From: Joshua Ball
Sent: Wednesday, February 19, 2020 8:04 AM
To: Oun, Amira (EGLE); Gulotty, Elle (DNR); Scott Hicks; Gene Mensch; Jim Grundstrom
Cc: Virgil E. Schlorke ; GenerationAdmin
Subject: Dead River License Request for Planned Deviation - Dead River Storage Basin Drawdown

Good Morning All,

As done in the past, UPPCO has been closely watching the snowpack information surrounding the Dead River Project to best understand how the conditions will impact project sites during spring. Early winter storms have provided a significant amount of snow on the ground throughout the Dead River Watershed (snowfall in January was 140-150% above average). As discussed in previous years, the amount of snow/water accumulated during the winter months significantly impacts the inflows into the Dead River Storage Basin during the spring melt.

I have attached the latest snow water equivalent (SWE) forecast from NOAA that depicts 8 to 12 inches of water equivalent in the majority of the Dead River watershed. Also attached is the 2019 SWE from the same date, which shows similar water equivalents at this point in the winter. Similar to last year, the National Weather Service January hydrology report (attached) states that the ground moisture level is in the 99th percentile, likely due to the high amounts of rain received in the fall and a quick transition to snow in November. As witnessed in 2019, a high ground saturation level allows a greater amount of the 'snow water' than average to enter the river system, as it is not absorbed into the ground. The NWS report also indicated that January had above average temperatures, which created a wetter, more dense snow. The increased temperatures have also contributed to above average river flows (most in a percentile greater than 90). To align with the NWS data, using a 10 year average, the DRSB sees minimum flow conditions though the winter with a slightly declining headwater. This year, outflows have been averaging well above minimum with minimal changes to the headwater elevation, indicating inflows into the storage basin are greater than average. The higher inflows can also be verified by the Humboldt gage station on the Escanaba river, which have seen historic highs over the last 3 months.

The long range forecast provided by NOAA (attached) indicates a cooler than average outlook for the next 3 months with precipitation higher than average over the same time period. With general 'U.P.' weather patterns considered, it is highly likely more snow is still to come. With the amount of snow already on the ground with 1-1/2 months of winter still left, final snow water totals similar to that of 2019 are possible.

Based upon the above data, historical operations records and utilizing the synthesized model to understand different scenarios, UPPCO is requesting the following proposed planned deviation at the Dead River Storage Basin (DRSB) development of the Dead River License (P-10855):

1. Lower the March and April Minimum Elevations to 1,333.5 ft NGVD.
2. Lower the April Start of Month Target Elevation to 1,334.0 ft NGVD.

The aforementioned planned deviation will help to reduce the potential of a headwater elevation over 1,344 ft NGVD (spillway crest) at the DRSB during the spring melt. As such, UPPCO believes that this deviation is the best course of action for all interested parties of the DRSB. Reducing the current headwater elevation (drawdown) allows room to capture spring flows when they are higher than the maximum powerhouse releases. This storage area helps to reduce the overall headwater peak elevation

and minimize the potential effects of bank erosion outside of the normal operating levels. As discussed due to concerns in previous years, starting the drawdown early reduces the daily drawdown rates to achieve the end target and helps minimize the impacts to the aquatic animals. If approved, UPPCO would like to use a start date of March 2, 2020. Upon approval and start, UPPCO would release approximately 200 CFS through the Hoist powerhouse until the target of 1334 feet is met (anticipate 30 days). The approximate flows will yield an average elevation drop per day of 0.12 feet.

As a comparative note; Last year the DRSB had an average of 12 to 14 inches of SWE at the start of the spring melt. Prior to spring melt, the headwater level was reduced to 1336.6 feet. At the peak of snowmelt, the DRSB rose to an elevation of 1345.75 feet, however, significant rains during the tail end of the snowmelt resulted in DRSB inflows of 4 times the maximum outflows and the headwater again rose to a peak elevation of 1346.53 feet. UPPCO is looking to proactively lower the headwater elevation prior to the start of the spring melt. Based on our model analysis, without a drawdown the headwater elevation at the DRSB has a 52% of exceeding the spillway. This number is reduced to 30% with a starting elevation of 1334.0 feet. UPPCO developed the 1334 foot target by comparing model runs with various drawdown targets. The 1334 target produced the best possible reduction of high headwater events with the fewest impacts to sustaining water levels though the remainder of the summer/fall. Based on historical data, on average a SWE of 8-10" yields a DRSB elevation increase of 6.5' and a SWE of 10-12" yields 7.5' of headwater elevation rise. Although these numbers vary depending on the weather conditions of spring (ie: a fast/slow melt, rain, etc) they provide a good check in determine the amount of drawdown required to best manage the peak spring and long term summer water conditions. Based on current conditions, the DRSB would be expected to rise 6-7 feet, again supporting a headwater drawdown to 1334 feet. As noted above, the NOAA anticipates above average precipitation now through April (beginning of spring melt).

Please provide your comments to UPPCO on the requested planned deviation by the close of business on Friday, February 28, 2020. UPPCO cannot implement an approved drawdown on March 2nd without written (either formal or email) correspondence from the EGLE, MDNR and the USFWS.

As always, please feel free to reach out with any questions.

