SEDIMENT LOADS, DISCHARGES, AND YIELDS IN THE EAST BRANCH MAHONING CREEK BASIN, CLEARFIELD AND JEFFERSON COUNTIES, PENNSYLVANIA, JUNE 1979 THROUGH SEPTEMBER 1981

By Connie A. Loper and Kim L. Wetzel

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FACTORS FOR CONVERTING INCH-POUND UNITS TO METRIC (INTERNATIONAL SYSTEM) UNITS

For the convenience of readers who may prefer to use metric (International System) units rather than the inch-pound units used in this report, values may be converted by using the following factors:

Multiply inch-pound unit	By	To obtain metric units
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
acre	4,407	square meters (m^2)
square mile (mi^2)	2.59	square kilometers (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
ton	0.9072	megagram (Mg)
ton per square mile (ton/mi^2)	0.3502	megagram per square kilometer (Mg/km^2)

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ABSTRACT

Rainfall, streamflow, and sediment-discharge data were collected from the East Branch Mahoning Creek basin from June 1979 through September 1981 to evaluate sediment discharges from an area in which erosion and sediment controls were being used on surface-mined areas. The study was made by the U.S. Geological Survey in cooperation with the Pennsylvania Department of Environmental Resources, Bureau of Mining and Reclamation.

Sediment yields from the basin averaged 144 tons per square mile per year. During this study, 9,570 tons of sediment were transported from the East Branch Mahoning Creek basin; 551 tons of sediment were discharged from June through September 1979; 4,770 tons were discharged from October 1979 through September 1980; and 4,260 tons were discharged from October 1980 through September 1981. Monthly suspended-sediment loads increased after July 1980 when reclamation was accelerated.

The Beaver Run subbasin constitutes 7 percent of the East Branch Mahoning Creek basin and discharged 576 tons of sediment, which was 7 percent of the load transported from the basin from December 1979 through September 1981.

Turbidity and suspended-sediment concentration follow a log-linear relation throughout the range of measured values. Using this relation and the frequency distribution of suspended-sediment concentrations, the estimated turbidity levels in the stream were equal to or greater than 30 Nephelometric Turbidity Units (the level at which the stream becomes unusable as a public-water source) approximately 15 percent of the time during the study period.

INTRODUCTION

The U.S. Geological Survey, in cooperation with the Pennsylvania Department of Environmental Resources, Bureau of Mining and Reclamation (BMR), investigated sediment discharges in the East Branch Mahoning Creek basin in west-central Pennsylvania (fig. 1). The East Branch Mahoning Creek was selected for this study because it is used as a public-water supply, and the basin has been affected by extensive surface mining and associated land-surface reclamation. It had been thought that sediment eroded from active and reclaimed surface mines was adversely affecting the quality of water in the creek.

The purpose of the study was to determine sediment yields from the basin and any changes in the yields caused by the reclamation of previously mined areas. Sediment loads, concentrations, and discharges also were determined. The data-collection program included analysis of suspended sediment in samples from the streams, measurement of streamflow by continuous recorders, and measurement of precipitation at two sites in the basin. Turbidity and specific conductance of each sample also were measured.

DESCRIPTION OF THE EAST BRANCH MAHONING CREEK BASIN

Physiography and Geology

The East Branch Mahoning Creek basin (fig. 1) is in west-central Pennsylvania, about 5.5 mi (mile) south of DuBois. The basin is 9.5 mi long and 4 mi wide; the area of the basin upstream from the gaging station at site 1 is 29.6 mi^2 (square mile) in Clearfield and Jefferson Counties. The basin is in the Pittsburgh Plateaus Section of the Appalachian Plateaus physiographic province and has the characteristics of a high, maturely dissected plateau (Pennsylvania Department of Environmental Resources, 1980). Three major tributaries flow into the East Branch Mahoning Creek in typical dendritic pattern. Two of these tributaries--Laurel and Beech Runs--drain land representing a variety of uses, including surface mining and logging operations. Both Laurel and Beech Runs have steep gradients, averaging approximately 150 ft (feet) increased elevation per stream mile. The highest point of 2,266 ft is in the headwaters of Laurel Run. Steep slopes favor increased erosion and runoff and reduce natural ground-water recharge.

Beaver Run has a gentler slope resembling the main stem of the East Branch Mahoning Creek, which averages 50 ft increased elevation per stream mile. Beaver Run subbasin is at the northwestern edge of the East Branch Mahoning Creek basin and drains a 2.21 mi^2 area of predominantly agricultural use. Site 2 is located at the northern basin boundary near Troutville which is the only village in the study area.

The geologic formations underlying the East Branch Mahoning Creek basin consist of rock types found in the Allegheny and overlying Conemaugh Groups of Pennsylvanian age. The Allegheny Group contains sandstones and limestones that separate extensive beds of coal. The Conemaugh consists of shale and siltstone with interbeds of sandstone, and thin and laterally discontinuous beds of coal and limestone. The shales and siltstones in the Conemaugh Group are of generally low permeability. Sandstones are usually more permeable than shales and, therefore, generally transmit ground water more readily.

Major mineral resources in the basin are bituminous-coal deposits and deep and shallow natural gas fields. The coal deposits are the more abundant of the two resources and are extracted by surface strip mining. Surface mining disturbs large areas of land that are readily eroded if erosion controls are not used. The thickness of the coal in the Upper and Lower Freeport seams in the Allegheny Group averages 40 inches; these seams compose the largest coal reserves in the basin. There are 300 to 400 active gas wells in the basin (L. DiLissio, BMR, written commun., 1981).

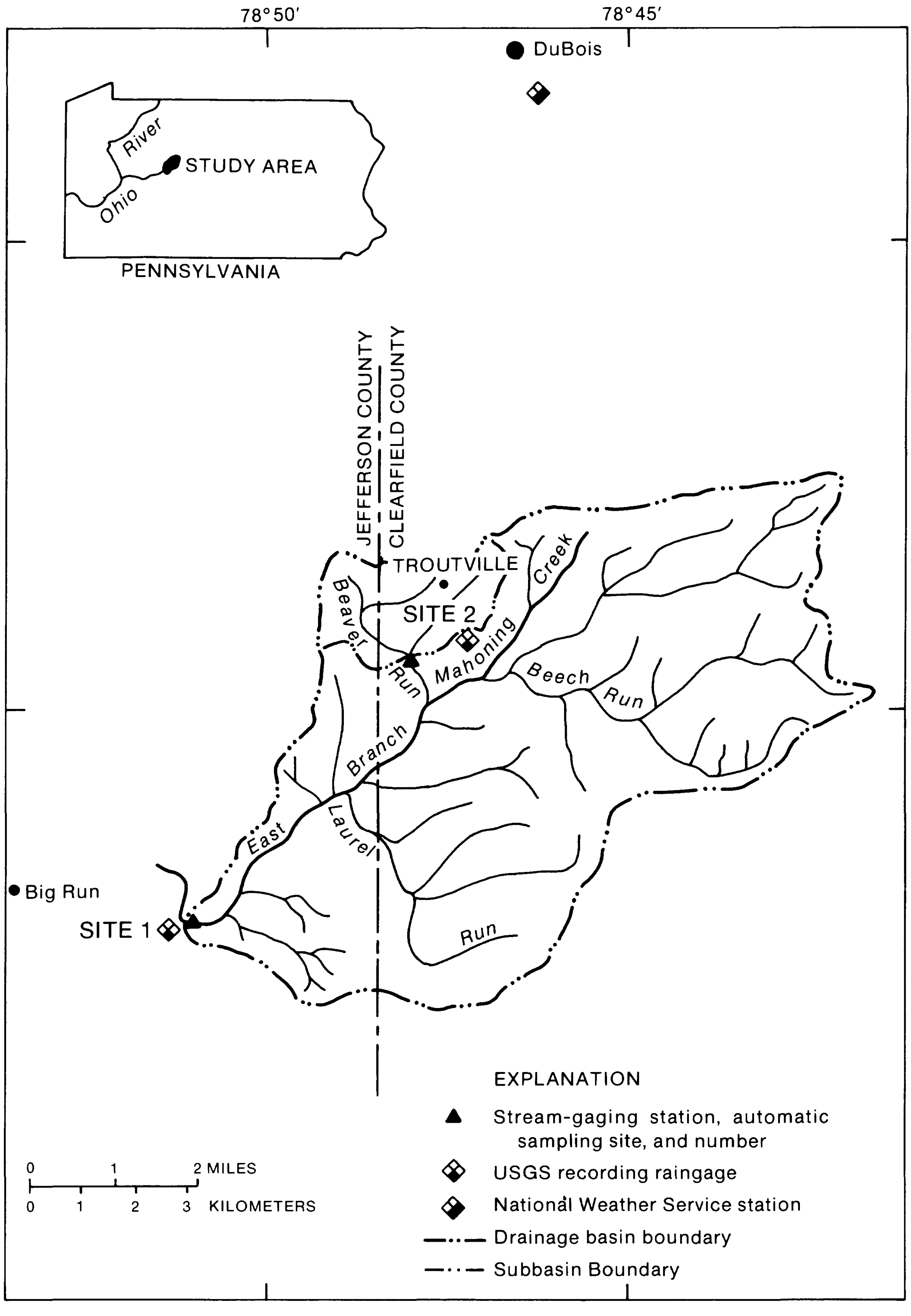

Figure 1.-- Location of East Branch Mahoning Creek basin.

Soils

Soils in the East Branch Mahoning Creek basin are from materials weathered from noncarbonate sedimentary rocks, predominantly of the Gilpin-Ernest-Wharton association (U.S. Department of Agriculture, 1972). The moderately fine to fine-textured soils in this group have low infiltration rates that can increase runoff. These soils have a moderate soil erodibility factor (K value) of 0.28. Soils with a K value of 0.17 or less are generally considered slightly erodible; those with a K value between 0.17 and 0.45 are moderately erodible, and those with a K value of 0.45 or higher are highly erodible (U. S. Soil Conservation Service, 1972, p. 4). Soil erodibility is affected predominantly by the particle-size composition and structure of the soil; however, during intense rain storms, even soils with low erodibility factors on steep slopes may be affected by rill and gully erosion. Also, soils in disturbed areas can be more easily eroded regardless of the listed K value for the soil type because the structure has been changed (Wischmeier and Smith, 1965).

Land Use

During the study period, 58 percent of the East Branch Mahoning Creek basin was forested, 26 percent was cropland; 1 percent was towns and paved roads; 11 percent was haul roads or reclaimed mined land, and 4 percent was actively mined land. The area affected by mining has been maintained at about 2,900 acres (G. Hess, BMR, oral commun., 1983).

Disturbed lands can greatly affect the water quality in an area. In East Branch Mahoning Creek basin, sediment is added to the streams from several sources. In some areas, forests are disrupted by logging operations that remove vegetative cover. This removal results in increased storm runoff and soil erosion, and decreased infiltration of water into the ground-water system. Unpaved haul roads, used for access to logging areas, gas wells, and strip mines in the study area, are routinely regraded without regard for sediment or erosion controls.

