STREAMFLOW AND SUSPENDED-SEDIMENT DISCHARGE FROM TWO SMALL WATERSHEDS IN SOUTHWESTERN WYOMING AND NORTHEASTERN UTAH, 1984

By L. W. Lenfest, Jr. and B. H. Ringen

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CONVERSION FACTORS

For use of readers who prefer to use metric units, conversion factors for terms used in this report are listed below:

Multiply	By	To obtain
foot	0.3048	meter
mile	1.609	kilometer
square foot	0.0929	square meter
square mile	2.590	square kilometer
foot per second	0.3048	meter per second
cubic foot per second	0.02832	cubic meter
ton (short) per day	0.9072	megagram per day

Temperature in degrees Celsius (^{o}C) can be converted to degrees Fahrenheit (^{o}F) as follows:

$$^{o}F = 9/5\ (^{o}C) + 32$$

STREAMFLOW AND SUSPENDED-SEDIMENT DISCHARGE FROM TWO SMALL WATERSHEDS IN SOUTHWESTERN WYOMING AND NORTHEASTERN UTAH, 1984

By L. W. Lenfest, Jr. and B. H. Ringen

ABSTRACT

Two adjacent watersheds with different levels of development were studied. A high level of minerals development was occurring in the Thief Creek drainage basin; little or no development was occurring in the Chicken Creek drainage basin.

Streamflow, suspended-sediment, water temperature, and specific conductance data were collected from both drainage basins during May through September, 1984. Water samples were analyzed for common characteristics and constituents, and also for trace metals, iron, and manganese. The data are summarized in this report.

INTRODUCTION

Accelerated erosion, resulting from mineral exploration and production in southwestern Wyoming, has caused concern that excessive sediment will be carried by streams. Excessive sediment concentrations can have detrimental effects on the ecosystem of streams.

Streamflow and suspended-sediment data were collected in cooperation with the Wyoming Department of Environmental Quality from two adjacent watersheds located along the Wyoming-Utah border about 15 miles south of Evanston, Wyoming (fig. 1). One watershed drained by Thief Creek has been greatly impacted by oil and gas exploration. The other watershed drained by Chicken Creek has been impacted to a lesser degree or not at all.

DATA COLLECTION

Data were collected near the mouth of Thief Creek and Chicken Creek where they are crossed by Yellow Creek Road. Each data-collection site was equipped with a staff gage for measurement of stream stage.

Data were collected periodically at the two sites from May through September, 1984. During visits to each of the two stream sites, stream stage, streamflow, water temperature, and specific conductance were measured; and suspended-sediment samples were collected. Summaries of the discharge measurements from Thief Creek and Chicken Creek are listed in tables 1 and 2. Water samples for chemical analysis were collected on May 16 and 25. Photographs of the data-collection sites are shown in figure 2. Photographs of development within the Thief Creek drainage basin are shown in figure 3.

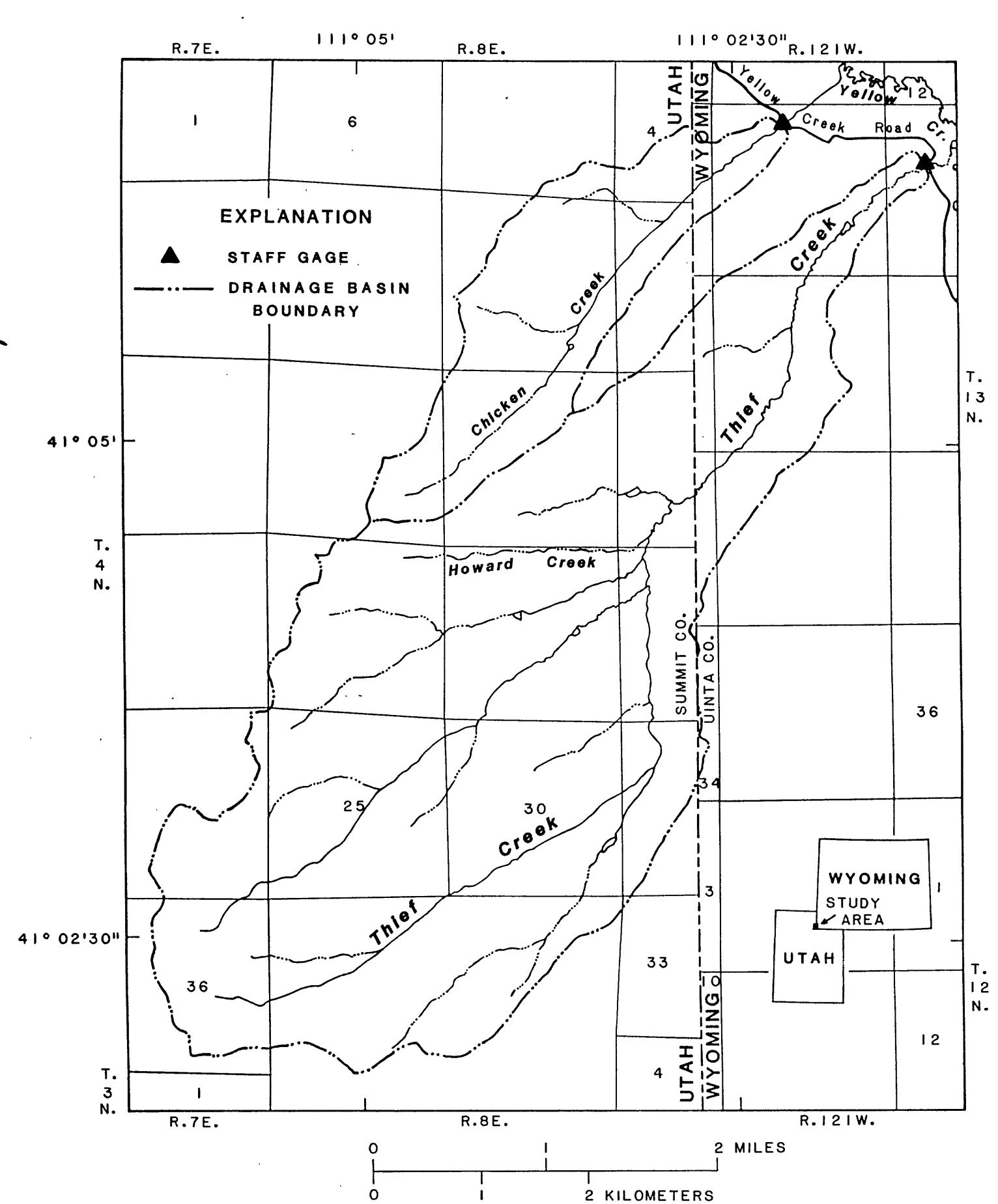

Figure 1.--Location of the study area.

