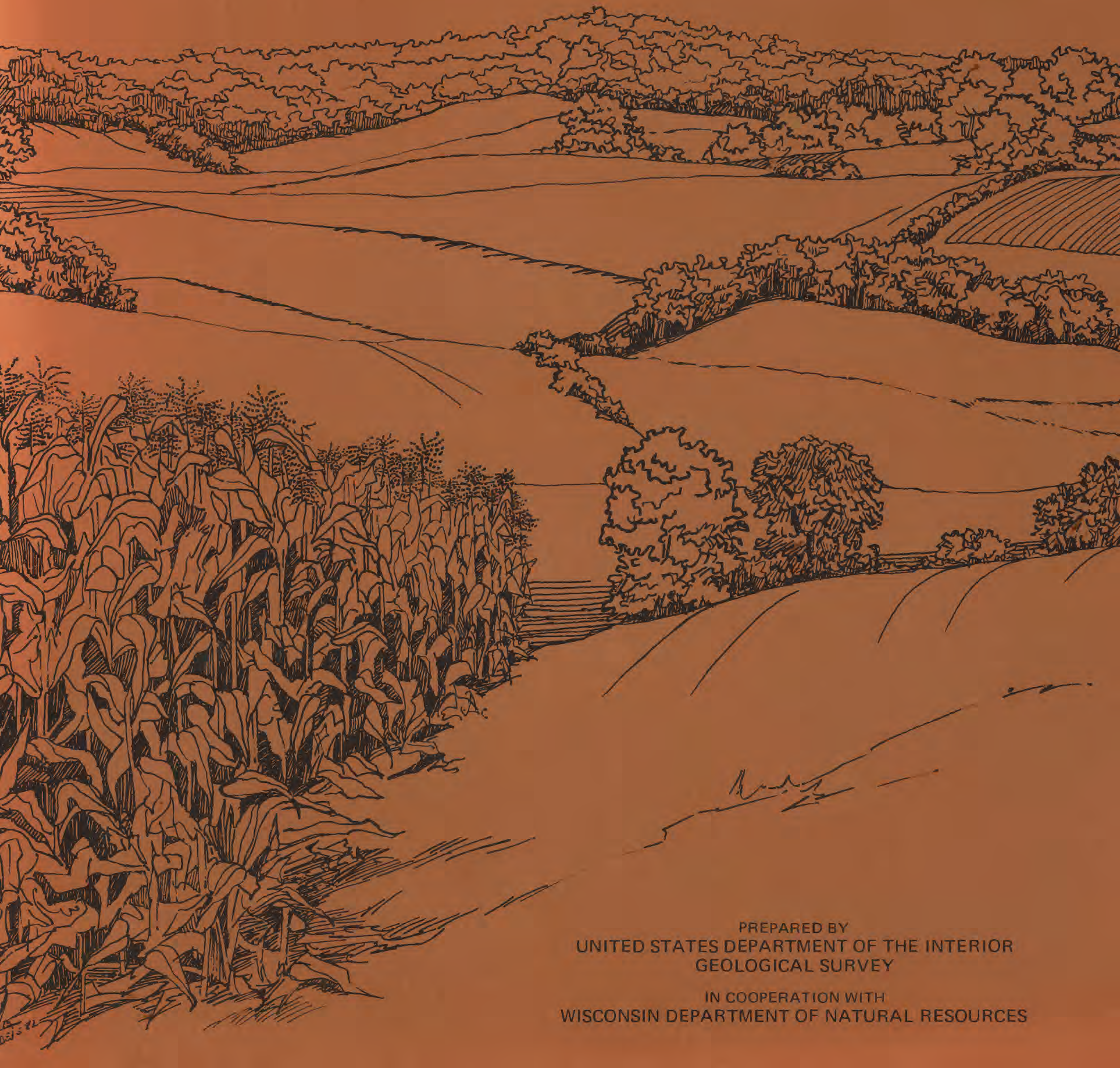
Water-Quality Assessment of Steiner Branch Basin, Lafayette County, Wisconsin



PREPARED BY
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

IN COOPERATION WITH
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

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S. J. FIELD AND R. A. LIDWIN

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CONVERSION TABLE

For readers who prefer to use SI units rather than inch-pound units, conversion factors for terms used in this report are listed below.

Multiply	By	To obtain
inch (in.)	25.40	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)
ton per square mile (ton/mi^2)	0.3503	metric ton per square kilometer (t/km^2)
cubic foot per second (ft^3/s)	2.832×10^{-2}	cubic meter per second (m^3/s)
degree Fahrenheit (°F)	0.555 - (F-32)	degree Celsius (°C)

NOTE: The use of brand names in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey.

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ABSTRACT

Steiner Branch basin in southwestern Wisconsin has rugged mature topography. Corn is planted in 30 percent of the basin on slopes ranging from 0 to 20 percent. Although contour stripcropping is a recommended practice for these easily eroded soil slopes, few conservation practices are followed to reduce soil losses. Because the stream drains into a manmade lake used for recreation, its water quality is of major concern. The purpose of this report is to assess the magnitude and types of nonpoint discharges that affect the water quality of Steiner Branch.

Total stream discharge for the 1978 and 1979 water years was 1,500 cubic feet per second per day and 1,800 cubic feet per second per day, respectively. The 1978 water year discharge was about 90 percent of the average and the 1979 discharge was 120 percent of average. During the 1978 water year, base flow was about 60 percent of the stream discharge, and in 1979 it was about 78 percent. Streamflow during the 2-year study period ranged from 1.5 cubic feet per second, which is approximately the low flow that occurs on the average of once every 2 years, to 392 cubic feet per second, a discharge of about a 5-year flood-recurrence interval.

Suspended-sediment yields were 369 tons per square mile in the 1978 water year and 84.6 tons per square mile in 1979. These yields were 1.66 times higher than those monitored in an adjoining basin where more typical conservation practices were employed. However, suspended-sediment yield per unit of stream discharge was only 1.30 times higher in the Steiner Branch basin than in the adjoining basin. The estimated long-term annual suspended-sediment yield for the Steiner Branch basin is 444 tons per square mile. Sediment concentrations in Steiner Branch ranged from 3 to 6,430 milligrams per liter.

Most of the nutrient load of the stream was transported during runoff: total organic nitrogen, 80 percent; ammonia nitrogen, 80 percent; total phosphorus, 84 percent; and total orthophosphorus, 77 percent. Transport of nitrite plus nitrate nitrogen and total nitrogen occurred primarily during base-flow conditions, with 75 and 56 percent, respectively, of the total load for the study period being transported during these conditions. The time distribution of total phosphorus, total orthophosphorus, ammonia nitrogen, and total organic nitrogen transport was very similar to suspended-sediment transport in Steiner Branch.

INTRODUCTION

In 1972, Congress mandated through Section 208 of Public Law 92-500, the Federal Water Pollution Control Act Amendments (FWPCAA), that the surface waters of the United States shall be "fishable and swimmable" by 1983 (92d Congress, 1972). To reach this goal, the states must identify and establish programs to improve water quality. It was evident that this water-quality goal could not be attained by regulation of point-source pollution only and that pollution from nonpoint sources could be major contributors to water-quality degradation (Donigon and Crawford, 1976).

The Wisconsin Department of Natural Resources (DNR) was designated as the State agency responsible for water-quality protection in Wisconsin (Wisconsin Department of Natural Resources, 1976) and had a primary role in meeting the FWPCAA requirements. However, to assess nonpoint-source input to water-quality degradation a data base must first be established. To assist in documenting an adequate data base, the U.S. Geological Survey, in cooperation with DNR, began a study in 1977 to define the water quality in relation to streamflow in basins that have pollution from nonpoint sources. The first basin chosen for study was that of Steiner Branch.

The purpose of this report is to present the magnitude and types of nonpoint discharges that affect the water quality of Steiner Branch. The scope includes determination of (1) the annual loadings of suspended sediment; (2) total nitrogen and phosphorus loadings associated with storms of varying magnitudes and seasons; (3) water temperature and dissolved solids; and (4) miscellaneous water-quality characteristics and constituents--dissolved oxygen, pH, biochemical oxygen demand, fecal coliform and fecal streptococcus bacteria, biomass, pesticides, trace metals, alkalinity, and chloride.

Steiner Branch is in Lafayette County 9 mi west of Blanchardville in southwestern Wisconsin (fig. 1). Its drainage area is 5.9 mi^2 at the gaging station. During the study, approximately 30 percent of the basin was planted with corn on steep slopes, some in excess of 12 percent on which conservation practices to reduce erosion were few. Downslope from cropland, a wooded fringe in excess of 20 percent slope was common. It was suspected that, despite the buffer of natural cover, the combination of these conditions could produce high soil losses and significant pollution in the receiving waters. The water quality of Steiner Branch was of major concern because it is tributary to Yellowstone Lake, a manmade recreation lake.

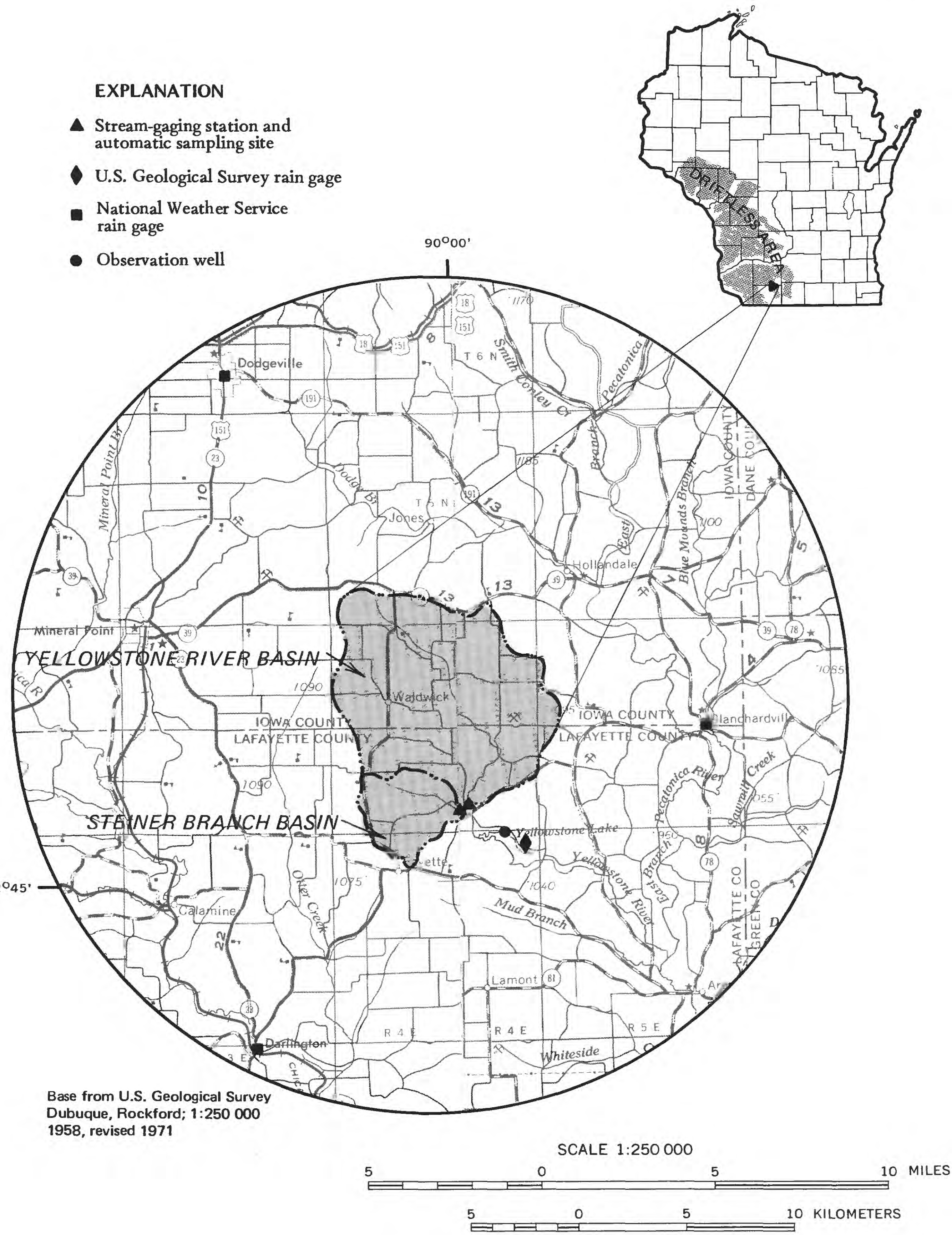


Figure 1. Location of Steiner Branch and Yellowstone River basins in Wisconsin.

Steiner Branch adjoins the Yellowstone River basin to the north (fig. 1), which is also tributary to Yellowstone Lake. In comparison to the monotypic corn cropping in the Steiner Branch basin, the Yellowstone River basin typifies the mixed agricultural uses of this historical dairy region. Although the Yellowstone River basin is not free of soil erosion and nonpoint water-pollution sources, the widespread adoption of contour stripcropping and other conservation practices expresses the high erosion risks and traditional concern for soil loss among the area's farmers. Figure 2 offers a partial aerial view of the contrasting pattern in agricultural practices between Steiner Branch and its surrounding watersheds.

The Yellowstone River basin, which is reasonably typical of the regional land use, is adjacent to the Steiner Branch basin and, in addition, afforded the use of historical water and sediment-monitoring data. For these reasons, it was chosen as the control for suspended-sediment and stream discharge. The Yellowstone River was monitored for sediment discharge from 1955 to 1960 and for stream discharge from July 1954 to September 1965. The gaging station was reactivated simultaneously with the gaging station on Steiner Branch. The drainage area of the Yellowstone River basin upstream from the gaging station is 28.5 mi^2.

The authors wish to thank the Yellowstone Lake State Park personnel for their assistance in the data collection, especially Mr. Walter Johnson who serviced the samplers.

PHYSICAL SETTING

Geography

TOPOGRAPHY

Steiner Branch and the Yellowstone River basins have rugged mature topography characterized by well-developed dendritic drainage consisting of flat-bottomed valleys separated by steep-walled, slightly rounded ridges. The topography of Steiner Branch is shown in figure 3 and is similar to that in the Yellowstone River basin.

The altitude of the drainage divide of the Steiner Branch basin is about 1,120 ft, whereas that of the Yellowstone River divide is about 1,250 ft. The altitude of the streambeds of both streams at the gaging stations is 840 ft.

VEGETATION

The woodlands in both basins are generally on the steep valley walls, whereas agricultural cropping is on the ridgetops and valley bottoms. The woodlands are in the northern extension of the Central Hardwood Forest Region (Watson, 1966). The forest vegetation is classified as the oak-hickory forest type but is transitional between that type and the northern hardwood type.

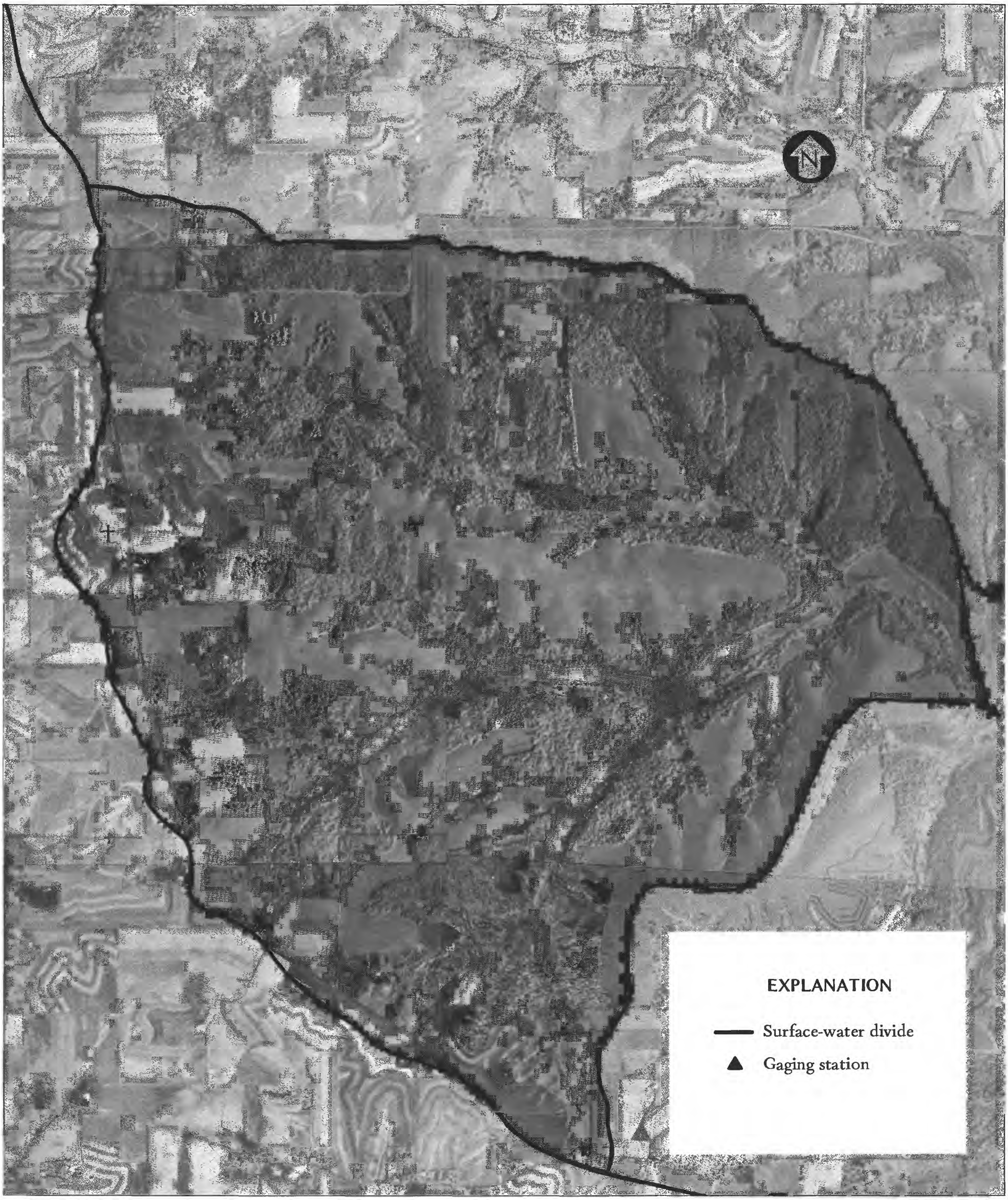
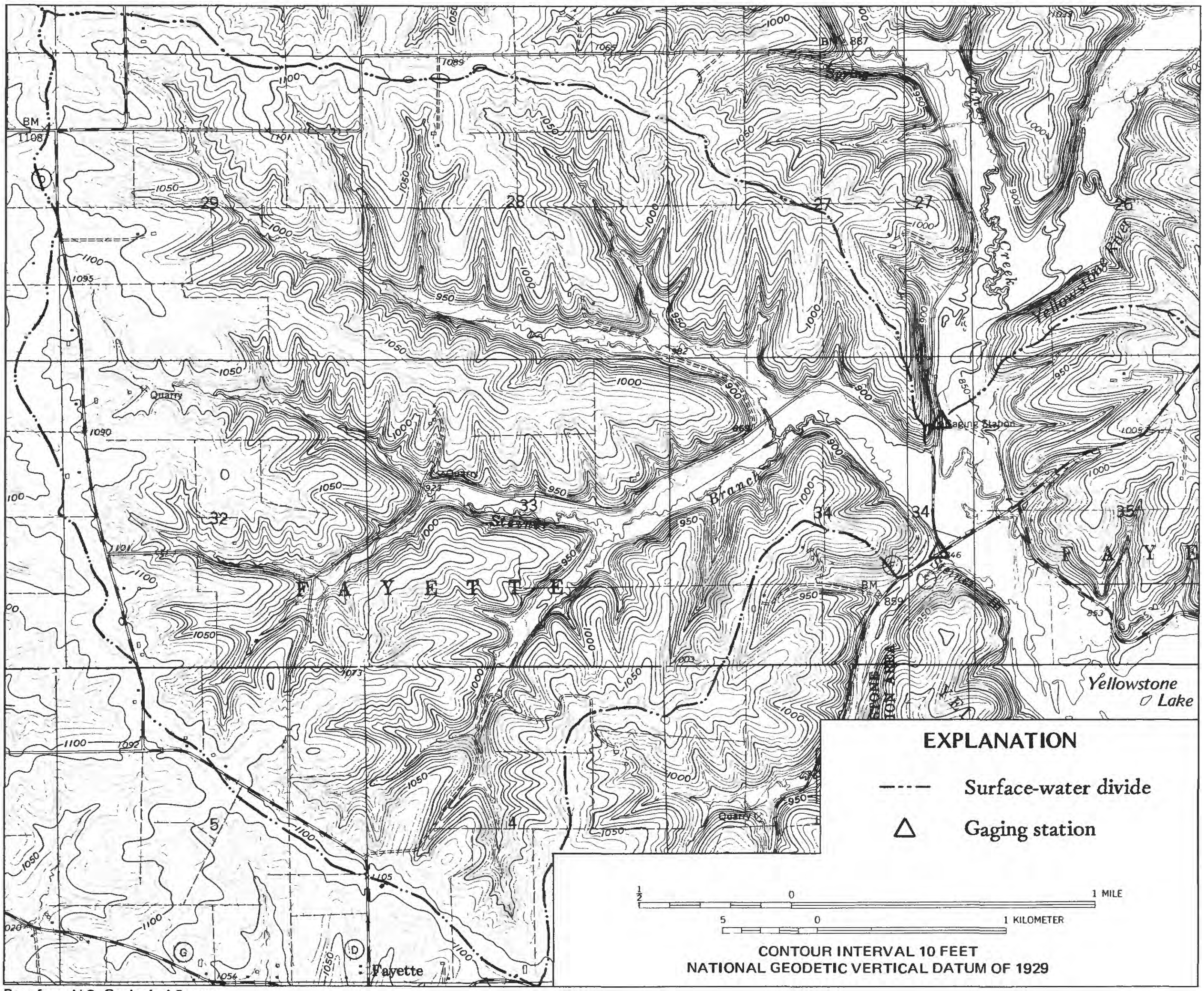


Figure 2. Aerial photograph of Steiner Branch basin.



Base from U.S. Geological Survey
Waldwick, Yellowstone Lake,
1:24 000, 1962

Figure 3. Topographic map of Steiner Branch basin.

STREAM-CHANNEL CHARACTERISTICS

The length of Steiner Branch from the drainage divide to the gaging station is 3.85 mi, with a gradient of 62 ft/mi. The length of the Yellowstone River is 11.5 mi from the drainage divide to the gaging station, with a gradient of 33 ft/mi, or about half the gradient of Steiner Branch.

CLIMATE

The climate is a continental type and has four definite seasons (Wisconsin Department of Agriculture, 1961). Winters are cold and snowy, summers have periods that are hot and humid, and spring and fall are at times mixtures of both summer and winter. Temperatures, which are recorded 9 mi to the southwest at Darlington, range from a mean monthly of 19.7°F in January to 72.2°F in July. The mean annual temperature is 47.1°F. About 60 percent of the annual normal precipitation is concentrated from May through September. The average annual precipitation is 33.32 in. (1931-59) with February the driest month (1.04 in.) and June the wettest (4.88 in.). Snowfall averages 34.5 in. annually.

Geology

The Steiner Branch and Yellowstone River basins are in the "Driftless Area", an area of the State that probably was not glaciated during the Pleistocene Epoch (Thwaites, 1958). The predominant surficial bedrock in the basins are sedimentary rocks of Ordovician age. The Galena-Platteville unit (Galena Dolomite, Decorah and Platteville Formations, undifferentiated), mainly dolomite, forms the main bedrock of the undulating uplands and is underlain by St. Peter Sandstone. St. Peter Sandstone forms the bedrock in the lower part of the stream valley (Bean, 1949).

Soils

Soils of the Steiner Branch and Yellowstone River basins are silty clay loams and are described by Watson (1966) in Lafayette County and by Klingelhoets (1962) in Iowa County. The uplands are covered by varying thicknesses of loessial material, whereas the valley bottoms are covered by moderately deep silty alluvium.

The Dubuque-Sogn series are the predominant soils, with the Dubuque soils dominant. The Dubuque soils are on gently sloping to sloping ridgetops and moderately steep to steep side slopes. These soils are in loessial material over red clayey material. Depth to the limestone bedrock ranges from 18 to 36 in. The Sogn soils are in small scattered areas on steep side slopes that border stream valleys. In these soils, depth to the limestone bedrock is less than 12 in. The erosion hazard for these soils is moderate to severe where the land is not forested.

The Arenzville-Orion soils are dominant on the nearly level lands along the stream bottoms. They are moderately deep soils formed in silty alluvium. The erosion hazard for these soils is slight to moderate.

In the extreme west edge of the Steiner Branch basin, Ashdale soils are found on the uplands. These soils overlie a layer of red clay weathered from limestone, where depth to bedrock is 4 to 6 ft. The erosion hazard for these soils is slight to moderate.

In the northern and northwestern parts of the Yellowstone River basin, Dodgeville soils are on the upland ridges, are moderately deep to thin, and were formed in loessial material that overlies reddish clay weathered from limestone. The erosion hazard for these soils is moderate.

Land use

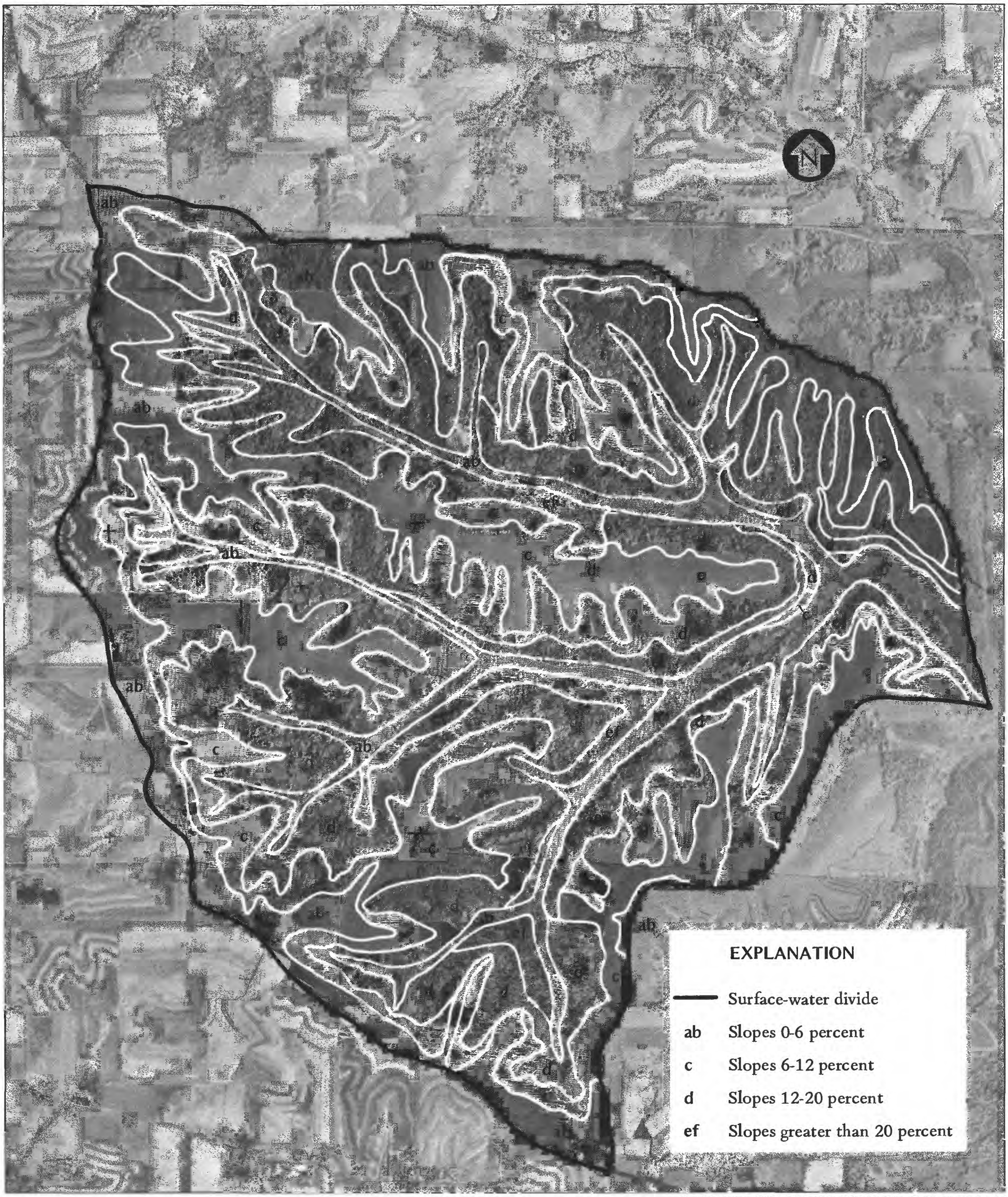
Agriculture is the principal land use in the Steiner Branch basin (Dave Kline, oral commun., 1979) which includes cropland, pasture, forest, and farmsteads. Few conservation measures to reduce soil loss are practiced in the basin. A September 1, 1978, aerial photograph by the Wisconsin Department of Transportation (fig. 2) shows little or no contour stripcropping. It also illustrates the sharp contrast between the lack of contour stripcropping in the Steiner Branch basin and its common use surrounding the basin and to the north in the Yellowstone River basin.