Regards,

Josh Ball
Generation Supervisor
Upper Peninsula Power Company
800 Greenwood St.
Ishpeming, MI 49849

National Operational Hydrologic Remote Sensing Center

Interactive Snow Information

2020

Quick Query Links
Get Time Series for Station ID: Go Listing
Get Time Series for Basin ID: ABRFC Go Listing
Get Basin Averages for RFC Go Listing
Get Climatology for Station ID: Go Listing

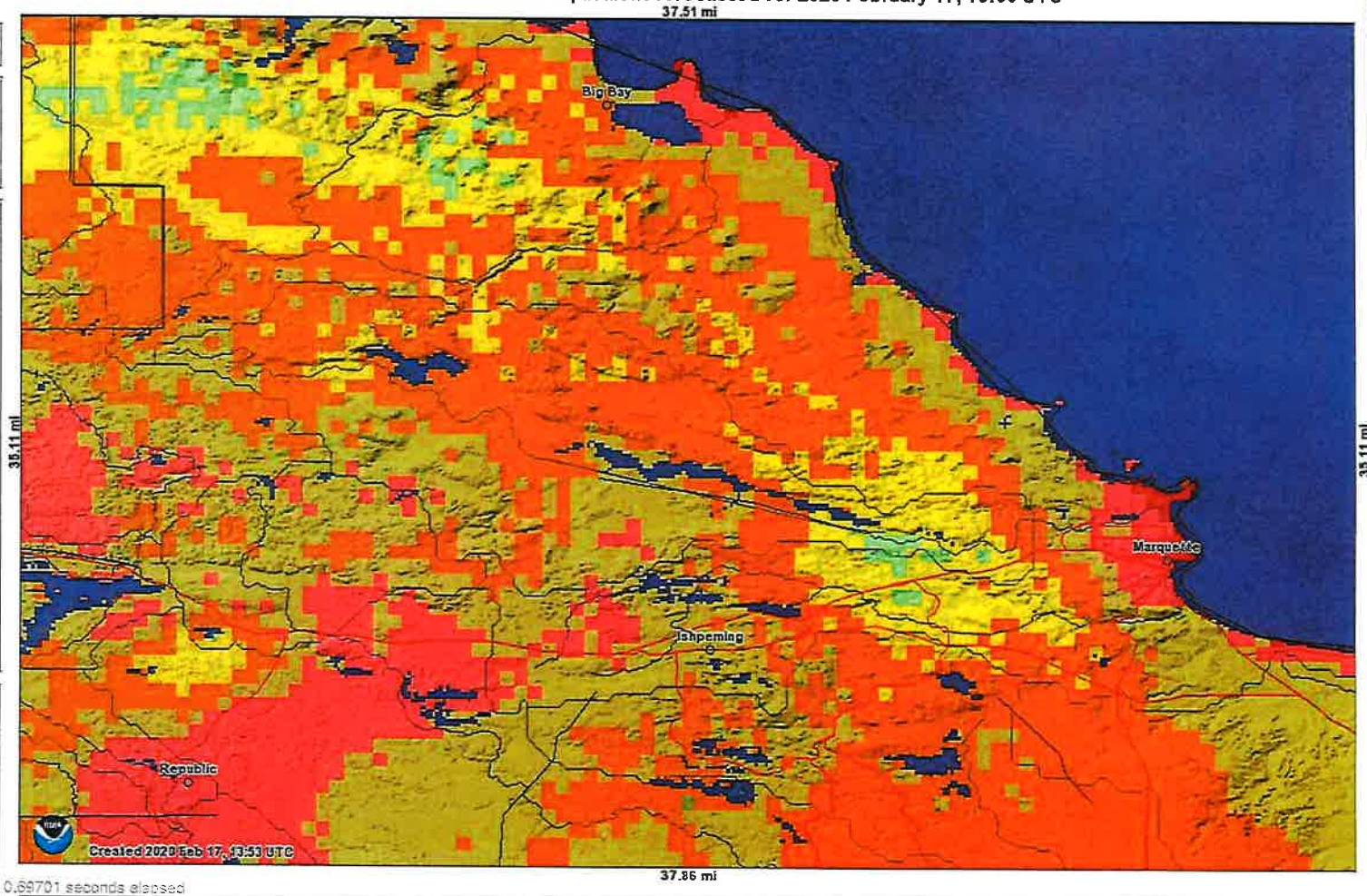
Home Help Comments

Navigation Tools — 48.9 N, 125.3 W — Zoom

Query — Station (2002-present)

Redraw Map

Modeled Snow Water Equivalent forecasted for 2020 February 17, 18:00 UTC



Inches of water equivalent

> 30
20 to 30
18 to 20
16 to 18
14 to 16
12 to 14
10 to 12
8 to 10
6 to 8
4 to 6
2 to 4
1 to 2
trace to 1

Not Estimated

Elevation in feet

> 13124
8203 to 13124
3281 to 8203
3 to 3281
< 3

0.69701 seconds elapsed

- Gridded observed snowfall images, seasonal totals, and data downloads in several formats can now be found on the National Snowfall Analysis page.

Directions:

- Select a physical element to view, select a date, select overlays, and click "Redraw Map."
- Clicking on the map while the Recenter button is selected (red) will recenter the map on that point.
- Clicking on the Zoom Control slider will zoom into or out of the map.
- Clicking on the map and dragging with the button held down while the Recenter button is selected (red) will zoom to a rectangle when the button is released.
- Stations and regions can be queried using the Query button and menu.

Vector GIS Datasets used by this page
Raster GIS Datasets used by this page

Select Physical Element: Snow Water Equivalent

Select Date: 2020 February 17 18:00 UTC — Snap to nearest time

Select Overlays
Hydrologic Features: RFC Basins (Label), Other Basins (Label), HUCs (6-digit), RFC Boundaries, Rivers and Streams, Lakes and Reservoirs
Political Features: County Boundaries, CWA Boundaries, State Boundaries, National Boundaries, Fed. Indian Land Areas
Point Features: Stations (Label), Cities (Label), Flight Lines (Label), Climate Sites (Label), Skiing (Label)
Transportation Features: Roads and Highways
Other features: NSA Disc. Regions, NSA Disc. Subregions, NSA Modelling Tiles

Map Preferences: English units; Legend below map; Background image; Hill shading; High-contrast palette; Title on image; 1100 pixels map width; 700 pixels map height; Show all observations; Small text; Javascript is on; Cookie use is off

