

**Analysis of Metals in Water, Stream Sediments and Floodplain Soils
Collected March 26-27, 2003 from the Bayou Creek System**

Wesley J. Birge

David J. Price

DRAFT REPORT

July 22, 2005

Submitted to

LeRoy Chittenden and Jon Maybriar

**Division of Waste Management
Kentucky's Environmental and Public Protection Cabinet**

INTRODUCTION

Water, stream sediments, and floodplain soils were collected for metal analyses from Big and Little Bayou Creeks on March 26-27, 2003. Water samples were taken from 10 stations on Big Bayou Creek (stations BB1A through BB9); five stations from Little Bayou Creek (stations LB2A through LB4); and effluents 006 and 010+011. The reference station at the west fork of Massac Creek (MC) also was sampled for water, stream sediments, and floodplain soils. Two sediment samples per station were collected for metal assays. A total of 29 metals (*i.e.* Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Sn, Sr, Ti, Tl, V, and Zn) were determined for each sample.

METHODS

Water Collection

Samples for water quality measurements were collected in 1-L "Cubitainer" receptacles and were placed on ice until delivery to the laboratory. Water samples for metal assays were collected in acid-cleaned 250-mL polyethylene bottles. Samples were preserved with concentrated HNO₃ upon collection and analyzed for total recoverable (TR) metals.

Sediments and Floodplain Soils Collection

Stream sediment samples were restricted to the upper 5-10 cm of sediment soil, including depositional areas when found. Floodplain soils were collected within 10 m of the shoreline (5-10 cm deep) in areas where flood debris was present. Any surface vegetation was removed prior to sampling floodplain soils. All sediment and floodplain samples were

collected in acetone-rinsed 0.47 L glass jars with Teflon-lined lids. Stainless steel spoons and scoops used for collections were acetone-rinsed between sampling stations.

Water Quality

On-site water quality measurements, which included temperature, pH, dissolved oxygen, and conductivity, were taken with a YSI 650 MDS meter and a YSI 600 QS multi-parameter sonde. Alkalinity and hardness were measured according to procedures described by APHA (1995), for bromocresol green-methyl red titrimetric and EDTA titrimetric procedures, respectively.

Metal Digestions and Determinations

Acidified water samples were analyzed directly for total recoverable (TR) metals. Sediment and floodplain soil samples were digested according to procedures described in EPA Method 3050B and ASTM Method D 3974-81 (U.S. EPA, 1997 and ASTM, 1989) and previously described by Birge and Price (2001). Metal analysis was performed using a Varian Vista-MPX simultaneous Inductively Coupled Plasma-Optical Emission Spectrophotometer (ICP-OES) and a Varian Model Spectra AA-20 graphite furnace Atomic Absorption Spectrophotometer (AAS) using procedures described by U.S. EPA (1997). All gases used were ultra pure carrier grade. Calibration curves were based on at least five standards. Instrument blanks (0.5 % HNO₃) and check standards were processed with all samples. Sample concentrations were then corrected for deviations from the standards and sample weights were factored into the calculations of final values.

Quality Assurance

Permanent bench records were kept of all assays and annotated as required under Good Laboratory Practices (*Federal Register*, 1989). All printouts and graphic recordings

were filed and are open for inspection. These bench records will be archived within two years after the close of the project but retrievable upon request.

RESULTS & DISCUSSION

General Water Quality

The results for general water quality parameters are given in Table 1. Station BB7 had the highest values for temperature, pH, and conductivity at 19.73, 9.07, and 655.0, respectively. The pH for Big Bayou Creek ranged from 7.24 to 9.07 among stations with an average of 8.17. Conductivity ranged from 174 to 656 and averaged 371.5 $\mu\text{S}/\text{cm}$, with stations BB6, BB7, and BB8 having the highest conductivity at 656, 655, and 633, respectively. Alkalinity was in the low to moderate range and varied from 60 to 120 mg CaCO_3/L in Big Bayou Creek and 120 to 200 mg CaCO_3/L in Little Bayou Creek. Hardness ranged from 56 to 212 mg CaCO_3/L and 92 to 100 mg CaCO_3/L for Big and Little Bayou Creeks, respectively. Hardness levels were highest for stations BB6 through BB9 on Big Bayou Creek. The water quality parameters given above and in Table 1 generally are not problematic, except that the high conductivity at and below station BB6 indicates a considerable outfall of electrolytes from effluent 001. This is consistent with previous studies.

Metals in Stream Water

Metal concentrations in water samples from Big Bayou and Little Bayou Creeks are presented in Tables 2 and 3, respectively. Comparisons between water, sediment, and floodplain soil concentrations in Big Bayou Creek are represented graphically in Figures 1

through 14. Silver concentrations in water ranged from 0.11 to 0.23 µg/L in Big Bayou Creek (Figures 1 and 2) and from 0.10 to 0.32 µg/L in Little Bayou Creek. Aluminum was fairly constant in Big Bayou Creek. In Little Bayou Creek, high values were observed at stations LB1 and LB2A with concentrations of 1285 and 1013 µg/L, respectively. Station LB1 is upstream of plant effluents. As, Cd, Co, Mo, Se, Sn were not detected at any of the stations sampled in the Bayou system. Beryllium, important to health concerns, was only detected at stations BB6 through BB9. In addition, Ca, K, Mg, Na, Sr also were elevated at stations BB6 through BB9. Cr was detected at effluent 006 and an upward trend was observed for stations BB3 through BB9 (Figures 5 and 6). In Little Bayou Creek, Cr was elevated at effluent 010+011 (2.19 µg/L) and was detected at all three downstream stations. This likely is trivalent Cr, assuming the use of hexa-chrome has been discontinued. Copper was highest at stations BB4 and BB6 with concentrations of 6.22 and 3.53 µg/L, respectively (Figures 3 and 4). Cu also was present in effluent 010+011 (2.58 µg/L). Fe in Big Bayou Creek was fairly constant, with stations BB3 and BB9 having the highest concentrations at 788.6 and 771.5 µg/L, respectively (Figures 7 and 8). As with Aluminum, Fe was observed to be elevated at stations LB1 and LB2, with concentrations of 1154.8 and 1045.8 µg/L, respectively. Nickel in Big Bayou Creek ranged from 0.95 to 2.30 µg/L and increased in a downstream progression (Figures 9 and 10). In Little Bayou Creek, Ni was fairly constant and ranged from <1.0 to 2.89 µg/L. Lead was detected only at station BB9 in Big Bayou Creek at a concentration of 4.98 µg/L, whereas Pb was detected at 4 of 6 six stations sampled in Little Bayou Creek, with LB1 having the highest concentration at 8.05 µg/L. Zn peaked at stations BB4 and BB6 with levels at 10.74 and 8.24 µg/L, respectively (Figures 12 and 13). In Little Bayou Creek, Zn was detected at effluent

010+011 (19.18 µg/L) and was elevated at the downstream stations.

Metals in Sediments and Floodplain Soils

A. Big Bayou Creek

Results for metal concentrations of individual assays of sediment and floodplain soils from Big Bayou Creek are given in Tables A1 and A3, whereas mean metal concentrations are given in Tables 4 and 6. Comparisons between water, sediment, and floodplain soil concentrations in Big Bayou Creek are represented graphically in Figures 1 through 14. Silver concentrations in sediments ranged from 0.02 to 0.03 µg/g with station BB7 having the highest concentration (Figures 1 and 2). In floodplain soils, Ag ranged from 0.01 to 0.03 µg/g and station BB8 had the highest concentration. Aluminum values ranged from 1405 to 5391 µg/g in the sediments and from 3588 to 6306 in the floodplain soils. Calcium in sediments was highest for stations BB6 and BB3 at concentrations of 4385 and 1969 µg/g, respectively. Calcium in floodplain soils was highest at stations BB1 and BB2. Copper in sediments ranged from 1.01 to 3.78 µg/g and station BB4 had the highest Cu concentration which corresponded with the elevated levels in the water column (Figure 3). In floodplain soils, both Cu and Cr were elevated at stations BB8 and BB9 (6.17 and 6.52 µg Cu/g; 16.47 and 10.42 µg Cr/g) (Figures 4 and 6). This may indicate downstream transport of these metals or some downstream local source. Station BB4 also had the highest concentration of sediment Cr (Table 4; Figure 5). Although Cd was not detected in the water samples, Cd peaked in sediments at stations BB1 and BB4, with values of 1.19 and 1.15 µg/g, respectively (Table 4). Cadmium in floodplain soils was generally constant and ranged from 0.62 to 0.84 µg/g (Table 6). Sediment Fe ranged from 4473 to 10442 µg/g

with station BB1 being the highest (Table 4; Figure 7). Floodplain Fe concentrations ranged from 6343 to 8652 $\mu\text{g/g}$ and station BB8 had the highest levels (Table 6; Figure 8). Sediment Ni concentrations in water presented an upward trend downstream observed at stations BB4 through BB9. However, Ni concentrations in water were similar to the reference sites. Ni in the sediments ranged from 1.44 to 3.71 $\mu\text{g/g}$ and was highest for BB8 (Figure 9), whereas Ni in floodplain soils ranged from 3.74 to 6.66 $\mu\text{g/g}$ and was highest at stations BB8 and BB9 (Table 6; Figure 10). Sediment and floodplain Pb levels were fairly constant as compared to the reference stations (Figure 11). Zn values demonstrated similar trends as Cu, where the highest water values were detected at stations BB4 and BB6 and slight increases in sediment and floodplain soil concentrations were observed at stations downstream of BB5 (Figures 12, 13, and 14). Sediment Zn was highest at BB4 (16.52 $\mu\text{g/g}$) and floodplain Zn was highest at BB9 (26.44 $\mu\text{g/g}$).

B. Little Bayou Creek

Results for metal concentrations of individual assays of sediment and floodplain soils from Little Bayou Creek are given in Tables A2 and A4, whereas mean metal concentrations are given in Tables 5 and 7. Sediment Ag ranged from 0.009 to 0.043 $\mu\text{g/g}$ and was highest at LB1. Floodplain Ag was detected at LB1 and LB4, with values of 0.014 and 0.068 $\mu\text{g/g}$, respectively. Mean sediment metal values were highest at station LB1 for Ag, Ba, Ca, K, Li, Mg, Ti, and Tl (Table 5). Mean floodplain concentrations were highest at LB1 for Al, As, B, Ba, Ca, Cd, Cu, Fe, K, Li, Mg, Mn, Na, Ni, Pb, Sb, Se, Si, Sn, Ti, Tl, V, and Zn (Table 7). Sediments from station LB3 had the

highest concentrations of As, Be, Cd, Co, Cr, Fe, Mn, Pb, Sb, Si, Sn, V, and Zn.

Summary Comments

Metals in the water column, with few exceptions were unspectacular. This includes highly toxic Cd and Pb which are less in evidence than in previous studies (Birge and Price, 2001). Be in the water samples, which has been less studied than other elements, peaked at stations BB6-BB8, reaching a high value of 0.53 µg/L (BB8). This correlates with the high values in sediments found at BB6 (0.36 µg/g). This tends to implicate effluent 001, which discharges a mixture of metals. Be was not detected in water samples from Little Bayou Creek, but did occur in sediments at concentrations up to 0.53 µg/g (LB3).

Silver is extremely toxic to aquatic life with a chronic toxicity value of about 0.2 ppb (Wood *et al.*, 2002). Values in this range in the water column were evident both in Big Bayou Creek (stations BB4-BB9) and Little Bayou Creek (stations LB2A, LB4). Slightly higher Ag sediment concentrations were evident in Big Bayou Creek. Effluent 008, upstream of BB4, appears to be the main source of Ag and further monitoring is important.