Precipitation

Average annual precipitation, determined from 20 years of National Weather Service record at nearby DuBois, was 41.6 inches. Precipitation near Big Run (site 1, fig. 1) totaled 16.27 inches from June through September 1979, 47.16 inches from October 1979 through September 1980, and 40.52 inches from October 1980 through September 1981. At the precipitation station near Troutville, (site 2, fig. 1) 26.82 inches were measured from March through September 1980, and 34.73 inches were measured from October 1980 through September 1981.

A maximum monthly rainfall of 7.1 inches was measured near Troutville in June 1981, and a minimum monthly rainfall of 0.9 inches was measured there and at DuBois in August 1981 (fig. 2).

Surface-Mining Practices and Sediment Production

During strip mining, sediment can be added to storm runoff in large quantities by two processes. The first is from removal of vegetation from the land surface to prepare the area for mining, exposing large tracts of topsoil

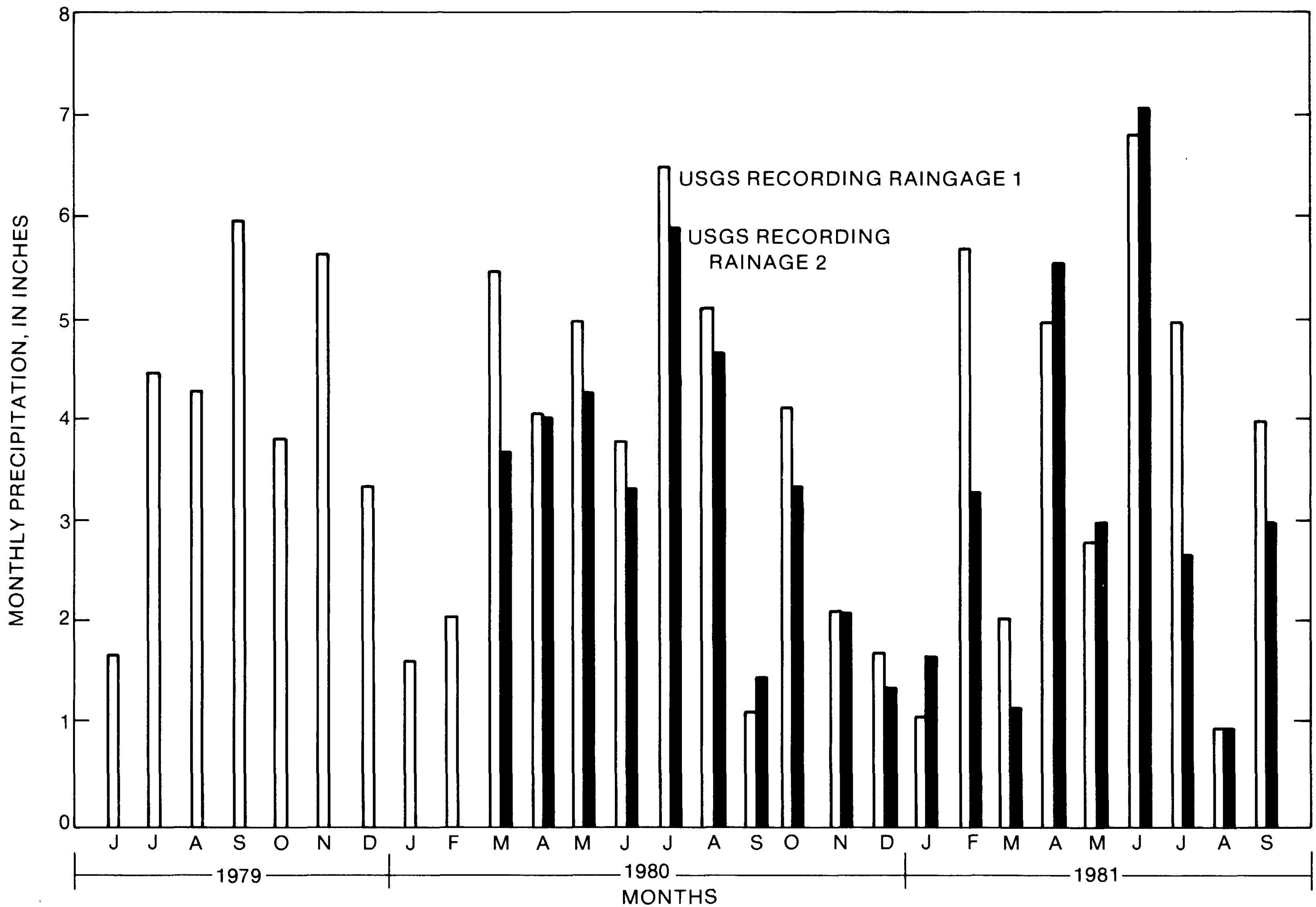

Figure 2.-- Monthly precipitation for the period June 1979 through September 1981.

to erosion. The second is from land reclamation, during and after the spreading of subsoil and topsoil; as much as 2 years may be required for vegetation to become sufficiently dense to reduce erosion from these areas.

Since July 1979, the Department of Environmental Resources has required that sediment controls be constructed at all active mining operations in the basin (L. DiLissio, BMR, oral commun., 1979). The most common controls are the pre-mining construction of diversion ditches and sedimentation ponds to transport and receive and contain surface runoff. Sedimentation ponds have established-design criteria, for example, their volumes must be 7,000 cubic feet per acre of disturbed land. Other ways to control soil erosion include lining trenches leading to and from sediment ponds, and mulching and planting following the spread of the topsoil.

Block cut and contour-mining methods have been used in the East Branch Mahoning Creek basin. In block-cut mining, excavation is made perpendicular to the land contours and the topsoil is stockpiled. Overburden from each new cut is used to fill the pit from the previous cut, and the topsoil is spread over the surface. Reclamation is usually concurrent with mining, and the exposed area remains constant. In contour mining, excavation follows the contour of the land around a hillside. Topsoil is stockpiled, and each additional cut is made into the hillside above the previous cut, and the overburden is deposited down slope. Because the mined coal beds are relatively flat, increasing amounts of overburden must be removed as the cuts proceed uphill; this eventually forms a high ridge (high wall) that is susceptible to landslides. Reclamation usually begins when the mining operation is completed; overburden must be pushed uphill to fill the pit, and topsoil is graded over the surface.

In the East Branch Mahoning Creek basin, most mining was done by the contour method. Extensive reclamation was not done until 1980 when legislation required reclamation of disturbed land before areas of equal size could be mined.

Methods of Study

One precipitation station was installed near Big Run (site 1, fig. 1) in 1979, and a second precipitation station (site 2, fig. 1) was installed in March 1980 near Troutville. The precipitation stations were equipped with weighing-type gages.

A streamflow-gaging station was installed on the East Branch Mahoning Creek near Big Run (site 1, fig. 1) in June 1979 and operated through September 1981. The stream-gaging stations were equipped with continuous stage recorders, and water discharge was measured by standard procedures described by Carter and Davidian (1968). In addition to the streamflow-gaging equipment, the station contained an automatic pumping sampler and a recording turbidimeter. The sampler collected samples twice daily during base flow; during storms, when streamflow and suspended sediment concentrations changed rapidly, samples were collected hourly.

In December 1979, a streamflow-gaging station was installed on Beaver Run near Troutville (site 2, fig. 1). An automatic pumping sampler was installed at this site to collect samples every half hour during storms. Samples were collected manually at about 3-day intervals during base-flow periods.

Sediment samples were analyzed in the Geological Survey's laboratory in Harrisburg by methods described by Guy (1969). The turbidity and specific conductance of each sample also were measured. Daily streamflow discharges and daily mean sediment concentrations and discharges were computed by techniques described by Porterfield (1972).

STREAMFLOW CHARACTERISTICS OF THE EAST BRANCH MAHONING CREEK

Runoff

Total runoff from the East Branch Mahoning Creek basin from June 1979 through September 1981 totaled 46.94 inches, about 45 percent of the total precipitation for the period (table 1). The remaining 55 percent went to evapotranspiration losses and ground-water recharge. Tables 1 and 2 list the monthly precipitation, total runoff, and the amounts of runoff occurring as direct runoff and as base flow at both study sites.

Because evapotranspiration rates are highest in summer and fall (June through November), a lower percentage of water from precipitation generally is available for ground-water recharge and runoff; streamflow is usually lower in these seasons. The total monthly runoff during summer and fall ranged from 11 to 61 percent of precipitation (25-percent median), and monthly base flow ranged from 0.18 to 1.8 inches (0.57-inch median). In winter and spring (December through May) evapotranspiration is at a minimum, and more water from precipitation and snowmelt is available for ground-water recharge and runoff. In winter and spring, monthly runoff ranged from 49 to 106 percent of precipitation (86-percent median), and base flow ranged from 0.62 to 3.12 inches (1.70-inches median).

During the study period, the minimum daily discharge of the East Branch Mahoning Creek was 5.2 ft^3/s (cubic feet per second) in September 1980, and maximum daily flow was 406 ft^3/s in February 1981. A maximum instantaneous discharge of 650 ft^3/s was recorded on November 26, 1979, when the gage height reached 4.02 ft.

The base flow from Beaver Run near Troutville is affected by previous underground mining. Water levels in the underground mines are controlled by gravity drains that discharge northwest of the Beaver Run subbasin. Ground-water levels are apparently below the stream bed, and in summer and fall zero flow occurs on many days. In this period, the total monthly runoff ranged from 1.1 to 20 percent of precipitation (8.2-percent median), and monthly base flow ranged from 0.003 to 0.84 inches (0.13-inch median). In winter and spring months, excluding January 1981, when there was extensive ice cover, the total monthly runoff ranged from 36 to 163 percent of precipitation (72-percent median), and base flow ranged from 0.63 to 2.02 inches (1.24-inches median).

Days of zero flow were recorded in July, September, October, and November 1980 and in August and September 1981, the number of zero-flow days in these months ranged from 2 to 23 days. Flow-duration curves for both sites for water year 1981 are shown in figures 3 and 4. Zero flow occurred at Beaver Run about 12 percent of the time in 1981 (fig. 4). A maximum daily mean discharge of 53 ft^3/s occurred on March 8, 1980, and a maximum instantaneous discharge of 105 ft^3/s was recorded this day, when the gage height rose to 7.37 ft.