Link to this image
Link to latest image
Link to latest page

National Operational Hydrologic Remote Sensing Center

Interactive Snow Information

2019

Get Time Series for Station ID: Go Listing
Get Time Series for Basin ID: ABRFC Go Listing
Get Basin Averages for RFC Go Listing
Get Climatology for Station ID: Go Listing

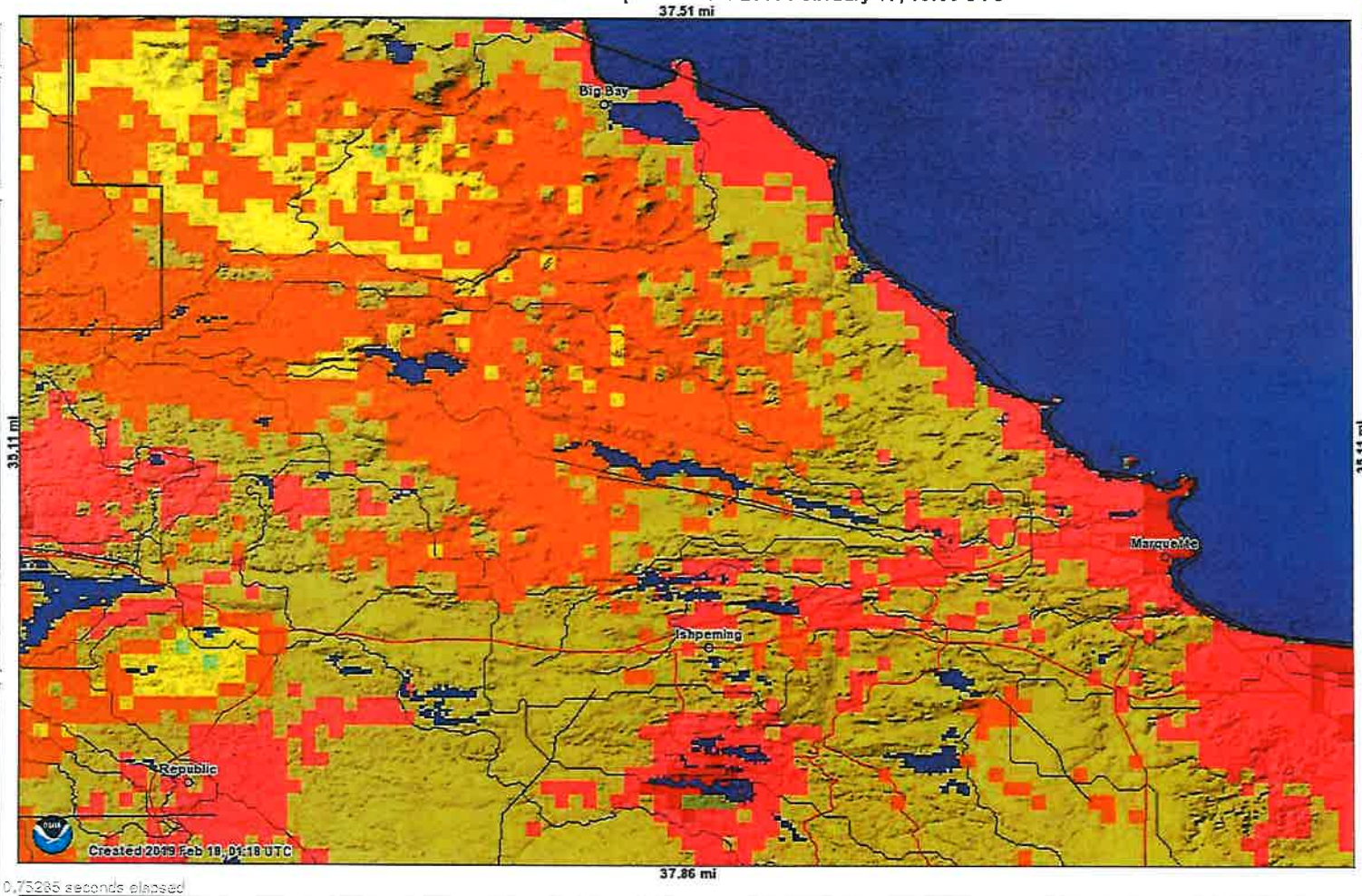
Home Help Comments

Navigation Tools — 48.5 N, 99.3 W — Zoom

Query — Station (2002-present)

Redraw Map

Modeled Snow Water Equivalent for 2019 February 17, 18:00 UTC



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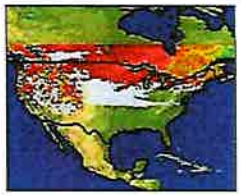

Inches of water equivalent

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20 to 30
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Not Estimated

Elevation in feet

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8203 to 13124
3281 to 8203
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< 3