In recent reports, less attention has been given to Vanadium (V). Therefore, we have looked more carefully at this element, as its biological effects are less well known and it may be important for tracking stream sediment contamination. The highest concentration observed for water samples from Big Bayou Creek was 1.35 µg/L at station BB7. However, this element occurred in sediments at 25.7, 15.1, and 15.7 µg/g at Big Bayou Creek stations BB1, BB4, and BB7, respectively. Although BB1 has been

used as a reference station, as it is upstream of the plant's KPDES effluents, it appears to have suffered from some contamination (Birge and Price, 2001). Sediment V peaked at 25.7 µg/g at LB3 on Little Bayou Creek.

In most cases, metal concentrations were significantly higher in floodplain soils samples than in corresponding sediment samples and such correlations generally were consistent for both streams. This suggests that runoff from the floodplain soils represents a major source of sediment contamination. In addition, the relationships between sediments and floodplain soils, with few exceptions, were closer than the relationships between 1) water column metals and sediment metals and 2) metal in the water column vs. floodplain soils (Figures 1-14). While metals in sediments resorb back into stream water to some extent, the major source of water column contamination for most metals appeared to be the KPDES effluents, at least during this study period.

It is very important to note that these metal values were sampled during high-flow water conditions and clearly were affected by the increased stream discharge. Also, sediment metals appear to be transported downstream during high-flow, affecting stations BB8 and BB9 on Big Bayou Creek. It will be important to reassess these conditions for the fall sampling period when stream discharge will be lower. During low-flow we should see a closer relationship between effluent outfalls and localized increases in water column metals. Likewise, localized sediment contamination resulting from specific effluents should be more evident (e.g. Ag, 008/BB4).

Table 1. Water quality results for stream water samples from the Bayou Creek system collected March 26-27, 2003.

Station	Temperature (°C)	pH	Conductivity (µS/cm)	D.O. (mg/L)	Alkalinity (mg CaCO ₃ /L)	Hardness (mg CaCO ₃ /L)
MC	17.22	7.55	121.0	12.27	60	44
BB1A	17.08	8.38	187.0	14.57	80	56
BB1	17.08	8.41	179.0	13.48	100	72
BB2	13.70	7.73	174.0	10.72	80	64
BB3	16.10	8.21	202.0	12.10	80	64
BB4	16.32	8.00	242.0	11.02	100	88
006	16.82	7.97	193.0	10.41	120	92
BB5	16.81	8.29	220.0	12.64	100	88
BB6	19.21	8.89	656.0	12.14	100	180
BB7	19.73	9.07	655.0	13.42	100	196
BB8	16.00	7.49	633.0	9.87	80	188
BB9	15.86	7.24	566.8	10.29	120	212
LB1	11.12	7.79	92.0	11.35	60	52
LB2A	--- ¹	--- ¹	--- ¹	--- ¹	200	108
010+011	--- ¹	--- ¹	--- ¹	--- ¹	80	104
LB2	14.16	7.02	331.0	10.87	140	96
LB3	13.38	7.55	308.0	13.47	120	92
LB4	15.75	7.85	282.0	12.20	120	96

¹ Temperature, pH, conductivity, and D.O. not taken at LB2A and 010+011 due to

possible radioactive contamination.

Table 2. Metal concentrations in water samples from Massac Creek (MC) and Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample	Water Metal Conc. (µg/L)							
			Ag	Al	As	B	Ba	Be	Ca	Cd
MC	03/27/03	MWS1	<0.25	180.02	<5.00	<1000.00	37.48	<0.25	6001.7	<0.25
BB1A	03/26/03	MWS1	<0.25	546.04	<5.00	450.94	39.96	<0.25	13542.5	<0.25
BB1	03/26/03	MWS1	0.19	411.55	<5.00	578.55	38.94	<0.25	14152.5	<0.25
BB2	03/27/03	MWS1	0.21	266.77	<5.00	651.60	55.22	<0.25	12284.0	<0.25
BB3	03/26/03	MWS1	0.11	521.75	<5.00	740.67	35.71	<0.25	15146.5	<0.25
BB4	03/26/03	MWS1	0.22	387.45	<5.00	760.14	28.20	<0.25	16387.5	<0.25
006	03/27/03	MWS1	0.16	353.07	<5.00	642.98	12.36	<0.25	15516.5	<0.25
BB5	03/27/03	MWS1	0.20	369.05	<5.00	655.94	20.15	<0.25	16505.0	<0.25
BB6	03/27/03	MWS1	0.23	373.25	<5.00	762.23	24.27	0.46	37421.0	<0.25
BB7	03/27/03	MWS1	0.22	339.88	<5.00	727.00	24.27	0.48	37738.0	<0.25
BB8	03/27/03	MWS1	0.22	330.79	<5.00	666.61	39.39	0.53	36894.5	<0.25
BB9	03/28/03	MWS1	0.21	457.29	<5.00	852.98	47.73	0.42	33375.0	<0.25

Table 2, continued. Metal concentrations in water samples from Massac Creek (MC) and Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample	Water Metal Conc. (µg/L)							
			Co	Cr	Cu	Fe	K	Li	Mg	Mn
MC	03/27/03	MWS1	<1.00	<1.00	<1.00	84.41	2775.70	<1.00	<1000.00	25.80
BB1A	03/26/03	MWS1	<1.00	<1.00	1.16	477.57	3421.20	<1.00	3459.90	71.83
BB1	03/26/03	MWS1	<1.00	<1.00	<1.00	508.00	3131.10	<1.00	3426.20	67.79
BB2	03/27/03	MWS1	<1.00	<1.00	<1.00	337.96	2123.30	1.03	3400.90	87.02
BB3	03/26/03	MWS1	<1.00	0.27	1.12	788.63	2895.85	2.18	3716.10	80.97
BB4	03/26/03	MWS1	<1.00	0.31	6.22	526.75	3158.00	2.41	4568.90	53.55
006	03/27/03	MWS1	<1.00	0.55	1.48	610.40	2116.75	1.48	5590.10	46.87
BB5	03/27/03	MWS1	<1.00	0.35	1.37	555.17	2906.55	2.32	5047.00	47.12
BB6	03/27/03	MWS1	<1.00	0.71	3.53	386.04	13999.00	9.42	11797.00	51.49
BB7	03/27/03	MWS1	<1.00	0.71	2.92	296.02	14002.00	9.13	11809.00	33.57
BB8	03/27/03	MWS1	<1.00	0.57	2.28	263.93	12992.00	8.52	11701.00	101.74
BB9	03/28/03	MWS1	<1.00	0.81	2.11	771.49	11142.00	7.01	10655.00	291.84

Table 2, continued. Metal concentrations in water samples from Massac Creek (MC) and Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample	Water Metal Conc. (µg/L)							
			Mo	Na	Ni	P	Pb	Sb	Se	Sn
MC	03/27/03	MWS1	<5.00	3771.70	<1.00	32.30	<1.00	2.51	<5.00	<5.00
BB1A	03/26/03	MWS1	<5.00	15211.00	1.98	41.67	<1.00	<1.00	<5.00	<5.00
BB1	03/26/03	MWS1	<5.00	14720.00	1.86	37.66	<1.00	<1.00	<5.00	<5.00
BB2	03/27/03	MWS1	<5.00	15166.50	0.95	27.14	<1.00	<1.00	<5.00	<5.00
BB3	03/26/03	MWS1	<5.00	16173.00	1.42	44.83	<1.00	1.40	<5.00	<5.00
BB4	03/26/03	MWS1	<5.00	20653.00	1.60	111.63	<1.00	<1.00	<5.00	<5.00
006	03/27/03	MWS1	<5.00	11899.00	<1.00	22.32	<1.00	<1.00	<5.00	<5.00
BB5	03/27/03	MWS1	<5.00	17550.50	1.19	103.17	<1.00	<1.00	<5.00	<5.00
BB6	03/27/03	MWS1	<5.00	51444.50	2.15	132.02	<1.00	<1.00	<5.00	<5.00
BB7	03/27/03	MWS1	<5.00	51622.50	1.93	123.93	<1.00	1.48	<5.00	<5.00
BB8	03/27/03	MWS1	<5.00	48866.00	2.25	79.39	<1.00	1.12	<5.00	<5.00
BB9	03/28/03	MWS1	<5.00	44297.50	2.30	61.78	4.98	<1.00	<5.00	<5.00

Table 2, continued. Metal concentrations in water samples from Massac Creek (MC) and Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample	Water Metal Conc. (µg/L)				
			Sr	Ti	Tl	V	Zn
MC	03/27/03	MWS1	70.61	1.027	<1.00	<1.00	<1.00
BB1A	03/26/03	MWS1	98.12	11.362	<1.00	1.10	2.39
BB1	03/26/03	MWS1	98.53	8.085	<1.00	1.03	1.52
BB2	03/27/03	MWS1	84.96	4.381	<1.00	<1.00	<1.00
BB3	03/26/03	MWS1	128.38	5.924	<1.00	0.95	3.89
BB4	03/26/03	MWS1	154.04	5.998	<1.00	1.02	10.74
006	03/27/03	MWS1	70.48	1.671	<1.00	1.00	1.08
BB5	03/27/03	MWS1	129.04	1.978	6.36	<1.00	3.47
BB6	03/27/03	MWS1	247.94	5.727	1.11	1.14	8.24
BB7	03/27/03	MWS1	252.69	4.610	5.67	1.35	1.52
BB8	03/27/03	MWS1	256.07	4.143	6.50	<1.00	4.34
BB9	03/28/03	MWS1	238.11	5.948	5.21	1.13	2.86

Table 3. Metal concentrations in water samples from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample	Water Metal Conc. ($\mu\text{g/L}$)							
			Ag	Al	As	B	Ba	Be	Ca	Cd
LB1	03/27/03	MWS1	0.10	1285.00	<5.00	499.67	76.81	<0.25	9592.55	<0.25
LB2A	03/27/03	MWS1	0.28	1013.39	<5.00	635.50	115.48	<0.25	19673.50	<0.25
010+011	03/27/03	MWS1	0.04	412.09	<5.00	666.71	14.80	<0.25	19503.50	<0.25
LB2	03/27/03	MWS1	0.16	495.64	<5.00	690.38	44.63	<0.25	19655.00	<0.25
LB3	03/27/03	MWS1	0.15	556.79	<5.00	500.80	53.02	<0.25	17751.50	<0.25
LB4	03/26/03	MWS1	0.32	682.17	<5.00	681.19	59.34	<0.25	17444.50	<0.25

Table 3, continued. Metal concentrations in water samples from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample	Water Metal Conc. (µg/L)							
			Co	Cr	Cu	Fe	K	Li	Mg	Mn
LB1	03/27/03	MWS1	<1.00	0.57	1.936	1154.75	2543.8	<1.00	2570.3	81.94
LB2A	03/27/03	MWS1	<1.00	0.59	<1.00	1045.75	2514.5	1.995	5845.1	101.91
010+011	03/27/03	MWS1	<1.00	2.19	2.577	441.12	3779.7	3.104	7314.9	33.71
LB2	03/27/03	MWS1	<1.00	1.40	1.939	548.45	3324.0	2.770	6834.3	54.05
LB3	03/27/03	MWS1	<1.00	1.19	1.380	542.39	3009.3	2.437	6053.6	82.60
LB4	03/26/03	MWS1	<1.00	1.30	1.770	785.92	3043.8	2.659	5708.2	127.79

Table 3, continued. Metal concentrations in water samples from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample	Water Metal Conc. (µg/L)							
			Mo	Na	Ni	P	Pb	Sb	Se	Sn
LB1	03/27/03	MWS1	<5.00	3147.9	2.89	52.09	8.05	<1.00	<5.00	<5.00
LB2A	03/27/03	MWS1	<5.00	37737.0	1.66	42.12	0.99	1.09	<5.00	<5.00
010+011	03/27/03	MWS1	<5.00	27843.0	<1.00	254.43	0.90	<1.00	<5.00	<5.00
LB2	03/27/03	MWS1	<5.00	31497.5	1.19	174.61	<1.00	1.29	<5.00	<5.00
LB3	03/27/03	MWS1	<5.00	29205.5	1.51	113.69	1.02	1.52	<5.00	<5.00
LB4	03/26/03	MWS1	<5.00	26402.5	1.97	64.68	<1.00	1.17	<5.00	<5.00

Table 3, continued. Metal concentrations in water samples from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample	Water Metal Conc. (µg/L)				
			Sr	Ti	Tl	V	Zn
LB1	03/27/03	MWS1	55.01	15.77	<1.00	2.06	8.07
LB2A	03/27/03	MWS1	429.47	10.46	<1.00	1.10	9.23
010+011	03/27/03	MWS1	173.19	3.19	6.00	1.13	19.18
LB2	03/27/03	MWS1	217.28	<1.00	5.88	<1.00	19.10
LB3	03/27/03	MWS1	268.43	8.33	6.46	0.98	11.82
LB4	03/26/03	MWS1	260.83	13.93	5.56	1.12	6.09

Table 4. Mean metal values in sediments from Massac Creek (MC) and Big Bayou Creek collected March 26-28, 2003.

