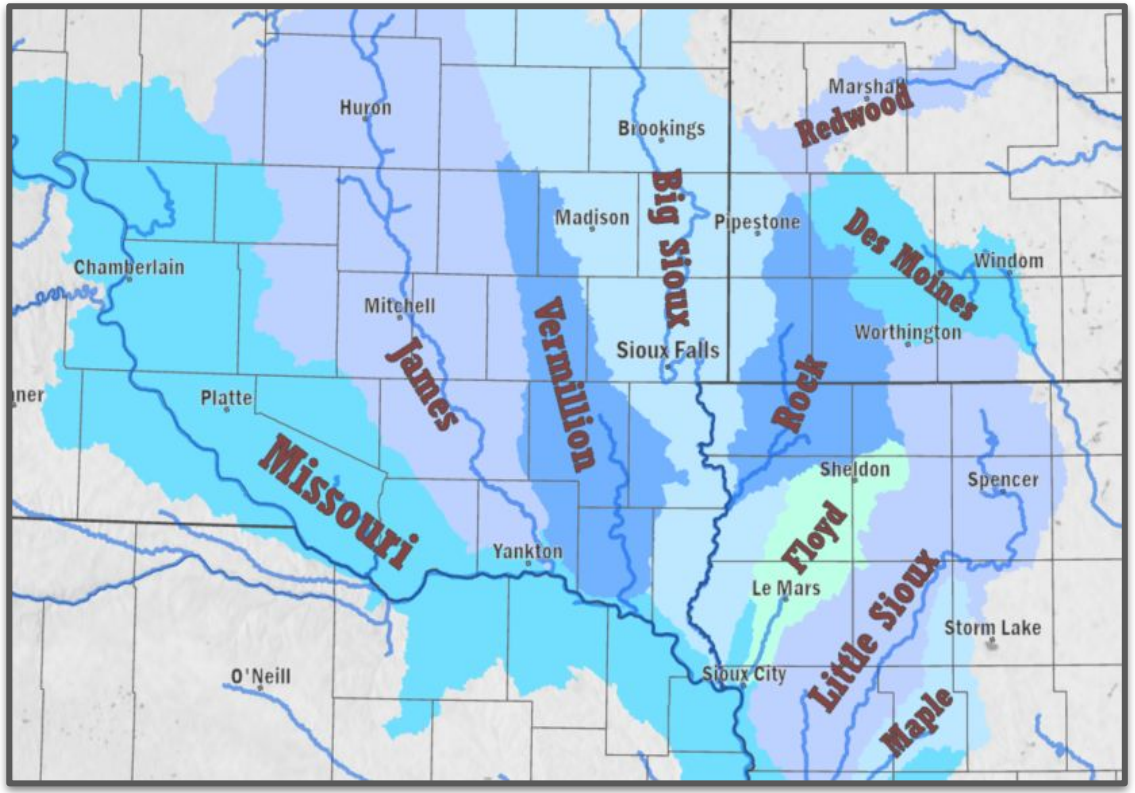
Spring 2023 Flood Outlook

90 Day Outlook thru May 26th

Issued: Feb 23rd, 2023

Final Outlook: March 9th



National Oceanic and Atmospheric Administration
U.S. Department of Commerce

National Weather Service
Sioux Falls, South Dakota

2023 Spring Flood Outlook (#2 of 3)

90 Day Outlook Valid through May 26th, 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 to normal flood risk for most basins over the next 90 days.
- **The flood risk has increased slightly over the last outlook due to recent heavy precipitation events.**
- 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.

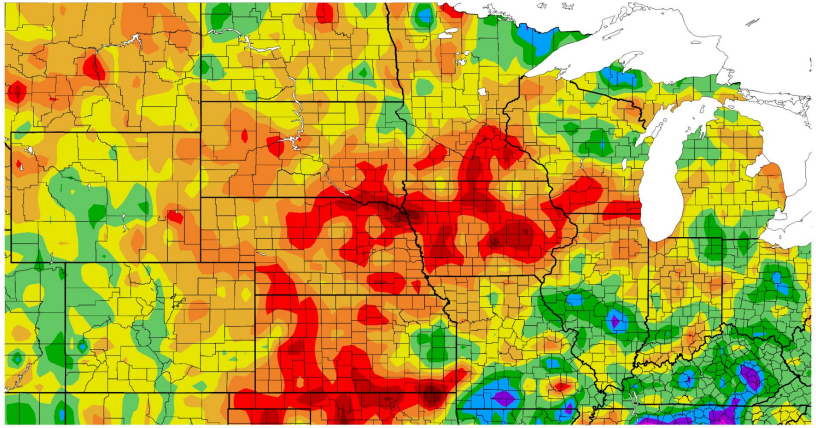
	Short Term (Next 14 Days)	Long Term (through late-May)
Snowpack/SWE	Below	Above
Frost Depth	Below	Normal
River Ice	Below	Normal
Soil Moisture	Below	Below
River Levels	Below	Below
Precipitation Outlook	Above	Normal

