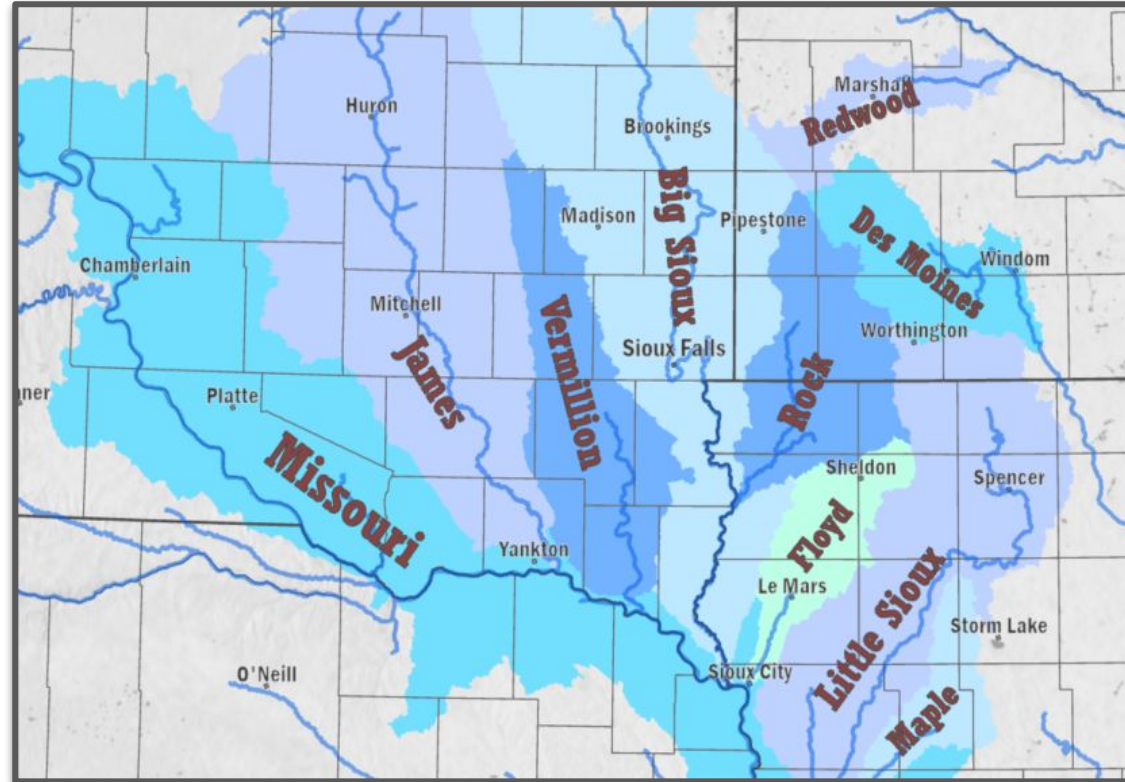




# Spring 2023 Flood Outlook

90 Day Outlook thru May 12th  
*Issued: Feb 9th, 2023*

**Next Outlook: February 23rd**  
**Final Outlook: March 9th**



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# 2023 Spring Flood Outlook (#1 of 3)

90 Day Outlook Valid through May 12th, 2023

## Key Messages

- The spring flood risk will be determined by several factors including snowpack, frost depth, river ice, soil moisture, antecedent river levels, and spring precipitation.
- While an above average snowpack currently exists, antecedent drought conditions and low river levels allow for increased capacity of the river systems.
- An average spring snowmelt and precipitation season would yield a below normal flood risk over the next 90 days.
- Lower probability scenarios of a rapid snowmelt and/or a heavy rain event would increase the flood risk.
- Ice jams may also result in localized flooding.

	Short Term (Next 14 Days)	Long Term (through mid-May)
Snowpack/SWE	Below	Above
Frost Depth	Below	Normal
River Ice	Below	Normal
Soil Moisture	Below	Below
River Levels	Below	Below
Precipitation Outlook	Above	Normal

Impact Potential	Below Normal	Normal	Above Normal
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# Departure From Normal Precipitation

Impact Potential:

