CHEMICAL QUALITY, BENTHIC ORGANISMS, AND SEDIMENTATION IN STREAMS DRAINING COAL-MINED LANDS IN RACCOON CREEK BASIN, OHIO, JULY 1984 THROUGH SEPTEMBER 1986

By Karen S. Wilson

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CONVERSION FACTORS AND ABBREVIATIONS

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 unit
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (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 per year [$(ton/mi^2)/yr$]	0.4255	megagram per square kilometer per year [$(Mg/km^2)/yr$]

Chemical concentrations and water temperature are given in metric units. Chemical concentration is given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter. For concentrations less than 7,000 mg/L, the numerical value is the same as for concentrations in parts per million.

Temperature is given in degrees Celsius (^{o}C), which can be converted to degrees Fahrenheit (^{o}F) by the following equation:

$$F = 1.8(^{o}C) + 32$$

STANDARD ABBREVIATIONS USED IN STATION NAMES

B	branch	F	fork	Rn	run
C	creek	L	little	St	state
DA	drainage area	Nr	near	W	west
E	east	R	river		

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ABSTRACT

The Ohio Department of Natural Resources, Division of Reclamation, plans widespread reclamation of abandoned coal mines in the Raccoon Creek basin in southeastern Ohio. Throughout Raccoon Creek basin, chemical, biological, and suspended-sediment data were collected from July 1984 through September 1986.

Chemical and biological data collected at 17 sites indicate that the East Branch, Brushy Creek, Hewett Fork, and Little Raccoon Creek subbasins, including Flint Run, are affected by drainage from abandoned coal mines.

In these basins, median pH values ranged from 2.6 to 5.1, median acidity values ranged from 20 to 1,040 mg/L (milligrams per liter) as $CaCO_3$, and median alkalinity values ranged from 0 to 4 mg/L as $CaCO_3$. Biological data indicate that these basins do not support diverse populations because of degraded water systems.

Suspended-sediment yields of 70.7 tons per square mile per year at the headwaters of Raccoon Creek and 54.5 tons per square mile per year near the mouth of Raccoon Creek indicate that cumulative sedimentation from erosion of abandoned-mine lands is not excessive in the basin.

INTRODUCTION

Background

The Raccoon Creek basin in southeastern Ohio has been influenced by its coal resources--coal mining in the basin began in the 1850's and continues today. Throughout the predominantly hilly landscape are abandoned underground mines and abandoned and active surface mines.

The long history of coal mining in the basin has resulted in serious and widespread degradation of surface-water quality as a result of mine drainage. The Raccoon Creek basin was classified by the Ohio Department of Natural Resources (ODNR) as a high-

priority area in which immediate reclamation of abandoned mines is desirable (Ohio Board on Unreclaimed Strip Mined Lands, 1974). ODNR plans reclamation of abandoned-mine lands throughout the Raccoon Creek basin. Several reclamation projects have been completed since 1980 in small subbasins of Raccoon Creek, and others will be initiated until reclamation is complete.

A previous study of the Raccoon Creek basin was conducted in 1983 and 1984 by the U.S. Geological Survey in cooperation with the Ohio Department of Natural Resources, Division of Reclamation, to develop a water-quality data base to prioritize individual reclamation projects (Wilson, 1985). Data collected for the study supplemented existing water-quality data that were compiled for the period January 1975 through January 1983 (Roth and Cooper, 1984; Pfaff and others, 1981; Childress, 1984; and Nichols, 1983). Results were used to characterize the extent of water-quality degradation due to coal mining.

The objectives of the study reported here, also conducted by the U.S. Geological Survey in cooperation with the Ohio Department of Natural Resources, Division of Reclamation, were to (1) extend the water-quality data base to enable documentation of long-term and large-scale changes in water quality due to planned reclamation in the basin; (2) compare the effect of mine drainage and drainage from reclaimed areas on the abundance and diversity of benthic organisms; and (3) measure sediment yields and rates of deposition and scour in the basin.

Initially, data collection was to continue through 1993 so that postreclamation conditions could be adequately evaluated and insight into the effectiveness of reclamation of abandoned mines could be gained for a large basin. Lack of funds limited the period of data collection from July 1984 through September 1986. As of 1986, widespread reclamation within the basin had not yet been completed.

Purpose and Scope

The purpose of this report is to present results of the analyses of chemical, biological, and suspended-sediment data collected from July 1984 through September 1986. These data can be used as background data for comparison after reclamation is complete. Chemical and biological data were collected at 17 sites, and suspended-sediment data were collected at 5 sites--3 sites on Raccoon Creek and 2 sites on Little Raccoon Creek, a large tributary. One of the 17 sites was in an unmined area and was used as a control site.

STUDY AREA

Raccoon Creek drains 684 square miles of southeastern Ohio (fig. 1). The stream, which is 110 miles long, originates in Hocking County and flows through Vinton, Meigs, and Gallia Counties to the Ohio River. Among the many tributaries are Little Raccoon Creek (drainage area, 155 square miles), Elk Fork (drainage area, 59.8 square miles), Hewett Fork (drainage area, 40.5 square miles), and Brushy Creek (drainage area, 34 square miles) (fig. 2).

The area is sparsely populated. The largest communities within the basin are Wellston (population 6,016), McArthur (population 1,912), Hamden (population 1,010), and Rio Grande (population 864) (U.S. Bureau of the Census, 1981). The main industries are coal mining, wood processing, and small-scale manufacturing. No municipal water supplies are taken from Raccoon Creek. However, there are two public surface-water supplies in the basin, at Rio Grande and Wellston, that withdraw water from Raccoon Creek tributaries. All other communities and most of the manufacturing plants in the basin obtain water from wells. Ground water also is the major source of domestic water supply (Federal Water Pollution Control Administration, 1967).

Raccoon Creek basin is in the central hardwood forest region, and woodland is a major land use. Pulp and lumber are important forest products. Agriculture also is important; livestock and general farming predominate. Principal crops grown are corn, soybeans, and tobacco.

Deposits of coal, limestone, clay, sand, and iron ore are found throughout the basin, however, high-grade iron-ore reserves essentially were depleted in the early 1900's. Coal production continues to be an important industry. Since the enactment of Public Law 95-87, the "Surface Mining Control and Reclamation Act of 1977", all surface mines are required to be reclaimed; however, many previously mined areas in the basin had already been abandoned. Some of these areas are reverting to brush and woodland, but others, with soils too toxic to support vegetation, remain barren.

Physiographic and Geologic Setting

The Raccoon Creek basin is in the unglaciated part of the Appalachian Plateaus physiographic province (Fenneman, 1938). In general, the terrain is hilly. The predominant formations cropping out in the basin in ascending order are the Pottsville, Allegheny, and Conemaugh Formations of Pennsylvanian age (fig. 3). The Pottsville and the Allegheny Formations crop out in the northern and western parts of the basin, and the Conemaugh Formation crops out in the southern and eastern parts of the basin. In the basin, bedrock generally consists of a series of alternating clay, coal, shale, limestone, and sandstone beds.

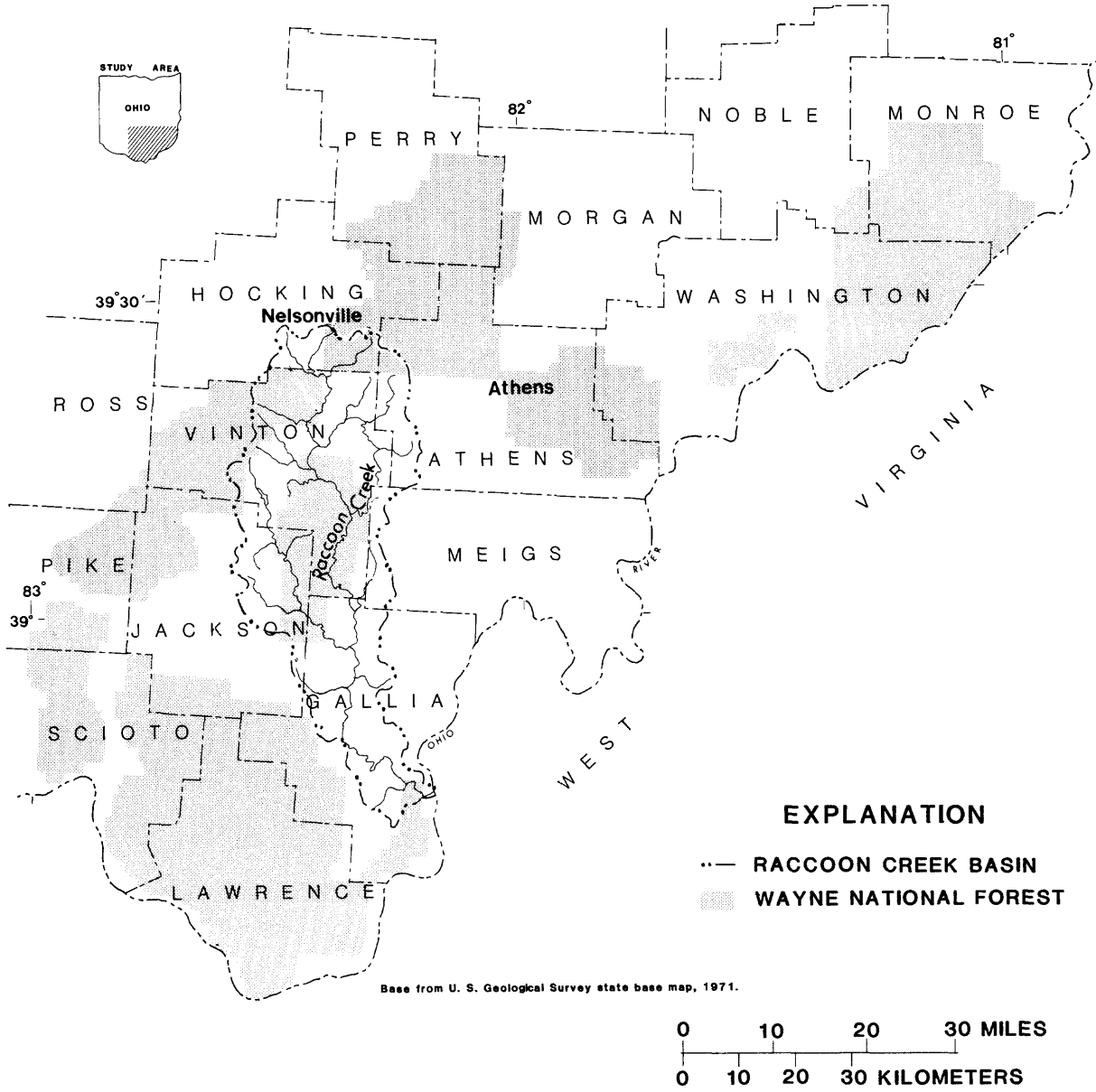

Figure 1.--The Raccoon Creek basin in southeastern Ohio.

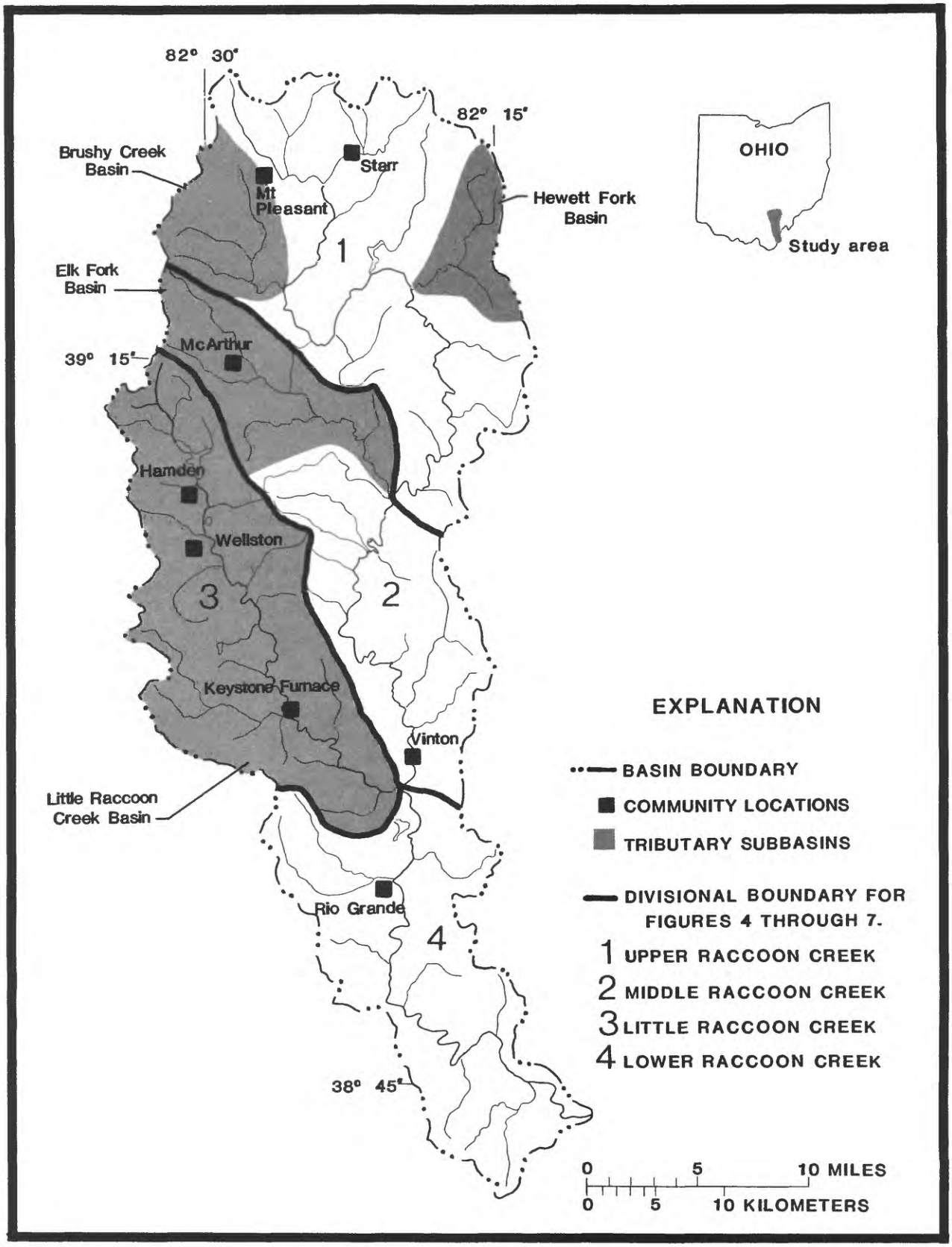

Figure 2.--The Raccoon Creek basin.

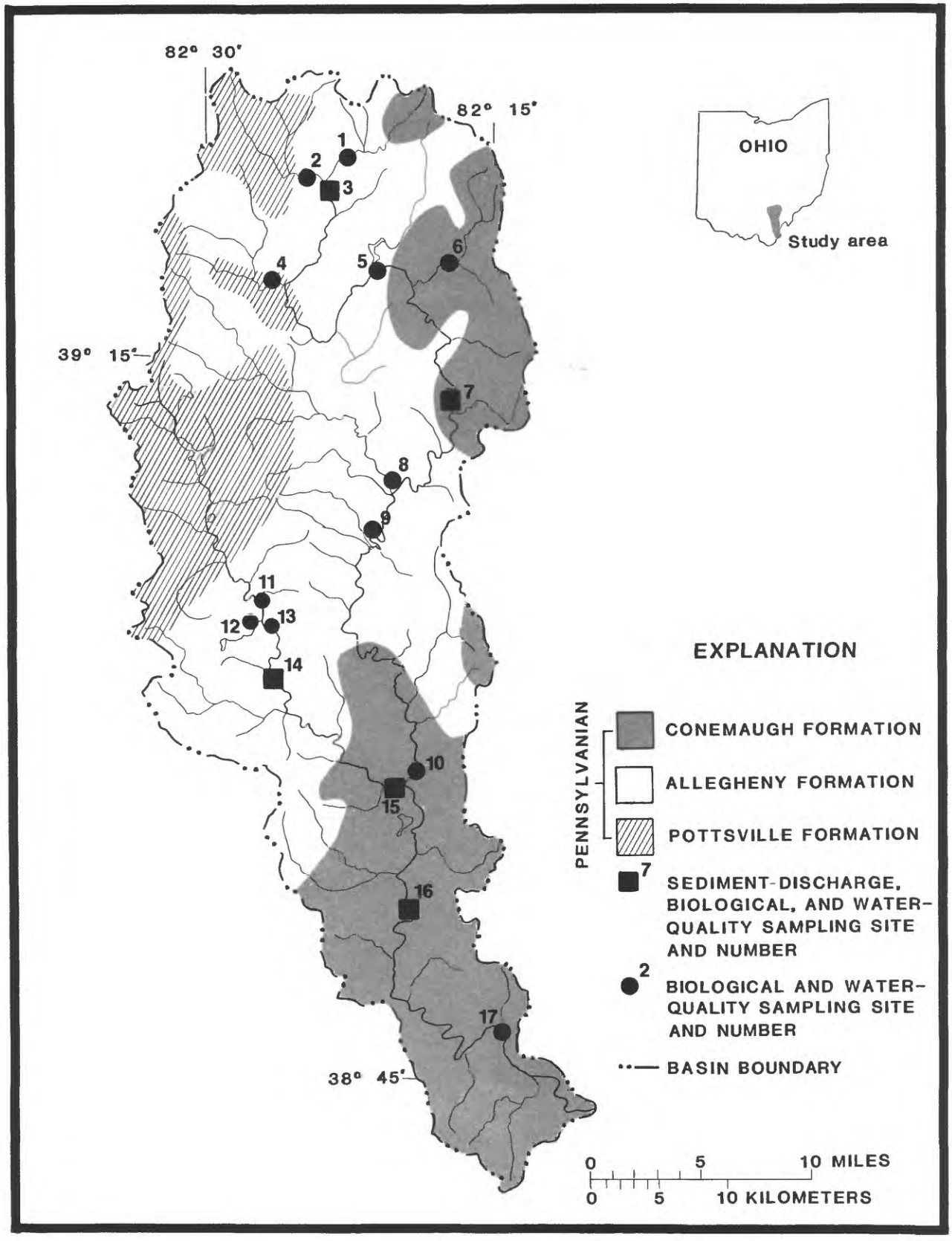

Figure 3.--Geologic formations in the Raccoon Creek basin (from Roth and Cooper, 1984).

The Pottsville Formation is the basal formation of the Pennsylvanian System. Shale and sandstone comprise most of this formation, which contains only thin strata of limestone. The Pottsville Formation has 12 identified coal beds. Although the coal beds of the Pottsville are considered a minor source, the highest quality heating coals in Ohio have been mined from the Sharon ("No. 1") and the Quakertown ("No. 2") in the Pottsville (Brant, 1964). Other mineable coal beds include the Lower Mercer, the Middle Mercer, and the Bedford.

Like the Pottsville, the overlying Allegheny Formation is composed of sandstones and shales, with only minor amounts of limestone. However, the Allegheny is considered a prime coal resource in Ohio because of its thick and persistent coals. The principal coal beds of 13 identified coal beds in the Allegheny Formation are the Brookville ("No. 4"), Clarion ("No. 4a"), Lower Kittanning ("No. 5"), Middle Kittanning ("No. 6"), Lower Freeport ("No. 6a"), and Upper Freeport ("No. 7").

The third formation of the Pennsylvanian System in the Raccoon Creek Basin is the Conemaugh Formation. Although the Conemaugh Formation has 13 identified coal beds, only a few are mineable deposits. The principal coals are the Mahoning, the Wilgus, the Anderson, and the Harlem. Limestone is found in mineable quantities.

Mining and Reclamation

Coal has been extracted from Raccoon Creek basin by surface and underground mining, which includes drift, slope, and shaft mining techniques (Clifford and Snavely, 1954). As of 1985, 10.3 square miles of the 684-square-mile basin had been altered by coal mining (U.S. Department of Agriculture, 1985). Underground mines underlie 4.4 square miles of the basin, surface mines cover 5.4 square miles, and reclaimed areas total 0.5 square mile. Figures 4-7 show the mined areas as mapped by the U.S. Department of Agriculture (1985). The basin (fig. 2) was divided into the upper Raccoon Creek basin (fig. 4), middle Raccoon Creek basin (fig. 5), Little Raccoon Creek basin (fig. 6), and lower Raccoon Creek basin (fig. 7).

Active mining, mostly surface mining, also is present in the basin. Areas in the basin where mining permits have been issued from 1975 through 1986 include Gallia County in the Little Raccoon Creek basin near Vinton, Hocking County in the East Branch Raccoon Creek basin near Starr, the Brushy Creek and West Branch Raccoon Creek basins near Mt. Pleasant, Jackson County in the Little Raccoon Creek basin near both Keystone Furnace and Wellston, and throughout Vinton County (Ohio Department of Natural Resources, written commun., 1986). Longwall mining was scheduled to begin in 1987 in the Raccoon Creek basin near Vinton (fig. 2). In view of the sizeable coal reserve and present mining techniques, coal production is expected to continue in the basin.

