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PROBABILISTIC HYDROLOGIC OUTLOOK

NATIONAL WEATHER SERVICE EASTERN NORTH DAKOTA/GRAND FORKS ND

842 AM CST Thu Mar 07 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 MAJOR FLOODING ALONG THE MAINSTEM RED RIVER WITH
MODERATE TO ISOLATED MAJOR ALONG THE TRIBUTARIES...

.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. Additionally, there is a high risk of major flooding at Harwood on the Sheyenne River and Abercrombie on the Wild Rice River.

There is a medium risk (35 to 65 percent) of major flooding at Wahpeton on the Red River. In North Dakota, there is a medium risk of major flooding at Kindred on the Sheyenne River and West Fargo at the Sheyenne River Diversion. In Minnesota, there is a medium risk of major flooding at Highlanding and Crookston on the Red Lake River and Hendrum 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 (greater than 65 percent) of moderate flooding at Wahpeton on the Red River. In North Dakota, there is a high risk of moderate flooding at Kindred on the Sheyenne River, West Fargo at the Sheyenne River Diversion, Enderlin and Mapleton on the Maple River, and Minto on the Forest River. In Minnesota, there is a high risk of moderate flooding at Sabin on the South Branch Buffalo River, Hawley and Dilworth on the Buffalo River, Hendrum on the Wild Rice River, Climax on the Sandhill River, Highlanding on the Red Lake 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 North Dakota, there is a medium risk of moderate flooding at Lisbon on the Sheyenne River, Hillsboro on the Goose River, and Grafton on the Park River. In Minnesota, there is a medium risk of moderate flooding at Twin Valley on the Wild Rice River and Shelly on the Marsh 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 medium risk (35 to 65 percent) of minor flooding at Valley City on the Sheyenne River. In Minnesota, there is a medium risk of minor flooding at Alvarado on the Snake River and at Roseau on the Roseau River.

In North Dakota, there is a low risk (less than 35 percent) of minor flooding at Walhalla and Neche on the Pembina River. In Minnesota, there is a low risk of minor flooding near Warren on the Snake River.

* This 90-day outlook covers the period from March 11, 2019 to June 9, 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 continued snowfall heading into March, the current snowpack is still considered above to much above normal. The deepest snowpack remains across the southern valley and into northwestern Minnesota where snow water content ranges from roughly three to five inches. Slightly lesser amounts are present across northeastern North Dakota and northern portions of the valley with snow water content generally between two and three inches.

* 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 deeper than normal across the basin due to the continued colder than normal conditions and lack of early deep snow cover. These deeper frost depths are likely to 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.

* RIVER ICE...

River ice and lake ice thicknesses are near to above seasonal normals. Note that since most ice is in the lower channels, ice jams

are likely to be more of a risk on the tributaries than on the mainstem Red (although not out of the question).

* 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

* SHORT TERM FORECAST...

A potential winter storm is on tap for the weekend (March 9-10) timeframe, mainly affecting the southern half of the basin. An additional system may also impact the region the middle of next week but uncertainty remains on the exact track of this system at this time.

* LONG TERM OUTLOOK...

Climate outlooks continue to indicate a later snowmelt and runoff cycle (i.e., continued below normal temperatures) which will increase the risk for rapid and/or rainfall enhanced runoff.

.NEXT SPRING FLOOD OUTLOOK...

An additional outlook may be issued during the second half of March if current weather conditions allow (i.e., melt is not yet underway or expected to be anytime soon).

.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...

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: 03/11/2019 - 06/09/2019

: Current and Historical

: Chances of Exceeding									
: Flood Categories									
: as a Percentage (%)									
: Categorical									
: Flood Stages (FT)									
Location	Minor	Mod	Major	Minor	Moderate	Major	Minor	Moderate	Major
-----	-----	-----	-----	CS	HS	CS	HS	CS	HS
-----	-----	-----	-----	---	---	---	---	---	---
Red River of the North.....									
WAHPETON	11.0	13.0	15.0	>95	62	79	30	44	15
HICKSON	30.0	34.0	38.0	80	27	36	14	<5	<5
FARGO	18.0	25.0	30.0	>95	82	>95	40	>95	26
HALSTAD	26.0	32.0	37.5	>95	35	>95	20	67	11
GRAND FORKS	28.0	40.0	46.0	>95	60	>95	32	78	11
OSLO	26.0	30.0	36.0	>95	63	>95	59	>95	28
DRAYTON	32.0	38.0	42.0	>95	52	>95	37	75	14
PEMBINA	39.0	44.0	49.0	>95	56	>95	43	>95	23

