URS

February 20, 2013

Mr. Kevin Bluhm
United States Army Corps of Engineers
St. Paul District
180 5th Street East
St. Paul, MN 55101

Re: Final Report
Evaluation of Fish, Benthic Invertebrates and Physical Habitat
Fargo/Moorhead Flood Risk Management Project

Dear Kevin,

URS Corporation (URS) is pleased to submit the enclosed Final Report for the Evaluation of Fish, Benthic Invertebrates and Physical Habitat of Rivers Potentially Affected by the Fargo/Moorhead Flood Risk Management Project. Per your request, twelve hard copies of the report and fifteen CDs containing both the final report and a copy of the Microsoft Access® database are enclosed. Additionally, in accordance with the Performance Work Statement, the original field collection datasheets are also included in this submittal. If you have any questions regarding this transmittal, please do not hesitate to contact me (314-743-4150).

Very truly yours,

Kevin Pulley

Kevin Pulley
Biologist

Enclosures

Cc: Tom Denes, URS

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FINAL REPORT

EVALUATION OF FISH, BENTHIC INVERTEBRATES AND PHYSICAL HABITAT

OF

RIVERS POTENTIALLY AFFECTED BY THE FARGO/MOORHEAD FLOOD RISK MANAGEMENT PROJECT

Prepared for
U.S. Army Corps of Engineers
St. Paul District
180 Fifth Street East
St. Paul, Minnesota 55101

February 2013

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ACRONYMS

^oC	degrees Celsius
cm	centimeter
CPUE	Catch Per Unit Effort
D	Simpson Diversity Index
1-D	Gini-Simpson Diversity Index
1/D	Inverse Simpson Diversity Index
DC	Direct Current
DELT	Deformities, Eroded Fins, Lesions, Tumors
D.O.	Dissolved Oxygen
$E(S_n)$	Expected Value of Sample n (Species Richness via Rarefaction Technique)
EIS	Environmental Impact Statement
EOR	Emmons & Olivier Resources
ft	foot
g	gram
GIS	Geographical Information Systems
GPP	Generator-Powered Pulsator
GPS	Global Positioning System
Hp	Horsepower
Hz	Hertz
IBI	Index of Biotic Integrity
kg	kilogram
kVA	kilovolt-ampere
MBI	Midwest Biodiversity Institute
mg/L	milligram per liter
mm	millimeter
MPCA	Minnesota Pollution Control Agency
µS/cm	microSiemen per centimeter
mS/cm	milliSiemen per centimeter
NAD83	North American 1983 Datum
NDDoH	North Dakota Department of Health
NDGF	North Dakota Game and Fish Department
NTU	Nephelometric Turbidity Unit
OEPA	Ohio Environmental Protection Agency
PDF	Portable Document Format
QHEI	Qualitative Habitat Evaluation Index
sec	second
sq. mi.	square mile
St Dev	Standard Deviation
SU	Standard Units
TALU	Tiered Aquatic Life Use Standard
URS	URS Corporation
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
V	Volt

ACRONYMS

VCSU	Valley City State University
VVP	Variable Voltage Pulsator

1.0 INTRODUCTION

1.1 PURPOSE

URS Corporation (URS), on behalf of the United States Army Corps of Engineers - St. Paul District (USACE), conducted a biological assessment to identify and characterize fish and invertebrate communities and biotic integrity within the Red River of the North and six tributaries. These waterbodies were assessed because they could be affected by a potential flood damage reduction project at Fargo, North Dakota and Moorhead, Minnesota. The assessed waterbodies included (**Figure 1.1**):

- Red River of the North
- Wild Rice River
- Sheyenne River
- Maple River
- Rush River
- Lower Rush River, and
- Wolverton Creek.

The USACE, together with the sponsor cities of Fargo, North Dakota and Moorhead, Minnesota, began the Fargo-Moorhead Metro Feasibility Study in September 2008. The purpose of this study was to identify alternatives for long-term flood risk management for the Fargo/Moorhead area. Components of the feasibility study included gaining a better understanding of flood issues, establishing flood risk management measures, documenting findings and, if appropriate, recommending implementation of a Federal project. The USACE and the cities of Fargo and Moorhead have subsequently developed a conceptual plan for a flood diversion channel around Fargo and Moorhead. The conceptual plan contains two potential diversion concepts: (1) a diversion in Minnesota or (2) a diversion in North Dakota. A North Dakota diversion would directly affect the Red River of the North and the six tributaries listed above. The USACE released a Supplemental Draft Feasibility Report and Environmental Impact Statement (EIS) in April 2011, and a Final Feasibility Report and Environmental Impact Statement was released in July 2011 (USACE 2011a; USACE 2011b).

Data collected for this initial Fargo/Moorhead Flood Risk Management Project fishery, macroinvertebrate and habitat evaluation will help the USACE and other State and Federal agencies to understand baseline aquatic community conditions within the rivers potentially affected by a proposed North Dakota diversion alignment. These data are the first of at least two pre-project baseline sampling events. Data collected in post-project monitoring events will be compared to these pre-project datasets, enabling State and Federal agencies to quantitatively assess impacts to the biological community from the Fargo/Moorhead Flood Risk Management Project activities. The sampling methodologies used for the Fargo/Moorhead Flood Risk Management Project adhere to index of biotic integrity (IBI) scoring systems presently being revised by the North Dakota Department of Health (NDDoH) and the Minnesota Pollution Control Agency (MPCA). The USACE will use the data collected during baseline sampling events to calculate IBI scores in accordance with the new NDDoH and MPCA systems. Species abundance and species composition metrics for this first baseline sampling event are presented below in Section 3.0 of this baseline assessment report. The USACE will incorporate these calculated metrics, as well as the raw data, into the new scoring systems for determination of IBIs.

Governing agencies, in their evaluation of whether water quality standards are met, will consider all readily available and reliable data and information, including IBIs calculated from measurements of the resident fish community, the resident aquatic invertebrate community and a quantitative or qualitative assessment of habitat quality. NDDoH and MPCA, in their development of new approaches to setting water quality standards, recognize that waterbodies naturally differ and that they, therefore, should not all be held to the same standards. This new approach is referred to as tiered aquatic life use standards (TALU). To date, Ohio is the only state to apply TALUs to non-wadeable rivers. Ohio designed their stream assessment method for application to different stream sizes (non-wadeable, wadeable and headwater streams), via the establishment of IBIs modified for each category of streams (Ohio Environmental Protection Agency [OEPA] 1988b).

It is important for the USACE to understand the integrity of the existing biological systems in waterbodies potentially affected by the Fargo/Moorhead Flood Risk Management Project, and thus, the capacity for these waterbodies to recover from perturbations related to the project. Systems that possess or reflect high biological integrity can withstand or rapidly recover from most perturbations imposed by natural environmental processes and some of those induced by humans (Karr et al. 1986), whereas biological communities that are degraded and have low biological integrity have already reached their threshold to withstand and rapidly recover from natural and anthropogenic perturbations. Because aquatic biota inhabit their receiving waters all of the time, and will show the harmful effects of past stresses, the condition of the aquatic biota is generally representative of environmental conditions even though maximum stresses might have occurred at times other than the sampling dates (OEPA 1988a).

1.2 BACKGROUND

The Fargo/Moorhead Flood Risk Management Project area is within the Glacial Lake Agassiz Basin Ecoregion of North Dakota (United States Geological Survey [USGS] 2006). Lake Agassiz was an expansive, shallow post-glacial lake covering much of northwestern Minnesota, northeastern North Dakota and southern Manitoba after the last stage of glacial advance (the Wisconsin Stage). When the lake retreated, it left a unique geologic setting within the Upper Great Plains that still strongly influences hydrology, stream geomorphology and aquatic biota today (Emmons & Olivier Resources, Inc [EOR] 2009). The Red River Valley is extremely flat, dropping only 157 feet over about 240 miles (measured as river valley length), or less than 1 foot/mile between Fargo and Lake Winnipeg (Haugerud 2006).

The combination of the flat open landscape, widespread agriculture and bare soils contribute to wind erosion rates well above the natural background rate (EOR 2009). Areas of excess bluff and streambank erosion are found in the Red River Valley. Research by Simon et al. (2008) found mass wasting of high streambanks or valley wall bluffs occurring in many Red River Valley streams, especially on the Wild Rice and Red Rivers (EOR 2009). Simon et al. (2008) found that most of the streams for which they conducted rapid geomorphic assessments had evidence of streambank instability; 71% were found to be in an unstable channel evolution stage. For example, both the Wild Rice River and Wolverton Creek, near their junction with the Red River, have substantial streambank erosion occurring (EOR 2009).

Sediment and nutrients may be carried as wash load, suspended load and bedload. Although wash load (or dissolved load) plays an important role in water chemistry and particularly in larger rivers such as the Red River, lower Buffalo and Wild Rice Rivers, suspended load and bedload are the primary concerns for impaired biota and turbidity. The large majority of sediment in the Red River Valley is transported as suspended material because of the fine particle size of soils in the Lake Plain; they are predominantly silts and clays. In addition, the silt and fine sand, prevalent in the Red River Valley, cause embeddedness of coarse gravels and cobbles needed by some fish for spawning, i.e., simple lithophilic spawners (Niemela et al. 1998). The majority of streams that contain spawning riffles are located on the eastern edge of the Red River Valley on the Lake Aggasiz benches located in Minnesota. Native species such as lake sturgeon and walleye are reliant on these systems for their reproductive success.

The Red River Basin contains a prevalence of intermittent streams, and, therefore, has lower fish diversity than the Mississippi River Basin to the east. Fish have difficulty surviving in low flow conditions, where temperature may be too high and dissolved oxygen too low. Though the lack of coarse bed material is thought to create poor habitat for many fish species, omnivores and tolerant fish species may thrive in this setting. Several of the larger tributaries of the Red River Valley are alluvial channels. Their bed and banks consist of coarser, sandier material than the lacustrine clays in the lake plain (EOR 2009).

Today approximately 90% of the entire Red River Valley is in agricultural land use with high losses of wetland and native prairie. Agricultural ditches and streams in farm fields have unique characteristics that distinguish them from less disturbed streams. These characteristics include reduced sinuosity, reduced habitat complexity, entrenchment from berm construction, altered sediment transport regime and loss of native riparian vegetation zones.

2.0 METHODS

The *Performance Work Statement for Evaluation of Fish, Benthic Invertebrates and Physical Habitat of Rivers Potentially Affected by the Fargo/Moorhead Flood Risk Management Project* (Performance Work Statement) is included in **Appendix A** of this document, and served as the project scope of work. Appendices associated with the Performance Work Statement are not included in this document; however, they are incorporated by reference in this document.

2.1 STUDY LOCATIONS AND SURVEY DESIGN

2.1.1 Study Location Selection

This biological assessment included a total of 23 study reaches selected by the USACE to be surveyed for the Fargo/Moorhead Flood Risk Management Project (see **Figure 1.1**). The study reaches include:

- footprint locations - likely footprint locations for concrete structures or channel diversions
- upstream and downstream locations - areas above and below structures where altered hydraulics could influence habitat and biota
- control sites

2.1.2 Study Reach Descriptions

The USACE reviewed various sources which recommend sample distances to adequately characterize stream diversity and biotic integrity. Based on this review of information, the USACE prescribed the study reach lengths to be assessed for the Red River of the North and its tributaries. For this study, the entire length of each footprint location (for concrete structures or channel diversions) was assessed. For all other study reaches, a length of at least 35 times the low-flow wetted stream width was surveyed.

2.1.3 Study Timing

The study was originally planned to be conducted on all of the stream reaches during the summer of 2011. This plan was modified due to higher than normal stream flows throughout the Red River Valley during the spring and summer of 2011. More normal stream flows were only observed on the smaller, wadeable streams during late summer in 2011, whereas stream flows on the non-wadeable streams remained high throughout the summer. All wadeable streams were assessed in 2011, while all non-wadeable streams were assessed in 2012.

2.1.4 Site Reconnaissance

URS performed an on-site reconnaissance of each study reach, prior to sampling for fish, macroinvertebrates and physical habitat. A reconnaissance of the wadeable stream reaches (Rush River, Lower Rush River and Wolverton Creek) was conducted in September 2011. A reconnaissance of the non-wadeable stream reaches (Red River of the North, Wild Rice River, Sheyenne River and Maple River) was conducted in August 2012.

The reconnaissance effort allowed field personnel to become familiar with the reaches, verify sampleability of the study reaches, determine the safest access points and confirm the use of sampling equipment appropriate for the reach characteristics. USACE personnel were present for some portions of the reconnaissance effort to observe and discuss site conditions with URS personnel. A combination of public boat ramps, highway rights-of-way and private property was used to access the seven streams of interest for this study.

During the reconnaissance effort, URS personnel verified the locations of the USACE-prescribed study reaches. Stream depth and width were measured at several locations throughout each study reach in an effort to verify that streams were navigable by boat for a distance at least 35 times the wetted width of the stream. During the 2012 reconnaissance effort, it was found that the originally-prescribed study lengths for three reaches on the Red River of the North (Reaches 4, 5 and 6) did not account for at least 35 times the wetted stream width. The lengths of study Reaches 4 and 6 were each extended 500 feet in both the upstream and downstream directions, prior to the commencement of sampling activities. Study Reach 5 (footprint location) was not extended, per instruction from USACE. Reach 7 (Wild Rice River) was determined to be navigable by boat throughout its originally-prescribed length. This study reach was boat navigable during the habitat assessment and macroinvertebrate sampling effort, conducted one and a half weeks after the site reconnaissance. However, five weeks lapsed between the reconnaissance and the fish sampling effort for this reach. In that time, the water level dropped approximately one foot due to beaver dam construction and dry weather, and the downstream extent of study Reach 7 was not suitable for boat navigation at the time of fish sampling. Therefore, fish shocking activities were terminated approximately 500 feet short of the originally-prescribed downstream extent.

A global positioning system (GPS) was used to collect geographic coordinates at the upstream and downstream extents of each study reach. The coordinates were saved as waypoints for subsequent navigation to the study reaches. Study reach geographic coordinates and final study reach lengths are presented in **Table 2.1**.

Table 2.1 – Study Reach Coordinates and Length

Study Reach #	Upstream Extent		Downstream Extent		Length (feet)
	Latitude	Longitude	Latitude	Longitude	
Red River of the North					
1	46.616330	-96.781785	46.620671	-96.776901	3948
2	46.711613	-96.783836	46.717867	-96.783832	4043
3	46.751585	-96.786004	46.754776	-96.784526	3828
4	46.926731	-96.775711	46.92691	-96.785317	4941
5	47.074474	-96.825334	47.076156	-96.827394	2645
6	47.127584	-96.82436	47.130675	-96.831044	4962
Wild Rice River					
7	46.486453	-96.792857	46.491236	-96.793128	2879
7 (Downstream extent of electroshocking)	46.486453	-96.792857	46.490197	-96.791293	2276
8	46.651845	-96.855716	46.655700	-96.856355	3039
9	46.696289	-96.843483	46.702462	-96.837897	4475
10	46.754004	-96.809335	46.757130	-96.806688	2974
Sheyenne River					
11	46.656703	-96.945821	46.657167	-96.939504	3033
12	46.735329	-96.930547	46.743898	-96.932438	4238
13	46.789944	-96.905453	46.793908	-96.906948	2944
14	46.937171	-96.916815	46.940267	-96.915770	3286
15	47.030688	-96.873607	47.035583	-96.873957	3644
Maple River					
16	46.902615	-97.056785	46.905185	-97.059218	2493
17	46.930479	-96.966724	46.930165	-96.955420	5615
18	46.924757	-96.931229	46.924617	-96.927286	2601
Lower Rush River					
19	46.948531	-96.996884	46.946072	-96.994222	1892
20	46.977390	-96.929308	46.977334	-96.922933	1591
Rush River					
21	46.972916	-97.013321	46.975811	-97.010624	1387
22	46.998632	-96.929545	46.996391	-96.924565	1524
Wolverton Creek					
23	46.699886	-96.767672	46.702324	-96.768147	1001

Notes:
For a given waterbody, sample reaches are presented in an upstream to downstream order.
All coordinates in decimal degrees. The geographical datum is North American 1983 Datum (NAD83).

2.2 FIELD SAMPLING METHODOLOGY

2.2.1 Non-Wadeable Streams

2.2.1.1 Fishery Assessment

Fisheries assessments of the Fargo/Moorhead Flood Risk Management Project's non-wadeable streams were conducted in August and September 2012 at base flow conditions. All fisheries assessments were conducted during daylight hours. Sampling was not started earlier than 60 minutes after sunrise, and finished no later than 60 minutes before sunset. Sampling was not conducted during periods of relatively increased turbidity and high flows, given that these conditions negatively affect sampling efficiency.

Equipment

The type of fish sampling equipment was selected based on site conditions noted during the on-site reconnaissance. The USACE had previously outlined anticipated equipment types for fish sampling at each study reach. URS coordinated any deviations from the USACE's identified fisheries protocol with the USACE Project Biologist and USACE Contract Point of Contact prior to sampling. According to observed site conditions at the time of sampling, the following streams were treated as non-wadeable:

- Red River of the North
- Wild Rice River
- Sheyenne River, and
- Maple River.

The site character warranted use of the following equipment for fisheries sampling on the non-wadeable streams:

Waterbody	Equipment	Logic
Red River of the North (Reaches 2 – 6)	Boom Shocker	• Large river • Accessible boat ramps • Ability to maneuver in and around submerged cover • Permits use of one boat driver and two fish netters
Red River of the North (Reach 1)	Mini-boom	• Non-wadeable river • Not accessible via boat ramp • Ability to portage boat and equipment • Permits use of one boat driver and one fish netter
Wild Rice River		
Sheyenne River		
Maple River		

For this Fargo/Moorhead Flood Risk Management Project, the USACE recommended, and URS adopted, the non-wadeable fish sampling protocols used in a 2010 fish assemblage assessment conducted on the Red River of the North (Midwest Biodiversity Institute [MBI] 2010, included as Appendix B of the Performance Work Statement). For the non-wadeable streams fisheries assessments, a boat-rigged, pulsed direct current (DC) electrofishing apparatus was used. Specifically, the equipment consisted of:

- Boom Shocker
    - 16-foot, modified V-hull, aluminum jon boat
    - Smith-Root® 5.0 generator-powered pulsator (GPP) alternator-pulsator
    - Electrode array
        - Cathode array - Port (left) bow: twelve droppers in linear array, 1/4-inch diameter galvanized cable, six feet eight inches long; Starboard (right) bow: ten droppers in linear array, 1/4-inch diameter galvanized cable, six feet eight inches to eight feet two inches long
        - Anode array – Two circular arrays, each 0.9 meter in diameter and extended approximately 1.4 meters in front of the forward bow; six droppers on each array, 3/16-inch diameter stainless steel cable, five feet long

Boom Shocker on Red River of the North

- Mini-boom Shocker
    - 15-foot, flat bottom, aluminum jon boat
    - Smith-Root® 5.0 GPP alternator-pulsator
    - Electrode array
        - Cathode array – thirty droppers in linear array on forward bow, 3/16-inch diameter stainless steel cable, three feet one inch long
        - Anode array – One circular array, 0.9 meter in diameter and extended approximately 0.9 meter in front of the forward bow, twelve droppers, 3/16-inch diameter stainless steel cable, five feet long

Mini-boom Shocker on Wild Rice River

The custom-built Smith-Root® 5.0 GPP alternator-pulsator was used to convert, control and regulate the electric current. It produces up to 1,000 volts (V) at 2-20 amperes, depending on the relative conductivity of the waterbody. The pulse configuration consists of a fast rise, slow decay wave that can be adjusted to 30, 60 or 120 Hertz (Hz, pulses per second). Via trial and error at the beginning of each study reach assessment, field personnel selected the voltage and pulse configuration settings that produced the most effective fish shocking. Based on the high conductivities of the sampled waterbodies, the low voltage range was selected (50-500V). Using the low voltage range, it was determined that a pulse configuration of 120 Hz produced the most effective fish shocking, which occurred with an electrical energy output of 9 to 14 amperes.

The unusually high conductivities of the waterbodies presented an initial challenge in accomplishing effective shocking of fish. Prior to adopting the custom-built Smith-Root® 5.0 GPP alternator-pulsator, URS tested traditional electroshocking equipment on the Red River of the North and its tributaries, which included an anode array(s) mounted from the boat, the boat serving as the cathode and a Smith-Root® variable voltage pulsator (VVP) 15B alternator-pulsator for the boom shocker and a Smith-Root® 1.5 kilovolt-ampere (kVA) alternator-pulsator for the mini-boom. However, the catch per unit effort (CPUE, fish caught per hour fished) ranged from 12 to 66 fish per hour, indicating that this traditional electroshocking equipment was not effective in the subject waters. The USACE, URS and Smith-Root collaborated to develop the specific electrofishing apparatus (alternator-pulsator and electrode arrays) outlined above, which was subsequently used to achieve the most effective fish shocking. **Table 2.2** presents the equipment specifications, alternator-pulsator settings and fish capture efficiency for each fish sampling attempt on each non-wadeable study reach.

Table 2.2 – Electroshocking Specifications and Fish Capture Efficiency for Non-Wadeable Streams

Study Reach		Equipment Specifications					Control Box Settings				Fish Capture	
Reach #	**Date Sampled**	**Jon Boat Length and Type**	**Motor**	**Generator**	**Anode Array**	**Cathode Array**	**Control Box Model**	**Voltage Range**	**Frequency**	**Amperes**	**Fish Abundance (# fish)**	**CPUE[1]**
Red River of the North												
1	09/04/12	15 ft, flat-bottom	Mercury, 15 hp	Kohler, 14 hp	Anode Setup 1	Cathode Setup 1	5.0 GPP (custom built)	50 - 500 (surveyed at 100)	120	10 - 13 (primarily 12)	73	107
	09/21/12									12	138	93
2	08/31/12	16 ft, modified V-hull	Evinrude, 60 hp	Honda, 11 hp	Anode Setup 2	Cathode Setup 2	VVP 15B	130 – 200 (primarily 200)	50	9 - 13	33	66
	09/08/12			Kohler, 14 hp			5.0 GPP (custom built)	50 – 500 (surveyed at 100)	120	9 - 14 (primarily 12)	162	108
3	08/30/12	16 ft, modified V-hull	Mercury, 15 hp	Honda, 11 hp	Anode Setup 2	Cathode Setup 2	VVP 15B	130 - 170 (primarily 150)	50 - 70 (primarily 50)	10 - 13	25	53
	09/09/12			Kohler, 14 hp			5.0 GPP (custom built)	50 - 500 (surveyed at 100)	120	12	168	112
4	08/29/12	16 ft, modified V-hull	Mercury, 15 hp	Honda, 11 hp	Anode Setup 2	Cathode Setup 2	VVP 15B	130 - 170 (primarily 150)	55-70	10 - 13	15	37
	09/11/12			Kohler, 14 hp			5.0 GPP (custom built)	50 - 500 (surveyed at 100)	120	12	245	144
5	09/01/12	16 ft, modified V-hull	Mercury, 15 hp	Honda, 11 hp	Anode Setup 2	Cathode Setup 2	VVP 15B	110-120	50	9 -10	9	12
	09/10/12			Kohler, 14 hp			5.0 GPP (custom built)	50 - 500 (surveyed at 50)	120	12	57	52
6	09/02/12	16 ft, modified V-hull	Mercury, 15 hp	Honda, 11 hp	Anode Setup 2	Cathode Setup 2	VVP 15B	100-110	55	9 -10	17	27
	09/10/12			Kohler, 14 hp			5.0 GPP (custom built)	50 - 500 (surveyed at 60)	120	12	78	45

Study Reach		Equipment Specifications					Control Box Settings				Fish Capture	
Reach #	Date Sampled	Jon Boat Length and Type	Motor	Generator	Anode Array	Cathode Array	Control Box Model	Voltage Range	Frequency	Amperes	Fish Abundance (# fish)	CPUE[1]
Wild Rice River												
7	09/13/12	15 ft, flat-bottom	Mercury, 15 hp	Kohler, 14 hp	Anode Setup 1	Cathode Setup 1	5.0 GPP (custom built)	50 - 500 (surveyed at 75)	120	12 - 14 (averaged 12)	347	358
8	09/12/12							50 - 500 (surveyed at 75)		12 - 14 (averaged 13)	184	173
9	09/14/12							50 - 500 (surveyed at 75)		12	524	349
10	09/15/12							50 - 500 (surveyed at 60)		12 - 13 (averaged 12)	544	443
Sheyenne River												
11	09/17/12	15 ft, flat-bottom	Mercury, 15 hp	Kohler, 14 hp	Anode Setup 1	Cathode Setup 1	5.0 GPP (custom built)	50 - 500 (surveyed at 50)	120	12 - 14 (averaged 14)	49	36
12	09/18/12							50 - 500 (surveyed at 60)		12	137	79
13	09/16/12							50 - 500 (surveyed at 50)		12-14	90	74
14	09/19/12							50 - 500 (surveyed at 60)		12-14	150	117
15	09/20/12							50 - 500 (surveyed at 60)		12 - 14 (averaged 14)	236	172
Maple River												
16	08/13/12	14 ft, flat-bottom	Mercury, 15 hp	Honda, Eu2000	Anode Setup 3	Cathode Setup 3	1.5 kVA	0 - 560	120	8-9	8	44
	09/05/12	15 ft, flat-bottom		Kohler, 14 hp	Anode Setup 1	Cathode Setup 1	5.0 GPP (custom built)	50 - 500 (surveyed at 60)	120	11-12	81	90
17	09/06/12	15 ft, flat-bottom		Kohler, 14 hp	Anode Setup 1	Cathode Setup 1	5.0 GPP (custom built)	50 - 500 (surveyed at 75)	120	12	383	244
18	08/14/12	14 ft, flat-bottom		Honda, Eu2000	Anode Setup 3	Cathode Setup 3	1.5 kVA	0 - 560	120	8-9	11	27
	09/05/12	15 ft, flat-bottom		Kohler, 14 hp	Anode Setup 1	Cathode Setup 1	5.0 GPP (custom built)	50 - 500 (surveyed at 50-75)	120	12	250	382

Notes: 1 – CPUE – Catch per unit effort – defined as fish caught per hour electroshocked.

Shaded rows represent trial sampling efforts. Unshaded rows represent study sampling events.

Anode Setup 1 = single, circular array with 12 droppers
Anode Setup 2 = two circular arrays with 6 droppers each
Anode Setup 3 = single, circular array with 3-6 droppers

Cathode Setup 1 = linear array at front of bow with 30 droppers
Cathode Setup 2 = two linear arrays: starboard (10 droppers) and port (12 droppers)
Cathode Setup 3 = hull of jon boat serves as the cathode

Sampling Procedure

The electrofishing crew for the boom shocker consisted of a boat driver, one primary netter on the forward bow and one assist netter standing behind the primary netter. The electrofishing crew for the mini-boom shocker consisted of a boat driver and one primary netter at the front of the boat. All crew members were equipped with nets and reasonable attempts were made to capture all fish sighted, including those that appeared behind the boat.

The primary netter operated a foot pedal switch, which controlled the timing and duration by which electrical energy was emitted to the water. The boat driver, for safety purposes, had a toggle switch immediately accessible to disengage the alternator-pulsator system. The netter(s) wore linemen's rubber insulating gloves during fish shocking at all times. All crew members wore life preservers at all times while on the boat. All crew members wore polarized sunglasses. The following boat nets were used:

- eight-foot handle and 1/4-inch mesh netting
- six-foot handle and 1/8-inch mesh netting

In accordance with accepted electroshocking procedure, the boat driver slowly and methodically maneuvered the boat in a downstream direction, along the shoreline, maneuvering in and around submerged cover, advantageously positioning the netter(s) to pick up stunned and immobilized fish. In swift-moving waters, the boat driver maintained the boat position and speed such that the electric field moved with or slightly faster than the water current. As necessary, the field crew would return to slower-moving areas along the shoreline and within submerged cover to more thoroughly shock these locations. Shocking in an upstream direction was avoided, so as not to compress the effective shocking zone, given that the natural mechanism is for fish to swim toward the anode in the presence of an electrical gradient. The boat driver also monitored and adjusted the alternator-pulsator to ensure that efficient and safe fish capture was maintained.

In trial sampling efforts, field personnel used fishing times of 1,400 seconds to 2,700 seconds for study reaches 0.8 to 1.5 kilometers in length. In an effort to yield fish numbers commensurate with those of the 2010 study on the Red River of the North (MBI 2010), URS subsequently employed fishing times within the range of those used in the 2010 study. Suggested fishing times are in the range of 2,000 to 2,500 seconds for a 0.5 kilometer site, but can range upwards to 3,500 to 4,500 seconds where there is extensive instream cover and slack flows. The fish sampling results presented in this report reflect the use of these suggested fishing times.

Sample Processing

Fish sampling was conducted by personnel experienced in electroshocking and handling of fish. Captured fish were immediately placed in an on-board live well. Two live wells were maintained – one for larger fish and one for smaller fish. To limit physical stress on the captured fish, crew members introduced an aerator to each live well and regularly replaced the live well water. For study reaches where the volume of fish captured exceeded the capacity of the live well, electroshocking activities were temporarily halted, and the crew motored several meters upstream of the current sampling location to process and release fish. Fish captured were identified to species, examined for external anomalies, weighed, measured and then released unless retained as voucher specimens. Fish holding and handling times were minimized as much as possible. Voucher specimens collected for later verification of identification were preserved with ethyl alcohol, and the container was labeled with the date of collection, waterbody and study reach. Although the Performance Work Statement specified the use of formalin preservative, field personnel used ethyl alcohol because none of the voucher specimens collected were retained for more than 48 hours. Regional ichthyology keys, including *The Fishes of Missouri* (Pflieger 1997) and *The Fishes of Ohio* (Trautman 1981), were used to identify voucher specimens, and all identification of voucher specimens was performed within 24 to 48 hours of collection. URS personnel trained in fish taxonomy performed the field identifications and identification of voucher specimens.

All fish were measured to the nearest 10 millimeters (mm) and recorded. Fish less than 20 mm in length were not counted as part of the catch. URS personnel used a 1,000-gram (g) hand-held spring scale or electronic scale to measure all fish less than 1,000 g to the nearest 1 g. Fish weighing more than 1,000 g were weighed to the nearest 25 g on a 50 kilogram (kg) hand-held spring scale. Small fish (e.g., minnows and young-of-year) within the same species were typically batch-weighed. Weights of all other fish were individually recorded on the datasheets. All observed incidences of external anomalies were recorded on the field datasheets.

The following information was recorded on field datasheets (Fish Data Sheet form, MBI 2010):

- Date
- Names of all sampling crew members
- Description of equipment type (unit design and power settings)
- Waterbody name and study reach number
- County
- GPS coordinates for beginning and end of study reach

- Photograph of beginning and end of each reach, looking upstream and downstream
- Conditions at the beginning of sampling (pH, water temperature, conductivity, dissolved oxygen, total suspended solids, Secchi depth)
- Time of day
- Seconds shocked
- All fish collected (identified to species), including total length (mm) and weight (g)
- Anomalies (DELT [deformities, eroded fins, lesions, tumors] and all other abnormalities observed on individual fish collected)

The following additional information was recorded in the field logbook for the project:

- Description of equipment type (unit design, power settings, electrode array)
- Names of field personnel
- Basic description of weather
- Daily calibration readings for water chemistry instrument
- Water chemistry measurements
- Beginning and ending time of sample collection
- Challenges to sampling effectiveness or efficiency
- Depth range during sampling (maximum, minimum, average)
- General substrate types and qualitative abundance
- Photograph of beginning and end of each reach, looking upstream and downstream

2.2.1.2 Water Chemistry Data Collection

In-situ water chemistry measurements were collected for pH, water temperature, conductivity, dissolved oxygen and total suspended solids for each non-wadeable study reach. These data were collected with a Horiba U-50 Series multi-parameter water quality meter. Water clarity was also measured with a Secchi disk at each non-wadeable study reach. Water chemistry measurements were collected from the side of the boat, near the center of the stream and at the upstream extent of each study reach. These measurements were collected immediately prior to fish sampling. Water chemistry measurements were recorded in the project field logbook and on the fisheries assessment field datasheets.

Field personnel, trained in instrument calibration and maintenance, performed equipment calibration in accordance with the instrument manufacturer's specifications and procedures. URS maintained operation manuals for the Horiba U-50 Series water quality meter in the field.

The calibration, maintenance and status of the instrument were documented in the project field logbook.

2.2.1.3 Physical Habitat Assessment

A physical habitat assessment was conducted per a modified version of the Qualitative Habitat Evaluation Index, QHEI (OEPA 2006, included in Appendix B of the Performance Work Statement), for each of the study reaches within the non-wadeable streams examined in the Fargo/Moorhead Flood Risk Management Project. The same modified version of the QHEI was used in the 2010 study for the Red River of the North (MBI 2010). This modified version used the guidance and scoring procedures outlined by Ohio EPA (2006); however, it incorporated modifications for large rivers. The QHEI is comprised of six principal metrics:

1) Substrate,
2) Instream Cover,
3) Channel Morphology,
4) Riparian Zone,
5) Pool/Riffle Quality, and
6) Map Gradient.

The QHEI is a rapid assessment procedure which provides the ability to relate habitat quality to the stream’s potential to support a biological community. It provides a measure of habitat that generally corresponds to those physical factors which affect fish communities and other aquatic life. General narrative ranges have been assigned to QHEI scores, providing a recognizable, quantifiable means to communicate general habitat quality. Separate narrative ranges have been established for headwater streams (≤ 20 square mile drainage area) and larger streams. On a maximum QHEI scoring scale of 100, the narrative ranges are as follows:

Narrative Rating	QHEI Range	
	Headwaters (≤ 20 sq. mi. drainage area)	Larger Streams
Excellent	≥ 70	≥ 75
Good	55 to 69	60 to 74
Fair	43 to 54	45 to 59
Poor	30 to 42	30 to 44
Very Poor	< 30	< 30

The QHEI does not necessarily have the resolution to predict the abundance of individual aquatic species in a stream, but it can be useful in explaining shifts in the general composition and ecological function of lotic fish communities (Rankin 1989).

2.2.1.4 Macroinvertebrate Assessment

For this Fargo/Moorhead Flood Risk Management Project, the USACE recommended the United States Environmental Protection Agency (USEPA) National Rivers and Streams Assessment benthic macroinvertebrate sampling protocol for non-wadeable streams (USEPA 2009, included as Appendix E of the Performance Work Statement). Macroinvertebrate sampling was conducted in August and September 2012 during base flow conditions. Sampling was not conducted during periods of high flows, given that these conditions negatively affect sampling efficiency.

Macroinvertebrate sampling was conducted several days prior to the fisheries assessments on all of the non-wadeable study reaches. This was a deviation from the Performance Work Statement, which indicated macroinvertebrate sampling would be conducted following the fish sampling. However, this was coordinated with the USACE Project Biologist and USACE Contract Point of Contact and allowed the field team to maintain sampling schedule efficiency while fisheries activities were temporarily paused to reassess fish sampling procedures and acquire custom electroshocking equipment more appropriate for site-specific stream characteristics.

Equipment and Sampling Procedure

A 500-micron mesh, modified D-frame kick net, with detachable bucket was used to collect composite macroinvertebrate samples. A composite sample comprised of sub-samples collected at eleven, equally-spaced transects was collected from each study reach. Geographical information systems (GIS) was used to establish geographic coordinates of sampling transects within each study reach. These transect coordinates were loaded into a GPS unit as waypoints for navigation by field personnel. At each of the eleven transects, a sample station (10 meters x 15 meters) was randomly selected at either the right or left descending bank. Sample stations were established in areas where the water depth did not exceed 0.5 meter. While standing in the boat, field personnel used the D-frame kick net to sweep through 1 linear meter of the most dominant habitat type along the stream bank within the randomly selected sample station.

Sample Processing

As sub-samples were collected within a study reach, net contents were emptied into a 500-micron mesh sieve bucket, which was nestled in a larger plastic bucket. At each transect location, a direct stream wash bottle was used to thoroughly rinse the contents collected within the kick net into the sieve bucket. Personnel continued to sieve the composite sample, reducing it in volume, as they progressed along the study reach.

The composite sample was transferred to a 1-liter Nalgene® bottle by gently agitating the sieve in the plastic bucket of water, washing the contents of the sieve to one side and pouring into the bottle. The sieve was examined for any clinging organisms which were then gently placed into the sample bottle before preserving with ethanol. The void space in the sample bottle was filled so as to ensure that the ethanol was not diluted below 70% and to leave zero headspace. Each jar was carefully tipped to mix the ethanol, water and macroinvertebrate contents. Larger, predaceous invertebrates were immediately placed in the sample bottle and preserved with 70% ethanol to prevent the damage or consumption of other collected specimens. Field personnel were able to reduce the volume of the samples so that each composite sample fit into one sample bottle. Each sample bottle was labeled with the collection date and study reach number. Information for each macroinvertebrate composite sample was recorded in the project field logbook.

With approval of the USACE Project Biologist, sorting and identification of the macroinvertebrate samples was contracted to Dr. Andre Delorme (Valley City State University). Labeled macroinvertebrate composite samples were stored in a cooler in a temperature controlled environment, until samples could be transported or shipped to the laboratory. Chain-of-custody procedures were followed to provide documentation of the handling of each sample from time of collection through receipt by the laboratory. The field team leader completed the chain-of-custody forms, which accompanied each sample through transit from the field to the laboratory. This form was used by both the field sampler and the laboratory to verify the contents of each shipment of samples. When transferring possession of the samples, both the individual relinquishing the container(s) and the receiver signed and dated the chain-of-custody form. As recommended by the USACE, macroinvertebrate samples were processed according to NDDoH methodologies (NDDoH 2008b, included as Appendix F of the Performance Work Statement).

2.2.2 Wadeable Streams

2.2.2.1 Fishery Assessment

Fisheries assessments of the Fargo/Moorhead Flood Risk Management Project's wadeable streams were conducted in September 2011. As with the non-wadeable streams, sampling was conducted at base flow conditions. All fisheries assessments were conducted during daylight hours. Sampling was not started earlier than 60 minutes after sunrise, and finished no later than 60 minutes before sunset. Sampling was not conducted during periods of increased turbidity and high flows, given that these conditions negatively affect sampling efficiency.

Equipment

The type of fish sampling equipment selected was based on site conditions noted during the on-site reconnaissance. In the Performance Work Statement, the USACE outlined anticipated equipment types for fish sampling on wadeable streams. Based on site conditions observed at the time of reconnaissance, the following streams were confirmed as wadeable:

- Rush River, and
- Wolverton Creek.

Per the Performance Work Statement, the USACE considers a site as sampleable if it has a defined stream channel and at least 50% of the sampling reach contains water. Less than 50% of the Lower Rush River streambed was wetted at the time of URS' September 2011 on-site reconnaissance. Based on visual assessment, this stream has an intermittent flow regime and did not meet the requirements of a sampleable stream. In coordination with the USACE Project Biologist and USACE Contract Point of Contact, the Lower Rush River was removed from the stream sampling schedule.

The following equipment was used for fisheries sampling on the wadeable streams:

Waterbody	Equipment	Logic
Rush River Wolverton Creek	Stream Shocker	• Larger, wadeable stream • Towable unit with power capability and two anodes to effectively sample larger streams • Ability to weave between habitat types in a single electrofishing run • One person to control electrofisher, two people to control anodes and to net fish

For this Fargo/Moorhead Flood Risk Management Project, the USACE recommended, and URS adopted, the NDDoH fish sampling protocol for wadeable streams (NDDoH 2009, included as Appendix A of the Performance Work Statement). For the wadeable streams fisheries assessments, a tote barge-mounted, pulsed DC electrofishing apparatus was used. Specifically, the equipment consisted of:

- Stream Shocker
    - Smith-Root® SR-6 Tote Barge with built-in cathode plate
    - Smith-Root® 2.5 GPP alternator-pulsator
    - Two, 6-foot-long pole anodes with electrode rings

Stream Shocker on Rush River

The Smith-Root® 2.5 GPP alternator-pulsator was used to control and regulate the electric current, and produces up to 1,000V at 0-8 amperes depending on the relative conductivity of the waterbody. The pulse configuration consists of a fast rise, slow decay wave that can be adjusted to 7.5, 15, 30, 60 or 120 Hz. Via trial and error at the beginning of each study reach assessment, the voltage and pulse configuration settings were selected that produced the most effective fish shocking. Based on the high conductivities of the sampled waterbodies, the low voltage range (0-500V) was selected. Using the low voltage range, it was determined that a pulse configuration of 30 Hz produced the most effective fish shocking, which occurred with an electrical energy output of 4.2 to 5.5 amperes.

Table 2.3 presents the equipment specifications, alternator-pulsator settings and fish capture efficiency for each fish sampling attempt on each wadeable study reach.

Table 2.3 – Electroshocking Specifications and Fish Capture Efficiency for Wadeable Streams

Study Reach		Equipment Specifications		Control Box Settings				Fish Capture	
Reach #	Date Sampled	Platform	Generator	Control Box Model	Voltage Range	Frequency	Amperes	Fish Abundance (# fish)	CPUE[1]
Rush River									
21	09/13/11	Smith-Root SR-6 Tote Barge[2]	Honda, 5.5 hp	2.5 GPP (custom built)	50 - 500 (surveyed at 250)	30	5.5	511	593
22	09/12/11				50 - 500 (surveyed at 250)	30	5.5	272	327
Wovlerton Creek									
23	09/14/11	Smith-Root SR-6 Tote Barge[2]	Honda, 5.5 hp	2.5 GPP (custom built)	50 - 500 (surveyed at 500)	30	4.2	49	133

Notes: 1 – CPUE – Catch per unit effort – defined as fish caught per hour electroshocked.

2 – The SR-6 Tote Barge has two, 11-inch electrode rings on anode wands (poles). Crew consisted of two shockers who each used an anode wand. The SR-6 also has one built-in cathode plate.

Sampling Procedure

The electrofishing crew for the stream shocker consisted of a three-person crew. Two people each handled a wand and a third person pushed the tote barge and attended the generator. The two crew members with wands were equipped with nets and netted all fish sighted. Crew members used dip nets with 1/8-inch mesh netting and six-foot long handles. Reasonable attempts were made to capture all fish sighted, including those that appeared behind the netters.

Each wand was equipped with a switch, which controlled the timing and duration that electrical energy was emitted to the water. The person attending the generator was required to depress a safety button to engage the system. All crew members wore linemen’s rubber insulating gloves at all active fish shocking times as well as non-conductive waders at all times while in the water. All crew members wore polarized sunglasses.

The wadeable study reaches lacked natural barriers to fish passage (i.e., riffle areas); therefore, prior to the commencement of electroshocking, block nets were positioned at the upstream and downstream extents, as well as at the approximate mid-point of each study reach. This prevented fish escaping. Sampling began at the furthest downstream end of the reach, and was performed by shocking along both stream banks simultaneously (each of the two wand handlers covered one half of the stream). Field personnel made a single pass up each wadeable study reach. The person attending the generator monitored and adjusted the alternator-pulsator to ensure that efficient and safe fish capture was maintained.

Sample Processing

Fish sampling was conducted by personnel experienced in electroshocking and handling of fish. Captured fish were immediately placed in a live well on the tote barge. Two live wells were maintained – one for larger fish and one for smaller fish. To limit physical stress on the captured fish, crew members introduced an aerator to each live well and regularly replaced the live well water. For study reaches where the volume of fish captured was anticipated to exceed the capacity of the live well, field personnel would temporarily halt electroshocking activities at the block net placed near the approximate mid-point of the stream reach, and proceed to process and release fish. Fish were released downstream of the block net.

Fish captured were identified to species, examined for external anomalies, weighed, measured and then released unless retained as voucher specimens. Fish holding and handling times were minimized as much as possible. Voucher specimens collected for later verification of identification were preserved with ethyl alcohol, and the container was labeled with the date of collection, waterbody and study reach. The Performance Work Statement specified formalin preservative; however, field personnel used ethyl alcohol since no voucher specimens were retained longer than 48 hours. Regional ichthyology keys, including *The Fishes of Missouri* (Pflieger 1997) and *The Fishes of Ohio* (Trautman 1981), were used to identify voucher specimens, and all identification of voucher specimens was performed within 24 to 48 hours of collection. Personnel trained in fish taxonomy performed the field identifications and identification of voucher specimens.

Adult and juvenile specimens were counted and identified to species. Fish were measured to the nearest 10 mm. Fish less than 20 mm in length were not counted as part of the catch. A 1,000-g hand-held spring scale or electronic scale was used to measure fish less than 1,000 g to the nearest 1 g. Fish weighing more than 1,000 g were weighed to the nearest 25 g on a 50-kg hand-held spring scale. Per the established protocol, only species-level information was recorded on the field datasheets, as opposed to information specific to the individuals. All observed incidences of external anomalies were recorded on the field datasheets.

The following information was recorded on field datasheets:

NDDoH Biological Monitoring Field Collection Data Form (NDDoH 2009)

- Waterbody name, study reach number and study reach description
- Latitude and longitude for beginning and end of study reach
- County
- River basin and ecoregion
- Basic description of weather
- Waterbody flow rate
- Conditions at the beginning of sampling (pH, water temperature, conductivity, dissolved oxygen)
- Study reach length, average width and average depth
- Stream habitat types present
- Substrate types present
- Collection method
- Beginning and ending time of sample collection
- Names of all sampling crew members

NDDoH Fish Collection Field Form (NDDoH 2009)

- Waterbody name, study reach number and study reach description
- Latitude and longitude for beginning and end of study reach
- County, township, range, section
- River basin and ecoregion
- Names of all sampling crew members
- List of all fish species collected
- Number of individuals collected within each species
- Minimum and maximum lengths (mm) within each species
- Bulk weight (g) for each species
- Number of anomalies observed within each species

The following additional information was recorded in the field logbook for the project:

- Date
- Description of equipment type (unit design, power settings, electrode array)
- Names of field personnel
- Basic description of weather
- Daily calibration readings for water chemistry instrument
- Water chemistry measurements
- Beginning and ending time of sample collection
- Seconds shocked
- Challenges to sampling effectiveness or efficiency
- Depth range during sampling (maximum, minimum, average)
- General substrate types and qualitative abundance
- Photograph looking upstream and downstream from the study reach mid-point
- Photograph of beginning and end of each reach, looking upstream and downstream

2.2.2.2 Water Chemistry Data Collection

In-situ water chemistry measurements were made for pH, water temperature, conductivity and dissolved oxygen for each wadeable study reach. These data were collected with a Horiba U-22 Series multi-parameter water quality meter. Water chemistry measurements were collected while wading in the stream, near the center the stream and at the upstream extent of each study reach. These measurements were collected immediately prior to fish sampling. Care was taken not to disturb the sediment and affect the water chemistry readings by allowing sufficient time for sediment to settle before collecting water chemistry readings, positioning downstream of the water chemistry reading location and facing upstream when collecting the water chemistry readings. Water chemistry measurements were recorded in the project field logbook and on the NDDoH Biological Monitoring Field Collection Data Form.

Field personnel trained in instrument calibration and maintenance performed equipment calibration in accordance with the instrument manufacturer's specifications and procedures. URS maintained operation manuals for the Horiba U-22 Series water quality meter in the field. The calibration, maintenance and status of the instrument were documented in the project field logbook.

2.2.2.3 Physical Habitat Assessment

Two physical habitat assessment protocols were conducted for each of the study reaches within the wadeable streams examined in the Fargo/Moorhead Flood Risk Management Project. Habitat assessments were conducted following the fisheries assessment in each study reach. One assessment was conducted per the modified version of the QHEI (OEPA 2006, included as Appendix B of the Performance Work Statement), also used for non-wadeable streams on this project. Another assessment was conducted per the MPCA Physical Habitat and Water Chemistry Assessment Protocol for Wadeable Stream Monitoring Sites (MPCA 2012, included as Appendix C of the Performance Work Statement).

MPCA’s habitat assessment protocol for wadeable streams is designed for use at wadeable monitoring sites for which an integrated assessment of water quality is conducted – fish, macroinvertebrate, physical habitat and water chemistry. The MPCA habitat assessment protocol uses a transect-point method in which thirteen transects are established within the study reach. In accordance with the protocol, four equally-spaced points were located, plus the thalweg, along each transect. Field personnel proceeded in a downstream to upstream direction collecting measurements and visual estimates of key components of the habitat structure. The key components in MPCA’s habitat assessment protocol include:

1) Channel Morphology,

2) Substrate,

3) Cover, and

4) Riparian Condition.

Data were recorded on the following datasheets:

- Station Features datasheet
    - one form for each study reach
    - describes the length and location of major morphological features
- Transect datasheet
    - one form for each transect within the study reach
    - describes instream characteristics, stream cover and land use characteristics
- Visit Summary datasheet
    - one form for each study reach
    - describes location information, water chemistry and channel characteristics

Similar to the QHEI, the MPCA habitat assessment protocol is a rapid assessment procedure which provides for the ability to relate habitat quality to the stream's potential to support a biological community. The habitat components included in the MPCA protocol are similar to those in the QHEI method, and are considered to generally correspond to physical factors which affect fish communities and other aquatic life.

2.2.2.4 Macroinvertebrate Assessment

In accordance with specifications of the Performance Work Statement, macroinvertebrates were sampled immediately following the fisheries assessment on each of the wadeable study reaches. For this Fargo/Moorhead Flood Risk Management Project, the USACE recommended the NDDoH macroinvertebrate sampling protocol for wadeable streams (NDDoH 2008a, included as Appendix D of the Performance Work Statement). Macroinvertebrate sampling was conducted in September 2011 during base flow conditions. Sampling was not conducted during periods of high flows, given that these conditions negatively affect sampling efficiency.

Equipment and Sampling Procedure

A 500-micron mesh, modified D-frame kick net with detachable bucket was used to collect composite macroinvertebrate samples. The composite sample for a given study reach was comprised of sub-samples collected at eleven equally-spaced transects. GIS was used to establish geographic coordinates of sampling transects within each study reach. These transect coordinates were loaded into a GPS unit as waypoints for navigation by field personnel. Within a given study reach, at the most-downstream transect (i.e., Transect A), field personnel randomly selected the initial sample station at either the right descending bank (R), stream center (C) or left descending bank (L). Following selection of the initial sample station, sample stations for subsequent transects were systematically assigned (i.e., R-L-C repeating pattern). At each sample station, personnel used the D-frame kick net to collect a sample one meter downstream of the given transect. Each sample station was classified as either riffle/run or pool/glide based on whether there was sufficient current to fully extend the net. Areas where water current was not sufficient to extend the net were operationally defined as pool/glide habitat. Sampling was initiated at the downstream extent of the study reach, and proceeded upstream.

The procedure for collecting macroinvertebrates was to seat the net on the stream bottom with the net opening facing upstream. A one-square-foot quadrat was visualized (one net width wide and one net width long) in front of the net. Large substrate particles and large rocks which occurred at least half way into the quadrat were manually picked, washed and/or gently scrubbed so that any organisms were washed into the net. All material picked/washed/scrubbed from the substrate was placed into a sieve-bottom bucket. After scrubbing large particles and rocks:

Riffle/Run Habitats -

No riffle/run habitats coincided with any of the transect sample stations. Therefore, no macroinvertebrate sampling of riffle/run habitats was conducted.

Pool/Glide Habitats -

Starting at the upstream end of the quadrat, the remaining finer substrate within the quadrat was vigorously kicked while dragging the net repeatedly through the disturbed area just above the stream bottom for 30 seconds. The net was continuously moved to prevent trapped organisms from escaping. The net was then quickly removed from the water using a surfacing motion to wash the organisms to the bottom of the net. For pool areas in which the water was too deep to effectively kick the substrate in front of the net, personnel faced upstream and jabbed and swept the net through the quadrat. After each jab and sweep, the net was completely removed from the water and placed back at the upstream extent of the quadrat to prevent the loss of organisms previously collected. In this situation, three series of jabs/sweeps were conducted within a quadrat. For pool/glide areas in which the water was too shallow for sampling with the net, the substrate was stirred with gloved hands and a 500-micron sieve used to collect the organisms from the water in the same manner a net is used in larger pools.

For sample stations containing large rocks which prevented proper seating of the net on the stream bottom, macroinvertebrates were hand-picked for 30 seconds from an approximate one-square-foot quadrat of substrate. For sample stations that were choked with vegetation, personnel swept the net through the vegetation within a one-square-foot quadrat for 30 seconds.

Sample Processing

As sub-samples were collected within a study reach, contents were emptied into a 500-micron mesh sieve bucket which was nestled in a larger plastic bucket. At each transect location, a direct stream wash bottle was used to thoroughly rinse the contents collected within the kick net into the sieve bucket. Sieving the composite sample was continued to reduce sample volume as personnel progressed along the study reach.

The composite sample was transferred to a one-liter Nalgene® bottle by gently agitating the sieve in the plastic bucket of water, washing the contents of the sieve to one side and pouring into the bottle. The sieve was examined for any clinging organisms which were gently placed into the sample bottle before preserving the sample with ethanol. The void space in the sample bottle was filled so as to ensure that the ethanol was not diluted below 70% and to leave zero headspace. Each jar was carefully tipped to mix the ethanol, water and macroinvertebrate contents. Larger, predaceous invertebrates were immediately placed in the sample bottle and preserved with 70% ethanol, to prevent the damage or consumption of other collected specimens. The volume of the samples was sufficiently reduced so that each composite sample fit into one sample bottle. Each sample bottle was labeled with the collection date and study reach number. Information for each macroinvertebrate composite sample was recorded in the project field logbook.

With approval from the USACE, sorting and identification of the macroinvertebrate samples collected from the wadeable study reaches was contracted to Dr. Andre Delorme (Valley City State University). Labeled macroinvertebrate composite samples were stored in a cooler in a temperature controlled environment until samples could be transported or shipped to the laboratory. Chain-of-custody procedures were followed to provide documentation of the handling of each sample from time of collection through receipt by the laboratory. The field team leader completed the chain-of-custody forms, which accompanied each sample through transit from the field to the laboratory. This form was used by both the field sampler and the laboratory to verify the contents of each shipment of samples. When transferring possession of the samples, both the individual relinquishing the container(s) and the receiver signed and dated the chain-of-custody form. As recommended by the USACE, macroinvertebrate samples were processed according to NDDoH methodologies (NDDoH 2008b, included as Appendix F of the Performance Work Statement).

2.2.3 Data Management and Analysis

All data collected for fisheries, water quality, physical habitat and macroinvertebrate assessments were entered into Microsoft Excel®, per direction of the USACE. These data were subsequently imported into Microsoft Access® to establish a project database in anticipation of future data collection. Geographic coordinates representing the study reach extents and macroinvertebrate sample transects were imported into ArcGIS®. All field datasheets were scanned and saved in portable document format (PDF). Site photographs were logged, and photographic logs saved in PDF. With submittal of this assessment findings report, data collected are provided in both electronic and hard copy form (including original field datasheets) to the USACE.

Various metrics will be used to compare these pre-project data to future, post-project data. USACE, in the Performance Work Statement, stipulated calculation of the following measures for each study reach sampled for fish and macroinvertebrates:

- Species Abundance
    - Total number of each species collected
    - Relative species abundance
    - Catch per unit effort

- Species Composition
    - Richness
    - Evenness
    - Diversity

Species richness is the number of different species in a population (or, for purposes of the Fargo/Moorhead Flood Risk Management Project, the number of different species within a study reach). As specified by the USACE, the rarefaction technique was used to assess species richness. In the rarefaction technique, the expected species richness for a standard sample size is calculated. The species richness values for samples of varying size can be standardized against this expected value. Typically samples to be compared (and, therefore, standardized) to one another would all be collected from a single entity monitored over time (i.e., a single study reach). Given that this sampling event represents the first baseline event, multiple data sets are not available for a given study reach. For this baseline assessment report, the sample size used for standardization of species richness is the minimum number of individuals sampled at any one of the 21 sampled study reaches. For aquatic macroinvertebrates, the minimum number of individuals collected for a given study reach was 195 (collected in Sheyenne River Study Reach 14). For fish, the minimum number of individuals collected for a given study reach was 49 (collected in Sheyenne River Study Reach 11). This assessment report also presents an alternative sample size used for standardization of species richness. This alternative sample size represents a number of individuals lower than the minimum caught within any one of the 21 study reaches sampled. The intent in establishing this alternative standard sample size is to allow for comparison of species richness among future samples within given study reaches (for instance, in case a future sampling yields less than 49 fish in a given study reach). For aquatic macroinvertebrates, this lower-than-minimum number is 100. For fish, this lower-than-minimum number is 25. This baseline sampling event allows for a comparison of species richness across study reaches. Collection of additional data with future sampling events, will allow for comparison of species richness within study reaches.

Whereas richness represents the number of species present within a study reach, evenness represents the relative abundance of the species (i.e., the number of individuals within a species proportionate to the total number of individuals within a sample). Within a given study reach, the relative abundance is calculated for each species by dividing the number of individuals of a given species by the total number of individuals in the study reach. Abundance plots of species rank versus relative abundance are presented in this assessment report, and provide a graphical representation of species evenness within study reach populations for aquatic macroinvertebrates and fish.

The Simpson Diversity Index was calculated for the aquatic macroinvertebrate and fish populations sampled at each of the 21 study reaches. The index provides a quantification of how many different types of species are present within the sampled population, and also accounts for how evenly the individuals are distributed among the species. The diversity index value is maximized when all species are equally abundant. For a given study reach, n(n-1) was calculated (n = # of individuals within a species), and summed across all species present. This summation was divided by N(N-1), where N = total # of individuals for the study reach.

$$D = \frac{\sum n(n-1)}{N(N-1)}$$

Where:
n = total # of individuals in a particular species, and
N = total # of individuals of all species

The value of D ranges between 0 and 1. A dataset with a high diversity yields a low diversity index value (i.e., 0 represents infinite diversity); whereas, a dataset with low diversity yields a high diversity index value (i.e., 1 represents no diversity). Since this interpretation is counterintuitive, it is common to transform the Simpson Diversity Index such that the resultant diversity index value increases with increasing dataset diversity and vice versa. The popular transformations are the inverse Simpson Index (1/D) and the Gini-Simpson Index (1-D). Both transformations of the Simpson Diversity Index were calculated for aquatic macroinvertebrate and fish data collected within each of the 21 study reaches assessed.

Per the Performance Work Statement, the USACE will use the collected data to calculate IBI scores. The prescribed sampling methodologies outlined by the USACE in the Performance Work Statement for the Fargo/Moorhead Flood Risk Management Project adhere to IBI scoring systems presently being revised by both the NDDoH and the MPCA. The prescribed sampling methodologies were primarily based on those provided by NDDoH, given that the majority of the study reaches are in North Dakota.

2.3 REPEATABILITY IN FUTURE SAMPLING

Maintaining consistency in monitoring methods will allow for temporal data comparability within study reaches over time. Trends may be elucidated as subsequent baseline and post-project impact sampling efforts are conducted. Haugerud (2006), however, indicates that the aquatic macroinvertebrate IBI for glide/pool habitats in the Lake Agassiz Plain Ecoregion, current as of May 2006, may not be robust enough to minimize between year comparisons. For the Fargo/Moorhead Flood Risk Management Project, it may be necessary to examine whether the adopted IBI scoring systems are based on sufficient monitoring data to adequately assess between year comparisons.

To ensure comparability of results among this extreme low-flow baseline sampling effort and subsequent sampling efforts on the Fargo/Moorhead Flood Risk Management Project, the same study reaches should be sampled (so as to provide data for among year comparisons within a reach), the same sampling methods should be incorporated, sampling should be conducted at the approximate same time of year and under similar hydrologic conditions. Since flow (hydrologic) conditions can vary significantly, a baseline should be established for wet, dry and normal hydrologic conditions during the preferred late summer low-flow period that is desired for electrofishing.

2.3.1 Locations

The premise of the Fargo/Moorhead Flood Risk Management Project is to monitor changes in the biotic structure of designated study reaches over time. To meet this objective, it will be necessary to sample the same study reaches in subsequent sampling efforts, with the purpose of comparing data within a given reach over time. Study reach locations and study reach lengths need to remain consistent from sampling event to sampling event. Spatial integrity is extremely important since temporal comparison of data among spatially different study reaches will not provide the information necessary to quantify the affects from activities of the Fargo/Moorhead Flood Risk Management Project.

2.3.2 Methods

The same electrofishing equipment should be employed each time a study reach is sampled. For instance, those streams that were sampled with a boom shocker in this event should continue to be sampled with a boom shocker in subsequent events. In addition, for each study reach, the same model of alternator-pulsator used in this sampling effort should be used in all subsequent sampling efforts. Fish capture is highly dependent on the manner in which the fish perceives and responds to the electrical shock. The conductivity of the water is the main factor affecting electrofishing efficiency. Therefore, the ability to control the electrical energy emitted to the water is of critical importance, especially in the high conductivity conditions of the waterbodies examined in the Fargo/Moorhead Flood Risk Management Project.

In studies within the same waterbodies and across waterbodies within the same ecoregion, it is important to employ the same level of effort for fish and macroinvertebrate capture. Population abundance is assessed by quantifying the number of individuals captured per unit of sampling effort and is reported as CPUE. Diversity is used as an indicator to support the concept that polluted sites yield fewer species. For instance, the same fishing effort protocols (seconds fished per study reach length) were adopted for the Fargo/Moorhead Flood Risk Management Project as practiced by MBI in their assessment of the Red River of the North three years prior. This reduces the risk of collecting misrepresentative data and subsequently misinterpreting data findings. The same macroinvertebrate collection protocols should be used in subsequent efforts on a given study reach, as these protocols dictate the area and/or time of sweeping.

2.3.3 Timing and Environmental Conditions

Subsequent sampling efforts, for a given study reach, should be conducted in the same time of year. Per accepted convention, fish sampling is conducted in mid to late summer during low-flow conditions. Subsequent sampling efforts should be conducted at the same time of year, so as to avoid the less efficient, colder temperature and higher flow portions of the year, and to minimize effects on sampling from changes in fish distribution which occur throughout the year. Restricting sampling to the summer months also minimizes the influence of spring spawning or other seasonal factors. In an effort to pair information on the macroinvertebrate community with collected fish data, macroinvertebrates should continue to be sampled at the same time as the fish. This reduces variability in environmental factors such as temperature, dissolved oxygen, precipitation and stream flow conditions.

2.3.4 Data Analysis

Consistency in taxonomic identification and the level of taxonomic refinement is important. Misidentification of species can lead to false scoring of the biotic integrity of a community. Lumping individuals into larger taxonomic groups, particularly macroinvertebrates, can make data unusable for IBI scoring. With regard to fish, field assessors should continue the practice of not including individuals less than 20 mm in length in the sampled fish population. It has been found that established methods do not consistently sample fish of this size (Karr et al. 1986; OEPA 1988b).

When calculating IBI scores, a trained biologist should examine the components of the score, together with the fish or aquatic macroinvertebrate community. In this scenario, computer-generated IBI scores can improve the overall evaluation by reducing time spent on calculations and increasing time available for interpretation. Total IBI scores, calculated without an in-depth analysis of the communities to which they are applied, can be an inappropriate measure of environmental quality (OEPA 1988b).

3.0 RESULTS

Per the Performance Work Statement, the following metrics have been calculated with data collected for this first baseline sampling event:

- Species Abundance
    - Total number of each species collected
    - Relative species abundance
    - Catch per unit effort
- Species Composition
    - Richness
    - Evenness (presented as abundance plots)
    - Diversity

The tables presented below include, for a given study reach, the total number of taxa/species collected, the catch per unit effort, species richness (per the rarefaction technique) and species diversity (per the Simpson Diversity Index).

As discussed in Section 2.2.3, species richness is presented in two different ways for both macroinvertebrates and fish. For a given study reach, it is presented as the number of taxa/species, (1) relative to the minimum number of individuals caught among all 21 study reaches (195 for macroinvertebrates and 49 for fish) and (2) relative to a number lower than the minimum caught in any study reach (100 for macroinvertebrates and 25 for fish).

The tables below present the Simpson Diversity Index in three ways – (1) the original Simpson Diversity Index as Simpson's D, (2) the Gini-Simpson Diversity Index as 1-D and (3) the inverse Simpson Diversity Index as 1/D. A high index value for Simpson's D is indicative of low diversity in the dataset; however, a high index value for Gini-Simpson or inverse Simpson is indicative of high diversity in the dataset.

Abundance plots are also presented below as a visualization of the species evenness. Relative abundance is plotted on the Y-axis and species ranks are plotted on the X-axis (the most abundant species is ranked 1, the second most abundant is 2, etc.). Relative species abundances are included in the report appendices. Relative species abundance is presented for each taxon/species within a study reach, and is the total number of individuals for that species, expressed as a percentage of the total number of individuals in the study reach.

No Federally- or State-listed species were captured during field assessment activities for the Fargo/Moorhead Flood Risk Management Project. There are no Federally- or State-listed fish or aquatic macroinvertebrate species with known occurrence in Cass and Richland Counties, North Dakota or Clay County, Minnesota. Two fish species that have not previously been documented within the Red River Basin were field identified during the study effort. These were the black redhorse sucker (*Moxostoma duquesnei*) and the river carpsucker (*Carpiodes carpio*). These species are further discussed in Section 4.4.

Site photographs are included in **Appendix B**. Copies of QHEI (and MPCA habitat assessment, as appropriate) field datasheets are included in **Appendix C**. **Appendix D** presents, for each study reach, a list of all aquatic macroinvertebrate taxa identified, the species richness and relative species abundance. **Appendix D** also includes aquatic macroinvertebrate abundance plots (species rank versus relative abundance) for each of the study reaches. Laboratory bench sheets for aquatic macroinvertebrates are presented in **Appendix E**. Copies of the fish datasheets are included in **Appendix F**. **Appendix G** presents, for each study reach, a list of all fish species captured, the species richness and the relative species abundance. **Appendix G** also includes fish abundance plots (species rank versus relative abundance) for each of the study reaches. **Appendix H** presents the lengths and weights of all individual fish captured, as well as observations of anomalies for each study reach.

3.1 RED RIVER OF THE NORTH

The Red River of the North contained six study reaches for this sampling effort (see **Figures 3.1 through 3.6**). Reach 1 is a location upstream of potential hydraulic alterations, Reaches 2 and 5 are at footprint locations, Reaches 3 and 4 are downstream of potential hydraulic alterations and Reach 6 is a control location. All six study reaches were assessed in August and September 2012.

3.1.1 QHEI Assessment Findings

A summary of the QHEI assessment, which presents scores for the six principal metrics for each of the Red River of the North study reaches, is included in **Table 3.1**.

Table 3.1 – Red River of the North QHEI Assessment

Study Reach (Date Assessed)	Metric 1	Metric 2	Metric 3	Metric 4	Metric 5 Pool/Glide and Riffle/Run Quality		Metric 6	Total QHEI Score Max = 100
	Substrate Max = 20	Instream Cover Max = 20	Channel Morphology Max = 20	Riparian Zone and Bank Erosion Max = 10	Pool/Glide Quality Max = 12	Riffle/ Run Quality Max = 8	Gradient and Drainage Area Max = 10	
Study Reach 1 (9/4/12)	4	7	8	7	8	0	10	44 poor
Study Reach 2 (8/31/12)	2.5	4	4	4	6	0	10	30.5 poor
Study Reach 3 (8/30/12	2.5	4	8	5	6	0	10	35.5 poor
Study Reach 4 (8/29/12)	4.5	7	7	4.5	9	3	10	45 fair
Study Reach 5 (9/1/12)	2.5	4	8	5	9	0	6	34.5 poor
Study Reach 6 (9/2/12)	2	7	8	5	9	0	8	40 poor

Substrates observed at all six of the Red River of the North study reaches were dominated by a mixture of hardpan and heavy silt with extensive embeddedness. Instream cover was sparse and was limited primarily to logs and other woody debris and some pools greater than 70 centimeters in depth. The morphology of the Red River of the North, within the assessed study reaches, exhibited moderate sinuosity, poor development of riffle/pool complexes, low channel stability and moderate affects from anthropogenic channel modifications. Bank erosion was consistently moderate, with approximately 50% of each streambank within each of the study reaches eroded, broken down or showing other signs of stress. The riparian width ranged from narrow (5-10 meters) to wide (>50 meters), with the widths at most study reaches being moderate (10-50 meters). The quality of the floodplain (area immediately outside of the riparian zone or greater than 100 meters from the stream) at the study reaches was generally poor, consisting of open pasture and row crops. Other poor-quality floodplain cover (urban/industrial), in addition to higher quality floodplains (forest/swamp and shrub/old field) were observed at some of the Red

River of the North study reaches. Of the six study reaches on the Red River of the North, only one (Reach 4) had riffle/run complexes present. The remainder of the study reaches were dominated by either pools or glides. All of the study reaches had low to moderate gradients and large drainage areas (QHEI defines a large drainage area as greater than 622.9 square miles).

3.1.2 Water Chemistry Assessment Findings

Water chemistry measurements taken immediately prior to sampling at each of the six study reaches on the Red River of the North are presented in **Table 3.2**.

Table 3.2 – Red River of the North Water Chemistry

Reach	Station Description	Sample Date	Water Temp (°C)	Specific Conductivity (mS/cm)	D.O. (mg/L)	Secchi Depth (inches)	Turbidity (NTU)	pH (SU)
Study Reach 1	Upstream Location	9/21/12	12.7	0.535	8.7	12.2	30.7	8.50
Study Reach 2	Footprint Site	9/8/12	18.0	0.527	8.4	9.1	147	7.76
Study Reach 3	Downstream Location	9/9/12	17.4	0.499	7.8	7.8	171	8.10
Study Reach 4	Downstream Location	9/11/12	18.5	0.601	8.4	10.5	53.6	7.61
Study Reach 5	Footprint Site	9/10/12	18.0	1.670	8.9	5.0	289	8.35
Study Reach 6	Control Site	9/10/12	16.8	1.670	8.6	6.0	305	7.97

Note - All water chemistry measurements were taken immediately prior to the fish sampling effort.

Dissolved oxygen (range of 7.8 to 8.9 mg/L) and pH (range of 7.61 to 8.50) measurements were well within the standard range of surface water readings. Water temperature at Reach 1 (12.7°C) was noticeably lower than the temperature at other study reaches on the Red River of the North, but was also taken at a later date (9/21/12, versus readings on 9/8/12 through 9/11/12 for the remaining study reaches). This deviation in water temperature could have reflected the beginning of the seasonal shift from summer to fall (maximum daily air temperatures in the area ranged from 21^{o}C to 33^{o}C from 09/1/12 to 09/15/12; however, as of 09/16/12 through 09/21/12, maximum daily air temperatures ranged from 16^{o}C to 20^{o}C). Study Reaches 5 and 6, the most-downstream reaches on the Red River of the North, displayed less clarity/higher turbidity than the four study reaches further upstream. The higher turbidities observed at Study Reaches 5 and 6 may have influenced the higher conductivities observed for these reaches, as compared to the more upstream study reaches. The increased turbidity and conductivity at Study Reaches 5 and 6 were likely a result of increased flows from the Sheyenne River observed during the assessment period. The Sheyenne River is discussed further in Section 3.3.

3.1.3 Macroinvertebrate Abundance and Composition

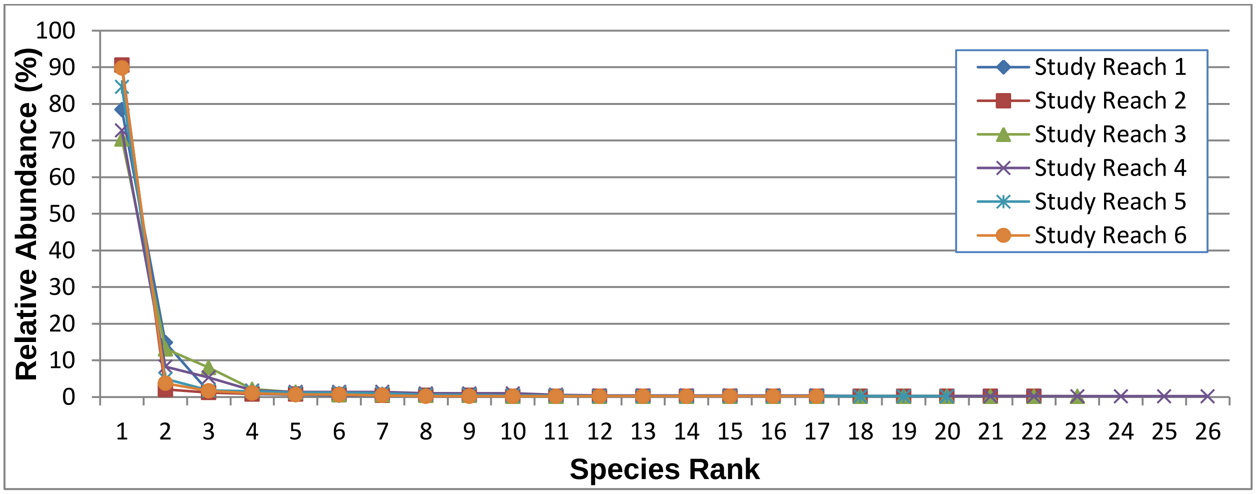
Macroinvertebrates were collected within each of the six study reaches on the Red River of the North, using the methodologies outlined in Section 2.2.1.4. Samples were picked and species identified to the lowest level possible by Valley City State University. A summary of the species composition is presented in **Table 3.3**. Additionally, a rank abundance plot (**Plot 3.1**) for the six study reaches on the Red River of the North is included.

Table 3.3 – Red River of the North Macroinvertebrate Data Analysis

Reach	Total # of Taxa	Total # of Individuals	CPUE	Richness $E(S_n)$	St Dev	Richness $E(S_{100})$	St Dev	Simpson's D	1-D	1/D
Study Reach 1	22	506	78.1	11.858	2.042	7.695	1.840	0.637	0.363	1.569
Study Reach 2	22	491	19.6	12.541	2.017	8.087	1.894	0.822	0.178	1.217
Study Reach 3	23	473	15.8	13.633	2.009	9.409	1.838	0.519	0.481	1.927
Study Reach 4	26	507	31.7	17.589	1.967	12.622	1.998	0.540	0.460	1.852
Study Reach 5	20	509	17.6	12.991	1.749	9.261	1.750	0.720	0.280	1.389
Study Reach 6	17	482	32.1	10.182	1.720	6.975	1.618	0.809	0.191	1.237

Note: CPUE (catch per unit effort) - average number of individuals per grid square picked

Plot 3.1 – Red River of the North Macroinvertebrate Abundance Plot



The total number of taxa identified at each of the study reaches on the Red River of the North was relatively consistent (ranging from 17 to 26, with a mean of 22). No obvious geographical differences were observed. The catch per unit effort (i.e., average number of individuals per grid square picked) indicates that more individuals were collected per grid square within Study

Reaches 1, 4 and 6, as compared to remaining reaches; however, per the abundance plot above, the abundance ranking of the dominant taxa at all study reaches was consistent. Within each of the six study reaches, the most common taxon (i.e., species rank 1) occurred at a relative abundance between 70.4% and 90.6% (mean 81.1%). Coincidentally, the water boatman (Corixidae family) was the most common taxon identified at each of the study reaches (see **Appendix D**). Relative abundance of all other taxa was low in comparison.

3.1.4 Fish Abundance and Composition

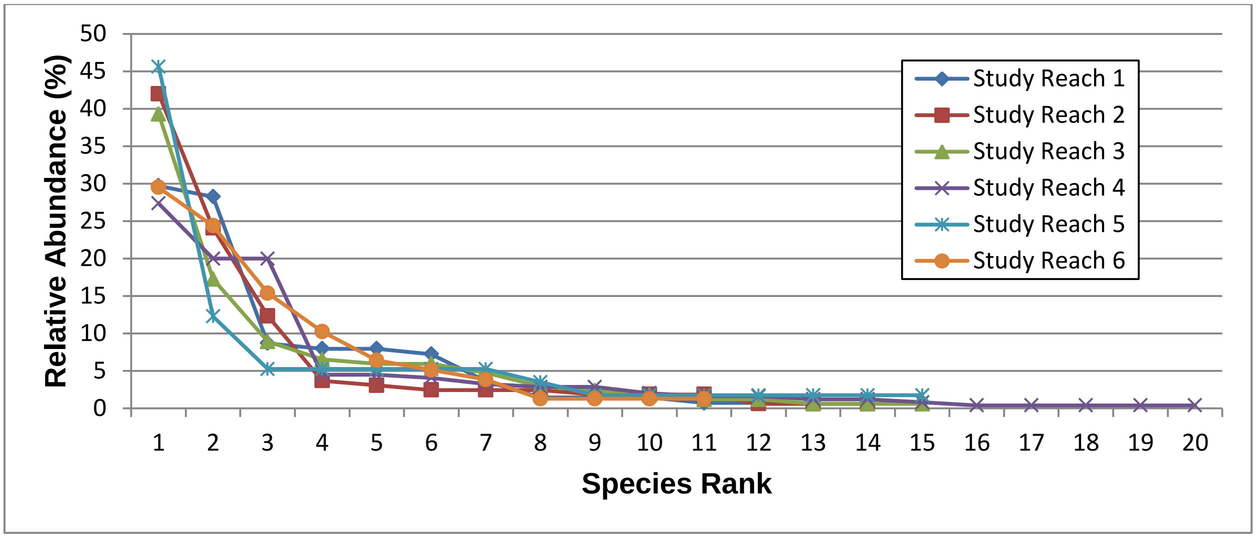
Fish were sampled at each of the six study reaches on the Red River of the North, using electrofishing techniques as discussed in Section 2.2.1.1. A summary of the species composition is presented in **Table 3.4**. Additionally, a rank abundance plot for the six study reaches on the Red River of the North is included.

Table 3.4 – Red River of the North Fish Data Analysis

Reach	Total # of Species	Total # of Individuals	Shock Time (sec)	CPUE	Richness $E(S_n)$	St Dev	Richness $E(S_{25})$	St Dev	Simpson's D	1-D	1/D
Study Reach 1	13	138	5289	93.9	9.69	1.20	7.76	1.21	0.19	0.81	5.27
Study Reach 2	14	162	5356	108.9	9.93	1.36	7.32	1.41	0.25	0.75	4.00
Study Reach 3	15	168	5386	112.3	10.96	1.29	8.53	1.34	0.20	0.80	4.92
Study Reach 4	20	245	6089	144.9	12.36	1.59	9.10	1.56	0.16	0.84	6.21
Study Reach 5	15	57	3882	52.9	13.99	0.88	9.90	1.40	0.23	0.77	4.41
Study Reach 6	11	78	6105	46.0	9.44	0.97	7.59	1.11	0.18	0.82	5.59

Note: CPUE (catch per unit effort) - number of individuals netted per electrofishing hour

Plot 3.2 – Red River of the North Fish Abundance Plot



The total number of fish species captured at each of the six study reaches on the Red River of the North ranged from 11 to 20 species, with a mean of 15 species. The total number of individuals ranged from 57 to 245, with a mean of 141. The catch per unit effort at the study reaches on the Red River of the North ranged from 46.0 to 144.9. Study Reaches 5 and 6 had the lowest number of individuals captured, and subsequently the lowest CPUEs (52.9 and 46.0, respectively). These two study reaches also had the highest turbidities (289 NTU and 305 NTU, respectively) and highest observed conductivities (1.67 mS/cm at both locations) of all study reaches assessed on the Red River of the North.

Three common species of fish were the most abundant at each of the six study reaches on the Red River of the North (see **Appendix G**). At Study Reaches 2, 3, 5 and 6, the channel catfish (*Ictalurus punctatus*) was the most abundant species captured, with the spotfin shiner (*Cyprinella spiloptera*) being the second most abundant at each of the sites except Study Reach 5. At Study Reach 1, the sand shiner (*Notropis stramineus*) was most abundant, followed by the spotfin shiner (*Cyprinella spiloptera*) and the channel catfish (*Ictalurus punctatus*). At Study Reach 4, the spotfin shiner (*Cyprinella spiloptera*) was the most abundant, with equal numbers of the sand shiner (*Notropis stramineus*) and channel catfish (*Ictalurus punctatus*) each present at lesser abundance. The higher species richness observed at Study Reach 4, as compared to other study reaches of the Red River of the North, may be attributable to the instream habitat present at Reach 4. This was the only study reach on the Red River of the North to contain riffle habitat.

A total of eight individual instances of anomalies were observed across all of the study reaches on the Red River of the North. Surface lesions were the most common anomaly observed (five of the eight instances). Other anomalies observed included an eroded fin and blindness. With the exception of Study Reach 5, all locations on the Red River had at least one anomaly observed.

3.2 WILD RICE RIVER

The Wild Rice River contained four study reaches for this sampling effort (see **Figures 3.7 through 3.10**). Reach 7 is an upstream control location, Reach 8 is upstream of potential hydraulic alterations, Reach 9 is a footprint location and Reach 10 is downstream of potential hydraulic alterations. These study reaches were assessed in August and September 2012.

3.2.1 QHEI Assessment Findings

A summary of the QHEI assessment, which presents scores for the six principal metrics for each of the Wild Rice River study reaches, is included in **Table 3.5**.

Table 3.5 – Wild Rice River QHEI Habitat Assessment

Study Reach (Date Assessed)	Substrate Max = 20	Instream Cover Max = 20	Channel Morphology Max = 20	Riparian Zone and Bank Erosion Max = 10	Pool/Glide Quality Max = 12	Riffle/ Run Quality Max = 8	Gradient and Drainage Area Max = 10	Total QHEI Score Max = 100
Study Reach 7 (8/20/12)	4.5	6	7	5	9	0	10	41.5 poor
Study Reach 8 (8/20/12)	3.5	10	10	5	6	0	8	42.5 poor
Study Reach 9 (8/21/12)	3.5	6	10	4.5	6	0	10	40 poor
Study Reach 10 (8/21/12)	5.5	6	6	5.5	6	0	6	35 poor

Substrates observed at all four of the Wild Rice River study reaches were dominated by a mixture of hardpan and silt, and included extensive embeddedness. Silt cover was moderate to heavy at each of the four reaches. Instream cover was sparse in Reaches 7, 9 and 10, but moderate in Reach 8. Pools (greater than 70 centimeters deep) and logs/woody debris comprised the available instream cover. Comparatively, the morphology of downstream Reaches 9 and 10 on the Wild Rice River was generally more stable and developed than that of upstream Reaches 7 and 8. Reach 7 displayed poor sinuosity and poor development of riffle/pool complexes. Reaches 8, 9 and 10 each displayed moderate sinuosity and the development of riffle/pool complexes was fair. Reach 10, however, is impounded due to the presence of a dam downstream of this reach whereas Reaches 8 and 9 currently display geomorphic character representative of a recovering system. Bank erosion was consistently moderate, with approximately 50% of each streambank within each of the study reaches eroded, broken down or showing other signs of stress. The width of the riparian zone was most typically moderate (10-50 meters). The quality of the floodplain at the study reaches was generally poor, consisting of open pasture and row crops. The floodplain in the vicinity of Reach 10 contained some slightly higher quality floodplain land cover (residential park/newly-abandoned agricultural field). Each of the four study reaches assessed on the Wild Rice River were dominated by pool/glide habitat. Riffle/run complexes were not observed on any of the reaches assessed on the Wild Rice River. The gradient of the Wild Rice River generally lessened from upstream to downstream. Reaches 7 and 8, the upstream reaches, had high and very high gradients, respectively; whereas, downstream Reaches 9 and 10 had moderate-high and low gradients, respectively. The drainage area is large (defined as greater than 622.9 square miles in the QHEI).

3.2.2 Water Chemistry Assessment Findings

Water chemistry measurements taken immediately prior to sampling at each of the four study reaches on the Wild Rice River are presented in **Table 3.6**.

Table 3.6 – Wild Rice River Water Chemistry

Reach	Station Description	Sample Date	Water Temp (°C)	Specific Conductivity (mS/cm)	D.O. (mg/L)	Secchi Depth (inches)	Turbidity (NTU)	pH (SU)
Study Reach 7	Upstream Location	9/13/12	13.7	1.580	5.3	9.0	74.1	7.88
Study Reach 8	Upstream Location	9/12/12	16.9	1.760	6.2	24.5	10.2	8.17
Study Reach 9	Footprint Site	9/14/12	13.9	1.770	6.8	14.2	19.7	8.30
Study Reach 10	Downstream Location	9/15/12	13.7	1.690	8.9	7.3	44.5	8.19

Note - All water chemistry measurements were taken immediately prior to the fish sampling effort.

Measurements for pH across the four study reaches were within the standard range for surface water, and temperature readings were typical for the time of year. Dissolved oxygen for Wild Rice River Study Reaches 7, 8 and 9 was reduced as compared to that for Study Reach 10 and study reaches on other waterbodies assessed for the Project. Dissolved oxygen levels recorded for Reaches 7, 8 and 9 may be reflective of stagnant, non-flowing water that was observed at these reaches on the Wild Rice River (although, Study Reach 10 also displayed little flow, but a higher concentration of dissolved oxygen registered here). Study Reach 8 was the least turbid of those assessed on the Wild Rice River. Water turbidity within the Wild Rice River did not display a trend from upstream to downstream. The Wild Rice River displayed relatively high conductivity at all reaches, consistent with all Red River Valley reaches assessed for this Project, with the exception of the four upstream reaches on the Red River of the North.

3.2.3 Macroinvertebrate Abundance and Composition

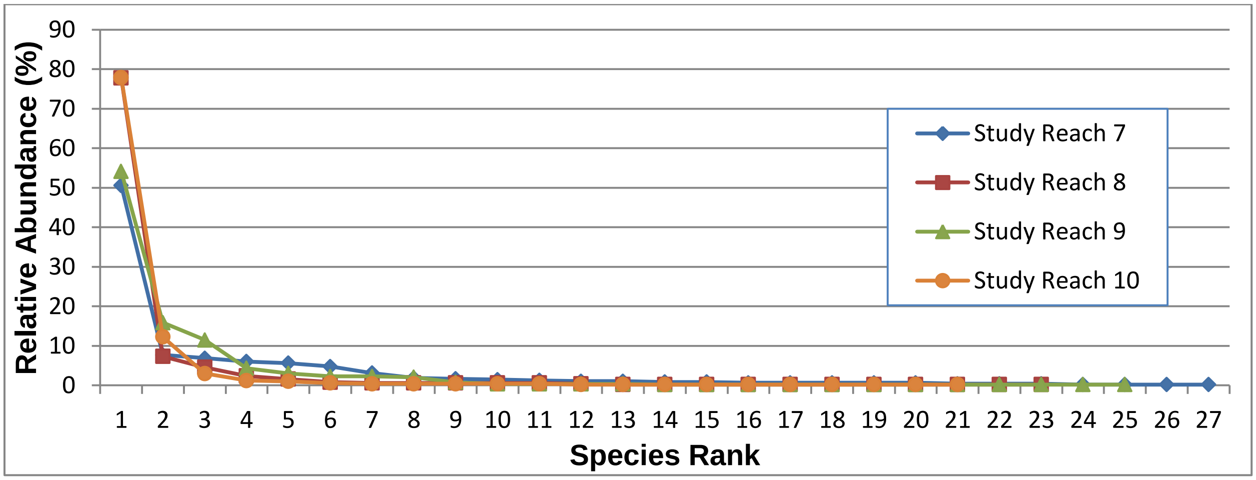
Macroinvertebrates were collected within each of the four study reaches on the Wild Rice River using the methodologies outlined in Section 2.2.1.4. Samples were picked and species identified to the lowest level possible by Valley City State University. A summary of the species composition is presented in **Table 3.7**. Additionally, a rank abundance plot for the four study reaches on the Wild Rice River is included below.

Table 3.7 – Wild Rice River Macroinvertebrate Data Analysis

Reach	Total # of Taxa	Total # of Individuals	CPUE	Richness $E(S_n)$	St Dev	Richness $E(S_{100})$	St Dev	Simpson's D	1-D	1/D
Study Reach 7	27	480	53.3	22.043	1.667	17.332	1.939	0.277	0.723	3.608
Study Reach 8	23	505	33.7	14.556	1.926	10.305	1.859	0.613	0.387	1.630
Study Reach 9	25	530	31.2	15.646	1.939	11.904	1.755	0.335	0.665	2.987
Study Reach 10	21	498	158.2	12.710	1.921	8.691	1.808	0.623	0.377	1.606

Note: CPUE (catch per unit effort) – average number of individuals per grid square picked

Plot 3.3 Wild Rice River Macroinvertebrate Abundance Plot



The total number of taxa identified at each of the study reaches on the Wild Rice River was consistent (ranging from 21 to 27, with a mean of 24). The catch per unit effort indicates that Reach 10 had a greater density of individuals, as compared to other study reaches on the Wild Rice River. The abundance plot shows that, for each of the four reaches on the Wild Rice River, the dominant taxon accounted for 50% to 80% of the sampled aquatic macroinvertebrate population. The evenness of the sampled macroinvertebrate populations in the Wild Rice River was low, with the second-most abundant species in each study reach accounting for only 7% to

16% of the population. The diversity indices show that Study Reach 7 had the greatest diversity (i.e., greatest number of and most evenness across taxa) and Study Reach 10 had the least diversity. No obvious geographical differences were observed, in that the same taxa were observed with the most abundant and least abundant occurrences across the four reaches (see **Appendix D**). A hemipteran, of the Corixidae family, and ostracods were the two most common taxa identified across the four study reaches on the Wild Rice River. The water boatman (Corixidae family) was the third-most commonly observed species across the four reaches assessed on the Wild Rice River. The prevailing abundance of only a few individual taxa is indicative of a macroinvertebrate community with poor biotic integrity.

3.2.4 Fish Abundance and Composition

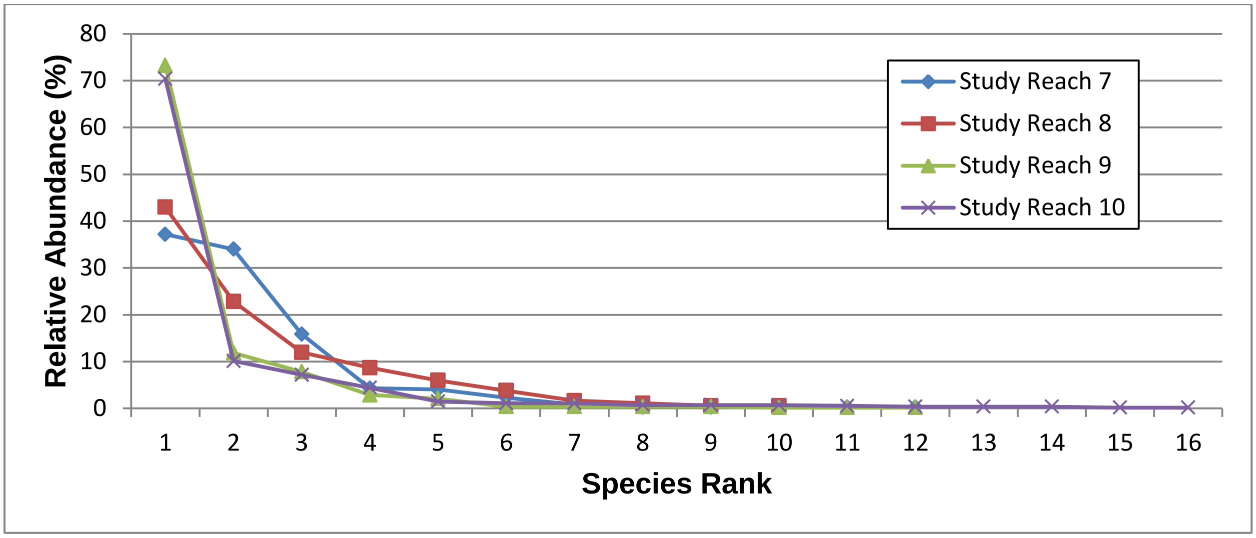
Fish were sampled at each of the four study reaches on the Wild Rice River using electrofishing techniques as discussed in Section 2.2.1.1. A summary of the species composition is presented in **Table 3.8**. Additionally, a rank abundance plot for the four study reaches on the Wild Rice River is included below.

Table 3.8 – Wild Rice River Fish Data Analysis

Reach	Total # of Species	Total # of Individuals	Shock Time (sec)	CPUE	Richness E(S_n)	St Dev	Richness E(S_{25})	St Dev	Simpson's D	1-D	1/D
Study Reach 7	12	347	3488	358.1	6.57	1.08	5.34	1.05	0.28	0.72	3.56
Study Reach 8	10	184	3818	173.5	7.46	0.98	6.22	1.02	0.26	0.74	3.85
Study Reach 9	12	523	5391	349.2	5.42	1.10	4.30	1.01	0.56	0.44	1.80
Study Reach 10	16	543	4416	442.7	7.17	1.45	5.29	1.28	0.51	0.49	1.95

Note: CPUE (catch per unit effort) – number of individuals netted per electrofishing hour

Plot 3.4 – Wild Rice River Fish Abundance Plot



The total number of species captured at each of the four study reaches on the Wild Rice River ranged from 10 to 16 species, with a mean of 13 species. The total number of individuals ranged from 184 to 543, with a mean of 399. The catch per unit effort on the Wild Rice River ranged from 173.5 to 442.7. Orangespotted sunfish (*Lepomis humilis*) was the most abundant fish species captured at each of the four study reaches, accounting for 37% to 74% of the population on any given reach (see **Appendix G**). Other small species, the spotfin shiner (*Cyprinella spiloptera*) and fathead minnow (*Pimephales promelas*), were the two next most common fish species captured. Reaches 7 and 8 displayed more species evenness (equivalent relative abundance) than did Reaches 9 and 10, in which a single species was highly dominant. The diversity indices show that Study Reaches 7 and 8 had higher diversity than downstream Study Reaches 9 and 10.

In addition to the orangespotted sunfish (*Lepomis humilis*), the spotfin shiner (*Cyprinella spiloptera*) and the fathead minnow (*Pimephales promelas*), other species captured within each of the four reaches on the Wild Rice River included the sand shiner (*Notropis stramineus*), channel catfish (*Ictalurus punctatus*) and common carp (*Cyprinus carpio*).

Only one anomaly was observed among all of the fish captured on the Wild Rice River. This was an eroded fin that was observed at Study Reach 7.

