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PROBABILISTIC HYDROLOGIC OUTLOOK
NATIONAL WEATHER SERVICE EASTERN NORTH DAKOTA/GRAND FORKS ND
159 PM CST Thu Feb 21 2019

...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.

...HIGH RISK OF MODERATE...WITH ISOLATED MAJOR...FLOODING FOR MUCH OF
THE RED RIVER BASIN...

.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 Oslo and Pembina on the Red River.

There is a medium risk (35 to 65 percent) of major flooding at
Fargo/Moorhead on the Red River and at Abercrombie ND on the Wild
Rice River.

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

Moderate Flooding...

There is a high risk 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 Harwood
on the Sheyenne River. In Minnesota, there is a high risk of moderate
flooding at Hendrum on the Wild Rice River and at Hallock on the Two
Rivers River.

There is a medium risk of moderate flooding at Halstad on the Red
River. In North Dakota, there is a medium risk of moderate flooding
at Mapleton on the Maple River, and at Minto on the Forest River. In
Minnesota, there is a medium risk of moderate flooding at Hawley and
Dilworth on the Buffalo River and at Crookston on the Red Lake River.

There is a low risk (less than 35 percent) of moderate flooding
throughout the remainder of the basin.

Minor Flooding...

In North Dakota, there is a low risk (less than 35 percent) of minor flooding at Valley City and Lisbon on the Sheyenne River and at Walhalla and Neche on the Pembina River. In Minnesota, there is a low risk of minor flooding at Warren on the Snake River and at Roseau on the Roseau River. Otherwise, there is a medium to high risk of minor flooding for the remainder of the Red River basin.

* This 90-day outlook covers the period from February 25, 2019 to May 26, 2019.

.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...

Due to recent snowfall (record February snowfall for some locations), snowpack conditions have increased substantially since the last outlook issuance. The current snowpack across the basin is now considered above normal, especially east of the Red River into northwestern Minnesota. Liquid water within the snowpack is near to slightly above normal (generally two to four inches) for most locations. Much of the snowfall the region has received occurred with very cold temperatures allowing the snow to hold less moisture than if temperatures were warmer and closer to the freezing mark.

* SOIL MOISTURE AND FROST DEPTHS...

At the time of freeze-up, soil moisture was above normal across southern portions of the basin, decreasing northward up the valley to below normal near the International border. Frost depths are slightly deeper than normal due to the recent colder than normal conditions and lack of early deep snow cover. Deeper frost depths may lead to greater potential for significant runoff if the spring warmup/snowmelt occurs quickly and/or is accompanied by rainfall and/or additional snowfall.

* RIVER FLOWS...

Base streamflows range from near normal across the north to above normal in southern portions of the basin (pushing much above normal in the far south).

* FACTORS YET TO BE DETERMINED...

- Further snowpack growth
- Rate and timing 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

* WEATHER OUTLOOK...

The active weather pattern is expected to continue for the near term before trending back towards a more normal pattern. Current projections are for the cold conditions to continue with below normal temperatures expected to persist into mid-March.

.NEXT SPRING FLOOD OUTLOOK...

The next flood outlook will be released on Thursday, March 7, 2019.

.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 categories; the second gives the current chances of river locations rising above the river stages listed.

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

Valid from February 25, 2019 to May 26, 2019

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: 02/25/2019 - 05/26/2019

Location	Categorical			: Current and Historical						
	Flood Stages (ft)			: Chances of Exceeding						
	Minor	Mod	Major	: Flood Categories						
				: as a Percentage (%)						
				Minor	Moderate	Major				
				CS	HS	CS	HS	CS	HS	
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Red River of the North.....										
WAHPETON	11.0	13.0	15.0	>95	56	34	27	14	13	
HICKSON	30.0	34.0	38.0	36	25	12	12	<5	<5	
FARGO	18.0	25.0	30.0	>95	81	94	40	62	26	
HALSTAD	26.0	32.0	37.5	94	35	63	18	24	11	
GRAND FORKS	28.0	40.0	46.0	>95	57	>95	31	32	11	
OSLO	26.0	30.0	36.0	>95	62	>95	56	87	26	
DRAYTON	32.0	38.0	42.0	>95	50	>95	36	34	13	
PEMBINA	39.0	44.0	49.0	>95	56	>95	43	76	23	

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

Categorical :

Location	Flood Stages (ft)			Minor		Moderate		Major	
	Minor	Mod	Major	CS	HS	CS	HS	CS	HS

Minnesota Tributaries.....									
SABIN	13.0	15.0	19.0	>95	39	32	15	<5	<5
HAWLEY	8.0	9.0	11.0	66	36	40	23	<5	<5
DILWORTH	13.0	20.0	26.0	>95	66	57	20	<5	<5
TWIN VALLEY	10.0	12.0	14.0	84	17	32	6	10	<5
HENDRUM	20.0	28.0	32.0	>95	53	71	22	16	6
SHELLY	14.0	20.0	23.0	68	30	14	11	<5	<5
CLIMAX	20.0	25.0	30.0	70	24	34	12	12	7
HIGH LANDING	12.0	12.5	13.0	39	18	26	17	13	13
CROOKSTON	15.0	23.0	25.0	>95	44	41	11	20	8
ABOVE WARREN	67.0	71.0	75.0	15	14	<5	<5	<5	<5
ALVARADO	106.0	108.0	110.0	37	18	14	15	<5	<5
HALLOCK	802.0	806.0	810.0	>95	60	86	42	9	9
ROSEAU	16.0	18.0	19.0	27	18	<5	7	<5	<5

