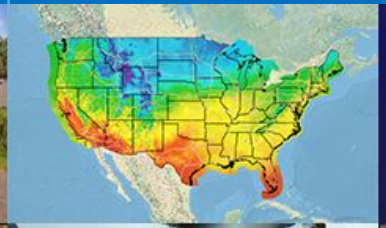
NWS Grand Forks Spring Flood Outlook

Amanda Lee
Service Hydrologist
NWS Grand Forks

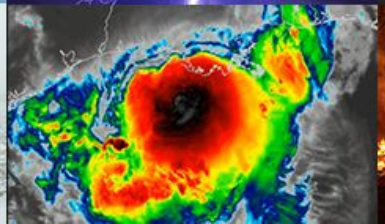
January 27, 2023

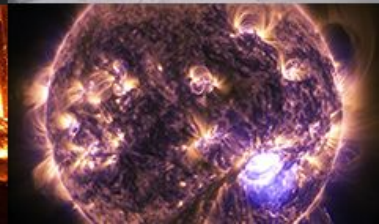
NATIONAL WEATHER SERVICE



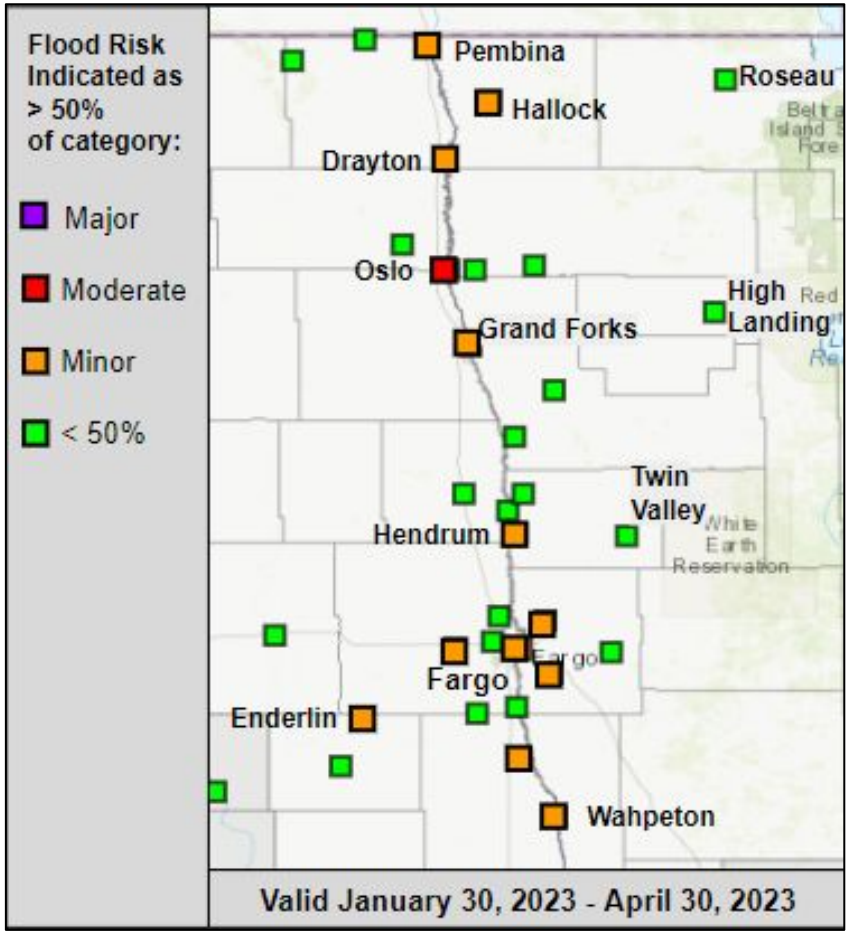






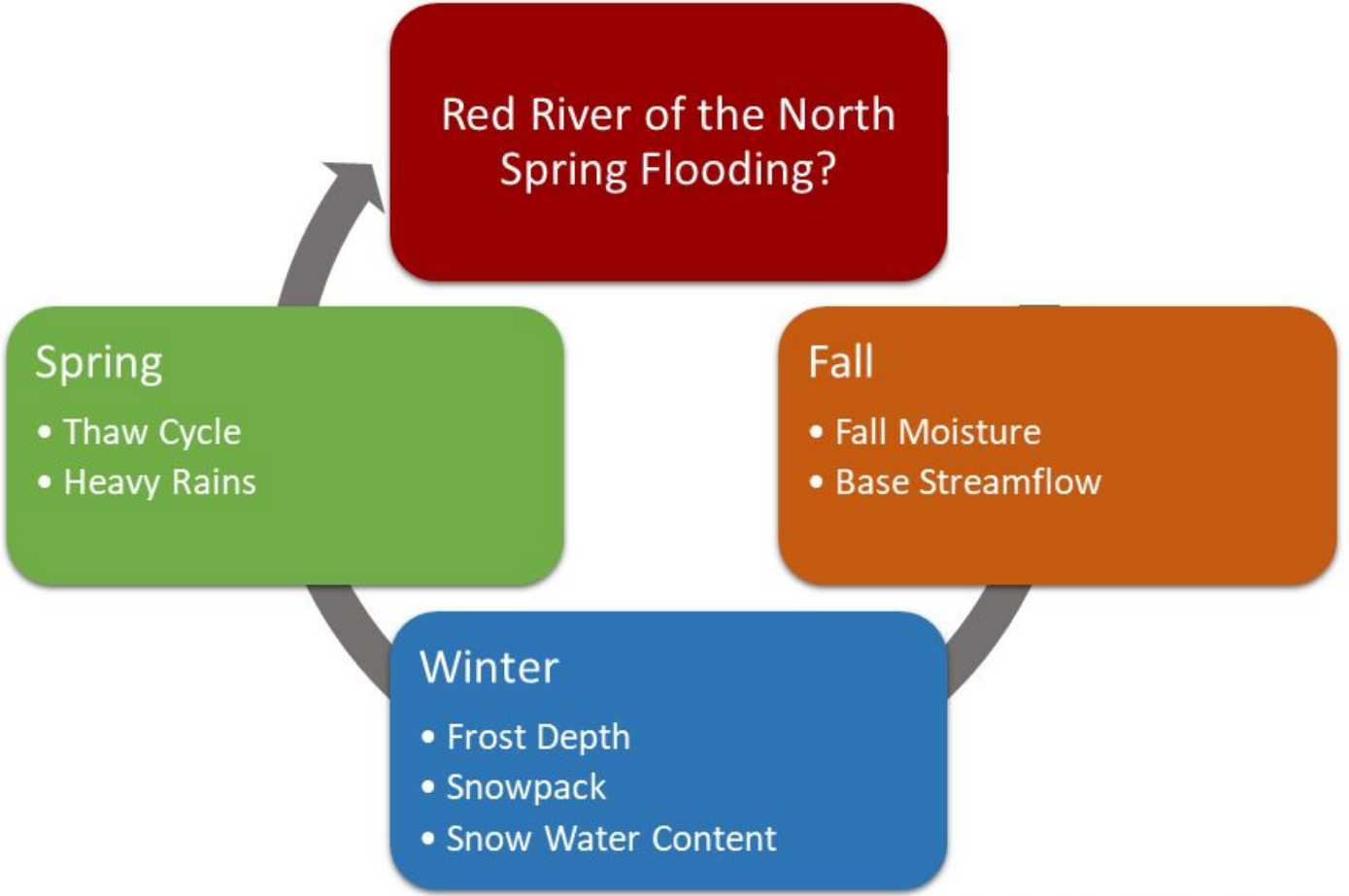
Key Message

The risk for significant (moderate or higher) spring flooding is relatively low with this outlook issuance, running slightly below long-term historical averages across the Red River Basin.



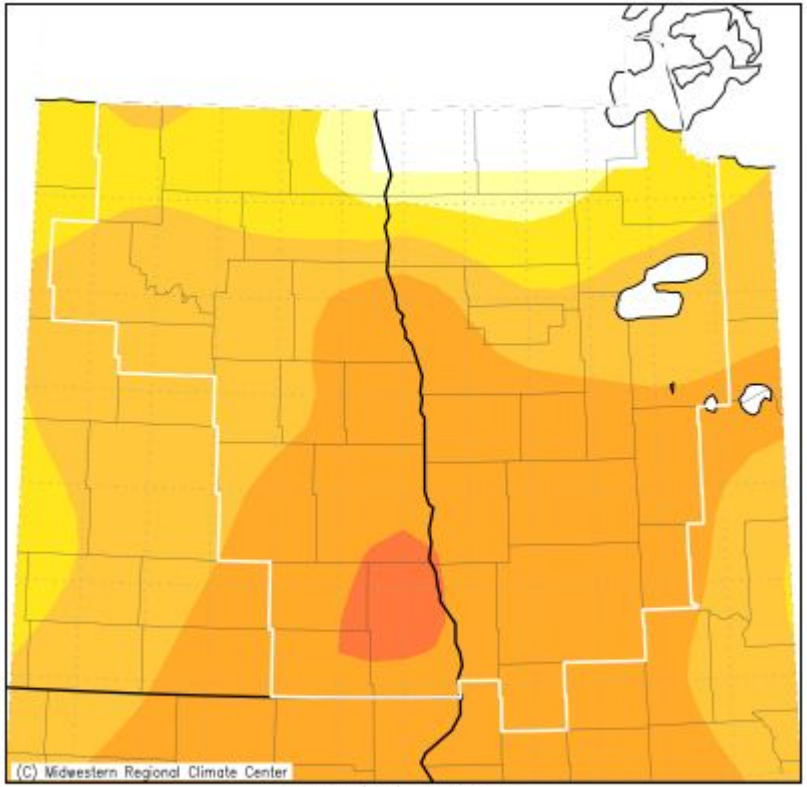
Key Points

- Minor to isolated moderate spring flooding (50% exceedance probability).
- Below normal soil moisture and near normal streamflows heading into freeze-up.
- Although January has been dry, early winter season storms brought above normal snowfall/precipitation (to date thus far).
- **As always: late winter snowfall, spring precipitation, and snowmelt timing/thaw cycle will be the most important factors for spring flooding.**

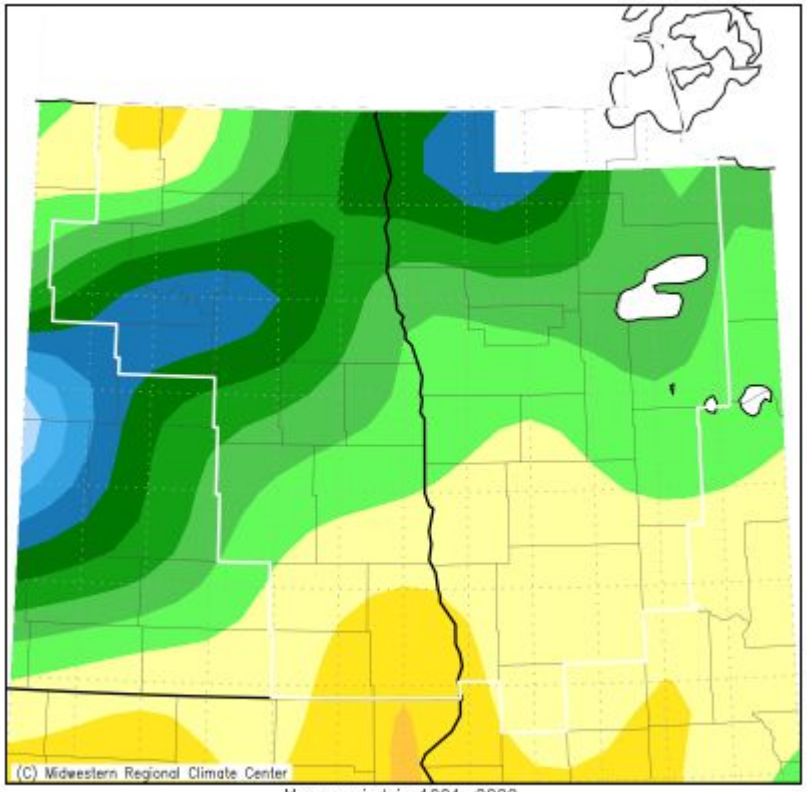


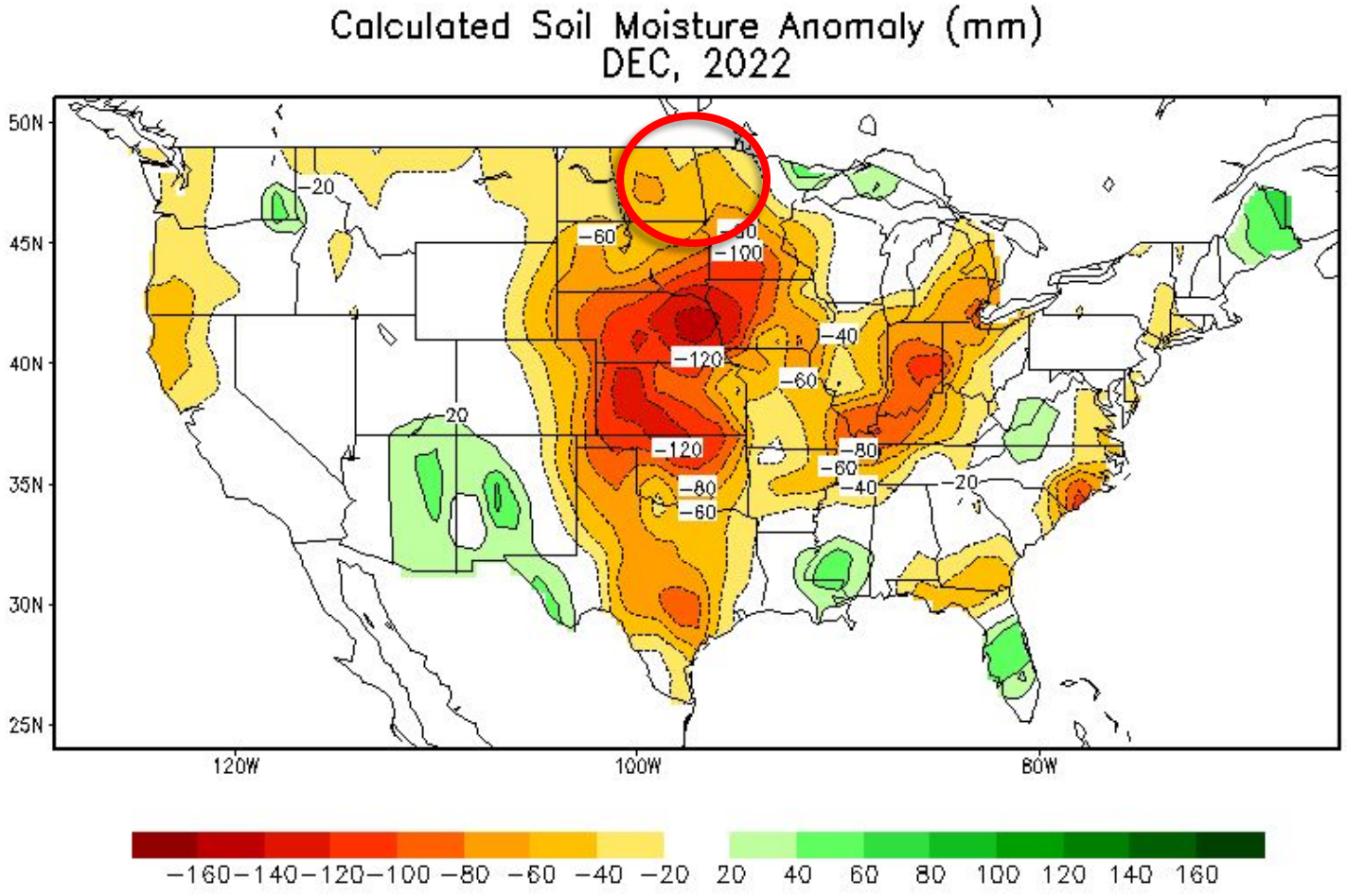
[Bluemle: Factors Affecting Flooding in the Red River Valley, 1997]

