Notable Local Floods of 1942–43

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1134

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'epared in cooperation with the Corps Engineers and the State of West irginia

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NOTABLE LOCAL FLOODS OF 1942-43

FLOOD OF AUGUST 4-5, 1943, IN CENTRAL WEST VIRGINIA

By H. M. Erskine

ABSTRACT

During the night of August 4–5, 1943, a violent thunderstorm of unusual intensity occurred in parts of Braxton, Calhoun, Gilmer, Ritchie, and Wirt Counties in the Little Kanawha River Basin in central West Virginia. Precipitation amounted to as much as 15 inches in 2 hours in some sections. As a result, many small streams and a reach of the Little Kanawha River in the vicinity of Burnsville and Gilmer reached the highest stages known. Computations based on special surveys made at suitable sites on representative small streams in the areas of intense flooding indicate that peak discharges closely approach 50 percent of the Jarvis scale.

Twenty-three lives were lost on the small tributaries as numerous homes were swept away by the flood, which developed with incredible rapidity during the early morning hours. Damage estimated at $1,300,000 resulted to farm buildings, crops, land, livestock, railroads, highways, and gas- and oil-producing facilities. Considerable permanent land damage resulted from erosion and deposition of sand and gravel.

INTRODUCTION

The flood of August 4–5, 1943, in the Little Kanawha River Basin in central West Virginia was of short duration and high intensity. The area affected (fig. 1) was about 50 miles long and 10 miles wide extending northwest along the major axis of the roughly diamond-shaped Little Kanawha River Basin. Many small streams in Braxton, Calhoun, Gilmer, Ritchie, and Wirt Counties reached stages much higher than previously known as a result of precipitation that amounted to as much as 15 inches in 2 hours. Little Kanawha River reached the highest stages of record in the vicinity of Burnsville and Gilmer, but farther downstream the peak stages were not exceptional. In less than one-fourth of the area of the basin was precipitation during the storm in excess of 4 inches.

Twenty-three lives were lost as a result of the flood. Although there was considerable flooding of residential property in the communities along the Little Kanawha River, all loss of life occurred along relatively small tributaries. There in the small valleys the water rose with great rapidity during the early morning hours, carrying away many homes.

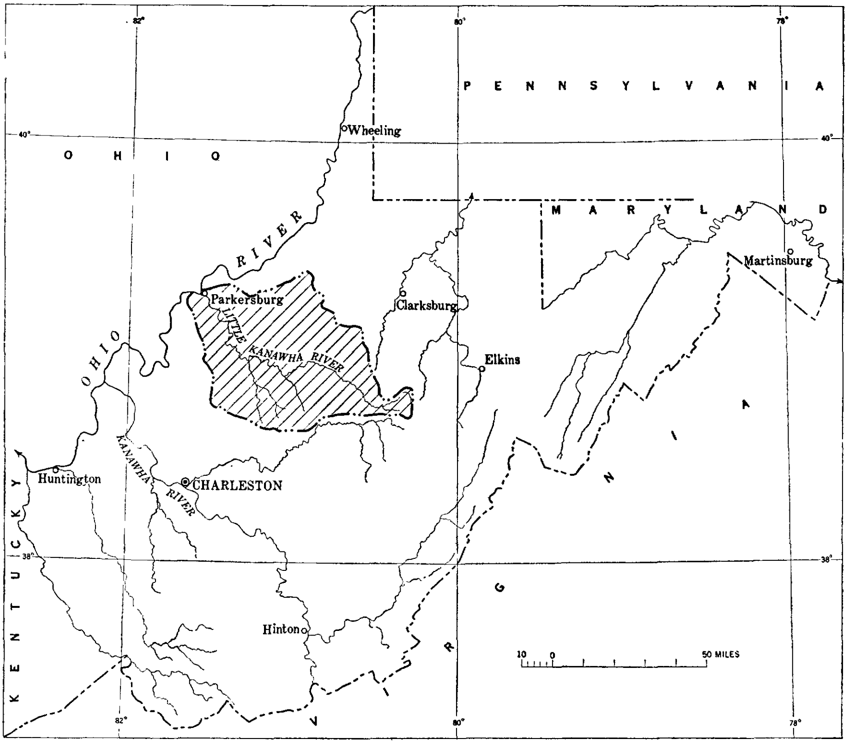


FIGURE 1.—Map of West Virginia showing location of Little Kanawha River basin.

Property damages were high considering the limited extent to which the area is settled. Crops and agricultural land, farm homes and farm buildings, railroads, highways and rural roads, and gas- and oil-producing facilities suffered heavy damages. As a result of a survey conducted by its office at Huntington, W. Va., the Corps of Engineers arrived at the following summary of damages:

Agricultural lands, farm buildings, livestock, etc	$511, 750
Urban damages	29, 500
Baltimore & Ohio Railroad Co	566, 935
State Road Commission	158, 950
Gas- and oil-producing companies	26, 938
Total	1, 294, 073

Severe flash floods, resulting from violent thunderstorms covering relatively small areas, are known to have occurred previously in West Virginia, but little or no factual information is available relative to the maximum rainfall and its intensity or to the maximum rate of discharge from the small areas affected. Notable among previous floods of this general type in West Virginia are the floods on Cabin

Creek and Coal River in Kanawha and Boone Counties during August 1916, when 40 lives were lost and the estimated property damage was $5,000,000, and the floods on Paint Creek and Armstrong Creek in Fayette and Kanawha Counties during July 1932, which caused the loss of 19 lives and property damage estimated at $1,000,000 (Congressional Doc., 1935).

The outstanding features of this flood made it appear highly desirable that factual information relative to it and the storm that produced it be collected and assembled in report form. Accordingly, the Geological Survey undertook to make special determinations of the peak discharges by means of slope-area measurements based on surveys at the most favorable sites available on representative small streams in the most severely flooded areas. The selection of these sites was coordinated closely with the data on rainfall that were assembled soon after the storm.

Although there were several regularly operated precipitation stations in the storm area, none of these were in the localities where the rainfall was intense. The wide variations in rainfall over relatively small areas made it essential that additional records be obtained to define accurately the amount and distribution of precipitation.

Representatives of the Corps of Engineers, the Weather Bureau, and the West Penn Power Co. made a thorough investigation of the area soon after the storm and interviewed many local residents regarding ertinent features of the storm. Numerous miscellaneous records of ainfall were thus obtained from the amount of water collected in ails, tubs, jars, and other containers that were uncovered and in the open during the storm.

It is the aim of this report to bring together in suitable form the data collected during those special investigations and the data collected at regular gaging and precipitation stations.

ADMINISTRATION AND PERSONNEL

This report was prepared in the Water Resources Division of the Geological Survey under the general administrative direction of G. L. Parker, Chief Hydraulic Engineer, until his death on February 12, 1946, and since that time by his successor, C. G. Paulsen. The field and office work was performed and the original report prepared by H. M. Erskine, district engineer, Charleston district, assisted by his staff. Hollister Johnson, hydraulic engineer, reviewed the computations of peak discharge.

ACKNOWLEDGMENTS

The general stream-measurement program in West Virginia at the time of the flood and during the subsequent investigation was carried on by the Geological Survey cooperating with the Corps of Engineers,

and with the State of West Virginia through its Geological and Economic Survey, Public Service Commission, Health Department, and Water Commission. Acknowledgment is made to those cooperating agencies and also to the Weather Bureau and to J. E. Stewart, hydraulic engineer, West Penn Power Co., who furnished much valuable material and many helpful suggestions.

DESCRIPTION OF THE STORM AND FLOOD

The heavy rainfall of August 4 to 5 and the resultant floods were caused by a large supply of convectively unstable, moist, tropical maritime air, transported from the general region of the Gulf of Mexico, which released its potential energy with explosive violence upon interaction with a cold air mass that had moved into the area from the northwest. Storms of this type are limited to the hot summer period and are characterized by intense rainfall, accompanied by thunder and lightning. This general type of storm is described in considerable detail elsewhere (Eisenlohr, 1951).

The U. S. Weather Bureau (1943) has described this storm as follows:

> Thundershowers, mostly of short duration, occurred about dusk on August 4, throughout the Little Kanawha River Basin. However, these showers were locally heavy in the Burnsville-Copen area. They were followed about 3 hours later by record-breaking rains accompanied by one of the worst, if not the worst, electrical storms of record. The excessive rains began to fall in the McFarlan-Girta area about 11 p. m., August 4, and progressed southeastward into the Saltlick Creek Basin where the excessive rains began about 1 a. m., August 5. These rains continued in most places for from 1 to 2 hours and were generally continuous, although quite a number of persons reported brief slackenings of the hard rains. There were two main peaks of excessive rainfall, one over the Burnsville-Copen-Cedarville area and the other over the Nobe-Brohard area.

The resulting flood developed with incredible speed and, coming as it did at night on the tributaries, gave no opportunity for warning the people residing along the normally small streams. The violence of the storm and the roar of the streams awakened many in time for them to seek refuge on higher ground. However, many were either not awakened in time or, if awake, did not realize the danger and remained in their homes, which in many cases were destroyed by the onrushing waters. Eight persons were drowned in the vicinity of Heaters on the O'Brien Fork Saltlick Creek, eight in the vicinity of Copen on Copen Run (fig. 2), five at Girta on Island Run, and two above Tanner on Tanner Creek. Of these 23 who lost their lives more than half were small children.

The area affected by the flood ranges from hilly to mountainous, with elevations varying from about 600 to 1,500 feet except for a few points in the southeastern part where elevations in excess of 2,000

FIGURE 2.—Residence of the Yeager family where six persons perished during the flood. The house was swept ½ mile down Copen Run and came to rest in the creek bed. Courtesy of Corps of Engineers.

feet are reached. The hillsides are generally steep, the valleys narrow, and the profiles of the tributary streams moderately steep. Heavy showers had fallen over most of the area during the week preceding the flood. These circumstances tended to produce a situation favorable to high rates of runoff.

The principal tributaries that had high rates of discharge—the highest stages known to local residents—were Saltlick Creek, Copen Run, Cedar Creek, Tanner Creek, Laurel Fork, Yellow Creek, and Leatherbark Creek. At Burnsville, Little Kanawha River reached a crest stage about 25 feet above extreme low water and 0.5 foot higher than the flood of March 1918, which had been the highest of record. At Gilmer, the 1918 maximum was exceeded by 0.1 foot. At Glenville, the crest stage was 30.73 feet compared to 33.6 feet in November 1926, which is the highest of record. The crest stage became lower as it advanced downstream.

The water-supply system for the town of Burnsville was put out of operation. Other municipal supplies were not affected but two-thirds of the wells in the flood area were reported contaminated by the flood waters. Emergency water-purification measures and public clinics for immunization against typhoid fever were promptly set up under the general direction of the State Health Department. The Red Cross and Civilian Defense workers were active in assisting with relief and rehabilitation work.

Probably the largest single property damaged by the flood was the 10-mile length of Baltimore & Ohio Railroad Co. tracks between Heaters and Burnsville where six railroad bridges in the Saltlick Creek basin were destroyed, much track washed out or moved, and the roadbed generally damaged. (See fig. 3.) About 5 miles of track along Copen Run between Copen and Gilmer were extensively damaged and out of operation for 11 days. (See fig. 4.) The primary State highways in the flood area closed temporarily because of slides and inundations and the washing out of small bridges and fills (fig. 5). Detours were provided where needed soon after the flood

FIGURE 3.—Residence near Heaters, which with its four occupants was washed a mile down O'Brien Fork of Saltlick Creek and lodged on a displaced section of railroad track. Courtesy of Baltimore & Ohio Railroad Co

FIGURE 4.—Washed-out railroad bridge on Copen Run. Courtesy of Corps of Engineers.

FIGURE 5.—Washed-out fill on State Route 5 at Jobs Run about 10 miles below Glenville. Courtesy of Corps of Engineers.

receded. The secondary road system suffered severely with many miles of roadway and dozens of small bridges and culverts completely destroyed.

Agricultural property was heavily damaged. In addition to the many farm homes and buildings demolished or badly damaged, much tillable land in small valleys was permanently damaged by erosion along the creek banks, the washing of topsoil from the cultivated bottom lands, and the depositing of heavy deposits of sand and gravel which came down every small run in great quantities (figs. 6, 7). The

FIGURE 6.—Rock and mud deposit from a hillside wash. This wash drains about 2 acres in Right Fork Saltlick Creek basin. The man is standing at site of five-room house that was swept away by flood. Courtesy of Corps of Engineers.

cleared hillside land, used mostly for grazing purposes, was frequently cut by deep gullies. Large slides and blow-outs were common. (See fig. 8.) There were many instances where hillside pastures lost at least one-third of their cover of sod as a result of these actions.

FIGURE 7.—Typical sand and gravel deposits. Right Fork Saltlick Creek basin.

FIGURE 8.—Typical hillside erosion. Right Fork Saltlick Creek basin.

The crops on the lowlands, particularly corn, hay, and garden truck, were almost a complete loss. (See fig. 9.) Many farmers faced the necessity of selling their livestock owing to the resulting shortage of feed.

Residential and business property in Burnsville and low-lying sections of Glenville suffered materially from inundation, but no lives were lost. Ninety percent of Burnsville was inundated during the crest of the flood. Gas- and oil-producing companies suffered damages to pipe lines, rigs, compressor stations, and company buildings.

FIGURE 9.—Cornfield destroyed by flood. Right Fork Saltlick Creek. Courtesy of Corps of Engineers.

RAINFALL

Precipitation had been high in central West Virginia during the latter part of July. Heavy rainfall July 28–30 resulted in high stream flows, particularly in the upper reaches of Little Kanawha River. The data of precipitation as recorded at Weather Bureau stations in and adjacent to Little Kanawha River basin during the period July 20 to August 6 are given in table 1, and the locations of the stations are shown in figure 2. Figure 10 also shows, by means of isohyetal lines, the total rainfall during the period July 26–30.

Although light thundershowers occurred generally over the flood area during the late afternoon of August 4, the downpour producing the flood did not begin until several hours later. In the northwestern part of the area the intense rain began about 11 p. m., while in the southeastern section it did not begin until about 1 a. m., August 5. The heavy rain continued for about 2 hours with little slackening. Although there were no recording precipitation gages in the areas where the rainfall was most intense, there were several near by. The

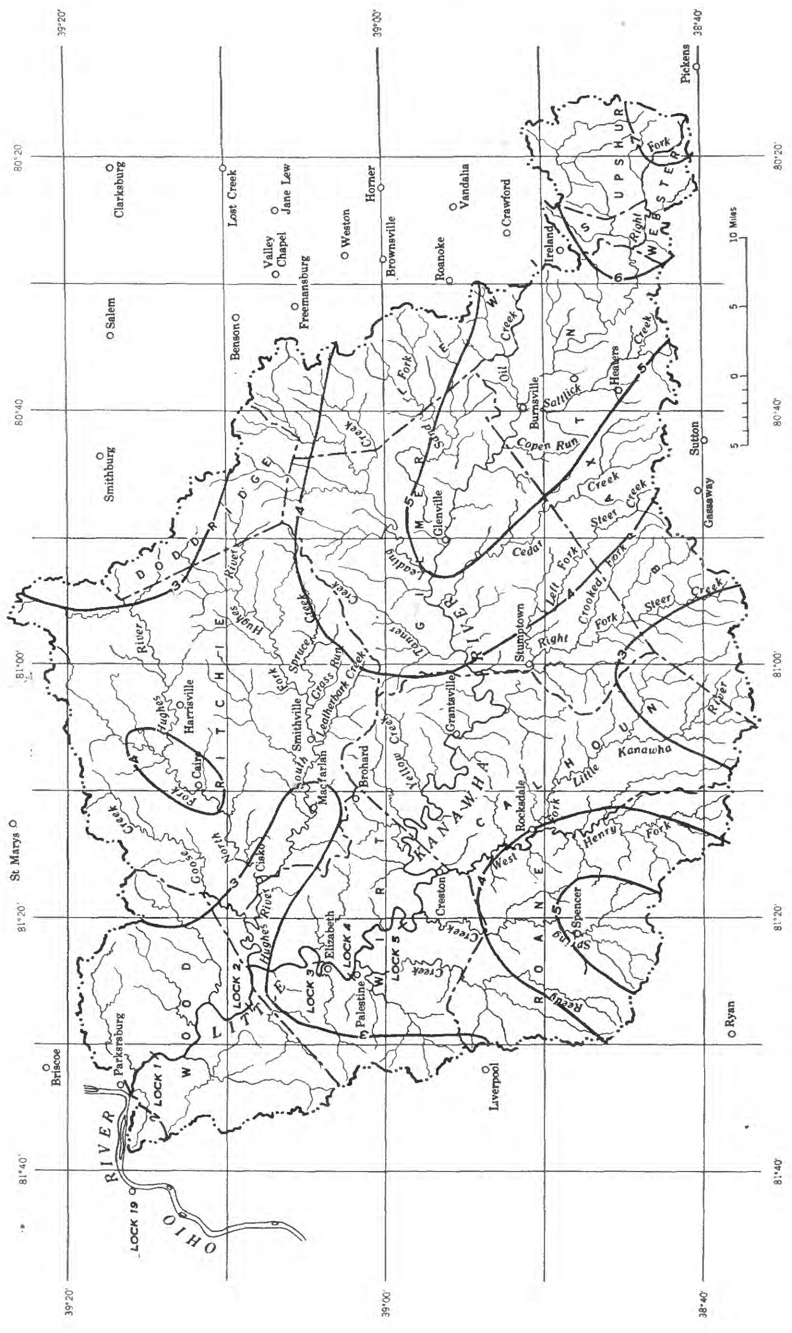


FIGURE 10.—Isohyetal map of Little Kanawha River basin showing total rainfall July 26-30, 1943.

TABLE 1.—*Daily precipitation, in inches, July 20 to Aug. 6, 1943, at stations in and adjacent to Little Kanawha River basin*

[From U. S. Weather Bureau]

Station (see fig. 10)	July												August						Totals for storms	
	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	July 25–30	Aug. 4–5
Cairo [1]			0.44				0.39		0.71	2.33	0.70					1.20	2.55		4.13	2.55
Creston [2]			.52				.72	0.19	.67	1.36	.25					.65	2.40		3.19	2.40
Elizabeth [2]			.95				.63		1.54	1.07	.22					.21	1.65		3.46	1.65
Freemansburg [3]			.52				.96		1.60	.68	.02				0.20	1.33			3.26	.74
Gassaway [3]			.65				1.10		2.50	.27					.45	.64	.97		3.87	1.17
Glenville [2]	0.12		.45				.27	.13	1.76	1.68	1.52					.77	3.70	Tr.	5.36	3.70
Ireland [1]		Tr.	.60			0.10	1.67		1.31	1.15	1.46				Tr.	.80	2.45		5.59	2.45
Macfarlan [3]			.54			.02	.30		1.77	.55	.29				.55	5.15	.03		2.91	5.03
Parkersburg [3]			.46			.05	.15		1.22	.80					.48	1.34			2.17	.98
Pickens [1]		1.11				.22	.82		1.95	1.58	2.90				.13	.47	.03		7.25	.03
Smithburg [3]	.14		.30				.84		.70	.55	[4] .02				.10	1.18			2.11	.31
Spencer [2]			.44				.33	.10	1.27	3.20	.29					.22	.63	.01	5.19	.63
St. Marys [2]			.42				.54		.12	1.21	.50					.94	1.61		2.37	1.61
Stumptown [3]			.32				.52				[5] 2.94				.08	.93	.67		3.46	1.46
Sutton [1]			.63				1.31		1.44	1.10					.16	.90	1.65		3.85	1.65

[1] Precipitation generally measured in late afternoon; amount recorded is for the 24 hours ending at the time of observation.
[2] Precipitation measured in morning; amount then recorded is for preceding 24 hours.
[3] Precipitation is for the 24-hour period midnight to midnight.
[4] Incomplete; no record 6 a. m. to 2 p. m.
[5] Total for period 3 p. m. 27th to 12 p. m. 30th.

records obtained from them are indicative of the distribution of the rainfall with respect to time and are in substantial agreement with the testimony of local residents in the storm area. The hourly precipitation at the recording gages during the storm period is listed in table 2.

TABLE 2.—*Hourly precipitation, in inches, for storm of Aug. 4–5, 1943, at recording gages*

[From U. S. Weather Bureau. Eastern Standard Time]

Hour ending	Freemansburg	Gassaway	Macfarlan	Parkersburg	Smithburg	Stumptown
Aug. 4						
4 p. m				0.02		
5	0.02		0.01	.07		
6	.41		.04	.01	0.02	
7	.01	0.02				0.31
8		.43				.04
9						
10	.14		.66	.82	.29	
11	.16		3.70	.06		.02
12			.59			.42
Aug. 5						
1 a. m		.67	.01			.61
2		.03	.02			.03
3		.02				
4						.02
5						.01
Total	0.74	1.17	5.03	0.98	0.31	1.46

It was apparent soon after the storm that the areas receiving the most intense rainfall were relatively small and were so scattered that the records for the regular precipitation stations did not give the complete picture. Accordingly, soon after the flood, field parties visited the area where intense rainfall was indicated and made a search for quantitative data. Thus, rainfall measurements were obtained at 118 additional points. The location of these points, amount of rainfall measured, and remarks regarding the reliability of each record are given in table 3. Figure 11 is an isohyetal map based on all available records for the storm.

