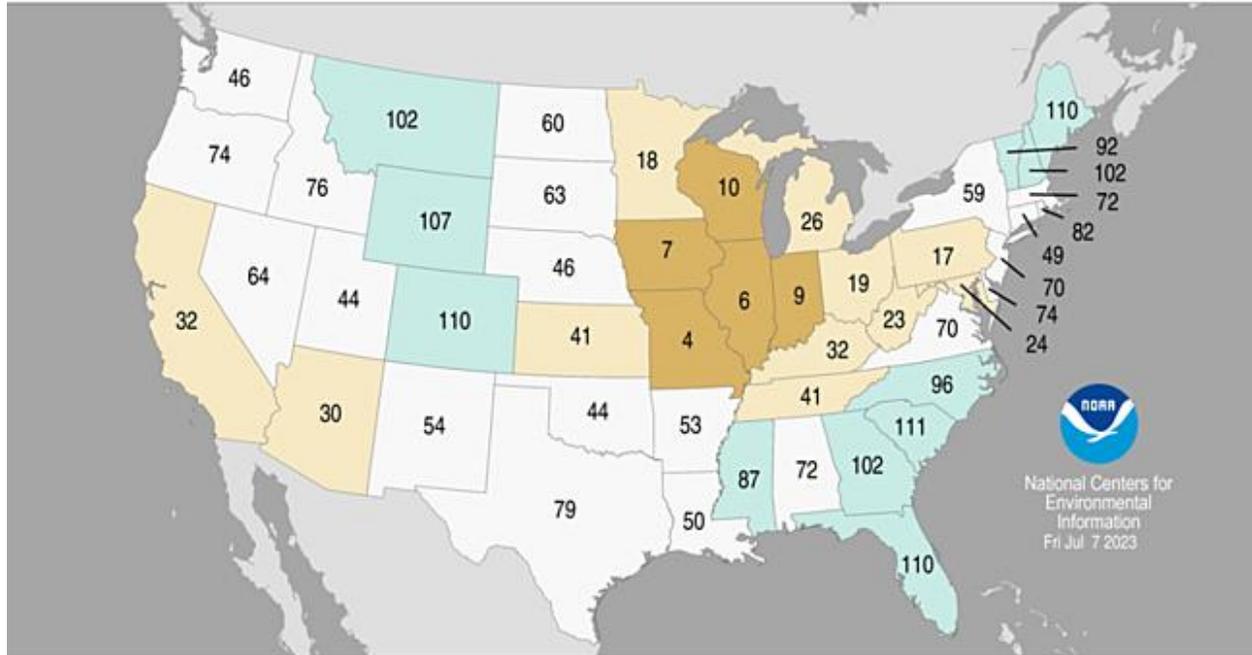
Source: <https://www.ncdc.noaa.gov/temp-and-precip/us-maps/>



# April – June Dryness

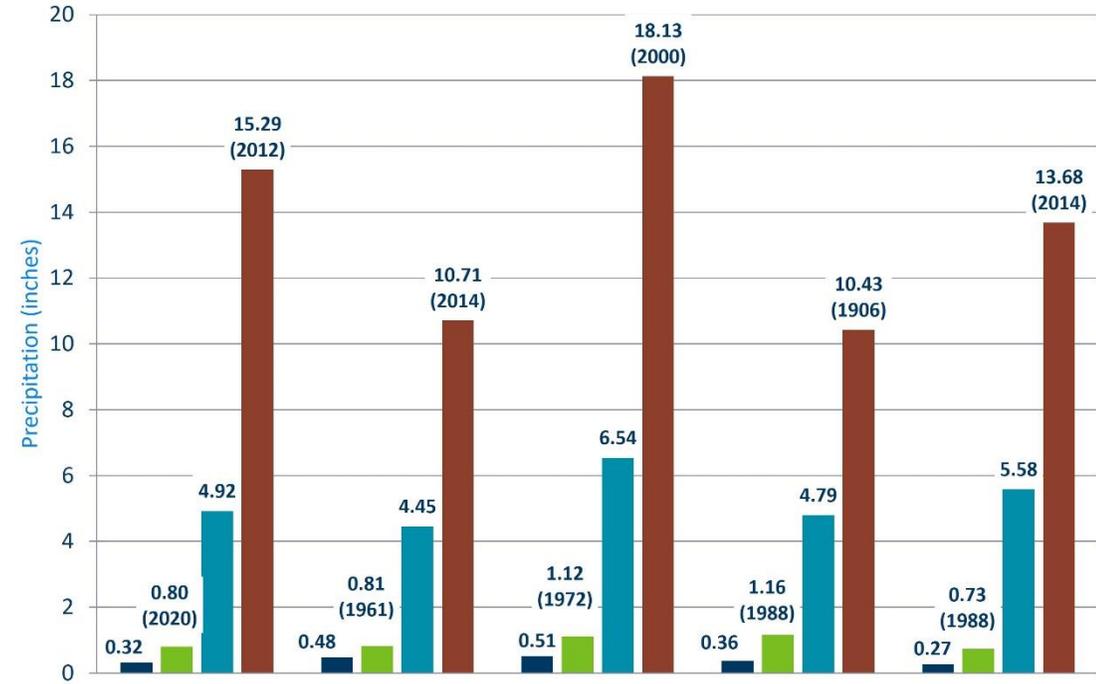
Source: Pete Boulay

Statewide Precipitation Ranks  
April – June 2023  
Period: 1895–2023



- Top 10 driest April-June in Iowa, Missouri, Illinois, Wisconsin, and Indiana

May 15 - June 21 Precipitation for 2023  
Compared to Previous Record Low, Normal, and Record High Values



mi DEPARTMENT OF NATURAL RESOURCES  
State Climatology Office

■ 2023 value ■ Previous record low ■ 1991-2020 normal value ■ Record high

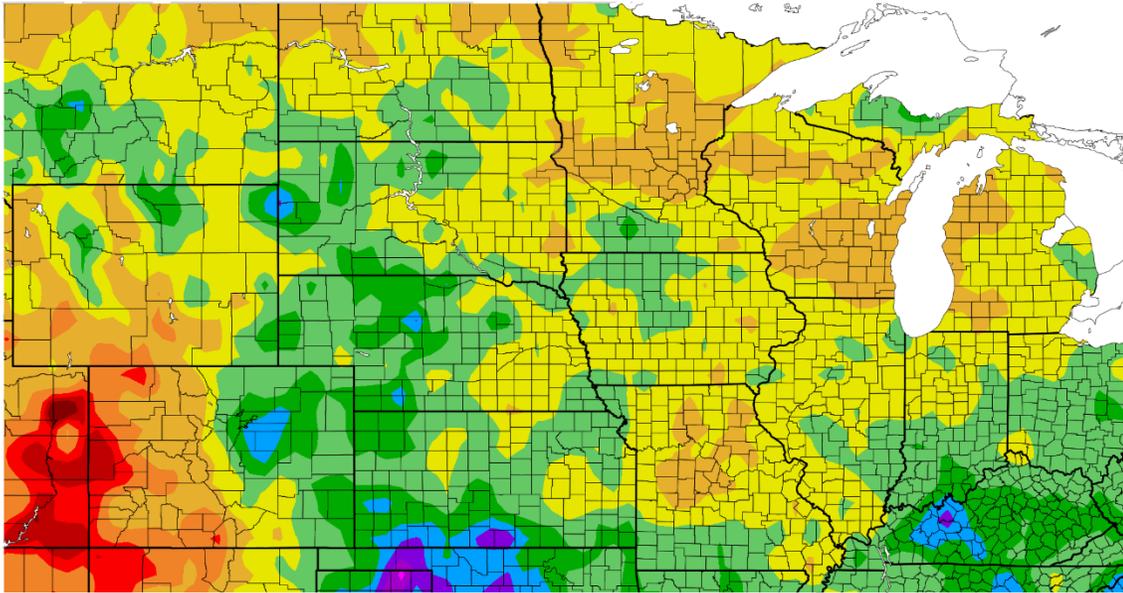
- Many places in Minnesota record driest from mid-May to mid-June
- Large part of eastern Colorado was wettest on record May – June

Source: <https://www.ncdc.noaa.gov/temp-and-precip/us-maps/>



# Precipitation – Last 90 Days

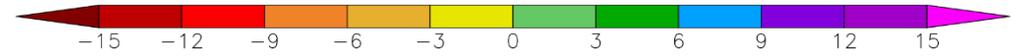
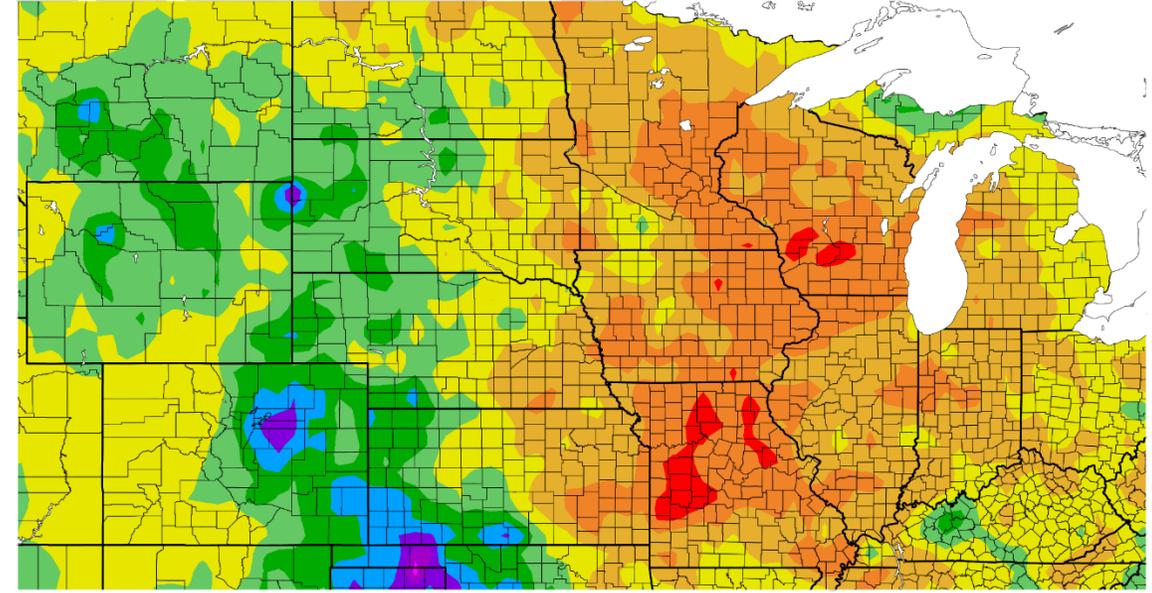
## Total Precipitation (inches)



Generated 7/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

## Departure from Normal (inches)



Generated 7/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

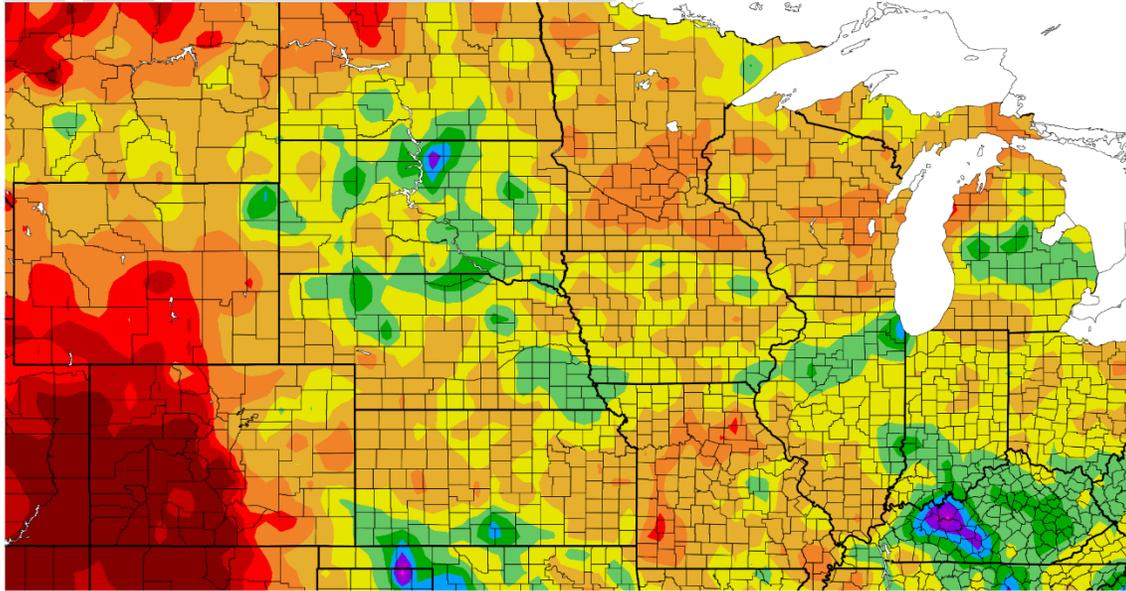
Source: HPRCC, [hprcc.unl.edu](http://hprcc.unl.edu)

- Wetter west and southeast... drier in central and Upper Midwest
- Most of MN, WI, IL, IA, and MO have been 3 to 12 inches drier than normal since mid-April
- Wettest time of the year for much of the driest area, but still can get rain in late July & August

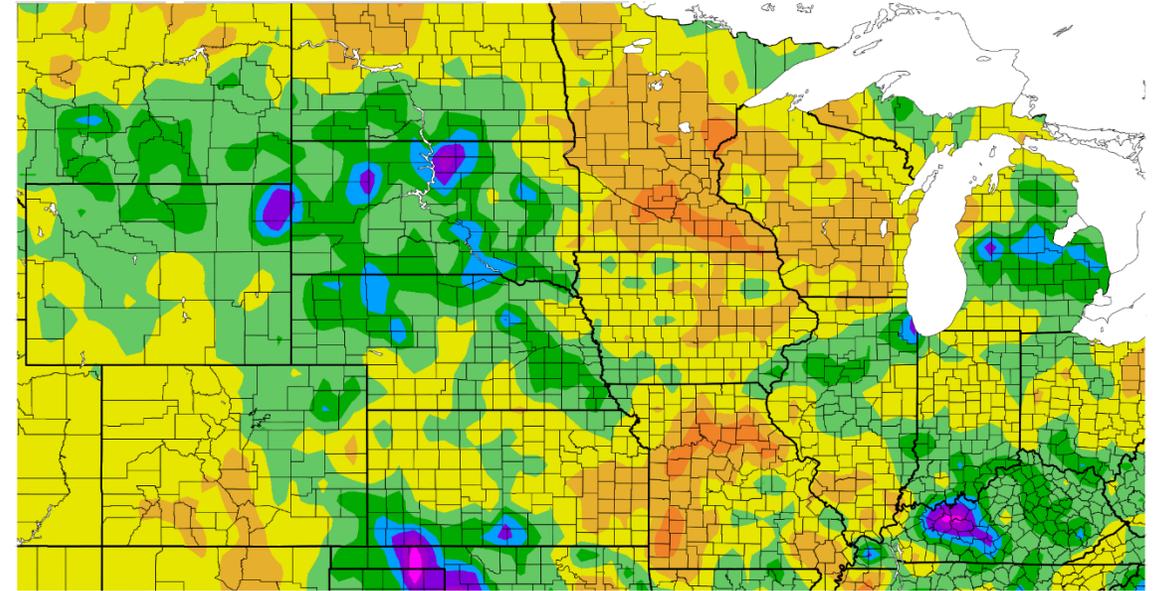


# Precipitation – Last 30 Days

## Total Precipitation (inches)

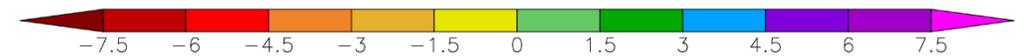


## Departure from Normal (inches)



Generated 7/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers



Generated 7/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

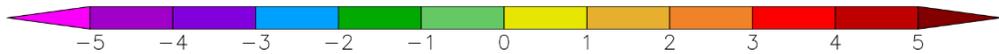
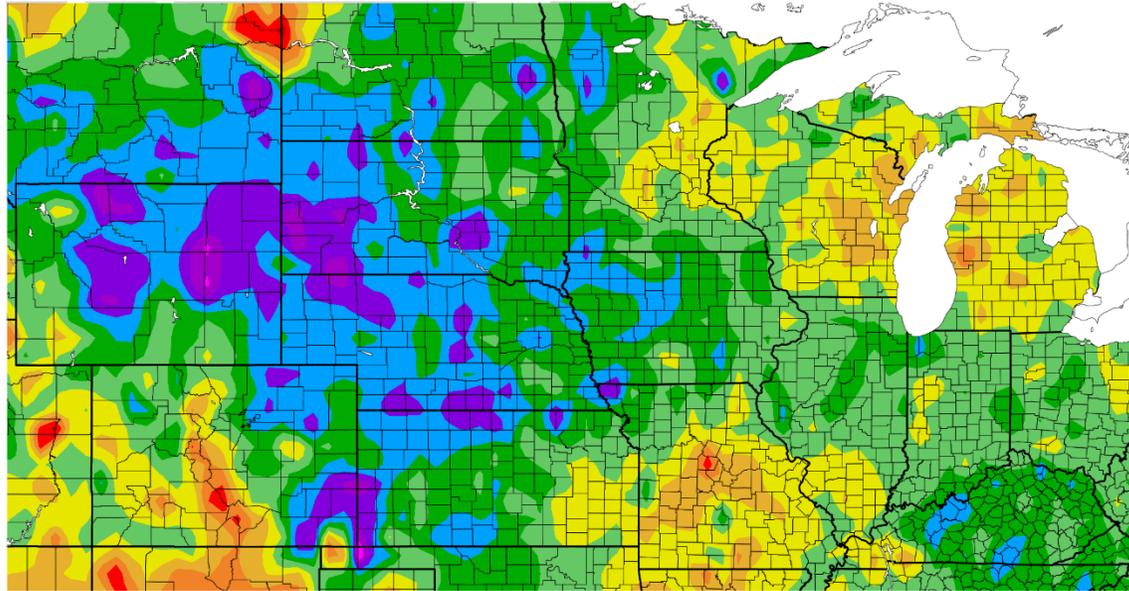
Source: HPRCC, [hprcc.unl.edu](http://hprcc.unl.edu)

