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/OH12x1) HYDROMETEOROLOGICAL INFO CENTER 1325 EAST-WEST HIGHWAY, RM 7116 SILVER SPRING, MD 20910	HSA OFFICE: **Marquette, MI** REPORT FOR (MONTH / YEAR): **March 2019** DATE: **April 1, 2018** SIGNATURE: **Robin J. Turner, MIC** **Keith White, Hydrology Program 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.

March Precipitation

After the relentless month of February left an anomalously deep, wet snowpack across Upper Michigan, we couldn't have asked for much better conditions in March. The majority of the area experienced below normal precipitation through the month, especially across the central UP where less than half of the normal March precipitation fell. The majority of this precipitation came during the week between March 9 and March 16. Over the last 7 days of the month, most locations received about 0.10" or less, although the Keweenaw Peninsula, Baraga, and Alger counties received up to about 0.3", mainly from a quick round of showers and thunderstorms on the 27th and light lake effect to close out March.

Below is a chart of some of the larger cities in the Upper Peninsula, with monthly precipitation in inches and the percent of normal for the month. Any notable monthly ranks are also included. See figures 1 and 2 below for a smoothed out aerial view of these data. The tip of the Keweenaw Peninsula and far Northeastern Upper Peninsula are not well analyzed during the winter months due to poor radar coverage of shallow precipitation.

Location	Precipitation	% of normal	Rank	Snowfall	Above/Below	Rank
WFO Marquette	1.12"	37	46/57	8.2"	-26.7"	47/57
Marquette City	0.82"	41		4.7"	-17"	
Houghton Airport	1.93"	124		M (20.0 @ Kearsarge)	M	
Ironwood	1.66"	84		18.8"	-6.1"	
Iron Mountain	0.86"	52		3.3"	-7.3"	
Manistique	1.62"	91		6.0"	-4.6"	
Munising	1.83"	86		12.5"	-6.3"	
Newberry	1.70"	75		7.9"	-10.0"	
Stambaugh	0.79"	52		3.7"	-7.5"	

Snowpack Discussion

Figure 3 below is the latest analysis of snow water equivalent (SWE). Figure 4 shows the mean +1 standard deviation SWE for early April from a 1999 study by Paul Crocker at Michigan Technological University, and an eyeballed comparison shows we are at or above these values currently across much of the area.

Monthly average temperatures for March were several degrees below normal, with most locations only reaching into the 50s on one or two occasions. Even when temperatures were above freezing, the airmasses were typically dry. Much of the area has seen the snowpack ripen and melt a little, and things will begin to accelerate a little this month. A slow meltoff thus far, combined with dry conditions and at least a little evaporation/sublimation have lessened the concerns for flooding somewhat, but we will still be vulnerable, especially if heavy rainfall events occur over the next 6-8 weeks.

Below are a few recent cores taken by cooperative observers on April 1 and the results of 3 days of snow surveying April 2-4. Five to 8 snow cores were taken at each site and averaged. Note: * denotes that the SWE measurement may have some error due to subpar equipment.

April 1:	**Depth**	**SWE**
Ironwood*:	11”	4.7”
NWS Marquette:	23”	8.0”
Stambaugh*	7”	2.3”
Norway	7”	2.9”

April 2:	**Depth**	**SWE**	**Frost Depth**
M94 Skandia	13”	3.8”	3” (2”thaw)
1N Carlshend	14”	4.3”	
Chatham	9”	3.0”	4” (3” thaw)
Nahma Junction	12”	4.3”	4”
Cornell	10”	3.2”	5”
Gwinn	11”	3.9”	18”?

April 3:	**Depth**	**SWE**	**FD**
Nestoria	24”	7.7”	
1NW Covington	15”	4.8”	11” (6” thaw)
Bergland Dam	17”	6.7”	0”
Rockland (45 bridge)	19”	7.5”	0” (Clay @ 7”)
1N Greenland	21”	8.2”	0”
Twin Lakes	36”	12.5”	0”
Toivola	32”	13.5”	0”
Peshekee Grade	30”	9.6”	0”

April 4:	**Depth**	**SWE**	**FD**
Net River	15”	5.4”	0”
Amasa	12”	4.2”	0”
Way Dam	13”	4.1”	0”
Channing	15”	4.6”	0”
Republic	16”	5.4”	0”
Ishpeming	21”	7.1”	0”
NWS Marquette	20”	7.4”	3”

