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PROBABILISTIC HYDROLOGIC OUTLOOK

NATIONAL WEATHER SERVICE EASTERN NORTH DAKOTA/GRAND FORKS ND

1100 AM CST Thu Feb 10 2022

...SPRING FLOOD AND WATER RESOURCES OUTLOOK...

...RED RIVER BASIN OUTLOOK FOR RIVER FLOOD POTENTIAL...

This outlook covers the Red River of the North
and its Minnesota and North Dakota tributaries.

...MINOR TO MODERATE FLOODING IS EXPECTED ACROSS THE RED RIVER OF THE
NORTH BASIN WITH ISOLATED LOW END MAJOR FLOODING...

* This 90-day outlook covers the period from 2/14/22 to 5/15/22.

.OUTLOOK SUMMARY...

* Probabilities for exceeding Major, Moderate, Minor Flood Stage...

Major Flooding...

There is a high risk (greater than 65 percent chance) of major
flooding at Pembina on the Red River.

There is a medium risk (35 to 65 percent chance) of major flooding at Fargo/Moorhead and Oslo on the Red River. In North Dakota, there is a medium risk of major flooding at Valley City, Kindred, the West Fargo Diversion, and Harwood on the Sheyenne River and Abercrombie on the Wild Rice River.

There is a low risk (less than 35 percent chance) of major flooding elsewhere across the basin.

Moderate Flooding...

There is a high risk (greater than 65 percent chance) of moderate flooding at Fargo/Moorhead, Grand Forks/East Grand Forks, Oslo, Drayton, and Pembina on the Red River. In North Dakota, there is a high risk of moderate flooding at Abercrombie on the Wild Rice River, Kindred and Harwood on the Sheyenne River, Enderlin on the Maple River, and Hillsboro on the Goose River.

There is a medium risk (35 to 65 percent chance) of moderate flooding at Wahpeton and Halstad on the Red River. In Minnesota, there is a medium risk of moderate flooding at Sabin on the South Branch Buffalo River, Dilworth on the Buffalo River, Hendrum on the Wild Rice River, Crookston on the Red Lake River, and Hallock on the Two Rivers River. In North Dakota, there is a medium risk of moderate flooding at Lisbon on the Sheyenne River and Mapleton on the Maple River.

There is a low risk (less than 35 percent chance) of moderate flooding elsewhere across the basin.

Minor Flooding...

There is a high risk (greater than 65 percent chance) of minor

flooding at Wahpeton and Halstad on the Red River. In Minnesota, there is a high risk of minor flooding at Sabin on the South Branch Buffalo River, Dilworth on the Buffalo River, Hendrum on the Wild Rice River, Crookston on the Red Lake River, and Hallock on the Two Rivers River. In North Dakota, there is a high risk of minor flooding at the West Fargo Diversion on the Sheyenne River, Mapleton on the Maple River, and Minto on the Forest river.

There is a medium risk (35 to 65 percent chance) of minor flooding at Hickson on the Red River. In Minnesota, there is a medium risk of minor flooding at Hawley on the Buffalo River, Climax on the Sand Hill River, and Alvarado on the Snake River.

There is a low risk (less than 35 percent chance) of minor flooding at Twin Valley on the Wild Rice River, Shelly on the Marsh River, High Landing on the Red Lake River, above Warren on the Snake River, and at Roseau on the Roseau River in Minnesota. In North Dakota, there is a low risk of minor flooding at Walhalla and Neche on the Pembina River.

.OUTLOOK DISCUSSION...

Hydrologic and climate conditions which affect each of the several factors that significantly determine the timing and magnitude of spring snowmelt flooding within the Red River of the North are discussed below:

* SNOWPACK CONDITIONS...

The current snowpack and associated water content is near to above normal. Since December 1, 2021, snowfall has been running near normal to above normal (roughly 90 to 130 percent of normal). This has been

the case for the majority of the basin this season. However, there is some unevenness of the snowpack due to numerous blowing snow and blizzard events over the course of the winter redistributing the snow on the ground.

* SOIL MOISTURE

At the time of freeze-up, soil moisture was generally near normal across the basin (just slightly above normal across the far south to slightly below normal across the far north). Timely precipitation last fall allowed for some recharging of the soil following months of drought conditions.