Accumulated Precipitation (in): Departure from Mean
September 1, 2022 to November 30, 2022



Accumulated Snowfall (in): Departure from Mean
September 1, 2022 to November 30, 2022




Calculated Soil Moisture Anomaly (mm)
DEC, 2022
50N
45N
40N
35N
30N
25N
120W
100W
80W
-20
-60
-100
-40
-120
-60
20
-120
-80
-60
-80
-60
-40
-20
-160 -140 -120 -100 -80 -60 -40 -20 20 40 60 80 100 120 140 160

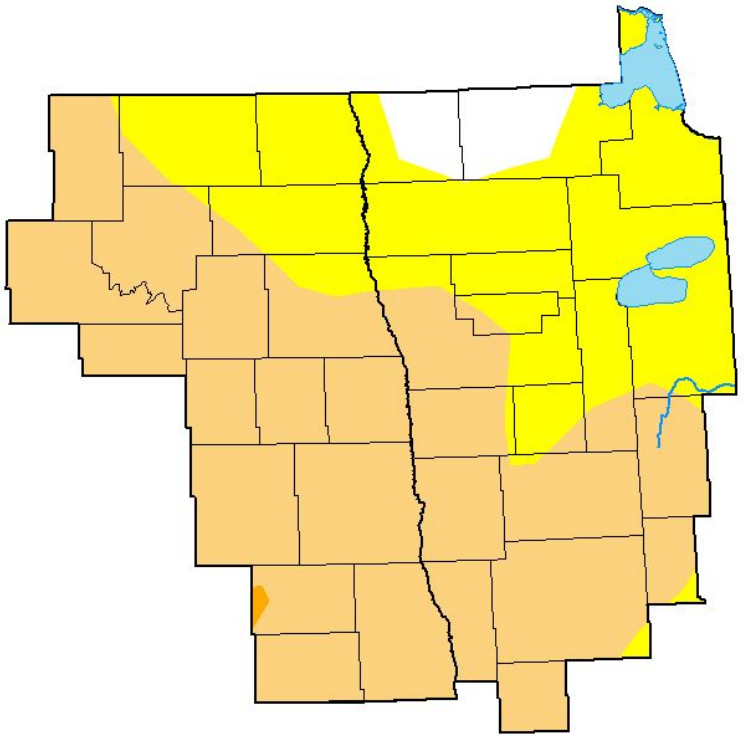
U.S. Drought Monitor

Grand Forks, ND WFO

January 24, 2023

(Released Thursday, Jan. 26, 2023)

Valid 7 a.m. EST



Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

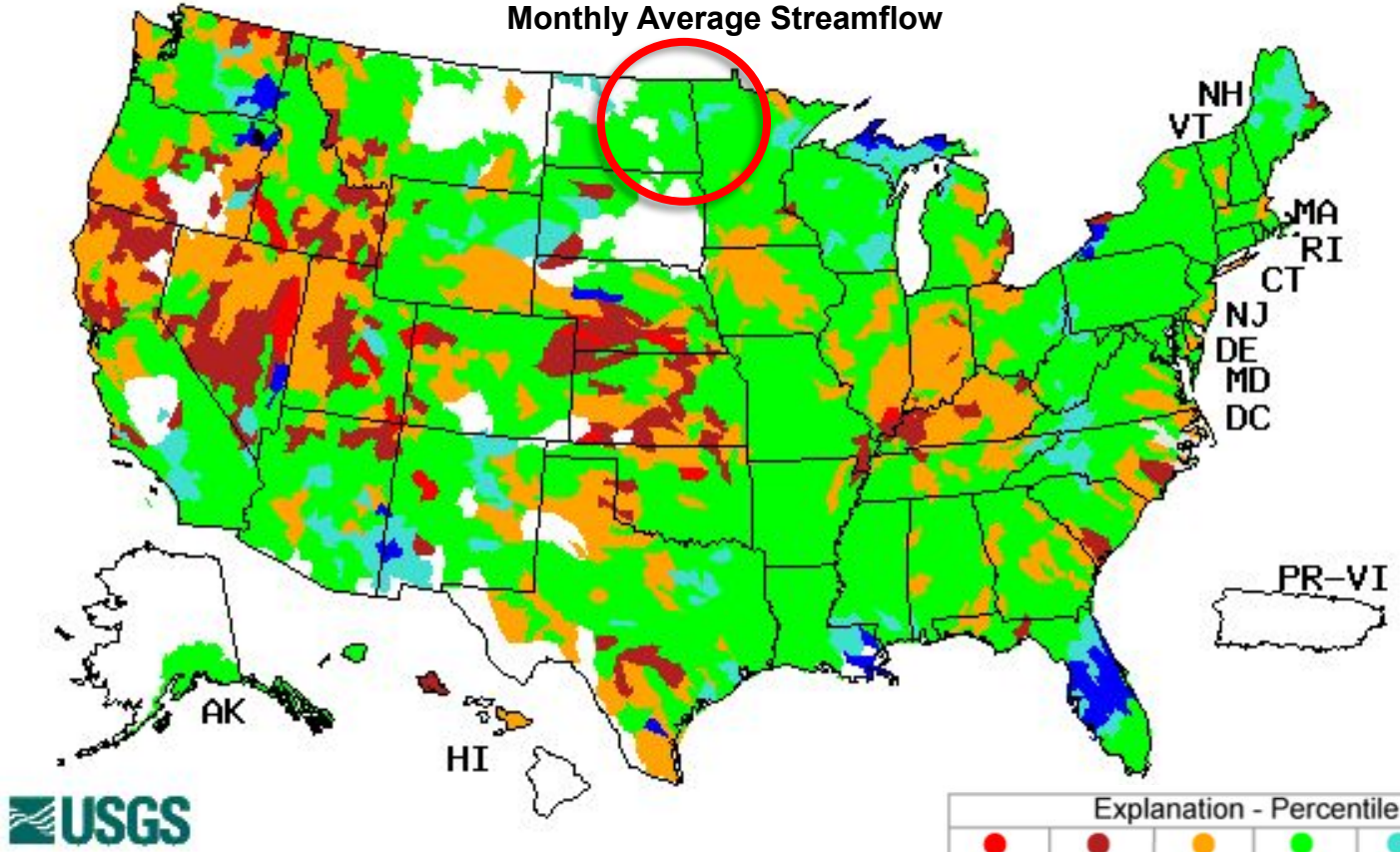
Author:

Rocky Bilotta
NCEI/NOAA

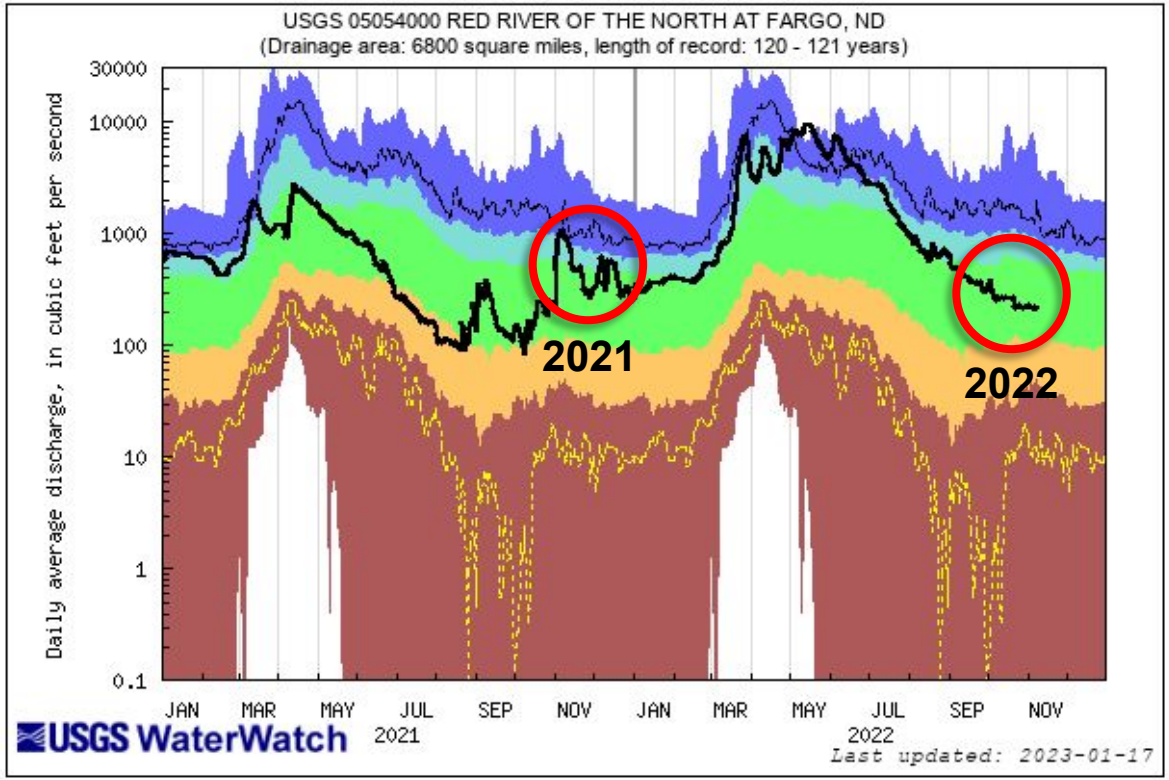
droughtmonitor.unl.edu

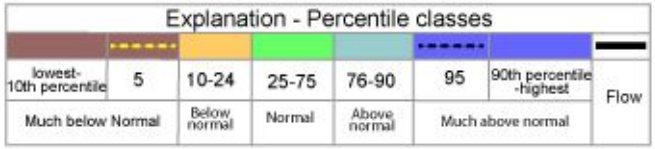
November 2022

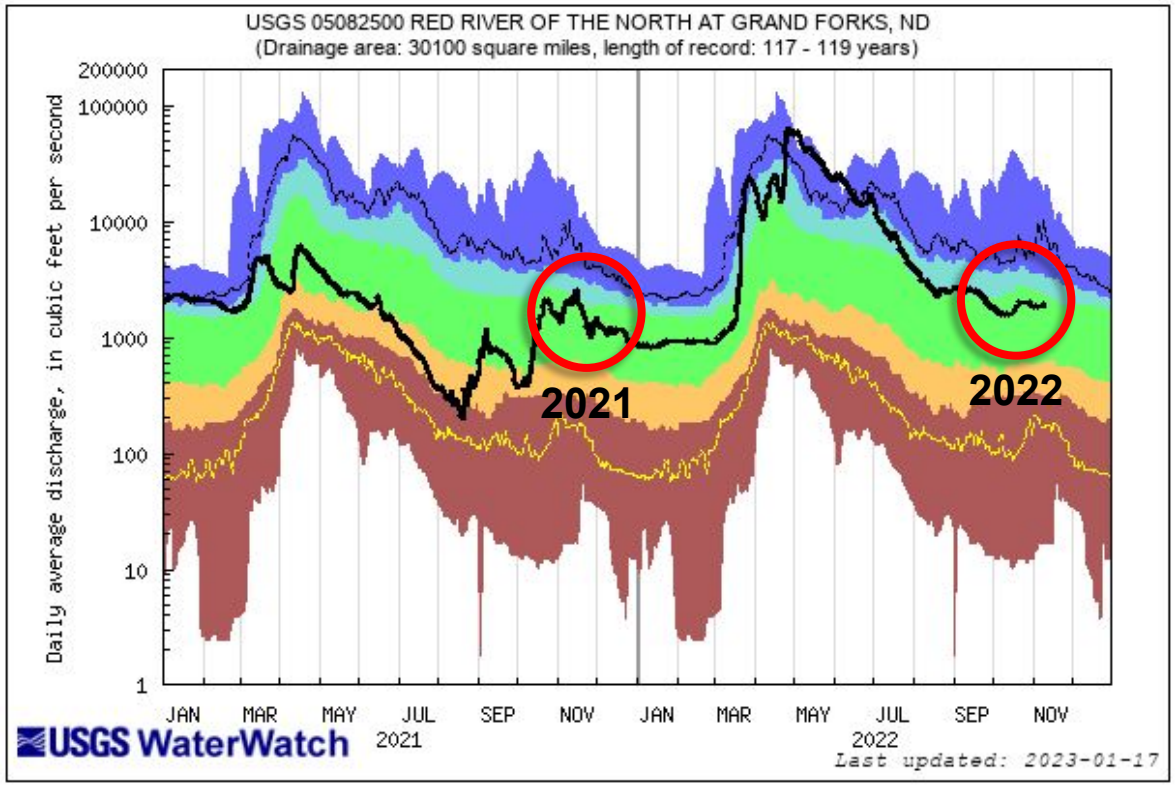
Monthly Average Streamflow

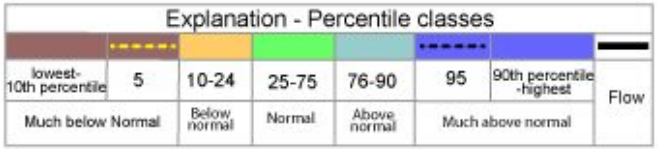


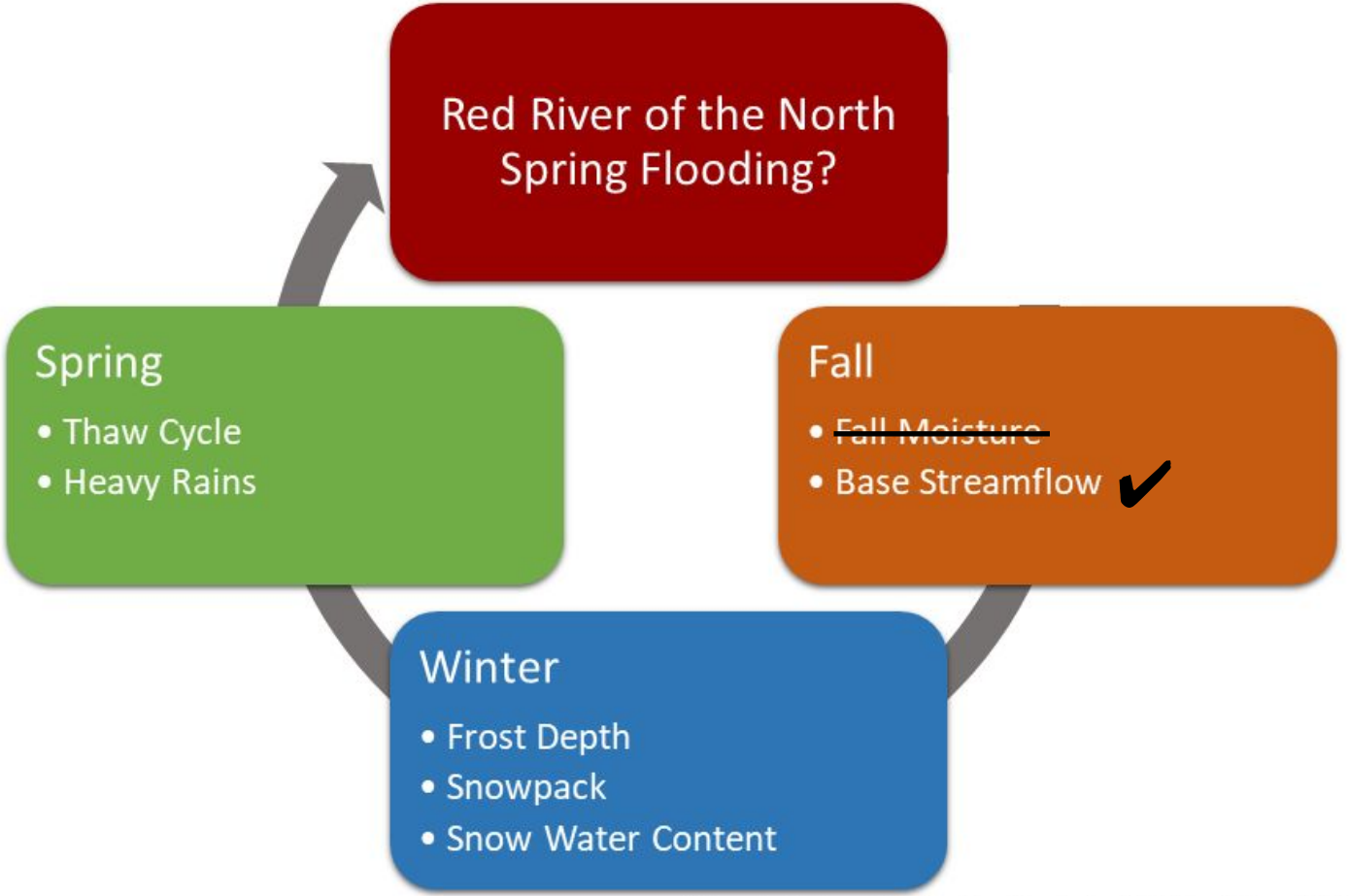
Explanation - Percentile classes						
Low	<10	10-24	25-75	76-90	>90	High
	Much below normal	Below normal	Normal	Above normal	Much above normal	


