

## Climate and Agriculture in Indiana – Issues, Impacts and a Look Ahead.

Indiana CCA Conf.

Indianapolis, IN

Dennis Todey, Director

18 December 2023

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### Topics/Agenda

- A brief Background of USDA Climate Hubs
  - Partners, Executive Committee and Steering Committee
  - More on the Midwest Climate Hub
- Tools
- Climate Issues
- Current Conditions
- Drought/El Niño
- Outlook and more
- For More Information
  - Resources
  - Website
  - Contact Info



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## Intro to Climate Hubs



**Assessments and Syntheses**  
*Delivering relevant information*

**Outreach and Education**  
*Enabling climate-informed decisions*

**Technical Support**  
*Facilitating engagement, discovery and exchange*

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Agricultural  
Research  
Service



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## Here in the Midwest...



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### Our Goal

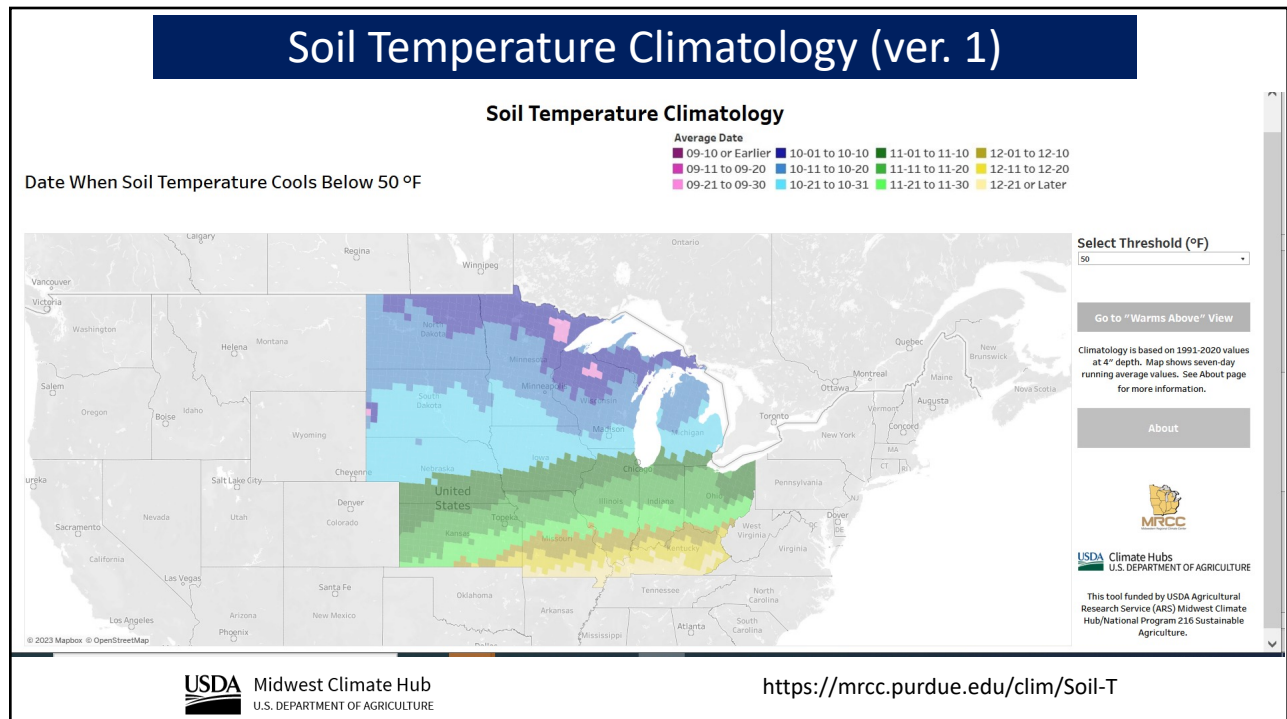
To provide information to help producers cope with climate change through **linkages of research, education and partnerships** in a region that represents one of the **most intense areas of agricultural production** in the world.

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Let us know if you have other needs....

## TOOLS

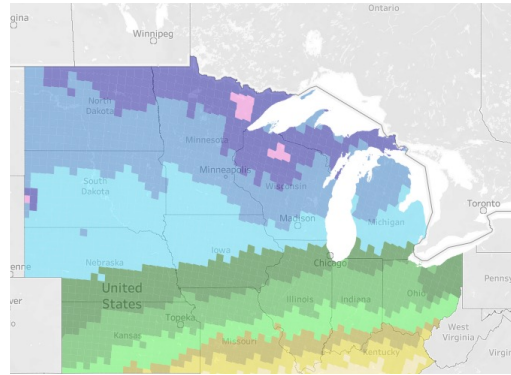
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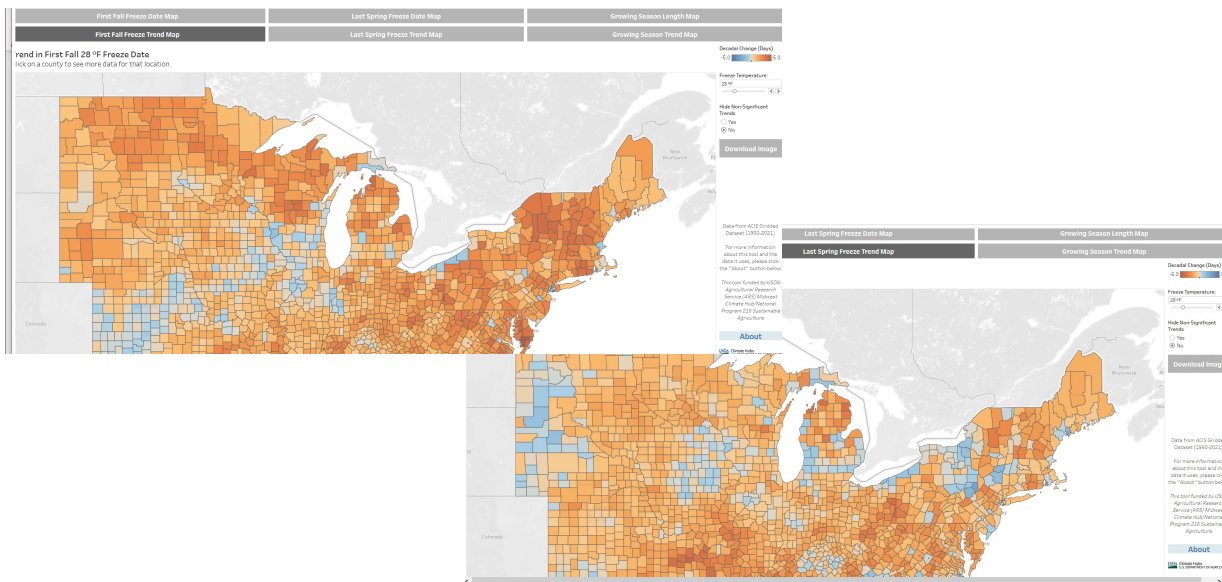
## Soil Temperature Climatology (ver. 1)

- Focus on average dates (50 F – spring and fall)
- Freeze dates – much more variable
- Watch for spring webinar
- Additional updates to the product
  - Changes over time
  - Data availability



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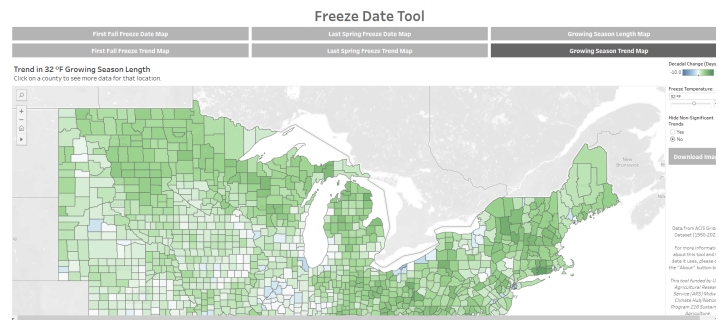
## Regional Frost-Free Season Change



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## Regional Frost-Free Season Change

- Also growing season length
- Statistical significance
- Various temperature cut-offs.
- Understand season lengths



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<https://mrcc.purdue.edu/freeze/freezeatetool.html>

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What is happening?

## CLIMATE ISSUES AND AGRICULTURE

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United States  
Department  
of Agriculture  
Climate Change  
Program Office  
Technical Bulletin 1953



## CLIMATE INDICATORS for AGRICULTURE



## Climate Change Indicators for Agriculture ISU Extension Agronomy Fall Meeting

22 September 2020

Dennis Todey

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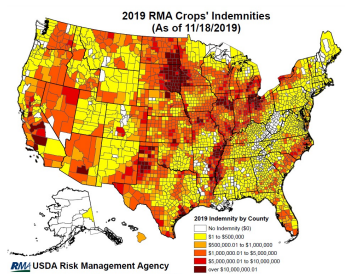
[https://www.usda.gov/sites/default/files/documents/climate\\_indicators\\_for\\_agriculture.pdf](https://www.usda.gov/sites/default/files/documents/climate_indicators_for_agriculture.pdf)

<https://naldc.nal.usda.gov/catalog/7201760>

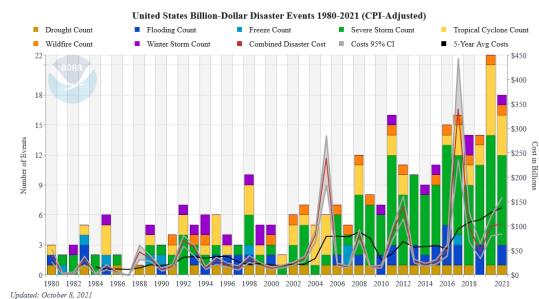
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## Climate-Impacted Issues for Agriculture