Table 1.--Summary of discharge measurements made during 1984 at Thief Creek near Millis
[PZF, point of zero flow]

Measurement number	Date	Made by	Stream width (feet)	Cross-sectional area (square feet)	Mean velocity (feet per second)	Stream atage (feet)	Discharge (cubic feet per second)	Shift adjustment (feet)	Difference (percent)	Method	Number of measurement sections	Stream stage change (feet)	Time (hour)	Measurement rated	Remarks
1	May 15	B. H. Ringen	11.7	14.1	2.47	1.72	34.8	0.00	+3.9	0.6	31	0	0.58	Good	Control clear
2	May 17	do.	11.0	11.5	2.43	1.44	28.0	.00	+1.8	.6	25	0	.50	Good	Do.
3	May 18	do.	16.0	16.0	1.58	1.34	25.2	.00	.0	.6	28	0	.42	Good	Do.
4	May 19	do.	17.0	14.4	1.61	1.26	23.2	.00	-.4	.6	25	0	.42	Good	Do.
5	May 22	do.	14.2	13.4	1.51	1.12	20.2	.00	+3.0	.6	30	0	.58	Good	Do.
6	May 25	H. W. Kennedy	13.8	11.2	1.54	1.02	17.2	.00	+1.2	.6	25	0	.50	Good	Do.
7	June 2	B. H. Ringen	15.0	7.85	1.49	.85	11.7	.00	-1.7	.6	31	0	.58	Good	Do.
8	June 25	do.	15.0	6.24	.96	.69	5.97	.00	+.8	.5,.6	27	0	.50	Good	Do.
9	Aug. 14	do.	6.3	2.12	.68	.61	1.45	-.15	-3.3	.5,.6	22	0	.42	Good	A little moss
10	Oct. 3	do.	6.0	1.84	.96	.62	1.76	-.14	+2.3	.5,.6	21	0	.33	Fair	Moss in channel, PZF = 0.16 foot

Table 2.--Summary of discharge measurements made during 1984 at Chicken Creek near Millis
[PZF, point of zero flow]

Measurement number	Date	Made by	Stream width (feet)	Cross-sectional area (square feet)	Mean velocity (feet per second)	Stream stage (feet)	Discharge (cubic feet per second)	Shift adjustment (feet)	Difference (percent)	Method	Number of measurement sections	Stream stage change (feet)	Time (hour)	Measurement rated	Remarks
1	May 16	B. H. Ringen	2.7	1.77	2.62	1.98	4.64	0.00	-1.7	0.6	10	0	0.17	Fair	Control clear
2	May 18	do.	2.7	1.52	2.28	1.86	3.47	.00	-4.9	.6	10	0	.17	Good	
3	May 19	do.	2.7	1.64	2.04	1.83	3.35	.00	-.9	.6	10	0	.17	Good	Control clear
4	May 22	do.	3.0	1.80	1.76	1.80	3.16	.00	+1.3	.6	11	0	.17	Good	Do.
5	May 23	H. W. Kennedy	3.9	1.60	1.76	1.77	2.82	.00	-1.4	.6	14	0	.33	Good	
6	May 24	do.	3.3	1.83	1.70	1.81	3.12	.00	-2.8	.6	12	0	.25	Fair	
7	May 25	do.	3.3	1.82	1.72	1.81	3.13	.00	-2.5	.6	12	0	.25	Fair	
8	May 26	do.	3.3	1.75	1.62	1.75	2.83	.00	+5.2	.6	12	0	.25	Good	Control clear
9	June 2	B. H. Ringen	2.6	1.46	1.70	1.72	2.48	.00	+2.1	.6	9	0	.17	Good	Do.
10	June 25	do.	2.1	1.30	1.02	1.59	1.32	.00	-2.2	.5,.6	8	0	.25	Good	Do.
11	Aug 14	do.	1.5	.56	1.24	1.57	.70	-.10	.0	.6	6	0	.17	Fair	Some grass
12	Oct 3	do.	1.5	.31	1.35	1.44	.42	-.06	-2.4	.6	6	0	.17	Fair	Algae, PZF = 1.04 feet

Upstream view of Thief Creek

Downstream view of Chicken Creek

Figure 2.--Data-collection sites.

Figure 3.--Development in the Thief Creek drainage basin.

A local resident was hired to assist with the collection of suspended-sediment samples. He recorded stream-stage and water-temperature measurements at the time each sample was taken. Measurements and samples were collected on an approximately daily basis from May 15 through June 30; after June 30, the frequency of collection was reduced to approximately every other day.

DATA ANALYSIS

Mean daily discharge for each site was determined from a stage-discharge relationship and the mean daily stream stage, which was estimated from once-daily or less-frequent stage observations. The stage-discharge relationships (tables 3 and 4) were determined by relating stream stage, which was measured using the staff gages, to the measured stream discharge. Daily mean discharges are listed for Thief Creek (table 5) and Chicken Creek (table 6).

Daily mean suspended-sediment concentrations were determined by plotting the sample concentrations of the water-sediment mixture for each site and constructing continuous concentration graphs. The daily mean suspended-sediment concentrations are listed for Thief Creek (table 5) and Chicken Creek (table 6).

Hydrographs of daily mean discharge and suspended-sediment concentrations are shown for Thief Creek (fig. 4) and Chicken Creek (fig. 5). Suspended-sediment concentrations exceeded 100 milligrams per liter in Thief Creek for only a short time, but did not exceed 100 milligrams per liter in Chicken Creek.

A hydrograph (fig. 6) shows the suspended-sediment concentrations at each site. Concentrations in Thief Creek are generally higher than in Chicken Creek.

Daily suspended-sediment discharges (tables 5 and 6) for the streams were computed by multiplying the daily mean suspended-sediment concentrations by the daily mean discharges and a conversion factor of 0.0027. Hydrographs showing both stream discharge and suspended-sediment discharge for Thief Creek are shown in figure 7 and for Chicken Creek in figure 8.

Water samples collected from Thief Creek and Chicken Creek on May 16 were analyzed for common characteristics and constituents, and also for trace metals, iron, and manganese; samples collected on May 25 were analyzed for common characteristics and constituents only. A summary of these analyses is shown in table 7.