* FROST DEPTHS...

Current frost depth values are near normal to slightly deeper than normal in some locations. A fairly extended period of cold conditions throughout January and early February allowed for deep frost penetration in most areas. Frost depth values range from 12 to 40 inches across the basin with the deepest frost across the north and especially into northwestern Minnesota.

* RIVER FLOWS...

Base streamflows are near normal for this time of year. The Red River and most of its tributaries are currently flowing at 25 to 75 percent of normal. Slightly higher than normal flows are seen in the far southern basin with slightly lower than normal flows near the International border.

* RIVER ICE...

River ice and lake ice thicknesses are generally near normal due

to the extended period of cold conditions to start the new year.

* FACTORS YET TO BE DETERMINED...

- Further snowpack growth,
- Rate of snowmelt/thaw,
- Heavy rain on snow or frozen ground during thaw or peak flood,
- Heavy rain on ice-covered rivers causing short-term ice jams.

* SHORT TERM WEATHER FORECAST...

The next few weeks will bring a roller coaster of temperatures with likely minimal appreciative precipitation. Minor precipitation events (regarding precipitation amounts) will continue to come and go with sporadic strong winds lending to the potential for impactful blowing snow and reduced visibility.

* LONG TERM CLIMATE OUTLOOK...

Climate outlooks for the remainder of February indicate increased chances for above normal temperatures with equal chances for below, normal, or above precipitation. As we shift into the end of winter and into spring, climate outlooks for March, April, and May indicate equal chances for below, normal, or above temperatures and precipitation (i.e, no strong signal in any direction).

.NEXT SPRING FLOOD OUTLOOK...

The next 2022 spring flood outlook will be issued on Thursday, February 24, 2022.

.FLOOD OUTLOOK PROBABILITIES TABLES...

The following message has two sections: the first gives the current and normal/historical chances of river locations reaching their minor, moderate, and major flood category. The second gives the current chances of river locations rising above river stages listed.

...Red River Long-Range Probabilistic Outlook by Flood Category...

Valid from February 14, 2022 to May 15, 2022

In Table 1 below, the current (CS) and historical (HS), or normal, probabilities of exceeding minor, moderate, and major flood stages are listed for the valid time period.

CS values indicate the probability of reaching a flood category based on current conditions.

HS values indicate the probability of reaching a flood category based on historical, or normal, conditions.

When the value of CS is greater than HS, the probability of exceeding that level is higher than normal. When the value of CS is less than HS, the probability of exceeding that level is lower than normal.

...Table 1--Probabilities for Minor, Moderate, and Major Flooding

Valid Period: 02/14/2022 - 05/15/2022

: Current and Historical
: Chances of Exceeding
: Flood Categories
: as a Percentage (%)

Categorical :

Flood Stages (FT) : Minor Moderate Major

Location Minor Mod Major : CS HS CS HS CS HS

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Red River of the North.....

WHPETON	11.0	13.0	15.0	:	>95	56	51	28	18	16
HICKSON	30.0	34.0	38.0	:	48	27	14	13	<5	<5
FARGO	18.0	25.0	30.0	:	>95	81	91	39	56	26
HALSTAD	26.0	32.0	37.5	:	87	33	53	18	20	11
GRAND FORKS	28.0	40.0	46.0	:	>95	57	85	30	26	11
OSLO	26.0	30.0	36.0	:	>95	63	>95	56	61	18
DRAYTON	32.0	38.0	42.0	:	>95	45	90	32	28	13
PEMBINA	39.0	44.0	49.0	:	>95	52	>95	43	66	22

: Current and Historical
: Chances of Exceeding
: Flood Categories
: as a Percentage (%)

Categorical :

Flood Stages (FT) : Minor Moderate Major

Location Minor Mod Major : CS HS CS HS CS HS

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Minnesota Tributaries.....