- Still wet in much of the western half of the region, a bit wetter in parts of IA, IL, MI
- Still missing larger rain in much of MN, WI, and MO
- A bit too much rain in western Kentucky



# Temperature Departure (°F) – Last 30 Days

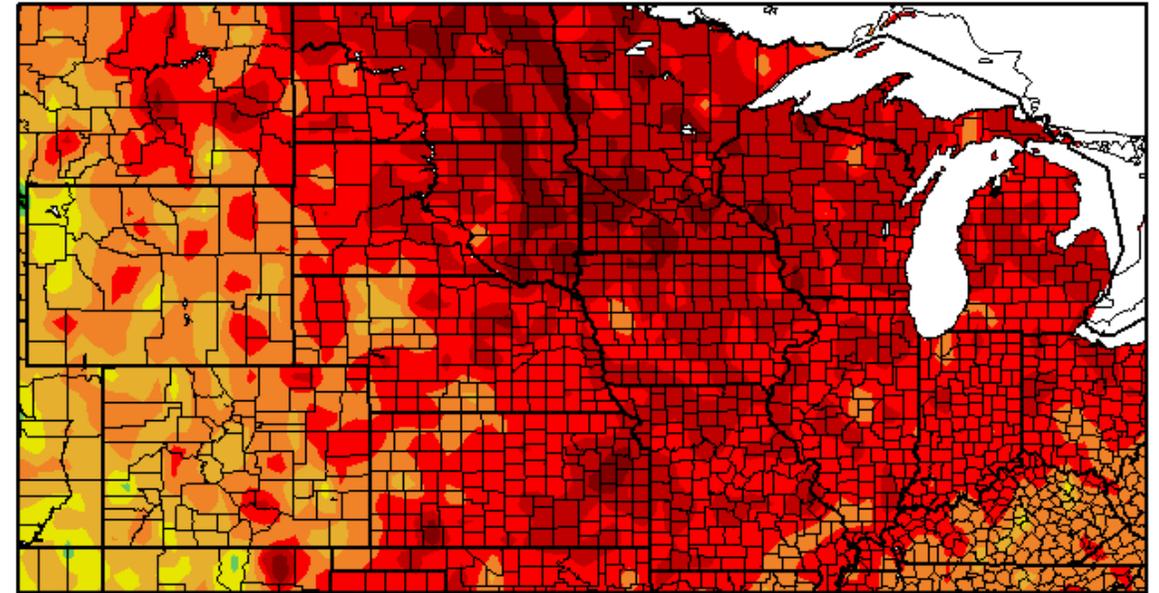
## This Year



Generated 7/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

## Same Time in 2012



Generated 8/22/2012 at HPRCC using provisional data.

Regional Climate Centers

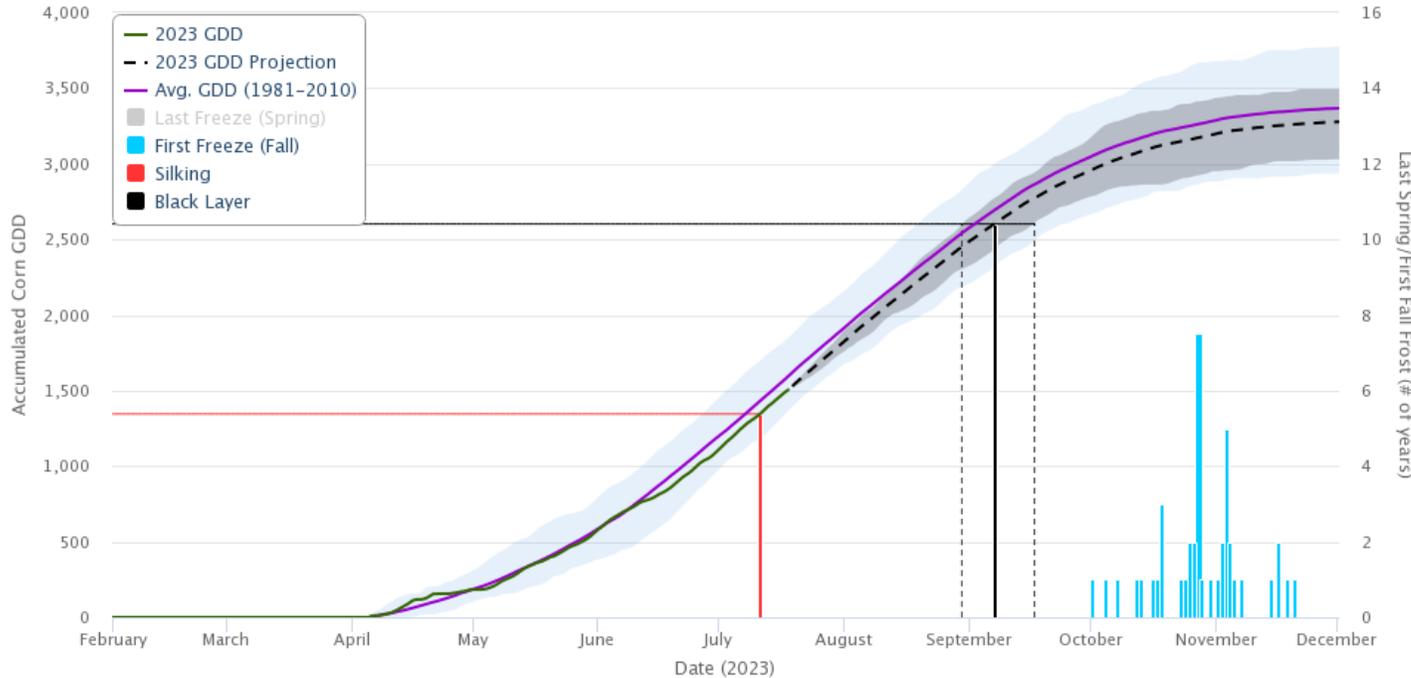
- Average temperatures 1 to 4 degrees cooler than normal in Plains, slightly cooler in eastern Corn Belt
- Only parts of WI, MI, and MO have been more than 1 degree warmer than normal since mid-June
- Same 30-day period in 2012 had temperatures 3 to 5 degrees above normal across the region



# Growing Degree Days (Since April 1<sup>st</sup>)

- GDDs are running near average in western corn belt, 50-150 below average in the east
- Indicative of temperature effects on crop progress – a bit delayed in eastern part of the region

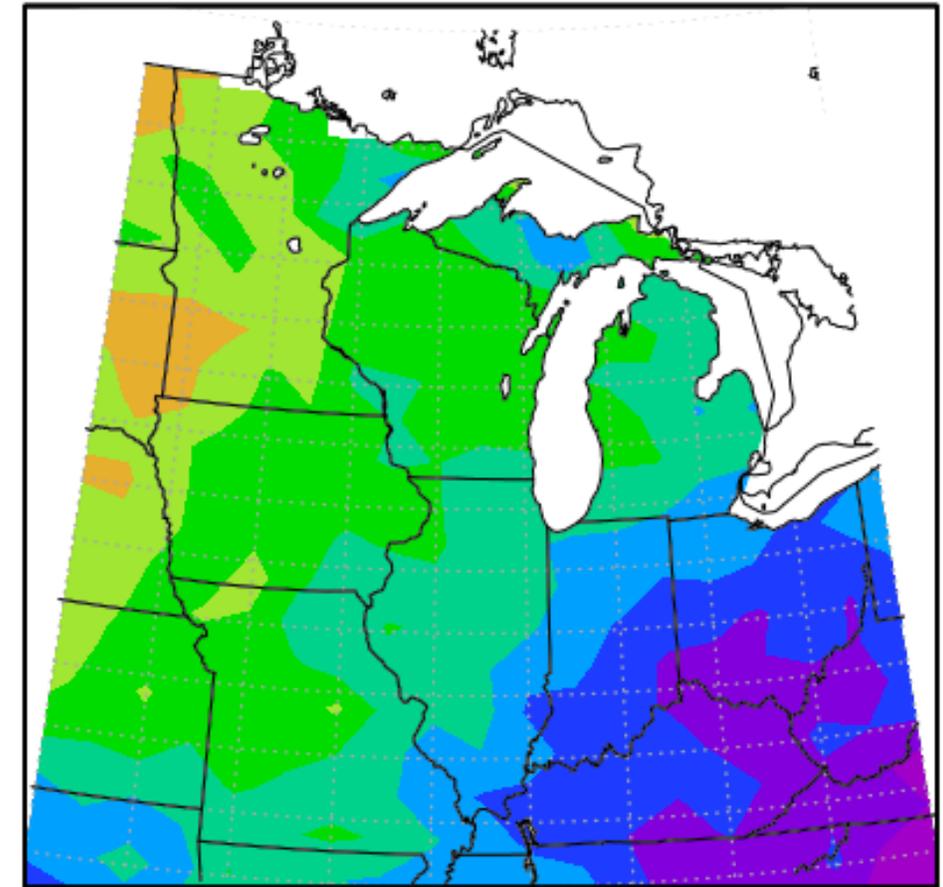
Corn Growing Degree Day Tool – Delaware County, Indiana



GDD Base 50/86 (degrees F); Created: 07/19/2023

<https://hprcc.unl.edu/agroclimate/gdd.php>

MGDD Departure, 4/1/2023 to 7/18/2023



Midwestern Regional Climate Center  
Purdue University

<https://mrcc.purdue.edu/>



Source: Trent Ford

# Drought & Hydrology Conditions

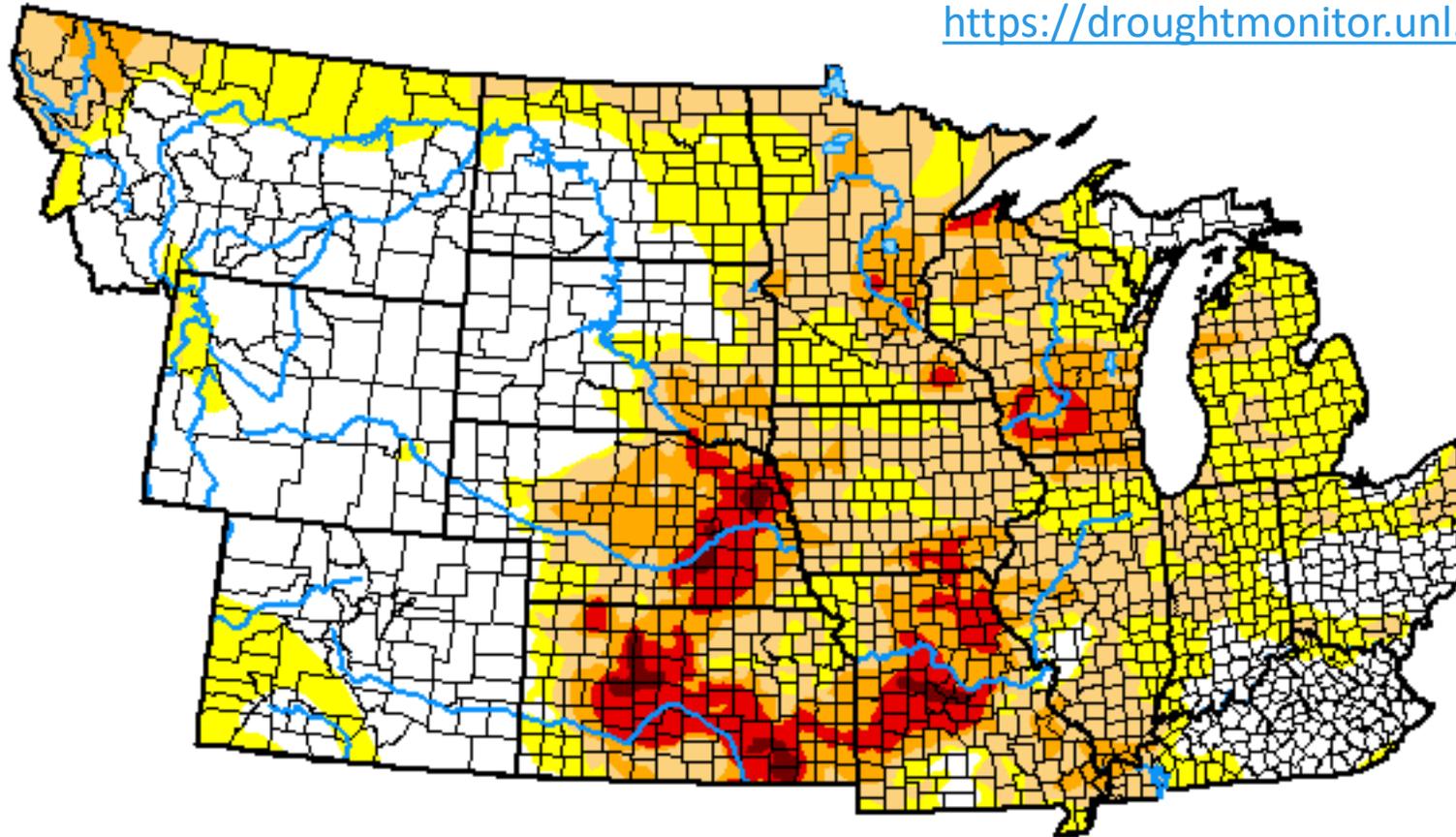


# Drought

## U.S. Drought Monitor NWS Central Region

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

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



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	37.97	62.03	38.17	16.24	5.73	0.65
<b>Last Week</b> <i>07-11-2023</i>	39.09	60.91	42.00	19.38	6.16	0.92
<b>3 Months Ago</b> <i>04-18-2023</i>	52.50	47.50	29.24	13.77	6.57	3.61
<b>Start of Calendar Year</b> <i>01-03-2023</i>	25.76	74.24	48.98	24.27	9.90	3.48
<b>Start of Water Year</b> <i>09-27-2022</i>	27.00	73.00	47.70	23.08	8.80	2.73
<b>One Year Ago</b> <i>07-19-2022</i>	44.40	55.60	33.92	16.69	4.16	0.28

Intensity:



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:

Richard Tinker  
CPC/NOAA/NWS/NCEP



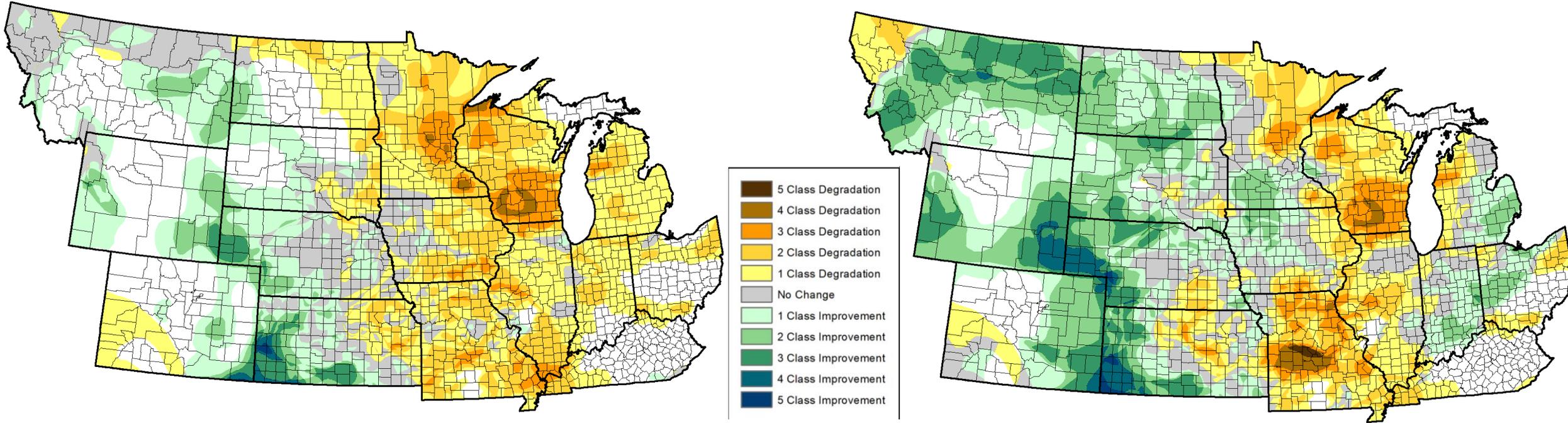
- Nearly 40% of the region in at least moderate drought
- Some recent improvement in central, persistence north