Table 1.--Precipitation and runoff, East Branch Mahoning Creek near Big Run (site 1), June 1979 through September 1981

Year and month	Precipitation (inches)	Total runoff (inches)	Total runoff (percent of precipitation)	Direct runoff (inches)	Base flow (inches)
1979					
June	1.64	0.20	12	0.02	0.18
July	4.44	.51	11	.15	.36
August	4.25	.59	14	.17	.42
September	5.94	1.3	22	.71	.59
October	3.77	2.3	61	.50	1.80
November	5.63	2.2	40	.66	1.54
December	3.27	2.0	61	.38	1.62
1980					
January	1.53	1.4	92	.26	1.14
February	2.04	1.0	49	.31	.69
March	5.41	4.6	85	2.00	2.60
April	4.05	4.1	101	.98	3.12
May	4.97	2.6	52	.83	1.77
June	3.73	1.1	30	.40	.70
July	6.47	1.1	17	.55	.55
August	5.18	1.4	27	.59	.81
September	1.11	.30	27	.05	.25
October	4.00	.52	13	.22	.30
November	2.08	.83	40	.20	.63
December	1.60	1.7	106	.26	1.44
1981					
January	1.10	.76	69	.14	.62
February	5.57	4.9	88	1.98	2.92
March	2.00	1.8	90	.27	1.53
April	4.92	3.0	61	1.07	1.93
May	2.75	2.5	91	.65	1.85
June	6.84	2.6	38	1.02	1.58
July	4.82	.82	17	.20	.62
August	.89	.33	37	.02	.31
September	3.95	.48	12	.15	.33
Total	103.95	46.94		14.74	32.20

Table 2.--Precipitation and runoff, Beaver Run near Troutville (site 2), March 1980 through September 1981

Year and month	Precipitation (inches)	Total runoff (inches)	Total runoff (percent of precipitation)	Direct runoff (inches)	Base flow (inches)
1980					
March	3.68	3.86	105	2.62	1.24
April	4.01	3.22	80	1.20	2.02
May	4.22	1.53	36	.52	1.01
June	3.24	.52	16	.26	.26
July	5.54	.61	11	.42	.19
August	4.70	.47	10	.17	.30
September	1.43	.02	1.4	.01	.01
October	3.33	.12	3.6	.08	.04
November	2.15	.28	13	.13	.15
December	1.30	2.12	163	.61	1.51
1981					
January	1.60	.16	10	.08	.08
February	3.19	3.77	118	1.85	1.92
March	1.09	.71	65	.08	.63
April	5.55	2.22	40	1.06	1.16
May	2.91	1.81	62	.57	1.24
June	7.15	1.43	20	.59	.84
July	2.61	.17	6.5	.06	.11
August	.91	.01	1.1	.007	.003
September	2.94	.05	1.7	.03	.02
Total	61.55	23.08		10.35	12.73

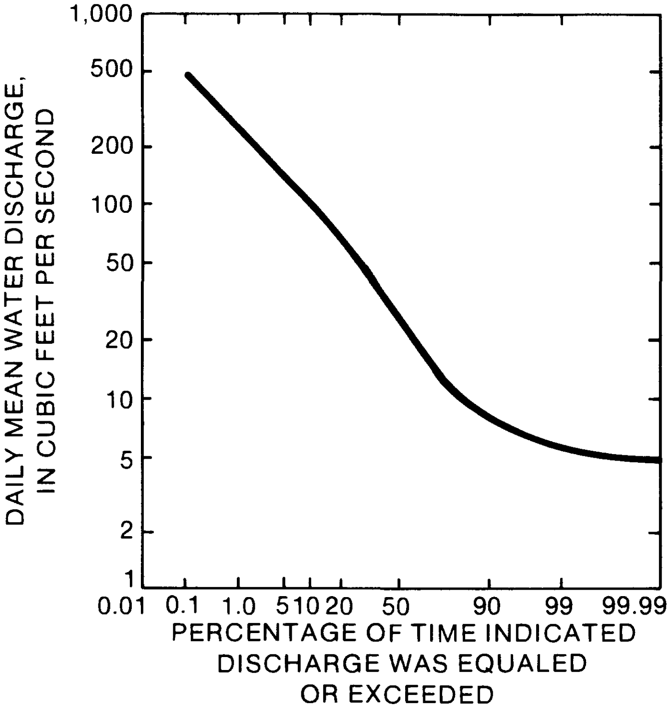

Figure 3.-- Duration curve of daily mean water discharge, East Branch Mahoning Creek near Big Run, 1981 water year.

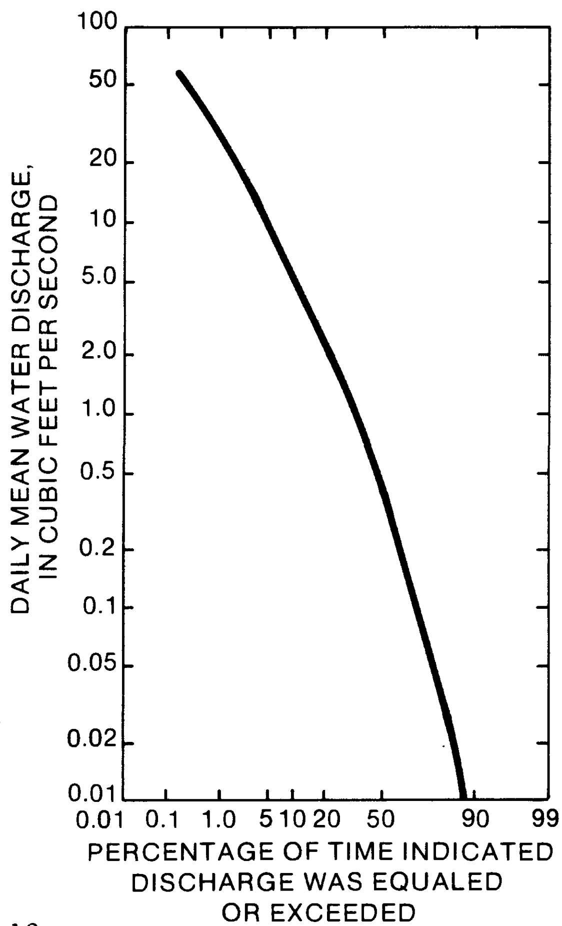

Figure 4.-- Duration curve of daily mean water discharge, Beaver Run near Troutville, 1981 water year.

The highest yield of direct runoff from Beaver Run, 24 $(ft^3/s)/mi^2$, was measured on March 8, 1980. The temporal variation in direct runoff was greatest at this site, and the hydrographs have higher and sharper peak flows than those at East Branch Mahoning Creek near Big Run. This is probably due to Beaver Run having a smaller drainage basin, in which variations in precipitation result in rapid changes in runoff and streamflow.

Turbidity

Turbidity is a measure of the ability of suspended material to disturb or diminish the penetration of light through a fluid; it is a function of concentrations and the particle sizes of suspended materials, and values may be affected by floating debris, small air bubbles, and water color. One study described by Kemp (1949) has shown that turbidities in excess of 3,000 NTU are dangerous to fish when maintained over a 10-day period. The material that causes turbidity sometimes cannot be removed effectively at public-water supply treatment plants.

Turbidity of collected sediment samples was measured in the laboratory, and it was also monitored continuously at the East Branch Mahoning Creek gage with a surface-scatter turbidimeter. Field-turbidity records were used to help define concentrations of suspended sediment. The relation of turbidity to suspended-sediment concentration at both sites is shown by graphs in figures 5 and 6. These graphs represent data plotted from laboratory measurements of individual samples. Both sites show a good degree of correlation between these two characteristics over the range of values measured. In the absence of sediment measurements, turbidity data can be used to estimate suspended-sediment concentrations. These relations, however, may not be applicable for use in studies of other stream basins.

Size Distribution of Suspended Sediment

The size distribution of three suspended-sediment samples was determined at the East Branch Mahoning Creek site (table 3). The limited amount of size-distribution data suggest that clay was the predominant material transported at this site. This material was most likely derived from erosion of soils in reclaimed areas.

Table 3.--Summary of particle-size distribution of samples collected at East Branch Mahoning Creek near Big Run
[ft^3/s, cubic feet per second; mg/L, milligrams per liter]

Date	Time	Instantaneous streamflow (ft^3/s)	Concentration (mg/L)	Percent suspended sediment in size class: Sand	Silt	Clay
07-17-80	0950	456	2,169	1	35	64
06-04-81	1150	183	1,390	1	25	74
06-04-81	1310	168	575	1	25	74

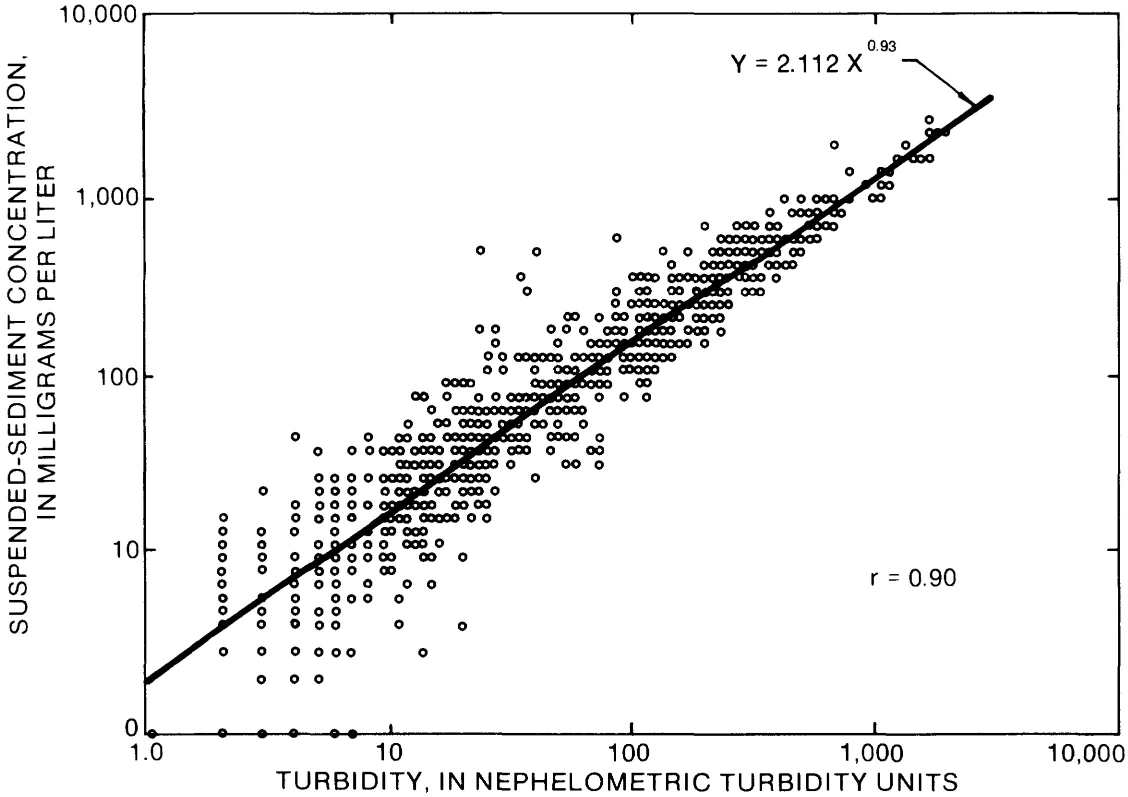

Figure 5.-- Relation of turbidity to suspended-sediment concentrations at Site 1, East Branch Mahoning Creek near Big Run.

