

A MACROBENTHIC STUDY AND MICROHABITAT CHARACTERIZATION OF
LOVE CREEK AND TAR CAMP CREEK, JEFFERSON COUNTY, ARKANSAS

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INTRODUCTION

Because there is constant concern regarding potential negative impacts on environmental quality by the construction and/or operation of an industry, this study was initiated. The monitoring of selected environmental features for the purpose of checking for such impacts should be an ongoing procedure. In order to respond to certain concerns from Arkansas Department of Pollution Control and Ecology regarding operations at their White Bluff Generating Plant, Arkansas Power & Light Company invited me to begin this project.

STUDY AREA AND METHODS

The physical site of AP&L's White Bluff Generating Station (Redfield, Jefferson County, Arkansas) is drained on the north by TAR Camp Creek and on the south by Love Creek. TAR Camp Creek flows eastward and empties into the Arkansas River near mile 88, whereas Love Creek, also flowing eastward, empties into a backwater area known as Grassy Lake near river mile 85 (Figure 1). During low flow periods, both streams exhibit very little observable flow or discharge, consisting primarily of a low-gradient meandering channel with water strongly colored with tannins and other organic decomposition products. During times of flood, flow may be impeded by numerous debris piles that have collected in the channels. Normal surface runoff was the primary concern for TAR Camp Creek, whereas seepage from a "surge" (retaining) pond was the primary concern for Love Creek.

The point of suspected pollution entry into each stream was located, and sampling stations were established above and below these

points (Figure 1) for comparative analysis. An additional downstream station was selected on Love Creek. The macrobenthic community was selected to be the major indicator, while physicochemical variables and sediment were minor indicators of environmental degradation, if present. Methods were patterned after Shackleford (1988).

Macrobenthos was sampled twice (6,7 August and 2,3 November) with a 6x6-inch standard Ekman grab. Organisms were hand-picked and preserved in 70 percent alcohol for laboratory identification and enumeration. Eight Dendy multiplate artificial substrate samplers were anchored at each station, three were recovered on 28 September, two on 19 October and three on 2,3 November. All organisms were picked, preserved, identified to the lowest feasible taxon and enumerated.

Selected physicochemical variables were measured with a HACH DR/EL portable spectrophotometer during each visit at each station. These tests are approved in Standard Methods (1985). A liter of sediment was collected at each station for a settling analysis. A visual evaluation of general habitat characteristics was recorded for each station.

The macrobenthic data were subjected to seven different analyses as follows with justification:

(1) Quantitative Similarity Index (QSI) (Shackleford 1988). This method compares the composition of two communities by comparing presence or absence of the same taxa (qualitative) as well as relative abundance (semi-quantitative).

(2) Indicator Assemblage Index (IAI) (Shackleford 1988). This method selects certain taxa known to be organophilic ("polluted") or non-organophilic ("pristine") and determines trends of ratio changes that might be present. This was calculated as given by Shackleford

(1988) and by adding four dipteran families not specified but pertinent. Chaoboridae are "pristine", whereas Heleidae, Psychodidae and Culicidae are "organophilic." Actually some heleids are "pristine", but for the sake of simplicity, all were considered organophilic in this context.

(3) Community Similarity Index. This value is calculated by the formula, $CSI = 2C/A+B$, where A and B are the number of taxa in communities A and B, respectively, and C is the number of taxa found in both communities. This method considers only the presence or absence of taxa.

(4) Shannon Diversity Index (H). Greater community diversity is generally equated with higher environmental quality. This method is sensitive to subtle changes in the number of both taxa and individuals and the way individuals are distributed among the taxa. This index is calculated thusly: $H = -\sum (n/N) \ln(n/N)$, where n is the number of individuals in each taxon, in turn, and N is the total number of individuals in the community. Since ln of decimals is negative, the negative sign before the simply makes the result positive for greater palatability.

(5) Competitive Overlap Index. This index is calculated with the formula, $COI = \sum P_{iA} P_{iB} / (\sum P_{iA}^2)(\sum P_{iB}^2)^{0.5}$, where P_{iA} is the numerical proportion the ith taxon comprises of community A and P_{iB} is the numerical proportion the ith taxon comprises of community B. Although this calculation is used primarily in assessing niche overlap between two species, it can also indicate a difference between two communities by considering the number of taxa and individuals in those taxa.

(6) Mann-Whitney U Test (U). This test checks for constancy of dominance position of the several taxa in two different communities without respect to the actual numbers of individuals in those taxa.

(7) Student's T-test. This test checks for significant difference between mean numbers of organisms from two communities. Multiple samples from each community must be taken for this test.

RESULTS AND DISCUSSION

Results of statistical tests are given in Tables 1 through 7, whereas physicochemical measurements are given in Table 8. Benthic sample data are given in Appendix A, habitat evaluations are in Appendix B, and sediment settling characteristics are given in Appendix C.

All stations were characterized with much organic sediment. At LC-1 there was a heavy concentration of detritus (leaves, twigs and other plant parts) embedded in and lying on top of the sediment. The fragments on top of or only partially embedded apparently provided numerous refugia for the large number of chaoborids found there. During the sampling period, however, there was considerable bulldozing and grading of the road and streambank immediately adjacent to the pool where the Dendy samplers were set. This and normal life cycle progress apparently caused the virtual disappearance of chaoborids at LC-1.

Station LC-2 had tall, dense grasses growing up to the edge of the water. Woody detritus was virtually absent. During the sampling period beavers began building a dam nearby, and a vandal stole the iron weight I had used to hold the Dendy samplers in place. Consequently a heavy rain washed them up against the bank into less than ideal substrate for

TABLE 1. Quantitative Similarity Indices (QSI) on paired stations on Love Creek and TAR Camp Creek, Jefferson County, Arkansas, August-November 1990. Larger numbers indicate greater similarity. Numbers in parentheses are numbers of organisms taken at each station.

Date	Coll. Type	LC-1 vs. LC-2		LC-1 vs. LC-3		TCC-1 vs. TCC-2	
6,7 Aug	3 Ekmans	(3559)	22 (357)	(3559)	82 (1306)	(618)	40 (976)
2,3 Nov	3 Ekmans	(186)	37 (100)	(186)	40 (85)	-----	
28 Sep	3 Dendys	-----		(4424)	63 (3026)	-----	
19 Oct	2 Dendys	(1583)	84 (851)	(1583)	94 (9015)	(4756)	78 (476)
2,3 Nov	3 Dendys	(1562)	69 (1960)	(1562)	95 (7240)	(4950)	80 (1617)

TABLE 2. Indicator Assemblage Indices (IAI) on paired stations on Love Creek and TAR Camp Creek, Jefferson County, Arkansas, August-November 1990. Values at or close to 0.5 indicate no change in community structure from upstream to downstream, values less than 0.5 indicate an increase of organophilic taxa and/or a decrease of pristine taxa, and values greater than 0.5 indicate the opposite.

INCLUDING FOUR ADDITIONAL FAMILIES OF DIPTERA (explained in text):

Date	Coll. Type	LC-1 vs. LC-2		LC-1 vs. LC-3		TCC-1 vs. TCC-2	
6,7 Aug	3 Ekmans	0.182		0.632		11.800	
2,3 Nov	3 Ekmans	2.422		2.976		----	
28 Sep	3 Dendys	----		10.543		----	
19 Oct	2 Dendys	0.957		0.523		0.530	
2,3 Nov	3 Dendys	0.498		0.494		0.551	

EXCLUDING FOUR ADDITIONAL FAMILIES OF DIPTERA:

6,7 Aug	3 Ekmans	1.769		0.254		9.680	
2,3 Nov	3 Ekmans	0.339		0.588		----	
28 Sep	3 Dendys	----		0.722		----	
19 Oct	2 Dendys	1.423		0.470		0.585	
2,3 Nov	3 Dendys	0.559		0.476		0.628	

TABLE 3. Community Similarity Indices on paired stations on Love Creek and TAR Camp Creek, Jefferson County, Arkansas, August-November 1990. This test only considers the presence or absence of taxa. Values range from zero to 1.00; larger values indicating greater similarity. Number of taxa in communities a and b, respectively, are in parentheses.

Date	Coll. Type	LC-1 vs. LC-2	LC-1 vs. LC-3	TCC-1 vs. TCC-2
6,7 Aug	3 Ekmans	0.60 (4,6)	0.67 (4,2)	0.67 (4,2)
2,3 Nov	3 Ekmans	0.67 (5,4)	0.60 (5,5)	-----
28 Sep	3 Dendys	-----	0.50 (11,5)	-----
19 Oct	2 Dendys	0.67 (8,4)	0.36 (8,3)	0.46 (7,6)
2,3 Nov	3 Dendys	0.80 (5,5)	0.50 (5,3)	0.71 (8,9)

TABLE 4. Shannon Diversity Indices on paired stations on Love Creek and TAR Camp Creek, Jefferson County, Arkansas, August-November 1990. Larger values indicate greater community diversity which is generally equated with higher environmentally quality.

