# Central Region Climate & Drought Outlook

March 17, 2022

Missouri River in Omaha
Source: Bryon Miller, NWS Omaha


TRENT FORD

ILLINOIS STATE CLIMATOLOGIST

ILLINOIS STATE WATER SURVEY | PRAIRIE RESEARCH INSTITUTE

UNIVERSITY OF ILLINOIS, URBANA-CHAMPAIGN


United States Department of Agriculture
Midwest Climate Hub

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
- Access to Future Climate Webinars & Past Recordings can be found:
  - https://mrcc.purdue.edu/multimedia/webinars.jsp
  - http://www.hprcc.unl.edu/webinars.php

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

Next Climate/Drought Outlook Webinar

**Thursday, April 21st**

**Dr. Dennis Todey**

**Director, USDA Midwest Climate Hub**

# Outline

## Recent Climate Conditions
- February and Winter review
- Last 60-, 90-days

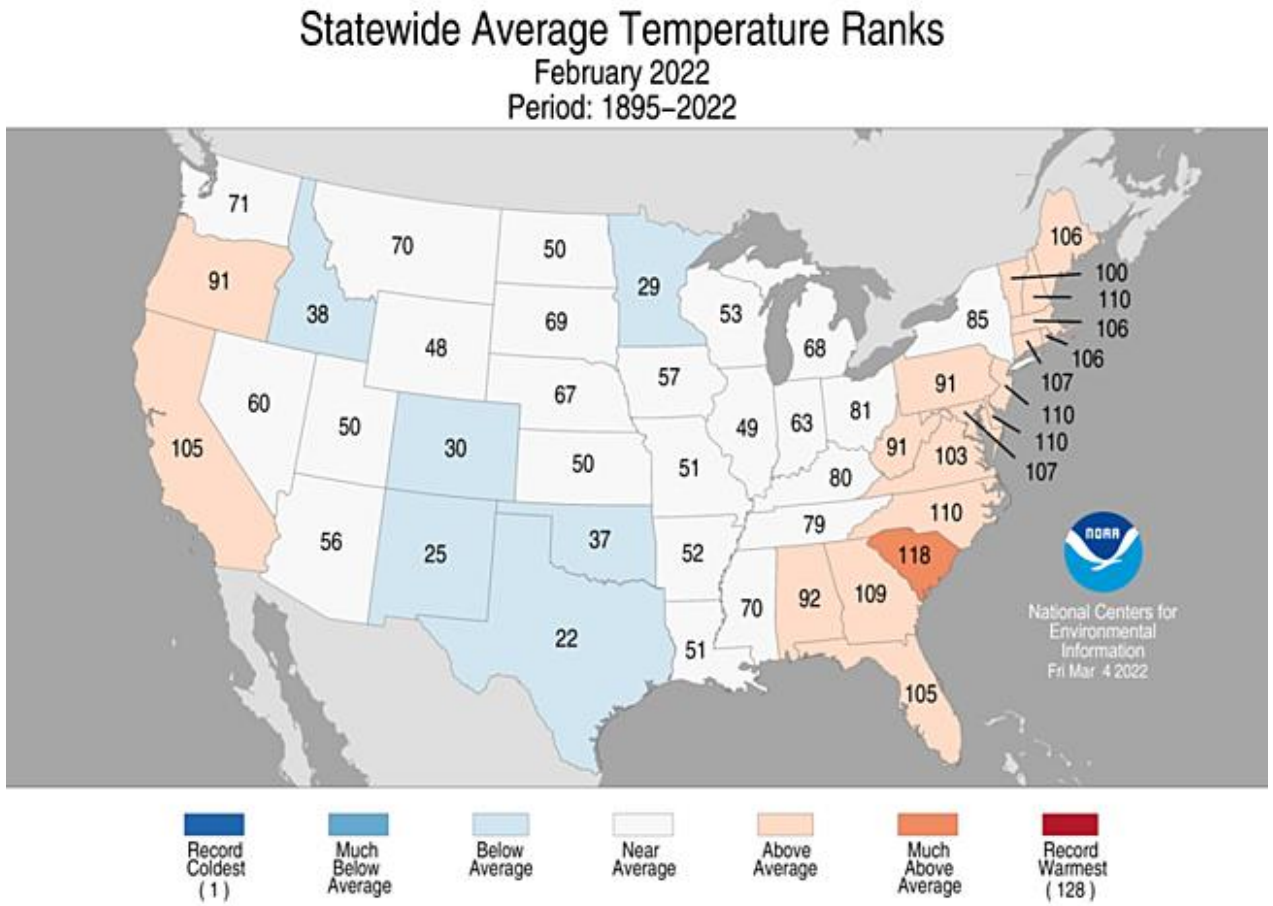
## Current Conditions
- Snow, Soils, & Streams (oh my!)
- Drought
- Great Lakes

## Impacts
- Drought, Flooding, Transportation, Infrastructure

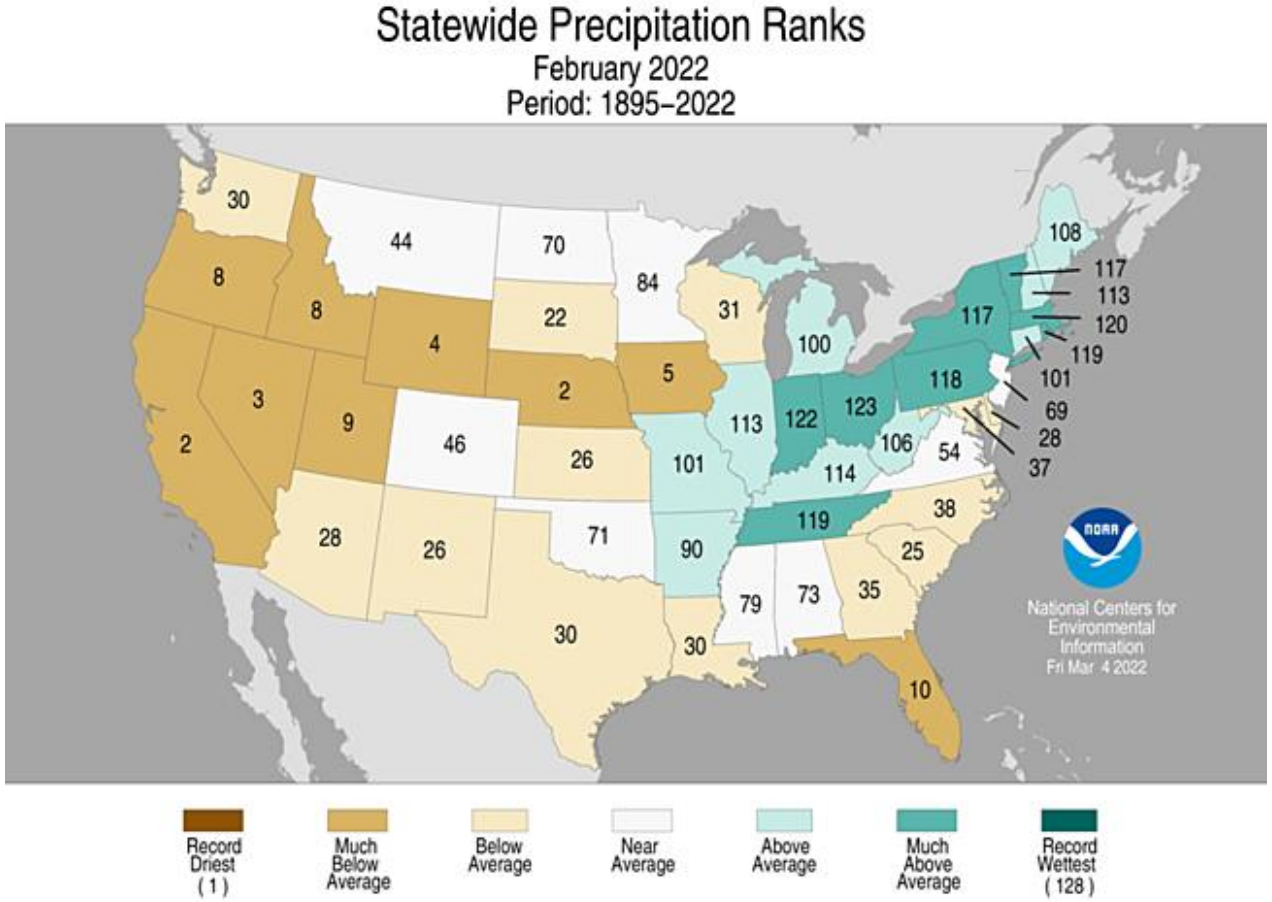
## Outlooks
- Next 2 – 4 weeks
- La Niña, rest of Spring, and Summer

# Recent Climate Conditions

# February Climate Review



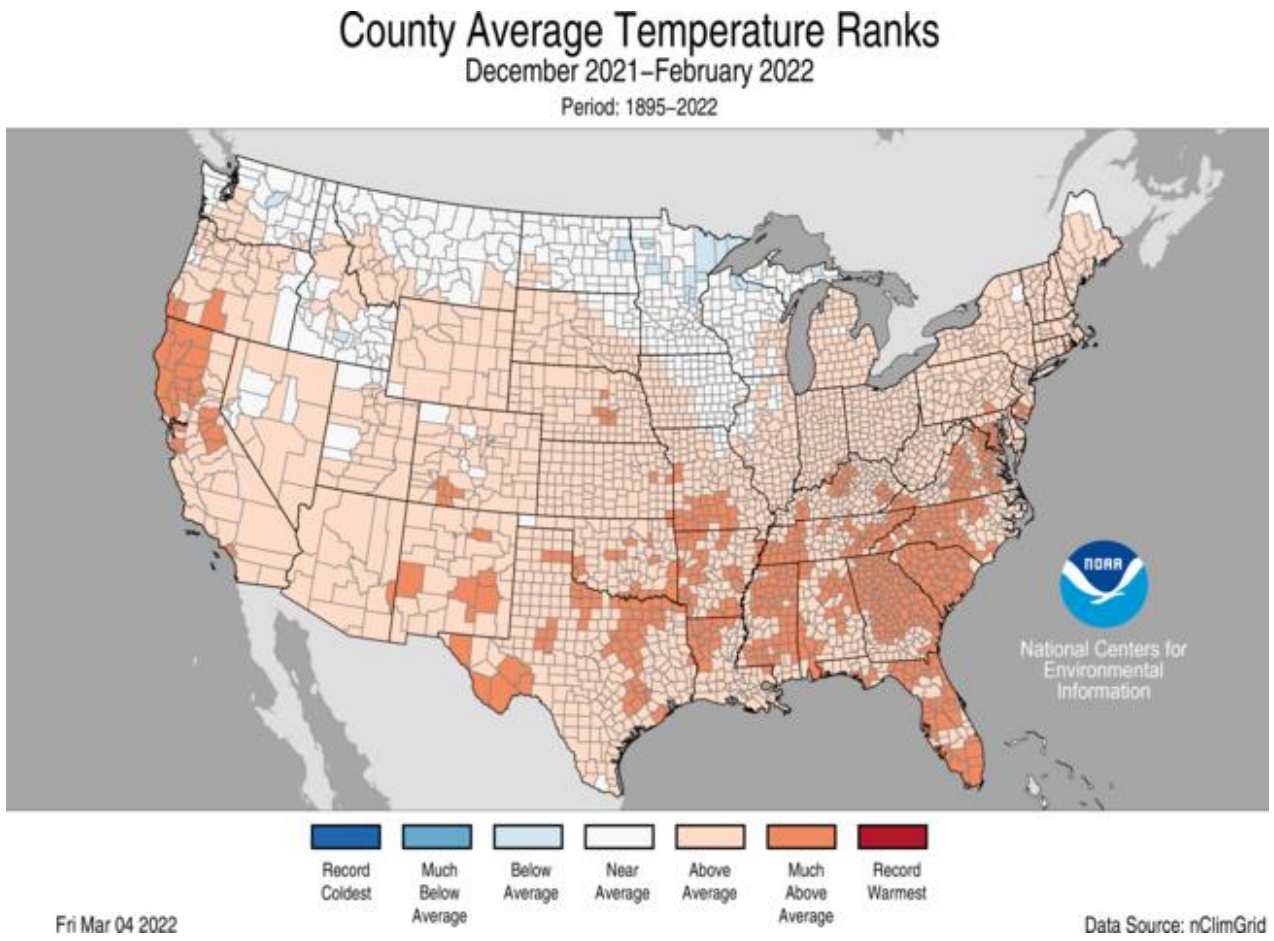

- Top 30 coldest February in MN, closer to normal elsewhere

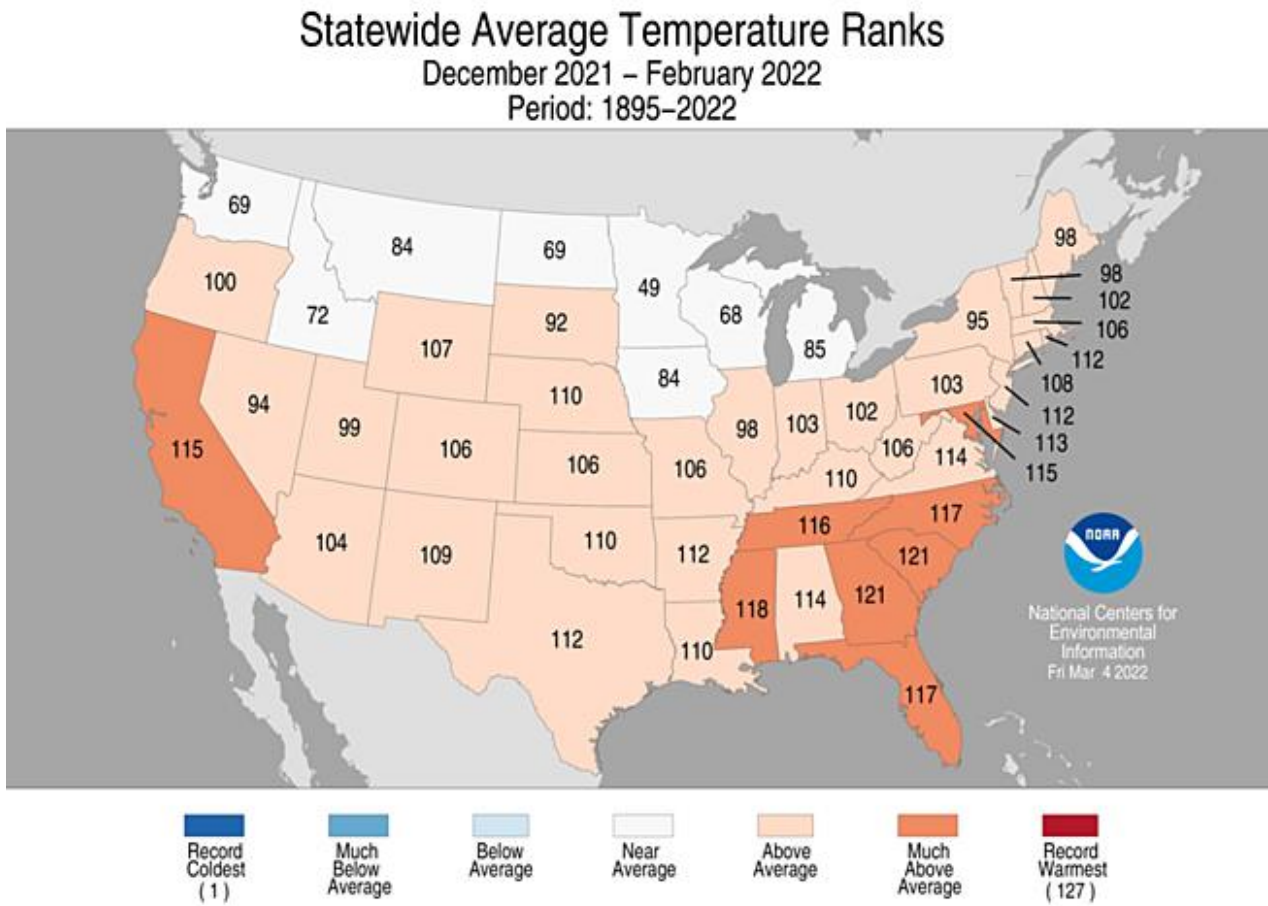



- Top 5 driest February in WY, NE, & IA
- Top 10 wettest February in Ohio & Indiana
- Wettest Feb. on record in 6 OH Counties

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

# Winter Review – Temperature

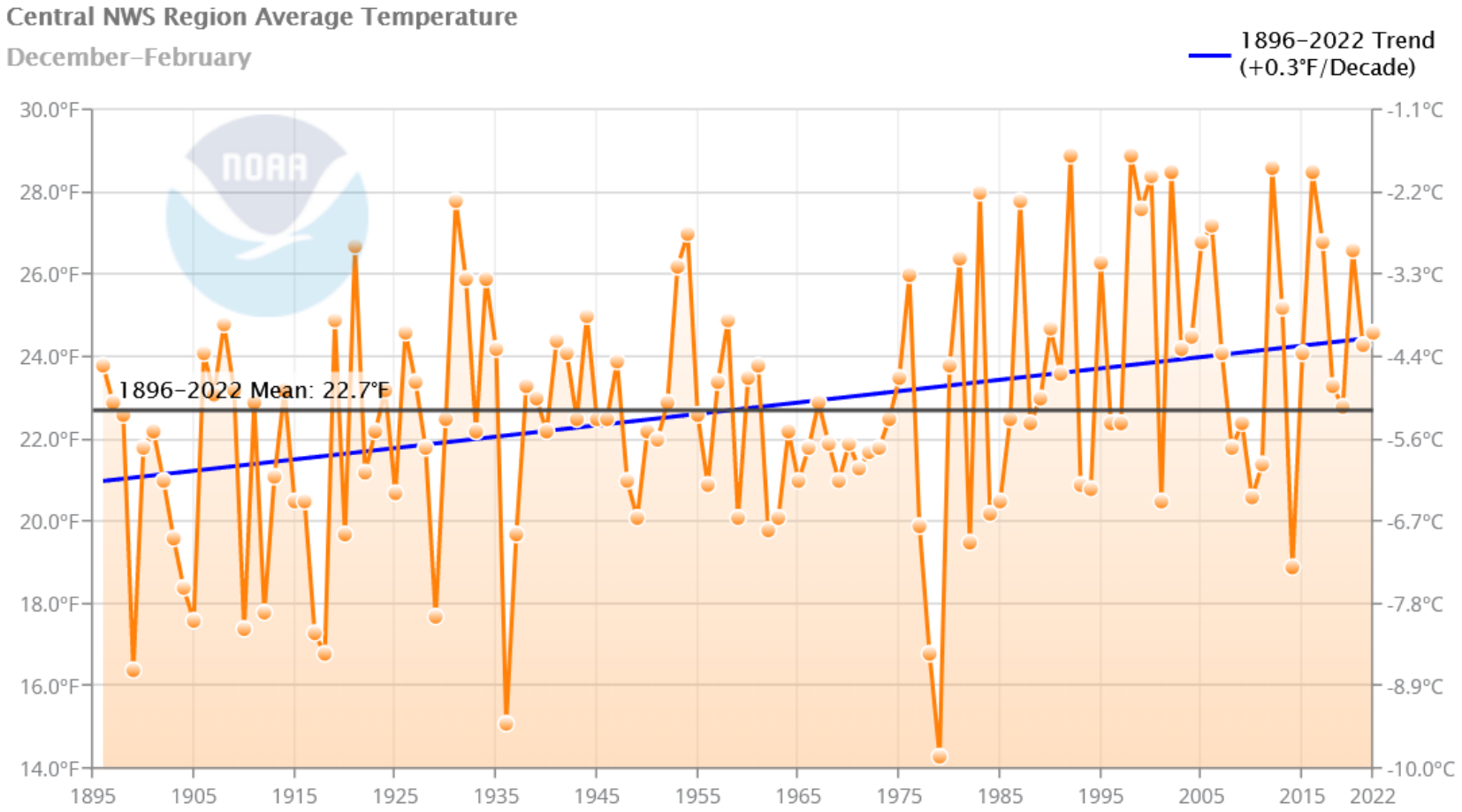



- Winter 21-22 was warmer than average in southern 2/3 of the region
- Very warm December outweighed cooler January & February

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

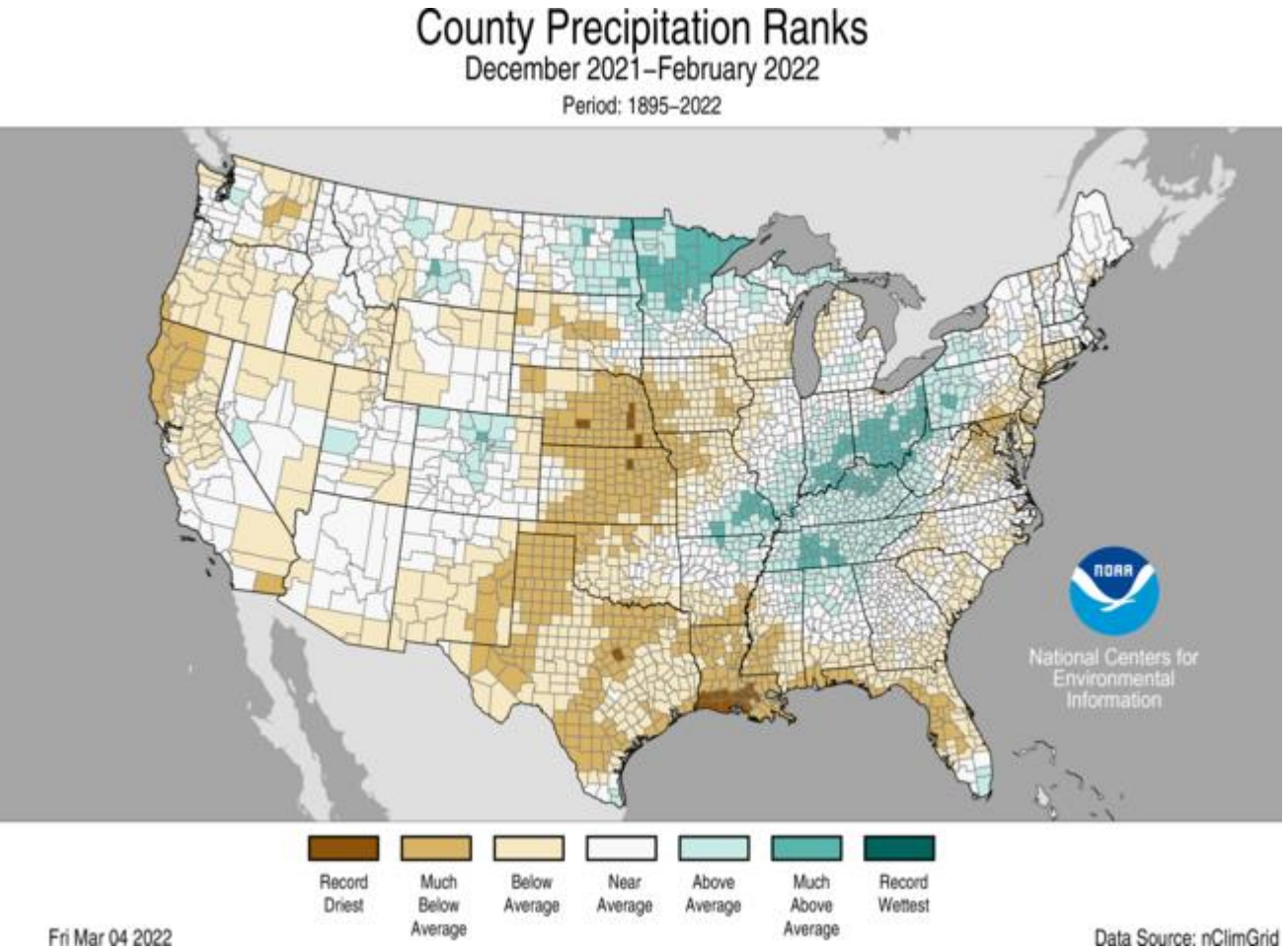
# Long-term Winter Warming in North Central U.S.




