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PROBABILISTIC HYDROLOGIC OUTLOOK
NATIONAL WEATHER SERVICE EASTERN NORTH DAKOTA/GRAND FORKS ND
925 AM CST Thu March 2 2017

...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,
from March 5th to June 3rd 2017.

...RISK OF SNOW MELT FLOODING MOSTLY NORTH OF HILLSBORO/HALSTAD...

.OUTLOOK SUMMARY...

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

Major Flooding...

A high risk (greater than 65%) of Major Flooding is expected at Pembina ND on the Red River, Grafton ND on the Park River, Neche ND on the Pembina River, and at High Landing MN on the Red Lake River.

Moderate Flooding...

A high risk (greater than 65%) of Moderate Flooding is expected at Oslo, Drayton, and Pembina on the Red River. Additionally, at High Landing MN on the Red Lake River, Hallock MN on the Two Rivers River, Grafton ND on the Park River, and Neche ND on the Pembina River.

A medium risk (35 to 65%) of Moderate Flooding is expected at Fargo/Moorhead and Grand Forks on the Red River. Additionally, at Alvarado on the Snake River, Abercrombie on the Wild Rice River, and on the West Fargo Diversion on the Sheyenne River.

Minor Flooding...

A low risk (less than 35%) of Minor Flooding is expected at Hickson on the Red River. On the Minnesota tributaries, at Twin Valley on the Wild Rice River, Shelly on the Marsh River, Climax on the Sandhill River, and Warren on the Snake River. On the North Dakota tributaries, at Valley City and Lisbon on the Sheyenne River.

Otherwise there is a high to medium risk of Minor Flooding for the rest of the forecast locations in the Red River of the North basin.

* This 90-day Outlook covers the period from March 5th to June 3rd 2017.

.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...

Since the last outlook, there has been a period of above normal temperatures, resulting in a reduction in the areal coverage and volume of the snowpack. However, some 10 to 20 inches of snow is still on the ground in the extreme northern part of the Red River Basin and northwest Minnesota. Specifically, in the Grafton, Pembina to Hallock regions of the valley proper and portions of Kittson, Marshall, and Roseau counties in northwest Minnesota. Additionally, 10 to 20 inches of snow extend across most of the Devils Lake basin.

Elsewhere, the snow depth tapers off rapidly south of a Cooperstown to Oslo to Thief River Falls line. Further south from Valley City to Grand Forks to Fosston, only trace residual snow patches remain, including roughly the southern half of the Red River Basin.

Snow Water Equivalents range from 3 to 5 inches of water in the deepest snowpack northeast of Devils Lake towards Pembina, then quickly decrease south of a Grafton to Warren to Warroad line.

For the most current snowpack information, refer to the National Operational Hydrologic Remote Sensing Center (NOHRSC) snow interactive snow information web site at:

www.nohrsc.noaa.gov/interactive/html/map.html

* SOIL MOISTURE AND FROST DEPTHS...

The warm and moist fall weather extending into the early winter months have kept the soil moistures high going into freeze-up. As of February 28th, the soil moistures in eastern North Dakota and far northwestern Minnesota range from the 90th to 99th percentile.

Due to the warm autumn and deep snowpack on the ground before the very cold temperatures, frost depths are less than normal for this time of year across northern portions of the Red River Valley, generally around 12 inches or less. On the other hand, the recent cool down, coupled with generally snow-free ground, has allowed frost depths to increase across southern parts of the valley, ranging from 12-24 inches, with 19 inches measured at Grand Forks and near 30 inches at Fargo.

* RIVER FLOWS...

The USGS indicates that rivers and streams in the basin are running two to six times their normal flow for this time of the year. High flows are attributed to excessive late summer and fall rainfalls, very moist soils, and recent thaw conditions.

* RIVER ICE...

There is little to no solid ice cover on the rivers and streams in the southern Red River Basin, with more normal ice thickness of 12 to 18 inches evident across the northern basin. Be aware that there will be thinner ice in more turbulent water, and especially near rock-riffle dams.

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

* SPRING SEASON CLIMATE OUTLOOK...

The NWS Climate Prediction Center is forecasting a March through May period with equal chances for below normal or above normal temperatures, combined with an above normal precipitation regime.

Details can be found at: www.cpc.noaa.gov

.NEXT HYDROLOGIC OUTLOOK...

The next monthly hydrologic outlook will be issued on, or around, Thursday, March 24th, should conditions warrant.

.FLOOD OUTLOOK PROBABILITIES TABLES...

The following is broken into 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 BY FLOOD CATEGORY...