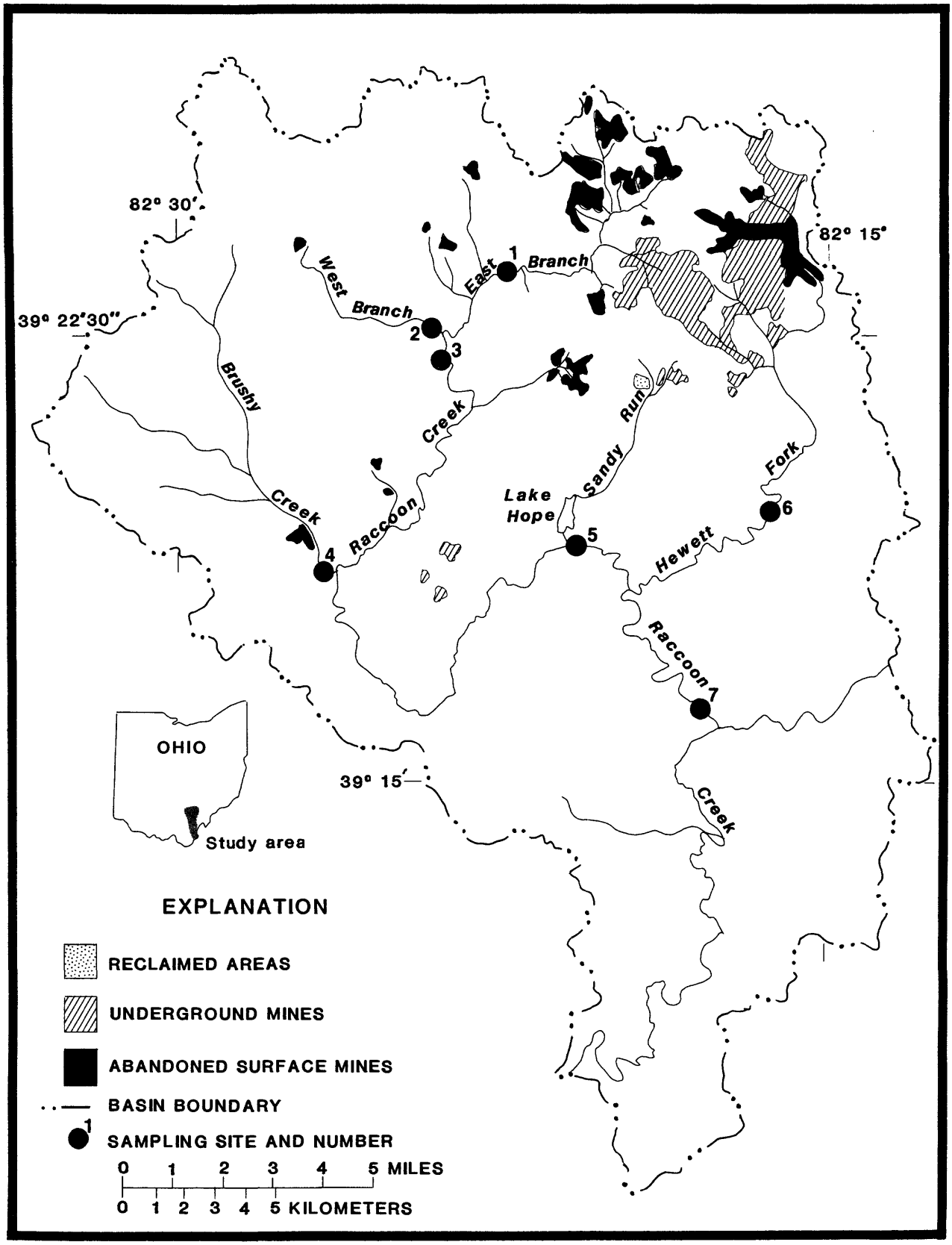

Figure 4.--Abandoned surface and underground mine areas in upper Raccoon Creek basin (division 1, fig. 2: modified from U.S. Department of Agriculture, 1985).

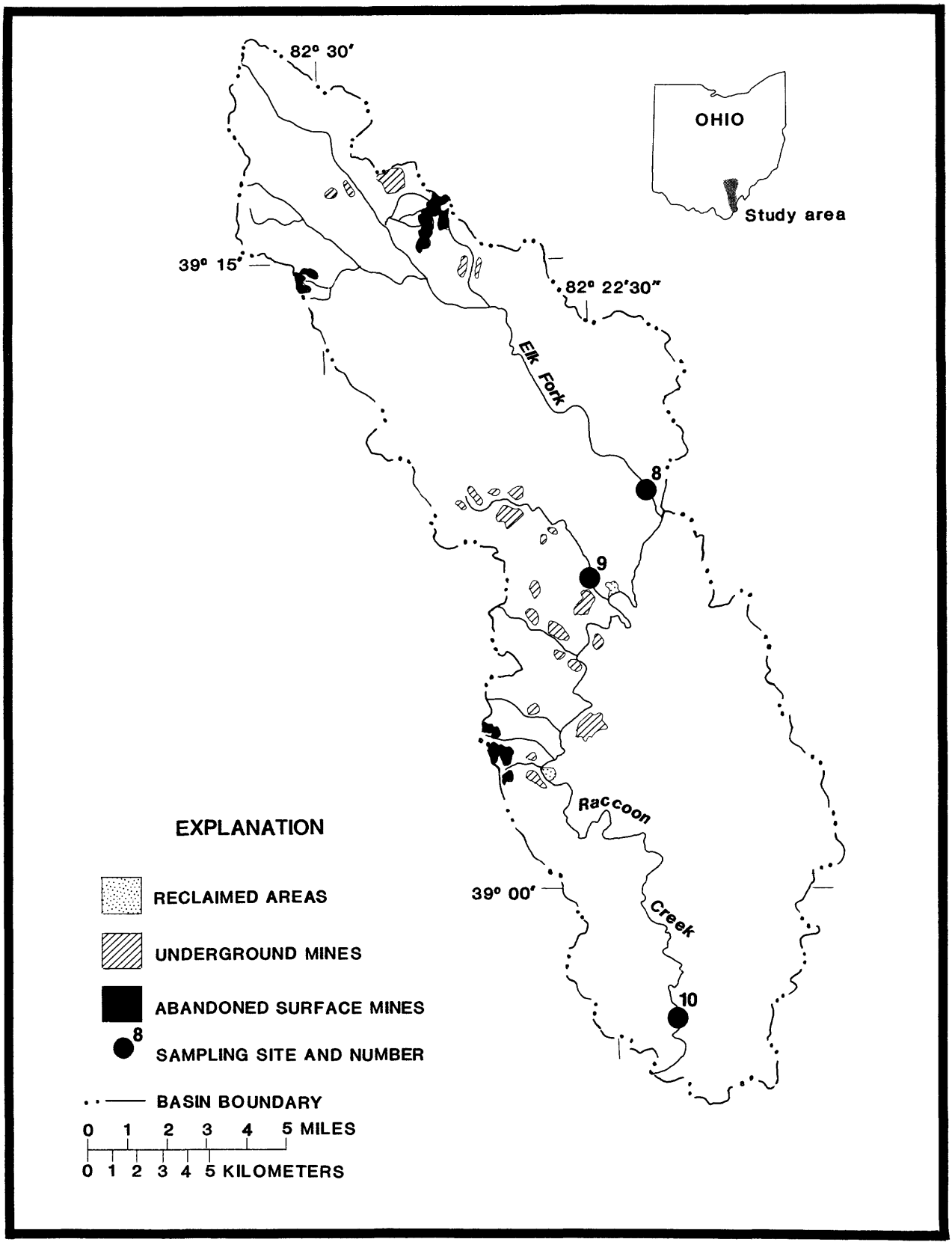

Figure 5.--Abandoned surface and underground mine areas in the middle Raccoon Creek basin (division 2, fig. 2: modified from U.S. Department of Agriculture, 1985).

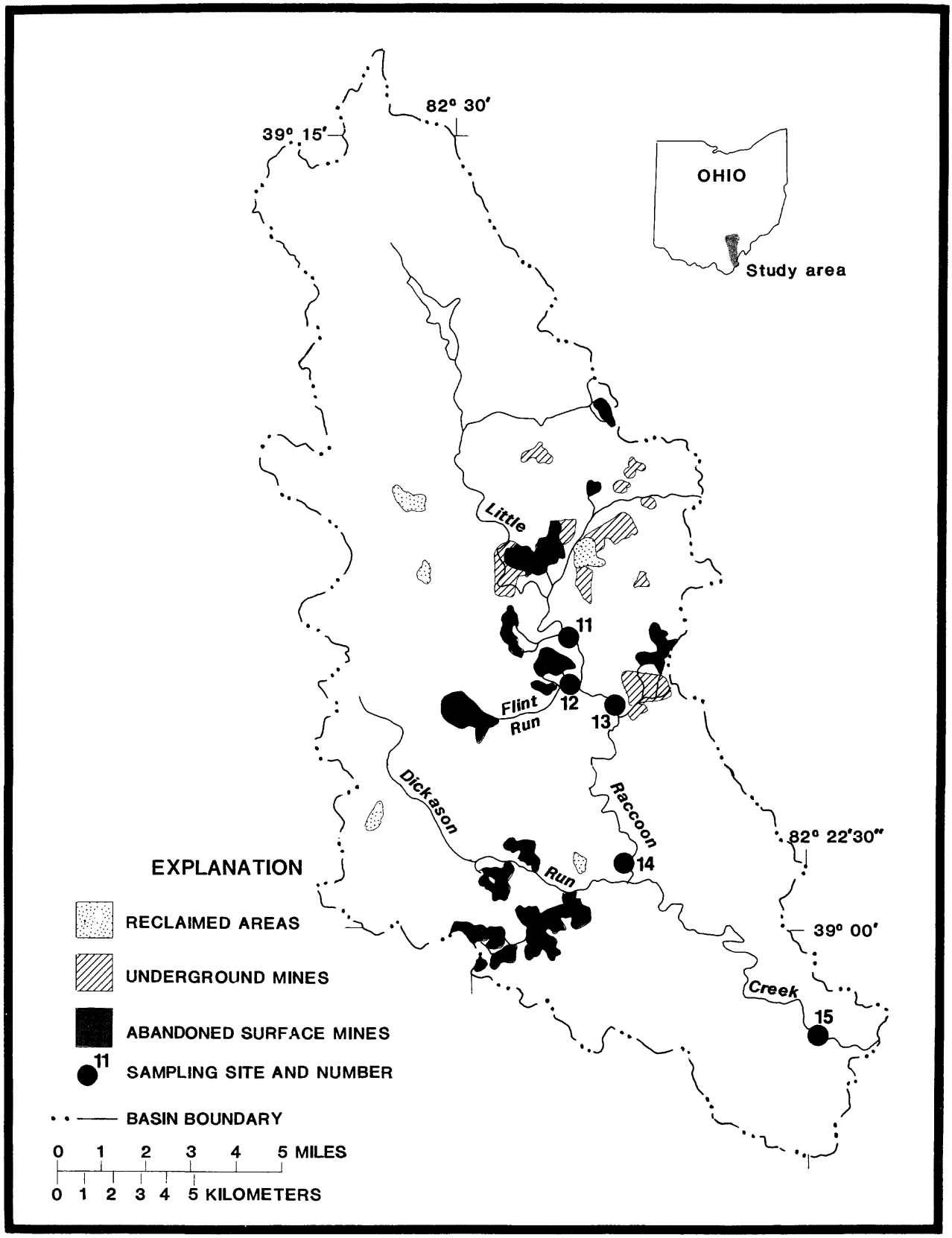

Figure 6.—Abandoned surface and underground mine areas in the Little Raccoon Creek basin (division 3, fig. 2: modified from U.S. Department of Agriculture, 1985).

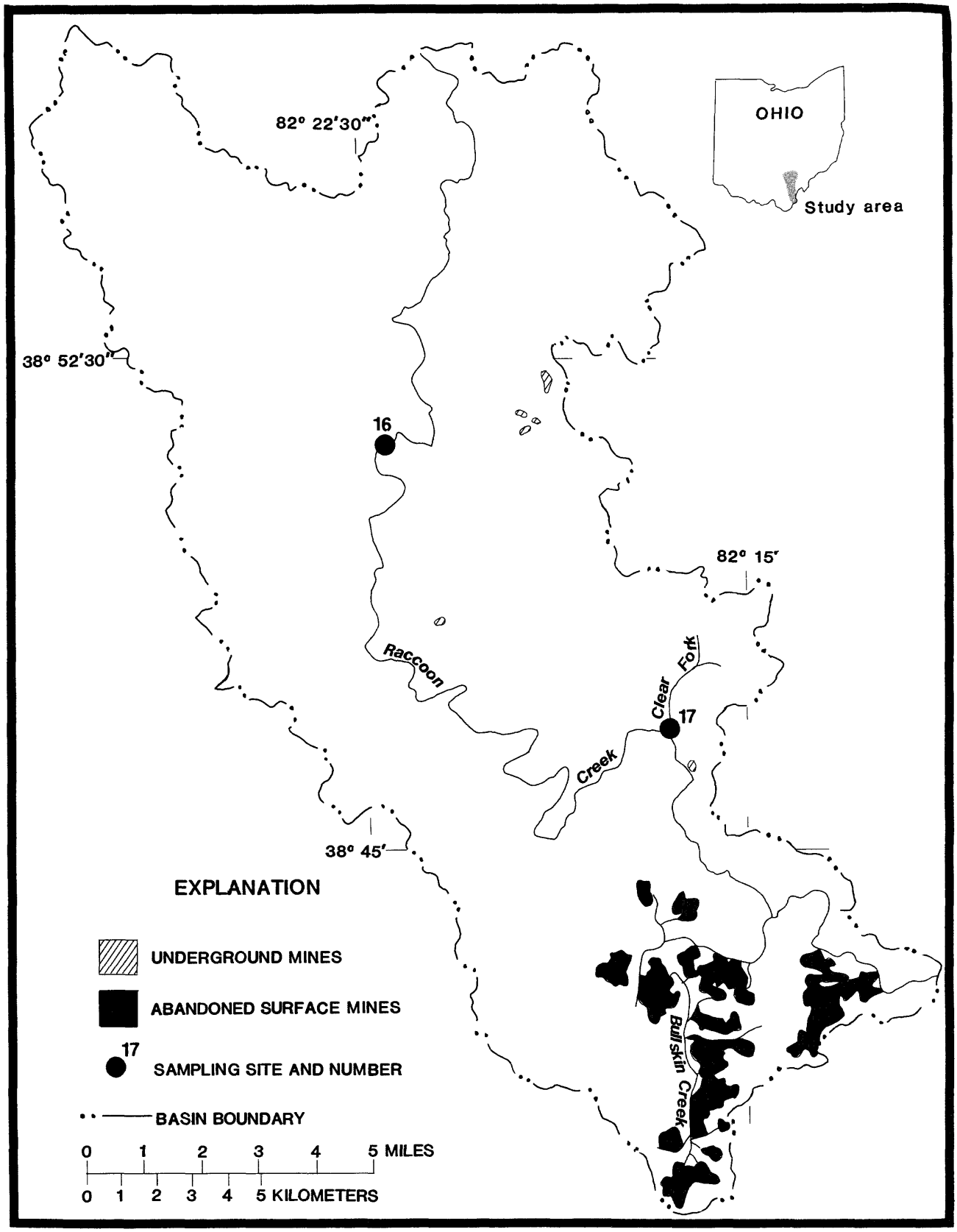

Figure 7.—Abandoned surface and underground mine areas in the lower Raccoon Creek basin (division 4, fig. 2: modified from U.S. Department of Agriculture, 1985).

SITE SELECTION AND METHODS OF STUDY

Chemical Quality

A network of 17 water-quality data-collection sites was established in the Raccoon Creek basin (fig. 8; table 1). From September 1984 through September 1986, water samples were collected at the 17 sites. The number of water samples collected at each site ranged from 4 to 15.

Five of the 17 sites represented the headwaters (site 3), the mid-basin (site 7), and the mouth of Raccoon Creek (site 16) and the mid-basin (site 14) and the mouth of Little Raccoon Creek (site 15). Eleven network sites were selected downstream from areas of known water-quality degradation from abandoned mines (fig. 8). Streams determined by previous study (Wilson, 1985) to be the major sources of mine drainage to Raccoon Creek were Little Raccoon Creek (site 11), East Branch Raccoon Creek (site 1), Brushy Creek (site 4), and Hewett Fork (site 6). In addition, the mouth of West Branch Raccoon Creek (site 2) was selected to document the difference in water quality from East Branch Raccoon Creek.

Sites 5 and 10 were established on the mainstem of Raccoon Creek to document cumulative downstream water quality. Elk Fork (site 8) is the second largest tributary of Raccoon Creek; therefore, one site was located near the mouth. Historically, the water-quality of Pierce Run near the headwaters had been degraded because of mining; therefore, site 9 was located at the mouth of Pierce Run.

Flint Run (site 12) was added to the network in 1985. It is a small subbasin (3.44 square miles) of Little Raccoon Creek that contains abandoned surface-mine spoils. In 1984, a partial reclamation project was begun there. Little Raccoon Creek near Buckeye Furnace State Memorial (site 13) located downstream of the mouth of Flint Run was added to the network in 1985 to determine the effect of reclamation in the Flint Run subbasin on the water quality of Little Raccoon Creek.

The last site, Clear Fork (site 17), located in the southeastern part of the basin in the Conemaugh Formation, was a control site because no mining has occurred in the basin.

Sampling of the 17 network sites was confined to short periods of time so that flow conditions throughout the basin would be relatively constant.

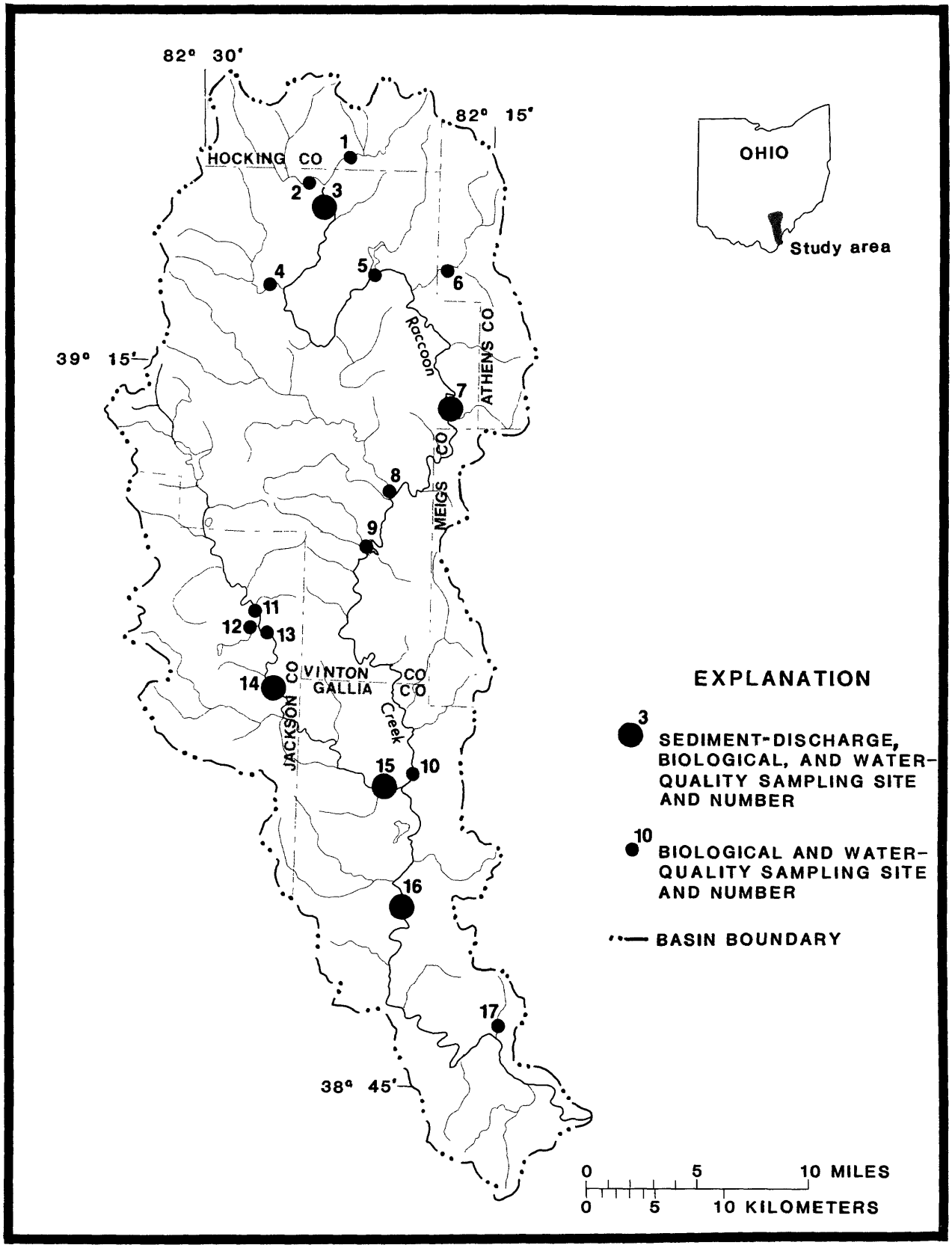

Figure 8.--Sediment-discharge, biological, and water-quality sampling sites in Raccoon Creek basin.