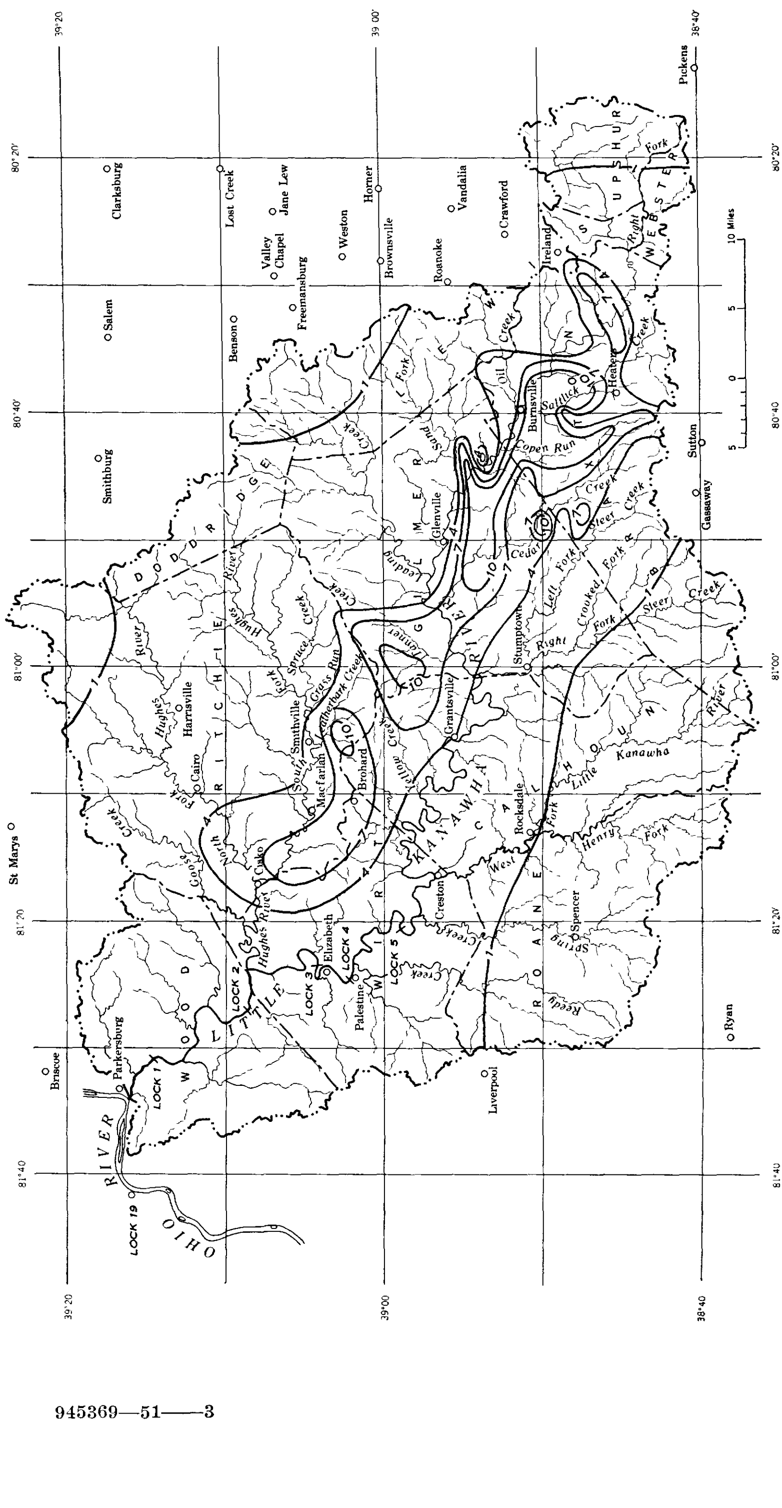


FIGURE 11.—Isohyetal map of Little Kanawha River basin showing total rainfall, August 4-5, 1943.

TABLE 3.—*Miscellaneous measurements of precipitation during storm of Aug. 4–5, 1943*

[Measurements taken from miscellaneous gages and from containers other than gages]

Measurement No.	Location						Elevation (feet above msl)	Rainfall (inches)	Estimated accuracy of measurement
	Latitude			Longitude					
	°	′	″	°	′	″			
1	39	01	11	81	13	33	800	[1] 5.5	Fair.
2	39	02	04	81	10	39	930	9.4	Good.
3	39	02	08	81	10	34	950	8.0	Do.
4	39	01	31	81	10	31	880	4.5	Fair.
5	39	02	32	81	10	00	800	[2] 2.0	Good.
6	38	55	21	81	07	51	710	5.0	Do.
7	39	04	32	81	05	42	700	5.5	Do.
8	39	03	53	81	05	26	840	10.4	Do.
9	39	00	49	81	05	03	900	6.0+	Fair.
10	38	59	44	81	04	41	1,020	5.0	Do.
11	38	59	36	81	04	17	1,020	[2] 2.0	Good.
12	38	58	15	81	03	08	960	9.4+	Do.
13	38	57	50	81	02	31	1,080	10.5+	Do.
14	38	58	43	81	02	23	1,100	6.8+	Do.
15	38	59	03	81	02	16	1,100	9.5	Do.
16	38	55	30	81	00	44	1,100	[2] 2.0	Do.
17	39	01	23	80	59	38	960	6.0	Do.
18	39	00	38	80	59	07	880	6.8+	Do.
19	39	01	12	80	57	38	900	8.1+	Fair.
20	38	59	02	80	56	31	750	5.1	Good.
21	38	55	05	80	51	50	760	13.0+	Do.
22	38	51	31	80	51	05	860	6.1	Do.
23	38	50	13	80	49	35	800	6.0	Fair.
24	38	50	42	80	49	10	820	7.0+	Reliable.
25	38	50	08	80	49	07	900	10.4	Good.
26	38	50	08	80	48	54	900	6.5	Fair.
27	38	52	15	80	48	44	860	7.2	Good.
28	38	52	10	80	48	13	860	4.5	Fair.
29	38	50	02	80	48	02	840	4.9	Good.
30	38	47	12	80	48	00	870	6.9+	Fair.
31	38	52	35	80	47	59	920	9.2	Good.
32	38	47	47	80	47	24	1,050	4.5	Do.
33	38	49	23	80	47	18	800	5.3	Do.
34	38	47	23	80	46	21	960	6.4	Fair.
35	38	49	59	80	46	13	880	7.8+	Good.
36	38	52	59	80	46	12	1,175	13.0	Do.
37	38	51	35	80	45	57	830	5.3	Do.
38	38	51	31	80	45	44	890	5.0	Do.
39	38	47	52	80	45	42	880	4.7+	Fair.
40	38	48	56	80	45	21	860	6.5+	Good.
41	38	54	57	80	45	10	720	10.8	Do.
42	38	51	36	80	44	59	860	6.4	Do.
43	38	52	07	80	44	43	830	11.0+	Fair.
44	38	53	07	80	44	41	750	5.4	Good.
45	38	53	45	80	44	18	850	3.1	Seems too low.
46	38	54	09	80	44	15	740	3.6	Questionable.
47	38	46	03	80	44	09	890	6.1	Good.
48	38	54	24	80	44	09	830	15.0+	Fair.
49	38	54	38	80	44	08	770	5.2+	Good.
50	38	53	40	80	43	49	760	7.6	Do.
51	38	50	15	80	43	47	860	[3] 9.3	Do.
52	38	46	00	80	43	46	920	7.0	Do.
53	38	50	52	80	43	35	830	7.1	Fair.
54	38	47	23	80	43	18	1,040	8.0	Good.
55	38	48	24	80	43	13	970	9.0	Do.
56	38	45	38	80	43	04	940	7.7	Do.
57	38	50	46	80	43	03	850	9.9	Do.
58	38	49	49	80	42	33	960	9.4+	Do.
59	38	46	22	80	42	31	950	10.5+	Do.
60	38	44	31	80	42	28	975	4.6	Do.
61	38	45	02	80	42	23	950	[4] 7.0	Do.
62	38	44	25	80	42	10	990	5.0	Do.
63	38	43	21	80	42	07	1,075	3.8	Do.
64	38	47	24	80	41	58	1,110	9.2+	Do.
65	38	48	33	80	41	54	980	8.0	Do.
66	38	42	03	80	41	49	975	5.0	Do.
67	38	45	02	80	41	48	940	8.5	Do.
68	38	44	54	80	41	44	1,020	7.0+	Do.
69	38	44	54	80	41	44	1,100	6.1+	Do.
70	38	51	26	80	41	31	800	10.0+	Do.
71	38	47	15	80	41	19	1,130	5.0	Do.
72	38	48	21	80	41	19	950	6.9+	Do.
73	38	47	06	80	41	10	1,180	4.8	Do.
74	38	47	59	80	41	[illegible]	1,020	9.2+	D

TABLE 3.—*Miscellaneous measurements of precipitation during storm of Aug. 4-5, 1943*—Continued

Measurement No.	Location						Elevation (feet above msl)	Rainfall (inches)	Estimated accuracy of measurement
	Latitude			Longitude					
	°	′	″	°	′	″			
75	38	49	46	80	40	52	790	12.5	Good.
76	38	43	41	80	40	52	1,160	7.9+	Do.
77	38	48	39	80	39	56	800	8.5+	Fair.
78	38	51	41	80	39	45	800	5.3	Good.
79	38	51	36	80	39	46	800	7.6+	Do.
80	38	48	10	80	39	37	870	3.3	Questionable.
81	38	47	48	80	39	37	1,080	7.2+	Good.
82	38	47	54	80	39	28	980	6.2	Fair.
83	38	45	21	80	39	18	890	4.2	Good.
84	38	51	31	80	39	17	780	8.9+	Do.
85	38	45	40	80	39	16	910	5.5	Fair.
86	38	43	55	80	39	14	980	4.6	Do.
87	38	51	41	80	39	12	880	14.8	Do.
88	38	51	03	80	38	56	780	10.0	Good.
89	38	45	45	80	38	33	880	6.0	Do.
90	38	46	41	80	38	26	820	6.9+	Fair.
91	38	46	25	80	38	15	950	7.7	Good.
92	38	48	45	80	38	06	960	[3] 12.0	Do.
93	38	45	43	80	38	04	920	4.8	Do.
94	38	50	41	80	37	33	780	10.3+	Fair.
95	38	48	23	80	37	07	840	10.0+	Good.
96	38	51	18	80	37	02	1,010	6.5	Do.
97	38	52	18	80	36	58	810	4.4	Fair.
98	38	49	38	80	36	54	740	3.5+	Do.
99	38	49	38	80	36	54	740	5.4	Do.
100	38	45	51	80	36	48	860	6.2	Good.
101	38	49	21	80	36	47	820	9.6+	Fair.
102	38	48	57	80	36	46	820	5.0	Do.
103	38	50	33	80	36	44	790	6.4	Good.
104	38	50	33	80	36	44	800	5.8+	Do.
105	38	49	05	80	36	43	850	9.3+	Do.
106	38	52	50	80	36	39	850	4.7	Do.
107	38	47	00	80	36	34	900	5.5	Do.
108	38	50	45	80	36	34	820	6.1+	Do.
109	38	50	51	80	36	28	825	6.7	Do.
110	38	45	58	80	36	09	820	6.2	Do.
111	38	45	53	80	35	53	900	6.5	Do.
112	38	46	12	80	34	02	785	4.9	Do.
113	38	46	12	80	34	02	785	4.6	Do.
114	38	44	56	80	33	44	1,225	9.5	Do.
115	38	46	31	80	32	48	825	7.6	Do.
116	38	46	02	80	31	31	980	7.8	Do.
117	38	48	02	80	29	54	1,025	[3] 8.0	Do.
118	38	48	02	80	29	54	1,025	8.0	Do.

NOTE.—Where the record is incomplete owing to overflowing of the container, the total amount is followed by +. All measurements include the fall from a shower or showers that occurred about dusk on August 4, 1943, and it is estimated that this fall did not exceed 1 inch at any place.

[1] Approximate.
[2] Considerably plus.
[3] Slightly plus.
[4] Estimated.

FLOOD DISCHARGE

MEASUREMENT OF FLOOD DISCHARGE

The usual method of determining stream discharge at gaging stations is by the application of the stage-discharge rating to the stages recorded. The rating is defined by current-meter discharge measurements through as much of the range between the extremes of low and high water as is practicable.

Many difficulties are encountered when attempts are made to obtain current-meter measurements at high stages, particularly at gaging stations on the relatively small and flashy streams. Impass able roads resulting from slides, debris deposits, washouts, and inun dation; washed-out or inaccessible bridges or cableways from whicl measurements are usually made; huge quantities of drift in the water and very swift and turbulent flow as well as rapidly changing stag are among the obstacles encountered. When it is impracticable o impossible to obtain current-meter measurements upon which to bas the upper end of a rating, it must be extended upward on the basi of special studies.

Information on flood flows may be desirable at points other thai at the regular gaging stations. This is particularly true of flasl floods resulting from intense rainfall over relatively small areas as in the flood of August 1943. Although it is usually impossible t determine the total flood runoff at such points, a reasonably accurat value for the peak discharge may be computed where field condition are favorable. The methods employed in determining the maximun discharges given in this report are: Extension of rating curves at th gaging stations, computation of flow by the critical-depth method computation of flow through contracted openings, and computatio of flow by the slope-area method. A brief statement concernin each of these methods is given below; fuller descriptions are give elsewhere (Corbett and others, 1943, pp. 98–108).

Extension of rating curves.—This method is based essentially on th shape of the upper part of the rating curve as defined by current meter measurements and a knowledge of the channel conditions an other pertinent factors that may affect the shape of the rating abov the highest measurements. Logarithmic plotting with suitable ad justments for overflow areas and other factors that may affect th channel capacity at high stages is frequently used.

Critical-depth method.—This method has limited usage as it depend on the flow at the selected section being under critical-depth con ditions. Proof that this condition prevailed usually depends upoi an independent determination of peak flow by other methods, there fore it is generally used in conjunction with determinations made b some other method.

Contracted-opening method.—Computations using this method ar based on the conversion of head into velocity while the flow is passin through a restricted section of the channel such as a narrow openin between bridge abutments.

Slope-area method.—This method has the widest application t conditions as they are usually found in natural streams. It was use in computing peak discharges at all but one of the sites where specia discharge determinations were made for this flood. The computations were based on the Manning formula.

The slope, area of cross section, and hydraulic radius were computed from data obtained by field surveys soon after the flood had subsided. Where necessary, owing to the relative difference in conveyance properties, the cross sections were divided into appropriate parts and a value of n assigned to each. Where cross sections were reasonably uniform, one value of n was assigned to the entire section. The value selected for n in each case was arrived at on the basis of the Geological Survey's background of experience gained through flood studies involving channels of various types and through reference to engineering texts and manuals dealing with the subject.

DISCHARGES AT GAGING STATIONS DURING THE FLOOD PERIOD

Records of stage and discharge for the flood period at the nine gaging stations in operation in the Little Kanawha River Basin are given on succeeding pages. These records consist of a station description, a table giving the daily mean discharge during July and August 1943, and a table showing the gage height and discharge at indicated time in sufficient detail to permit reasonably accurate plotting of the hydrographs during the flood period. The station description gives information regarding the location of the station, the drainage area, the character of the gage height and discharge records, the maximum during the flood of August 1943, and the greatest known flood prior to 1943. The table of gage height and discharge at indicated time is omitted for the stations on Leading and Steer Creeks because complications due to backwater prevented the computation of discharge with sufficient accuracy to warrant this refinement. Where backwater or other factors affected the normal stage-discharge relation, notation of the special methods used is made under "Discharge records."

In nearly all cases the stage-discharge relation is fairly well defined by current-meter measurements, up to the maximum for the August 1943 flood. Slope-area measurements have been used to aid in defining the upper ends of the ratings for the stations in the Hughes River Basin. Water-stage recorders functioned satisfactorily at all stations during the flood period. At nonrecording stations the gage readers rendered excellent service by obtaining special gage readings, which made it possible to construct accurate hydrographs for the flood period. Figures 12 and 13 are hydrographs showing the discharge of Little Kanawha River and its tributaries during the period July 26 to August 9.

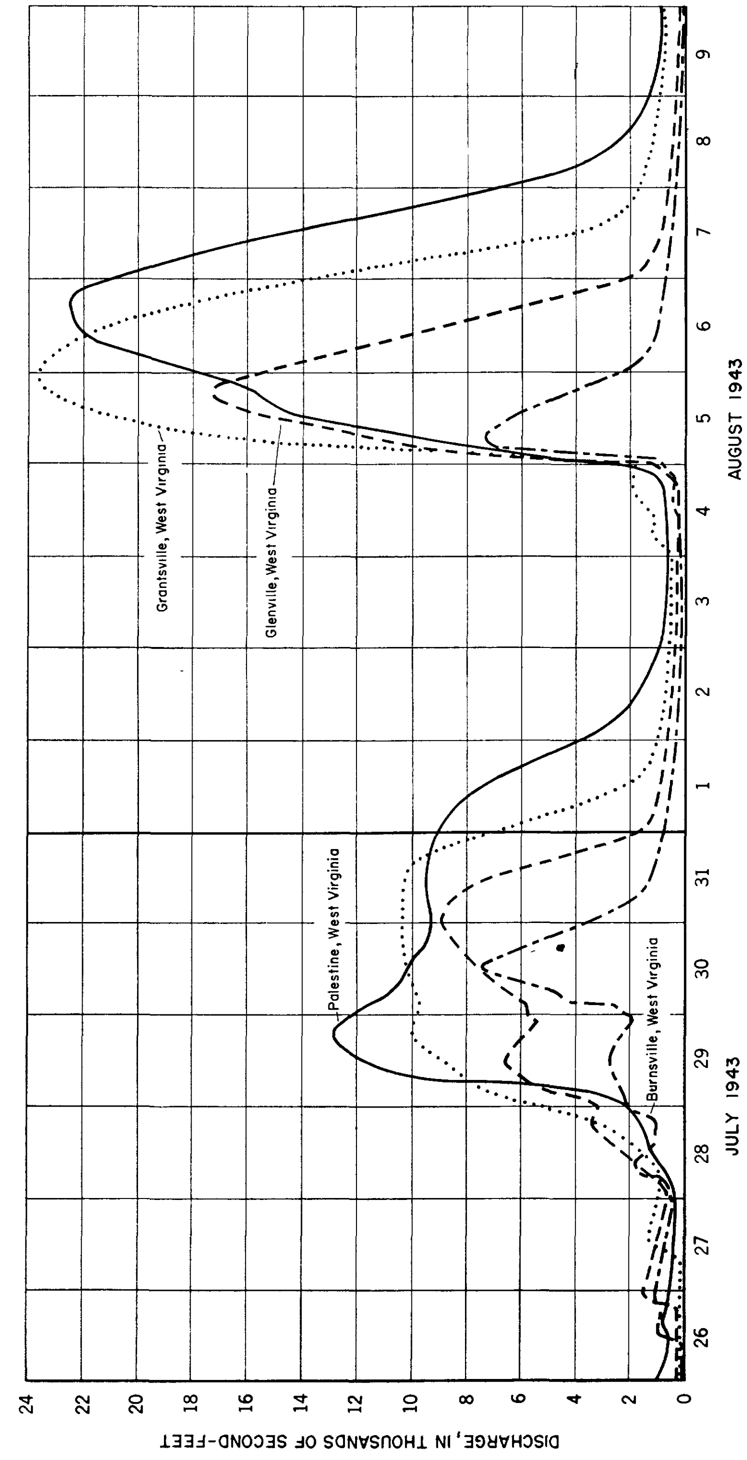


Figure 12.—Discharge hydrographs at stream-gaging stations on Little Kanawha River July 26 to Aug. 9, 1943.

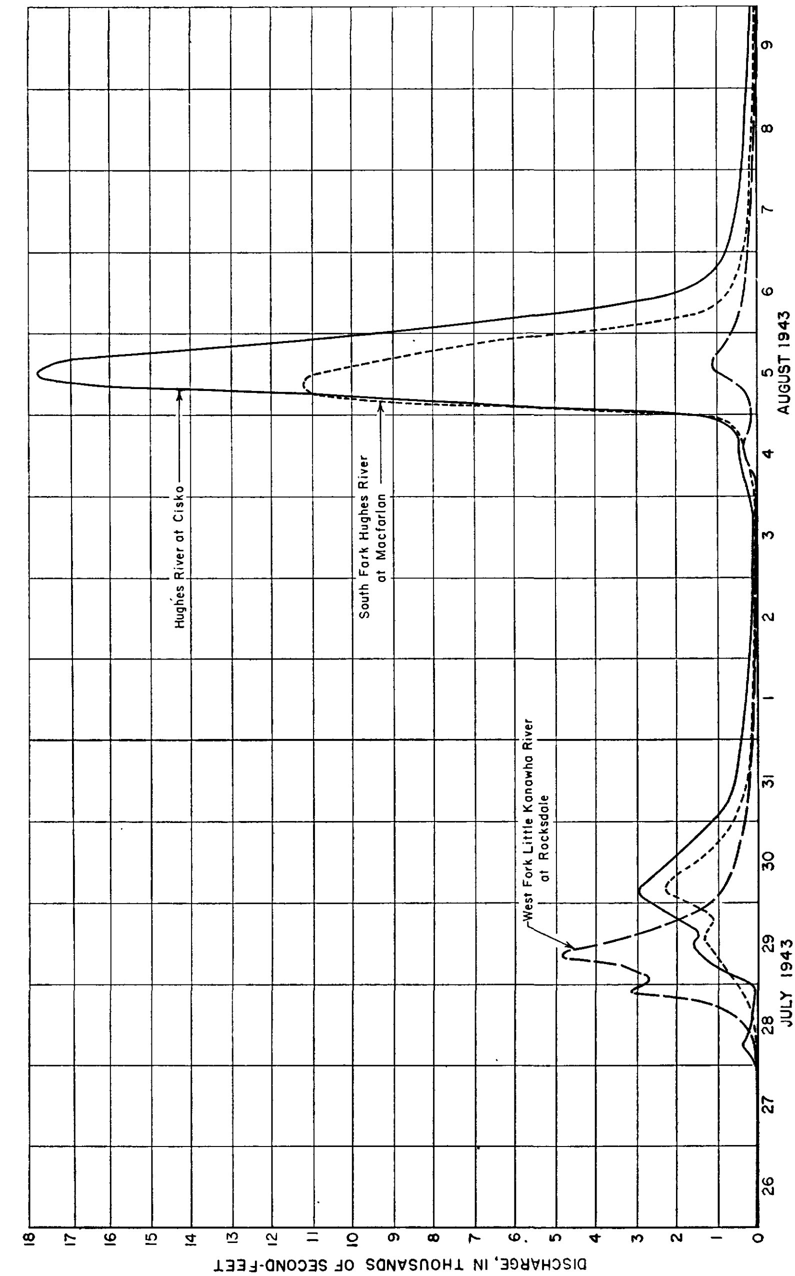


Figure 13.—Discharge hydrographs at stream-gaging stations on tributaries of Little Kanawha River July 26 to Aug. 9, 1943.