# Drought Change

Change Since May 23

Change Since January 24

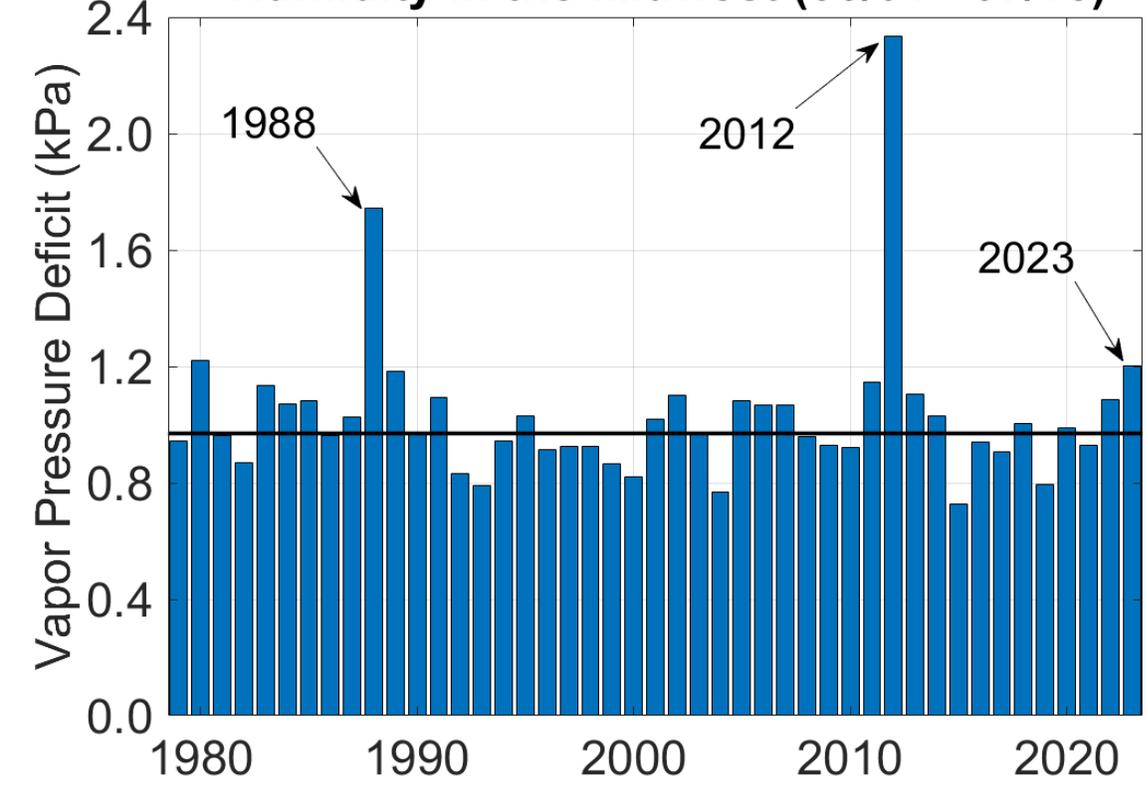


- Rapid drought intensification in May and June – 4 categories in 6 weeks in MN and WI
- Wet May and June improved drought from beginning of the year in western Plains

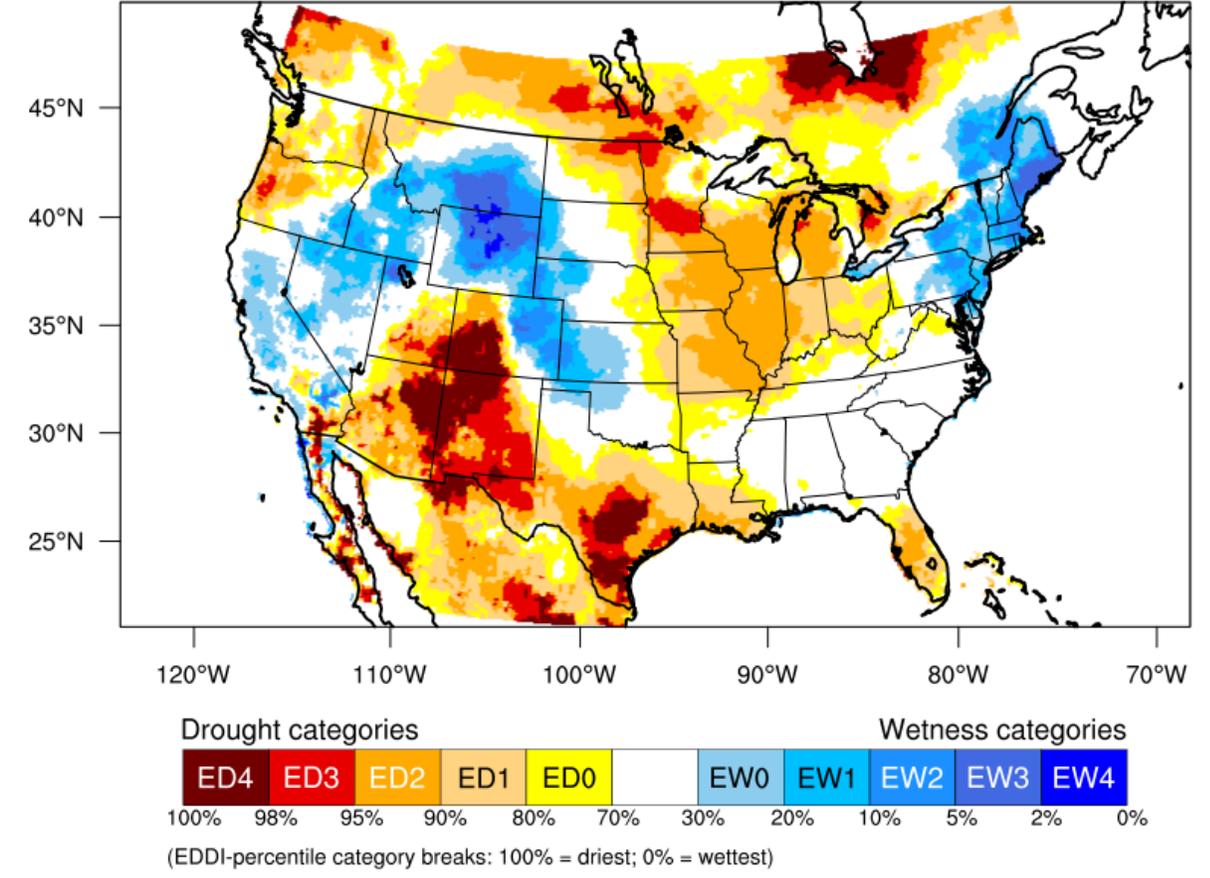
# Evaporative Demand - EDDI

- Above average evaporative demand (i.e., “thirstier atmosphere”) in central Midwest
- Below average demand in western Plains

Humidity in the Midwest (06/01 - 07/15)



1-month EDDI categories for July 14, 2023



Generated by NOAA/ESRL/Physical Sciences Laboratory

- Demand since June is well above average, but ***much*** lower than 1988 & 2012

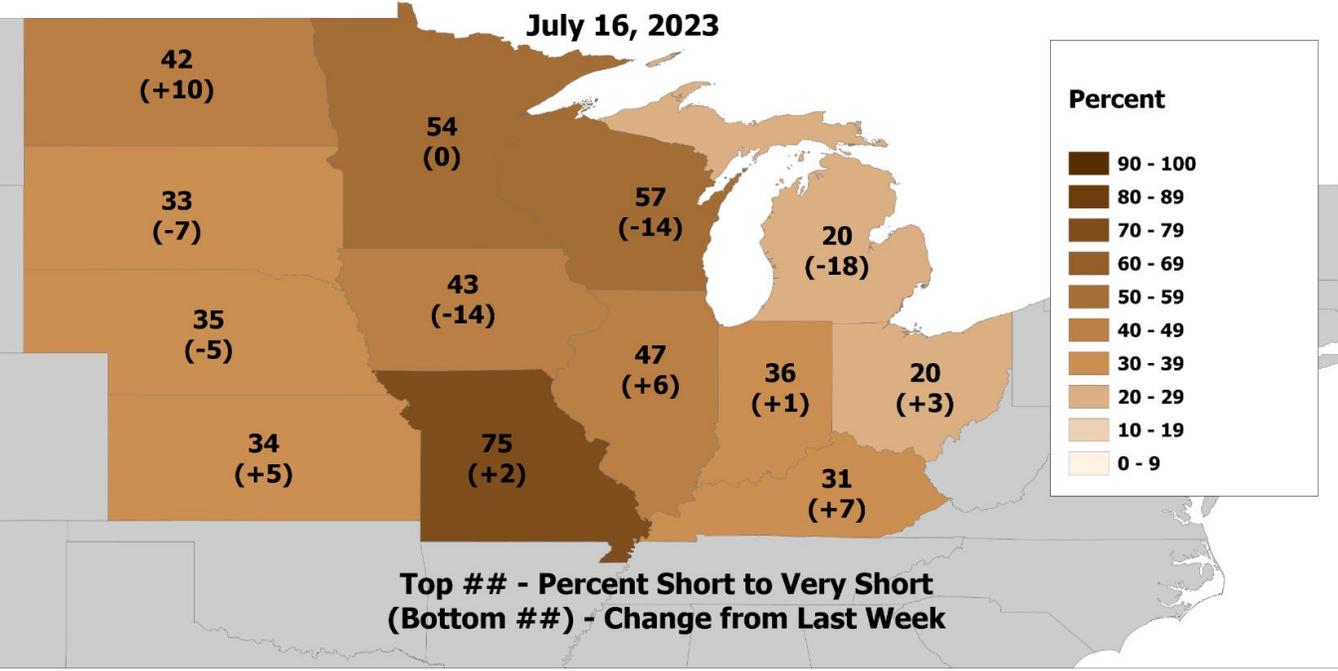


# Soil Moisture

## Topsoil Moisture

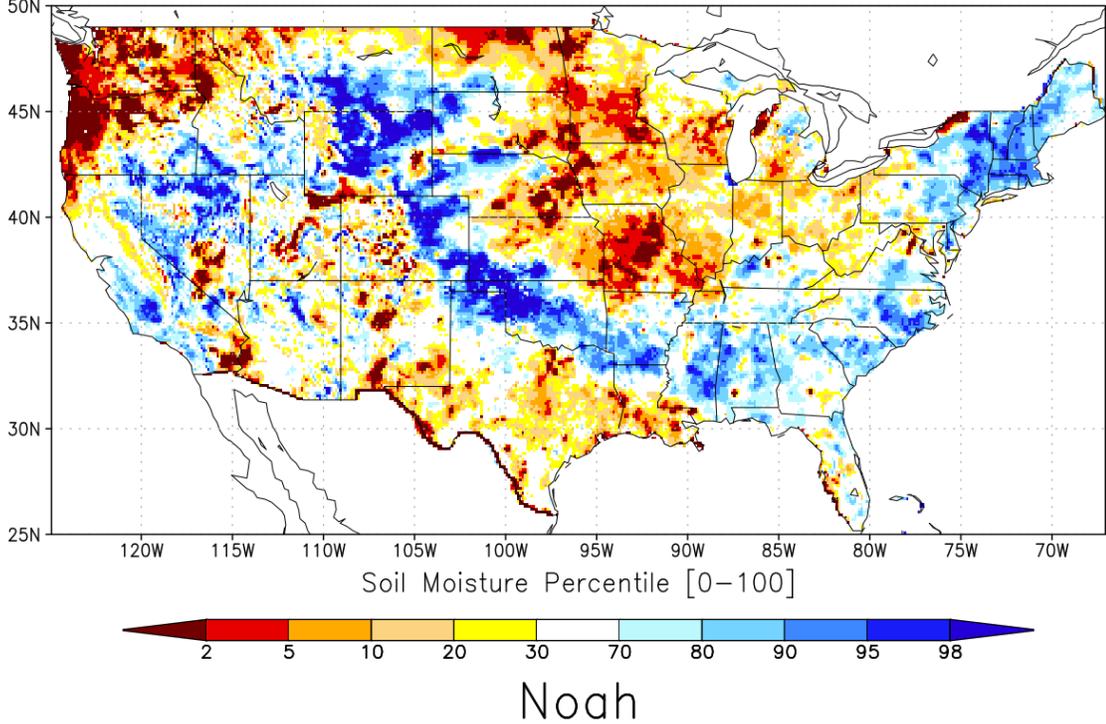
Percent Short to Very Short

July 16, 2023



Map by Bryce Bearson  
Data Source: USDA

NLDAS Noah: Past Week Top 1-meter Soil Moisture Percentile  
Valid: 14 Jul 2023



<https://ldas.gsfc.nasa.gov/nldas/drought-monitor>



# Stream Conditions

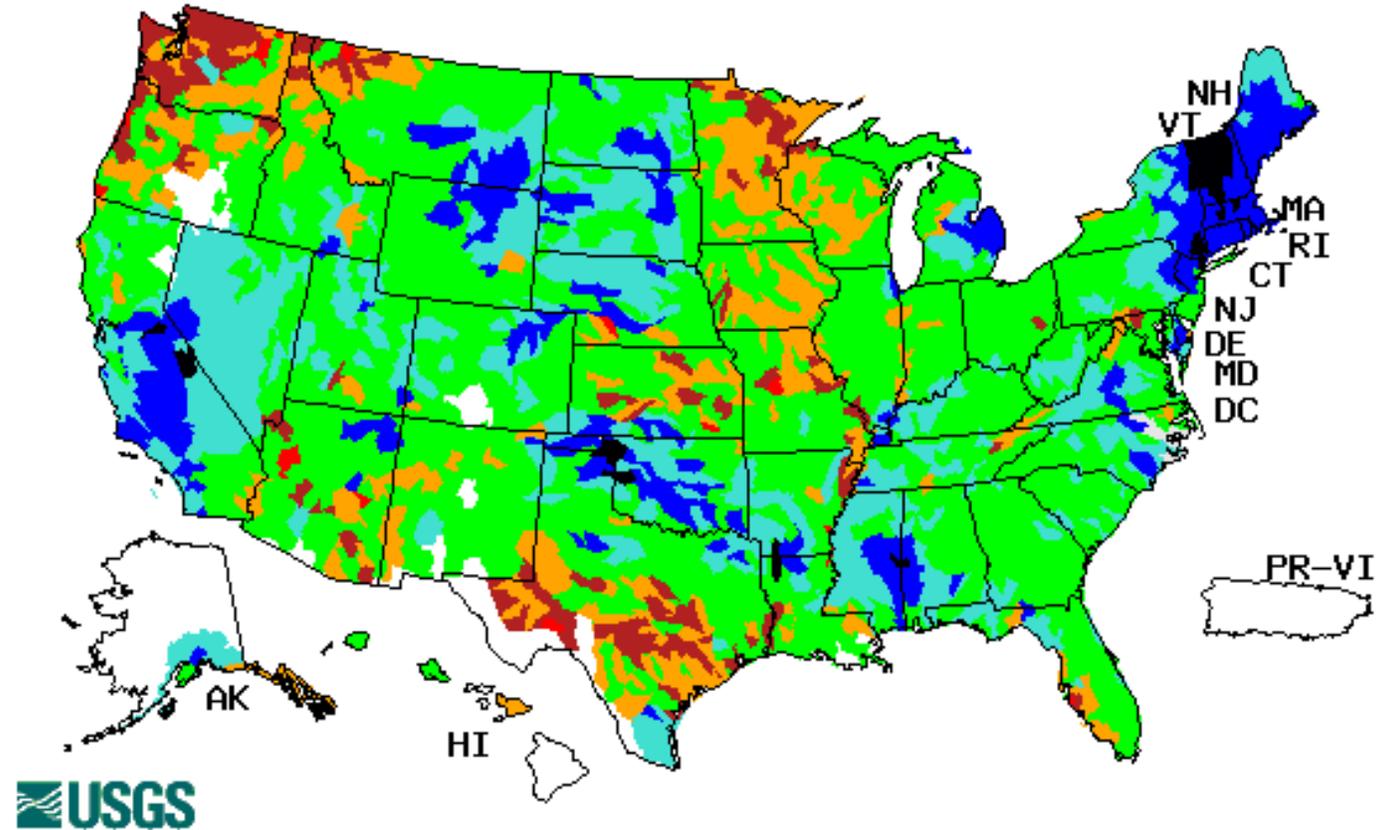
- Large improvement in streamflow in eastern corn belt since June
- Below normal flow remains in MN, WI, IA, MO, and KS



