City of Columbia

701 East Broadway, Columbia, Missouri 65201

Agenda Item Number: REP 82-14
Department Source: Public Works
To: City Council
From: City Manager & Staff
Council Meeting Date: September 2, 2014
Re: Reports Related to Hinkson Creek Collaborative Adaptive Management Process

Documents Included With This Agenda Item

Council memo
Supporting documentation includes: Hinkson Creek Macroinvertebrate Community Assessment Year 2; and Adaptive Management Progress Report 2012-2013

Executive Summary

The Missouri Department of Natural Resources (MDNR) has released the attached Hinkson Creek Macroinvertebrate Community Assessment for Year 2, that includes Spring 2013. MDNR reported that in Spring 2013, seven (7) of the eleven (11) sampling sites on the Hinkson Creek were fully supporting aquatic life.

Also attached is the Adaptive Management Progress Report presented by the Collaborative Adaptive Management Stakeholder Group, to the Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources. The report was presented on July 9, 2014, at the City of Columbia's 3M Hinkson Creek and Flat Branch Wetlands Pavilion.

Discussion

In Spring 2012, a five-party Collaborative Adaptive Management Agreement was negotiated to settle the Hinkson Creek TMDL (Total Maximum Daily Load) litigation. The parties include the City of Columbia, Boone County, the University of Missouri (partners in the local MS4 permit – municipal separate storm sewer system), the United States Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (MDNR).

According to the agreement, MDNR agreed to provide sampling and analysis of the eleven (11) sampling locations previously sampled for the TMDL. Per the agreement, macroinvertebrate and water quality sampling will be conducted each year in the spring, and the fall, for a three (3) year period at MDNR's expense. MDNR conducted both samples in 2012 and only a Spring sample in 2013. The report discusses the 2013 sampling periods.

Spring 2013 was the first season that MDNR was able to sample all 11 sites in a season. The samples were collected on three separate occasions with some samples being impacted by storm flows, and the first and last sampling being separated by a period of approximately one month. Water quality parameters were generally higher in Hinkson Creek than in the reference portions of Bonne Femme Creek, but none exceeded Water Quality Standards. Chloride and sulfate concentrations were discussed in the report. Both Fall 2012, and Fall 2013, were periods of extreme drought for the watershed. Consequently, the Fall 2012 had only one (1) of eight (8) sites attain a fully supporting aquatic life status, and three sites were unable to be sampled due to lack of water. Thus, MDNR decided that similar conditions in Fall 2013 "were not conducive to an accurate assessment of water quality; therefore, the fall 2013 HC (Hinkson Creek) sampling was canceled."

The Macroinvertebrate Stream Condition Index (MSCI) is considered an important indicator of stream health. MCSI scores of 16-20 qualify as fully supporting, 10-14 are partially supporting, and 4-8 are considered non-supporting, of the protection of warm water aquatic life beneficial use designation as specified in the Missouri Water Quality Standards. Table 7 of the attached report shows that results of all samples collected in Hinkson Creek by MDNR since 2001 have been partially or fully supporting of aquatic life. The current report shows seven (7) of the eleven (11) sites are fully supporting with a score of 16. The most upstream sampling location at Rogers Road was partially supporting with a score of 14. The most downstream three (3) sampling stations at Forum, Twin Lakes and Scott Boulevard were partially supporting with scores of 10, 14, and 12, respectively. The urban and rural portions of the study reach did not exhibit any distinct differences in the biological metrics. The downstream three (3) stations, however, have more notable biological metric differences than the other stations. The Science Team and Action Teams have been discussing the lower portion of the Hinkson Creek and are looking to the forthcoming Physical Habitat Assessment by Dr. Jason Hubbart, to determine if that portion of the Creek is different enough from the remaining portions of the stream that its reference characteristic should also be different.

Also of note in this report is that the biological criteria for the larger Ozark/Moreau/Lourtre watershed (of which Hinkson Creek belongs) changed "based on more samples over a wider range of years compared to those available during the earlier bioassessments." This means that MDNR revised downward some MCSI scores that were used to evaluate the Hinkson Creek during the TMDL process. None of the recent scores changed. Recommendations generally include continuing work of the MS4 partners and actions initiated by the Collaborative Adaptive Management process.

According to the five-party agreement, the MS4 Permit holders and Collaborative Adaptive Management Stakeholders group are to provide a periodic report summarizing the activities of the Stakeholder Committee. The 2012-2013 Adaptive Management report is attached and the website link as follows: <u>2012-2013 Adaptive Management Progress Report</u>

The progress report summarizes the activities of the Stakeholder group and includes presentations and reports, field trips, actions, and status of those actions. Each item has website links to the information provided to the Stakeholders. The actions approved by the Stakeholder Group, include two phases of a Physical Habitat Assessment of Hinkson Creek and the Forum Level Spreader project.

The Physical Habitat Assessment includes a geographical information system (GIS) assessment of Hinkson Creek data resulting in an online viewer showing the data that was collected and analyzed. The second phase of the Physical Habitat Assessment is a field investigation being conducted by Dr. Jason Hubbart and his students, evaluating the physical on-site conditions and habitat. Anticipated completion of field data collection is late summer of 2014, with a final report by the end of 2014. The Forum Level

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Spreader project is complete and successfully reconnects stormwater runoff to the adjacent flood plain. In the next year, a monitoring plan will be implemented to determine the water quality impacts of the project.

Positive sampling results and beneficial early actions by the Stakeholder group will continue to build support for Hinkson Creek and water quality improvements. The five-party Collaborative Adaptive Management agreement is functioning. Results so far are positive, leading to the ultimate goals of improving water quality in Hinkson Creek and completing and terminating the legal agreement with EPA and MDNR.

Fiscal Impact

Short-Term Impact: None with this report.
Long-Term Impact: None

Vision, Strategic & Comprehensive Plan Impact

Vision Impact: Development, Environment, Governance and Decision Making
Strategic Plan Impact: Health, Safety and Wellbeing, Infrastructure
Comprehensive Plan Impact: Environmental Management, Infrastructure

Suggested Council Action

For information only.

Legislative History

7/09/14 - Public presentation of Adaptive Management Progress Report to EPA and MDNR
4/01/13 - (Ord 21646) Authorizing an intergovernmental cooperation agreement with Boone County and UMC as it relates to the Hinkson Creek Collaborative Adaptive Management (CAM) process
4/16/12 - (Ord 21291) Authorizing a collaborative adaptive management (CAM) implementation schedule and agreement for Hinkson Creek TMDL

Department Approved

City Manager Approved

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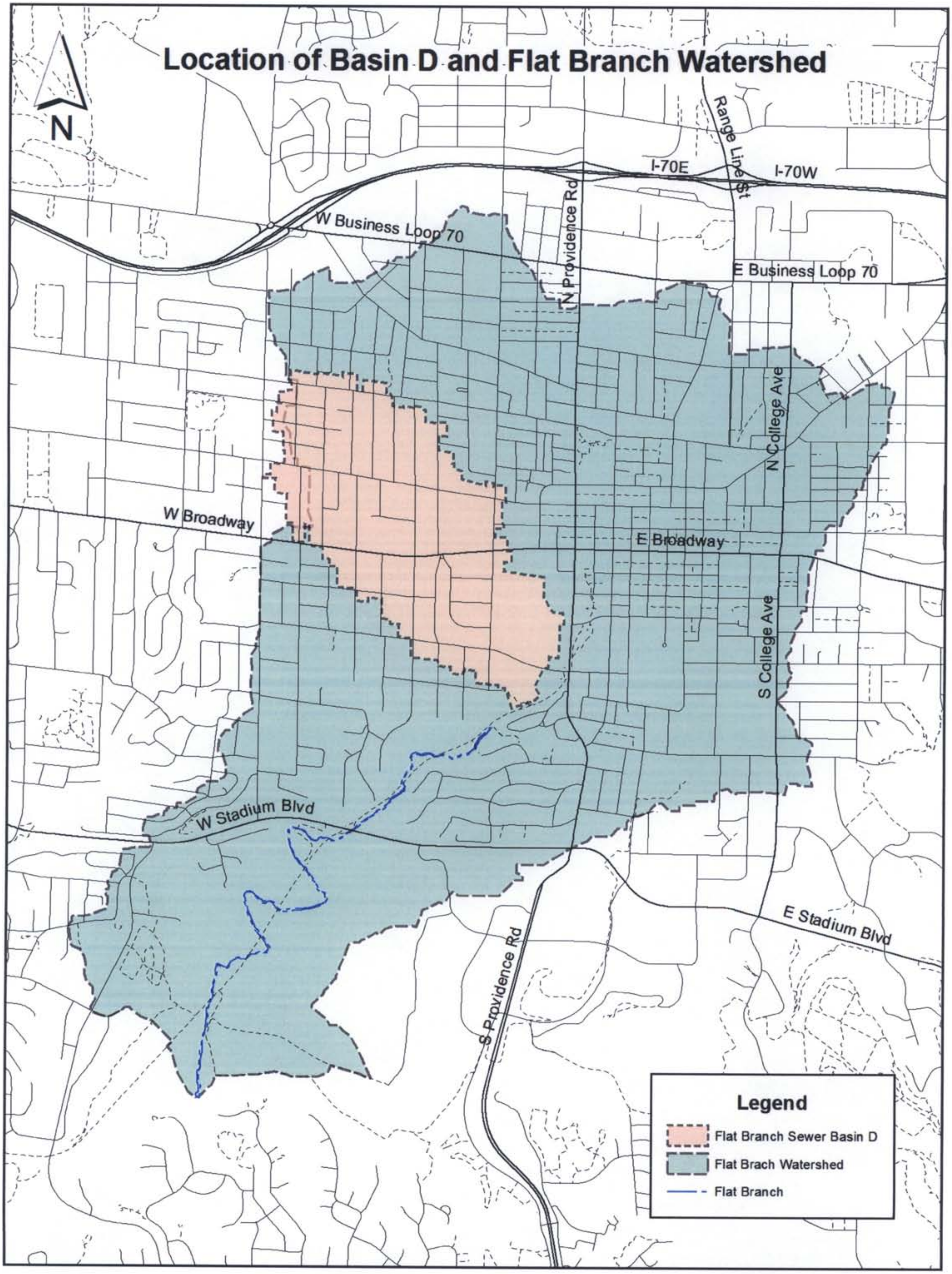
SUPPORTING DOCUMENTS INCLUDED WITH THIS AGENDA ITEM ARE AS FOLLOWS:

Hinkson Creek Macroinvertebrate Community Assessment Year 2
Adaptive Management Progress Report 2012-2013



Location of Basin D and Flat Branch Watershed
N
Range Line St
I-70E
I-70W
N Providence Rd
W Business Loop 70
E Business Loop 70
N College Ave
W Broadway
E Broadway
S College Ave
W Stadium Blvd
E Stadium Blvd
S Providence Rd
Legend
Flat Branch Sewer Basin D
Flat Brach Watershed
Flat Branch

Boone County Hinkson Creek

Adaptive Management Progress Report

CAM Stakeholder Committee
2012-2013

Committee Members:
Shawn Grindstaff, CAM Facilitator EPA

Diane Oerly
Don Stamper
Frank Gordon
Jeanine Pagan
Joe Engeln
Gary Ward
Karen M. Miller
Paul Land
Ben Londeree
Nathan Odle
Paul Mehrle
Jay Turner
Hank Ottinger
Barbara Hoppe
Jonathon Sessions

Hinkson Creek Adaptive Management Progress Report

March, 2014

Introduction. The Collaborative Adaptive Management (CAM) Stakeholders Group has met on 18 occasions and taken three field trips since its formation. Initially, efforts were directed at a legal, environmental and economic familiarization with the issue at hand and the process by which the group will progress. This encompassed a vigorous and wide-ranging exchange of ideas and expectations, a long list of significant "hotspots" that impinge on water quality, and a vision for the future of Hinkson Creek.

Following a thorough orientation to the CAM process (11/05/11), the group officially began its mission on April 30, 2012, solicited and heard a number of reports and presentations, conducted field trips, and approved several actions aimed at improving the aquatic quality of Hinkson Creek. CAM Fact sheet- http://www.helpthehinkson.org/documents/2012-03-28HinksonCreekCAMfactsheet.pdf

I. Presentations and Reports.

A. Dave Michaelson (MDNR): Overview of DNR Data and Assessment on the Hinkson. 08/01/12. http://www.helpthehinkson.org/CAMStakeholders.htm

B. Jason Hubbart, Professor of Forestry at University of Missouri –Columbia: Research Overview of the Hinkson. 08-01-12. See http://www.helpthehinkson.org/CAMStakeholders.htm

C. Georganne Bowman, Storm Water Coordinator, Boone County: A Virtual Tour of Hinkson Creek. 08/29/12 See: http://helpthehinkson.org/documents/HinksonCrvirtualtour.pdf

D. Gary Ward, Associate Vice Chancellor of Campus Facilities: A Summary of the Missouri University Master Plan (as it relates to the Hinkson). 03/07/13. See http://helpthehinkson.org/documents/HinksonCrvirtualtour.pdf

E. Action Team: Website Timeline of Major Events Related to the Hinkson (06/11/13) See http://helpthehinkson.org/timeline-assets/timeline.html#!date=1996-04-21_20:25:18!