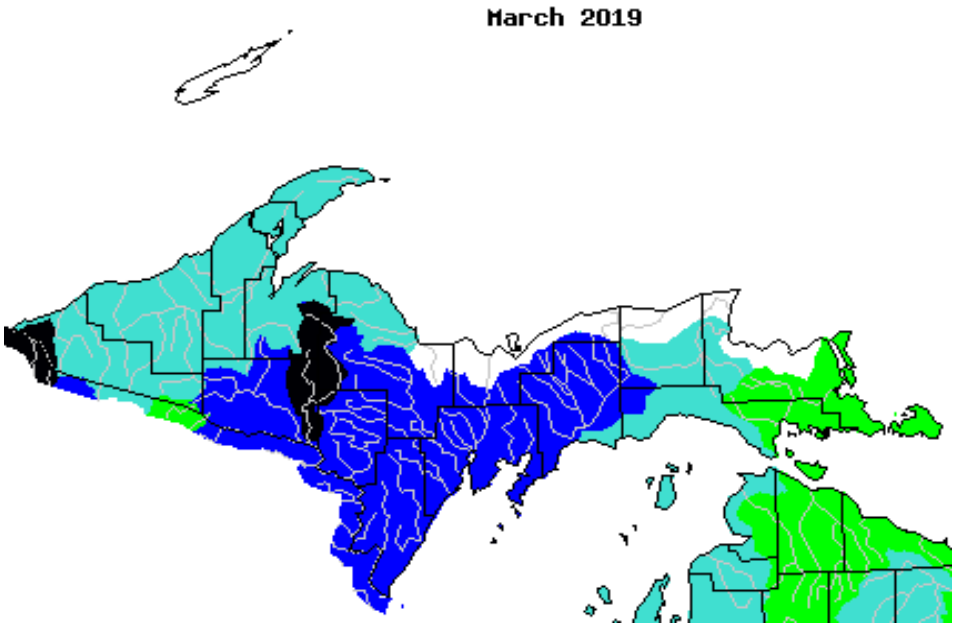
Drought Discussion

The March 28th update of the US Drought Monitor continues to indicate no drought conditions across the MWS MQT Hydrologic Service Area (HSA). For the latest drought status, please go to http://www.drought.gov.

March Flooding

No flooding was reported across Upper Michigan in March. Monthly average streamflows (below) remain near or above normal**,** with the highest values in the south central UP.

March River Levels



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		

March Products Issued

7 – Flood Watch (FFA; One watch, updated 5 times and then cancelled)
0 – Flood Warning (FLW)
0 – Flash Flood Warning (FFW)
0 – Flash Flood Statement (FFS)
0 – Flood Advisories and Statements (FLS)
31 – Hydrologic Summary (RVA)
0 – Daily River Forecasts (RVD)
2 – Hydrologic Outlook (ESF)