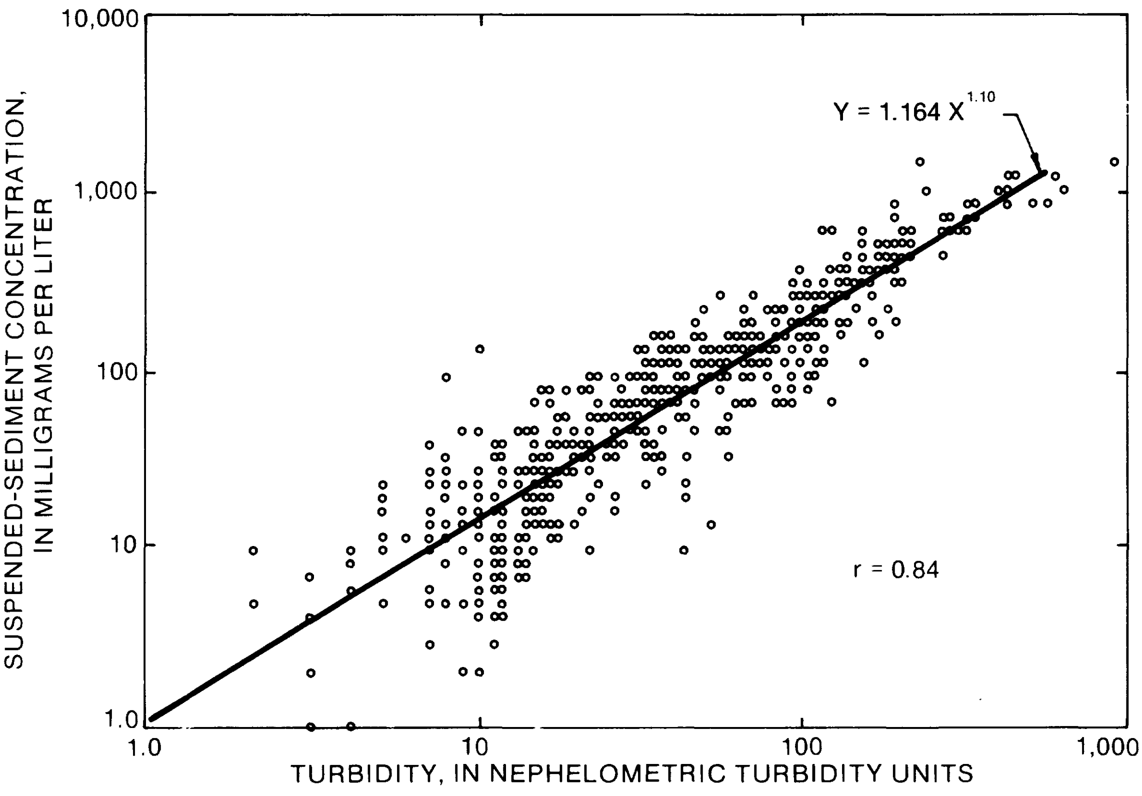

Figure 6.-- Relation of turbidity to suspended-sediment concentrations at Site 2, Beaver Run near Troutville.

SEDIMENT LOADS, DISCHARGES, AND YIELDS

During this study, 9,570 tons of sediment were transported from the East Branch Mahoning Creek basin; 551 tons were discharged from June through September 1979, 4,770 tons were discharged from October 1979 through September 1980, and 4,260 tons were discharged from October 1980 through September 1981. Approximately 6,000 tons were transported from the basin from July 1980 through September 1981, when reclamation was accelerated. During this period, the average suspended-sediment discharge was 400 tons per month. Prior to that time, in the period June 1979 through June 1980, the average suspended-sediment discharge was 298 tons per month. Figure 7 shows the relation between daily water discharge and daily suspended-sediment discharge for the two periods, June 1979 through June 1980, and July 1980 through September 1981.

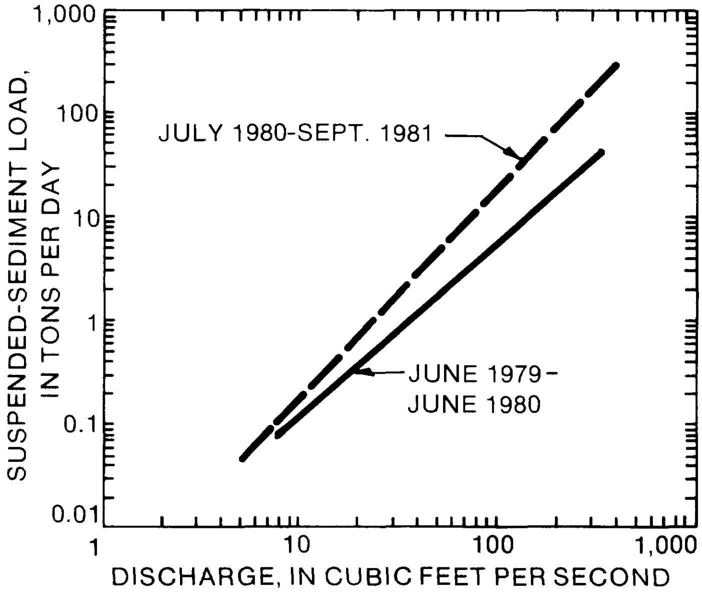

Figure 7.-- Sediment-transport curves at Site 1, East Branch Mahoning Creek near Big Run, for the periods June 1979 through 1980 and July 1980 through September 1981.

The lines represent the least-squares regression equation. There was considerable scattering of individual data points, but the figure shows that sediment discharges from July 1980 through September 1981 approximately tripled when the daily water discharge was 100 ft^3/s, and the sediment discharge approximately quadrupled when the daily water discharge was 200 ft^3/s.

The highest daily mean suspended-sediment concentration in the East Branch Mahoning Creek was 1,310 mg/L (milligrams per liter) on August 15, 1980 when 605 tons of sediment were discharged. Monthly suspended-sediment discharges averaged 354 tons and ranged from 32 tons in July 1979 to 1,550 tons in February 1981.

Beaver Run near Troutville discharged 576 tons of suspended sediment from January 1980 through September 1981. The highest daily mean suspended-sediment concentration was 845 mg/L on September 23, 1981, when 0.52 ton of sediment was discharged from the basin. Monthly sediment discharges averaged 27 tons and ranged from zero in September 1980 and August 1981 to 179 tons in March 1980. Of the suspended load discharged from the East Branch Mahoning Creek basin between October 1980 and September 1981, 5 percent, 212 tons, was from the Beaver Run subbasin.

The average yield of suspended sediment at the East Branch Mahoning Creek from June 1979 through June 1980 was 112 (tons/mi^2)/yr; this changed to 162 (tons/mi^2)/yr in the period July 1980 through September 1981. Over the entire study period the average yield of suspended sediment at the East Branch Mahoning Creek site was 144 (tons/mi^2)/yr, and the average yield from the Beaver Run subbasin was 145 (tons/mi^2)/yr. From July 1980 through September 1981 the Beaver Run average yield was 90 (tons/mi^2)/yr. Daily mean streamflow and concentrations and suspended-sediment discharges are listed in table 5.

Storms from each of the three summers of data collection are compared in figure 8. The first summer storm occurred on September 6-7, 1979. Although the peak water discharge was 480 ft^3/s during this storm, the suspended-sediment concentration peaked at only 1,100 mg/L. The 2 day suspended-sediment load for this storm was 315 tons.

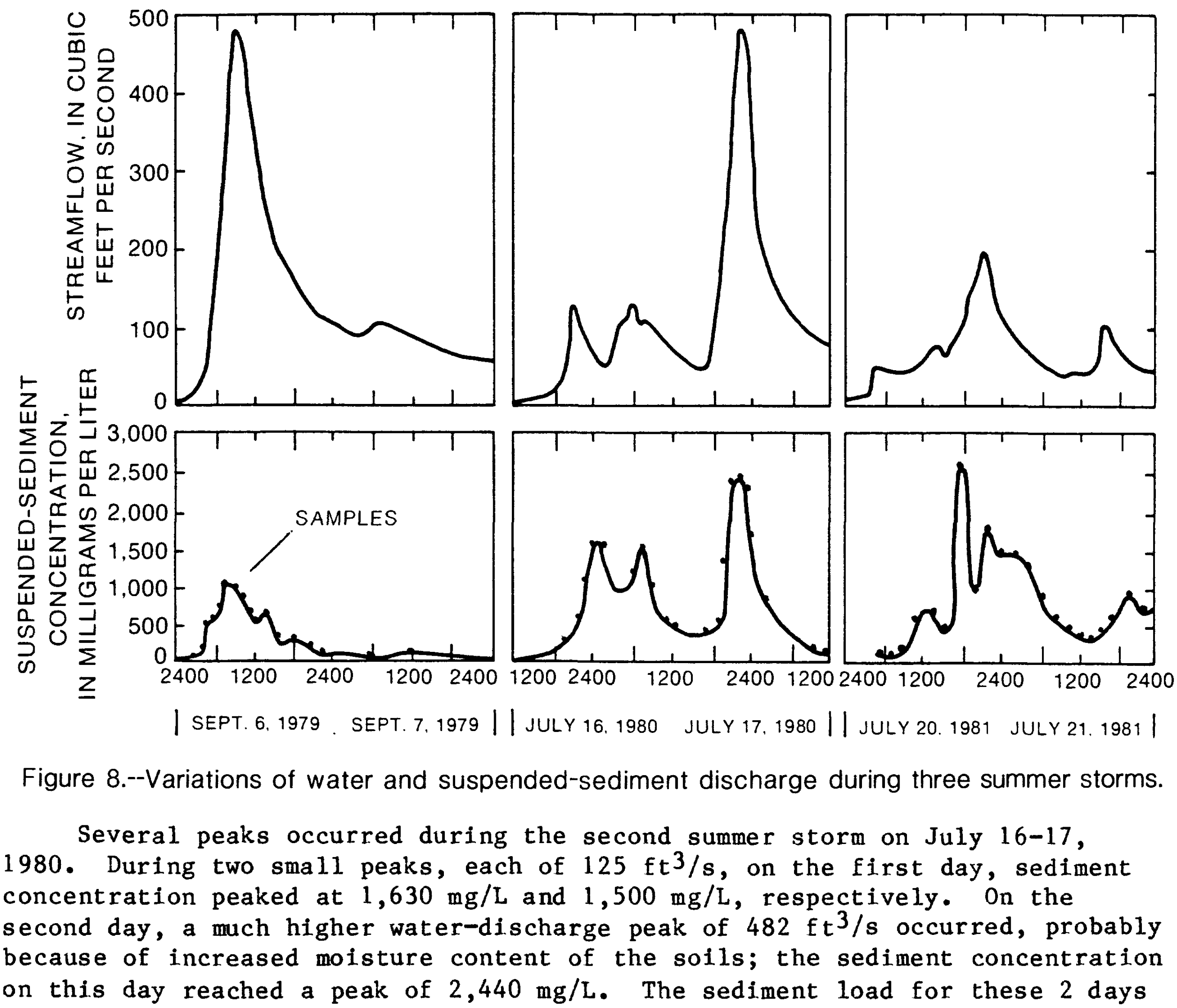

Figure 8.--Variations of water and suspended-sediment discharge during three summer storms.