Note: The Roseau numbers consider the flow through its diversion

SABIN	13.0	15.0	19.0	:	>95	57	47	16	<5	<5
HAWLEY	8.0	9.0	11.0	:	50	38	33	23	<5	<5
DILWORTH	13.0	20.0	26.0	:	>95	68	51	19	<5	<5
TWIN VALLEY	10.0	12.0	14.0	:	11	17	<5	<5	<5	<5

HENDRUM	20.0	28.0	32.0	:	94	51	51	19	<5	7
SHELLY	14.0	20.0	23.0	:	34	28	<5	11	<5	6
CLIMAX	20.0	25.0	30.0	:	63	23	28	12	10	8
HIGH LANDING	12.0	12.5	13.0	:	5	8	<5	<5	<5	<5
CROOKSTON	15.0	20.0	23.0	:	>95	46	52	24	20	10
ABOVE WARREN	67.0	71.0	75.0	:	10	8	<5	<5	<5	<5
ALVARADO	106.0	108.0	110.0	:	43	22	21	14	<5	<5
HALLOCK	802.0	806.0	810.0	:	>95	62	72	39	8	10
ROSEAU	16.0	18.0	19.0	:	23	21	7	13	<5	8

: Current and Historical
 : Chances of Exceeding
 : Flood Categories
 : as a Percentage (%)

Categorical :

Flood Stages (FT) : Minor Moderate Major

Location	Minor	Mod	Major	:	CS	HS	CS	HS	CS	HS
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North Dakota Tributaries.....

ABERCROMBIE	10.0	12.0	18.0	:	>95	40	90	34	37	19
VALLEY CITY	15.0	16.0	17.0	:	62	10	46	7	42	6
LISBON	15.0	17.0	19.0	:	64	11	40	10	31	7
KINDRED	16.0	19.0	20.5	:	95	20	70	11	43	10
WEST FARGO DVRSN	18.0	20.0	21.0	:	76	12	54	11	50	10
HARWOOD	84.0	86.0	91.0	:	89	26	84	21	45	10
ENDERLIN	9.5	12.0	14.0	:	>95	21	86	11	20	<5
MAPLETON	18.0	21.0	23.0	:	>95	34	64	16	12	5
HILLSBORO	10.0	13.0	16.0	:	>95	19	77	10	8	<5
MINTO	6.0	8.0	11.0	:	72	24	<5	7	<5	<5
WALHALLA	11.0	16.0	18.0	:	17	22	<5	<5	<5	<5
NECHE	18.0	19.0	20.5	:	32	27	22	25	13	20

LEGEND:

- CS = Conditional Simulation (Outlook for current conditions)
- HS = Historical Simulation (" " normal conditions)
- FT = Feet (above gage zero datum)

...Red River Long-Range Probabilistic Outlook by River Stage...

Valid from February 14, 2022 to May 15, 2022

LOCATION	95%	90%	75%	50%	25%	10%	05%

Red River of the North.....							
WHPETON	11.6	11.7	12.0	13.0	14.3	15.9	16.2
HICKSON	24.8	25.6	27.2	29.4	32.4	34.6	35.7
FARGO	24.0	25.2	27.2	30.9	33.9	35.9	38.3
HALSTAD	23.6	24.7	28.7	32.9	36.6	38.7	39.1
GRAND FORKS	36.8	38.7	41.8	44.4	46.1	49.2	50.6
OSLO	34.0	34.4	35.3	36.3	37.1	38.4	39.0
DRAYTON	36.8	38.0	39.8	41.1	42.2	42.9	43.6
PEMBINA	45.4	45.9	48.0	50.3	52.0	52.7	53.0
Minnesota Tribs:	95%	90%	75%	50%	25%	10%	05%

South Fork Buffalo River.....							
SABIN	13.4	13.9	14.5	15.0	15.7	16.5	17.6
Buffalo River.....							
HAWLEY	6.0	6.5	7.3	8.0	9.3	10.1	10.5
DILWORTH	15.4	16.4	18.5	20.1	21.6	22.8	23.8

