RIVER STAGES AND FLOODS

By C. R. JORDAN

Precipitation during April averaged 80 percent of normal for the entire country. In most States April had considerably less rainfall than March and in all but 12 States, precipitation during April was below normal for the month. The State normals ranged from 46 percent for Texas to 142 percent for Montana. Precipitation over the entire country for the first four months of the year averaged only 87 percent of normal.

Temperatures during April averaged generally below normal for most sections east of the Mississippi River and above normal over the remainder of the country. The mean temperatures for the month were from 3° to 7° below normal from Virginia and the Ohio River northward, while in the Southeast the temperatures were near normal. They were markedly above normal everywhere from the Plains States westward to the Great Basin, the largest departures from normal being in the western Plains and Rocky Mountain sections where the month was 6° to 8° warmer than normal. The unseasonably high temperatures over the upper Missouri Basin during the last week of March and the early part of April produced the highest discharge of record along the Missouri River from Bismarck, N. Dak., to Omaha, Nebr. However, a heavy snow cover still remained at the higher altitudes in the Northwest at the end of April.

Flooding associated with melting snow and ice jams occurred in western Minnesota, the eastern Dakotas, along the middle Missouri River, in northern and western Wyoming, western Montana, Idaho, northern Nevada, and Oregon. The flood along the Missouri River from Bismarck to Omaha was very severe, the previous highest stage of record at Nebraska City, Nebr., was exceeded by almost 2 feet. Flood records on many streams in Idaho and Oregon were also broken. Throughout the remainder of the country only widespread light flooding occurred.

Hudson Bay drainage.—A rather severe flood occurred in the Red River of the North, beginning the last few days of March and continuing into April. The river at Fargo, N. Dak., passed flood stage on March 31 and reached a crest of 34.3 feet on April 7. Considerable lowlands in the vicinity of Fargo were inundated and a number of residents were forced to move their belongings to higher grounds. No estimate of the damage that resulted has been received.

Atlantic slope drainage.—Rivers in this area were unusually low during the first half of April as a result of abnormally low temperatures retarding the melting of the above-normal snow covering. Warmer weather during the latter part of the month produced considerable runoff from snow-melt and the Connecticut River at South Newbury, Vt., and Hartford, Conn., rose slightly above flood stage at the end of April. The flow was augmented somewhat by rainfall on April 28 at the time of peak flow from snow-melt. No material damage was reported but traffic on a few secondary roads was obstructed by the flooding of low places along the river.

Rainfall, averaging about an inch, fell over the upper Susquehanna River basin from April 18 to 21, and the Chenango, Chemung, and Susquehanna Rivers rose slightly above flood stages at several points in New York. No damage was reported.

Moderate rains fell quite generally over the eastern section of the country, especially in the Southeast, on April 19 and 20. Amounts averaged as much as 3 inches over some basins in the Southeastern States, but streams were low from the light precipitation during the first half of the month and only light flooding occurred. Damage was light, being confined for the most part to the suspension of business in a few areas. The stations where flood stage was exceeded are listed in the table at the end of this report.

Upper Mississippi Basin.—Melting snow in the upper tributaries of the Mississippi River, and in the extreme upper Mississippi Valley proper, produced floods in that area during the early part of April. The following reports on the floods are submitted by the Officials in Charge at the Weather Bureau offices indicated:

MINNEAPOLIS, MINN.

The April 1943 flood in the extreme upper Mississippi Valley was caused by the rapid melting of a deep snow cover with the ground still frozen from a long, severe winter. Heavy and continuous rainfall is the most common cause of river floods, but this condition was absent as rains did not occur during the spring break-up and rise of streams. The temperature and snowfall in Minnesota during the preceding 4 months were the contributing factors. The mean temperature for the December–March period was 12.2°, or 3.8° below normal, and the total snowfall for the 4-month period was 47.3 inches, or 16.5 inches above normal. Although the snow layer limited the deep penetration of frost, nevertheless, the surface was frozen and unable to absorb the melting snow waters. Run-off was practically 100 percent. Ice gorges formed at some of the bridges and augmented the discharge when the gorges broke, and the older bridges were carried away and demolished. The change to mild weather and high temperature came suddenly during the closing days of March. The mean temperature for the first 3 weeks of March was 15°, the coldest of record for any similar period in March. In sharp contrast, the mean temperature for the closing 3 days was 53°, with many stations reporting maximum temperatures from 75° to 80°. This solar heat was sufficient to convert the snow layer into water.

