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Probabilistic Hydrologic Outlook
National Weather Service Eastern Grand Forks ND
1141 AM CDT Wed Apr 22 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.

.Discussion...

This outlook period has been adjusted and now begins May 10, 2020 and is valid until July 26, 2020. This was needed remove the effects of ongoing moderate to major flooding in the northern Red River valley on the probabilistic outlook process.

However, some effects of the ongoing flooding can still be seen in this probabilistic outlook issuance. The effects are generally seen at the lower end of the distribution (higher probabilities) and are more pronounced at locations that are currently in flood as of issuance date. Therefore, use the high probability information with caution for locations that are seeing these effects (i.e., locations that see a flat line in the conditional simulation at higher probabilities).

Overall, this 90-day outlook calls for near normal to slightly above normal chances for flooding across the majority of the basin as compared to historical normals. The only exception is along the Pembina River where probabilities are slightly below the historical normals.

Overall, this 90-day outlook calls for near normal precipitation (i.e., no strong signal either way) for May. For June and July the outlook is for near to slightly above normal precipitation (i.e., no strong signal either way). Temperatures for this period show no strong signal either way) normal values for June and July.

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 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.

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: 05/10/2020 - 07/26/2020

	Categorical Flood Stages (ft)			Current and Historical Chances of Exceeding Flood Categories as a Percentage (%)					
				Minor		Moderate		Major	
Location	Minor	Mod	Major	CS	HS	CS	HS	CS	HS
Red River of the North.....									
Wahpeton	11.0	13.0	15.0	53	53	28	24	7	7
Hickson	30.0	34.0	38.0	13	14	6	6	<5	<5
Fargo	18.0	25.0	30.0	64	61	21	19	10	13
Halstad	26.0	32.0	37.5	20	13	8	6	<5	<5
Grand Forks	28.0	40.0	46.0	32	35	10	8	<5	<5
Oslo	26.0	30.0	36.0	44	42	31	31	<5	<5
Drayton	32.0	38.0	42.0	24	22	10	13	<5	<5
Pembina	39.0	44.0	49.0	26	28	15	20	<5	10

Location	Categorical Flood Stages (ft) Minor	Mod	Major	Current and Historical Chances of Exceeding Flood Categories as a Percentage (%) Minor CS	Minor HS	Moderate CS	Moderate HS	Major CS	Major HS
Minnesota Tributaries.....									
Sabin	13.0	15.0	19.0	33	17	8	<5	<5	<5
Hawley	8.0	9.0	11.0	14	14	9	10	<5	<5
Dilworth	13.0	20.0	26.0	44	33	10	7	<5	<5
Twin Valley	10.0	12.0	14.0	9	7	<5	<5	<5	<5
Hendrum	20.0	28.0	32.0	34	26	12	10	<5	<5
Shelly	14.0	20.0	23.0	14	9	<5	<5	<5	<5
Climax	20.0	25.0	30.0	7	6	<5	<5	<5	<5
High Landing	12.0	12.5	13.0	<5	<5	<5	<5	<5	<5
Crookston	15.0	20.0	23.0	30	28	8	9	<5	<5
Above Warren	67.0	71.0	75.0	11	10	<5	<5	<5	<5
Alvarado	106.0	108.0	110.0	16	9	10	7	<5	<5
Hallock	802.0	806.0	810.0	24	28	13	13	<5	<5
Roseau	16.0	18.0	19.0	10	10	<5	<5	<5	<5