F. Robb Jacobson, Branch Chief, USGS: Overview of Sampling Data. 09/26/13. See http://www.helpthehinkson.org/Presentations-Reports/09-26-13%20Spatial%20variation%20of%20habitat%20-%20Hinkson.pdf

G. Jason Warzinik, Boone County GIS Manager: MoRap Stream Assessment Demonstration. 12/09/13. See http://maps.showmeboone.com/viewers/Flex_Viewers/RM_Hinkson_GIS_Technical_Report_Final_2013

II. Field Trips.

A. May 9, 2013. Stakeholders and representatives from the city and county toured various sections of the Hinkson Creek watershed, noting erosion and flow patterns, nearby development impacts, and monitoring stations.

B. October 29, 2013. A tour of Best Management Practices in the Hinkson watershed, including detention facilities at Battle High School and Sunrise Estates, a fire station water garden, and a University of Missouri project that buffers storm water from a parking area.

C. November 12, 2013. Invertebrate Sampling Demonstration by Dave Michaelson off Recreation Drive at the University of Missouri.

III. Actions.

A. September 18, 2012. Phase 1 of the GIS Habitat Assessment was approved by consensus as the highest priority at this time to give us an understanding about the hydrology and the stream morphology.

B. October 17, 2012. Following a discussion of possible projects, the group unanimously approved by voice vote a request to the city staff to develop a proposal for the Forum Nature Area storm water detention project.

C. November 1, 2012. A motion to endorse the second phase of the Habitat Assessment Survey passed unanimously on a voice vote.

D. January 31, 2013. A motion to support the Forum Nature Area Level Spreader Project (with a five-year monitoring requirement) passed unanimously on a voice vote. http://www.helpthehinkson.org/documents/ProjectProposal1.pdf

IV. Status of Actions.

A. First Phase of Physical Habitat Assessment. Missouri Resource Assessment Partnership (MoRAP) developed the requested Geographical Information Systems (GIS) data sets. MoRAP presented data and final report to the Stakeholders at the September 26, 2013 meeting. http://helpthehinkson.org/Presentations-Reports/07-31-13%20Hinkson%20GIS%20Technical%20Report%20Final%202013.pdf

B. First Phase of Physical Habitat Assessment. Boone County owns the MoRAP data. Boone County GIS office prepared a map viewer for CAM members and public to interact with data from MoRAP report. The Boone County GIS office presented the first version of the map viewer to the Stakeholders at the December 9, 2013 meeting. Based on suggestions, Boone County will revise the map viewer in 2014. (Link in item I.G. of this report.)

C. Second Phase of Physical Habitat Assessment. Field investigation commenced in 2013. Approximately 25.6% of the stations to be evaluated were completed by December 31, 2013; this includes the section of Hinkson Creek from Forum Boulevard to Interstate 70. Anticipated completion of data collection is late summer 2014 with a final report by the end of 2014.

D. Forum Level Spreader. Project approvals and design was completed by December 2013. Construction anticipated in early 2014. http://helpthehinkson.org/images/ConceptPlan.jpg

V. Conclusion: A foundation has been established for implementing positive early action. Current early actions are beneficial and build support and awareness of the CAM process within the community. Opportunities for additional actions are being developed and will be implemented as funding is appropriated.

Missouri Department of Natural Resources

Biological Assessment Report

Hinkson Creek Macroinvertebrate Community Assessment
Year 2: Spring 2013

Boone County, Missouri

Prepared for:

Missouri Department of Natural Resources
Division of Environmental Quality
Water Protection Program
Water Pollution Branch

Prepared by:

Missouri Department of Natural Resources
Division of Environmental Quality
Environmental Services Program
Water Quality Monitoring Section

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1.0 Introduction

In 1998 the Missouri Department of Natural Resources (**MDNR**) placed approximately 14 miles of Hinkson Creek (**HC**) on its list of impaired waters designated under Section 303(d) of the Clean Water Act. In the Total Maximum Daily Load (**TMDL**) document prepared for this watershed, the pollutant(s) causing the impairment were listed as unknown, and the sources of this pollution were listed as "urban runoff" and "urban nonpoint source" (United States Environmental Protection Agency [**USEPA**] 2011). As an alternative to the strict adherence to the requirements outlined in the TMDL, a collaborative adaptive management plan was developed among the stakeholders that included the city of Columbia, Boone County, the University of Missouri-Columbia, Region VII of the USEPA, MDNR, and other entities. As a partner in the collaborative adaptive management process, MDNR agreed to conduct a three-year biological study of HC beginning in 2012.

Agricultural and urban land uses (separated by Interstate 70) predominate in the HC watershed. These land uses have likely resulted in increased sedimentation in the system, removal of riparian buffer vegetation, and alteration of the natural hydrology of the stream (Lenat and Crawford 1994; Paul and Meyer 2001). Several studies of the physical, chemical, and biological conditions of the creek have presented evidence of stream degradation in various segments of the stream (Parris 2000; MDNR 2002, 2004, 2005, 2006; Nichols 2012). In 34 macroinvertebrate samples collected from HC between fall 2001 and spring 2006, 14 were classified as only partially supporting of aquatic life. The majority of these (12 of 14, or 86%) were collected in the portion of the stream downstream of the Interstate 70 crossing to the Columbia city limit just downstream of the Scott Boulevard crossing. These samples represent the subset of the HC macroinvertebrate community considered to be within an urban setting; upstream of the Interstate 70 crossing the creek is within a rural (primarily agricultural) setting.

2.0 Study Area

The geographical relationship of HC, Bonne Femme Creek (**BFC**), and their locations relative to the city of Columbia are illustrated in Figure 1. HC originates northeast of Hallsville in Boone County and flows approximately 26 miles in a southwesterly direction to its entrance into Perche Creek (Figure 1). It is classified as a permanent stream for the lower six miles and an intermittent stream upstream of the Highway 163 (Providence Road) crossing. Land use in the approximately 89-square-mile watershed is 20.7% urban, 11.5% cropland, 38.2% grassland, and 26.9% forest, with the remainder consisting of open water and barren surfaces (MoRAP 2005). HC is considered a Missouri Ozark border stream and is in the transitional zone between the Glaciated Plains to the north and the Ozark Highlands to the south (Thom and Wilson 1980). It is located in the Ozark/Moreau/Loutre ecological drainage unit (**EDU**). Thus, its bioassessment results were compared to reference streams considered to represent the best attainable biological conditions of this EDU.

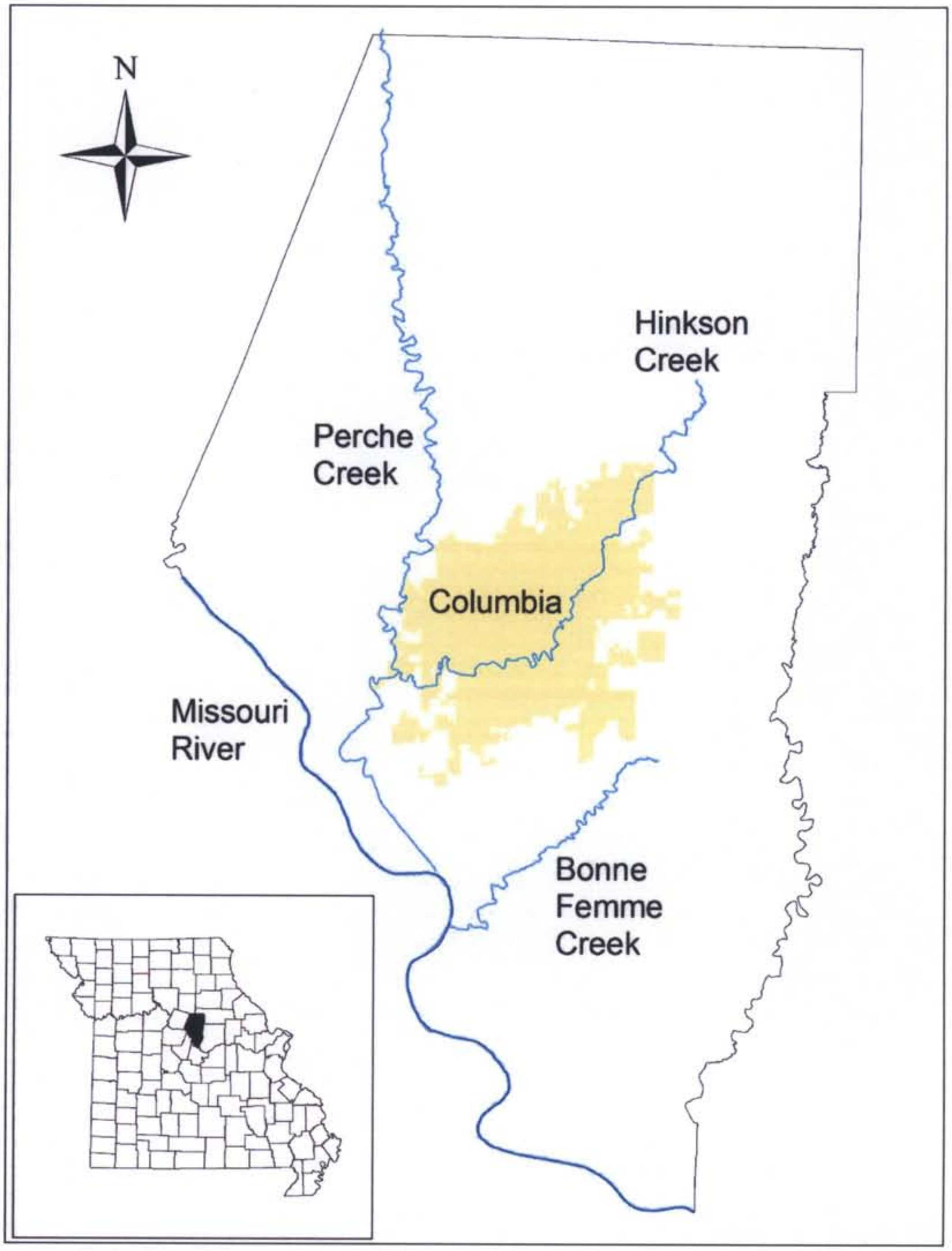

Figure 1. General study area.

HC Station #5.5 (NE ¼ sec. 18, T. 48 N., R. 12 W.) was located downstream of the Green Valley Drive bridge (just south of Broadway Street). Geographic coordinates of the upstream terminus of the station were UTME 560081, UTMN 4311180.

HC Station #6 (SW ¼ sec. 8, T. 48 N., R. 12 W.) was located in the vicinity of the East Walnut Street bridge. Geographic coordinates near the upstream terminus of the station were UTME 560767, UTMN 4312309.

HC Station #6.5 (SE ¼ sec. 5, T. 48 N., R. 12 W.) was located upstream of the Highway 63 connector (upstream of the trailer park east of the connector and behind Home Depot). Geographic coordinates in the downstream portion of the station were UTME 561861, UTMN 4313714.

HC Station #7 (NW ¼ sec. 27, T. 49 N., R. 12 W.) was located upstream of the Hinkson Creek Road/Wyatt Lane bridge. Geographic coordinates at the upstream terminus of the station were UTME 564140, UTMN 4317670.

HC Station #8 (SE ¼ sec. 15, T. 49 N., R. 12 W.) was located downstream of the Rogers Road bridge. Geographic coordinates at the downstream terminus of the station were UTME 565212, UTMN 4319627.

BFC Station #1 (SE ¼ sec. 25, T. 47 N., R. 13 W.) was located downstream of the Nashville Church Road bridge (Figure 3). Geographic coordinates at the upstream terminus of the station were UTME 558176, UTMN 4297283.

BFC Station #2 (SW ¼ sec. 30, T. 47 N., R. 12 W.) was located upstream of the Nashville Church Road bridge. Geographic coordinates at the downstream terminus of the station were UTME 558519, UTMN 4297449.