Soil slopes from the soil survey maps of the basin (Watson, 1966) are shown in figure 4. Large cornfields on the ridgetops are planted on soils where many soil slopes range from 6 to 20 percent. Soil slopes of these magnitudes require careful land management to control soil erosion (Watson, 1966). Figure 4 shows that many areas having soil slopes greater than 6 percent and most of the drainageways are forested.

Land use in the Steiner Branch basin was surveyed in 1978 and 1979 by the Lafayette County Soil and Water Conservation District (SWCD). The total amount of land in crops was 2.63 mi^2, or 45 percent of the basin. In 1978, corn was the predominant cash crop occupying, 28 percent of the basin, with hay, oats, and "government set aside" planted in the other 17 percent. The amount of corn in cropland increased slightly in 1979 to 31 percent of the basin with hay and oats occupying the other 14 percent. Erosion conditions of the cropland were determined as severe for 1.40 mi^2, medium for 0.74 mi^2, and low for 0.49 mi^2 (Clarence Keliher, written commun., 1980).

A field survey of land use in the Yellowstone River basin was not practical because of its relatively large size. Instead, land use was determined by Landsat imagery (Allord, 1979). An image taken May 9, 1976, indicated the basins to contain the following: forest, 41.4 percent; grass, 19.4 percent; bare soil, 15.0 percent; crop stubble, 10.8 percent; brush, 8 percent; wetlands, 1.2 percent; and water, 0.2 percent. Four percent was unclassified.

A similar determination of the land use was also done for the Steiner Branch basin. The land use values for the Steiner Branch basin were nearly the same as the land use values determined for the Yellowstone River basin. Due to the coarse resoltuion of Landsat imagery and the small size of the Steiner Branch basin, a Landsat classification may have some different results than a detailed field survey. However, the Landsat classification, in general, agreed with the field survey done by the SWCD assuming the bare soil, crop stubble, and grass categories represent land in crops.



Soil slopes by Baumann, Wisconsin Department of Natural Resources, written communication, 1980; modified from Watson, 1966

Figure 4. Soil slopes in Steiner Branch basin.

SAMPLING NETWORK AND DATA—COLLECTION METHODS

A gaging station to monitor water discharge, temperature, and specific conductance, and an Isco Model 1680 automatic water sampler to collect samples during runoff for suspended sediments, nutrients, and other constituents was installed in October 1977 at Steiner Branch. In December 1977, the gaging station on the Yellowstone River was reactivated to monitor water discharge, and an Isco Model 1680 automatic water sampler to collect samples during runoff for suspended sediments was installed. A local observer was hired to collect suspended-sediment samples weekly during nonstorm periods.

In addition to the National Weather Service rain gages at Darlington, Blanchardville, and Dodgeville, precipitation records were also collected at the Yellowstone State Park from April 1 to October 30, 1978, and April 1 to September 30, 1979.

For the nutrient samples, alternate, empty sample bottles were pretreated with 1 mL (milliliter) of mercuric chloride to inhibit bacterial or other biological activity and were removed from the sampler as soon as possible and chilled to 4°C by the Yellowstone State Park personnel. Generally, four samples pretreated with mercuric chloride and four untreated samples were selected throughout the hydrograph. Those treated with mercuric chloride were analyzed for total:

- Nitrite nitrogen
- Nitrite plus nitrate nitrogen
- Ammonia plus organic nitrogen
- Ammonia nitrogen
- Phosphorus
- Phosphorus, orthophosphate

The four untreated samples were filtered and analyzed for:

- Chloride
- Alkalinity
- Dissolved-solids, residue at 180°C

Samples were selected from the remaining bottles for suspended-sediment analyses. All water-quality data were published in the U.S. Geological Survey's 1979 data report.

Several manually collected stream cross-section samples were collected concurrently with automatically collected samples covering a range of stream discharge. These samples were collected by the equal-width increment method described by Guy and Norman (1970). The purpose of this was to insure that the automatically collected samples were representative of the average quality of water in the stream cross section.

At 6-week intervals, the following water-quality characteristics were determined:

- pH
- Dissolved oxygen
- Biochemical oxygen demand--5 day
- Fecal coliform bacteria
- Fecal streptococcus bacteria
- Chlorophyll a and b

pH and dissolved oxygen were determined at the gaging station with the Leeds and Northrup Model 7417 meter for pH and the Yellow Springs Instrument Co. Model 54 for dissolved oxygen. Samples for biochemical oxygen demand and fecal coliform and fecal streptococcus bacteria were chilled to 4°C and analyzed within 6 hours at the Survey's laboratory at Madison. Samples for chlorophyll a and b were chilled to 4°C and sent to the National Water Quality Laboratory at Doraville, Ga., for analyses.

HYDROLOGIC CONDITIONS DURING STUDY PERIOD

To evaluate the water-quality data collected, hydrologic conditions throughout the study period must first be assessed.

Precipitation

Precipitation values used in this report are from three National Weather Service stations at Dodgeville, Darlington, Blanchardville, and a station at Yellowstone State Park (fig. 1). The rain gage at Yellowstone State Park was read from April 1 to October 30, 1978, and April 1 to September 30, 1979. Precipitation amounts used throughout this report are the arithmetic means of the above stations except when explained in the text.

Precipitation totals for the 1978 water year were 38.65 in. and 32.43 in. for the 1979 water year.

Average annual precipitation at Dodgeville during a 57-year period was 33.04 in. (Environmental Data Service, 1973). Total precipitation and departure from normal for the 1977 to 1979 water years are shown in table 1. Both the 1977 and 1978 water years had greater than average precipitation, +6.32 in. and +5.04 in., respectively, whereas the 1979 water year had less than average, -4.01 in.

Table 1. Total precipitation and departure from normal, Dodgeville, Wis.

Water year	Total precipitation (in.)	Departure from normal (in.)
1977	39.36	+6.32
1978	38.58	+5.04
1979	29.03	-4.01

The 1978 water year had 10 storms that exceeded 1.0 in. of precipitation, including 6 greater than 1.5 in.; the 1979 water year had only 5 storms exceeding 1.0 in. of precipitation, including 2 greater than 1.5 in.

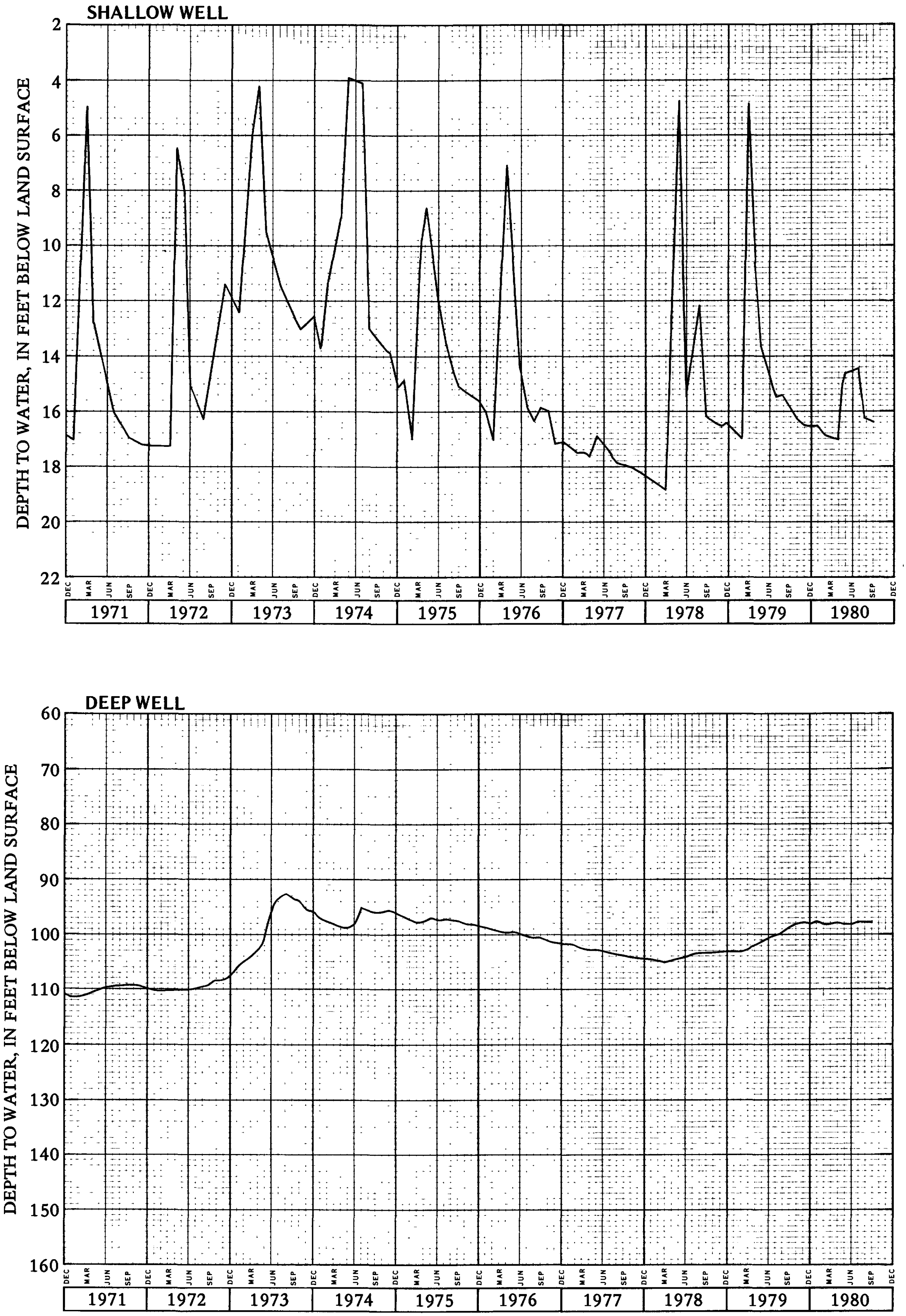


Figure 5. Water levels in a shallow and deep well.

Moisture equivalents of the snowpack during the study period were significantly different for the 2 years. On March 4, 1978, just before snowmelt, moisture equivalent in the snowpack at Madison, 40 mi to the northeast, was about 1.9 in. It is assumed that the snowpack in the Steiner Branch and Yellowstone River basins had similar moisture levels because from November to March precipitation at Dodgeville, Blanchardville, and Darlington was 5.43 in. compared with 5.27 in. at Madison. In contrast, on March 1, 1979, the moisture equivalent of the snowpack at Madison was 5.2 in.--a 50-year recurrence interval (U.S. Department of Commerce, 1964). Madison received 10.02 in. of precipitation from November to March, whereas at Blanchardville, Darlington, and Dodgeville, the average was 10.6 in.

Ground-water levels

Despite above-average precipitation in 1977, at the beginning of the study, ground-water levels continued to decline until spring recharge in April 1978. This is illustrated in figure 5 by two wells, a shallow well in St. Peter Sandstone of Middle Ordovician age and a deep well in the Galena-Platteville unit of Middle Ordovician age. The shallow well is near the basin (fig. 1), but the deep well (not shown on fig. 1) is about 25 mi southwest of the basin. The shallow well reflects a relatively fast response to precipitation, whereas the deep well reflects the slower response in the deeper aquifer.

Snowmelt in March 1978 and significant precipitation during the rest of the 1978 water year reversed the declining trend of ground-water levels. By October 1978, the deep aquifer water levels had reached their highest point since the study began. They remained at this level until snowmelt in March 1979. When the high-moisture snowpack melted in March 1979, recharge of the ground-water reservoir was significant. Despite less than normal precipitation (4.75 in. at Dodgeville) for the remainder of the water year, deep aquifer water levels continued to rise. Generally, deep and shallow aquifer water levels were higher in 1979 than they were in 1978.

Streamflow

Summaries of the streamflow data collected for Steiner Branch and the Yellowstone River are shown in table 2, and hydrographs for Steiner Branch are shown in figures 6 and 7. Streamflow data for both stations are shown in tables 10 and 11.

Total runoff for the Steiner Branch basin for the 1978 and 1979 water years was 1,500 and 1,800 ft^3/s-d (cubic feet per second-days), respectively. Runoff from the Yellowstone River basin during the 1978 water year was 10 percent below the 13-year average; during the 1979 water year runoff was 20 percent above the 13-year average.

Stream discharge was greater in water year 1979 than 1978 even though precipitation was 4.01 in. less than normal in 1979 and 6.22 in. more than normal in 1978. Higher ground-water levels in 1979 than in 1978 caused greater base-flow runoff in 1979 than in 1978. Hydrograph separations shown in figures 6 and 7 indicate the base-flow runoff was about 900 ft^3/s-d in 1978 compared with 1,400 ft^3/s-d in 1979. Direct runoff was about 400 ft^3/s-d in 1979

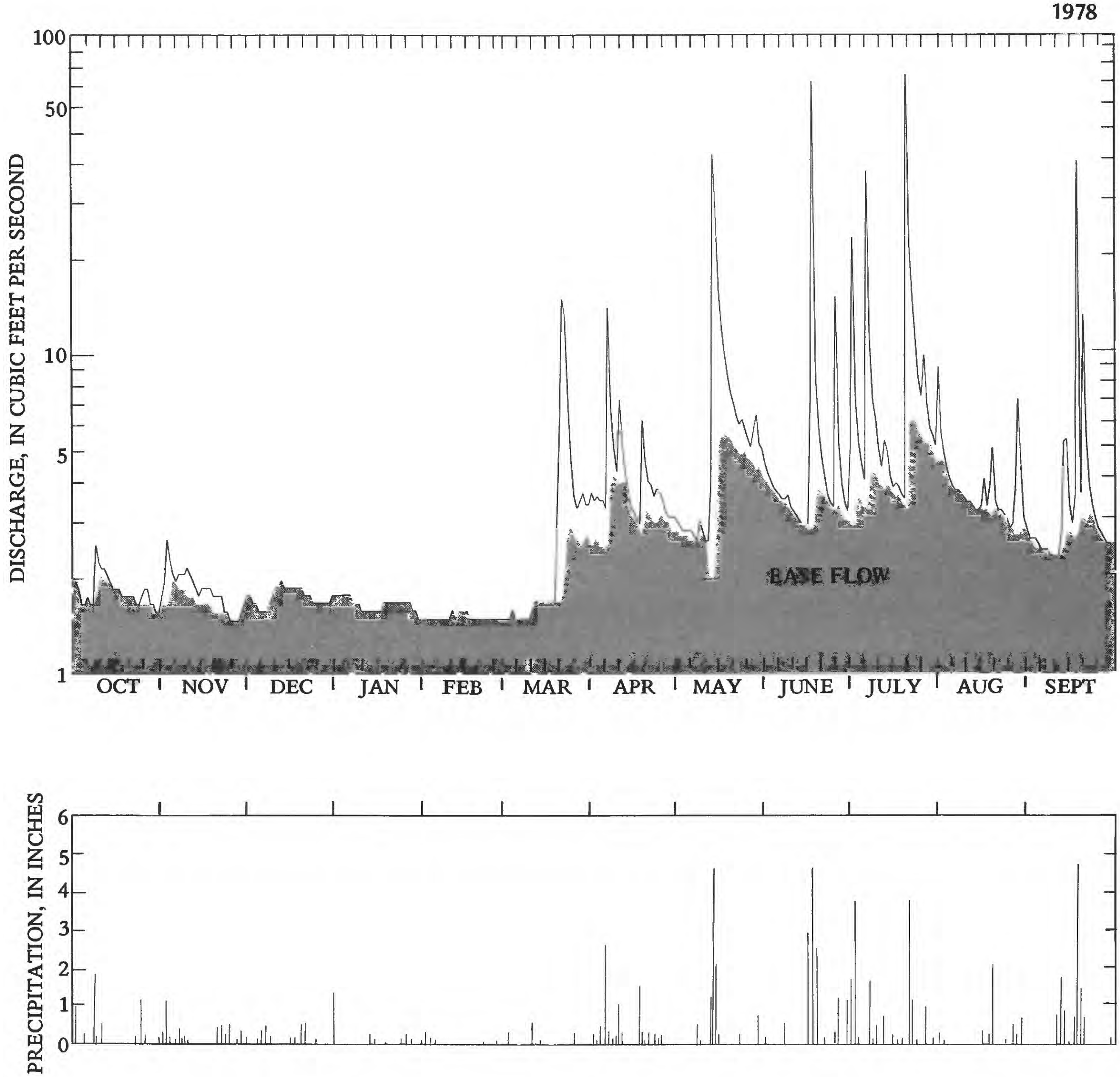


Figure 6. Hydrograph and precipitation for Steiner Branch, 1978 water year.

and 600 ft^3/s-d in 1978. The greater direct runoff in 1978 than in 1979 was due to the greater than normal precipitation and numerous large storms in 1978. To illustrate this difference, the 1978 and 1979 hydrographs are superimposed in figure 8.

Because hydrologic conditions are similar in the two river basins, the data from the Yellowstone River gaging station during the period of study comparing its long-term averages indicate the relative magnitude of the discharges at Steiner Branch. The storms during the 1978 water year caused stream discharge peaks of a much larger magnitude and more frequent occurrence than in 1979 (fig. 8). Instantaneous peak discharges above a base of 45 ft^3/s for Steiner

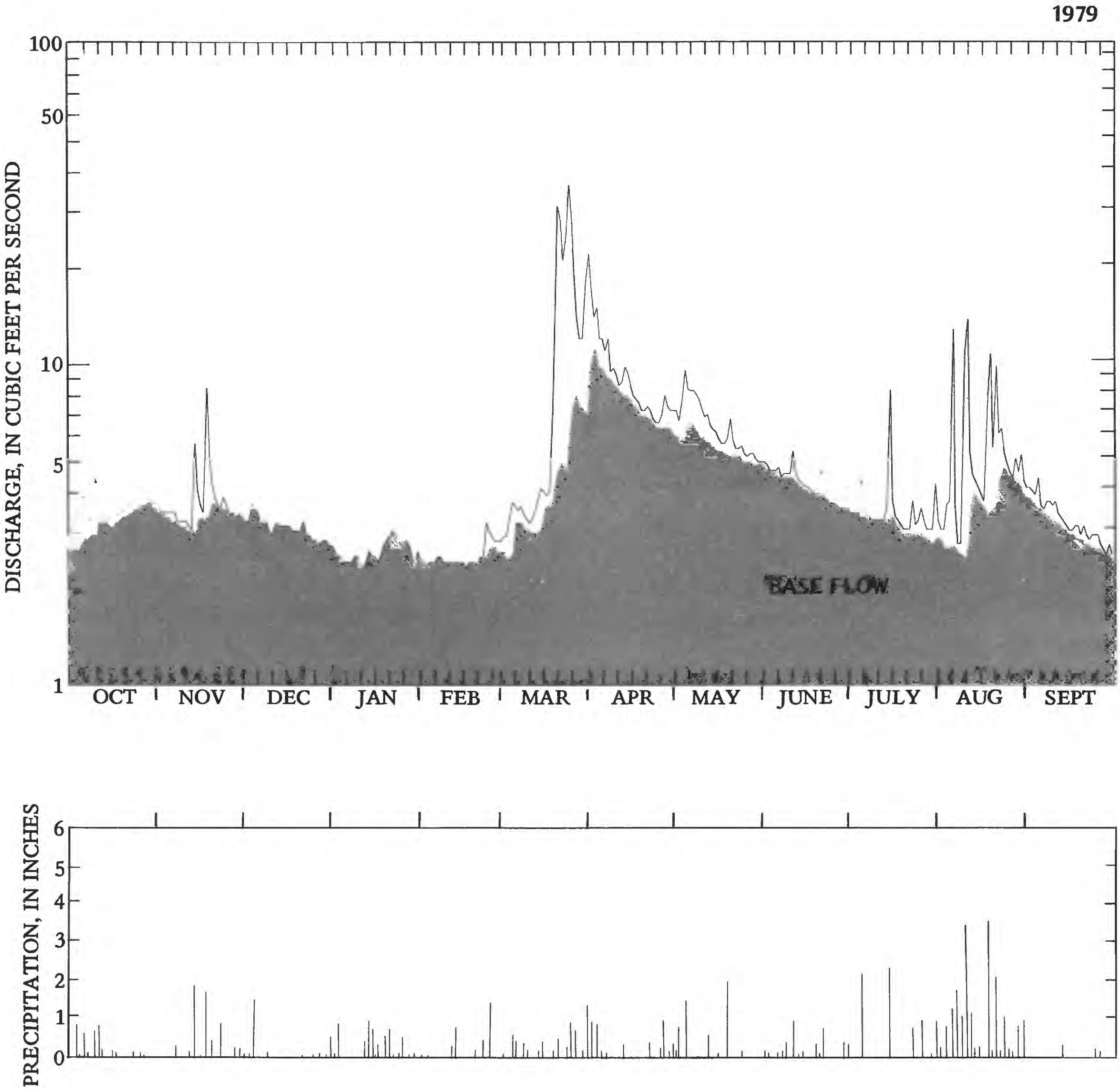


Figure 7. Hydrograph and precipitation for Steiner Branch, 1979 water year.

Branch are shown in table 3. For comparison, the peak discharges on the same day for Yellowstone River are also shown (table 3). The peak discharge of both streams was during the 1978 water year on July 20. The areal distribution of precipitation from that storm is shown in figure 9. About 3.2 in. of rain fell in the Steiner Branch basin, which caused a peak discharge of 392 ft^3/s, while 2.74 in. of rain fell in the Yellowstone River basin, increasing the stream discharge to a peak of 1,850 ft^3/s. This peak was at a recurrence interval equivalent to about a 5-year flood.

The minimum discharge at both streams was also during the 1978 water year on many days in February and March. Based on a low-flow frequency analysis of the recorded discharge at the Yellowstone River gage, the minimum discharge was

Table 2. Summaries of discharge characteristics for Steiner Branch and Yellowstone River, 1978 and 1979 water years.

Discharge parameter	Steiner Branch		Yellowstone River	
	1978	1979	1978	1979
Discharge, in cubic feet per second-days per year..........	1,500	1,802	5,262	7,039
Mean discharge, in cubic feet per second....................	4.12	4.94	14.4 [1](16.0)	19.3 [1](16.0)
Discharge, in cubic feet per second per square mile........	.70	.84	.51	.68
Inches of runoff................	9.49	11.36	6.87	9.19
Minimum 7-day mean low-flow, in cubic feet per second......	1.5	2.3	5.0	8.2
Peak discharge, in cubic feet per second...............	392	55	1,850	243

[1]Average discharge, in cubic feet per second, for 13 years of record.

Table 3. Comparison of peak discharges of Steiner Branch and Yellowstone River.

Date	Steiner Branch		Yellowstone River	
	Time	Discharge (ft^3/s)	Time	Discharge (ft^3/s)
May 13, 1978	0945	85	0930	155
June 17, 1978	1515	194	1415	1,290
July 1, 1978	1245	99	1245	221
July 6, 1978	2145	186	2200	88
July 20, 1978	1715	392	1730	1,850
Sept. 18, 1978	0645	184	0545	498
Mar. 23, 1979	2145	48	2200	180
Aug. 5, 1979	1445	52	1345	143
Aug. 9, 1979	1015	55	0900	117

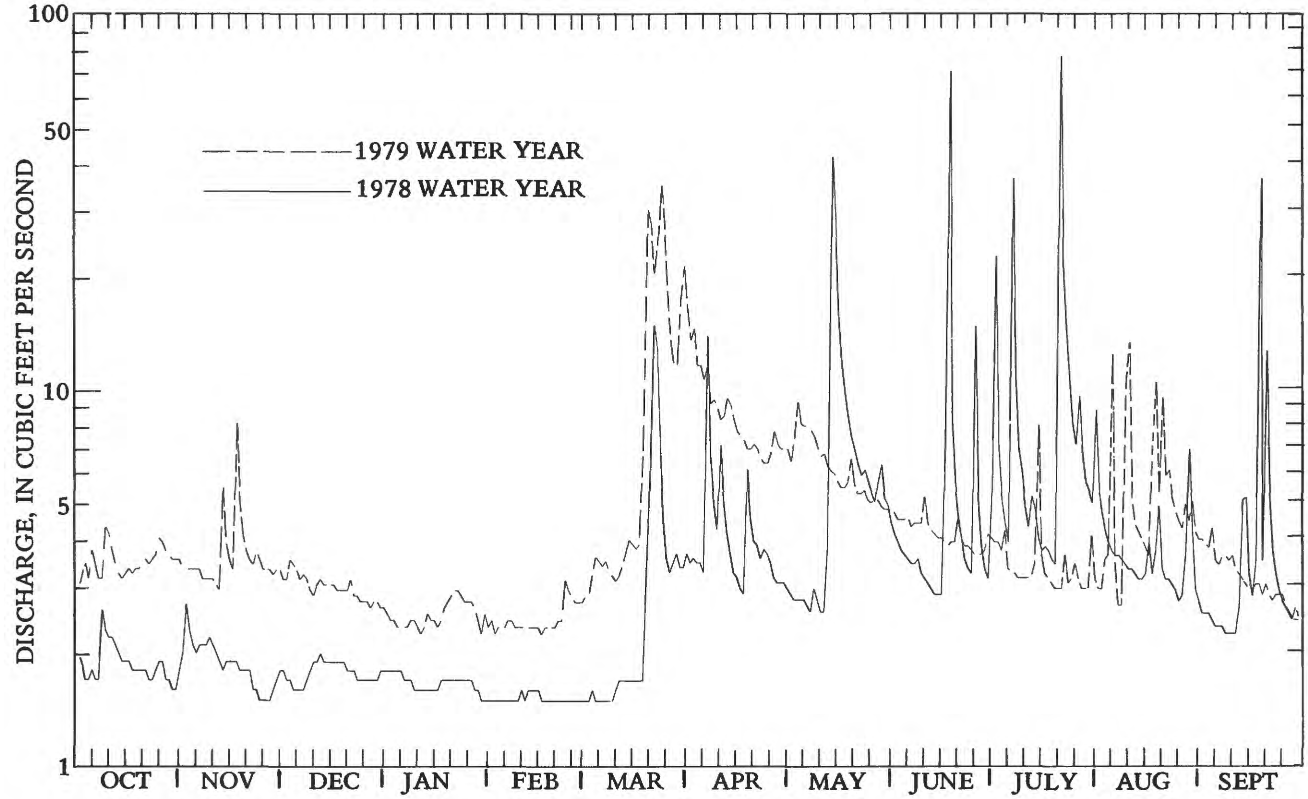


Figure 8. Hydrographs of the 1978 and 1979 water years for Steiner Branch.

slightly less than the average 7-day low flow that occurs on the average of once every 2 years.