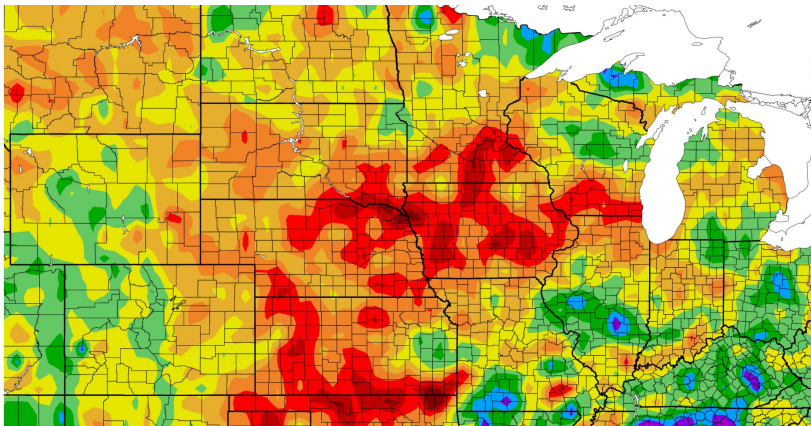
Short Term

Below Normal

Long Term

Below Normal

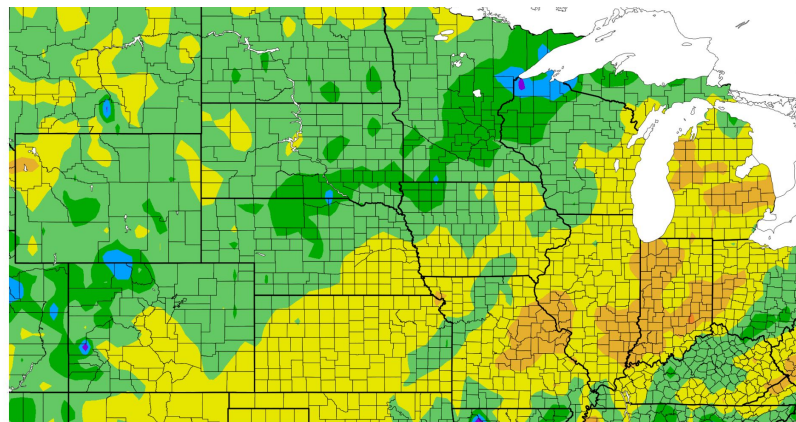
2 Year - Departure From Normal Precipitation



Generated 2/5/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

90 Day - Departure From Normal Precipitation



Generated 2/5/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

- Precipitation over the past couple of years across the broader region has been well below normal with drought conditions in place.
- Precipitation over the past 90 days has generally been above normal, although only a small percentage of the ongoing precipitation deficit.

## Precipitation Departure From Normal (By Year)

	2021	2022	2023 (Thru Feb 8th)
Huron	-3.04	-2.44	-0.30
Sioux Falls	-0.12	-3.04	+1.13
Sioux City	-6.31	-13.93	+0.59



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# Soil Moisture and Temperatures/Frost Depth

Impact Potential:

