

**CYPRESS CREEK DRAINAGE (TENNESSEE RIVER SYSTEM)  
BIOLOGICAL AND WATER QUALITY INVESTIGATION**

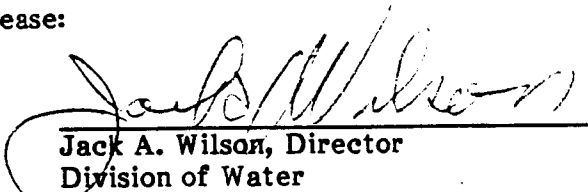
**Kentucky Department for Environmental Protection  
Division of Water  
Water Quality Branch**

**Frankfort, Kentucky**

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**This report has been approved for release:**

  
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## SUMMARY

- 1) A biological and water quality investigation was conducted in the Cypress Creek drainage from May, 1987 through August, 1987. This system drains 59.8 sq. mi. and flows through the northern half of Marshall County, including the area around Calvert City. The investigation revealed that the entire system has been degraded by basin activities, which include a large industrial complex, the urban area of Calvert City, and agricultural operations.
- 2) The development of recreational resources on Kentucky Lake and the Tennessee River has turned Marshall County into a major recreational area. However, the Cypress Creek system has limited recreational potential because of poor water quality and habitat destruction resulting from past channelization projects.
- 3) Of the 28 miles of Cypress Creek that appear on the USGS hydrologic unit map, 22.5 miles were determined to be partially supporting designated uses while 5.5 miles, from MP 0.0 to MP 5.5, were found to be nonsupporting of the Warmwater Aquatic Habitat use.
- 4) There are 18 permitted dischargers located in the Cypress Creek drainage. Fourteen discharge directly to the system. Of these, one is municipal, one is industrial, and the remaining 12 are schools, a subdivision, service stations, restaurants, etc.
- 5) At the time field investigations for this study were underway, the Calvert City wastewater treatment plant (WWTP), with a designed capacity of 390,000 gallons per day (GPD), was discharging to Cypress Creek near MP 7.8. During this time, the Calvert City WWTP was the largest potential pollution source in the drainage. Today this WWTP discharges directly to the Tennessee River at MP 16.9.

- 6) Physicochemical and sediment composite grab samples were collected at 15 locations in the Cypress Creek drainage in May, 1987. Physicochemical samples were taken again at seven stations in August, 1987. A total of 131 physicochemical and 85 sediment parameters were tested. In May, 28 physicochemical parameters exceeded the STORET mean at one or more stations. Violations of Kentucky Surface Water Standards (KSWs) occurred at one or more stations during May, 1987 for dissolved oxygen, iron, mercury, phenol, cadmium and phthalate esters. In August, 1987, 27 parameters exceed the STORET mean and violations of KSWs for phenol, iron, mercury and zinc were observed at one or more stations. Thirteen sediment parameters (COD, oil and grease, volatile solids, NH<sub>3</sub>-N, TKN, As, Cd, Cu, Fe, Mn, Hg, Ni, and Zn) were found to be in the moderately or heavily polluted category during this study.
- 7) Bacteriological data taken in August, 1987 showed violations of KSWs for secondary contact recreation in the lower portion of the Cypress Creek drainage at stations 12-4 (MP 5.3) and 14-1 (MP 8.3). The Calvert City WWTP effluent exceeded permit limits for fecal coliform bacteria, indicating improperly treated waste.
- 8) A total of 133 diatom taxa were identified from this survey, with taxa richness ranging from 37 to 60 at individual stations. The diatom data did not indicate any specific source of pollution. The flora present was typical of low gradient, low light, nutrient enriched, and circumneutral pH streams. While no pollution sensitive species were abundant, it is not clear whether this is related to deficiencies in water quality, habitat, or a combination of both.
- 9) Macroinvertebrate collections from eight locations in June, 1987 yielded 99 taxa. Taxa richness ranged from a high of 36 at station 13-1 to a low of 15 at station 12-1. The vast majority of the taxa collected were common to low

gradient, sluggish streams. The low to moderate taxa richness found throughout the drainage is partially the result of low habitat diversity. However, the lack of community similarity among stations may be the result of poor or fluctuating water quality.

- 10) Fish collections made from six stations in the Cypress Creek drainage yielded 503 fish representing 15 species. The species encountered were typical of streams with low gradient and extensive pool areas. Index of biotic integrity (IBI) data rated the fish community at four stations as fair, and one station as poor (12-4). The IBI could not be calculated at station 12-3 because no fish were obtained even though extensive collection efforts were employed. The absence of fish at 12-3 is an indication of a serious pollution problem.
- 11) Elevated levels of polychlorinated biphenyls and mercury were found in fish in the lower 5.5 miles of Cypress Creek in 1987; however, these levels did not exceed FDA action levels in fish fillets. High PCB values were observed in wholebody fish samples in 1987 and 1988 at station 14-1, which is located on Cypress Creek in Calvert City. Carpsucker fillets exceed the PCB FDA action level of 2.0 ppm at station 12-1 in 1988.
- 12) Acute and chronic toxicity tests on representative aquatic organisms were conducted on water column, sediment, and sediment-elutriate samples from eight stations in the Cypress Creek drainage. Results showed that acute toxicity was present at six sites while all eight had chronic toxicity. These results show that sensitive members of the aquatic community could be eliminated.

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## RECOMMENDATIONS

- 1) With the elimination of the Calvert City WWTP effluent, and based on the assumption that viable, diverse aquatic communities would inhabit the Cypress Creek drainage, it is recommended that all three Cypress Creek segments (09012, 09013, and 09014) be designated for Aquatic Life/Warmwater Aquatic Habitat per 401 KAR 5:031, Section 4 and the criteria of that section be applied without modification.
- 2) With the elimination of the Calvert City WWTP effluent from the Cypress Creek system, and based on the assumption that primary/secondary contact recreation can be attained through proper land management techniques, it is recommended that all three Cypress Creek segments (09012, 09013, and 09014) be designated for primary/secondary contact recreation per 401 KAR 5:031, Section 6 and the criteria of that section be applied without modification.
- 3) Because of the elevated levels of polychlorinated biphenyls found in fish tissue in Cypress Creek, additional sampling should be conducted to determine if a fish consumption advisory is necessary.
- 4) An investigation of the stormwater discharges should be conducted to determine if these discharges are a source of pollution to the Cypress Creek system.

## INTRODUCTION

The Cypress Creek basin lies within Marshall County, Kentucky. This drainage, including its major tributaries (Little John Creek, Stice Creek, Little Cypress Creek, Bloodyskin Branch, and Angle Creek), from the headwaters to the confluence with the Tennessee River (Tennessee River milepoint 10.1), encompasses three 303(e) segments. The segments are designated as 09 (Tennessee River Basin) 012, 013, and 014 (Tennessee River segment) in the Tennessee River Basin Water Quality Management Plan for Kentucky (TenEch, and Hazelet and Erdal 1975).

A survey of the Cypress Creek basin was initiated by the Kentucky Department for Environmental Protection (DEP) in May, 1987. <sup>*Eighteen*</sup> ~~*Fifteen*~~ sampling stations were established in the drainage basin (Figure 1). Table 1 gives the sampling regime, date sampled and the number of stations sampled during each sampling date. The location of these stations, dates sampled and parametric coverage are given in Appendix A.

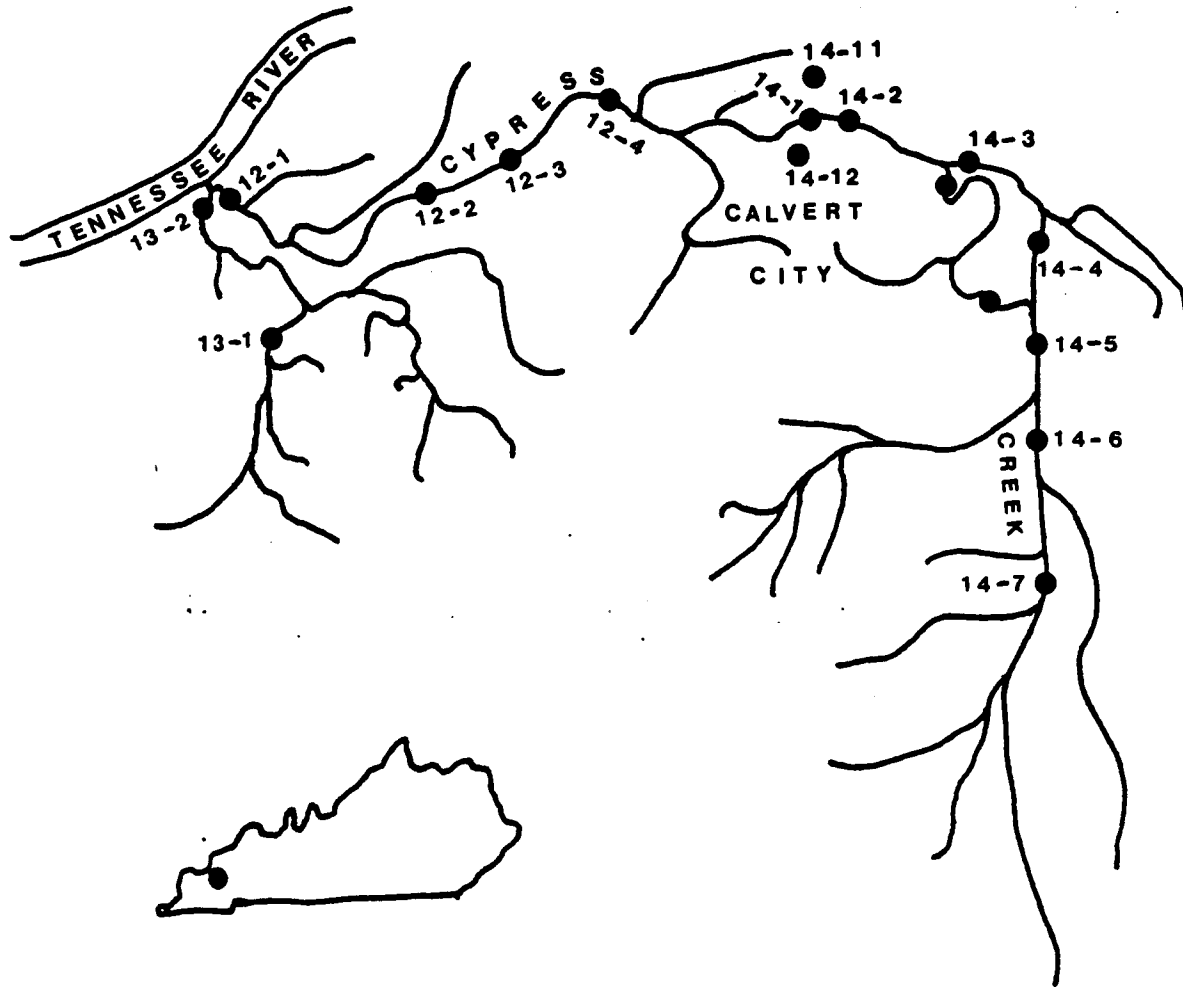
**TABLE 1: CYPRESS CREEK SAMPLING REGIME**

Type of Sample	Dates			
	May 1987	June 1987	August 1987	May 1988
Physicochemical	15 <del>28</del> stn.	-	7 stn.	-
Sediment	15 <del>28</del> stn.	-	-	-
Algae	-	10 stn.	-	-
Invertebrate	-	10 stn.	-	-
Fish	-	10 stn.	-	-
Fish Tissue	-	10 stn.	-	4 stn.
Bacteriological	-	-	12 stn.	-
Toxicity	-	11 stn.	-	-

The purposes of this investigation were as follows:

1. To determine the existing water quality of the basin.
2. To determine the aquatic uses currently being achieved in the drainage.
3. To determine the causes of any impairments of the aquatic uses.
4. To determine what aquatic uses can be attained, based on the physical, chemical and biological characteristics of the watershed.

FIGURE 1. MAP OF THE CYPRESS CREEK DRAINAGE  
DEPICTING SAMPLING STATIONS



## Literature Review

There are limited published data on the water quality and aquatic biology of the Cypress Creek system. In July, 1987, the Kentucky Department of Fish and Wildlife Resources (KDFWR) conducted fish surveys at five locations in the Cypress Creek basin (KDFWR 1988). In conjunction with their fish data, they recorded limited water quality data. TenEch, and Hazelet and Erdal (1976) reported pH, dissolved oxygen, and fecal and total coliform data at selected sites in the Cypress Creek system.

## Basin Impacts and Stream Uses

Neither Cypress Creek nor any of its tributaries have been designated by the Kentucky Division of Water (DOW) for specific uses. Therefore, according to the 1987 Kentucky Surface Water Standards (KSWs) 401 KAR 5:026, Section 7(2) streams within the Cypress Creek system "are designated for the use of warmwater aquatic habitat, primary contact recreation, secondary contact recreation, and domestic water supply in accordance with Section 1 of this regulation."

Cypress Creek flows adjacent to a large industrial complex located in the Calvert City area. According to Kentucky Division of Water (KDOW) facility files, none of the major industries discharge directly to the Cypress Creek system. However, in 1987 stormwater runoff from portions of the Atochem (Pennwalt), B.F. Goodrich, GAF, and Air Products properties discharged to the Cypress Creek drainage. The transportation and accidental discharge of hazardous material to the Cypress Creek system poses a continual threat to the creek's aquatic ecosystem.

Twenty-eight miles of the Cypress creek system appear on the USGS Hydrologic unit map, of which 22.5 miles were determined to be partially supporting designated uses, while the remaining 5.5 miles, from milepoint (MP) 0.0 to MP 5.5, were found not to be supporting the designated warmwater aquatic habitat (WAH) use.

Presently there are 18 permitted dischargers located in the Cypress Creek drainage (Table 2). Of these, only 14 actually discharge waste to the Cypress Creek system. The remaining four either discharge their waste to a closed system (1), or are

**Table 2: List of Permitted Dischargers Located in the  
Cypress Creek Drainage**

<u>Name</u>	<u>Facility No.</u>	<u>Facility Type</u>	<u>Design Flow</u>	<u>Discharge Stream</u>
Estron Chemical Inc.	KY0053767	Industrial	1,500	Closed Circuit
Calvert City Industrial Park	KY0058815	Municipal	25,000	UT to Cypress Cr.
North Star Steel	KY0072231	Industrial	7,600	UT to Cypress Cr.
LWD Landfill	KY0079626	Settling Basin	0	No discharge
Sharpe Elementary School	KY0023892	School	5,000	UT to Little Cypress Cr.
Calvert City-Camelot Subd.	KY0043516	Subdivision	35,000	Barrett Br.
Calvert City KOA Campground	KY0086991	Small Sewage	20,000	UT to Cypress Cr.
Darnell Chevron	KY0088790	Small Sewage	500	UT to Lone Valley
Kentucky Fried Chicken	KY0086461	Small Sewage	1,000	UT to Cypress Cr.
North Marshall Junior High School	KY0023876	School	6,000	UT to Little John Cr.
Ken Bar Inn	KY002508	Small Sewage	19,500	UT to Stice Cr.
O.J.'s Steak & Pizza	KY0046701	Small Sewage	6,000	UT to Stice Cr.
Catfish Kitchen	KY0082040	Small Sewage	2,000	UT to Cypress Cr.
Kaintuck Territory	KY0023922	Small Sewage	12,500	UT to Bloodyskin Br.
Kentucky Maid Restaurant	KY0023612	Small Sewage	4,000	UT to Bloodyskin Br.
Schug's Service Station	KY0023418	Small Sewage	500	UT to Bloodyskin Br.
Phillips 66 Bulk Plant	KY0030104	Industrial (Settling Basin)	0	No discharge
Calvert City Water Plant	KY0004383	Not Listed	0	No discharge

UT - unnamed tributary

listed as having no discharge (3). With the exception of Calvert City, the wastewater treatment plants (WWTPs) are all small, ranging in size from 35,000 gallons per day (GPD) to 500 GPD. At the time of the field investigations the Calvert City WWTP, with a designed capacity of 390,000 GPD, was discharging municipal waste to Cypress Creek approximately at milepoint (MP) 7.8. Since then, the Calvert City WWTP has relocated its discharge to the Tennessee River at MP 16.9.

According to the Division of Waste Management (DWM), five landfill and two landfarming permitted operations occur in or adjacent to the Cypress Creek drainage. All are located to the north and west of Calvert City. These facilities are listed in Table 3, with the general location, type of facility, and permit number. These facilities have been used to dispose of residential, inert, and containerized waste products. The Division of Waste Management lists one CERCLA (Comprehensive Environmental Response Compensation and Liability Act) site in the Cypress Creek drainage. This is located north-northwest of Calvert City off KY 95 on the Estron Chemical Company site. Six RCRA (Resource Conservation Recovery Act) sites are also found in the drainage: LWD Inc., Industrial Waste Hauling, Liquid Transporters Inc., Old Calvert City/A.W. Keeling Dump, Rail Services Inc. and Calverts Various Sites which are several locations referenced as one site.

Agriculture and silviculture activities occur within the Cypress Creek watershed. According to TenEch, and Hazelet and Erdal (1976), agricultural operations, primarily row crops, occur mainly to the south and west of Calvert City, while silviculture activities generally occur in the headwaters. They note that the principal nonpoint source pollution problem arises from sediment runoff. They list the sediment runoff potential for the soil found in the Cypress Creek drainage as medium to high.

The development of recreational resources on Kentucky Lake and the Tennessee River has turned Marshall County into a major recreational area. Only a minor portion of those recreation activities occur in conjunction with the Cypress Creek system. The

fishing reputation for this drainage is considered poor (KDFWR 1988). The historically poor water quality (refer to TenEch, and Hazelet and Erdal 1976) and the destruction of habitat through extensive channelization has seriously degraded the Cypress Creek fishery.

Hunting for waterfowl, small mammals, and deer may occur throughout the drainage in rural areas. Game animals, as well as non-game species, may utilize the various streams and adjacent buffer zones for breeding, rearing young, feeding and as a water supply. Trapping for small mammals such as muskrats, mink, etc., is also expected to occur in the drainage.

**Table 3: List of Active Solid Waste Disposal Sites  
Located in the Cypress Creek Drainage**

<u>Name</u>	<u>Location</u>	<u>Type</u>	<u>Permit No.</u>
Air Products and Chemicals, Inc.	North-Northwest of Calvert City off KY 95	Landfill, Residential Waste	79.09
SKW Alloys, Inc.	North of Calvert City off KY 1523	Landfill, Inert Waste	79.10
GAF Chemical Corp.	Northwest of Calvert City off KY 1523	Landfill, Inert Waste	79.12
Pennwalt Corp.	Northwest of Calvert City off KY 1523	Landfill, Inert Waste	79.11
LWD Sanitary Landfill, Inc.	West of Altona off Calvert City Rd.	Landfill, Contained Waste	79.15
Air Products and Chemicals, Inc.	North-Northwest of Calvert City off KY 95	Landfarm, Privately owned	79.13
Rail Services, Inc.	West of Calvert City near Calvert City WWTP	Landfarm, Privately owned	79.14

## METHODS

Water and sediment samples were collected in accordance with DOW's Standard Operating Procedures Manual (SOP) (DOW 1987a). All samples were iced and transported to the Division of Environmental Services laboratory for analysis.

Qualitative biological samples (bacteriological, algae, macroinvertebrates, and fish) were also collected in accordance with the DOW (1987a) manual. These samples were delivered to the Water Quality Branch laboratory and identified to the lowest possible taxonomic level. Laboratory procedures, data analysis, and interpretation methods are described in the DOW (1987a) manual. Quality assurance procedures are outlined in DOW (1986). Toxicity tests were conducted in accordance with DOW (1987b).



