NWS FORM E-5	**U.S. Department of Commerce** NOAA, NATIONAL WEATHER SERVICE	**HSA OFFICE:** **Grand Rapids, MI**
MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS		REPORT FOR (MONTH & YEAR): **December 2023**
TO:	NATIONAL WEATHER SERVICE (W/OS31) HYDROMETEOROLOGICAL INFO CENTER 1325 EAST-WEST HIGHWAY, RM 13468 SILVER SPRING, MD 20910	DATE: January 5th, 2024
		SIGNATURE: Joe Ceru, Meteorologist

When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (WSOM E-41).

X An **X** inside this box indicates that no flooding occurred within this hydrologic service area.

Summary

December, 2023 was hallmarked by its warmth and the lack of snowfall. The end of the year brought lower flows in the north and higher flows in the south. Precipitation was not too far off normals for the month with several precipitation events throughout the month. The year ended with above normal precipitation at Lansing and Kalamazoo and below normal precipitation at Grand Rapids and Muskegon.

Flood Conditions

No flooding occurred this month. The biggest story to end the year was the lack of snow. It was the least snowy start through December 31st at Grand Rapids. It was the 2nd warmest December on record. That is with 125+ years of recording. So the El Nino pattern which has dominated the weather pattern has clearly had a significant impact.

To end the year, the rivers were in two distinct categories. The northern rivers and watersheds missed out on much of this month's precipitation and had below normal flows. Up north as you can see in Figure 1) that region received lower actual precipitation, had a lower percent of mean and lower flows.

The rivers and streams from the Muskegon river southward had near, to above normal flows. While there was a lack of snow to start the winter season, precipitation was near to slightly above normal. It is important to note that while precipitation for Grand Rapids is below the latest 30 year normals, it is actually above normal when looking at the period of record. The Grand River and southward watersheds ended up with a higher percent of normal flows and actually had several peaks from rain events. Lansing and Kalamazoo both had slightly above normal precipitation.

The month began up north with the Pere Marquette being well below normal. The rain event from the 9th to the 10th caused a rise at the Scottville, MI gauge to get just below normal. However the month ended at 84% of normal with flows just below 600 CFS.

The Muskegon River began with flows well below normal with discharges at 700 CFS. While flows along the Muskegon continued below normal through most of the month, the rain event from the 22nd to the 23rd brought flows above normal. Flows ending just above normal.

The month began with flows on the Grand River above normal. Several rain events peaked flows along the Grand around the 5th, with flows of 5300 CFS at Grand Rapids. Flows slowly dropped through the month before having several slow rises including the rain event on the 22nd to the 23rd with the Grand River ending the month well above normal.

Flood Stage Report

No forecast points exceeded flood stage during the month. Thus, the NWS Form E-3 "Flood Stage Report" was not issued.

River Conditions

The end of December percentage of normal flow for selected rivers is listed below:

Location	River	% of Normal
Scottville	Pere Marquette	84
Whitehall	White	91
Evart	Muskegon	103
Mt. Pleasant	Chippewa	115
Lansing	Grand	149
Grand Rapids	Grand	129
East Lansing	Red Cedar	244
Hastings	Thornapple	138
Battle Creek	Battle Creek	133
Battle Creek	Kalamazoo	97

General Hydrologic Information

December precipitation amounts for Grand Rapids, Lansing, and Muskegon Michigan were 1.89, 2.20 and 1.81 inches, respectively (Figure 1). Monthly departures were -0.59, +0.30 and -0.61 inches respectively. Yearly departures through December 31st 2023 are -2.66, 3.45 and -2.59 inches for Grand Rapids, Lansing and Muskegon, respectively. Percent of mean precipitation for December 2023 is shown in Figure 2. Temperatures for the month of December well above normal at Grand Rapids, Lansing and Muskegon. The monthly average temperature departures for these sites were +7.9, +8.8 and +9.1 Fahrenheit, respectively.

