

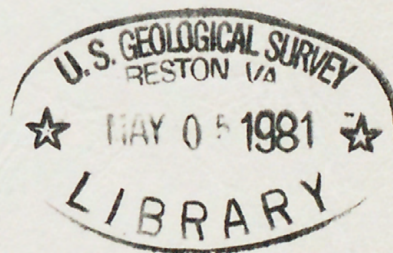
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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BACKGROUND HYDROLOGIC INFORMATION IN POTENTIAL LIGNITE MINING AREAS
IN MISSISSIPPI, AUGUST 1980

Open - File Report 81-421

Prepared in cooperation with the
Mississippi Department of Natural Resources,
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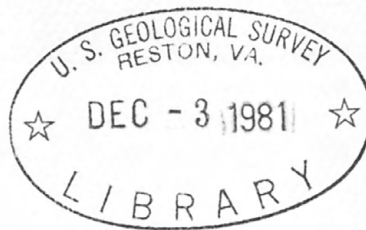
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UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

Doyle G. Frederick, Acting Director



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BACKGROUND HYDROLOGIC INFORMATION IN POTENTIAL LIGNITE MINING AREAS IN MISSISSIPPI, AUGUST 1980

by J. K. Arthur

ABSTRACT

The U.S. Geological Survey in cooperation with Mississippi Bureau of Geology is conducting a hydrologic data-collection program in the potential lignite-producing areas in Mississippi. During the week of August 25-28, 1980, hydrologic data on channel characteristics were collected at 15 sites on small streams draining potential lignite mining areas in east-central Mississippi. Streamflow measurements were made and water-quality samples were collected at 11 of the 15 sites.

Main channel widths at the 15 sampling sites in east-central Mississippi ranged from 126 feet on Sucarnoochee Creek to 15 feet on Houston Creek. Maximum water depth ranged from 7 feet on Pawticfaw Creek and Tallahatta Creek to one-half foot on Okatibbee Creek. The maximum stream discharge measured was 56 cubic feet per second on Pawticfaw Creek. Four sites had no discharge. Specific conductance at sampling sites ranged from 115 micromhos on Ponta Creek to 26 micromhos on Sucarnoochee Creek. The dissolved-oxygen concentration was 5.7 milligrams per liter or higher at all sites. The concentration of suspended sediment was not greater than 38 milligrams per liter at any site. Concentrations of calcium, magnesium, sodium, potassium, chloride, and sulfate were less than 10 milligrams per liter in all samples, but were highest at site 10 on Ponta Creek. Bottom-material samples commonly contained iron, manganese, and zinc.

INTRODUCTION

During the week of August 25-28, 1980, water samples and bottom sediment samples were collected at 11 of 15 pre-selected sites in a six-county area in east-central Mississippi. These water-quality data sites, selected jointly by the U.S. Geological Survey and the Mississippi Bureau of Geology, are the first of a series to be sampled for the purpose of providing background hydrologic information in potential lignite mining areas in Mississippi.

Surface-water hydrologic information is sparse in areas in Mississippi where recoverable deposits of lignite occur. The surface mining of lignite may require the removal of large amounts of previously unexposed materials, and it is essential that hydrologic information be

collected prior to any mining activity. The massive excavations and the effects of weathering of overburden materials will impact the hydrologic system. Sediment deposition and the effects on stream water quality are primary concerns.

OBJECTIVE AND SCOPE

The objective of this study is to collect background data on water quality and channel characteristics in many of the small streams draining areas of potential lignite mining. This will help document pre-mining conditions in an area where little information is available. This information will be an invaluable data base for any future study of effects of surface mining in Mississippi.

The area of potential lignite mining in Mississippi is large, extending in a 40 to 100-mile wide band from the Alabama border in east-central Mississippi to the Tennessee line in the northwestern part of the State. Each year about 15 small streams will be sampled during the low-flow season. Emphasis will be on collecting a limited amount of information on a large number of streams throughout the multicounty area. During the first year, 1980, streams in the east-central part of the State were sampled. In succeeding years, areas that have highest mining potential will be studied on a priority basis.

AREA OF STUDY

The 15 sites sampled in fiscal year 1980 are located in six counties in east-central Mississippi. Eight sites are in Kemper County, two each in Lauderdale and Newton Counties, and one each in Neshoba, Noxubee, and Winston Counties (table 1). Six of the sites are in the Chickasawhay River basin, two are in the Pearl River basin, and seven are in the Tombigbee River basin (figure 1).

All sites are on small streams. The largest drainage area is 133 mi² (square miles) and the smallest is 11.1 mi². All the sites except site 10 are in rural areas that drain farm or forest lands. The study area includes many localities of scenic or historical significance such as Sciples Mill and Nanawaya Mound (figures 1 and 3).

CHANNEL CROSS SECTIONS

Channel cross sections were delineated at each site at the time of sample collection (fig. 2). The cross sections were made by measuring with a steel tape from a horizontal reference point on the bridge down to the ground surface. Main-channel width ranged from 126 feet on Sucarnoochee Creek at site 12 to 15 feet on Houston Creek at site 5. Maximum water depths at sampling sites ranged from 7 feet on Pawticfaw Creek (site 1) and Tallahatta Creek (site 9) to one-half foot on Okatibbee Creek (site 3). Most channel bottoms were smooth and consisted mostly of sand and gravel. At no site did there appear to be major scour or deposition in the channel or in the flood plain. All sites are characterized by heavily vegetated banks and flood plains (fig. 3).