- Select Physical Element
  - Snow Water Equivalent
- Select Date
  - 2019 February
  - 17 18:00 UTC
  - – - + ++
  - Snap to nearest time
- Select Overlays
  - *Hydrologic Features*
    - RFC Basins Label
    - Other Basins Label
    - HUCs (8-digit)
    - RFC Boundaries
    - Rivers and Streams
    - Lakes and Reservoirs
  - *Political Features*
    - County Boundaries
    - CWA Boundaries
    - State Boundaries
    - National Boundaries
    - Fed. Indian Land Areas
  - *Point Features*
    - Stations Label
    - Cities Label
    - Flight Lines Label
    - Climate Sites Label
    - Skiing Label
  - *Transportation Features*
    - Roads and Highways
  - *Other features*
    - NSA Disc. Regions
    - NSA Disc. Subregions
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- Map Preferences
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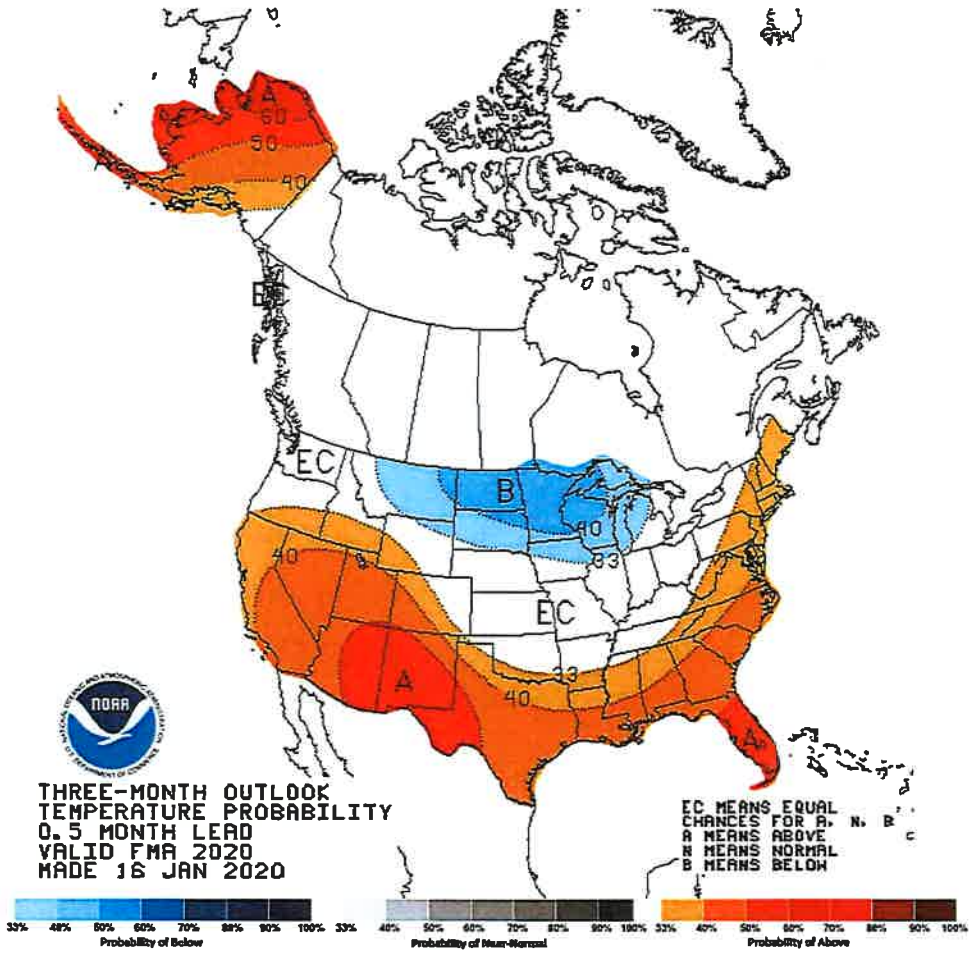
Vector GIS Datasets used by this page
Raster GIS Datasets used by this page


A
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THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.5 MONTH LEAD
VALID FMA 2020
MADE 16 JAN 2020
EC MEANS EQUAL
CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Below
40% 50% 60% 70% 80% 90% 100%
Probability of Near-Normal
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Above

Local forecast by "City, St"
City, St Go

Current Hazards
Watches / Warnings
Outlooks
Submit Report
Current Conditions
Observations
Radar
Satellite
Observed Precip
Forecasts
Forecast
Discussion
Local Area
Activity Planner
Aviation Weather
Fire Weather
Marine Weather
Severe Weather
Hurricane Center
Hydrology
Rivers & Lakes
Climate
Local
National
Drought
More
Weather Safety
Preparedness
Weather Radio
StormReady
Additional Info
Educational
Resources
COOP Observer
Top news Archives
Our Office
Rip Current Risk
Links and Local Information
Contact Us
Contact Info
Feedback
Ask Questions

USA.gov

Home > Climate > NWS Marquette > Climate Prediction > Local Temperature Outlook

Three-Month Temperature Outlook (Issued: January 2020)

National Outlook | Local Outlook | Background Information | Questions and Feedback

MARQUETTE CO AP, MI
MARQUETTE County, Coop ID: 205184
Elevation: 1415 ft.
Latitude: 46° 31' N Longitude: 87° 32' W

NOAA Online Weather Data Help

Three Category Outlook Table

Season	Below Normal		Near Normal		Above Normal	
	There is a chance for	temperature during this 3-month period to be lower than	There is a chance for	the average temperature during this 3-month period to be between	There is a chance for	temperature during this 3-month period to be higher than
Feb-Mar-Apr 2020	40.0%	25.4°	33.0%	25.4° and 28.1°	27.0%	28.1°
Mar-Apr-May 2020	34.0%	36.6°	33.0%	36.6° and 39.2°	33.0%	39.2°
Apr-May-Jun 2020	33.0%	48.9°	35.0%	48.9° and 50.8°	32.0%	50.8°
May-Jun-Jul 2020	32.0%	58°	33.0%	58° and 59.6°	35.0%	59.6°
Jun-Jul-Aug 2020	30.0%	62.2°	35.0%	62.2° and 64.1°	35.0%	64.1°
Jul-Aug-Sep 2020	30.0%	60.8°	34.0%	60.8° and 62.3°	36.0%	62.3°
Aug-Sep-Oct 2020	23.0%	53.4°	33.0%	53.4° and 55°	44.0%	55°
Sep-Oct-Nov 2020	22.0%	42.3°	33.0%	42.3° and 44.2°	45.0%	44.2°
Oct-Nov-Dec 2020	29.0%	30°	33.0%	30° and 32.2°	38.0%	32.2°
Nov-Dec-Jan 2020_21	28.0%	19.9°	34.0%	19.9° and 22.6°	38.0%	22.6°
Dec-Jan-Feb 2020_21	33.0%	15.2°	34.0%	15.2° and 18.1°	33.0%	18.1°
Jan-Feb-Mar 2021	33.0%	17.3°	34.0%	17.3° and 20.1°	33.0%	20.1°
Feb-Mar-Apr 2021	34.0%	25.4°	34.0%	25.4° and 28.1°	32.0%	28.1°

Legend: Blue, Gray, or Red Shading indicate an enhanced chance for Below, Near, or Above Normal Category respectively.