Date	Coll. Type	LC-1 vs. LC-2	LC-1 vs. LC-3	TCC-1 vs. TCC-2
6,7 Aug	3 Ekmans	0.56 vs. 1.16	0.56 vs. 0.64	1.04 vs. 0.13
2,3 Nov	3 Ekmans	1.52 vs. 1.27	1.52 vs. 1.56	---- vs. 1.46
28 Sep	3 Dendys	0.78 vs. ----	0.78 vs. 0.78	0.90 vs. ----
19 Oct	2 Dendys	0.43 vs. 0.63	0.43 vs. 0.21	0.44 vs. 1.12
2,3 Nov	3 Dendys	0.63 vs. 1.04	0.63 vs. 0.48	0.65 vs. 1.21

TABLE 5. Competitive Overlap Indices on paired stations on Love Creek and TAR Camp Creek, Jefferson County, Arkansas, August-November 1990. Values range from zero to 1.00; larger values indicate greater similarity considering both the taxa in common and the numbers representing the taxa.

Date	Coll. Type	LC-1 vs. LC-2	LC-1 vs. LC-3	TCC-1 vs. TCC-2
6,7 Aug	3 Ekmans	0.243	0.962	0.608
2,3 Nov	3 Ekmans	0.454	0.392	-----
28 Sep	3 Dendys	-----	0.854	-----
19 Oct	2 Dendys	0.988	0.999	0.983
2,3 Nov	3 Dendys	0.918	0.999	0.946

TABLE 6. Mann-Whitney U Tests on paired stations on Love Creek and TAR Camp Creek, Jefferson County, Arkansas, August-November 1990. This test checks for constancy of dominance position of the several taxa in two different communities. Tests are done on absolute numbers and relative abundances. N.S. means the null hypothesis ("there is no difference") is accepted.

Date	Coll. Type	LC-1 vs. LC-2		LC-1 vs. LC-3		TCC-1 vs. TCC-2	
		abs.#	rel.#	abs.#	rel.#	abs.#	rel.#
6,7 Aug	3 Ekmans	n.s.	n.s.	too few taxa		too few taxa	
2,3 Nov	3 Ekmans	n.s.	n.s.	n.s.	n.s.	too few taxa	
28 Sep	3 Dendys	too few taxa		n.s.	n.s.	too few taxa	
19 Oct	2 Dendys	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
2,3 Nov	3 Dendys	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

TABLE 7. Student's T-test on paired stations on Love Creek and TAR Camp Creek, Jefferson County, Arkansas, August-November 1990. This test checks for significant difference between mean numbers of organisms from two communities. P values of 0.05 or less are significant. Numbers in parentheses are numerical means of significantly different communities. This test can only be done with multiple samples from each community.

Date	Coll. Type	LC-1 vs. LC-2	LC-1 vs. LC-3	TCC-1 vs. TCC-2
28 Sep	3 Dendys	-----	P = 0.190	-----
19 Oct	2 Dendys	P = 0.122	P = 0.070	P = 0.009 (2378,248)
2,3 Nov	3 Dendys	P = 0.260	P = 0.010 (521,2413)	P = 0.050 (1650,539)

TABLE 8. Physicochemical measurements in Love Creek and TAR Camp Creek, Jefferson County, Arkansas, August-November 1990.

Date & Variable	LC-1	LC-2	LC-3	TCC-1	TCC-2
6,7 AUGUST 1990					
Air temperature (C)	27.0	29.5	31.0	23.0	25.5
Water temperature (C)	26.0	32.5	31.0	25.0	23.0
pH	5.90	6.94	6.53	5.50	5.80
Diss. oxygen (mg/l)	1.9	7.4	5.4	2.6	3.0
Turbidity (FTU)	52	55	60	61	270
Phosphate (mg/l)	0.12	0.28	0.13	0.16	0.26
Nitrate-N ₂ (mg/l)	2.0	0.5	0.4	0.5	0.3
Nitrite-N ₂ (mg/l)	0.057	0.061	0.019	0.023	0.20
Tot. alk. ₂ (mg/l)	15	17	30	20	25
Tot. hard. (,g/l)	15	12	28	25	15
Sp. conduc. (umhos)	74	75	90	60	77
Chloride (mg/l)	32	45	88	10	8
Iron (mg/l)	2+	2+	2+	2+	2+
Sulfate (,g/l)	2	5	3	0	2
28 SEPTEMBER 1990					
Air temperature (C)	30.0	32.0	33.0	33.0	32.0
Water temperature (C)	22.0	27.0	26.5	29.0	-----
pH	5.70	6.54	6.74	6.90	-----
Diss. oxygen (mg/l)	4.2	7.6	6.9	6.8	-----
Turbidity (FTU)	650	60	80	59	-----
Phosphate (mg/l)	0.12	0.18	0.26	0.78	-----
Nitrate-N ₂ (mg/l)	3.5	1.0	1.1	0.9	-----
Nitrite-N ₂ (mg/l)	0.000	0.066	0.010	0.040	-----
Tot. alk. ₂ (mg/l)	30	8	20	20	-----
Tot. hard. (mg/l)	25	10	30	18	-----
Sp. conduc. (umhos)	130	74	115	88	-----
Chloride (mg/l)	27.5	29.0	34.0	31.0	-----
Iron (mg/l)	3+	2.5+	2.8+	2.5+	-----
Sulfate (,g/l)	0	18	0	5	-----

TABLE 8. Physicochemical data (continued).

19 OCTOBER 1990					
Air temperature (C)	15.0	17.0	18.5	19.0	16.5
Water temperature (C)	16.5	18.0	20.0	17.0	17.0
pH	5.80	5.90	5.60	5.80	5.57
Diss. oxygen (mg/l)	5.6	8.4	8.4	9.0	3.8
Turbidity (FTU)	82	57	48	46	30
Phosphate (mg/l)	1.02	0.32	0.18	0.32	0.19
Nitrate-N ₂ (mg/l)	0.20	0.15	0.20	0.00	0.40
Nitrite-N ₂ (mg/l)	0.019	0.073	0.034	0.029	0.005
Tot. alk. ² (mg/l)	5	5	5	5	5
Tot. hard. (mg/l)	10	18	15	15	18
Sp. conduc. (umhos)	90	78	78	71	73
Chloride (mg/l)	35.5	28.0	25.0	26.0	28.0
Iron (mg/l)	0.93	1.54	1.02	0.70	0.48
Sulfate (mg/l)	24	24	18	22	22
2,3 NOVEMBER 1990					
Air temperature (C)	22.0	27.0	28.0	24.0	24.0
Water temperature (C)	15.0	20.0	25.0	17.0	17.5
pH	5.70	6.10	5.92	5.98	6.00
Diss. oxygen (mg/l)	4.4	8.6	7.4	6.8	3.4
Turbidity (FTU)	25	45	76	25	30
Phosphate (mg/l)	0.00	0.14	0.35	1.77	0.21
Nitrate-N ₂ (mg/l)	0.0	0.20	0.20	0.40	0.10
Nitrite-N ₂ (mg/l)	0.020	0.072	0.025	0.066	0.013
Tot. alk. ² (mg/l)	10	10	10	5	10
Tot. hard. (mg/l)	25	20	20	25	20
Sp. conduc. (umhos)	135	95	85	115	80
Chloride (mg/l)	11.0	8.5	10.0	15.0	12.0
Iron (mg/l)	0.48	1.60	2.30	0.84	0.72
Sulfate (mg/l)	37	24	22	34	20

macrobenthic colonization. This station partially dried up between 6 August and 28 September leaving the Dendy samplers out of the water.

Station LC-3 contained numerous large tree trunks and stumps partially buried in the sediment which contained some woody debris. The streambanks were very steep and muddy, and the streamside consisted of a mixture of trees and grasses.

Station TCC-1 had steep, slick muddy banks with dense shrubs and a few grasses nearby. There was also abundant pieces of decaying plants, the pieces being larger than twigs and leaves but not as large as whole trunks and stumps.

Station TCC-2 also had steep muddy banks and was completely surrounded by forest. The area where the Dendy samplers were set had extremely soft sediment with large amounts of leaves, twigs and other small plant components in some stage of decomposition. Walking in it liberated numerous gaseous compounds (decomposition products-?) which provided major assaults on the olfactory organs. It dried completely between 7 August and 28 September.

If QSI is greater than 65 there's no impairment, if QSI is 56-65 there is minimal impairment, if QSI is 45-55 there is substantial impairment, and if QSI is less than 45 there is excessive impairment (Shackleford 1988). For scoring of IAI values, Shackleford (1988) cites no impairment if IAI is greater than 0.80; minimal impairment if IAI is 0.65-0.80 or when IAI is greater than 1.0 and CAb (chironomids + annelids in community b) is 65-80 percent of CAa (chironomids + annelids in community a); substantial impairment if IAI is 0.50-0.64 or when IAI is greater than 1.0 and CAb is 50-64 percent of CAa; and excessive

impairment with IAI is less than 0.50 or when IAI is greater than 1.0 and CAB is less than 50 percent of CAa.