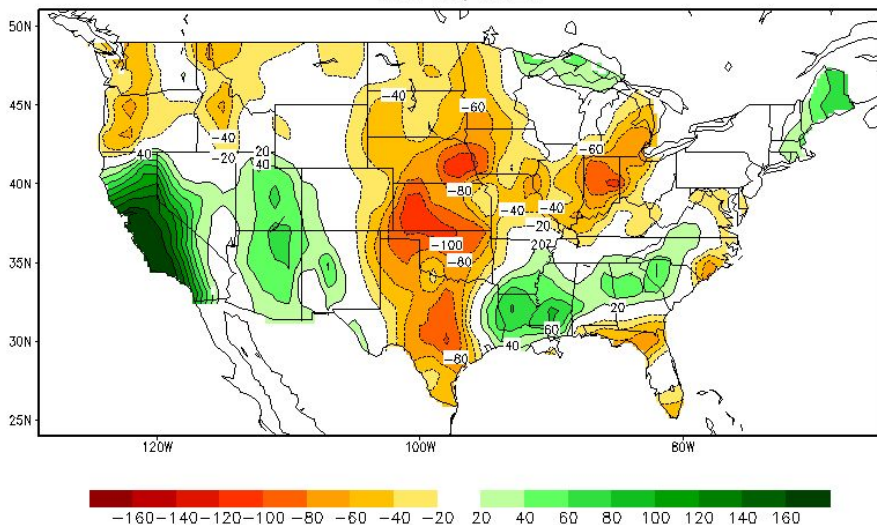
Short Term

Below Normal

Long Term

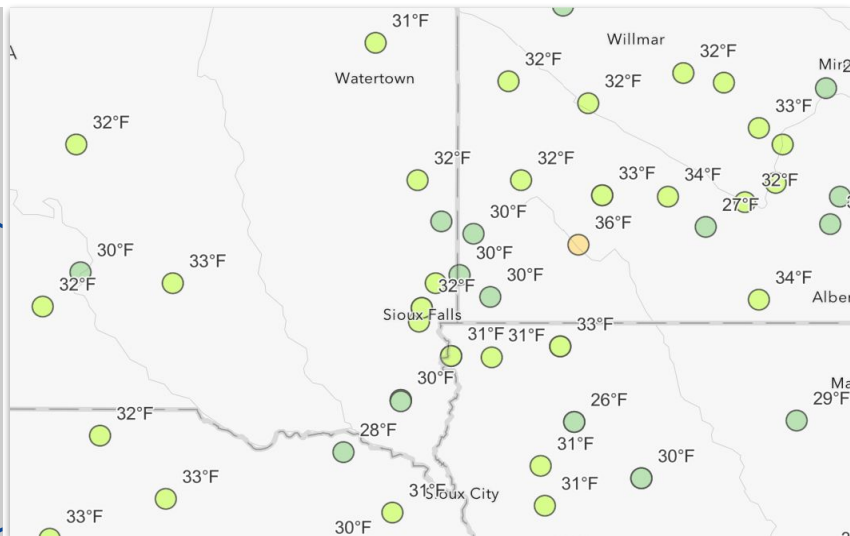
Below Normal

Calculated Soil Moisture Anomaly (mm)  
FEB 04, 2023



- Ground conditions remain abnormally dry across the region with soil moisture deficits generally in the lowest 30th percentile of climatology.
- Warmer ground temperatures and shallow frost depths may allow moisture to more easily penetrate the soil, limiting runoff into rivers.

Shallow Soil Temperature  
(Between 2-8 inches)



Sioux Falls Soil Temp/Frost Depth Values

	2 in	4 in	8 in
Soil Temp	32°	30°	32°
Frost Depth	12 inches		







# Antecedent River Conditions

Impact Potential:

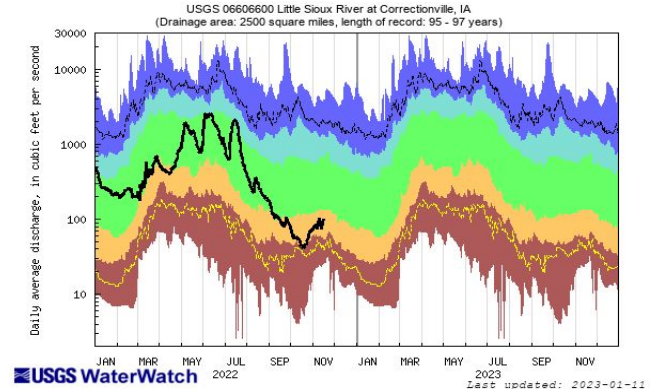
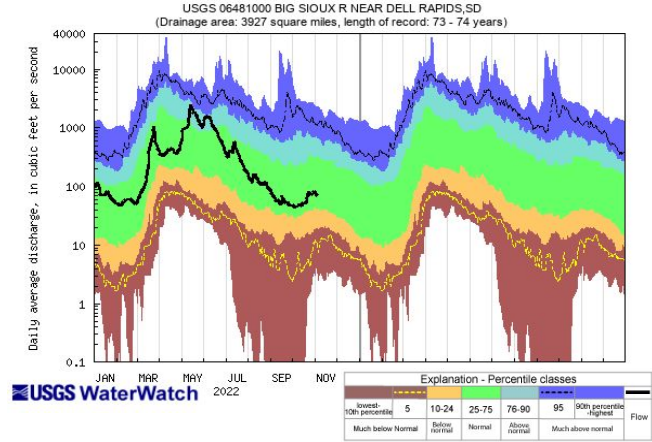
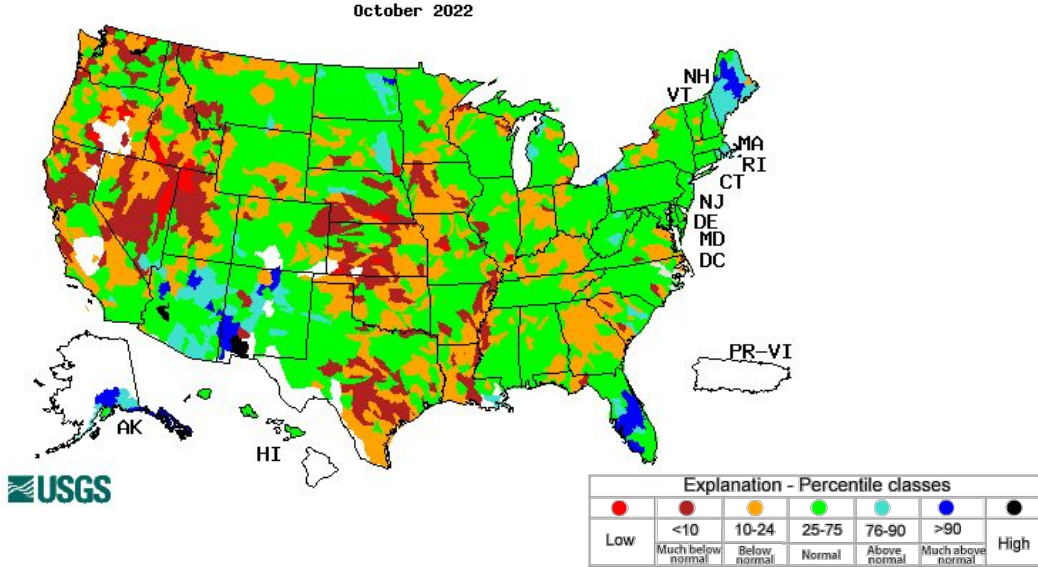
Short Term