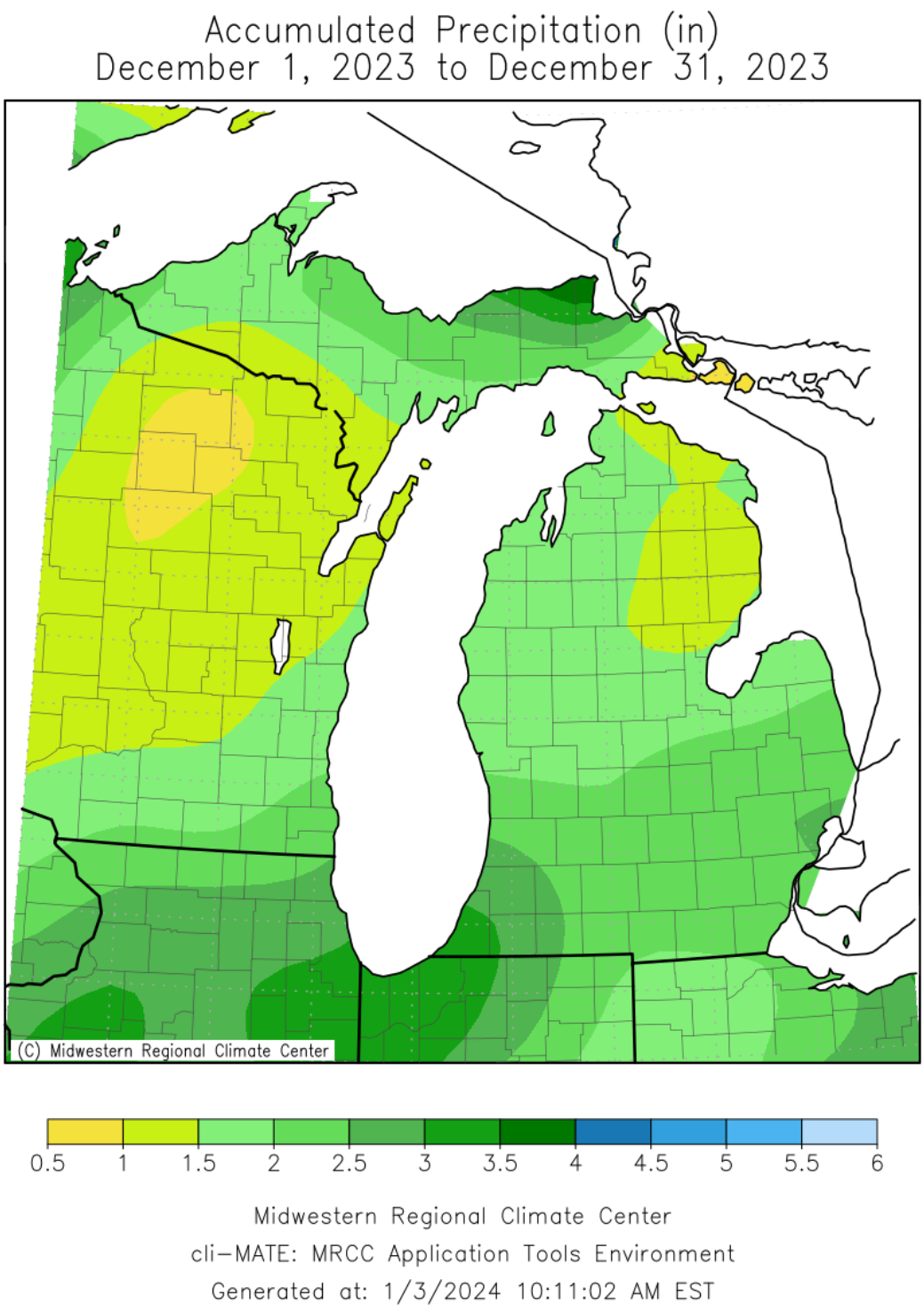

Figure 1 December 2023 Monthly Precipitation Totals.