LITTLE KANAWHA RIVER NEAR BURNSVILLE

LOCATION.—Lat. 38°49′25″, long. 80°35′35″, at bridge on State Highway 5, 0.1 mile downstream from Knawl Creek and 4 miles southeast of Burnsville, Braxton County. Datum of gage is 756.09 feet above mean sea level (levels by Corps of Engineers).

DRAINAGE AREA.—155 square miles.

GAGE-HEIGHT RECORD.—Water-stage recorder graph except for period 9 a. m. to 4 p. m. July 30 for which a graph was drawn based on a floodmark.

DISCHARGE RECORD.—Stage-discharge relation defined by current-meter measurements up to 6,500 second-feet and extended above. Gage heights used to half-tenths between 3.5 and 4.6 feet; hundredths below and tenths above these limits.

MAXIMA.—1943: Discharge, 7,370 second-feet 1 p. m. July 30 (gage height 17.62 feet from floodmark); 7,290 second-feet 6. a m. Aug. 5 (gage height, 17.46 feet).

1938–42: Discharge, 9,200 second-feet Feb. 3, 1939 (gage height, 19.04 feet, observed at crest).

The flood of Mar. 13, 1918, reached a stage of 19.7 feet, from floodmark (discharge about 9,800 second-feet).

Mean discharge, in second-feet, 1943

Day	July	August	Day	July	August	Day	July	August	Day	July	August
1	69	510	9	146	172	17	42	495	25	36	37
2	52	288	10	93	121	18	52	300	26	517	33
3	41	177	11	57	106	19	54	177	27	619	50
4	38	308	12	44	75	20	45	115	28	1, 120	147
5	35	5, 050	13	76	107	21	34	80	29	2, 280	104
6	134	1, 180	14	93	447	22	38	64	30	5, 190	61
7	84	495	15	76	705	23	78	53	31	1, 560	46
8	69	282	16	62	408	24	50	44			
Monthly mean discharge, in second-feet										416	395
Runoff, in inches										3. 09	2. 94

Gage height, in feet, and discharge, in second-feet, at indicated time, 1943

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
July 26:			*July 26*—Con.			*July 28*—Con.		
1 a. m.	1. 58	34	10	5. 38	1, 010	8	7. 78	1, 810
2	1. 58	34	11	5. 40	1, 010	9	7. 94	1, 840
3	1. 57	33	12	5. 43	1, 010	10	7. 80	1, 810
4	1. 57	33	*July 27:*			11	7. 43	1. 670
5	1. 56	33	2 a. m.	5. 34	980	Noon	6. 98	1, 530
6	1. 55	32	4	5. 00	890	2 p. m.	5. 82	1, 130
7	1. 55	32	6	4. 70	800	4	5. 22	950
8	1. 75	44	8	4. 40	710	6	5. 41	1, 010
9	2. 12	88	10	4. 15	635	8	5. 45	1, 010
10	3. 15	342	Noon	3. 95	575	10	7. 15	1, 600
11	4. 20	650	6 p. m.	3. 48	435	12	8. 46	2, 070
Noon	4. 77	830	12	3. 17	348	*July 29:*		
1 p. m.	5. 07	920	*July 28:*			4 a. m	8. 93	2, 200
2	5. 11	920	1 a. m.	3. 12	334	8	9. 30	2, 360
3	4. 90	860	2	3. 08	323	Noon	9. 83	2, 560
4	4. 62	770	3	3. 05	314	2. p. m	9. 86	2, 600
5	4. 48	740	4	3. 02	306	4	9. 63	2, 480
6	4. 75	830	5	3. 23	364	6	9. 24	2, 320
7	5. 10	920	6	5. 50	1, 040	8	8. 67	2, 120
8	5. 30	980	7	7. 15	1, 600	10	8. 00	1, 840
9	5. 35	995				12	8. 87	2, 200

Gage height, in feet, and discharge, in second-feet, at indicated time, 1943—Con.

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
July 30:			*Aug. 3:*			*Aug. 5*—Con.		
2 a. m	9.70	2,520	Noon	2.57	172	5	17.40	7,210
4	13.78	4,620	12 p. m	2.52	160	6	17.46	7,290
6	14.32	4,940	*Aug. 4:*			7	17.43	7,210
8	15.50	5,740	2 a. m	2.55	167	8	17.35	7,210
10	16.6	6,570	4	2.58	174	9	17.23	7,050
Noon	17.5	7,290	6	2.64	189	10	17.04	6,890
1 p. m	17.62	7,370	8	2.71	208	11	16.78	6,730
2	17.5	7,290	10	2.78	227	Noon	16.47	6,490
4	16.72	6,650	Noon	3.12	323	3 p. m	15.07	5,460
6	15.77	5,950	1 p. m	3.27	366	6	13.34	4,320
8	14.60	5,130	2	3.33	384	9	11.20	3,190
10	13.40	4,380	3	3.37	396	12	9.40	2,400
12	12.17	3,700	4	3.37	396	*Aug. 6:*		
July 31:			5	3.32	381	6 a. m	6.40	1,300
6 a. m	8.46	2,040	6	3.27	366	Noon	5.37	1,000
Noon	6.17	1,240	7	3.24	358	6 p. m	4.76	825
6 p. m	5.22	945	8	3.21	349	12	4.28	675
12	4.52	735	9	3.29	372	*Aug. 7:*		
Aug. 1:			10	3.82	525	8 a. m	3.82	525
6 a. m	4.02	585	11	4.15	630	4 p. m	3.55	450
Noon	3.70	495	12	4.52	735	12	3.29	372
6 p. m	3.49	432	*Aug. 5:*			*Aug. 8:*		
12	3.30	375	1 a. m	4.74	795	Noon	2.94	271
Aug. 2:			2	8.10	1,880	12 p. m	2.74	216
Noon	2.96	277	3	15.60	5,810	*Aug. 9:*		
12 p. m	2.76	221	4	17.08	6,970	Noon	2.55	167
						12 p. m	2.40	133

LITTLE KANAWHA RIVER AT GLENVILLE

Location.—Lat. 38°56′00″, long. 80°50′20″, at highway bridge at Glenville, Gilmer County, and about 1,000 feet upstream from Sycamore Run. Datum of gage is 697.79 feet above mean sea level, adjustment of 1912. Auxiliary gage on highway bridge at mouth of Leading Creek, 2.7 miles downstream. Datum of auxiliary gage is 700.23 feet above mean sea level, adjustment of 1912.

Drainage area.—386 square miles.

Gage-height record.—Water-stage recorder graph at the base gage. Graph drawn based on four readings a day of the auxiliary staff gage from 6 a. m. July 29 to 3 p. m. July 31 and 8 a. m. Aug. 5 to 6 p. m. Aug. 6.

Discharge record.—Stage-discharge relation defined by current-meter measurements for entire range of stage. Gage heights used to half-tenths between 3.5 and 5.5 feet; hundredths below and tenths above these limits. Stage-fall-discharge relation defined by current-meter measurements for entire range of stage, used during periods of backwater from Leading Creek 6 a. m. July 29 to 3 p. m. July 31 and 8 a. m. Aug. 5 to 6 p. m. Aug. 6.

Maxima.—1943: Discharge, 17,300 second-feet 6 p. m. Aug. 5 (gage height 30.73 feet).

1915–22, 1928–42: Discharge, 20,400 second-feet Apr. 16, 1939, from graph of discharge adjusted for changing stage; gage height, 33.22 feet Apr. 17, 1939, from floodmarks.

The flood of Nov. 16, 1926, reached a stage of 33.6 feet; discharge not determined, but probably less than that of Apr. 16, 1939.

Mean discharge, in second-feet, 1943

Day	July	August	Day	July	August	Day	July	August	Day	July	August
1	114	911	9	172	296	17	65	1,400	25	75	70
2	83	426	10	136	208	18	69	560	26	333	59
3	56	262	11	90	167	19	83	308	27	1,060	61
4	44	318	12	70	146	20	75	204	28	1,970	215
5	41	13,000	13	88	118	21	65	150	29	5,500	229
6	292	8,670	14	132	302	22	56	120	30	7,400	142
7	256	984	15	98	770	23	69	98	31	6,090	94
8	138	474	16	70	578	24	96	80			
Monthly mean discharge, in second-feet										803	1,014
Runoff, in inches										2.40	3.03

Gage height, in feet, and discharge, in second-feet, at indicated time, 1943

Honr	Gage height	Discharge
July 26:		
2 a. m.	2.24	61
6	2.22	59
Noon	2.28	66
2 p. m.	2.30	69
4	2.32	72
6	2.95	184
8	5.50	1,020
10	6.56	1,430
12	6.85	1,510
July 27:		
6 a. m.	6.21	1,280
Noon	5.70	1,100
6 p. m.	4.92	805
12	4.32	595
July 28:		
2 a. m.	4.17	542
4	4.05	508
6	4.80	770
8	5.48	1,020
10	6.62	1,430
Noon	7.80	1,880
2 p. m.	9.28	2,430
4	10.62	2,940
6	11.55	3,350
8	11.72	3,390
10	11.55	3,350
12	11.22	3,180
July 29:		
2 a. m.	11.90	3,470
4	13.50	4,180
6	14.90	5,400
8	15.95	5,850
10	16.80	6,380
Noon	17.23	6,620
2 p. m.	17.48	6,600
4	17.37	6,400
6	17.00	6,120
8	16.45	5,770
10	15.73	5,270
12	16.19	5,700

Hour	Gage height	Discharge
July 30:		
2 a. m.	16.30	5,720
4	16.82	6,050
6	17.40	6,480
8	17.98	6,850
10	18.50	7,250
Noon	18.95	7,580
2 p. m.	19.34	7,830
4	19.72	8,100
6	20.05	8,400
8	20.32	8,590
10	20.55	8,790
12	20.67	8,900
July 31:		
2 a. m.	20.65	8,820
4	20.46	8,700
6	20.06	8,500
8	19.50	8,020
10	18.62	7,310
Noon	17.50	6,620
6 p. m.	12.55	3,770
12	7.57	1,800
Aug. 1:		
4 a. m.	6.05	1,210
8	5.42	988
Noon	5.00	840
6 p. m.	4.52	665
12	4.20	560
Aug. 2:		
Noon	3.76	410
12 p. m.	3.45	320
Aug. 3:		
Noon	3.23	256
12 p. m.	3.11	224
Aug. 4:		
6 a. m.	3.16	237
Noon	3.40	305
6 p. m.	3.48	329
12	5.53	1,020
Aug. 5:		
1 a. m.	9.39	2,470
2	15.66	5,310
3	19.22	7,440

Hour	Gage height	Discharge
Aug. 5—Con.		
4	21.07	8,780
5	22.68	10,000
6	23.98	11,000
7	24.98	11,800
8	25.84	12,000
9	26.59	12,200
10	27.44	13,000
11	28.19	13,900
Noon	28.82	14,600
2 p. m.	29.85	16,200
4	30.51	16,900
6	30.73	17,300
8	30.68	17,200
10	30.25	16,400
12	29.73	15,700
Aug. 6:		
2 a. m.	29.00	14,600
4	28.05	13,500
6	26.90	12,200
8	25.51	11,000
10	24.00	10,100
Noon	22.17	9,030
2 p. m.	20.10	7,820
4	17.95	6,800
6	15.50	5,440
8	13.15	4,030
10	10.70	2,980
12	8.62	2,170
Aug. 7:		
6 a. m.	5.73	1,100
Noon	5.08	877
6 p. m.	4.62	700
12	4.34	612
Aug. 8:		
6 a. m.	4.12	525
Noon	3.91	458
6 p. m.	3.74	410
12	3.60	365
Aug. 9:		
Noon	3.37	296
12 p. m.	3.19	245
Aug. 10:		
Noon	3.05	208
12 p. m.	2.93	180

LITTLE KANAWHA RIVER AT GRANTSVILLE

LOCATION.—Lat. 38°55′20″, long. 81°05′50″, at bridge on State Highway 16 at Grantsville, Calhoun County, about 1,200 feet downstream from Philip Run. Datum of gage is 652.83 feet above mean sea level, adjustment of 1912.

DRAINAGE AREA.—913 square miles.

GAGE-HEIGHT RECORD.—Water-stage recorder graph.

DISCHARGE RECORD.—Stage-discharge relation defined by current-meter measurements. Gage heights used to half-tenths between 8.0 and 11.0 feet; hundredths below and tenths above these limits.

MAXIMA.—1943: Discharge, 23,700 second-feet 10:30 p. m. Aug. 5 (gage height, 34.95 feet).

1928–42: Discharge, 34,300 second-feet Apr. 17, 1939 (gage height, 43.10 feet).

Mean discharge, in second-feet, 1943

Day	July	August	Day	July	August	Day	July	August	Day	July	August
1	288	2,920	9	367	899	17	110	2,800	25	128	148
2	172	810	10	428	644	18	99	1,470	26	119	170
3	126	530	11	239	512	19	94	776	27	738	343
4	99	1,340	12	156	422	20	108	512	28	1,820	467
5	112	17,900	13	126	467	21	106	330	29	8,530	593
6	156	20,500	14	158	374	22	101	264	30	9,970	422
7	571	5,750	15	184	1,070	23	101	201	31	9,700	259
8	380	1,330	16	140	1,370	24	112	167			
Monthly mean discharge, in second-feet										1,146	2,121
Runoff, in inches										1.45	2.68

Gage height, in feet, and discharge, in second-feet, at indicated time, 1943

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
July 26:			*July 30*—Con.			*Aug. 5*—Con.		
2 a. m.	6.96	131	12	21.18	10,300	9	29.55	18,300
Noon	6.93	124	*July 31:*			10	30.30	19,000
12 p. m.	6.87	110	4 a. m.	21.23	10,300	11	31.00	19,700
July 27:			8	21.23	10,300	Noon	31.60	20,300
2 a. m.	6.87	110	Noon	21.03	10,200	1 p. m.	32.10	20,800
4	6.86	108	4 p. m.	20.51	9,700	2	32.70	21,400
6	6.86	108	8	19.50	8,800	3	33.22	21,900
8	6.88	112	12	17.83	7,270	4	33.75	22,500
10	8.50	565	*Aug. 1:*			5	34.10	22,800
Noon	9.84	1,180	4 a. m.	15.66	5,380	6	34.40	23,100
2 p. m.	10.03	1,290	8	13.35	3,500	7	34.62	23,300
4	10.02	1,260	Noon	11.60	2,240	8	34.80	23,500
6	9.96	1,240	6 p. m.	10.26	1,400	9	34.90	23,600
8	9.86	1,180	12	9.68	1,100	10	34.94	23,600
10	9.76	1,130	*Aug. 2:*			11	34.95	23,700
12	9.63	1,080	Noon	9.06	790	12	34.91	23,600
July 28:			12 p. m.	8.68	645	*Aug. 6:*		
2 a. m.	9.50	1,000	*Aug. 3:*			2 a. m.	34.75	23,500
4	9.35	925	Noon	8.35	512	4	34.50	23,200
6	9.48	1,000	2 p. m.	8.30	495	6	34.13	22,800
8	9.38	950	4	8.25	478	8	33.70	22,400
10	9.52	1,020	6	8.20	460	10	33.10	21,800
Noon	10.13	1,350	8	8.28	495	Noon	32.40	21,100
2 p. m.	10.71	1,670	10	8.35	512	4 p. m.	30.60	19,300
4	11.32	2,040	12	8.28	495	8	28.35	17,200
6	11.83	2,370	*Aug. 4:*			12	25.40	14,300
8	12.75	3,060	2 a. m.	8.74	665	*Aug. 7:*		
10	13.92	3,880	4	9.58	1,050	2 a. m.	23.65	12,600
12	15.30	5,020	6	9.87	1,180	4	21.85	10,900
July 29:			8	9.83	1,180	6	19.90	9,160
6 a. m.	18.20	7,630	10	9.70	1,100	8	17.95	7,450
Noon	19.50	8,800	Noon	9.85	1,180	10	16.00	5,650
2 p. m.	19.96	9,250	2 p. m.	10.33	1,460	Noon	14.40	4,240
4	20.38	9,610	4	10.78	1,730	4 p. m.	12.30	2,580
6	20.70	9,880	6	10.94	1,820	8	11.52	1,990
8	20.82	9,970	8	10.93	1,820	12	11.15	1,790
10	29.80	9,970	10	10.90	1,790	*Aug. 8:*		
12	20.62	9,790	12	10.85	1,760	2 a. m.	11.00	1,660
July 30:			*Aug. 5:*			Noon	10.45	1,330
2 a. m.	20.46	9,700	1 a. m.	11.00	1,850	12 p. m.	9.93	1,080
4	20.46	9,700	2	16.20	5,830	*Aug. 9:*		
6	20.60	9,790	3	17.85	7,270	Noon	9.51	878
8	20.74	9,880	4	20.70	9.880	12 p. m.	9.16	737
10	20.85	9,970	5	23.70	12,700	*Aug. 10:*		
Noon	20.91	10,100	6	25.90	14,800	Noon	8.89	644
4 p. m.	21.00	10,200	7	27.50	16,300	12 p. m.	8.63	560
8	21.08	10,200	8	28.70	17,500			

SUPPLEMENTAL RECORD.—Aug. 5, 10:30 p. m., gage height, 34.93 feet; discharge, 23,700 second-feet.

LITTLE KANAWHA RIVER AT PALESTINE

LOCATION.—Lat. 39°02′00″, long. 81°24′20″, in lower pool at lock 4 at Palestine, Wirt County, 0.9 mile downstream from Reedy Creek. Datum of gage is 596.075 feet above mean sea level, adjustment of 1912. Auxiliary water-stage recorder in upper pool at lock 3, 5.5 miles downstream from lock 4. Datum of gage is 590.51 feet above mean sea level, adjustment of 1912.

DRAINAGE AREA.—1,510 square miles.

GAGE-HEIGHT RECORD.—Water-stage recorder graphs. Record from auxiliary gage used during periods of no backwater from Ohio River.

DISCHARGE RECORD.—State-discharge relation defined by current-meter measurements up to 18,000 second-feet and extended above. Stage-fall-discharge

Mean discharge in second-feet, 1943

Day	July	August	Day	July	August	Day	July	August	Day	July	August
1	417	7,040	9	624	1,320	17	205	2,430	25	181	182
2	375	1,900	10	538	968	18	246	2,760	26	644	346
3	326	784	11	481	776	19	222	1,400	27	329	475
4	283	784	12	378	661	20	186	907	28	877	707
5	276	12,200	13	309	651	21	155	466	29	9,800	743
6	464	21,600	14	264	820	22	165	363	30	10,300	798
7	1,030	14,900	15	222	798	23	158	283	31	9,400	440
8	730	3,000	16	210	1,100	24	141	234			
Monthly mean discharge, in second-feet										1,288	2,640
Runoff in inches										0.98	2.02

Gage height, in feet, and discharge, in second-feet, at indicated time, 1943

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
July 25:			*July 29—*			*Aug. 5—*		
4 a.m.	9.50	162	Con.			Con.		
8	9.52	172	8	15.10	12,800	10	15.14	12,800
Noon	9.50	162	12	14.87	12,200	Noon	15.38	13,900
2 p.m.	9.48	155	*July 30:*			6 p.m.	15.77	15,300
4	9.47	152	8 a.m.	14.43	10,600	12	16.45	17,600
6	9.47	152	4 p.m.	14.18	10,000	*Aug. 6:*		
8	9.50	162	12	14.01	9,400	2 a.m.	16.62	18,400
10	9.60	210	*July 31:*			4	16.98	20,000
12	10.20	655	Noon	13.95	9,400	6	17.18	20,800
July 26:			12 p.m.	13.88	9,100	8	17.34	21,200
2 a.m.	10.50	1,010	*Aug. 1:*			10	17.48	22,000
4	10.40	880	8 a.m.	13.58	8,230	Noon	17.56	22,400
6	10.24	697	4 p.m.	12.90	6,340	2 p.m.	17.60	22,400
8	10.12	581	12	11.90	3,810	4	17.62	22,400
10	10.08	547	*Aug. 2:*			6	17.60	22,400
Noon	10.10	563	8 a.m.	11.14	2,110	8	17.55	22,400
2 p.m.	10.20	655	4 p.m.	10.74	1,370	10	17.47	22,000
4	10.20	655	12	10.50	1,010	12	17.34	21,200
6	10.15	609	*Aug. 3:*			*Aug. 7:*		
8	10.08	547	Noon	10.32	784	8 a.m.	16.45	17,600
10	10.04	514	12 p.m.	10.22	676	4 p.m.	15.00	12,500
12	9.98	466	*Aug. 4:*			12	13.22	7,130
July 27:			4 a.m.	10.20	655	*Aug. 8:*		
Noon	9.76	309	8	10.20	655	Noon	11.32	2,490
12 p.m.	9.67	252	Noon	10.26	718	12 p.m.	10.70	1,300
July 28:			2 p.m.	10.29	750	*Aug. 9:*		
4 a.m.	9.66	246	4	10.30	760	Noon	10.48	984
8	9.97	458	6	10.32	784	12 p.m.	10.33	796
Noon	10.40	880	8	10.35	820	*Aug. 10:*		
6 p.m.	10.72	1,330	10	10.65	1,220	Noon	10.22	676
12	11.07	1,970	12	11.36	2,580	12 p.m.	10.12	581
July 29:			*Aug. 5:*			*Aug. 11:*		
4 a.m.	12.75	5,950	2 a.m.	12.63	5,690	Noon	10.06	530
8	13.95	9,400	4	13.37	7,670	12 p.m.	9.98	466
Noon	14.68	11,500	6	13.90	9,100			
4 p.m.	14.98	12,500	8	14.65	11,200			

relation defined by current-meter measurements up to 25 feet and extended above. Gage heights used to half-tenths between 11.5 and 13.0 feet; hundredths below and tenths above these limits.

