NWS FORM E-5 **U.S. DEPARTMENT OF COMMERCE**
NOAA, NATIONAL WEATHER SERVICE

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

TO: NATIONAL WEATHER SERVICE (W/OS31)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 13468
SILVER SPRING, MD 20910

HSA OFFICE:
Grand Rapids, MI

REPORT FOR (MONTH &YEAR):
December 2019

DATE:
January 15, 2020

SIGNATURE:
Daniel K. Cobb, MIC
Andrew Dixon, Service Hydrologist

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).

☐ An **X** inside this box indicates that no significant flooding occurred within this Hydrologic Service Area.

Summary

December 2019 started with a rain and snow mix that left a few inches of snow on the ground, but the rivers were rising from the heavy rain that preceded this during the last few days of November. Much of the rest of December was fairly quiet, with below-average precipitation, until the very end of the month when a round of widespread heavy rain of 2+ inches fell across almost the entire area, shocking the river systems and sending them significantly upward. In contrast to November, December was overall much warmer than normal, and most of the area did not have any snow on the ground for the majority of days during the month.

The elevated streamflows, heavy additional rains, and generally warm conditions all worked together to limit the seasonal drop in Lake Michigan water levels. In fact, Lake Michigan-Huron recorded an overall drop for the month of less than 1 inch. Thus, seasonally typical storms continued to produce significant lakeshore flooding and erosion impacts in many areas. Additional homes were either torn down or fell into the lake this month due to the ongoing erosion.

Of note, for the calendar year, Grand Rapids and Muskegon both set a new record for wettest calendar year on the record. The old record at Muskegon was 45.98 inches of precipitation set in 2008, and the new record set in 2019 is 47.97 inches. The old record at Grand Rapids was 48.80 inches of precipitation set in 2008, and the new record set in 2019 is 51.37 inches.

Flood Conditions

Most of the larger rivers in West Michigan started the month higher than the 90th percentile flow for this time of year, with the Muskegon River setting new daily max values for this time of year. However, with fairly dry conditions for most of the area for the first few weeks of the month, was able to recover and most rivers made it "down" to around the 75th percentile flows. However, the big rains to end the month sent all streamflows very high again, with most stations ending the month higher than the 90th percentile flows once again. This also resulted in flood warnings (minor flood stage) at numerous sites in the area.

Temperatures were cold enough that ice formation did make some progress on a few of the

rivers in the northern sections of the area. This included the Muskegon River, and due to the very high freezeup levels, even a mild freezeup process resulted in flooding in parts of Mecosta County (in a favored troublespot for ice jams between Rogers Dam pond and Big Rapids). Flooding lasted a few days, before temperatures warmed up and most of the ice melted.

As the month came to a close, many reports from local officials, employees, and the general public continue to paint a picture of huge areas of standing water and saturated ground around West Michigan, particularly across the Grand River, Muskegon River, White River, and Pere Marquette River basins. This water will likely help maintain elevated streamflows throughout the winter, even if precipitation totals trend back closer to normal.

Flood Stage Report

Flood stage was exceeded at the forecast points along the Pine River at Alma, Muskegon River at Newaygo, Muskegon River at Bridgeton, Looking Glass River at Eagle, Sycamore Creek at Holt, Chippewa River at Mt. Pleasant, Maple River at Maple Rapids, and Grand River at Robinson Township. Thus, the NWS Form E-3 "Flood Stage Report" was issued.

River Conditions

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

Location	River	% of Normal
Scottville	Pere Marquette	237
Whitehall	White	295
Evart	Muskegon	376
Mt. Pleasant	Chippewa	709
Lansing	Grand	535
Grand Rapids	Grand	369
East Lansing	Red Cedar	813
Hastings	Thornapple	661
Battle Creek	Battle Creek	506
Battle Creek	Kalamazoo	311

General Hydrologic Information

December precipitation amounts for Grand Rapids, Lansing, and Muskegon, Michigan, were 4.04, 3.91, and 3.81 inches, respectively (Figure 1). Monthly departures were +1.54, +2.04, and +1.26 inches, respectively. Yearly departures were +13.10, +8.91 and +14.48 inches for Grand Rapids, Lansing and Muskegon respectively. Percent of mean precipitation for December 2019 is shown in Figure 2.