The river stages on the morning of April 3 were: Minneapolis, 15.0 feet, or 1 foot below flood line; and St. Paul, 11.6 feet, or 2.4 feet below flood line. The crest of the flood reached Minneapolis at 1 a. m. Wednesday morning with a reading of 17.0 feet, or 1 foot above the flood line, and at St. Paul the peak occurred at 1 p. m. Wednesday with a reading of 14.5 feet, or 0.5 foot above the flood line.

The dates and duration of flood stages on the Mississippi River during April 1943 are shown in the table at the end of this report.

The Coast Guard, River Patrol, and Red Cross assisted in the evacuation and care of a number of families whose dwellings were in the lowlands at St. Paul.

Crop losses, confined principally to meadows and hay lands, were placed at $25,000; livestock loss at $5,000; buildings and fences at $10,000; and the damage to highways and bridges was estimated at $110,000. Total losses were $150,000. Three lives were lost in the high water of the Minnesota River near Montevideo. Estimated savings as a result of the advisory and flood warnings was placed at $25,000.

The records at St. Paul go back to the year 1867 and show that the flood stage of 14.0 feet has never been reached in any March month or during the winter season. The following tabulation gives the dates and river gage readings that exceeded the flood line of 14.0 feet:

Floods at St. Paul, Minn.

Year	Date	Gage reading	Year	Date	Gage reading
1867	Apr. 22	17.4	1888	Apr. 14	14.4
	July 23	18.6	1893	May 5-7	14.7
1869	Apr. 7	15.6	1897	Apr. 6	18.0
	Sept. 24-27	16.1	1905	July 11	14.8
1873	Apr. 21	16.4	1908	June 29	16.8
	June 1	15.7	1916	Apr. 6-9	16.6
1875	Apr. 16	18.0	1917	Apr. 8	16.0
1880	June 17-18	15.2	1943	Apr. 7	14.5
1881	Apr. 29	19.7			

Taking the extreme upper Mississippi basin as a whole, the Mississippi River and its tributaries have been at higher stages in many previous floods with the exception of the Fort Ripley Clearwater and Fridley districts where near records for high water were established. The actual high water record at Fort Ripley is not available as the river gage was lost when the bridge went out. At Minneapolis the crest of 17.0 feet was the highest since June 1916.

LA CROSSE, WIS.

Due solely to melting of an unusually heavy snow cover in the headwaters of the Black, Chippewa, and Mississippi Rivers, floods reaching bankful or slightly over developed in this district the first 2 weeks in April. Abnormal temperatures in the latter part of March caused the smaller tributaries such as the Root, Zumbro, Whitewater, lower Black, and Trempleau Rivers in the southern end of the district to clear their flood waters first. This was followed by flooding in the Black and Chippewa the first 3 days in April. Alternate periods of mild and freezing temperatures resulted in a slow recession in the Chippewa River so that a large volume of water from this stream met and augmented an unusually large flow of melting snow water from above St. Paul from the 5th to 10th of April. Near flood stages were reached in the upper section of the main channel from Hastings to Lake Pepin, slightly under from Dam No. 4 to 5, and flood stage or slightly above from Dam No. 5A to Dam No. 8. The Mississippi crested at La Crosse 4 p. m. of the 12th, with a stage of 12.32 feet, and at Winona, Minn., a crest of 13.63 feet at 7 a. m. of the 11th. The lower Black crested at Galesville, Wis., with a peak of 12.8 feet 4 p. m. of the 2d, and the Chippewa at Durand, Wis., 12.8 feet at 7 a. m. of the 3d. The nature of flooding was not severe and coming at this time of the year when spring freshets are normally expected and when little or no agricultural loss is anticipated, the damages were comparatively slight. It may be stated that no effective precipitation occurred during the melting snow period, a fortunate circumstance which prevented higher crest stages. Over the entire drainage area, the percentage of run-off from potential snow cover moisture is estimated as 21 percent. The instantaneous peak discharge at La Crosse was about 113,500 c. f. s.

Damages were relatively small and confined for the most part to summer homes and cottages in the bottom lands. In the Black River, some damage occurred to a bridge construction project in the McGilvary bottoms on the highway leading to Trempleau. Agricultural damage was insignificant, mostly siltation of pasture land in the Black River Valley. There was little loss by erosion due to the extended and slow run-off. Railroad beds were in danger in some low places on both banks of the Mississippi by undercutting of wave action by strong winds over the pools. Road beds have been riprapped and reinforced so that flood levels would have to exceed at least 1 foot above the flood to produce serious damage. About 12 families had to vacate their homes temporarily in the vicinity of La Crosse. Seepage in basements occurred in low places in La Crosse, Winona, and Wabasha. Seepage into the sewer system in Winona, Minn., during the high water introduces a serious problem of continual pumping.

Damages in the La Crosse district have been estimated at approximately $8,500.