4.0 Methods

4.1 Macroinvertebrate Collection and Analyses

Samples for this study were collected on three separate occasions in the spring of 2013. The two BFC stations were sampled on March 19, 2013, but HC was experiencing higher flow and turbidity than desirable. A second attempt to sample HC was made on April 10, 2013, but heavy rains and rising water allowed for only Stations 1 and 2 to be completed. Periodic rain events and flooding prevented the remaining stations from being sampled until April 22, 2013. Carl Wakefield, Sam McCord, and Dave Michaelson collected HC macroinvertebrate samples, and Mike Irwin collected water chemistry grab samples. Brandy Bergthold and Carl Wakefield collected macroinvertebrate samples from BFC; Carl Wakefield collected the water chemistry samples. A standardized sample collection

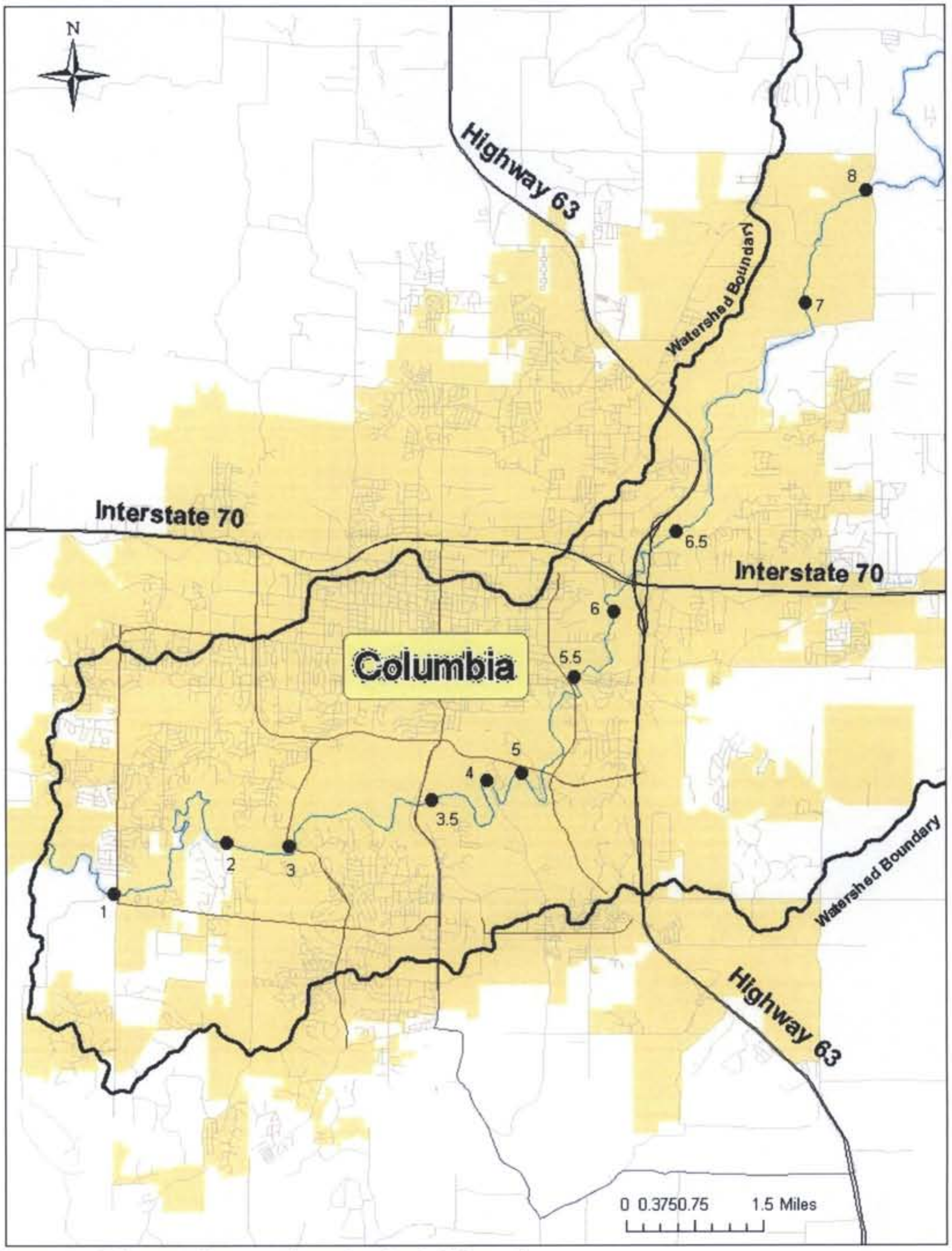

Figure 2. HC sampling stations for the 2013 study.

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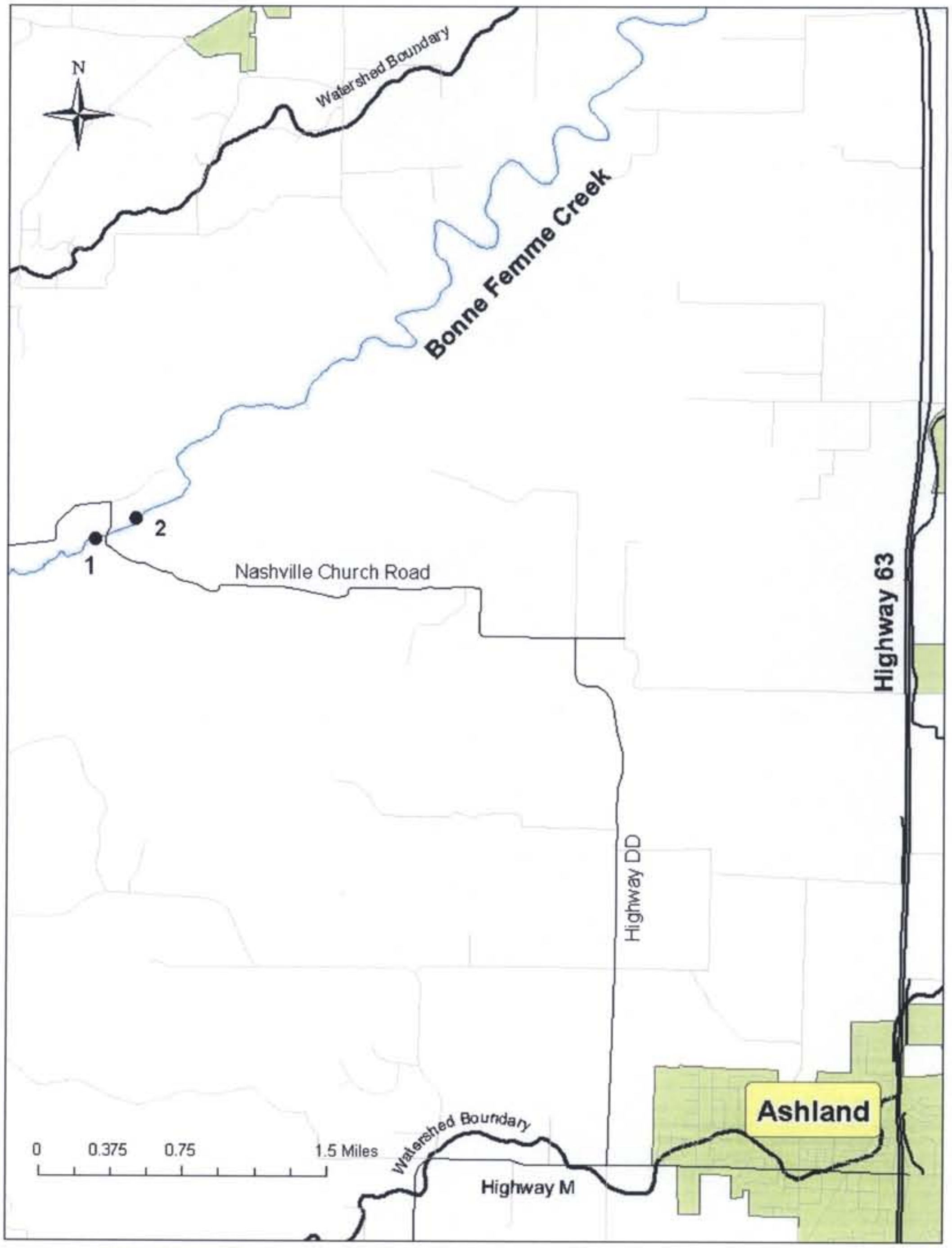

Figure 3. BFC sampling stations for the 2013 study.

procedure was followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure (**SMSBPP**) (MDNR 2012a). Three standard habitats—flowing water over coarse substrate (riffles and runs), depositional substrate in non-flowing water (pools), and rootmat at the stream edge—were sampled at all locations when available.

Although numerous high water events occurred during the spring sample season, the fall season was hampered by drought. Very little rainfall occurred after the first part of July 2013, which resulted in isolated pools throughout much of the HC study reach. It was decided that these conditions were not conducive to an accurate assessment of water quality; therefore, the fall 2013 HC sampling was canceled.

Laboratory processing was consistent with the description in the SMSBPP (MDNR 2012a). Each sample was processed under 10x magnification to remove a habitat-specific target number of individuals from debris. Individuals were identified to standard taxonomic levels (MDNR 2010e) and enumerated.

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**). These metrics were scored and combined to form the Macroinvertebrate Stream Condition Index (**MSCI**). MSCI scores of 16-20 qualify as fully supporting, 10-14 are partially supporting, and 4-8 are considered non-supporting of the protection of warm water aquatic life beneficial use designation as specified in the Missouri Water Quality Standards (MDNR 2014). The macroinvertebrate data, separated by habitat, are included in Appendix A as laboratory bench sheets.

Macroinvertebrate data were examined in the following ways: 1) longitudinal comparisons were made among HC reaches to address differences between rural (Stations 6.5, 7, and 8) and urban (Stations 1-6) segments of the creek; 2) rural and urban HC stations were compared to BFC stations; and 3) data from HC stations sampled in 2013 were compared to those obtained from HC in previous years.

4.2 Physicochemical Data Collection and Analysis

During each survey period, *in situ* water quality measurements were collected at all stations. At BFC, measurements were taken at a single site between the two longitudinally adjacent macroinvertebrate survey stations. Water quality parameters were measured *in-situ* or collected and returned for analyses at the state environmental laboratory. Temperature (^{o}C) (MDNR 2010c), pH (MDNR 2012c), specific conductance (μS/cm) (MDNR 2010d), and dissolved oxygen (mg/L) (MDNR 2012d) were measured in the field. Turbidity (NTU) (MDNR 2010b) was measured and recorded in the Environmental Services Program (**ESP**), Water Quality Monitoring Section (**WQMS**) biology laboratory. Additionally, water samples were collected and analyzed by ESP's Chemical Analysis Section for chloride, total phosphorus (**TP**), ammonia-N, nitrite+nitrate-N **(NO_2+NO_3-N)**, total nitrogen **(TN)**, and non-filterable residue (all parameters reported in mg/L). Procedures outlined in Field Sheet and Chain-of-Custody Record (MDNR 2010a) and Required/Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations (MDNR 2011) were followed when collecting water quality samples.

Stream velocity was measured at each station where practicable during the study using a Marsh-McBirney Flo-Mate™ Model 2000 flow meter. Discharge was calculated per the methods in the Standard Operating Procedure MDNR-ESP-113, Flow Measurement in Open Channels (MDNR 2013b).

Physicochemical data were summarized and presented in tabular form for comparison among HC stations and also for comparison between Hinkson and BFC stations.

4.3 Quality Assurance/Quality Control (QA/QC)

4.3.1 Field Meters

All field meters used to collect water quality parameters were maintained in accordance with the Standard Operating Procedure MDNR-ESP-213, QC Procedures for Checking Water Quality Field Instruments (MDNR 2010f).

4.3.2 Biological Samples

Steps to assure accuracy of organism removal from sample debris were performed consistent with those methods found in the SMSBPP document (MDNR 2012a).

4.3.3 Biological Data Entry

All macroinvertebrate data were entered into the WQMS macroinvertebrate database consistent with the Standard Operating Procedure MDNR-ESP-214, QC Procedures for Data Processing (MDNR 2012b).

5.0 Results

5.1 Physicochemical Data

Stream flow and *in situ* water quality data for this study are presented in Table 1. HC Stations 1 and 2 were sampled on April 10, 2013, during heavy rains and rising water levels. The remaining stations upstream all were sampled on April 22 following several days of stable weather. During the second round of sampling, discharge generally increased from upstream to downstream HC stations. Temperature tended to increase from downstream to upstream, which likely corresponds to the time of day samples were collected (i.e., increasing from morning to afternoon). Unlike temperature, dissolved oxygen remained relatively stable among HC stations despite the time of day. Dissolved oxygen concentrations collected on April 10 at Stations 1 and 2 were lower than Stations 3 through 8, which were collected nearly two weeks later. An opposite pattern exists with conductivity readings. Conductivity was slightly higher for Stations 1 and 2. Among the remaining stations, conductivity tended to decrease from downstream to upstream stations. As flow increased from Station 1 to Station 2, turbidity responded similarly. Although there was some variability in turbidity among the stations sampled on April 22, there did not appear to be a longitudinal trend. The most notable differences between the Hinkson and BFC water quality variables were for temperature and turbidity. Given that the BFC sample was collected much earlier in the sample season, it is not surprising that the temperature difference between systems is so large. Regarding turbidity, BFC was sampled near spring base flow conditions. HC, however, had experienced several elevated flow events even prior to the April 10 sample collection at Station 1, which may have contributed to the higher turbidity values.

