

Biological Assessment Report

Hickory Creek Daviness County, Missouri

Fall 2008 - Spring 2009

Prepared for:
Missouri Department of Natural Resources
Division of Environmental Quality
Water Protection Program
Water Pollution Control Branch

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1.0 Introduction

At the request of the Missouri Department of Natural Resources (**MDNR**), Water Protection Program (**WPP**), the Environmental Services Program (**ESP**), Water Quality Monitoring Section (**WQMS**) conducted a macroinvertebrate bioassessment and habitat study of Hickory Creek, water body identification number 422, in Daviess County in northeast Missouri. See the inset in Figure 1 for general stream location of the Hickory Creek stations.

Hickory Creek is a tributary of the Grand River that is located approximately 7 miles north of Gallatin in Daviess County. Hickory Creek is classified as a class “C” stream per the Missouri Water Quality Standards (**WQS**) (MDNR 2005a). The U.S. Environmental Protection Agency (**EPA**) added a 1.5 mile section of Hickory Creek to the 2002 303(d) list for unknown pollutants. Hickory Creek was sampled during spring 2006 and fall 2007 by Versar, Inc. The macroinvertebrate community of Hickory Creek was determined to be impaired and additional sampling was recommended. The goal of this study is to provide additional data for Hickory Creek and to reevaluate the stream for impairment.

This study assessed approximately 1.5 miles of Hickory Creek from sec. 10, T. 60 N., R. 28 W. at the confluence with Grand River upstream to Harbor Avenue at sec. 11, T. 60 N., R. 28 W. in Daviess County (WQS) (MDNR 2005a). According to the WQS, Hickory Creek is a class “C” (intermittent with perennial pools) stream, with the following designated uses: livestock and wildlife watering, protection of warm water aquatic life and human health fish consumption, and category B whole body contact recreation. The watershed is approximately 27 square miles and comprised mostly of grassland and cropland.

1.1 Purpose

The purpose of the study was to assess the habitat characteristics, macroinvertebrate community, and physicochemical characteristics of Hickory Creek to determine if the biological community of Hickory Creek is impaired.

1.2 Tasks

- 1) Conduct a habitat assessment of Hickory Creek.
- 2) Conduct a bioassessment of the macroinvertebrate community of Hickory Creek.
- 3) Conduct physicochemical monitoring of Hickory Creek.

1.3 Null Hypotheses

- 1) Habitat will not differ substantially among the Hickory Creek stations.
- 2) Macroinvertebrate assemblages will not differ substantially between longitudinally separate reaches of Hickory Creek.
- 3) Macroinvertebrate assemblages will not differ substantially between Hickory Creek and the bioreference streams in the Central Plains/Grand/Chariton EDU.

2.0 Methods

Brandy Berghold and Carl Wakefield of the MDNR, Division of Environmental Quality, ESP, WQMS conducted this study. Sampling was conducted during the fall of 2008 and the spring of 2009. Fall sampling was conducted on September 25, 2008 and consisted of macroinvertebrate sampling, habitat assessments, and water quality sampling at two stations on Hickory Creek. During the spring, water quality and macroinvertebrate sampling were conducted on April 8, 2009. Methods are included for biological assessments, stream habitat assessments, and physicochemical water quality collection.