## PHYSICAL EVALUATION

Cypress Creek, a fifth order tributary to the Tennessee River, originates in central Marshall County. The stream flows north to Calvert City for approximately 8.5 miles, then in a westerly direction for 11 miles to join the Tennessee River at MP 10.2. The watershed encompasses 59.8 square miles (TenEch, and Hazelet and Erdal 1976), and the stream gradient decreases from 3.85 feet per mile in the headwaters to 0.0 feet per mile in the lower half of the drainage.

The Cypress Creek basin lies predominantly in the Breaks of the Purchase Subregion of the Coastal Plain Province (Burr and Warren 1986). This area is characterized by steeply rolling to hilly terrain (TenEch, and Hazelet and Erdal 1976) underlain by unconsolidated gravels, sands, and clays that are subject to rapid erosion (Burr and Warren 1986). The principal soils of this subregion are the Henry-Grenada-Calloway, Grenada-Calloway-Loring and Brandon Loring Associations (TenEch, and Hazelet and Erdal 1976). As noted earlier, these soils have a medium to high propensity for erosion.

The USGS reports the 10-year, 7-day low flow as 0.1 cubic feet per second (cfs) at MP 3.0. Because of the low-gradient, ditch-like nature of Cypress Creek, water is generally present in the channel even during periods of zero flow.

The extensive channelization that has taken place throughout the drainage has eliminated a vast majority of the habitat diversity. The lower and upper third of the drainage have good to well-developed riparian zones, whereas extensive bank clearing has occurred in the middle portion. Information on each sampling site can be found in Appendix A.

## PHYSICOCHEMICAL AND SEDIMENT EVALUATION

Physicochemical and composite sediment grab samples were collected at fifteen locations in the Cypress Creek system in May, 1987 (Appendix B). Additional physicochemical samples were collected in August, 1987, at seven stations (Appendix B). Samples were analyzed for 131 physicochemical and 85 sediment parameters, including organic and inorganic constituents. Appendix C lists physicochemical and sediment parameters that were measured and found to be below detection limits at all stations. Water quality data from each site was compared to the 1987 Kentucky Surface Water Standard (KSWS) 401 KAR 5:031 and to STORET (1979-1988) mean values. STORET is a national computerized management information system operated by U.S. EPA. It is designed for the storage and retrieval of parametric water quality data. In Kentucky, STORET water quality data, and hence the means, are derived from a statewide network of 45 active stations (52 total stations) collected on a monthly basis since 1979.

TenEch, and Hazelet and Erdal (1976) reported that dissolved oxygen (DO) consistently violated KSWS throughout the spring, summer, and fall of 1968 for the entire length of Cypress Creek. However, temperature, pH, and dissolved solids were found to be within acceptable limits. The KDFWR (1988) reported data from July, 1987 for DO, pH, alkalinity, temperature, salinity and conductivity from four locations on Cypress Creek and one location on Little Cypress Creek. No violations of KSWS occurred for DO or pH, and the remaining parameters were within acceptable ranges.

In May 1987, water quality parameters (Appendix B) exceeded the STORET means (Table 4) the least number of times (5) at station 12-1 and the greatest number of occasions (19) at station 12-4 (Tables 4 and 5). Water quality parameters were considered to be substantially elevated if they exceeded the STORET mean by one or more standard deviations. As seen in Table 5, stations 12-1 and 14-11 only had two

**TABLE 4. PHYSICOCHEMICAL PARAMETERS THAT EXCEED STORET (1979 - 1988)  
MEAN VALUES FOR THE CYPRESS CREEK DRAINAGE  
DURING THE MAY SAMPLING PERIOD**

<u>#Parameters (mg/l)</u>	<u>Stations</u>															<u>STORET Mean</u>
	<u>13-1</u>	<u>12-1</u>	<u>12-2</u>	<u>12-3</u>	<u>12-4</u>	<u>14-1</u>	<u>14-2</u>	<u>14-3</u>	<u>14-4</u>	<u>14-5</u>	<u>14-6</u>	<u>14-7</u>	<u>14-8</u>	<u>14-9</u>	<u>14-11</u>	
Acidity	-	-	-	-	7.0	-	6.5	7.3	-	-	10.3	9.3	12.2	9.1	-	5.96
Alkalinity	-	-	105	92.4	96.0	-	-	-	-	-	-	-	-	168	-	89.9
BOD <sub>5</sub>	2.5	1.4	5.8*	2.9	1.9	4.4*	3.0	3.6	2.4	4.0	2.6	1.7	3.4	2.2	-	1.2
COD	-	-	37.7*	33.3*	26.0*	35.8*	36.0*	41.7*	34.7*	45.2*	45.7*	28.7*	47.4*	43.1*	-	12.5
Chloride	19.2	-	73.8*	53.8*	45.1	-	-	-	-	16.3	-	-	-	-	-	15.9
Conductivity (umhos/cm)	-	-	410	350	360	-	-	-	-	-	-	-	-	-	-	341
Fluoride	0.16	-	0.27	0.28	0.34*	0.18	0.16	0.19	0.20	0.16	-	-	-	-	0.27	0.14
Hardness	-	-	-	-	-	-	-	-	-	-	42.2	-	-	45.2	192	142
Suspended Solids	-	-	-	-	-	65	-	-	-	121	49	-	-	-	-	47.9
Dissolved Solids	-	-	224	218	222	-	-	-	-	-	-	-	-	-	237	213
Total Organic Carbon	5.1	-	12.8*	12.3*	11.7*	22.9*	13.1*	16.3*	13.0*	15.9*	16.5*	11.7*	17.4*	16.9*	6.1	3.7
Turbidity	-	-	-	-	-	-	-	-	-	94	55	-	-	-	-	32.3
Ammonia-Nitrogen	-	-	-	0.834	0.856	-	0.267	0.453	0.243	-	0.339	-	0.697	0.451	-	0.230
Kjeldahl Nitrogen	-	-	1.26	2.78*	1.62	1.09	1.27	3.13*	1.26	1.55	1.44	0.917	1.98*	1.44	1.92*	0.630
Phosphorus (total)	0.038*	0.092*	0.200*	0.370*	0.260*	0.092*	0.112*	0.142*	0.180*	0.260*	0.290*	0.110*	0.530*	0.525*	0.230*	0.005
Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	64.1	46.3
Potassium	-	-	-	3.05	3.51	-	-	-	-	-	-	-	-	3.00	3.55	2.90
Sodium	19.3	-	43.6*	37.6	35.1	-	-	-	-	-	-	-	-	-	-	16.2
Aluminum	-	-	-	-	-	-	-	-	-	0.670	0.510	-	-	-	-	0.481
Arsenic	0.004	-	0.006	0.007	0.005	0.004	-	-	-	-	0.004	-	0.006	-	-	0.003
Barium	-	-	0.053	-	0.540	-	-	-	-	-	-	-	-	-	-	0.052
Cadmium	-	-	-	-	-	-	0.026*	-	-	-	-	-	-	-	-	0.002
Chromium	-	-	-	-	-	-	-	-	0.004	0.004	-	-	-	0.004	-	0.003
Iron	-	-	1.05	2.16	1.19	1.72	1.54	1.82	1.46	4.40*	7.46*	2.66*	9.23*	5.55*	2.18	0.999
Lead	-	-	-	-	0.050	-	-	-	-	-	-	-	-	-	-	0.024
Manganese	1.04*	0.270	3.22*	1.66*	0.810*	2.59*	2.87*	2.41*	3.12*	4.21*	2.54*	1.87*	7.04*	1.71*	-	0.218
Selenium	0.002*	0.002*	0.003*	-	-	-	-	0.002*	0.002*	-	0.003*	0.002*	0.003*	0.002*	-	0.001
Silver	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-	0.001

\*Physicochemical parameters that exceeded the STORET (1979-1988) mean value by one or more standard deviations

#Parameter values in mg/l unless otherwise stated

**TABLE 5. PHYSICOCHEMICAL AND SEDIMENT SUMMARY TABLE**

<u>May Sampling Period</u>	<u>13-1</u>	<u>13-2</u>	<u>12-1</u>	<u>12-2</u>	<u>12-3</u>	<u>12-4</u>	<u>14-1</u>	<u>14-2</u>	<u>14-3</u>	<u>14-4</u>	<u>14-5</u>	<u>14-6</u>	<u>14-7</u>	<u>14-8</u>	<u>14-9</u>	<u>14-11</u>	<u>14-12</u>
Parameters Above STORET Mean	9	ND	5	16	16	19	11	11	11	11	12	15	10	13	14	8	ND
Parameters that Exceed STORET Mean by One Standard Deviation or More	3	ND	2	8	6	5	5	5	6	5	5	6	6	7	6	2	ND
Number of KSWs Violations	1	ND	0	1	1	3	2	2	1	3	2	2	2	2	2	2	ND
Moderately Polluted Sediment Parameters	1	ND	3	2	3	4	5	4	3	5	2	4	4	3	4	2	ND
Heavily Polluted Sediment Parameters	1	ND	5	3	2	4	1	2	2	2	3	3	3	2	2	6	ND
<u>August Sampling Period</u>																	
Parameters Above STORET Mean	ND	10	8	17	13	15	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	21
Parameters that Exceed STORET Mean by One Standard Deviation or More	ND	5	2	7	8	10	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	13
Number of KSWs Violations	ND	1	0	2	0	1	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	0

parameters that exceeded the STORET mean by one standard deviation, while station 12-2 had eight parameters. Most stations had five to six parameters that exceeded the STORET mean by one standard deviation. Also, during May, there were KSWs violations at all sites (Table 6) except station 12-1. Excluding station 12-1, the stations in the lower half of the Cypress Creek generally had worse water quality than those in the upper half of the drainage. Station 12-1 is located in a backwater area of the Tennessee River. The diluting effect of the river improved the water quality at station 12-1 during both the May and August sampling periods.

Nine parameters (BOD, COD, F, TOC, TKN, P, Mn, Fe, and Se) were consistently elevated throughout the drainage in May. The increased concentrations of BOD, TOC, phosphorus and TKN indicate that the system is high in nutrients. This could cause nuisance algal growths, resulting in low dissolved oxygen concentrations during the warmer months.

Analysis of water quality samples from seven stations collected during August showed eight or more parameters elevated above the STORET Mean (Table 7) at each site. Also, four parameters violated KSWs (Table 8). All stations had constituents that exceeded the STORET mean by one or more standard deviations (Table 7). Again, the station with the best overall water quality was 12-1, while the station exhibiting the worst water quality was on the unnamed tributary (UT) to Cypress Creek (14-12) which, at the time of sampling, was receiving effluent from the Calvert City municipal WWTP. The sampling location at 14-12 was a few yards downstream of the effluent pipe, and the WWTP effluent composed all of the stream flow.

Ten constituents (alkalinity, BOD, Cl, F, TOC, TKN, P, K, Na, and Mn) exceeded the STORET mean by at least one standard deviation during the August sampling (Table 7). The elevated levels of alkalinity, hardness, and calcium are considered to be non-inhibiting to aquatic life and nondegrading to water quality. These parameters can

**TABLE 6. PHYSICOCHEMICAL PARAMETERS THAT EXCEED KENTUCKY SURFACE WATER STANDARDS  
FOR WARMWATER AQUATIC HABITAT FROM THE CYPRESS CREEK DRAINAGE  
DURING THE MAY SAMPLING PERIOD**

<u>Parameters (mg/l)</u>	<u>12-1</u>	<u>12-2</u>	<u>12-3</u>	<u>12-4</u>	<u>13-1</u>	<u>14-1</u>	<u>14-2</u>	<u>14-3</u>	<u>14-4</u>
Dissolved Oxygen	-	-	-	2.7	-	-	3.8	-	2.7
Iron	-	1.05	2.16	1.19	-	1.72	1.54	1.82	1.46
Mercury	-	-	-	0.0002	0.0002	0.0004	-	-	0.0002
Phthalate Esters (Total)	-	-	-	-	-	-	-	-	-

<u>Parameters (mg/l)</u>	<u>14-5</u>	<u>14-6</u>	<u>14-7</u>	<u>14-8</u>	<u>14-9</u>	<u>14-11</u>	<u>Reg. Value</u>
Dissolved Oxygen	-	3.4	3.6	1.6	2.6	-	4.0
Iron	4.40	7.46	2.66	9.23	5.55	2.18	1.0
Mercury	0.0002	-	-	-	-	-	0.0002
Phthalate Esters (Total)	-	-	-	-	-	0.017	0.003

**TABLE 7: PHYSICOCHEMICAL PARAMETERS THAT EXCEED STORET (1979-1988)  
MEAN VALUES FOR THE CYPRESS CREEK DRAINAGE DURING THE  
AUGUST SAMPLING PERIOD**

<b>**Parameter (mg/l)</b>	<b>Stations</b>							<b>STORET MEAN</b>
	<b>12-1</b>	<b>12-2</b>	<b>12-3</b>	<b>12-4</b>	<b>13-2</b>	<b>14-1</b>	<b>14-12</b>	
Acidity	-	7.5	-	-	-	-	9.9	5.96
Alkalinity	-	117	140	186	-	90.1	182	89.9
BOD <sub>5</sub>	-	8.8*	5.9*	1.3	12.3*	6.2*	4.4*	1.2
COD	-	27.1*	26.7	40.2*	-	-	72.9*	12.5
Chloride	23.5	46.0*	75.6*	77.1*	-	-	90.1*	15.9
Conductivity (umhos/cm)	-	406	536	652*	-	-	849*	341
Fluoride	0.23	0.59*	0.61*	0.96*	0.16	0.25	0.74*	0.14
Hardness	-	-	-	152	-	-	181	142
Suspended Solids	-	-	-	-	-	-	60	47.9
Dissolved Solids	-	236	285	420	-	-	504*	213
Sulfate	-	-	-	-	-	-	122	66.3
TOC	9.07*	9.69*	10.6*	17.3*	7.52*	15.0*	33.4*	3.7
Turbidity (NTU)	-	-	-	-	36	-	-	32.3
Ammonia-Nitrogen	-	-	-	-	-	-	0.665	0.230
Kjeldahl-Nitrogen	0.728	1.20	0.933	1.97*	0.760	1.05	3.02*	0.630
Nitrate-Nitrogen	-	-	-	3.10*	-	-	-	0.840
Phosphorus (total)	0.078*	0.615*	0.560*	1.23*	0.095*	0.174*	5.60*	0.005
Calcium	-	-	-	53.8	-	-	75.9*	46.3
Potassium	-	4.45*	4.86*	8.25*	-	5.02*	12.57*	2.9
Sodium	18.0	38.4	59.0*	79.3*	-	-	107.9*	16.2
Aluminum	1.09	-	-	-	0.523	-	7.63*	0.481
Chromium	-	-	-	-	0.007*	-	0.005	0.003
Iron	-	1.01	-	-	-	1.24	-	0.999
Manganese	0.31	0.79	0.38	-	0.42	4.54*	-	0.218
Nickel	-	-	-	-	-	-	0.009	0.006
Selenium	-	0.002	-	-	0.008*	-	-	0.001
Zinc	-	0.058	-	-	-	-	-	0.034

\*Physicochemical parameters that exceed the STORET (1979-1988) mean value by one or more standard deviations.

\*\*Parameter values in mg/l unless otherwise stated.

**TABLE 8: PHYSICOCHEMICAL PARAMETERS THAT EXCEED  
KENTUCKY SURFACE WATER STANDARDS FOR  
WARMWATER AQUATIC HABITAT FROM THE CYPRESS CREEK DRAINAGE  
DURING THE AUGUST SAMPLING PERIOD**

<b>PARAMETER (mg/lg)</b>	<b><u>12-1</u></b>	<b><u>12-2</u></b>	<b><u>12-3</u></b>	<b><u>12-4</u></b>	<b><u>13-2</u></b>	<b><u>14-1</u></b>	<b><u>14-12</u></b>	<b>REG. STANDARD</b>
Phenol	-	-	-	-	-	0.006	-	0.005
Iron	-	1.01	-	-	-	1.24	-	1.00
Mercury	-	-	-	0.0002	0.0003	0.0002	-	0.0002
Zinc	-	0.058	-	-	0.142	-	-	0.047



exceed STORET means by considerable ranges and still not be detrimental to aquatic ecosystems.

Sediment samples taken in May showed elevated concentrations of two or more parameters at each station when compared to sediment data presented by the U.S. EPA (1977) (Table 9). The control site (13-1) had the lowest number (2) of elevated constituents. The highest number (8) was observed at stations 12-1, 12-4, and 14-11 (Table 9). Volatile solids, COD, ammonia-nitrogen, TKN, Fe, and Mn were in the moderately or heavily polluted range at most stations (Table 9). The sediment contamination was fairly consistent throughout Cypress Creek.

The physicochemical and sediment data indicate that the water quality of the Cypress Creek system is being degraded by activities occurring in the basin, and the system is only partially supporting the WAH use. This is based on the large number of KSWs violations. Since the elimination of the Calvert City WWTP discharge, subsequent to collection of these data, the principal sources of pollution are urban, agricultural, and industrial stormwater runoff. In addition, the return to earth of air pollutants, as either particulate or dissolved material, spillage of industrial compounds, improper use of agricultural fertilizers, herbicides, and pesticides, and the lack of best management practices in portions of the basin are all potential pollution sources for Cypress Creek.

**TABLE 9: LIST OF STATIONS AND ASSOCIATED SEDIMENT PARAMETERS  
THAT EXCEED THE U.S. ENVIRONMENTAL PROTECTION AGENCIES (1977)  
SEDIMENT GUIDELINES**

<u>PARAMETER</u>	<u>12-1</u>	<u>12-2</u>	<u>12-3</u>	<u>12-4</u>	<u>13-1</u>	<u>14-1</u>	<u>14-2</u>	<u>14-3</u>	<u>14-4</u>	<u>14-5</u>
COD	HP	HP	MP	HP	-	MP	HP	MP	MP	HP
Oil and Grease	HP	-	-	MP	-	-	-	-	MP	-
Volatile Solids	HP	-	-	MP	-	MP	HP	-	MP	MP
Ammonia Nitrogen	MP	HP	HP	MP	MP	MP	HP	HP	HP	HP
TKN	MP	MP	MP	HP	-	-	MP	MP	MP	-
Arsenic	-	-	-	-	-	-	-	-	-	-
Cadmium	-	-	-	-	-	-	-	-	-	-
Copper	-	-	-	MP	-	-	-	-	-	-
Iron	HP	MP	MP	MP	MP	MP	MP	MP	MP	MP
Manganese	HP	HP	HP	HP	-	HP	HP	HP	HP	HP
Mercury	-	-	-	-	-	-	-	-	-	-
Nickel	MP	-	-	-	-	-	-	-	-	-
Zinc	-	-	-	-	-	MP	-	-	-	-

<u>PARAMETER</u>	<u>14-6</u>	<u>14-7</u>	<u>14-8</u>	<u>14-9</u>	<u>14-11</u>
COD	HP	MP	MP	-	HP
Oil and Grease	-	MP	-	-	-
Volatile Solids	MP	HP	MP	MP	HP
Ammonia Nitrogen	HP	HP	HP	MP	HP
TKN	MP	-	MP	MP	MP
Arsenic	-	-	-	-	HP
Cadmium	-	MP	-	-	-
Copper	MP	-	-	-	MP
Iron	MP	MP	-	MP	HP
Manganese	HP	HP	HP	HP	HP
Mercury	-	-	-	HP	-
Nickel	-	-	-	-	-
Zinc	-	-	-	-	-

MP - Moderately Polluted  
HP - Heavily Polluted

## BIOLOGICAL EVALUATION

Biological data were collected from selected sites (Table 1) in the Cypress Creek drainage. These data consisted of analysis for bacteria, algae, macroinvertebrates, fish, fish-tissue, and toxicity. Without exception, all above data sets indicate that Cypress Creek is stressed by anthropogenic activities.

