IOWA DEPARTMENT OF NATURAL RESOURCES

WATER SUMMARY UPDATE

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A Review of Water Resource Trends from 2023

2023 marked the third year in a row of below-normal precipitation for the state of Iowa. The year ended with only 26.82 inches of precipitation, almost nine inches less than normal. Over the last three years the state has had an accumulated deficit of more than 15 inches. In some locations in east central Iowa the three-year shortfall in moisture is nearly 25 inches. Stream flow remains very low in parts of Iowa, and remains a concern for 2024 in central and southern Iowa. Recent rains have improved soil moisture somewhat, but dry soils remain a concern for 2024. The U.S. Drought Monitor showed worsening of drought conditions in the state over the past year, with large areas of D2-Moderate Drought and D3-Extreme Drought remaining as 2023 ended. A small area of the most severe conditions, D4-Exceptional Drought, existed in eastern Iowa during September and October, covering almost 5 percent of the state at its peak. The *Iowa Drought Plan*, implemented in 2023, currently shows southern Iowa in a Drought Warning. During 2023, Drought Region 1 (northwestern Iowa) has been mostly normal, while Drought Regions 4 and 5 (southern Iowa) have been consistently in "Drought Watch" or "Drought Warning."

PRECIPITATION AND TEMPERATURE FOR 2023

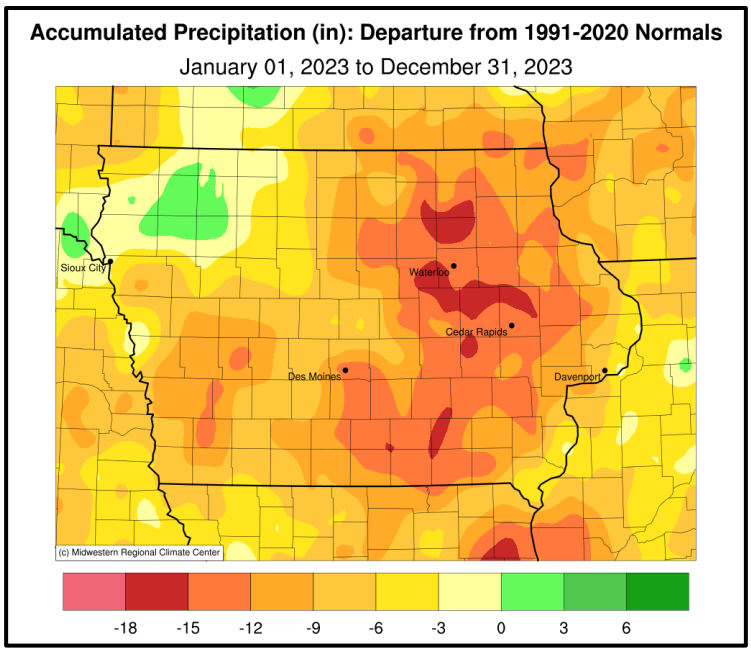
Based on 151 years of statewide observations, Iowa experienced its 22nd driest year on record in 2023 with a statewide average total of 26.82 inches of precipitation, 8.73 inches below normal. A drier year last occurred in 2012, which is the 19th driest on record, during the last widespread drought to impact Iowa. In 2023, precipitation was below-normal for eight of the twelve months of the year, especially through the growing season. The statewide average temperature was 50.6 degrees or 2.2 degrees above normal, tying 2016 as the 10th warmest year on record; 2012 was warmer and the 4th warmest.

WINTER 2023: Temperatures for the three winter months of December, January and February averaged 23.9 degrees or 1.1 degrees above normal while precipitation totaled 5.63 inches, 2.12 inches above normal. 2023's winter ranks as the 4th wettest on record. Statewide average snowfall was 21.6 inches, 0.5 inch below normal.

SPRING 2023: Temperatures for the three spring months of March, April and May averaged 48.7 degrees, 0.4 degree above normal. Precipitation totaled 6.09 inches or 4.41 inches below normal. This past spring ranks as the 16th driest in 151 years of records.

