INTRODUCTION

The West Virginina Water Science Center of the U.S. Geological Survey, in cooperation with State and Federal agencies, obtains a large amount of data pertaining to the water resources of West Virginia each water year. These data, accumulated during many water years, constitute a valuable data base for developing an improved understanding of the water resources of the State. To make these data readily available to interested parties outside the Geological Survey, the data are published annually in this report series titled "Water Resources Data - West Virginia."

This report includes records on both surface and ground water in the State. Specifically, it contains: Discharge records for 65 streamflow-gaging stations; discharge records provided by adjacent states for 8 streamflow-gaging stations; annual maximum discharge at 17 crest-stage partial-record stations; stage records for 14 detention reservoirs; water-quality records for 2 stations; and water-level records for 10 observation wells. Locations of streamflow, detention reservoir, and water-quality stations are shown on figure 4. Locations of ground-water observation wells are shown on figure 5. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous sites. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in West Virginia.

This series of annual reports for West Virginia began with the 1961 water year with a report that contained only data relating to the quantities of surface water. For the 1964 water year, a similar report was introduced that contained only data relating to water quality. Beginning with the 1975 water year, the report format was changed to present, in one volume, data on quantities of surface water, quality of surface and ground water, and ground-water levels.

Prior to introduction of this series and for several water years concurrent with it, water resources data for West Virginia were published in U.S. Geological Survey Water-Supply Papers. Data on stream discharge and stage and on lake or reservoir contents and stage, through September 1960, were published annually under the title "Surface-Water Supply of the United States, Parts 6A and 6B." For the 1961 through 1970 water years, the data were published in two 5-year reports. Data on chemical quality, temperature, and suspended sediment for the 1941 through 1970 water years were published annually under the title "Quality of Surface Waters of the United States," and water levels for the 1935 through 1974 water years were published under the title "Ground-Water Levels in the United States." The above mentioned Water-Supply Papers may be consulted in the libraries of the principal cities of the United States and may be purchased from the U. S. Geological Survey, Books and Open-File Reports, Federal Center, Box 25425, Denver, Colorado 80225.

Publications similar to this report are published annually by the Geological Survey for all States. These official Survey reports have an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number. For example, this volume is identified as "U.S. Geological Survey Water-Data Report WV-04-1." For archiving and general distribution, the reports for 1971-74 water years also are identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22161. Additional information, including current prices, for ordering specific reports may be obtained from the Water Science Center Director at the address given on the back of the title page or by telephone (304) 347-5130.

COOPERATION

The U.S. Geological Survey and agencies of the State of West Virginia have had joint-funding agreements for the collection of water-resource records since 1930. Organizations that assisted in collection, compilation, and publication of the data in this report through joint-funding agreement with the Survey are:

West Virginia Department of Military Affairs and Public Safety, James W. Spears, Secretary through West Virginia Office of Emergency Services, Stephen Kappa, Director.

West Virginia Department of Environmental Protection, Stephanie Timmermeyer, Secretary.
Division of Water and Waste Management, Lisa McClung, Director.
Division of Mining and Reclamation, Franklin J. Parker, Director.

West Virginia Department of Transportation, Danny Ellis, Secretary.

West Virginia Conservation Agency, Truman Wolfe, Director.

West Virginia Division of Natural Resources, Frank Jezioro, Director.

City of Hurricane, West Virginia, Raymond Peak, Mayor.

Assistance with funds or services was given by the U.S. Army Corps of Engineers, National Park Service, Office of Surface Mining and Reclamation, and U.S. Environmental Protection Agency.

Assistance was also furnished by the National Weather Service of the U.S. Department of Commerce.

Organizations that provided data are acknowledged in station descriptions.

SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

Monthly and annual mean discharges for the 2004 water year as compared to the median of mean monthly and yearly discharges for water years 1931-2000 for four streamflow stations in West Virginia are shown in figures 1 and 2. Monthly average streamflow at these streamflow-gaging stations was at or greater than the long-term average for each month of the year. Mean, maximum, and minimum stream statistics for the 2004 water year for selected gaging stations in West Virginia are shown in table 1. Streamflow throughout the State, as represented by the selected gaging stations shown in table 1, ranged between 107 and 201 percent of average for the year. Base flow of streams throughout the State was well maintained, and the minimum 7-day mean streamflows were significantly greater than the expected low at a 10-year recurrence interval.