3.3 SHEYENNE RIVER

The Sheyenne River contained five study reaches for this sampling effort (see **Figures 3.11 through 3.15**). Reach 11 is a location upstream of potential hydraulic alterations, Reach 12 is a footprint location and Reaches 13, 14 and 15 are all downstream of potential hydraulic alterations. All five study reaches were assessed in August and September 2012.

3.3.1 QHEI Assessment Findings

A summary of the QHEI assessment, which presents scores for the six principal metrics for each of the Sheyenne River study reaches, is included in **Table 3.9**.

Table 3.9 – Sheyenne River QHEI Habitat Assessment

Study Reach (Date Assessed)	Substrate Max = 20	Instream Cover Max = 20	Channel Morphology Max = 20	Riparian Zone and Bank Erosion Max = 10	Pool/Glide Quality Max = 12	Riffle/ Run Quality Max = 8	Gradient and Drainage Area Max = 10	Total QHEI Score Max = 100
Study Reach 11 (8/19/12)	2.5	11	8	5.5	8	0	10	45 fair
Study Reach 12 (8/19/12)	2.5	8	8	5	8	0	10	41.5 poor
Study Reach 13 (8/18/12)	2.5	12	8	5.5	8	0	6	42 poor
Study Reach 14 (8/18/12)	2.5	7	8	5	8	0	6	36.5 poor
Study Reach 15 (8/17/12)	2.5	7	8	6.5	8	0	8	40 poor

Substrates observed at all five of the Sheyenne River study reaches were dominated by a mixture of hardpan and heavy silt with extensive embeddedness. Instream cover primarily consisted of overhanging vegetation, logs and other woody debris and some pools greater than 70 centimeters in depth. The instream cover was sparse at Study Reaches 12, 14 and 15 and moderate at Study Reaches 11 and 13. The study reaches of the Sheyenne River generally exhibited moderate sinuosity, poor development of riffle/pool complexes, low channel stability, and moderate affects from anthropogenic channel modifications. Bank erosion was consistently moderate, with approximately 50% of each streambank within each of the study reaches eroded, broken down or showing other signs of stress. The riparian width ranged from narrow (5-10 meters) to wide (>50 meters), with the widths at most study reaches being moderate (10-50 meters). The floodplain adjacent to the study reaches was primarily open pasture and/or row crops, with one study reach (Reach 13) occurring within a residential community. None of the study reaches on the Sheyenne River contained riffle/run complexes, as all were dominated by glide/pool regimes. The calculated map gradients on the Sheyenne River study reaches were low to moderate-high and all reaches had large drainage areas (QHEI defines a large drainage area as greater than 622.9 square miles).

3.3.2 Water Chemistry Assessment Findings

Water chemistry measurements taken immediately prior to sampling at each of the five study reaches on the Sheyenne River are presented in **Table 3.10**.

Table 3.10 – Sheyenne River Water Chemistry

Reach	Station Description	Sample Date	Water Temp (°C)	Specific Conductivity (mS/cm)	D.O. (mg/L)	Secchi Depth (inches)	Turbidity (NTU)	pH (SU)
Study Reach 11	Upstream Location	9/17/12	14.7	2.080	9.0	6.50	218	8.54
Study Reach 12	Footprint Site	9/18/12	13.7	2.080	8.5	5.50	248	8.11
Study Reach 13	Downstream Location	9/16/12	15.3	2.070	9.7	4.80	240	8.36
Study Reach 14	Downstream Location	9/19/12	13.3	2.110	9.6	5.20	235	8.35
Study Reach 15	Downstream Location	9/20/12	12.6	2.080	9.4	4.70	259	8.53

Note - All water chemistry measurements were taken immediately prior to the fish sampling effort.

Dissolved oxygen (range of 8.5 to 9.7 mg/L) and pH (range of 8.11 to 8.54) measurements were within the standard range of surface water readings. Water temperatures were relatively consistent across the five study reaches and ranged from 15.27 to 12.55 °C, with a steady decline occurring as the sampling effort progressed. Turbidities and specific conductivities at the five study reaches were consistent (ranges of 218 to 259 NTU and 2.070 to 2.110 mS/cm, respectively) among the reaches, but were also higher than many of the other waterbodies examined during this study effort. These higher turbidity and conductivity readings were potentially caused by an increase in flow through the Sheyenne River, due to water pumped from Devil's Lake. Flows (though not measured in this study effort) were noticeably higher in all of the reaches on the Sheyenne River, as well as the downstream reaches of the Red River of the North.

3.3.3 Macroinvertebrate Abundance and Composition

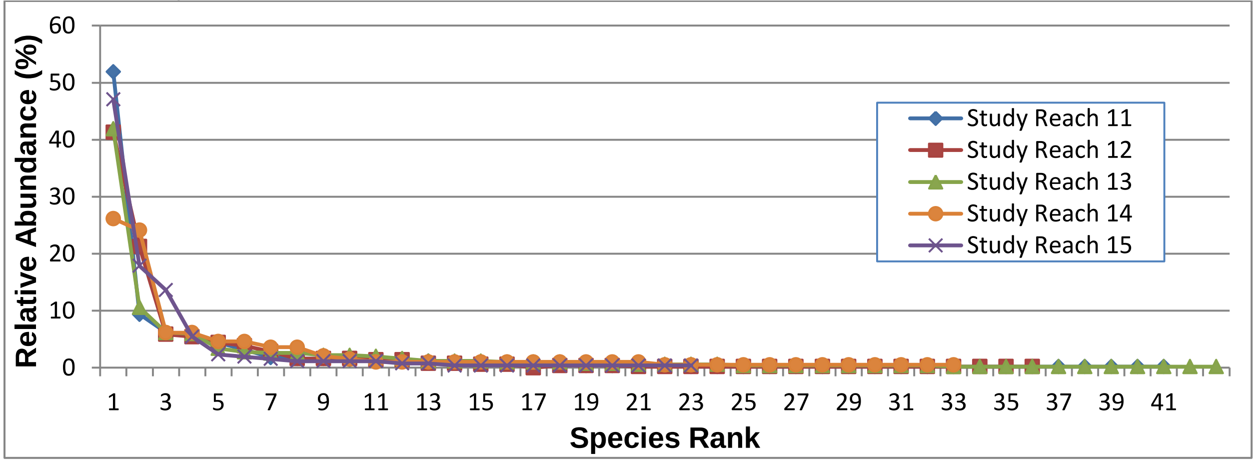
Macroinvertebrates were collected within each of the five study reaches on the Sheyenne River using the methodologies outlined in Section 2.2.1.4. Samples were picked and species identified to the lowest level possible by Valley City State University. A summary of the species composition is presented in **Table 3.11**. Additionally, a rank abundance plot for the five study reaches of the Sheyenne River is included below.

Table 3.11 – Sheyenne River Macroinvertebrate Data Analysis

Reach	Total # of Taxa	Total # of Individuals	CPUE	Richness $E(S_n)$	St Dev	Richness $E(S_{100})$	St Dev	Simpson's D	1-D	1/D
Study Reach 11	41	501	41.8	26.878	2.425	19.623	2.359	0.289	0.711	3.466
Study Reach 12	36	494	24.7	24.116	2.250	18.003	2.186	0.226	0.774	4.418
Study Reach 13	43	501	10.7	31.674	2.321	23.832	2.428	0.199	0.801	5.031
Study Reach 14	33	195	3.6	33.000	0.000	24.375	2.105	0.139	0.861	7.214
Study Reach 15	23	257	4.8	20.414	1.381	14.970	1.863	0.274	0.726	3.645

Note: CPUE (catch per unit effort) – average number of individuals per grid square picked

Plot 3.5 – Sheyenne River Macroinvertebrate Abundance Plot



The total number of taxa identified at each of the study reaches on the Sheyenne River ranged from 23 to 43 (mean of 35), with the two lowest values occurring at the downstream reaches (14 and 15). Overall there was a significant decline in catch per unit effort from the upstream study reach (Reach 11 - with a CPUE of 41.8) to the two furthest downstream reaches (Reach 14 and Reach 15, with CPUEs of 3.6 and 4.8, respectively). The relative abundance of the dominant taxa was not as consistent at the study reaches on the Sheyenne River, as compared to the Red River of the North and the Wild Rice River. The relative abundance of the most common taxa ranged from 26.2 to 51.9% (mean 41.7%). The differences between the most common taxon and the next most common taxon at any given reach was not as pronounced at the study reaches on the Sheyenne River. Similar to most of the study reaches on the Red River of the North and the Wild Rice River, the water boatman (Corixidae family) was the most common taxon identified at each of the study reaches on the Sheyenne River.

3.3.4 Fish Abundance and Composition

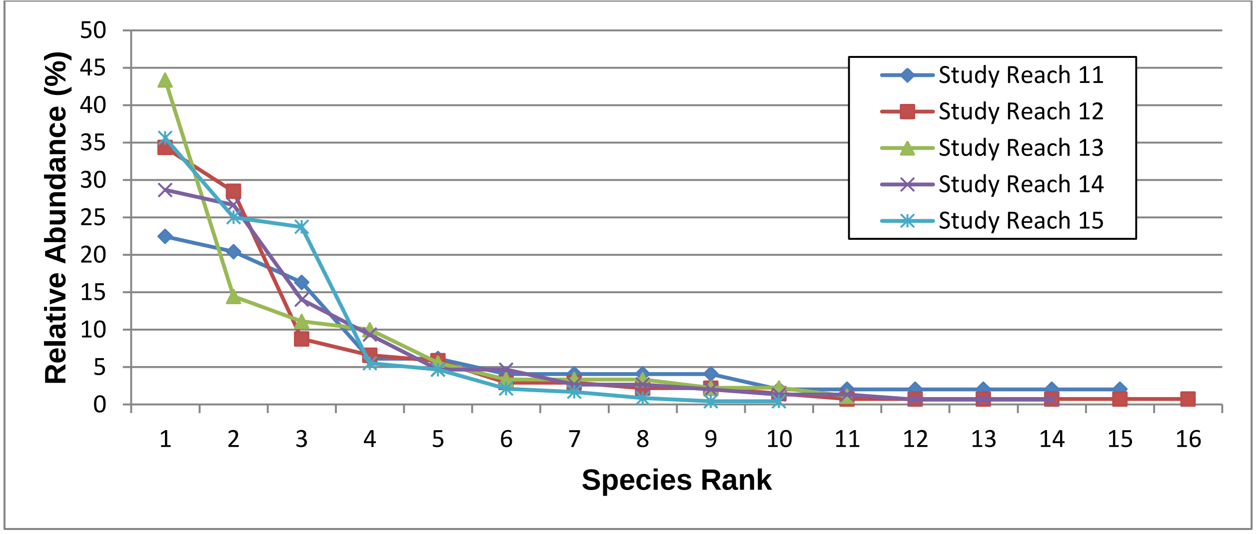
Fish were sampled at each of the five study reaches on the Sheyenne River, using mini-boom electroshocking techniques as discussed in Section 2.2.1.1. A summary of the species composition is presented in **Table 3.12**. Additionally, a rank abundance plot for the five study reaches on the Sheyenne River is included below.

Table 3.12 – Sheyenne River Fish Data Analysis

Reach	Total # of Species	Total # of Individuals	Shock Time (sec)	CPUE	Richness $E(S_n)$	St Dev	Richness $E(S_{25})$	St Dev	Simpson's D	1-D	1/D
Study Reach 11	15	49	4797	36.8	15.00	0.00	10.90	1.34	0.12	0.88	8.52
Study Reach 12	16	137	6220	79.3	10.83	1.44	8.03	1.42	0.21	0.79	4.73
Study Reach 13	11	90	4731	68.5	9.84	0.89	7.85	1.18	0.23	0.77	4.35
Study Reach 14	14	150	4834	111.7	10.25	1.28	7.95	1.32	0.18	0.82	5.47
Study Reach 15	10	236	4936	172.1	6.97	1.04	5.70	1.05	0.25	0.75	4.03

Note: CPUE (catch per unit effort) – number of individuals netted per electrofishing hour

Plot 3.6 – Sheyenne River Fish Abundance Plot



The total number of species captured at each of the five study reaches on the Sheyenne River ranged from 10 to 16 species, with a mean of 13.2 species. The total number of individuals ranged from 49 to 236, with a mean of 132. Study Reach 11 had the lowest number of individuals and the lowest catch per unit effort (36.8), but also had the second highest number of species (15); whereas Study Reach 15 had the highest number of individuals and highest catch per unit effort (172.1), but the lowest number of species (10).

The sand shiner (*Notropis stramineus*) was the most abundant species at Study Reaches 12, 13 and 15, as well as being the second-most abundant species at Study Reaches 11 and 14. The spotfin shiner (*Cyprinella spiloptera*) was the most abundant species at Study Reach 14 and the second-most abundant at Study Reach 15, while the channel catfish (*Ictalurus punctatus*) was the most abundant at Study Reach 11 and the second-most abundant at Study Reach 13.

Only one anomaly was observed among all of the fish captured on the Sheyenne River. This anomaly was surface lesions on one individual observed at Study Reach 7.

3.4 MAPLE RIVER

The Maple River contained three study reaches for this sampling effort (see **Figures 3.16 through 3.18**). Reach 16 is a location upstream of potential hydraulic alterations, Reach 17 is at a footprint location, and Reach 18 is downstream of potential hydraulic alterations. All three study reaches were assessed in August and September 2012.

3.4.1 QHEI Assessment Findings

A summary of the QHEI assessment, which presents scores for the six principal metrics for each of the Maple River study reaches, is included in **Table 3.13**.

Table 3.13 – Maple River QHEI Habitat Assessment

Study Reach (Date Assessed)	Substrate Max = 20	Instream Cover Max = 20	Channel Morphology Max = 20	Riparian Zone and Bank Erosion Max = 10	Pool/Glide Quality Max = 12	Riffle/ Run Quality Max = 8	Gradient and Drainage Area Max = 10	Total QHEI Score Max = 100
Study Reach 16 (9/5/12)	2.5	7	6	5	4	0	10	34.5 poor
Study Reach 17 (9/6/12)	4.5	6	5	6	9	3	6	39.5 poor
Study Reach 18 (9/5/12)	2.5	7	7	4.5	6	0	6	33 poor

Substrates observed at each of the three Maple River study reaches were dominated by a mixture of hardpan and heavy silt with extensive embeddedness. Instream cover was sparse and consisted of overhanging vegetation, logs and other woody debris and pools greater than 70 centimeters in depth. The morphology of the Maple River within the study reaches exhibited low sinuosity, poor to moderate development of riffle/pool complexes, low to moderate channel stability and moderate to heavy affects due to anthropogenic channel modification. Bank erosion varied from very low amounts on the upper two reaches (16 and 17) to moderate/heavy amounts at the downstream reach (18). The riparian zone width was consistently narrow (5-10 meters) to moderate (10-50 meters). The quality of the floodplain at the three study reaches was poor and consisted primarily of open pasture and row crops. Study Reach 17 was the only reach that contained riffle/run complexes, but they were of low quality. The other two reaches had pool habitat. The gradients ranged from high at Reach 16, even though an impoundment on the Maple River appears to have a great influence, to low at Reaches 17 and 18. The Maple River has a large drainage area (defined as greater than 622.9 square miles in the QHEI).

3.4.2 Water Chemistry Assessment Findings

Water chemistry measurements taken immediately prior to sampling at each of the three study reaches on the Maple River are presented in **Table 3.14**.

Table 3.14 – Maple River Water Chemistry

Reach	Station Description	Sample Date	Water Temp (°C)	Specific Conductivity (mS/cm)	D.O. (mg/L)	Secchi Depth (inches)	Turbidity (NTU)	pH (SU)
Study Reach 16	Upstream Location	9/5/12	19.1	1.400	7.2	9.00	63.2	8.16
Study Reach 17	Footprint Site	9/6/12	18.8	1.460	9.7	9.25	49.5	8.58
Study Reach 18	Downstream Location	9/5/12	20.6	1.500	8.8	7.25	62.4	8.65

Note - All water chemistry measurements were taken immediately prior to the fish sampling effort.

Measurements for pH across the three study reaches were within the standard range for surface water, and dissolved oxygen and temperature readings were typical for the time of year. Specific conductivities were consistent across all of the reaches on the Maple River and were similar to the other tributaries of the Red River of the North that were included in this study. Turbidity measurements were also relatively consistent across the three sample reaches.

3.4.3 Macroinvertebrate Abundance and Composition

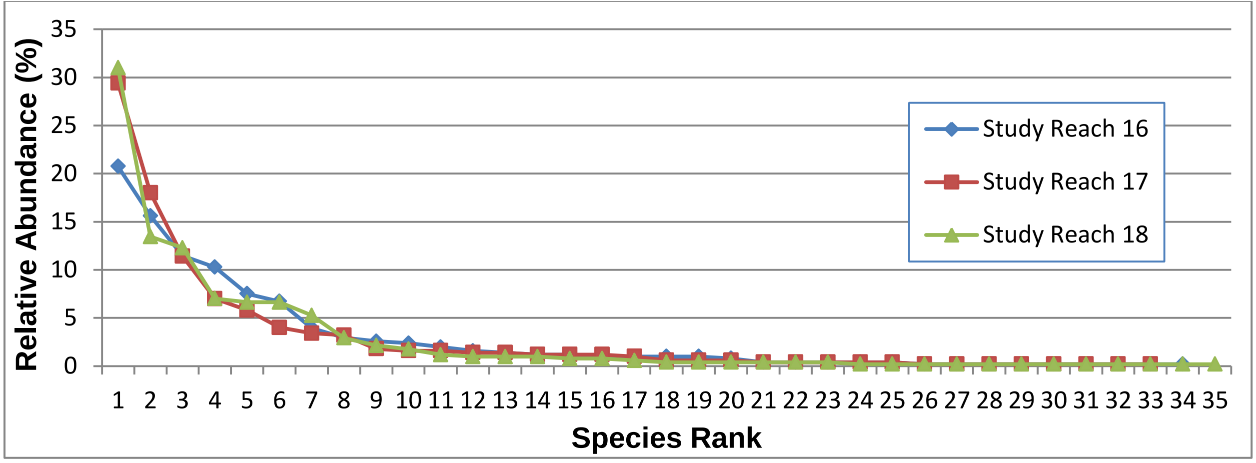
Macroinvertebrates were collected within each of the three study reaches on the Maple River, using the methodologies outlined in Section 2.2.1.4. Samples were picked and species identified to the lowest level possible by Valley City State University. A summary of the species composition is presented in **Table 3.15**. Additionally, a rank abundance plot for the three study reaches of the Maple River is included below.

Table 3.15 – Maple River Macroinvertebrate Data Analysis

Reach	Total # of Taxa	Total # of Individuals	CPUE	Richness E(S_n)	St Dev	Richness E(S_{100})	St Dev	Simpson's D	1-D	1/D
Study Reach 16	34	506	62.1	25.924	1.927	20.634	2.048	0.105	0.895	9.536
Study Reach 17	33	500	45.5	25.239	1.929	19.824	2.068	0.144	0.856	6.937
Study Reach 18	35	513	46.6	24.383	2.170	18.544	2.152	0.146	0.854	6.831

Note: CPUE (catch per unit effort) – average number of individuals per grid square picked

Plot 3.7 – Maple River Macroinvertebrate Abundance Plot



The total number of taxa identified at each of the study reaches on the Maple River was consistent (ranging from 33 to 35, with a mean of 34). The catch per unit effort was consistent at Reaches 17 and 18 (45.5 and 46.6, respectively), but higher at Study Reach 16 (CPUE of 62.1). Unlike some of the other rivers assessed in the study, the relative abundance at the three study reaches did not show a large amount of variance between the dominant taxon and the second (and subsequent) taxon, especially at Study Reaches 16 and 17. The relative abundance of the dominant taxon at the reaches ranged from 20.8% to 31.0%, while the abundance of the second- and third-most dominant taxon ranged from 13.5% to 18.0% and 11.4% to 12.3%, respectively. Additionally, each of the three study reaches had a different taxon identified as the most common. The evenness in the distribution of individuals across taxa in the Maple River study reaches is a positive indicator of community health, implying that conditions are suitable for a variety of organisms to equally survive.

3.4.4 Fish Abundance and Composition

Fish were sampled at each of the three study reaches on the Maple River, using electrofishing techniques as discussed in Section 2.2.1.1. A summary of the species composition is presented in

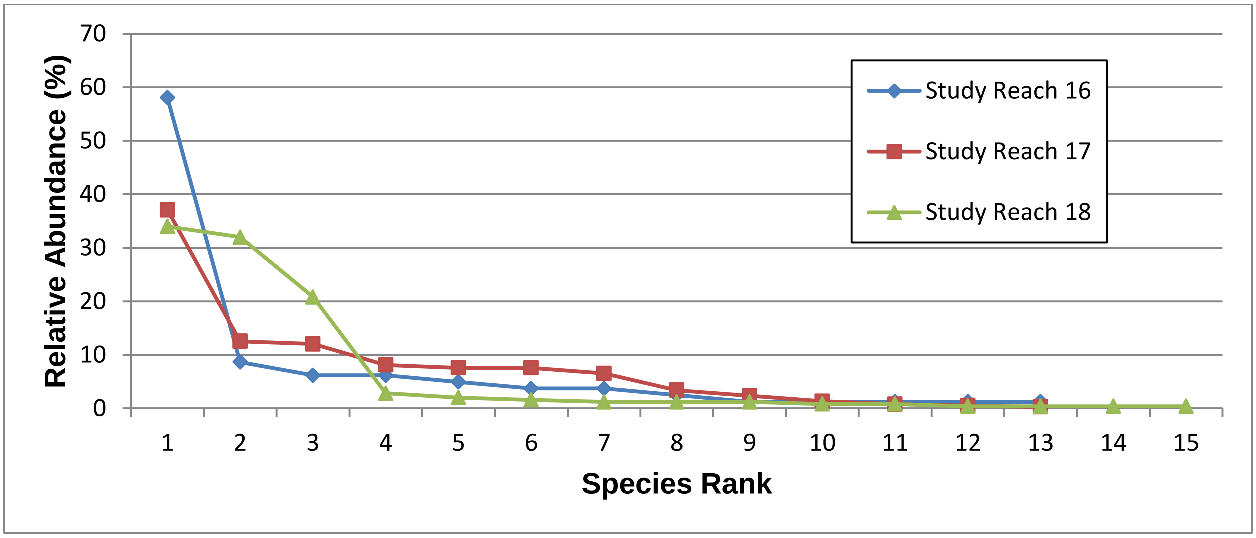
Table 3.16. Additionally, a rank abundance plot for the three study reaches on the Maple River is included below.

Table 3.16 – Maple River Fish Data Analysis

Reach	Total # of Species	Total # of Individuals	Shock Time (sec)	CPUE	Richness E(S_n)	St Dev	Richness E(S_{25})	St Dev	Simpson's D	1-D	1/D
Study Reach 16	13	81	3206	91.0	10.72	1.16	7.83	1.34	0.35	0.65	2.85
Study Reach 17	13	383	5650	244.0	9.68	1.06	8.10	1.14	0.19	0.81	5.27
Study Reach 18	15	250	2350	383.0	7.98	1.50	5.88	1.33	0.26	0.74	3.84

Note: CPUE (catch per unit effort) – number of individuals netted per electrofishing hour

Plot 3.8 – Maple River Fish Abundance Plot



The total number of species captured at each of the three study reaches on the Maple River ranged from 13 to 15 species, with a mean of 14 species. The total number of individuals ranged from 81 to 383, with a mean of 238. The catch per unit effort at the Maple River study reaches ranged from 91 to 383. Orangespotted sunfish (*Lepomis humilis*) was the most abundant fish species captured at Study Reaches 16 and 17 (58% and 37%, respectively), and the second-most abundant species (32% of the population) captured at Reach 18. The fathead minnow (*Pimephales promelas*) was the most dominant species captured at Study Reach 18, accounting for 34% of the population observed (see **Appendix G**).

A total of seven anomalies were observed on five individuals within the fish captured at the three study reaches on the Maple River. Four individuals had eroded fins, with two of these individuals also having an additional anomaly observed (one instance of parasites and one instance of swirled scales). Additionally, one individual was observed to have deformities. Each of the three study reaches had at least one anomaly noted.

3.5 LOWER RUSH RIVER

The Lower Rush River was one of three wadeable streams to be assessed in the Fargo/Moorhead Flood Risk Management Project. The USACE designated two study reaches for the Lower Rush River (see **Figures 3.19 and 3.20**). Study Reach 19 was a location upstream of potential hydraulic alterations and Study Reach 20 was a footprint location. However, during the September 2011 site reconnaissance, the Lower Rush River was found not to meet the requirements of a sampleable stream. Less than 50% of the Lower Rush River streambed was wetted at the time of the site reconnaissance; therefore, this stream was removed from the sampling schedule.

3.6 RUSH RIVER

The Rush River contained two wadeable study reaches for this sampling effort (see **Figures 3.21 and 3.22**). Reach 21 is a location upstream of potential hydraulic alterations and Reach 22 is a footprint location. Both study reaches were assessed in September 2011.

3.6.1 QHEI and MPCA Habitat Assessment Findings

A summary of the QHEI assessment, which presents scores for the six principal metrics for each of the Rush River study reaches, is included in **Table 3.17**. A summary of the MPCA habitat assessment, which presents information from the three key components for each of the Rush River study reaches, is included in **Table 3.18**.

Table 3.17 – Rush River QHEI Habitat Assessment

Study Reach (Date Assessed)	Substrate Max = 20	Instream Cover Max = 20	Channel Morphology Max = 20	Riparian Zone and Bank Erosion Max = 10	Pool/Glide Quality Max = 12	Riffle/ Run Quality Max = 8	Gradient and Drainage Area Max = 10	Total QHEI Score Max = 100
Study Reach 21 (9/13/11)	5.5	2	6	3	7	2	10	35.5 poor
Study Reach 22 (9/12/11)	1	2	4	1	2	0	6	16 very poor

For the MPCA habitat assessment, percent substrate types were derived from presence/absence tabulations for the thirteen transects within each reach. Each transect was comprised of five equidistant quadrats. Each quadrat was assumed to account for 20% of the stream cross-sectional cover. The assumed percentages were averaged across the thirteen transects for the reach. Percent cover for fish values were collected for each of the thirteen transects. Field assigned percentages were averaged across the transect for each cover type present. Cover types not present were assigned a percentage of zero.

Table 3.18 – Rush River MPCA Habitat Assessment

Study Reach (Date Assessed)	Morphology			Substrate		Cover for Fish		Riparian Condition	
	Stream Feature Type Present	Number of Stream Feature Types	Average Length for Given Stream Feature Type (meters)	Type	Percent	Type	Percent	Dominant land use within 30 meter of stream edge	Dominant land use from 30-100 meter of stream edge
Study Reach 21 (9/13/11)	Run	3	132	Clay	91	Undercut Bank	<1	Cropland	Cropland
	Riffle	2	5	Silt	9				
Study Reach 22 (9/12/11)	Run	1	449	Silt	75	Undercut Bank	<1	Cropland	Cropland
				Clay	25				

Substrates observed at both of the Rush River study reaches were dominated by a mixture of hardpan and moderate to heavy silt with extensive embeddedness. Instream cover was nearly absent and was limited to very small amounts of undercut banks. The morphology of the Rush River in the area of the study reaches exhibited no sinuosity, poor development of riffle/run complexes, low channel stability and severe effects from channel modifications. Bank erosion was severe throughout both reaches. The riparian zone width ranged from none to narrow with the surrounding floodplain consisting of open pasture/row crop. The riffle/run quality was low with poor substrate and extensive embeddedness. The study reaches had low to moderate gradients and large drainage areas (QHEI defines a large drainage area as greater than 622.9 square miles).

3.6.2 Water Chemistry Assessment Findings

Water chemistry measurements taken immediately prior to sampling at both of the study reaches on the Maple River are presented in **Table 3.19**.

Table 3.19 – Rush River Water Chemistry

Reach	Station Description	Sample Date	Water Temp (°C)	Flow (m^3/sec)	Specific Conductivity (mS/cm)	D.O. (mg/L)	Transparency Tube (cm)	Turbidity (NTU)	pH (SU)
Study Reach 21	Upstream Location	9/13/11	16.0	0.07	1.29	4.7	12	93.7	7.50
Study Reach 22	Footprint Site	9/12/11	20.7	0.06	1.35	5.5	21	155	7.67

Note - All water chemistry measurements were taken immediately prior to the fish sampling effort.

Water temperatures were within normal range for surface water during the time of year that the assessment was conducted and pH measurements were also within the standard range of surface water readings. Specific conductivity and turbidity readings were similar to other tributaries within the Red River Basin that were included in this study. Dissolved oxygen readings (4.7 and 5.5 mg/L) were lower than dissolved oxygen readings on most of the other tributaries in the study.

3.6.3 Macroinvertebrate Abundance and Composition

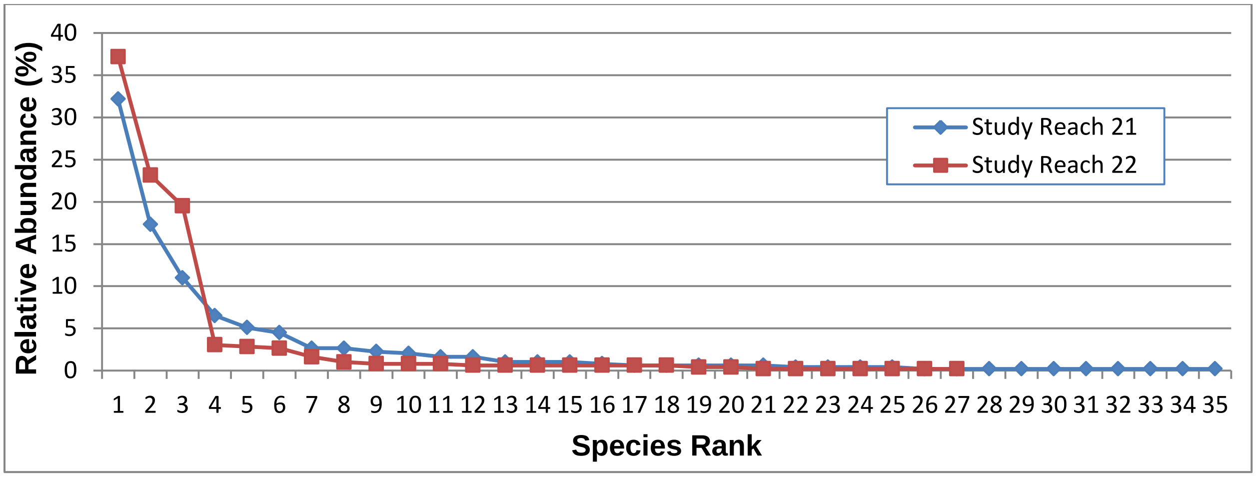
Macroinvertebrates were collected in both of the study reaches on the Rush River using the methodologies outlined in Section 2.2.2.4. Samples were picked and species identified to the lowest level possible by Valley City State University. A summary of the species composition is presented in **Table 3.20**. Additionally, a rank abundance plot for the two study reaches of the Rush River is included below.

Table 3.20 – Rush River Macroinvertebrate Data Analysis

Reach	Total # of Taxa	Total # of Individuals	CPUE	Richness $E(S_n)$	St Dev	Richness $E(S_{100})$	St Dev	Simpson's D	1-D	1/D
Study Reach 21	35	491	9.1	26.016	2.070	20.017	2.162	0.156	0.844	6.399
Study Reach 22	27	492	14.5	20.019	1.890	14.813	2.035	0.232	0.768	4.313

Note: CPUE (catch per unit effort) – average number of individuals per grid square picked

Plot 3.9 – Rush River Macroinvertebrate Abundance Plot



The total number of taxa identified at each of the study reaches on the Rush River was similar (35 and 27). No obvious geographical differences were observed between the two locations. Similarly, the catch per unit efforts (9.1 and 14.5) and the relative abundances were consistent between the two locations. The most common taxon identified at Study Reach 21 was a beetle in the Elmidae family (*Stenelmis*) that was present at a relative abundance of 32.2%, while a midge in the Chironomidae family (*Procladius*) was the most common taxon identified at Study Reach 22, with a relative abundance of 37.2% (see **Appendix D**).

3.6.4 Fish Abundance and Composition

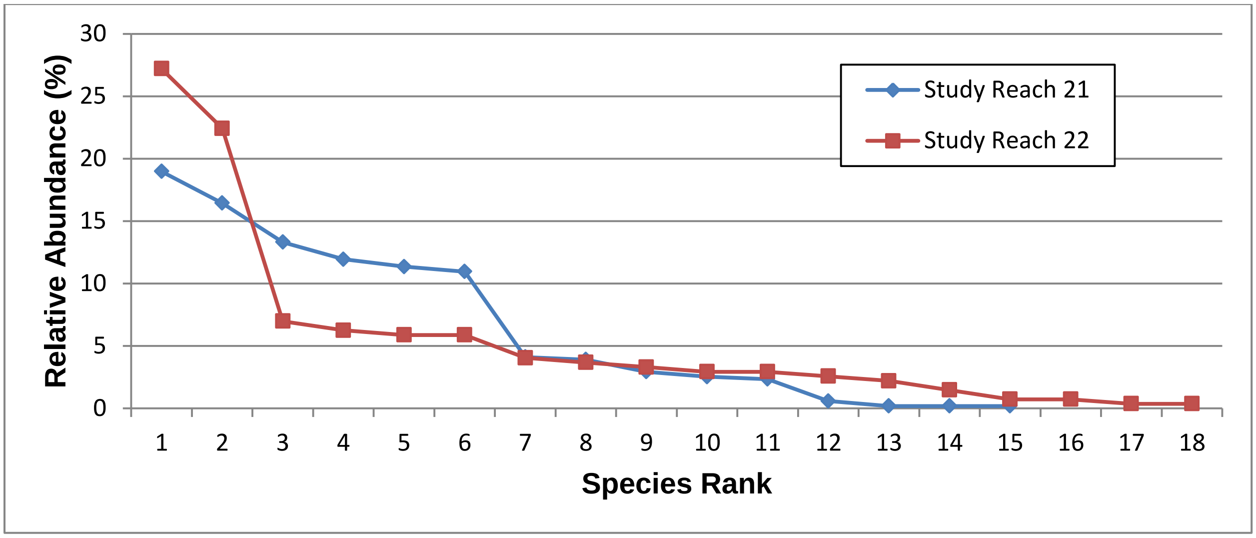
Fish were sampled at each of the study reaches on the Rush River, using wadeable electroshocking techniques as discussed in Section 2.2.2.1. A summary of the species composition is presented in **Table 3.21**. Additionally, a rank abundance plot for both of the study reaches on the Rush River is included below.

Table 3.21 – Rush River Fish Data Analysis

Reach	Total # of Species	Total # of Individuals	Shock Time (sec)	CPUE	Richness $E(S_n)$	St Dev	Richness $E(S_{25})$	St Dev	Simpson's D	1-D	1/D
Study Reach 21	15	511	3411	539.3	10.52	1.08	8.88	1.17	0.12	0.88	8.10
Study Reach 22	18	272	2897	338.0	13.10	1.37	10.01	1.48	0.14	0.86	6.94

Note: CPUE (catch per unit effort) – number of individuals netted per electrofishing hour

Plot 3.10 – Rush River Fish Abundance Plot



The total number of species captured at Study Reaches 21 and 22 on the Rush River were 15 and 18, respectively. The total number of individuals showed more variation between the two reaches, with 511 individuals being captured (CPUE of 539.3) at Reach 21 and 272 individuals being captured (CPUE of 338.0) at Reach 22. Coincidentally, the reach that had the higher number of individuals captured, also had the lower dissolved oxygen reading, indicating that dissolved oxygen is not a limiting factor in this water body.

A total of six individuals with anomalies were observed at Study Reach 22 on the Rush River. Specific anomalies were not documented, but typically include deteriorated or eroded fins, lesions or tumors. No anomalies were noted at Study Reach 21.

3.7 WOLVERTON CREEK

Wolverton Creek was the only waterbody assessed in this study that was wholly within Minnesota. It was a wadeable stream that contained one study reach (see **Figure 3.23**). Reach 23 is a footprint location that was assessed in September 2011.

3.7.1 QHEI and MPCA Habitat Assessment Findings

A summary of the QHEI assessment, which presents scores for the six principal metrics for Study Reach 23, is included in **Table 3.22**. A summary of the MPCA habitat assessment, which presents information from the three key components for Study Reach 23, is included in **Table 3.23**.

Table 3.22 – Wolverton Creek QHEI Habitat Assessment

Study Reach (Date Assessed)	Substrate Max = 20	Instream Cover Max = 20	Channel Morphology Max = 20	Riparian Zone and Bank Erosion Max = 10	Pool/Glide Quality Max = 12	Riffle/ Run Quality Max = 8	Gradient and Drainage Area Max = 10	Total QHEI Score Max = 100
Study Reach 23 (9/14/11)	3.5	6	9	6	9	0	8	41.5 poor

For the MPCA habitat assessment, percent substrate types were derived from presence/absence tabulations for the thirteen transects. Each transect was comprised of five equidistant quadrats. Each quadrat was assumed to account for 20% of the stream cross-sectional cover. The assumed percentages were averaged across the thirteen transects for the reach. Percent cover for fish values were collected for each of the thirteen transects. Field assigned percentages were averaged across the transect for each cover type present. Cover types not present were assigned a percentage of zero.

Table 3.23 – Wolverton Creek MPCA Habitat Assessment

	Morphology			Substrate		Cover for Fish		Riparian Condition	
Study Reach (Date Assessed)	Stream Feature Type Present	Number of Stream Feature Types	Average Length for Given Stream Feature Type (meters)	Type	Percent	Type	Percent	Dominant land use within 30 meter of stream edge	Dominant land use from 30-100 meter of stream edge
Study Reach 23 (9/14/11)	Run	3	99	Clay	68	Overhanging Vegetation	11	Meadow	Cropland
	Bend	2	3	Silt	25				
				Boulder	8				

The substrate observed within Study Reach 23 was a mixture of hardpan and moderate silt with extensive embeddedness. Instream cover was sparse and was limited to overhanging vegetation, some undercut banks and a few boulders. The few boulders present did not serve as functional cover for fish. Wolverton Creek consisted of a series of runs divided by bends. A small amount of functional overhanging vegetation was the only type of cover for fish that was present within the study reach. Stream morphology exhibited low sinuosity, poor development of riffle/pool complexes, high channel stability and little affects from historic channel modifications. Very little bank erosion was observed within Reach 23. The riparian zone width was moderate (10-50 meters) and the floodplain outside of the riparian zone was generally poor, consisting of row crops and open pasture. The study reach on Wolverton Creek had some riffle area, but it was less than 5 centimeters in depth. The reach had a very high gradient and a large drainage area (defined as greater than 622.9 square miles in the QHEI).

3.7.2 Water Chemistry Assessment Findings

Water chemistry measurements taken immediately prior to sampling at the study reach on Wolverton Creek are presented in **Table 3.24**.

Table 3.24 – Wolverton Creek Water Chemistry

Reach	Station Description	Sample Date	Water Temp (°C)	Flow (ft^3/sec)	Specific Conductivity (mS/cm)	D.O. (mg/L)	Transparency Tube (cm)	Turbidity (NTU)	pH (SU)
Study Reach 23	Footprint Location	9/14/11	12.8	0.01	1.06	6.3	9	74.8	7.86

Note - All water chemistry measurements were taken immediately prior to the fish sampling effort.

Dissolved oxygen, water temperature and pH measurements were within the standard range of surface water readings for the time of year when the assessment was performed. Specific conductivity and turbidity readings were consistent with readings from other water bodies within the Red River Valley.

3.7.3 Macroinvertebrate Abundance and Composition

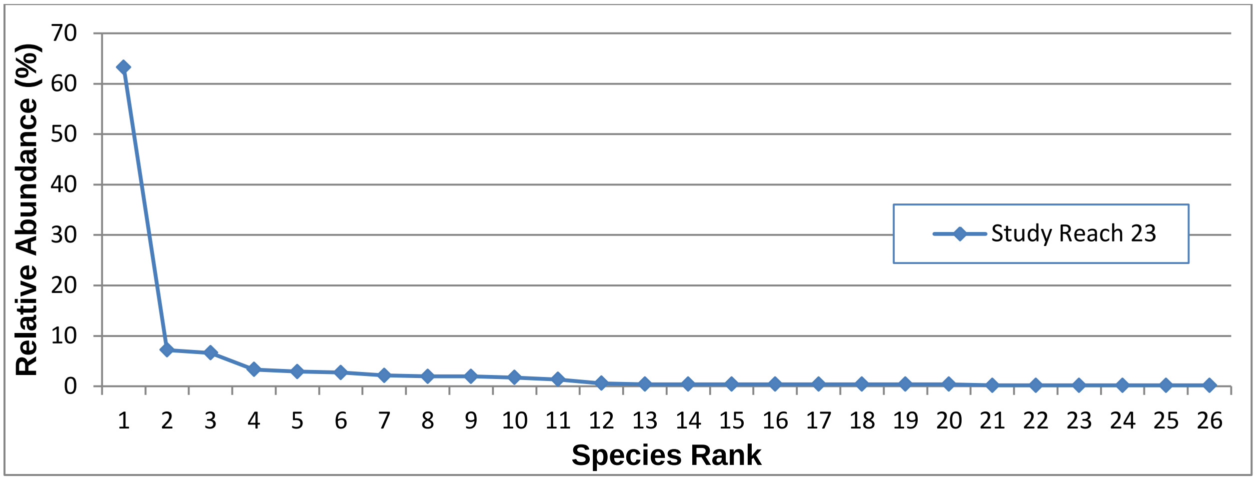
Macroinvertebrates were collected at Study Reach 23 on Wolverton Creek, using the methodologies outlined in Section 2.2.2.4. The sample was picked and species identified to the lowest level possible by Valley City State University. A summary of the species composition is presented in **Table 3.25**. Additionally, a rank abundance plot for Study Reach 23 is included below.

Table 3.25 – Wolverton Creek Macroinvertebrate Data Analysis

Reach	Total # of Taxa	Total # of Individuals	CPUE	Richness $E(S_n)$	St Dev	Richness $E(S_{100})$	St Dev	Simpson's D	1-D	1/D
Study Reach 23	26	514	39.5	18.890	1.848	14.677	1.849	0.413	0.587	2.423

Note: CPUE (catch per unit effort) – average number of individuals per grid square picked

Plot 3.11 – Wolverton Creek Macroinvertebrate Abundance Plot



A total of 26 taxa were identified at Study Reach 23. The relative abundance of the most common taxon (*Caenis*, within the Order Ephemeroptera) was 63.2% (see **Appendix D**). The second-most common taxon (*Procladius*, within the Family Chironomidae) was 7.2%. The high relative abundance of one individual taxon is typically indicative of a stressed macroinvertebrate community.

3.7.4 Fish Abundance and Composition

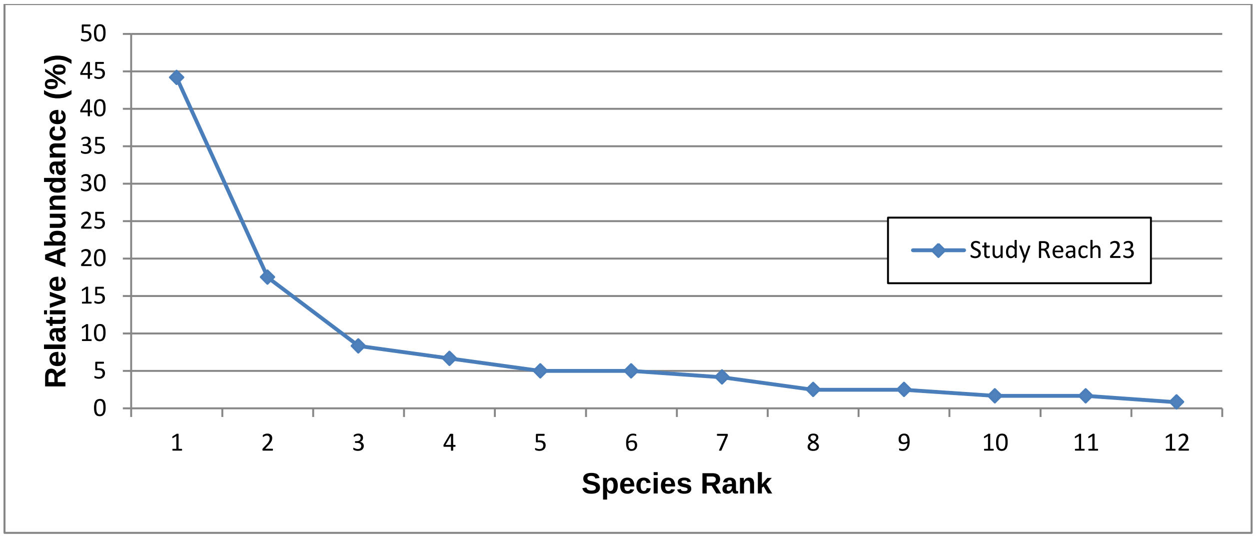
Fish were sampled at Study Reach 23 on Wolverton Creek, using wadeable electroshocking techniques as discussed in Section 2.2.2.1. A summary of the species composition is presented in **Table 3.26**. Additionally, a rank abundance plot for Study Reach 23 is included below.

Table 3.26 – Wolverton Creek Fish Data Analysis

Reach	Total # of Species	Total # of Individuals	Shock Time (sec)	CPUE	Richness $E(S_n)$	St Dev	Richness $E(S_{25})$	St Dev	Simpson's D	1-D	1/D
Study Reach 23	12	120	3238	133.4	10.14	1.04	7.96	1.26	0.24	0.76	4.18

Note: CPUE (catch per unit effort) – number of individuals netted per electrofishing hour

Plot 3.12 – Wolverton Creek Fish Abundance Plot



A total of 120 individuals representing 12 species were captured at Study Reach 23 on Wolverton Creek. The most common species was the black bullhead (*Ameiurus melas*), of which 53 individuals were captured, representing 44.2% of the individuals observed within the reach (see **Appendix G**). The second-most common species captured was the orangespotted sunfish (*Lepomis humilis*), which had 21 individuals. This represents 17.5% of the individuals observed within the reach.

A total of two individuals with anomalies were observed at Study Reach 23 on Wolverton Creek. Specific anomalies were not documented, but typically include deteriorated or eroded fins, lesions or tumors.

4.0 DISCUSSION

The purpose of this study is to identify and characterize fish and invertebrate communities and biotic integrity within the Red River of the North and six tributaries. These waterbodies were assessed because they could be affected by a potential flood damage reduction project at Fargo, North Dakota and Moorhead, Minnesota. The sampling activities documented in this report represent the first in a series of investigations that include fisheries and macroinvertebrate sampling, as well as an assessment of physical aquatic habitat, which will allow Federal and State agencies to better understand the existing aquatic community within rivers potentially affected by a North Dakota diversion alignment. As part of an adaptive approach, pre- and post-project monitoring is being performed to evaluate the impacts resulting from the project. Sampling outlined in this document is the first of at least two pre-project sampling events that will serve for future comparison. A discussion of findings is presented in the following sections.

Various metrics ultimately will be used for data comparison pre- and post-project, to include calculations of IBI scores. Revised IBI scoring systems are currently being developed for the Red River Basin by both NDDoH and MPCA. The sampling methodologies used for these scoring systems were followed for this effort.

4.1 FISHERY EVALUATION

Fish serve as good indicators of water quality conditions because changes in fish relative abundance (numbers and weight), species richness, composition and other attributes are directly influenced by the presence of water quality disturbances and/or habitat alterations. The presence of permanent, large populations of different fish species is generally considered to be the result of a combination of many favorable factors (Trautman 1942). Factors which account for variations in the distribution and abundance of fishes in streams and rivers include, but are not limited to, stream size, instream cover, stream morphology, depth, flow, substrate, gradient and water quality. The decreased diversity and abundance to the fish community from perturbations to the physical and/or chemical quality of a stream is reflected by an association predominated by stress tolerant species (Goldstein et al. 1994; OEPA 1988b). Tolerant species in the Red River Valley include black bullhead (*Ameiurus melas*), fathead minnow (*Pimephales promelas*), carp (*Cyprinus carpio*), creek chub (*Semotilus atromaculatus*), white sucker (*Catostomus commersonii*), central mudminnow (*Umbra limi*), blacknose dace (*Rhinichthys obtusus*), golden shiner (*Notemigonus crysoleucas*) and bluntnose minnow (*Pimephales notatus*) (Goldstein et al. 1994). Also, as large river habitat is encountered, additional species include quillback (*Carpoides cyprinus*), bigmouth buffalo (*Ictiobus cyprinellus*), channel catfish (*Ictalurus* *punctatus*), green sunfish (*Lepomis cyanellus*) and freshwater drum (*Aplodinotus grunniens*). Increases in tolerant species indicate a loss of biotic integrity (Goldstein et al. 1994).

Fish communities can become degraded without undergoing large declines in species richness, relative numbers or biomass. In fact, some forms of perturbation (e.g., habitat modification, nutrient enrichment) can cause fish numbers and biomass to increase with only slight reductions in species richness. In these instances, the degradation to the community is more often reflected by significant changes in trophic composition and predominant feeding guilds (OEPA 1988b).

Fish metrics generally fall into three main categories, including (1) species richness and composition, (2) trophic composition and (3) fish abundance and condition (Karr 1981; Rankin 1989). Fish species richness and abundance metrics were calculated for each study reach sampled. Each is discussed below.

4.1.1 Species Abundance

The greater the number of individuals within each species in a stream system, the greater the resiliency and the biotic integrity of the system. Total number of individuals in a sample is standardized by CPUE that accounts for both time and distance sampled. Relative abundance of all species present is comparable to the overall ability of the stream to support an aquatic community. Reductions in relative abundances from expected values would indicate some form of stress affecting some survival requirement of the fish community. The Rush River and two of the non-wadeable tributaries (Wild Rice and Maple Rivers) had the highest number of fish captured, as well as the highest CPUE. The abundance numbers in the Maple and Wild Rice Rivers were driven by the large catches of orangespotted sunfish (*Lepomis humilis*) and shiner species, whereas the high CPUE on the Rush River was more evenly distributed among large catches of carp (*Cyprinus carpio*), creek chub (*Semotilus atromaculatus*), fathead minnows (*Pimephales promelas*), freshwater drum (*Aplodinotus grunniens*), sand shiners (*Notropis stramineus*) and spotfin shiners (*Cyprinella spiloptera*). The CPUE was lower on the larger river systems, and a few sites had extremely low CPUE values. These low values may be attributable to high flow conditions on the Sheyenne River and on the Red River of the North downstream of the confluence with the Sheyenne River. These high flows during an extreme low-flow period were a result of excess water being diverted from Devil’s Lake into the Sheyenne River.

4.1.2 Species Composition

Richness is the total number of species, and it is a component of the diversity metric (Pielou 1975). Species richness is a function of the natural and anthropogenic changes occurring within an ecosystem. Generally, higher species richness is indicative of higher biotic integrity. In 1987, the Elm, Rush, Maple, Sheyenne and Wild Rice Rivers in North Dakota were sampled for fishes by the North Dakota Game and Fish Department, NDGF (Duerre 1988). Species richness of these tributaries ranged from a low of ten species for the Rush River to a high of 43 species for the Sheyenne River. Species richness observed during this Fargo/Moorhead Flood Risk Management Project sampling event ranged from a low of six species at Study Reach 9 on the Wild Rice River to a high of fifteen species on the Sheyenne River at Study Reach 11. Values were variable among study reaches but the general tendency was for the larger river systems to exhibit a higher richness value. The Rush River was an exception to this trend, although the higher flow conditions during the summer of 2011 (as compared to the summer of 2012) adds an additional variable to this trend. The higher flows could have drawn fish further up the tributaries from the larger streams such as the Red River.

Goldstein et al. (1995) noted that the majority of the rivers that drain the North Dakota side of the Red River flow through both the Red River Valley and Northern Glaciated Plains ecoregions. In comparison to the rivers on the Minnesota side, rivers flowing through these ecoregions contain fewer aquatic macrophytes, lower stream gradients, finer substrates and reduced diversity of geomorphological units. Water quality typically is characterized by higher nutrient concentrations, specific conductance and pH. These factors contribute to explaining the differences in species richness among such rivers as the Wild Rice, Sheyenne and Maple Rivers and the measured deviations in the species richness-watershed area relation in the Red River Basin, where species richness is lower in North Dakota rivers than in similar-sized Minnesota rivers (Goldstein et al. 1995).

Evenness describes the distribution of abundance of individuals among species (Pielou 1975). If all species have equal abundance, the distribution of abundances has maximum evenness. In many cases where environmental degradation has occurred, one species in the community has been able to increase its numbers while other species have declined. Those species with the capacity to capitalize on a change in physical or chemical environments are usually tolerant species. Plafkin et al. (1989) listed twelve tolerant Midwestern species, of which eleven are recorded from the Red River Valley. Reduced evenness indicates a loss of biotic integrity. Increases in tolerant species also indicate a loss of biotic integrity. Evenness trends for this sampling event were similar to species richness trends. The Maple and the Wild Rice Rivers displayed the lowest evenness, indicating that the biotic integrity in these systems was lower than in the larger river systems such as the Sheyenne and Red Rivers (see fish abundance plots in Section 3.0 Results). The abundance plot indicated that for each of the four reaches on the Wild Rice River, the dominant fish species accounted for 37% to 74% of the sample population. There were intra-stream spatial differences in evenness between upstream and downstream sites in this system and could be indicative of better biotic integrity in the upper reaches of the Wild Rice River. The Rush River was the anomaly again, and this small system exhibited the greatest evenness across species, possibly indicating a biotic integrity higher than all the other streams sampled in 2011 and 2012. However, and as previously noted, this could be a reflection of the difference in the hydrologic conditions between the two years.

Species diversity is the total number of individuals among different species present in the stream system. Species diversity accounts for both species richness and species evenness. As species diversity (the number and kinds of fish) increases, biotic integrity improves. Simpson Diversity Index values calculated for this Fargo/Moorhead Flood Risk Management Project predictably follow the trends observed for species richness and evenness. Values were variable among study reaches within a stream, but in a comparison of all study reaches, the Sheyenne and Red Rivers had the greatest fish species diversity of the non-wadeable streams. Species diversity within the wadeable Rush River rivaled that of the Sheyenne River, and appeared more diverse than the Red River; however, the Rush River diversity could also have been influenced by the higher flow conditions observed during 2011. Goldstein et al. (1995) observed that the number of species found in Red River Basin stream systems is related to stream size as measured by watershed area, but they noted that there were certain streams that were outliers. This Fargo/Moorhead Flood Risk Management Project study concurred with observations noted by the above authors. The highest species richness was found in the Rush and Red Rivers, with 25 and 24 fish species respectively. Wolverton Creek had the lowest with 12 fish species, while other systems ranged from 16 to 19 different fish species. Different fish species assemblages tended to be dominant in the larger river systems such as the Red and Sheyenne Rivers, compared to the smaller wadeable and non-wadeable tributaries sampled in 2011 and 2012. Sand shiners (*Notropis stramineus*) and spotfin shiners (*Cyprinella spiloptera*) dominated the catch in all stream systems. Carp (*Cyprinus carpio*) were present in good numbers in all systems but were only present in very low numbers in the Sheyenne River. Channel catfish (*Ictalurus punctatus*) were found in every river sampled, while goldeye (*Hiodon alosoides*) were abundant and were only found in the large flowing rivers including the Red, Sheyenne and Wild Rice Rivers. Orangespotted sunfish (*Lepomis humilis*) were only present in the Maple, Wild Rice and Rush Rivers, while fathead minnows (*Pimephales promelas*) were found in these same rivers as well as the Red and Sheyenne Rivers. These species compositions were similar to other fish studies conducted on the Red River of the North (Niemela et al. 1998; Yoder et al. 2011).

The fish communities in various parts of the Red River Valley have both similarities and differences. Most species assemblages contain a core of common species found throughout the Red River Valley. Channel catfish (*Ictalurus punctatus*), carp (*Cyprinus carpio*), white suckers (*Catostomus commersonii*), walleye (*Stizostedion vitreum*), sand shiners (*Notropis stramineus*) and spotfin shiners (*Cyprinella spiloptera*) were present in all stream systems, with the exception of Wolverton Creek where channel catfish and sand shiners were not observed. Differences in species assemblages likely are associated with numerous factors which include:

(1) the types and amounts of various habitats differ,

(2) the number of ecoregions the rivers flow through,

(3) the amount of anthropogenic disturbance, and

(4) the ability of each species to expand its range by colonization of new areas when environmental conditions are favorable.

These species assemblages are not constant as they appear to change through time, as noted by differing temporal fish compositions identified in different studies on these same streams (Goldstein et al. 1995; Niemela et al. 1998; Yoder et al. 2011). Hydrologic and climatic variability may also be important factors in contributing to changing fish distributions as noted in the localized effect of high flows in the Rush River during the 2011 sampling period and the Sheyenne River during the 2012 sampling period for the Fargo/Moorhead Flood Risk Management Project.

There was intra-stream variability present among reaches within each river system sampled in 2011 and 2012, but a general trend was evident when all the above fish metrics were compared. These fish metrics collectively indicate that the species abundance and composition of the large river systems such as the Red and Sheyenne Rivers is more vigorous than the species abundance and composition of other non-wadeable systems such as the Maple and Wild Rice Rivers. The Rush River was the outlier to this trend since it is not a large system but it had notable relative abundance and species diversity as compared to all the streams sampled. However, this may well have been influenced by higher flows during sampling of the Rush River in 2011.

4.2 AQUATIC MACROINVERTEBRATE EVALUATION

Advantages to using macroinvertebrates as sensors of water quality include their high diversity, rapid colonization and variability in tolerance to perturbation (Rosenberg and Resh 1993). Benthic macroinvertebrate metrics generally fall into five distinct categories, including (1) richness metrics, (2) composition metrics, (3) tolerance/intolerance metrics, (4) feeding measure metrics and (5) habit metrics. Macroinvertebrate richness and composition metrics were calculated in this investigation for each study reach sampled.

4.2.1 Species Abundance

The total number of collected macroinvertebrate individuals was consistent among study reaches within a stream and among the six streams assessed in the Fargo/Moorhead Flood Risk Management Project. The Sheyenne River was the outlier to this trend. Within the Red, Wild Rice, Maple and Rush Rivers and Wolverton Creek, the number of macroinvertebrate organisms collected ranged from 473 to 530. The number of organisms collected at the Sheyenne River ranged from 195 to 501, with the downstream reaches on the Sheyenne (Reaches 14 and 15) yielding noticeably fewer individuals than the upstream reaches (195 and 257 individuals collected on downstream reaches, as opposed to 494 to 501 individuals collected on upstream reaches). The collection of fewer macroinvertebrates on the downstream reaches of the Sheyenne River may be the result of poorer habitat conditions. When comparing the CPUE (average number of individuals per grid square picked) and the number of individuals collected across the assessed streams, the number of individuals collected generally reflected the CPUE. The CPUE for Wolverton Creek, relative to that of the other streams, indicated a lesser level of effort to yield a commensurate number of organisms.

The macroinvertebrate abundance numbers were dominated by one taxon, the water boatman (Order Hemiptera, Family Corixidae). This taxon was the most abundant organism in fifteen of the 21 study reaches and it was the second most abundant organism in two reaches. The water boatman accounted for more than 45% of the macroinvertebrate collection across all 21 study reaches. Ostracods (Order Ostracoda) were the next most abundant macroinvertebrate organism, accounting for more than 10% of all individuals collected.

4.2.2 Species Composition

Total macroinvertebrate taxa present within a waterbody can serve as an indicator of the integrity of that waterbody. Total taxa is a metric commonly used in IBI scoring systems. The number of taxa present within an area is expected to decrease in response to perturbation. The data collected across the 21 study reaches assessed for the Fargo/Moorhead Flood Risk Management Project do not display clear trends in number of macroinvertebrate taxa present with change in stream size. Within the larger rivers (Red River, Wild Rice River and Sheyenne River), total taxa collected within a given study reach ranged from 17 to 43 (average number of taxa = 27). Total macroinvertebrate taxa collected across the three study reaches of the Maple River (moderate-sized river) ranged from 33 to 35. Within the small rivers (Rush River and Wolverton Creek), total taxa collected within a given study reach ranged between 26 and 35, with an average of 29 taxa collected in a reach. There were no clear trends within a given waterbody between number of macroinvertebrate taxa present and progression upstream or downstream.

A general assessment of the number of dominant taxa within individual study reaches and across all 21 study reaches for the Fargo/Moorhead Flood Risk Management Project indicates a high relative abundance for a handful of taxa, indicating low evenness. A large percentage of a single dominant taxon can be equated with the dominance of a pollution tolerant organism and lowered diversity (Barbour et al. 1999). Community domination by a few species is typically an indicator of a stressed environment. The macroinvertebrate relative abundance plots presented in Section 3.0 for each of the six sampled waterbodies show a skew in abundance toward one to two taxa for all study reaches sampled on the Red River of the North, the Wild Rice River, the Sheyenne River and Wolverton Creek. A more even abundance across macroinvertebrate taxa was observed for all study reaches sampled on the Maple and Rush Rivers, indicating that these two rivers may have a more stable macroinvertebrate assemblage than other rivers sampled.

The skewed abundance toward a handful of macroinvertebrate taxa is evident when evaluating data collected across all 21 study reaches for the Fargo/Moorhead Flood Risk Management Project. One macroinvertebrate taxon (water boatman) accounted for 45.7% of the relative abundance of taxa sampled across all 21 study reaches. The water boatman is a predatory organism within the Order Hemiptera and Family Corixidae. The *Digital Key to Aquatic Insects of North Dakota* (Valley City State University [VCSU] 2012a) includes a 0 to 10 scale for rating an organism’s tolerance to poor water quality, with 0 representing non-tolerant taxa and 10 representing the most tolerant taxa. Per this rating system, the water boatman has an assigned tolerance value of 5, indicating that it is moderately tolerant to poor water quality conditions. Other taxa that accounted for a disproportionate amount of the individuals sampled across the 21 study reaches included Ostracoda (10.6% relative abundance), *Caenis* (4.7% relative abundance), *Palmacorixa gillettei* (4.2% relative abundance) and *Procladius* (4.2% relative abundance). Organisms within the Order Ostracoda are collectors, and inhabit that trophic guild. Ostracoda are considered to be organisms tolerant of poor water quality (tolerance value 8; VCSU 2012b). Organisms of the genus *Caenis* belong to Order Ephemeroptera, Family Caenidae. These organisms are omnivores, inhabiting the collector, gatherer and scraper trophic guilds. They have a tolerance value of 7. *Palmacorixa gillettei* is a predatory organism in Order Hemiptera and Family Corixidae, and has an assigned tolerance value of 5. Organisms of the genus *Procladius* are predatory and belong to Order Diptera, Family Chironomidae and Subfamily Tanypodinae. They have a tolerance value of 7 (VCSU 2012a). These data indicate that the taxa which account for approximately 70% of macroinvertebrate taxa sampled across all 21 study reaches are moderately to highly tolerant of poor water quality conditions.

Organisms of the Order Diptera (‘true’ fly larvae) are predominantly known to be tolerant of environmental stressors. When assessing macroinvertebrate communities, the percent Diptera is used as a common metric. For macroinvertebrates collected across all 21 study reaches of the Fargo/Moorhead Flood Risk Management Project, there were 41 taxa within the Order Diptera, accounting for 1,468 individuals. This represents 32% of the total macroinvertebrate taxa and 14.8% of the total number of individuals collected.

High levels of diversity (species richness, together with an even relative abundance) suggest that niche space, habitat and food sources are adequate to support a diverse community of macroinvertebrates (Barbour et al. 1999). Simpson Diversity Index values calculated for this Fargo/Moorhead Flood Risk Management Project indicate that the Sheyenne and Maple Rivers displayed more variation in macroinvertebrate diversity across sampled reaches, whereas species diversity was somewhat consistent across study reaches within the other streams. The Maple and Sheyenne Rivers had the greatest macroinvertebrate diversity. The Red River of the North and Wild Rice Rivers and Wolverton Creek had the lowest macroinvertebrate diversity. The macroinvertebrate diversity data do not appear to be correlated to fish diversity data within a given reach or waterbody. There are also no evident trends between the habitat scores and macroinvertebrate diversity across the 21 study reaches. For instance, the Red River of the North and the Sheyenne River received the highest QHEI overall habitat scores; however, the Red River of the North had the lowest macroinvertebrate diversity. The Sheyenne River had some of the highest macroinvertebrate diversity, despite the fact that it was one of the worst-scoring streams on the substrate habitat component in particular.

4.3 HABITAT EVALUATION

The QHEI gives scientists a measure of physical habitat characteristics of a sampled stream, similar to IBI measures of the vertebrate (fish) and macroinvertebrate communities. By combining evaluations of QHEI with measures of the fish and aquatic macroinvertebrate communities, the USACE is gaining a well-rounded perspective of both the physical and biological conditions of streams potentially affected by the Fargo/Moorhead Flood Risk Management Project. This type of comprehensive assessment facilitates an evaluation of human-induced disturbance, by calibrating the biological integrity results for examined fish and macroinvertebrate communities against habitat data.

Terrestrial habitat is linked to aquatic habitat quality because it exerts control over the quantity and quality of surface water runoff. Land use alterations of runoff impact stream invertebrates and fish through a variety of mechanisms, including changes in water chemistry, quality and direct habitat loss from sedimentation and erosion. Even in areas where stream habitat varies widely over several key drivers, land use is often the strongest and most significant parameter (Allan et al. 1997). Riparian vegetation not only provides habitat, but also stabilizes stream banks. The historic riparian vegetation of the Red River Valley consisted of prairie vegetation, with the exception of forests adjacent to the larger rivers.

In the Red River Valley, agricultural land use is directly associated with high nutrients, suspended solids and pesticides, while streams with undisturbed watersheds have the highest biotic integrity (Stoner et al. 1998). The agricultural shift in land cover leads to increased water temperature, higher flow rates directly into streams and loading of silt, organic material and other suspended solids into streams, which can impact respiration, inhibit visual predation and cover riffle habitats (EOR 2009).

Information collected in the QHEI assessments for this first baseline sampling event for the Fargo/Moorhead Flood Risk Management Project endorse the documented conditions of waterbodies in the Lake Agassiz Basin, with QHEI scores for each of the six principal QHEI metrics representative of lotic macrohabitats compromised in their ability to support fish and macroinvertebrate communities. In a comparison of overall study reach habitat scores to the QHEI narrative categories, two (10%) of the examined study reaches are categorized as having fair habitat (Red River Reach 4 and Sheyenne River Reach 11). Eighteen (85%) of the examined study reaches are categorized as having poor habitat. One (5%) of the examined study reaches is categorized as having very poor habitat (Rush River Reach 22).

Habitat conditions across all 21 study reaches assessed were generally consistent. The waterbodies are characteristic low gradient streams with clay/silt substrate, moderate to heavy silt load, high turbidity and a predominance of glide/pool microhabitats. Instream cover was limited (typically sparse at 5-25%, but occasionally moderate at 25-75%) within all waterbodies assessed, and was limited to pools greater than 70 centimeters deep, backwater areas and logs/woody debris. Study reaches on the Sheyenne and Maple Rivers contained some overhanging vegetation.

Run/riffle/pool complexes were absent in the six assessed waterbodies, with the exception of Reach 4 on the Red River of the North. This observed absence of run/riffle/pool complexes is characteristic of most waterbodies in the Lake Agassiz Basin ecoregion, with its low gradient and silt laden waters. A sizeable riffle area spans most of the Red River at the downstream extent of Study Reach 4. This riffle may be related to the on-site wastewater treatment plant which discharges to the Red River immediately upstream of the riffle area. The water current was swift in this location, the substrate was dominated by rocky substrates favored by fish and macroinvertebrates and the moving water likely stimulates the maintenance of high dissolved oxygen levels and lower water temperatures. A significant amount of partially submerged woody debris exists in this area, providing structure for fish and macroinvertebrates.

The assessed waterbodies reflected the character of the surrounding agricultural setting. All study reaches displayed low to moderate sinuosity and low channel stability (high bed load and unstable banks), with exception of Sheyenne River Reach 15 and Maple River Reach 16 which displayed moderate channel stability. Riparian zone widths among the 21 study reaches ranged from narrow (5-10 meters) to wide (>50 meters), with zones most often being moderate in width (10-50 meters). With the exception of the Maple River, Rush River and Wolverton Creek, riparian zones were forested; although, they could be quite narrow in some instances. Riparian zones along the Maple River, Rush River and Wolverton Creek consisted of old field vegetation. The floodplain quality of the assessed waterbodies was generally low, consisting primarily of row crop. Bank erosion was moderate to heavy at all assessed study reaches, with the exception of Maple River Reaches 16 and 17 where there was little to no bank erosion.

4.4 CHALLENGES TO SAMPLING AND DATA INTEGRITY

The effectiveness of electrofishing is influenced by a variety of environmental, technical and logistical factors. It was necessary for the electrofishing crew to remain diligent in overcoming sampling challenges, so as to minimize biasing the catch in terms of fish size and species composition. The pulse rate and the intensity of the electric field strongly influence the size and nature of the catch. The conductivity of the water influences the shape and extent of the electric field, and, thus, affects the field's ability to induce capture in the fish. With the exception of Reaches 1, 2, 3 and 4 on the Red River of the North, high water conductivities were of particular concern in all study reaches sampled in the Fargo/Moorhead Flood Risk Management Project. Conductivities in Wolverton Creek, Rush River, Maple River, Sheyenne River, Wild Rice River and the downstream portions of the Red River of the North (Reaches 5 and 6) ranged between 1,060 microSiemens/centimeter (µS/cm) and 2,110 µS/cm (as compared to conductivity ranges of 495 µS/cm to 601 µS/cm in the upstream portions of the Red River of the North). Effective stunning of fish occurs when an electrified zone of sufficient amplitude is introduced to the water. The conductivity of the water and that of the fish's flesh (which varies across species) are the main factors affecting electrofishing. Because the electric current follows the path of least resistance, if a high voltage is applied in high conductivity waters, the current will bypass the fish completely (i.e., shocking effectiveness is minimal). To combat this challenge, a custom-designed Smith-Root® 5.0 GPP electroshocking system was adopted, which enables the use of low voltages and high currents, and is rated effective in waters with conductivities between 10 µS/cm and 5,500 µS/cm.

All waterbodies sampled for the Fargo/Moorhead Flood Risk Management Project, with exception of the Red River of the North, had limited accessibility. The five most-downstream locations on the Red River of the North (Study Reaches 2 through 6) were the only reaches accessible via boat ramp, and, thereby accommodating use of the boom shocker. The remaining thirteen non-wadeable study reaches did not have boat ramp accessibility, and required the use of the mini-boom shocker. Use of the mini-boom shocker reduced netting efficiency in that this system could accommodate only one netter (as opposed to two netters on the boom shocker). In addition, the configuration of the mini-boom boat did not permit the netter to station themselves on the bow of the boat, which would otherwise allow them to exert more leverage when netting stunned and immobilized fish.

Habitat structure for fish was limited throughout the waterbodies sampled for the Fargo/Moorhead Flood Risk Management Project. The streams are low gradient and lack run/riffle/pool complexes. Stream banks were dominated by fine-grained substrate (silt and sand). Rocks and root mats were very limited along the shoreline. A limited amount of partially submerged and emergent debris existed along the edges of the streams and in the shallow water areas. Submerged debris was scattered within the flowing portion of the streams; however, much of this debris occurred at depths of 5 feet or greater (below the effective shocking depth).

Swift water current represented another challenge to electroshocking, particularly on the downstream study reaches (4, 5 and 6) of the Red River of the North and all reaches of the Sheyenne River. The swift currents required frequent turning, backing, shifting and changes in speed as the driver maneuvered the electrofishing boat in a manner that advantageously positioned the netters to pick up stunned and immobilized fish. Communication, awareness of the environment and deliberate and controlled movements were key practices that enabled maneuverability of the boat in as efficient and safe a manner as possible.

In addition to the swift water currents experienced on the Sheyenne River and portions of the Red River of the North downstream of the confluence with the Sheyenne River, the presence of submerged debris and variability in its distribution required increased maneuvering of the boat. Windy conditions also proved challenging to the boat driver’s ability to maneuver the boat and the netters’ ability to maintain footing and combat resistance, particularly on the following study reaches: Red River of the North Reaches 1, 2, 5 and 6; Wild Rice River Reach 8 and Sheyenne River Reaches 12, 14 and 15.

Netters were challenged in their ability to see stunned and immobilized fish, due to the highly turbid water within all waterbodies sampled for the Fargo/Moorhead Flood Risk Management Project. Visibility (Secchi depth) ranged from 12 centimeters (cm) to 200 cm, with an average of 30 cm, throughout the waterbodies sampled. As is advisable, sampling was conducted at periods of water clarity and flow typical for the given waterbodies.

As sampling progressed through the month of September, an increased volume of leaves were falling onto the water from the surrounding wooded riparian zones. The falling leaves proved distracting to netters while they maintained a close watch for fish at, or just below, the water's surface. Small leaf litter on the water was sometimes mistaken for small fish while larger leaf litter mats may have concealed stunned fish below the water's surface.

Although no hybrid fish species were observed in this sampling effort for the Fargo/Moorhead Flood Risk Management Project, field assessors were cognizant of the potential for presence of hybrid species. Hybrid fish species can be very difficult to identify. URS personnel trained in fish taxonomy performed the field identifications, and referenced regional ichthyological texts as appropriate. Some established IBI scoring systems include a metric for the proportion of individuals as hybrids; therefore, when such a metric is incorporated into the scoring, it is especially important that hybrids, when present, are accurately identified.

Within Study Reaches 16 and 18 of the Maple River, fish capture tallies include the black redhorse sucker (*Moxostoma duquesnei*, one adult individual on each of the two reaches). Within Study Reaches 17 and 18 of the Maple River, fish capture tallies include the river carpsucker (*Carpiodes carpio*, 31 juvenile individuals on Reach 17 and 3 juvenile individuals on Reach 18). Current documentation of fish distribution in the Red River Valley does not account for these two species (Peterka and Koel 1996). Field identifications were based on the morphometric and meristic characteristics of the individual specimens on the Maple River sites. Live individuals were verified against ichthyological field keys (Pfiegler 1997). Morphological features of the black redhorse sucker (*Moxostoma duquesnei*) are similar to those of the golden redhorse sucker (*Moxostoma etythrurum*); however, the black redhorse sucker has a longer, more slender caudal peduncle, usually 44-47 lateral scales and 10 pelvic rays. Whereas, the more common golden redhorse sucker (*Moxostoma etythrurum*) usually has 40-42 lateral scales, 9 pelvic rays and a shorter, deeper caudle peduncle. The meristic identification of these specimens in the field identified a higher lateral scale and pelvic ray count, which keyed them as black redhorse suckers (*Moxostoma duquesnei*). Morphological features of the river carpsucker (*Carpiodes carpio*) are similar to those of the quillback carpsucker (*Carpiodes cyprinus*). Quillback carpsuckers have a very high, pointed dorsal fin, with the first ray at least 4-6 times as long as the shortest dorsal ray. The juvenile specimens identified in the field had dorsal fin rays that were very short and did not reach beyond the middle of the dorsal fin. This distinction keyed them out as river carpsuckers (*Carpiodes carpio*). The presence of a nipple on the lower middle lip on the river carpsucker (*Carpiodes carpio*) is another differentiating characteristic between it and the quillback carpsucker (*Carpiodes cyprinus*), but the identification of this trait is virtually indistinguishable in juvenile specimens. Juvenile river carpsucker (*Carpiodes carpio*) can also be mistaken as common carp (*Cyprinus carpio*). The spines of the dorsal and anal fins are serrated on the common carp, whereas, the spines of the river carpsucker (*Carpiodes carpio*) are not.

Other golden redhorse sucker (*Moxostoma etythrurum*), quillback carpsucker (*Carpiodes cyprinus*) and common carp (*Cyprinus carpio*) specimens were captured during surveys in the Red River of the North and other assessed tributaries (including the Maple River), but the Maple River was the only place where the black redhorse sucker (*Moxostoma duquesnei*) and the river carpsucker (*Carpiodes carpio*) were identified. This could be a result of species introduction or the presence of different morphs of these species that have adapted to the Maple River drainage. The latter could result in a misidentification of these species in the field. The specimens in question were not archived for follow-up laboratory identification.

Samples with extremely low numbers in the catch can present a scoring problem in some of the proportional metrics unless certain adjustments are made. At low population sizes resultant of severe impact, the normal structure of the community is unpredictably altered, and the proportion of omnivores, insectivorous fishes and the percent affected by anomalies do not always match expected trends. Scoring very degraded sites without modifying scoring criteria for the proportional metrics can overrate the total IBI score for these sites. For instance, OEPA has found that when relative numbers are fewer than 200 individuals per 0.3 kilometer sampled via wading methods or 1.0 kilometer sampled via boat methods, total IBI scores can be overrated (OEPA 1988b). With exception of Red River Reach 4, Maple River Reaches 17 and 18, Sheyenne River Reach 15 and all reaches on the Wild Rice River, fish capture rates achieved on the remaining non-wadeable study reaches for this initial baseline effort for the Fargo/Moorhead Flood Risk Management Project were less than 200 fish per kilometer. With exception of Rush River Reach 21, fish capture rates achieved on the remaining wadeable study reaches were less than 200 fish per 0.3 kilometer. For this reason, NDDoH and MPCA's scoring system for fish community integrity should include modifications to account for low catch numbers.

4.5 PATH FORWARD – FARGO/MOORHEAD FLOOD RISK MANAGEMENT PROJECT

The multi-metric data collected for this first baseline sampling effort on the Fargo/Moorhead Flood Risk Management Project will provide input to the IBI scoring systems currently being developed by NDDoH and MPCA. The IBI scoring systems will enable quantitative comparison of the biotic communities within the study reaches to those representative of reference conditions as well as pre- and post-alignment conditions.

This first pre-project baseline sampling event was a biological assessment to identify and characterize fish and invertebrate communities and biotic integrity within the Red River of the North and other tributaries potentially affected by the project. Collected data were used to quantify habitat conditions and to calculate common metrics of species abundance and community composition. Collected habitat data correspond with documented conditions of the low gradient, predominantly agricultural Lake Agassiz Basin. Only two of 21 study reaches examined had fair habitat (Red and Sheyenne Rivers), with the remainder having poor or very poor (Rush River) habitat. A handful of taxa moderately to highly tolerant of poor water quality conditions dominated the macroinvertebrate collections. The Maple and Rush Rivers displayed the greatest evenness across macroinvertebrate taxa. Fish species composition among the sampled rivers was similar to other fish studies conducted on the Red River of the North. The large river systems, Red River of the North and Sheyenne River, contained more robust fish populations than smaller, non-wadeable systems; although the Rush River, a non-wadeable stream and one of the smallest sampled, had the greatest fish diversity of all six rivers examined.

Fisheries and macroinvertebrate sampling, as well as evaluation of physical aquatic habitat, will allow Federal and State agencies to better understand the aquatic community within rivers potentially affected by a North Dakota diversion alignment. Data in this report represent the first in a series of pre- and post-project monitoring activities that will be performed to evaluate the impacts resulting from the Fargo/Moorhead Flood Risk Management Project. These data ultimately will be used in revised IBI scoring systems currently being developed for the Red River Basin by both NDDoH and MPCA.

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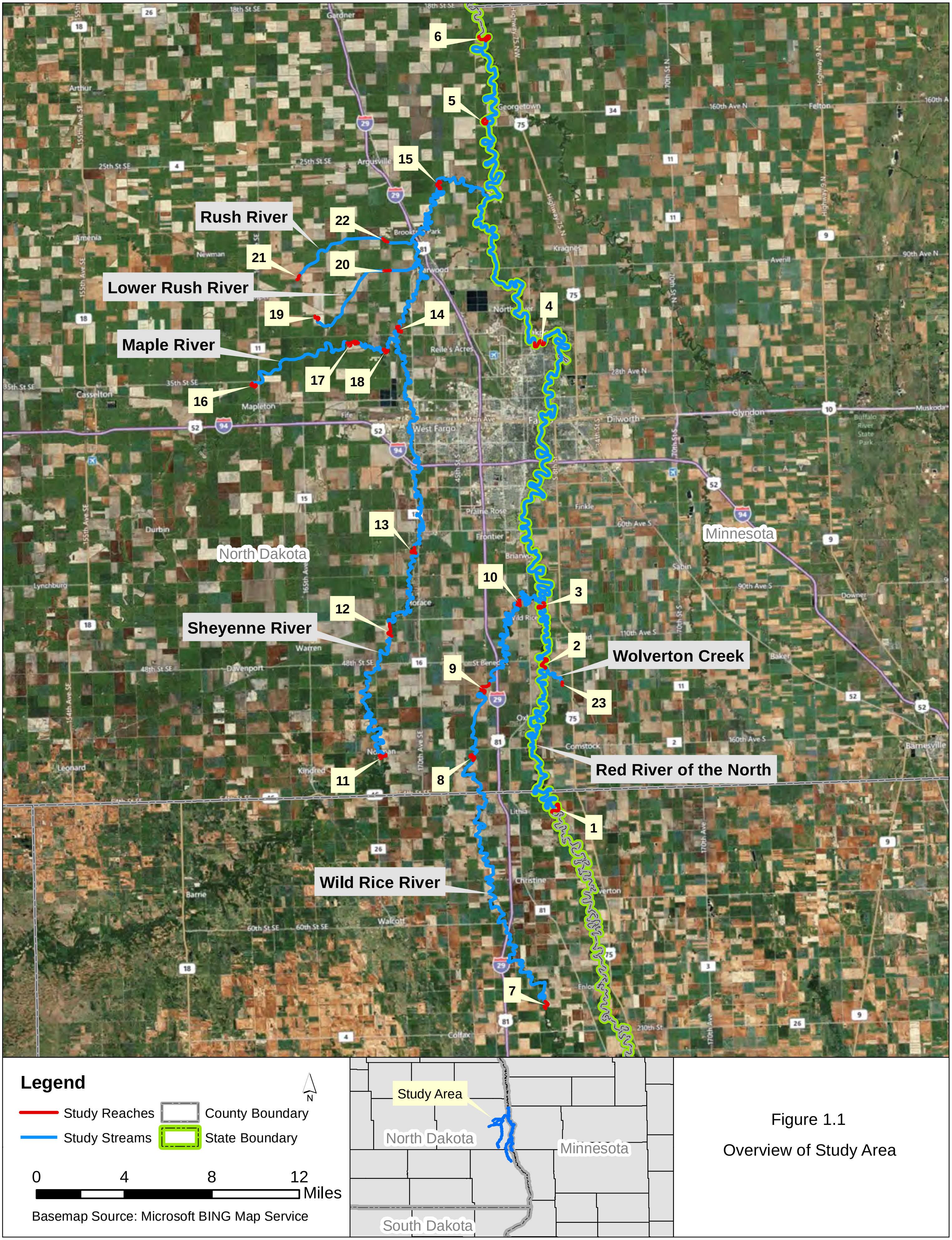


Figure 1.1

Overview of Study Area

Figure 3.1

Study Reach 1 along the Red River of the North

Basemap Source: Microsoft BING Map Service

Figure 3.2

Study Reach 2 along
the Red River of the North

Basemap Source: Microsoft BING Map Service

Figure 3.3

Study Reach 3 along
the Red River of the North

Figure 3.4

Study Reach 4 along
the Red River of the North

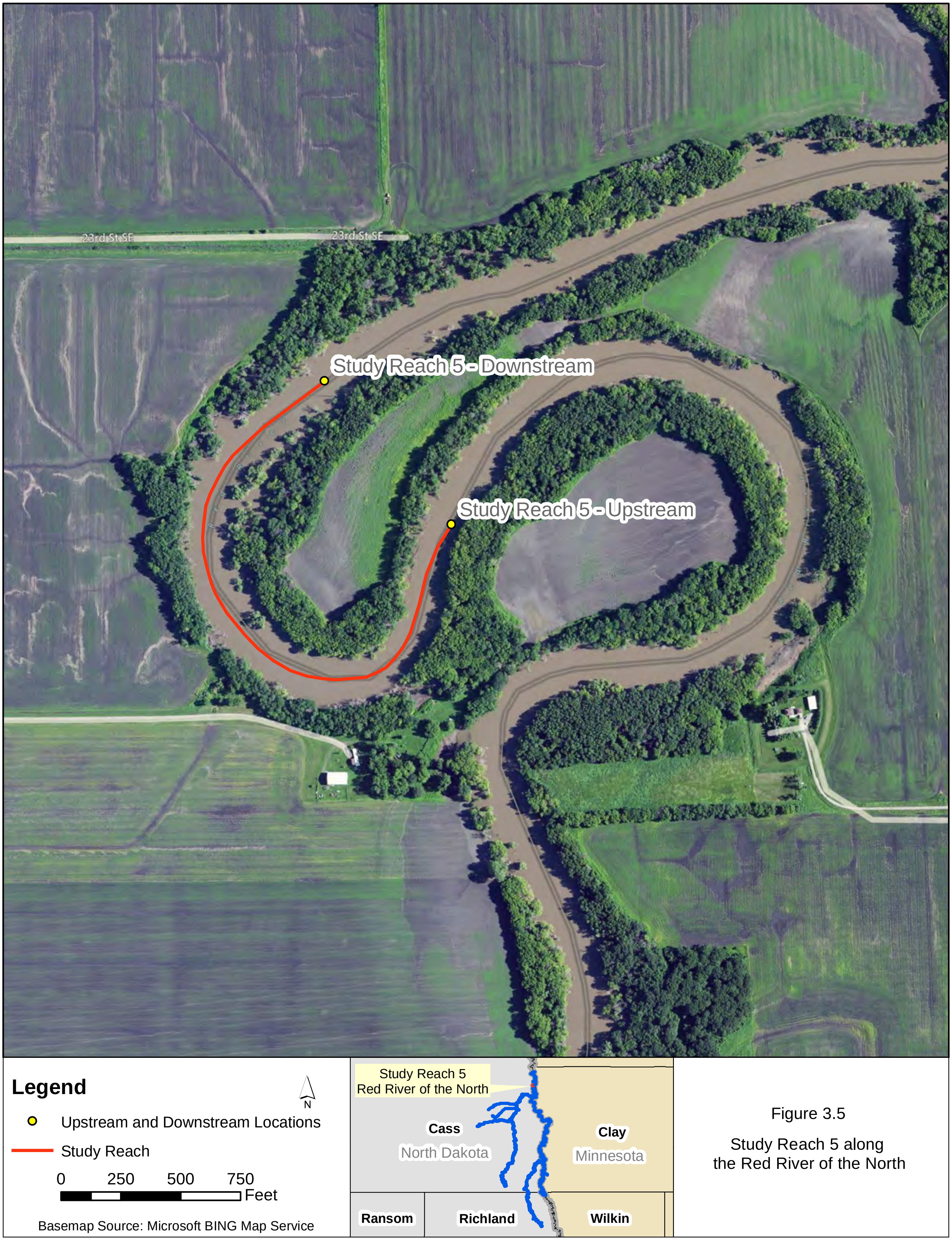
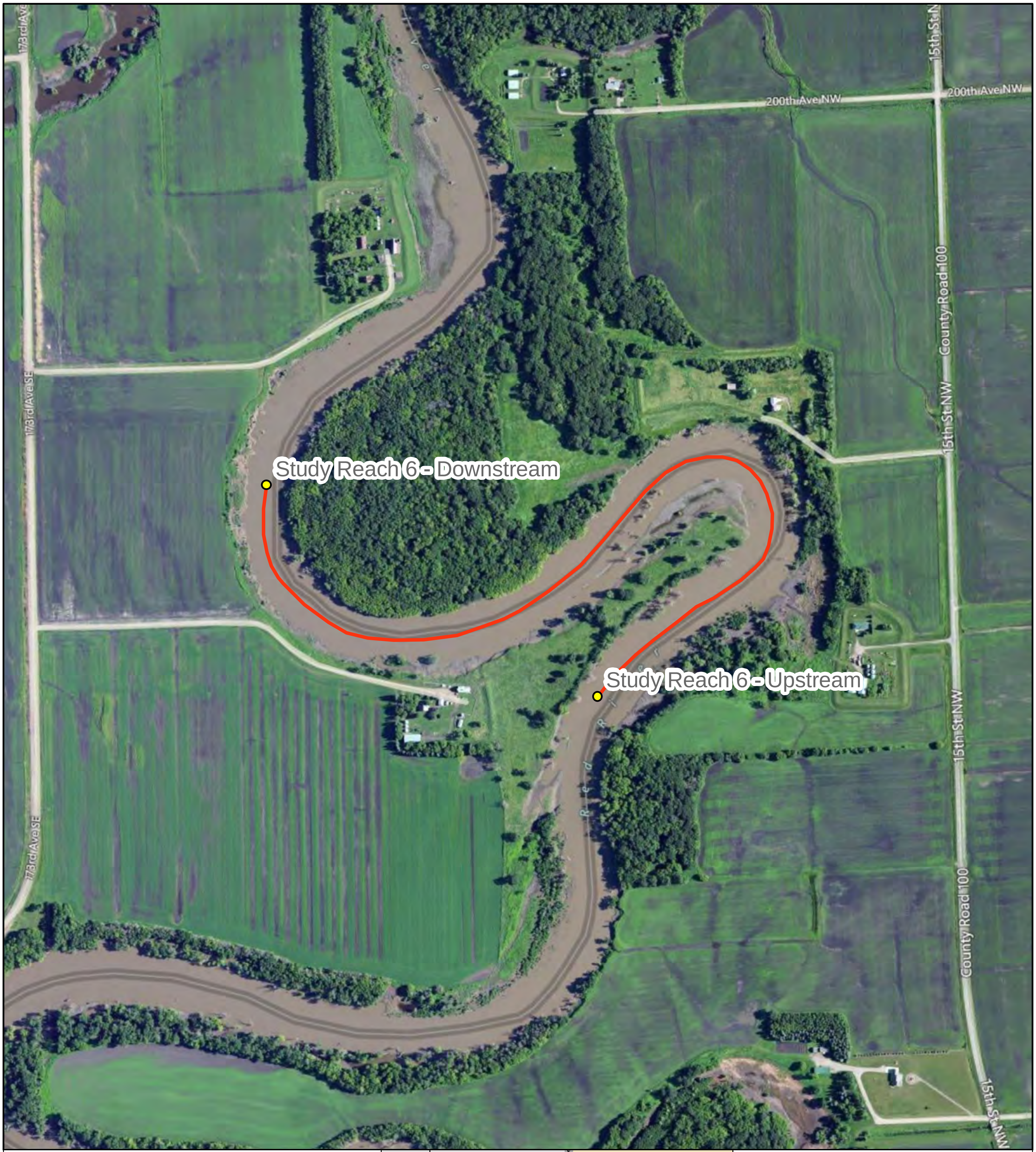


Figure 3.5

Study Reach 5 along the Red River of the North



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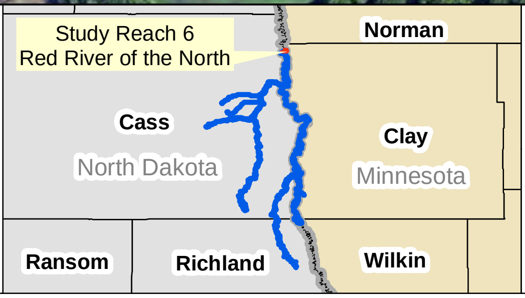