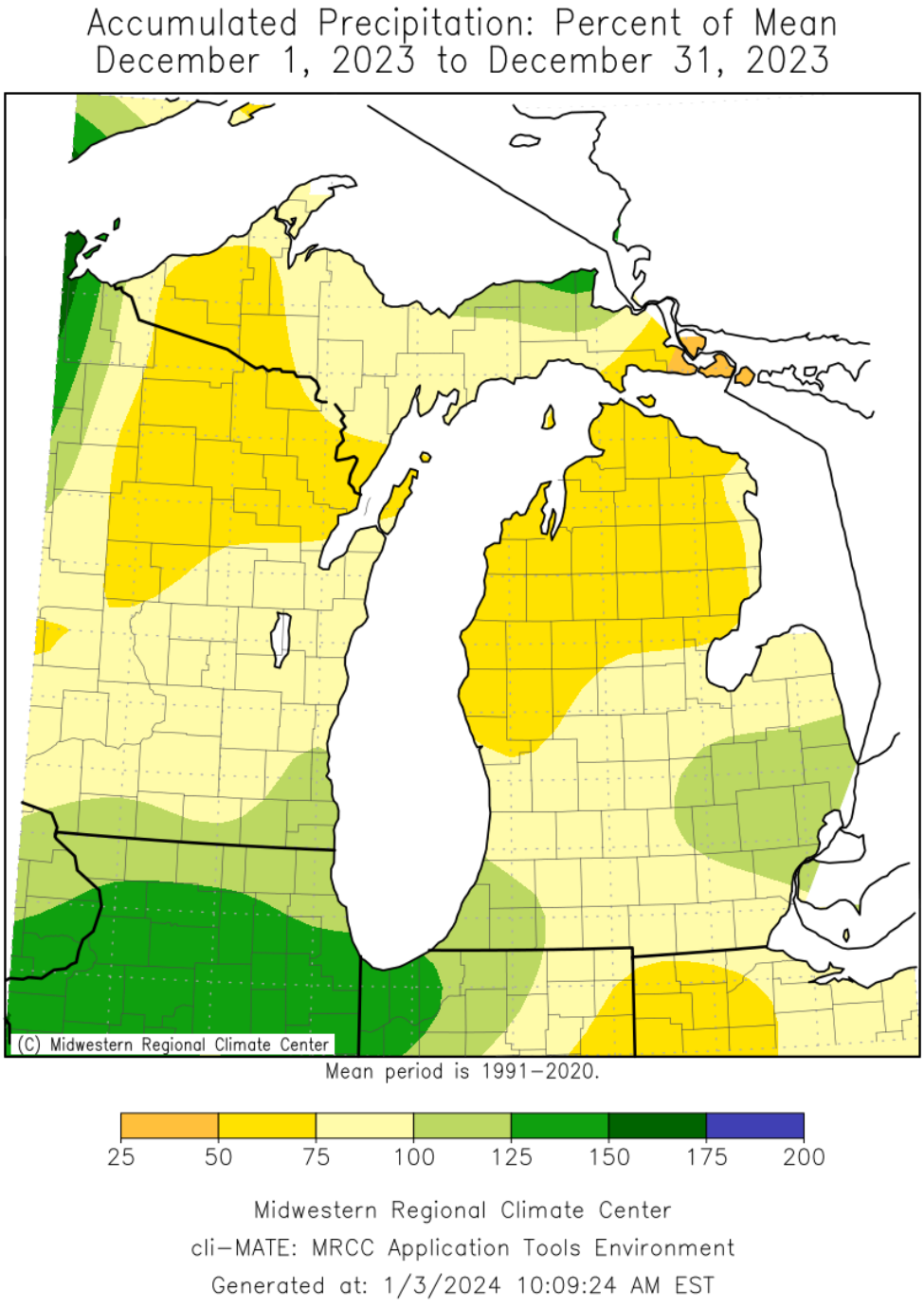

Figure 2 December 2023 Percent of Mean of Accumulated Precipitation.