Table 3.--Stage-discharge relationship at Thief Creek near Millis

Stream stage (feet)	Discharge (cubic feet per second)	Stream stage (feet)	Discharge (cubic feet per second	Stream stage (feet)	Discharge (cubic feet per second
0.45	1.40	1.00	16.4	1.50	28.8
.46	1.50	1.01	16.7	1.51	29.0
.47	1.61	1.02	17.0	1.52	29.3
.48	1.72	1.03	17.3	1.53	29.5
.49	1.83	1.04	17.6	1.54	29.7
		1.05	17.8	1.55	29.9
.50	1.95	1.06	18.1	1.56	30.1
.51	2.07	1.07	18.4	1.57	30.4
.52	2.19	1.08	18.7	1.58	30.6
.53	2.31	1.09	18.9	1.59	30.8
.54	2.44				
.55	2.58	1.10	19.2	1.60	31.0
.56	2.73	1.11	19.5	1.61	31.2
.57	2.89	1.12	19.7	1.62	31.4
.58	3.05	1.13	20.0	1.63	31.6
.59	3.22	1.14	20.2	1.64	31.9
		1.15	20.5	1.65	32.1
.60	3.40	1.16	20.8	1.66	32.3
.61	3.60	1.17	21.0	1.67	32.5
.62	3.81	1.18	21.3	1.68	32.7
.63	4.04	1.19	21.5	1.69	32.9
.64	4.29				
.65	4.56	1.20	21.8	1.70	33.1
.66	4.86	1.21	22.0	1.71	33.3
.67	5.19	1.22	22.3	1.72	33.5
.68	5.54	1.23	22.5	1.73	33.7
.69	5.92	1.24	22.8	1.74	33.9
		1.25	23.0	1.75	34.1
.70	6.30	1.26	23.3	1.76	34.4
.71	6.73	1.27	23.5	1.77	34.6
.72	7.15	1.28	23.7	1.78	34.8
.73	7.56	1.29	24.0	1.79	35.0
.74	7.95				
.75	8.34	1.30	24.2	1.80	35.2
.76	8.72	1.31	24.5	1.81	35.4
.77	9.10	1.32	24.7	1.82	35.6
.78	9.46	1.33	24.9	1.83	35.8
.79	9.82	1.34	25.2	1.84	36.0
		1.35	25.4	1.85	36.2
.80	10.2	1.36	25.6	1.86	36.4
.81	10.5	1.37	25.9	1.87	36.6
.82	10.9	1.38	26.1	1.88	36.8
.83	11.2	1.39	26.3	1.89	37.0
.84	11.5				
.85	11.9	1.40	26.6	1.90	37.2
.86	12.2	1.41	26.8	1.91	37.4
.87	12.5	1.42	27.0	1.92	37.6
.88	12.8	1.43	27.3	1.93	37.8
.89	13.2	1.44	27.5	1.94	38.0
		1.45	27.7	1.95	38.2
.90	13.5	1.46	27.9	1.96	38.3
.91	13.8	1.47	28.2	1.97	38.5
.92	14.1	1.48	28.4	1.98	38.7
.93	14.4	1.49	28.6	1.99	38.9
.94	14.7				
.95	15.0			2.00	39.1
.96	15.3				
.97	15.6				
.98	15.9				
.99	16.2				

Table 4.--Stage-discharge relationship at Chicken Creek near Millis

Stream stage (feet)	Discharge (cubic feet per second)	Stream stage (feet)	Discharge (cubic feet per second)
1.30	0.24	1.66	1.92
1.31	.26	1.67	2.01
1.32	.28	1.68	2.09
1.33	.30	1.69	2.18
1.34	.32		
1.35	.34	1.70	2.26
1.36	.36	1.71	2.35
1.37	.38	1.72	2.43
1.38	.41	1.73	2.52
1.39	.44	1.74	2.60
		1.75	2.69
1.40	.46	1.76	2.78
1.41	.49	1.77	2.86
1.42	.52	1.78	2.95
1.43	.55	1.79	3.04
1.44	.58		
1.45	.62	1.80	3.12
1.46	.66	1.81	3.21
1.47	.70	1.82	3.30
1.48	.74	1.83	3.38
1.49	.78	1.84	3.47
		1.85	3.56
1.50	.82	1.86	3.65
1.51	.87	1.87	3.74
1.52	.92	1.88	3.83
1.53	.98	1.89	3.91
1.54	1.03		
1.55	1.09	1.90	4.00
1.56	1.15	1.91	4.09
1.57	1.22	1.92	4.18
1.58	1.28	1.93	4.27
1.59	1.35	1.94	4.36
		1.95	4.45
1 60	1.43	1.96	4.54
1.61	1.51	1.97	4.63
1.62	1.59	1.98	4.72
1.63	1.67	1.99	4.81
1.64	1.76		
1.65	1.84	2.00	4.90

Table 5.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Thief Creek

[Drainage area is 9.51 square miles; Microsiemens, microsiemens per centimeter at 25 degrees Celsius; Per sq mile, surface-water discharge or suspended-sediment discharge per square mile; Average, average surface-water discharge or average suspended-sediment discharge; Weighted-average concentration, total suspended-sediment discharge divided by total surface-water discharge and a constant]

May

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	--	--	--	--	--
2	--	--	--	--	--
3	--	--	--	--	--
4	--	--	--	--	--
5	--	--	--	--	--
6	--	--	--	--	--
7	--	--	--	--	--
8	--	--	--	--	--
9	--	--	--	--	--
10	--	--	--	--	--
11	--	--	--	--	--
12	--	--	--	--	--
13	--	--	--	--	--
14	--	--	--	--	--
15	34	63	5.8	7.0	--
16	32	78	6.7	7.5	705
17	28	55	4.2	10.0	760
18	25	56	3.8	--	--
19	23	52	3.2	11.0	900
20	22	54	3.2	14.0	800
21	22	55	3.3	12.0	775
22	20	46	2.5	10.0	800
23	18	55	2.7	12.0	880
24	17	59	2.7	10.0	860
25	16	51	2.2	10.0	860
26	15	54	2.2	9.0	900
27	14	56	2.1	--	--
28	14	56	2.1	--	--
29	13	56	2.0	--	--
30	13	56	2.0	--	--
31	12	57	1.8	--	--

Table 5.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Thief Creek--Continued

June

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	12	57	1.8	--	--
2	12	56	1.8	12.0	1000
3	10	72	1.9	12.0	1100
4	10	105	2.8	10.5	969
5	14	126	4.8	10.0	1090
6	14	92	3.5	8.5	929
7	14	122	4.6	8.0	777
8	15	105	4.2	8.0	788
9	15	111	4.5	12.5	815
10	13	119	4.2	10.0	794
11	15	91	3.7	11.5	764
12	14	82	3.1	14.0	844
13	10	89	2.4	16.0	850
14	10	101	2.7	--	--
15	9.8	102	2.7	16.0	798
16	9.5	128	3.3	15.5	850
17	10	128	3.5	17.0	833
18	9.1	138	3.4	16.5	816
19	9.1	115	2.8	17.0	839
20	8.7	90	2.1	19.0	899
21	8.3	94	2.1	19.0	870
22	8.0	90	1.9	19.5	853
23	6.7	71	1.3	20.5	805
24	5.2	52	0.73	21.0	825
25	5.5	53	.79	20.5	745
26	5.9	41	.65	20.5	823
27	5.9	32	.51	21.0	841
28	5.9	29	.46	--	--
29	5.5	28	.42	--	--
30	5.2	21	.29	20.0	936
Total	296.3		72.95		
Per sq mile	31.2		7.67		
Average	9.9		2.43		
Weighted-average concentration		91			

