

The cause producing this sudden transition from a wet to a dry condition is undoubtedly the position of the Pacific HIGH. During the wet period it was central near the middle of the ocean, but about the 17th it moved much nearer the coast and this movement was followed by the dry weather. It is further believed that the proximity of the high to the coast is more controlling than the latitudinal position, although the latter is also an important factor in producing this weather sequence.

Storm warnings were issued five times during the month, as follows: Washington and Oregon coast on the 7th and 13th and on the California coast on the 4th, 8th, and 11th. The warnings were generally verified.

Frost warnings were issued in northern California on the 8th, 9th, 15th, 16th, and 17th and in Washington and Oregon on the 15th, 16th, 17th, 23d, 24th, and 25th, and were all timely.

Live-stock warnings were issued in eastern Washington, eastern Oregon, and Idaho on the 22d. This warning was only partly successful; the expected fall in temperature occurred, but instead of rain or snow the weather was clear.—*G. H. Willson.*

RIVERS AND FLOODS.

By H. C. FRANKENFIELD, Meteorologist.

Reference to the flood table at the end of this report will disclose the wide distribution of floods during the month of April. Virtually every stream east of the Rocky Mountains, except those in the Northwest, was in flood at some time during the month. The great floods in the Mississippi and its larger tributaries were at their height, but there were also other destructive floods of a more local character, notably in the upper Trinity River of Texas.

As the Mississippi flood was still in progress at the close of the month, report thereon will be delayed until after its final subsidence over the lower reaches, which will be sometime during the first half of June. A somewhat elaborate special report of this flood is contemplated, but its appearance will be delayed for several months. However, a summary thereof will appear in the MONTHLY WEATHER REVIEW for June, 1922, and mention may be made here that the flood from the mouth of the Arkansas River to the Passes was the greatest in history, and only the failure of portions of the levee system prevented still higher stages from Vicksburg, Miss., southward to the Gulf of Mexico.

Omitting further reference to the floods in the Mississippi drainage basin, those over other areas will be taken up in order, beginning with the Atlantic Basin.

Connecticut River.—In magnitude this flood is the 15th within the history of authentic flood records at Hartford, extending back to 1841 and probably to 1801. Prior to 1870 no systematic attempt had been made at this point to measure the daily water stage. Before that time the highest water of the floods was permanently marked by driving iron spikes into a wooden building (a brewery) that stood near the river's edge, so when the Army engineers began surveying the river in the early seventies they established a gage here and by careful leveling referred these flood crest marks to the present gage. It is believed that this record at Hartford of flood heights and continuity is not exceeded elsewhere in the United States, covering, as it does, the annual crest wave since 1838 and dates of the opening of the river since 1817.

On January 9, 1841, there was a crest of 26.3 feet, with a note, "the highest flood since 1801, and destroyed

many bridges over the river in the upper valley. The Hartford bridge was much damaged."

1801, March 20, 27.5 feet, with note, "no mark so high since 1692. It was the result of a three-day heavy rain, causing streams to rise rapidly to unexampled height, and resulting in an immediate inundation, loss of life and destruction of property.

1692. February 23, 26.2 feet. (Massachusetts Historical Society Proceedings.) Diary of Capt. Lawrence Hammond of Charlestown and Boston. "Feb. 23, 1692. Rain in ye nite & Continued all ye week, more or less to rain wth much wind betw ye S. E. & N. E. 28th. Likewise much rain and wind, som raine ye 29 also. March 1, Wind at NW & cleare weather. These rains wth ye Violent sudden melting of ye snow in ye Wilderness caused such a sudden & Violent flood yt hath done abundance of damage in most parts of ye country, carryng away bridges, Mills, & c. Connecticut River higher yn ever it was known before, destroyed much cattel in ye meadows, carryed away some Houses & washed away in many places ye very land with ye English graine sown in it."

History of Northampton, Mass. "Flood February 1692 was the highest experienced in this section of the valley previous to 1801. Medad Pomeroy's account of it represents the rain as falling for 5 days almost continuously, during which time the sun was not seen and the water rose to such a height as was scarce known in the country before. Much damage done throughout this entire region."