WATER QUALITY

Sediment

In this study, only the suspended part of the total sediment load was measured and calculated. Bedload, that part of the total sediment load that moves on or near the streambed, was not measured. Hindall (1975) estimated bedload to be between 5 and 15 percent of the total load for the Yellowstone River. Bedload as a percentage of total load in Steiner Branch is probably similar to that of the Yellowstone River. Suspended-sediment loads were computed by streamflow and sediment-concentration integration techniques described by Porterfield (1972). A summary of suspended-sediment parameters for Steiner Branch and Yellowstone River is shown in table 4. Daily suspended-sediment loads for both stations are shown in tables 12 and 13.

Suspended-sediment yields for the Steiner Branch basin were 369 tons/mi^2 in the 1978 water year and 84.6 tons/mi^2 in 1979. The average yield was

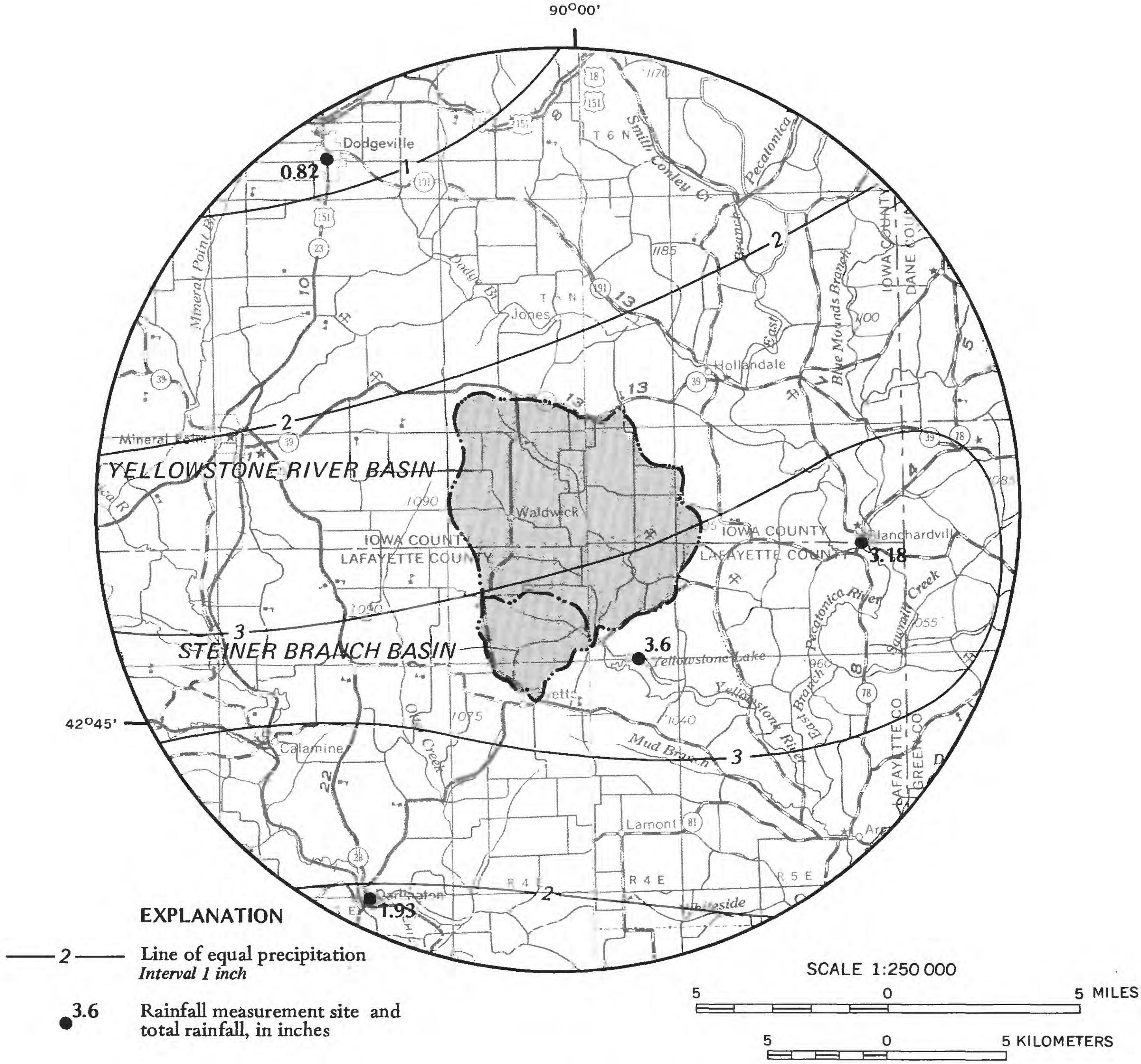


Figure 9. Precipitation for July 20, 1978 storm in the Steiner Branch and Yellowstone River basins.

227 tons/mi^2 for the 2-year study. These yields are 1.66 times greater than those in the Yellowstone River basin. The 8-year average (1955-60 and 1978-79) yield for the Yellowstone River basin is 268 tons/mi^2. The estimated long-term average yield for Steiner Branch is 444 tons/mi^2 and was determined as follows:

$$\text{long-term Steiner Branch basin yield} = \frac{268 \text{ tons/mi}^2 \text{ (long-term Yellowstone River basin yield)}}{137 \text{ tons/mi}^2 \text{ (1978-79 Yellowstone River basin yield)}} \times 227 \text{ tons/mi}^2 \text{ (1978-79 Steiner Branch basin yield)}$$

Table 4. Suspended-sediment parameters for Steiner Branch and Yellowstone River.

	Steiner Branch				Yellowstone River			
	1978	1979	1978-79 average	Long-term average	1978	1979	1978-79 average	Long-term average
Annual load, in tons........	2,179	499	1,339	---	6,277	1,547	3,912	---
Annual yield, in tons per square mile...............	369	84.5	227	444	220	54.3	137	268
Load per unit of runoff, in tons per cubic foot per second-days...............	1.45	.28	.81	---	1.19	.22	.64	---
Maximum concentration, in milligrams per liter......	6,430	1,430	---	---	6,540	1,370	---	---
Minimum concentration, in milligrams per liter......	3	4	---	---	1	4	---	---

Suspended-sediment load per unit of runoff is another method for comparing the two basins. The sediment load per unit of runoff in the Steiner Branch basin is 0.81 ton/ft^3 per second-day, whereas in the Yellowstone River basin it is 0.64 ton/ft^3 per second-day for the 2-year study. Sediment load per unit of runoff is 1.30 times higher in the Steiner Branch basin than in the Yellowstone River basin.

Suspended-sediment discharge is closely associated with direct runoff. As previously discussed, the more frequent and larger storms in 1978 than in 1979 produced greater direct runoff in 1978 than in 1979. Consequently, sediment loads of both streams were greater in 1978 than in 1979. During the study period 90 percent of the suspended-sediment load in Steiner Branch was transported during periods of direct runoff. Sediment loads for days above a base of 25 tons are given in table 5.

Table 5. Daily suspended-sediment loads for days when the load was more than 25 tons at Steiner Branch, 1978 and 1979 water years.

Date	Daily suspended-sediment load (tons)	Date	Daily suspended-sediment load (tons)
Mar. 21, 1978	32	July 20, 1978	505
May 13, 1978	185	Mar. 19, 1979	68
June 16, 1978	33	Mar. 20, 1979	25
June 17, 1978	643	Mar. 23, 1979	43
June 25, 1978	117	Aug. 5, 1979	28
July 1, 1978	133	Aug. 10, 1979	35
July 6, 1978	187		

Particle-size distribution of the suspended sediments on March 21, 1978, for Steiner Branch was 34 percent clay (0.00024 to 0.004 mm), 64 percent silt (0.004 to 0.062 mm), and 2 percent sand (0.062 to 2.0 mm) and are identical to the sample taken on the same date on the Yellowstone River. Figure 10 is a plot of the particle-size analysis for the Yellowstone River of March 21, 1978, and previous analyses. It shows the March 21, 1978, analysis is representative of the sand fraction, but, for the period of record, clay tends to be more in the 65 to 75 percent range, whereas silt is more in the 20 to 30 percent range. This may also be true of the Steiner Branch basin.

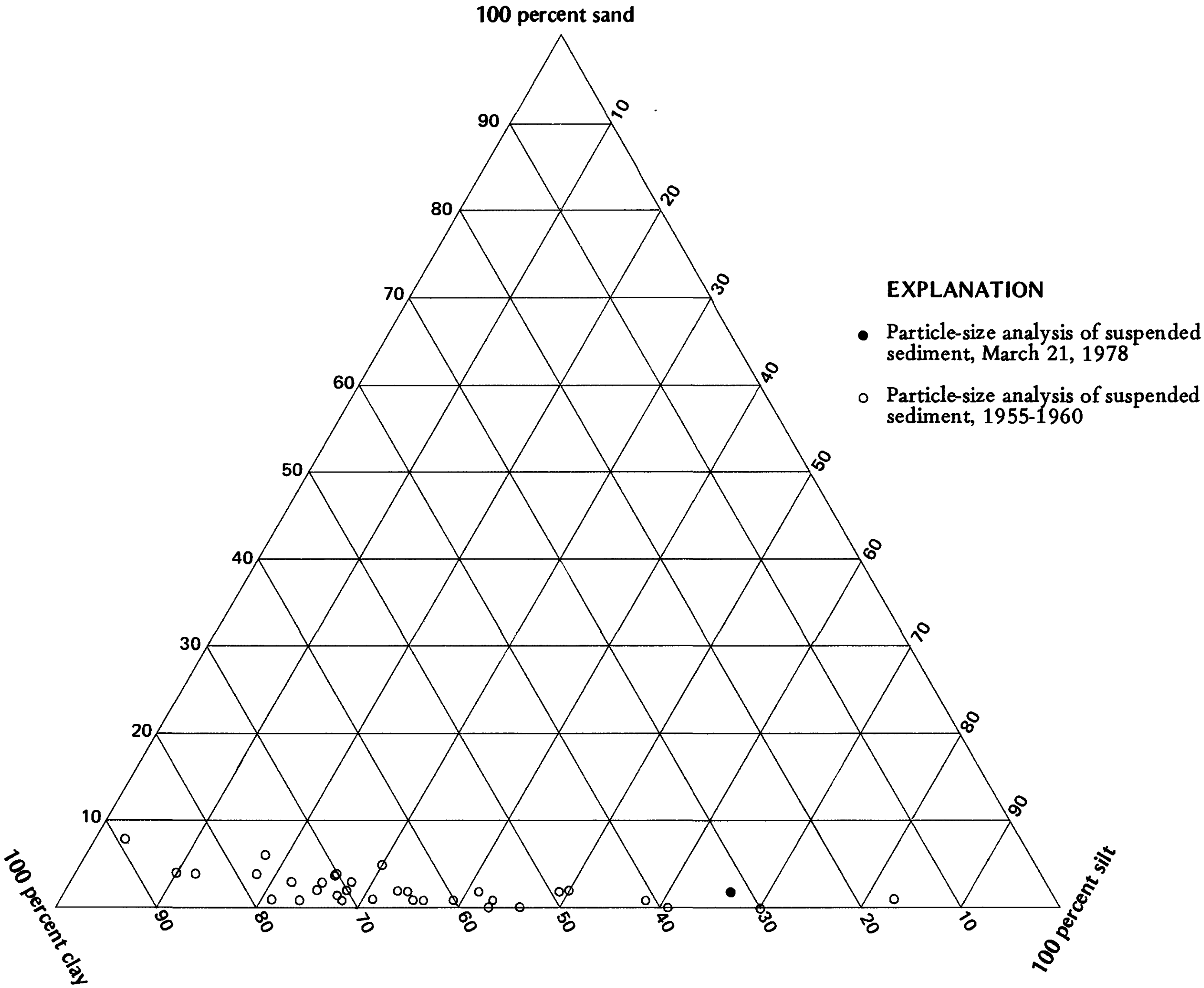


Figure 10. Particle-size distribution of suspended sediment at Yellowstone River.

At Steiner Branch, peak sediment concentrations for most storms generally preceded the peak stream discharge; however, there is a slight tendency toward coincident concentration and stream discharge peaks. The maximum sediment concentration of 6,430 mg/L and the maximum daily sediment load of 643 tons occurred on June 17, 1978. A plot of the sediment concentration and stream discharge versus time for two large storms (June 16-17 and July 20-21, 1978) are shown in figure 11. The July 20 storm exhibited a sediment-concentration pattern characteristic of large storms in the basin. After the peak, as the stream discharge and sediment concentration decreased, the sediment concentration gradually reversed its declining trend and started to increase. This was most likely due to a resuspension of sediment as the ponded flood water drained from the flood plain.

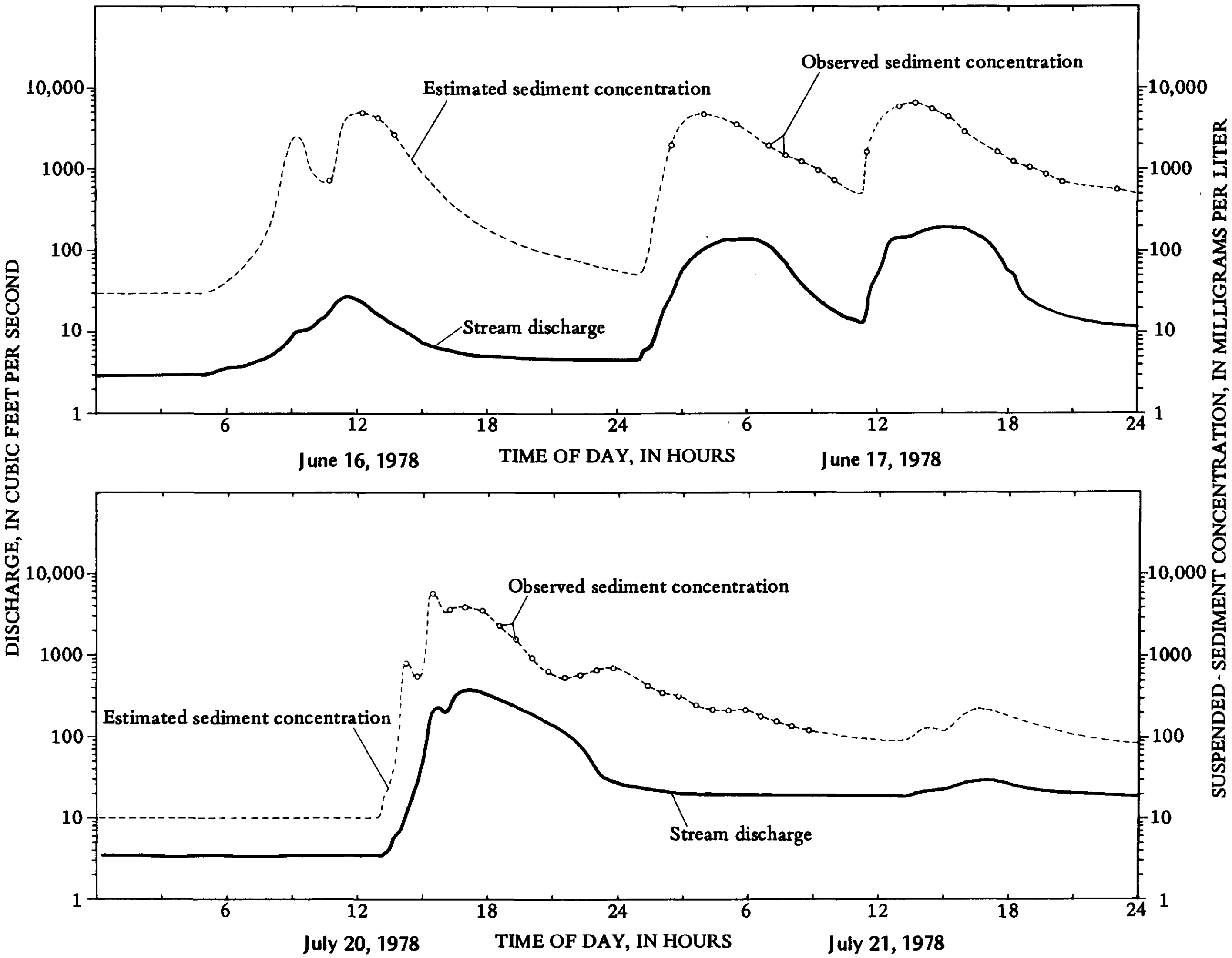


Figure 11. Stream discharge and suspended-sediment concentration for storms of June 16-17 and July 20-21, 1978.

The minimum sediment concentration of 3 mg/L on Steiner Branch and the minimum daily sediment load of 0.01 ton occurred on February 28, 1978.

Annual suspended-sediment yields for the Yellowstone River basin for both study years were less than the 8-year average (table 6). The yield in the 1978 water year was 220 tons/mi^2, and in 1979 it was 54.3 tons/mi^2. The maximum daily sediment load of 2,790 tons on June 17, 1978, was less than the maximum daily sediment load of 7,500 tons that occurred in 1960. The 1979 water year, however, had the lowest maximum daily sediment load in the 8 years of record.

Table 6. Suspended-sediment data for Yellowstone River for period of record.

Water year	Annual load (tons)	Annual yield (tons/mi^2)	Annual precipitation (in.)	Maximum daily load (tons)	Minimum daily load (tons)
1955	3,228	113	[1]25.05	1,020	<0.05
1956	1,429	50.1	[1]28.20	508	<.05
1957	7,466	262	[2]33.19	3,100	<.05
1958	991	34.7	[2]22.37	572	<.05
1959	21,234	745	[1]39.75	3,750	.1
1960	18,922	664	[1]43.39	7,500	.2
1978	6,277	220	[3]38.65	2,790	.02
1979	1,547	54.3	[3]32.43	344	.11

[1]Arithmetic average at Dodgeville, Blanchardville, and Darlington.

2Arithmetic average at Dodgeville and Darlington.

[3]Arithmetic average as described on page 11.

The maximum observed sediment concentration for the period of study was 6,450 mg/L on June 17, 1978; it was, however, considerably less than the maximum observed sediment concentration of 9,040 mg/L (Hindall, 1975). Minimum sediment concentration and minimum daily sediment loads were similar to those of past years. Considering the above data, the yields from the Steiner Branch basin for the 2-year study period are probably also lower than average.

General water quality

The water in Steiner Branch is of the calcium magnesium bicarbonate type with these being the dominant cations and anion, respectively. The water is slightly alkaline (pH range 7.8-8.4), with alkalinity ranging from 40 to 300 mg/L as calcium carbonate. These values are typical of those in southern Wisconsin streams. Relatively low biochemical oxygen demand (BOD) (0.8-3.4 mg/L) and periphyton biomass chlorophyll ratios (30-200), known as the autotrophic index (AI), indicate a low level of organic loading to the stream. The autotrophic index is computed by dividing the ash-free dry weight (g/m^2) of the periphyton sample by the chlorophyll a content (g/m^2). Values above 100 are generally considered to indicate some organic pollution (Weber, 1973). For heavily organically enriched streams, values are generally in the thousands.

Fecal coliform and fecal streptococcus bacteria were analyzed throughout the study. These bacteria indicate fecal contamination and the possible presence of pathogenic organisms. The values for fecal coliform bacteria ranged from 1 to 1,500 colonies per 100 mL of sample, with a median of 49; those for fecal streptococcus bacteria ranged from 10 to 63,000 colonies per 100 mL, with a median of 240.

The ratio of fecal coliform to fecal streptococcus bacteria can be helpful in determining the source of fecal pollution in streams. Based on this ratio, the source of the slight organic contamination of Steiner Branch was domestic animals and wildlife, not from human wastes.

Constituent concentrations reported for whole water samples represent more than 95 percent of the total concentration of the constituents in the water and sediment mixture. Whole water samples for pesticide analyses were collected from Steiner Branch during both water years. Except for a concentration of 23 µg/L of atrazine found in a sample collected March 21, 1978, the concentrations of pesticides were less than the detection limit. No data are available concerning recommended levels of atrazine in waters, but bioassays of a variety of fish and invertebrates found no adverse effects at levels of 1 mg/L (Battell, 1971).

The levels of trace metals in Steiner Branch fall below the established acceptable drinking-water standards (U.S. Environmental Protection Agency, 1976; National Academy of Sciences and National Academy of Engineering, 1972) except for iron, mercury, and lead. The criterion for iron for protection of freshwater aquatic life is 1.0 mg/L. The value for total recoverable iron in Steiner Branch was 2.0 mg/L. The results from a "total recoverable" analysis are commonly less than the results from a "total" analysis, on which the water-quality criteria are based. Therefore, the reported trace metal values may be conservative. The value for mercury (4.2 µg/L) exceeds the recommended criterion of for lead, 0.049 mg/L, for which the recommended limit to protect aquatic life is 0.03 mg/L.

Base-flow quality

Base-flow samples were collected at various times on Steiner Branch. Seasonal trends are not apparent from the data.

The average nutrient yields, in pounds per square mile of drainage area per day, during base-flow periods are shown in table 7. The values shown are for whole water samples (unfiltered), although, during base-flow periods, the greater amount of constituent may be in the dissolved phase due to the small amount of suspended material in the water column.

Nitrite nitrogen was almost nonexistent in the base-flow water samples. This is expected due to the relatively rapid rate of oxidation of nitrite (NO_2-) to nitrate (NO_3-) under well-aerated conditions usually present during base-flow periods. Nitrate nitrogen, however, accounted for 87 percent of the total nitrogen present. Organic nitrogen accounted for about 11 percent and ammonia nitrogen, 1 percent. Thirty-four percent of the total phosphorus was phosphorus, orthophosphate.

Arithmetic averages of constituent concentrations are as useful as flow-volume averages in streams. Arithmetic averages provide information concerning instream conditions at the time of sampling; flow-weighted volume averages provide information about the net water exported from a basin during a given time interval. Constituent concentration data, such as sediment, phosphorus, or nitrogen concentrations, are also the basis for the establishment of water--quality criteria and standards as well as the basis for management recommendations. Table 7 indicates average concentrations for base-flow sample constituents.

EPA (U.S. EPA, 1976) has suggested that to prevent the formation of biological nuisance growths, the following concentrations of total phosphorus should not be exceeded:

- 0.1 mg/L for streams not discharging into lakes or impoundments,
- 0.05 mg/L in any stream at the point where it enters a lake or reservoir, and
- 0.025 mg/L within a lake or reservoir.

The range of values for total phosphorus collected on Steiner Branch during low-flow periods was 0.02-0.06 mg/L, with the exception of one sample which had 0.23 mg/L. The median value was 0.05 mg/L.

The relative contribution of base flow to total yields for the period of study for the various constituents is shown in table 7.

Data collected by the Wisconsin Department of Natural Resources at about the same location on Steiner Branch during 1974-75 agree with base-flow analysis results obtained during this study.

Table 7. Average yields, average concentrations, and percentage contribution of total yields of base-flow samples.

	Nitrite + nitrate nitrogen	Ammonia nitrogen	Organic nitrogen	Total nitrogen	Total phosphorus	Phosphorus, ortho-phosphate
Average constituent yield, in pounds per square mile per day......	8.4	0.11	1.04	9.49	0.21	0.07
Average constituent concentration, in milligrams per liter.............	2.6	.03	.38	3.0	.07	.03
Percentage of total yield contributed by base flow...........	75	20	20	56	16	23

Water quality for selected storms

Eight storms during the 1978 water year and six storms during the 1979 water year were sampled on Steiner Branch for selected chemical constituents. All constituents were analyzed in whole water samples.

The loads for the individual 14 runoff events that were sampled for various constituents are shown in table 8. The variations in constituent and suspended-sediment concentrations are illustrated in the hydrograph of the storm of July 20-21, 1978 (fig. 12). These patterns are typical of most of the storms sampled. As illustrated, total phosphorus, orthophosphorus, total nitrogen, organic nitrogen, and ammonia nitrogen concentrations all closely follow concentrations of suspended sediment; nitrate plus nitrite nitrogen demonstrates an inverse relationship to stream discharge. Higher base flows caused by snowmelt or precipitation, however, contain higher concentrations of nitrate.

Note that, for the July 20-21, 1978, storm, the concentrations of total phosphorus, total nitrogen, organic nitrogen, and ammonia nitrogen peak before the stream discharge peak. This is unique to this storm in this study but has been shown to be common in other studies (Ward and Eckhardt, 1979; Sharpley and others, 1976). As was the case for sediment concentrations, increases in the concentrations of total nitrogen, organic nitrogen, and probably total phosphorus and ammonia nitrogen late in the storm were most likely due to a resuspension of sediment from the flood plain as the ponded floodwaters drained back to the channel.

About 84 percent of the total phosphorus transport during the study occurred during runoff. Phosphorus yields are closely related to suspended-sediment yields and stream discharge in the Steiner Branch basin, as they have been demonstrated to be in other basins (McElroy and others, 1976; Verhoff and others, 1979; Cahill, 1977; Sharpley and others, 1976). This is a direct result of the transport mechanisms involved in delivering phosphorus to the stream. Phosphorus is quickly adsorbed to the surface of soil particles, demonstrating a preference for the silt and clay fraction. These small particles have a greater surface area-to-weight ratio than larger diameter particles and thus are more efficient transporters of phosphorus. When soil is eroded during a rain storm, the sorbed phosphorus is transported to the stream along with soil particles.

Figure 13 indicates the proportion of total phosphorus that was orthophosphorus for the runoff events sampled. The total phosphorus in streams is composed of inorganic and organic phosphorus. Inorganic phosphorus is composed primarily of orthophosphorus (the equivalent of orthophosphate). The dissolved part and, eventually, part of the suspended orthophosphate is available to plants as a major nutrient for growth.

Nitrite plus nitrate nitrogen was the largest component of the total nitrogen transported, although organic nitrogen was the dominant part of the total transported nitrogen during most of the runoff events (an average of 58 percent of total nitrogen). Figure 14 indicates the constituent proportions of total nitrogen for the sampled runoff events. About 80 percent of the organic nitrogen fraction during the study period was transported during runoff, indicating that the transport mechanisms for organic nitrogen may be similar to those for

Table 8. Constituent loads and percentage of

[The numbers in this table have been rounded to three significant figures from the computer-generated tables]

Dates	Total nitrogen		Nitrite + nitrate nitrogen		Organic nitrogen	
	Load (lb)	Percent of total yield	Load (lb)	Percent of total yield	Load (lb)	Percent of total yield
Mar. 18-23, 1978	1,270	1.7	525	1.1	625	2.8
Apr. 5-7, 1978	472	<1	270	<1	170	<1
May 12-15, 1978	3,940	5.3	1,350	2.8	2,250	10.2
June 16-19, 1978	6,640	8.9	950	2.0	5,280	23.9
June 30-July 2, 1978	1,350	1.8	313	<1	963	4.4
July 6-8, 1978	2,230	3.0	446	<1	1,710	7.7
July 19-22, 1978	2,500	3.3	675	1.4	1,560	7.1
Sept. 17-21, 1978	1,520	2.0	490	1.0	866	3.9
Nov. 17-18, 1978	256	<1	161	<1	82	<1
Mar. 18-31, 1979	9,830	13.2	6,100	12.6	2,240	10.1
July 14-15, 1979	312	<1	141	<1	152	<1
Aug. 5-8, 1979	689	<1	269	<1	399	1.8
Aug. 9-11, 1979	822	1.1	412	<1	341	1.5
Aug. 17-21, 1979	1,070	1.4	488	1.0	493	2.2

total yields for the 14 runoff events sampled.