Table 5.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Thief Creek--Continued

July

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	4.9	13	0.17	21.0	843
2	4.0	11	.12	--	--
3	4.0	12	.13	19.5	861
4	4.0	10	.11	--	--
5	3.8	32	.33	21.5	866
6	3.6	33	.32	--	--
7	3.6	47	.46	20.0	902
8	3.8	38	.39	--	--
9	3.8	30	.31	--	--
10	3.4	36	.33	--	--
11	3.4	36	.33	--	--
12	3.4	38	.35	--	--
13	3.2	38	.33	24.0	910
14	3.0	37	.30	--	--
15	3.0	52	.42	24.0	913
16	3.0	44	.36	--	--
17	2.9	38	.30	20.0	979
18	2.7	56	.41	--	--
19	2.6	82	.58	20.0	971
20	2.3	90	.56	--	--
21	2.2	95	.56	--	--
22	2.2	98	.58	--	--
23	2.3	94	.58	20.0	1030
24	2.4	80	.52	--	--
25	2.6	69	.48	20.0	1040
26	2.4	73	.47	--	--
27	2.6	85	.60	20.0	1000
28	2.6	86	.60	--	--
29	2.7	83	.61	--	--
30	2.9	77	.60	--	--
31	2.9	68	.53	19.0	972
Total	96.2		12.74		
Per sq mile	10.1		1.34		
Average	3.1		0.41		
Weighted-average concentration		49			

Table 5.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Thief Creek--Continued

August

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	2.9	58	0.45	--	--
2	2.7	56	.41	19.0	1030
3	2.7	56	.41	--	--
4	2.6	60	.42	19.0	956
5	2.3	69	.43	--	--
6	2.3	70	.43	19.0	980
7	2.0	59	.32	--	--
8	1.7	50	.23	20.0	1100
9	1.6	46	.20	--	--
10	1.6	50	.22	20.0	1100
11	1.6	52	.22	--	--
12	1.5	48	.19	20.0	1100
13	1.5	50	.20	--	--
14	1.6	65	.28	18.0	1130
15	1.8	69	.34	--	--
16	2.4	59	.38	19.5	1040
17	2.4	40	.26	--	--
18	2.3	25	.16	20.0	1010
19	2.2	23	.14	--	--
20	2.3	29	.18	20.0	1040
21	2.3	28	.17	--	--
22	2.3	23	.14	20.0	1080
23	2.2	17	.10	--	--
24	2.2	11	.07	16.0	1040
25	2.2	9	.05	--	--
26	2.2	12	.07	--	--
27	2.3	11	.07	--	--
28	2.3	11	.07	--	--
29	2.2	11	.07	--	--
30	2.2	12	.07	--	--
31	2.2	15	.09	--	--
Total	66.6		6.84		
Per sq mile	7.0		0.72		
Average	2.2		0.22		
Weighted-average concentration		38			

Table 5.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Thief Creek--Continued

September

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	2.2	19	0.11	18.0	1070
2	2.2	18	.11	--	--
3	2.3	16	.10	19.0	1090
4	2.3	18	.11	--	--
5	2.3	23	.14	18.0	1060
6	2.3	24	.15	--	--
7	2.3	22	.14	18.0	1030
8	2.4	20	.13	--	--
9	2.4	20	.13	18.5	1050
10	2.4	20	.12	--	--
11	2.4	12	.08	17.0	1060
12	2.4	5	.03	--	--
13	2.4	2	.01	17.0	1050
14	2.4	4	.03	--	--
15	2.4	10	.06	18.0	1100
16	2.6	19	.13	--	--
17	2.7	25	.18	19.5	1110
18	2.9	28	.22	--	--
19	2.7	31	.23	12.5	1070
20	2.6	32	.22	--	--
21	2.6	30	.21	13.0	1010
22	2.3	29	.18	--	--
23	2.3	28	.17	10.5	1210
24	2.2	38	.23	--	--
25	2.2	60	.36	11.0	1180
26	2.2	56	.33	--	--
27	2.2	52	.31	11.0	1210
28	2.2	53	.31	--	--
29	2.2	55	.33	13.0	1260
30	2.2	54	.32	--	--
Total	71.9		5.18		
Per sq mile	7.6		0.54		
Average	2.4		0.17		
Weighted-average concentration		27			

Table 6.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Chicken Creek

[Drainage area is 1.87 square miles; Microsiemens, microsiemens per centimeter at 25 degrees Celsius; Per sq mile, surface-water discharge or suspended-sediment discharge per square mile; Average, average surface-water discharge or average suspended-sediment discharge; Weighted-average concentration, total suspended-sediment discharge divided by total surface-water discharge and a constant]

May

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	--	--	--	--	--
2	--	--	--	--	--
3	--	--	--	--	--
4	--	--	--	--	--
5	--	--	--	--	--
6	--	--	--	--	--
7	--	--	--	--	
8	--	--	--	--	--
9	--	--	--	--	--
10	--	--	--	--	--
11	--	--	--	--	--
12	--	--	--	--	--
13	--	--	--	--	--
14	--	--	--	--	--
15	4.7	9	0.11	--	--
16	4.6	16	.20	--	760
17	3.6	30	.29	6.0	785
18	3.6	59	.57	11.0	800
19	3.4	50	.46	10.0	810
20	3.1	56	.47	11.5	760
21	3.1	51	.43	12.0	800
22	3.1	40	.33	9.0	850
23	2.9	49	.38	10.5	920
24	3.1	42	.35	10.0	870
25	3.3	55	.49	--	840
26	2.8	70	.53	8.5	860
27	2.7	53	.39	--	--
28	2.6	51	.36	--	--
29	2.5	60	.41	--	--
30	2.5	64	.43	--	--
31	2.4	63	.41	--	--

Table 6.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Chicken Creek--Continued

June

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	2.4	63	0.41	--	--
2	2.4	59	.38	13.0	850
3	2.4	63	.41	12.0	855
4	2.4	73	.47	8.5	739
5	3.4	78	.72	8.0	879
6	2.4	72	.47	8.5	790
7	2.8	90	.68	8.0	812
8	3.1	46	.39	8.0	689
9	2.9	42	.33	13.0	781
10	2.7	36	.26	10.0	705
11	2.7	44	.32	9.5	696
12	2.1	47	.27	16.5	728
13	2.1	56	.32	15.5	717
14	2.4	47	.30	--	--
15	2.0	80	.43	16.5	835
16	1.9	93	.48	15.0	745
17	1.9	73	.37	18.0	814
18	1.8	63	.31	17.5	939
19	1.9	56	.29	18.0	867
20	1.9	60	.31	19.0	828
21	1.6	74	.32	19.0	863
22	1.5	71	.29	17.5	787
23	1.4	52	.20	--	--
24	1.2	26	.08	21.0	721
25	1.3	49	.17	22.0	865
26	1.2	20	.06	19.0	725
27	1.2	4	.01	19.0	725
28	1.0	5	.01	--	--
29	1.1	8	.02	--	--
30	1.1	10	.03	18.0	746
Total	60.2		9.11		
Per sq mile	32.2		4.87		
Average	2.0		0.30		
Weighted-average concentration		56			

