



Missouri
Department of
Natural Resources

Biological Assessment Report

**Clear Creek
Vernon County**

September 2003 – April 2004

Prepared for:

Missouri Department of Natural Resources
Water Protection and Soil Conservation Division
Water Protection Program

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1.0 Introduction

At the request of the Water Protection Program (**WPP**), the Environmental Services Program's (**ESP**) Water Quality Monitoring Section (**WQMS**) conducted a biological assessment of Clear Creek, which flows through a rural watershed in eastern Vernon County, Missouri.

Sampling at Clear Creek was conducted on September 15, 2003 and March 16 and 17, 2004. Sampling was conducted by Brian Nodine and Carl Wakefield of the ESP, Air and Land Protection Division (**ALPD**).

On August 19, 2003 a study plan was submitted to the WPP (formerly Water Pollution Control Program) (Appendix A). Two null hypotheses were stated in this plan. The first was that macroinvertebrate communities would not differ significantly from macroinvertebrate communities in similar sized reaches of reference streams (see Table 1 for reference streams) within the Plains/Osage Ecological Drainage Unit (**EDU**). The second was that macroinvertebrate communities would not differ significantly between longitudinally separate reaches of Clear Creek. A null hypothesis that macroinvertebrate communities will not differ significantly between seasons is also addressed in this study.

2.0 Study Area

Clear Creek originates in southern Vernon County just northeast of the city of Sheldon and flows northeast through its watershed of rural pasture and cropland (Table 1) until its confluence with the Osage River in St. Clair County. According to Chapter 7 of the State of Missouri Water Quality Standards (10 CSR 20-7.031), the 15.0-mile section from sec. 10, T. 35 N., R. 29 W. to sec. 16, T. 34 N., R. 30 W. is designated class "C". Beneficial use designations are for "livestock and wildlife watering" and "warm water aquatic life protection". The 15.0-mile section from sec. 10, T. 35 N., R. 29 W. to the confluence with the Osage River is designated as a class "P" stream with the same beneficial uses plus "whole body contact recreation". The upper fifteen-mile class "C" section of Clear Creek plus the upper three miles of the class "P" section were listed by the Clean Water Commission under section 303(d) of the Clean Water Act for impairment due to sediment.

Clear Creek and the reference streams are located within the Plains/Osage EDU. An EDU is a region where biological communities and habitat conditions can be expected to be similar. See Appendix B for maps of the EDUs and the 14-digit Hydrologic Units (**HU**) that contain the sampling reaches for Clear Creek. See Table 1 for a comparison of land use for the EDU and the 14-digit HUs. Land cover data were derived from the Thematic Mapper satellite data from 1991-1993, and interpreted by the Missouri Resource Assessment Partnership (MoRAP).

Table 1
 Percent Land Cover

	14-digit HU	Urban	Cropland	Grassland	Forest	Swamp
Plains/Osage EDU		0.2	23	54.9	17.9	0.3
Clear Cr. #1	10290105030005	0	10.7	51.4	37	0
Clear Cr. #2 & #3	10290105030002	0	12.2	49.3	37.9	0
Reference Streams						
E. Fork Crooked R.	10300101140007	0.1	67.1	22.3	8.5	0
Little Drywood Cr.	10290104060001	0	19.1	60.9	18.8	0
Little Drywood Cr.	10290104060003	1.3	13.9	62.7	19.7	0
Little Drywood Cr.	10290104060002	0.2	16.2	64.2	20	0

3.0 Site Descriptions

All sampling locations were located within Vernon County (see map Appendix B). The average width and discharge measurements during both survey periods are given for each sampling station in Table 2 of the results section. All stations are within Class C segments.

Clear Creek Station #1 (NW ¼ NE ¼ sec. 28, T. 35 N., R. 29 W.) was located immediately downstream of the unnamed county road crossing. Geographic coordinates at the upstream terminus of this station were Lat. 37.784667°, Long. -94.132472°.

Clear Creek Station #2 (NE ¼ NW ¼ sec. 2, T. 34 N., R. 30 W.) was located immediately upstream of the Highway E crossing. Geographic coordinates at the downstream terminus of this station were Lat. 37.757472°, Long. -94.190917°.

Clear Creek Station #3 (SW ¼ NE ¼ sec. 4, T. 34 N., R. 30 W.) was located immediately downstream of an unnamed county road crossing. Geographic coordinates at the upstream terminus of this station were 37.740167°, Long. -94.223194°.

4.0 Methods

4.1 Macroinvertebrate Collection and Analysis

A standardized sample collection procedure was followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure (SMSBPP) (MDNR 2003a). Three standard habitats, non-flowing water with depositional substrate (NF), large woody debris (SG), and rootmat (RM) at the stream edge were sampled at all locations.

A standardized sample analysis procedure was followed as described in the SMSBPP. The following four metrics were used: 1) Taxa Richness (**TR**); 2) total number of taxa in the orders Ephemeroptera, Plecoptera, and Trichoptera (**EPTT**); 3) Biotic Index (**BI**); and 4) Shannon Diversity Index (**SDI**).

Macroinvertebrate data were analyzed in three specific ways. First, Clear Creek stations were compared to biological criteria for the Plains/Osage EDU. Second, a longitudinal comparison between the three Clear Creek sites was performed. Finally, a comparison was made of Clear Creek data between fall and spring sampling seasons.

4.2 Physicochemical Data Collection and Analysis

During each survey period, *in situ* water quality measurements were collected at all stations for temperature (°C), dissolved oxygen concentration (mg/L), conductivity (µS/cm), and pH. These measurements followed Standard Operating Procedures MDNR-FSS-101 Field Measurement of Water Temperature (MDNR 1993), MDNR-WQMS-103 Sample Collection and Field Analysis for Dissolved Oxygen Using a Membrane Electrode Meter (MDNR 2002b), MDNR-FSS-102 Field Analysis for Specific Conductance (MDNR 2000a), and MDNR-FSS-100 Field Analysis of Water Samples for pH (MDNR 2001a) respectively. Additionally, water samples were collected and analyzed by ESP's Chemical Analysis Section for chloride (spring 2004 only), total phosphorus, ammonia-N, nitrate + nitrite-N, and total Kjeldahl nitrogen (TKN) and analyzed for turbidity (NTU) by WQMS.