### Bacteria

Thirteen fecal coliform (FC) analyses were performed on water samples from seven sample collection sites located on Cypress Creek and Little Cypress Creek. Samples from these streams and the Calvert City Wastewater Treatment Plant (WWTP) are included in these analyses.

Based on two samples per station, there were no violations of the FC standard for primary/secondary contact recreation (a geometric mean of 200 colonies per 100 ml, 401 KAR 5:031, Section 7) at the Little Cypress Creek station (13-2)(Table 10). Only station 12-4 at MP 5.3 on Cypress Creek had FC levels which could impair primary contact recreational use (i.e. swimming) (Table 10). The next upstream station (14-1, MP 8.3) on Cypress Creek had one value slightly above the FC standard.

One effluent sample from the Calvert City WWTP had elevated FC values. This indicates the waste was being improperly treated (refer to Table 10). This value represents a violation of the maximum daily average (400 per 100 ml) allowed by the KPDES permit for this facility.

Historical total and fecal coliform data are presented by TenEch, and Hazelet and Erdal (1975). Their data show that the FC standard for primary contact recreation was consistently violated in the lower half of the drainage during the recreation season in 1967 and 1968.

### Algae

Diatom taxa richness, relative abundance (RA), and percent community similarity ( $PS_c$ ) values were calculated at all biological stations. A total of 133 diatom taxa were identified for the survey, with taxa richness ranging from 37 at

**TABLE 10: BACTERIOLOGICAL DATA (FECAL COLIFORM)  
FROM THE CYPRESS CREEK DRAINAGE DURING AUGUST, 1987**

<u>STATION #</u>	<u>SOURCE/RECEIVING STREAM</u>	<u>MILEPOINT</u>	<u>DATES</u>	<u>FC/100 ml</u>
12-1	Cypress Creek	0.5	24 Aug 87	< 8
			25 Aug 87	< 8
12-2	Cypress Creek	3.2	24 Aug 87	8
			25 Aug 87	ND
12-3	Cypress Creek	4.0	24 Aug 87	140
			25 Aug 87	40
12-4	Cypress Creek	5.3	24 Aug 87	240
			25 Aug 87	32
13-2	Little Cypress Creek	0.1	24 Aug 87	< 8
			25 Aug 87	< 8
14-1	Cypress Creek	8.3	24 Aug 87	210
			25 Aug 87	32
14-12	Calvert City effluent Unnamed Tributary to Cypress Creek	0.3	24 Aug 87	>16,000
			25 Aug 87	< 8

station 14-9 (the old channel of Cypress Creek) to 60 at station 14-1 (Appendix D). Six species (Achnanthes lanceolata var. dubia, Eunotia curvata, E. pectinalis, Navicula confervacea, N. seminulum, and Gomphonema parvulum) were abundant (RA>10%) at one or more stations. An additional six species were very common (RA> 5%) and 34 were common (RA>1.0%) at one or more stations. Any taxon with an RA of < 1.0% was considered rare.

Most of the species that were abundant or common in the drainage prefer water with a circumneutral pH and are tolerant of elevated mineral or nutrient concentrations. The Eunotia and Pinnularia species found at these sites have an optimum pH of 6.5-7.0 (Lowe 1974), while N. confervacea and G. parvulum prefer a slightly higher pH and are nutrient tolerant. Navicula seminulum, abundant at Little Cypress Creek (13-1), the farthest upstream station (14-6), and the old channel station (14-9), is also tolerant of elevated nutrients (Lowe 1974). However, its low abundance at the other stations is probably related more to differences in habitat than water quality conditions. The abundance of Achnanthes and small Navicula species in Little Cypress Creek is most likely related to the presence of epilithic (rock) substrates, and faster current conditions than found in Cypress Creek.

Percent community similarity values were calculated for all station pairs (Table 11). Station pairs with  $PS_c$  values greater than 50% were considered similar. Using this criterion, no Cypress Creek diatom community was similar to the control station (13-1) on Little Cypress Creek. While station 13-1 was dominated by small Achnanthes and Navicula species most Cypress Creek stations were dominated by colonies of the nutrient tolerant species N. confervacea (RA from 45.6% -81.6%). The two Cypress Creek stations not dominated by this diatom were the old channel (14-9) and the farthest upstream Cypress Creek station (14-6), which were dominated by Eunotia spp., G. parvulum and N. seminulum. Stations 14-6 and 14-9 were similar to one another, but because of their low abundances of N. confervacea they were not similar to any other

stations. The diatom assemblages of the mainstem Cypress Creek stations below the wetlands (12-1, 12-3, 12-4, and 14-1) were all similar to one another, reflecting the homogeneity of the habitat, absence of riffles, and degraded water quality of that reach. The diatom data do not indicate any specific or point source of pollution. The flora is moderately diverse, and typical of the type of habitat (channelized, low light, slow current), circumneutral pH, and elevated nutrient concentrations present in Cypress Creek. No particularly pollution sensitive species were abundant, but it is not clear whether this is related to deficiencies in water quality, habitat, or a combination of both.

TABLE 11: PERCENT COMMUNITY SIMILARITY (PSc) DATA OF THE DIATOM COMMUNITY OBSERVED IN THE CYPRESS DRAINAGE

Stations	<u>12-1</u>	<u>12-3</u>	<u>12-4</u>	<u>14-1</u>	<u>14-4</u>	<u>14-6</u>	<u>14-9</u>
13-1	8.50	21.78	24.78	15.02	19.84	33.41	38.59
12-1	-	71.59	60.49	64.80	50.28	9.05	4.00
12-3	-	-	75.57	64.38	62.01	30.02	22.47
12-4	-	-	-	66.08	66.03	30.43	20.56
14-1	-	-	-	-	67.29	18.00	12.60
14-4	-	-	-	-	-	38.89	28.32
14-6	-	-	-	-	-	-	61.79

#### Macroinvertebrates

Macroinvertebrates were taken from eight locations in the Cypress Creek system. A total of 99 taxa were observed, with the dipterans (27 species) and the coleopterans (26 species) being the most diverse groups. Total number of taxa (TNT), total number of individuals (TNI), numbers of Ephemeroptera, Plecoptera and Trichoptera (EPT), and PSc were calculated for each site (Table 12). The TNT ranged from a high of 36 at station 13-1 to a low of 15 at station 12-1. Eleven taxa, Physella sp., Musculium partumeium, Asellus sp., Procambarus clarkii, Caenis sp., Hydroporus clypealis, Dineutus sp., Sigara sp., Notonecta irrorata, Palpomyia/Sphaeromyia, and Kiefferulus dux, were found at a majority of the stations.

**TABLE 12: MACROINVERTEBRATE NUMERICAL DATA  
FOR THE CYPRESS CREEK SYSTEM**

	STATIONS							
	<u>12-1</u>	<u>12-3</u>	<u>12-4</u>	<u>13-1</u>	<u>14-1</u>	<u>14-4</u>	<u>14-6</u>	<u>14-9</u>
Total Number of Taxa (TNT)	15	36	20	34	28	26	31	20
Total Number of Individuals	52	204	99	187	84	105	100	66
Ephemeroptera/Plecoptera/ Trichoptera (EPT)	2	1	0	3	2	1	1	0

A vast majority of the taxa collected during this study are common to low gradient, sluggish streams. The elimination of shallow-water riffle areas, which is the principal habitat for such pollution sensitive groups as the Ephemeroptera, Plecoptera, and Trichoptera, has resulted in a straight-sided ditch with similar depths for most of the stream's length. This lack of habitat diversity severely restricts macroinvertebrate diversity. Only the control station (13-1) has a riffle-pool habitat. High quality streams in this section of the state could be expected to have 50 or more taxa present and EPT values approaching 10.

The EPT was reduced at all sampling locations (Table 12), which is at least partially the result of lack of habitat. The EPT of three at the control site (13-1) was the highest observed during this study. The EPT was comprised solely of ephemeropterans; the three taxa of mayflies observed are all considered tolerant to a wide variety of ecological conditions. An EPT of zero was observed at stations 12-4 and 14-9.

Percent community similarity values were calculated at the family level for all station pairs (Table 13). Any  $PS_c$  greater than 50% indicated similarity. Stations 14-4 and 14-6 were very similar to each other and were both similar to two additional stations (Table 13). Because of the similarity in habitat and gradient throughout the drainage, the macroinvertebrate communities would be expected to be similar. However, of the 28 possible pairs only five indicated similarity and no sites were similar to the control (13-1), suggesting that poor water quality may be influencing community structure.

**TABLE 13: Percent Community Similarity (PSc) Data  
for the Macroinvertebrate Communities  
Observed in the Cypress Creek Drainage**

<u>Stations</u>	<u>12-1</u>	<u>12-3</u>	<u>12-4</u>	<u>14-1</u>	<u>14-4</u>	<u>14-6</u>	<u>14-9</u>
13-1	19.75	35.82	45.78	49.58	54.12	39.32	35.83
12-1	-	34.57	29.28	31.00	32.12	35.62	27.45
12-3	-	-	32.44	35.01	43.80	51.47	38.43
12-4	-	-	-	38.28	39.85	35.62	23.50
14-1	-	-	-	-	52.47	54.53	42.81
14-4	-	-	-	-	-	65.14	36.71
14-6	-	-	-	-	-	-	41.16

The macroinvertebrate data do not indicate any specific type of pollution. The organisms present are common to low or zero gradient water bodies. The low to moderate taxa diversity is the result of poor water quality and the lack of habitat diversity. Generally speaking, the organisms observed in this study are tolerant to a wide range of ecological and water quality conditions. The lack of community similarity among most sites indicates that low or fluctuating water quality may be limiting the macroinvertebrate fauna. Physicochemical data from this report indicate that activities within the watershed have impacted water quality, and hence the macroinvertebrate communities. This is further supported by the toxicity data.

#### Fish

Six stations in the Cypress Creek system were sampled for fish community structure during this study. A total of 503 fish, representing fifteen species, were collected at five stations (Table 14). Station 12-3 was repeatedly sampled, but yielded no fish.

The most frequently collected species were the mosquitofish (Gambusia affinis), the bluegill (Lepomis macrochirus), the grass pickerel (Esox americanus vermiculatus), the green sunfish (Lepomis cyanellus), and the warmouth (Lepomis gulosus).



**TABLE 14: SUMMARY OF FISH NUMERICAL DATA FOR THE CYPRESS CREEK DRAINAGE**

<b>Numerical Data</b>	<b>STATIONS</b>					
	<b><u>12-3</u></b>	<b><u>12-4</u></b>	<b><u>13-1</u></b>	<b><u>14-1</u></b>	<b><u>14-4</u></b>	<b><u>14-6</u></b>
Total Number of Species	0	5	9	10	6	10
Total Number of Individuals	0	198	55	57	37	156
Index of Biotic Integrity (IBI)	0	36	38	42	38	46
IBI Classification	No Fish	Poor	Fair	Fair	Fair	Fair

Previous fish collections have been made on Cypress Creek by the Kentucky Department of Fish and Wildlife Resources (KDFWR 1988) and by Kentucky Nature Preserves Commission (KNPC unpublished data). Species reported by these groups, but not collected during this study were: bowfin (Amia calva), creek chubsucker (Erimyzon oblongus), largemouth bass (Micropterus salmoides), and fantail darter (Etheostoma flabellare). A comparison of species collected is shown in Table 15.

An Index of Biotic Integrity (IBI) was calculated for all stations using the methods of Karr (1981). With the exception of Station 12-3 (No Fish) and Station 12-4 (Poor), all IBI ratings were in the Fair category (Table 14). The rating at station 12-4 was a reflection of low flow and extensive channel alteration.

No definitive reason could be determined for the absence of fish from Station 12-3 even though adequate habitat was present, and 53 diatom species and 36 macroinvertebrate species were collected. Significantly reduced survival was observed in chronic toxicity tests conducted on water and sediment samples from this site. These factors indicate that a serious pollution problem of unknown origin exists in this stream reach.

#### Fish Tissue

Six Cypress Creek stations (12-1, 13-1, 14-1, 14-4, 14-6, and 14-7) yielded sufficient fish samples for tissue analysis during 1987-1988. Samples were analyzed for

TABLE 15: COMPARISON OF FISH SPECIES COLLECTED  
FROM THE CYPRESS CREEK DRAINAGE

<u>Species</u>	<u>KNPC(1982)</u>	<u>KDFWR(1988)</u>	<u>DOW</u>
<u>Amia calva</u> Bowfin	X	X	-
<u>Campostoma anomalum</u> Central Stoneroller	-	-	X
<u>Notemigonus crysoleucas</u> Golden Shiner	-	-	X
<u>Semotilus atromaculatus</u> Creek Chub	X	X	-
<u>Erimyzon oblongus</u> Creek Chubsucker	X*	X	-
<u>Ameiurus natalis</u> Yellow Bullhead	X	-	-
<u>Esox americanus vermiculatus</u> Grass Pickerel	X*	-	X
<u>Aphredoderus sayanus</u> Pirate Perch	X	X	X
<u>Fundulus olivaceus</u> Blackspotted topminnow	X	X*	X
<u>Gambusia affinis</u> Mosquitofish	X	X	X
<u>Centrarchus macropterus</u> Flier	X	-	X
<u>Lepomis cyanellus</u> Green Sunfish	-	X	X
<u>Lepomis gulosus</u> Warmouth	X	X	X
<u>Lepomis humilis</u> Orangespotted Sunfish	X	-	-
<u>Lepomis macrochirus</u> Bluegill	X	X	X
<u>Lepomis megalotis</u> Longear Sunfish	-	-	X

TABLE 15: Continued

<u>Species</u>	<u>KNPC(1982)</u>	<u>KDFWR(1988)</u>	<u>DOW</u>
<u>Micropterus salmoides</u> Largemouth Bass	-	X	-
<u>Pomoxis nigromaculatus</u> Black Crappie	-	-	X
<u>Etheostoma chlorosomum</u> Bluntnose Darter	X	-	X
<u>Etheostoma flabellare</u> Fantail Darter	-	X	-
<u>Etheostoma gracile</u> Slough Darter	X	-	X
<u>Etheostoma smithi</u> Slabrock Darter	-	-	X
Total Species	13	11	15
Total Number	Not Reported	136	503

\*Reported only to genus

eleven metals, thirty-six pesticides, and nine PCB Aroclors (Appendices G and H).

Analytical results for samples collected during 1987 (Appendix G) were predominantly at, or below, detection levels, particularly for the organic parameters. Food and Drug Administration (FDA) action levels were not exceeded in the 1987 fillet samples. However, at Station 12-1, two contaminants, mercury and PCBs, were found at concentrations greater than one-half to one-fourth of the respective FDA action levels. In bowfin fillet, mercury was measured at 0.634 mg/kg and 0.703 mg/kg. These values are greater than one-half of the 1.0 mg/kg FDA action level. In carp fillets, mercury was present at 0.280 mg/kg ( $>\frac{1}{4}$  of the FDA action level) and PCB concentrations were 0.54 and 0.55 mg/kg. These PCB results are slightly greater than one-fourth the 2.0 ppm FDA action level.

In addition to fillet samples, whole-body composite samples were also collected in 1987. A composite flier sample from Station 14-1 produced a contaminant level of concern: PCBs at 11.3 mg/kg. Although FDA action levels do not apply to wholebody fish samples, this value (5.5 times greater than the action level) generated sufficient concern to conduct additional sampling during 1988.

Analytical results for fillet samples collected during 1988 (Appendix H) were similar to those obtained for the 1987 samples, especially for most organic parameters. PCBs and mercury were again the primary contaminants of concern. At station 12-1, PCB concentrations of 3.81 and 3.48 mg/kg in carpsucker filets exceeded the current FDA action level. Also at Station 12-1, a composite sample of crappie filets with 0.424 mg/kg mercury were greater than one-fourth of the FDA action level. Whole-body composite samples were also collected in 1988 and analyzed. PCB concentrations of 8.2 and 11.1 mg/kg were found in carpsuckers from Station 12-1. As a point of reference, these results exceeded the FDA action level by 4 and 5.5 times, respectively.

PCB and mercury contamination has been documented in five fish species from the Cypress Creek system, however, the source of these contaminants is not clear. Neither water nor sediment samples from stations 12-1 or 14-1 contained elevated concentrations of PCBs or mercury. Analysis of effluent discharges and other aquatic organisms may help determine sources and bioaccumulation pathways for these contaminants. Additional sampling and analysis of fish-tissue residues should also be conducted to determine if a consumption advisory is warranted.

#### Toxicity Testing

Both acute and chronic tests were conducted in the Cypress Creek drainage during August 19-25, 1987. The purpose of these tests was to determine if any substance or groups of substances were present in sufficient concentrations to be toxic to aquatic life. An acute toxicity test is a method used to determine the concentration of a substance that produces a toxic effect on a specified percentage of test organisms in a short period of time (i.e., 48 hours, 96 hours) (U.S. EPA 1982). Mortality is used as the measure of toxicity in this guideline, (DOW 1987). According to DOW (1987), a chronic toxicity test is a method used to determine the concentration of a substance in water that produces an adverse effect on a test organism over an extended period of time (i.e., 7-9 days); mortality, reproduction (i.e., the number of young/female for daphnids), teratogenicity, and growth (length and weight for the fathead minnow) are the criteria of toxicity in these test.

The Division of Water, in cooperation with U.S. Environmental Protection Agency, Region IV personnel, conducted the above referenced toxicity evaluations on surrogate aquatic organisms at several locations in the Cypress Creek system. All tests were conducted in EPA's mobile toxicity testing laboratory located at the Kentucky Dam Village State Park. Acute tests on the fathead minnow Pimephales promelas and the water-flea Daphnia pulex and chronic tests on the fathead minnow were conducted by DOW on water column, sediment, and sediment-elutriate samples. These procedures are discussed in DOW (1987b).

Results of the tests indicated that sediment elutriate, sediment, or water column samples from 6 sites (13-2, 12-1, 12-3, 12-4, 14-1 and 14-12) in the Cypress Creek system were acutely toxic (Table 16). Samples from all 8 sites tested in the Cypress Creek drainage showed chronic toxicity (Table 17). The toxicity test results show that sensitive members of the biotic community have probably been eliminated from the Cypress Creek system. This may explain a portion of the observed impairment of the aquatic communities.