A cursory examination of the various approaches to the macrobenthic data reveals no consistent trends. Some upstream-downstream comparisons show a declining trend, whereas approximately the same number show an upward trend. I believe the normal irregularities of macrobenthic data and the obvious microhabitat differences are sufficient to explain the results obtained. Neither do I see a significant difference of any physicochemical variable (upstream to downstream comparison) that may not be explained by natural microhabitat differences.

REFERENCES

- Shackleford, Bruce. 1988. Rapid bioassessments of lotic macro-invertebrate communities: Biocriteria development. Arkansas Department of Pollution Control & Ecology, Little Rock, 45pp.
- Standard Methods for the examination of water and wastewater, 16th ed. 1985. Edited by A. E. Greenberg, R. R. Trussell and L. S. Clesceri. Amer. Publ. Health Assoc., Washington, D.C., 1268pp.

APPENDIX A

NUMBERS OF ORGANISMS PER SQUARE METER COLLECTED FROM LOVE CREEK AND TAR CAMP CREEK, JEFFERSON COUNTY, ARKANSAS
AUGUST-NOVEMBER 1990

	Love Creek - 1			Love Creek - 2			Love Creek - 3			TAR Camp Cr.- 1			TAR Camp Cr.- 2		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
DENDY artificial substrates (3 recovered)															
28 SEPTEMBER 1990															
Turbellaria		11													
Oligochaeta	2023	1140	430				377	861	592	3034	850	2431			
Rotatoria colony										11		11			
Gastropoda											11				
Copepoda								22							
Hydracarina	11	97	151												
Ephemeroptera: Baetidae	32									54	140	43			
Odonata: Libellulidae		22								22	22				
Coleoptera adults			11									22			
Diptera: Chaoboridae	11	11	32				344	194	592						
Diptera: Chironomidae	194	43	108					22	11	4024	4852	3249			
Diptera: Heleidae		11	32				11			151	140	398			
Diptera: Psychodidae												11			
Megaloptera: Sialidae										22	43	43			
Osteichthyes: Cyprinodontidae			11												
Osteichthyes: Centrarchidae	43														
DENDY artificial substrates (2 recovered)															
19 OCTOBER 1990															
Turbellaria										11					
Oligochaeta	549	904		463	226		5863	2711		2270	1915		183	140	
Bivalvia: Sphaeriidae										11					
Gastropoda							11			32	11				
Amphipoda										11					
Hydracarina	11														
Ephemeroptera: Baetidae	11				11										
Odonata: Libellulidae	11														
Coleoptera larvae														22	
Diptera: Chaoboridae	11							11						32	
Diptera: Chironomidae		32		65	54		172	247		355	129		32	43	
Diptera: Heleidae		11			32						11			22	
Diptera: Psychodidae		43												22	
DENDY artificial substrates (3 recovered)															
3 NOVEMBER 1990															
Turbellaria													22	22	11
Oligochaeta	667	301	301	398	204	452	2851	1614	1463	2033	1151	850	538	312	247
Gastropoda												11			
Amphipoda										32	11	22	11	32	22
Copepoda										22		32		32	
Isopoda															
Hydracarina	11										11			22	11
Ephemeroptera: Baetidae							11				11				
Diptera: Chaoboridae															11
Diptera: Chironomidae	22	86	108	323	97	194	516	430	355	495	151	43	11	97	22
Diptera: Heleidae			11	151	54	54				32	43				
Diptera: Psychodidae	11	22	22	11	11								118	11	22
Megaloptera: Sialidae				11		11									43
EKMAN grab samples (3 each station, combined)															
6,7 AUGUST 1990															
Oligochaeta	29									43					
Amphipoda				86											
Hydracarina				14											
Ephemeroptera: Baetidae	43			14											
Diptera: Chaoboridae	2899			14			861			230			947		
Diptera: Chironomidae	588			215			445			316			29		
Diptera: Heleidae				14						29					
EKMAN grab samples (3 each station, combined)															
2,3 NOVEMBER 1990															
Oligochaeta	29			43			14						14		
Decapoda	43														
Hydracarina							14						14		
Odonata: Gomphidae															
Coleoptera adults													14		
Diptera: Chaoboridae	14			29			29						86		
Diptera: Chironomidae	43			14			14						29		
Diptera: Culicidae	57												14		
Diptera: Heleidae				14			14								

APPENDIX B

HABITAT EVALUATION SHEET*

Source of suspected pollutant Surface runoff

LC.1

Receiving Stream Love Creek, Jefferson Co. Ark Habitat Sampled pool

Potential pollutants _____

Date 6 Aug 1990 Collector JDR Recorder JDR

Ecoregion Gulf Coastal Plain Watershed Size _____

Gradient _____ air T° = 27°C

Land Uses (%):

Urban 0 Agriculture 0
Silviculture 80 Other Industrial 20

Hydrology: (AB) BL

Width 4m

Length 20m

Depth .35

Velocity NM

(Discharge)

pool vol 28 m³

Substrate Composition (%)

Inorganic (AB) BL

Bedrock 0

Large Boulders 0

Small Boulders 0

Cobble 0

Gravel 2

(mud) Sand 2

% Embeddedness 96

Organic (AB) BL

Emergent Vegetation 5

Submerged Vegetation 5

Brush/Logs/Roots 15

Leaf Litter 65

Fine Detritus 5

Periphyton 0

Algal mats 5

RIPARIAN AREA:

Vegetation (%): (AB) BL

Trees 75

Shrubs 10

Grasses/Forbs 10

Rock Outcropping 0

Bare Ground 5

Bank Stability (AB) BL

Stable ✓

Moderate

Unstable

Predominant Forest Type:

Coniferous Upland

Deciduous ✓ Lowland ✓

Mixed

WATER QUALITY:

Temp: 26 C.

pH: 5.9

D.O.: 1.9

Turb: 52 brown

PO₄: 0.12

NO₃: 2.0

NO₂: .057

T. alk: 15

T. Har: 15

Conduc: 74

Cl: 32

Fe: 2+ off scale

SO₄: 2

Coll. sample for sed. analy.

Macroinvertebrate sample: 3 Ekmians

8 Dendy samplers set out

Observed Gammarus and

Fundulus

*Adapted from Shackleford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant

Surface runoff

LC-2

Receiving Stream

Love Creek, Jefferson Co, Ark.

Habitat Sampled

pool

Potential pollutants

(1300 hrs) Date 6 Aug 90 Collector JDR Recorder JDR

Ecoregion GCP

Watershed Size

Gradient

air T: 29.5 C

Land Uses (%):

Urban

Agriculture

Silviculture 70

Other

trans. line
ind. 30 (pipeline X)

Hydrology:

AB

BL

Width

3.4m

Length

50m

Depth

0.403

Velocity

NH

(Discharge)

pool vol,

68.5m³

Substrate Composition (%)

Inorganic

AB

BL

Organic

AB

BL

Bedrock

0

Large Boulders

0

Small Boulders

0

Cobble

0

Gravel

1

(med) Sand

14

% Embeddedness

85

Emergent Vegetation

5

Submerged Vegetation

5

Brush/Logs/Roots

10

Leaf Litter

28

Fine Detritus

50

Periphyton

—

Algal mats

2

RIPARIAN AREA:

Vegetation (%):

AB

BL

Trees

30

20

Shrubs

—

10

Grasses/Forbs

—

60

Rock Outcropping

—

0

Bare Ground

—

10

Bank Stability

AB

BL

Stable

✓

Moderate

—

Unstable

—

Predominant Forest Type:

Coniferous

Upland

Deciduous

✓

Lowland

✓

Mixed

—

WATER QUALITY:

Temp: 32.5 C.

pH: 6.94

D.O.: 7.4

Turb: 55

PO₄: 0.28

NO₃: 0.5

NO₂: 0.061

T. alk: 17

T. Har: 12

Conduc: 75

Cl: 45

Fe: 2⁺ (off scale)

SO₄: 5

Observed Fundulus and
Gambusia

3 Ekman

5ed. sample

And samples for CO⁻ + Na⁺

8 Dendys set out

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant Surface Runoff

Receiving Stream Love Creek, Jefferson Co., Ark Habitat Sampled pool

Potential pollutants _____

Date 6 Aug 90 Collector JDR Recorder JDR

Ecoregion GCP Watershed Size _____

Gradient _____ Air T°: 31°C

Land Uses (%):

Urban 0 Agriculture 0
Silviculture 80 Other industrial 20

Hydrology: AB (BL)

Width _____ 5.2m

*Length _____

Depth _____ .452

Velocity _____ NM

Discharge _____

*long, continuous channel

Substrate Composition (%)

Inorganic AB (BL) Organic AB (BL)