Ammonia nitrogen		Total phosphorus		Phosphorus, orthophosphate		Suspended sediment	
Load (lb)	Percent of total yield	Load (lb)	Percent of total yield	Load (lb)	Percent of total yield	Load (ton)	Percent of total yield
102	4.3	113	2.0	48	3.6	50.9	2.1
29	1.2	28	<1	15	1.1	10.3	.4
322	13.6	488	8.8	97	7.3	88.9	3.7
315	13.3	1,030	18.6	225	16.8	682	28.3
51	2.2	211	3.8	29	2.2	138	5.7
56	2.4	310	5.6	55	4.1	196	8.2
202	8.5	1,340	24.3	187	14.0	517	21.5
105	4.4	234	4.2	49	3.7	74.8	3.1
11	<1	15	<1	6	<1	4.91	.2
514	21.7	510	9.2	166	12.4	236	9.8
17	<1	25	<1	6	<1	11.9	.5
32	1.4	90	1.6	22	1.6	29.1	1.1
50	2.1	100	1.8	49	3.7	47.0	2.0
49	2.1	130	2.3	58	4.3	14.5	.6

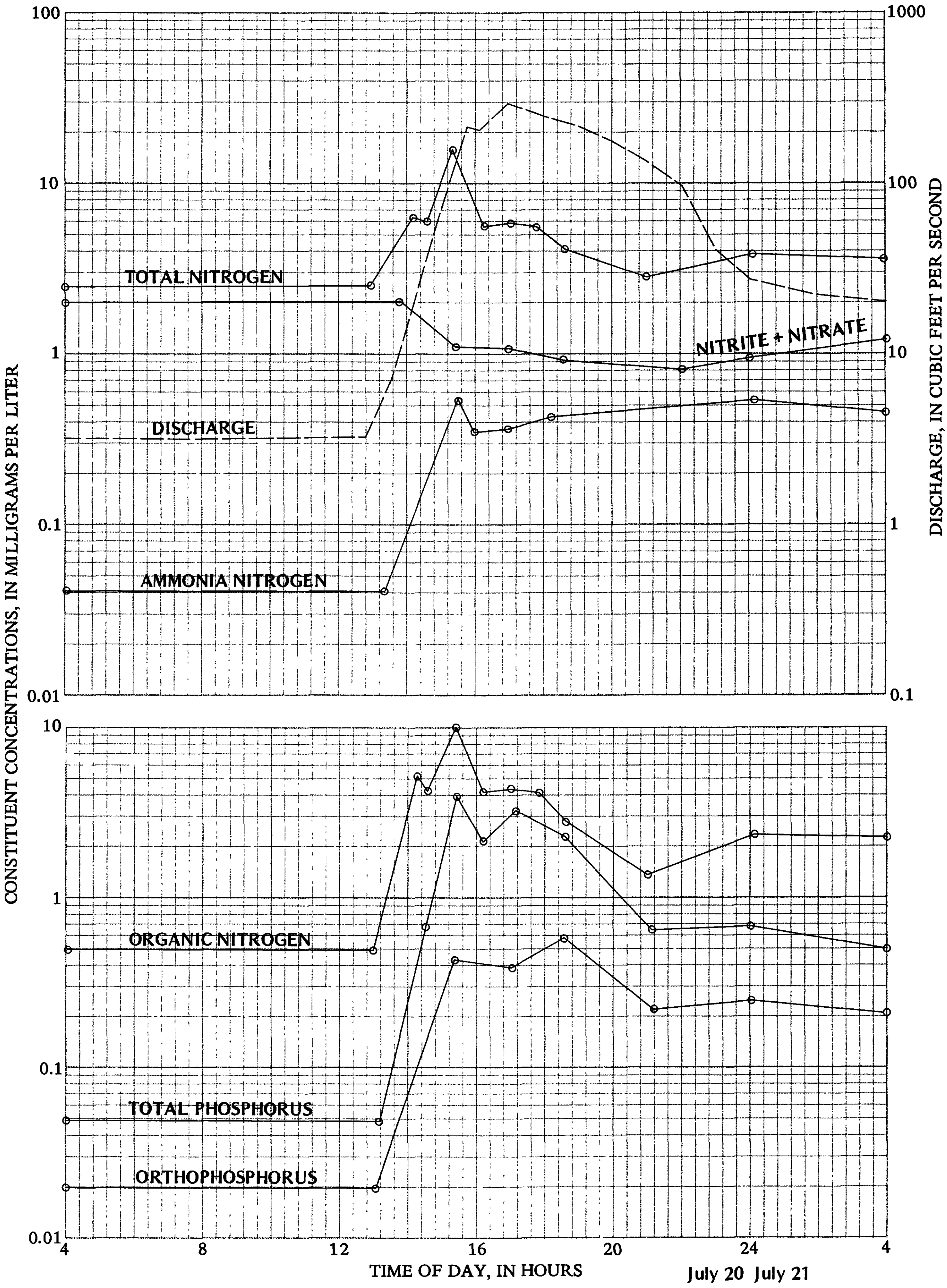


Figure 12. Hydrograph and constituent concentration graphs of the July 20-21, 1978 storm for Steiner Branch.

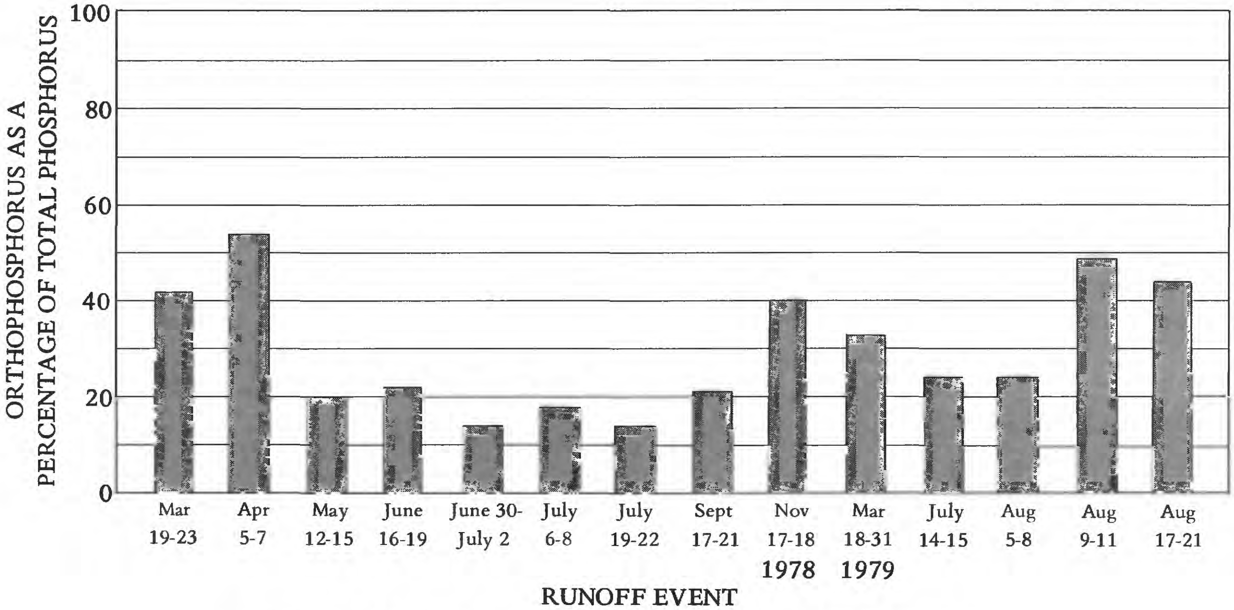


Figure 13. Orthophosphorus as a percentage of total phosphorus.

phosphorus. Ammonia nitrogen demonstrated the same pattern. An average of 7 percent of the total nitrogen in the sampled runoff events was ammonia nitrogen. About 80 percent of the ammonia nitrogen fraction was transported during runoff. The positively charged ammonium ions have an affinity for the negatively charged surfaces of clay-size soil particles and thus are transported in a "piggy-back" fashion during runoff along with the suspended sediments.

Figure 15 contains graphs of lines described by bivariate regression equations demonstrating the relationships between suspended-sediment concentration and constituent concentrations in Steiner Branch. These relationships are generally well defined, showing strong positive correlations of the nutrient constituent concentrations with sediment concentrations.

Nitrite and nitrate nitrogen are, however, readily soluble forms of nitrogen. They can leach through the soil profile along with precipitation, percolate to the ground-water reservoir, and eventually discharge to a surface-water body. Therefore, it is expected that the major part of the nitrite plus nitrate nitrogen would be contributed from base flow. The data collected on Steiner Branch showed that 75 percent of the nitrite plus nitrate nitrogen load was associated with base flow.

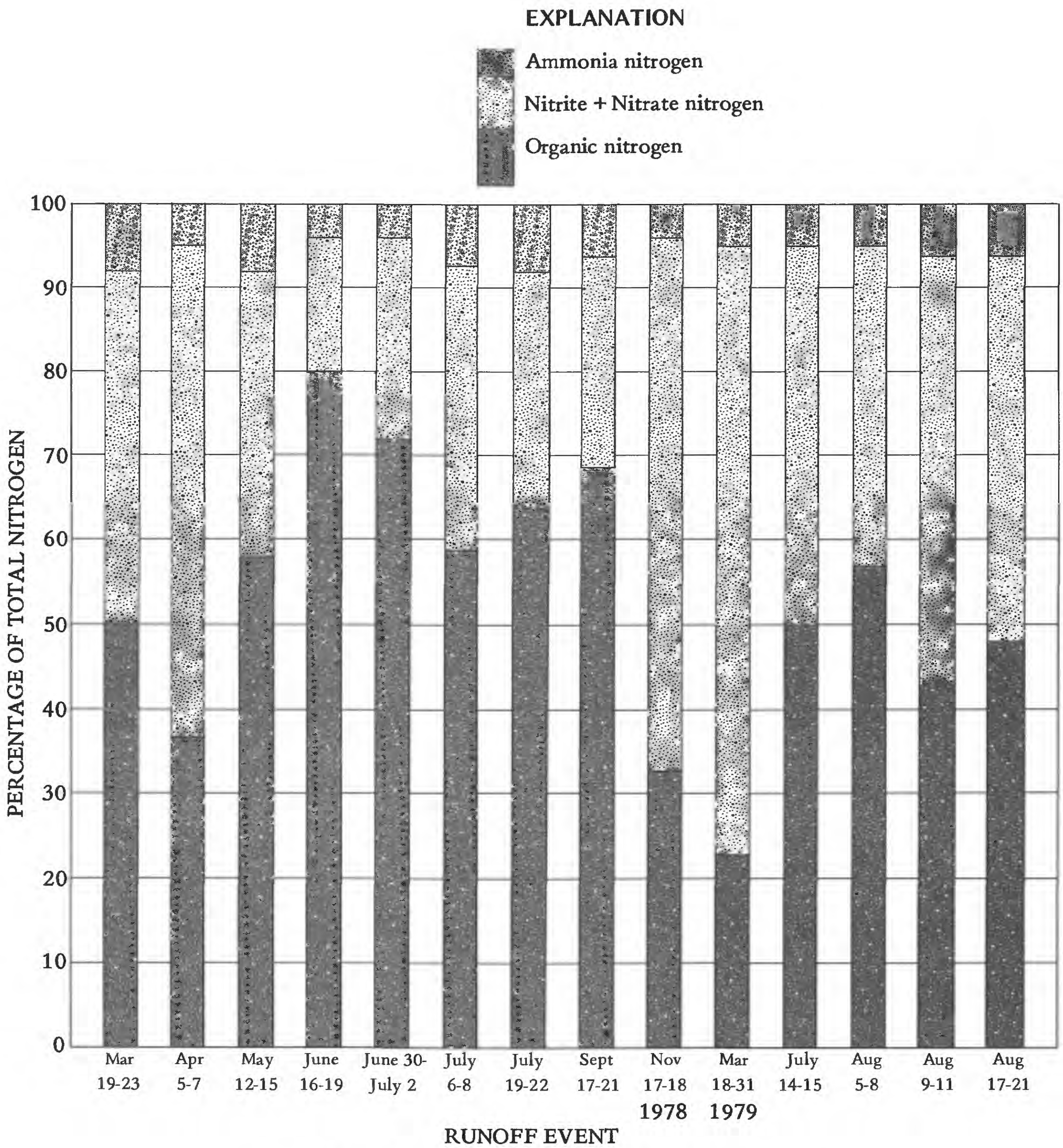
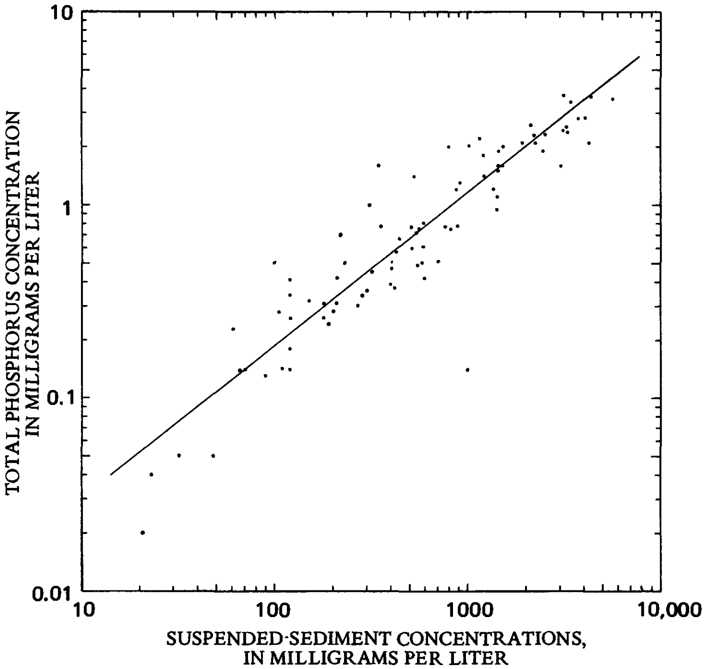
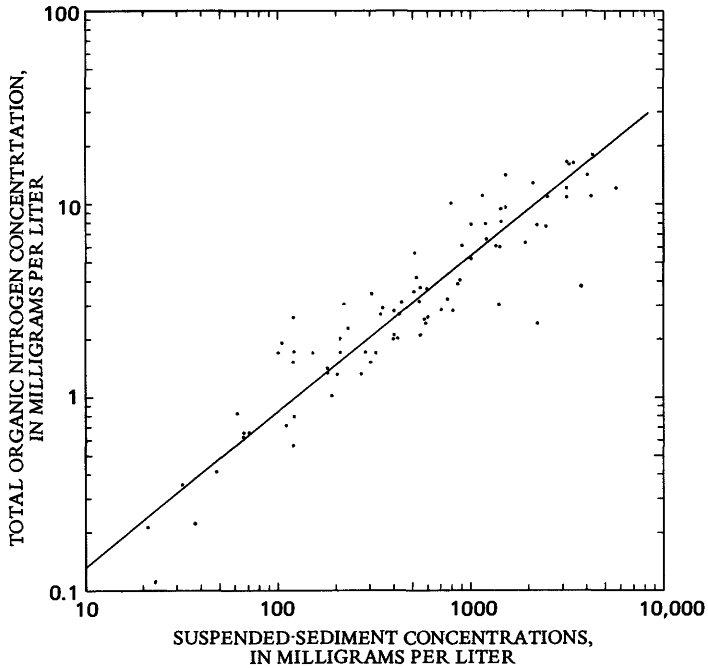
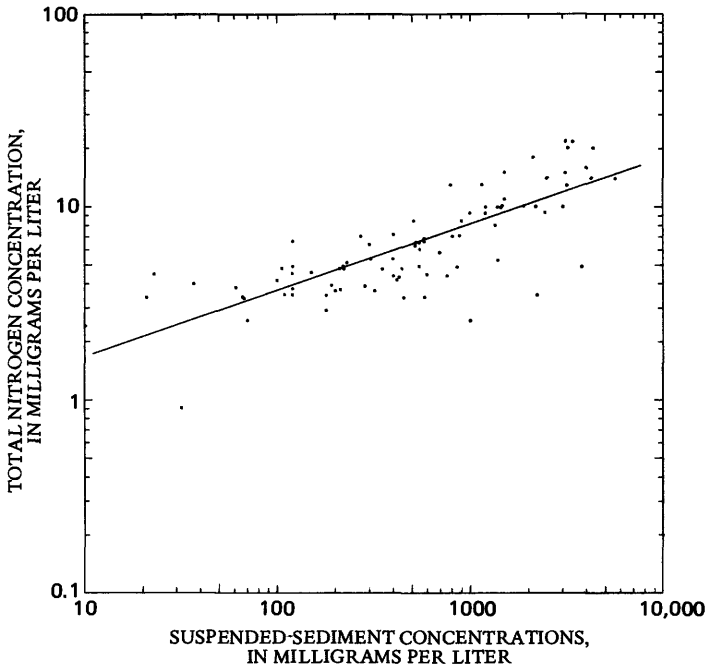


Figure 14. Constituent proportions of total nitrogen.

Figures 16 and 17 are accumulation curves for the nitrogen and phosphorus constituents, suspended sediment, and dissolved solids. The final point on each curve indicates the total "load" for that particular constituent. The numbers located next to each line represent the percentage contribution of each constituent by direct runoff during sampled events. Direct runoff accounted for 29 percent of the total stream discharge.







Relations between constituents

Regression equation	Coefficient of correlation	Standard error, in percent
Total phosphorus = $0.005(\text{suspended sediment})^{0.79}$	0.92	48
Total organic nitrogen = $0.02(\text{suspended sediment})^{0.81}$	0.91	53
Total nitrogen = $0.78(\text{suspended sediment})^{0.34}$	0.79	38

Figure 15. Relation between chemical constituents and suspended sediment.

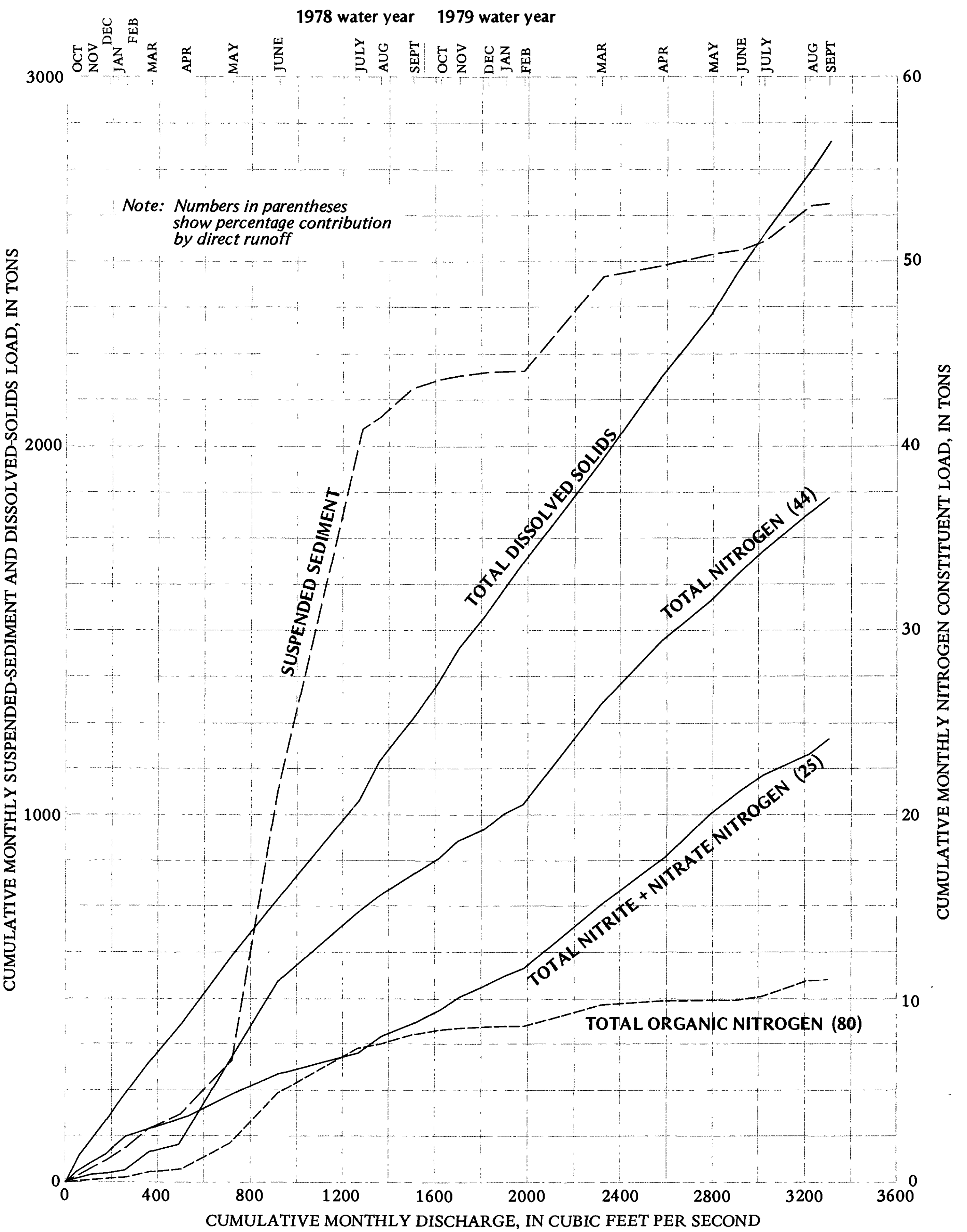


Figure 16. Double mass-accumulation curves for Steiner Branch for total dissolved solids, suspended sediment, total nitrogen, nitrite plus nitrate nitrogen, and organic nitrogen versus stream discharge.

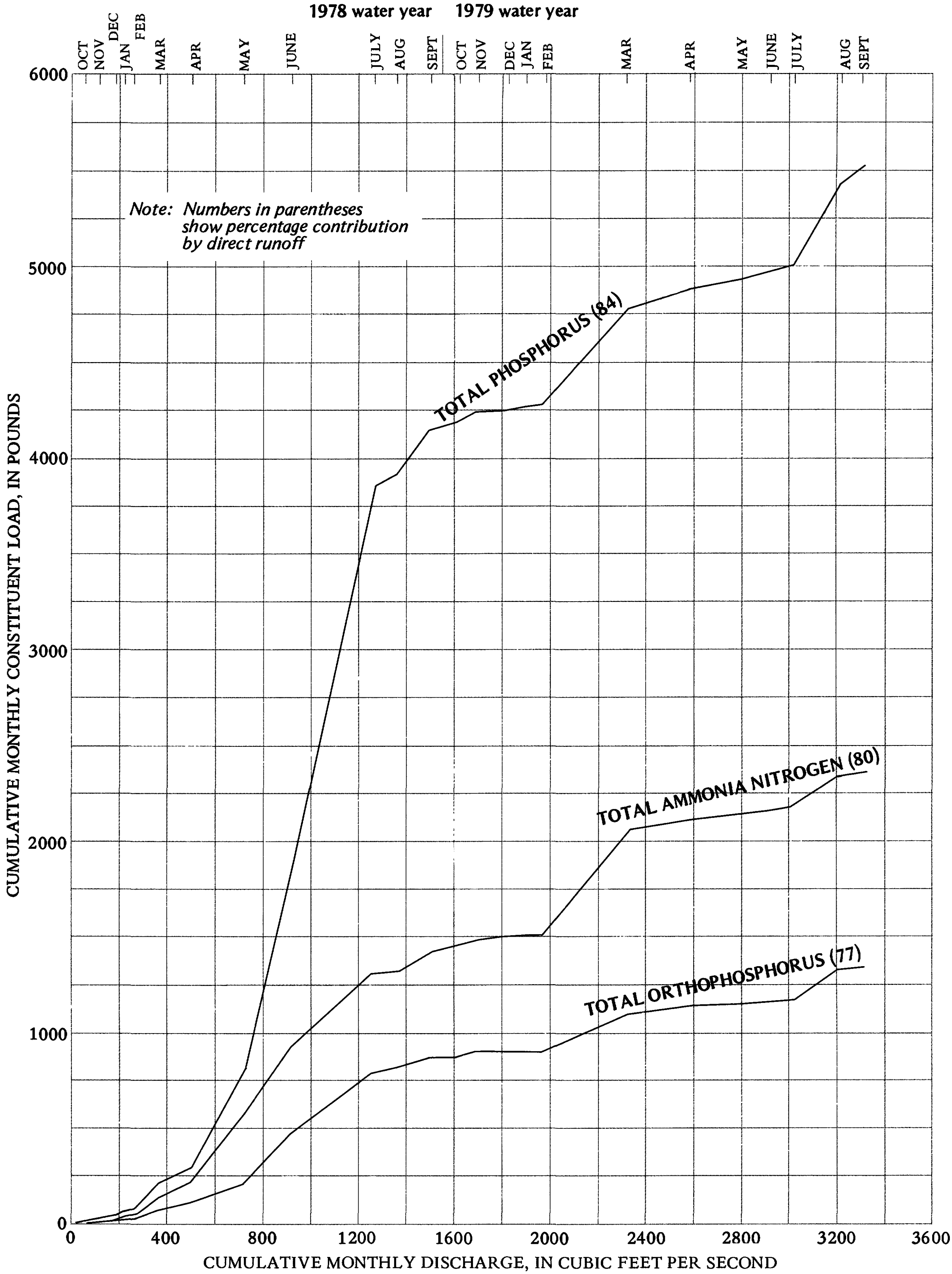


Figure 17. Double mass accumulation curves for Steiner Branch for total phosphorus, ammonia nitrogen, and ortho-phosphorus versus stream discharge.

The slopes of the line segments indicate the proportional increase of the constituent loads with stream discharge. The relatively unchanging slope for the nitrite plus nitrate and dissolved solids curves indicates those constituent loads increased proportionately with stream discharge. The total nitrogen curve shows a similar pattern, most likely due to the dominance of nitrite plus nitrate in the total nitrogen values. The curves for the remainder of the constituents, however, demonstrate sharp slope changes, indicating a disproportionately large loading of these constituents with increasing stream discharge. For the few months without major runoff, the curves of the individual constituents show nearly the same slopes indicating little seasonal variation in the loading rates at medium and low stream discharges. Note the similarity of the curves for total phosphorus and suspended sediment. This almost exact duplication illustrates that phosphorus is transported to the stream in association with sediment particles.

The average daily yields for the various constituents, in pounds per square mile per day, are indicated in table 9. Maximum daily yields for each of the constituents are also shown in table 9. During sampled runoff events, average daily yields for total phosphorus increased as much as 170 times, for orthophosphorus as much as 110 times, and for organic nitrogen as much as 160 times. Daily loads of all constituents on Steiner Branch are shown in tables 12 through 19.

Table 9. Average and maximum daily yields of nitrogen and phosphorus constituents for Steiner Branch.

Constituent	Average daily yield $[(lb/mi^2)/d]$	Maximum daily yield $[(lb/mi^2)/d]$
Total nitrogen	17.3	1,016
Organic nitrogen	5.13	838
Ammonia nitrogen	.55	47
Nitrite + nitrate nitrogen	9.57	131
Total phosphorus	1.29	219
Orthophosphorus	.31	35

Water temperature

Water temperature of Steiner Branch was recorded continuously. The daily maximum, minimum, and mean water temperatures and yearly values are shown in table 20.

Although the minimum water temperature was 0.5°C, the stream was ice covered during the winter.

Dissolved soilds

Specific conductance of water of Steiner Branch was recorded continuously. The daily maximum, minimum, and mean specific conductivities and yearly values are shown in table 21. Specific conductance values generally have an inverse relationship to stream discharge and a good direct relationship to dissolved solids in a particular stream. In Steiner Branch, the relationship between specific conductance and dissolved solids was found to be

$$0.603 \times \text{specific conductance } (\mu\text{mho/cm}) = \text{dissolved solids (mg/L)}$$

Dissolved solids loads during the 2 water years were 1,250 and 1,580 tons, respectively. The higher load during the second year was due to increased base-flow discharges.

Method comparison

A comparison was made of methods for calculating loads of total nitrogen and total phosphorus. The first method used a bivariate regression equation developed from all data points. Daily mean stream discharge was the independent variable, and daily phosphorus load in pounds was the dependent variable. The second method involved a series of "seasonal" regression analyses with the same variables as above to compute loads for unsampled periods and streamflow and concentration integration techniques (Porterfield, 1972) for the computation of sampled periods. The results from the second method were used in this report.

Annual loads for total nitrogen and total phosphorus computed by the two methods for the 1978 water year show good agreement. By the first method, the yearly totals for total nitrogen and total phosphorus were 35,094 lb and 3,255 lb, respectively. By the second method, the totals were 33,664 lb and 4,177 lb, respectively--diferences of -4 percent and +22 percent.

SUMMARY

The U.S. Geological Survey, in cooperation with the Wisconsin Department of Natural Resources, investigated the water quality of the Steiner Branch basin in southwestern Wisconsin during the 1978 and 1979 water years. The 5.9 mi^2 basin has rugged mature topography, and agriculture is the principal land use. Corn, occupying 30 percent of the basin, is the major cash crop and is planted on steep soil slopes, most ranging from 6 to 20 percent. Few conservation practices to reduce soil erosion are followed.