DUBUQUE, IOWA

Floods which occurred during this period were mostly light or moderate, and actual flood stages were recorded only at Portage and Muscoda on the Wisconsin, and Dubuque on the Mississippi.

The flood was unusual in that the spring rainfall apparently made only incidental contributions to the major rise. It resulted largely from the fact that a high ground water level was established in the autumn of 1942 throughout most of the upper Mississippi Valley States, and the additional fact that a heavy snow cover persisted throughout the winter over the upper valleys. In the lower reaches of the district, substantial portions of the snow cover melted shortly after the middle of February, but over the upper drainage areas the early season mild temperatures had but little effect upon the snow, other than to reduce it to ice or at least to a more compact state. Much of the rise originated above Lansing on the Mississippi and above the Dells of the Wisconsin. It began during the last few days of March.

Losses along the Wisconsin River were mostly in damages to fences, etc., with an aggregate monetary value of loss or cost of repairs of $1,400. Some pasture lands in the Mississippi Valley were flooded which delayed the use of them to some extent. Damage or loss to tangible property amounted to $38,700.00, most of which was the cost of repairs to railroad roadbeds. Many basements were reported flooded, mainly by seepage, but losses were light.

The heaviest loss reported was in the suspension of business during the high water.

Missouri Basin.—Moderate rains on April 10–11 caused light flooding at a few points along the Solomon and Republican Rivers. About 4,000 acres of crops in Osborne and Mitchell Counties, Kans., were flooded with losses estimated at $15,000. Additional losses to bridges and highways were estimated at $1,000. Only light damage resulted in the Republican Basin.

A rather severe flood occurred in the upper Missouri River Basin, resulting almost entirely from the melting of a heavy snow cover. The principal flood contributor was the Yellowstone River, with substantial contributions from small tributaries in the Dakotas, such as the Little Missouri, Heart, Cannonball, James, and Cheyenne Rivers. Between Bismarck and St. Joseph, the flood in the Missouri developed into a flood comparable to that which occurred in 1881. At Nebraska City, Nebr., the Missouri reached a stage higher than the previous maximum stage of record in 1881. Serious flooding did not occur at and below Kansas City, Mo. The most serious damage, probably was in the vicinity of Omaha, Nebr. A complete report of this flood and the damage caused by it is in the process of preparation and will be published in a later issue of the REVIEW.

Ohio Basin.—Moderate rains were general over the Ohio Basin April 13–20. There was a gradual increase in stream flow during this period but flood stages were not exceeded generally in the upper portion of the basin. Rainfall over the Green River Valley from the 10th to the 19th averaged 6.91 inches and over the Ohio Valley in the vicinity of Evansville, Ind., 8.86 inches. The Ohio River reached stages slightly above flood stage at most stations below Tell City, Ind. No damage was reported.

Flood stages were exceeded slightly at a few widely scattered stations in the White, Arkansas, Red, and Lower Mississippi River Basins. Losses were light being confined mostly to delay in farm work and to the suspension of business.

West Gulf of Mexico Drainage.—Heavy local thundershowers over the upper Trinity River Basin on April 8 caused a sharp rise in the upper Trinity and its tributaries. Overflow was light and no loss or damage was reported.

Gulf of California Drainage.—Water from melting snow caused the Gunnison River at Delta, Colo., to rise slightly above flood stage from April 24 to 27, and again on April 29, and it continued above flood stage at the beginning of May.

Pacific Slope Drainage.—Storms from March 30 to April 1 produced high run-off from northern Williamette tributaries draining the Coast Range. This run-off, augmented by water from melting snow, caused some flooding in Oregon and at Vancouver, Wash.

FLOOD-STAGE REPORT FOR APRIL 1943

[All dates in April unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
HUDSON BAY DRAINAGE					
Red of the North:	*Feet*			*Feet*	
Wahpeton, N. Dak.	6	Mar. 31	8	10.7	2
Moorhead, Minn.	17	Mar. 31	18	34.3	7
Grand Forks, N. Dak.	25	4	20	33.3	13
ATLANTIC SLOPE DRAINAGE					
Connecticut:					
South Newbury, Vt.	18	26	30	19.9	29
Hartford, Conn.	16	28	May 2	17.9	30
Chenango:					
Sherburne, N. Y.	8	20	20	7.97	20
Greene, N. Y.	8	20	20	8.0	20
Chemung: Chemung, N. Y.	12	20	22	13.96	22
Susquehanna:					
Oneonta, N. Y.	12	21	26	12.63	26
		28	29	12.16	28
Vestal, N. Y.	14	20	22	15.07	20
Little Juanita: Spruce Creek, Pa.	7	19	19	7.3	19