Table 1.--Sampling sites in study area

Site No.	Station No.	Name and location	County	Latitude	Longitude	Drainage area (mi ²)
1	02467290	Pawticfaw Cr west of Porterville, MS.	Kemper	32°40'26"	88°32'12"	92.7
2	02475800	Tallachula Cr near Damascus, MS.	Kemper	32°38'28"	88°51'29"	12.0
3	02475802	Okatibbee Cr near Klondike, MS.	Kemper	32°36'06"	88°51'13"	33.2
4	02475850	Chickasawhay Cr near Klondike, MS.	Kemper	32°35'28"	88°47'05"	26.1
5	02475810	Houston Cr near Klondike, MS.	Kemper	32°36'09"	88°51' 37"	11.1
6	02467390	Blackwater Cr near Oak Grove, MS.	Kemper	32°38'27"	88°32'10"	45.0
7	02475209	Tallashua Creek above Little Rock, MS.	Newton	32°32'58"	88°59'25"	44.2
8	02481820	Bogue Chitto near Bond, MS.	Neshoba	32°52'52"	88°56'20"	89.7
9	02475580	Tallahatta Cr near Little Rock, MS.	Newton	32°30'03"	88°55'06"	20.4
10	02467430	Ponta Cr near Lizelia, MS.	Lauderdale	32°31'28"	88°37'43"	22.9
11	02467459	Big Reed Cr near Taniola, MS.	Lauderdale	32°33'25"	88°31'45"	17.3
12	02467091	Sucarnoochee Creek below Dekalb, MS.	Kemper	32°47'41"	88°37'43"	76.2
13	02448310	Wahalak Cr at Wahalak, MS.	Kemper	32°53'42"	88°32'18"	27.5
14	02481760	Nanawaya Cr near Bond, MS.	Winston	32°55'10"	88°56'55"	133
15	02448190	Running Water Cr near Shuqualak, MS.	Noxubee	33°01'05"	88°36'50"	38.3

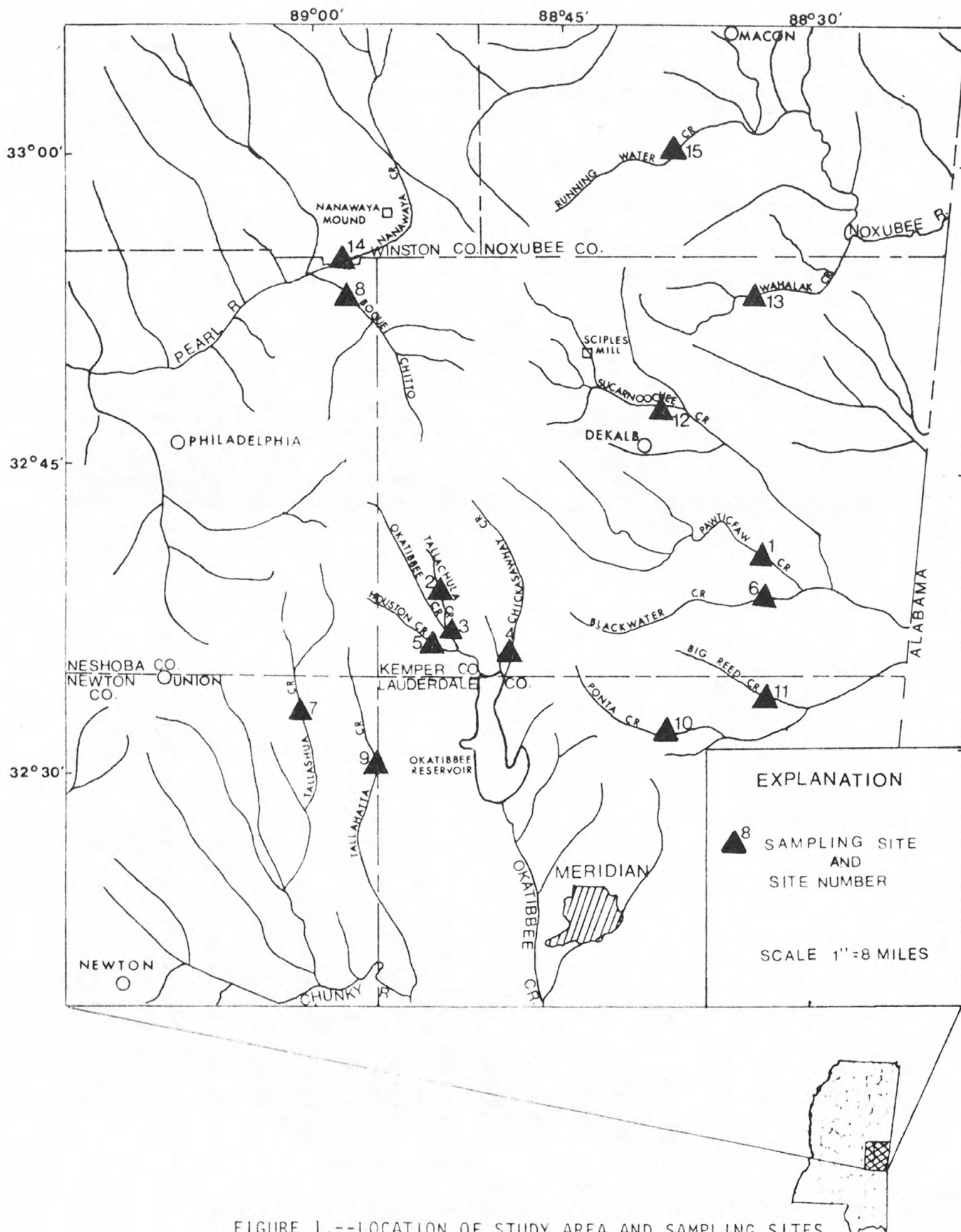


FIGURE 1.--LOCATION OF STUDY AREA AND SAMPLING SITES.