**TABLE 16: ACUTE TOXICITY TESTS  
FOR SELECTED SITES IN THE CYPRESS CREEK DRAINAGE**

	<b>Fathead Minnow 96-Hour Sediment Elutriate (% Survival)</b>	<b>Fathead Minnow 96-Hour Sediment (% Survival)</b>	<b>Fathead Minnow 96-Hour Water Column (% Survival)</b>	<b>Daphnid 48-Hour Water Column (% Survival)</b>
13-1 Little Cypress Cr. MP 4.3	Not Tested	Not Tested	94	Not Tested
13-2 Little Cypress MP 0.1	68*	73*	7*	100
12-1 Cypress Cr. MP 0.3	67*	78	10*	100
12-2 Cypress Cr. MP 3.2	Not Tested	Not Tested	86	95
12-3 Cypress Cr. MP 4.0	60*	75	16*	95
12-4 Cypress Cr. MP 5.4	35*	48*	70*	100
14-1 Cypress Cr. MP 8.3	45*	64*	13*	100
14-12 UT Below POTW	9*	41*	57*	100
Control	100	93	100	100

\*Significantly Different From Control (Acute toxicity)

**TABLE 17: CHRONIC TOXICITY TESTS FOR SELECTED SITES  
IN THE CYPRESS CREEK DRAINAGE**

	<b>Fathead Minnow 9-Day Embryo-Larval Water Column (% Survival)</b>	<b>Fathead Minnow 9-Day Embryo-Larval Sediment (% Survival)</b>
13-1 Lt. Cypress Cr. MP 4.3	86.9*	Not Tested
13-2 Lt. Cypress Cr. MP 0.1	6.1*	41*
12-1 Cypress Cr. MP 0.5	10.2*	13*
12-2 Cypress Cr. MP 3.2	44.4*	Not Tested
12-3 Cypress Cr. MP 4.0	14.1*	6*
12-4 Cypress Cr. MP 5.4	47.4*	1*
14-1 Cypress Cr. MP 8.3	10.2*	1*
14-12 UT Below POTW	46.8*	0*
Control	99.2	100

\*Significantly Different From Control (Chronic toxicity)



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**APPENDIX A**  
**SITE INFORMATION**

Site No: 09012001 (12-1)  
Stream: Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Near mouth at Calvert City Road  
Latitude: 37-01-43  
Longitude: 88-26-56  
Stream Order: IV  
U.S.G.S. Topo Quad.: Little Cypress, KY -IL  
DOW Map No.: 5-13  
MP: 0.3  
Sampling Dates: 5-12-87, 8-26-87, 5-25-88

Type Sampling: Physicochemical/  
Sediment/Bacteriological/  
Biological/Fish Tissue/Toxicity

Site No: 09012002 (12-2)  
Stream: Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: At Bennett Road bridge  
Latitude: 37-01-46  
Longitude: 88-24-46  
Stream Order: IV  
U.S.G.S. Topo Quad.: Little Cypress, KY-IL  
DOW Map No.: 5-13  
MP: 3.2  
Sampling Dates: 5-12-87, 8-26-87

Type Sampling: Physicochemical/  
Sediment/Bacteriological/  
Toxicity

Site No: 09012003 (12-3)  
Stream: Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Just downstream of LWD landfill  
Latitude: 37-02-00  
Longitude: 88-24-07  
Stream Order: IV  
U.S.G.S. Topo Quad.: Little Cypress, KY-IL  
DOW Map No.: 5-13  
MP: 4.0  
Sampling Dates: 5-12-87, 8-26-87, 5-25-88

Type Sampling: Physicochemical/  
Sediment/Bacteriological/  
Biological/Fish Tissue/Toxicity

Site No: 09012004 (12-4)  
Stream: Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: West of Calvert City at the KY 1523 bridge  
Latitude: 37-02-22  
Longitude: 88-23-09  
Stream Order: IV  
U.S.G.S. Topo Quad.: Little Cypress, KY-IL  
DOW Map No.: 5-13  
MP: 5.4  
Sampling Dates: 5-12-87, 8-26-87, 5-25-88

Type Sampling: Physicochemical/  
Sediment/Bacteriological/  
Biological/Fish Tissue/Toxicity

Site No: 09013001 (13-1)  
Stream: Little Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: West of Calverty City at US 62 bridge  
Latitude: 37-21-56  
Longitude: 88-26-22  
Stream Order: III  
U.S.G.S. Topo Quad: Little Cypress, KY  
DOW Map No.: 5-13  
MP: 4.3  
Sampling Dates: 5/13/87, 8-26-87

Type Sampling: Physicochemical/  
Sediment/Biological

Site No: 09013002 (13-2)  
Stream: Little Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040001  
Location: Just upstream from mouth  
Latitude: 37-01-45  
Longitude: 88-27-04  
Stream Order: IV  
U.S.G.S. Topo Quad.: Little Cypress, KY-IL  
DOW Map No.: 5-13  
MP: 0.05  
Sampling Dates: 8-26-87

Type Sampling: Physicochemical/  
Toxicity

Site No: 09014001 (14-1)  
Stream: Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Alabama St. bridge  
Latitude:  
Longitude:  
Stream Order: IV  
U.S.G.S. Topo Quad: Calvert City, KY  
DOW Map No.: 5-14  
MP: 8.35  
Sampling Dates: 5/12/87, 8-26-87, 5-25-88

Type Sampling: Physicochemical/  
Sediment/Bacteriological/  
Biological/Fish Tissue/Toxicity

Site No: 09014002 (14-2)  
Stream: Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Beech St. bridge  
Latitude: 37-02-04  
Longitude: 88-20-42  
Stream Order: IV  
U.S.G.S. Topo Quad: Calvert City, KY  
DOW Map No.: 5-14  
MP: 8.9  
Sampling Dates: 5/12/87

Type Sampling: Physicochemical/  
Sediment/Biological

Site No: 09014003 (14-3)  
Stream: New Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: KY 1523 bridge, east of Calvert City  
Latitude: 37-01-44  
Longitude: 88-19-37  
Stream Order: IV  
U.S.G.S. Topo Quad: Calvert City, KY  
DOW Map No.: 5-14  
MP: 10.0  
Sampling Dates: 5/13/87

Type Sampling: Physicochemical/  
Sediment/Biological

Site No: 09014004 (14-4)  
Stream: New Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Lone Valley Road bridge  
Latitude: 37-01-09  
Longitude: 88-18-33  
Stream Order: IV  
U.S.G.S. Topo Quad: Calvert City, KY  
DOW Map No.: 5-14  
MP: 11.35  
Sampling Dates: 5/13/87

Type Sampling: Physicochemical/  
Sediment/Biological

Site No: 09014005 (14-5)  
Stream: Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: U.S. 62 bridge, Southwest of Calvert City  
Latitude: 37-00-08  
Longitude: 88-18-46  
Stream Order: IV  
U.S.G.S. Topo Quad: Calvert City, KY  
DOW Map No.: 5-14  
MP: 12.55  
Sampling Dates: 5/13/87

Type Sampling: Physicochemical/  
Sediment/Biological

Site No: 09014006 (14-6)  
Stream: Cypress Creek Swamp  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Lakeview Church Rd.  
Latitude: 36-59-14  
Longitude: 88-18-47  
Stream Order: IV  
U.S.G.S. Topo Quad: Briensburg, KY  
DOW Map No.: 4-14  
MP: 13.6  
Sampling Dates: 5/13/87, 5-25-88

Type Sampling: Physicochemical/  
Sediment/Biological

Site No: 09014007 (14-7)  
Stream: Cypress Creek Swamp  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Enligh Road bridge  
Latitude: 36-57-35  
Longitude: 88-18-48  
Stream Order: IV  
U.S.G.S. Topo Quad: Briensburg, KY  
DOW Map No.: 4-14  
MP: 15.1  
Sampling Dates: 5/13/87, 5-25-88

Type Sampling: Physicochemical/  
Sediment/Biological

Site No: 09014008 (14-8)  
Stream: "Old" Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: KY 1523  
Latitude: 37-01-35  
Longitude: 88-19-44  
Stream Order: IV  
U.S.G.S. Topo Quad: Calvert City, KY  
DOW Map No.: 5-14  
MP: 0.4  
Sampling Dates: 5/13/87

Type Sampling: Physicochemical/  
Sediment/Biological

Site No: 09014009 (14-9)  
Stream: "Old" Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Lone Valley Road bridge  
Latitude: 37-00-52  
Longitude: 88-19-10  
Stream Order: IV  
U.S.G.S. Topo Quad: Calvert City, KY  
DOW Map No.: 5-14  
MP: 2.5  
Sampling Dates: 5/13/87

Type Sampling: Physicochemical/  
Sediment/Biological

Site No: 09014010 (14-10)  
Stream: B.N. Dorsett Pond  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Near I-24 & KY 62  
Latitude: 37-00-30  
Longitude: 88-19-01  
Stream Order: NA  
U.S.G.S. Topo Quad: Calvert City, KY  
DOW Map No.: 5-14  
MP: NA  
Sampling Dates: 5/13/87

Type Sampling: Physicochemical

Site No: 09014011 (14-11)  
Stream: Water Plant Slough  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: KY 95 bridge  
Latitude: 37-02-23  
Longitude: 88-21-03  
Stream Order: 1  
U.S.G.S. Topo Quad: Calvert City, KY  
DOW Map No.: 5-14  
MP: 0.5  
Sampling Dates: 5/13/87

Type Sampling: Physicochemical/  
Sediment

Site No: 09014012 (14-12)  
Stream: UT to Cypress Creek  
County: Marshall  
U.S.G.S. Hydro Unit No.: 06040006  
Location: Calvert City WWTP Effluent discharge point  
Latitude: 37-01-59  
Longitude: 88-21-26  
Stream Order: 1  
U.S.G.S. Topo Quad.: Calvert City, KY  
DOW Map No.: 5-14  
MP: 0.25  
Sampling Dates: 8-26-87

Type Sampling: Physicochemical/  
Toxicity



**APPENDIX B**

**PHYSICOCHEMICAL AND SEDIMENT DATA  
FOR THE CYPRESS CREEK DRAINAGE**

**PHYSIOCHEMICAL DATA FOR CYPRESS CREEK DRAINAGE  
DURING THE MAY SAMPLING PERIOD**

*Parameters (mg/l)	<u>Stations</u>				
	13-1	12-1	12-2	12-3	12-4
DO	6.7	9.3	6.9	5.1	2.7
Acidity	2.8	0.3	4.7	4.5	7.0
Alkalinity	84.0	57.0	105	92.4	96.0
BOD- 5 day	2.5	1.4	5.8	2.9	1.9
COD	12.3	10.9	37.7	33.3	26.0
Chloride	19.2	9.0	73.8	53.8	45.1
Conductivity	165	165	410	350	360
Cyanide, Amenable	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoride	0.16	0.12	0.27	0.28	0.34
Hardness	106	70.4	122	90.5	93.5
Phenol (4AAP)	<0.005	0.011	<0.005	<0.005	<0.005
pH (S.U.)	7.0	7.4	7.0	7.2	7.0
Suspended Solids	4	30	12	12	7
Dissolved Solids	150	94	224	218	222
Sulfate	31.3	13.2	9.23	11.3	23.3
Organic Carbon (total)	5.1	3.4	12.8	12.3	11.7
Turbidity (N.T.U.)	6.8	25	20	ND	7.4
Ammonia-Nitrogen	0.073	<0.05	<0.05	0.834	0.856
Kjeldahl Nitrogen	0.547	0.549	1.26	2.78	1.62
Sulfide	< 0.1	<0.1	<0.1	<0.1	<0.1
Nitrate	0.045	0.240	0.040	0.635	0.125
Phosphorus (total)	0.038	0.092	0.200	0.370	0.260
Calcium	26.1	23.0	31.3	28.5	32.0
Magnesium	8.87	3.70	5.54	4.90	5.25
Potassium	2.78	1.36	2.82	3.05	3.51
Sodium	19.3	6.90	43.6	37.6	35.1
Aluminum	0.185	0.410	0.328	0.208	0.067
Arsenic	0.004	0.001	0.006	0.007	0.005
Barium	0.046	0.014	0.053	0.043	0.54
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	<0.001	<0.001	<0.001	0.001	<0.001
Chromium	0.001	0.002	0.001	0.004	0.002
Copper	0.001	0.002	0.002	0.003	0.002
Iron	0.420	0.660	1.05	2.16	1.19
Lead	0.001	0.003	0.004	0.005	0.050
Manganese	1.04	0.270	3.22	1.66	0.810
Mercury	0.0002	0.0001	0.0001	0.0001	0.0002
Nickel	0.003	<0.001	0.006	0.006	0.004
Selenium	0.002	0.002	0.003	0.001	0.001
Silver	0.001	0.001	0.001	<0.001	<0.001
Zinc	0.011	0.011	0.026	0.022	0.013
1,2-Dichloroethane	<0.001	0.015	<0.001	<0.001	<0.001
Bis(2-Ethylhexyl) Phthalate	<0.020	<0.020	<0.020	<0.020	<0.020

\*Parameter are in mg/l unless otherwise stated.

Note: All metal values are total recoverable.

ND-Not determined

**PHYSIOCHEMICAL DATA FOR CYPRESS CREEK DRAINAGE  
DURING THE MAY SAMPLING PERIOD (CONT'D.)**

<u>*Parameters (mg/l)</u>	<u>Stations</u>				
	<u>14-1</u>	<u>14-2</u>	<u>14-3</u>	<u>14-4</u>	<u>14-5</u>
DO	4.8	3.8	4.1	2.7	11
Acidity	5.2	6.5	7.3	5.9	3.9
Alkalinity	53.8	55.4	53.4	79.8	68.1
BOD	4.4	3.0	3.6	2.4	4.0
COD	35.8	36.0	41.7	34.7	45.2
Chloride	6.0	6.7	9.0	9.4	16.3
Conductivity (umhos/cm)	120	140	50	200	260
Cyanide, Amenable	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoride	0.18	0.16	0.19	0.20	0.16
Hardness	54.3	54.3	53.3	71.4	74.4
Phenol (4AAP)	<0.005	0.011	<0.005	<0.005	<0.005
pH (S.U.)	6.6	6.8	7.2	7.0	7.2
Suspended Solids	65	21	15	24	121
Dissolved Solids	80	100	102	136	164
Sulfate	9.04	8.09	9.42	13.0	27.0
Organic Carbon (total)	22.9	13.1	16.3	13.0	15.9
Turbidity (N.T.U.)	16	10.0	10.0	21.0	94
Ammonia-Nitrogen	0.227	0.267	0.453	0.243	0.117
Kjeldhal Nitrogen	1.09	1.27	3.13	1.26	1.55
Sulfide	< 0.1	<0.1	<0.1	<0.1	<0.1
Nitrate	0.215	0.105	0.050	0.040	0.04
Phosphorus (total)	0.092	0.112	0.142	0.180	0.260
Calcium	17.1	14.1	13.2	19.1	18.7
Magnesium	4.31	4.14	4.58	6.62	8.37
Potassium	2.74	2.68	2.50	2.37	2.66
Sodium	5.20	6.00	10.2	11.8	15.8
Aluminum	0.431	0.134	0.149	0.288	0.670
Arsenic	0.004	0.002	0.001	<0.001	0.003
Barium	0.049	0.023	0.026	0.033	0.039
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	<0.001	0.026	0.001	<0.001	<0.001
Chromium	0.001	0.002	0.001	0.004	0.004
Copper	0.003	0.003	0.002	0.002	0.003
Iron	1.72	1.54	1.82	1.46	4.40
Lead	0.001	0.002	0.001	0.002	0.004
Manganese	2.59	2.87	2.41	3.12	4.21
Mercury	0.0004	0.0001	0.0001	0.002	0.0002
Nickel	0.005	0.006	0.004	0.003	0.005
Selenium	<0.001	<0.001	0.002	0.002	<0.001
Silver	0.001	<0.001	<0.001	<0.001	<0.001
Zinc	0.027	0.015	0.017	0.009	0.030
1,2-Dichloroethane	<0.001	<0.001	<0.001	<0.001	<0.001
Bis(2-Ethylhexyl) Phthalate	<0.021	<0.020	<0.020	<0.020	<0.020

ND - Not Determined

\*Parameters are in mg/l unless otherwise stated

Note: All metal values are total recoverable

**PHYSIOCHEMICAL DATA FOR CYPRESS CREEK DRAINAGE  
DURING THE MAY SAMPLING PERIOD (CONT'D.)**

<u>*Parameters (mg/l)</u>	<u>Stations</u>				
	<u>14-6</u>	<u>14-7</u>	<u>14-8</u>	<u>14-9</u>	<u>14-11</u>
DO	3.4	3.6	1.6	2.6	8.9
Acidity	10.3	9.3	12.2	9.1	3.4
Alkalinity	47.3	52.1	77.0	48.0	168
BOD	2.6	1.7	3.4	2.2	0.6
COD	45.7	28.7	47.4	43.1	8.0
Chloride	5.5	3.8	7.10	5.6	14.6
Conductivity (umhos/cm)	120	140	170	120	310
Cyanide,Amenable	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoride	0.10	0.12	0.14	0.12	0.27
Hardness	42.2	56.3	61.8	45.2	192
Phenol (4AAP)	0.007	0.006	0.010	0.152	0.007
pH (S.U.)	6.4	6.5	7.2	6.8	7.4
Suspended Solids	49	11	21	5	7
Dissolved Solids	80	92	134	96	237
Sulfate	7.52	15.3	8.66	9.42	13.6
Organic Carbon (total)	16.5	11.7	17.4	16.9	6.1
Turbidity (NTU)	55	21	21	9	20
Ammonia-Nitrogen	0.339	0.173	0.697	0.451	0.05
Kjeldhal Nitrogen	1.44	0.917	1.98	1.44	0.192
Sulfide	< 0.1	<0.1	<0.1	<0.1	<0.1
Nitrate	0.025	0.055	0.010	0.035	0.225
Phosphorus (total)	0.290	0.110	0.530	0.525	0.230
Calcium	12.6	16.9	20.2	14.4	64.1
Magnesium	3.74	4.33	4.04	3.17	5.62
Potassium	2.35	2.47	3.00	3.55	0.650
Sodium	5.20	5.20	6.20	6.70	10.1
Aluminum	0.510	0.149	0.143	0.044	0.128
Arsenic	0.004	<0.001	0.006	0.001	<0.001
Barium	0.036	0.025	0.030	0.023	0.022
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	0.003	0.002	0.002	0.004	0.003
Copper	0.002	0.002	0.001	0.002	0.001
Iron	7.46	2.66	9.23	5.55	2.18
Lead	0.002	0.002	0.001	<0.001	<0.001
Manganese	2.54	1.87	704	1.71	0.170
Mercury	0.0001	0.0001	<0.0001	<0.0001	0.0001
Nickel	0.006	0.003	0.001	0.001	<0.001
Selenium	0.003	0.002	0.003	0.002	<0.001
Silver	<0.003	0.002	<0.001	<0.001	<0.001
Zinc	0.009	0.016	0.023	0.017	0.011
1,2-Dichloroethane	<0.001	<0.001	<0.001	<0.001	<0.001
Bis(2-Ethylhexyl) Phthalate	<0.020	ND	<0.020	<0.020	0.017

ND- Not Determined

\*Parameters are in mg/l unless otherwise stated

NOTE: All metal values are total recoverable

**PHYSICOCHEMICAL DATA FOR THE CYPRESS CREEK  
DRAINAGE DURING THE AUGUST SAMPLING PERIOD**

<u>*PARAMETER (mg/l)</u>	<u>Stations</u>						
	<u>12-1</u>	<u>12-2</u>	<u>12-3</u>	<u>12-4</u>	<u>13-2</u>	<u>14-1</u>	<u>14-12</u>
Acidity	2.8	7.5	3.5	5.8	3.8	5.4	9.9
Alkalinity	75.5	117	140	186	74.1	90.1	182
BOD <sub>5</sub>	0.9	8.8	5.9	1.3	12.3	6.2	4.4
COD	11.3	27.1	26.7	40.2	12.0	10.8	72.9
Chloride	23.5	46.0	75.6	77.1	18.3	4.9	90.1
Conductivity (umhos/cm)	266	406	536	652	256	191	849
Cyanide, Amenable	ND	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoride	0.23	0.59	0.61	0.96	0.16	0.25	0.74
Hardness	81.6	116.1	126.2	151.6	87.4	81.4	181
Phenol (4AAP)	ND	<0.005	<0.005	<0.005	<0.005	0.006	<0.005
pH (SU)	6.9	7.0	7.2	7.6	6.9	6.9	7.4
Suspended Solids	32.0	10.0	8.0	5.0	42	6	60
Dissolved Solids	133	236	285	420	142	90	504
Sulfate	14.0	15.6	13.8	34.3	18.7	< 5.0	122
Organic Carbon (total)	9.07	9.69	10.6	17.3	7.52	15.0	33.4
Turbidity (NTU)	32.0	7.5	8.0	3.0	36	4.5	14.0
Ammonia-Nitrogen	0.162	0.124	0.092	0.076	0.062	0.119	0.665
Kjeldahl Nitrogen	0.728	1.20	0.933	1.97	0.760	1.05	3.02
Nitrate	0.075	0.030	0.020	3.10	0.020	0.045	0.365
Phosphorus, total	0.078	0.615	0.560	1.23	0.095	0.174	5.60
Calcium	24.2	43.5	42.9	53.8	26.9	22.6	75.9
Magnesium	4.49	5.46	6.04	6.84	6.81	5.59	6.60
Potassium	2.24	4.45	4.86	8.25	1.94	5.02	12.57
Sodium	18.0	38.4	59.0	79.3	12.8	6.0	107.9
Aluminum	1.09	0.140	0.059	0.120	0.523	0.080	7.63
Arsenic	0.002	0.003	0.003	0.002	<0.002	0.003	<0.002
Barium	0.026	0.026	0.029	0.023	0.31	0.049	0.018
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	<0.001	0.002	0.001	0.001	0.007	<0.001	0.005
Copper	<0.001	0.002	<0.001	0.002	0.002	0.002	0.002
Iron	0.63	1.01	0.49	0.54	0.92	1.24	0.29
Lead	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese	0.31	0.79	0.38	0.08	0.42	4.54	0.10
Mercury	0.0001	0.0001	0.0001	0.0002	0.0003	0.0002	0.0001