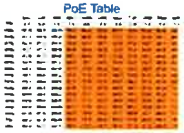
Table Text Only

Select Location: MARQUETTE CO A | Select Time Period: Feb-Mar-Apr 2020 | Select Product: Outlook Table | Go

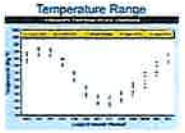
Outlook Evaluation

Back To Outlook Calendar

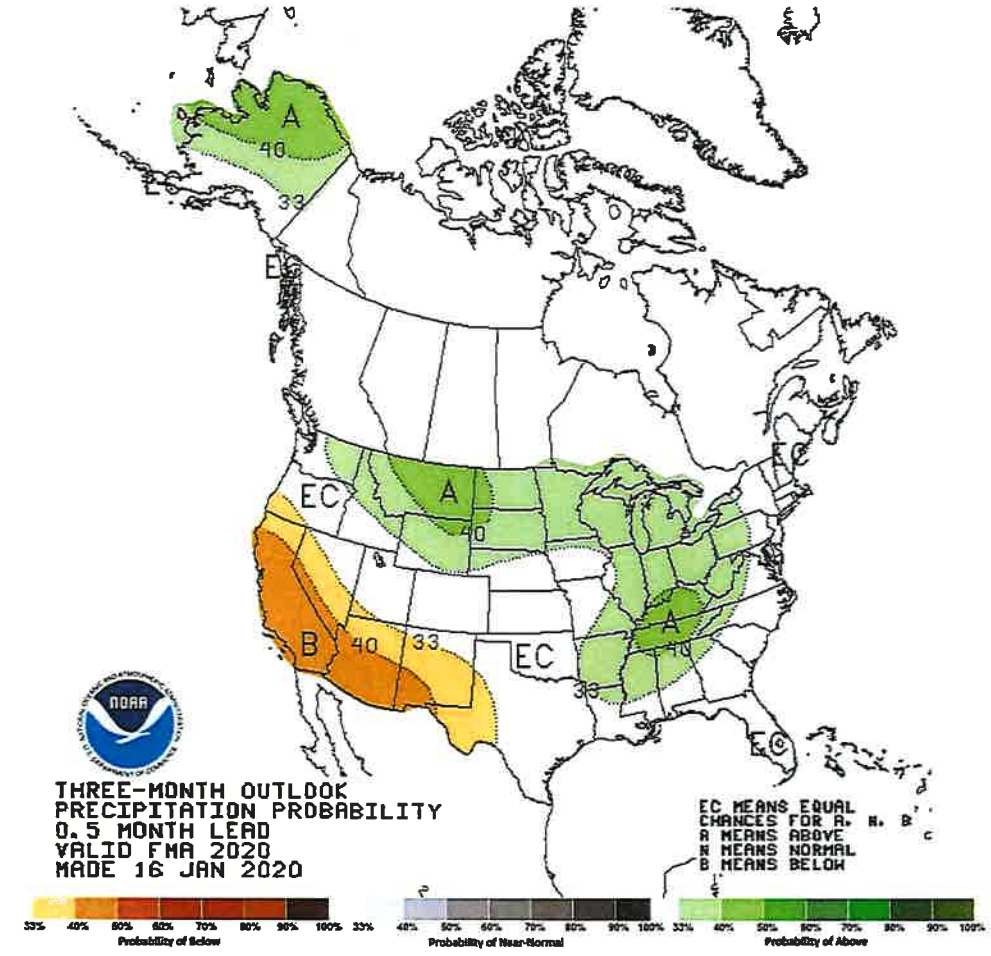
PoE Table



Temperature Range



Marquette Weather Forecast Office
112 Airpark Drive South
Negaunee, MI 49866
Tel:
Ask Questions/Webmaster
Page last modified: 18-Dec-2014 9:26 PM


A
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EC
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B
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THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
VALID FMA 2020
MADE 16 JAN 2020
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33% 40% 50% 60% 70% 80% 90% 100%
Probability of Below
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Probability of Near-Normal
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Above

NWS FORM E-5 U.S. DEPARTMENT OF COMMERCE NOAA, NATIONAL WEATHER SERVICE	HSA OFFICE: **Marquette, MI**
MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS	REPORT FOR (MONTH / YEAR): **January 2020**
TO: NATIONAL WEATHER SERVICE (W/OH12x1) HYDROMETEOROLOGICAL INFO CENTER 1325 EAST-WEST HIGHWAY, RM 7116 SILVER SPRING, MD 20910	DATE: **February 3, 2020**
	SIGNATURE: **Robin J. Turner, MIC** **Linda Gilbert, Hydrology Program co-Manager**
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.

January Precipitation Summary

To start the year 2020, January continued the above normal precipitation trend for much of Upper Michigan, with an average of 140% to 150%. Despite the above normal temperatures also featured throughout the month of January, most of the precipitation fell in the form of snow, yielding to above normal snowfall for most locations (the notable exceptions in the list below are Ironwood and Marquette City). The combination of above normal temperatures yet still cold enough to remain in the form of snow attributed to the wetter, denser snow events that occurred, as opposed to the "fluffier" snow that tends to be more common in the area during the heart of the winter season. Additionally, Lake Superior remains "open" in ice-coverage, adding to the complexity of this winter season thus far.