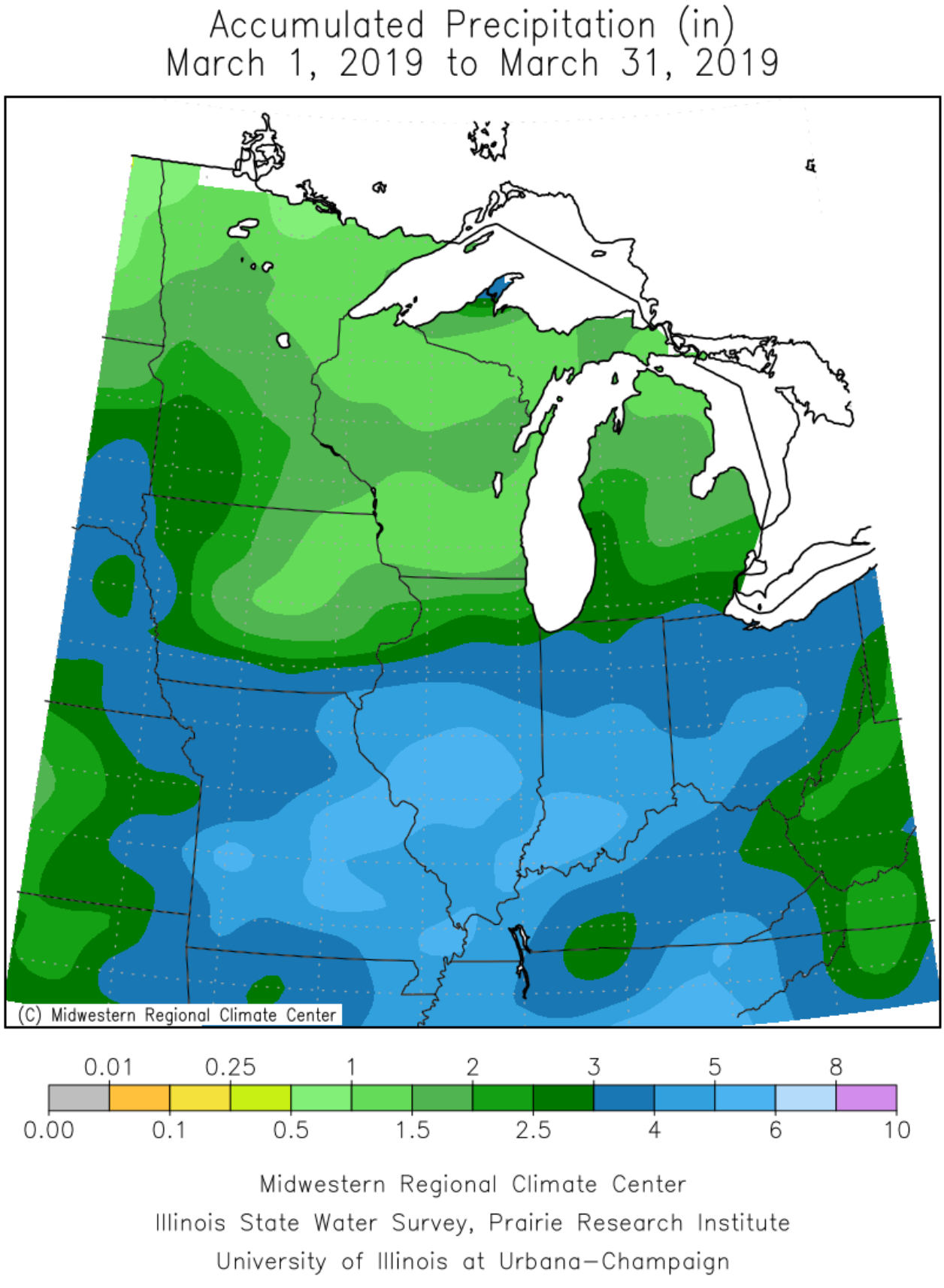


Figure 1. March 2018 Monthly Precipitation Totals.