- 2021-22 winter is part of a long-term increasing winter temperature trend from Rockies to Great Lakes

Source: https://www.ncdc.noaa.gov/cag/regional/mapping

# Winter Review – Precipitation

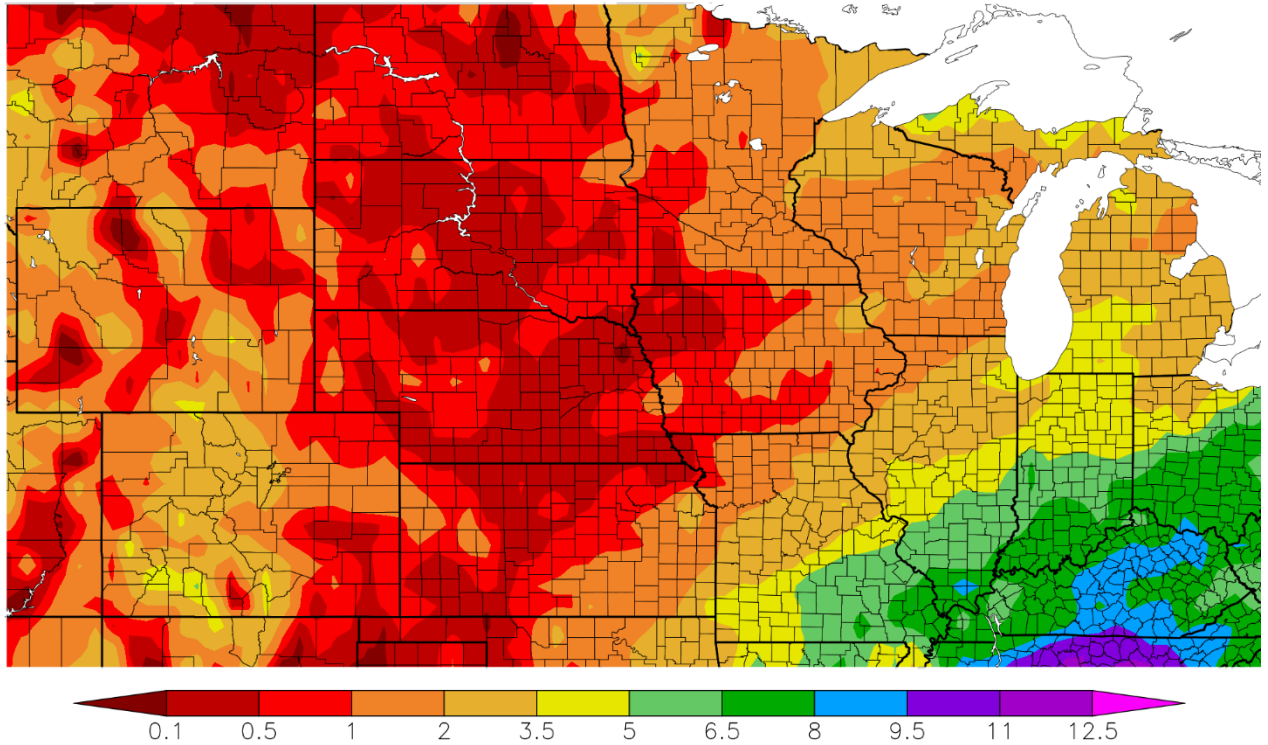



- Winter reinforced the wet-east/dry-west pattern across the region
- 11th wettest winter on record in MN
- 4th driest in NE, 5th driest in KS
- Driest winter on record in 6 NE counties and 1 KS county
- 2nd driest winter on record in Lincoln (0.56”)

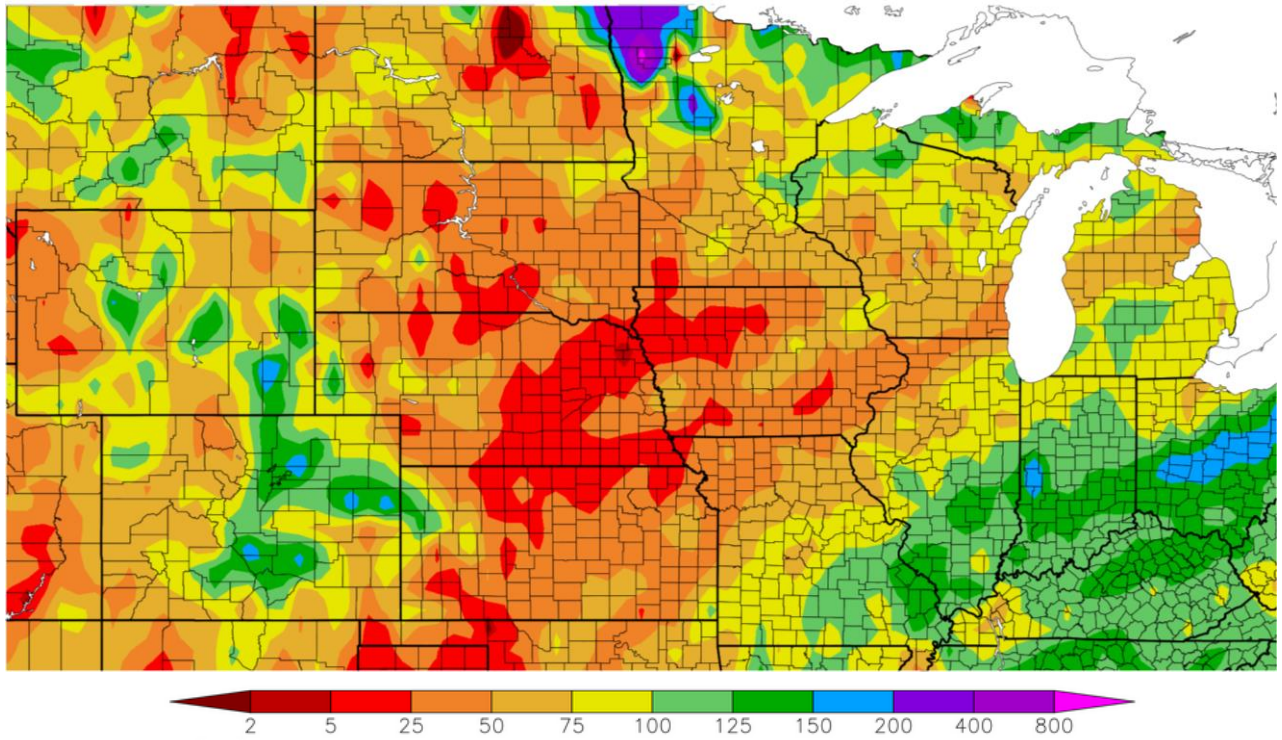
Source: https://www.ncdc.noaa.gov/temp-and-precip/us-maps/

# Precipitation – Last 60 Days

## Total Precipitation (inches)




## Percent of Normal (%)



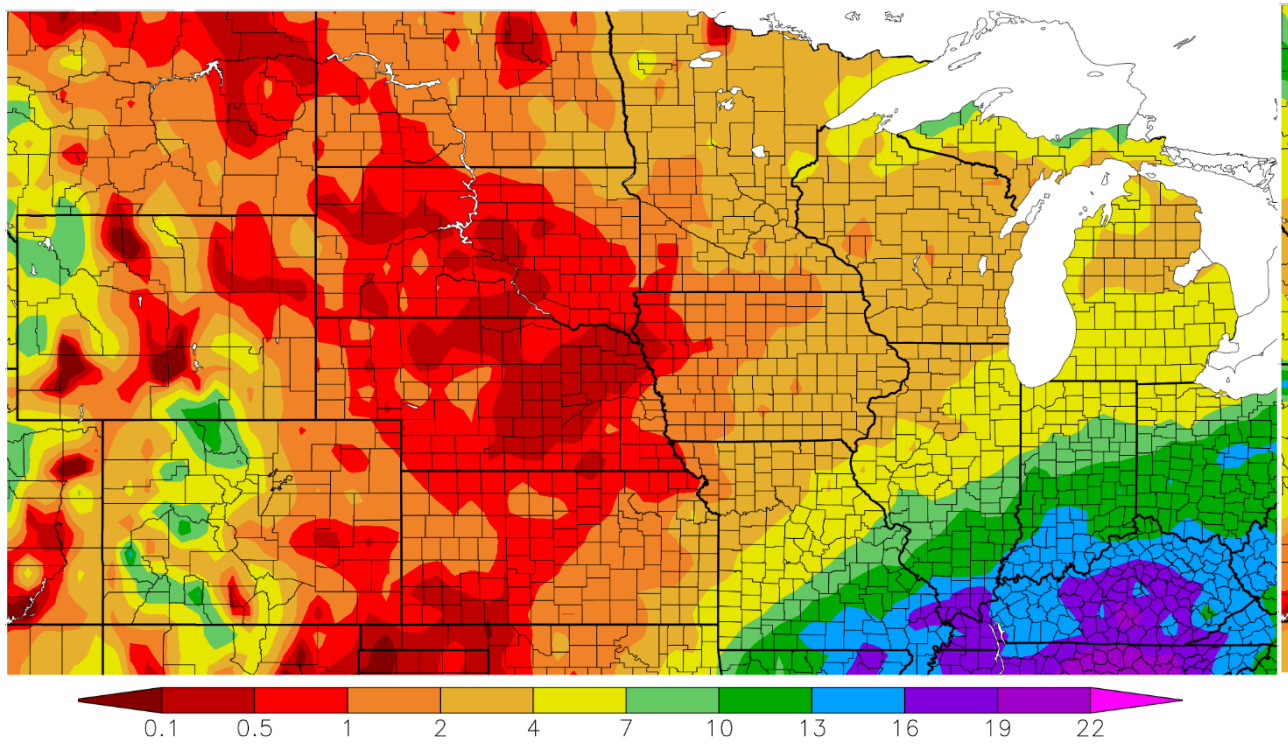

Source: HPRCC, hprcc.unl.edu

- Western Midwest & Plains have been 1-2” drier than normal (5 – 50% of normal)
- Ohio Valley has been 1-5” wetter than normal
- Driest time of the year for much of the region

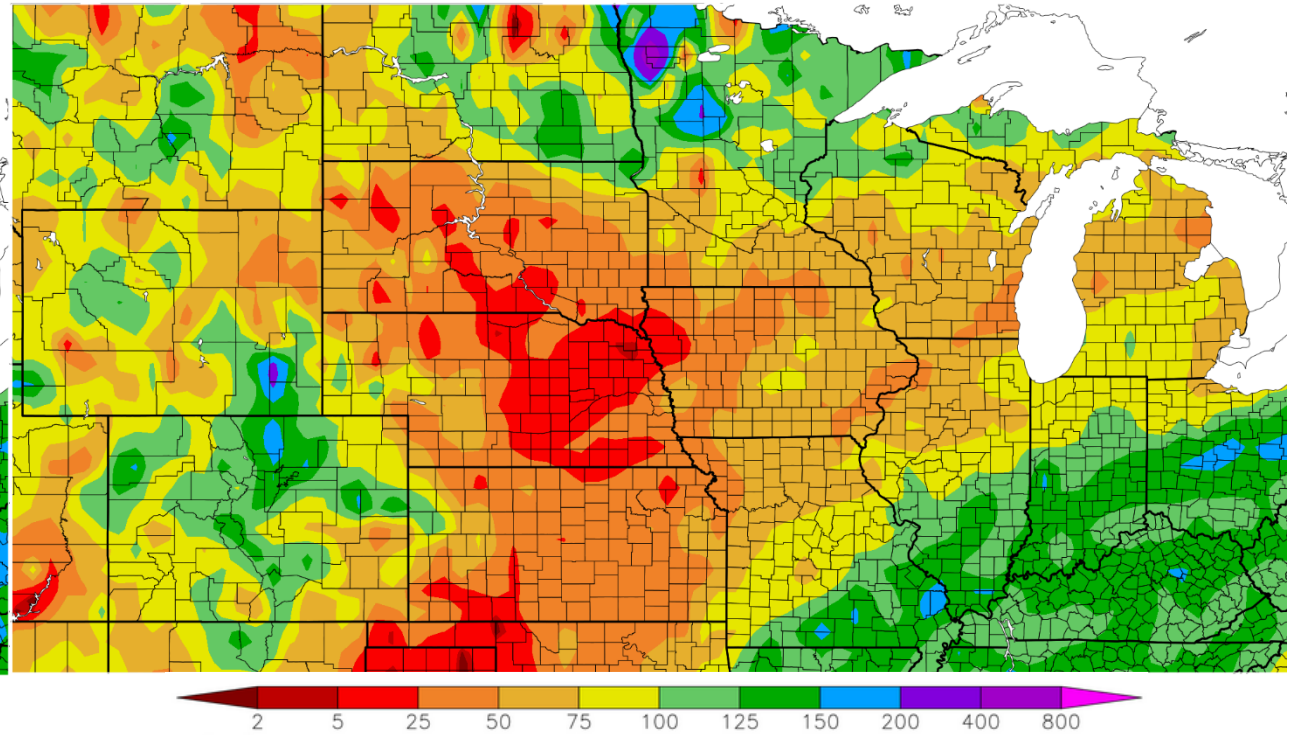
January 1 – March 16, 2022
Driest on record in Norfolk, NE
3rd driest in Grand Island & Valentine, NE

# Precipitation – Last 90 Days

## Total Precipitation (inches)



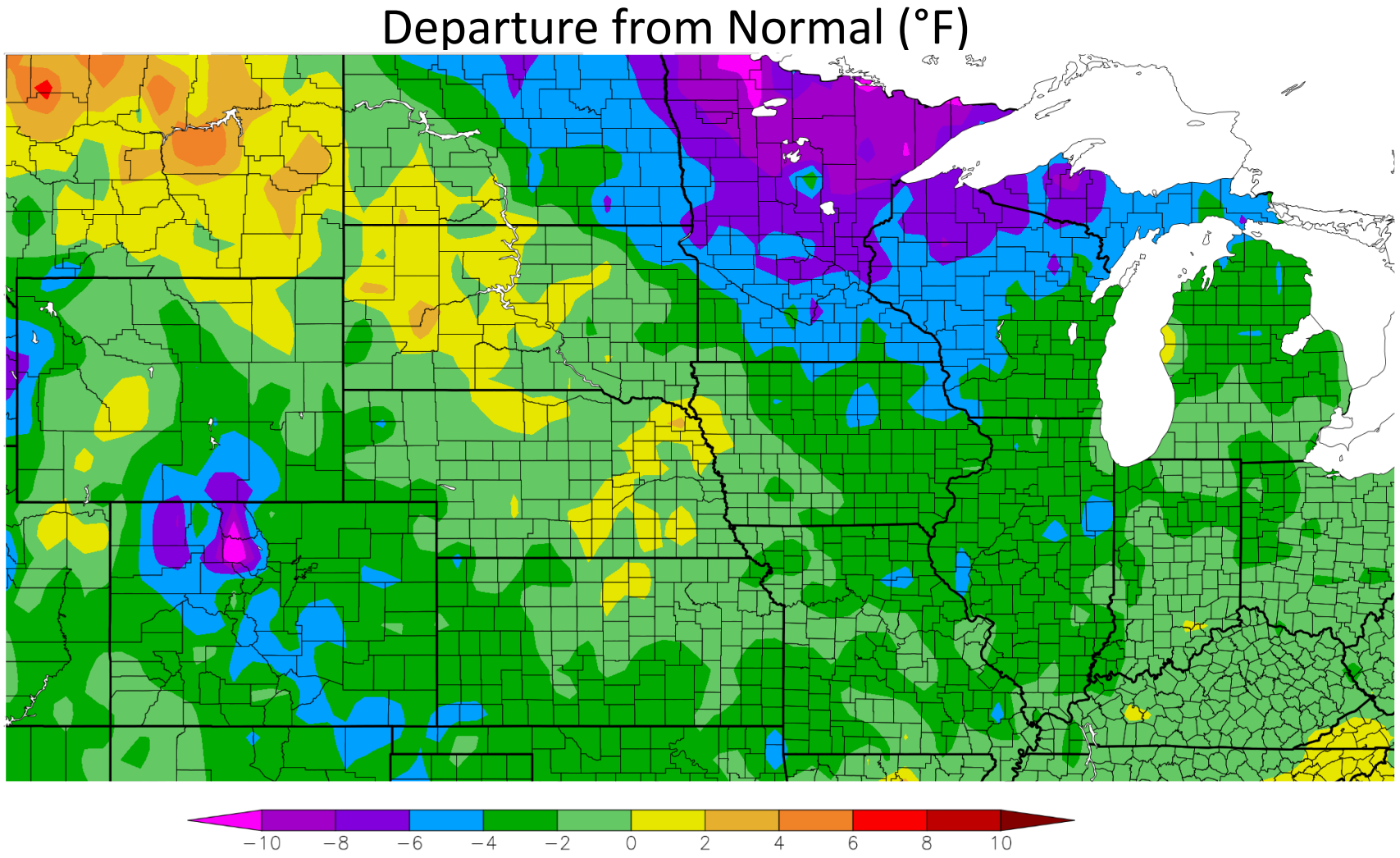

## Percent of Normal (%)




Source: HPRCC, hprcc.unl.edu

- Most of the region 1-6” drier than normal at 90-days
- Eastern Nebraska < 25% of normal precipitation since mid-December
- Parts of southern IL, southeast MO, and KY are 6-8” wetter than normal

# Temperature Departure (°F) – Last 60 Days

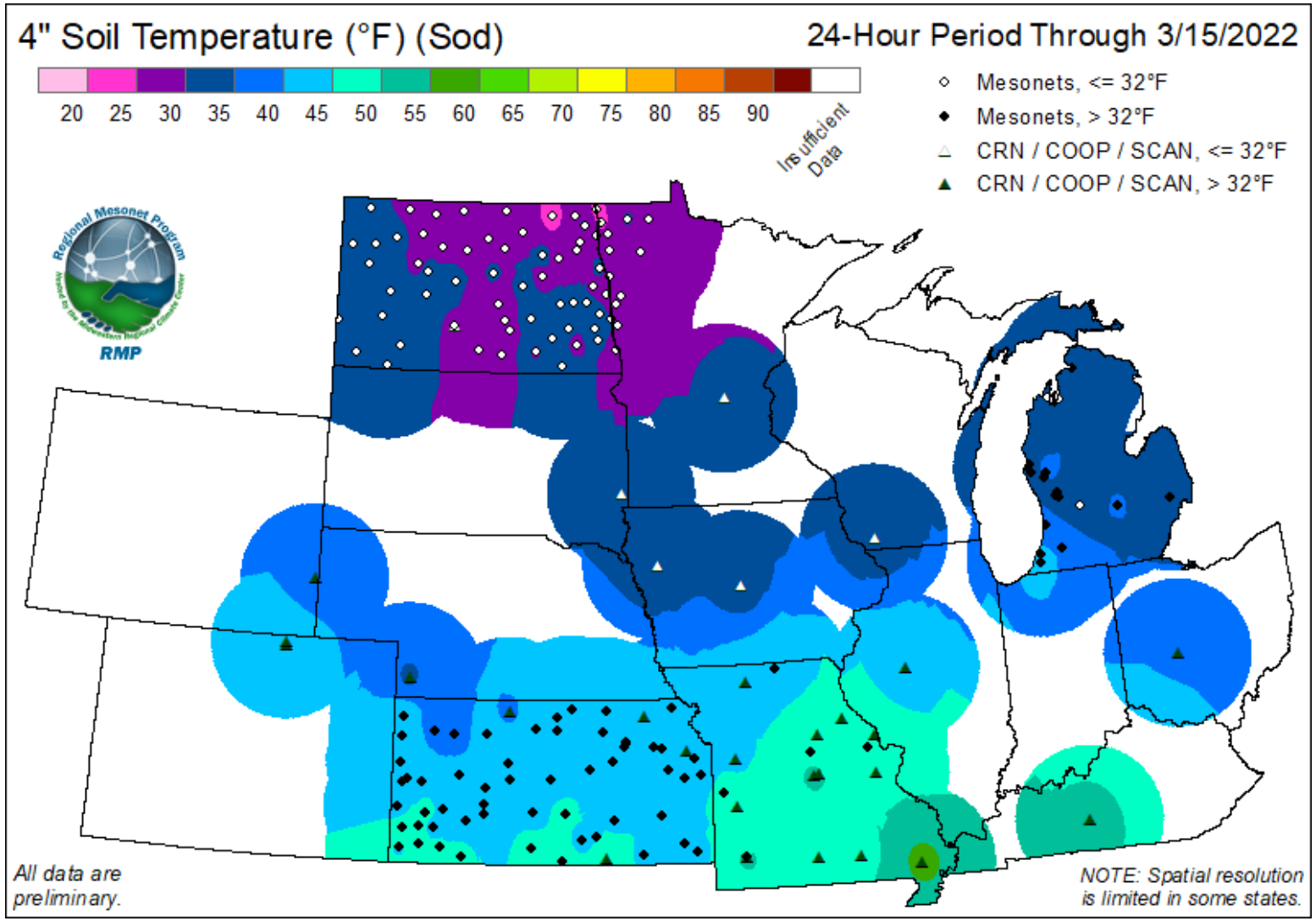



Source: HPRCC, hprcc.unl.edu

- Below normal temperatures for eastern half of the region, 4 – 10 degrees below normal in MN, WI, MI

# Soil Temperatures – 4” Sod

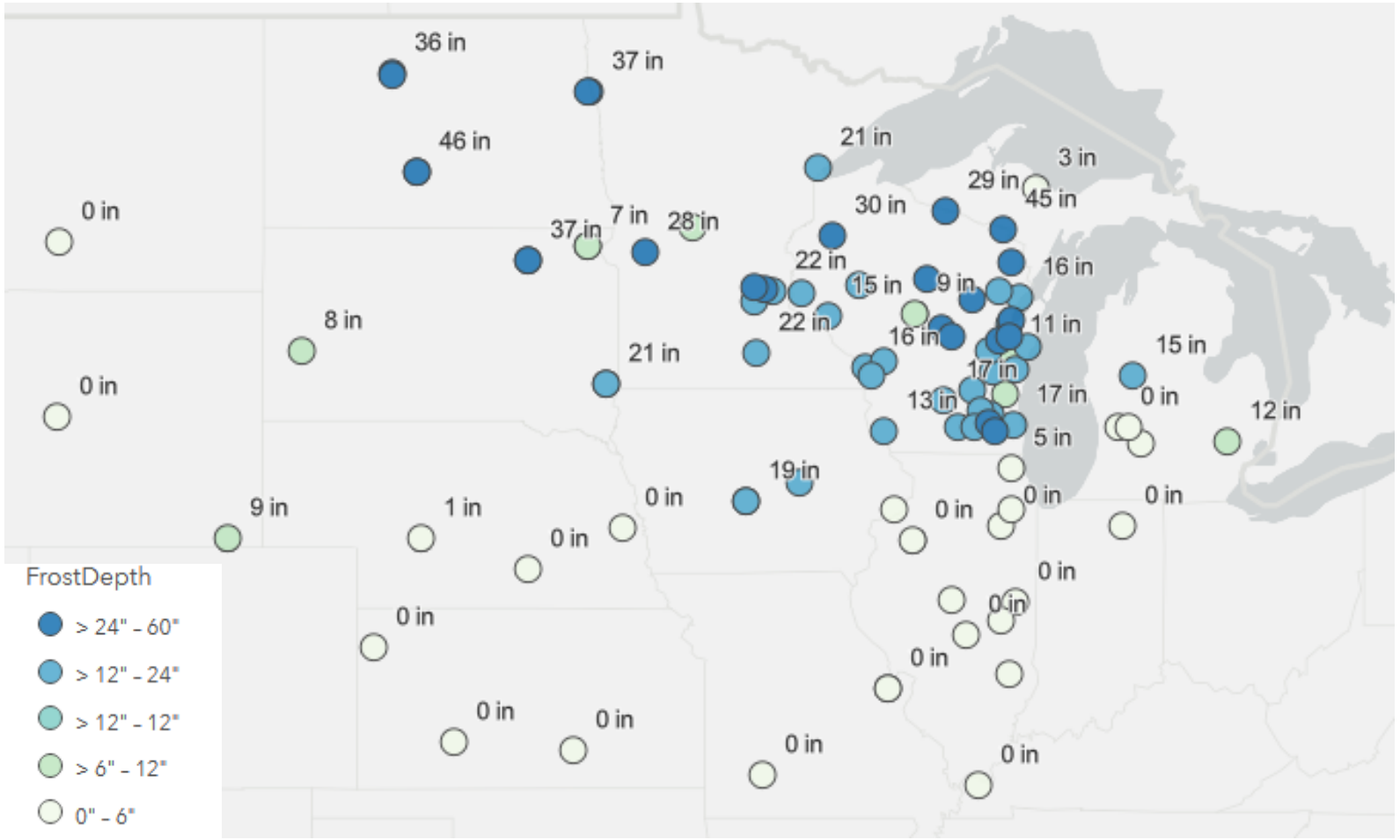
- 4” soils remain frozen in northern half of the region
- Warming trend from lack of snow, recent mild weather




