Climate Changes Impacting Missouri

A Background

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Topics

• A brief Background of USDA Climate Hubs
  • The need, mission
  • More on the Midwest Climate Hub

• Climate changes and Missouri
  • Precipitation
  • Temperature
  • Impacts/other

• Resources of the USDA Midwest Climate Hub
  • Website
  • For more Information
USDA Climate Hubs

Providing...

Information and Tools to Decision Makers to Build Resilience to climate variability.
Here in the Midwest...

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.
Figure 7.1: Annual and seasonal changes in precipitation over the United States. Changes are the average for present-day (1986–2015) minus the average for the first half of the last century (1901–1960 for the contiguous United States, 1925–1960 for Alaska and Hawaii) divided by the average for the first half of the century. (Figure source: top adapted from Peterson et al. 2013,© American Meteorological Society. Used with permission; bottom four NOAA NCEI, data source: nCLIMDiv).

https://science2017.globalchange.gov/
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https://science2017.globalchange.gov/
Spring and Fall biggest increases in MO

https://www.ncdc.noaa.gov/cag
Issues from Precip Changes

- Variable across the corn belt
- Increasing precip intensity (especially off-season)
- More soil/nutrient loss potential
- Soil loss
  - Reducing tillage
  - Cover crops
- Nutrient loss
  - 4Rs
- Increased need for drainage
Figure 6.1. Observed changes in annual, winter, and summer temperature (°F). Changes are the difference between 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 Hawaii). Estimates are derived from the nClimDiv dataset.¹ ² (Figure NOAA/NCEI).
Observed Number of Very Warm Nights

Missouri

Number of Days with Minimum Temperature Above 75°F

5-year Period

1900-04
1910-14
1920-24
1930-34
1940-44
1950-54
1960-64
1970-74
1980-84
1990-94
2000-04
2010-14

https://statesummaries.ncics.org/mo
Summer trend flat overall

Driven by overnight lows not by daily highs

https://www.ncdc.noaa.gov/cag
Warm Nights

- Added livestock/human stress
- Additional cooling needed (humans/livestock)
- Push GDD accumulation/phenological state

- Does help increase frost free season period
The frost-free season length, defined as the period between the last occurrence of 32°F in the spring and the first occurrence of 32°F in the fall, has increased in each U.S. region during 1991-2012 relative to 1901-1960. Increases in frost-free season length correspond to similar increases in growing season length. (Figure source: NOAA NCDC / CICS-NC).
Frost Free Season Change

- Longer hybrid
- Earlier spring (confounded)
- Earlier planting not always possible/soil conditions
- Average dates change – not always a solid guarantee
Warming impacts

• Overwintering of insects is easier/further north
• More life cycles per year
• Invasives

• Additional precip leads to changing disease risk
But can $\text{CO}_2$ affect herbicide efficacy?

As carbon dioxide increases, glyphosate efficacy is reduced

Ziska et al. 1999. Weed Science. 47:608-615, inter alia
CSCAP/U2U Survey

Weeds

Diseases

Insects
CSCAP/U2U Survey Results

https://sustainablecorn.org/What_Farmers_are_Saying/Farmer_Survey.html
Climate Forcing

https://science2017.globalchange.gov/
Historic GHG Amounts

https://science2017.globalchange.gov/
Projected Change (%) in Seasonal Precipitation

Late 21\textsuperscript{st} Century

https://science2017.globalchange.gov/
OPTIONAL SLIDES
Resources: Website

https://www.climatehubs.oce.usda.gov/hubs/midwest

Search for tools, research and events by Region, Topic, type of crop, or climate Impact.
Resources: Operational Products

Midwest Ag-Focus
Climate outlook

The Midwest represents one of the most diverse areas of agricultural production in the world and consistently affects the global economy. Agriculture is impacted by climate. Find out how and how best to adapt agricultural practices to maintain yields here.
To our Newsletter, Resources, Publications and One-Pagers
Increasing the efficiency of Information Flow
Increasing the efficiency of Information Flow

Weather and Climate Experts
- Raw Data
- Feedback on Data Needs
- Impacts to Improve Forecasts, Supplemental Info for National Reporting (NDMC, AASC, ETC)
- Raw Data, Early Warning, Localized Info

Tools Expert
- Producer and Extension Tool Needs

Extension and Producers
- Raw Data
- Weather and Climate Information
- Impacts, Climate Concerns, and Information Needs

Midwest Climate Hub

USDA Midwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE
Box 1.1: About the Adaptation Resources for Agriculture

The Adaptation Resources for Agriculture:
- Supports producers, service providers, and educators in the Midwest and Northeast Regions of the United States.
  - **Midwest:** Michigan, Ohio, Indiana, Illinois, Missouri, Kansas, Nebraska, South Dakota, North Dakota, Minnesota, Wisconsin, and Iowa.
- Helps producers consider both short-term adaptive management actions (<5 years) and long-range strategic plans (5-20 years, subject to farm type).
- Promotes adaptation through multiple resources, including:
  - A "menu" of many adaptation strategies and approaches (Chapter 3) and example tactics for row cropping and forages, confined livestock, grazing, and production of feed for the scale.
- A five-state Workbook, incorporating existing resources, is available.
- Examples from Michigan's case study are considered.

The Resources for Agriculture:
- Recommendations:
  - Address the impacts of climate variability and change in the Midwest and Northeast regions.
  - Support agricultural producers in adapting to the impacts of climate variability and change.
  - Promote resilience and sustainability in agricultural systems.
  - Attempt to minimize the negative effects of climate variability and change on agricultural production and economic viability.
Resources: Adaptation Guide

Midwest Corn Growers’ Decision Calendar

Figure 2.2 The Midwest Corn Grower’s Decision Calendar shows an example of considerations over short- and long-term timeframes. Source: Takle et al. (2014).
Predicting Changes in Range Distribution and Population Dynamics of Pests
Climate Monitoring Tools: Useful To Usable