- Bigger events
- More extremes
- Larger disaster issues
- Increased variability



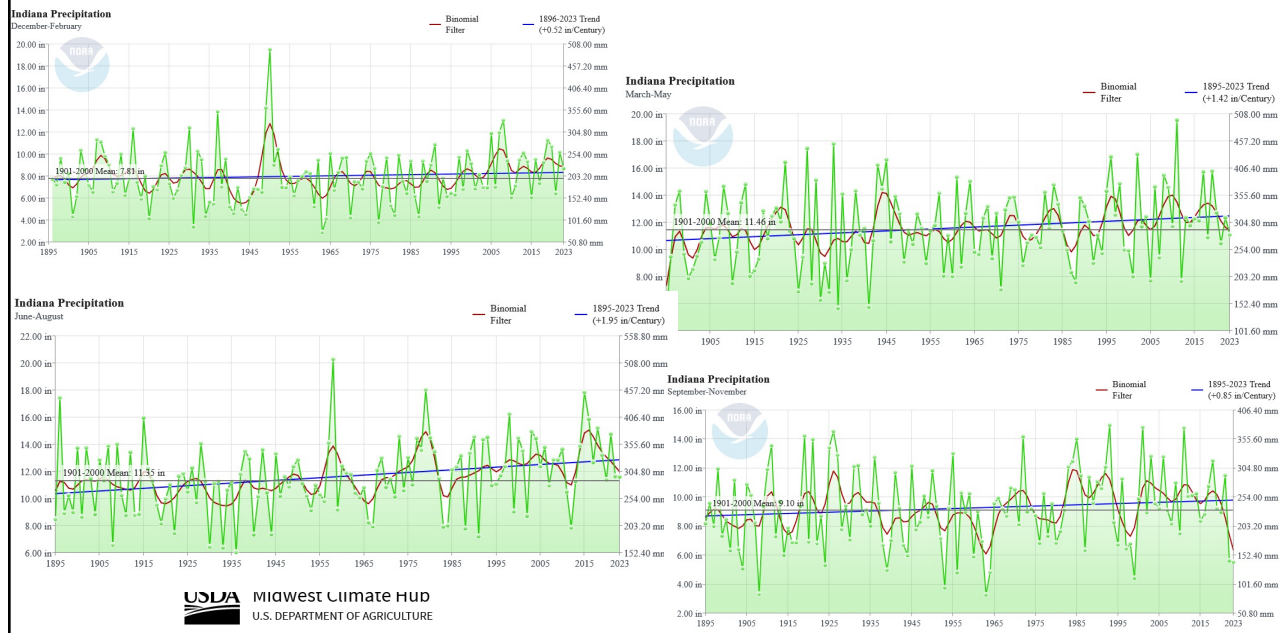
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## Precipitation Change



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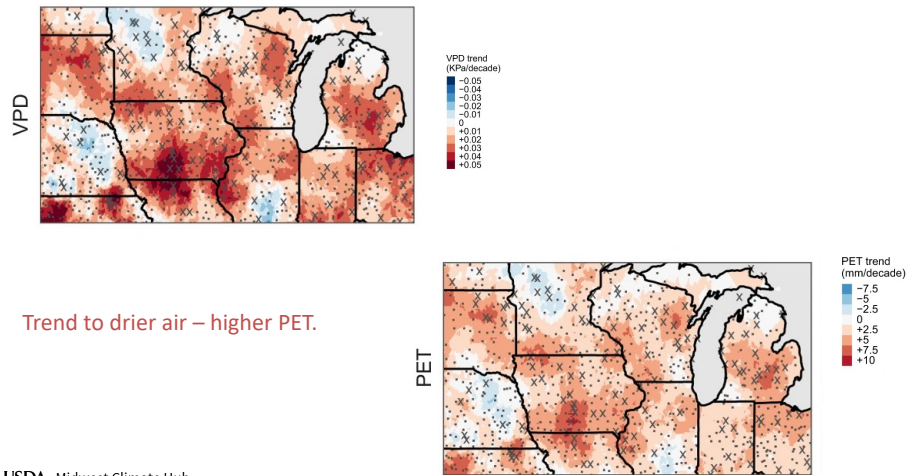
## Possible Management Changes

- Flooding/inundation (extended periods)
- Increasing precip intensity/amounts (especially off-season)
- More soil/nutrient loss potential
- Soil loss
  - Reducing tillage
  - Cover crops
- Splash potential
- Drought?
  - Still occurs
  - Even in wet years...
  - Quicker transitions
- Location specific



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### 30 Year Trend (Summer VPD and PET)



Trend to drier air – higher PET.

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Basso et al. 2021

<https://www.nature.com/articles/s41467-021-21763-7>

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### Temperature Change

- Warming
  - Winter
  - Nights
- Adds livestock/human stress
- Push GDD accumulation/phenological state
- Does help increase frost free season period

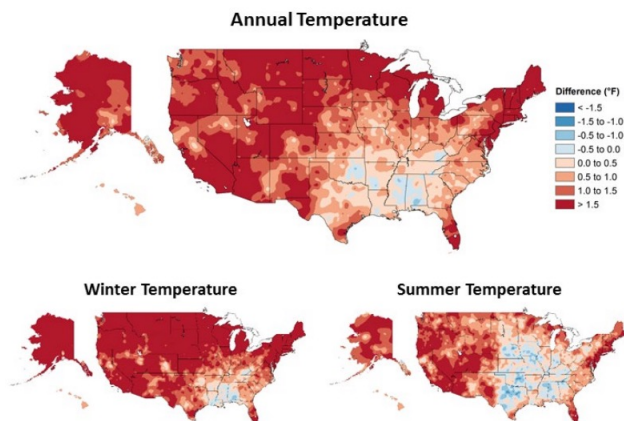
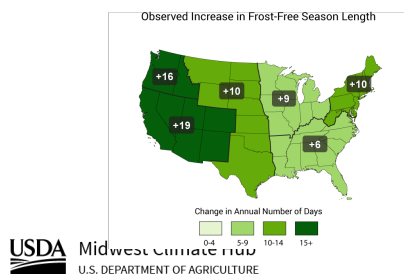
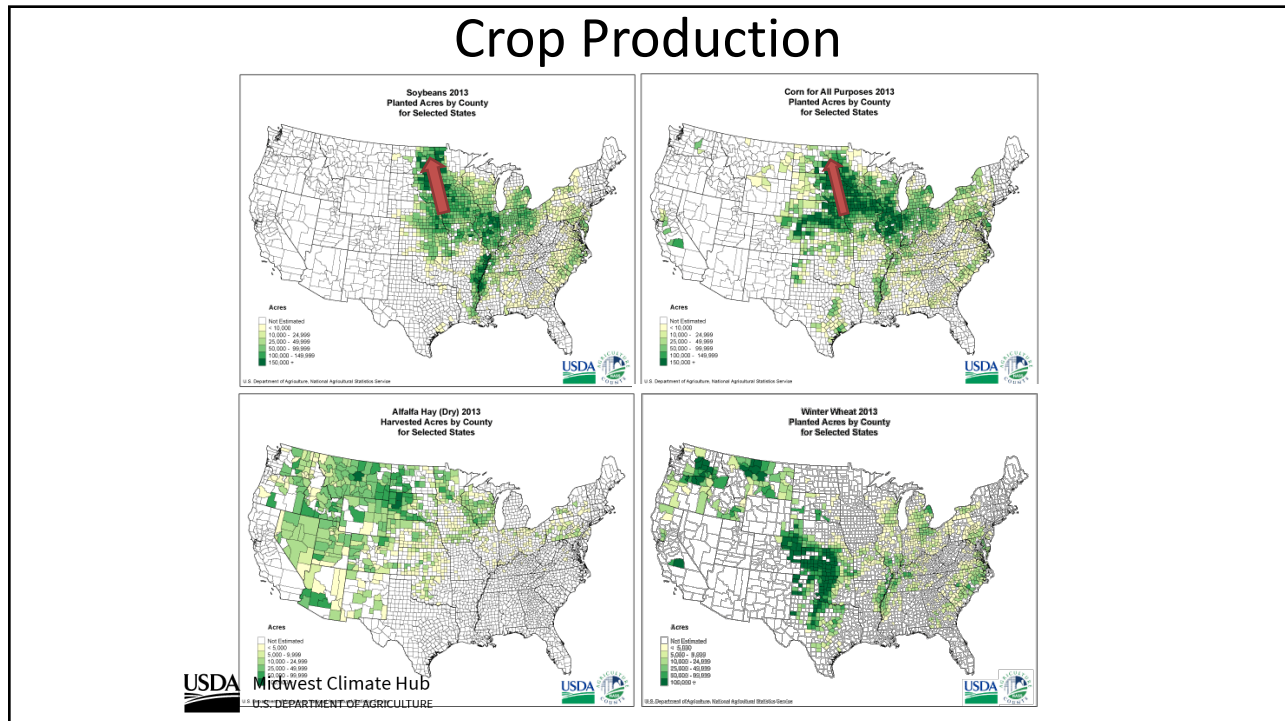
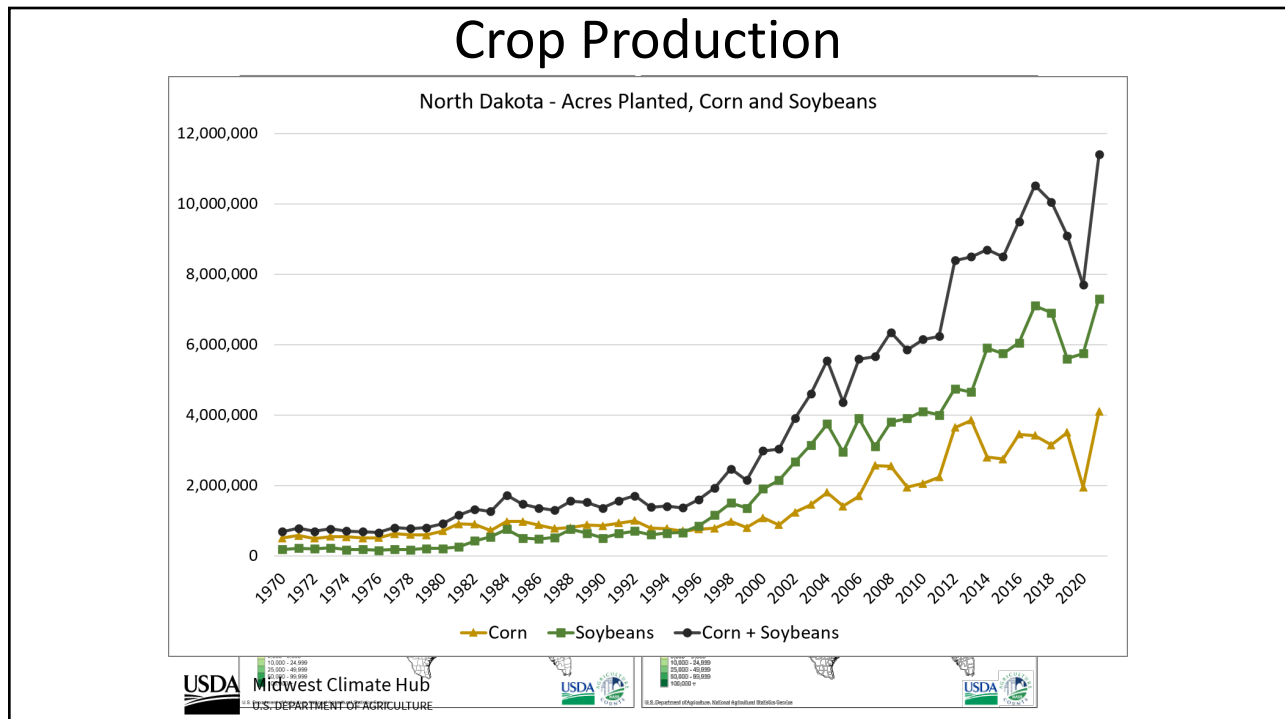


Figure 6.1. Observed changes in annual, winter, and summer temperature (°F). Changes are the difference between the average for present-day (1986–2016) and the average for the first half of the last century (1901–1960 for the contiguous United States, 1925–1960 for Alaska and Hawai'i). Estimates are derived from the nClimDiv dataset.<sup>1,2</sup> (Figure source: NOAA/NCEI).