Stream discharge in cubic feet per second (cfs) was measured during each survey period using a Marsh-McBirney Flo-Mate Model 2000. At sample station 2, the stream was pooled preventing discharge measurement during fall 2003 sampling. Discharge was calculated per the methods in the Standard Operating Procedure MDNR-FSS-113 Flow Measurement in Open Channels (2001b).

Stream habitat characteristics for each sampling station were measured during the spring 2004 survey period using a standardized assessment analysis procedure as described for glide/pool habitat in the Stream Habitat Assessment Project Procedure (MDNR 2003b).

Physicochemical data were summarized and presented in tabular form for comparison among the three stations and between sample seasons on Clear Creek.

4.3 Quality Assurance/Quality Control (QA/QC)

QA/QC procedures were followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure (MDNR 2003a).

5.0 Data Results

5.1 Physicochemical Data

Physical characteristics of Clear Creek are presented in Table 2. Average stream widths at Clear Creek stations ranged from 29 feet at the most upstream station to 46 feet at the most downstream station.

Table 2
 Clear Creek Physical Characteristics of the Stations

Station		Fall 2003	Spring 2004
	Ave. Width (feet)	Flow (cfs)	Flow (cfs)
1	46	0.18	82.4
2	40	-	40.4
3	29	0.03	34.3

In situ water quality measurements and turbidity are summarized in Table 3 (fall 2003) and Table 4 (spring 2004). Mean temperatures at Clear Creek stations were 20.7°C and 7.7°C in the fall 2003 and spring 2004 surveys, respectively.

Conductivity levels were consistent among stations and between seasons. Dissolved oxygen levels were consistent between stations within each season. Dissolved oxygen during the fall did fall below the Water Quality Standards minimum concentration for warm-water and cool-water fisheries (5.0 mg/L). The difference in DO levels between seasons is likely because of the seasonal difference in water temperatures and flows. Turbidity levels were notably higher at stations 2 and 3 during the fall season.

Table 3
In situ Water Quality Measurements and Turbidity at all Clear Creek Stations (Fall 2003)

Station	Parameter				
	Temp. (°C)	Diss. O ₂ (mg/l)	Cond. (µmhos/cm)	pH	Turb. (NTU)
1	21	3.8	178	7.96	13.2
2	21	2.1	179	7.59	47.0
3	20	3.0	192	7.51	40.0

Table 4
In situ Water Quality Measurements and Turbidity at all Clear Creek Stations
 (Spring 2004)

Station	Parameter				
	Temp. (°C)	Diss. O ₂ (mg/l)	Cond. (µmhos/cm)	pH	Turb. (NTU)
1	7.2	11.0	191	7.46	14.0
2	8.5	12.2	204	7.09	14.5
3	7.4	11.9	220	7.4	18.1

Nutrient and chloride concentrations are presented in Table 5 (fall 2003) and Table 6 (spring 2004). Ammonia results were below detectable limits with the exception of stations 2 and 3 during the fall 2003 season where levels, although detectable, were below general warm-water fishery chronic criteria for total ammonia. Nitrate + nitrite concentrations were below detection limits during the fall season and generally consistent between stations during spring sampling. Total phosphorous levels were slightly higher during the fall season. Chloride levels during the spring were consistent and well below chronic criteria for protection of aquatic life and drinking water supply.

Table 5
 Nutrient Concentrations at all Clear Creek Stations (Fall 2003)

Station	Sample #	Parameter (mg/L)				
		NH ₃ -N	NO ₃ +NO ₂ -N	TKN	Total Phos.	Chloride
1	0333713	<0.03	<0.01	0.96	0.11	
2	0333714	0.21	<0.01	1.39	0.19	
3	0333715	0.18	<0.01	1.93	0.35	

Table 6
 Nutrient Concentrations at all Clear Creek Stations (Spring 2004)

Station	Sample #	Parameter (mg/L)				
		NH ₃ -N	NO ₃ +NO ₂ -N	TKN	Total Phos.	Chloride
1	0411770	<0.03	0.48	0.30	0.05	7.24
2	0411772	<0.03	0.53	0.27	0.05	8.57
3	0411771	<0.03	0.57	0.36	0.07	9.53

5.2 Habitat Assessment

Habitat assessment scores were recorded for each sampling station. Results are presented in Table 7. According to the project procedure guidance the total score from the physical habitat assessment should be at least 75% to 100% similar to the total score of the control

site for a study site to support a similar biological community. The habitat score for the control stream, Little Dry Wood Creek, is 127. All Clear Creek stations had habitat scores that exceeded the aforementioned range of similarity. It was therefore inferred that based on habitat, the sites should support comparable biological communities.

Table 7
 Clear Creek and Control Stream Habitat Scores (2004)

Control Stream	Habitat Score	Clear Creek	Habitat Score	% of Mean Control
Little Dry Wood Cr.	127	Station #1	143	112.6
		Station #2	144	113.4
		Station #3	133	104.7

5.3 Biological Assessment

5.3.1 Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure (SMSBPP)

The SMSBPP evaluation used biological criteria that were calculated from ESP's database of Biological Criteria for Wadeable and Perennial Streams within the Plains/Osage EDU as explained in Biological Criteria for Wadeable/Perennial Streams of Missouri (MDNR 2002a). These criteria are listed for fall and spring seasons in Tables 8 and 9 respectively. Stream Condition Index (SCI) sustainability scores of 20-16 qualify as fully sustaining, 14-10 is partially sustaining, and 8-4 is considered non-sustaining of aquatic life.