Table 1
Spring 2013 Flow and *In situ* Water Quality Measurements

	Parameter					
Station	Flow (cfs)	Temperature (˚C)	Dissolved O_2 (mg/L)	Conductivity (µS/cm)	pH	Turbidity (NTU)
HC 8	16.9	16.6	10.02	299	8.0	18.4
HC 7	17.0	16.2	10.07	334	8.0	16.4
HC 6.5	28.4	16.9	10.27	384	8.2	13.9
HC 6	35.0	15.7	10.49	403	8.3	13.8
HC 5.5	31.0	15.6	10.79	418	8.3	14.0
HC 5	40.4	14.4	10.64	418	8.4	17.8
HC 4	51.2	13.4	10.74	439	8.3	13.6
HC 3.5	51.1	12.3	9.88	451	8.0	13.9
HC 3	65.3	12.3	9.48	471	7.9	14.5
HC 2	107.1	16.1	7.37	582	7.9	17.5
HC 1	40.9	17.4	7.80	538	8.0	7.81
BFC 1	6.8	5.6	11.53	339	7.3	2.54

Nutrient and chloride concentrations are presented in Table 2; additional water chemistry parameters are presented in Table 3. Nutrient parameters were present in detectable concentrations at each of the Hinkson and BFC stations, with the exception that ammonia was below detectable levels at BFC. Ammonia concentrations were nearly identical among the middle HC reach stations (3.5 upstream to 6.5). Ammonia was higher at Stations 1 to 3 as well as Stations 7 and 8. These concentrations were very similar to one another, despite being at opposite extremes of the study reach. None of the ammonia concentrations, however, exceeded Missouri Water Quality Standards' chronic criteria threshold (MDNR 2014). The remaining nutrient parameters were unremarkable, with the exception that NO_2+NO_3-N and total nitrogen were substantially lower at Station 1 compared to the remaining upstream sites. For these stations, NO_2+NO_3-N and total nitrogen were mostly similar to one another. Chloride concentrations tended to decrease from downstream to upstream stations. An exception was Station 2, in which chloride was 1.6 times higher than Station 1. Station 2 also had the highest non-filterable residue (total suspended solids) concentration of the study, being more than three times higher than the next nearest reading. Given the rising water levels at the time Station 2 samples were collected, it is not surprising that the non-filterable residue concentrations were so much higher than the remaining sites. Unlike chloride and non-filterable residue, which appeared to increase in response to higher flow, sulfate was highest in the sample collected at Station 1 before HC started to rise. Sulfate concentrations at Station 1 were more than double that of any of the remaining upstream stations.

Compared to HC, several BFC water quality parameters were present in considerably lower levels. Ammonia and non-filterable residue concentrations were below detectable levels at BFC. Turbidity was a fraction of even the lowest HC reading. The lowest HC sulfate concentration was four times higher than the BFC reading. Among nutrients, NO_2+NO_3-N was slightly higher at BFC, but the remaining nutrient parameters either were similar to (TN, TP) or lower than (NH_3-N) HC.

Table 2
Spring 2013 Nutrient and Chloride Concentrations

	Parameter (mg/L)				
Station	NH_3-N	NO_2+NO_3-N	Total Nitrogen	Total Phosphorus	Chloride
HC 8	0.11	0.44	0.87	0.060	9.12
HC 7	0.13	0.44	0.91	0.074	10.4
HC 6.5	0.092	0.44	0.88	0.059	14.2
HC 6	0.083	0.44	0.87	0.060	17.3
HC 5.5	0.088	0.43	0.88	0.070	18.8
HC 5	0.088	0.48	0.96	0.087	20.3
HC 4	0.082	0.43	0.83	0.063	22.3
HC 3.5	0.084	0.47	0.88	0.082	23.3
HC 3	0.12	0.50	0.95	0.071	27.9
HC 2	0.17	0.26	0.97	0.097	73.3
HC 1	0.11	0.02	0.46	0.054	45.4
BFC 1	0.030*	0.67	0.78	0.05	19.0

*Estimated value, detected below Practical Quantitation Limits

Table 3
Hinkson and Bonne Femme Creek Spring 2013 Water Chemistry Parameters

	Parameter (mg/L)				
Station	Calcium	Magnesium	Hardness	Sulfate	TSS
HC 8	42.9	7.14	137	64.2	15.0
HC 7	48.6	7.76	153	74.9	13.0
HC 6.5	57.3	8.54	178	84.6	13.0
HC 6	59.8	8.38	184	86.5	13.0
HC 5.5	62.1	8.81	191	87.9	14.0
HC 5	62.5	8.52	191	83.5	16.0
HC 4	66.4	8.63	201	82.6	12.0
HC 3.5	69.2	8.81	209	81.2	14.0
HC 3	70.1	8.76	211	79.2	15.0
HC 2	60.4	10.1	192	82.6	59.0
HC 1	70.5	10.7	220	180*	19.0
BFC 1	62.0	5.94	179	15.6	<5**

*Sample was diluted during analysis
**Below detectable limits

5.2 Biological Assessment

5.2.1 Hinkson Creek Longitudinal Comparison

Completion of both 2012 sample seasons was prevented by a toxic release in the Flat Branch watershed in the spring and a severe drought in the fall. Spring 2013 was the first season since inception of the collaborative adaptive management process in which all HC and BFC stations were sampled. Unfortunately, as mentioned earlier, fall 2013 sampling was canceled due to extreme low flow conditions, which results in this report accounting for only a single season bioassessment.

Hinkson and BFC macroinvertebrate community metrics were calculated using biological criteria derived from reference streams in the Ozark/Moreau/Loutre EDU (Table 4). In spring 2013, seven of the 11 stations had fully supporting MSCI scores (Table 5). The fully supporting scores, all of which were 16, occurred within the reach that included HC stations 3.5 to 7. The downstream three stations and the uppermost site all had partially supporting MSCI scores ranging from 10 (Station 3) to 14 (Stations 2 and 8). For each of the stations with partially supporting MSCI scores, metrics that accounted for the difference between fully and partially supporting scores were taxa richness and EPT taxa. Although HC Station 2 had a fully supporting individual metric score for taxa richness, it had the lowest possible (non-supporting) EPT taxa score, which resulted in a partially supporting MSCI score.

Table 4
Biological Criteria for Warm Water Reference Streams in the Ozark/Moreau/Loutre EDU, Spring

	Score = 5	Score = 3	Score = 1
TR	>71	35-71	<35
EPTT	>17	9-17	<9
BI	<6.4	6.4-8.2	>8.2
SDI	>2.8	1.4-2.8	<1.4

Table 5
Metric Values and Scores for Hinkson Creek and Bonne Femme Creek Stations, Spring 2013, Using Ozark/Moreau/Loutre Biological Criteria

Site	TR	EPTT	BI	SDI	MSCI	Support
HC 8	66	12	6.4	3.23		
	3	3	3	5	14	**Partial**
HC 7	77	13	6.9	3.23		
	5	3	3	5	16	**Full**
HC 6.5	83	13	6.8	3.04		
	5	3	3	5	16	**Full**
HC 6	75	9	7.2	3.18		
	5	3	3	5	16	**Full**
HC 5.5	77	12	7.1	3.10		
	5	3	3	5	16	**Full**
HC 5	82	12	6.9	3.07		
	5	3	3	5	16	**Full**
HC 4	79	11	7.0	2.84		
	5	3	3	5	16	**Full**
HC 3.5	81	13	7.0	2.95		
	5	3	3	5	16	**Full**
HC 3	67	7	7.4	2.80		
	3	1	3	3	10	**Partial**
HC 2	83	4	8.0	3.12		
	5	1	3	5	14	**Partial**
HC 1	66	7	6.9	2.82		
	3	1	3	5	12	**Partial**
BFC 2	80	11	6.7	3.03		
	5	3	3	5	16	**Full**
BFC 1	76	10	7.0	2.86		
	5	3	3	5	16	**Full**

With the exception of the lower three HC stations, many of the individual biological metrics were similar among sites. Each of the three downstream stations had non supporting EPT taxa metric scores and partially supporting biotic index scores. The remaining stations, including BFC, had partially supporting EPT taxa and fully supporting SDI scores. Although there was some variability in biotic index values, all stations had partially supporting scores. HC Station 8, the only upstream site with a partially supporting MSCI score, had the lowest biotic index value of 6.4, which is the cut off between an individual metric score of 3 and 5. This site, however, also tied Station 1 for having the lowest taxa richness; it was this metric that separated Station 8 from the remaining sites upstream of Station 3 that had fully supporting scores. In comparing the urban (Station 1-6) and rural (Station 6.5-8) portions of the study reach, there was no distinct difference among the four biological metrics in Spring 2013. The most notable difference occurred with the downstream three stations, all of which had fewer EPT taxa than the upstream stations, and two of the three had lower taxa richness.

The macroinvertebrate community composition tended to vary among stations, but few longitudinal patterns were evident (Table 6). The highest chironomid abundance occurred at HC Station 1, in which midge larvae accounted for over 80 percent of the sample. The species groups *Polypedilum convictum* and *P. illinoense* grp. combined to account for 40 percent of Station 1 chironomids. None of the remaining stations had *Polypedilum* sp. in similar abundance. Other chironomid taxa that tended to be abundant among HC samples included *Cladotanytarsus*, *Cricotopus/Orthocladius* grp., and *Hydrobaenus*. The highest aquatic worm abundance occurred at Stations 2 and 3. Tubificidae and Enchytraeidae combined to make up 32.5 percent of the Station 2 sample and 20.7 percent of the Station 3 sample. Station 1 had the lowest percentage of mayflies among HC sites, despite having the mayfly family Caenidae among the five most abundant taxa. One caenid mayfly species, *Caenis latipennis*, was the dominant mayfly taxon among all HC stations. The number of mayfly taxa ranged from three at Stations 2 and 3 to seven at Station 3.5. Of these seven taxa, however, five were represented by a single individual found in the subsample. Other abundant taxa among HC stations included the riffle beetle *Stenelmis* and the stonefly *Perlesta*, which was locally abundant at the two most upstream HC sites.

5.2.2 Comparison of Hinkson and Bonne Femme Creeks

Both BFC stations had fully supporting MSCI scores of 16 in spring 2013 (Table 6). Of the three rural HC stations, two had fully supporting scores of 16, whereas the remaining station had a partially supporting MSCI score of 14 (Table 6). Among the urban stations, five of the eight sites had fully supporting scores of 16, and the remaining stations had partially supporting scores. Mean taxa richness was only slightly higher at the BFC stations (78) compared to HC rural (75) or urban (76) sites (Figure 4). Mean EPT

Table 6
Spring 2013 Hinkson and Bonne Femme Creek Macroinvertebrate Composition

↓Variable Station→	1	2	3	3.5	4	5	5.5	6	6.5	7	8	BFC1	BFC2
Taxa Richness	66	83	67	81	79	82	77	75	83	77	66	76	80
Number EPT Taxa	7	4	7	13	11	12	12	9	13	13	12	10	11
% Ephemeroptera	6.7	10.7	28.7	29.8	38.7	19.1	26.9	27.2	14.4	18.0	18.2	4.1	3.9
% Plecoptera	-	-	0.1	0.6	0.6	0.7	0.7	1.4	1.2	3.2	11.3	5.8	6.6
% Trichoptera	0.2	<0.1	0.4	0.6	0.8	0.4	0.9	0.6	1.1	0.9	1.5	0.8	1.0
MSCI Score	12	14	10	16	16	16	16	16	16	16	14	16	16
% Dominant Families													
Chironomidae	80.8	43.2	26.6	25.1	34.3	42.5	35.2	31.4	26.2	23.0	14.1	50.8	59.3
Caenidae	6.2	10.3	26.2	27.3	32.6	16.3	25.0	22.5	11.1	14.8	12.9	1.9	2.7
Tubificidae	5.0	16.3	18.7	10.4	4.7	4.8	6.6	8.2	9.8	9.0	8.8	19.1	5.4
Elmidae	2.1	2.8	13.7	14.4	7.0	17.8	9.2	9.8	26.2	17.1	14.5	7.6	8.3
Ceratopogonidae	1.2	2.5	0.2	2.2	0.7	0.4	1.8	1.7	1.3	2.5	0.6	2.0	1.1
Enchytraeidae	0.2	16.2	2.0	1.6	2.4	2.2	3.1	3.1	2.7	6.6	6.1	0.8	1.4
Heptageniidae	0.5	0.2	2.4	2.2	5.3	2.2	0.8	3.0	0.5	0.1	0.6	2.2	1.2
Crangonyctidae	<0.1	<0.1	2.0	3.9	2.6	0.5	0.8	1.1	2.0	1.8	2.9	1.2	0.6
Hyalellidae	-	0.2	0.3	1.0	0.3	0.7	2.7	1.3	2.8	2.7	2.1	-	1.9
Perlidae	-	-	0.1	0.6	0.5	0.7	0.6	1.4	0.6	2.1	6.3	3.4	4.7

richness also was nearly equal among BFC (10.5) versus HC rural (12.6) and urban (10.5) stations (Figure 5). SDI values were nearly identical at the urban Hinkson (2.99) and BFC (2.95) sites (Figure 5). Mean SDI values were highest at the rural HC sites (3.16). Mean biotic index values were higher among the HC urban sites (7.2) compared to rural Hinkson sites (6.7) and BFC (6.9) (Figure 5).

Several taxa were dominant in both HC and BFC samples. The riffle beetle *Stenelmis* as well as the chironomids *Cricotopus/Orthocladius* grp. and *Hydrobaenus* were abundant in both creeks. There were also some important differences to note. Most notable was the difference among stations in stonefly abundance and taxa richness. Whereas HC Stations 1 and 2 each had no stoneflies in the samples, and the remaining urban stations had no more than two stonefly taxa, the rural Hinkson stations had three to five stonefly taxa and the BFC sites had either four or five. When stoneflies were present in the urban portion of the HC study reach, they were relatively rare compared to the rural portion. The highest number of stoneflies among the urban subsamples occurred at Station 6 (N = 11), which was similar to the number at Station 6.5 (N = 17). Station 7 and 8 samples, however, had 34 and 111 stoneflies, respectively. By comparison, Bonne Femme Station 1 had 71 stonefly individuals among five taxa, and Station 2 had 83 individuals among four taxa. Although there was some variation of stonefly taxa richness and abundance among all sites, the genus *Perlesta* was consistently the most numerous. Two stonefly taxa--Chloroperlidae and *Prostoia*--were unique to BFC. There were also two stonefly taxa that were unique to HC (*Neoperla* and Leuctridae). The remaining four taxa groups had at least some overlap between Hinkson and BFC sites.