USGS 05054000 RED RIVER OF THE NORTH AT FARGO, ND
(Drainage area: 6800 square miles, length of record: 120 - 121 years)
Daily average discharge, in cubic feet per second
30000
10000
1000
100
10
1
0.1
JAN
MAR
MAY
JUL
SEP
NOV
JAN
MAR
MAY
JUL
SEP
NOV
2021
2022
2021
2022
2021
2022
USGS WaterWatch
Last updated: 2023-01-17


Explanation - Percentile classes
lowest-10th percentile
5
10-24
25-75
76-90
95
90th percentile -highest
Flow
Much below Normal
Below normal
Normal
Above normal
Much above normal

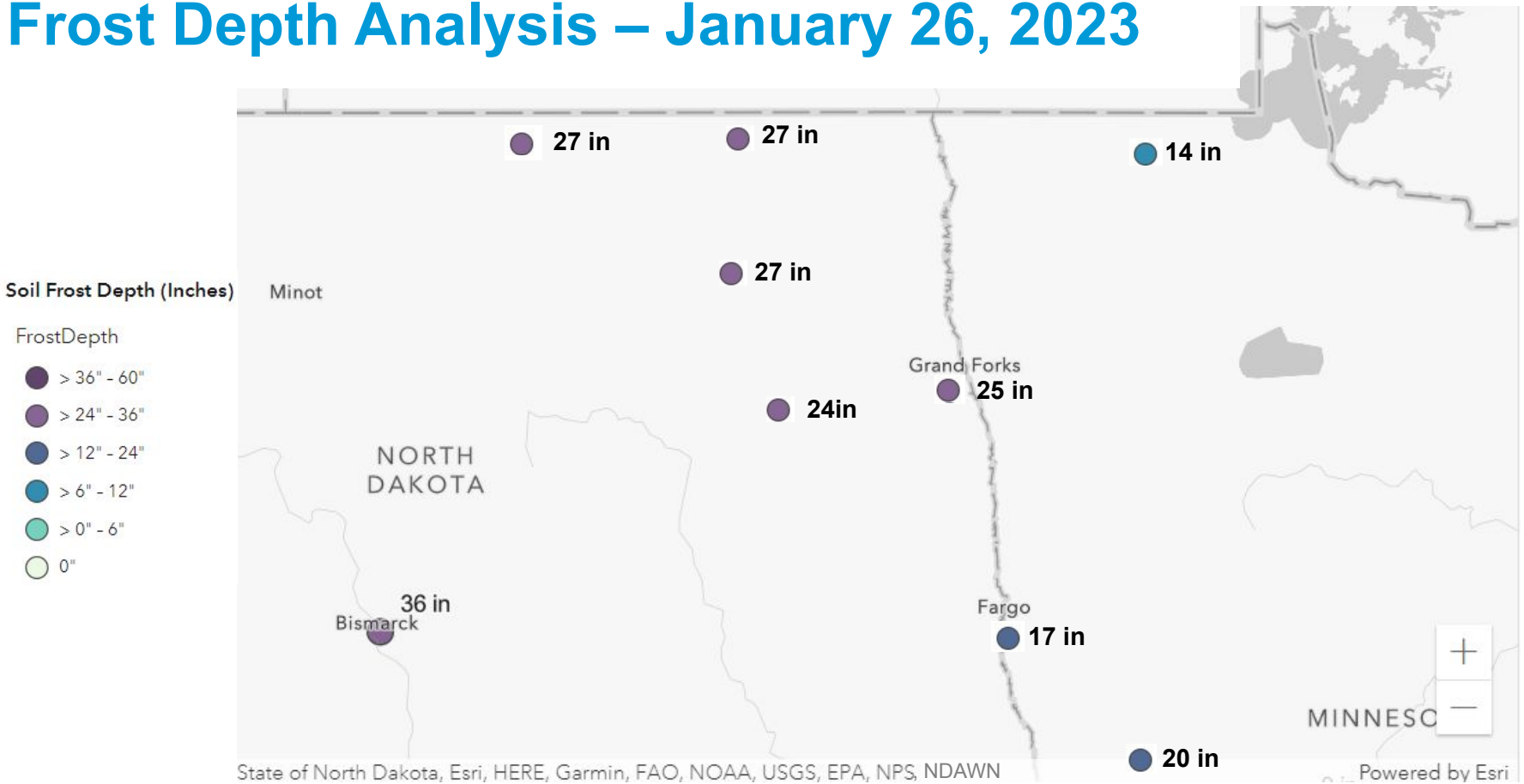

USGS 05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND
(Drainage area: 30100 square miles, length of record: 117 - 119 years)
Daily average discharge, in cubic feet per second
200000
100000
10000
1000
100
10
1
JAN
MAR
MAY
JUL
SEP
NOV
JAN
MAR
MAY
JUL
SEP
NOV
2021
2022
2021
2022
2021
2022
USGS WaterWatch
Last updated: 2023-01-17


Explanation - Percentile classes
lowest-10th percentile
5
10-24
25-75
76-90
95
90th percentile -highest
Flow
Much below Normal
Below normal
Normal
Above normal
Much above normal

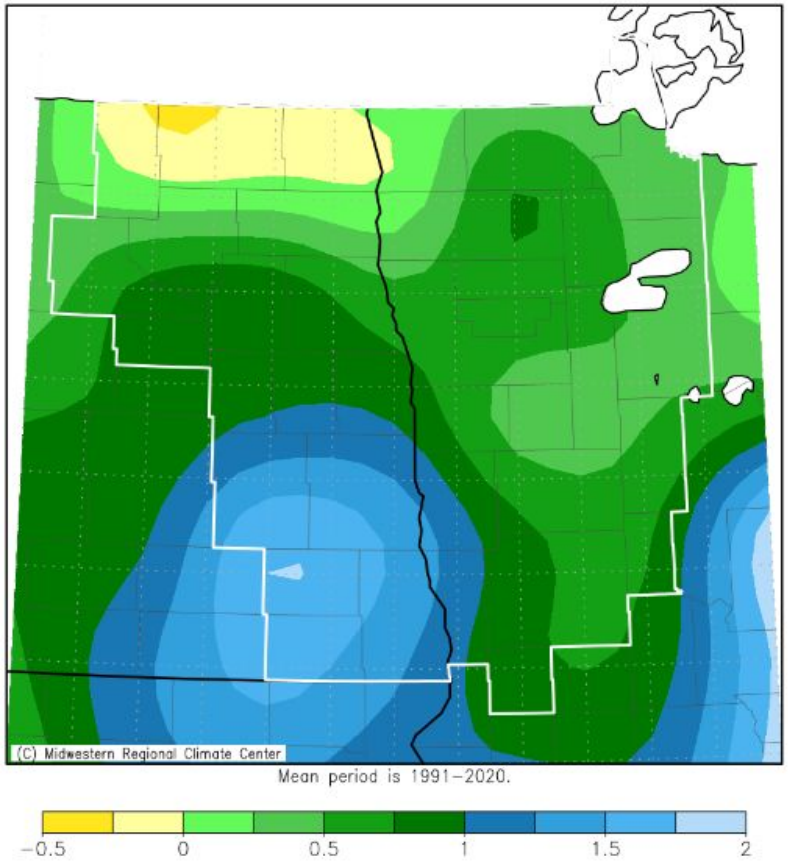


[Bluemle: Factors Affecting Flooding in the Red River Valley, 1997]

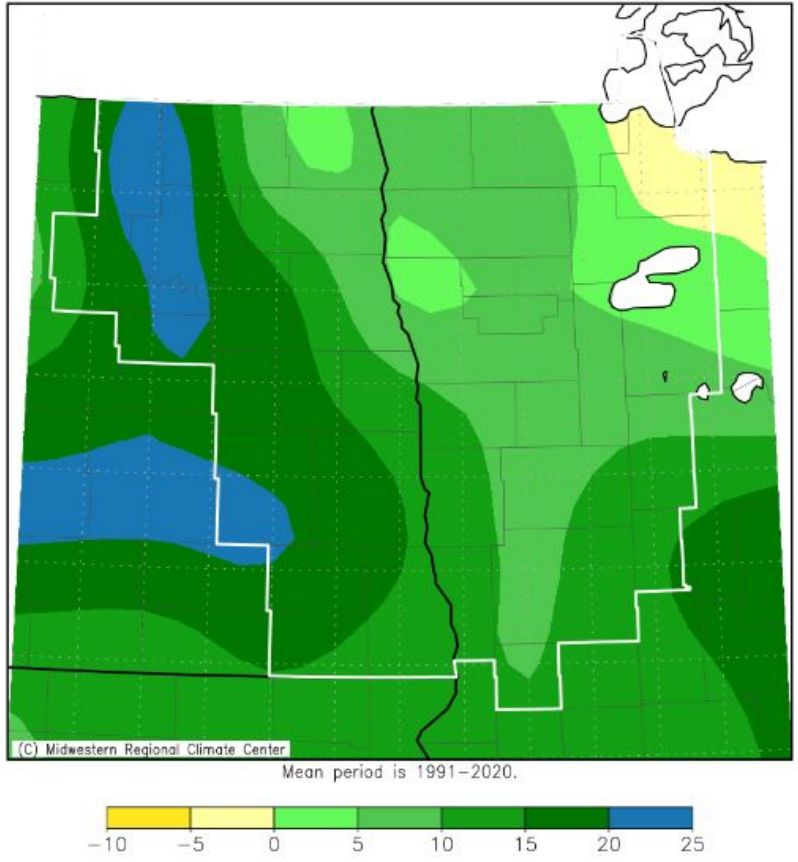
Frost Depth Analysis – January 26, 2023



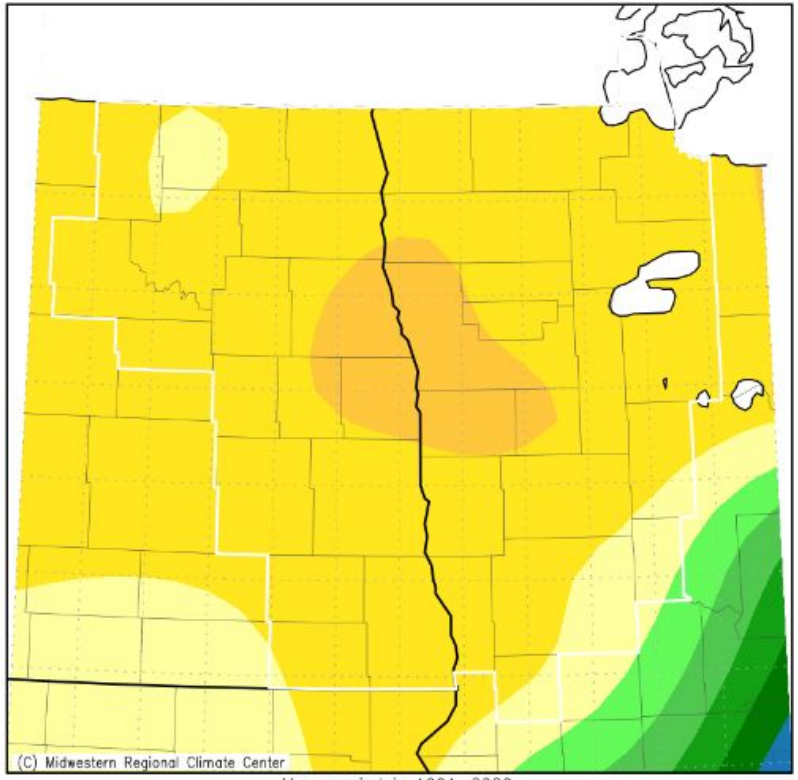
Accumulated Precipitation (in): Departure from Mean
December 1, 2022 to January 26, 2023



Accumulated Snowfall (in): Departure from Mean
December 1, 2022 to January 26, 2023

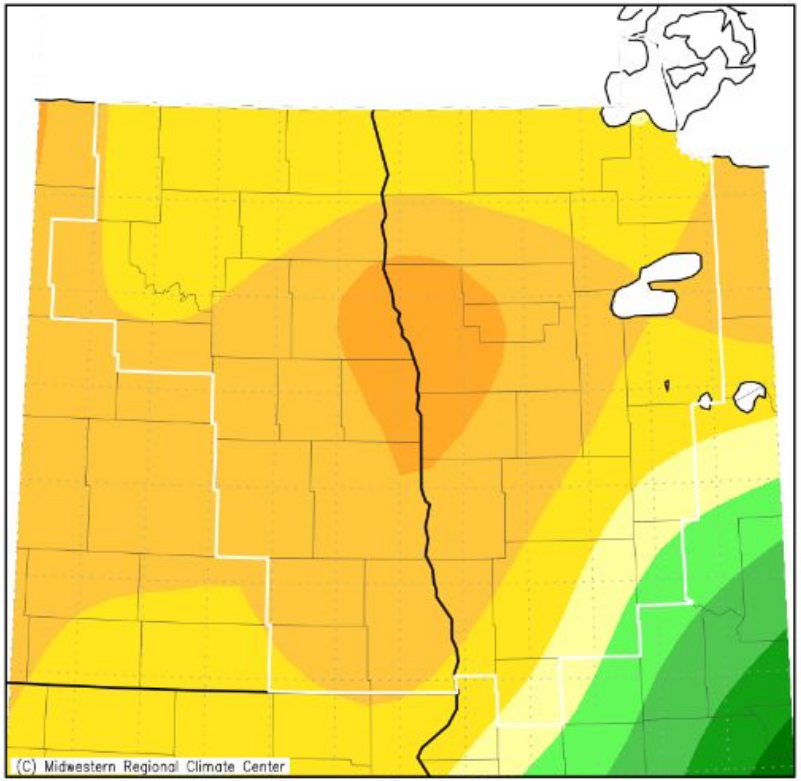


Accumulated Precipitation (in): Departure from Mean
January 1, 2023 to January 26, 2023



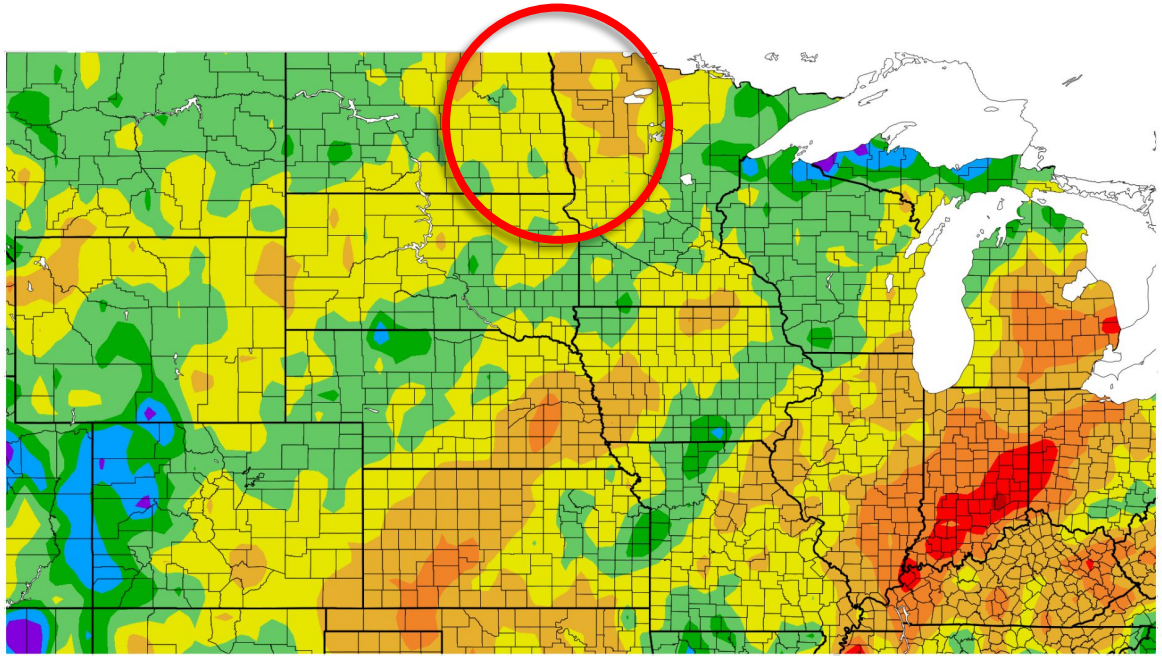
Mean period is 1991–2020.