Table 6.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Chicken Creek--Continued

July

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	0.87	6	0.01	21.0	752
2	.74	5	.01	--	--
3	.74	15	.03	20.0	747
4	.74	37	.07	--	--
5	.74	49	.10	19.5	750
6	.70	52	.10	--	--
7	.58	51	.08	20.0	773
8	.52	49	.07	--	--
9	.52	46	.06	--	--
10	.52	42	.06	--	--
11	.55	38	.06	--	--
12	.55	28	.04	--	--
13	.52	23	.03	23.0	816
14	.52	31	.04	--	--
15	.52	63	.09	24.0	779
16	.52	63	.09	--	--
17	.52	57	.08	20.0	816
18	.46	53	.07	--	--
19	.46	51	.06	19.0	803
20	.46	36	.04	--	--
21	.46	35	.04	--	--
22	.46	35	.04	--	--
23	.44	35	.04	20.0	854
24	.44	35	.04	--	--
25	.44	42	.05	20.0	837
26	.44	44	.05	--	--
27	.46	42	.05	20.0	864
28	.46	38	.05	--	--
29	.49	36	.05	--	--
30	.52	35	.05	--	--
31	.55	34	.05	19.0	828
Total	16.91		1.70		
Per sq mile	9.04		0.91		
Average	0.55		0.05		
Weighted-average concentration		37			

Table 6.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Chicken Creek--Continued

August

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	0.55	33	0.05	--	--
2	.52	28	.04	19.0	886
3	.52	25	.04	--	--
4	.52	30	.04	19.0	841
5	.52	34	.05	--	--
6	.55	30	.04	19.0	929
7	.52	28	.04	--	--
8	.52	36	.05	17.5	919
9	.52	35	.05	--	--
10	.52	17	.02	18.0	935
11	.52	7	.01	--	--
12	.46	7	.01	20.0	889
13	.49	10	.01	--	--
14	.62	15	.03	21.0	880
15	.62	13	.02	--	--
16	.55	13	.02	15.5	824
17	.74	21	.04	--	--
18	.66	30	.05	15.5	818
19	.55	30	.04	--	--
20	.62	38	.06	16.0	804
21	.62	37	.06	--	--
22	.62	36	.06	15.5	837
23	.66	37	.07	--	--
24	.66	35	.06	20.0	811
25	.66	33	.06	--	--
26	.66	33	.06	--	--
27	.66	34	.06	--	--
28	.66	32	.06	--	--
29	.66	33	.06	--	--
30	.66	33	.06	--	--
31	.66	33	.06	--	--
Total	18.27		1.38		
Per sq mile	9.77		0.74		
Average	0.59		0.04		
Weighted-average concentration		28			

Table 6.--Streamflow, suspended-sediment concentration, suspended-sediment discharge, water temperature, and specific conductance for Chicken Creek--Continued

September

Day	Surface-water discharge (cubic feet per second)	Suspended-sediment concentration (milligrams per liter)	Suspended-sediment discharge (tons per day)	Water temperature (degrees Celsius)	Specific conductance (microsiemens)
1	0.66	33	0.06	16.5	858
2	.70	38	.07	--	--
3	.70	56	.11	16.5	865
4	.66	56	.10	--	--
5	.66	52	.09	15.5	814
6	.66	45	.08	--	--
7	.62	37	.06	16.0	843
8	.58	28	.04	--	--
9	.58	19	.03	16.5	892
10	.58	21	.03	--	--
11	.55	34	.05	16.5	843
12	.52	21	.03	--	--
13	.46	5	.01	16.5	842
14	.41	4	.00	--	--
15	.41	14	.02	17.0	933
16	.41	20	.02	--	--
17	.41	20	.02	17.0	876
18	.38	21	.02	--	--
19	.38	25	.03	12.0	869
20	.38	30	.03	--	--
21	.34	30	.03	12.0	836
22	.24	34	.02	--	--
23	.28	49	.04	10.0	800
24	.38	50	.05	--	--
25	.36	35	.03	10.0	808
26	.32	26	.02	--	--
27	.34	27	.02	11.0	892
28	.38	31	.03	--	--
29	.36	34	.03	12.0	920
30	.32	35	.03	--	--
Total	14.03		1.20		
Per sq mile	7.50		0.64		
Average	0.47		0.04		
Weighted-average concentration		32			