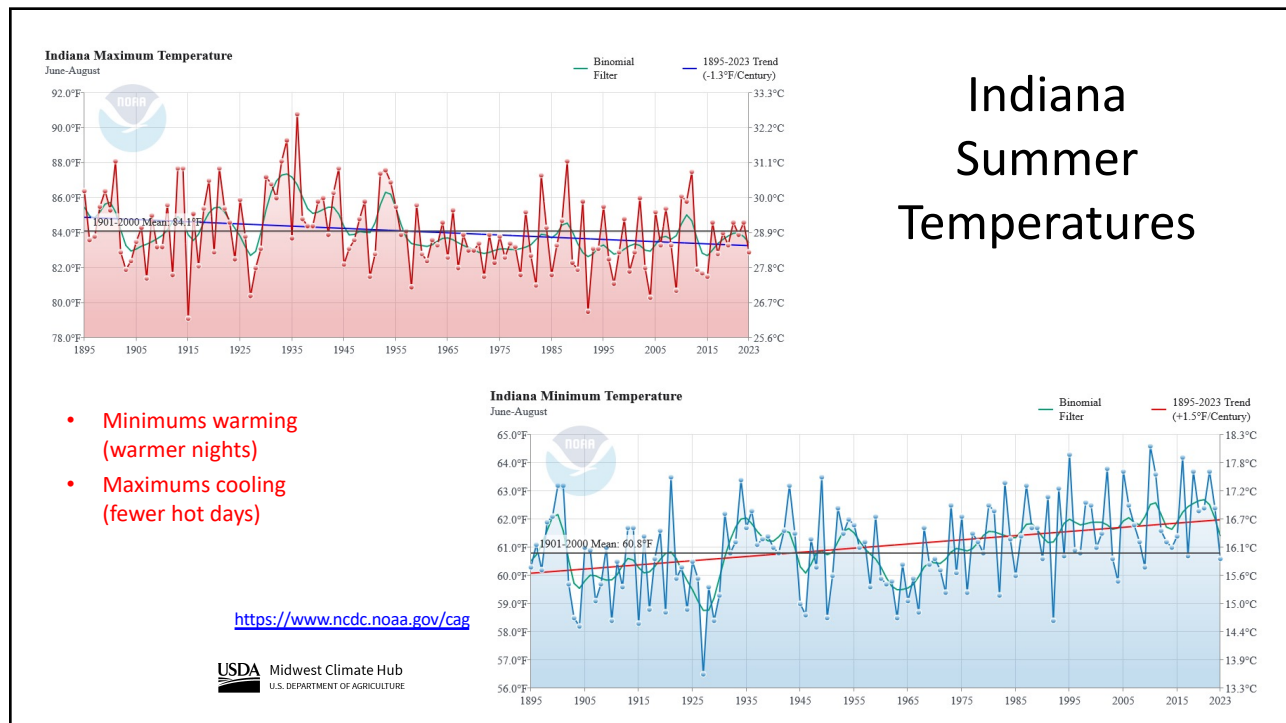
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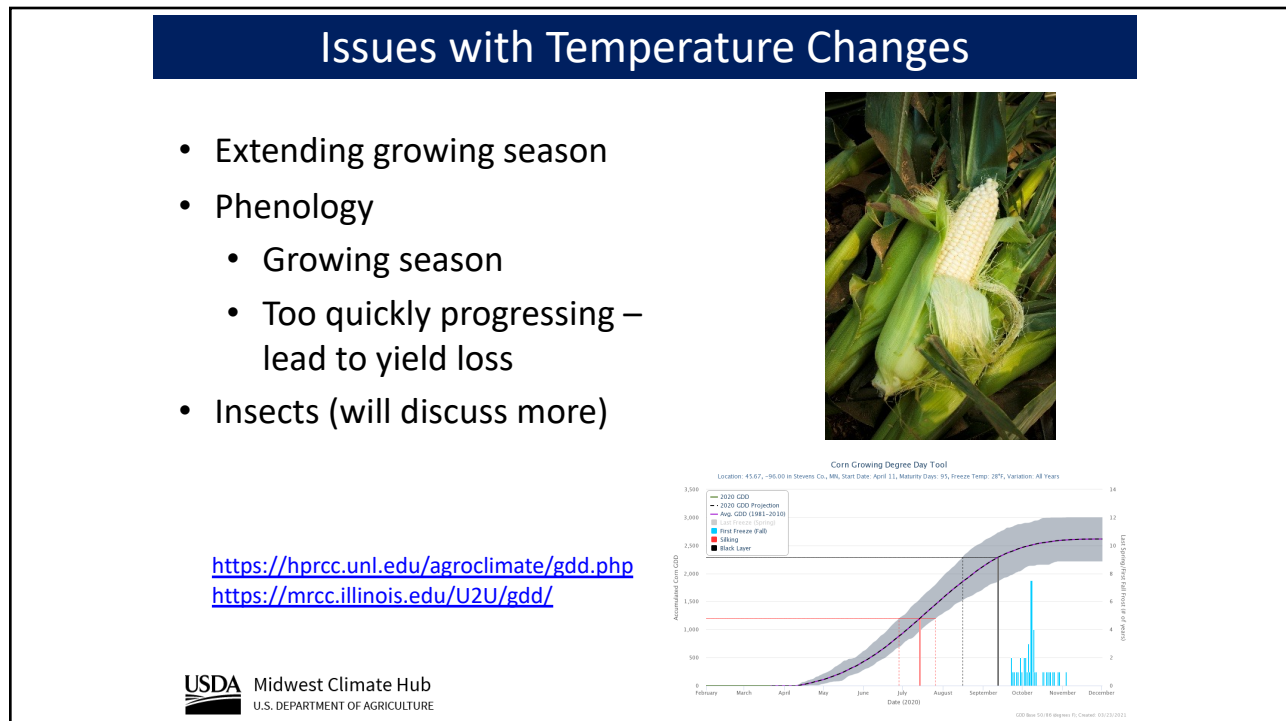
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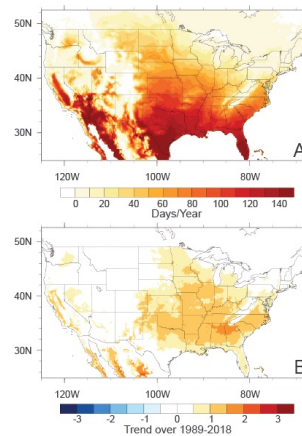
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## Heat Waves

- Interfere with normal biophysical functioning of agricultural plants and animals
- More frequent, more intense, and longer duration heat waves are anticipated with detrimental effects on productivity
- Adaptation may reduce biophysical impacts, but raises production inputs, reducing efficiencies (see TFP)

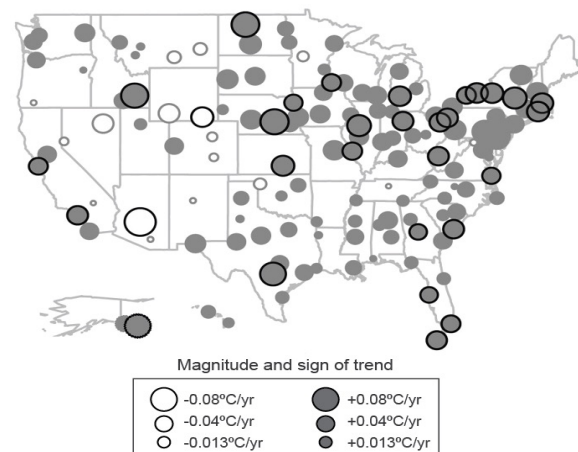


a) Annual average number of heat wave days for 1989–2018. b) Trends in the number of annual heat wave days (1989–2019).

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## Humidity Changes

- Increased at most regional scales in the U.S. over the last 50 years
- Key factor in plant and animal stress indices, and provides a measure of atmospheric water available for agriculture
- Trends can be influenced by land use and agricultural management practices



U.S. summer dew point temperature trends

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## Livestock issues and temperature/humidity

- Warm/humid conditions –less cooling at night
- Creates additional stress on livestock
  - Reduced production
  - Reduced gain
  - Possible breeding issues
  - Mortality – extreme cases

Tougher on humans working in these conditions, too.

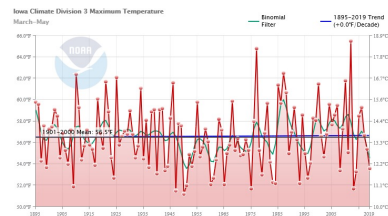
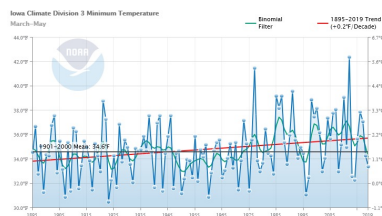
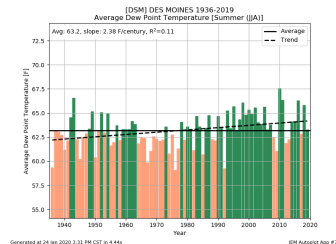


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## Issues with Diseases

- Higher humidity
  - More moisture in air
  - Changing day-night temps.
  - Longer possible dew periods



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

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## Issues with Insects



- 1) Expanding geographic ranges northward
- 2) Reducing winter die offs
- 3) Earlier spring emergence
- 4) Increased generations per year

- Invasive insects are of particular concern since they often limited more by climate in their non-native ranges (no natural enemies and abundant food)

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## Issues with Weeds

- Weeds often more competitive than crops
- CO<sub>2</sub> fertilization
- Many crop CO<sub>2</sub> changes
- Increased cost of production
- Increased management
- More potential crop loss
- More use of chemicals
  - Also resistance issues



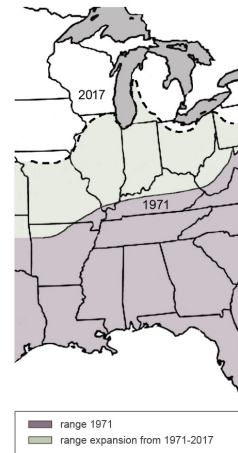
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Ziska et al. 1999. Weed Science. 47:608-615, inter alia

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## Issues with Weeds

- Weeds lead to the greatest direct economic losses and the greatest control costs in crop production of all pest types
- Observations show that some weed species are migrating and/or will migrate northward as the U.S. climate warms, affecting weed demographics, population intensity, and management
- Effects may include rangeland quality or as disease distribution (e.g., kudzu is a carrier for Asian soybean rust).