Source: MRCC, https://mrcc.purdue.edu/RMP/currentMaps.html#banner

# Soil Temperatures & Frost Depth

- Soil frost depths still 30”+ in ND
- 14”+ in MN, WI, central IA
- Soil profile mostly thawed in eastern corn belt and central & northwest Plains

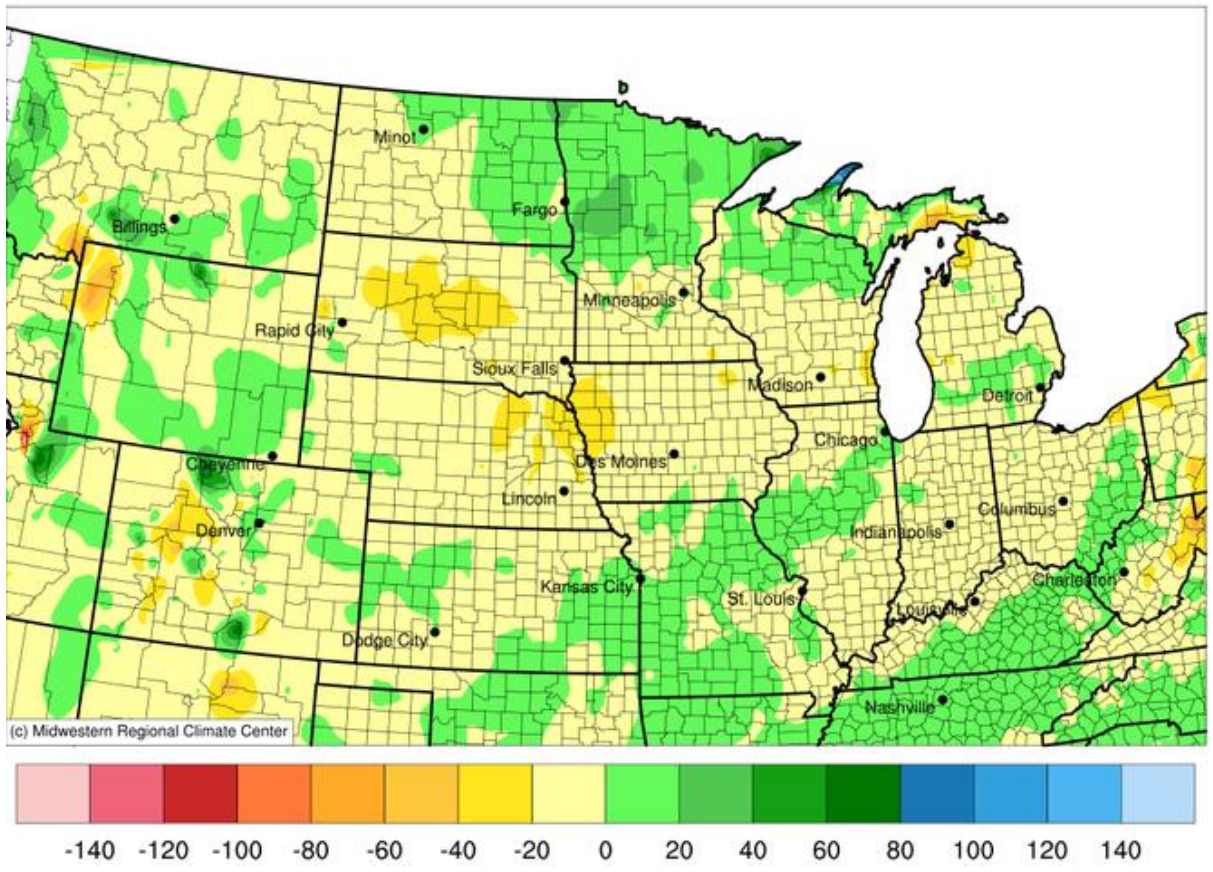



Source: NWS, https://www.weather.gov/ncrfc/LMI_FrostDepthMap

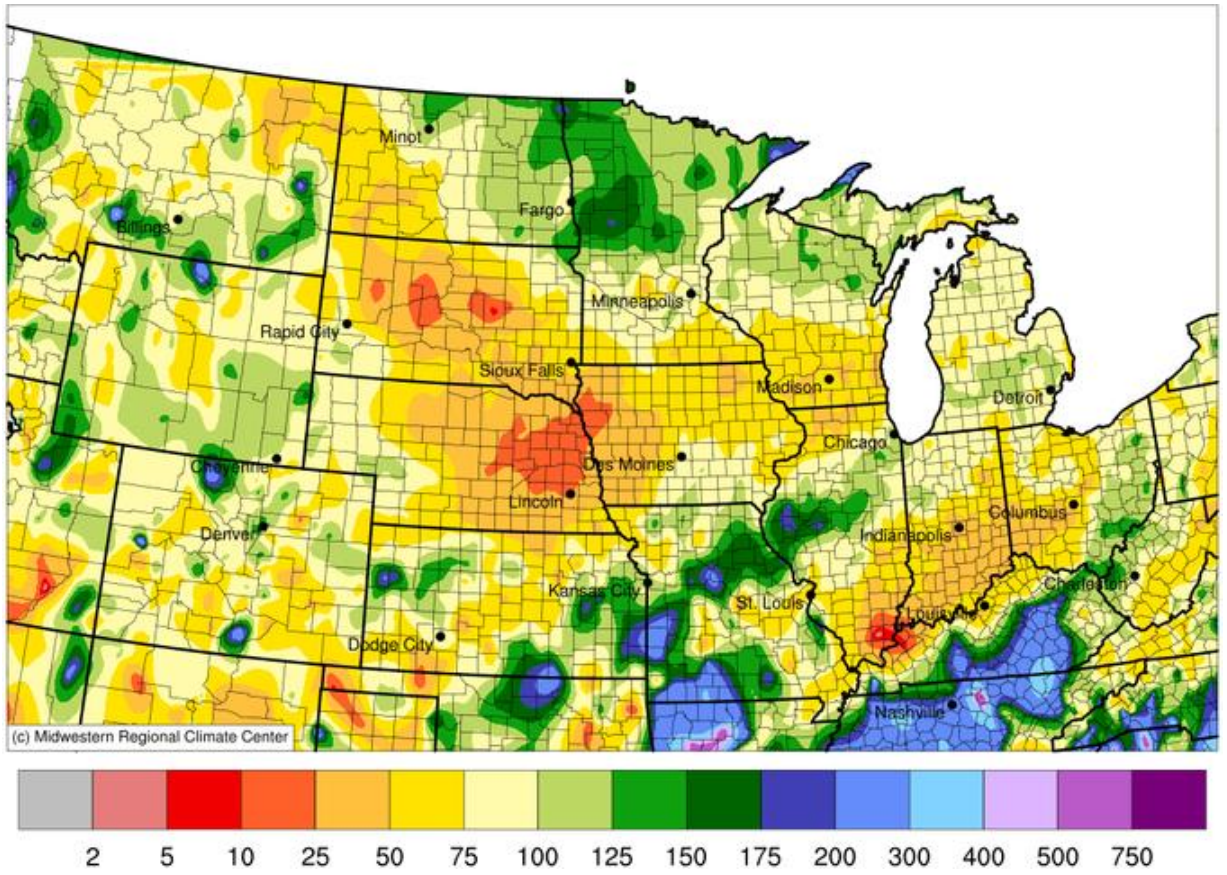
# Accumulated Snowfall (Since August 1st)

Source: MRCC, https://mrcc.purude.edu/CLIMATE/Maps

## Departure from Normal (inches)



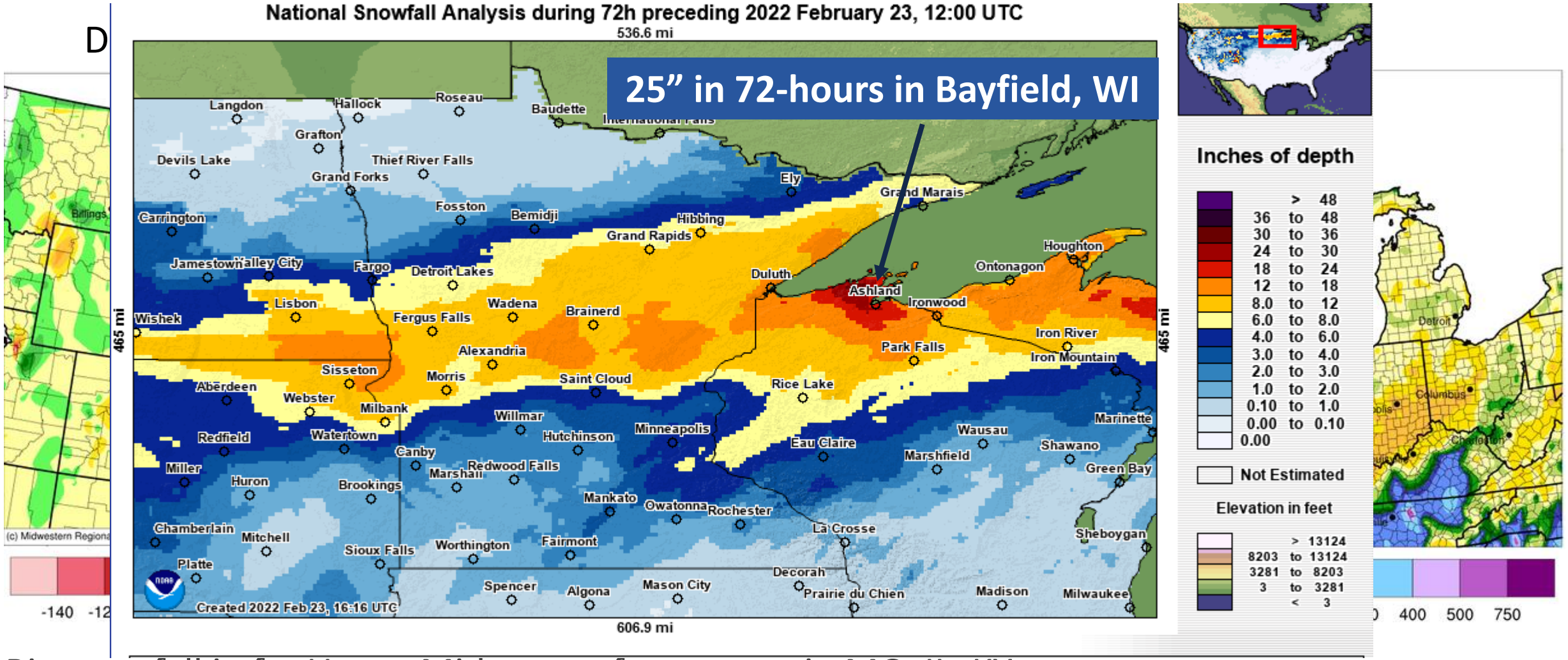

## Percent of Normal (%)




- Big snowfall in far Upper Midwest, a few storms in MO, IL, KY
- Below normal snowfall in central Plains – snow hole in eastern Nebraska

# Accumulated Snowfall (Since August 1st)

Source: MRCC, https://mrcc.purude.edu/CLIMATE/Maps

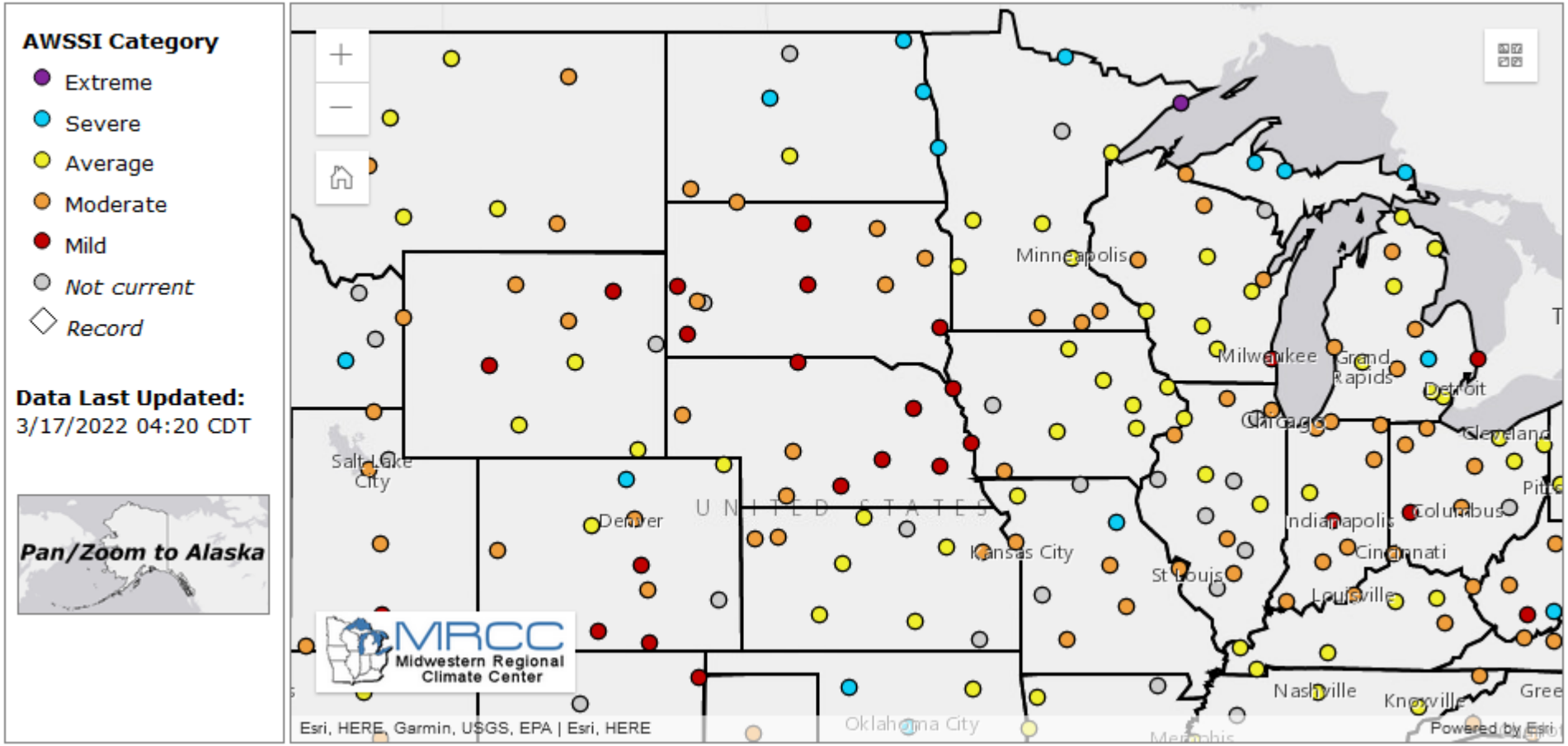



- Big snowfall in far Upper Midwest, a few storms in MO, IL, KY
- Below normal snowfall in central Plains – snow hole in eastern Nebraska

# Winter Severity So Far

## Accumulated Winter Season Severity Index (AWSSI)

- Represents cumulative winter season "severity" with respect to historical record
- Severity at all stations in red is less than 20th percentile
- "Mild" winter in NE, SD reflecting lack of snow
- Cooler weather & snow has parts of ND & MN in "severe" winter



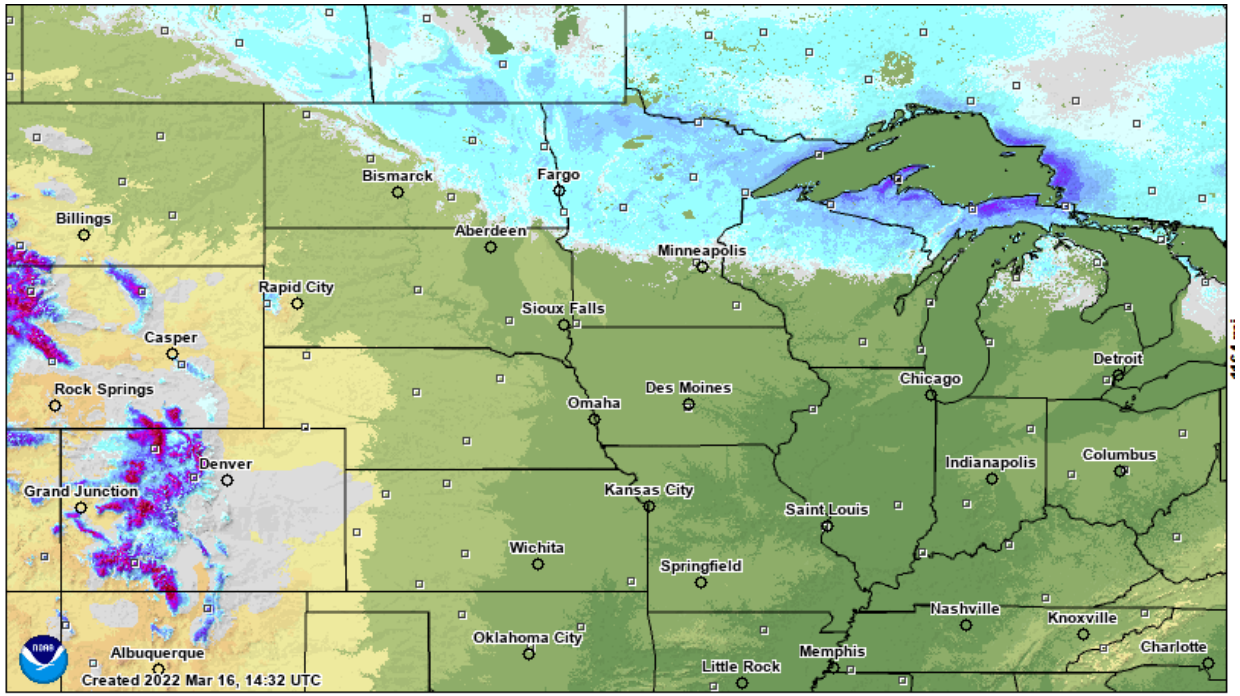

Source: MRCC, https://mrcc.purdue.edu/research/awssi/indexAwssi.jsp

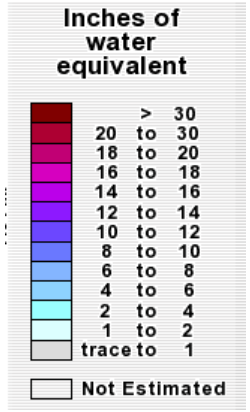
# Current Hydrology Conditions

# Snowpack

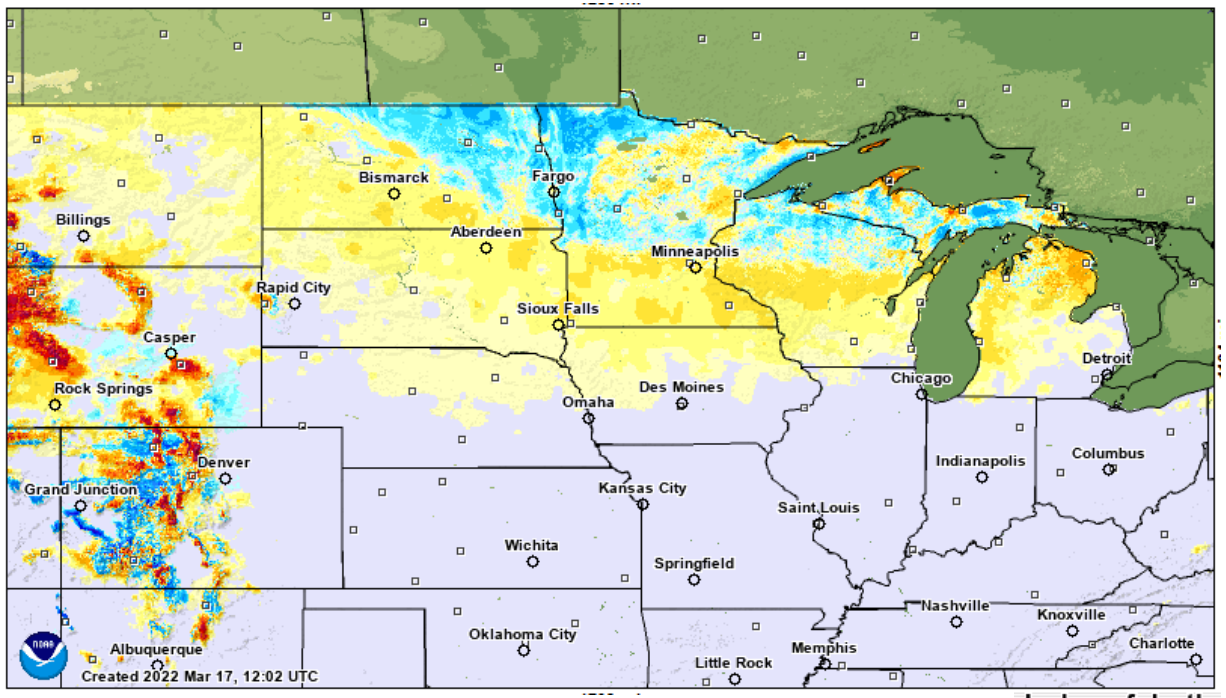
https://www.nohrsc.noaa.gov/interactive/html/map.html

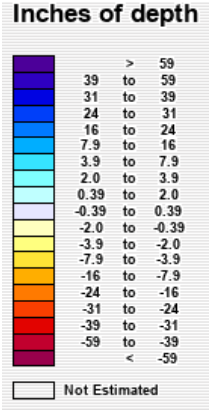
## Snow Water Equivalent - March 17, 2022




