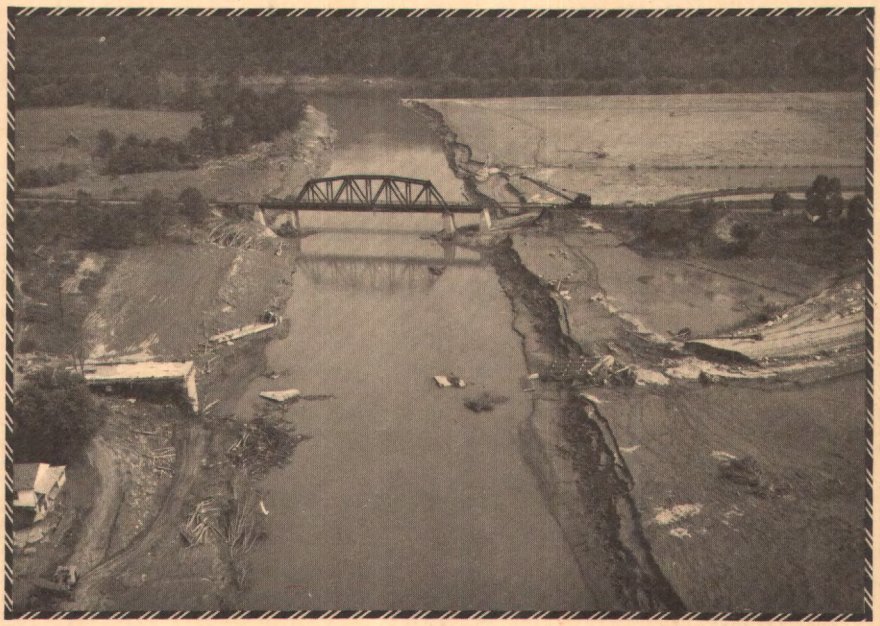
UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

FLOOD OF AUGUST 1969 IN VIRGINIA



Prepared in cooperation with the

STATE OF VIRGINIA

Open-file report 70-51

Richmond, Virginia

1970

Cover - Tye River at Norwood, Va.; James River in background.
(Photograph by Virginia Department of Highways)

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IN
VIRGINIA

By
J. D. Camp
and
E. M. Miller

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ABSTRACT

Hurricane Camille became a tropical depression and soaked central Virginia with up to 28 inches of rain during the night of August 19th and morning of the 20th. The rains, flash floods, and rain-induced landslides accompanying the storm's passage have been called the worst natural disaster ever to strike Virginia.

Discharge of streams in the James, Potomac, Rappahannock, and York River basins exceeded previous known maximums. At Tye River near Lovingston the peak flood discharge was eight times the previous high during the 31 years of record. James River stations downstream from the Maury River recorded peak flows of greater than 100-year recurrence interval.

As of Nov. 13, 1969, the State had counted 113 dead and 102 injured with 39 persons still missing. The total damage amounted to over $116 million.

This report provides hydrologic data needed for planning and design. The report includes a general description of the flood; precipitation information; sediment aspects of the flood; and records of stage and/or discharge for 105 sites.

INTRODUCTION

During the evening of August 19th and early morning of the 20th, the remnants of Hurricane Camille moved eastward across Virginia. Heavy rainfall occurred on the western slopes of the Blue Ridge Mountains, and more than 10 inches accumulated at Clifton Forge. The rainfall continued to intensify on the eastern slopes of the Blue Ridge where it reached catastrophic cloudburst proportions with a near record 28-inch total catch reported in Nelson County.

Peak discharges of many streams were the highest of record, and in some instances exceeded maximum discharges that are likely to occur on the average of once in 100 years.

Flash flooding on the headwater streams and tributaries of the James River, which occurred early on Aug. 20, 1969, was followed by record flooding along the main stem of the James as far downstream as Richmond, where the tidal estuary begins. The flash flooding reached disaster levels in Rockbridge, Amherst, Nelson, Albemarle, and Fluvanna counties. On the Tye, Piney, and Rockfish River watersheds in Nelson and Amherst counties where the greatest rainfall occurred, the flash flooding and rain-induced landslides caused a major disaster.

In the mountainous area the disaster came in the night without warning, the streams rose higher and faster than anyone would have predicted, and left no time for those caught in their path to reach safety.

The U. S. Geological Survey and the Virginia Division of Water Resources operate a streamflow network within the areas affected by this flood. This report contains records of stage and/or discharge for 49 continuous record stream-gaging stations, 26 flood-hydrograph station, 11 crest-stage stations, 8 miscellaneous sites, 5 discontinued gaging-station sites, and 6 U. S. Weather Bureau river gages. The flood affected areas and gaging sites are shown on plate 1.

Purpose and Scope

The purpose of this report is to make available to the public as quickly as possible pertinent hydrologic data for the flood and to supplement in more detail the peak-flow and flood-volume data that will be published in the annual series of reports on surface-water supply of Virginia. The report discusses the precipitation, flood damages, measurement of the flood discharges, and relates the magnitude of the August 1969 flood to that of previously known floods.

Stage and discharge hydrographs covering the flood period can be reconstructed for the regular gaging stations from the data presented. For those stations that were overtopped during the flood, the data were estimated using floodmarks of peak stages, hydrographs for previous floods at that site, and comparison with nearby stations.

Acknowledgments

The data presented in the report were collected as a part of cooperative programs between the U. S. Geological Survey and several Federal and State agencies.

The data were collected and compiled in the Richmond, Virginia, office of the Geological Survey, Water Resources Division, under the supervision of J. W. Gambrell, district chief. Collection of field data necessary for the determination of peak discharge by indirect methods and the computation of these measurements were accomplished through the assistance of technical personnel of the Water Resources Division of the U. S. Geological Survey from other States detailed to the flood area. The assistance of personnel from the Virginia Division of Water Resources in making the field surveys for the indirect measurements and for providing flood data for 31 gaging stations is gratefully acknowledged.

Data furnished by the City of Richmond, Counties of Chesterfield and Henrico, Virginia Electric and Power Company, and Appalachian Power Company were useful in the preparation of the report.

Precipitation data for this report were furnished by the U. S. Weather Bureau. Data furnished by other agencies is specifically acknowledged where they appear in the text.

Flood-Inundation Maps

The program of the U. S. Geological Survey to prepare inundation maps of metropolitan areas reflects the growing interest in flood-plain zoning. The maps, a part of the Hydrologic Investigations Atlas series of publications, are of special value to urban planners. Inundation maps show the approximate area inundated by at least one specific flood. The flood boundaries are defined from marks left by floods and are shown on multicolored topographic map bases that record the flood hazard in graphical form.

For the flood of August 1969 in Virginia, the Survey prepared the following Hydrologic Atlases:

HA-409 Flood of August 1969, Bon Air Quadrangle, Richmond, Virginia

HA-410 Flood of August 1969, Richmond Quadrangle, Richmond, Virginia

HA-411 Flood of August 1969, Drewrys Bluff Quadrangle, Richmond, Virginia

HA-412 Flood of August 1969 on Maury River at Buena Vista, Virginia

Aerial Photography

Aerial photographs, taken at the time of inundation by a major flood, provide accurate and easily definable flood boundaries. These boundaries can be readily transferred to maps or photomosaics.

During and immediately following the flood of August 1969, aerial photography was obtained along the James River from Hopewell to Natural Bridge and along the Maury, South, Buffalo, Piney, Tye, Rockfish, and Rivanna Rivers.

THE STORM

Prepared by ESSA-Weather Bureau Staff

The eye of Hurricane Camille moved inland just east of Bay St. Louis, Mississippi, on the night of August 17, 1969. Gusts estimated to be at least 190 mph (miles per hour) hit the city, while winds of 150 mph or more raked the area east of Biloxi. Camille weakened as she moved inland on a curving path through Mississippi, Tennessee, Kentucky, and West Virginia during the 17th, 18th, and 19th of August. The heavy rains normally accompanying a dying hurricane's path over land diminished from amounts approaching 8 inches in southern Mississippi to 1-2 inches in eastern Kentucky as the storm passed. Figure 1 shows the storm's path from the 14th to the 22nd of August 1969.

During the evening of the 19th and early morning of the 20th, the remnants of Camille intensified rapidly as she crossed the Appalachian Mountain ridges. The gentle rains that had fallen in Kentucky without causing significant flooding became, in the space of a few hours and tens of miles, a torrent of rain that spread eastward across southern West Virginia and west-central Virginia during the evening, merging with a band of heavy showers and thunderstorms that had moved into Virginia from the north and northwest earlier in the afternoon and evening. By about 10 p.m. EDT, August 19, a band of rain and thunderstorms some 40-50 miles wide extended in a general east-west orientation from the vicinity of White Sulphur Springs, West Virginia, to Fredericksburg, Virginia. Near midnight, the low pressure center began to intensify as it moved eastward into Virginia along a track south of Roanoke and Lynchburg. Rainfall to the north and east of the low pressure center increased very rapidly along the western slopes of the Blue Ridge Mountains, with more than 10 inches accumulating at Clifton Forge, Virginia. The rainfall

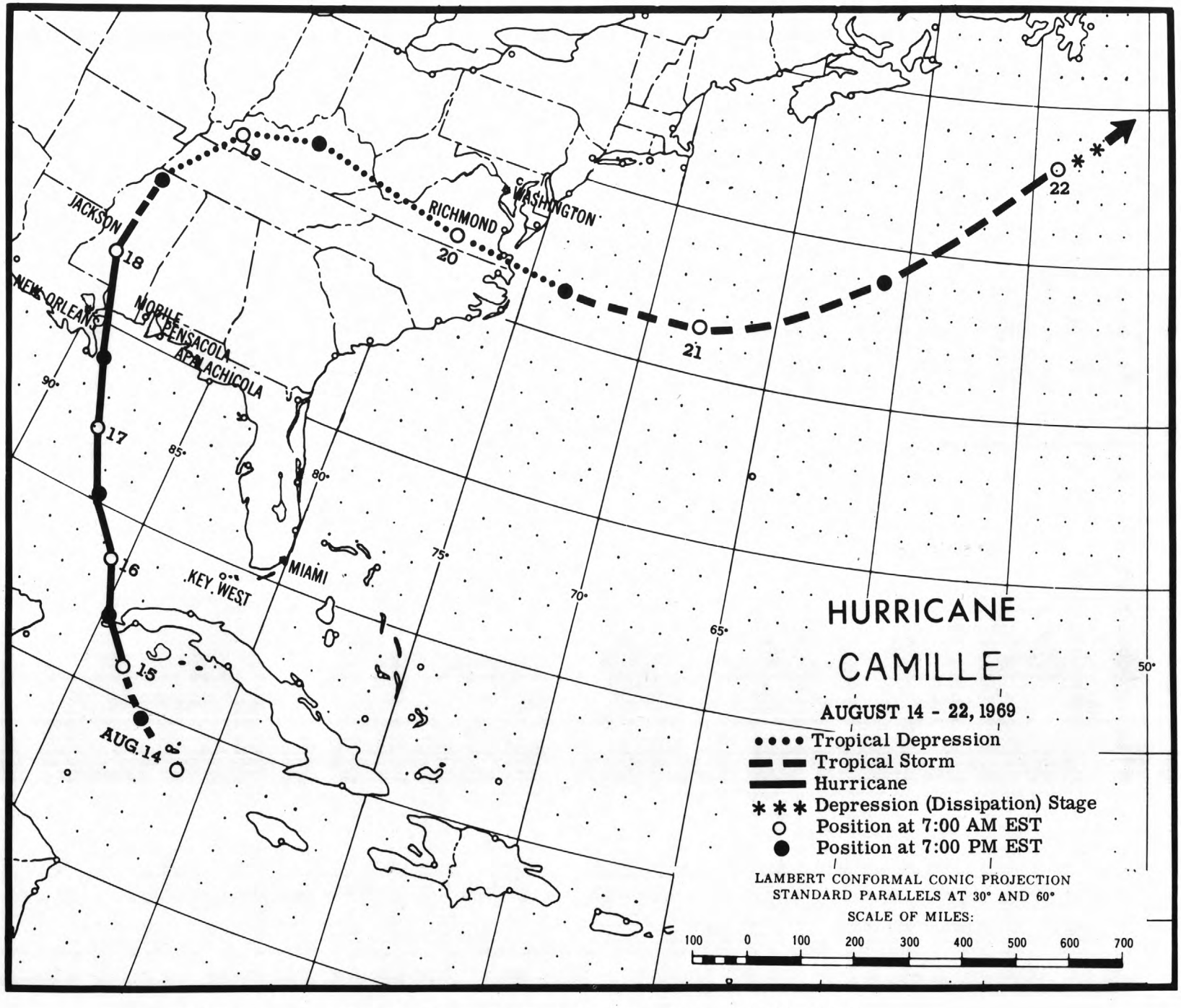


Figure 1.--Storm path of Hurricane Camille, Aug. 14-22, 1969.

continued to intensify on the eastern slopes of the Blue Ridge Mountains where it reached catastrophic cloudburst proportions. Results of a post-storm survey by Weather Bureau personnel show that rainfall of 12-14 inches was fairly widespread in Nelson County and the southern part of Albemarle County, with reliable indications of 27-28 inches in the central part of Nelson County. Rainfall in excess of 4 inches fell over an area 30-40 miles wide and more than 130 miles long, as the storm moved eastward across Virginia on August 20, 1969. Figure 2 shows the rainfall as determined from post-storm information.

The 27-28 inch rainfall within about 8 hours in Nelson County, Virginia, represents one of the all-time meteorological anomalies in the United States A study made by the Weather Bureau in 1956 for the Corps of Engineers concluded that the probable maximum rainfall possible in this area was 28 inches in 6 hours and 31 inches in 12 hours. The previous record rainfall in Virginia was 8.4 inches in 12 hours at Big Meadows on the Skyline Drive associated with a hurricane in 1942. For purposes of comparison, this catastrophic 27-28 inch rainfall approaches the following records:

12 inches in 42 minutes at Holt, Mo., in 1947

19 inches in 2 hours, 10 minutes at Rockport, West Virginia, in 1889

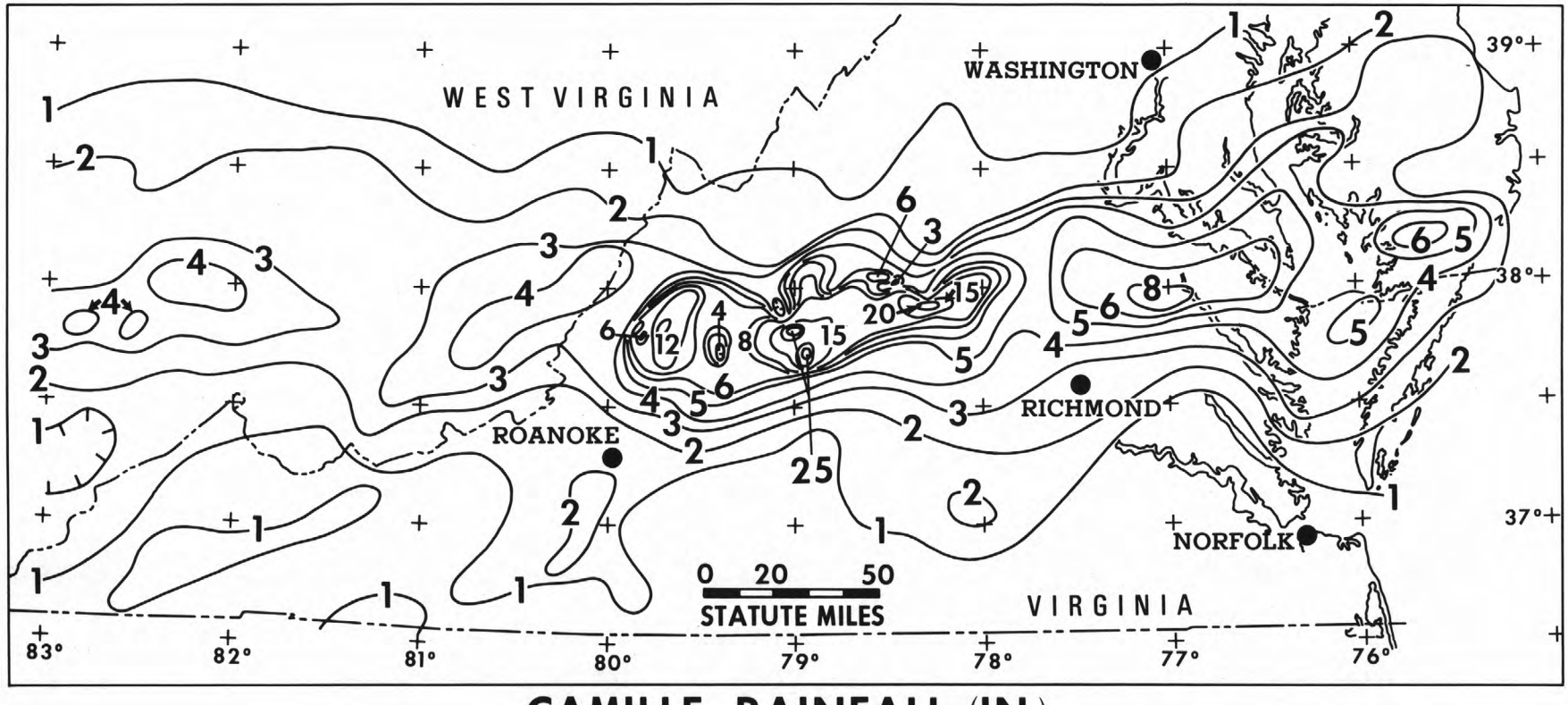
22 inches in 2 hours, 45 minutes at D'Hanis, Texas in 1935

31 inches in 4 hours, 30 minutes at Smethport, Pa., in 1942

34 inches in 12 hours, at Smethport, Pa., in 1942

Table 1 lists the data obtained by Weather Bureau personnel traveling through the James River basin during the several days immediately following the disastrous flooding. Most of the rain fell during the 8-hour period beginning about 7 p.m. on the 19th. Wide publicity was given to a report of 31 inches near Tye River, Va. Attempts to verify this measurement were unsuccessful.

FIGURE 2



CAMILLE RAINFALL (IN.)

AUG. 19TH NOON TO AUG. 20TH MIDNIGHT 1969

Table 1.--SUPPLEMENTARY PRECIPITATION DATA

Storm of August 19-20, 1969
(Remnants of Hurricane Camille)

County	Latitude	Longitude	24-hour total (inches)	Type of gage	Accuracy	Remarks
Albemarle	37° 56'	78° 38'	10.3	5" fence post gage	Good	Gage emptied several times during storm--always before it overflowed
Albemarle	37° 54'	78° 40'	13	Cylindrical bucket	Good	Bucket did not overflow
Albemarle	38° 06'	78° 42'	4.3	10" fence post gage	Good	Fruit grower keeps daily precipitation record
Albemarle	38° 01'	78° 47'	4.5	5" fence post gage	Good	Gage did not overflow. Ponds on farm did not overflow--as they have done in heavy rain
Albemarle	37° 57'	78° 45'	5+	5" fence post gage	Good	At Crown Orchard. Gage overflowed
Albemarle	38° 00'	78° 43'	12+	Cement cistern pipe	Fair	Pipe 24" diameter and 24" deep was about half full before rain and it overflowed
Albemarle	37° 58'	78° 24'	13+	Paint bucket	Good	Bucket overflowed
Alleghany	37° 48'	79° 44'	8.4		Good	On Cowpasture River one mile south of Rt. 60
Alleghany	37° 48'	79° 44'	8+	12 quart bucket	Good	Bucket overflowed Intersection Rt. 60 and Cowpasture River

Table 1.--SUPPLEMENTARY PRECIPITATION DATA

County	Latitude	Longitude	24-hour total (inches)	Type of gage	Accuracy	Remarks
Bath	37° 55'	79° 54'	3.25	Wedge gage	Good	7 miles SW of Hot Springs on Rt. 220
Bath	37° 55'	79° 44'	8.5	Cylindrical bucket	Fair	11 miles NE of Clifton Forge on Rt. 42
Bath	38° 00'	79° 34'	8+	12 quart bucket	Fair	1 mile W of Mill Creek on Rt. 42
Botetourt	37° 30'	79° 52'	3.25	Petroleum gage	Good	
Botetourt	37°41'	79° 49'	8.5	Petroleum gage	Good	
Botetourt	37° 46'	79° 47'	5+	5" petroleum gage	Good	4.5" fell by 10:00 p.m. Gage overflowed
Fluvanna	37° 55'	78° 21'	13+	Paint bucket	Good	Bucket overflowed
Fluvanna	37° 54'	78° 15'	12.5+	5" fence post gage	Good	Gage was emptied several times during night--but it had already overflowed before it was emptied the first time
Fluvanna	37° 56'	78° 18'	21+	Plastic trash basket	Good	Container overflowed
Hanover	37° 50'	77° 41'	4.75	Rain gage	Good	
King & Queen	37° 53'	77° 03'	6.5	Comm. rain gage	Good	
King & Queen	37° 54'	77° 02'	8.5	Comm. rain gage	Good	

Table 1.--SUPPLEMENTARY PRECIPITATION DATA

County	Latitude	Longitude	24-hour total (inches)	Type of gage	Accuracy	Remarks
Louisa	38° 02'	78° 00'	11.18	8" Std.	Good	WB Substation
Nelson	37° 49'	78° 52'	11+	11" bucket	Good	Bucket overflowed before 2 a.m. Hard rain from 8 p.m. to 4 a.m.
Nelson	37° 42'	78° 52'	14	---	---	
Nelson	37° 42'	79° 02'	12	---	---	
Nelson	37° 52'	79° 08'	8.33	8" Std.	Good	National Park Service
Nelson	37° 52'	79° 08'	11+	WB Recorder	Good	Gage overflowed
Nelson	37° 49'	79° 00'	27"	Trash barrel	Good	Barrel had been emptied afternoon before rain began
Nelson	37° 45'	78° 56'	25	Barrel	Good	
Nelson	37° 54'	78° 52'	8+	8"	Good	Gage overflowed during night
Nelson	37° 53'	78° 54'	11+	Wash tub	Good	Tub 11" deep--overflowed
Nelson	37° 48'	78° 59'	16	---	Fair	2 miles NE of Massies Mill
Nelson	37° 48'	78° 59'	12+	12" cylindrical bucket	Good	Bucket overflowed
Nelson	37° 51'	78° 49'	14+	Comm. rain gage	Good	At foot of Davis Creek Gage overflowed

Table 1.--SUPPLEMENTARY PRECIPITATION DATA

County	Latitude	Longitude	24-hour total (inches)	Type of gage	Accuracy	Remarks
Nelson	37° 40'	78° 58'	23	Street trash container	Good	On Rt. 29 between Amherst and Lovingston Container was 14" dia., 28" deep
Nelson	37° 43'	79° 00'	13+	Ice cream freezer	Good	On Rt. 158 Freezer was filled to overflow hole
Nelson	37° 41'	78° 58'	20.4+	Plastic garbage container	Good	Container overflowed was 17.5" dia. at top and 15.5" dia. at bottom, 23" deep
Rockbridge	37° 54'	79° 36'	10.6	5" petroleum gage	Good	Gage was dumped three times. 2-1/2 miles N of Alleghany-Rockbridge City Line on Rt. 60
Rockbridge	37° 50'	79° 30'	9	5 gal. cylindrical bucket	Good	On Route 780 3 miles south of Goshen
City						
Buena Vista	37° 44'	79° 21'	6+	8" Std.	Fair	WB (b) station
Charlottesville	36° 03'	78° 30'	6+	Garbage can	Fair	At University Gym; can overflowed
Charlottesville	36° 06'	78° 32'	4.5	Comm. rain gage	Good	
Clifton Forge	37° 42'	79° 49'	4.25	Comm. rain gage	Good	

Table 1.--SUPPLEMENTARY PRECIPITATION DATA

City	Latitude	Longitude	24-hour total (inches)	Type of gage	Accuracy	Remarks
Covington	37° 48'	80° 00'	3.45	8" Std.	Good	WB "a" station
Fredericksburg	38° 17'	77° 29'	4.4	Comm. rain gage	Good	At WFVA Studios
Fredericksburg	38° 18'	77° 28'	4.62	8" Std.	Good	At Battlefield Park Museum
Fredericksburg	38° 18'	77° 28'	5.1	Comm. rain gage	Good	At American Viscose Plant
Lexington	37° 47'	79° 26'	4.95	8" Std.	Good	WB Substation
Richmond	37° 33'	77° 33'	2.8	Small rain gage	Good	
Richmond	37° 39'	77° 33'	2.9	Straight sided dog bowl	Good	At 3900 Block West End Dr. Bowl 15" dia., 5-3/4 deep

DESCRIPTION OF THE FLOOD

Camille, one of the most intense storms in recorded North Atlantic tropical cyclone history, devastated the Mississippi coast with winds up to 190 miles per hour and tides between 15 and 30 feet, and then in a weakened condition dumped up to 28 inches of rain over Virginia's Blue Ridge Mountains resulting in extensive flooding and landslides in west-central Virginia.

Camille moved eastward across Virginia covering a band some 40-50 miles wide with heavy rainfall resulting in the most severe flooding of the James River (fig. 3) and its tributaries that had been experienced in nearly a century, and also causing record floods in the York River basin. In addition to the flooding, the rains caused numerous landslides (fig. 4) on the eastern slopes of the mountains that contributed greatly to the property damage and high death toll.

Small streams on the eastern slopes of the Blue Ridge Mountains in west-central Virginia responded quickly to the torrential rains. Several rose to unprecedented heights with a suddenness that proved disastrous to many towns along their banks. Other towns and communities that survived the high water were buried under tons of debris and silt. Buena Vista had 6 feet of water from the Maury River in its business district. Glasgow (fig. 5), at the junction of the Maury and James Rivers, had its entire business district inundated by almost 14 feet of water. Scottsville's business district (fig. 6) was under 8 feet of water from the James River. Downtown Waynesboro was submerged under 8 feet of water from the South River. In Amherst and Nelson Counties many communities were partly destroyed along with highways, bridges, utilities, and railways.

The James River basin, as shown on plate 1, is an irregular, tapering area that extends in a southeasterly direction through the central part of Virginia

Figure 3.--James River at Balcony Falls Dam, Aug. 20, 1969.
Photograph courtesy of Virginia State Police.

Figure 4.--Landslide at Davis Creek, 5 miles north of Lovingston.
Photograph by Virginia Department of Highways.

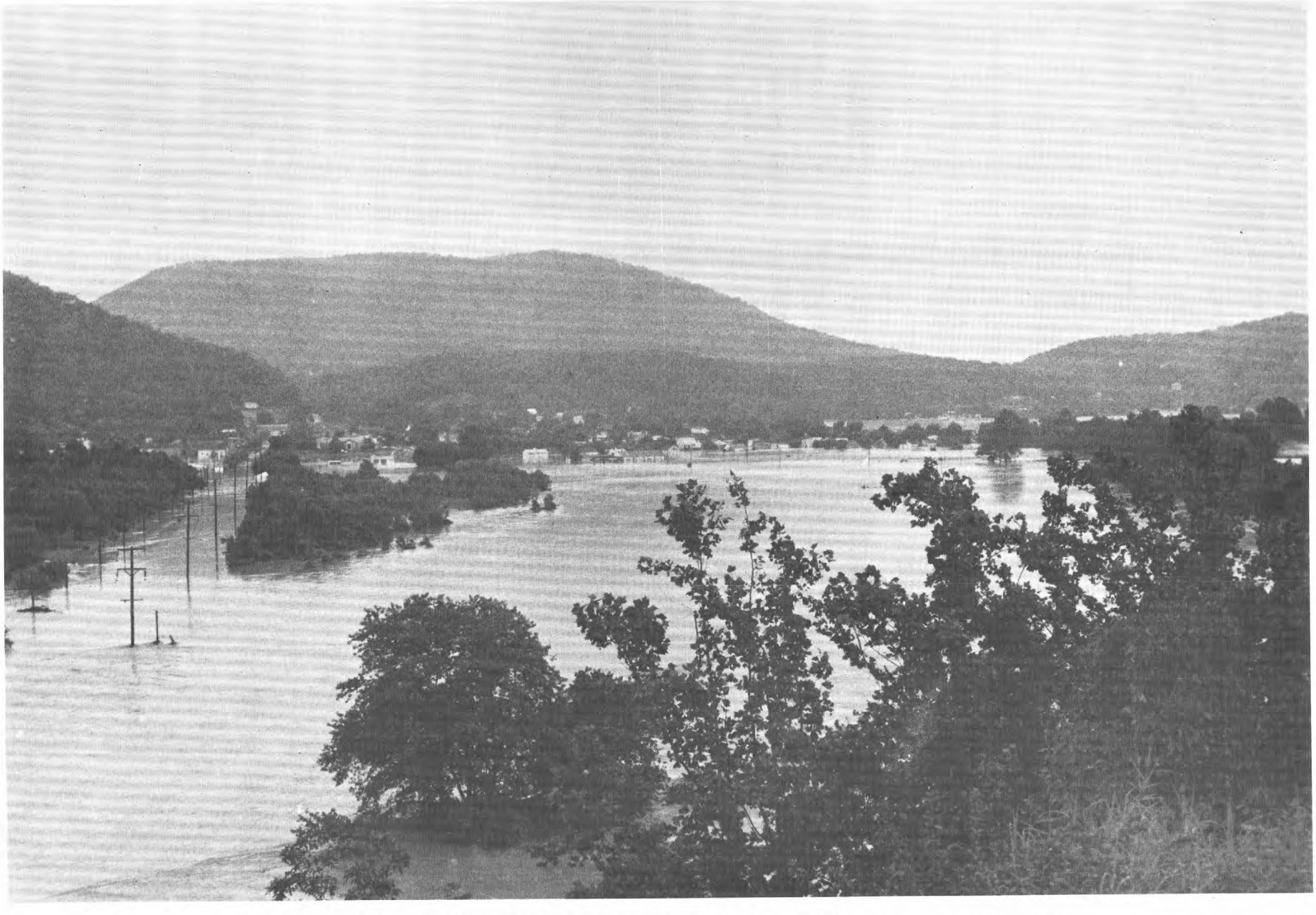


Figure 5.--Maury River flooding low-lying areas of Glasgow, Aug. 20, 1969.
Photograph courtesy of Virginia State Police.