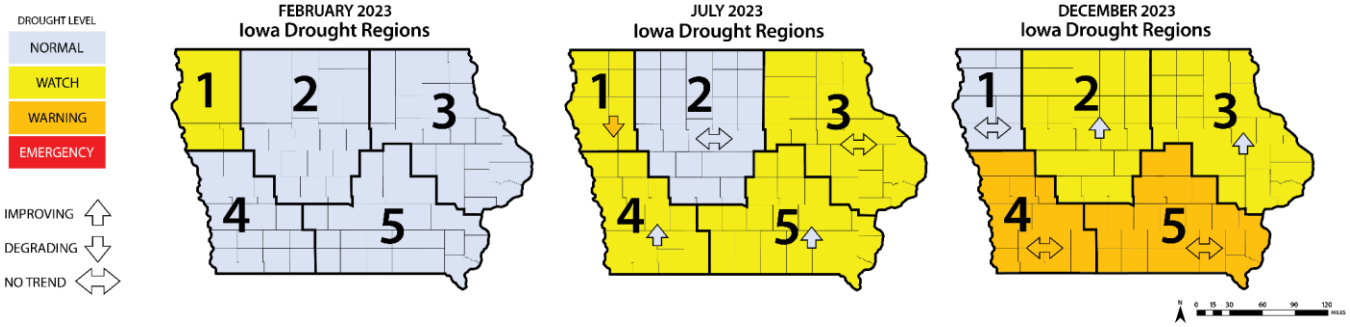
SUMMER 2023: Temperatures for the three summer months of June, July and August averaged 71.9 degrees, which is 0.5 degrees above normal. Precipitation totaled 8.90 inches or 4.66 inches below normal. The 2023 summer ranks as the 17th driest summer in 151 years of records.

FALL 2023: Temperatures over the three autumn months of September, October and November averaged 50.8 degrees or 2.7 degrees above normal. Precipitation totaled 5.61 inches or 2.38 inches below normal. Fall 2023 ties 1954, 1990 and 2005 as the 19th warmest fall among the period of record; it also tied 1895 as the 34th driest fall on record. Fall 2021 was warmer while 2022 was drier.

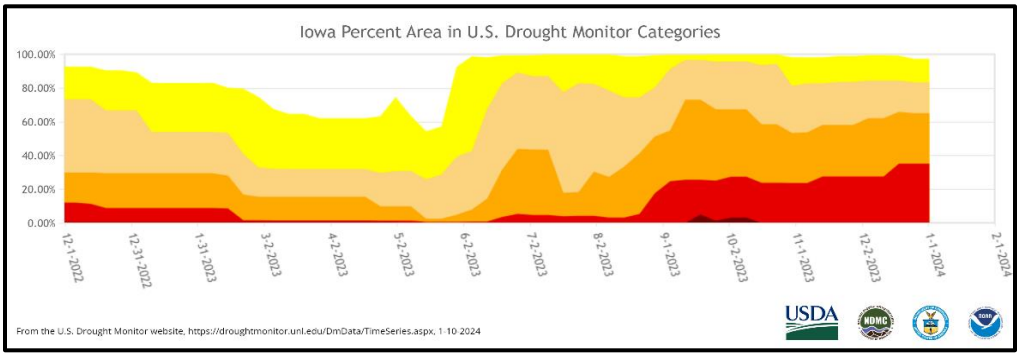


IOWA DROUGHT PLAN FOR 2023

The 2023 Iowa Drought Plan (IDP) was implemented in early 2023. The IDP was developed as a collaborative effort between the Department of Natural Resources, the Department of Agriculture and Land Stewardship, and the Department of Homeland Security and Emergency Management. The IDP divides the state into five drought regions, and drought conditions were reported for those regions beginning in March 2023. Conditions can be designated as Normal, Drought Watch, Drought Warning, and Drought Emergency. 2023 began with Drought Region 1 (northwest Iowa) in Drought Warning, and the balance of the state in normal conditions. Over the course of the year the driest areas shifted from northwest Iowa toward southeast Iowa. 2023 ended with Drought Region 1 in normal conditions, Drought Regions 2 and 3 in Drought Watch, and Drought Regions 4 and 5 (southern Iowa) designated as Drought Warning, with conditions generally improving or stable.