## Current Snow Depth Departure from Normal

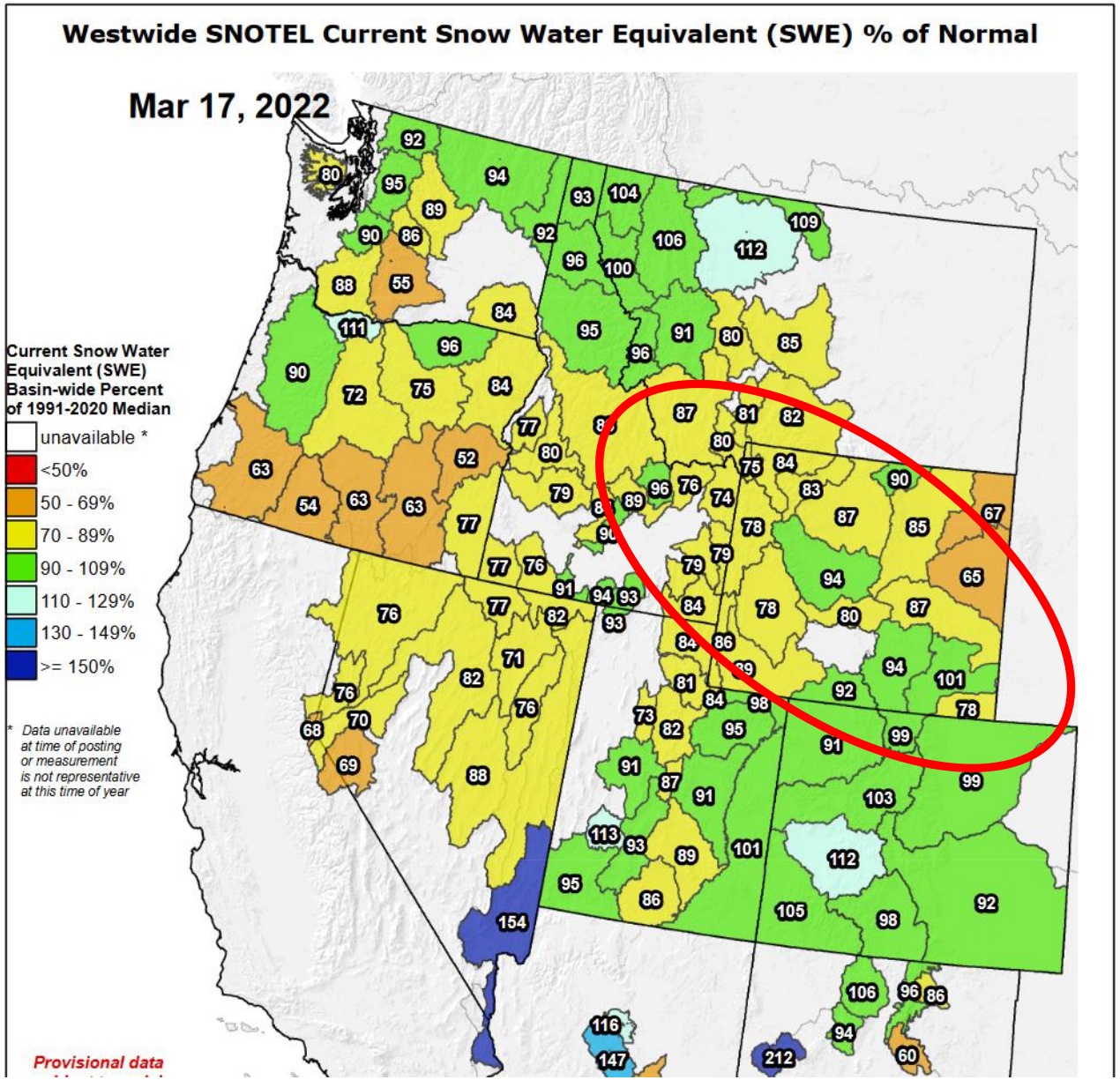



- Snowpack remains in eastern ND, northern MN, WI, MI
- Below normal snow depth for most of Upper Midwest, SD, eastern MT
- Northeast South Dakota normal snow depth mid-March is 2 – 5”

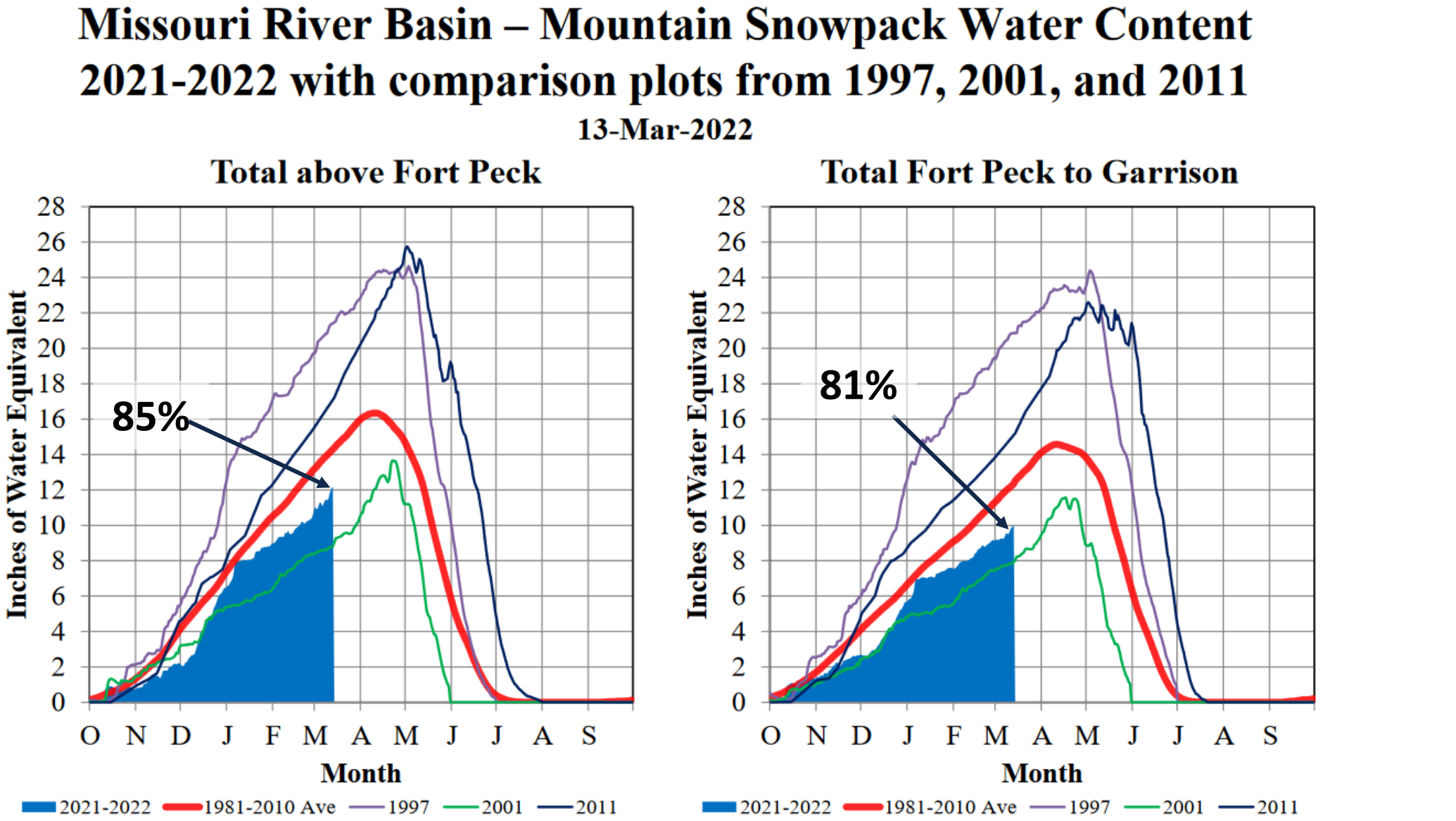
# Mountain Snowpack

- USDA/NRCS Snow Water Equivalent (% normal)
- Northern basins mostly 75 – 95% of normal SWE, closer to normal in CO
- Missouri Headwaters at 80% of normal
- Plattes at 92% and 86%, north and south



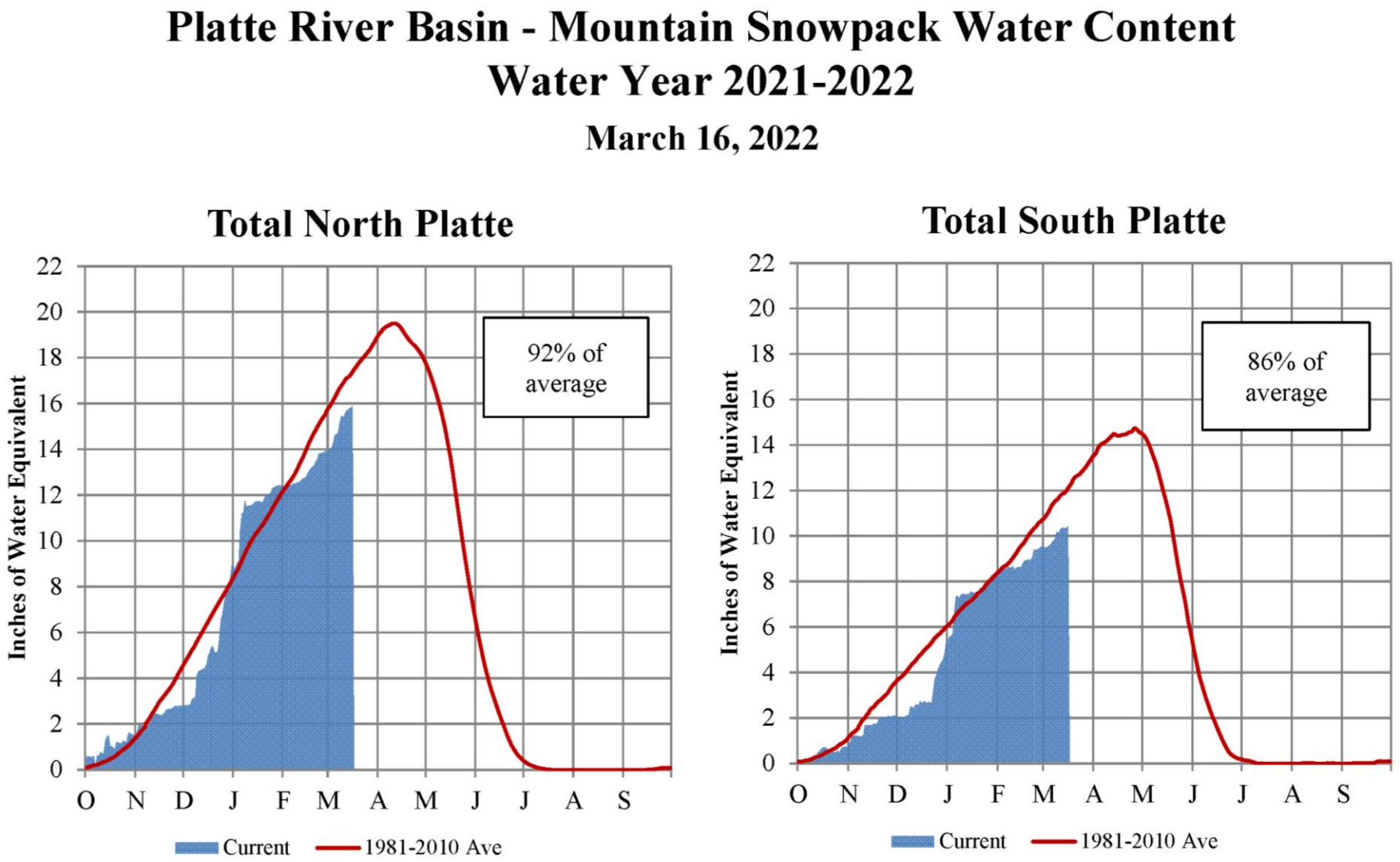

https://www.wcc.nrcs.usda.gov/ftpref/data/water/wcs/gis/maps/west_swepctnormal_update.pdf

# Mountain Snowpack – Missouri River Basin



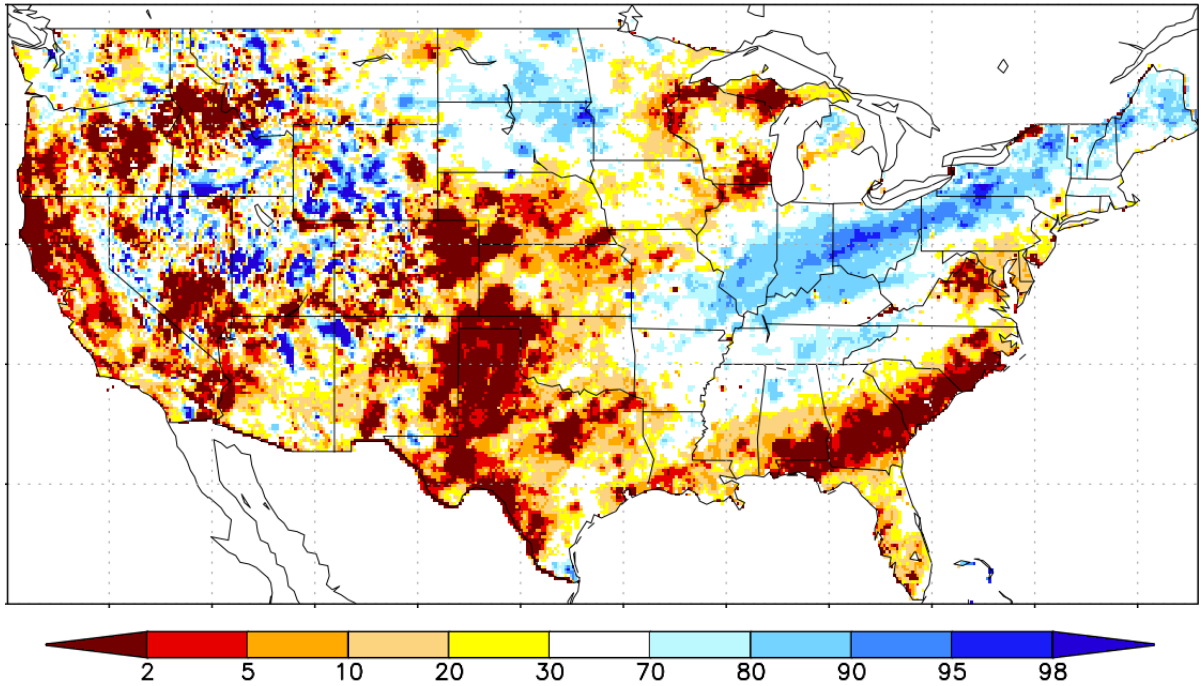

http://www.nwd-mr.usace.army.mil/rcc/reports/snow.pdf

# Mountain Snowpack – Missouri River Basin

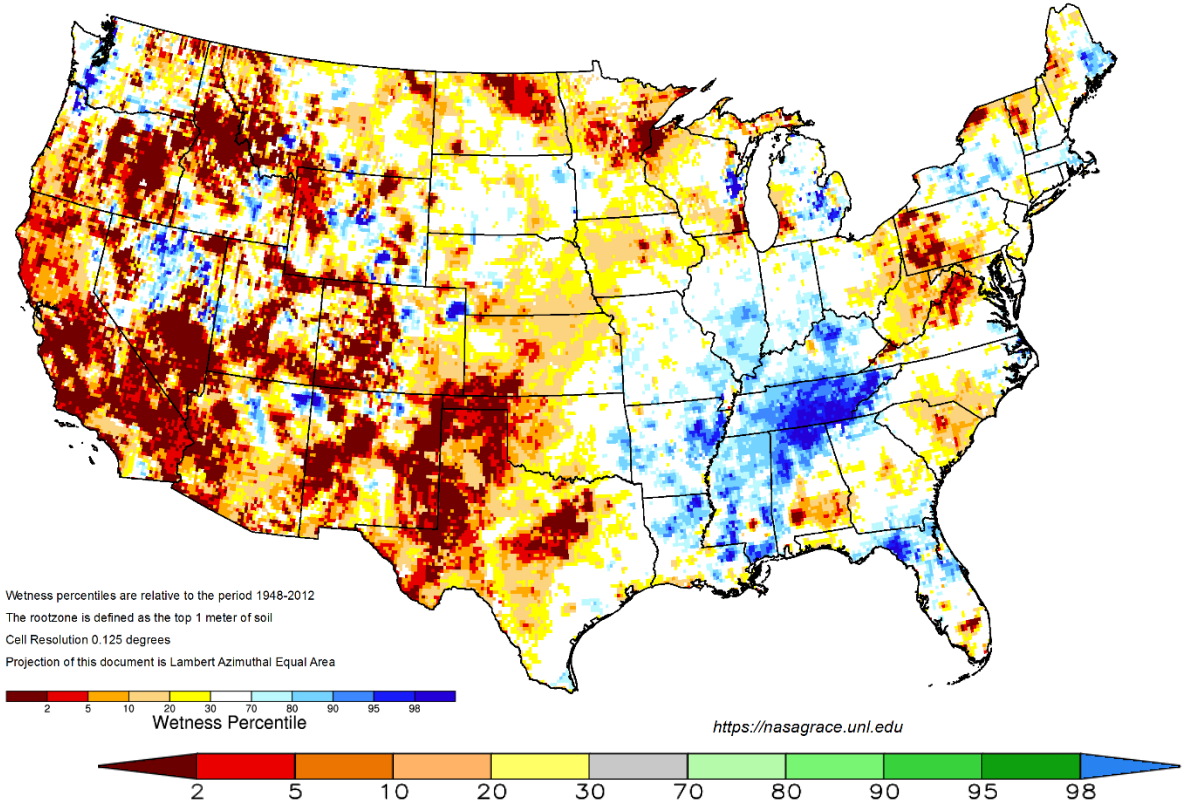



https://www.nwd-mr.usace.army.mil/rcc/reports/platte_snow.png

# Soil Moisture: 0 – 40” Percentiles




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

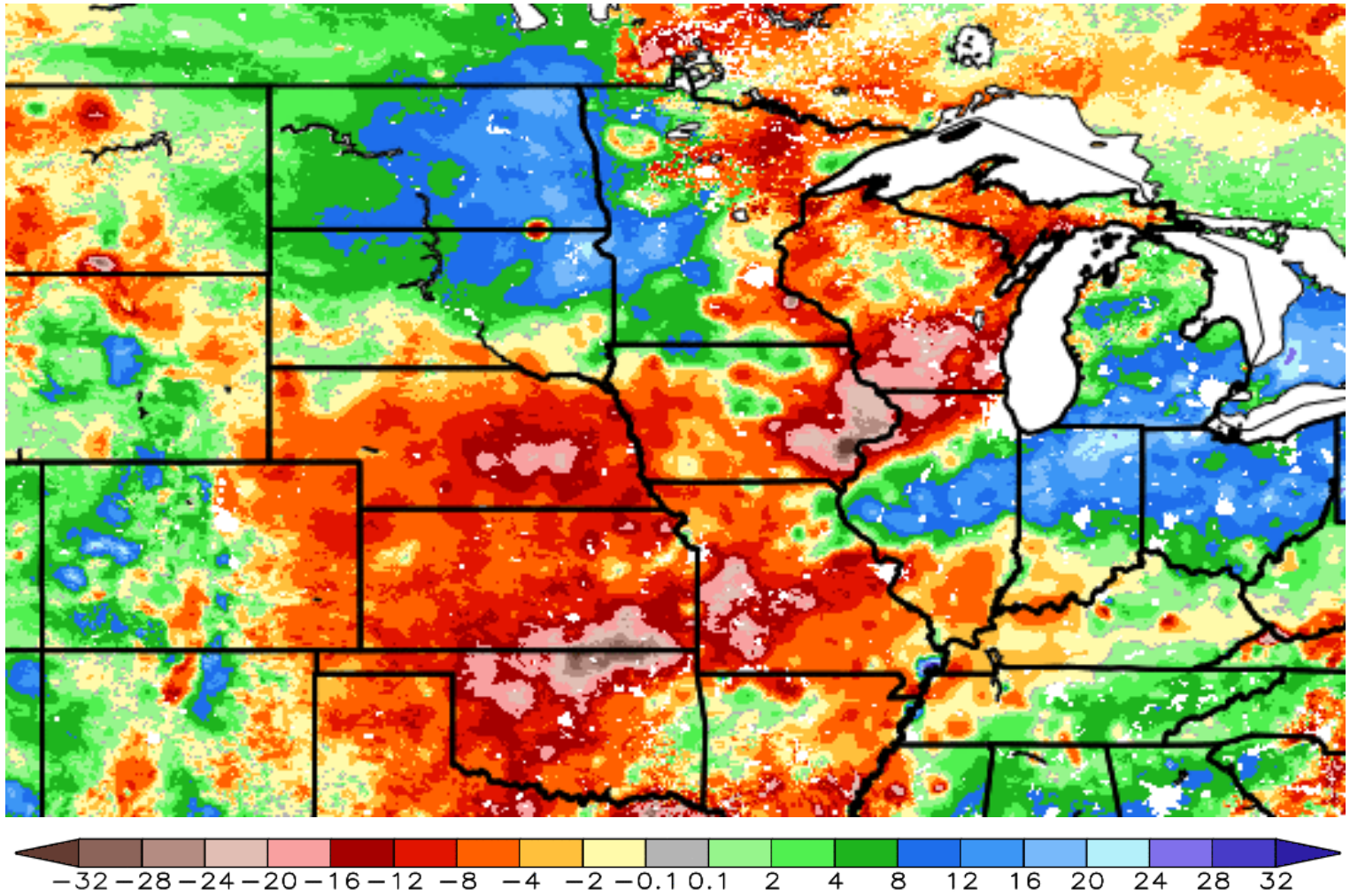



Source: https://nasagrace.unl.edu/

- Very dry soils from central Plains through parts of Iowa, Missouri, Illinois, Wisconsin
- Moisture in areas of NE, KS, northern IL, southern WI are less than 5$^{th}$ percentile (1-in-20 years)
- Wet soils in Ohio Valley, excessively so in southern IN and western OH

# Soil Moisture: 1-year change (% water content)

- Parts of WI, IL, IA, KS, NE have lost 6 – 8” of moisture from top 40” since last year
- Parts of the eastern Dakotas, IL, IN, OH, MI have gained 4-6” of moisture in top 40” since last year



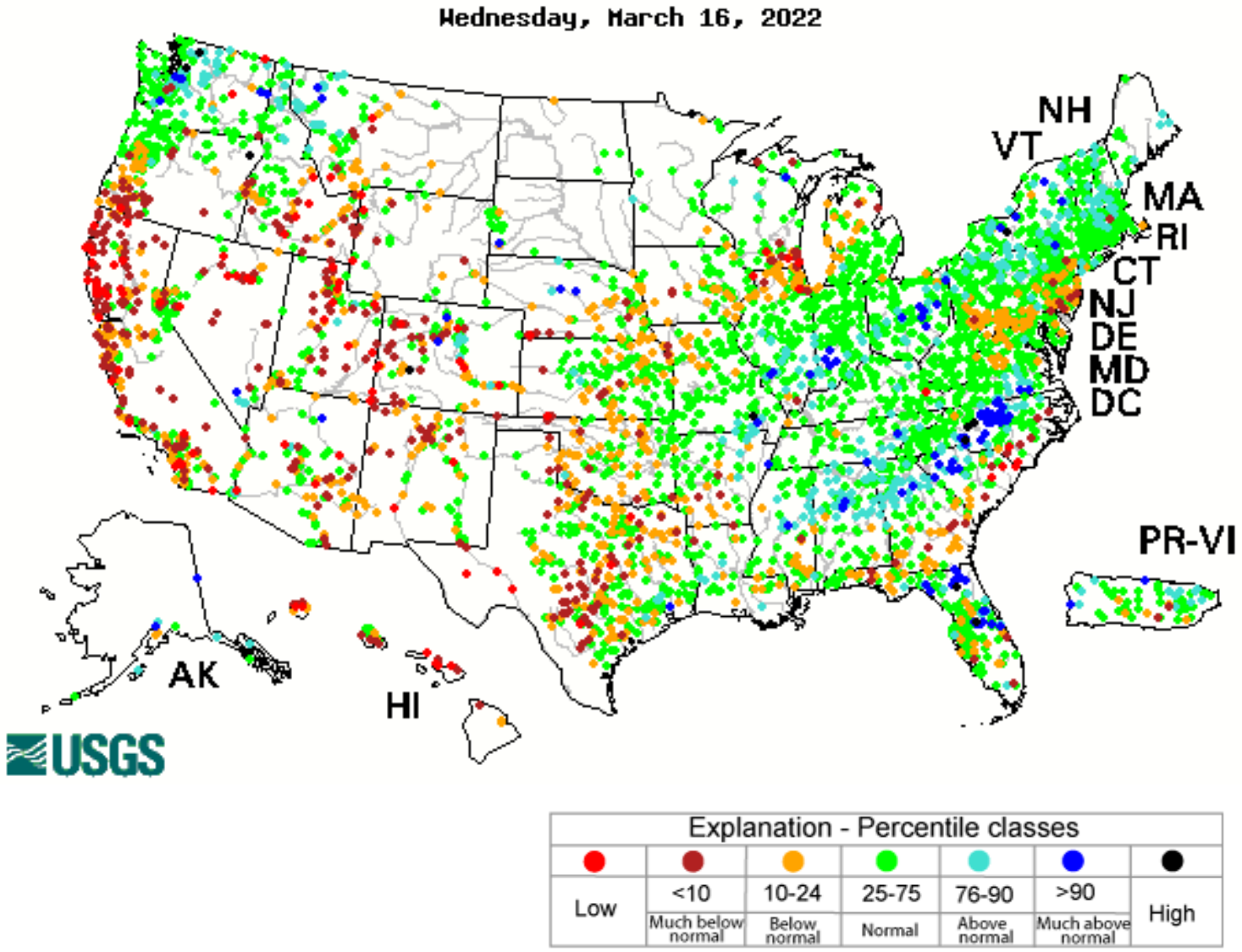

Source: weather.msfc.nasa.gov/sport/case_studies/lis_CONUS.html

# Streamflow

- Streamflow (not affected by ice) mostly below normal in CO, eastern NE, eastern IA, northern IL