Several peaks occurred during the second summer storm on July 16-17, 1980. During two small peaks, each of 125 ft^3/s, on the first day, sediment concentration peaked at 1,630 mg/L and 1,500 mg/L, respectively. On the second day, a much higher water-discharge peak of 482 ft^3/s occurred, probably because of increased moisture content of the soils; the sediment concentration on this day reached a peak of 2,440 mg/L. The sediment load for these 2 days was 623 tons.

The peak flow during the third summer storm, July 20-21, 1981, was much lower, 197 ft^3/s, but the sediment concentration reached a maximum of 2,600 mg/L. This sediment concentration peak also occurred 3 hours before the peak water discharge. A second sediment concentration peak, 1,750 mg/L, occurred about 1 hour after the peak water discharge. The load for this storm was 383 tons. During the second and third summers, a large amount of sediment (possibly due to reclamation) was readily available for transport by storm runoff. Regardless of peak concentrations, all storms were similar in that concentrations quickly returned to pre-existing levels after the storm.

The frequency distributions of suspended-sediment concentrations for East Branch Mahoning Creek and Beaver Run are listed in table 4. Turbidity in excess of 30 NTU precludes use of East Branch Mahoning Creek as a water source (B. Brusso, Western Pennsylvania Water Co., oral commun., 1984). Using the formula derived from figure 6, this is equal to sediment concentration of 50 mg/L. The frequency distributions in table 4 show that sediment concentrations in the streamflow were greater than or equal to this limit during 13 percent of the time for the first year of the investigation and 17 percent of the remaining time of the study when sediment discharges from the basin were larger. Applying figure 7 to Beaver Run near Troutville, the approximate sediment concentration corresponding to a turbidity of 30 NTU is 49 mg/L. This sediment concentration was equalled or exceeded approximately 9 percent of the time during the study.

Table 4.--Frequency distribution of suspended-sediment concentration at East Branch Mahoning Creek near Big Run and Beaver Run near Troutville

Site	Period of record	Mean daily concentrations, in milligrams per liter, that was equalled or exceeded for the following percentages of time												
		2.0	5.0	10	20	25	30	40	50	60	70	80	90	95
East Branch Mahoning Creek near Big Run	June 1979 to June 1980	438	184	61	27	20	15	11	8	7	5	4	2	2
	July 1980 to September 1981	354	182	83	37	30	24	17	14	10	8	6	5	3
Beaver Run near Troutville	July 1980 to September 1981	322	170	39	14	11	10	7	6	5	4	2	1	0

SUMMARY AND CONCLUSIONS

The U.S. Geological Survey, in cooperation with the Pennsylvania Department of Environmental Resources, Bureau of Mining and Reclamation, investigated sediment loads, concentrations, and discharges in the East Branch Mahoning Creek basin. This stream, which is used as a public-water supply source, drains an area of west-central Pennsylvania affected by numerous sources of possible erosion such as active and reclaimed surface-mined areas, unpaved haul roads, farms, and logged areas.

Precipitation, streamflow, turbidity, and suspended-sediment data were collected at two sites in the basin from June 1979 to September 1981. Turbidity and specific conductance also were measured in all water samples. Sediment discharges and turbidity from the Beaver Run subbasin (2.21 square miles of mostly farmland) were compared with those from East Branch Mahoning Creek basin (29.6 square miles of various land uses). The average yield of suspended sediment at the East Branch Mahoning Creek from June 1979 through June 1980 was 112 (tons/mi^2)/yr, this changed to 162 (tons/mi^2)/yr in the period July 1980 through September 1981. The average annual suspended-sediment yields at both sites for the entire study period were essentially the same: 144 tons/mi^2 from the East Branch Manoning Creek basin and 145 tons/mi^2 from the Beaver Run subbasin. From July 1980 through September 1981 the yield at the East Branch Mahoning Creek site was 162 (tons/mi^2)/yr while the yield at the Beaver Run site for the same period was 90 (tons/mi^2)/yr.

From June 1979 through September 1981, about 9,570 tons of suspended sediment were discharged from the East Branch Mahoning Creek basin; about 6,000 tons of this load were discharged from July 1980 through September 1981 when reclamation was accelerated. The average suspended-sediment discharge from the basin before reclamation was 298 tons per month; the average suspended-sediment discharge during reclamation was 400 tons per month.

Suspended-sediment discharges during the reclamation period (July 1980 through September 1981) approximately tripled those of the pre-reclamation period when the daily water discharge was 100 ft^3/s, and the sediment discharge approximately quadrupled when the daily water discharge was 200 ft^3/s.

The relation between turbidity and suspended-sediment concentration is log-linear throughout the range of measured values. Suspended-sediment concentrations from turbidity data and available suspended-sediment data, indicate that the East Branch Mahoning Creek was not usable for a public-water supply during 13 percent of the time from June 1979 through June 1980, and during 17 percent from July 1980 through September 1981. These periods approximately correspond to the time before and after reclamation was accelerated.

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Table 5.--Daily mean streamflow and suspended-sediment concentration and discharge
[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, ton per day]

03033222 Beaver Run near Troutville, PA

Water year October 1979 to September 1980

Day	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean dischsrge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)
		OCTOBER			NOVEMBER			DECEMBER	
1	---	---	---	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	---	---	---
16	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	---	---
18	---	---	---	---	---	---	0.70	---	---
19	---	---	---	---	---	---	.70	---	---
20	---	---	---	---	---	---	.62	---	---
21	---	---	---	---	---	---	.55	---	---
22	---	---	---	---	---	---	.55	---	---
23	---	---	---	---	---	---	.62	---	---
24	---	---	---	---	---	---	1.4	---	---
25	---	---	---	---	---	---	14	---	---
26	---	---	---	---	---	---	5.2	---	---
27	---	---	---	---	---	---	3.0	5	0.04
28	---	---	---	---	---	---	2.3	5	.03
29	---	---	---	---	---	---	1.8	5	.02
30	---	---	---	---	---	---	1.6	4	.02
31	---	---	---	---	---	---	1.4	4	.02
TOTAL							34.44	---	.13
		JANUARY			FEBRUARY			MARCH	
1	1.1	4	0.01	0.10	3	0.00	0.22	4	0.00
2	.98	3	.00	.10	3	.00	.17	4	.00
3	.88	3	.00	.10	2	.00	.11	3	.00
4	.70	3	.00	.10	2	.00	.08	6	.00
5	.70	3	.00	.10	5	.00	31	256	21
6	3.2	24	.21	.09	4	.00	4.1	105	1.2
7	.49	4	.00	.09	5	.00	3.0	353	2.9
8	.38	3	.00	.09	6	.00	53	689	99
9	.60	4	.00	.09	5	.00	4.3	42	.49
10	.81	9	.02	.09	5	.00	3.3	8	.07
11	1.2	32	.10	.09	4	.00	2.0	10	.05
12	3.5	58	.55	.09	4	.00	.88	8	.02
13	.38	8	.00	.09	3	.00	.70	6	.01
14	2.0	40	.22	.09	3	.00	.70	6	.01
15	1.2	12	.04	.09	2	.00	.49	5	.00
16	.62	10	.02	.08	3	.00	2.5	133	.90
17	.44	11	.01	.08	6	.00	18	458	22
18	.28	10	.00	.08	5	.00	20	149	8.0
19	.25	8	.00	.08	3	.00	4.3	10	.12
20	.24	7	.00	.08	3	.00	3.3	6	.05
21	.21	4	.00	9.5	120	3.1	8.0	36	.78
22	.19	4	.00	35	129	12	4.6	9	.11
23	.18	4	.00	5.8	60	.94	4.0	25	.27
24	.17	3	.00	2.1	24	.14	4.4	13	.15
25	.16	4	.00	1.2	12	.04	3.9	6	.06
26	.15	3	.00	.70	7	.01	2.3	5	.03
27	.13	5	.00	.49	6	.00	2.0	4	.02
28	.13	4	.00	.44	5	.00	1.8	7	.03
29	.12	3	.00	.38	5	.00	9.9	100	2.7
30	.12	3	.00	---	---	---	5.0	44	.59
31	.11	3	.00	---	---	---	31	220	18
TOTAL	21.62	---	1.18	57.41	---	16.23	229.05	---	178.56

Table 5.--Daily mean streamflow and suspended-sediment concentration and discharge--Continued
[ft³/s, cubic feet per second; mg/L, milligrams per liter; ton/d, ton per day]