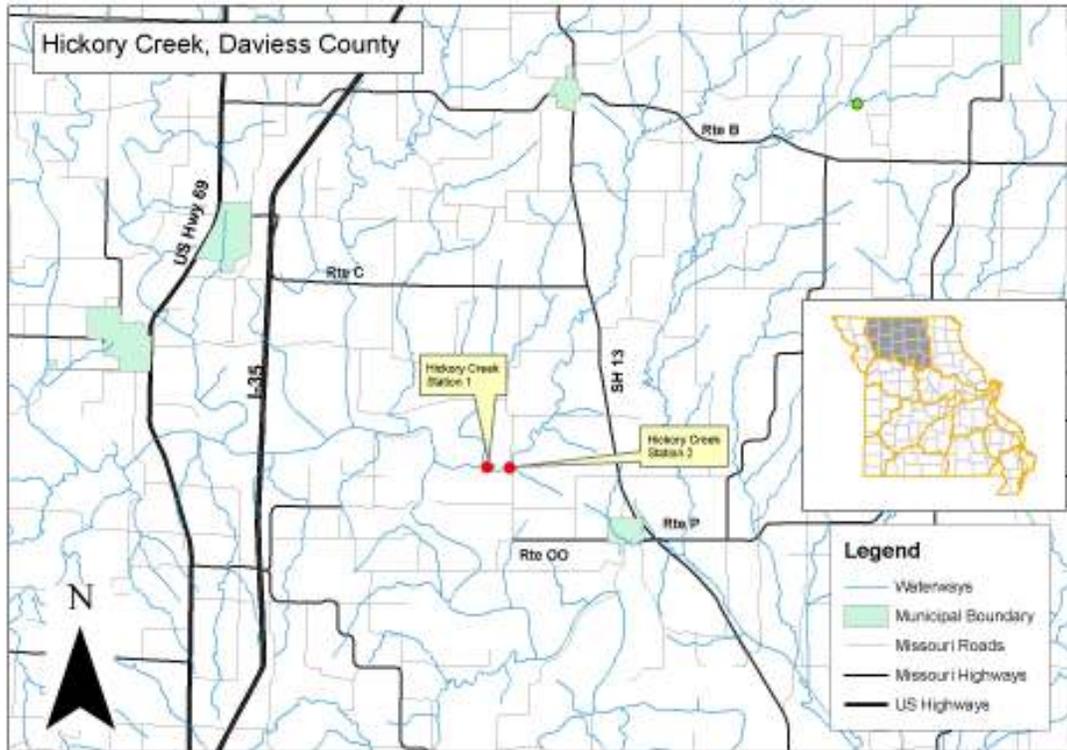
2.1 Station Descriptions

The study included sampling two stations on Hickory Creek in Daviess County (Figure 1). Station locations and descriptions are listed below in Table 1.

Table 1
Descriptive Information for Stations in the Hickory Creek Study

Stations	Location-UTM Zone 15	Description	County
Hickory Creek #1	412411 E 4430476 N	Downstream of 202 Street (Located downstream of Station #2)	Daviess
Hickory Creek #2	412711 E 4430476 N	Downstream of 202 Street	Daviess

Figure 1
 Hickory Creek Sampling Stations for Fall 2008 and Spring 2009



2.1.1 Land Use Description

The land use conditions were summarized from land cover GIS files. Percent land cover data were derived from Thematic Mapper (TM) satellite data collected between 2000 and 2004 and interpreted by the Missouri Resource Assessment Partnership (MoRAP). See Table 2 for a comparison of land use for the EDU and the 14-digit hydrologic unit codes (HUC) that contain the Hickory Creek Study segments.

Table 2
 Percent Land Cover in Hickory Creek Study
 Stations and Central Plains/Grand/Chariton EDU

Stations	14-digit HUC	Urban	Crops	Grass	Forest
Hickory Creek #1	10280101160002	2	35	40	17
Hickory Creek #2	10280101160002	2	35	40	17
Central Plains/Grand/ Chariton EDU	—	2	28	45	18

2.2 Stream Habitat Assessment Project Procedure

Standardized assessment procedures were followed as described for glide/pool prevalent streams in the Stream Habitat Assessment Project Procedure (**SHAPP**) (MDNR 2003a). According to the SHAPP, the aquatic community is influenced by the quality of the stream habitat. Stream habitat quality is scored for each station and the scores are typically compared with the bioreference SHAPPs. However, due to an oversight, a SHAPP was not conducted at a bioreference during the study. The SHAPP scores were calculated for the Hickory Creek stations and examined for irregular results.

2.3 Bioassessment

2.3.1 Macroinvertebrate Sampling and Analyses

Macroinvertebrate sampling was conducted according to the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure (**SMSBPP**) (MDNR 2003b). Hickory Creek is considered a glide/pool dominated system. The three standard habitats sampled at all locations were: non-flowing water over depositional substrate (**NF**), large woody debris substrate (**SG**), and rootmat (**RM**). Macroinvertebrate samples were sub sampled in the laboratory and identified to specific taxonomic levels (MDNR 2005b) in order to develop biological criteria metrics (MDNR 2003b).