Temperatures for the month of December were significantly warmer than normal at Grand Rapids, Lansing and Muskegon. The monthly average temperature departures for these sites were +4.0, +4.7, and +3.2 degrees Fahrenheit, respectively.

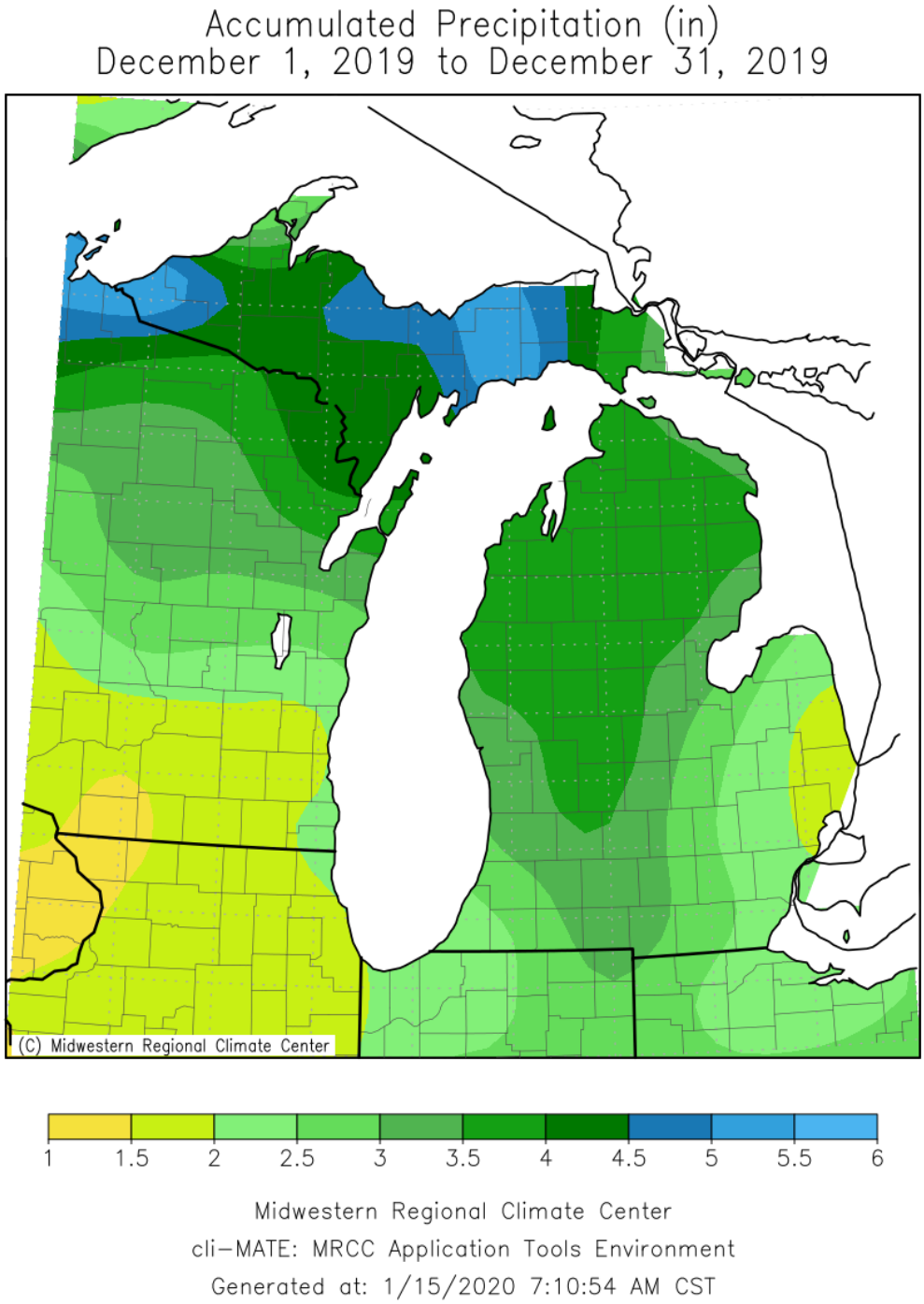