Source: George Kraft

## 14-day Streamflow by Watershed

Wednesday, July 19, 2023



Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		

<https://waterwatch.usgs.gov/>

# Major Rivers

## Missouri River

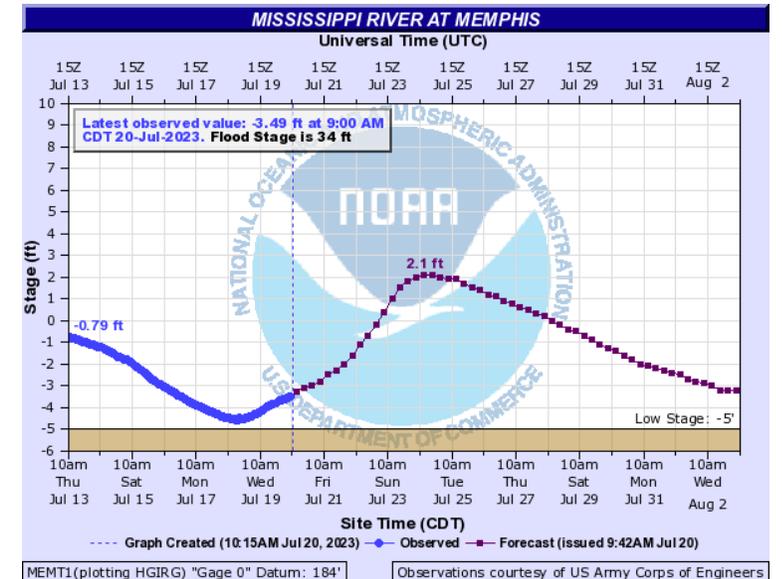
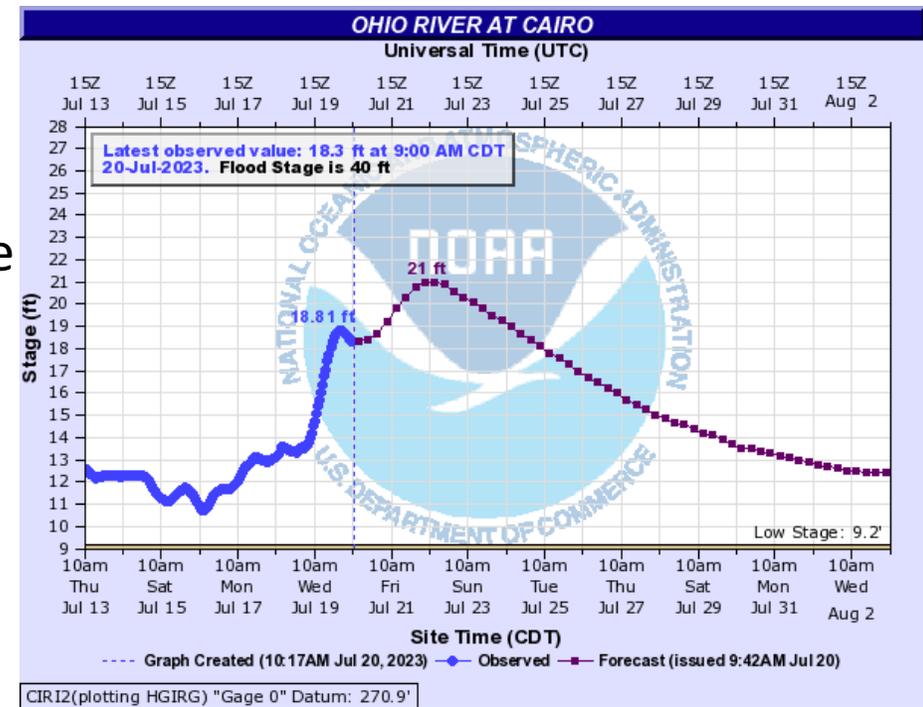
- Near-average snow melt + more rain, 1.5 kcfs below full service
- Full 8-month navigation season
- Gavins Point releases lower than forecasted

## Mississippi River

- Flow maintained by better rain in OH Valley
- Concerns of low flow in lower MS remain

## Ohio River

- Better flow from rain in Ohio and Kentucky
- Recent heavy rain in Illinois and Kentucky bumped up flow forecast, but...
- Low flow concerns still exist, we need good rain through August and September



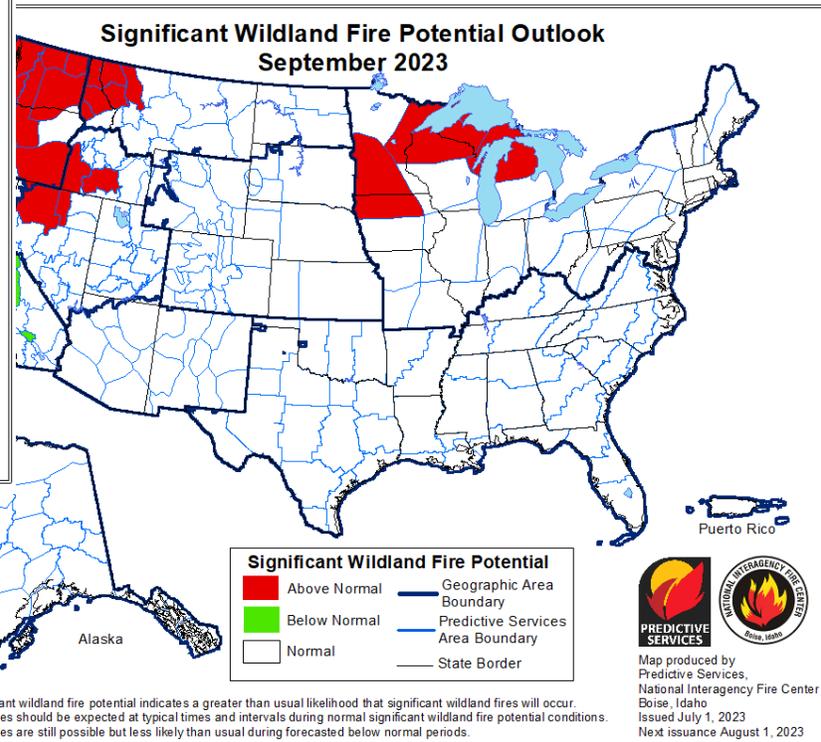
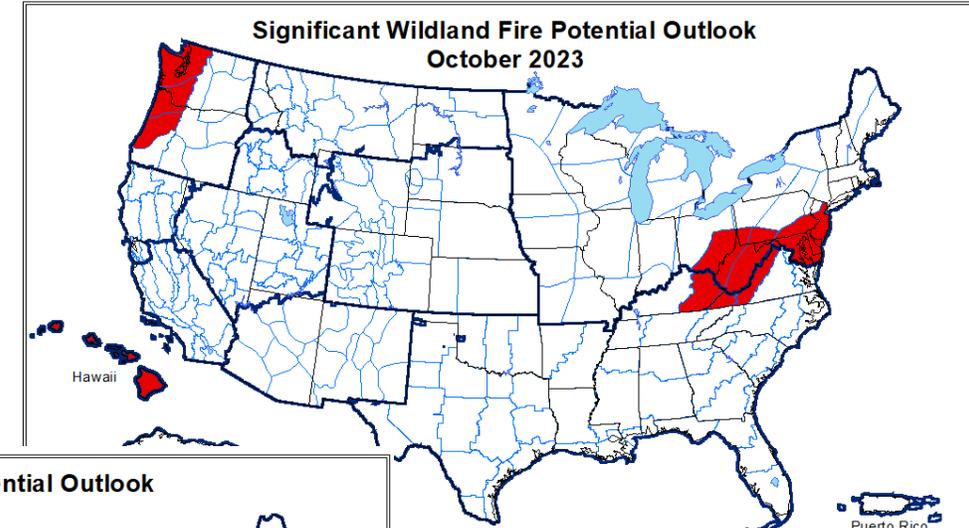
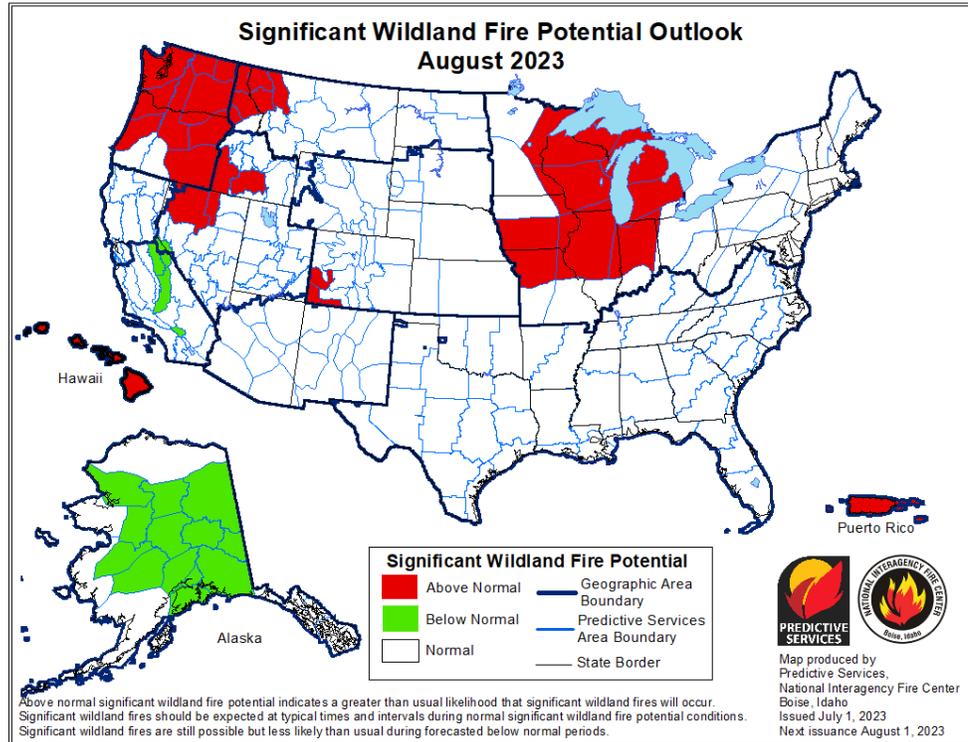
# Local-Sourced Wildfire Issues in the Region

- 830+ acre wildfire in Waushara County in early July
- Over 4400 acres of DNR-managed land burned in Wisconsin so far this year, compared to < 700 acres in all of 2022
- 225 acres burned in northern Michigan in July
- Recent rain in Upper Midwest has helped, Fuel & Fire Behavior Advisory was rescinded in July
- Kansas disaster declarations from earlier Ford County fires



Wildfire in Waushara County, Wisconsin.  
Source: Wisconsin DNR

# Wildland Fire Outlooks: Aug – Oct



**Significant Wildland Fire Potential**

- Above Normal
- Below Normal
- Normal
- Geographic Area Boundary
- Predictive Services Area Boundary
- State Border

Map produced by Predictive Services, National Interagency Fire Center Boise, Idaho. Issued July 1, 2023. Next issuance August 1, 2023.

<https://www.nifc.gov/nicc/predictive-services/outlooks>



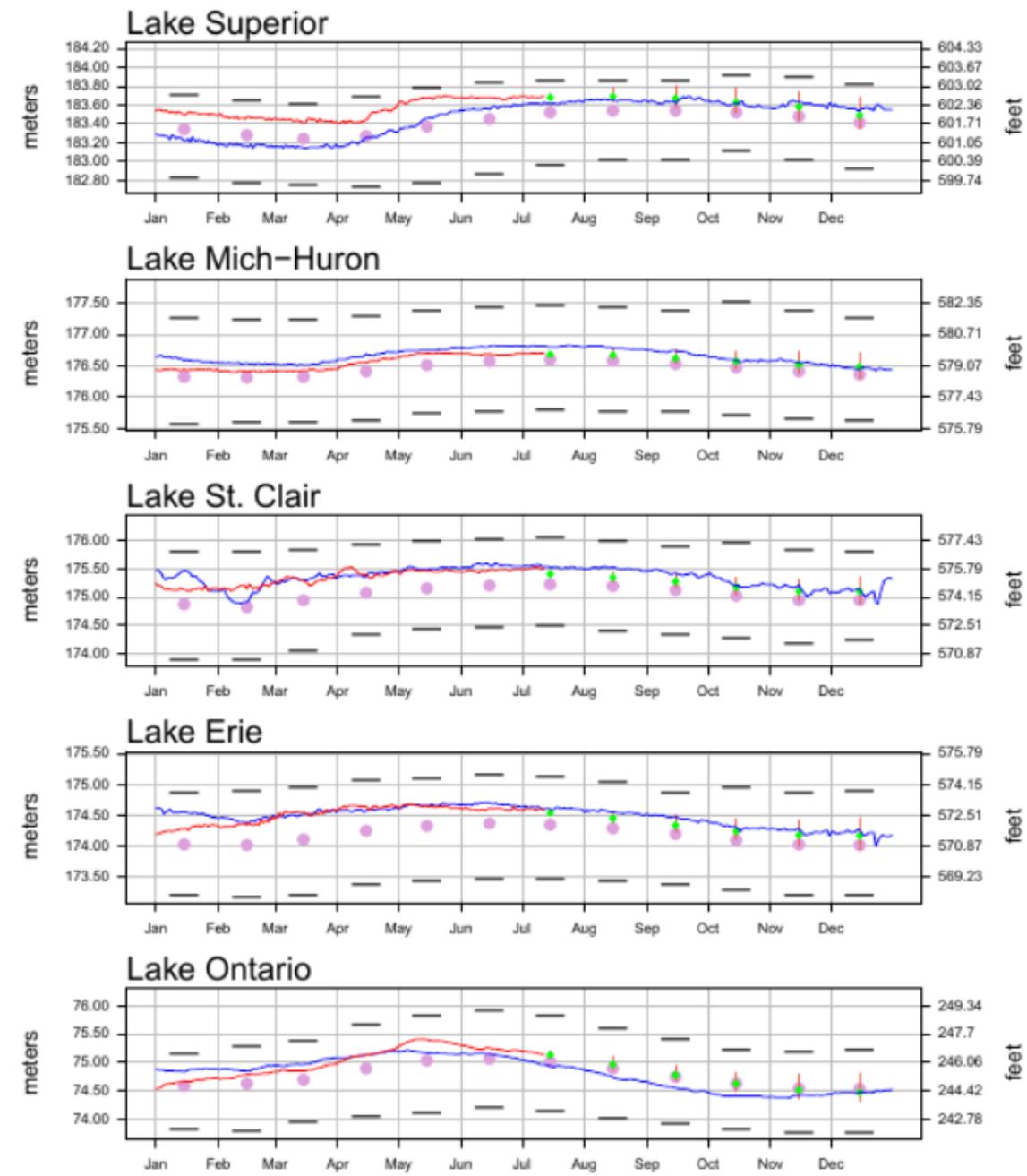
# Great Lakes: Temperatures & Levels

## Lake Temperatures

- Superior running 2-4°F below average
- All other lakes are within 1°F of average

## Lake Levels

- Levels plateaued in May
- Michigan-Huron is slightly below normal
- All other lakes very close to or slightly above normal levels



Daily Great Lakes Water Levels

- 2023
- 2022
- LTA Monthly Mean
- Record High/Low Monthly Mean
- Coordinated Forecast

<https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Information-2/Water-Level-Data/>



# Impacts & Notable Events

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Source: Barry Butler



# Agriculture Impacts

- Drought stress in corn and beans across Midwest:
  - Stunted growth & short tasseling in Illinois and elsewhere
  - Recent rains have improved conditions in many places, but not everywhere... more rain is needed across growing areas
  - Lack of heat has greatly helped crops manage drought, but delayed progress in IN, OH, and KY
- Livestock problems in Missouri and elsewhere:
  - Poor pasture regrowth after 1<sup>st</sup> or 2<sup>nd</sup> cuttings
  - Very low or unusable stock ponds, lots of water hauling
  - Concerns over water quality
  - Limited hay stocks in many places from Fall '22 drought, made worse by current situation
- Rye growth and other wetness issues forcing producers to bail wheat in Wyoming
- Rain-fed fruit and vegetable crops struggling, irrigated crops doing well
- Hail damage in western part of the region