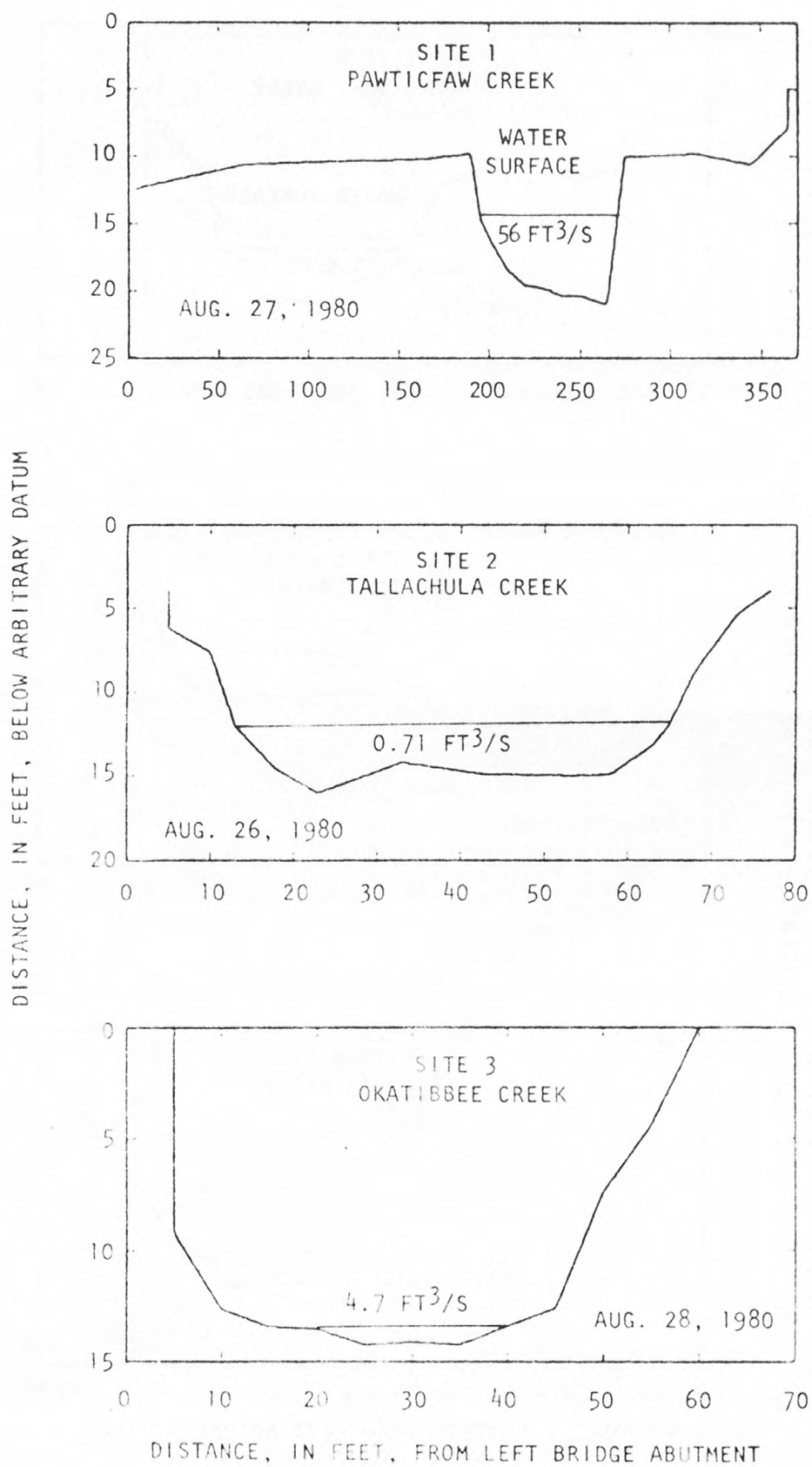


FIGURE 2.--CHANNEL CROSS SECTIONS AT SAMPLING SITES, AUGUST 25-28, 1980.

