

TABLE 2.—Free-air resultant winds based on pilot balloon observations made near 5 p. m., E. S. T. (2200 G. C. T.), during January 1946. Directions given in degrees from north (N=360°, E=90°, S=190°, W=270°). Velocities in meters per second—Continued

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)			Oklahoma City, Okla. (396 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			St. Paul, Minn. (225 m.)			San Antonio, Tex. (240 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich. (225 m.)			Seattle, Wash. (116 m.)			Spokane, Wash. (603 m.)			Washing- ton, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity						
Surface	31	331	1.2	24	283	1.8	29	299	1.6	31	71	0.5	31	331	3.7	28	253	2.5	23	252	2.7	27	262	0.4	30	265	3.0	15	230	1.8	29	201	3.9	29	234	2.6	27	277	1.8
500	30	352	3.2	24	282	2.2	29	280	2.2	31	48	0.6	31	331	3.7	28	246	4.3	23	263	4.3	27	324	0.7	30	323	2.1	15	237	3.3	29	210	7.5	27	277	4.4	27	256	4.4
1,000	30	359	2.3	24	277	2.0	25	268	6.2	31	16	0.7	31	330	3.7	25	263	7.4	21	279	7.3	24	229	1.0	27	29	2.6	24	216	2.6	29	218	5.0	26	268	5.6	26	272	5.8
1,500	30	336	4.1	24	288	4.1	21	279	10.3	30	347	1.1	31	311	7.6	22	280	10.5	21	290	10.3	18	248	5.5	26	19	4.1	15	226	15	271	7.6	15	271	9.0	19	280	15.7	
2,000	30	319	4.9	23	301	5.9	19	286	11.8	29	8	1.5	30	298	8.9	22	275	13.3	20	285	13.7	17	263	6.6	25	19	5.2	14	242	7.3	16	264	7.8	21	286	11.6			
2,500	30	313	6.0	23	281	7.4	20	286	12.6	29	349	2.4	30	299	11.3	22	275	15.4	18	290	15.9	14	274	9.2	24	8	5.6	13	271	13	14	281	11.0	17	277	17.7			
3,000	30	317	7.9	23	268	9.7	19	286	13.2	28	348	4.0	27	299	12.3	22	277	15.8	16	288	17.2	14	271	11.2	23	355	7.2	12	272	8.7	14	281	11.0	17	277	17.7			
4,000	29	303	10.5	19	273	14.2	19	291	18.2	22	313	7.8	24	292	13.6	20	280	19.9	15	288	20.0	13	268	13.4	18	341	10.3	10	294	14.8	16	278	22.3	16	278	22.3			
5,000	25	313	11.7	17	272	19.5	18	296	20.4	20	309	11.6	18	290	12.8	16	292	21.5	12	289	20.9	12	270	18.1	16	330	11.6	8	321	12.4	10	294	14.8	16	278	22.3			
6,000	23	312	14.5	16	271	21.7	16	294	21.9	16	302	12.0	18	293	14.2	14	297	24.0	10	293	23.8	8	306	17.6	10	306	17.6	11	272	28.9	11	272	28.9						
8,000	11	305	14.8	10	289	20.1	11	283	16.7	12	300	30.0	12	293	23.8	8	306	17.6	10	293	23.8	8	306	17.6	10	306	17.6	11	272	28.9	11	272	28.9						
10,000	12	315	16.6	10	289	20.1	11	283	16.7	12	300	30.0	12	293	23.8	8	306	17.6	10	293	23.8	8	306	17.6	10	306	17.6	11	272	28.9	11	272	28.9						

TABLE 3.—Maximum free-air wind velocities (m. p. s.) for different sections of the United States based on pilot balloon observations during January 1946