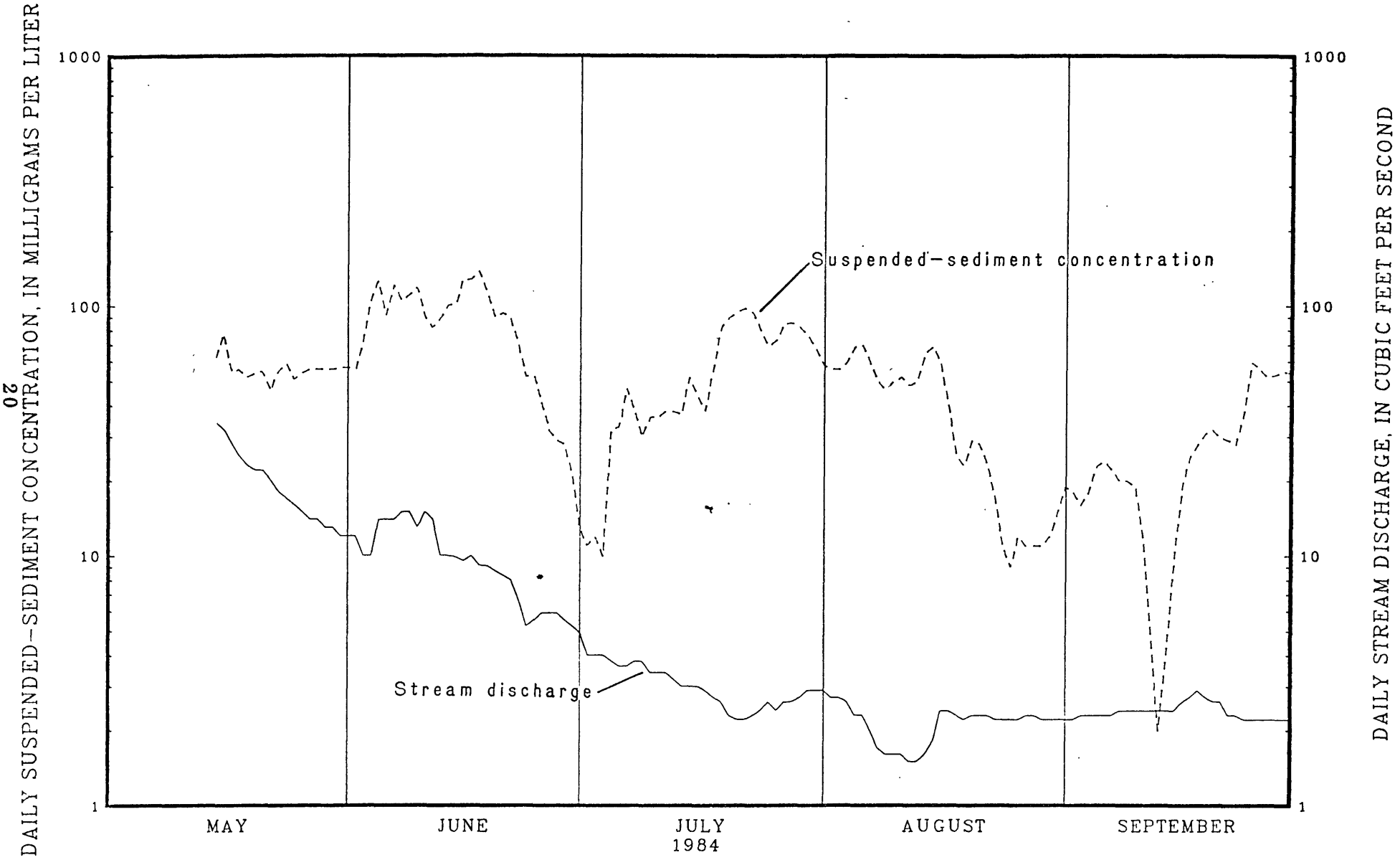

Figure 4.--Suspended-sediment concentrations and stream discharge for Thief Creek.

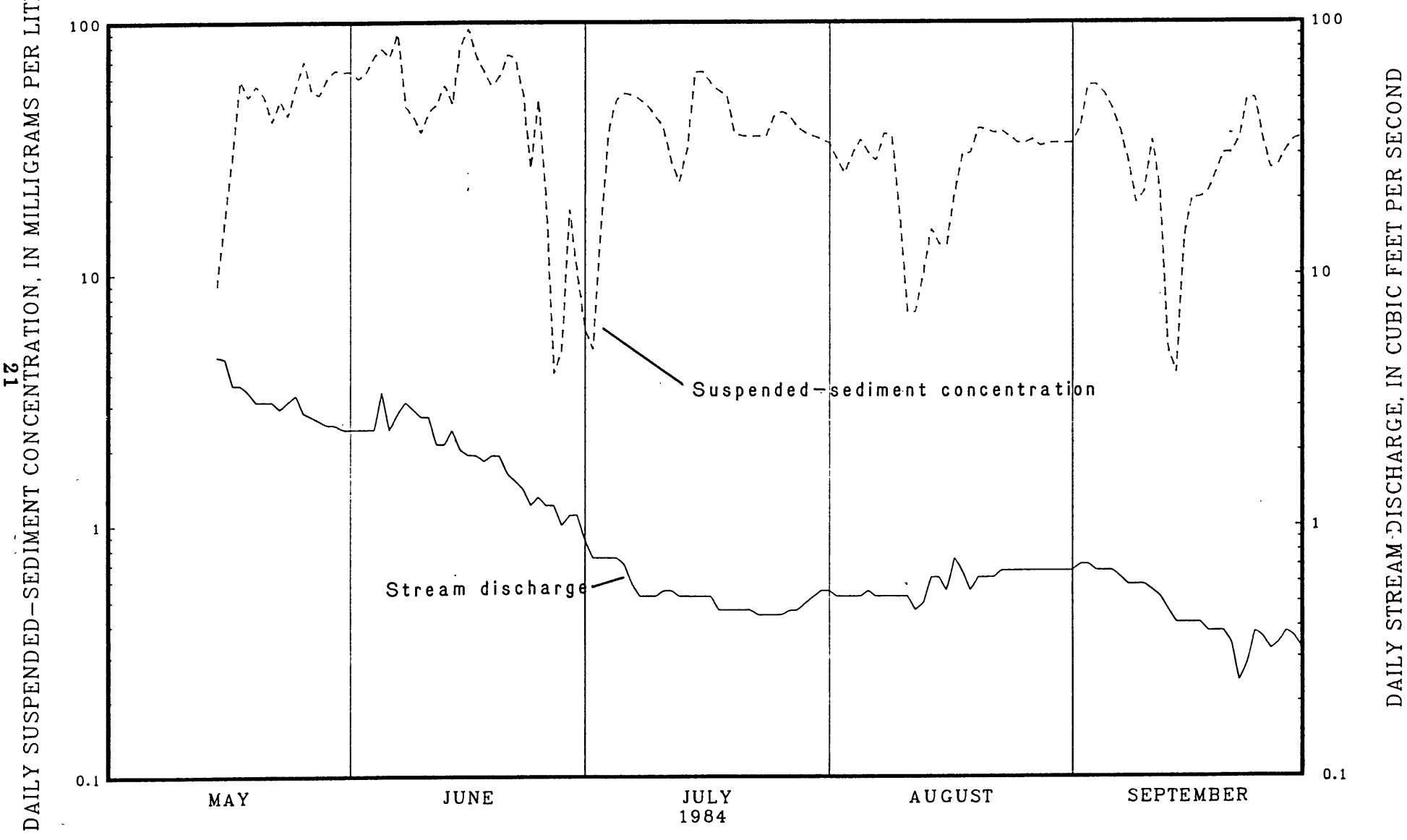

Figure 5.--Suspended-sediment concentrations and stream discharge for Chicken Creek.