Impact Potential	Below Normal	Normal	Above Normal

Departure From Normal Precipitation

Impact Potential: **Short Term** Below Normal **Long Term** Below Normal

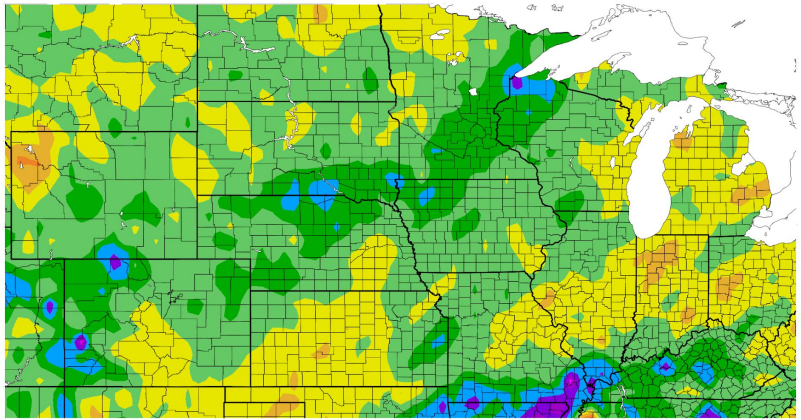
2 Year - Departure From Normal Precipitation



−20 −16 −12 −8 −4 0 4 8 12 16 20

Generated 2/22/2023 at HPRCC using provisional data. NOAA Regional Climate Centers

90 Day - Departure From Normal Precipitation



−7.5 −6 −4.5 −3 −1.5 0 1.5 3 4.5 6 7.5

Generated 2/22/2023 at HPRCC using provisional data. NOAA Regional Climate Centers

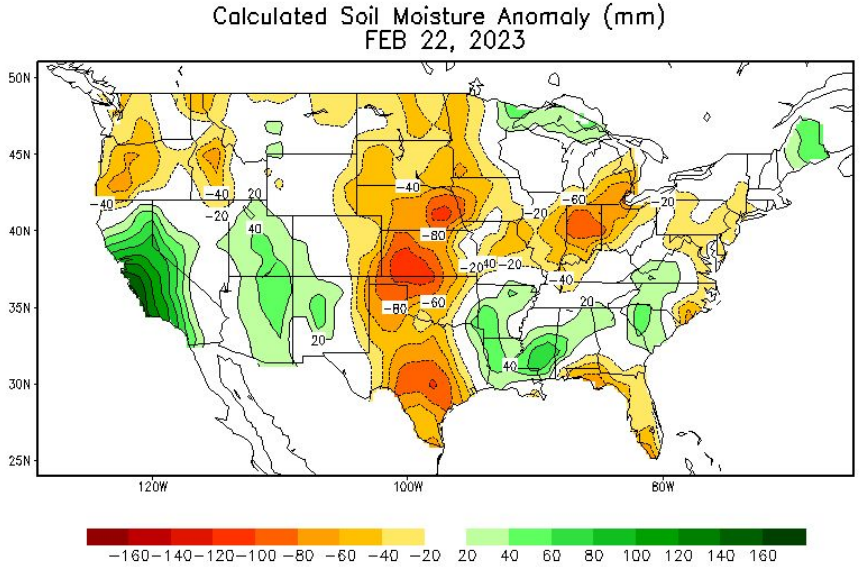
- Precipitation over the past couple of years across the broader region has been well below normal with drought conditions in place.
- Precipitation over the past 90 days has generally been above normal, although only a small percentage of the ongoing precipitation deficit.

Precipitation Departure From Normal (By Year)			
	2021	2022	2023 (Thru Feb 22nd)
Huron	-3.04	-2.44	-0.03
Sioux Falls	-0.12	-3.04	+1.80
Sioux City	-6.31	-13.93	+0.85

