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PROBABILISTIC HYDROLOGIC OUTLOOK
NATIONAL WEATHER SERVICE EASTERN NORTH DAKOTA/GRAND FORKS ND
412 PM CST Thu Jan 23 2020

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

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

...HIGH RISK OF MAJOR FLOODING THIS SPRING ALONG THE MAINSTEM RED
RIVER WITH WIDESPREAD MINOR TO MODERATE FLOODING ALONG THE
TRIBUTARIES...

This outlook covers the period from January 27, 2020 to May 19,
2020. Note that this period has been extended to encompass the
entirety of the spring flood season.

.OUTLOOK SUMMARY...

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

Major Flooding...

There is a high risk (greater than 65 percent) of major flooding
at Fargo/Moorhead, Halstad, Grand Forks/East Grand Forks, Oslo,
Drayton, and Pembina on the Red River. In North Dakota, there is a
high risk of major flooding at Valley City, Kindred, the West Fargo
Diversion, and Harwood on the Sheyenne River and at Abercrombie on
the Wild Rice River. In Minnesota, there is not a high risk of major
flooding at any forecast points with this outlook issuance.

There is a medium risk (35 to 65 percent) of major flooding at
Wahpeton/Breckenridge on the Red River. In North Dakota, there is a
medium risk of major flooding at Lisbon on the Sheyenne River,
Mapleton on the Maple River, and Neche on the Pembina River. In
Minnesota, there is a medium risk of major flooding at Hendrum on the
Wild Rice River, Climax on the Sand Hill River, and at High Landing
and Crookston on the Red Lake River.

There is a low risk (less than 35 percent) of major flooding
throughout the remainder of the basin with this outlook issuance.

Moderate Flooding...

There is a high risk (greater than 65 percent) of moderate
flooding at Wahpeton/Breckenridge on the Red River. In North Dakota,
there is a high risk of moderate flooding at Lisbon on the Sheyenne
River, Enderlin and Mapleton on the Maple River, Hillsboro on the
Goose River, and Neche on the Pembina River. In Minnesota, there is a

high risk of moderate flooding at Sabin on the South Branch of the Buffalo River, Hawley and Dilworth on the Buffalo River, Hendrum on the Wild Rice River, Climax on the Sand Hill River, Crookston on the Red Lake River, Alvarado on the Snake River, and Hallock on the Two Rivers River.

There is a medium risk (35 to 65 percent) of moderate flooding at Hickson on the Red River. In Minnesota, there is a medium risk of moderate flooding at Twin Valley on the Wild Rice River, Shelly on the Marsh River, and High Landing on the Red Lake River.

Minor Flooding...

There is a high risk (greater than 65 percent) of minor flooding at Minto on the Forest River and Walhalla on the Pembina River. There is a medium risk (35 to 65 percent) of minor flooding at Roseau on the Roseau River and Grafton* on the Park River. There is a low risk of minor flooding near Warren on the Snake River.

*Note: With the recent completion of the Grafton Bypass, river flows will be divided between the main channel and the diversion. This will significantly reduce the impact on the City of Grafton and surrounding areas protected by the diversion, and the in town river gage at Grafton is not likely to reach the stages depicted here. However, locations outside the protection of the diversion still have the depicted risk probability associated with historic levels on the Grafton gage.

.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 above normal. Since December 1, 2019, snowfall has been much above average (roughly 150 to 300 percent of normal). This has been the case for much of the basin with the exception of far northeastern ND and northwestern MN. The current water content of the snow ranges from 2.5 to 5.0 inches which are values usually seen closer to snowmelt (i.e., running high for this point in the winter).

* SOIL MOISTURE...

At the time of freeze-up, soil moisture was well above normal across much of the basin due to record precipitation during the fall. Some locations even had standing water frozen into some ditches.

* FROST DEPTHS...

Current frost depth values are shallower than normal due to early and persistent snowcover this winter. The far southern valley currently reports frost depth values of 6 to 12 inches while most

locations north of Fargo range from 14 to 30 inches.

* RIVER FLOWS...

Base streamflows are much above normal, even nearing record levels for this time of year due to the record wet fall. The Red River and most tributaries (mainly south of Oslo) are currently flowing at the 95th percentile or greater. Further north, flows are in the 76th to 95th percentiles.

* RIVER ICE...

River ice and lake ice thicknesses are currently less than normal and quite variable across the region.