Monthly average streamflow was above normal in October, even though precipitation was near normal, because of continued runoff from Hurricane Isabel September 19-20, 2003. Rainfall of 2 to 4 inches fell November 11-13 causing significant stream rises. Beginning November 18, another storm system brought widespread rains on already-saturated ground of about 3 inches with higher localized amounts of 4 to 5 inches. Rises in streamflow to the 5-year recurrence interval were common throughout the State. Flood peaks to the 25-year recurrence interval occurred on the South Branch Potomac River at Franklin in the Potomac River Basin and on Buffalo Creek at Barrackville in the Monongahela River Basin. Flood peaks above the 25-year recurrence interval occurred on the Guyandotte River near Baileysville and at several stream gages in the Kanawha River Basin. The Kanawha River at Charleston exceeded flood stage for the first time since 1955 reaching 37.65 feet on November 20.

During the evening of February 5 and the following morning, snow and rain totaling 1 to 2.5 inches fell across portions of the State. Peak flows resulting from this storm approached the 10-year recurrence interval in the Tygart Valley River system of the Monongahela River Basin.

The only other period of peak flows at gages exceeding the 5-year recurrence interval occurred when rain totaling 5 to 9 inches fell during September in the Wheeling Creek Basin from Hurricane Ivan. The peak flow at Wheeling Creek at Elm Grove approached the 50-year recurrence interval on September 17. Ivan tracked along the Ohio River, and localized runoff caused a rise of over 21 feet in 24 hours between September 17 and 18 on the Ohio River at Marietta, OH. The river peaked at a stage of 42.37 feet, which was 7 feet above flood stage and the highest level since 1964.

Ground-Water Levels

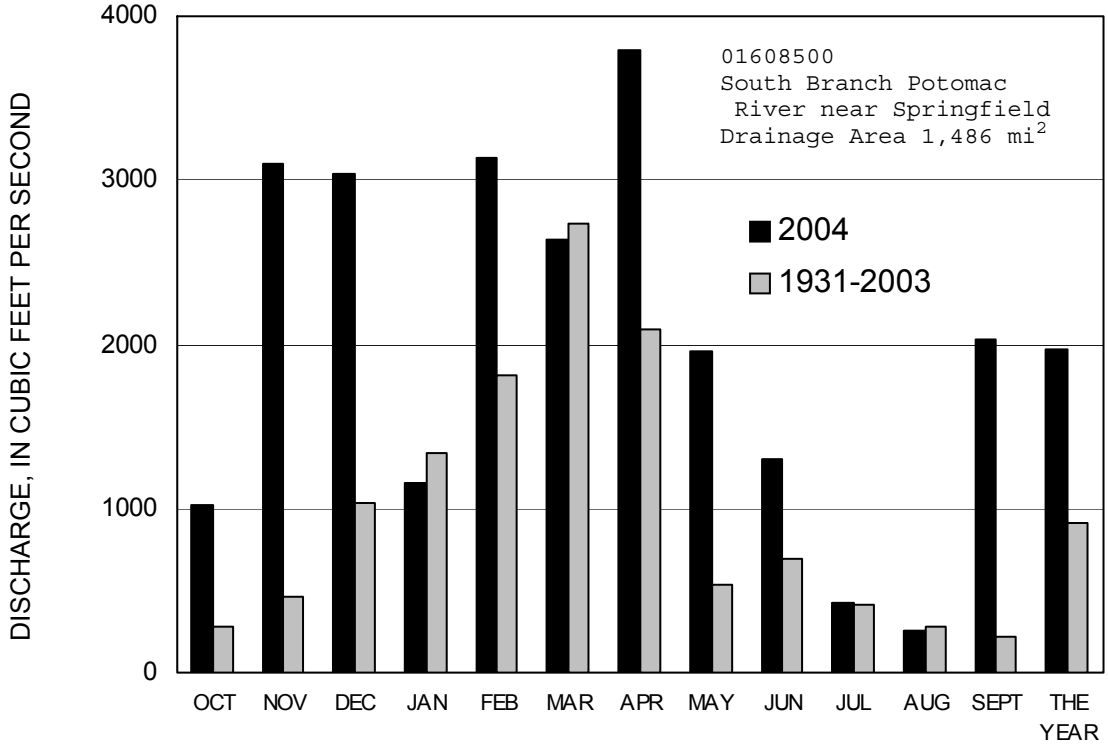
Ground-water levels were normal to above normal statewide for the entire year. In Berkeley, Grant, and Wayne Counties, water levels remained above normal the entire year. The year started with above normal water levels in October of 2003 everywhere within the State except in Mingo County where levels were near normal. Ground-water levels remained above normal through December of 2003. In January 2004, water levels began to fall towards more normal levels except in Berkeley, Grant, and Wayne counties where they remained above normal. In June, mostly as a result of summer thunderstorms, water levels began to rise back to above normal levels. In the period from July through September 2004, water levels remained either normal or above normal. There did not appear to be any specific geographic distribution of areas with either near normal or above normal water levels, and none of the major hurricanes that impacted the mid-Atlantic area appeared to have significant impacts on ground-water levels within the State.