Figure 6.--Downtown Scottsville flooded by James River.
Richmond Times-Dispatch photograph.

from the West Virginia State line to Hampton Roads at the entrance to Chesapeake Bay. The James River has its source in the Alleghany Mountains and drains and area of 10,060 square miles, of which 9,980 square miles are in Virginia and 80 square miles are in West Virginia. It is formed by the confluence of the Jackson and the Cowpasture Rivers about 4 miles below Clifton Forge. Below the confluence, the principal tributaries are the Maury, Tye, Slate, Rivanna, Willis, Appomattox, and Chickahominy Rivers, and Craig Creek. The total length of the James River is 340 miles and the total fall is 988 feet. At and below Richmond, the stream is a tidal estuary of Hampton Roads.

Major floods of the past in the James River basin have occurred at various times of the year. Those between December and May result from winter and spring rainstorms, whereas those between August and October are generally caused by the hurricane-type storms that originate in the Atlantic and Gulf waters.

Table 2 lists flood stages for the main stem James River stations. Included are historical data that have been compiled.

Within the period of reliable record, the maximum flood stages along the James River prior to the floods of August 1969 occurred above Lynchburg during the flood of March 1913, and at Richmond and from Lynchburg to near Scottsville during the flood of March 1936. At Scottsville, the floods of August 1940 and September 1944 exceeded that of 1936. From the mouth of the Rivanna River to below Cartersville, the highest stage was reached during the flood of September 1944.

The stages shown for the floods in September 1795 at Lynchburg and in May 1771 at Richmond were determined from authenticated diary accounts. These stages have not been approached since that time.

Table 2.--Flood stages at main stem James River stations.

	1771	1795	1870	1877	1913	1936	1944	1969	Mile[1/]	Datum[2/]
Lick Run	-	-	-	33	30.4	25.65	-	25.53	338.9	978.30
Buchanan	-	-	-	a34.9	31.0	26.80	-	23.37	301.2	802.90
Balcony Falls	-	-	-	-	-	*15.6	b8.0	18.6	288	703.60
Holcombs Rock	-	-	-	-	31.3	30.78	16.6	35.50	263.2	548.53
Lynchburg	c35	c36	c29.4	c28.6	b24.6	b24.7	b14.9	b28.0	253.6	499.06
Bent Creek	-	-	c27	c24	-	23.02	18.0	24.77	222.9	381.39
Scottsville	-	-	30.7	27.9	25.16	25.46	26.0	30.00	184.6	253.18
Bremo Bluff	-	-	c37.4	c34.8	c30.1	c32.8	b34.5	b39.1	171	191.4
Columbia	-	-	b39	b37.5	b30.0	b35.8	b37.4	b41.3	161.8	173.04
Cartersville	-	-	c32	c32	23.4	28.77	29.60	33.75	152.4	161.57
State Farm	-	-	-	-	-	b25.2	b26.4	-	132	131.22
Richmond (near)	-	-	-	-	-	23.42	21.80	24.95	111.7	98.82
Richmond (at)	c38	-	c25.2	c26.7	b17.5	b26.5	b22.4	b27.6	104.6	2.36
Richmond (at)	-	-	-	-	-	-	-	b28.64	103.7	0.0

1/ Miles upstream from mouth.

2/ Add this figure to stage to obtain elevation above mean sea level.

* Revised.

a Maximum since at least 1870.

b From U. S. Weather Bureau data.

c From reports by Corps of Engineers.

Previously known maximum discharges of 40 or more years of record were exceeded by the August 1969 flood at the following stations:

Dunlap Creek near Covington

James River at Bent Creek

James River at Cartersville

James River at Holcombs Rock

James River at Scottsville

Maury River near Lexington

North Anna River near Doswell

South Anna River near Ashland

South River near Waynesboro

Previous maximum discharges of record at 27 active or discontinued gaging stations in the Potomac, James, and York basins were exceeded by this flood. At Tye River near Lovingston, the peak discharge was eight times the previously recorded maximum discharge. The North Anna River near Doswell rose 27 feet in 7 hours and the Rivanna River at Palmyra rose 35 feet in 9 hours.

The flow of the James River at Richmond peaked at 222,000 cubic feet per second and is considered to be the second highest discharge on the James River since Jamestown was settled in 1607.

At Buena Vista, the measured flood discharge in the Maury River was 105,000 cubic feet per second or about 170 times the average discharge, and probably the highest since at least 1870, and not likely to be equaled or exceeded on the average of more than once every 130 years. This flow was more than twice the 1936 discharge, the previous known maximum flood flow since records of discharge were kept beginning around the turn of the centrury.

FLOOD DAMAGES

The excessive rainfall caused extensive flash flooding in Albemarle, Alleghany, Amherst, Bath, Botetourt, Buckingham, Cumberland, Fluvanna, Goochland, Nelson, Orange, Powhatan, and Rockbridge counties. The flash flooding reached disaster levels in Rockbridge, Amherst, Nelson, Albemarle, and Fluvanna counties. On the Tye and Rockfish River watersheds in Nelson County where the greatest rainfall occurred, the flash flooding and rain-induced landslides caused a major disaster.

The rains, floods, and landslides accompanying the storm's passage were revealed in the next few days as the worst natural disaster ever to strike Virginia. As of Nov. 13, 1969, the State had counted 113 dead and 102 injured with 39 persons still missing.

Water, boulders, and uprooted trees smashed houses, destroyed bridges and roads and whole communities (fig. 7-11). In the Davis Creek community in Nelson County, only two of 25 houses remained. Twenty-seven persons were known dead and 22 were missing from this one hollow. Every building except two houses and a church in the community of Massies Mill was rendered unusable and much of the town itself was swept away by floodwaters.

State police reported that floodwaters reached a depth of 30 feet in Buena Vista and covered "whole factories" near the Maury River. At the height of the flood, residents said automobiles and heavy trucks were rolled down the city's Main Street like toys.

The eastern section of Waynesboro, in the Shenandoah Valley, was under 8 feet of water as a result of overflow by the South River.

The City of Richmond received advance warning of impending floodwaters, consequently the loss of life and the devastation sustained in parts of the

Figure 7.--Damage from mudslide in Nelson County.
Richmond Times-Dispatch photograph.

Figure 8.--Wrecked house across the tracks from Howardsville Depot.
Charlottesville Daily Progress photograph.

Figure 9.--The oldest building in Howardsville, the Old Irving Store, flooded by James River. Charlottesville Daily Progress photograph.

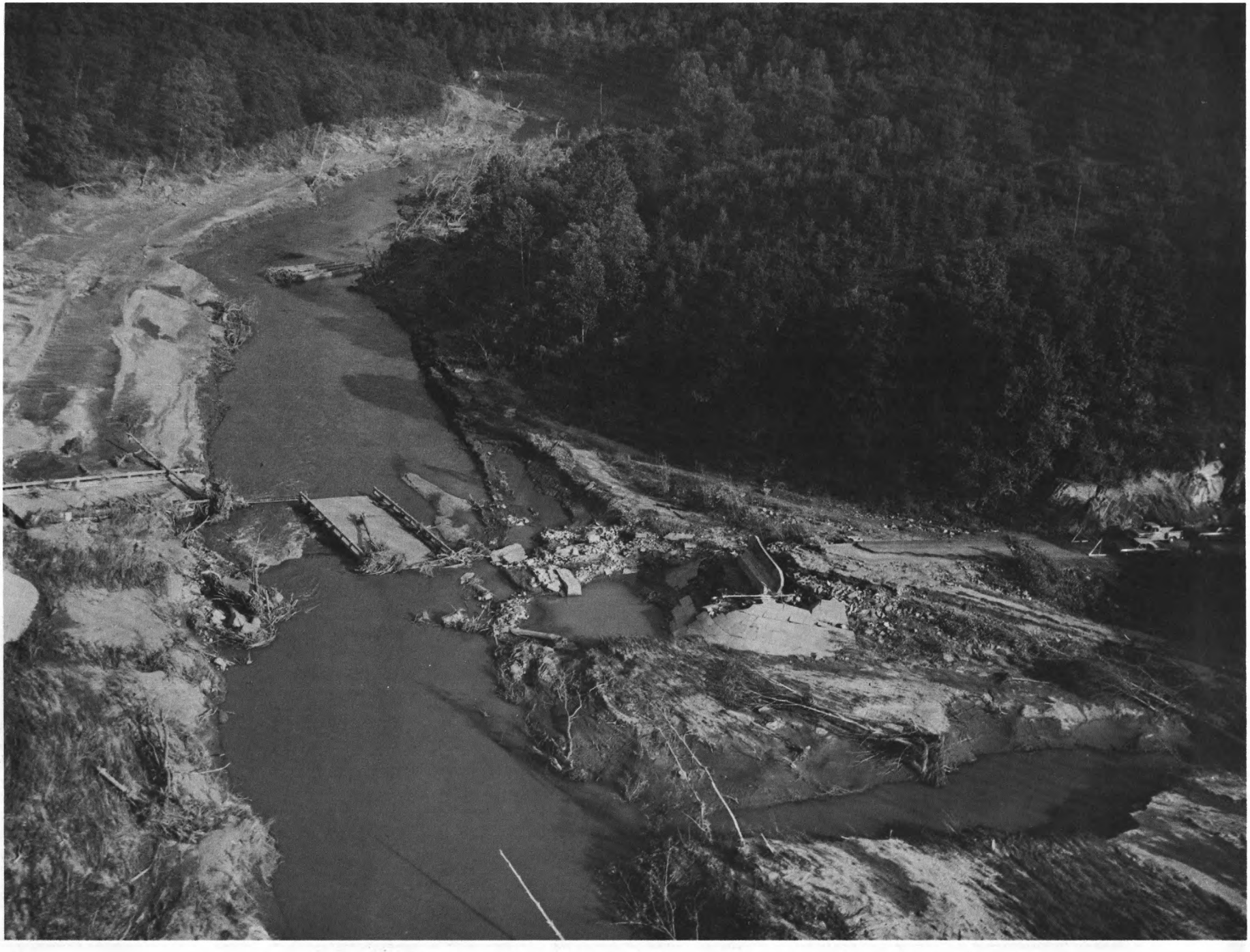


Figure 10.--Bridge over Rockfish River in Nelson County destroyed by flood.
Photograph by Virginia Department of Highways.

Figure 11.--Flood damage, Muddy Creek on U. S. Highway 29 north of Lovingston.
Photograph by Virginia Department of Highways.

upper James River basin was avoided. Although a flood disaster plan was implemented, serious flooding occurred in the lower elevations of the city (fig. 12-13).

Urban flood damage estimates are given in table 3.

The American National Red Cross provided the following statistical information of flood damages:

	Destroyed	Major damage	Minor damage	Total
Dwellings	313	415	1,870	2,598
Mobile homes	71	65	220	356
Farm buildings	430	520	-	950
Small buisnesses (one-family type operations)	X	X	-	91

Total number of families suffering losses 3,765.

Virginia State Highway Commissioner, Douglas B. Fugate, reported that 133 bridges had been destroyed or damaged (fig. 14-18) and that 25 miles of primary and 175 miles of secondary highways had been washed out or obliterated by landslides. Among the bridges destroyed were three secondary road bridges over the James River, each of which lost two truss spans. The bridges were on Route 690 at Columbia, Route 602 at Howardsville, (fig. 19) and Route 603 at Elk Island.

Primary roads destroyed or damaged beyond use included 15 miles on Route 56 in Nelson County, 5 miles on Route 151 in Nelson County, and 3 miles on U. S. 29 in Amherst and Nelson Counties. Secondary roads out of use included 110 miles in Nelson County, 24 miles in Amherst County, and 40 miles in Rockbridge County. Interstate highway damage was confined to paved shoulders, ditches, and gutters, and to guardrails and roadside slopes (fig. 20). North-south traffic was temporarily halted on Interstate 95 in Caroline County due to flooding.

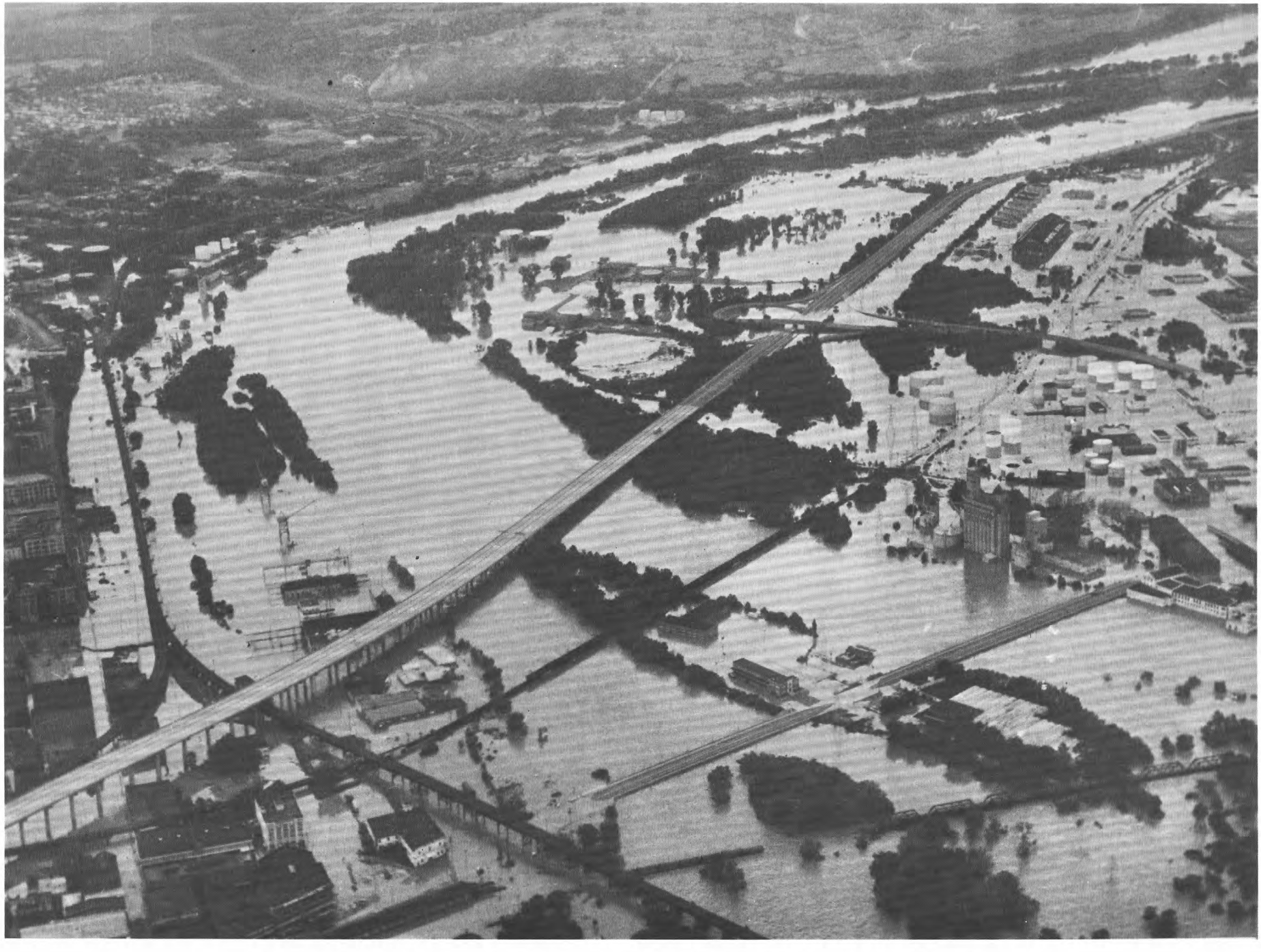


Figure 12.--Interstate 95 spanning flooded James River at Richmond.
Richmond News-Leader photograph.

Figure 13.--Richmond's Main Street flooded by James River.
Richmond Times-Dispatch photograph.

Table 3.--Urban flood damage estimates.

City or Town	Residential	Business Commercial Industrial	Water Facilities	Sewer Facilities	Schools	Bridges and Streets	Miscel-laneous	Total
Clifton Forge	-	$ 15,000	$131,000	-	$ 20,000	$13,000	$45,000	$ 24,000
Buena Vista	$437,000	26,034,000	60,000	$ 50,000	2,000	85,000	87,000	26,755,000
Glasgow	610,000	1,555,000	4,000	24,000	2,000	-	-	2,195,000
Lexington	171,000	105,000	-	10,000	-	-	-	286,000
Waynesboro	469,500	1,735,000	-	10,000	-	5,000	20,000	2,239,500
Scottsville	137,000	855,000	3,000	3,000	150,000	-	4,000	1,152,000
Bremo Bluff	45,000	8,000	-	-	-	-	-	53,000
Columbia	15,000	20,000	-	-	-	-	-	35,000
Richmond	166,000	8,780,000	-	10,000	-	15,000	30,000	9,001,000
Total	$2,050,500	$39,107,000	$198,000	$107,000	$174,000	$118,000	$186,000	$41,940,500

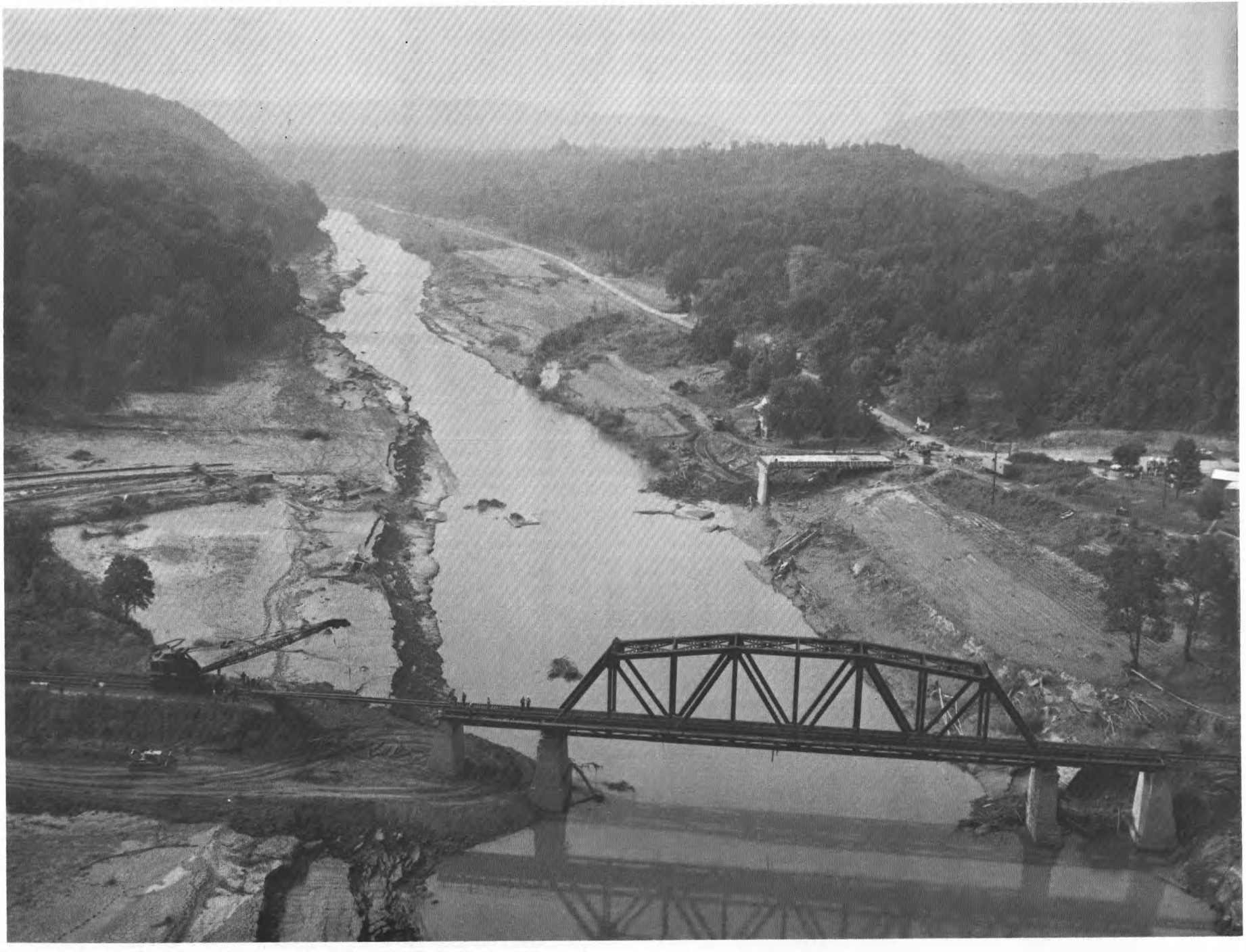


Figure 14.--Route 655 bridge over Tye River at Norwood.
Photograph by Virginia Department of Highways.

Figure 15.--Route 739 bridge over Tye River at Tye River.
Photograph by Virginia Department of Highways.

Figure 16.--North Anna River overflows U. S. Highway 1 near Doswell.
Photograph by Virginia Department of Highways.

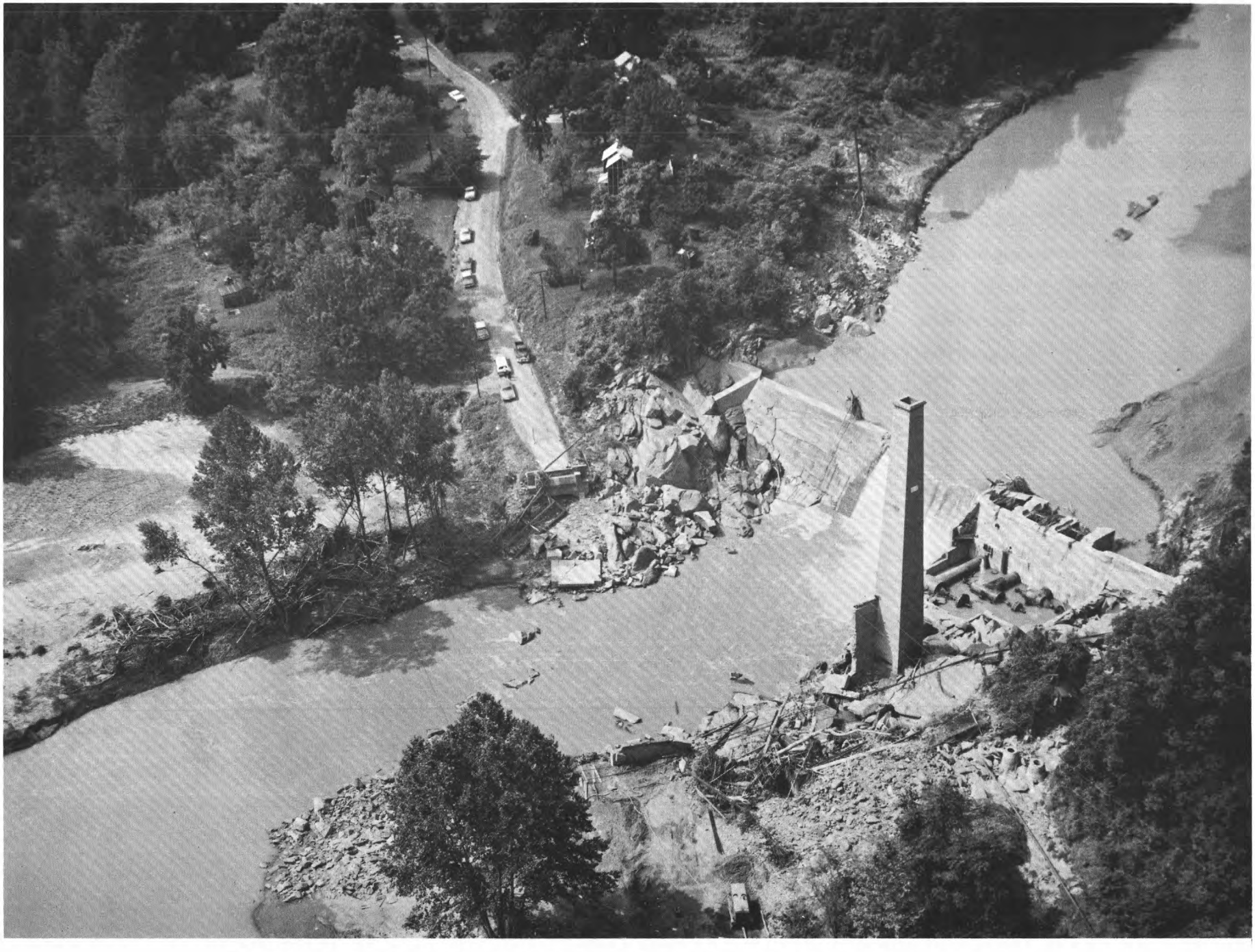


Figure 17.--Flood damage to bridge and dam, Rockfish River at Schuyler.
Photograph by Virginia Department of Highways.

Figure 18.--U. S. Highway 29 bridge over Buffalo River near Amherst.
Photograph by Virginia Department of Highways.

Figure 19.--Route 602 bridge over James River at Howardsville; route 626 over Rockfish River in background. Photograph by Virginia Department of Highways.

Figure 20.--Flood damage to Interstate 95, one mile north of Ladysmith exit.
Photograph by Virginia Department of Highways.

Estimates of Damages Resulting from Flooding and Mountain Slides 1/
James River Basin, August 19 and 20, 1969

"The estimates of flood damage which follow are predicated on replacement value where applicable and are grouped into three basic categories--public service corporations, the private sector, and government property.

The estimated damages to public service corporation are as follows: railroads, $4,198,650; electric utilities, $1,087,000; gas utilities, $128,225; telephone utilities, $1,301,800.

In the private sector, estimated damages are as follows: agriculture, $23,817,658, to include farm buildings, fencing, land damage, loss of land, land reclamation, loss of crops and livestock, loss of equipment, etc; residential, $10,224,822, to include furniture and furnishings, landscaping, yard fencing, etc. (260 homes were totally destroyed and 2,300 homes had either minor or major damage). The business, commercial, and industrial damages are estimated at $54,635,350. In the miscellaneous category the damages amount to $531,870, which includes vehicles, churches, fraternal buildings, etc.

In the governmental category, local, State and Federal, the estimated damages to water facilities are $267,365; sewer facilities, $197,225; public schools, $266,000; bridges and streets in localities not under the direct responsibility of the State Highway Department, $141,450; miscellaneous governmental facilities to include municipal buildings, public works shops and material, storage area, terminal, etc., $277,265; State facilities to include State parks, correctional institutions, etc., $284,970; and secondary roads maintained by the State Department of Highway, $17,200,000 and the primary road system, $1,900,000.

The total damages in all categories are $116,460,550."

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1. Statement by T. Edward Temple, Director, Division of State Planning and Community Affairs Commonwealth of Virginia (Senate Public Works Subcommittee September 18, 1969).

The following estimates of rural economic losses, because of flood damage, are based on evaluations conducted by representatives of Virginia agricultural agencies and the U. S. Department of Agriculture:[1]

Value of livestock loss	$ 241,345
Value of crops damaged or destroyed	3,880,413
Value of farm buildings damaged or destroyed	3,428,500
Value of farm machinery damaged or lost	558,500
Damage to land, an estimated cost for reclaiming	15,708,900
	$23,817,658

1. Statement presented to the Public Works Subcommitte on Flood Control-Rivers and Harbors, United States Senate, Washington, D. C., September 18, 1969, by Maurice B. Rowe, Commissioner, Department of Agriculture and Commerce, Commonwealth of Virginia.

SEDIMENT ASPECTS OF THE FLOOD

By Garnett P. Williams and Harold P. Guy

Widespread movement and deposition of sediment occurred in connection with the August 1969 flood, greatly increasing the severity of the flood damages. In general, the greatest damage from sediment occurred in mountainous areas within the James River basin, where deposition, battering, and erosion of channels occurred. Damage due to sediment was most extensive in Nelson County, on the eastern slope of the Blue Ridge Mountains. The Rockfish and the Tye River basins were especially hard hit. Once the raging floodwaters had reached the flatter, broader flood plains of the Piedmont area, damage, though still great, primarily resulted from mud and silt deposits.