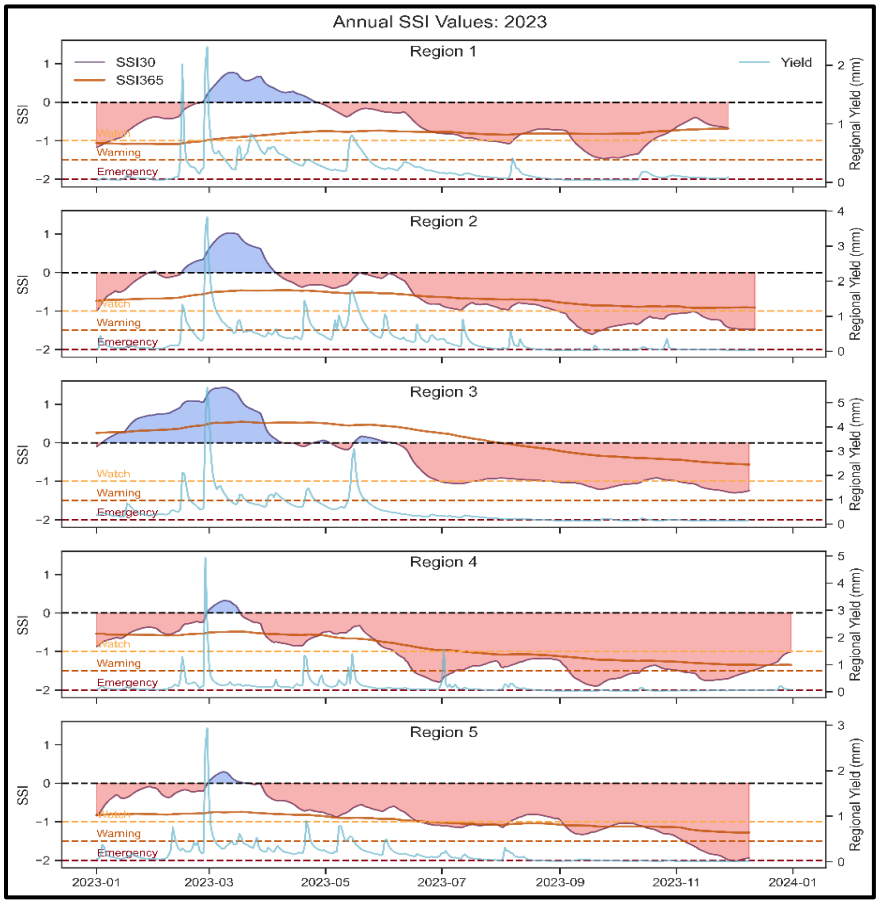


The U.S. Drought Monitor (one of the data sources used in the IDP) shows that Iowa has been in some form of drought for more than 180 weeks, and has shown large areas of D3 Extreme Drought for most of 2023. Below is a graph that shows statewide coverage of drought conditions for 2023, with nearly the entire state in some form of drought since June.