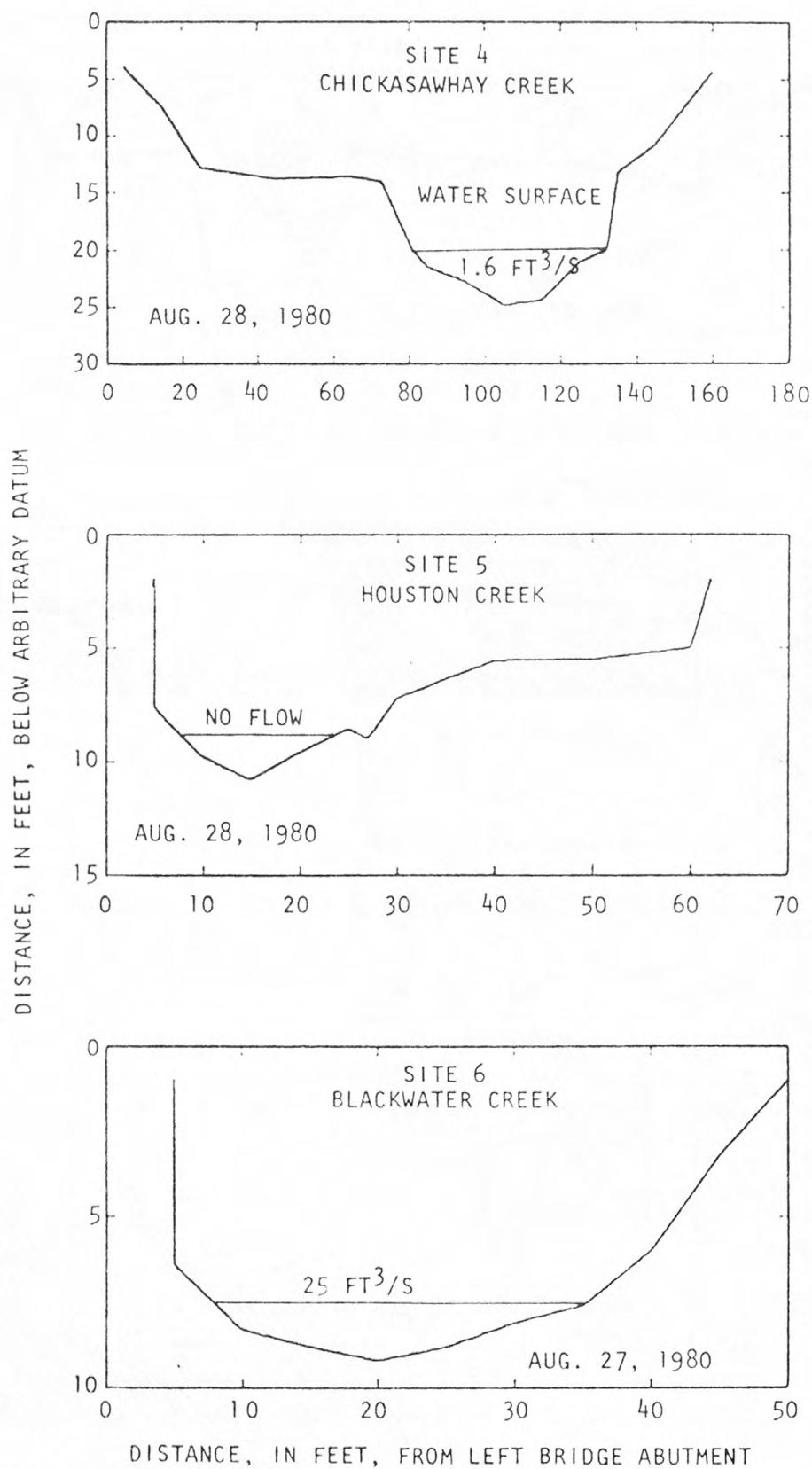


FIGURE 2.--CHANNEL CROSS SECTIONS AT SAMPLING SITES, AUGUST 25-28, 1980. - CONTINUED--

DISTANCE, IN FEET, BELOW ARBITRARY DATUM

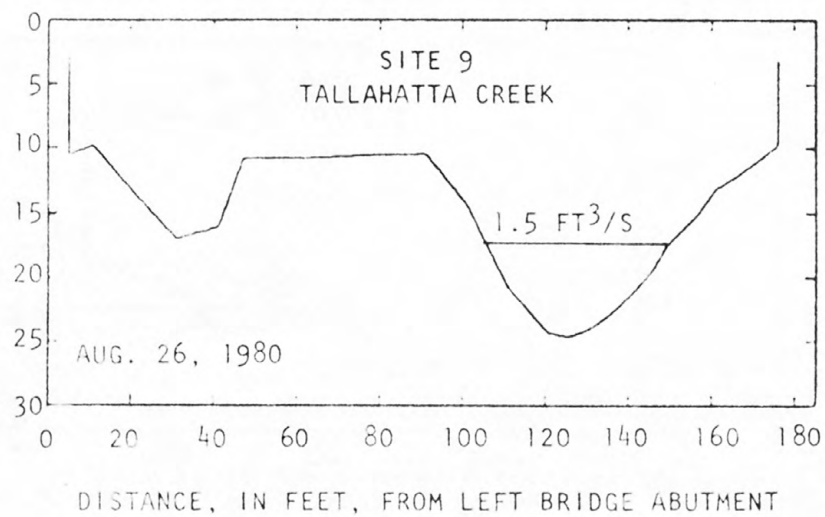
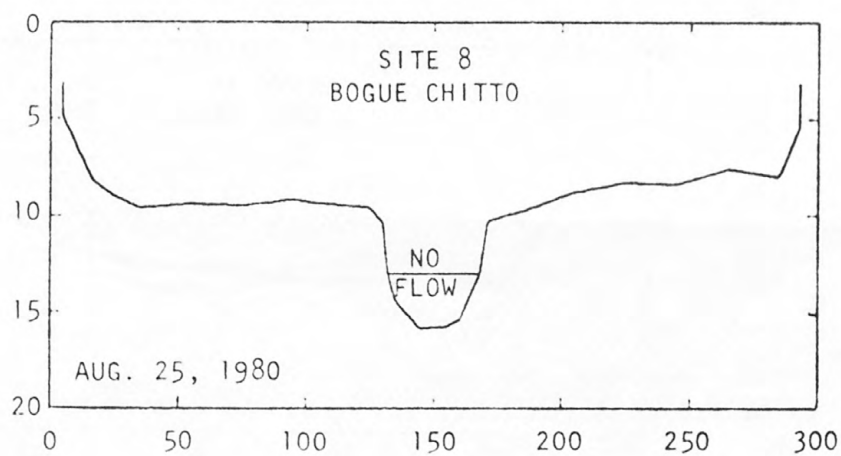
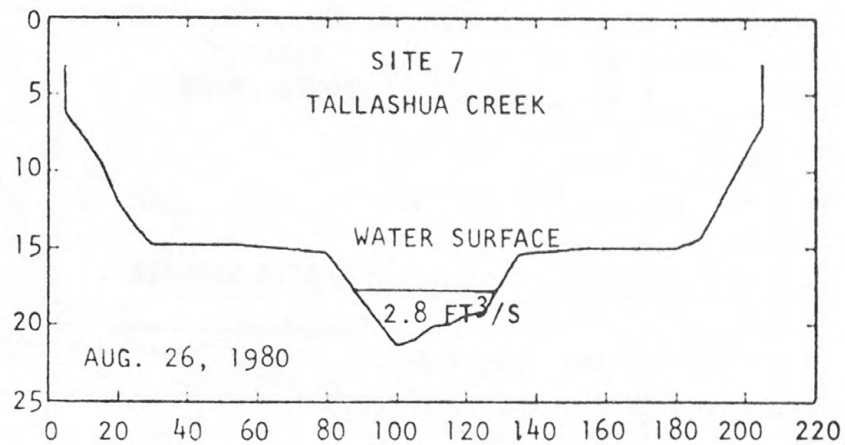