Sediment transported during the flood came principally from hillslopes and stream channels. Field inspection indicates that hillslopes were the greatest single source of sediment while a relatively smaller amount came from the beds and banks of streams. Erosion in the form of spectacular scars, which stripped away bare soil in huge single units, accounted for much of the material transported. The number of scars and the areal extent to which the hillsides are stripped are greatest in the headwaters of the common valley and decrease downstreamward. The scars are generally restricted to a 40-square-mile area in the middle of Nelson County, just south of Horseshoe Mountain, where the greater rainfall occurred. A typical scar is about 1 to 3 feet deep, 25-75 feet wide (gradually widening in the down-slope direction) and 300-600 feet long (fig. 21). Stream channels experienced scour and widening at various places during the flood, and overbank flooding in some instances caused flood-plain erosion.

Extensive deposits of sediment were laid down by the floodwaters, In some instances sediment moved only a short distance from its source such as to

Figure 21.--Hillslope scars formed by debris avalanches. Note exposed bedrock.

the foot of a hillside, while fine particles eroded from hillsides were transported as far as the Atlantic Ocean.

From an inspection of many of the streams, a definite pattern of sediment deposition is discernible. In downstream order, typical deposits such as the following were observed. Tons of debris resulting from landslides could be seen in the steep mountainous areas. Frequently these slides buried sections of roadway therby sealing off small mountain communities. Enormous debris piles composed of trees, boulders, cobblestones, and sand 10-20 feet deep, 100 feet wide, and 200 feet in length were created as the mountain ravines became clogged, often due to tree-jams in the stream channel (fig. 22). As the torrents emerged from the mountains, alluvial fans formed at the base of the mountain (fig. 23). These fans range from 40-150 feet wide, 800-2,000 feet long and up to 3 feet thick. The fans are continuous debris collections that spread out gradually with distance downstream. Water leaving the lower end of these fans bears heavy sand and silt concentrations. Large deposits of these fine-grained materials accumulated in back of bridges and culverts that acted as dams once the structures became clogged. Such deposits, built up to road level, were found within half a mile to 6 miles of the sediment source (fig. 24). Overbank flow laid down extensive deposits of sand, silt, and mud on flat-lying strips of land bordering the major streams and rivers (fig. 25-26). Generally the sediment particles on the flood plains were sand size or finer. Figure 27 shows the grain-size distributions of sediment deposits on the Rockfish River at Woods Mill and at Howardsville, Rucker Run at Shipman, and unnamed stream in Melton Hollow near Lovingston.

Figure 22.--Debris deposited in mountain ravines. Most of this sediment probably was deposited during the recession stage of the flow.

Figure 23.--Alluvial fan at Shaeffer Hollow, near the East Branch of Hat Creek in Nelson County.

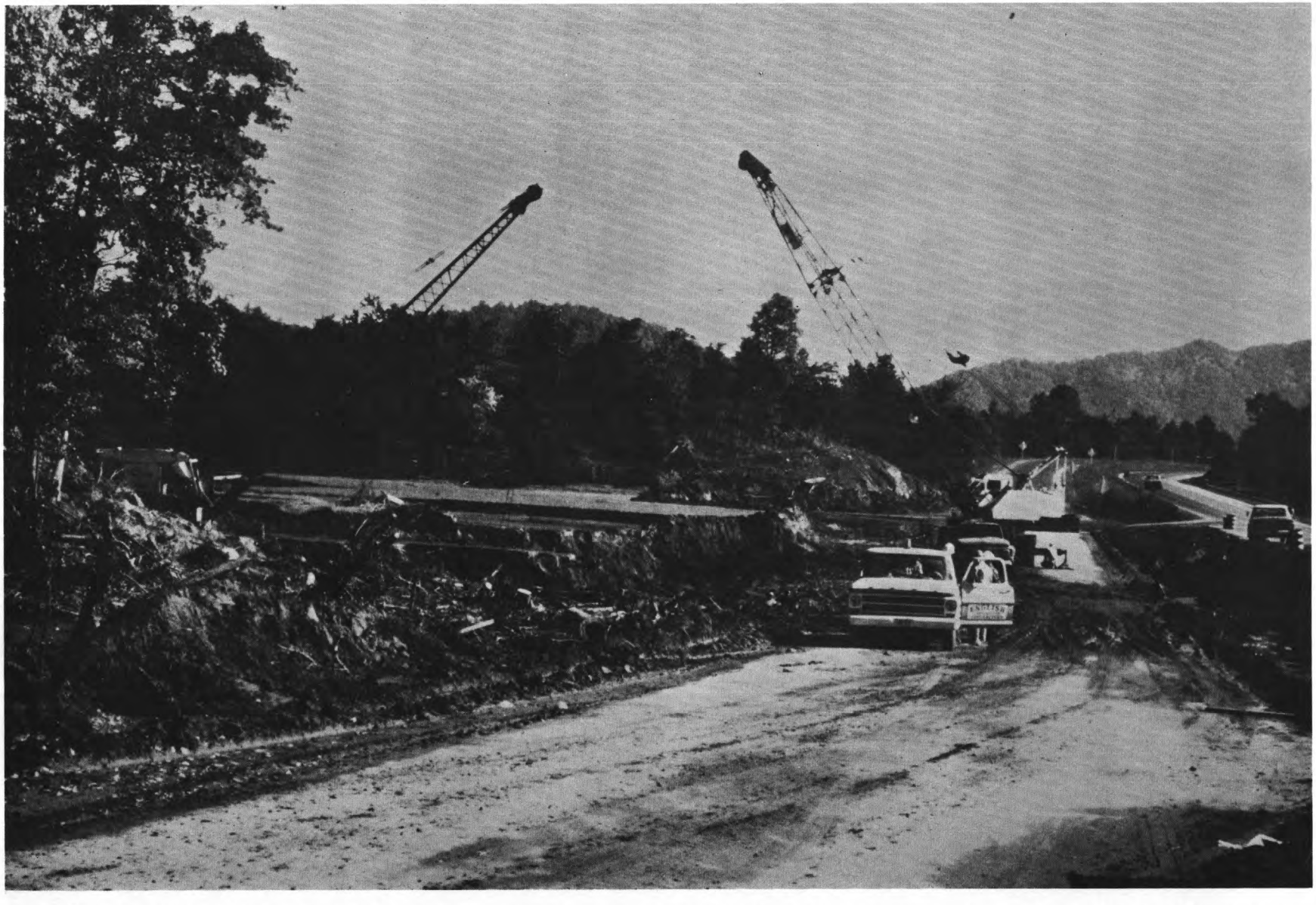

Figure 24.--Side view of the highway delta formed where Dillard Creek crosses U. S. Highway 29 in Nelson County.

Figure 25.--Typical floodplain deposits, Tye River at Norwood.

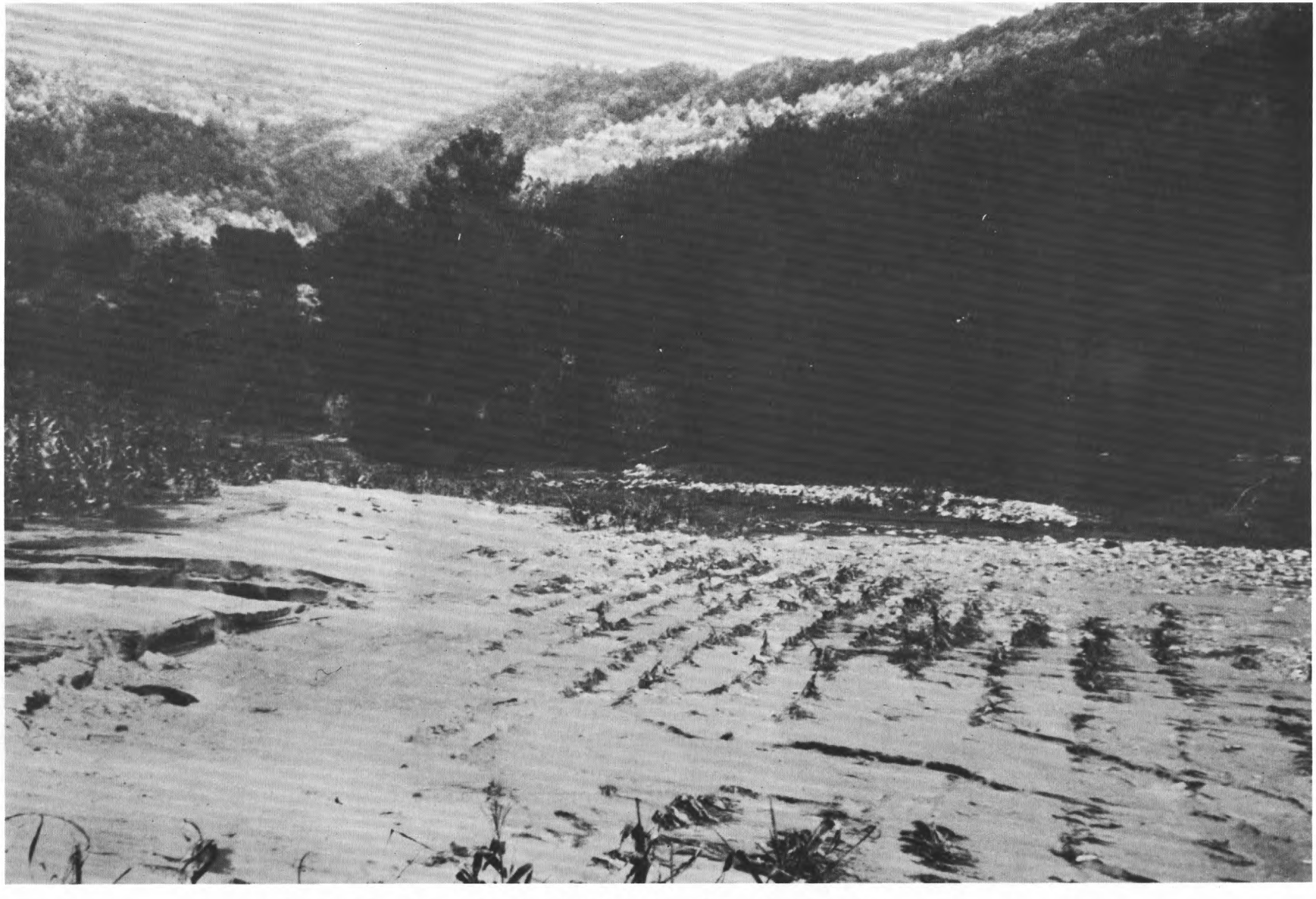

Figure 26.--Typical floodplain deposits, Hat Creek near Bryant.

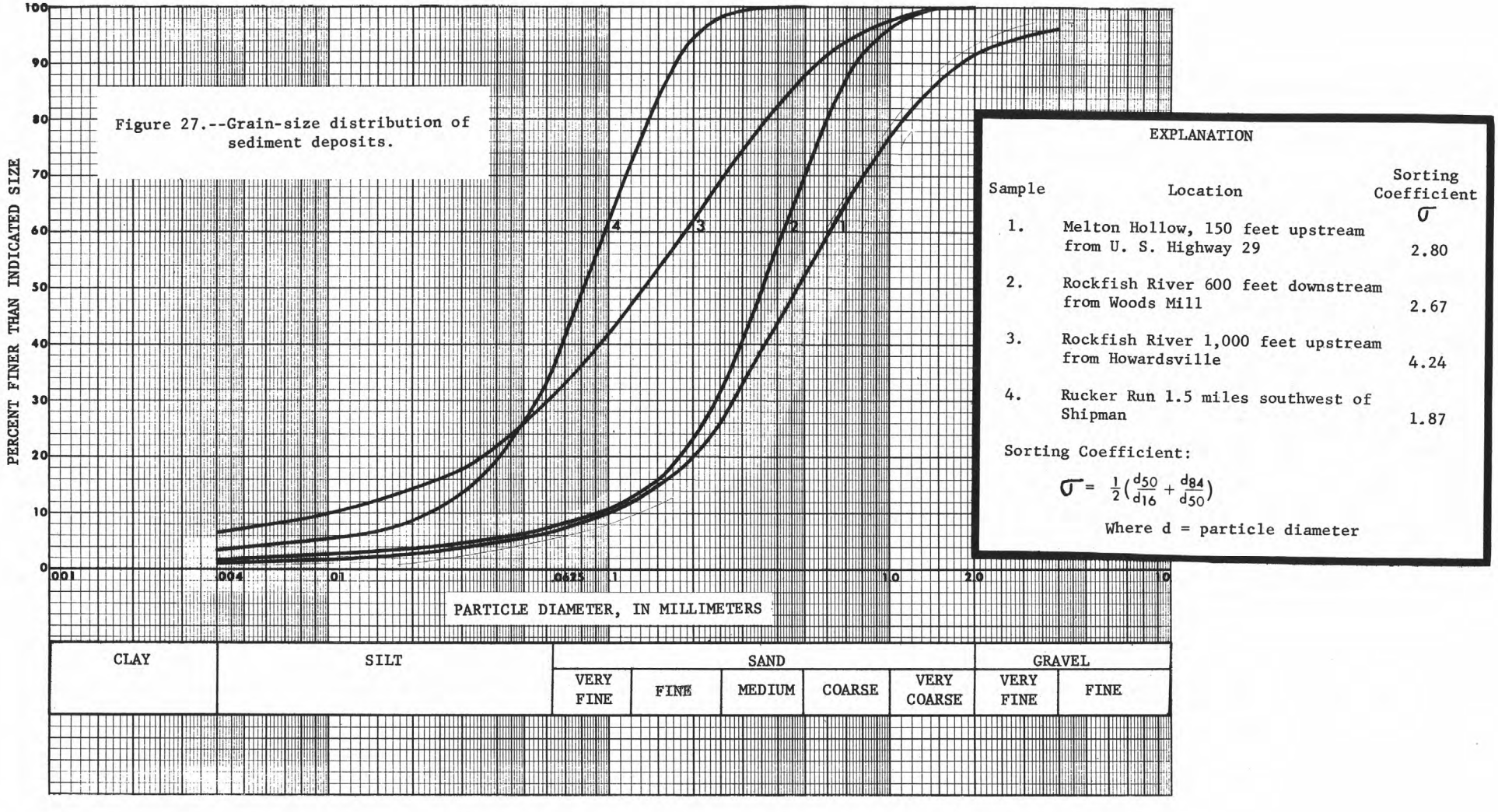

Figure 27.--Grain-size distribution of sediment deposits.

DETERMINATION OF FLOOD DISCHARGES

The operation of a stream-gaging station is principally for establishing a relation between stage and discharge from which the discharge can be determined when the stage is known. The stage-discharge relation, or discharge rating curve, generally is based on current-meter measurements throughout the range in stage experienced, or through a sufficient part of that range, so that a discharge corresponding to maximum stage can be obtained by a reasonable extension of the rating curve. Extensions of rating curves are usually made by logarithmic plotting, from velocity-area studies, or by utilizing other measurable hydraulic properties.

During major floods, current-meter measurements are often impossible to obtain because of destruction of structures from which flood measurements are made, impassable roads, or as in the case of this flood, it occurs at night and the flood peak has gone before any notice is received. Where necessary, the stage-discharge relation at many gaging stations was extended to peak flow by means of indirect measurements such as computation of flow through contractions, flow over highway embankment or dams, slope-area, flow through culverts, or a combination of the above. Peak flow was determined by indirect measurements at several miscellaneous sites. Descriptions of these indirect methods, as well as the usual methods of stream gaging are described in Geological Survey publications.

SUMMARY OF FLOOD STAGES AND DISCHARGES

Maximum stages and discharges at 105 sites consisting of regular gaging stations, crest-stage stations, flood-hydrograph stations or miscellaneous sites, are summarized in table 5.

Explanation of data in the 13 columns in table 5 follows:

Number.--The number by which each station is identified on the location map (plate 1). The numerical order follows the Geological Survey's standard downstream order of listing stations.

Permanent station number.--The number used in the Geological Survey's water-supply papers of surface-water supply in the United States and the annual reports of surface-water records of Virginia. The number for each station includes the part (Geological Survey's geographical division of principal river basins) number.

Stream and place of determination.--The name adopted for the site to which the listed data apply.

Drainage area.--The gross drainage area, in square miles, above the measuring site as determined from topographic maps.

Period.--The period of known floods prior to August 1969. This period does not necessarily correspond to that in which continuous records of discharge were obtained, but for many records it extends back to an earlier date.

Year.--The calendar year of the maximum stage or discharge in the period of known floods before August 1969.

Day.--The day of the peak stage or discharge during the floods of August 1969.

Gage height and discharge.--Data in each pair of columns are associated with the year or date in the preceding column. The 1969 peak discharges, in cubic feet per second per square mile, are shown.

Recurrence interval.--The average interval of time in which the peak discharge of August 1969 can be expected to be equaled or exceeded once. Where the recurrence interval is greater than 50 years, the ratio of the peak discharge to the discharge of the 50-year flood is shown except for the main stem James River stations where the ratio of the peak discharge to the discharge of the 100-year flood is shown.

The recurrence intervals for peak discharge have been computed on the basis of the data and method reported by Miller (1969).[1]

Figure 28 shows the relation of the peak discharge, expressed in cubic feet per second per square mile, to the size of drainage basin. This graph presents another method of comparing flood discharges from drainage basins that differ in size, but it does not bring out varying influences of topography or other basin characteristics that may not be comparable. It may be used as a rough indication of the maximum floods to be expected from a given drainage area. The curves shown in this figure are expressions of the Jarvis-Myers formula, $q = C/A^{0.50}$. The upper curve, designated $q = 10{,}000/A^{0.50}$, is 100 percent on the Myers scale of maximum flood flows. The curve labeled $q = 5{,}000/A^{0.50}$ is 50 percent on the Myers scale. These curves provide a basis for determining the possible flood potential within a basin, but do not indicate the frequency of such floods.

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1. Miller, E. M., 1969, Floods in Virginia magnitude and frequency: U. S. Geological Survey open-file report.

Table 4.--Summary of flood stages and discharges

No.	Permanent station number	Stream and place of determination	Drainage area (sq mi)	Maximum previously known				Maximum during August 1969 flood				Recurrence interval (years)
				Period	Year	Gage height (feet)	Discharge (Cfs)	Day	Gage height (feet)	Discharge		
										Cfs	Cfs per sq mi	
		POTOMAC RIVER BASIN										
1	01-6243.00	Middle River near Verona	178	1968-69	1968	6.71	2,120	20	9.42	3,790	21	2
2	01-6248.00	Christians Creek near Fishersville	70.1	1968-69	1968	6.22	685	20	12.78	3,800	54	5
3	01-6250.00	Middle River near Grottoes	360	1877-1969	1936	28.57	24,500	20	13.04	5,860	16	---
4	01-6260.00	South River near Waynesboro	136	1928-69	1942 1955	14.3 ---	--- 13,500	20	15.27	17,400	128	a1.39
		RAPPAHANNOCK RIVER BASIN										
5	01-6682.00	Guicatic Run tributary near Port Royal	2.82	1966-69	1966	8.28	85	20	8.40	130	46	---
6	01-6683.00	Farmers Hall Creek near Champlain	2.18	1966-69	1966	5.21	85	20	19.20	510	234	---
7	01-6685.00	Cat Point Creek near Montross	45	1935 1944-69	1935 1955	b9.3 7.56	(*) 2,350	20	10.45	6,820	152	a1.36
8	01-6688.00	Hoskins Creek near Tappahannock	15.4	1965-69	1967	5.01	95	20	10.23	1,400	91	---
9	01-6690.00	Piscataway Creek near Tappahannock	28.1	1952-69	1955	7.07	1,870	20	7.52	2,380	85	17
		PIANKATANK RIVER BASIN										
10	01-6695.00	Dragon Swamp near Church View	86	1935 1944-69	1935 1963	b17 10.00	(*) 3,990	23	6.98	1,000	12	---
		WARE RIVER BASIN										
11	01-6700.00	Beaverdam Swamp near Ark	7.1	1950-69	1960	5.88	570	21	2.60	33	5	---
		YORK RIVER BASIN										
12	01-6701.00	Mountain Run tributary near Gordonsville	0.50	1966-69	1969	8.0	110	20	5.10	55	110	---
13	01-6710.00	North Anna River near Doswell	439	1926-69	1928	33.7	18,400	21	32.60	24,800	56	a1.16
14	01-6711.00	Little River near Doswell	107	1961-69	1961	7.70	4,430	21	11.09	12,000	112	a1.58

See footnotes at end of table.

Table 4.--Summary of flood stages and discharges

No.	Permanent station number	Stream and place of determination	Drainage area (sq mi)	Maximum previously known				Maximum during August 1969 flood				Recurrence interval (years)
				Period	Year	Gage height (feet)	Discharge (Cfs)	Day	Gage height (feet)	Discharge		
										Cfs	Cfs per sq mi	
		YORK RIVER BASIN										
15	01-6715.00	Bunch Creek near Boswells Tavern	4.1	1948-69	1951	7.38	680	20	10.64	2,750	671	a2.87
16	01-6716.15	Fosters Creek near Ferncliff	0.61	1961-69	1961	8.89	296	20	10.55	1,000	1,640	---
17	01-6716.50	Waldrop Creek near Louisa	2.85	---	---	---	---	20	21.0	2,500	877	---
18	01-6717.50	Harris Creek near Trevilians	3.31	---	---	---	---	20	16.7	3,300	997	---
19	01-6724.00	South Anna River tributary near Ashland	0.33	1966-69	1966	5.95	126	20	9.3	360	1,090	---
20	01-6725.00	South Anna River near Ashland	393	1928-69	1928	24	14,500	23	24.99	17,100	44	45
21	01-6729.00	Pamunkey River tributary near Hanover	0.71	1966-69	1966	3.35	24	20	8.45	175	246	---
22	01-6730.00	Pamunkey River near Hanover	1,072	1928 1942-69	1928 1955	32.6 26.12	--- 20,900	23	31.12	40,300	38	50
23	01-6735.00	Totopotomoy Creek near Atlee	6.0	1945, 1949-69	1955	8.62	748	20	4.17	62	10	---
24	01-6738.00	Po River near Spotsylvania	77.5	1963-69	1963	12.27	2,200	20	14.00	4,480	58	15
25	01-6740.00	Mattaponi River near Bowling Green	251	1928, 1942-69	1928	19.5	15,000	21	16.70	8,960	36	10
26	01-6741.00	Motto River tributary near Cedon	1.64	1967-69	1969	5.15	170	20	12.80	690	421	---
27	01-6741.40	South River near Ladysmith	22.6	---	---	---	---	20	---	13,000	575	---
28	01-6741.60	Stevens Mill Run near Ladysmith	11.4	---	---	---	---	20	---	10,000	877	---
29	01-6741.65	Stevens Mill Run trib. No. 1, near Golansville	5.94	---	---	---	---	20	---	9,000	1,520	---
30	01-6741.70	Stevens Mill Run trib. No. 2, near Ruther Glen	1.84	---	---	---	---	20	---	1,100	598	---
31	01-6742.00	Reedy Creek near Dawn	16.8	1951-69	1952	5.28	310	20	7.28	2,500	149	a 1.22
32	01-6745.00	Mattaponi River near Beulahville	619	1928, 1942-69	1928	23	12,000	23	24.04	12,300	20	6

See footnotes at end of table.

Table 4.--Summary of flood stages and discharges

No.	Permanent station number	Stream and place of determination	Drainage area (sq mi)	Maximum previously known				Maximum during August 1969 flood				Recurrence interval (years)
				Period	Year	Gage height (feet)	Discharge (Cfs)	Day	Gage height (feet)	Discharge		
										Cfs	Cfs per sq mi	
		JAMES RIVER BASIN										
33	02-0115.00	Back Creek near Mountain Grove	131	1913 1950-69	1913 1967	17 10.77	--- 12,700	20	9.65	9,270	71	10
34	02-0125.00	Jackson River at Falling Spring	409	1913, 1926-69	1913	20	50,000	20	13.35	18,700	46	10
35	02-0129.00	Jackson River at Covington	440	1913, 1944-69	1913	22	---	20	14.5	---	---	---
36	02-0129.50	Sweet Springs Creek trib. at Sweet Chalybeate	0.66	1966-69	1967	4.61	58	20	6.80	185	280	---
37	02-0130.00	Dunlap Creek near Covington	166	1913 1929-69	1913 1963	18 10.98	--- 9,120	20	13.13	10,300	62	10
38	02-0140.00	Potts Creek near Covington	157	1913 1929-56, 1966-69	1913 1935	12.5 c10.10	--- 7,510	20	7.88	4,000	25	2
39	02-0156.00	Cowpasture River near Headwaters	11.3	1949-69	1949	6.5	5,650	20	2.94	107	9	---
40	02-0157.00	Bullpasture River at Williamsville	108	1961-69	1967	5.91	6,230	20	4.03	2,800	26	---
41	02-0159.00	Jerry Branch near Clifton Forge	0.55	1967-69	1967	4.15	84	20	7.50	270	491	---
42	02-0160.00	Cowpasture River near Clifton Forge	456	1913, 1926-69	1913	20.8	45,000	20	15.70	25,000	55	25
43	02-0165.00	James River at Lick Run	1,369	1877-1913, 1924-69	1877	33	120,000	20	25.53	58,500	43	15
44	02-0174.00	Johns Creek tributary near New Castle	1.57	1967-69	1967	3.86	75	20	4.05	50	32	---
45	02-0175.00	Johns Creek at New Castle	106	1927-69	1935	10.80	8,000	20	6.14	674	6	---
46	02-0180.00	Craig Creek at Parr	331	1926-69	1935	17.0	19,100	21	7.48	2,510	8	---
47	02-0185.00	Catawba Creek near Catawba	34	1940 1943-69	1940 1954	13.26 6.58	--- 5,670	20	4.78	1,500	44	3
48	02-0194.00	Looney Mill Creek near Buchanan	29.6	1928 1950-69	1928 1954 1961	14 10.82 10.83	--- 7,200 7,200	20	6.05	1,550	52	3
49	02-0195.00	James River at Buchanan	2,084	1870-1969	1877	34.9	125,000	20	23.37	65,800	32	15

See footnotes at end of table.

Table 4.--Summary of flood stages and discharges

No.	Permanent station number	Stream and place of determination	Drainage area (sq mi)	Maximum previously known				Maximum during August 1969 flood				Recurrence interval (years)
				Period	Year	Gage height (feet)	Discharge (Cfs)	Day	Gage height (feet)	Discharge		
										Cfs	Cfs per sq mi	
		JAMES RIVER BASIN										
50	02-0201.00	Renick Run near Buchanan	2.06	1967-69	1967	6.57	580	20	9.90	1,210	587	---
51	02-0202.00	Calfpasture River near West Augusta	12.8	1949-69	1949	6.6	4,800	20	2.41	310	24	---
52	02-0205.00	Calfpasture River above Mill Creek at Goshen	147	1939-69	1949	12.14	14,800	20	8.06	5,600	38	5
53	02-0211.00	Bratton Creek tributary near Goshen	1.62	---	---	---	---	20	9.20	670	414	---
54	02-0215.00	Maury River at Rockbridge Baths	329	1929-69	1936	13.07	33,000	20	11.48	22,900	70	30
55	02-0217.00	Cedar Grove Branch near Rockbridge Baths	12.3	1967-69	1967	7.0	364	20	31.2	7,300	593	---
56	02-0225.00	Kerrs Creek near Lexington	34	1927-69	1950	c13.8	23,000	19	13.38	13,800	406	a2.07
57	02-0230.00	Maury River near Lexington	487	1926-60	1936	23.58	40,000	20	27.08	52,000	107	a1.38
58	02-0233.00	South River near Steeles Tavern	15.7	1951-69	1955	6.52	2,770	20	8.70	4,700	299	50
59	02-0235.00	South River near Riverside	111	1936 1950-62	1936 1961	13.7 8.63	--- 6,300	20	15.2	d35,000	357	a2.20
60	02-0240.00	Maury River near Buena Vista	649	1936-69	1936	22	e45,000	20	31.23	105,000	162	a2.27
61	02-0246.00	James River at Balcony Falls	2,975	1936-69	1936	15.6	---	20	18.6	130,000	44	f1.08
62	02-0250.00	Pedlar River near Pedlar Mills	91	1942-56	1942	14.10	11,200	20	21.0	32,000	352	a2.44
63	02-0255.00	James River at Holcombs Rock	3,250	1900-17, 1926-69	1913	31.3	118,000	20	35.50	150,000	46	f1.09
64	02-0256.00	James River at Reusens Reservoir nr Lynchburg	3,300	---	---	---	---	20	---	150,000	45	---
65	02-0257.00	James River at Lynchburg	3,305	1771-1969	1795	g36	---	20	28.0	---	---	---
66	02-0258.00	Burton Creek tributary at Lynchburg	2.36	1966-69	1967	5.10	(*)	20	3.55	135	57	---
67	02-0260.00	James River at Bent Creek	3,671	1870, 1925-69	1870	h27	150,000	20	24.77	144,000	39	f1.19
68	02-0264.00	Tye River at Massies Mill	66	---	---	---	---	20	---	70,000	1,060	a5.34
69	02-0270.00	Tye River near Lovingston	92	1934, 1939-69	1944	13.7	9,670	20	29.0	80,000	870	a5.16

See footnotes at end of table.