Streamflow during the 1978 water year was about 90 percent of average despite the fact that precipitation was 5.04 in. above normal. Low ground-water levels during the 1978 water year contributed to low base flows. The 1978 water year had 10 storms in which rainfall was greater than 1.0 in., including 6 greater than 1.5 in.

Runoff for the 1979 water year was about 120 percent of average, but precipitation was 4.01 in. below normal. Ground-water recharge from the 1978-79 snowpack, that had a moisture content of 5.2 in. (a 50-year recurrence interval), significantly increased base flow. Base runoff in the 1979 water

year constituted 78 percent of the total runoff. Five storms having rainfall exceeding 1.0 in., including two greater than 1.5 in., occurred in the 1979 water year.

Streamflow ranged from 1.5 ft^3/s, a 7-day low flow that occurs on the average of once every 2 years, to 392 ft^3/s, a discharge of about a 5-year flood-recurrence interval.

Suspended-sediment yields from Steiner Branch basin were 369 ton/mi^2 in the 1978 water year and 84.6 ton/mi^2 in 1979. The average yield (227 ton/mi^2) was 1.66 times greater than the average yield for the Yellowstone River basin, where more typical conservation practices are followed. The load per unit runoff from Steiner Branch basin was 1.30 times greater than from the Yellowstone River basin. The estimated long-term annual suspended-sediment yield for the Steiner Branch basin is 444 ton/mi^2. Suspended-sediment concentrations ranged from 3 to 6,430 mg/L.

A particle-size analysis of the suspended sediments showed 34 percent clay, 64 percent silt, and 2 percent sand. However, long-term analysis of particle-size data from the Yellowstone River indicate the percentages for clay should be more in the 65 to 75 percent range, whereas that for silt should be more in the 20 to 30 percent range.

The vegetation between the cornfields and the stream acts as a buffer and probably traps much of the sediment that could be transported to the stream. Without these vegetated areas sediment yields would probably be higher.

Most of the nutrient load, except for nitrite plus nitrate nitrogen and total nitrogen, was transported during runoff. The percentages transported during runoff are: total organic nitrogen, 80 percent; ammonia nitrogen, 80 percent; total phosphorus, 84 percent; and total orthophosphorus, 77 percent. Transport of nitrite plus nitrate nitrogen and total nitrogen occurred primarily during base-flow conditions, with 75 and 55 percent, respectively, of the total load for the study period being transported during these conditions. Total phosphorus, total orthophosphorus, ammonia nitrogen, and total organic nitrogen loadings were strongly similar to suspended-sediment loading in Steiner Branch. Of the total nitrogen transported, 66 percent was nitrite plus nitrate; 30 percent was organic nitrogen; and 3 percent was ammonia nitrogen. Of the total phosphorus transported, 24 percent was orthophosphorus. Most of the remainder was organic phosphorus.

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Table 10. Stream discharges for Steiner Branch, 1978 and 1979 water years.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	2.0	1.8	1.8	1.5	1.5	3.5	2.9	4.2	23	5.5	2.6
2	1.9	2.7	1.7	1.8	1.5	1.5	3.6	2.8	4.0	7.1	4.8	2.6
3	1.7	2.3	1.7	1.8	1.5	1.6	3.5	2.8	3.8	5.2	4.3	2.6
4	1.7	2.1	1.6	1.8	1.5	1.5	3.5	2.8	3.7	4.5	4.0	2.5
5	1.8	2.0	1.6	1.8	1.5	1.5	3.3	2.8	3.6	4.0	3.8	2.4
6	1.7	2.1	1.6	1.7	1.5	1.5	14	2.7	3.5	37	3.7	2.4
7	1.7	2.1	1.6	1.7	1.5	1.5	6.7	2.6	3.5	11	3.7	2.4
8	2.6	2.1	1.7	1.7	1.5	1.5	5.1	3.0	3.6	7.1	3.6	2.3
9	2.3	2.2	1.8	1.6	1.5	1.5	4.3	2.8	3.3	6.2	3.5	2.3
10	2.2	2.1	1.9	1.6	1.6	1.6	7.2	2.6	3.2	5.0	3.4	2.3
11	2.2	2.0	1.9	1.6	1.5	1.7	5.1	2.6	3.1	4.4	3.4	2.3
12	2.1	1.9	2.0	1.6	1.6	1.7	4.2	3.9	3.0	5.3	3.3	2.7
13	2.0	1.8	1.9	1.6	1.6	1.7	3.7	42	2.9	4.9	3.2	5.2
14	1.9	1.9	1.9	1.6	1.6	1.7	3.3	27	2.9	4.1	3.2	5.3
15	1.9	1.9	1.9	1.6	1.6	1.7	3.2	16	2.9	3.8	3.3	3.3
16	1.9	1.9	1.9	1.6	1.5	1.7	3.0	12	7.2	3.9	4.0	2.9
17	1.8	1.9	1.9	1.7	1.5	1.7	2.9	10	71	3.8	3.3	3.6
18	1.8	1.8	1.9	1.7	1.5	1.7	6.2	8.6	8.5	3.6	3.8	41
19	1.8	1.8	1.9	1.7	1.5	3.2	4.6	7.6	5.8	3.5	5.0	3.6
20	1.8	1.8	1.8	1.7	1.5	5.9	4.0	7.0	4.7	78	3.4	13
21	1.8	1.8	1.8	1.7	1.5	15	3.9	6.4	4.1	22	3.2	5.4
22	1.7	1.6	1.8	1.7	1.5	13	3.6	6.0	3.6	15	3.2	3.8
23	1.7	1.6	1.7	1.7	1.5	7.2	3.8	6.2	3.4	11	3.1	3.3
24	1.8	1.5	1.7	1.7	1.5	4.6	3.7	5.8	3.3	8.3	3.0	3.0
25	1.9	1.5	1.7	1.7	1.5	3.6	3.5	5.4	15	7.3	2.8	2.8
26	1.9	1.5	1.7	1.7	1.5	3.3	3.2	5.1	5.2	9.8	2.9	2.7
27	1.7	1.5	1.7	1.6	1.5	3.5	3.1	5.8	3.9	6.9	3.7	2.6
28	1.7	1.6	1.7	1.6	1.5	3.7	3.1	6.4	3.4	5.8	7.1	2.5
29	1.6	1.7	1.7	1.5	---	3.4	3.1	5.2	3.2	5.5	4.3	2.5
30	1.6	1.8	1.8	1.5	---	3.4	3.0	5.0	5.2	5.1	3.0	2.5
31	1.8	---	1.8	1.5	---	3.7	---	4.5	---	9.0	2.8	---
TOTAL	58.0	56.5	55.1	51.6	42.5	102.3	128.9	226.3	198.7	331.1	115.3	138.4
MEAN	1.87	1.88	1.78	1.66	1.52	3.30	4.30	7.30	6.62	10.7	3.72	4.61
MAX	2.6	2.7	2.0	1.8	1.6	15	14	42	71	78	7.1	41
MIN	1.6	1.5	1.6	1.5	1.5	1.5	2.9	2.6	2.9	3.5	2.8	2.3
CFSM	.32	.32	.30	.28	.26	.56	.73	1.24	1.12	1.81	.63	.78
IN.	.37	.36	.35	.33	.27	.64	.81	1.43	1.25	2.09	.73	.87

WTR YR 1978 TOTAL 1504.7 MEAN 4.12 MAX 78 MIN 1.5 CFSM .70 IN 9.49

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.0	3.4	3.2	2.6	2.5	2.9	14	6.7	4.9	4.1	3.1	4.2
2	3.2	3.4	3.2	2.5	2.3	2.9	15	7.7	4.7	4.1	3.1	4.1
3	3.6	3.4	3.6	2.5	2.4	3.3	12	9.6	4.7	3.9	3.7	4.0
4	3.2	3.4	3.5	2.4	2.4	3.7	12	8.4	4.7	4.4	3.8	4.5
5	3.8	3.4	3.4	2.4	2.4	3.6	11	8.3	4.8	3.5	13	3.7
6	3.5	3.4	3.2	2.4	2.5	3.5	12	8.3	4.5	3.4	3.7	3.6
7	3.2	3.2	3.3	2.4	2.5	3.6	9.5	8.1	4.6	3.4	2.8	3.8
8	3.2	3.2	3.2	2.5	2.4	3.4	9.7	7.8	4.6	3.3	2.8	3.8
9	4.4	3.2	3.0	2.5	2.4	3.3	9.3	7.3	4.6	3.3	11	3.7
10	4.2	3.2	2.9	2.4	2.4	3.2	8.6	6.9	5.4	3.3	14	3.8
11	3.8	3.1	3.1	2.3	2.4	3.3	8.8	7.0	4.6	3.3	5.4	3.5
12	3.5	3.0	3.2	2.4	2.4	3.5	9.8	6.5	4.4	3.3	4.6	3.4
13	3.3	5.6	3.1	2.6	2.4	3.8	9.4	6.3	4.3	3.6	4.4	3.3
14	3.2	4.0	3.1	2.5	2.4	4.1	8.6	6.2	4.2	8.4	4.2	3.2
15	3.3	3.6	3.1	2.5	2.4	4.0	8.0	5.9	4.2	3.8	4.0	3.1
16	3.4	3.4	3.1	2.4	2.3	3.9	7.8	5.7	4.1	3.4	3.8	3.1
17	3.3	8.3	3.0	2.5	2.4	4.0	7.6	5.7	4.0	3.3	7.6	3.2
18	3.4	5.1	3.0	2.7	2.4	7.4	7.2	5.9	4.1	3.2	11	3.2
19	3.4	4.2	3.0	2.8	2.4	31	7.2	6.8	4.1	3.1	5.6	3.0
20	3.5	3.8	3.0	2.9	2.4	28	7.4	5.8	4.7	3.1	10	3.2
21	3.6	3.6	3.2	3.0	2.5	21	7.2	5.5	4.2	3.1	6.2	3.0
22	3.5	3.5	2.9	3.0	2.5	25	6.8	5.5	4.0	3.8	6.4	2.9
23	3.6	3.8	2.9	2.9	3.2	36	6.6	5.6	4.0	3.2	5.4	3.0
24	3.7	3.6	2.8	2.8	3.0	28	6.6	5.3	3.9	3.3	5.0	3.0
25	4.1	3.4	2.8	2.8	2.9	19	7.0	5.2	3.8	3.6	4.7	3.0
26	4.0	3.4	2.8	2.8	2.8	14	8.0	5.3	3.8	3.3	4.5	2.8
27	3.8	3.4	2.7	2.7	2.8	12	7.4	5.3	3.8	3.1	5.2	2.7
28	3.7	3.3	2.8	2.5	2.8	12	7.2	5.1	3.9	3.1	4.7	2.6
29	3.6	3.4	2.8	2.3	---	18	7.2	5.0	4.3	3.1	5.3	2.8
30	3.6	3.4	2.7	2.6	---	22	7.2	5.0	4.2	4.3	4.4	2.6
31	3.6	---	2.7	2.4	---	17	---	5.0	---	3.3	4.2	---
TOTAL	110.2	112.1	94.3	80.0	70.6	350.4	266.1	198.7	130.1	112.4	177.6	99.8
MEAN	3.55	3.74	3.04	2.58	2.52	11.3	8.87	6.41	4.34	3.63	5.73	3.33
MAX	4.4	8.3	3.6	3.0	3.2	36	15	9.6	5.4	8.4	14	4.5
MIN	3.0	3.0	2.7	2.3	2.3	2.9	6.6	5.0	3.8	3.1	2.8	2.6
CFSM	.60	.63	.52	.44	.43	1.92	1.50	1.09	.74	.62	.97	.56
IN.	.69	.71	.59	.50	.45	2.21	1.68	1.25	.82	.71	1.12	.63

CAL YR 1978 TOTAL 1651.7 MEAN 4.53 MAX 78 MIN 1.5 CFSM .77 IN 10.41
WTR YR 1979 TOTAL 1802.3 MEAN 4.94 MAX 36 MIN 2.3 CFSM .84 IN 11.36

Table 11. Stream discharges for Yellowstone River, 1978 and 1979 water years.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.9	7.8	6.4	6.4	5.6	5.0	17	9.9	13	62	19	11
2	6.5	9.8	6.4	6.4	5.6	5.0	17	9.8	13	29	17	11
3	6.2	8.2	6.2	6.4	5.6	5.0	16	9.8	12	24	16	10
4	6.0	7.5	6.2	6.4	5.6	5.0	16	9.8	12	21	15	10
5	6.2	7.2	6.0	6.4	5.6	5.2	14	9.8	11	19	15	10
6	6.0	7.4	6.0	6.2	5.6	5.6	45	9.6	11	29	15	9.8
7	5.8	7.4	6.2	6.2	5.6	5.6	26	9.4	11	27	14	9.6
8	9.0	7.4	6.4	6.0	5.6	5.6	21	11	11	19	14	9.4
9	8.2	7.8	6.6	5.8	5.4	5.8	19	9.9	10	19	14	9.4
10	7.8	7.6	6.8	5.8	5.4	6.0	27	9.4	9.6	17	14	9.2
11	7.8	7.0	7.0	5.8	5.4	6.2	21	9.3	9.7	16	14	9.2
12	7.6	6.8	7.0	5.8	5.4	6.4	18	16	9.6	16	14	12
13	7.2	6.6	6.8	5.8	5.4	6.4	16	84	9.4	18	14	19
14	6.8	6.8	6.6	5.8	5.2	6.4	15	73	9.5	15	13	21
15	6.6	6.8	6.6	6.0	5.2	6.4	14	47	9.7	14	13	13
16	6.6	6.8	6.6	6.0	5.2	6.4	13	37	18	15	15	12
17	6.5	6.8	6.6	6.2	5.2	6.4	12	30	259	14	13	13
18	6.5	6.6	6.6	6.2	5.2	6.4	22	26	38	14	14	97
19	6.4	6.4	6.6	6.2	5.2	13	18	22	24	13	19	22
20	6.2	6.4	6.6	6.2	5.2	27	16	22	21	277	14	41
21	6.2	6.2	6.4	6.2	5.2	65	16	20	19	74	13	27
22	6.2	6.0	6.4	6.2	5.2	52	14	19	18	51	13	21
23	6.2	5.8	6.2	6.2	5.2	35	15	20	17	34	12	18
24	6.4	5.6	6.2	6.2	5.2	23	14	19	16	29	12	17
25	6.8	5.6	6.2	6.2	5.2	18	13	18	31	25	12	16
26	6.6	5.6	6.2	6.0	5.0	17	12	17	20	28	13	15
27	6.2	5.8	6.2	6.0	5.0	17	12	18	17	23	15	15
28	6.0	6.0	6.2	5.8	5.0	19	11	21	15	21	15	14
29	5.8	6.4	6.2	5.8	---	17	11	17	14	20	15	14
30	5.6	6.6	6.4	5.6	---	16	10	16	18	18	13	14
31	6.4	---	6.4	5.6	---	17	---	15	---	21	12	---
TOTAL	205.6	204.8	199.2	187.8	149.2	440.8	511	664.7	706.7	1022	441	529.6
MEAN	6.63	6.83	6.43	6.06	5.33	14.2	17.0	21.4	23.6	33.0	14.2	17.7
MAX	9.0	9.8	7.0	6.4	5.6	65	45	84	259	277	19	97
MIN	5.6	5.6	6.0	5.6	5.0	5.0	10	9.3	9.4	13	12	9.2
CFSM	.23	.24	.23	.21	.19	.50	.60	.75	.83	1.16	.50	.62
IN.	.27	.27	.26	.25	.19	.58	.67	.87	.92	1.33	.58	.69

WTR YR 1978 TOTAL 5262.4 MEAN 14.4 MAX 277 MIN 5.0 CFSM .51 IN 6.87

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	12	12	9.2	9.0	10	56	25	18	15	14	18
2	14	12	11	8.6	8.4	10	55	27	18	14	14	18
3	16	11	12	8.4	8.2	12	49	35	18	19	17	17
4	14	11	12	8.2	8.2	13	47	28	18	27	15	17
5	15	12	12	8.0	8.2	12	45	27	18	15	47	16
6	14	12	11	8.2	8.6	13	38	26	18	15	20	15
7	14	11	11	8.2	8.6	12	38	25	18	14	16	15
8	13	11	11	8.4	8.6	11	39	25	18	14	22	15
9	17	11	10	8.6	8.2	11	37	24	18	14	62	15
10	17	11	10	8.2	8.2	11	34	23	21	14	56	15
11	15	11	11	8.0	8.2	11	35	24	18	16	24	14
12	15	11	12	8.4	8.4	11	37	22	17	15	20	14
13	14	21	11	8.8	8.4	13	33	22	17	15	19	14
14	14	14	11	8.6	8.6	15	31	21	16	27	18	14
15	14	12	11	8.4	8.8	13	29	20	16	16	17	14
16	14	12	11	8.2	8.4	13	28	20	16	15	17	14
17	13	28	10	8.6	8.2	14	27	19	16	14	35	14
18	14	19	11	8.8	8.2	37	26	20	16	14	52	13
19	13	15	11	9.2	8.2	185	25	25	16	14	26	13
20	13	14	11	9.6	8.4	136	27	20	19	14	46	14
21	13	13	9.6	10	8.6	96	27	19	16	14	30	13
22	13	13	9.9	10	10	106	25	19	15	18	31	13
23	13	14	9.7	9.8	11	142	24	20	15	14	25	13
24	12	13	9.8	9.6	11	99	24	19	15	14	23	14
25	14	13	9.7	9.4	10	70	27	19	14	15	21	14
26	13	12	9.4	9.6	9.8	56	30	19	14	14	20	13
27	12	13	9.2	9.8	9.8	50	25	19	14	14	22	13
28	12	12	9.4	9.0	10	49	26	18	15	13	20	13
29	12	13	9.4	8.4	---	70	26	18	17	13	26	13
30	12	12	9.7	9.0	---	86	28	18	16	23	19	13
31	12	---	9.2	9.2	---	65	---	18	---	15	18	---
TOTAL	424	399	327.0	274.4	248.2	1452	998	684	501	488	812	431
MEAN	13.7	13.3	10.5	8.85	8.86	46.8	33.3	22.1	16.7	15.7	26.2	14.4
MAX	17	28	12	10	11	185	56	35	21	27	62	18
MIN	12	11	9.2	8.0	8.2	10	24	18	14	13	14	13
CFSM	.48	.47	.37	.31	.31	1.64	1.17	.78	.59	.55	.92	.51
IN.	.55	.52	.43	.36	.32	1.90	1.30	.89	.65	.64	1.06	.56

CAL YR 1978 TOTAL 5802.8 MEAN 15.9 MAX 277 MIN 5.0 CFSM .56 IN 7.57
WTR YR 1979 TOTAL 7038.6 MEAN 19.3 MAX 185 MIN 8.0 CFSM .68 IN 9.19

Table 12. Suspended-sediment discharges for Steiner Branch, 1978 and 1979 water years.

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	30	.16	62	.33	17	.08	23	.11	18	.07	5	.02
2	30	.15	75	.56	18	.08	21	.10	19	.08	9	.04
3	29	.13	92	.57	19	.09	20	.10	20	.08	16	.07
4	29	.13	113	.64	19	.08	18	.09	22	.09	24	.10
5	28	.14	138	.74	20	.09	17	.08	23	.09	35	.15
6	28	.13	168	.95	21	.09	16	.07	25	.10	52	.21
7	28	.13	196	1.1	22	.10	15	.07	26	.11	76	.31
8	75	.53	191	1.1	23	.11	14	.06	25	.10	88	.36
9	40	.25	182	1.1	24	.12	13	.06	22	.09	28	.12
10	38	.23	173	1.0	25	.13	12	.05	19	.08	8	.04
11	36	.21	165	.89	26	.13	11	.05	17	.07	8	.03
12	34	.19	157	.81	27	.15	11	.05	15	.07	9	.04
13	32	.17	150	.73	27	.14	12	.05	14	.06	10	.04
14	30	.15	143	.73	23	.12	12	.05	12	.05	11	.05
15	30	.15	134	.69	27	.14	13	.06	13	.06	12	.05
16	30	.15	102	.52	33	.17	13	.06	14	.06	11	.05
17	30	.15	72	.37	40	.21	13	.06	15	.06	11	.05
18	30	.15	51	.25	49	.25	14	.06	15	.06	10	.05
19	30	.15	36	.17	58	.30	14	.06	17	.07	72	1.1
20	30	.15	25	.12	56	.27	13	.06	18	.07	157	4.4
21	25	.12	18	.09	52	.25	13	.06	19	.08	415	32
22	25	.11	13	.06	48	.23	13	.06	19	.08	253	12
23	25	.11	12	.05	45	.21	13	.06	15	.06	125	2.5
24	25	.12	13	.05	41	.19	12	.06	11	.04	76	.96
25	25	.13	13	.05	39	.18	12	.06	8	.03	41	.40
26	23	.22	14	.06	36	.17	13	.06	6	.02	28	.25
27	23	.14	15	.06	33	.15	13	.06	4	.02	26	.26
28	28	.13	15	.06	31	.14	14	.06	3	.01	29	.29
29	34	.15	16	.07	29	.13	15	.06	---	---	28	.27
30	41	.18	17	.08	27	.13	15	.06	---	---	28	.25
31	51	.24	---	---	25	.12	16	.07	---	---	27	.26
TOTAL	---	5.25	---	14.00	---	4.75	---	2.02	---	1.86	---	56.72

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)	MEAN CONCENTRATION (MG/L)	LOADS (T/DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	26	.24	11	.08	47	.54	946	133	117	1.8	39	.27
2	48	.48	14	.11	51	.54	96	1.9	79	1.0	44	.31
3	45	.43	17	.13	56	.58	67	.95	77	.89	49	.34
4	35	.33	16	.12	61	.61	70	.85	74	.80	54	.37
5	35	.33	14	.10	55	.53	72	.77	72	.74	61	.40
6	215	9.0	12	.09	49	.47	554	187	70	.70	68	.45
7	56	1.0	12	.08	45	.44	188	8.1	68	.67	76	.48
8	47	.65	12	.10	41	.40	64	1.2	66	.64	77	.48
9	46	.54	12	.09	38	.34	59	.98	64	.61	75	.46
10	64	1.3	12	.08	35	.30	56	.76	63	.58	74	.46
11	28	.38	12	.08	32	.27	53	.63	61	.56	72	.44
12	25	.28	28	.46	32	.25	70	1.2	59	.53	71	.52
13	21	.21	1290	185	31	.24	68	.92	57	.50	109	1.9
14	18	.16	278	23	31	.24	60	.65	56	.47	105	1.7
15	15	.12	117	4.9	30	.23	53	.55	54	.49	55	.49
16	14	.11	106	3.4	784	33	47	.49	53	.58	50	.39
17	15	.12	83	2.3	2060	643	42	.42	51	.47	63	.88
18	52	.98	71	1.6	209	5.1	33	.33	61	.65	350	73
19	35	.43	63	1.3	81	1.3	13	.13	92	1.3	90	.88
20	24	.26	55	1.0	70	.88	755	505	67	.62	246	12
21	17	.18	54	.94	65	.72	200	12	60	.51	81	1.2
22	12	.12	53	.87	61	.58	92	3.8	55	.48	53	.55
23	11	.12	53	.87	57	.53	78	2.3	50	.41	44	.39
24	11	.11	52	.82	53	.47	82	1.8	45	.36	40	.33
25	10	.09	51	.74	1490	117	54	1.1	44	.34	37	.28
26	10	.09	51	.70	310	4.6	123	4.4	43	.33	33	.24
27	9	.08	177	4.1	96	1.0	59	1.1	41	.41	31	.21
28	9	.08	256	5.2	87	.81	57	.88	197	9.3	28	.19
29	8	.07	64	.91	80	.69	54	.81	113	1.8	26	.17
30	8	.07	52	.70	176	3.1	52	.73	38	.31	27	.18
31	---	---	49	.59	---	---	300	13	35	.26	---	---
TOTAL	---	18.36	---	240.46	---	818.76	---	987.75	---	29.11	---	99.96

TOTAL LOAD FOR YEAR: 2179.00 TONS.

Table 12. Suspended-sediment discharges for Steiner Branch, 1978 and 1979 water years.

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	27	.18	7	.05	5	.05	13	.09	38	.26	10	.08
2	30	.22	8	.06	4	.03	13	.09	39	.25	10	.08
3	35	.28	8	.06	5	.05	13	.09	39	.24	15	.13
4	40	.29	8	.06	6	.06	14	.09	40	.26	23	.23
5	45	.40	8	.06	7	.07	14	.09	40	.26	27	.26
6	51	.41	9	.07	9	.08	14	.09	40	.26	29	.28
7	55	.41	9	.07	12	.11	14	.09	41	.28	31	.30
8	58	.43	9	.07	15	.13	---	.09	41	.27	34	.31
9	61	.63	9	.07	19	.15	---	.10	42	.27	37	.33
10	65	.63	9	.07	---	.14	---	.10	42	.27	39	.34
11	66	.57	10	.07	---	.17	---	.10	42	.27	42	.37
12	39	.31	10	.07	21	.18	---	.12	43	.28	44	.42
13	33	.25	83	1.6	17	.14	---	.13	37	.24	45	.47
14	31	.23	44	.48	14	.12	---	.14	29	.19	46	.51
15	28	.21	39	.38	11	.10	---	.14	24	.15	47	.51
16	26	.20	33	.31	9	.08	---	.14	19	.12	48	.51
17	24	.18	137	4.1	8	.06	---	.16	15	.10	49	.52
18	22	.17	57	.81	7	.06	---	.17	12	.08	277	9.0
19	20	.16	46	.52	9	.07	---	.19	12	.08	810	68
20	18	.15	42	.44	11	.09	---	.20	13	.08	330	25
21	16	.13	39	.38	13	.11	26	.21	13	.09	227	13
22	14	.11	36	.34	16	.12	24	.19	13	.09	298	24
23	12	.10	33	.34	19	.15	20	.16	14	.12	418	43
24	10	.08	30	.30	23	.18	17	.13	14	.11	223	18
25	8	.08	25	.23	23	.17	15	.11	15	.12	114	5.7
26	7	.07	19	.18	21	.16	13	.10	15	.11	105	4.0
27	6	.06	15	.13	19	.14	11	.08	13	.10	96	3.2
28	6	.05	11	.10	16	.12	10	.06	12	.09	87	2.9
29	6	.05	9	.08	15	.11	14	.09	---	---	242	15
30	7	.06	7	.06	13	.09	23	.16	---	---	179	11
31	7	.06	---	---	13	.10	36	.23	---	---	150	6.9
TOTAL	---	7.16	---	11.56	---	3.39	---	3.93	---	5.04	---	254.35

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	118	4.5	22	.39	64	.85	32	.36	53	.44	20	.22
2	74	2.9	40	1.0	63	.81	32	.35	49	.41	19	.21
3	43	1.5	76	2.0	63	.79	32	.35	46	.49	19	.20
4	26	.79	57	1.3	62	.79	32	.38	43	.44	19	.23
5	16	.48	48	1.1	62	.79	32	.31	354	28	19	.19
6	18	.58	41	.91	61	.75	32	.29	93	1.1	19	.19
7	24	.62	40	.87	58	.72	33	.30	96	.72	19	.19
8	32	.84	41	.86	55	.68	33	.30	183	1.4	18	.18
9	43	1.1	42	.84	52	.64	33	.29	---	35	18	.18
10	56	1.3	43	.81	60	.89	33	.29	186	11	18	.18
11	58	1.4	45	.84	36	.46	33	.29	66	.96	18	.17
12	55	1.4	46	.81	29	.34	34	.30	60	.74	18	.17
13	---	1.3	47	.81	29	.34	35	.34	55	.65	19	.17
14	---	1.2	49	.81	29	.33	294	11	55	.63	19	.16
15	---	1.1	47	.75	29	.33	87	.89	54	.57	19	.16
16	---	.99	45	.69	30	.33	67	.62	52	.53	19	.16
17	---	.92	43	.66	30	.33	60	.54	107	5.0	19	.16
18	---	.84	42	.67	30	.33	58	.50	179	9.5	20	.17
19	---	.80	88	1.6	30	.33	55	.47	45	.67	20	.16
20	---	.78	84	1.3	30	.38	53	.44	140	4.7	20	.17
21	---	.72	80	1.2	30	.34	51	.43	61	1.0	21	.17
22	---	.64	78	1.1	30	.33	56	.58	68	1.2	21	.16
23	---	.59	76	1.1	31	.33	47	.41	46	.67	22	.18
24	---	.55	74	1.1	31	.33	44	.40	39	.53	22	.18
25	---	.66	72	1.0	31	.32	41	.40	33	.42	22	.18
26	---	.86	70	1.0	31	.32	38	.34	28	.34	23	.17
27	---	.70	68	.99	31	.32	36	.64	23	.33	23	.17
28	---	.58	66	.93	31	.33	34	.28	20	.26	24	.17
29	---	.49	66	.89	31	.36	32	.26	33	.48	24	.18
30	23	.46	65	.87	32	.36	68	.93	20	.24	25	.17
31	---	---	64	.87	---	---	57	.51	20	.23	---	---
TOTAL	---	31.59	---	30.07	---	14.55	---	23.79	---	108.65	---	5.35

TOTAL LOAD FOR YEAR: 499.43 TONS.