Although there were a number of snow events that occurred throughout the month of January, the most notable occurred in the middle of the month, stretching over the weekend of January 17th through the 19th. Heavy snow associated with a system moving through the region transitioned to lake-effect toward the latter half of the weekend, with lower snow to liquid ratios early on, rising toward the end of the event. In Calumet/Tamarack (CO-OP station CLUM4), nearly 2' (23.5") of snow was measured over a 48-hour period, ending the morning of January 19th. At WFO Marquette during that same weekend/event, 14.9" of snow was measured in a 48-hour period, also through the morning of January 19th. Across Upper Michigan, snowfall for a 48-hour period ending 12Z on January 19th ranged from around 6" to 18", with locally higher amounts, as noted.

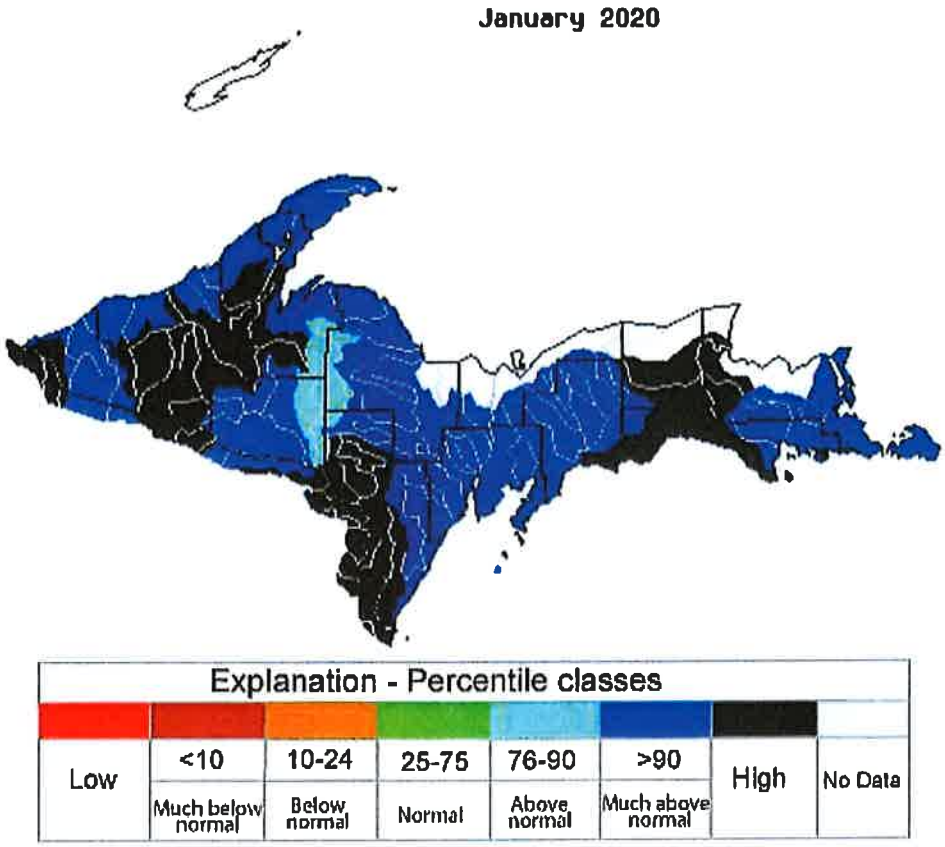
Location	Precipitation	% of Normal	Snowfall
WFO Marquette	3.18"	132%	51.6"
Marquette City	2.87"	157%	18.4"
Quincy Hill	3.22"	125%	54.9"
Ironwood	2.43"	126%	33.4"
Iron Mountain	1.90"	154%	21.5"
Manistique	2.51"	160%	28.5"
Munising	3.61"	110%	45.6"
Stambaugh	1.83"	187%	21.0"

January Flooding Conditions

Rivers did not reach flood stage in the Upper Peninsula.

January River Conditions

Streamflows across the NWS Marquette Hydrologic Service Area ran high/above normal across all basins, except where no data was available in the Chocolay and Pictured Rocks/Two-Hearted basins along Lake Superior. The measurements of snow-water equivalents (SWE) for the upcoming spring melt period will be crucial in determining how rivers/basins will respond.



January Drought Discussion

No drought conditions are depicted in the Upper Peninsula. For the latest drought status, please go to http://www.drought.gov.

Media Links

None at this time.

January Products Issued

1 – 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)
30 – Hydrologic Summary (RVA)
0 – Daily River Forecasts (RVD)