Table 1.--Station number, drainage area, and latitude and longitude for water-quality, biological, and suspended-sediment sampling sites

Site number	Site name	U.S. Geological Survey identification number	Drainage area (square miles)	Latitude	Longitude
1	E B Raccoon C nr New Plymouth, OH----------	392348082220200	14.5	0392348	0822202
2	W B Raccoon C nr New Plymouth, OH----------	392249082234500	22.7	0392249	0822345
3	Raccoon C nr New Plymouth, OH----------	0320155	43.1	0392208	0822328
4	Brushy C nr Creola, OH----------	391830082262300	33.7	0391830	0822623
5	Raccoon C nr Zaleski, OH----------	391901082210400	122	0391901	0822104
6	Hewett F nr Albany, OH----------	391903082164200	27.8	0391903	0821642
7	Raccoon C nr Bolins Mills, OH----------	03201902	205	0391040	0821854
8	Elk F nr Radcliff, OH----------	390941082212200	59.5	0390941	0822122
9	Pierce Rn nr Radcliff, OH----------	390828082224900	9.7	0390828	0822249
10	Raccoon C nr Vinton, OH----------	385826082201800	382	0385826	0822018
11	L Raccoon C nr Roads, OH----------	390509082281900	67.5	0390509	0822819
12	Flint Rn nr Roads, OH----------	390421082282300	3.4	0390421	0822823
13	L Raccoon C nr Buckeye Furnace St Memorial, OH	390342082271900	73.1	0390342	0822719
14	L Raccoon C nr Ewington, OH----------	03201980	99.7	0390038	0822708
15	L Raccoon C nr Vinton, OH----------	03201988	154	0385711	0822156
16	Raccoon C at Adamsville, OH----------	03202000	585	0385132	0822143
17	Clearfork at Northup, OH----------	384651082162800	7.2	0384651	0821628

At each site, measurements of streamflow, specific conductance, pH, temperature, alkalinity, and acidity were made. When pH was above 6.5, acidity was not determined and was assumed to be zero. When pH was below 4.5, alkalinity was not determined and also was assumed to be zero. All water samples were analyzed for concentrations of aluminum, iron, manganese, and dissolved sulfate.

Samples collected for analyses of dissolved constituents were filtered in the field. All samples were treated and preserved in compliance with established procedures and methods (Federal Interagency Work Groups, 1977; and U.S. Geological Survey, 1983) and analyzed at the U.S. Geological Survey National Water Quality Laboratory (Fishman and Friedman, 1985).

Benthic Organisms

Benthic organisms were collected three times at the 17 chemical-quality sites (fig. 8) from June 1985 through September 1986. Samples were collected in June 1985, June 1986, and September 1986.

Benthic communities were sampled using jumbo multiple-plate samplers (Greeson and others, 1977). These artificial substrate samplers were attached to reinforcement bar at each site and were left in the stream for 6 weeks (42 days). The samplers were placed in flowing water, although not in turbulent conditions. All samplers were placed so as not to touch the streambed to avoid siltation on the sampler. Because the sites generally were shallow, the sampler was usually exposed to the entire water column.

When removed from a site, each sampler was enclosed in a large dip net then placed in a plastic bag. In the laboratory, the sampler was disassembled and organisms were brushed off into a pan of water. The sample was sieved through a 40-mesh screen, and organisms were removed and placed in a preservative. The samples were counted and identified at the Heidelberg College Water Quality Laboratory (Hilsenhoff, 1982, and Merritt and Cummins, 1984).

Sedimentation

Stream-stage and suspended-sediment data were collected at five gaging stations for the computation of sediment yields (fig. 8). Three stations were on the main stem of Raccoon Creek; Raccoon Creek near New Plymouth, located below the convergence of the east and west branches (site 3); Raccoon Creek near Bolins Mills, approximately mid-basin (site 7); and Raccoon Creek near Adamsville, near the mouth of the stream (site 16). The other two stations were established at Little Raccoon Creek near Ewington (site 14) and Little Raccoon Creek near Vinton (site 15).

Each suspended-sediment station was instrumented with a PS-69 automatic suspended-sediment sampler (Skinner and Beverage, 1981), and daily sediment data were collected concurrently with continuous-streamflow data. Suspended-sediment data were collected from July 1984 through September 1985 at Raccoon Creek near New Plymouth (site 3), Little Raccoon Creek near Vinton (site 15), and Raccoon Creek near Adamsville (site 16). Suspended-sediment data were collected from July 1984 through June 1985 at Raccoon Creek near Bolins Mills (site 7) and Little Raccoon Creek near Ewington (site 14). Suspended-sediment concentrations were determined at the Heidelberg College Water Quality Laboratory (Guy, 1977). Suspended-sediment discharge was computed for each site, and sediment yields were calculated for sites 3, 15, and 16.

To determine deposition and scour rates, channel cross sections were established at two sites in October 1984; Raccoon Creek near New Plymouth (site 3) and Little Raccoon Creek near Vinton (site 15) (fig. 8). At Raccoon Creek near New Plymouth (site 3), three cross sections were located 100 feet apart. At Little Raccoon Creek near Vinton (site 15), two cross sections were located 100 feet apart (fig. 9). Each cross section was surveyed three times: October 11, 1984; May 1, 1985; and September 18, 1985.

CHEMICAL, BIOLOGICAL, AND SEDIMENTATION CHARACTERISTICS OF STREAMS DRAINING COAL-MINED LANDS

Chemical Quality

Degradation of water quality can result from surface and underground mine drainage. Iron-sulfide minerals found in coal-bearing formations in Ohio are exposed to air and water during mining. Oxidation of the iron sulfide minerals in water produces acidic and mineralized conditions. The major source of acid drainage into the streams of the Raccoon Creek basin is abandoned surface and underground mines.

Low pH, high specific conductance, and elevated concentrations of iron, sulfate, aluminum, and manganese typify streams draining abandoned mine lands. Reclamation of abandoned mine lands can restore levels of pH, alkalinity, acidity, total aluminum, total and dissolved iron, and total manganese to premined levels. Reclamation does not always restore specific conductance or sulfate to premined levels (Pfaff and others, 1981; Hren and others, 1984).

The mineralogy of the exposed bedrock is important because rocks with a substantial carbonate content can neutralize acidity in runoff produced by mining activities. The carbonate content of the strata increases from older to younger in Pennsylvanian rocks. In the Raccoon Creek basin, the Conemaugh Formation contains more carbonate rocks than the Allegheny and Pottsville Formations.

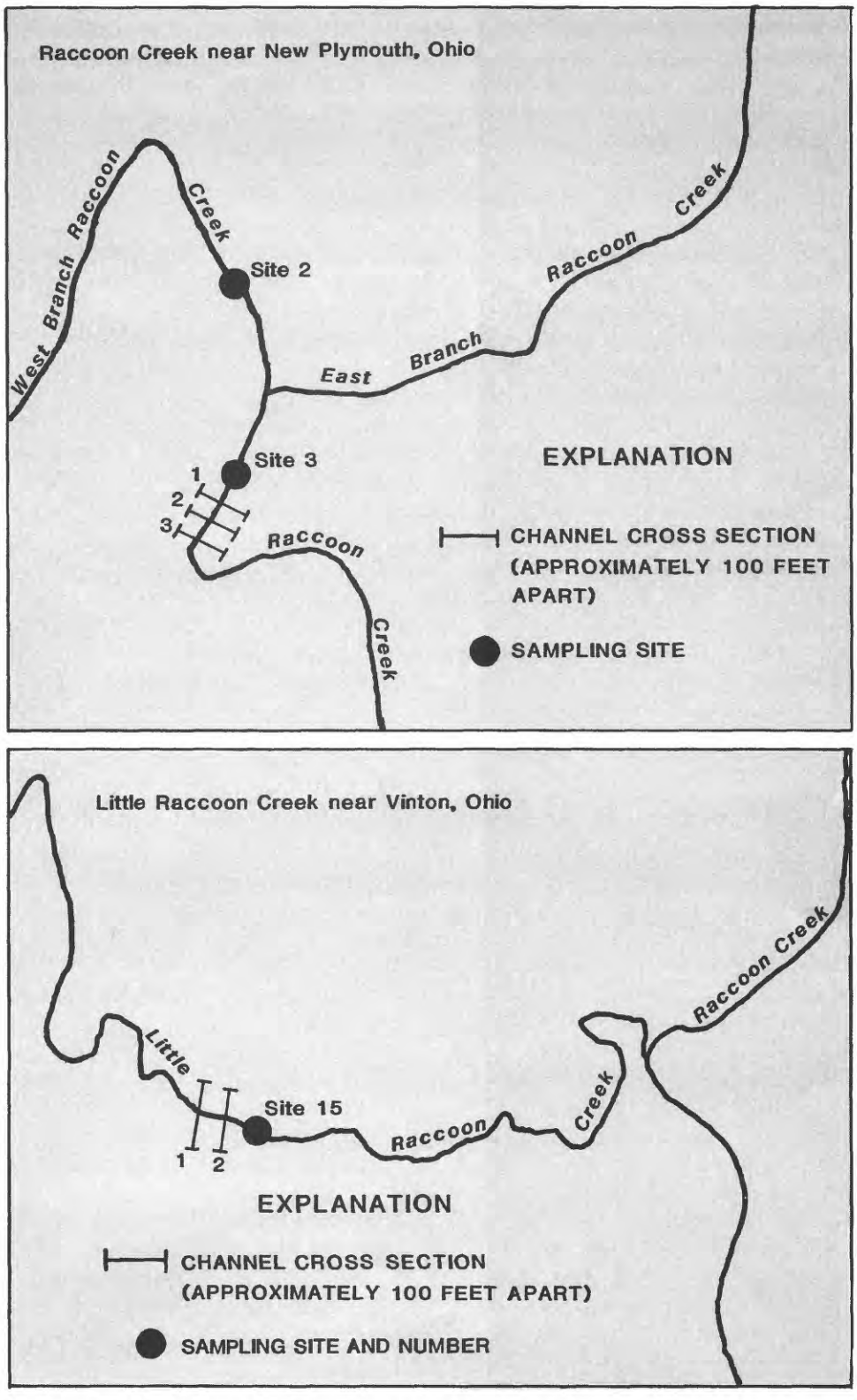

Figure 9.--Sketch of location of channel cross sections at Raccoon Creek near New Plymouth, Ohio (site 3) and Little Raccoon Creek near Vinton, Ohio (site 15).

Analyses of 144 water samples collected at 17 sites were compiled (table 2, at back of report). Median values of pH, specific conductance, acidity, alkalinity, dissolved sulfate, dissolved and total iron, dissolved and total aluminum, and dissolved and total manganese were computed for each of the 17 sites sampled (table 3).

The basins most severely affected by mine drainage are East Branch Raccoon Creek (site 1), Brushy Creek (site 4), Hewett Fork (site 6), Flint Run (site 12), in the Little Raccoon Creek subbasin, and Little Raccoon Creek (sites 13, 14, 15) (table 3). The median pH of these basins ranged from 2.6 to 5.1, whereas Clear Fork (which drains an unmined area) had a median pH of 7.7. Each basin had acidic water that ranged in median values from 20 mg/L (milligrams per liter) as $CaCO_3$ at Little Raccoon Creek near Vinton to 1,040 mg/L at Flint Run. Alkalinity ranged from 4 mg/L as $CaCO_3$ to zero in these basins. At Clear Fork, acidity was not found, and the median alkalinity value was 164 mg/L as $CaCO_3$. Dissolved and total constituents of sulfate, iron, aluminum, and manganese also were found in concentrations typical of streams draining abandoned coal-mined lands.

From Raccoon Creek at New Plymouth (site 3) to Raccoon Creek at Vinton (site 10), at the mainstem sites, median concentrations of specific conductance, acidity, sulfate, aluminum, and manganese decrease, and median concentrations of alkalinity and pH increase (table 3). Between Raccoon Creek at Vinton (site 10) and Raccoon Creek near Adamsville (site 16), Little Raccoon Creek drains into Raccoon Creek. Specific conductance, sulfate, total iron, total aluminum, and total and dissolved manganese increase, whereas pH and alkalinity decrease as a result of loading from this major tributary that is affected by acid mine drainage.

At Raccoon Creek at Vinton (site 10) and Raccoon Creek at Adamsville (site 16), median concentrations of specific conductance, acidity, sulfate, iron, and aluminum are similar to median concentrations from Clear Fork (site 17), the unmined basin. Manganese is present at concentrations in excess of 1,000 mg/L; however, manganese is known to persist in water at great distances downstream from a source (Hem, 1985).

Water quality improved during the period of study at Little Raccoon Creek near Vinton (site 15). Between June 1985 and September 1985 (table 2), pH increased from 4.2 to 6.9, alkalinity increased from zero mg/L to 16 mg/L as $CaCO_3$, and acidity decreased from 40 mg/L to zero mg/L as $CaCO_3$. Upstream, Little Raccoon Creek near Ewington (site 14) did not show a similar change. Active surface mining was occurring directly upstream from site 15 during the entire period of study, and the water often was sediment-laden during periods of low flow. Active mining probably was discharging buffered water into the stream, thereby affecting the water quality.

Table 3.--Median values and median concentrations for properties and constituents measured at 17 sites in Raccoon Creek basin

[mg/L, milligrams per liter; µg/L, micrograms per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius. Shading indicates main-stem Raccoon Creek sites. Dash indicates concentration was assumed to be zero.]

Site number	Site name	Number of samples	pH	Specific conductance (µS/cm)	Alkalinity (mg/L as $CaCO_3$)	Acidity (mg/L as $CaCO_3$)	Sulfate, dissolved (mg/L as SO_4)	Iron, total (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Aluminum, dissolved (µg/L as Al)	Aluminum, total (µg/L as Al)	Manganese, dissolved (µg/L as Mn)	Manganese, total (µg/L as Mn)
1	E B Raccoon C nr New Plymouth, OH--	6	3.6	1,500	--	180	720	2,700	2,000	17,500	20,500	14,000	15,000
2	W B Raccoon C nr New Plymouth, OH--	4	5.9	528	4	17	170	1,300	885	350	900	4,250	4,350
3	Raccoon C nr New Plymouth, OH-------	11	4.4	725	--	71	290	1,200	860	6,800	6,800	6,200	6,400
4	Brushy C nr Creola, OH----------	6	3.4	785	--	106	270	3,800	3,250	11,500	12,000	5,700	5,800
5	Raccoon C nr Zaleski, OH----------	7	4.8	520	1	18	200	690	200	500	590	4,800	4,900
6	Hewett F nr Albany, OH----------	6	3.5	900	--	82	335	2,400	1,800	7,000	6,850	3,600	3,700
7	Raccoon C nr Bolins Mills, OH-------	12	5.4	405	3	14	145	770	220	300	550	2,400	2,500
8	Elk F nr Radcliff, OH----------	7	7.1	370	38	--	100	1,000	370	100	100	760	730
9	Pierce Rn nr Radcliff, OH----------	6	6.2	580	7	8	230	1,150	845	80	135	3,250	3,250
10	Raccoon C nr Vinton, OH----------	8	7.0	400	19	--	135	670	110	100	200	1,050	1,100
11	L Raccoon C nr Roads, OH----------	9	7.0	560	48	--	190	1,500	210	100	1,450	1,800	2,400
12	Flint Rn nr Roads, OH----------	5	2.6	2,900	--	1,040	1,500	150,000	140,000	53,000	58,000	16,000	16,000
13	L Raccoon C nr Buckeye Furnace St Memorial, OH----------	7	5.1	587	4	21	240	670	460	1,000	2,100	3,000	3,000
14	L Raccoon C nr Ewington, OH--------	14	4.1	588	--	35	230	2,500	995	2,350	2,600	2,700	2,800
15	L Raccoon C nr Vinton, OH----------	15	4.7	540	2	20	230	1,000	190	1,400	1,500	2,100	2,100
16	Raccoon C nr Adamsville, OH---------	14	6.6	430	14	--	145	810	105	100	300	1,400	1,450
17	Clear F nr Northup, OH----------	7	7.7	580	164	--	110	480	30	100	100	320	580

Raccoon Creek near Bolins Mills (site 7) underwent a more gradual improvement in water quality from 1984 to 1986. Alkalinity increased from 2 mg/L to 26 mg/L as $CaCO_3$, acidity decreased from 20 mg/L to 0 mg/L as $CaCO_3$, and pH increased from 4.9 to 7.0. The dissolved and total constituents also showed variable degrees of decreasing concentrations.

For the period of study, the partial reclamation of Flint Run basin did not cause a change in water quality.

Benthic Organisms

Benthic organisms, which live in and on the streambed, commonly are used as indicators of water-quality conditions. Data collected for benthic communities include the number of different types or kinds of organisms (or taxa) present and relative abundances. Evenness (or an equitability index) describes the observed degree of uniformity of the distribution of individuals among the taxa in the sample. The quantitative expression of the distribution of organisms is called a diversity index.

The Shannon-Wiener diversity index and the Pielou equitability index were computed for each sample and are included in table 4 at the back of the report (Smith, 1974, and Odum, 1971). The Shannon-Wiener diversity index is computed from:

$$H' = 3.322[\log_{10}n - (1/n \sum n_i \log_{10} n_i),$$

where H' is measure of diversity,
n is total number of individuals, and
n_i is number of individuals in each taxa.

The Pielou equitability index is computed from:

$$e = \frac{H}{\log_{10} s},$$

where e is measure of evenness,
H is Shannon-Wiener diversity index, and
s is total number of taxa.

A true quantitative measure of diversity requires that each specimen be identified to the same taxonomic level. In this study, each specimen was not identified to the same taxonomic level; therefore, the calculated diversity index is not a precise measure of diversity, but a working diversity value (K. V. Slack, U.S. Geological Survey, written commun., 1985). However, because uniform procedures were used throughout the study, the measure of diversity is useful for comparative purposes.

The benthic community of an unstressed, clean-water system normally has a high diversity value if it has many taxa and the abundances are fairly even among taxa. Surface-water systems

stressed or degraded by contamination are characterized by benthic communities with low diversity values; that is, the taxa are few and the abundance is uneven.

The Shannon-Wiener diversity index values for clean water usually range from 3 to 4 (Wilhm, 1970). Values from 1 to 3 indicate slight to moderate levels of degradation, and values less than 1 indicate polluted waters.

Relative evenness (Pielou equitability index) ranges from zero for the least even sample to 1 for the most even sample. Streams known to be unaffected by pollution have evenness levels above 0.5 (Wilhm, 1970).

In mined areas, reduced pH, sedimentation, and elevated concentrations of metals adversely affect benthic communities. Therefore, it was expected that community diversity and abundance would be lower in basins affected by mining than in unmined basins.

Diversity in the study area ranged from zero at Flint Run near Roads (site 12) and Little Raccoon Creek near Buckeye Furnace State Memorial (site 13) to 3.82 at Elk Fork near Radcliff (site 8). At least one of three diversity indices was above 3 at Elk Fork near Radcliff (site 8), at Raccoon Creek near Bolins Mills (site 7), at Pierce Run near Radcliff (site 9), and at Clear Fork near Northup (site 17) (table 5); however, median values were not above 3 (fig. 10).

The Pielou equitabilty index ranged from 1.00 at Raccoon Creek at Vinton (site 10) to zero at Flint Run near Roads (site 12), at Little Raccoon Creek near Buckeye Furnace State Memorial (site 13), and at Raccoon Creek near Zaleski (site 5).

As was indicated by the water quality, subbasins such as East Branch, Brushy Creek, Hewett Fork, Little Raccoon Creek, and Flint Run are affected by mine drainage and do not support diverse biological populations (fig. 10). Clear Fork, Elk Fork, Pierce Run, Little Raccoon Creek near Roads, and three mainstem Raccoon Creek sites (7, 10, and 16) support more diverse populations, indicative of a less degraded water system.

Sedimentation

Increased erosion and sediment deposition in streams can produce some of the most detrimental effects of surface mining. Erosion of abandoned surface-mined lands represents the highest rate of soil loss within the State of Ohio (U.S. Department of Agriculture, 1985). Spoils of abandoned surface and underground mine lands are exposed to natural elements that cause erosion. The consequences of excessive erosion and deposition of sediment

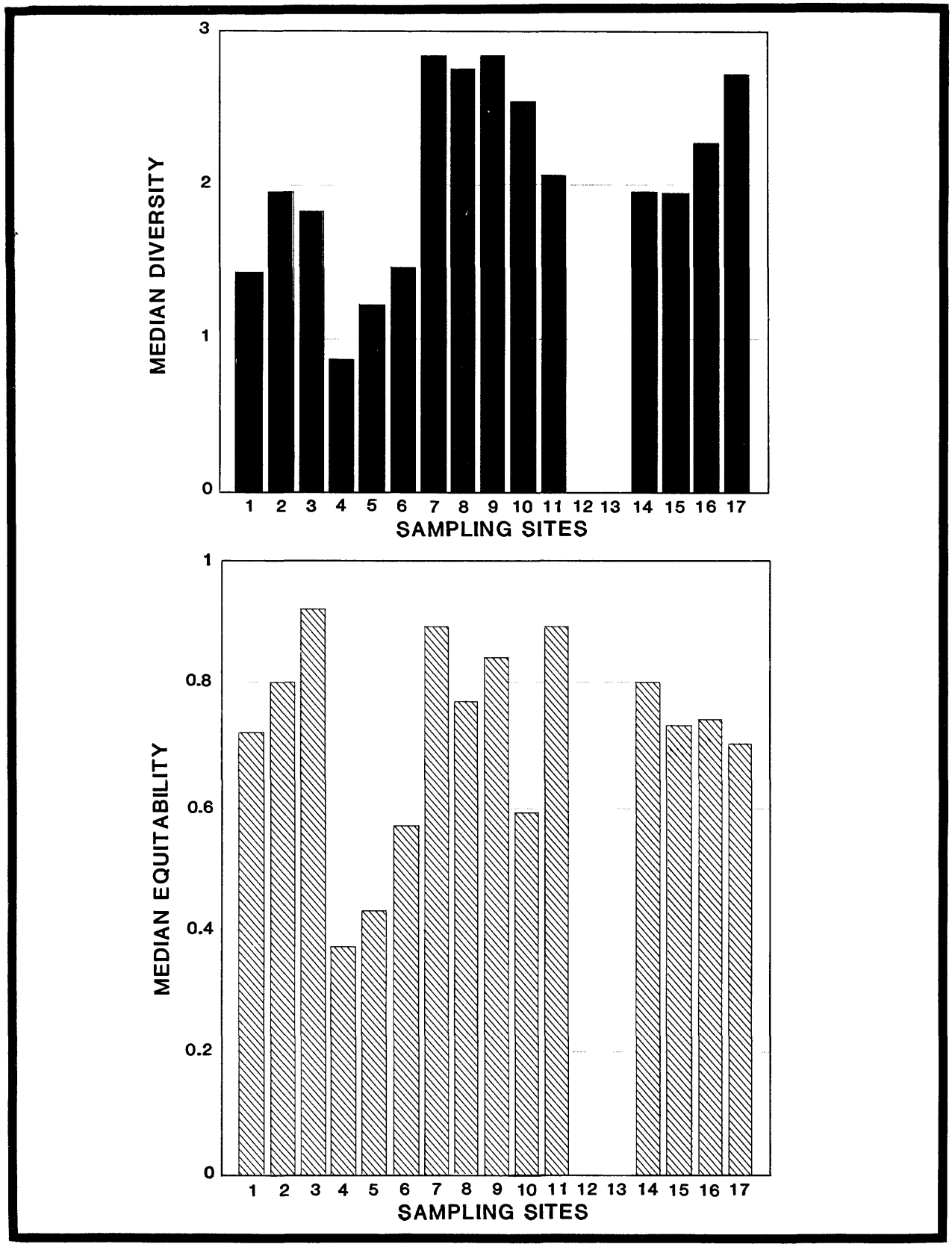

Figure 10.--Median equitability and diversity at 17 sampling sites in Raccoon Creek basin, June 1985 through September 1986.

can include loss of land, reduction of aquatic habitat, and flooding due to loss of channel conveyance. Reclamation of abandoned mines can reduce erosion and sediment transport in a basin.