Wild Rice River.....							
TWIN VALLEY	5.7	6.0	6.6	7.6	9.2	10.2	11.2
HENDRUM	19.9	21.9	24.4	28.1	30.3	31.6	32.0
Marsh River.....							
SHELLY	9.1	9.6	10.7	12.3	15.6	17.2	18.6
Sand Hill River.....							
CLIMAX	14.8	15.8	18.5	22.8	26.1	30.1	31.2
Red Lake River.....							
HIGH LANDING	6.8	7.1	8.3	9.4	10.9	11.8	12.1
CROOKSTON	15.5	16.6	18.3	20.4	22.5	26.6	31.0
Snake River.....							
ABOVE WARREN	63.7	63.9	64.2	65.1	65.9	67.0	68.5
ALVARADO	101.3	101.9	103.0	105.3	107.4	108.6	109.3
Two Rivers River.....							
HALLOCK	804.1	804.6	805.8	807.5	808.6	809.4	810.4
Roseau River..... considering the flow through the Roseau diversion							
ROSEAU	11.7	12.1	13.3	14.6	15.6	17.4	18.1
North Dakota Tribs: 95% 90% 75% 50% 25% 10% 05%							

Wild Rice River.....							
ABERCROMBIE	10.1	11.9	14.1	16.9	19.8	23.2	24.6
Sheyenne River.....							
VALLEY CITY	12.2	12.6	13.4	15.8	19.2	22.1	23.0
LISBON	12.6	13.1	14.6	16.0	19.4	22.5	24.1
KINDRED	15.9	16.8	18.5	20.3	21.2	21.2	21.2
WEST FARGO DVRSN	15.7	17.2	18.0	21.1	21.3	21.3	21.3
HARWOOD	83.7	83.8	87.9	90.7	91.5	92.1	92.2
Maple River.....							
ENDERLIN	11.3	11.6	12.2	12.7	13.7	14.5	15.2
MAPLETON	19.2	19.5	20.5	21.7	22.4	23.3	23.9
Goose River.....							

HILLSBORO	10.4	11.4	13.1	13.9	14.9	15.8	16.4
Forest River.....							
MINTO	5.1	5.4	5.8	6.8	7.2	7.8	7.9
Pembina River.....							
WALHALLA	5.3	5.5	6.6	8.0	10.1	13.0	13.8
NECHE	9.7	10.3	11.8	15.3	18.6	21.3	21.4

.THE OUTLOOK PRODUCTION PROCESS...

This long range probabilistic outlook is based on a series of peak river levels or crests taken from the forecast hydrograph results of the NWS Community Hydrologic Prediction System (CHPS). The model is run for multiple scenarios starting at current river levels and soil conditions using 69 years (1949-2018) of past precipitation and temperature conditions that were experienced for those past years during the time-frame of the outlook period. These crests can then be ranked from lowest to highest and assigned an exceedance probability. For example, for a series of 50 years, the lowest ranked crest has 49 crests above it and since 95 percent of the crests are above it, it is assigned a 95 percent probability of exceedance (POE).

A YouTube video on "How to Interpret River Outlook Products" is at:

www.youtube.com/watch?v=pSoEgvsnpv4

The probabilities can be used for risk management by using them as an indication of the range of crests that may be expected during the valid period of the outlook. By providing a range of peak river level probabilities, the NWS is contributing to the area's Decision Support Services that help with long-range flood planning and response readiness. This outlook is a part of NOAA's National

Weather Service's AHPS (Advanced Hydrologic Prediction Services).

.ADDITIONAL INFORMATION SOURCES...

The AHPS Long-Range Probabilistic Hydrologic Outlooks are issued each month typically between the first and second Friday after mid-month. However, Spring Flood and Water Resources Outlooks are issued several times leading up to the spring melt period, usually on Thursdays beginning in late February or early March and ending in early April, depending on the spring flooding conditions.

This outlook is also presented as graphs of the probability of stage exceedance for the full period and for weekly intervals during the period. These graphs, along with explanations for interpreting them, are available from the NWS Grand Forks AHPS web page:

www.weather.gov/grandforks or weather.gov/fgf

then click on the "Rivers and Lakes" tab above the map.

Current river conditions for all river forecast points in the Red River of the North and Devils/Stump Lake basins are also available on our website, as well as 7-day forecasts when river levels at forecast points are in or near flood.

Additional Probabilistic Hydrologic Outlooks will be issued monthly throughout the rest of the year during the later part of the month or as conditions warrant.

Refer to the separate Devils Lake Probabilistic Hydrologic Outlook for Devils and Stump Lakes Probability of Exceedance levels and low-water non-exceedance levels.

If you have any questions, contact the NWS at 701-772-0720.

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