Quality of Water

Surface water: Waites Run near Wardensville was sampled as part of the National Water Quality Assessment (NAWQA) of the Potomac River and Delmarva Peninsula Basins. This site, located in a relatively undisturbed forested basin, is used as a comparative reference condition for the Potomac/ Delmarva study unit. More information on the NAWQA program is available on page 12.

Ground water: Each year, 30 wells are sampled in cooperation with the West Virginia Department of Environmental Protection, Division of Water and Waste Management, in an effort to ascertain the characteristics and quality of water in the State's major aquifers. In 2003, at the completion of a 5-year cycle, ground-water samples had been obtained from all major surface-water drainage basins in West Virginia. During 2004, the start of another 5-year cycle, ambient ground water was sampled in the following basins: Gauley River, Lower Guyandotte River, Northern Middle Ohio River, Southern Middle Ohio River, direct tributaries to the Potomac River, and Tug Fork.

Surface and ground water: Seven wells, four drive points, two stream sites, and one spring were sampled for major ions, nutrients, total arsenic, and various arsenic species in the Muddy Creek drainage of Virginia to determine how arsenic cycles through an agricultural watershed. The data were collected to examine arsenic transport through the agricultural watershed, sorption and desorption of arsenic species, biotransformation of arsenic in poultry litter, and effects of poultry litter application to soil.