Table 8
 Biological Criteria for Warm Water Reference Streams in the Plains/Osage EDU Fall Season

	Score = 5	Score = 3	Score = 1
TR	>57	28-57	0-27
EPTT	>6	3-6	0-2
SDI	>2.86	1.43-2.86	0-1.42
BI	<7.63	7.63-8.82	8.83-10

Table 9
 Biological Criteria for Warm Water Reference Streams in the Plains/Osage EDU Spring Season

	Score = 5	Score = 3	Score =1
TR	>50	25-50	0-24
EPTT	>8	4-8	0-3
SDI	>2.29	1.14-2.29	0-1.13
BI	<7.16	7.16-8.58	8.59-10

5.3.2 Comparisons of Clear Creek with Regional Reference Streams in the Plains/Osage EDU

Stream Condition Indices were calculated for Clear Creek as derived from biological criteria from regional Plains/Osage EDU reference streams. The four metrics, total scores, and SCI sustainability rankings for Clear Creek during fall 2003 and spring 2004 are presented in Tables 10 and 11 respectively. All stations during both seasons received a “fully sustainable” ranking with the exception of station 3 during the fall season that received a “partially sustainable” ranking. A possible reason for the lower score at station 3 during the fall season is because of the lower relative channel flow and water volume. This sample however was very close to a higher total score and would have received a “fully sustainable” score if just two more taxa or just one more EPT taxon were collected.

Table 10
 Metric Values and Stream Condition Indices for Clear Creek, Fall 2003 Sampling Season

Station	TR	EPTT	SDI	BI	T-Score	Sustainability
1	68	8	3.03	7.86	18	Fully
2	60	7	2.94	7.42	20	Fully
3	56	6	2.97	8.08	14	Partially

Table 11
 Metric Values and Stream Condition Indices for Clear Creek, Spring 2004 Sampling Season

Station	TR	EPTT	SDI	BI	T-Score	Sustainability
1	61	11	2.63	6.74	20	Fully
2	57	6	2.51	7.8	16	Fully
3	58	9	3.05	7.46	18	Fully

5.3.3 Clear Creek Longitudinal Comparison

There are no significant differences between SCIs and metrics longitudinally. With the exception of station 3 receiving a SCI of “partially sustaining” during the fall season, all other sampling stations during both seasons received an SCI of “fully sustainable”.

5.3.4 Clear Creek Seasonal Comparison

There are no substantial differences between SCIs between seasons. During the fall season, SCI total scores ranged from 14 to 20 and during the spring season SCI total scores ranged from 16 to 20.

5.3.5 Macroinvertebrate Percent and Community Composition

Macroinvertebrate taxa richness, EPT taxa, and percent EPT relative abundance are presented in Table 12. These tables also present percent composition for the five dominant macroinvertebrate taxa at the three Clear Creek sites. The percent of relative abundance data were averaged from the sum of the three macroinvertebrate habitats (depositional non-flow, woody debris, and rootmat) sampled at each station.

Diptera was the dominant order and Chironomidae was the dominant family at all three sample stations during both seasons. Chironomidae was especially dominant at stations 1 and 2 during the spring 2004 season. During the fall 2003 season Tubificidae, Hyalellidae, and Arachnoidea were also well represented.

Taxa richness and total EPTT scores were consistent between stations and seasons.

Table 12
 Clear Creek Macroinvertebrate Composition

	Fall 2003			Spring 2004		
	Station #1	Station #2	Station #3	Station #1	Station #2	Station #3
Taxa Richness	68	60	56	61	57	58
EPTT	8	7	6	11	6	9
% Ephemeroptera	1.3	1.5	1.9	3.2	2.1	2.3
% Plecoptera	0	0	0	7.2	2.2	3.2
% Trichoptera	0.4	0.1	0.2	0.4	0.4	1.1
Total EPT %	1.7	1.6	2.1	10.8	4.7	6.6
% Diptera	41.7	39.1	44.3	79.1	75.1	50
% Dominant Families						
Chironomidae	40.5	31.3	36.9	73.4	70.9	40.4
Physidae			4.4			
Hyalellidae	14.2	13.9	8.5		2.9	
Tubificidae	16	9.3	21.7	2.5	9.5	10.5
Arachnoidea	5.9	20.9				6.1
Ceratopogonidae	5	5.8	4.4		2.5	
Perlidae				5.7	2.2	
Simuliidae				4.2		4
Leptophlebiidae				2.6		
Asellidae						13.7

6.0 Discussion

Physicochemical results reveal few definitive trends other than typical seasonal differences.

Macroinvertebrate data do not reveal any notable impairment in Clear Creek and tend to indicate a healthy community for its EDU. The only sample that did not receive a “fully sustainable” ranking failed to do so by a very narrow margin.

Habitat assessments also do not reveal any impairment in Clear Creek. Clear Creek is typical of streams in the Plains/Osage EDU with mostly steep banks and soft substrates littered with woody debris. At the three stations, banks and riparian zones appeared predominantly well managed which should limit the quantity of sediment runoff entering the stream if consistent throughout its entire length.

7.0 Conclusions

Based on this study, there can be no conclusion drawn that Clear Creek is biologically impaired by sediment.

8.0 Recommendations

Because no impairment was revealed by this study and Clear Creek appears to be maintaining a healthy macroinvertebrate community, it is recommended it be removed from the 303(d) list of impaired waters.

9.0 Summary

1. The null hypothesis that macroinvertebrate assemblages will not differ substantially between Clear Creek and reference streams in the same EDU is accepted.
2. The null hypothesis that macroinvertebrate assemblages will not differ between longitudinally separate reaches of Clear Creek is accepted.
3. The null hypothesis that macroinvertebrate assemblages will not differ between seasons in Clear Creek is accepted.

10.0 References

- Missouri Department of Natural Resources. 1993. Field Measurement of Water Temperature. MDNR-FSS-101. Missouri Department of Natural Resources, Environmental Services Program, P.O. Box 176, Jefferson City, Missouri 65102. 2 pp.
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Appendix A

Proposed Bioassessment Study Plan
Clear Creek
August 19, 2003

**Missouri Department of Natural Resources
Bioassessment Study Plan
Clear Creek, Vernon County
August 19, 2003**

Objective

This study will characterize the macroinvertebrate communities in Clear Creek at three sites within the 18 miles of 303(d) listed section to determine if the stream is impaired and justifies continued 303(d) listing. The objective of this study is to determine if aquatic macroinvertebrate life is impaired along the listed section of Clear Creek.