MAXIMA.—1943: Discharge, 22,400 second-feet 4 p. m. Aug. 6 (gage height 17.62 feet).

1939–42: Discharge, 40,500 second-feet Dec. 30, 1942 (gage height, 27.5 feet, from graph based on gage readings).

The flood of April 17, 1939, reached a stage of 32.25 feet, from floodmarks (discharge, about 53,000 second-feet).

LEADING CREEK NEAR GLENVILLE

LOCATION.—Lat. 38°57′45″, long. 80°52′05″, 200 feet upstream from Big Run, 1.4 miles above mouth, and 2¾ miles northwest of Glenville, Gilmer County. Datum of gage is 700.23 feet above mean sea level, adjustment of 1912. Auxiliary gage is at site of abandoned highway bridge at mouth 1.3 miles downstream. Datum of auxiliary gage is same as base gage.

DRAINAGE AREA.—144 square miles.

GAGE-HEIGHT RECORD.—Base staff gage read twice a day to hundredths. Graphs drawn based on all available gage readings July 5–10, 27–31, Aug. 4–7, 14–15, 27–28. Auxiliary staff gage read four times a day July 29–31 and Aug. 5–6; graphs drawn based on all available readings for these days.

DISCHARGE RECORD.—Stage-discharge relation defined by current meter-measurements up to 5 feet. Gage heights used to half-tenths between 2.5 and 4.0 feet; hundredths below and tenths above these limits. Stage-fall-discharge relation defined by current-meter measurements between 5.0 and 24.0 feet, and used during periods of backwater from Little Kanawha River, July 29–31 and Aug. 5–6.

MAXIMA.—1943: Discharge, about 3,500 second-feet 8:00 p. m. Aug. 5 (gage-height, 24.1 feet, observed at crest).

1938–42: Discharge not determined; gage height, 27.5 feet Apr. 17, 1939.

REMARKS.—Gage heights given in the paragraph on maxima are affected by backwater from Little Kanawha River.

Mean discharge, in second-feet, 1943

Day	July	August	Day	July	August	Day	July	August	Day	July	August
1	18	139	9	202	62	17	7.0	65	25	11	11
2	11	64	10	94	45	18	7.3	64	26	8.2	9.9
3	6.7	34	11	36	34	19	7.9	34	27	36	20
4	6.7	456	12	22	26	20	7.9	22	28	426	206
5	21	1,420	13	15	24	21	9.7	18	29	1,170	58
6	160	2,130	14	12	30	22	32	15	30	1,150	29
7	90	323	15	9.4	77	23	16	13	31	681	19
8	104	92	16	7.9	43	24	14	12			
Monthly mean discharge, in second-feet										142	180
Runoff, in inches										1.14	1.45

STEER CREEK NEAR GRANTSVILLE

LOCATION.—Lat. 38°51′45″, long. 81°02′05″, at highway bridge 500 feet upstream from Rush Run, 2.2 miles above mouth and 5.5 miles southeast of Grantsville, Calhoun County. Datum of gage is 678.00 feet above mean sea level, adjustment of 1912. Auxiliary gage is the water-stage recorder at Grantsville (see page 22).

DRAINAGE AREA.—166 square miles.

GAGE-HEIGHT RECORD.—Water-stage recorder graphs.

DISCHARGE RECORD.—Stage-discharge relation defined by current-meter measurements up to 6,000 second-feet and extended above. Gage heights used to half-tenths between 4.6 and 6.5 feet; hundredths below and tenths above these limits. Stage and discharge ratios of the base and auxiliary gages were used in computing discharge for periods of backwater from Little Kanawha River Aug. 5–7.

MAXIMA.—1943: Discharge, 5,580 second-feet 1 p. m. Aug. 5; gage height 18.72 feet 3 p. m. Aug. 5.

1938–42: Discharge 12,400 second-feet Apr. 16, 1939; gage height 28.15 feet Apr. 16, 1939, from graph based on gage readings.

REMARKS.—All gage heights given in the paragraph on Maxima are affected by backwater from Little Kanawha River.

Mean discharge, in second-feet, 1943

Day	July	August	Day	July	August	Day	July	August	Day	July	August
1	32	80	9	34	54	17	9.1	471	25	10	16
2	17	49	10	17	42	18	8.0	114	26	13	107
3	11	35	11	11	61	19	9.3	56	27	17	150
4	8.6	119	12	8.6	50	20	12	40	28	186	143
5	12	3,070	13	32	80	21	8.6	32	29	1,260	60
6	34	1,060	14	44	148	22	6.8	26	30	401	40
7	50	162	15	22	169	23	17	20	31	169	30
8	36	84	16	13	193	24	19	17			
Monthly mean discharge, in second-feet										81.5	219
Runoff, in inches										0.57	1.52

WEST FORK LITTLE KANAWHA RIVER AT ROCKSDALE

LOCATION.—Lat. 38°50′35″, long. 81°13′20″, at highway bridge about 50 feet downstream from Henrys Fork, 800 feet downstream from Rocksdale, Calhoun County, and 9 miles southwest of Grantsville. Datum of gage is 657.85 feet above mean sea level, adjustment of 1912.

DRAINAGE AREA.—205 square miles.

GAGE-HEIGHT RECORD.—Wire-weight gage read to hundredths twice a day. Graphs drawn based on all available readings July 5–9, 27–31, Aug. 3–8, 12–18, and 26–28.

DISCHARGE RECORD.—Stage-discharge relation defined by current-meter measurements up to 12,000 second-feet. Gage heights used to half-tenths between 5.8 and 7.6 feet; hundredths below and tenths above these limits.

MAXIMA.—1943: Discharge, 1,100 second-feet 3 p. m. Aug. 5 (gage height 9.72 feet from graph based on gage readings).

1928–31, 1938–42: Discharge 20,200 second-feet Apr. 16, 1939 (gage height 30.3 feet, from floodmarks), from rating curve extended above 13,000 second-feet.

Mean discharge, in second-feet, 1943

Day	July	August	Day	July	August	Day	July	August	Day	July	August
1	39	90	9	144	51	17	12	510	25	10	16
2	24	61	10	57	42	18	11	150	26	9.3	55
3	17	45	11	35	38	19	14	70	27	23	85
4	15	193	12	26	32	20	11	44	28	831	47
5	121	640	13	20	182	21	9.6	32	29	2,980	30
6	212	348	14	18	115	22	10	25	30	634	21
7	154	148	15	17	119	23	9.3	22	31	210	15
8	238	80	16	15	170	24	12	19			
Monthly mean discharge, in second-feet										192	113
Runoff, in inches										1.08	0.63

Gage height, in feet, and discharge, in second-feet, at indicated time, 1943

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
July 26			*July 30*			*Aug. 5—*		
1 a. m.	5.08	9.2	6 a. m.	8.75	785	Con.		
Noon	5.05	8.0	Noon	8.15	576	8	7.60	390
			6 p. m.	7.75	448	10	8.40	645
6 p. m.	5.09	9.6	12	7.40	334	Noon	9.20	925
12	5.30	20	*July 31:*			2 p. m.	9.70	1,100
July 27:			Noon	6.90	206	4	9.70	1,100
6 a. m.	5.40	25	12 p. m.	6.50	131	6	9.35	995
Noon	5.30	20	*Aug. 1:*			8	9.00	855
6 p. m.	5.30	20	Noon	6.20	90	10	8.60	715
12	5.55	34	12 p. m.	6.00	70	12	8.30	610
July 28:			*Aug. 2:*			*Aug. 6:*		
6 a. m.	6.25	96	Noon	5.85	57	4 a. m.	7.90	478
Noon	7.50	362	12 p. m.	5.76	50	8	7.60	390
2 p. m.	8.10	543	*Aug. 3:*			Noon	7.40	334
4	8.80	785	Noon	5.68	44	6 p. m.	7.12	254
6	9.94	1,180	6 p. m.	5.65	42	12	6.90	206
8	12.05	2,050	12	5.73	47	*Aug. 7:*		
10	14.2	3,140	*Aug. 4:*			8 a. m.	6.70	166
12	13.5	2,780	4 a. m.	6.10	80	4 p. m.	6.45	124
July 29:			8	6.75	176	12	6.30	102
2 a. m.	13.3	2,680	Noon	7.35	320	*Aug. 8:*		
4	14.2	3,140	4 p. m.	7.30	307	Noon	6.10	80
6	15.4	3,480	8	6.80	185	12 p. m.	5.90	61
8	16.9	4,830	12	6.70	166	*Aug. 9:*		
10	16.7	4,690	*Aug. 5:*			Noon	5.77	51
Noon	15.6	3,960	2 a. m.	6.70	166	12 p. m.	5.67	43
6 p. m.	12.4	2,230	4	6.85	196			
12	9.8	1,140	6	7.15	267			

SUPPLEMENTAL RECORD.—Aug. 5, 3 p. m., gage height, 9.72 feet; discharge, 1,100 second-feet.

SOUTH FORK HUGHES RIVER AT MACFARLAN

LOCATION.—Lat. 39°04′40″, long. 81°11′25″, at highway bridge 0.4 mile east of Macfarlan, Ritchie County, 0.5 mile upstream from Dutchman Run and 1.5 miles upstream from Macfarlan Creek. Datum of gage is 635.28 feet above mean sea level, adjustment of 1912.

DRAINAGE AREA.—210 square miles.

GAGE-HEIGHT RECORD.—Wire-weight gage read to hundredths twice a day, more frequently during high water. Graphs drawn based on all available gage heights on days of fluctuating stage.

DISCHARGE RECORD.—Stage-discharge relation defined by current-meter measurements up to 6,000 second-feet and extended above on basis of slope-area measurements at 21.7 and 27.91 feet. Gage heights used to half-tenths between 4.6 and 5.4 feet; hundredths below and tenths above these limits.

MAXIMA.—1943: Discharge 11,200 second-feet at 8:45 a. m. Aug. 5 (gage height 27.91 feet, observed at crest).

1915–22, 1938–42: Discharge 11,000 second-feet Jan. 22, 1917 (gage height 25.7 feet).

A flood of unknown date, but prior to 1915, reached a stage of about 29 feet, from information by local residents (discharge about 13,000 second-feet).

Mean discharge, in second-feet, 1943

Day	July	August	Day	July	August	Day	July	August	Day	July	August
1	2.8	104	9	9.1	74	17	2.8	51	25	3.4	13
2	2.2	60	10	7.6	56	18	9.4	53	26	3.7	11
3	1.8	37	11	11	45	19	18	44	27	3.2	12
4	1.5	374	12	10	34	20	7.9	37	28	140	58
5	5.4	8,570	13	11	31	21	4.5	29	29	1,070	65
6	14	1,190	14	7.0	64	22	5.0	24	30	1,510	44
7	23	216	15	4.5	181	23	5.0	19	31	295	30
8	14	116	16	3.2	75	24	4.0	15			
Monthly mean discharge, in second-feet										104	378
Runoff, in inches										0.57	2.08

Gage height, in feet, and discharge, in second-feet, at indicated time, 1943

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
July 26:			*July 31:*			*Aug. 5—* Con.		
Noon	3.12	3.7	Noon	5.00	246	2 p. m.	25.90	10,100
12	3.11	3.6	12	4.60	150	4	24.50	9,380
July 27:			*Aug. 1:*			6	22.90	8,500
6 a. m.	3.10	3.4	Noon	4.40	108	8	21.10	7,500
Noon	3.08	3.2	12	4.20	74	10	18.70	6,300
6 p. m.	3.06	2.9	*Aug. 2:*			12	15.70	4,800
12	3.20	5.0	Noon	4.10	60	*Aug. 6:*		
July 28:			12	4.00	48	2 a. m.	12.50	3,200
6 a. m.	3.48	13	*Aug. 3:*			4	10.40	2,210
Noon	4.20	74	Noon	3.90	38	6	8.40	1,390
6 p. m.	5.00	246	6 p. m.	3.85	34	8	7.50	1,060
12	6.00	532	12	4.28	87	10	6.90	846
July 29:			*Aug. 4:*			Noon	6.50	710
6 a. m.	6.95	870	6 a. m.	4.80	196	4 p. m.	5.90	520
Noon	8.00	1,230	Noon	5.20	300	8	5.55	430
4 p. m.	8.10	1,270	4 p. m.	5.45	370	12	5.30	342
8	7.85	1,150	8	6.00	532	*Aug 7:*		
12	9.20	1,710	12	10.00	2,030	Noon	4.80	206
July 30:			*Aug. 5:*			12 p. m.	4.60	156
4 a. m.	10.60	2,300	2 a. m.	15.50	4,700	*Aug. 8:*		
8	10.00	2,030	4	23.60	8,880	Noon	4.40	112
Noon	8.80	1,550	6	27.20	10,900	12 p. m.	4.30	94
6 p. m.	7.40	1,010	8	27.90	11,200	*Aug. 9:*		
12	6.30	628	10	27.85	11,200	Noon	4.18	75
			Noon	27.20	10,900	12 p. m.	4.10	65

SUPPLEMENTAL RECORD.—Aug. 5, 8:45 a. m., gage height, 27.91 feet; discharge, 11,200 second-feet.

HUGHES RIVER AT CISKO

LOCATION.—Lat. 39°07′45″, long. 81°17′10″, 200 feet downstream from county footbridge at Cisko, Ritchie County, and 1 mile downstream from confluence of North and South Forks and 4½ miles south of Petroleum. Datum of gage is 605.35 feet above mean sea level, adjustment of 1912.

DRAINAGE AREA.—453 square miles.

GAGE-HEIGHT RECORD.—Staff gage read to hundredths twice a day, more frequently during high water. Graphs drawn based on gage readings on days of fluctuating stage.

DISCHARGE RECORD.—Stage-discharge relation defined by current-meter measurements up to 21 feet, extended to 27.5 feet on the basis of slope-area measurements at 24.5 and 27.5 feet. Gage heights used to half-tenths between 3.5 and 4.8 feet; hundredths below and tenths above these limits.

MAXIMA.—1943: Discharge, 17,800 second-feet noon Aug. 5 (gage height, 24.5 feet, from floodmark).

1915–22, 1929–31, 1939–42: Discharge about 25,700 second-feet Jan. 22, 1917 (gage height, 30.25 feet).

Mean discharge, in second-feet, 1943

Day	July	August	Day	July	August	Day	July	August	Day	July	August
1	10	307	9	45	196	17	17	133	25	18	31
2	9.4	173	10	85	133	18	215	142	26	16	24
3	8.4	120	11	45	105	19	51	142	27	18	22
4	9.4	537	12	33	85	20	35	93	28	164	29
5	58	12,600	13	18	74	21	22	66	29	1,440	104
6	110	3,190	14	23	84	22	24	49	30	2,150	94
7	40	502	15	20	353	23	25	36	31	652	69
8	41	292	16	16	208	24	22	35			
Monthly mean discharge, in second-feet										175	646
Runoff, in inches										0.45	1.64

Gage height, in feet, and discharge, in second-feet, at indicated time, 1943

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
July 26:			*July 30:*			*Aug. 5:*		
1 a.m.	2.52	17	4 a.m.	10.10	2,920	2 a.m.	13.0	4,900
Noon	2.50	16	8	9.64	2,610	4	16.4	7,660
12 p.m.	2.62	22	Noon	8.90	2,200	6	19.6	10,900
July 27:			6 p.m.	7.90	1,700	8	23.3	15,800
Noon	2.51	16	12	6.70	1,170	10	24.2	17,200
6 p.m.	2.47	15	*July 31:*			Noon	24.5	17,800
12 p.m.	2.90	39	6 a.m.	5.60	732	2 p.m.	24.4	17,600
July 28:			Noon	5.20	587	4	24.2	17,200
2 a.m.	3.65	133	12 p.m.	4.74	434	6	23.0	15,300
4	4.25	277	*Aug. 1:*			8	21.4	13,100
6	4.42	322	Noon	4.35	307	10	19.7	11,000
8	4.30	292	12 p.m.	4.03	221	12	18.1	9,300
10	4.03	221	*Aug. 2:*			*Aug. 6:*		
Noon	3.82	162	Noon	3.83	173	6 a.m.	13.2	5,040
4 p.m.	3.50	108	12 p.m.	3.75	152	Noon	8.6	2,040
8	3.35	86	*Aug. 3:*			6 p.m.	6.50	1,090
12	3.95	196	Noon	3.50	108	12	5.70	770
July 29:			6 p.m.	3.45	100	*Aug. 7:*		
2 a.m.	4.80	450	12	3.95	196	8 a.m.	5.10	552
4	5.80	808	*Aug. 4:*			4 p.m.	4.75	434
6	6.60	1,130	6 a.m.	4.60	385	12	4.58	385
8	7.20	1,380	Noon	4.80	450	*Aug. 8:*		
10	7.80	1,650	2 p.m.	4.84	450	8 a.m.	4.36	307
Noon	7.70	1,600	4	4.88	483	4 p.m.	4.20	262
2 p.m.	7.40	1,470	6	5.00	517	12	4.10	234
4	7.50	1,520	8	5.25	587	*Aug. 9:*		
6	8.10	1,790	10	6.20	965	Noon	3.95	196
8	8.70	2,100	12	10.0	2,850	12 p.m.	3.80	162
10	9.20	2,370						
12	9.70	2,670						

SUMMARY OF FLOOD DISCHARGES

Data from all flood measurements made in the flood area are summarized in table 4. The locations of points where the discharges were measured are shown in figure 14, the number shown for each point being the corresponding number in the first column of table 4.

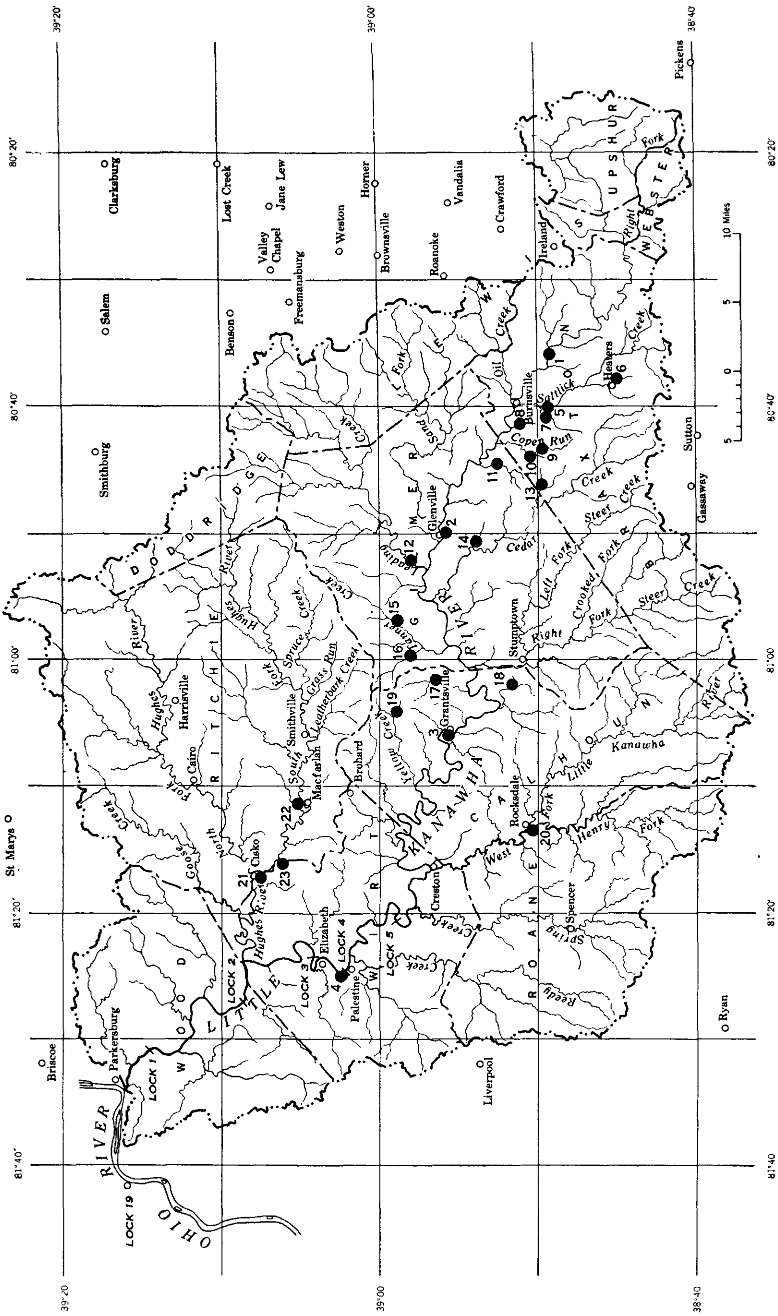


FIGURE 14.—Map of Little Kanawha River basin showing location of flood discharges listed in table 4.