Figure 1. December 2019 Monthly Precipitation Totals.

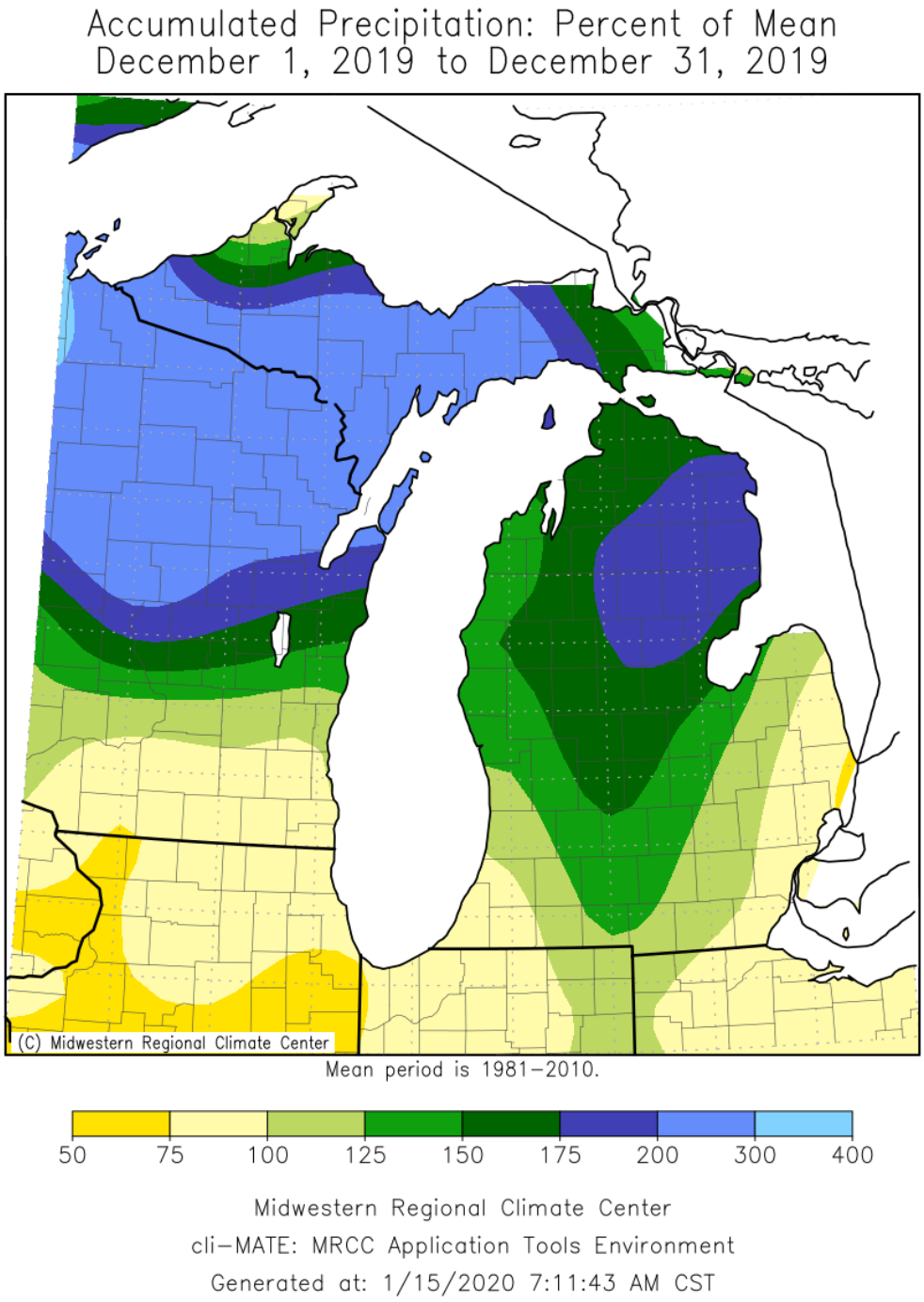
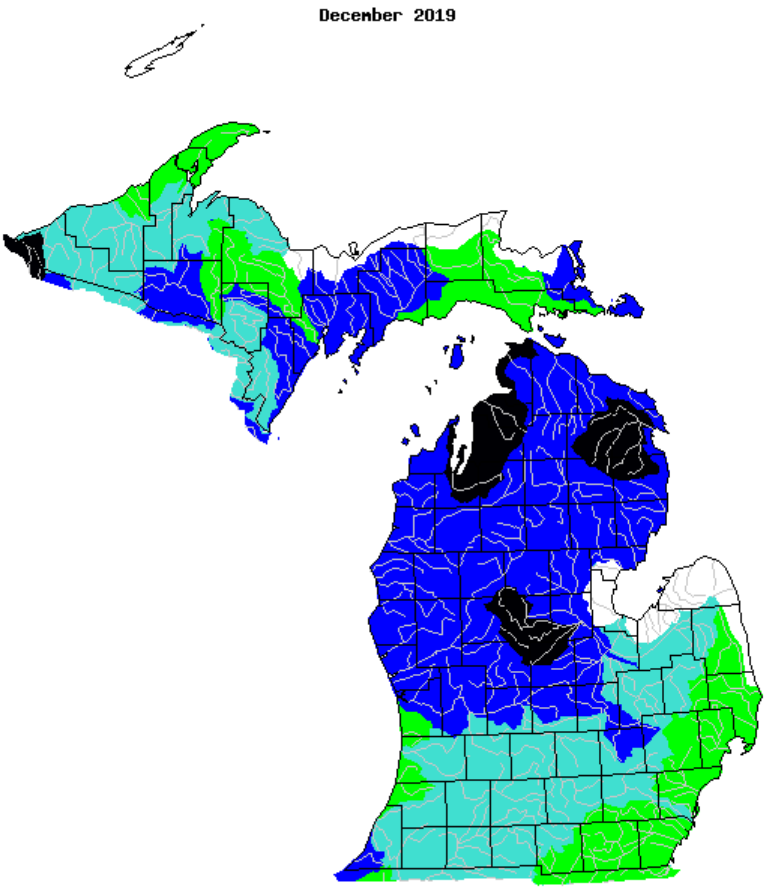


