Weather/Climate Issues for Ag 2019 and Beyond

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Topics

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

• Tools
• Long Term Crop Impacts
• Monitoring
• Outlooks
• Resources of the USDA Midwest Climate Hub
  • Website
  • For more Information
Topics

• A brief Background of USDA Climate Hubs
  • The need
  • More on
• Current Conditions
• Crop Impact
• Outlook
• Resources
  • Website
  • For more information
Intro to Climate Hub Work

Assessments and Syntheses
*delivering relevant information*

Outreach and Education
*enabling climate-informed decisions*

Technical Support
*facilitating engagement, discovery and exchange*

USDA Midwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE
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.
MCH Thematic Areas

Assessments and Syntheses
*delivering relevant information*

United States Department of Agriculture
National Institute of Food and Agriculture

AMERICAN FRUIT GROWER

U.S. Global Change Research Program
National Climate Assessment

AMERICAN VEGETABLE GROWER

Midwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE
MCH Thematic Areas

Outreach and Education
*enabling climate-informed decisions*

MAC-T
Midwest Agriculture and Climate Team

USDA Climate Hub
Midwest Agriculture Climate Outlook

Drought Status Update
Midwest & Northern Plains
JUNE 21, 2018

Drought Concerns: Linger With Above-Normal Temperatures
- Midwest has seen above-normal temperatures in recent months, which has persisted into July.
- Conditions have improved in eastern Nebraska, northeastern Kansas, and eastern Iowa.
- Portions of Nebraska and Minnesota have seen above-normal temperatures.

Great Lakes Region
Regional Climate Summary
June 2018
Would have been a pretty good growing season except.....

A LITTLE CLIMATE BACKGROUND
May temperatures mostly colder than average. Signal more in the max temps.

Top 10 coldest average highs in central/western US.

Warmer minimums in the eastern US.
May/Spring Precipitation

- May and spring precipitation well above average through middle US
- Top 10 and wettest all time for a few states at these time scales

[Link to map: https://www.ncdc.noaa.gov/temp-and-precip/us Maps]
• Extended period of wetness back to a year.
• Top 10/record wettest in states back to a year.
• Wetness problems are long term issues.
• Iowa wettest June-May period on record (124 years)

Corn and Bean Status

CROP CONDITIONS
Crop progress (corn dough and dent) nationally through August 18 (dough 55% -21%; dent 15% -15%). Iowa (dough 59% -21%; dent 7% -19%).
Soybean progress (blooming and setting pods) nationally through August 18 (blooming 90% -6%; pods 68% -17%). Iowa (blooming 93% -4%; pods 71% -18%).
Soybean progress (setting pods) nationally through August 25 (pods 79% - 12%). Iowa (pods 84% - 10%).

Lowest pod set on record as of Aug. 25.
Corn progress (dented) nationally through August 25 (27% -19%). Iowa (21% -25%).

6th lowest dented on record as of Aug. 25.
LONG TERM IMPACTS - AGRICULTURE

Using data to make decisions
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 Hawai'i) divided by the average for the first half of the century. (Figure source: [top panel] adapted from Peterson et al. 2013, © American Meteorological Society. Used with permission; [bottom four panels] NOAA NCEI, data source: nCLIMDiv).
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Only 6 of last 25 years below long term average.

https://www.ncdc.noaa.gov/cag/divisional/time-series
Only 5 of last 25 years below long term average.

https://www.ncdc.noaa.gov/cag/divisional/time-series
Issues from Precip Changes

- Variable across the corn belt
- Increasing precip totals (especially off-season)
- More soil/nutrient loss potential
- Soil loss
  - Reducing tillage
  - Cover crops
- Nutrient loss
  - 4Rs
- Planting/harvesting issues
- Increased need for drainage
Observed U.S. Temperature Change

Temperature Change (°F)

-1.5 to >1.5

-1.5 to -1.0
-1.0 to -0.5
-0.5 to 0.0
0.0 to 0.5
0.5 to 1.0
1.0 to 1.5

USDA
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.1,2 (Figure NOAA/NCEI).
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).
Using data to make decisions

TOOLS
Decision Support Tools

**AgClimate View**
A convenient way to access customized historical climate and crop yield data for the U.S. Corn Belt. View graphs of monthly temperature and precipitation, plot corn and soybean yield trends, and compare climate and yields over the past 30 years.

**Climate Patterns Viewer**
Discover how global climate patterns like the El Niño Southern Oscillation (ENSO) and Arctic Oscillation (AO) have historically affected local climate conditions and crop yields across the U.S. Corn Belt.

**Probable Fieldwork Days**
This spreadsheet-based tool uses USDA data on Days Suitable for Fieldwork to determine the probability of completing in-field activities during a user-specified time period. This product is currently available for Illinois, Iowa, Kansas, and Missouri. (Hosted by the University of Missouri)

**Corn GDD**
Track real-time and historical GDD accumulations, assess spring and fall frost risk, and guide decisions related to planting, harvest, and seed selection. This innovative tool integrates corn development stages with weather and climate data for location-specific decision support tailored specifically to agricultural production.

**Corn Split N**
Determine the feasibility and profitability of using post-planting nitrogen application for corn production. This product combines historical data on crop growth and fieldwork conditions with economic considerations to determine best/worst/average scenarios of successfully completing nitrogen applications within a user-specified time period.