The areal distribution of rainfall during the storm of August 4–5 was such that the maximum amount of rainfall fell on only a small part of the drainage area above any gaging station. In no case did rainfall amounting to 4 inches or more fall on more than half the drainage area above a gaging station. As a result, the gaging-station records do not give a good indication of the peak discharges on the smaller streams whose drainage areas were wholly within the region of heavy rainfall. The general location of each peak-discharge measurement on a small stream was selected after an examination of the region and a study of the rainfall records in order to obtain representative measurements in areas where the peak runoff rates were unusually high. It is believed that the measurements showing the highest unit-runoff rates with respect to a drainage area of given size are very close to the maximum rates that occurred on drainage areas of corresponding size anywhere in the flood area.

The maximum unit discharges, in second-feet per square mile, are plotted against the drainage area in square miles in figure 15. The

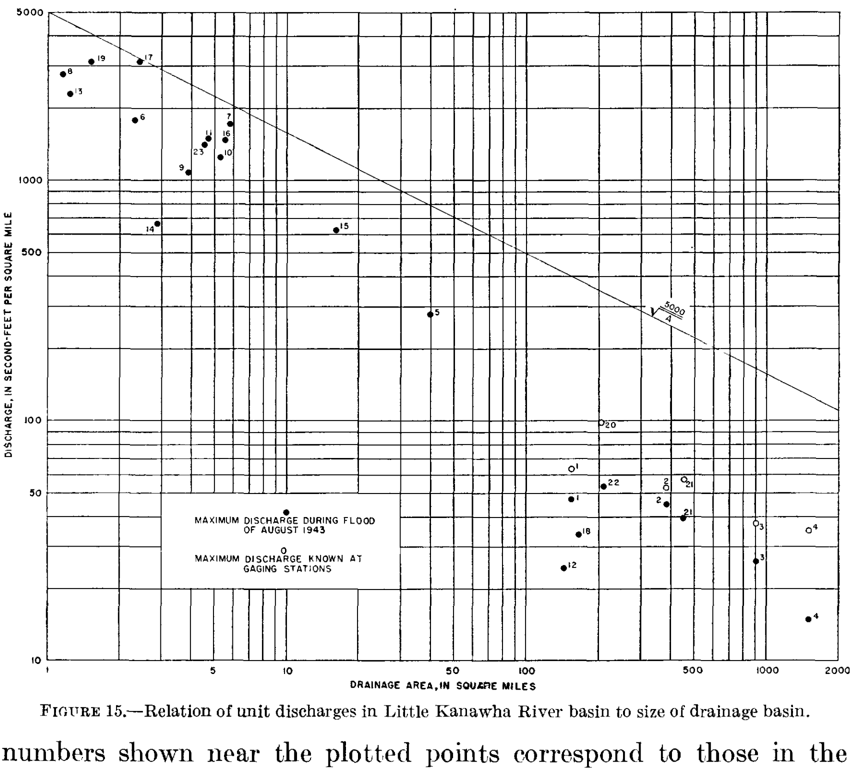


FIGURE 15.—Relation of unit discharges in Little Kanawha River basin to size of drainage basin.

numbers shown near the plotted points correspond to those in the first column of table 4 and on figure 14. At gaging stations where the flood of August 1943 was not the maximum known, the discharge for the maximum flood previously known is also plotted.

TABLE 4.—*Summary of flood discharges in Little Kanawha River basin, for the flood of August 1943*

No.	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during present flood			
				Date	Gage height (feet)	Discharge: Second-feet	Discharge: Second-feet per square mile	Time	Gage height (feet)	Discharge: Second-feet	Discharge: Second-feet per square mile
1	Little Kanawha River near Burnsville [1]	155	1938–42	Mar. 13, 1918	19.7	9,800	63.4	Aug. 5, 6 a. m.	17.46	7,290	47.0
2	Little Kanawha River at Glenville [1]	386	1915–22; 1928–43	Apr. 16, 1939 [2]	[3] 33.22	20,400	52.8	Aug. 5, 6 p. m.	30.73	17,300	44.8
3	Little Kanawha River at Grantsville [1]	913	1928–43	Apr. 17, 1939	43.10	34,300	37.6	Aug. 5, 10:30 p. m.	34.95	23,700	26.0
4	Little Kanawha River at Palestine [1]	1,510	1939–43	do	32.25	53,000	35.1	Aug. 6, 4 p. m.	17.62	22,400	14.8
5	Saltlick Creek above Gem [4]	39.8								11,000	276
6	Berry Fork at Heaters [4]	2.30								4,100	1,780
7	Right Fork Saltlick Creek at Gem [4]	5.74								9,800	1,710
8	Hyers Run near Burnsville	1.15								3,200	2,780
9	Copen Run above Copen [5]	3.87								4,300	1,080
10	Copen Run at Copen [6]	5.27								6,600	1,250
11	Duskcamp Run near Stouts Mill [4]	4.67								6,900	1,480
12	Leading Creek near Glenville [1]	144	1938–43	Apr. 17, 1939	27.5			Aug. 5, 8 p. m.	24.1	3,500	24.3
13	Walker Fork at Flower [4]	1.23								2,800	2,280
14	Spruce Fork near Glenville [4]	2.87								1,900	660
15	Tanner Creek at Tanner [4]	16.1								10,000	621
16	Trace Fork at Revere [4]	5.47								8,000	1,460
17	Laurel Fork above White Pine [4]	2.42								7,400	3,060
18	Steer Creek near Grantsville [1]	166	1938–43	Apr. 16, 1939	28.15	12,400	74.7	Aug. 5, 1 p. m.	18.72	5,580	33.6
19	North Fork Yellow Creek near Big Spring [4]	1.51								4,700	3,100
20	West Fork Little Kanawha River at Rocksdale [1]	205	1928–31; 1938–43	Apr. 16, 1939	30.3	20,200	98.5	Aug. 5, 3 p. m	9.72	1,100	5.4
21	South Fork Hughes River at Macfarlan [1]	210	1915–22; 1938–43	(7)	29.0	13,000	61.9	Aug. 5, 8:45 a. m.	27.91	11,200	53.3
22	Hughes River at Cisko [1]	453	1915–22; 1929–31; 1939–43	Jan. 22, 1917	30.25	25,700	56.8	Aug. 5, 12 m.	24.5	17,800	39.3
23	Island Run at Girta [4]	4.50								6,300	1,400

[1] Gaging-station record.
[2] Greater flood occurred Nov. 16, 1926. Gage height, 33.6 feet.
[3] Apr. 17, 1939.
[4] Slope-area method.
[5] Contracted-opening and critical-depth methods.
[6] Slope-area and contracted-opening methods.
[7] Prior to 1915.

FLOOD CRESTS

The heights reached by great floods are matters of primary importance to be considered in planning many of man's activities. Adequate knowledge of flood heights over long periods of time is essential to the solution of problems involving the design and location of structures and works in the river valleys and also to the control of floods.

Records of the stages reached by floods in recent years are available at a number of gaging stations and at several miscellaneous points where floodmarks recorded by local residents have later been correlated with sea-level datum by surveys. These data are summarized in table 5.

TABLE 5.—*Flood crests reached by major floods at points on Little Kanawha River*

[Feet above mean sea level]

Location	Miles above mouth	Elevation (in feet) of flood crests on indicated date						
		March 1913	March 1918	November 1926	January 1937	February 1939	April 1939	August 1943
Burnsville, USGS gage near	127.1		775.8	773.7		775.1	774.4	773.6
Burnsville	121.5		766.8	764.0		764.0	765.8	767.3
Gilmer—Braxton Co. line	116.6		755.8				755.2	755.9
Stouts Mill	113.5		748.8				748.8	748.7
Sand Fork	110.2		741.7	741.8			742.7	741.3
Glenville, USGS gage	103.7		730.4	731.4	722.9	727.4	731.0	728.5
Leading Creek	100.9						727.4	724.0
Dekalb	92.6		721.7	721.7				717.0
Steer Creek	83.3		701.5				701.5	694.4
Grantsville, USGS gage	78.0		695.5	692.7	686.2	689.8	695.9	687.8
Creston, USWB gage	48.7	642.1	652.5	645.4	644.5		654.9	641.4
Lock and Dam 5, upper gage	41.2	635.0	641.5	636.6	633.6		643.5	[1] 632.8
Lock and Dam 4, upper gage	30.7	621.7	628.7	622.8	625.4		629.2	[1] 619.6
Lock and Dam 3, upper gage	25.3	621.3	621.7	614.6	622.1		622.5	608.1
Lock and Dam 2, upper gage	14.9	620.9	609.9	603.6	618.4		609.6	[1] 598.4
Lock and Dam 1, upper gage	3.8	620.5	596.9	591.6	617.0		596.8	[1] 587.2
Parkersburg, USWB gage	0	620.5	596.8	588.9	616.7	595.1	596.1	575.6

[1] Highest gage reading, may not be the peak.

The flood profile in figure 16 was constructed from the data in table 5 supplemented by elevations at a number of other locations where the information was available for only one or two floods.

It is of interest to note in figure 16 that, although the flood of April 1939 was higher over a greater length of river than any other flood, the profile of recorded maximum stages, in the relatively short length of 127 miles, is made of sections of five major floods: March 1913, March 1918, November 1926, April 1939, and August 1943.

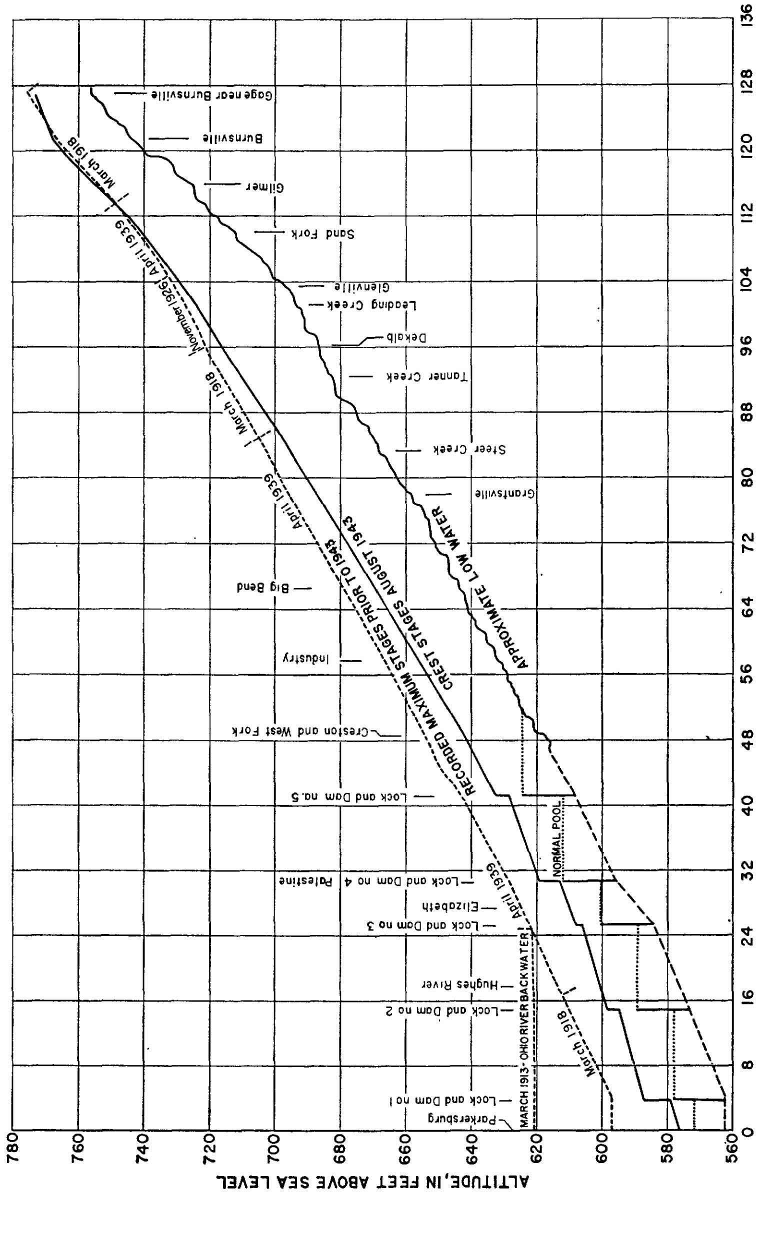


FIGURE 16.—Flood profiles of Little Kanawha River.

PREVIOUS FLOODS

FLOODS PRIOR TO APRIL 1939

Several large floods have occurred in the Little Kanawha River Valley since 1900 when systematic records were started. Fairly good information is available for most of these floods but relatively little is known about the floods prior to that time. A brief description of the floods prior to 1943, for which we have some information, is given below.

April 1852.—The meager information available indicates that this was probably the greatest flood on Little Kanawha River since white settlers first located in its valley. At Prices Ripple (mile 85) the river rose 38 feet above low water and at Dekalb the peak was 36 feet above low water. These points indicate stages approximately 2 feet higher than were reached in April 1939 in the section of river between Glenville and Grantsville.

September 1861.—The only record is one obtained from an aged resident of Burnsville, who stated that the floods of 1861 and 1875 exceeded that of 1918. No doubt this flood in the Little Kanawha River Valley was a great flood as records for Elk River show that the greatest flood known on that river occurred at this time.

August 1875.—This flood exceeded the 1918 flood at Burnsville (see above flood of September 1861); it was the greatest flood known on Middle Island Creek at Little, reaching a stage of 33.5 feet. Thus a great flood is on record on the lower reaches of the Little Kanawha River as well as in the headwaters.

February 1884.—There is no evidence of particularly high stage in the upper part of the basin during this flood but there were undoubtedly high stages in the lower section owing to backwater from the Ohio River, which reached the highest stage known prior to the great flood of 1913; the stage at Parkersburg reached 53.9 feet.

July 1888.—No record of this flood has been found, but the extremely high flood recorded in the West Fork, Tygart, and Elk River Basins indicates that a major flood probably occurred also in the upper part of the Little Kanawha Valley.

March 1913.—The lowest 23-mile stretch of Little Kanawha River reached the highest known stage as the result of backwater from the Ohio River that reached a stage of 58.9 feet at Parkersburg, the highest known stage at that place. The flood was relatively small on that part of Little Kanawha River above the effect of backwater.

The Ohio River flood of 1913 is described by Horton and Jackson (1913).

March 1918.—This was the greatest flood known in some sections of the Little Kanawha River valley between Grantsville and Glenville and above Burnsville. A rainfall of 4.8 inches in 24 hours was reported at Sutton, a few miles outside the upper end of the Little Kanawha Basin. Probably 2 to 5 inches of rain fell on the basin.

November 1926.—This was the highest flood of record at Glenville and in a reach of the river extending about 10 miles downstream. The rainfall for 1 day at Glenville was 3.50 inches. The heaviest rainfall was apparently concentrated near Glenville and in the Leading Creek area. The rise was quick and the runoff high.

January 1937.—Moderately high floods occurred all along the river as the result of general heavy rainfall. The most severe part of this flood was in the lower reaches where backwater from the Ohio River was the principal factor, as indicated by the stage of 55.4 feet recorded at Parkersburg.

The 1937 flood is described by Grover (1938).

February 1939.—This flood was the result of heavy rainfall in the headwaters of the Little Kanawha, Elk, Gauley, and Tygart River basins. A rainfall of 3.5 inches was recorded at Sutton. Rainfall was less in the middle and lower reaches of the Little Kanawha Valley resulting in a moderate flood in those sections. At the gaging station near Burnsville the stage reached was the highest recorded during the period of continuous records, exceeded, as far as is known, only by the flood of 1918.

FLOOD OF APRIL 1939

The flood of April 1939 was the greatest flood of record in sections of the river extending about 4 miles above and below Sand Fork and from the mouth of Steer Creek to Lock 3. (See fig. 16.) The maximum flood of record occurred in 70 of the 127 miles between the Burnsville gaging station and Parkersburg. In view of the magnitude of this flood (figs. 17, 18) and the records of precipitation, stage, and discharge available for the period, it is described in greater detail than the previous floods.

Rainfall during the period April 14–18 ranged from about 3 inches along the northern edge of the basin in the headwaters of the North Fork Hughes River to nearly 5 inches along the southwest edge in the headwaters of Spring Creek. The records for the precipitation stations in the basin and adjacent thereto are given in table 6. The isohyetal map (fig. 19) illustrates the areal distribution of the rainfall.

FIGURE 17.—Business section of Burnsville during flood of April 16, 1939. Stage is about 1.5 feet lower than the maximum August 5, 1943. Courtesy of Corps of Engineers.

FIGURE 18.—Part of flooded section of Glenville during flood of April 1939 Stage is about 2 feet below the crest of April 1939 flood.

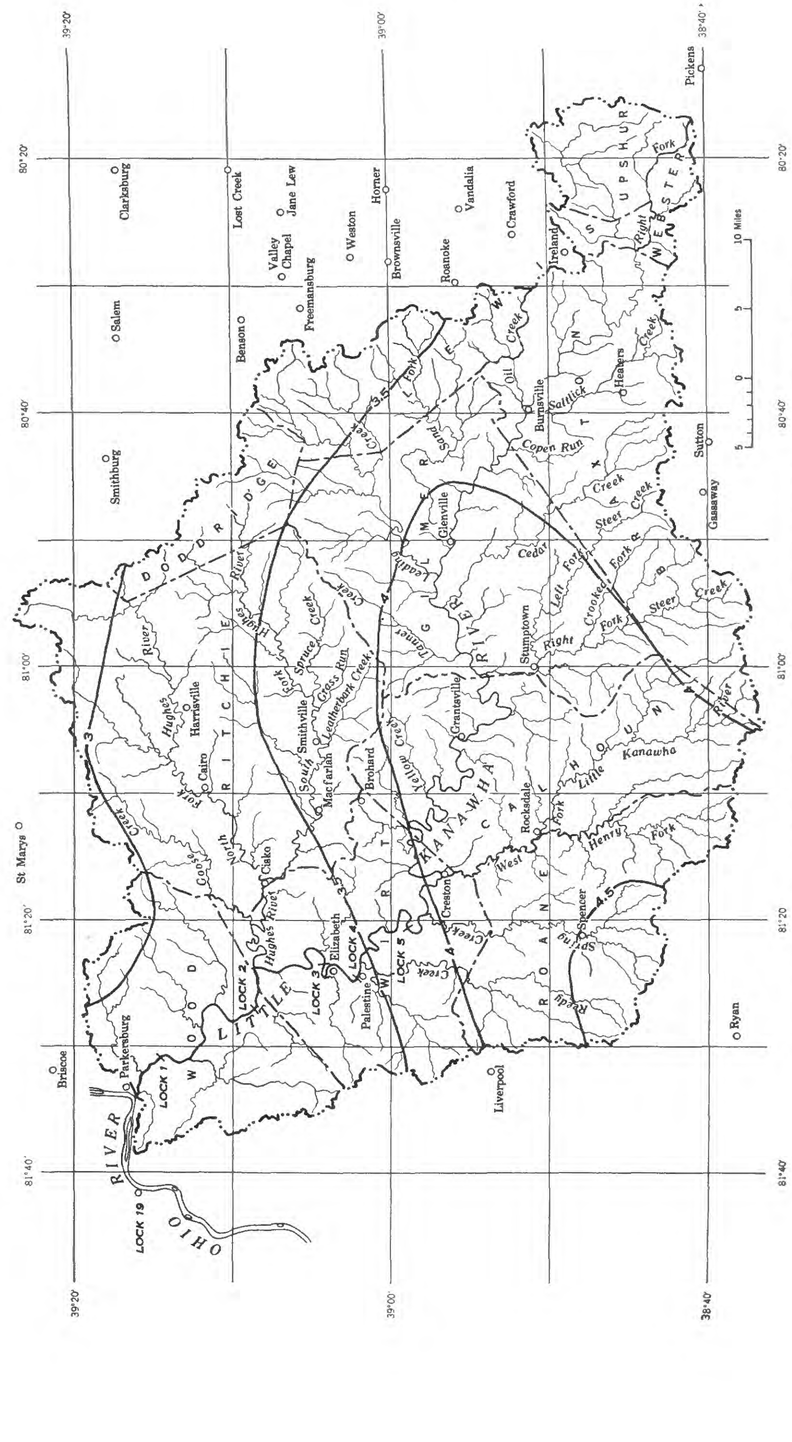


FIGURE 19.—Isohyetal map of Little Kanawha River basin showing total rainfall April 14–18, 1939.