When the three taxonomic families are combined, Chironomidae and aquatic worms (Tubificidae and Enchytraeidae) had their highest abundance at HC Station 1 (86.2 percent) and Station 2 (75.7 percent). Although Stations 1-3 were similar with respect to low EPT diversity and partially supporting MSCI scores, Station 3 chironomid and aquatic worm abundance (47.3 percent) was similar to the remaining urban stations (37.1 to 49.5 percent). Although these taxa groups were less abundant among the three rural HC stations compared to most urban stations, only Station 8 was much lower. This observation was due largely to chironomids making up a much lower percentage of the Station 8 sample than any other site. BFC chironomid and aquatic worm abundance was actually similar to HC Stations 1 and 2. Chironomids and aquatic worms made up 70.7 percent of the BFC Station 1 sample and 66.1 percent at Station 2.

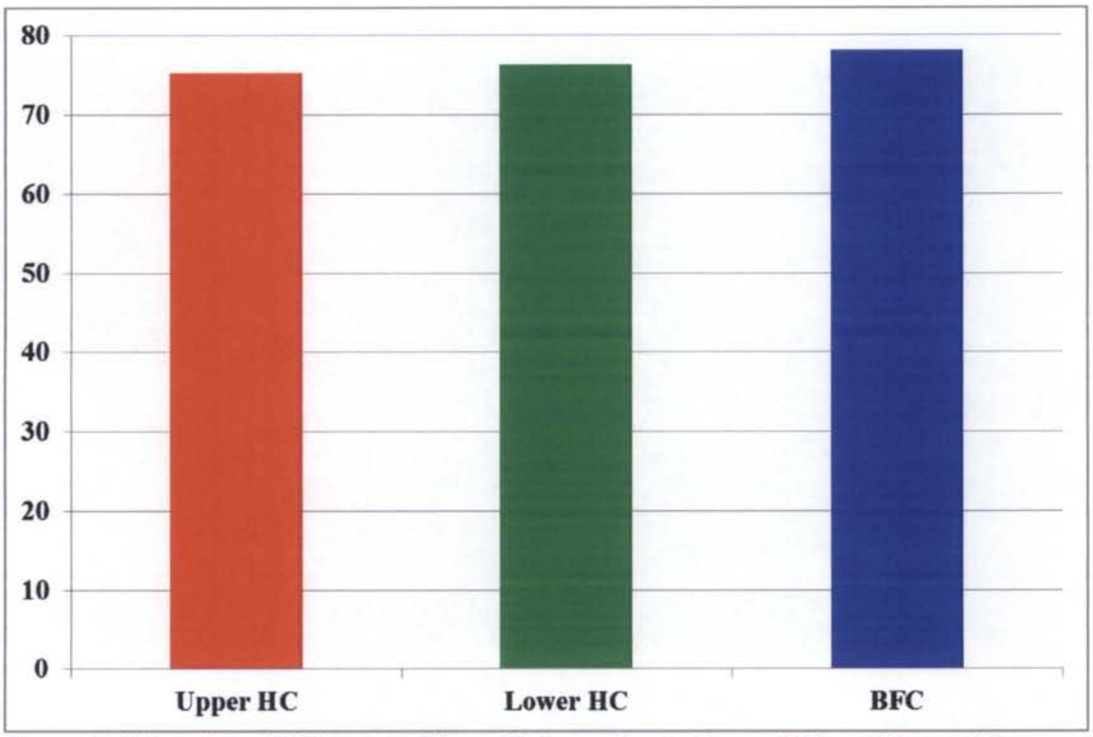

Figure 4. Mean Taxa Richness at Upper Hinkson Creek, Lower HC, and Bonne Femme Creek in Spring 2013 samples.

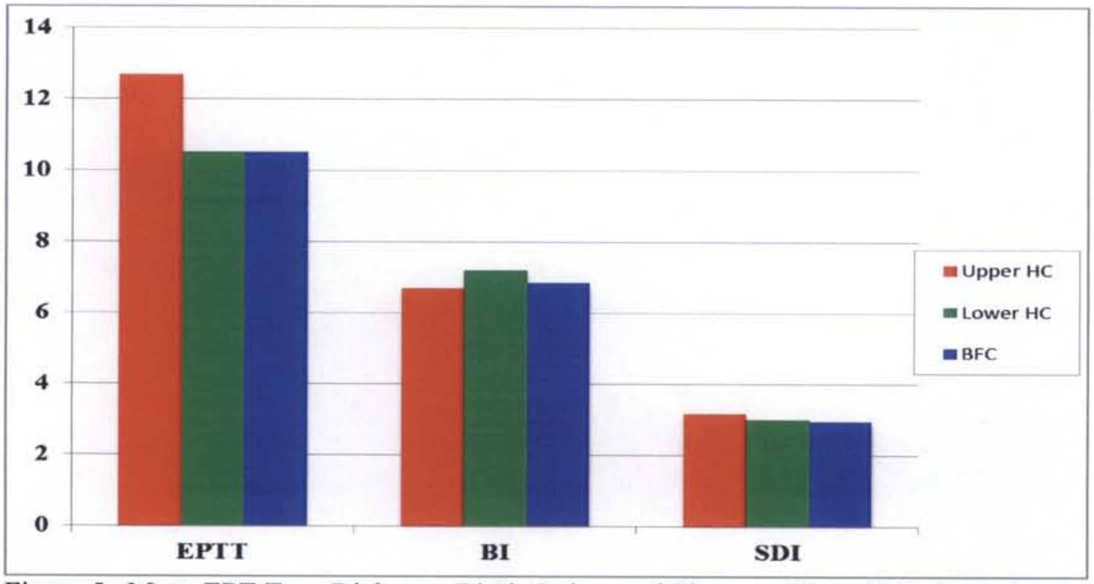

Figure 5. Mean EPT Taxa Richness, Biotic Index, and Shannon Diversity Index values at upper Hinkson Creek, lower Hinkson Creek, and Bonne Femme Creek in Spring 2013 samples.

5.2.3 Comparison of 2013 Data and Historical Data

The 2012 HC biological assessment (MDNR 2013a) included an in-depth analysis and comparison of macroinvertebrate trends between fall 2001 and fall 2012, the duration that MDNR had been studying this reach. The overall trend has been that the urban portion of the study area (the reach downstream of Interstate 70) has had a higher degree of impairment than the rural portion, even when taking into consideration habitat limitations and drought-related effects.

This trend remains unchanged after adding the spring 2013 data to the rural/urban comparison methods used in last year's assessment (i.e., excluding samples that were likely affected by drought conditions and samples in which only two of three habitats were adequate) (MDNR 2013a). The Year 1 bioassessment reported 14 of 25 (56 percent) of the urban and 10 of 10 (100 percent) of the rural reach had fully supporting scores (MDNR 2013a). It is important to note that the findings in Table 7 in this report differ from the Year 1 assessment. The past assessment used MSCI scores taken directly from bioassessment reports, which were calculated using biological criteria current at the time. The scores in this report, however, have been calculated using the most recent criteria, which resulted in the reduction of several MSCI scores. A re-evaluation of the Year 1 bioassessment based on current criteria indicates that 10 of 25 (40 percent) of the urban and 10 of 10 (100 percent) of the rural reach have fully supporting scores. When including the spring 2013 data, 15 of 33 (45 percent) of the urban and 12 of 13 (92 percent) of the rural stations were fully supporting.

Table 7
MSCI Scores in Samples from All Stations on Hinkson Creek, Fall 2001-Spring 2013

Station	Land use segment	Fall 2001	Spring 2002	Fall 2003	Spring 2004	Spring 2005	Fall 2005	Spring 2006	Spring 2012	Fall 2012	Spring 2013
HC 8 – Rogers Rd.	Rural	12	16†						18		14
HC 7 – Hinkson Cr. Rd.	Rural	12	16†	18	16†	16	18		16		16
HC 6.5 – Hwy 63 Connector	Rural				16				16		16
HC 6 – E. Walnut St.	Urban	12	10†	16	14	18	16†		14	12	16
HC 5.5 – Broadway	Urban			14††	16	16	12†		16	16	16
HC 5 – Upstr. of Grindstone	Urban	16	10†						16	10	16
HC 4 – Dwnstr. of Grindstone	Urban	18	12†						16	12	16
HC 3.5 – Recreation Dr.	Urban					12†	12†		14	12	16
HC 3 – Forum Blvd.	Urban	16†	12†					16		12	10
HC 2 – Twin Lakes RA	Urban	14††	12†					12†		14	14
HC 1 – Scott Blvd.	Urban	14††	14					14††		14	12

Shaded cells indicate that the sample did not attain fully supporting status. Cross-hatched cells indicate that only two of three habitats were fully represented.

†MSCI scores that are lower than original bioassessment report due to updated biological criteria for the Ozark/Moreau/Loutre EDU.

††Samples with MSCI scores that changed from fully supporting to partially supporting due to updated biological criteria

Assessing all HC samples using current biological criteria resulted in the reduction of 19 MSCI scores of the 61 samples collected between fall 2001 and spring 2013. Of the rural samples, four of 15 MSCI scores were reduced, and 15 of 46 urban MSCI scores were lowered. Of the 19 score changes, four changed categories from fully to partially supporting. Each of the four samples that changed support categories occurred in the urban reach.

Table 8 builds on the Year 1 bioassessment's analysis (MDNR 2013a) by including spring 2013 data to the mean values of the four biological metrics, grouped by rural and urban land use. Samples affected by drought and missing or sparse habitat have again been eliminated from consideration. The metric averages in Table 8 include 13 rural and 33 urban samples. The addition of the 2013 sample data did not change the four metrics appreciably compared to the Year 1 assessment (MDNR 2013a). Regarding average taxa richness, there were roughly four fewer taxa in the urban samples (73.7) compared to rural (77.4). EPT taxa averaged 9.6 for the urban samples and 14.1 for the rural samples, which tends to account for the difference in overall taxa richness between the two reaches. Average biotic index values for 2013 data were identical to those of 2012, with the urban reach being slightly higher (7.0) than the rural (6.7). SDI averaged 3.12 in the rural reach and 3.08 in the urban reach. The inclusion of the 2013 data had very little effect on the SDI average for either reach.

Table 8
Mean Values for Individual MSCI Metrics at Rural (N=10) and Urban (N=33) Hinkson Creek Stations, Fall 2001-Spring 2013

Variable	Rural (HC 6.5, 7, and 8)	Urban (HC 1 – 6)
Taxa Richness	77.4	73.7
EPT Richness	14.1	9.6
Biotic Index	6.7	7.0
Shannon Diversity Index	3.12	3.08

6.0 Discussion

Although many of the water quality parameters analyzed at Hinkson and BFCs were similar or otherwise unremarkable, there were a few that showed differences either longitudinally or between watersheds. As mentioned earlier, HC Stations 1 and 2 were sampled during heavy rains. Sampling was completed at Station 1 prior to notable runoff, but the stream was rising noticeably while Station 2 was being sampled. After Station 2 was completed, an attempt was made to sample Station 3, but rapidly increasing flow conditions made it too dangerous to continue. Conductivity and chloride both were higher at Stations 1 and 2 compared to the remaining upstream sites and the chloride concentration at Station 2 was 1.6 times higher than Station 1. This trend suggests that the influx of storm water had a higher concentration of chloride than the HC receiving stream. Allert et al. (2012) observed chloride concentrations of 90-158 mg/L during winter low flow conditions during a snowmelt in mainstem HC and much higher concentrations in two tributaries (301 mg/L in Grindstone and 1252 mg/L in Flat Branch). It is possible that the increasing chloride concentrations observed during the leading edge of a flash flood may be at least partly due to residual snowmelt chemicals (sodium chloride and calcium chloride) applied in the watershed during the preceding winter months. The spring 2013 chloride concentrations observed in HC, however, were much lower than the chronic chloride criterion (230 mg/L) established by the USEPA.

In comparing rural HC (Stations 6.5-8) and urban (Stations 1-6) sites, several differences were observed. Conductivity was higher in the urban reach than the three rural stations. The highest conductivity readings occurred at the two downstream stations, and was likely related to the chloride concentrations discussed above. Sulfate concentrations were more than twice as high at Station 1 than any of the remaining stations. Conversely, Station 1 had the lowest total nitrogen and NO_2+NO_3-N concentrations of any of the spring samples. Nothing observed during sample collection, however, would explain these phenomena.

When comparing Hinkson and BFC water chemistry trends, only a few constituents were different between watersheds. Sulfate concentrations were consistently much higher among HC stations. The lowest HC sulfate concentration was over four times higher than the BFC sample. Possibly former coal mining activities in the upper HC watershed contributed to the difference. Other water quality parameters such as temperature and turbidity differed among watersheds due mainly to sample timing and discharge conditions.

The severe drought conditions during the summer and fall of 2012 may have had an effect on the macroinvertebrate community of the smallest stream reaches in this assessment. Station 8 and the two BFC stations had 11 and 12 fewer taxa, respectively and between three and nine fewer EPT taxa when comparing spring 2012 and 2013 samples. However, with the exception of Station 4, each of the remaining stations (3.5 through 7) had between two and 13 more taxa in spring 2013 samples than 2012. HC Stations 1-3 were not sampled in spring 2012; therefore no comparison among years can be made for these sites.