Accumulated Snowfall (in): Departure from Mean
January 1, 2023 to January 26, 2023



Mean period is 1991–2020.

Departure from Normal Precipitation (in)
10/1/2022 – 1/26/2023

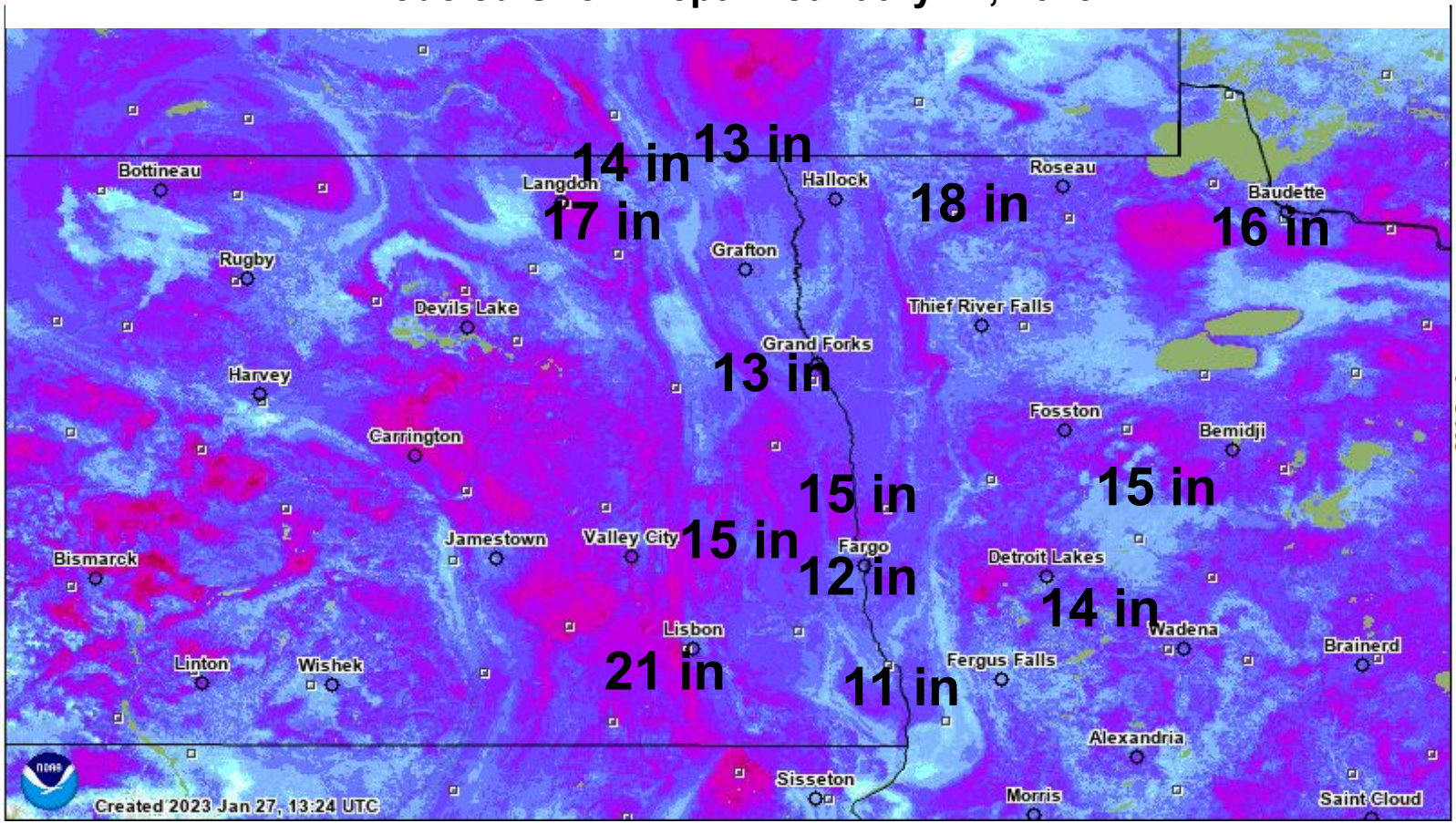


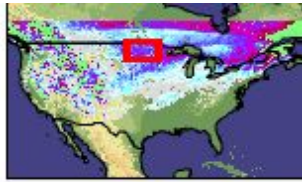
−7.5 −6 −4.5 −3 −1.5 0 1.5 3 4.5 6 7.5

Generated 1/27/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

Modeled Snow Depth - January 27, 2023





Inches of depth

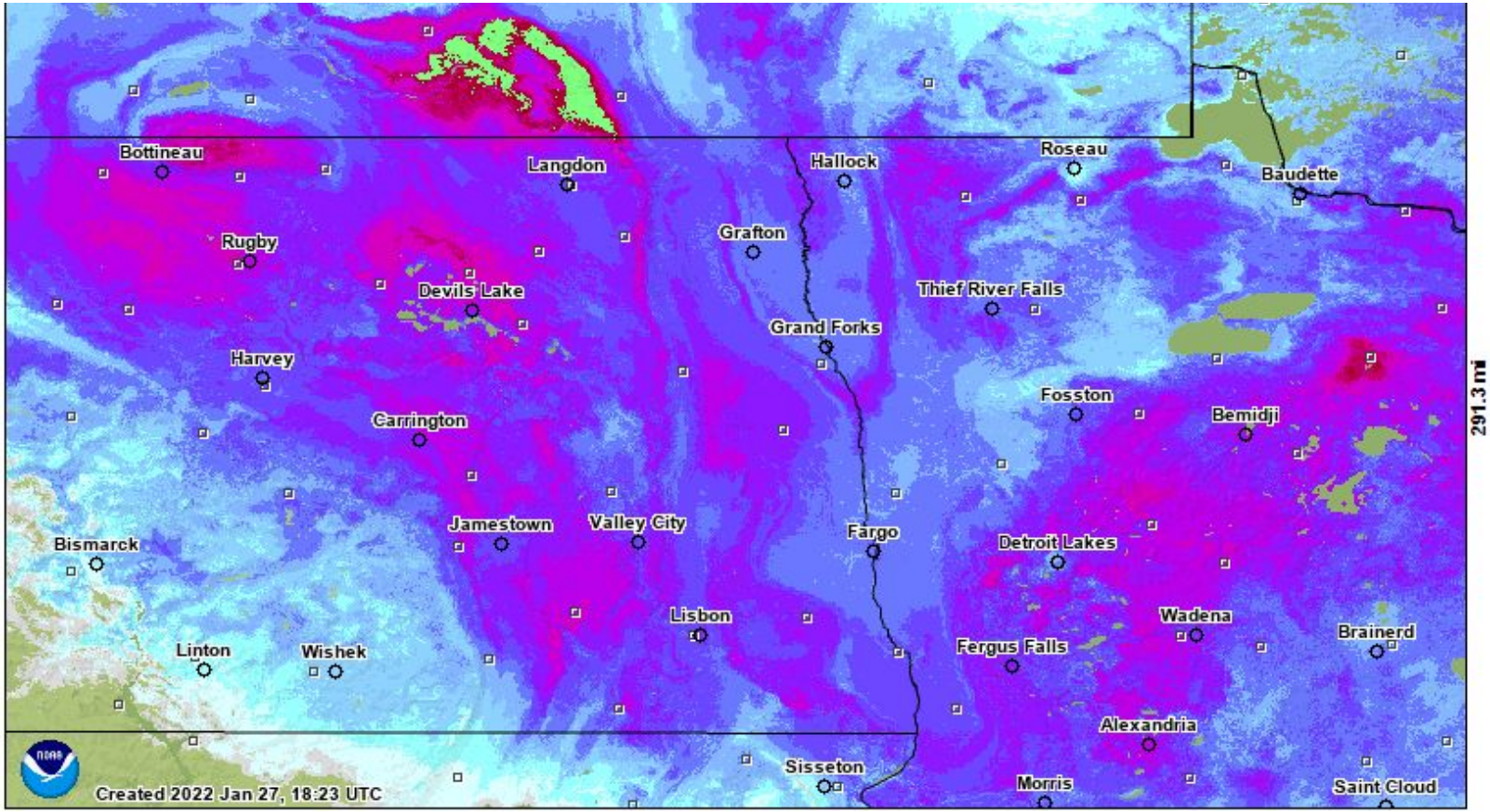
	>	24	
22	to	24	
20	to	22	
18	to	20	
16	to	18	
14	to	16	
12	to	14	
10	to	12	
8	to	10	
6	to	8	
4	to	6	
2	to	4	
trace	to	2	

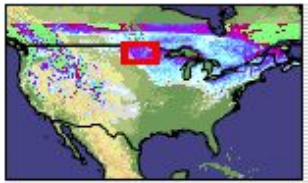
Not Estimated

Elevation in feet

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

Modeled Snow Depth - January 27, 2022





Inches of depth

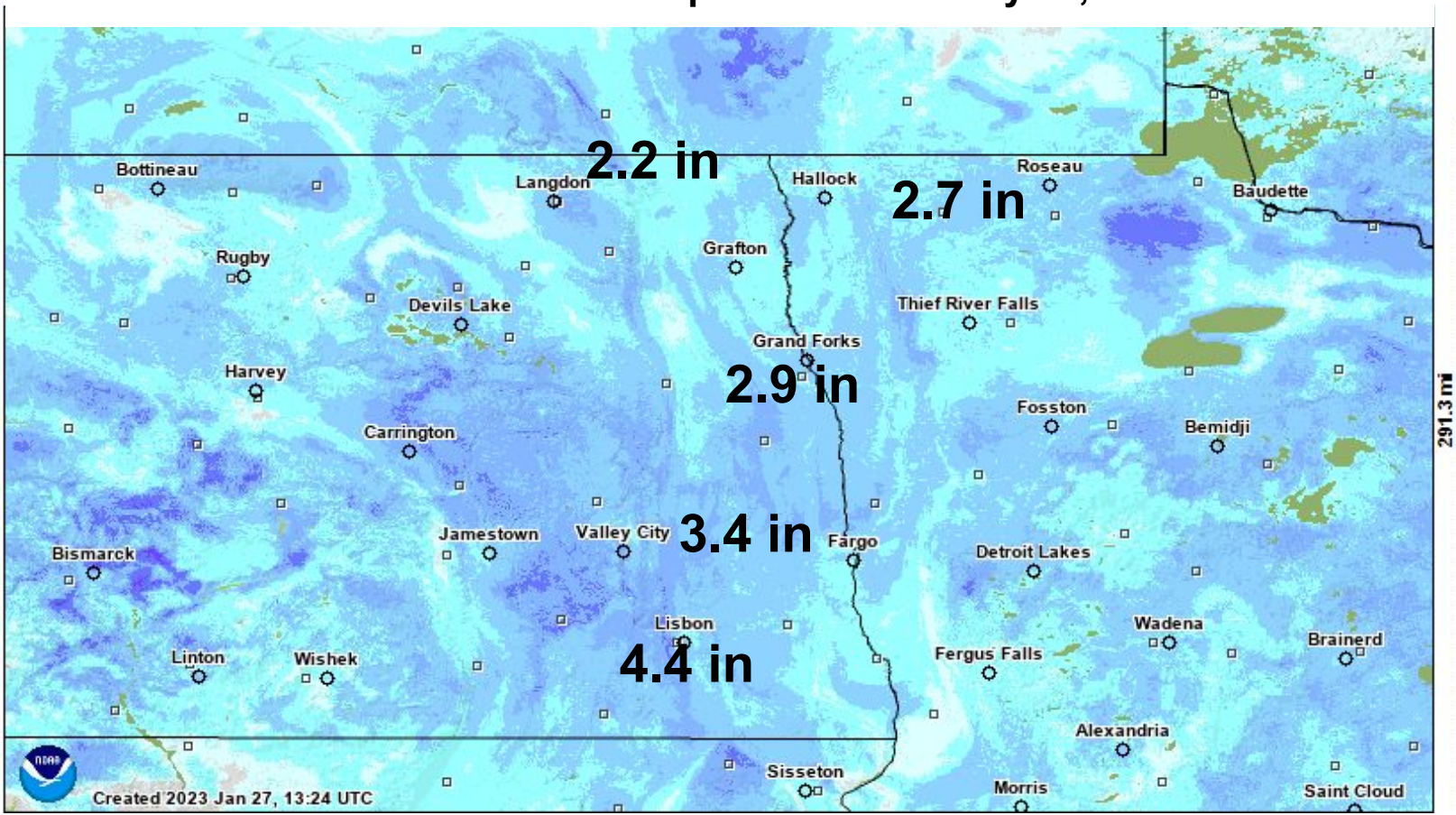
	>	24	
22	to	24	
20	to	22	
18	to	20	
16	to	18	
14	to	16	
12	to	14	
10	to	12	
8	to	10	
6	to	8	
4	to	6	
2	to	4	
trace	to	2	