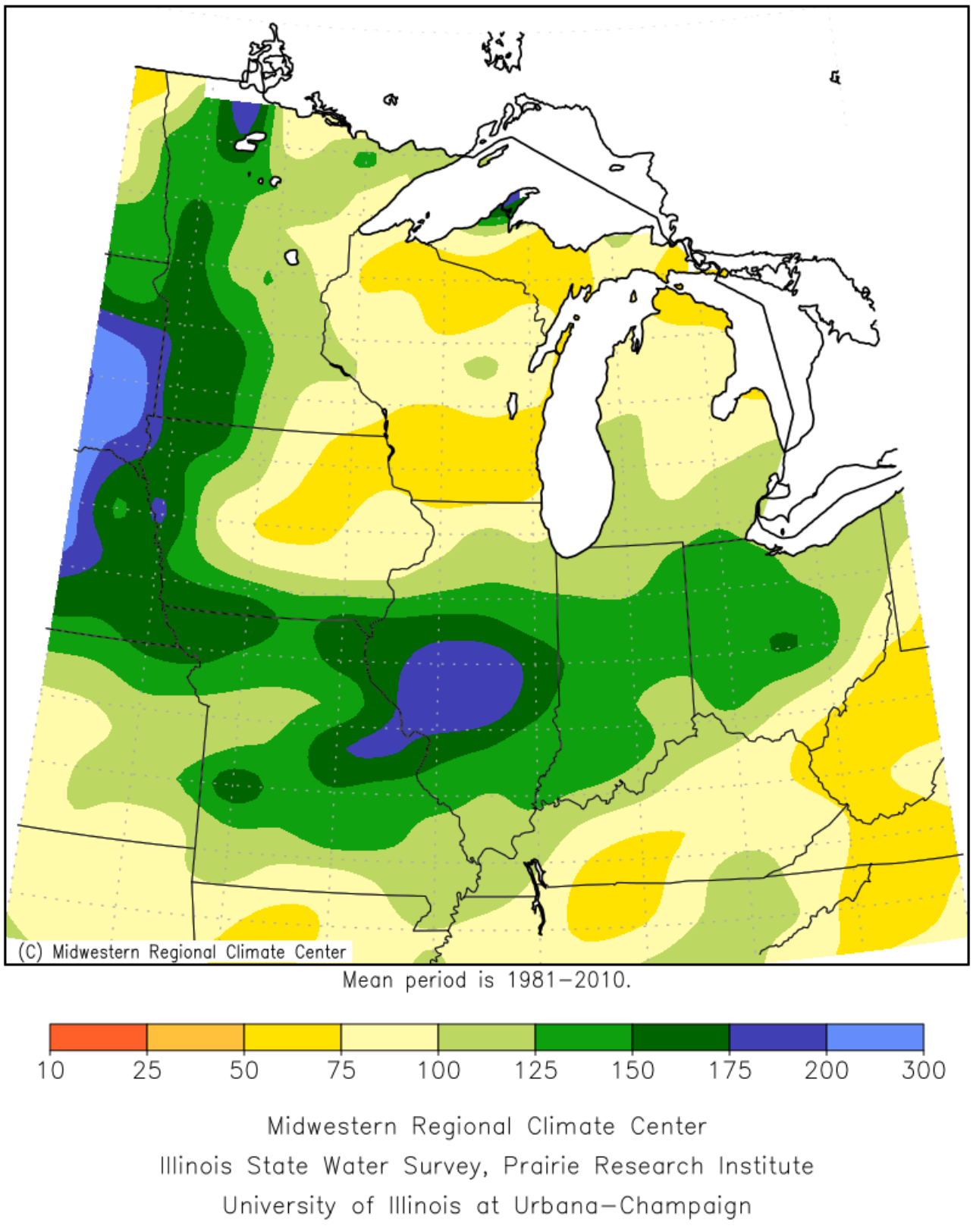


Figure 2. March 2018 Percent of Mean of Accumulated Precipitation

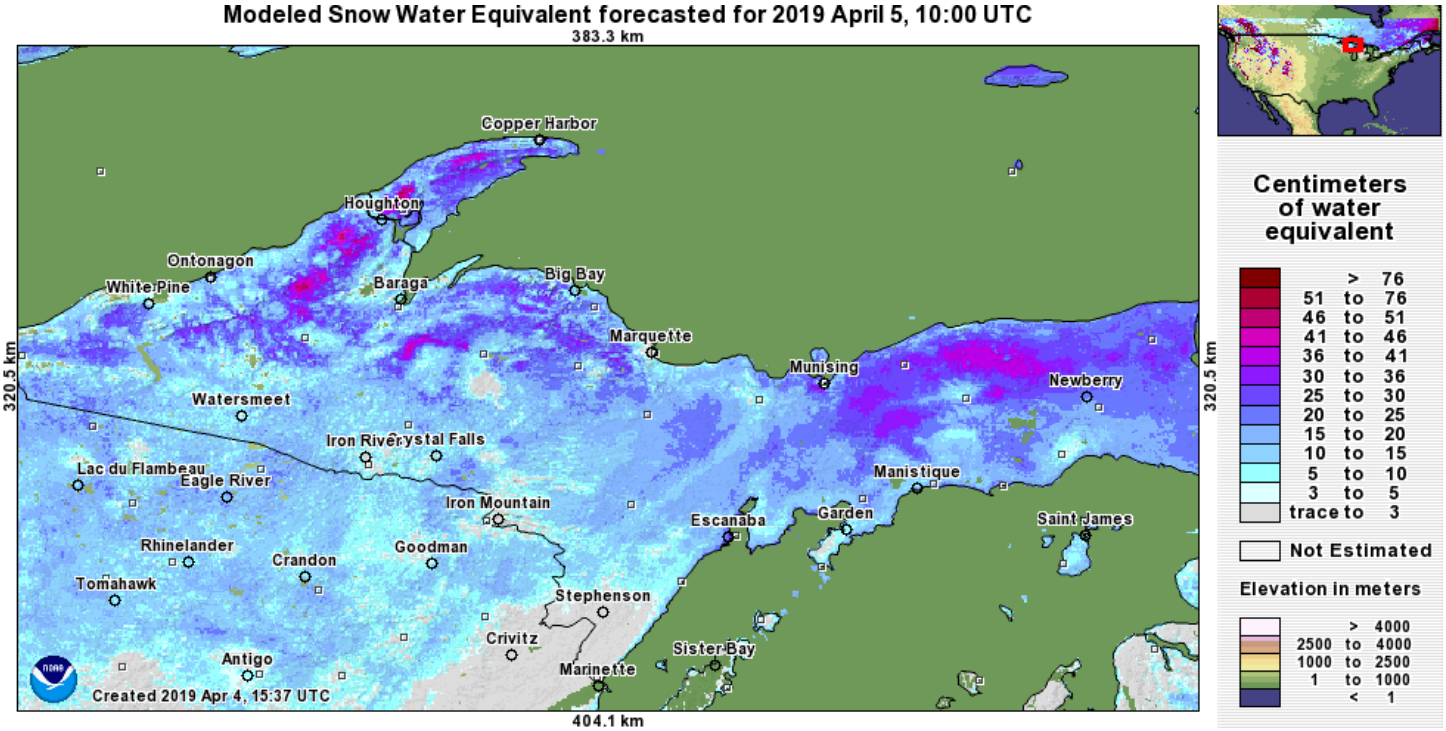


Figure 3: April 5th snow water equivalent (in centimeters for purposes of comparison to Figure 4) from NOHRSC.