Macroinvertebrate data were evaluated by comparing the data with the bioreference streams in the Central Plains/Grand/Chariton EDU. Biological criteria are calculated separately for the fall (mid-September through mid-October) and spring (mid-March through mid-April) index periods. The SMSBPP provides details on the calculation of metrics and scoring of the multi-metric Macroinvertebrate Stream Condition Index (**MSCI**). The four components of the MSCI are: Taxa Richness (**TR**); Ephemeroptera, Plecoptera, and Trichoptera Taxa (**EPTT**); Biotic Index (**BI**); and the Shannon Diversity Index (**SDI**). An MSCI score of 16-20 is considered as full biological sustainability, 10-14 as partial biological sustainability, and 4-8 as non-biological sustainability.

2.3.2 Physicochemical Water Sampling and Analyses

Physicochemical water samples were handled according to the appropriate MDNR, ESP Standard Operating Procedure (**SOP**) and/or Project Procedure (**PP**). Results for physicochemical water parameters were examined by season and station. All physicochemical water parameters were sampled by field measurements or grab samples. Water samples were collected according to the SOP MDNR-ESP-001 Required/Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations (MDNR 2008a). All samples were kept on ice during transport to ESP.

Water quality parameters were measured *in-situ* or collected and returned for analyses at the state environmental laboratory. Temperature (C°) (MDNR2003c), pH (MDNR 2001a), specific conductance (µS) (MDNR 2003d), dissolved oxygen (mg/L) (MDNR 2002a), and discharge (cubic feet per second-cfs) (MDNR 2003e) were measured in the

field. Turbidity (NTU) (MDNR 2005c) was measured and recorded in the ESP, WQMS biology laboratory. The ESP, Chemical Analysis Section (CAS) in Jefferson City, Missouri conducted the analyses for ammonia-nitrogen (mg/L), nitrate+nitrite-nitrogen (mg/L), total nitrogen (mg/L), chloride (mg/L), non-filterable residue (mg/L), and total phosphorus (mg/L).

Physicochemical water parameters were compared between stations as well as with Missouri's WQS (MDNR 2005a). Interpretation of acceptable limits in the WQS may be dependent on a stream's classification and its beneficial use as designated in the WQS (MDNR 2005a).

2.3.3 Discharge

Stream flow was measured using a Marsh-McBirney Model 2000 Flo-Mate current meter at each station during the fall sampling season. Stream flow was measured using a SonTek/YSI FlowTracker® flow meter at each station during the spring sampling season. Velocity and depth measurements were recorded at each station according to SOP MDNR-WQMS-113 Flow Measurement in Open Channels (MDNR 2003e).

3.0 Results and Analyses

3.1 Land Use

The land use data in Table 2 provides a comparison between the 14-digit hydrologic units covered within the study reach of the Hickory Creek Study and the Central Plains/Grand/Chariton EDU.

3.2 Stream Habitat Assessment

Scoring results of the habitat assessment are found in Table 3. Hickory Creek #1 scored 114 and Hickory Creek #2 scored 115, differing by only 1 point. These stations have comparable habitats and are expected to support comparable biological communities.

Table 3
Stream Habitat Assessment Scores and Percentage Comparison

Stations	SHAPP Scores
Hickory Creek #1	114
Hickory Creek #2	115

3.3 Biological Assessment and Macroinvertebrate Community Analyses

Tables 4 and 5 provide scoring criteria and results for the fall and spring index periods, respectively. MSCI scores were calculated by scoring station metrics against the appropriate Biological Criteria (BIOREF) scores located in the tables. An MSCI score of 16-20 results in an assignment of a fully supported biological community. Both Hickory Creek stations scored an MSCI score of fully supporting for both sampling seasons.