The available recording precipitation gage records and the notes by observers at the standard precipitation gages indicate that the time during which there was rainfall was quite uniform over the basin. Figure 20 shows the hourly rainfall at recording gages in and near Little Kanawha River Basin. The gages at Valley Head and Weston are in the Monongahela River Basin a few miles from the boundary of the Little Kanawha Basin at its southeastern and central eastern edges, respectively. In general, light rain fell over the basin during the afternoon and evening of April 14. About midnight on the 14th steady rain began, continuing with only short interruptions until

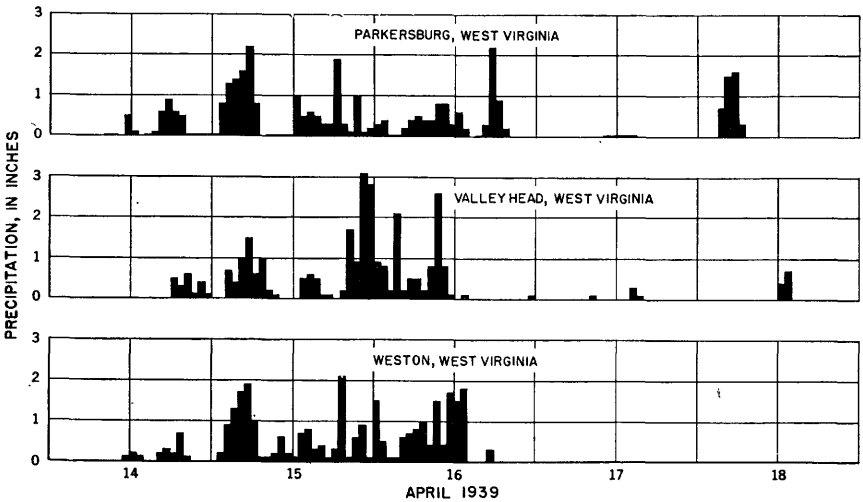


FIGURE 20.—Hourly precipitation at recording rain gages April 14–18, 1939.

the afternoon of the 16th when the period of steady rainfall ended. Light rains were reported at some stations on the 17th and 18th.

Antecedent conditions were favorable for high percentages of runoff. Precipitation at Glenville during March amounted to 5.34 inches, 1.19 inches of which fell March 28–31. An additional 0.69 inch was recorded April 23. It may be seen from table 6 that general rainfall over the basin during the period April 6–12 ranged from about 1.5 to 2 inches with some rainfall reported nearly every day.

The maximum stage and discharge, precipitation, runoff, and retention for each gaging station are summarized in table 7. The rainfall for each drainage area was determined from the isohyetal map (fig. 19) based on all rainfall records in and adjacent to the basin. The direct runoff was computed as the observed discharge during and following the storm minus the base flow. The method is illustrated in figure 21, showing the discharge graph for Grantsville.

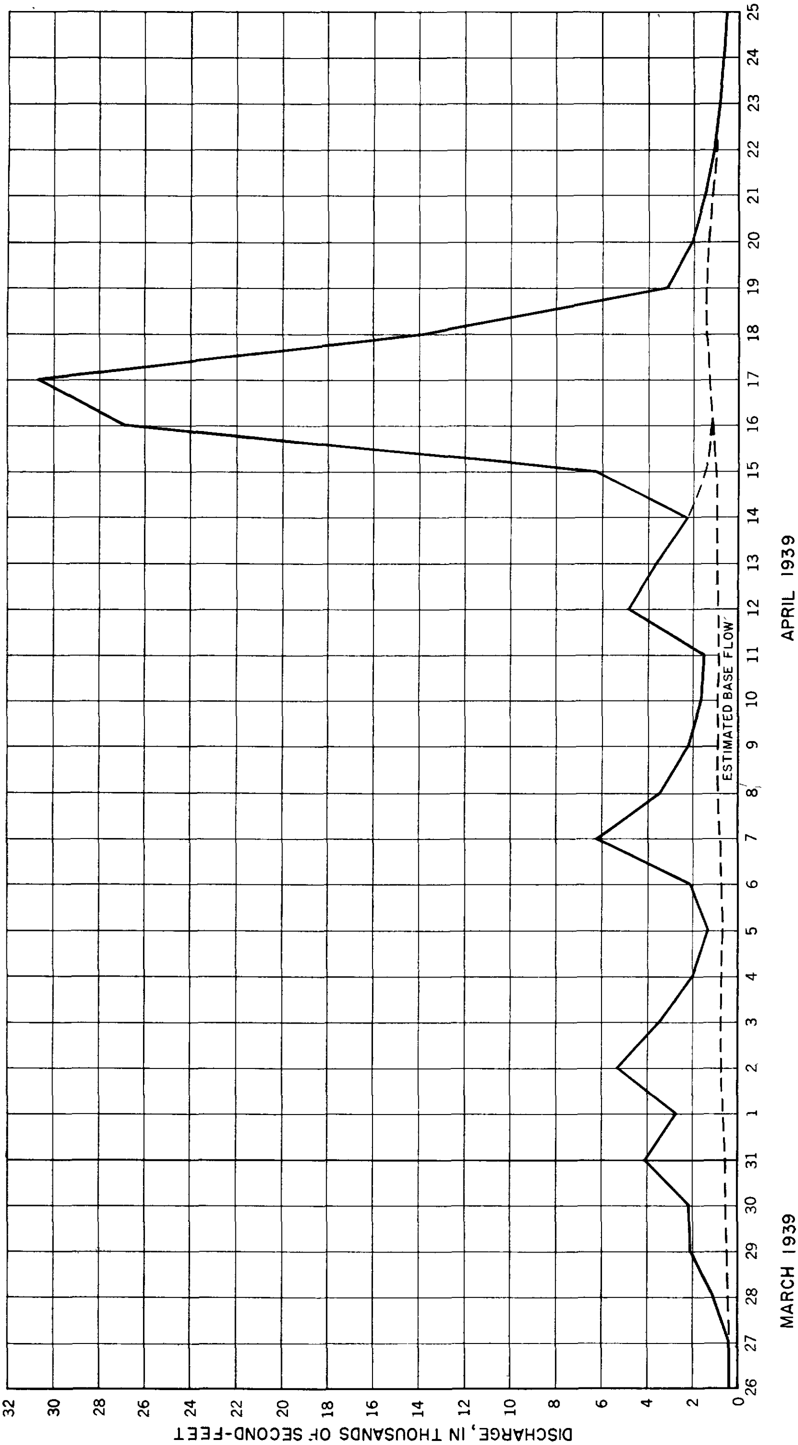


FIGURE 21.—Graph of daily mean discharge of Little Kanawha River at Grantsville, March 26 to April 25, 1939, showing estimated base flow.

TABLE 6.—*Daily precipitation in inches, April 5–20, 1939*

[Data from U. S. Weather Bureau]

Station	April																Storm total, Apr. 14–18
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Cairo [1]		1.13	0.02		0.12	0.14	0.25	0.39		0.08	1.26	1.47	0.27	0.25	0.05		3.33
Creston [2]		.45	.50		.15	.05	.12	.57	T	.40	.75	1.80	.87	.28	.10	T	4.10
Elizabeth [2]		.66	.40	T	.12	.08	.12	.40			1.08	1.35	.45	.36		.02	3.24
Glenville [2]		.39	.44		T	.06	.09	.71			1.06	1.98	.86	.17	.12	.04	4.07
Ireland [1]		.77		.16	.32	.06	.34	.11			1.28	2.40	.01				3.69
Parkersburg [3]	0.08	.94	.01	.03	.10	.06	.28	.04		.33	1.49	.89	.01	.41	T		3.13
Pickens [1]		.06	.10		.40		.21	.02		.33	1.28	2.25	.06	T			3.92
Spencer [2]		.38	.35		.14	.06	.15	.55	T		.64	2.52	1.08	.25	.12	.01	4.49
St. Marys [2]		.75	.36		.09	.30	.13	.41			1.02	.86	.65	.35			2.88
Sutton [1]		.70			.20		.55				.93	2.62		.15			3.70
Weston [3]		.80		.15	.10	.09	.62	.08		.18	1.47	1.29					2.94

[1] Precipitation generally measured in late afternoon; amount recorded is for the 24 hours ending at the time of observation.
[2] Precipitation measured in morning; amount then recorded is for preceeding 24 hours.
[3] Precipitation is for the 24-hour period midnight to midnight.

TABLE 7.—*Summary of crest stage and discharge, precipitation, runoff, and retention, at gaging stations for the flood of April 15–17, 1939*

Stream	Location	Drainage area (square miles)	Crest stage (feet)	Maximum discharge		Precipitation (inches)	Direct runoff (inches)	Retention (inches)
				Second-feet	Second-feet per square mile			
Little Kanawha River	Near Burnsville	155	18.3	8,680	56.0	3.65	2.65	1.0
Do	Glenville	386	33.22	20,400	52.8	3.7	3.3	.4
Do	Grantsville	913	43.10	34,300	37.6	3.85	3.05	.8
Do	Palestine	1,510	32.25	53,000	35.1			
West Fork Little Kanawha River	Rocksdale	205	30.3	20,200	98.5	4.2	3.25	.95
Hughes River	Cisko	453	23.5	15,900	35.1	3.4	2.75	.65
South Fork Hughes River	Macfarlan	210	23.97	10,200	48.5	3.55	2.65	.90

The base flow, consisting essentially of effluent from ground-water storage, is shown by the dashed line. The area between the dashed and the solid line represents the direct runoff resulting from the storm. The method used in computing the base flow and runoff is explained in detail in previous water-supply papers (Scofield, 1938, p. 488; Youngquist and Langbein, 1941, p. 76).

The retention, computed as the difference between rainfall and runoff, ranged from 0.4 inch at Glenville to 1.0 inch near Burnsville. The average for all stations is 0.8 inch.

DISTRIBUTION AND FREQUENCY OF FLOOD EVENTS

The recorded annual maximum stage, and floods exceeding the established flood stages at Creston and Glenville, are listed in table 8 for the periods of record for the gages near Burnsville, at Glenville, at Grantsville, and at Creston.

The data collected at Glenville—43 years of gage-height record and 14 years of discharge record—appear to be best suited to illustrate the annual and seasonal distribution of past floods and the frequency with which they have occurred.

The recorded floods exceeding the flood stage of 23 feet at Glenville are shown in figure 22. Probably the relatively few minor floods recorded during the years 1901–12 is due to some extent to the fact that the practice of making special readings of gage height at or near flood crests was not generally in use for minor floods prior to 1913. It may be of some significance that no floods exceeding 30 feet were recorded prior to 1918 but during the years 1918–43 four such floods were recorded.

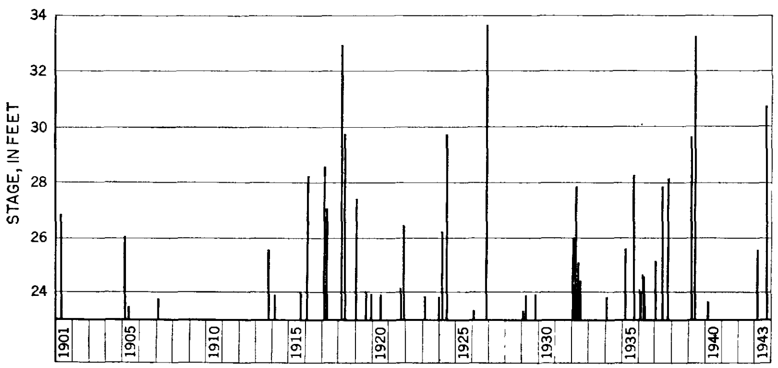


FIGURE 22.—Stages reached by floods exceeding 23 feet at Glenville, 1901–43.

TABLE 8.—*Recorded flood-crest stages, in feet, at stations on Little Kanawha River.*

[For annual maximum flood and other floods for which the gage height was greater then 23 feet at Glenville or 20 feet at Creston]

Year	Burnsville [1]		Glenville [2]		Grantsville [3]		Creston [4]	
	Date	Gage height	Date	Gage height	Date	Gage height	Date	Gage height
1901			Apr. 4	26.8			Apr. 4	23.5
1901			Apr. 20	22.0			Apr. 20	25.8
1902			Jan. 27	16.2			Jan. 27	21.9
1902			Feb. 26	15.0			Feb. 26	21.7
1903			Feb. 28	21.1			Mar. 1	21.5
1904			Mar. 23	[5] 11.5			Mar. 24	13.0
1904							Apr. 28	16.0
1905			Feb. 9	12.5			Feb. 10	20.0
1905			Mar. 10	26.0			Mar. 10	23.5
1905			May 12	23.5			May 12	20.0
1906			Mar. 16	16.5			Mar. 16	19.5
1906			Dec. 18	17.1			Dec. 18	18.5
1907			Jan. 9	23.7			Jan. 9	16.6
1907			Jan. 13	20.9			Jan. 13	22.0
1907			Jan. 17	22.1			Jan. 18	21.2
1908			Feb. 7	6.3			Feb. 6	16.0
1908			May 10	17.5			May 11	12.8
1909			Feb. 16	14.5			Feb. 17	15.0
1909			May 1	14.5			May 1	18.3
1910			Jan. 7	17.5			Jan. 7	13.6
1910			Jan. 19	15.5			Jan. 19	16.6
1911			Jan. 30	22.6			Jan. 30	19.5
1912			Feb. 27	15.1			Feb. 27	16.0
1912			July 22	19.1			July 23	12.6
1913			Mar. 27	22.5			Mar. 28	20.4
1913			Nov. 16	25.5			Nov. 17	23.1
1914			Feb. 19	23.9			Feb. 20	22.3
1915			Oct. 1	24.0			Oct. 2	19.8
1915			Dec. 18	22.0			Dec. 19	20.7
1916			Jan. 12	28.2			Jan. 12	24.0
1916			Feb. 13	22.5			Feb. 13	20.6
1917			Jan. 22	28.5			Jan. 22	24.1
1917			Mar. 12	27.0			Mar. 12	23.2
1917			May 29	22.3			May 29	24.0
1918			Jan. 29	22.7			Jan. 29	32.0
1918	Mar. 13	19.7	Mar. 13	32.9	Mar. —	42.7	Mar. 14	32.0
1918			May 26	29.7			May 26	17.5
1919			Jan. 2	27.4			Jan. 2	24.6
1919			June 26	23.0			June 27	17.5
1919			July 17	24.0			July 17	17.0
1919			Dec. 7	23.9			Dec. 7	18.6
1920			Jan. 23	22.3			Jan. 23	19.7
1920			July 25	23.9			July 26	12.0
1921			Nov. 29	24.1			Nov. 29	20.3
1921			Dec. 24	26.4			Dec. 24	21.0
1922			Mar. 15	22.7			Mar. 16	18.3
1922			June 18	22.8			June 19	10.3
1923			Feb. 2	23.8			Feb. 2	19.4
1923			Dec. 31	23.8				
1924							Jan. 1	17.8
1924			Feb. 20	26.2			Feb. 20	21.8
1924			May 12	29.7			May 13	23.8

TABLE 8.—*Recorded flood-crest stages, in feet, at stations on Little Kanawha River*—Continued

[For annual maximum flood and other floods for which the gage height was greater then 23 feet at Glenville or 20 feet at Creston]

Year	Burnsville [1]		Glenville [2]		Grantsville [3]		Creston [4]	
	Date	Gage height	Date	Gage height	Date	Gage height	Date	Gage height
1925			May 12	22.5			May 12	15.4
1925			Oct. 25	22.2			Oct. 26	15.6
1926			Jan. 22	23.3			Jan. 22	17.3
1926	Nov. —	17.6	Nov. 16	33.6	Nov. —	39.9	Nov. 17	23.7
1927			Feb. 19	22.8			Feb. 20	16.8
1927			May 1	21.5			May 1	16.9
1928			Apr. 30	19.5			Apr. 30	17.5
1928			June 30	19.6			June 30	16.4
1929			Feb. 26	19.2	Feb. 26	28.4	Feb. 27	18.1
1929			Mar. 6	23.9	Mar. 5	27.2	Mar. 6	17.4
1929			Oct. 3	23.9	Oct. 3	24.7	Oct. 4	13.4
1930			Feb. 5	16.8	Feb. 5	23.7	Feb. 5	14.0
1931			Apr. 1	14.6	Apr. 2	21.9	Apr. 2	14.7
1931			Aug. 22	18.0	Aug. 22	22.8	Aug. 23	10.5
1932			Jan. 30	26.0	Jan. 30	35.8	Jan. 30	22.0
1932			Feb. 5	27.8	Feb. 5	31.2	Feb. 5	21.4
1932			Mar. 17	25.0	Mar. 16	28.9	Mar. 18	20.7
1932			Mar. 28	24.4	Mar. 28	30.7	Mar. 28	21.3
1933			Feb. 15	13.8	Feb. 15	30.4	Feb. 16	12.4
1933			Mar. 19	21.7	Mar. 19	28.3	Mar. 19	19.1
1934			Jan. 7	23.8	Jan. 7	29.4	Jan. 8	19.5
1935			Mar. 12	25.5	Mar. 12	33.5	Mar. 12	23.4
1935			Aug. 8	28.2	Aug. 8	34.7	Aug. 8	21.0
1936			Jan. 3	24.1	Jan. 3	[6] 28.0	Jan. 3	21.3
1936			Feb. 15	24.0	Feb. 15	30.4	Feb. 15	23.9
1936			Mar. 17	24.6	Mar. 18	31.8	Mar. 17	21.4
1936			Apr. 6	23.4	Apr. 6	31.8	Apr. 6	21.9
1937			Jan. 23	25.1	Jan. 23	33.4	Jan. 23	22.8
1937			June 22	27.8	June 22	30.1	June 22	17.6
1937			Oct. 28	28.1	Oct. 29	32.1	Oct. 29	20.7
1938	May 21	11.0	May 20	21.5	May 21	30.0	May 22	19.2
1939	Feb. 3	19.0	Feb. 4	29.6	Feb. 4	37.0	Feb. 4	25.7
1939	Apr. 16	18.3	Apr. 16	33.2	Apr. 17	43.1	Apr. 17	33.2
1940	Mar. 31	9.6	Mar. 31	23.6	Mar. 31	30.3	Mar. 31	19.6
1940	Apr. 20	10.8	Apr. 20	22.5	Apr. 20	31.2	Apr. 20	21.4
1941	June 5	8.5	June 4	18.6	June 4	25.5	June 5	15.3
1942	Dec. 30	9.8	Dec. 30	22.2	Dec. 30	31.6	Dec. 30	23.8
1943	Mar. 20	11.5	Mar. 20	25.5	Mar. 20	34.2	Mar. 20	23.6
1943	July 30	17.6	July 31	20.7	July 31	21.3	July 29	12.0
1943	Aug. 5	17.5	Aug. 5	30.7	Aug. 5	35.0	Aug. 6	19.7

[1] Records from floodmarks prior to 1938, two or more gage readings daily, 1938, 1939, and water-stage recorder charts beginning Feb. 26, 1940. Gage is 4 miles upstream from Burnsville.

[2] Records from U. S. Weather Bureau prior to 1929 consisting of one daily reading, which was supplemented by special readings during floods beginning in 1913; Weather Bureau records and twice-daily gage readings by Geological Survey 1929-34, water-stage recorder charts beginning Dec. 14, 1934. All records reduced to the present gage datum.

[3] Records from floodmarks prior to 1929; two or more gage readings daily, 1929-34; water-stage recorder charts beginning Nov. 21, 1934.

[4] Records from U. S. Weather Bureau. Gage read once daily supplemented by special readings during floods beginning in 1913. Datum of gage is 612.71 feet above mean sea level, adjustment of 1912.

[5] May not be the maximum for year; no record Apr. 1 to July 11, 1904.

[6] Estimated from records at other stations.

The seasonal distribution of floods recorded at Glenville is shown in figure 23. Eleven of the 48 recorded floods exceeding 23 feet in the 43-year period occurred during March. The next highest in rates of occurrence were January with nine floods and February with seven.

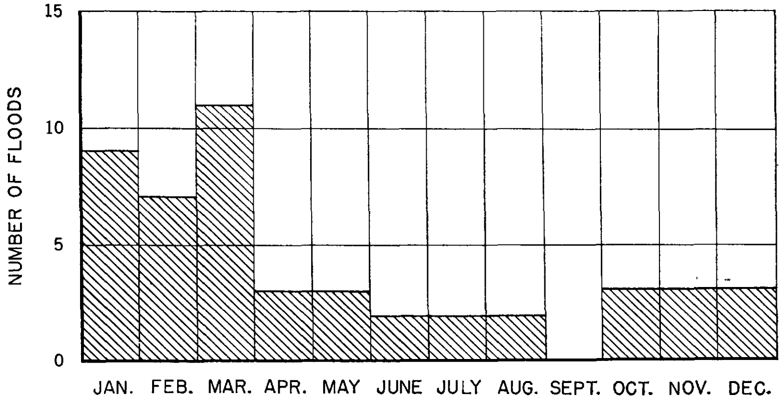


FIGURE 23.—Monthly distribution of floods exceeding 23 feet at Glenville, 1901–43.

No floods have been recorded in September but from two to three occurred in each of the other eight months of the year.