**PHYSICOCHEMICAL DATA FOR THE CYPRESS CREEK  
DRAINAGE DURING THE AUGUST SAMPLING PERIOD**

<u>*PARAMETER (mg/l)</u>	<u>Stations</u>						
	<u>12-1</u>	<u>12-2</u>	<u>12-3</u>	<u>12-4</u>	<u>13-2</u>	<u>14-1</u>	<u>14-12</u>
Nickel	<0.002	0.003	0.004	0.004	0.008	0.003	0.009
Selenium	<0.002	0.002	<0.002	<0.002	0.008	<0.002	<0.002
Silver	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Zinc	0.008	0.058	0.005	0.030	0.140	0.014	0.009
1,2-Dichloroethane	0.008	ND	ND	ND	ND	ND	ND
Dibromochloromethane	<0.001	ND	<0.001	ND	ND	ND	0.002
Bromoform	<0.001	ND	<0.001	ND	ND	ND	0.130

**SEDIMENT DATA FOR CYPRESS CREEK  
DURING THE MAY SAMPLING PERIOD**

<u>*Parameters (mg/kg)</u>	<u>Stations</u>				
	<u>13-1</u>	<u>12-1</u>	<u>12-2</u>	<u>12-3</u>	<u>12-4</u>
COD	32,800	121,000	93,800	62,500	82,000
Cyanide	< 0.80	<1.26	<1.03	<1.26	<1.32
Oil & Grease	575	4,195	720	880	1,315
Volatile Solids %	4.09	10.9	4.17	4.62	5.75
Organic Carbon	2,820	8,870	4,870	4,710	5,100
Ammonia-Nitrogen	291	123	536	875	1,130
Kjeldhal Nitrogen	675	1,850	1,320	1,820	2,110
Aluminum	5,810	6,380	12,700	10,000	8,720
Arsenic	2.37	2.45	1.98	0.963	0.893
Cadmium	0.135	0.998	0.900	0.563	0.652
Chromium	7.49	6.51	15.0	11.3	11.2
Copper	8.86	19.1	17.1	14.4	25.4
Iron	19,700	29,400	24,000	19,600	23,600
Lead	14.2	19.2	12.6	11.4	12.8
Manganese	941	1,400	913	616	650
Mercury	0.038	0.208	ND	0.071	0.085
Nickel	5.40	18.3	ND	0.917	8.97
Zinc	29.2	81.7	ND	56.0	60.8
Tetrachloroethene	< 5.0	<5.0	<5.0	<5.0	8.20
Pentachlorophenol	0.01	<0.01	<0.01	<0.01	<0.01

<u>*Parameters (mg/kg)</u>	<u>Stations</u>				
	<u>14-1</u>	<u>14-2</u>	<u>14-3</u>	<u>14-4</u>	<u>14-5</u>
COD	44,600	103,000	49,500	52,100	85,500
Cyanide	< 0.91	<1.40	<0.88	<0.99	<1.13
Oil & Grease	905	810	730	1,710	640
Volatile Solids %	6.96	11.5	4.87	5.28	6.40
Organic Carbon	5,870	9,450	4,080	5,260	5,010
Ammonia-Nitrogen	155	536	382	204	209
Kjeldhal Nitrogen	934	1,970	1,000	1,060	967
Aluminum	6,750	8,750	7,590	8,260	6,560
Arsenic	2.02	2.27	1.46	1.27	2.60
Cadmium	0.481	0.530	0.370	0.320	0.290
Chromium	8.29	6.36	10.3	10.4	8.59
Copper	19.1	9.55	10.9	11.7	11.0
Iron	20,700	23,600	17,000	19,600	17,800
Lead	24.2	26.5	23.2	13.4	12.2
Manganese	2,190	5,250	1,700	9,400	1,400
Mercury	0.076	0.170	0.119	0.079	0.105
Nickel	5.77	13.0	7.05	12.3	10.8
Zinc	25	73.1	60.1	57.5	43.6
Pentachlorophenol	0.025	<0.01	<0.01	<0.01	<0.01

\*Parameters in mg/kg unless otherwise noted  
ND - Not determined

**SEDIMENT DATA FOR CYPRESS CREEK  
DURING THE MAY SAMPLING PERIOD (CONT'D.)**

<u>*Parameters (mg/kg)</u>	<u>Stations</u>				
	<u>14-6</u>	<u>14-7</u>	<u>14-8</u>	<u>14-9</u>	<u>14-11</u>
COD	107,00	71,500	58,800	34,300	87,600
Cyanide	< 1.39	<0.92	<0.80	<0.79	<3.47
Oil & Grease	455	1,110	730	325	605
Volatile Solids %	6.52	8.35	7.54	5.23	13.3
Organic Carbon	6,650	4,510	5,980	4,110	11,300
Ammonia-Nitrogen	306	265	222	192	268
Kjeldhal Nitrogen	1,130	949	1,190	804	1,880
Aluminum	7,140	8,110	9,810	10,700	3,240
Arsenic	1.13	0.017	1.49	1.89	10.0
Cadmium	0.210	0.554	0.603	0.233	2.41
Chromium	8.67	4.17	9.22	11.8	6.16
Copper	25.6	24.9	12.8	17.9	38.2
Iron	17,000	18,400	15,000	20,500	204,000
Lead	29.4	17.3	23.4	24.6	14.0
Manganese	855	936	1,080	889	2,390
Mercury	0.068	0.068	0.093	1.46	0.200
Nickel	7.23	<0.01	1.36	11.2	9.29
Zinc	34.1	110	56.2	76.3	99.2
Pentachlorophenol	< 0.01	<0.01	0.022	ND	ND

\*Parameters in mg/kg unless otherwise noted  
ND - Not Determined



**APPENDIX C**  
**PHYSICOCHEMICAL AND SEDIMENT PARAMETERS THAT WERE BELOW**  
**DETECTION LEVELS AT ALL STATIONS**

**PHYSIOCHEMICAL PARAMETERS THAT WERE BELOW  
DETECTION LEVELS AT ALL STATIONS**

<u>TOTAL CONSTITUENTS</u>	<u>CONCENTRATION</u>
Methylene Chloride	< 0.010 mg/l
1,2-Dichloroethene	< 0.001 mg/l
Chloroform	< 0.001 mg/l
1,1,1-Trichloroethane	< 0.001 mg/l
Carbon Tetrachloride	< 0.001 mg/l
Bromodichloromethane	< 0.001 mg/l
Trichloroethene	< 0.001 mg/l
1,2-Dichloropropane	< 0.001 mg/l
Chloroethylvinyl ether	< 0.001 mg/l
Tetrachloroethene	< 0.001 mg/l
Chlorobenzene	< 0.001 mg/l
Benzene	< 0.001 mg/l
Toluene	< 0.001 mg/l
Ethyl benzene	< 0.001 mg/l
o-Xylene	< 0.001 mg/l
m-Xylene	< 0.001 mg/l
p-Xylene	< 0.001 mg/l
Total Xylenes	< 0.001 mg/l
Styrene	< 0.001 mg/l
o-Chlorotoluene	< 0.001 mg/l
Phenol	< 0.022 mg/l
Aniline	< 0.022 mg/l
Bis-(2-Chloroethyl) ether	< 0.022 mg/l
2-Chlorophenol	< 0.022 mg/l
1,3-Dichlorobenzene	< 0.022 mg/l
1,4-Dichlorobenzene	< 0.022 mg/l
Benzyl Alcohol	< 0.022 mg/l
1,2-Dichlorobenzene	< 0.022 mg/l
2-Methylphenol	< 0.022 mg/l
Bis-(2-Chloroisopropyl) ether	< 0.022 mg/l
4-Methylphenol	< 0.022 mg/l
N-Nitroso-di-n-propylamine	< 0.022 mg/l
Hexachloroethane	< 0.022 mg/l
Nitrobenzene	< 0.022 mg/l
Isophorone	< 0.022 mg/l
2-Nitrophenol	< 0.022 mg/l
2,4-Dimethylphenol	< 0.022 mg/l
Bis-(2-Chloroethoxy)methane	< 0.022 mg/l
Benzoic Acid	< 0.088 mg/l
2,4-Dichlorophenol	< 0.022 mg/l
1,2,4-Trichlorobenzene	< 0.022 mg/l
Napthalene	< 0.022 mg/l
4-Chloroaniline	< 0.022 mg/l
1,1,2,3,4,4-Hexachloro-1,3-butadiene	< 0.022 mg/l
4-Chloro-3-methylphenol	< 0.022 mg/l
2-Methylnaphthalene	< 0.022 mg/l
1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene	< 0.022 mg/l
2,4,6-Trichlorophenol	< 0.022 mg/l
2,4,5-Trichlorophenol	< 0.022 mg/l

**PHYSIOCHEMICAL PARAMETERS THAT WERE BELOW  
DETECTION LEVELS AT ALL STATIONS**

<u>TOTAL CONSTITUENTS</u>	<u>CONCENTRATION</u>
2-Chloronaphthalene	< 0.022 mg/l
2-Nitroaniline	< 0.022 mg/l
Dimethyl Phthalate	< 0.022 mg/l
Acenaphthylene	< 0.022 mg/l
2,6-Dinitrotoluene	< 0.022 mg/l
3-Nitroaniline	< 0.022 mg/l
Acenaphthene	< 0.022 mg/l
2,4-Dinitrophenol	< 0.088 mg/l
4-Nitrophenol	< 0.022 mg/l
Dibenzofuran	< 0.022 mg/l
2,4-Dinitrotoluene	< 0.022 mg/l
Diethyl Phthalate	< 0.022 mg/l
Fluorene	< 0.022 mg/l
4-Chlorophenyl phenyl ether	< 0.022 mg/l
4-Nitroaniline	< 0.022 mg/l
2-Methyl-4,6-Dinitrophenol	< 0.022 mg/l
N-Nitrosodiphenylamine	< 0.022 mg/l
1,2-Diphenylhydrazine	< 0.022 mg/l
4-Bromophenylphenylether	< 0.022 mg/l
Hexachlorobenzene	< 0.022 mg/l
Pentachlorophenol	< 0.022 mg/l
Phenanthrene	< 0.022 mg/l
Anthracene	< 0.022 mg/l
Dibutyl Phthalate	< 0.022 mg/l
Fluoranthene	< 0.022 mg/l
Benzidine	< 0.022 mg/l
Pyrene	< 0.022 mg/l
Butyl Benzyl Phthalate	< 0.022 mg/l
3,3'-Dichlorobenzidine	< 0.022 mg/l
Benzo(A)Anthracene	< 0.022 mg/l
Chrysene	< 0.022 mg/l
Diethylphthalate	< 0.022 mg/l
Benzo(B)Fluoranthene	< 0.022 mg/l
Benzo(K)Fluoranthene	< 0.022 mg/l
Benzo(A)Pyrene	< 0.022 mg/l
Indeno(1,2,3-C,D)Pyrene	< 0.022 mg/l
Dibenzo(A,H)Anthracene	< 0.022 mg/l
Benzo(G,H,I)Perylene	< 0.022 mg/l
Sulfide	< 0.1 mg/l

\*Sample lost due to laboratory accident.

**SEDIMENT PARAMETERS THAT WERE BELOW DETECTION  
LEVELS AT ALL STATIONS**

<u>TOTAL CONSTITUENTS</u>	<u>CONCENTRATION</u>
Methylene Chloride	< 50.0 mg/kg
1,2-Dichloroethene	< 5.0 mg/kg
Chloroform	< 5.0 mg/kg
1,2-Dichloroethane	< 5.0 mg/kg
1,1,1-Trichloroethane	< 5.0 mg/kg
Carbon Tetrachloride	< 5.0 mg/kg
Bromodichloromethane	< 5.0 mg/kg
Trichloroethene	< 5.0 mg/kg
1,2-Dichloropropane	< 5.0 mg/kg
Dibromochloromethane	< 5.0 mg/kg
Chloroethylvinylether	< 5.0 mg/kg
Bromoform	< 5.0 mg/kg
Tetrachloroethene	< 5.0 mg/kg
Chlorobenzene	< 5.0 mg/kg
Benzene	< 5.0 mg/kg
Toluene	< 5.0 mg/kg
Ethylbenzene	< 5.0 mg/kg
o-Xylene	< 5.0 mg/kg
m-Xylene	< 5.0 mg/kg
p-Xylene	< 5.0 mg/kg
Total Xylenes	< 5.0 mg/kg
Styrene	< 5.0 mg/kg
o-Chlorotoluene	< 5.0 mg/kg
Hexachlorobenzene	< 0.01 mg/kg
Hexachlorocyclohexane, alpha isomer	< 0.01 mg/kg
Hexachlorocyclohexane, beta isomer	< 0.01 mg/kg
Hexachlorocyclohexane, gamma isomer	< 0.01 mg/kg
Hexachlorocyclohexane, delta isomer	< 0.01 mg/kg
Heptachlor	< 0.01 mg/kg
Aldrin	< 0.01 mg/kg
Heptachlor Epoxide	< 0.01 mg/kg
Oxychlorane	< 0.01 mg/kg
t-Chlordane	< 0.01 mg/kg
c-Chlordane	< 0.01 mg/kg
t-Nonachlor	< 0.01 mg/kg
alpha-Chlordene	< 0.01 mg/kg
Chlordene	< 0.01 mg/kg
gamma-Chlordene	< 0.01 mg/kg
cis-Nonachlor	< 0.01 mg/kg
O, P' - DDE	< 0.01 mg/kg
P, P' - DDE	< 0.01 mg/kg
Dieldrin	< 0.01 mg/kg
Endrin	< 0.01 mg/kg
O, P' - DDD	< 0.01 mg/kg
P, P' - DDD	< 0.01 mg/kg
O, P' - DDT	< 0.01 mg/kg
P, P' - DDT	< 0.01 mg/kg
Total DDT	< 0.01 mg/kg
Methoxychlor	< 0.01 mg/kg
Mirex	< 0.01 mg/kg
Endosulfan I	< 0.01 mg/kg
Endosulfan II	< 0.01 mg/kg

**SEDIMENT PARAMETERS THAT WERE BELOW DETECTION  
LEVELS AT ALL STATIONS**

**TOTAL CONSTITUENTS**

**CONCENTRATION**

Endosulfan Sulfate	< 0.01 mg/kg
Endrin Aldehyde	< 0.01 mg/kg
Endrin Ketone	< 0.01 mg/kg
Toxaphene	< 0.1 mg/kg
2,3,4,5-Tetrachlorophenol	< 0.01 mg/kg
2,3,4,6-Tetrachlorophenol	< 0.01 mg/kg
Aroclor 1016	< 0.1 mg/kg
Aroclor 1221	< 0.1 mg/kg
Aroclor 1232	< 0.1 mg/kg
Aroclor 1242	< 0.1 mg/kg
Aroclor 1248	< 0.1 mg/kg
Aroclor 1254	< 0.1 mg/kg
Aroclor 1260	< 0.1 mg/kg
Aroclor 1262	< 0.1 mg/kg
Aroclor 1268	< 0.1 mg/kg

**APPENDIX D**  
**DIATOM SYNOPTIC AND RELATIVE ABUNDANCES LIST**

DIATOM SPECIES AND RELATIVE ABUNDANCES LIST

Taxa	Stations								RA
	13-1	12-1	12-3	12-4	14-1	14-4	14-6	14-9	
<u>Achnanthes hungarica</u>	-	-	-	-	0.2	-	-	-	
<u>A. inflata</u>	-	*	-	-	-	-	-	-	r
<u>A. lanceolata</u>	-	-	0.4	0.4	-	-	-	-	r
<u>A. lanceolata</u> var. <u>dubia</u>	18.1	-	*	-	*	-	-	1.2	a
<u>A. lapponica</u> var. <u>ninckeii</u>	*	-	-	-	0.8	0.5	-	-	r
<u>A. linearis</u> f. <u>curta</u>	8.8	-	3.0	4.6	-	-	1.4	-	vc
<u>A. minutissima</u>	9.9	-	-	-	-	-	-	1.0	vc
<u>A. pinnata</u>	-	-	*	-	-	-	-	-	r
<u>A. spp.</u>	-	-	0.4	0.6	-	0.7	-	-	r
<u>Amphipleura pellucida</u>	*	-	-	-	-	-	-	-	r
<u>Amphora ovalis</u> var. <u>pediculus</u>	-	-	-	-	0.2	*	-	-	r
<u>Bacillaria paradoxa</u>	-	0.4	-	-	-	-	-	-	r
<u>Caloneis bacillum</u>	2.1	-	-	-	-	*	0.2	-	r
<u>C. hyalina</u>	-	-	0.2	0.2	-	-	-	-	r
<u>C. lewisii</u> var. <u>inflata</u>	-	-	-	-	-	-	*	-	r
<u>C. ventricosa</u>	-	-	-	-	-	-	0.2	0.4	r
<u>Cyclotella atomus</u>	-	0.6	1.0	-	-	-	-	-	c
<u>C. meneghiniana</u>	-	-	0.2	0.2	-	-	-	-	r
<u>C. pseudostelligera</u>	-	-	-	*	-	-	-	-	r
<u>C. spp.</u>	0.2	-	-	-	-	-	-	-	r
<u>C. striata</u> var. <u>ambigua</u>	-	0.4	0.2	1.4	0.6	-	-	-	c
<u>Cymbella aspera</u>	*	-	-	-	-	-	0.2	-	r
<u>C. minuta</u>	1.0	-	*	-	0.2	0.2	-	*	c
<u>C. triangulum</u>	*	-	-	-	-	-	-	-	r
<u>C. tumida</u>	0.4	*	-	-	-	-	-	-	r
<u>C. spp.</u>	-	*	-	0.4	0.2	*	-	*	r
<u>Entomoneis ornata</u>	-	-	*	-	1.0	1.9	-	-	c
<u>Eunotia curvata</u>	0.6	-	*	-	1.2	0.9	16.5	13.8	a
<u>E. pectinalis</u> (&var. <u>minor</u> )	0.6	-	*	1.4	3.2	10.0	14.8	8.0	a
<u>E. spp.</u>	-	*	-	-	0.4	-	-	-	e
<u>Fragilaria vaucheriae</u>	*	0.2	-	-	-	-	-	-	r
<u>Frustulia rhomboides</u> var. <u>crassinervia</u>	-	-	-	-	0.4	1.4	3.3	1.0	c
<u>F. vulgaris</u>	0.2	*	-	-	0.2	0.2	0.2	-	r
<u>Gomphonema abbreviatum</u>	0.2	-	-	-	*	-	-	-	r
<u>G. accuminatum</u>	0.2	-	-	-	-	-	-	-	r
<u>G. affine</u>	1.3	-	-	0.4	0.2	-	0.2	1.8	c
<u>G. gracile</u>	1.9	0.4	0.6	0.8	0.6	0.5	1.7	4.2	c
<u>G. parvulum</u>	9.5	0.2	7.8	17.0	2.0	5.6	10.7	10.2	a
<u>G. sp. (dichotomum?)</u>	0.2	-	-	-	0.4	-	*	1.4	c
<u>G. sp. (small subclavatum?)</u>	-	-	-	-	*	-	-	-	r
<u>G. truncatum</u>	-	-	*	*	0.6	-	-	-	r
<u>Gyrosigma scalpoides</u>	*	0.2	-	-	-	-	-	-	r
<u>G. spencerii</u>	*	-	*	-	7.0	1.4	-	-	c
<u>Hantzschia amphioxys</u>	-	0.2	-	-	0.4	-	0.2	*	r
<u>H. elongata</u>	-	-	-	-	0.2	-	-	-	r
<u>Melosira distans</u> var. <u>alpigena</u>	-	0.8	-	-	-	-	-	-	r
<u>M. granulata</u>	-	0.4	*	-	-	-	-	-	r
<u>M. varians</u>	4.4	3.8	0.8	2.4	4.2	0.7	-	-	c