Null Hypotheses

- 1). Macroinvertebrate communities in Clear Creek will not differ significantly from macroinvertebrate communities in similar sized reaches of reference streams within the Plains/Osage Ecological Drainage Unit (EDU).
- 2). Macroinvertebrate communities will not differ significantly between longitudinally separate reaches of Clear Creek.

Background

Clear Creek is located in southwestern Vernon County. An eighteen mile segment from Sec. 19/20, T 34 N, R 30 W to Sec. 15, T 35 N, R 29 W is listed on the 303(d) list as impaired by aquatic habitat loss. Stream segments listed as impaired by “sediment” are proposed to have the pollutant changed to “habitat loss”. Sediment is just one of several problems affecting habitat including channelization, bank alteration, and loss of riparian corridor. Changes in distribution of fish species are among the evidence used to list streams as habitat impaired. Land use that is typical in prairie regions of the state is a contributing factor to aquatic habitat loss. The goal of this study is to evaluate the listed segment of Clear Creek for impairment. If impairment is not demonstrated, rationale will be provided for removing Clear Creek from the 303(d) list.

Study Design

General: Three Clear Creek stations will be surveyed. The site locations are: 1) at the county road crossing in NW ¼ NE ¼ Sec. 28, T 35 N, R 29 W.; 2) at the Hwy. E crossing in NE ¼ NW ¼ Sec. 2, T 34 N, R 30 W.; and 3) at the county road crossing in SW ¼ NE ¼ Sec. 4, T 34 N, R 30 W. Data from these three sites will be compared against biological criteria reference data from similar streams.

At each station, the length sampled will extend 20 times the average stream width as outlined in MDNR-WQMS-032. To assess comparability between sampling stations and

reference streams, stream discharge, habitat assessment and water chemistry will be determined during macroinvertebrate surveys. Sampling will be conducted during the fall of 2003 (mid September through mid October) and the spring of 2004 (mid March through mid April).

Biological Sampling Methods: Macroinvertebrates will be sampled as per the guidelines of the Semi-Quantitative Macroinvertebrate Stream Bioassessment Project Procedure (SMSBPP). Clear Creek will be considered a “glide/pool” predominant stream; therefore samples will be collected from flow over depositional (non-flow), root-mat, and wood debris (snag) habitats. Each macroinvertebrate sample will be a composite of six subsamples within each habitat.

Habitat Sampling Methods: Stream habitat assessments will be conducted within each study area following the guidelines of MDNR-FSS-032.

Water Quality Sampling Methods: Stream discharge will be measured at each sampling location using a Marsh-McBirney flow meter. Water samples from all sampled stations will be analyzed at the ESP laboratory for ammonia, nitrogen as $\text{NO}_2 + \text{NO}_3$, total Kjeldahl nitrogen, total phosphorus, chloride and turbidity. Field measurements will include pH, conductivity, temperature and dissolved oxygen.

Laboratory Methods: All samples of macroinvertebrates will be processed and identified as per MDNR-FSS-209, Taxonomic Levels for Macroinvertebrate Identification. Turbidity samples will be analyzed at the MDNR biological laboratory.

Data Recording and Analyses: Macroinvertebrate data will be entered in a Microsoft Access database in accordance with MDNR-WQMS-214, Quality Control Procedures for Data Processing. Data analysis is automated within the Access database. Four standard metrics are calculated according to the SMSBPP: Total Taxa (TT); Ephemeroptera, Plecoptera, Trichoptera Taxa (EPTT); Biotic Index (BI); and the Shannon Index (SI) will be calculated for each reach.

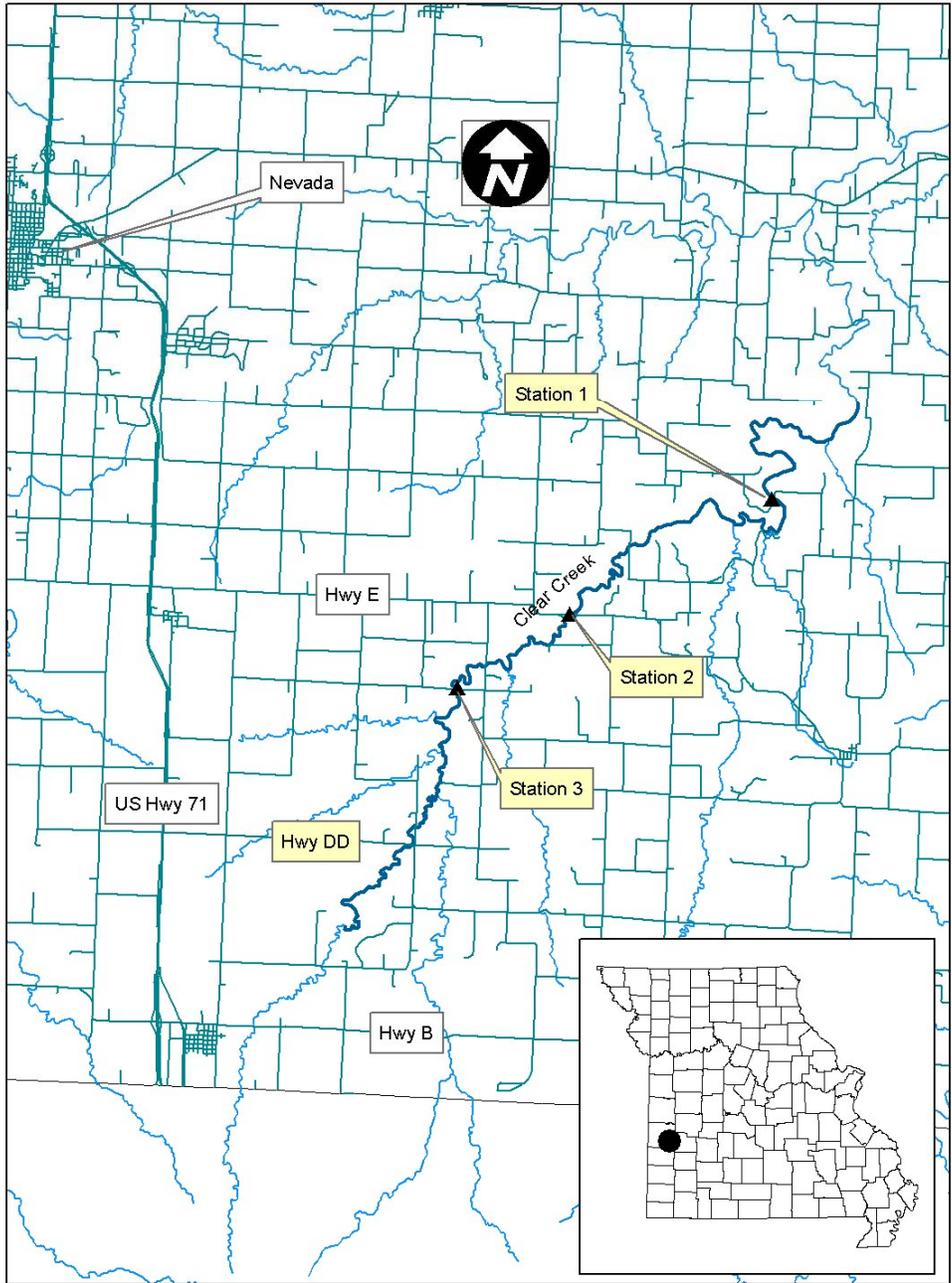
Macroinvertebrate data will be analyzed in two ways. First, a longitudinal comparison between the three Clear Creek reaches will be performed. Secondly, the data from the Clear Creek sites will be compared to biological criteria from wadeable/perennial reference streams with similar geology and watershed size classification.