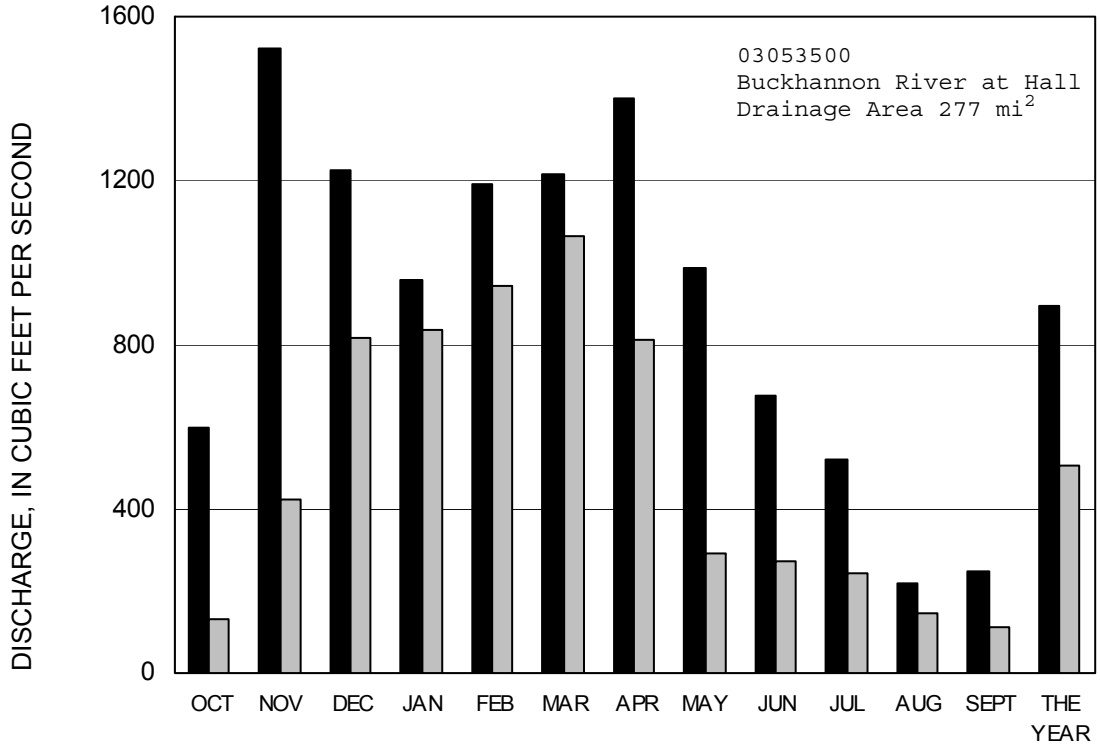
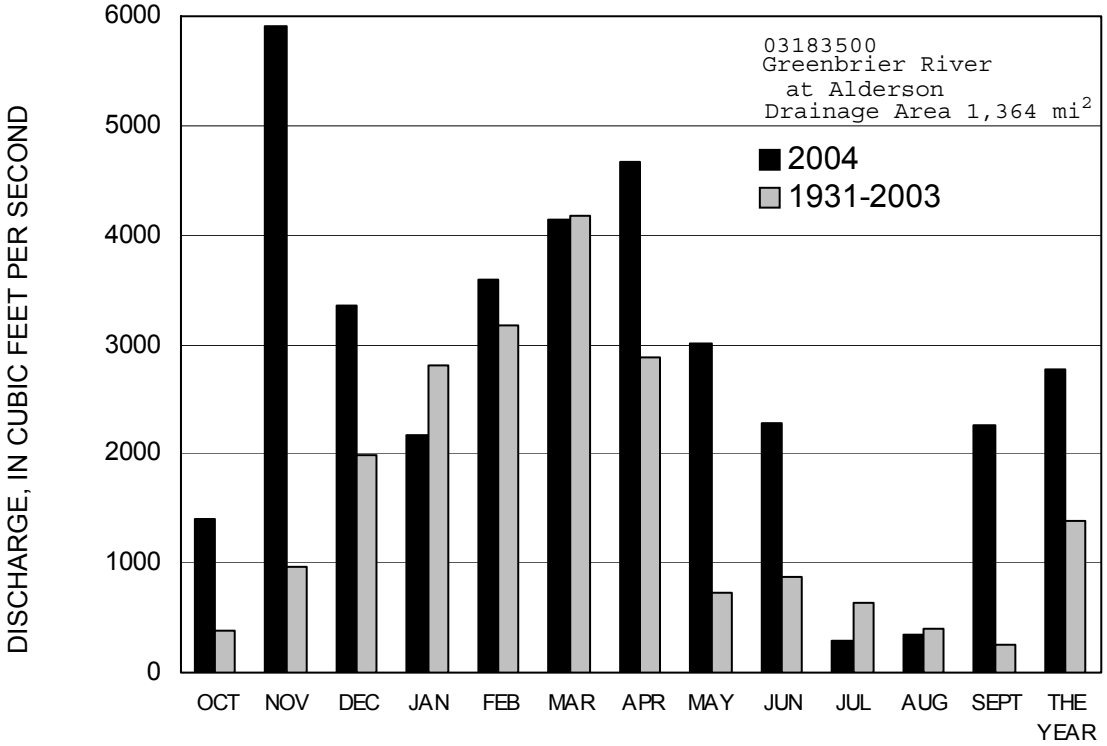


Figure 1. --Discharge at the South Branch Potomac River and the Buckhannon River index gaging stations during the 2004 water year compared to median discharge for the period 1931-2003.