1683. July-August, flood, 26.0 feet.

1639. March 19, great flood. This is the earliest flood of which we have record. (Mass. Col. 4th series, vol. 6, page 355.) Letter from John Haynes to John Winthrop, dated Wethersfield, 27th, 1st. month, 1639 (i. e. March 27): "Wee have lately hadd a great floode that came upp to some of our houwses and carryed away a good parte of our fences in our lowe grounds. Otherwise wee blesse the Lord. wee are generally in good health." Matthew Grant, Windsor Church records, original mss. at Conn. His. Soc. Hartford, "I found in the old book that the great flood began the 5th. of March 1638/9. On the 11th. day of March it began to fall, but by reason of much rain on the 12th. day, it rose very high. On the 14th. two youths were drowned being in a canoe on the flood gathering up pales swimming on the flood against Thomas Dewey's house. Matthew Ramond and Henry Lush. On the 15th and 16th days it (the flood) had fallen near two feet, but on the 16th day was much rain and great wind out of the southeast which made it exceeding great storm. It indamaged houses and break down many trees so that by the cause of which rain all the 17h and 18th days the water rose very high, more than had ever before been known by the Indians. It drowned many houses very deep and indamaged many cattle over (i. e. east of) The (Great) River, for all the ground there was drowned to one little ridge where Samual Grant now lives. (This was in the present town of South Windsor just in rear of the Theological Seminary.) It carried away much timber and hay and beat up pales out of the ground, and post and rails, and carried them away and whole trees and all. On the 18th day at night there was a great fear of another storm of wind and rain. It began but it pleased the Lord, it ceased quickly, and by the morning one might perceive the water was begun to fall, and so it continued. On the 22nd day at night it was well fallen, and yet it was as high as the highest flood we had known before."

For the flood of 1922 warnings were issued from April 8 to 12, inclusive. The flood stage of 13 feet at White River Junction, Vt., was passed on the 8th, and on the morning of the 13th a crest stage of 26.8 feet was reached. A stage of 24 feet, 8 feet above flood stage was forecast for Hartford, where the river had remained in moderate flood since March 29, and later increased to 24.5 feet for April 14. The crest was 24.5 feet on the day specified. At Holyoke, Mass., the crest stage on April 13 was 11.35 feet, 2.35 feet above flood stage.

The winter was devoid of the usual "thaws," so that the snow remaining in the north mountains and sheltered places was in a condition to melt rapidly with the rain and high temperature. On the 10th there was a temporary cessation as the White River emptied at our outpost, White River Junction, but during the next 24 hours there was another rapid rise, and, swollen that night by a heavy rain which concentrated generally over the central portions of Vermont and New Hampshire, all streams were soon transformed into raging torrents. The Passumpsic and the Wells particularly, being short steep streams, emptied volumes of water into the main stream, which by this time had become very high, due to the overflowing of the Connecticut lakes. The combined result was that the swollen waters of the upper Connecticut rose to a record surpassed but once since the Weather Bureau began its river work in this valley.

From the source to the mouth of the river much damage was inflicted to dwellings and other buildings. All along the valley crews of men worked night and day to ward off more serious consequence. Happily there was an absence of ice with the flood, and fortunately very few log drives were in the river this winter, so the chance for loss by these was small. However, large quantities of wood, poles, ties, beams, etc., piled near the river disappeared, and in addition the floating débris consisted of portions of buildings, garages, hencoops, uprooted trees, etc. Families living in the meadows moved to upper stories of the houses, having egress and ingress entirely by boat. Others were forced to abandon their homes entirely during the high water. This was especially the case in the river sections of the cities. Stores and shops in the lower business sections of the cities were flooded and activities abandoned, and many fields that had been prepared for planting were covered with several feet of water. In cases, no doubt, the farmer found that his fields were well fertilized by the oozy mud left by the receding waters, while in many others they found that where once were rich loamy fields there now are gullies, expensive to reclaim. Railroad beds and tracks were washed out, while on the tributaries bridges were washed away and highways cut out as though built of sand, leaving the water running through deep gullies.