Drying pond in Missouri  
Source: CMOR System



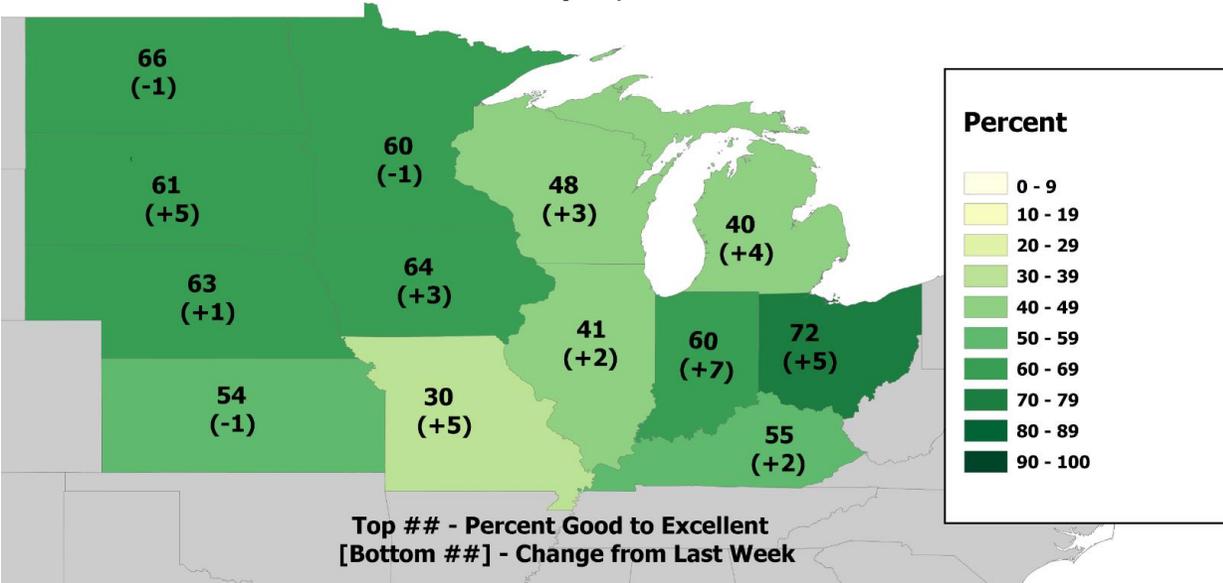
Bailed wheat in Wyoming  
Source: Justin Derner

# USDA NASS Crop Conditions: Corn

## Corn Conditions

Percent Good to Excellent

July 16, 2023

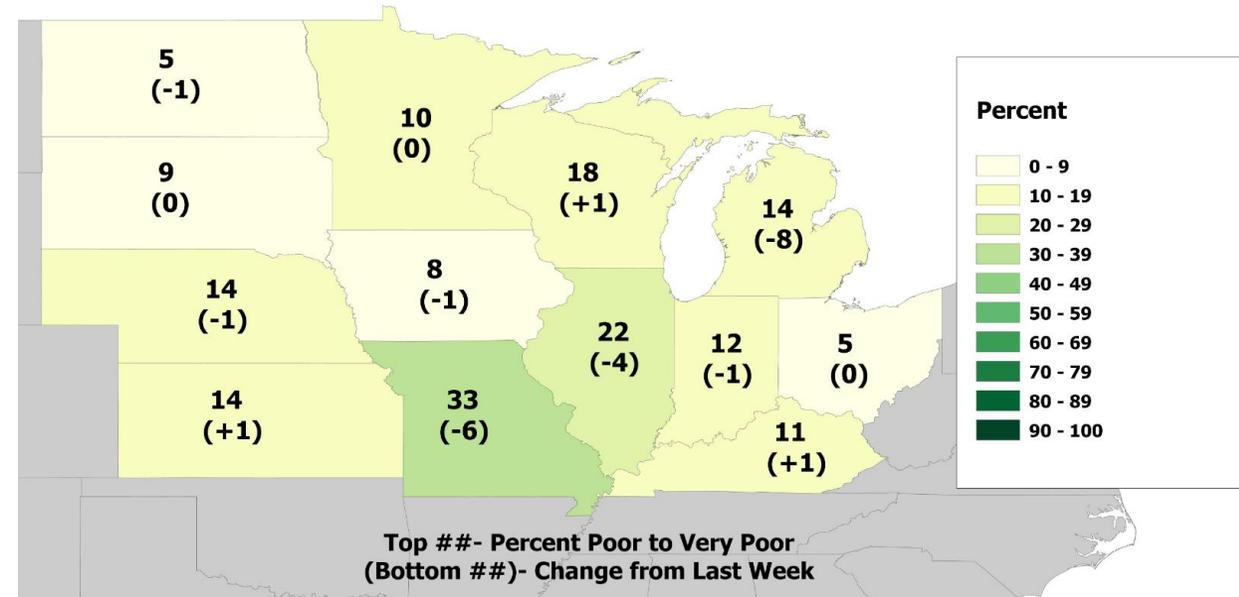


Maps by Bryce Bearson  
Data Source: USDA NASS

## Corn Conditions

Percent Poor to Very Poor

July 16, 2023



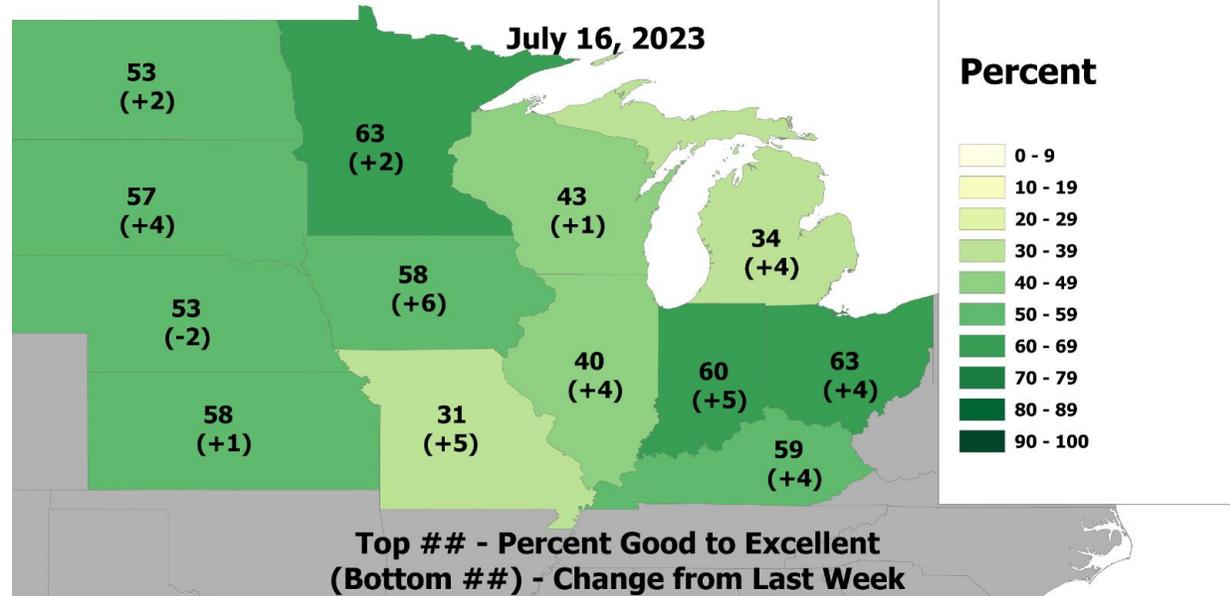
- Slight improvement in corn conditions across the region, especially in IN and OH
- MO and IL still have > 20% poor to very poor corn conditions – lighter soils and/or late planted
- Recent rains have been critical to build up soil moisture moving into pollination and grain fill



## Soybean Conditions

Percent Good to Excellent

July 16, 2023



## Soybean Conditions

Percent Poor to Very Poor

July 16, 2023



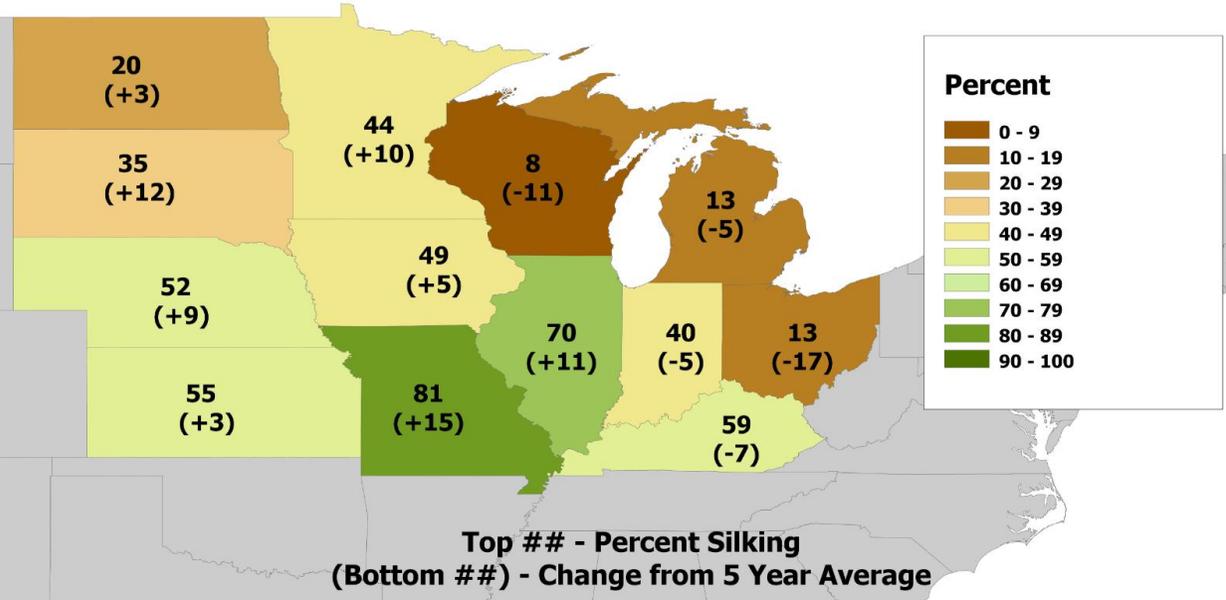
- Similar improvement in beans from last week
- Late-planted beans still struggling in many places - > 20% poor to very poor in MO and IL
- Recent rains have helped, but need good soil moisture into August for beans



# USDA NASS Crop Progress: Corn & Soy

## Corn Progress

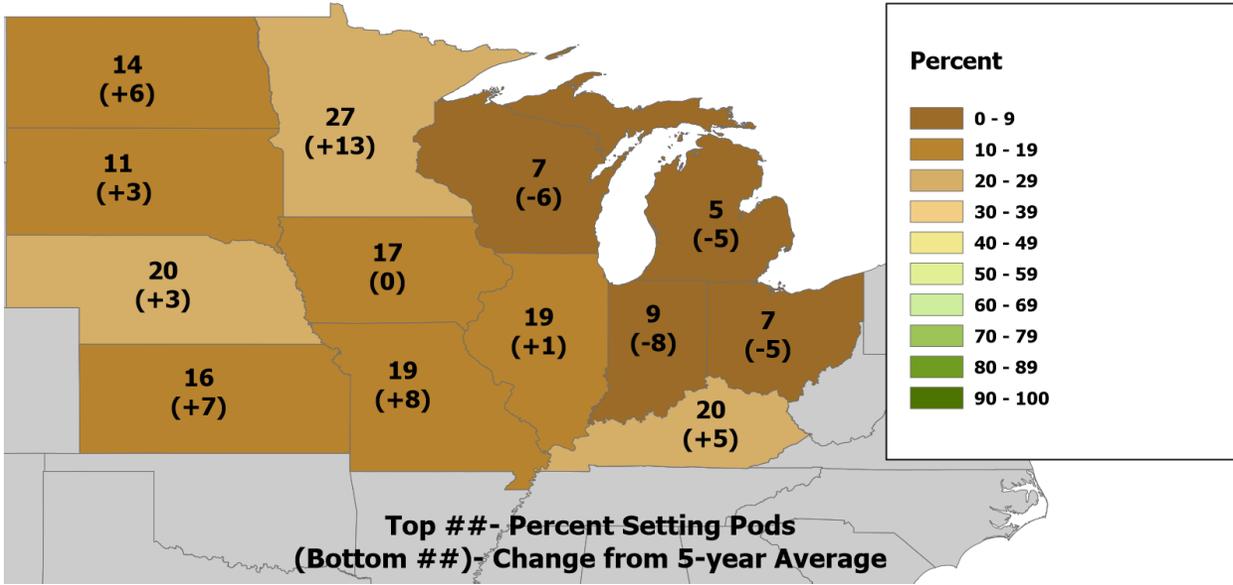
Percent Silking  
July 16, 2023



Maps by Bryce Bearson  
Data Source: USDA NASS

## Soybean Conditions

Percent Setting Pods  
July 16, 2023



- Corn silking way ahead of 5-year average in IL and MO... April dryness helped
- Corn and bean progress are near to ahead of 5-year average west of MS River
- Progress in both crops slightly to moderately delayed in WI, IN, OH, and MI

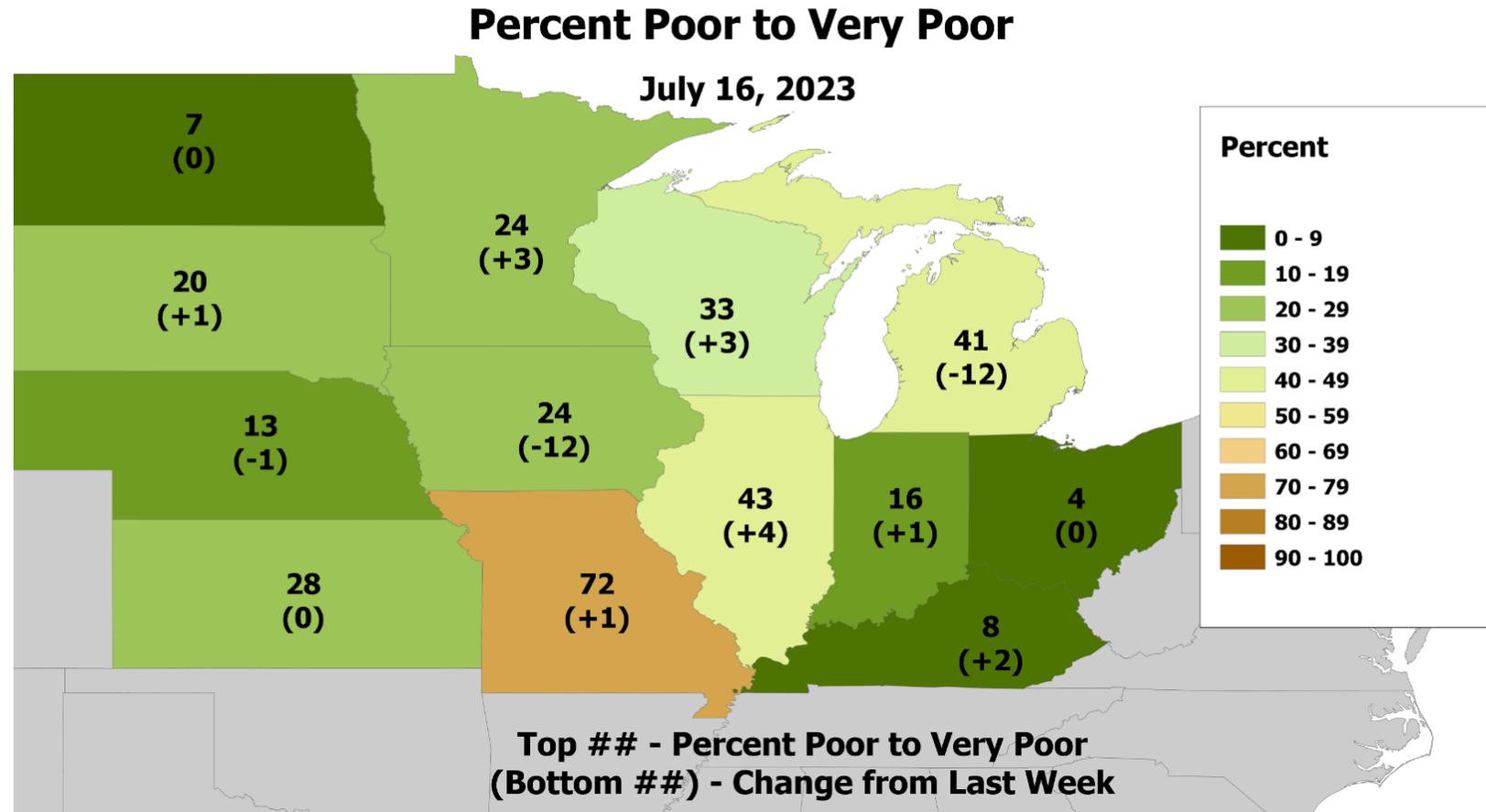


# USDA NASS Pasture Conditions

Maps by Bryce Bearson  
Data Source: USDA NASS

- Pasture has been a big impact from drought, especially in MO, IL, WI, and MI
- Recent rains have helped some regrowth, but this is a longer-term issue
- Cool-wet springs and dry late summer-fall for multiple years have been challenging for pastures
- Dispersal and herd reductions in Missouri and southern Illinois in recent weeks

## Pasture and Range Conditions



# Other Significant Weather Impacts

## Severe Weather

- Derecho in Illinois and Indiana on June 29 and 30
  - \$20+ million in damage in Springfield, IL alone
  - Thousands without power for 7-10 days
- Hailstorm in Red Rocks in Colorado on June 22 – 7 hospitalized
- Severe weather in Northern Illinois on July 13 – 11 tornadoes, temporary shut down of O'Hare airport
- Illinois – 119\* tornadoes this year, 3<sup>rd</sup> most active year already
- Colorado – 36 tornadoes on June 21<sup>st</sup>, highest single day total on record
- Colorado – Governor disaster declaration from hail damage – 310\* reports in June