Below Normal

Long Term

Below Normal

Streamflow Percent of Normal  
(Going Into Winter 2022-2023)



- River levels and streamflows going into winter were near or below normal across much of the region.
- These low antecedent river levels will allow for extra capacity of spring snowmelt and rainfall compared to a normal spring season.





# Snow Depth and Snow Water Equivalent (SWE)

Impact Potential:

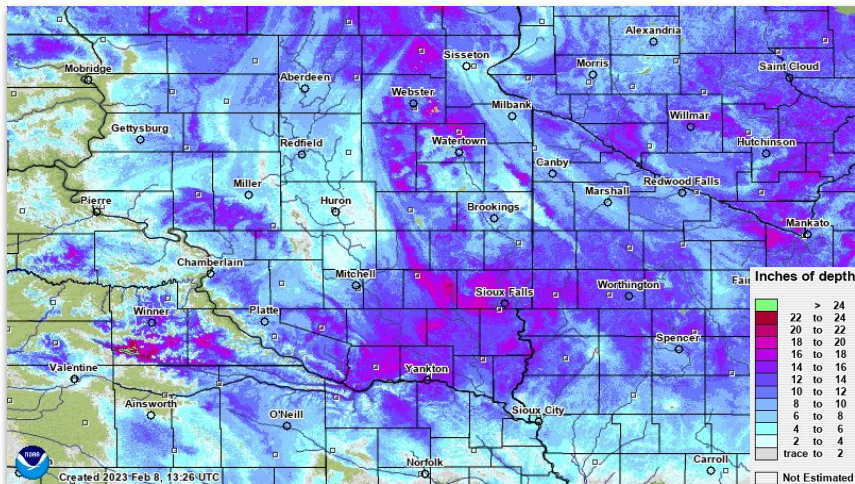
Short Term

Below Normal

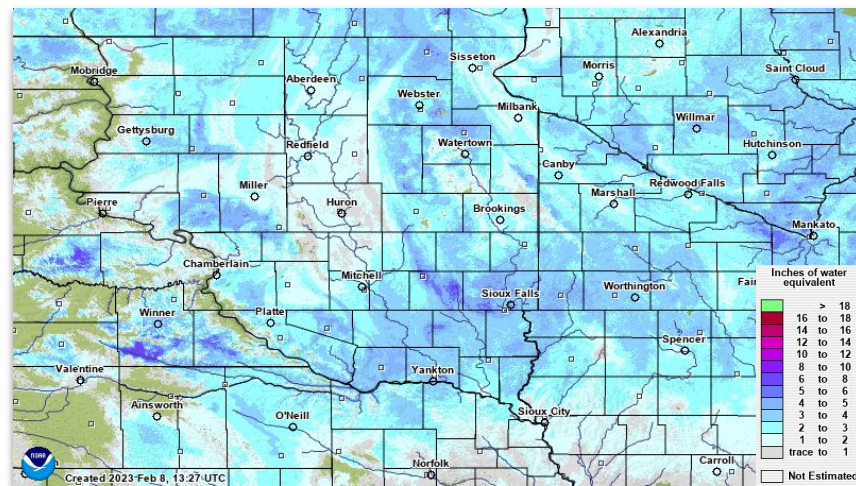
Long Term

Above Normal

Snow Depth



Snow Water Equivalent



- Snow depth is currently highest along a corridor from Lake Andes to Yankton to Sioux Falls to Worthington. Within this corridor, depths of 1 to 2 feet exist.
- This corridor or greatest snow depth is currently carrying as much as 3 to 5 inches of liquid water.
- These values of snow water equivalent (SWE) are well above normal.