- Near to above average streamflow in Ohio Valley

## 7-day Average Streamflow




USGS Dashboard: https://dashboard.waterdata.usgs.gov/app/nwd/?aoi=default

Source: waterwatch.usgs.gov

# Flooding

- Gages along Wabash & western Ohio Rivers still at minor flood stage

- No gages currently above flood stage in eastern Ohio, Upper Mississippi, or Missouri Basins

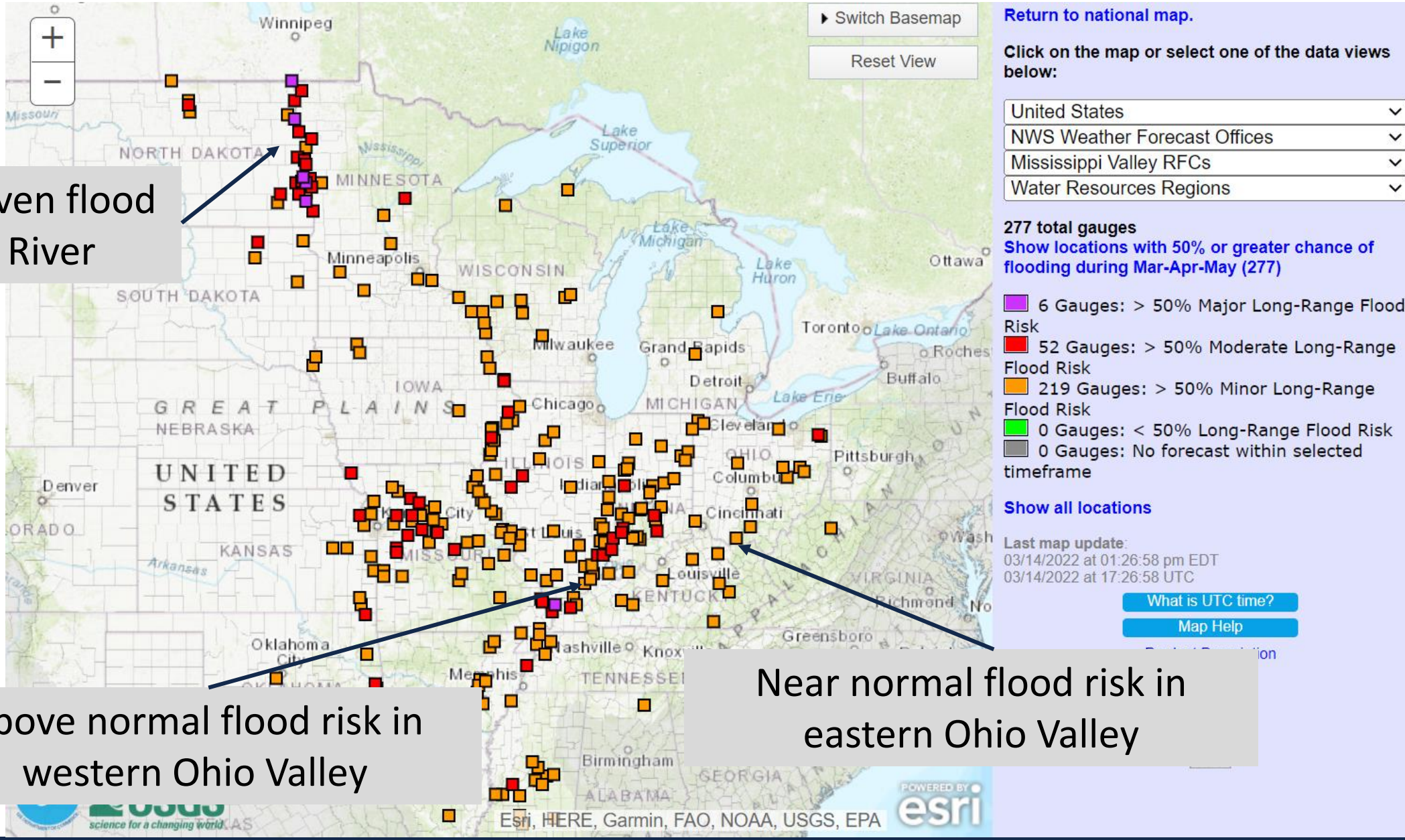
## Gages Currently at/above Flood Stage


Source: https://www.weather.gov/ohrfc/

# Flooding

## Gages with > 50% chance of flooding in Spring

Source: https://www.weather.gov/ohrfc/




Snowmelt-driven flood risk in Red River

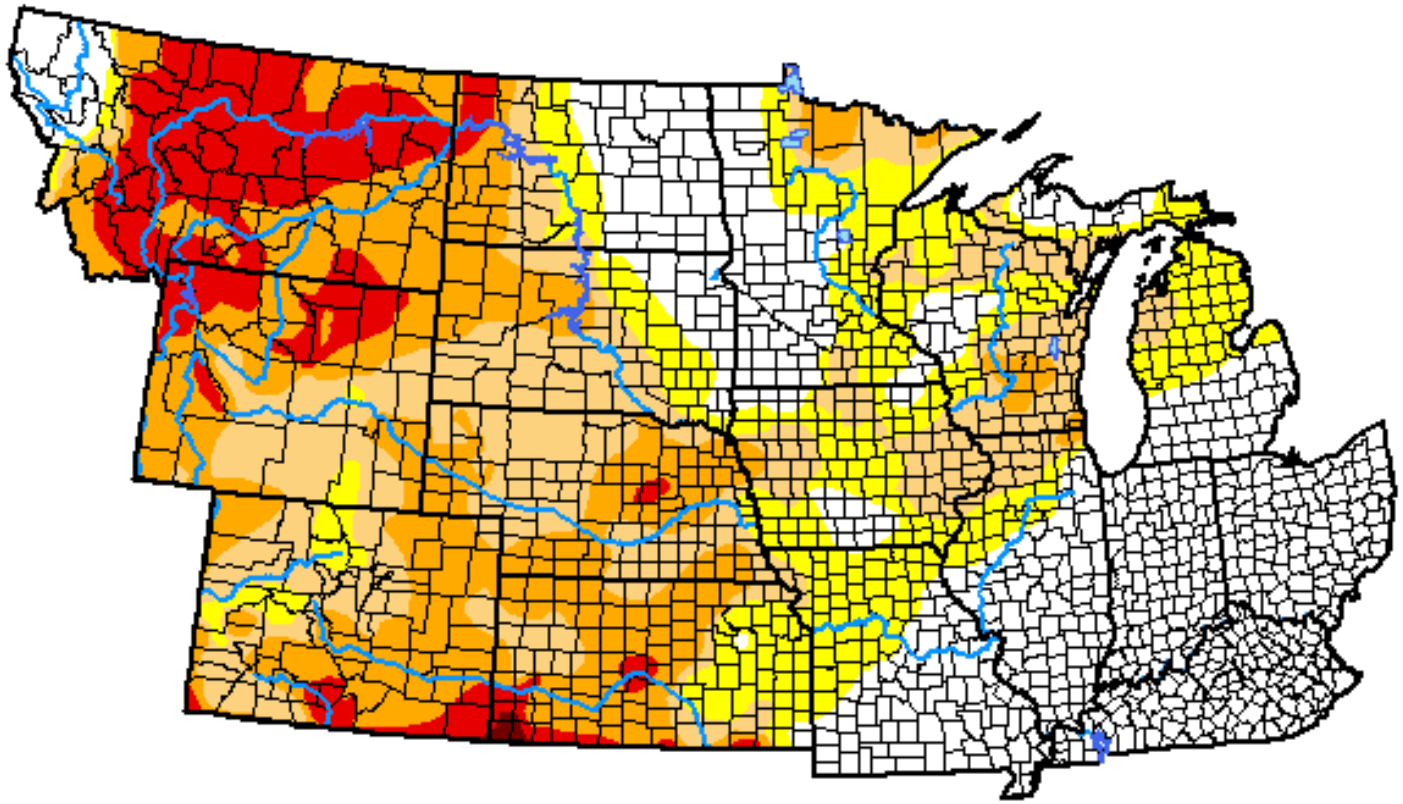
Above normal flood risk in western Ohio Valley

Near normal flood risk in eastern Ohio Valley

# Drought

## U.S. Drought Monitor
## NWS Central Region

https://droughtmonitor.unl.edu/



**March 15, 2022**
*(Released Thursday, Mar. 17, 2022)*
**Valid 8 a.m. EDT**

*Drought Conditions (Percent Area)*

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|---|---|---|---|---|---|---|
| **Current** | 30.31 | 69.69 | 53.60 | 32.19 | 10.12 | 0.13 |
| **Last Week** *03-08-2022* | 30.28 | 69.72 | 53.57 | 31.49 | 8.94 | 0.62 |
| **3 Months Ago** *12-14-2021* | 32.68 | 67.32 | 47.64 | 29.04 | 12.47 | 3.89 |
| **Start of Calendar Year** *01-04-2022* | 33.94 | 66.06 | 46.53 | 27.27 | 10.67 | 1.77 |
| **Start of Water Year** *09-28-2021* | 31.08 | 68.92 | 50.85 | 37.30 | 18.35 | 3.17 |
| **One Year Ago** *03-16-2021* | 28.16 | 71.84 | 38.50 | 21.47 | 6.34 | 1.36 |

*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*

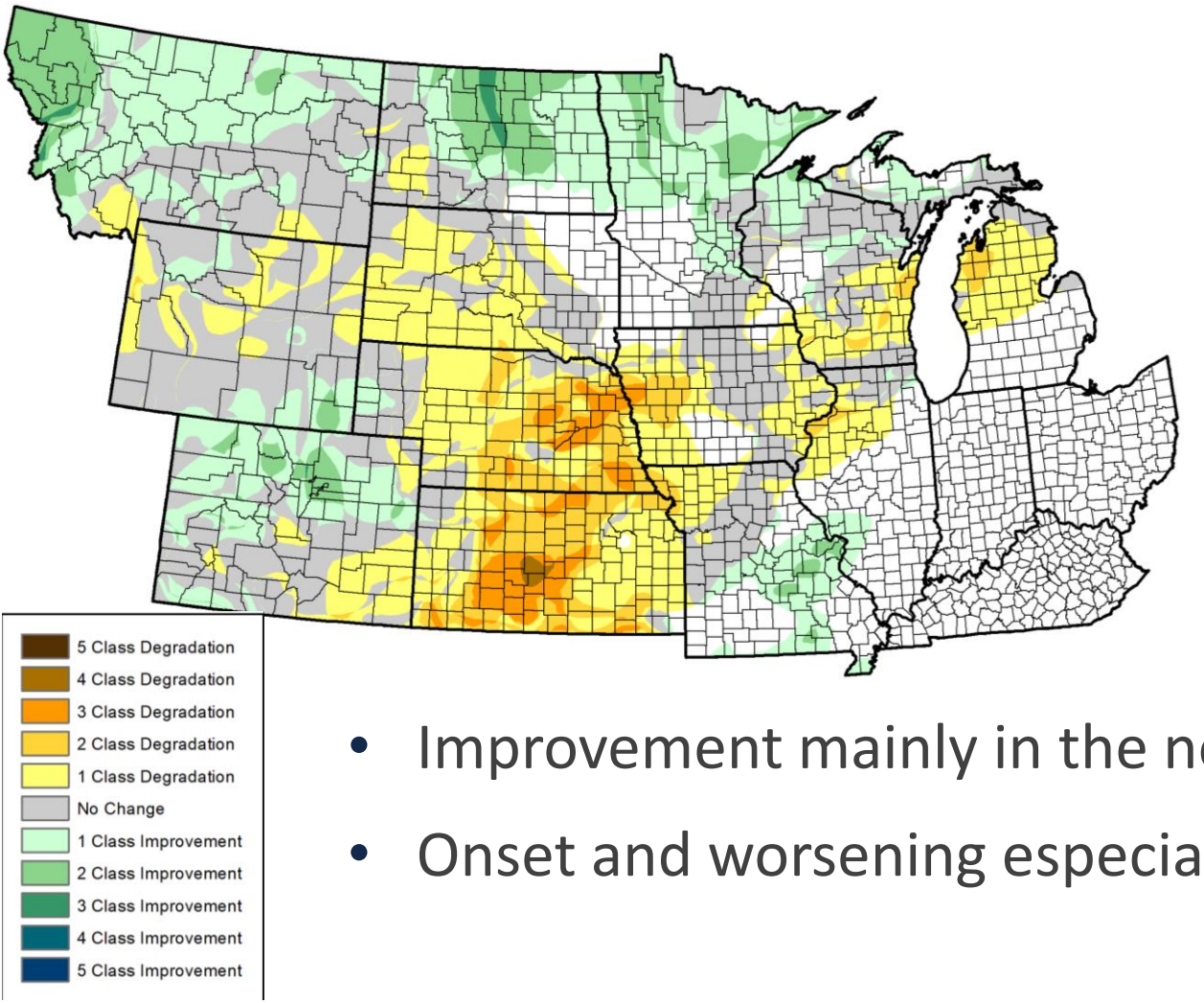
*Author:*
Adam Hartman
NOAA/NWS/NCEP/CPC

- 53% of the north-central region in moderate to exceptional drought
- Over half of the region has been in at least D0 since August 2020

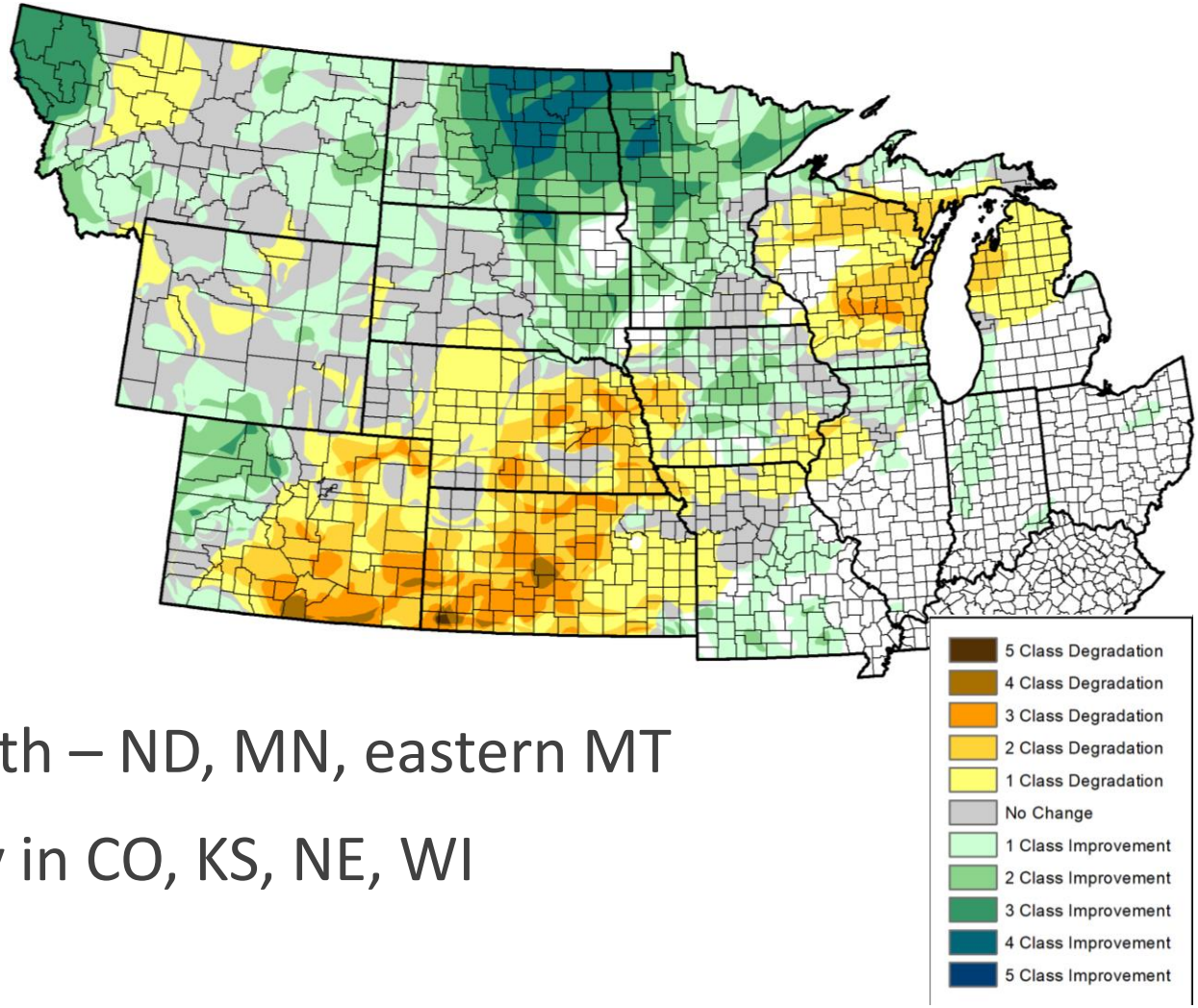
# Drought Change

https://droughtmonitor.unl.edu/Maps/ChangeMaps.aspx

## Change Since December 14



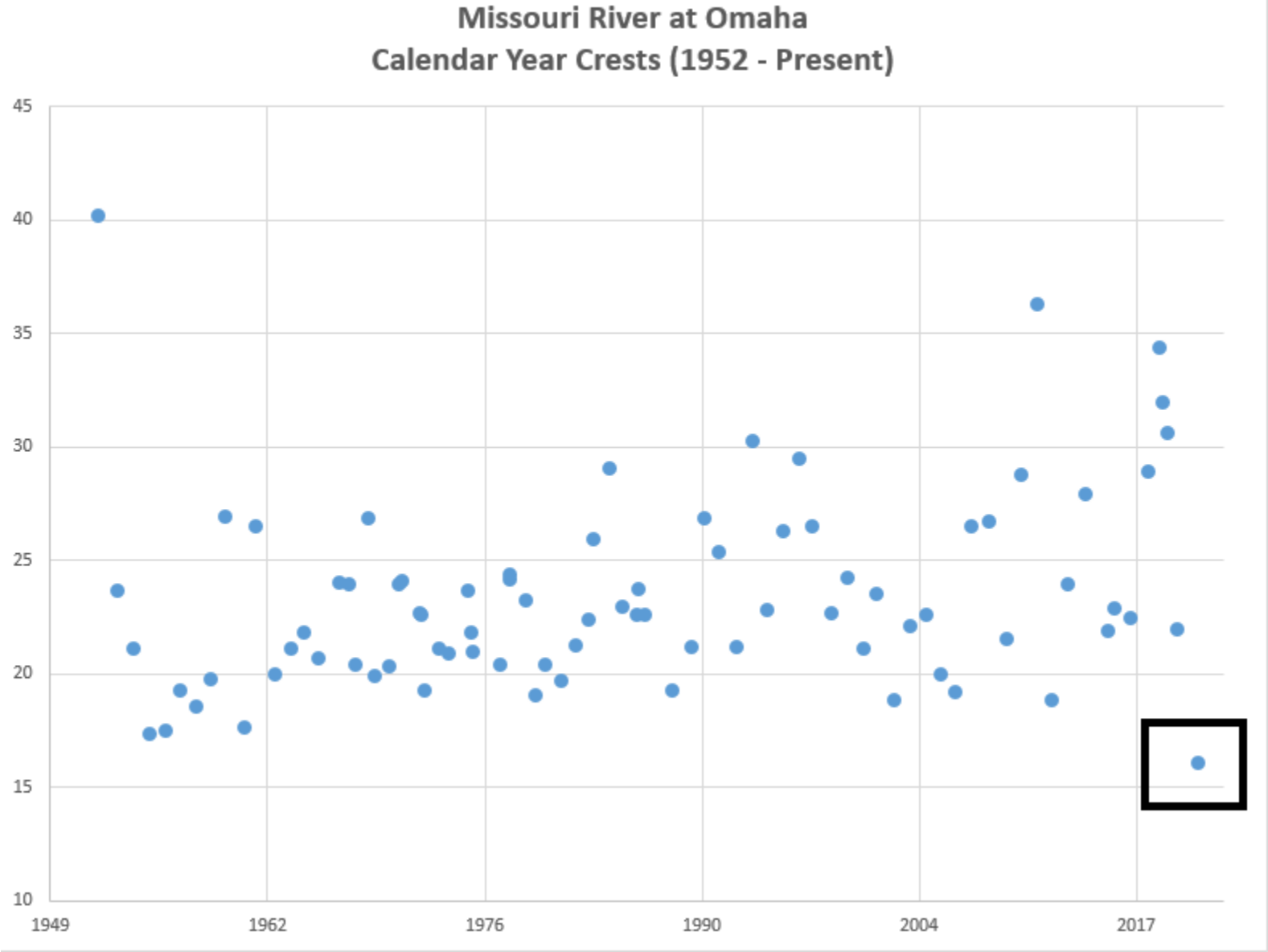

## Change Since September 28




- Improvement mainly in the north – ND, MN, eastern MT
- Onset and worsening especially in CO, KS, NE, WI

# Streamflow Drought

- Highest MO River peak in Omaha in 2021 was the lowest on record (since 1952)