Tornado near Tyndall,  
South Dakota

## Heavy Rain & Flooding

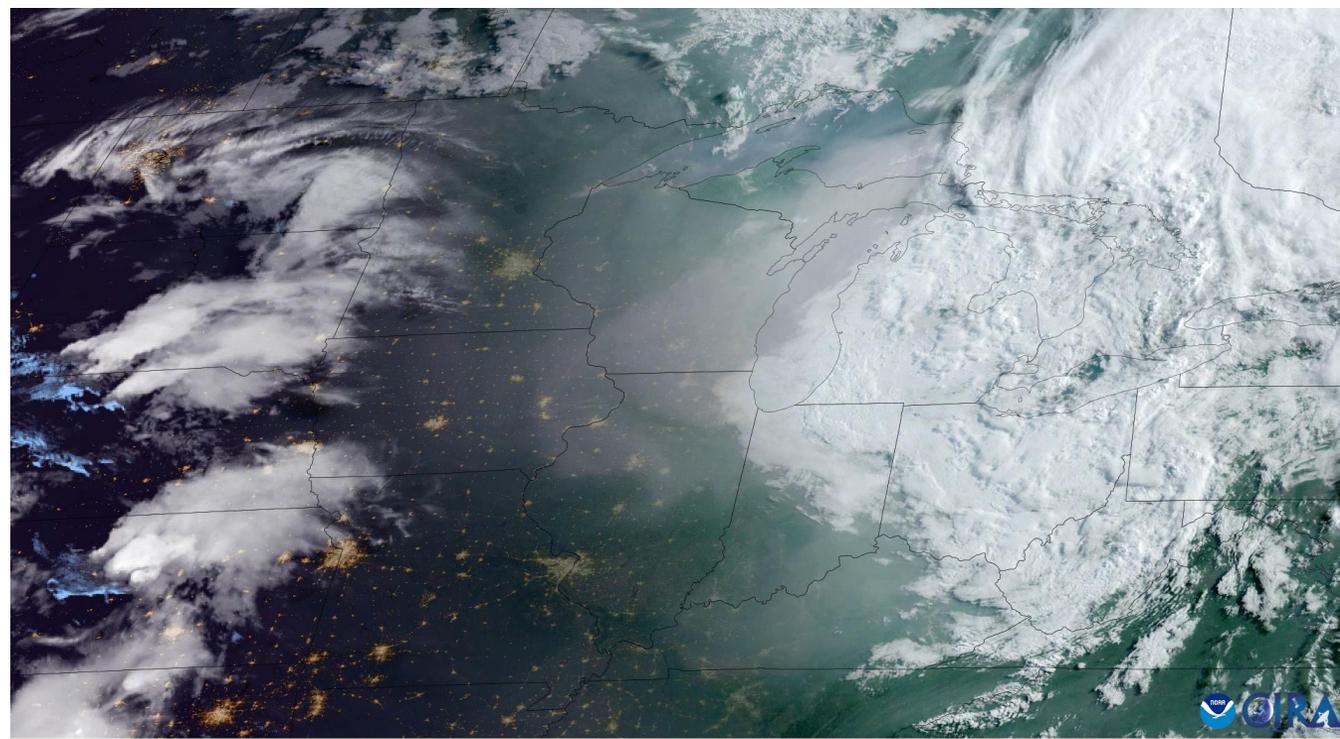
- 11.28" in < 24 hours near Mayfield, KY on July 18-19 (potential record)
- Heavy rain in Chicagoland on July 2<sup>nd</sup> – 8" in 12 hours
- Flooding-related death in Colorado in June



Hail damage in western Nebraska

# Air Quality Problems

- Unusually high wildfire activity in Ontario & Quebec + northerly flow caused multiple rounds of wildfire smoke to surface level across Midwest
- Very poor air quality: EPA's AQI > 300 (hazardous) in some places due to particulate matter



06-27-2023 | 11:46:17 UTC | GOES-16 | GeoColor

<https://satlib.cira.colostate.edu/event/western-canada-wildfires/>

- Wildfires in western US and Canada has also contributed smoke across Midwest
- Many cities have had the most “Unhealthy” air quality days in at least 10 years
- Will be a recurring problem through the summer and into fall



Detroit skyline (I think?)

Source: Fox2 Detroit



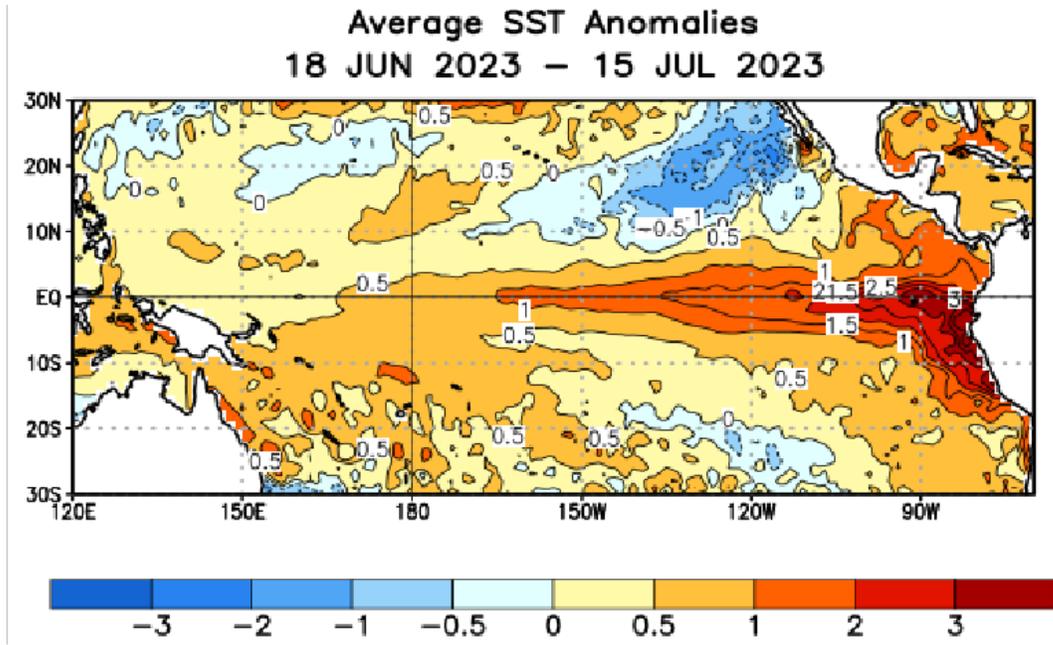
# Outlooks

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# El Niño-Southern Oscillation (ENSO) Outlooks

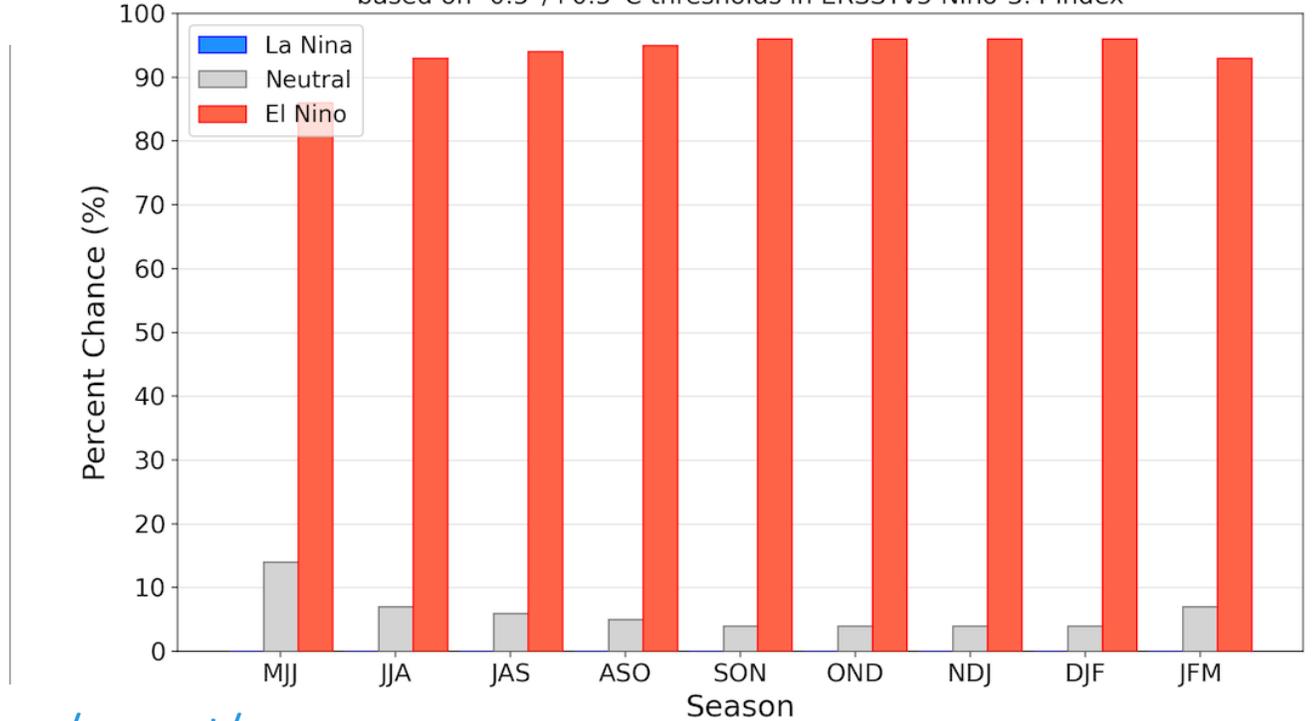
- El Niño is observed via SST anomalies
- Tropical Pacific atmospheric conditions consistent with a weak El Niño
- Last year El Niño *developed* in summer was 2009



- > 90% likelihood of El Niño persisting through winter
- Tropical Pacific atmospheric conditions consistent with a weak El Niño

Official NOAA CPC ENSO Probabilities (issued June 2023)

based on  $-0.5^{\circ}/+0.5^{\circ}\text{C}$  thresholds in ERSSTv5 Niño-3.4 index

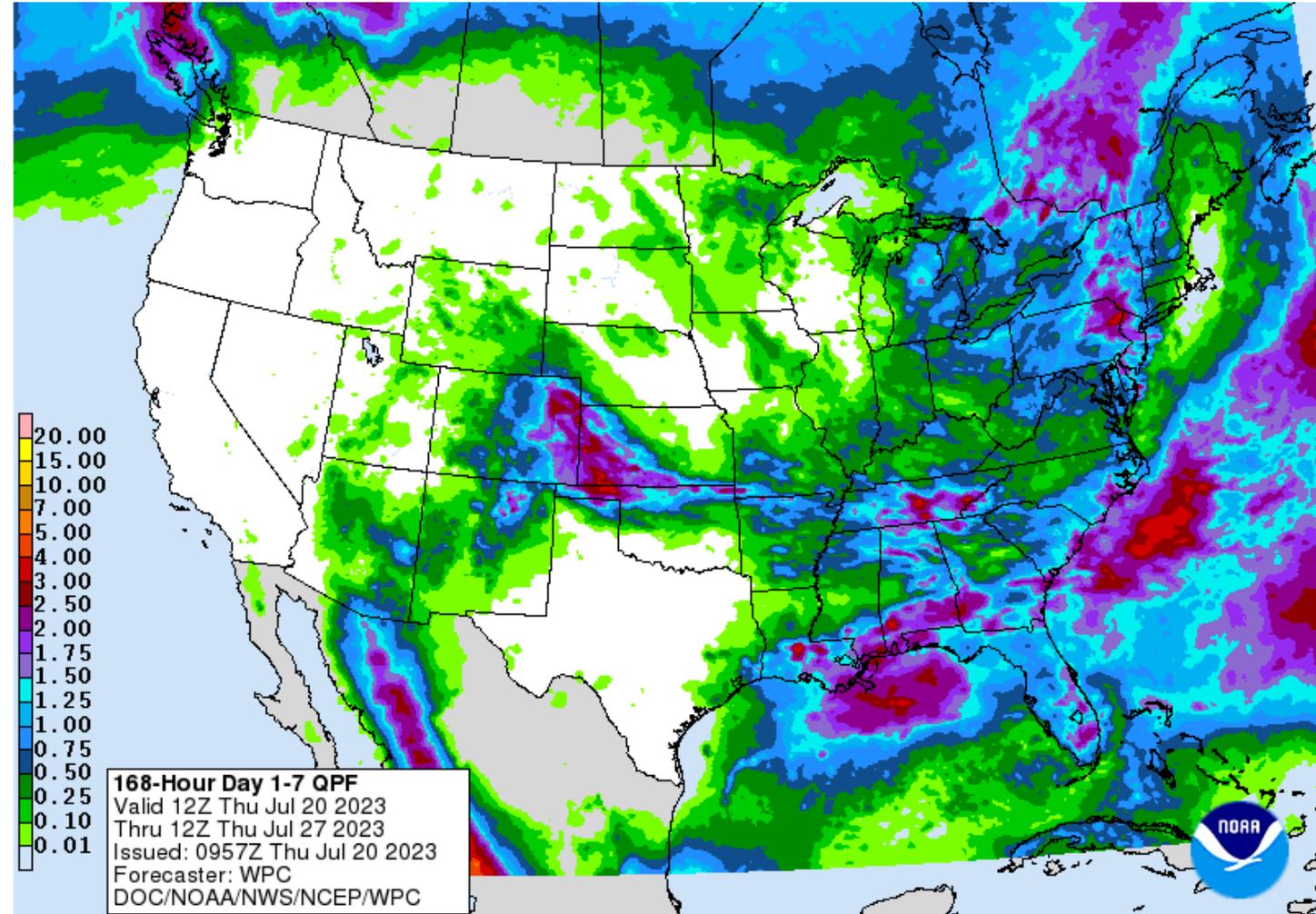


<https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>



# 7-day Precipitation Forecast

- Rain in eastern Colorado and western Kansas
- Scattered storms in OH Valley and Michigan
- Drier in Upper Midwest, western corn belt, and Dakotas
- We'll need to live off soil moisture the places where we have it



Source: [wpc.ncep.noaa.gov/qpf/](https://wpc.ncep.noaa.gov/qpf/)