03033222 Beaver Run near Troutville, PA

Water year October 1979 to September 1980

Day	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)
		APRIL			MAY			JUNE	
1	22	45	2.7	1.6	6	0.03	0.31	8	0.00
2	12	8	.26	1.4	5	.02	.36	7	.00
3	7.0	7	.13	1.4	7	.03	.31	8	.00
4	7.0	12	.23	1.1	6	.02	.19	9	.00
5	5.2	5	.07	.88	6	.01	.10	8	.00
6	3.3	4	.04	.78	5	.01	.10	7	.00
7	2.3	5	.03	.70	6	.01	.15	179	.07
8	5.0	381	5.1	.55	5	.00	12	248	8.0
9	40	633	68	.44	5	.00	3.9	27	.28
10	14	25	.95	.38	4	.00	3.8	12	.12
11	8.6	6	.14	.48	18	.02	2.1	6	.03
12	6.5	14	.25	20	557	30	1.4	6	.02
13	5.7	13	.20	13	46	1.6	1.0	5	.01
14	10	35	.95	20	186	10	.80	5	.01
15	11	18	.53	7.5	11	.22	.76	6	.01
16	6.4	13	.22	3.9	7	.07	.84	7	.02
17	4.4	13	.15	2.5	6	.04	.41	5	.00
18	3.0	10	.08	3.0	12	.10	.36	5	.00
19	2.1	10	.06	2.1	6	.03	.27	5	.00
20	1.6	11	.05	1.6	5	.02	.36	8	.00
21	1.5	13	.05	1.5	5	.02	.27	6	.00
22	1.5	12	.05	1.4	5	.02	.19	5	.00
23	1.2	9	.03	.98	5	.01	.16	5	.00
24	1.1	8	.02	.98	5	.01	.10	14	.00
25	.88	7	.02	.70	6	.01	.08	6	.00
26	.78	6	.01	.49	6	.00	.06	5	.00
27	.91	6	.01	.38	7	.00	.04	8	.00
28	1.3	17	.06	.31	8	.00	.04	12	.00
29	3.2	31	.27	.31	8	.00	.08	9	.00
30	1.8	8	.04	.36	9	.00	.08	10	.00
31	---	---	---	.47	9	.01	---	---	---
TOTAL	191.27	---	80.70	91.19	---	42.31	30.62	---	8.57
		JULY			AUGUST			SEPTEMBER	
1	0.03	5	0.00	0.13	1	0.00	0.10	8	0.00
2	.02	5	.00	.65	55	.10	.21	21	.01
3	.58	26	.04	1.9	47	.24	.16	9	.00
4	.10	4	.00	.47	5	.00	.08	9	.00
5	.06	3	.00	.27	5	.00	.06	8	.00
6	.02	1	.00	.19	4	.00	.05	7	.00
7	.00	0	.00	.16	4	.00	.04	6	.00
8	1.4	92	.35	.36	12	.01	.00	0	.00
9	.31	5	.00	.31	8	.00	.00	0	.00
10	.16	5	.00	.23	10	.00	.00	0	.00
11	.10	4	.00	.27	12	.00	.00	0	.00
12	.06	3	.00	2.2	49	.29	.00	0	.00
13	.02	2	.00	.80	3	.00	.00	0	.00
14	.01	2	.00	.93	48	.12	.24	27	.02
15	.00	0	.00	6.7	36	.65	.06	10	.00
16	2.0	182	.98	3.2	10	.09	.04	7	.00
17	18	650	32	2.3	8	.05	.04	6	.00
18	2.8	12	.09	1.6	9	.04	.02	4	.00
19	1.4	7	.03	1.0	10	.03	.00	0	.00
20	.80	4	.00	.80	10	.02	.00	0	.00
21	.54	4	.00	.61	9	.01	.00	0	.00
22	2.2	74	.44	.47	9	.01	.00	0	.00
23	2.1	5	.03	.47	8	.01	.00	0	.00
24	.92	4	.00	.36	9	.00	.00	0	.00
25	.61	3	.00	.27	10	.00	.00	0	.00
26	.47	3	.00	.23	9	.00	.00	0	.00
27	.41	2	.00	.19	9	.00	.00	0	.00
28	.36	1	.00	.16	9	.00	.00	0	.00
29	.31	1	.00	.13	8	.00	.00	0	.00
30	.19	1	.00	.10	8	.00	.00	0	.00
31	.16	1	.00	.19	11	.00	---	---	---
TOTAL	36.14	---	33.96	27.65	---	1.67	1.10	---	0.03
YEAR	720.49		363.34						

Table 5.--Daily mean streamflow and suspended-sediment concentration and discharge--Continued
[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, ton per day]

03033222 Beaver Run near Troutville, PA

Water year October 1980 to September 1981

Day	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)
		OCTOBER			NOVEMBER			DECEMBER	
1	0.00	0	0.00	0.03	1	0.00	1.4	6	0.02
2	.00	0	.00	.02	1	.00	11	295	8.8
3	.00	0	.00	.00	0	.00	17	50	2.3
4	.00	0	.00	.00	0	.00	11	9	.27
5	.00	0	.00	.00	0	.00	8.3	5	.11
6	.00	0	.00	.00	0	.00	5.9	4	.06
7	.00	0	.00	.00	0	.00	5.5	6	.09
8	.00	0	.00	.36	29	.03	6.2	10	.17
9	.00	0	.00	.60	45	.07	9.0	29	.70
10	.00	0	.00	.56	13	.02	11	7	.21
11	.13	34	.01	.22	6	.00	8.1	5	.11
12	.00	0	.00	.14	4	.00	7.3	4	.08
13	.00	0	.00	.11	1	.00	6.7	4	.07
14	.00	0	.00	.11	1	.00	4.1	3	.03
15	.00	0	.00	.11	1	.00	2.5	3	.02
16	.00	0	.00	.10	1	.00	2.3	3	.02
17	.00	0	.00	.22	39	.02	1.8	3	.01
18	.00	0	.00	.28	23	.02	1.4	3	.01
19	.00	0	.00	.12	7	.00	.93	3	.00
20	.00	0	.00	.10	5	.00	.46	2	.00
21	.00	0	.00	.10	5	.00	.26	2	.00
22	.00	0	.00	.10	3	.00	.26	2	.00
23	.00	0	.00	.12	5	.00	.56	4	.00
24	.00	0	.00	3.5	58	.55	.49	3	.00
25	4.5	78	.95	3.3	16	.14	.31	2	.00
26	2.0	19	.10	1.6	7	.03	.26	2	.00
27	.31	6	.00	1.3	6	.02	.26	2	.00
28	.18	5	.00	1.3	5	.02	.26	2	.00
29	.10	3	.00	1.3	4	.01	.36	4	.00
30	.05	3	.00	1.2	4	.01	.53	5	.00
31	.05	1	.00	---	---	---	.42	3	.00
TOTAL	7.32	---	1.06	16.90	---	0.94	125.86	---	13.08
		JANUARY			FEBRUARY			MARCH	
1	0.36	3	0.00	0.81	6	0.01	2.1	13	0.07
2	.31	3	.00	14	173	6.5	2.1	10	.06
3	.26	2	.00	3.3	5	.04	1.8	8	.04
4	.22	2	.00	1.3	4	.01	2.1	6	.03
5	.18	2	.00	.56	4	.00	1.8	6	.03
6	.18	2	.00	.42	3	.00	1.6	5	.02
7	.22	3	.00	.36	3	.00	1.4	6	.02
8	.18	2	.00	.42	4	.00	1.2	7	.02
9	.15	2	.00	.49	6	.00	.92	6	.01
10	.12	2	.00	3.5	202	1.9	.92	5	.01
11	.12	2	.00	40	291	31	.92	5	.01
12	.08	1	.00	10	7	.19	1.0	7	.02
13	.06	1	.00	6.2	5	.08	2.1	11	.06
14	.06	1	.00	3.0	5	.04	1.9	10	.05
15	.08	1	.00	4.1	14	.15	1.6	9	.04
16	.08	1	.00	11	111	3.3	1.6	9	.04
17	.06	1	.00	8.7	92	2.2	1.4	9	.03
18	.06	1	.00	8.2	34	.75	1.3	9	.03
19	.06	1	.00	6.7	28	.51	1.0	9	.02
20	.06	1	.00	29	183	14	.92	8	.02
21	.06	1	.00	28	140	11	.82	8	.02
22	.06	1	.00	8.0	17	.37	.82	6	.01
23	.06	1	.00	13	127	4.5	.92	7	.02
24	.05	1	.00	9.5	29	.74	.72	7	.01
25	.05	1	.00	5.4	10	.15	.64	8	.01
26	.38	28	.03	3.1	12	.10	.49	9	.01
27	5.0	46	.62	2.2	11	.07	1.5	19	.08
28	.26	5	.00	2.7	15	.11	1.2	9	.03
29	.22	4	.00	---	---	---	1.0	7	.02
30	.15	3	.00	---	---	---	2.1	36	.20
31	.18	4	.00	---	---	---	2.2	13	.08
TOTAL	9.37	---	0.65	223.96	---	77.72	42.09	---	1.12

Table 5.--Daily mean streamflow and suspended-sediment concentration and discharge--Continued
[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, ton per day]

03033222 Beaver Run near Troutville, PA

Water year October 1980 to September 1981

Day	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)
		APRIL			MAY			JUNE	
1	1.8	7	0.03	7.1	21	0.40	0.18	4	0.00
2	1.6	6	.03	3.9	18	.19	.74	64	.13
3	1.4	5	.02	2.6	14	.10	1.0	31	.08
4	1.3	4	.01	2.1	11	.06	2.4	52	.34
5	1.3	4	.01	1.7	10	.05	1.3	9	.03
6	1.0	5	.01	1.7	12	.06	1.0	7	.02
7	.64	8	.01	1.4	13	.05	.64	7	.01
8	.56	9	.01	1.2	10	.03	.42	7	.00
9	.64	9	.02	.92	8	.02	10	279	7.5
10	.49	8	.01	.72	7	.01	3.4	25	.23
11	.72	14	.03	15	340	14	2.2	11	.07
12	2.2	16	.10	12	59	1.9	1.6	8	.03
13	3.6	23	.22	3.8	17	.17	1.5	34	.14
14	10	103	2.8	4.5	324	3.9	4.2	76	.86
15	6.4	58	1.0	23	345	21	3.1	17	.14
16	3.9	9	.09	6.8	14	.26	2.4	21	.14
17	4.3	17	.20	3.9	9	.09	3.8	26	.27
18	3.1	9	.08	2.8	7	.05	2.2	10	.06
19	2.2	6	.04	2.2	5	.03	1.8	8	.04
20	1.9	4	.02	1.9	5	.03	1.4	7	.03
21	1.5	2	.00	1.6	5	.02	1.5	27	.11
22	1.4	2	.00	1.3	6	.02	8.0	271	5.9
23	1.7	10	.05	1.2	5	.02	2.6	17	.12
24	2.1	8	.05	.82	5	.01	2.1	8	.05
25	1.6	5	.02	.72	5	.00	13	316	11
26	1.4	4	.02	.56	6	.00	4.8	24	.31
27	1.3	4	.01	.49	5	.00	2.6	12	.08
28	5.8	149	2.3	.49	5	.00	1.9	11	.06
29	50	249	34	.42	6	.00	1.6	10	.04
30	16	31	1.3	.36	5	.00	1.3	9	.03
31	---	---	---	.31	5	.00	---	---	---
TOTAL	131.85	---	42.49	107.51	---	42.47	84.68	---	27.82
		JULY			AUGUST			SEPTEMBER	
1	0.92	8	0.02	0.03	6	0.00	0.00	0	0.00
2	.82	6	.01	.02	5	.00	.01	20	.00
3	.64	5	.00	.03	5	.00	.03	9	.00
4	.38	5	.00	.03	7	.00	1.1	161	.48
5	.36	5	.00	.02	6	.00	.10	10	.00
6	.31	5	.00	.02	4	.00	.03	9	.00
7	.22	5	.00	.02	8	.00	.01	7	.00
8	.18	5	.00	.03	6	.00	.09	30	.00
9	.17	5	.00	.02	5	.00	.04	8	.00
10	.12	5	.00	.01	5	.00	.01	6	.00
11	.08	4	.00	.01	12	.00	.01	6	.00
12	.07	4	.00	.02	9	.00	.01	6	.00
13	.06	4	.00	.02	7	.00	.01	4	.00
14	.06	4	.00	.01	6	.00	.00	0	.00
15	.05	3	.00	.01	6	.00	.05	28	.00
16	.05	3	.00	.02	15	.00	.02	6	.00
17	.04	3	.00	.02	9	.00	.64	120	.21
18	.04	3	.00	.02	6	.00	.08	6	.00
19	.04	8	.00	.01	4	.00	.05	5	.00
20	2.8	397	3.0	.00	0	.00	.04	5	.00
21	1.6	60	.26	.00	0	.00	.03	4	.00
22	.42	15	.02	.00	0	.00	.03	3	.00
23	.17	10	.00	.00	0	.00	.23	845	.52
24	.13	9	.00	---	0	---	.15	350	.14
25	.10	9	.00	.00	0	.00	.23	560	.35
26	.10	7	.00	.00	0	.00	.01	5	.00
27	.08	7	.00	.00	0	.00	.01	3	.00
28	.08	7	.00	.00	0	.00	.00	0	.00
29	.08	8	.00	.00	0	.00	.00	0	.00
30	.05	10	.00	.00	0	.00	.00	0	.00
31	.04	7	.00	.00	0	.00	---	---	---
TOTAL	10.26	---	3.31	0.37	---	0.00	3.02	---	1.70
YEAR	763.19		212.36						