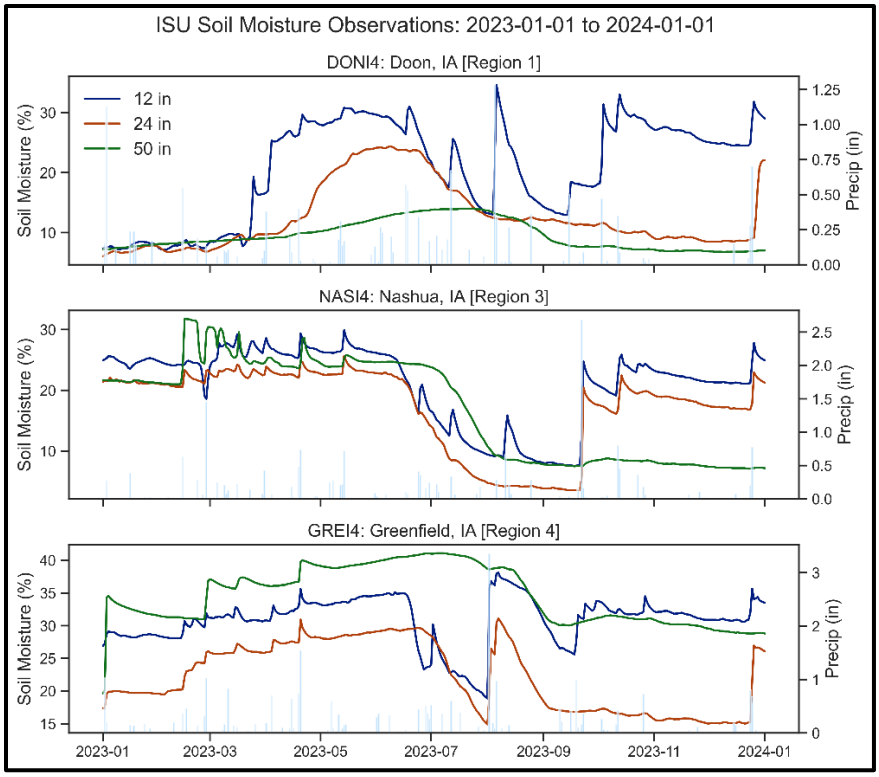
2023 RUNOFF AND STREAMFLOW

Streamflow Index is a way to evaluate streamflow compared to average flow. In the graphs below (one for each IDP Region) the blue shading shows when stream flows were above normal for each region, and the red shaded areas show when streamflow was below normal. For each drought region, stream flows were above normal for a short period of time in the spring months, but were generally below normal for most of 2023. Streamflow index values in Drought Regions 4 and 5 have been in the “Drought Emergency” level for parts of the year. It is hoped that the wet start to 2024 will result in improvement in stream flow as the year progresses.



2023 SOIL MOISTURE

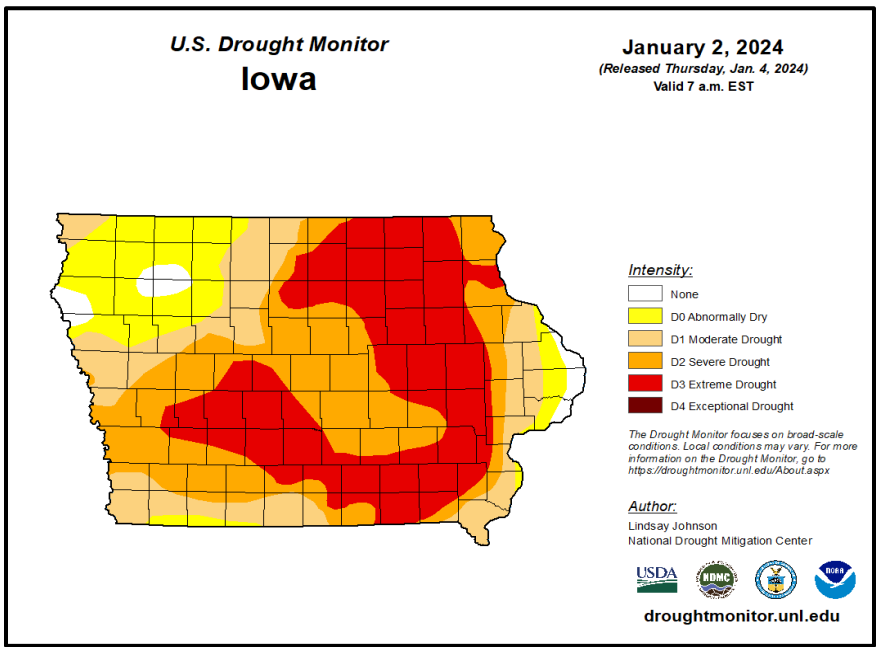
The graph below shows measured soil moisture values at three different depths (12, 24, and 50 inches) for three locations in Iowa (Doon, Nashua, and Greenfield). In the middle graph for Nashua, Iowa the impact of the summer drought conditions can be clearly seen. Over the summer months soil moisture levels decline steadily at all depths until October. Increased rainfall in October led to soil moisture conditions improving rapidly and remained at improved levels through the rest of 2023. Soil moisture levels will be unchanged during the winter months, as soils typically remain frozen and show little improvement or degradation until the spring.



