

NWS FORM E-5	U.S. DEPARTMENT OF COMMERCE NOAA, NATIONAL WEATHER SERVICE	HSA OFFICE: Marquette, MI		
MONTHLY REPORT OF	FRIVER AND FLOOD CONDITIONS	REPORT FOR (MONTH / YEAR): December 2023		
TO: NATIONAL WEATHER SERVICE (W/OH12x1)		DATE: January 15th, 2024		
1325 EAST-WEST SILVER SPRING, N	HIGHWAY, RM 7116 ID 20910	SIGNATURE: Evan Kutta, Hydro Program Manager Matt Zika, AMIC		
When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice				

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 no flooding occurred within this Hydrologic Service Area.

### Summary

Precipitation was near to below-normal during December across Upper Michigan (Table 1) and much abovenormal temperatures resulted in most of the precipitation falling as rain instead of snow leading to near to above-normal streamflow for most UP watersheds (Figure 1). In fact, snow cover was almost completely absent at the end of December with similarly snowless conditions across much of the Upper Midwest (Figures 2 and 3). After a warm and very wet start to 2023 –culminating with the May 1-2 snowstorm- persistently abovenormal temperatures and near to below-normal precipitation resulted in near-normal precipitation and abovenormal temperatures across Upper Michigan (Tables 2 and 3). Each site was 2.94" to 4.74" drier during 2023 than 2022 except for the Marquette area that was between 1.55" and 5.03" wetter than 2022. Each site was between 2.3°F (WFO Marquette) and 3.8°F (Ironwood) warmer than last year with 2023 ranking between the 6<sup>th</sup> and 23<sup>rd</sup> warmest year on record at each site.

Location	Precipitation	% of Normal	Snowfall
WFO Marquette	2.12"	82%	8.5"
Marquette City	2.01"	102%	3.9"
Quincy Hill	2.28"	М	4.5"
Ironwood	2.25"	95%	7.7"
Iron Mountain	1.01"	57%	0.1"
Manistique	1.77"	73%	1.0"
Munising	2.95"	86%	6.3"
Stambaugh	0.75"	51%	1.5"

**Table 1.** Total precipitation and snowfall observed at sites across Upper Michigan during December 2023. **<u>NOTE</u>**: Precipitation after 8 AM EST December 31<sup>st</sup> was counted in January stats for all but the WFO Marquette site due to the reporting structure of our cooperative observers.



## **Precipitation Summary for 2023**

Location	Precipitation	% of Normal	Rank	Last Year
WFO Marquette (Records: 1962-2023)	44.83"	122%	7 <sup>th</sup> wettest	43.28"
Marquette City (Records: 1875-2023)	33.63"	109%	46 <sup>th</sup> wettest	28.60"
Ironwood (Records: 1901-2023)	38.66"	108%	32 <sup>nd</sup> wettest	42.96"
Iron Mountain (Records: 1902-2023)	28.65"	96%	43 <sup>rd</sup> driest	32.14"
Manistique (Records: 1938-2023)	29.95"	96%	22 <sup>nd</sup> driest	32.89"
Munising (Records: 1912-2023)	41.23"	113%	18 <sup>th</sup> wettest	44.91"
Stambaugh (Records: 1900-2023)	27.25"	90%	53 <sup>rd</sup> wettest	31.99"

**Table 2.** Total observed precipitation at long-term climate sites across Upper Michigan for January through December 2023.

## **Temperature Summary for 2023**

Location	Avg Temp	Departure	Rank	Last Year
WFO Marquette (Records: 1962-2023)	42.9°F	+2.9°F	6 <sup>th</sup> warmest	40.6°F
Marquette City (Records: 1875-2023)	44.6°F	+1.8°F	15 <sup>th</sup> warmest	42.2°F
Ironwood (Records: 1901-2023)	42.5°F	+1.9°F	17 <sup>th</sup> warmest	38.7°F
Iron Mountain (Records: 1902-2023)	45.0°F	+2.7°F	6 <sup>th</sup> warmest	42.2°F
Manistique (Records: 1938-2023)	42.9°F	+1.0°F	21st warmest	40.4°F
Munising (Records: 1912-2023)	43.4°F	+1.8°F	11 <sup>th</sup> warmest	40.8°F
Stambaugh (Records: 1900-2023)	41.1°F	+1.3°F	23 <sup>rd</sup> warmest	37.9°F

**Table 3.** Average of daily maximum and minimum temperatures at long-term climate sites across Upper Michigan for January through December 2023.



### **Flooding Conditions**

There were no flooding concerns during the month of December 2023.

## **Media Links**

None.

# **River Conditions**

Streamflow ranged from below normal to much above normal, but most of Upper Michigan was near-normal during December. Precipitation during December primarily fell as rain that immediately flowed into rivers, but most sites observed below-normal precipitation leading to the mixture of streamflow percentiles.



Figure 1: USGS monthly average streamflow in December 2023 across Upper Michigan



# **Snowpack SWE (Snow Water Equivalent) Conditions**

Snow cover was almost completely absent at the end of 2023 with just a few patches of small SWE values. This may be the least amount of snow on the ground across Upper Michigan at the end of the year in recorded history.



Figure 2: Modeled snowpack snow water equivalent on January 1st, 2024.



Figure 3: Modeled snow water equivalent for drainage basins on January 1st as a percent of 19-year median.



## **Drought Discussion**

Abnormal dryness continued across Upper Michigan during December with patches of moderate to severe drought across the western and south-central UP. For the latest drought status, please visit <u>http://www.drought.gov</u>.



Hvdro	Products	Issued

Product	Number
Hydrologic Outlook (ESF)	0
Flood Watch (FFA)	0
Flood Warning (FLW)	0
Flood Advisories and Statements (FLS)	0
Flash Flood Warning (FFW)	0
Flash Flood Statement (FFS)	0
Hydrologic Summary (RVA)	31

January 2, 2024 (Released Thursday, Jan. 4, 2024) Valid 7 a.m. EST

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.01	99.99	15.20	4.96	0.00	0.00
Last Week 12-26-2023	0.01	99.99	15.20	4.96	0.00	0.00
3 Month s Ago 10-03-2023	55.88	44.12	13.42	5.42	0.00	0.00
Start of Calendar Year	0.01	99.99	15.20	4.96	0.00	0.00
Start of Water Year 09-26-2023	55.88	44.12	13.42	5.42	0.00	0.00
One Year Ago 01-03-2023	93.80	6.20	0.00	0.00	0.00	0.00



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

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## **Precipitation Summary**

# **Accumulated Precipitation (in)**

December 01, 2023 to December 31, 2023



Figure 5: December 2023 Monthly Precipitation Totals.



## **Precipitation Summary Continued**

# Accumulated Precipitation (in): Percent of 1991-2020 Normals

December 01, 2023 to December 31, 2023



Figure 6: December 2023 Percent of Normal of Accumulated Precipitation.



## **Soil Moisture Anomaly**



Figure 7: Climate Prediction Center's monthly average soil moisture anomaly for December 2023.



## **Shallow and Deep Soil Moisture Percentiles**

SPoRT-LIS 0-40 cm Soil Moisture percentile valid 01 Jan 2024



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

Figure 8: NASA's Short-term Prediction Research and Transition (SPoRT) Center's shallow (0-40 cm) soil moisture percentile valid January 1, 2024.



SPoRT-LIS 0-200 cm Soil Moisture percentile valid 01 Jan 2024

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

Figure 9: NASA's Short-term Prediction Research and Transition (SPoRT) Center's deep (0-200 cm) soil moisture percentile valid January 1, 2024.