The range of sediment yield typical of streams in southeastern Ohio is 100 to 200 tons per square mile per year ((tons/mi^2)/yr) (Antilla and Tobin, 1978). Based on sediment records from 1946 through 1970, at Raccoon Creek near Adamsville (site 16), the average sediment yield was 68 (tons/mi^2)/yr. For the period from October 1984 through September 1985 at the headwaters of Raccoon Creek (site 3) the sediment yield was 70.7 (tons/mi^2)/yr (table 5). The sediment yield from Little Raccoon Creek (site 15) was 41.4 (tons/mi^2)/yr. At Raccoon Creek near Adamsville (site 16) the sediment yield was 55.4 (tons/mi^2)/yr. These yields indicate that excessive sedimentation from coal-mining processes is not a large-scale problem in the basin. Daily mean water discharge, daily mean suspended-sediment concentrations, and daily suspended-sediment discharge are presented in tables 6 through 10 (at back of report) for the five suspended-sediment stations.

Data on the deposition of sediment and the scouring of the channel were very limited. However, the data collected do not indicate extreme scour or deposition, which confirms the conclusion that excessive sedimentation from coal-mining processes does not appear to be a large-scale problem in Raccoon Creek basin. Surveys of channel cross sections are illustrated at Raccoon Creek near New Plymouth (site 3) (fig. 11) and at Little Raccoon Creek near Vinton (site 15) (fig. 12).

SUMMARY AND CONCLUSIONS

Hydrologic data were collected in several of the coal-mined areas of Raccoon Creek basin in southeastern Ohio from July 1984 through September 1986. The data were to be used to document the long-term and large-scale changes in surface-water quality, biology, and sedimentation that resulted from planned reclamation in the basin.

The data include field measurements of streamflow, pH, specific conductance, alkalinity, acidity, and analyses of dissolved and total iron, dissolved and total aluminum, dissolved and total manganese, and dissolved sulfate. Benthic organisms were collected; organisms were identified taxonomically and counted. Diversity and equitability indices were calculated. Suspended-sediment data were collected from five sites within the basin, and cross sections of the stream channel were surveyed.

Table 5.--Mean water-discharge and suspended-sediment data for the five gaging stations within Raccoon Creek basin

[ft^3/s, cubic feet per second; ton/d, tons per day; $(ton/mi^2)/yr$, tons per square mile per year. Dash indicates no data available.]

Site	Period of record	Mean water discharge (ft^3/s)	Suspended-sediment discharge (ton/d)	Suspended-sediment yield $(ton/mi^2)/yr$
3	July 1984 - September 1984	1,679	14.5	
	October 1984 - September 1985	11,461	3,048	70.7
7	July 1984 - September 1984	360	10.4	
	October 1984 - June 1985	67,440	14,140	--
14	August 1984 - September 1984	769	7.91	
	October 1984 - June 1985	36,310	3,728	--
15	August 1984 - September 1984	1,026	3.04	
	October 1984 - September 1985	55,401	6,371	41.4
16	July 1984 - September 1984	5,313	105	
	October 1984 - September 1985	192,838	32,404	55.4

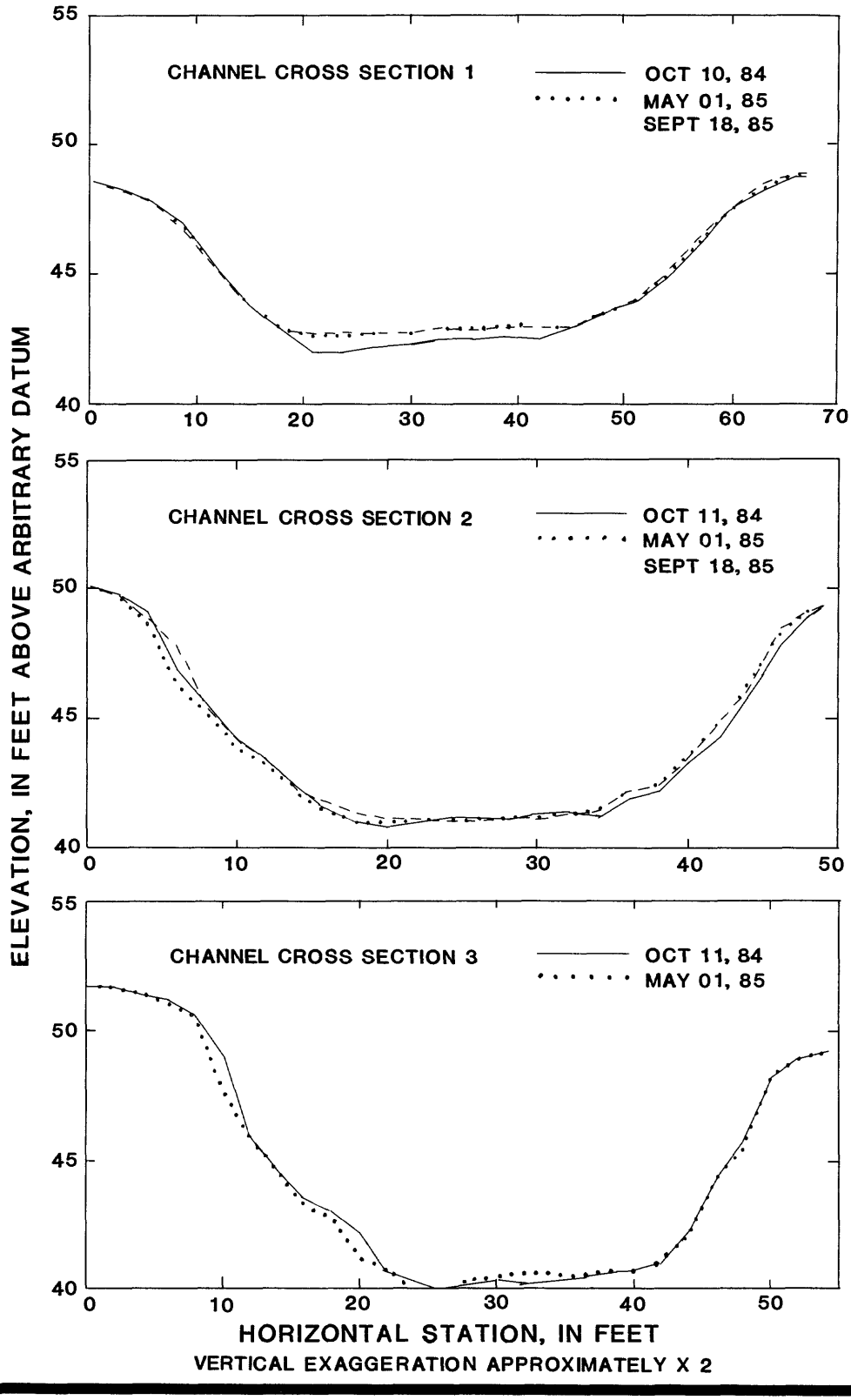

Figure 11.--Channel cross sections at Raccoon Creek near New Plymouth, Ohio (Site 3).

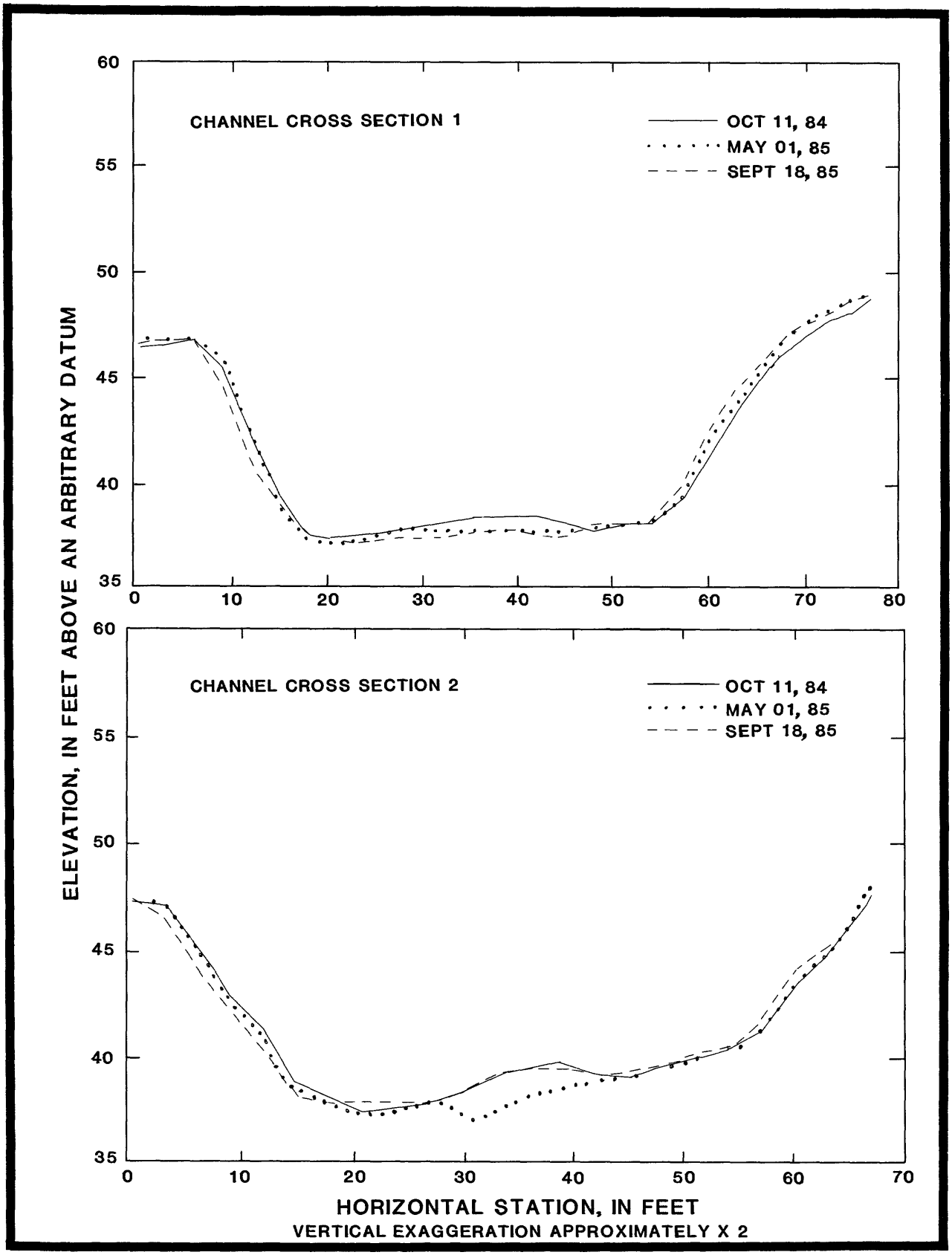

Figure 12.—Channel cross sections at Little Raccoon Creek near Vinton, Ohio (Site 15).

Data collected were used to document water-quality conditions and biological quality as well as sediment discharge at selected sites throughout the basin. Results of the analyses of these data can be used as background data for comparison with data collected after reclamation is complete.

Water-quality data collected from 17 sites indicate that the subbasins most severely affected by mine drainage were East Branch, Brushy Creek, Hewett Fork, Little Raccoon Creek, and Flint Run. These basins had median pH values ranging from 2.6 to 5.1, median acidity values ranging from 20 to 1,040 mg/L as $CaCO_3$, and median alkalinity values ranging from 0 to 4 mg/L (as $CaCO_3$). Clear Fork, the unmined basin, had a median pH of 7.7, a median acidity value of zero, and a median alkalinity of 164 mg/L as $CaCO_3$.

Mine drainage has degraded the water quality in the headwaters of Raccoon Creek, where the median pH was 4.4 and the median acidity was 71 mg/L as $CaCO_3$. At mid-basin, water-quality conditions improve, with a median pH of 5.4 and a median acidity of 14 mg/L as $CaCO_3$, and, in lower Raccoon Creek basin, water-quality conditions, with a median pH of 7.0 and zero for acidity, are comparable to Clear Fork, which drains an unmined area.

Diversity and equitabilty of benthic organisms at 17 sites also indicate that the water quality of East Branch, Brushy Creek, Hewett Fork, Little Raccoon Creek, and Flint Run is degraded as a result of mine drainage, whereas Elk Fork, Pierce Run, and Raccoon Creek from mid-basin to the lower basin are not significantly affected by mine drainage.

Annual suspended-sediment yields determined at two mainstem Raccoon Creek sites indicate that sedimentation in the basin is typical of streams in southeastern Ohio.

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Table 2.--Chemical-quality data from samples collected at 17 sites within Raccoon Creek basin, July 1984 through September 1986

[°C, degrees Celsius; ft^3/s, cubic foot per second; mg/L, milligrams per liter; µg/L, micrograms per liter; µS/cm, microsiemens per centimeter at 25°C. Dash indicates no data available.]

Date	Stream-flow, instan-taneous (ft^3/s)	Spe-cific con-duc-tance (µS/cm)	pH	Temper-ature (°C)	Acidity (mg/L as $CaCO_3$)	Alka-linity field (mg/L as $CaCO_3$)	Sulfate dis-solved (mg/L)	Alumi-num, total recov-erable (µg/L)	Alumi-num, dis-solved (µg/L)	Iron, total recov-erable (µg/L)	Iron, dis-solved (µg/L)	Manga-nese, total recov-erable (µg/L)	Manga-nese, dis-solved (µg/L)
Site 1 E B Raccoon C nr New Plymouth, OH													
09/26/84	0.16	1630	3.30	15.0	263	--	970	36000	36000	4000	4000	18000	18000
06/18/85	1.7	1600	3.60	20.0	194	--	720	20000	19000	2300	2000	15000	13000
09/24/85	.0	---	----	----	---	--	---	-----	-----	----	----	-----	----
12/19/85	10	990	3.80	.5	139	--	540	16000	16000	2300	2000	8200	8300
04/09/86	6.1	1000	3.70	9.0	110	--	540	16000	16000	1800	1800	9100	9300
06/26/86	.08	1400	3.60	19.5	165	--	720	21000	21000	3100	1400	15000	15000
08/28/86	.4	1600	3.50	18.5	216	--	1000	30000	20	4400	4100	15000	15000
Site 2 W B Raccoon C nr New Plymouth, OH													
09/26/84	0.0	---	----	----	--	--	---	---	---	----	---	----	----
06/18/85	.84	615	5.80	19.0	25	5	190	400	200	1300	770	5800	5400
09/24/85	.0	---	----	----	--	--	---	----	---	----	----	----	----
12/19/85	12	440	5.95	.5	25	3	150	2100	500	1300	1000	2900	2900
04/26/86	7.2	425	5.60	11.5	9.1	3	150	1400	850	770	670	2800	3100
06/26/86	.05	845	6.70	23.0	--	8	220	330	60	1800	1100	7600	7700
08/28/86	<.01	---	----	----	--	--	---	----	---	----	----	----	----
Site 3 Raccoon C nr New Plymouth, OH													
09/26/84	<0.01	1240	4.80	14.5	74	1	680	5400	5400	10000	10000	15000	15000
10/18/84	.19	1260	3.80	16.5	109	--	660	12000	12000	2000	1200	17000	17000
11/15/84	6.8	1080	4.10	6.0	99	--	450	12000	12000	2000	2000	11000	11000
12/19/84	36	720	4.90	8.5	50	2	260	5300	4700	880	570	5500	5500
03/14/85	97	420	4.90	6.0	20	3	170	3400	3100	1000	380	3100	3000
04/18/85	28	545	4.40	16.0	55	--	240	5700	5600	950	900	4000	3000
05/15/85	21	725	4.20	20.0	84	--	3.7	8500	8400	1200	610	6400	6200
06/18/85	2.7	980	4.10	20.5	94	--	400	10000	10000	800	420	9700	8600
09/24/85	.0	---	----	--	--	--	--	--	--	--	--	--	--
11/20/85	32	610	4.70	12.0	35	2	250	3800	3600	1200	900	4400	4700
04/09/86	17	690	4.50	11.5	46	--	290	6800	6800	940	860	5200	5500
06/26/86	.1	950	4.00	23.5	71	--	410	8200	8100	1800	360	9100	9100
08/28/86	.0	---	----	--	--	--	--	--	--	--	--	--	--

Table 2.--Chemical-quality data from samples collected at 17 sites within Raccoon Creek basin, July 1984 through September 1986--Continued

Date	Stream-flow, instan-taneous (ft^3/s)	Spe-cific con-duc-tance (µS/cm)	pH	Temper-ature (°C)	Acidity (mg/L as $CaCO_3$)	Alka-linity field (mg/L as $CaCO_3$)	Sul-fate dis-solved (mg/L)	Alumi-num, total recov-erable (µg/L)	Alumi-num, dis-solved (µg/L)	Iron, total recov-erable (µg/L)	Iron, dis-solved (µg/L)	Manga-nese, total recov-erable (µg/L)	Manga-nese, dis-solved (µg/L)
Site 4	Brushy C nr Creola, OH												
09/26/84	<0.01	905	3.30	20.0	119	--	360	20000	20000	2000	2000	11000	11000
06/18/85	2.4	850	3.30	22.0	139	--	270	12000	12000	5100	5100	5600	5200
09/24/85	.0	--	--	--	--	--	--	--	--	--	--	--	--
12/19/85	17	370	5.10	.5	60	4	140	3400	3200	9900	9500	2300	2300
04/09/86	8.4	430	3.90	12.5	47	--	170	5500	4800	7700	4300	2800	3000
06/26/86	.4	720	3.40	23.5	102	--	270	12000	12000	2500	2200	6000	6200
08/28/86	.3	870	3.50	23.0	111	--	410	12000	11000	1500	170	8500	8400
Site 5	Raccoon C nr Zaleski, OH												
09/26/84	0.01	610	4.10	19.5	9.9	--	220	300	300	1400	590	5000	5000
06/18/85	11	560	4.50	20.0	25	--	200	2300	2300	430	130	5000	4800
09/25/85	1.0	485	6.70	16.5	--	11	200	300	<100	1200	200	4900	4700
12/19/85	62	400	5.10	1.0	25	4	150	1900	1700	2500	2400	2600	260
04/09/86	41	450	4.80	14.0	22	1	200	3500	3300	620	500	3600	3900
06/26/86	3.4	520	5.30	19.5	7	3	170	590	500	690	100	4600	4800
08/29/86	.3	640	4.60	17.5	13	1	270	490	500	670	100	6700	7000
Site 6	Hewett F nr Albany, OH												
09/26/84	0.03	1110	3.10	20.5	109	--	500	16000	15000	2700	2700	6700	6700
06/18/85	3.9	830	3.60	25.0	84	--	300	6200	6200	2100	1800	3500	3200
09/24/85	.0	--	--	--	--	--	--	--	--	--	--	--	--
12/19/85	19	385	4.10	1.0	35	--	190	2300	1800	5000	4300	1500	1400
04/09/86	12	540	3.80	13.0	32	--	220	3400	3500	1300	1000	1800	1900
06/26/86	.8	970	3.40	17.5	79	--	370	7500	7800	2100	1800	3900	4000
08/29/86	.9	1150	3.10	15.0	138	--	410	13000	12000	5500	1800	5900	8800

Table 2.--Chemical-quality data from samples collected at 17 sites within Raccoon Creek basin, July 1984 through September 1986--Continued