Table 4.--Summary of flood stages and discharges

No.	Permanent station number	Stream and place of determination	Drainage area (sq mi)	Maximum previously known				Maximum during August 1969 flood				Recurrence interval (years)
				Period	Year	Gage height (feet)	Discharge (Cfs)	Day	Gage height (feet)	Discharge		
										Cfs	Cfs per sq mi	
		JAMES RIVER BASIN										
70	02-0272.50	Piney River at Woodson	22	---	---	---	---	20	---	18,500	841	a2.94
71	02-0275.00	Piney River at Piney River	48	1949-69	1949	9.9	e9,720	20	13.8	38,000	792	a3.65
72	02-0278.00	Buffalo River near Tye River	146	1961-69	1965	11.03	6,400	20	27.95	45,000	308	a2.87
73	02-0280.00	Tye River near Norwood	360	1940-60	1942 1944	18.1 18.1	33,500 33,500	20	41.0	200,000	556	a5.51
74	02-0285.00	Rockfish River near Greenfield	96	1942-69	1942	23.4	30,000	20	31.20	70,000	729	a4.35
75	02-0287.00	Cove Creek near Covesville	4.0	1944, 1950-69	1944	9.1	2,000	20	8.8	3,000	750	a1.85
76	02-0287.50	Cove Creek at Faber	19.7	1967-69	1967	34.0	(*)	20	56.0	28,000	1,420	---
77	02-0288.00	Ballinger Creek at Esmont	5.42	1967-69	1967	12.84	(*)	20	17.6	4,800	886	---
78	02-0288.95	Miller Creek near Keene	5.91	---	---	---	---	20	---	5,500	931	---
79	02-0289.00	Miller Creek near Scottsville	6.60	1967-69	1967	10.29	(*)	20	13.44	6,300	955	---
80	02-0290.00	James River at Scottsville	4,571	1870 1877-1969	1870 1877	30.7 27.9	--- 160,000	20	30.00	188,000	41	f1.13
81	02-0292.00	North Fork Hardware River at Red Hill	11.0	1950-69	1959	10.00	4,030	20	17.0	7,300	664	a2.86
82	02-0294.00	South Branch of North Fork Hardware River near North Garden	6.59	1949-69	1959	8.86	3,050	20	8.70	6,200	941	a2.37
83	02-0294.10	Sowell Branch near Charlottesville	1.55	1967-69	1967	3.96	140	20	14.6	1,500	968	---
84	02-0294.30	Harris Creek near Keene	1.71	1967-69	1967	3.8	(*)	20	8.0	2,200	1,290	---
85	02-0294.50	Thomas Creek at Keene	0.28	1966-69	1967	4.60	110	20	7.37	440	1,590	---
86	02-0300.00	Hardware River below Briery Run nr Scottsville	116	1939-69	1944	23.8	23,000	20	31.0	52,000	448	a4.44
87	02-0301.00	Frisby Branch near Buckingham	4.35	1967-69	1967	5.66	165	20	5.50	170	39	---
88	02-0305.00	Slate River near Arvonia	235	1927-69	1935	22.18	13,600	20	13.00	5,400	23	3

See footnotes at end of table.

Table 4.--Summary of flood stages and discharges

No.	Permanent station number	Stream and place of determination	Drainage area (sq mi)	Maximum previously known				Maximum during August 1969 flood				Recurrence interval (years)
				Period	Year	Gage height (feet)	Discharge (Cfs)	Day	Gage height (feet)	Discharge		
										Cfs	Cfs per sq mi	
		JAMES RIVER BASIN										
89	02-0307.00	James River at Bremo Bluff	5,040	1870-1969	1870	h37.4	---	20	39.1	---	---	---
90	02-0308.00	Stockton Creek near Afton	2.80	1967-69	1967	5.65	180	20	9.3	650	232	---
91	02-0333.00	Moores Creek near Charlottesville	3.52	1967-69	1968	14.96	(*)	20	16.85	2,000	568	---
92	02-0337.00	Henderson Creek near Shadwell	1.76	1966-69	1967	5.51	(*)	20	9.60	2,000	1,140	---
93	02-0340.00	Rivanna River at Palmyra	675	1934-69	1942	37.4	78,000	20	39.85	98,800	146	a2.82
94	02-0340.50	Hunters Branch near Palmyra	1.63	1967-69	1968	3.47	100	20	10.82	1,500	920	---
95	02-0341.00	James River at Columbia	5,744	1870-1969	1870	39	---	20	41.3	---	---	---
96	02-0345.00	Willis River at Flanagan Mills	247	1926-69	1937	23.86	9,580	20 21	--- i22.57	1,720 ---	7	---
97	02-0350.00	James River at Cartersville	6,242	1870 1877 1899-1969	1870 1877 1944	g32 g32 29.6	--- --- 180,000	21	33.75	250,000	40	f1.25
98	02-0354.00	Big Lickinghole Creek tributary near Ferncliff	0.55	1962-69	1961	4.28	150	20	5.55	600	1,090	---
99	02-0354.50	Mill Creek near Gum Springs	0.34	1966-69	1968	7.59	142	20	9.72	190	559	---
100	02-0365.00	Fine Creek at Fine Creek Mills	23	1945-69	1961	8.35	3,640	20	3.55	392	17	---
101	02-0375.00	James River near Richmond	6,757	1934-69	1936	23.42	175,000	21	24.95	222,000	33	f1.16
102	02-0377.00	James River at Richmond	---	1771-1969	1771	g38	---	22	28.64	---	---	---
103	02-0378.00	Falling Creek near Midlothian	18.1	1951-69	1960	8.62	1,450	20	4.07	251	14	---
104	02-0380.00	Falling Creek near Chesterfield	32.8	1955-69	1960	12.67	2,510	20	4.95	171	5	---
105	02-0400.00	Appomattox River at Mattoax	729	1901-05, 1926-69	1940	35.3	35,000	20	13.94	2,290	3	---

* Discharge not determined.
a Ratio of peak discharge to 50-year flood.
b From information by local residents.
c At different site and datum.
d At site 3 miles upstream, drainage area, 98 sq mi.
e Not previously published.
f Ratio of peak discharge to 100-year flood.
g From report by Corps of Engineers.
h From flood profile by Corps of Engineers.
i Backwater from James River.

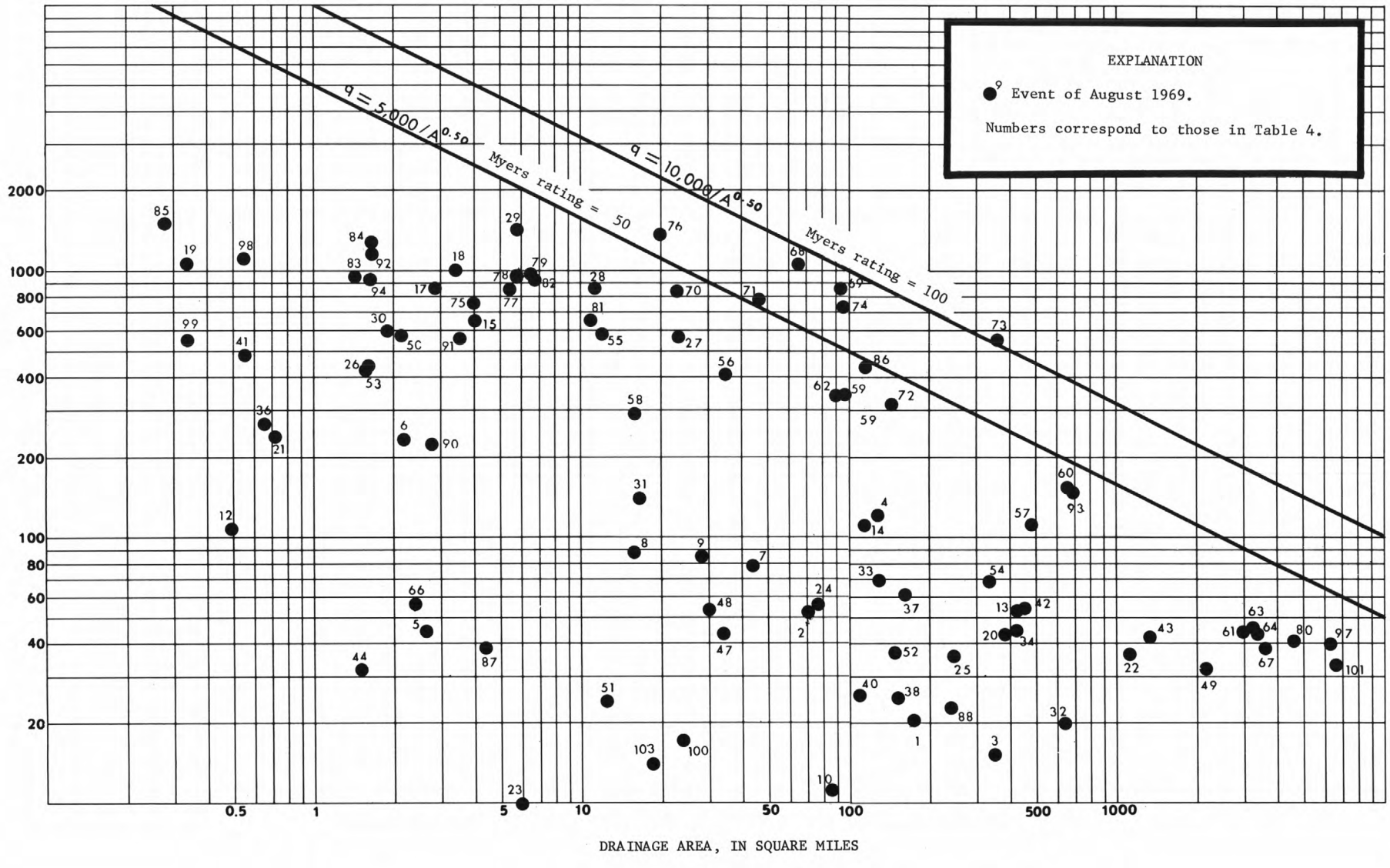

Figure 28.-- Relationship of peak unit discharge to size of drainage area.

FLOOD STAGES AND DISCHARGES

Stage and discharge data are given for regular and partial-record gaging stations in the flood-affected area. Data are presented in sufficient detail at some of the regular gaging sites to permit definition of the gage-height and discharge hydrographs.

The data consist of a description of the station or site, and tables of stages and discharges at indicated times for many of the gaging stations.

The station description gives information relative to the location of the gage, size of the drainage basin above the gage, nature of the gage-height record obtained during the period covered by this report, datum or altitude of gage, definition of the stage-discharge relation, maximum stage and discharge during the August 1969 flood, the previous maximum for the period of known floods, and other pertinent general information.

The table of stages and discharges at indicated times covers the period prior to the start of the major rise to an arbitrary point on the recession. The time period is not the same for all stations.

The gaging-station records are arranged by geographical parts in the order used in the annual reports of surface-water records of Virginia.

Discharge hydrographs at selected gaging stations are shown in figures 29-31.

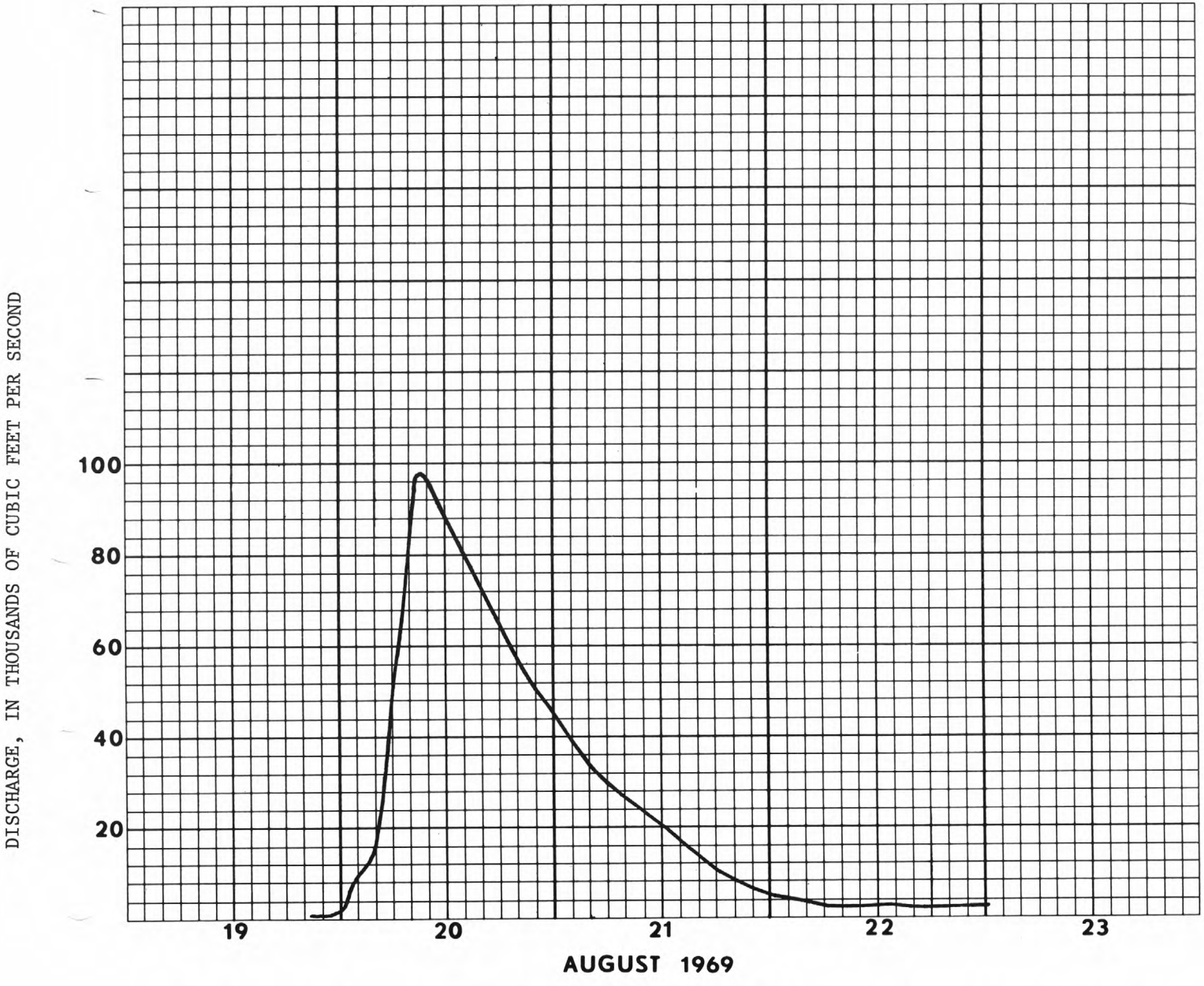

Figure 29.--Discharge hydrograph for Rivanna River at Palmyra, Virginia 02-0340.00

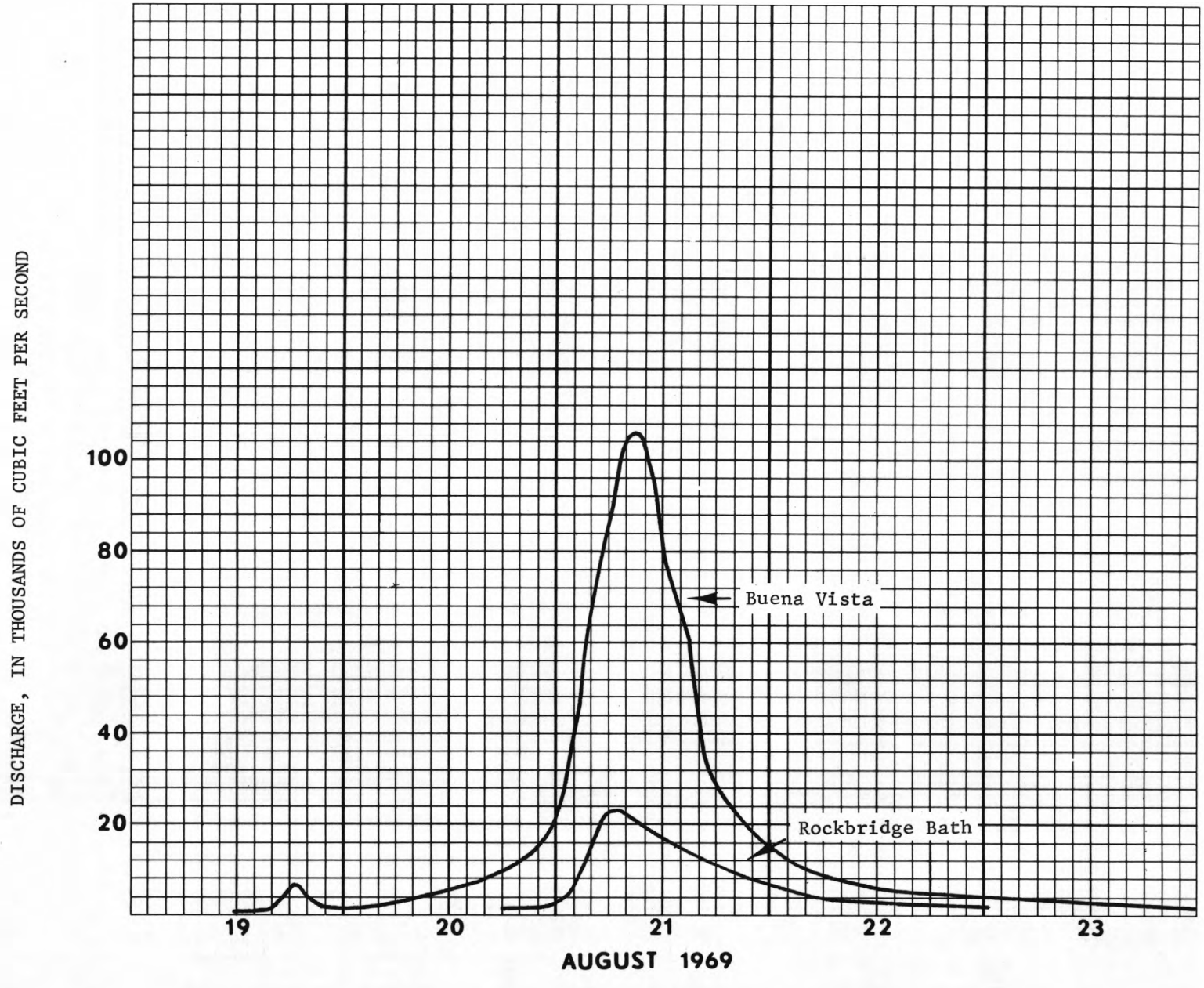

Figure 30.--Discharge hydrographs at gaging stations on Maury River.

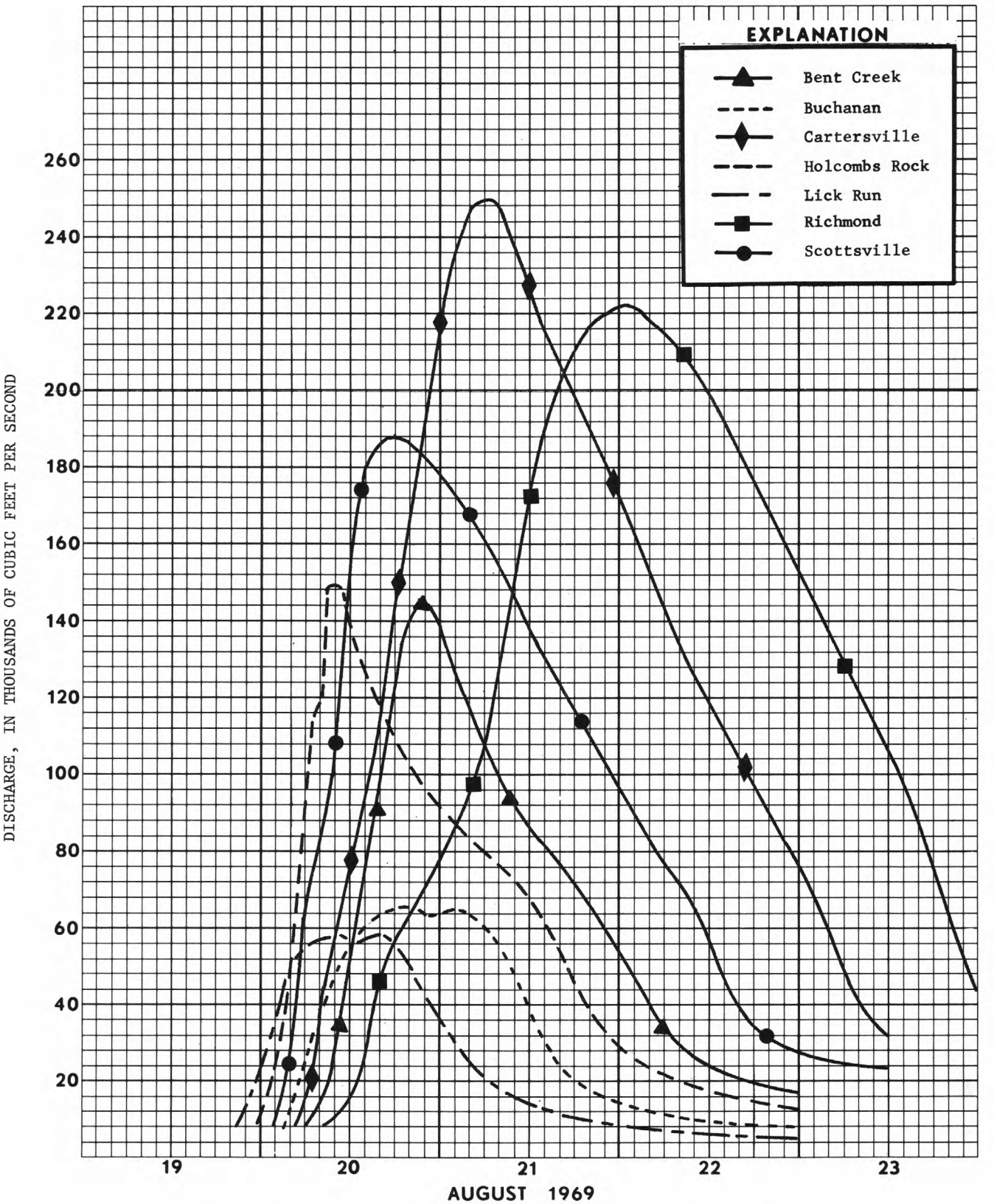

Figure 31.--Discharge hydrographs at gaging stations on James River.

01-6243.00 Middle River near Verona, Va.

Location.--Lat 38°14'36", long 79°02'08", on right bank at downstream side of bridge on State Highway 742, 2.7 miles downstream from Moffett Creek, and 3.2 miles northwest of Verona, Augusta County.

Drainage area.--178 sq mi.

Gage-height record.--Water-stage recorder graph. Altitude of gage is 1,260 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--August 1969: Discharge, 3,790 cfs 1400 hours Aug. 20 (gage height, 9.42 ft).
1968 to July 1969: Discharge, 2,120 cfs May 27, 1968 (gage height, 6.71 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 19		
2400	2.43	262
Mean----------		230
Aug. 20		
0200	2.65	318
0400	3.05	435
0600	4.20	850
0800	6.47	2,010
1000	7.58	2,610
1200	8.70	3,300
1400	9.42	3,790
1600	8.70	3,300
Aug. 20--Continued		
1800	7.55	2,610
2000	6.80	2,220
2200	6.22	1,900
2400	5.77	1,680
Mean----------		2,020
Aug. 21		
0200	5.40	1,470
0400	5.07	1,320
0600	4.70	1,120
0800	4.49	1,020
1000	4.30	935
1200	4.12	850
1400	3.97	790
1600	3.83	750
Aug. 21--Continued		
1800	3.70	690
2000	3.59	655
2200	3.46	602
2400	3.37	568
Mean----------		966
Aug. 22		
2400	2.68	354
Mean----------		461
Aug. 23		
2400	2.37	248
Mean----------		285

01-6248.00 Christians Creek near Fishersville, Va.

Location.--Lat 38°07'42", long 78°59'41", on right bank at upstream side of bridge on State Highway 794, 2.2 miles northwest of Fishersville, Augusta County, and 5.6 miles upstream from mouth.

Drainage area.--70.1 sq mi.

Gage-height record.--Water-stage recorder graph. Altitude of gage is 1,230 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--August 1969: Discharge, 3,800 cfs 0600 hours Aug. 20 (gage height, 12.78 ft).
1968 to July 1969: Discharge, 685 cfs Mar. 12, 1968 (gage height, 6.22 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge	Time	Gage Height	Discharge	Time	Gage Height	Discharge
Aug. 19			Aug. 20--Continued			Aug. 21		
2400	1.97	82	0900	11.00	2,800	0600	3.44	535
Mean----------		44	1000	10.20	2,440	1200	3.19	270
			1100	9.23	2,000	1800	2.97	225
Aug. 20			1200	8.10	1,580	2400	2.77	192
			1400	6.15	1,000	Mean----------		306
0100	2.80	180	1600	5.10	705			
0200	4.40	530	1800	4.53	568	Aug. 22		
0300	6.85	1,180	2000	4.22	480			
0400	9.35	2,080	2200	3.97	418	2400	2.36	122
0500	11.65	3,140	2400	3.80	381	Mean----------		148
0600	12.78	3,800	Mean----------		1,420			
0700	12.53	3,630						
0800	11.75	3,240						

01-6250.00 Middle River near Grottoes, Va.

Location.--Lat 38°15'42", long 78°51'44", on left bank at upstream side of bridge on State Highway 256 at Mount Meridian, Augusta County, 1.8 miles upstream from mouth, and 2.0 miles west of Grottoes, Rockingham County.

Drainage area.--360 sq mi.

Gage-height record.--Digital-recorder tape punched at 30-minute intervals. Datum of gage is 1,061.50 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 15,000 cfs and extended above.

Maxima.--August 1969: Discharge, 5,860 cfs Aug. 20 (gage height, 13.04 ft).
1877 to July 1969: Discharge, 24,500 cfs Mar. 18, 1936 (gage height, 28.57 ft, from floodmarks).

01-6260.00 South River near Waynesboro, Va.

Location.--Lat 38°03'27", long 78°54'30", on right bank 80 ft downstream from bridge on State Highway 664, 1.3 miles southwest of post office at Waynesboro, Augusta County, and 2.4 miles downstream from Back Creek.

Drainage area.--136 sq mi, of which 32 sq mi is above flood-detention structures.

Gage-height record.--Digital-recorder tape punched at 30-minute intervals. Datum of gage is 1,296.20 ft above mean sea level, datum of 1929, Culpeper supplementary adjustment of 1943.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 4,200 cfs and by contracted-opening measurement at 13,700 cfs.

Maxima.--August 1969: Discharge, 17,400 cfs 0700 hours Aug. 20 (gage height, 15.27 ft).
1928 to July 1969: Discharge, 13,500 cfs Aug. 18, 1955; gage height, 14.3 ft Oct. 15, 1942, from floodmarks.

Time	Gage Height	Discharge
Aug. 18		
0600	2.76	75
1200	2.75	74
1800	2.76	75
2000	2.77	77
2030	3.05	127
2100	3.55	243
2130	3.73	291
2200	3.81	313
2400	3.93	349
Mean----------		109
Aug. 19		
0600	3.80	310
1200	3.73	291
1800	3.59	253
2100	3.53	238
2400	3.72	288
Mean----------		291
Aug. 20		
0100	3.93	349
0200	5.29	945
0300	6.84	2,010
0400	8.46	3,710
0430	9.42	4,900
0500	10.77	6,930
0530	12.41	9,920
0600	14.15	14,000
0630	15.04	16,700
0700	15.27	17,400
0800	14.52	15,200
1000	12.54	10,200
1200	11.02	7,340
1800	10.38	6,310
2400	8.93	4,270
Mean----------		7,110
Aug. 21		
0600	7.97	3,170
1200	7.35	2,500
1800	6.89	2,050
2400	6.57	1,760
Mean----------		2,660
Aug. 22		
1200	6.12	1,410
2400	5.80	1,210
Mean----------		1,430
Aug. 23		
1200	5.40	1,000
2400	4.99	795
Mean----------		991
Aug. 24		
1200	4.64	626
2400	4.43	542
Mean----------		638
Aug. 25		
1200	4.27	478
2400	4.05	390
Mean----------		474
Aug. 26		
1200	3.77	302
2400	3.64	267
Mean----------		306
Aug. 27		
1200	3.56	246
2400	3.48	225
Mean----------		246
Aug. 28		
1200	3.42	210
2400	3.34	190
Mean----------		209
Aug. 29		
1200	3.17	151
2400	3.07	130
Mean----------		158
Aug. 30		
1200	3.04	125
2400	3.01	119
Mean----------		123

01-6682.00 Guicatic Run tributary near Port Royal, Va.
(Flood-hydrograph station)

Location.--Lat 38°12'40", long 77°09'10", at culvert on State Highway 623, 1.3 miles upstream from mouth and 3.5 miles northeast of Port Royal, Caroline County.

Drainage area.--2.82 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 50 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 130 cfs Aug. 20 (gage height, 8.40 ft).
1966 to July 1969: Discharge, 85 cfs Sept. 21, 1966 (gage height, 8.28 ft).

01-6683.00 Farmers Hall Creek near Champlain, Va.
(Flood-hydrograph station)

Location.--Lat 38°00'05", long 76°58'40", at culvert on U. S. Highway 17, 1.0 mile upstream from Rouzie Swamp, and 1.2 miles southeast of Champlain, Essex County.