Station	Sediment Metal Conc. ($\mu\text{g/g}$)													
	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	K	Li
MC	0.022	2046.2	2.49	2.48	N.D.	0.21	175.9	0.56	3.07	9.15	1.70	5707.8	133.39	1.66
BB1A	0.018	5167.6	1.50	5.77	N.D.	0.29	476.4	0.75	3.07	10.69	2.74	6743.1	233.09	3.48
BB1	0.025	3199.7	6.78	3.85	N.D.	0.53	374.7	1.19	4.99	16.44	3.29	10442.0	186.27	1.74
BB2	0.023	2222.2	1.47	2.92	N.D.	0.22	1968.8	0.48	4.57	7.09	1.92	5666.3	149.10	1.55
BB3	0.015	1404.5	0.96	2.40	N.D.	N.D.	202.6	0.59	1.51	5.54	1.01	4473.4	90.46	N.D.
BB4	0.031	4491.6	2.50	10.71	N.D.	0.35	417.2	1.15	2.44	37.06	3.78	8414.1	206.42	2.38
BB5	0.029	3346.7	1.43	3.98	N.D.	0.23	386.3	0.58	2.19	8.85	2.70	6510.5	156.75	1.94
BB6	0.027	5391.4	1.14	3.20	N.D.	0.36	4384.9	0.48	1.80	7.19	1.74	5498.4	222.42	3.00
BB7	0.033	3290.3	2.76	3.25	N.D.	0.31	300.3	0.65	2.98	12.22	2.45	6894.9	169.78	1.96
BB8	0.027	4579.9	1.67	4.72	N.D.	0.26	678.4	0.56	3.69	7.51	3.60	6124.2	293.53	3.11
BB9	0.029	4087.7	1.48	4.48	N.D.	0.28	628.4	0.49	2.91	8.55	3.23	5623.9	286.59	3.14

Table 4, continued. Mean metal values in sediments from Massac Creek (MC) and Big Bayou Creek collected March 26-28, 2003.

Station	Sediment Metal Conc. ($\mu\text{g/g}$)														
	Mg	Mn	Mo	Na	Ni	Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	V	Zn
MC	186.30	384.39	N.D.	152.39	2.19	4.22	0.36	N.D.	124.75	0.31	2.14	17.56	0.67	11.58	5.83
BB1A	422.14	261.66	N.D.	145.06	3.50	6.00	0.40	N.D.	187.31	N.D.	5.40	4.64	0.58	17.68	9.12
BB1	324.19	535.55	N.D.	208.35	3.67	8.87	0.68	N.D.	320.64	0.36	3.40	21.55	0.44	25.74	11.76
BB2	312.15	190.26	N.D.	237.20	2.38	5.34	0.25	N.D.	89.19	0.22	10.10	16.31	0.52	11.27	8.14
BB3	110.20	241.74	N.D.	199.44	1.44	3.02	0.21	N.D.	72.02	0.19	8.88	12.86	0.55	7.54	7.47
BB4	359.52	169.01	N.D.	215.84	3.02	6.07	0.70	N.D.	235.67	N.D.	4.67	4.04	N.D.	15.06	16.52
BB5	278.95	211.79	N.D.	253.47	2.62	5.05	0.36	N.D.	135.14	N.D.	2.57	11.35	0.42	11.27	9.09
BB6	467.16	164.70	N.D.	232.18	2.64	3.41	0.33	N.D.	112.06	0.29	9.23	8.77	1.30	9.97	6.58
BB7	244.34	339.60	N.D.	215.59	3.25	5.38	0.48	N.D.	154.45	0.43	2.99	12.91	0.39	15.72	10.66
BB8	478.40	551.33	N.D.	262.76	3.71	6.07	0.42	N.D.	123.41	N.D.	6.16	6.47	0.76	11.54	12.33
BB9	449.46	405.21	N.D.	219.41	3.46	5.01	0.33	N.D.	93.27	N.D.	5.19	6.82	0.47	9.17	12.33

Table 5. Mean metal values in sediments from Little Bayou Creek collected March 26-28, 2003.

Station	Sediment Metal Conc. ($\mu\text{g/g}$)													
	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	K	Li
LB1	0.043	5077.9	2.67	2.61	59.33	0.39	1672.7	0.64	3.73	9.24	4.49	7384.5	392.12	4.59
LB2A	0.020	6231.5	0.85	2.57	35.53	0.33	1154.5	0.60	3.10	9.82	3.03	6664.7	241.59	3.55
LB2	0.018	5602.4	1.10	4.24	40.74	0.30	924.2	0.67	4.18	13.72	3.98	6435.9	248.82	3.81
LB3	0.009	4255.0	6.48	2.72	44.47	0.53	742.3	1.15	5.56	32.15	4.56	10722.5	199.83	2.34
LB4	0.039	4433.5	3.02	3.30	48.55	0.35	1547.7	0.66	3.65	17.78	4.89	6466.0	266.88	3.80

Table 5, continued. Mean metal values in sediments from Little Bayou Creek collected March 26-28, 2003.

Station	Sediment Metal Conc. ($\mu\text{g/g}$)														
	Mg	Mn	Mo	Na	Ni	Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	V	Zn
LB1	675.09	382.24	N.D.	185.60	4.52	6.69	0.41	N.D.	141.38	0.22	7.36	6.74	0.55	12.42	22.98
LB2A	543.83	190.36	N.D.	280.49	3.72	4.54	0.40	N.D.	144.67	N.D.	13.17	1.03	0.22	11.90	14.69
LB2	485.61	255.83	N.D.	315.54	3.87	5.49	0.45	N.D.	145.24	N.D.	10.14	1.22	0.80	12.23	22.91
LB3	400.09	405.26	N.D.	232.09	4.94	9.41	0.76	N.D.	320.55	0.38	10.82	3.36	0.39	25.73	24.61
LB4	488.48	308.23	N.D.	327.13	5.57	6.61	0.43	N.D.	134.89	N.D.	12.72	6.32	0.35	13.52	20.23

Table 6. Mean metal values in floodplain soils from Big Bayou Creek collected March 26-28, 2003.

Station	Floodplain Metal Conc. ($\mu\text{g/g}$)													
	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	K	Li
BB1A	0.012	6257.4	1.63	3.66	45.43	0.26	748.8	0.63	3.77	6.31	4.55	6342.8	412.39	4.79
BB1	0.012	3926.5	2.34	3.68	47.97	0.26	2376.8	0.70	3.74	9.56	4.32	6354.1	308.25	3.13
BB2	0.019	6274.6	2.32	3.94	52.01	0.31	3174.5	0.79	5.46	7.90	5.95	7417.7	652.14	6.23
BB3	0.013	5571.3	2.58	4.50	41.64	0.32	980.2	0.77	5.96	8.19	4.50	7646.4	436.32	4.20
BB4	0.017	3955.7	2.90	3.87	N.D.	0.30	604.2	0.77	4.59	11.93	3.48	7420.1	226.30	2.86
BB5	0.019	4565.7	2.35	4.03	N.D.	0.27	742.3	0.66	4.40	8.81	3.95	6479.2	400.36	3.83
BB6	0.015	3588.1	2.14	4.72	N.D.	0.27	695.5	0.62	3.75	8.78	3.01	7083.7	235.18	2.32
BB7	0.015	4160.2	1.84	3.45	N.D.	0.26	974.8	0.64	3.77	9.15	3.68	6772.9	305.86	2.87
BB8	0.031	5419.4	2.52	3.06	37.87	0.32	858.4	0.84	5.35	16.47	6.17	8651.7	412.04	4.20
BB9	0.023	6306.1	1.80	3.66	52.30	0.34	1178.1	0.78	4.64	10.42	6.52	7185.5	560.21	5.94

Table 6, continued. Mean metal values in floodplain soils from Big Bayou Creek collected March 26-28, 2003.

Station	Floodplain Metal Conc. (µg/g)														
	Mg	Mn	Mo	Na	Ni	Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	V	Zn
BB1A	636.06	526.46	N.D.	253.24	4.95	6.94	0.29	N.D.	129.15	0.24	6.24	6.87	0.86	12.07	16.90
BB1	470.09	461.28	N.D.	239.72	4.19	6.77	0.30	N.D.	130.04	N.D.	12.11	7.95	0.73	12.06	26.34
BB2	821.78	635.88	N.D.	272.78	6.27	8.69	0.56	N.D.	165.48	0.33	12.02	7.58	0.75	15.04	23.52
BB3	534.17	628.22	N.D.	370.85	5.03	9.52	0.48	N.D.	174.25	N.D.	9.81	9.78	0.58	17.22	18.02
BB4	406.74	439.36	N.D.	237.36	3.74	7.53	0.56	N.D.	169.62	0.23	5.74	8.18	0.53	17.40	12.91
BB5	519.41	449.70	N.D.	255.09	4.44	7.86	0.43	N.D.	138.05	N.D.	6.04	8.22	1.08	14.46	15.64
BB6	420.32	373.16	N.D.	270.93	3.24	6.66	0.35	N.D.	132.26	N.D.	4.55	10.79	0.78	14.20	11.89
BB7	450.97	390.97	N.D.	227.76	3.84	6.81	0.36	N.D.	145.00	N.D.	7.69	8.33	0.86	13.59	15.54
BB8	541.00	642.22	N.D.	234.24	6.06	9.65	0.39	N.D.	204.80	0.20	6.20	8.29	0.52	16.44	21.35
BB9	748.35	550.12	N.D.	277.84	6.77	7.87	0.46	0.37	168.03	0.25	10.16	5.16	0.49	13.30	26.44

Table 7. Mean metal values in floodplain soils from Little Bayou Creek collected March 26-28, 2003.

Station	Floodplain Metal Conc. ($\mu\text{g/g}$)													
	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	K	Li
LB1	0.014	8114.8	3.61	3.68	65.72	0.42	1789.3	0.96	5.33	9.44	6.94	9359.5	704.31	6.55
LB2A	N.D.	5061.7	1.24	3.46	44.44	0.28	1048.4	0.58	3.70	16.96	4.51	6102.1	272.57	3.60
LB2	N.D.	5616.1	2.51	3.43	48.30	0.39	1231.1	0.85	5.73	21.76	5.10	7801.5	338.38	4.77
LB3	N.D.	3906.0	1.23	3.31	N.D.	0.25	623.8	0.53	3.43	12.93	3.04	6130.3	208.74	2.68
LB4	0.068	2865.3	1.20	3.14	N.D.	0.20	722.3	0.45	2.40	47.46	4.63	4688.2	209.70	2.33

Table 7, continued. Mean metal values in floodplain soils from Little Bayou Creek collected March 26-28, 2003.