Date	Stream-flow, instan-taneous (ft^3/s)	Spe-cific con-duc-tance (µS/cm)	pH	Temper-ature (^oC)	Acidity (mg/L as $CaCO_3$)	Alka-linity field (mg/L as $CaCO_3$)	Sulfate dis-solved (mg/L)	Alumi-num, total recov-erable (µg/L)	Alumi-num, dis-solved (µg/L)	Iron, total recov-erable (µg/L)	Iron, dis-solved (µg/L)	Manga-nese, total recov-erable (µg/L)	Manga-nese, dis-solved (µg/L)
Site 7 Raccoon C nr Bolin Mills, OH													
11/15/84	51	640	4.90	5.0	20	2	240	2100	1300	360	260	4400	--
12/19/84	139	475	5.30	10.0	25	3	160	2000	900	550	150	2800	2800
03/13/85	1350	220	5.40	6.5	15	3	74	600	100	1500	120	1000	900
04/18/85	159	325	5.10	16.0	15	2	120	1500	1500	620	450	2000	1400
05/15/85	108	405	5.10	19.5	20	3	140	1900	900	780	120	2400	2400
06/18/85	29	455	5.00	22.5	25	2	170	500	500	360	160	3600	3500
09/23/85	.91	400	6.80	22.0	--	9	150	300	100	1000	320	2900	2800
10/16/85	.08	370	6.60	16.5	--	26	120	200	<100	2900	1200	1800	1800
11/20/85	235	345	7.30	11.5	--	5	120	300	100	760	480	1700	1700
04/09/86	100	410	5.10	13.5	12	2	170	1700	1500	650	530	2600	2600
06/26/86	16	405	6.50	23.5	--	12	120	70	10	860	80	2600	2500
08/28/86	.5	440	7.00	21.0	--	26	150	170	30	1000	180	720	560
Site 8 Elk F nr Radcliff, OH													
09/27/84	0.16	405	7.10	21.5	--	56	100	100	100	1800	440	720	560
06/18/85	8.1	370	7.30	21.0	--	27	120	<100	100	1000	120	900	900
09/24/85	1.2	460	7.80	20.5	--	62	130	100	<100	1200	370	650	630
12/18/85	48	285	6.55	2.0	--	12	93	300	<100	830	500	970	950
04/08/86	10	350	7.10	16.5	--	23	130	140	100	690	270	1000	1000
06/25/86	4.3	345	7.60	20.5	--	38	89	70	60	1000	850	730	750
08/27/86	.5	575	7.10	21.0	--	44	1.7	20	20	750	330	730	760
Site 9 Pierce Rn nr Radcliff, OH													
09/27/84	<0.01	650	6.10	12.0	9.9	8	300	<100	<100	3100	2700	2800	2800
06/18/85	1.0	640	5.60	22.5	27	4	260	200	200	1000	740	4300	4100
09/24/85	.0	--	--	--	--	--	--	--	--	--	--	--	--
12/17/85	10	360	6.00	3.0	9.9	12	130	200	<100	2000	1800	1600	1600
04/08/86	3.4	520	6.30	19.0	6.0	6	200	170	60	1300	950	2800	2800
06/25/86	.85	490	6.50	22.5	5.0	8	200	<10	50	680	530	3700	3700
08/27/86	.2	720	6.20	22.0	6.0	5	350	60	20	590	120	5000	5000

Table 2.--Chemical-quality data from samples collected at 17 sites within Raccoon Creek basin, July 1984 through September 1986--Continued

Date	Stream-flow, instan-taneous (ft^3/s)	Spe-cific con-duc-tance (µS/cm)	pH	Temper-ature (°C)	Acid-ity (mg/L as $CaCO_3$)	Alka-linity field (mg/L as $CaCO_3$)	Sulfate dis-solved (mg/L)	Alumi-num, total recov-erable (µg/L)	Alumi-num, dis-solved (µg/L)	Iron, total recov-erable (µg/L)	Iron, dis-solved (µg/L)	Manga-nese, total recov-erable (µg/L)	Manga-nese, dis-solved (µg/L)
Site 10 Raccoon C at Vinton, OH													
09/26/84	2.7	410	6.80	18.0	--	39	140	<100	<100	720	140	830	830
06/18/85	54	388	7.10	21.0	--	18	130	400	200	1200	50	1500	1500
09/23/85	4.4	580	7.20	22.0	--	26	170	200	100	620	50	900	890
09/30/85	3.9	475	7.10	15.0	--	20	150	200	200	480	120	1200	1100
12/18/85	393	290	6.95	2.5	--	8	100	200	--	840	780	1000	1000
04/08/86	156	350	6.70	17.0	--	10	130	140	20	540	100	1500	1700
06/25/86	28	390	6.70	23.0	--	6	110	110	20	790	70	1300	1300
08/27/86	6.2	475	7.00	23.5	--	38	170	200	20	370	130	830	810
Site 11 L Raccoon C nr Roads, OH													
09/27/84	3.6	810	7.20	15.5	--	150	200	500	<100	1400	80	1700	1600
10/17/84	4.5	840	7.00	18.5	--	115	250	1300	300	1500	470	4400	4400
04/23/85	46	460	6.00	20.5	9.9	8	190	2400	100	2100	290	2500	1800
06/18/85	23	535	7.10	22.0	--	39	190	1600	200	1500	210	2700	2600
09/24/85	4.0	620	8.00	17.5	--	130	140	--	--	--	94	--	340
12/18/85	79	350	6.00	2.0	20	14	2.5	2000	100	1900	580	1700	1300
04/10/86	34	560	6.80	10.5	--	42	200	2100	60	2000	450	2300	2500
06/25/86	9.4	500	7.40	21.0	--	75	110	510	100	1000	90	870	870
08/28/86	12	640	6.70	20.0	--	48	240	1200	50	910	170	3000	3100
Site 12 Flint Run nr Roads, OH													
04/23/85	2.4	1650	2.60	24.0	596	--	830	31000	31000	66000	64000	7000	5300
06/18/85	1.3	2490	2.60	26.0	1040	--	1400	45000	44000	150000	150000	14000	12000
09/24/85	4.0	3200	2.70	19.0	1290	--	1800	58000	--	120000	120000	17000	17000
06/25/86	.5	2900	2.50	23.5	997	--	1500	58000	62000	150000	140000	16000	16000
08/28/86	.71	2900	2.50	21.0	1310	--	2100	75000	72000	260000	240000	17000	17000

Table 2.--Chemical-quality data from samples collected at 17 sites within Raccoon Creek basin, July 1984 through September 1986--Continued

Date	Stream-flow, instan-taneous (ft^3/s)	Spe-cific con-duc-tance ($\mu S/cm$)	pH	Temper-ature (^oC)	Acid-ity (mg/L as $CaCO_3$)	Alka-linity field (mg/L as $CaCO_3$)	Sulfate dis-solved (mg/L)	Alumi-num, total recov-erable ($\mu g/L$)	Alumi-num, dis-solved ($\mu g/L$)	Iron, total recov-erable ($\mu g/L$)	Iron, dis-solved ($\mu g/L$)	Manga-nese, total recov-erable ($\mu g/L$)	Manga-nese, dis-solved ($\mu g/L$)
Site 13 L Raccoon C nr Buckeye Furnace St Memorial, OH													
10/18/84	4.6	950	4.80	19.0	30	--	380	2500	2500	660	320	6000	6000
04/23/85	48	500	5.10	20.0	30	2	210	3600	1000	4900	450	3000	3000
06/18/85	29	587	4.70	22.0	42	2	240	3400	2300	6400	510	3300	3200
09/24/85	4.3	770	5.60	19.5	9.9	7	290	1500	1500	380	360	2000	2000
12/18/85	95	350	5.40	2.0	20	6	160	2100	300	4500	3600	1600	1800
06/25/86	12	540	7.00	21.0	--	38	160	40	200	430	520	1400	1500
08/28/86	14	680	5.10	21.0	21	4	290	760	760	670	460	3300	3400
Site 14 L Raccoon C nr Ewington, OH													
09/27/84	4.3	845	3.60	15.5	35	--	310	1300	1300	500	360	3400	3400
10/17/84	6.4	1060	3.30	19.0	104	--	420	7200	6100	1500	1300	5300	5300
11/14/84	43	740	3.60	5.0	74	--	270	6200	6200	6800	5900	3500	3500
12/19/84	76	535	4.10	10.0	55	1	210	4800	4300	7900	1900	2800	2800
03/13/85	518	310	4.50	6.5	30	--	120	1500	1400	4300	2100	1100	1100
04/18/85	105	465	4.10	15.5	40	--	210	4800	4600	6000	1100	2500	1700
05/14/85	54	530	4.20	20.5	35	--	--	3100	2300	3500	580	2600	2600
06/18/85	3.7	605	3.90	20.0	45	--	240	2800	2800	1300	710	3200	3100
09/24/85	3.6	800	5.10	19.0	25	3	310	2400	2400	350	140	2800	2600
10/16/85	3.8	890	3.80	17.0	33	--	--	2200	2200	1100	820	3000	3100
11/20/85	169	370	5.10	12.0	27	2	140	1900	400	4800	1800	1700	1600
04/10/86	40	570	5.60	11.5	13	4	220	1800	360	4400	1200	2700	2600
06/25/86	8.0	570	5.70	23.0	5.0	3	200	60	70	690	500	2000	2100
08/28/86	14	870	3.60	19.0	51	--	390	4400	4500	1000	890	4500	4600

Table 2.--Chemical-quality data from samples collected at 17 sites within Raccoon Creek basin, July 1984 through September 1986--Continued

Date	Stream-flow, instan-taneous (ft^3/s)	Spe-cific con-duc-tance (µS/cm)	pH	Temper-ature (°C)	Acidity (mg/L as $CaCO_3$)	Alka-linity field (mg/L as $CaCO_3$)	Sulfate dis-solved (mg/L)	Alumi-num, total recov-erable (µg/L)	Alumi-num, dis-solved (µg/L)	Iron, total recov-erable (µg/L)	Iron, dis-solved (µg/L)	Manga-nese, total recov-erable (µg/L)	Manga-nese, dis-solved (µg/L)
Site 15 L Raccoon C nr Vinton, OH													
09/26/84	1.4	770	4.20	17.5	20	--	280	1000	1000	380	150	2900	2900
10/17/84	3.5	975	3.50	17.5	89	--	410	11000	11000	1400	910	6000	6000
11/14/84	73	570	4.10	4.5	40	--	230	3700	3700	2600	2500	2800	2800
12/18/84	105	445	4.30	9.5	30	--	180	3700	3100	1600	340	2100	2100
03/12/85	720	350	4.70	8.5	30	3	130	3100	2700	8600	900	1600	1500
04/17/85	171	405	4.20	14.5	40	--	180	3600	3100	2000	600	1900	1400
05/14/85	81	540	3.90	20.0	50	--	230	5000	5000	790	490	2600	2600
06/18/85	42	532	4.20	20.0	40	--	210	2500	2500	560	190	2900	2900
09/23/85	5.8	610	6.90	21.0	--	16	240	200	<100	610	20	1400	1300
09/30/85	8.7	595	6.10	14.0	11	8	240	1000	300	700	150	1900	2000
10/17/85	12	750	5.00	14.0	18	2	320	1500	1400	240	20	2800	2900
11/19/85	488	295	5.40	12.5	17	3	110	1300	100	4800	1100	1000	1000
04/08/86	87	390	6.60	16.0	--	6	160	400	30	1000	160	1600	1600
06/25/86	4.9	455	6.80	20.0	--	19	160	290	20	1000	150	2000	2000
08/27/86	9.4	680	6.70	23.0	--	17	280	310	30	450	40	3400	3500
Site 16 Raccoon C at Adamsville, OH													
09/26/84	5.2	585	6.20	18.5	9.9	15	170	<100	<100	1000	50	2100	2100
10/17/84	6.5	730	6.40	17.5	5.0	16	240	300	<100	600	70	2900	2900
11/13/84	559	530	5.60	7.0	15	3	190	900	400	1200	370	2900	2800
12/18/84	593	390	6.60	9.5	--	8	130	1000	300	840	90	1600	1600
03/12/85	2130	200	6.90	7.5	--	79	64	6000	<100	15000	20	1000	400
04/17/85	623	310	5.70	14.5	9.9	3	110	900	600	1300	1100	1400	1000
05/14/85	285	325	6.00	21.0	9.9	8	120	600	100	250	120	1500	1400
06/18/85	128	409	6.50	20.0	--	14	160	300	200	430	60	1700	1700
09/23/85	14	620	7.00	22.0	--	14	190	200	<100	630	<10	1500	1400
10/17/85	13	580	6.85	15.5	--	30	170	<100	<100	750	160	600	620
11/19/85	2380	245	6.80	11.0	--	10	82	2100	<100	4300	270	880	870
04/10/86	242	420	6.70	12.0	--	18	130	150	40	680	220	1400	1400
06/24/86	55	440	7.00	25.0	--	21	120	150	20	780	90	1100	1100
08/27/86	16	680	6.90	23.0	--	21	230	170	20	1100	120	960	780

Table 2.--Chemical-quality data from samples collected at 17 sites within Raccoon Creek basin, July 1984 through September 1986--Continued

Date	Stream-flow, instan-taneous (ft^3/s)	Spe-cific con-duc-tance (µS/cm)	pH	Temper-ature (°C)	Acidity (mg/L as $CaCO_3$)	Alka-linity field (mg/L as $CaCO_3$)	Sulfate dis-solved (mg/L)	Alumi-num, total recov-erable (µg/L)	Alumi-num, dis-solved (µg/L)	Iron, total recov-erable (µg/L)	Iron, dis-solved (µg/L)	Manga-nese, total recov-erable (µg/L)	Manga-nese, dis-solved (µg/L)
Site 17 Clear F at Northup, OH													
09/26/84	0.04	720	6.90	17.5	--	192	140	<100	<100	550	90	1400	1400
06/18/85	.16	562	7.60	21.5	--	150	140	100	100	230	60	320	320
09/23/85	.01	650	8.20	25.0	--	180	110	200	100	490	20	1200	1100
12/17/85	3.7	380	7.70	4.0	--	164	68	300	100	480	10	110	120
04/08/86	4.9	420	8.30	15.0	--	88	110	510	50	770	80	60	50
06/24/86	.11	670	7.90	23.5	--	170	130	60	20	250	30	580	570
08/27/86	.1	580	7.60	22.5	--	163	23	40	10	50	30	990	<10

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers

SITE 1 East Branch Raccoon C nr New Plymouth, OH

Drainage Area 14.46 square miles
Stream bottom - Sand

Date collected - June 18, 1985

Insecta	
Megaloptera	
Sialidae	
Sialis	4
Corydalidae	
Nigronia	1
Trichoptera	
Hydropsychidae	
Cheumatopsyche	1
Diptera	
Chironomidae	
Corynoneura	22
Polypedilum	16
Rheotanytarsus	1
Total No. in Sample	46
Total Taxa	6
Shannon Diversity Index:	1.83
Pielou Equitability Index:	0.65

Date collected - June 26, 1986

Insecta	
Megaloptera	
Corydalidae	
Nigronia	1
Sialidae	
Sialus	11
Diptera	
Chironomidae	
Polypedilum	7
Corynoneura	1
Total No. in Sample	20
Total Taxa	4
Shannon Diversity Index:	1.44
Pielou Equitability Index:	0.72

Date collected - September 10, 1986

Insecta	
Hemiptera	
Corixidae	
Sigara	1
Megaloptera	
Sialidae	
Sialis	6
Diptera	
Chironomidae	
Polypedilum	2
Total No. in Sample	9
Total Taxa	3
Shannon Diversity Index:	1.23
Pielou Equitability Index:	0.77

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 2 West Branch Raccoon C nr New Plymouth, OH

Drainage Area 22.70 square miles
Stream Bottom - Silty sand, some gravel, coal in bed material

Date collected - June 18,1985

Arthropoda	
Crustacea	
Decapoda	
Astacidae	1
Insecta	
Megaloptera	
Sialidae	
Sialis	2
Diptera	
Chironomidae	
Chironomus	4
Phaenopsectra	1
Rheotanytarsus	1

Total No. in Sample 9 Total Taxa 5
Shannon Diversity Index: 2.06
Pielou Equitability Index: 0.89

Date collected - June 26, 1986

Insecta	
Coleoptera	
Gyrinidae	
Dineutus	1
Megaloptera	
Sialidae	
Sialis	8
Diptera	
Chironomidae	
Phaenopsectra	1
Rheotanytarsus	1
Tribelos	1
pupa	1

Total No. in Sample 13 Total Taxa (incl. pupa) 6
Shannon Diversity Index: 1.86
Pielou Equitability Index: 0.72

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 3 Raccoon C nr New Plymouth, OH

Drainage Area 43.10 square miles
Stream Bottom - Firm sand, gravel, and rocks

Date collected - June 26, 1986

Insecta	
Megaloptera	
Corydalidae	
Nigronia	2
Sialidae	
Sialis	1
Anisoptera	
Aeshnidae	
Aeshna	2
Diptera	
Chironomidae	
Polypedilum	4
Total No. in Sample	9
Total Taxa	4
Shannon Diversity Index:	1.84
Pielou Equitability Index:	0.92

SITE 4 Brushy F nr Creola, OH

Drainage Area 33.70 square miles
Stream Bottom - Silt, mud, twigs, and debris

Date collected - June 18, 1985

Insecta	
Coleoptera	
Gyrinidae	
Dineutus	2
Dytiscidae	
Laccophilus	1
Megaloptera	
Sialidae	
Sialis	1
Diptera	
Chironomidae	
Chironomus	80
Rheotanytarsus	80
Polypedilum	880
Total No. in Sample	1044
Total Taxa	6
Shannon Diversity Index:	0.81
Pielou Equitability Index:	0.31

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 4 Brushy F nr Creola, OH--Continued

Date collected - June 26, 1986

Insecta
- Megaloptera
  - Sialidae
    - Sialis 5
- Ephemeroptera
  - Heptageniidae
    - Stenacron 1
- Diptera
  - Chironomidae
    - Polypedilum 4
    - pupa 1

Total No. in Sample 11 Total Taxa (incl. pupa) 4
Shannon Diversity Index: 1.68
Pielou Equitability Index: 0.84

Date collected - September 10, 1986

Insecta
- Odonata
  - Anisoptera
    - Aeshnidae
      - Anax 1
- Diptera
  - Chironomidae
    - Tanytarsus 146
    - Polypedilum 1316
    - Einfeldia 74
    - pupa 32

Total No. in Sample 1569 Total Taxa (incl. pupa) 5
Shannon Diversity Index: 0.86
Pielou Equitability Index: 0.37

SITE 5 Raccoon C nr Zaleski, OH

Drainage Area 122.0 square miles
Stream Bottom - Firm sand, gravel, and rocks

Date collected - June 26, 1986

Insecta
- Coleoptera
  - Gyrinidae
    - Dineutus 2

Total No. in Sample 2 Total Taxa 1
Shannon Diversity Index: 0
Pielou Equitability Index: 0

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 5 Raccoon C nr Zaleski, OH--Continued

Date Collected - September 10, 1986

Arthropoda	
Crustacea	
Branchicpoda	
Cladocera	
Diaphanosoma	8
Insecta	
Megaloptera	
Sialidae	
Sialis	1
Trichoptera	
Polycentropodidae	
Polycentropus	6
Diptera	
Chironomidae	
Tanytarsus	14
Polypedilum	17
Corynoneura	3
pupa	4

Total No. in Sample 53 Total Taxa (incl. pupa) 7
Shannon Diversity Index: 2.43
Pielou Equitability Index: 0.86

SITE 6 Hewett F nr Albany, OH

Drainage Area 27.79 square miles
Stream Bottom - Sand, mud, and debris

Date collected - June 18, 1985

Insecta	
Megaloptera	
Sialidae	
Sialis	1
Corydalidae	
Nigronia	1
Trichoptera	
Polycentropodidae	
Polycentropus	1
Diptera	
Chironomidae	
Corynoneura	1
Polypedilum	9
Rheotanytarsus	24

Total No. in Sample 37 Total Taxa 6
Shannon Diversity Index: 1.47
Pielou Equitability Index: 0.57

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 6 Hewett F nr Albany, OH--Continued

Date collected - June 26, 1986

Insecta	
Megaloptera	
Corydalidae	
Nigronia	6
Sialidae	
Sialis	1
Trichoptera	
Polycentropodidae	
Polycentropus	1
Diptera	
Chironomidae	
Polypedilum	5
Unidentified	1
Ceratopogonidae	
Bezzia	1
Total No. in Sample	15
Total Taxa	5
Shannon Diversity Index:	1.84
Pielou Equitability Index:	0.79

Date Collected - September 10, 1986

Insecta	
Diptera	
Chironomidae	
Tanytarsus	2
Polypedilum	44
Corynoneura	2
Orthocladiinae	1
Ceratopogonidae	
Culicoides	4
Total No. in Sample	53
Total Taxa	5
Shannon Diversity Index:	0.97
Pielou Equitability Index:	0.42

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 7 Raccoon C nr Bolins Mills, OH

Drainage Area 204.59 square miles
Stream Bottom - Mud, silty sand, and debris

Date collected - June 18, 1985

Insecta	
Plecoptera	
Perlidae	
Acroneuria	1
Trichoptera	
Hydropsychidae	
Cheumatopsyche	3
Polycentropodidae	
Polycentropus	1
Diptera	
Chironomidae	
Polypedilum	35
Rheotanytarsus	2
Thienemanniella	5
Total No. in Sample	47
Total Taxa	6
Shannon Diversity Index:	1.35
Pielou Equitability Index:	0.52

Date collected - June 26, 1986

Insecta	
Coleoptera	
Gyrinidae	
Dineutus	4
Megaloptera	
Sialidae	
Sialis	4
Ephemeroptera	
Heptageniidae	
Stenonema	3
Trichoptera	
Polycentropodidae	
Polycentropus	3
Diptera	
Chironomidae	
Rheotanytarsus	9
Tribelos	6
Polypedilum	3
Thienemannimyia	2
Ablabesmyia	1
Thienemanniella	1
pupa	4
Total No. in Sample	40
Total Taxa (incl. pupa)	11
Shannon Diversity Index:	3.22
Pielou Equitability Index:	0.93