Table 13. Suspended sediment discharges for Yellowstone River, 1978 and 1979 water years.

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1		.22		.29	---	.17	71	1.2	35	.53	14	.19
2		.19		.50	9	.16	72	1.2	35	.53	6	.08
3		.16		.34	10	.17	72	1.2	35	.53	2	.03
4		.15		.28	10	.17	72	1.2	34	.51	2	.03
5		.17		.24	11	.18	72	1.2	33	.50	2	.03
6		.15		.26	12	.19	73	1.2	33	.50	1	.02
7		.14		.26	12	.20	73	1.2	32	.48	1	.02
8		.42		.26	13	.22	73	1.2	29	.44	1	.02
9		.34		.29	14	.25	73	1.1	26	.38	2	.03
10		.29		.28	15	.28	74	1.2	23	.34	4	.06
11		.29		.23	16	.30	73	1.1	20	.29	5	.08
12		.28		.21	17	.32	64	1.0	18	.26	6	.10
13		.24		.20	18	.33	54	.85	16	.23	7	.12
14		.21		.21	20	.36	47	.74	14	.20	9	.18
15		.19		.21	25	.44	40	.65	16	.22	11	.22
16		.19		.21	33	.59	34	.55	19	.27	11	.23
17		.19		.21	42	.75	29	.49	23	.32	11	.23
18		.19		.20	54	.96	25	.42	26	.37	11	.24
19		.18		.18	66	1.2	23	.39	31	.44	17	.75
20		.16		.18	68	1.2	21	.35	36	.51	93	8.4
21		.16		.17	69	1.2	19	.32	42	.59	461	136
22		.16		.15	69	1.2	17	.28	48	.67	285	48
23		.16		.14	69	1.2	16	.27	46	.65	96	10
24		.18		.13	69	1.2	14	.23	44	.62	38	2.4
25		.21		.13	70	1.2	13	.22	41	.58	29	1.4
26		.19		.13	70	1.2	15	.24	39	.53	20	.90
27		.16		.14	70	1.2	17	.28	37	.50	23	1.1
28		.15		.15	70	1.2	19	.30	32	.43	36	1.8
29		.14		.18	71	1.2	21	.33	---	---	32	1.5
30		.13		.20	71	1.2	24	.36	---	---	29	1.3
31		.18			71	1.2	27	.41	---	---	27	1.2
TOTAL		6.17		6.56	---	21.64	---	21.68	---	12.42	---	216.66

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	24	1.1	12	.33	---	2.3	477	147	51	2.5	---	.70
2	22	1.0	12	.31	---	2.1	120	9.8	38	1.8	---	.70
3	22	.93	12	.31	---	1.8	54	3.5	32	1.4	---	.54
4	22	.95	17	.45	---	1.7	42	2.4	30	1.2	---	.54
5	22	.83	26	.69	51	1.7	42	2.1	29	1.2	---	.54
6	184	25	37	.97	57	1.7	109	16	29	1.1	---	.52
7	30	2.1	34	.86	63	1.9	142	12	29	1.1	---	.50
8	19	1.1	27	.81	70	2.1	83	4.2	28	1.1	---	.46
9	28	1.4	22	.59	77	2.1	59	3.0	28	1.1	---	.46
10	32	2.4	18	.45	86	2.3	52	2.4	28	1.1	---	.44
11	17	1.0	14	.36	92	2.4	47	2.0	28	1.0	---	.44
12	18	.90	18	.81	90	2.3	50	2.3	27	1.0	---	.85
13	19	.83	508	145	86	2.2	63	3.1	27	.99	---	2.7
14	20	.79	132	28	82	2.1	55	2.2	27	.96	---	3.4
15	21	.77	50	6.5	78	2.1	52	2.0	26	.96	---	1.0
16	20	.69	40	4.0	160	8.8	49	2.0	26	1.0	25	.81
17	19	.62	29	2.4	2070	2790	46	1.7	26	.93	35	1.3
18	34	2.2	18	1.3	261	32	40	1.5	26	.97	422	257
19	16	.77	33	2.0	50	3.3	22	.81	37	2.0	62	3.7
20	14	.60	---	1.8	40	2.2	682	2140	30	1.1	136	18
21	12	.50	---	1.6	38	2.0	162	37	30	1.0	53	3.8
22	10	.38	---	1.5	37	1.8	61	8.7	29	1.0	35	2.0
23	10	.40	---	1.6	36	1.6	40	3.6	29	.98	30	1.5
24	11	.42	---	1.5	35	1.5	35	2.7	29	.96	28	1.3
25	11	.39	---	1.5	330	43	57	3.8	29	.95	---	1.2
26	11	.37	---	1.4	67	3.6	117	8.2	29	1.0	25	1.0
27	12	.38	57	4.1	48	2.1	33	2.1	37	1.5	24	.94
28	12	.37	130	9.8	42	1.7	31	1.7	33	1.4	22	.85
29	13	.38	---	4.6	36	1.4	29	1.5	44	1.8	21	.81
30	13	.36	---	3.4	47	2.5	27	1.4	58	2.0	22	.84
31	---	---	---	2.8	---	---	46	3.2	56	1.8	---	---
TOTAL	---	49.93	---	231.74	---	2928.3	---	2433.91	---	38.90	---	308.84

TOTAL LOAD FOR YEAR: 6276.75 TONS.

NOTE: NUMBER OF MISSING DAYS OF RECORD EXCEEDED 20% OF YEAR

Table 13. Suspended sediment discharges for Yellowstone River, 1978 and 1979 water years.

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	24	.80	5	.16	13	.42	31	.77	18	.44	17	.46
2	33	1.3	5	.16	14	.42	30	.70	18	.41	10	.28
3	47	2.0	5	.15	15	.49	28	.64	19	.42	18	.63
4	42	1.6	5	.15	16	.52	26	.58	20	.44	34	1.2
5	41	1.7	5	.16	17	.55	25	.54	21	.46	40	1.3
6	40	1.5	5	.16	18	.54	24	.53	22	.51	41	1.4
7	35	1.3	5	.15	19	.56	22	.49	23	.53	43	1.4
8	29	1.0	4	.13	21	.62	21	.48	24	.56	45	1.4
9	57	2.6	4	.12	22	.59	20	.47	24	.53	47	1.4
10	46	2.1	4	.12	24	.65	19	.42	26	.58	50	1.3
11	29	1.2	4	.12	27	.80	18	.39	27	.60	51	1.7
12	20	.82	4	.12	31	1.0	17	.39	28	.64	49	1.4
13	17	.63	68	4.5	31	.92	16	.38	26	.59	46	1.5
14	14	.51	39	1.5	31	.92	15	.34	23	.53	43	1.7
15	11	.41	26	.86	30	.89	14	.32	21	.50	40	1.4
16	9	.33	20	.66	30	.89	13	.37	19	.43	38	1.3
17	7	.24	116	12	30	.82	13	.30	17	.38	35	1.3
18	6	.21	49	2.5	31	.92	12	.29	15	.33	114	18
19	4	.16	30	1.3	32	.95	11	.27	17	.38	687	344
20	4	.13	24	.91	33	.98	11	.29	20	.45	188	73
21	3	.11	19	.70	35	.91	10	.27	24	.56	108	28
22	4	.14	15	.54	36	.96	11	.30	30	.81	147	50
23	4	.14	12	.46	38	1.0	12	.32	35	1.0	158	63
24	4	.13	10	.35	39	1.0	13	.34	40	1.2	108	31
25	4	.15	9	.32	39	1.0	14	.36	46	1.2	50	9.4
26	4	.14	10	.32	39	.99	16	.41	53	1.4	40	6.1
27	4	.13	11	.37	38	.94	17	.45	46	1.4	34	4.6
28	4	.13	11	.37	37	.94	19	.46	40	1.2	29	3.9
29	4	.13	12	.41	36	.91	18	.41	---	---	131	30
30	4	.13	12	.41	35	.92	18	.44	---	---	100	23
31	5	.15	---	---	33	.82	17	.42	---	---	66	12
TOTAL	---	22.02	---	30.18	---	24.84	---	13.14	---	18.48	---	717.07

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	29	4.4	8	.51	71	3.4	30	1.2	35	1.3	28	1.4
2	33	5.0	23	2.2	75	3.6	28	1.1	28	1.1	26	1.2
3	47	6.3	239	24	79	3.8	65	8.8	37	1.7	24	1.1
4	66	8.4	105	7.8	84	4.0	146	15	25	1.0	22	1.0
5	89	11	60	4.4	89	4.3	46	1.9	296	74	21	.92
6	71	7.1	29	2.1	91	4.4	38	1.5	92	5.3	19	.81
7	49	5.0	26	1.8	77	3.7	33	1.3	39	1.7	18	.72
8	33	3.5	28	1.9	61	3.0	29	1.1	58	3.7	17	.67
9	23	2.3	31	1.9	49	2.4	26	.98	247	50	15	.61
10	16	1.5	33	2.0	71	4.1	23	.86	205	42	14	.57
11	13	1.2	36	2.4	70	3.3	65	3.4	51	3.2	14	.54
12	12	1.2	40	2.3	64	2.9	54	2.3	50	2.8	13	.49
13	11	.97	43	2.5	60	2.7	37	1.5	49	2.5	13	.50
14	10	.84	47	2.6	57	2.5	168	15	42	2.1	12	.45
15	9	.71	45	2.5	54	2.3	65	2.9	35	1.6	12	.45
16	8	.61	41	2.2	51	2.2	42	1.7	30	1.3	11	.41
17	9	.61	38	2.0	49	2.1	31	1.2	126	51	11	.40
18	9	.63	37	2.0	46	2.1	26	.96	230	56	10	.38
19	10	.69	66	4.5	44	1.9	25	.93	38	2.7	10	.35
20	11	.79	47	2.6	57	2.9	25	.91	145	22	10	.36
21	12	.84	45	2.4	34	1.5	25	.93	89	7.1	10	.36
22	13	.84	44	2.3	34	1.4	83	4.2	67	5.7	10	.35
23	14	.87	44	2.3	34	1.4	40	1.5	40	2.8	11	.37
24	12	.75	46	2.3	34	1.3	37	1.4	35	2.2	11	.40
25	12	.87	48	2.4	34	1.3	35	1.4	31	1.8	11	.41
26	43	3.7	51	2.6	34	1.3	33	1.2	27	1.5	11	.38
27	15	1.0	54	2.7	34	1.3	31	1.1	39	2.4	12	.41
28	12	.83	57	2.8	34	1.4	29	1.0	30	1.6	13	.46
29	9	.64	60	2.9	48	2.3	27	.95	54	3.9	14	.51
30	7	.55	64	3.1	33	1.4	132	11	33	1.7	16	.56
31	---	---	67	3.4	---	---	51	2.1	30	1.5	---	---
TOTAL	---	73.64	---	103.41	---	76.2	---	91.32	---	359.2	---	17.54

TOTAL LOAD FOR YEAR: 1547.04 TONS.

Table 14. Total organic nitrogen for Steiner Branch, 1978 and 1979 water years, in pounds.

TOTAL ORGANIC NITROGEN IN POUNDS, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.4	2.4	1.9	1.9	1.2	1.2	9.4	5.0	9.3	884	24	7.8
2	2.1	5.0	1.6	1.9	1.2	1.2	10	4.5	7.5	38	20	7.8
3	1.6	3.4	1.6	1.9	1.2	1.4	9.4	4.5	6.9	19	17	7.8
4	1.6	2.7	1.4	1.9	1.2	1.4	9.4	4.5	6.5	13	15	7.3
5	1.9	2.4	1.4	1.9	1.2	1.4	6.9	4.5	6.2	9.3	14	6.9
6	1.6	2.7	1.4	1.6	1.2	1.4	133	4.2	5.9	1553	13	6.9
7	1.6	2.7	1.4	1.6	1.2	1.4	30	3.9	5.9	110	13	6.9
8	4.6	2.7	1.6	1.6	1.2	1.4	16	5.2	6.2	43	13	6.5
9	3.4	3.0	1.9	1.4	1.2	1.4	11	4.5	5.3	30	12	6.5
10	3.0	2.7	2.1	1.4	1.4	1.4	33	3.9	5.0	17	12	6.5
11	3.0	2.4	2.1	1.4	1.2	1.6	16	3.9	4.7	12	12	6.5
12	2.7	2.1	2.4	1.4	1.4	1.6	11	25	4.5	20	11	8.3
13	2.4	1.9	2.1	1.4	1.4	1.6	8.1	1834	4.2	16	11	22
14	2.1	2.1	2.1	1.4	1.4	1.6	6.4	328	4.2	10	11	23
15	2.1	2.1	2.1	1.4	1.4	1.6	6.0	60	4.2	8.1	11	11
16	2.1	2.1	2.1	1.4	1.2	1.6	5.2	55	242	8.7	15	9.2
17	1.9	2.1	2.1	1.6	1.2	1.6	4.8	40	4947	8.1	11	15
18	1.9	1.9	2.1	1.6	1.2	1.6	24	30	73	7.0	14	712
19	1.9	1.9	2.1	1.6	1.2	7.5	10	24	17	6.5	21	13
20	1.9	1.9	1.9	1.6	1.2	67	9.6	21	14	1319	12	89
21	1.9	1.9	1.9	1.6	1.2	292	9.1	18	10	126	11	24
22	1.6	1.4	1.9	1.6	1.2	209	7.7	16	7.0	110	11	14
23	1.6	1.4	1.6	1.6	1.2	48	8.6	17	6.0	69	10	11
24	1.9	1.2	1.6	1.6	1.2	18	8.1	15	5.6	45	9.7	9.7
25	2.1	1.2	1.6	1.6	1.2	10	7.2	13	323	37	8.8	8.8
26	2.1	1.2	1.6	1.6	1.2	8.1	6.0	12	19	58	9.2	8.3
27	1.6	1.2	1.6	1.4	1.2	9.4	5.6	15	8.7	34	13	7.8
28	1.6	1.4	1.6	1.4	1.2	11	5.6	18	6.0	26	36	7.4
29	1.4	1.6	1.6	1.2	---	8.7	5.6	12	5.1	24	17	7.4
30	1.4	1.9	2.1	1.2	---	8.7	5.2	11	41	22	9.7	7.4
31	1.9	---	2.1	1.2	---	11	---	9.3	---	51	8.8	---
MAX	4.6	5.0	2.4	1.9	1.4	292	133	1830	4950	1550	36	712
MIN	1.4	1.2	1.4	1.2	1.2	1.2	4.8	3.9	4.2	6.5	8.8	6.5

WTR YR 1978 MAX 4950 MIN 1.2

TOTAL ORGANIC NITROGEN IN POUNDS, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.7	12	4.2	2.3	2.0	3.1	33	3.5	1.40	.80	5.5	18
2	11	12	4.2	2.0	1.6	3.1	40	5.4	1.20	.80	5.5	17
3	13	12	5.9	2.0	1.8	4.6	21	10	1.20	.69	9.8	16
4	11	12	5.4	1.8	1.8	6.4	21	7.0	1.20	1.00	11	21
5	14	12	5.0	1.8	1.8	5.9	16	6.8	1.30	.50	358	13
6	12	12	4.2	1.8	2.0	5.4	21	6.8	1.00	.46	27	13
7	11	11	4.6	1.8	2.0	5.9	10	6.3	1.10	.46	7.0	14
8	11	11	4.2	2.0	1.8	5.0	11	5.6	1.10	.42	7.0	14
9	17	11	3.5	2.0	1.8	4.6	9.5	4.6	1.10	.42	166	13
10	16	11	3.1	1.8	1.8	4.2	7.5	3.9	1.90	.42	190	14
11	13	10	3.8	1.6	1.8	4.6	8.0	4.0	1.10	.42	52	12
12	12	9.7	3.6	1.8	1.8	5.4	11	3.2	1.00	.42	22	11
13	11	25	3.8	2.3	1.8	6.9	9.8	2.9	.93	.54	20	10
14	11	15	3.8	2.0	1.8	8.7	7.5	2.8	.86	133.0	18	9.6
15	11	13	3.8	2.0	1.8	8.0	6.0	2.4	.86	19.00	16	8.9
16	12	12	3.8	1.8	1.6	7.5	5.6	2.2	.80	7.40	14	8.9
17	11	60	3.5	2.0	1.8	8.0	5.2	2.2	.75	6.80	69	9.6
18	12	22	3.5	2.5	1.8	67	4.4	2.4	.80	6.10	212	9.6
19	12	9.3	3.5	2.8	1.8	473	4.4	3.7	.80	5.50	35	8.3
20	12	6.9	3.5	3.1	1.8	220	4.8	2.3	1.20	5.50	133	9.6
21	13	5.9	4.2	3.5	2.0	160	4.4	2.0	.86	5.50	44	8.3
22	12	5.4	3.1	3.5	2.0	259	3.7	2.0	.75	11.00	28	7.7
23	13	6.9	3.1	3.1	4.2	412	3.4	2.0	.75	3.80	32	8.3
24	13	5.9	2.8	2.8	3.5	259	3.4	1.7	.69	6.80	27	8.3
25	16	5.0	2.8	2.8	3.1	54	4.0	1.7	.64	9.00	23	8.3
26	15	5.0	2.8	2.8	2.8	33	6.0	1.7	.64	6.80	21	7.0
27	14	5.0	2.5	2.5	2.8	21	4.8	1.7	.64	5.50	29	6.5
28	13	4.6	2.8	2.0	2.8	21	4.4	1.6	.69	5.50	23	6.0
29	13	5.0	2.8	1.6	---	70	4.4	1.5	.93	5.50	31	7.0
30	13	5.0	2.5	2.3	---	128	4.3	1.5	.86	16.00	20	6.0
31	13	---	2.5	1.8	---	59	---	1.5	---	6.80	18	---
MAX	17	60	5.9	3.5	4.2	473	40	10	1.9	133	358	21
MIN	9.7	4.6	2.5	1.6	1.6	3.1	3.4	1.5	.64	.42	5.5	6.0

WTR YR 1979 MAX 473 MIN .42

Table 15. Total nitrogen for Steiner Branch, 1978 and 1979 water years, in pounds.

TOTAL NITROGEN IN POUNDS, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	28	25	25	21	21	50	28	59	1137	78	33
2	27	38	24	25	21	21	50	26	45	117	67	33
3	24	32	24	25	21	22	50	26	42	78	59	33
4	24	29	22	25	21	21	50	26	40	60	54	31
5	25	28	22	25	21	21	30	26	38	49	51	30
6	24	29	22	24	21	21	317	25	36	1873	49	30
7	24	29	22	24	21	21	125	24	36	217	49	30
8	36	29	24	24	21	21	69	30	38	137	48	28
9	32	31	25	22	21	21	52	26	33	112	46	28
10	31	29	27	22	22	22	119	24	31	80	45	28
11	31	28	27	22	21	24	69	24	30	66	45	28
12	29	27	28	22	22	24	50	49	28	88	43	34
13	28	25	27	22	22	24	41	2831	27	78	42	73
14	27	27	27	22	22	24	34	765	27	59	42	75
15	27	27	27	22	21	24	33	292	27	53	43	43
16	27	27	27	22	21	24	30	263	345	55	54	39
17	25	27	27	24	21	24	28	196	5994	53	43	57
18	25	25	27	24	21	24	94	154	197	49	51	1011
19	25	25	27	24	21	45	58	126	101	52	70	49
20	25	25	25	24	21	146	47	111	75	1844	45	261
21	25	25	25	24	21	496	45	96	60	348	42	92
22	24	22	25	24	21	409	39	86	49	252	42	61
23	24	22	24	24	21	149	43	91	45	175	40	52
24	25	21	24	24	21	95	41	82	42	126	39	46
25	27	21	24	24	21	60	38	73	489	109	36	43
26	27	21	24	24	21	50	33	67	88	153	37	41
27	24	21	24	22	21	55	31	82	56	102	49	39
28	24	22	24	22	21	60	31	96	45	83	105	37
29	22	24	24	21	---	50	31	69	40	78	59	37
30	22	25	25	21	---	55	30	64	98	72	39	37
31	25	---	25	21	---	---	---	54	---	139	36	---
MEAN	26	26	25	23	21	69	59	191	275	255	50	82

WTR YR 1978 MEAN 92 MAX 5994 MIN 21

TOTAL NITROGEN IN POUNDS, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	46	54	54	42	40	48	400	158	107	85	60	83
2	50	54	54	40	37	44	437	189	101	85	60	81
3	57	54	62	40	38	56	330	249	101	80	75	78
4	50	54	60	38	38	64	330	210	101	93	77	92
5	61	54	58	38	38	62	296	207	104	70	517	70
6	55	54	54	38	40	60	330	207	96	67	78	67
7	50	50	56	38	40	61	246	201	98	67	47	72
8	50	50	54	40	38	58	252	192	98	65	47	72
9	73	50	50	40	38	56	239	176	98	65	322	70
10.	69	50	48	38	38	54	217	164	120	65	381	72
11	72	48	59	37	38	56	223	167	98	65	119	65
12	55	46	59	38	38	60	256	152	93	65	95	62
13	52	97	52	42	38	66	242	146	90	72	89	59
14	50	65	52	40	38	72	217	143	88	247	83	57
15	52	57	52	40	38	70	198	135	88	65	78	54
16	54	54	52	38	37	68	192	129	85	67	72	54
17	52	162	50	40	38	70	185	129	82	65	168	57
18	54	94	50	44	38	180	173	135	85	62	353	57
19	54	74	50	46	38	1132	173	161	85	60	125	52
20	55	66	50	48	38	1015	179	132	101	60	282	57
21	57	62	54	50	40	657	173	123	88	60	144	52
22	55	60	48	50	40	888	161	123	82	77	131	50
23	57	66	48	48	54	1294	155	126	82	69	119	52
24	59	62	46	46	50	948	155	118	80	65	107	52
25	67	58	46	46	48	488	167	115	77	72	98	52
26	65	58	46	46	46	452	198	118	77	65	92	47
27	61	58	44	44	46	364	179	118	77	60	113	45
28	59	56	46	40	46	364	173	112	80	60	98	43
29	57	58	46	37	---	643	173	109	90	60	116	47
30	57	58	44	42	---	853	175	109	88	90	89	43
31	57	---	44	38	---	594	---	109	---	65	83	---
MEAN	57	63	51	42	41	352	227	150	91	75	139	60

WTR YR 1979 MEAN 113 MAX 1294 MIN 37

Table 16. Total nitrite plus nitrate nitrogen for Steiner Branch, 1978 and 1979 water years, in pounds.

TOTAL NO2 + NO3 IN POUNDS, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33.7	33.7	31.6	31.7	28.3	11.2	31.7	27.3	41.7	195	55.1	39.8
2	32.7	40.7	30.5	31.7	28.3	11.2	32.8	26.3	39.4	70.0	49.6	39.8
3	30.5	36.8	30.5	31.7	28.3	12.1	31.7	26.3	37.2	52.8	45.5	39.8
4	30.5	34.8	29.4	31.7	28.3	11.2	31.7	26.3	36.1	47.2	43.0	38.7
5	31.6	33.7	29.4	31.7	28.3	11.2	23.0	26.3	35.0	43.0	41.4	37.9
6	30.5	34.8	29.4	30.6	28.3	11.2	162	25.2	33.9	288	40.5	37.9
7	30.5	34.8	29.4	30.6	28.3	11.2	85.0	24.1	33.9	91.0	40.5	37.9
8	39.7	34.8	30.5	30.6	28.3	11.2	50.4	28.4	35.0	67.2	39.7	36.9
9	36.8	35.8	31.6	29.4	28.3	11.2	40.8	26.3	31.7	60.5	38.8	36.9
10	35.8	34.8	32.7	29.4	29.4	12.1	77.1	24.2	30.6	51.2	37.9	36.9
11	35.8	33.7	32.7	29.4	28.3	13.0	50.4	24.2	29.5	46.4	37.9	36.9
12	34.8	32.7	33.7	29.4	29.4	13.0	39.7	23.0	28.4	53.6	37.1	40.8
13	33.7	31.6	32.7	29.4	29.4	13.0	33.9	695	27.3	50.4	36.2	61.3
14	32.7	32.7	32.7	29.4	29.4	13.0	29.5	409	27.3	43.9	36.2	62.0
15	32.7	32.7	32.7	29.4	29.4	13.0	28.4	222	27.3	41.4	37.1	46.2
16	32.7	32.7	32.7	29.4	28.3	13.0	262	138	74.0	42.2	43.0	42.6
17	31.6	32.7	32.7	30.6	28.3	13.0	25.1	112	707	41.4	37.1	39.0
18	31.6	31.6	32.7	30.6	28.3	13.0	64.1	94.3	91.0	39.7	41.4	210
19	31.6	31.6	32.7	30.6	28.3	28.4	44.4	81.9	78.0	38.8	51.2	35.0
20	31.6	31.6	31.6	30.6	28.3	71.0	37.4	74.6	47.4	365	37.9	109
21	31.6	31.6	31.6	30.6	28.3	161	36.2	67.3	40.6	151	36.2	62.8
22	30.5	29.4	31.6	30.6	28.3	167	32.8	62.6	35.0	120	36.2	50.4
23	30.5	29.4	30.5	30.6	28.3	85.0	35.1	65.0	32.8	94.4	35.3	46.2
24	31.6	28.2	30.5	30.6	28.3	44.4	33.9	60.2	31.7	75.9	34.4	43.5
25	32.7	28.2	30.5	30.6	28.3	32.8	31.7	55.5	178	68.7	32.6	41.7
26	32.7	28.2	30.5	30.6	28.3	29.5	28.4	52.0	53.2	86.3	33.5	40.8
27	30.5	28.2	30.5	29.4	28.3	31.7	27.3	60.2	38.3	65.7	40.5	39.8
28	30.5	29.4	30.5	28.3	28.3	33.9	27.3	67.3	32.8	57.4	67.2	38.9
29	29.4	30.5	30.5	28.3	---	30.6	27.3	53.2	30.6	55.1	45.5	38.9
30	29.4	31.6	31.6	28.3	---	30.6	26.2	50.8	48.0	52.0	34.4	38.9
31	31.6	---	31.6	28.3	---	33.9	---	45.1	---	80.8	32.6	---
MEAN	32.3	32.4	31.3	30.1	28.5	32.2	49.6	89.5	67.1	85.0	40.5	50.2

WTR YR 1978 MEAN 47.5 MAX 707 MIN 11.2

TOTAL NO2 + NO3 IN POUNDS, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1979

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	43.4	46.9	45.2	34.4	31.4	45.3	276	157	107	60.2	48.5	53.7
2	45.2	46.9	45.2	31.4	26.0	45.3	298	186	102	60.2	48.5	52.9
3	48.6	46.9	48.6	31.4	28.6	52.6	231	242	102	57.9	55.6	52.0
4	45.2	46.9	47.7	28.6	28.6	59.9	231	206	102	63.4	56.8	56.0
5	50.2	46.9	46.9	28.6	28.6	58.1	209	203	105	53.3	133	49.6
6	47.7	46.9	45.2	28.6	31.4	56.2	231	203	96.7	52.1	46.0	48.3
7	45.2	45.2	46.0	28.6	31.4	58.1	177	197	99.4	52.1	44.8	50.4
8	45.2	45.2	45.2	31.4	28.6	54.4	181	188	99.4	50.9	44.8	50.4
9	55.0	45.2	43.4	31.4	28.6	52.6	176	174	99.4	50.9	161	49.6
10	53.5	45.2	42.5	28.6	28.6	50.8	158	162	121	50.9	159	50.4
11	50.2	44.3	44.3	26.0	28.6	52.6	162	165	99.4	50.9	92.0	47.9
12	47.7	43.4	45.2	28.6	28.6	56.2	183	151	94.1	50.9	65.9	47.0
13	46.0	63.9	44.3	34.4	28.6	61.8	175	145	91.6	54.4	63.6	46.2
14	45.2	51.9	44.3	31.4	28.6	67.4	158	143	89.0	97.0	61.4	45.3
15	46.0	48.6	44.3	31.4	28.6	65.6	145	134	89.0	44.0	59.1	44.4
16	46.9	46.9	44.3	28.6	26.0	63.7	141	129	86.4	52.1	56.8	44.4
17	46.0	93.0	43.4	31.4	28.6	65.6	137	129	83.9	50.9	90.0	45.3
18	46.9	68.0	43.4	37.4	28.6	98.0	129	134	86.4	49.7	118	45.3
19	46.9	53.5	43.4	40.6	28.6	558	129	160	86.4	48.5	76.8	43.5
20	47.7	50.2	43.4	44.0	28.6	729	133	132	102	48.5	121	45.3
21	48.6	48.6	45.2	47.5	31.4	469	129	123	89.0	48.5	83.1	43.5
22	47.7	47.7	42.5	47.5	31.4	564	120	123	83.9	56.8	85.2	42.6
23	48.6	50.2	42.5	44.0	55.0	774	116	126	83.9	49.7	74.6	43.5
24	49.4	48.6	41.6	40.6	47.5	578	116	118	81.3	50.9	70.3	43.5
25	52.7	46.9	41.6	40.6	44.0	418	125	115	78.8	54.4	67.0	43.5
26	51.9	46.9	41.6	40.6	40.6	276	145	118	78.8	50.9	64.8	41.7
27	50.2	46.9	40.7	37.4	40.6	231	133	118	78.8	48.5	72.5	40.8
28	49.4	46.0	41.6	31.4	40.6	231	129	113	81.3	48.5	67.0	39.8
29	48.6	46.9	41.6	26.0	---	368	129	110	91.6	62.5	73.5	41.7
30	48.6	46.9	40.7	34.3	---	463	129	110	89.0	50.9	63.6	39.8
31	48.6	---	40.7	28.6	---	345	---	110	---	91.6	61.4	---
MEAN	48.2	50.0	43.8	34.0	32.4	228	164	149	92.6	55.2	76.9	46.3

WTR YR 1979 MEAN 85.5 MAX 774 MIN 26.0

Table 17. Total ammonia nitrogen for Steiner Branch, 1978 and 1979 water years, in pounds.