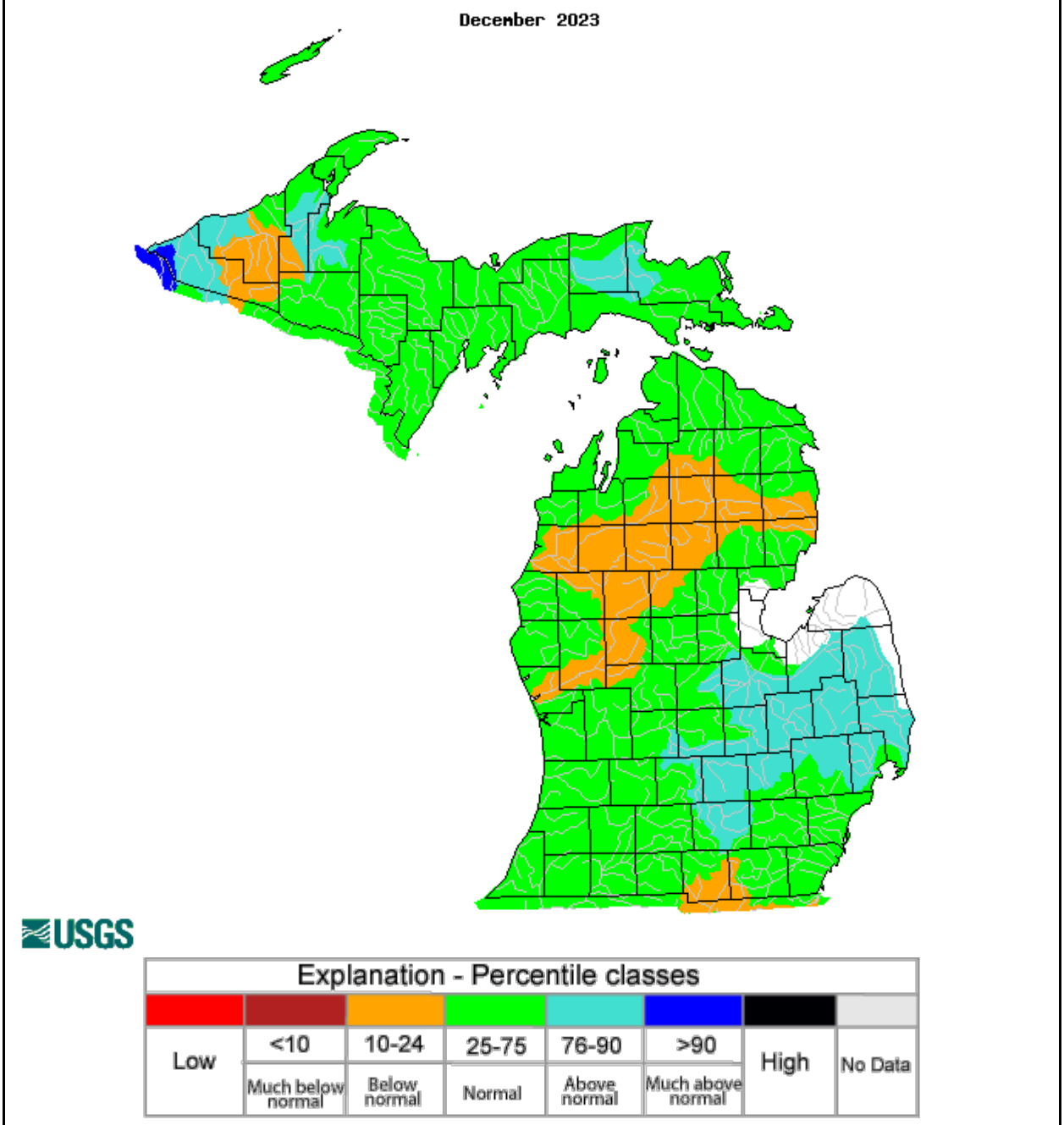

Figure 3. USGS monthly streamflow for December, grouped by significant hydrologic units Much of northern lower Michigan remains below normal. Several basins through central and eastern Michigan are much above normal to high.