Data Reporting: Results of the study will be summarized and interpreted in report format.

Quality Control: As stated in the various MDNR Project Procedures and Standard Operating Procedures.

Attachments

Map of all sampling stations in this study

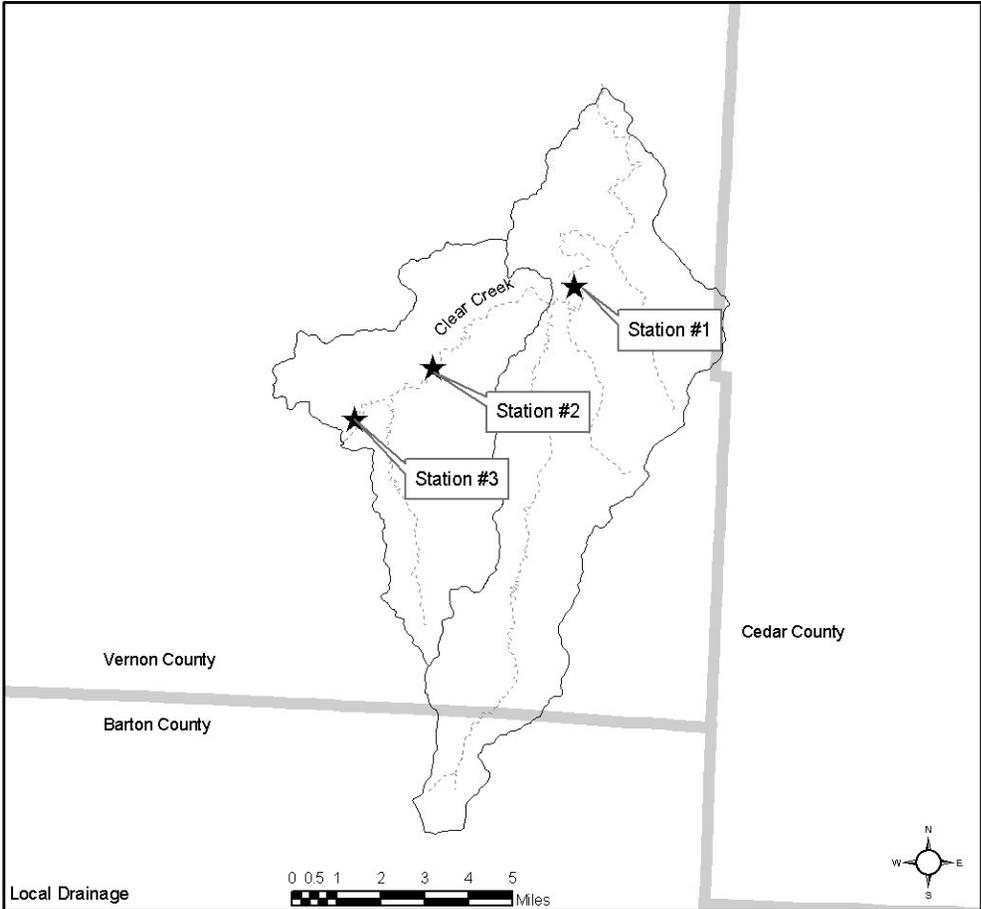


Appendix B

Map

Clear Creek
Plains/Osage EDU

Clear Creek Study Stations



- ★ Sampling Location
- ▭ County Boundary
- ▭ Local Drainage
- Stream/River

Local Drainage and Biologic Sampling Site Location

Ecological Drainage Unit (EDU) - An EDU is an area that contains a unique combination of habitats and organisms. Missouri is divided into 19 EDUs as shown in the inset map below. This site is located in the highlighted EDU.

Local Drainage - The local drainage area, also known as a 14 Digit Hydrologic Unit, is shown in the main map at left. This area is a portion of the local watershed. Missouri is split into over 1500 such units.