Station	Floodplain Metal Conc. ($\mu\text{g/g}$)														
	Mg	Mn	Mo	Na	Ni	Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	V	Zn
LB1	1028.20	708.85	N.D.	296.85	6.75	11.13	0.57	0.31	249.80	0.27	7.94	4.59	1.45	19.89	32.98
LB2A	514.78	237.94	N.D.	275.48	4.19	6.47	0.33	N.D.	118.23	N.D.	12.76	1.73	0.67	12.74	22.99
LB2	556.60	388.18	N.D.	248.46	5.60	8.31	0.65	0.25	199.23	N.D.	12.12	2.33	0.31	18.74	22.48
LB3	423.55	279.44	N.D.	245.61	3.36	6.01	0.33	N.D.	101.63	N.D.	10.73	2.52	0.28	12.68	16.22
LB4	385.89	410.05	N.D.	211.40	3.14	6.04	0.55	N.D.	91.66	N.D.	5.31	3.20	0.49	8.93	25.31

Figure 1. Silver mean metal concentrations in water and sediments from Big Bayou Creek collected March 26-27, 2003.

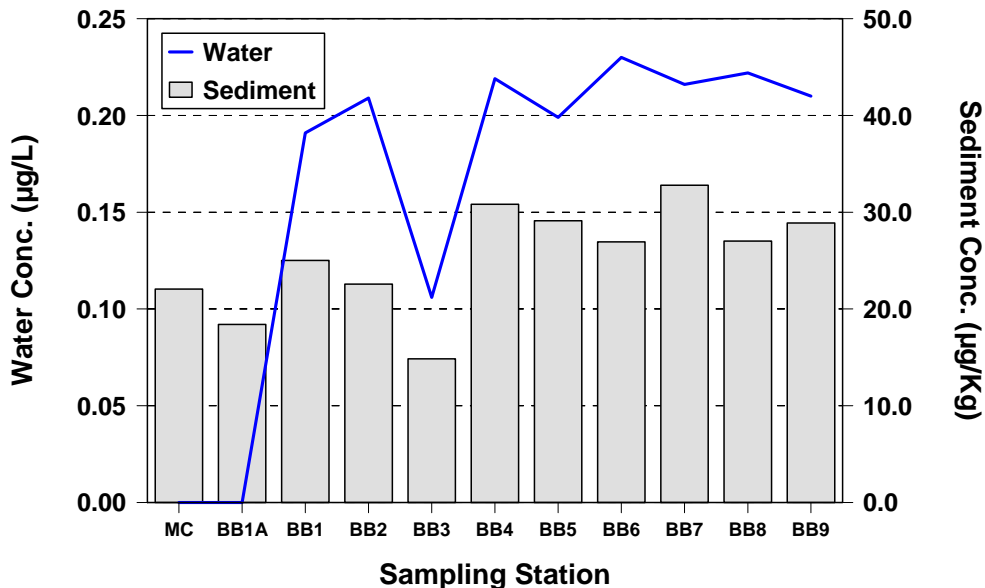


Figure 2. Silver mean metal concentrations in water and floodplain soils from Big Bayou Creek collected March 26-27, 2003.

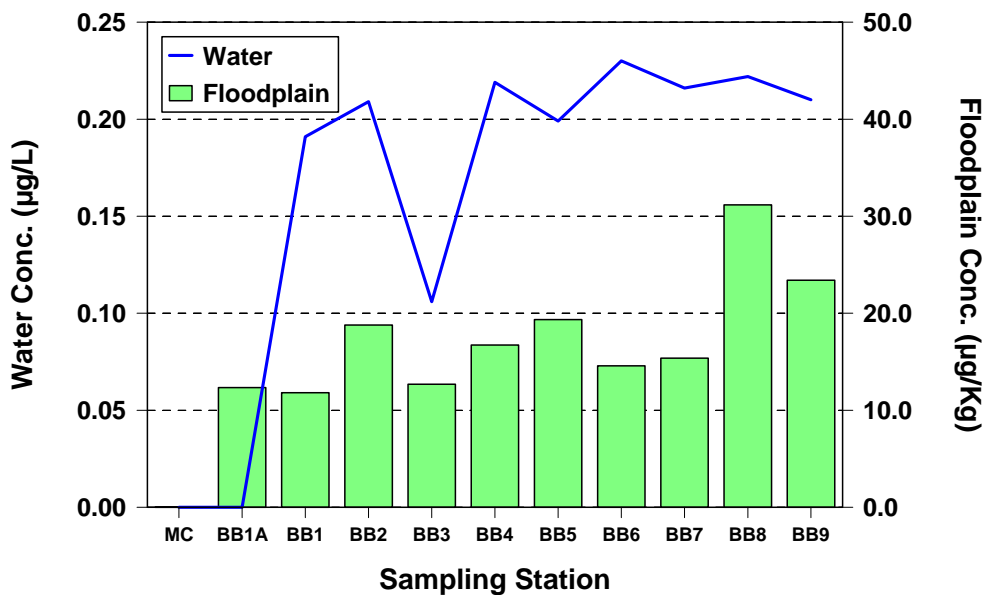


Figure 3. Copper mean metal concentrations in water and sediments from Big Bayou Creek collected March 26-27, 2003.

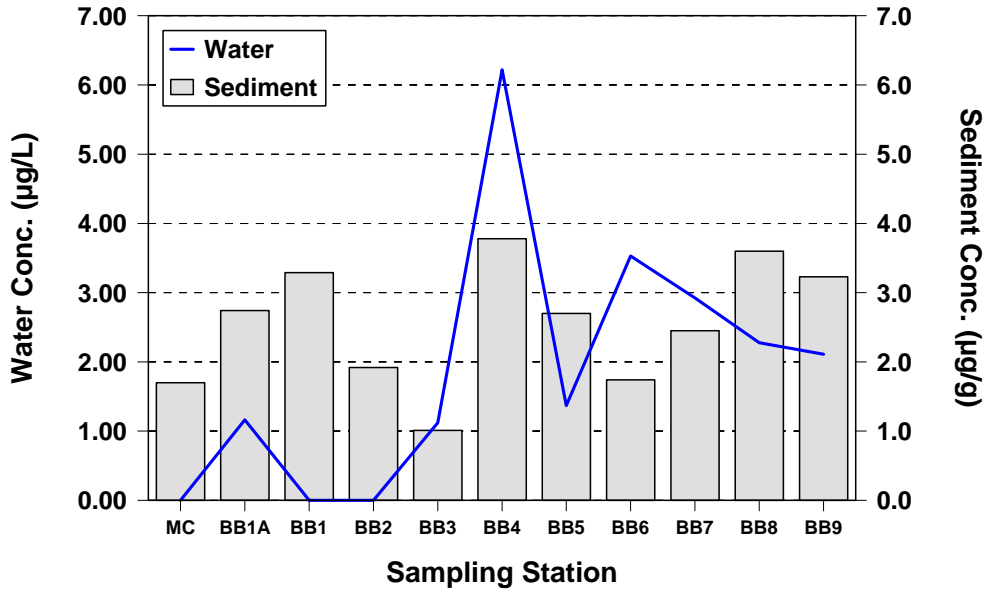


Figure 4. Copper mean metal concentrations in water and floodplain soils from Big Bayou Creek collected March 26-27, 2003.

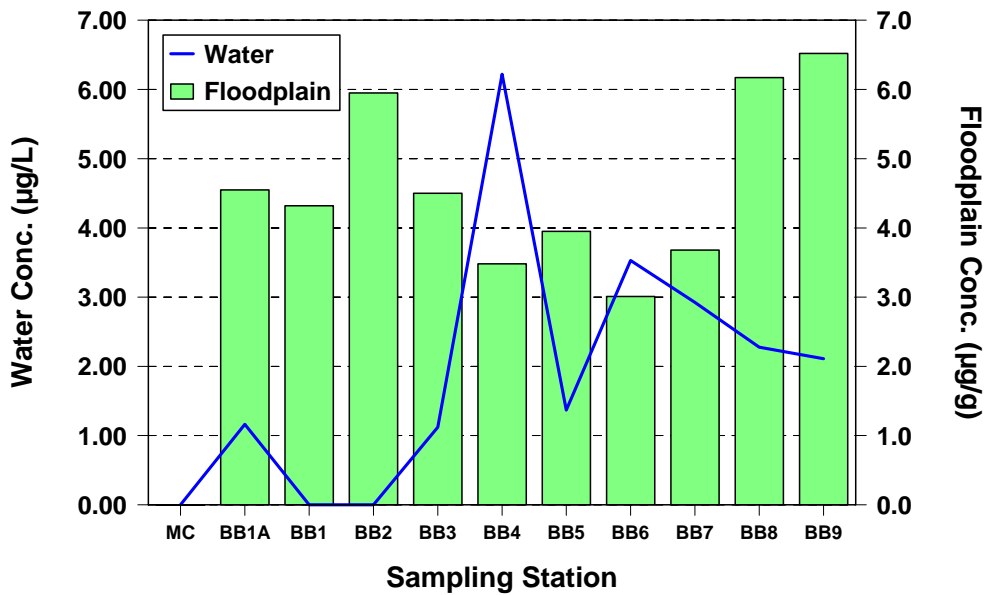


Figure 5. Chromium mean metal concentrations in water and sediments from Big Bayou Creek collected March 26-27, 2003.

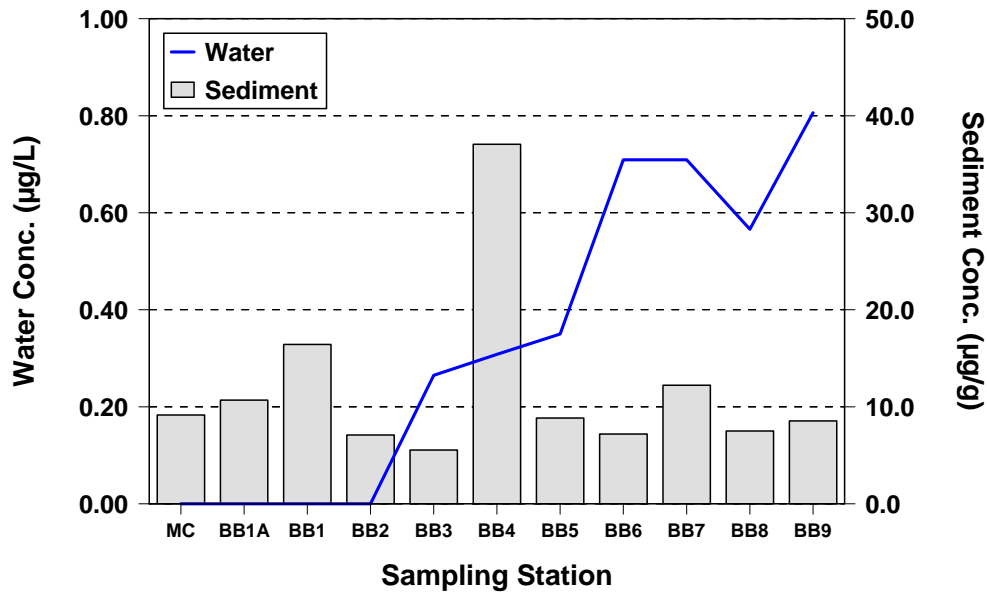


Figure 6. Chromium mean metal concentrations in water and floodplain soils from Big Bayou Creek collected March 26-27, 2003.