## Local Measurements

	SWE	Snow Depth
Sioux Falls, SD	3.6"	13"
Tyndall, SD	4.3"	17"
Marshall, MN	1.2"	4"
Mitchell, SD	3.9"	13"
Brookings, SD	2.5"	8"
Windom, MN	3.3"	14"



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# Precipitation and Temperature Outlook

Impact Potential:

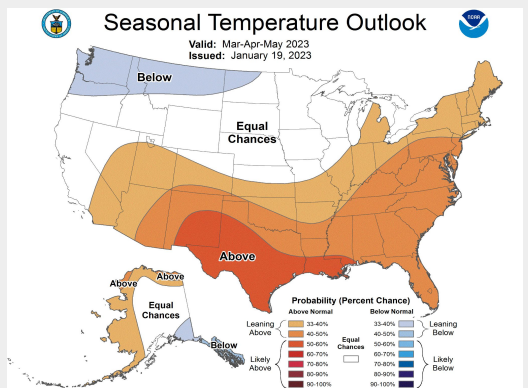
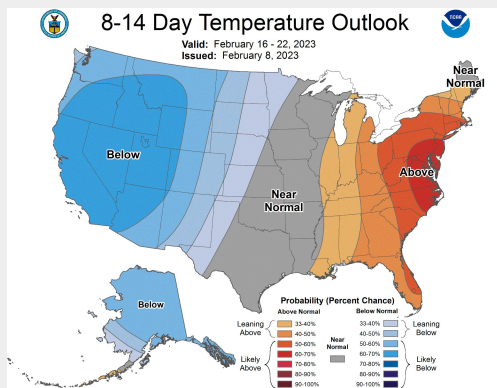
Short Term

Above Normal

Long Term

Normal

Temperature

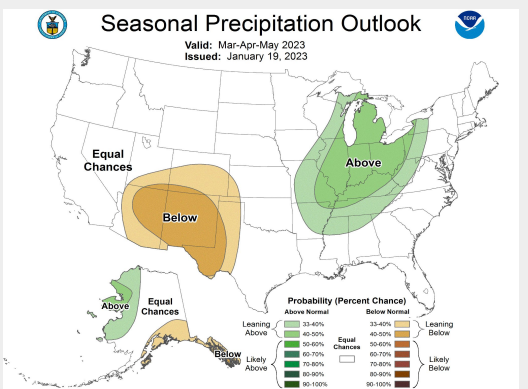
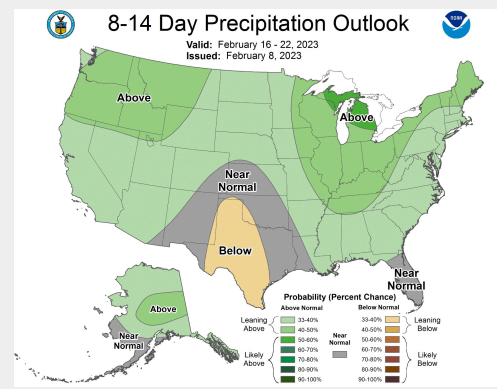


→ In the near term (next 2 weeks), the potential for well above normal temperatures (rapid snow melt) is low, but there is increased potential for additional snowfall.

→ Medium range outlooks for the latter half of February favor near to potentially below normal temperatures, with near to above normal precipitation.

→ Seasonal outlooks for March through May have equal odds of above/below/near normal precipitation and temperatures.