The frequency with which floods of various magnitudes have occurred above a base stage of 23 feet at Glenville during the period of record is shown in figure 24. The recurrence interval was computed

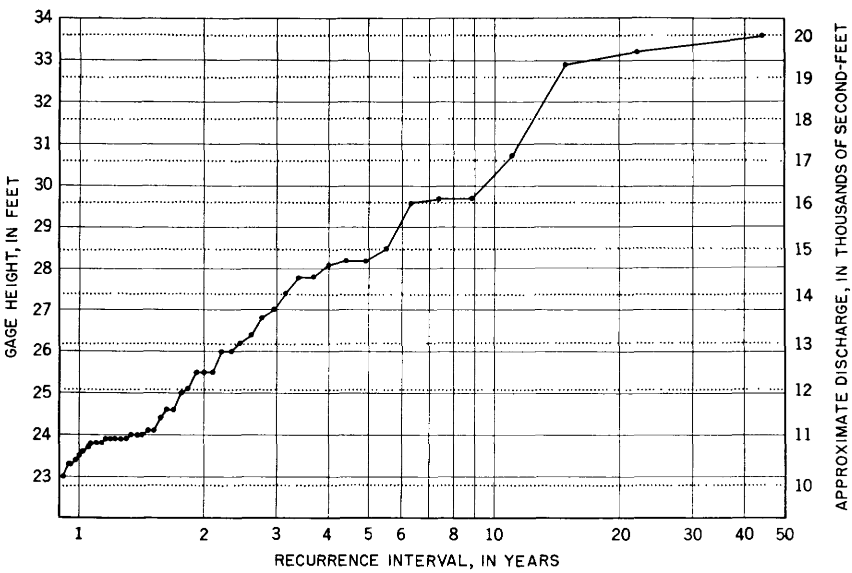


FIGURE 24.—Recurrence interval of floods on Little Kanawha River at Glenville, 1901–43.

from the formula $\frac{N+1}{M}$, in which N is the number of years of record, and M is the relative magnitude of the event beginning with the highest as one. The trend of the plotted points indicates that floods reaching a stage of 23½ feet and discharge of 10,500 second-feet have been equaled or exceeded on an average of once a year during period of record, and floods reaching or exceeding a stage of 28 feet and discharge of 14,500 second-feet have occurred on an average of once every 4 years.

Flood-frequency studies have a very important place in establishing road-bed levels, bridge elevations and clearances, channel capacities, and in other engineering and economic problems where costs of the works must be balanced against probable damages and liabilities that are a function of the frequency of flooding. Anyone attempting to use flood-frequency data should understand its limitations. The relative shortness of the record as well as deficiencies in the application of the statistical theory tend to introduce errors, particularly in the recurrence interval for larger floods.

Much has been written on the subject of flood-frequency analysis, and several methods have been summarized (Jarvis and others, 1936). A more recent approach which is viewed with favor by some students of the subject is that presented by Gumbel (1945, pp. 833–839).

SUMMARY OF FLOOD STAGES AND DISCHARGES IN WEST VIRGINIA

A summary of the known peak stages and discharges at gaging stations and at certain other points on streams in West Virginia and on its boundaries is given in table 9.

Except as otherwise noted, the discharge data given in this table are from the published reports or from the unpublished data in the files of the Geological Survey. Records of peak stage have been taken from the U. S. Weather Bureau publications in those cases where the gage-height record was collected by that agency. The records of peak stages for most of the gages at locks and dams were taken from the reports of the Corps of Engineers.

The summary includes data for practically all points on West Virginia streams where systematic records of stage and discharge have been collected for periods of a few years or more, with the exception of abandoned navigation locks and dams and certain points on Ohio River. A number of old navigation structures were abandoned and removed from Kanawha and Monongahela Rivers when modern locks and dams were constructed. In these cases the records are given for the present locks but not for those that were removed. Stage and discharge records for Ohio River along the border of West Virginia have been summarized only at stations where discharge records were secured. There are numerous other locations where records of stage are available. Records of flood stages for these points have been summarized in previous water-supply papers (Horton, 1913, Grover, 1937, 1938).

Different gages have been used from time to time at or near the same site at some stations. Insofar as practicable, the records have been reduced to the datum of the gage last used. The datum of the gage in terms of feet above mean sea level is given where this information is available.

The period of known floods is not necessarily the same as the period for which continuous and systematic records have been collected. In many cases records of flood heights have been extended for a number of years prior to the establishment of gages on the basis of reliable floodmarks that were pointed out by local residents.

Wherever practicable, the approximate discharge for great floods outside the period of continuous discharge record have been determined by the extension of rating curves developed in recent years. In some cases this procedure was not applicable because of changes in channel conditions. In others it would have been necessary to extend the rating curve so far beyond the limit to which it was defined that a reasonable degree of accuracy in the result could not be assured. Under these conditions the maximum known stage is given and also the peak discharge for the greatest flood during the period of continuous discharge record.

The reference numbers assigned to the points listed in table 9 may be used in finding its location on the map, plate 1.

Figure 25 shows the peak discharge in second-feet per square mile plotted against the corresponding drainage area for each point where the discharge was given in table 9. Any study attempting to arrive at a probable peak discharge for a drainage basin by comparison with this chart should take into consideration the physical characteristics of the basin such as topography, shape, soil, vegetal cover, and channel conditions, as well as the drainage area.

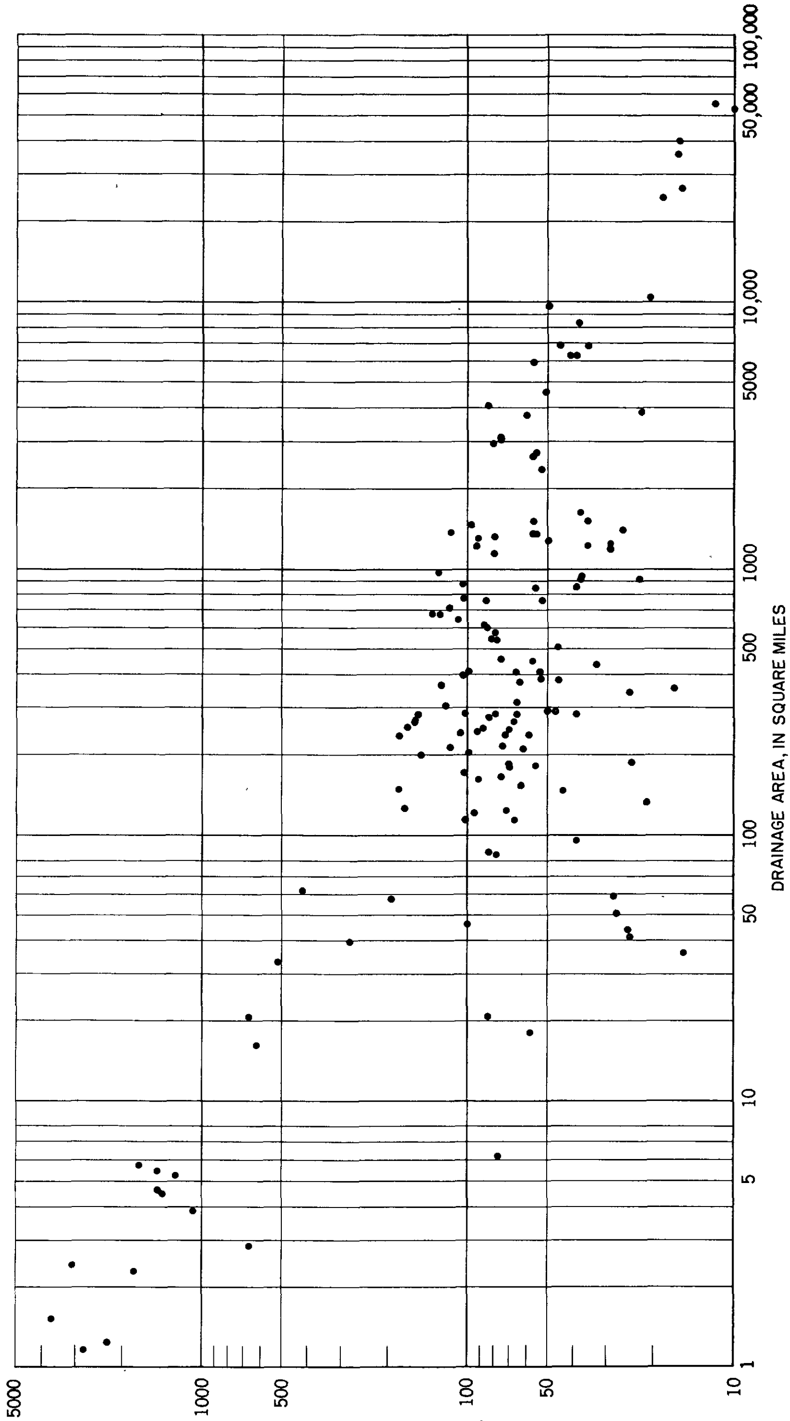
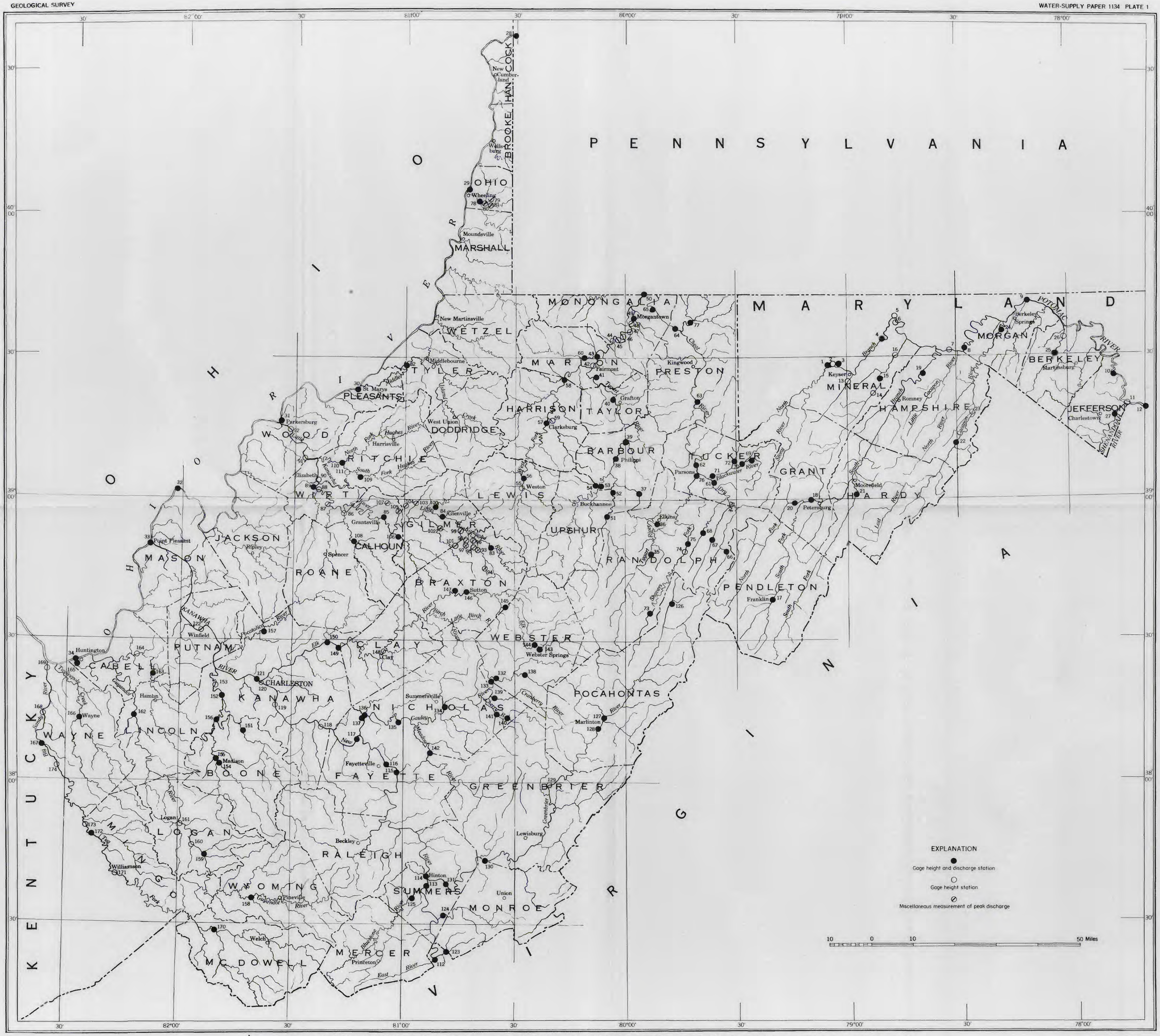


FIGURE 25.—Relation of unit discharges in table 9 to size of drainage basin.



MAP OF WEST VIRGINIA SHOWING LOCATION OF STAGES AND DISCHARGES LISTED IN TABLE 9

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TABLE 9.—*Maximum known flood stages and discharges in West Virginia*

No.	Stream and place of determination	Drainage area (square miles)	Datum of gage in feet above mean sea level	Period of known floods	Peak stage and discharge: Date	Stage in feet	Discharge: Second-feet	Discharge: Second-feet per square mile	Remarks
	Potomac River basin								
1	North Branch Potomac River at Bloomington, Md.	287	[1] 951.98	1924–43	Mar. 29, 1924	[2] 17	29,000	101	Gaging-station record.
2	North Branch Potomac River at Luke, Md	402			Mar. 17, 1936		40,000	99.5	Discharge by slope-area method. Flood of Mar. 19, 1924, reached a stage about 1.5 feet higher.
3	North Branch Potomac River at Piedmont, W. Va.	410		1899–1906, 1936	do		40,000	98.5	Discharge by slope-area method.
4	North Branch Potomac River at Pinto, Md	596	[3] 648.23	1924–43	Mar. 29, 1924	24	55,000	92.3	Gaging-station record.
5	North Branch Potomac River at Cumberland, Md.	619			Mar. 18, 1936		53,600	86.6	Discharge by slope-area method.
6	North Branch Potomac River near Cumberland, Md.	875	[3] 585.22	1889–1943	June 1, 1889	29.2	89,000	102	Gaging-station record.
7	Potomac River at Okonoko, W. Va	2,983			Mar. 18, 1936		239,000	80.2	Discharge by slope-area method.
8	Potomac River at Paw Paw, W. Va	3,109	[3] 487.88	1936–43	do	54	240,000	75.2	Gaging-station record.
9	Potomac River at Hancock, Md	4,073	[1] 383.46	1889–1943	do	47.6	340,000	83.4	Do.
10	Potomac River at Shepherdstown, W. Va	5,936	[1] 281.00	1889–1943	Mar. 19, 1936	42.1	335,000	56.4	Do.
11	Potomac River at Harpers Ferry, W. Va	9,372	[4] 245.53	1889–1943	do	36.53			From U. S. Weather Bureau.
12	Potomac River at Point of Rocks, Md	9,651	[1] 200.54	1889–1943	do	41.03	480,000	49.7	Gaging-station record.
13	New Creek at Keyser, W. Va	46.4			Mar. 17, 1936		4,600	100	Discharge by slope-area method.
14	Patterson Creek at Headsville, W. Va	161			do		14,600	90.6	Do.
15	Patterson Creek near Headsville, W. Va	216	[3] 631.04	1936–43	do	17.2	16,000	74	Gaging-station record.
16	Patterson Creek at Alaska, W. Va	249			do		17,400	69.9	Discharge by slope-area method.
17	South Branch Potomac River at Franklin, W. Va.	182	[3] 1,692.5	1936–43	March 1936 May 16, 1942	13 8.69	 10,100	 55.5	Discharge not determined. Gaging-station record.
18	South Branch Potomac River near Petersburg, W. Va.	642	[1] 692.00	1877–1943	1877	21.2	54,000	84	Do.
19	South Branch Potomac River near Springfield, W. Va.	1,471	[1] 562.02	1877–1943	Mar. 18, 1936	34.2	143,000	97.2	Do.
20	North Fork of South Branch Potomac River at Cabins, W. Va.	314	[3] 1,050.13	1936–43	Mar. 17, 1936	12.8	20,600	65.6	Do.
21	South Fork of South Branch Potomac River near Moorefield, W. Va.	283	[3] 861.51	1928–43	do	14.9	30,400	107	Do.
22	Cacapon River at Yellow Springs, W. Va	306	[3] 858.51	1936–43	Oct. 15, 1942	22.22	36,700	120	Do.
23	Cacapon River at Cacapon Bridge, W. Va	367		1924–36	Mar. 17, 1936	26	46,000	125	Discharge by slope-area method.
24	Cacapon River near Great Cacapon, W. Va	677	[3] 456.78	1889–1943	Mar. 18, 1936	30.1	87,600	128	Gaging-station record.

25	Back Creek near Jones Spring, W. Va	243	[3] 416.42	1928–43	Oct. 15, 1942	25.1	22,400	92.3	Do.
26	Back Creek near Hedgesville, W. Va	252		1889–1936	Mar. 18, 1936	25	22,000	87.4	Discharge by slope-area method.
27	Shenandoah River at Millville, W. Va	3,040	[1] 293.00	1870–1943	Oct. 16, 1942	32.4	230,000	75.6	Gaging-station record.
	Ohio Main Stem								
28	Ohio River at Montgomery Island Dam, Pa	22,960	[1] 653.62	1941–43	Dec. 31, 1942	46.8	438,000	19.1	Gaging-station record. Lower-pool gage.
29	Ohio River at Wheeling, W. Va	24,800	[5] 610.8	1810–1943	Mar. 19, 1936	53.6	466,000	18.8	Gaging-station record. Wharf gage.
30	Ohio River at St. Marys, W. Va	26,850	[5] 577.30	1884–1943	Mar. 29, 1913 Jan. 1, 1943	54.2 46.67	 421,000	 15.7	From Corps of Engineers, U. S. Army. Gaging-station record. Gage on highway bridge.
31	Ohio River at Parkersburg, W. Va	35,600	[5] 561.97	1884–1943	Mar. 29, 1913	58.93	577,000	16.2	Gaging-station record. Gage on railroad bridge over Little Kanawha River. Little Kanawha River not included.
32	Ohio River at Pomeroy, Ohio	39,950	[5] 517.50	1884–1943	Mar. 30, 1913	65.8	633,000	15.8	Gaging-station record. Gage on Pomeroy-Mason City bridge.
33	Ohio River at Pt. Pleasant, W. Va	52,760	[5] 514.10	1884–1943	Mar. 30, 1913 Jan. 1, 1943	62.8 [5a] 54.38	 522,000	 9.9	From Corps of Engineers, U. S. Army. Gaging-station record. Gage on highway bridge. Kanawha River included.
34	Ohio River at Huntington, W. Va	55,900	[5] 490.26	1884–1943	Jan. 27-28, 1937	69.45	654,000	11.7	Gaging-station record. Upper gage at Lock 28.
	Monongahela River basin								
35	Tygart River near Dailey, W. Va	187	[1] 1,940.09	1915–43	Feb. 4, 1932	17.2	13,100	70	Gaging-station record.
36	Tygart River at Elkins, W. Va	268	[3] 1,900.44	1913–43	Mar. 14, 1918 Feb. 5, 1932	18.5	18,000	67.2	From U. S. Weather Bureau.
37	Tygart River at Belington, W. Va	408	[1] 1,679.49	1888–1943	July 1888	21.7	26,900	65.9	Gaging-station record.
38	Tygart River at Philippi, W. Va	916	[6] 1,280.55	1912–43	July 25, 1912	26	37,000	40.4	Do.
39	Tygart River at Arden, W. Va	945	[3] 1,220.00	1936–40	Oct. 29, 1937	20.6	35,000	37	Do.
40	Tygart River at Fetterman, W. Va	1,304	[1] 957.86	1888–1939	July 10, 1888	32.5	93,000	91.2	Do.
41	Tygart River at Colfax, W. Va	1,366	[7] 855.49	1939–43	Feb. 8, 1940	16.56			Gaging-station record. Due to ice jam. Flow regulated by Tygart Reservoir.
42	Monongahela River at Fairmont, W. Va	2,258	[1] 839.91	1888–1921	July 10, 1888	37			From U. S. Weather Bureau.
43	Monongahela River at Lock 15, Hoult, W. Va	2,388	[8] 849.58	1888–1943	do	26	125,000	52.3	Gaging-station record. Upper-pool gage.
44	Monongahela River at Lock 14, W. Va	2,530	[3] 828.24	1888–1943	do	34.8			From Corps of Engineers, U. S. Army. Lower-pool gage.
45	Monongahela River at Lock 13, W. Va	2,536	[3] 817.58	1888–1943	do	35.9			Do.
46	Monongahela River at Lock 12, W. Va	2,543	[3] 806.91	1888–1943	do	37.7			Do.
47	Monongahela River at Lock 11, W. Va	2,571	[3] 796.2	1888–1943	do	35.4			Do.
48	Monongahela River at Lock 10, W. Va	2,585	[3] 785.4	1888–1943	do	39.1			Do.
49	Monongahela River at Morgantown, W. Va	2,648	[1] 789.05	1888–1943	do	34.5	150,000	57	Gaging-station record. Gage at highway bridge.
50	Monongahela River at Lock 8, Pt. Marion, Pa	2,720	[3] 782.50	1888–1943	do	28	150,000	55.2	Gaging-station record. Upper-pool gage.
51	Middle Fork at Midvale, W. Va	122	[1] 1,812.63	1888–1943	Feb. 3, 1939	18.5	11,400	93.4	Gaging-station record.
52	Middle Fork at Audra, W. Va	149		1942–43	Aug. 24, 1942	10.29	6,540	43.9	Do.
53	Buckhannon River at Hall, W. Va	277	[7] 1,369.15	1888–1943	Mar. 14, 1918 Oct. 29, 1937	14.7	12,200	83.0	Do.