DIATOM SPECIES AND RELATIVE ABUNDANCES LIST

Taxa	Stations								RA
	13-1	12-1	12-3	12-4	14-1	14-4	14-6	14-9	
<u>Meridion circulare</u>	*	-	*	0.2	0.8	*	0.4	-	r
<u>Navicula capitata</u>	0.6	*	*	-	1.8	1.4	-	-	r
<u>N. confervacea</u>	-	81.6	65.6	51.9	56.4	45.6	4.7	0.4	a
<u>N. cryptocephala</u>	4.2	1.0	2.6	2.6	2.2	4.7	5.0	6.4	vc
<u>N. cryptocephala</u> var. <u>veneta</u>	0.4	-	1.2	0.8	-	-	1.0	-	c
<u>N. cuspidata</u>	-	-	0.2	*	*	-	-	-	r
<u>N. eligensis</u> var. <u>neglecta</u>	-	-	-	-	*	*	-	-	r
<u>N. exigua</u> var. <u>capitata</u>	*	-	0.2	0.6	1.6	0.2	*	-	c
<u>N. halophila</u> var. <u>tenuirostris</u>	-	-	*	-	0.2	-	-	-	r
<u>N. heufleri</u> var. <u>leptocephala</u>	-	-	*	-	-	-	-	-	r
<u>N. hustedtii</u>	1.7	-	-	-	-	-	0.6	-	r
<u>N. lanceolata</u>	0.4	-	0.4	-	-	0.5	-	0.2	r
<u>N. luzonensis</u>	-	-	*	*	-	-	-	-	r
<u>N. mutica</u>	-	2.8	-	-	-	-	0.2	-	r
<u>N. notha</u>	-	-	-	-	-	0.2	-	-	r
<u>N. pupula</u>	*	*	0.8	2.0	0.4	2.3	1.6	0.2	c
<u>N. rhynchocephala</u> var. <u>germanii</u>	1.5	0.2	0.2	0.6	0.6	1.2	0.8	1.4	c
<u>N. salinarum</u> var. <u>intermedia</u>	-	*	-	-	-	-	-	-	r
<u>N. secreta</u> var. <u>apiculata</u>	1.0	-	-	-	-	-	-	-	r
<u>N. seminulum</u>	12.6	-	3.6	0.8	-	-	5.0	16.6	a
<u>N. sp. 1</u> (arvensis?)	-	-	0.8	-	-	-	3.3	1.8	c
<u>N. sp. 2</u> (gottlandica?)	-	-	-	-	*	-	-	-	r
<u>N. spp.</u>	0.2	-	1.6	-	0.2	0.7	1.2	0.6	c
<u>N. symmetrica</u>	0.8	-	-	-	-	1.2	-	-	c
<u>N. tenera</u>	0.4	-	-	-	-	-	0.2	-	r
<u>N. tripunctata</u>	-	0.4	0.8	0.4	-	-	-	-	r
var. <u>schizonemoides</u>	-	-	-	-	-	-	-	-	-
<u>Neidium affine</u>	-	*	*	-	-	-	0.6	-	r
var. <u>amphirhynchus</u>	-	-	-	-	-	-	-	-	-
<u>Nitzschia acicularioides</u>	*	-	-	0.4	0.4	*	-	-	r
<u>N. acicularis</u>	-	-	-	-	-	0.2	-	-	r
<u>N. agnita</u>	-	-	-	-	-	-	0.2	-	r
<u>N. amphibia</u>	1.3	*	*	0.4	0.2	0.2	-	-	r
<u>N. apiculata</u>	*	-	-	-	-	-	-	-	r
<u>N. clausii</u>	0.8	0.2	0.2	-	-	0.5	1.2	-	r
<u>N. denticula</u>	0.2	-	-	-	-	-	-	-	r
<u>N. filiformis</u>	2.3	0.4	-	*	-	-	5.2	0.4	vc
<u>N. frustulum</u>	1.1	-	*	0.2	-	*	1.7	3.3	c
<u>N. gandersheimiensis</u>	0.2	0.2	-	*	-	0.7	-	-	r
<u>N. gracilis</u>	0.8	-	-	0.2	-	0.2	0.6	0.2	r
<u>N. hungarica</u>	-	*	-	-	-	-	-	-	r
<u>N. levidensis</u>	0.2	-	*	-	-	0.2	-	-	r
<u>N. linearis</u>	0.8	*	-	-	0.4	1.4	-	*	c
<u>N. palea</u>	1.0	1.4	4.0	2.4	-	2.8	8.2	6.4	vc
<u>N. paleacea</u>	-	-	-	-	-	-	-	4.0	c
<u>N. rautenbachiae</u>	-	-	-	-	1.2	2.1	-	-	r
<u>N. recta</u>	-	-	-	-	*	-	-	-	r
<u>N. romana</u>	0.2	-	0.4	-	-	0.2	0.8	3.2	c



**DIATOM SPECIES AND RELATIVE ABUNDANCES LIST**

Taxa	Stations								RA
	13-1	12-1	12-3	12-4	14-1	14-4	14-6	14-9	
<u>N. sigma</u>	-	*	-	*	0.2	*	-	-	r
<u>N. sigmoidea</u>	-	*	-	-	-	-	-	-	r
<u>N. sp. 1 (acula?)</u>	1.3	-	-	-	-	-	-	-	c
<u>N. sp. 2 (bremensis?)</u>	-	-	-	-	-	-	*	-	r
<u>N. sp. 3 (capitellata?)</u>	-	-	0.4	-	-	-	-	-	r
<u>N. sp. 4 (valga?)</u>	-	-	0.2	*	-	-	-	-	r
<u>N. spp.</u>	0.2	-	-	0.4	*	-	-	-	r
<u>N. tropica</u>	-	*	*	*	-	0.5	-	-	r
<u>N. tryblionella var. victoriae</u>	-	*	-	-	3.2	2.3	0.2	-	c
<u>Pinnularia acrosphaeria</u>	-	-	-	-	*	*	-	-	r
<u>var. turgidula</u>	-	-	-	-	-	-	-	-	-
<u>P. braunii var. amphicephala</u>	-	-	0.8	2.4	0.2	2.8	3.1	1.0	c
<u>P. legumen</u>	-	-	-	*	-	-	-	-	r
<u>P. mesogonglya</u>	-	-	-	-	-	0.2	-	1.4	r
<u>P. mesolepta</u>	-	-	-	-	-	*	*	-	r
<u>P. obscura</u>	-	-	-	-	0.2	0.5	1.0	4.4	c
<u>P. sp. CY1.87</u>	-	*	0.4	1.8	-	0.5	*	*	c
<u>P. sp. CY2.87</u>	-	-	*	-	*	-	-	-	c
<u>P. sp. CY3.87</u>	-	*	-	-	-	-	0.2	-	r
<u>P. spp.</u>	-	-	0.2	-	0.2	-	-	-	r
<u>Stauroneis anceps f. gracilis</u>	-	-	-	-	0.2	*	-	0.6	r
<u>S. kriegeri</u>	-	-	-	-	-	-	0.8	5.0	vc
<u>S. nobilis f. alabamae</u>	-	-	-	-	*	0.2	-	-	r
<u>S. phoenicenteron</u>	-	-	-	-	-	-	1.0	*	c
<u>S. smithii var. incisa</u>	-	-	-	-	-	-	0.2	-	r
<u>Stephanodiscus alpinus</u>	-	0.2	-	-	-	-	-	-	r
<u>S. hantzschii</u>	-	*	-	-	-	-	-	-	r
<u>S. minutulus</u>	-	0.4	-	-	-	-	-	-	r
<u>S. niagarae</u>	-	1.0	-	0.2	-	-	-	-	c
<u>S. spp.</u>	-	-	0.2	0.2	-	-	-	-	r
<u>Surirella angusta</u>	0.4	0.2	*	*	0.4	0.7	0.4	-	r
<u>S. ovalis</u>	1.9	-	*	*	0.2	0.2	0.2	-	c
<u>S. ovata</u>	0.2	0.2	-	0.8	0.4	1.4	*	-	c
<u>S. sp. (biseriata)</u>	-	-	-	-	*	-	-	-	r
<u>S. tenera var. varinervosa</u>	-	-	-	-	1.0	-	-	-	c
<u>Synedra acus</u>	1.7	-	-	-	0.2	-	0.2	0.4	c
<u>S. delicatissima</u>	-	0.4	-	-	-	-	-	-	r
<u>var. angustissima</u>	-	-	-	-	-	-	-	-	-
<u>S. rumpens var. familiaris</u>	1.5	-	*	*	0.2	0.2	1.0	0.4	c
<u>S. ulna</u>	0.8	1.8	0.6	1.8	2.4	-	*	-	c
<b>Taxa Richness:</b>	<b>59</b>	<b>46</b>	<b>55</b>	<b>43</b>	<b>60</b>	<b>57</b>	<b>51</b>	<b>37</b>	

#Taxa encountered in survey: 133

a = abundant, vc = very common, c = common, r = rare

\*Present, but not encountered during count of 500 valves

**APPENDIX E**  
**MACROINVERTEBRATE SYNOPTIC LIST**

MACROINVERTEBRATE SYNOPTIC LIST

Stations

<u>Order/Family</u>	<u>Taxa</u>	<u>13-1</u>	<u>12-1</u>	<u>12-3</u>	<u>12-4</u>	<u>14-1</u>	<u>14-4</u>	<u>14-6</u>	<u>14-9</u>
Haplotaxida									
Lumbricidae	Unidentified taxa	-	-	-	-	-	-	2	-
Tubificidae	<u>Limnodrilus/Tubifex</u>	-	-	4	-	-	-	-	-
Rhynchobdellida									
Glossiphoniidae	<u>Helobdella triserialis</u>	-	-	-	-	-	1	-	-
	<u>Placobdella parasitica</u>	-	-	-	-	-	-	1	-
Limnophila									
Hydrobiidae	<u>Amnicola</u> sp.	2	-	-	-	-	-	-	-
Limnophilidae	<u>Pseudosuccinea collumella</u>	1	-	-	-	-	-	-	-
Physidae	<u>Physella</u> sp.	10	-	9	3	2	11	3	1
Planorbidae	<u>Helisoma anceps</u>	2	-	-	-	-	-	-	9
Heterodonta									
Sphaeriidae	<u>Sphaerium fabale</u>	10	-	-	-	-	-	-	-
	<u>S. striatinum</u>	3	-	-	-	-	-	-	-
	<u>Musculium partumeium</u>	-	-	15	6	12	16	19	8
	<u>M. transversum</u>	-	1	3	2	-	-	4	-
	<u>Pisidium</u> sp.	-	-	-	-	-	3	-	-
Isopoda									
Asellidae	<u>Asellus</u> sp.	-	-	12	-	12	10	11	8
	<u>Lirceus fontinalis</u>	7	-	-	-	-	-	-	-
Amphipoda									
Gammaridae	<u>Crangonyx</u> sp.	5	-	10	-	-	10	6	2
Talitridae	<u>Hyaella azteca</u>	-	-	-	3	13	-	-	-
Decapoda									
Cambaridae	<u>Cambarus diogenes</u>	-	-	-	-	-	-	2	-
	<u>Procambarus clarkii</u>	1	-	1	-	6	2	2	-
	<u>Palaemonetes kadiakensis</u>	-	3	-	-	1	-	4	-

MACROINVERTEBRATE SYNOPTIC LIST (CONT'D.)

Order/Family	Taxa	Stations																
		13-1	12-1	12-3	12-4	14-1	14-4	14-6	14-9									
Ephemeroptera																		
Baetidae	<u>Callibaetis sp.</u>	2	2	4	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Caenidae	<u>Caenis sp.</u>	5	15	-	-	5	2	1	-	-	-	-	-	-	-	-	-	-
Heptageniidae	<u>Stenonema femoratum</u>	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Odonata																		
Coenagrionidae	<u>Enallagma signatum</u>	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	<u>Ischnura sp.</u>	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Aeschnidae	<u>Nasiaeschna pentacantha</u>	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Cordulegastridae	<u>Cordulegaster sp.</u>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Corduliidae	<u>Somatochlora sp.</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Libellulidae	<u>Perithemis sp.</u>	4	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-
	<u>Sympetrum vicinum</u>	5	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
	<u>Tramea carolina</u>	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Coleoptera																		
Dytiscidae	<u>Agabus gagates</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	<u>Coptotomus interrogatus</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
	<u>Dytisca hybridus</u>	-	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	<u>Graphoderus sp.</u>	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
	<u>Hydroporus blanchardi</u>	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	<u>H. carolina</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	<u>H. clypealis</u>	2	10	59	11	2	13	10	-	-	-	-	-	-	-	-	-	1
	<u>H. straitopunctatus</u>	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	<u>H. undulatus</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
	<u>H. sp.</u>	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	<u>Laccophilus fasciatus rufus</u>	-	-	5	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	<u>L. maculosus maculosus</u>	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
	<u>Uvarus granarius</u>	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gyrinidae	<u>Dineutus sp.</u>	1	1	1	1	-	3	7	1	1	3	7	1	1	1	1	1	1
Elmidae	<u>Dubiraphia bivittata</u>	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Halipidae	<u>Peltodytes duodecimpunctatus</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	<u>P. sexmaculatus</u>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-

MACROINVERTEBRATE SYNOPTIC LIST (CONT'D.)

<u>Order/Family</u>	<u>Taxa</u>	<u>Stations</u>								
		<u>13-1</u>	<u>12-1</u>	<u>12-3</u>	<u>12-4</u>	<u>14-1</u>	<u>14-4</u>	<u>14-6</u>	<u>14-9</u>	
Hydrophilidae	<u>Berosus pantherinus</u>	-	3	-	-	1	-	-	-	-
	<u>Helochares</u> sp.	1	-	1	-	-	-	-	-	-
	<u>Helophorus</u> sp.	-	-	2	-	-	-	1	-	6
	<u>Hydrochus</u> sp.	1	-	9	-	-	-	-	-	3
	<u>Tropisternus collaris striolatus</u>	-	-	2	-	-	-	-	-	-
	<u>T. glaber</u>	-	-	1	-	-	-	-	-	-
	<u>T. lateralis nimbatus</u>	-	-	-	-	-	-	-	-	2
	<u>T. natator</u>	-	-	-	-	-	-	-	-	4
	<u>T. sp. (larvae)</u>	-	-	1	-	-	-	-	-	-
	<u>Prinocyphon</u> sp.	-	-	2	-	-	5	-	-	-
Scirtidae										
Hemiptera										
Belostomatidae	<u>Belostoma</u> sp.	-	-	2	-	-	-	-	-	2
Corixidae	<u>Hesperocorixa</u> sp.	-	-	1	-	-	-	-	-	7
	<u>Sigara</u> sp.	3	10	-	-	4	1	-	-	1
Gerridae	<u>Trichocorixa</u> sp.	-	-	5	-	-	-	-	-	1
	<u>Gerris remegis</u>	1	-	-	-	7	-	-	-	-
Mesoveliidae	<u>G. alacris</u>	1	-	-	-	-	-	-	-	-
	<u>Limnoporus</u> sp.	1	-	-	-	-	-	-	-	-
	<u>Metrobates</u> sp.	1	-	-	-	-	-	-	-	-
	<u>Mesovelia mulsanti</u>	1	-	-	-	-	-	-	-	-
	<u>Ranatra buenoi</u>	-	-	1	-	-	-	-	-	2
Nepidae	<u>Notonecta irrorata</u>	-	1	2	-	1	-	-	-	3
	<u>Neoplea striola</u>	-	-	-	-	-	2	-	-	-
Veliidae	<u>Microvelia americana</u>	2	-	-	-	-	-	-	-	1
Megaloptera										
Sialidae	<u>Sialis</u> sp.	-	16	1	-	-	-	9	-	-
Diptera										
Ceratopogonidae	<u>Alluaudomyia</u> sp.	-	1	-	-	6	-	-	-	-
	<u>Palpomyia/Sphaeromyias</u> gp.	-	-	1	2	1	1	2	-	-
	<u>Anopheles</u> sp.	-	-	-	-	-	-	-	-	1
Culicidae										

MACROINVERTEBRATE SYNOPTIC LIST (CONT'D.)