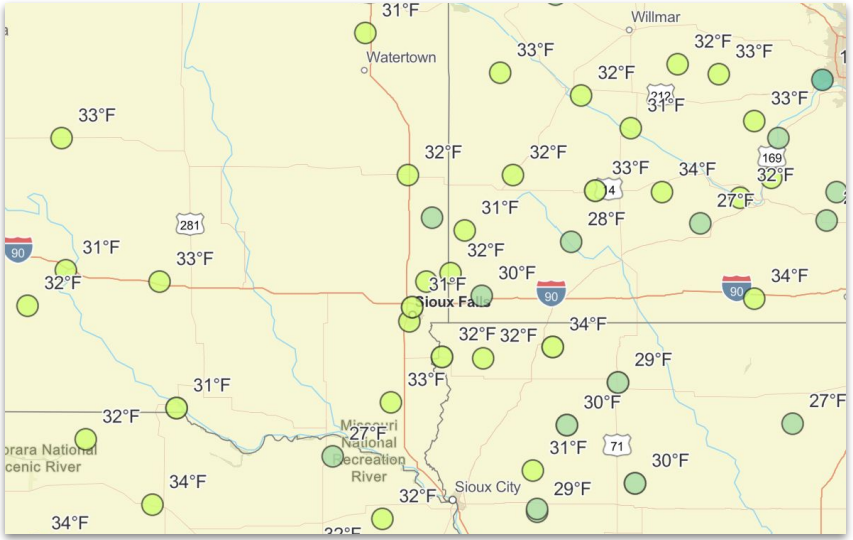
Soil Moisture and Temperatures/Frost Depth

Impact Potential: **Short Term** Below Normal **Long Term** Below Normal

Soil Moisture Anomaly



Shallow Soil Temperature (Between 2-8 inches)



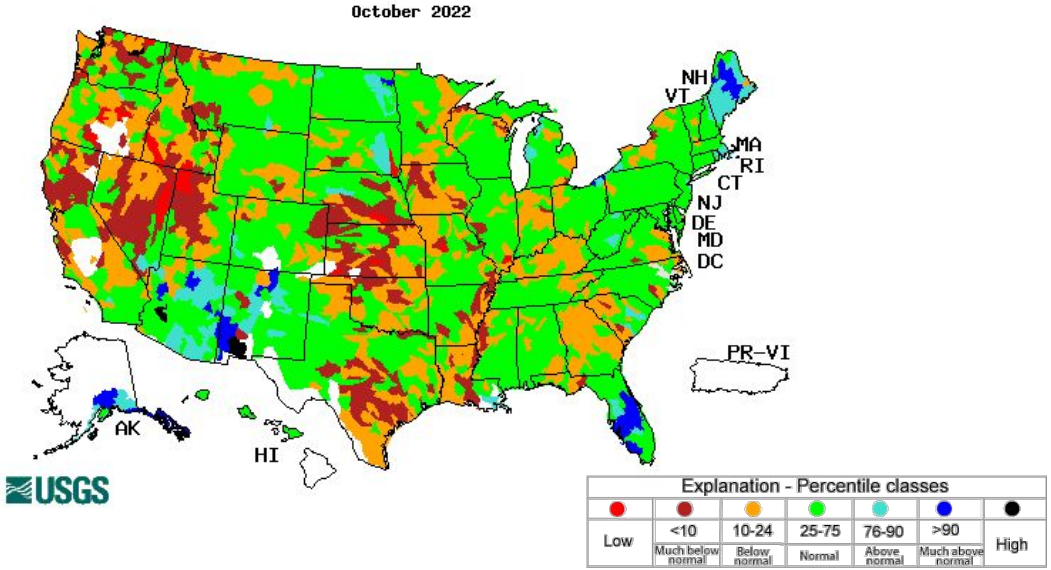
- Ground conditions remain abnormally dry, especially for southwest Minnesota, western Iowa, and much of Nebraska, with soil moisture deficits generally in the lowest 30th percentile of climatology.
- Warmer ground temperatures and shallow frost depths may allow moisture to more easily penetrate the soil, limiting runoff into rivers.

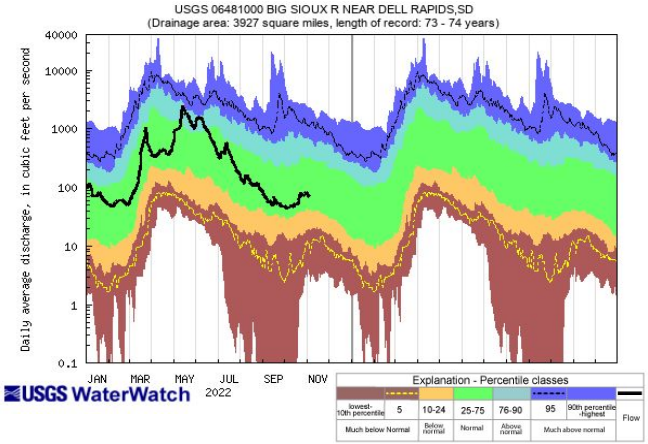
Sioux Falls Soil Temp/Frost Depth as of 2/23			
	2 in	**4 in**	**8 in**
Soil Temp	30°	30°	32°
Frost Depth		10 inches	