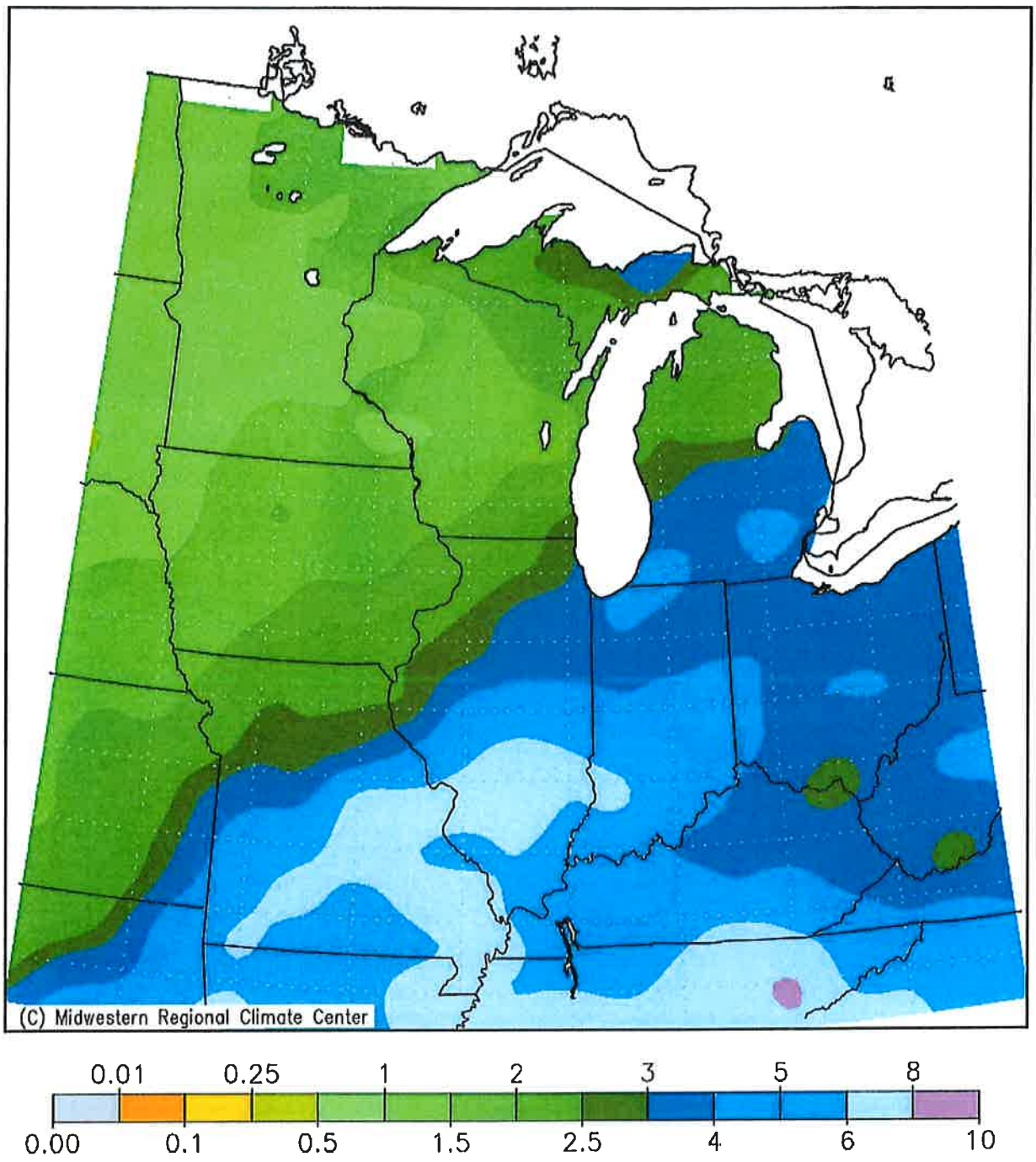


Figure 1: January 2020 Monthly Precipitation Totals.

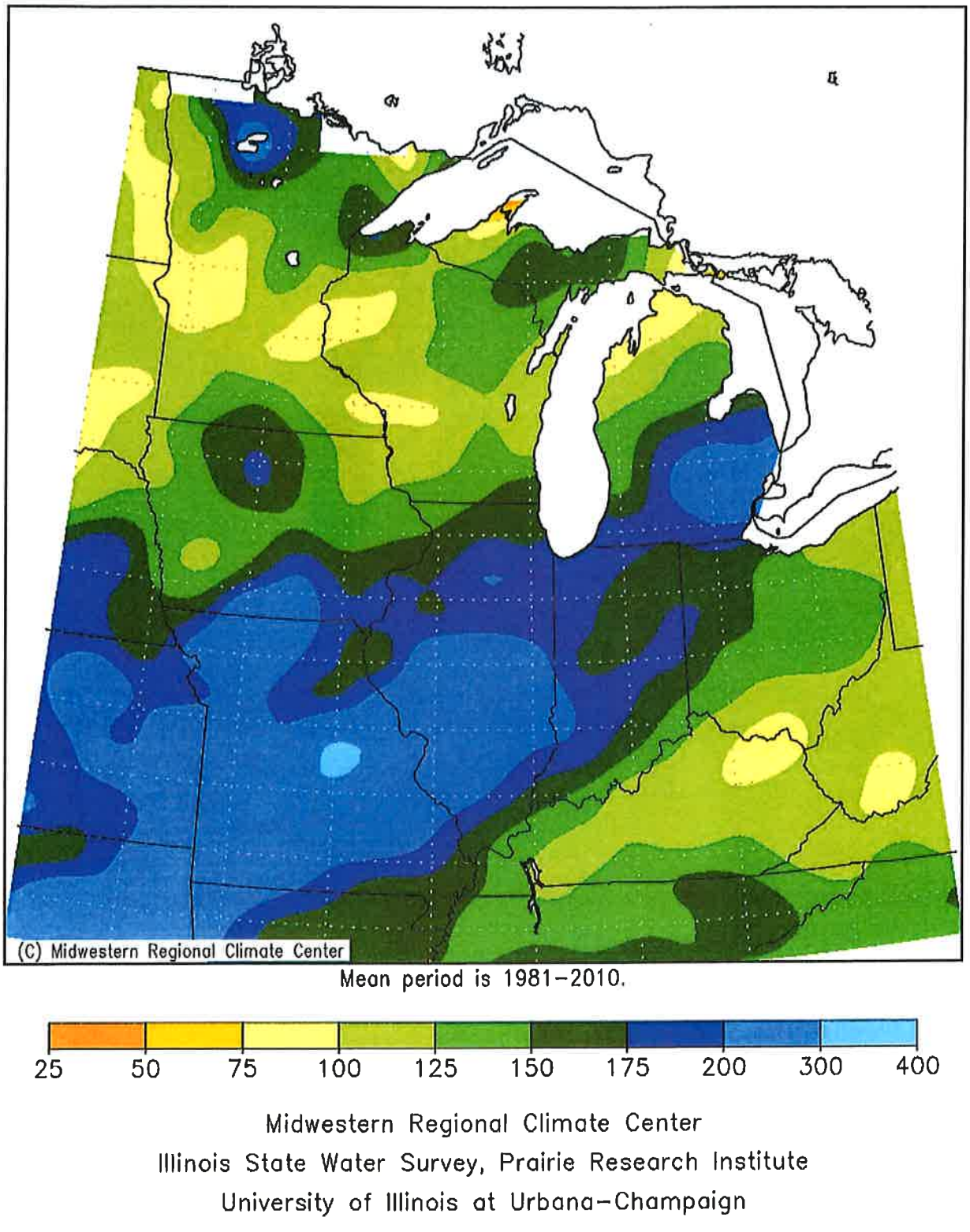


Figure 2: January 2020 Percent of Mean of Accumulated Precipitation.