Railroad transportation was seriously handicapped, and regular schedules were abandoned, particularly on the Central Vermont, and many divisions of the Boston and Maine Railway. Tracks were undermined and torn away, culverts and bridge abutments washed away, while landslides were reported near Ryegate, McIndoes, and Wilder, Vt.

There were two serious train derailments, one killing three trainmen, and at Hartford one young girl was drowned. Industrial plants in many cities and towns were closed, and no steamer landings could be made between Hartford and the mouth of the river.

No reliable estimate of the amount of loss and damage could be obtained but it undoubtedly ran into hundreds of thousands of dollars, if not a million.—*Abstracted from*

the report by Mr. W. W. Neifert, meteorologist in charge, Weather Bureau Office, Hartford, Conn.

Hudson River.—This flood was due to the same general conditions that prevailed over the Connecticut Valley, and warnings were first issued on April 11. A stage of 17 feet, or 5 feet above flood stage, was forecast for Albany, N. Y., on April 12 and the crest stage from 9 to 12 p. m. on that date was 16.8 feet.

The accuracy of the warnings occasioned much favorable comment, and the losses did not exceed \$50,000. The value of property saved through the warnings was between \$25,000 and \$35,000.

There were no other floods of consequence in the North Atlantic States.

The floods in the Peedee and Santee systems were moderate, although flood stages were generally exceeded by from 2 to 6 feet. The Santee River remained in flood throughout the month and had been in that condition since the early days of February, 1922.

Losses and damage reported amounted to \$12,000 or \$13,000, largely to hogs and growing oats, while the money value of property saved through the warnings issued was reported at \$90,000.

The flood in the Apalachicola River of Florida was moderate and featureless.

East Gulf Drainage.—There were two floods in the Tombigbee basin of Alabama. While neither was of great importance, yet the warnings issued were of considerable value to farming and lumber interests. The losses and damage so far as reported amounted to \$10,300 and the value of property saved through the Weather Bureau warnings to \$20,800.

Floods continued from March over the lower Pearl River system of Mississippi and Louisiana, but, as the season was early, no great damage was done. Warnings were issued as often as necessary, and the total losses did not exceed \$8,500, while the value of property reported saved by the flood warnings was \$11,000.

Great Lakes Drainage.—There were two moderate floods in the Maumee Basin of Indiana and Ohio. The first was caused by the heavy rains of March 30, and the flood stages were exceeded during the early days of April with a maximum crest of 19.4 feet, 4.4 feet above flood stage, at Fort Wayne, Ind., on April 1. Additional substantial rains from April 10 to 18, inclusive, were responsible for the second flood which lasted from April 12 to 22, inclusive, with a crest stage at Fort Wayne of 17.7 feet on April 15 and 16. Warnings were issued in ample time and there was no damage of consequence. The floods in the Sandusky River of Ohio, and the Saginaw and Grand River systems of Michigan were very moderate and the damage slight.

North Canadian River.—There were moderate to heavy rains on April 8 and again from April 24 to 30, inclusive, over the North Canadian basin, and high water resulted from Oklahoma County, Okla., eastward to the junction with the Canadian River. Low bottom lands were submerged, but there was little or no damage, as the warnings which were disseminated through the cooperation of the Oklahoma State board of agriculture enabled farmers and others to remove and protect property.

Rivers of Texas.—All rivers of Texas, except the Rio Grande, were in flood at some time during the month. There were two floods in the upper Trinity, the Brazos, Neches, Colorado, and Guadalupe Rivers, one in the lower Sabine, and one continuous flood in the upper Sabine and lower Trinity Rivers, that began in March and continued into May, 1922.

The Sabine and Neches floods were severe, and at the time of the flood crest the Neches River was $1\frac{1}{2}$ miles wide, and on the left banks of both the Sabine and Neches Rivers the overflow waters ran from 1 to 3 feet deep over a width of 3 to 6 miles. At Logansport, La., on the Sabine River, the crest stage of 34.7 feet on April 2 was 9.7 feet above the flood stage, while at Rockland, Tex., on the Neches River, the crest stage of 28.9 feet or 8.9 feet above the flood stage, on the same date was the highest stage of record.

