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Probabilistic Hydrologic Outlook
National Weather Service Eastern North Dakota/Grand Forks ND
1055 AM CDT Thu Mar 22 2018

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

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

.OUTLOOK SUMMARY...

The threat for significant (moderate to major) snowmelt flooding remains low across the main-stem Red River and its tributaries. Current conditions and expectations into late April now indicate minor to low moderate flooding (generally near long term averages) as the predominant risk.

Major Flooding...

There is a low risk (less than 35 percent chance) of major flooding at all forecast points across the Red River basin.

Moderate Flooding...

There is a high risk (greater than 65 percent chance) of moderate flooding at Oslo MN on the Red River and Hallock MN on the Two Rivers River. There is a medium risk (35 to 65 percent chance) of moderate flooding at Abercrombie ND on the Wild Rice River and at Fargo, Drayton, and Pembina on the Red River. Elsewhere, there is a low risk (less than 35 percent chance) of moderate flooding.

Minor Flooding...

There is a high risk (greater than 65 percent chance) of minor flooding at Fargo, Grand Forks, Oslo, Drayton, and Pembina on the Red River, along with Abercrombie ND on the Wild Rice River, Sabin MN on the South Branch Buffalo River, Dilworth MN on the Buffalo River, Crookston MN on the Red Lake River, Hallock MN on the Two Rivers River, and Minto ND on the Park River. There is a medium risk (35 to 65 percent chance) of minor flooding at Wahpeton and Halstad on the Red River, along with Hendrum MN on the Wild Rice River, Enderlin ND on the Maple River, and Hillsboro ND on the Goose River. Elsewhere, this is a low risk (less than 35 percent chance) of minor flooding.

.OUTLOOK DISCUSSION...

Abnormally dry conditions have steadily diminished across most of the area and should continue to improve. The early spring period

should start with temperatures continuing to be below normal but trend to near normal by late April, in addition to somewhat above normal moisture.

Snowpack and snow water content is now near normal in most areas thanks to recent precipitation. Snowpack and associated snow water content remains least across the far southern Red River Valley and far northeastern ND with the highest across east central ND and into far northwestern MN (6 to 22 inches of snowpack holding two to five inches of water).

Base streamflow remains near normal while soil moisture remains near to well below normal due to dry conditions last summer and fall (prior to freeze-up). Frost depths are slightly lower than normal and range from 40 to 50 inches across the area.

.CHANGES FROM PREVIOUS OUTLOOK...

Changes from the previous outlook include moderate increases at points along the Red River with slight increases at some points along the tributaries. While minor to low moderate flooding is possible, the main message is that the threat for significant (moderate to major) snowmelt flooding remains low across the main-stem Red River and its tributaries.

.NEXT OUTLOOK...

The next monthly hydrologic outlook will be issued by Thursday, April 26th.

The following message has three river data sections:

- The first (Table 1) gives the current and normal/historical chances of river locations reaching their minor, moderate, and major flood categories.
- The second (Table 2) gives the current chances of river locations rising above the river stages listed.
- The third (Table 3) gives the current chances of river locations falling below the river stages listed.

.Red River Long-Range Probabilistic Outlook by Flood Category... Valid from March 25, 2018 to June 23, 2018.

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: 03/25/2018 - 06/23/2018

Location	Categorical			: Current and Historical								
	Flood Stages (ft)			: Chances of Exceeding								
	Minor	Mod	Major	: Flood Categories		: as a Percentage (%)						
	Minor	Mod	Major	Minor	Moderate	Major	CS	HS	CS	HS	CS	HS
Red River of the North.....												
WAHPETON	11.0	13.0	15.0	: 60	61	30	35	6	15			
HICKSON	30.0	34.0	38.0	: 20	30	5	14	<5	<5			
FARGO	18.0	25.0	30.0	: 92	82	45	42	17	27			
HALSTAD	26.0	32.0	37.5	: 35	37	11	20	<5	11			
GRAND FORKS	28.0	40.0	46.0	: 93	57	34	34	6	11			
OSLO	26.0	30.0	36.0	: >95	65	92	56	17	21			
DRAYTON	32.0	38.0	42.0	: 82	50	44	35	6	12			
PEMBINA	39.0	44.0	49.0	: 87	56	54	43	21	23			