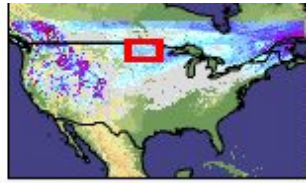
Not Estimated

Elevation in feet

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

Modeled Snow Water Equivalent - January 27, 2023





Inches of water equivalent

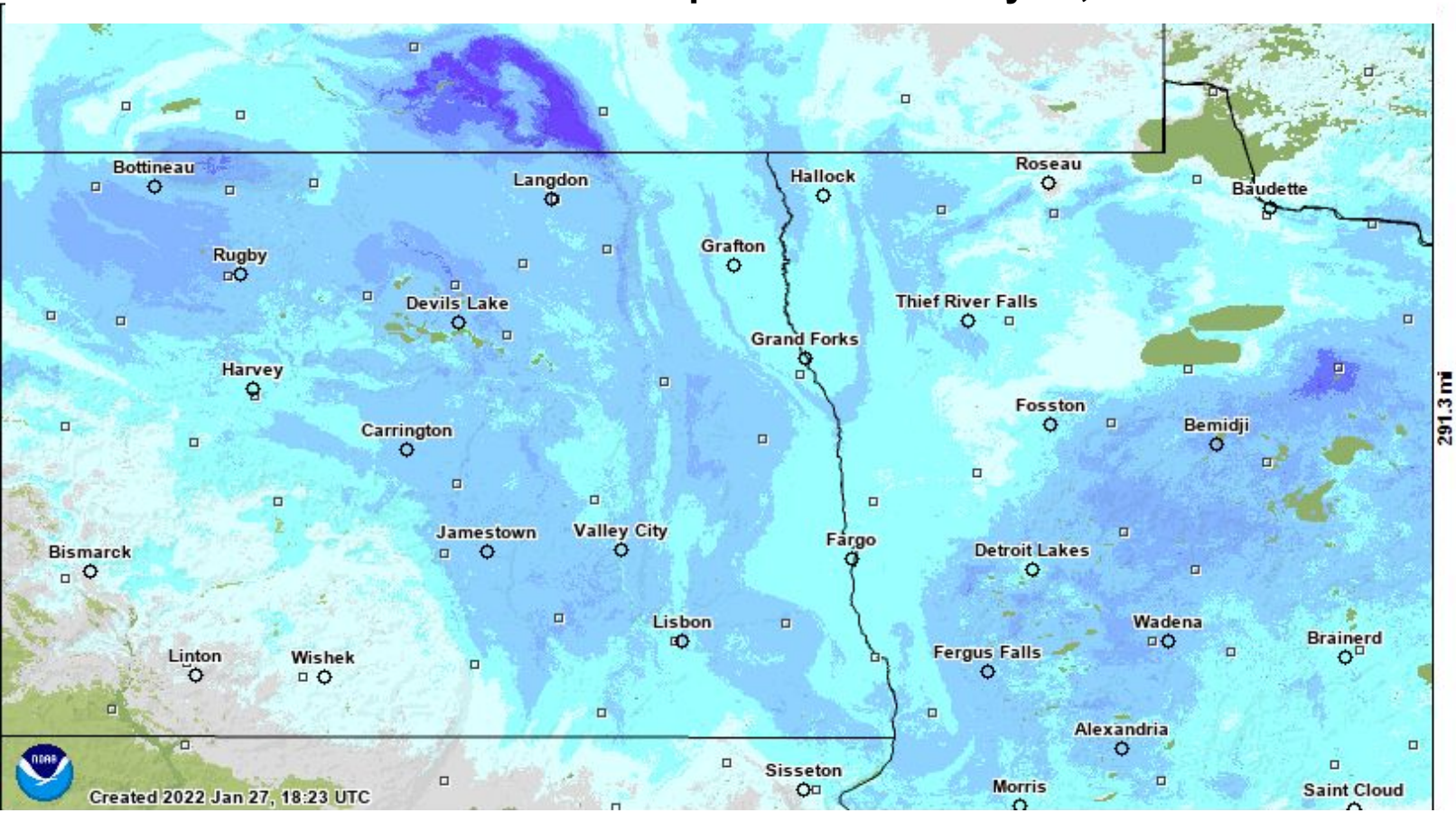
>		18
16	to	18
14	to	16
12	to	14
10	to	12
8	to	10
6	to	8
5	to	6
4	to	5
3	to	4
2	to	3
1	to	2
trace	to	1

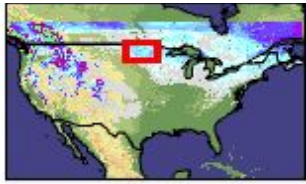
Not Estimated

Elevation in feet

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

Modeled Snow Water Equivalent - January 27, 2022





Inches of water equivalent

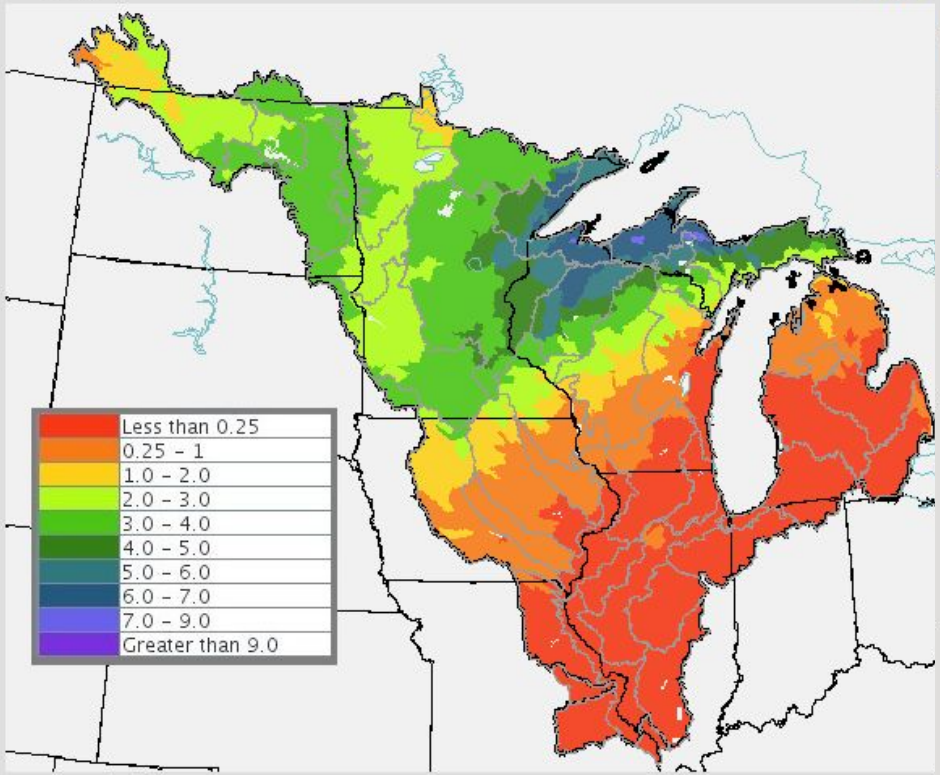
	>	18
16	to	18
14	to	16
12	to	14
10	to	12
8	to	10
6	to	8
5	to	6
4	to	5
3	to	4
2	to	3
1	to	2
trace	to	1

Not Estimated

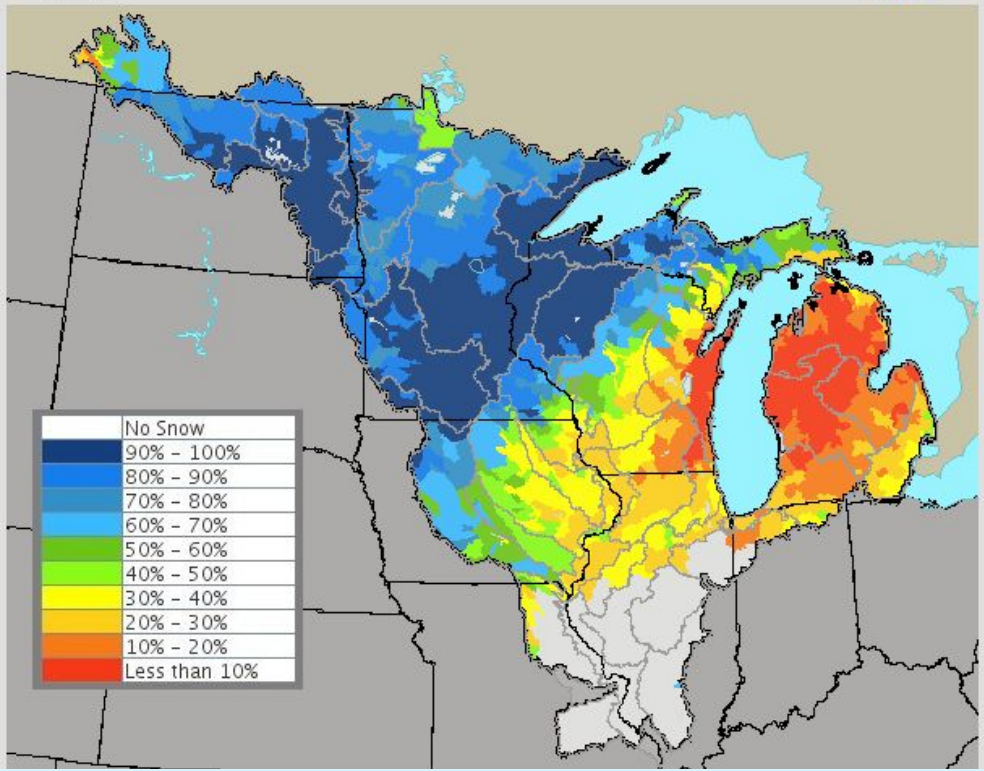
Elevation in feet

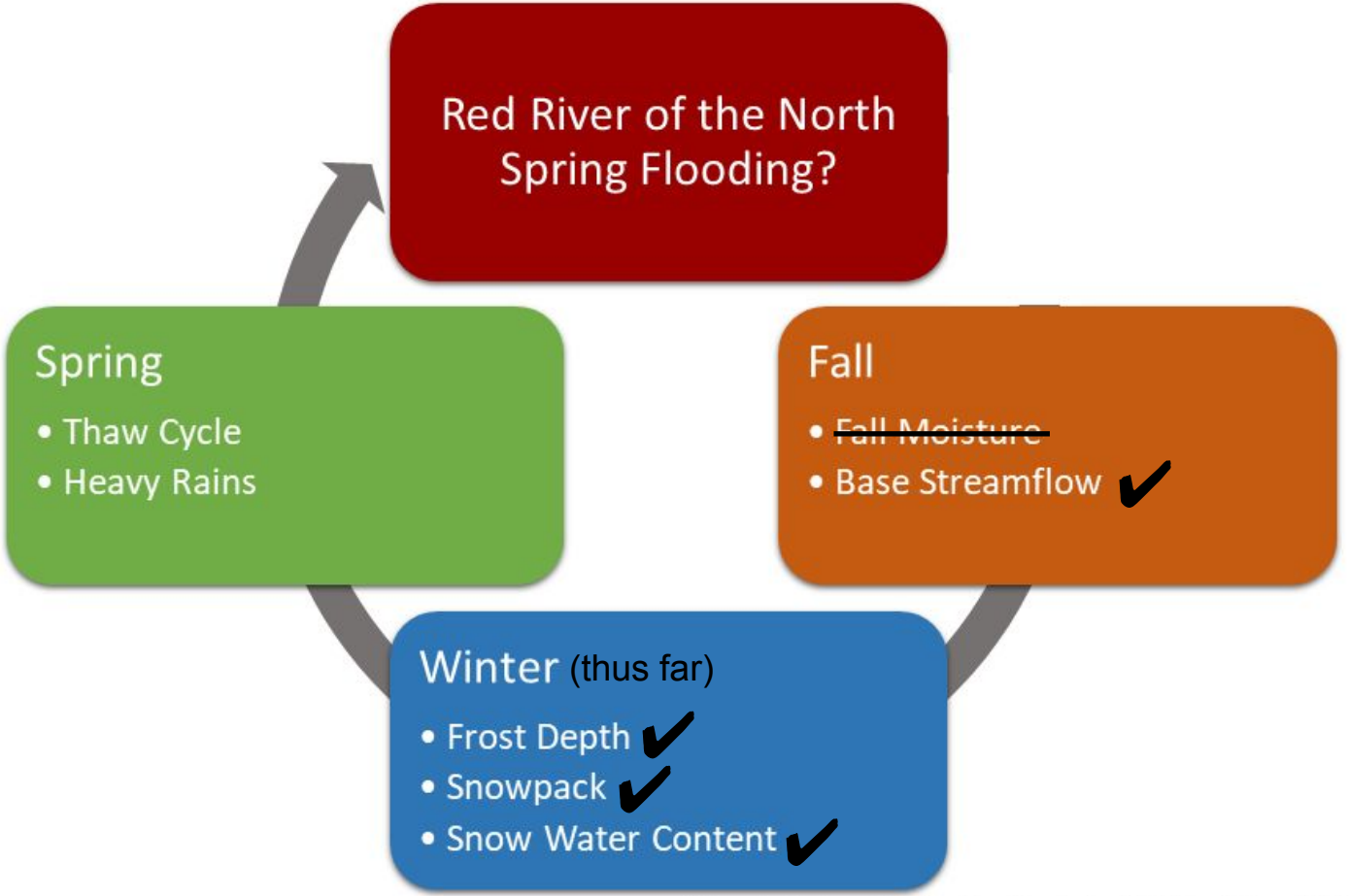
	>	13124
8203	to	13124
3281	to	8203
3	to	3281
	<	3

North Central River Forecast Center
Model Simulated Snow Water Equivalent
Valid for 01/23/2023 12 GMT



North Central River Forecast Center
Ranked Simulated Snow Water Equivalent
Valid for 01/23/2023 12 GMT

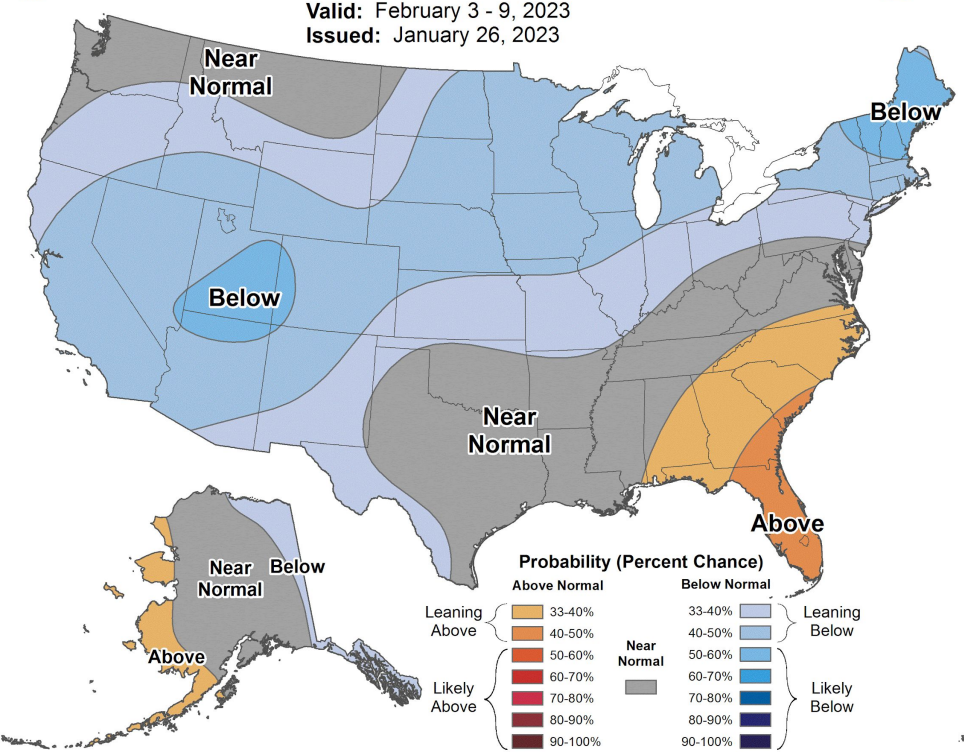




[Bluemle: Factors Affecting Flooding in the Red River Valley, 1997]