Monthly Conditions: December 2023

DROUGHT MONITOR FOR DECEMBER 2023

Overall drought and dryness in Iowa deteriorated somewhat in December, with most of the state continuing to show some level of dryness or drought. The area of D3 Extreme Drought expanded into parts of central Iowa, while a small area showing no dryness or drought was introduced in northwest Iowa. December saw areas affected by extreme drought increase from 27 percent of Iowa to 35 percent.

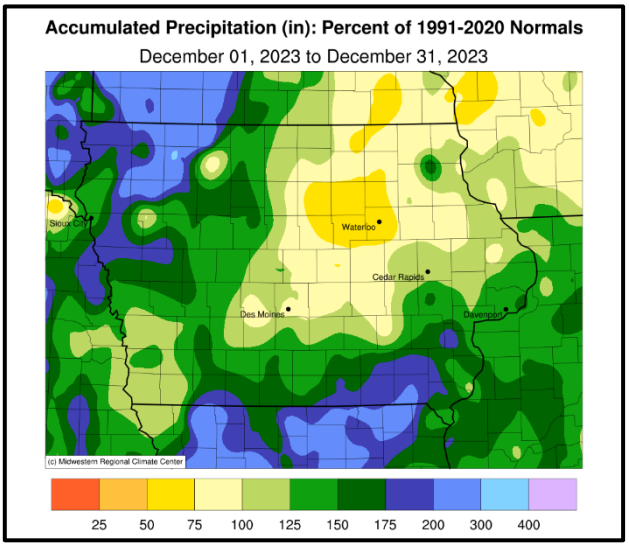


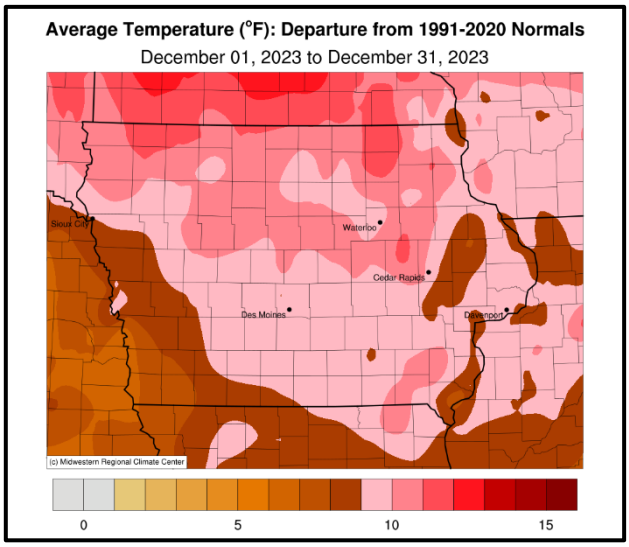
PRECIPITATION AND TEMPERATURE FOR DECEMBER 2023

Precipitation for December was 1.79 inches, or 0.42 inches above normal. This marks only the fourth month of 2023 of above-average precipitation. Stations across western, southern and eastern Iowa reported positive departures with the wettest conditions in the northwest and southeast corners. Portions of northeastern Iowa reported the driest conditions

with deficits approaching an inch at several stations. The statewide average snowfall was 1.4 inches, 6.5 inches below normal.

Monthly average temperatures were well above normal statewide with the warmest conditions reported across northern Iowa, where departures were nearly 12 degrees warmer than average. Donnellson and Keokuk Lock and Dam reported the month's high temperature of 64 degrees on the 7th, on average 23 degrees above normal. Fayette reported the month's low temperature of six degrees on the 19th, six degrees below normal.





STREAMFLOW CONIDTIONS FOR DECEMBER 2023

During December, streamflow conditions remained low across the state, with most streams below normal. Since November, portions of the Chariton, Skunk, Thompson, and Upper Iowa, Nishnabotna Rivers have all moved into the below normal condition. It should be noted that winter months are when the lowest stream flow levels normally occur in Iowa.

ADDITIONAL INFORMATION

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