Location	Categorical			: Current and Historical								
	Flood Stages (ft)			: Chances of Exceeding								
	Minor	Mod	Major	: Flood Categories		: as a Percentage (%)						
	Minor	Mod	Major	Minor	Moderate	Major	CS	HS	CS	HS	CS	HS
Minnesota Tributaries.....												
SABIN	13.0	15.0	19.0	: 70	51	11	17	<5	<5			
HAWLEY	8.0	9.0	11.0	: 28	36	12	23	<5	<5			
DILWORTH	13.0	20.0	26.0	: 82	69	16	20	<5	<5			
TWIN VALLEY	10.0	12.0	14.0	: 5	17	<5	6	<5	<5			
HENDRUM	20.0	28.0	32.0	: 57	56	16	24	<5	6			
SHELLY	14.0	20.0	23.0	: 28	28	<5	11	<5	<5			
CLIMAX	20.0	25.0	30.0	: 14	26	<5	12	<5	7			
HIGH LANDING	12.0	12.5	13.0	: 9	18	6	17	<5	13			
CROOKSTON	15.0	23.0	25.0	: 77	51	13	11	<5	8			
ABOVE WARREN	67.0	71.0	75.0	: 14	13	<5	<5	<5	<5			
ALVARADO	106.0	108.0	110.0	: 25	21	11	15	<5	<5			
HALLOCK	802.0	806.0	810.0	: >95	60	85	43	7	11			
ROSEAU	16.0	18.0	19.0	: 14	20	<5	8	<5	<5			

Note: The Roseau numbers consider the flow thru its diversion

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

Location	Categorical			Minor		Moderate		Major	
	Minor	Mod	Major	CS	HS	CS	HS	CS	HS
North Dakota Tributaries.....									
ABERCROMBIE	10.0	12.0	18.0	77	42	60	38	19	20
VALLEY CITY	15.0	16.0	17.0	6	10	5	9	<5	<5
LISBON	15.0	17.0	19.0	16	10	10	8	6	6
KINDRED	16.0	19.0	20.5	26	19	15	10	7	9
WEST FARGO DVRSN	18.0	20.0	21.0	34	23	21	18	15	12
HARWOOD	884.0	886.0	891.0	25	24	22	22	8	10
ENDERLIN	9.5	12.0	14.0	52	21	9	10	<5	<5
MAPLETON	905.0	908.0	910.0	34	37	10	14	<5	<5
HILLSBORO	10.0	13.0	16.0	45	15	17	9	<5	<5
MINTO	6.0	8.0	11.0	77	31	26	11	<5	<5
GRAFTON	12.0	13.5	14.5	14	22	6	8	<5	6
WALHALLA	11.0	16.0	18.0	<5	19	<5	<5	<5	<5
NECHE	18.0	19.0	20.5	<5	30	<5	28	<5	19

LEGEND:

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

...Table 2--Exceedance Probabilities...

In Table 2 below, the 95 through 5 percent columns indicate the probability of exceeding the listed stage levels (ft) for the valid time period at the locations listed.

Interpretation Aid: The flood stage for Wahpeton on the Red River of the North is 11 feet. There is a 50 percent chance that it will rise above 11.6 feet and only a 10 percent chance that it will rise above 14.4 feet.

at Specific Locations	Chance of Exceeding Stages							Valid
	95%	90%	75%	50%	25%	10%	05%	
Period: 03/25/2018 - 06/23/2018								
LOCATION	95%	90%	75%	50%	25%	10%	05%	
Red River of the North.....								
WAHPETON	8.6	8.9	10.3	11.6	13.4	14.4	15.2	
HICKSON	17.7	18.1	19.3	23.9	29.0	32.3	34.0	
FARGO	17.7	18.4	19.8	24.5	27.8	33.1	34.8	
HALSTAD	16.2	17.6	18.8	22.7	28.9	32.8	36.3	
GRAND FORKS	27.1	30.0	32.8	36.2	42.2	44.6	47.1	
OSLO	27.6	30.6	32.6	33.9	35.5	36.5	37.6	
DRAYTON	28.3	30.2	32.9	36.7	40.2	41.0	42.4	
PEMBINA	37.9	38.7	41.4	45.7	47.8	50.1	51.8	
Minnesota Tribs:								
South Fork Buffalo River.....	95%	90%	75%	50%	25%	10%	05%	
SABIN	12.1	12.3	12.8	13.4	14.4	15.1	15.7	