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 7 Raccoon C nr Bolins Mills, OH--Continued

Date Collected - September 10, 1986

Insecta
- Trichoptera
  - Polcentropodidae
    - Polycentropus 12
- Odonata
  - Zygoptera
    - Coenagrionidae 1
  - Diptera
    - Chironomidae
      - Tanytarsus 4
      - Polypedilum 3
      - Corynoneura 7
      - Thienemannimyia 3
      - Ablabesmyia 9
      - Psectrocladius 2
      - pupa 3

Total No. in Sample 44 Total Taxa (incl. pupa) 9
Shannon Diversity Index: 2.84
Pielou Equitability Index: 0.89

SITE 8 Elk F nr Radcliff, OH

Drainage Area 59.50 square miles
Stream Bottom - Silty sand

Date collected - June 18, 1985

Insecta
- Ephemeroptera
  - Heptageniidae
    - Stenacron 27
    - Stenonenia 2
- Trichoptera
  - Hydropsychidae
    - Cheumatopsyche 1
  - Polycentropedidae
    - Polycentropus 5
- Odonata
  - Calupterygidae
    - Calopteryx 1
- Diptera
  - Chironomidae 2
    - Ablabesmyia 2
    - Corynoneura 13
    - Phaenopsectra 1
    - Polypedilum 4
    - Rheotanytarsus 4
    - Stenochironomus 1
    - Thienemannimyia 10

Total No. in Sample 73 Total Taxa 12
Shannon Diversity Index: 2.76
Pielou Equitability Index: 0.77

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 8 Elk F nr Radcliff, OH--Continued

Date collected - June 25, 1986

Vertebrata	
Cyclostomi	
Petromyzontidae	
Lampetra	
Acpyptera	1
Arthropoda	
Crustacea	
Decapoda	
Astacidae	1
Insecta	
Megaloptera	
Sialidae	
Sialis	5
Emphemeroptera	
Heptageniidae	
Stenacron	15
Odonata	
Anisoptera	
Gomphidae	
Gomaphus	1
Aeshnidae	
Boyeria	1
Diptera	
Chironomidae	
Phaenopsectra	1
Thienemannimyia	3
Tribelos	15
Total No. in Sample	43
Shannon Diversity Index:	2.32
Pielou Equitability Index:	0.73
Total Taxa	9

Date Collected - September 9, 1986

Annelida	
Oligochaeta	
Tubificidae	1
Mollusca	
Bivalvia	
Sphaeriidae	1
Arthropoda	
Crustacea	
Decapoda	1
Cladocera	1
Cyclopoida	5
Arachnida	
Acarina	2
Insecta	
Coleoptera	
Elmidae	
Dubiraphia	1
Ephemeroptera	
Heptageniidae (not a taxon)	4
Stenacron	11
Macdunnoa	3
Oligeneuriidae	
Isonychia	1
Caenidae	
Caenis	1

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 8 Elk F nr Radcliff, OH--Continued

September 9, 1986--Continued

Insecta--Continued	
Odonata	
Coenagrionidae	1
Calopterygidae	
Hetaerina	2
Diptera	
Chironomidae	
Tanytarsus	21
Polypedilum "A"	11
Polypedilum "B"	4
Rheosmittia	3
Thienemannimyia	7
Larsia	4
Tribelos	14
Endochironomus	4
pupa	3
Ceratopogonidae	3
Total No. in Sample	109
Total Taxa (incl. pupa)	24
Shannon Diversity Index:	3.89
Pielou Equitability Index:	0.85

SITE 9 Pierce Rn nr Radcliff, OH

Drainage Area 9.70 square miles
Stream Bottom - Sand and gravel

Date collected - June 18, 1985

Insecta	
Megaloptera	
Sialidae	
Sialis	5
Zygoptera	
Coenagrionidae	1
Diptera	
Chironomidae	
Ablabesmyia	3
Corynoneura	3
Nilothauma	6
Polypedilum	14
Rheotanytarsus	8
Thienemannimyia	3
Tribelos	3
Total No. in Sample	46
Total Taxa	9
Shannon Diversity Index:	2.84
Pielou Equitability Index:	0.90

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 9 Pierce Rn nr Radcliff, OH--Continued

Date collected - June 25, 1986

Insecta
- Megaloptera
  - Sialidae
    - Sialis 5
  - Corydalidae
    - Nigronia 1
- Diptera
  - Chironomidae
    - Thienemannimyia 2
    - Psectrocladius 1
    - Rheotanytarsus 1

Total No. in Sample 10 Total Taxa 5
Shannon Diversity Index: 1.96
Pielou Equitability Index: 0.84

Date Collected - September 9, 1986

Arthropoda
- Crustacea
  - Branchiopoda
    - Cladocera
      - Daphniiboe
        - Simocephalus 1

Insecta
- Megaloptera
  - Sialidae
    - Sialis 1
- Ephemeroptera 5
- Odonata
  - Gomphidae 1
- Diptera
  - Chironomidae
    - Tanytarsus 10
    - Polypedilum "A" 2
    - Polypedilum "B" 2
    - Ablabesmyia 3
    - Einfeldia 3
    - Tribeilos 2
    - Chironomini (not a taxon) 2
    - Endochironomus 22
    - Procladius 3
    - Paratanytarsus 3
    - pupa 3
  - Ceratopogonidae 4

Total No. in Sample 67 Total Taxa (incl. pupa) 16
Shannon Diversity Index: 3.34
Pielou Equitability Index: 0.83

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 10 Raccoon C at Vinton, OH

Drainage Area 381.50 square miles
Stream Bottom - Bedrock and gravel

Date collected - June 18, 1985

Mollusca	
Bivalvia	
Sphaeviidae	
Pisidium	1
Insecta	
Coleoptera	
Gyrinidae	
Dineutus	1
Ephemeroptera	
Heptageniidae	
Stenacron	1
Baetidae	
Callibaetis	2
Diptera	
Chironomidae	
Ablabesmyia	8
Polypedilum	124
Rheotanytarsus	8
Tribelos	40
Total No. in Sample	185
Total Taxa	8
Shannon Diversity Index:	1.45
Pielou Equitability Index:	0.48

Date collected - June 25, 1986

Insecta	
Ephemeroptera	
Oligoneuriidae	
Isonychia	1
Trichoptera	
pupa in case	1
Diptera	
Chironomidae	
Polypedilum	1
Rheotanytarsus	1
pupa	1
Ceratopogonidae	
Bezzia	1
Total No. in Sample	6
Total Taxa (incl. pupa)	6
Shannon Diversity Index:	2.59
Pielou Equitability Index:	1.00

Date Collected - September 9, 1986

Platyhelminthes	
Turbellaria	1
Mollusca	
Gastropoda	
Limpets	2
Bivalvia	
Sphaeriidae	1
Arthropoda	
Crustacea	
Ostracoda	11

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1984 through 1986 using multiplate samplers--Continued

SITE 10 Raccoon C at Vinton, OH--Continued

September 9, 1986--Continued

Arthropoda--Continued	
Arachnida	
Acarina	17
Insecta	
Megaloptera	
Corydalidae	
Corydalus	3
Ephemeroptera	
Heptageniidae	
Stenacron	2
Stenonema	7
Unidentified	3
Tricorythidae	
Tricorythodes	12
Trichoptera	6
Hydropsychidae	
Cheumatopsyche	2
Diptera	
Chironomidae	
Tanytarsus	159
Psectrocladius	26
Tanytarsus	452
Larsia	53
Cricotopus	27
pupa	29
Ceratopogonidae	5
Empididae	218
Unidentified pupa (not a taxon)	2
Arachnida	
Acarina	17

Total No.in Sample	1038	Total Taxa (incl. pupa)	20
Shannon Diversity Index:	2.55		
Pielou Equitability Index:	0.59		

SITE 11 L Raccoon C nr Roads, OH

Drainage Area 67.50 square miles
Stream Bottom - Sand

Date collected - June 18, 1985

Insecta	
Trichoptera	
Hydropsychidae	
Cheumatopsyche	17
Hydropsyche	7
pupa	6
Diptera	
Chironomidae	
Polypedilum	7
Thienemannimyia	3
Empididae	3

Total No. in Sample	43	Total Taxa	6
Shannon Diversity Index:	2.32		
Pielou Equitability Index:	0.90		

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 11 L Raccoon C nr Roads, OH--Continued

Date collected - June 25, 1986

Arthropoda	
Crustacea	
Amphipoda	
Talitridae	
Hyalelle azteca	1
Insecta	
Megaloptera	
Corydalidae	
Nigronia	2
Trichoptera	
Hydropsychidae	
Cheumatopsyche	18
pupa	1
Odonata	
Zygoptera	
Coenagrionidae	1
Diptera	
Chironomidae	
Thienemannimyia	1
Polypedilum	1
pupa	2

Total No. in Sample 27 Total Taxa (incl. pupa) 8
Shannon Diversity Index: 1.83
Pielou Equitability Index: 0.61

Date collected - September 9, 1986

Arthropoda	
Crustacea	
Decapoda	1
Insecta	
Megaloptera	
Sialidae	
Sialis	1
Trichoptera	
Hydropsychidae	
Cheumatopsyche	2
Diptera	
Chironomidae	
Polypedilum "B"	4
Cryptochironomus	1

Total No.in Sample 9 Total Taxa 5
Shannon Diversity Index: 2.06
Pielou Equitability Index: 0.89

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 12 Flint Rn nr Roads, OH

Drainage Area square miles Latitude 390421 longitude 0822823
Stream Bottom - Sand and coal

Date collected - June 25, 1986

Insecta
Diptera
Chironomidae
Chironomus 20

Total No.in Sample 20 Total Taxa 1
Shannon Diversity Index: 0
Pielou Equitability Index: 0 Comments: No organisms other than chironomids.

Date Collected - September 9, 1986

Insecta
Diptera
Chironomidae
Chironomus 7

Total No. in Sample 7 Total Taxa 1
Shannon Diversity Index: 0
Pielou Equitability Index: 0 Comments: No organisms other than chironomids.

SITE 13 L Raccoon C nr Buckeye Furnace State Memorial, OH

Drainage Area 73.14 square miles
Stream Bottom - Sand, gravel and some coal

Date Collected - September 9, 1986

Insecta
Diptera
Chironomidae
Polypedilum 1

Total No. in Sample 1 Total Taxa 1
Shannon Diversity Index: 0
Pielou Equitability Index: 0

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 14 L Raccoon C nr Ewington, OH

Drainage Area 99.70 square miles
Stream Bottom - Sand and silty sand

Date collected June 18, 1985

Arthropoda	
Crustacea	
Copepoda	
Harpacticoida	1
Insecta	
Megaloptera	
Sialidae	
Sialis	2
Corydalidae	
Nigronia	1
Trichoptera	
Polycentropodidae	
Polycentropus	15
Diptera	
Chironomidae	
Polypedilum	46
Psectrocladius	2
Rheotanytarsus	19
Ceratopogonidae	
Bezzia	5
Total No. in Sample	91
Shannon Diversity Index:	2.02
Pielou Equitability Index:	0.67
Total Taxa	8

Date Collected - September 9, 1986

Insecta	
Megaloptera	
Sialidae	
Sialis	2
Trichoptera	
Polycentropodidae	
Polycentiopus	2
Diptera	
Chironomidae	
Tanytarsus	3
Polypedilum	5
Total No. in Sample	12
Shannon Diversity Index:	1.89
Pielou Equitability Index:	0.94
Total Taxa	4

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 15 L Raccoon C nr Vinton, OH

Drainage Area 154.00 square miles
Stream Bottom - Sand and silty sand

Date collected - June 18, 1985

Insecta	
Megaloptera	
Sialidae	
Sialis	7
Trichoptera	
Polycentropodidae	
Polycentropus	14
Nyctiophylax	5
Diptera	
Chironomidae	
Corynoneura	3
Phaenopsectra	1
Polypedilum	3
Rheotanytarsus	32
Ceratopogonidae	
Bezzia	1
Total No. in Sample	66
Total Taxa	8
Shannon Diversity Index:	2.20
Pielou Equitability Index:	0.73

Date collected - June 25, 1986

Insecta	
Megaloptera	
Sialidae	
Sialis	2
Trichoptera	
Polycentropedidae	
Polycentropus	1
Diptera	
Chironomidae	
Polypedilum	1
Tribelos	2
Unidentified	1
Total No. in Sample	7
Total Taxa	4
Shannon Diversity Index:	1.95
Pielou Equitability Index:	0.98

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 15 L Raccoon C nr Vinton, OH--Continued

Date Collected - September 9, 1986

Insecta
- Trichoptera
  - Polycentropodidae
    - Polycentropus 8
    - Nyctiophylax 2
- Odonata
  - Macromiidae
    - Marcromia 1

Total No. in Sample 11 Total Taxa 3
Shannon Diversity Index: 1.10
Pielou Equitability Index: 0.69

SITE 16 Raccoon C nr Adamsville, OH

Drainage area 585.00 square miles
Stream Bottom - Bedrock

Date collected June 18, 1985

Insecta
- Megaloptera
  - Sialidae
    - Sialis 3
- Ephemeroptera
  - Heptageniidae 3
- Trichoptera
  - Polycentropodidae
    - Polycentropus 5
- Odonata
  - Zygoptera
    - Coenagrionidae 1
- Diptera
  - Chironomidae
    - Ablabesmyia 21
    - Phaenopsectra 12
    - Procladius 5
    - Polypedilum 2
    - Rheotanytarsus 7
    - Thienemannimyia 2
    - Tribelos 80
  - Ceratopogonidae 2

Total No. in Sample 143 Total Taxa 12
Shannon Diversity Index: 2.27
Pielou Equitability Index: 0.63

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 16 Raccoon C nr Adamsville, OH--Continued

Date collected - June 24, 1986

Insecta	
Coleoptera	
Gyrinidae	
Dineutus	1
Trichoptera	
Polycentropodidae	
Nyctiophylax	1
Diptera	
Chironomidae	
Phaenopsectra	3
Polypedilum	3
Total No. in Sample	8
Total Taxa	4
Shannon Diversity Index:	1.81
Pielou Equitability Index:	0.91

Date collected - September 9, 1986

Arthropoda	
Crustacea	
Copepoda	
Harpacticoida	1
Branchiopoda	
Cladocera	
Macrothricidae	
Ilyocryptus	1
Insecta	
Megaloptera	
Sialidae	
Sialis	1
Ephemeroptera	
Heptageniidae	
Stenacron	7
Unidentified	1
Trichoptera	
Polycentropodidae	
Nyctiophylax	4
Polycentropus	1
Cyrnellus	2
Unidentified (not a taxon)	1
Odonata	
Coenagrionidae	1
Diptera	
Chironomidae	
Tanytarsus	32
Polypedilum	3
Ablabesmyia	8
Thienemannimyia	3
Tribelos	2
Pentaneurini	2
Tanytarsini	3
Total No. in Sample	73
Total Taxa	16
Shannon Diversity Index:	2.98
Pielou Equitability Index:	0.74

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1985 through 1986 using multiplate samplers--Continued

SITE 17 Clear F nr Northup, OH

Drainage Area 7.19 square miles
Stream Bottom - Sand and gravel

Date collected - June 24, 1986

Insecta	
Megaloptera	
Sialidae	
Sialis	1
Ephemeroptera	
Heptageniidae	
Stenonem	23
Stenacron	18
Caenidae	
Caenis	7
Odonata	
Zygoptera	
Coenagrionidae	
Coenagrion	1
Anisoptera	
Gomphidae	1
Diptera	
Chironomidae	
Chironomus	2
Corynoneura	1
Microtendipes	1
Rheotanytarsus	1
Thienemannimyia	2
Total No. in Sample	58
Total Taxa	11
Shannon Diversity Index:	2.37
Pielou Equitability Index:	0.68

Table 4.--Benthic organisms collected in the Raccoon Creek basin from 1984 through 1986 using multiplate samplers--Continued

SITE 17 Clear F nr Northup, OH--Continued

Date Collected - September 9, 1986

Nematoda	4
Mollusca	
Planorbidae	1
Arthropoda	
Crustacea	
Copepoda	
Cyclopoida	1
Insecta	
Ephemeroptera	
Heptageniidae	
Macdunnoa	1
Stenacron	12
Stenonema	24
Caenidae	
Caenis	29
Odonata	
Zygoptera	
Coenagrionidae	1
Diptera	
Chironomidae	
Tanytarsus	10
Polypedilum	1
Orthocladiinae	1
Ablabesmyia	3
Einfeldia	3
Larsia	2
Endochironomus	1
Paratanytarsus	1
Nilothauma	1
Microtendipes	1
Paratendipes	1
pupa	1

Total No. in Sample 99 Total Taxa (incl. pupa) 19
Shannon Diversity Index: 3.08
Pielou Equitability Index: 0.72

Table 6.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near New Plymouth, Ohio (site 3)

[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, tons per day. Dash indicates no data available.]

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984					
		JULY			AUGUST			SEPTEMBER	
1	7.4	---	---	44	3	0.36	0.00	0	0.00
2	6.2	---	---	42	3	.34	.00	0	.00
3	11	---	---	39	3	.32	.00	0	.00
4	21	---	---	36	3	.29	.00	0	.00
5	31	---	---	45	5	.61	.00	0	.00
6	38	---	---	52	5	.70	.00	0	.00
7	32	---	---	49	5	.66	.00	0	.00
8	29	---	---	56	7	1.1	.00	0	.00
9	37	---	---	27	6	.44	.00	0	.00
10	36	---	---	26	5	.35	.00	0	.00
11	38	---	---	25	6	.41	.00	0	.00
12	38	---	---	24	13	.84	.00	0	.00
13	38	---	---	17	6	.28	.00	0	.00
14	38	---	---	15	4	.16	.00	0	.00
15	37	---	---	14	4	.15	.00	0	.00
16	36	---	---	13	4	.14	.00	0	.00
17	33	---	---	10	4	.11	.00	0	.00
18	29	---	---	9.0	4	.10	.00	0	.00
19	28	---	---	8.0	4	.09	.00	0	.00
20	36	7	.68	5.4	4	.06	.00	0	.00
21	36	7	.68	1.9	4	.02	.00	0	.00
22	33	7	.62	.52	3	.00	.00	0	.00
23	30	7	.57	.58	3	.00	.00	0	.00
24	27	7	.51	.17	3	.00	.00	0	.00
25	35	6	.57	.00	0	.00	.00	0	.00
26	39	5	.53	.00	0	.00	.00	0	.00
27	53	7	1.0	.00	0	.00	.00	0	.00
28	49	5	.66	.00	0	.00	.00	0	.00
29	45	4	.49	.00	0	.00	.00	0	.00
30	42	3	.34	.00	0	.00	.00	0	.00
31	43	3	.35	.00	0	.00	---	---	---
TOTAL	1031.6	---	7.00	559.57	---	7.53	0.00	---	0.00
PARTIAL YEAR	1679.17		14.53						

Table 6.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near New Plymouth, Ohio (site 3)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		OCTOBER			NOVEMBER			DECEMBER	
1	0.00	0	0.00	0.59	5	0.00	2.0	5	0.03
2	.00	0	.00	6.8	4	.07	.00	0	.00
3	1.0	7	.02	13	4	.14	.00	0	.00
4	.52	7	.00	12	4	.13	.00	0	.00
5	.02	6	.00	15	3	.12	.00	0	.00
6	.00	0	.00	.76	3	.00	.00	0	.00
7	.00	0	.00	.00	0	.00	.00	0	.00
8	.00	0	.00	.00	0	.00	.00	0	.00
9	6.9	10	.19	7.5	5	.10	.00	0	.00
10	5.0	10	.14	79	111	24	57	70	11
11	1.5	3	.01	50	15	2.0	97	27	7.1
12	.68	4	.00	20	10	.54	49	8	1.1
13	.24	4	.00	10	6	.16	37	7	.70
14	.20	4	.00	6.9	5	.09	45	6	.73
15	.23	4	.00	7.6	4	.08	42	6	.68
16	.12	4	.00	7.2	3	.06	32	6	.52
17	.25	5	.00	4.7	3	.04	26	5	.35
18	.29	7	.00	4.6	3	.04	31	5	.42
19	.37	7	.00	12	3	.10	35	19	1.8
20	.09	9	.00	16	3	.13	42	20	2.3
21	.00	0	.00	11	3	.09	92	114	28
22	16	23	.99	7.5	3	.06	220	159	94
23	7.2	12	.23	6.5	3	.05	69	16	3.0
24	.00	0	.00	6.8	3	.06	46	15	1.9
25	.00	0	.00	7.1	3	.06	36	14	1.4
26	.00	0	.00	6.9	3	.06	27	13	.95
27	.28	4	.00	6.5	3	.05	25	11	.74
28	.53	4	.00	19	9	.46	23	10	.62
29	2.9	5	.04	17	7	.32	21	8	.45
30	2.6	5	.04	1.8	5	.02	67	59	11
31	.80	5	.01	---	---	---	65	23	4.0
TOTAL	47.72	---	1.67	363.75	---	29.03	1186.00	---	172.79