Local Drainage

0 0.5 1 2 3 4 5 Miles



Ecological Drainage Unit

Appendix C

Macroinvertebrate Bench Sheets

Clear Creek Station #1
Fall 2003, Sample #0318697 (1 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Planariidae			5	Planariidae
Branchiobdellida			5	
Tubificidae	110	1	5	Tubificidae
Branchiura sowerbyi	19			Tubificidae
Aulodrilus	1			Tubificidae
Limnodrilus cervix	1			Tubificidae
Limnodrilus hoffmeisteri	3		2	Tubificidae
Lumbriculidae	1			Lumbriculidae
Glossiphoniidae		3	-99	Glossiphoniidae
Lirceus		1	4	Asellidae
Hyalella azteca		1	125	Hyalellidae
Palaemonetes			1	Palaemonidae
Orconectes virilis			1	Cambaridae
Callibaetis			1	Baetidae
Paracloeodes		1		Baetidae
Stenacron			1	Heptageniidae
Tricorythodes	2			Tricorythidae
Caenis latipennis	4		1	Caenidae
Leptophlebiidae		2		Leptophlebiidae
Argia			3	Coenagrionidae
Enallagma			6	Coenagrionidae
Nasiaeschna			1	Aeshnidae
Gomphus	-99			Gomphidae
Libellula	1		6	Libellulidae
Belostoma			-99	Belostomatidae
Mesovelia			1	Mesoveliidae
Nectopsyche	1			Leptoceridae
Triaenodes			3	Leptoceridae
Hydroporus			1	Dytiscidae
Tropisternus			-99	Hydrophilidae
Helichus lithophilus			6	Dryopidae
Scirtes		1	6	Scirtidae
Ancyronyx variegatus			1	Elmidae
Dubiraphia	7		26	Elmidae
Stenelmis	2		2	Elmidae
Climacia			1	Sisyridae
Anopheles			1	Culicidae
Chaoborus	12	1		Chaoboridae
Ceratopogoninae	41		4	Ceratopogonidae
Ablabesmyia		1	1	Chironomidae
Procladius	19			Chironomidae
Pseudosmittia	1			Chironomidae

Clear Creek Station #1
 Fall 2003, Sample #0318697 (2 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Chironomus	23	3	1	Chironomidae
Cryptochironomus	1	1		Chironomidae
Dicrotendipes	2	64	3	Chironomidae
Glyptotendipes	12	128	13	Chironomidae
Cryptotendipes	7	2	1	Chironomidae
Paralauterborniella	1			Chironomidae
Kiefferulus	2	9		Chironomidae
Paratendipes	2			Chironomidae
Parachironomus	1		8	Chironomidae
Phaenopsectra		3		Chironomidae
Polypedilum illinoense			1	Chironomidae
Polypedilum scalaenum	2	1		Chironomidae
Stictochironomus	1			Chironomidae
Tribelos		2		Chironomidae
Cladotanytarsus	5	4		Chironomidae
Paratanytarsus			1	Chironomidae
Tanytarsus	8	6	3	Chironomidae
Clinotanypus			1	Chironomidae
Tanypus	8			Chironomidae
Thienemannimyia grp.		2		Chironomidae
Labrundinia		1	4	Chironomidae
Acarina	9	37	7	
Physella	1		7	Physidae
Menetus			10	Planorbidae
Ancylidae	3	1	1	Ancylidae
Sphaerium	8	2	6	Sphaeriidae

NF = Non-flow Habitat
 SG = Woody Debris (Snag) Habitat
 RM = Rootmat Habitat
 -99 = Present

Clear Creek Station #2
Fall 2003, Sample #0318698 (1 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Planariidae			15	Planariidae
Branchiobdellida			15	
Tubificidae	78	1	4	Tubificidae
Branchiura sowerbyi	5		5	Tubificidae
Aulodrilus	6			Tubificidae
Lumbriculidae			4	Lumbriculida
Glossiphoniidae	2	11	11	Glossiphonii
Erpobdellidae	-99		2	Erpobdellida
Lirceus		1	1	Asellidae
Hyaella azteca		69	79	Hyaellidae
Orconectes virilis			-99	Cambaridae
Callibaetis	1			Baetidae
Procloeon			1	Baetidae
Stenacron		2		Heptageniida
Caenis latipennis	5	2	2	Caenidae
Leptophlebiidae		2	1	Leptophlebiid
Argia			1	Coenagrionid
Enallagma			3	Coenagrionid
Libellula	3	2	2	Libellulidae
Rheumatobates			1	Gerridae
Trepobates			1	Gerridae
Neoplea		1		Pleidae
Phryganeidae			1	Phryganeida
Oecetis	1			Leptoceridae
Hydroporus	1		1	Dytiscidae
Hydrochus		1		Hydrochidae
Scirtes		6	6	Scirtidae
Dubiraphia		3	9	Elmidae
Anopheles			1	Culicidae
Culex			3	Culicidae
Chaoborus	16			Chaoboridae
Forcipomyiinae		1		Ceratopogon
Ceratopogoninae	43	16	2	Ceratopogon
Larsia		1		Chironomida
Procladius	31	2		Chironomida
Nanocladius			1	Chironomida
Chironomus	13	1		Chironomida
Cladopelma		1		Chironomida
Cryptochironomus	1			Chironomida
Dicrotendipes	7	81	1	Chironomida
Glyptotendipes	1	87	6	Chironomida
Cryptotendipes	21	3		Chironomida

Clear Creek Station #2
 Fall 2003, Sample #0318698 (2 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Kiefferulus	3	8	2	Chironomida
Parachironomus	1	1	15	Chironomida
Polypedilum halterale grp			2	Chironomida
Polypedilum illinoense		1	2	Chironomida
Cladotanytarsus	1		1	Chironomida
Paratanytarsus			2	Chironomida
Tanytarsus	4	2	1	Chironomida
Xestochironomus		1		Chironomida
Chlorotabanus		1		Tabanidae
Clinotanypus			1	Chironomida
Tanypus	7	1		Chironomida
Thienemannimyia grp.		4		Chironomida
Labrundinia		1	13	Chironomida
Acarina	73	87	62	
Physella	1	1	5	Physidae
Menetus		5	16	Planorbidae
Ancylidae	5	6	1	Ancylidae
Sphaerium	13	1	-99	Sphaeriidae

NF = Non-flow Habitat
 SG = Woody Debris (Snag) Habitat
 RM = Rootmat Habitat
 -99 = Present