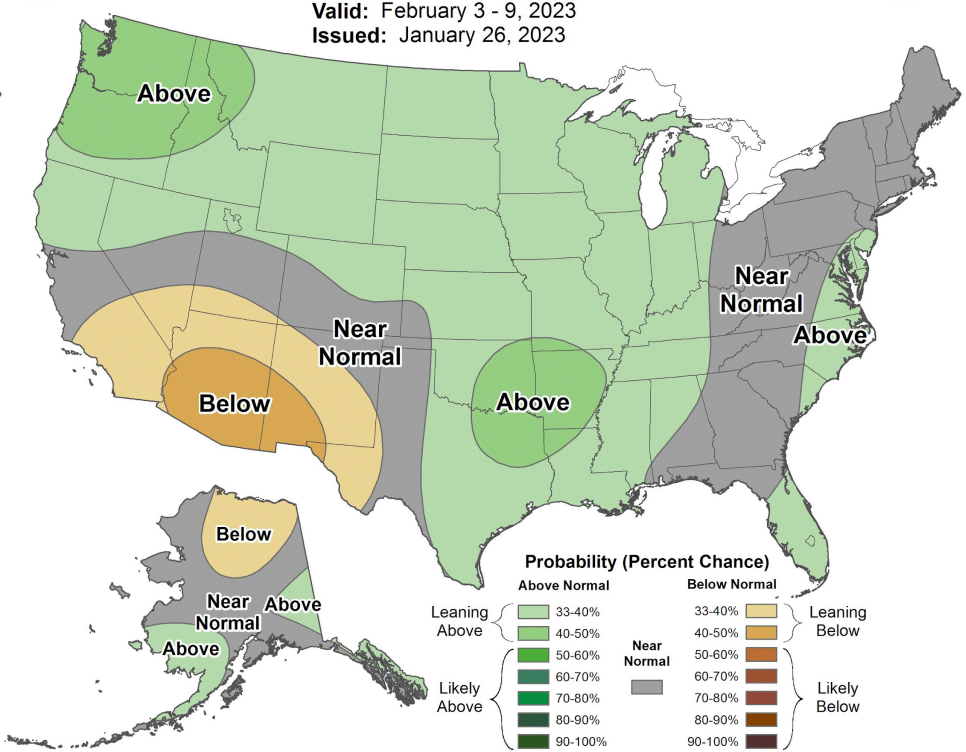
8-14 Day Temperature Outlook

Valid: February 3 - 9, 2023
Issued: January 26, 2023



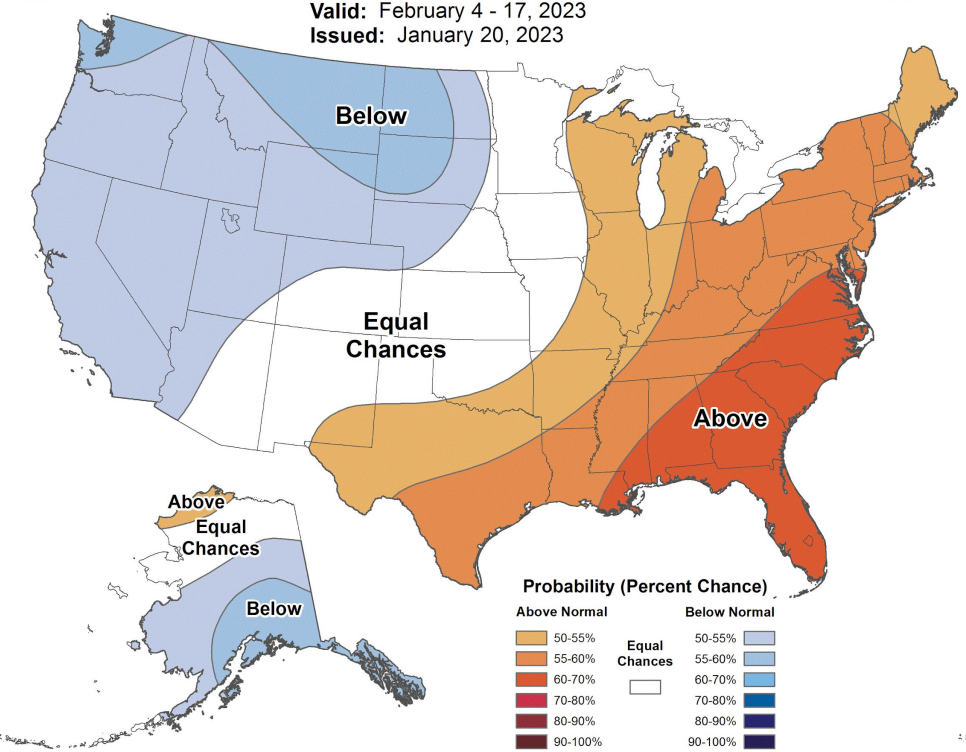
8-14 Day Precipitation Outlook

Valid: February 3 - 9, 2023
Issued: January 26, 2023



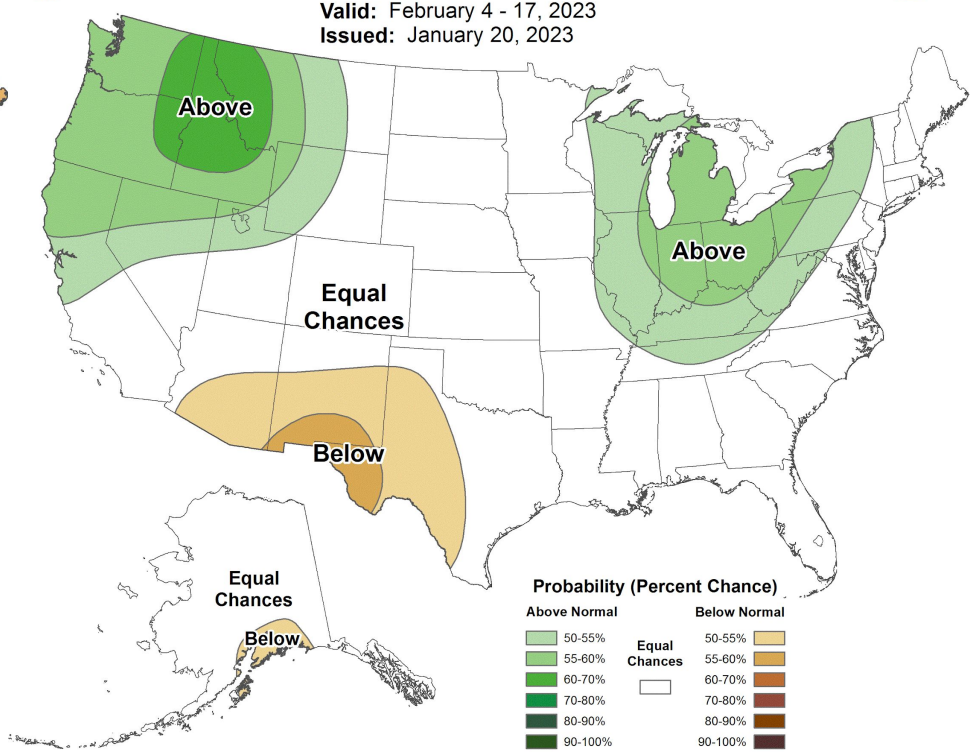
Weeks 3-4 Temperature Outlook

Valid: February 4 - 17, 2023
Issued: January 20, 2023



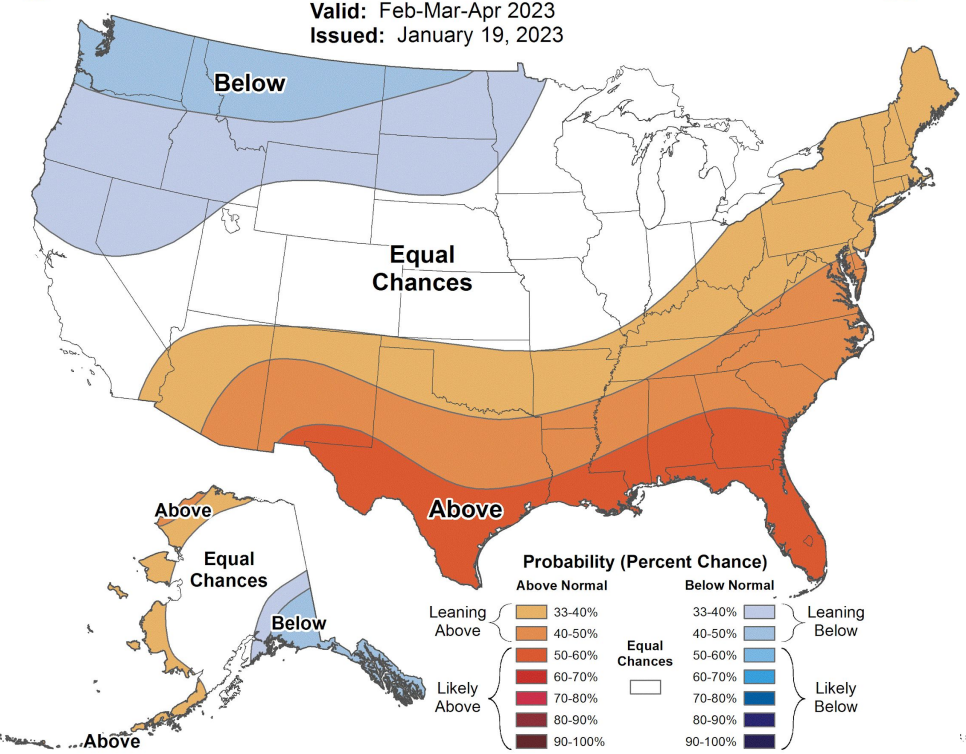
Weeks 3-4 Precipitation Outlook

Valid: February 4 - 17, 2023
Issued: January 20, 2023



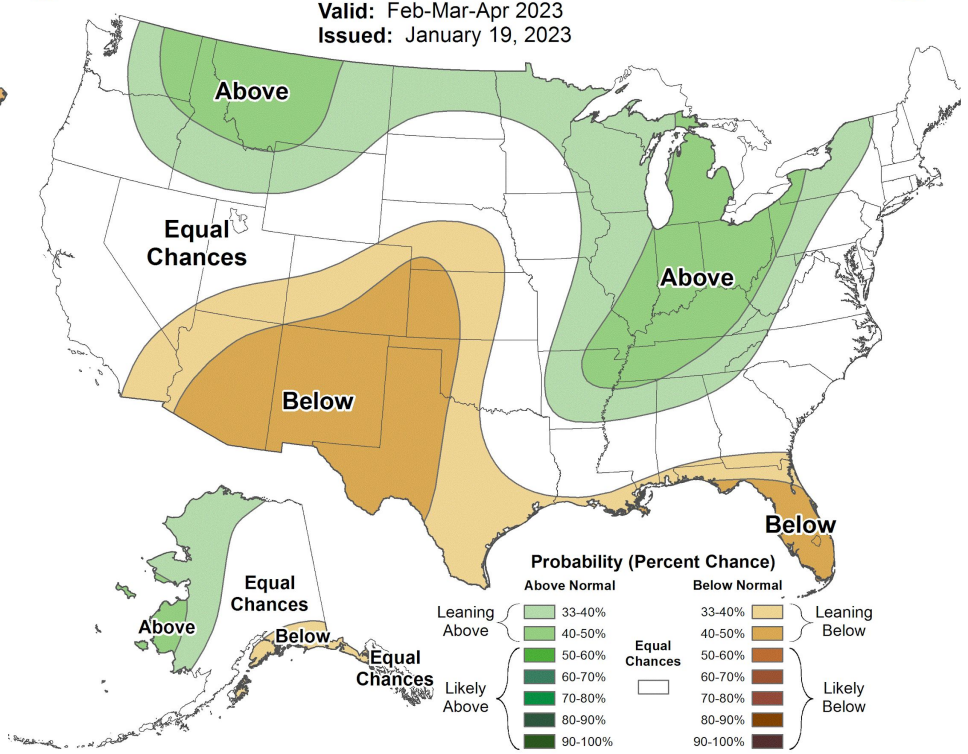
Seasonal Temperature Outlook

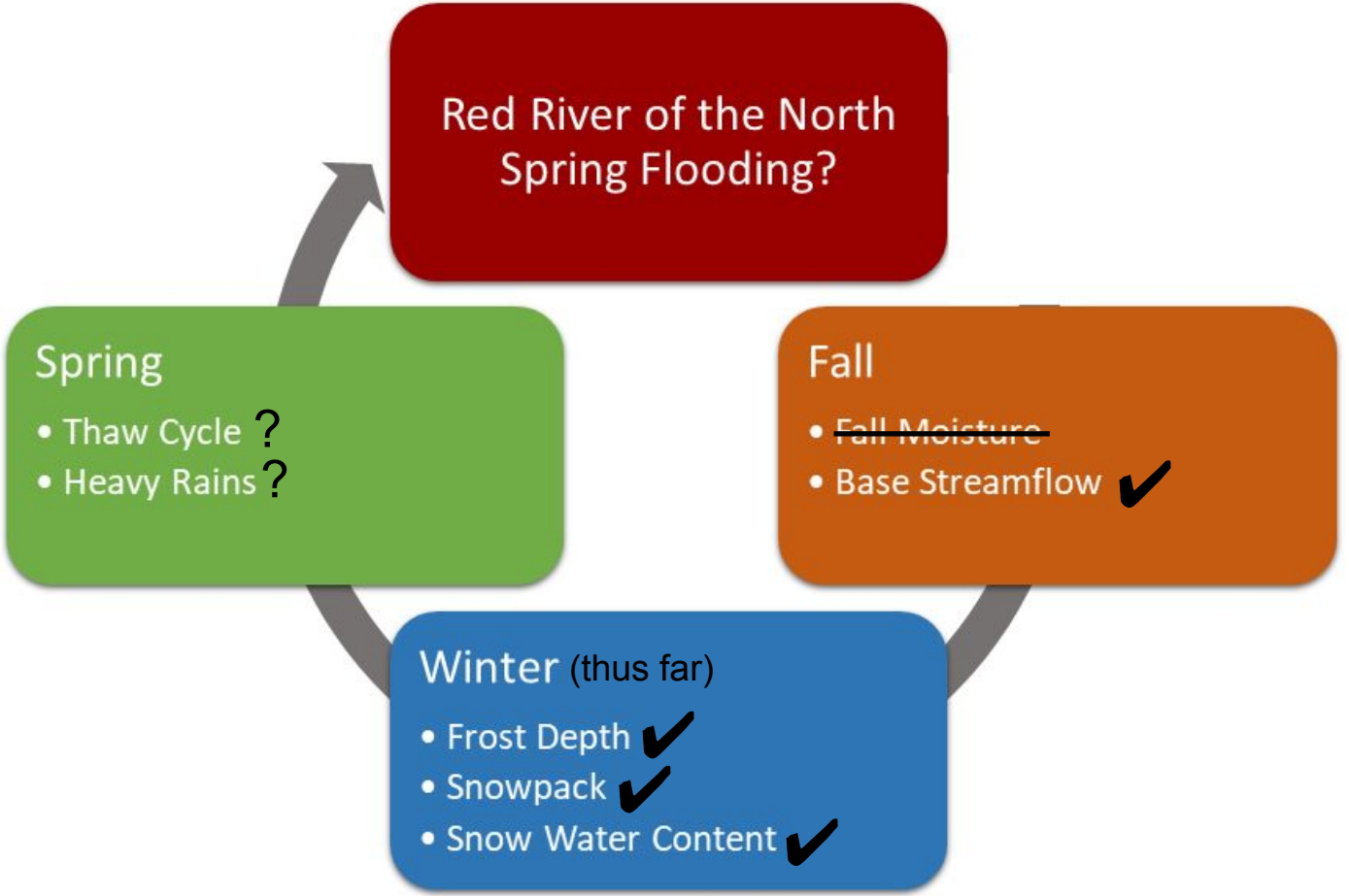
Valid: Feb-Mar-Apr 2023
Issued: January 19, 2023