*Kudzu range in the midwestern United States, 1971–2017.*

## Terms

**Adaptation – How do we shift agricultural activities to adapt to changing conditions?**

**Mitigation – How can we do activities that help reduce the risk of future problems?**

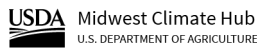
**We cannot adapt our way out of our current situation.**

## Climate Smart Agriculture

**Climate-Smart Agriculture is guided by three main goals:**

1. Increased productivity (sustainably intensifying agriculture)
2. Enhanced resilience (adapting to climate change)
3. Reduced emissions (mitigating greenhouse gas emissions)

Borrowed from USDA Northeast Climate Hub



<https://www.climatehubs.usda.gov/hubs/northeast/topic/role-climate-smart-agriculture-climate-adaptation-and-mitigation-northeast>

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## Climate Smart Agriculture

**What does a practice really do?**

**Can we quantify its capability?**

**Where do practices work (or not)?**

**How should practices be implemented?**

**How do we get practices adopted?**

**Can a practice be implemented incorrectly?**

**Can actions after a practice undo its effects?**

**What about for different crops?**



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# Climate Smart Agriculture



**Partnerships for Climate-Smart Commodities**

Equity at USDA

**Climate Solutions**

**Partnerships for Climate-Smart Commodities**

Partnerships for Climate-Smart Commodities Project Summaries

USDA is committed to supporting a diverse range of farmers, ranchers, and private forest landowners through Partnerships for Climate-Smart Commodities. This effort will expand markets for America's climate-smart commodities, leverage the greenhouse gas benefits of climate-smart commodity production, and provide direct, meaningful benefits to production agriculture, including for small and underserved producers.


USDA is investing more than \$3.1 billion for 141 projects through this effort and all the projects require meaningful involvement of small and underserved producers.

<https://www.usda.gov/climate-solutions/climate-smart-commodities>

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# Climate Smart Agriculture



## Climate Ready Midwest


Climate Ready Midwest is a multistate partnership working to increase the impact of climate-smart agriculture across the region. Our mission is twofold:


- 1** To define what climate-smart agriculture means to the midwestern Extension agricultural community
- 2** To empower Extension professionals to lead climate-informed agricultural programming across the Midwest

Extension professionals and the USDA Midwest Climate Hub are working together to assess and build climate-informed programming by:

















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<https://northcentralclimate.org/climate-ready-midwest/>


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## Climate Smart Agriculture



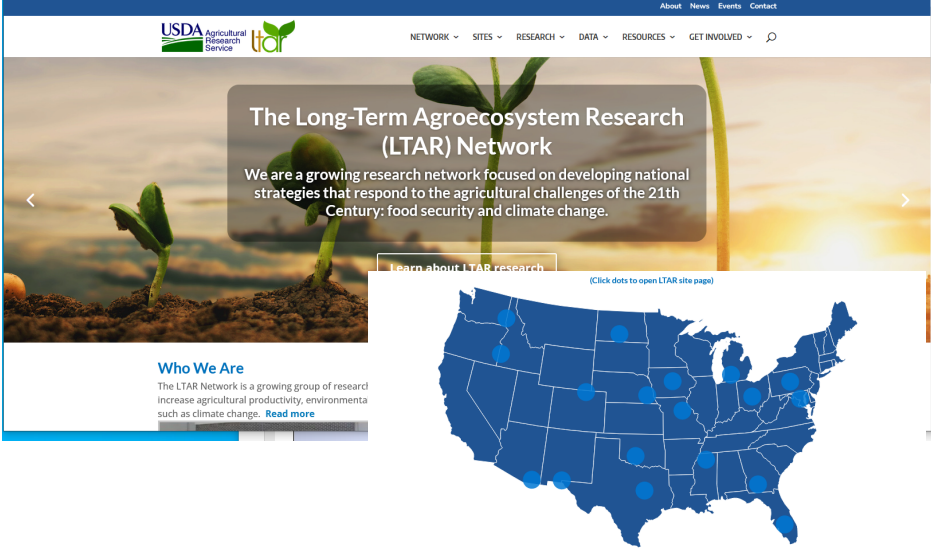
The screenshot shows a web browser displaying a news release from Purdue University. The URL in the address bar is <https://www.purdue.edu/newsroom/releases/2023/Q2/purdue-led-usda-project-aims-to-double-impact-of-climate-smart-corn-belt-agriculture>. The page features the Purdue University logo and navigation links. The main headline is "Purdue-led USDA project aims to double impact of climate-smart Corn Belt agriculture", dated May 18, 2023. Below the headline is a photograph of a cornfield. To the right of the photo are social media sharing buttons for Twitter, Facebook, LinkedIn, and a generic share button. Further right, under the heading "Ag News", are two bullet points: "Purdue receives \$1.4 million for cattle and swine research projects" and "Drone imagery analysis to help". At the bottom of the browser window, a Windows taskbar is visible with the date 6/22/2023 and time 6:00 AM.

<https://cris.nifa.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=R=98533&format=WEBFMT6NT>


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## Climate Smart Agriculture



The screenshot shows the homepage of the USDA Long-Term Agroecosystem Research (LTAR) Network. The header includes the USDA logo and navigation links: About, News, Events, Contact. Below the header is a large banner image of a seedling growing in soil. Overlaid on the banner is a text box with the title "The Long-Term Agroecosystem Research (LTAR) Network" and the text "We are a growing research network focused on developing national strategies that respond to the agricultural challenges of the 21st Century: food security and climate change." Below the banner is a section titled "Who We Are" with the text "The LTAR Network is a growing group of research increase agricultural productivity, environmental such as climate change. [Read more](#)". To the right of this section is a map of the United States with blue dots indicating LTAR research sites. Below the map is a link that says "(Click dots to open LTAR site page)".

<https://ltar.ars.usda.gov/>


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## Climate Smart Agriculture

Much more to come on management changes  
and their implications.

We welcome your questions and ideas.

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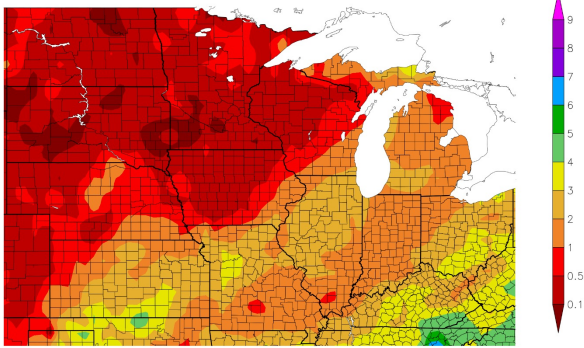
Where do we stand right now?

## **CURRENT CONDITIONS**

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# Precipitation (30 days)

Precipitation (in)  
11/18/2023 – 12/17/2023



Generated 12/18/2023 at HPRCC using provisional data.

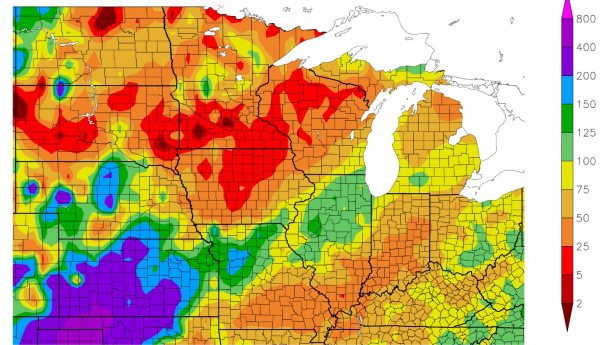
NOAA Regional Climate Centers

<https://hprcc.unl.edu/maps.php?maps=ACISClimateMaps>

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**Dry conditions continue.**

Percent of Normal Precipitation (%)  
11/18/2023 – 12/17/2023



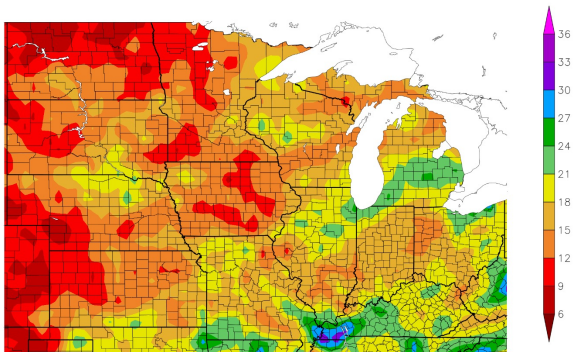
Generated 12/18/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

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# Precipitation (6 months)

Precipitation (in)  
6/17/2023 – 12/16/2023



Generated 12/17/2023 at HPRCC using provisional data.

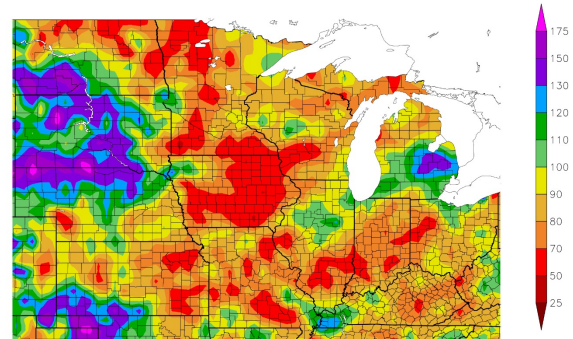
NOAA Regional Climate Centers

<https://hprcc.unl.edu/maps.php?maps=ACISClimateMaps>

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**Very dry conditions continue.**

Percent of Normal Precipitation (%)  
6/17/2023 – 12/16/2023



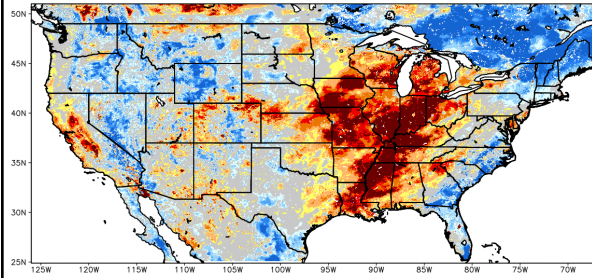
Generated 12/17/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

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# Modeled Soil Moisture

SPoRT-LIS 0-100 cm Soil Moisture percentile valid 18 Dec 2023

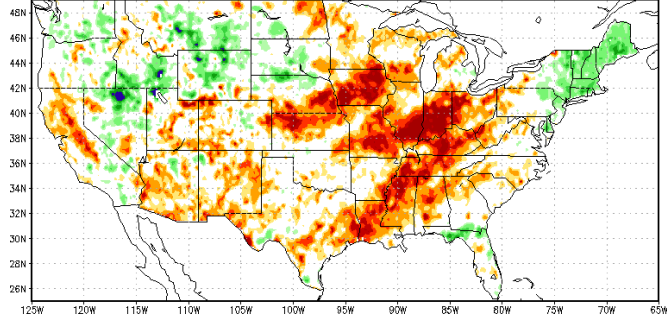


\*\*NOTE\*\*  
\*\*Experimental\*\*

[https://weather.msfc.nasa.gov/sport/case\\_studies/lis\\_CONUS.html](https://weather.msfc.nasa.gov/sport/case_studies/lis_CONUS.html)  
[https://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/smp\\_new.shtml#](https://www.cpc.ncep.noaa.gov/products/Drought/Monitoring/smp_new.shtml#)

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Ensemble-Mean Current SMP 14Dec2023



2 5 10 20 30 70 80 90 95 98

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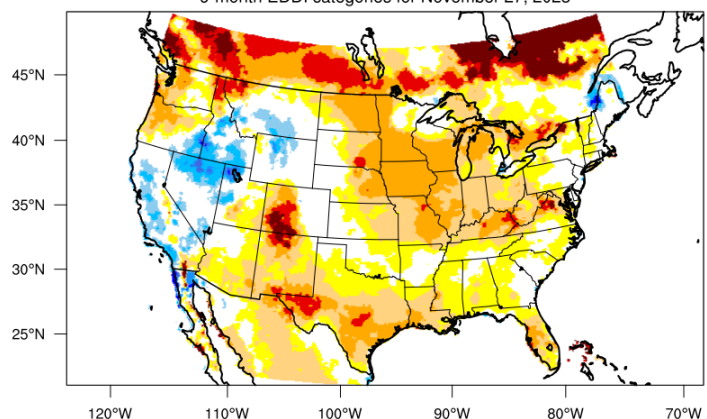
# Evaporation Growing Season 2023

Very dry conditions continue.