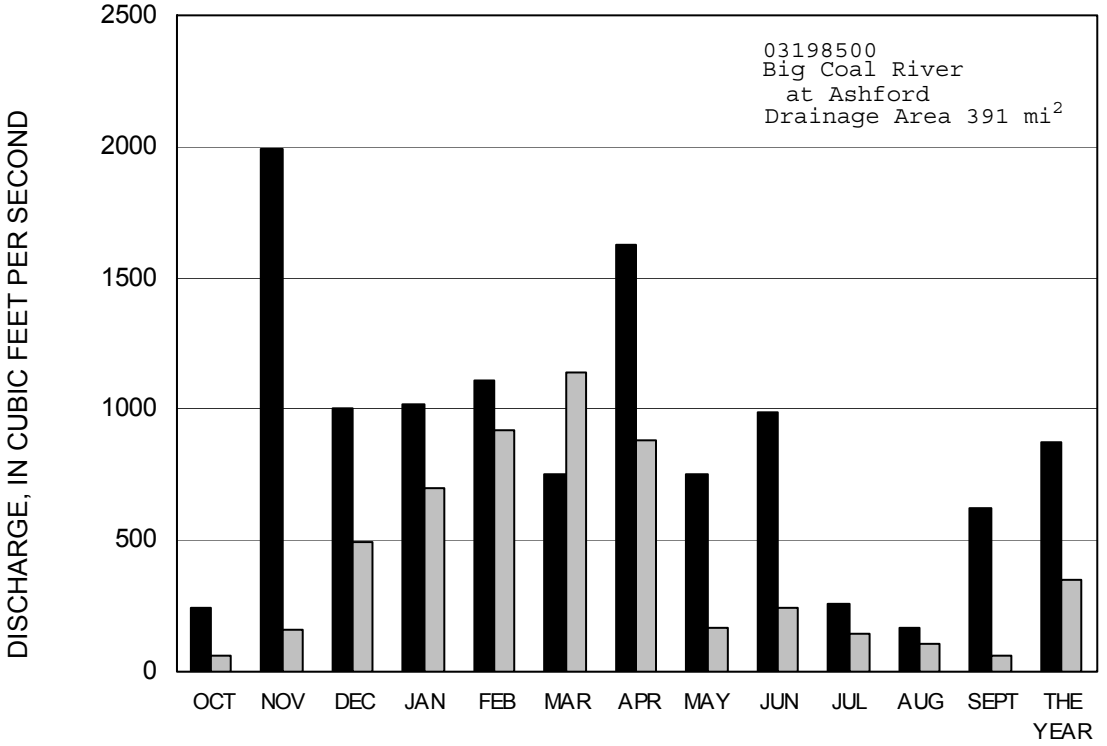


Figure 2. --Discharge at the Greenbrier River and the Big Coal River index gaging stations during the 2004 water year compared to median discharge for the period 1931-2003.

Table 1.--Mean, maximum, and minimum stream statistics for water year 2004 at selected stations in West Virginia.

[$7Q_{10}$: 7-day minimum mean streamflow for 10-year recurrence interval; R: regulated period only; ---: unknown or not applicable.]