FIGURE 2.--CHANNEL CROSS SECTIONS AT SAMPLING SITES, AUGUST 25-28, 1980. -CONTINUED--

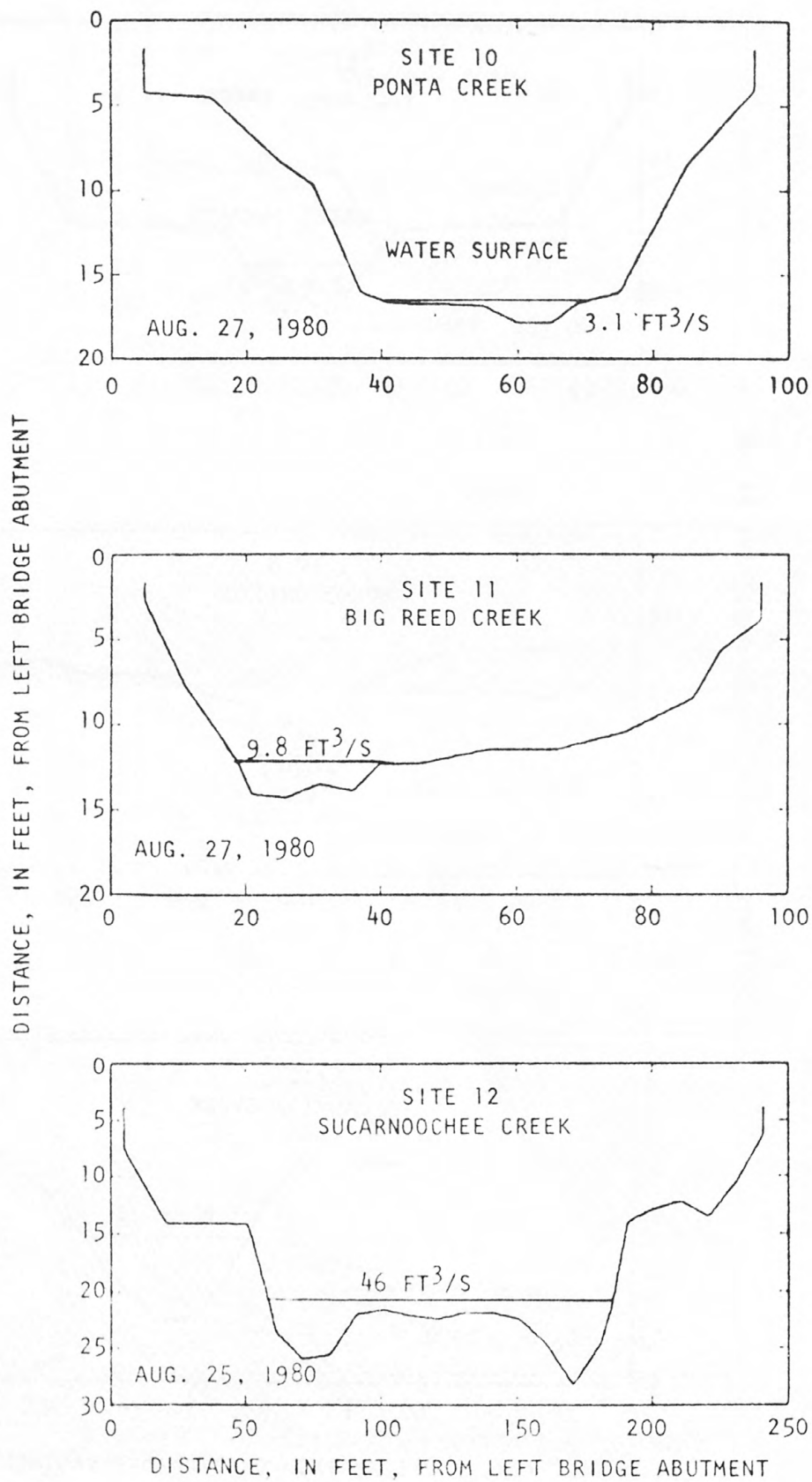


FIGURE 2.--CHANNEL CROSS SECTIONS AT SAMPLING SITES, AUGUST 25-28, 1980. -CONTINUED--

DISTANCE, IN FEET, BELOW ARBITRARY DATUM

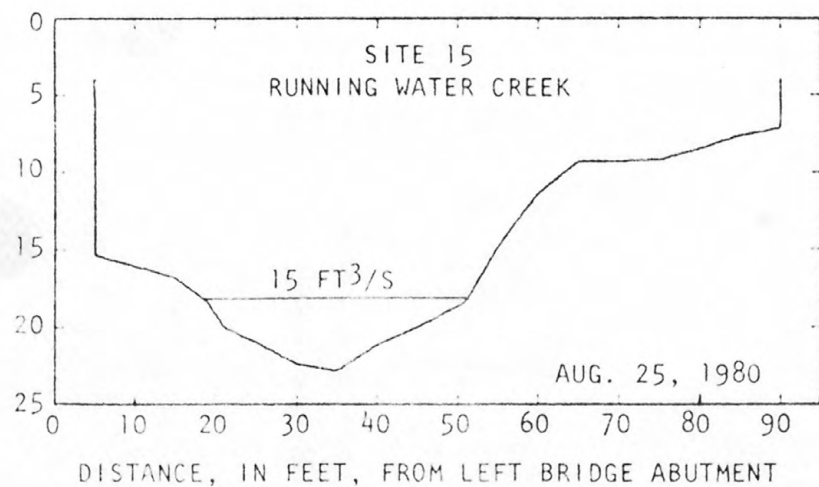
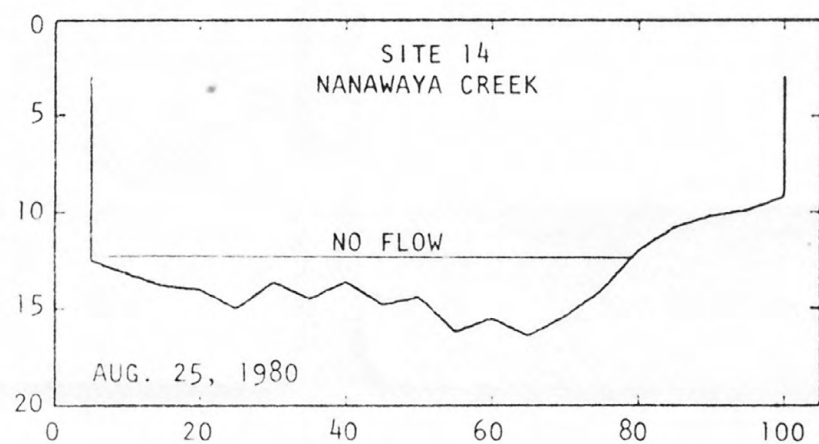
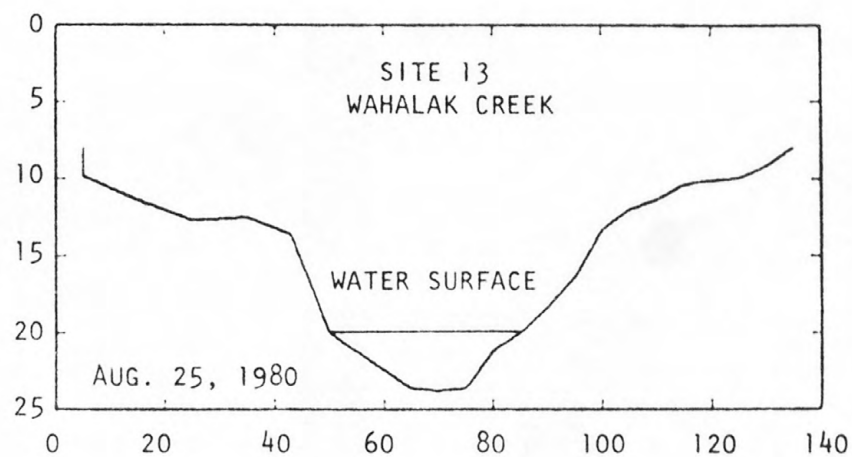


FIGURE 2.--CHANNEL CROSS SECTIONS AT SAMPLING SITES, AUGUST 25-28, 1980. -CONTINUED--



SCIPLE'S MILL - RUNNING TIGER CREEK, 6 MILES
NORTHWEST OF DEKALB, AUG. 25, 1980



SITE 1.--PAWTICFAW CREEK WEST OF PORTERVILLE
MS., AUG. 27, 1980.



SITE 2.--TALLACHULA CREEK NEAR DAMASCUS, MS.,
AUG. 26, 1980.



SITE 3.--OKATIBBEE CREEK NEAR KLONDIKE, MS.,
AUG. 28, 1980.

FIGURE 3.--PHOTOGRAPHS OF STUDY SITES, AUGUST 25-28, 1980.



SITE 4.--CHICKASAWHAY CREEK NEAR KLONDIKE,
MS., AUG. 28, 1980.



SITE 5.--HOUSTON CREEK NEAR KLONDIKE, MS.,
AUG. 28, 1980.



SITE 6.--BLACKWATER CREEK NEAR OAK GROVE, MS.,
AUG. 27, 1980.



SITE 7.--TALLASHUA CREEK ABOVE LITTLE ROCK, MS.,
AUG. 26, 1980.



SITE 8.--BOGUE CHITTO NEAR BOND, MS.,
AUG. 25, 1980.



SITE 9.--TALLAHATTA CREEK NEAR LITTLE ROCK, MS.,
AUG. 26, 1980.



SITE 10.--PONTA CREEK NEAR LIZELIA, MS.,
AUG. 27, 1980.



SITE 11.--BIG REED CREEK NEAR TAMOLA, MS.,
AUG. 27, 1980.



SITE 12.--SUCARNOOCHEE CREEK BELOW DELKALB, MS.,
AUG. 25, 1980.