Table 4
Bioreference (BIOREF) Criteria Metric Scores, Biological Support Category, and
Macroinvertebrate Stream Condition Index (MSCI) Scores, Fall 2008

Stations	Sample No.	TR	EPTT	BI	SDI	MSCI	Support
Hickory Creek #1	0804084	76	13	7.1	3.32	20	Full
Hickory Creek #2	0804083	50	9	7.1	3.22	16	Full
BIOREF Score=5		>53	>9	<7.2	>2.69	20-16	Full
BIOREF Score=3		53-27	9-5	7.2-8.6	2.69-1.35	14-10	Partial
BIOREF Score=1		<27	<5	>8.6	<1.35	8-4	Non

MSCI Scoring Table (in light gray) developed from BIOREF streams (n = 18). TR=Taxa Richness;
EPTT=Ephemeroptera, Plecoptera, Trichoptera Taxa; BI=Biotic Index; SDI=Shannon Diversity Index

Table 5
Bioreference (BIOREF) Criteria Metric Scores, Biological Support Category, and
Macroinvertebrate Stream Condition Index (MSCI) Scores, Spring 2009

Stations	Sample No.	TR	EPTT	BI	SDI	MSCI	Support
Hickory Creek #1	0930037	53	9	7.3	2.96	18	Full
Hickory Creek #2	0930038	61	11	7.4	3.10	18	Full
BIOREF Score=5		>51	>8	<7.3	>2.53	20-16	Full
BIOREF Score=3		51-25	8-4	7.3- 8.7	2.53- 1.27	14-10	Partial
BIOREF Score=1		<25	<4	>8.7	< 1.27	8-4	Non

MSCI Scoring Table (in light gray) developed from BIOREF streams (n = 23). TR=Taxa Richness;
EPTT=Ephemeroptera, Plecoptera, Trichoptera Taxa; BI=Biotic Index; SDI=Shannon Diversity Index

The fall 2008 macroinvertebrate community analysis is shown in Table 6. Of the EPT taxa, both stations had Ephemeroptera and Trichoptera but lacked Plecoptera. Chironomidae was the most dominant family. Caenidae and Hydropsychidae were also abundant at the Hickory Creek stations.

Table 6
 Fall 2008 Macroinvertebrate Community Analysis

Station	Hickory Creek #1	Hickory Creek #2
% Ephemeroptera	30.5	24
% Plecoptera	0	0
% Trichoptera	9.6	8.7
Total EPT %	40.1	32.7
% Diptera	48.9	51.6
% Dominant Families		
Chironomidae	42.9	42.9
Caenidae	17.3	14.1
Hydropsychidae	9.4	8.7
Baetidae	6.8	5.1
Tubificidae	3.7	3.7
Enchytraeidae	1.9	5.5

The spring 2009 macroinvertebrate community analysis is shown in Table 7. Ephemeroptera and Trichoptera were present at both stations. Plecoptera were present at station #2. Chironomidae was the dominant family at the stations while Caenidae was the second most dominant family. Heptageniidae were also prevalent.

Table 7
 Spring 2009 Macroinvertebrate Community Analysis

Station	Hickory Creek #1	Hickory Creek #2
% Ephemeroptera	12.2	18.5
% Plecoptera	0	0.2
% Trichoptera	2.4	2.5
Total EPT %	14.6	21.2
% Diptera	80.8	68.8
% Dominant Families		
Chironomidae	76.5	64.7
Caenidae	6.4	8.8
Heptageniidae	4.1	6.9
Tubificidae	1.8	4.7
Baetidae	1.2	2.6

3.4 Physicochemical Water Parameters

Physicochemical results from both sampling seasons can be found in Tables 8 and 9. None of the physicochemical water quality results were elevated and most likely did not have an impact on the biological community during the study seasons.