Station number	Station name	Drainage Area (mi^2)	Years of Discharge Record	--------MEAN-------- Daily Streamflow (ft^3/s)	Percent of Average	----------MAXIMUM---------- Peak Stage (ft)	Peak Discharge (ft^3/s)	Date	Recurrence Interval (Years) (a)	--------MINIMUM-------- 7-day Mean Streamflow (ft^3/s)	$7Q_{10}$ Streamflow (ft^3/s) (b)
	POTOMAC RIVER BASIN										
01595200	Stony River nr Mount Storm	48.7	43	126	127	6.88	1,850	Sep 8	---	8.4	---
01604500	Patterson Creek nr Headsville	211	67	234	134	9.03	2,890	Feb 6	<2	13	2.9
01605500	South Branch Potomac R at Franklin	179	57	264	149	12.26	16,800	Nov 19	25	43	18.3
01606000	NF South Branch Potomac River at Cabins	335	30	615	151	11.06	12,600	Nov 19	2-5	18	7.3
01606500	South Branch Potomac River nr Petersburg	676	76	1,108	148	14.86	29,000	Nov 19	5-10	106	52
01607500	SF South Branch Potomac R at Brandywine	103	61	155	148	6.68	3,170	Sep 28	2	7.0	2.3
01608000	SF South Branch Potomac R nr Moorefield	277	73	326	139	8.35	7,570	Sep 28	2	21	8.5
01608070	South Branch Potomac River near Moorefield	1,241	---	---	---	18.41	---	Nov 20	---	---	---
01608500	South Branch Potomac River nr Springfield	1,486	80	1,976	146	18.00	29,000	Nov 20	2-5	155	---
01611500	Cacapon River nr Great Cacapon	675	81	1,010	170	12.54	14,000	Dec 11	2	84	37.7
01616500	Opequon Creek nr Martinsburg	273	57	398	161	13.21	6,980	Sep 29	2-5	100	34.1
01636500	Shenandoah River at Millville	3,022	89	3,921	141	14.15	44,500	Sep 30	2-5	700	---
	MONONGAHELA RIVER BASIN										
03050000	Tygart Valley River near Dailey	185	16	479	134	12.60	9,670	Feb 6	5	7.6	1.6
03050500	Tygart Valley River nr Elkins	271	60	669	127	14.79	8,860	Feb 7	2-5	26	13.9
03051000	Tygart Valley River at Belington	406	97	1,094	133	16.92	14,700	Feb 7	5-10	48	4.8
03052000	Middle Fork River at Audra	148	53	494	139	10.41	7,160	Feb 6	2-5	32	.9
03052500	Sand Run nr Buckhannon	14.3	58	42	151	6.72	1,410	Nov 19	5-10	.97	.8
03052450	Buckhannon River at Buckhannon	217	---	---	---	25.06	---	Dec 7	---	---	---
03053500	Buckhannon River at Hall	277	89	895	148	12.97	8,950	Feb 7	2-5	65	3.0
03054500	Tygart Valley River at Philippi	914	64	2,757	144	21.40	33,000	Feb 7	5-10	155	---
03056250	Three Fork Creek nr Grafton	96.8	20	251	138	15.72	7,540	Nov 19	5-10	18	---
03057000	Tygart Valley River at Colfax	1,363	---	---	---	15.09	---	Nov 19	---	---	---
03057300	West Fork River at Walkersville	28.8	---	---	---	14.97	---	Nov 19	---	---	---
03058500	West Fork River at Butcherville	181	---	---	---	10.02	---	Nov 19	---	---	---
03058975	West Fork River nr Mount Clare	368	17	887	R150	18.25	10,900	Nov 20	---	94	---
03061000	West Fork River at Enterprise	759	71	1,859	R155	23.81	28,100	Nov 19	5-10	170	15.2
03061500	Buffalo Creek at Barrackville	116	81	245	145	14.08	9,460	Nov 19	25	18	.8
03062500	Deckers Creek at Morgantown	63.2	25	148	141	5.77	2,290	Nov 19	2-5	8.8	1.0
03065000	Dry Fork at Hendricks	349	62	1,046	133	7.40	11,000	Feb 6	<2	69	11.5
03065400	Blackwater River nr Davis	54.7	13	175	107	6.22	1,430	Feb 7	---	10	---

Table 1.--Mean, maximum, and minimum stream statistics for water year 2004 at selected stations in West Virginia--Continued.

[$7Q_{10}$: 7-day minimum mean streamflow for 10-year recurrence interval; R: regulated period only; ---: unknown or not applicable.]