Precipitation



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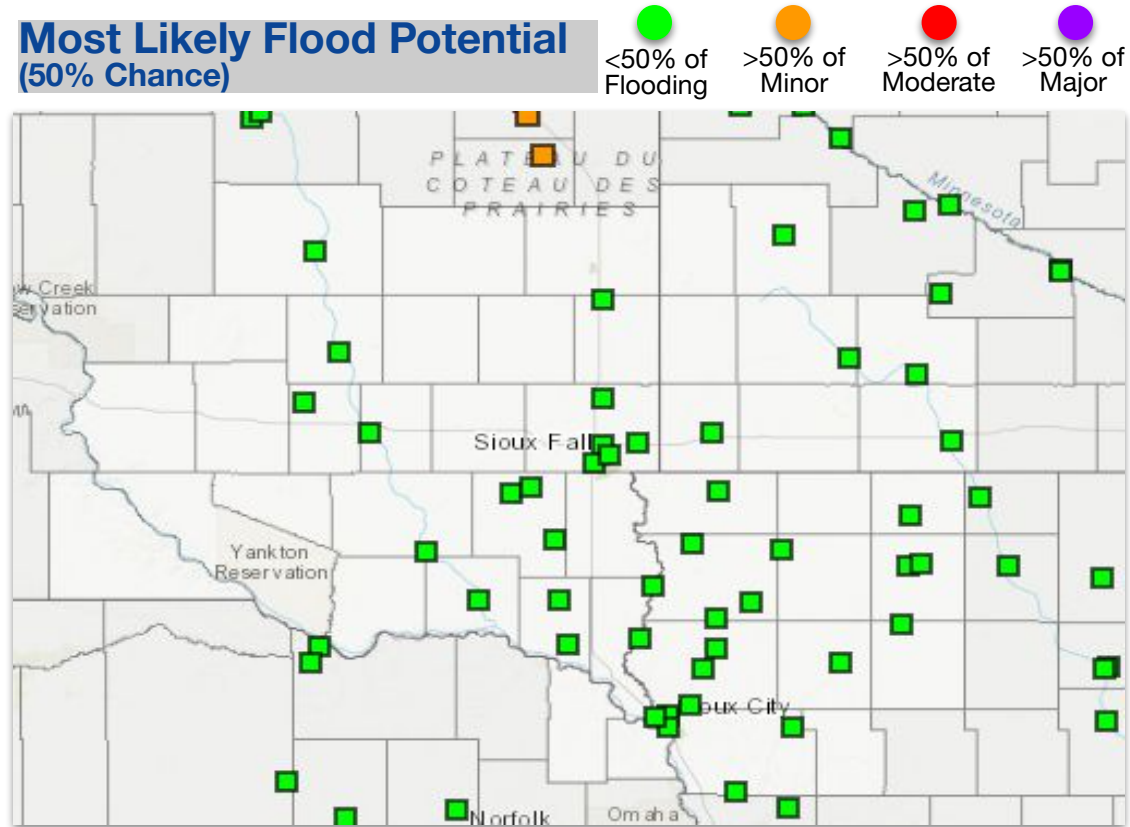


# Scenario #1 - Most Likely

90 Day Outlook Valid through May 12th, 2023

- In a spring characterized by normal snowmelt and precipitation, a below normal river flood risk is expected over the next 90 days.
- This is primarily due to the dry antecedent soil conditions, the shallow frost depths allowing for a normal/quicker than normal thaw of the soils, and the low river levels, all allowing for extra capacity in the broader water system.
- This 'Most Likely' scenario does not account for ice jams, which would be more localized in nature.
- Urban street flooding may also be common in areas with blocked storm drains.

## Most Likely Flood Potential (50% Chance)



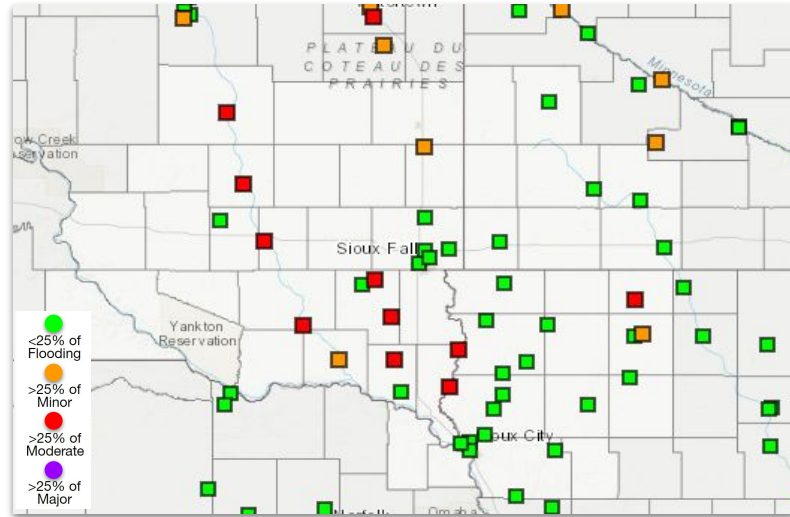




# Less Likely Flood Scenarios

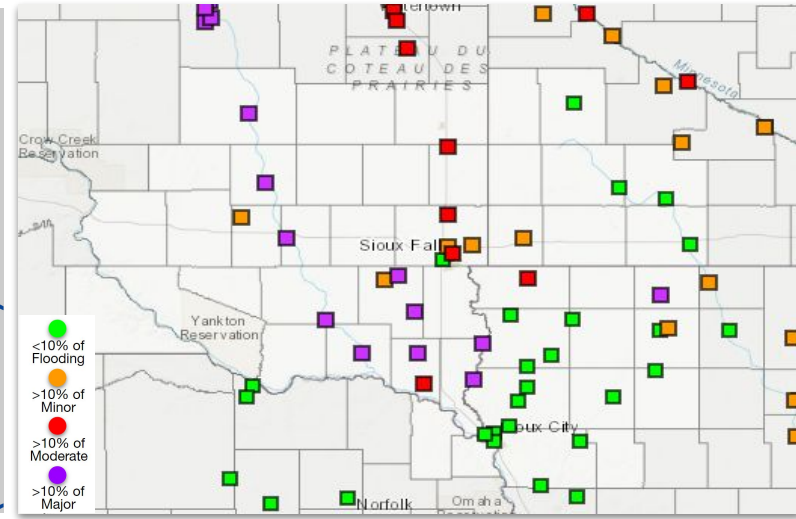
90 Day Outlook Valid through May 12th, 2023