Evaporative demand adding to the issue

Winter warmth also helps dry soils some.

9-month EDDI categories for November 27, 2023



Drought categories

Wetness categories

ED4 ED3 ED2 ED1 ED0 EW0 EW1 EW2 EW3 EW4  
100% 98% 95% 90% 80% 70% 30% 20% 10% 5% 2% 0%

(EDDI-percentile category breaks: 100% = driest; 0% = wettest)

[https://psl.noaa.gov/eddi/#current\\_conditions](https://psl.noaa.gov/eddi/#current_conditions)

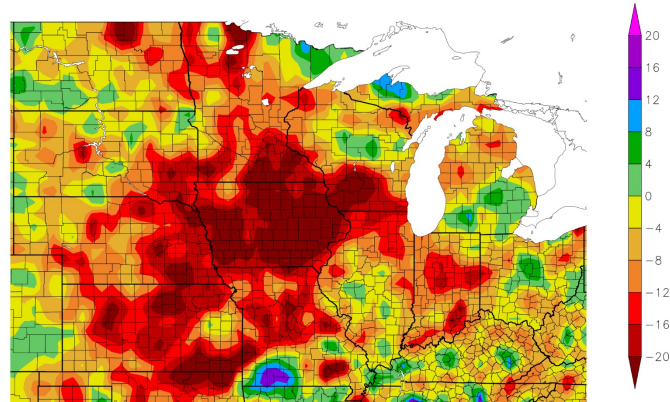
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Generated by NOAA/ESRL/Physical Sciences Laboratory

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# Precipitation (departure last 3 years)

Departure from Normal Precipitation (in)  
12/3/2020 – 12/2/2023



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Generated 12/3/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

<https://hprcc.unl.edu/maps.php?maps=ACISClimateMaps>

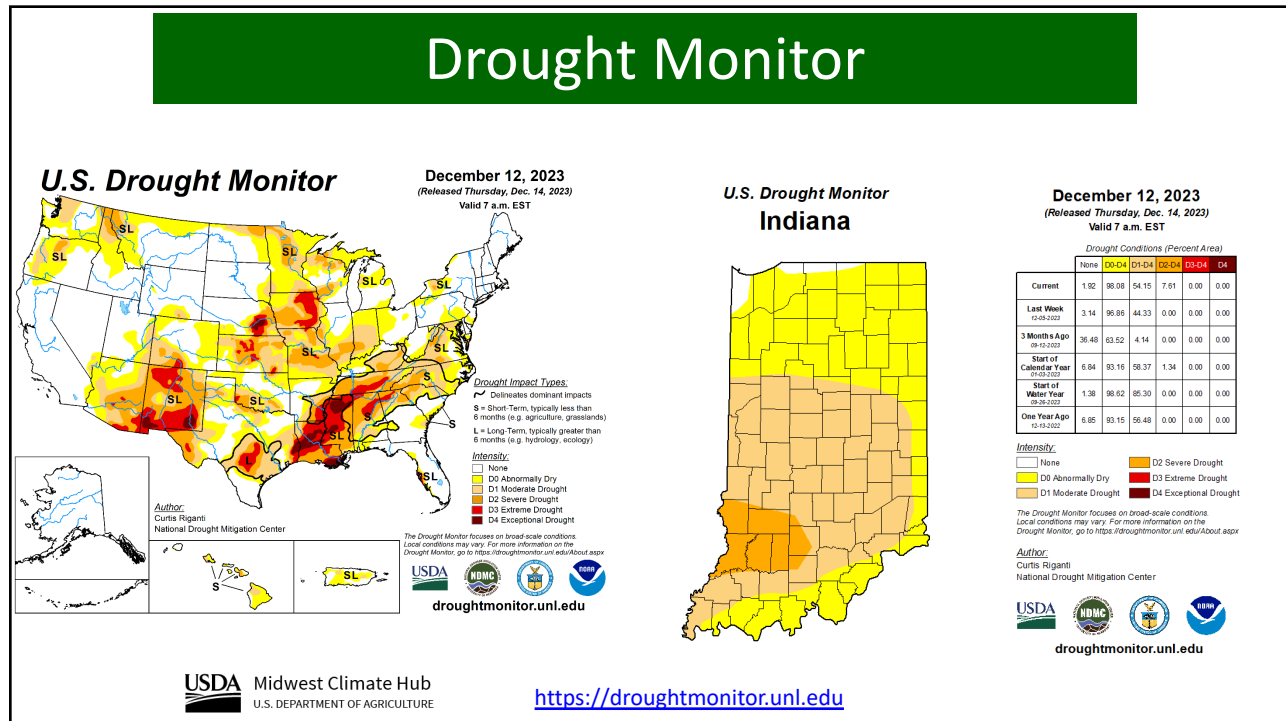
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Climate context

## DROUGHT

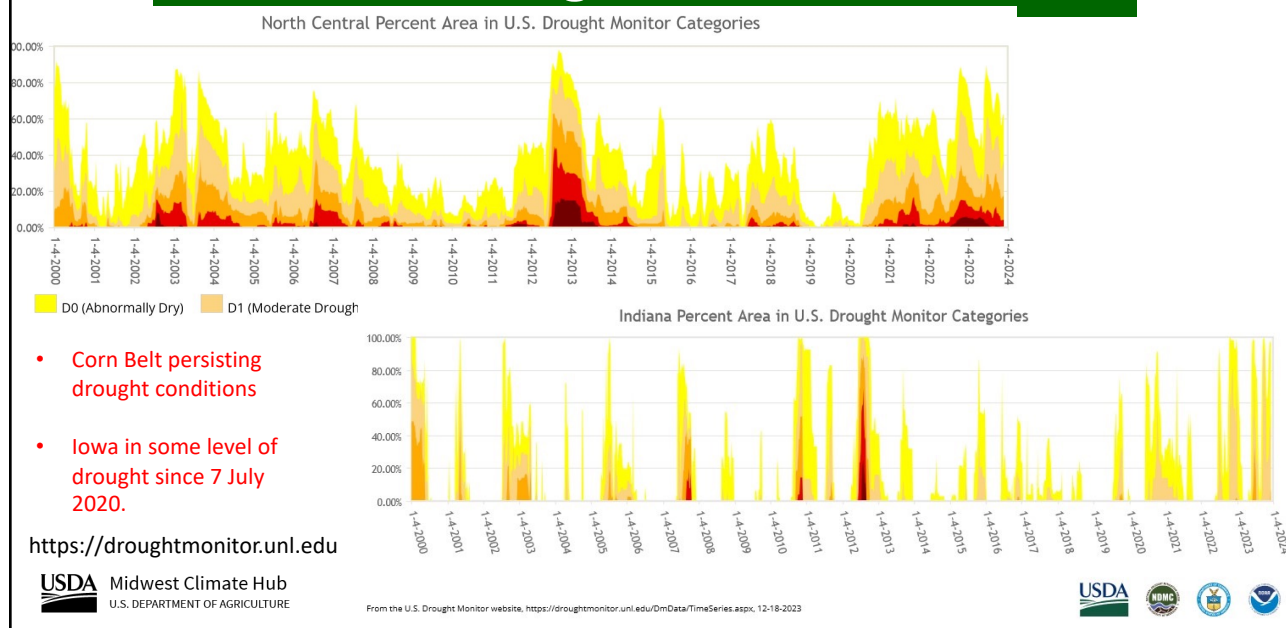
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# Drought Monitor



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## Drought-context



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# Things you can do - reporting

Drought Impacts Toolkit
Home Tools Emerging Impacts Impact Assessments

CMOR Desktop and Mobile Options

CMOR Reports Dashboard for desktop  
(Includes reports 2018-present and more filter options)

Map of Reports Submit a Report

CMOR Reports Map for mobile  
(Includes year-to-date reports and fewer filter options)

Map of Reports Submit on Mobile

Other Resources

- Frequently asked questions
- Factsheet on how to submit and view reports:  
In English | En Español
- Video on how to submit and view reports
- Help Recruit CMOR Participants (sample press rele)
- Social Media Resources for people to submit obser
- Related publications

Reports received today 12/04/2023 as of 9:13 AM EST

Daily	Multi-day	SigWx	Hail	Condition	ET
6,193	251	0	0	19	3

24-hour Precipitation Dec 4, 2023  
0-100.00 mm (local obs time)

- NA
- Zero
- Trace
- 0.00 - 0.10 in
- 0.10 - 0.25 in
- 0.25 - 0.50 in
- 0.50 - 0.75 in
- 0.75 - 1.00 in
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<https://droughtimpacts.unl.edu/Tools/ConditionMonitoringObservations.aspx>  
<https://www.cocorahs.org/>