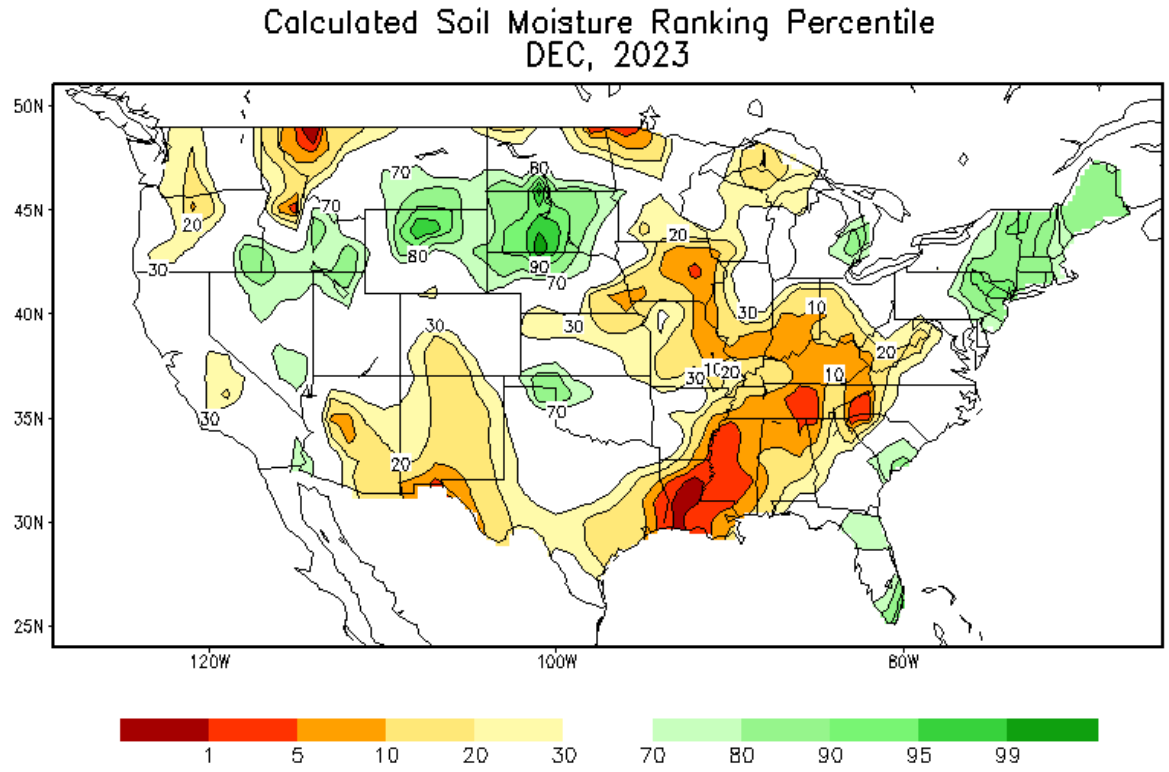

Figure 4.Calculated Soil Moisture Percentile for December, 2023. This supports conditions becoming more normal through much of lower Michigan.