[www.AgClimate4U.org](http://www.AgClimate4U.org)
Corn Growing Degree Days

This tool puts current conditions into a 30-year historical perspective and offers trend projections through the end of the calendar year. Growing Degree Day (GDD) projections, combined with analysis of historical analog data, can help you make decisions about:

- Climate Risks – Identify the likelihood of reaching maturity before frosts/freezes.
- Activity Planning – Consider corn hybrid estimated physiological maturity requirements, along with GDD projections when making seed purchasing and other growing season decisions.
- Marketing – Look at historical and projected GDD when considering forward pricing and crop insurance purchases.
GDD Graph

Corn Growing Degree Day Tool

Location: 42.06, -93.43 in Story Co., IA, Start Date: April 25, Maturity Days: 108, Freeze Temp: 28°F, Variation: All Years

- 2019 GDD
- 2019 GDD Projection
- Last Freeze (Spring)
- First Freeze (Fall)
- Silking
- Black Layer

https://hprcc.unl.edu/gdd.php or https://mrcc.illinois.edu/U2U/gdd/
U2U Tools

- High Plains Regional Climate Center
- https://hprcc.unl.edu/gdd.php

- Other ag tools there
  - Soil T
  - Vegetation/freeze
  - Others
When will it happen?

FROST/FREEZE
GDD Graph

Corn Growing Degree Day Tool

Location: 43.31, -96.91 in Turner Co., SD, Start Date: June 4, Maturity Days: 95, Freeze Temp: 28°F, Variation: All Years

Graphs show the accumulated corn GDD (Growing Degree Days) from February to December. The graph includes lines for 2019 GDD, 2019 GDD Projection, Avg. GDD (1981-2010), Last Freeze (Spring), First Freeze (Fall), Silking, and Black Layer.

GDD Base 50/86 (degrees F); Created: 07/09/2019
GDD Base 50/86 (degrees F); Created: 10/09/2015

www.AgClimate4U.org
Freeze date - 50th percentile

Half the time earlier – half the time later.
Around here

Early – very late September

Late – End of October

Median Agronomy Farm
32 F Oct. 9
28 F Oct. 20
Around here
Early – very late September
Late – End of October
Take Home on Frost-Freeze

• Be as patient as you can be
• Do not buy in to anything on early freeze at this point. Too early to address here. (far northern corn belt we need to start watching)
• Some corn will not make it.
• Trend is in our favor....
Heaviest rain in last 30 days SW to Dubuque area 4-6” (100-150% avg.). Much lighter far NW and SE where less than 50% or even 25% avg.
90 Day Precip. Total/% Avg.

90 day around 10-15” with heavier in the south and a few other pockets. Much of the state slightly below avg. to below 70%. Wetter than avg. in smaller pockets statewide.
30 Day Temperatures

Departure from Normal Temperature (F)
7/26/2019 – 8/24/2019

Mostly slightly cooler than average statewide last 30 days.
Soil moisture closer to average central IA. Wetter west – mixed to the east.
D0 pockets in Minnesota. Northern North Dakota in D1/D2.
Precipitation deficits since early summer continue to show D1-D0 conditions. D1 Moderate drought in pockets of eastern IA.

Please share impacts of dryness with any crop.
Crop/Harvest issues

• Growing season:
  • Delayed planting/phenology
  • Slow development
  • Disease
  • Weed issues
  • Lack of sunlight (don’t have good data on this)

• Harvest:
  • Freeze concerns/timing
  • More likely lots of immature high moisture corn
  • Wetness (likely less of an issue this year)

• GDD Tool - Keep checking back on progress
ENSO-neutral is most likely to continue through the Northern Hemisphere winter 2019-20.
7 Day Forecast Precip.

Biggest rain amounts to our south next 7 days.

http://www.wpc.ncep.noaa.gov/qpf/p168i.gif?1484935973
Slightly increased chances for cooler and wetter into 2nd week of September.

http://www.cpc.ncep.noaa.gov/
Limited indications for September. Slightly higher chance on precip - NW. Almost nothing on temperature.

http://www.cpc.ncep.noaa.gov/
Similar wet pattern to the 30 day in the 3 month. Wetter slightly more possible into the fall. Warmer than avg. more likely. Would be beneficial to hopefully lengthen season and drydown.
Take Home

• Current conditions:
  • Drier conditions more recently (+/-)
  • Precip totals widely ranging 30 and 90 days.
  • Temperatures close to avg. last 30 days
  • Crop conditions overall still slow.

• Outlook info:
  • Some rains in the near term – probably too late to help much
  • No indications on early freeze
  • Fall outlook in our favor with warmer likely overall
Midwest and Great Plains Climate-Drought Outlook
15 September 2016

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Sign up:
https://www.drought.gov/drought/dews/midwest
Archives:
http://mrcc.isws.illinois.edu/multimedia/webinars.jsp.
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https://www.climatehubs.oce.usda.gov/hubs/midwest
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Ames, Iowa 50011-3611
Crop Production

Soybeans 2013
Planted Acres by County
for Selected States

Corn for All Purposes 2013
Planted Acres by County
for Selected States

Alfalfa Hay (Dry) 2013
Harvested Acres by County
for Selected States

Winter Wheat 2013
Planted Acres by County
for Selected States

U.S. Department of Agriculture, National Agricultural Statistics Service
Soybeans 2016 Production by County for Selected States

Soybean Yield
United States

Bushels per Acre
Climate Change and Agricultural Pests

1) Expanding geographic ranges northward
2) Reducing winter die off's
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)
But can CO$_2$ affect herbicide efficacy?

As carbon dioxide increases, glyphosate efficacy is reduced.

Ziska et al. 1999. Weed Science. 47:608-615, inter alia
Real data around you

MONITORING
Inversions and Drift

- Developing regional inversion potential for drift issues
- Missouri first
- Six additional states and Dakotas now adding
- Measuring low level inversion potential and timing
Inversions and Drift

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