Drainage area.--2.18 sq mi.

Gage-height record.--Floodmarks only. Altitude of gage is 50 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 510 cfs Aug. 20 (gage height, 19.20 ft, from floodmarks).
1966 to July 1969: Discharge, 85 cfs Sept. 21, 1966 (gage height, 5.21 ft).

01-6685.00 Cat Point Creek near Montross, Va.

Location.--Lat 38°02'23", long 76°49'38", on right bank 10 ft upstream from bridge on State Highway 637, 1.7 miles west of Farmers Fork, 3.8 miles south of Montross, Westmoreland County, and 11.4 miles upstream from mouth.

Drainage area.--45 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 2.93 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,350 cfs and extended above.

Maxima.--August 1969: Discharge, 6,680 cfs 1330 hours Aug. 20 (gage height, 10.45 ft).
1944 to July 1969: Discharge, 2,350 cfs Aug. 13, 1955 (gage height, 7.56 ft).
Flood of September 1935 was over bridge floor (elevation, 9.3 ft, gage datum), from information by local residents.

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

01-6688.00 Hoskins Creek near Tappahannock, Va.

Location.--Lat 37°55'38", long 76°57'16", at bridge on State Highway 771 (Criddlin Swamp Road), 2.9 miles below Hutchinson Mill Pond, and 5.0 miles west of Tappahannock, Essex County.

Drainage area.--15.4 sq mi.

Gage-height record.--Floodmarks only. Gage destroyed by flood. Datum of gage is 34.30 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 52 cfs and extended above.

Maxima.--August 1969: Discharge, 1,400 cfs 1200 hours Aug. 20 (gage height, 10.23 ft, from floodmarks).
1965 to July 1969: Discharge, 95 cfs Aug. 5, 1967 (gage height, 5.01 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

01-6690.00 Piscataway Creek near Tappahannock, Va.

Location.--Lat 37°52'37", long 76°54'03", on right bank at upstream side of bridge on State Highway 691 (old location of U. S. 360), 0.6 mile south of Henley Fork, 2.3 miles downstream from Sturgeon Swamp, and 4.2 miles southwest of Tappahannock, Essex County.

Drainage area.--28.1 sq mi.

Gage-height record.--Water-stage recorder graph except 0900 hours Aug. 20 to 1200 hours Aug. 21, recorder hung in reversal. Datum of gage is 2.50 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,340 cfs and extended above.

Maxima.--August 1969: Discharge, 2,380 cfs 1300 hours Aug. 20 (gage height, 7.52 ft, from floodmarks).
1952 to July 1969: Discharge, 1,870 cfs Aug. 13, 1955 (gage height, 7.07 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

PIANKANTANK RIVER BASIN

01-6695.00 Dragon Swamp near Church View, Va.

Location.--Lat 37°41'01", long 76°43'37", on left bank at downstream side of bridge on State highway 602, 0.9 mile upstream from Briery Swamp, 1.8 miles downstream from Tim Branch Swamp, 2.6 miles west of Church View, Middlesex County, and 2.9 miles east of Dragonville.

Drainage area.--86 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 34.00 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,900 cfs and extended above.

Maxima.--August 1969: Discharge, 1,000 cfs 0230 hours Aug. 23 (gage height, 6.98 ft).
1944 to July 1969: Discharge, 3,990 cfs June 4, 1963 (gage height, 10.00 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

WARE RIVER BASIN

01-6700.00 Beaverdam Swamp near Ark, Va.

Location.--Lat 37°28'15", long 76°33'50", on right bank 300 ft downstream from bridge on State Highway 606, 1.4 miles upstream from Beech Swamp, 2.3 miles north of Ark, Gloucester County, and 4.3 miles northwest of Gloucester.

Drainage area.--7.1 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 36.43 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 130 cfs and extended above by logarithmic plotting.

Maxima.--August 1969: Discharge, 33 cfs 0330 hours Aug. 21 (gage height, 2.60 ft).
1950 to July 1969: Discharge, 570 cfs Sept. 12, 1960 (gage height, 5.88 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

YORK RIVER BASIN

01-6701.00 Mountain Run tributary near Gordonsville, Va.
(Flood-hydrograph station)

Location.--Lat 38°09'45", long 78°09'45", at culvert on U. S. Highway 15, 0.4 mile upstream from mouth, and 2.2 miles northeast of Gordonsville, Orange County.

Drainage area.--0.50 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 425 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 55 cfs Aug. 20 (gage height, 5.10 ft).
1966 to July 1969: Discharge, 110 cfs July 22, 1969 (gage height, 8.0 ft, from floodmark).

01-6710.00 North Anna River near Doswell, Va.

Location.--Lat 37°53'15", long 77°29'15", on left bank 1.5 miles upstream from bridge on U. S. Highway 1, 2.5 miles northwest of Doswell, Hanover County, and 4.4 miles upstream from Bull Run.

Drainage area.--439 sq mi. At site used March 1926 to August 1928, 424 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 55.66 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--August 1969: Discharge, 24,800 cfs 1900 hours Aug. 21 (gage height, 32.60 ft).
1926 to July 1969: Discharge, 18,400 cfs Aug. 12, 1928 (gage height, 33.7 ft, from floodmarks).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 19		
2400	1.46	167
Mean		119
Aug. 20		
0100	1.55	195
0200	1.68	240
0300	1.95	344
0400	2.70	680
0500	10.00	3,050
0600	16.00	6,760
0700	21.20	11,400
0800	26.50	16,800
0900	28.65	19,400
1000	29.52	20,500
1100	29.63	20,700
1200	29.47	20,500
1300	29.39	20,400
1400	29.40	20,400
1600	29.70	20,800
1800	30.20	21,500
2000	30.63	22,000
2200	31.00	22,600
2400	31.34	23,000
Mean		15,400
Aug. 21		
0100	31.50	23,200
0300	31.76	23,700
0500	31.97	24,000
0700	32.17	24,200
0900	32.27	24,400
1100	32.29	24,400
1300	32.37	24,500
1500	32.47	24,700
1700	32.50	24,700
1900	32.60	24,800
2100	32.59	24,800
2300	32.56	24,800
2400	32.50	24,700
Mean		24,300
Aug. 22		
0100	32.45	24,500
0600	31.95	24,000
1200	30.89	22,400
1800	29.32	20,300
2400	27.52	18,000
Mean		22,000
Aug. 23		
0300	26.49	16,800
0600	25.30	15,400
0900	24.05	14,000
1200	22.77	12,800
1500	21.30	11,400
1800	19.45	9,730
2100	15.60	6,440
2400	11.25	3,560
Mean		12,200
Aug. 24		
0300	8.00	2,350
0600	5.90	1,680
0900	4.40	1,270
1200	3.20	890
1500	2.73	702
1800	2.50	590
2100	2.38	536
2400	2.32	509
Mean		1,260

01-6711.00 Little River near Doswell, Va.

Location.--Lat 37°52'21", long 77°30"48", on left bank at downstream side of bridge on State Highway 685, 0.8 mile southwest of Verdon, 2.9 miles west of Doswell, Hanover County, and 9.6 miles upstream from mouth.

Drainage area.--107 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 132.30 ft above mean sea level, datum of 1929 (levels by Prade Bros., Engineers).

Discharge record.-- Stage-discharge relation defined by current-meter measurements below 7,580 cfs and by contracted-opening measurement at 12,900 cfs.

Maxima.--August 1969: Discharge, 12,000 cfs 0300 hours Aug. 21 (gage height, 11.09 ft). 1961 to July 1969: Discharge, 4,430 cfs Oct. 22, 1961 (gage height, 7.70 ft from highwater mark in well).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 19		
2400	2.39	27
Mean----------		26
Aug. 20		
0200	2.55	48
0400	2.93	116
0600	4.40	680
0800	5.77	1,720
1000	6.30	2,350
1200	7.15	3,480
1400	7.90	4,570
1600	8.88	6,220
1800	9.40	7,150
2000	10.00	8,550
2200	10.48	9,950
2400	10.77	11,000
Mean----------		4,200
Aug. 21		
0200	11.00	11,700
0300	11.09	12,000
0600	11.05	11,700
0800	10.88	11,400
1000	10.70	10,600
1200	10.52	9,950
Aug. 21--Continued		
1400	10.24	9,050
1600	10.00	8,550
1800	9.67	7,810
2000	9.37	7,150
2200	9.00	6,400
2400	8.65	5,700
Mean----------		9,800
Aug. 22		
0200	8.32	5,210
0400	7.98	4,730
0600	7.64	4,120
0800	7.25	3,550
1000	6.90	3,130
1200	6.55	2,680
1400	6.26	2,290
1600	5.97	1,940
1800	5.69	1,670
2000	5.41	1,380
2200	5.16	1,170
2400	4.85	945
Mean----------		2,930
Aug. 23		
0600	4.16	560
1200	3.76	374
1800	3.58	303
2400	3.48	268
Mean----------		460
Aug. 24		
2400	3.22	186
Mean----------		221
Aug. 25		
2400	2.90	110
Mean----------		155
Aug. 26		
2400	2.60	55
Mean----------		78

01-6715.00 Bunch Creek near Boswells Tavern, Va.
(Formerly published as Hudson Creek near Boswells Tavern)

Location.--Lat 38°01'55", long 78°11'25", on right bank at upstream side of bridge on U. S. Highway 15, 2.7 miles south of Boswells Tavern, Louisa County, 4.8 miles north of Zion Crossroads, 5.0 miles upstream from mouth, and 10 miles west of Louisa.

Drainage area.--4.1 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 377.14 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 425 cfs and extended above on basis of by contracted-opening measurement at 2,750 cfs.

Maxima.--August 1969: Discharge, 2,750 cfs 0300 hours Aug. 20 (gage height, 10.64 ft)
1948 to July 1969: Discharge, 680 cfs June 10, 1951 (gage height, 7.38 ft).

Remarks.--Records computed and furnished by th Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 18		
2400	1.71	2.6
Mean----------		2.2
Aug. 19		
1800	1.70	2.4
1900	1.85	6.1
2000	4.35	167
2100	6.63	480
2200	7.13	585
2300	6.70	490
2400	6.45	441
Mean----------		83

Time	Gage Height	Discharge
Aug. 20		
0100	6.58	470
0200	7.68	765
0300	10.64	2,750
0400	10.35	2,500
0500	7.80	800
0600	6.20	396
0800	5.70	315
1000	5.41	270
1200	5.11	225
1400	4.70	166
1600	4.17	100
1800	3.88	70
2000	3.66	51
2200	3.53	42
2400	3.43	35
Mean----------		442

Time	Gage Height	Discharge
Aug. 21		
0600	3.24	24
1200	3.12	18
1800	2.97	12
2400	2.90	9.7
Mean----------		19
Aug. 22		
2400	2.75	4.9
Mean----------		7.7

01-6716.15 Fosters Creek near Ferncliff, Va.
(U. S. Department of Agriculture Watershed station, discontinued March 1969)

Location.--Lat 37°57'35", long 78°11'20", at culvert on U. S. Highway 250, 1.9 miles southeast of Zion Crossroads, 4.6 miles northwest of Ferncliff, Louisa County, and 5.0 miles upstream from mouth.

Drainage area.--0.61 sq mi.

Gage-height record.--Floodmarks only. Altitude of gage is 430 ft (from topographic map).

Maxima.--August 1969: Discharge, 1,000 cfs Aug. 20 (gage height, 10.55 ft, from floodmarks).
1961 to July 1969: Discharge, 296 cfs Oct. 20, 1961 (gage height, 8.89 ft).

01-6716.50 Waldrop Creek near Louisa, Va.
(Flood-hydrograph station)

Location.--Lat 38°00'08", long 78°04'22", on left upstream wingwall of culvert on State Highway 632, 2.3 miles upstream from mouth, and 4.2 miles southwest of Louisa, Louisa County.

Drainage area.--2.85 sq mi.

Gage-height record.--Floodmarks only. Altitude of gage is 360 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maximum.--August 1969: Discharge, 2,500 cfs Aug. 20 (gage height, 21.0 ft, from floodmarks).

01-6717.50 Harris Creek near Trevilians, Va.
(Flood-hydrograph station)

Location.--Lat 38°01'02", long 78°03'06", on left upstream wingwall of culvert on State Highway 632, 2.7 miles southeast of Trevilians, Louisa County and 6 miles upstream from mouth.

Drainage area.--3.31 sq mi.

Gage-height record.--Floodmarks only. Altitude of gage is 395 ft (from topographic map).

Maximum.--August 1969: Discharge, 3,300 cfs Aug. 20 (gage height, 16.7 ft, from floodmarks).

01-6724.00 South Anna River tributary near Ashland, Va.
(Flood-hydrograph station)

Location.--Lat 37°48'40", long 77°34'20", at culvert on State Highway 54, 0.5 mile upstream from mouth, and 5.5 miles northwest of Ashland, Hanover County.

Drainage area.--0.33 sq mi.

Gage-height record.--Flood-hydrograph recorder graph except 0700 hours to 0815 hours Aug. 20. Peak stage determined from high-water marks near gage. Altitude of gage is 175 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 360 cfs Aug. 20 (gage height, 9.3 ft, from floodmarks).
1966 to July 1969: Discharge, 126 cfs Sept. 21, 1966 (gage height, 5.95 ft).

01-6725.00 South Anna River near Ashland, Va.

Location.--Lat 37°47'48", long 77°32'57", on right bank at downstream side of bridge on State Highway 54, 4.5 miles northwest of Ashland, Hanover County, and 7.6 miles upstream from Newfound River.

Drainage area.--393 sq mi.

Gage-height record.--Digital-recorder tape punched at 30-minute intervals. Datum of gage is 83.74 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 13,000 cfs and extended above by logarithmic plotting.

Maxima.--August 1969: Discharge, 17,100 cfs 0530 hours Aug. 23 (gage height, 24.99 ft).
1928 to July 1969: Discharge, 14,500 cfs Aug. 15, 1928 (gage height, 24 ft).

Time	Gage Height	Discharge
Aug. 19		
2400	2.54	105
Mean		106
Aug. 20		
0200	2.64	121
0400	2.85	160
0700	7.13	1,540
0730	10.25	2,860
0800	12.96	4,210
0830	14.33	5,040
0900	15.17	5,620
0930	15.91	6,140
1000	16.63	6,680
1030	17.30	7,220
1100	17.71	7,590
1200	18.09	7,930
1400	17.70	7,580
1600	16.67	6,710
1800	15.67	5,970
2000	15.18	5,630
2200	15.23	5,670
2400	15.61	5,930
Mean		4,510
Aug. 21		
0400	16.32	6,540
1200	16.64	6,800
1800	17.39	7,430
2000	17.80	7,790
2200	18.34	8,310
2400	19.05	9,060
Mean		7,070
Aug. 22		
0200	19.80	9,990
0400	20.58	10,900
0600	21.30	11,800
0800	21.99	12,600
1000	22.47	13,200
1200	23.10	14,000
1400	23.48	14,600
1800	24.29	15,800
2400	24.73	16,600
Mean		13,700
Aug. 23		
0400	24.81	16,700
0500	24.90	16,900
0530	24.99	17,100
0600	24.86	16,800
1200	24.68	16,500
1800	24.06	15,500
2400	23.35	14,400
Mean		16,000
Aug. 24		
0400	22.84	13,600
0800	22.21	12,800
1200	21.60	12,100
1600	20.91	11,200
2000	20.01	10,200
2400	19.10	9,200
Mean		11,900
Aug. 25		
0300	18.31	8,320
0600	17.54	7,600
0900	16.69	6,870
1200	15.70	6,120
1500	14.50	5,280
1800	12.61	4,110
2100	10.14	2,890
2400	7.01	1,560
Mean		5,830
Aug. 26		
0100	6.19	1,200
0300	5.05	805
0600	4.25	565
0900	3.91	463
1200	3.81	433
1800	3.66	388
2400	3.61	373
Mean		538

01-6729.00 Pamunkey River tributary near Hanover, Va.
(Flood-hydrograph station)

Location.--Lat 37°48'00", long 77°22'20", at culvert on U. S. Highway 301, 0.6 mile upstream from mouth, and 2.6 miles north of Hanover, Hanover County.

Drainage area.--0.71 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 65 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 175 cfs Aug. 20 (gage height, 8.45 ft).
1966 to July 1969: Discharge, 24 cfs June 10, 1966 (gage height, 3.35 ft).

01-6730.00 Pamunkey River near Hanover, Va.

Location.--Lat 37°46'03", long 77°19'57", near center of span on downstream side of bridge on State Highway 614, 0.3 mile upstream from Mechumps Creek, 2.0 miles east of Hanover, Hanover County, and 7.0 miles upstream from Millpond Creek.

Drainage area.--1,072 sq mi.

Gage-height record.--Graph drawn on basis of twice daily wire-weight gage readings. Datum of gage is 14.72 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current meter measurements.

Maxima.--August 1969: Discharge, 40,300 cfs 1100 hours Aug. 23 (gage height, 31.12 ft).
1942 to July 1969: Discharge, 20,900 cfs Aug. 20, 1955 (gage height, 26.12 ft, from graph based on gage readings).
Flood in August 1928 reached a stage of 32.6 ft, from information by local residents.

Time	Gage Height	Discharge
Aug. 20		
0300	3.58	299
0600	3.82	343
0700	4.00	375
0800	4.55	476
0900	6.30	910
1000	7.95	1,400
1200	11.02	2,360
1600	14.75	3,840
2000	17.23	5,390
2400	19.77	7,940
Mean----------		2,730
Aug. 21		
0400	22.24	12,100
0800	24.78	17,700
1000	25.76	20,000
1600	27.76	26,200
2000	28.55	29,200
2400	29.05	31,200
Mean----------		21,200
Aug. 22		
1200	30.12	35,900
2400	30.84	39,100
Mean----------		35,700
Aug. 23		
1100	31.12	40,300
2400	30.25	36,500
Mean----------		39,300
Aug. 24		
1200	28.96	30,800
2400	27.28	24,500
Mean----------		30,800
Aug. 25		
1200	25.46	19,300
2400	23.83	15,400
Mean----------		19,400
Aug. 26		
1200	22.00	11,600
2400	19.90	8,100
Mean----------		11,700
Aug. 27		
1200	17.35	5,500
1800	15.76	4,350
2400	13.96	3,480
Mean----------		5,580
Aug. 28		
1200	9.50	1,870
1800	7.20	1,180
2400	6.47	961
Mean----------		1,980
Aug. 29		
1200	5.81	641
2400	5.47	575
Mean----------		663

01-6735.00 Totopotomoy Creek near Atlee, Va.

Location.--Lat 37°40'09", long 77°22'58", on right bank at upstream side of bridge on U. S. Highway 301, 0.7 mile upstream from Opossum Creek, and 1.6 miles northeast of Atlee, Hanover County.

Drainage area.--6.0 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 116.33 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 190 cfs and extended above on basis of logarithmetic plotting.

Maxima.--August 1969: Discharge, 62 cfs Aug. 20 (gage height, 4.17 ft).
1945, 1949 to July 1969: Discharge, 748 cfs Aug. 13, 1955 (gage height, 8.62 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

01-6738.00 Po River near Spotsylvania, Va.

Location.--Lat 38°10'17", long 77°35'42", on right bank at upstream side of bridge on State Highway 208, 1.6 miles north of Snell, 2.0 miles south of Spotsylvania, Spotsylvania County, 4.8 miles from Gladys Run, and 4.9 miles upstream from U. S. Highway 1 crossing.

Drainage area.--77.5 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 183.76 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 3,360 cfs and by slope-area measurement at 5,000 cfs.

Maxima.--August 1969: Discharge, 4,480 cfs 2400 hours Aug. 20 (gage height, 14.00 ft). 1963 to July 1969: Discharge, 2,200 cfs Mar. 13, 1963 (gage height, 12.27 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Developement, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 19		
2400	2.01	9.6
Mean----------		6.0
Aug. 20		
0100	2.25	19
0200	3.85	134
0300	5.80	393
0400	6.60	547
0500	9.13	1,210
0600	10.00	1,520
0700	10.20	1,600
0800	10.00	1,520
0900	9.67	1,420
1000	9.75	1,460
1100	10.55	1,780
1200	11.64	2,340
1400	13.10	3,540
1600	13.57	4,020
1800	13.79	4,240
2000	13.90	4,360
2200	13.97	4,480
2400	14.00	4,480
Mean----------		2,540
Aug. 21		
0200	13.92	4,360
0400	13.84	4,240
0600	13.60	4,020
0800	13.30	3,730
1000	12.90	3,350
1200	12.44	2,930
1400	11.94	2,550
1600	11.48	2,270
1800	10.92	1,930
2000	10.25	1,600
2200	9.38	1,320
2400	8.50	1,020
Mean----------		2,870
Aug. 22		
0200	7.50	760
0400	6.35	495
0600	5.12	293
0800	4.33	218
1000	3.95	178
1200	3.73	158
1800	3.37	94
2400	3.16	77
Mean----------		264
Aug. 23		
2400	2.69	42
Mean----------		57
Aug. 24		
2400	2.45	28
Mean----------		36
Aug. 25		
2400	2.30	21
Mean----------		24

01-6740.00 Mattaponi River near Bowling Green, Va.

Location.--Lat 38°03'42", long 77°23'10", on left bank, 0.1 mile upstream from bridge on State Highway 605, 2.2 miles northwest of Bowling Green, Caroline County, 2.4 miles upstream from South River, and 7.1 miles and downstream from confluence of Matta and Poni Rivers.

Drainage area.--251 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 85.14 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 6,200 cfs and extended above.

Maxima.--August 1969: Discharge, 8,960 cfs 1000 hours, Aug. 21 (gage height, 16.70 ft) 1928, 1942 to July 1969: Discharge 15,000 cfs August 1928 (gage height, 19.5 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 19		
2400	2.64	48
Mean----------		26
Aug. 20		
0100	3.15	87
0200	4.55	261
0300	5.60	439
0400	6.25	558
0500	6.95	732
0600	7.90	995
0800	9.32	1,540
1000	10.32	2,010
1200	12.30	3,170
1400	13.81	4,530
1600	14.25	5,000
1800	14.52	5,360
2000	14.75	5,780
2200	14.95	6,100
2400	15.37	6,740
Mean----------		3,500
Aug. 21		
0200	15.81	7,380
0400	16.19	8,060
0600	16.48	8,600
0800	16.65	8,780
1000	16.70	8,960
1200	16.68	8,960
1400	16.62	8,780
1600	16.52	8,600
1800	16.38	8,420
2000	16.20	8,060
2200	16.01	7,700
2400	15.79	7,380
Mean----------		8,280
Aug. 22		
0200	15.59	7,060
0400	15.37	6,740
0600	15.16	6,420
0800	14.90	5,940
1000	14.68	5,640
1200	14.50	5,360
1400	14.29	5,120
1600	14.06	4,880
1800	13.86	4,640
2000	13.60	4,310
2200	13.33	4,010
2400	13.06	3,830
Mean----------		5,480
Aug. 23		
0600	12.09	3,030
1200	11.06	2,440
1800	10.00	1,860
2400	8.97	1,410
Mean----------		2,490
Aug. 24		
0600	8.19	1,100
1200	7.52	875
1800	6.85	686
2400	6.12	538
Mean----------		909
Aug. 25		
0600	5.33	393
1200	4.70	283
1800	4.29	227
2400	4.03	194
Mean----------		317

01-6741.00 Motto River tributary near Cedon, Va.
(Flood-hydrograph station)

Location.--Lat 38°05'24", long 78°31'11", at culvert on State Highway 605, 1.9 miles north of Cedon, Caroline County, and 3.0 miles upstream from mouth.

Drainage area.--1.64 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 210 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 690 cfs Aug. 20 (gage height, 12.80 ft).
1967 to July 1969: Discharge, 170 cfs July 22, 1969 (gage height, 5.15 ft).

01-6741.40 South River near Ladysmith, Va.
(Miscellaneous site)

Location.--Lat 38°02'25", long 77°30'00", at culvert on Interstate 95, 1.4 miles upstream from Motto River, and 1.8 miles northeast of Ladysmith, Caroline County.

Drainage area.--22.6 sq mi.

Maximum.--August 1969: Discharge 13,000 cfs Aug. 20 from flow-through-culvert and flow-over-road measurement.

01-6741.60 Stevens Mill Run near Ladysmith, Va.
(Miscellaneous site)

Location.--Lat 37°59'10", long 77°29'35", at culvert on Interstate 95, 2.5 miles southeast of Ladysmith, Caroline County, and 2.8 miles upstream from mouth.

Drainage area.--11.4 sq mi.

Maximum.--August 1969: Discharge, 10,000 cfs Aug. 20 from flow-through-culvert and flow-over-road measurement.

01-6741.65 Stevens Mill Run tributary No. 1, near Galonsville, Va.
(Miscellaneous site)

Location.--Lat 37°58'00", long 77°29'25", at culvert on Interstate 95, 0.9 mile upstream from mouth, and 1.1 miles southeast of Golansville, Caroline County.

Drainage area.--5.94 sq mi.

Maximum.--August 1969: Discharge, 9,000 cfs Aug. 20 from flow-through culvert and flow-over-road measurement.

01-6741.70 Stevens Mill Run tributary No. 2, near Ruther Glen, Va.
(Miscellaneous site)

Location.--Lat 37°57'10", long 77°28'50", at culvert on Interstate 95, 1.1 miles upstream from mouth and 2.1 miles northwest of Ruther Glen, Caroline County.

Drainage area.--1.84 sq mi.

Maximum.--August 1969: Discharge, 1,100 cfs Aug. 20 from flow-through-culvert measurement.

01-6742.00 Reedy Creek near Dawn, Va.
(Flood-hydrograph station)

Location.--Lat 37°52'55", long 77°21'35", at bridge on U. S. Highway 301. 3.3 miles north of Dawn, Caroline County.

Drainage area.--16.8 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 110 ft (from topographic map).

Discharge record.--Stage-discharge relation defined indirect methods.

Maxima.--August 1969: Discharge, 2,500 cfs Aug. 20 (gage height, 7.28 ft).
1951 to July 1969: Discharge, 310 cfs Sept. 1, 1952 (gage height, 5.28 ft).

01-6745.00 Mattaponi River near Beulahville, Va.

Location.--Lat 37°53'18", long 77°09'48", on right bank 0.4 mile upstream from bridge on State Highway 628, 2.4 miles north of Beulahville, King William County, and 2.7 miles downstream from Maracossic Creek.

Drainage area.--619 sq mi.

Gage-height record.--Digital-recorder tape punched at 30-minute intervals. Datum of gage is 12.43 ft above mean sea level, datum of 1929, (levels by Virginia Department of Highways).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 4,400 cfs and extended above.

Maxima.--August 1969: Discharge, 12,300 cfs Aug. 23 (gage height, 24.04 ft).
1928, 1942 to July 1969: Discharge, 12,000 cfs August 1928 (gage height, 23 ft, based on comparative stages near Milton and Reedy Mill).

Time	Gage Height	Discharge
Aug. 19		
0600	3.74	169
1200	3.90	187
1800	3.89	186
2400	3.87	184
Mean----------		179
Aug. 20		
0300	3.97	195
0400	4.08	207
0500	4.50	257
0600	5.34	359
0700	6.99	618
0800	8.67	934
0900	10.69	1,420
1000	11.73	1,720
1200	12.29	1,920
1400	12.70	2,060
1600	13.96	2,640
1800	16.22	4,110
2000	18.13	5,480
2200	19.35	6,630
2400	19.95	7,260
Mean----------		2,570
Aug. 21		
0400	20.50	7,870
0800	20.92	8,330
1200	21.30	8,750
1600	21.62	9,100
2000	21.91	9,430
2400	22.14	9,710
Mean----------		8,690
Aug. 22		
0600	22.53	10,200
1200	22.91	10,700
1800	23.28	11,200
2400	23.64	11,700
Mean----------		10,700
Aug. 23		
1200	24.00	12,200
1900	24.04	12,300
2400	24.03	12,300
Mean----------		12,200
Aug. 24		
1200	23.40	11,400
1800	22.92	10,700
2400	22.31	9,910
Mean----------		11,300
Aug. 25		
0600	21.25	8,700
1200	20.16	7,500
1800	19.10	6,380
2400	18.20	5,540
Mean----------		7,490
Aug. 26		
0600	17.48	5,000
1200	16.80	4,520
1800	16.20	4,100
2400	15.68	3,740
Mean----------		4,520
Aug. 27		
1200	14.69	3,070
2400	13.78	2,550
Mean----------		3,050

02-0115.00 Back Creek near Mountain Grove, Va.

Location.--Lat 38°04'10", long 79°53'50", on left bank 0.4 mile downstream from Cummings Run, 0.9 mile downstream from bridge on State Highway 39, and 2.1 miles south of Mountain Grove, Bath County.

Drainage area.--131 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,701.45 ft above mean sea level, datum of 1929, supplementary adjustment of 1944.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 4,000 cfs and by slope-area measurements at 4,370, 7,940, and 8,630 cfs.

Maxima.--August 1969: Discharge, 9,270 cfs 0500 hours Aug. 20 (gage height, 9.65 ft).
1950 to July 1969: Discharge, 12,700 cfs Mar. 7, 1967 (gage height, 10.77 ft).
Flood of March 1913 reached a stage 17 ft, from information by local residents.