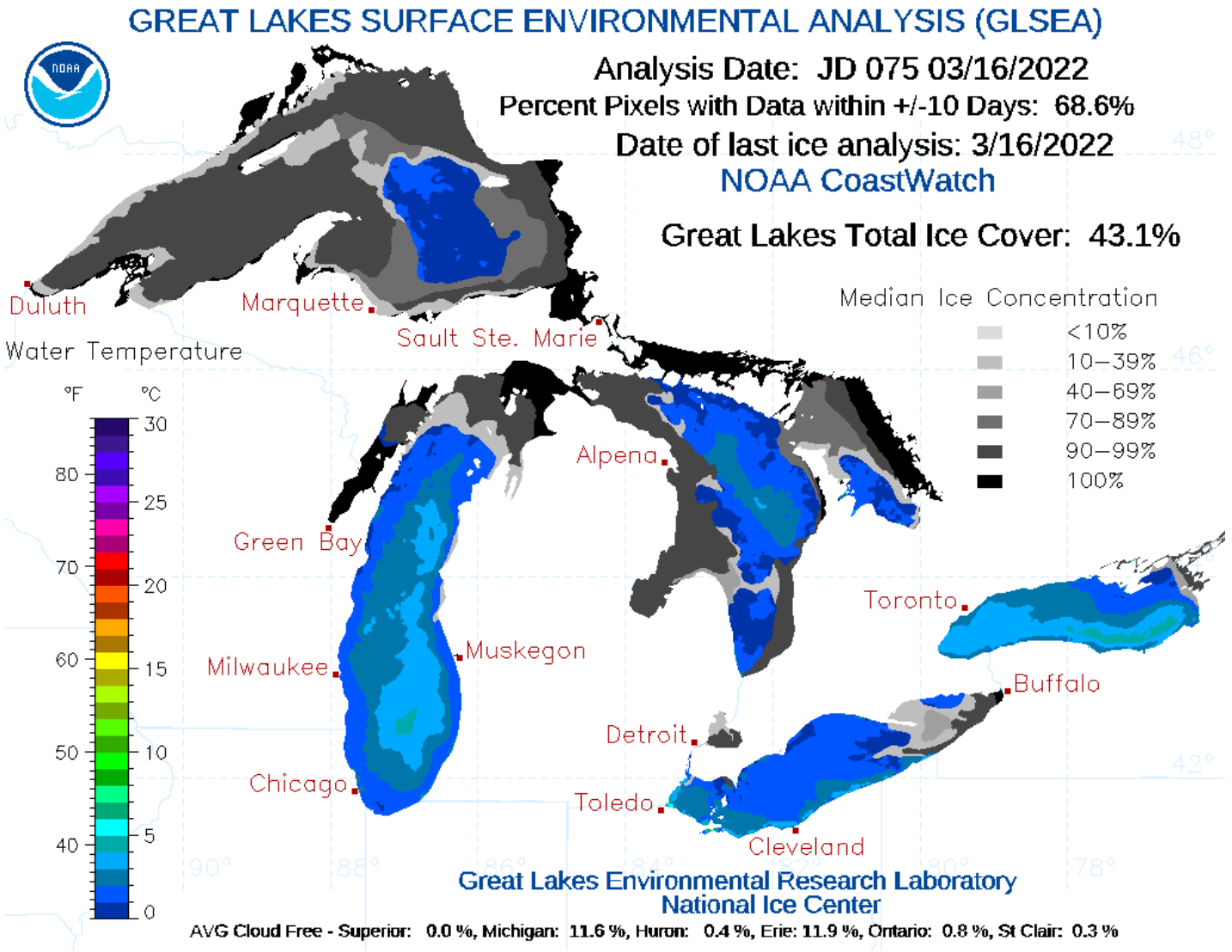



Courtesy of David Pearson (NWS Omaha)

# Streamflow Drought – Omaha


# Great Lakes Temperatures & Ice

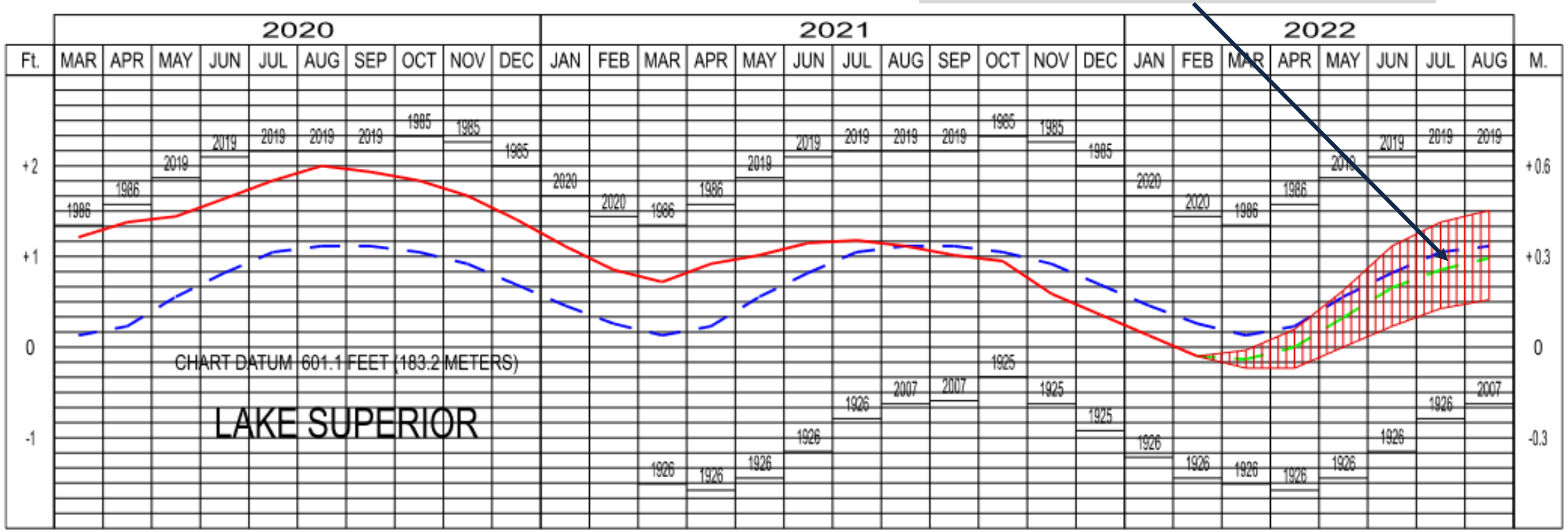
- Quite a bit of ice cover still on Lakes, cooler temperatures in response to January and February
- Total 43.1% ice cover
  - 7.8% this time in 2021
  - 41% in 2019
- Well above average in Superior, near average Michigan-Huron, below average Erie
- More extensive ice helps buffer shoreline against spring storms, erosion



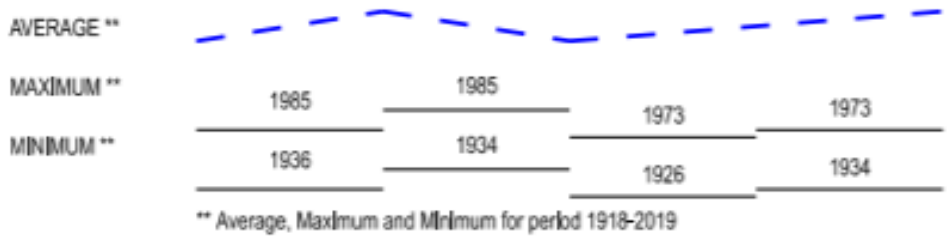

Source: https://www.glerl.noaa.gov/res/glcfs/glsea.html

# Great Lakes Levels – Superior

Forecast near normal levels through summer



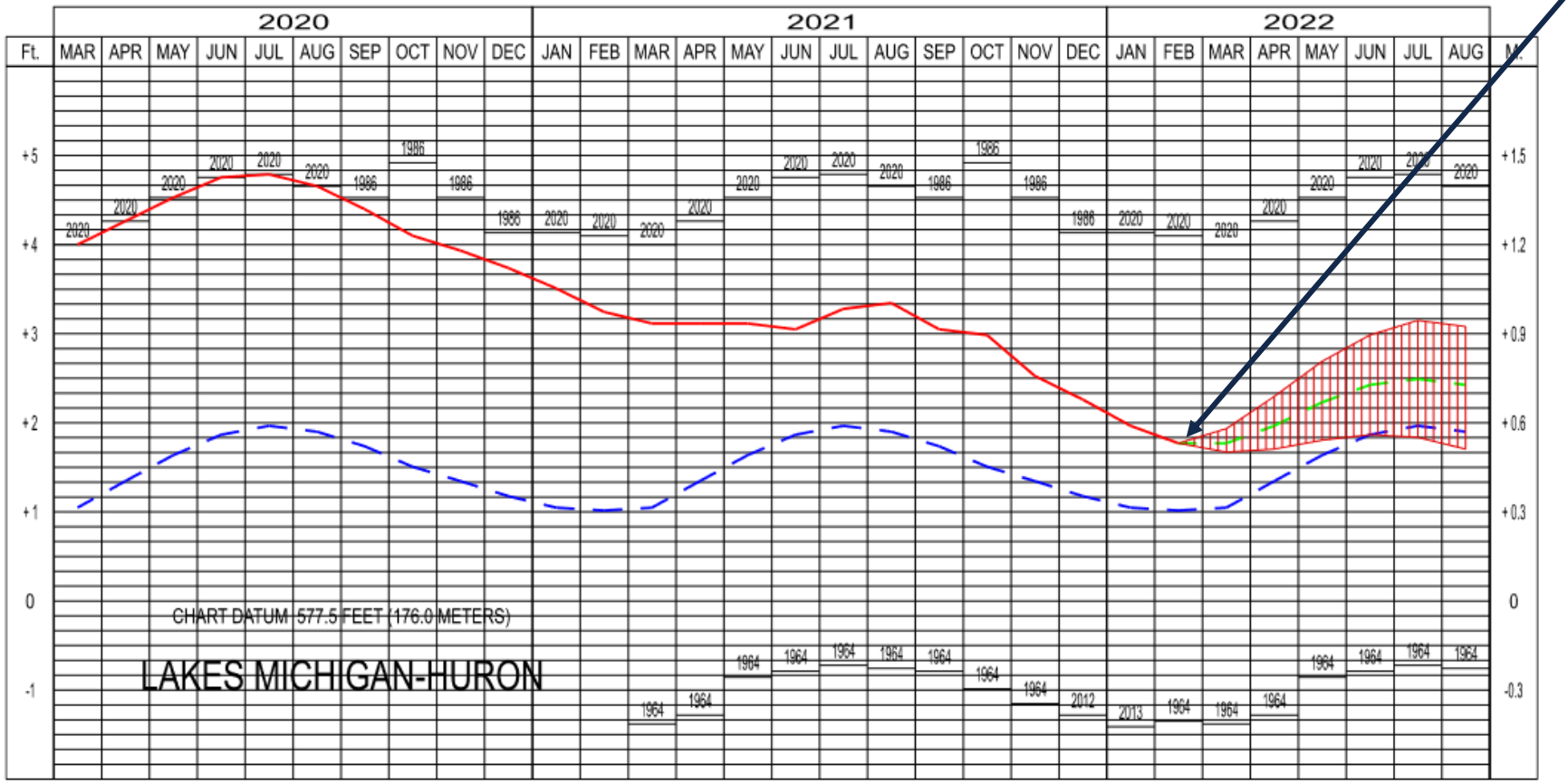





https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Water-Levels/Water-Level-Forecast/Monthly-Bulletin-of-Great-Lakes-Water-Levels/

# Great Lakes Levels – Michigan-Huron

Still above normal but much less extreme





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# Great Lakes Levels – Erie

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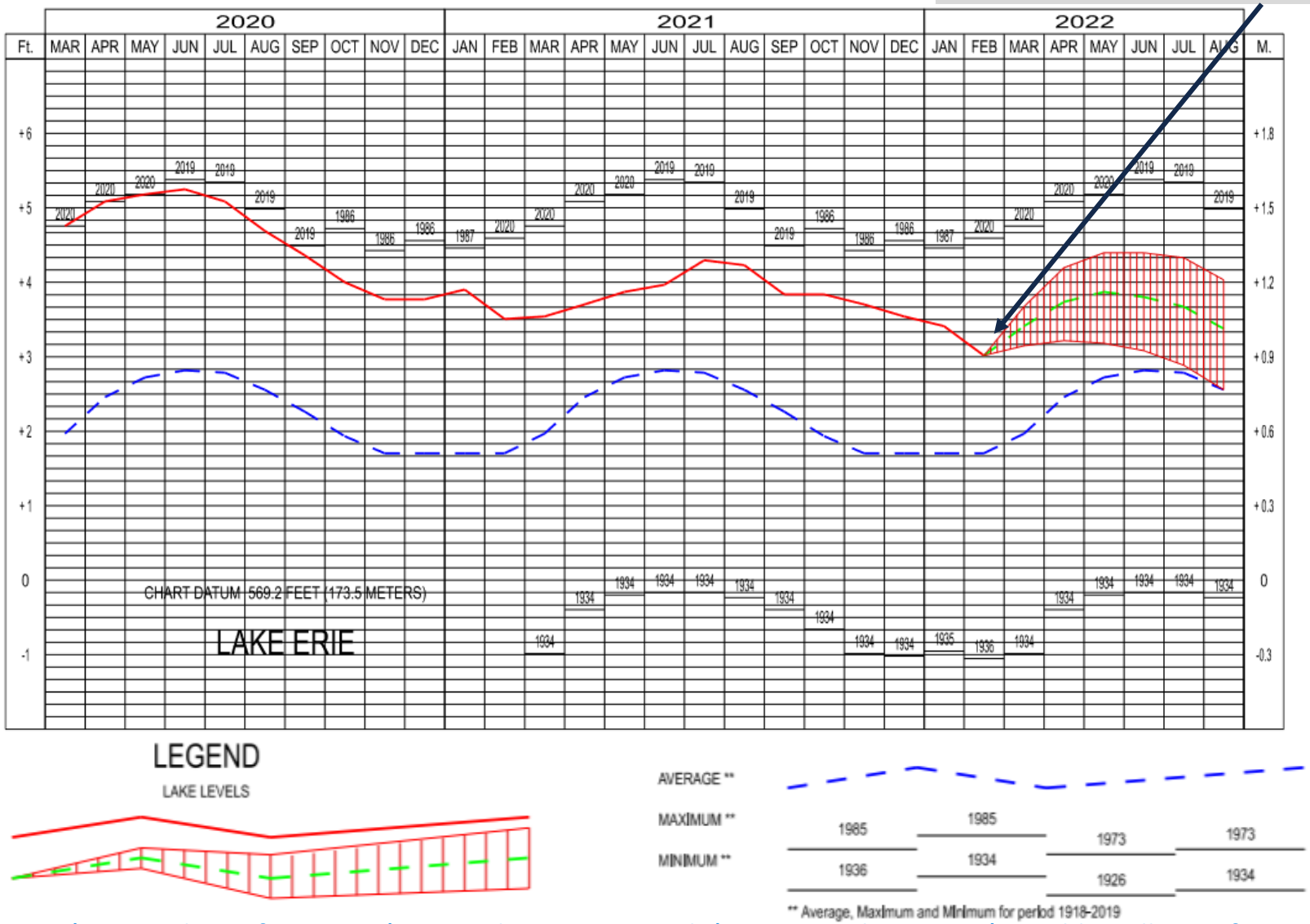
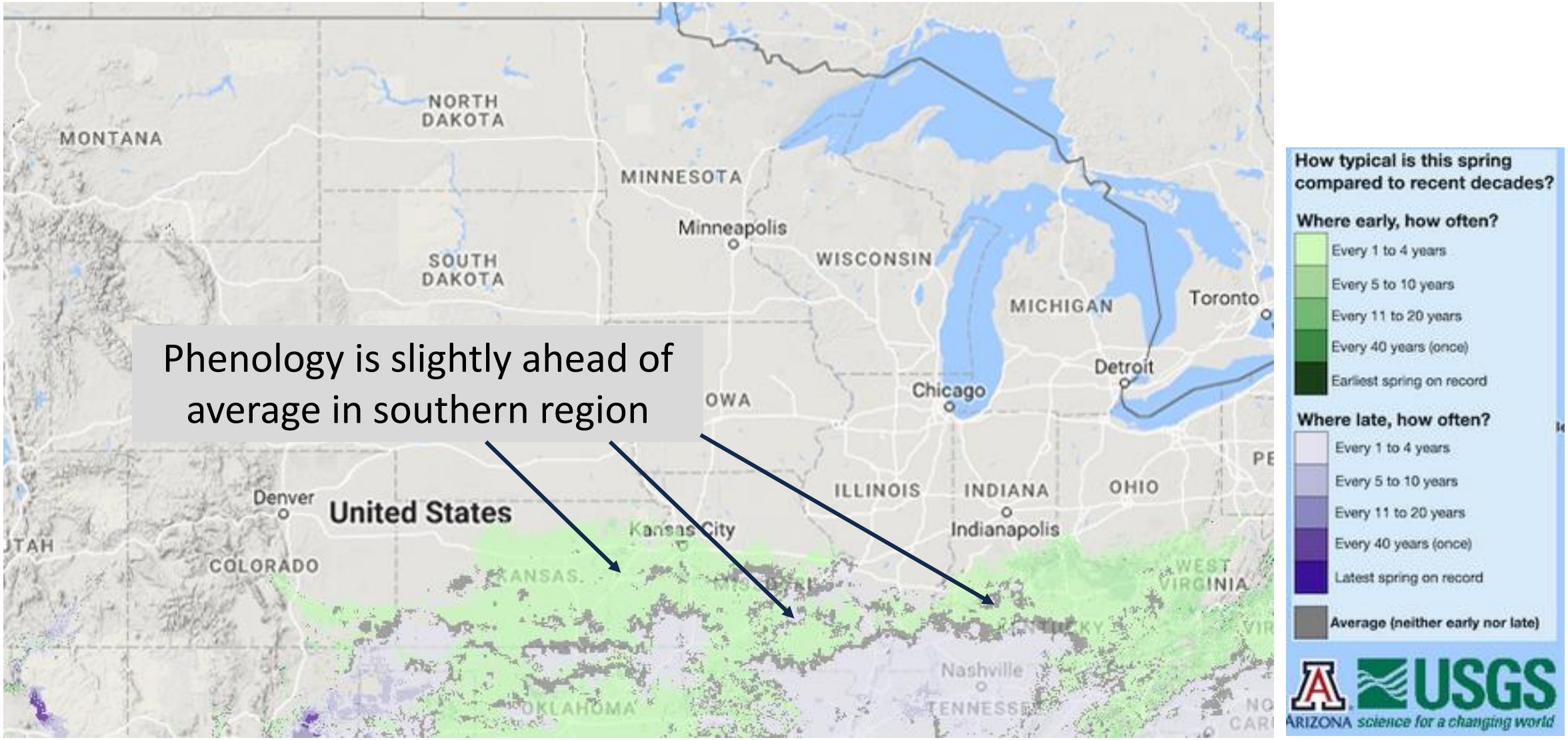






https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Water-Levels/Water-Level-Forecast/Monthly-Bulletin-of-Great-Lakes-Water-Levels/

# Spring is Upon Us




https://www.usanpn.org/news/spring

# Impacts

# Agriculture Impacts

- Concerns of potentially toxic levels of total dissolved solids (TDS) for livestock in North Dakota, legacy of 2 years of drought
- Wheat starting to break dormancy along KS-NE border, close to average
- Drier conditions in Plains helping with calving
- Fruit tree dormancy break in southern Midwest – watch for risk of freeze injury


# Significant Weather Impacts

- Severe thunderstorms from IA to OH on March 5th:
  - 14 tornadoes, 7 fatalities
  - EF-4 in south-central Iowa – farthest north EF-4 this early in the year
  - Reports of golfball to baseball size hail in SW IA
  - Severe winds – 81 mph measured in Rockford, IL
- Heavy rain caused minor urban and flash flooding in Ohio
- Travel impacts from very snowy February in MN

Damage near Winterset, IA
Source: NWS Des Moines

Urban flooding in Dayton, OH
Source: Cox Media

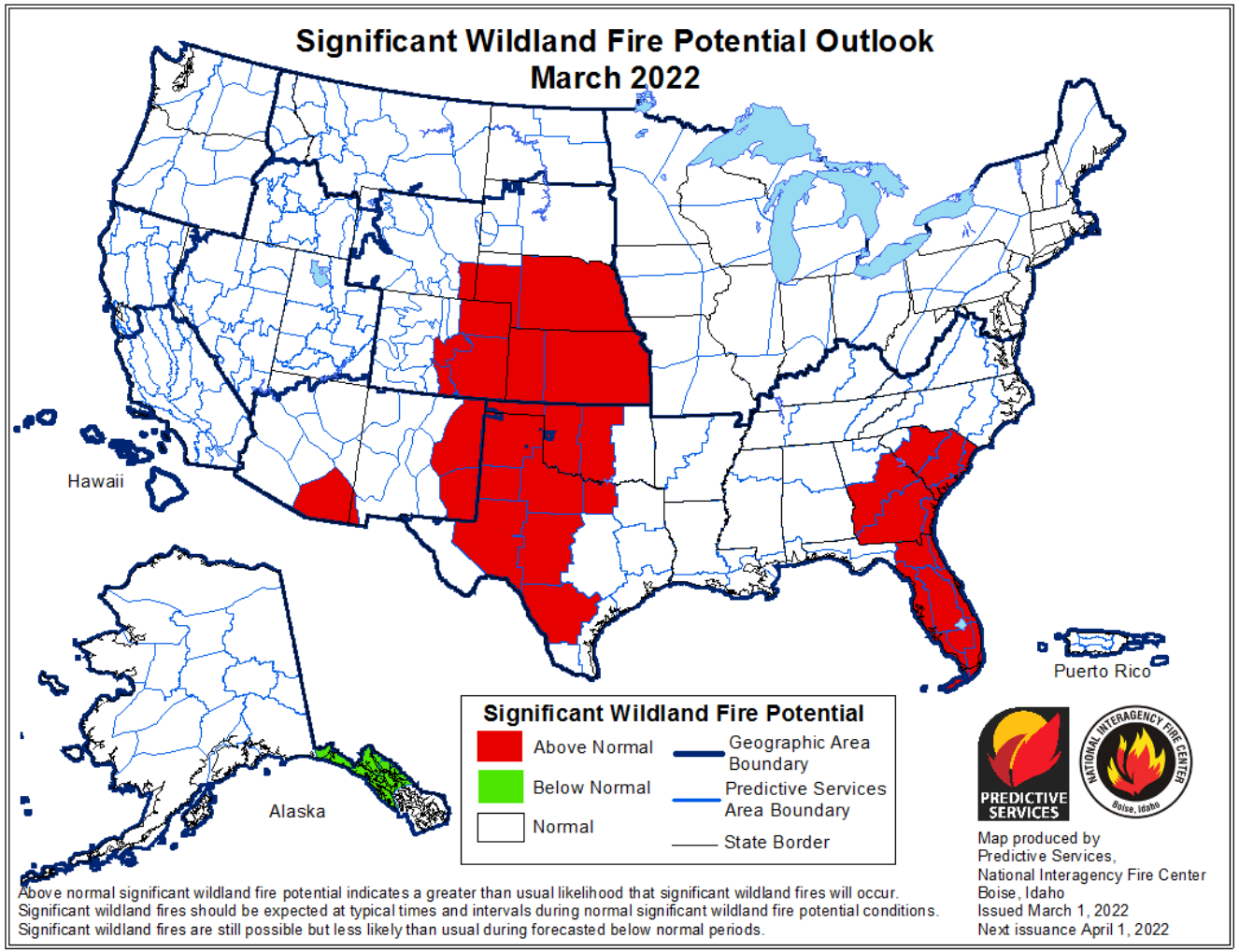
# Other Impacts

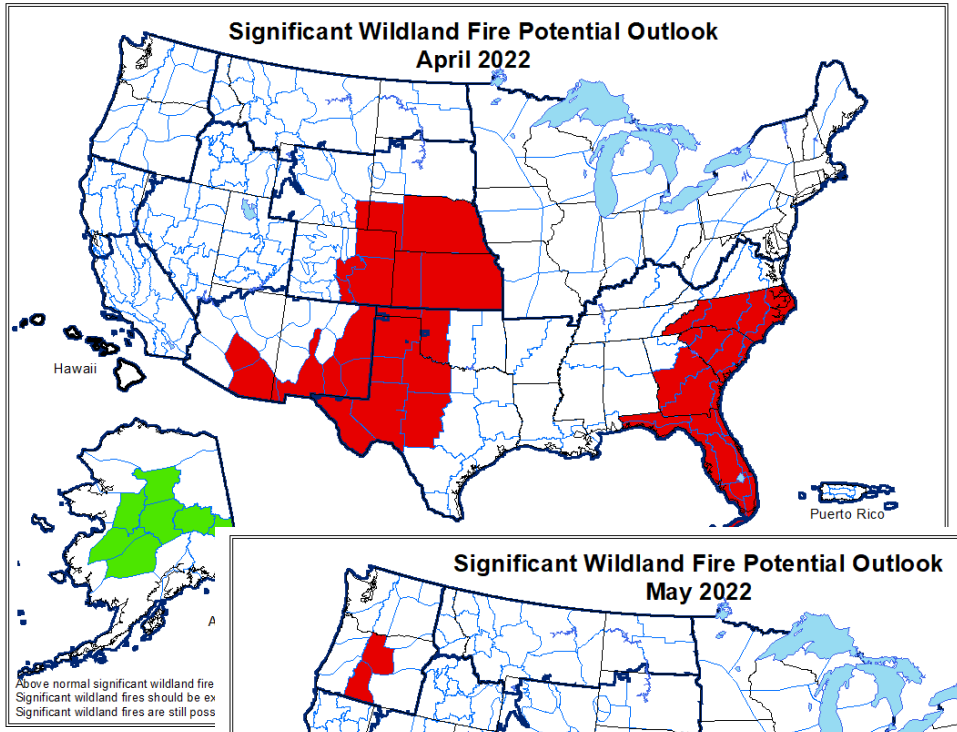
- Several large fires in western KS
- Cottonwood Complex fire: Hutchinson, KS
  - 1 fatality, destroyed 35 homes, 110 vehicles
  - 12,000+ acres burned
- Warm winter & lack of significant snow challenging for winter recreation in Wisconsin