Figure 3.6

Study Reach 6 along
the Red River of the North

Figure 3.7

Study Reach 7 along the Wild Rice River

Basemap Source: Microsoft BING Map Service

Figure 3.8

Study Reach 8 along the Wild Rice River

Basemap Source: Microsoft BING Map Service

Figure 3.9

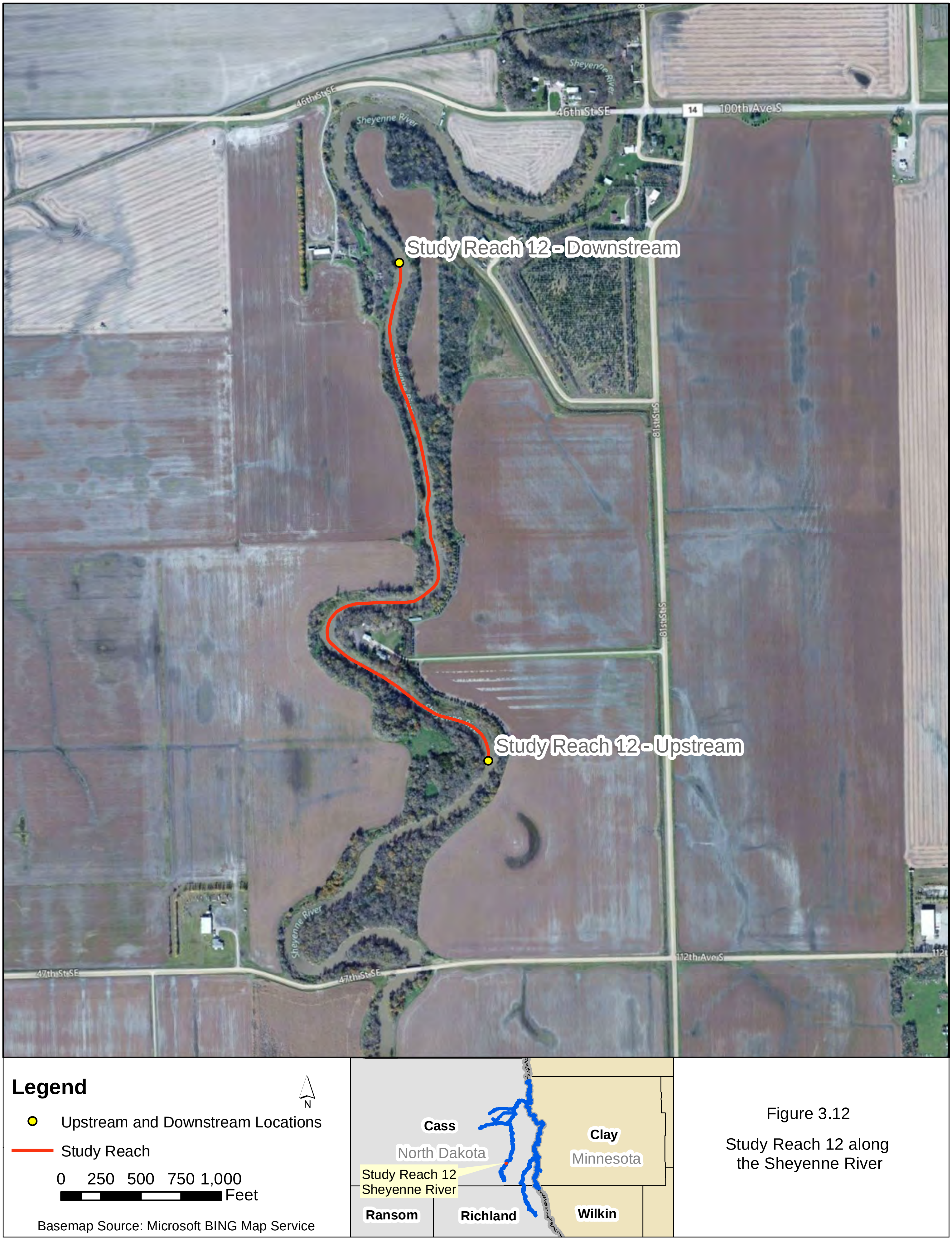
Study Reach 9 along the Wild Rice River

Figure 3.10

Study Reach 10 along the Wild Rice River

Figure 3.11

Study Reach 11 along the Sheyenne River



Basemap Source: Microsoft BING Map Service

Figure 3.12

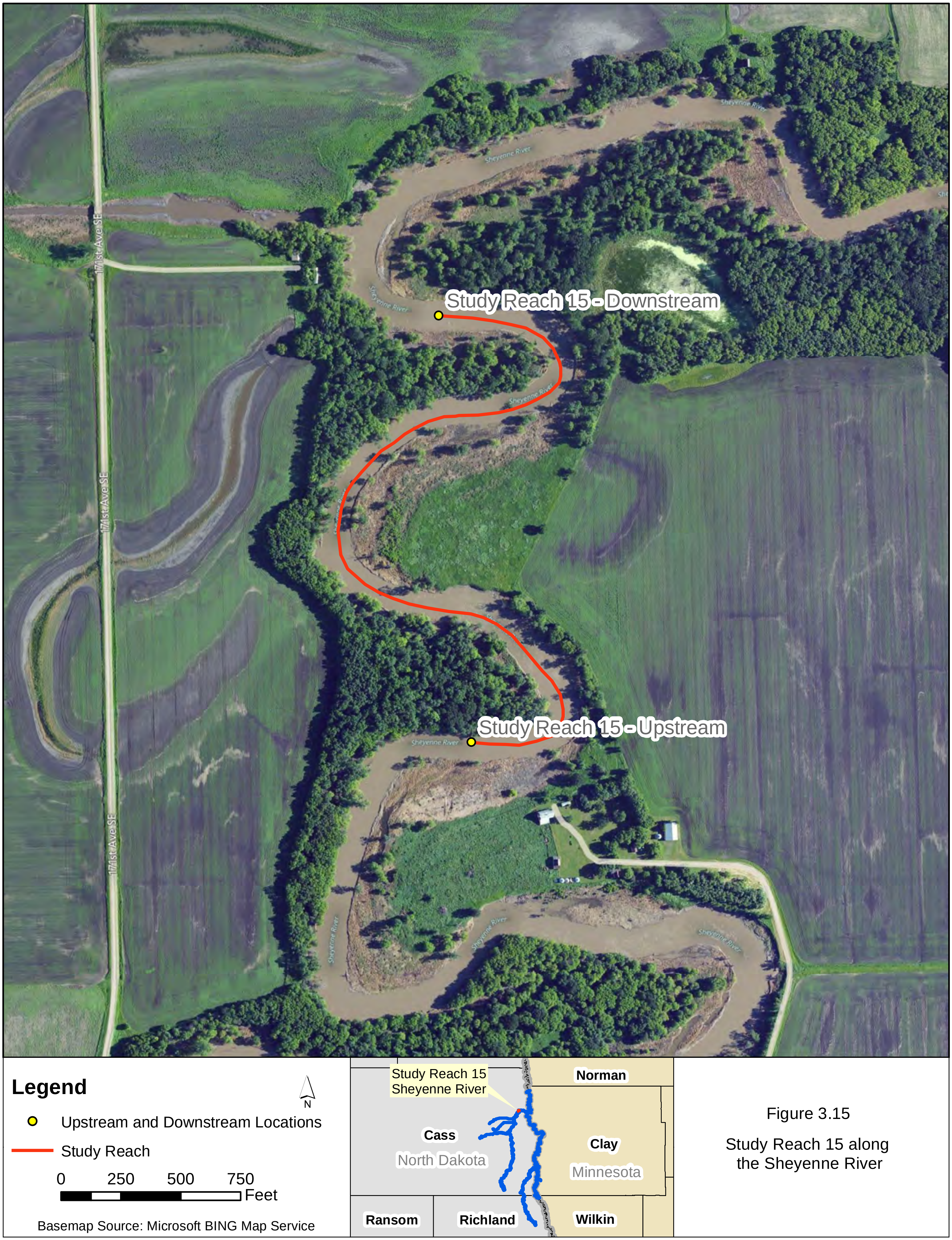
Study Reach 12 along the Sheyenne River

Figure 3.13

Study Reach 13 along the Sheyenne River

Figure 3.14

Study Reach 14 along the Sheyenne River



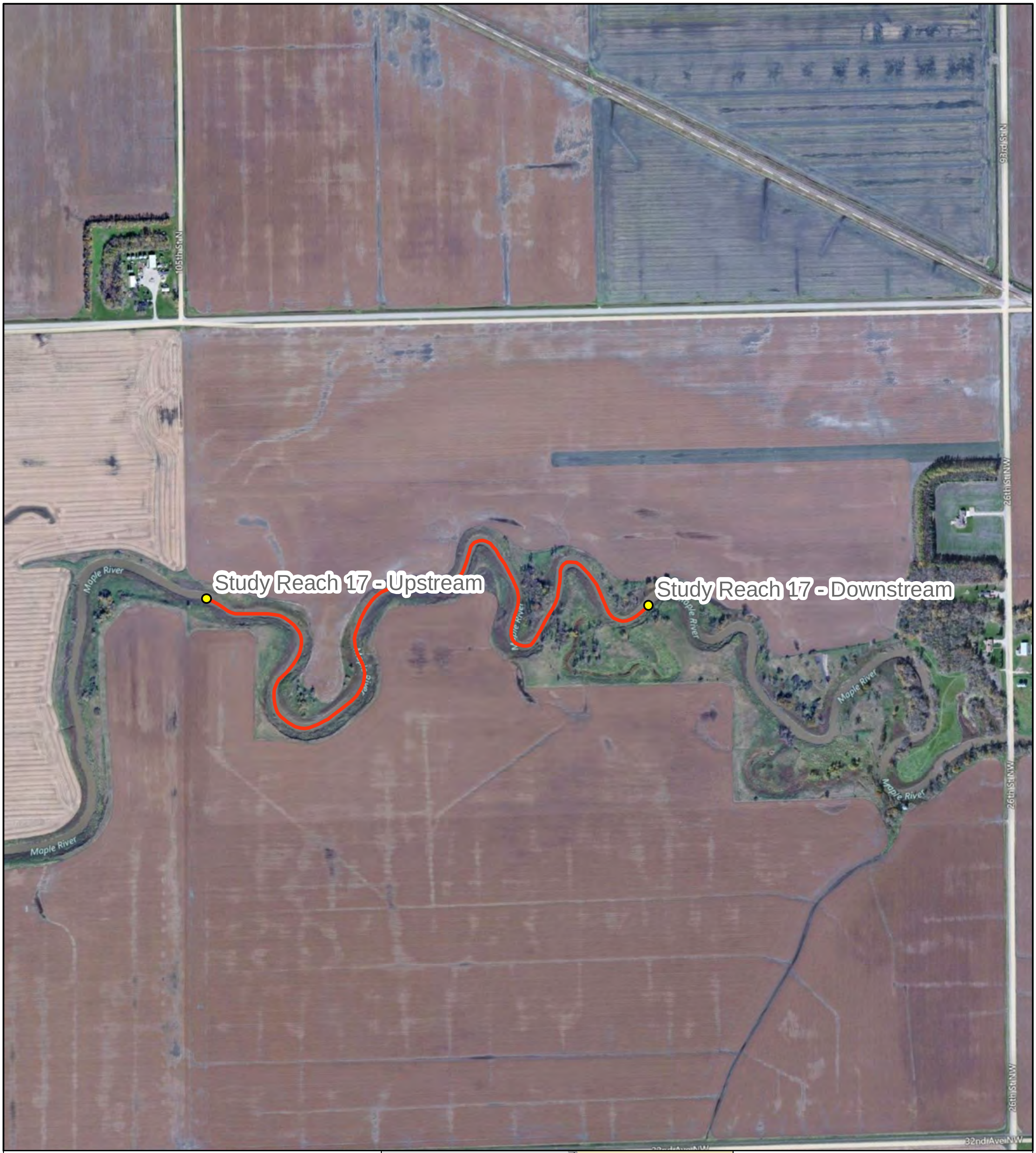
Basemap Source: Microsoft BING Map Service

Figure 3.15

Study Reach 15 along the Sheyenne River

Figure 3.16

Study Reach 16 along the Maple River



Legend

● Upstream and Downstream Locations

🟥 Study Reach

Basemap Source: Microsoft BING Map Service

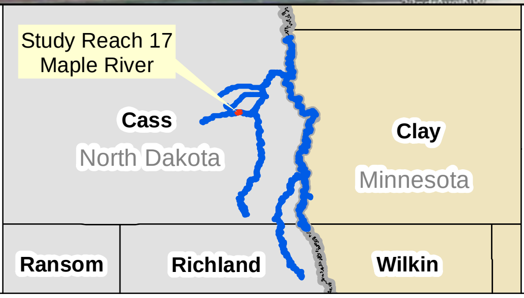


Figure 3.17

Study Reach 17 along the Maple River

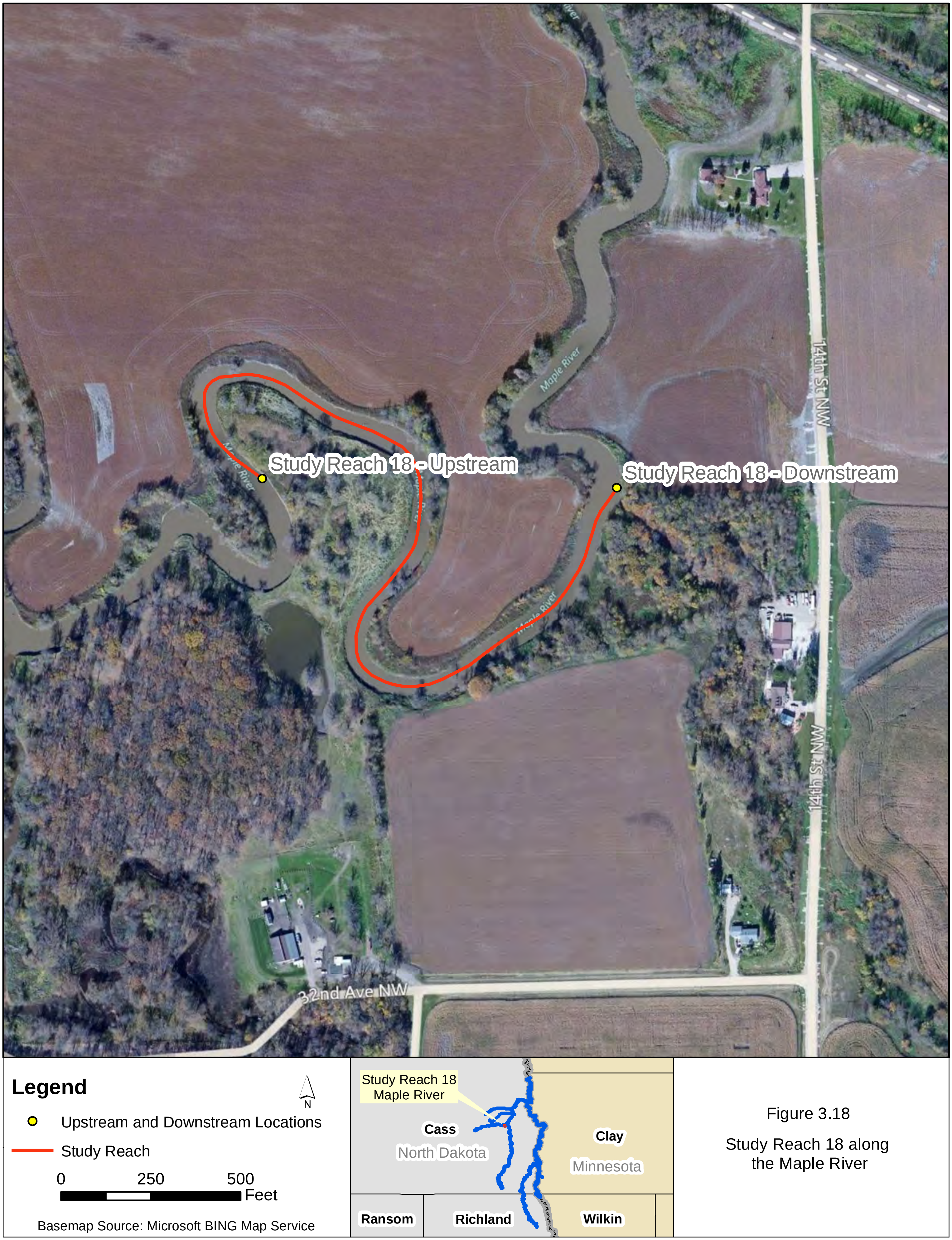


Figure 3.18

Study Reach 18 along the Maple River

Figure 3.19

Study Reach 19 along
the Lower Rush River

Figure 3.20

Study Reach 20 along the Lower Rush River

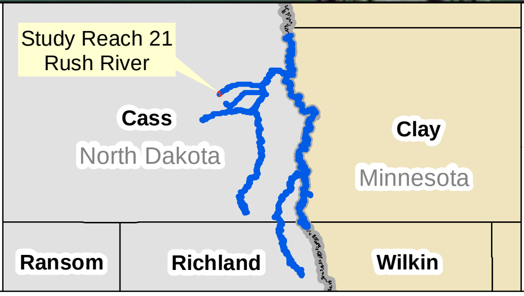


Figure 3.21

Study Reach 21 along the Rush River

Basemap Source: Microsoft BING Map Service

Figure 3.22

Study Reach 22 along the Rush River

Figure 3.23

Study Reach 23 along Wolverton Creek

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9 May 2012

PERFORMANCE WORK STATEMENT FOR

EVALUATION OF FISH, BENTHIC INVERTEBRATES AND PHYSICAL HABITAT OF RIVERS POTENTIALLY AFFECTED BY THE FARGO/MOORHEAD FLOOD RISK MANAGEMENT PROJECT

1. DESCRIPTION OF SERVICES. The Contractor shall provide all management, equipment, fuel and labor necessary to complete this contract. All work performed by the contractor shall be performed in accordance with all applicable laws, regulations, instructions, and commercial practices. **Because of the unfavorable weather conditions during the summer of 2011, the majority of the field work was not able to be started and will need to be completed during the 2012 summer season. The scope of work remains the same as proposed last season with altered timeframe to accommodate the data collect to the summer of 2012.**

1.1 Purpose: The purpose of this study is to identify and characterize fish and invertebrate communities and biotic integrity within the Red River and six tributaries that could be affected by a potential flood damage reduction project at Fargo, ND and Moorhead, MN. These include the Red, Wild Rice, Sheyenne, Maple, Rush and Lower Rush rivers; and Wolverton Creek (Figure 1).

1.2 Background:

The St. Paul District, Army Corps of Engineers (USACE), and the sponsor cities of Fargo, North Dakota and Moorhead, Minnesota began the Fargo-Moorhead Metro Feasibility Study in September 2008. Purpose of the study was to identify alternatives for long-term flood risk management for the Fargo/Moorhead area.

The scope of the feasibility study was to better understand flood issues, establish flood risk management measures that could be implemented, document findings and, if appropriate, recommend implementation of a Federal project. The analyses performed to date have resulted in a conceptual plan for a flood diversion channel around Fargo and Moorhead. This has included two potential diversion concepts being carried forward: a diversion in Minnesota, or a diversion in North Dakota. A North Dakota diversion would directly affect the Red River and six tributaries. USACE released a draft EIS in May, 2010. A Supplemental Draft EIS was released in May, 2011.

Under this SOW the Contractor shall perform fisheries and macroinvertebrate sampling, as well as assess physical aquatic habitat, that will allow federal and State agencies to better understand the existing aquatic community within rivers potentially affected by a North Dakota diversion alignment. As a part of an adaptive approach, pre- and post-project monitoring will be performed to evaluate the impacts resulting from the project. This will include multiple sampling events prior to and following construction. It also will include sampling within direct impact areas, as well as adjacent control sites. Sampling outlined here will provide the first of at least two pre-project sampling events that will serve for future comparison. Post-project monitoring also will be performed in these same areas.

Sampling sites for this effort will be located on the Red, Wild Rice, Sheyenne, Maple, Rush and Lower Rush rivers, as well as Wolverton Creek (Figure 1). Work efforts will include field surveys, data entry and brief report summary.

Various metrics will be used for data comparison pre and post-project, to include calculations of IBI scores. Revised IBI scoring systems are currently being developed for the Red River Basin by both North Dakota (ND Dept. of Health); and Minnesota (MN Pollution Control Agency). These IBIs are both still in development, and will be based on prescribed sampling methodologies. These sampling methodologies will be followed for this effort. Since the majority of study reaches are in North Dakota, the methods will be primarily based from those provided from North Dakota. Methodologies used to guide sampling are be identified within this Scope of Work.

2. SERVICE SUMMARY (SS): The contract will perform field work to complete reach sampling for fish, macroinvertebrates and physical habitat. Data analysis and report preparation also shall be performed. Quality Control and Quality Assurance measures will be utilized during execution of the contract. The government shall inspect and evaluate the contractor's performance to ensure services are received in accordance with this contract. A written Quality Control Plan shall be submitted to the contract POC for review, feedback, and approvial.

2.1 Study Reaches: A total of 23 study reaches will be surveyed (Figure 1; Table 1). Study reaches include the likely footprint locations for concrete structures or channel diversions. They also include areas above and below structures where altered hydraulics could influence habitat and biota. Lastly, most rivers shall include one adjacent study reach to serve as a control site. USACE shall provide a GIS Shape file for the study reaches which shall serve to further verify reach location.

Table 1. The contractor shall perform surveys for fish, macroinvetebrates and physical habitat at each of the study reaches listed here and shown in Figure 1.

Study Reach No.	**Tributary**	**Descriptor**	**Type**	**Length (feet)**	**Method**	**Fisheries Gear Type**
1	Red River	Upstream (Hydraulic)	Test	4,000	Non-Wade	Boomshocker*
2	Red River	Footprint	Test	4,500	Non-Wade	Boomshocker*
3	Red River	Protected Area (Hyd)	Test	4,000	Non-Wade	Boomshocker*
4	Red River	Protected Area (Hyd)	Test	4,000	Non-Wade	Boomshocker*
5	Red River	Footprint	Test	2,500	Non-Wade	Boomshocker*
6	Red River	Downstream	Control	4,000	Non-Wade	Boomshocker*
7	Wild Rice River	Upstream	Control	3,000	Non-Wade	Mini-boom
8	Wild Rice River	Upstream (Hyd)	Test	3,000	Non-Wade	Mini-boom
9	Wild Rice River	Footprint Location	Test	4,500	Non-Wade	Mini-boom
10	Wild Rice River	Protected Area (Hyd)	Test	3,000	Non-Wade	Mini-boom
11	Sheyenne River	Upstream	Control	3,200	Non-Wade	Mini-boom
12	Sheyenne River	Footprint	Test	4,300	Non-Wade	Mini-boom
13	Sheyenne River	Protected Area (Hyd)	Test	3,200	Non-Wade	Mini-boom
14	Sheyenne River	Protected Area (Hyd)	Test	3,200	Non-Wade	Mini-boom
15	Sheyenne River	Protected Area (Hyd)	Test	3,700	Non-Wade	Mini-boom
16	Maple River	Upstream	Control	2,500	Non-Wade	Mini-boom
17	Maple River	Footprint	Test	5,600	Non-Wade	Mini-boom
18	Maple River	Protected Area (Hyd)	Test	2,500	Non-Wade	Mini-boom
19	Lower Rush River	Upstream	Control	1,300	Wadeable	Stream shocker
20	Lower Rush River	Footprint	Test	1,300	Wadeable	Stream shocker
21	Rush River	Upstream	Control	2,000	Wadeable	Stream shocker
22	Rush River	Footprint	Test	2,000	Wadeable	Stream shocker
23	Wolverton Creek	Footprint	Test	1,000	Wadeable	Stream shocker

*These study reaches will be sampled by boomshocker, provided they require less than 60 minutes to reach, one way, by boat. If they require longer than 60 minutes to reach by boat, then these reaches will be sampled via mini-boom.

2.2 Study Reach Length: The distance of stream or river that should be sampled to adequately characterize diversity or biotic integrity varies. Lyons (1992) recommend sampling a stream segment at least 35 times the mean stream width for estimating species richness in midwestern U.S. streams with a DC stream shocker. EPA's Environmental Monitoring and Assessment Program, using a "proportional-distance designation," recommends sampling a stream segment at least 40 times the mean stream width. Others such as Ohio EPA (after Yoder and Smith 1999) recommend a distance from 0.5 to 1.0 km for surveying rivers that require a boat for electroshocking.

The distance of each survey reach is identified in Table 1. These are based on several factors. Footprint areas will have the entire footprint surveyed. All other survey reaches will sample an area at least 35 times the stream width. Contractor must ensure that reach sample lengths are at least 35 times stream width, based on field conditions.

2.3 Field Tasks: The contractor shall perform the following field tasks:

1) Site Reconnaissance Investigation
2) Fisheries Assessment
3) Physical Habitat Assessment
4) Macroinvertebrate Assessment

Reach Reconnaissance: First, the contractor shall perform Reconnaissance of each study reach prior to sampling for fish, macroinvertebrates and physical habitat. This Reconaissance shall include becoming familiar with each survey reach to the extent that will allow efficient sampling. This Reconaissance shall include a cursory view of survey sites, confirming the appropriate gear for sampling fish and macroinvertebrates based on sample reach characteristics; confirming reach access and any other logistical issues for sampling. A Reach Reconaissance will be performed by the biologist and one technician that will participate in sampling for fish and macroinvertebrates. Reach Reconnaissance shall be performed during June or July and will be coordinated with Corps Project Biologist. Whenever practical, the Corps and agency members will participate in the Reach Reconaissance to observe and discuss conditions.

The contractor can select how they wish to access survey sites whether from public access (e.g., boat landings), public road crossings or private property. USACE will provide rights-of-entry allowing direct access from adjacent property for all survey reaches. Site access on most tributary sites may be limited to portable equipment on private property. Contractor must plan appropriately for sampling in such conditions.

For fisheries sampling, gear types include the following (gear types further discussed in attachments):

Stream-shocker: Used in larger, wadeable streams and rivers. The stream-shocker is a towable unit that can effectively sample larger streams because it has additional power capabilities and employs two anodes, thus increasing the electrified zone. Three personnel are required for operation, one to control the electrofisher, one to control the anode, and one to transfer fish. A single electrofishing run is conducted in an upstream direction weaving between habitat types.

Mini-boom: Used in non-wadeable streams and rivers that are either too small or that do not afford the access necessary to utilize a boom-shocker. The mini-boom electrofisher is a jon-boat that is light enough to be portaged, yet provides a stable work platform. Personnel consist of one person to operate the boat, monitor the control box, and ensure the safety of a single fish collector on the bow. A single electrofishing run is conducted in a downstream direction weaving between habitat types.

Boom-shocker: Used in large, accessible rivers. The accepted sampling procedure is to slowly and methodically maneuver the electrofishing boat in a downstream direction maneuvering in and around submerged cover to advantageously position the netter(s) to pick up stunned and immobilized fish. Personnel consist of one person to operate the boat, monitor the control box, and ensure the safety of two fish collectors on the bow.

The anticipated gear types for each reach are outlined in Table 1. This includes stipulations for sampling on the Red River with a boomshocker versus use of a mini-boom for sampling. The above shall be considered when preparing the cost estimate. Any deviation in gear type, based on field conditions observed during reconnaissance, must be coordinated with the Project Biologist and Contract Point of Contact (POC). A contract modification shall be considered at that point, as appropriate.

Additional consideration shall be give to the Lower Rush River during Reach Reconaissance. This tributary may be intermittent, and may or may not be sampleable. A site is considered *sampleable* if it has a defined stream channel and at least 50% of the sampling reach contains water. The site on the Lower Rush will be qualitatively (visually) assessed for whether it meets this criteria. If the Lower Rush appears to not be sampleable, the contractor shall coordinate with the project biologist and determine whether this tributary should be included in the proposal for sampling of fish, macroinvertebrates and physical habitat (Task 2).

2.3.1 Pre-Project Teleconference: The contractor shall hold a teleconference with USACE, as well as federal and state natural resource agencies, at least two weeks prior to the initiation of field surveys. Purpose is to review the SOW, sampling approach, field schedule, survey sites, gear-type to be used at each survey site, contractor field personnel, and agency participation. Contractor will contact USACE for a list of agency personal that shall be invited to attend the telecom.

2.3.2 Fisheries Assessment: The contractor shall complete fisheries sampling according to the appended sampling protocol for wadeable (Appendix A) and non-wadeable streams (Appendix B). For this contract the Rush, Lower Rush and Wolverton Creek would be considered wadable streams; and the Red, Wild Rice, Sheyenne and Maple rivers would be considered non-wadeable streams. This shall be verified during site reconnaissance, with final sampling methodology discussed during the agency phone conference.

Deviation from the identified fisheries protocol will be made to include the following stipulations. Any additional deviations planned prior to sampling must be coordinated with the Project Biologist. Deviations from the protocol that must be made in the field during sampling to account for field conditions, or other circumstances, must be fully identified and documented within field notes.

2.3.2.1 The contractor shall complete all fisheries surveys during daylight hours between 1 July and 30 September, 2012. Daylight hours are defined as starting sampling no earlier than 60 minutes after sunrise, and finishing no later than 60 minutes before sunset. Sampling shall occur when streams are at or near base flow conditions. The contractor shall contact the Project Biologist when sampling is planned to commence and agree with the Project Biologist that flow conditions are appropriate.

2.3.2.2 Electrical settings for electrofishing are described for boomshocking in Appendix B. To the extent practicable these settings will be followed for boomshocking, mini-boomshocking and stream shocking. Power settings shall ultimately be selected on those needed for the optimum combination of voltage and amperage output to most effectively stun fish. This shall be determined on a trial and error basis at the beginning of each survey. Contractor shall try to avoid power settings so extreme that fish mortality becomes excessive. Because power output affects catch rates of fishes differently, it is critical that power settings and output from all electrofishing samples is recorded on field data sheets. Water quality observations (including temperature and conductivity) shall also be collected (outlined below).

2.3.2.3 Field collection of fish *must* be conducted by qualified/trained technicians that are efficient with this type of sampling. During sampling an effort shall be made to collect all fish observed. Fish < 20 mm in total length are not counted as part of the catch.

2.3.2.4 Field identifications of fish *must* be conducted by qualified/trained fish taxonomists or fisheries biologist, familiar with local and regional ichthyofauna. Fish collected shall be identified in the field down to species using scientifically accepted taxonomic keys (e.g., Becker 2001, Pflieger 1997, Trautman 1981). Fish that cannot be identified will have a voucher specimen collected, preserved using accepted methods, and identified later in the lab.

2.3.2.5 All fish will be measured to the nearest 10 mm and recorded.

2.3.2.6 All fish that are alive after processing should be immediately returned to the stream, unless they are needed as voucher specimens. Effort shall be made to minimize handling mortality, such as using a live well, quickly sorting fish into numerous wet containers, and replacing their water supply.

2.3.2.7 Should individuals of any federally threatened or endangered species be captured at any time during fieldwork, the contractor shall, as soon as it is convenient, but not to exceed the following work day, notify the Corps' Project Biologist and the Agency Points of Contact. Specimens also should be photographed for documentation.

2.3.2.8 At a minimum, the contractor shall record the following information for each survey:
2.3.2.8.1 County
2.3.2.8.2 Stream name, location description and reach number,
2.3.2.8.3 GPS coordinates for beginning and end of reach sampled
2.3.2.8.4 Date
2.3.2.8.5 Photograph of beginning and ending of each reach, looking upstream or downstream towards the area sampled
2.3.2.8.6 beginning and ending time of sample collection,
2.3.2.8.7 names of all sampling crew members
2.3.2.8.8 full description of gear type, basic unit design, number of anodes, power settings, etc.

2.3.2.8.9 All fish collected down to species, including length,
2.3.2.8.10 conditions at the beginning of sampling, to include:

- water temperature
- conductivity
- dissolved oxygen
- Secchi disk depth
- total suspended solids (as measured in Nephelometric Turbidity Units (NTUs)
- Basic description of weather

2.3.2.8.11 Note any issues that may have influenced sampling effectiveness or efficiency
2.3.2.8.12 depth range during sampling (minimum and maximum),
2.3.2.8.13 approximate average depth,
2.3.2.8.14 general substrate types encountered, and qualitative abundance of each

2.3.3 Physical Habitat Assessment: Following completion of the fisheries survey, the contractor also shall perform an assessment of physical habitat and water chemistry. The contractor shall follow the protocol from Appendix D for non-wadeable streams; and Appendix D and E for wadeable streams. This will include two assessments for wadeable streams. Lab water quality analyses shall not be performed as a part of this effort (Appendix D, E.3 Lab Water Chemistry will not be performed).

2.3.4 Macroinvertebrate Assessment: Macroinvertebrate Assessments shall be completed after assessments for fisheries. Macroinvertebrate surveys will follow the methodology outlined at Appendix E for wadeable streams; and Appendix F for non-wadeable. Macroinvertebrate samples will be processed according to the methodology at Appendix G. Several acceptable laboratories are available for analysis. Before a laboratory is used, the Corps Project Biologist must approve of the desired laboratory. State agency partners have used similar protocol and achieved satisfactory results through contracting with the following laboratories for macroinvertebrate analysis: Rithron Inc, (Missoula, MT); and Dr. Andre Delorme with Valley City State University.

2.4 **Data Entry**: All data collected for fisheries surveys, macroinvertebrate surveys and physical habitat shall be entered into Microsoft Excel 2007. All data sheets shall be scanned and saved as a PDF file. The Contractor will be responsible to provide study data, both electronic and hard copies, to USACE at study completion.

2.5 **Data analysis** shall include measures of species abundance and composition at each study reach using the following format or methodologies. These will be computed for both fish and macroinvertebrates.

2.5.1 Abundance
2.5.1.1 *Total number of each species collected for each reach sampled.*
2.5.1.2 *Relative species abundance* – total number of individuals of a species expressed as a percentage of the total number of individuals of all species.
2.5.1.3 *Catch Per Unit Effort (CPUE)* – expressed as the number of each species collected per hour of electrofishing time.

2.5.2 Composition
2.5.2.1 *Richness* - Rarefaction method $[E(S_n)]$.
2.5.2.2 *Evenness* -Abundance plots [species rank (X) –vs- relative abundance (Y)].
2.5.2.3 *Diversity Indices* – Simpson's (D_s)

2.5.3 Index of Biotic Integrity: IBI scores will be computed by the government from data collected during this effort. Contractor shall not be reimbursed for calculating IBI scores from project data.

2.6 **Reporting Requirements:** The Contractor shall prepare, in draft and final forms, a technical report for this effort. The report shall:

2.6.1 consist of the following sections:

- Introduction
- Methods
- Results
- Discussion

2.6.2 include the following:

- The map from this SOW showing location of all reaches sampled.
- General characterization of fish and invertebrate communities within each study reach, including discussion of species abundance and diversity.
- Discussion of presence and abundance of rare species (e.g., federally Threatened or Endangered species; as well as similar species with such designations by the State of North Dakota).
- Discussion of field conditions during sampling, including any field conditions that may have influenced sampling efficiency or the results observed.

2.6.3 Five (5) copies of the draft report shall be provided to the Contract POC. The Contractor shall be responsible for any revisions to the draft report required by the Contract POC.

2.6.4 Fifteen (15) copies of the final report shall be furnished to the Contract POC. One copy of original field collection data/notes (hard copy and electronic), photo logs, photographs, and negatives shall be provided along with the final report.

2.6.5 This scope of work, minus the appendices shall be included as an appendix of the final report. The appendices of this Performance Work Statement shall be referenced.

2.6.6 Original field data sheets, as well as CD with scanned electronic copies of all data sheets, shall be provided to USACE at the time the final report is submitted.

3.0 GOVERNMENT FURNISHED PROPERTY AND SERVICES

3.1 Government Furnished Facilities. None

3.2 Government Furnished Supplies and Equipment. None

3.3 Government Furnished Utilities. None.

3.4 Telephone Service. None.

3.5 Security and Fire. None.

3.6 Refuse Collection and Disposal. N/A.

3.7 Mail Service. N/A.

4. GENERAL INFORMATION

4.1 Safety. All work shall adhere to pertinent provisions of the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, dated 3 September 1996 (and all subsequent revisions).

4.2 Survey work shall be done in rivers with moving water and variable clarity, obstructions and bottom conditions. Adequate safety precautions should be taken to minimize the risk of bodily injury or damage to equipment.

4.3 USACE shall provide rights-of-entry allowing direct access from adjacent property at all sampling sites

4.4 Permits. The Contractor shall be responsible for securing all applicable sampling permits from both State and Federal Governments.

4.5 Agency Participation. The contractor shall allow at least one agency representative (e.g., USACE, U.S. Fish and Wildlife Service, North Dakota Game and Fish, Minnesota Department of Natural Resources) to observe all aspects of field work. Additional agency representatives may observe all aspects of field work from the river bank. This shall occur for reconnaissance site visits, fisheries sampling, macroinvertebrate sampling and physical habitat assessment. The contractor shall contact the Project Biologist at least one week in advance of any field work to identify dates of work and determine logistics of agency participation with the consultant. For sampling with a mini-boom shocker, it's recognized the boat may not be able to accommodate agency biologists. In this case, agency biologists may observe from the bank. Agency participation is critical for transparency, developing confidence in study results, and providing oversight that sampling is done in a reasonable and reliable manor.

4.6 Training. The contractor must ensure that sample collection, identification, analysis and report preparation are performed by fully qualified individuals. This contract does not include training to complete the requirements outlined.

4.7 Contract Coordination.

4.7.1 Elliott Stefanik is the Project Biologist for this work. He may be reached by phone: 651-290-5260, or E-mail: Elliott.L.Stefanik@usace.army.mil. It is the Contractor's responsibility to contact the Project Biologist to if field conditions, or any other conditions, will affect completion of surveys pursuant to the SOW.

4.7.2 Kevin Bluhm is the contractPOC for this work. He may be reached by phone: 651-290-5247, E-mail: Kevin.W.Bluhm@usace.army.mil, and by mail at: Attn: Kevin Bluhm, PD-E; Corps of Engineers; St. Paul District; 180 5th Street East, St. Paul, MN 55101.

4.7.3 Agency Points of Contact are for MNDNR is Nathan Kestner: Nathan.Kestner@state.mn.us; North Dakota Game and Fish is Bruce Kreft: bkreft@nd.gov; U.S. Fish and Wildlife Service is Rich Davis: Richard.Davis@fws.gov.

4.8 Project Schedule. The following Project Schedule shall apply:

Tasks/Milestone	Date/Calendar Day
Date of Award*	*0
Field Work Completed	30 September, 2012
Draft Report Submittal	**15 November, 2012**
Date of Letter with Corps Project Review Comments on Draft Report Submitted to Contractor	**31 December 2012**
Final Report Submittal	15 days following date of Corps letter with Project Review Comments.

*:Calendar Day 0 is the Date in Block 3 of DD Form 1155.

4.9 Payment Schedule. The Payment Schedule shall be as follows:

Tasks/Milestone	Percent of Contract Amount
100 Percent Field Work Completion**	60
Submittal of Draft Report	15
Corps Acceptance of Final Report	25

**:Completion of field work shall be documented by letter submitted by the contractor to the Corps Contracting Point of Contact (POC).

4.11 References.

Becker, G.C. 2001. Fishes of Wisconsin. The University of Wisconsin Press, Madison, WI.

EPA. 1998. Development of Index of Biotic Integrity Expectations for the Lake Agassiz Plain Ecoregion. U.S. Environmental Protection Agency, Region 5, Chicago, IL. EPA 905-R-96-005. NTS. September 1998.
Located at: http://www.pca.state.mn.us/water/biomonitoring/bio-streams-fish.html

Lyons, J. 1992. The Length of Stream to Sample with a Towed Electrofishing Unit When Fish Species Richness Is Estimated. North American Journal of Fisheries Management. 12:198-203. 1992.

Minnesota Pollution Control Agency, Biological Monitoring Program. Fish Community Sampling Protocol for Stream Monitoring Sites. No date listed. Located at: http://www.pca.state.mn.us/water/biomonitoring/bio-streams-fish.html

Pflieger, W.L. 1997. The Fishes of Missouri. Missouri Department of Conservation. Jefferson City, Missouri.

Trautman, M.B. 1981. The Fishes of Ohio. Ohio State University Press.

5.0 APPENDICES. Following are the appendices that provide more specific guidance on methodology for sample collection.

APPENDIX A - Methodology for fisheries sampling for wadeable streams.

APPENDIX B - Methodology for fisheries sampling for non-wadeable streams.

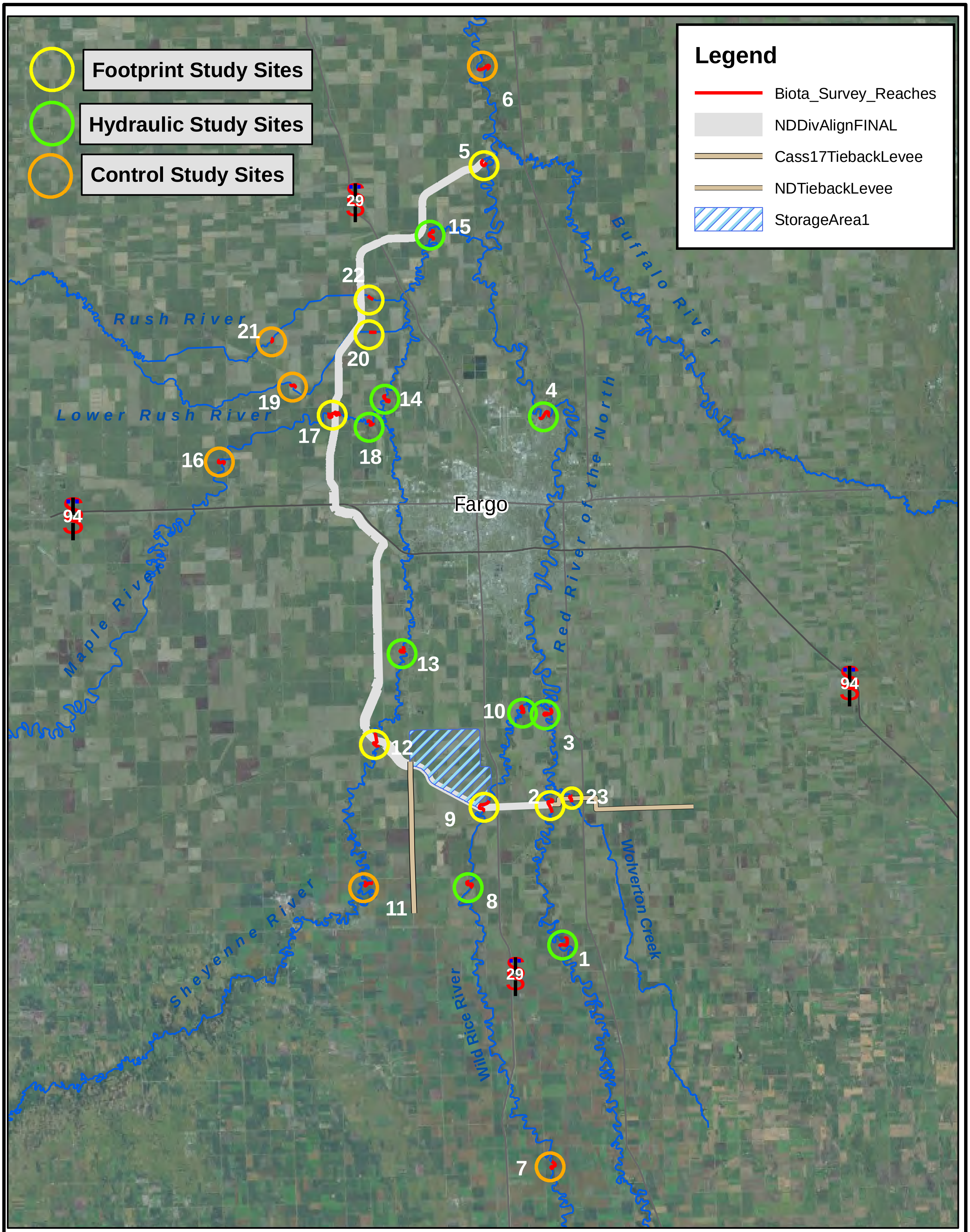
APPENDIX C – Methodology for sampling physical habitat on non-wadeable streams.

APPENDIX D – Methodology for sampling physical habitat on wadeable streams.

APPENDIX E - Methodology for macroinvertebrate surveys on wadeable streams.

APPENDIX F - Methodology for macroinvertebrate surveys on non-wadeable streams.

APPENDIX G - Laboratory procedures for processing macroinvertebrate samples.



Study Reach locations for pre-project fish, macroinvertebrate and physical habitat surveys to verify project impacts.

BGW_12JAN2010_mvd\mvp\projects\SA\ActiveFolders\SA_Fargo-Moorhead_Metro_FDR-153866\GIS\MXD NDDivAlign12Jan2010.mxd

Client Name:	Site Location:	Project No.
USACE – St Paul District	Red River of the North	25008875

Photo No. 1

Date: 9/4/12

Description:

Photo taken from upstream end of Study Reach 1, facing upstream.

Photo No. 2

Date: 9/4/12

Description:

Photo taken from upstream end of Study Reach 1, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Red River of the North	25008875

Photo No.	**Date:**
3	9/4/12

Description:

Photo taken from downstream end of Study Reach 1, facing upstream.

Photo No.	**Date:**
4	9/4/12

Description:

Photo taken from downstream end of Study Reach 1, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St Paul District	Red River of the North	25008875

Photo No. 5

Date: 8/31/12

Description:

Photo taken from upstream end of Study Reach 2, facing upstream.

Photo No. 6

Date: 8/31/12

Description:

Photo taken from upstream end of Study Reach 2, facing downstream.

Photo No.	Date:
7	8/31/12

Description:

Photo taken from downstream end of Study Reach 2, facing upstream.

Photo No.	Date:
8	8/31/12

Description:

Photo taken from downstream end of Study Reach 2, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St Paul District	Red River of the North	25008875

Photo No.	Date:
9	8/30/12

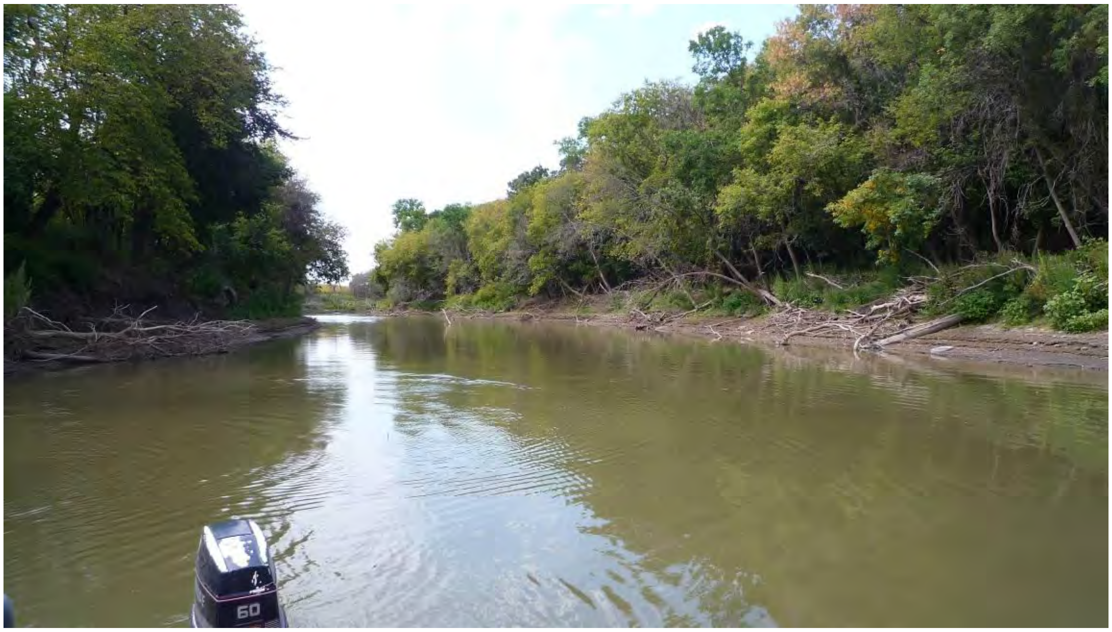
Description:

Photo taken from upstream end of Study Reach 3, facing upstream.

Photo No.	Date:
10	8/30/12

Description:

Photo taken from upstream end of Study Reach 3, facing downstream.



Client Name: USACE – St. Paul District	**Site Location:** Red River of the North	**Project No.** 25008875

Photo No. **11**	**Date:** 8/30/12

Description:

Photo taken from downstream end of Study Reach 3, facing upstream.

Photo No. **12**	**Date:** 8/30/12

Description:

Photo taken from downstream end of Study Reach 3, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St Paul District	Red River of the North	25008875

Photo No. 13 **Date:** 8/29/12

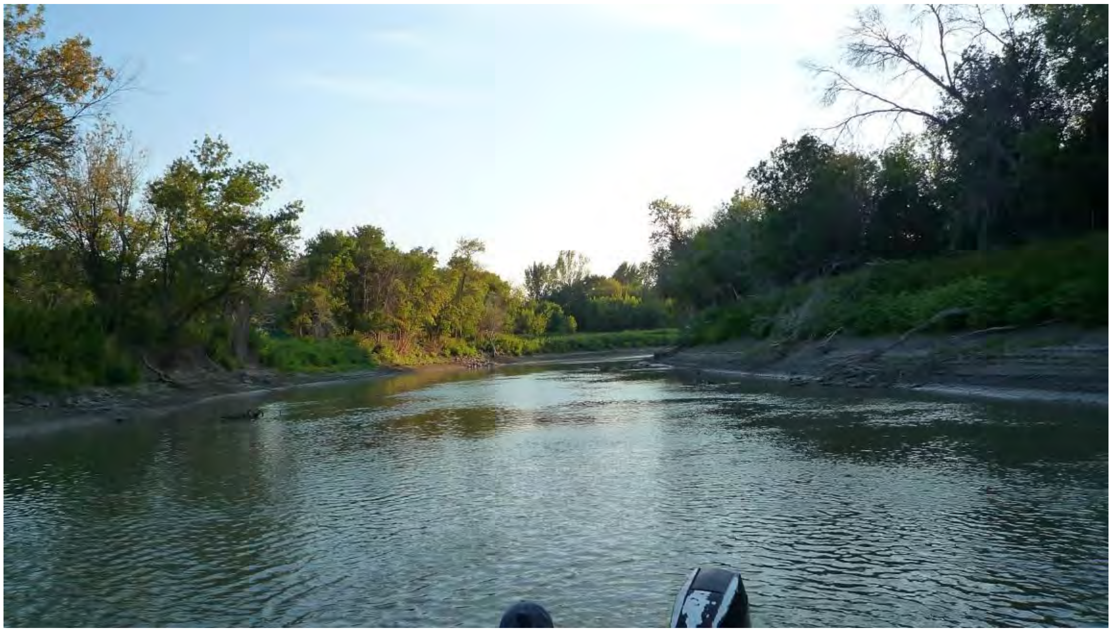
Description:

Photo taken from upstream end of Study Reach 4, facing upstream.

Photo No. 14 **Date:** 8/29/12

Description:

Photo taken from upstream end of Study Reach 4, facing downstream.



Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Red River of the North	25008875

Photo No.	**Date:**
15	8/29/12

Description:

Photo taken from downstream end of Study Reach 4, facing upstream.

Photo No.	**Date:**
16	8/29/12

Description:

Photo taken from downstream end of Study Reach 4, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St Paul District	Red River of the North	25008875

Photo No. **17**

Date: 9/1/12

Description:

Photo taken from upstream end of Study Reach 5, facing upstream.

Photo No. **18**

Date: 9/1/12

Description:

Photo taken from upstream end of Study Reach 5, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Red River of the North	25008875

Photo No. **19**

Date: 9/1/12

Description:

Photo taken from downstream end of Study Reach 5, facing upstream.

Photo No. **20**

Date: 9/1/12

Description:

Photo taken from downstream end of Study Reach 5, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St Paul District	Red River of the North	25008875

Photo No. 21 **Date:** 9/2/12

Description:

Photo taken from upstream end of Study Reach 6, facing upstream.

Photo No. 22 **Date:** 9/2/12

Description:

Photo taken from upstream end of Study Reach 6, facing downstream.

Photo No.	**Date:**
23	9/2/12

Description:

Photo taken from downstream end of Study Reach 6, facing upstream.

Photo No.	**Date:**
24	9/2/12

Description:

Photo taken from downstream end of Study Reach 6, facing downstream.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
USACE – St Paul District	Wild Rice River	25008875

Photo No.	Date:
25	9/13/12

Description:

Photo taken from upstream end of Study Reach 7, facing upstream.

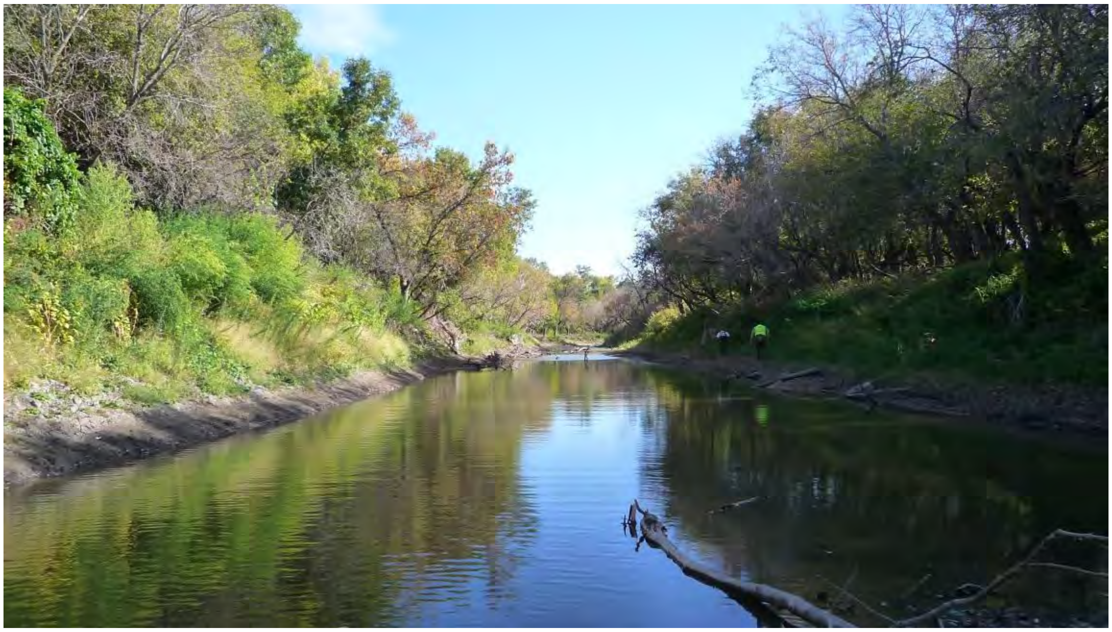


Photo No.	Date:
26	9/13/12

Description:

Photo taken from upstream end of Study Reach 7, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Wild River River	25008875

Photo No.	Date:
27	9/13/12

Description:

Photo taken from downstream end of Study Reach 7, facing upstream.

Photo No.	Date:
28	9/13/12

Description:

Photo taken from downstream end of Study Reach 7, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St Paul District	Wild Rice River	25008875

Photo No.	**Date:**
29	9/12/12

Description:

Photo taken from upstream end of Study Reach 8, facing upstream.

Photo No.	**Date:**
30	9/12/12

Description:

Photo taken from upstream end of Study Reach 8, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Wild Rice River	25008875

Photo No. **31** **Date:** 9/12/12

Description:

Photo taken from downstream end of Study Reach 8, facing upstream.

Photo No. **32** **Date:** 9/12/12

Description:

Photo taken from downstream end of Study Reach 8, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St Paul District	Wild Rice River	25008875

Photo No. 33

Date: 9/14/12

Description:

Photo taken from upstream end of Study Reach 9, facing upstream.

Photo No. 34

Date: 9/14/12

Description:

Photo taken from upstream end of Study Reach 9, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Wild Rice River	25008875

Photo No. **35** **Date:** 9/14/12

Description:

Photo taken from downstream end of Study Reach 9, facing upstream.

Photo No. **36** **Date:** 9/14/12

Description:

Photo taken from downstream end of Study Reach 9, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St Paul District	Wild Rice River	25008875

Photo No.	Date:
37	9/15/12

Description:

Photo taken from upstream end of Study Reach 10, facing upstream.

Photo No.	Date:
38	9/15/12

Description:

Photo taken from upstream end of Study Reach 10, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Wild Rice River	25008875

Photo No.	**Date:**
39	9/15/12

Description:

Photo taken from downstream end of Study Reach 10, facing upstream.

Photo No.	**Date:**
40	9/15/12

Description:

Photo taken from downstream end of Study Reach 10, facing downstream.

URS

PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project No.**
USACE – St Paul District	Sheyenne River	25008875

Photo No.	**Date:**
41	9/17/12

Description:

Photo taken from upstream end of Study Reach 11, facing upstream.

Photo No.	**Date:**
42	9/17/12

Description:

Photo taken from upstream end of Study Reach 11, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Sheyenne River	25008875

Photo No. **43**

Date: 9/17/12

Description:

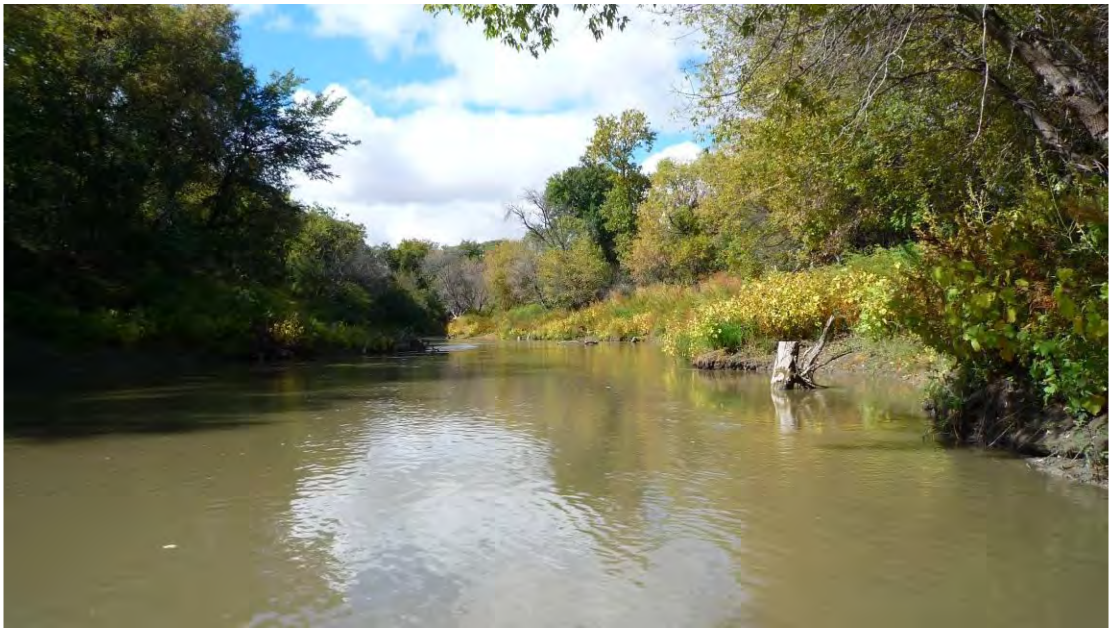
Photo taken from downstream end of Study Reach 11, facing upstream.

Photo No. **44**

Date: 9/17/12

Description:

Photo taken from downstream end of Study Reach 11, facing downstream.



Client Name:	**Site Location:**	**Project No.**
USACE – St Paul District	Sheyenne River	25008875

Photo No. 45

Date: 9/18/12

Description:

Photo taken from upstream end of Study Reach 12, facing upstream.

Photo No. 46

Date: 9/18/12

Description:

Photo taken from upstream end of Study Reach 12, facing downstream.

Photo No.	**Date:**
47	9/18/12

Description:

Photo taken from downstream end of Study Reach 12, facing upstream.

Photo No.	**Date:**
48	9/18/12

Description:

Photo taken from downstream end of Study Reach 12, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St Paul District	Sheyenne River	25008875

Photo No. **49**

Date: 9/16/12

Description:

Photo taken from upstream end of Study Reach 13, facing upstream.

Photo No. **50**

Date: 9/16/12

Description:

Photo taken from upstream end of Study Reach 13, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Sheyenne River	25008875

Photo No. **51** | **Date:** 9/16/12

Description:

Photo taken from downstream end of Study Reach 13, facing upstream.

Photo No. **52** | **Date:** 9/16/12

Description:

Photo taken from downstream end of Study Reach 13, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St Paul District	Sheyenne River	25008875

Photo No.	Date:
53	9/19/12

Description:

Photo taken from upstream end of Study Reach 14, facing upstream.

Photo No.	Date:
54	9/19/12

Description:

Photo taken from upstream end of Study Reach 14, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Sheyenne River	25008875

Photo No. **55**

Date: 9/19/12

Description:

Photo taken from downstream end of Study Reach 14, facing upstream.

Photo No. **56**

Date: 9/19/12

Description:

Photo taken from downstream end of Study Reach 14, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St Paul District	Sheyenne River	25008875

Photo No.	**Date:**
57	9/20/12

Description:

Photo taken from upstream end of Study Reach 15, facing upstream.

Photo No.	**Date:**
58	9/20/12

Description:

Photo taken from upstream end of Study Reach 15, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Sheyenne River	25008875

Photo No.	**Date:**
59	9/20/12

Description:

Photo taken from downstream end of Study Reach 15, facing upstream.

Photo No.	**Date:**
60	9/20/12

Description:

Photo taken from downstream end of Study Reach 15, facing downstream.

Photo No.	**Date:**
61	8/13/12

Description:

Photo taken from upstream end of Study Reach 16, facing upstream.

Photo No.	**Date:**
62	8/13/12

Description:

Photo taken from upstream end of Study Reach 16, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Maple River	25008875

Photo No. **63**

Date: 8/13/12

Description:

Photo taken from downstream end of Study Reach 16, facing upstream.

Photo No. **64**

Date: 8/13/12

Description:

Photo taken from downstream end of Study Reach 16, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St Paul District	Maple River	25008875

Photo No. 65

Date: 8/22/12

Description:

Photo taken from upstream end of Study Reach 17, facing upstream.

Photo No. 66

Date: 8/22/12

Description:

Photo taken from upstream end of Study Reach 17, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Maple River	25008875

Photo No.	**Date:**
67	8/22/12

Description:

Photo taken from downstream end of Study Reach 17, facing upstream.

Photo No.	**Date:**
68	8/22/12

Description:

Photo taken from downstream end of Study Reach 17, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St Paul District	Maple River	25008875

Photo No.	Date:
69	8/14/12

Description:

Photo taken from upstream end of Study Reach 18, facing upstream.

Photo No.	Date:
70	8/14/12

Description:

Photo taken from upstream end of Study Reach 18, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Maple River	25008875

Photo No.	**Date:**
71	8/14/12

Description:

Photo taken from downstream end of Study Reach 18, facing upstream.

Photo No.	**Date:**
72	8/14/12

Description:

Photo taken from downstream end of Study Reach 18, facing downstream.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
USACE – St Paul District	Lower Rush River	25008875

Photo No. 73

Date: 9/15/11

Description:

Photo taken from upstream end of Study Reach 19, facing upstream.

Photo No. 74

Date: 9/15/11

Description:

Photo taken from upstream end of Study Reach 19, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Lower Rush River	25008875

Photo No. **75**

Date: 9/15/11

Description:

Photo taken from mid-point of reach within Study Reach 19, facing upstream.

Photo No. **76**

Date: 9/15/11

Description:

Photo taken from mid-point of reach within Study Reach 19, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Lower Rush River	25008875

Photo No.	**Date:**
77	9/15/11

Description:

Photo taken from downstream end of Study Reach 19, facing upstream.

Photo No.	**Date:**
78	9/15/11

Description:

Photo taken from downstream end of Study Reach 19, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Lower Rush River	25008875

Photo No. 79

Date: 9/15/11

Description:

Photo taken from upstream end of Study Reach 20, facing upstream.

Photo No. 80

Date: 9/15/11

Description:

Photo taken from upstream end of Study Reach 20, facing downstream.

Photo No.	Date:
81	9/15/11

Description:

Photo taken from mid-point of reach within Study Reach 20, facing upstream.

Photo No.	Date:
82	9/15/11

Description:

Photo taken from mid-point of reach within Study Reach 20, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Lower Rush River	25008875

Photo No. 83

Date: 9/15/11

Description:

Photo taken from downstream end of Study Reach 20, facing upstream.

Photo No. 84

Date: 9/15/11

Description:

Photo taken from downstream end of Study Reach 20, facing downstream.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Rush River	25008875

Photo No.	Date:
85	9/13/11

Description:

Photo taken from upstream end of Study Reach 21, facing upstream.

Photo No.	Date:
86	9/13/11

Description:

Photo taken from upstream end of Study Reach 21, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Rush River	25008875

Photo No.	**Date:**
87	9/13/11

Description:

Photo taken from downstream end of Study Reach 21, facing upstream.

Photo No.	**Date:**
88	9/13/11

Description:

Photo taken from downstream end of Study Reach 21, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Rush River	25008875

Photo No.	**Date:**
89	9/12/11

Description:

Photo taken from upstream end of Study Reach 22, facing upstream.

Photo No.	**Date:**
90	9/12/11

Description:

Photo taken from upstream end of Study Reach 22, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Rush River	25008875

Photo No. **91**

Date: 9/12/11

Description:

Photo taken from downstream end of Study Reach 22, facing upstream.

Photo No. **92**

Date: 9/12/11

Description:

Photo taken from downstream end of Study Reach 22, facing downstream.

Client Name:	Site Location:	Project No.
USACE – St. Paul District	Wolverton Creek	25008875

Photo No.	Date:
93	9/14/11

Description:

Photo taken from upstream end of Study Reach 23, facing upstream.

Photo No.	Date:
94	9/14/11

Description:

Photo taken from upstream end of Study Reach 23, facing downstream.

Client Name:	**Site Location:**	**Project No.**
USACE – St. Paul District	Wolverton Creek	25008875

Photo No.	**Date:**
95	9/14/11

Description:

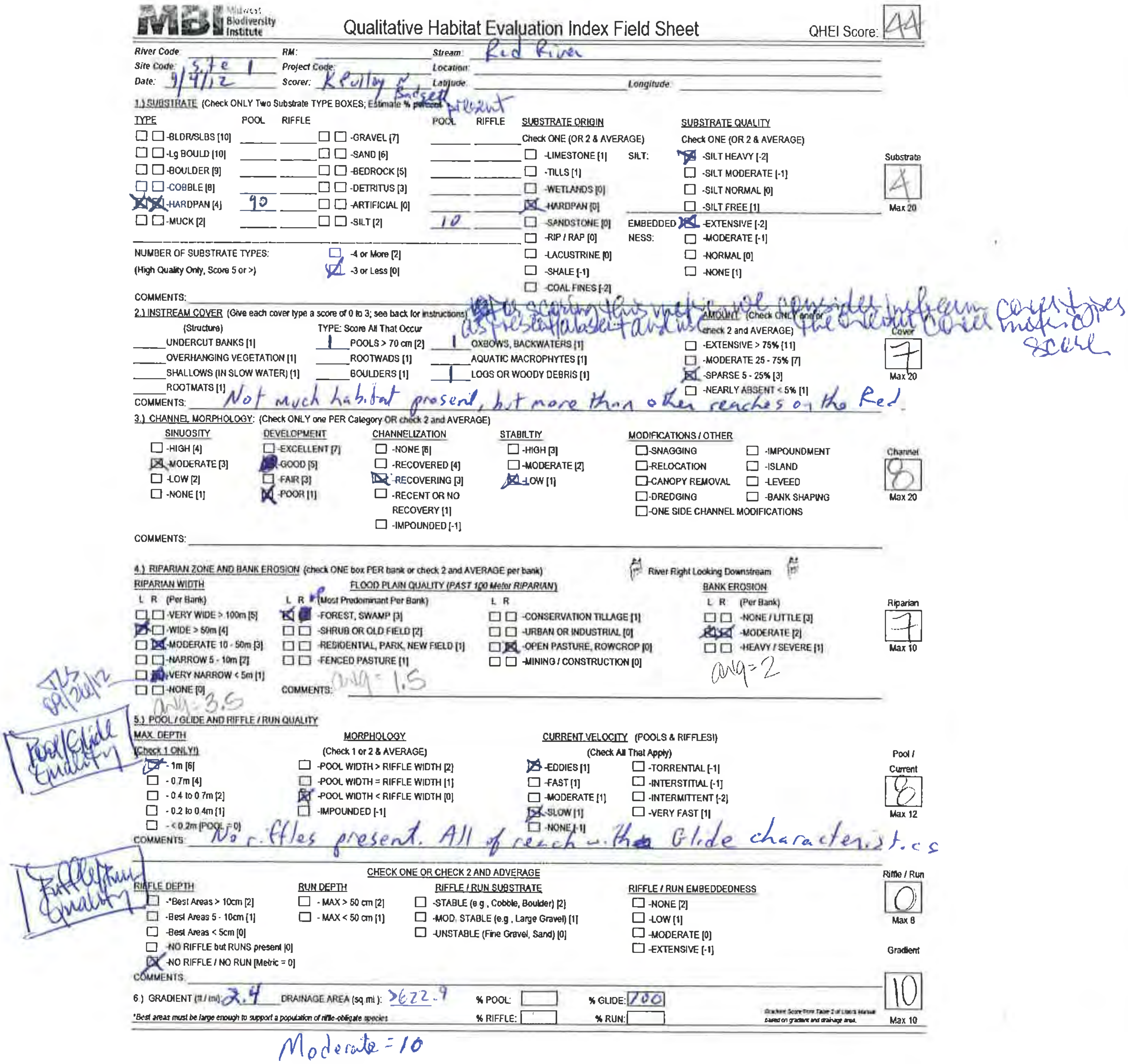
Photo taken from downstream end of Study Reach 23, facing upstream.

Photo No.	**Date:**
96	9/14/11

Description:

Photo taken from downstream end of Study Reach 23, facing downstream.

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 44

River Code: ____ RM: ____ Stream: Red River
Site Code: Site 1 Project Code: ____ Location: ____
Date: 9/4/12 Scorer: K Pulley & Badgett Latitude: ____ Longitude: ____

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☒ -HARDPAN [4]	90		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]	10	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☑ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
- ☐ -LIMESTONE [1]
- ☐ -TILLS [1]
- ☐ -WETLANDS [0]
- ☒ -HARDPAN [0]
- ☐ -SANDSTONE [0]
- ☐ -RIP / RAP [0]
- ☐ -LACUSTRINE [0]
- ☐ -SHALE [-1]
- ☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

SILT:
- ☒ -SILT HEAVY [-2]
- ☐ -SILT MODERATE [-1]
- ☐ -SILT NORMAL [0]
- ☐ -SILT FREE [1]

EMBEDDEDNESS:
- ☒ -EXTENSIVE [-2]
- ☐ -MODERATE [-1]
- ☐ -NORMAL [0]
- ☐ -NONE [1]

Substrate: 4 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

For scoring this metric we consider instream cover types as present/absent and use the overall cover metric score

(Structure)
- ____ UNDERCUT BANKS [1]
- ____ OVERHANGING VEGETATION [1]
- ____ SHALLOWS (IN SLOW WATER) [1]
- ____ ROOTMATS [1]

TYPE: Score All That Occur
- 1 POOLS > 70 cm [2]
- ____ ROOTWADS [1]
- ____ BOULDERS [1]
- 1 OXBOWS, BACKWATERS [1]
- ____ AQUATIC MACROPHYTES [1]
- 1 LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY one or check 2 and AVERAGE)
- ☐ -EXTENSIVE > 75% [11]
- ☐ -MODERATE 25 - 75% [7]
- ☒ -SPARSE 5 - 25% [3]
- ☐ -NEARLY ABSENT < 5% [1]

Cover: 7 Max 20

COMMENTS: Not much habitat present, but more than other reaches on the Red

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
- ☐ -HIGH [4]
- ☒ -MODERATE [3]
- ☐ -LOW [2]
- ☐ -NONE [1]

DEVELOPMENT
- ☐ -EXCELLENT [7]
- ■ -GOOD [5]
- ☐ -FAIR [3]
- ☒ -POOR [1]

CHANNELIZATION
- ☐ -NONE [6]
- ☐ -RECOVERED [4]
- ☒ -RECOVERING [3]
- ☐ -RECENT OR NO RECOVERY [1]
- ☐ -IMPOUNDED [-1]

STABILTIY
- ☐ -HIGH [3]
- ☐ -MODERATE [2]
- ☒ -LOW [1]

MODIFICATIONS / OTHER
- ☐ -SNAGGING
- ☐ -RELOCATION
- ☐ -CANOPY REMOVAL
- ☐ -DREDGING
- ☐ -ONE SIDE CHANNEL MODIFICATIONS
- ☐ -IMPOUNDMENT
- ☐ -ISLAND
- ☐ -LEVEED
- ☐ -BANK SHAPING

Channel: 8 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
- ☐ ☐ -VERY WIDE > 100m [5]
- ☒ ☐ -WIDE > 50m [4]
- ☐ ☒ -MODERATE 10 - 50m [3]
- ☐ ☐ -NARROW 5 - 10m [2]
- ☐ ■ -VERY NARROW < 5m [1]
- ☐ ☐ -NONE [0]

avg = 3.5

TLS 09/26/12

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)*
L R (Most Predominant Per Bank)
- ☒ ■ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☐ ☒ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

COMMENTS: avg = 1.5

BANK EROSION
L R (Per Bank)
- ☐ ☐ -NONE / LITTLE [3]
- ☒ ☒ -MODERATE [2]
- ☐ ☐ -HEAVY / SEVERE [1]

avg = 2

Riparian: 7 Max 10

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH (Check 1 ONLY!)
- ☒ - 1m [6]
- ☐ - 0.7m [4]
- ☐ - 0.4 to 0.7m [2]
- ☐ - 0.2 to 0.4m [1]
- ☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- ☐ -POOL WIDTH > RIFFLE WIDTH [2]
- ☐ -POOL WIDTH = RIFFLE WIDTH [1]
- ☒ -POOL WIDTH < RIFFLE WIDTH [0]
- ☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- ☒ -EDDIES [1]
- ☐ -FAST [1]
- ☐ -MODERATE [1]
- ☒ -SLOW [1]
- ☐ -NONE [-1]
- ☐ -TORRENTIAL [-1]
- ☐ -INTERSTITIAL [-1]
- ☐ -INTERMITTENT [-2]
- ☐ -VERY FAST [1]

Pool / Current: 8 Max 12

COMMENTS: No riffles present. All of reach with Glide characteristics

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- ☐ -*Best Areas > 10cm [2]
- ☐ -Best Areas 5 - 10cm [1]
- ☐ -Best Areas < 5cm [0]
- ☐ -NO RIFFLE but RUNS present [0]
- ☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
- ☐ - MAX > 50 cm [2]
- ☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ -STABLE (e.g., Cobble, Boulder) [2]
- ☐ -MOD. STABLE (e.g., Large Gravel) [1]
- ☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ -NONE [2]
- ☐ -LOW [1]
- ☐ -MODERATE [0]
- ☐ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.4 DRAINAGE AREA (sq mi): >622.9 % POOL: ☐ % GLIDE: 100 % RIFFLE: ☐ % RUN: ☐

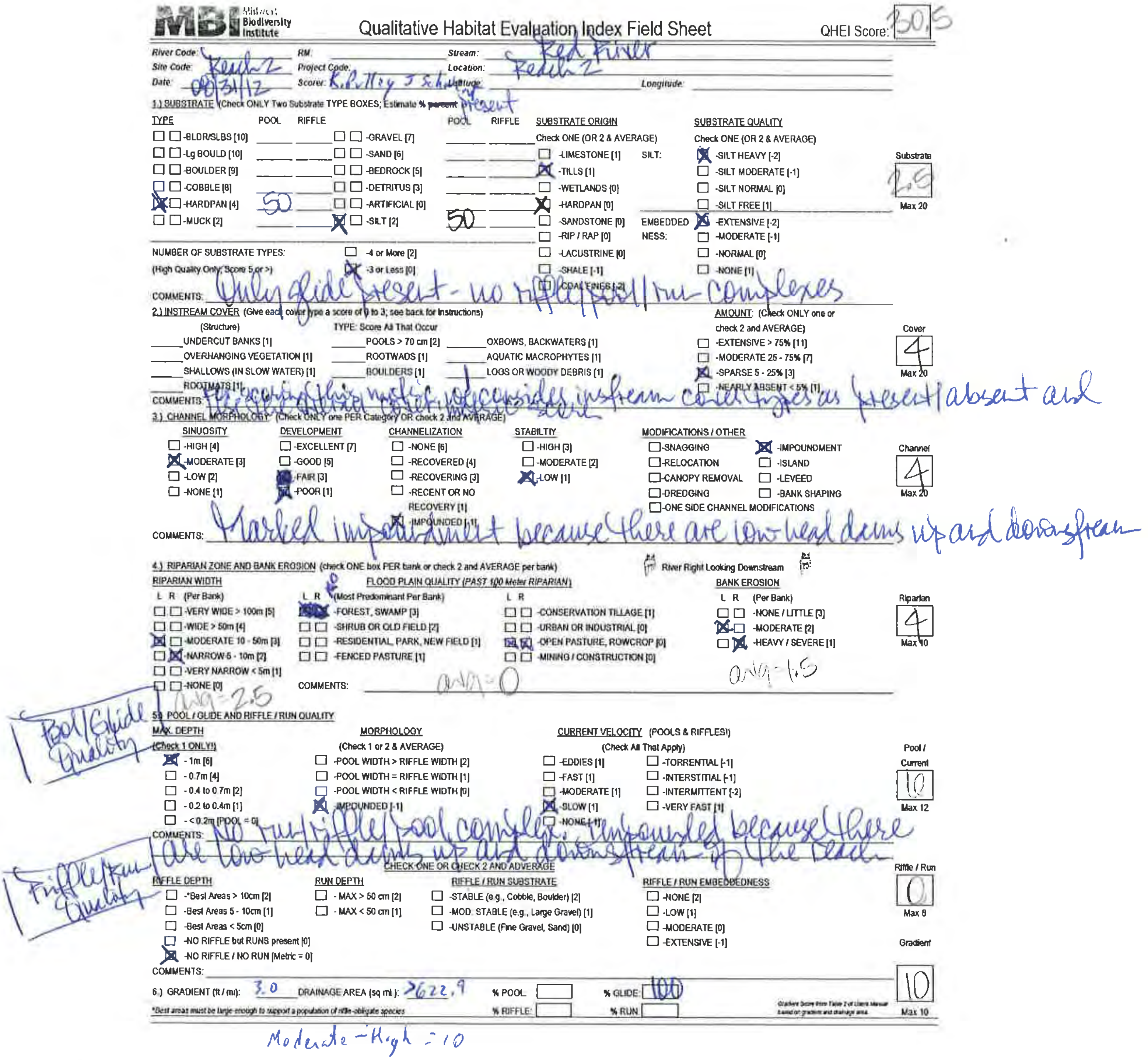
*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of User's Manual based on gradient and drainage area.

Gradient: 10 Max 10

Moderate = 10

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 30.5

River Code: RM: Stream: Red River
Site Code: Reach 2 Project Code: Location: Reach 2
Date: 08/31/12 Scorer: K. Pettey J. Sch[illegible] Latitude: Longitude:

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]	50		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☒ ☐ -SILT [2]	50	

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate 2.5 Max 20

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

COMMENTS: Only glide present - no riffle/pool/run complexes

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)
(Structure) TYPE: Score All That Occur

____ UNDERCUT BANKS [1]
____ OVERHANGING VEGETATION [1]
____ SHALLOWS (IN SLOW WATER) [1]
____ ROOTMATS [1]
____ POOLS > 70 cm [2]
____ ROOTWADS [1]
____ BOULDERS [1]
____ OXBOWS, BACKWATERS [1]
____ AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover 4 Max 20

COMMENTS: Recognizing this metric, we considered instream cover types as present/absent and [illegible] score

3.) CHANNEL MORPHOLOGY (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☒ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☒ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☐ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☒ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☒ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel 4 Max 20

COMMENTS: Marked impoundment because there are low head dams up and downstream

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☐ -MODERATE 10 - 50m [3]
☐ ☒ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 2.5

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
☒ ☒ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☒ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☐ -MODERATE [2]
☐ ☒ -HEAVY / SEVERE [1]
avg = 1.5

Riparian 4 Max 10

COMMENTS: avg = 0

Pool/Glide Quality

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH
(Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!)
(Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current 10 Max 12

COMMENTS: No run/riffle/pool complex. Impounded because there are low head dams up and downstream of the reach.

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 3.0 DRAINAGE AREA (sq mi.): >622.9 % POOL: % GLIDE: 100 % RIFFLE: % RUN:

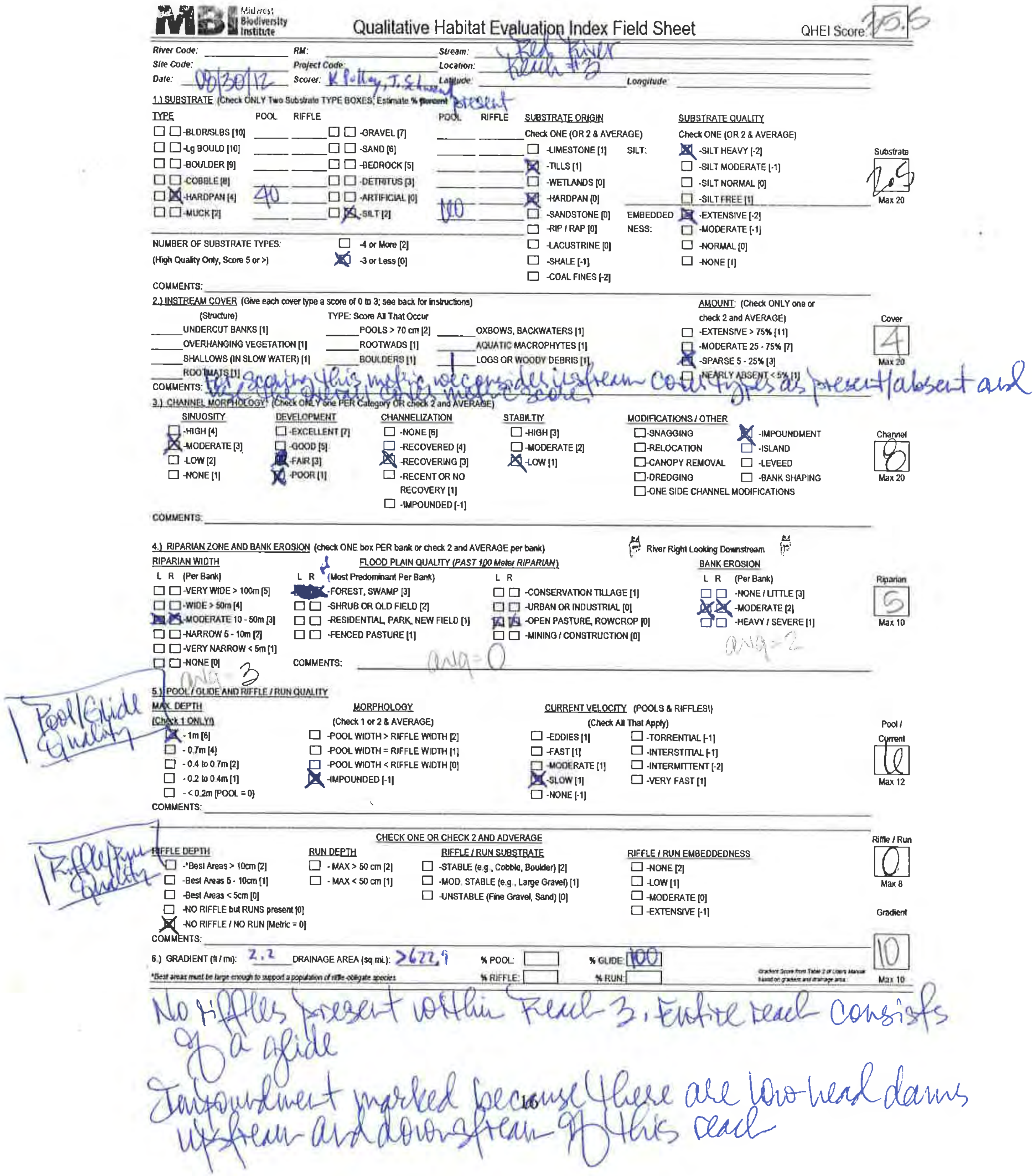
*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area

Gradient 10 Max 10

Moderate – High = 10

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 35.5

River Code: RM: Stream: Red River
Site Code: Project Code: Location: Reach #3
Date: 08/30/12 Scorer: K Polley, J. Schwartz Latitude: Longitude:

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~Percent~~ present

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☐ ☒ -HARDPAN [4]	40		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☒ -SILT [2]	100	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate 2.5 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
____ UNDERCUT BANKS [1]
____ OVERHANGING VEGETATION [1]
____ SHALLOWS (IN SLOW WATER) [1]
____ ROOTMATS [1]
____ POOLS > 70 cm [2]
____ ROOTWADS [1]
____ BOULDERS [1]
____ OXBOWS, BACKWATERS [1]
____ AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover 4 Max 20

COMMENTS: For scoring this metric, we considered instream cover types as present/absent and the overall cover metric score

3.) CHANNEL MORPHOLOGY (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☒ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☒ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☒ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel 8 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☒ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 3

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)*
L R (Most Predominant Per Bank)
■ ■ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☒ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 2

Riparian 5 Max 10

COMMENTS: avg = 0

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH
(Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!)
(Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current 6 Max 12

COMMENTS:

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.2 DRAINAGE AREA (sq mi.): >622.9 % POOL: % GLIDE: 100 % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle obligate species

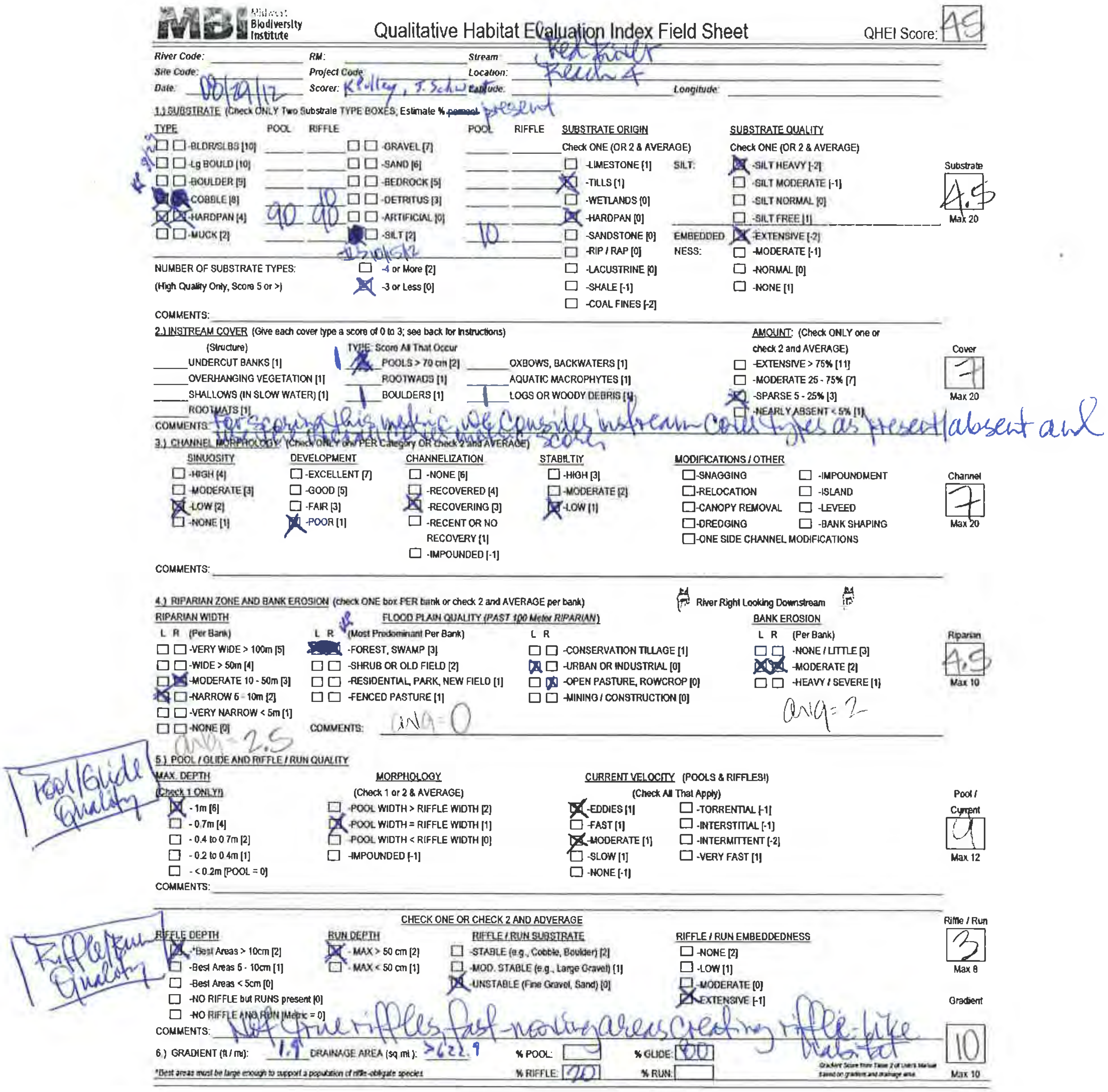
Gradient Score from Table 2 of Users Manual based on gradient and drainage area

Gradient 10 Max 10

No riffles present within Reach 3. Entire reach consists of a glide

Impoundment marked because there are low-head dams upstream and downstream of this reach

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 45

River Code: ______ RM: ______ Stream: Red River
Site Code: ______ Project Code: ______ Location: Reach 4
Date: 08/29/12 Scorer: K. Kelley, J. Schu Latitude: ______ Longitude: ______

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
■ ■ -COBBLE [8]		10	☐ ☐ -DETRITUS [3]		
☒ ☒ -HARDPAN [4]	90	90	☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			■ ☐ -SILT [2]	10	

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)
☐ -4 or More [2]
☒ -3 or Less [0]

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT:
☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS:
☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate: 4.5 (Max 20)

COMMENTS: ______

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
_____ UNDERCUT BANKS [1]
_____ OVERHANGING VEGETATION [1]
_____ SHALLOWS (IN SLOW WATER) [1]
_____ ROOTMATS [1]
| ☒ POOLS > 70 cm [2]
_____ ROOTWADS [1]
| BOULDERS [1]
_____ OXBOWS, BACKWATERS [1]
_____ AQUATIC MACROPHYTES [1]
| LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 7 (Max 20)

COMMENTS: For scoring this metric we consider instream cover types as present/absent and [illegible] score

3.) CHANNEL MORPHOLOGY (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☒ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILITY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 7 (Max 20)

COMMENTS: ______

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☒ -MODERATE 10 - 50m [3]
☒ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 2.5

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)* — L R (Most Predominant Per Bank)
■ ■ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☒ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 2

Riparian: 4.5 (Max 10)

COMMENTS: avg = 0

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH (Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☒ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☒ -EDDIES [1]
☐ -FAST [1]
☒ -MODERATE [1]
☐ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 9 (Max 12)

COMMENTS: ______

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☒ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE AND RUN [Metric = 0]

RUN DEPTH
☒ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run: 3 (Max 8)

COMMENTS: Not true riffles, fast-moving areas creating riffle-like habitat

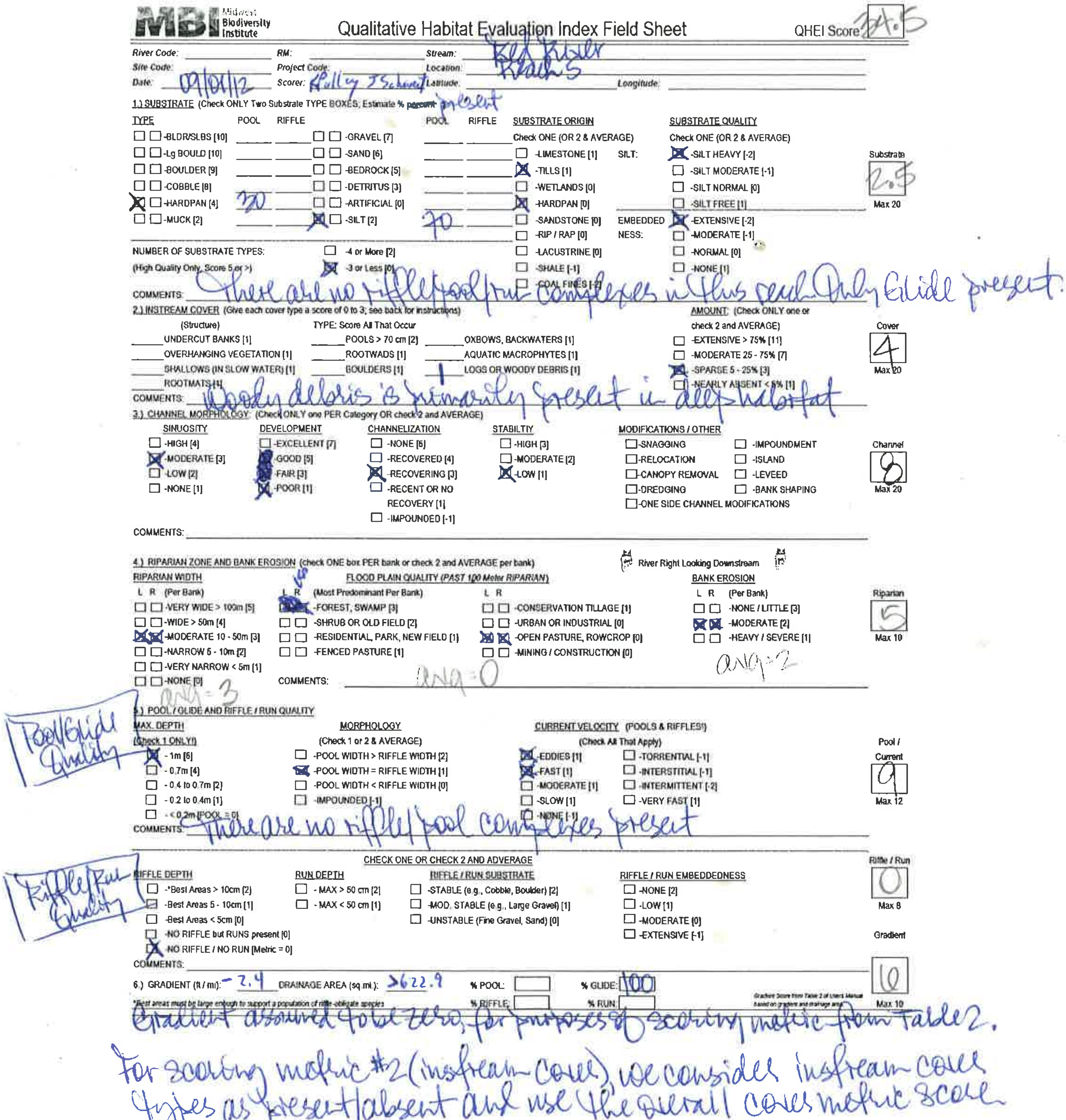
6.) GRADIENT (ft / mi): 1.9 DRAINAGE AREA (sq mi): >622.9
% POOL: ______ % GLIDE: 80
% RIFFLE: 20 % RUN: ______

Gradient Score from Table 2 of User's Manual based on gradient and drainage area

Gradient: 10 (Max 10)

*Best areas must be large enough to support a population of riffle-obligate species

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



MBI Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet QHEI Score 34.5

River Code: ______ RM: ______ Stream: Red River
Site Code: ______ Project Code: ______ Location: Reach 5
Date: 09/01/12 Scorer: Holly J Schwarz Latitude: ______ Longitude: ______

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]	30		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☒ ☐ -SILT [2]	70	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate 2.5 Max 20

COMMENTS: There are no riffle/pool/run complexes in this reach. Only Glide present.