Figure 2. December 2019 Percent of Mean of Accumulated Precipitation.



Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		

Figure 3. USGS monthly average streamflow for December, grouped by significant hydrologic units. Note streamflows across Lower Michigan widespread higher than the 90th percentile for the month.

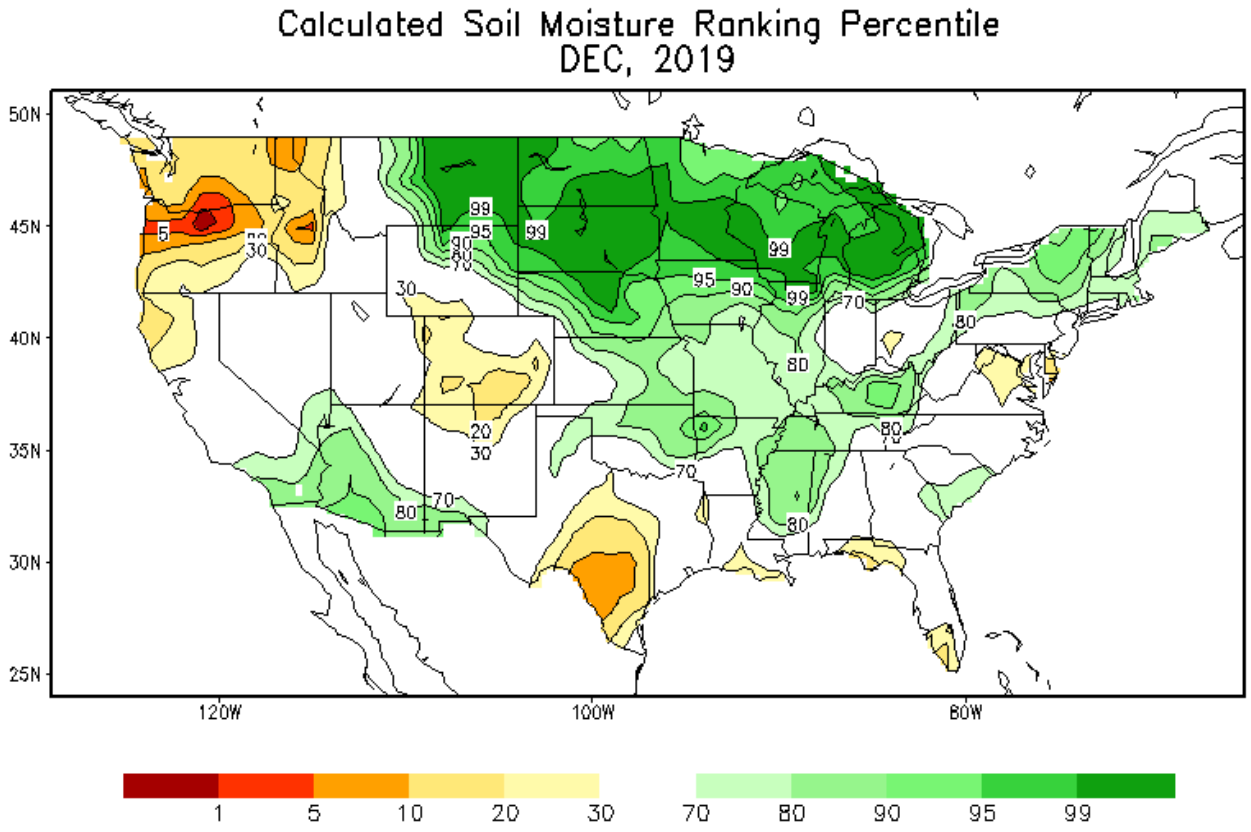


Figure 4. Chart of monthly values of soil moisture, by percentile ranking. This is the 15th consecutive month West Michigan has been at or above the 80th percentile. This saturated ground leads to increased runoff efficiency of rainfall into rivers and streams.

Hydrologic Products issued this month:

31 Hydrologic Summaries (ARBRVAGRR)
1 Probabilistic Hydrologic Outlook (ARBESFGRR)
2 Event-driven Hydrologic Outlook (ARBESFGRR)
0 Daily River Forecasts (ARBRVDGRR)
9 Areal Flood Advisory Statements (ARBFLSGRR)
4 Flood Warning Statements (ARBFLWGRR)
0 Flood Watch Statements (ARBFFAGRR)
22 River Statements (ARBRVSGRR)

News Articles and Related Documentation

https://www.mlive.com/news/g66l-2019/12/18a411cc457181/record-warmth-and-a-supersoaker-winter-rain-for-michigans-weekend-weather.html

https://www.lansingstatejournal.com/story/news/local/2019/12/12/great-lakes-lake-huron-water-levels-2019-michigan-state-parks-flooding-mi/4239358002/

https://www.michiganradio.org/post/fitting-end-wet-2019-some-parts-michigan-enter-new-year-under-flood-warning