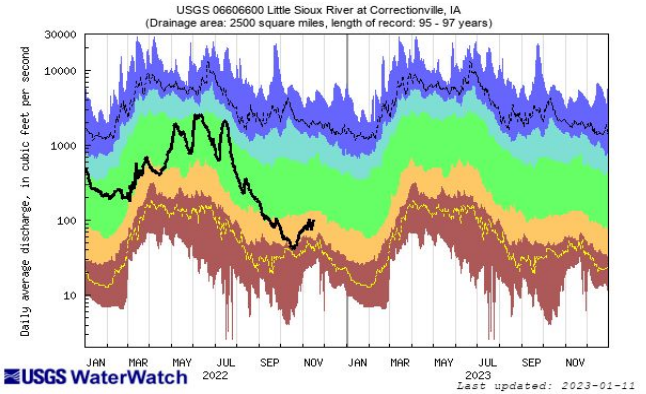
Antecedent River Conditions

Impact Potential: **Short Term** Below Normal **Long Term** Below Normal

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





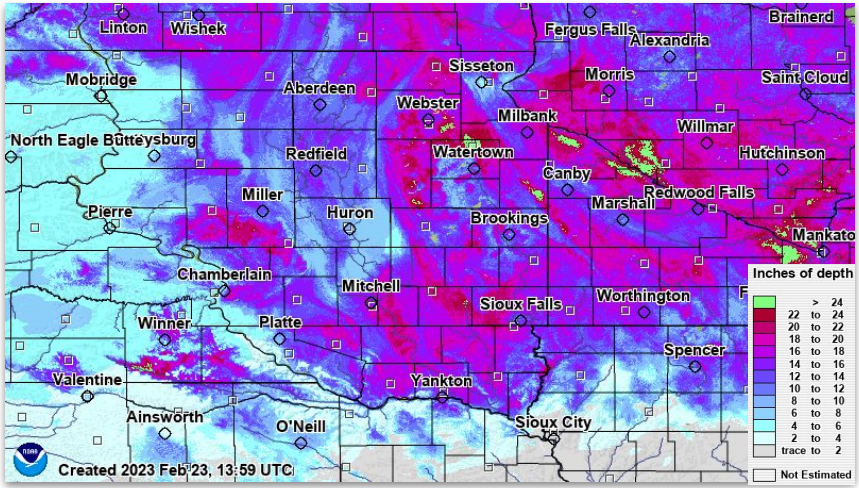


- River levels and streamflows going into winter were near or below normal across much of the region.
- These low antecedent river levels will allow for extra capacity of spring snowmelt and rainfall compared to a normal spring season.

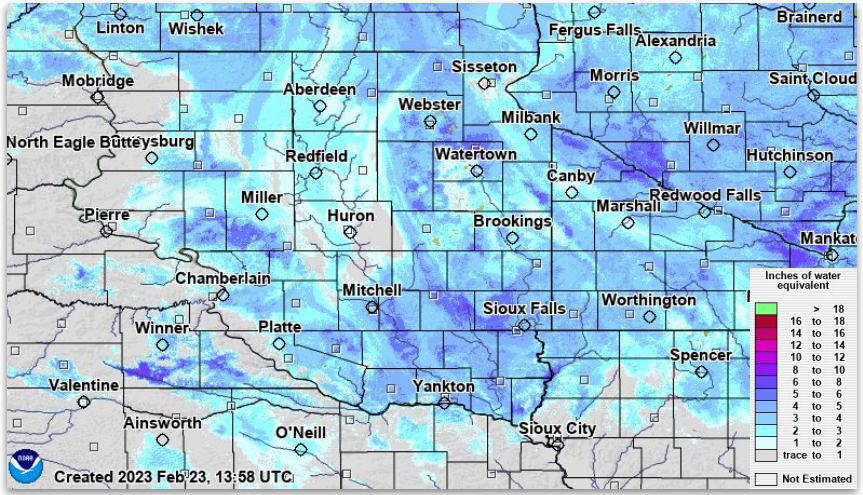
Snow Depth and Snow Water Equivalent (SWE)

Impact Potential: **Short Term** Below Normal **Long Term** Above Normal

Snow Depth



Snow Water Equivalent



- Snow depth is currently highest along and north of a corridor from Yankton to Sioux Falls to Worthington. Within this broad area, depths of 1 to 2 feet exist. These images may not fully capture the most recent 3-day storm.
- This area of greatest snow depth is currently carrying as much as 3 to 4+ inches of liquid water (table to the right does not include most recent snow event for Tyndall/Mitchell/Spencer).
- These values of snow water equivalent (SWE) are well above normal.