Table 8
Fall 2008 Physicochemical Water Parameters

Parameters	Hickory Creek #1	Hickory Creek #2 ¹
Ammonia as N (mg/L)	0.03*	
Chloride (mg/L)	7.63	
Dissolved Oxygen (mg/L)	7.13	
Flow (cfs)	7.02	
pH (su)	7.72	
Specific Conductance (µS/cm)	318	
Temperature (°C)	18.9	
Turbidity (NTU)	50.7	
Nitrate+Nitrite as N (mg/L)	0.13	
Total Nitrogen (mg/L)	1.03	
Total Phosphorus (mg/L)	0.24	

* Below detectable limits

¹ Originally, the two Hickory Creek stations were set up to occur upstream and downstream of a low water crossing. Above average precipitation for the year 2008 resulted in the station upstream of the low water crossing being backed up and exhibiting characteristics of a lentic situation that extended several hundred yards upstream, close to the extent of the landowner whom we had permission to access the creek. However, this did not become apparent to us until after we'd entered the water downstream of the low water crossing to collect physicochemical samples. As a result, we determined it would be most beneficial to travel farther downstream in order to get 2 stations in the stream reach. This resulted in only one physicochemical sample during the fall sampling season

Table 9
Spring 2009 Physicochemical Water Parameters

Parameters	Hickory Creek #1	Hickory Creek #2
Ammonia as N (mg/L)	0.03*	0.03*
Chloride (mg/L)	9.18	9.75
Dissolved Oxygen (mg/L)	11.7	11.7
Flow (cfs)	6.75	6.75
pH (su)	8.40	8.20
Specific Conductance (µS/cm)	472	470
Temperature (°C)	10.0	11.2
Turbidity (NTU)	8.29	30.1
Nitrate+Nitrite as N (mg/L)	0.52	0.50
Non-Filterable Residue (mg/L)	11.0	14.0
Total Nitrogen (mg/L)	0.77	0.87
Total Phosphorus (mg/L)	0.01*	0.03*

* Below detectable limits

4.0 Discussion

During 2008, Missouri experienced above normal precipitation. The northwestern part of the state experienced several major flood events during the summer months, setting record rainfalls during the month of July. Although the area had experienced above normal precipitation, the channel flow status ranked in the low to mid range for both stations of Hickory Creek. The channel had areas exposed along the banks. The substrate consisted mostly of unconsolidated sand and was difficult to walk through.

Hickory Creek was characteristic of having a wide shallow channel consisting of expansive areas that could be considered run habitat. The study stream ranked low on the availability of epifaunal substrate. Neither site appeared to suffer from any form of channelization. Both stations ranked low on vegetative protection of the banks but had substantial riparian cover on either side of the stream.

As previously mentioned, a SHAPP was not conducted at a bioreference stream for habitat comparison. Had the macroinvertebrate community ranked as impaired, staff would have returned to the area and conducted a SHAPP on a bioreference stream in the EDU for further evaluation. However, the stream scored fully supporting, indicating the habitat was able to support a healthy aquatic community.

The macroinvertebrate data did not reveal any impairment in Hickory Creek during either sampling season. When compared to bioreference streams, Hickory Creek scored in the fully supporting range. There was little variation in the community make up during each sampling season for Hickory Creek. Dominant families were consistent between the study stations. Total EPT taxa ranged from 32.7% to 40.1% during the fall and 14.6% to 21.2% during the spring. Plecoptera were absent during the fall and were only found at station #2 during the spring.

The physicochemical data does not show any significant trends. All values were fairly consistent for each sampling season. It appears that physicochemical water quality did not affect the biological community during the study seasons.

Versar, Inc. conducted a bioassessment on Hickory Creek during spring 2006 and fall 2007 and determined the macroinvertebrate community to be impaired. Versar, Inc. recommended additional sampling. Versar, Inc. also noted low flow conditions and that much of the stream bed was dry. Field crews found extensive areas of dry stream beds. The most upstream site was only sampled during the spring due to the drought conditions. Several habitat issues were identified during Versar, Inc.'s study. Low flow conditions resulted in lack of available substrate, specifically woody debris and rootmat habitat. During this time the Midwest was suffering from an extended period of drought conditions. Since that time, the Midwest has experienced several years of abundant rainfall which provided a chance for the macroinvertebrate community to recover from the drought conditions. This has lead MSCI scores to score in the fully supporting category.