* 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 continue to see a slight warm up with temperatures trending towards above normal values (possibly pushing above freezing for some locations for brief periods). Quiet weather conditions also look to continue for the next week.

* LONG TERM OUTLOOK...

Climate outlooks for February, March, and April indicate the potential for near to slightly above precipitation with below normal temperatures.

.NEXT SPRING FLOOD OUTLOOK...

The next 2020 spring flood outlook will be issued on Thursday, February 13, 2020.

.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 January 27, 2020 to May 19, 2020

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 more 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: 01/27/2020 - 05/19/2020

Location	Categorical			: Current and Historical : Chances of Exceeding : Flood Categories : as a Percentage (%)					
	Flood Stages (FT)			: Minor		: Moderate		: Major	
	Minor	Mod	Major	CS	HS	CS	HS	CS	HS
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Red River of the North.....									
WAHPETON	11.0	13.0	15.0	>95	57	79	28	36	13
HICKSON	30.0	34.0	38.0	78	25	40	11	<5	<5
FARGO	18.0	25.0	30.0	>95	81	>95	39	94	24
HALSTAD	26.0	32.0	37.5	>95	33	95	18	81	11
GRAND FORKS	28.0	40.0	46.0	>95	57	>95	31	80	11
OSLO	26.0	30.0	36.0	>95	62	>95	56	>95	26
DRAYTON	32.0	38.0	42.0	>95	47	>95	32	82	11
PEMBINA	39.0	44.0	49.0	>95	53	>95	43	>95	23

Location	Categorical			: Current and Historical : Chances of Exceeding : Flood Categories : as a Percentage (%)					
	Flood Stages (FT)			: Minor		: Moderate		: Major	
	Minor	Mod	Major	CS	HS	CS	HS	CS	HS
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Minnesota Tributaries.....									
SABIN	13.0	15.0	19.0	>95	51	>95	14	8	<5
HAWLEY	8.0	9.0	11.0	>95	35	91	24	18	<5
DILWORTH	13.0	20.0	26.0	>95	66	>95	19	7	<5
TWIN VALLEY	10.0	12.0	14.0	81	17	50	6	14	<5
HENDRUM	20.0	28.0	32.0	>95	51	95	21	63	6
SHELLY	14.0	20.0	23.0	94	30	39	11	8	<5
CLIMAX	20.0	25.0	30.0	>95	24	88	12	52	7
HIGH LANDING	12.0	12.5	13.0	66	18	56	17	37	13
CROOKSTON	15.0	20.0	23.0	>95	50	87	27	56	12
ABOVE WARREN	67.0	71.0	75.0	31	15	5	<5	<5	<5
ALVARADO	106.0	108.0	110.0	95	19	67	15	10	<5
HALLOCK	802.0	806.0	810.0	>95	60	84	42	9	9
ROSEAU	16.0	18.0	19.0	45	21	27	14	<5	8

Location	Categorical Flood Stages (FT)			: Current and Historical Chances of Exceeding Flood Categories as a Percentage (%)					
	Minor	Mod	Major	Minor		Moderate		Major	
				CS	HS	CS	HS	CS	HS
Note: The Roseau numbers consider the flow thru its diversion									
North Dakota Tributaries.....									
ABERCROMBIE	10.0	12.0	18.0	>95	36	>95	32	92	18
VALLEY CITY	15.0	16.0	17.0	94	9	85	7	74	<5
LISBON	15.0	17.0	19.0	94	10	80	8	53	6
KINDRED	16.0	19.0	20.5	>95	18	>95	10	82	9
WEST FARGO DVRSN	18.0	20.0	21.0	>95	10	93	10	90	9
HARWOOD	84.0	86.0	91.0	>95	23	>95	22	94	11
ENDERLIN	9.5	12.0	14.0	>95	24	88	9	21	<5
MAPLETON	18.0	21.0	23.0	>95	32	>95	16	38	6
HILLSBORO	10.0	13.0	16.0	95	15	77	9	11	<5
MINTO	6.0	8.0	11.0	70	21	22	8	<5	<5
GRAFTON	12.0	13.5	14.5	39	22	25	8	18	6
WALHALLA	11.0	16.0	18.0	70	19	<5	<5	<5	<5
NECHE	18.0	19.0	20.5	88	28	83	26	57	19

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 January 27, 2020 to May 19, 2020