SITE 13.--WAHALAK CREEK AT WAHALAK, MS.,
AUG. 25, 1980.



SITE 14.--NANAWAYA CREEK NEAR BOND, MS.,
AUG. 25, 1980.



SITE 15.--RUNNING WATER CREEK NEAR SHUQUALAK, MS.,
AUG. 25, 1980.

FIGURE 3.--PHOTOGRAPHS OF STUDY SITES, AUG. 25-28, 1980. -CONTINUED--

WATER QUALITY

At each sampling site that had streamflow, field determinations of stream discharge, water temperature, specific conductance, pH, and dissolved oxygen were made. Water samples were collected for analysis of major chemical constituents and suspended sediment concentration. Bottom material samples were collected for analysis of selected metals.

Discharge measurements were made at 11 of the 15 sampling sites (figure 1). Four of the sites, 5, 8, 13, and 14, had no stream discharge at the time they were visited. Of these, it is interesting to note that both Nanawaya Creek, the stream with the largest drainage area, and Houston Creek, which had the smallest drainage area, had no discharge. The results of these discharge measurements are listed in table 2. The largest discharge measured was 56 ft³/s (cubic feet per second) on Pawticfaw Creek (site 1). Sucarnoochee Creek (site 12) had 46 ft³/s; Blackwater Creek (site 6), 25 ft³/s; Running Water Creek (site 15), 15 ft³/s; and all other sites had less than 10 ft³/s. Although the study was made in late summer, flow conditions in the area were not extremely low.