The losses reported along the two rivers amounted to \$126,000, while property to the money value of \$50,500 was reported as having been saved through the warnings.

The first flood in the upper Trinity River was caused by abnormally heavy local rains on April 2 to 4, inclusive. At Dallas, Tex., 6.08 inches fell in 24 hours, and at Fort Worth, Tex., 5.33 inches. Flood stages were not reached above Dallas, but at Dallas the crest stage was 36.5 feet on April 5, and at Trinidad, 38.3 feet on April 11, flood stages being at 25 and 28 feet respectively.

These crest stages closely correspond with the forecast stages, and the warnings issued on April 3 and 4 permitted the saving of property of an aggregate value of \$55,000. The losses, mainly to roads and bridges, amounted to about the same.

The second flood, which occurred throughout the entire length of the Trinity River, was due to still heavier rains from April 24 to 26, inclusive.¹ At Fort Worth 7.55 inches of rain fell during the 24 hours ending at 7 a. m., April 25, and 3.06 inches during the following 24 hours, a total of 10.61 inches in 48 hours, while at Weatherford, in the adjoining county to the westward, the figures for the corresponding periods were 6.75, 4.30, and 11.05 inches, respectively. Below Fort Worth the rainfall was not so heavy, although Dallas reported 5.36 inches in the two days.

The crest stage of 39.1 feet, or 9.1 feet above flood stage, at Fort Worth on April 25 was the highest stage of record and 1.5 feet above the previous high stage of June 10, 1915. The crest stage of 42.3 feet at Dallas on April 27, although 17.2 feet above flood stage, was 10.3 feet below the record stage of May 25, 1908. Correspondingly high stages were experienced below Dallas, and only the local character of the torrential rains prevented a general flood beyond all previous records.

This flood was also forecast with the usual accuracy and the warnings were highly commended on all sides. Local authorities, especially in Dallas, assisted in the widespread distribution of warnings, literally from house to house in some sections, and many lives and much property were saved thereby. Unfortunately, 11 lives were lost in the vicinity of Fort Worth, the victims being caught by the sudden rush of water, and a number of person were reported missing.

The general damage was of the character incident to great sudden overflows, and in addition a number of levees were broken and two dams were washed out. From below Bridgeport southward the river ranged from 1 to 7 miles wide at the peak of the flood, and hundreds of square miles of land were submerged. The losses and damage amounted to more than \$1,000,000, of which only \$6,700 (\$5,000 at Fort Worth) was in live stock. As there were more than \$1,000,000 worth of cattle in the lowlands prior to the flood, the loss of less than 1 per cent affords another illustration of the efficiency of the flood-warning service. It has been difficult to obtain estimates of other property saved by the warnings, although a few

persons reported an aggregate of \$132,725. There was certainly much more.

Some additional details of the local flood at Fort Worth may be found in another portion of this REVIEW. (See pp. 188-189.)

The first flood in the Brazos River began at Waco on April 4 with a 24-hour rise in the river of 18.7 feet to a stage of 25.5 feet, 1.7 feet below the flood stage. The crest of 33.3 feet occurred at 8 p. m. of the same day. The width of the river was then about 1 mile, and 50,000 acres of land in McLennan County were under water. At Washington the crest stage of 49.9 feet, 4.9 feet above the flood stage, occurred at 1 p. m., April 8, when the river was 2 miles wide. The crest reached the mouth of the river at Freeport on April 13, with a stage of 42 feet, 0.2 foot above the flood stage.

The second flood began with an initial rise of 18 feet in 24 hours at Kopperl on April 26, and the crest stage was 20 feet, 1 foot below the flood stage at 3:15 p. m. of the same date. At Valley Junction the crest stage on April 29 was 3.3 feet above the flood stage of 44 feet, and at the close of the month the water was flooding the lowlands around Washington with a river stage of 46.2 feet, 1.2 feet above the flood stage.