Bedrock	_____	<u>0</u>	Emergent Vegetation	_____	<u>2</u>
Large Boulders	_____	<u>0</u>	Submerged Vegetation	_____	<u>2</u>
Small Boulders	_____	<u>0</u>	Brush/Logs/Roots	_____	<u>50</u>
Cobble	_____	<u>0</u>	Leaf Litter	_____	<u>16</u>
Gravel	_____	<u>1</u>	Fine Detritus	_____	<u>30</u>
(Mud) Sand	_____	<u>5</u>	Periphyton	_____	<u>—</u>
% Embeddedness	_____	<u>94</u>	Algal mats	_____	<u>0</u>

RIPARIAN AREA:

Vegetation (%)	AB	<u>(BL)</u>	Bank Stability	AB	<u>(BL)</u>
Trees	_____	<u>50</u>	Stable	_____	<u>✓</u>
Shrubs	_____	<u>20</u>	Moderate	_____	_____
Grasses/Forbs	_____	<u>30</u>	Unstable	_____	_____
Rock Outcropping	_____	<u>0</u>			
Bare Ground	_____	<u>0</u>			

Predominant Forest Type:

Coniferous	_____	Upland	_____
Deciduous	<u>✓</u>	Lowland	<u>✓</u>
Mixed	_____		

WATER QUALITY:

Temp: <u>31</u> C.	T. alk: <u>30</u>	<u>3 Ekman</u> <u>8 Dendys set out</u> <u>Sediment Sample</u> <u>H₂O samples for Cl⁻ & Na⁺</u> <u>Observed Faunal</u>
pH: <u>6.53</u>	T. Har: <u>28</u>	
D.O.: <u>5.4</u>	Conduc: <u>90</u>	
Turb: <u>60</u>	Cl: <u>88</u>	
PO ₄ : <u>0.13</u>	Fe: <u>2+ (off scale)</u>	
NO ₃ : <u>0.4</u>	SO ₄ : <u>3</u>	
NO ₂ : <u>.019</u>		

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant Surface runoff
 Receiving Stream Tar Camp Creek, Jefferson Co. Habitat Sampled lowland channel
 Potential pollutants _____

(0900 hrs) Date 7 Aug 90 Collector JDR Recorder JDR

Ecoregion GCP Watershed Size _____

Gradient _____ Air T° 23 °C

Land Uses (%):

Urban _____ Agriculture _____
 Silviculture 80 Other industrial 20

Hydrology: (AB) BL
 Width 5.8 m
 X Length _____
 Depth 0.52 m
 Velocity NM
 Discharge _____

→ long lowland channel

Substrate Composition (%)

Inorganic (AB) BL
 Bedrock 0
 Large Boulders 0
 Small Boulders 0
 Cobble 8
 Gravel 2
 (Mud) Sand 5
 % Embeddedness 85

Organic (AB) BL
 Emergent Vegetation 2
 Submerged Vegetation 2
 Brush/Logs/Roots 40
 Leaf Litter 25
 Fine Detritus 29
 Periphyton -
 Algal mats 2

RIPARIAN AREA:

Vegetation (%): AB BL
 Trees 70
 Shrubs 25
 Grasses/Forbs 4
 Rock Outcropping 0
 Bare Ground 1

Bank Stability AB BL
 Stable ✓
 Moderate _____
 Unstable _____

Predominant Forest Type:

Coniferous _____ Upland _____
 Deciduous ✓ Lowland ✓
 Mixed _____

WATER QUALITY:

Temp: 25 C.
 pH: 5.5
 D.O.: 2.6
 Turb: 61
 PO₄: 0.16
 NO₃: 0.5
 NO₂: .023
 T. alk: 20
 T. Har: 25
 Conduc: 60
 Cl: 10
 Fe: 2+ (off scale)
 SO₄: 0

3 Ekman
 Sediment sample
 H₂O sample for Na⁺
 8 Dendy: set out
 Observed Fundulus

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant Surface runoffTCC 2 Receiving Stream Tar Camp Creek, Jefferson Co. AR Habitat Sampled pool

Potential pollutants _____

(1230 hrs) Date 7 Aug 90 Collector _____ Recorder _____Ecoregion GCP Watershed Size _____Gradient _____ Air T°: 25.5

Land Uses (%):

Urban _____ Agriculture _____
Silviculture 100 Other _____

Hydrology: AB (BL)

Width _____ 3.1m
Length _____ 30m
Depth _____ 0.28m
Velocity _____ NM
(Discharge) _____ 26m³pool vol.
Channel interrupted

Substrate Composition (%)

Inorganic AB (BL)

Bedrock _____ 0
Large Boulders _____ 0
Small Boulders _____ 0
Cobble _____ 0
Gravel _____ 0
(mud) Sand _____ 10
% Embeddedness _____ 90

Organic AB (BL)

Emergent Vegetation _____ 0
Submerged Vegetation _____ 0
Brush/Logs/Roots _____ 10
Leaf Litter _____ 70
Fine Detritus _____ 20
Periphyton _____ -
Algal mats _____ 0

RIPARIAN AREA:

Vegetation (%) AB (BL)

Trees _____ 95
Shrubs _____ 0
Grasses/Forbs _____ 0
Rock Outcropping _____ 0
Bare Ground _____ 5

Bank Stability AB (BL)

Stable _____
Moderate _____ ✓
Unstable _____

Predominant Forest Type:

Coniferous _____ Upland _____
Deciduous _____ Lowland ✓
Mixed ✓

WATER QUALITY:

Temp: 23 C.pH: 5.8D.O.: 3.0Turb: 270PO₄: 0.26NO₃: 0.3NO₂: 0.020T. alk: 25T. Har: 15Conduc: 77Cl: 8Fe: 2⁺ (off scale)SO₄: 23 Ekman's
Sediment sample
H₂O sample for Na⁺
8 Dendys set out

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream LC1

Habitat Sampled still channel

Potential pollutants _____

Date 28 Sep 90 Collector JDR Recorder JDR

Ecoregion GCP Watershed Size _____

Gradient _____ air T°: 30 C.

Land Uses (%):

Urban _____ Agriculture _____
Silviculture _____ Other _____

Hydrology: AB BL
Width 0.75
Length 1.25
Depth 0.08
Velocity 0
(Discharge) 0.075
Pool vol. m³

Substrate Composition (%)

Inorganic AB BL

Organic AB BL

Bedrock _____
Large Boulders _____
Small Boulders _____
Cobble _____
Gravel _____
Sand _____
% Embeddedness _____

Emergent Vegetation _____
Submerged Vegetation _____
Brush/Logs/Roots _____
Leaf Litter _____
Fine Detritus _____
Periphyton _____
Algal mats _____

RIPARIAN AREA:

Vegetation (%): AB BL

Trees _____
Shrubs _____
Grasses/Forbs _____
Rock Outcropping _____
Bare Ground _____

Bank Stability AB BL

Stable _____
Moderate _____
Unstable _____

Predominant Forest Type:

Coniferous _____ Upland _____
Deciduous _____ Lowland _____
Mixed _____

WATER QUALITY:

Temp: 22 C.
pH: 5.70
D.O.: 4.2
Turb: 650
PO₄: 0.12
NO₃: 3.5
NO₂: 0.00

T. alk: 30
T. Har: 25
Conduc: 130
Cl: 27.5
Fe: 3+ 6H scale
SO₄: 0

Pool ~~was~~ was samplers were
set almost dry. Samples
were still in water.

Collected 3 samplers
for analysis.

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate
Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____
 Receiving Stream LC2 Habitat Sampled still channel

Potential pollutants _____

(1120) Date 28 Sep 90 Collector JDR Recorder JDR

Ecoregion GCP Watershed Size _____

Gradient _____ air T: 32 C.

Land Uses (%):

Urban _____ Agriculture _____
 Silviculture _____ Other _____

Hydrology:	AB	BL
Width	<u>2.5</u>	<u>2.5m</u>
Length		<u>35m</u>
Depth		<u>0.2m</u>
Velocity		<u>0</u>
(Discharge)		
Pool vol.		<u>17.5m³</u>

Substrate Composition (%)

Inorganic	AB	BL	Organic	AB	BL
Bedrock			Emergent Vegetation		
Large Boulders			Submerged Vegetation		
Small Boulders			Brush/Logs/Roots		
Cobble			Leaf Litter		
Gravel			Fine Detritus		
Sand			Periphyton		
% Embeddedness			Algal mats		

RIPARIAN AREA:

Vegetation (%)	AB	BL	Bank Stability	AB	BL
Trees			Stable		
Shrubs			Moderate		
Grasses/Forbs			Unstable		
Rock Outcropping					
Bare Ground					

Predominant Forest Type:

Coniferous _____ Upland _____
 Deciduous _____ Lowland _____
 Mixed _____

WATER QUALITY:

Temp: <u>27</u> C.	T. alk: <u>8</u>
pH: <u>6.54</u>	T. Har: <u>10</u>
D.O.: <u>7.6</u>	Conduc: <u>74</u>
Turb: <u>60</u>	Cl: <u>29</u>
PO ₄ : <u>0.18</u>	Fe: <u>2.5</u>
NO ₃ : <u>1.0</u>	SO ₄ : <u>18</u>
NO ₂ : <u>0.066</u>	

Pool where samplers were set mostly dry. (Samplers were dry). Moved to another part that still had water.