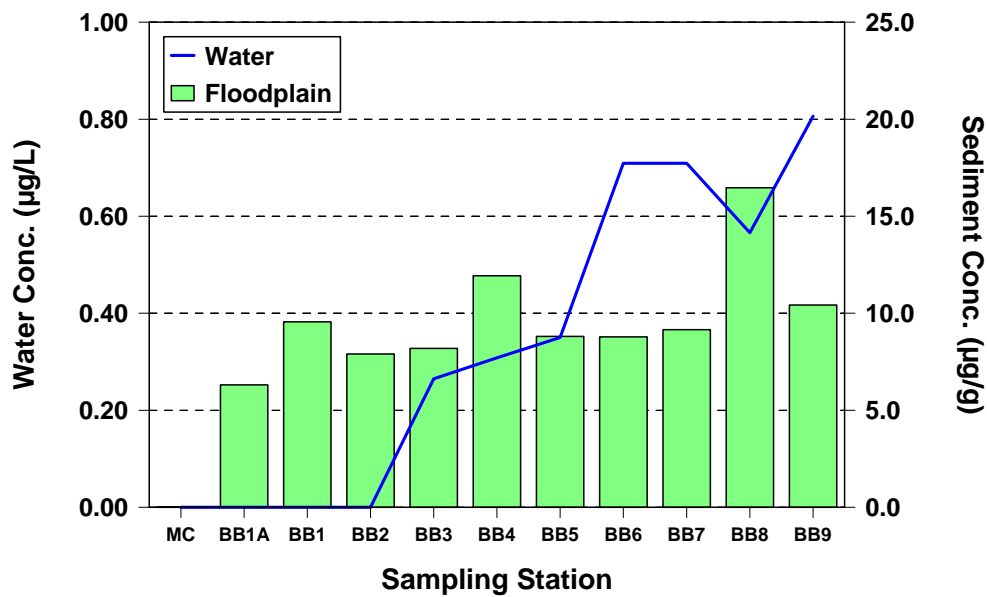


Figure 7. Iron mean metal concentrations in water and sediments from Big Bayou Creek collected March 26-27, 2003.

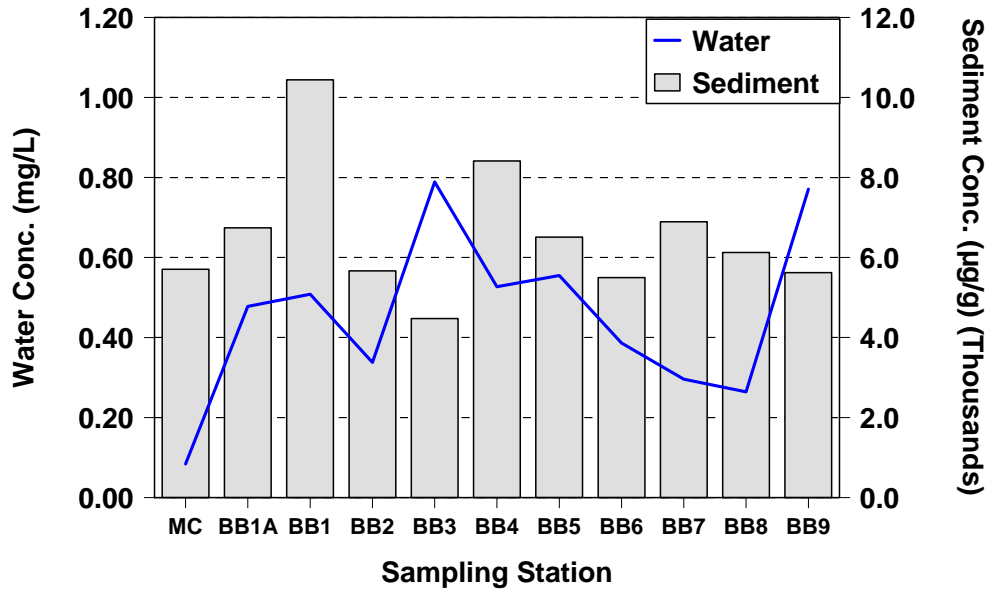


Figure 8. Iron mean metal concentrations in water and floodplain soils from Big Bayou Creek collected March 26-27, 2003.

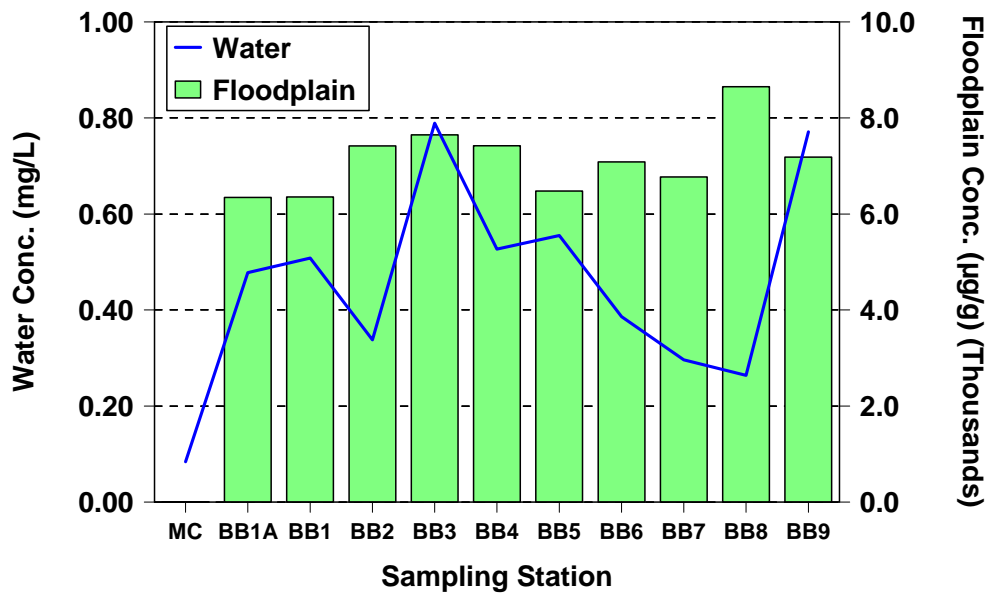


Figure 9. Nickel mean metal concentrations in water and sediments from Big Bayou Creek collected March 26-27, 2003.

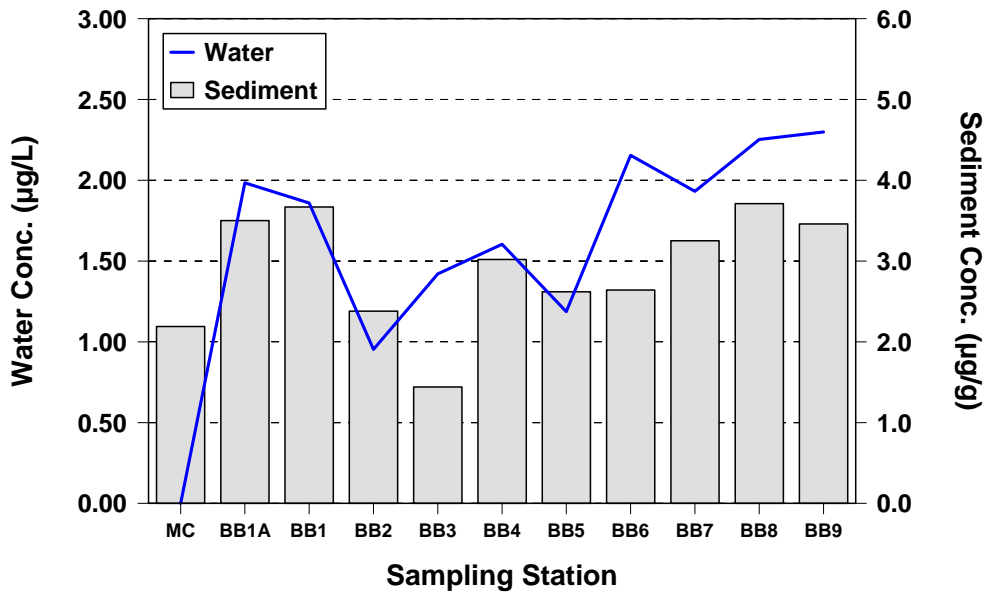


Figure 10. Nickel mean metal concentrations in water and floodplain soils from Big Bayou Creek collected March 26-27, 2003.

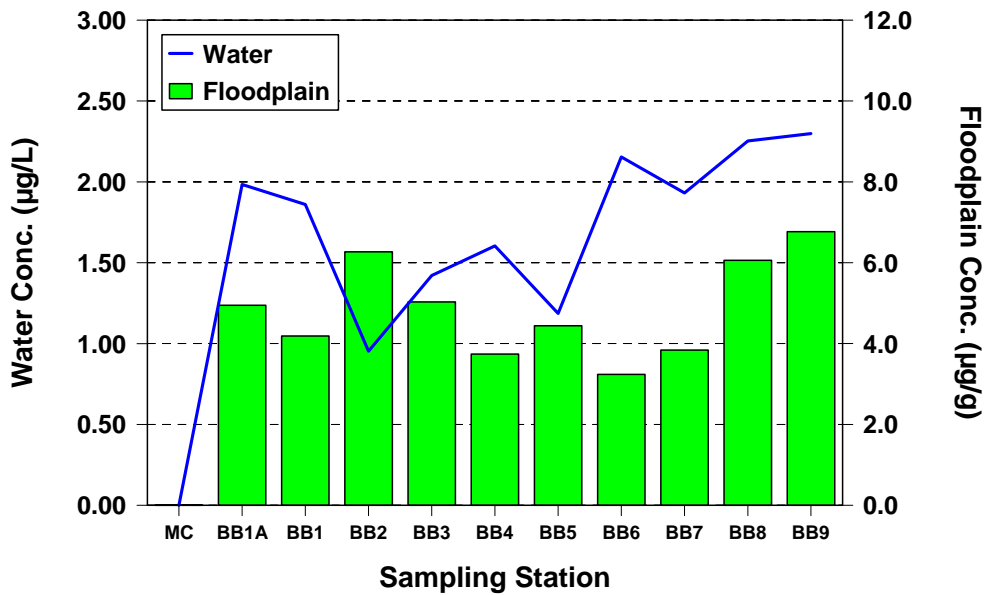


Figure 11. Lead mean metal concentrations in water and sediments from Big Bayou Creek collected March 26-27, 2003.

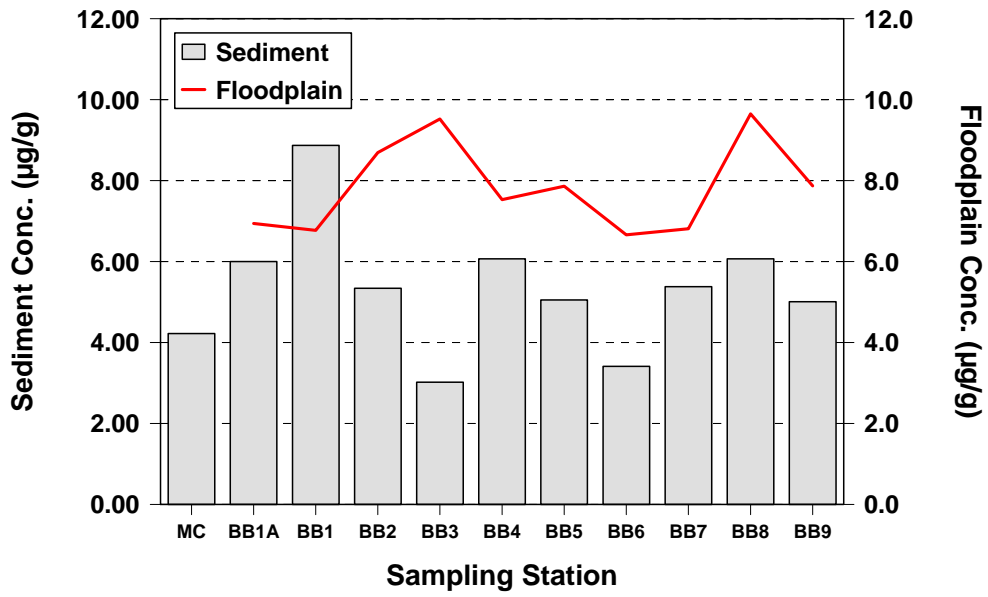


Figure 12. Zinc mean metal concentrations in water and sediments from Big Bayou Creek collected March 26-27, 2003.