5.0 Conclusion

Three null hypotheses were stated in the introduction: 1) Habitat will not differ substantially among the Hickory Creek stations; 2) Macroinvertebrate assemblages will not differ substantially between longitudinally separate reaches of Hickory Creek; 3) Macroinvertebrate assemblages will not differ substantially between Hickory Creek and the bioreference streams in the Central Plains/Grand/Chariton EDU.

Null hypothesis #1 is accepted. The SHAPP scores for the two Hickory Creek stations differed by only 1 point. The habitat of the Hickory Creek stations is comparable.

Null hypothesis #2 is accepted. The Hickory Creek macroinvertebrate samples exhibited similar dominant taxa and had MSCI scores in the fully supporting category at both sampling stations during each sampling season.

Null hypothesis #3 is accepted. The macroinvertebrate community of the Hickory Creek stations ranked as fully supporting when compared to the bioreference streams for both sampling seasons and therefore, did not substantially differ from the MSCI calculated from the bioreference streams within the same EDU.

Overall, the bioassessment for Hickory Creek, WBID 442, suggests no biological impairment due to water quality. The MSCI scores of both Hickory Creek stations during both seasons were >16, indicating a healthy macroinvertebrate community when compared to the bioreference streams for that EDU. The physicochemical results revealed few definitive trends other than typical seasonal differences.

6.0 Literature Cited

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Appendix A

Invertebrate Database Bench Sheet Report
Hickory Creek, Daviess County
Grouped by Season and Station

Aquid Invertebrate Database Bench Sheet Report

Hickory Cr [0804084], Station #1, Sample Date: 9/25/2008 2:30:00 PM

NF = Nonflow; RM = Rootmat; SG = Woody Debris; -99 = Presence

ORDER: TAXA	NF	RM	SG
"HYDRACARINA"			
Acarina			1
AMPHIPODA			
Hyalella azteca	2	1	2
COLEOPTERA			
Dytiscidae	1		
Helichus basalis		1	
Scirtidae		1	
DIPTERA			
Ablabesmyia	1		
Ceratopogoninae	16	2	
Chaoborus	1		1
Chironomidae	4	1	3
Chironomus	10		2
Chrysops	2		
Cladotanytarsus	1		1
Corynoneura		1	
Cricotopus bicinctus	1	4	5
Cricotopus/Orthocladius			2
Cryptochironomus	5	1	
Cryptotendipes	1		
Dicrotendipes	4	2	22
Diptera	3		
Dolichopodidae	1		
Endochironomus		1	
Ephydriidae	1		
Glyptotendipes			1
Hydrobaenus	1		1
Labrundinia	1	2	
Mesosmittia	1		1
Nanocladius		1	6
Natarsia			1
Ormosia	1	2	
Paralauterborniella	2		
Paratanytarsus	18	16	8
Phaenopsectra	4	1	1
Polypedilum convictum		5	5
Polypedilum fallax grp	6	1	5
Polypedilum halterale grp	1		2
Polypedilum illinoense grp	2	8	1
Polypedilum scalaenum grp	3		1
Rheocricotopus	1		5
Rheotanytarsus	3	1	2
Saetheria	1	2	1
Simulium		11	6
Stempellinella	5		
Stictochironomus	1		
Tanytarsus	33	19	64

Aquid Invertebrate Database Bench Sheet Report
Hickory Cr [0804084], Station #1, Sample Date: 9/25/2008 2:30:00 PM
NF = Nonflow; RM = Rootmat; SG = Woody Debris; -99 = Presence

ORDER: TAXA	NF	RM	SG
Thienemanniella	1		2
Thienemannimyia grp.	2	9	21
Tipula		1	
Tipulidae			1
Tribelos	1		
Zavrelimyia	1		
EPHEMEROPTERA			
Acerpenna		3	
Baetis	2	23	23
Caenis latipennis	11	79	26
Caenis punctata	24	3	
Callibaetis		1	
Heptageniidae	2	3	
Hexagenia	2		
Leptophlebiidae	6	6	1
Pseudocloeon		4	
Stenacron	7	13	11
Stenonema femoratum	1		
HEMIPTERA			
Microvelia		4	
Neoplea		1	
Trepobates		1	
LIMNOPHILA			
Physella	1	4	
LUMBRICINA			
Lumbricina		1	1
ODONATA			
Argia		3	2
Calopteryx		4	
Enallagma	3	2	
Gomphidae	3		1
Macromia	2		
Nasiaeschna pentacantha		1	
TRICHOPTERA			
Cheumatopsyche	3	24	51
Ptilostomis		1	
TUBIFICIDA			
Enchytraeidae	3	12	1
Tubificidae	10	16	5