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream LC3 Habitat Sampled _____

Potential pollutants _____

(1205) Date 28 Sep 90 Collector JDR Recorder JDR

Ecoregion GCP Watershed Size _____

Gradient _____ air T°: 33 C.

Land Uses (%):
Urban _____ Agriculture _____
Silviculture _____ Other _____

Hydrology: AB BL
Width _____ 4.1
Length _____
Depth _____ 0.26
Velocity _____ 0
(Discharge) _____
① Long cont. channel

Substrate Composition (%)					
Inorganic	AB	BL	Organic	AB	BL
Bedrock	_____	_____	Emergent Vegetation	_____	_____
Large Boulders	_____	_____	Submerged Vegetation	_____	_____
Small Boulders	_____	_____	Brush/Logs/Roots	_____	_____
Cobble	_____	_____	Leaf Litter	_____	_____
Gravel	_____	_____	Fine Detritus	_____	_____
Sand	_____	_____	Periphyton	_____	_____
% Embeddedness	_____	_____	Algal mats	_____	_____

RIPARIAN AREA:					
Vegetation (%)	AB	BL	Bank Stability	AB	BL
Trees	_____	_____	Stable	_____	_____
Shrubs	_____	_____	Moderate	_____	_____
Grasses/Forbs	_____	_____	Unstable	_____	_____
Rock Outcropping	_____	_____	Predominant Forest Type:		
Bare Ground	_____	_____	Coniferous	_____	Upland
			Deciduous	_____	Lowland
			Mixed	_____	

WATER QUALITY:

Temp: <u>26.5 C.</u>	T. alk: <u>20</u>	Water level @ 16 inches Lower than last time. Collected 3 Dendy samplers for analysis
pH: <u>6.74</u>	T. Har: <u>30</u>	
D.O.: <u>6.9</u>	Conduc: <u>115</u>	
Turb: <u>80</u>	Cl: <u>34</u>	
PO ₄ : <u>0.26</u>	Fe: <u>2.8+ (off scale)</u>	
NO ₃ : <u>1.1</u>	SO ₄ : <u>0.0</u>	
NO ₂ : <u>0.01</u>		

*Adapted from Shackleford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream TCC1 Habitat Sampled _____

Potential pollutants _____

Date 28 Sep 90 Collector JDR Recorder JDR

Ecoregion GCP Watershed Size _____

Gradient _____ Air T°: 33 C

Land Uses (%):

Urban _____ Agriculture _____

Silviculture _____ Other _____

Hydrology: AB BL

Width 2.0

⊗ Length _____

Depth 0.22

Velocity 0

(Discharge) _____

⊗ long continuous channel

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock _____ Emergent Vegetation _____

Large Boulders _____ Submerged Vegetation _____

Small Boulders _____ Brush/Logs/Roots _____

Cobble _____ Leaf Litter _____

Gravel _____ Fine Detritus _____

Sand _____ Periphyton _____

% Embeddedness _____ Algal mats _____

RIPARIAN AREA:

Vegetation (%): AB BL Bank Stability AB BL

Trees _____ Stable _____

Shrubs _____ Moderate _____

Grasses/Forbs _____ Unstable _____

Rock Outcropping _____

Bare Ground _____

Predominant Forest Type:

Coniferous _____ Upland _____

Deciduous _____ Lowland _____

Mixed _____

WATER QUALITY:

Temp: 29 C. T. alk: 20

pH: 6.9 T. Har: 18

D.O.: 6.8 Conduc: 88

Turb: 59 Cl: 31

PO₄: 0.78 Fe: 2.5 (off scale)

NO₃: 0.9 SO₄: 5

NO₂: 0.04

Water level @ 16"
lower than last time.
Dendy samplers partially
out of water. Moved
rest of them to deeper
water.
Collected 3 Dendy
Samplers for analysis

*Adapted from Shackleford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream TCC2 Habitat Sampled _____

Potential pollutants _____

(1505) Date 28 Sep 90 Collector JDR Recorder JDR

Ecoregion GCP Watershed Size _____

Gradient _____ Air T°: 32 C.

Land Uses (%):

Urban _____	Agriculture _____
Silviculture _____	Other _____

Hydrology: AB BL

Width _____

Length dry

Depth dry

Velocity _____

Discharge _____

Substrate Composition (%)

Inorganic	AB	BL	Organic	AB	BL
Bedrock	_____	_____	Emergent Vegetation	_____	_____
Large Boulders	_____	_____	Submerged Vegetation	_____	_____
Small Boulders	_____	_____	Brush/Logs/Roots	_____	_____
Cobble	_____	_____	Leaf Litter	_____	_____
Gravel	_____	_____	Fine Detritus	_____	_____
Sand	_____	_____	Periphyton	_____	_____
% Embeddedness	_____	_____	Algal mats	_____	_____

RIPARIAN AREA:

Vegetation (%)	AB	BL	Bank Stability	AB	BL
Trees	_____	_____	Stable	_____	_____
Shrubs	_____	_____	Moderate	_____	_____
Grasses/Forbs	_____	_____	Unstable	_____	_____
Rock Outcropping	_____	_____			
Bare Ground	_____	_____			

Predominant Forest Type:

Coniferous	_____	Upland	_____
Deciduous	_____	Lowland	_____
Mixed	_____		

WATER QUALITY:

Temp: _____ C.	T. alk: _____
pH: _____	T. Har: _____
D.O.: _____	Conduc: _____
Turb: _____	Cl: _____
PO ₄ : _____	Fe: _____
NO ₃ : _____	SO ₄ : _____
NO ₂ : _____	

Stream completely dry—
No other water/pools
accessible. Left Dendy
Samplers in place,
No water samples.

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream LCI Habitat Sampled _____

Potential pollutants _____

Date 19 Oct 90 Collector JDR Recorder JDR

Ecoregion _____ Watershed Size _____

Gradient _____

Land Uses (%):

Urban _____ Agriculture _____

Silviculture _____ Other _____

Hydrology: AB BL

Width _____

Length _____

Depth _____

Velocity _____

Discharge _____

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock _____ Emergent Vegetation _____

Large Boulders _____ Submerged Vegetation _____

Small Boulders _____ Brush/Logs/Roots _____

Cobble _____ Leaf Litter _____

Gravel _____ Fine Detritus _____

Sand _____ Periphyton _____

% Embeddedness _____ Algal mats _____

RIPARIAN AREA:

Vegetation (%): AB BL Bank Stability AB BL

Trees _____ Stable _____

Shrubs _____ Moderate _____

Grasses/Forbs _____ Unstable _____

Rock Outcropping _____

Bare Ground _____

Predominant Forest Type:

Coniferous _____ Upland _____

Deciduous _____ Lowland _____

Mixed _____

WATER QUALITY:

Temp: 16.5C. T. alk: 5

pH: 5.8 T. Har: 10

D.O.: 5.6 Conduc: 90

Turb: 82 Cl: 35.5

PO₄: 1.02 Fe: 0.93

NO₃: 0.2 SO₄: 24

NO₂: 0.019

Collected 2 dendys.
Water level about 5 cm
above that of first visit.

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream LC2 Habitat Sampled _____

Potential pollutants _____

Date 19 Oct 90 Collector JDR Recorder JDR

Ecoregion _____ Watershed Size _____

Gradient _____

Land Uses (%):

Urban _____ Agriculture _____
Silviculture _____ Other _____

Hydrology: AB BL

Width _____

Length _____

Depth _____

Velocity _____

Discharge _____

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock _____ Emergent Vegetation _____

Large Boulders _____ Submerged Vegetation _____

Small Boulders _____ Brush/Logs/Roots _____

Cobble _____ Leaf Litter _____

Gravel _____ Fine Detritus _____

Sand _____ Periphyton _____

% Embeddedness _____ Algal mats _____

RIPARIAN AREA:

Vegetation (%) AB BL Bank Stability AB BL

Trees _____ Stable _____

Shrubs _____ Moderate _____

Grasses/Forbs _____ Unstable _____

Rock Outcropping _____

Bare Ground _____

Predominant Forest Type:

Coniferous _____ Upland _____

Deciduous _____ Lowland _____

Mixed _____

WATER QUALITY:

Temp: 18 C. T. alk: 5

pH: 5.9 T. Har: 18

D.O.: 8.4 Conduc: 78

Turb: 57 Cl: 28

PO₄: 0.32 Fe: 1.35

NO₃: 0.15 SO₄: 24

NO₂: 0.073

Air T: 17C

Current survey samplers up against bank; little substrate there to encourage colonization. The weight for this group of samplers was stolen. Coll. 2 dendys.