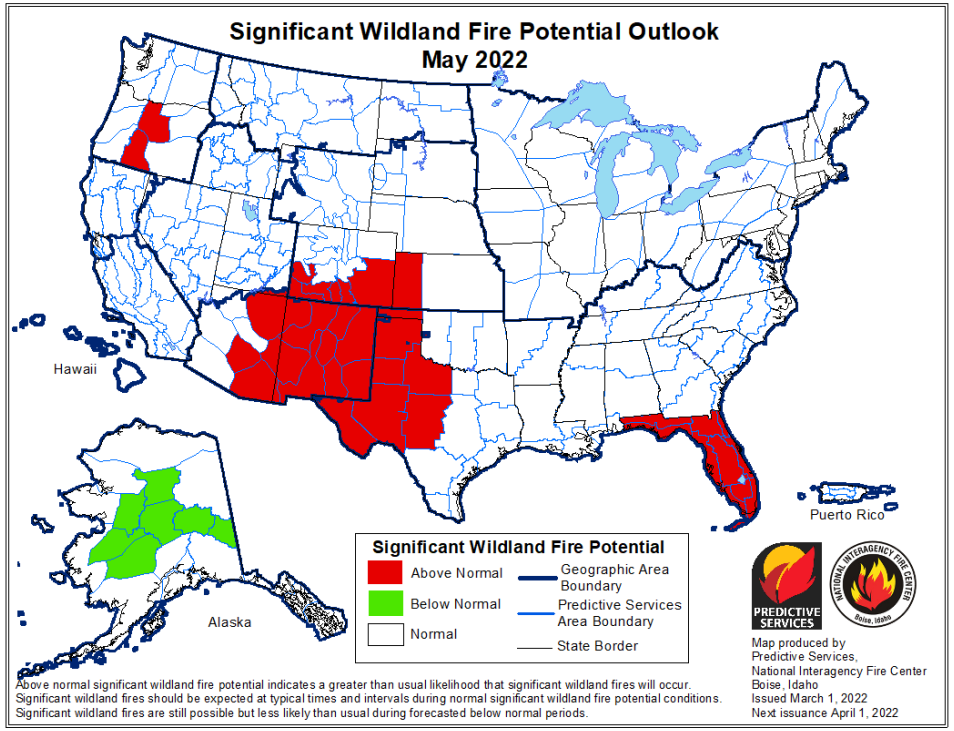
Cottonwood Complex Fire
Source: Sedgwick County Fire #1

# Outlooks

# Wildland Fire Outlook



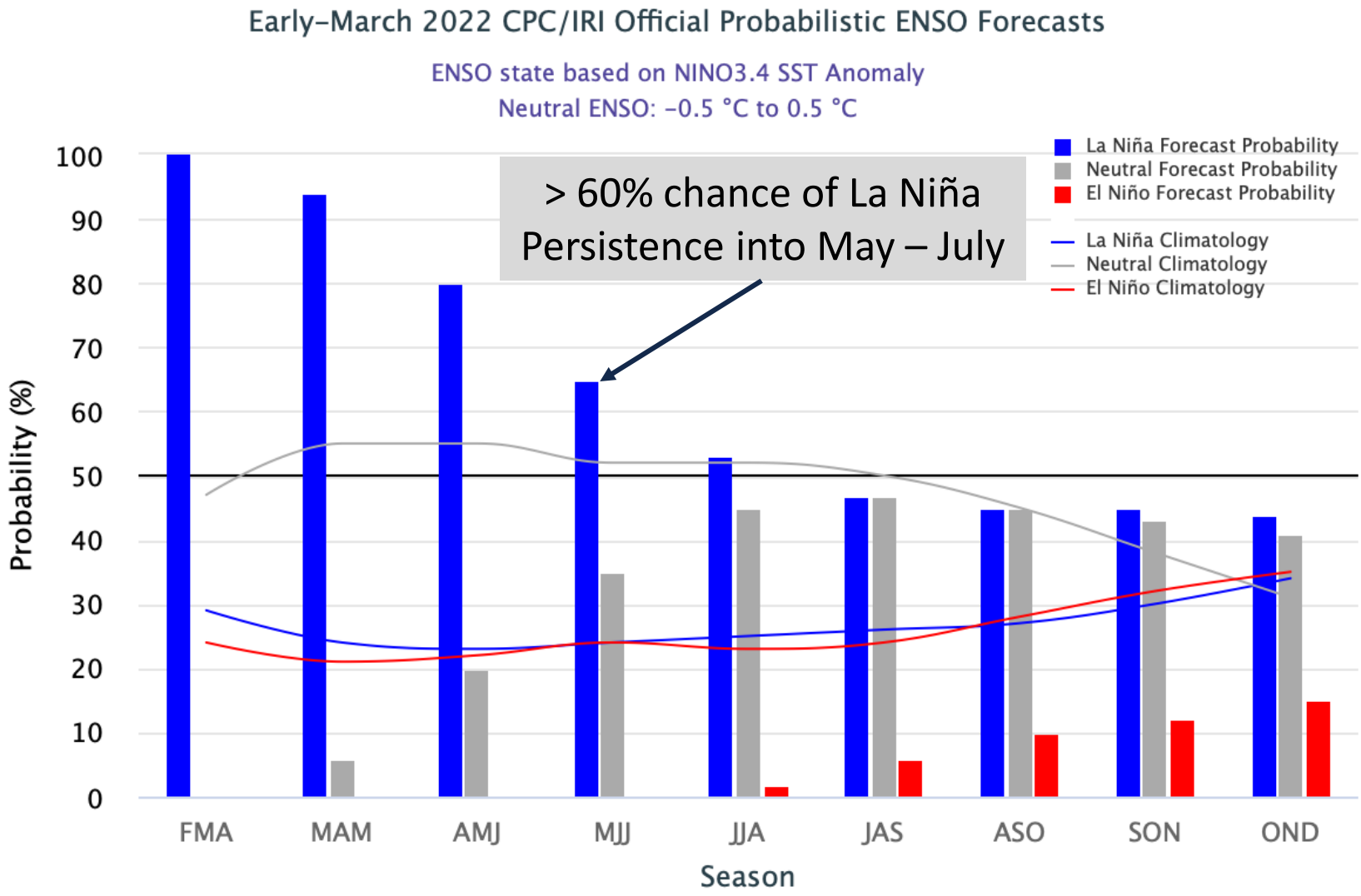




https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm

# El Niño-Southern Oscillation (ENSO) Outlooks

Forecasts:

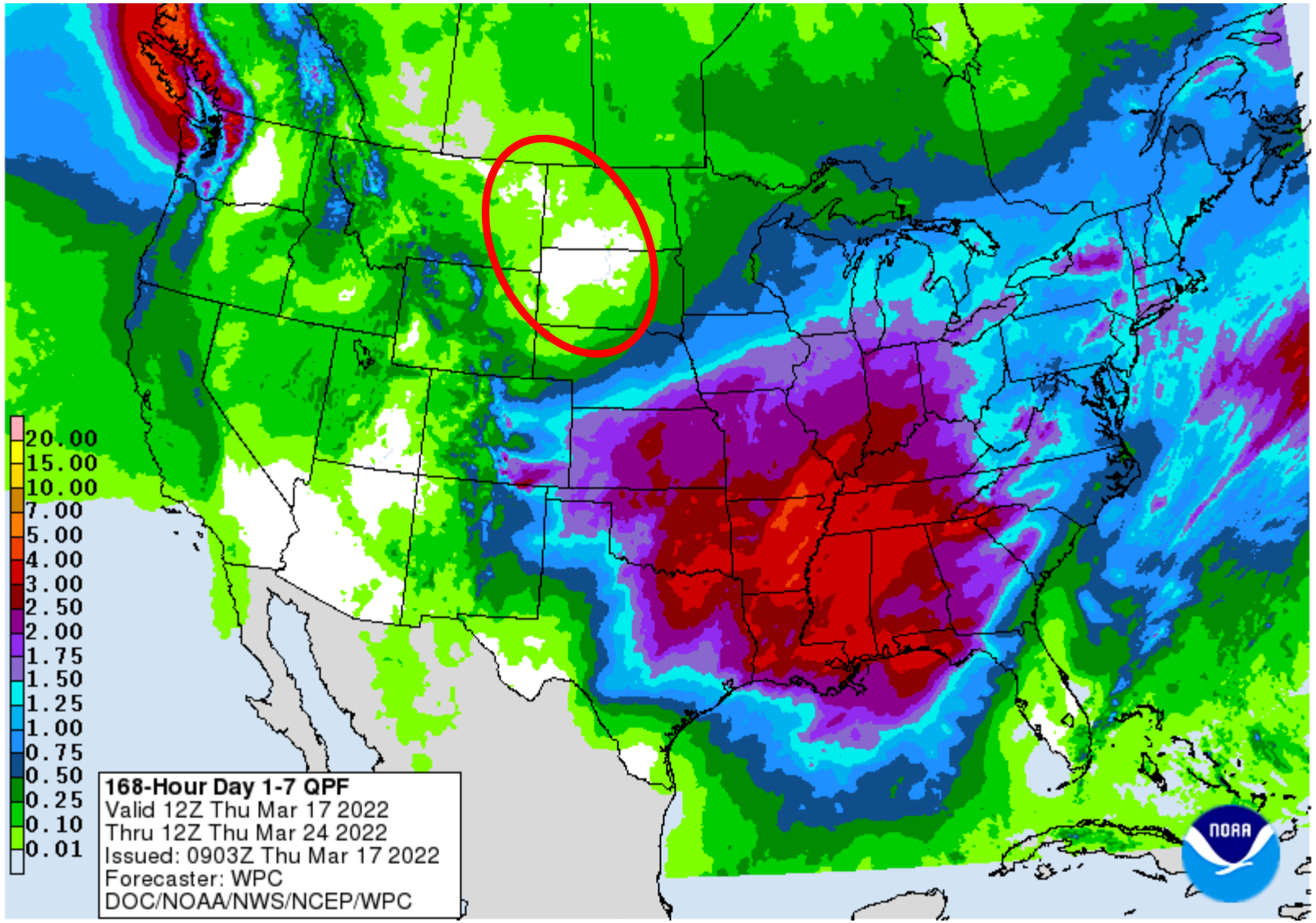
- Very likely La Niña stays with us through May and into June
- Early summer La Niña have precedent – 12-15 cases since 1950
- Only 4 instances of “double-dip” La Niña persisting to MJJ




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

# 7-day Precipitation Forecast

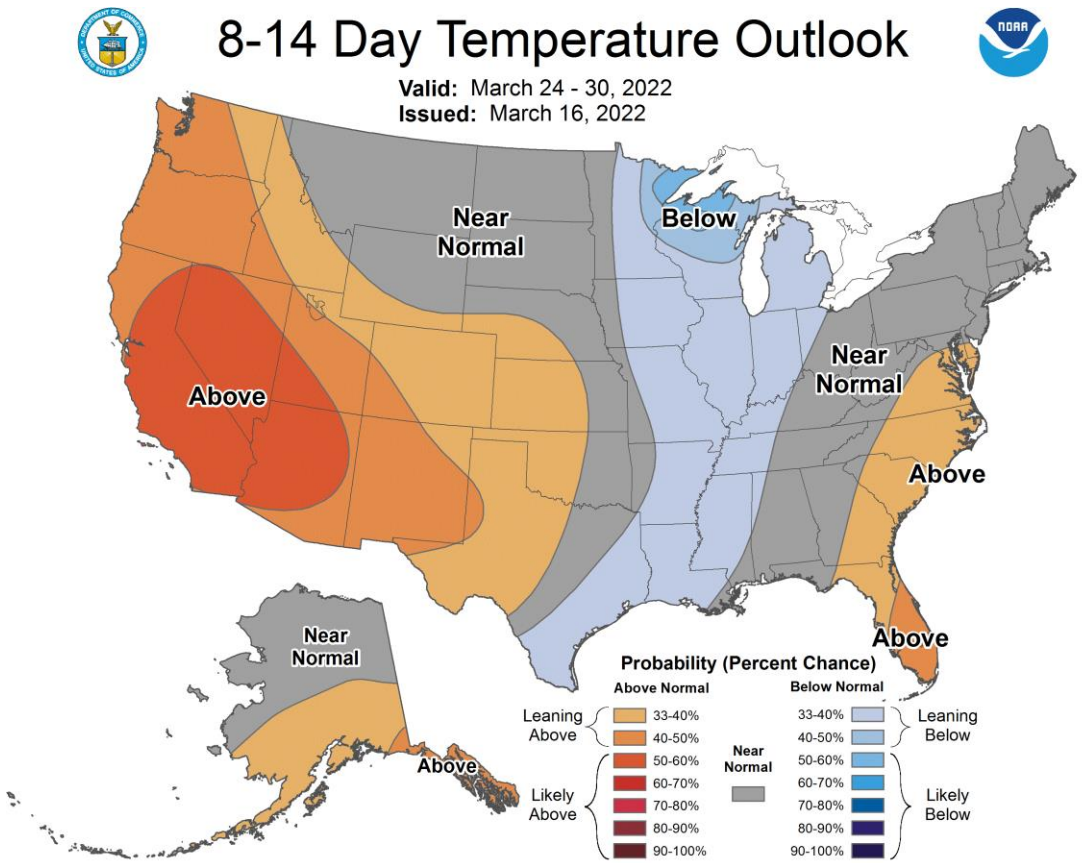
- Culmination of 2 systems
- Could bring much needed moisture to KS, eastern NE
- Help improvement in parts of IA, WI, IL, MO
- Not needed in Ohio Valley
- Lack of moisture in western SD, eastern MT/WY concerning



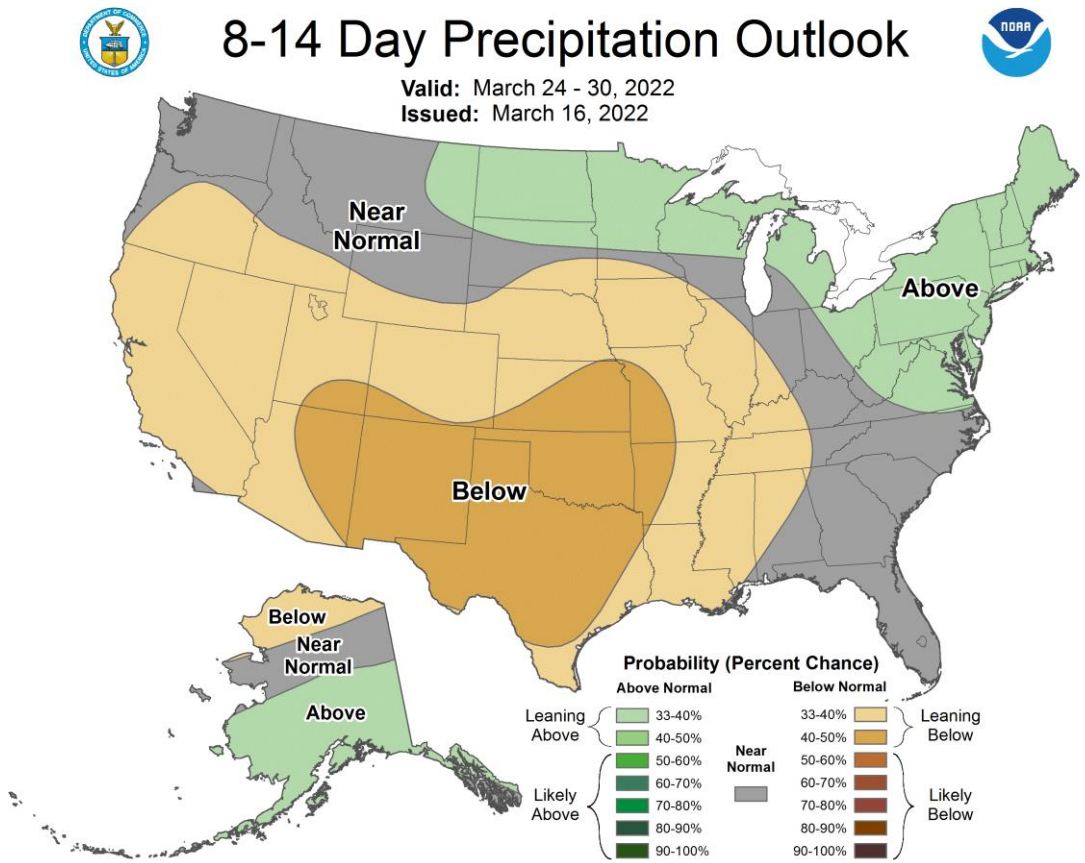

Source: [wpc.ncep.noaa.gov/qpf/](wpc.ncep.noaa.gov/qpf/)

# 8-14 Day Outlooks

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



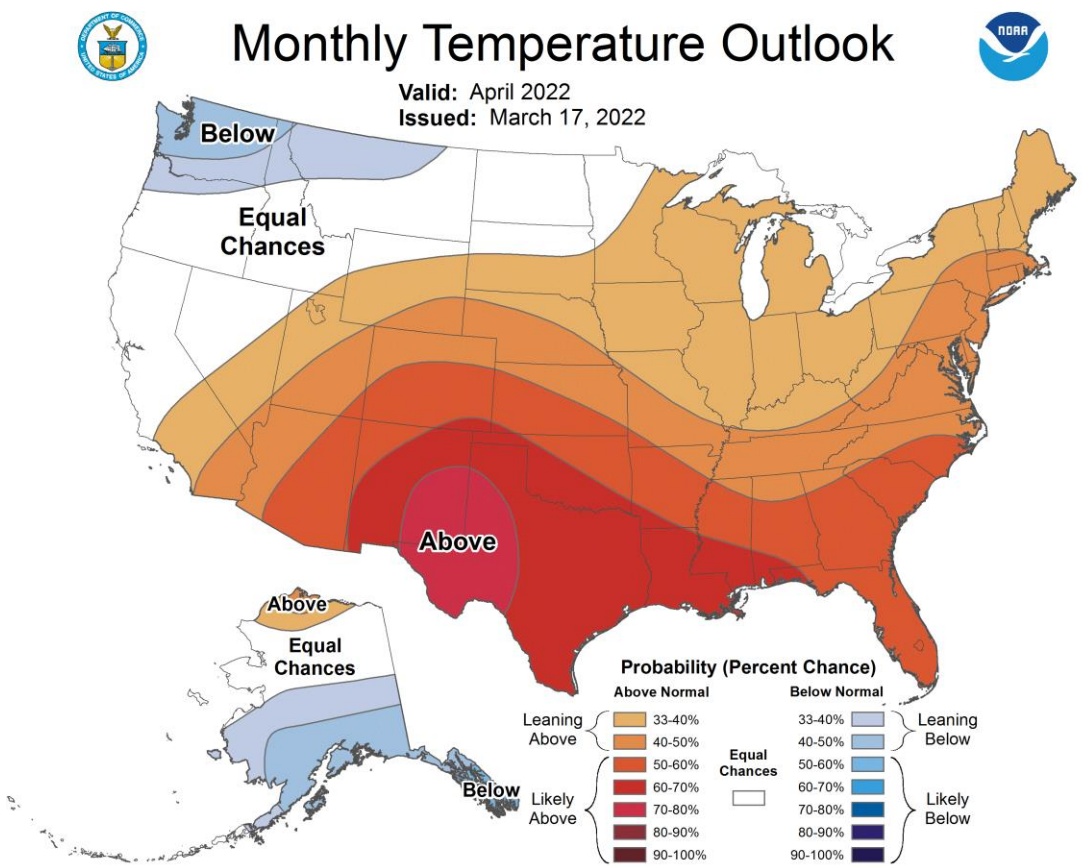

Elevated odds of **Warmer** than normal west, **Colder** than normal central Midwest



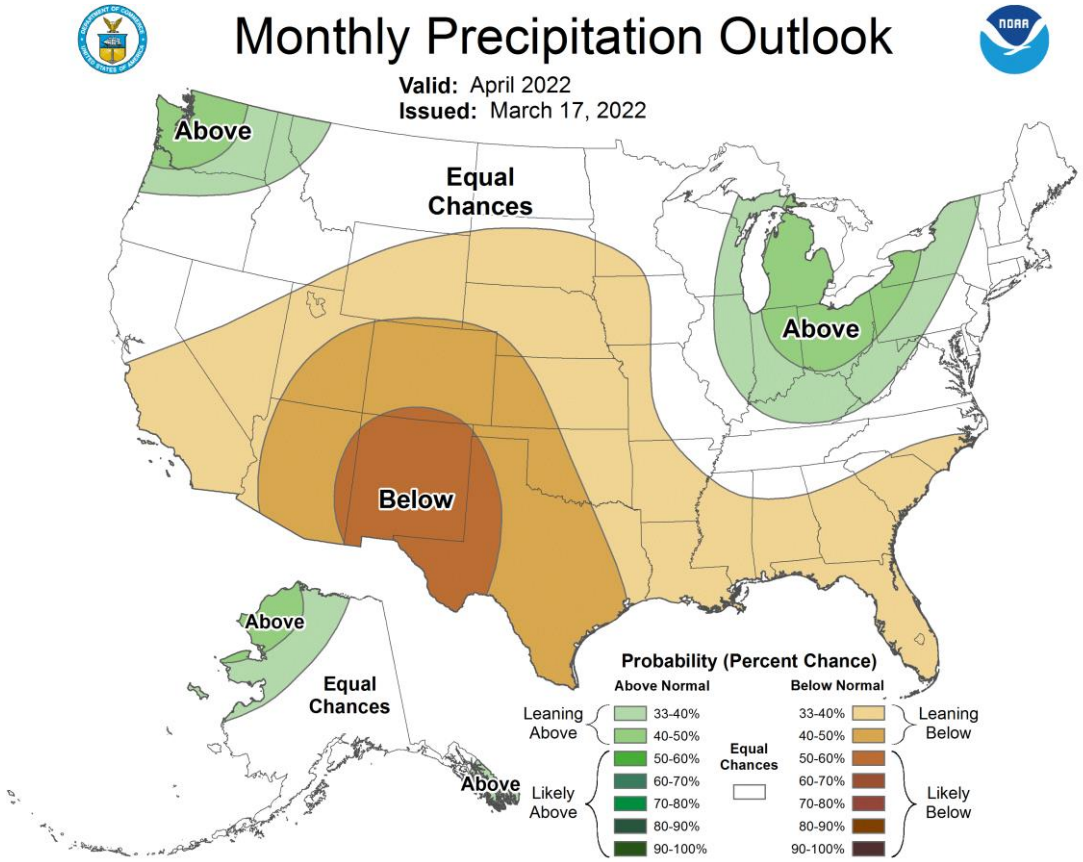

Elevated odds of **Drier** than normal in most of the region, maybe a bit **Wetter** than normal in the north