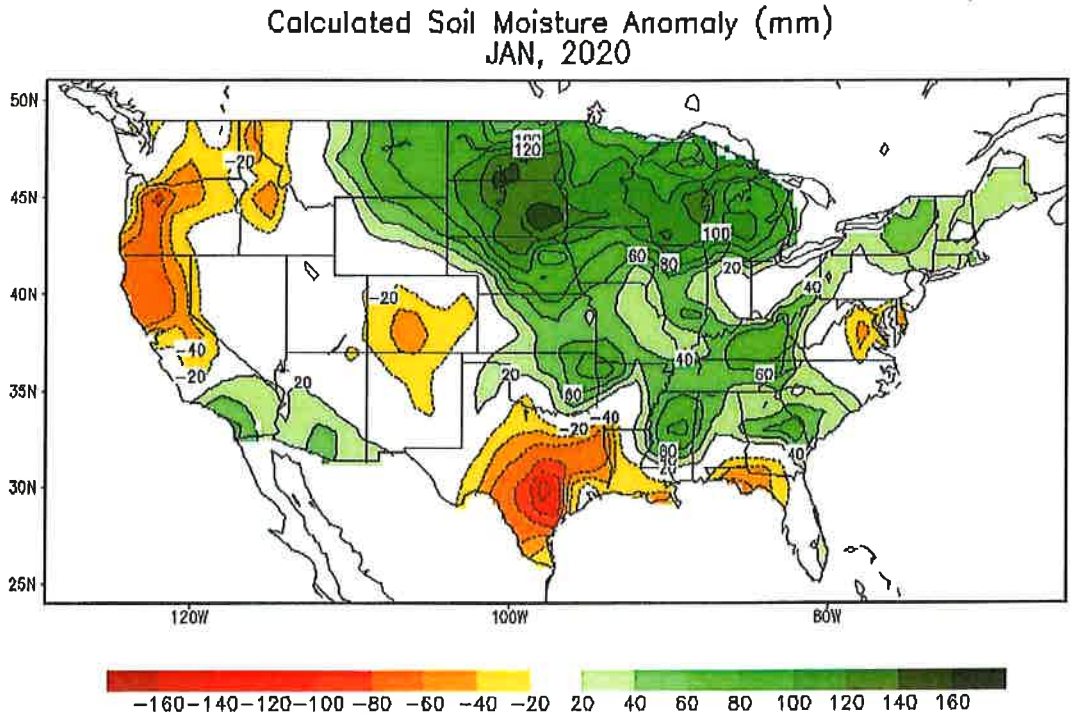


Figure 3: January 2020 Monthly Soil Moisture Anomaly (courtesy of the Climate Prediction Center).

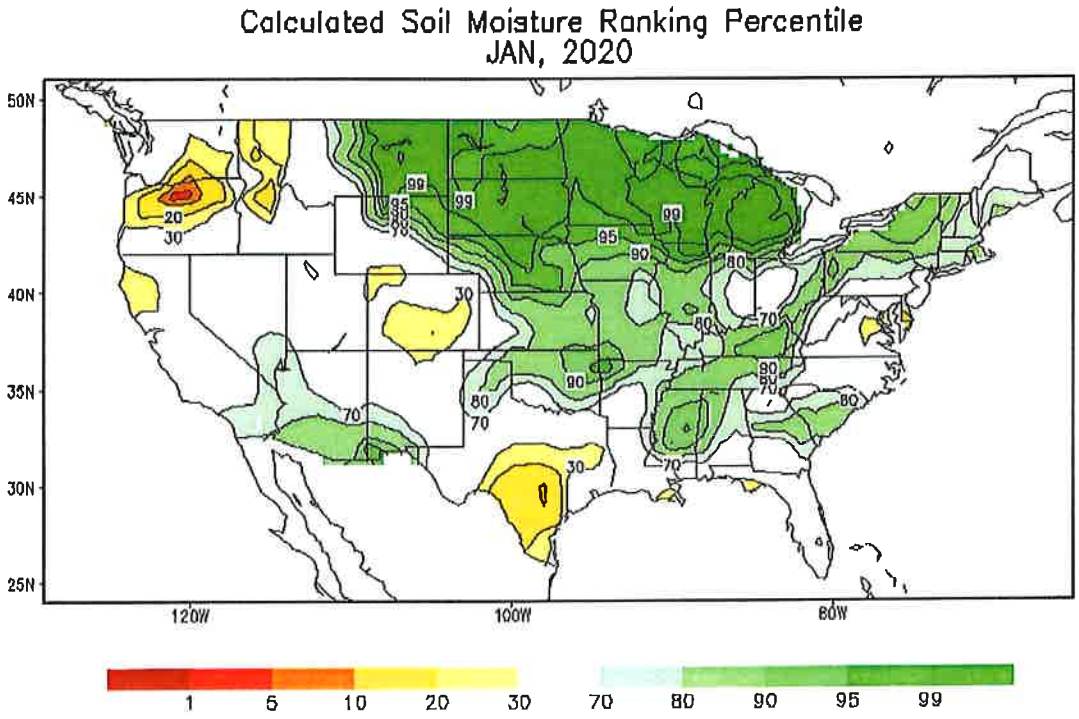


Figure 4: January 2020 Monthly Soil Moisture Ranking Percentile (courtesy of the Climate Prediction Center).