In the Year 1 bioassessment report (MDNR 2013a), it was observed that previous HC studies (MDNR 2002, 2004, 2005, 2006; Nichols 2012) noted that the urban reach has tended to have a lower abundance of stoneflies and a higher abundance of tubificid worms. Although fewer stoneflies were present in the spring 2013 Hinkson urban reach, tubificid abundance was more variable. Despite an abundance of depositional habitat, which should favor aquatic worm abundance, Station 1 had among the lowest percent of tubificids in the spring 2013 study. At the same time, however, chironomids accounted for nearly twice as much of the Station 1 sample compared to the remaining HC stations. Despite certain macroinvertebrate community similarities between BFC and the rural HC stations, BFC had chironomid and aquatic worm abundance more similar to the downstream two Hinkson stations.

The use of current biological criteria as a standard benchmark for all HC samples resulted in reduced MSCI scores for 19 of the total 61 samples collected since fall 2001. Of those 19 reductions, a total of four changed from fully to partially supporting. Although changing criteria made a notable difference in the ratio of partially to fully supporting samples, it would be inaccurate to gauge all 61 samples without using the same criteria thresholds. The biological criteria now calculated for the Ozark/Moreau/Loutre EDU are based on more samples over a wider range of years compared to those available during the earlier bioassessments and, therefore, should have a better representation of the reference condition for that EDU.

Habitat and stream channel differences that occur throughout the HC survey reach as summarized in MDNR (2013a) continue to provide challenges for biological assessment of the stream. During this assessment period, the macroinvertebrate community in the urban portion of HC upstream of Station 3 compared favorably to the rural reach and to BFC. The three downstream stations, however, were outliers with respect to numbers of EPT taxa in particular and MSCI scores in general.

7.0 Recommendations

1. Promote environmentally-conscious development practices in the HC watershed, in and near the riparian zones, and especially in areas immediately adjacent to the stream.

2. Encourage practices that will ultimately protect or widen the riparian zone.

3. Continue the work begun through the collaborative adaptive management process in determining which stormwater detention basins and other mitigative projects would be most effective.

4. Encourage the completion of ongoing stream habitat evaluation work.

5. Work toward conducting fisheries research in the watershed to assess the quality of a potentially complementary facet of the HC aquatic community.

6. Continue with research geared toward a greater understanding of the fluvial geomorphological processes at work in this watershed.

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Appendix A

Spring 2013 Macroinvertebrate Taxa Lists

Hinkson Creek

Bonne Femme Creek

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131956], Station #1, Sample Date: 4/10/2013 9:50:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	**CS**	**NF**	**RM**
"HYDRACARINA"			
Acarina	1		1
AMPHIPODA			
Crangonyx			1
BASOMMATOPHORA			
Lymnaeidae			2
Physella			-99
COLEOPTERA			
Berosus	1		3
Dubiraphia			1
Peltodytes			1
Stenelmis	25	2	1
DECAPODA			
Palaemonetes kadiakensis			1
DIPTERA			
Ablabesmyia		4	11
Ceratopogoninae	2	14	1
Chironomus		2	
Cladotanytarsus	28	71	
Clinocera	1		
Corynoneura			1
Cricotopus bicinctus	16	2	16
Cricotopus trifascia	4		
Cricotopus/Orthocladius	75	5	28
Cryptochironomus	5	1	
Cryptotendipes		22	
Dicrotendipes	47	11	12
Diplocladius	1		2
Eukiefferiella	18		
Glyptotendipes			5
Hydrobaenus	21	6	14
Labrundinia			1
Nanocladius			3
Ormosia	11		
Paralauterborniella		3	
Phaenopsectra			3
Polypedilum flavum	257	1	
Polypedilum halterale grp		6	1
Polypedilum illinoense grp		2	183
Polypedilum scalaenum grp	6	4	2
Procladius			2

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131956], Station #1, Sample Date: 4/10/2013 9:50:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Rheotanytarsus	1		
Simulium	7		
Stictochironomus	2		
Tabanus	1		
Tanytarsus	58	80	43
Thienemannimyia grp.	8	2	5
EPHEMEROPTERA			
Caenis latipennis	36	20	29
Hexagenia limbata		-99	
Stenacron		1	2
Stenonema femoratum	3		1
ISOPODA			
Caecidotea		1	1
LUMBRICINA			
Lumbricina		-99	
ODONATA			
Argia			2
Basiaeschna janata			-99
Calopteryx			1
Enallagma			3
Epitheca (Epicordulia)		-99	
Ischnura			1
Libellula			-99
Nasiaeschna pentacantha			1
TRICHOPTERA			
Cheumatopsyche	1		
Hydroptila	1	1	
Ironoquia			1
TRICLADIDA			
Planariidae	1		
TUBIFICIDA			
Branchiura sowerbyi	3	1	
Enchytraeidae	1		2
Limnodrilus claparedianus		5	
Limnodrilus hoffmeisteri	7		
Tubificidae	33	19	1
VENEROIDA			
Corbicula	2		
Pisidiidae	1	2	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131957], Station #2, Sample Date: 4/10/2013 10:50:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	1	2	3
AMPHIPODA			
Crangonyx			1
Hyalella azteca			3
ARHYNCHOBDELLIDA			
Erpobdellidae		1	
BASOMMATOPHORA			
Lymnaeidae			1
Menetus			1
Physella			3
COLEOPTERA			
Berosus	1	5	2
Dubiraphia	1		
Dytiscidae		1	
Peltodytes			9
Scirtidae			2
Sperchopsis		1	
Stenelmis	35	6	
DECAPODA			
Palaemonetes kadiakensis			1
DIPTERA			
Ablabesmyia	7	7	1
Caloparyphus	1		1
Ceratopogoninae	12	17	8
Chironomus	2	2	2
Cladotanytarsus	31	13	
Clinocera	3		
Corynoneura	3	2	1
Cricotopus bicinctus	27	3	9
Cricotopus/Orthocladius	77	9	5
Cryptochironomus	4	1	
Cryptotendipes		17	
Dasyheleinae			1
Dicrotendipes	40	5	6
Diptera	1		
Eukiefferiella	6		
Glyptotendipes			1
Hydrobaenus	58	3	3
Mesosmittia			1
Nanocladius		1	1
Nilotanypus	3		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131957], Station #2, Sample Date: 4/10/2013 10:50:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Nilothauma	1		
Ormosia	23		1
Paralauterborniella	1	1	
Paraphaenocladius			6
Paratanytarsus		2	2
Paratendipes	4	2	
Phaenopsectra			2
Polypedilum flavum	27		
Polypedilum halterale grp	2		
Polypedilum illinoense grp	16	11	75
Polypedilum scalaenum grp	3		
Prionocera			1
Procladius		3	1
Pseudosmittia			2
Psychodidae	1		
Rheocricotopus	1		
Simulium	6		1
Smittia	1		2
Stempellinella		6	
Tabanus	1		
Tanytarsus	61	25	8
Thienemanniella	3		
Thienemannimyia grp.	16	1	
Tipula	2		2
Zavrelimyia	1		
EPHEMEROPTERA			
Caenis latipennis	84	53	16
Centroptilum			1
Stenonema femoratum	4	-99	
HEMIPTERA			
Belostoma			1
Trichocorixa	1		
LUMBRICINA			
Lumbricina			3
ODONATA			
Argia	1	1	1
Basiaeschna janata			-99
Calopteryx			1
Enallagma	1	1	2
Epiaeschna heros		-99	
Libellula	1	3	
Progomphus obscurus		-99	
RHYNCHOBDELLIDA			

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131957], Station #2, Sample Date: 4/10/2013 10:50:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Piscicolidae	1		
TRICHOPTERA			
Cheumatopsyche	1		
TRICLADIDA			
Planariidae	1		1
TUBIFICIDA			
Branchiura sowerbyi	1	3	
Enchytraeidae	57	49	134
Limnodrilus claparedianus	1	2	
Limnodrilus hoffmeisteri	31	26	2
Tubificidae	106	52	17
VENEROIDA			
Corbicula	5	5	1
Pisidiidae		3	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131958], Station #3, Sample Date: 4/22/2013 9:15:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	**CS**	**NF**	**RM**
"HYDRACARINA"			
Acarina		8	3
AMPHIPODA			
Crangonyx	2	3	20
Hyalella azteca			4
BASOMMATOPHORA			
Ancylidae	1		
Menetus	1		1
Physella			1
BRANCHIOBDELLIDA			
Branchiobdellida			1
COLEOPTERA			
Berosus		3	1
Dubiraphia		1	1
Macronychus glabratus			1
Stenelmis	148	18	1
DIPTERA			
Ablabesmyia		5	7
Ceratopogoninae	1	1	1
Chaoborus			1
Chironomus	1	1	
Cladotanytarsus	27	12	
Clinocera	3		
Cricotopus bicinctus	2		5
Cricotopus/Orthocladius	16	5	18
Cryptochironomus	3	3	
Cryptotendipes		1	
Dicrotendipes	59	19	5
Ephydridae		7	
Eukiefferiella	8		
Glyptotendipes	1		
Hydrobaenus	3	8	26
Larsia			1
Mesosmittia		1	
Nilotanypus		1	1
Ormosia	2		1
Paratendipes	2		
Polypedilum flavum	19	2	2
Polypedilum halterale grp		2	
Polypedilum illinoense grp			3
Polypedilum scalaenum grp	20		
Procladius		1	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131958], Station #3, Sample Date: 4/22/2013 9:15:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Pseudochironomus	3		
Simulium	3		
Stempellinella		1	
Stictochironomus	4	2	
Tabanus	1		-99
Tanytarsus	4	8	15
Thienemannimyia grp.	1	1	2
EPHEMEROPTERA			
Acentrella	1		
Caenis latipennis	42	132	151
Stenonema femoratum	17	10	3
Tricorythodes	1		
HEMIPTERA			
Notonecta			1
ISOPODA			
Caecidotea		4	4
LUMBRICINA			
Lumbricina	5	-99	-99
LUMBRICULIDA			
Lumbriculidae	1		
ODONATA			
Argia	3	1	1
Basiaeschna janata			-99
Calopteryx			-99
Enallagma			7
Libellula		-99	-99
Perithemis		-99	-99
PLECOPTERA			
Perlesta	2		
TRICHOPTERA			
Hydroptila	4		
Ironoquia			1
TUBIFICIDA			
Branchiura sowerbyi	5	3	
Enchytraeidae	6	12	7
Ilyodrilus templetoni		1	
Limnodrilus claparedianus	3	2	
Limnodrilus hoffmeisteri	45	12	5
Tubificidae	114	31	12
VENEROIDA			
Corbicula	19	1	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131959], Station #3.5, Sample Date: 4/22/2013 10:20:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	1	20	7
AMPHIPODA			
Crangonyx	4	5	36
Hyalella azteca			12
BASOMMATOPHORA			
Physella			1
BRANCHIOBDELLIDA			
Branchiobdellida			4
COLEOPTERA			
Berosus		1	2
Dubiraphia		2	3
Helichus basalis			1
Macronychus glabratus			1
Peltodytes		1	3
Stenelmis	142	7	10
DECAPODA			
Orconectes virilis			1
DIPTERA			
Ablabesmyia			4
Ceratopogoninae	2	22	1
Chaoborus		4	
Chironomus		4	
Cladopelma		1	
Cladotanytarsus	33	41	2
Clinocera	2		
Cricotopus bicinctus			1
Cricotopus/Orthocladius	18	4	11
Cryptochironomus	4	4	
Cryptotendipes		5	
Dasyheleinae		1	
Dicrotendipes	16	11	7
Diptera		5	2
Dolichopodidae		1	
Eukiefferiella	7		
Glyptotendipes	1		
Hydrobaenus	9	12	7
Limnophyes	1		
Natarsia			1
Nilothauma	1	1	
Ormosia	1	1	
Paraphaenocladius		1	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131959], Station #3.5, Sample Date: 4/22/2013 10:20:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Paratendipes	2	3	
Pericoma			1
Phaenopsectra		1	
Polypedilum flavum	11	1	
Polypedilum halterale grp		3	
Polypedilum illinoense grp	1		1
Polypedilum scalaenum grp	1	2	
Procladius		4	1
Pseudochironomus	2	2	
Rheocricotopus			1
Rheotanytarsus			1
Simulium	6		1
Smittia	1	1	
Stictochironomus	6	10	
Tabanus	-99		
Tanytarsus	7	11	5
Thienemannimyia grp.		1	1
Tipula	4	1	1
EPHEMEROPTERA			
Acentrella			1
Acerpenna			1
Caenis latipennis	31	64	216
Hexagenia limbata		-99	
Leptophlebiidae		1	
Stenacron			1
Stenonema femoratum	19	4	2
HEMIPTERA			
Belostoma			-99
ISOPODA			
Caecidotea			3
ODONATA			
Argia	1	1	
Basiaeschna janata			-99
Calopteryx			-99
Enallagma			15
Epitheca (Epicordulia)			-99
Libellula			1
PLECOPTERA			
Perlesta	6		1
TRICHOPTERA			
Cheumatopsyche	3		
Chimarra	1		
Ironoquia			2