TOTAL AMMONIA NITROGEN IN POUNDS, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.1	.1	.2	.3	.3	.4	.7	.3	.9	42	1.7	.1
2	.1	.1	.2	.3	.3	.4	.8	.3	.8	4.8	.9	.1
3	.1	.1	.2	.3	.3	.4	.7	.3	.7	1.3	.6	.1
4	.1	.1	.2	.3	.3	.4	.7	.3	.7	.7	.4	.1
5	.1	.1	.2	.3	.3	.4	.7	.3	.6	.4	.3	.1
6	.1	.1	.2	.3	.3	.4	19	.2	.6	42	.3	.1
7	.1	.1	.2	.3	.3	.4	9.0	.2	.6	8.8	.3	.1
8	.1	.1	.2	.3	.3	.4	3.4	.4	.6	5.3	.3	.1
9	.1	.1	.2	.3	.3	.4	1.6	.3	.5	2.9	.2	.1
10	.1	.1	.2	.3	.3	.4	9.7	.2	.5	1.1	.2	.1
11	.1	.1	.2	.3	.3	.5	3.4	.2	.5	.6	.2	.1
12	.1	.1	.2	.3	.3	.5	1.5	1.6	.4	1.4	.2	.1
13	.1	.1	.2	.3	.3	.5	.9	263	.4	1.0	.2	1.3
14	.1	.1	.2	.3	.3	.5	.5	45	.4	.5	.2	1.4
15	.1	.1	.2	.3	.3	.5	.5	12	.4	.3	.2	.2
16	.1	.1	.2	.3	.3	.5	.4	7.6	18	.4	.4	.1
17	.1	.1	.2	.3	.3	.5	.3	5.2	278	.3	.2	2.5
18	.1	.1	.2	.3	.3	.5	7.7	3.8	14	.3	.3	79
19	.1	.1	.2	.3	.3	.6	2.2	3.0	4.7	.2	1.1	2.8
20	.1	.1	.2	.3	.3	9.8	1.2	2.5	1.2	145	.2	16
21	.1	.1	.2	.3	.3	49	1.1	2.1	.5	35	.2	5.4
22	.1	.1	.2	.3	.3	28	.7	1.8	.2	22	.2	.7
23	.1	.1	.2	.3	.3	14	1.0	1.9	.1	15	.1	.2
24	.1	.1	.2	.3	.3	2.2	.9	1.7	.1	10	.1	.2
25	.1	.1	.2	.3	.3	.8	.7	1.5	25	5.9	.1	.2
26	.1	.1	.2	.3	.3	.5	.5	1.5	2.5	13	.1	.2
27	.1	.1	.2	.3	.3	.7	.4	1.7	.3	4.6	.3	.2
28	.1	.1	.2	.3	.3	.9	.4	2.1	.1	2.1	5.3	.2
29	.1	.1	.2	.2	---	.6	.4	1.4	.1	1.7	.6	.2
30	.1	.1	.2	.2	---	.6	.4	1.2	4.6	1.2	.1	.2
31	.1	---	.2	.2	---	.9	---	1.0	---	11	.1	---
MEAN	.1	.1	.2	.3	.3	3.8	2.4	12	12	12	.5	3.7

WTR YR 1978 MEAN 4.0 MAX 278 MIN .1

TOTAL AMMONIA NITROGEN IN POUNDS, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.2	.3	.4	.3	.3	.8	5.2	.3	.3	.6	.4	.9
2	.2	.3	.4	.2	.2	.8	6.6	1.7	.3	.6	.4	.9
3	.4	.3	.7	.2	.2	1.4	3.0	3.9	.3	.5	1.5	.9
4	.2	.3	.6	.2	.2	2.1	3.0	2.4	.3	.7	1.8	1.0
5	.7	.3	.5	.2	.2	1.9	2.2	2.3	1.0	.3	25	.8
6	.3	.3	.4	.2	.3	1.7	3.0	2.3	.7	.3	3.1	.8
7	.2	.2	.5	.2	.3	1.9	1.3	2.1	.8	.3	2.0	.8
8	.2	.2	.4	.2	.2	1.5	1.4	1.8	.8	.3	2.0	.8
9	2.1	.2	.3	.2	.2	1.4	1.2	1.4	.8	.3	27	.8
10	1.5	.2	.3	.2	.2	1.2	.9	1.2	1.5	.3	20	.8
11	.2	.2	.4	.2	.2	1.4	.9	1.2	.8	.3	3.1	.8
12	.3	.2	.4	.2	.2	1.7	1.4	.9	.7	.3	1.1	.7
13	.2	5.6	.4	.3	.2	2.4	1.2	.8	.7	.3	.8	.7
14	.2	1.0	.4	.2	.2	3.2	.9	.8	.6	15	.6	.7
15	.2	.4	.4	.2	.2	2.9	.7	.7	.6	2.1	.4	.7
16	.3	.3	.4	.2	.2	2.6	.6	.6	.6	.8	.3	.7
17	.2	8.3	.3	.2	.2	2.9	.6	.6	.5	.7	6.2	.7
18	.3	3.2	.3	.3	.2	11	.5	.7	.6	.5	22	.7
19	.3	1.4	.3	.4	.2	95	.5	1.1	.6	.4	.6	.7
20	.3	.9	.3	.4	.2	61	.5	.6	.9	.4	19	.7
21	.4	.7	.4	.5	.3	28	.5	.5	.6	.4	1.2	.7
22	.3	.6	.3	.5	.3	60	.4	.5	.5	1.8	1.4	.6
23	.4	1.4	.3	.4	.9	109	.3	.5	.5	.5	1.2	.7
24	.5	.7	.2	.4	.6	76	.3	.4	.5	.7	1.0	.7
25	1.2	.5	.2	.4	.6	14	.4	.4	.4	1.2	1.0	.7
26	1.0	.5	.2	.4	.5	5.2	.7	.4	.4	.7	1.0	.6
27	.7	.5	.2	.3	.5	3.0	.5	.4	.4	.4	1.1	.6
28	.5	.5	.2	.2	.5	3.0	.5	.4	.5	.4	1.0	.6
29	.4	.5	.2	.2	---	13	.4	.4	.7	.4	1.1	.6
30	.4	.5	.2	.3	---	26	.4	.4	.6	4.4	1.0	.6
31	.4	---	.2	.2	---	10	---	.4	---	.7	.9	---
MEAN	.5	1.0	.4	.3	.3	18	1.3	1.0	.6	1.2	4.8	.7

WTR YR 1979 MEAN 2.5 MAX 109 MIN .2

Table 18. Total phosphorus for Steiner Branch, 1978 and 1979 water years, in pounds per day.

TOTAL PHOSPHORUS IN POUNDS PER DAY, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.50	.50	.50	.50	.40	.40	2.60	.60	1.10	194	2.00	.40
2	.50	.70	.50	.50	.40	.40	2.80	.50	.90	9.6	1.50	.40
3	.50	.60	.50	.50	.40	.40	2.60	.50	.80	2.6	1.20	.40
4	.50	.60	.40	.50	.40	.40	2.60	.50	.80	1.8	1.00	.30
5	.50	.50	.40	.50	.40	.40	2.30	.50	.70	1.4	.90	.30
6	.50	.60	.40	.50	.40	.40	22.00	.50	.70	291	.80	.30
7	.50	.60	.40	.50	.40	.40	4.80	.50	.70	13	.80	.30
8	.70	.60	.50	.50	.40	.40	2.20	.60	.70	5.5	.80	.30
9	.60	.60	.50	.40	.40	.40	1.50	.50	.60	4.0	.70	.30
10	.60	.60	.50	.40	.40	.40	4.90	.50	.60	2.4	.70	.30
11	.60	.50	.50	.40	.40	.50	2.20	.50	.50	1.7	.70	.30
12	.60	.50	.50	.40	.40	.50	1.40	11.00	.50	2.7	.60	.40
13	.50	.50	.50	.40	.40	.50	1.00	403.0	.50	2.2	.60	9.00
14	.50	.50	.50	.40	.40	.50	.80	62.00	.50	1.5	.60	2.00
15	.50	.50	.50	.40	.40	.50	.70	12.00	.50	1.2	.60	.60
16	.50	.50	.50	.40	.40	.50	.60	9.00	54.00	1.3	3.00	.50
17	.50	.50	.50	.50	.40	.50	.60	6.20	962.0	1.2	.60	2.10
18	.50	.50	.50	.50	.40	.50	3.40	4.50	12.00	1.1	.90	200.0
19	.50	.50	.50	.50	.40	2.20	1.70	3.50	3.70	1.0	.80	1.60
20	.50	.50	.50	.50	.40	8.00	1.20	2.90	2.00	1300	.70	22.00
21	.50	.50	.50	.50	.40	60.00	1.20	2.40	1.50	28	.60	4.00
22	.50	.40	.50	.50	.40	31.00	1.00	2.10	1.10	21	.60	2.00
23	.50	.40	.50	.50	.40	11.00	1.10	2.30	.90	10	.60	1.80
24	.50	.40	.50	.50	.40	4.60	1.00	2.00	.90	5.3	.50	1.60
25	.50	.40	.50	.50	.40	2.80	.90	1.70	15.00	3.9	.40	1.40
26	.50	.40	.50	.50	.40	2.30	.70	1.50	2.60	30	.50	1.30
27	.50	.40	.50	.40	.40	2.60	.70	2.00	1.30	3.5	.80	1.30
28	.50	.40	.50	.40	.40	2.90	.70	2.40	.90	2.3	16.00	1.20
29	.40	.50	.50	.40	---	2.50	.70	1.60	.80	2.1	1.20	1.10
30	.40	.50	.50	.40	---	2.60	.60	1.40	7.70	1.7	.50	1.10
31	.50	---	.50	.40	---	2.90	---	1.20	---	25	.40	---
MAX	.70	.70	.50	.50	.40	60	22	403	962	1300	16	200
MIN	.40	.40	.40	.40	.40	.40	.60	.50	.50	1.0	.40	.30

WTR YR 1978 MAX 1300 MIN .30

TOTAL PHOSPHORUS IN POUNDS PER DAY, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.90	1.20	.50	.20	.20	.30	9.1	1.2	1.00	.60	.90	4.9
2	1.00	1.20	.50	.20	.20	.30	11	1.8	.90	.60	.90	4.6
3	1.30	1.20	.70	.20	.20	.50	6.0	4.7	.90	.60	1.60	4.3
4	1.00	1.20	.60	.20	.20	.80	6.0	3.4	.90	.80	1.70	5.6
5	1.50	1.20	.60	.20	.20	.70	4.8	3.4	.90	.40	79.00	3.7
6	1.20	1.20	.50	.20	.20	.60	6.0	3.4	1.20	.80	7.20	3.4
7	1.00	1.00	.50	.20	.20	.70	3.5	3.2	.80	.80	2.00	3.9
8	1.00	1.00	.50	.20	.20	.60	3.4	2.9	.80	.70	2.00	3.9
9	2.00	1.00	.40	.20	.20	.50	3.0	2.5	.80	.70	40.00	3.7
10	1.80	1.00	.30	.20	.20	.50	2.4	2.2	1.20	.70	55.00	3.9
11	.80	1.00	.40	.20	.20	.50	2.6	2.3	.80	.70	4.60	3.2
12	1.20	.90	.40	.20	.20	.60	3.5	1.9	.80	.70	5.90	3.0
13	1.10	3.30	.40	.20	.20	.90	3.1	1.8	.70	.50	5.40	2.8
14	1.00	1.60	.40	.20	.20	1.20	2.4	1.7	.70	23.00	4.90	2.7
15	1.10	1.30	.40	.20	.20	1.00	2.0	1.5	.70	1.70	4.40	2.5
16	1.20	1.20	.40	.20	.20	1.00	1.9	1.4	.70	1.20	3.90	2.5
17	1.10	12.00	.40	.20	.20	1.00	1.8	1.4	.60	1.10	16.00	2.7
18	1.20	3.50	.40	.30	.20	11.00	1.5	1.5	.70	1.00	61.00	2.7
19	1.20	1.20	.40	.30	.20	114.0	1.5	2.1	.70	.90	9.10	2.3
20	1.20	.90	.40	.30	.20	65.00	1.6	1.5	.90	.90	33.00	2.7
21	1.30	.70	.50	.40	.20	40.00	1.5	1.3	.70	.90	11.00	2.3
22	1.20	.60	.30	.40	.20	52.00	1.3	1.3	.60	1.70	7.60	2.2
23	1.30	.90	.30	.30	.50	83.00	1.2	1.3	.60	1.00	8.40	2.3
24	1.40	.70	.30	.30	.40	49.00	1.2	1.2	.60	1.10	7.10	2.3
25	1.70	.60	.30	.30	.30	11.00	1.4	1.1	.50	1.40	6.20	2.3
26	1.60	.60	.30	.30	.30	9.10	2.0	1.2	.50	1.10	5.70	2.0
27	1.50	.60	.30	.30	.30	6.00	1.6	1.2	.50	.90	7.80	1.8
28	1.40	.50	.30	.20	.30	6.00	1.5	1.1	.60	.90	6.20	1.7
29	1.30	.60	.30	.20	---	18.00	1.6	1.0	.70	.90	8.10	2.0
30	1.30	.60	.30	.20	---	31.00	1.5	1.0	.70	2.60	5.40	1.7
31	1.30	---	.30	.20	---	15.00	---	1.0	---	1.10	4.90	---
MAX	2.0	12	.70	.40	.50	114	11	4.7	1.2	23	79	5.6
MIN	.80	.50	.30	.20	.20	.30	1.2	1.0	.50	.40	.90	1.7

WTR YR 1979 MAX 114 MIN .20

Table 19. Total orthophosphorus for Steiner Branch, 1978 and 1979 water years, in pounds.

TOTAL ORTHOPHOSPHORUS IN POUNDS, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.10	.10	.10	.10	.10	.10	.50	.30	.40	23	1.8	.10
2	.10	.20	.10	.10	.10	.10	.50	.20	.40	4.8	1.0	.10
3	.10	.20	.10	.10	.10	.10	.50	.20	.40	1.4	.60	.10
4	.10	.10	.10	.10	.10	.10	.50	.20	.30	.80	.50	.10
5	.10	.10	.10	.10	.10	.10	.40	.20	.30	.50	.40	.10
6	.10	.10	.10	.10	.10	.10	11	.20	.30	42	.30	.10
7	.10	.10	.10	.10	.10	.10	4.0	.20	.30	8.2	.30	.10
8	.20	.10	.10	.10	.10	.10	1.1	.30	.30	5.3	.30	.10
9	.20	.10	.10	.10	.10	.10	.70	.20	.30	3.0	.30	.10
10	.10	.10	.10	.10	.10	.10	2.6	.20	.30	1.2	.20	.10
11	.10	.10	.10	.10	.10	.10	1.1	.20	.20	.70	.20	.10
12	.10	.10	.10	.10	.10	.10	.70	2.1	.20	1.6	.20	.10
13	.10	.10	.10	.10	.10	.10	.50	73	.20	1.1	.20	1.4
14	.10	.10	.10	.10	.10	.10	.40	18	.20	.50	.20	1.6
15	.10	.10	.10	.10	.10	.10	.30	4.2	.20	.40	.20	.20
16	.10	.10	.10	.10	.10	.10	.30	3.1	8.0	.40	.50	.10
17	.10	.10	.10	.10	.10	.10	.30	2.2	205	.40	.20	.60
18	.10	.10	.10	.10	.10	.10	1.8	1.7	10	.30	.40	37
19	.10	.10	.10	.10	.10	.40	.80	1.3	2.3	.30	1.2	.20
20	.10	.10	.10	.10	.10	8.0	.60	1.1	.90	166	.20	9.0
21	.10	.10	.10	.10	.10	18	.60	1.0	.50	12	.20	1.7
22	.10	.10	.10	.10	.10	15	.40	.80	.30	9.0	.20	.40
23	.10	.10	.10	.10	.10	5.6	.50	.90	.20	7.0	.20	.20
24	.10	.10	.10	.10	.10	1.1	.50	.80	.20	5.0	.10	.10
25	.10	.10	.10	.10	.10	.50	.40	.70	15	4.2	.10	.10
26	.10	.10	.10	.10	.10	.40	.30	.60	1.4	6.5	.10	.10
27	.10	.10	.10	.10	.10	.50	.30	.80	.40	4.7	.30	.10
28	.10	.10	.10	.10	.10	.60	.30	1.0	.20	2.3	5.3	.10
29	.10	.10	.10	.10	---	.50	.30	.60	.20	1.8	.60	.10
30	.10	.10	.10	.10	---	.50	.30	.60	1.4	1.3	.10	.10
31	.10	---	.10	.10	---	.60	---	.50	---	6.0	.10	---
MEAN	.11	.11	.10	.10	.10	1.7	1.1	3.8	8.3	10	.53	1.8

WTR YR 1978 MEAN 2.4 MAX 205 MIN .10

TOTAL ORTHOPHOSPHORUS IN POUNDS, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.10	.20	.20	.10	.10	.10	3.6	.40	.30	.20	.30	.80
2	.20	.20	.20	.10	.10	.20	4.3	.80	.20	.20	.30	.70
3	.30	.20	.30	.10	.10	.20	2.5	1.4	.20	.20	.50	.70
4	.20	.20	.30	.10	.10	.30	2.5	1.0	.20	.20	.60	1.0
5	.40	.20	.20	.10	.10	.30	2.0	1.0	.30	.10	16	.50
6	.30	.20	.20	.10	.10	.30	2.5	1.0	.20	.10	3.6	.50
7	.20	.20	.20	.10	.10	.30	1.4	1.0	.20	.10	1.0	.60
8	.20	.20	.20	.10	.10	.20	1.5	.90	.20	.10	1.0	.60
9	.70	.20	.20	.10	.10	.20	1.3	.70	.20	.10	14	.50
10	.60	.20	.10	.10	.10	.20	1.1	.60	.30	.10	30	.60
11	.40	.20	.20	.10	.10	.20	1.2	.70	.20	.10	5.1	.40
12	.30	.10	.30	.10	.10	.30	1.5	.60	.20	.10	4.0	.40
13	.20	2.0	.20	.10	.10	.40	1.4	.50	.20	.10	3.0	.30
14	.20	.50	.20	.10	.10	.50	1.1	.50	.20	5.1	2.1	.30
15	.20	.30	.20	.10	.10	.50	.90	.40	.20	1.0	1.5	.30
16	.20	.20	.20	.10	.10	.40	.90	.40	.20	.40	1.0	.30
17	.20	4.4	.20	.10	.10	.50	.80	.40	.20	.40	5.9	.30
18	.20	2.0	.20	.10	.10	1.6	.70	.40	.20	.30	28	.30
19	.20	.60	.20	.10	.10	21	.70	.60	.20	.30	2.2	.20
20	.30	.40	.20	.10	.10	19	.80	.40	.20	.30	18	.30
21	.30	.30	.20	.10	.10	12	.70	.40	.20	.30	3.2	.20
22	.30	.30	.10	.10	.10	20	.60	.40	.20	.60	3.8	.20
23	.30	.40	.10	.10	.20	34	.60	.40	.20	.30	2.0	.20
24	.30	.30	.10	.10	.10	21	.60	.30	.20	.40	1.5	.20
25	.50	.20	.10	.10	.10	5.8	.70	.30	.20	.50	1.2	.20
26	.50	.20	.10	.10	.10	3.6	.90	.30	.20	.40	1.0	.20
27	.40	.20	.10	.10	.10	2.5	.70	.30	.20	.30	1.7	.20
28	.30	.20	.10	.10	.10	2.5	.40	.30	.20	.30	1.2	.10
29	.30	.20	.10	.10	---	6.7	.40	.30	.20	.30	1.8	.20
30	.30	.20	.10	.10	---	11	.40	.30	.20	.90	.90	.10
31	.30	---	.10	.10	---	5.8	---	.30	---	.40	.80	---
MEAN	.30	.51	.17	.10	.10	5.5	1.3	.56	.21	.46	5.1	.38

WTR YR 1979 MEAN 1.2 MAX 34 MIN .10

Table 20. Water temperatures of Steiner Branch, 1978 and 1979 water years.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	---	---	---	11.0	10.5	11.0	3.0	1.0	2.0	.5	.5	.5
2	---	---	---	12.0	10.5	11.0	3.5	1.0	2.5	.5	.5	.5
3	---	---	---	12.5	10.0	11.5	1.0	.5	.5	.5	.5	.5
4	---	---	---	10.0	8.0	9.0	1.0	.5	.5	.5	.5	.5
5	---	---	---	10.0	6.5	8.5	2.0	1.0	1.5	2.0	.5	1.0
6	---	---	---	10.5	10.0	10.0	1.5	.5	.5	3.0	1.5	2.5
7	---	---	---	11.5	10.5	11.0	.5	.5	.5	4.0	3.0	3.5
8	---	---	---	12.0	11.0	11.5	.5	.5	.5	3.5	.5	1.0
9	---	---	---	12.5	8.0	11.0	.5	.5	.5	.5	.5	.5
10	---	---	---	8.0	5.5	6.5	.5	.5	.5	.5	.5	.5
11	---	---	---	5.5	3.0	4.5	.5	.5	.5	.5	.5	.5
12	---	---	---	4.5	2.0	3.0	.5	.5	.5	.5	.5	.5
13	---	---	---	5.0	1.5	3.5	2.5	1.0	2.0	.5	.5	.5
14	---	---	---	7.0	3.0	5.0	3.5	2.5	3.0	.5	.5	.5
15	---	---	---	8.5	5.5	7.0	4.5	3.0	3.5	1.5	.5	1.0
16	---	---	---	7.5	5.0	6.0	5.0	3.0	4.5	1.5	1.0	1.0
17	---	---	---	5.5	3.5	5.0	5.5	5.0	5.0	1.5	1.0	1.0
18	---	---	---	6.0	4.5	5.0	5.0	5.0	5.0	2.0	1.0	1.5
19	---	---	---	6.0	4.5	5.0	5.0	3.5	4.5	2.5	2.0	2.0
20	---	---	---	9.0	5.0	7.0	3.5	1.0	2.0	2.0	1.5	2.0
21	---	---	---	4.5	1.5	2.5	2.5	1.0	1.5	2.0	1.0	1.5
22	---	---	---	3.5	1.0	2.5	2.5	.5	1.5	1.5	.5	1.0
23	---	---	---	5.0	1.5	3.5	2.5	.5	1.5	2.0	1.0	1.5
24	---	---	---	4.0	1.5	3.0	3.5	.5	1.5	2.0	1.0	2.0
25	12.0	11.0	11.5	1.0	.5	.5	.5	.5	.5	2.0	.5	1.5
26	11.0	10.0	10.5	1.0	.5	.5	.5	.5	.5	1.5	.5	1.0
27	13.0	10.0	11.5	.5	.5	.5	.5	.5	.5	1.0	.5	.5
28	11.5	8.0	9.5	.5	.5	.5	.5	.5	.5	1.0	.5	.5
29	11.0	8.0	9.5	1.0	.5	.5	.5	.5	.5	.5	.5	.5
30	11.0	8.0	9.5	1.0	.5	.5	2.0	.5	1.0	.5	.5	.5
31	11.0	9.5	10.0	---	---	---	2.0	.5	1.5	1.0	.5	.5
MONTH	13.0	8.0	10.5	12.5	.5	5.5	5.5	.5	1.5	4.0	.5	1.0

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	1.0	.5	.5	2.5	.5	1.5	13.0	6.5	9.5	15.0	4.5	9.5
2	1.0	.5	1.0	2.0	.5	1.0	7.0	3.5	4.5	16.0	5.0	10.0
3	1.5	.5	1.0	2.5	1.0	1.5	12.0	4.0	7.5	15.0	5.5	10.5
4	1.5	.5	1.0	1.0	.5	1.0	10.5	7.0	8.5	10.0	7.5	8.5
5	1.5	1.0	1.0	1.0	.5	1.0	8.5	4.0	6.5	9.0	6.5	7.5
6	1.0	.5	.5	3.0	1.0	2.0	9.0	6.0	7.5	14.5	5.0	9.5
7	1.0	.5	1.0	3.5	1.0	2.0	14.5	4.5	9.0	10.5	9.0	9.5
8	2.0	.5	1.5	3.5	1.0	2.0	8.5	5.5	6.5	17.0	9.0	12.0
9	2.0	1.5	1.5	3.5	1.0	2.0	12.5	5.0	8.5	12.5	9.0	10.5
10	1.0	.5	1.0	5.0	1.5	3.0	9.0	7.0	8.0	20.0	7.0	13.0
11	2.0	.5	1.0	5.0	3.0	4.0	11.5	5.5	8.0	18.5	12.0	15.0
12	2.5	1.0	2.0	5.0	3.0	4.0	14.0	5.0	9.0	19.5	13.0	16.0
13	2.0	1.0	1.5	4.5	2.5	3.5	12.5	4.5	8.0	14.5	9.5	11.0
14	2.0	.5	1.5	5.0	3.0	4.0	11.0	4.5	7.5	11.0	9.0	9.5
15	2.0	1.0	1.5	5.5	3.0	4.0	14.0	3.5	8.5	14.0	9.0	11.0
16	1.5	.5	1.0	6.0	1.5	3.5	14.0	4.5	9.0	13.0	10.0	11.5
17	1.0	.5	.5	5.5	.0	2.5	9.0	4.0	7.0	17.0	9.0	13.0
18	1.0	.5	.5	5.5	.0	3.0	10.0	5.5	7.5	21.0	10.0	15.0
19	1.0	.5	.5	7.0	1.5	3.5	7.5	6.5	7.0	20.5	11.0	15.5
20	1.5	.5	1.0	---	---	---	7.5	5.5	6.5	19.5	13.5	16.5
21	1.0	.5	.5	6.5	.5	2.5	14.0	4.0	8.5	21.0	11.0	15.5
22	1.0	.5	.5	7.0	1.0	3.0	12.0	3.5	8.0	18.0	11.0	14.5
23	2.5	1.0	1.5	8.5	1.0	4.5	12.0	7.0	9.0	15.0	13.0	14.0
24	3.0	1.5	2.5	5.0	.5	2.5	11.0	6.5	8.5	20.0	12.5	16.0
25	3.0	2.0	2.5	2.0	1.0	1.5	15.5	6.0	10.0	23.5	13.0	18.0
26	2.5	1.0	1.5	6.5	1.5	3.5	15.5	5.0	10.0	25.5	15.0	20.5
27	2.5	.5	1.5	4.5	1.0	2.0	16.0	5.5	10.5	24.0	15.5	19.5
28	3.5	2.0	2.5	8.5	4.5	6.5	17.5	6.5	12.0	23.5	16.0	19.5
29	---	---	---	10.0	2.0	6.0	14.0	9.0	11.5	24.0	16.0	19.5
30	---	---	---	11.0	5.0	7.5	15.5	6.0	10.0	21.0	14.5	18.0
31	---	---	---	14.5	4.5	9.5	---	---	---	23.5	13.5	18.5
MONTH	3.5	.5	1.0	14.5	.0	3.5	17.5	3.5	8.5	25.5	4.5	14.0