*Adapted from Shackleford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream LC 3 Habitat Sampled _____

Potential pollutants _____

Date 19 Oct 90 Collector JDR Recorder JDR

Ecoregion _____ Watershed Size _____

Gradient _____

Land Uses (%):

Urban _____ Agriculture _____
Silviculture _____ Other _____

Hydrology: AB BL
Width _____
Length _____
Depth _____
Velocity _____
Discharge _____

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock	_____	_____	Emergent Vegetation	_____	_____
Large Boulders	_____	_____	Submerged Vegetation	_____	_____
Small Boulders	_____	_____	Brush/Logs/Roots	_____	_____
Cobble	_____	_____	Leaf Litter	_____	_____
Gravel	_____	_____	Fine Detritus	_____	_____
Sand	_____	_____	Periphyton	_____	_____
% Embeddedness	_____	_____	Algal mats	_____	_____

RIPARIAN AREA:

Vegetation (%)	AB	BL	Bank Stability	AB	BL
Trees	_____	_____	Stable	_____	_____
Shrubs	_____	_____	Moderate	_____	_____
Grasses/Forbs	_____	_____	Unstable	_____	_____
Rock Outcropping	_____	_____			
Bare Ground	_____	_____			

Predominant Forest Type:
Coniferous _____ Upland _____
Deciduous _____ Lowland _____
Mixed _____

WATER QUALITY:

Temp: <u>20</u> C.	T. alk: <u>5</u>
pH: <u>5.6</u>	T. Har: <u>15</u>
D.O.: <u>8.4</u>	Conduc: <u>78</u>
Turb: <u>48</u>	Cl: <u>25</u>
PO ₄ : <u>0.18</u>	Fe: <u>1.54</u>
NO ₃ : <u>0.20</u>	SO ₄ : <u>18</u>
NO ₂ : <u>0.034</u>	

Flood flow pulled samplers
downstream + against bank.
Weight lost. Coll. 2 dendys.

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream TCC1 Habitat Sampled _____

Potential pollutants _____

Date 19 Oct 90 Collector JDR Recorder JDR

Ecoregion _____ Watershed Size _____

Gradient _____

Land Uses (%):

Urban _____ Agriculture _____
Silviculture _____ Other _____

Hydrology: AB BL
Width _____
Length _____
Depth _____
Velocity _____
Discharge _____

Substrate Composition (%)

Inorganic	AB	BL	Organic	AB	BL
Bedrock	_____	_____	Emergent Vegetation	_____	_____
Large Boulders	_____	_____	Submerged Vegetation	_____	_____
Small Boulders	_____	_____	Brush/Logs/Roots	_____	_____
Cobble	_____	_____	Leaf Litter	_____	_____
Gravel	_____	_____	Fine Detritus	_____	_____
Sand	_____	_____	Periphyton	_____	_____
% Embeddedness	_____	_____	Algal mats	_____	_____

RIPARIAN AREA:

Vegetation (%)	AB	BL	Bank Stability	AB	BL
Trees	_____	_____	Stable	_____	_____
Shrubs	_____	_____	Moderate	_____	_____
Grasses/Forbs	_____	_____	Unstable	_____	_____
Rock Outcropping	_____	_____			
Bare Ground	_____	_____			

Predominant Forest Type:

Coniferous _____ Upland _____
Deciduous _____ Lowland _____
Mixed _____

WATER QUALITY:

Temp: 17 C.
pH: 5.8
D.O.: 9.0
Turb: 46
PO₄: 0.32
NO₃: 0
NO₂: 0.029

T. alk: 5
T. Har: 15
Conduc: 71
Cl: 26
Fe: 1.02
SO₄: 22

Picked up 2 Dandy samplers.
*Pool had @ 15 cm. deeper H₂O
than during first sampling
time

*Adapted from Shackleford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream TCC 2 Habitat Sampled _____

Potential pollutants _____

Date 19 Oct 90 Collector JD Recorder JD

Ecoregion _____ Watershed Size _____

Gradient _____

Land Uses (%):

Urban _____ Agriculture _____
Silviculture _____ Other _____

Hydrology: AB BL

Width _____

Length _____

Depth _____

Velocity _____

Discharge _____

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock _____ Emergent Vegetation _____

Large Boulders _____ Submerged Vegetation _____

Small Boulders _____ Brush/Logs/Roots _____

Cobble _____ Leaf Litter _____

Gravel _____ Fine Detritus _____

Sand _____ Periphyton _____

% Embeddedness _____ Algal mats _____

RIPARIAN AREA:

Vegetation (%) AB BL Bank Stability AB BL

Trees _____ Stable _____

Shrubs _____ Moderate _____

Grasses/Forbs _____ Unstable _____

Rock Outcropping _____

Bare Ground _____

Predominant Forest Type:

Coniferous _____ Upland _____

Deciduous _____ Lowland _____

Mixed _____

WATER QUALITY:

Temp: 17 C. T. alk: 5

pH: 5.57 T. Har: 18

D.O.: 3.8 Conduc: 73

Turb: 30 Cl: 28

PO₄: 0.19 Fe: 0.70

NO₃: 0.40 SO₄: 22

NO₂: 0.005

Air T: 16.5

Picked up 2 Dendy Samplers
"Pool" had @ 15 cm deeper water
than initial sampling date.

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream LCI Habitat Sampled _____

Potential pollutants _____

Date 3 Nov 90 Collector JDR Recorder JDR Hydrology: AB BL

Ecoregion _____ Watershed Size _____

Gradient _____

Land Uses (%):

Urban _____ Agriculture _____
Silviculture _____ Other _____

Width _____
Length _____
Depth _____
Velocity _____
Discharge _____

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock	_____	_____	Emergent Vegetation	_____	_____
Large Boulders	_____	_____	Submerged Vegetation	_____	_____
Small Boulders	_____	_____	Brush/Logs/Roots	_____	_____
Cobble	_____	_____	Leaf Litter	_____	_____
Gravel	_____	_____	Fine Detritus	_____	_____
Sand	_____	_____	Periphyton	_____	_____
% Embeddedness	_____	_____	Algal mats	_____	_____

RIPARIAN AREA:

Vegetation (%): AB BL Bank Stability AB BL

Trees	_____	_____	Stable	_____	_____
Shrubs	_____	_____	Moderate	_____	_____
Grasses/Forbs	_____	_____	Unstable	_____	_____
Rock Outcropping	_____	_____			
Bare Ground	_____	_____			

Predominant Forest Type:

Coniferous _____ Upland _____
Deciduous _____ Lowland _____
Mixed _____

WATER QUALITY:

Temp: <u>15</u> C.	T. alk: <u>10</u>
pH: <u>5.70</u>	T. Har: <u>25</u>
D.O.: <u>4.4</u>	Conduc: <u>135</u>
Turb: <u>25</u>	Cl: <u>11</u>
PO ₄ : <u>0.0</u>	Fe: <u>0.48</u>
NO ₃ : <u>0.0</u>	SO ₄ : <u>37</u>
NO ₂ : <u>0.020</u>	

Bulldozing and clearing in area —
on road + on bank @ 20 ft away
from our sampling spot. No doubt
the soil disturbance has affected
the characteristics of the water and
probably the benthic community.
3 dumdys recovered; 3 Ekm an
samples; substrate sample
Water level same as first trip (6 Aug 90)

*Adapted from Shackelford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream LC2 Habitat Sampled _____

Potential pollutants _____

Date 3 Nov 90 Collector SDR Recorder SDR Hydrology: AB BL

Ecoregion _____ Watershed Size _____ Width _____

Gradient _____ Length _____

Land Uses (%): Depth _____

Urban _____ Agriculture _____ Velocity _____

Silviculture _____ Other _____ Discharge _____

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock _____ Emergent Vegetation _____

Large Boulders _____ Submerged Vegetation _____

Small Boulders _____ Brush/Logs/Roots _____

Cobble _____ Leaf Litter _____

Gravel _____ Fine Detritus _____

Sand _____ Periphyton _____

% Embeddedness _____ Algal mats _____

RIPARIAN AREA:

Vegetation (%): AB BL Bank Stability AB BL

Trees _____ Stable _____

Shrubs _____ Moderate _____

Grasses/Forbs _____ Unstable _____

Rock Outcropping _____

Bare Ground _____

Predominant Forest Type:

Coniferous _____ Upland _____

Deciduous _____ Lowland _____

Mixed _____

WATER QUALITY:

Temp: 20 C. T. alk: 10

pH: 6.1 T. Har: 20

D.O.: 8.6 Conduc: 95

Turb: 45 Cl: 8.5

PO₄: 0.14 Fe: 1.6

NO₃: 0.20 SO₄: 24

NO₂: 0.072

Recovered 3 dandy samples;
3 Ekman; substrate sample
Beavers making a deeper pool here.
Observed Fundulus.