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 18		
2400	4.11	677
Mean----------		394
Aug. 19		
0600	3.98	591
1200	3.86	519
1800	3.76	463
2000	3.77	468
2200	3.97	585
2400	5.00	1,410
Mean----------		586

Time	Gage Height	Discharge
Aug. 20		
0100	6.20	2,700
0200	7.85	5,090
0300	9.05	7,790
0400	9.52	9,000
0500	9.65	9,270
0600	9.47	9,000
0800	8.95	7,790
1000	8.35	6,390
1200	7.82	5,090
1400	7.20	4,010
1600	6.75	3,430
1800	6.30	2,820
2000	6.00	2,460
2200	5.71	2,110
2400	5.47	1,860
Mean----------		4,920

Time	Gage Height	Discharge
Aug. 21		
0200	5.27	1,660
0400	5.13	1,560
0600	4.95	1,365
0800	4.81	1,230
1000	4.70	1,140
1200	4.60	1,060
1800	4.32	831
2400	4.12	684
Mean----------		1,130

02-0125.00 Jackson River at Falling Spring, Va.

Location.--Lat 37°52'36", long 79°58'39", on right bank 20 ft upstream from Smith Bridge, 0.8 mile south of town of Falling Spring, Alleghany County, 1.6 miles downstream from Falling Springs Creek, and 5.5 miles north of Covington.

Drainage area.--409 sq mi.

Gage-height record.--Digital recorder tape punched at 30-minute intervals. Datum of gage is 1,333.49 ft above mean sea level, (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 17,000 cfs and extended above on basis of records for other stations in James River basin.

Maxima.--August 1969: Discharge, 18,700 cfs 1230 hours Aug. 20 (gage height, 13.35 ft).
1913, 1926 to July 1969: Discharge, 50,000 cfs March 1913 (gage height, 20 ft).

Time	Gage Height	Discharge
Aug. 17		
2400	4.13	409
Mean		427
Aug. 18		
1400	4.01	366
1600	4.08	391
1800	4.11	402
2000	4.19	430
2100	4.28	463
2200	4.40	510
2230	4.44	526
2300	4.64	613
2330	5.30	980
2400	5.77	1,280
Mean		434
Aug. 19		
0030	5.99	1,430
0100	6.13	1,530
0200	6.24	1,610
0300	6.25	1,620
0400	6.20	1,580
0600	6.08	1,500
1200	5.87	1,350
1600	5.72	1,240
2000	5.60	1,160
2200	5.64	1,190
2400	5.89	1,360
Mean		1,360
Aug. 20		
0100	6.40	1,720
0130	6.99	2,190
0200	7.76	2,880
0230	8.56	4,040
0300	9.24	5,580
Aug. 20--Continued		
0330	9.80	6,920
0400	10.22	7,970
0430	10.65	9,090
0500	11.00	10,000
0600	11.45	11,600
0800	12.13	14,000
1000	12.84	16,600
1200	13.33	18,700
1230	13.35	18,700
1400	13.17	17,900
1600	12.60	15,600
1800	11.86	13,000
2000	11.11	10,400
2200	10.37	8,360
2400	9.77	6,850
Mean		11,800
Aug. 21		
0200	9.28	5,670
0400	8.89	4,760
0600	8.57	4,060
0800	8.31	3,560
1200	7.86	2,980
1600	7.49	2,640
2000	7.15	2,340
2400	6.83	2,050
Mean		3,420
Aug. 22		
0400	6.56	1,840
0800	6.33	1,670
1600	5.97	1,420
2400	5.67	1,210
Mean		1,570
Aug. 23		
0600	5.46	1,080
1200	5.31	986
1800	5.17	902
2400	5.04	824
Mean		993
Aug. 24		
0600	4.91	746
1200	4.80	690
1800	4.71	645
2400	4.63	609
Mean		699
Aug. 25		
1200	4.47	538
2400	4.35	490
Mean		543
Aug. 26		
1200	4.23	445
2400	4.13	409
Mean		447
Aug. 27		
1200	4.04	376
2400	3.96	349
Mean		378
Aug. 28		
1200	3.88	324
2400	3.81	301
Mean		325

02-0129.00 Jackson River at Covington, Va.
(U.S. Weather Bureau gage)

Location.--Lat 37°47'45", long 79°59'40", near right bank on pier on Chesapeake & Ohio Railway bridge on West Virginia Pulp and Paper Co.'s mill at Covington, Alleghany County, and 700 ft upstream from Dunlap Creek.

Drainage area.--440 sq mi.

Gage-height record.--Staff gage read once daily Monday through Friday; hourly readings during flood stages. Datum of gage is 1217.93 ft above mean sea level, adjustment of 1959.

Maxima.--August 1969: Stage, 14.5 ft Aug. 20.
1913, 1944 to July 1969: Stage 22 ft Mar. 1913.

Remarks.--Records for August flood furnished by West Virginia Pulp and Paper Company.

Time	Gage Height	Discharge	Time	Gage Height	Discharge	Time	Gage Height	Discharge
Aug. 19			Aug. 20			Aug. 21		
0800	4.00	-	0100	5.0	-	0800	6.5	-
2300	4.00	-	0200	6.0	-			
2400	4.50	-	0300	7.5	-			
			0400	10.0	-	Aug. 22		
			0500	12.0	-			
			0600	13.0	-	0800	4.6	-
			0700	13.1	-			
			0800	14.0	-			
			0900	14.2	-	Aug. 29		
			1000	14.4	-			
			1100	14.4	-	0800	2.0	-
			1200	14.5	-			
			1300	14.5	-			
			1400	14.4	-	Aug. 31		
			1500	14.3	-			
			1600	14.0	-	0800	1.5	-
			2100	10.8	-			

02-0129.50 Sweet Springs Creek tributary at Sweet Chalybeate, Va.
(Flood-hydrograph station)

Location.--Lat 37°39'25", long 80°14'10", at culvert on State Highway 311, 0.1 mile upstream from mouth, and 0.9 mile north of Sweet Chalybeate, Alleghany County.

Drainage area.--0.66 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 1,930 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 185 cfs Aug. 20 (gage height, 6.80 ft).
1966 to July 1969: Discharge, 58 cfs Mar. 15, 1967 (gage height, 4.61 ft).

02-0130.00 Dunlap Creek near Covington, Va.

Location.--Lat 37°48'10", long 80°02'50", on right bank 20 ft downstream from bridge on U. S. Highway 60, 2.2 miles downstream from Ogle Creek, and 3.0 miles west of Covington, Alleghany County.

Drainage area.--166 sq mi.

Gage-height record.--Digital recorder tape punched at 30-minute intervals. The maximum gage height was determined from high-water mark in the well. Datum of gage is 1,294.70 ft above mean sea level, datum of 1929, supplementary adjustment of 1959.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 4,500 cfs and by contracted-opening measurement at 10,300 cfs.

Maxima.--August 1969: Discharge, 10,300 cfs 0500 hours Aug. 20 (gage height, 13.13 ft).
1929 to July 1969: Discharge, 9,120 cfs Mar. 12, 1963 (gage height, 10.98 ft).
Flood of March 1913 reached a stage of 18 ft, from information by local residents.

Time	Gage Height	Discharge
Aug. 17		
2400	1.15	36
Mean----------		37
Aug. 18		
1200	1.13	34
1400	1.16	37
1500	1.37	66
1530	1.53	93
1600	1.88	178
1630	2.96	582
1700	5.26	2,080
1730	6.46	3,150
1800	7.10	3,740
1900	7.29	3,930
1930	7.33	3,970
2000	7.18	3,820
2100	7.22	3,860
2200	7.48	4,120
2300	7.24	3,880
2400	6.51	3,200
Mean----------		1,210
Aug. 19		
0100	5.81	2,570
0200	5.34	2,150
0400	4.61	1,590
0600	4.06	1,200
0800	3.66	956
1200	3.11	655
1600	2.75	488
2000	2.55	400
2200	3.04	620
2300	4.48	1,500
2400	5.99	2,730
Mean----------		1,040
Aug. 20		
0100	6.91	3,560
0130	7.73	4,370
0200	9.09	5,840
0230	10.75	7,660
0300	12.15	9,200
0400	12.83	9,950
0500	13.13	10,300
0700	12.73	9,840
1000	12.27	9,340
1400	9.45	6,240
1600	7.80	4,440
1800	6.78	3,440
2000	6.00	2,740
2200	5.43	2,230
2400	5.01	1,880
Mean----------		7,060
Aug. 21		
0100	4.82	1,450
0300	4.52	1,240
0600	4.18	1,030
0900	3.93	878
1200	3.74	770
1500	3.57	685
1800	3.44	620
2100	3.33	569
2400	3.24	528
Mean----------		855
Aug. 22		
1200	2.98	256
2400	2.78	196
Mean----------		260
Aug. 23		
1200	2.65	159
2400	2.54	130
Mean----------		159
Aug. 24		
1200	2.46	112
2400	2.39	97
Mean----------		113
Aug. 25		
1200	2.34	87
2400	2.29	79
Mean----------		87

02-0140.00 Potts Creek near Covington, Va.

Location.--Lat 37°43'44", long 80°02'33", on left bank at downstream side of bridge on State Highway 18, 0.8 mile downstream from Blue Spring Creek and 5.2 miles southwest of Covington, Alleghany County.

Drainage area.--157 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,273.93 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 4,000 cfs and extended above on basis of velocity-area studies.

Maxima.--August 1969: Discharge, 4,000 cfs 1230 hours, Aug. 20 (gage height, 7.88 ft).
1929-56, 1966 to July 1969: Discharge, 7,510 cfs Jan. 23, 1935 (gage height, 10.10 ft, site and datum then in use).
Flood of March 1913 reached a stage of 12.5 ft, from information by local residents.

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

02-0156.00 Cowpasture River near Headwaters, Va.
(Crest-stage station)

Location.--Lat 38°19'30", long 79°26'14", at bridge on U. S. Highway 250, 1.2 miles west of Headwaters, Highland County.

Drainage area.--11.3 sq mi.

Gage-height record.--Crest stages only. Datum of gage is 1,985.65 ft above mean sea level, datum of 1929, supplementary adjustment of 1944.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 187 cfs and by contracted-opening measurements at 900 and 5,650 cfs.

Maxima.--August 1969: Discharge, 107 cfs Aug. 20 (gage height, 2.94 ft).
1949 to July 1969: Discharge, 5,650 cfs June 17, 1949 (gage height, 6.5 ft).

02-0157.00 Bullpasture River at Williamsville, Va.

Location.--Lat 38°12'00", long 79°34'21", on right bank 324 ft above bridge on State Highway 614 at Williamsville, Bath County, and 0.75 mile upstream from Cowpasture River.

Drainage area.--108 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,621.98 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 3,300 cfs and extended above.

Maxima.--August 1969: Discharge, 2,800 cfs 0700 hours Aug. 20 (gage height, 4.03 ft).
1961 to July 1969: Discharge, 6,230 cfs Mar. 7, 1967 (gage height, 5.91 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

02-0159.00 Jerry Branch near Clifton Forge, Va.
(Flood-hydrograph station)

Location.--Lat 37°52'23", long 79°44'36", at culvert on State Highway 42, 0.2 mile upstream from mouth, and 6 miles northeast of Clifton Forge, Alleghany County.

Drainage area.--0.55 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 1,150 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 270 cfs Aug. 20 (gage height, 7.50 ft).
1967 to July 1969: Discharge, 84 cfs Mar. 7, 1967 (gage height, 4.15 ft).

02-0160.00 Cowpasture River near Clifton Forge, Va.

Location.--Lat 37°47'30", long 79°45'35", on left bank 100 ft downstream from highway bridge, 2.5 miles upstream from confluence with Jackson River, and 4.0 miles southeast of Clifton Forge, Alleghany County.

Drainage area.--456 sq mi.

Gage-height record.--Digital recorder tape punched at 30-minute intervals. Datum of gage is 1,006.93 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 13,000 cfs and by slope-area measurement at 25,000 cfs.

Maxima.--August 1969: Discharge, 25,000 cfs 0600 hours Aug. 20 (gage height, 15.70 ft). 1913, 1926 to July 1969: Discharge, 45,000 cfs March 1913 (gage height, 20.8 ft).

Time	Gage Height	Discharge
Aug. 18		
1700	3.23	580
2100	3.47	724
2400	3.60	802
Mean----------		681
Aug. 19		
0200	3.65	930
0300	4.61	1,790
0400	5.53	2,880
0500	5.79	3,220
0800	5.41	2,720
1200	4.99	2,200
1600	4.81	2,000
2000	4.62	1,800
2100	5.02	2,230
2130	5.61	2,980
2200	6.40	4,010
2230	7.65	5,780
2300	8.79	7,640
2330	9.59	9,120
2400	10.08	10,100
Mean----------		2,620
Aug. 20		
0100	11.37	12,700
0300	13.65	18,400
0500	15.42	24,000
0600	15.70	25,000
0800	15.04	22,600
1000	14.05	19,600
1200	13.72	18,600
1400	14.24	20,100
1500	14.46	20,800
1530	14.50	21,000
1600	14.45	20,800
1800	14.06	19,600
2100	12.71	15,900
2400	11.17	12,300
Mean----------		17,600
Aug. 21		
0200	10.34	10,600
0400	9.55	9,050
0600	8.80	7,660
0900	7.88	6,120
1200	7.21	5,120
1800	6.34	3,930
2400	5.77	3,190
Mean----------		6,010
Aug. 22		
0600	5.34	2,630
1200	4.98	2,190
1800	4.70	1,880
2400	4.48	1,660
Mean----------		2,270
Aug. 23		
0600	4.26	1,460
1200	4.07	1,290
1800	3.91	1,150
2400	3.78	1,030
Mean----------		1,310
Aug. 24		
0600	3.66	938
1200	3.55	855
1800	3.44	784
2400	3.35	730
Mean----------		863
Aug. 25		
0600	3.28	688
1200	3.22	652
2400	3.08	569
Mean----------		647
Aug. 26		
1200	3.00	525
2400	2.90	475
Mean----------		522

02-0165.00 James River at Lick Run, Va.

Location.--Lat 37°46'25", long 79°47'05", on right bank at community of Lick Run, Botetourt County, 1,000 ft downstream from bridge on U. S. Highway 220, 0.9 mile downstream from confluence of Cowpasture and Jackson River, 1.8 miles south of Iron Gate, and at mile 338.9

Drainage area.--1,369 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 978.30 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 42,400 cfs and extended above on basis of slope-conveyence study.

Maxima.--August 1969: Discharge, 58,500 cfs 1600 hours, Aug. 20 (gage height, 25.53 ft). 1877-1913, 1924 to July 1969: Discharge, 120,000 cfs November 1877 (gage height, 33 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 18		
2400	4.30	2,260
Mean		1,420
Aug. 19		
0200	6.35	5,250
0400	7.80	7,560
0600	7.68	7,390
0800	7.15	6,540
1000	6.96	6,200
1200	6.75	5,880
1400	6.50	5,400
1600	6.26	5,100
1800	6.06	4,800
1900	6.10	4,800
2000	7.00	6,200
2100	9.00	9,650
2200	10.80	13,200
2300	13.00	17,900
2400	15.00	22,300
Mean		7,130

Time	Gage Height	Discharge
Aug. 20		
0100	17.40	28,000
0200	20.00	35,100
0300	22.20	42,400
0400	23.60	48,400
0500	24.65	53,400
0600	24.95	55,600
0800	25.28	57,300
1000	25.38	57,900
1200	25.17	56,700
1400	25.34	57,300
1600	25.53	58,500
1800	25.00	55,600
2000	23.95	50,300
2200	22.40	43,300
2400	20.30	36,000
Mean		50,500
Aug. 21		
0200	18.20	30,000
0400	16.25	25,100
0600	14.40	21,000
0800	13.10	18,100
1000	12.00	15,800
1200	11.07	13,900

Time	Gage Height	Discharge
Aug. 21--Continued		
1400	10.45	12,400
1600	9.85	11,200
1800	9.45	10,400
2000	9.05	9,650
2200	8.67	9,110
2400	8.35	8,580
Mean		16,600
Aug. 22		
0600	7.59	7,220
1200	6.97	6,200
1800	6.49	5,400
2400	6.10	4,800
Mean		6,380
Aug. 23		
0600	5.80	4,350
1200	5.52	3,900
1800	5.27	3,530
2400	5.10	3,320
Mean		3,960

02-0174.00 Johns Creek tributary near New Castle, Va.
(Flood-hydrograph station)

Location.--Lat 37°30'30", long 80°11'20", at culvert on State Highway 311, 0.1 mile upstream from mouth, and 4.2 miles west of New Castle, Craig County.

Drainage area.--1.57 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 1,530 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 50 cfs Aug. 20 (gage height, 4.05 ft).
1967 to July 1969: Discharge, 75 cfs Mar. 7, 1967 (gage height, 3.86 ft).

02-0175.00 Johns Creek at New Castle, Va.

Location.--Lat 37°30'20", long 80°06'25", on right bank 20 ft downstream from bridge on State Highway 615, at New Castle, Craig County, and 1,700 ft upstream from mouth.

Drainage area.--106 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,254.30 ft above mean sea level, datum of 1929, supplementary adjustment of 1936.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 3,200 cfs and by slope-area measurement at 8,000 cfs.

Maxima.--August 1969: Discharge, 674 cfs 1500 hours Aug. 20 (gage height, 6.14 ft).
1927 to July 1969: Discharge, 8,000 cfs Jan. 23, 1935 (gage height, 10.80 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

02-0180.00 Craig Creek at Parr, Va.

Location.--Lat 37°39'55", long 79°54'40", on right bank 12 ft upstream from Chesapeake and Ohio Railway bridge, 700 ft downstream from Stony Run, 0.2 mile northeast of Horton, 0.4 mile northwest of Parr, Botetourt County, and 12 miles upstream from mouth.

Drainage area.--331 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 992.50 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 11,000 cfs and extended above.

Maxima.--August 1969: Discharge, 2,510 cfs 0230 hours Aug. 21 (gage height, 7.48 ft).
1926 to July 1969: Discharge, 19,100 cfs Jan. 23, 1935 (gage height, 17.0 ft, from graph based on gage readings).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

02-0185.00 Catawba Creek near Catawba, Va.

Location.--Lat 37°28'05", long 80°00'20", on right bank 40 ft below highway bridge, 1.0 mile downstream from Little Catawba Creek, 1.9 miles west of Haymakertown, and 8.2 miles northeast of Catawba, Roanoke County.

Drainage area.--34 sq mi, approximately.

Gage-height record.--Digital recorder tape punched at 15-minute intervals. Datum of gage is 1,299.96 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,000 cfs and extended above by logarithmic plotting.

Maxima.--August 1969: Discharge, 1,500 cfs 0630 hours Aug. 20 (gage height, 4.78 ft).
1943 to July 1969: Discharge, 5,670 cfs Mar. 1, 1954 (gage height, 6.58 ft).
Flood in August 1940 reached a stage of 13.26 ft, from information by observer.

Time	Gage Height	Discharge	Time	Gage Height	Discharge	Time	Gage Height	Discharge
Aug. 19			Aug. 20--Continued			Aug. 22		
2100	2.06	36	0700	4.70	1,400	1200	2.31	67
2400	2.15	45	0800	4.52	1,200	2400	2.23	55
Mean----------		58	0900	4.34	1,020	Mean----------		68
			1000	4.20	890			
Aug. 20			1100	3.93	654	Aug. 23		
			1200	3.74	518			
0200	2.20	50	1300	3.60	430	1200	2.16	46
0300	2.32	68	1500	3.42	344	2400	2.09	39
0315	2.54	108	1800	3.24	277	Mean----------		46
0330	3.04	225	2100	3.02	220			
0345	3.29	292	2400	2.88	185	Aug. 24		
0400	3.38	327	Mean----------		503			
0415	3.58	420				1200	2.05	36
0430	3.74	518	Aug. 21			2400	2.00	31
0445	4.00	710				Mean----------		35
0500	4.48	1,160	0300	2.78	160			
0515	4.77	1,480	0600	2.71	143			
0530	4.74	1,450	1200	2.61	122			
0545	4.70	1,400	1600	2.53	106			
0600	4.71	1,410	2000	2.47	95			
0615	4.76	1,470	2400	2.43	87			
0630	4.78	1,500	Mean----------		124			
0645	4.76	1,470						

02-0194.00 Looney Mill Creek near Buchanan, Va.
(Crest-stage station)

Location.--Lat 37°29'48", long 79°45'28", at bridge on State Highway 636, 150 ft east of U. S. Highway 11, and 5 miles southwest of Buchanan, Botetourt County.

Drainage area.--29.6 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 950 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 30 cfs and by contracted-opening measurements at 6,990 and 7,680 cfs.

Maxima.--August 1969: Discharge, 1,550 cfs Aug. 20 (gage height, 6.05 ft, from floodmark).
1950 to July 1969: Discharge, 7,200 cfs Oct. 15, 1954 and Aug. 25, 1961; gage height, 10.83 ft Aug. 25, 1961.
Flood of August 1928 reached a stage of 14 ft, from information by local residents.

02-0195.00 James River at Buchanan, Va.

Location.--Lat 37°31'50", long 79°40'45", on left bank at Chesapeake & Ohio Railway station at Buchanan, Botetourt County, 300 ft upstream from bridge on U. S. Highway 11, 1,000 ft upstream from Purgatory Creek, 1½ miles downstream from Looney Creek, and at mile 301.2.

Drainage area.--2,084 sq mi.

Gage-height record.--Digital recorder tape punched at 15-minute intervals. Datum of gage is 802.90 ft above mean sea level, datum of 1929, supplementary adjustment of 1936.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 62,000 cfs and extended above by logarithmic plotting.

Maxima.--August 1969: Discharge, 65,800 cfs 1830 hours Aug. 20 (gage height, 23.37 ft). 1870 to July 1969: Discharge, 125,000 cfs November 1877 (gage height, 34.9 ft, from floodmarks).

Time	Gage Height	Discharge
Aug. 19		
1400	6.74	6,600
1600	7.09	7,300
1630	7.11	7,420
1800	8.98	7,130
2100	6.69	6,490
2400	6.51	6,100
Mean----------		4,580
Aug. 20		
0200	6.93	7,020
0300	7.19	7,610
0400	8.97	11,900
0600	12.70	22,100
0800	16.45	36,100
1000	19.16	46,900
1200	20.99	54,800
1500	22.72	62,700
1800	23.17	64,900
1830	23.37	65,800
2100	23.22	65,100
2400	23.02	64,100
Mean----------		44,300
Aug. 21		
0200	23.17	64,900
0400	22.89	63,500
0600	22.26	60,500
0800	21.23	55,800
1000	19.38	47,800
1200	17.21	39,100
1400	15.04	30,500
1600	13.28	23,800
1800	12.04	20,300
2000	11.17	17,800
2400	9.99	14,600
Mean----------		39,900
Aug. 22		
0400	9.20	12,500
0800	8.60	11,000
1200	8.08	9,660
1600	7.64	8,640
2000	7.26	7,770
2400	6.92	6,990
Mean----------		10,000
Aug. 23		
0600	6.51	6,100
1200	6.18	5,430
1800	5.88	4,900
2400	5.61	4,460
Mean----------		5,530
Aug. 24		
1200	5.20	3,830
2400	4.88	3,350
Mean----------		3,850
Aug. 25		
1200	4.60	2,930
2400	4.39	2,620
Mean----------		2,950
Aug. 26		
1200	4.18	2,300
2400	4.02	2,090
Mean----------		2,320
Aug. 27		
1200	3.86	1,900
2400	3.73	1,760
Mean----------		1,910
Aug. 28		
1200	3.58	1,610
2400	3.45	1,500
Mean----------		1,620

02-0201.00 Renick Run near Buchanan, Va.
(Flood-hydrograph station)

Location.--Lat 37°35'27", long 79°38'04", at culvert on frontage road of Interstate Highway 81, 2.2 miles upstream from mouth, and 4.8 miles northeast of Buchanan, Botetourt County.

Drainage area.--2.06 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 1,270 ft (from topographic map).

Discharge record.--Stage discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 1,210 cfs Aug. 20 (gage height, 9.90 ft).
1967 to July 1969: Discharge, 580 cfs Mar. 7, 1967 (gage height, 6.57 ft).

02-0202.00 Calfpasture River near West Augusta, Va.
(Flood-hydrograph station)

Location.--Lat 38°16'24", long 79°18'02", at bridge on U. S. Highway 250, 1.5 miles east of West Augusta, Augusta County, and 9 miles west of Churchville.

Drainage area.--12.8 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Datum of gage is 1,897.46 ft above mean sea level, datum of 1929, supplementary adjustment of 1944.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 14 cfs and by slope-area measurement at 1,840 cfs.

Maxima.--August 1969: Discharge, 310 cfs Aug. 20 (gage height, 2.41 ft).
1949 to July 1969: Discharge, 4,800 cfs June 17, 1949 (gage height, 6.6 ft).

02-0205.00 Calfpasture River above Mill Creek, at Goshen, Va.

Location.--Lat 37°59'15", long 79°29'40", on left bank 20 ft upstream from bridge on State Highway 42 at Goshen, Rockbridge County, and 400 ft upstream from Mill Creek.

Drainage area.--147 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,384.84 ft above mean sea level, datum of 1929, Parkersburg-Uniontown supplementary adjustment of 1944.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 9,200 cfs and extended above by logarithmic plotting.

Maxima.--August 1969: Discharge, 5,600 cfs 0430 hours Aug. 20 (gage height, 8.06 ft).
1939 to July 1969: Discharge, 14,800 cfs June 18, 1949 (gage height, 12.14 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

02-0211.00 Bratton Creek tributary near Goshen, Va.
(Flood-hydrograph station)

Location.--Lat 37°55'55", long 79°34'40", at culvert on State Highway 780, 0.2 mile upstream from mouth, and 5.8 miles southwest of Goshen, Rockbridge County.

Drainage area.--1.62 sq mi.

Gage-height record.--Floodmarks at gage site. Altitude of gage is 1,570 ft (from topographic map).

Discharge record.--Stage discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 670 cfs Aug. 20 (gage height, 9.20 ft, from floodmarks).
1966 to July 1969: Peak stage did not reach bottom of gage.

02-0215.00 Maury River at Rockbridge Baths, Va.

Location.--Lat 37°54'26", long 79°25'20", on right bank at Rockbridge Baths, Rockbridge County, 700 ft upstream from bridge on State Highway 39, and 1.0 mile upstream from Hays Creek.

Drainage area.--329 sq mi.

Gage-height record.--Digital recorder tape punched at 30-minute intervals. Datum of gage is 1,100.33 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter mearurements below 16,000 cfs and extended above by logarithmic plotting.

Maxima.--August 1969: Discharge, 22,900 cfs 0700 hours Aug. 20 (gage height, 11.48 ft).
1929 to July 1969: Discharge, 33,000 cfs Mar. 17, 1936 (gage height, 13.07 ft).

Time	Gage Height	Discharge
Aug. 18		
0200	2.36	433
0800	2.33	417
1500	2.30	400
1600	2.49	505
1700	2.59	564
1800	2.73	648
1900	3.26	1,010
2000	3.42	1,140
2100	3.61	1,290
2200	3.83	1,480
2400	3.86	1,500
Mean----------		637
Aug. 19		
0400	3.79	1,440
0800	3.67	1,340
1200	3.45	1,160
1800	3.37	1,100
1900	3.36	1,090
2000	3.40	1,120
2100	4.03	1,660
2200	4.09	1,710
2300	4.25	1,860
2400	5.12	2,730
Mean----------		1,350
Aug. 20		
0100	6.12	4,010
0200	7.62	6,950
0300	8.88	10,900
0400	10.10	15,600
0500	10.99	20,000
0600	11.43	22,600
0700	11.48	22,900
0800	11.32	21,900
1000	10.86	19,300
1200	10.36	16,800
1400	9.85	14,600
1600	9.36	12,600
1800	8.91	11,000
2000	8.45	9,380
2200	8.02	8,060
2400	7.61	6,930
Mean----------		13,600
Aug. 21		
0200	7.04	5,670
0400	6.73	5,060
0600	6.43	4,520
1200	5.79	3,530
1800	4.91	2,510
2100	4.48	2,080
2400	4.33	1,930
Mean----------		3,650
Aug. 22		
0300	4.20	1,810
0600	4.08	1,700
0900	3.97	1,600
1200	4.26	1,860
1800	3.93	1,570
2400	3.66	1,330
Mean----------		1,680
Aug. 23		
0600	3.44	1,150
0900	3.35	1,080
1200	2.90	750
1800	2.78	678
2400	2.67	612
Mean----------		899
Aug. 24		
0600	2.60	570
1200	2.54	534
1800	2.66	606
2400	2.58	558
Mean----------		576
Aug. 25		
1200	2.44	477
2400	2.31	406
Mean----------		478
Aug. 26		
1200	2.22	360
2400	2.12	310
Mean----------		358

02-0217.00 Cedar Grove Branch near Rockbridge Baths, Va.
(Flood-hydrograph station)

Location.--Lat 37°53'00", long 79°23'10", at culvert on State Highway 39, 0.1 mile upstream from mouth, and 1.8 miles southeast of Rockbridge Baths, Rockbridge County.

Drainage area.--12.3 sq mi.