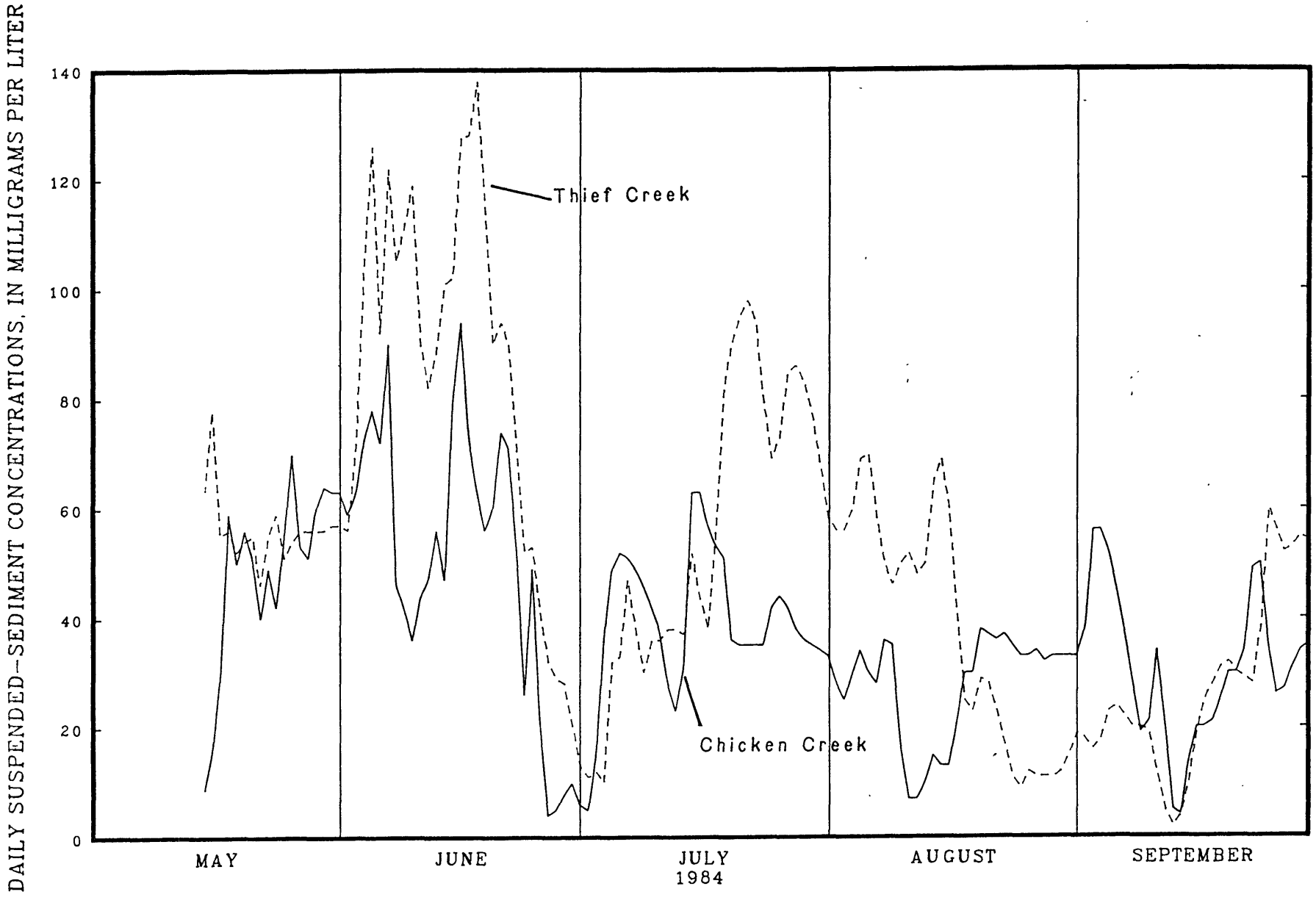

Figure 6.--Suspended-sediment concentrations for Thief Creek and Chicken Creek.

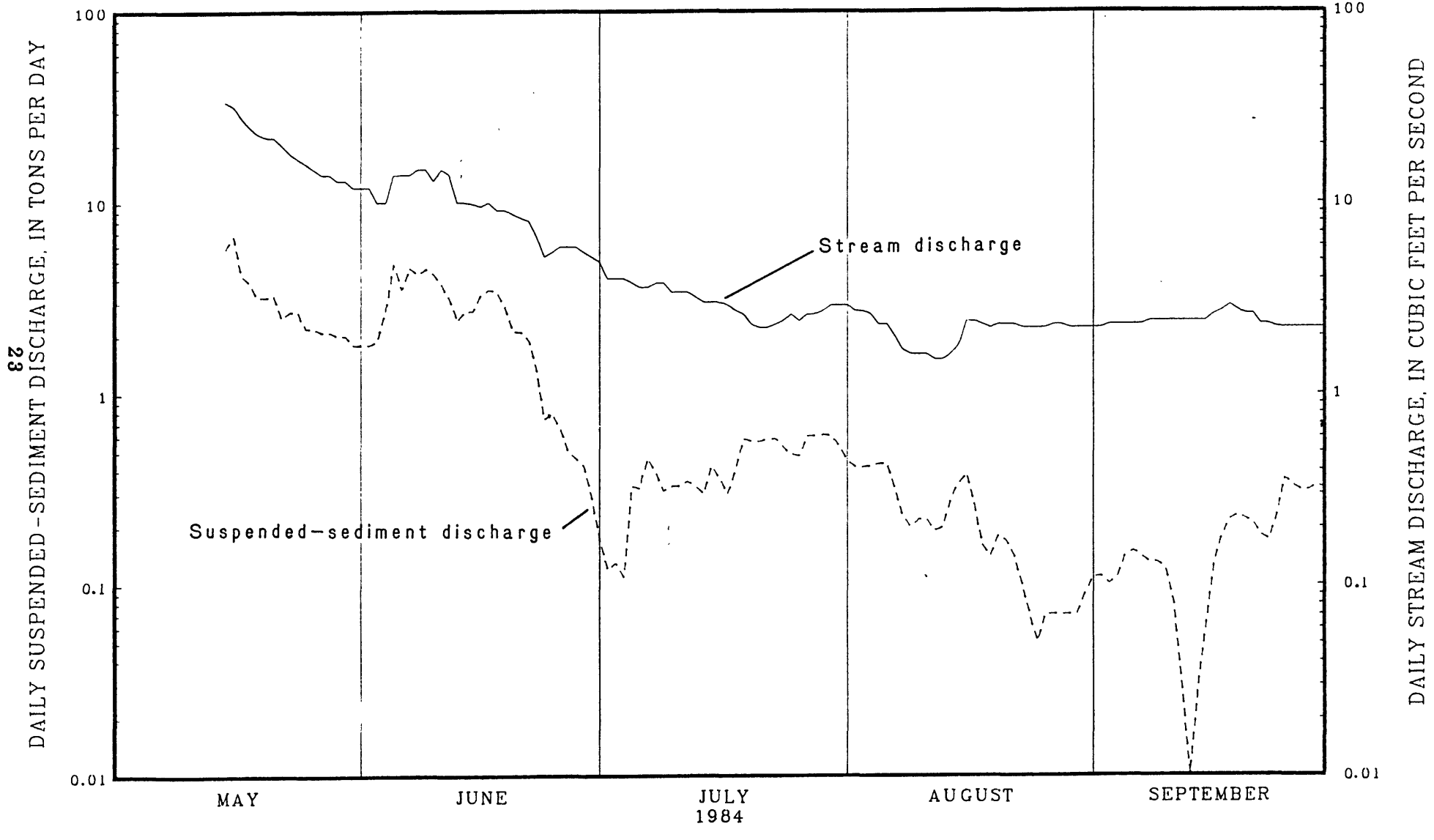

Figure 7.--Suspended-sediment discharge and stream discharge for Thief Creek.