Station number	Station name	Drainage Area (mi^2)	Years of Discharge Record	--------MEAN-------- Daily Streamflow (ft^3/s)	Percent of Average	----------MAXIMUM---------- Peak Stage (ft)	Peak Discharge (ft^3/s)		Recurrence Interval (Years) (a)	--------MINIMUM-------- 7-day Mean Streamflow (ft^3/s)	$7Q_{10}$ Streamflow (ft^3/s) (b)
	MONONGAHELA RIVER BASIN--										
03066000	Blackwater River at Davis	85.9	83	273	134	7.99	2,360	Feb 6	2	17	5.0
03067510	Shavers Fork nr Cheat Bridge	60.2	3	222	108	15.57	7,600	Nov 19	---	14	---
03068800	Shavers Fork below Bowden	151	15	552	123	12.37	22,900	Nov 19	---	52	25.4
03069500	Cheat River nr Parsons	722	91	2,379	137	12.87	31,100	Nov 19	2-5	177	---
03069870	Cheat River near Rowlesburg	912	7	3,302	126	12.83	29,700	Nov 20	---	276	---
03070500	Big Sandy Creek at Rockville	200	91	614	146	12.66	8,930	Nov 19	2-5	43	24.2
	WHEELING CREEK BASIN										
03110830	Kings Cr at Weirton	49.0	3	100	148	17.21	8,700	Sep 17	---	12	---
03112000	Wheeling Creek at Elm Grove	281	64	653	192	13.83	22,300	Sep 17	25-50	48	.6
	LITTLE KANAWHA RIVER BASIN										
03151400	Little Kanawha River nr Wildcat	112	29	317	138	13.14	7,790	May 5	5	12	2.7
03151600	Little Kanawha River at Burnsville	248	---	---	---	15.74	---	Nov 19	---	---	---
03152000	Little Kanawha River at Glenville	387	---	---	---	30.37	---	Nov 19	---	---	---
03153500	Little Kanawha River at Grantsville	913	---	---	---	39.42	---	Nov 20	---	---	---
03154000	West Fork Little Kanawha River at Rocksdale	205	---	---	---	26.63	---	Nov 19	---	---	---
03155000	Little Kanawha River at Palestine	1,516	65	3,238	145	35.22	40,400	Nov 20	5-10	107	---
	KANAWHA RIVER BASIN										
03179000	Bluestone River nr Pipestem	395	54	750	158	15.57	18,700	Nov 19	25-50	68	13.3
03180500	Greenbrier River at Durbin	133	61	371	139	7.33	7,390	Feb 6	5	14	2.3
03182500	Greenbrier River at Buckeye	540	75	1,236	138	15.91	31,800	Nov 19	10	68	13.9
03183500	Greenbrier River at Alderson	1,364	109	2,768	138	16.88	45,400	Nov 20	5	159	---
03184000	Greenbrier River at Hilldale	1,619	68	3,314	144	19.57	49,000	Nov 20	5	125	---
03184500	New River at Hinton	6,256	67	---	---	9.05	---	Nov 20	---	---	---
03185000	Piney Creek at Raleigh	52.7	32	130	201	9.12	2,790	May 31	10-25	19	.7
03185400	New River at Thurmond	6,687	23	12,270	R138	19.05	84,600	Nov 20	---	2,270	---
03186500	Williams River at Dyer	128	75	437	130	16.99	20,000	Nov 19	50	10	2.3
03187000	Gauley River at Camden-on-Gauley	236	---	---	---	22.65	---	Nov 19	---	---	---
03187500	Cranberry River nr Richwood	80.4	45	299	128	11.90	12,200	Nov 19	50	10	2.9
03189100	Gauley River near Craigsville	529	19	1,858	129	25.94	63,500	Nov 19	50-100	56	---
03189600	Gauley River below Summersville Dam	806	33	---	---	18.50	---	Nov 20 May 29	---	---	---
03190400	Meadow River nr Mt. Lookout	365	35	992	134	16.31	27,200	Nov 19	>100	33	16.9

Table 1.--Mean, maximum, and minimum stream statistics for water year 2004 at selected stations in West Virginia--Continued.

[$7Q_{10}$: 7-day minimum mean streamflow for 10-year recurrence interval; R: regulated period only; ---: unknown or not applicable.]