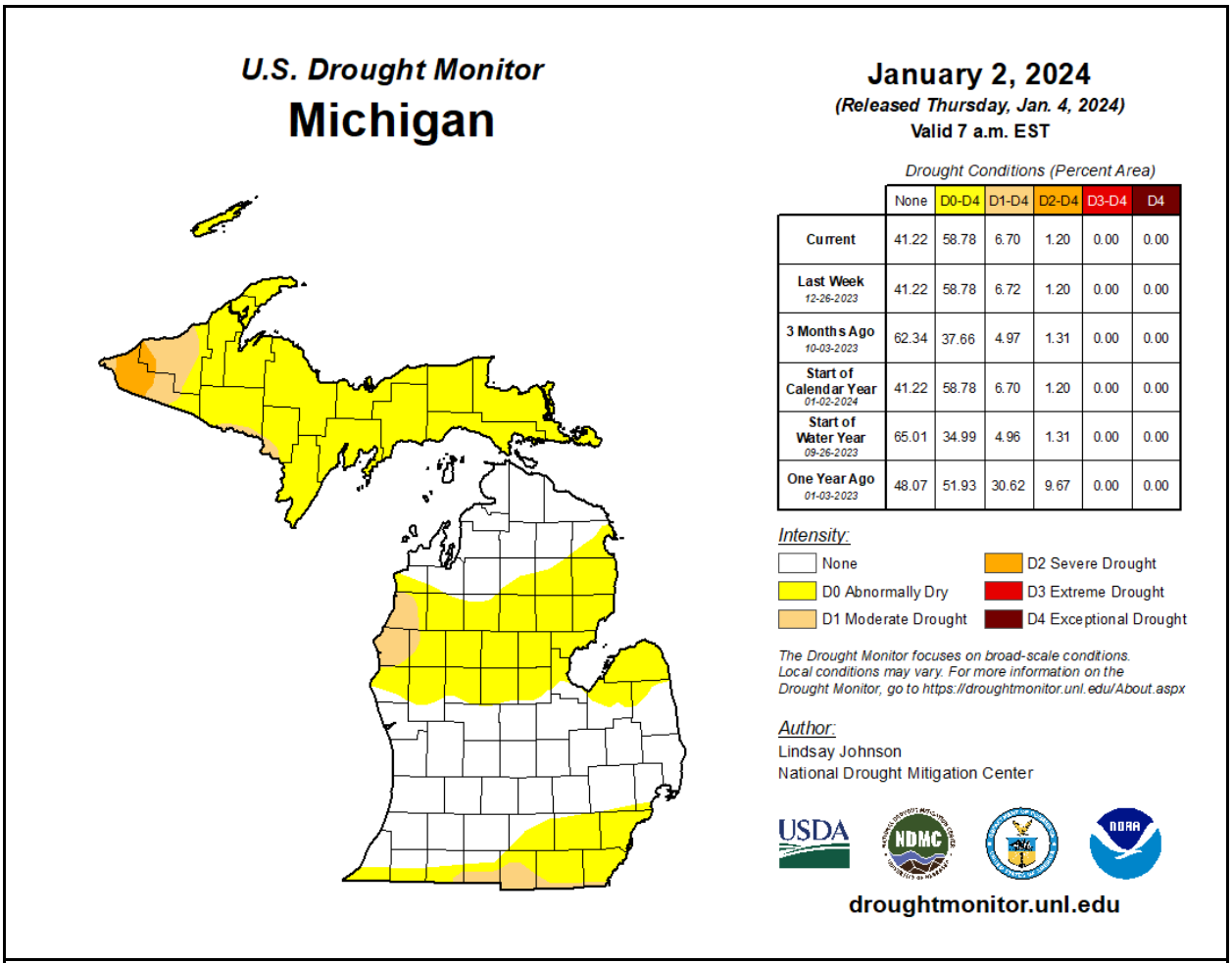

Figure 5.U.S. Drought Monitor showing abnormal dry area across Central Michigan with a moderate drought along the corresponding lakeshore.

Hydrologic Products issued this month

31 Hydrologic Summaries (ARBRVAGRR)
0 Probabilistic Hydrologic Outlook (ARBESFGRR)
0 Event-driven Hydrologic Outlook (ARBESFGRR1)
0 Areal Flood Advisory Statements (ARBFLSGRR)
0 Flood Warning Statements (ARBFLWGRR)
0 Flood Watch Statements (ARBFFAGRR)
0 River Statements (ARBRVSGRR)

News Articles and Related Documentation

El Nino Dry December pattern