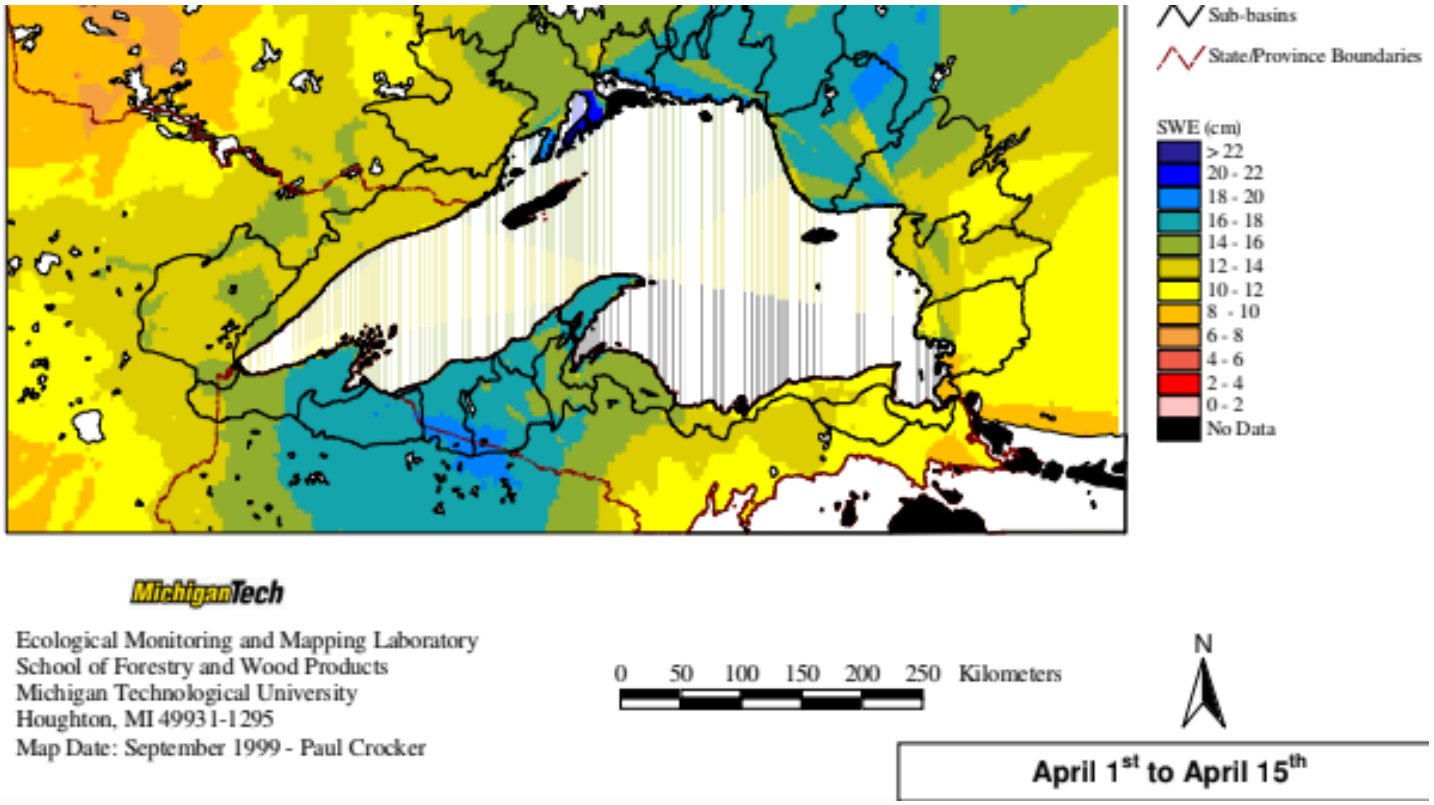


Figure 4: Mean+1 standard deviation snow water equivalent for the first half of April. From a 1999 Michigan Technological University Masters Thesis study by Paul C. Crocker titled "Compilation and Analysis of Snowpack Data for the Lake Superior Basin."