Table 5.--Daily mean streamflow and suspended-sediment concentration and discharge--Continued
[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, ton per day]

03033225 East Branch Mahoning Creek near Big Run, PA

Water year October 1978 to September 1979

Day	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)
		APRIL			MAY			JUNE	
1	---	---	---	---	---	---	---	---	---
2	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	12	5	0.17
16	---	---	---	---	---	---	12	5	.16
17	---	---	---	---	---	---	11	6	.18
18	---	---	---	---	---	---	11	8	.23
19	---	---	---	---	---	---	11	8	.23
20	---	---	---	---	---	---	10	7	.19
21	---	---	---	---	---	---	9.7	7	.18
22	---	---	---	---	---	---	10	9	.25
23	---	---	---	---	---	---	9.7	8	.21
24	---	---	---	---	---	---	9.2	8	.20
25	---	---	---	---	---	---	8.8	8	.19
26	---	---	---	---	---	---	8.6	8	.19
27	---	---	---	---	---	---	8.1	8	.18
28	---	---	---	---	---	---	8.4	9	.20
29	---	---	---	---	---	---	8.6	8	.19
30	---	---	---	---	---	---	11	10	.30
31	---	---	---	---	---	---	---	---	---
TOTAL							159.1	---	3.25
		JULY			AUGUST			SEPTEMBER	
1	15	30	1.2	35	334	32	11	8	0.23
2	13	7	.25	19	72	3.6	10	9	.25
3	11	12	.34	16	42	1.8	11	9	.26
4	12	11	.36	12	18	.58	10	8	.22
5	11	12	.36	10	14	.39	9.5	7	.18
6	9.5	8	.20	9.9	12	.32	187	600	303
7	8.6	8	.19	9.2	11	.27	85	53	12
8	8.1	8	.18	8.8	11	.26	49	19	2.5
9	7.7	8	.17	8.4	11	.25	36	6	.59
10	34	130	12	11	19	.56	29	5	.39
11	17	39	1.8	26	59	4.1	24	4	.26
12	12	13	.42	28	37	2.8	20	4	.22
13	15	23	.92	19	16	.80	18	7	.33
14	28	82	6.2	14	7	.26	22	9	.53
15	21	33	1.9	12	7	.23	22	8	.47
16	14	21	.79	12	8	.25	16	7	.31
17	12	11	.34	10	8	.22	14	6	.23
18	11	8	.23	11	7	.20	12	6	.20
19	10	7	.19	18	14	.66	14	7	.27
20	9.2	5	.12	11	9	.26	12	5	.16
21	9.0	5	.12	10	6	.16	17	17	.78
22	8.6	4	.09	9.0	6	.15	31	21	1.7
23	9.0	7	.17	8.8	7	.17	17	5	.22
24	11	7	.21	9.7	7	.18	14	4	.15
25	12	4	.13	10	6	.16	12	3	.10
26	14	14	.53	11	9	.27	12	4	.13
27	11	10	.28	41	87	9.6	11	4	.12
28	9.5	13	.33	21	22	1.2	91	354	87
29	17	25	1.1	19	13	.65	157	87	37
30	15	14	.58	15	9	.37	84	15	3.4
31	11	10	.28	12	8	.27	---	---	---
TOTAL	406.2	---	31.98	466.8	---	62.99	1,057.5	---	453.20
YEAR	2,089.6		551.42						

Table 5.--Daily mean streamflow and suspended-sediment concentration and discharge--Continued
[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, ton per day]

03033225 East Branch Mahoning Creek near Big Run, PA

Water year October 1979 to September 1980

Day	Mean discharge (ft^3/s)	Mean concen-tration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concen-tration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concen-tration (mg/L)	Sediment discharge (ton/d)
		OCTOBER			NOVEMBER			DECEMBER	
1	61	7	1.2	20	5	0.27	65	6	1.1
2	48	5	.65	59	30	4.8	56	4	.60
3	90	40	9.7	53	8	1.1	46	3	.37
4	62	7	1.2	40	1	.11	42	1	.11
5	160	123	53	36	1	.10	40	1	.11
6	167	34	15	35	1	.09	39	2	.21
7	143	12	4.6	36	2	.19	43	7	.81
8	118	12	3.8	33	2	.18	38	5	.51
9	116	11	3.4	32	1	.09	31	9	.75
10	108	11	3.2	65	10	1.8	30	5	.41
11	90	6	1.5	49	6	.79	29	4	.31
12	75	5	1.0	42	2	.23	30	4	.32
13	71	7	1.3	42	1	.11	53	14	2.0
14	55	3	.45	39	1	.11	59	10	1.6
15	46	4	.50	38	2	.21	47	2	.25
16	40	5	.54	50	4	.54	45	5	.61
17	38	3	.31	42	3	.34	42	6	.68
18	33	2	.18	38	3	.31	40	7	.76
19	30	2	.16	34	3	.28	38	10	1.0
20	28	2	.15	31	2	.17	35	10	.95
21	26	2	.14	29	2	.16	32	9	.78
22	24	3	.19	29	3	.23	31	5	.42
23	25	5	.34	29	3	.23	31	7	.59
24	29	12	.94	45	14	1.7	42	8	.91
25	24	3	.19	49	10	1.3	143	73	28
26	22	2	.12	268	270	195	108	12	3.5
27	21	2	.11	180	39	19	88	6	1.4
28	32	6	.52	140	18	6.8	74	5	1.0
29	28	7	.53	106	12	3.4	64	4	.69
30	23	2	.12	82	8	1.8	55	3	.45
31	21	1	.06	---	---	---	49	3	.40
TOTAL	1,854	---	105.10	1,771	---	241.44	1,565	---	51.60
		JANUARY			FEBRUARY			MARCH	
1	44	4	0.48	19	3	0.15	32	9	0.78
2	38	3	.31	18	3	.15	31	6	.50
3	34	3	.28	18	3	.15	31	5	.42
4	31	3	.25	17	2	.09	30	5	.41
5	29	3	.23	16	5	.22	79	61	13
6	27	2	.15	15	4	.16	121	131	43
7	26	2	.14	15	6	.24	59	45	7.2
8	24	2	.13	14	5	.19	335	472	427
9	23	2	.12	14	4	.15	194	111	58
10	22	2	.12	13	4	.14	114	35	11
11	28	8	.60	13	3	.11	113	38	12
12	92	94	23	13	5	.18	83	30	6.7
13	69	38	7.1	13	4	.14	70	22	4.2
14	75	38	7.7	12	3	.10	69	18	3.4
15	71	37	7.1	13	3	.11	52	18	2.5
16	55	16	2.4	13	3	.11	51	11	1.5
17	45	7	.85	13	5	.18	123	185	61
18	38	6	.62	13	5	.18	211	222	126
19	35	6	.57	12	4	.13	134	26	9.4
20	31	4	.33	12	3	.10	117	14	4.4
21	29	5	.39	16	18	.78	147	77	31
22	28	4	.30	143	66	25	136	52	19
23	28	4	.30	123	78	26	112	12	3.6
24	26	3	.21	66	14	2.5	116	21	6.6
25	25	4	.27	52	5	.70	119	26	8.4
26	25	3	.20	42	4	.45	94	14	3.6
27	23	5	.31	38	3	.31	80	14	3.0
28	22	4	.24	35	3	.28	74	18	3.6
29	21	3	.17	34	3	.28	221	246	147
30	20	3	.16	---	---	---	163	27	12
31	19	3	.15	---	---	---	320	257	222
TOTAL	1,103	---	55.18	835	---	59.28	3,631	---	1,252.21

Table 5.--Daily mean streamflow and suspended-sediment concentration and discharge--Continued
[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, ton per day]