LOCATION	95%	90%	75%	50%	25%	10%	05%
Red River of the North.....							
WAHPETON	11.9	12.3	13.1	14.2	15.7	17.4	17.5
HICKSON	26.6	27.6	30.4	32.8	34.7	36.4	36.9
FARGO	27.6	31.9	34.1	35.9	37.6	39.6	40.6
HALSTAD	31.5	36.1	38.0	39.0	39.7	40.2	40.8
GRAND FORKS	43.4	44.6	46.6	48.8	51.2	53.1	55.4
OSLO	36.7	37.0	37.4	37.8	37.9	38.0	38.1
DRAYTON	40.7	41.3	42.4	43.2	44.4	45.1	45.6
PEMBINA	50.0	50.5	52.1	53.0	54.0	54.6	54.9
Minnesota Tribs:							
South Fork Buffalo River.....							
SABIN	15.0	15.6	16.1	16.8	17.8	18.5	19.7
Buffalo River.....							
HAWLEY	8.5	9.1	9.7	10.2	10.8	11.2	11.9
DILWORTH	20.8	22.0	22.9	23.6	24.7	25.2	26.7

Wild Rice River.....							
TWIN VALLEY	8.8	9.4	10.5	12.0	13.1	14.6	15.2
HENDRUM	28.0	29.8	31.2	32.3	32.8	33.6	34.5
Marsh River.....							
SHELLY	13.2	14.8	17.4	19.2	21.3	22.5	24.0
Sand Hill River.....							
CLIMAX	21.2	24.4	28.2	30.5	33.2	35.5	37.0
Red Lake river.....							
HIGH LANDING	9.7	10.4	11.4	12.8	13.1	13.3	13.5
CROOKSTON	19.3	19.7	21.5	24.0	25.5	28.2	28.5
Snake River.....							
ABOVE WARREN	65.1	65.3	65.5	66.3	67.5	69.8	71.4
ALVARADO	105.9	106.6	107.8	109.2	109.6	110.0	110.9
Two Rivers River.....							
HALLOCK	804.5	805.3	807.0	807.8	808.6	809.7	810.3
Roseau River..... considering the flow thru the Roseau diversion.							
ROSEAU	12.7	13.7	14.9	15.6	18.1	18.4	18.8

North Dakota Tribs:	95%	90%	75%	50%	25%	10%	05%
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Wild Rice River.....							
ABERCROMBIE	16.8	19.3	22.0	24.2	25.7	27.6	28.5
Sheyenne River.....							
VALLEY CITY	13.8	15.3	16.8	19.6	21.8	24.4	27.4
LISBON	14.9	15.6	17.3	19.4	22.8	27.4	30.5
KINDRED	19.6	20.2	20.8	21.2	21.2	21.2	21.2
WEST FARGO DVRSN	19.3	20.9	21.3	21.3	21.3	21.3	21.3
HARWOOD	90.3	91.2	91.6	92.0	92.1	92.2	92.3
Maple River.....							
ENDERLIN	11.0	11.8	12.6	13.1	13.7	14.5	15.0
MAPLETON	21.5	22.1	22.4	22.8	23.3	23.9	24.1
Goose River.....							
HILLSBORO	9.9	11.8	13.2	14.0	14.9	16.0	17.1
Forest River.....							
MINTO	4.6	5.2	5.7	6.7	7.5	9.0	9.2
Park River.....							
GRAFTON*	10.0	10.2	10.8	11.4	13.5	15.3	15.8
Pembina River.....							
WALHALLA	8.9	9.5	10.9	12.1	14.1	15.5	15.8
NECHE	16.4	17.3	19.7	20.9	21.4	21.5	21.6

*Note: With the recent completion of the Grafton Bypass, river flows will be divided between the main channel and the diversion. This will significantly reduce the impact on the City of Grafton and surrounding areas protected by the diversion, and the in town river gage at Grafton is not likely to reach the stages depicted here. However, locations outside the protection of the diversion still have the depicted risk probability associated with historic levels on the Grafton gage.

.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, low and

soil conditions and using over 60 years 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 then be 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).

This outlook was produced using precipitation and temperatures for the years 1949 through 2012.

.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 during the critical 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...together with explanations that help in interpreting them are available from the NWS Grand Forks AHPS web page on the Internet at:

www.weather.gov/grandforks OR weather.gov/fgf

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

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

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

Also...7-day deterministic forecasts will be issued at least once a day when the river forecast locations will be in flood during that period.

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.

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