Note: The Roseau numbers consider the flow thru its diversion

Location	Categorical Flood Stages (ft) Minor	Mod	Major	Current and Historical Chances of Exceeding Flood Categories as a Percentage (%) Minor CS	Minor HS	Moderate CS	Moderate HS	Major CS	Major HS
North Dakota Tributaries.....									
Abercrombie	10.0	12.0	18.0	21	21	16	15	6	<5
Valley City	15.0	16.0	17.0	10	<5	6	<5	<5	<5
Lisbon	15.0	17.0	19.0	12	6	6	<5	<5	<5
Kindred	16.0	19.0	20.5	16	15	12	7	7	<5
West Fargo Dvsn	18.0	20.0	21.0	13	11	11	7	9	6
Harwood	84.0	86.0	91.0	21	15	17	10	6	<5
Enderlin	9.5	12.0	14.0	16	12	<5	<5	<5	<5
Mapleton	18.0	21.0	23.0	31	20	19	9	<5	<5
Hillsboro	10.0	13.0	16.0	6	5	<5	<5	<5	<5
Minto	6.0	8.0	11.0	7	6	<5	<5	<5	<5
Grafton*	12.0	13.5	14.5	<5	<5	<5	<5	<5	<5
Walhalla	11.0	16.0	18.0	<5	8	<5	<5	<5	<5
Neche	18.0	19.0	20.5	6	16	<5	14	<5	<5

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

*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.

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 11.2 feet and only a 10 percent chance that it will rise above 16.5 feet.

...Table 2--Exceedance Probabilities...
Valid Period: 05/10/2020 - 07/26/2020

LOCATION	95%	90%	75%	50%	25%	10%	05%
Red River of the North.....							
Wahpeton	7.6	8.2	9.1	11.2	13.4	14.3	16.5
Hickson	14.3	15.3	17.3	22.0	28.0	30.8	34.5
Fargo	16.8	16.8	17.1	19.4	24.5	30.2	33.2
Halstad	13.8	13.8	13.8	16.7	23.1	30.3	33.8
Grand Forks	20.7	20.7	20.9	24.5	33.9	39.8	42.0
Oslo	19.2	19.3	19.7	24.6	33.1	34.8	35.8
Drayton	20.9	20.9	21.0	24.6	31.7	38.3	40.3
Pembina	28.8	28.8	29.0	32.2	39.5	46.3	48.2

Minnesota Tribs:	95%	90%	75%	50%	25%	10%	05%
South Fork Buffalo River.....							
Sabin	6.4	6.4	8.4	11.2	13.3	14.1	15.4
Buffalo River.....							
Hawley	4.2	4.2	4.7	5.5	6.5	8.8	10.2
Dilworth	5.6	5.6	8.0	12.1	16.4	20.0	21.3
Wild Rice River.....							
Twin Valley	3.4	3.4	3.4	5.2	7.2	9.8	10.8
Hendrum	10.4	10.5	12.1	16.3	22.3	29.4	30.4
Marsh River.....							
Shelly	5.2	5.2	5.4	8.3	12.4	15.0	16.6
Sand Hill River.....							
Climax	5.7	5.9	7.5	8.4	13.4	19.4	21.4
Red Lake River.....							
High Landing	7.3	7.4	7.7	8.4	9.0	9.0	9.3
Crookston	7.8	7.9	9.2	11.7	16.5	19.7	20.7
Snake River.....							
Above Warren	62.5	62.5	62.8	63.8	65.3	67.8	70.3
Alvarado	99.8	99.8	99.9	101.4	104.9	107.6	109.6
Two Rivers River.....							
Hallock	795.0	795.4	796.8	798.4	801.6	807.0	808.4

Roseau River..... considering the flow thru the Roseau diversion							
Roseau	6.1	6.1	6.6	7.9	10.5	15.8	17.3

North Dakota Tribs:	95%	90%	75%	50%	25%	10%	05%
Wild Rice River.....							
Abercrombie	2.9	2.9	3.0	4.0	8.9	15.5	18.6
Sheyenne River.....							
Valley City	6.0	6.0	6.3	7.7	11.6	14.6	16.9
Lisbon	5.5	5.5	5.5	7.3	11.1	15.5	17.9
Kindred	7.0	7.0	7.0	8.9	13.8	20.2	20.7
West Fargo Dvsn	10.8	10.8	10.9	10.9	14.7	20.6	21.3
Harwood	76.0	76.0	76.0	76.8	81.0	90.1	91.1
Maple River.....							
Enderlin	3.6	3.6	3.6	3.6	7.0	11.2	11.6
Mapleton	14.3	14.3	14.3	14.3	19.1	21.8	22.6
Goose River.....							
Hillsboro	3.0	3.0	3.0	3.1	4.7	8.5	12.2
Forest River.....							
Minto	1.7	1.7	1.7	2.3	3.8	5.4	6.5
Park River.....							
Grafton*	7.7	7.7	7.7	8.2	9.5	10.5	11.9
Pembina River.....							
Walhalla	4.2	4.2	4.2	4.3	6.1	8.6	10.3
Neche	6.9	6.9	6.9	7.0	10.1	15.7	18.7

*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.