Buffalo River.....							
HAWLEY	4.8	5.2	6.1	7.2	8.3	9.2	9.4
DILWORTH	11.7	12.4	14.2	16.8	19.4	20.3	21.6
Wild Rice River.....							
TWIN VALLEY	4.4	4.6	5.0	6.1	7.3	9.5	10.0
HENDRUM	16.6	17.5	18.5	21.2	26.3	29.1	29.8
Marsh River.....							
SHELLY	9.0	9.8	10.5	12.2	14.3	18.6	19.6
Sand Hill River.....							
CLIMAX	11.1	11.4	11.7	12.0	18.1	20.8	25.0
Red Lake River.....							
HIGH LANDING	6.3	6.6	7.3	8.4	10.0	11.9	12.6
CROOKSTON	13.0	14.1	15.3	17.1	20.5	23.6	24.6
Snake River.....							
ABOVE WARREN	63.6	64.0	64.5	65.0	65.8	67.4	68.2
ALVARADO	100.6	101.7	102.7	104.1	106.1	108.3	109.1
Two Rivers River.....							
HALLOCK	805.0	805.4	806.2	807.4	808.8	809.6	810.1
Roseau River..... considering the flow thru the Roseau diversion							
ROSEAU	10.7	10.9	11.5	12.7	15.1	16.3	16.6
North Dakota Tribs:	95%	90%	75%	50%	25%	10%	05%
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Wild Rice River.....							
ABERCROMBIE	6.7	7.5	10.0	13.0	17.1	19.8	20.8
Sheyenne River.....							
VALLEY CITY	7.7	8.2	10.1	12.1	12.6	13.8	16.0
LISBON	7.5	8.2	10.2	12.1	13.0	17.0	20.1
KINDRED	9.2	10.6	11.9	14.5	16.1	20.1	20.7
WEST FARGO DVRSN	14.2	14.4	15.5	17.0	18.9	22.4	23.1
HARWOOD	877.0	878.2	878.9	880.4	883.8	889.9	891.9
Maple River.....							
ENDERLIN	8.4	8.7	9.0	9.5	10.5	11.9	12.7
MAPLETON	900.4	900.8	901.9	903.1	905.8	907.7	909.2
Goose River.....							
HILLSBORO	5.7	6.5	8.6	9.7	12.1	14.0	14.5
Forest River.....							
MINTO	4.5	5.4	6.2	7.2	8.1	8.7	9.6
Park River.....							
GRAFTON	9.1	9.2	9.4	9.7	10.3	12.9	13.8
Pembina River.....							
WALHALLA	3.3	3.5	3.8	4.7	6.7	8.5	9.1
NECHE	5.4	5.7	6.4	7.8	11.3	15.5	17.5

...Table 3--Non-Exceedance Probabilities...

In Table 3 below, the 95 through 5 percent columns indicate the probability of falling below the listed stage levels (ft) for the valid time period at the locations listed.

Interpretation Aid: The flood stage for Wahpeton on the Red River of the North is 11 feet. There is a 50 percent chance that it will fall below 5.4 feet and only a 10 percent chance that it will fall below 4.2 feet.