Although warnings were timely and frequent, the losses as reported amounted to \$821,500, mainly to growing cotton and corn, while property to the value of \$322,000 was saved through the warnings.

There were also two floods in the Colorado and Guadalupe Rivers, the first from April 5 to 7, inclusive, and the second near the close of the month. Flood stages were not reached during the first flood, except from Columbus southward, and only local warnings were issued. The second flood was a more general one, and flood stages were exceeded at all places below Ballinger. Warnings were issued at the proper time.

The early flood in the Guadalupe River reached serious proportions and did considerable damage to growing crops, etc. The Cuero Light & Power Plant was damaged to the extent of \$15,000, but no other figures are available. The crest stage of 23.9 feet at Victoria on the 9th was 7.3 feet above the flood stage and within 1.2 feet of the record flood of October 21, 1919. At Gonzales the river rose 28.5 feet in 24 hours on April 4-5 to a crest of 33.3 feet, 11.3 feet above the flood stage, and cattle to the value of \$5,000 were saved through the timely warnings at this place alone. The flood at the end of the month was less pronounced and was also well forecast.

Flood stages during April, 1922.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
ATLANTIC DRAINAGE.					
<i>Connecticut:</i>					
White River Junction, Vt.....	13	(1)	1	13.4	1
Bellows Falls, Vt.....	13	9	22	28.8	12
Holyoke, Mass.....	12	12	13	16.4	12
Hartford, Conn.....	9	12	16	11.4	13
	16	(1)	2	19.3	1
	16	10	22	24.5	14
<i>Hudson:</i>					
Corinth, N. Y.....	10	12	13	11.1	13
Albany, N. Y.....	12	12	16	16.8	12
<i>Susquehanna:</i>					
Oneonta, N. Y.....	12	13	13	12.8	13
<i>Pedee:</i>					
Cheraw, S. C.....	27	8	8	30.3	8
<i>Lynches:</i>					
Effingham, S. C.....	14	13	13	14.5	13
<i>Santee:</i>					
Bimini, S. C.....	12	(1)	(2)	18.4	11
Ferguson, S. C.....	12	(1)	(2)	14.3	12
<i>Catawba-Waterloo:</i>					
Catawba, S. C.....	12	7	7	15.0	7
Camden, S. C.....	24	7	9	29.3	7

¹Cf. Landis, D. S.: Rainfall and flood at Fort Worth, Tex. This REVIEW, pp. 188-189.

Flood stages during April, 1922—Continued.