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
____ UNDERCUT BANKS [1]
____ OVERHANGING VEGETATION [1]
____ SHALLOWS (IN SLOW WATER) [1]
____ ROOTMATS [1]
____ POOLS > 70 cm [2]
____ ROOTWADS [1]
____ BOULDERS [1]
____ OXBOWS, BACKWATERS [1]
____ AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover 4 Max 20

COMMENTS: Woody debris is primarily present in deep habitat

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☒ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
■ -GOOD [5]
■ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel 8 Max 20

COMMENTS: ______

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)
River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☒ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 3

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
■ ■ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☒ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]
avg = 0

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 2

Riparian 5 Max 10

COMMENTS: ______

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH
(Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☒ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!)
(Check All That Apply)
☒ -EDDIES [1]
☒ -FAST [1]
☐ -MODERATE [1]
☐ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current 9 Max 12

COMMENTS: There are no riffle/pool complexes present

CHECK ONE OR CHECK 2 AND ADVERAGE

Riffle/Run Quality

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run 0 Max 8

COMMENTS: ______

6.) GRADIENT (ft / mi): ~2.4 DRAINAGE AREA (sq mi.): >622.9 % POOL: ☐ % GLIDE: 100 % RIFFLE: ☐ % RUN: ☐

Gradient 10 Max 10

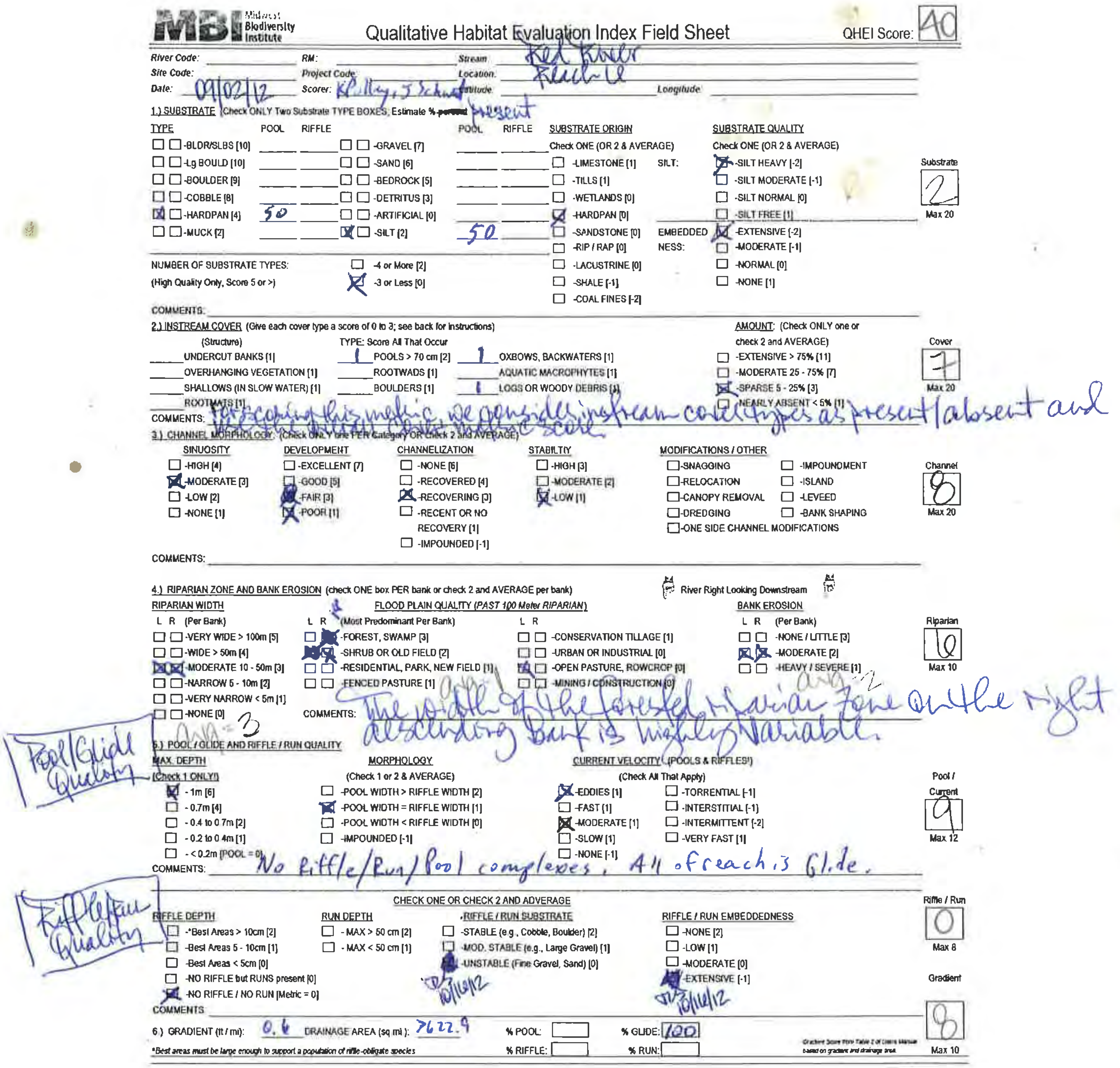
Gradient Score from Table 2 of User's Manual based on gradient and drainage area

*Best areas must be large enough to support a population of riffle-obligate species

~~Gradient assumed to be zero, for purposes of scoring metric from Table 2.~~

For scoring metric #2 (instream cover), we consider instream cover types as present/absent and use the overall cover metric score

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



MBI Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 40

River Code: ______ RM: ______ Stream: Red River
Site Code: ______ Project Code: ______ Location: Reach 12
Date: 09/02/12 Scorer: K. Kelley, J. Schmidt Latitude: ______ Longitude: ______

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]	50		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☒ ☐ -SILT [2]	50	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
- ☐ -LIMESTONE [1]
- ☐ -TILLS [1]
- ☐ -WETLANDS [0]
- ☒ -HARDPAN [0]
- ☐ -SANDSTONE [0]
- ☐ -RIP / RAP [0]
- ☐ -LACUSTRINE [0]
- ☐ -SHALE [-1]
- ☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT:
- ☒ -SILT HEAVY [-2]
- ☐ -SILT MODERATE [-1]
- ☐ -SILT NORMAL [0]
- ☐ -SILT FREE [1]

EMBEDDEDNESS:
- ☒ -EXTENSIVE [-2]
- ☐ -MODERATE [-1]
- ☐ -NORMAL [0]
- ☐ -NONE [1]

Substrate: 2 Max 20

COMMENTS: ______

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur

___ UNDERCUT BANKS [1]	1 POOLS > 70 cm [2]	1 OXBOWS, BACKWATERS [1]
___ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	___ AQUATIC MACROPHYTES [1]
___ SHALLOWS (IN SLOW WATER) [1]	___ BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
___ ROOTMATS [1]		

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
- ☐ -EXTENSIVE > 75% [11]
- ☐ -MODERATE 25 - 75% [7]
- ☒ -SPARSE 5 - 25% [3]
- ☐ -NEARLY ABSENT < 5% [1]

Cover: 7 Max 20

COMMENTS: In scoring this metric, we considered instream cover types as present/absent and used the actual check box score

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR Check 2 and AVERAGE)

SINUOSITY
- ☐ -HIGH [4]
- ☒ -MODERATE [3]
- ☐ -LOW [2]
- ☐ -NONE [1]

DEVELOPMENT
- ☐ -EXCELLENT [7]
- ☐ -GOOD [5]
- ☒ -FAIR [3]
- ☒ -POOR [1]

CHANNELIZATION
- ☐ -NONE [6]
- ☐ -RECOVERED [4]
- ☒ -RECOVERING [3]
- ☐ -RECENT OR NO RECOVERY [1]
- ☐ -IMPOUNDED [-1]

STABILITY
- ☐ -HIGH [3]
- ☐ -MODERATE [2]
- ☒ -LOW [1]

MODIFICATIONS / OTHER
- ☐ -SNAGGING
- ☐ -RELOCATION
- ☐ -CANOPY REMOVAL
- ☐ -DREDGING
- ☐ -ONE SIDE CHANNEL MODIFICATIONS
- ☐ -IMPOUNDMENT
- ☐ -ISLAND
- ☐ -LEVEED
- ☐ -BANK SHAPING

Channel: 8 Max 20

COMMENTS: ______

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
- ☐ ☐ -VERY WIDE > 100m [5]
- ☐ ☐ -WIDE > 50m [4]
- ☒ ☒ -MODERATE 10 - 50m [3]
- ☐ ☐ -NARROW 5 - 10m [2]
- ☐ ☐ -VERY NARROW < 5m [1]
- ☐ ☐ -NONE [0]

Avg = 3

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
- ☐ ☒ -FOREST, SWAMP [3]
- ☒ ☒ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

Avg [illegible]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☒ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION
L R (Per Bank)
- ☐ ☐ -NONE / LITTLE [3]
- ☒ ☒ -MODERATE [2]
- ☐ ☐ -HEAVY / SEVERE [1]

Avg = 2

Riparian: 6 Max 10

COMMENTS: The width of the forested riparian zone on the right descending bank is highly variable.

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH (Check 1 ONLY!)
- ☒ - 1m [6]
- ☐ - 0.7m [4]
- ☐ - 0.4 to 0.7m [2]
- ☐ - 0.2 to 0.4m [1]
- ☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- ☐ -POOL WIDTH > RIFFLE WIDTH [2]
- ☒ -POOL WIDTH = RIFFLE WIDTH [1]
- ☐ -POOL WIDTH < RIFFLE WIDTH [0]
- ☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- ☒ -EDDIES [1]
- ☐ -FAST [1]
- ☒ -MODERATE [1]
- ☐ -SLOW [1]
- ☐ -NONE [-1]
- ☐ -TORRENTIAL [-1]
- ☐ -INTERSTITIAL [-1]
- ☐ -INTERMITTENT [-2]
- ☐ -VERY FAST [1]

Pool / Current: 9 Max 12

COMMENTS: No Riffle/Run/Pool complexes. All of reach is Glide.

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- ☐ -*Best Areas > 10cm [2]
- ☐ -Best Areas 5 - 10cm [1]
- ☐ -Best Areas < 5cm [0]
- ☐ -NO RIFFLE but RUNS present [0]
- ☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
- ☐ - MAX > 50 cm [2]
- ☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ -STABLE (e.g., Cobble, Boulder) [2]
- ☐ -MOD. STABLE (e.g., Large Gravel) [1]
- ☒ -UNSTABLE (Fine Gravel, Sand) [0]

[illegible] 10/11/12

RIFFLE / RUN EMBEDDEDNESS
- ☐ -NONE [2]
- ☐ -LOW [1]
- ☐ -MODERATE [0]
- ☒ -EXTENSIVE [-1]

[illegible] 10/11/12

Riffle / Run: 0 Max 8

COMMENTS: ______

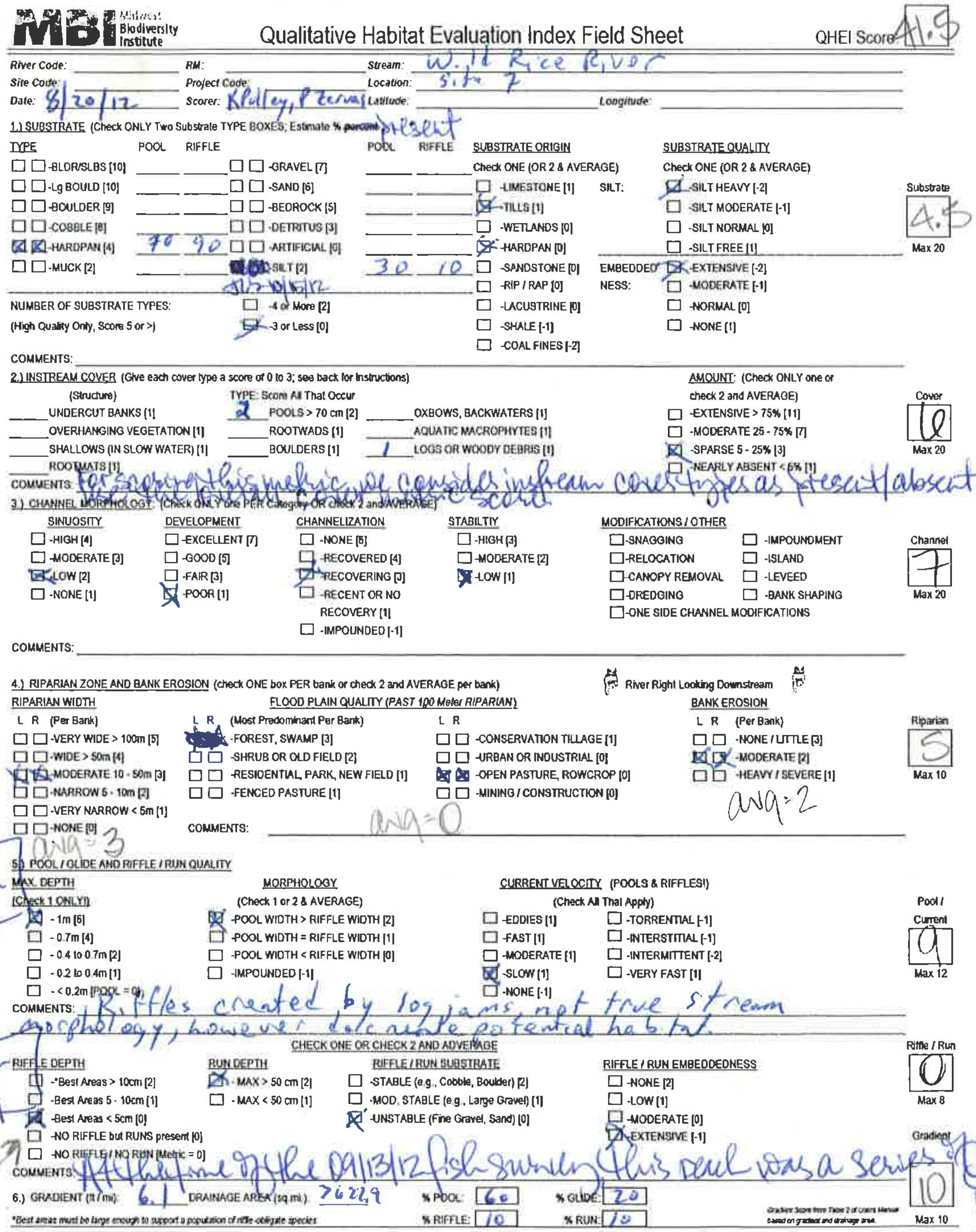
6.) GRADIENT (ft / mi): 0.6 DRAINAGE AREA (sq mi): 7622.9 % POOL: ☐ % GLIDE: 100 % RIFFLE: ☐ % RUN: ☐

Gradient: 8 Max 10

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

*Best areas must be large enough to support a population of riffle-obligate species

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 41.5

River Code: RM: Stream: Wild Rice River
Site Code: Project Code: Location: Site 7
Date: 8/20/12 Scorer: K Ridley, P Zervas Latitude: Longitude:

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☒ -HARDPAN [4]	70	90	☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			■ ■ -SILT [2]	30	10

[illegible] 10/15/12

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate: 4.5 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
___ UNDERCUT BANKS [1]
___ OVERHANGING VEGETATION [1]
___ SHALLOWS (IN SLOW WATER) [1]
___ ROOTMATS [1]
2 POOLS > 70 cm [2]
___ ROOTWADS [1]
___ BOULDERS [1]
___ OXBOWS, BACKWATERS [1]
___ AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 6 Max 20

COMMENTS: For scoring this metric, we consider instream cover types as present/absent and [illegible] score

3.) CHANNEL MORPHOLOGY (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☒ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 7 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☒ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 3

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
■ ■ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☒ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

COMMENTS: avg = 0

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 2

Riparian: 5 Max 10

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH (Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☒ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 9 Max 12

COMMENTS: Riffles created by log jams, not true stream morphology, however, adequate potential habitat.

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☒ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☒ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS: At the time of the 09/13/12 fish survey this reach was a series of pools, due to the presence of beaver dams.

6.) GRADIENT (ft / mi): 6.1 DRAINAGE AREA (sq.mi.): 762,9 % POOL: 60 % GLIDE: 20 % RIFFLE: 10 % RUN: 10

Gradient: 10 Max 10

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

*Best areas must be large enough to support a population of riffle-obligate species

The best riffle area is less than 5cm deep. Therefore, the entire Riffle/Run Quality component is scored as zero.

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 42.5

River Code: ______ RM: ______ Stream: Wild Rice River
Site Code: ______ Project Code: ______ Location: Site 8
Date: 08/20/12 Scorer: Kimberly Pizzo Latitude: ______ Longitude: ______

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~present~~ Yes present)

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]	70		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☒ ☐ -SILT [2]	30	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☐ -SILT HEAVY [-2]
☒ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate 3.5 Max 20

COMMENTS: ______

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
______ UNDERCUT BANKS [1]
______ OVERHANGING VEGETATION [1]
______ SHALLOWS (IN SLOW WATER) [1]
______ ROOTMATS [1]
1 POOLS > 70 cm [2]
______ ROOTWADS [1]
______ BOULDERS [1]
______ OXBOWS, BACKWATERS [1]
______ AQUATIC MACROPHYTES [1]
2 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover 10 Max 20

COMMENTS: For scoring this metric we consider instream cover types as present/absent and use the overall cover metric score.

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☒ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☒ -FAIR [3]
☐ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel 10 Max 20

COMMENTS: ______

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☒ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 3

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
☒ ☒ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☒ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -MINING / CONSTRUCTION [0]
avg = 0

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 2

Riparian 5 Max 10

COMMENTS: A portion of the riparian zone of the left descending bank is more scrub/shrub than forest.

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH
(Check 1 ONLY!)
☒ -1m [6]
☐ -0.7m [4]
☐ -0.4 to 0.7m [2]
☐ -0.2 to 0.4m [1]
☐ -< 0.2m [POOL = 0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!)
(Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current 6 Max 12

COMMENTS: ______

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☒ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☒ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run 0 Max 8

COMMENTS: ______

6.) GRADIENT (ft / mi): ~~[illegible]~~ 12.1 DRAINAGE AREA (sq mi): >622.9 % POOL: 60 % GLIDE: 40
% RIFFLE: ______ % RUN: ______

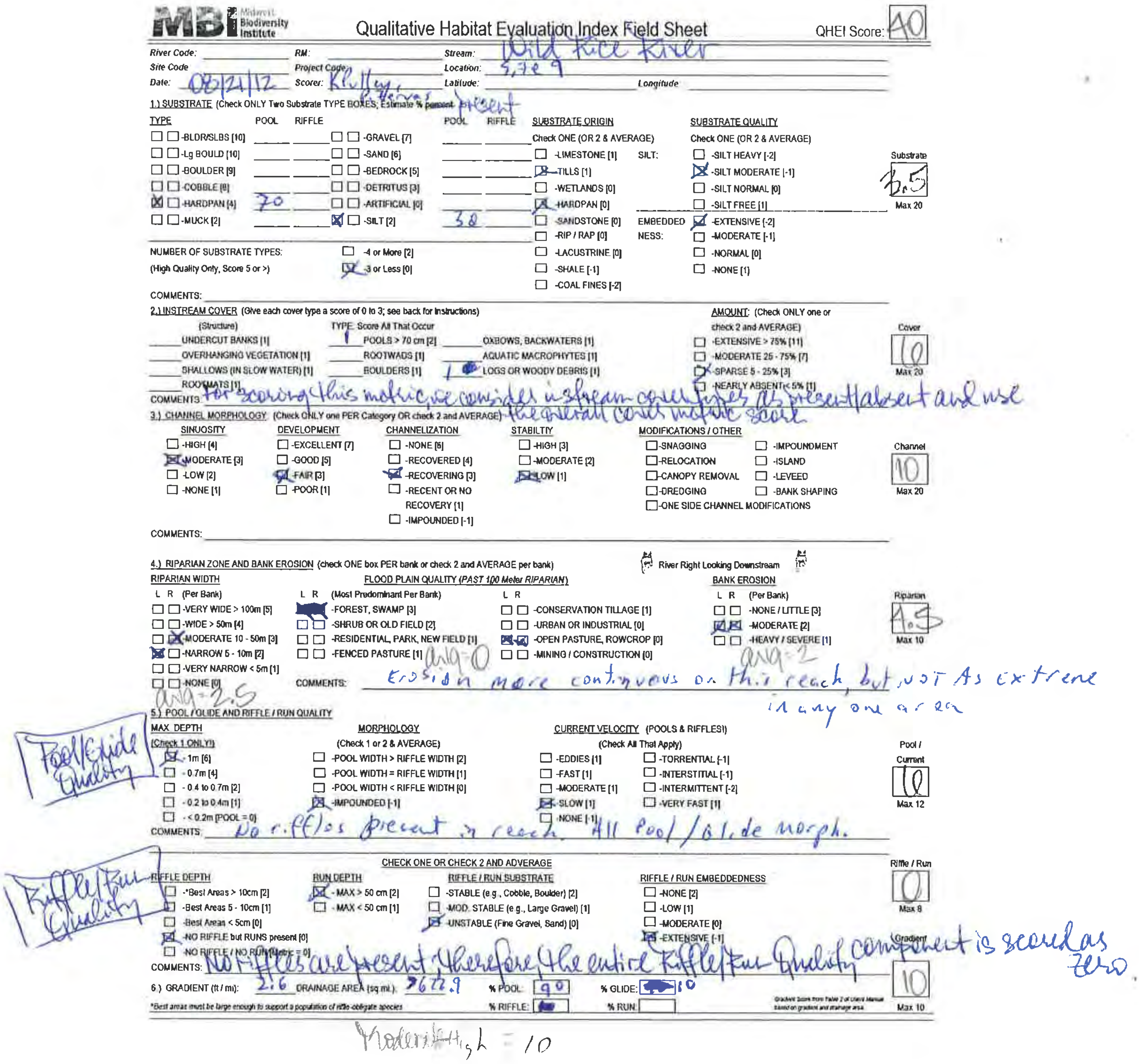
Gradient Score from Table 2 of Users Manual based on gradient and drainage area

Gradient 8 Max 10

*Best areas must be large enough to support a population of riffle-obligate species

No riffles are present therefore the entire Riffle/Run Quality component is scored as zero.

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute — Qualitative Habitat Evaluation Index Field Sheet — QHEI Score: 40

River Code: ______ RM: ______ Stream: Wild Rice River
Site Code ______ Project Code ______ Location: 5,7e 9
Date: 08/21/12 Scorer: Kluffey, R. Hervas Latitude: ______ Longitude ______

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]	70		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☒ ☐ -SILT [2]	30	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☐ -SILT HEAVY [-2]
☒ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate 3.5 Max 20

COMMENTS: ______

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
___ UNDERCUT BANKS [1]
___ OVERHANGING VEGETATION [1]
___ SHALLOWS (IN SLOW WATER) [1]
___ ROOTMATS [1]
1 POOLS > 70 cm [2]
___ ROOTWADS [1]
___ BOULDERS [1]
___ OXBOWS, BACKWATERS [1]
___ AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover 10 Max 20

COMMENTS: For scoring this metric, we consider instream cover types as present/absent and use the overall cover metric score.

3.) CHANNEL MORPHOLOGY (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☒ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☒ -FAIR [3]
☐ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILITY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel 10 Max 20

COMMENTS: ______

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☒ -MODERATE 10 - 50m [3]
☒ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 2.5

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
☒ ☒ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☒ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]
avg = 0

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 2

Riparian 4.5 Max 10

COMMENTS: Erosion more continuous on this reach, but not as extreme in any one area

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH (Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current 10 Max 12

COMMENTS: No riffles present in reach. All pool/glide morph.

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☒ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☒ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run 0 Max 8

COMMENTS: No riffles are present therefore the entire Riffle/Run Quality component is scored as zero

6.) GRADIENT (ft / mi): 2.6 DRAINAGE AREA (sq mi.): 7672.9 % POOL: 90 % GLIDE: [redacted] 10
% RIFFLE: [redacted] % RUN: ______

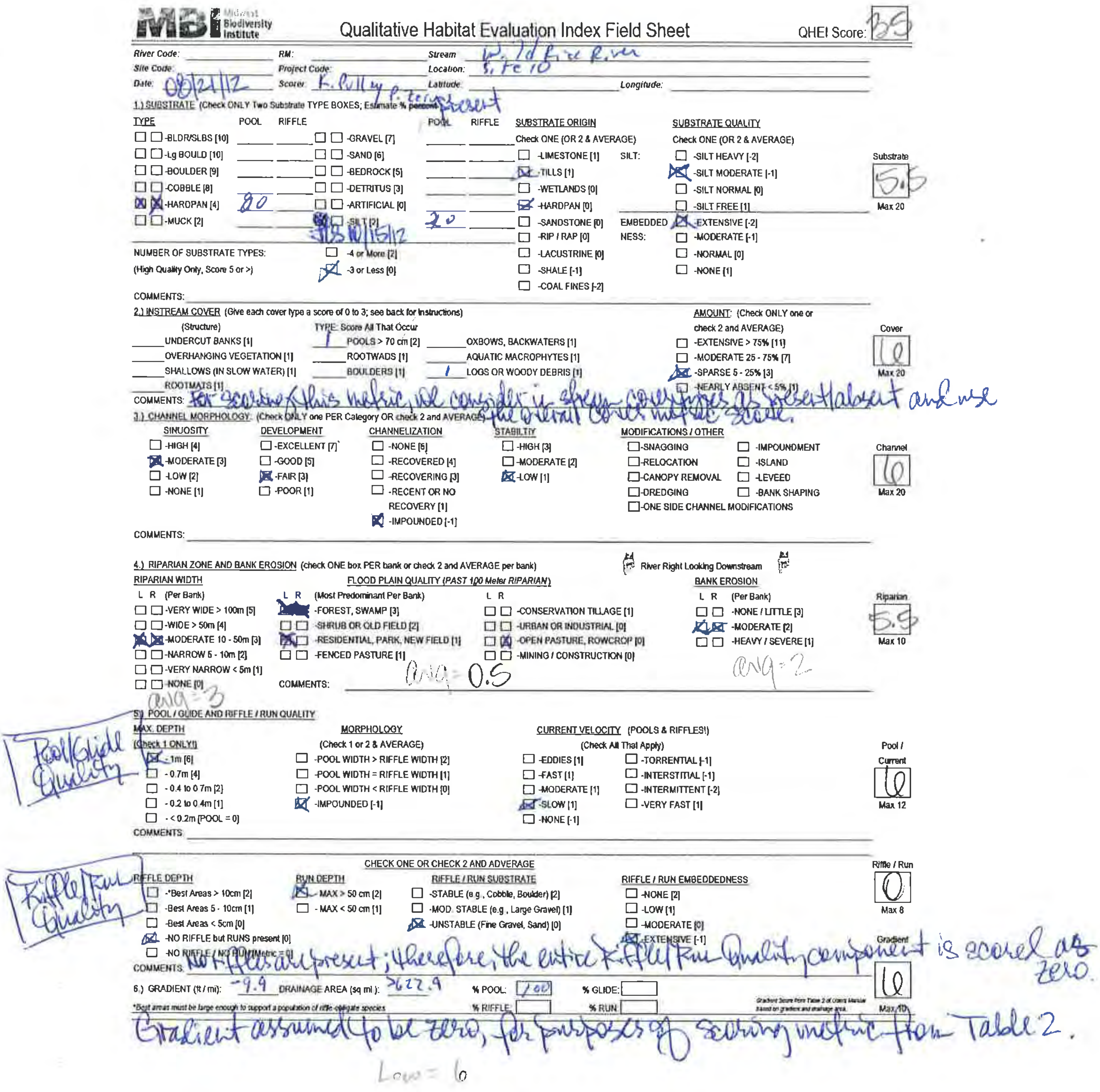
*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area

Gradient 10 Max 10

Moderate High = 10

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 35

River Code: ______ RM: ______ Stream: Wildrice River
Site Code: ______ Project Code: ______ Location: Site 10
Date: 08/21/12 Scorer: K. Pulley P. Terry Latitude: ______ Longitude: ______

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE POOL RIFFLE
☐ ☐ -BLDR/SLBS [10] ___ ___
☐ ☐ -Lg BOULD [10] ___ ___
☐ ☐ -BOULDER [9] ___ ___
☐ ☐ -COBBLE [8] ___ ___
☒ ☒ -HARDPAN [4] 80 ___
☐ ☐ -MUCK [2] ___ ___

POOL RIFFLE
☐ ☐ -GRAVEL [7] ___ ___
☐ ☐ -SAND [6] ___ ___
☐ ☐ -BEDROCK [5] ___ ___
☐ ☐ -DETRITUS [3] ___ ___
☐ ☐ -ARTIFICIAL [0] ___ ___
☒ ☐ -SILT [2] 20 ___

JS 10/15/12

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☐ -SILT HEAVY [-2]
☒ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate: 5.5 Max 20

COMMENTS: ______

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
___ UNDERCUT BANKS [1]
___ OVERHANGING VEGETATION [1]
___ SHALLOWS (IN SLOW WATER) [1]
___ ROOTMATS [1]
1 POOLS > 70 cm [2]
___ ROOTWADS [1]
___ BOULDERS [1]
___ OXBOWS, BACKWATERS [1]
___ AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 6 Max 20

COMMENTS: For scoring of this metric, we consider in-stream cover types as present/absent and use the overall cover metric score.

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☒ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☒ -FAIR [3]
☐ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☐ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☒ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 6 Max 20

COMMENTS: ______

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☒ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 3

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
☒ ☒ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]
avg = 0.5

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 2

Riparian: 5.5 Max 10

COMMENTS: ______

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH (Check 1 ONLY!)
☒ - > 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 6 Max 12

COMMENTS: ______

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☒ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☒ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS: No riffles are present; therefore, the entire Riffle/Run Quality component is scored as zero.

6.) GRADIENT (ft / mi): -9.9 DRAINAGE AREA (sq mi): >622.9 % POOL: 100 % GLIDE: ______
% RIFFLE: ______ % RUN: ______

Gradient Score from Table 2 of users Manual based on gradient and drainage area.

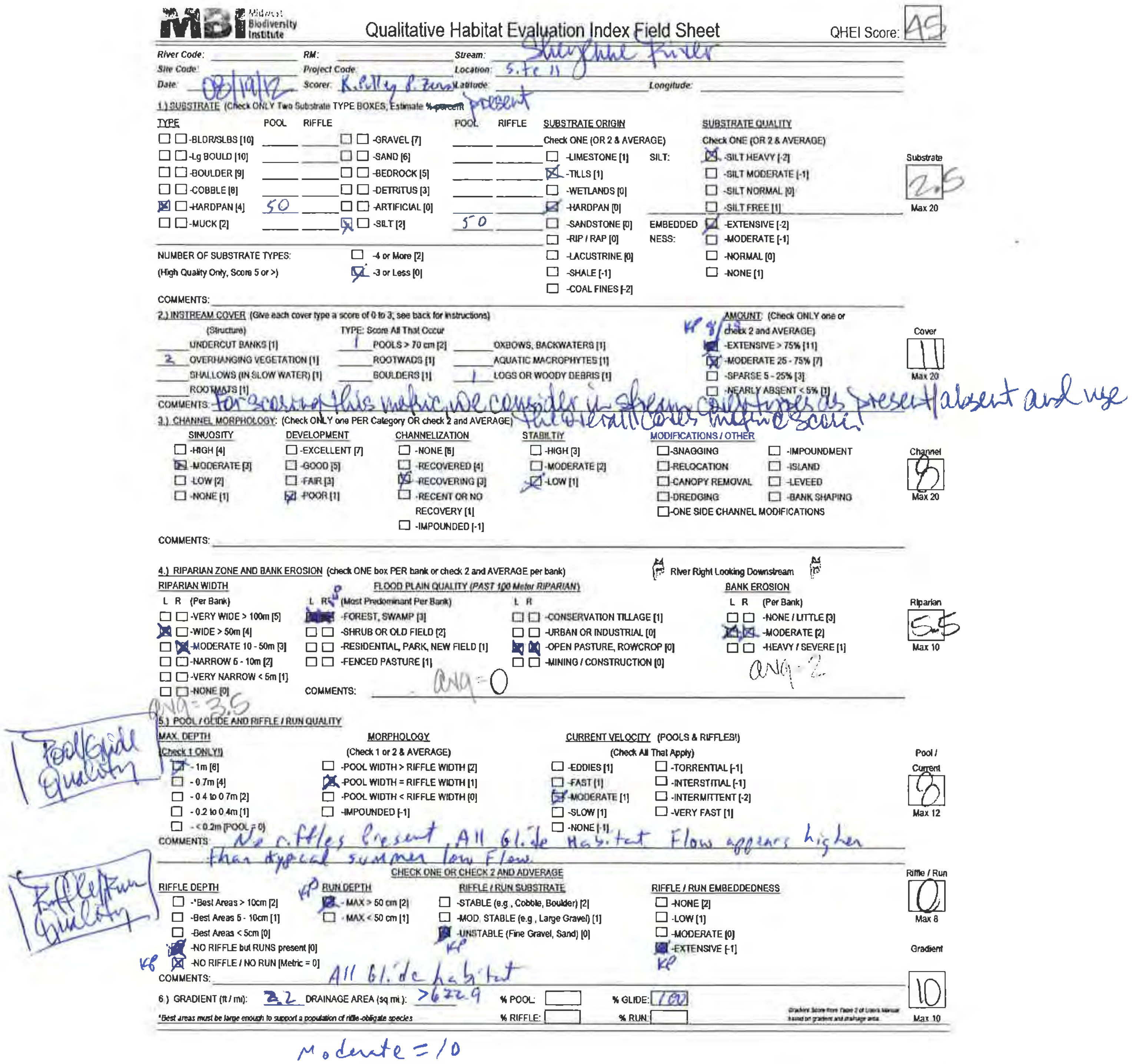
Gradient: 6 Max 10

*Best areas must be large enough to support a population of riffle-obligate species

Gradient assumed to be zero, for purposes of scoring metric from Table 2.

Low = 6

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 45

River Code: ______ RM: ______ Stream: Sheyenne River
Site Code: ______ Project Code: ______ Location: Site 11
Date: 08/19/12 Scorer: K. Pelly P. Zern Latitude: ______ Longitude: ______

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate ~~% percent~~ present

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]	50		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☒ ☐ -SILT [2]	50	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate: 2.5
Max 20

COMMENTS: ______

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)	TYPE: Score All That Occur	
___ UNDERCUT BANKS [1]	1 POOLS > 70 cm [2]	___ OXBOWS, BACKWATERS [1]
2 OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	___ AQUATIC MACROPHYTES [1]
___ SHALLOWS (IN SLOW WATER) [1]	___ BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
___ ROOTMATS [1]		

KP 8/13
AMOUNT: (Check ONLY one or check 2 and AVERAGE)
■ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 11
Max 20

COMMENTS: For scoring this metric, we consider in-stream cover types as present/absent and use the overall covers metric score!

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☒ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 8
Max 20

COMMENTS: ______

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☒ ☐ -WIDE > 50m [4]
☐ ☒ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 3.5

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)*
L R (Most Predominant Per Bank)
■ ■ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☒ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

COMMENTS: avg = 0

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 2

Riparian: 5.5
Max 10

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH
(Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☒ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!)
(Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☒ -MODERATE [1]
☐ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 8
Max 12

COMMENTS: No riffles present. All Glide Habitat. Flow appears higher than typical summer low flow.

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
■ -NO RIFFLE but RUNS present [0]
KP ☒ -NO RIFFLE / NO RUN [Metric = 0]

KP
RUN DEPTH
■ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
■ -UNSTABLE (Fine Gravel, Sand) [0]
KP

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
■ -EXTENSIVE [-1]
KP

Riffle / Run: 0
Max 8

COMMENTS: All Glide habitat

6.) GRADIENT (ft / mi): 2.2 DRAINAGE AREA (sq mi.): >622.9 % POOL: ☐ % GLIDE: 100 % RIFFLE: ☐ % RUN: ☐

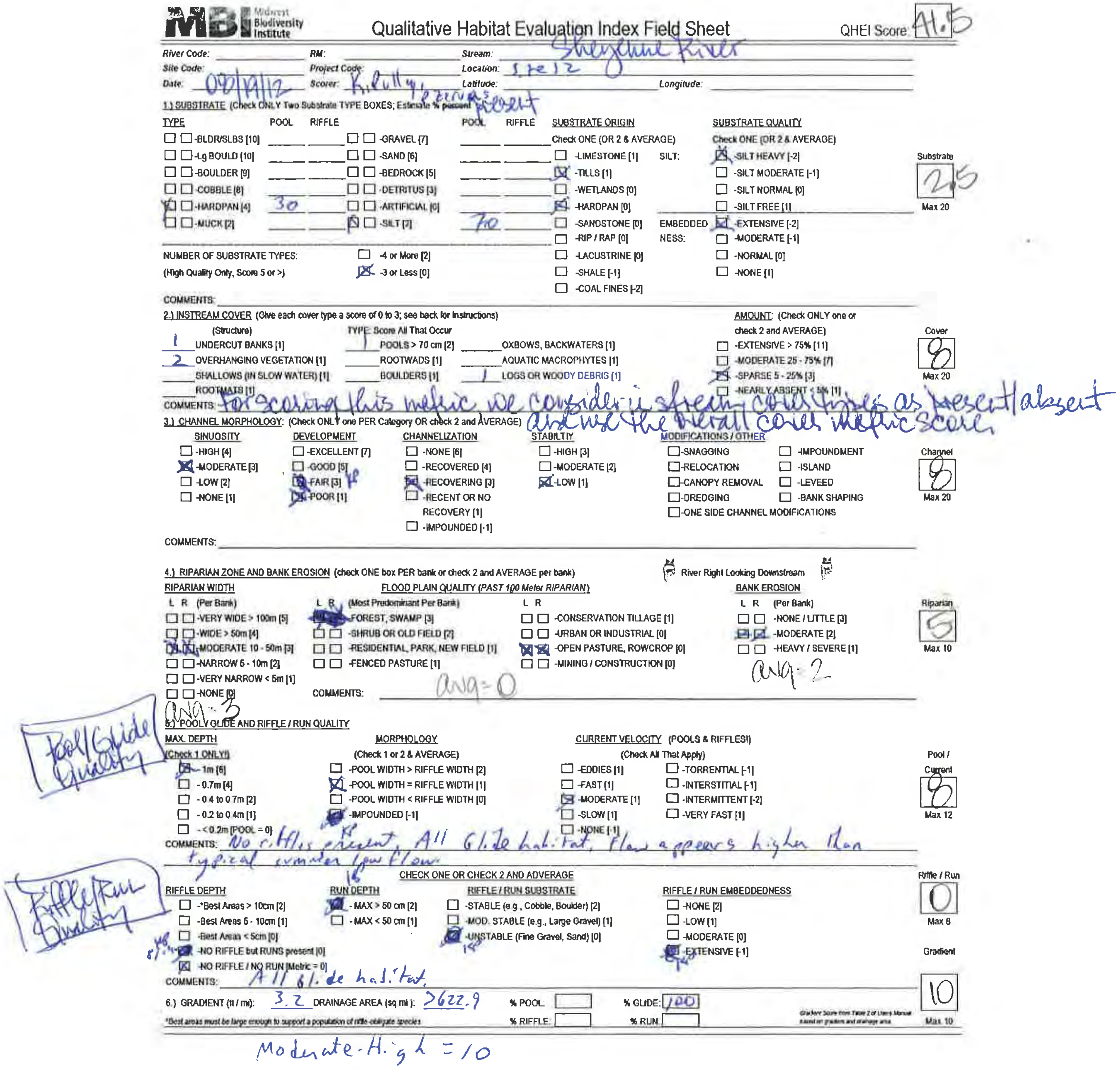
Gradient: 10
Max 10

Gradient Score from Table 2 of Users Manual based on gradient and drainage area

*Best areas must be large enough to support a population of riffle-obligate species

Moderate = 10

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 41.5

River Code: RM: Stream: Sheyenne River
Site Code: Project Code: Location: S te 12
Date: 08/19/12 Scorer: K. Kelly, Lerrlyas? Latitude: Longitude:

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present) present

TYPE POOL RIFFLE
- ☐ ☐ -BLDR/SLBS [10]
- ☐ ☐ -Lg BOULD [10]
- ☐ ☐ -BOULDER [9]
- ☐ ☐ -COBBLE [8]
- ☒ ☐ -HARDPAN [4] 30
- ☐ ☐ -MUCK [2]
- ☐ ☐ -GRAVEL [7]
- ☐ ☐ -SAND [6]
- ☐ ☐ -BEDROCK [5]
- ☐ ☐ -DETRITUS [3]
- ☐ ☐ -ARTIFICIAL [0]
- ☒ ☐ -SILT [2] 70

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)
- ☐ -4 or More [2]
- ☒ -3 or Less [0]

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
- ☐ -LIMESTONE [1]
- ☒ -TILLS [1]
- ☐ -WETLANDS [0]
- ☒ -HARDPAN [0]
- ☐ -SANDSTONE [0]
- ☐ -RIP / RAP [0]
- ☐ -LACUSTRINE [0]
- ☐ -SHALE [-1]
- ☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)

SILT:
- ☒ -SILT HEAVY [-2]
- ☐ -SILT MODERATE [-1]
- ☐ -SILT NORMAL [0]
- ☐ -SILT FREE [1]

EMBEDDEDNESS:
- ☒ -EXTENSIVE [-2]
- ☐ -MODERATE [-1]
- ☐ -NORMAL [0]
- ☐ -NONE [1]

Substrate: 2.5 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
- 1 UNDERCUT BANKS [1]
- 2 OVERHANGING VEGETATION [1]
- ___ SHALLOWS (IN SLOW WATER) [1]
- ___ ROOTMATS [1]
- 1 POOLS > 70 cm [2]
- ___ ROOTWADS [1]
- ___ BOULDERS [1]
- ___ OXBOWS, BACKWATERS [1]
- ___ AQUATIC MACROPHYTES [1]
- 1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
- ☐ -EXTENSIVE > 75% [11]
- ☐ -MODERATE 25 - 75% [7]
- ☒ -SPARSE 5 - 25% [3]
- ☐ -NEARLY ABSENT < 5% [1]

Cover: 8 Max 20

COMMENTS: For scoring this metric we consider instream cover types as present/absent and use the overall cover metric score.

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
- ☐ -HIGH [4]
- ☒ -MODERATE [3]
- ☐ -LOW [2]
- ☐ -NONE [1]

DEVELOPMENT
- ☐ -EXCELLENT [7]
- ☐ -GOOD [5]
- ☒ -FAIR [3] ½
- ☒ -POOR [1]

CHANNELIZATION
- ☐ -NONE [6]
- ☐ -RECOVERED [4]
- ☒ -RECOVERING [3]
- ☐ -RECENT OR NO RECOVERY [1]
- ☐ -IMPOUNDED [-1]

STABILTIY
- ☐ -HIGH [3]
- ☐ -MODERATE [2]
- ☒ -LOW [1]

MODIFICATIONS / OTHER
- ☐ -SNAGGING
- ☐ -RELOCATION
- ☐ -CANOPY REMOVAL
- ☐ -DREDGING
- ☐ -ONE SIDE CHANNEL MODIFICATIONS
- ☐ -IMPOUNDMENT
- ☐ -ISLAND
- ☐ -LEVEED
- ☐ -BANK SHAPING

Channel: 8 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
- ☐ ☐ -VERY WIDE > 100m [5]
- ☐ ☐ -WIDE > 50m [4]
- ☒ ☒ -MODERATE 10 - 50m [3]
- ☐ ☐ -NARROW 5 - 10m [2]
- ☐ ☐ -VERY NARROW < 5m [1]
- ☐ ☐ -NONE [0]

avg - 3

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) — L R (Most Predominant Per Bank)
- ☒ ☒ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☒ ☒ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

COMMENTS: avg = 0

BANK EROSION — L R (Per Bank)
- ☐ ☐ -NONE / LITTLE [3]
- ☒ ☒ -MODERATE [2]
- ☐ ☐ -HEAVY / SEVERE [1]

avg - 2

Riparian: 5 Max 10

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH (Check 1 ONLY!)
- ☒ -1m [6]
- ☐ - 0.7m [4]
- ☐ - 0.4 to 0.7m [2]
- ☐ - 0.2 to 0.4m [1]
- ☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- ☐ -POOL WIDTH > RIFFLE WIDTH [2]
- ☒ -POOL WIDTH = RIFFLE WIDTH [1]
- ☐ -POOL WIDTH < RIFFLE WIDTH [0]
- ☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- ☐ -EDDIES [1]
- ☐ -FAST [1]
- ☒ -MODERATE [1]
- ☐ -SLOW [1]
- ☐ -NONE [-1]
- ☐ -TORRENTIAL [-1]
- ☐ -INTERSTITIAL [-1]
- ☐ -INTERMITTENT [-2]
- ☐ -VERY FAST [1]

Pool / Current: 8 Max 12

COMMENTS: No riffles present, All Glide habitat, Flow appears higher than typical summer low flow.

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- ☐ -*Best Areas > 10cm [2]
- ☐ -Best Areas 5 - 10cm [1]
- ☐ -Best Areas < 5cm [0]
- ☒ -NO RIFFLE but RUNS present [0]
- ☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
- ☒ - MAX > 50 cm [2]
- ☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ -STABLE (e.g., Cobble, Boulder) [2]
- ☐ -MOD. STABLE (e.g., Large Gravel) [1]
- ☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ -NONE [2]
- ☐ -LOW [1]
- ☐ -MODERATE [0]
- ☒ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS: All Glide habitat.

6.) GRADIENT (ft / mi): 3.2 DRAINAGE AREA (sq mi): >622.9 % POOL: % GLIDE: 100 % RIFFLE: % RUN:

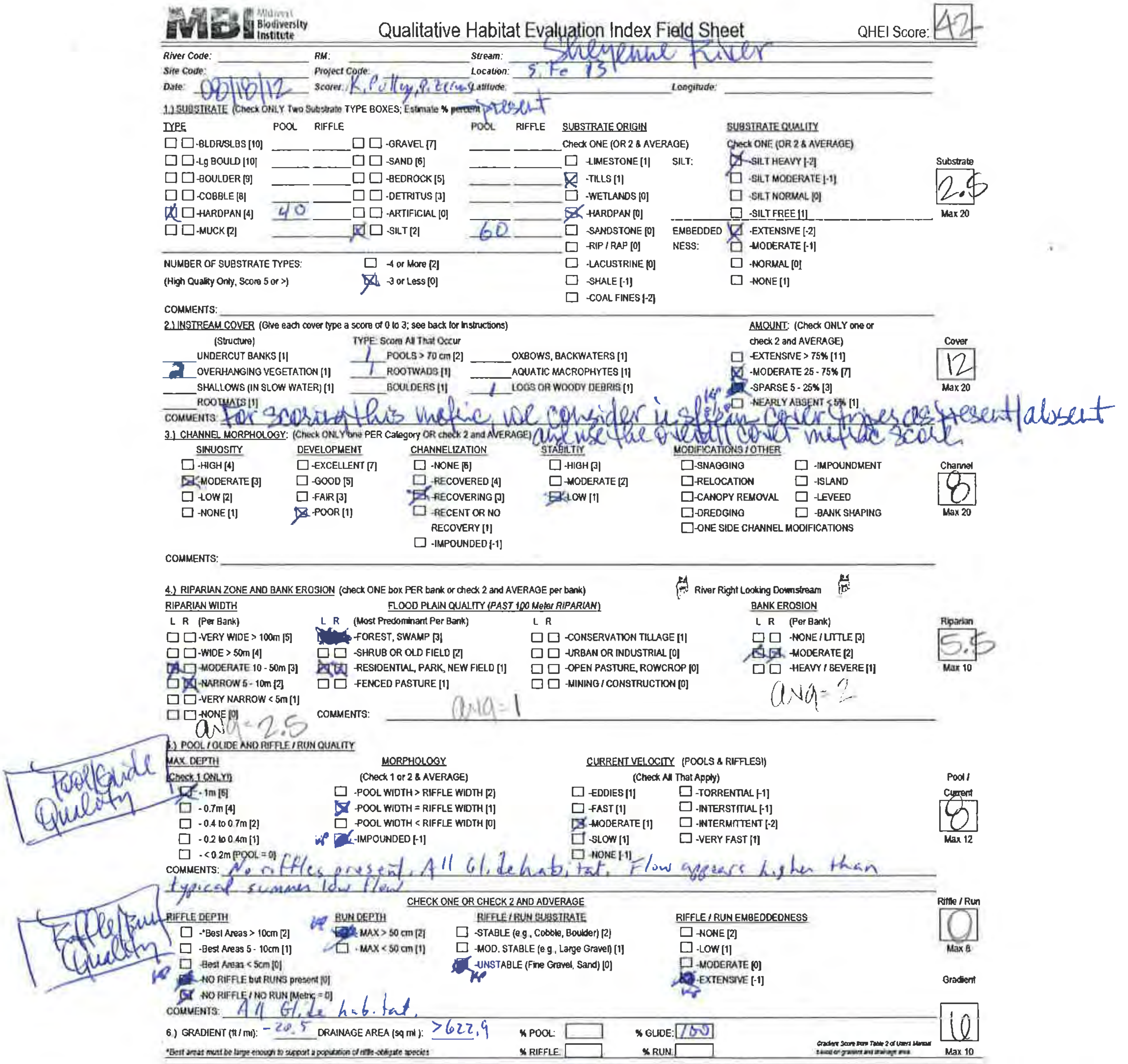
Gradient: 10 Max 10

Gradient Score from Table 2 of Users Manual based on gradient and drainage area

*Best areas must be large enough to support a population of riffle-obligate species

Moderate-High = 10

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 42

River Code: RM: Stream: Sheyenne River
Site Code: Project Code: Location: S. Fe 13
Date: 08/18/12 Scorer: K. Pottey, P. Zeeling Latitude: Longitude:

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]	40		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☒ ☐ -SILT [2]	60	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate: 2.5 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
_____ UNDERCUT BANKS [1]
2 OVERHANGING VEGETATION [1]
_____ SHALLOWS (IN SLOW WATER) [1]
_____ ROOTMATS [1]
1 POOLS > 70 cm [2]
1 ROOTWADS [1]
_____ BOULDERS [1]
_____ OXBOWS, BACKWATERS [1]
_____ AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]
14

Cover: 12 Max 20

COMMENTS: For scoring this metric, we consider instream cover types as present/absent and use the overall cover metric score.

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☒ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 8 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☐ -MODERATE 10 - 50m [3]
☐ ☒ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 2.5

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
☒ ☒ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

COMMENTS: avg = 1

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 2

Riparian: 5.5 Max 10

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH
(Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☒ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
W ☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!)
(Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☒ -MODERATE [1]
☐ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 8 Max 12

COMMENTS: No riffles present. All Glide habitat. Flow appears higher than typical summer low flow.

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
W ☒ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

W RUN DEPTH
☒ -MAX > 50 cm [2]
☐ -MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0] W

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1] W

Riffle / Run: 0 Max 8

COMMENTS: All Glide habitat.

6.) GRADIENT (ft / mi): ~20.5 DRAINAGE AREA (sq mi): >622.9
% POOL: % GLIDE: 100
% RIFFLE: % RUN:

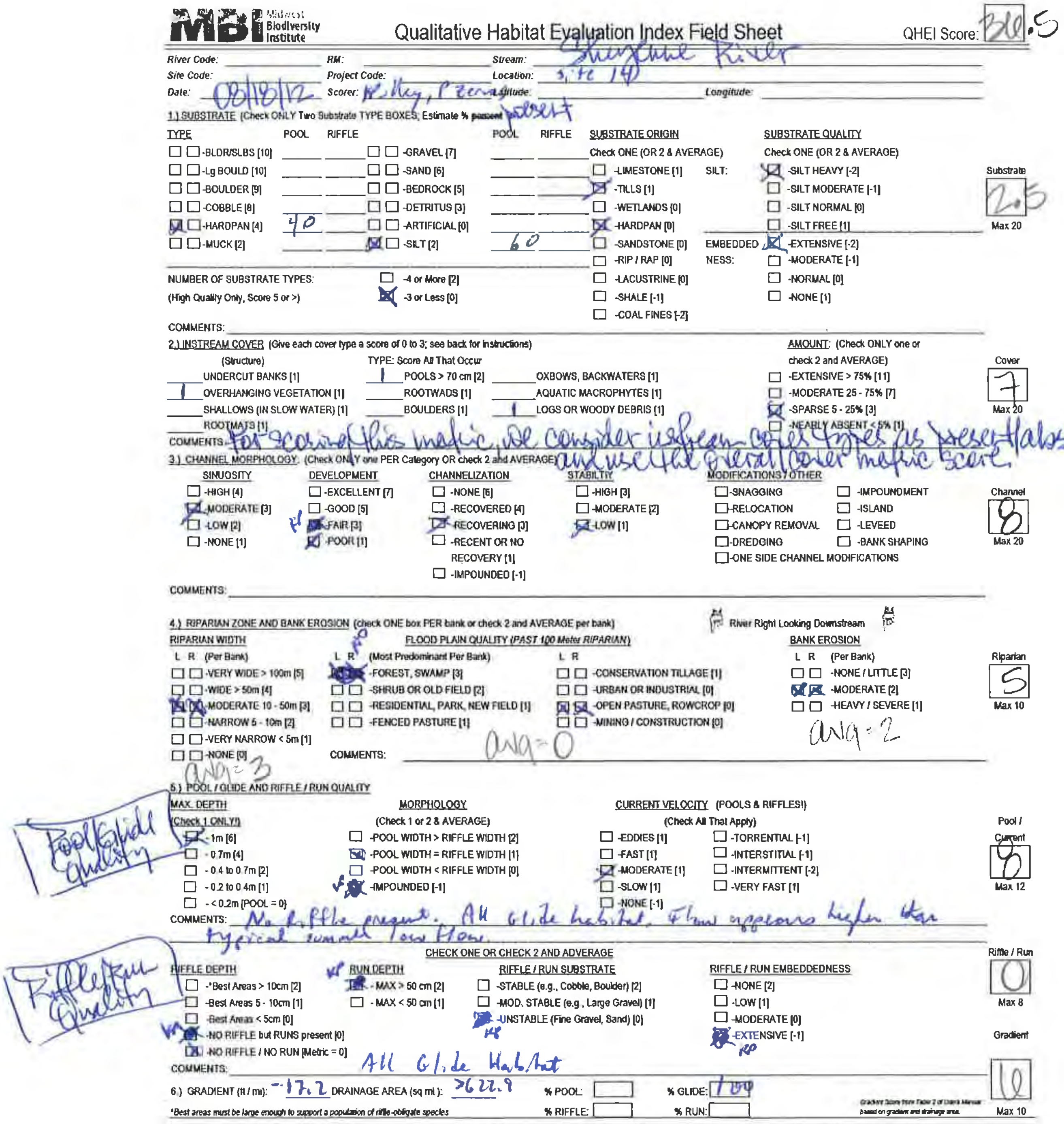
*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of User's Manual based on gradient and drainage area

Gradient: 10 Max 10

Gradient assumed ~~to be zero~~ Low = 6 for purposes of scoring metric from Table 2.

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 30.5

River Code: RM: Stream: Sheyenne River
Site Code: Project Code: Location: Site 14
Date: 08/18/12 Scorer: Kelley, P Zerr Latitude: Longitude:

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]	40		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☒ ☐ -SILT [2]	60	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
- ☐ -LIMESTONE [1]
- ☒ -TILLS [1]
- ☐ -WETLANDS [0]
- ☒ -HARDPAN [0]
- ☐ -SANDSTONE [0]
- ☐ -RIP / RAP [0]
- ☐ -LACUSTRINE [0]
- ☐ -SHALE [-1]
- ☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
- SILT: ☒ -SILT HEAVY [-2]
- ☐ -SILT MODERATE [-1]
- ☐ -SILT NORMAL [0]
- ☐ -SILT FREE [1]
- EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
- ☐ -MODERATE [-1]
- ☐ -NORMAL [0]
- ☐ -NONE [1]

Substrate 2.5 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur

___ UNDERCUT BANKS [1]	1 POOLS > 70 cm [2]	___ OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	___ AQUATIC MACROPHYTES [1]
___ SHALLOWS (IN SLOW WATER) [1]	___ BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
___ ROOTMATS [1]		

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
- ☐ -EXTENSIVE > 75% [11]
- ☐ -MODERATE 25 - 75% [7]
- ☒ -SPARSE 5 - 25% [3]
- ☐ -NEARLY ABSENT < 5% [1]

Cover 7 Max 20

COMMENTS: For scoring this metric, we consider instream cover types as present/absent and use the overall cover metric score.

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
- ☐ -HIGH [4]
- ☒ -MODERATE [3]
- ☐ -LOW [2]
- ☐ -NONE [1]

DEVELOPMENT
- ☐ -EXCELLENT [7]
- ☐ -GOOD [5]
- ✓ ☒ -FAIR [3]
- ☒ -POOR [1]

CHANNELIZATION
- ☐ -NONE [6]
- ☐ -RECOVERED [4]
- ☒ -RECOVERING [3]
- ☐ -RECENT OR NO RECOVERY [1]
- ☐ -IMPOUNDED [-1]

STABILITY
- ☐ -HIGH [3]
- ☐ -MODERATE [2]
- ☒ -LOW [1]

MODIFICATIONS / OTHER
- ☐ -SNAGGING
- ☐ -RELOCATION
- ☐ -CANOPY REMOVAL
- ☐ -DREDGING
- ☐ -ONE SIDE CHANNEL MODIFICATIONS
- ☐ -IMPOUNDMENT
- ☐ -ISLAND
- ☐ -LEVEED
- ☐ -BANK SHAPING

Channel 8 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
- ☐ ☐ -VERY WIDE > 100m [5]
- ☐ ☐ -WIDE > 50m [4]
- ☒ ☒ -MODERATE 10 - 50m [3]
- ☐ ☐ -NARROW 5 - 10m [2]
- ☐ ☐ -VERY NARROW < 5m [1]
- ☐ ☐ -NONE [0]

avg = 3

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)*
L R (Most Predominant Per Bank)
- ☒ ☒ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☒ ☒ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

avg = 0

BANK EROSION
L R (Per Bank)
- ☐ ☐ -NONE / LITTLE [3]
- ☒ ☒ -MODERATE [2]
- ☐ ☐ -HEAVY / SEVERE [1]

avg = 2

Riparian 5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH (Check 1 ONLY!)
- ☒ -1m [6]
- ☐ -0.7m [4]
- ☐ -0.4 to 0.7m [2]
- ☐ -0.2 to 0.4m [1]
- ☐ -< 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- ☐ -POOL WIDTH > RIFFLE WIDTH [2]
- ☒ -POOL WIDTH = RIFFLE WIDTH [1]
- ☐ -POOL WIDTH < RIFFLE WIDTH [0]
- ✓ ☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- ☐ -EDDIES [1]
- ☐ -FAST [1]
- ☒ -MODERATE [1]
- ☐ -SLOW [1]
- ☐ -NONE [-1]
- ☐ -TORRENTIAL [-1]
- ☐ -INTERSTITIAL [-1]
- ☐ -INTERMITTENT [-2]
- ☐ -VERY FAST [1]

Pool / Current 8 Max 12

COMMENTS: No riffle present. All glide habitat. Flow appears higher than typical summer low flow.

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- ☐ -*Best Areas > 10cm [2]
- ☐ -Best Areas 5 - 10cm [1]
- ☐ -Best Areas < 5cm [0]
- ✓ ☒ -NO RIFFLE but RUNS present [0]
- ☒ -NO RIFFLE / NO RUN [Metric = 0]

✓ RUN DEPTH
- ☒ -MAX > 50 cm [2]
- ☐ -MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ -STABLE (e.g., Cobble, Boulder) [2]
- ☐ -MOD. STABLE (e.g., Large Gravel) [1]
- ☒ -UNSTABLE (Fine Gravel, Sand) [0] HB

RIFFLE / RUN EMBEDDEDNESS
- ☐ -NONE [2]
- ☐ -LOW [1]
- ☐ -MODERATE [0]
- ☒ -EXTENSIVE [-1] KD

Riffle / Run 0 Max 8

COMMENTS: All Glide Habitat

6.) GRADIENT (ft / mi): -17.2 DRAINAGE AREA (sq mi.): >622.9 % POOL: % GLIDE: 100
% RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

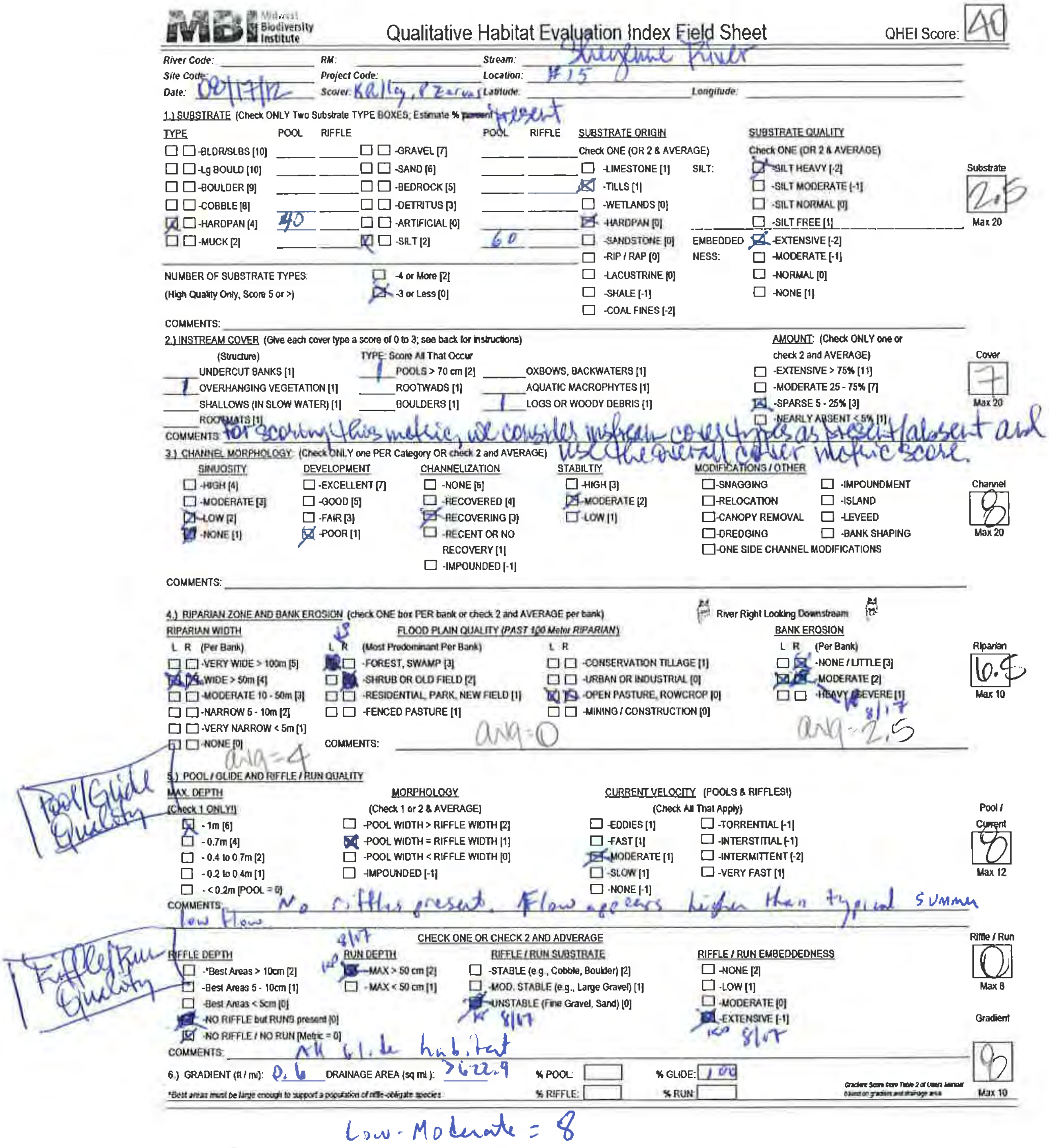
Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient 10 Max 10

Low = 6

Gradient assumed to be zero for purposes of scoring metric from Table 2.

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 40

River Code: ______ RM: ______ Stream: Sheyenne River
Site Code: ______ Project Code: ______ Location: #15
Date: 08/17/12 Scorer: Kelly, P Zarvas Latitude: ______ Longitude: ______

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~parent~~ present)

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]	40		☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☒ ☐ -SILT [2]	60	

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
- ☐ -LIMESTONE [1]
- ☒ -TILLS [1]
- ☐ -WETLANDS [0]
- ☒ -HARDPAN [0]
- ☐ -SANDSTONE [0]
- ☐ -RIP / RAP [0]
- ☐ -LACUSTRINE [0]
- ☐ -SHALE [-1]
- ☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
- SILT: ☒ -SILT HEAVY [-2]
- ☐ -SILT MODERATE [-1]
- ☐ -SILT NORMAL [0]
- ☐ -SILT FREE [1]
- EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
- ☐ -MODERATE [-1]
- ☐ -NORMAL [0]
- ☐ -NONE [1]

Substrate 2.5 Max 20

COMMENTS: ______

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur

	UNDERCUT BANKS [1]	1	POOLS > 70 cm [2]		OXBOWS, BACKWATERS [1]
1	OVERHANGING VEGETATION [1]		ROOTWADS [1]		AQUATIC MACROPHYTES [1]
	SHALLOWS (IN SLOW WATER) [1]		BOULDERS [1]	1	LOGS OR WOODY DEBRIS [1]
	ROOTMATS [1]				

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
- ☐ -EXTENSIVE > 75% [11]
- ☐ -MODERATE 25 - 75% [7]
- ☒ -SPARSE 5 - 25% [3]
- ☐ -NEARLY ABSENT < 5% [1]

Cover 7 Max 20

COMMENTS: For scoring this metric, we consider instream cover types as present/absent and use the overall cover metric score.

3.) CHANNEL MORPHOLOGY (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
- ☐ -HIGH [4]
- ☐ -MODERATE [3]
- ☒ -LOW [2]
- ☒ -NONE [1]

DEVELOPMENT
- ☐ -EXCELLENT [7]
- ☐ -GOOD [5]
- ☐ -FAIR [3]
- ☒ -POOR [1]

CHANNELIZATION
- ☐ -NONE [6]
- ☐ -RECOVERED [4]
- ☒ -RECOVERING [3]
- ☐ -RECENT OR NO RECOVERY [1]
- ☐ -IMPOUNDED [-1]

STABILTIY
- ☐ -HIGH [3]
- ☒ -MODERATE [2]
- ☐ -LOW [1]

MODIFICATIONS / OTHER
- ☐ -SNAGGING
- ☐ -RELOCATION
- ☐ -CANOPY REMOVAL
- ☐ -DREDGING
- ☐ -ONE SIDE CHANNEL MODIFICATIONS
- ☐ -IMPOUNDMENT
- ☐ -ISLAND
- ☐ -LEVEED
- ☐ -BANK SHAPING

Channel 8 Max 20

COMMENTS: ______

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
- ☐ ☐ -VERY WIDE > 100m [5]
- ☒ ☒ -WIDE > 50m [4]
- ☐ ☐ -MODERATE 10 - 50m [3]
- ☐ ☐ -NARROW 5 - 10m [2]
- ☐ ☐ -VERY NARROW < 5m [1]
- ☒ ☐ -NONE [0]

avg=4

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
- ☒ ☐ -FOREST, SWAMP [3]
- ☐ ☒ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☒ ☒ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

avg=0

BANK EROSION
L R (Per Bank)
- ☐ ☒ -NONE / LITTLE [3]
- ☒ ☒ -MODERATE [2]
- ☐ ☐ -HEAVY / SEVERE [1]

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avg-2.5

Riparian 6.5 Max 10

COMMENTS: ______

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

Pool/Glide Quality

MAX. DEPTH
(Check 1 ONLY!)
- ☒ - 1m [6]
- ☐ - 0.7m [4]
- ☐ - 0.4 to 0.7m [2]
- ☐ - 0.2 to 0.4m [1]
- ☐ - < 0.2m [POOL = 0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
- ☐ -POOL WIDTH > RIFFLE WIDTH [2]
- ☒ -POOL WIDTH = RIFFLE WIDTH [1]
- ☐ -POOL WIDTH < RIFFLE WIDTH [0]
- ☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!)
(Check All That Apply)
- ☐ -EDDIES [1]
- ☐ -FAST [1]
- ☒ -MODERATE [1]
- ☐ -SLOW [1]
- ☐ -NONE [-1]
- ☐ -TORRENTIAL [-1]
- ☐ -INTERSTITIAL [-1]
- ☐ -INTERMITTENT [-2]
- ☐ -VERY FAST [1]

Pool / Current 8 Max 12

COMMENTS: No riffles present. Flow appears higher than typical summer low flow.

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

8/17

RIFFLE DEPTH
- ☐ -*Best Areas > 10cm [2]
- ☐ -Best Areas 5 - 10cm [1]
- ☐ -Best Areas < 5cm [0]
- ☒ -NO RIFFLE but RUNS present [0]
- ☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
- ☒ -MAX > 50 cm [2]
- ☐ -MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ -STABLE (e.g., Cobble, Boulder) [2]
- ☐ -MOD. STABLE (e.g., Large Gravel) [1]
- ☒ -UNSTABLE (Fine Gravel, Sand) [0]

8/17

RIFFLE / RUN EMBEDDEDNESS
- ☐ -NONE [2]
- ☐ -LOW [1]
- ☐ -MODERATE [0]
- ☒ -EXTENSIVE [-1]

8/17

Riffle / Run 0 Max 8

COMMENTS: All glide habitat

6.) GRADIENT (ft / mi): 0.6 DRAINAGE AREA (sq mi.): 3622.9 % POOL: ______ % GLIDE: 100
% RIFFLE: ______ % RUN: ______

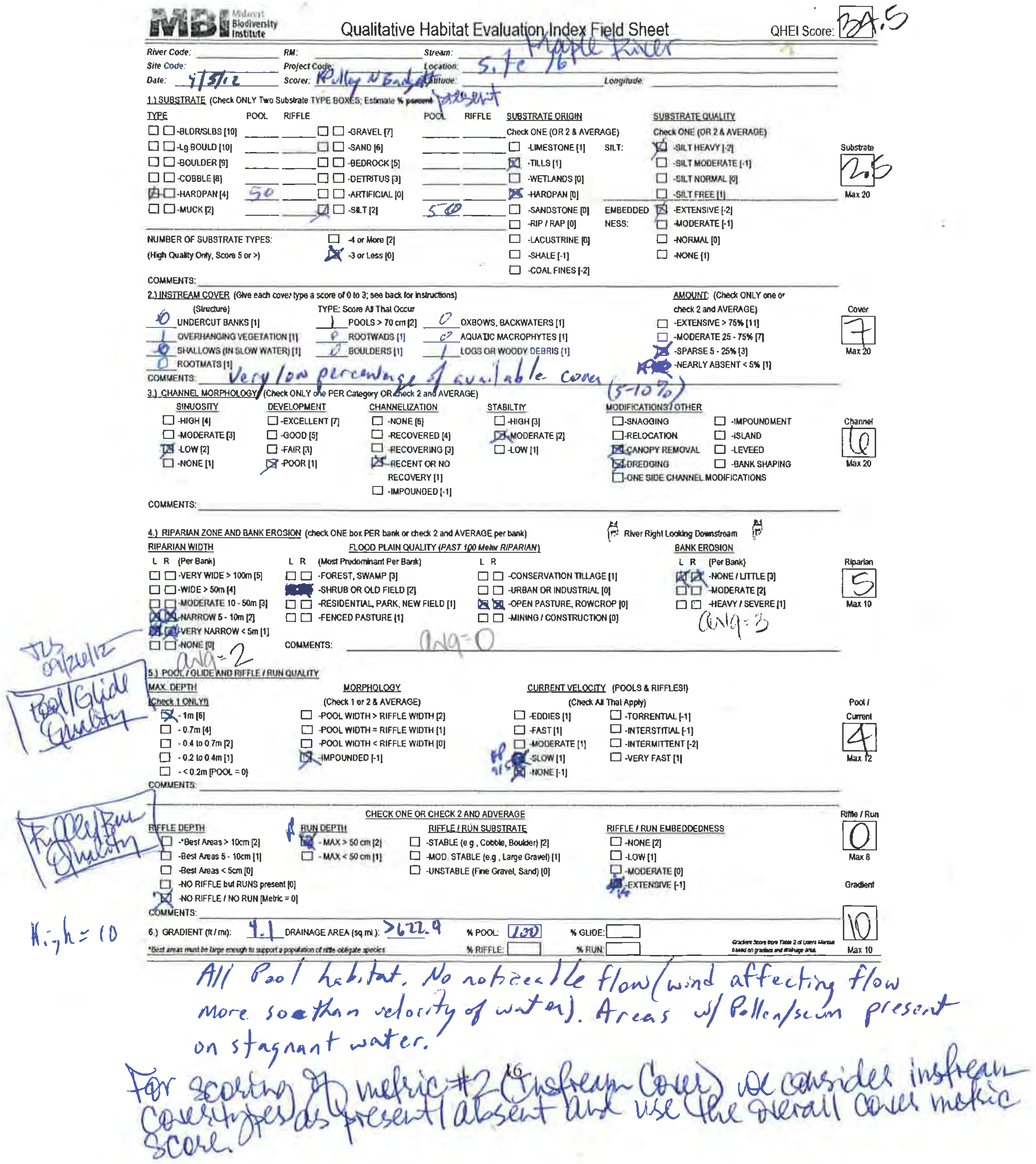
*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area

Gradient 9 Max 10

Low-Moderate = 8

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



MBI Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 34.5

River Code: ____ RM: ____ Stream: Maple River
Site Code: ____ Project Code: ____ Location: Site 16
Date: 9/5/12 Scorer: K Polley N Bock Latitude: ____ Longitude: ____

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present)

TYPE POOL RIFFLE | POOL RIFFLE

- ☐ ☐ -BLDR/SLBS [10] ____ ____ ☐ ☐ -GRAVEL [7] ____ ____
- ☐ ☐ -Lg BOULD [10] ____ ____ ☐ ☐ -SAND [6] ____ ____
- ☐ ☐ -BOULDER [9] ____ ____ ☐ ☐ -BEDROCK [5] ____ ____
- ☐ ☐ -COBBLE [8] ____ ____ ☐ ☐ -DETRITUS [3] ____ ____
- ☒ ☐ -HARDPAN [4] 50 ____ ☐ ☐ -ARTIFICIAL [0] ____ ____
- ☐ ☐ -MUCK [2] ____ ____ ☒ ☐ -SILT [2] 50 ____

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
- ☐ -LIMESTONE [1]
- ☒ -TILLS [1]
- ☐ -WETLANDS [0]
- ☒ -HARDPAN [0]
- ☐ -SANDSTONE [0]
- ☐ -RIP / RAP [0]
- ☐ -LACUSTRINE [0]
- ☐ -SHALE [-1]
- ☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT:
- ☒ -SILT HEAVY [-2]
- ☐ -SILT MODERATE [-1]
- ☐ -SILT NORMAL [0]
- ☐ -SILT FREE [1]

EMBEDDEDNESS:
- ☒ -EXTENSIVE [-2]
- ☐ -MODERATE [-1]
- ☐ -NORMAL [0]
- ☐ -NONE [1]

Substrate 2.5 Max 20

COMMENTS: ____

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
- 0 UNDERCUT BANKS [1]
- 1 OVERHANGING VEGETATION [1]
- 0 SHALLOWS (IN SLOW WATER) [1]
- 0 ROOTMATS [1]
- 1 POOLS > 70 cm [2]
- 0 ROOTWADS [1]
- 0 BOULDERS [1]
- 0 OXBOWS, BACKWATERS [1]
- 0? AQUATIC MACROPHYTES [1]
- 1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
- ☐ -EXTENSIVE > 75% [11]
- ☐ -MODERATE 25 - 75% [7]
- ☒ -SPARSE 5 - 25% [3]
- ☒ -NEARLY ABSENT < 5% [1]

Cover 7 Max 20

COMMENTS: Very low percentage of available cover (5-10%)

3.) CHANNEL MORPHOLOGY (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
- ☐ -HIGH [4]
- ☐ -MODERATE [3]
- ☒ -LOW [2]
- ☐ -NONE [1]

DEVELOPMENT
- ☐ -EXCELLENT [7]
- ☐ -GOOD [5]
- ☐ -FAIR [3]
- ☒ -POOR [1]

CHANNELIZATION
- ☐ -NONE [6]
- ☐ -RECOVERED [4]
- ☐ -RECOVERING [3]
- ☒ -RECENT OR NO RECOVERY [1]
- ☐ -IMPOUNDED [-1]

STABILTIY
- ☐ -HIGH [3]
- ☒ -MODERATE [2]
- ☐ -LOW [1]

MODIFICATIONS / OTHER
- ☐ -SNAGGING
- ☐ -RELOCATION
- ☒ -CANOPY REMOVAL
- ☒ -DREDGING
- ☐ -ONE SIDE CHANNEL MODIFICATIONS
- ☐ -IMPOUNDMENT
- ☐ -ISLAND
- ☐ -LEVEED
- ☐ -BANK SHAPING

Channel 6 Max 20

COMMENTS: ____

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
- ☐ ☐ -VERY WIDE > 100m [5]
- ☐ ☐ -WIDE > 50m [4]
- ☐ ☐ -MODERATE 10 - 50m [3]
- ☒ ☒ -NARROW 5 - 10m [2]
- ☒ ☒ -VERY NARROW < 5m [1]
- ☐ ☐ -NONE [0]

Avg = 2

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
- ☐ ☐ -FOREST, SWAMP [3]
- ■ ■ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☒ ☒ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

COMMENTS: Avg = 0

BANK EROSION
L R (Per Bank)
- ☒ ☒ -NONE / LITTLE [3]
- ☐ ☐ -MODERATE [2]
- ☐ ☐ -HEAVY / SEVERE [1]

Avg = 3

Riparian 5 Max 10

JZS 09/24/12

Pool/Glide Quality

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH
(Check 1 ONLY!)
- ☒ - 1m [6]
- ☐ - 0.7m [4]
- ☐ - 0.4 to 0.7m [2]
- ☐ - 0.2 to 0.4m [1]
- ☐ - < 0.2m [POOL = 0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
- ☐ -POOL WIDTH > RIFFLE WIDTH [2]
- ☐ -POOL WIDTH = RIFFLE WIDTH [1]
- ☐ -POOL WIDTH < RIFFLE WIDTH [0]
- ☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!)
(Check All That Apply)
- ☐ -EDDIES [1]
- ☐ -FAST [1]
- ☐ -MODERATE [1]
- ☒ -SLOW [1]
- ☒ -NONE [-1]
- ☐ -TORRENTIAL [-1]
- ☐ -INTERSTITIAL [-1]
- ☐ -INTERMITTENT [-2]
- ☐ -VERY FAST [1]

Pool / Current 4 Max 12

COMMENTS: ____

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- ☐ -*Best Areas > 10cm [2]
- ☐ -Best Areas 5 - 10cm [1]
- ☐ -Best Areas < 5cm [0]
- ☐ -NO RIFFLE but RUNS present [0]
- ☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
- ☒ - MAX > 50 cm [2]
- ☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ -STABLE (e.g., Cobble, Boulder) [2]
- ☐ -MOD. STABLE (e.g., Large Gravel) [1]
- ☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ -NONE [2]
- ☐ -LOW [1]
- ☐ -MODERATE [0]
- ☒ -EXTENSIVE [-1]

Riffle / Run 0 Max 8

COMMENTS: ____

High = 10

6.) GRADIENT (ft / mi): 4.1 DRAINAGE AREA (sq mi): >622.9 % POOL: 100 % GLIDE: ____ % RIFFLE: ____ % RUN: ____

*Best areas must be large enough to support a population of riffle obligate species

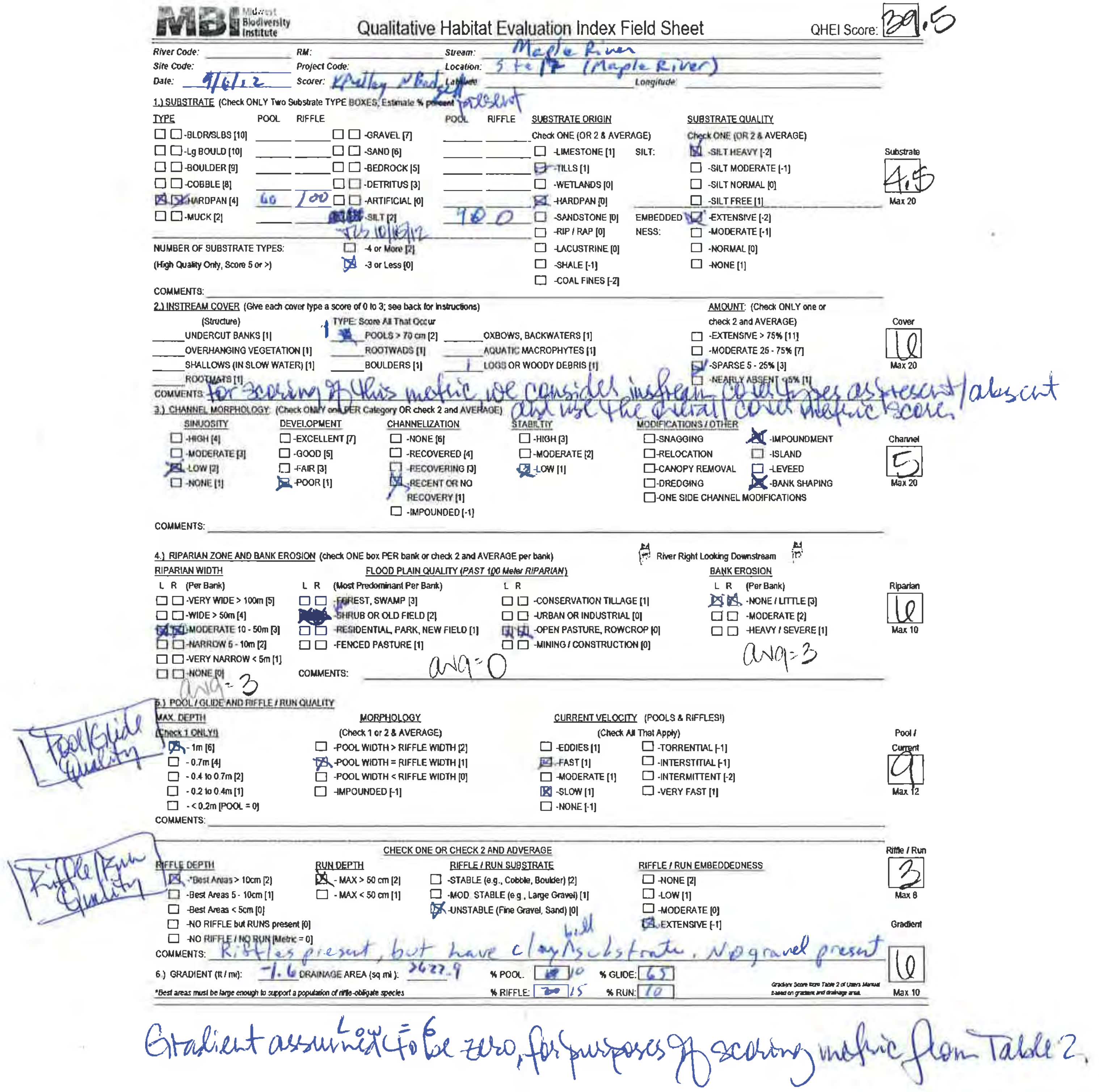
Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient 10 Max 10

All Pool habitat. No noticeable flow (wind affecting flow more so than velocity of water). Areas w/ Pollen/scum present on stagnant water.

For scoring of metric #2 (Instream Cover) we consider instream cover types as present/absent and use the overall cover metric score.

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet.



MBI Midwest Biodiversity Institute — **Qualitative Habitat Evaluation Index Field Sheet** — QHEI Score: 39.5

River Code: RM: Stream: Maple River
Site Code: Project Code: Location: Site 17 (Maple River)
Date: 9/6/12 Scorer: KKelley, NBad Latitude: Longitude:

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~present~~ present)

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☒ -HARDPAN [4]	60	100	☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			~~☐ ☐~~ -SILT [2] TB 10/18/12	40	0

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate 4.5 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) TYPE: Score All That Occur
____ UNDERCUT BANKS [1]
____ OVERHANGING VEGETATION [1]
____ SHALLOWS (IN SLOW WATER) [1]
____ ROOTMATS [1]
1 POOLS > 70 cm [2]
____ ROOTWADS [1]
____ BOULDERS [1]
____ OXBOWS, BACKWATERS [1]
____ AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☑ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover 6 Max 20

COMMENTS: for scoring of this metric we considered instream cover types as present/absent and use the overall cover metric score.

3.) CHANNEL MORPHOLOGY (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☒ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☐ -RECOVERING [3]
☒ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILITY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☒ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☒ -BANK SHAPING

Channel 5 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☒ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 3

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☒ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]
avg = 0

BANK EROSION
L R (Per Bank)
☒ ☒ -NONE / LITTLE [3]
☐ ☐ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]
avg = 3

Riparian 6 Max 10

COMMENTS:

Pool/Glide Quality

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☒ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☒ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current 9 Max 12

COMMENTS:

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☒ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☒ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run 3 Max 8

COMMENTS: Riffles present, but have clay/till substrate. No gravel present

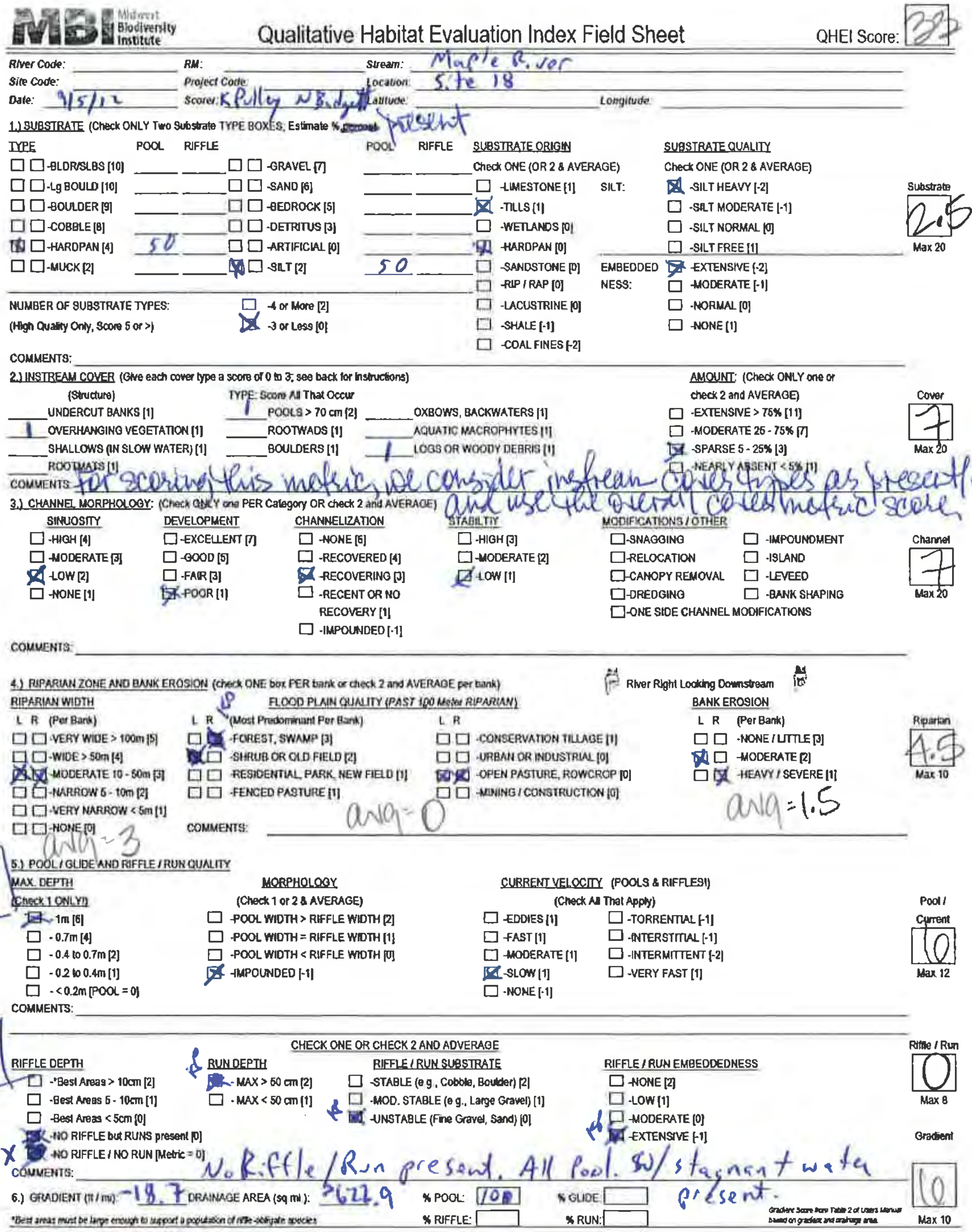
6.) GRADIENT (ft / mi): -1.6 DRAINAGE AREA (sq mi): 3627.9
% POOL: ~~[illegible]~~ 10 % GLIDE: 65
% RIFFLE: ~~20~~ 15 % RUN: 10

Gradient 6 Max 10
Gradient Score from Table 2 of Users Manual based on gradient and drainage area

*Best areas must be large enough to support a population of riffle-obligate species

Gradient assumed to be zero, for purposes of scoring metric from Table 2. Low = 6

Figure 5. Qualitative habitat evaluation index (QHEI) field sheet. 18



Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 32

River Code: RM: Stream: Maple River
Site Code: Project Code: Location: Site 18
Date: 9/5/12 Scorer: K Pulley N Bridgett Latitude: Longitude:

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % ~~percent~~ present

TYPE POOL RIFFLE
☐ ☐ -BLDR/SLBS [10]
☐ ☐ -Lg BOULD [10]
☐ ☐ -BOULDER [9]
☐ ☐ -COBBLE [8]
☒ ☐ -HARDPAN [4] 50
☐ ☐ -MUCK [2]

POOL RIFFLE
☐ ☐ -GRAVEL [7]
☐ ☐ -SAND [6]
☐ ☐ -BEDROCK [5]
☐ ☐ -DETRITUS [3]
☐ ☐ -ARTIFICIAL [0]
☒ ☐ -SILT [2] 50

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☒ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate 2.5 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
___ UNDERCUT BANKS [1]
1 OVERHANGING VEGETATION [1]
___ SHALLOWS (IN SLOW WATER) [1]
___ ROOTMATS [1]

TYPE: Score All That Occur
1 POOLS > 70 cm [2]
___ ROOTWADS [1]
___ BOULDERS [1]

___ OXBOWS, BACKWATERS [1]
___ AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover 7 Max 20

COMMENTS: for scoring this metric, we consider instream cover types as present/absent and use the overall cover metric score.

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☒ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILITY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel 7 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☒ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]
avg = 3

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) LR
L R (Most Predominant Per Bank)
☐ ☒ -FOREST, SWAMP [3]
☒ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]

L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☒ ☒ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION
L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☐ -MODERATE [2]
☐ ☒ -HEAVY / SEVERE [1]

COMMENTS: avg = 0 avg = 1.5

Riparian 4.5 Max 10

Pool/Glide Quality

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH
(Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY
(Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!)
(Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current 10 Max 12

COMMENTS:

Riffle/Run Quality

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☒ -NO RIFFLE but RUNS present [0]
X ☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☒ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run 0 Max 8

COMMENTS: No Riffle/Run present. All Pool. W/ stagnant water present.

6.) GRADIENT (ft / mi): -18.7 DRAINAGE AREA (sq mi): 2622.9 % POOL: 100 % GLIDE:
% RIFFLE: % RUN:

Gradient 10 Max 10
Gradient Score from Table 2 of Users Manual based on gradient and drainage area

*Best areas must be large enough to support a population of riffle-obligate species

Gradient assumed for ≈ 6 to be zero, for purposes of scoring metric from Table 2.

OhioEPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 35.5

Stream & Location: Site 21 Rush River Upper Reach **RM:** __ . __ **Date:** 09/13/~~08~~ 11

Scorers Full Name & Affiliation: KP, GP, NB

River Code: __ - __ - __ **STORET #:** ______ **Lat./ Long.:** (NAD 83 - decimal °) __ . ____ /8__ . ____ **Office verified location** ☐

1] SUBSTRATE

Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☒ ☒ HARDPAN [4]	95	95
☐ ☐ BOULDER [9]			☐ ☐ DETRITUS [3]		
☐ ☐ COBBLE [8]			☐ ☐ MUCK [2]		
☐ ☐ GRAVEL [7]			☐ ■ SILT [2]	5	5
☐ ☐ SAND [6]			☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☒ TILLS [1]
- ☐ WETLANDS [0]
- ☒ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ☒ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☒ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 5.5 Maximum 20

2] INSTREAM COVER

Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
0 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]
0 POOLS > 70cm [2]
0 ROOTWADS [1]
0 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
0 AQUATIC MACROPHYTES [1]
0 LOGS OR WOODY DEBRIS [1]

AMOUNT

Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☒ NEARLY ABSENT <5% [1]

Comments For scoring this metric, we consider instream cover types as present/absent + use overall cover metric score.

Cover [illegible] 2 Maximum 20

3] CHANNEL MORPHOLOGY

Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☒ FAIR [3]	☐ RECOVERING [3]	☒ LOW [1]
☒ NONE [1]	■ POOR [1]	☒ RECENT OR NO RECOVERY [1]	

Comments

Channel 6 Maximum 20

4] BANK EROSION AND RIPARIAN ZONE

Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L R	RIPARIAN WIDTH L R	FLOOD PLAIN QUALITY L R	L R
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
☐ ☐ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☒ ☒ HEAVY / SEVERE [1]	☒ ☒ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	
	☐ ☐ NONE [0]	☒ ☒ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian 3 Maximum 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH

Check ONE (ONLY!)
- ☐ > 1m [6]
- ☒ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH

Check ONE (Or 2 & average)
- ☒ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ■ POOL WIDTH ≠ RIFFLE WIDTH [0]

<

CURRENT VELOCITY

Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☐ MODERATE [1]
- ☒ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 7 Maximum 12

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average).

☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☒ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☒ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☒ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☐ MODERATE [0]
- ☒ EXTENSIVE [-1]

Comments

Riffle / Run 2 Maximum 8

6] GRADIENT (1.8 ft/mi)

DRAINAGE AREA (>622.9 mi²)

- ■ VERY LOW - LOW [2-4]
- ☒ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: 0 %GLIDE: 90
%RUN: [illegible] %RIFFLE: 10

Gradient [illegible] 10 Maximum 10

EPA 4520 Mod = 10 06/16/06

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☒ WADE
- ☒ L. LINE
- ☐ OTHER

STAGE
1st -sample pass- 2nd
- ☐ HIGH ☐
- ☐ UP ☐
- ☒ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE
- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☒ OTHER

407.5
meters

CLARITY
1st --sample pass-- 2nd
- ☒ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ■ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

CANOPY
- ☒ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

pass 1st ________ cm
2nd ________ cm

C] RECREATION
AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS
- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☒ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE
Circle some & *COMMENT*

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
[✓ FLOOD CONTROL / DRAINAGE]

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / [✓ EROSION] / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_2O / TILE / H_2O TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
$\bar{x}$ width
$\bar{x}$ depth
max. depth
$\bar{x}$ bankfull width
bankfull $\bar{x}$ depth
W/D ratio
bankfull max. depth
floodprone x^2 width
entrench. ratio
Legacy Tree:

Stream Drawing:

Field Recording Form for Biological Monitoring
North Dakota Department of Health
Division of Water Quality-SWQMP
Telephone: 701.328.5210
Fax: 701.328.5200

SITE ID: Site 21

DATE: 09 / 13 / 11

FIELD NUMBER:

SAMPLERS: KP GP + NB

STATION DESCRIPTION: Rush River, upper end

Downstream End **~~LATITUDE~~:** N 5204396.911m, E651309.593m Upstream End: **~~LONGITUDE:~~** N 5204069.950m, E 651112.660m

ECOREGION (circle one): 43 42 46 48

INVERTEBRATE COLLECTION METHOD (circle one): [✓ D-NET] OTHER

REACH LENGTH: KP ~~405.4~~ 407.5 **M**

see MPCA Habitat info

STREAM HABITAT TYPE (%):	RIFFLE:	POOL:	SNAG:	UNDERCUT BANK:
	AQUATIC VEG:	OVERHANG VEG:	OTHER:	

FIELD WATER CHEMISTRY		**SITE PHOTOS**	
TEMP:	16.0 °C	UPSTREAM:	See Photo logs
DO:	4.67 mg/L	DOWNSTREAM:	〃
pH:	7.50		
COND:	1.29 S/cm		

WEATHER CONDITIONS (Temp., Wind, etc.): Sunny Clear, Temp 50°F Wind 15-20 mph

COMMENTS:

Figure 7.17.3. Macroinvertebrate Field Collection Data Recording Form

SITE DRAWING (Show direction of water flow and north)
COMMENTS:

Figure 7.17.3 ctd. Macroinvertebrate Field Collection Data Recording Form (reverse).

STATION FEATURES

MPCA

Field Number: Site 21 Date(mm/dd/yy): 09/13/11 Crew: KP, GP, NB

DISTANCE FROM START (~~m~~) ft	STREAM FEATURE (Riffle, Pool, Run, Bend Log Jam, etc.) *	LENGTH (~~m~~) ft
0	Run	596'
596	Riffle	15'
611	Run	20
631	Riffle	20
651	Run	686

DISTANCE SUMMARY

Distance Between Bends(m):		Distance Between Riffles(~~m~~ ft):	
1st - 2nd:		1st - 2nd:	20
2nd - 3rd:		2nd - 3rd:	
3rd - 4th:		3rd - 4th:	
4th - 5th:		4th - 5th:	
5th - 6th:		5th - 6th:	
6th - 7th:		6th - 7th:	
7th - 8th:		7th - 8th:	
8th - 9th:		8th - 9th:	
9th - 10th:		9th - 10th:	
10th - 11th:		10th - 11th:	
11th - 12th:		11th - 12th:	
12th - 13th:		12th - 13th:	
13th - 14th:		13th - 14th:	
14th - 15th:		14th - 15th:	
Sum:	0	Sum:	20'
Mean:	0	Mean:	20'

Length (~~m~~ ft) Of Individual Riffles, Pools, And Runs:

1st Riffle:	15	1st Pool:		1st Run:	596
2nd Riffle:	20	2nd Pool:		2nd Run:	20
3rd Riffle:		3rd Pool:		3rd Run:	686
4th Riffle:		4th Pool:		4th Run:	
5th Riffle:		5th Pool:		5th Run:	
6th Riffle:		6th Pool:		6th Run:	
7th Riffle:		7th Pool:		7th Run:	
8th Riffle:		8th Pool:		8th Run:	
9th Riffle:		9th Pool:		9th Run:	
10th Riffle:		10th Pool:		10th Run:	
11th Riffle:		11th Pool:		11th Run:	
12th Riffle:		12th Pool:		12th Run:	
13th Riffle:		13th Pool:		13th Run:	
14th Riffle:		14th Pool:		14th Run:	
15th Riffle:		15th Pool:		15th Run:	
Sum:	~~17.5~~ 35	Sum:		Sum:	~~434~~ 1302

* For riffles, runs, and pools note distance from start at beginning of feature. For bends, log jams, etc., note center-point.

(Revised Dec. 2002)

Station Features Continued:

DISTANCE FROM START (m)	STREAM FEATURE (Bend, Riffle, Pool, Run, Log Jam, etc.) *	LENGTH (m)
0		

VISIT SUMMARY

MPCA

LOCATION INFORMATION

Field Number: 11RR021 Date (mm/dd/yy): 09/13/11 Stream Name: Rush River

Location: Site 21 Rush River Upstream Loc County: ______

Visit Result (circle one): [✓ Reportable] - Replicate - Other (explain) ______

GPS File Name: Fargo_Fisheries_091311 Type of GPS Fix: ☐ 2D ☒ 3D PDOP: ______
(only if GPS taken during visit)

Data Source: USACE Project: Fargo Fisheries

FIELD WATER CHEMISTRY

Time (24 hr clock): 0930 Air Temp.(°C): 8.9 Water Temp.(°C): 16.0

Conductivity (~~umhos~~@25°C): 1.29 mS/cm Dissolved Oxygen (mg/l): 4.67

Turbidity (ntu): 93.7 pH: 7.50 Stream Flow (m³/s): [redacted] 0.07

Transparency Tube (cm): 12 Water Level: ☒ Normal ☐ Below_____(m) ☐ Above_____(m)

LAB WATER CHEMISTRY

Collection Time (field sample): — Collection Time (field duplicate): —

CHANNEL CHARACTERISTICS

Transect Spacing (m): 31.3 Station Length (m) (from stream features form): 407.5

Channel Condition (check appropriate box):

☐ Natural Channel ☒ Old Channelization ☐ Recent Channelization ☐ Concrete Channel

Mean Distance Between Bends (m): — Mean Distance Between Riffles (~~m~~ ft): 20

Total Length (Sum) of All (~~m~~ ft): Riffles: 20 Pools: — Runs: 1302

Total Number of: Riffles: 2 Pools: 0 Runs: 3 Bends: 0 Log Jams: 0

COMMENTS/NOTES: Channelized stream w/ ditch-like qualities

Depth M | Vel M/S

Flow Measure

0	0.00	LB
0.27	0.02	0.0054
0.27	0.03	0.0081
0.33	0.06	0.0198
0.43	0.08	0.0344
0.46	0.06	0.0276
0.37	0.06	0.0222
0.21	0.00	0.00
0.15	0.00	0.00
0	0	RB

Width = 5.2 m

(Revised Dec. 2002)

TRANSECT **MPCA**

Field Number: Site 21 Date (mm/dd/yy): 9/13/11 Transect Number (1-13): 1

Crew: KP, GP, NB Distance from Start (m): 15

Stream Width (m): 5.5 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	10	42	52	36	52
Depth of Fines and Water (cm)	11	42	52	38	52
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect **(over at least 10 cm water depth)** with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil, **within 5 m of waters edge**, along transect:*
LEFT BANK *: 0.8 (m) RIGHT BANK *: 0.8 (m)

Riparian Land Use: *Dominant land use **within 30 m of stream edge** (along transect): **(L / R)** **
X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock
__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Land Use: *Dominant land use **from 30 to 100 m of stream edge** (along transect): **(L / R)** **
X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock
__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect, **within 10 m of stream:***
LEFT BANK *: 5 (m) RIGHT BANK *: 5 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 21 Date (mm/dd/yy): 09/13/11 Transect Number (1-13): 2

Crew: KP, GP, NB Distance from Start (m): [redacted] 46

Stream Width (m): 5.0 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	20	48	55	42	55
Depth of Fines and Water (cm)	20	48	56	43	56
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*
LEFT BANK *: 1.0 (m) RIGHT BANK *: 1.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 5 (m) RIGHT BANK *: 5 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):
0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 21

Date (mm/dd/yy): 09/13/11

Transect Number (1-13): 3

Crew: KP, GP, NB

Distance from Start (m): 77

Stream Width (m): 4,4

Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	38	54	58	54	58
Depth of Fines and Water (cm)	38	54	59	54	59
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):________

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*

LEFT BANK *: 1,0 (m) RIGHT BANK *: 1,0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):________

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):________

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 5 (m) RIGHT BANK *: 5 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 21 Date (mm/dd/yy): 09/13/11 Transect Number (1-13): 4

Crew: KP, GP, NB Distance from Start (m): 108

Stream Width (m): 3.7 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	25	38	49	41	49
Depth of Fines and Water (cm)	25	39	49	43	49
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify): ____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 1.0 (m) RIGHT BANK *: 1.5 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify): ____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify): ____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 5 (m) RIGHT BANK *: 5 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 21 Date (mm/dd/yy): 09/13/11 Transect Number (1-13): 5

Crew: KP, GP, NB Distance from Start (m): 139

Stream Width (m): 3.7 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	43	46	64	29	64
Depth of Fines and Water (cm)	48	46	66	30	66
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

5 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify): ____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*

LEFT BANK *: 1.1 (m) RIGHT BANK *: 1.5 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland ___/___ Pasture ___/___ Barnyard ___/___ Developed ___/___ Exposed Rock

___/___ Meadow ___/___ Shrubs ___/___ Woodland ___/___ Wetland ___/___ Other (specify): ____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland ___/___ Pasture ___/___ Barnyard ___/___ Developed ___/___ Exposed Rock

___/___ Meadow ___/___ Shrubs ___/___ Woodland ___/___ Wetland ___/___ Other (specify): ____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 4 (m) RIGHT BANK *: 5 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 21 Date (mm/dd/yy): 09/13/11 Transect Number (1-13): 6

Crew: KP, GP, NB Distance from Start (m): 170

Stream Width (m): 2.9 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	43	46	64	29	64
Depth of Fines and Water (cm)	48	46	68	30	68
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*

LEFT BANK *: 0.9 (m) RIGHT BANK *: 2.8 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 5 (m) RIGHT BANK *: 6 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 21 Date (mm/dd/yy): 09/13/11 Transect Number (1-13): 7

Crew: KP, GP, NB Distance from Start (m): 201

Stream Width (m): 2.7 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	43	39	40	25	43
Depth of Fines and Water (cm)	43	41	43	35	43
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt				X	
Clay	X	X	X		X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect **(over at least 10 cm water depth)** with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):__________

Bank Erosion: *Length (nearest 0.1 m) of bare soil, **within 5 m of waters edge**, along transect:*

LEFT BANK *: 0.9 (m) RIGHT BANK *: 3.6 (m)

Riparian Land Use: *Dominant land use **within 30 m of stream edge** (along transect): **(L / R)** **

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):__________

Riparian Land Use: *Dominant land use **from 30 to 100 m of stream edge** (along transect): **(L / R)** **

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):__________

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect, **within 10 m of stream:***

LEFT BANK *: 4 (m) RIGHT BANK *: 6 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 21 Date (mm/dd/yy): 09/13/11 Transect Number (1-13): 8

Crew: KP, GP, NB Distance from Start (m): 232

Stream Width (m): 4.6 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	20	29	41	42	42
Depth of Fines and Water (cm)	21	36	44	43	43
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt		X			
Clay	X		X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*

LEFT BANK *: 2.0 (m) RIGHT BANK *: 2.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 4 (m) RIGHT BANK *: 6 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 21 Date (mm/dd/yy): 09/13/11 Transect Number (1-13): 9

Crew: KP, GB, NB Distance from Start (m): 263

Stream Width (m): [redacted] 3.7 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	21	35	33	29	35
Depth of Fines and Water (cm)	26	35	33	31	35
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X				
Clay		X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 1.0 (m) RIGHT BANK *: 2.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 5 (m) RIGHT BANK *: 6 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):
0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: 5,7e 21 Date (mm/dd/yy): 09/13/11 Transect Number (1-13): 10

Crew: KP, GP, NB Distance from Start (m): 294

Stream Width (m): 4.3 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position **(fifths of wetted stream width and deepest point, 0 = rightbank *)**	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	31	43	57	37	57
Depth of Fines and Water (cm)	33	50	58	38	58
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position **(fifths of wetted stream width and deepest point, 0 = rightbank *)**	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt		X			
Clay	X		X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position **(fifths of wetted stream width and deepest point, 0 = rightbank *)**	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify): ____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 2.5 (m) RIGHT BANK *: 3.5 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify): ____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify): ____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 1 (m) RIGHT BANK *: 1 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 21 Date (mm/dd/yy): 09 Transect Number (1-13): 11

Crew: KP, GG, NB Distance from Start (m): 325

Stream Width (m): 3.7 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	38	54	28	30	54
Depth of Fines and Water (cm)	38	56	30	36	56
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt				X	
Clay	X	X	X		X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):___

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*

LEFT BANK *: 1.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):___

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):___

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 6 (m) RIGHT BANK *: 1 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 21 Date (mm/dd/yy): 08/13/11 Transect Number (1-13): 12

Crew: KP, GP, NB Distance from Start (m): 336

Stream Width (m): 3.1 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	18	52	57	39	57
Depth of Fines and Water (cm)	19	53	57	41	57
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 6 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 1.0 (m) RIGHT BANK *: 3.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 6 (m) RIGHT BANK *: 3 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):
1 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 21 Date (mm/dd/yy): 09/13/11 Transect Number (1-13): 13

Crew: KP, GP, NB Distance from Start (m): 367

Stream Width (m): 2.6 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	46	50	37	40	50
Depth of Fines and Water (cm)	51	53	38	43	53
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X				
Clay		X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

7 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):________

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*

LEFT BANK *: 0.6 (m) RIGHT BANK *: 0.6 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):________

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):________

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 7 (m) RIGHT BANK *: 3 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

OhioEPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 16

Stream & Location: Rush River Site 22 **RM:** __ __ . __ **Date:** 09/12/[illegible]11

Scorers Full Name & Affiliation: Kevin Pulley URS

River Code: __ - __ - __ **STORET #:** __ **Lat./ Long.:** (NAD 83 - decimal °) __ . __ /8_ . __ Office verified location ☐

1] SUBSTRATE
Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☐ ☐ HARDPAN [4]	5	
☐ ☐ BOULDER [9]			☐ ☐ DETRITUS [3]		
☐ ☐ COBBLE [8]			☐ ☐ MUCK [2]		
☐ ☐ GRAVEL [7]			☒ ☒ SILT [2]	95	
☐ ☐ SAND [6]			☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☒ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☒ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☒ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 1 *Maximum 20*

2] INSTREAM COVER
Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]
__ OVERHANGING VEGETATION [1]
__ SHALLOWS (IN SLOW WATER) [1]
__ ROOTMATS [1]
__ POOLS > 70cm [2]
__ ROOTWADS [1]
__ BOULDERS [1]
__ OXBOWS, BACKWATERS [1]
__ AQUATIC MACROPHYTES [1]
__ LOGS OR WOODY DEBRIS [1]

AMOUNT
Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☒ NEARLY ABSENT <5% [1]

Comments For scoring this metric, we consider instream cover types as present/absent & use overall cover metric score

Cover 2 *Maximum 20*

3] CHANNEL MORPHOLOGY
Check ONE in each category (*Or 2 & average*)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☒ LOW [1]
☒ NONE [1]	☒ POOR [1]	☒ RECENT OR NO RECOVERY [1]	

Comments

Channel 4 *Maximum 20*

4] BANK EROSION AND RIPARIAN ZONE
Check ONE in each category for *EACH BANK* (*Or 2 per bank & average*)

River right looking downstream

L R EROSION	L R RIPARIAN WIDTH	L R FLOOD PLAIN QUALITY	L R
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
☐ ☐ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☒ ☒ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	*Indicate predominant land use(s) past 100m riparian.*
	☒ ☒ NONE [0]	☒ ☒ OPEN PASTURE, ROWCROP [0]	

Comments Riparian zone did not include woody vegetation, therefore scored zero

Riparian 1 *Maximum 10*

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check ONE (*ONLY!*)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☒ < 0.2m [0]

CHANNEL WIDTH
Check ONE (*Or 2 & average*)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☒ POOL WIDTH = RIFFLE WIDTH [1]
- ■ POOL WIDTH > RIFFLE WIDTH [0] <

CURRENT VELOCITY
Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☐ MODERATE [1]
- ☒ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 2 *Maximum 12*

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☒ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☒ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☒ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☒ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☐ MODERATE [0]
- ☒ EXTENSIVE [-1]

Comments Reach did not contain riffles, therefore scored zero.

Riffle / Run 0 *Maximum 8*

6] GRADIENT
(-15.2 ft/mi) ☐ VERY LOW - LOW [2-4]
DRAINAGE AREA (>622.9 mi²) ☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 0 %GLIDE: 100
%RUN: [illegible] %RIFFLE: 0

Gradient 6 *Maximum 10*

EPA 4520 Low = 6 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD
☐ BOAT
☐ WADE
☐ L. LINE
☐ OTHER

DISTANCE
☐ 0.5 Km
☐ 0.2 Km
☐ 0.15 Km
☐ 0.12 Km
☒ OTHER
_______ meters

STAGE
1st -sample pass- 2nd
☐ HIGH ☐
☒ UP ☐
☐ NORMAL ☐
☐ LOW ☐
☐ DRY ☐

CLARITY
1st --sample pass-- 2nd
☐ < 20 cm ☐
☐ 20-<40 cm ☐
☐ 40-70 cm ☐
☒ > 70 cm/ CTB ☐
☐ SECCHI DEPTH ☐

CANOPY
☒ ≥ 85%- OPEN
☐ 55%-<85%
☐ 30%-<55%
☐ 10%-<30%
☐ <10%- CLOSED

pass
1st_________ cm
2nd_________ cm

C] RECREATION

AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

☐ NUISANCE ALGAE
☐ INVASIVE MACROPHYTES
☒ EXCESS TURBIDITY
☐ DISCOLORATION
☐ FOAM / SCUM
☐ OIL SHEEN
☐ TRASH / LITTER
☐ NUISANCE ODOR
☐ SLUDGE DEPOSITS
☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / [✓ BOTH] / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

Circle some & *COMMENT*

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / [✓ EROSION] / SURFACE
FALSE BANK / MANURE / LAGOON
WASH $H_2$0 / [✓ TILE] / $H_2$0 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

$\bar{x}$ width
$\bar{x}$ depth
max. depth
$\bar{x}$ bankfull width
bankfull $\bar{x}$ depth
W/D ratio
bankfull max. depth
floodprone x^2 width
entrench. ratio
Legacy Tree:

Stream Drawing:

Field Recording Form for Biological Monitoring
North Dakota Department of Health
Division of Water Quality-SWQMP
Telephone: 701.328.5210
Fax: 701.328.5200

SITE ID: Site 22

DATE: 09 / 12 / 11

FIELD NUMBER: 11RR022

SAMPLERS: KP, GP, NB

STATION DESCRIPTION: FootPrint Location @ lower End of Rush River

Downstream End **~~LATITUDE~~:** N5206853.616 m, E657794.353m **~~LONGITUDE~~:** UPSTREAMEND, N5207042.626m, E657402.174m

ECOREGION (circle one): 43 42 46 48

INVERTEBRATE COLLECTION METHOD (circle one): [✓ D-NET] OTHER

REACH LENGTH: ~~448~~ m M
448.7m

STREAM HABITAT TYPE (%):	RIFFLE:		POOL:		SNAG:		UNDERCUT BANK:
	AQUATIC VEG:		OVERHANG VEG:		OTHER: Run: 100%		

FIELD WATER CHEMISTRY		**SITE PHOTOS**	
TEMP:	20.7 °C	UPSTREAM:	See Photo Log
DO:	5.46 mg/L	DOWNSTREAM:	
pH:	7.67		
COND:	1.35 S/cm		

WEATHER CONDITIONS (Temp., Wind, etc.): 21.1 °C, Clear, strong wind (~30mph)

COMMENTS:

Figure 7.17.3. Macroinvertebrate Field Collection Data Recording Form

SITE DRAWING (Show direction of water flow and north)

COMMENTS:

Figure 7.17.3 ctd. Macroinvertebrate Field Collection Data Recording Form (reverse).

STATION FEATURES

MPCA

Field Number: 22

Date(mm/dd/yy): 09/12/11

Crew: KB, NB, GP

DISTANCE FROM START (m)	STREAM FEATURE (Riffle, Pool, Run, Bend Log Jam, etc.) *	LENGTH (m)
0	Run	448.7

DISTANCE SUMMARY

Distance Between Bends(m):

1st - 2nd: 0
2nd - 3rd:
3rd - 4th:
4th - 5th:
5th - 6th:
6th - 7th:
7th - 8th:
8th - 9th:
9th - 10th:
10th - 11th:
11th - 12th:
12th - 13th:
13th - 14th:
14th - 15th:

Sum: 0

Mean: —

Distance Between Riffles(m):

1st - 2nd: 0
2nd - 3rd:
3rd - 4th:
4th - 5th:
5th - 6th:
6th - 7th:
7th - 8th:
8th - 9th:
9th - 10th:
10th - 11th:
11th - 12th:
12th - 13th:
13th - 14th:
14th - 15th:

Sum: 0

Mean: —

Length (m) Of Individual Riffles, Pools, And Runs:

1st Riffle: 0
2nd Riffle:
3rd Riffle:
4th Riffle:
5th Riffle:
6th Riffle:
7th Riffle:
8th Riffle:
9th Riffle:
10th Riffle:
11th Riffle:
12th Riffle:
13th Riffle:
14th Riffle:
15th Riffle:

Sum: 0

1st Pool: 0
2nd Pool:
3rd Pool:
4th Pool:
5th Pool:
6th Pool:
7th Pool:
8th Pool:
9th Pool:
10th Pool:
11th Pool:
12th Pool:
13th Pool:
14th Pool:
15th Pool:

Sum: 0

1st Run: 448.7
2nd Run:
3rd Run:
4th Run:
5th Run:
6th Run:
7th Run:
8th Run:
9th Run:
10th Run:
11th Run:
12th Run:
13th Run:
14th Run:
15th Run:

Sum: 448.7

* For riffles, runs, and pools note distance from start at beginning of feature. For bends, log jams, etc., note center-point.

(Revised Dec. 2002)

Station Features Continued:

DISTANCE FROM START (m)	STREAM FEATURE (Bend, Riffle, Pool, Run, Log Jam, etc.) *	LENGTH (m)
0		

VISIT SUMMARY MPCA

LOCATION INFORMATION ==

Field Number: 11RR022 Date (mm/dd/yy): 09/12/11 Stream Name: Rush River

Location: Site 22 (FootPrint Location) County: Cass

Visit Result (circle one): [✓ Reportable] - Replicate - Other (explain)

GPS File Name: Fargo_Fisheries_091211 Type of GPS Fix: ☐ 2D ☒ 3D PDOP:
(only if GPS taken during visit)

Data Source: USACE Project: Fargo Fisheries

FIELD WATER CHEMISTRY ==

Time (24 hr clock): 0848 Air Temp.(°C): 21.1 Water Temp.(°C): 20.7

Conductivity (~~umhos~~@25°C): 1.35 mS/cm Dissolved Oxygen (mg/l): 5.46

Turbidity (ntu): 155 pH: 7.67 Stream Flow (m^3/s): 0.06

Transparency Tube (cm): ~~79~~ KP 21 Water Level: ☒ Normal ☐ Below______(m) ☐ Above______(m)

LAB WATER CHEMISTRY ==

Collection Time (field sample): NA Collection Time (field duplicate): NA

CHANNEL CHARACTERISTICS ==

Transect Spacing (m): 34.5 Station Length (m) (from stream features form): 448.7

Channel Condition (check appropriate box):

☐ Natural Channel ☒ Old Channelization ☐ Recent Channelization ☐ Concrete Channel

Mean Distance Between Bends (m): 0 Mean Distance Between Riffles (m): 0

Total Length (Sum) of All (m): Riffles: 0 Pools: 0 Runs: 448.7

Total Number of: Riffles: 0 Pools: 0 Runs: 1 Bends: 0 Log Jams: 0

COMMENTS/NOTES: Straight/Channelized stream, no definable bends/riffles/Pools

(Revised Dec. 2002)

TRANSECT

MPCA

Field Number: Site 22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 1

Crew: KP, GP, NB Distance from Start (m): 34.5

Stream Width (m): 7.3 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	29	44	49	43	49
Depth of Fines and Water (cm)	47	53	82	45	82
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X	X	X	X
Clay					
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect **(over at least 10 cm water depth)** with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):__________

Bank Erosion: *Length (nearest 0.1 m) of bare soil, **within 5 m of waters edge**, along transect:*
LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use **within 30 m of stream edge** (along transect): **(L / R)** **
X/___Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/X Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):__________

Riparian Land Use: *Dominant land use **from 30 to 100 m of stream edge** (along transect): **(L / R)** **
X/___Cropland ___/___Pasture ___/X Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):__________

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect, **within 10 m of stream:***
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):
0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 2

Crew: KP, GP, NB Distance from Start (m): 69

Stream Width (m): 7.6 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	46	54	39	40	54
Depth of Fines and Water (cm)	61	62	56	48	62
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X	X	X	X
Clay					
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):______

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*

LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):______

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):______

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 2 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 3

Crew: KP, GP, NB Distance from Start (m): 103.5

Stream Width (m): 4.3 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	38	45	43	37	45
Depth of Fines and Water (cm)	59	63	63	38	63
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X	X		X
Clay				X	
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):________

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):________

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):________

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 4

Crew: KP, GP, NB Distance from Start (m): 138

Stream Width (m): 4.9 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	25	51	51	50	51
Depth of Fines and Water (cm)	28	78	70	65	78
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt		X	X	X	X
Clay	X				
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*

LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

X/X Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock

__/__Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X/X Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock

__/__Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

TRANSECT **MPCA**

Field Number: Site 22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 5

Crew: KP, GP, NB Distance from Start (m): 172.5

Stream Width (m): 6.4 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	69	71	68	40	71
Depth of Fines and Water (cm)	73	78	72	40	78
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt		X			X
Clay	X		X	X	
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 6 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: 5,7e22 Date (mm/dd/yy): 09/12/11 Transcect Number (1-13): 6

Crew: KB, NB, GP Distance from Start (m): 207

Stream Width (m): 4.6 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	27	47	15	29	47
Depth of Fines and Water (cm)	27	48	15	39	48
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt				X	
Clay	X	X	X		X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):___

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*

LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):___

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):___

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 22 Date (mm/dd/yy): 07/12/11 Transect Number (1-13): 7

Crew: KB, NB, GB Distance from Start (m): 24.5

Stream Width (m): 4,0 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	28	33	38	26	38
Depth of Fines and Water (cm)	40	33	44	32	44
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X		X	X	X
Clay		X			
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*

LEFT BANK *: 5,0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock

__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock

__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 22 Date (mm/dd/yy): 09/12/14 Transcript Number (1-13): 8

Crew: KP, NB, GP Distance from Start (m): 276

Stream Width (m): 5.3 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	49	67	59	44	67
Depth of Fines and Water (cm)	52	72	62	51	72
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt		X		X	X
Clay	X		X		
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*
LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: 5.7e 22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 9

Crew: KP, GP, NB Distance from Start (m): 310.5

Stream Width (m): 4.7 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	45	58	58	38	58
Depth of Fines and Water (cm)	55	66	63	38	66
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X	X		X
Clay				X	
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*

LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock

__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock

__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 10

Crew: KP, NB, GP Distance from Start (m): 345

Stream Width (m): 6.1 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	31	29	33	32	33
Depth of Fines and Water (cm)	42	38	38	41	38
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X	X	X	X
Clay					
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*
LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock
__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock
__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 11

Crew: KP, NB, GP Distance from Start (m): 379.5

Stream Width (m): 7.2 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	28	28	26	21	28
Depth of Fines and Water (cm)	48	50	31	21	50
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X	X		X
Clay				X	
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 5.0 (m) RIGHT BANK *: 3.5 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 12

Crew: KP, NB, GP Distance from Start (m): 414

Stream Width (m): 5.9 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	39	47	46	35	47
Depth of Fines and Water (cm)	53	56	48	37	56
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X			X
Clay			X	X	
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
3 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock
__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock
__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):
0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: 5.7e22 Date (mm/dd/yy): 09/12/11 Transect Number (1-13): 13

Crew: KP, GP, NB Distance from Start (m): 448.5

Stream Width (m): 3.5 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	10	19	18	17	19
Depth of Fines and Water (cm)	24	46	38	27	46
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X	X	X	X
Clay					
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)					
Macrophytes (nearest 5%)					

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):______

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 5.0 (m) RIGHT BANK *: 5.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):______

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):______

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

OhioEPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 41.5

Stream & Location: Site 23 **RM:** _ _ . _ **Date:** 09 / 14 / ~~08~~ 11

Scorers Full Name & Affiliation: Kevin Pulley URS

River Code: _ _ - _ _ _ - _ _ _ **STORET #:** _ _ _ _ _ _ **Lat./ Long.:** (NAD 83 - decimal °) _ _ . _ _ _ _ _ /8 _ . _ _ _ _ _ Office verified location ☐

1] SUBSTRATE

Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☒ ☐ HARDPAN [4]	70	
☐ ☐ BOULDER [9]			☐ ☐ DETRITUS [3]		
☐ ☐ COBBLE [8]			☐ ☐ MUCK [2]		
☐ ☐ GRAVEL [7]			☒ ☐ SILT [2]	30	
☐ ☐ SAND [6]			☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☒ TILLS [1]
- ☐ WETLANDS [0]
- ☒ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ☒ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☒ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 3.5 *Maximum 20*

2] INSTREAM COVER

Indicate presence 0 to 3: **0**-Absent; **1**-Very small amounts or if more common of marginal quality; **2**-Moderate amounts, but not of highest quality or in small amounts of highest quality; **3**-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

1 UNDERCUT BANKS [1]
2 OVERHANGING VEGETATION [1]
__ SHALLOWS (IN SLOW WATER) [1]
__ ROOTMATS [1]
__ POOLS > 70cm [2]
__ ROOTWADS [1]
1 BOULDERS [1]
__ OXBOWS, BACKWATERS [1]
__ AQUATIC MACROPHYTES [1]
__ LOGS OR WOODY DEBRIS [1]

AMOUNT

Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☒ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments For scoring this metric, we consider instream cover types as present/absent & use overall cover metric score.

Cover 6 *Maximum 20*

3] CHANNEL MORPHOLOGY

Check ONE in each category (*Or 2 & average*)

SINUOSITY
- ☐ HIGH [4]
- ☐ MODERATE [3]
- ☒ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☐ GOOD [5]
- ☑ FAIR [3]
- ☒ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ☒ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☒ HIGH [3]
- ☐ MODERATE [2]
- ☐ LOW [1]

Comments

Channel 9 *Maximum 20*

4] BANK EROSION AND RIPARIAN ZONE

Check **ONE** in each category for ***EACH BANK*** (*Or 2 per bank & average*)

River right looking downstream

EROSION (L R)
- ☒ ☒ NONE / LITTLE [3]
- ☐ ☐ MODERATE [2]
- ☐ ☐ HEAVY / SEVERE [1]

RIPARIAN WIDTH (L R)
- ☐ ☐ WIDE > 50m [4]
- ☒ ☒ MODERATE 10-50m [3]
- ☐ ☐ NARROW 5-10m [2]
- ☐ ☐ VERY NARROW < 5m [1]
- ☐ ☐ NONE [0]

FLOOD PLAIN QUALITY (L R)
- ☐ ☐ FOREST, SWAMP [3]
- ■ ■ SHRUB OR OLD FIELD [2]
- ☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ FENCED PASTURE [1]
- ☒ ☒ OPEN PASTURE, ROWCROP [0]
- ☐ ☐ CONSERVATION TILLAGE [1]
- ☐ ☐ URBAN OR INDUSTRIAL [0]
- ☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian 6 *Maximum 10*

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH

Check ONE (*ONLY!*)
- ☒ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH

Check ONE (*Or 2 & average*)
- ☒ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ■ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY

Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☐ MODERATE [1]
- ☒ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 9 *Maximum 12*

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☒ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☒ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☒ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☒ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☐ MODERATE [0]
- ☒ EXTENSIVE [-1]

Comments small riffle at upstream end of reach. very High = 8

Riffle / Run 0 *Maximum 8*

6] GRADIENT

(10.8 ft/mi) DRAINAGE AREA (>622.9 mi²)

- ☐ VERY LOW - LOW [2-4]
- ☐ MODERATE [6-10]
- ☒ HIGH - VERY HIGH [10-6]

%POOL: %GLIDE: 95
%RUN: %RIFFLE: 5

Gradient ~~2~~ 8 *Maximum 10*

EPA 4520 06/16/06

The best riffle area is <5cm deep, therefore the entire riffle/run component is scored a zero.

A] SAMPLED REACH
Check ALL that apply

METHOD
☐ BOAT
☐ WADE
☒ L. LINE
☐ OTHER

STAGE

	1st -sample pass- 2nd	
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

DISTANCE
☐ 0.5 Km
☐ 0.2 Km
☐ 0.15 Km
☐ 0.12 Km
☐ OTHER

_______ meters

CLARITY

	1st —sample pass-- 2nd	
☒	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

pass 1st_________ cm
pass 2nd_________ cm

CANOPY
☐ >-85%- OPEN
☐ 55%-<85%
☐ 30%-<55%
☐ 10%-<30%
☐ <10%- CLOSED

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

C] RECREATION
AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

B] AESTHETICS
☐ NUISANCE ALGAE
☐ INVASIVE MACROPHYTES
☐ EXCESS TURBIDITY
☐ DISCOLORATION
☐ FOAM / SCUM
☐ OIL SHEEN
☐ TRASH / LITTER
☐ NUISANCE ODOR
☐ SLUDGE DEPOSITS
☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE
Circle some & *COMMENT*

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
$\bar{x}$ width
$\bar{x}$ depth
max. depth
$\bar{x}$ bankfull width
bankfull $\bar{x}$ depth
W/D ratio
bankfull max. depth
floodprone x^2 width
entrench. ratio
Legacy Tree:

Stream Drawing:

Field Recording Form for Biological Monitoring
North Dakota Department of Health
Division of Water Quality-SWQMP
Telephone: 701.328.5210
Fax: 701.328.5200

SITE ID: SITE 23

DATE: 09 / 14 / 11

FIELD NUMBER: 11WC023

SAMPLERS: KP, GP, NB

STATION DESCRIPTION: WOLVERTON Creek - FOOTPRINT SITE

Downstream End: ~~**LATITUDE:**~~ N5174504.459m, E670615.427m UPSTREAM END ~~**LONGITUDE:**~~ N5174234.589m, E670659.432m

ECOREGION (circle one): 43 42 46 48

INVERTEBRATE COLLECTION METHOD (circle one): [✓ D-NET] OTHER ____________

REACH LENGTH: 304 **M**

STREAM HABITAT TYPE (%):	RIFFLE:	POOL:	SNAG:	UNDERCUT BANK:
	AQUATIC VEG:	OVERHANG VEG:	OTHER:	

FIELD WATER CHEMISTRY	**SITE PHOTOS**
TEMP: 12.8 °C	UPSTREAM:
DO: 6.32 mg/L	DOWNSTREAM:
pH: 7.86	
COND: 1.06 s/cm	

WEATHER CONDITIONS (Temp., Wind, etc.): 41°F, Sunny Clear, Mod wind

COMMENTS:

Figure 7.17.3. Macroinvertebrate Field Collection Data Recording Form

SITE DRAWING (Show direction of water flow and north)
COMMENTS:

Figure 7.17.3 ctd. Macroinvertebrate Field Collection Data Recording Form (reverse).

STATION FEATURES

MPCA

Field Number: Site 23 Date(mm/dd/yy): 09/14/11 Crew: KP, GP, NB

DISTANCE FROM START (m)	STREAM FEATURE (Riffle, Pool, Run, Bend Log Jam, etc.) *	LENGTH (m)
0	Run	153
153	Bend	2
155	Run	66
221	Bend	4
225	Run	79
304		

DISTANCE SUMMARY

Distance Between Bends(m):

Begin - 1st ~~1st - 2nd~~: 153
1st - 2nd ~~2nd - 3rd~~: 66
2nd End ~~3rd - 4th~~: 79
4th - 5th:
5th - 6th:
6th - 7th:
7th - 8th:
8th - 9th:
9th - 10th:
10th - 11th:
11th - 12th:
12th - 13th:
13th - 14th:
14th - 15th:

Sum: 298

Mean: 99

Distance Between Riffles(m):

1st - 2nd:
2nd - 3rd:
3rd - 4th:
4th - 5th:
5th - 6th:
6th - 7th:
7th - 8th:
8th - 9th:
9th - 10th:
10th - 11th:
11th - 12th:
12th - 13th:
13th - 14th:
14th - 15th:

Sum:

Mean:

Length (m) Of Individual Riffles, Pools, And Runs:

1st Riffle:	1st Pool:	1st Run: 153
2nd Riffle:	2nd Pool:	2nd Run: 66
3rd Riffle:	3rd Pool:	3rd Run: 79
4th Riffle:	4th Pool:	4th Run:
5th Riffle:	5th Pool:	5th Run:
6th Riffle:	6th Pool:	6th Run:
7th Riffle:	7th Pool:	7th Run:
8th Riffle:	8th Pool:	8th Run:
9th Riffle:	9th Pool:	9th Run:
10th Riffle:	10th Pool:	10th Run:
11th Riffle:	11th Pool:	11th Run:
12th Riffle:	12th Pool:	12th Run:
13th Riffle:	13th Pool:	13th Run:
14th Riffle:	14th Pool:	14th Run:
15th Riffle:	15th Pool:	15th Run:
Sum:	Sum:	Sum: 298

* For riffles, runs, and pools note distance from start at beginning of feature. For bends, log jams, etc., note center-point.

Station Features Continued:

DISTANCE FROM START (m)	STREAM FEATURE (Bend, Riffle, Pool, Run, Log Jam, etc.) *	LENGTH (m)
0		

VISIT SUMMARY MPCA

LOCATION INFORMATION

Field Number: 11WC023 Date (mm/dd/yy): 09/14/11 Stream Name: Wolverton Creek

Location: Site 23 County: CLAY

Visit Result (circle one): [✓ Reportable] - Replicate - Other (explain)

GPS File Name: Fargo_Fisheries_09144 Type of GPS Fix: ☐ 2D ☒ 3D PDOP:
(only if GPS taken during visit)

Data Source: USACE Project: FARGO FISHERIES

FIELD WATER CHEMISTRY

Time (24 hr clock): 0905 Air Temp.(°C): 5.0 Water Temp.(°C): 12.8

Conductivity ~~(umhos~~@25°C): 1.06 mS/cm Dissolved Oxygen (mg/l): 6.32

Turbidity (ntu): 74.8 pH: 7.86 Stream Flow (m^3/s): 0.01

Transparency Tube (cm): 9 Water Level: ☒ Normal ☐ Below ____ (m) ☐ Above ____ (m)

LAB WATER CHEMISTRY

Collection Time (field sample): — Collection Time (field duplicate): —

CHANNEL CHARACTERISTICS

Transect Spacing (m): 23.4 Station Length (m) (from stream features form): 304

Channel Condition (check appropriate box):

☒ Natural Channel ☐ Old Channelization ☐ Recent Channelization ☐ Concrete Channel

Mean Distance Between Bends (m): 99 Mean Distance Between Riffles (m): 0

Total Length (Sum) of All (m): Riffles: 0 Pools: 6 Runs: 298

Total Number of: Riffles: 0 Pools: 0 Runs: 3 Bends: 2 Log Jams:

COMMENTS/NOTES:

(Revised Dec. 2002)

TRANSECT MPCA

Field Number: Site 23 Date (mm/dd/yy): 9/14/11 Transect Number (1-13): 1

Crew: KP, GP, NB Distance from Start (m): 11.7

Stream Width (m): 5.4 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	76	104	110	113	113
Depth of Fines and Water (cm)	79	107	113	118	118
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt				X	
Clay	X	X	X		X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 15 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *
___/___Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
X / X Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 2

Crew: KP, GP, NB Distance from Start (m): 35.2

Stream Width (m): 5.4 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	24 KP	34	37	91	91
Depth of Fines and Water (cm)	39	49	52	100	100
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X	X	X	X
Clay					
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 15 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):______

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*

LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

__/__Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock

X/X Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):______

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X/X Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock

__/__Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):______

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 3

Crew: KP, GP, NB Distance from Start (m): 58.7

Stream Width (m): 8.5 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	85	79	98	18	98
Depth of Fines and Water (cm)	100	85	104	24	104
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X	X	X	X
Clay					
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 10 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *
X / ___ Cropland ___ / ___ Pasture ___ / ___ Barnyard ___ / ___ Developed ___ / ___ Exposed Rock
___ / X Meadow ___ / ___ Shrubs ___ / ___ Woodland ___ / ___ Wetland ___ / ___ Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland ___ / ___ Pasture ___ / ___ Barnyard ___ / ___ Developed ___ / ___ Exposed Rock
___ / ___ Meadow ___ / ___ Shrubs ___ / ___ Woodland ___ / ___ Wetland ___ / ___ Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):
0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 4

Crew: KP, GP, NB Distance from Start (m): 82.2

Stream Width (m): 5.0 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	37 [illegible]	79	52	24	79
Depth of Fines and Water (cm)	37	79	52	24	79
Embeddedness of Coarse Substrates (nearest 25%)	75 ~~100~~	~~100~~ 75	~~100~~ 75	~~100~~ 75	~~100~~ 75

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)	X	X	X	X	X
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay					
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*
LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
__/__Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock
X / X Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock
__/__Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):
0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 5

Crew: KP, GP, NB Distance from Start (m): 105.7

Stream Width (m): 4.6 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	18	76	91	76	91
Depth of Fines and Water (cm)	18	79	91	76	91
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 12 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):__________

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*

LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *

__/__Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock

X / X Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):__________

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock

__/__Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):__________

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 6

Crew: KP, GP, NB Distance from Start (m): 129.2

Stream Width (m): 5,5 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	49	94	76	46	94
Depth of Fines and Water (cm)	55	100	76	52	100
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt	X	X		X	X
Clay			X		
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 0 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):________

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*

LEFT BANK *: 2.0 (m) RIGHT BANK *: 0.6 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *

___/___Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

X / X Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):________

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):________

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 7

Crew: KP, GP, NB Distance from Start (m): 152.7

Stream Width (m): [illegible] 3.6 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	[illegible] 73	76	79	67	79
Depth of Fines and Water (cm)	73	76	82	70	82
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 20 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*

LEFT BANK *: 0 (m) RIGHT BANK *: 0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *

__/__Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock

X / X Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland __/__Pasture __/__Barnyard __/__Developed __/__Exposed Rock

__/__Meadow __/__Shrubs __/__Woodland __/__Wetland __/__Other (specify):____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 8

Crew: KP, GP, NB Distance from Start (m): 176.2

Stream Width (m): 4.9 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	67	58	37	21	67
Depth of Fines and Water (cm)	70	64	40	24	70
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt		X			
Clay	X		X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 5 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*

LEFT BANK *: 0.3 (m) RIGHT BANK *: 0.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *

__/__ Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock

X / X Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock

__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT **MPCA**

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 9

Crew: KP, GP, NB Distance from Start (m): 199.7

Stream Width (m): 2.7 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	70	91	76	46	91
Depth of Fines and Water (cm)	73	94	78	46	94
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

___Undercut Banks 10 Overhanging Vegetation ____Woody Debris ____Boulders

___Submergent Macrophytes ____Emergent Macrophytes ____Other (specify):____________

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*

LEFT BANK *: __________(m) RIGHT BANK *: __________ (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *

___/___Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

X / X Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):__________

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *

X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock

___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):__________

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 10

Crew: KP, GO, NB Distance from Start (m): 223.2

Stream Width (m): 4.6 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	64	91	70	18	91
Depth of Fines and Water (cm)	64	94	73	18	94
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*
0 Undercut Banks 10 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 10 Emergent Macrophytes 0 Other (specify):

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 0.0 (m) RIGHT BANK *: 0.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R)*** *
__/__ Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock
X / X Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R)*** *
X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock
__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT MPCA

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 11

Crew: KP, GP, NB Distance from Start (m): 246.7

Stream Width (m): 2.6 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	43	64	70	64	70
Depth of Fines and Water (cm)	45	70	72	67	72
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 20 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):___

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*
LEFT BANK *: 0.0 (m) RIGHT BANK *: 0.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
___/___Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
X/X Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):___

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X/X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):___

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 12

Crew: KP, GP, NB Distance from Start (m): 270.2

Stream Width (m): 3.9 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Water Depth (cm)	49	58	40	34	58
Depth of Fines and Water (cm)	49	58	40	36	58
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	**1/5**	**2/5**	**3/5**	**4/5**	**Deep**
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 10 Overhanging Vegetation 0 Woody Debris 0 Boulders

0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):____

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge,*** *along transect:*

LEFT BANK *: 0.0 (m) RIGHT BANK *: 0.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****

__/__ Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock

X / X Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):____

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****

X / X Cropland __/__ Pasture __/__ Barnyard __/__ Developed __/__ Exposed Rock

__/__ Meadow __/__ Shrubs __/__ Woodland __/__ Wetland __/__ Other (specify):____

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***

LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

TRANSECT

MPCA

Field Number: Site 23 Date (mm/dd/yy): 09/14/11 Transect Number (1-13): 13

Crew: KP, GP, NB Distance from Start (m): 293.7

Stream Width (m): 3.8 Channel Type (circle one): Riffle Pool [✓ Run]

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Water Depth (cm)	73	94	94	85	94
Depth of Fines and Water (cm)	73	97	96	88	97
Embeddedness of Coarse Substrates (nearest 25%)	100	100	100	100	100

Check Dominant Substrate Type in Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Bedrock (solid slab)					
Boulder (basketball or bigger)					
Rubble/Cobble (tennis ball to basketball)					
Gravel (BB to tennis ball)					
Sand (gritty, visible, < BB)					
Silt					
Clay	X	X	X	X	X
Detritus					
Other (specify)					

Note Amount Observed on Quadrate:

Channel Position (fifths of wetted stream width and deepest point, 0 = rightbank *)	1/5	2/5	3/5	4/5	Deep
Algae (attached & filamentous., nearest 5%)	0	0	0	0	0
Macrophytes (nearest 5%)	0	0	0	0	0

Cover for Fish: *Percent length of transect* ***(over at least 10 cm water depth)*** *with:*

0 Undercut Banks 20 Overhanging Vegetation 0 Woody Debris 0 Boulders
0 Submergent Macrophytes 0 Emergent Macrophytes 0 Other (specify):____________

Bank Erosion: *Length (nearest 0.1 m) of bare soil,* ***within 5 m of waters edge****, along transect:*
LEFT BANK *: 0.0 (m) RIGHT BANK *: 0.0 (m)

Riparian Land Use: *Dominant land use* ***within 30 m of stream edge*** *(along transect):* ***(L / R) ****
___/___Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
X / X Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____________

Riparian Land Use: *Dominant land use* ***from 30 to 100 m of stream edge*** *(along transect):* ***(L / R) ****
X / X Cropland ___/___Pasture ___/___Barnyard ___/___Developed ___/___Exposed Rock
___/___Meadow ___/___Shrubs ___/___Woodland ___/___Wetland ___/___Other (specify):____________

Riparian Buffer Width: *Length (nearest meter) of undisturbed land use along transect,* ***within 10 m of stream:***
LEFT BANK *: 10 (m) RIGHT BANK *: 10 (m)

Canopy/Shading (Densiometer reading, note #/17 that are shaded):

0 Center Upstream 0 Center Left 0 Center Downstream 0 Center Right 0 Left Bank * 0 Right Bank *

* Right Bank and Left Bank identified while facing downstream.

(Revised Dec 2002)

Macroinvertebrate Taxa List

Order	**Family**	**Subfamily**	***Genus***	**Taxa**
Hemiptera	Corixidae	-	-	1
Ostracoda	-	-	-	2
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	3
Ephemeroptera	Baetidae	-	-	4
Veneroida	Pisidiidae	-	*Sphaerium*	5
Oligochaeta	Tubificidae	-	-	6
Diptera	Chironomidae	-	-	7
Coleoptera	Heteroceridae	-	-	8
Odonata	Coenagrionidae	-	*Argia*	9
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	10
Odonata	Gomphidae	-	*Gomphus*	11
Trichoptera	-	-	-	12
Diplostraca	Macrothricidae	-	-	13
Diptera	Chironomidae	Tanypodinae	*Procladius*	14
Diptera	Chironomidae	Tanypodinae	*Telopelopia okoboji*	15
Diptera	Chironomidae	Chironominae	*Polypedilum*	16
Diptera	Chironomidae	Chironominae	*Chironomus*	17
Diptera	Chironomidae	Chironominae	*Paralauterborniella*	18
Diptera	Chironomidae	Chironominae	*Cryptotendipes*	19
Diptera	Chironomidae	Chironominae	-	20
Ephemeroptera	Baetidae	-	*Procloeon*	21
Odonata	Gomphidae	-	-	22
Hemiptera	Corixidae	-	*Trichocorixa*	23
Coleoptera	Elmidae	-	*Stenelmis*	24
Coleoptera	Carabidae	-	-	25
Collembola	-	-	-	26
Coleoptera	Elmidae	-	*Macronychus*	27
Odonata	Gomphidae	-	*Stylurus*	28
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	29
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	30
Decapoda	Hyalellidae	-	*Hyalella azteca*	31
Diptera	Ceratopogonidae	-	*Probezzia*	32
Coleoptera	Dytiscidae	-	*Liodessus*	33
Trichoptera	Hydropsychidae	-	*Potamyia*	34
Oligochaeta	Naididae	-	-	35
Diptera	Chironomidae	Chironominae	*Axarus*	36
Diptera	Chironomidae	Chironominae	*Harnichia*	37
Ephemeroptera	Baetidae	-	*Acerpenna*	38
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	39
Ephemeroptera	Heptageniidae	-	*Maccaffertium*	40
Trichoptera	Hydropsychidae	-	-	41
Ephemeroptera	Caenidae	-	*Caenis*	42
Coleoptera	-	-	-	43
Diptera	Chironomidae	Chironominae	*Harnischia*	44
Basommatophora	Physidae	-	*Physa*	45
Hemiptera	Gerridae	-	*Rheumatobates*	46

Macroinvertebrate Taxa List

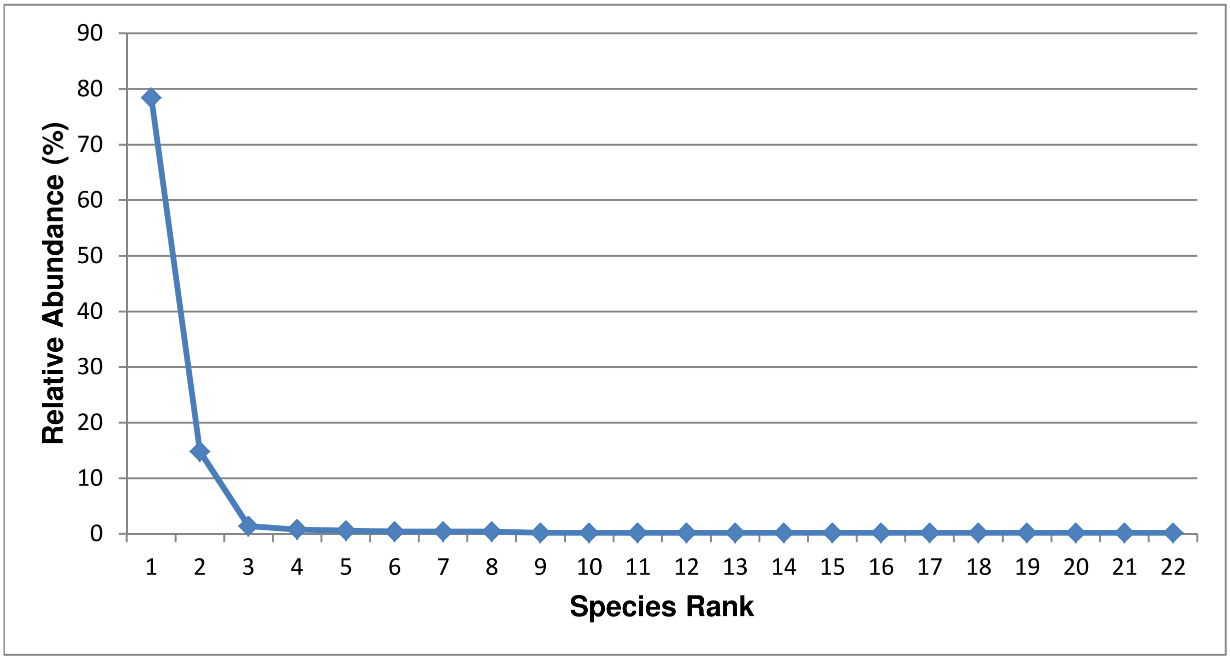
Order	Family	Subfamily	*Genus*	Taxa
Acari	-	-	-	47
Coleoptera	Elmidae	-	*Dubiraphia*	48
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	49
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*	50
Trichoptera	Hydropsychidae	-	*Cheumatopsyche*	51
Trichoptera	Leptoceridae	-	*Oecetis*	52
Trichoptera	Hydropsychidae	-	*Hydrospsyche*	53
Ephemeroptera	Heptageniidae	-	-	54
Hemiptera	Corixidae	-	*Sigara*	55
Coleoptera	Dytiscidae	-	*Laccophilus*	56
Coleoptera	Haliplidae	-	*Peltodytes*	57
Basommatophora	Ancylidae	-	*Ferrissia*	58
Cyclopoida	Cyclopidae	-	-	59
Diptera	Dolichopodidae	-	-	60
Diptera	Chironomidae	Chironominae	*Dicrotendipes*	61
Calanoida	Diaptomidae	-	*Diaptomus*	62
Trichoptera	Leptoceridae	-	*Nectopsyche*	63
Thysanoptera	-	-	-	64
Odonata	Coenagrionidae	-	-	65
Araneae	-	-	-	66
Veneroida	Pisidiidae	-	*Pisidium*	67
Diptera	Ephydridae	-	*Hydrellia*	68
Diplostraca	Daphniidae	-	-	69
Ostracoda	Candonidae	-	-	70
Diptera	-	-	-	71
Diptera	Simuliidae	-	*Simulium*	72
Ephemeroptera	Baetiscidae	-	*Baetisca*	73
Neotaenioglossa	Hydrobiidae	-	-	74
Coleoptera	Hydrophilidae	-	*Tropisternus*	75
Ephemeroptera	Baetidae	-	*Baetis*	76
Ephemeroptera	Baetidae	-	*Apobaetis*	77
Ephemeroptera	Baetidae	-	*Pseudocloeon*	78
Decapoda	Cambaridae	-	*Orconectes*	79
Hemiptera	Nepidae	-	*Ranatra fusca*	80
Ephemeroptera	Heptageniidae	-	*Heptagenia*	81
Odonata	Calopterygidae	-	*Hetaerina*	82
-	-	-	-	83
Ephemeroptera	Ephemeridae	-	*Pentagenia*	84
Hemiptera	Hebridae	-	*Merragata*	85
Diptera	Psychodidae	-	*Pericoma*	86
Coleoptera	Hydraenidae	-	*Ochthebius*	87
Hemiptera	Belostomatidae	-	*Belostoma flumineum*	88
Trichoptera	Hydroptilidae	-	*Neotrichia*	89
Hemiptera	Pleidae	-	*Neoplea*	90
Ephemeroptera	Ephemeridae	-	*Hexagenia limbata*	91
Diptera	Chironomidae	Orthocladiinae	*Cricotopus*	92

Macroinvertebrate Taxa List

Order	**Family**	**Subfamily**	***Genus***	**Taxa**
Diptera	Chironomidae	Chironominae	*Rheotanytarsus exiguus gr.*	93
Diptera	Chironomidae	Chironominae	*Paracladopelma*	94
Diptera	Chironomidae	Chironominae	Chironomini	95
Hemiptera	Corixidae	-	*Sigara lineata*	96
Diptera	Ephydridae	-	*Parydra*	97
Trichoptera	Hydroptilidae	-	-	98
Diptera	Ceratopogonidae	-	-	99
Diptera	Ephydridae	-	-	100
Trichoptera	Hydroptilidae	-	*Mayatrichia*	101
Coleoptera	Lampyridae	-	-	102
Odonata	Coenagrionidae	-	*Enallagma*	103
Diptera	Chironomidae	Chironominae	*Parachironomus*	104
Nemata	-	-	-	105
Diptera	Chironomidae	Chironominae	*Endochironomus*	106
Ephemeroptera	Ephemeridae	-	*Hexagenia*	107
Diptera	Chironomidae	Orthocladiinae	*Nanocladius*	108
Diptera	Chironomidae	Chironominae	*Paralauterborniella nigrohalteralis*	109
Diptera	Ceratopogonidae	-	*Forcipomyia*	110
Hemiptera	Notonectidae	-	*Notonecta*	111
Coleoptera	Staphylinidae	-	-	112
Diptera	Ceratopogonidae	Ceratopogoninae	-	113
Diptera	Ceratopogonidae	-	*Bezzia*	114
Diptera	Ceratopogonidae	-	*Culicoides*	115
Diptera	Chironomidae	Chironominae	*Phaenopsectra*	116
Diptera	Chironomidae	Orthocladiinae	-	117
Lepidoptera	Noctuidae	-	-	118
Oligochaeta	-	-	-	119
Cyclpoida	Cyclopidae	-	-	120
Diplostraca	Bosminidae	-	-	121
Diptera	Chironomidae	Chironominae	Microchironomus	122
Heteroptera	Corixidae	-	-	123
Heteroptera	Nepidae	-	Ranatra	124
Heteroptera	Belostomatidae	-	Belostoma	125
Amphipoda	Hyalellidae	-	*Hyalella*	126
Megaloptera	Sialidae	-	*Sialis*	127
Diptera	Chironomidae	Chironominae	*Paratanytarsus*	128
Diptera	Chironomidae	Orthocladiinae	*Synendotendipes*	129

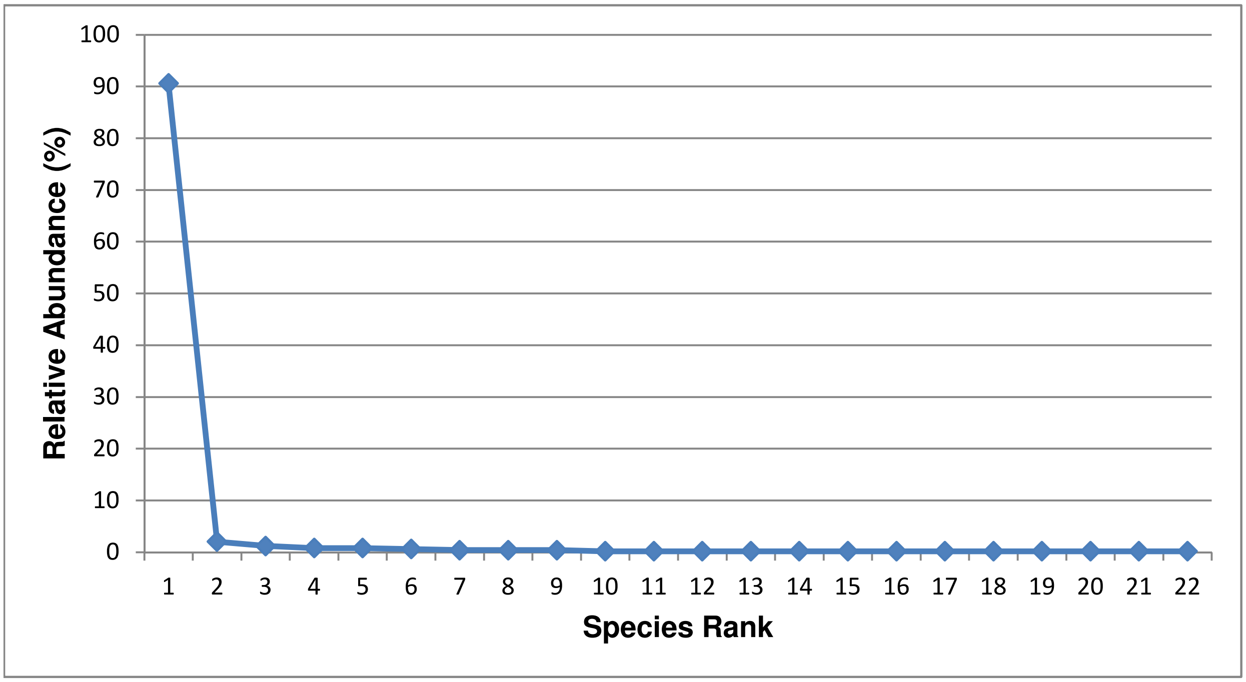
Study Reach 1 - Red River of the North

Taxa	# of individuals	% relative abundance	Catch / square	
1	397	78.46	61.25	35 of 54 squares picked in a
2	75	14.82	11.57	subsample of 10
4	7	1.38	1.08	
3	4	0.79	0.62	
5	3	0.59	0.46	
8	2	0.40	0.31	
14	2	0.40	0.31	
16	2	0.40	0.31	
6	1	0.20	0.15	
7	1	0.20	0.15	
9	1	0.20	0.15	
10	1	0.20	0.15	
11	1	0.20	0.15	
12	1	0.20	0.15	
13	1	0.20	0.15	
15	1	0.20	0.15	
17	1	0.20	0.15	
18	1	0.20	0.15	
19	1	0.20	0.15	
20	1	0.20	0.15	
21	1	0.20	0.15	
22	1	0.20	0.15	



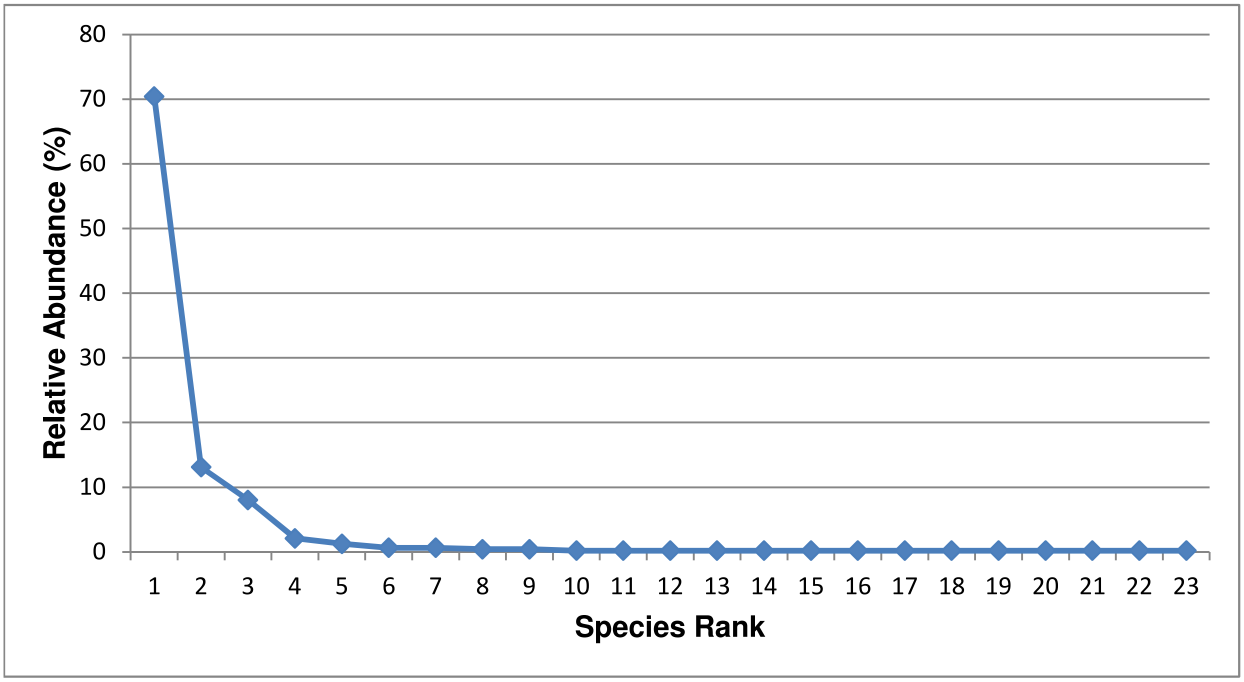
Study Reach 2 - Red River of the North

Taxa	# of individuals	% relative abundance	Catch / square	
1	445	90.63	17.80	25 of 54 squares picked
3	10	2.04	0.40	
6	6	1.22	0.24	
18	4	0.81	0.16	
24	4	0.81	0.16	
30	3	0.61	0.12	
5	2	0.41	0.08	
7	2	0.41	0.08	
8	2	0.41	0.08	
2	1	0.20	0.04	
9	1	0.20	0.04	
10	1	0.20	0.04	
11	1	0.20	0.04	
14	1	0.20	0.04	
17	1	0.20	0.04	
19	1	0.20	0.04	
23	1	0.20	0.04	
25	1	0.20	0.04	
26	1	0.20	0.04	
27	1	0.20	0.04	
28	1	0.20	0.04	
29	1	0.20	0.04	



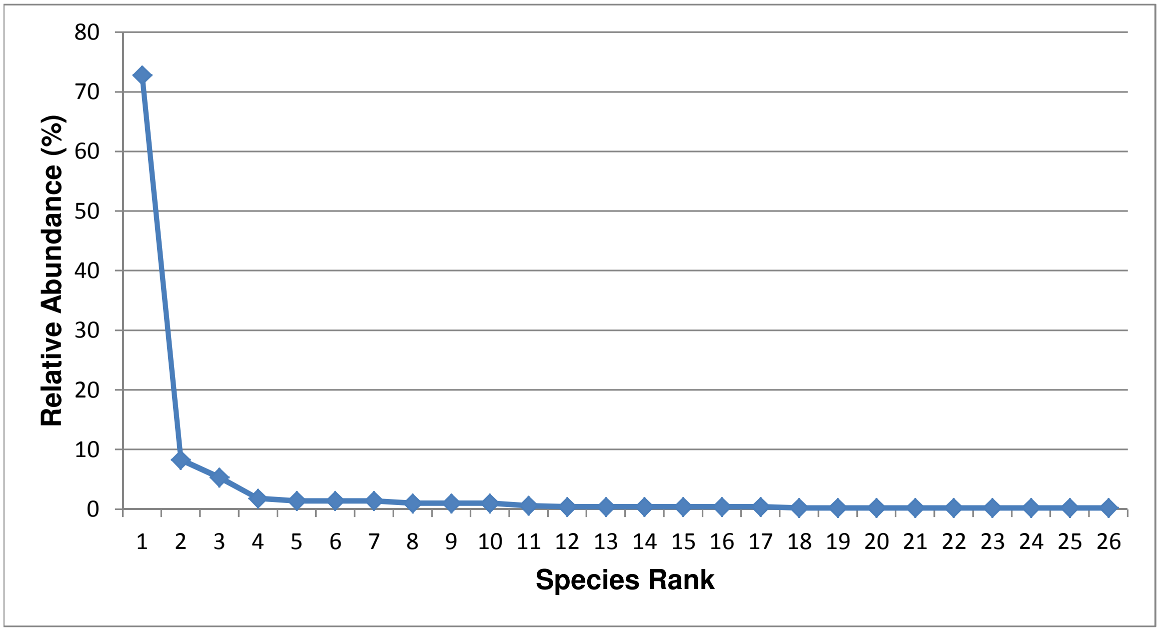
Study Reach 3 - Red River of the North

Taxa	# of individuals	% relative abundance	Catch / square	
1	333	70.40	11.10	30 of 54 squares picked
6	62	13.11	2.07	
2	38	8.03	1.27	
5	10	2.11	0.33	
17	6	1.27	0.20	
8	3	0.63	0.10	
20	3	0.63	0.10	
3	2	0.42	0.07	
10	2	0.42	0.07	
4	1	0.21	0.03	
11	1	0.21	0.03	
19	1	0.21	0.03	
21	1	0.21	0.03	
23	1	0.21	0.03	
29	1	0.21	0.03	
30	1	0.21	0.03	
31	1	0.21	0.03	
32	1	0.21	0.03	
33	1	0.21	0.03	
34	1	0.21	0.03	
35	1	0.21	0.03	
36	1	0.21	0.03	
37	1	0.21	0.03	



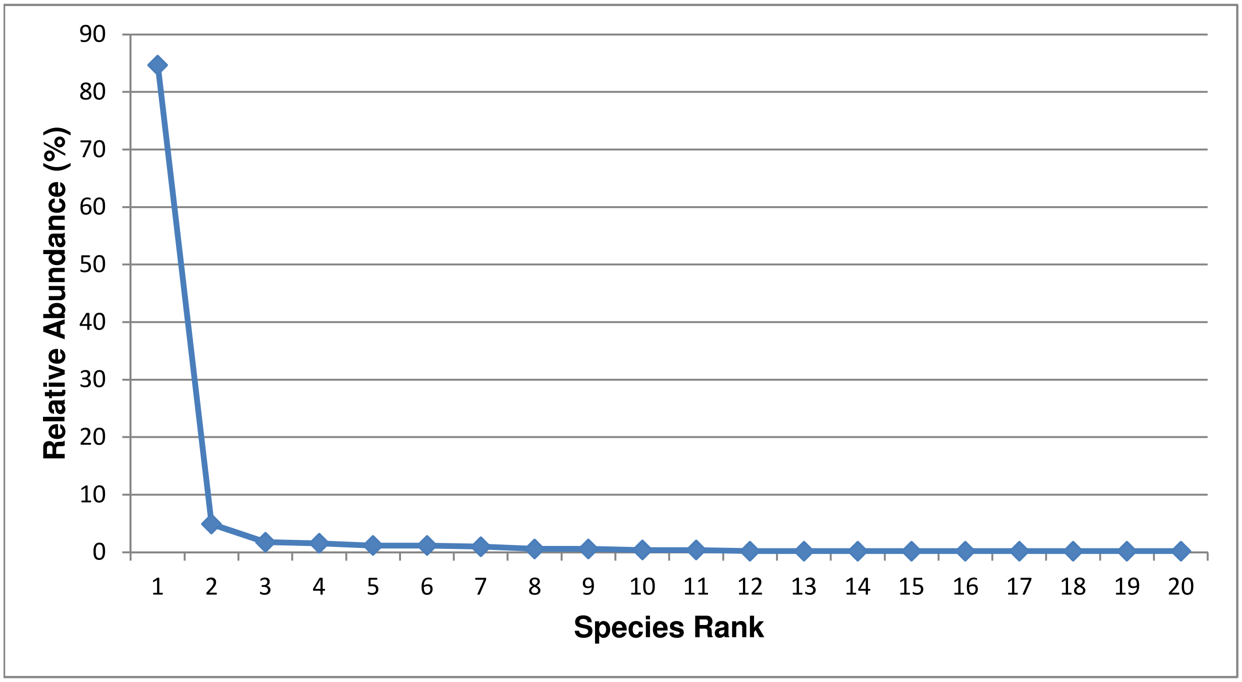
Study Reach 4 - Red River of the North

Taxa	# of individuals	% relative abundance	Catch / square	
1	369	72.78	23.06	16 of 54 squares picked
2	42	8.28	2.63	
10	27	5.33	1.69	
3	9	1.78	0.56	
7	7	1.38	0.44	
16	7	1.38	0.44	
38	7	1.38	0.44	
5	5	0.99	0.31	
6	5	0.99	0.31	
39	5	0.99	0.31	
40	3	0.59	0.19	
8	2	0.39	0.13	
11	2	0.39	0.13	
17	2	0.39	0.13	
23	2	0.39	0.13	
26	2	0.39	0.13	
35	2	0.39	0.13	
14	1	0.20	0.06	
24	1	0.20	0.06	
28	1	0.20	0.06	
29	1	0.20	0.06	
30	1	0.20	0.06	
31	1	0.20	0.06	
41	1	0.20	0.06	
42	1	0.20	0.06	
43	1	0.20	0.06	



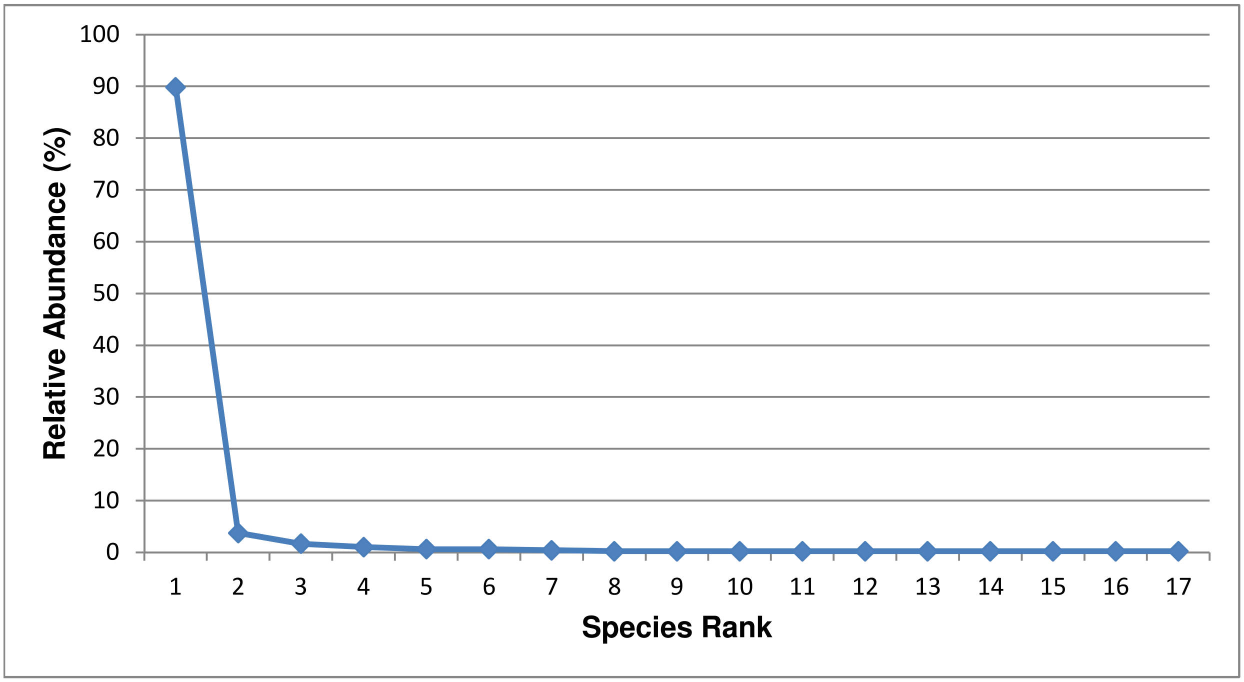
Study Reach 5 - Red River of the North

Taxa	# of individuals	% relative abundance	Catch / square	
1	431	84.68	14.86	29 of 54 squares picked
6	25	4.91	0.86	
2	9	1.77	0.31	
38	8	1.57	0.28	
16	6	1.18	0.21	
21	6	1.18	0.21	
35	5	0.98	0.17	
5	3	0.59	0.10	
10	3	0.59	0.10	
3	2	0.39	0.07	
76	2	0.39	0.07	
4	1	0.20	0.03	
7	1	0.20	0.03	
11	1	0.20	0.03	
14	1	0.20	0.03	
17	1	0.20	0.03	
33	1	0.20	0.03	
40	1	0.20	0.03	
63	1	0.20	0.03	
66	1	0.20	0.03	



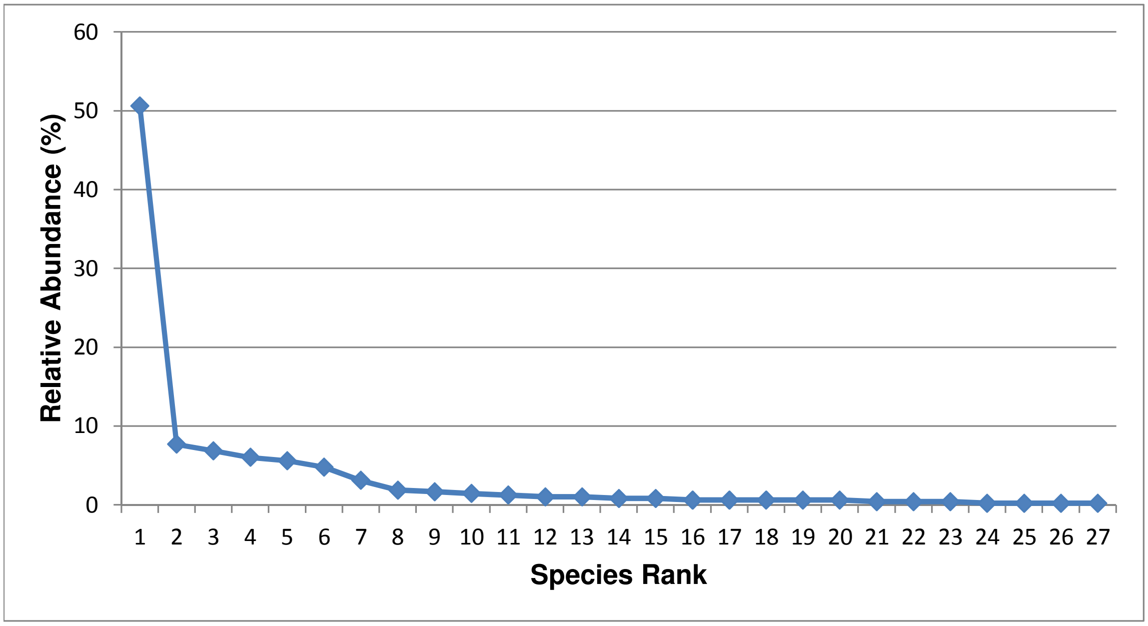
Study Reach 6 - Red River of the North

Taxa	# of individuals	% relative abundance	Catch / square	
1	433	89.83	28.87	15 of 54 squares picked
6	18	3.73	1.20	
5	8	1.66	0.53	
17	5	1.04	0.33	
2	3	0.62	0.20	
10	3	0.62	0.20	
39	2	0.41	0.13	
4	1	0.21	0.07	
7	1	0.21	0.07	
14	1	0.21	0.07	
22	1	0.21	0.07	
23	1	0.21	0.07	
24	1	0.21	0.07	
26	1	0.21	0.07	
35	1	0.21	0.07	
38	1	0.21	0.07	
44	1	0.21	0.07	



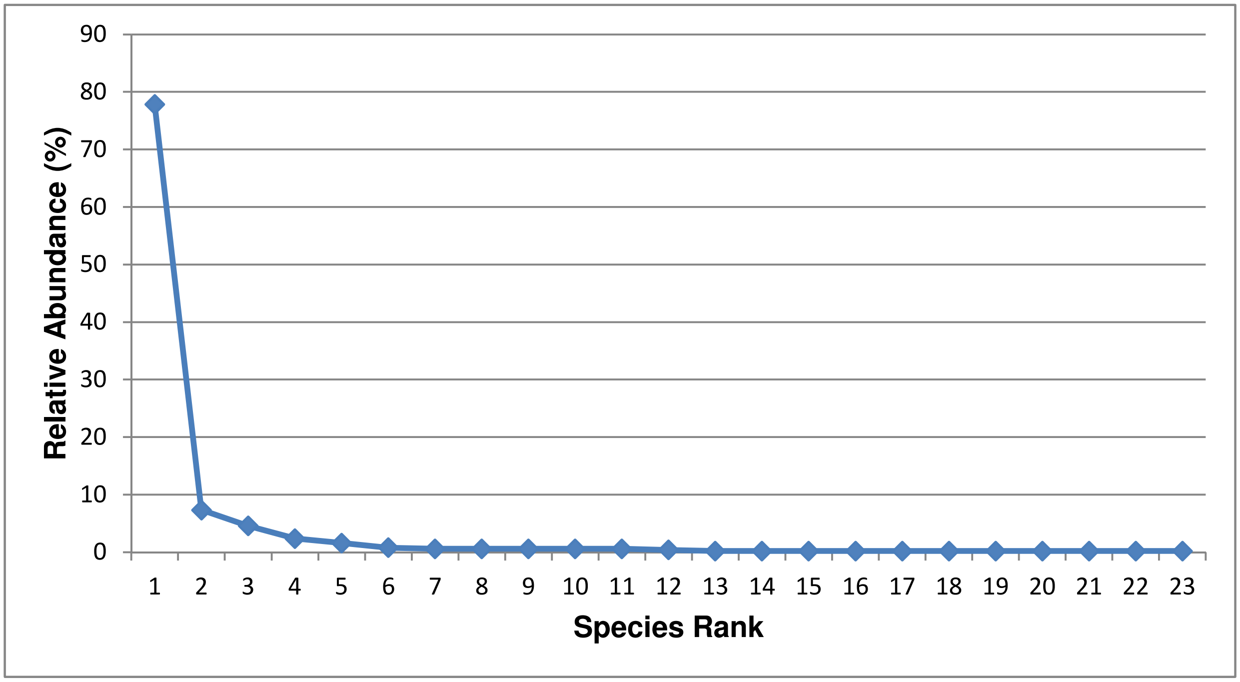
Study Reach 7 - Wild Rice River

Taxa	# of individuals	% relative abundance	Catch / square	
1	243	50.63	27.00	9 of 54 squares picked
2	37	7.71	4.11	
9	33	6.88	3.67	
3	29	6.04	3.22	
41	27	5.63	3.00	
24	23	4.79	2.56	
16	15	3.13	1.67	
49	9	1.88	1.00	
45	8	1.67	0.89	
34	7	1.46	0.78	
30	6	1.25	0.67	
14	5	1.04	0.56	
46	5	1.04	0.56	
17	4	0.83	0.44	
50	4	0.83	0.44	
6	3	0.63	0.33	
10	3	0.63	0.33	
13	3	0.63	0.33	
29	3	0.63	0.33	
47	3	0.63	0.33	
4	2	0.42	0.22	
5	2	0.42	0.22	
48	2	0.42	0.22	
20	1	0.21	0.11	
27	1	0.21	0.11	
36	1	0.21	0.11	
39	1	0.21	0.11	



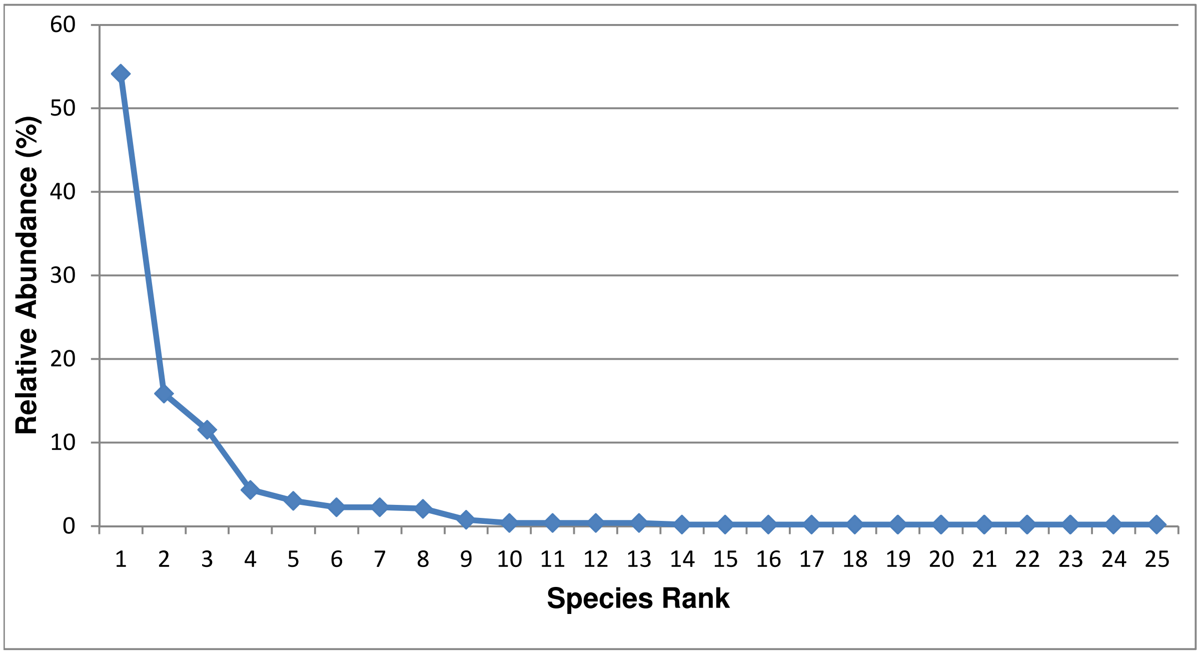
Study Reach 8 - Wild Rice River

Taxa	# of individuals	% relative abundance	Catch / square	
1	393	77.82	26.20	15 of 54 squares picked
2	37	7.33	2.47	
3	23	4.55	1.53	
17	12	2.38	0.80	
23	8	1.58	0.53	
14	4	0.79	0.27	
9	3	0.59	0.20	
20	3	0.59	0.20	
24	3	0.59	0.20	
30	3	0.59	0.20	
45	3	0.59	0.20	
10	2	0.40	0.13	
5	1	0.20	0.07	
6	1	0.20	0.07	
13	1	0.20	0.07	
16	1	0.20	0.07	
35	1	0.20	0.07	
39	1	0.20	0.07	
49	1	0.20	0.07	
51	1	0.20	0.07	
52	1	0.20	0.07	
53	1	0.20	0.07	
54	1	0.20	0.07	



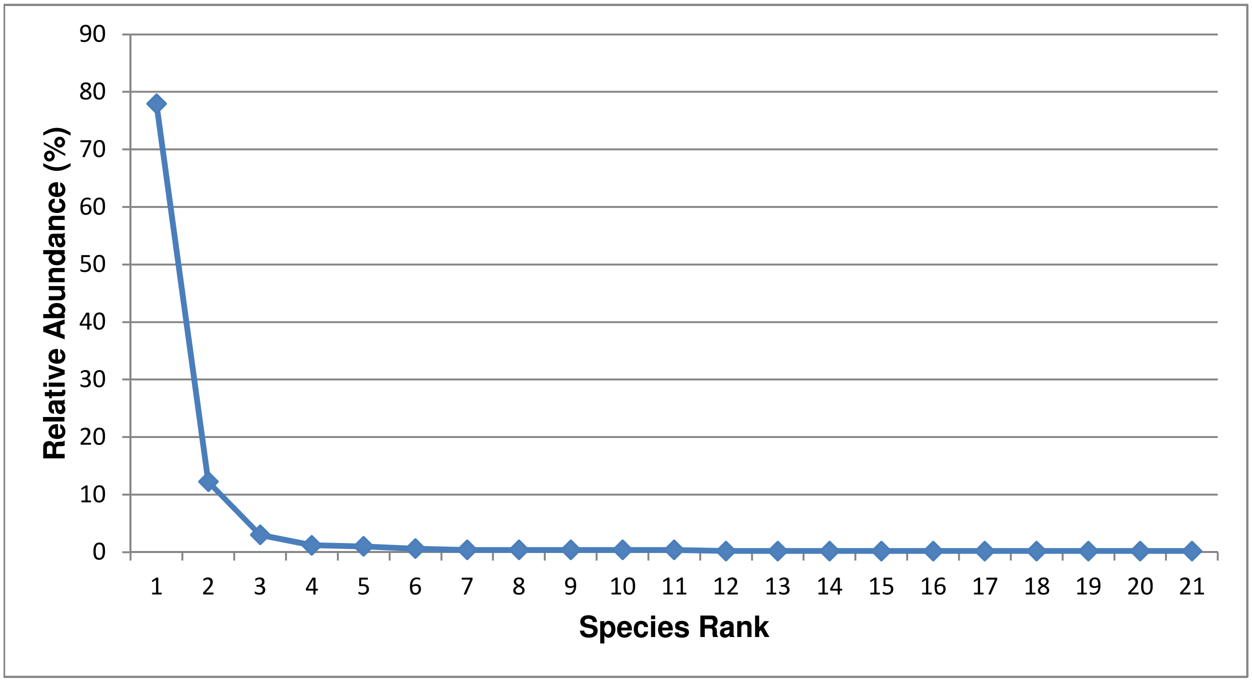
Study Reach 9 - Wild Rice River

Taxa	# of individuals	% relative abundance	Catch / square	
1	287	54.15	16.88	17 of 54 squares picked
3	84	15.85	4.94	
2	61	11.51	3.59	
45	23	4.34	1.35	
23	16	3.02	0.94	
9	12	2.26	0.71	
49	12	2.26	0.71	
24	11	2.08	0.65	
47	4	0.75	0.24	
14	2	0.38	0.12	
17	2	0.38	0.12	
50	2	0.38	0.12	
52	2	0.38	0.12	
6	1	0.19	0.06	
8	1	0.19	0.06	
12	1	0.19	0.06	
16	1	0.19	0.06	
20	1	0.19	0.06	
29	1	0.19	0.06	
39	1	0.19	0.06	
48	1	0.19	0.06	
55	1	0.19	0.06	
56	1	0.19	0.06	
57	1	0.19	0.06	
58	1	0.19	0.06	



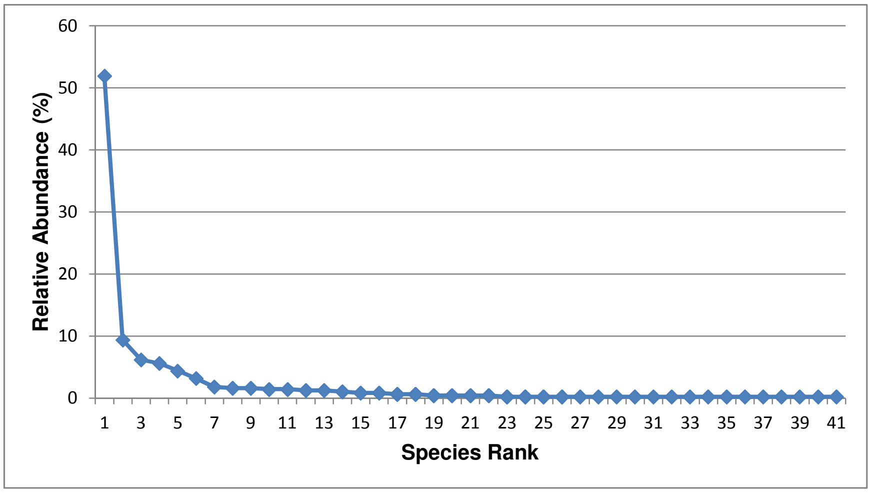
Study Reach 10 - Wild Rice River

Taxa	# of individuals	% relative abundance	Catch / square	
2	388	77.91	123.25	
1	61	12.25	19.38	17 of 54 squares picked in a subsample of 10
49	15	3.01	4.76	
3	6	1.20	1.91	
9	5	1.00	1.59	
23	3	0.60	0.95	
7	2	0.40	0.64	
14	2	0.40	0.64	
29	2	0.40	0.64	
46	2	0.40	0.64	
47	2	0.40	0.64	
6	1	0.20	0.32	
24	1	0.20	0.32	
27	1	0.20	0.32	
35	1	0.20	0.32	
39	1	0.20	0.32	
45	1	0.20	0.32	
52	1	0.20	0.32	
59	1	0.20	0.32	
60	1	0.20	0.32	
61	1	0.20	0.32	



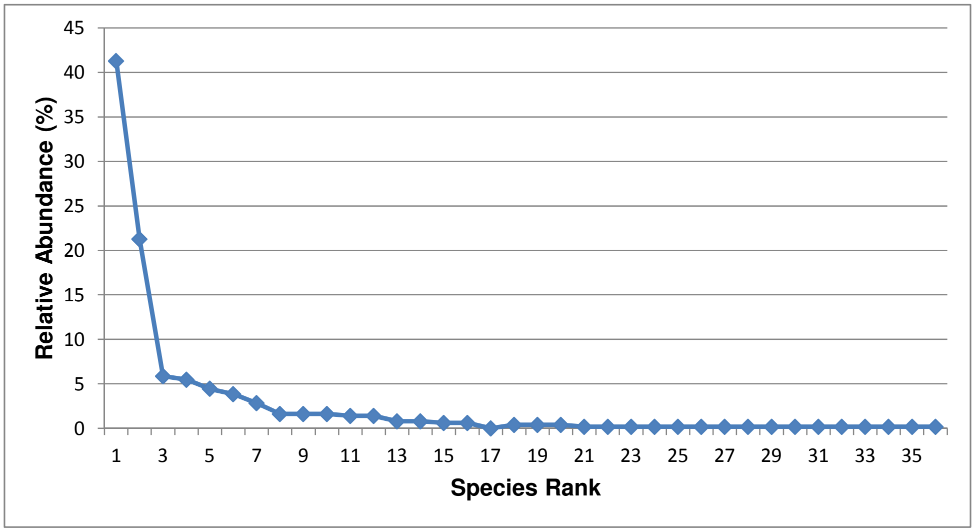
Study Reach 11 - Sheyenne River

Taxa	# of individuals	% relative abundance	Catch / square	
1	260	51.90	21.67	12 of 54 squares picked
2	47	9.38	3.92	
62	31	6.19	2.58	
23	28	5.59	2.33	
3	22	4.39	1.83	
76	16	3.19	1.33	
51	9	1.80	0.75	
63	8	1.60	0.67	
78	8	1.60	0.67	
6	7	1.40	0.58	
21	7	1.40	0.58	
4	6	1.20	0.50	
17	6	1.20	0.50	
16	5	1.00	0.42	
7	4	0.80	0.33	
40	4	0.80	0.33	
42	3	0.60	0.25	
66	3	0.60	0.25	
10	2	0.40	0.17	
18	2	0.40	0.17	
64	2	0.40	0.17	
77	2	0.40	0.17	
5	1	0.20	0.08	
14	1	0.20	0.08	
20	1	0.20	0.08	
45	1	0.20	0.08	
53	1	0.20	0.08	
54	1	0.20	0.08	
56	1	0.20	0.08	
65	1	0.20	0.08	
67	1	0.20	0.08	
68	1	0.20	0.08	
69	1	0.20	0.08	
70	1	0.20	0.08	
71	1	0.20	0.08	
72	1	0.20	0.08	
73	1	0.20	0.08	
74	1	0.20	0.08	
75	1	0.20	0.08	
79	1	0.20	0.08	
80	1	0.20	0.08	