*Adapted from Shackleford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream LC3 Habitat Sampled _____

Potential pollutants _____

Date 3 Nov 90 Collector JDR Recorder JDR Hydrology: AB BL

Ecoregion _____ Watershed Size _____ Width _____

Gradient _____ Length _____

Land Uses (%): Discharge _____

Urban _____ Agriculture _____
Silviculture _____ Other _____

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock	_____	_____	Emergent Vegetation	_____	_____
Large Boulders	_____	_____	Submerged Vegetation	_____	_____
Small Boulders	_____	_____	Brush/Logs/Roots	_____	_____
Cobble	_____	_____	Leaf Litter	_____	_____
Gravel	_____	_____	Fine Detritus	_____	_____
Sand	_____	_____	Periphyton	_____	_____
% Embeddedness	_____	_____	Algal mats	_____	_____

RIPARIAN AREA:

Vegetation (%) AB BL Bank Stability AB BL

Trees	_____	_____	Stable	_____	_____
Shrubs	_____	_____	Moderate	_____	_____
Grasses/Forbs	_____	_____	Unstable	_____	_____
Rock Outcropping	_____	_____			
Bare Ground	_____	_____			

Predominant Forest Type:

Coniferous _____ Upland _____
Deciduous _____ Lowland _____
Mixed _____

WATER QUALITY:

Temp: 25 C.
pH: 5.92
D.O.: 7.4
Turb: 76
PO₄: 0.35
NO₃: 0.20
NO₂: 0.025

T. alk: 10
T. Har: 20
Conduc: 85
Cl: 10
Fe: 2.3
SO₄: 22

3 dandy samplers recovered;
3 Ekman's; substrate sample
Water @ 6 cm higher than
on first trip (6 Aug 90)

*Adapted from Shackleford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream TCC1 Habitat Sampled _____

Potential pollutants _____

Date 2 Nov 90 Collector JDR Recorder JDR Hydrology: AB BL

Ecoregion _____ Watershed Size _____

Gradient _____

Land Uses (%):

Urban _____ Agriculture _____
Silviculture _____ Other _____

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock	_____	_____	Emergent Vegetation	_____	_____
Large Boulders	_____	_____	Submerged Vegetation	_____	_____
Small Boulders	_____	_____	Brush/Logs/Roots	_____	_____
Cobble	_____	_____	Leaf Litter	_____	_____
Gravel	_____	_____	Fine Detritus	_____	_____
Sand	_____	_____	Periphyton	_____	_____
% Embeddedness	_____	_____	Algal mats	_____	_____

RIPARIAN AREA:

Vegetation (%):	AB	BL	Bank Stability	AB	BL
Trees	_____	_____	Stable	_____	_____
Shrubs	_____	_____	Moderate	_____	_____
Grasses/Forbs	_____	_____	Unstable	_____	_____
Rock Outcropping	_____	_____			
Bare Ground	_____	_____			

Predominant Forest Type:

Coniferous _____ Upland _____
Deciduous _____ Lowland _____
Mixed _____

WATER QUALITY:

Temp: 17 C.
pH: 5.98
D.O.: 6.8
Turb: 25
PO₄: 1.77
NO₃: 0.4
NO₂: 0.066

T. alk: 5
T. Har: 25
Conduc: 115
Cl: 15
Fe: 0.84
SO₄: 34

*Pulled up remaining 3 dendys.
Took sediment sample and
3 Ekman (sand)
Water level same as on first
trip (7 Aug 90)*

*Adapted from Shackleford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

HABITAT EVALUATION SHEET*

Source of suspected pollutant _____

Receiving Stream TCC2 Habitat Sampled _____

Potential pollutants _____

Date 2 Nov 90 Collector JDR Recorder JDR Hydrology: AB BL

Ecoregion _____ Watershed Size _____

Gradient _____

Land Uses (%):

Urban _____ Agriculture _____
Silviculture _____ Other _____

Width _____
Length _____
Depth _____
Velocity _____
Discharge _____

Substrate Composition (%)

Inorganic AB BL Organic AB BL

Bedrock	_____	_____	Emergent Vegetation	_____	_____
Large Boulders	_____	_____	Submerged Vegetation	_____	_____
Small Boulders	_____	_____	Brush/Logs/Roots	_____	_____
Cobble	_____	_____	Leaf Litter	_____	_____
Gravel	_____	_____	Fine Detritus	_____	_____
Sand	_____	_____	Periphyton	_____	_____
% Embeddedness	_____	_____	Algal mats	_____	_____

RIPARIAN AREA:

Vegetation (%): AB BL Bank Stability AB BL

Trees	_____	_____	Stable	_____	_____
Shrubs	_____	_____	Moderate	_____	_____
Grasses/Forbs	_____	_____	Unstable	_____	_____
Rock Outcropping	_____	_____			
Bare Ground	_____	_____			

Predominant Forest Type:

Coniferous _____ Upland _____
Deciduous _____ Lowland _____
Mixed _____

WATER QUALITY:

Temp: 17.5 C.
pH: 6.0
D.O.: 3.4
Turb: 30
PO₄: 0.21
NO₃: 0.10
NO₂: 0.013

T. alk: 10
T. Har: 20
Conduc: 80
Cl: 12
Fe: 0.72
SO₄: 20

Pulled rest of study samplers,
Kept 3 for analysis.

Sediment sample; 3 Ekman
for macroinvertebrates.

Water level ≈ to first sampling
trip. (7 Aug 90)

*Adapted from Shackleford, B. Rapid Bioassessments of Lotic Macroinvertebrate Communities: Biocriteria Development. Ark. Dept. Poll. Control & Ecology, 1988.

APPENDIX C

BENTHOS ENUMERATION

All caddisflies listed as
Stenonemuridae are Psychodidae

Date: 28 Sep 90 Dredge size: (Dandy): 1 ft² Factor: 10.7584

Location: Love Creek, Jefferson Co. Ark.

Notes: Dandy samplers (3 each Sta.) - 2 sta. dry (Σ=9 samples)
Page 1 of 2, this date

Count or no./m ²	Sta <u>LC1-a</u>		Sta <u>LC1-b</u>		Sta <u>LC1-c</u>		Sta <u>LC3-a</u>		Sta <u>LC3-b</u>	
Sample No.-->	#	#/m ²	#	#/m ²	#	#/m ²	#	#/m ²	#	#/m ²
✓ Chironomidae	18	194	4	43	10	108			2	22
✓ Chaoborus	1	11	1	11	3	32	32	344	18	194
✓ Oligochaeta	188	2023	106	1140	40	430	35	377	80	861
Hexagenia										
✓ Sphaeriidae Beetles					1	11				
✓ Rhicula Fundulus					1	11				
✓ Nematoda Copepods									2	22
Damselfly nymph										
✓ Dragonfly nymph (Libell)			2	22						
✓ Other mayflies (Prot. Baetis)	3	32								
✓ Water mites	1	11	9	97	14	151				
✓ YOY Lepomis	4	43								
✓ Heleidae			1	11	3	32	1	11		
Planarians			1	11						
Depth										
Bottom temperature										
Substrate characteristics										

BENTHOS ENUMERATION

Date: 28 Sep 90 Dredge size: (Dredge - 1 ft²) Factor: 10.7584Location: Love Creek + Tar Camp Creek
Jefferson Co., Ark.Notes: Dredge Samplers (3 each Sta.)Page 2 of 2, this date

Count or no./m ²	Sta <u>LC3-C</u>		Sta <u>TCC1-a</u>		Sta <u>TCC1-b</u>		Sta <u>TCC1-c</u>		Sta _____	
Sample No.-->	#	#/m ²	#	#/m ²	#	#/m ²	#	#/m ²	#	#/m ²
Chironomidae	1	11	374	4024	451	4852	302	3249		
Chaoborus	55	592								
Oligochaeta	55	592	282	3034	79	850	226	2431		
Hexagenia Bivalvia										
Sphaeriidae Adult benth							2	22		
Hydrulicula Other fly larvae							1	11		
Nematoda Water Mites										
Damselfly nymph	0									
Dragonfly nymph (Libell)	2		2	22	2	22				
Helicidae			14	151	13	140	37	398		
Sialis larval			2	22	4	43	4	43		
Mayflies (Baetis)			5	54	13	140	4	43		
Rotifer Colony			1	11			1	11		
Gastropods					1	11				
Depth										
Bottom temperature										
Substrate characteristics										

215
205
105
267

BENTHOS ENUMERATION

Date: 19 Oct 90 Dredge size: (Dendys - 1 ft²) Factor: 10.7584Location: Love Creek + Tar Camp Creek, Jefferson Co. Ark.Notes: Dendy artificial substrate samplers, 2 each site (Σ=10 samples)
Page 1 of 2, this date

Count or no./m ²	Sta <u>LC1-a</u>		Sta <u>LC1-b</u>		Sta <u>LC2-a</u>		Sta <u>LC2-b</u>		Sta <u>LC3-a</u>	
Sample No.-->	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²
✓ Chironomidae			3	32	6	65	5	54	16	172
✓ Chaoborus	1	11							1	
✓ Oligochaeta	51	549	84	904	43	463	21	226	545	5863
✓ Hexagenia Mayflies (Bord)	1	11			1		1	11		
Sphaeriidae										
bicula										
Nematoda										
Damselfly nymph										
✓ Dragonfly nymph (Libel.)	1	11								
✓ Heleidae	1		1	11			3	32		
✓ Other Diptera (Strati)	1		4	43						
✓ Gastropods									1	11
✓ Water mites	1	11								
Depth										
Bottom temperature										
Substrate characteristics										