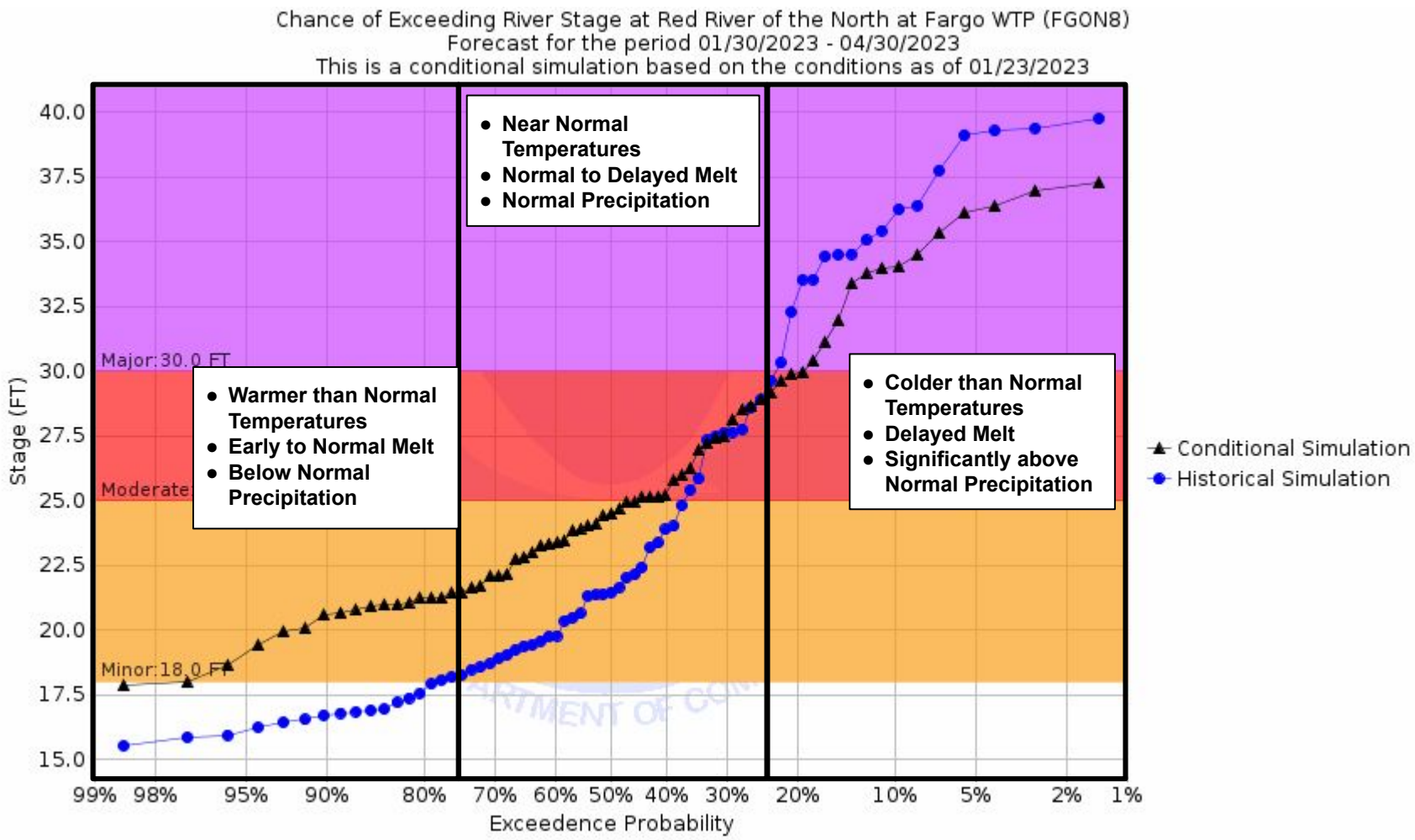
Seasonal Precipitation Outlook

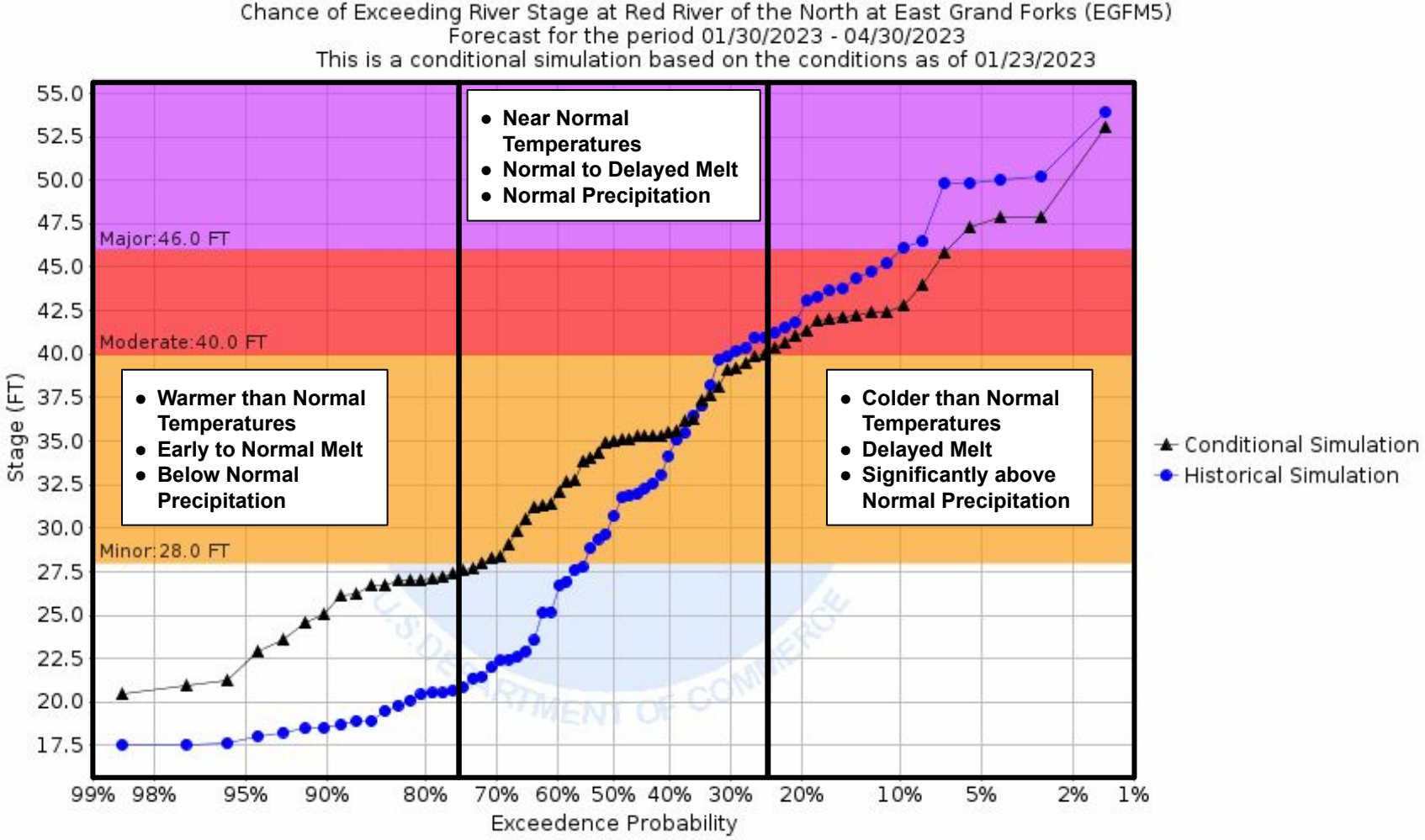
Valid: Feb-Mar-Apr 2023
Issued: January 19, 2023





[Bluemle: Factors Affecting Flooding in the Red River Valley, 1997]


Chance of Exceeding River Stage at Red River of the North at Fargo WTP (FGON8)
Forecast for the period 01/30/2023 - 04/30/2023
This is a conditional simulation based on the conditions as of 01/23/2023
Stage (FT)
40.0
37.5
35.0
32.5
30.0
27.5
25.0
22.5
20.0
17.5
15.0
Major: 30.0 FT
Moderate
Minor: 18.0 FT
99% 98% 95% 90% 80% 70% 60% 50% 40% 30% 20% 10% 5% 2% 1%
Exceedence Probability
• Near Normal Temperatures
• Normal to Delayed Melt
• Normal Precipitation
• Warmer than Normal Temperatures
• Early to Normal Melt
• Below Normal Precipitation
• Colder than Normal Temperatures
• Delayed Melt
• Significantly above Normal Precipitation
Conditional Simulation
Historical Simulation


Chance of Exceeding River Stage at Red River of the North at East Grand Forks (EGFM5)
Forecast for the period 01/30/2023 - 04/30/2023
This is a conditional simulation based on the conditions as of 01/23/2023
Major:46.0 FT
Moderate:40.0 FT
Minor:28.0 FT
• Near Normal Temperatures
• Normal to Delayed Melt
• Normal Precipitation
• Warmer than Normal Temperatures
• Early to Normal Melt
• Below Normal Precipitation
• Colder than Normal Temperatures
• Delayed Melt
• Significantly above Normal Precipitation
Conditional Simulation
Historical Simulation
Stage (FT)
55.0
52.5
50.0
47.5
45.0
42.5
40.0
37.5
35.0
32.5
30.0
27.5
25.0
22.5
20.0
17.5
99% 98% 95% 90% 80% 70% 60% 50% 40% 30% 20% 10% 5% 2% 1%
Exceedence Probability

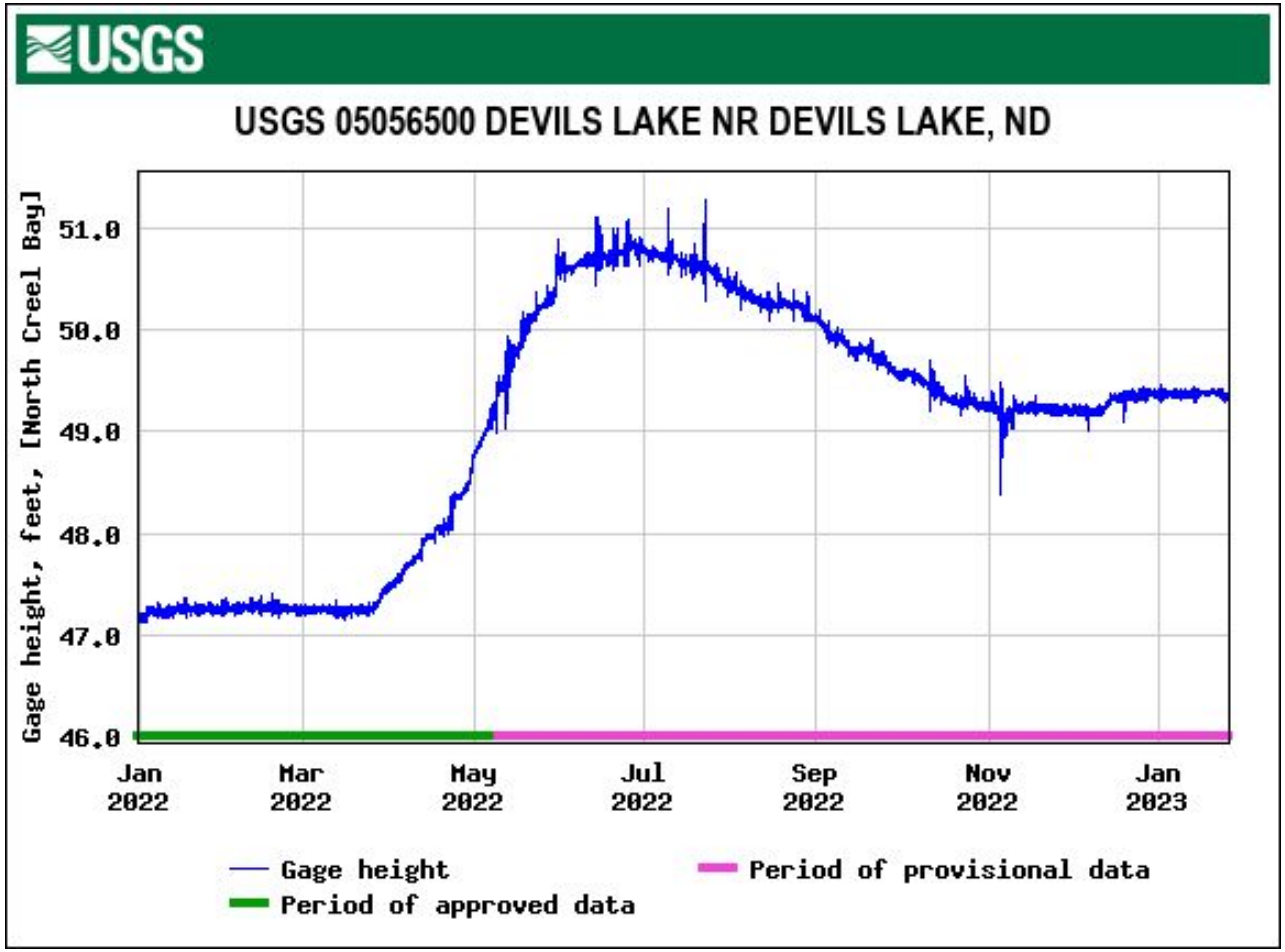
Valid January 30, 2023 - April 30, 2023

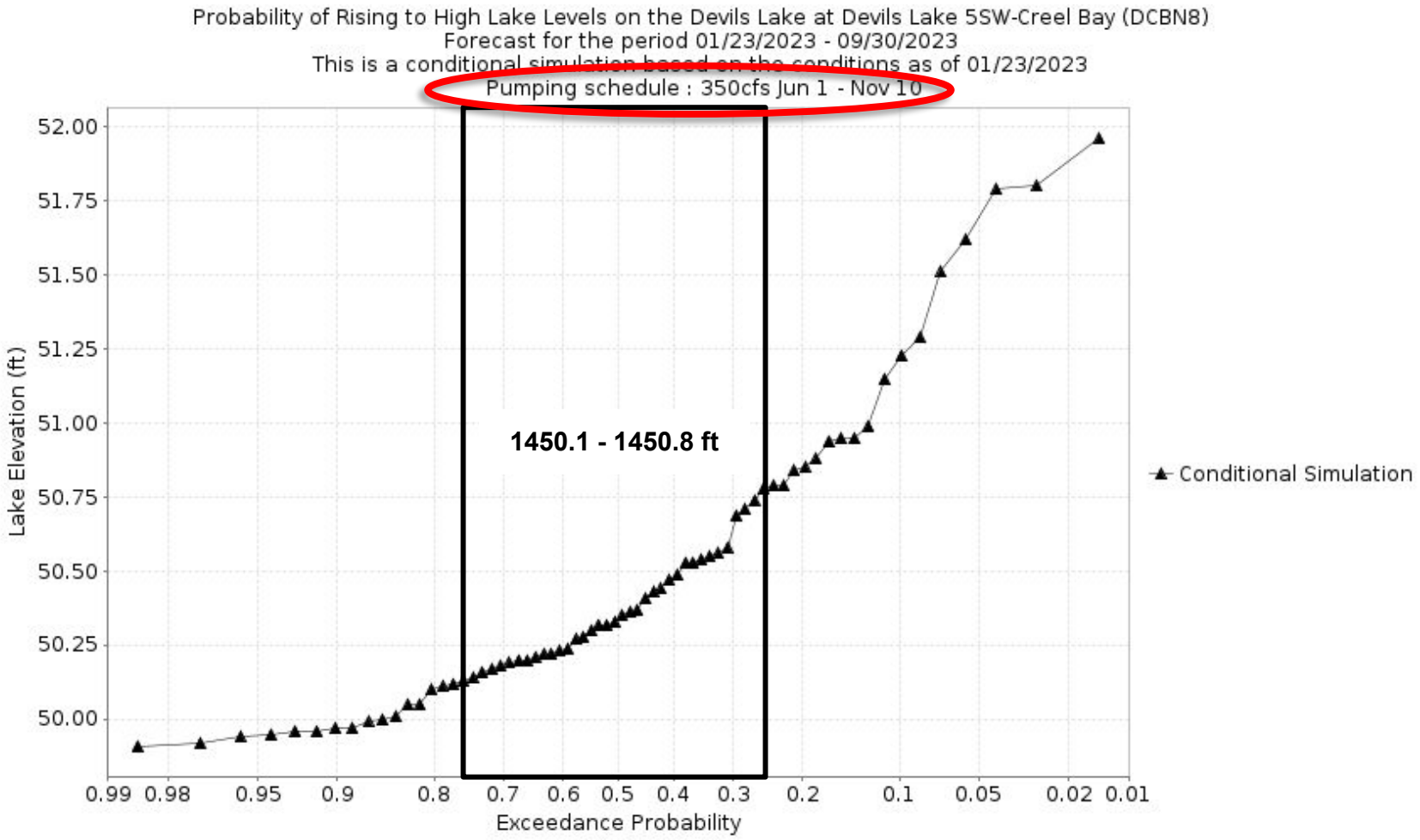
RED RIVER MAINSTEM	95%	90%	75%	50%	25%	10%	5%
Wahpeton	10.2	10.7	11.2	11.9	13.4	14.8	15.6
Hickson	18.3	19.8	21.4	24.5	29.6	33.5	35.4
Fargo	19.1	20.6	21.5	24.5	28.9	34.0	36.2
Halstad	15.7	18.1	20.6	23.5	28.6	33.9	37.6
Grand Forks	22.3	25.2	27.6	35.0	40.0	42.7	47.5
Oslo	19.4	24.6	27.8	33.6	34.8	35.6	37.7
Drayton	22.2	26.1	29.4	34.6	39.4	40.2	42.1
Pembina	29.0	32.7	37.3	42.2	47.5	49.7	51.0