Footnotes at end of table.

TABLE 9.—*Maximum known flood stages and discharges in West Virginia*—Continued

No.	Stream and place of determination	Drainage area (square miles)	Datum of gage in feet above mean sea level	Period of known floods	Peak stage and discharge: Date	Stage in feet	Discharge: Second-feet	Discharge: Second-feet per square mile	Remarks
	Monongahela River basin—Continued								
54	Big Run at Volga, W. Va	6.19	[1] 1,387.37	1941–43	Oct. 15, 1942	2.38	473	76.5	Gaging-station record.
55	West Fork River at Weston, W. Va			1888–1943	July 1888	22.5			From Treatise on water resources, Scotland G. Highland.
		133	[4] 995.6	1903–43	Apr. 16, 1939	20.25			From U. S. Weather Bureau.
56	West Fork River at Butcherville, W. Va	181	[9] 993.00	1888–1943	July 1888	17	12,600	69.6	Gaging-station record.
57	West Fork River at Clarksburg, W. Va	384		1888–1943	July 1888	35			From Treatise on water resources, Scotland G. Highland.
			[6] 931.82	1923–43	Apr. 17, 1939	8.22	13,500	35.2	Gaging-station record.
58	West Fork River at Enterprise, W. Va	759	[3] 869.45	1888–1943	do	[10] 21.57	31,500		Do.
59	Elk Creek near Clarksburg, W. Va	107	[11] 955.01	1910–18	July 25, 1912	15			Discharge not determined.
60	Buffalo Creek at Barrackville, W. Va	115	[1] 882.42	1907–08 1912–43	July 1912	18	11,600	101	Gaging-station record.
61	Dry Fork at Hendricks, W. Va	345	[1] 1,698.76	1940–43	May 16, 1942	6.75	8,400	24.4	Do.
62	Cheat River near Parsons, W. Va	718	[12] 1,590.79	1888–1943	July 10, 1888	20.5	85,000	118	Do.
63	Cheat River at Rowlesburg, W. Va	972	[7] 1,369.8	1844–1943	July 6, 1844	16.7	125,000	129	Do.
64	Cheat River near Pisgah, W. Va	1,354	[1] 875.68	1927–43	Oct. 28, 1937 Feb. 3, 1939	24.28	74,700	55.1	Do.
65	Cheat River near Morgantown, W. Va	1,380	[13] 822.28	1888–1925	July 10, 1888	18.7	160,000	116	Do.
66	Gandy Creek at Horton, W. Va	36		1924–26	Sept. 30, 1924	2.70	550	15.3	Do.
67	Laurel Fork at Wymer, W. Va	44		1924–26	Oct. 25, 1925	3.30	1,100	25.0	Do.
68	Glady Fork at Evenwood, W. Va	41		1924–26	do	3.10	1,010	24.6	Do.
69	Blackwater River above Beaver Creek near Davis, W. Va.	58.7		1929–32	Feb. 5, 1932	5.0	1,640	28.0	Do.
70	Blackwater River at Davis, W. Va	86.2	[13] 3,058.87	1921–43	Mar. 29, 1924	13.2	7,170	83.2	Do.
71	Blackwater River at Hendricks, W. Va	148		1911–18	Mar. 12, 1917	8.37			Discharge not determined.
72	North Fork Blackwater River at Douglas, W. Va.	17.9		1929–31	Oct. 2, 1929	3.81	1,020	58.0	Gaging-station record.
73	Shavers Fork at Cheat Bridge, W. Va	57.5		1896–1926	July 22, 1896	14	11,000	191	Do.
74	Shavers Fork at Bemis, W. Va	115		1918–25	March 1918	15.3			Discharge not determined.
					May 12, 1924	11.0	7,680	66.8	Gaging-station record.
75	Shavers Fork at Flint, W. Va	124	[13] 2,407.82	1924–32	June 20, 1928	9.31	8,800	71.0	Do.
					Feb. 4, 1932	9.54	8,710	70.2	Do.
76	Shavers Fork at Parsons, W. Va	214	[12] 1,631.70	1880–1943	July 10, 1888 July 17, 1907	12.5	25,000	117	Gaging-station record. Datum of gage in use since 1941 is 1634.87 feet above mean sea level.

77	Big Sandy Creek at Rockville, W. Va	200		1888–1943	July 10, 1888	20 to 20.5	28,000 to 30,000	150	Gaging-station record.
	Wheeling Creek basin								
78	Wheeling Creek at Elm Grove, W. Va	282	[6] 667.59	1940-43	Dec. 30, 1942	13.67	22,100	78.4	Do.
79	Little Wheeling Creek above Elm Grove, W. Va.	20.6			July 10, 1937		13,700	665	Discharge by slope-area method. From Corps of Engineers, U. S. Army.
80	Little Wheeling Creek at Elm Grove, W. Va	62.0			do		25,900	417	Discharge by slope-area method. From Corps of Engineers, U. S. Army.
81	Middle Wheeling Creek at Elm Grove, W. Va	33.5			do		17,200	513	Do.
	Middle Island Creek basin								
82	Middle Island Creek at Little, W. Va	458	[1] 631.32	1875–1943	August 1875	33.5	34,000	74.3	Gaging-station record.
	Little Kanawha River basin								
83	Little Kanawha River near Burnsville, W. Va	155	[1] 756.09	1918–43	March 1918	19.7	9,800	63.2	Do.
84	Little Kanawha River at Glenville, W. Va	386	[1] 697.79	1901–43	Nov. 16, 1926	33.6			Discharge not determined; probably less than peak discharge Apr. 16, 1939.
					Apr. 16, 1939	[14] 33.22	20,400	52.8	Gaging-station record.
85	Little Kanawha River at Grantsville, W. Va	913	[1] 652.83	1918–43	Apr. 17, 1939	43.10	34,300	37.6	Gaging-station record.
86	Little Kanawha River at Creston, W. Va	1,263	[1] 621.71	1901–43	do	33.2			From U. S. Weather Bureau.
87	Little Kanawha River at Lock 5, W. Va	1,330	[1] 616.8	1913–43	April 1939	26.7			From Corps of Engineers, U. S. Army. Upper-pool gage.
88	Little Kanawha River at Lock 4, W. Va	1,509	[1] 602.6	1913–43	Apr. 17, 1939	26.55			From Corps of Engineers, U. S. Army. Upper-pool gage.
89	Little Kanawha River at Palestine, W. Va	1,510	[1] 596.08	1915–43	do	32.25	53,000	35.2	Gaging-station record. Lock 4, lower-pool gage.
90	Little Kanawha River at Lock 3, W. Va	1,536	[1] 590.51	1913–43	do	32.0			From Corps of Engineers, U. S. Army. Upper-pool gage.
91	Little Kanawha River at Lock 2, W. Va	2,086	[1] 580.6	1913–43	March 1913	40.3			Do.
92	Little Kanawha River at Lock 1, W. Va	2,251	[1] 569.4	1913–43	do	51.1			Do.
93	Saltlick Creek above Gem, W. Va	39.8			Aug. 5, 1943		11,000	276	Discharge by slope-area method.
94	Berry Fork at Heaters, W. Va	2.30			do		4,100	1,780	Do.
95	Right Fork Saltlick Creek at Gem, W. Va	5.74			do		9,800	1,710	Do.
96	Hyers Run near Burnsville, W. Va	1.15			do		3,200	2,780	Do.
97	Copen Run above Copen, W. Va	3.87			do		4,300	1,080	Discharge by critical-depth and contracted-opening methods.
98	Copen Run at Copen, W. Va	5.27			do		6,600	1,250	Discharge by slope-area and contracted-opening methods.
99	Duskcamp Run near Stout's Mill, W. Va	4.67			do		6,900	1,480	Discharge by slope-area method.
100	Leading Creek near Glenville, W. Va	144	[1] 700.23	1938–43	Apr. 17, 1939	27.5			Discharge not determined.
101	Walker Fork at Flower, W. Va	1.23			Aug. 5, 1943		2,800	2,280	Discharge by slope-area method.
102	Spruce Run near Glenville, W. Va	2.87			do		1,900	660	Do.
103	Tanner Creek at Tanner, W. Va	16.1			do		10,000	621	Do.
104	Trace Fork at Revere, W. Va	5.47			do		8,000	1,460	Do.
105	Laurel Creek above White Pine, W. Va	2.42			do		7,400	3,060	Do.
106	Steer Creek near Grantsville, W. Va	166	[1] 678.00	1938–43	Apr. 16, 1939	28.15	12,400	74.7	Gaging-station record.

Footnotes at end of table

TABLE 9.—*Maximum known flood stages and discharges in West Virginia*—Continued

No.	Stream and place of determination	Drainage area (square miles)	Datum of gage in feet above mean sea level	Period of known floods	Peak stage and discharge: Date	Peak stage and discharge: Stage in feet	Discharge: Second-feet	Discharge: Second-feet per square mile	Remarks
	Little Kanawha basin—Continued								
107	North Fork Yellow Creek near Big Spring, W. Va.	1.51			Aug. 5, 1943		4,700	3,100	Discharge by slope-area method.
108	West Fork Little Kanawha River at Rocksdale, W. Va.	205	[1] 657.85	1928–43	Apr. 16, 1939	30.3	20,200	98.5	Gaging-station record.
109	South Fork Hughes River at Macfarlan, W. Va.	210	[1] 635.28	1915–43	Uncertain	29	13,000	61.9	Gaging-station record. Peak stage sometime prior to 1915.
110	Hughes River at Cisko, W. Va	453	[1] 605.35	1915–43	Jan. 22, 1917	30.25	25,700	56.8	Gaging-station record.
111	Island Run at Girta, W. Va	4.50			Aug. 5, 1943		6,300	1,400	Discharge by slope-area method.
	Kanawha River basin								
112	New River at Glenlyn, Va	3,768	[6] 1,489.76	1927–43	Aug. 14, 1940	27.5	226,000	60.0	Gaging-station record.
113	New River near Hinton, W. Va	4,600	[6] 1,368.49	1901–43	Apr. 21, 1901 May 23, 1901	24.2	234,000	50.8	Do.
114	New River at Hinton, W. Va	6,257	[4] 1,348.2	1878–1943	Sept. 13, 1878	20.2	260,000	41.6	U. S. Weather Bureau staff gage at site of lower ferry.
			[6] 1,355.18	1936–43	Aug. 15, 1940	18.97	246,000	39.3	Gaging-station record. U. S. G. S. recording gage.
115	New River at Caperton, W. Va	6,826	[6] 938.44	1928–43	do	36.0	244,000	35.8	Gaging-station record.
116	New River at Fayette, W. Va	6,850	[1] 838.44	1878–1943	Sept. 13, 1878	53	310,000	45.3	Do.
117	Kanawha River at Kanawha Falls, W. Va	8,367	[6] 623.20	1861–1943	Sept. 14, 1878	37.8	320,000	38.2	Do.
118	Kanawha River at London Dam, W. Va	8,490	[3] 600.00 [3] 580.00	1935–43	Aug. 15, 1940	23.3 42.9			U. S. G. S. recording gage in forebay. U. S. G. S. recording gage in afterbay.
119	Kanawha River at Marmet Dam, W. Va	8,816	[3] 580.00 [3] 560.00	1935–43	do	21.4 40.8			U. S. G. S. recording gage in forebay. U. S. G. S. recording gage in afterbay.
120	Kanawha River at Charleston, W. Va	8,881	[6] 558.87	1822–1943	Sept. 29, 1861	46.9			From Corps of Engineers, U. S. Army. Gage on South Side bridge.
121	Kanawha River at Charleston, W. Va	10,420	[6] 548.00	1939–43	Aug. 15, 1940 Dec. 31, 1942	38.25 38.77	216,000	20.7	From gaging station record. Recording gage at old Lock 6.
122	Kanawha River at Winfield Dam, W. Va	11,810	[3] 560.00 [3] 530.00	1939–43	Dec. 31, 1942	15.30 45.05			U. S. G. S. recording gage in forebay. U. S. G. S. recording gage in afterbay
123	Rich Creek at Peterstown, W. Va	50.6	[6] 1,565.94	1941–43	Mar. 13, 1943	4.90	1,390	27.5	Gaging-station record.
124	Indian Creek at Indian Mills, W. Va	189	[6] 1,472.54	1941–43	do	9.09	4,560	24.1	Do.
125	Bluestone River at Lilly, W. Va	438	[6] 1,433.7	1908–16 1929–43	Mar. 25, 1935	11.0	16,600	37.9	Do.

126	Greenbrier River at Durbin, W. Va	134	[6] 2, 699. 71	1943	Mar. 13, 1943	5. 07	2, 830	21. 1	Do.
127	Greenbrier River at Marlinton, W. Va	406		1908–16	Mar. 27, 1913	14. 2	21, 700	53. 4	Do.
128	Greenbrier River at Buckeye, W. Va	540	[6] 2, 085. 89	1929–43	Feb. 5, 1932	17. 5	41, 500	76. 9	Do.
129	Greenbrier River at Renick, W. Va	680	[1] 1, 853. 4	1889–1943	1889	21. 6			From U. S. Weather Bureau in 1928.
130	Greenbrier River at Alderson, W. Va	1, 357	[6] 1, 529. 42	1895–1943	Mar. 14, 1918	22. 0	77, 500	57. 1	Gaging-station record.
131	Greenbrier River at Hilldale, W. Va	1, 625	[6] 1, 388. 66	1936–43	Mar. 18, 1936	21. 85	60, 800	37. 4	From data furnished by U. S. Corps of Engineers.
132	Gauley River at Camden-on-Gauley, W. Va	236	[1] 2, 003. 28	1901–43	July 4, 1932	27. 38	42, 500	180	Gaging-station record.
133	Gauley River at Allingdale, W. Va	251	[1] 2, 003. 28	1908–34	do	23. 3	42, 500	169	Do.
134	Gauley River near Summersville, W. Va	680	[1] 1, 580. 90	1908–43	do	28. 75	92, 000	135	Do.
135	Gauley River near Leander, W. Va	1, 210	[1] 981. 17	1913–30	Mar. 13, 1918	34. 0	112, 000	92. 6	Do.
136	Gauley River above Belva, W. Va	1, 315	[1] 669. 0	1928–43	July 5, 1932	28. 60	105, 000	79. 8	Do.
137	Gauley River at Belva, W. Va	1, 402	[7] 663. 53	1908–16	Jan. 30, 1911	19	37, 000	26. 4	Do.
138	Williams River at Dyer, W. Va	128	[1] 2, 193. 46	1929–43	July 4, 1932	18. 45	22, 000	172	Do.
139	Cranberry River at Woodbine, W. Va	96		1929–31	Nov. 18, 1929	8. 25	3, 720	38. 8	Do.
140	Cherry River at Richwood, W. Va	85		1908–16	Oct. 1, 1915	9. 0	6, 600	77. 7	Do.
141	Cherry River at Fenwick, W. Va	150	[1] 2, 088. 94	1929–43	June 27, 1940	15. 2	27, 300	182	Do.
142	Meadow River at Nallen, W. Va	287	[1] 1, 869. 47	1908–16 1928–43	Mar. 5, 1934	15. 64	11, 200	39. 0	Do.
143	Elk River at Webster Springs, W. Va	171		1908–16	Jan. 29, 1911	11. 0	17, 300	101	Do.
144	Elk River below Back Fork at Webster Springs, W. Va.	242		1929–34	July 4, 1932	12. 98	26, 000	107	Do.
145	Elk River at Centralia, W. Va	281	[6] 931. 89	1934–43	Feb. 3, 1939	14. 72	18, 300	65. 1	Do.
146	Elk River at Sutton, W. Va	543	[6] 807. 19	1918–43	Mar. 13, 1918	37. 2	44, 000	81. 0	Do.
147	Elk River at Gassaway, W. Va	579	[1] 796. 31	1908–18	do	44	46, 000	79. 4	Do.
148	Elk River at Clay, W. Va	994	[1] 676. 6	1916–43	do	32. 4			From U. S. Weather Bureau.
149	Elk River at Queen Shoals, W. Va	1, 145	[6] 604. 13	1918–43	July 5, 1932	29. 2	91, 300	79. 7	Gaging-station record.
150	Elk River at Clendenin, W. Va	1, 290		1888–16	1888	32	64, 000	49. 6	Do.
151	Coal River at Ashford, W. Va	393	[6] 622. 46	1908–16 1930–43	Aug. 9, 1916	35. 0	40, 700	104	Do.
152	Coal River at Fuga, W. Va	849		1911–16	do	36. 6	47, 300	55. 7	Do.
153	Coal River at Tornado, W. Va	857	[1] 576. 9	1908–31	Aug. 1916	35			Discharge not determined.
					Nov. 18, 1929	16. 3	33, 500	39. 1	Gaging-station record.
154	Little Coal River at Madison, W. Va	267	[1] 667. 92	1930–41	Feb. 3, 1939	27. 35	42, 800	160	Do.
155	Little Coal River at Danville, W. Va	270	[6] 661. 12	1939–43	do	30. 2	42, 800	158	Do.
156	Little Coal River at McCorkle, W. Va	375		1915–22	Aug. 9, 1916	28. 57	24, 000	64. 0	Do.
157	Pocatalico River at Sissonville, W. Va	238	[1] 594. 56	1908–43	June 27, 1910	32. 4	17, 000	71. 4	Do.
					Apr. 16, 1939	34. 4	14, 100	59. 2	Datum of gage questionable.
	Guyandot River basin								
158	Guyandot River at Baileysville, W. Va	354		1929–31	Nov. 18, 1929	13. 64	5, 950	16. 8	Gaging-station record.
159	Guyandot River at Man, W. Va	762	[1] 710. 88	1928–43	Mar. 3, 1934	19. 11	40, 000	52. 5	Do.
160	Guyandot River at Wilber, W. Va	791		1915–22	Jan. 28, 1918	24. 8			Discharge not determined.
161	Guyandot River at Logan, W. Va	859	[4] 639. 08	1915–43	do	27. 0			From U. S. Weather Bureau.
162	Guyandot River at Branchland, W. Va	1, 226	[1] 547. 91	1907–43	1907	44	43, 500	35. 5	Gaging-station record.
163	Mud River near Milton, W. Va	291	[1] 572. 64	1938–43	Feb. 3, 1939	29. 35	14, 500	49. 9	Do.
164	Mud River at Yates, W. Va	318		1915–22	Uncertain	23. 0			Discharge not determined. Peak stage was some time prior to 1915.

Footnotes at end of table.

TABLE 9.—*Maximum known flood stages and discharges in West Virginia*—Continued

No.	Stream and place of determination	Drainage area (square miles)	Datum of gage in feet above mean sea level	Period of known floods	Peak stage and discharge				Remarks
					Date	Stage in feet	Discharge		
							Second-feet	Second-feet per square mile	
	Fourpole Creek basin								
165	Fourpole Creek at Huntington, W. Va	20.9	[2] 520.23	1940–43	Apr. 19, 1943	7.96	1,750	83.7	Gaging-station record. Higher stages recorded as result of backwater from Ohio River.
	Twelvepole Creek basin								
166	Twelvepole Creek at Wayne, W. Va	291	[1] 574.92	1915–43	June 30, 1928	28.3	14,000	48.1	Gaging-station record.
	Big Sandy River basin								
167	Big Sandy River at Louisa, Ky	3,870	[5] 516.81	1875–1943	Apr. 3, 1908	48.4			Gaging-station record. Lower gage at Lock 3.
					Feb. 5, 1939; Mar. 6, 1899	48.0	85,000	22.2	
168	Big Sandy River at Lock 2, Ky	4,198	[5] 506.0	1908–43	Jan. 27, 1937	51.7			From Corps of Engineers, U. S. Army. Lower-pool gage.
169	Big Sandy River at Lock 1, Ky	4,275	[5] 489.6	1908–43	do	69.5			Do.
170	Tug Fork at Litwar, W. Va	502	[6] 936.36	1930–43	Mar. 25, 1935	19.0	23,000	45.8	Gaging-station record.
171	Tug Fork at Williamson, W. Va	941	[4] 620.6	1901–43	Jan. 29, 1918	38.1			From U. S. Weather Bureau.
172	Tug Fork near Kermit, W. Va	1,185	[6] 581.82	1934–43	Feb. 3, 1939	35.9	34,400	29.0	Gaging-station record.
173	Tug Fork at Kermit, W. Va	1,240	[6] 574.44	1915–43	Uncertain	46.9			Discharge not determined. Peak stage was some time prior to 1915.
					Jan. 29, 1918	39.0	36,000	29.0	Gaging-station record.
174	Tug Fork at Lock 1, Ky	1,514	[5] 527.6	1908–43	Apr. 3, 1908	43.0			From Corps of Engineers, U. S. Army. Lower-pool gage.

[1] Adjustment of 1912.
[2] About.
[3] From Corps of Engineers, or bench mark of that agency.
[4] From U. S. Weather Bureau.
[5] Sandy Hook datum.
[5a] Occurred January 2, 1943.
[6] Datum of 1929.
[7] Baltimore & Ohio R. R. bench mark.
[8] Adjustment of 1907.
[9] West Virginia State Road Commission bench mark.
[10] Greater flood occurred in 1888 at stage of about 33 feet.
[11] City of Clarksburg bench mark.
[12] Adjustment of 1903.
[13] Level 6 by West Virginia Power and Transmission Co.
[14] Occurred April 17, 1939.

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