03033225 East Branch Mahoning Creek near Big Run, PA

Water year October 1979 to September 1980

Day	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)
		APRIL			MAY			JUNE	
1	260	81	57	59	7	1.1	25	13	0.88
2	184	52	26	53	8	1.1	24	13	.84
3	142	31	12	58	10	1.6	29	27	2.1
4	135	34	12	48	13	1.7	26	21	1.5
5	113	31	9.5	43	10	1.2	18	8	.39
6	94	27	6.9	40	7	.76	16	4	.17
7	80	24	5.2	37	5	.50	17	29	1.3
8	82	39	8.6	33	5	.45	139	712	267
9	306	306	253	30	9	.73	74	44	8.8
10	188	42	21	28	8	.60	88	82	19
11	146	23	9.1	31	8	.67	57	24	3.7
12	126	20	6.8	215	444	258	46	7	.87
13	115	24	7.5	191	57	29	38	7	.72
14	146	48	19	198	173	92	32	8	.69
15	171	54	25	143	23	8.9	30	8	.65
16	138	21	7.8	113	15	4.6	37	31	3.1
17	114	14	4.3	89	15	3.6	25	11	.74
18	96	14	3.6	98	14	3.7	20	9	.49
19	80	13	2.8	78	8	1.7	17	9	.41
20	68	10	1.8	65	7	1.2	20	10	.54
21	57	8	1.2	69	9	1.7	16	6	.26
22	49	8	1.1	56	7	1.1	14	6	.23
23	44	9	1.1	46	6	.75	12	5	.16
24	39	11	1.2	41	6	.66	12	5	.16
25	37	8	.80	37	5	.50	11	6	.18
26	33	6	.53	30	4	.32	10	6	.16
27	33	9	.80	26	4	.28	9.8	5	.13
28	49	34	4.5	24	4	.26	9.0	6	.15
29	87	61	14	21	3	.17	10	8	.22
30	67	12	2.2	21	4	.23	13	12	.42
31	---	---	---	25	18	1.2	---	---	---
TOTAL	3,279	---	526.33	2,046	---	420.28	894.8	---	315.96
		JULY			AUGUST			SEPTEMBER	
1	9.8	5	0.13	12	7	0.23	9.4	11	0.28
2	8.7	5	.12	22	115	6.8	13	39	1.4
3	40	322	35	77	329	68	18	47	2.3
4	18	225	11	31	26	2.2	10	10	.27
5	12	24	.78	48	530	69	9.0	10	.24
6	11	16	.48	27	44	3.2	8.7	11	.26
7	9.0	12	.29	22	22	1.3	7.7	11	.23
8	56	266	40	25	23	1.6	7.1	12	.23
9	29	166	13	40	85	9.2	6.8	13	.24
10	17	27	1.2	25	17	1.1	6.8	14	.26
11	15	19	.77	29	19	1.5	6.5	14	.25
12	13	14	.49	80	678	146	6.2	13	.22
13	11	13	.39	40	60	6.5	6.0	15	.24
14	9.8	12	.32	40	115	12	15	26	1.1
15	9.0	12	.29	171	1,310	605	12	10	.32
16	65	851	149	89	77	19	8.4	4	.09
17	161	1,090	474	64	44	7.6	8.0	3	.06
18	59	40	6.4	49	24	3.2	7.7	3	.06
19	37	25	2.5	40	14	1.5	6.8	3	.06
20	28	15	1.1	32	10	.86	6.2	2	.03
21	23	15	.93	27	10	.73	6.2	2	.03
22	38	52	5.3	23	10	.62	6.2	2	.03
23	49	110	15	20	9	.49	8.0	7	.15
24	25	14	.95	17	9	.41	6.5	4	.07
25	20	10	.54	15	8	.32	5.7	2	.03
26	17	10	.46	14	8	.30	6.0	1	.02
27	15	8	.32	13	7	.25	5.4	1	.01
28	16	7	.30	12	8	.26	5.2	1	.01
29	15	8	.32	11	7	.21	5.7	5	.08
30	15	8	.32	10	6	.16	5.7	2	.03
31	13	4	.14	10	7	.19	---	---	---
TOTAL	864.3	---	761.84	1,135	---	969.73	239.9	---	8.60
YEAR	19,218.0		4,767.55						

Table 5.--Daily mean streamflow and suspended-sediment concentration and discharge--Continued
[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, ton per day]

03033225 East Branch Mahoning Creek near Big Run, PA

Water year October 1980 to September 1981

Day	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)
		OCTOBER			NOVEMBER			DECEMBER	
1	5.7	1	0.02	12	55	1.8	38	23	2.4
2	5.4	1	.01	11	35	1.0	54	30	4.4
3	6.2	3	.05	10	5	.14	90	50	12
4	6.8	3	.06	10	6	.16	70	56	11
5	6.0	2	.03	10	8	.22	60	51	8.3
6	5.7	1	.02	10	10	.27	54	46	6.7
7	5.7	1	.02	9.0	13	.32	53	42	6.0
8	5.7	1	.02	22	21	1.2	53	36	5.2
9	5.4	1	.01	25	14	.95	52	30	4.2
10	5.4	1	.01	28	25	1.9	80	60	13
11	13	26	.91	18	14	.68	70	54	10
12	7.7	16	.33	16	6	.26	62	50	8.4
13	6.5	7	.12	15	6	.24	62	41	6.9
14	6.5	3	.05	14	6	.23	56	38	5.7
15	7.1	1	.02	14	6	.23	44	30	3.6
16	6.5	1	.02	13	6	.21	50	35	4.7
17	5.7	1	.02	13	6	.21	44	29	3.4
18	5.4	2	.03	12	6	.19	38	24	2.5
19	6.2	3	.05	11	5	.15	37	20	2.0
20	6.0	2	.03	11	5	.15	22	15	.89
21	6.0	2	.03	11	5	.15	33	20	1.8
22	5.7	1	.02	16	8	.35	29	21	1.6
23	5.7	1	.02	34	13	1.2	24	20	1.3
24	5.7	1	.02	60	22	3.6	24	18	1.2
25	96	288	75	52	38	5.3	24	17	1.1
26	71	34	6.5	46	34	4.2	27	20	1.5
27	26	11	.77	42	31	3.5	19	14	.72
28	22	9	.53	40	30	3.2	23	13	.81
29	17	7	.32	39	26	2.7	19	12	.62
30	15	6	.24	39	25	2.6	22	17	1.0
31	13	5	.18	---	---	---	20	14	.76
TOTAL	411.7	---	85.46	663.0	---	37.31	1,353	---	133.70
		JANUARY			FEBRUARY			MARCH	
1	20	12	0.65	21	11	0.62	82	30	6.6
2	16	9	.39	100	20	5.4	69	21	3.9
3	21	10	.57	90	70	17	58	17	2.7
4	30	20	1.6	100	64	17	56	12	1.8
5	30	25	2.0	170	135	62	48	9	1.2
6	30	18	1.5	148	110	44	44	9	1.1
7	21	15	.85	118	100	32	39	8	.84
8	29	20	1.6	56	45	6.8	35	7	.66
9	25	16	1.1	100	60	16	31	9	.75
10	18	11	.53	43	26	3.0	31	15	1.3
11	18	8	.39	100	48	13	31	7	.59
12	18	7	.34	135	100	36	30	8	.65
13	21	7	.40	100	85	23	44	18	2.1
14	21	6	.34	89	70	17	56	21	3.2
15	21	6	.34	70	63	12	50	25	3.4
16	20	6	.32	70	60	11	58	15	2.3
17	17	5	.23	135	80	29	50	18	2.4
18	17	5	.23	210	130	74	43	16	1.9
19	17	4	.18	217	200	117	36	14	1.4
20	15	4	.16	358	329	318	36	12	1.2
21	13	4	.14	406	348	381	35	13	1.2
22	13	4	.14	220	118	70	34	18	1.7
23	11	4	.12	208	166	93	34	12	1.1
24	9.0	3	.07	183	125	62	36	10	.97
25	12	4	.13	145	100	39	33	12	1.1
26	12	5	.16	117	75	24	32	10	.86
27	25	8	.54	95	50	13	59	28	4.5
28	24	15	.97	92	40	9.9	49	12	1.6
29	21	14	.79	---	---	---	47	9	1.1
30	21	13	.74	---	---	---	68	27	5.0
31	20	12	.65	---	---	---	76	19	3.9
TOTAL	606.0	---	18.17	3,896	---	1,545.72	1,430	---	63.02

Table 5.--Daily mean streamflow and suspended-sediment concentration and discharge--Continued
[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, ton per day]

03033225 East Branch Mahoning Creek near Big Run, PA

Water year October 1980 to September 1981

Day	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)	Mean discharge (ft^3/s)	Mean concentration (mg/L)	Sediment discharge (ton/d)
		APRIL			MAY			JUNE	
1	67	15	2.7	145	34	13	14	5	0.19
2	63	10	1.7	108	27	7.9	30	30	2.4
3	54	8	1.2	86	22	5.1	24	18	1.2
4	48	13	1.7	70	18	3.4	97	529	139
5	50	17	2.3	59	14	2.2	51	87	12
6	43	10	1.2	58	22	3.4	39	27	2.8
7	36	9	.87	48	10	1.3	32	21	1.8
8	33	8	.71	39	8	.84	25	17	1.1
9	35	14	1.3	33	7	.62	143	942	364
10	31	11	.92	31	6	.50	91	67	16
11	32	15	1.3	99	164	44	74	38	7.6
12	66	28	5.0	133	96	34	54	24	3.5
13	82	38	8.4	91	12	2.9	45	18	2.2
14	158	130	55	87	107	25	83	291	65
15	138	52	19	183	176	87	124	335	112
16	113	17	5.2	126	12	4.1	73	84	17
17	106	27	7.7	84	12	2.7	139	329	123
18	88	31	7.4	82	13	2.9	82	36	8.0
19	69	24	4.5	68	10	1.8	67	21	3.8
20	59	18	2.9	57	9	1.4	56	50	7.6
21	48	15	1.9	46	7	.87	52	18	2.5
22	42	13	1.5	38	7	.72	107	402	116
23	53	28	4.0	32	7	.60	72	93	18
24	65	23	4.0	29	6	.47	49	23	3.0
25	53	14	2.0	25	6	.41	98	495	131
26	45	10	1.2	22	6	.36	108	189	55
27	44	14	1.7	20	6	.32	71	24	4.6
28	102	175	48	18	5	.24	56	19	2.9
29	337	186	169	17	5	.23	45	19	2.3
30	200	40	22	17	5	.23	38	17	1.7
31	---	---	---	16	5	.22	---	---	---
TOTAL	2,360	---	386.30	1,967	---	248.73	2,039	---	1,227.19
		JULY			AUGUST			SEPTEMBER	
1	32	16	1.4	11	20	0.59	7.4	8	0.16
2	31	15	1.3	11	17	.50	7.7	7	.15
3	27	13	.95	10	16	.43	11	34	1.0
4	24	10	.65	11	13	.39	62	297	50
5	22	9	.53	10	10	.27	27	32	2.3
6	21	8	.45	9.4	10	.25	14	16	.60
7	17	8	.37	9.4	10	.25	11	15	.45
8	16	7	.30	10	10	.27	19	61	3.1
9	15	6	.24	9.2	9	.22	17	35	1.6
10	14	6	.23	8.7	9	.21	11	10	.30
11	13	7	.25	8.7	9	.21	9.5	8	.21
12	12	7	.23	10	9	.24	8.8	6	.14
13	12	7	.23	8.4	8	.18	8.4	5	.11
14	12	7	.23	8.4	8	.18	8.4	5	.11
15	11	6	.18	8.4	8	.18	17	48	2.2
16	11	6	.18	9.4	10	.25	12	14	.45
17	10	6	.16	8.7	9	.21	20	41	2.2
18	9.8	5	.13	7.7	8	.17	12	12	.39
19	9.8	7	.19	7.4	7	.14	10	9	.24
20	80	1,070	231	7.1	7	.13	9.4	8	.20
21	70	806	152	6.8	7	.13	8.7	8	.19
22	32	229	20	6.8	7	.13	8.7	8	.19
23	18	38	1.8	6.5	6	.11	8.7	8	.19
24	16	25	1.1	6.5	6	.11	8.0	7	.15
25	15	20	.81	6.8	6	.11	7.7	6	.12
26	16	31	1.3	6.5	6	.11	7.4	6	.12
27	17	54	2.5	6.5	5	.09	7.1	6	.12
28	18	60	2.9	6.5	5	.09	7.1	5	.10
29	24	221	14	6.5	5	.09	6.8	5	.09
30	16	25	1.1	7.2	10	.19	7.1	5	.10
31	13	20	.70	9.6	12	.31	---	---	---
TOTAL	654.6	---	437.41	260.1	---	6.74	379.9	---	67.28
YEAR	16,020.3		4,257.03						