50

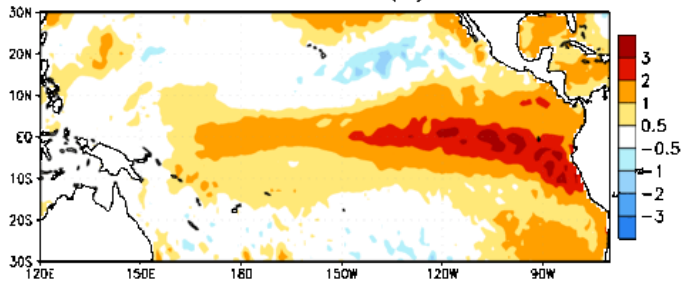
Climate context

## EL NIÑO

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## Strong El Niño

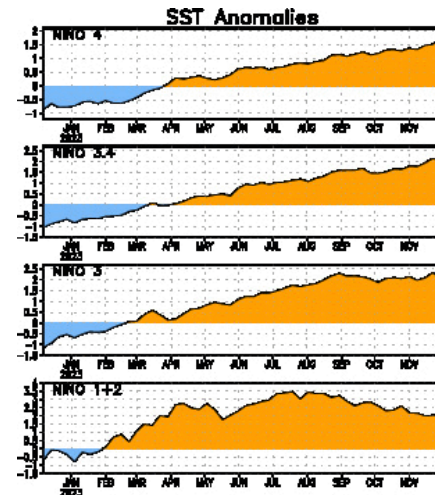
Week centered on 13 SEP 2023  
SST Anomalies (°C)



- Current status – El Niño
- Weakening in the spring
- Unlikely to affect summer

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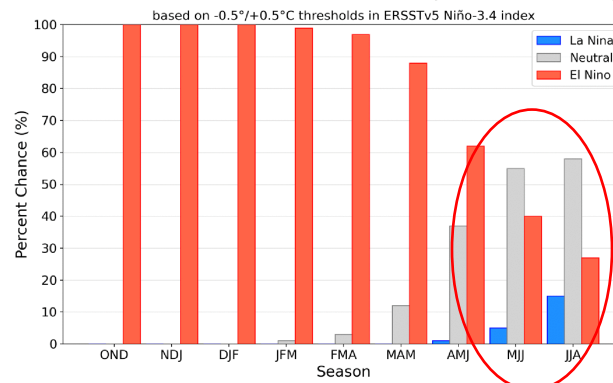
<https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>



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## ENSO Probabilistic Forecast

Official NOAA CPC ENSO Probabilities (issued Nov. 2023)



- Current status – El Niño
- Weakening into spring
- Unlikely to affect summer
- Neutral conditions probably more likely later in 2024.

Figure 7. Official ENSO probabilities for the Niño 3.4 sea surface temperature index (5°N-5°S, 120°W-170°W). Figure updated 9 November 2023.

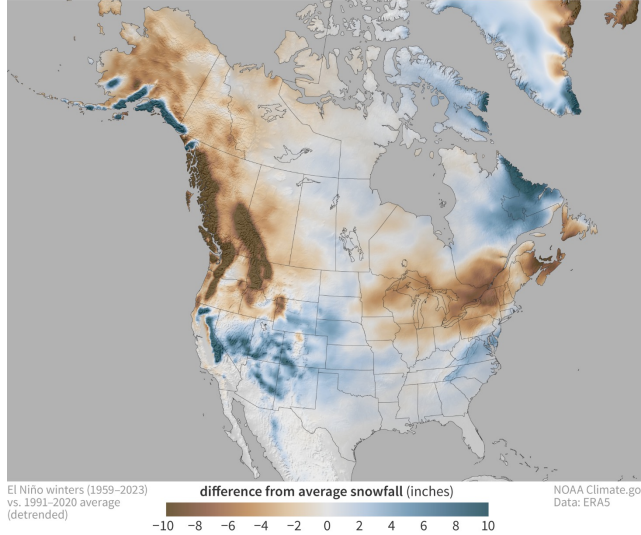
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[https://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/enso\\_advisory/ensoadisc.shtml](https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensoadisc.shtml)

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# El Niño and Winter

Snowfall during all El Niño winters (Jan-Mar)



- Less snow more likely with El Niño this winter (Jan. Mar.).

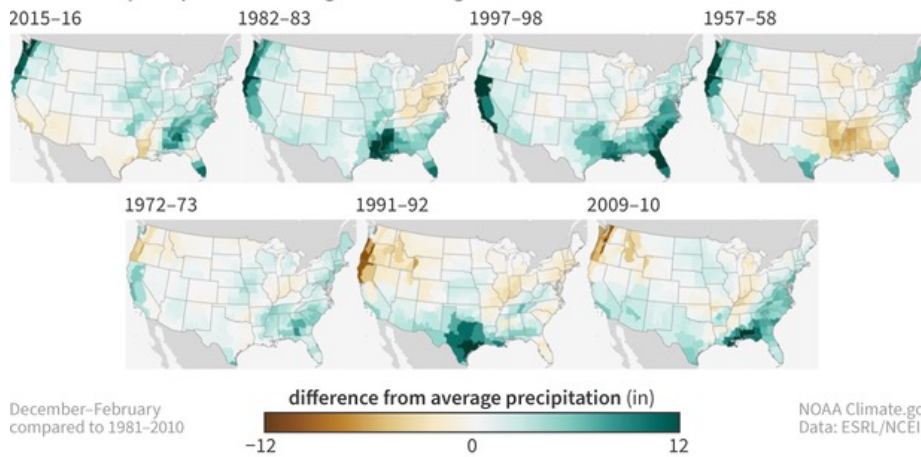
USDA Midwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

<https://www.climate.gov/news-features/blogs/enso>

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# El Niño and Winter

U.S. winter precipitation during the 7 strongest El Niños since 1950



- Some wetness this winter possible – central Corn Belt
- Mixed but more likely drier eastern Corn Belt.

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<https://www.climate.gov/news-features/blogs/enso>

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A look ahead

## OUTLOOKS

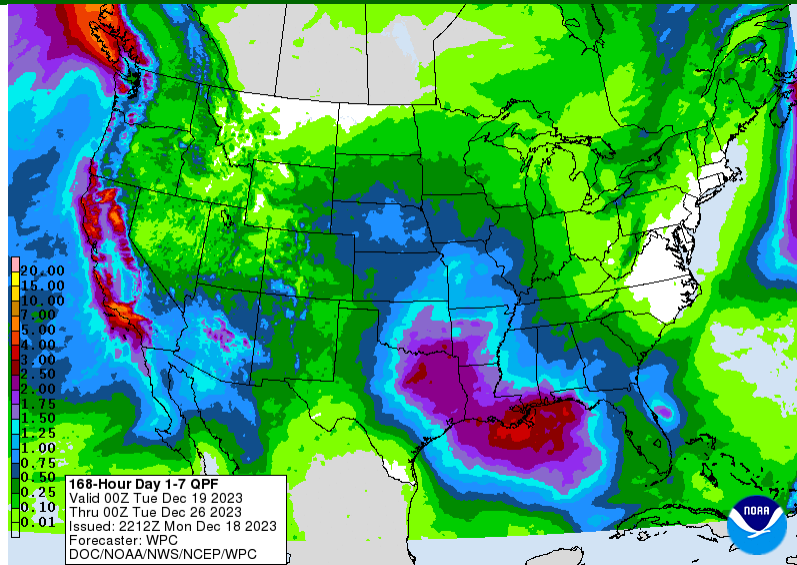
57

## Climate Outlooks

- 6-10 and 8-14 day updated daily
- Monthly updated 2x/month
- Longer range updated monthly
- Based on probabilities
- Good to have ag interpretation
- Check [Midwest Climate Hub website](#) for ag interpretation

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## 7-day Quantitative Precipitation Forecast

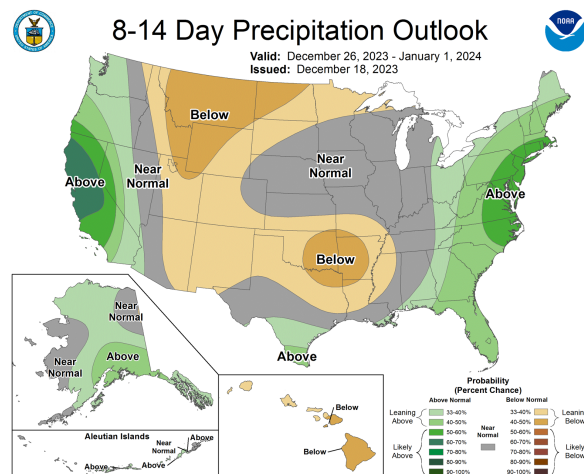
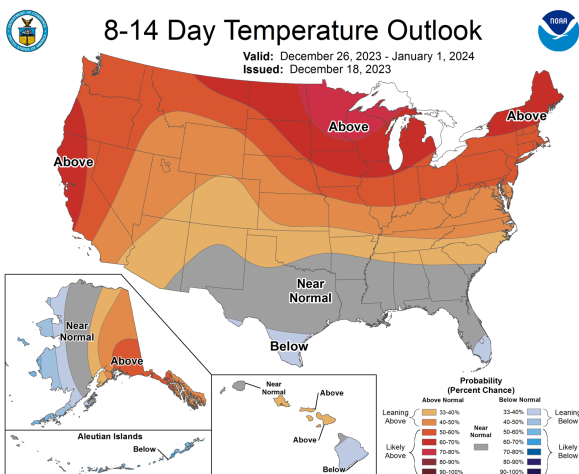


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<http://www.wpc.ncep.noaa.gov/qpf/day1-7.shtml>

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## 8-14 Day Temp. and Precip. Outlook

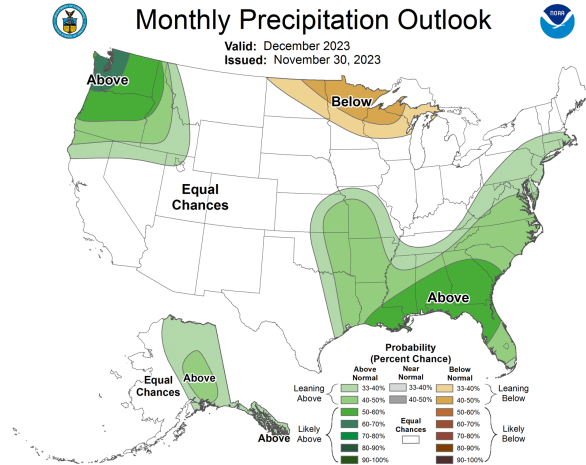
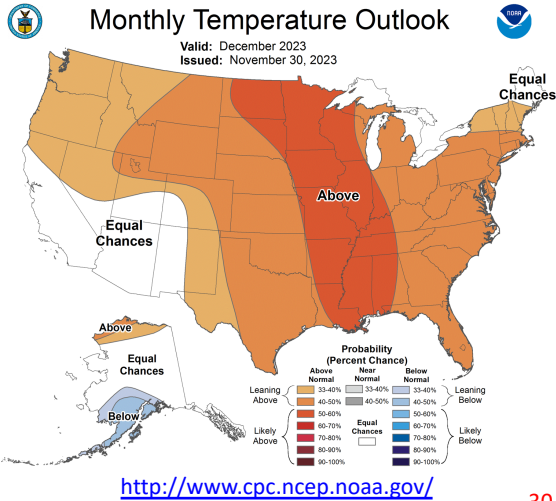


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U.S. DEPARTMENT OF AGRICULTURE

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

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## 30 Day Temp and Precip. Outlook

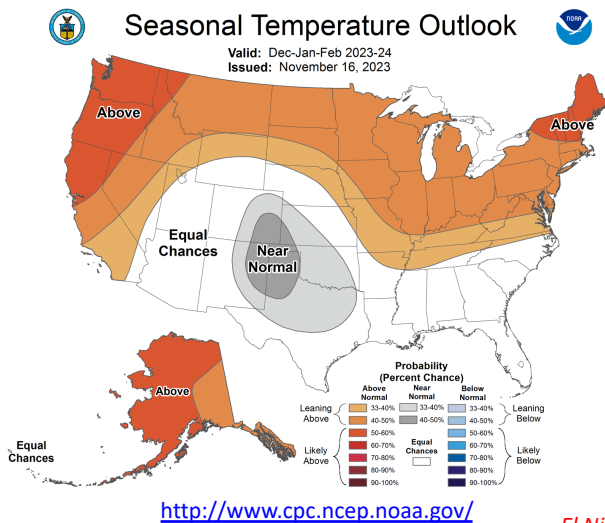


30 day outlook fro December – likely warmer. No strong indications on precipitation.