Aquid Invertebrate Database Bench Sheet Report
Hickory Cr [0804083], Station #2, Sample Date: 9/25/2008 12:40:00 PM
NF = Nonflow; RM = Rootmat; SG = Woody Debris; -99 = Presence

ORDER: TAXA	NF	RM	SG
AMPHIPODA			
Hyaella azteca		11	
COLEOPTERA			
Berosus	-99		1
Helichus lithophilus	-99	5	2
Neoporus	1	1	
Paracymus	1		
Scirtidae		1	
DIPTERA			
Ablabesmyia		2	
Ceratopogoninae	4		
Chironomidae		1	
Chrysops	1		
Cladotanytarsus			1
Corynoneura		2	
Cricotopus bicinctus		6	
Cricotopus/Orthocladus		3	5
Cryptochironomus	1	2	
Dicrotendipes	1		4
Forcipomyiinae			28
Hydrobaenus	1	3	2
Nanocladus	1	7	
Paratanytarsus	2	19	1
Phaenopsectra		5	
Polypedilum		1	1
Polypedilum convictum		8	
Polypedilum fallax grp		4	2
Polypedilum halterale grp	3	1	2
Polypedilum illinoense grp	1	8	
Rheocricotopus		8	1
Rheotanytarsus	1	2	1
Saetheria	4		
Simulium	1	9	1
Tanytarsus	2	42	14
Thienemanniella	2	11	
Thienemannimyia grp.	1	24	3
EPHEMEROPTERA			
Baetis	2	16	6
Caenis latipennis	5	62	4
Callibaetis		1	
Heptagenia	-99	2	4
Heptageniidae	2	2	
Leptophlebiidae		2	
Pseudocloeon			1
Stenacron		8	4
HEMIPTERA			
Microvelia			1
LIMNOPHILA			

Aquid Invertebrate Database Bench Sheet Report
Hickory Cr [0804083], Station #2, Sample Date: 9/25/2008 12:40:00 PM
NF = Nonflow; RM = Rootmat; SG = Woody Debris; -99 = Presence

ORDER: TAXA	NF	RM	SG
Physella		1	
LUMBRICINA			
Lumbricina		1	
ODONATA			
Argia		1	
Enallagma		1	
Progomphus obscurus	2	1	
TRICHOPTERA			
Cheumatopsyche	1	36	7
TUBIFICIDA			
Enchytraeidae	1	22	5
Tubificidae	5	5	9

Aquid Invertebrate Database Bench Sheet Report**Hickory Cr [0930037], Station #1, Sample Date: 4/8/2009 2:30:00 PM****NF = Nonflow; RM = Rootmat; SG = Woody Debris; -99 = Presence**

ORDER: TAXA	NF	RM	SG
AMPHIPODA			
Hyaella azteca	1	1	1
BRANCHIOBDELLIDA			
Branchiobdellida		1	
COLEOPTERA			
Gyrinus	1		
Helichus lithophilus		1	
Peltodytes	1		
Scirtidae			1
DIPTERA			
Ablabesmyia	2		
Ceratopogoninae	2		2
Chironomidae		1	1
Chrysops		-99	
Cricotopus bicinctus	5	24	7
Cricotopus/Orthocladius	9	30	34
Dicrotendipes	1	2	15
Diptera	15		
Endochironomus			1
Eukiefferiella		3	3
Glyptotendipes	1		2
Hydrobaenus	82	53	42
Nanocladius		1	1
Parametriocnemus	1	1	
Paratanytarsus	6	19	14
Phaenopsectra		2	4
Polypedilum convictum	1	23	17
Polypedilum fallax grp			1
Polypedilum halterale grp	6		3
Polypedilum illinoense grp	5	12	2
Polypedilum scalaenum grp	2		1
Rheocricotopus		1	1
Rheotanytarsus		8	13
Saetheria	8	1	
Simulium		6	10
Smittia		1	
Stenochironomus			10
Tanytarsus	2	32	39
Thienemanniella		3	
Thienemannimyia grp.	8	44	16
EPHEMEROPTERA			
Acerpenna		8	2
Caenis latipennis	9	34	9
Caenis punctata	1		
Heptagenia		22	10
Leptophlebia		3	
Stenacron			2
HEMIPTERA			