Figure 4 shows the specific conductance and dissolved solids concentration at those sites in the study area that were sampled. Site 10 on Ponta Creek, the most urbanized basin sampled, had the highest specific conductance and dissolved-solids concentration, 115 umhos (micromhos) and 97 mg/L (milligrams per liter), respectively. At all other sites the specific conductance and dissolved solids were very low, ranging from 26 to 75 umhos and from 35 to 71 mg/L, respectively.

Dissolved-oxygen concentrations ranged from 5.7 to 8.5 mg/L (table 2). The lowest dissolved-oxygen concentration occurred at site 7 on Tallashua Creek. Turbidity values were less than 10 NTU (nephelometric turbidity units) at all but one site. Site 15 on Running Water Creek had a turbidity value of 15 NTU. Color was less than 50 units at all but sites 3 and 7 where the color was 55 and 50 units, respectively. Concentrations of suspended sediment ranged from 11 to 38 mg/L and exceeded 30 mg/L only at sites 2 and 15.

The results of laboratory analyses of the principal constituents in the water samples collected during the study are given in table 3. The data in this table indicate that concentrations of the constituents calcium, magnesium, sodium, potassium, chloride, and sulfate were less than 10 mg/L in all samples, but were highest at site 10 on Ponta Creek. Total hardness was also higher at site 10 than at other sites, but was less than 40 mg/L at all sites. TOC (total organic carbon) was less than 10 mg/L at all sites, but was appreciably higher at site 7 on Tallashua Creek than at other sites. Nitrate plus nitrite nitrogen concentrations ranged from 0.08 to 0.33 mg/L and were highest at sites 10 and 7. Iron and manganese were present in most of the samples. Dissolved concentrations ranged from 0.07 to 0.78 mg/L for iron and 0.04 to 0.26 for manganese. Suspended iron concentration was as high as 2.4 mg/L at site 10. The highest concentration of suspended manganese was less than 0.10 mg/L.

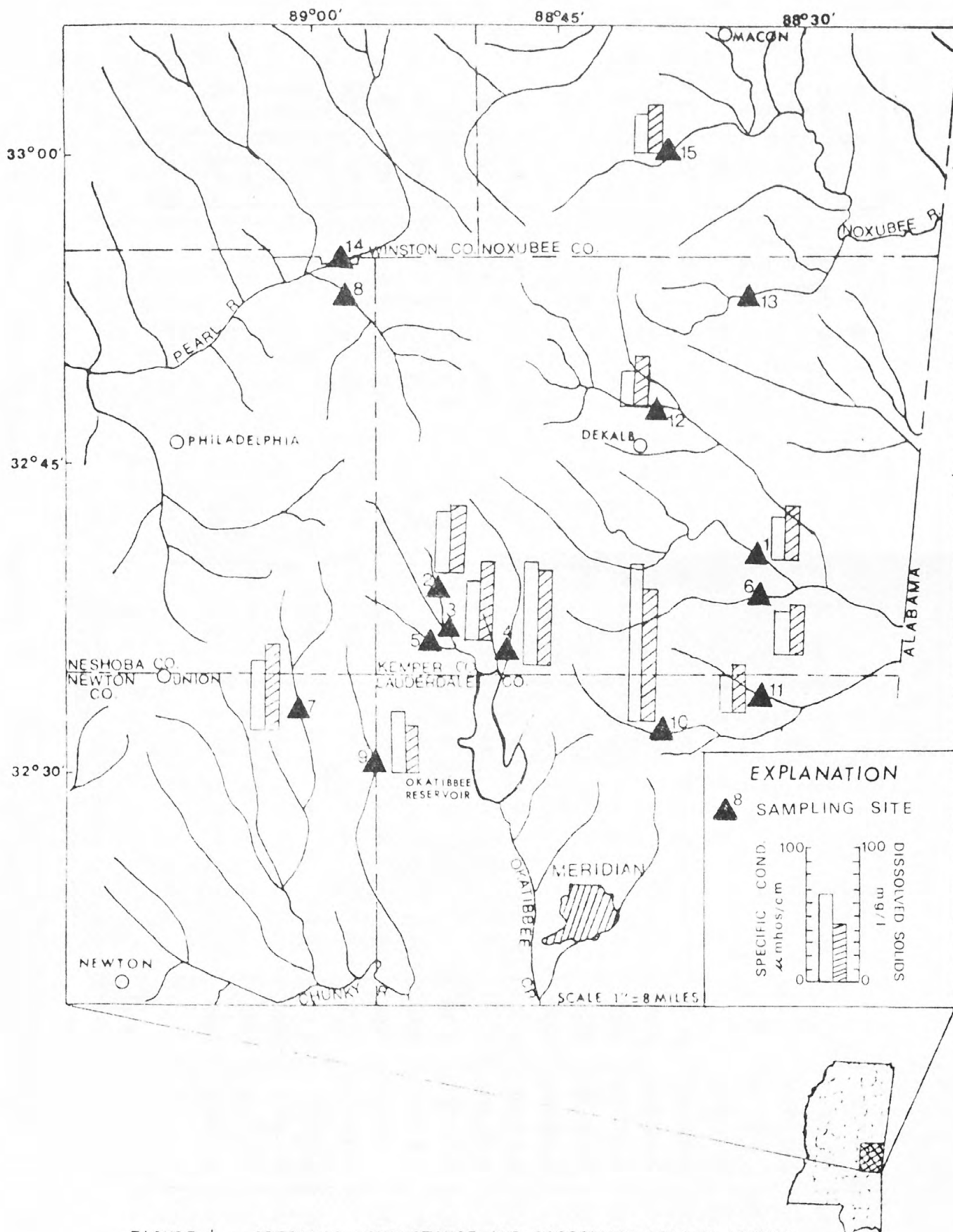


FIGURE 4.--SPECIFIC CONDUCTANCE AND DISSOLVED SOLIDS CONCENTRATION AT SAMPLING SITES, AUGUST 25-28, 1980.