Table 6.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near New Plymouth, Ohio (site 3)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		JANUARY			FEBRUARY			MARCH	
1	51	16	2.2	6.4	13	0.22	68	12	2.2
2	43	15	1.7	20	10	.54	60	12	1.9
3	34	15	1.4	17	9	.41	51	12	1.7
4	32	14	1.2	15	7	.28	49	12	1.6
5	28	14	1.1	13	5	.18	47	11	1.4
6	22	14	.83	11	5	.15	40	11	1.2
7	22	14	.83	9.4	5	.13	38	11	1.1
8	20	14	.76	8.1	5	.11	45	10	1.2
9	14	13	.49	7.0	5	.09	41	10	1.1
10	15	13	.53	9.0	5	.12	37	10	1.0
11	14	13	.49	14	7	.26	118	107	34
12	12	13	.42	38	20	2.1	414	283	316
13	9.6	12	.31	111	104	31	139	50	19
14	6.0	12	.19	130	50	18	93	30	7.5
15	3.6	12	.12	91	26	6.4	70	27	5.1
16	2.5	12	.08	70	15	2.8	58	26	4.1
17	1.8	12	.06	63	8	1.4	52	26	3.7
18	1.4	12	.05	57	8	1.2	44	25	3.0
19	1.1	11	.03	60	12	1.9	40	23	2.5
20	.90	11	.03	69	14	2.6	37	22	2.2
21	.86	10	.02	96	22	5.7	33	20	1.8
22	.62	10	.02	446	355	427	34	19	1.7
23	.54	10	.01	916	145	359	39	17	1.8
24	.47	10	.01	652	120	211	36	17	1.7
25	.39	9	.00	273	83	61	32	15	1.3
26	.35	8	.00	137	50	18	28	14	1.1
27	.30	8	.00	99	33	8.8	28	12	.91
28	.27	7	.00	77	13	2.7	28	10	.76
29	.24	7	.00	---	---	---	34	8	.73
30	.22	7	.00	---	---	---	455	366	450
31	1.8	12	.06	---	---	---	544	250	367
TOTAL	339.96	---	12.94	3514.9	---	1163.09	2832	---	1240.30

Table 6.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near New Plymouth, Ohio (site 3)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		APRIL			MAY			JUNE	
1	217	78	46	7.7	10	0.21	8.5	6	0.14
2	114	20	6.2	128	111	38	7.6	6	.12
3	86	11	2.6	107	30	8.7	6.6	6	.11
4	70	10	1.9	50	15	2.0	5.8	5	.08
5	60	10	1.6	32	14	1.2	6.0	5	.08
6	135	82	30	22	13	.77	6.2	7	.12
7	123	55	18	14	12	.45	5.0	8	.11
8	151	49	20	7.6	10	.21	4.0	7	.08
9	118	36	11	1.7	9	.04	2.2	8	.05
10	86	27	6.3	.10	8	.00	2.3	8	.05
11	75	23	4.7	.18	7	.00	1.8	8	.04
12	63	20	3.4	6.7	10	.18	11	10	.30
13	55	17	2.5	7.8	10	.21	1.2	6	.02
14	49	15	2.0	.74	8	.02	.12	5	.00
15	44	15	1.8	37	67	6.7	.00	5	.00
16	41	14	1.5	87	170	40	.00	5	.00
17	34	12	1.1	157	77	33	.01	6	.00
18	30	10	.81	88	29	6.9	3.0	10	.08
19	26	10	.70	106	65	19	2.1	6	.03
20	23	10	.62	52	21	2.9	2.9	5	.04
21	20	10	.54	32	19	1.6	7.6	5	.10
22	18	10	.49	24	17	1.1	8.8	5	.12
23	14	10	.38	20	16	.86	17	9	.41
24	13	10	.35	14	14	.53	12	5	.16
25	11	10	.30	10	12	.32	9.9	5	.13
26	6.9	10	.19	8.3	10	.22	9.8	5	.13
27	3.3	10	.09	19	16	.82	8.2	5	.11
28	3.3	10	.09	18	10	.49	16	9	.39
29	1.1	10	.03	14	8	.30	8.5	5	.11
30	1.7	10	.05	12	7	.23	3.4	5	.05
31	---	---	---	9.6	7	.18	---	---	---
TOTAL	1692.3	---	165.24	1093.42	---	167.14	177.53	---	3.16

Table 6.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near New Plymouth, Ohio (site 3)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		JULY			AUGUST			SEPTEMBER	
1	1.4	5	0.02	0.92	5	0.01	0.00	0	0.00
2	8.5	15	.34	1.5	5	.02	.25	5	.00
3	11	28	.83	1.2	5	.02	.84	10	.02
4	.02	5	.00	.03	5	.00	.39	7	.00
5	.00	0	.00	.00	0	.00	.25	6	.00
6	6.5	10	.18	.00	0	.00	.88	8	.02
7	.12	6	.00	.00	0	.00	1.3	7	.02
8	.00	0	.00	.00	0	.00	1.3	6	.02
9	.00	0	.00	.00	0	.00	1.6	5	.02
10	9.1	5	.12	.00	0	.00	1.9	4	.02
11	.00	0	.00	.00	0	.00	1.7	3	.01
12	.00	0	.00	.00	0	.00	1.2	3	.00
13	.00	0	.00	.00	0	.00	.82	3	.00
14	.00	0	.00	.00	0	.00	.50	3	.00
15	47	407	52	6.3	30	.51	.22	3	.00
16	15	10	.41	12	25	.81	.00	0	.00
17	3.7	8	.08	4.3	5	.06	.00	0	.00
18	1.8	7	.03	2.2	5	.03	.00	0	.00
19	2.0	5	.03	1.1	5	.01	.00	0	.00
20	1.4	5	.02	.61	5	.00	.00	0	.00
21	5.2	6	.08	1.1	5	.01	.00	0	.00
22	9.1	6	.15	.80	5	.01	.00	0	.00
23	5.6	6	.09	.04	4	.00	.00	0	.00
24	2.1	5	.03	.00	0	.00	.00	0	.00
25	.61	5	.00	28	489	37	.00	0	.00
26	.17	5	.00	.08	25	.00	.00	0	.00
27	6.6	5	.09	.00	0	.00	.00	0	.00
28	2.8	5	.04	.00	0	.00	.00	0	.00
29	.35	5	.00	.00	0	.00	.00	0	.00
30	.00	0	.00	.00	0	.00	.00	0	.00
31	.20	5	.00	.00	0	.00	---	---	---
TOTAL	140.27	---	54.54	60.18	---	38.49	13.15	---	0.13
YEAR	11461.18		3048.52						

Table 7.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near Bolins Mills, Ohio (site 7)

[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, tons per day. Dash indicates no data available.]

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984					
		JULY			AUGUST			SEPTEMBER	
1	---	---	---	4.7	6	0.08	0.14	4	0.00
2	---	---	---	5.0	8	.11	.14	4	.00
3	---	---	---	7.2	8	.16	.42	5	.00
4	---	---	---	7.3	19	.37	.56	5	.00
5	---	---	---	16	22	.95	.28	5	.00
6	---	---	---	38	20	2.1	.42	7	.00
7	---	---	---	32	12	1.0	.28	7	.00
8	---	---	---	21	12	.68	.28	7	.00
9	---	---	---	17	10	.46	3.4	9	.08
10	---	---	---	13	9	.32	.42	8	.00
11	---	---	---	11	7	.21	.28	5	.00
12	---	---	---	9.9	10	.27	.14	5	.00
13	---	---	---	8.0	9	.19	1.0	0	.00
14	---	---	---	9.5	11	.28	.28	5	.00
15	---	---	---	11	7	.21	3.4	8	.07
16	---	---	---	9.3	6	.15	2.7	7	.05
17	---	---	---	6.7	6	.11	2.5	6	.04
18	3.8	---	---	5.5	6	.09	2.2	6	.04
19	3.3	14	.12	5.0	6	.08	2.0	5	.03
20	2.6	13	.09	4.0	5	.05	2.0	5	.03
21	2.6	13	.09	3.5	5	.05	1.7	4	.02
22	2.3	15	.09	3.4	6	.06	1.5	4	.02
23	4.8	10	.13	3.9	7	.07	1.3	3	.01
24	1.7	9	.04	2.8	6	.05	1.1	4	.01
25	1.4	8	.03	1.7	5	.02	1.4	6	.02
26	1.8	7	.03	1.1	5	.01	1.1	7	.02
27	4.0	10	.11	.72	5	.00	.70	6	.01
28	6.4	16	.28	.52	5	.00	.42	5	.00
29	14	10	.38	.31	4	.00	.70	0	.00
30	11	9	.27	.14	4	.00	.70	0	.00
31	7.0	6	.11	.28	4	.00	---	---	---
TOTAL	66.7	---	1.77	259.47	---	8.13	33.46	---	0.45
PARTIAL YEAR	359.63		10.35						

Table 7.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near Bolins Mills, Ohio (site 7)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		OCTOBER			NOVEMBER			DECEMBER	
1	0.70	0	0.00	11	9	0.27	135	8	2.9
2	.70	5	.00	11	8	.24	117	8	2.5
3	.70	7	.01	10	6	.16	95	8	2.1
4	.42	7	.00	5.4	6	.09	73	8	1.6
5	.28	5	.00	.13	4	.00	67	9	1.6
6	.00	0	.00	.93	6	.02	66	9	1.6
7	.00	0	.00	.00	0	.00	65	9	1.6
8	.00	0	.00	.00	0	.00	62	8	1.3
9	.00	0	.00	.06	0	.00	55	7	1.0
10	.14	2	.00	71	7	1.3	130	55	19
11	.98	3	.00	307	27	22	500	37	50
12	1.3	3	.01	220	35	21	430	19	22
13	2.0	4	.02	111	18	5.4	251	17	12
14	2.7	6	.04	70	16	3.0	202	15	8.2
15	2.8	5	.04	54	15	2.2	220	16	9.5
16	3.2	6	.05	47	14	1.8	199	13	7.0
17	3.2	3	.03	43	7	.81	159	12	5.2
18	3.1	6	.05	38	7	.72	135	11	4.0
19	3.4	6	.06	49	8	1.1	149	10	4.0
20	4.1	8	.09	74	19	3.8	250	13	8.8
21	5.4	10	.15	78	15	3.2	313	32	27
22	9.4	7	.18	64	12	2.1	935	140	353
23	20	13	.70	56	8	1.2	940	21	53
24	1.2	8	.03	50	7	.95	405	10	11
25	3.6	6	.06	49	6	.79	259	9	6.3
26	.16	3	.00	48	7	.91	190	8	4.1
27	1.5	3	.01	46	7	.87	152	7	2.9
28	4.6	12	.15	60	8	1.3	141	6	2.3
29	8.2	12	.27	154	7	2.9	129	5	1.7
30	9.7	10	.26	162	8	3.5	135	7	2.6
31	14	9	.34	---	---	---	316	10	8.5
TOTAL	107.48	---	2.55	1889.52	---	81.63	7275	---	638.3

Table 7.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near Bolins Mills, Ohio (site 7)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		JANUARY			FEBRUARY			MARCH	
1	331	27	24	103	15	4.2	318	19	16
2	277	23	17	170	18	8.3	268	18	13
3	224	20	12	155	18	7.5	221	17	10
4	187	18	9.1	145	17	6.7	191	16	8.3
5	150	17	6.9	132	16	5.7	182	15	7.4
6	123	17	5.6	120	16	5.2	164	14	6.2
7	106	16	4.6	110	15	4.5	140	13	4.9
8	94	16	4.1	102	15	4.1	140	12	4.5
9	86	15	3.5	94	14	3.6	155	13	5.4
10	80	15	3.2	86	14	3.3	147	15	6.0
11	74	14	2.8	81	14	3.1	192	22	11
12	70	14	2.6	79	14	3.0	1190	165	530
13	66	14	2.5	78	14	2.9	1490	35	141
14	63	14	2.4	78	14	2.9	1160	25	78
15	60	13	2.1	115	20	6.2	480	23	30
16	57	13	2.0	240	30	19	327	21	19
17	54	12	1.7	410	20	22	267	20	14
18	52	12	1.7	383	15	16	223	18	11
19	50	12	1.6	385	15	16	185	17	8.5
20	49	11	1.5	425	25	29	166	16	7.2
21	48	11	1.4	504	27	37	150	15	6.1
22	47	11	1.4	944	64	163	137	14	5.2
23	46	10	1.2	1940	195	1020	162	13	5.7
24	46	10	1.2	2720	37	272	175	12	5.7
25	45	10	1.2	3030	25	205	159	12	5.2
26	45	10	1.2	2280	23	142	137	11	4.1
27	44	9	1.1	1190	21	67	123	10	3.3
28	44	9	1.1	433	20	23	121	10	3.3
29	44	9	1.1	---	---	---	126	10	3.4
30	44	9	1.1	---	---	---	947	249	637
31	70	9	1.7	---	---	---	1930	58	302
TOTAL	2776	---	124.6	16532	---	2102.2	11773	---	1912.4

Table 7.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near Bolins Mills, Ohio (site 7)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		APRIL			MAY			JUNE	
1	2190	23	136	60	15	2.4	53	10	1.4
2	1900	13	67	543	863	1270	47	9	1.1
3	1010	11	30	1770	691	3300	41	8	.89
4	437	10	12	1800	223	1080	38	7	.72
5	341	9	8.3	821	40	89	33	7	.62
6	481	32	42	284	17	13	35	7	.66
7	711	23	44	201	17	9.2	29	7	.55
8	861	39	91	152	16	6.6	29	7	.55
9	748	28	57	119	15	4.8	33	7	.62
10	524	27	38	96	14	3.6	34	7	.64
11	408	26	29	81	13	2.8	31	7	.59
12	344	25	23	74	12	2.4	36	8	.78
13	283	23	18	68	11	2.0	91	15	3.7
14	246	20	13	63	10	1.7	72	10	1.9
15	220	20	12	353	491	468	40	8	.86
16	201	20	11	1440	504	1800	29	8	.63
17	180	20	9.7	1600	60	259	27	7	.51
18	148	20	8.0	1440	29	113	24	7	.45
19	132	20	7.1	862	20	47	21	7	.40
20	119	19	6.1	536	19	27	19	7	.36
21	109	18	5.3	300	17	14	17	6	.28
22	99	17	4.5	203	16	8.8	16	6	.26
23	89	16	3.8	166	15	6.7	15	6	.24
24	82	15	3.3	146	14	5.5	17	6	.28
25	76	14	2.9	117	14	4.4	19	6	.31
26	69	12	2.2	93	13	3.3	15	5	.20
27	62	10	1.7	81	13	2.8	13	5	.18
28	115	19	5.9	84	12	2.7	12	5	.16
29	120	19	6.2	87	12	2.8	11	5	.15
30	73	17	3.4	73	11	2.2	11	5	.15
31	---	---	---	60	10	1.6	---	---	---
TOTAL	12378	---	701.4	13773	---	8556.3	908	---	20.14
PARTIAL YEAR	67440.10		14139.52						

Table 8.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Little Raccoon Creek near Ewington, Ohio (site 14)

[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, tons per day. Dash indicates no data available.]

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984					
	JULY			AUGUST			SEPTEMBER		
1	---			8.1	---	---	5.2	7	0.10
2	---			8.1	---	---	4.8	7	.09
3	---			13	---	---	4.7	7	.09
4	---			15	---	---	5.0	6	.08
5	---			95	---	---	5.4	5	.07
6	---			67	---	---	5.3	4	.06
7	---			37	---	---	4.8	3	.04
8	---			23	---	---	4.4	3	.04
9	---			20	4	.22	4.0	3	.03
10	---			18	4	.19	3.8	4	.04
11	---			36	20	1.9	3.5	5	.05
12	---			37	7	.70	3.3	5	.04
13	---			24	10	.65	3.2	4	.03
14	---			18	9	.44	3.4	3	.03
15	---			13	8	.28	8.1	3	.07
16	---			11	7	.21	7.4	4	.08
17	---			11	7	.21	4.8	5	.06
18	---			10	6	.16	3.5	6	.06
19	---			10	4	.11	3.0	6	.05
20	---			9.2	4	.10	2.5	6	.04
21	---			7.8	4	.08	2.3	6	.04
22	---			8.2	7	.15	2.7	5	.04
23	---			9.2	5	.12	2.8	4	.03
24	---			9.2	5	.12	3.9	4	.04
25	8.3			7.7	6	.12	6.2	4	.07
26	8.4			6.4	6	.10	6.5	3	.05
27	13			5.7	7	.11	4.1	3	.03
28	15			5.8	7	.11	3.6	3	.03
29	14			6.1	6	.10	3.5	4	.04
30	11			5.8	5	.08	4.0	4	.04
31	8.7			5.6	6	.09	---	---	---
TOTAL	78.4			560.9	---	6.35	129.7	---	1.56
PARTIAL YEAR	769.0		7.91						

Table 8.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Little Raccoon Creek near Ewington, Ohio (site 14)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		OCTOBER			NOVEMBER			DECEMBER	
1	4.5	10	0.12	25	4	0.27	84	8	1.8
2	4.8	8	.10	19	3	.15	82	8	1.8
3	5.1	6	.08	17	3	.14	67	7	1.3
4	4.2	3	.03	17	3	.14	57	7	1.1
5	3.3	3	.03	17	3	.14	48	7	.91
6	3.0	3	.02	30	5	.41	45	6	.73
7	2.8	3	.02	28	5	.38	47	6	.76
8	2.9	4	.03	22	5	.30	42	6	.68
9	5.5	5	.07	20	12	.65	40	5	.54
10	4.4	4	.05	55	7	1.0	103	26	7.2
11	4.0	3	.03	203	5	2.7	267	23	17
12	3.9	3	.03	210	5	2.8	194	20	10
13	3.8	3	.03	125	4	1.4	134	20	7.2
14	3.8	3	.03	65	4	.70	122	19	6.3
15	3.7	3	.03	40	3	.32	126	18	6.1
16	4.2	3	.03	38	3	.31	109	18	5.3
17	5.3	3	.04	33	3	.27	92	17	4.2
18	5.5	3	.04	39	11	1.2	80	17	3.7
19	5.1	3	.04	196	14	7.4	77	16	3.2
20	5.6	3	.05	180	10	4.9	94	30	6.4
21	5.8	3	.05	101	9	2.5	207	73	64
22	9.0	4	.10	63	8	1.4	679	94	166
23	18	6	.29	49	8	1.1	512	33	60
24	13	4	.14	44	8	.95	350	30	41
25	10	3	.08	38	8	.82	213	27	26
26	9.3	3	.08	34	7	.64	149	25	14
27	8.5	3	.07	32	7	.60	120	23	9.3
28	9.0	4	.10	41	16	1.8	106	22	7.1
29	31	10	.84	85	15	3.4	95	20	5.7
30	51	6	.83	76	8	1.6	107	33	8.5
31	30	5	.41	---	---	---	157	30	8.7
TOTAL	280.0	---	3.89	1942	---	40.39	4605	---	496.52

Table 8.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Little Raccoon Creek near Ewington, Ohio (site 14)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		JANUARY			FEBRUARY			MARCH	
1	156	25	11	70	15	2.8	155	37	15
2	140	23	8.7	100	12	3.2	132	36	13
3	115	22	6.8	96	10	2.6	111	35	10
4	100	21	5.7	92	9	2.2	100	30	8.1
5	94	20	5.1	90	9	2.2	100	25	6.8
6	86	19	4.4	82	8	1.8	91	24	5.9
7	80	17	3.7	76	8	1.6	82	23	5.1
8	72	16	3.1	70	10	1.9	82	22	4.9
9	68	16	2.9	64	11	1.9	84	21	4.8
10	64	15	2.6	60	10	1.6	76	20	4.1
11	60	15	2.4	72	10	1.9	119	20	9.0
12	57	15	2.3	214	45	26	532	102	154
13	54	14	2.0	273	55	41	599	45	73
14	51	14	1.9	344	40	37	534	33	48
15	48	14	1.8	345	23	21	302	32	26
16	46	14	1.7	271	15	11	190	32	16
17	44	13	1.5	239	12	7.7	149	30	12
18	42	13	1.5	213	11	6.3	123	27	9.0
19	40	13	1.4	215	11	6.4	105	26	7.4
20	38	13	1.3	241	10	6.5	94	26	6.6
21	37	12	1.2	325	17	15	82	26	5.8
22	36	12	1.2	522	42	65	81	26	5.7
23	35	12	1.1	811	78	169	97	26	6.8
24	34	11	1.0	1030	45	125	98	27	7.1
25	33	11	.98	895	44	106	164	53	23
26	32	11	.95	639	43	74	160	25	11
27	32	10	.86	348	42	39	130	23	8.1
28	31	10	.84	204	38	21	115	21	6.5
29	31	10	.84	---	---	---	110	20	5.9
30	30	10	.81	---	---	---	455	---	---
31	45	23	2.8	---	---	---	1270	98	302
TOTAL	1831	---	84.38	8001	---	800.6	6522	---	820.6

Table 8.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Little Raccoon Creek near Ewington, Ohio (site 14)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		APRIL			MAY			JUNE	
1	1210	55	180	40	7	0.76	39	12	1.3
2	780	42	88	195	131	128	35	11	1.0
3	462	38	47	619	106	170	34	10	.92
4	257	36	25	534	30	43	33	10	.89
5	192	35	18	343	28	26	35	9	.85
6	297	34	27	158	27	12	34	9	.83
7	292	33	26	110	25	7.4	34	8	.73
8	339	30	27	84	23	5.2	45	8	.97
9	289	28	22	70	22	4.2	38	7	.72
10	223	26	16	59	22	3.5	56	7	1.1
11	187	24	12	53	21	3.0	40	7	.76
12	161	22	9.6	53	21	3.0	84	7	1.6
13	141	20	7.6	68	20	3.7	82	6	1.3
14	129	18	6.3	62	20	3.3	52	6	.84
15	117	16	5.1	161	148	107	40	6	.65
16	100	14	3.8	480	107	137	36	5	.49
17	103	13	3.6	570	42	65	32	5	.43
18	90	12	2.9	600	34	55	31	5	.42
19	83	11	2.5	563	34	52	28	5	.38
20	78	11	2.3	305	33	27	29	5	.39
21	73	10	2.0	167	32	14	26	4	.28
22	68	10	1.8	116	30	9.4	23	4	.25
23	62	10	1.7	103	29	8.1	26	4	.28
24	58	9	1.4	98	28	7.4	22	4	.24
25	55	9	1.3	83	27	6.1	21	4	.23
26	51	9	1.2	69	24	4.5	18	3	.15
27	48	9	1.2	59	22	3.5	18	3	.15
28	47	8	1.0	54	20	2.9	17	3	.14
29	43	8	.93	52	19	2.7	16	3	.13
30	40	8	.86	46	16	2.0	15	3	.12
31	---	---	---	41	14	1.5	---	---	---
TOTAL	6075	---	545.09	6015	---	918.16	1039	---	18.54
PARTIAL YEAR	36310		3728.17						

Table 9.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Little Raccoon Creek near Vinton, Ohio (site 15)

[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, tons per day. Dash indicates no data available.]