Aquid Invertebrate Database Bench Sheet Report
Hickory Cr [0930037], Station #1, Sample Date: 4/8/2009 2:30:00 PM
NF = Nonflow; RM = Rootmat; SG = Woody Debris; -99 = Presence

ORDER: TAXA	NF	RM	SG
Belostoma		-99	
ODONATA			
Argia			1
Calopteryx			-99
Enallagma		1	
Gomphidae	1	1	
TRICHOPTERA			
Cheumatopsyche		8	6
Isonychia		5	
Nectopsyche		1	
TUBIFICIDA			
Enchytraeidae		7	3
Limnodrilus hoffmeisteri	2	2	
Tubificidae	9		2

Aquid Invertebrate Database Bench Sheet Report

Hickory Cr [0930038], Station #2, Sample Date: 4/8/2009 3:45:00 PM

NF = Nonflow; RM = Rootmat; SG = Woody Debris; -99 = Presence

ORDER: TAXA	NF	RM	SG
AMPHIPODA			
Crangonyx			1
Hyaella azteca	1	1	
COLEOPTERA			
Helichus basalis		1	
Helichus lithophilus	1		
Heterosternuta	1		
DECAPODA			
Cambarus diogenes		-99	
Orconectes virilis	1		
DIPTERA			
Ablabesmyia	4	1	
Ceratopogoninae	5	1	
Chironomidae		1	
Cricotopus bicinctus	3	16	4
Cricotopus/Orthocladius	3	44	11
Cryptochironomus	1		
Dicrotendipes	2		
Diplocladius	1		
Diptera	7	1	
Dolichopodidae	2	1	
Ephydriidae	1		
Eukiefferiella			1
Glyptotendipes	1	1	
Hydrobaenus	72	59	19
Labrundinia	1	1	
Nanocladius	1	1	
Paratanytarsus	13	11	
Phaenopsectra	2	3	
Polypedilum convictum	2	9	
Polypedilum fallax grp		1	
Polypedilum halterale grp	16		
Polypedilum illinoense grp	7	7	6
Rheotanytarsus	6	14	
Saetheria	9	2	
Simulium	3	3	2
Smittia	1		
Stenochironomus			1
Stictochironomus	1		
Tabanus	2		
Tanytarsus	16	17	
Thienemanniella	1	2	
Thienemannimyia grp.	15	25	
Zavrelimyia	3	1	
EPHEMEROPTERA			
Acerpenna	2	14	2
Caenis latipennis	23	30	2
Caenis punctata	5		

Aquid Invertebrate Database Bench Sheet Report
Hickory Cr [0930038], Station #2, Sample Date: 4/8/2009 3:45:00 PM
NF = Nonflow; RM = Rootmat; SG = Woody Debris; -99 = Presence

ORDER: TAXA	NF	RM	SG
Heptagenia	16	21	6
Leptophlebia		1	
Stenacron		2	1
Stenonema femoratum	1		
HEMIPTERA			
Microvelia		1	
LIMNOPHILA			
Physella	1		
ODONATA			
Calopteryx	1	-99	
Enallagma		6	
Gomphus	1		
Ischnura	-99		
Progomphus obscurus	4		
PLECOPTERA			
Perlesta	1	1	
TRICHOPTERA			
Cheumatopsyche	7	5	
Isonychia	1	3	
Ptilostomis	1		
TUBIFICIDA			
Enchytraeidae	11	2	
Limnodrilus hoffmeisteri	8		
Tubificidae	24		