Gage-height record.--Floodmarks at gage site. Altitude of gage is 1,050 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by flow-through culvert and by slope-area measurement at 7,300 cfs.

Maxima.--August 1969: Discharge, 7,300 cfs Aug. 20 (gage height, 31.2 ft, from floodmarks).
1967 to July 1969: Discharge, 364 cfs Mar. 7, 1967 (gage height, 7.0 ft).

02-0225.00 Kerrs Creek near Lexington, Va.

Location.--Lat 37°49'35", long 79°26'35", on right bank 0.2 mile upstream from bridge on State Highway 602, 1.4 miles upstream from mouth, and 2.9 miles north of Lexington, Rockbridge County.

Drainage area.--34 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 980.32 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 800 cfs and by slope-area measurement at 5,260 cfs and contracted-opening and slope-area measurements at 23,000 cfs.

Maxima.--August 1969: Discharge, 13,800 cfs 2400 hours Aug. 19 (gage height, 13.38 ft).
1927 to July 1969: Discharge, 23,000 cfs Sept. 10, 1950 (gage height, 13.8 ft, site and datum then in use).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 18		
2400	3.59	118
Mean----------		68
Aug. 19		
0600	3.41	88
1200	3.31	72
1800	3.24	63
1900	3.23	61
2000	4.80	530
2100	8.02	3,420
2200	10.55	7,910
2400	13.38	13,800
Mean----------		1,200

Time	Gage Height	Discharge
Aug. 20		
0100	12.93	12,740
0200	12.55	12,080
0300	11.85	10,560
0400	9.20	5,320
0500	7.70	3,060
0600	7.10	2,340
0700	6.70	1,890
0800	6.32	1,530
0900	6.00	1,300
1000	5.71	1,080
1100	5.50	943
1200	5.37	848
1400	5.10	695
1600	4.90	581
1800	4.75	505
2000	4.62	443
2200	4.52	399
2400	4.40	350
Mean----------		2,770

Time	Gage Height	Discharge
Aug. 21		
1200	4.02	223
2400	3.75	152
Mean----------		237
Aug. 22		
2400	3.46	95
Mean----------		112
Aug. 23		
2400	3.29	70
Mean----------		76

02-0230.00 Maury River near Lexington, Va.
(Gaging station, discontinued 1960, published as North River prior to October 1945)

Location.--Lat 37°48'49", long 79°26'42", 900 ft upstream from Lime Kiln highway bridge, 0.2 mile downstream from Kerrs Creek, and 2.8 miles upstream from Lexington, Rockbridge County.

Drainage area.--487 sq mi.

Gage-height record.--High-water marks on the right bank at gage site. Datum of gage is 906.56 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Peak discharge by contracted-opening measurement.

Maxima.--August 1969: Discharge, 52,000 cfs Aug. 20 (gage height, 27.08 ft, from floodmarks).
1926 to July 1960: Discharge, 40,000 cfs Mar. 18, 1936 (gage height, 23.58 ft), from rating curve extended above 9,000 cfs.

02-0233.00 South River near Steeles Tavern, Va.
(Flood-hydrograph station)

Location.--Lat 37°55'50", long 79°09'55", at bridge on State Highway 608, 3 miles east of Steeles Tavern, and 5 miles south of Greenville, Augusta County.

Drainage area.--15.7 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 1,600 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 360 cfs and by slope-area measurements at 2,770 and 4,700 cfs.

Maxima.--August 1969: Discharge, 4,700 cfs and Aug. 20 (gage height, 8.70 ft).
1951 to July 1969: Discharge, 2,770 cfs Aug. 18, 1955 (gage height, 6.52 ft).

02-0235.00 South River near Riverside, Va.
(Gaging station, discontinued 1962)

Location.--Lat 37°47'00", long 79°21'35", on right bank 20 ft upstream from highway bridge 1.1 miles southwest of Riverside, Rockbridge County, 1.9 miles upstream from mouth and 4 miles east of Lexington.

Drainage area.--111 sq mi.

Gage-height record.--High-water marks on the bank at gage site. Altitude of gage is 910 ft (from topographic map).

Discharge record.--Peak discharge by contracted-opening measurement at site 3 miles upstream.

Maxima.--August 1969: Discharge, 35,000 cfs Aug. 20 (gage height, 15.2 ft, from floodmarks).
1950 to July 1962: Discharge, 6,300 cfs Oct. 21, 1961 (gage height, 8.63 ft) from rating curve extended above 3,000 cfs.
Flood of March 1936 reached a stage of 13.7 ft, from information by local residents.

02-0240.00 Maury River near Buena Vista, Va.

Location.--Lat 37°45'45", long 79°23'30", on right bank 0.5 mile downstream from South River, and 2.8 miles northwest of Buena Vista, Rockbridge County.

Drainage area.--649 sq mi.

Gage-height record.--Digital recorder tape punched at 30-minute intervals, except 0200 hours Aug. 19 to 1000 hours Aug. 30, for which graph was drawn on basis of peak stage and typical recession. Datum of gage is 846.58 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 22,400 cfs and by slope-area measurement at 105,000 cfs.

Maxima.--August 1969: Discharge, 105,000 cfs 0900 hours Aug. 20 (gage height, 31.23 ft, from floodmarks).
1936 to July 1969: Discharge, 45,000 cfs Mar. 18, 1936 (gage height, 22 ft, from information by local residents).

Time	Gage Height	Discharge
Aug. 18		
0300	4.24	1,170
0600	4.11	1,080
0900	3.90	935
1200	3.81	877
1500	3.76	846
1600	3.88	922
1630	4.32	1,230
1700	5.12	1,840
1730	6.75	3,370
1800	8.55	5,640
1830	8.65	5,790
1900	8.06	4,960
2000	6.94	3,570
2200	6.26	2,850
2400	6.14	2,730
Mean----------		1,720
Aug. 19		
0300	6.70	3,310
0600	7.20	3,880
0900	8.00	4,880
1200	8.80	6,010
1500	10.00	7,950
1800	11.20	10,100
2100	12.80	13,400
2400	15.60	20,400
Mean----------		8,740
Aug. 20		
0300	24.00	55,000
0600	29.20	87,600
0900	31.23	105,000
1200	28.00	79,000
1500	24.80	59,000
1800	18.00	28,000
2100	15.60	20,400
2400	13.20	14,200
Mean----------		56,000
Aug. 21		
0300	11.40	10,500
0600	10.20	8,300
0900	9.30	6,790
1200	8.60	5,710
1500	8.10	5,010
1800	7.80	4,620
2100	7.30	4,000
2400	6.90	3,530
Mean----------		6,060
Aug. 22		
1200	5.80	2,420
2400	4.90	1,660
Mean----------		2,510
Aug. 23		
1200	4.50	1,360
2400	4.10	1,070
Mean----------		1,360
Aug. 24		
1200	4.00	1,000
2400	3.95	968
Mean----------		1,010
Aug. 25		
1200	3.90	935
2400	3.70	810
Mean----------		912
Aug. 26		
1200	3.65	782
2400	3.60	754
Mean----------		782

02-0246.00 James River at Balcony Falls, Va.
(U. S. Weather Bureau gage)

Location.--Lat 37°37', long 79°27', in the pool or forbay of the Balcony Falls dam of the Virginia Electric and Power Co. at Balcony Falls, Rockbridge County, and at mile 288.

Drainage area.--2,975 sq mi.

Gage-height record.--Crest stages only. Datum of gage is 703.60 ft above mean sea level, datum of 1929.

Maxima.--August 1969: Discharge, 130,000 cfs Aug. 20 (gage height, 18.6 ft) from flow-over-dam measurement.
1936 to July 1969: Stage, 20.6 ft Mar. 18, 1936.

02-0250.00 Pedlar River near Pedlar Mills, Va.
(Gaging station, discontinued 1956)

Location.--Lat 37°32'35", long 79°15'10", on right bank 6 ft downstream from highway bridge, 1.2 miles south of Pedlar Mills, Amherst County, 1.5 miles downstream from Horsley Mill Creek, and 3.7 miles upstream from mouth.

Drainage area.--91 sq mi, approximately.

Gage-height record.--High-water marks on right bank at gage site. Altitude of gage is 656 ft (by barometer).

Discharge record.--Peak discharge by contracted-opening measurement.

Maxima.--August 1969: Discharge, 32,000 cfs Aug. 20 (gage height, 21.0 ft, from floodmarks).
1942 to September 1956: Discharge, 11,200 cfs Aug. 8, 1942 (gage height, 14.10 ft), from rating curve extended above 2,200 cfs.

02-0255.00 James River at Holcombs Rock, Va.

Location.--Lat 37°30'04", long 79°15'46", on right bank at Holcombs Rock, Bedford County, 0.9 mile downstream from Pedlar River, and at mile 263.2.

Drainage area.--3,250 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 548.53 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 73,000 cfs and extended above on basis of flow-over-dam measurement at site 25 miles upstream.

Maxima.--August 1969: Discharge, 150,000 cfs 1000 hours Aug. 20 (gage height, 35.50 ft). 1900-17, 1926 to July 1969: Discharge, 118,000 cfs Mar. 28, 1913 (gage height, 31.3 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 18		
2400	8.89	8,990
Mean		4,520
Aug. 19		
0200	8.60	8,300
0400	8.06	7,200
0600	7.78	6,540
0800	7.79	6,540
1000	7.89	6,760
1200	7.98	6,980
1400	7.92	6,760
1600	7.75	6,540
1800	7.64	6,120
2000	8.12	7,200
2200	9.44	10,200
2400	10.13	11,900
Mean		7,460
Aug. 20		
0100	11.10	14,500
0200	12.90	19,800
0300	16.40	32,500
0400	20.30	49,600
0500	24.00	69,900
0600	28.00	95,400
0700	30.80	115,000
0800	31.30	118,000
0900	35.00	146,000
1000	35.50	150,000
1100	34.95	146,000
1200	34.00	138,000
1400	32.45	126,000
1600	31.25	118,000
1800	30.10	110,000
2000	29.00	102,000
2200	28.20	96,800
2400	27.45	91,500
Mean		98,800
Aug. 21		
0200	26.72	87,000
0400	26.15	83,700
0600	25.60	79,800
0800	25.10	76,600
1000	24.60	73,500
1200	23.85	68,700
1400	22.75	62,700
1600	21.30	54,500
1800	19.60	46,200
2000	17.90	38,700
2200	16.45	32,500
2400	15.38	28,600
Mean		63,700
Aug. 22		
0200	14.50	25,300
0400	13.90	23,200
0600	13.39	21,500
0800	12.95	20,100
1000	12.59	18,800
1200	12.25	17,600
1400	11.94	16,700
1600	11.66	16,100
1800	11.40	15,300
2000	11.22	14,800
2200	11.05	14,200
2400	10.82	13,700
Mean		18,700
Aug. 23		
0200	10.60	13,200
0400	10.40	12,600
0600	10.20	12,100
0800	10.03	11,600
1000	9.86	11,400
1200	9.71	10,900
1400	9.56	10,700
1600	9.42	10,200
1800	9.29	9,900
2000	9.15	9,700
2200	9.01	9,200
2400	8.86	9,000
Mean		11,100

02-0256.00 James River at Reusens Dam, near Lynchburg, Va.
(Miscellaneous site)

Location.--Lat 37°27'45", long 79°11'10", at Appalachian Power Company dam, 0.2 mile downstream from Judith Creek, and 4.5 miles northwest of Lynchburg, Campbell County.

Drainage area.--3,300 sq mi.

Maximum.--August 1969: Discharge, 150,000 cfs Aug. 20 from flow-over-dam measurement.

02-0257.00 James River at Lynchburg, Va.
(U. S. Weather Bureau gage)

Location.--Lat 37°25'10", long 79°08'20", on upstream side of bridge on U. S. Highway 29, at Lynchburg, Amherst County.

Drainage area.--3,305 sq mi.

Gage-height record.--Staff or wire-weight gage read only during flooding. Datum of gage is 499.06 ft above mean sea level, levels by U. S. Weather Bureau.

Maxima.--August 1969: Stage, 28.0 ft 1300 hours Aug. 20.
1771 to July 1969: Stage, 36 ft Sept. 27, 1795 (from report by Corps of Engineers).

Time	Gage Height	Discharge	Time	Gage Height	Discharge	Time	Gage Height	Discharge
Aug. 20			Aug. 20--Continued			Aug. 21		
0800	22.5	-	1300	28.0	-	0500	20.0	-
0845	23.5	-	1400	27.4	-			
0900	24.0	-	1500	26.0	-			
1000	26.0	-	1600	25.0	-			
1100	27.0	-	1700	24.0	-			
1200	27.0	-	1800	24.0	-			

02-0258.00 Burton Creek tributary at Lynchburg, Va.
(Flood-hydrograph station)

Location.--Lat 37°21'10", long 79°11'05", at culvert on access road just west of U. S. Highway 29, 0.6 mile south of city limits of Lynchburg, Campbell County, and 1.5 miles upstream from mouth.

Drainage area.--2.36 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 765 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 135 cfs Aug. 20 (gage height, 3.55 ft).
1966 to July 1969: Stage, 5.10 ft Aug. 24, 1967(discharge not determined).

02-0260.00 James River at Bent Creek, Va.

Location.--Lat 37°32'10", long 78°49'30", on left bank 300 ft upstream from bridge on U. S. Highway 60 at town of Bent Creek, Appomattox County, 150 ft downstream from Bent Creek, 1 mile downstream from Gladstone, and at mile 222.9.

Drainage area.--3,671 sq mi.

Gage-height record.--Digital recorder tape punched at 15-minute intervals. Datum of gage is 381.39 ft above mean sea level, datum of 1929, supplementary adjustment of 1936.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 74,000 cfs and extended above on basis of velocity-area studies.

Maxima.--August 1969: Discharge, 144,000 cfs 2145 hours Aug. 20 (gage height, 24.77 ft). 1925 to July 1969: Discharge, 115,000 cfs Mar. 18, 1936 (gage height, 23.02 ft). Flood of Sept. 30, 1870 reached a stage of 27 ft (discharge, 150,000 cfs) from flood profiles by Corps of Engineers.

Time	Gage Height	Discharge
Aug. 18		
0200	4.96	5,550
0400	5.16	6,150
0500	5.20	6,270
0600	5.19	6,240
1200	4.78	5,040
1500	4.67	4,740
1800	4.22	3,550
2100	4.54	4,380
2400	4.96	5,550
Mean----------		5,140
Aug. 19		
0200	4.67	4,740
0400	4.80	5,100
0600	5.12	6,030
1200	5.24	6,390
1600	5.31	6,610
2000	5.60	7,490
2400	5.70	7,800
Mean----------		6,530
Aug. 20		
0400	5.52	7,250
0500	5.64	7,620
0600	6.05	9,030
0700	6.59	10,900
0800	7.12	12,800
0900	8.39	17,600
1000	10.64	27,400
1100	12.90	38,500
1200	14.85	49,600
1300	16.63	61,400
Aug. 20--Continued		
1400	18.14	73,300
1500	19.59	86,300
1600	21.02	100,000
1800	23.24	125,000
2000	24.50	141,000
2145	24.77	144,000
2200	24.71	143,000
2300	24.57	142,000
2400	24.20	137,000
Mean----------		64,100
Aug. 21		
0200	23.40	127,000
0400	22.51	117,000
0600	21.70	108,000
0800	20.88	98,800
1000	20.15	91,500
1200	19.54	85,900
1600	18.55	76,900
2000	17.46	67,700
2400	15.66	54,800
Mean----------		90,200
Aug. 22		
0400	13.21	40,200
0600	12.01	34,100
0800	11.10	29,500
1200	9.95	24,300
1800	8.94	19,800
2400	8.31	17,200
Mean----------		28,100
Aug. 23		
0600	7.85	15,400
1200	7.45	13,900
1800	7.11	12,700
2400	6.76	11,500
Mean----------		14,200
Aug. 24		
0600	6.54	10,700
1200	6.22	9,620
1800	5.95	8,680
2400	5.75	7,980
Mean----------		9,710
Aug. 25		
1200	5.48	7,130
2400	5.21	6,300
Mean----------		7,190
Aug. 26		
1200	5.01	5,690
2400	4.74	4,930
Mean----------		5,700

02-0264.00 Tye River at Massies Mill, Va.
(Miscellaneous site)

Location.--Lat 37°45'56", long 79°59'50", at bridge on State Highway 56, 0.7 mile southeast of Massies Mill, Nelson County, and 0.9 mile downstream from Rocky Run.

Drainage area.--66 sq mi.

Maximum.--August 1969: Discharge 70,000 cfs Aug. 20 from slope-area measurement.

02-0270.00 Tye River near Lovingston, Va.

Location.--Lat 37°42'55", long 78°58'55", on right bank at downstream side of bridge on State Highway 158, 3.5 miles downstream from Hat Creek, 4.8 miles upstream from Piney River, and 6.8 miles southwest of Lovingston, Nelson County.

Drainage area.--92 sq mi, approximately.

Gage-height record.--Water-stage recorder graph prior to 1900 hours Aug. 19; gage destroyed by flood; graph drawn on basis of floodmarks and typical recession. Datum of gage is 578.39 ft above mean sea level, datum of 1929, Culpeper supplementary adjustment of 1943.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 7,600 cfs and by slope-area measurement at 80,000 cfs.

Maxima.--August 1969: Discharge, 80,000 cfs 0400 hours Aug. 20 (gage height, 29.0 ft, from floodmarks).
1934, 1939 to July 1969: Discharge, 9,670 cfs Sept. 19, 1944 (gage height, 13.7 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 18		
1900	1.52	112
2000	1.90	203
2100	3.40	785
2200	3.15	668
2300	2.90	555
2400	2.79	510
Mean----------		194
Aug. 19		
0600	2.53	402
1200	2.38	348
1800	2.25	304
1900	2.25	304
2000	3.75	962
2100	5.10	1,730
2200	6.85	2,890
2300	8.60	4,410
2400	10.00	5,800
Mean----------		845
Aug. 20		
0100	12.80	8,680
0200	15.00	11,700
0300	26.00	60,000
0400	29.00	80,000
0500	28.00	73,000
0600	26.65	63,600
0700	25.40	57,000
0800	24.25	51,000
0900	23.15	46,000
1000	22.00	41,000
1100	20.95	37,000
1200	19.80	32,200
1300	19.25	29,800
1400	18.75	28,200
1500	18.20	25,800
1600	17.65	23,400
1700	17.15	21,800
1800	16.60	19,400
1900	16.00	17,000
2000	15.50	15,500
2100	14.90	13,800
2200	14.45	12,500
2300	14.00	11,500
2400	13.55	10,700
Mean----------		32,600
Aug. 21		
0200	12.65	8,900
0400	11.70	7,600
0600	10.80	6,390
0800	9.75	5,100
1000	9.30	4,480
1200	9.02	4,120
1400	8.78	3,900
1600	8.58	3,680
1800	8.42	3,480
2000	8.24	3,280
2200	8.09	3,180
2400	7.95	3,080
Mean----------		5,080
Aug. 22		
0600	7.55	2,880
1200	7.18	2,340
1800	6.83	2,020
2400	6.50	1,810
Mean----------		2,370
Aug. 23		
0600	6.17	1,610
1200	5.85	1,370
1800	5.53	1,200
2400	5.22	1,040
Mean----------		1,400
Aug. 24		
0600	4.93	890
1200	4.74	790
1800	4.60	745
2400	4.48	700
Mean----------		824

02-0272.50 Piney River at Woodson, Va.
(Miscellaneous site)

Location.--Lat 37°44'44", long 79°04'00", at bridge on county road, 0.5 mile south of Woodson, Amherst County, and 1.4 miles upstream from Whiteoak Branch.

Drainage area.--22 sq mi.

Maximum.--August 1969: Discharge 18,500 cfs Aug. 20 from slope-area measurement.

02-0275.00 Piney River at Piney River, Va.

Location.--Lat 37°42'10", long 79°01'40", on right bank 20 ft downstream from bridge on State Highway 151, 0.2 mile southwest of Piney River Post Office, Nelson County, 1.7 miles downstream from Indian Creek, and 2.5 miles southeast of Lowesville.

Drainage area.--48 sq mi, approximately.

Gage-height record.--Floodmarks only. Gage removed for bridge construction. Datum of gage is 633.58 ft above mean sea level, datum of 1929, Culpeper supplementary adjustment of 1943.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,000 cfs and by slope-area measurement at 38,000 cfs.

Maxima.--August 1969: Discharge, 38,000 cfs Aug. 20 (gage height, 13.8 ft from floodmarks).
1949 to July 1969: Discharge, 9,720 cfs June, 1949 (gage height, 9.9 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

02-0278.00 Buffalo River near Tye River, Va.

Location.--Lat 37°36'20", long 78°55'25", on right bank 70 ft downstream from bridge on State Highway 657, 2.1 miles upstream from Tye River, and 3.5 miles southeast of town of Tye River, Nelson County.

Drainage area.--146 sq mi.

Gage-height record.--Water-stage recorder graph prior to 0800 hours Aug. 20; graph drawn on basis of floodmarks and typical recession. Datum of gage is 444.39 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,800 cfs and by flow-over-dam measurement at 6,400 cfs and slope-area measurement at 45,000 cfs.

Maxima.--August 1969: Discharge, 45,000 cfs 1100 hours Aug. 20 (gage height, 27.95 ft from floodmark).
1961 to July 1969: Discharge, 6,400 cfs Feb. 7, 1965 (gage height, 11.03 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge	Time	Gage Height	Discharge	Time	Gage Height	Discharge
Aug. 20			Aug. 21			Aug. 22		
0100	1.55	106	0100	14.73	12,400	0200	6.48	1,130
0200	6.70	1,830	0200	14.33	11,600	0400	6.23	955
0300	6.90	1,950	0300	14.00	11,000	0600	6.02	800
0400	8.00	2,800	0400	13.55	10,300	0800	5.82	700
0500	9.20	4,020	0500	13.05	9,300	1000	5.66	625
0600	9.30	4,130	0600	12.58	8,620	1200	5.51	555
0700	13.00	9,300	0700	12.12	7,770	1400	5.38	490
0800	22.70	29,800	0800	11.68	7,150	1600	5.27	435
0900	25.50	37,500	0900	11.23	6,400	1800	5.15	375
1000	27.70	44,100	1000	10.82	5,830	2000	5.07	335
1100	27.95	45,000	1100	10.39	5,290	2200	4.98	292
1200	27.88	44,700	1200	10.00	4,750	2400	4.91	264
1300	27.50	43,500	1300	9.68	4,360	Mean----------		625
1400	26.73	41,100	1400	9.30	3,860			
1500	25.85	38,400	1500	8.95	3,500	Aug. 23		
1600	25.00	36,000	1600	8.60	3,060			
1700	23.60	32,000	1700	8.30	2,750	0600	4.73	214
1800	20.50	24,200	1800	8.02	2,450	1200	4.58	184
1900	19.33	21,600	1900	7.75	2,220	1800	4.45	162
2000	18.55	20,200	2000	7.53	2,040	2400	4.35	145
2100	17.70	18,400	2100	7.30	1,820	Mean----------		191
2200	16.95	17,000	2200	7.12	1,640			
2300	16.10	15,200	2300	6.93	1,500			
2400	15.15	13,400	2400	6.78	1,370			
Mean----------		22,500	Mean----------		5,710			

02-0280.00 Tye River near Norwood, Va.
(Gaging station, discontinued 1960, formerly published as Buffalo River near Norwood)

Location.--Lat 37°38', long 78°53', on right bank 1 mile downstream from Tye River, 3 miles upstream from Rucker Run, and 4 1/4 miles upstream from mouth and Norwood, Nelson County.

Drainage area.--360 sq mi.

Gage-height record.--High-water marks on the right bank at gage site. Datum of gage is 400.78 ft above mean sea level, datum of 1929, supplementary adjustment of 1936.

Discharge record.--Peak discharge by slope-area measurement.

Maxima.--August 1969: Discharge, 200,000 cfs Aug. 20 (gage height, 41.0 ft, from floodmarks).
1940 to September 1960: Discharge, 33,500 cfs Oct. 15, 1942 and Sept. 19, 1944 (gage height, 18.1 ft) from rating curve extended above 18,000 cfs.

02-0285.00 Rockfish River near Greenfield, Va.

Location.--Lat 37°52'10", long 78°49'25", on left bank 50 ft downstream from bridge on State Highway 634, 2.8 miles downstream from confluence of North and South Forks, and 4.1 miles south of Greenfield, Nelson County.

Drainage area.--96 sq mi, approximately.

Gage-height record.--Water-stage recorder graph prior to 0300 hours Aug. 20; graph drawn on basis of floodmarks and typical recession. Datum of gage is 530.29 ft above mean sea level, datum of 1929, Culpeper supplementary adjustment of 1943.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 8,500 cfs and by slope-area measurements at 13,700, 30,000, and 70,000 cfs.

Maxima.--August 1969: Discharge, 70,000 cfs 0400 hours Aug. 20 (gage height, 31.20 ft, from floodmarks).
1942 to July 1969: Discharge, 30,000 cfs Oct. 15, 1942 (gage height 23.4 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 19		
0600	3.76	339
1200	3.52	289
1800	3.38	269
1900	3.38	269
2000	3.60	309
2100	5.35	720
2200	6.22	990
2300	7.65	1,520
2400	10.20	2,880
Mean----------		478
Aug. 20		
0100	12.50	4,660
0200	17.00	11,000
0300	30.00	62,000
0400	31.20	70,000
0500	30.40	64,600
0600	29.60	59,400
0700	28.60	53,300
0800	27.55	47,600
0900	26.35	41,400
1000	25.15	35,700
1100	24.30	31,900
1200	23.60	29,100
1300	22.85	26,100
1400	22.05	23,400
1500	21.15	21,000
1600	20.15	18,200
1700	19.55	16,600
1800	18.95	15,200
1900	18.35	13,900
2000	17.70	12,400
2100	17.00	11,000
2200	16.30	9,600
2300	15.55	8,440
2400	14.90	7,460
Mean----------		28,800
Aug. 21		
0100	14.45	6,810
0200	14.10	6,420
0300	13.68	5,930
0400	13.30	5,450
0500	12.90	4,980
0600	12.50	4,530
0700	12.10	4,130
0800	11.65	3,690
0900	11.20	3,360
1000	10.75	3,050
1100	10.35	2,760
1200	10.00	2,480
1400	9.45	2,100
1600	9.10	1,920
1800	8.83	1,740
2000	8.60	1,640
2200	8.40	1,540
2400	8.22	1,440
Mean----------		3,240
Aug. 22		
0300	7.98	1,360
0600	7.78	1,270
0900	7.60	1,190
1200	7.42	1,110
1500	7.27	1,070
1800	7.13	1,010
2100	6.99	950
2400	6.85	890
Mean----------		1,140
Aug. 23		
0600	6.62	790
1200	6.41	710
1800	6.11	610
2400	5.95	565
Mean----------		709

02-0287.00 Cove Creek near Covesville, Va.
(Crest-stage station)

Location.--Lat 37°52'06", long 78°43'32", at bridge on U. S. Highway 29, 1.5 miles southwest of Covesville, Albemarle County.

Drainage area.--4.0 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 640 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 30 cfs and by contracted-opening measurements at 2,000 and 3,000 cfs.

Maxima.--August 1969: Discharge, 3,000 cfs Aug. 20 (gage height, 8.8 ft, from floodmarks).
1944, 1950 to July 1969: Discharge, 2,000 cfs Sept. 19, 1944 (gage height, 9.1 ft).

02-0287.50 Cove Creek at Faber, Va.
(Crest-stage station)

Location.--Lat 37°49'40", long 78°44'10", at bridge on State Highway 632, at Faber, Nelson County.

Drainage area.--19.7 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 550 ft (from topographic map).

Discharge record.--Peak discharge defined by slope area measurement at site 0.6 mile downstream.

Maxima.--August 1969: Discharge, 28,000 cfs Aug. 20 (gage height, 56.0 ft, from floodmarks).
1967 to July 1969: Stage, 34.0 ft Mar. 7, 1967 (discharge not determined).

02-0288.00 Ballinger Creek at Esmont, Va.
(Crest-stage station)

Location.--Lat 37°49'39", long 78°36'32", at bridge on State Highway 6, at Esmont, Albemarle County.

Drainage area.--5.42 sq mi.

Gage-height record.--Crest-stages only. Altitude of gage is 425 ft (from topographic map).

Discharge record.--Peak discharge defined by contracted-opening and flow-over-road measurement at 4,800 cfs.

Maxima.--August 1969: Discharge, 4,800 cfs Aug. 20 (gage height, 17.6 ft, from floodmarks).
1967 to July 1969: Stage, 12.84 ft Aug. 24, 1967 (discharge not determined).

02-0288.95 Miller Creek near Keene, Va.
(Miscellaneous site)

Location.--Lat 37°49'07", long 78°30'29", at culvert on State Highway 20, 1.6 miles upstream from mouth, and 4.1 miles southeast of Keene, Albemarle County.

Drainage area.--5.91 sq mi.

Maximum.--August 1969: Discharge, 5,500 cfs Aug. 20 from flow-through-culvert and flow-over-road measurement.

02-0289.00 Miller Creek near Scottsville, Va.
(Crest-stage station)

Location.--Lat 37°48'30", long 78°30'46", at bridge on State Highway 6, 1.5 miles west of Scottsville, Albemarle County.