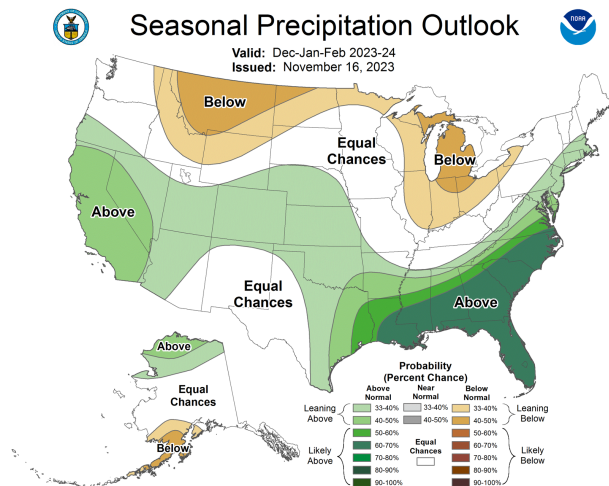
USDA Midwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

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## 90 Day Temp and Precip. Outlook



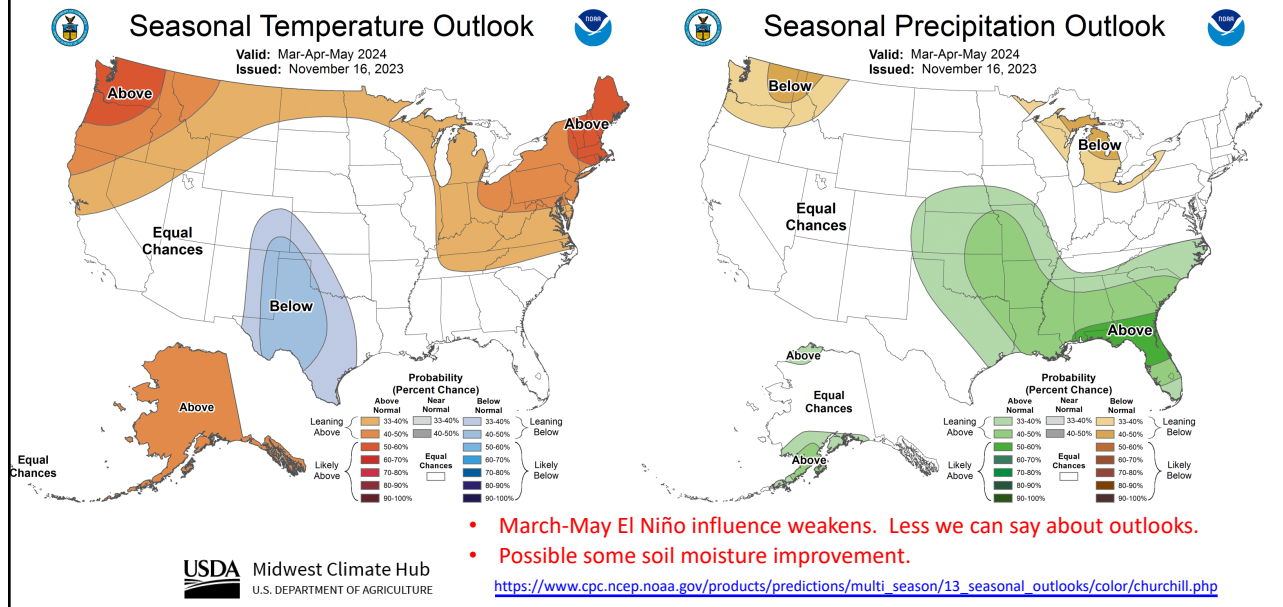
USDA Midwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE



El Nino-looking pattern. More likely warm. Iowa in-between slightly drier east and slight wetter west.

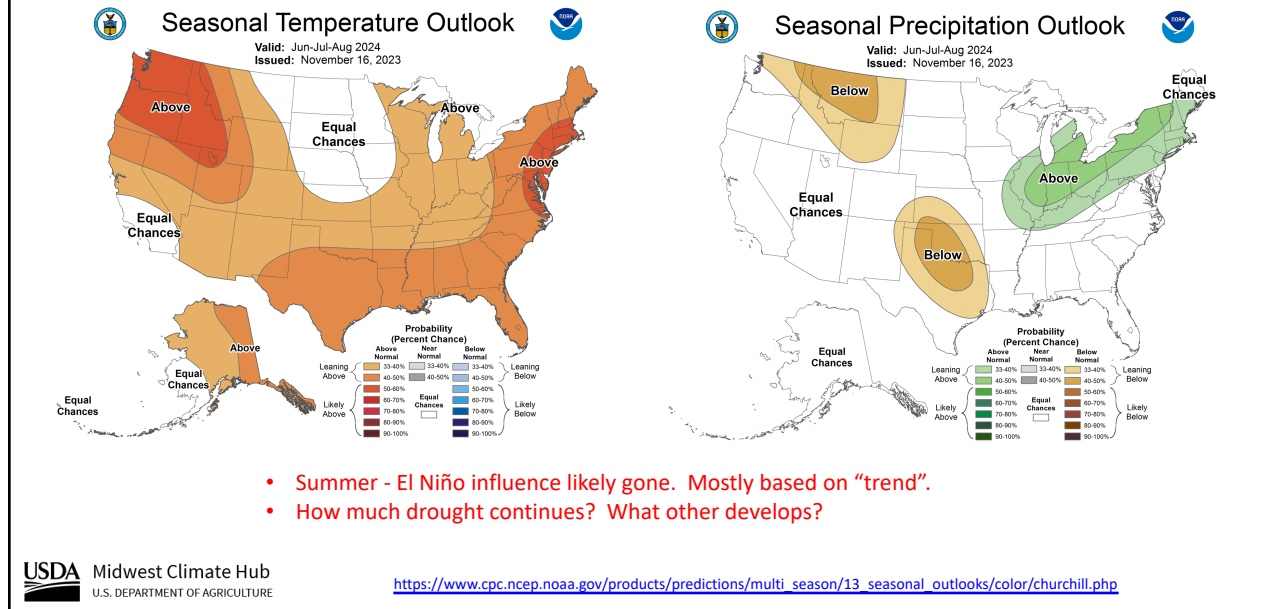
62

## Spring Outlook (March-May)



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## Seasonal Outlook for June-August



64

## Summary

- *Conditions*
- Some dryness issues
- Warm
- El Niño helping drive current conditions – along with climate change
- *Outlooks*
- El Niño will continue to play into winter and spring
- Drought recovery (some but marginal)
- Spring planting won't have major wetness slowdowns.

## Recommendations

- Strongly consider yield goals – fertilizer recommendations (soil moisture recovery could limit)
- Soil management – tillage loses soil moisture.
- If depending on a water source (irrigation/livestock etc.) – check its level and develop alternate plans

## Useful Resources

## Historical Climate Data



Home Climate Information Data Access Customer Support Contact About

### Climate at a Glance

Global National Regional Statewide Divisional **County** City

Mapping Time Series Rankings Haywood Plots Data Information Background

County Time Series

Choose from the options below and click "Plot" to create a time series graph.  
Please note, Degree Days and Palmer Indices are not available for Counties.

Parameter: Average Temperature

Time Scale: 1-Month

Month: September

Start Year: 1895

End Year: 2022

State: Alabama

County: Autauga County

Options

☒ Display Base Period  
Start: 1901 End: 2000

☐ Display Trend  
per Decade per Century  
Start: 1895 End: 2022

☐ Smoothed Time Series  
☐ Binomial Filter ☐ LOESS

Plot

**Find all links at**  
**[tiny.cc/acj1vz](https://tiny.cc/acj1vz)**

**USDA** Midwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

**Plus, NRCS Climate Quick Reference Guides (Counties)**  
<https://webapps.ionr.ada.nmsu.edu/climate-quick-guides/>

### NCEI Climate at a Glance

### Midwestern Regional Climate Center

**Midwestern Regional Climate Center**

About Us Data & Services Midwest C

**Featured Products**

**cli-MATE**  
MRCC APPLICATION TOOLS & ENVIRONMENT

**Midwest CLIMATE WATCH**

cli-MATE Online Data Portal  
Self-service access to climate data, rankings, maps, and more

Midwest Climate Watch  
Monitor recent climate conditions and impacts

**Seasonal Tools**

**Core Growing Degree Day**  
Estimate corn maturity by GDDs

**Regional Mesonet Project**  
Monitor soil temperatures

**Freeze Date Tool**  
Explore freeze date trends

**VIP Freeze Maps**  
Monitor 2022-2023 freeze maps

**Highlighted Products**

**VIP Freeze Probabilities**

**AWRS1 Winter Index**

**Weather on Your Birthday**

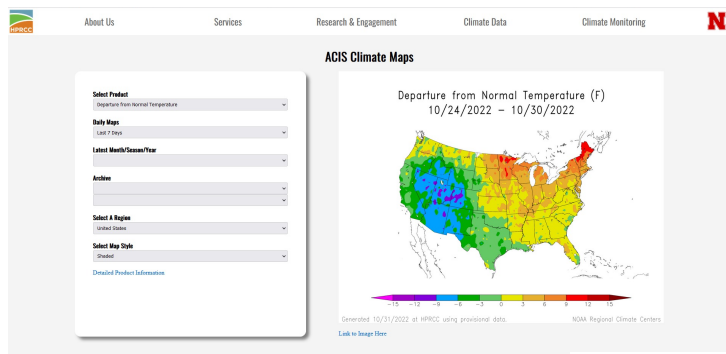
**Climate Perspectives Tool**

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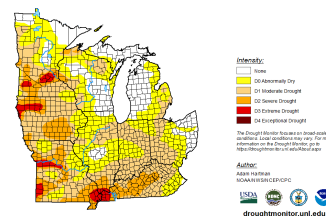
## Useful Resources

## Recent/Current Conditions



U.S. Drought Monitor  
Midwest

October 25, 2022  
(Revised Thursday, Oct. 27, 2022)  
MID 8 a.m. EDT



**Find all links at**  
**[tiny.cc/acj1vz](https://tiny.cc/acj1vz)**

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U.S. DEPARTMENT OF AGRICULTURE

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## Useful Resources

## Forecasts and Outlooks

**National Weather Service**  
**Climate Prediction Center**

Home Site Map News Organization  
DOC NOAA NWS NCEP Centers: AWC CPC EMC NCO NHC OPC SPC SWPC WPC

**Climate News**

- NOAA Issues Winter Outlook (20 Oct 2022)
- 75% chance of La Niña during Northern Hemisphere winter (December-February) 2022-23, with 54% chance for ENSO-neutral in February-April 2023 (13 Oct 2022)
- 47th Climate Diagnostics and Prediction Workshop Announcement (15 Apr 2022)

Click on product title to go to product page. Move cursor over product parameter name to display the graphic -- click to enlarge. Links to these same products are also available below.