Clear Creek Station #3
Fall 2003, Sample #0318699 (1 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Branchiobdellida			5	
Tubificidae	175	15	2	Tubificidae
Aulodrilus	1			Tubificidae
Limnodrilus hoffmeisteri	9			Tubificidae
Glossiphoniidae		6	2	Glossiphoniidae
Erpobdellidae	5	2		Erpobdellidae
Lirceus		15	23	Asellidae
Hyaella azteca	1	2	76	Hyaellidae
Baetidae	1			Baetidae
Callibaetis		1		Baetidae
Caenis latipennis	1			Caenidae
Leptophlebiidae		2	13	Leptophlebiidae
Argia		2	3	Coenagrionidae
Enallagma			4	Coenagrionidae
Nasiaeschna			3	Aeshnidae
Libellula	4	1	5	Libellulidae
Pachydiplax longipennis	1			Libellulidae
Steinovelia			1	Veliidae
Rheumatobates			1	Gerridae
Neoplea			1	Pleidae
Corixidae	2	4		Corixidae
Phryganeidae			1	Phryganeidae
Triaenodes			1	Leptoceridae
Hydroporus		2	2	Dytiscidae
Helochaers			1	Hydrophilidae
Hydrochus			1	Hydrochidae
Tropisternus		1		Hydrophilidae
Scirtes			20	Scirtidae
Anopheles			2	Culicidae
Chaoborus	25	1		Chaoboridae
Forcipomyiinae		2		Ceratopogonidae
Ceratopogoninae	28	9	2	Ceratopogonidae
Larsia		1		Chironomidae
Procladius	53	5	1	Chironomidae
Parakiefferiella		6	21	Chironomidae
Chironomus	9	2		Chironomidae
Cladopelma	1			Chironomidae
Dicrotendipes		31	6	Chironomidae
Glyptotendipes	11	125	4	Chironomidae
Kiefferulus	1	7	4	Chironomidae
Parachironomus		1	9	Chironomidae
Polypedilum halterale grp		4	1	Chironomidae

Clear Creek Station #3
 Fall 2003, Sample #0318699 (2 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Stenochironomus		1		Chironomidae
Polypedilum illinoense		1		Chironomidae
Tanytarsus	8	12		Chironomidae
Clinotanypus	1			Chironomidae
Tanypus	12			Chironomidae
Thienemannimyia grp.		2		Chironomidae
Labrundinia		2	1	Chironomidae
Acarina	21	1	6	
Physella		9	32	Physidae
Helisoma		1		Planorbidae
Menetus			7	Planorbidae
Planorbella			1	Planorbidae
Ancylidae	3	2		Ancylidae
Sphaerium	2	6	8	Sphaeriidae

NF = Non-flow Habitat
 SG = Woody Debris (Snag) Habitat
 RM = Rootmat Habitat

Clear Creek Station #1
Spring 2004, Sample #0418710 (1 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Lumbricidae	1			Lumbricidae
Tubificidae	9		1	Tubificidae
Branchiura sowerbyi	2			Tubificidae
Limnodrilus cervix	2			Tubificidae
Limnodrilus hoffmeisteri	3	1		Tubificidae
Limnodrilus	3	1		Tubificidae
Enchytraeidae	1	1	3	Enchytraeidae
Erpobdellidae	2			Erpobdellidae
Lirceus		1	3	Asellidae
Hyaella azteca	2	2	6	Hyaellidae
Orconectes virilis			1	Cambaridae
Ameletus			-99	Ameletidae
Stenonema femoratum	1			Heptageniidae
Caenis latipennis	2		2	Caenidae
Leptophlebiidae	3		20	Leptophlebiidae
Libellula			-99	Libellulidae
Amphinemura		1	8	Nemouridae
Taeniopteryx		1		Taeniopterygidae
Perlesta	9	3	37	Perlidae
Isoperla		1	2	Perlodidae
Rhyacophila			3	Rhyacophilidae
Ironoquia			1	Limnephilidae
Pycnopsyche			-99	Limnephilidae
Hydroporus	3		5	Dytiscidae
Helichus lithophilus		3		Dryopidae
Dubiraphia	2		1	Elmidae
Tipula			-99	Tipulidae
Ceratopogoninae	8	1		Ceratopogonidae
Simulium		6	30	Simuliidae
Ablabesmyia	4	1	1	Chironomidae
Procladius	4			Chironomidae
Cricotopus bicinctus	1	1	3	Chironomidae
Mesocricotopus	1		1	Chironomidae
Corynoneura	4			Chironomidae
Cricotopus/Orthocladius	32	76	72	Chironomidae
Diplocladius		1	2	Chironomidae
Eukiefferiella	1	64	4	Chironomidae
Nanocladius	1			Chironomidae
Parakiefferiella	2	1		Chironomidae
Paraphaenocladius	1			Chironomidae
Smittia	2			Chironomidae
Hydrobaenus	96	115	44	Chironomidae

Clear Creek Station #1
Spring 2004, Sample #0418710 (2 of 2)

CmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Tvetenia	1	2	21	Chironomidae
Bryophaenocladus			1	Chironomidae
Chironomus	3			Chironomidae
Dicrotendipes	1	2	2	Chironomidae
Glyptotendipes	3	3	1	Chironomidae
Microtendipes			1	Chironomidae
Polypedilum convictum			1	Chironomidae
Polypedilum illinoense		2		Chironomidae
Stictochironomus	25			Chironomidae
Paratanytarsus	3		13	Chironomidae
Tanytarsus	1	2	1	Chironomidae
Tabanus	1			Tabanidae
Thienemannimyia grp.		1	1	Chironomidae
Diptera	2			
Acarina	8		1	
Fossaria			1	Lymnaeidae
Physella			3	Physidae
Menetus		1		Planorbidae
Sphaeriidae	10		1	Sphaeriidae

NF = Non-flow Habitat
 SG = Woody Debris (Snag) Habitat
 RM = Rootmat Habitat
 -99 = Present