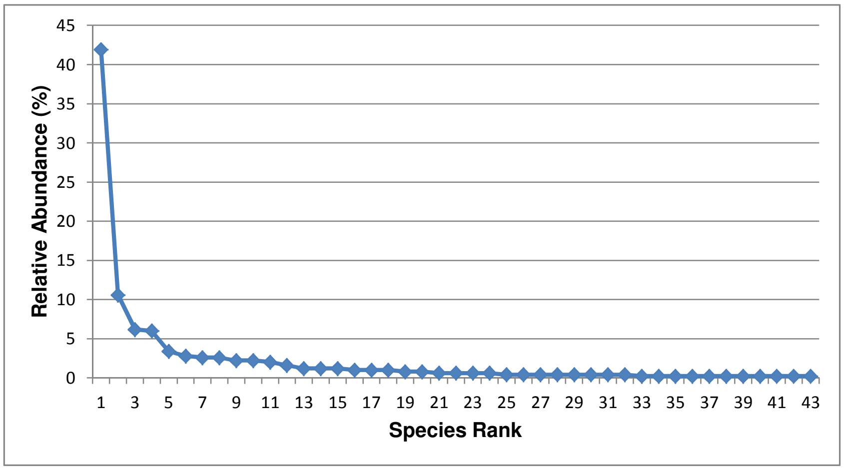
Study Reach 12 - Sheyenne River

Taxa	# of individuals	% relative abundance	Catch / square	
1	204	41.30	10.20	20 of 54 squares picked
2	105	21.26	5.25	
23	29	5.87	1.45	
6	27	5.47	1.35	
21	22	4.45	1.10	
3	19	3.85	0.95	
77	14	2.83	0.70	
4	8	1.62	0.40	
76	8	1.62	0.40	
78	8	1.62	0.40	
66	7	1.42	0.35	
68	7	1.42	0.35	
7	4	0.81	0.20	
62	4	0.81	0.20	
35	3	0.61	0.15	
81	3	0.61	0.15	
83	0	0.00	0.00	
16	2	0.40	0.10	
29	2	0.40	0.10	
71	2	0.40	0.10	
5	1	0.20	0.05	
11	1	0.20	0.05	
40	1	0.20	0.05	
41	1	0.20	0.05	
47	1	0.20	0.05	
54	1	0.20	0.05	
55	1	0.20	0.05	
56	1	0.20	0.05	
79	1	0.20	0.05	
80	1	0.20	0.05	
82	1	0.20	0.05	
84	1	0.20	0.05	
85	1	0.20	0.05	
86	1	0.20	0.05	
87	1	0.20	0.05	
88	1	0.20	0.05	



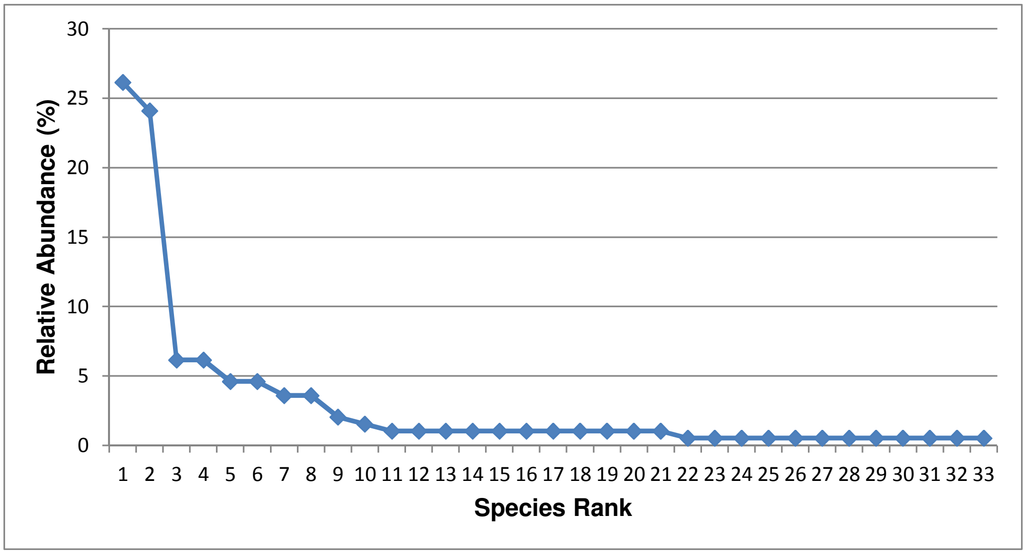
Study Reach 13 - Sheyenne River

Taxa	# of individuals	% relative abundance	Catch / square	
1	210	41.92	4.47	47 of 54 squares picked
3	53	10.58	1.13	
6	31	6.19	0.66	
77	30	5.99	0.64	
21	17	3.39	0.36	
10	14	2.79	0.30	
2	13	2.59	0.28	
63	13	2.59	0.28	
4	11	2.20	0.23	
78	11	2.20	0.23	
23	10	2.00	0.21	
16	8	1.60	0.17	
40	6	1.20	0.13	
41	6	1.20	0.13	
76	6	1.20	0.13	
20	5	1.00	0.11	
42	5	1.00	0.11	
51	5	1.00	0.11	
29	4	0.80	0.09	
55	4	0.80	0.09	
66	3	0.60	0.06	
68	3	0.60	0.06	
81	3	0.60	0.06	
93	3	0.60	0.06	
5	2	0.40	0.04	
9	2	0.40	0.04	
30	2	0.40	0.04	
32	2	0.40	0.04	
46	2	0.40	0.04	
53	2	0.40	0.04	
71	2	0.40	0.04	
89	2	0.40	0.04	
7	1	0.20	0.02	
8	1	0.20	0.02	
24	1	0.20	0.02	
47	1	0.20	0.02	
54	1	0.20	0.02	
82	1	0.20	0.02	
90	1	0.20	0.02	
91	1	0.20	0.02	
92	1	0.20	0.02	
94	1	0.20	0.02	
95	1	0.20	0.02	



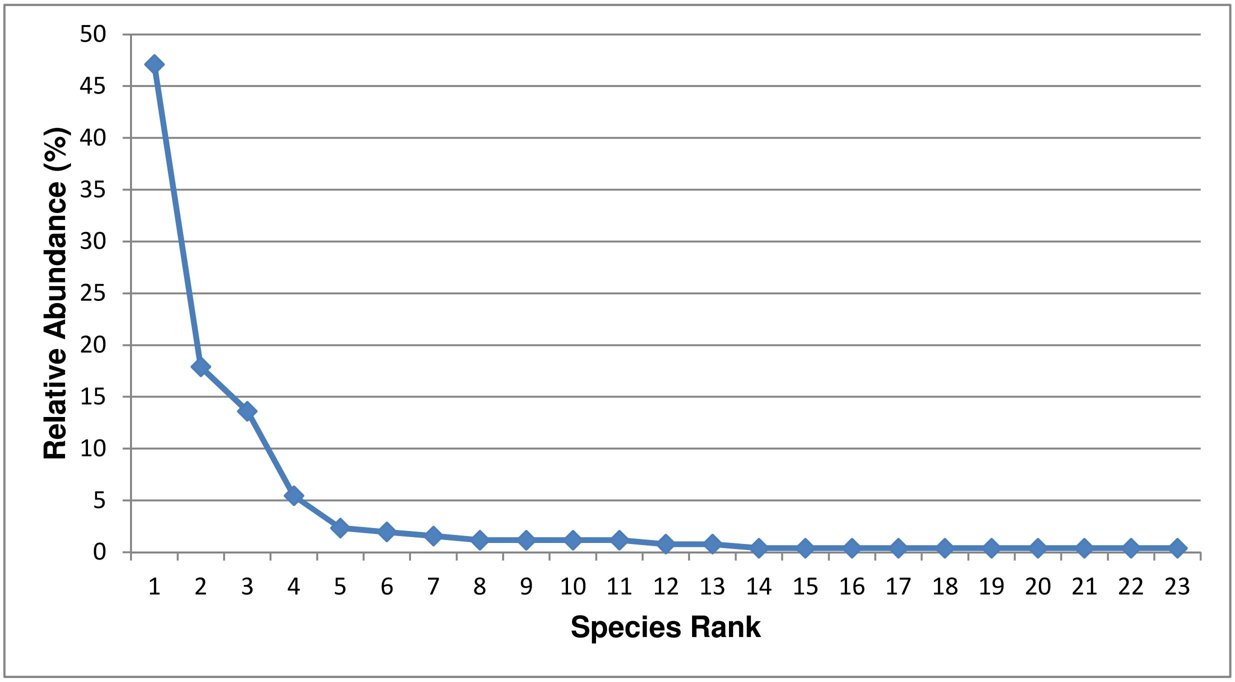
Study Reach 14 - Sheyenne River

Taxa	# of individuals	% relative abundance	Catch / square	
1	51	26.15	0.94	Entire Sample Picked
3	47	24.10	0.87	
23	12	6.15	0.22	
96	12	6.15	0.22	
16	9	4.62	0.17	
53	9	4.62	0.17	
10	7	3.59	0.13	
41	7	3.59	0.13	
17	4	2.05	0.07	
5	3	1.54	0.06	
6	2	1.03	0.04	
7	2	1.03	0.04	
24	2	1.03	0.04	
29	2	1.03	0.04	
30	2	1.03	0.04	
42	2	1.03	0.04	
55	2	1.03	0.04	
76	2	1.03	0.04	
77	2	1.03	0.04	
98	2	1.03	0.04	
99	2	1.03	0.04	
2	1	0.51	0.02	
8	1	0.51	0.02	
14	1	0.51	0.02	
18	1	0.51	0.02	
36	1	0.51	0.02	
38	1	0.51	0.02	
40	1	0.51	0.02	
63	1	0.51	0.02	
66	1	0.51	0.02	
71	1	0.51	0.02	
97	1	0.51	0.02	
100	1	0.51	0.02	



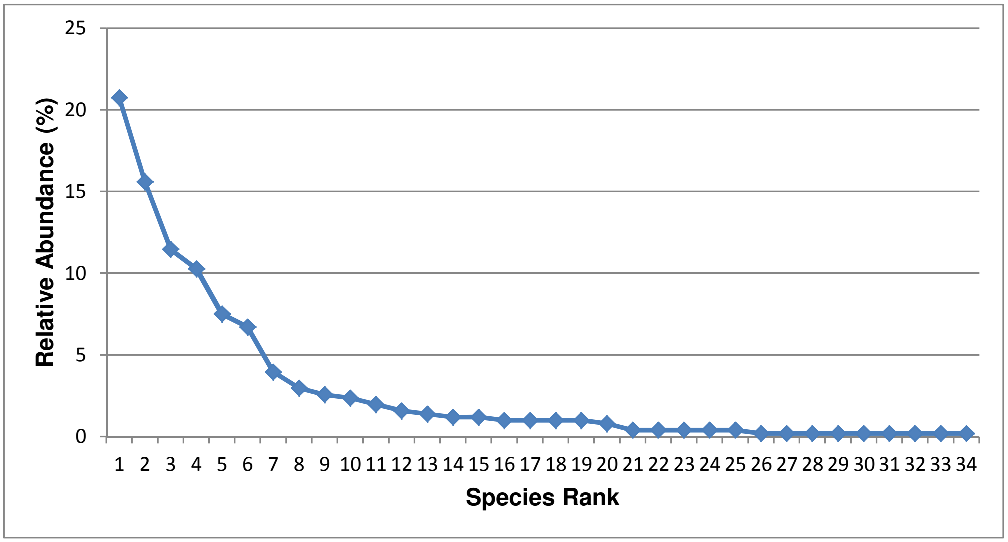
Study Reach 15 - Sheyenne River

Taxa	# of individuals	% relative abundance	Catch / square	
1	121	47.08	2.24	Entire Sample Picked
6	46	17.90	0.85	
3	35	13.62	0.65	
17	14	5.45	0.26	
23	6	2.33	0.11	
96	5	1.95	0.09	
77	4	1.56	0.07	
10	3	1.17	0.06	
14	3	1.17	0.06	
18	3	1.17	0.06	
76	3	1.17	0.06	
16	2	0.78	0.04	
29	2	0.78	0.04	
7	1	0.39	0.02	
24	1	0.39	0.02	
28	1	0.39	0.02	
44	1	0.39	0.02	
54	1	0.39	0.02	
66	1	0.39	0.02	
80	1	0.39	0.02	
90	1	0.39	0.02	
101	1	0.39	0.02	
102	1	0.39	0.02	



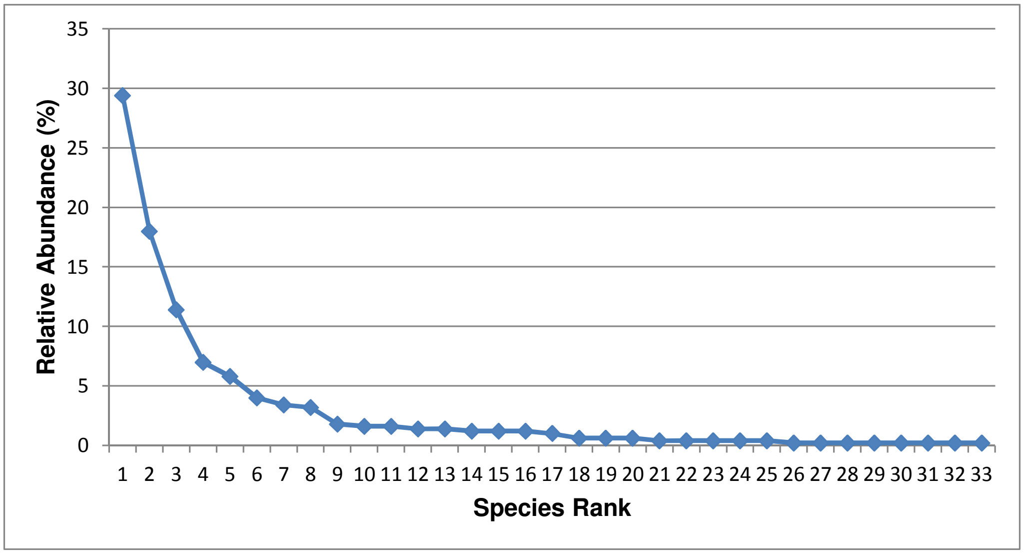
Study Reach 16 - Maple River

Taxa	# of individuals	% relative abundance	Catch / square	
23	105	20.75	12.89	44 of 54 squares picked in a subsample of 10
49	79	15.61	9.70	
1	58	11.46	7.12	
17	52	10.28	6.38	
3	38	7.51	4.66	
24	34	6.72	4.17	
9	20	3.95	2.45	
2	15	2.96	1.84	
16	13	2.57	1.60	
14	12	2.37	1.47	
45	10	1.98	1.23	
5	8	1.58	0.98	
50	7	1.38	0.86	
29	6	1.19	0.74	
31	6	1.19	0.74	
6	5	0.99	0.61	
20	5	0.99	0.61	
104	5	0.99	0.61	
106	5	0.99	0.61	
48	4	0.79	0.49	
32	2	0.40	0.25	
39	2	0.40	0.25	
55	2	0.40	0.25	
69	2	0.40	0.25	
103	2	0.40	0.25	
7	1	0.20	0.12	
54	1	0.20	0.12	
57	1	0.20	0.12	
59	1	0.20	0.12	
66	1	0.20	0.12	
85	1	0.20	0.12	
88	1	0.20	0.12	
90	1	0.20	0.12	
105	1	0.20	0.12	



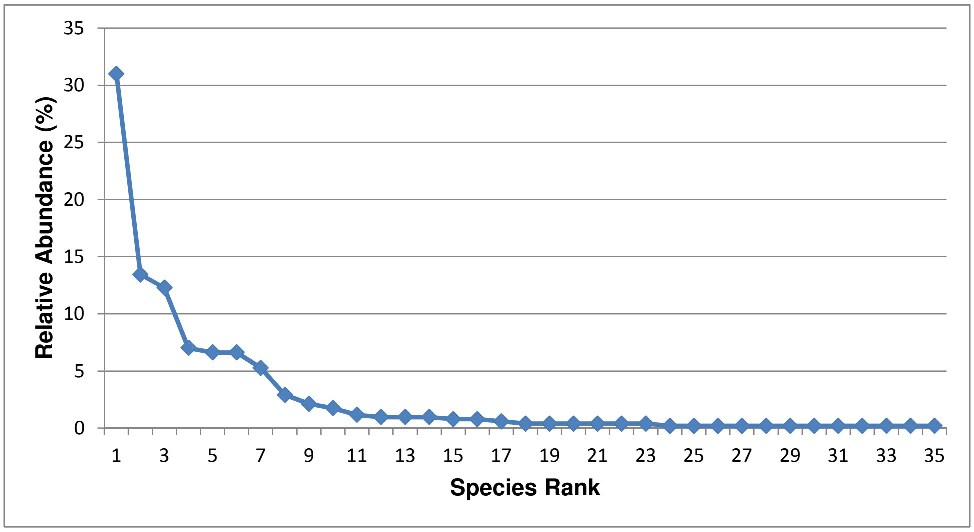
Study Reach 17 - Maple River

Taxa	# of individuals	% relative abundance	Catch / square	
2	147	29.40	13.36	11 of 54 squares picked
1	90	18.00	8.18	
24	57	11.40	5.18	
17	35	7.00	3.18	
39	29	5.80	2.64	
5	20	4.00	1.82	
30	17	3.40	1.55	
23	16	3.20	1.45	
14	9	1.80	0.82	
10	8	1.60	0.73	
16	8	1.60	0.73	
42	7	1.40	0.64	
53	7	1.40	0.64	
6	6	1.20	0.55	
7	6	1.20	0.55	
29	6	1.20	0.55	
107	5	1.00	0.45	
47	3	0.60	0.27	
49	3	0.60	0.27	
52	3	0.60	0.27	
3	2	0.40	0.18	
8	2	0.40	0.18	
59	2	0.40	0.18	
108	2	0.40	0.18	
109	2	0.40	0.18	
21	1	0.20	0.09	
22	1	0.20	0.09	
35	1	0.20	0.09	
63	1	0.20	0.09	
67	1	0.20	0.09	
79	1	0.20	0.09	
92	1	0.20	0.09	
100	1	0.20	0.09	



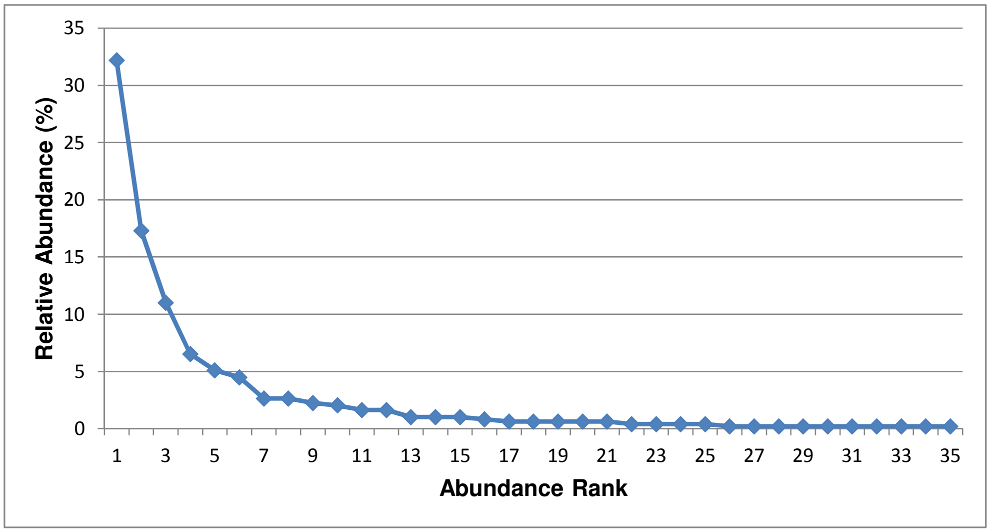
Study Reach 18 - Maple River

Taxa	# of individuals	% relative abundance	Catch / square	
1	159	30.99	14.45	11 of 54 squares picked
14	69	13.45	6.27	
17	63	12.28	5.73	
2	36	7.02	3.27	
3	34	6.63	3.09	
23	34	6.63	3.09	
49	27	5.26	2.45	
6	15	2.92	1.36	
16	11	2.14	1.00	
20	9	1.75	0.82	
5	6	1.17	0.55	
9	5	0.97	0.45	
29	5	0.97	0.45	
45	5	0.97	0.45	
24	4	0.78	0.36	
52	4	0.78	0.36	
18	3	0.58	0.27	
48	2	0.39	0.18	
50	2	0.39	0.18	
59	2	0.39	0.18	
66	2	0.39	0.18	
67	2	0.39	0.18	
69	2	0.39	0.18	
39	1	0.19	0.09	
55	1	0.19	0.09	
56	1	0.19	0.09	
68	1	0.19	0.09	
80	1	0.19	0.09	
90	1	0.19	0.09	
92	1	0.19	0.09	
95	1	0.19	0.09	
96	1	0.19	0.09	
106	1	0.19	0.09	
110	1	0.19	0.09	
111	1	0.19	0.09	



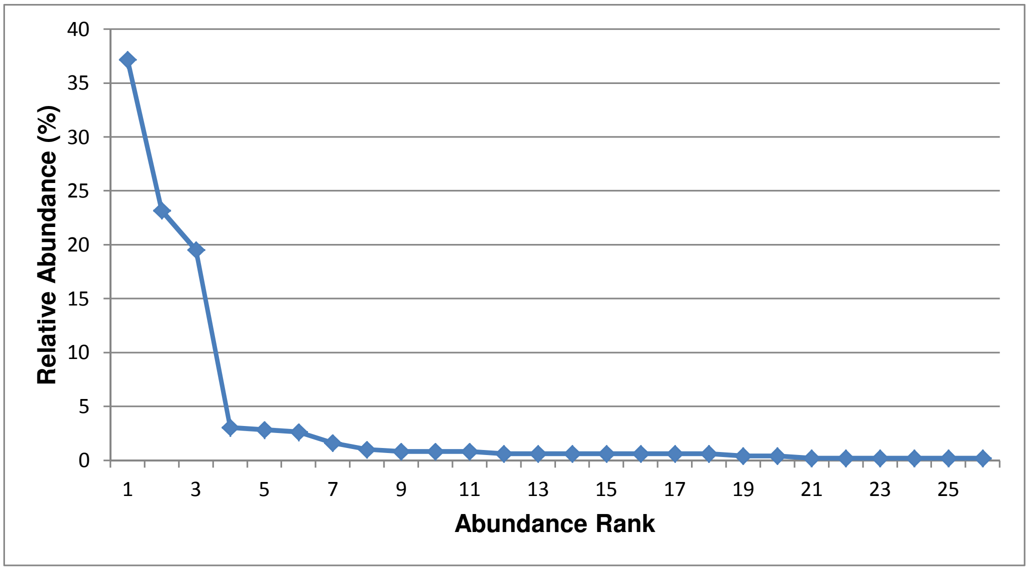
Study Reach 21 - Rush River

Taxa	# of individuals	% relative abundance	Catch / square	
24	158	32.18	2.93	Entire sample picked
14	85	17.31	1.57	
30	54	11.00	1.00	
51	32	6.52	0.59	
29	25	5.09	0.46	
92	22	4.48	0.41	
42	13	2.65	0.24	
108	13	2.65	0.24	
5	11	2.24	0.20	
36	10	2.04	0.19	
17	8	1.63	0.15	
107	8	1.63	0.15	
16	5	1.02	0.09	
22	5	1.02	0.09	
49	5	1.02	0.09	
105	4	0.81	0.07	
32	3	0.61	0.06	
48	3	0.61	0.06	
112	3	0.61	0.06	
113	3	0.61	0.06	
115	3	0.61	0.06	
7	2	0.41	0.04	
44	2	0.41	0.04	
117	2	0.41	0.04	
119	2	0.41	0.04	
19	1	0.20	0.02	
20	1	0.20	0.02	
47	1	0.20	0.02	
50	1	0.20	0.02	
54	1	0.20	0.02	
65	1	0.20	0.02	
66	1	0.20	0.02	
114	1	0.20	0.02	
116	1	0.20	0.02	
118	1	0.20	0.02	



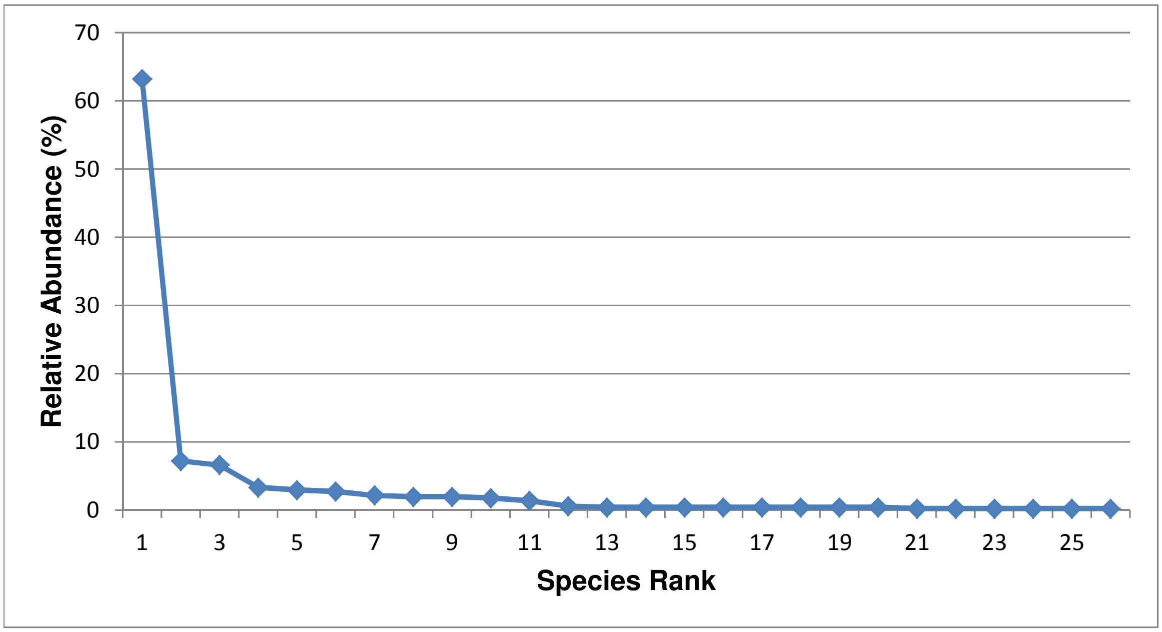
Study Reach 22 - Rush River

Taxa	# of individuals	% relative abundance	Catch / square	
14	183	37.20	5.38	34 or 54 squares picked
42	114	23.17	3.35	
17	96	19.51	2.82	
19	15	3.05	0.44	
107	14	2.85	0.41	
122	13	2.64	0.38	
103	8	1.63	0.24	
92	5	1.02	0.15	
29	4	0.81	0.12	
49	4	0.81	0.12	
108	4	0.81	0.12	
9	3	0.61	0.09	
20	3	0.61	0.09	
32	3	0.61	0.09	
47	3	0.61	0.09	
50	3	0.61	0.09	
112	3	0.61	0.09	
123	3	0.61	0.09	
79	2	0.41	0.06	
121	2	0.41	0.06	
16	1	0.20	0.03	
45	1	0.20	0.03	
67	1	0.20	0.03	
115	1	0.20	0.03	
117	1	0.20	0.03	
119	1	0.20	0.03	
120	1	0.20	0.03	



Study Reach 23 - Wolverton Creek

Taxa	# of individuals	% relative abundance	Catch / square	
42	325	63.23	25.00	13 or 54 squares picked
14	37	7.20	2.85	
48	34	6.61	2.62	
103	17	3.31	1.31	
123	15	2.92	1.15	
116	14	2.72	1.08	
17	11	2.14	0.85	
36	10	1.95	0.77	
47	10	1.95	0.77	
29	9	1.75	0.69	
50	7	1.36	0.54	
92	3	0.58	0.23	
16	2	0.39	0.15	
20	2	0.39	0.15	
45	2	0.39	0.15	
52	2	0.39	0.15	
115	2	0.39	0.15	
120	2	0.39	0.15	
126	2	0.39	0.15	
128	2	0.39	0.15	
57	1	0.19	0.08	
107	1	0.19	0.08	
124	1	0.19	0.08	
125	1	0.19	0.08	
127	1	0.19	0.08	
129	1	0.19	0.08	



Macroinvertebrate data, Fargo Diversion work, 2012: Site 1

Date Sampled: 9/4/2012
35 of 54 squares picked in a subsample of 10

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Hemiptera	Corixidae	-	-	N	396	
Ostracoda	-	-	-	-	75	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	4	
Ephemeroptera	Baetidae	-	-	L	7	Damaged
Veneroida	Pisidiidae	-	*Sphaerium*	-	3	
Oligochaeta	Tubificidae	-	-	-	1	
Diptera	Chironomidae	-	-	P	1	Damaged
Hemiptera	Corixidae	-	-	A	1	
Coleoptera	Heteroceridae	-	-	A	1	
Coleoptera	Heteroceridae	-	-	L	1	
Odonata	Coenagrionidae	-	*Argia*	L	1	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	1	
Odonata	Gomphidae	-	*Gomphus*	L	1	
Trichoptera	-	-	-	P	1	Damaged
Diplostraca	Macrothricidae	-	-	-	1	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	2	
Diptera	Chironomidae	Tanypodinae	*Telopelopia okoboji*	L	1	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	2	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	1	
Diptera	Chironomidae	Chironominae	*Paralauterborniella*	L	1	
Diptera	Chironomidae	Chironominae	*Cryptotendipes*	L	1	
Diptera	Chironomidae	Chironominae	-	P	1	
Ephemeroptera	Baetidae	-	*Procloeon*	L	1	
Odonata	Gomphidae	-	-	L	1	L&R/Voucher

Macroinvertebrate data, Fargo Diversion work, 2012: Site 2

Date Sampled: 8/31/2012
25 of 54 squares picked

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Hemiptera	Corixidae	-	-	N	445	
Oligochaeta	Tubificidae	-	-	-	6	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	10	
Hemiptera	Corixidae	-	*Trichocorixa*	A	1	
Coleoptera	Elmidae	-	*Stenelmis*	L	4	
Diptera	Chironomidae	-	-	P	2	
Coleoptera	Heteroceridae	-	-	A	2	Voucher (2)
Veneroida	Pisidiidae	-	*Sphaerium*	-	2	
Coleoptera	Carabidae	-	-	A	1	Voucher
Odonata	Coenagrionidae	-	*Argia*	L	1	
Odonata	Gomphidae	-	*Gomphus*	L	1	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	1	
Collembola	-	-	-	-	1	
Ostracoda	-	-	-	-	1	
Coleoptera	Elmidae	-	*Macronychus*	L	1	
Odonata	Gomphidae	-	*Stylurus*	L	1	
Diptera	Chironomidae	Chironominae	*Cryptotendipes*	L	1	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	1	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	1	
Diptera	Chironomidae	Chironominae	*Paralauterborniella*	L	4	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	1	
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	L	3	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 3

Date Sampled: 8/31/2012
30 of 54 squares picked

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Hemiptera	Corixidae	-	-	N	333	
Oligochaeta	Tubificidae	-	-	-	62	
Ostracoda	-	-	-	-	38	
Veneroida	Pisidiidae	-	*Sphaerium*	-	10	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	2	
Ephemeroptera	Baetidae	-	-	L	1	Damaged
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	2	
Coleoptera	Heteroceridae	-	-	A	2	
Odonata	Gomphidae	-	*Gomphus*	L	1	
Coleoptera	Heteroceridae	-	-	L	1	
Decapoda	Hyalellidae	-	*Hyalella azteca*	-	1	
Diptera	Ceratopogonidae	-	*Probezzia*	L	1	
Coleoptera	Dytiscidae	-	*Liodessus*	A	1	Voucher
Trichoptera	Hydropsychidae	-	*Potamyia*	L	1	Voucher
Hemiptera	Corixidae	-	*Trichocorixa*	A	1	
Ephemeroptera	Baetidae	-	*Procloeon*	L	1	
Oligochaeta	Naididae	-	-	-	1	
Diptera	Chironomidae	Chironominae	-	L	3	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	6	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	1	
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	L	1	
Diptera	Chironomidae	Chironominae	*Axarus*	L	1	
Diptera	Chironomidae	Chironominae	*Harnichia*	L	1	
Diptera	Chironomidae	Chironominae	*Cryptotendipes*	L	1	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 4

Date Sampled: 8/31/2012
16 of 54 squares picked

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Hemiptera	Corixidae	-	-	N	369	
Ostracoda	-	-	-	-	42	
Oligochaeta	Tubificidae	-	-	-	5	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	27	
Ephemeroptera	Baetidae	-	*Acerpenna*	L	7	Damaged
Diptera	Chironomidae	-	-	P	7	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	9	
Hemiptera	Corixidae	-	*Trichocorixa*	A	2	
Odonata	Gomphidae	-	*Stylurus*	L	1	Voucher
Veneroida	Pisidiidae	-	*Sphaerium*	-	5	
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	-	5	
Odonata	Gomphidae	-	*Gomphus*	L	2	
Ephemeroptera	Heptageniidae	-	*Maccaffertium*	L	3	
Collembola	-	-	-	-	2	
Coleoptera	Elmidae	-	*Stenelmis*	L	1	
Decapoda	Hyalellidae	-	*Hyalella azteca*	-	1	
Trichoptera	Hydropsychidae	-	-	L	1	Early Instar
Coleoptera	Heteroceridae	-	-	A	1	
Coleoptera	Heteroceridae	-	-	L	1	
Ephemeroptera	Caenidae	-	*Caenis*	L	1	
Coleoptera	-	-	-	L	1	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	7	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	2	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	1	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	1	
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	L	1	
Oligochaeta	Naididae	-	-	-	2	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 5

Date Sampled: 8/31/2012
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Class/SubClass/Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Hemiptera	Corixidae	-	-	N	431	
Oligochaeta	Tubificidae	-	-	-	25	
Ephemeroptera	Baetidae	-	-	L	1	Damaged
Ostracoda	-	-	-	-	9	
Veneroida	Pisidiidae	-	*Sphaerium*	-	3	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	2	
Ephemeroptera	Heptageniidae	-	*Maccaffertium*	L	1	
Araneae	-	-	-	-	1	
Diptera	Chironomidae	-	-	P	1	
Coleoptera	Dytiscidae	-	*Liodessus*	A	1	Voucher
Odonata	Gomphidae	-	*Gomphus*	L	1	
Gastropoda	Hydrobiidae	-	-	-	1	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	3	
Trichoptera	Leptoceridae	-	*Nectopsyche*	L	1	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	1	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	6	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	1	
Ephemeroptera	Baetidae	-	*Baetis*	L	2	
Ephemeroptera	Baetidae	-	*Procloeon*	L	6	
Ephemeroptera	Baetidae	-	*Acerpenna*	L	8	Voucher (3)
Oligochaeta	Naididae	-	-	-	5	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 6

Date Sampled: 8/31/2012
15 of 54 squares picked

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Hemiptera	Corixidae	-	-	N	433	
Oligochaeta	Tubificidae	-	-	-	18	
Veneroida	Pisidiidae	-	*Sphaerium*	-	8	
Ephemeroptera	Baetidae	-	-	L	1	Damaged
Hemiptera	Corixidae	-	*Trichocorixa*	A	1	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	3	
Diptera	Chironomidae	-	-	P	1	
Coleoptera	Elmidae	-	*Stenelmis*	L	1	
Collembola	-	-	-	-	1	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	1	
Diptera	Chironomidae	Chironominae	*Harnischia*	L	1	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	5	
Ephemeroptera	Baetidae	-	*Acerpenna*	L	1	
Oligochaeta	Naididae	-	-	-	1	
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	-	2	
Ostracoda	-	-	-	-	3	
Odonata	Gomphidae	-	-	-	1	Large and Rare

Macroinvertebrate data, Fargo Diversion work, 2012: Site 7

Date Sampled: 8/20/2012
9 of 54 squares picked

Class/SubClass/Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Hemiptera	Corixidae	-	-	N	243	
Ostracoda	-	-	-	-	37	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	29	
Odonata	Coenagrionidae	-	*Argia*	L	33	
Oligochaeta	Tubificidae	-	-	-	3	
Coleoptera	Elmidae	-	*Stenelmis*	L	21	
Trichoptera	Hydropsychidae	-	-	L	27	Early Instar
Basommatophora	Physidae	-	*Physa*	-	8	
Veneroida	Pisidiidae	-	*Sphaerium*	-	2	
Trichoptera	Hydropsychidae	-	*Potamyia*	L	7	
Hemiptera	Gerridae	-	*Rheumatobates*	-	5	
Acari	-	-	-	-	3	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	3	
Coleoptera	Elmidae	-	*Stenelmis*	A	2	
Diplostraca	Macrothricidae	-	-	-	3	
Ephemeroptera	Baetidae	-	-	L	2	Damaged
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	-	1	
Coleoptera	Elmidae	-	*Dubiraphia*	L	2	Voucher
Diptera	Chironomidae	Chironominae	-	P	1	
Coleoptera	Elmidae	-	*Macronychus*	L	1	
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	L	6	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	5	
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	L	9	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	15	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	3	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	4	
Diptera	Chironomidae	Chironominae	*Axarus*	L	1	
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*	L	4	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 8

Date Sampled: 8/31/2012
15 of 54 squares picked

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Hemiptera	Corixidae	-	-	N	393	
Ostracoda	-	-	-	-	37	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	23	
Hemiptera	Corixidae	-	*Trichocorixa*	A	8	
Coleoptera	Elmidae	-	*Stenelmis*	L	3	
Odonata	Coenagrionidae	-	*Argia*	L	3	
Diptera	Chironomidae	Chironominae	-	P	3	
Basommatophora	Physidae	-	*Physa*	-	3	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	2	
Oligochaeta	Tubificidae	-	-	-	1	
Trichoptera	Hydropsychidae	-	*Cheumatopsyche*	L	1	
Diplostraca	Macrothricidae	-	-	-	1	
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	-	1	
Trichoptera	Leptoceridae	-	*Oecetis*	L	1	
Trichoptera	Hydropsychidae	-	*Hydrospsyche*	L	1	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	12	
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	L	1	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	1	
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	L	3	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	4	
Oligochaeta	Naididae	-	-	-	1	
Veneroida	Pisidiidae	-	*Sphaerium*	-	1	Large and Rare
Ephemeroptera	Heptageniidae	-	-	L	1	Large and Rare

Macroinvertebrate data, Fargo Diversion work, 2012: Site 9

Date Sampled: 8/21/2012

17 of 54 squares picked

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Hemiptera	Corixidae	-	-	N	287	
Ostracoda	-	-	-	-	61	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	84	
Hemiptera	Corixidae	-	*Trichocorixa*	A	16	
Hemiptera	Corixidae	-	*Sigara*	A	1	
Basommatophora	Physidae	-	*Physa*	-	23	
Acari	-	-	-	-	4	
Odonata	Coenagrionidae	-	*Argia*	L	12	
Coleoptera	Elmidae	-	*Stenelmis*	L	10	
Oligochaeta	Tubificidae	-	-	-	1	
Coleoptera	Dytiscidae	-	*Laccophilus*	A	1	
Coleoptera	Haliplidae	-	*Peltodytes*	A	1	
Trichoptera	Leptoceridae	-	*Oecetis*	L	2	
Coleoptera	Elmidae	-	*Stenelmis*	A	1	
Coleoptera	Elmidae	-	*Dubiraphia*	L	1	
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	-	1	
Basommatophora	Ancylidae	-	*Ferrissia*	-	1	
Coleoptera	Heteroceridae	-	-	L	1	
Trichoptera	-	-	-	P	1	
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	L	12	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	2	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	1	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	1	
Diptera	Chironomidae	Chironominae	-	L	1	
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*	L	2	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	2	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 10

Date Sampled: 8/21/2012
17 of 54 squares picked in a subsample of 10

Class/SubClass/Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Ostracoda	-	-	-	-	388	
Hemiptera	Corixidae	-	-	N	61	
Oligochaeta	Tubificidae	-	-	-	1	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	6	
Hemiptera	Corixidae	-	*Trichocorixa*	A	3	
Odonata	Coenagrionidae	-	*Argia*	L	5	
Diptera	Chironomidae	-	-	P	2	
Acari	-	-	-	-	2	
Hemiptera	Gerridae	-	*Rheumatobates*	L	2	
Basommatophora	Physidae	-	*Physa*	-	1	
Coleoptera	Elmidae	-	*Stenelmis*	L	1	
Cyclopoida	Cyclopidae	-	-	-	1	
Coleoptera	Elmidae	-	*Macronychus*	L	1	
Trichoptera	Leptoceridae	-	*Oecetis*	L	1	
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	-	1	
Diptera	Dolichopodidae	-	-	L	1	
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	L	15	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	2	
Diptera	Chironomidae	Chironominae	*Dicrotendipes*	L	1	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	2	
Oligochaeta	Naididae	-	-	-	1	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 11

Date Sampled: 8/19/2012
12 of 54 squares picked

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Hemiptera	Corixidae	-	-	N	260	
Ostracoda	-	-	-	-	47	
Hemiptera	Corixidae	-	*Trichocorixa*	A	28	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	22	
Ephemeroptera	Baetidae	-	-	L	6	Damaged
Calanoida	Diaptomidae	-	*Diaptomus*	-	31	
Oligochaeta	Tubificidae	-	-	-	7	
Trichoptera	Leptoceridae	-	*Nectopsyche*	L	8	
Trichoptera	Hydropsychidae	-	*Cheumatopsyche*	L	9	
Ephemeroptera	Heptageniidae	-	*Maccaffertium*	L	4	
Ephemeroptera	Heptageniidae	-	-	L	1	
Diptera	Chironomidae	-	-	P	4	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	5	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	6	
Thysanoptera	-	-	-	-	2	Voucher (2)
Ephemeroptera	Caenidae	-	*Caenis*	L	3	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	2	
Odonata	Coenagrionidae	-	-	L	1	Early Instar
Araneae	-	-	-	-	3	
Basommatophora	Physidae	-	*Physa*	-	1	
Veneroida	Pisidiidae	-	*Pisidium*	-	1	
Diptera	Ephydridae	-	*Hydrellia*	P	1	
Diplostraca	Daphniidae	-	-	-	1	Voucher
Ostracoda	Candonidae	-	-	-	1	
Diptera	-	-	-	L	1	
Diptera	Simuliidae	-	*Simulium*	L	1	Voucher
Ephemeroptera	Baetiscidae	-	*Baetisca*	L	1	Voucher
Trichoptera	Hydropsychidae	-	*Hydrospsyche*	L	1	
Neotaenioglossa	Hydrobiidae	-	-	-	1	
Coleoptera	Hydrophilidae	-	*Tropisternus*	L	1	Voucher
Diptera	Chironomidae	Chironominae	*Paralauterborniella*	L	2	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	1	
Diptera	Chironomidae	Chironominae	-	L	1	
Ephemeroptera	Baetidae	-	*Baetis*	L	16	
Ephemeroptera	Baetidae	-	*Apobaetis*	L	2	
Ephemeroptera	Baetidae	-	*Procloeon*	L	7	
Ephemeroptera	Baetidae	-	*Pseudocloeon*	L	8	
Coleoptera	Dytiscidae	-	*Laccophilus*	A	1	Large and Rare
Veneroida	Pisidiidae	-	*Sphaerium*	-	1	Large and Rare
Decapoda	Cambaridae	-	*Orconectes*	-	1	Large and Rare
Hemiptera	Nepidae	-	*Ranatra fusca*	A	1	Large and Rare

Macroinvertebrate data, Fargo Diversion work, 2012: Site 12

Date Sampled: 8/19/2012
20 of 54 squares picked

Class/SubClass/Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Hemiptera	Corixidae	-	-	N	204	-
Ostracoda	-	-	-	-	105	-
Ephemeroptera	Baetidae	-	-	L	8	Damaged
Ephemeroptera	Baetidae	-	*Baetis*	L	8	Voucher (4)
Oligochaeta	Tubificidae	-	-	-	27	-
Hemiptera	Corixidae	-	*Trichocorixa*	A	29	-
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	19	-
Araneae	-	-	-	-	7	-
Diptera	Ephydridae	-	*Hydrellia*	L	7	-
Ephemeroptera	Heptageniidae	-	*Heptagenia*	L	3	Damaged
Decapoda	Cambaridae	-	*Orconectes*	-	1	-
Odonata	Calopterygidae	-	*Hetaerina*	L	1	-
Diptera	Chironomidae	-	-	P	4	-
Calanoida	Diaptomidae	-	*Diaptomus*	-	4	Voucher (2)
Diptera	-	-	-	P	2	-
Acari	-	-	-	-	1	-
Veneroida	Pisidiidae	-	*Sphaerium*	-	1	-
Ephemeroptera	Ephemeridae	-	*Pentagenia*	L	1	Damaged
Hemiptera	Hebridae	-	*Merragata*	A	1	-
Trichoptera	Hydropsychidae	-	-	L	1	Early Instar
Coleoptera	Dytiscidae	-	*Laccophilus*	A	1	-
Odonata	Gomphidae	-	*Gomphus*	L	1	-
Diptera	Psychodidae	-	*Pericoma*	L	1	Voucher
Hemiptera	Corixidae	-	*Sigara*	A	1	-
Coleoptera	Hydraenidae	-	*Ochthebius*	A	1	Voucher
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	2	-
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	2	-
Ephemeroptera	Baetidae	-	*Apobaetis*	L	14	-
Ephemeroptera	Baetidae	-	*Procloeon*	L	22	-
Ephemeroptera	Baetidae	-	*Pseudocloeon*	L	8	-
Ephemeroptera	Heptageniidae	-	*Maccaffertium*	L	1	-
Ephemeroptera	Heptageniidae	-	-	L	1	Damaged
Oligochaeta	Naididae	-	-	-	3	-
Hemiptera	Nepidae	-	*Ranatra fusca*	A	1	Large and Rare
Hemiptera	Belostomatidae	-	*Belostoma flumineum*	A	1	Large and Rare

Macroinvertebrate data, Fargo Diversion work, 2012: Site 13

Date Sampled: 8/18/2012
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Class/SubClass/Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Hemiptera	Corixidae	-	-	N	210	
Oligochaeta	Tubificidae	-	-	-	31	
Ephemeroptera	Baetidae	-	-	L	11	Damaged
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	53	
Hemiptera	Corixidae	-	*Trichocorixa*	A	10	
Trichoptera	Leptoceridae	-	*Nectopsyche*	L	13	Voucher (5)
Ostracoda	-	-	-	-	13	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	14	Voucher (4)
Trichoptera	Hydropsychidae	-	-	L	6	
Trichoptera	Hydropsychidae	-	*Cheumatopsyche*	L	5	Voucher (3)
Trichoptera	Hydropsychidae	-	*Hydrospsyche*	L	2	Voucher (1)
Araneae	-	-	-	-	3	
Ephemeroptera	Heptageniidae	-	*Maccaffertium*	L	6	Voucher (2)
Ephemeroptera	Heptageniidae	-	-	L	1	
Ephemeroptera	Heptageniidae	-	*Heptagenia*	L	3	Voucher (1)
Ephemeroptera	Caenidae	-	*Caenis*	L	5	Voucher (2)
Odonata	Coenagrionidae	-	*Argia*	L	2	Voucher (1)
Veneroida	Pisidiidae	-	*Sphaerium*	-	2	
Hemiptera	Corixidae	-	*Sigara*	A	4	Voucher (2)
Diptera	Ephydridae	-	*Hydrellia*	L	3	Voucher (2)
Diptera	-	-	-	P	2	
Diptera	Ceratopogonidae	-	*Probezzia*	L	2	Voucher (2)
Trichoptera	Hydroptilidae	-	*Neotrichia*	L	2	Voucher (2)
Hemiptera	Gerridae	-	*Rheumatobates*	A	2	Voucher (2)
Hemiptera	Pleidae	-	*Neoplea*	A	1	
Diptera	Chironomidae	-	-	P	1	
Coleoptera	Elmidae	-	*Stenelmis*	A	1	
Acari	-	-	-	-	1	
Ephemeroptera	Ephemeridae	-	*Hexagenia limbata*	L	1	
Odonata	Calopterygidae	-	*Hetaerina*	L	1	Voucher
Coleoptera	Heteroceridae	-	-	L	1	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	4	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	8	
Diptera	Chironomidae	Chironominae	-	L	5	
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	L	2	
Diptera	Chironomidae	Orthocladiinae	*Cricotopus*	L	1	
Ephemeroptera	Baetidae	-	*Baetis*	L	6	
Ephemeroptera	Baetidae	-	*Apobaetis*	L	30	Voucher (8)
Ephemeroptera	Baetidae	-	*Procloeon*	L	17	
Ephemeroptera	Baetidae	-	*Pseudocloeon*	L	11	Voucher (4)
Diptera	Chironomidae	Chironominae	*Rheotanytarsus exiguus gr.*	L	3	
Diptera	Chironomidae	Chironominae	*Paracladopelma*	L	1	
Diptera	Chironomidae	Chironominae	Chironomini	L	1	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 14

Date Sampled: 8/18/2012
Entire Sample Picked

Class/SubClass/Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Hemiptera	Corixidae	-	-	N	51	
Oligochaeta	Tubificidae	-	-	-	2	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	47	
Hemiptera	Corixidae	-	*Trichocorixa*	A	12	
Hemiptera	Corixidae	-	*Sigara lineata*	A	12	
Ephemeroptera	Baetidae	-	*Apobaetis*	L	2	Damaged
Trichoptera	Hydropsychidae	-	*Hydrospsyche*	L	9	
Trichoptera	Hydropsychidae	-	-	L	7	Early Instar
Veneroida	Pisidiidae	-	*Sphaerium*	-	3	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	7	
Coleoptera	Elmidae	-	*Stenelmis*	A	2	
Ephemeroptera	Caenidae	-	*Caenis*	L	2	
Diptera	Chironomidae	-	-	P	2	
Diptera	Ephydridae	-	*Parydra*	L	1	Voucher
Trichoptera	Hydroptilidae	-	-	P	2	
Hemiptera	Corixidae	-	*Sigara*	A	2	
Trichoptera	Leptoceridae	-	*Nectopsyche*	L	1	
Araneae	-	-	-	-	1	
Ephemeroptera	Heptageniidae	-	*Maccaffertium*	L	1	
Ostracoda	-	-	-	-	1	
Diptera	-	-	-	P	1	
Coleoptera	Heteroceridae	-	-	L	1	
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	L	2	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	1	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	4	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	2	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	9	
Diptera	Chironomidae	Chironominae	*Axarus*	L	1	
Diptera	Ceratopogonidae	-	-	L	2	Damaged
Diptera	Chironomidae	Chironominae	*Paralauterborniella*	L	1	
Ephemeroptera	Baetidae	-	*Baetis*	L	2	
Ephemeroptera	Baetidae	-	*Acerpenna*	L	1	
Diptera	Ephydridae	-	-	L	1	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 15

Date Sampled: 8/17/2012
Entire Sample Picked

Class/SubClass/Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Hemiptera	Corixidae	-	-	N	121	
Oligochaeta	Tubificidae	-	-	-	46	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	35	
Ephemeroptera	Baetidae	-	*Baetis*	L	3	Damaged
Hemiptera	Corixidae	-	*Sigara lineata*	A	5	
Hemiptera	Corixidae	-	*Trichocorixa*	A	6	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	3	
Hemiptera	Nepidae	-	*Ranatra fusca*	-	1	
Araneae	-	-	-	-	1	
Diptera	Chironomidae	-	-	P	1	
Hemiptera	Pleidae	-	*Neoplea*	A	1	
Ephemeroptera	Heptageniidae	-	-	L	1	Damaged
Odonata	Gomphidae	-	*Stylurus*	L	1	
Coleoptera	Elmidae	-	*Stenelmis*	L	1	
Trichoptera	Hydroptilidae	-	*Mayatrichia*	L	1	Voucher
Coleoptera	Lampyridae	-	-	L	1	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	14	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	2	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	2	
Diptera	Chironomidae	Chironominae	*Harnischia*	L	1	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	3	
Diptera	Chironomidae	Chironominae	*Paralauterborniella*	L	3	
Ephemeroptera	Baetidae	-	*Apobaetis*	L	4	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 16

Date Sampled: 8/13/2012
44 of 54 squares picked in a subsample of 10

Class/SubClass/Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	38	Voucher (10)
Hemiptera	Corixidae	-	*Trichocorixa*	A	105	Voucher (25)
Odonata	Coenagrionidae	-	*Enallagma*	L	2	
Hemiptera	Corixidae	-	-	N	58	
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*	L	7	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	12	
Diptera	Chironomidae	Chironominae	*Parachironomus*	L	5	
Odonata	Coenagrionidae	-	*Argia*	L	20	Voucher (3)
Coleoptera	Elmidae	-	*Stenelmis*	L	23	Voucher (10)
Coleoptera	Elmidae	-	*Stenelmis*	A	11	Voucher (5)
Ostracoda	-	-	-	-	15	
Veneroida	Pisidiidae	-	*Sphaerium*	-	8	Voucher (4)
Basommatophora	Physidae	-	*Physa*	-	10	
Decapoda	Hyalellidae	-	*Hyalella azteca*	-	6	
Coleoptera	Elmidae	-	*Dubiraphia*	A	3	Voucher (2)
Coleoptera	Elmidae	-	*Dubiraphia*	L	1	
Hemiptera	Pleidae	-	*Neoplea*	A	1	
Oligochaeta	Tubificidae	-	-	-	5	
Araneae	-	-	-	-	1	
Ephemeroptera	Heptageniidae	-	-	L	1	Damaged/Early Instar
Diptera	Chironomidae	-	-	P	1	
Cyclopoida	Cyclopidae	-	-	-	1	
Diplostraca	Daphniidae	-	-	-	2	
Coleoptera	Haliplidae	-	*Peltodytes*	A	1	
Nemata	-	-	-	-	1	
Diptera	Ceratopogonidae	-	*Probezzia*	L	2	
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	-	2	Voucher (2)
Hemiptera	Corixidae	-	*Sigara*	A	2	
Hemiptera	Hebridae	-	*Merragata*	A	1	Voucher
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	L	79	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	52	
Diptera	Chironomidae	Chironominae	-	L	5	
Diptera	Chironomidae	Chironominae	*Endochironomus*	L	5	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	13	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	6	
Hemiptera	Belostomatidae	-	*Belostoma flumineum*	A	1	L&R/Voucher

Macroinvertebrate data, Fargo Diversion work, 2012: Site 17

Date Sampled: 8/22/2012
11 of 54 squares picked

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Ostracoda	-	-	-	-	147	
Hemiptera	Corixidae	-	-	N	90	
Coleoptera	Elmidae	-	*Stenelmis*	L	56	
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	-	29	
Veneroida	Pisidiidae	-	*Sphaerium*	-	20	
Hemiptera	Corixidae	-	*Trichocorixa*	A	16	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	2	
Ephemeroptera	Leptohyphidae	-	*Tricorythodes*	L	8	
Ephemeroptera	Caenidae	-	*Caenis*	L	7	
Ephemeroptera	Ephemeridae	-	*Hexagenia*	L	5	Early Instar
Diptera	Chironomidae	-	-	P	6	
Acari	-	-	-	-	3	
Trichoptera	Hydropsychidae	-	*Hydrospsyche*	L	7	
Coleoptera	Heteroceridae	-	-	L	2	
Trichoptera	Leptoceridae	-	*Oecetis*	L	3	
Trichoptera	Leptoceridae	-	*Nectopsyche*	L	1	
Cyclopoida	Cyclopidae	-	-	-	1	
Ephemeroptera	Baetidae	-	*Procloeon*	L	1	
Diptera	Ephydridae	-	-	L	1	
Coleoptera	Elmidae	-	*Stenelmis*	A	1	
Veneroida	Pisidiidae	-	*Pisidium*	-	1	
Odonata	Gomphidae	-	-	L	1	Early Instar
Oligochaeta	Tubificidae	-	-	-	6	
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	L	17	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	9	
Diptera	Chironomidae	Orthocladiinae	*Nanocladius*	L	2	
Diptera	Chironomidae	Orthocladiinae	*Cricotopus*	L	1	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	35	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	8	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	6	
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	L	3	
Diptera	Chironomidae	Chironominae	*Paralauterborniella nigrohalteralis*	L	2	
Decapoda	Cambaridae	-	*Orconectes*	-	1	Large and Rare
Oligochaeta	Naididae	-	-	-	1	
Cyclopoida	Cyclopidae	-	-	L	1	

Macroinvertebrate data, Fargo Diversion work, 2012: Site 18

Date Sampled: 8/14/2012
11 of 54 squares picked

Class/SubClass/Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Hemiptera	Corixidae	-	-	N	159	
Hemiptera	Corixidae	-	*Trichocorixa*	A	34	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	69	
Diptera	Chironomidae	Chironominae	-	L	9	
Hemiptera	Corixidae	-	*Palmacorixa gillettei*	A	34	
Oligochaeta	Tubificidae	-	-	-	15	
Ostracoda	-	-	-	-	35	
Veneroida	Pisidiidae	-	*Sphaerium*	-	6	
Basommatophora	Physidae	-	*Physa*	-	5	
Odonata	Coenagrionidae	-	*Argia*	L	5	
Trichoptera	Leptoceridae	-	*Oecetis*	L	4	
Coleoptera	Elmidae	-	*Stenelmis*	A	3	
Veneroida	Pisidiidae	-	*Pisidium*	-	2	Voucher (2)
Coleoptera	Elmidae	-	*Dubiraphia*	L	2	
Cyclopoida	Cyclopidae	-	-	-	2	
Diplostraca	Daphniidae	-	-	-	2	
Araneae	-	-	-	-	2	
Coleoptera	Elmidae	-	*Stenelmis*	L	1	
Hemiptera	Pleidae	-	*Neoplea*	A	1	
Coleoptera	Dytiscidae	-	*Laccophilus*	A	1	
Hemiptera	Nepidae	-	*Ranatra fusca*	A	1	
Hemiptera	Corixidae	-	*Sigara*	A	1	
Hemiptera	Corixidae	-	*Sigara lineata*	A	1	
Diptera	Ceratopogonidae	-	*Forcipomyia*	L	1	Voucher
Ostracoda	-	-	-	-	1	
Diptera	Ephydridae	-	*Hydrellia*	L	1	
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*	L	2	
Diptera	Chironomidae	Orthocladiinae	*Cricotopus*	L	1	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	63	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	5	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	11	
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	L	27	
Diptera	Chironomidae	Chironominae	*Endochironomus*	L	1	
Diptera	Chironomidae	Chironominae	*Paralauterborniella*	L	3	
Hemiptera	Notonectidae	-	*Notonecta*	-	1	Large and Rare
Neotaenioglossa	Hydrobiidae	-	*Amnicola limosa*	-	1	Large and Rare
Diptera	Chironomidae	Chironominae	Chironomini	L	1	

Macroinvertebrate data, Fargo Diversion work, 2011: Site 21

Data updated 1-24-12 with Chironomid information

Date Sampled: 9/13/2011
Entire sample picked

Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Acari	-	-	-	-	1	
Araneae	-	-	-	-	1	
Coleoptera	Elmidae	-	*Dubiraphia*	L	3	
Coleoptera	Elmidae	-	*Stenelmis*	L	156	
Coleoptera	Elmidae	-	*Stenelmis*	A	2	
Coleoptera	Staphylinidae	-	-	A	3	
Diptera	Ceratopogonidae	Ceratopogoninae	-	L	3	early instar
Diptera	Ceratopogonidae	-	*Bezzia*	L	1	
Diptera	Ceratopogonidae	-	*Culicoides*	L	3	
Diptera	Ceratopogonidae	-	*Probezzia*	L	3	
Diptera	Chironomidae	Chironominae	*Axarus*	L	10	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	8	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	25	
Diptera	Chironomidae	Chironominae	*Cryptotendipes*	L	1	
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	L	5	
Diptera	Chironomidae	Chironominae	*Harnischia*	L	2	
Diptera	Chironomidae	Chironominae	*Phaenopsectra*	L	1	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	5	
Diptera	Chironomidae	Chironominae	-	P	1	
Diptera	Chironomidae	Orthocladiinae	*Cricotopus*	L	22	
Diptera	Chironomidae	Orthocladiinae	*Nanocladius*	L	13	
Diptera	Chironomidae	Orthocladiinae	-	P	2	
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*	L	1	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	85	
Diptera	Chironomidae	Tanypodinae	*Telopelopia*	L	54	
Diptera	Chironomidae	-	-	-	2	Emerging
Ephemeroptera	Caenidae	-	*Caenis*	L	13	
Ephemeroptera	Ephemeridae	-	*Hexagenia*	L	8	
Ephemeroptera	Heptageniidae	-	-	L	1	Damaged
Lepidoptera	Noctuidae	-	-	L	1	
Nemata	-	-	-	-	4	
Odonata	Coenagrionidae	-	-	L	1	Early Instar
Odonata	Gomphidae	-	-	L	5	Early Instar
Oligochaeta	-	-	-	-	2	
Trichoptera	Hydropsychidae	-	*Cheumatopsyche*	L	32	
Veneroida	Pisidiidae	-	*Sphaerium*	-	11	

Red numbers and names indicate updated data after QA/QC

Macroinvertebrate data, Fargo Diversion work, 2011: Site 22

Data updated 1-24-12 with Chironomid information

Date Sampled: 9/12/2011

34 or 54 squares picked

Order	Family	Subfamily	*Genus*	Life Stage	Count	Notes
Acari	-	-	-	-	3	
Basommatophora	Physidae	-	*Physa*	-	1	
Coleoptera	Staphylinidae	-	-	A	3	
Cyclpoida	Cyclopidae	-	-	-	1	
Decapoda	Cambaridae	-	*Orconectes*	-	2	
Diplostraca	Bosminidae	-	-	-	2	
Diptera	Ceratopogonidae	-	*Culicoides*	L	1	
Diptera	Ceratopogonidae	-	*Probezzia*	L	3	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	96	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	4	
Diptera	Chironomidae	Chironominae	*Cryptotendipes*	L	15	
Diptera	Chironomidae	Chironominae	*Glyptotendipes*	L	4	
Diptera	Chironomidae	Chironominae	*Microchironomus*	L	13	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	1	
Diptera	Chironomidae	Chironominae	-	L	2	
Diptera	Chironomidae	Chironominae	-	P	1	
Diptera	Chironomidae	Orthocladiinae	*Cricotopus*	L	5	
Diptera	Chironomidae	Orthocladiinae	*Nanocladius*	L	4	
Diptera	Chironomidae	Orthocladiinae	-	P	1	
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*	L	3	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	183	
Ephemeroptera	Caenidae	-	*Caenis*	L	114	
Ephemeroptera	Ephemeridae	-	*Hexagenia*	L	14	
Heteroptera	Corixidae	-	-	N	3	
Odonata	Coenagrionidae	-	*Argia*	L	3	
Odonata	Coenagrionidae	-	*Enallagma*	L	8	
Oligochaeta	-	-	-	-	1	
Veneroida	Pisidiidae	-	*Pisidium*	-	1	

Red numbers indicate updated numbers after QA/QC

Macroinvertebrate data, Fargo Diversion work, 2011: Site 23

Data updated 1-24-12 with Chironomid information

Date Sampled: 9/14/2011

13 or 54 squares picked

Order	**Family**	**Subfamily**	***Genus***	**Life Stage**	**Count**	**Notes**
Ephemeroptera	Caenidae	-	*Caenis*	L	325	
Diptera	Chironomidae	Tanypodinae	*Procladius*	L	37	
Odonata	Coenagrionidae	-	*Enallagma*	L	17	
Coleoptera	Elmidae	-	*Dubiraphia*	L	33	
Heteroptera	Corixidae	-	-	N	15	
Acari	-	-	-	-	10	
Diptera	Chironomidae	Orthocladiinae	*Cricotopus*	L	3	
Basommatophora	Physidae	-	*Physa*	-	2	
Diptera	Ceratopogonidae	-	*Culicoides*	L	2	
Heteroptera	Nepidae	-	*Ranatra*	A	1	
Heteroptera	Belostomatidae	-	*Belostoma*	A	1	
Trichoptera	Leptoceridae	-	*Oecetis*	L	2	
Coleoptera	Elmidae	-	*Dubiraphia*	A	1	
Amphipoda	Hyalellidae	-	*Hyalella*	-	2	
Cyclpoida	Cyclopidae	-	-	-	2	
Ephemeroptera	Ephemeridae	-	*Hexagenia*	L	1	
Megaloptera	Sialidae	-	*Sialis*	L	1	
Coleoptera	Haliplidae	-	*Peltodytes*	A	1	
Diptera	Chironomidae	Chironominae	*Chironomus*	L	11	
Diptera	Chironomidae	Chironominae	*Axarus*	L	10	
Diptera	Chironomidae	Chironominae	*Phaenopsectra*	L	14	
Diptera	Chironomidae	Chironominae	*Polypedilum*	L	2	
Diptera	Chironomidae	Chironominae	*Cryptochironomus*	L	9	
Diptera	Chironomidae	Chironominae	*Paratanytarsus*	L	2	
Diptera	Chironomidae	Chironominae	-	L	2	damaged
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*	L	7	
Diptera	Chironomidae	Orthocladiinae	*Synendotendipes*	L	1	

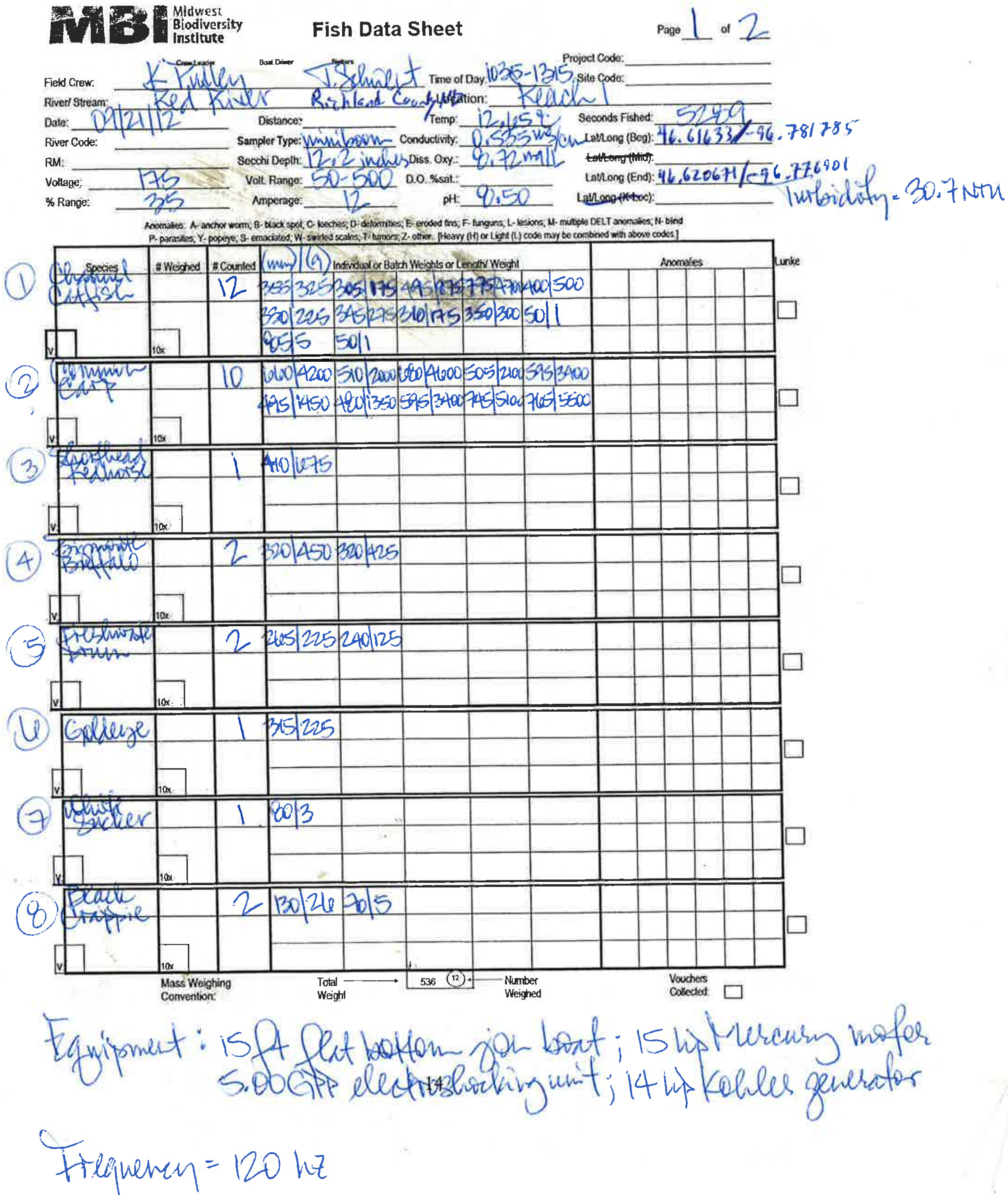
Red numbers and names indicate updated data after QA/QC

Macroinvertebrate Data for 21 samples collected by URS
Samples processed and Identified by:

VCSU Macroinvertebrate Lab
101 SW College St.
Valley City, ND   58072

Contact Person:
Dr. Andre DeLorme
701-845-7573
andre.delorme@vcsu.edu

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



MBI Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: Crew Leader K Pulley Boat Driver Netters J. Schmidt
Time of Day: 1035-1315
Project Code:
Site Code:
River/ Stream: Red River Richland County
Location: Reach 1
Date: 09/21/12
Distance:
Temp: 12.659
Seconds Fished: 5249
River Code:
Sampler Type: miniboom
Conductivity: 0.535 ws/cm
Lat/Long (Beg): 46.61633/-96.781785
RM:
Secchi Depth: 12.2 inches
Diss. Oxy.: 8.72 mg/L
~~Lat/Long (Mid)~~:
Voltage: 175
Volt. Range: 50-500
D.O. %sat.:
Lat/Long (End): 46.620671/-96.776901
% Range: 35
Amperage: 12
pH: 8.50
Lat/Long ~~(X-loc)~~:
Turbidity = 30.7 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	(mm)	(g) Individual or Batch Weights or Length/ Weight									Anomalies	Lunker
① Channel Catfish		12	335	325	305	175	495	875	775	4700	400	500		
			330	225	345	275	310	175	350	300	50	1		☐
V:	10x		805	5	50	1								
② Common Carp		10	660	4200	510	2000	680	4600	505	2100	595	3400		
			495	1450	480	1350	595	3400	745	5100	765	5500		☐
V:	10x													
③ Shorthead Redhorse		1	410	675										
														☐
V:	10x													
④ Bigmouth Buffalo		2	320	450	380	425								
														☐
V:	10x													
⑤ Freshwater Drum		2	265	225	240	125								
														☐
V:	10x													
⑥ Goldeye		1	315	225										
														☐
V:	10x													
⑦ White Sucker		1	80	3										
														☐
V:	10x													
⑧ Black Crappie		2	130	24	70	5								
														☐
V:	10x													

Mass Weighing Convention:
Total Weight → 536 (12) ← Number Weighed
Vouchers Collected: ☐

Equipment: 15 ft flat bottom jon boat; 15 hp Mercury motor 5.0GPP electroshocking unit; 14 hp Kohler generator

Frequency = 120 hz

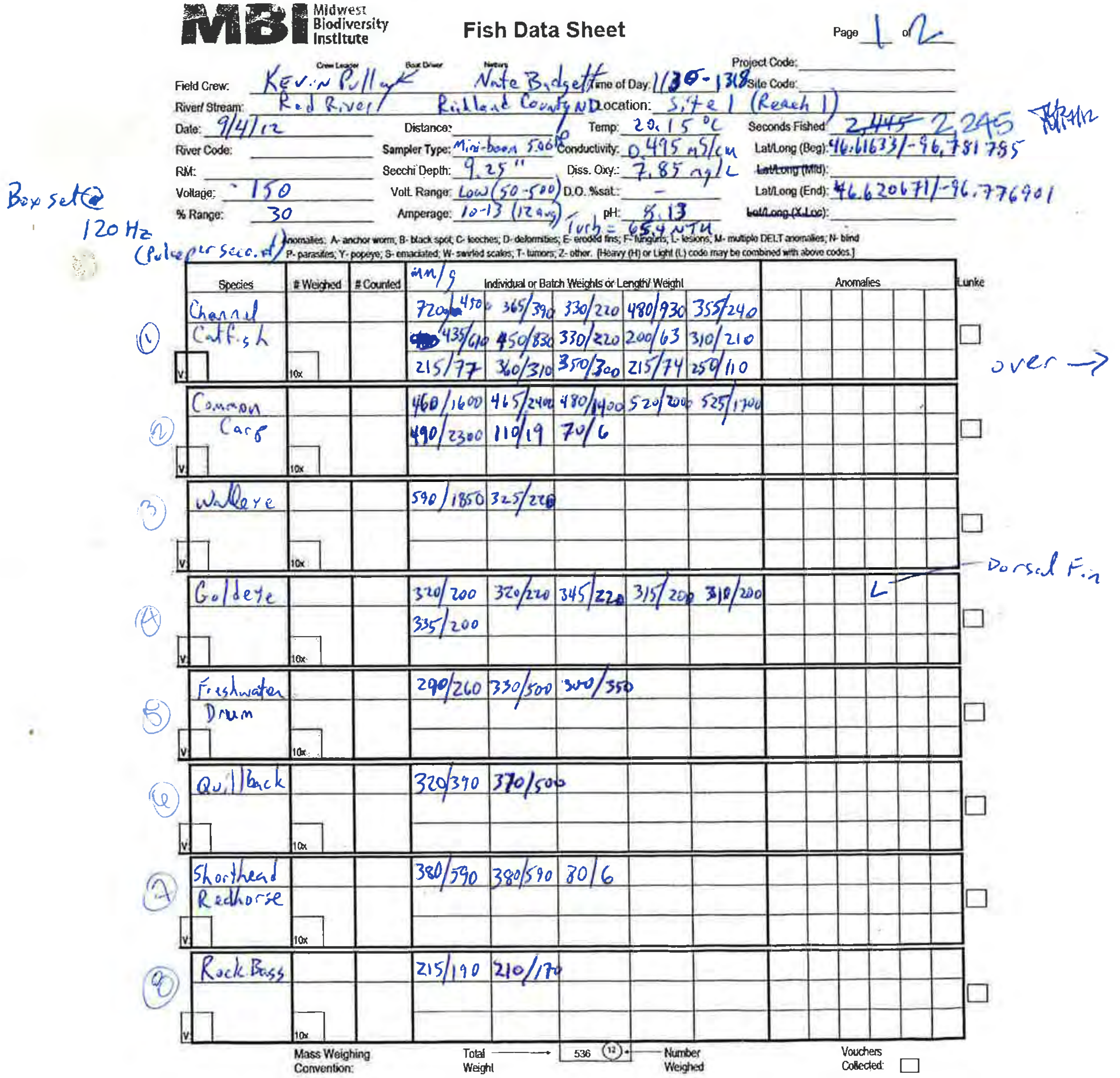
Figure 4. continued

Page 2 of 2

	Species	# Weighed	# Counted	(mm)	(g) Individual or Batch Weights or Length/ Weight									Anomalies	Lunker
⑨	Orangespotted Sunfish		11	75	38	40	38	45	38	50	38	30	38		
				40	38	40	38	70	38	95	38	45	38		☐
	V:	10x		35	38										
⑩	Bluegill		5	50	10	40	10	45	10	45	10	45	10		
															☐
	V:	10x													
⑪	Spotfin Shiner		15	70	59	100	59	35	59	70	59	105	59		
				100	59	35	59	50	59	40	59	45	59		☐
	V:	10x		105	59	105	59	105	59	55	59	100	59		
	Spotfin Shiner		15	45	59	50	59	40	59	105	59	45	59		
				50	59	45	59	105	59	100	59	105	59		☐
	V:	10x		50	59	55	59	30	59	35	59	100	59		
	Spotfin Shiner		9	45	59	75	59	40	59	50	59	40	59		
				30	59	30	59	45	59	100	59				☐
	V:	10x													
⑫	Sand Shiner		15	100	31	100	31	45	31	30	31	100	31		
				50	31	35	31	50	31	40	31	50	31		☐
	V:	10x		50	31	35	31	35	31	40	31	30	31		
	Sand Shiner		15	55	31	55	31	40	31	35	31	45	31		
				30	31	35	31	45	31	35	31	35	31		☐
	V:	10x		25	31	45	31	35	31	30	31	30	31		
	Sand Shiner		11	35	31	45	31	30	31	40	31	45	31		
				40	31	30	31	40	31	35	31	30	31		☐
	V:	10x		35	31										
⑬	Fathead Minnow		11	50	11	30	11	35	11	40	11	55	11		
				45	11	40	11	35	11	45	11	50	11		☐
	V:	10x		40	11										
															☐
	V:	10x													
															☐
	V:	10x													
															☐
	V:	10x													
															☐
	V:	10x													

Orangespotted Sunfish weight (38g) is a batch weight
Bluegill weight (10 g) is a batch weight
Spotfin Shiner weight (59g) is a batch weight
Sand Shiner weight (31g) is a batch weight
Fathead minnow weight (11 g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: Kevin Pollak (Crew Leader) Nate Bidgett (Boat Driver) (Netters)
Time of Day: 1130-1318
Project Code:
Site Code:
River/ Stream: Red River/ Richland County ND
Location: Site 1 (Reach 1)
Date: 9/4/12
Distance:
Temp: 20.15 °C
Seconds Fished: ~~2,445~~ 2,245 [illegible]
River Code:
Sampler Type: Mini-boom 5.0GP
Conductivity: 0.495 mS/cm
Lat/Long (Beg): 46.61633/-96.781785
RM:
Secchi Depth: 9.25"
Diss. Oxy.: 7.85 mg/L
~~Lat/Long (Mid)~~:
Voltage: ~150
Volt. Range: Low (50-500)
D.O. %sat.: –
Lat/Long (End): 46.620671/-96.776901
% Range: 30
Amperage: 10-13 (12 avg)
pH: 8.13
~~Lat/Long (X-Loc)~~:
Turb = 65.4 NTU

Box set@ 120 Hz (Pulse per second)

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind; P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight mm/g					Anomalies	Lunke	
①	Channel Catfish			720/450	365/390	330/220	480/930	355/240		☐	over →
				435/610	450/830	330/220	200/63	310/210			
	V:	10x		215/77	360/310	350/300	215/74	250/110			
②	Common Carp			460/1600	465/2400	480/1400	520/2000	525/1700		☐	
				490/2300	110/19	70/6					
	V:	10x									
③	Walleye			590/1850	325/220					☐	
	V:	10x									
④	Goldeye			320/200	320/220	345/220	315/200	310/200	L	☐	Dorsal Fin
				335/200							
	V:	10x									
⑤	Freshwater Drum			290/260	330/500	300/350				☐	
	V:	10x									
⑥	Quillback			320/390	370/500					☐	
	V:	10x									
⑦	Shorthead Redhorse			380/590	380/590	80/6				☐	
	V:	10x									
⑧	Rock Bass			215/190	210/170					☐	
	V:	10x									

Mass Weighing Convention:
Total Weight → 536 (12) ← Number Weighed
Vouchers Collected: ☐

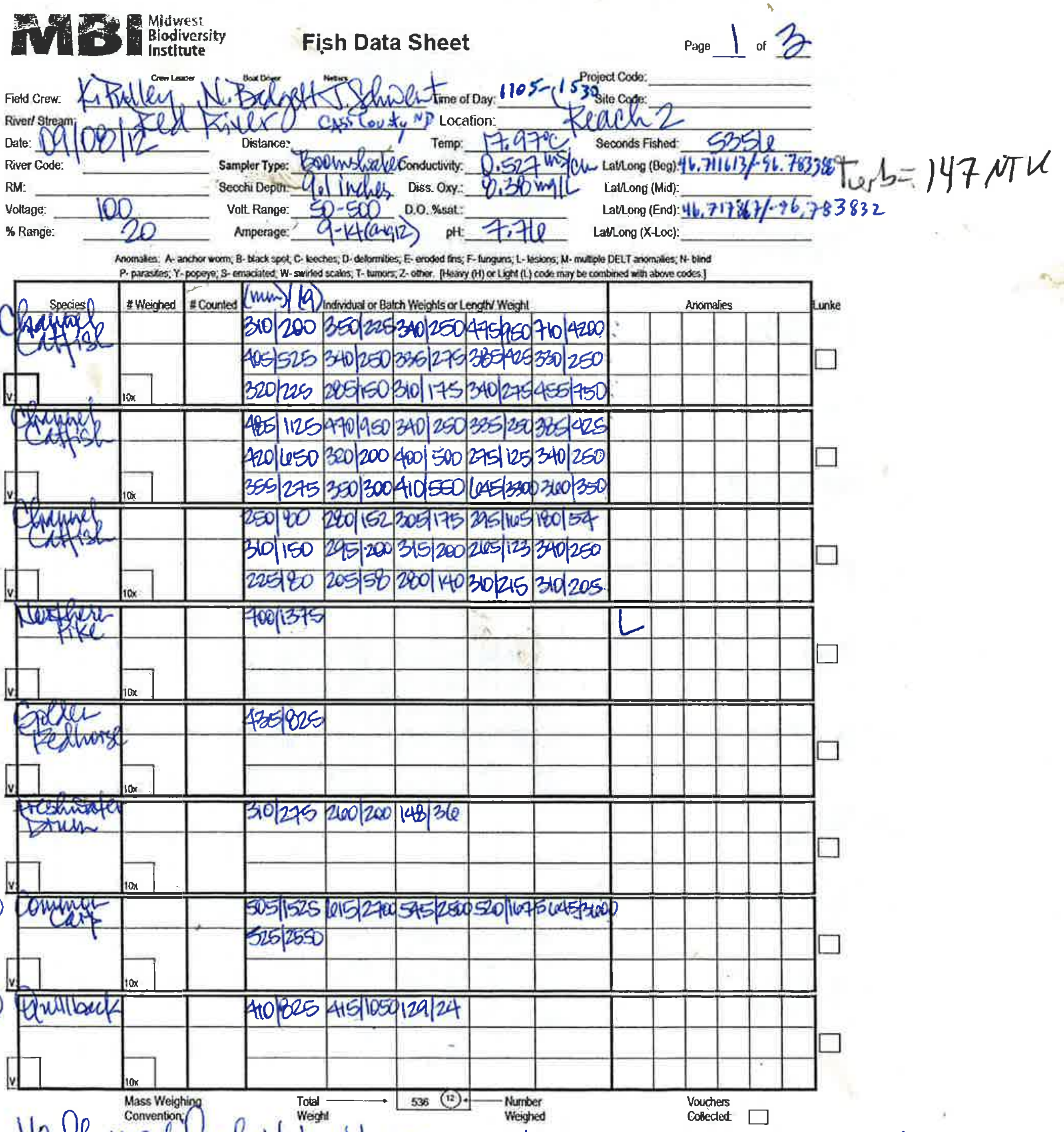
Figure 4. continued

Page 2 of 2

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
	Channel Catfish V:	10x		225/83	~~255~~/124	220/78	210/69			☐
(9) 6g	Bluegill V:	10x		50/6	40/6	30/6	30/6			☐
(10)	Orangespotted V:	10x		45/2	70/5	80/10				☐
(11) 26g	Spotfin Shiner V:	10x		60/26	65/26	55/26	60/26	65/26		☐
				65/26	55/26	65/26	55/26	55/26		
				45/26	45/26	55/26	50/26	70/26		
	Spotfin Shiner V:	10x		55/26						☐
(13)	Sand Shiner V:	10x		43/1	45/1					☐
(12)	Fathead Minnow V:	10x		35/1	35/1	47/1				☐
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐

Spotfin Shiner weight (26g) is a batch weight.
Sandshiner weight (1g) is a batch weight
Fathead minnow weight (1g) is a batch weight
Bluegill weight (6g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 3

Field Crew: K. Kelley (Crew Leader), N. Badgett (Boat Driver), J. Schwent (Netters)
Time of Day: 1105-1530
Project Code:
Site Code:
River/ Stream: Red River Cass County ND
Location: Reach 2
Date: 09/08/12
Distance:
Temp: 17.97°C
Seconds Fished: 5356
River Code:
Sampler Type: Boomshocker
Conductivity: 0.527 mS/cm
Lat/Long (Beg): 46.711613/-96.783389
Turb = 147 NTU
RM:
Secchi Depth: 9.1 inches
Diss. Oxy.: 8.38 mg/L
Lat/Long (Mid):
Voltage: 100
Volt. Range: 50-500
D.O. %sat.:
Lat/Long (End): 46.717867/-96.783832
% Range: 20
Amperage: 9-14 (avg 12)
pH: 7.76
Lat/Long (X-Loc):

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunke
①	Channel Catfish			310/200	350/225	340/250	475/950	710/4200		
				405/525	340/250	336/275	385/425	330/250		☐
	V:	10x		320/225	285/150	310/175	340/275	455/750		
	Channel Catfish			485/1125	470/950	340/250	335/250	385/425		
				420/650	320/200	400/500	275/125	340/250		☐
	V:	10x		355/275	350/300	410/560	645/3300	360/350		
	Channel Catfish			250/90	280/152	305/175	295/165	180/54		
				310/150	295/200	315/280	265/123	340/250		☐
	V:	10x		225/80	205/58	280/140	310/215	310/205		
②	Northern Pike			700/1375					L	
										☐
	V:	10x								
③	Golden Redhorse			435/825						
										☐
	V:	10x								
④	Freshwater Drum			310/275	260/200	148/36				
										☐
	V:	10x								
⑤	Common Carp			505/1525	615/2700	545/2500	520/1675	645/3600		
				525/2550						☐
	V:	10x								
⑥	Quillback			410/825	415/1050	129/24				
										☐
	V:	10x								

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

16 ft modified V-hull jon boat, 60 hp Evinrude motor
Frequency = 120 Hz
5.0 GPP control box
Kohler generator, 14 hp

Figure 4. continued

Page 2 of 3

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies						Lunker
⑦ Walleye			360/325											
														☐
V:	10x													
⑧ Goldeye			325/175	330/200	365/375	310/150								
														☐
V:	10x													
Channel Catfish			315/250	195/60	275/180	195/100	280/170							
			140/21	300/190	350/300	200/50	155/30							☐
V:	10x		170/32	135/20	205/62	205/69	165/35							
⑨ Shorthead Redhorse			370/500	195/95	105/15	60/3								
														☐
V:	10x													
Channel Catfish			185/47	700/3650	490/1200	470/925	63/3							
			60/3	50/2	50/3									☐
V:	10x													
⑩ Bluegill			40/2	30/2	30/2	30/1								
														☐
V:	10x													
⑪ Orange-spotted Sunfish			40/4	40/4	30/4									
														☐
V:	10x													
⑫ Emerald Shiner			50/8	55/8	60/8	55/8	70/8							
														☐
V:	10x													
⑬ Spotfin Shiner			65/78	55/78	65/78	60/78	50/78							
			65/78	70/78	55/78	50/78	60/78							☐
V:	10x		60/78	50/78	45/78	55/78	65/78							
⑭ Sand Shiner			55/18	35/18	50/18	55/18	45/18							
			40/18	40/18	50/18	50/18	25/18							☐
V:	10x		35/18	50/18	35/18	25/18	25/18							
Fathead minnow														
														☐
V:	10x													
Spotfin Shiner			65/78	55/78	65/78	60/78	50/78							
			55/78	55/78	60/78	30/78	60/78							☐
V:	10x		70/78	60/78	60/78	60/78	65/78							
Spotfin Shiner			55/78	55/78	50/78	55/78	45/78							
			40/78	50/78	35/78	40/78								☐
V:	10x													

Orange-spotted Sunfish weight (4g) is a batch weight.
Emerald shiner weight (8g) is a batch weight
Spotfin shiner weight (78g) is a batch weight
Sand shiner weight (18g) is a batch weight.

Reach 2
09/08/2012

Figure 4. continued

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Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies						Lunker
Sand Shiner V:	10x		50/18	50/18	45/18	40/18	45/18							☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.

Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 1

Project Code:
Field Crew: Crew Leader K. Kelley Boat Driver N. Baumgart Netters J. Schmidt
Time of Day: 1020-1215
Site Code:
River/ Stream: Red River @ Cass County ND
Location: Reach 2
Date: 08/31/12
Distance:
Temp: 22.18°C
Seconds Fished: 1777
River Code:
Sampler Type: Boomshocker
Conductivity: 0.601 mS/cm
Lat/Long (Beg): 46.711613/ -96.783386
Turb= 53.1 NTU
RM:
Secchi Depth: 10.5 inches
Diss. Oxy.: 7.29 mg/L
~~Lat/Long (Mid)~~:
Voltage: 200
Volt. Range: 130-200
D.O. %sat:
Lat/Long (End): 46.717867/-96.783832
% Range: 50 (Duty Cycle)
Amperage: 9-13
pH: 7.85
~~Lat/Long (X-Loc)~~:

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
Channel Catfish			315/175	510/1150	305/175	300/175	305/200		
		12	510/1325	305/150	380/450	215/80	300/190		☐
V	10x		195/55	145/23					
Common Carp		2	470/1150	450/975					
									☐
V	10x								
Shorthead Redhorse		3	415/875	305/550	305/225				
									☐
V	10x								
(Juvenile) Channel Catfish		2	105/3	90/1					
									☐
V	10x								
Spotfin Shiner		14	55/30	70/30	65/30	65/30	60/30		
			50/30	55/30	55/30	65/30	65/30		☐
V	10x		55/30	65/30	55/30	68/30			
									☐
V	10x								
									☐
V	10x								
									☐
V	10x								

Mass Weighing Convention: Total Weight → 536 ⑫ ← Number Weighed

Vouchers Collected: ☐

Frequency = 50 hz
Boomshocker Control Box = VVP 15B; DC current
Spotfin Shiner weights (30g) is a batch weight

Figure 4. continued

Page ____ of ____

Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight					Anomalies						Lunker
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
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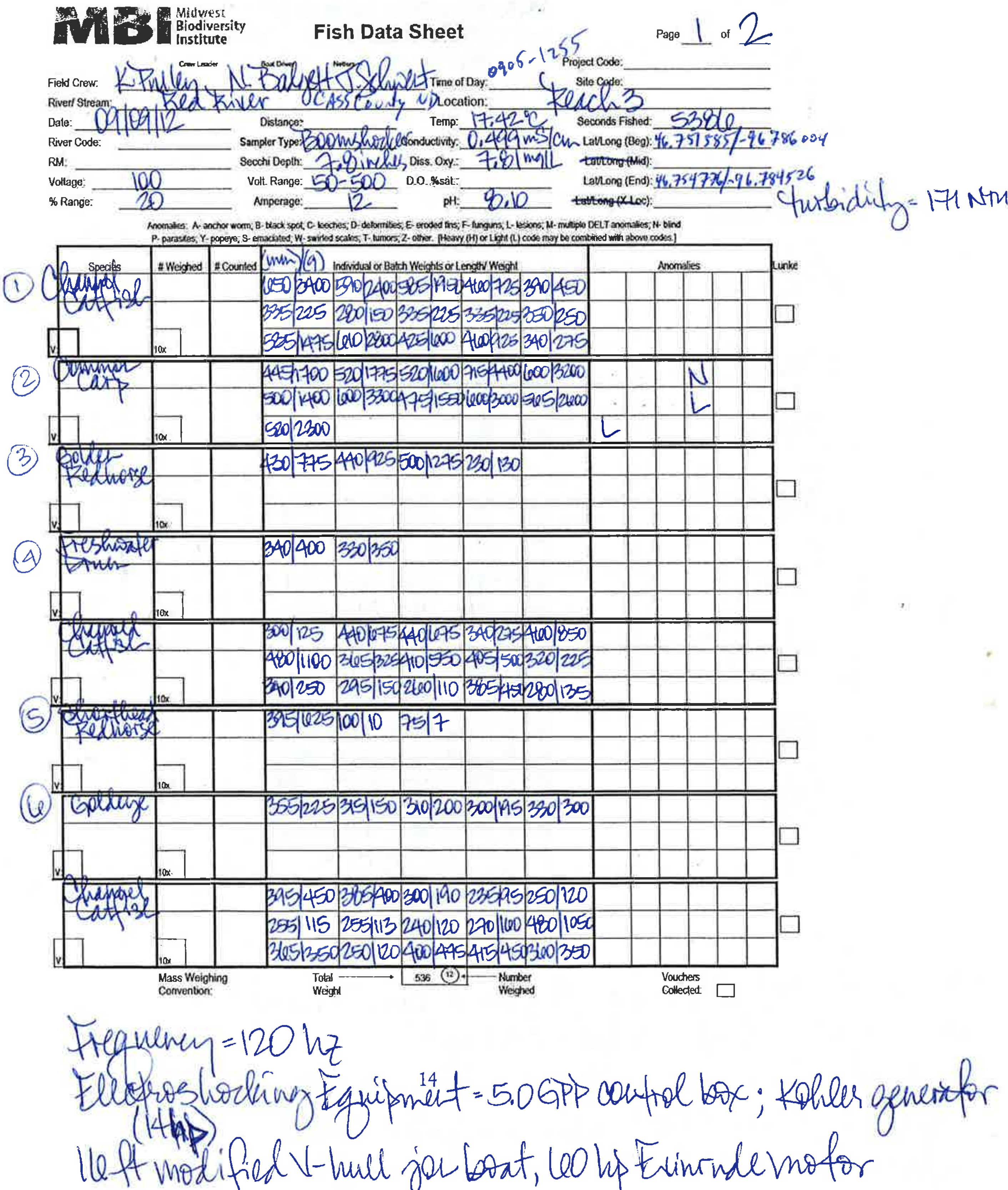
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: K. Pulley (Crew Leader), N. Balgett (Boat Driver), J. Schmidt (Netters)
Time of Day: 0906-1255
Project Code:
Site Code:
River/ Stream: Red River (Cass County ND)
Location: Reach 3
Date: 09/09/12
Distance:
Temp: 17.42°C
Seconds Fished: 5386
River Code:
Sampler Type: Boomshocker
Conductivity: 0.499 mS/cm
Lat/Long (Beg): 46.751585/-96.786004
RM:
Secchi Depth: 7.8 inches
Diss. Oxy.: 7.81 mg/L
~~Lat/Long (Mid)~~:
Voltage: 100
Volt. Range: 50-500
D.O. %sat.:
Lat/Long (End): 46.754776/-96.784526
% Range: 20
Amperage: 12
pH: 8.10
~~Lat/Long (X-Loc)~~:
Turbidity = 171 NTU

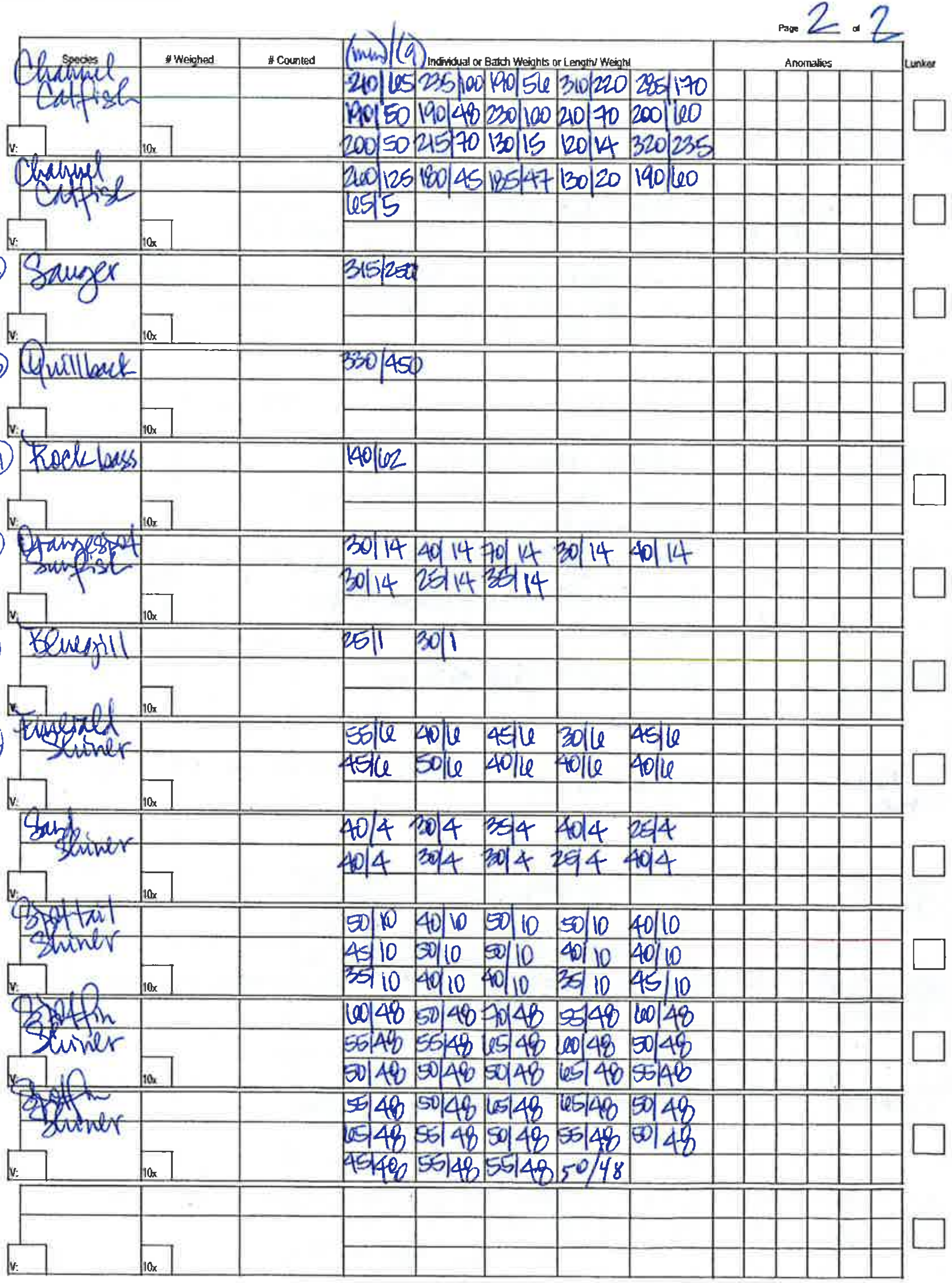
Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)	(g) Individual or Batch Weights or Length/ Weight									Anomalies	Lunker
①	Channel Catfish			650	3400	590	2400	585	1950	400	725	390	450		
				335	225	280	150	335	225	335	225	350	250		☐
	V:	10x		525	1475	610	2800	425	600	400	925	340	275		
②	Common Carp			445	1700	520	1775	520	1600	715	4400	600	3200	N	
				500	1400	600	3300	475	1550	600	3000	505	2600	L	☐
	V:	10x		520	2300									L	
③	Golden Redhorse			430	775	440	925	500	1275	230	130				
															☐
	V:	10x													
④	Freshwater Drum			340	400	330	350								
															☐
	V:	10x													
	Channel Catfish			300	125	440	675	440	675	340	275	400	850		
				480	1100	365	325	410	550	405	500	320	225		☐
	V:	10x		340	250	295	150	260	110	365	450	280	135		
⑤	Shorthead Redhorse			395	625	100	10	75	7						
															☐
	V:	10x													
⑥	Goldeye			355	225	315	150	310	200	300	195	330	300		
															☐
	V:	10x													
	Channel Catfish			395	450	385	400	300	190	235	95	250	120		
				255	115	255	113	240	120	270	160	480	1050		☐
	V:	10x		365	350	250	120	400	445	415	450	360	350		

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Frequency = 120 hz
Electroshocking Equipment = 5.0 GPP control box; Kohler generator (14 hp)
16 ft modified V-hull jon boat, 60 hp Evinrude motor

Figure 4. continued

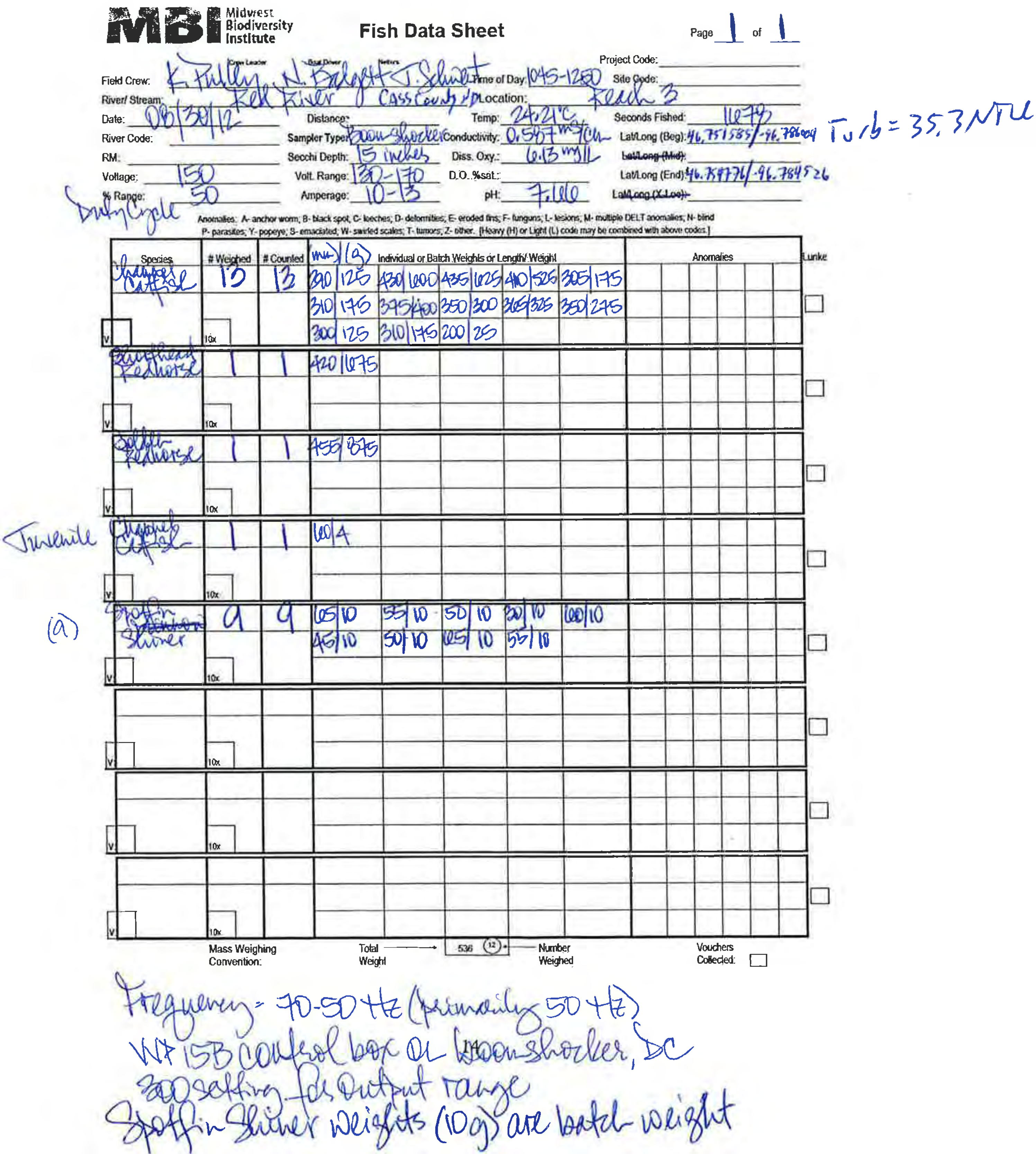


Page 2 of 2

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
Channel Catfish			240/165	235/100	190/56	310/220	285/170		
			190/50	190/48	230/100	210/70	200/160		☐
V:	10x		200/50	215/70	130/15	120/14	320/235		
Channel Catfish			260/125	180/45	185/47	130/20	190/160		
			165/5						☐
V:	10x								
⑦ Sauger			315/250						
									☐
V:	10x								
⑧ Quillback			330/450						
									☐
V:	10x								
⑨ Rock bass			140/62						
									☐
V:	10x								
⑩ Orangespot sunfish			30/14	40/14	70/14	30/14	40/14		
			30/14	25/14	35/14				☐
V:	10x								
⑪ Bluegill			25/1	30/1					
									☐
V:	10x								
⑫ Emerald Shiner			55/6	40/6	45/6	30/6	45/6		
			45/6	50/6	40/6	40/6	40/6		☐
V:	10x								
⑬ Sand Shiner			40/4	30/4	35/4	40/4	25/4		
			40/4	30/4	30/4	25/4	40/4		☐
V:	10x								
⑭ Spottail Shiner			50/10	40/10	50/10	50/10	40/10		
			45/10	50/10	50/10	40/10	40/10		☐
V:	10x		35/10	40/10	40/10	35/10	45/10		
⑮ Spotfin Shiner			60/48	50/48	70/48	55/48	60/48		
			55/48	55/48	65/48	60/48	50/48		☐
V:	10x		50/48	50/48	50/48	65/48	55/48		
Spotfin Shiner			55/48	50/48	65/48	65/48	50/48		
			65/48	55/48	50/48	55/48	50/48		☐
V:	10x		45/48	55/48	55/48	50/48			
									☐
V:	10x								

Orangespot Sunfish weight (14g) is a batch weight.
Bluegill weight (1g) is a batch weight
Emerald shiner weight (6g) is a batch weight
Spottail shiner weight (10g) is a batch weight
Spotfin shiner weight (48g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 1

Project Code:
Field Crew: (Crew Leader) K. Pulley (Boat Driver) N. Balgett (Netters) J. Schwert
Time of Day: 1045-1250
Site Code:
River/ Stream: Red River Cass County ND
Location: Reach 3
Date: 08/30/12
Distance:
Temp: 24.21°C
Seconds Fished: 1679
River Code:
Sampler Type: Boom-shocker
Conductivity: 0.587 ms/cm
Lat/Long (Beg): 46.751585/-96.786004
Turb = 35.3 NTU
RM:
Secchi Depth: 15 inches
Diss. Oxy.: 6.13 mg/L
~~Lat/Long (Mid):~~
Voltage: 150
Volt. Range: 130-170
D.O. %sat.:
Lat/Long (End): 46.757776/-96.784526
% Range: 50 Duty Cycle
Amperage: 10-13
pH: 7.66
~~Lat/Long (X-Loc):~~

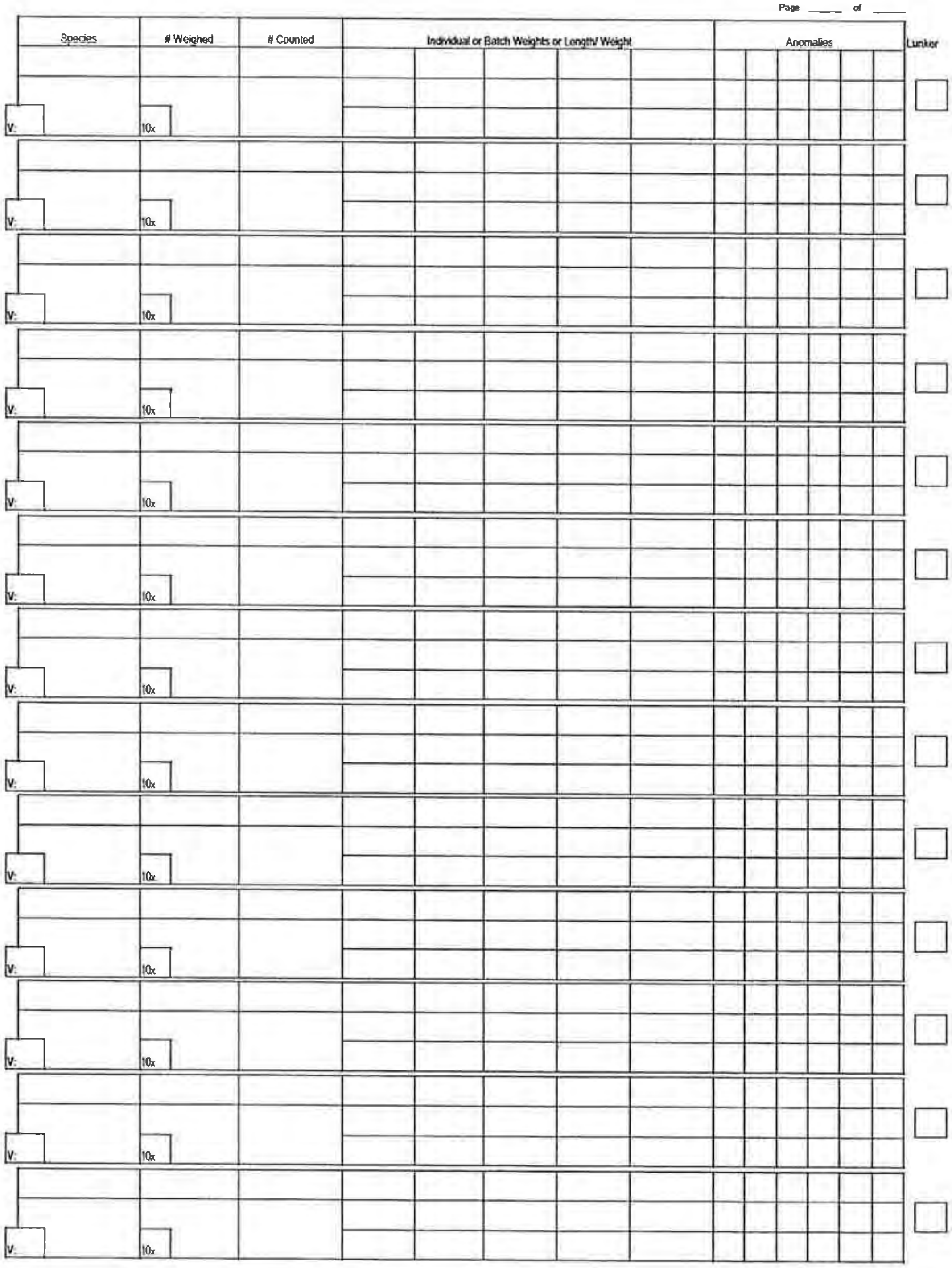
Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
	Channel Catfish	13	13	390/125	430/600	435/625	410/525	305/175		☐
				310/175	375/400	350/300	365/325	350/275		
	V ☐	10x ☐		300/125	310/175	200/25				
	Shorthead Redhorse	1	1	420/675						☐
	V ☐	10x ☐								
	Silver Redhorse	1	1	455/875						☐
	V ☐	10x ☐								
Juvenile	Channel Catfish	1	1	60/4						☐
	V ☐	10x ☐								
(a)	Spotfin ~~[illegible]~~ Shiner	9	9	65/10	55/10	50/10	80/10	60/10		☐
				45/10	50/10	65/10	55/10			
	V ☐	10x ☐								
										☐
	V ☐	10x ☐								
										☐
	V ☐	10x ☐								
										☐
	V ☐	10x ☐								

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Frequency = 70-50 Hz (primarily 50 Hz)
WP 15B control box on boomshocker, DC
300 setting for output range
Spotfin Shiner weights (10g) are batch weight

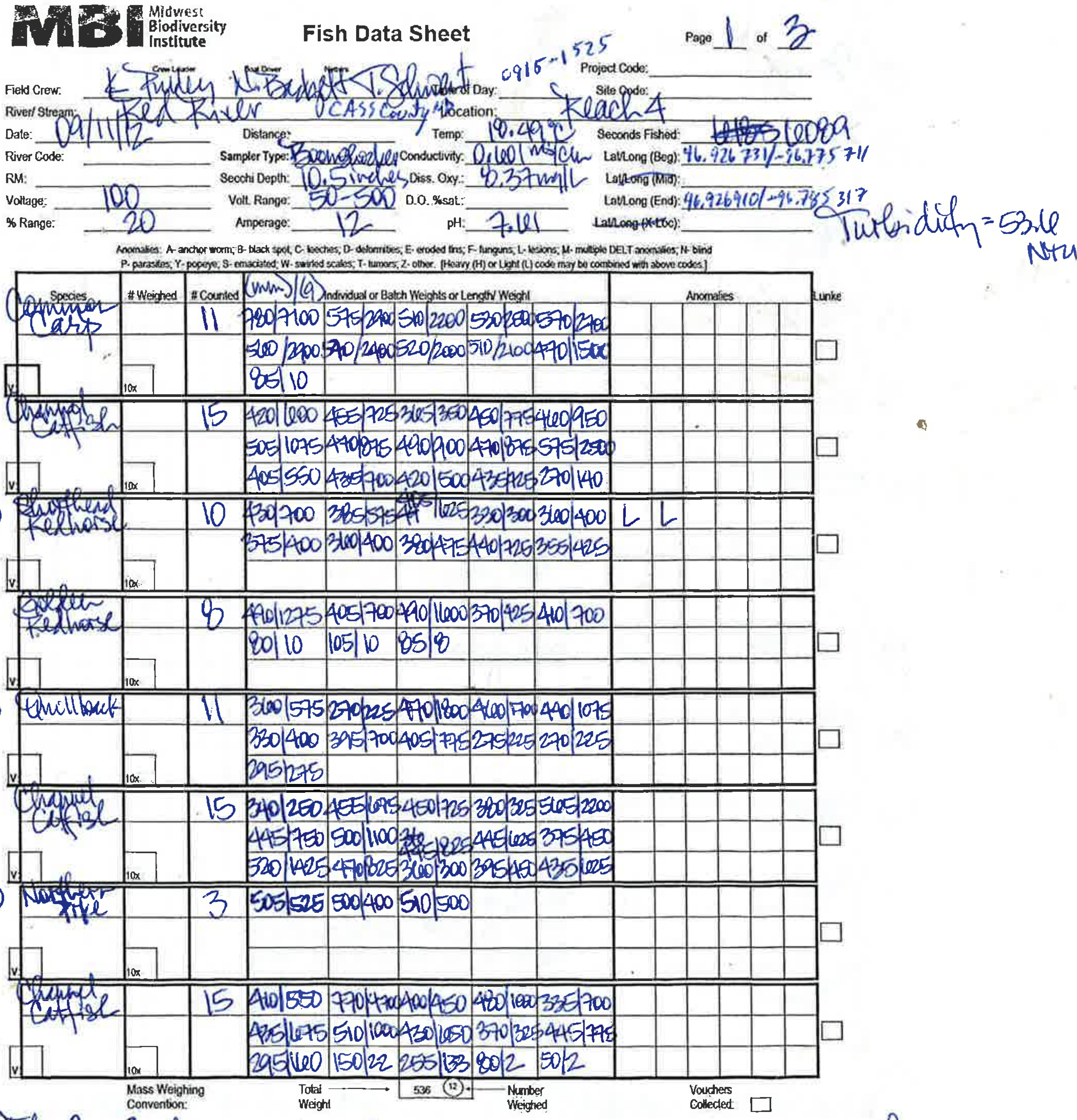
Figure 4. continued



Page ____ of ____

Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight	Anomalies	Lunker
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 3

Field Crew: Crew Leader K. Pulley Boat Driver N. Beckett Netters T. Schmidt
Time of Day: 0915-1525
Project Code:
Site Code:
River/ Stream: Red River
Location: CASS County ND Reach 4
Date: 09/11/12
Distance:
Temp: 18.49°C
Seconds Fished: ~~14185~~ 10089
River Code:
Sampler Type: Boom shocker
Conductivity: 0.661 mS/cm
Lat/Long (Beg): 46.926731/-96.775711
RM:
Secchi Depth: 10.5 inches
Diss. Oxy.: 8.37 mg/L
Lat/Long (Mid):
Voltage: 100
Volt. Range: 50-500
D.O. %sat.:
Lat/Long (End): 46.926910/-96.785317
% Range: 20
Amperage: 12
pH: 7.61
Lat/Long ~~(X-Loc)~~:
Turbidity = 53.6 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies		Lunke
① Common Carp		11	780/7100	575/2900	510/2200	530/2800	570/2400			
			500/2900	540/2400	520/2000	510/2100	470/1500			☐
V:	10x		85/10							
② Channel Catfish		15	420/1000	455/725	365/350	450/775	460/950			
			505/1075	470/875	490/900	470/875	575/2500			☐
V:	10x		405/550	435/700	420/500	435/825	270/140			
③ Shorthead Redhorse		10	430/700	385/575	445/625	330/300	360/400	L	L	
			375/400	360/400	380/475	440/725	355/425			☐
V:	10x									
④ Golden Redhorse		8	490/1275	405/700	490/1600	370/425	410/700			
			80/10	105/10	85/8					☐
V:	10x									
⑤ Quillback		11	360/575	270/225	470/1800	460/700	440/1075			
			330/400	395/700	405/775	275/225	270/225			☐
V:	10x		295/275							
Channel Catfish		15	340/250	455/695	450/725	380/325	505/2200			
			445/750	500/1100	445/825	445/625	375/450			☐
V:	10x		320/425	470/825	360/300	395/450	435/625			
⑥ Northern Pike		3	505/525	500/400	510/500					
										☐
V:	10x									
Channel Catfish		15	410/550	770/4700	400/450	480/1000	335/700			
			435/675	510/1000	430/1050	370/325	445/775			☐
V:	10x		295/160	150/22	255/133	80/2	50/2			

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Electroshocking equipment = 5.0 GPP and 14 hp Kohler generator 16 ft modified V hull jon boat, 60 hp Evinrude motor
Frequency = 120 hz

Figure 4. continued

Page 2 of 3

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
⑦	Goldeye V:	10x	5	330/250	325/200	315/225	330/250	205/82		☐
⑧	Sauger V:	10x	1	325/250						☐
⑨	Freshwater Drum V:	10x	2	435/1025	340/450					☐
⑩	Smallmouth Bass V:	10x	1	110/20						☐
⑪	Rock Bass V:	10x	1	120/35						☐
⑫	White Bass V:	10x	1	135/30						☐
⑬	Orangespotted Sunfish V:	10x	3	75/8	30/1	40/1				☐
	Channel Catfish V:	10x	4	55/2	60/2	65/3	55/1			☐
⑭	Trout Perch V:	10x	4	70/3	65/2	65/3	65/3			☐
⑮	White Sucker V:	10x	1	80/5						☐
⑯	Sand Shiner V:	10x	15	25/36 35/36 35/36	30/36 40/36 45/36	30/36 50/36 50/36	45/36 50/36 40/36	40/36 40/36 40/36		☐
	Sand Shiner V:	10x	15	45/36 50/36 40/36	45/36 45/36 40/36	45/36 45/36 40/36	40/36 50/36 40/36	50/36 35/36 35/36		☐
	Sand Shiner V:	10x	15	35/36 40/36 55/36	40/36 45/36 30/36	30/36 35/36 55/36	40/36 50/36 35/36	40/36 40/36 45/36		☐

Sand Shiner weight (36g) is a batch weight - continued on page 3

Site 4, Red River
09/11/12

Figure 4. continued

Page 3 of 3

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
Sand Shiner		4	30/36	40/36	45/36	55/36			☐
V:	10x								
⑰ Spotfin Shiner		15	60/105	65/105	70/105	70/105	65/105		☐
			55/105	60/105	30/105	70/105	60/105		
V:	10x		75/105	35/105	40/105	35/105	75/105		
Spotfin Shiner		15	60/105	65/105	70/105	65/105	60/105		☐
			65/105	55/105	65/105	60/105	50/105		
V:	10x		45/105	50/105	45/105	65/105	65/105		
Spotfin Shiner		15	55/105	40/105	35/105	70/105	35/105		☐
			55/105	45/105	50/105	45/105	50/105		
V:	10x		50/105	65/105	50/105	75/105	55/105		
Spotfin Shiner		15	40/105	65/105	40/105	50/105	40/105		☐
			30/105	35/105	30/105	45/105	50/105		
V:	10x		30/105	60/105	55/105	45/105	50/105		
Spotfin Shiner		7	45/105	40/105	50/105	40/105	70/105		☐
			70/105	70/105					
V:	10x								
⑱ Emerald Shiner		4	75/6	40/6	55/6	40/6			☐
V:	10x								
⑲ Fathead minnow		7	55/7	60/7	40/7	55/7	40/7		☐
			60/7	30/7					
V:	10x								
⑳ Spottail Shiner		7	50/5	45/5	40/5	40/5	50/5		☐
			45/5	40/5					
V:	10x								
									☐
V:	10x								
									☐
V:	10x								
									☐
V:	10x								
									☐
	10x								

Spottail shiner weight (5 g) is a batch weight

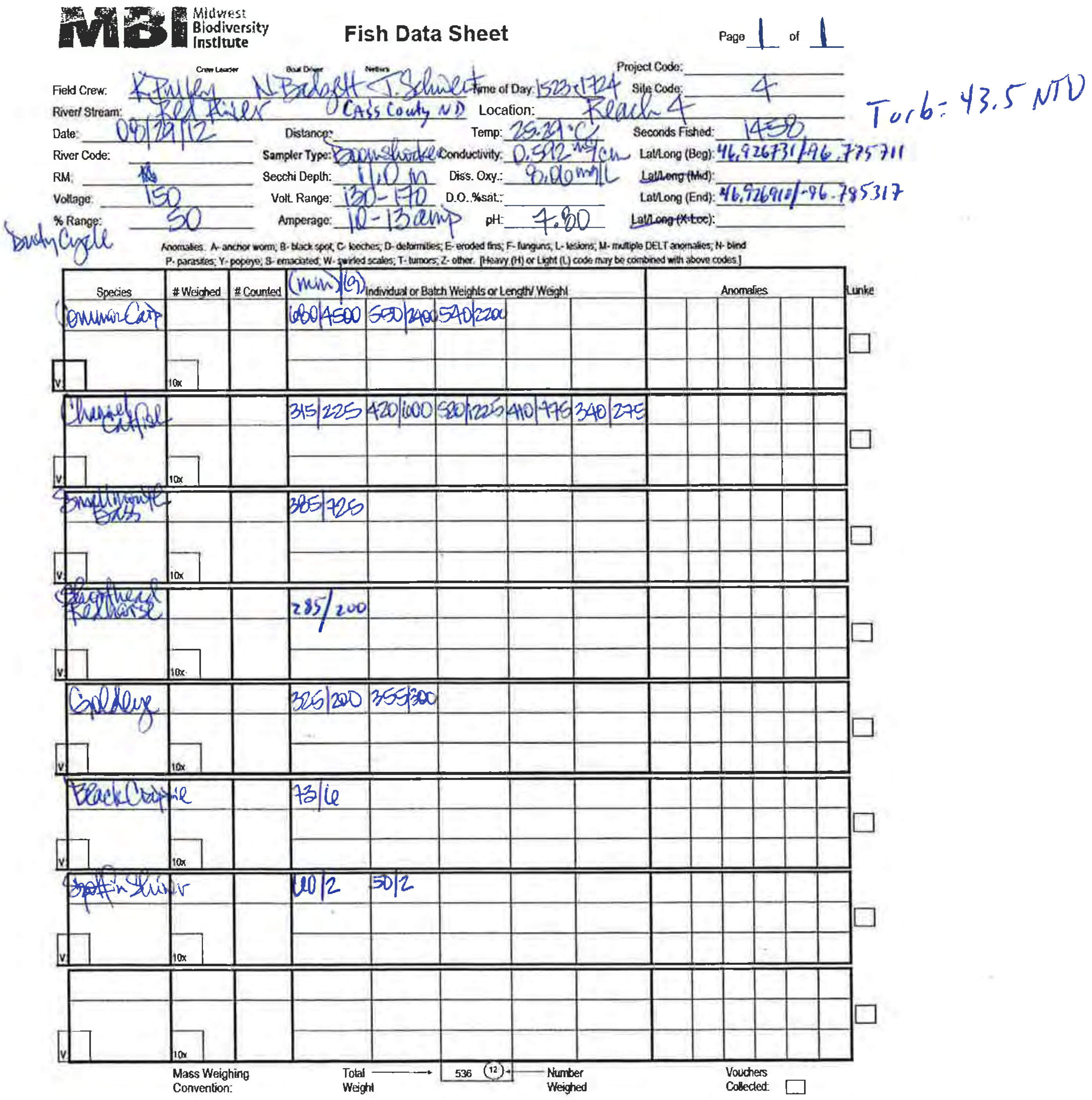
Sand shiner weight (36g) is a batch weight - continued from page 2

Spotfin shiner weight (105g) is a batch weight

Emerald shiner weight (6 g) is a batch weight

Fathead minnow weight (7g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 1

Project Code:
Field Crew: K Pulley (Crew Leader) N Badgett (Boat Driver) T. Schulert (Netters)
Time of Day: 1523-1724
Site Code: 4
River/ Stream: Red River Cass County ND
Location: Reach 4
Date: 08/29/12
Distance:
Temp: 25.39 °C
Seconds Fished: 1458
River Code:
Sampler Type: Boomshocker
Conductivity: 0.592 mS/cm
Lat/Long (Beg): 46.926731/96.775711
RM: NA
Secchi Depth: 1.0 m
Diss. Oxy.: 8.06 mg/L
~~Lat/Long (Mid)~~:
Voltage: 150
Volt. Range: 130-170
D.O. %sat.:
Lat/Long (End): 46.926910/-96.785317
% Range: 50 Duty Cycle
Amperage: 10-13 amp
pH: 7.80
~~Lat/Long (X-Loc)~~:

Turb: 43.5 NTU

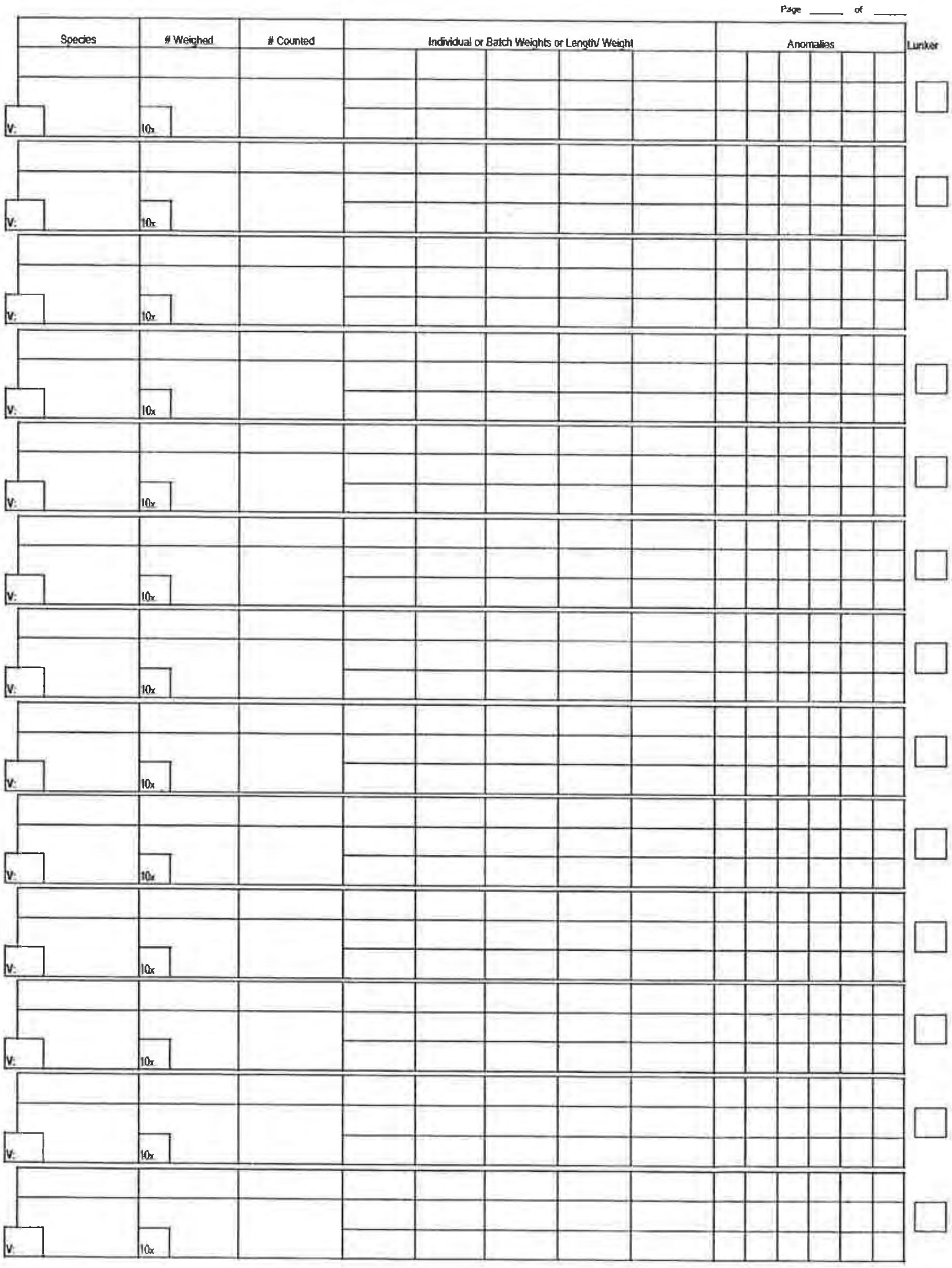
Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind
P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunke
Common Carp			680/4500	550/2400	540/2200				☐
V 10x									
Channel Catfish			315/225	420/600	380/1225	410/776	340/275		☐
V 10x									
Smallmouth Bass			385/725						☐
V 10x									
Shorthead Redhorse			285/200						☐
V 10x									
Goldeye			325/200	355/300					☐
V 10x									
Black Crappie			73/6						☐
V 10x									
Spotfin Shiner			60/2	50/2					☐
V 10x									
									☐
V 10x									

Mass Weighing Convention:
Total Weight → 536 (12) ← Number Weighed
Vouchers Collected: ☐

Frequency = 55-70 hz.
WP 15B - control box on boomshocker, DC
Spotfin Shiner weights (2g) are batch weight

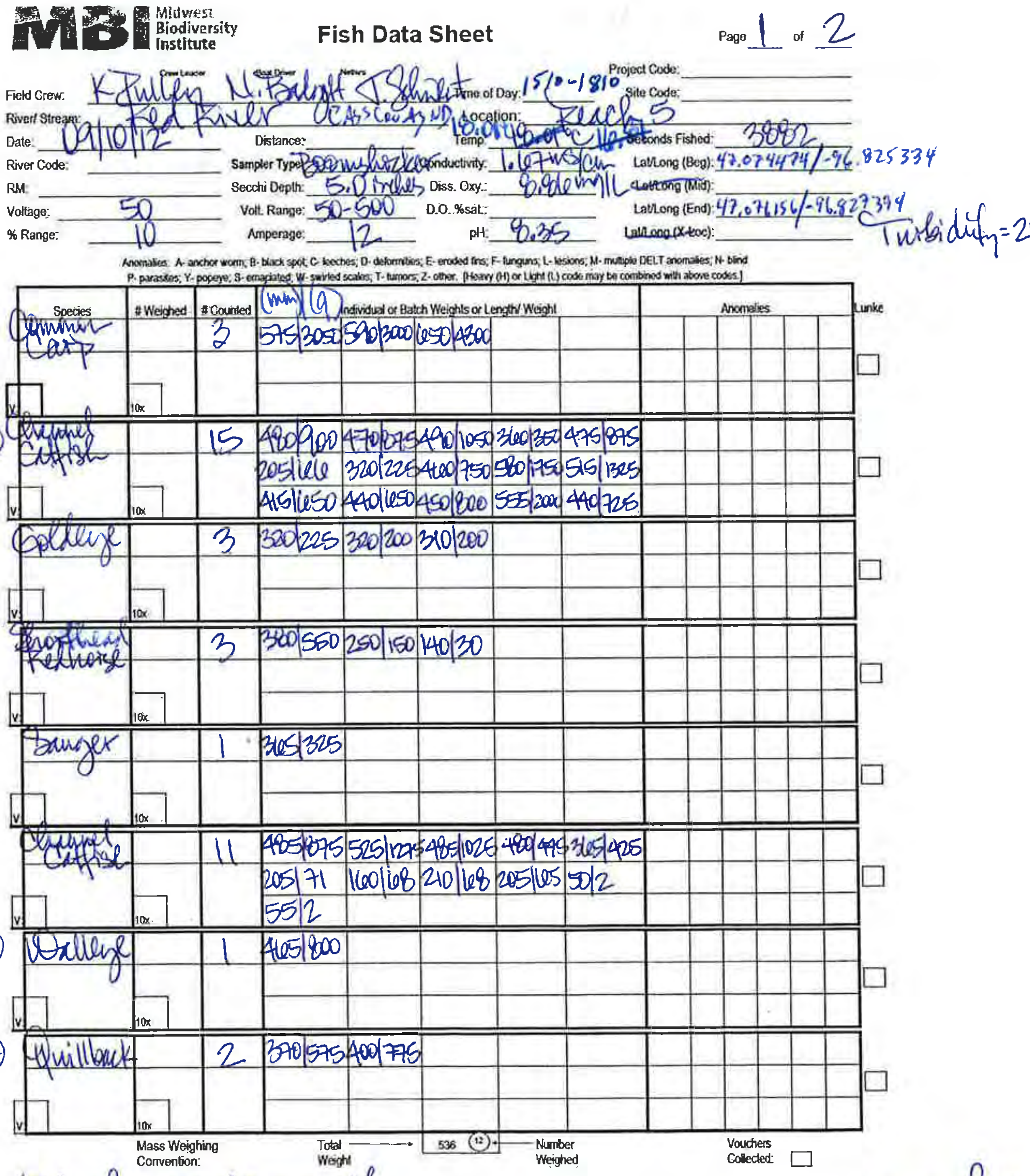
Figure 4. continued



Page ______ of ______

Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight	Anomalies	Lunker
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: K. Pulley (Crew Leader) N. Balogh (Boat Driver) J. Schmidt (Netters)
River/ Stream: Red River CASS County ND
Date: 09/10/12
River Code:
RM:
Voltage: 50
% Range: 10
Distance:
Sampler Type: Boomshocker
Secchi Depth: 5.0 inches
Volt. Range: 50-500
Amperage: 12
Time of Day: 1510-1810
Location: Reach 5
Temp: 18.0°C
Conductivity: 1.67 mS/cm
Diss. Oxy.: 8.96 mg/L
D.O. %sat.:
pH: 8.35
Project Code:
Site Code:
Seconds Fished: 3882
Lat/Long (Beg): 47.074474/-96.825334
Lat/Long (Mid):
Lat/Long (End): 47.076156/-96.827394
Lat/Long (X-loc):
Turbidity = 289 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. (Heavy (H) or Light (L) code may be combined with above codes.)

	Species	# Weighed	# Counted	(mm) (g) Individual or Batch Weights or Length/ Weight						Anomalies	Lunke
①	Common Carp		3	575/3050	590/3000	650/4300					☐
②	Channel Catfish		15	480/900	470/875	490/1050	360/350	475/875			☐
				205/66	320/225	400/750	580/1750	515/1325			
				415/650	440/650	450/800	555/2000	440/725			
③	Goldeye		3	320/225	320/200	310/200					☐
④	Shorthead Redhorse		3	380/550	250/150	140/30					☐
⑤	Sauger		1	365/325							☐
	Channel Catfish		11	485/1075	525/1275	485/1025	480/445	365/425			☐
				205/71	160/68	210/68	205/65	50/2			
				55/2							
⑥	Walleye		1	465/800							☐
⑦	Quillback		2	370/575	400/775						☐

Mass Weighing Convention: Total Weight → 536 ⑫ ← Number Weighed

Vouchers Collected: ☐

Electroshocking unit - 5.0 GPP with Kohler 14 hp Generator
16 ft modified V-hull jon boat, 60 hp Evinrude motor
Frequency = 120 hz

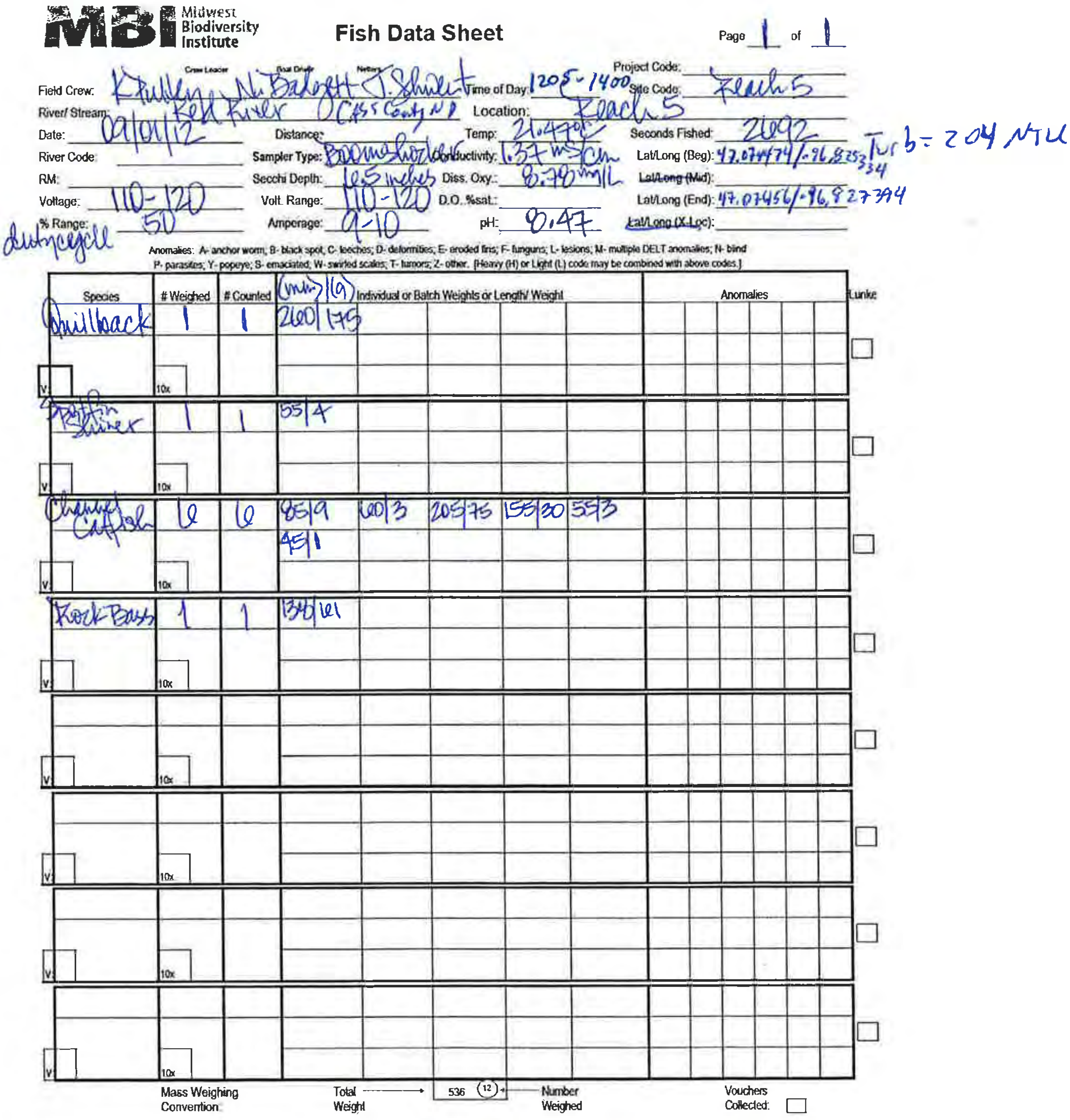
Figure 4. continued

Page 2 of 2

Species	# Weighed	# Counted	(mm)|(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
⑧ Stonecat V:	10x	3	195|53	155|30	200|65				☐
⑨ Golden Redhorse V:	10x	1	150|27						☐
⑩ Orangespotted Sunfish V:	10x	3	50|4	55|4	25|4				☐
⑪ Freshwater Drum V:	10x	1	100|10						☐
⑫ Rock Bass V:	10x	1	135|~~135~~ 105						☐
⑬ Spotfin Shiner V:	10x	1	60|1						☐
⑭ Sand Shiner V:	10x	7	55|5 30|5	40|5 40|5	40|5	35|5	35|5		☐
⑮ Fathead minnow V:	10x	1	50|2						☐
V:	10x								☐
V:	10x								☐
V:	10x								☐
V:	10x								☐
V:	10x								☐

Orange-spotted Sunfish weight (4 g) is a batch weight
Sandshiner weight (5g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 1

Field Crew: K Pullen (Crew Leader) N. Balogh (Boat Driver) J. Shuler (Netters)
Time of Day: 1205-1400
Project Code:
Site Code: Reach 5
River/ Stream: Red River (Cass County ND)
Location: Reach 5
Date: 09/04/12
Distance:
Temp: 21.47°C
Seconds Fished: 2092
River Code:
Sampler Type: Boomshocker
Conductivity: 1.37 mS/cm
Lat/Long (Beg): 47.074474/-96.825334
Turb = 204 NTU
RM:
Secchi Depth: 16.5 inches
Diss. Oxy.: 8.78 mg/L
~~Lat/Long (Mid)~~:
Voltage: 110-120
Volt. Range: 110-120
D.O. %sat.:
Lat/Long (End): 47.07456/-96.827394
% Range: 50 dutycycle
Amperage: 9-10
pH: 8.47
Lat/Long (X-Loc):

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
Quillback V:	1 10x	1	260/175						☐
Spotfin Shiner V:	1 10x	1	55/4						☐
Channel Catfish V:	6 10x	6	85/9 45/1	60/3	205/75	155/30	55/3		☐
Rock Bass V:	1 10x	1	134/61						☐
V:	10x								☐
V:	10x								☐
V:	10x								☐
V:	10x								☐

Mass Weighing Convention
Total Weight → 536 (12) ← Number Weighed
Vouchers Collected: ☐

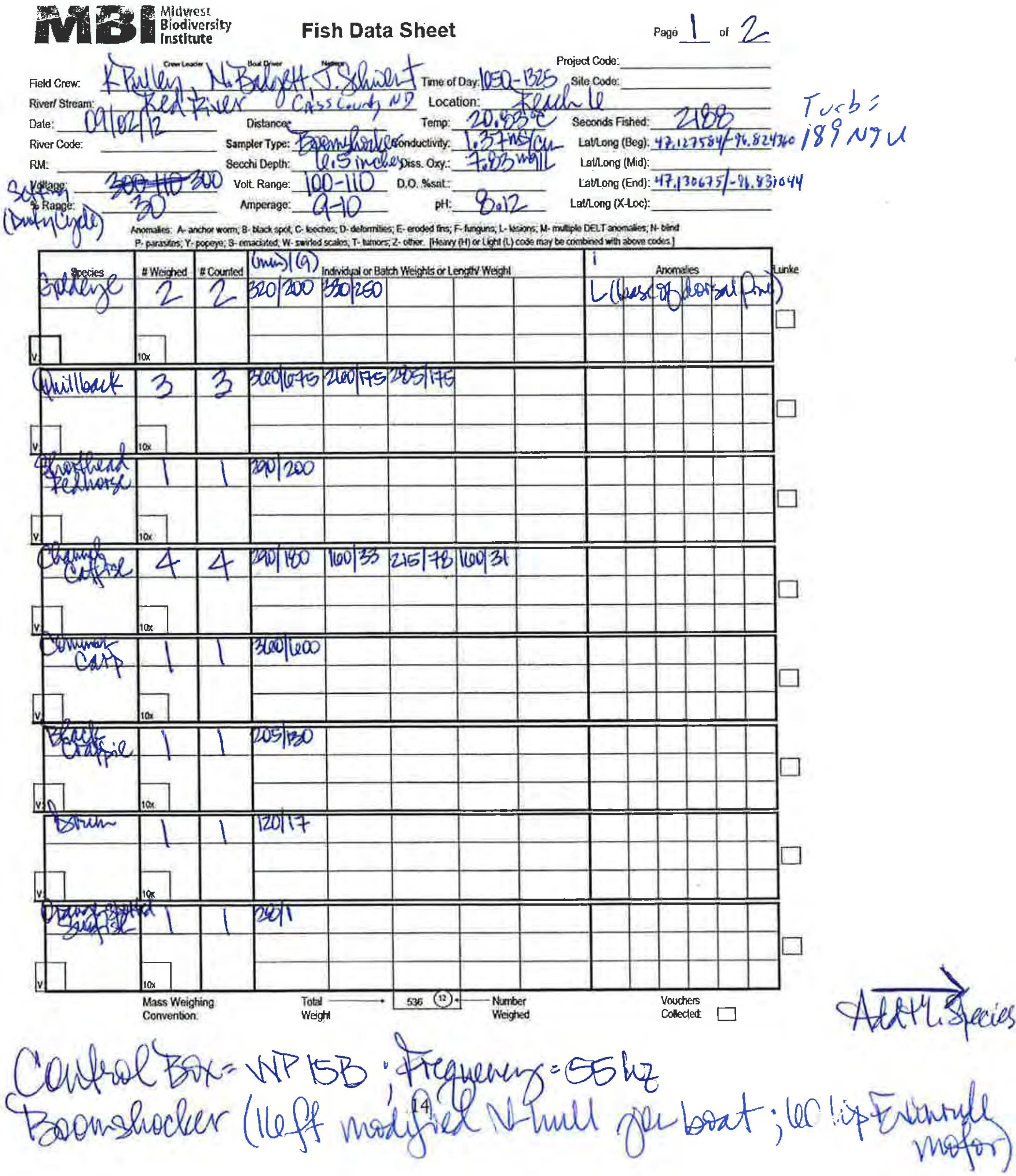
WP 15B - Control box; (Boomshocker; Frequency = 50 hz
At least one Common Carp observed, but not netted
Approximately five other fish observed, but not netted.

Figure 4. continued

Page ____ of ____

Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight					Anomalies						Lunker
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: Crew Leader K Pulley, Boat Driver N. Balgett, Netters J. Schwert

Time of Day: 1050-1325

Project Code:

Site Code:

River/ Stream: Red River Cass County ND

Location: Reach 16

Date: 09/02/12

Distance:

Temp: 20.83°C

Seconds Fished: 2188

Turb = 189 NTU

River Code:

Sampler Type: Boomshocker

Conductivity: 1.37 mS/cm

Lat/Long (Beg): 47.127584/-96.824360

RM:

Secchi Depth: 6.5 inches

Diss. Oxy.: 7.83 mg/L

Lat/Long (Mid):

Voltage: ~~300~~ ~~110~~ 300

Volt. Range: 100-110

D.O. %sat.:

Lat/Long (End): 47.130675/-96.831044

Setting (Duty Cycle) % Range: 30

Amperage: 9-10

pH: 8.12

Lat/Long (X-Loc):

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind; P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunke
Goldeye	2	2	320/200	330/250				L (base of dorsal fin)	☐
Quillback	3	3	360/675	260/175	225/175				☐
Shorthead Redhorse	1	1	300/200						☐
Channel Catfish	4	4	290/180	160/33	215/78	160/31			☐
Common Carp	1	1	360/600						☐
Black Crappie	1	1	205/130						☐
Drum	1	1	120/17						☐
Orangespotted Sunfish	1	1	58/1						☐

Mass Weighing Convention:

Total Weight → 536 ⑫ ← Number Weighed

Vouchers Collected ☐

Add'l Species →

Control Box = VVP 15B ; Frequency = 55 hz

Boomshocker (16 ft modified V-hull jon boat ; 60 hp Evinrude motor)

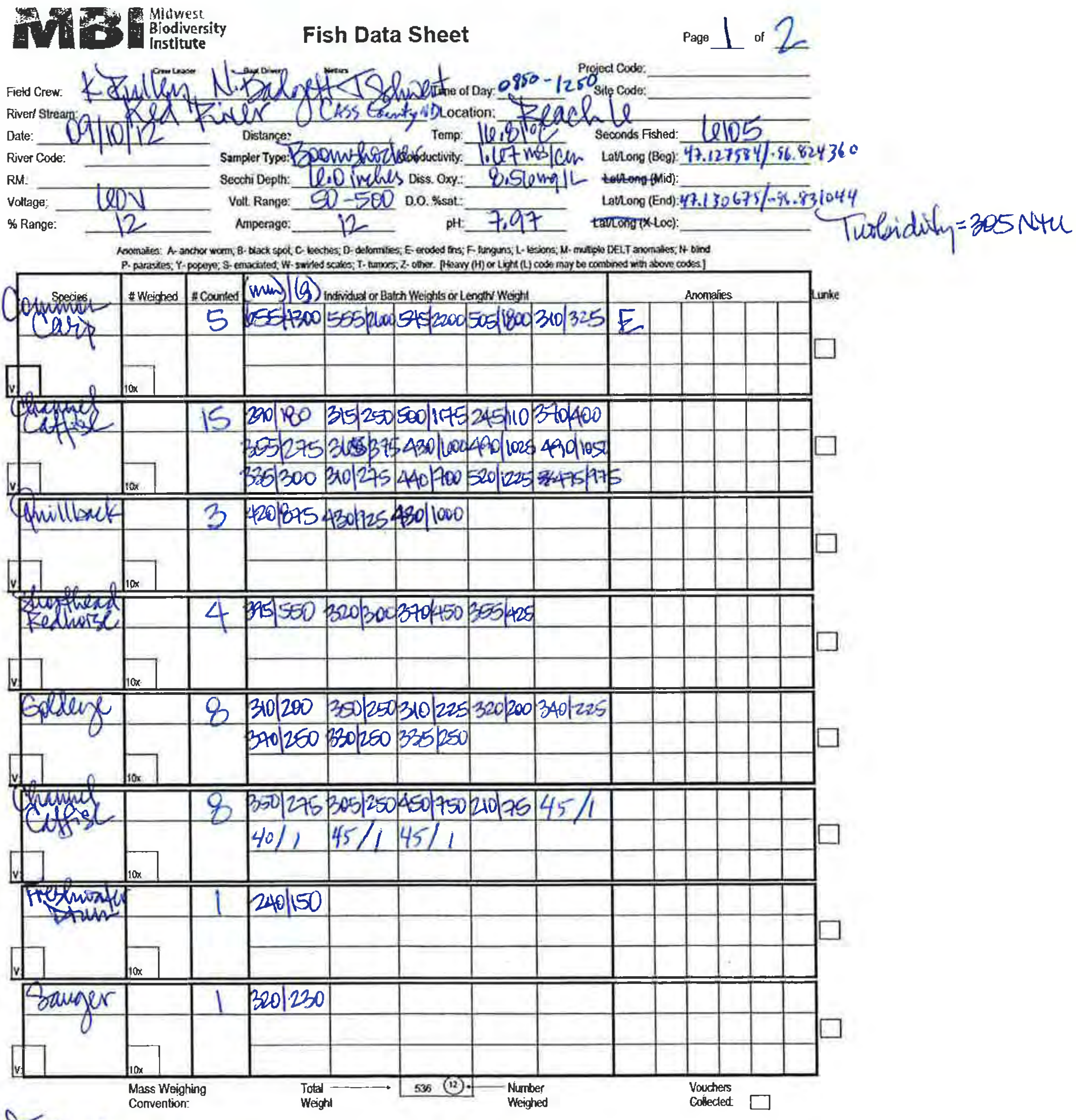
Figure 4. continued

Page 2 of 2

Species	# Weighed	# Counted	(mm)/(g)	Individual or Batch Weights or Length/ Weight					Anomalies						Lunker
Spotfin Shiner	2	2	55/4	50/4											
V:	10x														☐
Blue Cat[illegible]	1	1	205/84												
V:	10x														☐
V:	10x														☐
V:	10x														☐
V:	10x														☐
V:	10x														☐
V:	10x														☐
V:	10x														☐
V:	10x														☐
V:	10x														☐
V:	10x														☐
V:	10x														☐
V:	10x														☐

Spotfin Shiner weight (4g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: Crew Leader K Fuller, Boat Driver N. Balogh, Netters T Schwert
Time of Day: 0850 - 1250
Project Code:
Site Code:
River/ Stream: Red River @ Cass County ND
Location: Reach 6
Date: 09/10/12
Distance:
Temp: 16.8°C
Seconds Fished: 6605
River Code:
Sampler Type: Boomshocker
Conductivity: 1.67 mS/cm
Lat/Long (Beg): 47.127584/-96.824360
RM:
Secchi Depth: 6.0 inches
Diss. Oxy.: 8.56 mg/L
~~Lat/Long~~ (Mid):
Voltage: 60V
Volt. Range: 50 - 500
D.O. %sat.:
Lat/Long (End): 47.130675/-96.831044
% Range: 12
Amperage: 12
pH: 7.97
~~Lat/Long (X-Loc)~~:
Turbidity = 305 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- funguns; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	(mm) | (g) Individual or Batch Weights or Length/ Weight										Anomalies	Lunke
① Common Carp		5	655	1300	555	2400	545	2200	505	1800	310	325	E	☐
V	10x													
② Channel Catfish		15	290	180	315	250	500	1175	245	110	370	400		☐
			365	275	~~3~~5	375	430	1000	490	1025	490	1050		
V	10x		335	300	310	275	440	700	520	1225	~~34~~475	975		
③ Quillback		3	420	875	430	925	480	1000						☐
V	10x													
④ Shorthead Redhorse		4	395	550	320	300	370	450	355	425				☐
V	10x													
⑤ Goldeye		8	310	200	350	250	310	225	320	200	340	225		☐
V	10x		370	250	330	250	335	250						
Channel Catfish		8	350	275	305	250	450	750	210	75	45	1		☐
V	10x		40	1	45	1	45	1						
⑥ Freshwater Drum		1	240	150										☐
V	10x													
⑦ Sauger		1	320	230										☐
V	10x													

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Frequency = 120 hz
16ft modified V-hull jon boat; 60 hp Evinrude motor
5.0 GPP electroshocking unit; 14 hp Kohler generator

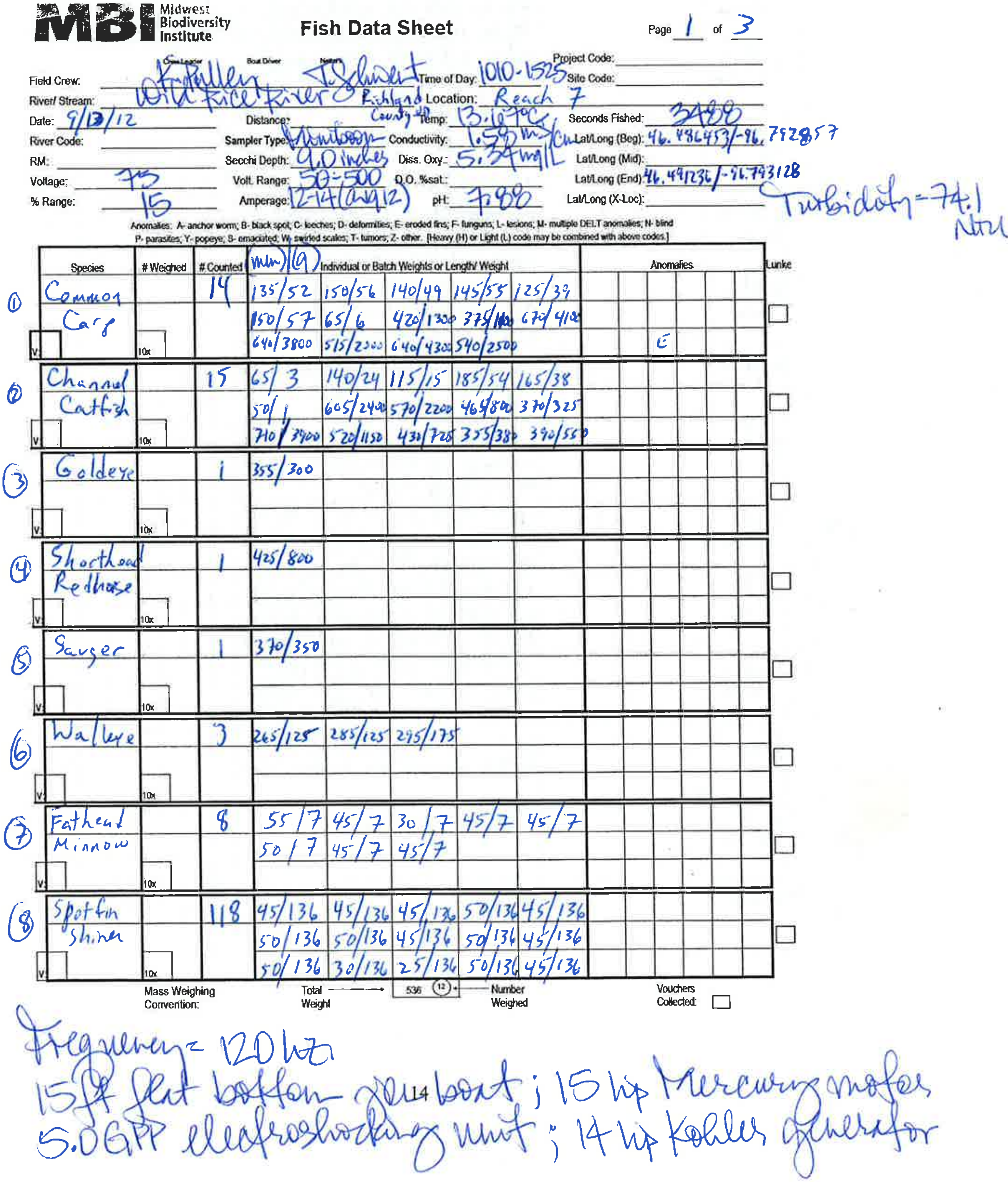
Figure 4. continued

Page 2 of 2

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies						Lunker
⑧	Spotfin		15	65/15	60/15	35/15	30/15	40/15							
	Shiner			25/15	25/15	35/15	20/15	45/15							☐
	V:	10x		25/15	35/15	40/15	45/15	40/15							
	Spotfin		4	25/15	25/15	30/15	40/15								
	Shiner														☐
	V:	10x													
⑨	Sand		12	45/9	50/9	55/9	50/9	40/9							
	Shiner			30/9	35/9	30/9	30/9	25/9							☐
	V:	10x		25/9	20/9										
⑩	Fathead		1	50/1											
	Minnow														☐
	V:	10x													
⑪	Trout		1	60/2											
	Perch														☐
	V:	10x													
															☐
	V:	10x													
															☐
	V:	10x													
															☐
	V:	10x													
															☐
	V:	10x													
															☐
	V:	10x													
															☐
	V:	10x													
															☐
	V:	10x													
															☐
	V:	10x													

Spotfin Shiner weight (15 g) is a batch weight.
Sand Shiner weight (9g) is a batch weight.

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 3

Field Crew: Crew Leader: K. Pullen Boat Driver: Netters: T. Schwert
Time of Day: 1010-1525
Project Code:
Site Code:
River/ Stream: Wild Rice River Richland County 4D
Location: Reach 7
Date: 9/13/12
Distance:
Temp: 13.16 °C
Seconds Fished: 3488
River Code:
Sampler Type: Pontoon
Conductivity: 1.58 mS/cm
Lat/Long (Beg): 46.486453/-96.792857
RM:
Secchi Depth: 9.0 inches
Diss. Oxy.: 5.34 mg/L
Lat/Long (Mid):
Voltage: 75
Volt. Range: 50-500
D.O. %sat.:
Lat/Long (End): 46.491236/-96.793128
% Range: 15
Amperage: 12-14 (avg 12)
pH: 7.88
Lat/Long (X-Loc):
Turbidity = 74.1 Ntu

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunke
①	Common		14	135/52	150/56	140/49	145/55	125/39		
	Carp			150/57	65/6	420/1300	375/1100	670/4100		☐
	V: ☐	10x ☐		640/3800	515/2300	640/4300	540/2500		E	
②	Channel		15	65/3	140/24	115/15	185/54	165/38		
	Catfish			50/1	605/2400	570/2200	465/850	370/325		☐
	V: ☐	10x ☐		710/3900	520/1150	430/725	355/380	390/550		
③	Goldeye		1	355/300						
										☐
	V: ☐	10x ☐								
④	Shorthead		1	425/800						
	Redhorse									☐
	V: ☐	10x ☐								
⑤	Sauger		1	370/350						
										☐
	V: ☐	10x ☐								
⑥	Walleye		3	265/125	285/125	295/175				
										☐
	V: ☐	10x ☐								
⑦	Fathead		8	55/7	45/7	30/7	45/7	45/7		
	Minnow			50/7	45/7	45/7				☐
	V: ☐	10x ☐								
⑧	Spotfin		118	45/136	45/136	45/136	50/136	45/136		
	Shiner			50/136	50/136	45/136	50/136	45/136		☐
	V: ☐	10x ☐		50/136	30/136	25/136	50/136	45/136		

Mass Weighing Convention:
Total Weight → 536 (12) ← Number Weighed
Vouchers Collected: ☐

Frequency = 120 hz
15 ft flat bottom jon boat; 15 hp Mercury motor
5.0 GPP electroshocking unit; 14 hp Kohler generator

Figure 4. continued

Page 2 of 3

	Species	# Weighed	# Counted	(mm)(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
	Spotfin			50/136	50/136	30/136	45/136	50/136		
	Shiner			45/136	50/136	45/136	30/136	65/136		☐
	V:	10x		25/136	45/136	50/136	30/136	40/136		
	Spotfin			40/136	45/136	45/136	45/136	45/136		
	Shiner			30/136	40/136	35/136	30/136	45/136		☐
	V:	10x		30/136	50/136	45/136	50/136	45/136		
	Spotfin			50/136	50/136	40/136	45/136	25/136		
	Shiner			25/136	50/136	50/136	50/136	45/136		☐
	V:	10x		45/136	35/136	50/136	45/136	50/136		
	Spotfin			60/136	60/136	55/136	30/136	40/136		
	Shiner			50/136	55/136	35/136	45/136	25/136		☐
	V:	10x		40/136	30/136	45/136	45/136	60/136		
	Spotfin			60/136	70/136	60/136	40/136	50/136		
	Shiner			65/136	45/136	45/136	55/136	40/136		☐
	V:	10x		65/136	50/136	50/136	60/136	60/136		
	Spotfin			55/136	50/136	50/136	40/136	45/136		
	Shiner			50/136	50/136	45/136	40/136	45/136		☐
	V:	10x		25/136	45/136	35/136	45/136	50/136		
	Spotfin			45/136	50/136	45/136	40/136	45/136		
	Shiner			30/136	25/136	25/136	25/136	25/136		☐
	V:	10x		45/136	40/136	45/136				
(9)	Sand		55	50/38	45/38	45/38	30/38	25/38		
	shiner			50/38	50/38	25/38	25/38	50/38		☐
	V:	10x		40/38	50/38	35/38	30/38	40/38		
	Sand			50/38	30/38	40/38	40/38	30/38		
	shiner			45/38	45/38	45/38	35/38	35/38		☐
	V:	10x		30/38	25/38	50/38	25/38	45/38		
	Sand			50/38	40/38	25/38	30/38	25/38		
	shiner			50/38	30/38	70/38	25/38	45/38		☐
	V:	10x		25/38	50/38	30/38	50/38	40/38		
	Sand			30/38	30/38	25/38	30/38	30/38		
	Shiner			30/38	30/38	25/38	30/38	25/38		☐
	V:	10x								
(10)	Trout		1	65/3						
	Perch									☐
	V:	10x								
(11)	Stonecat		1	75/5						
										☐
	V:	10x								

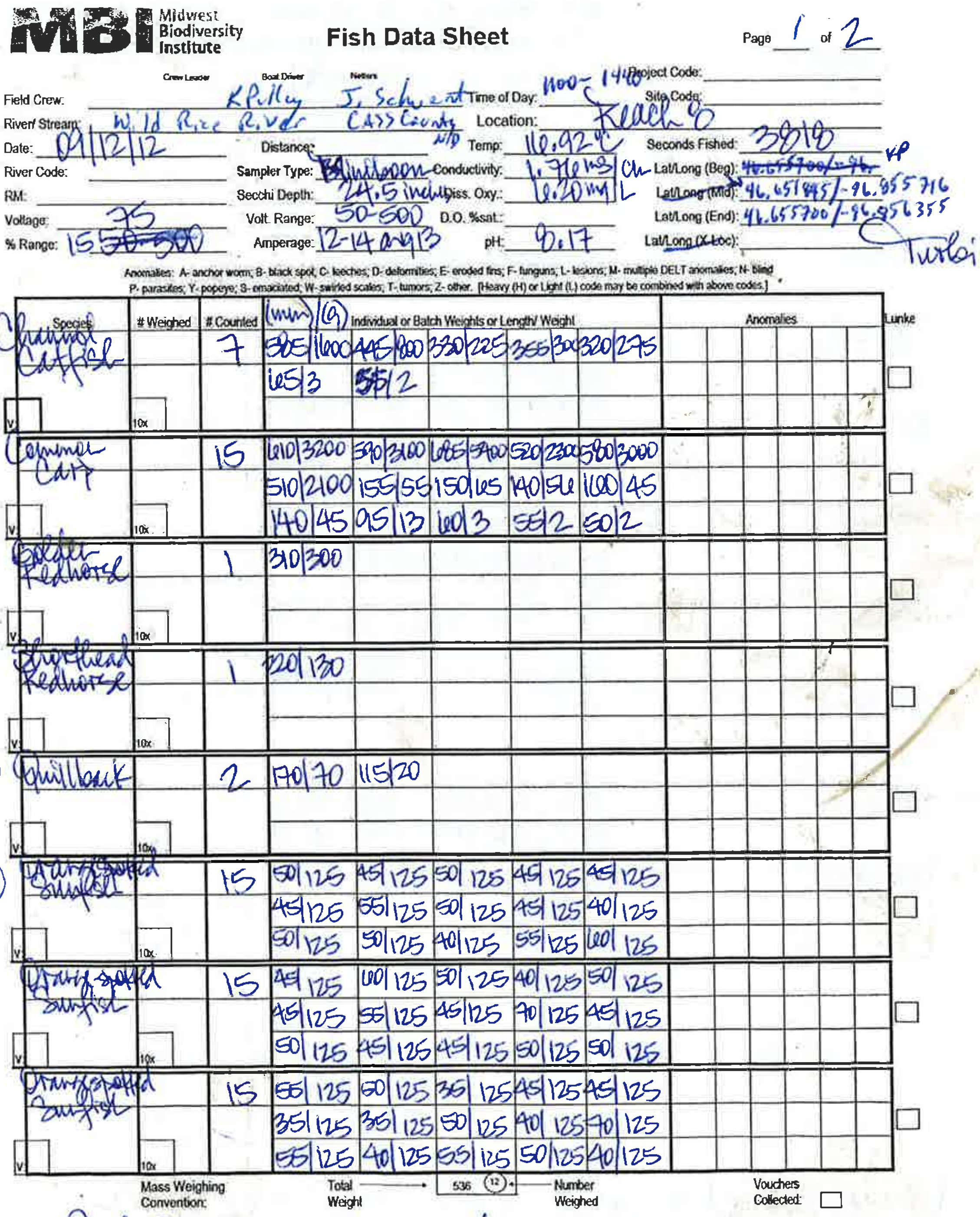
09/13/12
Reach 7

Figure 4. continued

Page 3 of 3

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
⑫ Orangespotted		124	50/214	60/214	30/214	50/214	30/214		☐
Sunfish			50/214	40/214	50/214	55/214	25/214		
V:	10x		45/214	40/214	45/214	45/214	40/214		
orangespotted			40/214	45/214	40/214	35/214	40/214		☐
Sunfish			45/214	60/214	40/214	30/214	40/214		
V:	10x		20/214	30/214	60/214	30/214	30/214		
Orangespotted			20/214	40/214	40/214	25/214	40/214		☐
sunfish			20/214	20/214	40/214	30/214	40/214		
V:	10x		35/214	25/214	40/214	45/214	45/214		
orangespotted			45/214	45/214	40/214	40/214	40/214		☐
Sunfish			30/214	55/214	30/214	60/214	25/214		
V:	10x		45/214	45/214	25/214	40/214	35/214		
orange spotted			30/214	45/214	30/214	30/214	50/214		☐
Sunfish			55/214	30/214	55/214	30/214	30/214		
V:	10x		35/214	30/214	45/214	40/214	40/214		
orange spotted			45/214	40/214	50/214	45/214	40/214		☐
Sunfish			30/214	40/214	40/214	35/214	40/214		
V:	10x		30/214	40/214	25/214	84/214	75/214		
Orange spotted			45/214	30/214	40/214	25/214	30/214		☐
Sunfish			35/214	25/214	20/214	45/214	45/214		
V:	10x		45/214	60/214	35/214	40/214	30/214		
Orange spotted			25/214	40/214	30/214	40/214	35/214		☐
Sun fish			40/214	45/214	60/214	35/214	45/214		
V:	10x		35/214	30/214	45/214	25/214	35/214		
orangespotted			35/214	45/214	30/214	30/214	45/214		☐
Sunfish			25/214	40/214	30/214	25/214			
V:	10x								
									☐
V:	10x								
									☐
V:	10x								
									☐
V:	10x								
									☐
V:	10x								

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: Crew Leader K Pelley Boat Driver Netters J. Schwent
River/ Stream: Wild Rice River CASS County
Date: 09/12/12
River Code:
RM:
Voltage: 75
% Range: 15 ~~50-500~~
Distance: N/D
Sampler Type: ~~B~~ Miniboom
Secchi Depth: 24.5 inch
Volt. Range: 50-500
Amperage: 12-14 avg 13
Time of Day: 1100-1410
Location: Reach 8
Temp: 16.92°C
Conductivity: 1.716 mS/cm
Diss. Oxy.: 6.20 mg/L
D.O. %sat.:
pH: 8.17
Project Code:
Site Code:
Seconds Fished: 3810
Lat/Long (Beg): ~~46.655700/-96.~~ KP
Lat/Long (Mid): 46.651845/-96.855716
Lat/Long (End): 46.655700/-96.856355
Lat/Long (X-Loc):

Turbidity = 10.2 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	(mm)	(g) Individual or Batch Weights or Length/ Weight									Anomalies	Lunke
① Channel Catfish		7	305	1600	445	800	330	225	355	300	320	275		
			65	3	55	2								☐
V:	10x													
② Common Carp		15	610	3200	590	3100	685	3900	520	2300	580	3000		
			510	2100	155	55	150	65	140	56	160	45		☐
V:	10x		140	45	95	13	60	3	55	2	50	2		
③ Golden Redhorse		1	310	300										
														☐
V:	10x													
④ Shorthead Redhorse		1	220	130										
														☐
V:	10x													
⑤ Quillback		2	170	70	115	20								
														☐
V:	10x													
⑥ Orangespotted Sunfish		15	50	125	45	125	50	125	45	125	45	125		
			45	125	55	125	50	125	45	125	40	125		☐
V:	10x		50	125	50	125	40	125	55	125	60	125		
Orangespotted Sunfish		15	45	125	60	125	50	125	40	125	50	125		
			45	125	55	125	45	125	70	125	45	125		☐
V:	10x		50	125	45	125	45	125	50	125	50	125		
Orangespotted Sunfish		15	55	125	60	125	35	125	45	125	45	125		
			35	125	35	125	50	125	40	125	70	125		☐
V:	10x		55	125	40	125	55	125	50	125	40	125		

Mass Weighing Convention: Total Weight → 536 (12) ← Number Weighed

Vouchers Collected: ☐

15 foot aluminum jon boat, 15 hp Mercury motor
5.0 GPP electroshocking unit, 14 hp Kohler generator
Frequency = 120 hz

Figure 4. continued

Page 2 of 2

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight										Anomalies	Lunker
Orangespotted Sunfish	450	15	35	125	55	125	55	125	45	125	40	125		
			100	125	45	125	50	125	100	125	50	125		☐
V:	10x		55	125	45	125	40	125	55	125	40	125		
Orangespotted Sunfish		15	55	125	45	125	55	125	40	125	40	126		
			50	125	30	125	40	126	45	125	35	125		☐
V:	10x		30	125	50	125	35	125	45	125	35	125		
Orangespotted Sunfish		4	40	125	25	125	40	125	45	126				
														☐
V:	10x													
⑦ Bluegill		3	55	3	25	3	30	3						
														☐
V:	10x													
⑧ Fathead Minnow		15	50	35	55	35	40	35	60	35	45	35		
			55	35	45	35	45	35	50	35	50	35		☐
V:	10x		40	35	45	35	55	35	45	35	50	35		
Fathead Minnow		15	45	35	35	35	50	35	40	35	40	35		
			30	35	35	35	45	35	40	35	55	35		☐
V:	10x		40	35	40	35	50	35	45	35	50	35		
Fathead Minnow		12	45	35	35	35	40	35	45	35	50	35		
			45	35	50	35	90	35	50	35	55	35		☐
V:	10x		40	35	30	35								
⑨ Sand Shiner		15	60	15	50	15	45	15	55	15	55	15		
			55	15	50	15	55	15	40	15	40	15		☐
V:	10x		50	15	50	15	45	15	50	15	35	15		
Sand Shiner		1	30	15										
														☐
V:	10x													
⑩ Spotfin Shiner		11	70	22	70	22	65	22	70	22	55	22		
			60	22	55	22	60	22	50	22	40	22		☐
V:	10x		40	22										
Common Carp		7	60	3	45	1	40	1	50	1	45	1		
			45	1	50	1								☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													

Orangespotted sunfish weight (125g) is a batch weight
Bluegill weight (3g) is a batch weight
Fathead minnow weight (35g) is a batch weight
Sand shiner weight (15g) is a batch weight
Spotfin shiner weight (22g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.

MBI Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 4

Field Crew: Crew Leader K. Pulley Boat Driver J. Schmidt Netters B. Marinos
Time of Day: 1020-1427
Project Code:
Site Code:
River/ Stream: Wild Rice River CASS County ND
Location: Reach 9
Date: 09/14/12
Distance:
Temp: 13.4°C
Seconds Fished: 5391
River Code:
Sampler Type: Miniboom
Conductivity: .77 mS/cm
Lat/Long (Beg): 46.646289 / -96.843483
RM:
Secchi Depth: 14.2 inches
Diss. Oxy.: 6.80 mg/L
~~Lat/Long (Mid)~~:
Voltage: 75
Volt. Range: 50-500
D.O. %sat.:
Lat/Long (End): 46.702462 / 96.837897
% Range: 15
Amperage: 12
pH: 8.30
~~Lat/Long (X-Loc)~~:

Turbidity = 19.7 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunke
① Common		15	645/4100	600/3300	645/4200	635/3900	100/3		
Carp			60/3	65/4	60/3	80/8	50/2		☐
V	10x		55/2	55/2	60/4	55/2	60/4		
② Channel		15	440/700	140/22	120/11	115/11	150/25		
Catfish			80/4	60/2	50/1	60/2	55/2		☐
V	10x		55/2	50/1	55/2	55/2	45/1		
③ Walleye			285/200	240/120					
									☐
V	10x								
④ Black			220/168						
Crappie									☐
V	10x								
⑤ Shorthead			100/10	100/13					
Redhorse									☐
V	10x								
⑥ White Sucker			110/14	95/9					
									☐
V	10x								
⑦ Stonecat			70/4						
									☐
V	10x								
⑧ Trout Perch			75/4						
									☐
V	10x								

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Equipment: 15 ft flat bottom jon boat; 15 hp Mercury motor
5.0 GPP electroshocking unit; 14 hp Kohler generator

Frequency = 120 hz.

Figure 4. continued

Page 2 of 4

(9) (1)

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight										Anomalies	Lunker
Orangespotted Sunfish		15	45	595	55	595	55	595	30	595	50	595		
			50	595	40	595	50	595	40	595	55	595		☐
V:	10x		40	595	35	595	45	595	50	595	50	595		
Orangespotted Sunfish		15	55	595	50	595	40	595	25	595	50	595		
			35	595	40	595	25	595	45	595	50	595		☐
V:	10x		30	595	40	595	55	595	45	595	55	595		
Orangespotted Sunfish		15	45	595	40	595	25	595	25	595	50	595		
			50	595	50	595	35	595	45	595	45	595		☐
V:	10x		55	595	60	595	55	595	40	595	40	595		
Orangespotted Sunfish		15	45	595	55	595	45	595	35	595	50	595		
			45	595	45	595	55	595	55	595	50	595		☐
V:	10x		50	595	35	595	40	595	40	595	45	595		
Orangespotted Sunfish		15	45	595	50	595	45	595	45	595	45	595		
			60	595	40	595	35	595	45	595	30	595		☐
V:	10x		40	595	40	595	50	595	55	595	45	595		
Orangespotted Sunfish		15	60	595	50	595	50	595	55	595	45	595		
			35	595	45	595	40	595	50	595	45	595		☐
V:	10x		55	595	30	595	35	595	50	595	45	595		
Orangespotted Sunfish		15	35	595	45	595	40	595	30	595	40	595		
			55	595	45	595	40	595	60	595	45	595		☐
V:	10x		40	595	35	595	60	595	40	595	40	595		
Orangespotted Sunfish		15	30	595	55	595	55	595	50	595	45	595		
			45	595	55	595	40	595	35	595	45	595		☐
V:	10x		40	595	45	595	35	595	45	595	50	595		
Orangespotted Sunfish		15	40	595	50	595	45	595	45	595	50	595		
			50	595	40	595	40	595	35	595	60	595		☐
V:	10x		40	595	50	595	25	595	45	595	25	595		
Orangespotted Sunfish		15	45	595	35	595	35	595	60	595	45	595		
			55	595	50	595	55	595	50	595	60	595		☐
V:	10x		35	595	45	595	45	595	45	595	45	595		
Orangespotted Sunfish		15	45	595	50	595	25	595	55	595	40	595		
			50	595	50	595	40	595	45	595	50	595		☐
V:	10x		40	595	40	595	40	595	50	595	40	595		
Orangespotted Sunfish		15	30	595	30	595	30	595	30	595	40	595		
			45	595	55	595	35	595	50	595	40	595		☐
V:	10x		30	595	40	595	35	595	50	595	55	595		
Orangespotted Sunfish		15	35	595	40	595	40	595	55	595	50	595		
			45	595	25	595	45	595	50	595	45	595		☐
V:	10x		45	595	35	595	45	595	40	595	50	595		

Orangespotted Sunfish were weighed as a batch = 595g
(continued on page 3)

Reach 9 (Wild Rice River)
09/14/2012

Figure 4. continued

Page 3 of 4

Species	# Weighed	# Counted	(mm)	(g) Individual or Batch Weights or Length/ Weight									Anomalies	Lunker
Orangespotted Sunfish		15	40	595	45	595	30	595	35	595	35	595		
			45	595	45	595	50	595	55	595	50	595		☐
V:	10x		35	595	50	595	40	595	35	595	45	595		
Orangespotted Sunfish		15	45	595	100	595	40	595	30	595	45	595		
			25	595	40	595	20	595	45	595	50	595		☐
V:	10x		45	595	55	595	45	595	55	595	50	595		
Orangespotted Sunfish		15	45	595	45	595	30	595	35	595	45	595		
			65	595	40	595	35	595	45	595	50	595		☐
V:	10x		40	595	30	595	30	595	50	595	40	595		
Orangespotted Sunfish		15	45	595	55	595	55	595	50	596	50	595		
			100	595	50	595	55	595	40	595	45	595		☐
V:	10x		40	595	55	595	50	595	50	595	35	595		
Orangespotted Sunfish		15	45	595	50	595	45	595	50	595	35	595		
			45	595	30	595	55	595	40	595	40	595		☐
V:	10x		35	595	35	595	30	595	30	595	50	595		
Orangespotted Sunfish		15	80	595	45	595	45	595	35	595	20	595		
			40	595	45	595	50	595	40	595	45	595		☐
V:	10x		45	595	40	595	35	595	35	595	30	595		
Orangespotted Sunfish		15	20	595	40	595	105	595	40	595	55	595		
			45	595	35	595	45	595	30	595	30	595		☐
V:	10x		40	595	45	595	50	595	50	595	45	595		
Orangespotted Sunfish		15	35	595	45	595	50	595	35	595	50	595		
			30	595	30	595	30	595	35	595	40	595		☐
V:	10x		35	595	35	595	45	595	35	595	45	595		
Orangespotted Sunfish		15	35	595	35	595	35	595	40	595	30	595		
			20	595	50	595	30	595	45	595	25	595		☐
V:	10x		35	595	40	595	50	595	50	595	45	595		
Orangespotted Sunfish		15	35	595	85	595	45	595	45	595	90	595		
			90	595	80	595	85	595	35	595	45	595		☐
V:	10x		80	595	40	595	40	595	35	595	45	595		
Orangespotted Sunfish		15	35	595	75	595	45	595	40	595	50	595		
			100	595	35	595	40	595	35	595	30	595		☐
V:	10x		50	595	45	595	30	595	35	595	30	595		
Orangespotted Sunfish		15	30	595	50	595	45	595	35	595	35	595		
			25	595	40	595	35	595	50	595	45	595		☐
V:	10x		45	595	30	595	30	595	30	595	40	595		
Orangespotted Sunfish			40	595	40	595	35	595	40	595	40	595		
			45	595	125	37	45	595	~~120~~	~~37~~	STS 09/14/12			☐
V:	10x													

Orangespotted Sunfish were weighed as a batch = 595 g
(continued from page 2)
One individual was weighed separately (125 mm and 37 g)

Reach 9 (Wild Rice River)
09/14/2012

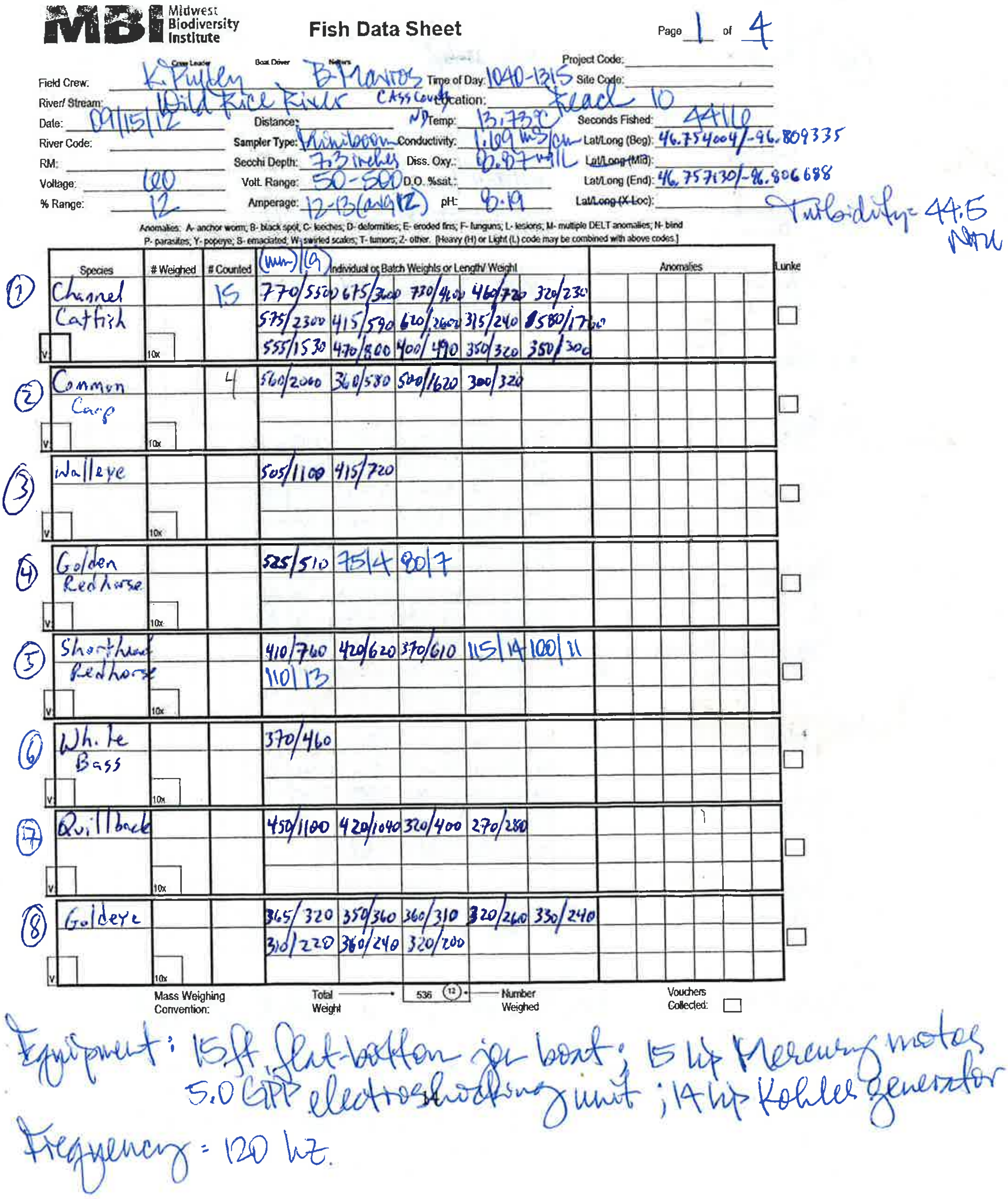
Figure 4. continued

Page 4 of 4

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
⑩ Fathead Minnow		15	100/82	50/82	55/82	50/82	55/82		☐
			50/82	40/82	55/82	50/82	55/82		
V:	10x		55/82	40/82	55/82	50/82	55/82		
Fathead Minnow		15	50/82	40/82	55/82	45/82	50/82		☐
			55/82	50/82	45/82	50/82	50/82		
V:	10x		50/82	55/82	50/82	100/82	45/82		
Fathead Minnow		15	50/82	55/82	40/82	40/82	55/82		☐
			100/82	45/82	50/82	45/82	55/82		
V:	10x		60/82	30/82	40/82	50/82	40/82		
Fathead Minnow		15	55/82	45/82	45/82	55/82	50/82		☐
			55/82	45/82	50/82	45/82	50/82		
V:	10x		50/82	40/82	50/82	45/82	45/82		
Fathead Minnow		2	50/82	35/82					☐
V:	10x								
⑪ Spotfin Shiner		2	55/1	75/3					☐
V:	10x								
⑫ Sand Shiner		11	55/7	35/7	40/7	50/7	40/7		☐
			40/7	45/7	45/7	40/7	35/7		
V:	10x		20/7						
Common Carp		15	100/12	55/2	60/3	60/3	60/3		☐
			50/2	60/4	65/4	60/3	65/5		
V:	10x		85/9	65/4	55/2	55/3	55/3		
Common Carp		11	60/3	85/9	65/4	60/4	60/3		☐
			55/3	50/3	65/4	55/3	45/2		
V:	10x		55/3						
									☐
V:	10x								
									☐
V:	10x								
									☐
V:	10x								
									☐
V:	10x								

Fathead minnow weight (82g) is a batch weight
Sand shiner weight (7g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 4

Field Crew: Crew Leader K. Pulley Boat Driver Netters B Travros
Time of Day: 1040-1315
Project Code:
Site Code:
River/ Stream: Wild Rice River
Cass County Location: Reach 10
Date: 09/15/12
Distance:
ND Temp: 13.73°C
Seconds Fished: 4416
River Code:
Sampler Type: Miniboom
Conductivity: 1.169 mS/cm
Lat/Long (Beg): 46.754004/-96.809335
RM:
Secchi Depth: 7.3 inches
Diss. Oxy.: 10.87 mg/L
~~Lat/Long (Mid)~~:
Voltage: 100
Volt. Range: 50-500
D.O. %sat.:
Lat/Long (End): 46.757130/-96.806688
% Range: 12
Amperage: 12-13 (avg 12)
pH: 8.19
~~Lat/Long (X-Loc)~~:
Turbidity = 44.5 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight	Anomalies	Lunke
①	Channel Catfish V	10x	15	770/5500 675/3600 730/4100 460/720 320/230 575/2300 415/590 620/2600 315/240 580/1700 555/1530 470/800 400/490 350/320 350/300		☐
②	Common Carp V	10x	4	560/2060 360/580 500/1620 300/320		☐
③	Walleye V	10x		505/1100 415/720		☐
④	Golden Redhorse V	10x		525/510 75/4 80/7		☐
⑤	Shorthead Redhorse V	10x		410/760 420/620 370/610 115/14 100/11 110/13		☐
⑥	White Bass V	10x		370/460		☐
⑦	Quillback V	10x		450/1100 420/1040 320/400 270/280		☐
⑧	Goldeye V	10x		365/320 350/360 360/310 320/260 330/240 310/220 360/240 320/200		☐

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Equipment: 15 ft flat-bottom jon boat; 15 hp Mercury motor
5.0 GPP electroshocking unit; 14 hp Kohler generator
Frequency = 120 hz.