Drainage area.--6.60 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 315 ft (from topographic map).

Discharge record.--Peak discharge defined by contracted-opening measurement.

Maxima.--August 1969: Discharge, 6,300 cfs Aug. 20 (gage height, 13.44 ft).
1967 to July 1969: Stage, 10.29 ft, Mar. 15, 1967 (discharge not determined).

02-0290.00 James River at Scottsville, Va.

Location.--Lat 37°47'50", long 78°29'30", on left bank 1,200 ft downstream from bridge on State Highway 20 at Scottsville, Albemarle County, 6.8 miles upstream from Hardware River and at mile 184.6.

Drainage area.--4,571 sq mi.

Gage-height record.--Digital water-stage recorder tape punched at 15-minute intervals, except 1200 hours Aug. 20 to 1200 hours Aug. 22, for which graph was drawn based on wire-weight gage readings. Datum of gage is 253.18 ft above mean sea level, datum of 1929, supplementary adjustment of 1936.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 120,000 cfs and extended above.

Maxima.--August 1969: Discharge, 188,000 cfs Aug. 20 (gage height, 30.00 ft, from floodmarks).
1877 to July 1969: Discharge, 160,000 cfs November 1877 (gage height, 27.9 ft).
Flood of October 1870 reached a stage of 30.7 ft, from information by local residents.

Time	Gage Height	Discharge
Aug. 19		
2400	5.90	6,430
Mean----------		5,100
Aug. 20		
0200	7.44	9,950
0400	13.72	33,200
0600	19.39	66,200
0800	21.61	82,500
1000	24.04	106,000
1200	27.84	158,000
1400	29.40	180,000
1600	29.90	187,000
1800	30.00	188,000
2000	29.80	186,000
2200	29.50	182,000
2400	29.20	177,000
Mean----------		130,000
Aug. 21		
0200	28.90	173,000
0400	28.50	168,000
0600	28.10	162,000
0800	27.50	154,000
1000	26.90	145,000
1200	26.40	138,000
1400	25.90	131,000
1600	25.40	124,000
1800	24.80	116,000
2000	24.30	110,000
2200	23.80	104,000
2400	23.20	97,200
Mean----------		135,000
Aug. 22		
0200	22.50	90,300
0400	21.90	84,900
0600	21.00	77,600
0800	20.20	71,900
1000	19.30	65,600
1200	17.93	56,600
1400	16.46	47,700
1600	15.07	40,000
1800	14.00	34,500
2000	13.18	30,900
2200	12.77	29,100
2400	12.53	28,100
Mean----------		54,800
Aug. 23		
0400	11.90	25,500
0800	11.59	24,300
1200	11.44	23,700
2400	11.11	22,300
Mean----------		24,100
Aug. 24		
1200	10.71	20,800
2400	10.40	19,600
Mean----------		20,900
Aug. 25		
1200	10.14	18,600
2400	9.88	17,700
Mean----------		18,600
Aug. 26		
1200	9.55	16,500
2400	9.13	15,100
Mean----------		16,500

02-0292.00 North Fork Hardware River at Red Hill, Va.
(Crest-stage station)

Location.--Lat 37°58'03", long 78°37'04", at bridge on U. S. Highway 29, 0.5 mile west of Red Hill, Albemarle County.

Drainage area.--11.0 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 590 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 260 cfs and by contracted-opening measurements at 4,030 and 7,300 cfs.

Maxima.--August 1969: Discharge, 7,300 cfs Aug. 20 (gage height, 17.0 ft, from floodmarks).
1950 to July 1969: Discharge, 4,030 cfs Sept. 30, 1959 (gage height, 10.00 ft).

02-0294.00 South Branch of North Fork Hardware River near North Garden, Va.
(Crest-stage station)

Location.--Lat 37°57'21", long 78°39'35", at bridge on U. S. Highway 29 at Crossroads, 1.5 miles northwest of North Garden, Albemarle County.

Drainage area.--6.59 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 690 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 100 cfs and by contracted-opening measurements at 3,050 and 6,200 cfs.

Maxima.--August 1969: Discharge, 6,200 cfs Aug. 20 (gage height, 8.43 ft).
1949 to July 1969: Discharge, 3,050 cfs Sept. 30, 1959 (gage height, 8.86 ft).

02-0294.10 Sowell Branch near Charlottesville, Va.
(Flood-hydrograph station)

Location.--Lat 37°56'30", long 78°32'16", at culvert on State Highway 20, 1.2 miles upstream from mouth and 6.8 miles southwest of Charlottesville, Albemarle County.

Drainage area.--1.55 sq mi.

Gage-height record.--Floodmarks only. Altitude of gage is 475 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 1,500 cfs Aug. 20 (gage height, 14.6 ft, from floodmarks).
1967 to July 1969: Discharge, 140 cfs Aug. 24, 1967 (gage height, 3.96 ft).

02-0294.30 Harris Creek near Keene, Va.
(Crest-stage station)

Location.--Lat 37°53'05", long 78°33'00", at bridge on State Highway 20, 1.4 miles north of Keene, Albemarle County.

Drainage area.--1.71 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 420 ft (from topographic map).

Maxima.--August 1969: Discharge, 2,200 cfs Aug. 20 (gage height, 8.0 ft, from floodmarks).
1967 to July 1969: Stage, 3.8 ft Mar. 7, 1967 (discharge not determined).

02-0294.50 Thomas Creek at Keene, Va.
(Flood-hydrograph station)

Location.--Lat 37°52'25", long 78°33'10", at culvert on State Highway 20, 0.7 mile north of Keene, Albemarle County, and 2.3 miles upstream from mouth.

Drainage area.--0.28 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 470 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 440 cfs Aug. 20 (gage height, 7.37 ft).
1966 to July 1969: Discharge, 110 cfs Aug. 24, 1967 (gage height, 4.60 ft).

02-0300.00 Hardware River below Briery Run, near Scottsville, Va.

Location.--Lat 37°48'45", long 78°27'20", on left bank 75 ft upstream from bridge on State Highway 637, 0.8 mile downstream from Briery Run, 2.4 miles northeast of Scottsville, Albemarle County, and 10.8 miles upstream from mouth.

Drainage area.--116 sq mi.

Gage-height record.--Water-stage recorder graph except 0400 hours Aug. 20 to 0800 Aug. 21, for which graph was drawn on basis of peak stage and typical recession. Datum of gage is 294.96 ft above mean sea level, datum of 1929, Culpeper supplementary adjustment of 1943.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 18,000 cfs and by slope-area measurements at 23,000 and 52,000 cfs.

Maxima.--August 1969: Discharge, 52,000 cfs 1000 hours Aug. 20 (gage height, 31.0 ft, from floodmarks).
1939 to July 1969: Discharge, 23,000 cfs Sept. 19, 1944 (gage height, 23.8 ft, from floodmark in gage house).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 18		
2400	2.57	143
Mean		85
Aug. 19		
0200	2.83	181
0400	3.16	232
0600	3.20	240
0800	3.00	208
1000	2.81	178
1200	2.68	158
1400	2.61	148
1600	2.55	140
1800	2.51	134
2000	2.48	130
2200	2.75	168
2300	5.50	669
2400	10.50	1,820
Mean		228
Aug. 20		
0100	14.90	5,880
0200	21.25	16,560
0300	23.50	22,200
0400	25.25	27,000
0500	29.50	42,900
0600	30.20	46,800
0700	30.50	48,800
0800	30.70	50,000
0900	30.90	51,400
1000	31.00	52,000
1100	30.93	51,300
1200	30.70	49,800
1300	30.35	47,700
1400	30.00	44,800
1500	27.50	29,800
1600	24.70	20,000
1700	22.70	14,500
1800	21.25	12,100
1900	20.45	11,100
2000	19.60	10,100
2100	18.50	8,850
2200	17.40	7,700
2300	16.20	6,500
2400	15.00	5,400
Mean		28,400
Aug. 21		
0200	14.10	4,590
0400	13.00	3,650
0600	12.00	2,800
0800	11.00	2,060
1000	10.25	1,680
1200	9.42	1,390
1400	8.35	1,150
1600	7.45	918
1800	6.70	770
2000	6.33	690
2200	6.00	630
2400	5.70	570
Mean		1,940
Aug. 22		
0600	5.18	470
1200	4.87	410
1800	4.62	360
2400	4.38	330
Mean		422
Aug. 23		
2400	3.94	255
Mean		292

02-0301.00 Frisby Branch near Buckingham, Va.
(Flood-hydrograph station)

Location.--Lat 37°31'15", long 78°37'04", at culvert on State Highway 24, 0.5 mile upstream from mouth, and 4 miles southwest of Buckingham, Buckingham County.

Drainage area.--4.35 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 410 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 170 cfs Aug. 20 (gage height, 5.50 ft).
1967 to July 1969: Discharge, 165 cfs June 23, 1967 (gage height, 5.66 ft).

02-0305.00 Slate River near Arvonia, Va.

Location.--Lat 37°42'10", long 78°22'40", on left bank 100 ft upstream from Bumpers Bridge on State Highway 676, 1.8 miles northwest of Arvonia, Buckingham County, 2.9 miles upstream from Hunts Creek, and 3.8 miles upstream from mouth.

Drainage area.--235 sq mi.

Gage-height record.--Digital recorder tape punched at 30-minute intervals. Datum of gage is 238.78 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 5,200 cfs and extended above on basis of velocity-area studies.

Maxima.--August 1969: Discharge, 5,400 cfs 1000 hours Aug. 20 (gage height, 13.00 ft).
1927 to July 1969: Discharge, 13,600 cfs Sept. 6, 1935 (gage height, 22.18 ft, from floodmark).

02-0307.00 James River at Bremo Bluff, Va.
(U. S. Weather Bureau gage)

Location.--Lat 37°42'38", long 78°17'57", at Virginia Electric and Power Co.'s steam plant, 3/4 mile downstream from Bremo Bluff, Fluvanna County, and at mile 171.

Drainage area.--5,040 sq mi.

Gage-height record.--Staff gage read hourly when stage is above 15 ft. Datum of gage is 191.4 ft above mean sea level, datum of 1929.

Maxima.--August 1969: Stage 39.1 ft 2100 hours Aug. 20.
1870 to July 1969: Stage, 37.4 ft September 1870 (from flood profile by Corps of Engineers).

Remarks.--Records for August flood furnished by Virginia Electric and Power Company.

Time	Gage Height	Discharge
Aug. 18		
0100	8.4	-
0800	8.5	-
1600	8.5	-
Aug. 19		
No readings		
Aug. 20		
0400	10.3	-
0600	15.0	-
0800	22.8	-
0900	24.3	-
1000	26.7	-
1100	27.9	-
1200	29.3	-
1300	30.6	-
1400	32.2	-
1500	34.2	-
1600	35.8	-
1700	36.9	-
1800	37.8	-
1900	38.5	-
2000	38.9	-
2100	39.1	-
2200	39.0	-
2300	38.9	-
2400	38.5	-

Time	Gage Height	Discharge
Aug. 21		
0100	38.2	-
0200	37.7	-
0300	37.4	-
0400	36.9	-
0500	36.7	-
0600	36.6	-
0700	36.0	-
0800	35.6	-
0900	35.5	-
1000	35.4	-
1100	35.1	-
1200	34.9	-
1300	34.8	-
1400	34.5	-
1500	34.3	-
1600	34.0	-
1700	33.7	-
1800	33.5	-
1900	33.2	-
2000	32.9	-
2100	32.5	-
2200	32.2	-
2300	31.8	-
2400	31.5	-

Time	Gage Height	Discharge
Aug. 22		
0200	31.0	-
0400	30.3	-
0600	29.4	-
0800	28.6	-
1000	28.0	-
1200	27.2	-
1400	26.2	-
1600	24.5	-
1800	22.6	-
2000	20.5	-
2200	18.7	-
2400	17.5	-
Aug. 23		
0400	15.7	-
0800	14.8	-
1200	14.2	-
1600	13.8	-
2000	13.3	-
2400	13.0	-
Aug. 24		
0600	12.6	-
1200	12.1	-
1800	11.8	-
2400	11.4	-

02-0308.00 Stockton Creek near Afton, Va.
(Flood-hydrograph station)

Location.--Lat 38°01'48", long 78°48'30", at culvert on State Highway 6, 1.7 miles east of Afton, Nelson County, and 4.3 miles upstream from Stony Run.

Drainage area.--2.80 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 860 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 650 cfs Aug. 20 (gage height, 9.3 ft).
1967 to July 1969: Discharge, 180 cfs Mar. 7, 1967 (gage height, 5.65 ft).

02-0333.00 Moores Creek near Charlottesville, Va.
(Crest-stage station)

Location.--Lat 38°00'25", long 78°34'25", at culvert on access road, 150 ft north of U. S. Highway 29, and 4 miles southwest of Charlottesville, Albemarle County.

Drainage area.--3.52 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 510 ft (from topographic map).

Discharge record.--Peak discharge defined by flow-through-culvert and flow-over-road measurement.

Maxima.--August 1969: Discharge, 2,000 cfs Aug. 20 (gage height, 16.85 ft).
1967 to July 1969: Stage, 14.96 ft July 2, 1968 (discharge not determined).

02-0337.00 Henderson Creek near Shadwell, Va.
(Flood-hydrograph station)

Location.--Lat 37°59'05", long 78°24'05", at culvert on State Highway 729, 0.7 mile upstream from mouth, and 2.0 miles south of Shadwell, Albemarle County.

Drainage area.--1.76 sq mi.

Gage-height record.--Floodmarks only. Altitude of gage is 290 ft (from topographic map).

Discharge record.--Peak discharge defined by flow-through-culvert and flow-over-road measurement.

Maxima.--August 1969: Discharge, 2,000 cfs Aug. 20 (gage height, 9.60 ft, from floodmarks).
1966 to July 1969: Stage, 5.51 ft Jan. 27, 1967 (discharge not determined).

02-0340.00 Rivanna River at Palmyra, Va.

Location.--37°51'28", long 78°15'58", on left bank 10 ft upstream from bridge on U. S. Highway 15 at Palmyra, Fluvanna County, 0.5 mile upstream from Cunningham Creek, and 15 miles upstream from mouth.

Drainage area.--675 sq mi.

Gage-height record.--Digital recorder tape punched at 30-minute intervals. Datum of gage is 210.39 ft above mean sea level, datum of 1929, supplementary adjustment of 1943.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 80,000 cfs and extended above.

Maxima.--August 1969: Discharge, 98,800 cfs 0930 hours Aug. 20 (gage height, 39.85 ft).
1934 to July 1969: Discharge, 78,000 cfs Oct. 16, 1942 (gage height, 37.4 ft).

Time	Gage Height	Discharge
Aug. 19		
1200	3.74	690
1800	3.68	634
2100	3.75	700
2300	3.82	772
2400	4.76	1,730
Mean----------		650
Aug. 20		
0100	12.12	6,600
0200	14.68	8,810
0300	17.50	11,800
0400	22.12	18,500
0500	26.06	27,200
0600	31.08	44,300
0700	34.93	63,600
0800	37.76	82,300
0900	39.81	98,500
0930	39.85	98,800
1000	39.78	98,200
1400	37.55	80,800
1800	34.79	62,700
2400	30.47	41,900
Mean----------		57,000
Aug. 21		
0200	29.11	36,900
0400	27.85	32,600
0600	26.68	29,000
1200	23.09	20,400
1800	15.98	10,100
2400	10.32	5,330
Mean----------		20,500
Aug. 22		
0300	8.28	4,110
0600	7.12	3,410
1200	6.27	2,900
1800	5.59	2,450
2400	5.24	2,190
Mean----------		2,740
Aug. 23		
1200	4.77	1,740
2400	4.57	1,540
Mean----------		1,500
Aug. 24		
1200	4.39	1,360
2400	4.10	1,070
Mean----------		1,130
Aug. 25		
1200	3.99	959
2400	3.93	893
Mean----------		822
Aug. 26		
1200	3.85	805
2400	3.78	730
Mean----------		670

02-0340.50 Hunters Branch near Palmyra, Va.
(Flood-hydrograph station)

Location.--Lat 37°56'48", long 78°14'30", at culvert on U. S. Highway 15, 1.0 mile upstream from mouth, and 6.1 miles north of Palmyra, Fluvanna County.

Drainage area.--1.63 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 410 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 1,500 cfs Aug. 20 (gage height, 10.82 ft).
1967 to July 1969: Discharge, 100 cfs Jan. 14, 1968 (gage height, 3.47 ft).

02-0341.00 James River at Columbia, Va.
(U. S. Weather Bureau gage)

Location.--Lat 37°45'00", long 78°09'40", on highway bridge just downstream from mouth of Rivanna River, at Columbia, Fluvanna County, and at mile 161.8.

Drainage area.--5,744 sq mi.

Gage-height record.--Staff gage read during flood stage. Datum of gage is 173.04 ft above mean sea level, datum of 1929.

Maxima.--August 1969: Stage, 41.3 ft 2300 hours Aug. 20.
1870 to July 1969: Stage, 39 ft Sept. 30, 1870.

Time	Gage Height	Discharge	Time	Gage Height	Discharge	Time	Gage Height	Discharge
Aug. 20			Aug. 20--Continued			Aug. 21		
1000	25.5	-	2100	41.1	-	0100	41.02	-
1200	30.6	-	2200	41.3	-	0200	40.93	-
1400	32.7	-	2300	41.3	-	0300	40.49	-
2000	40.8	-	2400	41.2	-	0500	40.01	-
						0600	39.68	-

02-0345.00 Willis River at Flanagan Mills, Va.

Location.--Lat 37°40'00", long 78°10'00", on left bank 15 ft upstream from bridge on State Highway 690, 0.4 mile east of Flanagan Mills, Cumberland County, 6.9 miles upstream from mouth, and 7.7 miles downstream from Reynolds Creek.

Drainage area.--247 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 178.98 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 5,800 cfs and extended above on basis of velocity-area studies.

Maxima.--August 1969: Discharge, 1,720 cfs 1030 hours, Aug. 20; gage height, 22.57 ft 1330 hours Aug. 21 (backwater from James River).
1926 to July 1969: Discharge, 9,580 cfs Apr. 27, 1937 (gage height, 23.86 ft, from floodmarks).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

02-0350.00 James River at Cartersville, Va.

Location.--Lat 37°40'15", long 78°05'10", on left bank 200 ft downstream from bridge on State Highway 45 between Pemberton and Cartersville, Cumberland County, 2 miles downstream from Willis River, and at mile 152.4.

Drainage area.--6,242 sq mi.

Gage-height record.--Digital recorder tape punched at 30-minute intervals except 2000 hours Aug. 20 to 1200 hours Aug. 23, for which graph was drawn on basis of peak stage and typical recession. Datum of gage is 161.57 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 160,000 cfs and extended above on basis of slope-conveyence measurement.

Maxima.--August 1969: Discharge, 250,000 cfs 0600 hours Aug. 21 (gage height, 33.75 ft, from floodmarks).

1899 to July 1969: Discharge, 180,000 cfs Sept. 20, 1944 (gage height, 29.6 ft, from floodmark in gage).

Floods of Oct. 1, 1870 and Nov. 25, 1877 reached a stage of 32 ft (from report by Corps of Engineers).

Time	Gage Height	Discharge
Aug. 19		
2400	3.52	5,800
Mean----------		5,660
Aug. 20		
0400	4.04	6,800
0500	4.41	7,620
0600	6.50	13,000
0700	9.79	23,400
0800	12.77	35,100
0900	15.66	47,800
1000	17.66	57,700
1100	19.24	65,800
1200	20.46	73,200
1400	22.40	85,600
1600	24.58	104,000
1800	27.24	132,000
2000	29.81	170,000
2200	31.20	197,000
2400	32.40	221,000
Mean----------		82,800
Aug. 21		
0200	33.25	238,000
0600	33.75	250,000
1200	32.65	225,000
1800	31.25	197,000
2400	30.00	173,000
Mean----------		216,000
Aug. 22		
0400	28.70	152,000
0800	27.30	133,000
1200	26.00	118,000
1800	23.90	98,100
2400	21.30	78,000
Mean----------		119,000
Aug. 23		
0400	18.00	59,200
0800	13.90	39,700
1200	12.02	31,800
1600	10.78	27,000
2000	9.82	23,400
2400	9.22	21,300
Mean----------		37,200
Aug. 24		
0800	8.34	18,400
1600	7.62	16,200
2400	7.03	14,400
Mean----------		17,400
Aug. 25		
1200	6.21	12,200
1800	5.87	11,300
2400	5.59	10,500
Mean----------		12,200

02-0354.00 Big Lickinghole Creek tributary near Ferncliff, Va.
(Crest-stage station)

Location.--Lat 37°49'34", long 77°58'23", at bridge on U. S. Highway 250, 10.1 miles southeast of Ferncliff, Louisa County.

Drainage area.--0.55 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 235 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by contracted-opening measurements at 150 and 600 cfs.

Maxima.--August 1969: Discharge, 600 cfs Aug. 20 (gage height, 5.55 ft).
1962 to July 1969: Discharge, 150 cfs Nov. 21, 1961 (gage height, 4.28 ft).

02-0354.50 Mill Creek near Gum Springs, Va.
(Flood-hydrograph station)

Location.--Lat 37°47'15", long 77°54'40", at culvert on U. S. Highway 250, 0.8 mile upstream from mouth, and 1.2 miles northwest of Gum Springs, Louisa County.

Drainage area.--0.34 sq mi.

Gage-height record.--Flood-hydrograph recorder graph. Altitude of gage is 295 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by indirect methods.

Maxima.--August 1969: Discharge, 190 cfs Aug. 20 (gage height, 9.72 ft).
1966 to July 1969: Discharge, 142 cfs Aug. 19, 1968 (gage height, 7.59 ft).

02-0365.00 Fine Creek at Fine Creek Mills, Va.

Location.--Lat 37°35'52", long 77°49'12", on right bank 75 ft downstream from bridge on State Highway 711, at Fine Creek Mills, Powhatan County, 0.8 mile upstream from mouth, and 6.7 miles northeast of Powhatan.

Drainage area.--23 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 156.59 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,500 cfs and extended above by logarithmic plotting.

Maxima.--August 1969: Discharge, 392 cfs 2,130 hours Aug. 20 (gage height, 3.55 ft).
1945 to July 1969: Discharge, 3,640 cfs Oct. 21, 1961 (gage height, 8.35 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

02-0375.00 James River near Richmond, Va.

Location.--Lat 37°33'47", long 77°32'50", on left bank 0.1 mile upstream from Huguenot Memorial Bridge, 0.5 mile west of city limits of Richmond, Henrico County, 1.7 miles downstream from Bosher Dam, 3.3 miles upstream from Powhite Creek, and at mile 111.7.

Drainage area.--6,757 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 98.82 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--August 1969: Discharge, 222,000 cfs 2400 hours Aug. 21 (gage height, 24.95 ft). 1934 to July 1969: Discharge, 175,000 cfs Mar. 19, 1936 (gage height, 23.42 ft).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.

Time	Gage Height	Discharge
Aug. 18		
2400	4.59	3,450
Mean		3,200
Aug. 19		
0400	4.75	3,820
0800	4.80	3,950
1200	4.81	3,950
1600	4.92	4,200
2000	5.14	4,840
2400	5.27	5,120
Mean		4,170
Aug. 20		
0200	5.29	5,260
0400	5.30	5,260
0600	5.49	5,850
0800	6.02	7,490
1000	6.82	10,500
1200	7.52	13,500
1400	10.02	26,600
1600	12.77	46,500
1800	13.97	57,000
2000	14.74	63,600
2200	15.32	69,600
2400	15.95	77,200
Mean		29,400
Aug. 21		
0200	16.80	86,100
0400	17.59	95,700
0600	18.52	108,000
0800	19.84	128,000
1000	21.27	153,000
1200	22.52	174,000
1400	23.42	192,000
1600	24.04	203,000
1800	24.52	212,000
2000	24.78	218,000
2200	24.92	220,000
2400	24.95	222,000
Mean		162,000
Aug. 22		
0400	24.77	218,000
0800	24.37	211,000
1200	23.80	199,000
1600	23.05	184,000
2000	22.18	169,000
2400	21.30	153,000
Mean		195,000
Aug. 23		
0300	20.67	143,000
0600	19.94	129,000
0900	19.22	119,000
1200	18.38	106,000
1500	17.47	94,500
1800	16.00	77,200
2100	14.12	57,900
2400	12.52	44,000
Mean		103,000
Aug. 24		
0400	10.80	31,600
0800	9.82	25,400
1200	9.24	22,000
1600	8.84	19,900
2000	8.54	18,400
2400	8.28	17,400
Mean		24,700
Aug. 25		
0400	8.07	16,400
0800	7.88	15,400
1200	7.71	14,500
1600	7.52	13,500
2000	7.27	12,600
2400	6.97	11,300
Mean		14,500
Aug. 26		
0600	6.78	10,500
1200	6.60	9,700
1800	6.47	9,130
2400	6.34	8,755
Mean		9,840
Aug. 27		
2400	5.88	7,150
Mean		7,840
Aug. 28		
2400	5.48	5,850
Mean		6,320

02-0377.00 James River at Richmond, Va.
(U. S. Weather Bureau gage)

Location.--Lat 37°31'31", long 77°25'07", at City Locks entrance to Kanawha Canal, in City of Richmond just south of Dock Street and foot of Pear Street, and at mile 103.7.

Drainage area.--Not determined.

Gage-height record.--Telemark called once daily and hourly for significant rises. Datum of gage at mean sea level, datum of 1929. Prior to September 1957, at site 0.9 mile upstream at datum 2.36 ft higher.

Maxima.--August 1969: Stage, 28.64 ft 0600 hours Aug. 22.
1771 to July 1969: Stage, 38 ft May 27, 1771 (from report by Corps of Engineers).

Time	Gage Height	Discharge	Time	Gage Height	Discharge	Time	Gage Height	Discharge
Aug. 20			Aug. 21--Continued			Aug. 23		
1400	1.16	-	1600	24.00	-	0200	23.62	-
1600	3.25	-	1800	25.43	-	0400	22.81	-
1800	5.48	-	1900	25.60	-	0600	22.03	-
2000	8.15	-	2000	26.30	-	0800	21.14	-
2200	9.38	-	2200	27.20	-	1200	19.31	-
2400	10.21	-	2400	27.70	-	1600	17.43	-
						2000	14.47	-
Aug. 21			Aug. 22			2400	10.49	-
0200	10.98	-	0200	28.30	-	Aug. 24		
0400	12.04	-	0400	28.52	-			
0500	12.52	-	0600	28.64	-	0300	7.98	-
0600	13.23	-	0700	28.64	-	0600	5.90	-
0700	14.21	-	0800	28.57	-	0900	4.10	-
0800	16.09	-	1000	28.37	-	1200	3.50	-
0900	17.05	-	1200	28.09	-	1800	2.30	-
1000	17.68	-	1400	27.64	-	2400	3.20	-
1100	18.88	-	1600	27.18	-			
1200	20.55	-	1800	26.47	-			
1300	21.34	-	2000	25.74	-			
1400	22.26	-	2200	25.18	-			
1500	23.26	-	2400	24.39	-			

02-0378.00 Falling Creek near Midlothian, Va.
(Crest-stage station)

Location.--Lat 37°27'15", long 77°35'20", at bridge on State Highway 653, 4 miles southeast of Midlothian, Chesterfield County.

Drainage area.--18.1 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 170 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 270 cfs and by contracted-opening measurements at 943 and 1,450 cfs.

Maxima.--August 1969: Discharge, 251 cfs Aug. 20 (gage height, 4.07 ft).
1951 to July 1969: Discharge, 1,450 cfs Sept. 12, 1960 (gage height, 8.62 ft).

02-0380.00 Falling Creek near Chesterfield, Va.

Location.--Lat 37°26'37", long 77°31'21", on left bank at upstream side of bridge on State Highway 651, 0.8 mile downstream from Licking Creek, 2.8 miles upstream from Pocoshock Creek, and 4.7 miles northwest of Chesterfield, Chesterfield County.

Drainage area.--32.8 sq mi.

Gage-height record.--Digital recorder tape punched at 15-minute intervals. Datum of gage is 126.39 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,400 cfs and extended above by logarithmic plotting.

Maxima.--August 1969: Discharge, 171 cfs 1300 hours Aug. 20 (gage height, 4.95 ft).
1955 to July 1969: Discharge, 2,510 cfs Sept. 12, 1960 (gage height, 12.67 ft).

02-0400.00 Appomattox River at Mattoax, Va.

Location.--Lat 37°25'17", long 77°51'33", on right bank 75 ft upstream from Southern Railway bridge at Mattoax, Amelia County, 0.3 mile upstream from Skinquarter Creek, and 3.7 miles upstream from Flat Creek.

Drainage area.--729 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 174.51 ft above mean sea level, datum of 1929, supplementary adjustment of 1936.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 20,000 cfs and extended above on basis of records for stations at Farmville and near Petersburg.

Maxima.--August 1969: Discharge, 2,290 cfs 1630 hours Aug. 20 (gage height, 13.94 ft).
1901-05, 1926 to July 1969: Discharge, 35,000 cfs Aug. 18, 1940 (gage height, 35.3 ft, from floodmark in gage house).

Remarks.--Records computed and furnished by the Virginia Department of Conservation and Economic Development, Division of Water Resources.