Clear Creek Station #2
Spring 2004, Sample #0418712 (1 of 2)

cmbTAXACODE	TxtNF	txtSG	txtR	txtFamily
Planariidae			1	Planariidae
Branchiobdellida	6		7	
Tubificidae	60	1		Tubificidae
Limnodrilus cervix	6			Tubificidae
Limnodrilus hoffmeisteri	7	3	1	Tubificidae
Limnodrilus	7			Tubificidae
Enchytraeidae		6	7	Enchytraeidae
Glossiphoniidae	-99	-99	1	Glossiphoniidae
Lirceus		3	3	Asellidae
Hyaella azteca	-99	4	22	Hyaellidae
Palaemonetes			1	Palaemonidae
Orconectes virilis	-99		-99	Cambaridae
Caenis latipennis	2		6	Caenidae
Leptophlebiidae	4		7	Leptophlebiidae
Ischnura			-99	Coenagrionidae
Nasiaeschna			1	Aeshnidae
Perlesta	8	12		Perlidae
Cheumatopsyche			1	Hydropsychidae
Agrypnia	-99	1	1	Phryganeidae
Pycnopsyche			1	Limnephilidae
Hydroporus	2	1	3	Dytiscidae
Helichus basalis		1	1	Dryopidae
Helichus lithophilus			1	Dryopidae
Scirtes		1		Scirtidae
Gonomyia			1	Tipulidae
Ceratopogoninae	22		1	Ceratopogonidae
Simuliidae		1		Simuliidae
Simulium		11		Simuliidae
Ablabesmyia	1		1	Chironomidae
Procladius	10		1	Chironomidae
Cricotopus bicinctus		1	2	Chironomidae
Mesocricotopus	2			Chironomidae
Cricotopus/Orthocladius	14	95	106	Chironomidae
Diplocladius			3	Chironomidae
Eukiefferiella		3		Chironomidae
Parakiefferiella	1		1	Chironomidae
Paraphaenocladius			1	Chironomidae
Hydrobaenus	126	104	63	Chironomidae
Tvetenia	2		2	Chironomidae
Chironomus	3			Chironomidae
Dicrotendipes	2	15		Chironomidae
Glyptotendipes	3	15		Chironomidae

Clear Creek Station #2
Spring 2004, Sample #0418712 (2 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Cryptotendipes	9			Chironomidae
Kiefferulus	1	2		Chironomidae
Microtendipes	1			Chironomidae
Polypedilum halterale grp	1			Chironomidae
Polypedilum illinoense			2	Chironomidae
Polypedilum scalaenum		1		Chironomidae
Stictochironomus	5			Chironomidae
Tribelos		1		Chironomidae
Paratanytarsus	1	2	22	Chironomidae
Tanytarsus	3	2	3	Chironomidae
Clinocera		1	1	Empididae
Thienemannimyia grp.		1		Chironomidae
Acarina	9	1	8	
Fossaria		1		Lymnaeidae
Sphaerium	3			Sphaeriidae

NF = Non-flow Habitat
SG = Woody Debris (Snag) Habitat
RM = Rootmat Habitat
-99 = Present

Clear Creek Station #3
Spring 2004, Sample #0418711 (1 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Tubificidae	58	4		Tubificidae
Limnodrilus cervix	1			Tubificidae
Limnodrilus hoffmeisteri	6			Tubificidae
Limnodrilus	2			Tubificidae
Enchytraeidae	2	5	8	Enchytraeidae
Glossiphoniidae	5		2	Glossiphoniidae
Erpobdellidae	2			Erpobdellidae
Lirceus	3	3	86	Asellidae
Hyaella azteca	1		18	Hyaellidae
Siphonurus			2	Siphonuridae
Caenis latipennis	3			Caenidae
Leptophlebia			1	Leptophlebiidae
Paraleptophlebia	1		9	Leptophlebiidae
Enallagma	2			Coenagrionidae
Nasiaeschna			1	Aeshnidae
Plathemis	1			Libellulidae
Perlesta	1	5	15	Perlidae
Isoperla			1	Perlodidae
Polycentropodidae			1	Polycentropodidae
Agrypnia	1			Phryganeidae
Ironoquia		1	5	Limnephilidae
Hydroporus	1	1		Dytiscidae
Helichus basalis		2	6	Dryopidae
Scirtes			1	Scirtidae
Tipula			1	Tipulidae
Ormosia		1	4	Tipulidae
Ceratopogoninae	23	1		Ceratopogonidae
Simulium	1	7	19	Simuliidae
Procladius	28		1	Chironomidae
Cricotopus bicinctus			1	Chironomidae
Mesocricotopus	1			Chironomidae
Corynoneura			1	Chironomidae
Cricotopus/Orthocladius	12	15	35	Chironomidae
Diplocladius			2	Chironomidae
Nanocladius			2	Chironomidae
Parakiefferiella			1	Chironomidae
Paraphaenocladius			1	Chironomidae
Mesosmittia			1	Chironomidae
Hydrobaenus	59	30	23	Chironomidae
Thienemanniella			1	Chironomidae
Tvetenia			3	Chironomidae
Dicrotendipes	2	1		Chironomidae

Clear Creek Station #3
Spring 2004, Sample #0418711 (2 of 2)

cmbTAXACODE	txtNF	txtSG	txtR	txtFamily
Glyptotendipes	5	12	5	Chironomidae
Cryptotendipes	2			Chironomidae
Kiefferulus		1	1	Chironomidae
Paratendipes	3			Chironomidae
Polypedilum halterale	8			Chironomidae
Polypedilum illinoense	1		4	Chironomidae
Paratanytarsus			3	Chironomidae
Tanytarsus	5			Chironomidae
Tabanus	4	1		Tabanidae
Labrundinia	1			Chironomidae
Diptera			2	
Acarina	27		14	
Fossaria	1	1	2	Lymnaeidae
Physella			5	Physidae
Ancylidae		1		Ancylidae
Sphaerium	13		4	Sphaeriidae

NF = Non-flow Habitat
 SG = Woody Debris (Snag) Habitat
 RM = Rootmat Habitat