# April Outlooks

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



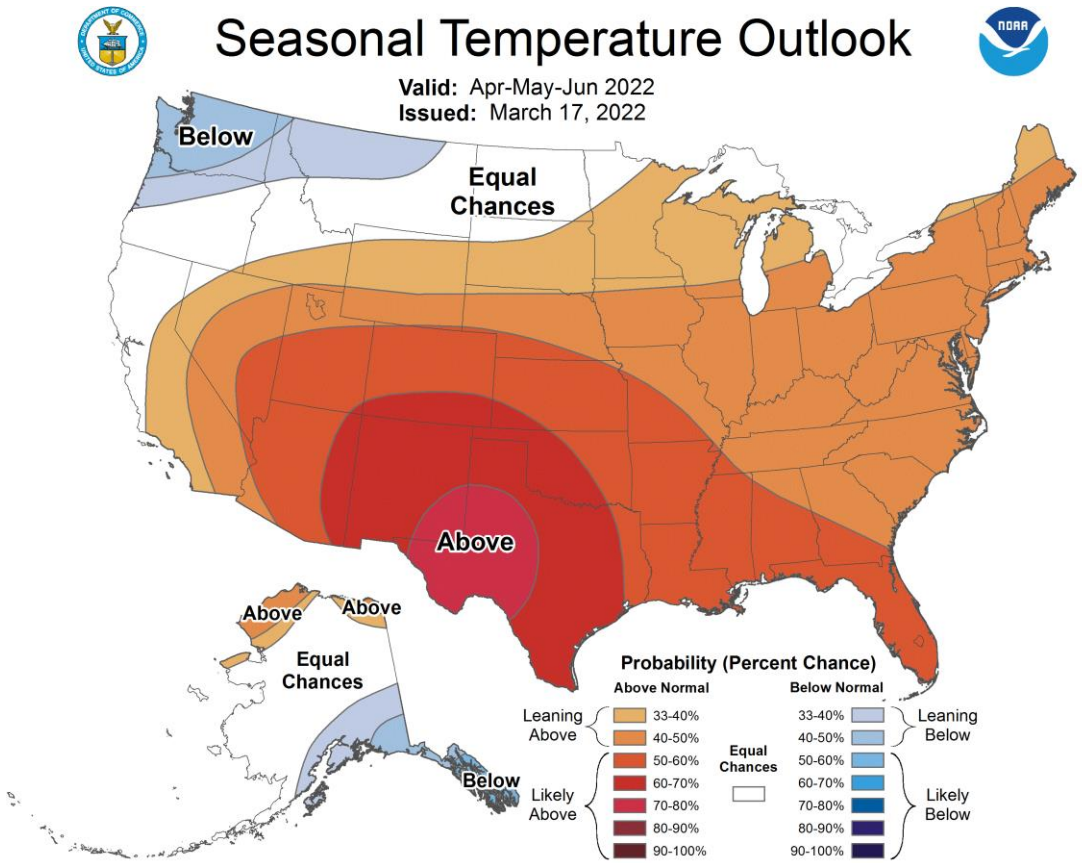

Likely to Leaning **Warmer** & **Drier** in Plains

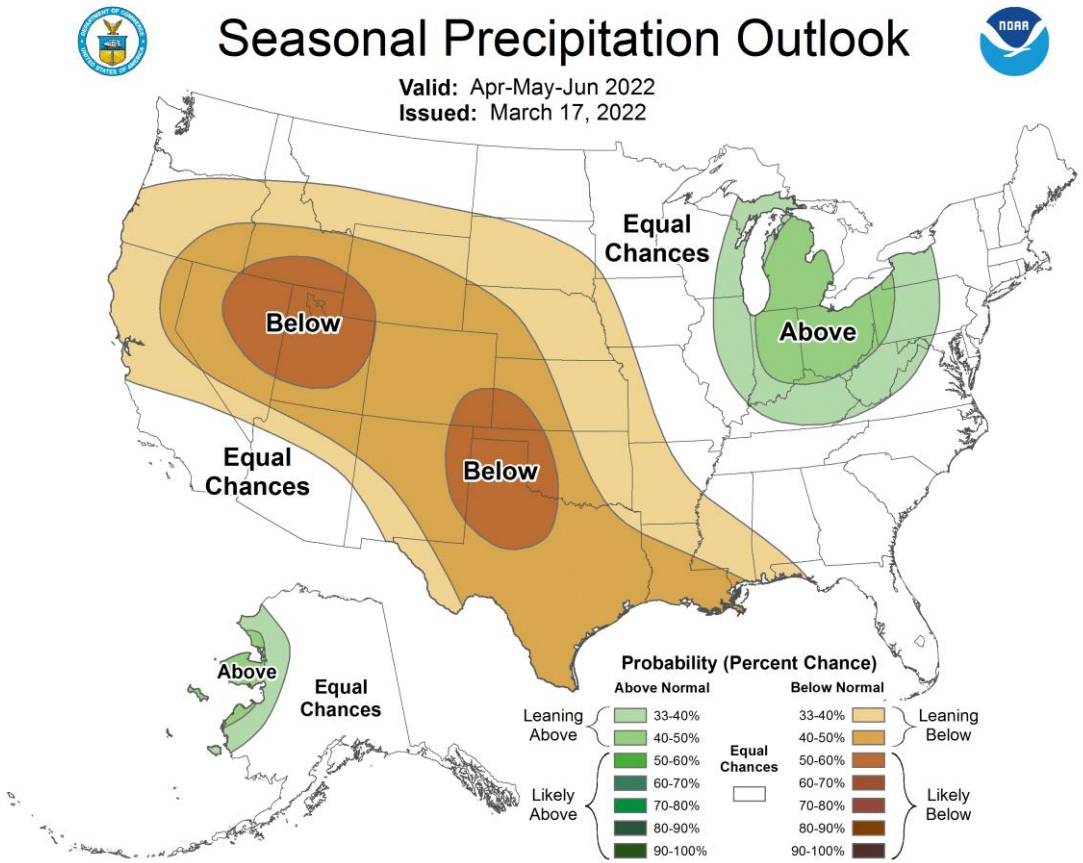



Keeping **Wetter** in Great Lakes & Ohio Valley

# Season Outlooks April – June

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



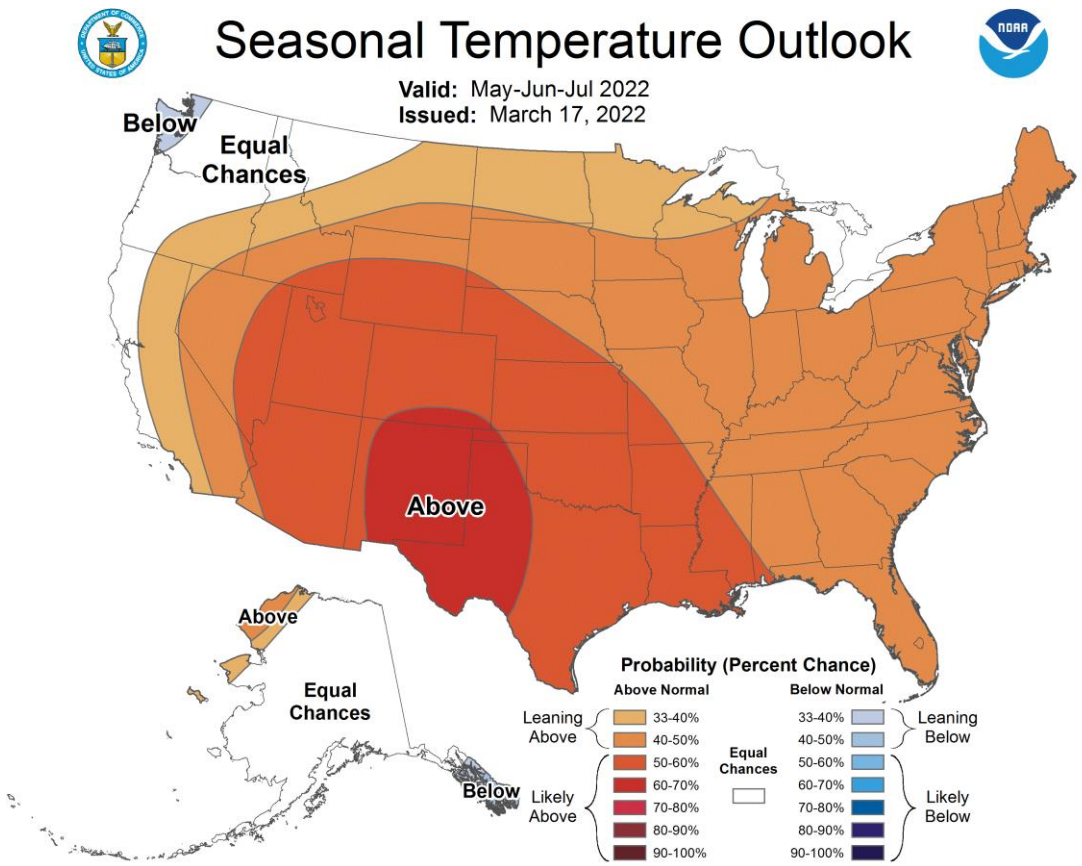




Likely to Leaning **Warmer** & **Drier** in Plains, pushing into western IA & MO

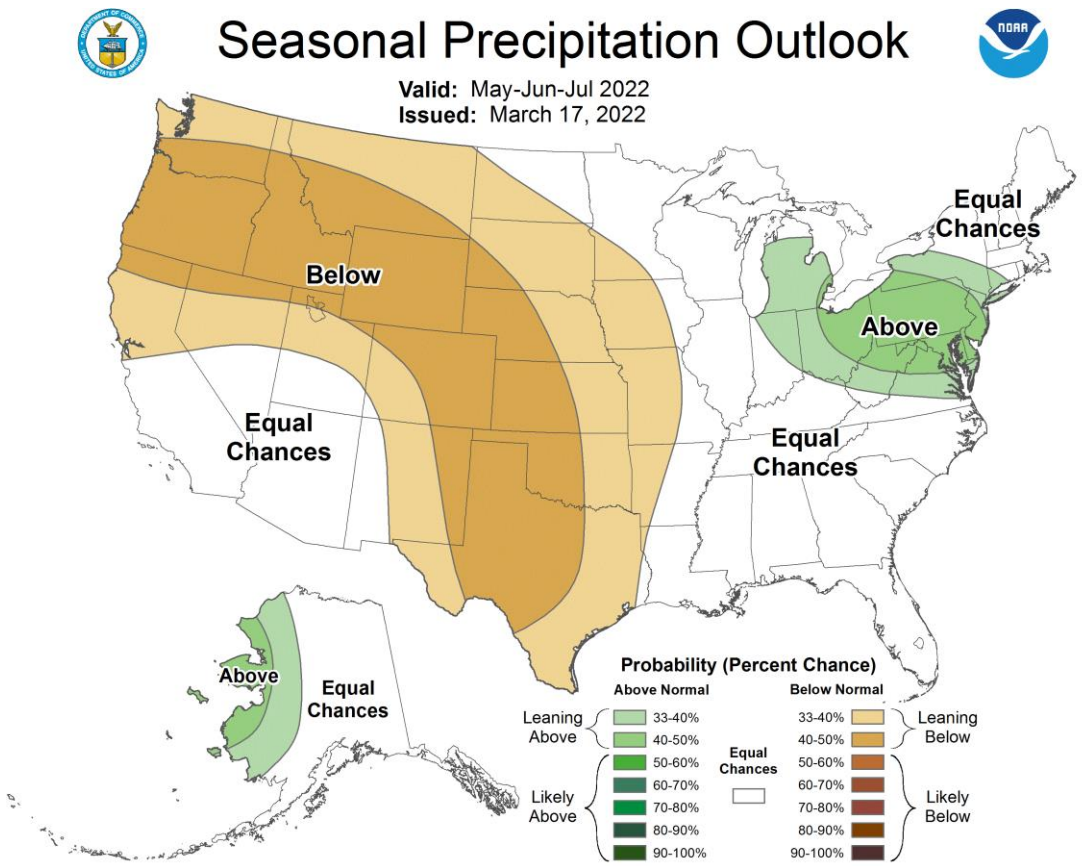
Keeping **Wetter** in Great Lakes & Ohio Valley

# Season Outlooks May – July

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



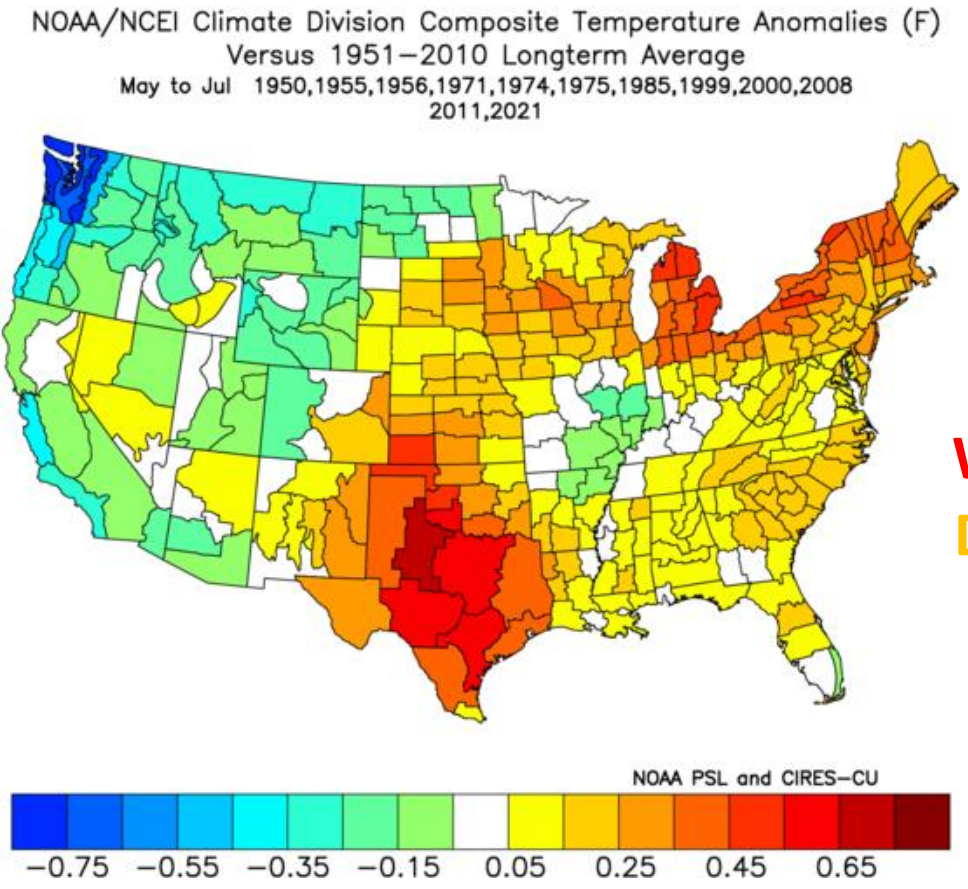

Likely **Warmer** than normal throughout most of CONUS




Higher odds of **Drier** expand, **Wetter** than normal area shifted east

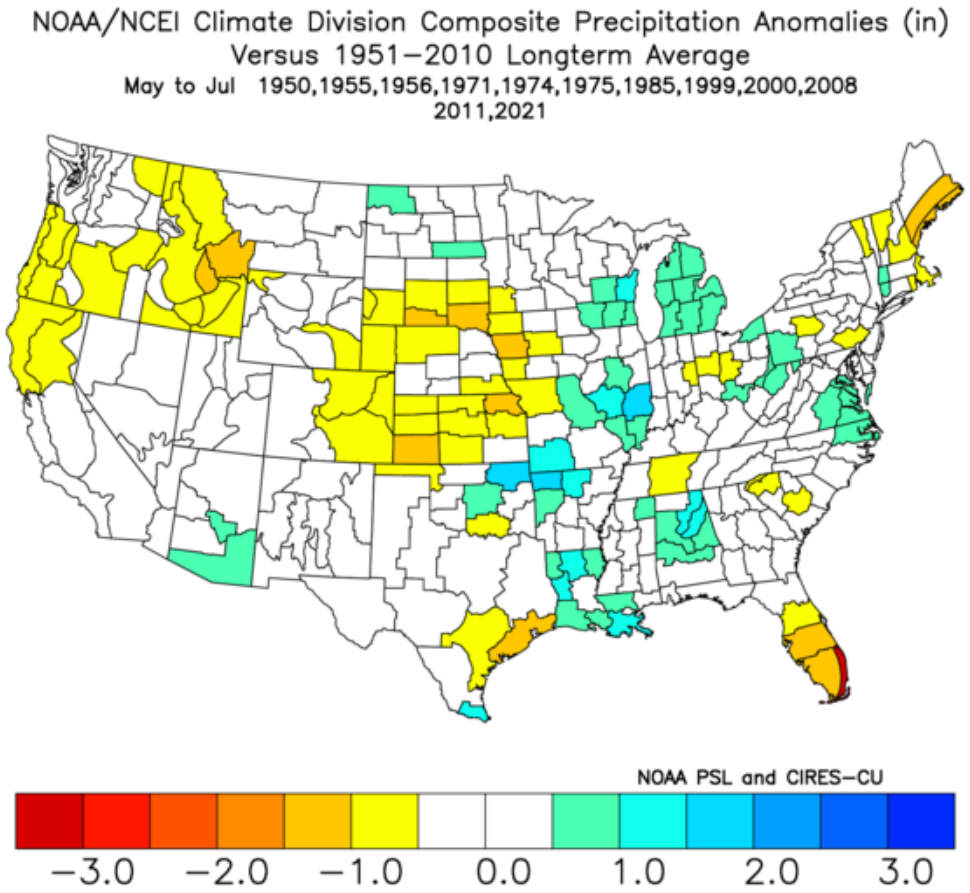
# Past May – July La Niña Events

## Temperature Anomalies




Average anomalies in past events lean **Warmer** in most places; **Drier** west, a bit **Wetter** in IL, WI, MI

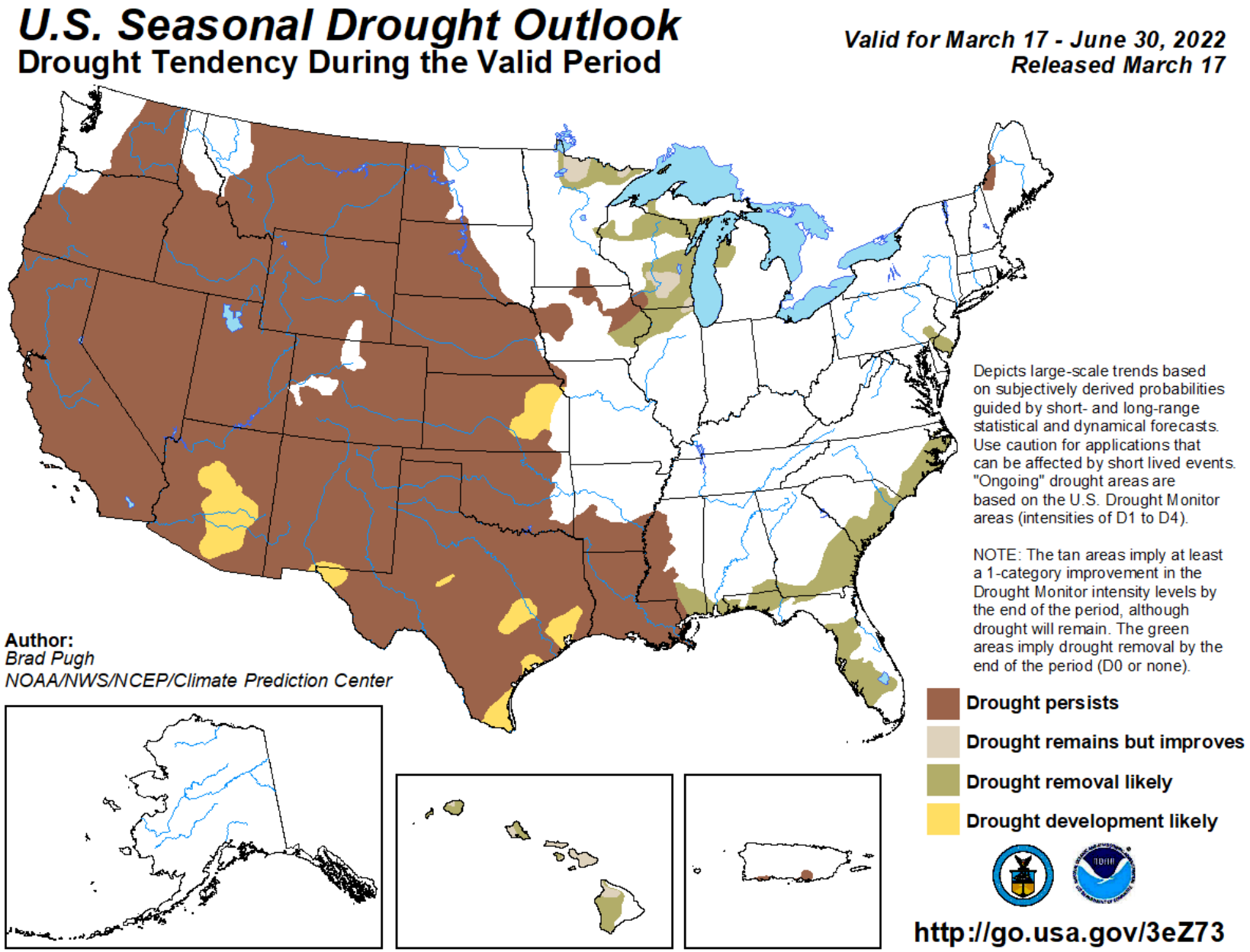
## Precipitation Anomalies




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

# Drought Outlook

- Drought persistence throughout the western US, development in eastern KS
- Possible drought improvement or removal in IA, WI, IL



# Summary

## Current Conditions

- February reinforced wet-East, dry-West pattern across the region
- Dry winter has worsened drought conditions in Plains
- Flooding: increased risk in western Ohio Valley, near normal in eastern Ohio, below normal in Missouri
- Snowpack: below normal in most of the region; 80% in MO headwaters, 85-90% in Plattes
- Great Lakes: more ice cover, near to above average levels

## Outlooks

- Pair of storm systems moving through central US next 7-days… will be very important for Plains to pick up some moisture
- Leaning to likely warmer than normal for April, April-June, and May-July… and beyond
- Outlooks leaning to persistence of dry-west, wetter east for April, April-June

# Drought Summary

**South Dakota & Eastern Montana/Wyoming**

- Approaching climatological wettest time of the year – will need serious moisture return to avoid further drought deterioration
- Outlooks leaning drier than normal through July – lower probabilities than south/central Plains

**Nebraska, Kansas, Eastern Colorado**

- Drought intensification since start of water year – concerns of moisture for start of growing season
- Possibility of picking up good moisture this week – outlooks mostly leaning/likely drier than normal for April and through July

**Iowa, Minnesota, Missouri, Wisconsin, Illinois**

- A bit of short-term improvement on top of longer-term deficits
- Better chances of improvement in April
- Outlooks leaning drier/near-normal moving into late spring and summer – will need to watch for a return to dryness this summer

# Further Information – Partners

- Today's & Past Recorded Presentations at:
  - https://mrcc.Illinois.edu/multimedia/webinars.jsp
  - https://hprcc.unl.du/webinars.php
- NOAA National Centers for Environmental Information: www.ncei.noaa.gov
- Monthly climate reports (US & Global): https://www.ncdc.noaa.gov/sotc/
- NOAA Climate Prediction Center: www.cpc.ncep.noaa.gov
- Climate Portal: www.climate.gov
- U.S. Drought Portal: 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, 515-294-2013
  - Doug Kluck: doug.kluck@noaa.gov, 816-994-3008
  - Ray Wolf: ray.wolf@noaa.gov, 563-386-3976
  - Melissa Widhalm: mwidhalm@purdue.edu, 765-494-8191
  - Brian Fuchs: bfuchs2@unl.edu, 402-472-6775
  - Molly Woloszyn: molly.woloszyn@noaa.gov,
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  - crhroc@noaa.gov