Table 20. Water temperatures of Steiner Branch, 1978 and 1979 water years.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	23.0	16.0	19.0	21.5	17.5	19.5	19.5	13.5	15.5	19.0	14.0	16.5
2	20.5	13.0	16.5	18.5	16.5	17.5	---	---	---	19.0	14.0	16.5
3	20.5	11.5	16.0	17.5	15.5	16.0	---	---	---	20.0	15.5	17.5
4	22.5	12.0	17.0	20.0	15.0	17.0	---	---	---	19.0	14.5	16.5
5	22.0	12.5	17.0	23.0	15.5	19.0	---	---	---	18.5	13.5	16.0
6	22.5	13.0	17.5	23.0	17.0	20.0	---	---	---	19.0	13.5	16.0
7	23.0	14.5	18.0	21.5	16.5	19.0	---	---	---	19.5	13.5	16.5
8	21.5	13.5	17.0	---	---	---	---	---	---	20.5	15.5	18.0
9	22.0	12.0	17.0	---	---	---	---	---	---	20.0	15.5	17.5
10	23.5	13.5	18.5	---	---	---	---	---	---	20.0	15.0	17.5
11	25.0	15.5	20.0	---	---	---	---	---	---	20.0	15.5	17.5
12	24.0	16.5	20.0	---	---	---	---	---	---	18.0	16.0	16.5
13	21.0	13.0	17.5	---	---	---	---	---	---	16.0	15.0	15.5
14	17.0	13.5	15.5	---	---	---	---	---	---	18.5	15.0	16.5
15	21.5	14.0	17.5	---	---	---	---	---	---	18.0	13.0	15.5
16	19.0	16.5	18.0	---	---	---	---	---	---	16.0	14.5	15.5
17	21.0	17.0	19.0	---	---	---	---	---	---	17.0	14.5	15.5
18	21.5	15.0	18.0	---	---	---	---	---	---	18.0	15.0	16.5
19	22.0	13.0	17.5	22.0	20.0	21.5	---	---	---	20.0	15.0	17.5
20	18.5	14.5	16.5	21.5	17.0	19.0	---	---	---	18.0	14.5	17.0
21	21.0	13.0	17.0	20.5	16.0	18.0	---	---	---	15.5	13.5	14.0
22	20.5	13.0	17.0	20.0	15.5	17.5	---	---	---	15.0	10.5	12.5
23	18.0	14.5	16.0	19.5	14.5	17.0	---	---	---	14.5	10.0	12.5
24	21.0	14.5	17.5	19.5	13.5	16.5	22.0	17.5	20.0	15.5	10.5	13.0
25	20.0	16.5	18.5	19.5	13.5	16.5	19.0	17.0	17.5	14.5	10.5	12.5
26	24.5	16.0	20.0	19.5	15.5	17.5	18.0	16.0	17.0	15.0	10.5	12.5
27	23.5	17.0	20.0	20.0	14.5	17.5	17.5	16.0	16.5	15.0	12.0	13.0
28	22.0	15.5	19.0	19.5	14.0	17.0	20.0	15.5	17.5	13.5	9.5	11.5
29	23.5	16.0	19.5	19.0	16.0	17.5	19.0	15.0	17.0	13.5	10.5	12.0
30	22.0	17.5	19.5	17.0	14.5	15.0	18.5	13.5	16.0	12.5	11.5	12.0
31	---	---	---	19.5	13.0	16.0	18.5	13.5	16.0	---	---	---
MONTH	25.0	11.5	18.0	23.0	13.0	17.5	22.0	13.5	17.0	20.5	9.5	15.5
YEAR	25.5	.0	8.5									

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	14.5	10.0	12.0	9.0	6.0	7.5	3.5	2.0	3.0	1.5	1.0	1.0
2	13.0	10.5	12.0	10.5	6.5	8.5	3.0	1.5	2.0	1.0	1.0	1.0
3	14.5	12.5	13.5	11.5	7.0	9.5	3.0	1.5	2.0	---	---	---
4	13.5	11.0	12.0	12.0	9.0	10.5	2.5	1.0	2.0	---	---	---
5	12.5	11.5	12.0	11.5	9.0	10.5	4.5	2.5	3.5	---	---	---
6	12.0	11.0	11.5	10.0	7.0	9.5	---	---	---	---	---	---
7	11.0	9.5	10.0	8.0	5.5	6.5	3.0	1.5	2.5	---	---	---
8	11.5	7.5	9.5	9.0	5.5	7.5	2.5	1.0	1.5	---	---	---
9	12.0	10.0	11.0	10.0	7.0	8.5	1.5	1.0	1.5	---	---	---
10	12.5	11.5	12.0	10.0	7.5	9.0	1.5	1.0	1.0	---	---	---
11	13.5	11.5	12.5	9.0	7.0	8.5	2.0	1.5	1.5	---	---	---
12	12.0	10.5	11.0	7.5	6.5	7.0	4.0	2.0	3.0	---	---	---
13	11.5	8.5	10.0	10.0	7.5	8.5	3.0	1.5	2.5	---	---	---
14	10.0	8.0	9.0	7.5	4.5	6.0	3.5	1.5	2.5	---	---	---
15	11.0	8.5	9.5	6.5	4.0	5.0	4.0	2.5	3.0	---	---	---
16	10.5	8.5	9.5	6.0	3.0	4.5	4.5	2.5	3.0	---	---	---
17	10.0	7.0	8.5	6.5	6.0	6.5	3.0	1.5	2.0	---	---	---
18	10.5	7.5	9.0	8.0	6.0	7.0	4.5	2.0	3.5	---	---	---
19	11.0	7.0	9.0	6.0	3.5	4.5	4.5	3.5	4.0	---	---	---
20	12.0	8.0	10.0	4.0	3.5	3.5	5.0	3.0	4.0	---	---	---
21	13.5	9.5	11.5	4.5	3.0	3.5	3.0	1.0	2.0	1.0	.5	1.0
22	12.0	11.0	11.5	4.0	2.5	3.5	3.5	2.0	2.5	2.0	1.0	1.5
23	11.0	8.5	10.0	6.0	3.0	4.5	4.5	2.0	3.5	2.5	1.5	2.0
24	10.0	6.5	8.5	5.5	3.0	4.0	4.5	2.0	4.0	1.5	1.0	1.0
25	11.0	9.5	10.0	4.0	2.0	3.0	2.5	1.0	2.0	1.0	1.0	1.0
26	10.5	8.0	9.5	5.0	3.5	4.0	2.0	1.0	1.5	1.5	1.0	1.0
27	10.5	7.0	8.5	6.0	4.0	5.0	1.5	1.0	1.5	3.0	1.5	2.5
28	9.5	6.5	8.0	4.5	2.0	2.5	2.0	1.5	1.5	3.5	2.0	3.0
29	10.0	7.5	9.0	6.0	2.0	4.0	3.0	2.0	2.5	3.0	1.0	2.5
30	11.0	8.0	9.5	2.5	1.0	2.0	3.0	1.5	2.5	2.5	1.0	1.5
31	10.5	7.5	9.0	---	---	---	1.5	1.0	1.0	2.0	1.0	1.5
MONTH	14.5	6.5	10.5	12.0	1.0	6.0	5.0	1.0	2.5	3.5	.5	1.5

Table 20. Water temperatures of Steiner Branch, 1978 and 1979 water years.

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	1.0	1.0	1.0	6.5	3.5	5.0	7.0	6.5	6.5	11.5	5.0	8.5
2	2.0	1.0	1.5	5.0	3.5	4.0	6.5	5.5	6.0	10.0	8.0	9.0
3	2.0	1.0	1.5	5.0	4.0	4.0	7.0	5.5	6.5	23.0	8.0	11.5
4	1.0	1.0	1.0	5.0	3.5	4.0	7.5	6.5	7.0	15.0	6.5	10.5
5	1.0	1.0	1.0	5.5	3.0	4.0	7.5	1.5	6.0	14.5	6.5	10.5
6	---	---	---	6.0	1.5	4.0	9.0	1.0	4.5	22.5	9.0	13.0
7	---	---	---	5.0	4.0	4.5	8.5	3.5	5.5	16.5	10.0	13.0
8	---	---	---	6.5	3.5	5.0	6.5	4.0	5.5	19.0	10.5	15.0
9	---	---	---	6.5	1.5	4.5	7.0	4.5	5.5	21.5	12.0	16.5
10	---	---	---	2.0	1.0	1.0	10.0	3.0	6.5	22.0	12.5	17.0
11	---	---	---	4.0	1.0	2.0	6.0	5.0	5.5	16.5	15.0	15.5
12	1.0	.5	1.0	6.5	1.0	3.0	14.5	5.5	10.0	---	---	---
13	2.5	1.0	1.5	8.5	---	---	12.0	7.0	9.0	---	---	---
14	2.5	1.0	2.0	5.5	1.0	3.5	11.5	5.0	8.0	16.0	12.0	14.0
15	2.5	2.0	2.5	5.5	1.0	2.5	13.5	6.5	9.5	18.0	8.5	13.0
16	2.0	1.0	1.5	7.5	1.0	4.0	14.0	5.0	9.5	18.0	7.5	13.0
17	1.0	1.0	1.0	5.5	3.5	5.0	15.0	5.5	10.0	20.0	10.5	15.0
18	1.0	1.0	1.0	8.0	3.5	6.0	14.5	6.0	10.5	17.5	13.0	15.5
19	1.0	1.0	1.0	4.5	3.0	3.5	9.5	7.5	8.5	20.0	12.5	15.5
20	---	---	---	7.0	3.0	4.5	10.5	8.0	9.5	19.0	10.0	14.5
21	---	---	---	7.0	4.0	5.0	15.0	9.0	11.5	17.0	8.5	12.5
22	---	---	---	7.5	4.0	6.0	17.0	7.0	11.5	12.5	8.5	11.0
23	---	---	---	6.5	5.0	6.0	17.0	7.5	12.5	12.5	9.5	11.0
24	---	---	---	5.0	2.5	3.5	12.0	9.5	11.0	9.5	7.5	8.0
25	2.5	.5	2.0	8.0	2.5	4.5	14.5	10.5	12.5	---	---	---
26	3.0	1.0	1.5	7.5	2.0	4.5	13.5	8.5	10.5	---	---	---
27	4.0	1.0	2.0	9.5	2.5	5.5	---	---	---	---	---	---
28	4.5	1.0	3.0	6.5	4.5	5.5	---	---	---	---	---	---
29	---	---	---	6.0	5.5	6.0	---	---	---	---	---	---
30	---	---	---	8.0	6.0	7.0	9.5	7.5	8.5	---	---	---
31	---	---	---	7.5	7.0	7.0	---	---	---	---	---	---
MONTH	4.5	.5	1.5	9.5	1.0	4.5	17.0	1.0	8.5	23.0	5.0	13.0

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	---	---	---	21.0	13.0	17.0	---	---	---	20.0	16.0	18.0
2	---	---	---	21.0	13.0	17.0	---	---	---	19.5	15.0	17.0
3	---	---	---	20.5	14.0	17.0	---	---	---	18.0	14.0	16.0
4	---	---	---	21.0	15.5	17.5	---	---	---	18.0	13.5	15.5
5	---	---	---	19.5	12.5	15.5	---	---	---	18.5	13.5	16.0
6	---	---	---	18.0	11.5	14.5	20.0	17.5	19.5	18.5	14.5	16.5
7	---	---	---	18.5	12.0	15.5	23.0	16.0	19.5	15.5	12.0	13.5
8	16.5	15.0	16.0	20.0	12.5	16.0	19.5	17.5	18.5	14.5	10.5	12.5
9	16.5	14.0	15.0	20.5	13.0	16.5	21.5	18.5	19.5	16.0	11.5	14.0
10	15.5	12.5	14.0	21.0	14.0	17.5	20.5	17.5	19.5	18.0	14.0	16.0
11	20.0	10.5	15.0	18.5	15.0	17.0	18.0	14.0	16.0	18.5	14.5	16.0
12	20.0	12.5	16.0	21.0	14.5	17.5	18.0	12.5	15.0	17.5	13.5	15.5
13	19.0	12.0	16.0	18.0	16.0	16.5	15.5	14.5	15.0	16.5	14.0	15.0
14	21.5	13.0	17.0	20.5	15.5	18.5	16.5	12.5	14.5	14.0	11.0	12.5
15	23.0	15.0	19.0	21.5	15.0	18.0	16.5	11.0	13.5	14.0	9.5	12.0
16	21.0	15.0	18.5	20.0	14.5	17.5	14.5	11.0	12.5	15.0	10.0	12.0
17	20.5	15.0	17.5	19.0	14.5	16.5	18.0	13.5	14.5	15.0	10.0	12.5
18	16.0	13.0	14.5	16.0	12.0	13.5	17.5	15.5	16.5	15.5	11.0	13.0
19	20.5	12.5	16.0	---	---	---	17.0	14.5	15.5	13.5	10.0	12.0
20	21.5	15.0	18.5	---	---	---	18.0	16.0	17.0	15.0	9.5	12.0
21	22.5	14.5	18.5	---	---	---	17.5	15.0	16.0	14.5	11.5	13.0
22	20.5	13.5	16.5	---	---	---	18.5	15.0	16.5	12.5	9.0	10.5
23	17.0	13.0	15.0	---	---	---	17.5	14.5	16.0	12.5	8.5	10.5
24	19.5	11.0	15.0	---	---	---	16.0	12.5	14.5	12.0	10.0	11.0
25	19.5	10.5	15.0	---	---	---	17.0	12.5	14.5	14.0	10.5	12.0
26	21.0	11.5	16.0	---	---	---	18.0	13.5	15.5	14.5	10.0	12.0
27	19.5	14.5	17.0	---	---	---	18.0	15.0	16.0	14.5	10.5	12.5
28	19.5	13.5	16.5	---	---	---	17.5	14.0	15.5	15.0	10.5	12.5
29	17.5	14.5	16.0	---	---	---	19.0	15.0	17.0	15.0	12.0	13.5
30	21.0	13.0	16.5	---	---	---	19.0	14.0	16.5	14.5	12.0	13.0
31	---	---	---	---	---	---	19.0	14.5	17.0	---	---	---
MONTH	23.0	10.5	16.5	21.5	11.5	16.5	23.0	11.0	16.0	20.0	8.5	13.5
YEAR	23.0	.5	9.5									

Table 21. Specific conductance of Steiner Branch, 1978 and 1979 water years.

SPECIFIC CONDUCTANCF (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	577	564	572	551	540	546	526	513	516
2	---	---	---	591	561	578	559	548	553	551	528	539
3	---	---	---	591	588	591	585	559	574	548	528	539
4	---	---	---	588	559	579	591	556	572	540	513	525
5	---	---	---	577	569	573	559	537	550	523	515	520
6	---	---	---	572	551	565	597	548	575	526	517	522
7	---	---	---	588	569	579	607	561	585	526	521	524
8	---	---	---	588	582	587	564	543	553	561	521	533
9	---	---	---	588	577	582	572	551	564	588	561	575
10	---	---	---	580	572	575	569	551	562	572	543	558
11	---	---	---	574	564	570	569	551	559	553	528	542
12	---	---	---	569	561	567	556	543	551	540	508	524
13	---	---	---	566	561	564	545	523	532	508	497	503
14	---	---	---	566	561	565	561	548	554	504	497	501
15	---	---	---	574	566	570	564	553	560	517	506	513
16	---	---	---	574	569	572	564	559	563	519	513	516
17	---	---	---	572	566	568	566	508	536	519	513	516
18	---	---	---	572	564	568	574	532	558	519	510	515
19	---	---	---	569	564	567	580	572	577	515	508	513
20	---	---	---	572	564	568	569	548	556	515	510	513
21	---	---	---	566	561	564	559	553	557	517	513	515
22	---	---	---	564	561	563	566	559	563	523	510	518
23	---	---	---	566	537	550	561	553	558	517	510	515
24	---	---	---	566	556	560	561	543	555	517	508	515
25	569	556	560	577	545	558	597	556	583	561	548	555
26	564	545	558	619	580	599	597	559	574	553	532	547
27	545	537	542	585	543	558	574	553	564	566	551	559
28	543	535	539	559	545	554	559	523	537	566	548	560
29	540	532	537	577	545	562	526	513	519	572	551	563
30	540	523	532	572	545	559	523	515	521	574	543	559
31	572	526	549	---	---	---	528	510	522	561	543	554
MONTH	572	523	545	619	537	570	607	508	556	588	497	531

SPECIFIC CONDUCTANCF (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	561	537	550	548	523	534	535	521	530	551	525	537
2	551	540	546	551	523	535	530	513	521	553	525	539
3	551	535	547	548	526	536	532	513	526	586	499	538
4	556	540	548	574	535	551	530	513	523	553	517	535
5	548	543	547	577	532	553	526	461	514	555	534	545
6	564	540	554	548	528	539	530	412	481	550	515	537
7	561	535	550	553	530	539	553	528	540	565	536	555
8	551	535	544	556	530	540	556	542	550	562	528	546
9	548	535	543	561	528	541	561	517	549	564	543	554
10	566	535	551	548	523	535	547	505	531	561	528	547
11	564	532	549	535	517	527	552	537	546	561	517	545
12	548	535	543	540	526	536	555	520	543	548	464	531
13	551	535	544	548	528	540	552	518	540	432	271	381
14	559	537	546	543	526	536	549	514	537	477	385	453
15	551	535	544	545	530	537	551	504	535	497	485	492
16	559	535	546	551	532	540	549	502	532	505	502	504
17	566	532	550	551	532	542	547	515	534	517	508	512
18	566	526	548	548	506	537	537	486	515	527	512	519
19	561	526	544	530	404	513	539	530	536	584	470	505
20	551	526	539	---	---	---	544	522	535	572	543	562
21	559	526	541	424	255	342	546	522	534	567	530	556
22	561	523	542	434	309	372	546	520	535	566	536	557
23	537	519	532	412	343	390	544	527	537	588	577	584
24	537	526	532	458	433	447	549	527	539	591	546	577
25	537	526	532	486	478	483	549	512	535	590	537	571
26	543	528	535	522	506	515	549	515	534	588	535	566
27	545	528	536	541	533	535	554	517	536	584	494	558
28	537	523	532	543	535	539	552	506	532	576	489	554
29	---	---	---	545	537	541	548	518	536	602	543	566
30	---	---	---	545	532	539	553	518	540	582	553	572
31	---	---	---	540	523	533	---	---	---	574	551	566
MONTH	566	519	543	577	255	515	561	412	533	602	271	538

Table 21. Specific conductance of Steiner Branch, 1978 and 1979 water years.

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	588	559	569	569	149	427	620	506	594	528	517	524
2	572	551	565	601	577	598	---	---	---	523	515	519
3	561	545	555	597	591	595	---	---	---	521	510	517
4	580	548	558	591	577	584	---	---	---	517	508	514
5	580	564	570	577	564	572	---	---	---	513	506	509
6	577	556	568	566	115	451	---	---	---	510	502	506
7	573	541	561	591	360	538	---	---	---	508	500	504
8	565	549	558	---	---	---	---	---	---	582	502	526
9	563	542	557	---	---	---	---	---	---	574	564	571
10	561	547	555	---	---	---	---	---	---	564	553	560
11	598	553	575	---	---	---	---	---	---	553	543	550
12	593	577	587	---	---	---	---	---	---	543	535	538
13	583	573	579	---	---	---	---	---	---	532	504	513
14	578	570	575	---	---	---	---	---	---	523	500	513
15	579	565	574	---	---	---	---	---	---	535	521	528
16	576	285	488	---	---	---	---	---	---	530	526	528
17	552	173	327	---	---	---	---	---	---	526	476	519
18	593	563	584	---	---	---	---	---	---	493	267	404
19	611	560	589	588	566	571	---	---	---	530	497	520
20	582	577	580	579	90	415	---	---	---	526	396	459
21	577	569	574	579	370	510	---	---	---	532	495	521
22	572	561	567	612	571	606	---	---	---	540	528	535
23	561	556	560	621	617	620	---	---	---	535	530	533
24	556	545	552	622	605	617	---	---	---	535	528	530
25	548	176	413	610	602	604	566	559	565	530	521	526
26	585	508	569	609	486	571	559	548	554	526	519	522
27	577	564	574	616	592	611	548	530	532	528	519	523
28	564	553	559	613	599	608	532	343	495	521	515	518
29	553	540	548	609	593	603	528	364	473	519	513	515
30	543	425	488	600	590	597	537	528	532	515	513	514
31	---	---	---	597	378	538	532	526	530	---	---	---
MONTH	611	173	549	622	90	562	620	343	534	582	267	519

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	600	593	596	549	546	548	563	557	561	563	554	558
2	595	585	591	552	547	550	560	554	558	560	554	556
3	591	585	589	553	548	551	555	544	549	---	---	---
4	596	589	592	554	547	550	556	545	550	---	---	---
5	591	587	588	553	548	551	565	557	561	---	---	---
6	596	592	593	554	545	549	---	---	---	---	---	---
7	592	587	590	548	544	546	563	500	561	---	---	---
8	592	585	588	551	547	548	562	560	560	---	---	---
9	590	585	586	552	550	550	565	561	563	---	---	---
10	598	588	593	551	549	550	577	557	568	---	---	---
11	601	596	599	552	550	551	576	567	571	---	---	---
12	642	553	596	551	547	549	598	536	568	---	---	---
13	595	584	589	548	526	535	571	566	569	---	---	---
14	585	579	583	553	538	547	578	570	574	---	---	---
15	580	575	579	556	550	554	577	569	573	---	---	---
16	579	571	576	555	548	552	576	568	572	---	---	---
17	572	567	571	556	493	516	575	570	571	---	---	---
18	573	568	571	553	522	542	574	569	572	---	---	---
19	571	566	569	554	549	552	573	570	572	---	---	---
20	570	567	569	555	552	554	572	567	571	---	---	---
21	571	560	567	558	553	557	571	568	569	557	487	555
22	569	564	567	559	552	557	573	567	570	563	559	561
23	567	557	563	555	551	554	574	566	570	567	562	565
24	563	558	560	559	552	554	571	563	568	575	564	570
25	567	564	566	557	549	554	572	562	568	581	577	579
26	568	554	561	561	558	559	574	563	567	587	583	584
27	561	555	557	559	557	559	591	565	578	597	589	594
28	556	551	554	558	550	553	567	554	562	628	595	601
29	555	550	553	566	555	561	560	552	558	596	588	594
30	556	551	553	558	554	556	558	553	555	596	589	593
31	554	548	551	---	---	---	561	555	556	623	557	592
MONTH	642	548	576	566	493	550	598	500	566	628	487	577

Table 21. Specific conductance of Steiner Branch, 1978 and 1979 water years.

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	612	585	598	569	556	564	497	476	486	583	554	572
2	588	586	587	592	536	562	504	493	499	586	508	562
3	597	579	589	574	528	552	533	494	514	537	511	528
4	618	569	606	548	530	538	542	520	532	536	514	528
5	619	616	618	572	548	560	597	544	567	530	508	522
6	---	---	---	574	569	571	604	578	595	529	503	519
7	---	---	---	572	564	567	601	590	595	528	510	522
8	---	---	---	569	559	564	595	576	587	541	526	536
9	---	---	---	564	543	555	575	565	569	562	545	554
10	---	---	---	569	537	554	569	558	564	573	561	566
11	---	---	---	572	521	546	568	552	561	574	574	574
12	571	528	563	540	523	531	567	554	560	---	---	---
13	577	569	572	532	504	520	569	556	564	---	---	---
14	578	562	574	521	508	514	565	549	560	573	519	568
15	579	571	575	537	513	523	567	548	560	572	557	563
16	582	572	575	530	510	520	561	538	552	570	547	559
17	599	575	587	523	510	516	549	531	540	574	558	565
18	589	562	577	510	376	472	541	526	533	564	548	558
19	574	574	574	376	337	349	536	527	532	560	547	553
20	---	---	---	489	398	453	544	535	539	559	537	549
21	---	---	---	524	456	492	543	532	538	547	532	539
22	---	---	---	504	397	460	537	518	529	539	531	536
23	---	---	---	472	429	449	525	510	518	544	536	540
24	---	---	---	500	447	481	529	514	523	541	537	539
25	570	521	568	535	511	523	521	500	515	---	---	---
26	583	558	572	592	489	547	518	497	509	---	---	---
27	579	561	570	569	548	556	---	---	---	---	---	---
28	571	564	566	553	502	521	---	---	---	---	---	---
29	---	---	---	509	406	456	---	---	---	---	---	---
30	---	---	---	454	430	445	577	564	569	---	---	---
31	---	---	---	474	446	459	---	---	---	---	---	---
MONTH	619	521	581	592	337	514	604	476	545	586	503	548

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---				---	---	---	525	521	523
2	---	---	---				---	---	---	519	514	516
3	---	---	---				---	---	---	513	507	510
4	---	---	---				---	---	---	---	---	---
5	---	---	---				---	---	---	---	---	---
6	---	---	---				624	572	619	---	---	---
7	---	---	---				628	619	625	---	---	---
8	572	553	564				619	528	567	---	---	---
9	569	553	563				597	272	439	---	---	---
10	558	520	531				541	350	478	---	---	---
11	535	522	530				589	572	584	---	---	---
12	526	511	521				631	620	626	---	---	---
13	513	504	510				654	577	612	---	---	---
14	510	495	504				612	601	609	---	---	---
15	506	486	497				626	607	616	---	---	---
16	504	493	496				635	462	488	---	---	---
17	499	488	494				517	395	495	---	---	---
18	492	488	490				555	410	509	---	---	---
19	501	488	494				593	580	586	---	---	---
20	498	485	493				612	539	572	---	---	---
21	507	487	497				618	611	614	---	---	---
22	---	---	---				637	578	606	---	---	---
23	---	---	---				614	611	613	---	---	---
24	---	---	---				608	595	601	---	---	---
25	---	---	---				592	580	585	---	---	---
26	---	---	---				588	577	582	---	---	---
27	---	---	---				572	564	568	---	---	---
28	---	---	---				575	566	570	---	---	---
29	---	---	---				558	536	547	---	---	---
30	---	---	---				544	539	542	---	---	---
31	---	---	---				536	528	532	---	---	---
MONTH	572	485	513				654	272	569	525	507	516
YEAR	654	272	553									

NOTE: NUMBER OF MISSING DAYS OF RECORD EXCEEDED 20% OF YEAR