River and station.	Flood stage.	Above flood stages—dates.		Crest.		River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.			From—	To—	Stage.	Date.
ATLANTIC DRAINAGE—continued.						MISSISSIPPI DRAINAGE—continued.					
<i>Broad:</i>	<i>Fect.</i>			<i>Fect.</i>		<i>West Fork of White:</i>	<i>Fect.</i>			<i>Fect.</i>	
Blairs, S. C.	15	7	8	19.7	7	Anderson, Ind.	12	1	1	12.2	1
<i>Saluda:</i>							12	11	12	12.8	11
Peizer, S. C.	7	6	7	8.0	6-7		12	15	16	17.5	15
Chappells, S. C.	14	6	9	18.8	8		12	18	19	14.7	12
	14	20	21	16.0	20		14	12	12	14.7	12
<i>Congaree:</i>						Noblesville, Ind.	14	15	16	17.3	16
Columbia, S. C.	15	7	8	18.5	7		14	18	19	15.4	18
<i>Apalachicola:</i>							14	18	19	15.4	18
River Junction, Fla.	12	(1)	7	14.0	3	Elliston, Ind.	19	(1)	5	24.5	3
Blountstown, Fla.	15	(1)	11	17.0	3		19	9	23	27.0	20
<i>Tombigbee:</i>						<i>Mississippi:</i>					
Lock 4, Demopolis, Ala.	39	3	10	46.7	6	La Crosse, Wis.	12	12	21	13.7	17
	39	22	27	44.4	25	Prairie du Chien, Wis.	18	17	22	19.4	20
<i>Black Warrior:</i>						Dubuque, Iowa	18	17	26	21.0	20-21
Lock 10, Tuscaloosa, Ala.	46	20	20	48.5	20	Clinton, Iowa	16	18	29	19.0	22-23
<i>Pearl:</i>						Le Claire, Iowa	10	17	(3)	12.9	23
Edinburg, Miss.	21	2	4	22.0	3-4	Davenport, Iowa	15	19	28	17.1	23
Jackson, Miss.	20	(1)	14	27.6	6	Muscatine, Iowa	14	19	29	19.5	24
Columbia, Miss.	18	3	10	20.2	5-6	Keokuk, Iowa	16	15	(3)	17.6	23
<i>West Pearl:</i>						Warsaw, Ill.	17	15	(3)	20.2	24
Pearl River, La.	13	(1)	22	15.2	1	Quincy, Ill.	14	14	(2)	18.7	25
						Hannibal, Mo.	13	12	(3)	18.9	25
						Louisiana, Mo.	12	10	(2)	17.0	26-27
						Grafton, Ill.	18	(1)	4	19.4	2
						Alton, Ill.	21	(1)	7	25.8	3
						St. Louis, Mo.	30	10	(3)	31.5	19-20
						Chester, Ill.	27	3	3	34.0	19
						Cape Girardeau, Mo.	30	(1)	9	37.0	3
						New Madrid, Mo.	34	(1)	(3)	34.0	20-21
						Memphis, Tenn.	35	(1)	(5)	38.0	21-22
						Helena, Ark.	42	(1)	(3)	41.7	26-27
						Arkansas City, Ark.	48	(1)	(3)	52.9	30
						Greenville, Miss.	42	(1)	(3)	58.0	22-27
						Vicksburg, Miss.	45	(1)	(3)	52.1	25-27
						Natchez, Miss.	46	(1)	(3)	55.0	28-29
						Baton Rouge, La.	35	2	(3)	44.6	27-28
						Donaldsonville, La.	28	(1)	(3)	35.8	27-28
						New Orleans, La.	18	(1)	(3)	22.7	24
						<i>Wisconsin:</i>					
						Merrill, Wis.	11	11	11	11.0	11
						Knowlton, Wis.	12	5	13	18.6	11
						Wisconsin Rapids, Wis.	12	11	12	13.5	11
						Portage, Wis.	14	11	17	15.8	14
						<i>Illinois:</i>					
						Morris, Ill.	13	(1)	22	20.1	12
						Peru, Ill.	14	(1)	(3)	23.8	13
						Henry, Ill.	7	(1)	(3)	18.0	15-16
						Peoria, Ill.	16	(1)	(3)	24.8	15
						Havana, Ill.	14	(1)	(3)	22.6	20
						Beardstown, Ill.	12	(1)	(3)	25.1	20
						Pearl, Ill.	12	(1)	(3)	23.0	19
						<i>Grand:</i>					
						Chillicothe, Mo.	18	10	11	19.1	10
						Brunswick, Mo.	10	10	14	12.6	11-12
						<i>Osage:</i>					
						Osceola, Mo.	20	(1)	2	21.6	2
							20	8	21	28.8	10
							22	(1)	6	26.8	4
							22	8	22	34.9	12
							22	28	(3)	25.3	28
							25	(1)	23	37.7	17
							25	29	(3)	27.4	30
						<i>Meramec:</i>					
						Steelville, Mo.	12	18	18	13.1	18
							11	(1)	3	17.9	3
							11	11	13	12.3	11
							11	17	20	17.4	20
							11	30	(3)	12.6	30
							14	(1)	4	21.0	3
							14	11	13	14.8	12
							14	15	21	22.8	19
						<i>Bourbeuse:</i>					
						Union, Mo.	10	1	3	14.4	2
							10	17	19	13.6	19
						<i>St. Francis:</i>					
						Marked Tree, Ark.	17	(1)	(3)	19.3	15-17
						<i>Yazoo:</i>					
						Yazoo City, Miss.	25	(1)	(3)	31.9	29-30
						<i>Tallahatchie:</i>					
						Swan Lake, Miss.	25	(1)	30	28.0	1
						<i>Red:</i>					
						Fulton, Ark.	28	8	10	28.5	9
						Alexandria, La.	36	12	23	37.1	18-20
						<i>Ouachita:</i>					
						Camden, Ark.	30	(1)	13	36.2	4
						Monroe, La.	30	30	(3)	30.1	30
							40	11	(3)	41.4	21-22
						<i>Atchafalaya:</i>					
						Simmesport, La.	41	6	(3)	49.5	28-29
						Melville, La.	37	1	(3)	44.8	28
						<i>Missouri:</i>					
						Hermann, Mo.	21	8	20	24.7	18
						St. Charles, Mo.	25	(1)	2	25.5	1
							25	8	22	30.8	13, 19
						<i>James:</i>					
						Huron, S. Dak.	9	(1)	(3)	12.1	1
						<i>Smoky Hill:</i>					
						Lindsborg, Kans.	19	26	27	21.4	27