<u>Order/Family</u>	<u>Taxa</u>	<u>Stations</u>								
		<u>13-1</u>	<u>12-1</u>	<u>12-3</u>	<u>12-4</u>	<u>14-1</u>	<u>14-4</u>	<u>14-6</u>	<u>14-9</u>	
Chironomidae	<u>Ablabesmyia parajanta</u>	-	-	-	1	-	-	-	-	
	<u>Chironomus anthrocinus</u> gp.	-	-	1	-	-	-	-	-	
	<u>C. decorus</u> gp.	2	-	-	21	-	1	3	-	
	<u>C. sp.</u>	-	-	-	24	-	-	1	-	
	<u>Clinotanytus pinguis</u>	-	-	-	3	-	1	-	-	
	<u>Cryptochironomus fulvus</u>	-	-	-	-	1	-	-	-	
	<u>Dicrotendipes modestus</u>	15	1	-	-	-	1	2	-	
	<u>D. nervosus</u>	-	1	-	-	-	1	-	-	
	<u>D. simpsoni</u>	-	-	2	-	-	-	-	-	
	<u>D. sp.</u>	2	-	-	-	-	-	-	-	
	<u>Einfieldia</u> sp.1	-	-	1	-	-	-	-	-	
	<u>E. sp.2</u>	-	-	2	-	-	-	-	-	
	<u>Glyptotendipes barbipes</u>	-	-	-	-	-	1	-	-	
	<u>Kiefferulus dux</u>	-	1	1	2	-	1	-	3	
	<u>Larsia</u> sp.	-	-	-	1	-	-	-	-	
	<u>Nilothauma babyi</u>	2	-	-	-	-	-	-	-	
	<u>Parachironomus abortivus</u>	-	-	1	2	1	-	-	-	
	<u>Phaenopsectra jucundus</u>	-	-	-	-	-	3	-	-	
	<u>Polypedilum illinoense</u>	-	1	-	1	6	-	1	-	
<u>P. (Tripodura)</u>	-	-	-	-	-	4	-	-		
<u>Procladius bellus</u>	-	-	-	-	1	-	-	-		
<u>P. sublettei</u>	5	-	-	-	1	1	1	-		
<u>Strictochironomus divinctus</u>	10	-	-	-	-	-	-	-		
<u>Tanytarsus</u> sp.	-	-	-	-	1	-	-	-		

**APPENDIX F**  
**FISH SYNOPTIC LIST AND INDEX OF BIOTIC INTEGRITY**

FISH SYNOPTIC LIST

Stations

<u>Species</u>	<u>12-3</u>	<u>12-4</u>	<u>13-1</u>	<u>14-1</u>	<u>14-4</u>	<u>14-6</u>
<u>Esox americanus vermiculatus</u> Grass Pickerel	-	-	1	2	1	9
<u>Campostoma anomalum</u> Central Stoneroller	-	-	4	-	-	-
<u>Notemigonus crysoleucas</u> Golden Shiner	-	165	-	1	-	30
<u>Fundulus olivaceus</u> Blackspotted Topminnow	-	-	6	7	-	2
<u>Gambusia affinis</u> Mosquitofish	-	29	19	3	1	44
<u>Aphredoderus sayanus</u> Pirate Perch	-	-	-	-	-	2
<u>Centrarchus macropterus</u> Flier	-	-	-	4	1	35
<u>Lepomis cyanellus</u> Green Sunfish	-	1	20	-	1	3
<u>Lepomis gulosus</u> Warmouth	-	-	2	18	4	10
<u>Lepomis macrochirus</u> Bluegill	-	1	2	19	29	19
<u>Lepomis megalotis</u> Longear Sunfish	-	-	1	-	-	-
<u>Pomoxis nigromaculatus</u> Black Crappie	-	2	-	1	-	-
<u>Etheostoma chlorosomum</u> Bluntnose Darter	-	-	-	1	-	2
<u>Etheostoma gracile</u> Slough Darter	-	-	-	1	-	-
<u>Etheostoma smithi</u> Slabrock Darter	-	-	4	-	-	-



**Index of Biotic Integrity  
for Selected Stations In the  
Cypress/Tennessee System**

Station	Number of Individuals					Proportion of Individuals (%)									Index	Class
	Stream Size	Total Species	Total Individuals	Darter Species	Sunfish Species	Sucker Species	Intolerant Species	Ominivores	Insectivorous Cyprinids	Green Sunfish	Top Carnivores	Hybrids	Diseased etc.			
12-3					NO FISH											
12-4	4	5	+ /198	-/0	3/+	-/0	-/0	-/83	-/0	+ /0.5	0/1	-/0	+ /0	36	Poor	
13-1	3	+ /9	0/55	0/1	-/4	-/0	-/1	-/0	-/0	0/36	0/2	+ /0	+ /0	38	Fair	
14-1	4	+ /10	0/57	0/2	+ /14	-/0	-/0	+ /2	-/0	+ /0	0/5	+ /0	+ /0	42	Fair	
14-4	4	0/6	0/37	-/10	+ /4	-/0	-/0	+ /0	-/0	+ /3	0/3	+ /0	+ /0	38	Fair	
14-6	4	+ /10	+ /156	0/1	+ /4	-/0	-/0	+ /1	-/0	+ /2	+ /6	+ /0	+ /0	46	Fair	

**APPENDIX G**

**1987 CYPRESS CREEK FISH TISSUE DATA**

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-10-87	6-10-87	6-10-87	6-10-87
Station No.	12-1	12-1	12-1	12-1
Species	Carp	Carp	Carp	Carp
Sample Type	WB*	WB	Fillet	Fillet
Parameters (mg/kg)				
Aluminum	71.4	11.6	92.2	5.96
Arsenic	<0.144	0.143	<0.142	<0.139
Beryllium	0.008	<0.009	0.007	<0.009
Cadmium	<0.005	0.044	<0.005	<0.009
Chromium	0.558	1.04	0.660	1.19
Copper	1.30	1.33	0.783	0.750
Lead	<0.080	<0.142	<0.080	<0.148
Manganese	10.6	7.14	11.3	13.0
Mercury	0.143	0.264	0.176	0.280
Nickel	0.346	0.188	0.330	0.194
Zinc	54.1	57.7	32.4	44.8
Hexachlorobenzene	0.015	0.013	0.016	<0.010
Hexachlorocyclohexane (a)	<0.01	<0.010	<0.01	<0.010
Hexachlorocyclohexane (b)	<0.01	<0.010	<0.01	<0.010
Hexachlorocyclohexane (g)	<0.01	<0.010	<0.01	<0.010
Hexachlorocyclohexane (d)	<0.01	<0.010	<0.01	<0.010
Heptachlor	<0.01	<0.010	<0.01	<0.010
Aldrin	<0.01	<0.010	<0.01	<0.010
Heptachlor Epoxide	<0.01	<0.010	<0.01	<0.010
Oxychlordane	0.011	<0.010	0.012	<0.010
trans-Chlordane	0.011	0.023	0.011	0.032
cis-Chlordane	0.022	<0.010	0.024	<0.010
trans-Nonachlor	0.028	0.042	0.031	0.051
alpha-Chlordene	<0.01	<0.010	<0.01	<0.010
Chlordene	<0.01	<0.010	<0.01	0.010

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-10-87	6-10-87	6-10-87	6-10-87
Station No.	12-1	12-1	12-1	12-1
Species	Carp	Carp	Carp	Carp
Sample Type	WB*	WB	Fillet	Fillet
Parameters (mg/kg)				
gamma-Chlordene	<0.01	<0.010	<0.01	<0.010
cis-Nonachlor	<0.01	0.020	<0.01	0.021
O,P'-DDE	<0.01	<0.010	<0.01	<0.010
P,P'-DDE	0.14	<0.010	0.15	0.220
Dieldrin	0.014	<0.010	0.015	<0.010
Endrin	<0.01	0.020	<0.01	<0.010
O,P'-DDD	<0.01	<0.010	<0.01	<0.010
P,P'-DDD	0.11	0.410	0.12	0.39
O,P'-DDT	<0.01	<0.010	<0.01	<0.010
P,P'-DDT	<0.01	<0.010	<0.01	<0.010
Total DDT	0.25	0.69	0.27	0.61
Methoxychlor	<0.01	<0.010	<0.01	<0.010
Mirex	<0.01	<0.010	<0.01	<0.010
Endosulfan I	<0.01	<0.010	<0.01	<0.010
Endosulfan II	<0.01	<0.010	<0.01	<0.010
Endosulfan Sulfate	<0.01	<0.010	<0.01	<0.010
Endrin Aldehyde	<0.01	<0.010	<0.01	<0.010
Endrin Ketone	<0.01	<0.010	<0.01	<0.010
Toxaphene	<0.2	<0.20	<0.2	<0.22
Pentachlorophenol	<0.01	<0.010	<0.01	<0.010
2,3,4,5-Tetrachlorophenol	<0.01	<0.010	<0.01	<0.010
2,3,4,6-Tetrachlorophenol	<0.01	<0.010	<0.01	<0.010
Aroclor 1016	<0.2	<0.20	<0.2	<0.22
Aroclor 1221	<0.2	<0.20	<0.2	<0.22
Aroclor 1232	<0.2	<0.20	<0.2	<0.22
Aroclor 1242	<0.2	<0.20	<0.2	<0.22

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-10-87	6-10-87	6-10-87	6-10-87
Station No.	12-1	12-1	12-1	12-1
Species	Carp	Carp	Carp	Carp
Sample Type	WB*	WB	Fillet	Fillet
Parameters (mg/kg)				
Aroclor 1248	<0.2	<0.20	<0.2	<0.22
Aroclor 1254	<0.2	<0.20	<0.2	<0.22
Aroclor 1260	0.47	0.41	0.54	0.55
Aroclor 1262	<0.2	<0.20	<0.2	<0.22
Aroclor 1268	<0.2	<0.20	<0.2	<0.22
Percent Lipid (%)	9.2%	9.9%	10.3%	10.5
* WB = Wholebody				
F = Fillet				

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-10-87	6-10-87	6-10-87	6-10-87
Station No.	12-1	12-1	12-1	12-1
Species	Bowfin	Bowfin	Bowfin	Bowfin
Sample Type	Fillet	Fillet	WB	WB
Parameters (mg/kg)				
Aluminum	60	1.04	72.2	2.63
Arsenic	<0.127	<0.144	0.802	<0.134
Beryllium	<0.005	<0.010	0.008	<0.009
Cadmium	<0.005	<0.010	<0.005	<0.009
Chromium	0.627	1.15	0.491	1.00
Copper	0.864	0.413	1.46	1.48
Lead	<0.080	<0.154	<0.080	0.196
Manganese	10.2	8.65	11.3	10.7
Mercury	0.634	0.703	0.519	0.642
Nickel	0.318	0.144	0.642	0.313
Zinc	17.2	24.9	13.6	17.2
Hexachlorobenzene	<0.01	<0.010	<0.01	<0.010
Hexachlorocyclohexane (a)	<0.01	<0.010	<0.01	<0.010
Hexachlorocyclohexane (b)	<0.01	<0.010	<0.01	<0.010
Hexachlorocyclohexane (g)	<0.01	<0.010	<0.01	<0.010
Hexachlorocyclohexane (d)	<0.01	<0.010	<0.01	<0.010
Heptachlor	<0.01	<0.010	<0.01	<0.010
Aldrin	<0.01	<0.010	<0.01	<0.010
Heptachlor Epoxide	<0.01	<0.010	0.011	<0.010
Oxychlordane	<0.01	<0.010	<0.01	<0.010
trans-Chlordane	<0.01	<0.010	0.012	<0.010
cis-Chlordane	<0.01	<0.010	0.024	<0.010
trans-Nonachlor	<0.01	<0.010	0.012	<0.010

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-10-87	6-10-87	6-10-87	6-10-87
Station No.	12-1	12-1	12-1	12-1
Species	Bowfin	Bowfin	Bowfin	Bowfin
Sample Type	Fillet	Fillet	WB	WB
Parameters (mg/kg)				
alpha-Chlordene	<0.01	<0.010	<0.01	<0.010
Chlordene	<0.01	<0.010	<0.01	<0.010
gamma-Chlordene	<0.01	<0.010	<0.01	<0.010
cis-Nonachlor	<0.01	<0.010	<0.01	<0.010
O,P'-DDE	<0.01	<0.010	<0.01	<0.010
P,P'-DDE	0.040	0.10	0.15	0.24
Dieldrin	<0.01	<0.010	<0.01	<0.010
Endrin	<0.01	<0.010	<0.01	<0.010
O,P'-DDD	<0.01	<0.010	<0.01	<0.010
P,P'-DDD	0.018	0.035	0.069	0.20
O,P'-DDT	<0.01	<0.010	<0.01	<0.010
P,P'-DDT	<0.01	<0.010	<0.01	0.018
Total DDT	0.058	0.14	0.22	0.46
Methoxychlor	<0.01	<0.010	<0.01	<0.010
Mirex	<0.01	<0.010	<0.01	<0.010
Endosulfan I	<0.01	<0.010	<0.01	<0.010
Endosulfan II	<0.01	<0.010	<0.01	<0.010
Endosulfan Sulfate	<0.01	<0.010	<0.01	<0.010
Endrin Aldehyde	<0.01	<0.010	<0.01	<0.010
Endrin Ketone	<0.01	<0.010	<0.01	<0.010
Toxaphene	<0.1	0.10	<0.1	<0.10
Pentachlorophenol	<0.01	<0.010	<0.01	<0.010
2,3,4,5-Tetrachlorophenol	<0.01	<0.010	<0.01	<0.010
2,3,4,6-Tetrachlorophenol	<0.01	<0.010	<0.01	<0.010

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-10-87	6-10-87	6-10-87	6-10-87
Station No.	12-1	12-1	12-1	12-1
Species	Bowfin	Bowfin	Bowfin	Bowfin
Sample Type	Fillet	Fillet	WB	WB
Parameters (mg/kg)				
Aroclor 1016	<0.1	<0.10	<0.1	<0.10
Aroclor 1221	<0.1	<0.10	<0.1	<0.10
Aroclor 1232	<0.1	<0.10	<0.1	<0.10
Aroclor 1242	<0.1	<0.10	<0.1	<0.10
Aroclor 1248	<0.1	<0.10	<0.1	<0.10
Aroclor 1254	<0.1	<0.10	<0.1	<0.10
Aroclor 1260	<0.1	0.12	0.22	0.29
Aroclor 1262	<0.1	<0.10	<0.1	<0.10
Aroclor 1268	<0.1	<0.10	<0.1	<0.10
Percent Lipid (%)	1.7%	1.5	4.9	5.0
* WB = Wholebody				
F = Fillet				



1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-10-87	6-11-87	6-11-87	6-10-87
Station No.	14-4	13-1	13-1	14-1
Species	Bowfin	Creek Chub	Bluegill	Golden Shiner
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Aluminum	116.0	59.2	309	150
Arsenic	<0.139	0.552	0.562	<0.112
Beryllium	0.007	0.006	0.011	0.017
Cadmium	<0.005	<0.005	<0.005	<0.005
Chromium	0.491	0.320	0.592	1.19
Copper	0.944	1.90	3.32	3.63
Lead	<0.080	<0.160	<0.160	0.104
Manganese	16.7	15.4	40.8	70.2
Mercury	0.504	0.120	0.161	0.231
Nickel	3.31	0.470	0.923	1.23
Zinc	19.0	20.8	22.5	42.1
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclohexane (a)	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclohexane (b)	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclohexane (g)	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclohexane (d)	<0.01	<0.01	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	<0.01	<0.01	0.016	<0.01
Oxychlordane	<0.01	0.015	0.022	<0.01
trans-Chlordane	<0.01	<0.01	<0.01	<0.01
cis-Chlordane	<0.01	0.010	<0.01	<0.01
trans-Nonachlor	<0.01	<0.01	<0.01	<0.01
alpha-Chlordene	<0.01	<0.01	<0.01	<0.01

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-10-87	6-11-87	6-11-87	6-10-87
Station No.	14-4	13-1	13-1	14-1
Species	Bowfin	Creek Chub	Bluegill	Golden Shiner
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Chlordene	<0.01	<0.01	<0.01	<0.01
gamma-Chlordene	<0.01	<0.01	<0.01	<0.01
cis-Nonachlor	<0.01	<0.01	<0.01	<0.01
O,P'-DDE	<0.01	<0.01	0.015	<0.01
P,P'-DDE	0.011	0.011	<0.01	0.023
Dieldrin	<0.01	<0.01	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01	<0.01
O,P'-DDD	<0.01	<0.01	<0.01	<0.01
P,P'-DDD	<0.01	<0.01	<0.01	0.011
O,P'-DDT	<0.01	<0.01	<0.01	<0.01
P,P'-DDT	<0.01	<0.01	<0.01	<0.01
Total DDT	0.011	0.011	<0.01	0.034
Methoxychlor	<0.01	<0.01	<0.01	<0.01
Mirex	<0.01	<0.01	<0.01	<0.01
Endosulfan I	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01
Endrin Aldehyde	<0.01	<0.01	<0.01	<0.01
Endrin Ketone	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.1	0.1	<0.1	<0.10
Pentachlorophenol	<0.01	<0.01	<0.01	0.011
2,3,4,5-Tetrachlorophenol	<0.01	<0.01	<0.01	<0.01
2,3,4,6-Tetrachlorophenol	<0.01	<0.01	<0.01	<0.1
Aroclor 1016	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	<0.1	<0.1	<0.1	<0.1

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-10-87	6-11-87	6-11-87	6-10-87
Station No.	14-4	13-1	13-1	14-1
Species	Bowfin	Creek Chub	Bluegill	Golden Shiner
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Aroclor 1232	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	<0.1	<0.1	<0.1	<0.1
Percent Lipid (%)	2.2%	5.9%	5.2%	4.7%
* WB = Wholebody				
F = Fillet				

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-11-87	6-11-87	6-11-87	6-11-87
Station No.	14-1	14-4	14-4	14-6
Species	Flier	Carp	Flier	Golden Shiner
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Aluminum	51.9	80.3	64.3	166
Arsenic	1.00	0.778	<0.142	0.779
Beryllium	0.008	0.006	0.007	0.006
Cadmium	<0.005	<0.005	<0.005	0.005
Chromium	0.664	0.333	0.462	0.409
Copper	2.08	1.23	1.5	4.46
Lead	0.865	<0.160	<0.080	<0.080
Manganese	40.4	10.2	40.6	51.0
Mercury	0.331	0.093	0.361	0.198
Nickel	0.596	0.444	0.651	0.635
Zinc	28.4	39.4	32.3	37.7
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclohexane (a)	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclohexane (b)	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclohexane (g)	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclohexane (d)	<0.01	<0.01	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01
Oxychlordane	<0.01	<0.01	<0.01	<0.01
trans-Chlordane	<0.01	<0.01	<0.01	<0.01
cis-Chlordane	<0.01	<0.01	<0.01	<0.01
trans-Nonachlor	<0.01	<0.01	<0.01	<0.01
alpha-Chlordene	<0.01	<0.01	<0.01	<0.01

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-11-87	6-11-87	6-11-87	6-11-87
Station No.	14-1	14-4	14-4	14-6
Species	Flier	Carp	Flier	Golden Shiner
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Chlordene	<0.01	<0.01	<0.01	<0.01
gamma-Chlordene	<0.01	<0.01	<0.01	<0.01
cis-Nonachlor	<0.01	<0.01	<0.01	<0.01
O,P'-DDE	<0.01	<0.01	<0.01	<0.01
P,P'-DDE	<0.01	<0.01	0.011	<0.01
Dieldrin	<0.01	<0.01	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01	<0.01
O,P'-DDD	<0.01	<0.01	<0.01	<0.01
P,P'-DDD	<0.01	<0.01	<0.01	<0.01
O,P'-DDT	<0.01	<0.01	<0.01	<0.01
P,P'-DDT	<0.01	<0.01	<0.01	<0.01
Total DDT	<0.01	<0.01	0.011	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01
Mirex	<0.01	<0.01	<0.01	<0.01
Endosulfan I	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01
Endrin Aldehyde	<0.01	<0.01	<0.01	<0.01
Endrin Ketone	<4.5	<0.01	<0.01	<0.1
Toxaphene	<0.01	<0.1	0.1	<0.01
Pentachlorophenol	<0.01	<0.01	<0.01	<0.01
2,3,4,5-Tetrachlorophenol	<0.01	<0.01	<0.01	<0.01
2,3,4,6-Tetrachlorophenol	<0.01	<0.01	<0.1	<0.01
Aroclor 1016	<4.5	<0.1	<0.1	<0.1
Aroclor 1221	<4.5	<0.1	<0.1	<0.1

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-11-87	6-11-87	6-11-87	6-11-87
Station No.	14-1	14-4	14-4	14-6
Species	Flier	Carp	Flier	Golden Shiner
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Aroclor 1232	<4.5	<0.1	<0.1	<0.1
Aroclor 1242	<4.5	<0.1	<0.1	<0.1
Aroclor 1248	11.3	<0.1	<0.1	<0.1
Aroclor 1254	<4.5	<0.1	<0.1	<0.1
Aroclor 1260	<4.5	<0.1	<0.1	<0.1
Aroclor 1262	<4.5	<0.1	<0.1	<0.1
Aroclor 1268	<4.5	<0.1	<0.1	<0.1
Percent Lipid (%)	4.1%	9.6%	3.7%	3.1%
* WB = Wholebody				
F = Fillet				

1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-11-87			
Station No.	14-6			
Species	Flier			
Sample Type	WB			
Parameters (mg/kg)				
Aluminum	53.7			
Arsenic	<0.144			
Beryllium	0.009			
Cadmium	<0.005			
Chromium	0.423			
Copper	1.08			
Lead	<0.160			
Manganese	28.8			
Mercury	0.478			
Nickel	0.894			
Zinc	31.1			
Hexachlorobenzene	0.013			
Hexachlorocyclohexane (a)	<0.01			
Hexachlorocyclohexane (b)	<0.01			
Hexachlorocyclohexane (g)	<0.01			
Hexachlorocyclohexane (d)	<0.01			
Heptachlor	<0.01			
Aldrin	<0.01			
Heptachlor Epoxide	<0.01			
Oxychlordane	<0.01			
trans-Chlordane	0.013			
cis-Chlordane	0.030			
trans-Nonachlor	0.044			
alpha-Chlordene	<0.01			