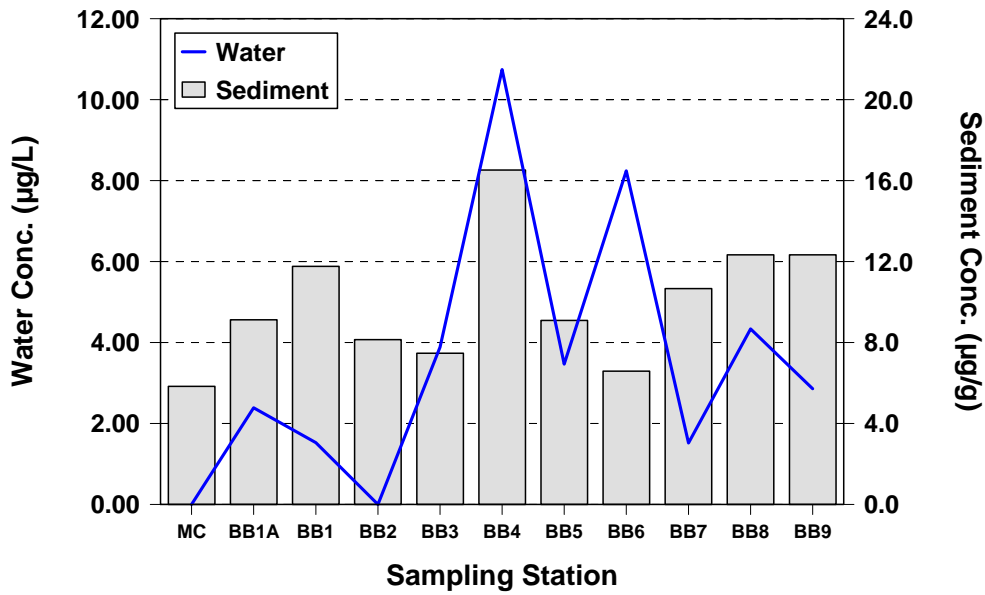


Figure 13. Zinc mean metal concentrations in water and floodplain soils from Big Bayou Creek collected March 26-27, 2003.

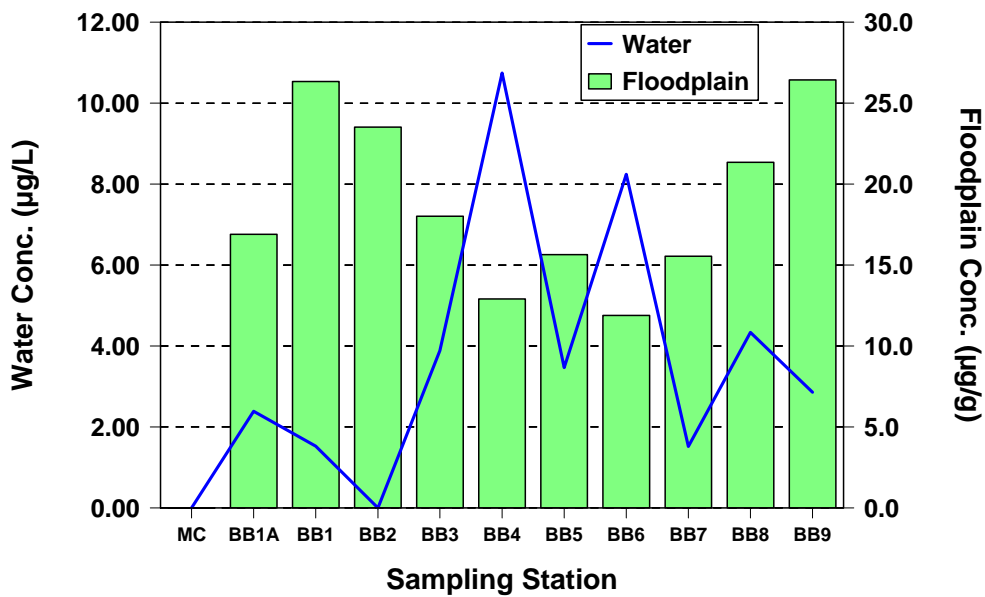


Figure 14. Zinc mean metal concentrations in water and sediments from Big Bayou Creek collected March 26-27, 2003.

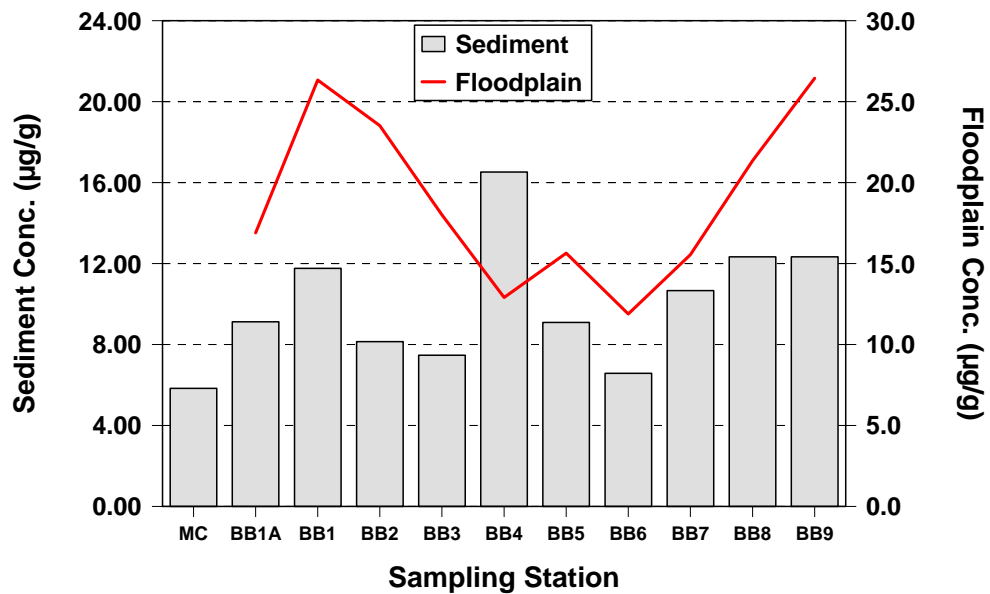


Table A1. Metal concentrations in sediments from Massac Creek (MC) and Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Sediment Metal Conc. (µg/g)									
			Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr
MC	03/27/03	MSED1	0.025	1095.4	3.06	2.05	<40.14	0.22	84.16	0.59	2.58	11.72
MC	03/27/03	MSED2	0.019	2997.1	1.91	2.90	<37.45	0.20	267.71	0.54	3.57	6.59
BB1A	03/26/03	MSED1	0.022	4420.3	2.06	9.18	<47.24	0.29	462.33	0.79	4.04	8.79
BB1A	03/26/03	MSED2	0.015	5915.0	0.94	2.36	<34.63	0.29	490.43	0.70	2.10	12.59
BB1	03/26/03	MSED1	0.031	2592.1	11.02	2.44	<38.45	0.79	367.06	1.77	5.77	26.34
BB1	03/26/03	MSED2	0.019	3807.3	2.53	5.26	<43.16	0.26	382.32	0.61	4.21	6.54
BB2	03/28/03	MSED1	0.026	2741.0	2.04	3.21	<46.38	0.26	3753.32	0.57	5.05	7.46
BB2	03/28/03	MSED2	0.019	1703.5	0.91	2.63	<36.28	0.18	184.36	0.40	4.09	6.72
BB3	03/26/03	MSED1	0.012	1516.5	0.89	2.76	<38.08	<0.19	215.11	0.34	1.46	6.00
BB3	03/26/03	MSED2	0.017	1292.6	1.02	2.04	<38.28	<0.19	190.11	0.84	1.57	5.08
BB4	03/26/03	MSED1	0.039	3945.7	3.07	18.57	<46.10	0.33	476.66	1.58	2.88	12.56
BB4	03/26/03	MSED2	0.023	5037.5	1.92	2.85	<38.48	0.37	357.76	0.72	2.00	61.57
BB5	03/27/03	MSED1	0.024	2328.0	<0.88	2.50	<43.98	<0.22	194.13	0.59	2.09	7.50
BB5	03/27/03	MSED2	0.034	4365.4	1.43	5.47	<38.34	0.23	578.57	0.57	2.28	10.20
BB6	03/27/03	MSED1	0.032	9156.2	<0.94	3.61	<46.97	0.36	1350.47	0.56	2.15	7.22
BB6	03/27/03	MSED2	0.022	1626.7	1.14	2.78	<39.95	<0.20	7419.30	0.39	1.45	7.16
BB7	03/27/03	MSED1	0.041	1668.5	4.01	3.35	<38.15	0.33	234.78	0.80	4.18	16.83
BB7	03/27/03	MSED2	0.024	4912.2	1.52	3.14	<40.39	0.28	365.81	0.49	1.78	7.62
BB8	03/28/03	MSED1	0.026	3702.9	1.87	3.30	<42.34	0.24	509.59	0.54	3.56	8.05
BB8	03/28/03	MSED2	0.028	5457.0	1.48	6.13	<41.37	0.28	847.15	0.58	3.83	6.97
BB9	03/28/03	MSED1	0.029	2718.4	<0.91	2.83	<45.66	<0.23	409.74	0.41	2.00	10.13

¹ MSED1 and MSED2 are duplicates from the same sample.

Table A1, continued. Metal concentrations in sediments from Massac Creek (MC) and Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Sediment Metal Conc. (µg/g)								
			Cu	Fe	K	Li	Mg	Mn	Mo	Na	Ni
MC	03/27/03	MSED1	1.39	5810.1	79.94	<0.80	67.29	320.67	<0.80	107.82	1.83
MC	03/27/03	MSED2	2.02	5605.4	186.83	1.66	305.31	448.12	<0.75	196.96	2.55
BB1A	03/26/03	MSED1	3.16	6340.3	267.44	3.17	518.18	452.95	<0.94	116.37	3.65
BB1A	03/26/03	MSED2	2.31	7145.8	198.73	3.78	326.10	70.37	<0.69	173.75	3.36
BB1	03/26/03	MSED1	3.95	14405.6	143.61	1.02	225.11	492.67	<0.77	194.49	4.20
BB1	03/26/03	MSED2	2.63	6478.4	228.92	2.47	423.28	578.44	<0.86	222.21	3.14
BB2	03/28/03	MSED1	2.56	6289.9	192.49	2.17	466.37	92.11	<0.93	308.06	3.05
BB2	03/28/03	MSED2	1.27	5042.6	105.71	0.93	157.93	288.42	<0.73	166.34	1.70
BB3	03/26/03	MSED1	1.06	5086.8	96.05	<0.76	115.01	254.01	<0.76	238.78	1.25
BB3	03/26/03	MSED2	0.96	3860.1	84.87	<0.77	105.38	229.46	<0.77	160.10	1.64
BB4	03/26/03	MSED1	3.02	9224.5	201.17	2.18	354.34	239.92	<0.92	267.23	3.17
BB4	03/26/03	MSED2	4.54	7603.7	211.67	2.58	364.70	98.11	<0.77	164.45	2.87
BB5	03/27/03	MSED1	2.05	6221.9	120.48	1.23	182.49	203.50	<0.88	168.85	2.26
BB5	03/27/03	MSED2	3.35	6799.1	193.02	2.64	375.42	220.07	<0.77	338.09	2.97
BB6	03/27/03	MSED1	2.02	6349.9	324.19	4.78	569.61	<46.97	<0.94	286.94	3.74
BB6	03/27/03	MSED2	1.46	4646.8	120.65	1.22	364.70	164.70	<0.80	177.41	1.53
BB7	03/27/03	MSED1	2.15	8148.6	105.67	0.97	145.82	551.74	<0.76	208.02	3.88
BB7	03/27/03	MSED2	2.75	5641.2	233.89	2.95	342.86	127.47	<0.81	223.16	2.61
BB8	03/28/03	MSED1	2.68	6326.0	224.08	2.16	425.65	473.36	<0.85	267.03	2.98
BB8	03/28/03	MSED2	4.53	5922.4	362.98	4.05	531.15	629.31	<0.83	258.50	4.44
BB9	03/28/03	MSED1	1.94	5325.3	210.19	2.22	367.77	181.10	<0.91	180.32	2.49

¹ MSED1 and MSED2 are duplicates from the same sample.