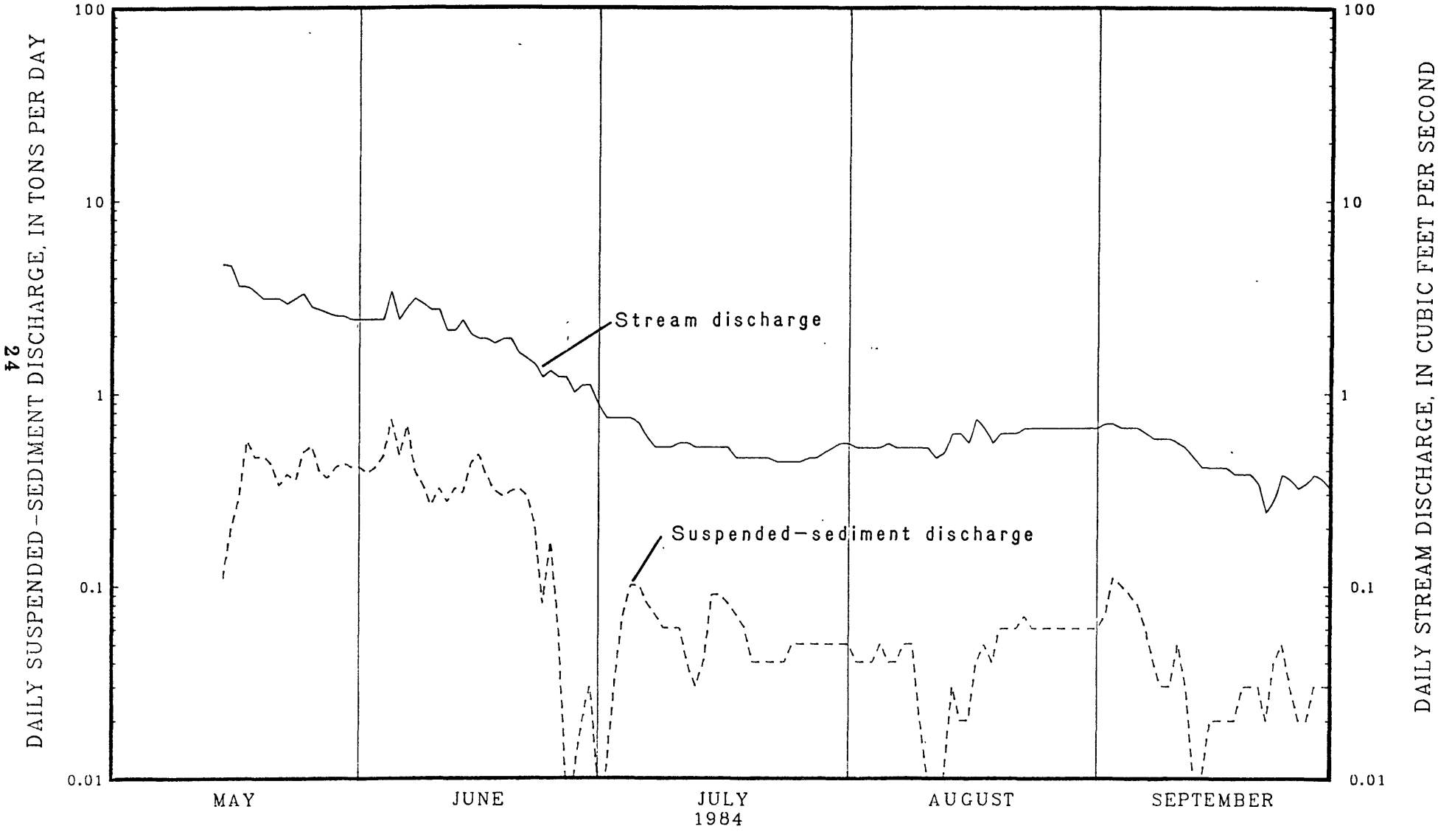

Figure 8.--Suspended-sediment discharge and stream discharge for Chicken Creek.

Table 7.--Summary of chemical analyses of water samples from Thief Creek and Chicken Creek

[Abbreviations: ft^3/s, cubic feet per second; °C, degrees Celsius; µS/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; µg/L, micrograms per liter; <, less than]

Measurements	Thief Creek		Chicken Creek	
	05-16-84	05-25-84	05-16-84	05-25-84
Field measurements:				
Stream discharge (ft^3/s)	32.0	17.0	4.5	3.1
Air temperature (°C)	-	7.0	-	15.0
Water temperature (°C)	11.0	10.0	11.5	-
Laboratory measurements:				
pH	8.3	8.4	8.3	8.4
Specific conductance (µS/cm)	749	906	809	840
Dissolved Calcium (mg/L)	85	100	85	94
Dissolved Magnesium (mg/L)	28	34	41	45
Dissolved Sodium (mg/L as Na)	29	37	30	35
Dissolved Potassium (mg/L as K)	2.9	2.9	2.0	1.8
Alkalinity (mg/L as CaCO3)	230	270	270	300
Dissolved Sulfate (mg/L as SO4)	21	26	41	46
Dissolved Chloride (mg/L as Cl)	98	120	82	94
Dissolved Fluoride (mg/L as Fl)	0.1	0.0	0.1	0.4
Dissolved Silica (mg/L as SiO2)	7.5	7.3	6.2	7.7
Dissolved Nitrogen (mg/L as N)	.1	.0	.3	.7
Total Phosphorus	.03	.04	.01	.00
Turbidity (standard units NTU)	90	21	-	3.5
Dissolved Arsenic (µg/L)	<1	-	<1	-
Total Arsenic (µg/L)	<1	-	<1	-
Dissolved Cadmium (µg/L)	<1	-	<1	-
Total Cadmium (µg/L)	<1	-	<1	-
Dissolved Chromium (µg/L)	<10	-	<10	-
Total Chromium (µg/L)	<10	-	<10	-
Dissolved Cobalt (µg/L)	<1	-	<1	-
Total Cobalt (µg/L)	1	-	<1	-
Dissolved Copper (µg/L)	2	-	1	-
Suspended Copper (µg/L)	4	-	5	-
Total Copper (µg/L)	6	-	6	-
Dissolved Iron (µg/L)	32	-	22	-
Suspended Iron (µg/L)	1100	-	190	-
Total Iron (µg/L)	1100	-	210	-
Dissolved Lead (µg/L)	<1	-	1	-
Suspended Lead (µg/L)	-	-	5	-
Total Lead (µg/L)	5	-	6	-
Dissolved Manganese (µg/L)	12	-	30	-
Suspended Manganese (µg/L)	40	-	20	-
Total Manganese (µg/L)	50	-	50	-
Dissolved Mercury (µg/L)	<.1	-	<.1	-
Total Mercury (µg/L)	<.1	-	<.1	-
Dissolved Selenium (µg/l)	<1	-	<1	-
Total Selenium (µg/L)	<1	-	1	-
Dissolved Zinc (µg/L)	17	-	13	-
Suspended Zinc (µg/L)	40	-	7	-
Total Zinc (µg/L)	60	-	20	-

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