## Scenario #2 - Less Likely (25% Chance)



- **Scenario #2 (25% Chance)** could include additional snowfall, rapid snowmelt, OR a moderate rain event on existing snowpack.
- This would result in a larger coverage of minor flooding, particularly in the James, lower Vermillion/Big Sioux and upper Little Sioux Rivers.

## Scenario #3 - Least Likely (10% Chance)



- **Scenario #3 (10% Chance)** could include additional snowfall, rapid snowmelt AND a moderate to heavy rain event on existing snowpack.
- This would result in fairly widespread moderate to major flooding across much of southeast SD and more localized portions of northwest IA and southwest MN.



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# Chance of Exceeding Stage at Location

90 Day Outlook Valid through May 12th, 2023

	Chance of Exceeding Stage...				Flood Stage		
	50%	25%	10%	5%	Minor	Moderate	Major
<b>Floyd River</b>							
Floyd at Sheldon	6.8	8.4	9.4	10.7	12	14	16
Floyd at Alton	7.3	8.5	9.2	10	12	16	18
Floyd at Le Mars	13.2	14	15.5	15.8	20	21	24
Floyd at Struble	5.6	6.5	7.2	8.3	14	15	16
Floyd at Merrill	2.3	3	4.2	4.5	12	14	16
Floyd at James	10.6	11.1	12.1	12.4	26	30	34
<b>Little Sioux River</b>							
Little Sioux at Milford	11.2	14	16.5	17.9	12	14	16
Little Sioux at Spencer	8.6	10.4	11.9	12.5	10	14	16
Ocheyedan at Spencer	4.1	5.7	7.3	8	8	9.5	10.5
Little Sioux at Linn Grove	10.1	13.2	15.3	16	18	19.5	21
Little Sioux at Cherokee	11	13.9	15.3	16.3	17	21	24
Little Sioux at Correctionville	7.3	10	11.6	14.3	19	21	23
Little Sioux at Turin	10.5	12.3	13.7	19.7	25	28	34.5
West Fork at Hornick	10.7	11.9	12.9	14.6	20	22	26.5
Perry Creek at Sioux City	8.1	8.3	8.7	9.6	24	26	28
<b>Maple River</b>							
Maple at Mapleton	5.9	6.9	7.5	14.3	21	22	23

Columns are river stage values for each 'Chance of Exceeding' percentage

Example: the Floyd River at Sheldon has a 50% of exceeding 6.8 ft, a 25% chance of exceeding 8.4 ft and a 10% chance of exceeding 9.4 ft

Below Flood Stage

Minor Flood Stage

Moderate Flood Stage

Major Flood Stage





Chance of Exceeding Stage...				Flood Stage		
50%	25%	10%	5%	Minor	Moderate	Major

<b>Missouri River</b>							
Missouri at Sioux City	13.1	16.7	22.2	26	30	33	36

Flood Stage	Chance of Exceeding Stage...				Minor	Moderate	Major
	50%	25%	10%	5%			

James at Huron	10.8	13.3	20.4	22.6	11	13	15
James at Forestburg	8.7	13.9	18.4	21.8	12	14	16
James at Mitchell	14.6	20.6	23.9	25.9	17	20	22
Firesteel Creek at Mount Vernon	3.4	6.3	11.6	15.2	8	13	15
James at Scotland	7.7	15.3	18.4	19.6	13	14	16
James at Yankton	5.4	12.7	20	22.4	12	14	16

W FK Vermillion at Parker	3.5	5.4	9.4	10.2	9	10	11
E FK Vermillion at Parker	9.5	13.4	18.4	18.5	12	14	16
Vermillion at Davis	9.9	13.4	15	15.1	11	13	15
Vermillion at Wakonda	11.3	16.7	17.7	17.7	14	15.5	17
Vermillion at Vermillion	10.6	16.9	26.8	27.2	21	22	30