Chance of Not Exceeding Stages
at Specific Locations Valid
Period: 03/25/2018 - 06/23/2018

LOCATION	95%	50%	75%	50%	25%	10%	05%
Red River of the North.....							
WHPETON	8.2	7.9	6.5	5.4	4.8	4.2	3.8
HICKSON	14.0	13.2	12.4	11.3	10.8	10.3	10.1
FARGO	15.9	15.8	15.6	14.9	14.6	14.3	14.1
HALSTAD	7.6	7.4	7.2	5.9	4.9	4.0	3.6
GRAND FORKS	16.1	16.0	16.0	15.9	15.9	15.7	15.5
OSLO	7.1	7.0	7.0	7.0	6.9	6.7	6.4
DRAYTON	11.7	11.7	11.6	11.6	11.6	11.6	11.4
PEMBINA	9.0	9.0	8.9	8.9	8.9	8.8	8.5

Minnesota Tribs:	95%	90%	75%	50%	25%	10%	05%
South Fork Buffalo River.....							
SABIN	6.6	6.3	5.9	5.6	5.4	5.1	5.0
Buffalo River.....							
HAWLEY	3.9	3.9	3.7	3.6	3.5	3.4	3.3
DILWORTH	5.2	5.0	4.5	4.1	3.8	3.5	3.4
Wild Rice River.....							
TWIN VALLEY	2.8	2.7	2.7	2.4	2.2	1.9	1.8
HENDRUM	4.2	3.8	3.4	2.8	2.4	2.0	2.0
Marsh River.....							
SHELLY	4.4	4.2	4.1	4.0	4.0	3.9	3.9
Sand Hill River.....							
CLIMAX	5.1	4.9	4.8	4.6	4.5	4.3	4.2
Red Lake River.....							
HIGH LANDING	1.6	1.5	1.1	0.9	0.8	0.7	0.7
CROOKSTON	3.6	3.0	2.8	2.7	2.7	2.7	2.7
Snake River.....							
ABOVE WARREN	60.8	60.8	60.7	60.7	60.7	60.7	60.7
ALVARADO	96.0	96.0	95.9	95.8	95.8	95.8	95.8
Two Rivers River.....							
HALLOCK	794.3	794.1	794.0	793.9	793.7	793.6	793.4
Roseau River..... considering the flow thru the Roseau diversion							
ROSEAU	5.7	5.7	5.3	4.8	4.6	4.5	4.5

North Dakota Tribs:	95%	90%	75%	50%	25%	10%	05%
Wild Rice River.....							
ABERCROMBIE	1.0	0.9	0.8	0.6	0.5	0.2	0.1
Sheyenne River.....							
VALLEY CITY	4.1	3.7	3.6	3.5	3.5	3.5	3.5
LISBON	3.3	3.0	2.6	2.4	2.4	2.3	2.3
KINDRED	3.9	3.5	2.9	2.5	2.4	2.3	2.3
WEST FARGO DVRSN	10.4	10.2	10.0	9.7	9.5	9.4	9.3
HARWOOD	871.1	869.8	868.8	867.8	867.0	866.6	866.4
Maple River.....							
ENDERLIN	2.0	1.9	1.7	1.7	1.7	1.7	1.7
MAPLETON	895.4	895.1	895.0	894.9	894.8	894.7	894.6

Goose River.....								
HILLSBORO	1.7	1.7	1.7	1.7	1.7	1.6	1.6	
Forest River.....								
MINTO	1.5	1.4	1.3	1.3	1.3	1.2	1.2	
Park River.....								
GRAFTON	7.2	7.2	7.2	7.1	7.1	7.1	7.1	
Pembina River.....								
WALHALLA	1.8	1.7	1.6	1.5	1.4	1.2	1.1	
NECHE	2.8	2.7	2.4	2.3	2.1	1.7	1.7	

Probabilistic Hydrologic Outlooks now use 64 years (1949-2012) of past weather, temperature, and precipitation for the ensemble predictive hydrographs used in calculating the probabilities of exceeding a river level for the valid period of the outlook.

Outlook Schedule - The National Weather Service in Grand Forks, North Dakota will be providing the Advanced Hydrologic Prediction Services (AHPS) Long-Range Probabilistic Hydrologic Outlooks for the Red River of the North and its Minnesota and North Dakota tributaries according to the following schedule:

- Near the end of the month throughout the year, except for...
- The Spring Flood and Water Resources Outlooks that will be issued at least twice a month during the spring snowmelt season beginning in mid-to-late February or early March.

.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 Impacted-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.

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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