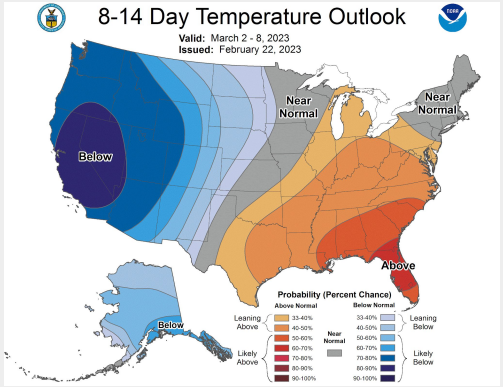
Local Measurements as of 2/20 (except Sioux Falls/Marshall, as of 2/23)

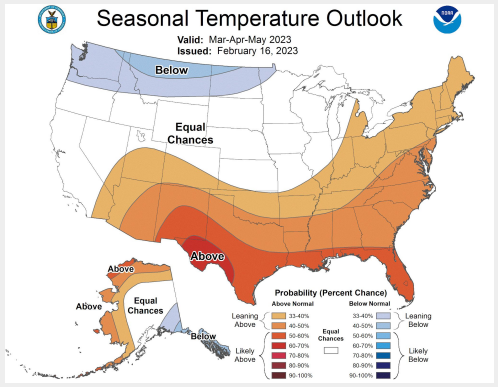
	SWE	Snow Depth
Sioux Falls, SD	3.5”	18”
Marshall, MN	2.7”	16”
Tyndall, SD	3.2”	11”
Mitchell, SD	3.2”	9”
Spencer, IA	0.9”	5”

Precipitation and Temperature Outlook

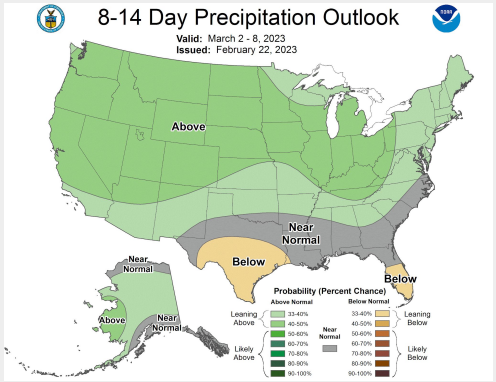
Impact Potential: **Short Term** Above Normal **Long Term** Normal

