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### SNOWMELT OUTLOOK VERIFICATION

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#### 1. Introduction

Each spring the North Central River Forecast Center (NCRFC) issues a snowmelt outlook which provides guidance about expected flooding from runoff of melting snow. The outlook identifies two crests. The first is based on the normal melting of existing snowcover. The second includes the normal melting plus normal precipitation up to and through the melting period.

The outlook is first issued in mid-February as a narrative statement. It is updated as a numerical forecast in early March. This study attempts to verify the accuracy of the forecast by comparing the expected crests with observed crests at various locations in the major river basins of the NCRFC.

#### 2. Analysis

Snowmelt outlook and observed crest values for 1980-1987 were compiled and entered into an IBM-PC using Symphony software. Snowmelt values were not available for 1988 due to the lack of a snow cover. Twenty three tables were generated for major drainage in the NCRFC area of responsibility. Difference values were obtained by subtracting the observed crests from the outlook crest values. Average Difference and Average Absolute Difference values were derived using this information.

The Average Difference (Ave. Diff.) is found by taking the average of the differences between the outlook and observed crests, including the negative sign for cases when the observed crest is greater than the outlook. A negative average difference indicates a bias toward underestimation of crests. A positive average difference indicates a bias toward overestimation of crests.

The Average Absolute Difference (Ave. Abs. Diff.) is found by taking the average of the absolute values of the differences between the outlook and observed crests. This value can be used to represent the average error (because negative values are not included in the computations).

The first two tables are for the Red River (from Wahpeton, North Dakota to Pembina, North Dakota) and the Mississippi River (from Libby, Minnesota to Chester, Illinois). The remaining tables are for river basin groups within the

Mississippi, Red, and Great Lakes drainages. The difference values for the Red and Mississippi Rivers (from the outlooks based on normal additional precipitation) are shown below.

	Ave. Diff. (ft)	Ave. Abs. Diff. (ft)
Red River	1.2	3.1
Mississippi River	0.6	2.0

The average difference values indicate a bias toward overestimation of crests for both the Red and Mississippi Rivers (both have positive Ave. Diff. Values).

The average absolute difference values indicate that the Mississippi River outlooks are more accurate than the Red River outlooks (Ave. Abs. Diff. values of 2.0 feet for the Mississippi versus 3.1 feet for the Red River). The greater average absolute difference for the Red River may be due to a greater range in observed crests (which makes accurate prediction more difficult). The table below shows that the Red River at Grand Forks, North Dakota has experienced a greater range in crest stage (20.4 feet) over the eight year period than the Mississippi River at Winona, Minnesota (10.2 feet).

Observed Crests (ft)

	<u>Grand Forks, ND</u>	<u>Winona, MN</u>
1987	33.2	6.4
1986	37.0	16.6
1985	25.8	11.7
1984	37.1	10.6
1983	28.3	14.5
1982	37.2	12.2
1981	6.8	7.7
1980	31.0	9.0

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Range	20.4	10.2
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The larger average absolute differences for the Red River may also be due to other factors such as modeling, data, soil types, and climatic conditions.

### 3. Summary

For 1980-1987, the average absolute difference for all the river stations with observed crests is approximately 2.0 feet (using the first outlooks based on normal additional precipitation). A summary table, which follows, shows the difference values for all the basins.

SUMMARY

<u>Table</u>	<u>River</u>	<u>Ave.Diff.</u>	<u>Ave.Abs.Diff.</u>	<u>Description</u>
1	Red	1.2	3.1	Wahpeton, ND-Pembina, ND
2	Mississippi	0.6	2.0	Libby, MN-Chester, IL
	<u>Basin</u>			
3	MINN	0.3	2.2	Minnesota River Basin
4	UPRMIS	1.3	1.9	Mississippi R BSN above Hastings, MN
5	STCROIX	0.0	2.1	St. Croix and NW Wisconsin tribs
6	WISR	0.8	1.5	Wisconsin River Basin
7	HST-LSE	1.6	2.0	Miss R BSN, below Hastings- LaCrosse, WI
8	LSE-DBQ	0.9	2.2	Miss R BSN, below LaCrosse- Dubuque, IA
9	ROCK	0.5	1.1	Rock River Basin
10	IOWA	1.4	1.8	Iowa River Basin
11	UPRDESM	0.0	1.1	Des Moines R BSN above 2nd Ave Des Moines
12	MIDDLE	0.3	2.1	Miss R BSN, Dam 12-Dam 22
13	UPRIL	-0.8	1.0	Illinois R BSN above Fox River
14	LWRIL	-1.4	1.4	Illinois R BSN, LaSalle-Harding, IL
15	MERGER	-1.1	2.2	Miss R BSN, Louisiana, MO -Chester, IL
16	SHEYENNE	1.6	2.7	Sheyenne R BSN
17	UPRRED	1.6	2.7	Red R BSN above Goose R
18	LWRRED	1.1	2.4	Red R BSN below Goose R
19	US SOURIS	2.1	2.5	Souris R BSN
20	SOMICH	0.2	2.0	Southern Lower Michigan Basins
21	CEMICH	0.4	1.1	Central Lower Michigan Basins
22	UGL	0.3	0.7	Upper Great Lakes in WI and MN
23	DEVILSLK	0.1	0.5	Devils Lake, ND