Section	Surface to 2,500 meters (m. s. l.)				Above 2,500 to 5,000 meters (m. s. l.)				Above 5,000 meters (m. s. l.)						
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast ¹	63.2	NW.	1,542	26	Caribou, Maine	59.8	WNW.	4,547	14	Portland, Maine	93.7	W.	7,837	20	Caribou, Maine
East-Central ²	63.2	WNW.	1,917	14	Portland, Maine	60.7	WSW.	3,600	31	Knoxville, Tenn.	110.0	W.	10,930	29	Huntington, W. Va.
Southeast ³	42.0	W.	2,151	31	Greensboro, N. C.	42.2	SW.	2,938	5	Birmingham, Ala.	60.0	W.	12,791	2	Charleston, S. C.
North-Central ⁴	35.0	WNW.	1,962	31	Spartanburg, S. C.	51.2	WSW.	4,355	20	Sault Ste. Marie, Mich.	88.0	SW.	7,862	6	Milwaukee, Wis.
Central ⁵	41.4	SSW.	1,194	6	Detroit, Mich.	63.0	WSW.	3,140	30	Evansville, Ind.	84.0	WSW.	12,985	28	Dodge City, Kans.
South-Central ⁶	41.2	SSW.	1,650	5	Evansville, Ind.	52.5	WSW.	5,000	30	Amarillo, Tex.	82.0	S.	8,740	10	San Antonio, Tex.
Southwest ⁷	38.2	WSW.	2,200	14	Del Rio, Tex.	56.0	NNW.	3,670	20	Glasgow, Mont.	84.0	NW.	8,229	23	Great Falls, Mont.
West-Central ⁸	42.2	WSW.	1,379	5	Havre, Mont.	61.0	WNW.	3,047	24	Cheyenne, Wyo.	67.0	NW.	5,763	5	Oakland, Calif.
Southwest ⁹	36.9	WSW.	2,038	4	Casper, Wyo.	58.0	WSW.	4,798	30	Roswell, N. Mex.	68.0	WSW.	10,915	31	Tucson, Ariz.
	32.1	NW.	2,367	11	Sandberg, Calif.										

¹ Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
² Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
³ South Carolina, Georgia, Florida, and Alabama.
⁴ Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
⁵ Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.

⁶ Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
⁷ Montana, Idaho, Washington, and Oregon.
⁸ Wyoming, Colorado, Utah, northern Nevada, and northern California.
⁹ Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

RIVER STAGES AND FLOODS FOR JANUARY 1946

By C. R. JORDAN

Precipitation during January averaged above normal in the south-central States from eastern New Mexico and Colorado to Georgia and western Virginia, and in the western Lake Region. Less than half the normal amount was recorded in southern Florida, Pennsylvania, Ohio, and over much of the western half of the country.

Run-off and ground water levels were dominantly high over a great portion of the country. Run-off at a number of representative stations was the greatest of record according to the U. S. Geological Survey. Severely high and damaging floods occurred in the southern states, particularly in Kentucky, Tennessee, and Georgia. The greatest winter floods of record were reported in Iowa, southern Minnesota, and Wisconsin.

Atlantic Slope drainage.—A week of unseasonably warm weather during the period of January 9–14, melted much of the snow cover over the northeastern States and resulted in substantial rises in the streams of this area, with tributary streams reaching flood stage at a few places in New York. However, the river heights reached in most

cases were well below flood stage, and no damage was reported.

Most of the coastal streams from the Roanoke River southward reached flood stage one or more times during the month. There were rather general rains over the Southeastern States on January 6 to 9 that raised the streams to moderately high stages, and flood stage was exceeded slightly at numerous places in Virginia, the Carolinas, and Georgia. Moderately heavy rains, or sleet in some cases, again fell over the area on January 16 and 17, prolonging the high stages and causing some streams to exceed flood stage for the second time during the month. The heaviest sleet storm of record was reported over the eastern Piedmont region of North Carolina; a maximum of 10 inches was measured in western Chatham County. The lower reaches of the streams in North and South Carolina persisted above flood stage most of the month. Unusually high stages were reached in the headwaters of the Altamaha River Basin in Georgia.

Eastern Gulf of Mexico drainage.—Scattered floods of record-breaking proportions occurred in many of the streams of the East Gulf States as a result of heavy

rains that fell over the area during the period January 5-10. High stages were prolonged, and in some cases increased, by additional rainfall near the middle of the month.

Floods were severe in the upper Chattahoochee River Basin, exceeding any other floods within the memory of local people in the vicinity of Gainesville, Ga., and reaching the highest stage in 43 years of record at Norcross, Ga. High flood stages were also reached in the Etowah River and in the Coosa River Basin as far downstream as Gadsden, Ala. The previous high-water mark at Canton, Ga., was exceeded slightly, and the crest at Cartersville, Ga., has been exceeded only twice since records were begun.

A series of heavy rains from January 5-9, averaged 5.25 inches over the upper Black Warrior Basin and 6.00 inches over the upper Tombigbee basin, producing substantial rises in both rivers. At Tuscaloosa, Ala., the Black Warrior rose from 17.3 feet on January 5, to 61.1 feet at 11 p. m., January 10, a rise of 44 feet. Rainfall was not so heavy over the southern portions of the watersheds, but it was heavy enough to cause substantial local rises in the lower Tombigbee well ahead of the passage of the flood waters from the upper basin. After the crest passed Tuscaloosa, the Black Warrior at that point subsided slowly and went below flood stage on the 14th. Additional rainfall on January 15-16 checked the fall at Tuscaloosa and started another rise that approached flood stage on January 17; the stream then fell steadily during the remainder of the month. The later rains only slowed up the rate of fall of the upper Tombigbee River, prolonging the period above flood stage. South of Columbus, Miss., the rate of rise was increased slightly, and some of the crest stages were also increased a little.