Valid from March 5, 2017 to June 3, 2017

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: 03/05/2017 - 06/03/2017

	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	69	53	28	26	12	14
Hickson	30.0	34.0	38.0	20	23	5	12	<5	<5
Fargo	18.0	25.0	30.0	94	80	42	39	17	23
Halstad	26.0	32.0	37.5	40	35	13	18	<5	9
Grand Forks	28.0	40.0	46.0	>95	59	49	34	6	10
Oslo	26.0	30.0	36.0	>95	63	>95	56	26	20
Drayton	32.0	38.0	42.0	>95	51	89	35	13	11
Pembina	39.0	44.0	49.0	>95	56	>95	43	78	23
Minnesota Tributaries.....									
Sabin	13.0	15.0	19.0	72	50	13	15	<5	<5
Hawley	8.0	9.0	11.0	52	38	22	26	<5	<5
Dilworth	13.0	20.0	26.0	87	67	18	21	<5	<5
Twin Valley	10.0	12.0	14.0	11	18	<5	6	<5	<5
Hendrum	20.0	28.0	32.0	69	55	16	23	<5	6
Shelly	14.0	20.0	23.0	17	31	<5	11	<5	6
Climax	20.0	25.0	30.0	21	24	6	11	<5	7
High Landing	12.0	12.5	13.0	>95	46	>95	43	86	33
Crookston	15.0	23.0	25.0	>95	53	18	13	6	8
Above Warren	67.0	71.0	75.0	22	14	<5	<5	<5	<5
Alvarado	106.0	108.0	110.0	77	21	43	16	7	<5
Hallock	802.0	806.0	810.0	>95	63	>95	45	30	15
Roseau	16.0	18.0	19.0	35	19	<5	5	<5	<5
Note: The Roseau numbers consider the flow through its diversion									
North Dakota Tributaries.....									
Abercrombie	10.0	12.0	18.0	55	37	40	34	8	20
Valley City	15.0	16.0	17.0	30	8	28	7	21	<5
Lisbon	15.0	17.0	19.0	28	9	19	8	12	6
Kindred	16.0	19.0	20.5	59	18	28	10	17	9
West Fargo Dvrsn	18.0	20.0	21.0	65	21	35	16	31	11
Harwood	884.0	886.0	891.0	43	23	30	21	11	10
Enderlin	9.5	12.0	14.0	46	21	14	10	<5	<5
Mapleton	905.0	908.0	910.0	56	33	16	14	<5	<5
Hillsboro	10.0	13.0	16.0	76	17	33	10	<5	<5
Minto	6.0	8.0	11.0	>95	26	23	8	<5	<5
Grafton	12.0	13.5	14.5	>95	19	>95	6	94	<5
Walhalla	11.0	16.0	18.0	>95	19	8	<5	<5	<5
Neche	18.0	19.0	20.5	>95	28	>95	26	93	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 March 5, 2017 to June 3, 2017

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

...TABLE 2--EXCEEDANCE PROBABILITIES...
Valid Period: 03/05/2017 - 06/03/2017

LOCATION	95%	90%	75%	50%	25%	10%	05%
Red River of the North.....							
Wahpeton	8.7	9.5	10.8	11.6	13.3	15.2	15.6
Hickson	17.7	18.4	22.2	24.5	28.0	32.9	34.0
Fargo	17.9	19.1	20.9	24.1	28.5	32.5	35.0
Halstad	15.6	17.2	19.7	24.6	29.9	33.6	35.6
Grand Forks	29.5	31.0	35.5	40.0	43.3	45.0	47.7
Oslo	30.7	31.7	33.8	34.8	36.0	36.7	37.9
Drayton	35.8	37.9	39.6	40.8	41.3	42.2	43.4
Pembina	46.9	47.6	49.5	50.8	51.6	52.7	53.5
Minnesota Tribs:	**95%**	**90%**	**75%**	**50%**	**25%**	**10%**	**05%**
South Fork Buffalo River.....							
Sabin	11.5	11.9	12.8	13.6	14.5	15.2	15.9
Buffalo River.....							
Hawley	5.8	6.1	6.9	8.1	8.8	9.5	10.2
Dilworth	11.5	12.8	14.7	17.8	19.6	20.9	22.0
Wild Rice River.....							
Twin Valley	5.3	5.8	6.6	7.6	8.8	10.4	11.5
Hendrum	14.6	16.2	19.1	22.3	26.2	29.1	30.4
Marsh River.....							
Shelly	6.5	7.2	9.1	10.8	12.9	16.1	18.0
Sand Hill River.....							
Climax	8.9	10.1	11.6	13.2	17.2	22.2	27.4
Red Lake river.....							
High Landing	12.9	13.0	13.1	13.2	13.3	13.4	13.6
Crookston	15.8	17.3	19.1	20.8	22.5	24.4	25.5
Snake River.....							
Above Warren	64.4	64.6	65.0	65.6	66.8	68.1	69.7
Alvarado	105.1	105.3	106.3	107.8	109.0	109.8	110.3
Two Rivers River.....							
Hallock	807.6	808.1	808.7	809.5	810.2	810.7	811.1
Roseau River..... considering the flow through the Roseau diversion.							
Roseau	12.8	13.0	14.2	15.4	16.4	17.3	17.4
North Dakota Tribs:	**95%**	**90%**	**75%**	**50%**	**25%**	**10%**	**05%**
Wild Rice River.....							
Abercrombie	3.7	5.4	7.4	11.2	15.0	17.5	19.8
Sheyenne River.....							
Valley City	11.5	11.7	12.3	13.1	16.5	20.0	23.4
Lisbon	11.2	11.4	11.9	13.0	15.8	19.5	24.5
Kindred	13.8	14.0	14.8	16.5	20.0	21.1	21.1
West Fargo Dvrsn	16.4	16.5	17.3	18.5	22.3	23.1	23.2
Harwood	878.3	879.1	880.1	883.0	887.0	891.2	892.0
Maple River.....							
Enderlin	7.3	7.6	8.4	9.1	10.6	12.3	13.4
Mapleton	899.1	899.7	902.1	905.8	907.6	908.7	909.4

Goose River.....							
Hillsboro	7.8	8.5	10.2	12.3	13.6	14.5	15.9
Forest River.....							
Minto	6.5	6.7	7.1	7.5	7.9	8.7	8.8
Park River.....							
Grafton	14.5	14.8	16.1	17.2	18.1	19.4	20.0
Pembina River.....							
Walhalla	11.6	12.0	12.7	13.9	14.8	15.8	16.4
Neche	20.3	20.7	21.2	21.4	21.5	21.6	21.6

.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 levels and soil conditions 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:

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

Then click on "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 basins are also available on our web site, as well as 7-day forecasts when river levels at the forecast point is 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.

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

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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