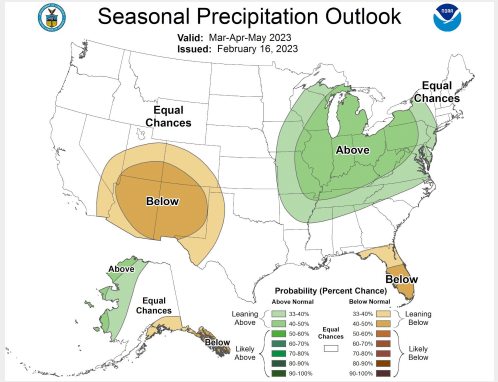
Temperature





Precipitation





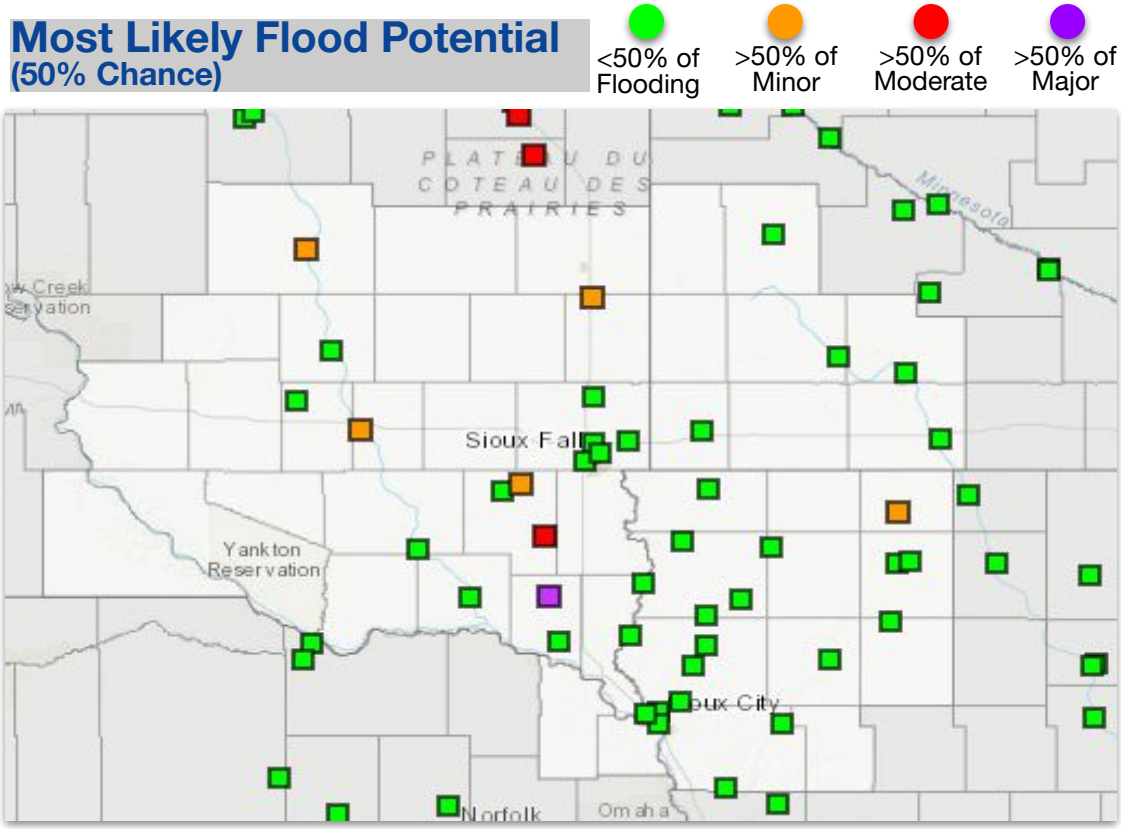
- In the near term (next 2 weeks), the potential for well above normal temperatures (rapid snow melt) is low, but there is increased potential for additional precipitation/snowfall.
- Medium range outlooks for the latter half of March favor near to below normal temperatures, with near to above normal precipitation.
- Seasonal outlooks for March through May have equal chances of above/below/near normal precipitation and temperatures.

Scenario #1 - Most Likely

90 Day Outlook Valid through May 26th, 2023

- In a spring characterized by normal snowmelt and precipitation, a **below normal to normal river flood risk** is expected over the next 90 days.
- The recent winter storm has added several inches of snow depth, and corresponding water equivalent. As a result, **probabilities for flooding have increased in some locations**, specifically the Vermillion Basin and portions of the James and Big/Little Sioux Basins.
- 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.

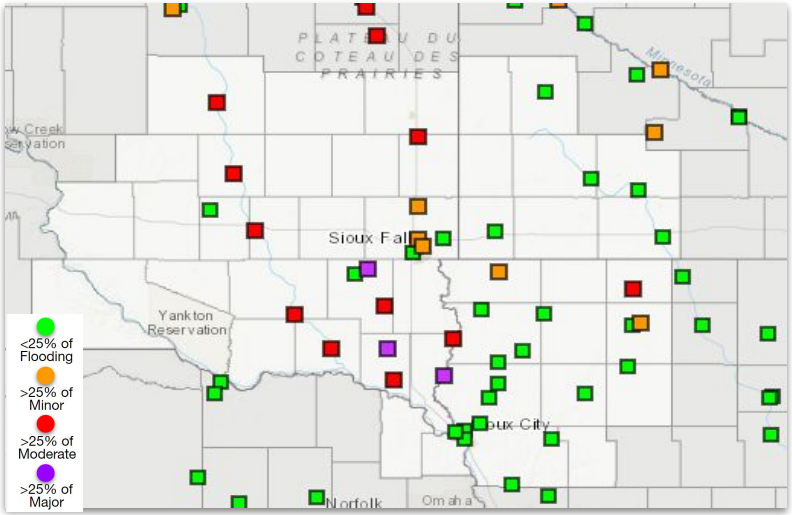
Most Likely Flood Potential
(50% Chance)