Table A1, continued. Metal concentrations in sediments from Massac Creek (MC) and Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Sediment Metal Conc. (µg/g)									
			Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	V	Zn
MC	03/27/03	MSED1	3.89	0.35	<0.20	130.75	0.31	<2.01	22.74	0.51	12.86	4.65
MC	03/27/03	MSED2	4.55	0.37	<0.19	118.75	<0.19	2.14	12.37	0.82	10.30	7.01
BB1A	03/26/03	MSED1	7.01	0.37	<0.24	202.12	<0.24	4.68	8.43	0.91	14.12	11.63
BB1A	03/26/03	MSED2	5.00	0.44	<0.17	172.51	<0.17	6.11	0.84	0.24	21.24	6.61
BB1	03/26/03	MSED1	11.42	1.04	<0.19	502.77	0.48	3.40	31.03	0.19	38.29	14.04
BB1	03/26/03	MSED2	6.32	0.32	<0.22	138.50	0.23	3.39	12.07	0.70	13.19	9.48
BB2	03/28/03	MSED1	6.70	<0.23	<0.23	100.69	<0.23	10.10	15.06	0.57	13.31	10.83
BB2	03/28/03	MSED2	3.97	0.25	<0.18	77.69	0.22	<1.81	17.56	0.48	9.23	5.45
BB3	03/26/03	MSED1	2.92	0.21	<0.19	66.14	0.19	<1.90	13.32	0.30	7.62	5.12
BB3	03/26/03	MSED2	3.13	<0.19	<0.19	77.91	<0.19	8.88	12.41	0.80	7.46	9.82
BB4	03/26/03	MSED1	6.79	0.58	<0.23	294.32	<0.23	4.19	5.71	<0.23	16.89	12.11
BB4	03/26/03	MSED2	5.35	0.81	<0.19	177.01	<0.19	5.16	2.37	<0.19	13.22	20.92
BB5	03/27/03	MSED1	5.29	0.30	<0.22	125.63	<0.22	2.19	16.95	0.48	10.13	7.71
BB5	03/27/03	MSED2	4.81	0.41	<0.19	144.65	<0.19	2.94	5.75	0.36	12.42	10.47
BB6	03/27/03	MSED1	3.90	0.41	<0.23	127.21	<0.23	7.77	<0.94	<0.23	11.43	7.18
BB6	03/27/03	MSED2	2.92	0.26	<0.20	96.92	0.29	10.69	8.77	1.30	8.50	5.98
BB7	03/27/03	MSED1	5.33	0.61	<0.19	199.55	0.43	2.03	18.87	0.40	19.65	12.00
BB7	03/27/03	MSED2	5.43	0.35	<0.20	109.34	<0.20	3.96	6.96	0.39	11.79	9.31
BB8	03/28/03	MSED1	5.92	0.47	<0.21	124.06	<0.21	4.61	7.66	0.84	11.74	9.80
BB8	03/28/03	MSED2	6.21	0.37	<0.21	122.75	<0.21	7.71	5.29	0.67	11.33	14.86
BB9	03/28/03	MSED1	3.80	0.29	<0.23	63.80	<0.23	2.68	8.36	0.28	7.01	9.79

¹ MSED1 and MSED2 are duplicates from the same sample.

Table A2. Metal concentrations in sediments from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Sediment Metal Conc. (µg/g)									
			Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr
LB1	03/27/03	MSED1	0.057	7437.5	2.67	2.39	59.33	0.39	2935.65	0.88	5.46	8.36
LB2A	03/27/03	MSED1	0.023	6937.2	<0.75	2.31	34.18	0.36	1231.78	0.61	2.66	9.19
LB2A	03/27/03	MSED2	0.017	5525.7	0.85	2.84	36.88	0.29	1077.31	0.59	3.55	10.46
LB2	03/27/03	MSED1	0.018	5511.3	0.87	3.44	<41.72	0.28	927.43	0.61	4.35	16.41
LB2	03/27/03	MSED2	0.018	5693.5	1.32	5.04	40.74	0.32	920.93	0.72	4.00	11.02
LB3	03/27/03	MSED1	0.010	4584.9	10.04	2.19	44.47	0.69	760.34	1.55	7.21	45.63
LB3	03/27/03	MSED2	0.008	3925.0	2.92	3.25	<39.67	0.36	724.20	0.76	3.91	18.66
LB4	03/28/03	MSED1	0.029	2658.8	<0.85	2.54	<42.70	<0.21	950.60	0.37	1.86	24.10
LB4	03/28/03	MSED2	0.050	6208.2	3.02	4.06	48.55	0.35	2144.81	0.95	5.44	11.47

¹ MSED1 and MSED2 are duplicates from the same sample.

Table A2, continued. Metal concentrations in sediments from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Sediment Metal Conc. (µg/g)								
			Cu	Fe	K	Li	Mg	Mn	Mo	Na	Ni
LB1	03/27/03	MSED1	7.04	9443.7	574.05	6.96	982.40	583.39	<0.82	190.89	6.55
LB2A	03/27/03	MSED1	2.62	6990.0	231.94	3.45	588.13	147.78	<0.75	282.61	3.72
LB2A	03/27/03	MSED2	3.44	6339.5	251.25	3.66	499.54	232.95	<0.73	278.36	3.73
LB2	03/27/03	MSED1	4.22	5779.3	233.13	3.49	451.15	251.49	<0.83	283.25	3.74
LB2	03/27/03	MSED2	3.73	7092.6	264.52	4.13	520.08	260.17	<0.77	347.83	3.99
LB3	03/27/03	MSED1	5.76	13933.0	200.45	2.19	344.47	515.97	<0.74	215.61	6.32
LB3	03/27/03	MSED2	3.37	7511.9	199.22	2.48	455.71	294.55	<0.79	248.58	3.57
LB4	03/28/03	MSED1	2.93	4269.0	160.68	1.94	274.24	130.50	<0.85	254.83	2.17
LB4	03/28/03	MSED2	6.84	8663.1	373.09	5.66	702.72	485.97	<0.93	399.43	8.98

¹ MSED1 and MSED2 are duplicates from the same sample.

Table A2, continued. Metal concentrations in sediments from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Sediment Metal Conc. (µg/g)									
			Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	V	Zn
LB1	03/27/03	MSED1	9.57	0.53	<0.21	218.96	0.22	12.05	5.12	0.81	17.84	36.16
LB2A	03/27/03	MSED1	3.80	0.39	<0.19	151.00	<0.19	12.01	<0.75	0.22	11.42	10.75
LB2A	03/27/03	MSED2	5.28	0.42	<0.18	138.34	<0.18	14.33	1.03	<0.18	12.38	18.63
LB2	03/27/03	MSED1	5.70	0.42	<0.21	122.36	<0.21	9.79	1.24	0.70	11.74	27.79
LB2	03/27/03	MSED2	5.27	0.48	<0.19	168.13	<0.19	10.49	1.21	0.89	12.73	18.03
LB3	03/27/03	MSED1	11.73	0.99	<0.19	463.93	0.38	10.80	4.42	0.39	33.05	28.50
LB3	03/27/03	MSED2	7.10	0.53	<0.20	177.17	<0.20	10.84	2.30	<0.20	18.42	20.71
LB4	03/28/03	MSED1	4.38	0.34	<0.21	56.96	<0.21	7.20	2.39	0.35	8.77	12.82
LB4	03/28/03	MSED2	8.85	0.52	<0.23	212.81	<0.23	18.23	10.26	0.35	18.28	27.64

¹ MSED1 and MSED2 are duplicates from the same sample.

Table A3. Metal concentrations in floodplain soils from Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Floodplain Metal Conc. (µg/g)									
			Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr
BB1A	03/26/03	MFP1A	0.013	6380.4	1.66	3.71	45.43	0.26	712.17	0.66	3.68	6.30
BB1A	03/26/03	MFP1B	0.011	6134.5	1.60	3.61	<44.52	0.26	785.46	0.61	3.86	6.32
BB1	03/26/03	MFP1A	<0.012	3884.0	2.41	3.27	49.04	0.27	2069.31	0.73	3.92	10.15
BB1	03/26/03	MFP1B	0.012	3969.1	2.27	4.09	46.91	0.25	2684.33	0.67	3.56	8.97
BB2	03/28/03	MFP1A	0.020	6044.5	2.17	4.15	49.71	0.29	3625.02	0.74	4.88	7.06
BB2	03/28/03	MFP1B	0.018	6504.6	2.47	3.73	54.30	0.32	2724.01	0.84	6.05	8.75
BB3	03/26/03	MFP1A	0.013	5330.8	2.90	3.66	41.64	0.34	837.13	0.86	6.51	8.64
BB3	03/26/03	MFP1B	<0.012	5811.7	2.26	5.35	<49.16	0.29	1123.21	0.69	5.41	7.74
BB4	03/26/03	MFP1A	0.019	4473.0	3.36	3.53	<44.96	0.32	712.59	0.86	5.33	12.35
BB4	03/26/03	MFP1B	0.015	3438.3	2.44	4.22	<39.97	0.27	495.80	0.68	3.85	11.52
BB5	03/27/03	MFP1A	0.020	4897.6	2.41	4.60	<48.05	0.28	790.00	0.68	4.51	9.00
BB5	03/27/03	MFP1B	0.019	4233.9	2.29	3.46	<48.05	0.26	694.67	0.63	4.30	8.62
BB6	03/27/03	MFP1A	0.016	3387.2	2.13	4.40	<48.03	0.27	677.23	0.63	3.75	8.90
BB6	03/27/03	MFP1B	0.014	3788.9	2.14	5.04	<47.51	0.26	713.68	0.62	3.76	8.66
BB7	03/27/03	MFP1A	0.015	4642.1	2.08	3.39	<44.82	0.28	1053.25	0.68	4.28	9.34
BB7	03/27/03	MFP1B	0.016	3678.3	1.59	3.50	<41.60	0.24	896.30	0.60	3.25	8.95
BB8	03/28/03	MFP1A	0.033	5420.6	2.86	2.62	39.70	0.35	827.84	0.88	5.63	17.59
BB8	03/28/03	MFP1B	0.029	5418.2	2.17	3.50	36.04	0.30	888.94	0.79	5.06	15.36
BB9	03/28/03	MFP1A	0.024	6391.5	1.60	4.30	48.91	0.32	1033.90	0.71	4.25	10.01
BB9	03/28/03	MFP1B	0.023	6220.7	1.99	3.03	55.70	0.35	1322.40	0.85	5.03	10.83

¹ MFP1A and MFP1B are duplicates from the same sample.