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131959], Station #3.5, Sample Date: 4/22/2013 10:20:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polycentropus	1		
Rhyacophila	-99		
TRICLADIDA			
Planariidae		1	
TUBIFICIDA			
Branchiura sowerbyi	2	3	
Enchytraeidae	16	1	2
Limnodrilus claparedianus	2	2	
Limnodrilus hoffmeisteri	11	7	2
Tubificidae	61	26	3
VENEROIDA			
Corbicula	11	7	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131960], Station #4, Sample Date: 4/22/2013 11:30:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina			2
AMPHIPODA			
Crangonyx	4	7	22
Hyalella azteca		1	3
ARHYNCHOBDELLIDA			
Erpobdellidae	-99		
BASOMMATOPHORA			
Menetus		1	
Physella			2
BRANCHIOBDELLIDA			
Branchiobdellida	3	1	2
COLEOPTERA			
Berosus	1		2
Dubiraphia	1	1	
Ectopria nervosa			1
Helichus basalis	1		
Peltodytes		1	
Stenelmis	61	13	11
DECAPODA			
Orconectes virilis	1		1
DIPTERA			
Ablabesmyia	1	8	1
Ceratopogoninae	1	7	
Chaoborus	1	3	
Cladotanytarsus	6	22	4
Clinocera	5	1	
Corynoneura		1	
Cricotopus bicinctus			3
Cricotopus/Orthocladius	52	14	20
Cryptochironomus	1	1	
Cryptotendipes		1	
Dasyheleinae		1	
Diamesa	1		
Dicrotendipes	44	18	11
Diptera		2	2
Eukiefferiella	27		1
Glyptotendipes			2
Hydrobaenus	30	12	13
Larsia		1	2
Micropsectra		1	
Natarsia	1		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131960], Station #4, Sample Date: 4/22/2013 11:30:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Ormosia	1	3	
Parametriocnemus	1		
Paratendipes		1	
Pilaria			1
Polypedilum aviceps	48		4
Polypedilum illinoense grp	1	2	
Procladius		2	
Pseudochironomus		1	1
Rheotanytarsus			1
Simulium	23		
Smittia	1		3
Stictochironomus		1	
Tabanus	1		
Tanytarsus	31	11	13
Tipula	-99		2
Zavrelimyia		1	
EPHEMEROPTERA			
Acentrella	4		3
Caenis latipennis	163	107	131
Hexagenia limbata		1	
Stenacron	11	2	
Stenonema femoratum	41	10	2
ISOPODA			
Caecidotea	1	3	2
LUMBRICINA			
Lumbricina	1		1
LUMBRICULIDA			
Lumbriculidae		2	
ODONATA			
Argia	4	1	
Basiaeschna janata			-99
Dromogomphus			1
Enallagma			5
Epitheca (Epicordulia)			1
Ischnura			1
Libellula		-99	-99
Nasiaeschna pentacantha			-99
Perithemis			1
PLECOPTERA			
Amphinemura			1
Perlesta	7		
TRICHOPTERA			
Cheumatopsyche	4		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131960], Station #4, Sample Date: 4/22/2013 11:30:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Hydroptila	3		
Ironoquia			2
Rhyacophila	1		
TUBIFICIDA			
Branchiura sowerbyi	2	4	1
Enchytraeidae	14	8	8
Limnodrilus claparedianus		1	
Limnodrilus hoffmeisteri	4		1
Tubificidae	8	37	
VENEROIDA			
Corbicula	-99	2	1

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131961], Station #5, Sample Date: 4/22/2013 12:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		14	5
AMPHIPODA			
Crangonyx	1	2	4
Hyalella azteca			9
ARHYNCHOBDELLIDA			
Erpobdellidae	-99		-99
BASOMMATOPHORA			
Lymnaeidae			1
Physella	1		3
COLEOPTERA			
Berosus		2	
Dubiraphia	1		1
Ectopria nervosa	1	1	
Helichus basalis			2
Macronychus glabratus	1		
Neoporus			1
Psephenus herricki	1		
Stenelmis	191	19	6
DECAPODA			
Orconectes virilis	1		1
DIPTERA			
Ablabesmyia		1	2
Ceratopogoninae	1	4	
Chaoborus		4	
Cladotanytarsus	29	8	1
Clinocera	6		2
Cricotopus/Orthocladius	67	28	21
Cryptochironomus		2	
Demicryptochironomus	3		
Dicrotendipes	39	24	4
Diplocladius			1
Diptera	5	4	
Dolichopodidae		1	
Endochironomus			1
Eukiefferiella	32		
Glyptotendipes		4	3
Hydrobaenus	49	33	21
Nanocladius			1
Nilothauma	1		
Ormosia	2	5	
Paratanytarsus	1		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131961], Station #5, Sample Date: 4/22/2013 12:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Paratendipes	1	1	
Phaenopsectra			1
Polypedilum flavum	26	2	
Polypedilum halterale grp	1	1	
Polypedilum illinoense grp	5	6	3
Polypedilum scalaenum grp	4	1	
Prionocera	1		1
Procladius		1	
Pseudochironomus		7	1
Simulium	8	1	2
Smittia	1		
Stictochironomus	8	4	
Tanytarsus	12	38	13
Thienemannimyia grp.	2	4	3
Tipula	-99		1
EPHEMEROPTERA			
Acentrella	1		4
Caenis latipennis	41	32	128
Leptophlebia		1	
Stenacron	1		
Stenonema femoratum	18	7	1
Tricorythodes		1	
HAPLOTAXIDA			
Haplotaxis	1		
HEMIPTERA			
Trichocorixa			1
ISOPODA			
Caecidotea	2	3	3
LUMBRICINA			
Lumbricina		1	
ODONATA			
Argia	2	1	
Basiaeschna janata			2
Calopteryx			1
Dromogomphus		2	
Enallagma		2	14
Libellula		1	1
Macromia			-99
PLECOPTERA			
Perlesta	5	3	1
RHYNCHOBDELLIDA			
Piscicolidae		1	
TRICHOPTERA			

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131961], Station #5, Sample Date: 4/22/2013 12:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Helicopsyche			1
Hydroptila	1		
Ironoquia			3
Polycentropus		-99	
Rhyacophila			1
TRICLADIDA			
Planariidae	2		1
TUBIFICIDA			
Branchiura sowerbyi	2	4	
Enchytraeidae	13	7	7
Limnodrilus claparedianus	3	2	
Limnodrilus hoffmeisteri	3		
Tubificidae	13	31	2
VENEROIDA			
Corbicula	1	2	1
Pisidiidae	4	2	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131962], Station #5.5, Sample Date: 4/22/2013 2:40:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		12	
AMPHIPODA			
Crangonyx		1	8
Hyalella azteca		1	27
ARHYNCHOBDELLIDA			
Erpobdellidae	2	-99	1
BASOMMATOPHORA			
Physella	3		3
BRANCHIOBDELLIDA			
Branchiobdellida			1
COLEOPTERA			
Berosus		1	2
Dubiraphia		2	3
Hydrophilidae		1	
Neoporus		2	1
Optioservus sandersoni		1	
Peltodytes			4
Stenelmis	57	22	9
Tropisternus			2
DECAPODA			
Orconectes virilis			-99
DIPTERA			
Ablabesmyia		7	3
Ceratopogoninae		18	1
Chaoborus		2	
Cladotanytarsus	9	43	1
Clinocera	5	3	1
Cricotopus/Orthocladius	65	8	32
Cryptochironomus	3	7	
Cryptotendipes		2	
Diamesa	1		
Dicrotendipes	3	9	7
Diptera	1	6	
Eukiefferiella	13		
Glyptotendipes	1	5	
Hydrobaenus	23	11	17
Mesosmittia		1	
Nanocladius	1		
Natarsia		3	3
Nilothauma		1	
Ormosia	5	4	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131962], Station #5.5, Sample Date: 4/22/2013 2:40:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum aviceps	1		
Polypedilum halterale grp		3	
Polypedilum illinoense grp			1
Polypedilum scalaenum grp	11	1	
Procladius		2	
Pseudochironomus		2	
Simulium	8		
Stictochironomus	1	42	
Tabanus	1	-99	
Tanytarsus	5	2	1
Thienemannimyia grp.	3	1	
Tipula	2	1	
Tribelos		2	
EPHEMEROPTERA			
Acentrella	4		2
Caenis latipennis	27	63	164
Leptophlebiidae	1	1	2
Stenonema femoratum	6	2	1
HEMIPTERA			
Ranatra kirkaldyi			-99
Trichocorixa			1
ISOPODA			
Caecidotea			2
LUMBRICULIDA			
Lumbriculidae	1	3	
ODONATA			
Argia	2		
Basiaeschna janata			-99
Calopteryx			2
Enallagma		2	22
Hagenius brevistylus			-99
Libellula			1
Macromia		1	
PLECOPTERA			
Amphinemura	1		
Perlesta	6		1
TRICHOPTERA			
Cheumatopsyche	1		
Helicopsyche			1
Ironoquia			2
Oecetis		1	
Rhyacophila	2		
Triaenodes		1	2

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131962], Station #5.5, Sample Date: 4/22/2013 2:40:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
TRICLADIDA			
Planariidae	1		
TUBIFICIDA			
Branchiura sowerbyi	9	1	
Enchytraeidae	3	21	8
Limnodrilus claparedianus		1	1
Limnodrilus hoffmeisteri	6	1	1
Tubificidae	21	22	4
VENEROIDA			
Pisidiidae	5		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131963], Station #6, Sample Date: 4/22/2013 3:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		4	8
AMPHIPODA			
Crangonyx	2		7
Hyalella azteca			10
BASOMMATOPHORA			
Menetus			2
Physella			4
BRANCHIOBDELLIDA			
Branchiobdellida	1		1
COLEOPTERA			
Berosus		1	1
Dubiraphia		3	6
Ectopria nervosa	1	2	
Helichus basalis			1
Neoporus		1	1
Peltodytes		1	1
Sperchopsis			1
Stenelmis	45	14	7
DECAPODA			
Orconectes virilis	-99		
DIPTERA			
Ablabesmyia		2	3
Ceratopogoninae		8	4
Chaoborus		1	
Chironomus	1	1	
Cladotanytarsus	2	20	
Clinocera	6	2	
Clinotanypus		2	
Cricotopus bicinctus			1
Cricotopus/Orthocladius	37	9	34
Cryptochironomus		1	
Cryptotendipes		1	
Dasyheleinae		1	
Dicrotendipes	7	8	1
Diplocladius	1		1
Diptera	1	4	1
Eukiefferiella	3		
Hydrobaenus	18	8	24
Larsia			7
Ormosia	2	1	
Paramerina		1	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131963], Station #6, Sample Date: 4/22/2013 3:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Pericoma			2
Phaenopsectra		2	
Polypedilum illinoense grp			1
Polypedilum scalaenum grp	1		
Procladius		3	
Pseudochironomus	1	2	1
Rheocricotopus			1
Simulium	4		1
Smittia		2	1
Stictochironomus	3	13	
Tanytarsus	6		8
Thienemannimyia grp.	1		
Tipula	2		-99
Zavrelimyia		1	
EPHEMEROPTERA			
Acentrella	5	2	2
Caenis latipennis	35	46	91
Leptophlebia			4
Stenacron	1		
Stenonema femoratum	19	3	
ISOPODA			
Caecidotea	1		4
LUMBRICINA			
Lumbricina	1		
ODONATA			
Argia	1		1
Basiaeschna janata			-99
Enallagma		3	15
Erythemis			1
Gomphus	1		-99
Ischnura			1
Libellula			9
Progomphus obscurus	-99		
PLECOPTERA			
Perlesta	7	1	3
TRICHOPTERA			
Cheumatopsyche	3		
Helicopsyche	1		
Ironoquia			1
TRICLADIDA			
Planariidae			1
TUBIFICIDA			
Branchiura sowerbyi	2		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131963], Station #6, Sample Date: 4/22/2013 3:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Enchytraeidae	1	16	7
Limnodrilus claparedianus		2	
Limnodrilus hoffmeisteri	3	4	1
Tubificidae	5	41	5
VENEROIDA			
Pisidiidae			8

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131964], Station #6.5, Sample Date: 4/22/2013 4:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	1	24	2
AMPHIPODA			
Crangonyx		4	24
Hyalella azteca			39
ARHYNCHOBDELLIDA			
Erpobdellidae	1		
BASOMMATOPHORA			
Lymnaeidae			1
Physella	2	1	8
BRANCHIOBDELLIDA			
Branchiobdellida		3	
COLEOPTERA			
Berosus	1	2	3
Dubiraphia		4	13
Helichus basalis	1		3
Helichus lithophilus			1
Neoporus			4
Paracymus	1		
Peltodytes		1	1
Stenelmis	311	20	7
DECAPODA			
Orconectes virilis		1	-99
DIPTERA			
Ablabesmyia		1	3
Ceratopogoninae	12	6	
Chaoborus	1		
Chrysops		1	
Cladotanytarsus	17	27	
Clinocera	20	6	
Cricotopus/Orthocladius	47	30	40
Cryptochironomus	1	1	
Dicrotendipes	10	12	2
Diplocladius			1
Diptera		2	
Dolichopodidae		-99	1
Ephydridae	3	3	
Eukiefferiella	10		
Glyptotendipes		2	
Hexatoma	1	1	
Hydrobaenus	16	48	25
Labrundinia			2