Station number	Station name	Drainage Area (mi^2)	Years of Discharge Record	MEAN: Daily Streamflow (ft^3/s)	MEAN: Percent of Average	MAXIMUM: Peak Stage (ft)	MAXIMUM: Peak Discharge (ft^3/s)	MAXIMUM:	MAXIMUM: Recurrence Interval (Years) (a)	MINIMUM: 7-day Mean Streamflow (ft^3/s)	MINIMUM: $7Q_{10}$ Streamflow (ft^3/s) (b)
	KANAWHA RIVER BASIN--Continued										
03191500	Peters Creek nr Lockwood	40.2	32	101	156	14.79	5,030	Nov 12	10	7.5	.1
03192000	Gauley River above Belva	1,317	76	3,950	R137	19.23	47,800	Nov 19	2-5	249	---
03193000	Kanawha River at Kanawha Falls	8,371	127	17,730	R146	22.06	147,000	Nov 19	---	2,570	---
03194700	Elk River below Webster Springs	266	44	835	120	13.76	23,000	Nov 19	10-25	43	13.7
03195500	Elk River at Sutton	542	---	---	---	20.89	---	Feb 7	---	---	---
03196600	Elk River near Frametown	751	---	---	---	15.45	---	Nov 19	---	---	---
03196800	Elk River at Clay	992	---	---	---	20.96	---	Nov 19	---	---	---
03197000	Elk River at Queen Shoals	1,145	76	2,887	R134	23.34	39,200	Nov 19	5-10	156	---
03197990	Kanawha River at Charleston	10,448	65	22,790	R150	37.65	156,000	Nov 20	---	2,990	---
03198350	Clear Fork at Whitesville	62.8	8	141	160	21.96	5,370	Nov 19	---	8.2	---
03198500	Big Coal River at Ashford	391	82	872	165	25.95	24,900	Nov 19	10-25	88	4.7
03200500	Coal River at Tornado	862	46	1,859	152	28.98	32,500	Nov 20	10	209	13.3
03201405	Hurricane Creek at Hurricane	26.8	5	62.2	174	18.01	3,690	Nov 19	---	1.1	---
	GUYANDOTTE RIVER BASIN										
03202400	Guyandotte River nr Baileysville	306	36	625	146	23.82	28,000	Nov 19	25-50	110	33.3
03202750	Clear Fork at Clear Fork	126	30	279	143	14.18	8,250	Nov 19	10-25	23	7.1
03202915	Guyandotte River below R.D. Bailey Dam	535	---	---	---	9.13	---	Feb 6	---	---	---
03203000	Guyandotte River at Man	758	---	---	---	14.85	---	Nov 19	---	---	---
03203600	Guyandotte River at Logan	833	42	1,689	R149	26.21	26,000	May 31	---	212	---
03204000	Guyandotte River at Branchland	1,224	---	---	---	28.54	---	Nov 20	---	---	---
	TWELVEPOLE CREEK BASIN										
03206600	East Fork Twelvepole Creek nr Dunlow	38.5	40	72	137	13.71	2,780	Nov 19	5-10	3.9	.03
03206790	EF Twelvepole Creek below East Lynn Dam	138	---	---	---	12.07	---	Feb 7	---	---	---
03207020	Twelvepole Creek below Wayne	291	---	---	---	24.57	---	Nov 13	---	---	---
	BIG SANDY RIVER BASIN										
03212750	Tug Fork at Welch	174	16	339	166	15.17	8,080	Nov 19	5-10	76	---
03212980	Dry Fork at Beartown	209	16	359	155	11.98	9,990	Nov 19	5-10	54	---
03213500	Panther Creek nr Panther	31.0	41	55	157	9.04	2,640	Nov 19	2-5	6.8	.16
03213700	Tug Fork at Williamson	936	37	1,655	146	29.08	23,800	Nov 20	2-5	240	---
03214500	Tug Fork at Kermit	1,280	19	2,206	149	39.73	2,790	May 31	2-5	324	---

a Based on U.S. Geological Survey Water-Resources Investigations Report 00-4080.

b Based on U.S. Geological Survey Water-Resources Investigations Report 88-4072.

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