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 4.5 feet.

...Table 3--Non-Exceedance Probabilities...
Valid Period: 05/10/2020 - 07/26/2020

LOCATION	95%	90%	75%	50%	25%	10%	05%
Red River of the North.....							
Wahpeton	7.4	6.8	5.9	5.4	4.9	4.7	4.5
Hickson	13.3	12.8	11.9	11.3	10.9	10.7	10.6
Fargo	16.2	15.9	15.3	15.0	14.8	14.6	14.6
Halstad	10.6	9.9	8.1	7.3	6.5	6.1	6.0
Grand Forks	18.7	18.5	18.0	17.5	17.2	16.9	16.9

Oslo	14.1	13.5	12.2	10.6	9.9	9.3	9.2
Drayton	16.6	15.8	15.0	13.9	13.6	13.2	13.2
Pembina	22.4	20.5	18.9	16.7	15.5	14.5	14.1

Minnesota Tribs:	95%	90%	75%	50%	25%	10%	05%
South Fork Buffalo River.....							
Sabin	5.8	5.6	5.4	5.3	5.1	5.1	5.0
Buffalo River.....							
Hawley	4.0	3.9	3.8	3.8	3.7	3.7	3.6
Dilworth	4.7	4.7	4.5	4.3	4.1	4.0	4.0
Wild Rice River.....							
Twin Valley	3.1	2.9	2.8	2.7	2.6	2.6	2.6
Hendrum	7.4	6.2	5.0	4.2	3.5	3.4	3.4
Marsh River.....							
Shelly	4.7	4.6	4.4	4.3	4.2	4.1	4.1
Sand Hill River.....							
Climax	5.3	5.3	5.1	5.0	4.9	4.8	4.8
Red Lake River.....							
High Landing	7.6	7.4	7.0	6.7	6.3	5.9	5.6
Crookston	7.4	7.2	6.7	6.4	6.3	6.1	5.9
Snake River.....							
Above Warren	62.0	61.9	61.7	61.6	61.5	61.5	61.5
Alvarado	98.5	98.3	97.9	97.6	97.5	97.4	97.3
Two Rivers River.....							
Hallock	794.6	794.4	794.0	793.7	793.5	793.3	793.2
Roseau River..... considering the flow thru the Roseau diversion							
Roseau	6.0	5.9	5.8	5.7	5.6	5.4	5.2

North Dakota Tribs:	95%	90%	75%	50%	25%	10%	05%
Wild Rice River.....							
Abercrombie	2.0	1.5	1.2	0.9	0.8	0.8	0.7
Sheyenne River.....							
Valley City	5.2	5.1	4.9	4.8	4.6	4.6	4.6
Lisbon	4.2	4.1	3.9	3.7	3.6	3.5	3.5
Kindred	4.8	4.7	4.4	4.0	3.9	3.8	3.8
West Fargo Dvsn	8.2	8.2	8.2	8.2	8.2	8.1	8.1
Harwood	72.6	71.5	70.7	70.3	70.0	69.8	69.8
Maple River.....							
Enderlin	2.9	2.8	2.6	2.6	2.6	2.6	2.6
Mapleton	9.5	9.4	9.2	9.1	9.0	9.0	9.0
Goose River.....							
Hillsboro	2.5	2.4	2.3	2.2	2.2	2.2	2.1
Forest River.....							
Minto	1.6	1.6	1.5	1.5	1.4	1.4	1.4
Park River.....							
Grafton*	7.6	7.6	7.5	7.5	7.4	7.4	7.4
Pembina River.....							
Walhalla	3.5	2.8	2.1	1.8	1.6	1.4	1.4
Neche	5.6	4.2	3.1	2.6	2.3	2.0	2.0

*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, 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 www.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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