1 Continued from March, 1922.

1 Continued into May, 1922.

Flood stages during April, 1922—Continued.

MEAN LAKE LEVELS DURING APRIL, 1922.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
MISSISSIPPI DRAINAGE—continued.					
<i>Arkansas:</i>	<i>Feet.</i>			<i>Feet.</i>	
Wichita, Kans.....	9	9	10	9.9	9
Fort Smith, Ark.....	22	10	17	27.8	12
Dardanelle, Ark.....	20	11	18	25.2	13
Little Rock, Ark.....	23	14	15	23.3	14
Pine Bluff, Ark.....	25	14	17	26.0	16
<i>Neosho:</i>					
Neosho Rapids, Kans.....	22	10	11	24.4	11
Le Roy, Kans.....	24	9	11	27.4	9
Iola, Kans.....	15	9	13	19.2	10
Oswego, Kans.....	17	5	17	23.8	9
Wyandotte, Okla.....	23	10	10	23.5	10
Fort Gibson, Okla.....	22	10	17	30.0	11
	22	19	19	22.4	19
<i>Cottonwood:</i>					
Emporia, Kans.....	20	10	12	22.9	11
<i>North Canadian:</i>					
Woodward, Okla.....	3	5	10	3.4	8
Canton, Okla.....	3	25	(*)	5.0	25
Okiahoma City, Okla.....	3	26	26	3.7	26
	12	10	10	12.6	10
<i>Petit Jean:</i>					
Danville, Ark.....	20	(1)	3	22.7	2
	20	6	9	22.6	7
<i>Little Arkansas:</i>					
Sedgwick, Kans.....	18	23	9	23.5	9
<i>White:</i>					
Newport, Ark.....	26	13	14	26.2	13-14
Georgetown, Ark.....	22	(1)	24	23.9	6-9,11,15
Clarendon, Ark.....	30	7	27	30.7	11-21
<i>Black:</i>					
Black Rock, Ark.....	14	(1)	(2)	23.4	9
<i>Catche:</i>					
Patterson, Ark.....	9	(1)	19	10.3	1
<i>Sulphur:</i>					
Finley, Tex.....	22	(1)	16	26.4	2-3
	22	27	(1)	28.2	30
Ringo Crossing, Tex.....	20	6	10	23.0	6
	20	26	(2)	23.3	28
<i>Cypress:</i>					
Jefferson, Tex.....	18	2	8	21.6	4
	18	27	(2)	20.5	28
WEST GULF DRAINAGE.					
<i>Sabine:</i>					
Logansport, La.....	25	(1)	(2)	34.7	2
Orange, Tex.....	4	8	24	5.0	17
<i>Neches:</i>					
Rockland, Tex.....	20	(1)	17	28.9	2
Beaumont, Tex.....	20	29	(2)	21.7	30
	7	4	21	11.2	9-10
<i>Trinity:</i>					
Fort Worth, Tex.....	30	25	26	39.1	25
Dallas, Tex.....	25	4	9	36.5	5
	25	26	(2)	42.3	27
Trinidad, Tex.....	28	6	17	38.3	11
	28	26	(2)	38.8	30
Long Lake, Tex.....	40	9	16	41.7	9
Liberty, Tex.....	40	30	(2)	42.4	30
	25	(1)	(2)	28.0	7-10
<i>Brazos:</i>					
Waco, Tex.....	27	4	5	33.3	4
	27	27	27	30.4	27
Valley Junction, Tex.....	44	5	7	49.4	6
	44	29	29	47.3	29
Washington, Tex.....	45	6	10	49.9	8
Hempstead, Tex.....	45	29	30	48.2	30
	40	8	11	42.7	9
Freeport, Tex.....	4	13	14	4.2	13-14
	4	16	17	4.2	15-17
COLORADO DRAINAGE.					
<i>Colorado (Texas):</i>					
Austin, Tex.....	18	27	(2)	21.2	28
Smithville, Tex.....	24	30	(2)	24.1	30
Columbus, Tex.....	28	5	7	31.7	6
	28	29	(2)	33.0	30
<i>Guadalupe:</i>					
Gonzales, Tex.....	22	5	6	33.3	5
	22	29	29	25.2	29
Victoria, Tex.....	16	1	3	21.0	3
	16	5	10	23.9	9
	16	30	(2)	17.2	30
<i>Colorado:</i>					
Lee's Ferry, Ariz.....	12	26	(2)	13.6	30
<i>North Fork of Gunnison:</i>					
Paonia, Colo.....	8	26	(2)	8.6	30