BENTHOS ENUMERATION

Date: 19 Oct 90 Dredge size: (Dendys - 1 ft²) Factor: 10.7584Location: Love Creek + TAR Camp Creek, Jefferson Co. Ark.Notes: Dendy artificial substrate samplers, 2 each sitePage 2 of 2, this date

Count or no./m ²	Sta <u>LC3-b</u>		Sta <u>TCC1-a</u>		Sta <u>TCC1-b</u>		Sta <u>TCC2-a</u>		Sta <u>TCC2-b</u>	
Sample No.-->	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²
✓ Chironomidae	23	247	33	355	12	129	3	32	4	43
✓ Chaoborus	1	11							3	32
✓ Oligochaeta	252	2711	211	2270	178	1915	17	183	13	140
✓ <u>Hexagenia</u> Other Diptera (Stratiomyidae)									2	22
✓ Sphaeriidae			1	11						
✓ <u>bicula</u>										
✓ Nematoda Beetle larvae									2	22
Damselfly nymph										
Dragonfly nymph										
<u>Sialis</u> larvae			1	11						
✓ Gastropods			3	32	1	11				
✓ Planarians			1	11						
✓ Amphipods			1	11						
✓ Helleidae					1	11			2	22
Depth										
Bottom temperature										
Substrate characteristics										

BENTHOS ENUMERATION

Date: 3 Nov 90 Dredge size: (Dondys- 1 ft²) Factor: 10.7584Location: Love Creek + TAR Camp Creek, Jefferson Co. Ark.Notes: Dondy artificial substrate samplers, 3 each site (E=15 samples)Page 1 of 3, this date

Count or no./m ²	Sta <u>LC1-a</u>		Sta <u>LC1-b</u>		Sta <u>LC1-c</u>		Sta <u>LC2-a</u>		Sta <u>LC2-b</u>	
Sample No.-->	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²
> Chironomidae	2	22	8	86	10	108	30	323	9	97
Chaoborus										
> Oligochaeta	62	667	28	301	28	301	37	398	19	204
Hexagenia										
Sphaeriidae										
Hydricula										
Nematoda										
Damselfly nymph										
Dragonfly nymph										
> Other Diptera (Strati.)	1	11	2	22	2	22	1	11		
> Water mites	1	11								
> Helicidae					1	11	14	151	5	54
> Sialis larvae							1	11		
Depth										
Bottom temperature										
Substrate characteristics										

BENTHOS ENUMERATION

Date: 2, 3 Nov 90 Dredge size: Dendys - 1 ft² Factor: 10,7584Location: Love Creek + TAR Camp Creek, Jefferson Co., Ark.Notes: Dendy artificial substrate samplers; 3 each sitePage 2 of 3, this date

Count or no./m ²	Sta <u>LC2-C</u>		Sta <u>LC3-a</u>		Sta <u>LC3-b</u>		Sta <u>LC3-c</u>		Sta <u>TCC1-a</u>	
Sample No.-->	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²
> Chironomidae	18	194	48	516	40	430	33	355	46	495
<u>Chaoborus</u>										
> Oligochaeta	42	452	265	2851	150	1614	136	1463	189	2033
> <u>Hexagenia</u> <u>Mayflies</u> <u>(Plecoptera)</u>			1	11						
<u>Sphaeriidae</u>										
<u>bicula</u>										
Nematoda										
Damselfly nymph										
Dragonfly nymph										
> <u>Heleidae</u>	5	54							3	32
> <u>Sialis</u> larvae	1	11								
> <u>Amphipoda</u>									3	32
> <u>Copepoda</u>									2	22
Depth										
Bottom temperature										
Substrate characteristics										

BENTHOS ENUMERATION

Date: 2 Nov 90 Dredge size: (Dendys - 1 ft²) Factor: 10.7584Location: Love Creek & TAR Camp Creek, Jefferson Co. Ark.Notes: Dendy artificial substrate samplers - 3 ex. site
Page 3 of 3, this date

Count or no./m ²	Sta TCC1-b		Sta TCC1-C		Sta TCC2-a		Sta TCC2-b		Sta TCC2-c	
Sample No.-->	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²
> Chironomidae	14	151	4	43	1	11	9	97	2	22
> Chaoborus									1	11
> Oligochaeta	107	1151	79	850	50	538	29	312	23	247
> <u>Hexagenia</u> Mayflies (Baetidae)	1	11								
> Sphaeriidae										
> Isopoda Copepoda			3	32			3	32		
> Nematoda Planaria					2	22	2	22	1	11
> Damselfly nymph										
> Dragonfly nymph										
> Helicidae	4	43					1	11	2	22
> Amphipods	1	11	2	22	1	11	3	32	2	22
> Isopods	1	11					2	22	1	11
> Gastropoda			1	11						
> Other Diptera (Stratiomyidae)					11	118			4	43
Depth										
Bottom temperature										
Substrate characteristics										

BENTHOS ENUMERATION

Date: 6, 7 Aug 90 Dredge size: (6x6) x 3 Factor: 14.35Location: Love Creek (6 Aug) and Tar Camp Creek (7 Aug)
Jefferson Co., Ark.Notes: 3 Ekman Samples
analyzed (JDR): 23 Oct 90

Count or no./m ²	Sta LC1		Sta LC2		Sta LC3		Sta TCC1		Sta TCC2	
Sample No.-->	#	#/m ²	#	#/m ²	#	#/m ²	#	#/m ²	#	#/m ²
Chironomidae	41	588	15	215	31	445	22	316	2	29
Chaoborus	202	2899	1	14	60	861	16	230	66	947
Oligochaeta	2	29					3	43		
Hexagenia										
Sphaeriidae										
bicula										
Nematoda										
Damselfly nymph										
Dragonfly nymph										
Other mayflies (Prob. Baetis)	3	43	1	14						
Amphipods			6	86						
Water mites			1	14						
Heleids			1	14			2	29		
Depth										
Bottom temperature										
Substrate characteristics										

BENTHOS ENUMERATION

Date: 2,3 Nov 90 Dredge size: 6x6 std Ekman Factor: 14.35Location: Love Creek + TAR Camp Creek, Jefferson Co., Ark.Notes: Each sample 3 Ekman's combined
analyzed (JDR) 29 Nov 90

Count or no./m ²	Sta <u>LC1</u>		Sta <u>LC2</u>		Sta <u>LC3</u>		Sta <u>TCC1</u>		Sta <u>TCC2</u>	
Sample No.-->	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²	No.	No./m ²
Chironomidae	3	43	1	14	1	14	N	0	2	29
Chaoborus	1	14	2	29	2	29	0	0	6	86
Oligochaeta	2	29	3	43	1	14	1	0	1	14
Hexagenia							H			
Sphaeriidae							1			
C. bicala							N			
Nematoda							G			
Damselfly nymph										
Dragonfly nymph (Zygoptera)					1	14		0		
Culicidae	4	57							1	14
Decapoda (Astacidae)	3	43								
Heleidae			1	14	1	14		0		
adult beetle									1	14
Water mites									1	14
Depth										
Bottom temperature										
Substrate characteristics										

APPENDIX D

SEDIMENT SETTLING DESCRIPTIONS

Date collected: 6,7 August 1990

- LC-1: 100mm of uniform gray sediment (size medium-coarse); no layering; silt and sand mix; iron-containing water on top (orange)
- LC-2: 78mm layer of coarse, dark gray; 15mm layer of medium-coarse gray; and 6mm layer of medium, light gray; water on top light grayish-yellow. Coarse layer contains fine white sand.
- LC-3: 104mm layer of coarse, dark gray; 9mm layer of medium-coarse; 1mm layer of medium; 14mm layer of medium-fine. Water on top light grayish-yellow (more gray than LC-2).
- TCC-1: Single 107mm layer of medium-coarse, dark gray (almost black with lots of organics). Water on top partially translucent yellow-orange.
- TCC-2: Single 94mm layer of medium-coarse, gray. Water on top partially translucent yellow-orange.
-

Date collected: 6,7 November 1990

- LC-1: 85mm layer of medium-coarse, dark gray; 18mm layer of very fine brownish material. Water on top brown.
- LC-2: Single 82mm layer of uniform, medium-coarse, dark gray sediment. Water on top light yellow.
- LC-3: Single 115mm layer of medium gray, medium-fine sediment. Water on top translucent light yellow.
- TCC-1: 80mm layer of coarse, dark gray; 5mm layer of fine, light gray material. Water on top layered--27mm of yellowish and 12mm of translucent pale water.
- TCC-2: 80mm layer of medium-coarse, dark gray; 4mm of fine, light gray; 23mm for very fine, medium-gray material. Water on top layered--10mm of dark yellow and 10mm of light yellow.