: Current and Historical									
: Chances of Exceeding									
: Flood Categories									
: as a Percentage (%)									
: Categorical									
: Flood Stages (FT)									
Location	Minor	Mod	Major	Minor	Moderate	Major	Minor	Moderate	Major
-----	-----	-----	-----	CS	HS	CS	HS	CS	HS
-----	-----	-----	-----	---	---	---	---	---	---
Minnesota Tributaries.....									
SABIN	13.0	15.0	19.0	>95	53	70	17	8	<5
HAWLEY	8.0	9.0	11.0	>95	36	82	23	9	<5
DILWORTH	13.0	20.0	26.0	>95	67	94	20	5	<5
TWIN VALLEY	10.0	12.0	14.0	>95	17	60	6	28	<5
HENDRUM	20.0	28.0	32.0	>95	54	>95	23	50	6
SHELLY	14.0	20.0	23.0	>95	30	35	11	12	<5
CLIMAX	20.0	25.0	30.0	>95	26	81	12	30	7
HIGH LANDING	12.0	12.5	13.0	93	21	86	18	55	16
CROOKSTON	15.0	23.0	25.0	>95	51	64	13	42	8
ABOVE WARREN	67.0	71.0	75.0	25	13	6	<5	<5	<5
ALVARADO	106.0	108.0	110.0	50	19	28	15	7	<5
HALLOCK	802.0	806.0	810.0	>95	57	>95	42	12	9
ROSEAU	16.0	18.0	19.0	42	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 (%)									
: Categorical									
: Flood Stages (FT)									
Location	Minor	Mod	Major	Minor	Moderate	Major	Minor	Moderate	Major
-----	-----	-----	-----	CS	HS	CS	HS	CS	HS
-----	-----	-----	-----	---	---	---	---	---	---
North Dakota Tributaries.....									
ABERCROMBIE	10.0	12.0	18.0	>95	37	>95	35	>95	20
VALLEY CITY	15.0	16.0	17.0	42	10	31	9	22	<5
LISBON	15.0	17.0	19.0	63	10	38	8	24	6
KINDRED	16.0	19.0	20.5	>95	19	89	10	49	9
WEST FARGO DVRSN	18.0	20.0	21.0	93	11	68	10	63	9
HARWOOD	84.0	86.0	91.0	>95	24	>95	22	90	10

ENDERLIN	9.5	12.0	14.0	:	>95	21	66	10	7	<5
MAPLETON	18.0	21.0	23.0	:	>95	36	>95	16	17	<5
HILLSBORO	10.0	13.0	16.0	:	89	15	48	9	9	<5
MINTO	6.0	8.0	11.0	:	>95	32	75	11	<5	<5
GRAFTON	12.0	13.5	14.5	:	62	22	43	8	26	6
WALHALLA	11.0	16.0	18.0	:	15	19	<5	<5	<5	<5
NECHE	18.0	19.0	20.5	:	20	30	20	28	11	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 from March 11, 2019 to June 09, 2019

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

Red River of the North.....							
WAHPETON	11.8	12.2	13.1	14.6	15.6	16.9	17.5
HICKSON	28.0	28.9	31.3	33.0	34.4	35.8	37.0
FARGO	31.1	31.9	33.4	34.9	36.6	38.2	39.1
HALSTAD	35.6	36.1	37.1	38.2	39.0	39.8	40.3
GRAND FORKS	44.5	44.8	46.4	47.8	49.7	52.5	54.6
OSLO	37.0	37.0	37.3	37.5	37.8	38.0	38.1
DRAYTON	41.2	41.4	42.0	42.6	43.4	44.6	45.3
PEMBINA	50.2	50.3	51.2	52.0	52.8	53.8	54.4

Minnesota Tribs:	95%	90%	75%	50%	25%	10%	05%

South Fork Buffalo River.....							
SABIN	14.2	14.4	14.8	15.6	16.6	18.3	19.6
Buffalo River.....							
HAWLEY	8.2	8.7	9.2	9.6	10.3	10.9	11.2
DILWORTH	19.9	20.4	21.3	22.2	23.2	24.7	26.2
Wild Rice River.....							
TWIN VALLEY	10.4	10.7	11.2	12.5	14.4	15.4	17.0
HENDRUM	29.7	30.3	30.9	32.0	32.8	33.7	34.5
Marsh River.....							
SHELLY	15.0	15.4	16.5	18.3	21.5	23.5	25.2
Sand Hill River.....							
CLIMAX	23.4	24.0	25.7	27.1	30.8	33.3	36.3
Red Lake river.....							
HIGH LANDING	11.6	12.3	12.8	13.1	13.3	13.6	13.6
CROOKSTON	20.2	20.9	22.4	24.5	26.1	29.3	30.7
Snake River.....							
ABOVE WARREN	64.4	64.6	65.1	65.8	67.0	69.4	71.4
ALVARADO	103.0	103.8	104.5	106.0	108.3	109.8	110.1
Two Rivers River.....							
HALLOCK	806.4	806.6	807.7	808.5	809.3	810.5	811.2
Roseau River..... considering the flow thru the Roseau diversion							
ROSEAU	12.6	13.5	14.2	15.4	16.5	17.3	17.9

North Dakota Tribs:	95%	90%	75%	50%	25%	10%	05%
Wild Rice River.....							
ABERCROMBIE	19.2	19.8	20.6	22.0	23.4	25.4	26.2
Sheyenne River.....							
VALLEY CITY	12.4	12.6	12.8	14.0	16.5	19.9	20.8
LISBON	13.0	13.4	14.4	16.3	18.5	21.8	25.1
KINDRED	17.4	18.9	20.0	20.5	21.1	21.2	21.2
WEST FARGO DVRSN	17.2	18.7	19.5	21.3	21.3	21.3	21.3
HARWOOD	90.6	91.0	91.4	92.0	92.1	92.2	92.3
Maple River.....							
ENDERLIN	10.9	11.2	11.7	12.4	12.9	13.6	14.1
MAPLETON	21.6	21.6	21.8	22.3	22.7	23.2	23.8
Goose River.....							
HILLSBORO	8.9	9.7	11.6	12.9	14.6	15.9	17.2
Forest River.....							
MINTO	7.3	7.7	8.0	8.8	9.5	9.9	10.2
Park River.....							
GRAFTON	10.1	10.4	11.2	13.2	14.9	15.7	17.9
Pembina River.....							
WALHALLA	5.3	6.0	6.8	7.6	8.7	11.9	12.7
NECHE	9.3	10.2	11.7	13.8	16.2	20.7	21.2

.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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