**1987 CYPRESS CREEK FISH TISSUE DATA**

Collection Date	6-11-87			
Station No.	14-6			
Species	Flier			
Sample Type	WB			
Parameters (mg/kg)				
Chlordene	<0.01			
gamma-Chlordene	<0.01			
cis-Nonachlor	<0.01			
O,P'-DDE	<0.01			
P,P'-DDE	0.13			
Dieldrin	0.013			
Endrin	<0.01			
O,P'-DDD	<0.01			
P,P'-DDD	0.067			
O,P'-DDT	<0.01			
P,P'-DDT	<0.01			
Total DDT	0.02			
Methoxychlor	<0.01			
Mirex	<0.01			
Endosulfan I	<0.01			
Endosulfan II	<0.01			
Endosulfan Sulfate	<0.01			
Endrin Aldehyde	<0.01			
Endrin Ketone	<0.7			
Toxaphene	<0.01			
Pentachlorophenol	<0.01			
2,3,4,5-Tetrachlorophenol	<0.01			
2,3,4,6-Tetrachlorophenol	<0.01			
Aroclor 1016	<0.7			
Aroclor 1221	<0.7			
Aroclor 1232	<0.7			



1987 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	6-11-87			
Station No.	14-6			
Species	Flier			
Sample Type	WB			
Parameters (mg/kg)				
Aroclor 1242	<0.7			
Aroclor 1248	0.26			
Aroclor 1254	<0.7			
Aroclor 1260	1.8			
Aroclor 1262	<0.7			
Aroclor 1268	<0.7			
Percent Lipid (%)	2.5%			
* WB = Wholebody				
F = Fillet				

**APPENDIX H**  
**1988 CYPRESS CREEK FISH TISSUE DATA**

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	12-1	12-1	12-1	12-1
Species	Carp-sucker	Carp-sucker	Carp-sucker	Carp-sucker
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Aluminum	5.91	16.9	2.06	12.1
Arsenic	<0.129	<0.132	<0.134	<0.144
Beryllium	<0.009	<0.009	0.067	<0.010
Cadmium	<0.009	<0.009	<0.016	<0.010
Chromium	0.716	0.667	1.04	1.90
Copper	0.647	1.01	0.705	0.750
Lead	<0.138	<0.140	<0.143	<0.154
Manganese	48.3	78.9	60.7	45.2
Mercury	0.051	0.033	0.074	0.125
Nickel	0.051	0.254	0.304	1.01
Zinc	0.129	22.2	17.5	17.0
Hexachlorobenzene	24.6	<0.005	<0.010	<0.010
Hexachlorocyclohexane (a)	<0.005	<0.005	<0.010	<0.010
Hexachlorocyclohexane (b)	<0.005	<0.005	<0.010	<0.010
Hexachlorocyclohexane (g)	<0.005	<0.005	<0.010	<0.010
Hexachlorocyclohexane (d)	<0.005	<0.005	<0.010	<0.010
Heptachlor	<0.005	<0.005	0.068	<0.010
Aldrin	<0.005	<0.005	<0.010	<0.010
Heptachlor Epoxide	<0.005	<0.005	0.15	<0.010
Oxychlordane	<0.005	<0.005	<0.010	<0.010
trans-Chlordane	<0.055	<0.005	0.011	0.020
cis-Chlordane	<0.005	<0.005	0.095	0.055
trans-Nonachlor	<0.005	<0.005	<0.010	<0.010
alpha-Chlordene	<0.005	<0.005	<0.010	<0.010

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	12-1	12-1	12-1	12-1
Species	Carp-sucker	Carp-sucker	Carp-sucker	Carp-sucker
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Chlordene	<0.005	<0.005	<0.010	<0.010
gamma-Chlordene	<0.005	<0.005	<0.010	<0.010
cis-Nonachlor	<0.005	<0.005	<0.010	<0.010
O,P'-DDE	<0.005	<0.005	<0.010	<0.010
P,P'-DDE	0.023	0.010	0.11	0.033
Dieldrin	<0.005	<0.005	0.074	0.018
Endrin	<0.005	<0.005	<0.010	<0.010
O,P'-DDD	<0.005	<0.005	<0.010	<0.010
P,P'-DDD	0.005	<0.005	0.042	0.39
O,P'-DDT	<0.005	<0.005	<0.010	<0.010
P,P'-DDT	<0.005	<0.005	<0.010	<0.010
Total DDT	0.028	0.010	0.15	0.059
Methoxychlor	0.005	<0.005	<0.010	<0.010
Mirex	<0.005	<0.005	<0.010	<0.010
Endosulfan I	<0.005	<0.005	<0.010	<0.010
Endosulfan II	<0.005	<0.005	<0.010	<0.010
Endosulfan Sulfate	<0.005	<0.005	<0.010	<0.010
Endrin Aldehyde	<0.005	<0.005	<0.010	<0.010
Endrin Ketone	<0.005	<0.005	<0.010	<0.010
Toxaphene	<0.050	<0.050	<4.5	<3.0
Pentachlorophenol	<0.005	<0.005	<0.010	<0.010
2,3,4,5-Tetrachlorophenol	<0.005	<0.005	<0.010	<0.010
2,3,4,6-Tetrachlorophenol	<0.005	<0.005	<0.010	<0.010
Aroclor 1016	<0.050	<0.050	<4.5	<3.0
Aroclor 1221	<0.050	<0.050	<4.5	<3.0

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	12-1	12-1	12-1	12-1
Species	Carp-sucker	Carp-sucker	Carp-sucker	Carp-sucker
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Aroclor 1232	<0.050	<0.050	<4.5	<3.0
Aroclor 1242	<0.050	<0.050	<4.5	<3.0
Aroclor 1248	<0.050	<0.050	<4.5	<3.0
Aroclor 1254	0.14	<0.050	11.1	8.2
Aroclor 1260	<0.050	<0.050	<4.5	<3.0
Aroclor 1262	<0.050	<0.050	<4.5	<3.0
Aroclor 1268	<0.050	<0.050	<4.5	<3.0
Percent Lipid (%)	4.0%	2.0%	6.8%	6.0%
* WB = Wholebody				
F = Fillet				

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	12-1	12-1	12-1	12-1
Species	Carp-sucker	Carp-sucker	Bluegill	Bluegill
Sample Type	Fillet	Fillet	WB	WB
Parameters (mg/kg)				
Aluminum	83.4	0.655	1.49	64.5
Arsenic	<0.139	<0.129	<0.136	<0.134
Beryllium	<0.009	0.009	<0.009	<0.009
Cadmium	0.011	0.586	0.014	0.020
Chromium	0.667	0.129	2.29	1.94
Copper	0.185	<0.138	0.573	0.554
Lead	<0.148	3.45	0.209	<0.143
Manganese	3.70	0.056	38.1	84.8
Mercury	0.059	<0.198	0.172	0.143
Nickel	<0.213	6.64	0.523	1.00
Zinc	8.80	<0.010	27.0	33.9
Hexachlorobenzene	<0.010	<0.010	<0.005	<0.005
Hexachlorocyclohexane (a)	<0.010	<0.010	<0.005	<0.005
Hexachlorocyclohexane (b)	<0.010	<0.010	<0.005	<0.005
Hexachlorocyclohexane (g)	<0.010	<0.010	<0.005	<0.005
Hexachlorocyclohexane (d)	<0.010	<0.010	<0.005	<0.005
Heptachlor	<0.010	<0.010	<0.005	<0.005
Aldrin	<0.010	<0.010	<0.005	<0.005
Heptachlor Epoxide	0.050	0.068	<0.005	<0.009
Oxychlordane	<0.010	<0.010	<0.005	0.011
trans-Chlordane	<0.039	0.043	0.026	0.031
cis-Chlordane	<0.034	0.036	0.012	0.012
trans-Nonachlor	<0.010	<0.010	0.026	<0.005

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	12-1	12-1	12-1	12-1
Species	Carp-sucker	Carp-sucker	Bluegill	Bluegill
Sample Type	Fillet	Fillet	WB	WB
Parameters (mg/kg)				
alpha-Chlordene	<0.010	<0.010	<0.005	<0.005
Chlordene	<0.010	<0.010	<0.005	<0.005
gamma-Chlordene	<0.010	<0.010	<0.005	<0.005
cis-Nonachlor	<0.010	<0.010	<0.005	<0.005
O,P'-DDE	<0.010	<0.010	<0.005	<0.005
P,P'-DDE	0.041	0.043	0.15	0.15
Dieldrin	0.028	0.029	0.012	0.012
Endrin	<0.010	<0.010	<0.005	<0.005
O,P'-DDD	<0.010	<0.010	<0.005	<0.005
P,P'-DDD	0.013	0.018	0.18	0.19
O,P'-DDT	<0.010	<0.010	<0.005	<0.005
P,P'-DDT	<0.010	<0.010	0.007	<0.005
Total DDT	0.054	0.061	0.34	0.34
Methoxychlor	<0.010	<0.010	<0.005	<0.005
Mirex	<0.010	<0.010	<0.005	<0.005
Endosulfan I	<0.010	<0.010	<0.005	<0.005
Endosulfan II	<0.010	<0.010	<0.005	<0.005
Endosulfan Sulfate	<0.010	<0.010	<0.005	<0.005
Endrin Aldehyde	<0.010	<0.010	<0.005	<0.005
Endrin Ketone	<0.010	<0.010	<0.005	<0.005
Toxaphene	<1.5	<1.5	<0.10	<0.10
Pentachlorophenol	<0.010	<0.010	<0.005	<0.005
2,3,4,5-Tetrachlorophenol	<0.010	<0.010	<0.005	<0.005
2,3,4,6-Tetrachlorophenol	<0.010	<0.010	<0.005	<0.005
Aroclor 1016	<1.5	<1.5	<0.005	<0.10

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	12-1	12-1	12-1	12-1
Species	Carp-sucker	Carp-sucker	Bluegill	Bluegill
Sample Type	Fillet	Fillet	WB	WB
Parameters (mg/kg)				
Aroclor 1221	<1.5	<1.5	<0.10	<0.10
Aroclor 1232	<1.5	<1.5	<0.10	<0.10
Aroclor 1242	<1.5	<1.5	<0.10	<0.10
Aroclor 1248	<1.5	<1.5	<0.10	<0.10
Aroclor 1254	3.48	3.81	<0.10	0.16
Aroclor 1260	<1.5	<1.5	0.12	<0.10
Aroclor 1262	<1.5	<1.5	<0.10	<0.10
Aroclor 1268	<1.5	<1.5	<0.10	<0.10
Percent Lipid (%)	1.6%	1.8%	4.7%	4.8%
* WB = Wholebody				
F = Fillet				



1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	12-1	12-1	12-1	14-1
Species	Crappie	Crappie	Crappie	Golden Shiner
Sample Type	WB	WB	Fillet	WB
Parameters (mg/kg)				
Aluminum	10.3	1.09	1.03	8.02
Arsenic	<0.142	<0.144	<0.142	<0.136
Beryllium	<0.009	<0.010	<0.009	<0.009
Cadmium	0.014	0.014	<0.009	0.013
Chromium	0.567	1.23	0.962	0.655
Copper	0.406	0.746	0.481	1.18
Lead	0.189	<0.147	<0.151	0.200
Managese	10.4	14.7	1.89	60.0
Mercury	0.243	0.254	0.424	0.119
Nickel	0.377	0.494	<0.217	<0.209
Zinc	26.3	28.8	9.72	35.5
Hexachlorobenzene	<0.005	<0.005	<0.001	<0.005
Hexachlorocyclohexane (a)	<0.005	<0.005	<0.001	<0.005
Hexachlorocyclohexane (b)	<0.005	<0.005	<0.001	<0.005
Hexachlorocyclohexane (g)	<0.005	<0.005	<0.001	<0.005
Hexachlorocyclohexane (d)	<0.005	<0.005	<0.001	<0.005
Heptachlor	<0.005	<0.005	<0.001	<0.005
Aldrin	<0.005	<0.005	<0.001	<0.005
Heptachlor Epoxide	<0.005	<0.005	<0.001	<0.005
Oxychlordan	<0.005	<0.005	<0.001	<0.005
trans-Chlordane	0.020	0.014	0.003	<0.005
cis-Chlordane	0.008	0.008	0.002	<0.005
trans-Nonachlor	<0.005	<0.005	<0.001	<0.005
alpha-Chlordene	<0.005	<0.005	<0.001	<0.005

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	12-1	12-1	12-1	14-1
Species	Crappie	Crappie	Crappie	Golden Shiner
Sample Type	WB	WB	Fillet	WB
Parameters (mg/kg)				
Chlordene	<0.005	<0.005	<0.001	<0.005
gamma-Chlordene	<0.005	<0.005	<0.001	<0.005
cis-Nonachlor	<0.005	<0.005	<0.001	<0.005
O,P'-DDE	<0.005	<0.005	<0.001	<0.005
P,P'-DDE	0.025	0.029	0.007	0.011
Dieldrin	<0.005	<0.005	<0.001	<0.005
Endrin	<0.005	<0.005	<0.001	<0.005
O,P'-DDD	<0.005	<0.005	<0.001	<0.005
P,P'-DDD	0.020	0.025	0.003	<0.005
O,P'-DDT	<0.005	<0.005	<0.001	<0.005
P,P'-DDT	<0.005	<0.005	<0.001	<0.005
Total DDT	0.045	0.054	0.010	0.011
Methoxychlor	<0.005	<0.005	<0.001	<0.005
Mirex	<0.005	<0.005	<0.001	<0.005
Endosulfan I	<0.005	<0.005	<0.001	<0.005
Endosulfan II	<0.005	<0.005	<0.001	<0.005
Endosulfan Sulfate	<0.005	<0.005	<0.001	<0.005
Endrin Aldehyde	<0.005	<0.005	<0.001	<0.005
Endrin Ketone	<0.005	<0.005	<0.001	<0.005
Toxaphene	<0.10	<0.10	<0.001	<0.050
Pentachlorophenol	<0.005	<0.005	<0.001	<0.005
2,3,4,5-Tetrachlorophenol	<0.005	<0.005	<0.001	<0.005
2,3,4,6-Tetrachlorophenol	<0.005	<0.005	<0.001	<0.005
Aroclor 1016	<0.10	<0.10	<0.050	<0.050
Aroclor 1221	<0.10	<0.10	<0.050	<0.050

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	12-1	12-1	12-1	14-1
Species	Crappie	Crappie	Crappie	Golden Shiner
Sample Type	WB	WB	Fillet	WB
Parameters (mg/kg)				
Aroclor 1232	<0.10	<0.10	<0.05	<0.050
Aroclor 1242	<0.10	<0.10	<0.050	<0.050
Aroclor 1248	<0.10	<0.10	<0.050	<0.050
Aroclor 1254	<0.10	<0.10	<0.050	<0.050
Aroclor 1260	0.16	<0.17	<0.050	<0.050
Aroclor 1262	<0.10	<0.10	<0.050	<0.050
Aroclor 1268	<0.10	<0.10	<0.050	<0.050
Percent Lipid (%)	3.2%	3.4%	0.6%	2.7%
* WB = Wholebody				
F = Fillet				

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	14-1	14-6	14-6	14-7
Species	Flier	Common Shiner	Flier	Flier
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Aluminum	5.05	26.6	9.35	13.6
Arsenic	<0.127	<0.139	<0.136	<0.110
Beryllium	<0.009	<0.009	<0.009	0.009
Cadmium	<0.009	<0.009	<0.009	<0.007
Chromium	0.695	0.852	0.491	0.544
Copper	2.53	2.19	0.691	2.19
Lead	0.169	<0.148	<0.145	<0.118
Manganese	71.2	46.3	34.5	57.4
Mercury	0.380	0.392	0.182	0.219
Nickel	0.203	<0.213	0.345	0.750
Zinc	37.9	37.8	32.5	42.1
Hexachlorobenzene	<0.005	<0.001	<0.005	<0.005
Hexachlorocyclohexane (a)	<0.005	<0.001	<0.005	<0.005
Hexachlorocyclohexane (b)	<0.005	<0.001	<0.005	<0.005
Hexachlorocyclohexane (g)	<0.005	<0.001	<0.005	<0.005
Hexachlorocyclohexane (d)	<0.005	<0.001	<0.005	<0.005
Heptachlor	<0.005	<0.001	<0.005	<0.005
Aldrin	<0.005	<0.001	<0.005	<0.005
Heptachlor Epoxide	<0.005	<0.001	<0.005	<0.005
Oxychlordane	<0.005	<0.001	<0.005	<0.005
trans-Chlordane	<0.005	<0.001	<0.005	<0.005
cis-Chlordane	<0.005	<0.001	<0.005	<0.005
trans-Nonachlor	<0.005	<0.001	<0.005	<0.005
alpha-Chlordene	<0.005	<0.001	<0.005	<0.005

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	14-1	14-6	14-6	14-7
Species	Flier	Common Shiner	Flier	Flier
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Chlordene	<0.005	<0.001	<0.005	<0.005
gamma-Chlordene	<0.005	<0.001	<0.005	<0.005
cis-Nonachlor	<0.005	<0.001	<0.005	<0.005
O,P'-DDE	<0.005	<0.001	<0.005	<0.005
P,P'-DDE	0.028	0.008	0.006	0.014
Dieldrin	<0.005	<0.001	<0.005	<0.005
Endrin	<0.005	<0.001	<0.005	<0.005
O,P'-DDD	<0.005	<0.001	<0.005	<0.005
P,P'-DDD	0.010	<0.001	<0.005	<0.005
O,P'-DDT	<0.005	<0.001	<0.005	<0.005
P,P'-DDT	<0.005	<0.001	<0.005	<0.005
Total DDT	0.038	0.008	<0.005	0.014
Methoxychlor	<0.005	<0.001	<0.005	<0.005
Mirex	<0.005	<0.001	<0.005	<0.005
Endosulfan I	<0.005	<0.001	<0.005	<0.005
Endosulfan II	<0.005	<0.001	<0.005	<0.005
Endosulfan Sulfate	<0.005	<0.001	<0.005	<0.005
Endrin Aldehyde	<0.005	<0.001	<0.005	<0.005
Endrin Ketone	<0.005	<0.001	<0.005	<0.005
Toxaphene	<0.10	<0.050	<0.050	<0.050
Pentachlorophenol	<0.005	<0.001	<0.005	<0.005
2,3,4,5-Tetrachlorophenol	<0.005	<0.001	<0.005	<0.005
2,3,4,6-Tetrachlorophenol	<0.005	<0.001	<0.005	<0.005
Aroclor 1016	<0.010	<0.050	<0.050	<0.050
Aroclor 1221	<0.010	<0.050	<0.050	<0.050

1988 CYPRESS CREEK FISH TISSUE DATA				
Collection Date	5-25-88	5-25-88	5-25-88	5-25-88
Station No.	14-1	14-6	14-6	14-7
Species	Flier	Common Shiner	Flier	Flier
Sample Type	WB	WB	WB	WB
Parameters (mg/kg)				
Aroclor 1232	<0.010	<0.050	<0.050	<0.050
Aroclor 1242	<0.10	<0.050	<0.050	<0.050
Aroclor 1248	<0.10	<0.050	<0.050	<0.050
Aroclor 1254	0.27	0.13	<0.050	<0.050
Aroclor 1260	<0.10	<0.050	<0.050	<0.050
Aroclor 1262	<0.10	<0.050	<0.050	<0.050
Aroclor 1268	<0.10	<0.050	<0.050	<0.050
Percent Lipid (%)	3.7%	2.7%	4.0%	2.7%
* WB = Wholebody				
F = Fillet				