Note: The Roseau numbers consider the flow thru its diversion

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

Location	Flood Stages (ft)			Minor		Moderate		Major	
	Minor	Mod	Major	CS	HS	CS	HS	CS	HS

North Dakota Tributaries.....									
ABERCROMBIE	10.0	12.0	18.0	>95	36	>95	33	53	20
VALLEY CITY	15.0	16.0	17.0	21	10	14	9	9	<5
LISBON	15.0	17.0	19.0	22	10	12	8	7	6
KINDRED	16.0	19.0	20.5	78	19	32	10	15	9
WEST FARGO DVRSN	18.0	20.0	21.0	37	11	21	10	19	9
HARWOOD	84.0	86.0	91.0	92	24	84	22	31	10
ENDERLIN	9.5	12.0	14.0	94	21	27	10	<5	<5
MAPLETON	18.0	21.0	23.0	>95	34	60	16	7	<5
HILLSBORO	10.0	13.0	16.0	59	15	25	9	6	<5
MINTO	6.0	8.0	11.0	>95	32	49	11	<5	<5
GRAFTON	12.0	13.5	14.5	39	22	28	8	21	6
WALHALLA	11.0	16.0	18.0	14	19	<5	<5	<5	<5
NECHE	18.0	19.0	20.5	22	28	19	26	6	19

LEGEND:

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

...Table 2--Long-Range Probabilistic Outlook by River Stage...
Valid Period: 02/25/2019 - 05/26/2019

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

Red River of the North.....							
WAHPETON	11.3	11.5	11.8	12.2	14.1	15.5	16.5

HICKSON	23.3	24.7	26.2	28.6	31.8	34.5	35.7
FARGO	24.7	26.1	28.8	31.0	33.7	36.1	36.9
HALSTAD	25.6	27.0	30.8	33.5	37.4	39.0	39.2
GRAND FORKS	41.0	41.6	42.9	44.3	46.9	49.6	51.2
OSLO	35.5	35.8	36.4	36.9	37.4	37.8	37.9
DRAYTON	39.7	40.1	40.6	41.4	42.5	43.2	44.1
PEMBINA	46.9	47.7	49.1	50.6	52.0	52.8	53.6

Minnesota Tribs:	95%	90%	75%	50%	25%	10%	05%
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South Fork Buffalo River.....							
SABIN	13.4	13.6	13.9	14.6	15.2	16.4	18.3
Buffalo River.....							
HAWLEY	7.0	7.4	7.7	8.4	9.5	10.3	10.7
DILWORTH	17.0	17.5	18.6	20.3	21.8	22.7	24.3
Wild Rice River.....							
TWIN VALLEY	9.3	9.8	10.3	11.3	12.7	14.0	15.5
HENDRUM	24.6	25.4	27.4	29.7	31.4	32.5	32.9
Marsh River.....							
SHELLY	11.8	12.3	13.2	15.4	17.7	20.6	21.9
Sand Hill River.....							
CLIMAX	15.9	16.8	19.9	22.7	26.2	30.4	33.0
Red Lake River.....							
HIGH LANDING	8.8	9.4	10.2	11.3	12.6	13.2	13.2
CROOKSTON	17.0	17.9	19.6	21.7	24.2	27.7	29.7
Snake River.....							
ABOVE WARREN	63.8	63.9	64.4	65.3	66.1	67.6	69.5
ALVARADO	101.9	102.1	103.2	105.2	107.2	109.1	109.8
Two Rivers River.....							
HALLOCK	805.1	805.3	806.6	807.9	809.0	809.8	810.3
Roseau River..... considering the flow thru the Roseau diversion							
ROSEAU	12.2	12.8	13.4	14.3	16.1	16.9	17.8

North Dakota Tribs:	95%	90%	75%	50%	25%	10%	05%
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Wild Rice River.....							
ABERCROMBIE	12.7	13.9	16.6	18.7	20.7	23.4	24.0
Sheneye River.....							
VALLEY CITY	11.4	11.9	12.4	12.8	14.5	16.9	19.6
LISBON	11.3	12.0	12.6	13.2	14.6	17.8	23.0
KINDRED	14.8	15.3	16.1	17.6	19.7	20.7	21.2
WEST FARGO DVRSN	15.1	15.1	16.1	17.2	19.3	21.3	21.3
HARWOOD	83.1	85.1	87.5	89.7	91.2	92.0	92.2
Maple River.....							
ENDERLIN	9.5	9.6	10.5	11.0	12.2	13.0	13.7
MAPLETON	19.8	20.2	20.7	21.2	22.2	22.7	23.4
Goose River.....							
HILLSBORO	6.7	7.1	8.8	10.8	12.9	14.7	16.7
Forest River.....							
MINTO	6.0	6.7	7.4	8.0	8.8	9.8	10.0
Park River.....							
GRAFTON	9.8	9.9	10.3	11.0	13.9	15.7	17.0
Pembina River.....							
WALHALLA	5.1	5.3	6.3	7.0	8.5	11.5	11.9
NECHE	8.7	9.4	10.9	12.6	16.7	20.3	20.6

.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, snow, and soil conditions using over 60 years of past precipitation and temperature conditions that were experienced for those past years during the timeframe 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. 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 Impact-Based 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 Advanced Hydrologic Prediction Services (AHPS).

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

.ADDITIONAL INFORMATION SOURCES...

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 at:

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

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

Current river conditions for all river forecast points in the Red River of the North and Devils/Stump Lake basins are available on our web site. Also, 7-day deterministic forecasts will be issued at least once a day when river forecast locations will be at or above flood during that period.

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

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