# 8-14 Day Outlooks

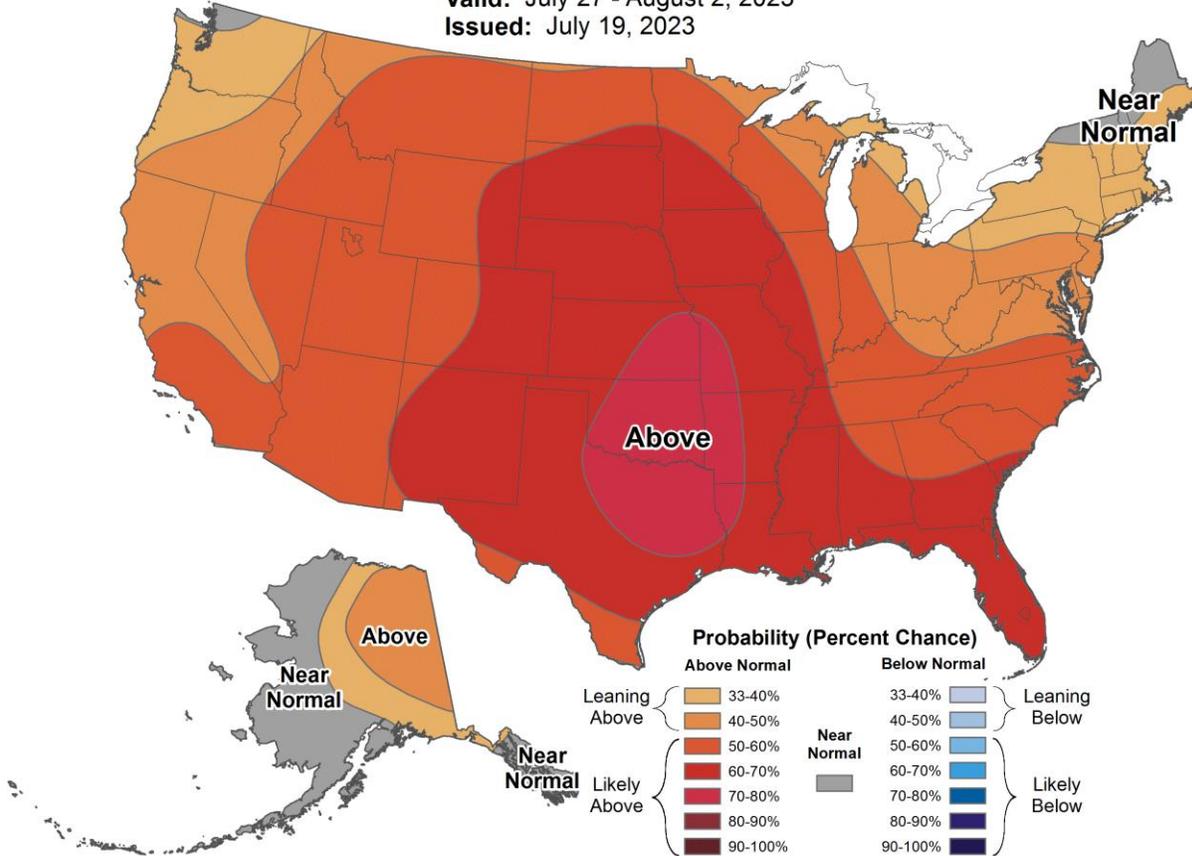
<https://www.cpc.ncep.noaa.gov/>



## 8-14 Day Temperature Outlook



Valid: July 27 - August 2, 2023  
Issued: July 19, 2023



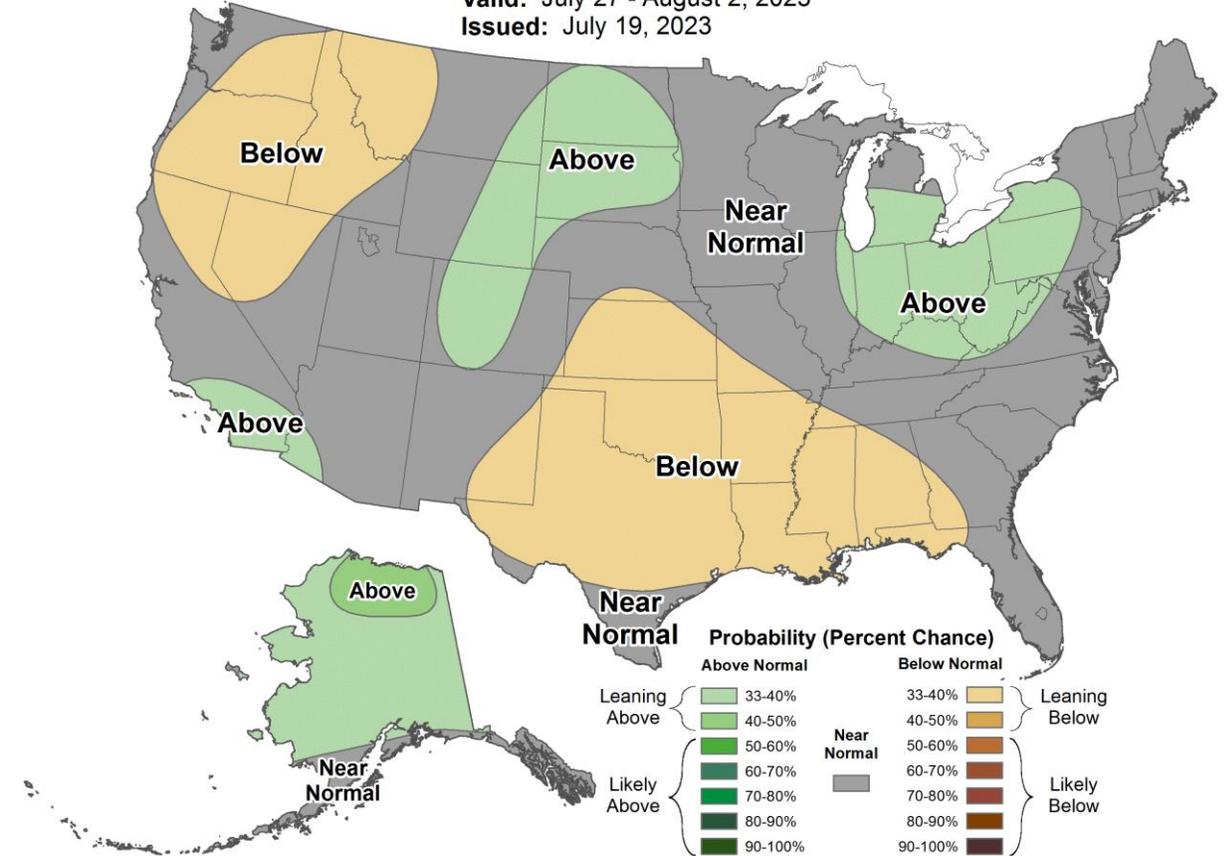
Higher chances of **Warmer** than normal everywhere as heat is expected to spread from southwest



## 8-14 Day Precipitation Outlook



Valid: July 27 - August 2, 2023  
Issued: July 19, 2023

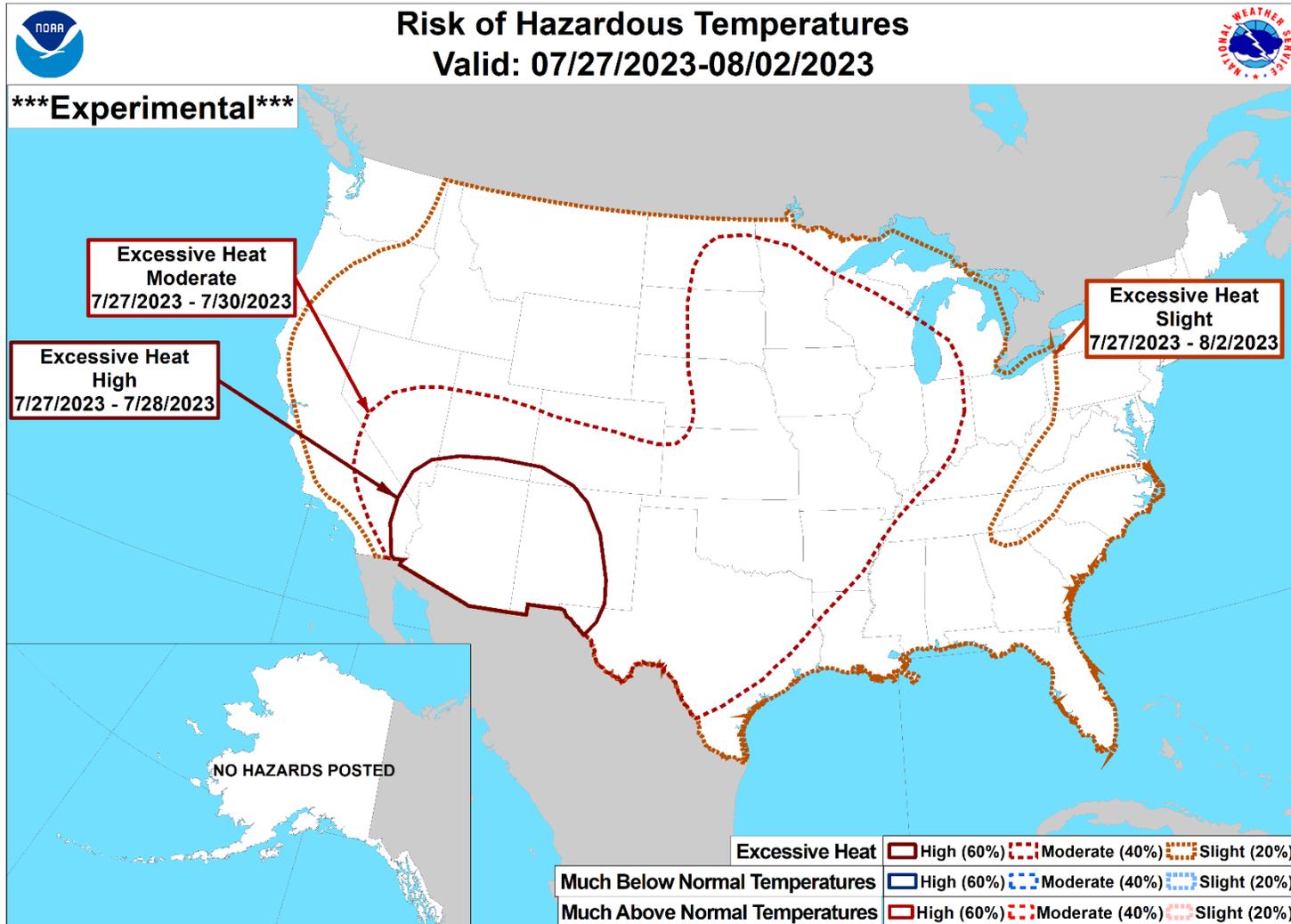


Slightly higher chances of **Wetter** in Dakotas and east, maybe a bit **Drier** in KS and MO



# 8-14 Day Hazards – The Heat!

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



Climate Prediction Center

Made: 07/19/2023 3PM EDT

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- Moderate to Slight risk of hazardous temperatures in late July and early August
- Likely temperatures into 90s across the region, possible triple digits in some places + the humidity
- More of a human and livestock problem in places with soil moisture
- Additional crop stress in driest parts
- Questions of persistence beyond week 2



# August Outlooks

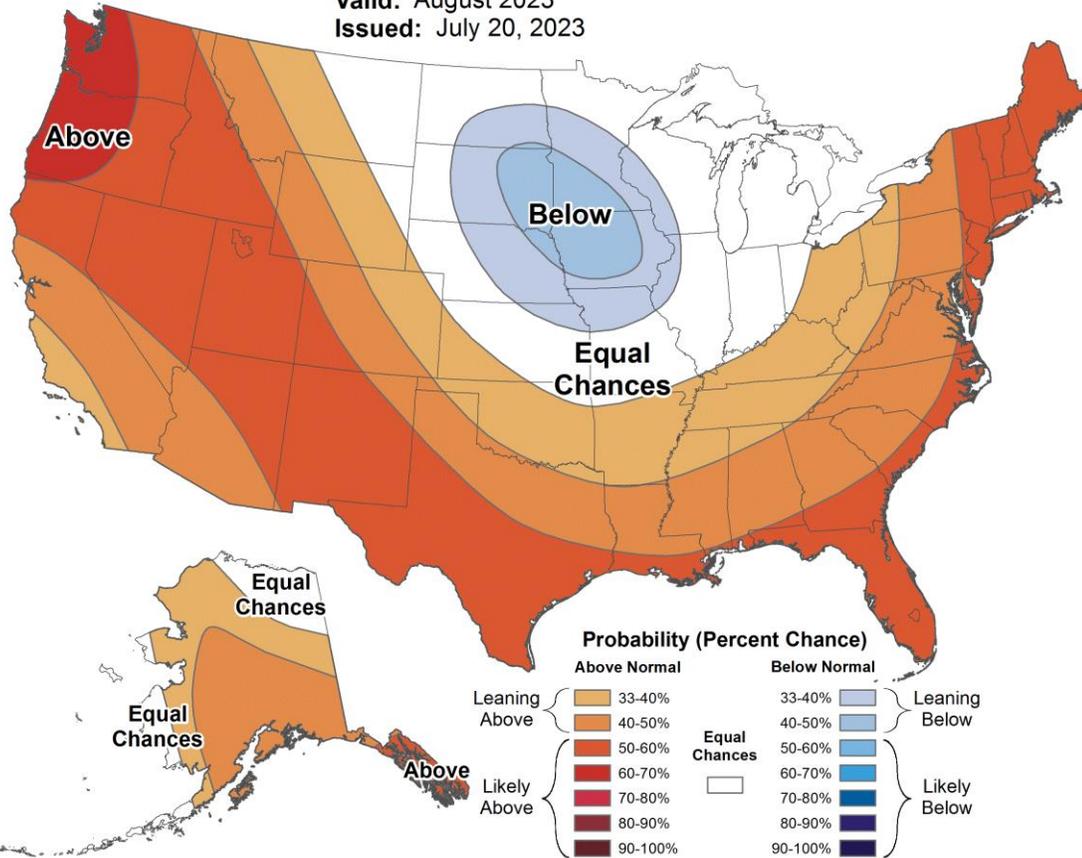
<https://www.cpc.ncep.noaa.gov/>



## Monthly Temperature Outlook



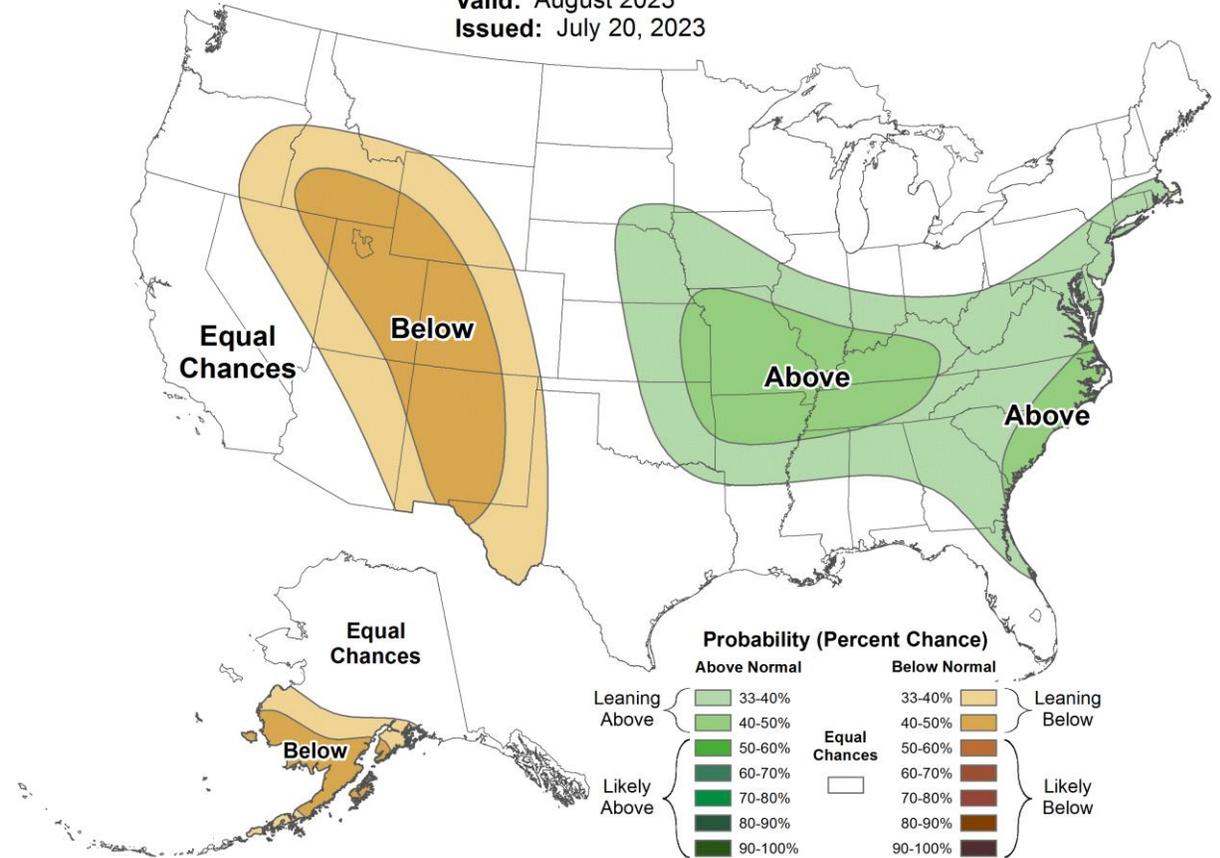
Valid: August 2023  
Issued: July 20, 2023