NORTH DAKOTA TRIBUTARIES	95%	90%	75%	50%	25%	10%	5%
Wild Rice River							
Abercrombie	4.6	6.1	7.6	11.4	15.0	19.4	22.0
Sheyenne River							
Valley City	7.6	7.9	8.9	10.9	12.1	13.6	14.1
Lisbon	7.3	7.8	9.0	11.2	12.6	13.9	15.4
Kindred	9.9	10.6	12.2	14.4	16.7	19.4	19.8
West Fargo Diversion	10.9	11.6	13.0	14.4	16.2	19.1	19.3
Harwood	77.1	77.6	78.7	83.1	87.9	91.1	91.5
Maple River							
Enderlin	7.6	8.0	8.9	10.2	11.4	12.2	13.5
Mapleton	14.1	15.0	16.6	18.9	21.2	22.3	22.6
Goose River							
Hillsboro	3.9	4.4	6.0	8.4	11.5	13.6	14.5
Forest River							
Minto	3.1	3.3	3.9	4.5	5.5	6.4	6.6
Pembina River							
Walhalla	4.8	5.3	5.9	6.9	8.8	10.8	12.6
Neche	7.1	8.0	9.4	12.1	17.2	19.9	21.1

Valid January 30, 2023 - April 30, 2023

MINNESOTA TRIBUTARIES	95%	90%	75%	50%	25%	10%	5%
South Fork Buffalo River							
Sabin	12.0	12.5	13.1	13.7	14.3	15.1	16.7
Buffalo River							
Hawley	4.6	4.7	5.4	6.3	7.8	8.8	9.8
Dilworth	11.0	12.0	13.5	16.3	18.2	20.6	22.1
Wild Rice River							
Twin Valley	4.7	5.1	5.7	6.7	7.8	8.9	10.2
Hendrum	15.0	16.3	18.6	21.7	25.4	28.2	31.2
Marsh River							
Shelly	7.6	8.1	9.1	10.4	12.5	15.2	16.2
Sand Hill River							
Climax	9.8	10.9	11.5	14.2	17.8	23.3	27.9
Red Lake River							
High Landing	5.2	5.6	6.4	8.0	9.4	10.4	12.1
Crookston	9.6	10.1	11.6	14.5	17.4	20.2	22.7
Snake River							
Above Warren	62.3	62.5	62.8	63.4	64.3	65.3	66.2
Alvarado	98.0	98.6	99.0	101.0	103.1	105.1	107.1
Two Rivers River							
Hallock	799.2	800.1	801.4	804.2	806.6	808.3	808.6
Roseau River							
Roseau	7.8	8.2	9.3	10.3	12.7	15.3	16.7


USGS
USGS 05056500 DEVILS LAKE NR DEVILS LAKE, ND
Gage height, feet, [North Creel Bay]
51.0
50.0
49.0
48.0
47.0
46.0
Jan 2022
Mar 2022
May 2022
Jul 2022
Sep 2022
Nov 2022
Jan 2023
Gage height
Period of approved data
Period of provisional data

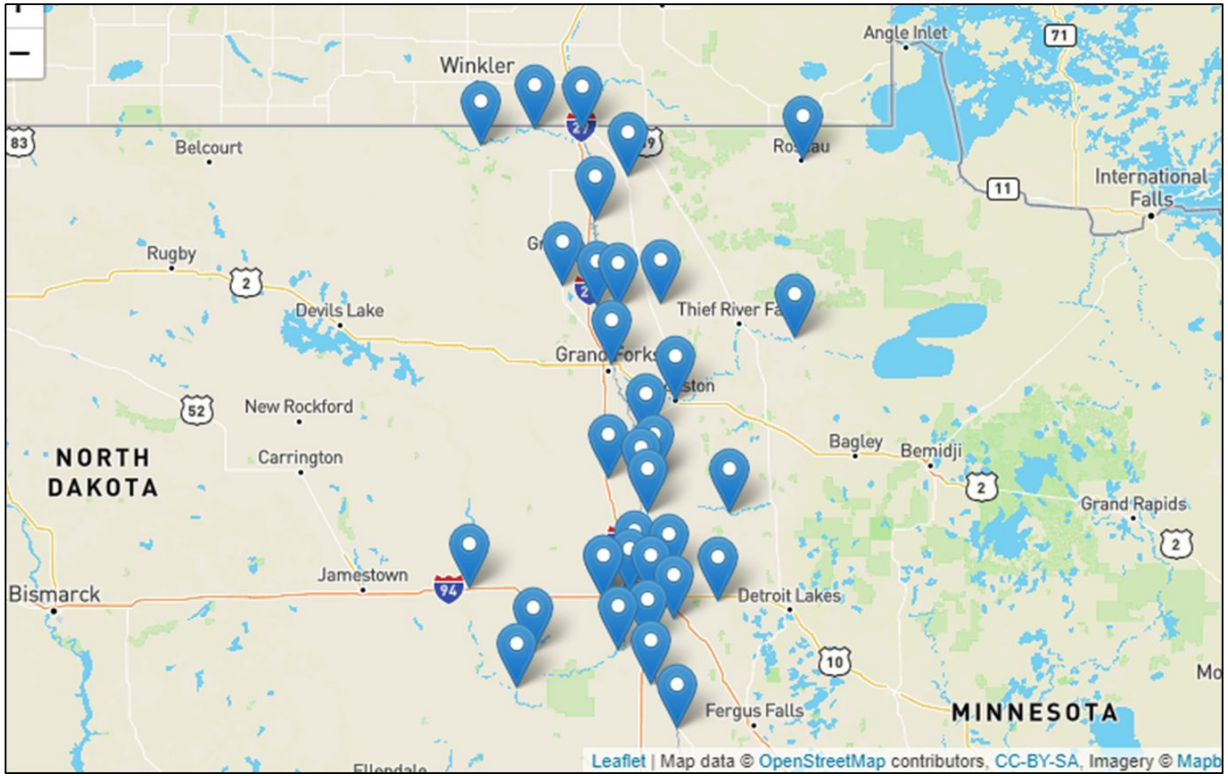

Probability of Rising to High Lake Levels on the Devils Lake at Devils Lake 5SW-Creel Bay (DCBN8)
Forecast for the period 01/23/2023 - 09/30/2023
This is a conditional simulation based on the conditions as of 01/23/2023
Pumping schedule : 350cfs Jun 1 - Nov 10
1450.1 - 1450.8 ft
Lake Elevation (ft)
52.00
51.75
51.50
51.25
51.00
50.75
50.50
50.25
50.00
0.99 0.98 0.95 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.05 0.02 0.01
Exceedance Probability
Conditional Simulation

Probabilistic Flood Outlook Summary (PFOS)

- Same probabilistic data, just in a different format
- Includes all Red River mainstem and tributary forecast points
- At a glance, relates current risk to:
  - flood categories
  - recent crests
  - floods of record

Use the map below to view forecast point PFOS Graphics

(click a site marker below, then click on the image to expand)



www.weather.gov/fgf/PFOS

Probabilistic Flood Outlook Summary (PFOS)

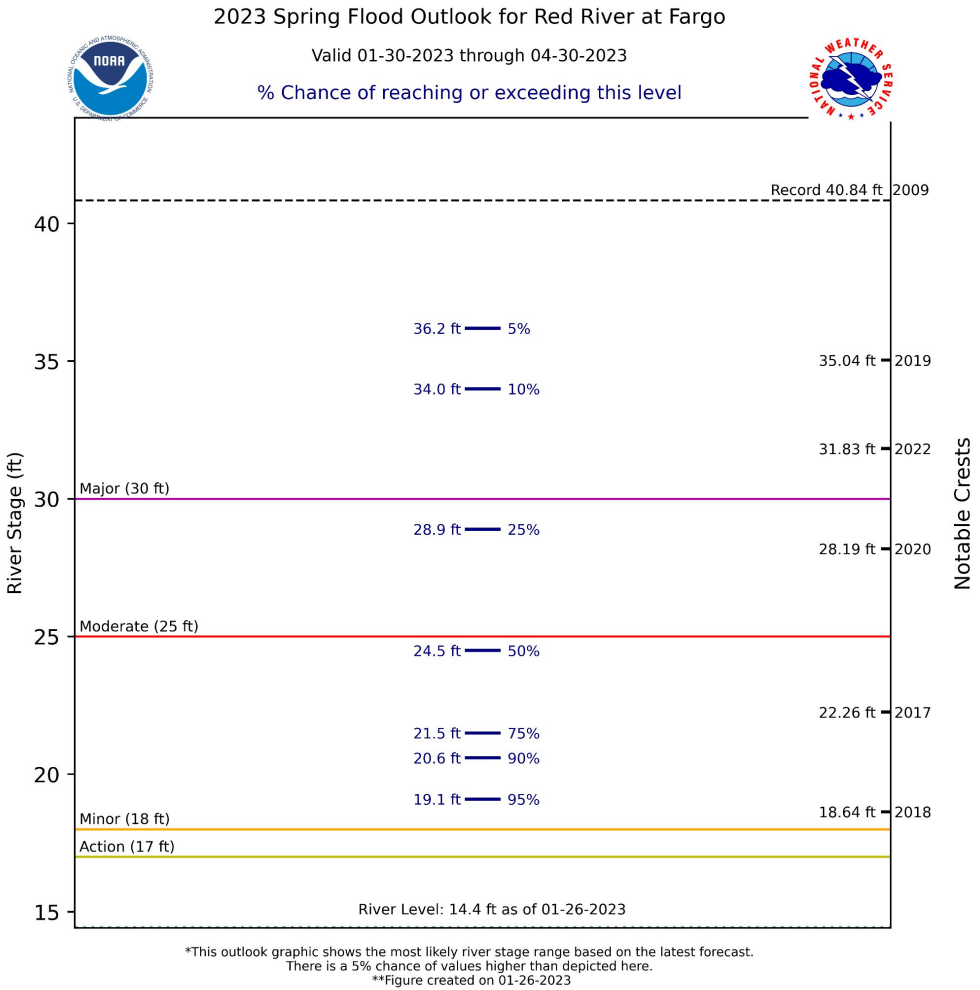
Please provide feedback!

amanda.lee@noaa.gov

or

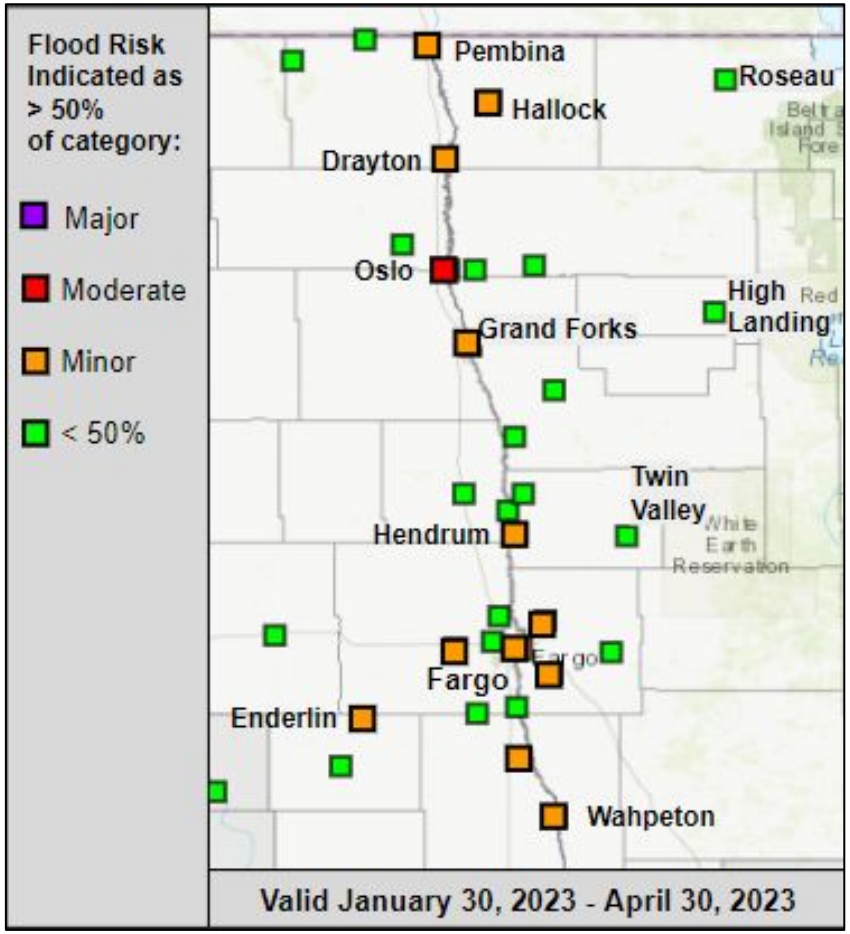
Survey link via website

www.weather.gov/fgf/PFOS



Key Message

The risk for significant (moderate or higher) spring flooding is relatively low with this outlook issuance, running slightly below long-term historical averages across the Red River Basin.



Key Points

- Minor to isolated moderate spring flooding (50% exceedance probability).
- Below normal soil moisture and near normal streamflows heading into freeze-up.
- Although January has been dry, early winter season storms brought above normal snowfall/precipitation (to date thus far).
- **As always: late winter snowfall, spring precipitation, and snowmelt timing/thaw cycle will be the most important factors for spring flooding.**

Upcoming 2023 Probabilistic Outlooks:

Thursday, February 9th
Thursday, February 23rd
Thursday, March 9th

Amanda Lee
Service Hydrologist
amanda.lee@noaa.gov