1 Continued from March, 1922.

2 Continued into May, 1922.

By UNITED STATES LAKE SURVEY.

[Detroit, Mich., May 3, 1922.]

The following data are reported in the "Notice to Mariners" of the above date:

Data.	Lakes. ¹			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during April, 1922:				
Above mean sea level at New York.....	<i>Feet.</i> 601.45	<i>Feet.</i> 579.93	<i>Feet.</i> 572.35	<i>Feet.</i> 246.06
Above or below—				
Mean stage of March, 1922.....	+0.10	+0.53	+0.96	+0.98
Mean stage of April, 1921.....	-0.24	-0.41	-0.44	-0.32
Average stage for April, last 10 years.....	-0.37	-0.45	-0.12	-0.35
Highest recorded April stage.....	-1.24	-3.30	-1.83	-2.37
Lowest recorded April stage.....	+0.91	+0.71	+1.09	+1.22
Average relation of the April level to:				
March level.....		+0.30	+0.70	+0.70
May level.....		-0.30	-0.40	-0.30

¹ Lake St. Clair's level: In April, 575.08 feet.

EFFECT OF WEATHER ON CROPS AND FARMING OPERATIONS, APRIL, 1922.

By J. WARREN SMITH, Meteorologist.

The first half of April was warm for the season in the Central and Eastern States, but unseasonably cool weather persisted west of the Rocky Mountains, while the latter half of the month was cool in the east, with freezing temperatures extending southward well into the Appalachian Mountain districts.

The unseasonably cold and stormy weather in the more Western States was decidedly unfavorable for stock in that section, especially for young lambs, and considerable loss was reported. The warm weather in Eastern States had forced a rapid development of fruit bloom, and early varieties were coming into blossom in districts that were visited by freezing temperatures and killing frosts the latter part of the month. Much damage was done to fruit in the upper Ohio Valley and the central Appalachian districts by the freeze of April 22-24. Additional damage occurred to fruit in these sections during the following week, being rather heavy in central Ohio and West Virginia, and to grapes and early cherries in New York.

The weather continued generally favorable for winter wheat and other fall-sown grains east of the Rocky Mountains. The mild temperatures and abundant moisture caused rapid growth of winter wheat, while the rains early in the month favorably affected this crop in the Southwest. There was too much rain, however, in some central districts; and much wheat land was flooded in many low sections, while plants continued to show lack of vitality and stooled poorly in western Kansas, due to the previous long winter drought.

Seeding of spring wheat and spring oats was further delayed in central and northern districts by frequent rains, but there was a marked improvement in soil condition the latter part of the month, which permitted of much better progress, especially in some large oat-producing sections of the upper Mississippi Valley. Spring-wheat seeding was pushed during the last two weeks of