## Monthly Precipitation Outlook



Valid: August 2023  
Issued: July 20, 2023



Leaning **Cooler** than normal in western corn belt,  
equal chances elsewhere

**Wetter** in southern region, equal  
chances north and Great Lakes



# Season Outlooks August – October

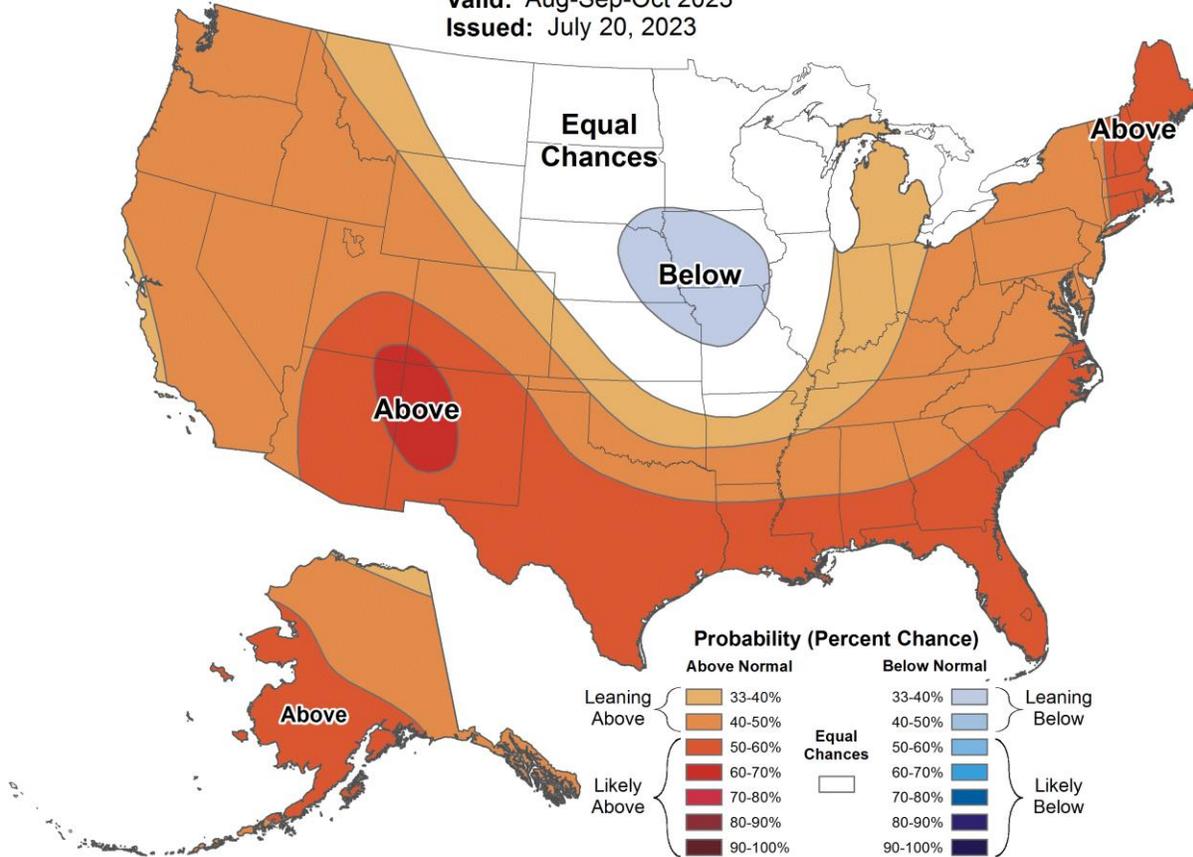
<https://www.cpc.ncep.noaa.gov/>



## Seasonal Temperature Outlook



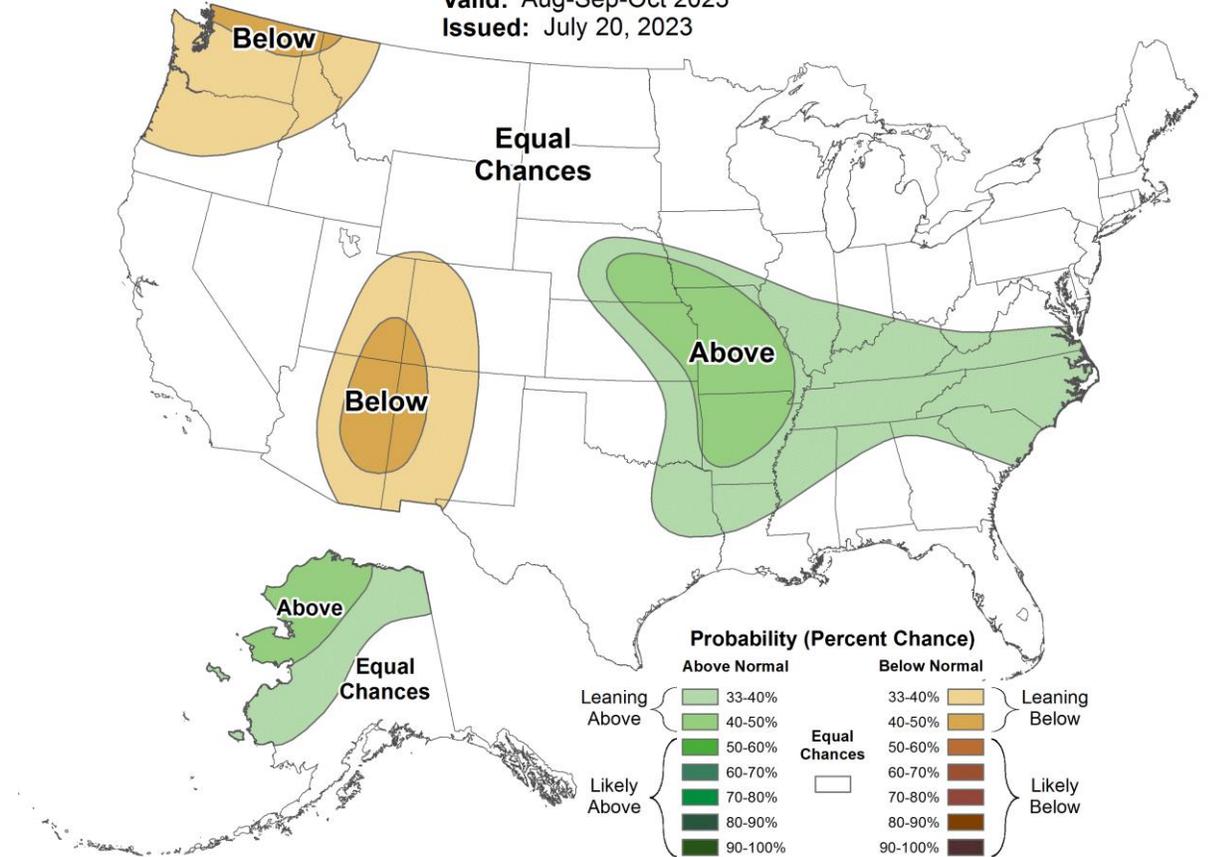
Valid: Aug-Sep-Oct 2023  
Issued: July 20, 2023



## Seasonal Precipitation Outlook



Valid: Aug-Sep-Oct 2023  
Issued: July 20, 2023



Keeping **Cooler** in central, but a bit smaller  
EC or leaning **Warmer** elsewhere

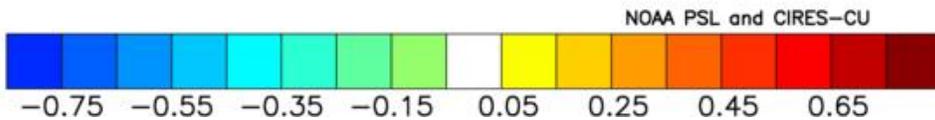
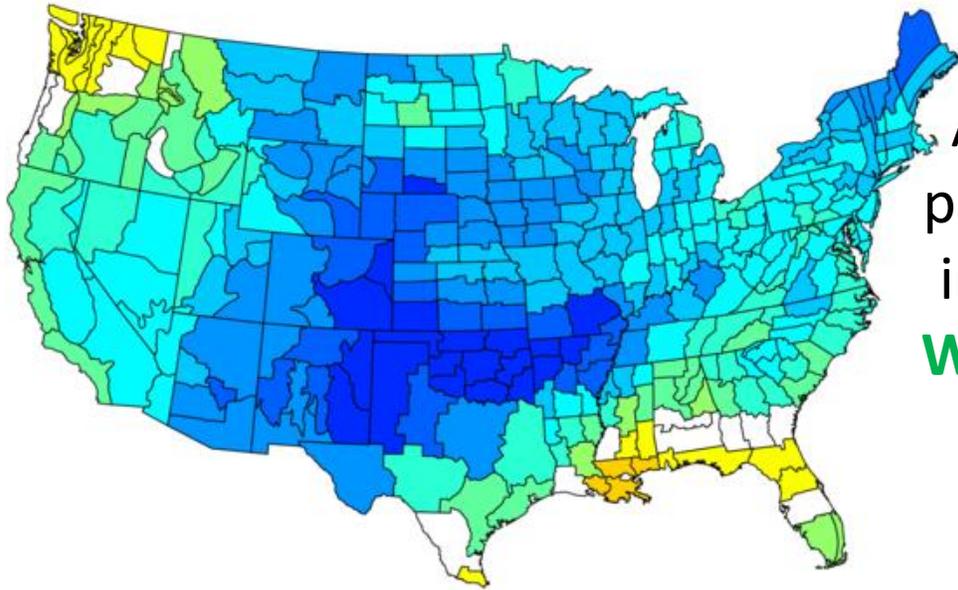
Keeping **Wetter** in lower MO Basin,  
equal chances elsewhere



# August – October Conditions in Past El Niño Events (Since 1990)

## Temperature Anomalies

NOAA/NCEI Climate Division Composite Temperature Anomalies (F)  
Aug to Oct 1991,1994,1997,2002,2004,2006,2009,2015,2018  
Versus 1991–2020 Longterm Average

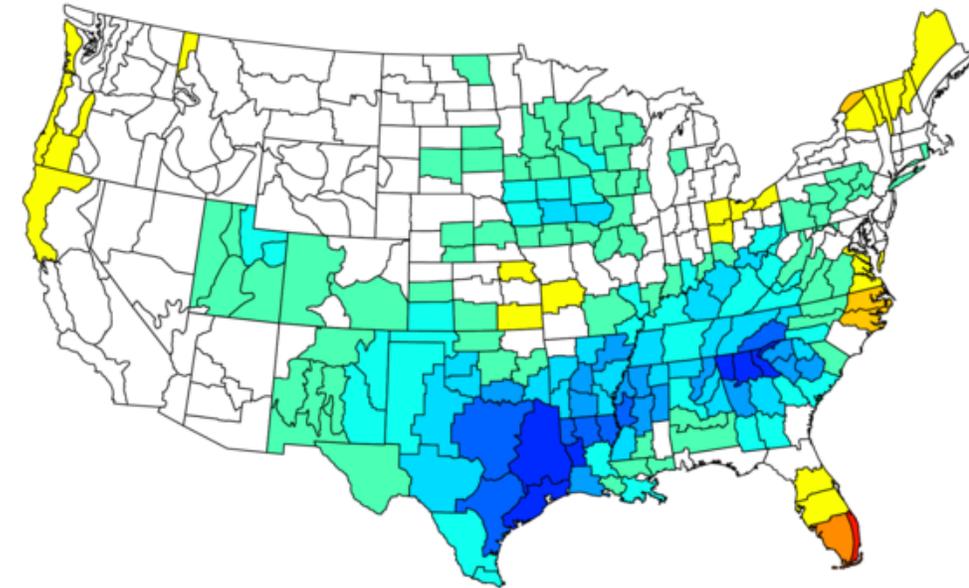


<https://psl.noaa.gov/data/usclimdivs/>

Not Forecast

## Precipitation Anomalies

NOAA/NCEI Climate Division Composite Precipitation Anomalies (in)  
Aug to Oct 1991,1994,1997,2002,2004,2006,2009,2015,2018  
Versus 1991–2020 Longterm Average



Average anomalies in past events lean **Cooler** in the central US; a bit **Wetter** in MS Basin and lower OH Basin

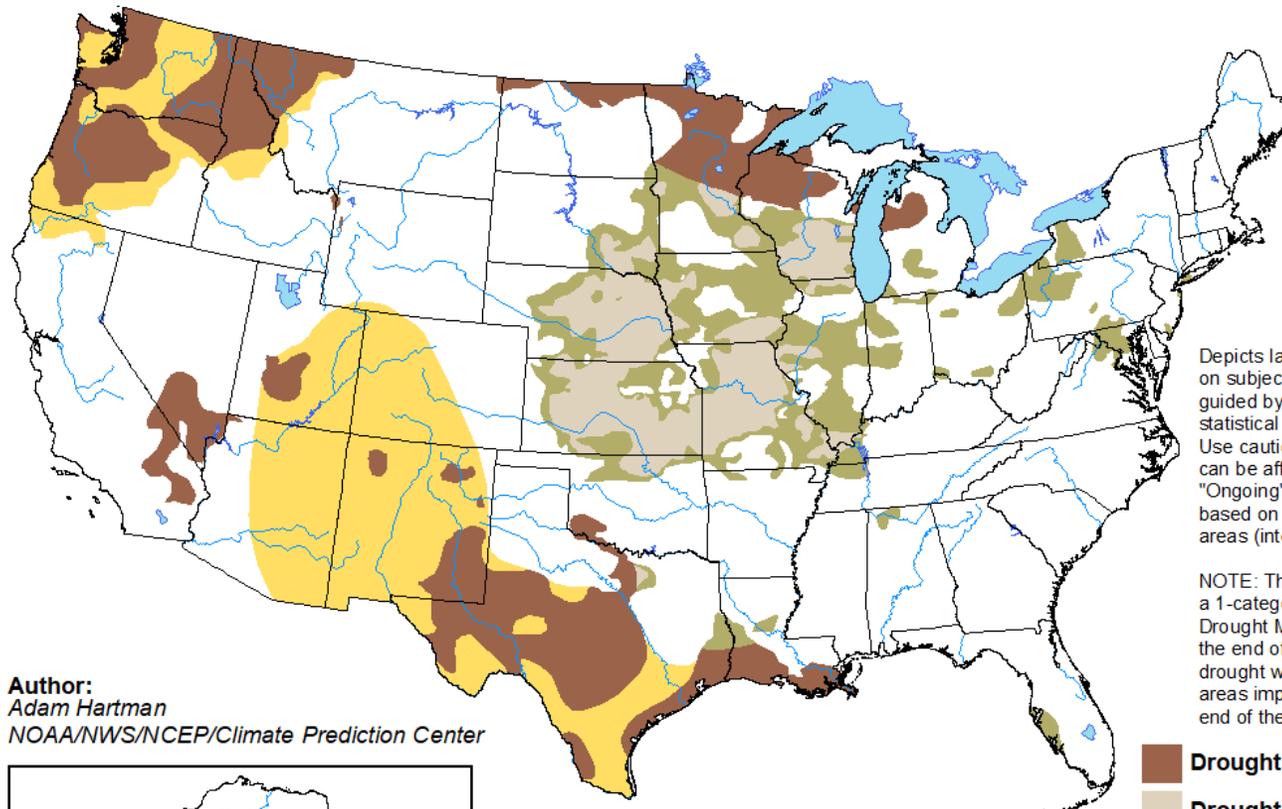
# Drought Outlook – July through October

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

Valid for July 20 - October 31, 2023  
Released July 20

### Following 1- and 3-month Outlooks:

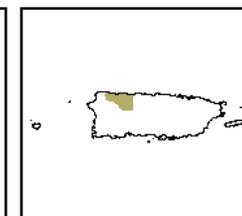
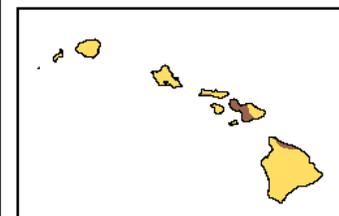
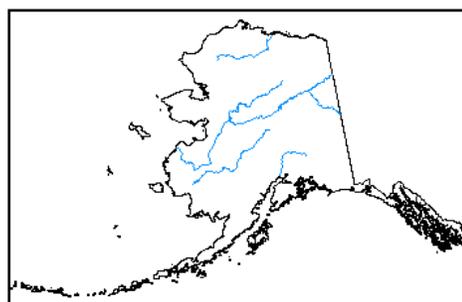
- Drought improvement and/or removal in much of the region
- Drought persistence in northern Great Lakes with equal chances precipitation outlooks
- Looking at fire risk in northern forests if drought persists into fall



Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Author:  
Adam Hartman  
NOAA/NWS/NCEP/Climate Prediction Center



- Drought persists
- Drought remains but improves
- Drought removal likely
- Drought development likely



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

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



# Summary

## Current Conditions

- Recent rains eased drought in some places after a very dry April – June (except in Colorado)
- Drought remains in much of the region – crop conditions okay for now, pasture is hurting
- Better conditions west, but a lot of hail has caused some issues; Good conditions east, but some delays from cooler conditions
- This is not 2012 or 1988 (even with next week's heat)
- Air quality issues from Canadian wildfires – likely ephemeral issue for the rest of summer

## Outlooks

- A bit of a drier near-term forecast + heat will stress crops in already dry soils
- Heat also stressing livestock with water concerns + human impacts across the region
- Outlooks leaning near-normal or wetter in much of the region in August, especially helpful for beans
- Some concerns with fire in northern part of the region if drought persists
- Navigation concerns in lower MS if we do not get consistent rain in August and September



# Further Information – Partners

- Today's & Past Recorded Presentations at:
  - <https://mrcc.purdue.edu/webinars>
  - <https://hprcc.unl.edu/webinars.php>
- NOAA National Centers for Environmental Information: [www.ncei.noaa.gov](http://www.ncei.noaa.gov)
- Monthly climate reports (US & Global): <https://www.ncdc.noaa.gov/sotc/>
- NOAA Climate Prediction Center: [www.cpc.ncep.noaa.gov](http://www.cpc.ncep.noaa.gov)
- Climate Portal: [www.climate.gov](http://www.climate.gov)
- U.S. Drought Portal: [www.drought.gov](http://www.drought.gov)
- National Drought Mitigation center: <https://drought.unl.edu>
- State Climatologists: <http://www.stateclimate.org>
- Regional Climate Centers:
  - Midwestern – <https://mrcc.purdue.edu>
  - High Plains – <https://hprcc.unl.edu>
- USDA Midwest Climate Hub: <https://www.climatehubs.usda.gov/hubs/midwest>



# Thank You, Questions?

- Questions – Climate
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  - Dennis Todey: [dennis.todey@ars.usda.gov](mailto:dennis.todey@ars.usda.gov), 515-294-2013
  - Doug Kluck: [doug.kluck@noaa.gov](mailto:doug.kluck@noaa.gov), 816-994-3008
  - Gannon Rush: [grush2@unl.edu](mailto:grush2@unl.edu)
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  - Brian Fuchs: [bfuchs2@unl.edu](mailto:bfuchs2@unl.edu), 402-472-6775
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- Questions – Weather
  - [crhroc@noaa.gov](mailto:crhroc@noaa.gov)