The heavy rain during the early days of January caused the Pearl River to rise rapidly and exceed flood stage by the 8th. Occasional light to moderate rains thereafter caused the river to rise slowly through the 21st, when it reached 26.8 feet at Jackson, Miss., or nearly 8 feet above flood stage.

Upper Mississippi and Missouri River Basins.—Floods, unusual for so early in the year, were reported in eastern Iowa and adjoining portions of Illinois, Wisconsin, and Minnesota. Winter floods in Iowa are uncommon; the flood of January 5-10 was the greatest one of record for the area. Ice action aggravated the overflow in many streams.

On the Root River at Houston, Minn., ice gorges above the railroad bridges backed up the water for several miles, resulting in stages within a foot of the extreme high water of June 30, 1942. Some damage was also reported in the Kickapoo, Zumbro-Whitewater, La Crosse, and other smaller streams in southern Wisconsin and southeastern Minnesota.

Practically every tributary of the Mississippi River in eastern Iowa went out of its banks as a result of the "January thaw" attended by rainfall that averaged somewhat over an inch. The ground was frozen and run-off was exceptionally high and rapid. Ice action was an important factor and was responsible for many of the most damaging overflows. Flood records were broken for several of the smaller streams. There was some overflow of the Illinois River, and flood stage was exceeded slightly at a few points along the Mississippi River.

High stages were reported in the upper portion of the

Grand River, and there was some overflow of the Osage River in Missouri.

Ohio Basin.—Severe and damaging floods occurred in Kentucky, Tennessee, and western North Carolina, and moderate flood stages were reached in the Wabash River Basin.

Moderate to locally heavy rainfall occurred in the headwaters of the Big Sandy and New Rivers during the first week of January. This mountainous section was covered with snow which was melted by the rain and warm temperatures. Streams in the area rose rapidly to near or above flood stage. Flood stage was exceeded at two Weather Bureau stations, Pikeville and Paintsville, Ky., and some property damage resulted.

The rainfall was moderate to heavy over the Green and Barren River basins, and the streams rose rapidly, reaching flood stage at Bowling Green and Woodbury, Ky., on January 9, and at Rumsey, Ky., on the 12th. Moderate overflow resulted.

A light flood was in progress in portions of the upper Wabash River, in the lower West Fork of the White River, and in the main White River as the month opened, resulting from the general thawing which took place during the last few days of December. The principal crests occurred at LaFayette and Covington, Ind., on the 1st and 2d; slight secondary crests, passing flood stage, occurred at these two points on the 10th and 11th, respectively. At Terre Haute and below, the crests were delayed by an ice jam at Covington which began to break up during the afternoon of the 5th.

The Cumberland River flood during the period January 7-25, resulted from heavy rainfall that averaged from 5 to almost 8 inches over the basin. The rate of the rainfall was excessive in many cases, several stations reporting between 4 and 6 inches in a 24-hour period. Record stages were reached in the upper reaches of the Cumberland River.

Tributaries in the upper Tennessee River Basin reached high stages with flooding of some bottom lands. Local flooding occurred in the Tennessee River at Chattanooga, Tenn.

Flood stages were exceeded in the Ohio River from Tell City, Ind., to Cairo, Ill. Stages did not reach seriously high levels and during a normal year would have caused little damage. However, this year there was a considerable amount of corn that had not been harvested because of the shortage of labor and wet weather during the fall and winter, and some loss of corn resulted.

South-central States.—There was light overflow at scattered points throughout Arkansas, Kansas, Missouri, Texas, Louisiana, and Mississippi. Flooding was severe in northern Mississippi. Record stages were exceeded in the headwaters of the Tallahatchie River, and the Yazoo River at Greenwood, Miss., reached a stage of 38.9 feet on January 21, only slightly more than a foot lower than the highest stage of record at that location. Flood stages were reached on the Mississippi River below the mouth of the Ohio.

The Sabine River was above flood stage most of the month, and the lower part of the stream was still out of its banks at the end of the month.

Pacific Slope drainage.—Flood stages were exceeded slightly at a few stations in the Columbia River Basin in Oregon.