Redwood River at Marshall	9.9	11.4	13.4	16.1	14	15	16.5
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Des Moines at Avoca	1420.9	1422.8	1424.9	1425.7	1425	1426	1428
Des Moines above Windom	13.5	15.9	17.8	18.5	19	21	25
Des Moines at Jackson	9.2	10.2	11	11.3	12	12.5	14



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Sioux Falls, South Dakota**





# Flood Outlook Summary

90 Day Outlook Valid through May 12th, 2023

## Key Messages

- The **spring river flood risk is below normal** for the next 90 days across the immediate region, primarily owing to the dry antecedent conditions and below normal river levels heading into winter.
- The highest flood risks are through much of the James River, and the lower portions of the Big Sioux and Vermillion Rivers, downstream of the current axis of highest snow cover.
- Lower probability scenarios of significant additional snowfall, a rapid snowmelt and/or a heavy rain event would increase the flood risk.
- Additional flood risks may exist beyond the 90 day period, further into May.
- Ice jams may also result in more localized flooding. Urban street flooding may occur in locations with blocked storm drains.

	90 Day Flood Risk*
Missouri	BELOW NORMAL
James	BELOW NORMAL
Vermillion	BELOW NORMAL
Big Sioux	BELOW NORMAL
Rock	BELOW NORMAL
Floyd	BELOW NORMAL
Little Sioux	BELOW NORMAL
West Fork of Des Moines	BELOW NORMAL
Redwood	BELOW NORMAL

\*Outlook for normal snowmelt and precipitation (in the absence of heavy rain and/or ice jams) for the next 90 days





# Flood and Outlook Resources

National Weather Service - Sioux Falls

[weather.gov/fsd](https://weather.gov/fsd)

NWS Sioux Falls Flooding Resource Page

[weather.gov/fsd/flooding](https://weather.gov/fsd/flooding)

Advanced Hydrologic Prediction Service Page

[water.weather.gov/ahps/index.php?wfo=FSD](https://water.weather.gov/ahps/index.php?wfo=FSD)

Snow Depth/SWE Information (NOHRSC)

[nohrsc.noaa.gov/interactive/html/map.html](https://nohrsc.noaa.gov/interactive/html/map.html)

Climate Prediction Center Outlooks

[cpc.ncep.noaa.gov/](https://cpc.ncep.noaa.gov/)

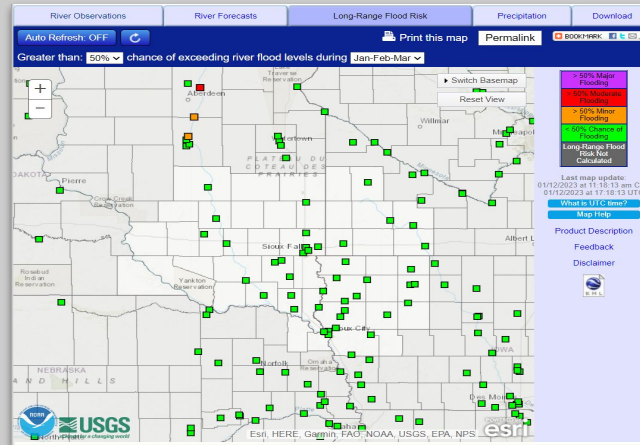
USGS National Water Dashboard

[dashboard.waterdata.usgs.gov/](https://dashboard.waterdata.usgs.gov/)

Flood Safety Information

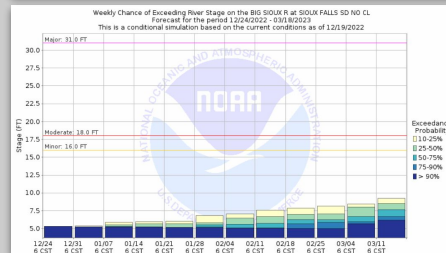
[weather.gov/safety/flood](https://weather.gov/safety/flood)

Additional Flood Outlook Info: [weather.gov/ahps2/long\\_range.php?wfo=FSD](https://weather.gov/ahps2/long_range.php?wfo=FSD)

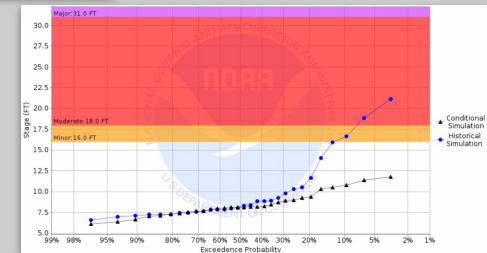


## Flood Outlooks By River Point

- 1) Click river point of interest
- 2) Under “Probability Information”, choose desired information



Weekly Chance of Exceeding Levels



Chance of Exceeding Levels During Entire Period



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