6-10 Day Outlook (interactive) Temperature Precipitation	One Month Outlook (interactive) Temperature Precipitation
8-14 Day Outlook (interactive) Temperature Precipitation	Three Month Outlook (interactive) Temperature Precipitation
Week 3-4 Outlooks Temperature Exp. Precipitation	Composite 8-14 Day U.S. Hazards Outlook Probabilistic: Temp Precip Snow Wind
U.S. Drought Information Monitor Monthly Outlook Seasonal Outlook	Global Tropics Hazards Outlook Weeks 2 and 3

**8-14 Day Temperature Outlook**  
Valid: November 8 - 14, 2022  
Issued: October 31, 2022

Probability Percent Chances:  
Below Normal: 0-10%, 10-20%, 20-30%, 30-40%, 40-50%, 50-60%, 60-70%, 70-80%, 80-90%, 90-100%  
Near Normal: 0-10%, 10-20%, 20-30%, 30-40%, 40-50%, 50-60%, 60-70%, 70-80%, 80-90%, 90-100%  
Above Normal: 0-10%, 10-20%, 20-30%, 30-40%, 40-50%, 50-60%, 60-70%, 70-80%, 80-90%, 90-100%

**8-14 Day Precipitation Outlook**  
Valid: November 8 - 14, 2022  
Issued: October 31, 2022

Probability Percent Chances:  
Above Normal: 0-10%, 10-20%, 20-30%, 30-40%, 40-50%, 50-60%, 60-70%, 70-80%, 80-90%, 90-100%  
Near Normal: 0-10%, 10-20%, 20-30%, 30-40%, 40-50%, 50-60%, 60-70%, 70-80%, 80-90%, 90-100%  
Below Normal: 0-10%, 10-20%, 20-30%, 30-40%, 40-50%, 50-60%, 60-70%, 70-80%, 80-90%, 90-100%

Find all links at  
[tiny.cc/acj1vz](https://tiny.cc/acj1vz)

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## Midwest and Great Plains Climate-Drought Outlook 15 September 2016

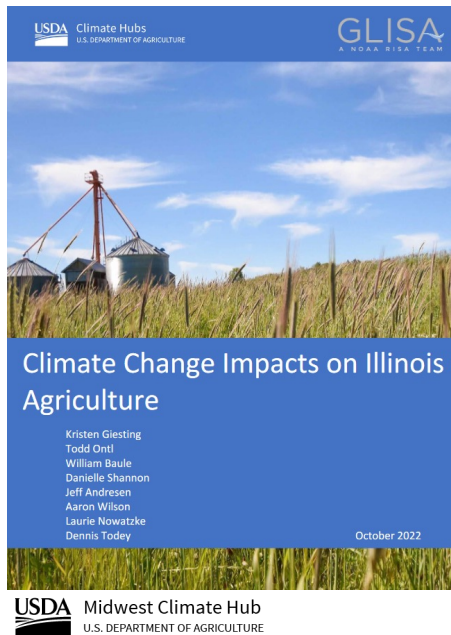
<https://www.drought.gov/drought/dews/midwest/reports-assessments-and-outlooks>



United States Department of Agriculture  
Midwest Climate Hub

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## Climate Hub – Ongoing Projects



- Hear more about these tomorrow at 10 and 11.

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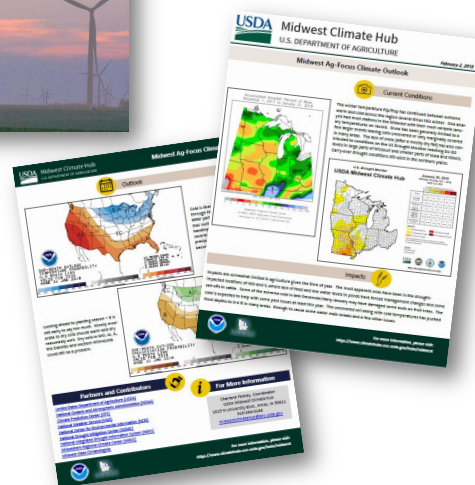
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## Climate Hub –Operational Products



### Midwest Ag-Focus Climate Outlook

<https://www.climatehubs.usda.gov/hubs/midwest/climate-outlooks>



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## Climate Smart Agriculture



### Climate Ready Midwest

Climate Ready Midwest is a multistate partnership working to increase the impact of climate-smart agriculture across the region. Our mission is twofold:

- 1 To define what climate-smart agriculture means to the midwestern Extension agricultural community
- 2 To empower Extension professionals to lead climate-informed agricultural programming across the Midwest

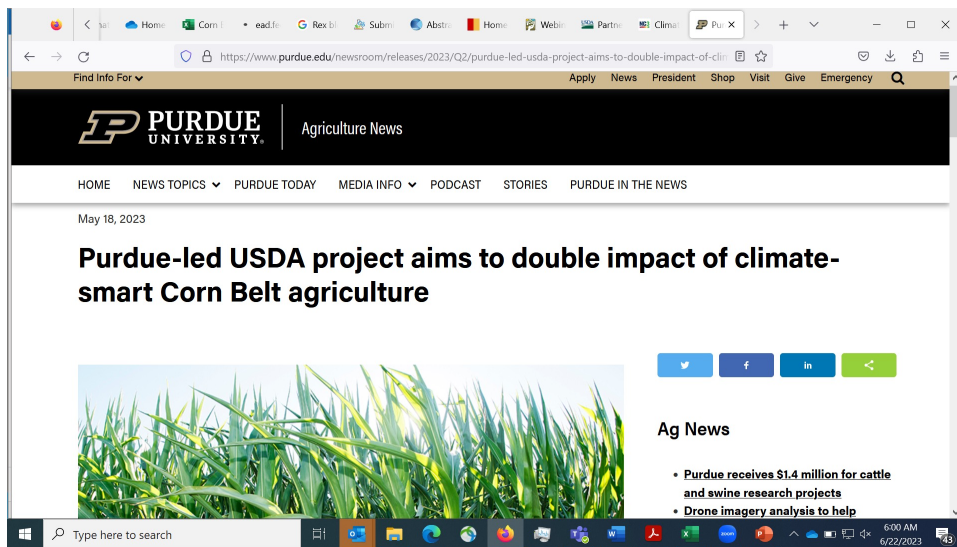
Extension professionals and the USDA Midwest Climate Hub are working together to assess and build climate-informed programming by:



<https://northcentralclimate.org/climate-ready-midwest/>

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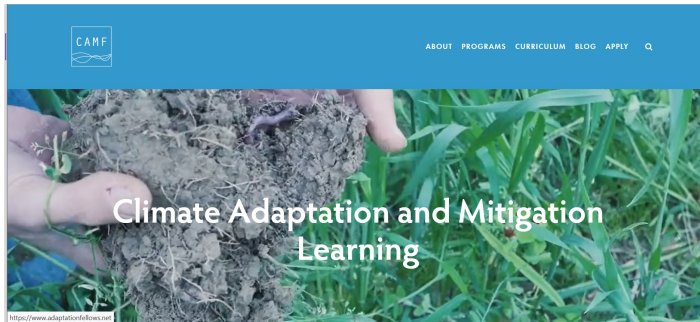
## Climate Smart Agriculture



<https://cris.nifa.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=R=98533&format=WEBFMT6NT>

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## Climate Smart Agriculture



- *Partners needed!*
- Training fellowship for producers and advisers
- 4 week training in February (virtual) – CEUs available
- Understand more about climate issues in the Midwest
- Develop new adaptation strategies working with other producers
- Sign up soon!

USDA Midwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

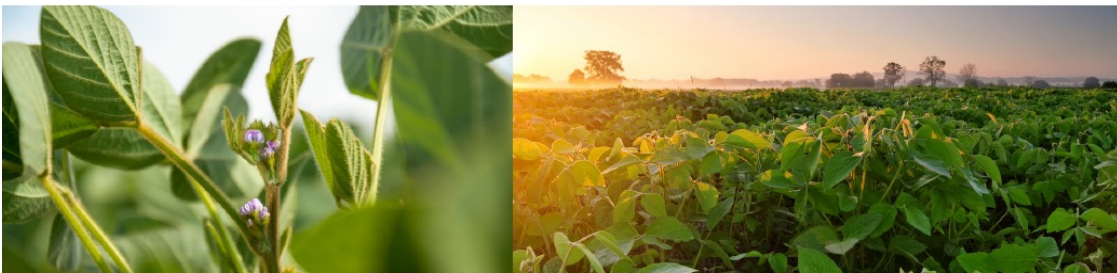
<https://www.adaptationfellows.net/>

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This 10-minute survey is designed to help us understand the weather data and products used by your farm, or what you wish you could be using, in order to help us identify the types of weather data needed for researchers and weather forecasting scientists to provide farmers the accurate weather data tools they need to improve yields and profitability.



**Take the Survey**



**P PURDUE**  
UNIVERSITY®

Indiana State Climate Office



**MRCC**  
Midwestern Regional  
Climate Center

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## For More Information



@USDAClimateHubs  
@dennistoday



<https://www.climatehubs.usda.gov/hubs/midwest>

<https://www.climatehubs.usda.gov/newsletter-signup>

[MidwestClimateHub@usda.gov](mailto:MidwestClimateHub@usda.gov)



**USDA** Midwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE  
National Laboratory for Agriculture and the Environment  
Attn: Midwest Climate Hub  
1015 N University Blvd  
Ames, Iowa 50011-3611

**Contact Laurie to sign  
up for newsletter and  
monthly ag outlooks!** →



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Melissa Kadolph – Admin

[Melissa.Kadolph@usda.gov](mailto:Melissa.Kadolph@usda.gov)

Adam Reed – NRCS Co-Lead

[Adam.Reed@usda.gov](mailto:Adam.Reed@usda.gov)