Table A3, continued. Metal concentrations in floodplain soils from Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Floodplain Metal Conc. (µg/g)								
			Cu	Fe	K	Li	Mg	Mn	Mo	Na	Ni
BB1A	03/26/03	MFP1A	5.24	5872.2	433.65	5.51	683.73	494.15	<0.91	240.93	5.36
BB1A	03/26/03	MFP1B	3.86	6813.5	391.13	4.07	588.40	558.78	<0.89	265.55	4.54
BB1	03/26/03	MFP1A	4.39	6343.8	305.93	3.26	503.35	461.01	<0.94	224.13	4.39
BB1	03/26/03	MFP1B	4.24	6364.6	310.57	3.00	436.83	461.55	<0.96	255.31	4.00
BB2	03/28/03	MFP1A	5.45	6570.6	597.50	5.58	767.98	572.05	<0.91	287.89	5.80
BB2	03/28/03	MFP1B	6.45	8264.8	706.78	6.88	875.58	699.71	<0.84	257.67	6.73
BB3	03/26/03	MFP1A	4.82	7472.5	410.11	4.42	528.91	627.95	<0.81	366.44	5.33
BB3	03/26/03	MFP1B	4.18	7820.3	462.54	3.98	539.42	628.49	<0.98	375.26	4.73
BB4	03/26/03	MFP1A	3.97	8220.6	251.58	3.17	465.56	507.63	<0.90	229.21	4.17
BB4	03/26/03	MFP1B	2.99	6619.7	201.01	2.54	347.91	371.10	<0.80	245.50	3.30
BB5	03/27/03	MFP1A	4.17	6576.9	424.79	4.22	485.83	460.83	<0.96	279.55	4.70
BB5	03/27/03	MFP1B	3.73	6381.6	375.93	3.43	553.00	438.58	<0.96	230.63	4.17
BB6	03/27/03	MFP1A	3.05	7351.6	228.37	2.37	414.00	353.63	<0.96	256.81	3.24
BB6	03/27/03	MFP1B	2.96	6815.9	241.99	2.28	426.63	392.69	<0.95	285.04	3.25
BB7	03/27/03	MFP1A	3.94	7072.6	331.68	3.35	465.63	431.95	<0.90	226.49	4.10
BB7	03/27/03	MFP1B	3.42	6473.2	280.04	2.38	436.31	349.99	<0.83	229.03	3.58
BB8	03/28/03	MFP1A	6.47	8730.3	423.53	4.39	545.26	659.17	<0.76	220.67	6.38
BB8	03/28/03	MFP1B	5.87	8573.2	400.55	4.01	536.75	625.27	<0.74	247.81	5.74
BB9	03/28/03	MFP1A	6.03	6564.0	496.78	6.25	677.60	494.53	<1.00	309.89	6.16
BB9	03/28/03	MFP1B	7.02	7807.1	623.64	5.62	819.09	605.72	<0.73	245.80	7.38

¹ MFP1A and MFP1B are duplicates from the same sample.

Table A3, continued. Metal concentrations in floodplain soils from Big Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Floodplain Metal Conc. (µg/g)									
			Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	V	Zn
BB1A	03/26/03	MFP1A	6.96	0.32	<0.23	121.90	<0.23	6.81	6.40	0.89	11.97	18.68
BB1A	03/26/03	MFP1B	6.91	0.27	<0.22	136.40	0.24	5.67	7.34	0.83	12.16	15.12
BB1	03/26/03	MFP1A	6.98	0.32	<0.23	133.40	<0.23	11.44	9.08	0.92	12.56	27.31
BB1	03/26/03	MFP1B	6.57	0.28	<0.24	126.68	<0.24	12.78	6.81	0.55	11.56	25.38
BB2	03/28/03	MFP1A	7.64	0.58	<0.23	143.26	0.40	12.41	7.69	0.95	13.49	23.21
BB2	03/28/03	MFP1B	9.73	0.54	<0.21	187.71	0.25	11.64	7.47	0.55	16.59	23.83
BB3	03/26/03	MFP1A	10.48	0.55	<0.20	183.74	<0.20	9.55	11.26	0.51	18.73	17.80
BB3	03/26/03	MFP1B	8.57	0.42	<0.25	164.76	<0.25	10.06	8.30	0.65	15.72	18.23
BB4	03/26/03	MFP1A	8.49	0.56	<0.22	190.07	0.23	6.74	7.34	0.45	19.17	14.49
BB4	03/26/03	MFP1B	6.57	0.56	<0.20	149.17	<0.20	4.74	9.02	0.61	15.63	11.34
BB5	03/27/03	MFP1A	8.16	0.36	<0.24	143.15	<0.24	6.53	8.96	1.03	14.90	16.62
BB5	03/27/03	MFP1B	7.55	0.50	<0.24	132.95	<0.24	5.55	7.48	1.13	14.02	14.65
BB6	03/27/03	MFP1A	6.76	0.38	<0.24	125.54	<0.24	4.63	10.69	1.02	14.38	12.16
BB6	03/27/03	MFP1B	6.56	0.33	<0.24	138.97	<0.24	4.47	10.88	0.54	14.02	11.62
BB7	03/27/03	MFP1A	7.19	0.44	<0.22	152.06	<0.22	8.71	6.66	0.98	14.29	16.62
BB7	03/27/03	MFP1B	6.44	0.28	<0.21	137.95	<0.21	6.67	10.00	0.74	12.90	14.46
BB8	03/28/03	MFP1A	10.46	0.46	<0.19	211.53	<0.19	6.31	8.41	0.69	17.44	22.40
BB8	03/28/03	MFP1B	8.84	0.32	<0.19	198.06	0.20	6.10	8.17	0.36	15.43	20.30
BB9	03/28/03	MFP1A	7.58	0.44	<0.25	140.91	0.26	9.09	5.54	0.30	12.90	23.93
BB9	03/28/03	MFP1B	8.16	0.49	0.37	195.14	0.25	11.23	4.78	0.68	13.70	28.94

¹ MFP1A and MFP1B are duplicates from the same sample.

Table A4. Metal concentrations in floodplain soils from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Floodplain Metal Conc. (µg/g)									
			Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr
LB1	03/27/03	MFP1A	0.016	9096.9	3.25	3.77	60.27	0.39	1916.96	0.88	5.46	8.93
LB1	03/27/03	MFP1B	0.012	7132.6	3.98	3.60	71.17	0.45	1661.57	1.03	5.19	9.95
LB2A	03/27/03	MFP1A	<0.011	5684.0	1.46	3.79	47.32	0.30	1085.60	0.65	4.11	19.23
LB2A	03/27/03	MFP1B	<0.011	4439.4	1.02	3.13	41.56	0.25	1011.28	0.51	3.28	14.68
LB2	03/27/03	MFP1A	<0.010	5946.5	2.62	3.83	49.35	0.41	1306.30	0.89	5.72	24.66
LB2	03/27/03	MFP1B	<0.010	5285.7	2.40	3.02	47.26	0.38	1155.83	0.82	5.74	18.86
LB3	03/27/03	MFP1A	<0.012	4368.6	1.55	3.40	<49.88	0.29	706.63	0.60	3.88	15.25
LB3	03/27/03	MFP1B	<0.011	3443.4	0.91	3.22	<42.54	0.22	541.03	0.45	2.98	10.62
LB4	03/28/03	MFP1A	0.057	3067.4	1.08	2.90	<35.45	0.20	732.35	0.44	2.45	43.84
LB4	03/28/03	MFP1B	0.079	2663.3	1.32	3.37	<44.40	<0.22	712.28	0.46	2.35	51.08

¹ MFP1A and MFP1B are duplicates from the same sample.

Table A4, continued. Metal concentrations in floodplain soils from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Floodplain Metal Conc. (µg/g)								
			Cu	Fe	K	Li	Mg	Mn	Mo	Na	Ni
LB1	03/27/03	MFP1A	6.18	11114.7	734.14	7.44	1080.21	778.32	<0.90	344.81	6.49
LB1	03/27/03	MFP1B	7.71	7604.3	674.48	5.67	976.19	639.38	<0.69	248.88	7.00
LB2A	03/27/03	MFP1A	4.48	6450.1	284.80	3.97	491.58	280.26	<0.86	307.83	4.58
LB2A	03/27/03	MFP1B	4.53	5754.1	260.33	3.24	537.98	195.63	<0.92	243.13	3.80
LB2	03/27/03	MFP1A	5.36	8170.6	340.63	4.96	574.41	390.47	<0.80	262.73	5.82
LB2	03/27/03	MFP1B	4.84	7432.4	336.12	4.58	538.79	385.88	<0.79	234.19	5.39
LB3	03/27/03	MFP1A	3.55	6741.2	234.44	3.11	481.17	332.65	<1.00	262.81	3.88
LB3	03/27/03	MFP1B	2.53	5519.4	183.04	2.25	365.93	226.23	<0.85	228.41	2.84
LB4	03/28/03	MFP1A	4.48	4922.7	214.99	2.39	404.32	422.14	<0.71	194.00	3.08
LB4	03/28/03	MFP1B	4.78	4453.8	204.41	2.27	367.45	397.97	<0.89	228.79	3.19

¹ MFP1A and MFP1B are duplicates from the same sample.

Table A4, continued. Metal concentrations in floodplain soils from Little Bayou Creek collected March 26-28, 2003.

Station	Date	Sample ¹	Floodplain Metal Conc. (µg/g)									
			Pb	Sb	Se	Si	Sn	Sr	Ti	Tl	V	Zn
LB1	03/27/03	MFP1A	10.73	0.56	0.36	246.73	0.28	8.85	4.33	1.25	18.35	31.32
LB1	03/27/03	MFP1B	11.52	0.57	0.26	252.87	0.25	7.03	4.85	1.64	21.43	34.64
LB2A	03/27/03	MFP1A	7.01	0.35	<0.22	141.42	<0.22	12.59	1.91	0.92	13.92	25.13
LB2A	03/27/03	MFP1B	5.92	0.32	<0.23	95.04	<0.23	12.93	1.55	0.43	11.56	20.85
LB2	03/27/03	MFP1A	8.57	0.65	0.25	210.75	<0.20	12.83	2.27	0.30	19.45	23.79
LB2	03/27/03	MFP1B	8.06	0.64	<0.20	187.70	<0.20	11.41	2.38	0.32	18.02	21.17
LB3	03/27/03	MFP1A	6.69	0.34	<0.25	114.03	<0.25	12.35	2.27	0.46	13.83	18.92
LB3	03/27/03	MFP1B	5.34	0.31	<0.21	89.22	<0.21	9.11	2.78	0.09	11.53	13.51
LB4	03/28/03	MFP1A	6.22	0.49	<0.18	79.04	<0.18	5.30	3.20	0.43	8.81	24.86
LB4	03/28/03	MFP1B	5.85	0.61	<0.22	104.27	<0.22	5.32	3.20	0.54	9.04	25.76

¹ MFP1A and MFP1B are duplicates from the same sample.

REFERENCES

APHA-American Public Health Association, American Water Works Association and Water Pollution Control Federation. 1995. Standard Methods for the Examination of Water and Wastewater, 19th edition. American Public Health Association, Washington, DC.

ASTM. 1989. Standard Practice for Preparation of Sediment Samples for Chemical Analysis. D 3976-88. Annual Book of ASTM Standards. Vol. 11.02. pp. 598-600. ASTM, Philadelphia, PA.

Birge, W.J. and D.J. Price. 2001. Summary of Monitoring Studies Reported in December 1997 through December 1999. Final Report submitted August 29, 2001 to Jon Maybriar, Division of Waste Management, 21 pp.

Federal Register. 1989. Good Laboratory Practice Standards. 40 CFR Part 160. August 17, 1989. Washington, DC.

U.S. EPA. 1997. Test methods for evaluating solid wastes, SW-846, Final Update 3. Office of Solid Waste and Emergency Response, Washington, D.C.

Wood, C.M, T.W. La Point, D.E. Armstrong, W.J. Birge, C.J. Brauner, K.V. Brix, D.J. Call, E.A. Crecelius, P.H. Davies, J.W. Gorsuch, C. Hogstrand, J.D. Mahony, J.C. McGeer, T.P. O'Connor. 2002. Chapter 2, Biological Effects of Silver. In: *Argentum VI, Transport, Fate, and Effects of Silver in the Environment*. Eds. A.W. Andren, T.W. Bober. SETAC Press, Pensacola, FL. pp. 27-64.