Less Likely Flood Scenarios

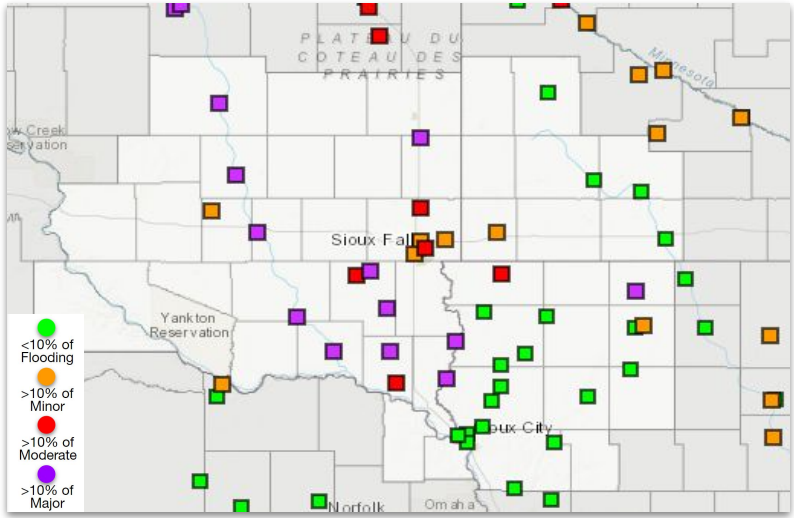
90 Day Outlook Valid through May 26th, 2023

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 to moderate flooding, with localized major flooding, particularly in the Vermillion and lower Big 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.

Chance of Exceeding Stage at Location

90 Day Outlook Valid through May 26th, 2023

	Chance of Exceeding Stage...					Flood Stage		
	75%	50%	25%	10%	5%	Minor	Moderate	Major
Floyd River								
Floyd at Sheldon	6.7	7.1	8.8	9.6	10.7	12	14	16
Floyd at Alton	6.8	7.2	8.5	8.9	9.7	12	16	18
Floyd at Le Mars	12.6	13.7	14.7	15.8	16.6	20	21	24
Floyd at Struble	5.3	6	7.2	7.6	8.6	14	15	16
Floyd at Merrill	2.2	2.7	3.6	4.6	5	12	14	16
Floyd at James	10.4	10.8	11.5	12.5	12.9	26	30	34
Little Sioux River								
Little Sioux at Milford	11	12.3	15	16.7	18.1	12	14	16
Little Sioux at Spencer	8.7	9.8	11.1	12.3	13.3	10	14	16
Ocheyedan at Spencer	4.4	5.3	6.6	7.8	8.9	8	9.5	10.5
Little Sioux at Linn Grove	10.5	11.8	14.8	16.8	18	18	19.5	21
Little Sioux at Cherokee	11.2	12.6	14.8	16.7	17.2	17	21	24
Little Sioux at Correctionville	7.9	9.1	11.5	12.7	14.9	19	21	23
Maple at Mapleton	6	6.4	7.2	7.7	14.6	21	22	23
Little Sioux at Turin	10.3	11.5	13.6	14.5	20	25	28	34.5
West Fork at Hornick	9.8	11.6	12.6	14	15.2	20	22	26.5
Perry Creek at Sioux City	7.7	8.1	8.5	9	9.8	24	26	28
Missouri River								
Missouri at Sioux City	13.1	14.2	19.3	23.9	30.6	30	33	36

Columns are river stage values for each ‘Chance of Exceeding’ percentage

Example: the Floyd River at Sheldon has a 50% of exceeding 7.1 ft, a 25% chance of exceeding 8.8 ft and a 10% chance of exceeding 9.6 ft

Below Flood Stage
Minor Flood Stage
Moderate Flood Stage
Major Flood Stage

Chance of Exceeding Stage at Location

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	Chance of Exceeding Stage...					Flood Stage		
	75%	50%	25%	10%	5%	Minor	Moderate	Major
Big Sioux River								
Big Sioux at Brookings	8	9	11	12.2	12.3	9	10.5	12
Big Sioux at Dell Rapids	9	10	12.6	14.7	15.7	12	14	15
Big Sioux at Sioux Falls	10.4	10.8	12.4	14.9	16.7	12	15	17
Skunk Creek at Sioux Falls	6.6	7.8	10	12.2	13.5	11.5	15	17
Big Sioux at North Cliff	11.1	12.5	16.2	19.7	23	16	18	31
Split Rock at Corson	4.4	5.5	8.2	10.2	12.7	8.5	11	14
Big Sioux at Hawarden	18.8	20	26.7	28.3	29.9	20.5	24	27
Big Sioux at Akron	14.6	15.8	20.6	21.4	22.1	16	18	20
Big Sioux at Sioux City	18.9	19.9	25.5	26.7	28.5	32	38	41
Rock at Luverne	5.8	6.6	7.8	11.2	11.7	10	12	14
Rock at Rock Rapids	10.1	11.4	13.8	17	18.1	13	16	19
Rock at Rock Valley	10.4	11.8	14.3	15.5	16.4	16	17	19
Redwood River								
Redwood River at Marshall	10.4	11.1	13	15.2	17.4	14	15	16.5
Des Moines River								
Des Moines at Avoca	1421.7	1422.7	1424.4	1426.4	1426.9	1425	1426	1428
Des Moines above Windom	14.5	16.4	17.6	19	19.8	19	21	25
Des Moines at Jackson	9.5	10.2	10.8	11.5	11.8	12	12.5	14