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984					
	JULY			AUGUST			SEPTEMBER		
1	---			15	---	---	6.0	5	0.08
2	---			14	---	---	5.8	3	.05
3	---			15	---	---	5.6	5	.08
4	---			22	---	---	6.0	5	.08
5	---			72	---	---	6.4	19	.33
6	---			93	---	---	4.5	24	.29
7	---			61	---	---	5.2	7	.10
8	---			28	---	---	5.2	6	.08
9	---			26	---	---	4.5	5	.06
10	---			24	---	---	4.1	4	.04
11	---			49	---	---	4.5	5	.06
12	---			30	---	---	3.1	4	.03
13	---			22	---	---	2.4	3	.02
14	---			18	---	---	3.1	3	.03
15	---			16	---	---	3.4	3	.03
16	---			15	---	---	6.2	6	.10
17	---			14	---	---	5.2	5	.07
18	---			13	---	---	3.8	3	.03
19	17			12	---	---	3.1	3	.03
20	17			11	---	---	2.1	2	.01
21	19			10	---	---	2.2	2	.01
22	21			12	---	---	2.8	2	.02
23	19			11	---	---	4.0	3	.03
24	17			10	---	---	5.0	4	.05
25	13			8.8	6	.14	7.0	5	.09
26	11			7.8	6	.13	6.8	7	.13
27	13			7.0	6	.11	5.6	7	.11
28	19			6.6	6	.11	4.6	5	.06
29	23			7.4	8	.16	3.7	4	.04
30	21			6.8	7	.13	3.0	3	.02
31	18			6.2	6	.10	---	---	---
TOTAL	228			663.6	---	0.88	134.9	---	2.16
PARTIAL YEAR	1026.5		3.04						

Table 9.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Little Raccoon Creek near Vinton, Ohio (site 15)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		OCTOBER			NOVEMBER			DECEMBER	
1	2.8	3	0.02	30	3	0.24	99	8	2.1
2	4.1	4	.04	23	3	.19	109	9	2.6
3	3.1	4	.03	17	3	.14	90	8	1.9
4	1.7	3	.01	17	3	.14	77	8	1.7
5	.34	1	.00	29	5	.39	66	7	1.2
6	.20	1	.00	43	5	.58	61	7	1.2
7	3.1	3	.03	34	3	.28	58	6	.94
8	.69	1	.00	28	3	.23	67	6	1.1
9	1.0	1	.00	48	5	.65	56	6	.91
10	2.8	3	.02	233	22	14	108	24	7.0
11	1.2	1	.00	292	11	8.7	324	40	35
12	1.3	1	.00	197	10	5.3	281	12	9.1
13	.92	1	.00	111	8	2.4	193	11	5.7
14	.99	1	.00	72	7	1.4	160	10	4.3
15	1.2	1	.00	57	7	1.1	164	10	4.4
16	1.8	2	.00	51	6	.83	150	10	4.1
17	3.5	4	.04	44	5	.59	129	10	3.5
18	8.5	5	.11	52	7	.98	103	9	2.5
19	17	7	.32	227	30	18	104	12	3.4
20	22	8	.48	263	20	14	127	14	4.8
21	29	9	.70	161	17	7.4	294	87	112
22	44	9	1.1	96	13	3.4	787	154	323
23	50	9	1.2	72	11	2.1	805	61	135
24	60	7	1.1	62	10	1.7	498	48	65
25	55	6	.89	54	10	1.5	309	42	35
26	53	5	.72	47	10	1.3	224	30	18
27	56	4	.60	41	9	1.0	177	17	8.1
28	63	7	1.2	50	9	1.2	156	14	5.9
29	96	7	1.8	97	9	2.4	138	13	4.8
30	81	5	1.1	106	9	2.6	152	20	8.2
31	45	4	.49	---	---	---	221	33	20
TOTAL	710.24	---	12.00	2654	---	94.74	6287	---	832.45

Table 9.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Little Raccoon Creek near Vinton, Ohio (site 15)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		JANUARY			FEBRUARY			MARCH	
1	226	24	15	120	25	8.1	252	23	16
2	210	17	9.6	200	20	11	199	23	12
3	174	16	7.5	175	15	7.1	169	23	10
4	159	16	6.9	155	13	5.4	150	22	8.9
5	162	16	7.0	145	11	4.3	146	22	8.7
6	148	16	6.4	138	11	4.1	135	21	7.7
7	133	15	5.4	120	10	3.2	120	21	6.8
8	126	15	5.1	105	10	2.8	117	21	6.6
9	113	14	4.3	90	9	2.2	123	20	6.6
10	99	14	3.7	78	8	1.7	115	20	6.2
11	94	14	3.6	90	7	1.7	168	32	15
12	88	13	3.1	232	45	28	629	146	227
13	84	13	2.9	543	114	168	791	54	111
14	78	12	2.5	724	65	127	727	30	59
15	72	12	2.3	781	37	78	483	22	29
16	70	11	2.1	410	20	22	285	20	15
17	68	11	2.0	343	16	15	221	18	11
18	66	10	1.8	310	15	13	185	17	8.5
19	63	10	1.7	309	15	13	158	16	6.8
20	60	9	1.5	339	17	16	139	15	5.6
21	58	9	1.4	454	45	55	122	14	4.6
22	56	8	1.2	736	125	266	116	13	4.1
23	54	8	1.2	1070	92	259	134	12	4.3
24	52	8	1.1	1310	40	141	150	35	14
25	51	7	.96	1380	30	112	304	55	45
26	49	7	.93	1190	25	80	266	30	22
27	48	7	.91	859	25	58	206	22	12
28	47	6	.76	523	24	34	181	17	8.3
29	46	6	.75	---	---	---	166	15	6.7
30	45	5	.61	---	---	---	483	81	144
31	66	5	.89	---	---	---	1220	159	500
TOTAL	2865	---	105.11	12929	---	1536.6	8660	---	1342.4

Table 9.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Little Raccoon Creek near Vinton, Ohio (site 15)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		APRIL			MAY			JUNE	
1	1610	60	261	49	5	0.66	52	6	0.84
2	1410	40	152	221	73	121	46	6	.75
3	1020	37	102	752	98	194	42	6	.68
4	509	35	48	753	43	87	41	6	.66
5	288	32	25	558	25	38	43	6	.70
6	312	50	42	262	16	11	42	5	.57
7	395	50	53	161	12	5.2	40	5	.54
8	399	40	43	123	8	2.7	54	5	.73
9	370	35	35	99	7	1.9	55	5	.74
10	305	30	25	83	6	1.3	55	5	.74
11	251	27	18	72	5	.97	52	5	.70
12	218	23	14	67	4	.72	110	11	3.3
13	189	20	10	82	5	1.1	84	5	1.1
14	171	17	7.8	87	4	.94	66	5	.89
15	155	15	6.3	190	50	26	58	5	.78
16	151	15	6.1	560	150	227	50	5	.68
17	150	14	5.7	780	125	263	45	5	.61
18	133	14	5.0	845	80	183	42	5	.57
19	117	13	4.1	840	65	147	36	5	.49
20	108	13	3.8	520	25	35	31	5	.42
21	101	12	3.3	300	25	20	33	5	.45
22	92	11	2.7	200	24	13	28	5	.38
23	86	10	2.3	167	21	9.5	29	5	.39
24	79	9	1.9	150	19	7.7	29	5	.39
25	75	8	1.6	135	16	5.8	25	5	.34
26	68	7	1.3	103	13	3.6	24	4	.26
27	62	7	1.2	90	10	2.4	23	4	.25
28	60	6	.97	80	8	1.7	22	4	.24
29	56	5	.76	71	7	1.3	21	4	.23
30	51	5	.69	65	6	1.1	20	4	.22
31	---	---	---	57	---	---	---	---	---
TOTAL	8991	---	883.52	8522	---	1413.59	1298	---	19.64

Table 9.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Little Raccoon Creek near Vinton, Ohio (site 15)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		JULY			AUGUST			SEPTEMBER	
1	42	10	1.1	34	16	1.5	10	7	0.19
2	31	7	.59	50	10	1.4	10	7	.19
3	31	7	.59	19	6	.31	10	6	.16
4	53	7	1.0	10	5	.14	13	5	.18
5	35	6	.57	6.9	5	.09	15	5	.20
6	27	5	.36	7.6	5	.10	14	4	.15
7	24	4	.26	12	5	.16	14	4	.15
8	45	9	1.1	15	4	.16	16	6	.26
9	41	12	1.3	16	4	.17	20	7	.38
10	70	17	3.2	17	4	.18	23	13	.81
11	145	30	12	16	3	.13	24	15	.97
12	100	18	4.9	19	3	.15	24	10	.65
13	54	10	1.5	19	4	.21	19	6	.31
14	53	8	1.1	19	5	.26	18	6	.29
15	44	7	.83	18	5	.24	16	6	.26
16	31	5	.42	30	9	.73	15	6	.24
17	29	5	.39	27	7	.51	16	6	.26
18	42	9	1.0	22	6	.36	14	6	.23
19	33	9	.80	19	6	.31	13	6	.21
20	25	10	.68	22	6	.36	11	6	.18
21	21	11	.62	24	7	.45	8.5	7	.16
22	30	11	.89	28	7	.53	5.8	7	.11
23	59	13	2.1	29	7	.55	5.3	7	.10
24	35	8	.76	31	7	.59	5.2	7	.10
25	18	4	.19	100	112	63	4.3	7	.08
26	20	4	.22	99	21	5.6	6.1	7	.12
27	56	12	1.8	36	10	.97	8.1	7	.15
28	59	11	1.8	16	9	.39	8.6	7	.16
29	26	7	.49	11	9	.27	11	7	.21
30	14	5	.19	8.6	8	.19	10	7	.19
31	13	5	.18	9.5	8	.21	---	---	---
TOTAL	1306	---	42.93	790.6	---	80.22	387.9	---	7.65
YEAR	55400.74		6370.85						

Table 10.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near Adamsville, Ohio (site 16)

[ft^3/s, cubic feet per second; mg/L, milligrams per liter; ton/d, tons per day. Dash indicates no data available.]

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984					
		JULY			AUGUST			SEPTEMBER	
1	89	---	---	59	20	3.2	15	7	0.28
2	123	---	---	59	18	2.9	12	7	.23
3	130	---	---	60	17	2.8	10	7	.19
4	118	---	---	59	15	2.4	9.0	7	.17
5	115	---	---	75	20	4.1	8.6	6	.14
6	184	---	---	192	25	13	7.4	6	.12
7	400	---	---	194	23	12	6.8	6	.11
8	294	---	---	115	15	4.7	6.2	6	.10
9	213	---	---	99	10	2.7	6.0	6	.10
10	141	---	---	93	10	2.5	6.0	5	.08
11	105	---	---	105	30	8.5	6.0	5	.08
12	90	---	---	88	10	2.4	5.8	5	.08
13	90	---	---	87	10	2.3	5.4	5	.07
14	86	---	---	72	9	1.7	5.2	5	.07
15	73	---	---	66	9	1.6	7.8	10	.21
16	69	---	---	64	8	1.4	11	8	.24
17	66	---	---	62	8	1.3	15	17	.69
18	75	---	---	57	8	1.2	11	12	.36
19	69	---	---	46	8	.99	8.8	10	.24
20	63	---	---	39	8	.84	6.4	8	.14
21	59	---	---	30	8	.65	5.2	7	.10
22	56	---	---	28	8	.60	5.4	8	.12
23	54	---	---	20	7	.38	5.8	8	.13
24	54	---	---	15	7	.28	6.0	9	.15
25	52	23	3.2	13	7	.25	5.8	8	.13
26	51	20	2.8	11	6	.18	5.4	7	.10
27	52	21	2.9	12	7	.23	5.6	7	.11
28	53	22	3.1	13	7	.25	5.8	7	.11
29	56	23	3.5	14	7	.26	6.3	8	.14
30	63	25	4.3	16	7	.30	6.9	9	.17
31	62	23	3.9	17	7	.32	---	---	---
TOTAL	3205	---	23.7	1880	---	76.23	227.6	---	4.96
PARTIAL YEAR	202100.8		104.89						

Table 10.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near Adamsville, Ohio (site 16)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		OCTOBER			NOVEMBER			DECEMBER	
1	15	10	0.41	81	17	3.7	398	23	25
2	16	10	.43	64	16	2.8	401	23	25
3	18	12	.58	54	16	2.3	362	22	22
4	15	12	.49	49	15	2.0	294	21	17
5	14	14	.53	49	15	2.0	241	20	13
6	7.1	12	.23	61	15	2.5	210	20	11
7	5.7	10	.15	80	21	4.5	180	20	9.7
8	6.1	9	.15	74	17	3.4	160	17	7.3
9	5.7	8	.12	179	39	30	196	15	7.9
10	5.2	8	.11	539	45	65	404	53	72
11	5.3	8	.11	764	37	76	864	28	65
12	6.3	8	.14	702	27	51	1010	17	46
13	6.9	8	.15	559	23	35	911	13	32
14	15	8	.32	362	17	17	697	12	23
15	7.5	8	.16	236	15	9.6	598	12	19
16	6.1	8	.13	178	12	5.8	569	12	18
17	6.3	8	.14	144	10	3.9	521	11	15
18	7.0	8	.15	179	15	7.2	465	10	13
19	8.7	7	.16	777	143	308	458	10	12
20	12	5	.16	633	80	137	475	11	14
21	13	7	.25	483	40	52	1060	67	323
22	17	12	.55	342	16	15	2230	149	916
23	31	17	1.4	252	10	6.8	2150	70	406
24	52	23	3.2	201	10	5.4	1750	44	208
25	38	13	1.3	170	10	4.6	1200	35	113
26	63	13	2.2	147	10	4.0	790	27	58
27	48	10	1.3	132	10	3.6	620	20	33
28	54	9	1.3	189	12	6.1	525	18	26
29	101	32	8.7	279	44	33	464	20	25
30	127	26	8.9	337	28	25	560	35	53
31	106	20	5.7	---	---	---	697	38	72
TOTAL	838.9	---	39.62	8296	---	924.2	21460	---	2699.9

Table 10.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near Adamsville, Ohio (site 16)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		JANUARY			FEBRUARY			MARCH	
1	777	36	76	300	25	33	2080	25	140
2	827	30	67	375	13	19	813	23	50
3	701	21	40	420	10	15	659	22	39
4	627	18	30	380	10	15	574	21	33
5	601	18	29	350	10	14	537	20	29
6	553	17	25	325	10	13	493	18	24
7	498	17	23	303	10	12	451	17	21
8	457	17	21	286	10	11	431	16	19
9	413	17	19	270	10	9.5	442	15	18
10	330	17	15	260	10	8.3	426	13	15
11	300	16	13	350	10	7.8	649	78	230
12	275	16	12	585	50	81	1950	309	1530
13	250	15	10	1000	70	202	2310	123	765
14	245	15	9.6	1150	35	114	2410	67	436
15	228	15	8.9	1200	27	93	2100	52	295
16	218	15	8.4	1180	23	79	1280	37	128
17	208	15	7.9	1150	19	61	844	30	68
18	195	14	7.0	1090	18	53	689	28	52
19	187	13	6.1	1070	17	49	594	26	42
20	178	13	5.8	1160	15	47	524	25	35
21	170	13	5.5	1500	15	61	466	24	30
22	162	12	4.9	2350	107	762	439	23	27
23	158	12	4.7	3280	142	1250	458	22	27
24	150	12	4.5	3580	80	773	533	91	211
25	147	11	4.0	3920	53	561	1520	428	1950
26	143	11	3.9	4360	40	471	912	57	140
27	139	10	3.4	4470	33	398	689	53	99
28	137	10	3.2	3890	30	315	612	45	74
29	135	8	2.5	---	---	---	524	37	52
30	133	7	2.2	---	---	---	1080	138	574
31	215	28	20	---	---	---	2940	298	2240
TOTAL	9757	---	492.5	40554	---	5527.6	30429	---	9393

Table 10.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near Adamsville, Ohio (site 16)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
			WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985						
		APRIL			MAY			JUNE	
1	4480	63	724	232	8	5.0	195	7	3.7
2	5390	27	393	402	79	165	174	7	3.3
3	4820	23	299	1930	182	895	159	6	2.6
4	3340	22	198	2300	94	584	153	6	2.5
5	1430	21	81	2380	51	328	152	6	2.5
6	923	21	52	2070	36	201	140	6	2.3
7	1130	40	122	911	30	74	130	5	1.8
8	1340	57	206	542	23	34	139	7	2.6
9	1400	50	189	430	20	23	145	7	2.7
10	1270	43	147	352	17	16	162	7	3.1
11	1020	37	102	297	15	12	170	8	3.7
12	835	35	79	263	13	9.2	205	7	3.9
13	720	33	64	254	10	6.9	270	17	12
14	636	31	53	302	10	8.2	267	11	7.9
15	575	30	47	727	297	718	221	9	5.4
16	555	27	40	2800	502	3210	174	8	3.8
17	524	25	35	3790	184	1870	144	7	2.7
18	470	25	32	3530	70	667	137	7	2.6
19	419	23	26	3280	43	381	120	7	2.3
20	376	21	21	2640	34	242	107	7	2.0
21	352	20	19	1270	23	79	104	7	2.0
22	326	18	16	758	17	35	96	7	1.8
23	300	17	14	585	15	24	89	7	1.7
24	275	15	11	504	13	18	88	7	1.7
25	257	14	9.7	441	12	14	81	7	1.5
26	239	13	8.4	373	10	10	73	7	1.4
27	219	11	6.5	312	8	6.7	67	6	1.1
28	205	10	5.5	277	7	5.2	64	6	1.0
29	232	12	7.5	257	7	4.9	60	6	.97
30	274	8	5.9	239	7	4.5	57	6	.92
31	---	---	---	222	7	4.2	---	---	---
TOTAL	34332	---	3013.5	34670	---	9654.8	4143	---	87.49

Table 10.--Daily mean water discharge, daily mean suspended-sediment concentration, and daily suspended-sediment discharge at Raccoon Creek near Adamsville, Ohio (site 16)--Continued

Day	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended-sediment discharge (ton/d)	Mean water discharge (ft^3/s)	Mean suspended-sediment concentration (mg/L)	Suspended sediment discharge (ton/d)
				WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985					
		JULY			AUGUST			SEPTEMBER	
1	68	6	1.1	87	15	3.5	100	9	2.5
2	81	20	4.4	145	20	7.8	80	9	2.0
3	73	15	3.0	103	12	3.3	64	9	1.6
4	86	16	3.7	76	9	1.8	50	9	1.2
5	80	15	3.2	60	9	1.5	42	9	1.0
6	78	15	3.2	53	9	1.3	40	8	.86
7	81	15	3.3	49	9	1.2	35	8	.76
8	155	25	10	47	8	1.0	33	8	.71
9	149	20	8.0	45	7	.85	31	8	.67
10	212	31	48	43	7	.81	31	8	.67
11	608	84	182	39	7	.74	30	8	.65
12	268	25	18	37	6	.60	31	8	.67
13	161	17	7.4	34	6	.55	32	8	.69
14	114	14	4.3	33	6	.53	27	7	.51
15	99	12	3.2	30	5	.41	24	7	.45
16	96	12	3.1	34	5	.46	22	7	.42
17	86	7	1.6	69	10	1.9	22	7	.42
18	103	12	3.3	178	33	19	21	7	.40
19	123	15	5.0	198	12	6.4	20	7	.38
20	88	10	2.4	124	10	3.3	19	6	.31
21	76	10	2.1	85	10	2.3	17	6	.28
22	103	12	3.3	65	9	1.6	16	6	.26
23	210	30	17	54	8	1.2	15	6	.24
24	182	17	8.4	49	7	.93	12	6	.19
25	126	8	2.7	141	34	29	11	6	.18
26	93	8	2.0	430	47	55	11	6	.18
27	108	15	4.4	350	13	12	10	5	.14
28	143	13	5.0	260	10	7.3	9.7	5	.13
29	118	12	3.8	190	10	5.7	9.3	5	.13
30	91	12	2.9	140	10	4.3	10	5	.14
31	82	14	3.1	94	10	3.5	---	---	---
TOTAL	4141	---	372.9	3342	---	179.78	875.0	---	18.74
YEAR	192837.9		32404.03						

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