Table 2.--Results of field and laboratory measurements of samples collected August 25-28, 1980

Site number	Date	Time	Water temperature °C	pH	Specific conductance (micromhos) at 25°C	Dissolved solids (mg/)	Dissolved oxygen (mg/)	Stream discharge (ft ³ /s)	Suspended sediment (mg/)	Color	Turbidity (NTU)
1	8-27-80	0930	23.0	6.8	31	40	8.5	56	28	15	4
2	8-26-80	1630	25.5	6.9	45	49	7.8	.71	38	20	8
3	8-28-80	1200	23.0	6.8	44	59	7.6	4.7	14	55	9
4	8-28-80	1000	23.0	6.8	75	71	6.5	1.6	12	20	4
5	8-28-80	1300	--	--	--	--	--	0	--	--	--
6	8-27-80	1230	22.0	6.7	32	37	8.5	25	14	15	--
7	8-26-80	1100	25.0	6.6	51	63	5.7	2.8	11	50	5
8	8-25-80	0830	--	--	--	--	--	0	--	--	--
9	8-26-80	1300	24.5	6.8	45	36	6.3	1.5	14	25	--
10	8-27-80	1700	23.0	7.0	115	97	7.7	3.1	23	20	7
11	8-27-80	1430	22.0	6.0	28	35	8.3	9.9	15	30	3
12	8-25-80	1600	26.0	6.8	26	37	7.8	46	24	30	8
13	8-25-80	1400	--	--	--	--	--	0	--	--	--
14	8-25-80	0930	--	--	--	--	--	0	--	--	--
15	8-25-80	1200	25.5	6.8	28	35	8.1	15	36	39	15

Table 3 .--Results of laboratory analyses for common constituents on water samples collected August 25-28, 1980

In Milligrams per liter

Site number	Date of collection	Calcium, dissolved	Magnesium, dissolved	Potassium, dissolved	Sodium, dissolved	Chloride, dissolved	Sulfate, dissolved	Hardness, total	TOC	Nitrite + Nitrate, total	Iron, dissolved	Iron, suspended	Manganese, dissolved	Manganese, suspended
1	8-27-80	1.3	0.9	1.0	2.1	2.6	1.4	7	1.8	0.12	0.12	0.82	0.04	0.02
2	8-26-80	2.4	1.9	1.3	2.1	2.8	1.0	14	4.4	.09	.47	1.20	.08	.07
3	8-28-80	2.3	1.6	1.3	2.1	2.9	1.7	12	3.7	.11	.54	1.10	.07	.02
4	8-28-80	4.0	2.7	1.9	3.9	3.7	2.7	21	3.8	.12	.78	.42	.11	0
5	8-28-80	--	--	--	--	--	--	--	--	--	--	--	--	--
6	8-27-80	1.2	.8	1.0	2.2	2.2	2.1	6	2.2	.09	.12	.82	.04	.01
7	8-26-80	2.6	1.8	1.6	2.5	3.9	1.9	14	9.4	.21	.38	1.20	.26	0
8	8-25-80	--	--	--	--	--	--	--	--	--	--	--	--	--
9	8-26-80	2.1	1.4	1.8	3.0	2.8	1.9	11	2.4	.14	.57	.83	.12	0
10	8-27-80	8.4	3.7	2.7	5.5	4.1	4.3	36	5.2	.33	.15	2.40	.14	.01
11	8-27-80	1.1	.7	.9	1.5	2.7	3.1	6	2.8	.08	.23	1.20	.08	.02
12	8-25-80	1.0	.7	1.0	1.9	3.0	.7	5	1.9	.17	.09	1.20	.05	.04
13	8-25-80	--	--	--	--	--	--	--	--	--	--	--	--	--
14	8-25-80	--	--	--	--	--	--	--	--	--	--	--	--	--
15	8-25-80	1.2	.8	.7	1.7	2.5	1.0	6	2.2	.15	.07	1.40	.07	.02

Table 4 lists the results of laboratory analyses for selected metals in bottom-material samples collected during the study. Most metals in the bottom-material samples were either not present or concentrations were below the detection limit in the analytical procedure. Iron, manganese, and zinc were the metals found to be commonly present in appreciable amounts.

Table 4.--Results of laboratory analyses on bottom material collected
August 25-28, 1980

In Micrograms per gram												
Site number	Date of collection	Arsenic	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Selenium	Zinc
1	8-27-80	0	<10	<10	10	<10	3400	<10	360	0	0	6.5
2	8-26-80	0	<10	<10	<10	<10	1000	<10	210	0	0	1.7
3	8-28-80	0	<10	<10	<10	<10	1400	<10	130	0	0	2.9
4	8-28-80	0	<10	<10	30	<10	7900	10	1500	0	0	6.4
5	8-28-80	--	--	--	--	--	--	--	--	--	--	--
6	8-27-80	0	<10	<10	<10	<10	720	<10	14	0	0	1.5
7	8-26-80	0	<10	10	<10	<10	200	<10	18	0	0	1.2
8	8-25-80	--	--	--	--	--	--	--	--	--	--	--
9	8-26-80	0	<10	<10	<10	<10	1000	<10	130	0	0	3.0
10	8-27-80	0	<10	<10	<10	<10	3800	<10	130	0	0	9.0
11	8-27-80	0	<10	<10	<10	<10	460	<10	11	0	0	1.0
12	8-25-80	0	<10	<10	<10	<10	3800	<10	1200	0	0	6.9
13	8-25-80	--	--	--	--	--	--	--	--	--	--	--
14	8-25-80	--	--	--	--	--	--	--	--	--	--	--
15	8-25-80	0	<10	<10	<10	<10	3500	<10	410	0	0	13

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