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131964], Station #6.5, Sample Date: 4/22/2013 4:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Larsia	1	2	5
Ormosia		1	
Parakiefferiella			1
Paratanytarsus	1		
Paratendipes	1		
Polypedilum aviceps	1		2
Procladius		1	
Pseudochironomus	4	4	
Rheotanytarsus		2	
Simulium	13		
Smittia		1	
Stictochironomus	1	6	1
Tabanus	5	1	-99
Tanytarsus	4	5	9
Thienemannimyia grp.			3
Tipula	11		-99
Zavrelimyia		2	3
EPHEMEROPTERA			
Acentrella	29		
Caenis latipennis	7	53	91
Centroptilum			1
Leptophlebia		1	5
Stenonema femoratum	3	5	-99
HEMIPTERA			
Ranatra kirkaldyi			-99
ISOPODA			
Caecidotea			7
Caecidotea (Blind & Unpigmented)		1	
LUMBRICULIDA			
Lumbriculidae	2	1	
ODONATA			
Argia		1	
Basiaeschna janata			-99
Calopteryx			1
Dromogomphus		-99	
Enallagma			7
Ischnura			1
Libellula			1
Nasiaeschna pentacantha			-99
Progomphus obscurus		1	
PLECOPTERA			
Amphinemura	6		1

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131964], Station #6.5, Sample Date: 4/22/2013 4:45:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	**CS**	**NF**	**RM**
Isoperla	1		
Perlesta	7	2	
TRICHOPTERA			
Helicopsyche	1		
Ironoquia			5
Nyctiophylax		1	
Pycnopsyche		1	1
Rhyacophila	5		1
TRICLADIDA			
Planariidae		1	1
TUBIFICIDA			
Branchiura sowerbyi		13	
Enchytraeidae	10	21	6
Limnodrilus hoffmeisteri	9	3	1
Tubificidae	95	11	1
VENEROIDA			
Pisidiidae	4		1

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131965], Station #7, Sample Date: 4/22/2013 6:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		7	10
AMPHIPODA			
Crangonyx	1	6	12
Hyalella azteca			28
BASOMMATOPHORA			
Lymnaeidae		1	1
Menetus		2	
Physella			4
BRANCHIOBDELLIDA			
Branchiobdellida			9
COLEOPTERA			
Dubiraphia		2	15
Helichus lithophilus		1	3
Neoporus		1	2
Peltodytes			8
Stenelmis	148	9	4
DECAPODA			
Orconectes virilis			1
DIPTERA			
Ceratopogoninae	7	18	1
Chaoborus		11	
Chironomidae	1		2
Chironomus		1	
Cladotanytarsus	4	35	
Clinocera	12	3	
Cricotopus/Orthocladius	20	8	18
Cryptochironomus		1	
Demicryptochironomus	1		
Dicrotendipes	5	4	1
Diplocladius		1	
Diptera	1	11	1
Eukiefferiella	1		
Glyptotendipes	1		1
Hexatoma	2		
Hydrobaenus	28	19	23
Larsia		1	4
Natarsia	2	1	1
Ormosia	12	7	
Paratendipes	1	1	
Polypedilum halterale grp		2	
Polypedilum scalaenum grp	2		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131965], Station #7, Sample Date: 4/22/2013 6:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Procladius		5	
Pseudochironomus	1	1	
Pseudorthocladius	1		
Pseudosmittia		1	
Simulium	6		
Stictochironomus	1	23	
Stratiomys			-99
Tabanus	4	1	
Tanytarsus	4	5	4
Thienemannimyia grp.			3
Tipula	-99		1
EPHEMEROPTERA			
Acentrella	19		3
Caenis latipennis	13	32	109
Leptophlebiidae			9
Stenonema femoratum	2		-99
GORDIOIDEA			
Gordiidae	1		
HAPLOTAXIDA			
Haplotaxis		3	
LUMBRICINA			
Lumbricina	1		
ODONATA			
Argia			2
Basiaeschna janata			-99
Calopteryx			1
Enallagma		-99	8
Epitheca (Epicordulia)			1
Gomphidae		-99	
Ischnura			1
Macromia		-99	
Somatochlora			1
PLECOPTERA			
Amphinemura	8		
Isoperla	3		
Leuctridae		1	
Perlesta	18	-99	4
TRICHOPTERA			
Ironoquia			2
Polycentropus		1	
Pycnopsyche			1
Rhyacophila	2		
Triaenodes			4

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131965], Station #7, Sample Date: 4/22/2013 6:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
TUBIFICIDA			
Branchiura sowerbyi		1	
Enchytraeidae	25	32	12
Limnodrilus claparedianus		1	
Limnodrilus hoffmeisteri	5	3	1
Tubificidae	21	62	
VENEROIDA			
Pisidiidae		8	2

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131966], Station #8, Sample Date: 4/22/2013 7:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		1	
AMPHIPODA			
Crangonyx	5	2	22
Hyalella azteca	1		20
ARHYNCHOBDELLIDA			
Erpobdellidae	2		
BASOMMATOPHORA			
Lymnaeidae	1		1
Menetus		1	4
Physella	2	5	14
COLEOPTERA			
Dubiraphia	1		4
Helichus basalis	4		4
Peltodytes	1		
Stenelmis	133	3	1
DECAPODA			
Orconectes virilis			1
DIPTERA			
Ablabesmyia			1
Ceratopogoninae	4	1	1
Chaoborus	2		
Chrysops	3		
Cladotanytarsus	1		
Clinocera	39	1	
Cricotopus/Orthocladius	22	3	19
Cryptochironomus		1	
Dicrotendipes	1	1	
Diptera		5	
Dolichopodidae	1		
Eukiefferiella	2	1	
Glyptotendipes		1	1
Hexatoma	2		1
Hydrobaenus	21	9	18
Larsia	7	1	5
Lipiniella		1	
Natarsia	8		
Odontomyia	1		
Ormosia	41		2
Procladius	1		
Rheocricotopus		1	3
Simulium	24		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [131966], Station #8, Sample Date: 4/22/2013 7:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Stictochironomus		4	
Tabanus	1		
Tanytarsus			2
Thienemannimyia grp.	1		
Tipula	6		1
Tribelos		1	
Tvetenia bavarica grp	1		
EPHEMEROPTERA			
Acentrella	26		
Caenis latipennis	52	9	66
Leptophlebia		3	16
Stenonema femoratum	6		
LUMBRICINA			
Lumbricina	1		1
ODONATA			
Enallagma			3
Ischnura			2
Libellula			1
Somatochlora			-99
PLECOPTERA			
Amphinemura	20		2
Isoperla	26		
Neoperla			2
Perlesta	57	1	2
Zealeuctra	1		
TRICHOPTERA			
Chimarra	1		
Ironoquia		1	2
Rhyacophila	10		1
TRICLADIDA			
Planariidae	4	2	
TUBIFICIDA			
Enchytraeidae	25	12	23
Limnodrilus claparedianus			1
Limnodrilus hoffmeisteri	18	3	4
Tasserkidrilus superiorensis		1	
Tubificidae	40	4	15
VENEROIDA			
Pisidiidae	3	-99	3

Aquid Invertebrate Database Bench Sheet Report
Bonne Femme Cr [131941], Station #1, Sample Date: 3/19/2013 10:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	2	10	2
AMPHIPODA			
Crangonyx	7		8
BASOMMATOPHORA			
Lymnaeidae	4	3	4
Menetus			1
Physella	2	1	9
COLEOPTERA			
Dubiraphia	1		
Helichus lithophilus		1	
Stenelmis	83	4	4
DIPTERA			
Ablabesmyia		1	1
Ceratopogoninae	2	23	
Chironomus		6	
Chrysops	1		
Clinocera	2		
Corynoneura		7	1
Cricotopus bicinctus	1		
Cricotopus/Orthocladius	141	33	170
Dicrotendipes		16	7
Diplocladius	13	1	2
Diptera	1		
Dolichopodidae	1		
Eukiefferiella	11		
Glyptotendipes	2	7	5
Hemerodromia	3		
Hexatoma	5		
Hydrobaenus	31	41	34
Kiefferulus		1	
Micropsectra		2	4
Microtendipes			1
Myxosargus	1		
Natarsia		17	
Ormosia	1		
Orthocladius (Euorthocladius)	1		
Parametriocnemus	3		1
Paratanytarsus			3
Paratendipes	1	1	
Polypedilum aviceps	2		
Polypedilum illinoense grp	1		

Aquid Invertebrate Database Bench Sheet Report
Bonne Femme Cr [131941], Station #1, Sample Date: 3/19/2013 10:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum scalaenum grp		1	
Procladius		4	4
Prosimulium	3		
Simulium	7		1
Smittia		2	
Stegopterna	1		
Stictochironomus		4	
Tabanus	1		
Tanypus		2	
Tanytarsus	2	11	4
Thienemannimyia grp.		3	1
Tipula	-99		1
Tvetenia bavarica grp	3	1	2
Zavrelimyia		1	
EPHEMEROPTERA			
Caenis latipennis	3	19	1
Stenacron	1	1	
Stenonema femoratum	1	7	17
GORDIOIDEA			
Gordiidae		1	
HEMIPTERA			
Belostoma			1
ISOPODA			
Caecidotea	5	5	2
LUMBRICINA			
Lumbricina	1		
ODONATA			
Ischnura			1
Libellula		2	
Macromia		-99	
Nasiaeschna pentacantha			-99
Perithemis		1	
PLECOPTERA			
Amphinemura	3		
Chloroperlidae	1		
Isoperla	19		1
Perlesta	36		6
Zealeuctra	3	1	1
TRICHOPTERA			
Pycnopsyche		-99	1
Rhyacophila	9		
TUBIFICIDA			
Branchiura sowerbyi		4	

Aquid Invertebrate Database Bench Sheet Report
Bonne Femme Cr [131941], Station #1, Sample Date: 3/19/2013 10:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Enchytraeidae	8	2	
Limnodrilus claparedianus	1	14	
Limnodrilus hoffmeisteri	2	14	1
Tubificidae	37	157	1
VENEROIDA			
Pisidiidae	1		1

Aquid Invertebrate Database Bench Sheet Report
Bonne Femme Cr [131942], Station #2, Sample Date: 3/19/2013 11:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	2	10	
AMPHIPODA			
Bactrurus		-99	
Crangonyx		7	1
Hyalella azteca			25
ARHYNCHOBDELLIDA			
Erpobdellidae		-99	
BASOMMATOPHORA			
Ancylidae			1
Lymnaeidae	1	2	3
Menetus	1	2	3
Physella	1	6	8
COLEOPTERA			
Berosus			1
Dubiraphia			3
Helichus basalis	4		
Psephenus herricki	2		
Scirtidae		2	1
Stenelmis	87	11	6
DECAPODA			
Palaemonetes kadiakensis			2
DIPTERA			
Ablabesmyia		4	2
Ceratopogoninae	3	11	1
Chironomidae	4	5	2
Chironomus		5	1
Cladotanytarsus		4	
Clinocera	9		
Corynoneura		7	6
Cricotopus/Orthocladius	210	31	141
Diamesa	2		
Dicrotendipes	1	16	21
Diplocladius	5		1
Diptera	1	1	
Empididae	2		
Eukiefferiella	7		
Glyptotendipes		3	9
Hexatoma	15	3	
Hydrobaenus	30	64	49
Kiefferulus	1		1
Micropsectra			2

Aquid Invertebrate Database Bench Sheet Report
Bonne Femme Cr [131942], Station #2, Sample Date: 3/19/2013 11:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Microtendipes		2	1
Natarsia	10	15	7
Ormosia	5		
Parachironomus			1
Parametriocnemus	8		
Paraphaenocladius	4	1	
Paratanytarsus		2	4
Paratendipes		3	
Polypedilum aviceps	2		
Polypedilum illinoense grp			1
Procladius		1	
Prosimulium	2		
Simulium	6		
Stempellinella		1	
Stictochironomus		6	1
Tabanus	5	-99	
Tanytarsus	1	43	4
Thienemanniella	3		1
Thienemannimyia grp.		1	2
Tipula	1		1
Tvetenia bavarica grp	2		
Zavreliella		1	
EPHEMEROPTERA			
Caenis latipennis	8	13	14
Stenonema femoratum	6	10	
ISOPODA			
Caecidotea	4	2	3
LUMBRICULIDA			
Lumbriculidae	6	2	
MEGALOPTERA			
Sialis		1	1
ODONATA			
Basiaeschna janata		1	-99
Enallagma			1
Ischnura			1
PLECOPTERA			
Chloroperlidae	8	1	
Isoperla	13		
Perlesta	58	3	
Prostoia	2		
TRICHOPTERA			
Nectopsyche			2
Oecetis		1	

Aquid Invertebrate Database Bench Sheet Report
Bonne Femme Cr [131942], Station #2, Sample Date: 3/19/2013 11:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polycentropus		1	
Pycnopsyche			1
Rhyacophila	8		
TUBIFICIDA			
Branchiura sowerbyi	1		
Enchytraeidae	17	1	1
Limnodrilus claparedianus	1	3	
Limnodrilus hoffmeisteri	4	4	
Tubificidae	14	40	3
VENEROIDA			
Pisidiidae	2	1	1