	Chance of Exceeding Stage...					Flood Stage		
	75%	50%	25%	10%	5%	Minor	Moderate	Major
James River								
James at Huron	10.3	11.1	13.5	20.9	22.5	11	13	15
James at Forestburg	8.3	11.3	13.9	18.4	21.8	12	14	16
James at Mitchell	14.1	17	20.7	24.2	26	17	20	22
Firesteel Creek at Mount Vernon	3	4.3	7.5	11.9	15.5	8	13	15
James at Scotland	7.4	11.2	15.6	19.3	20.6	13	14	16
James at Yankton	5.3	7.5	14.3	22.4	25.5	12	14	16
Vermillion River								
W FK Vermillion at Parker	4.4	5.2	7.4	10.1	10.4	9	10	11
E FK Vermillion at Parker	11.5	13.2	16.8	19	19.9	12	14	16
Vermillion at Davis	12.4	13.3	14.6	15.3	15.7	11	13	15
Vermillion at Wakonda	15.4	17.1	17.6	17.8	17.9	14	15.5	17
Vermillion at Vermillion	14.9	17.2	25.1	28	28.7	21	22	30

Flood Outlook Summary

90 Day Outlook Valid through May 26th, 2023

Key Messages

- The **spring river flood risk is below normal to normal** for the next 90 days for most of the basins across the immediate region, primarily owing to the dry antecedent conditions and below normal river levels heading into winter.
- **The flood risk has increased slightly over the last outlook due to recent heavy precipitation events.**
- The highest flood risks are found through much of the Vermillion River, lower reaches of the Big Sioux and portions of the James, especially downstream from 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 further.
- Additional flood risks may exist beyond the 90 day period.
- 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	ABOVE NORMAL
Big Sioux	NORMAL
Rock	BELOW NORMAL
Floyd	BELOW NORMAL
Little Sioux	BELOW NORMAL
West Fork of Des Moines	NORMAL
Redwood	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

NWS Sioux Falls Flooding Resource Page
weather.gov/fsd/flooding

Advanced Hydrologic Prediction Service Page
water.weather.gov/ahps/index.php?wfo=FSD

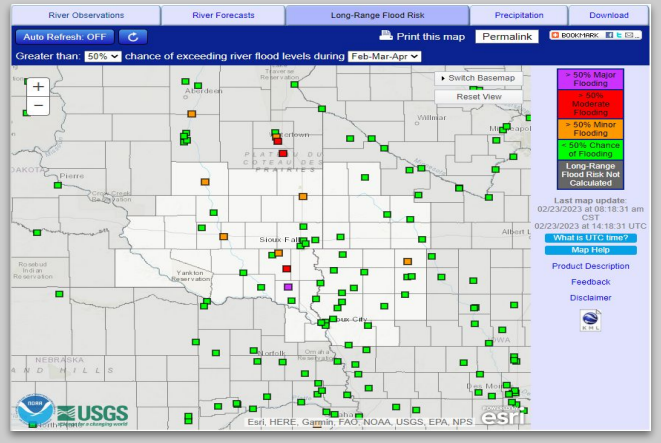
Snow Depth/SWE Information (NOHRSC)
nohrsc.noaa.gov/interactive/html/map.html

Climate Prediction Center Outlooks
cpc.ncep.noaa.gov/

USGS National Water Dashboard
dashboard.waterdata.usgs.gov/

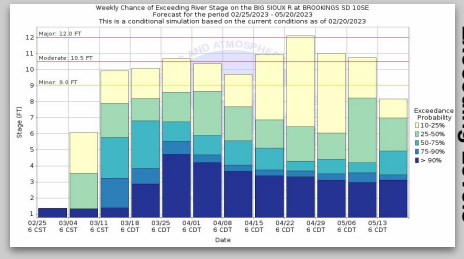
Flood Safety Information
weather.gov/safety/flood

Additional Flood Outlook Info: *weather.gov/ahps2/long_range.php?wfo=FSD*

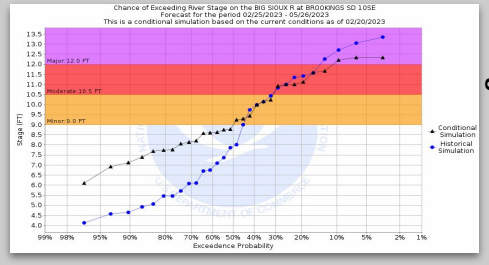


Flood Outlooks By River Point

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