Figure 4. continued

Page 2 of 4

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
⑨	Rock Bass			250/380						☐
	V:	10x								
⑩	Sauger			325/210	~~300/390~~					☐
					380/370					
	V:	10x								
	Channel Catfish		15	350/320	300/200	350/300	340/320	350/370		☐
				240/140	330/240	310/240	380/400	350/300		
	V:	10x		380/380	430/580	320/200	260/106	250/100		
⑪	Freshwater Drum			290/300	300/280	480/1300	310/220	220/100		☐
				220/100						
	V:	10x								
	Channel Catfish			240/95	270/136	320/210	240/100	350/340		☐
				220/75	400/580	105/1	55/1			
	V:	10x								
⑫	Black Bullhead			130/30	125/25					☐
	V:	10x								
⑬	Spotfin Shiner		15	50/44	40/44	35/44	45/44	100/44		☐
				50/44	100/44	30/44	70/44	100/44		
	V:	10x		45/44	55/44	35/44	35/44	35/44		
	Spotfin Shiner		15	30/44	50/44	35/44	25/44	100/44		☐
				50/44	75/44	100/44	35/44	40/44		
	V:	10x		35/44	45/44	50/44	40/44	40/44		
	Spotfin Shiner		15	35/44	40/44	30/44	30/44	30/44		☐
				45/44	50/44	50/44	35/44	30/44		
	V:	10x		30/44	30/44	30/44	30/44	35/44		
	Spotfin Shiner		10	40/44	30/44	35/44	30/44	30/44		☐
				25/44	55/44	35/44	40/44	25/44		
	V:	10x								
⑭	Sand Shiner		15	50/22	50/22	50/22	30/22	45/22		☐
				35/22	40/22	45/22	50/22	40/22		
	V:	10x		55/22	100/22	100/22	35/22	100/22		
	Sand Shiner		9	50/22	55/22	40/22	40/22	40/22		☐
				55/22	50/22	40/22	40/22			
	V:	10x								
⑮	Fathead Minnow			40/2	40/2	40/2	40/2			☐
	V:	10x								

Spotfine Shiner weight (44 g) is a batch weight
Sand Shiner weight (22 g) is a batch weight
Fathead Minnow weight (2 g) is a batch weight

Reach 10 (Wild Rice River)
09/15/12

Figure 4. continued

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(120)

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight										Anomalies	Lunker
Orangespotted		15	40	431	30	431	50	431	45	431	40	431		
Sunfish			30	431	35	431	40	431	35	431	40	431		☐
V:	10x		40	431	50	431	40	431	45	431	45	431		
Orangespotted Sunfish		15	45	431	25	431	45	431	40	431	35	431		
			35	431	35	431	45	431	40	431	45	431		☐
V:	10x		35	431	45	431	35	431	40	431	45	431		
Orangespotted Sunfish		15	30	431	45	431	50	431	40	431	45	431		
			35	431	40	431	40	431	50	431	35	431		☐
V:	10x		35	431	45	431	30	431	30	431	30	431		
Orangespotted Sunfish		15	35	431	45	431	35	431	45	431	50	431		
			35	431	100	431	45	431	30	431	45	431		☐
V:	10x		45	431	40	431	35	431	30	431	45	431		
Orangespotted Sunfish		15	40	431	35	431	50	431	40	431	35	431		
			30	431	40	431	40	431	35	431	50	431		☐
V:	10x		45	431	55	431	100	431	40	431	50	431		
Orangespotted Sunfish		15	30	431	40	431	45	431	35	431	45	431		
			40	431	45	431	30	431	40	431	35	431		☐
V:	10x		30	431	40	431	35	431	45	431	50	431		
Orangespotted Sunfish		15	45	431	40	431	45	431	45	431	55	431		
			40	431	45	431	30	431	50	431	40	431		☐
V:	10x		45	431	50	431	40	431	40	431	35	431		
Orangespotted Sunfish		15	35	431	50	431	40	431	50	431	100	431		
			35	431	35	431	45	431	45	431	35	431		☐
V:	10x		45	431	40	431	30	431	35	431	50	431		
Orangespotted Sunfish		15	55	431	65	431	30	431	50	431	40	431		
			45	431	40	431	45	431	45	431	50	431		☐
V:	10x		40	431	55	431	35	431	35	431	40	431		
Orangespotted Sunfish		15	100	431	40	431	40	431	30	431	35	431		
			40	431	35	431	40	431	40	431	45	431		☐
V:	10x		55	431	40	431	55	431	40	431	45	431		
Orangespotted Sunfish		15	45	431	45	431	35	431	45	431	35	431		
			100	431	35	431	45	431	65	431	40	431		☐
V:	10x		100	431	50	431	50	431	100	431	35	431		
Orangespotted Sunfish		15	30	431	35	431	40	431	35	431	45	431		
			40	431	100	431	40	431	45	431	40	431		☐
V:	10x		45	431	40	431	50	431	40	431	40	431		
Orangespotted Sunfish		15	40	431	45	431	50	431	45	431	40	431		
			35	431	50	431	55	431	45	431	50	431		☐
V:	10x		40	431	35	431	55	431	45	431	50	431		

Orange-spotted sunfish were weighed in batch = 431 g
(continued on pg 4)

Reach 10 (Wild Rice River)
09/15/12

Figure 4. continued

Page 4 of 4

Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight										Anomalies	Lunker
			(mm)	(g)										
Orangespotted Sunfish		15	50	431	50	431	35	431	30	431	40	431		☐
			30	431	35	431	35	431	35	431	40	431		
V:	10x		30	431	40	431	50	431	35	431	40	431		
Orangespotted Sunfish		15	40	431	50	431	30	431	40	431	40	431		☐
			30	431	40	431	30	431	30	431	35	431		
V:	10x		40	431	40	431	40	431	40	431	30	431		
Orangespotted Sunfish		15	30	431	45	431	50	431	35	431	30	431		☐
			35	431	45	431	40	431	40	431	50	431		
V:	10x		40	431	35	431	45	431	50	431	45	431		
Orangespotted Sunfish		15	35	431	40	431	40	431	30	431	35	431		☐
			35	431	30	431	40	431	40	431	45	431		
V:	10x		45	431	40	431	40	431	40	431	45	431		
Orangespotted Sunfish		15	40	431	50	431	50	431	45	431	45	431		☐
			45	431	50	431	40	431	45	431	50	431		
V:	10x		40	431	45	431	45	431	50	431	35	431		
Orangespotted Sunfish		15	45	431	35	431	40	431	35	431	35	431		☐
			30	431	45	431	40	431	35	431	40	431		
V:	10x		50	431	35	431	35	431	45	431	30	431		
Orangespotted Sunfish		15	40	431	40	431	50	431	40	431	40	431		☐
			50	431	35	431	30	431	50	431	40	431		
V:	10x		30	431	40	431	40	431	40	431	40	431		
Orangespotted Sunfish		15	45	431	45	431	30	431	45	431	45	431		☐
			40	431	35	431	40	431	35	431	50	431		
V:	10x		40	431	30	431	50	431	45	431	40	431		
Orangespotted Sunfish		15	35	431	40	431	40	431	40	431	40	431		☐
			35	431	40	431	45	431	45	431	35	431		
V:	10x		35	431	35	431	40	431	30	431	45	431		
Orangespotted Sunfish		15	40	431	40	431	45	431	35	431	45	431		☐
			40	431	45	431	40	431	40	431	45	431		
V:	10x		45	431	45	431	40	431	40	431	45	431		
Orangespotted Sunfish		15	40	431	40	431	35	431	45	431	45	431		☐
			50	431	50	431	40	431	45	431	35	431		
V:	10x		35	431	35	431	40	431	45	431	30	431		
Orangespotted Sunfish		15	35	431	45	431	40	431	50	431	35	431		☐
			35	431	45	431	45	431	40	431	40	431		
V:	10x		50	431	40	431	35	431	30	431	25	431		
Orangespotted Sunfish			35	431	45	431	45	431	35	431	30	431		☐
			35	431	30	431								
V:	10x													

Orangespotted Sunfish were weighed in batch = 431 g
(continued from pg 3)

Note: ~~Steady~~ KP
STEADY Rain Present
For Initial 2,700 seconds
of Survey.

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.

Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Crew Leader Boat Driver Netters
Field Crew: K. Pulley J. Schmidt
River/ Stream: Sheyenne River CASS County
Date: 09/17/20
River Code:
RM:
Voltage: 50
% Range: 10
Distance: ND
Sampler Type: Miniboom
Secchi Depth: 6.5 inches
Volt. Range: 50-500
Amperage: 12-14 (avg 14)
Time of Day: 0955-1310
Location: Reach 11
Temp: 14.69°C
Conductivity: 2.08 mS/cm
Diss. Oxy.: 6.98 mg/L
D.O. %sat.:
pH: 8.54
Project Code:
Site Code:
Seconds Fished: 4797
Lat/Long (Beg): 46.656703/-96,945~~[illegible]~~ 821 KP
~~Lat/Long (Mid)~~:
Lat/Long (End): 46.657167/-96.939504
~~Lat/Long (X-Loc)~~:
Turbidity = 218 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight						Anomalies	Lunke
①	Channel Catfish V: ☐	10x ☐	11	355/300 280/150 65/2	290/150 650/4000	410/500 70/2	280/125 65/2	55/1 65/2			☐
②	Quillback V: ☐	10x ☐	2	450/1100	380/700						☐
③	Shorthead Redhorse V: ☐	10x ☐	3	355/425	330/325	375/450				L	☐
④	Goldeye V: ☐	10x ☐	1	310/225							☐
⑤	Walleye V: ☐	10x ☐	1	360/275							☐
⑥	Smallmouth Bass V: ☐	10x ☐	1	205/115							☐
⑦	Rock Bass V: ☐	10x ☐	1	235/250							☐
⑧	White Bass V: ☐	10x ☐	2	125/50	130/26						☐

Mass Weighing Convention:
Total Weight → 536 (12) ← Number Weighed
Vouchers Collected: ☐

Equipment: 15 ft flat-bottom jon boat; 15 hp Mercury motor; 5.0 GPP electroshocking unit; 14 hp Kohler generator

Frequency = 120 Hz

Figure 4. continued

Page 2 of 2

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
⑨	[illegible]		3	105/19	80/8	70/6				☐
	V:	10x								
⑩	Golden Redhorse		1	110/17						☐
	V:	10x								
⑪	White Sucker		2	130/25	75/4					☐
	V:	10x								
⑫	Trout Perch		1	70/4						☐
	V:	10x								
⑬	Fathead Minnow		2	55/2	45/2					☐
	V:	10x								
⑭	Spotfin Shiner		8	45/9	45/9	45/9	65/9	40/9		☐
				50/9	65/9	40/9				
	V:	10x								
⑮	Sand Shiner		10	30/7	50/7	40/7	40/7	50/7		☐
				30/7	45/7	35/7	40/7	45/7		
	V:	10x								
										☐
	V:	10x								
										☐
	V:	10x								
										☐
	V:	10x								
										☐
	V:	10x								
										☐
	V:	10x								
										☐
	V:	10x								

Fathead minnow weight (2g) is a batch weight
Spotfin Shiner weight (9 g) is a batch weight
Sand Shiner weight (7 g) is a batch weight

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Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.

Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: Crew Leader K. Ryllen Boat Driver Netters J. Schlect
Time of Day: 0945-1345
Project Code:
Site Code:
River/ Stream: Sheyenne River Cass County ND
Location: Reach 12
Date: 09/18/12
Distance:
Temp: 13.73°C
Seconds Fished: 10220
River Code:
Sampler Type: Minnboom
Conductivity: 2.09mS/Cm
Lat/Long (Beg): 46.735329/-96.930547
RM:
Secchi Depth: 5.5 inches
Diss. Oxy.: 9.51mg/L
~~Lat/Long (Mid)~~:
Voltage: 100
Volt. Range: 50-500
D.O. %sat.:
Lat/Long (End): 46.743898/-96.932478
% Range: 12
Amperage: 12
pH: 9.11
~~Lat/Long (X-Loc)~~:
Turbidity = 248 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight	Anomalies	Lunke
①	Channel Catfish V:	10x	12	300/200 480/950 240/110 305/200 305/175 335/250 390/400 270/150 75/4 100/3 70/4 70/4		☐
②	Golden Redhorse V:	10x	1	305/275		☐
③	Shorthead Redhorse V:	10x	3	305/475 375/500 340/375		☐
④	Walleye V:	10x	4	335/275 370/375 326/225 350/325	L	☐
⑤	White Sucker V:	10x	9	190/200 65/4 90/7 65/4 65/4 65/4 60/3 70/4 65/4		☐
⑥	Walleye V:	10x	1	130/18		☐
⑦	Common Carp V:	10x	1	120/24		☐
⑧	White Bass V:	10x	1	125/25		☐

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Equipment: 15 ft flat bottom jon boat; 15 hp Mercury motor
5.0 GPP electroshocking unit; 14 hp Kohler generator
Frequency: 120 hz

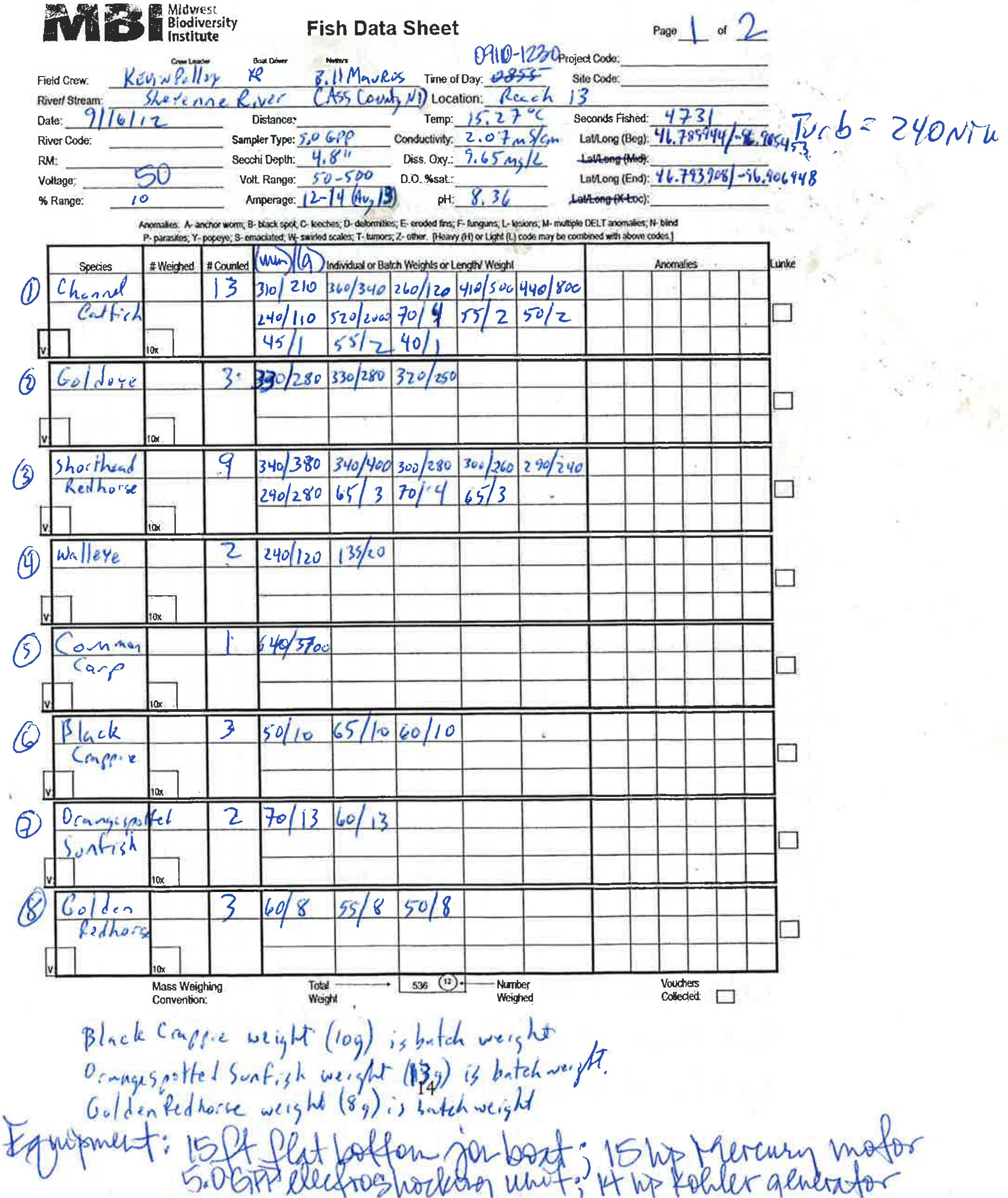
Figure 4. continued

Page 2 of 2

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
(9)	Smallmouth Bass		1	95 | 13						☐
	V:	10x								
(10)	Black Crappie		4	135 | 36	65 | 4	55 | 2	55 | 3			☐
	V:	10x								
(11)	Orangespotted Sunfish		2	70 | 7	65 | 6					☐
	V:	10x								
(12)	Black Bullhead		1	110 | 17						☐
	V:	10x								
(13)	Trout Perch		3	70 | 3	75 | 4	105 | 4				☐
	V:	10x								
(14)	Spotfin Shiner		15	105 | 47	70 | 47	55 | 47	105 | 47	35 | 47		☐
				70 | 47	100 | 47	105 | 47	100 | 47	100 | 47		
	V:	10x		55 | 47	40 | 47	45 | 47	45 | 47	45 | 47		
	Spotfin Shiner		15	70 | 47	50 | 47	30 | 47	35 | 47	50 | 47		☐
				50 | 47	100 | 47	50 | 47	40 | 47	35 | 47		
	V:	10x		45 | 47	55 | 47	35 | 47	40 | 47	40 | 47		
	Spotfin Shiner		9	45 | 47	45 | 47	35 | 47	40 | 47	30 | 47		☐
				50 | 47	29 | 47	105 | 47	100 | 47			
	V:	10x								
(15)	Sand Shiner		15	45 | 23	100 | 23	35 | 23	40 | 23	30 | 23		☐
				40 | 23	40 | 23	45 | 23	40 | 23	55 | 23		
	V:	10x		40 | 23	40 | 23	45 | 23	40 | 23	55 | 23		
	Sand Shiner		15	40 | 23	30 | 23	40 | 23	50 | 23	40 | 23		☐
				45 | 23	40 | 23	25 | 23	25 | 23	30 | 23		
	V:	10x		25 | 23	35 | 23	45 | 23	45 | 23	30 | 23		
	Sand Shiner		15	40 | 23	35 | 23	40 | 23	40 | 23	35 | 23		☐
				45 | 23	40 | 23	35 | 23	30 | 23	40 | 23		
	V:	10x		30 | 23	40 | 23	35 | 23	25 | 23	35 | 23		
	Sand Shiner		2	30 | 23	40 | 23					☐
	V:	10x								
(16)	Fathead Minnow		8	70 | 13	50 | 13	50 | 13	45 | 13	45 | 13		☐
	V:	10x		55 | 13	50 | 13	45 | 13				

Spotfin shiner weight (47g) is a batch weight
Sand shiner weight (23g) is a batch weight
Fathead minnow weight (13 g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: Crew Leader Kevin Pelloy Boat Driver KP Netters B. Il Mauros
River/ Stream: Sheyenne River (CASS County ND)
Date: 9/6/12
River Code:
RM:
Voltage: 50
% Range: 10
Distance:
Sampler Type: 5.0 GPP
Secchi Depth: 4.8"
Volt. Range: 50-500
Amperage: 12-14 (Av, 13)
0910-1230
Time of Day: ~~0855~~
Location: Reach 13
Temp: 15.27 °C
Conductivity: 2.07 mS/cm
Diss. Oxy.: 9.65 mg/L
D.O. %sat.:
pH: 8.36
Project Code:
Site Code:
Seconds Fished: 4731
Lat/Long (Beg): 46.789944/-96.905453
~~Lat/Long (Mid)~~:
Lat/Long (End): 46.793908/-96.906448
~~Lat/Long (X-Loc)~~:
Turb = 240 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
①	Channel Catfish		13	310/210	360/340	260/120	410/500	440/800		☐
				240/110	520/2000	70/4	55/2	50/2		
	V	10x		45/1	55/2	40/1				
②	Goldeye		3	330/280	330/280	320/250				☐
	V	10x								
③	Shorthead Redhorse		9	340/380	340/400	300/280	300/260	290/240		☐
				290/280	65/3	70/4	65/3			
	V	10x								
④	Walleye		2	240/120	135/20					☐
	V	10x								
⑤	Common Carp		1	640/5700						☐
	V	10x								
⑥	Black Crappie		3	50/10	65/10	60/10				☐
	V	10x								
⑦	Orangespotted Sunfish		2	70/13	60/13					☐
	V	10x								
⑧	Golden Redhorse		3	60/8	55/8	50/8				☐
	V	10x								

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Black Crappie weight (10g) is batch weight
Orangespotted Sunfish weight (13g) is batch weight.
Golden Redhorse weight (8g) is batch weight

Equipment: 15 ft flat bottom jon boat; 15 hp Mercury motor
5.0 GPP electroshocking unit; 14 hp Kohler generator

Figure 4. continued

Page 2 of 2

	Species	# Weighed	# Counted	mm/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
(9)	Fathead Minnow		5	50/10	55/10	45/10	55/10	45/10		
										☐
	V:	10x								
(10)	Sand		39	40/15	25/15	25/15	25/15	35/15		
	shiner			40/15	40/15	20/15	25/15	25/15		☐
	V:	10x		30/15	40/15	20/15	30/15	30/15		
(11)	Spotfin		10	25/16	55/16	60/16	50/16	65/16		
	Shiner			65/16	35/16	55/16	30/16	55/16		☐
	V:	10x								
	Sand			30/15	30/15	35/15	30/15	30/15		
	shiner			25/15	35/15	30/15	30/15	45/15		☐
	V:	10x		30/15	25/15	30/15	30/15	30/15		
	Sand			30/15	35/15	30/15	30/15	30/15		
	shiner			45/15	30/15	25/15	40/15			☐
	V:	10x								
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐
	V:	10x								☐

Fathead Minnow weight (10g) is a batch weight.
Sand Shiner weight (15g) is a batch weight.
Spotfin Shiner weight (16g) is a batch weight.

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.

Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: Crew Leader K. Pullen Boat Driver Netters J. Schuldt
Time of Day: 0920-1220
Project Code:
Site Code:
River/ Stream: Sheyenne River Cass County ND
Location: Reach 14
Date: 09/19/12
Distance:
Temp: 13:32°C
Seconds Fished: 4934
River Code:
Sampler Type: Miniboom
Conductivity: 2.11 mS/Cm
Lat/Long (Beg): 46.937171/-96.916815
RM:
Secchi Depth: 5.2 inches
Diss. Oxy.: 9.56 mg/L
Lat/Long (Mid):
Voltage: 100
Volt. Range: 50-500
D.O. %sat.:
Lat/Long (End): 46.940267/-96.915770
% Range: 12
Amperage: 12-14
pH: 8.35
Lat/Long (X-Loc):

Turbidity = 235 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm) (g) Individual or Batch Weights or Length/ Weight										Anomalies	Lunke
①	Goldeye		15	355	325	320	250	305	200	325	225	320	200		
				330	225	320	200	315	200	320	225	340	200		☐
	V ☐	10x		320	250	310	225	320	200	330	225	310	200		
②	Channel Catfish		7	390	400	515	1225	375	375	355	300	245	105		
				55	2	60	1								☐
	V ☐	10x													
③	Shorthead Redhorse		3	400	525	390	550	385	525						
															☐
	V ☐	10x													
	Goldeye		6	310	200	355	325	360	325	340	250	315	225		
				325	275										☐
	V ☐	10x													
④	Walleye		1	420	625										
															☐
	V ☐	10x													
⑤	Sauger		1	235	114										
															☐
	V ☐	10x													
⑥	Common Carp		2	495	1750	340	625								
															☐
	V ☐	10x													
⑦	White Bass		1	130	26										
															☐
	V ☐	10x													

Mass Weighing Convention: Total Weight → 536 ⑫ ← Number Weighed

Vouchers Collected: ☐

Equipment: 15 ft flat bottom jon boat; 15 hp Mercury motor
5.0 GPP electroshocking unit; 14 hp Kohler generator

Frequency = 120 hz

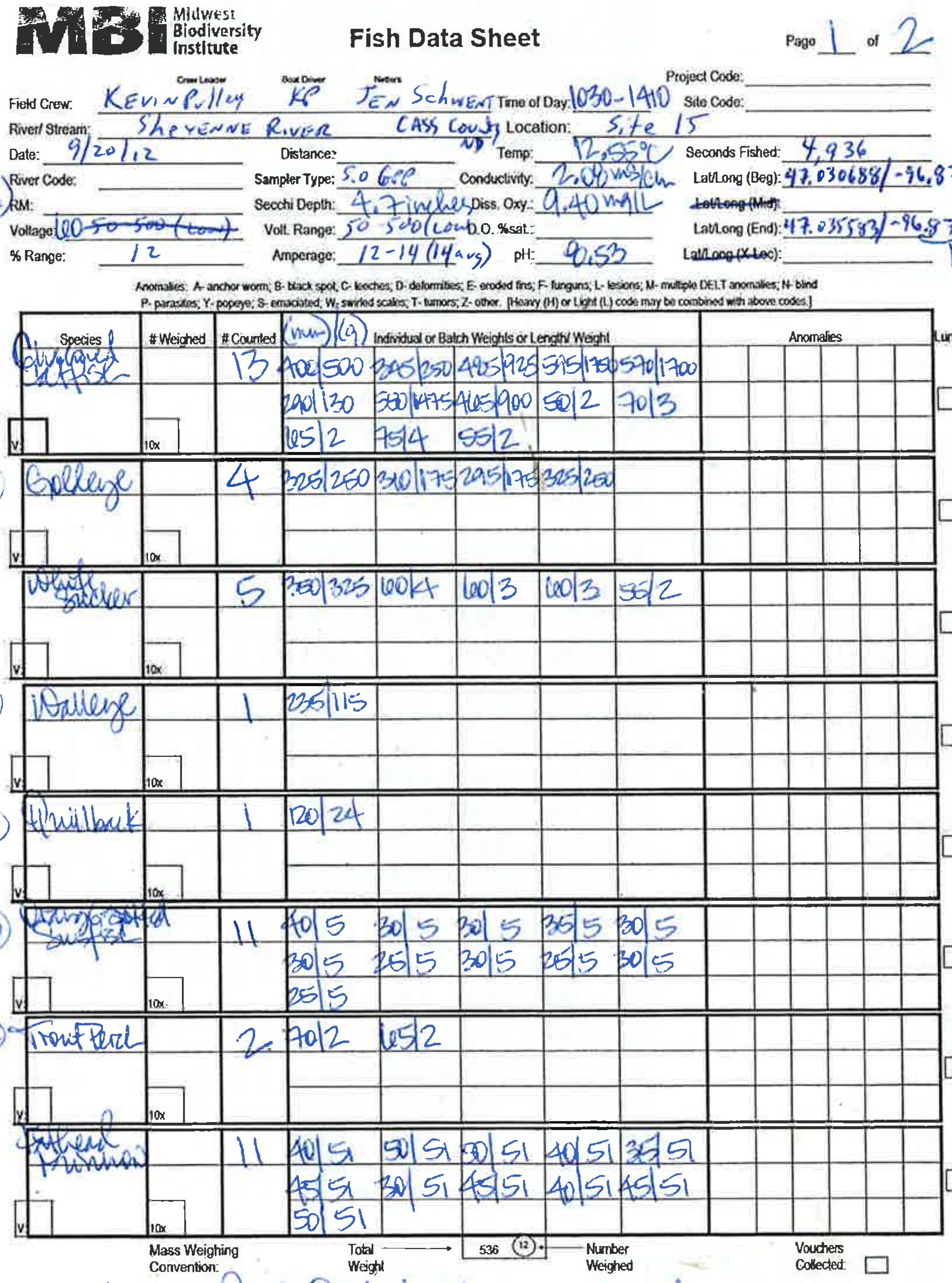
Figure 4. continued

Page 2 of 2

	Species	# Weighed	# Counted	(mm)	(g) Individual or Batch Weights or Length/ Weight									Anomalies	Lunker
⑧	Orangespotted Sunfish		7	70	16	45	16	100	16	45	16	35	16		☐
				35	16	35	16								
	V:	10x													
⑨	Quillback		4	115	15	110	17	105	14	110	16				☐
	V:	10x													
⑩	White Sucker		4	70	4	70	4	70	4	105	3				☐
	V:	10x													
⑪	Trout Perch		2	75	5	90	16								☐
	V:	10x													
⑫	Sand Shiner		15	100	50	55	50	40	50	55	50	55	50		☐
				100	50	55	50	50	50	55	50	100	50		
	V:	10x		35	50	30	50	50	50	55	50	50	50		
	Sand Shiner		15	50	50	50	50	100	50	50	50	55	50		☐
				35	50	100	50	50	50	55	50	50	50		
	V:	10x		55	50	45	50	100	50	50	50	40	50		
	Sand Shiner		10	50	50	40	50	50	50	55	50	50	50		☐
				30	50	55	50	40	50	50	50	45	50		
	V:	10x													
⑬	Spotfin Shiner		15	105	58	100	58	55	58	55	58	50	58		☐
				45	58	70	58	55	58	55	58	35	58		
	V:	10x		50	58	100	58	105	58	50	58	105	58		
	Spotfin Shiner		15	50	58	100	58	50	58	50	58	45	58		☐
				100	58	55	58	50	58	55	58	50	58		
	V:	10x		100	58	55	58	45	58	90	58	40	58		
	Spotfin Shiner		13	100	58	105	58	50	58	55	58	105	58		☐
				45	58	40	58	45	58	100	58	30	58		
	V:	10x		30	58	25	58	40	58						
⑭	Fathead Minnow		14	35	13	45	13	45	13	50	13	100	13		☐
				40	13	45	13	30	13	45	13	50	13		
	V:	10x		50	13	55	13	100	13	90	13				
															☐
	V:	10x													
															☐
	V:	10x													

Orangespotted sunfish weight (16g) is a batch weight
Sand shiner weight (50 g) is a batch weight
Spotfin shiner weight (58g) is a batch weight
Fathead minnow weight (13g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Field Crew: Crew Leader KEVIN Pulley Boat Driver KP Netters JEN Schwent
Time of Day: 1030-1410
Project Code:
Site Code:
River/ Stream: Sheyenne River CASS County ND
Location: Site 15
Date: 9/20/12
Distance:
Temp: 12,55°C
Seconds Fished: 4,936
River Code:
Sampler Type: 5.0 GPP
Conductivity: 2,04 mS/cm
Lat/Long (Beg): 47.030688/-96.877607
RM:
Secchi Depth: 4.7 inches
Diss. Oxy.: 9.40 mg/L
~~Lat/Long (Mid)~~:
Voltage: 100 ~~50-500 (Low)~~
Volt. Range: 50-500 (Low)
D.O. %sat.:
Lat/Long (End): 47.035583/-96.873957
% Range: 12
Amperage: 12-14 (14 avg)
pH: 9.53
~~Lat/Long (X-Loc)~~:

Hz = 120 DC (Pulse Per Sec)

Turbidity = 259 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)	(g)	Individual or Batch Weights or Length/ Weight								Anomalies	Lunke
①	Channel Catfish		13	400	500	325	250	425	925	575	1750	570	1700		
				240	130	330	1475	405	900	50	2	70	3		☐
	V: ☐	10x ☐		65	2	75	4	55	2						
②	Goldeye		4	325	250	310	175	295	175	325	250				
															☐
	V: ☐	10x ☐													
③	White Sucker		5	350	325	60	4	60	3	60	3	55	2		
															☐
	V: ☐	10x ☐													
④	Walleye		1	235	115										
															☐
	V: ☐	10x ☐													
⑤	Quillback		1	120	24										
															☐
	V: ☐	10x ☐													
⑥	Orange-spotted Sunfish		11	40	5	30	5	30	5	35	5	30	5		
				30	5	25	5	30	5	25	5	30	5		☐
	V: ☐	10x ☐		25	5										
⑦	Trout Perch		2	70	2	65	2								
															☐
	V: ☐	10x ☐													
	Fathead Minnow		11	40	51	50	51	30	51	40	51	35	51		
				45	51	30	51	45	51	40	51	45	51		☐
	V: ☐	10x ☐		50	51										

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Equipment: 15 foot flat-bottom jon boat; 15 hp Mercury motor
5.0 GPP electroshocking unit; 14 hp Kohler generator

Orange-spotted sunfish weight (5 g) is a batch weight
Fathead minnow weight (51 g) is a batch weight (cont'd from page 2)

Figure 4. continued

Page 2 of 2

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight										Anomalies	Lunker
⑧ Sand Shiner		15	40	926	45	926	45	926	55	926	100	926		☐
			55	926	40	926	55	926	45	926	50	926		
V:	10x		100	926	100	926	45	926	100	926	30	926		
Sand Shiner		15	50	926	45	926	40	926	55	926	50	926		☐
			45	926	55	926	30	926	35	926	100	926		
V:	10x		55	926	50	926	100	926	50	926	50	926		
Sand Shiner		15	55	926	35	926	40	926	35	926	55	926		☐
			100	926	50	926	40	926	55	926	50	926		
V:	10x		55	926	50	926	50	926	55	926	50	926		
Sand Shiner		15.	50	926	30	926	35	926	45	926	40	926		☐
			50	926	55	926	35	926	45	926	55	926		
V:	10x		40	926	50	926	45	926	55	926	100	926		
Sand Shiner		15	55	926	50	926	55	926	45	926	55	926		☐
			100	926	55	926	55	926	50	926	55	926		
V:	10x		40	926	55	926	45	926	45	926	50	926		
Sand Shiner		9	40	926	50	926	40	926	40	926	50	926		☐
			45	926	55	926	30	926	40	926				
V:	10x													
⑨ Spotfin Shiner		15	75	902	105	902	75	902	40	902	35	902		☐
			30	902	45	902	100	902	105	902	105	902		
V:	10x		50	902	30	902	30	902	100	902	45	902		
Spotfin Shiner		15.	105	902	70	902	50	902	45	902	100	902		☐
			50	902	40	902	50	902	55	902	100	902		
V:	10x		100	902	50	902	35	902	55	902	50	902		
Spotfin Shiner		15	55	902	45	902	55	902	35	902	55	902		☐
			55	902	50	902	50	902	50	902	55	902		
V:	10x		55	902	100	902	55	902	55	902	50	902		
Spotfin Shiner		14	100	902	50	902	40	902	55	902	45	902		☐
			55	902	50	902	55	902	55	902	45	902		
V:	10x		35	902	100	902	50	902	100	902				
⑩ Fathead Minnow		15	55	51	50	51	50	51	50	51	40	51		☐
			100	51	45	51	55	51	40	51	45	51		
V:	10x		40	51	40	51	40	51	55	51	55	51		
Fathead Minnow		15.	100	51	45	51	45	51	50	51	50	51		☐
			40	51	45	51	45	51	50	51	50	51		
V:	10x		50	51	40	51	45	51	50	51	45	51		
Fathead Minnow		15.	45	51	45	51	45	51	45	51	40	51		☐
			40	51	40	51	55	51	45	51	40	51		
V:	10x		45	51	50	51	45	51	40	51	40	51		

Sandshiner weight (926g) is a batch weight
Spotfin shiner weight (902g) is a batch weight
Fathead minnow weight (51 g) is a batch weight (cont'd on pg 1)

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.

Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 2

Project Code:
Field Crew: Crew Leader K. Pulley Boat Driver Netters N. Badgett
Time of Day: 0906-1020
Site Code:
River/ Stream: Maple River Cass County ND
Location: Site 16
Date: 9/5/12
Distance:
Temp: 19.10 °C
Seconds Fished: 3206
River Code:
Sampler Type: Mini Boom 5.0 GPP
Conductivity: 1.40 mS/cm
Lat/Long (Beg): 46.902615 / -97.056785
RM:
Secchi Depth: 9.0"
Diss. Oxy.: 7.22 mg/L
~~Lat/Long (Mid)~~:
Voltage: 120 Hz (Pulse Per sec)
Volt. Range: Low (50-500)
D.O. %sat.:
Lat/Long (End): 46.905185 / -97.059218
% Range: 10-12
Amperage: 11-12
pH: 8.16
~~Lat/Long (X-Loc)~~:
Turb = 63.2 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
①	Channel Catfish	10x		465/1025						☐
②	Quillback	10x		390/450						☐
③	Black Redhorse	10x		510/1425						☐
④	Common Carp	10x		720/5400	500/1725	110/19	75/5	75/7	E	☐
				70/6	65/3					
⑤	White Sucker	10x		325/375	245/120	90/12	85/7	105/10	E	☐
⑥	Bluegill	10x		125/61					E,P	☐
⑦	Northern Rockbass	10x		75/21	95/19	90/15	90/21			☐
⑧	Orangespot Sunfish	10x		85/12	85/13	70/6	25/56	85/11		☐
				70/5	40/56	25/56	35/56	45/56		
				35/56	25/56	30/56	30/56	35/56		

Mass Weighing Convention:
Total Weight → 536 ⑫ ← Number Weighed
Vouchers Collected: ☐

Orangespot Sunfish - All individuals with weight of 56g were included in a batch weigh

Additional Species →

Spotfin Shiner weight (8g) is a batch weight

Figure 4. continued

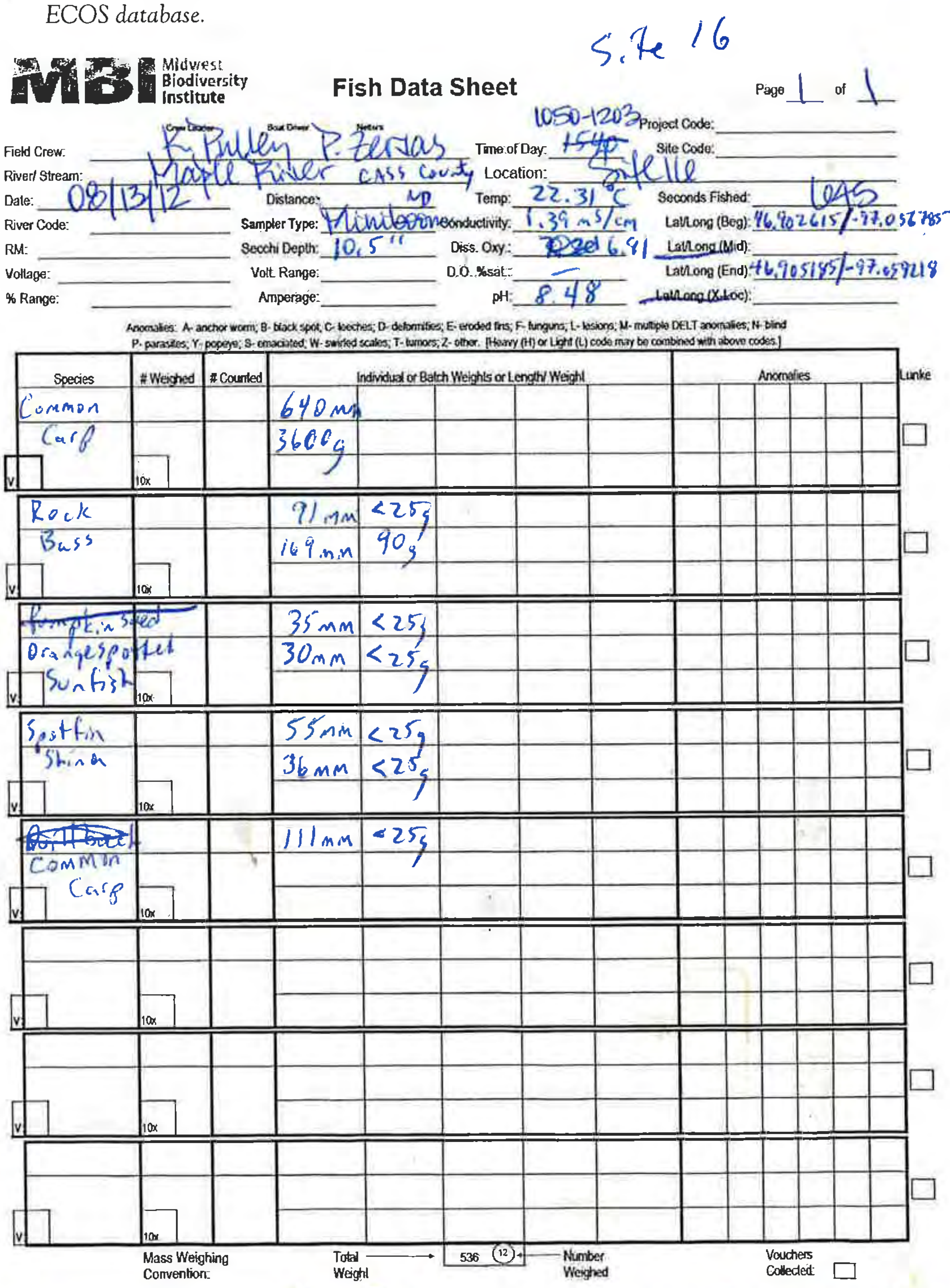
Page 2 of 2

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
Orangespot Sunfish			30|56	50|56	45|56	35|56	45|56		
			40|56	35|56	40|56	25|56	35|56		☐
V:	10x		40|56	30|56	40|56	45|56	70|56		
Orangespot Sunfish			80|56	105|56	50|56	30|56	40|56		
			35|56	35|56	40|56	30|56	35|56		☐
V:	10x		30|56	25|56	30|56	30|56	30|56		
⑨ Shorthead Redhorse			105|13					E,W	
									☐
V:	10x								
Orangespot Sunfish			30|56	25|56					
									☐
V:	10x								
⑩ Trout Perch			65|2	70|3					
									☐
V:	10x								
⑪ Spotfin Shiner			45|8	65|8	55|8	55|8	50|8		
									☐
V:	10x								
⑫ Fathead Minnow			51|1	48|1	42|1				
									☐
V:	10x								
⑬ Sand Shiner			69|2	57|2	46|2				
									☐
V:	10x								
									☐
V:	10x								
									☐
V:	10x								
									☐
V:	10x								
									☐
V:	10x								
									☐
V:	10x								

Fathead minnow weight (1g) is a batch weight
Sandshiner weight (2g) is a batch weight

Equipment: 15 ft flat bottom jon boat; 15 hp Mercury motor
5.0 GPP electroshocking unit; 14 hp Kohler generator

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Site 16

Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 1

Field Crew: Crew Leader K. Pullen Boat Driver P. Zerdas Netters

River/ Stream: Maple River CASS County

Date: 08/13/12

River Code:

RM:

Voltage:

% Range:

Distance: ND

Sampler Type: Miniboom

Secchi Depth: 10.5"

Volt. Range:

Amperage:

Time of Day: ~~1540~~ 1050-1203

Location: Site 16

Temp: 22.31 °C

Conductivity: 1.39 mS/cm

Diss. Oxy.: ~~7.20~~ 6.91

D.O. %sat.: –

pH: 8.48

Project Code:

Site Code:

Seconds Fished: 1045

Lat/Long (Beg): 46.902615/-97.056785 Turb= 59.0 ntu

Lat/Long (Mid):

Lat/Long (End): 46.905185/-97.059218

Lat/Long (X-Loc):

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight		Anomalies	Lunke
	Common Carp V	10x		640 mm 3600 g			☐
	Rock Bass V	10x		91 mm 169 mm	<25 g 90 g		☐
H	~~Pumpkinseed~~ Orangespotted Sunfish V	10x		35 mm 30 mm	<25 g <25 g		☐
~~unk~~	Spotfin Shiner V	10x		55 mm 36 mm	<25 g <25 g		☐
Juv	~~Bullhead~~ Common Carp V	10x		111 mm	<25 g		☐
	V	10x					☐
	V	10x					☐
	V	10x					☐

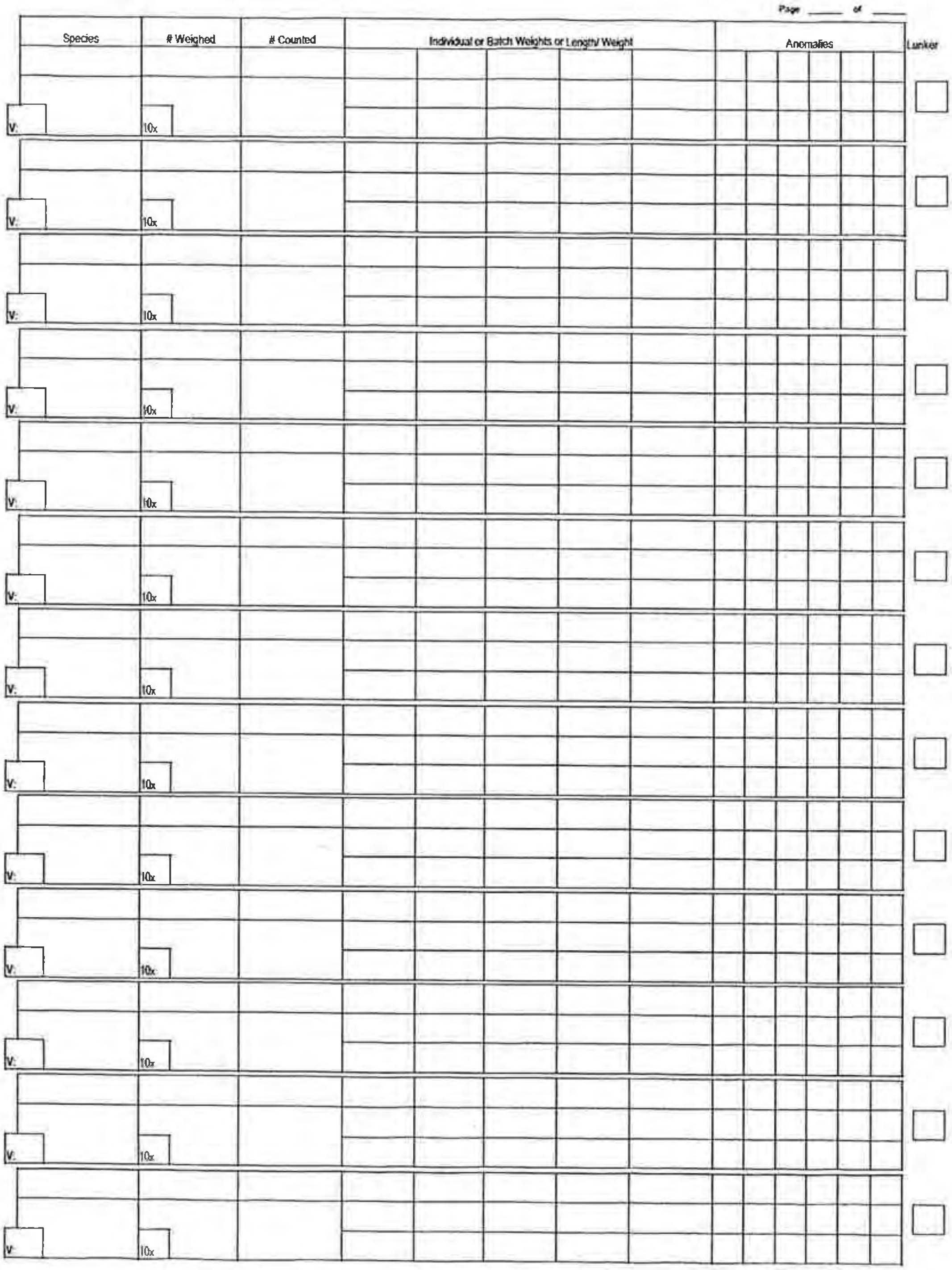
Mass Weighing Convention:

Total Weight → 536 (12) ← Number Weighed

Vouchers Collected: ☐

Equipment: 14 ft flat bottom jon boat; 15 hp Mercury motor
Smith Root 1.5 KVA electroshocking unit
Honda EU2000 generator

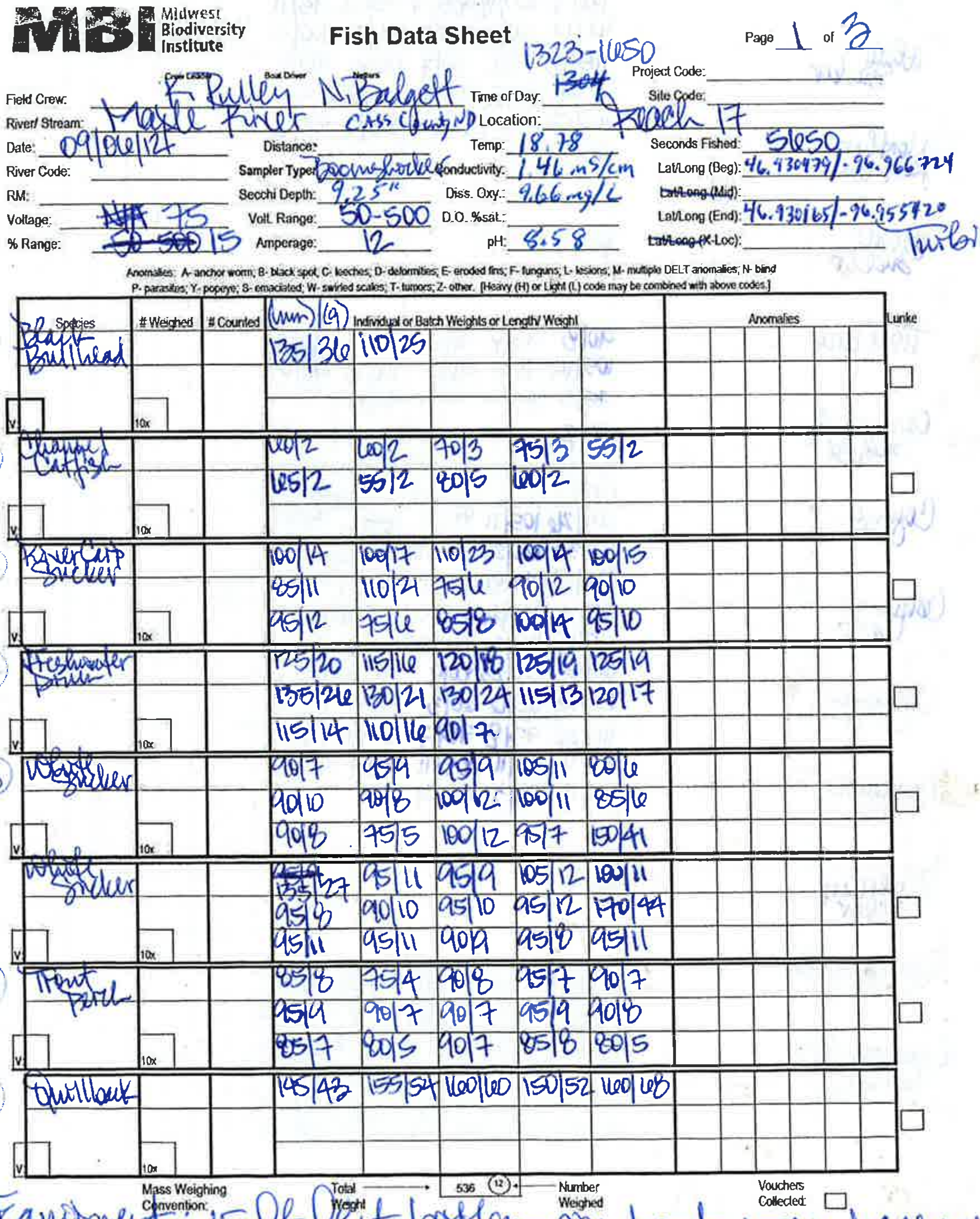
Figure 4. continued



Page ____ of ____

Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight					Anomalies						Lunker
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐
V:	10x													☐

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 3

Crew Leader: F. Pulley · Boat Driver: N. Badgett · Netters:

Field Crew: F. Pulley N. Badgett

Time of Day: 1323-1050 ~~1304~~

Project Code:

Site Code:

River/ Stream: Maple River CASS County ND

Location: Reach 17

Date: 09/06/12

Distance:

Temp: 18.78

Seconds Fished: 5650

River Code:

Sampler Type: Boomshocker

Conductivity: 1.46 mS/cm

Lat/Long (Beg): 46.930479/-96.966724

RM:

Secchi Depth: 9.25"

Diss. Oxy.: 9.66 mg/L

~~Lat/Long (Mid)~~:

Voltage: ~~N/A~~ 75

Volt. Range: 50-500

D.O. %sat.:

Lat/Long (End): 46.930165/-96.955420

% Range: ~~50-500~~ 15

Amperage: 12

pH: 8.58

~~Lat/Long (X-Loc)~~:

Turbidity = 49.5 NTU

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunke
①	Black Bullhead			135/36	110/25					☐
	V:	10x								
②	Channel Catfish			60/2	60/2	70/3	75/3	55/2		☐
				65/2	55/2	80/5	60/2			
	V:	10x								
③	River Carp Sucker			100/14	100/17	110/23	100/14	100/15		☐
				85/11	110/24	75/6	90/12	90/10		
	V:	10x		95/12	75/6	85/8	100/14	95/10		
④	Freshwater Drum			125/20	115/16	120/18	125/19	125/19		☐
				135/26	130/21	130/24	115/13	120/17		
	V:	10x		115/14	110/16	90/7				
⑤	White Sucker			90/7	95/9	95/9	105/11	80/6		☐
				90/10	90/8	100/12	100/11	85/6		
	V:	10x		90/8	75/5	100/12	95/7	150/41		
	White Sucker			135/27	95/11	95/9	105/12	100/11		☐
				95/8	90/10	95/10	95/12	170/44		
	V:	10x		95/11	95/11	90/9	95/8	95/11		
⑥	Trout Perch			85/8	75/4	90/8	95/7	90/7		☐
				95/9	90/7	90/7	95/9	90/8		
	V:	10x		85/7	80/5	90/7	85/8	80/5		
⑦	Quillback			145/43	155/54	160/60	150/52	160/68		☐
	V:	10x								

Mass Weighing Convention:

Total Weight → 536 ⑫ ← Number Weighed

Vouchers Collected: ☐

Equipment: 15 ft flat bottom Jon boat; 15 hp Mercury motor 5.0 GPP electroshocking unit; 14 hp Kohler generator

Hz = 120 (pulse per second)

% Power (Output) = 15

Figure 4. continued

Page 2 of 3

Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
River Carp Sucker			105/18	105/14	105/16	115/22	105/14		
			180/7	100/18	85/7	95/12	95/11		☐
V:	10x		100/14	100/15	100/12	90/10	60/5		
White Sucker			115/18	85/6	80/7	90/8	90/6		
			95/9	80/5	95/10	85/8	95/9		☐
V:	10x		100/17	100/14	160/47	85/7	80/6		
(8) Northern Rock Bass			45/2						
									☐
V:	10x								
White Sucker			85/7						
									☐
V:	10x								
Trout Perch			90/8	95/8	70/5	85/5	90/7		
			105/14	70/4	90/9	100/10	90/8		☐
V:	10x		75/5	75/5	90/8	90/8			
(9) Orangespotted Sunfish			50/2	45/187	45/187	43/187	41/187		
			43/187	42/187	46/187	47/187	33/187		☐
V:	10x		46/187	52/187	40/187	43/187	45/187		
(10) Common Carp			125/26	105/11	85/11	~~105~~ 150/33	75/8		
			130/30	120/25	120/26	160/57	135/34		☐
V:	10x		130/28	175/80	80/7	120/24	85/11	D	
Common Carp			65/4	140/41	145/37	135/36	65/5		
			55/3	110/21	120/25	140/38	125/27		☐
V:	10x		60/5	120/23	80/9	150/52	125/27		
Common Carp			130/34	65/6	60/3	75/8	130/31		
			110/22	75/8	70/7	155/43	120/21		☐
V:	10x		80/7	80/10	85/11	75/7	75/7		
Common Carp			65/4	75/7	120/19				
									☐
V:	10x								
River Carp Sucker			60/4						
									☐
V:	10x								
Orangespotted Sunfish			54/187	47/187	50/187	52/187	46/187		
			54/187	45/187	43/187	40/187	47/187		☐
V:	10x		58/187	45/187	42/187	42/187	45/187		
Orangespotted Sunfish			43/187	50/187	48/187	43/187	53/187		
			54/187	50/187	54/187	40/187	40/187		☐
V:	10x		37/187	51/187	50/187	53/187	50/187		

Common Carp deformity = abnormal scales
Orangespotted Sunfish weight (187g) is a batch weight.

Reach 17 (Maple River)
09/06/2012

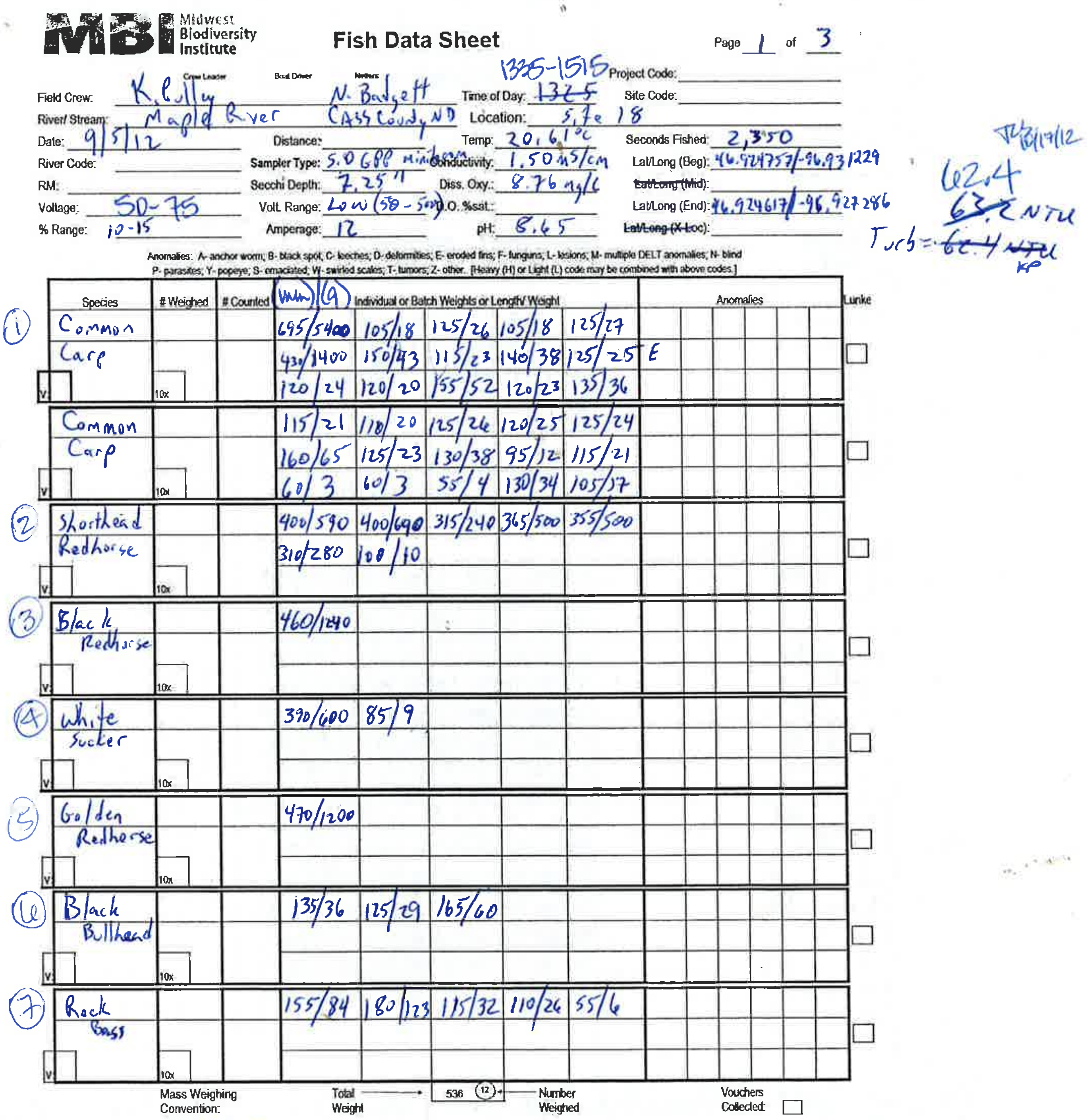
Figure 4. continued

Page 3 of 3

Species	# Weighed	# Counted	(mm)	(g) Individual or Batch Weights or Length/ Weight									Anomalies	Lunker
Orangespotted Sunfish			45	187	52	187	51	187	40	187	42	187		☐
			53	187	43	187	46	187	50	187	54	187		
V:	10x		48	187	42	187	44	187	45	187	52	187		
Orangespotted Sunfish			55	187	45	187	40	187	40	187	40	187		☐
			57	187	47	187	50	187	65	187	52	187		
V:	10x		46	187	45	187	50	187	42	187	40	187		
Orangespotted Sunfish			51	187	48	187	43	187	52	187	55	187		☐
			42	187	45	187	46	187	50	187	48	187		
V:	10x		47	187	40	187	47	187	43	187	38	187		
Orangespotted Sunfish			45	187	63	187	50	187	44	187	46	187		☐
			45	187	48	187	43	187	43	187	41	187		
V:	10x		47	187	31	187	47	187	46	187	48	187		
Orangespotted Sunfish			53	187	48	187	53	187	51	187	40	187		☐
			46	187	38	187	46	187	46	187	47	187		
V:	10x		49	187	46	187	50	187	38	187	37	187		
Orangespotted Sunfish			54	187	48	187	44	187	47	187	52	187		☐
			47	187	43	187	50	187	43	187	42	187		
V:	10x		43	187	50	187	41	187	43	187	46	187		
Orangespotted Sunfish			45	187	50	187	45	187	45	187	43	187		☐
			41	187	43	187								
V:	10x													
⑪ Fathead Minnow			50	1	46	1	29	1						☐
V:	10x													
⑫ Sand Shiner			60	32	60	32	63	32	58	32	58	32		☐
			62	32	57	32	62	32	61	32	57	32		
V:	10x		57	32	57	32	57	32	60	32	67	32		
Sand Shiner			60	32	47	32	59	32	60	32	50	32		☐
			50	32	62	32	47	32	53	32	45	32		
V:	10x													
⑬ Spotfin Shiner			60	48	60	48	30	48	35	48	41	48		☐
			46	48	55	48	65	48	50	48	65	48		
V:	10x		60	48	60	48	46	48	47	48	50	48		
Spotfin Shiner			48	48	47	48	45	48	44	48	50	48		☐
			50	48	47	48	41	48	46	48	58	48		
V:	10x		42	48	44	48	43	48	43	48				
														☐
V:	10x													

Fathead minnow weight (1g) is a batch weight
Sandshiner weight (32g) is a batch weight.
Spotfin Shiner weight (48g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 3

Field Crew: K. Culley (Crew Leader) Boat Driver: Netters: N. Badgett

River/ Stream: Maple River Cass County, ND

Date: 9/5/12

River Code:

RM:

Voltage: 50-75

% Range: 10-15

Distance:

Sampler Type: 5.0 GPP mini boom

Secchi Depth: 7.25"

Volt. Range: Low (50-500)

Amperage: 12

Time of Day: ~~1325~~ 1335-1515

Location: Site 18

Temp: 20.61°C

Conductivity: 1.50 mS/cm

Diss. Oxy.: 8.76 mg/L

D.O. %sat.:

pH: 8.65

Project Code:

Site Code:

Seconds Fished: 2,350

Lat/Long (Beg): 46.924757/-96.931229

~~Lat/Long (Mid)~~:

Lat/Long (End): 46.924617/-96.927286

~~Lat/Long (X-Loc)~~:

JLB 8/17/12

62.4

~~63.2~~ NTU

Turb = ~~62.4~~ ~~NTU~~ KP

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

	Species	# Weighed	# Counted	(mm) (g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunke
①	Common			695/5400	105/18	125/26	105/18	125/27		
	Carp			430/1400	150/43	115/23	140/38	125/25	E	☐
	V:	10x		120/24	120/20	155/52	120/23	135/36		
	Common			115/21	110/20	125/26	120/25	125/24		
	Carp			160/65	125/23	130/38	95/12	115/21		☐
	V:	10x		60/3	60/3	55/4	130/34	105/17		
②	Shorthead			400/590	400/690	315/240	365/500	355/500		
	Redhorse			310/280	100/10					☐
	V:	10x								
③	Black			460/1240						
	Redhorse									☐
	V:	10x								
④	White			390/600	85/9					
	Sucker									☐
	V:	10x								
⑤	Golden			470/1200						
	Redhorse									☐
	V:	10x								
⑥	Black			135/36	125/29	165/60				
	Bullhead									☐
	V:	10x								
⑦	Rock			155/84	180/123	115/32	110/26	55/6		
	Bass									☐
	V:	10x								

Mass Weighing Convention:

Total Weight → 536 ⑫ ← Number Weighed

Vouchers Collected: ☐

Equipment: 15 ft flat bottom jon boat; 15 hp Mercury motor 5.0 GPP electroshocking unit; 14 hp Kohler generator

27
281

Figure 4. continued

Page 2 of 3

	Species	# Weighed	# Counted	(mm)/(g) Individual or Batch Weights or Length/ Weight					Anomalies	Lunker
(8)	Walleye			215/98						
										☐
	V:	10x								
(9)	Freshwater			130/22	115/14	140/31				
	Drum									☐
	V:	10x								
(10)	~~Golden~~			115/23	125/34	80/6				
	~~Shiner~~ River									☐
	V: Carpsucker	10x								
(11)	Channel			60/2	70/4	60/3	60/3			
	Catfish									☐
	V:	10x								
	Common			65/4	70/6	135/28	60/3	140/38		
	Carp			135/33	110/20	110/19	125/26	95/11		☐
	V:	10x		130/29	145/40	120/26	55/2	115/15		
(12)	Trout			80/5						
	Perch									☐
	V:	10x								
	Common			45/2	50/4	140/40	170/74	125/26		
	Carp			130/31	140/41					☐
	V:	10x								
(13)	Orangespotted			60/146	35/146	75/146	25/146	45/146		
	Sunfish			85/146	75/146	75/146	35/146	75/146		☐
	V:	10x		40/146	35/146	35/146	55/146	45/146		
	Orangespotted			80/146	75/146	25/146	25/146	40/146		
	sunfish			45/146	40/146	70/146	40/146	45/146		☐
	V: cont	10x		40/146	40/146	45/146	40/146	40/146		
	Orangespotted			45/146	45/146	40/146	35/146	40/146		
	Sunfish			45/146	45/146	40/146	45/146	30/146		☐
	V:	10x		30/146	50/146	45/146	35/146	35/146		
	Orangespotted			35/146	30/146	30/146	35/146	25/146		
146g	Sunfish			40/146	40/146	40/146	40/146	25/146		☐
	V:	10x		40/146	40/146	30/146	40/146	45/146		
	Orangespotted			35/146	40/146	40/146	45/146	35/146		
	sunfish			40/146	40/146	45/146	45/146	35/146		☐
	V:	10x		30/146	25/146	40/146	30/146	45/146		
	Orange spotted			40/146	35/146	35/146	40/146	30/146		
	Sunfish									☐
	V:	10x								

Orangespotted sunfish weight (146g) is a batch weight

Site 18 (Maple River)
09/05/12

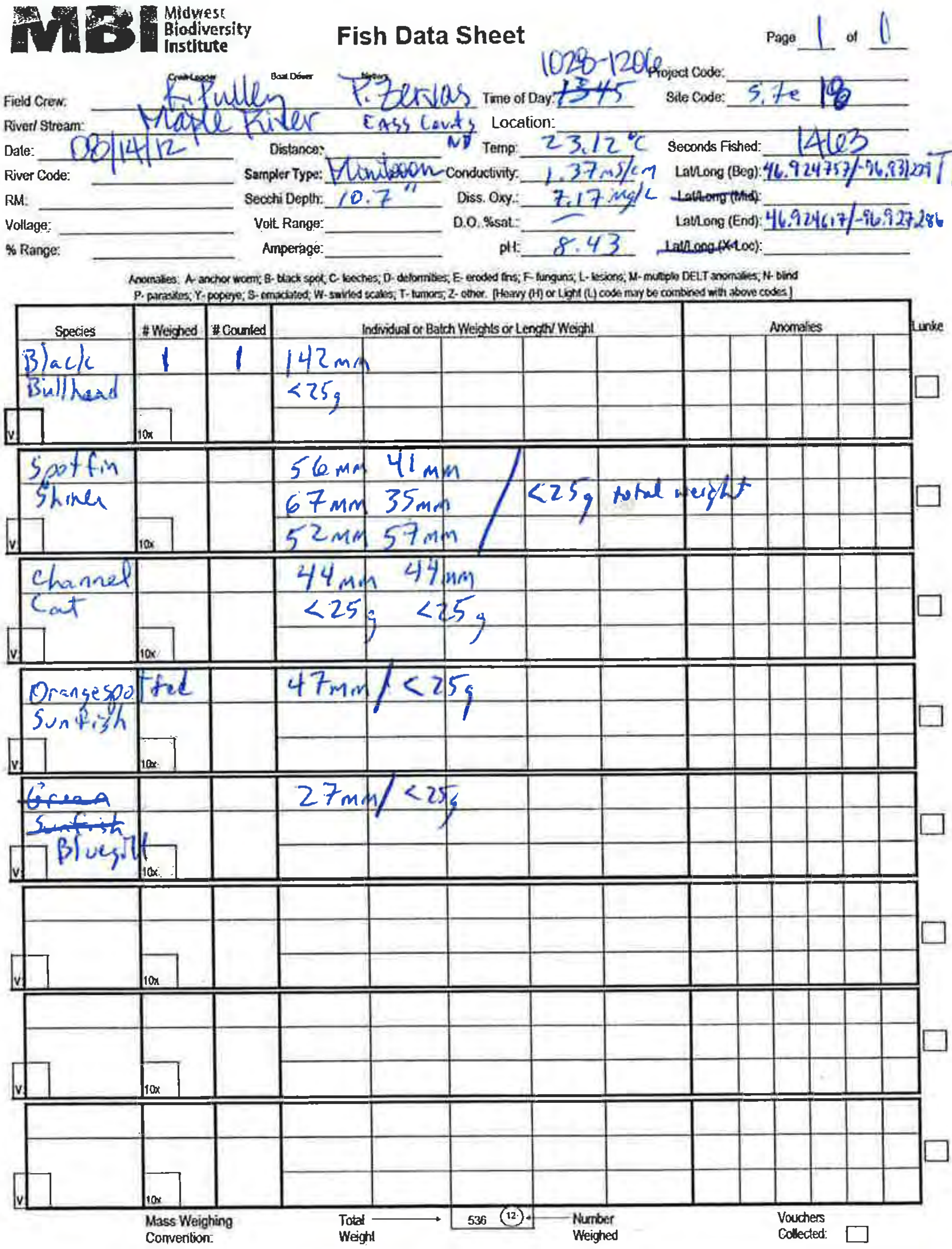
Figure 4. continued

Page 3 of 3

Species	# Weighed	# Counted	(mm)	(g) Individual or Batch Weights or Length/ Weight									Anomalies	Lunker
⑭ Spotfin Shiner			33	1	41	1								☐
V:	10x													
⑮ Fathead Minnow			40	54	39	54	43	54	39	54	37	54		☐
			40	54	43	54	46	54	33	54	39	54		
V:	10x		35	54	43	54	50	54	37	54	34	54		
Fathead Minnow			36	54	36	54	42	54	56	54	42	54		☐
			55	54	47	54	40	54	44	54	55	54		
V:	10x		41	54	46	54	38	54	41	54	37	54		
Fathead Minnow			49	54	36	54	47	54	48	54	51	54		☐
			41	54	41	54	36	54	40	54	50	54		
V:	10x		50	54	46	54	42	54	45	54	45	54		
Fathead Minnow			35	54	43	54	46	54	51	54	45	54		☐
			36	54	37	54	43	54	47	54	35	54		
V:	10x		57	54	55	54	37	54	55	54	52	54		
Fathead Minnow			36	54	42	54	55	54	42	54	43	54		☐
			40	54	49	54	47	54	50	54	52	54		
V:	10x		53	54	47	54	45	54	45	54	50	54		
Fathead Minnow			46	54	36	54	39	54	47	54	49	54		☐
			35	54	40	54	44	54	42	54	36	54		
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													
														☐
V:	10x													

Spotfin Shiner weight (1g) is a batch weight
Fathead minnow weight (54g) is a batch weight

Figure 4. Field data sheet for recording electrofishing collection data and for entry into the Ohio ECOS database.



Midwest Biodiversity Institute

Fish Data Sheet

Page 1 of 1

Field Crew: Crew Leader E. Pulley Boat Driver Netters P. Zervas

Time of Day: ~~1345~~ 1028-1206

Project Code:

Site Code: Site 18

River/ Stream: Maple River Cass County ND

Location:

Date: 08/14/12

Distance:

Temp: 23.12 °C

Seconds Fished: 1403

River Code:

Sampler Type: Wintoon

Conductivity: 1.37 mS/cm

Lat/Long (Beg): 46.924757/-96.931209 Turb = 62.4 NTU

RM:

Secchi Depth: 10.7"

Diss. Oxy.: 7.17 mg/L

~~Lat/Long (Mid):~~

Voltage:

Volt. Range:

D.O. %sat.: —

Lat/Long (End): 46.924617/-96.927286

% Range:

Amperage:

pH: 8.43

~~Lat/Long (X-Loc):~~

Anomalies: A- anchor worm; B- black spot; C- leeches; D- deformities; E- eroded fins; F- fungus; L- lesions; M- multiple DELT anomalies; N- blind P- parasites; Y- popeye; S- emaciated; W- swirled scales; T- tumors; Z- other. [Heavy (H) or Light (L) code may be combined with above codes.]

Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight	Anomalies	Lunke
Black Bullhead V ☐	1 10x ☐	1	142mm <25g		☐
Spotfin Shiner V ☐	10x ☐		56mm 41mm 67mm 35mm 52mm 57mm / <25g total weight		☐
Channel Cat V ☐	10x ☐		44mm 44mm <25g <25g		☐
Orangespotted Sunfish V ☐	10x ☐		47mm / <25g		☐
# ~~Green Sunfish~~ Bluegill V ☐	10x ☐		27mm / <25g		☐
V ☐	10x ☐				☐
V ☐	10x ☐				☐
V ☐	10x ☐				☐

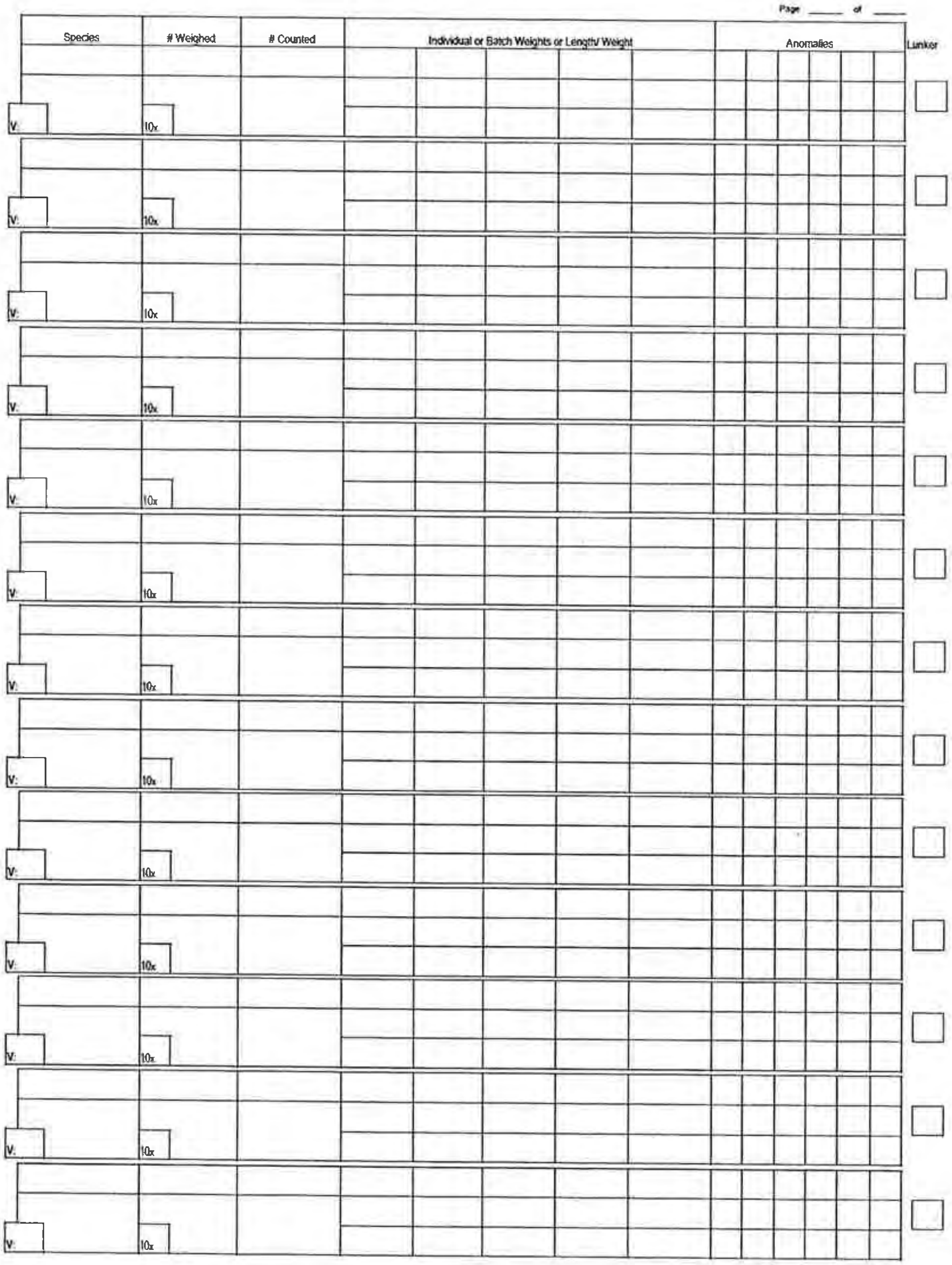
Mass Weighing Convention:

Total Weight → 536 (12) ← Number Weighed

Vouchers Collected: ☐

Equipment: 14 ft flat bottom jon boat; 15 hp Mercury motor
Smith Root 1.5 KVA electroshocking unit
Honda EU2000 generator

Figure 4. continued



Page ______ of ______

Species	# Weighed	# Counted	Individual or Batch Weights or Length/ Weight	Anomalies	Lunker
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐
V:	10x				☐

North Dakota Department of Health
Division of Water Quality
Biological Monitoring Field Collection Data Form

Station ID: S.te 21 Field Number: 11RR021
Waterbody Name: Rush River
Station Description: Upstream Location
Downstream End ~~Latitude~~: N5204396.911m E651309.593m ~~Longitude~~: UPSTREAM: N5204069.950m E651112.660m
County: CASS Township: ________ Range: ________ Section: ________
River Basin: ________ Ecoregion: ________
Weather (air temp, wind, etc.): Mostly Sunny Clear Temp 50's Wind 15-20 Flow (cfs): ~~0.04~~ 2.47 cfs
Water Temp: 16.0°C ~~[illegible]~~ pH: 7.50 Specific Cond.: 1.29mS/cm Dissolved Oxygen: 4.67 mg/L
Reach Length (m): 407.5 Average Reach Width (m): ________ Average Reach Depth (m): ________
Stream Habitat Type (%): Riffle: ____ Pool: ____ Snag: ____ Aquatic Vegetation: ____ Undercut Bank: ____
Overhanging Vegetation: ____ Other: ________
Bottom SubstrateType(%): Boulder: ____ Cobble: ____ Gravel: ____ Sand: ____ Silt: 5 Clay: 95
Collection Method: Tote Barge Electroshock Time Start: 1120/1321 Time Stop: 1158/1352 Total Time: 69 min
Habitat Assesment: [✓ Yes] or No Macroinvertebrate Sample: [✓ Yes] or No Water Chemistry: [✓ Yes] or No
Sampler(s): Kevin Pulley, Nathan Badgett Gary Pruitts
Comments: Electroshock for 3,411 seconds.

Decimal Degree Coordinates

D.S. End	46.975804 LAT -97.010633 LONG
U.S. End	46.972908 LAT -97.013330 LONG

Figure 7.16.1. Biological Monitoring Field Collection Data Form.

North Dakota Department of Health
Division of Water Quality
Fish Collection Field Form

Station ID: Site 21 Field Number: 11RR021

Waterbody Name: Rush River

Station Description: Upstream Location

Downstream Location ~~Latitude~~: N5204396.911m, E651309.593m ~~Longitude~~: UPSTREAM END: N5204069.950m, E651112.660m

County: CASS Township: ________ Range: ________ Section: ________

River Basin: ________ Ecoregion: ________

Sampler(s): KP, GP, NB

Comments:

Species	Number of individuals	Length Range (mm)		Bulk Weight (g)	No. Anomalies	Voucher	
		Minimum	Maximum			Y	N
Channel Catfish	21	50	600	8820	0		X
White Sucker	15	80	350	3075	0		X
Common Carp	61	70	240	3725	0		X
Black Bullhead	20	105	160	850	0		X
Creek Chub	84	55	160	670	0		X
BLACKSIDE ~~River~~ Darter	97	45	75	195	0		X
Rock Bass	1	175	175	400	0		X
TROUT PERCH	3	65	95	20	0		X
Tadpole MADTOM	13	35	85	30	0		X
LONGNOSE DACE	1	60	60	<5	0		X
COMMON SHINER	12	95	150	120	0		X
STONECAT MADTOM	1	50	50	<5	0		X
SPOTFIN SHINER	56	40	105	170	0		X
FATHEAD MINNOW	68	40	60	70	0		X
SAND SHINER	58	40	65	90	0		X

Figure 7.16.2 Fish Collection Field Form.

511 TOTAL

North Dakota Department of Health
Division of Water Quality
Biological Monitoring Field Collection Data Form

Station ID: SITE 22 Field Number: [illegible] 11RR022

Waterbody Name: RUSH RIVER

Station Description: DOWNSTREAM LOCATION (CONTROL STRUCTURE)

UPStream ~~Do~~ End ~~Latitude~~: N5207092.626m, E657409.174m ~~Longitude~~: Down STREAM End N5206853.616m, E657794.353m

County: CASS Township: ____ Range: ____ Section: ____

River Basin: ____ Ecoregion: ____

Weather (air temp, wind, etc.): 21.1°C Clear, Strong Wind (30 mph) Flow (cfs): 2.12

Water Temp: 20.7°C pH: 7.67 Specific Cond.: 1.35mS/cm Dissolved Oxygen: 5.46 mg/L

Reach Length (m): 448.7 Average Reach Width (m): ____ Average Reach Depth (m): ____

Stream Habitat Type (%): Riffle: ____ Pool: ____ Snag: ____ Aquatic Vegetation: ____ Undercut Bank: ____
Overhanging Vegetation: ____ Other: ____

Bottom SubstrateType(%): Boulder: ____ Cobble: ____ Gravel: ____ Sand: ____ Silt: ____ Clay: ____

Collection Method: Tote Barge Shock Time Start: 0945 Time Stop: 1110 Total Time: 85 min

Habitat Assesment: [✓ Yes] or No Macroinvertebrate Sample: ~~Yes~~ or No Water Chemistry: ~~Yes~~ or No

Sampler(s): KEVIN Pulley, GARY Pritts, Nathan Badgett

Comments: Electroshock for 2,987 seconds.

Decimal Degree Coordinates

D.S. End	46.996386	Lat
	-96.924571	Long
U.S End	46.998627	LAT
	-96.929548	Long

Figure 7.16.1. Biological Monitoring Field Collection Data Form.

North Dakota Department of Health
Division of Water Quality
Fish Collection Field Form

Station ID: SITE 22 Field Number: 11 RR022
Waterbody Name: RUSH RIVER
Station Description: DOWNSTREAM Location (CONTROL STRUCTURE)
Downstream END ~~Latitude:~~ N5206853.616m, E657794.353m ~~Longitude:~~ UPSTREAM END N5207092.626m, 657409.174m
County: CASS Township: ________ Range: ________ Section: ________
River Basin: ________ Ecoregion: ________
Sampler(s): KP, GP, NB
Comments:

Species	Number of individuals	Length Range (mm)		Bulk Weight (g)	No. Anomalies	Voucher	
		Minimum	Maximum			Y	N
Northern Pike	4	210	260	510	0		X
Brown Bullhead	1	315	315	400	0		X
Black Bullhead	17	50	230	1240	0		X
~~Carp~~ Common Carp	74	60	230	5320	5		X
Quillback	16	135	240	2350	0		X
white Sucker	9	85	335	3000	0		X
Drum	61	110	235	1600	0		X
Walleye	10	70	180	1600	1		X
White Bass	8	75	135	150	0		X
Bluegill	11	85	100	260	0		X
Black Crappie	1	95	95	40	0		X
Tadpole Madtom	7	35	70	25	0		X
TROUT PERCH	19	60	90	100	0		X
Channel Catfish	2	60	70	<25	0		X
~~River Darter~~ BLACKSIDE DARTER	8	50	65	<25	0		X
Yellow PERCH	6	65	80	25	0		X
~~[illegible]~~ Orangespotted SUNFISH	2	60	75	<25	0		X
Sand Shiner	16	40	75	<25	0		X

Figure 7.16.2 Fish Collection Field Form.

North Dakota Department of Health
Division of Water Quality
Biological Monitoring Field Collection Data Form

Station ID: SITE 23 Field Number: 11 WC023
Waterbody Name: Wolverton Creek
Station Description: FOOTPRINT SITE
DOWNSTREAM END ~~Latitude~~: N5174504.459m, E670615.427m ~~Longitude~~: UPSTREAM END: N5174234.589m, E670659.432m
County: CLAY Township: ________ Range: ________ Section: ________
River Basin: ________ Ecoregion: ________
Weather (air temp, wind, etc.): 41°F, Sunny, Clear, Med wind Flow (cfs): 0.35
Water Temp: 12.8°C pH: 7.86 Specific Cond.: 1.06 mS/cm Dissolved Oxygen: 6.32 mg/L
Reach Length (m): ________ Average Reach Width (m): ________ Average Reach Depth (m): ________
Stream Habitat Type (%): Riffle: ____ Pool: ____ Snag: ____ Aquatic Vegetation: ____ Undercut Bank: ____
Overhanging Vegetation: ____ Other: ________
Bottom SubstrateType(%): Boulder: ____ Cobble: ____ Gravel: ____ Sand: ____ Silt: ____ Clay: ____
Collection Method: TOTE BARGE SHOCK Time Start: 1121/1232 Time Stop: 1151/1304 Total Time: 62
Habitat Assesment: [✓ Yes] or No Macroinvertebrate Sample: [✓ Yes] or No Water Chemistry: [✓ Yes] or No
Sampler(s): Kevin Puller, GARY PRITTS, NATHAN BADGETT
Comments:
Electroshock for ~~1,474~~ 3,238 seconds KP

DECIMAL DEGREE COORDINATES

D.S. End: 46.702324 LAT
-96.768147 LONG

U.S. End: 46.699886 LAT
-96.767672 LONG

Figure 7.16.1. Biological Monitoring Field Collection Data Form.

North Dakota Department of Health
Division of Water Quality
Fish Collection Field Form

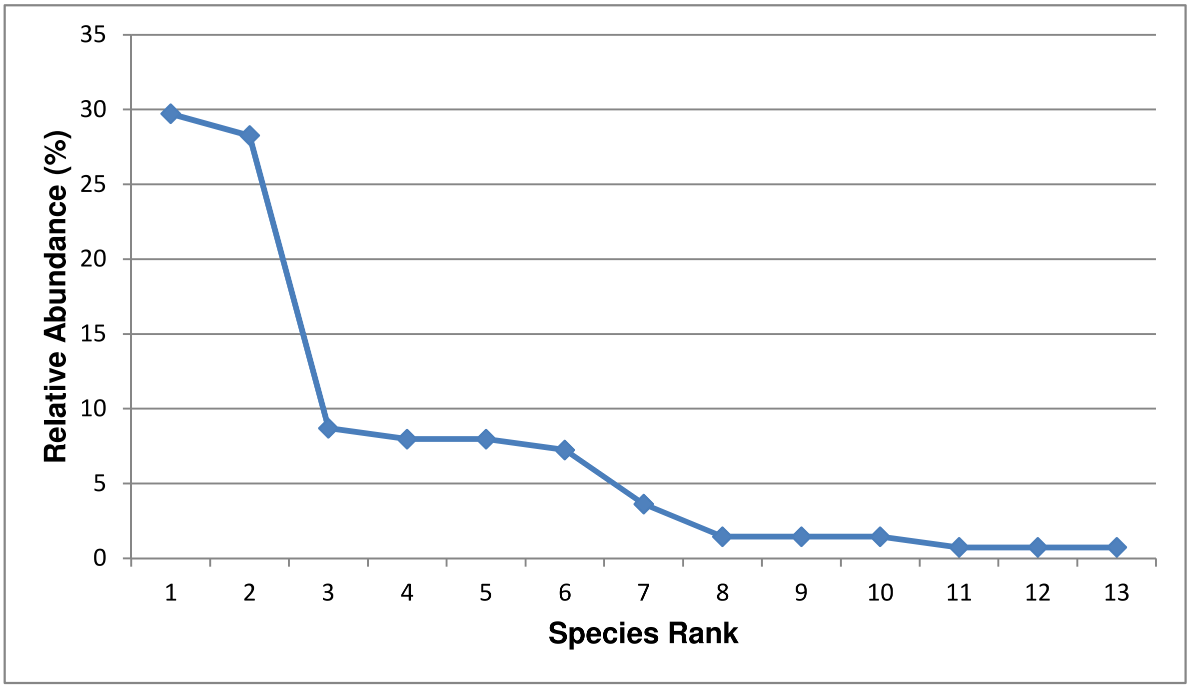
Station ID: Site 23 Field Number: 11WC023
Waterbody Name: Wolverton Creek
Station Description: FOOTPRINT SITE
Downstream End ~~Latitude~~: N5174504.459m, E670615.427m ~~Longitude~~: UPSTREAM End; N5174234.589m, E670659.432m
County: CLAY Township: ______ Range: ______ Section: ______
River Basin: ______ Ecoregion: ______
Sampler(s): KP, GP, NB
Comments:

Species	Number of individuals	Length Range (mm)		Bulk Weight (g)	No. Anomalies	Voucher	
		Minimum	Maximum			Y	N
Black Bullhead	53	45	150	675	–		X
GREEN SUNFISH	6	40	100	75	–		X
FRESHWATER DRUM	1	130	130	<25	–		X
WHITE BASS	3	90	110	<25	–		X
NORTHERN PIKE	3	180	470	700	–		X
WALLEYE	5	125	160	100	–		X
WHITE SUCKER	2	90	345	525	–		X
COMMON CARP	10	100	270	550	2		X
ROCK BASS	2	95	115	25	–		X
SPOTFIN SHINER	16	65	85	<25	–		X
BLACKSIDE DARTER	8	50	65	10	–		X
ORANGESPOTTED SUNFISH	21	60	85	150	–		X

Figure 7.16.2 Fish Collection Field Form.

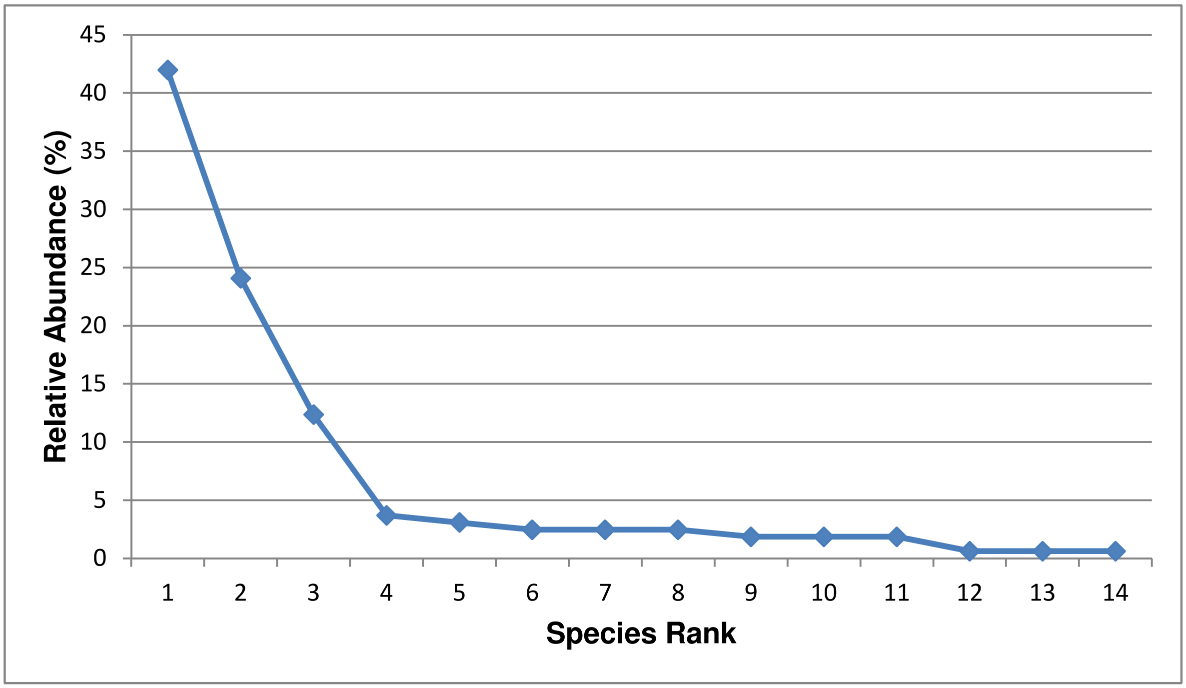
Study Reach 1 - Red River of the North

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Sand Shiner	41	29.71	27.91	5289.00
Spotfin Shiner	39	28.26	26.55	
Channel Catfish	12	8.70	8.17	
Fathead Minnow	11	7.97	7.49	
Orangespotted Sunfish	11	7.97	7.49	
Common Carp	10	7.25	6.81	
Bluegill	5	3.62	3.40	
Black Crappie	2	1.45	1.36	
Freshwater Drum	2	1.45	1.36	
Smallmouth Buffalo	2	1.45	1.36	
Goldeye	1	0.72	0.68	
Shorthead Redhorse	1	0.72	0.68	
White Sucker	1	0.72	0.68	



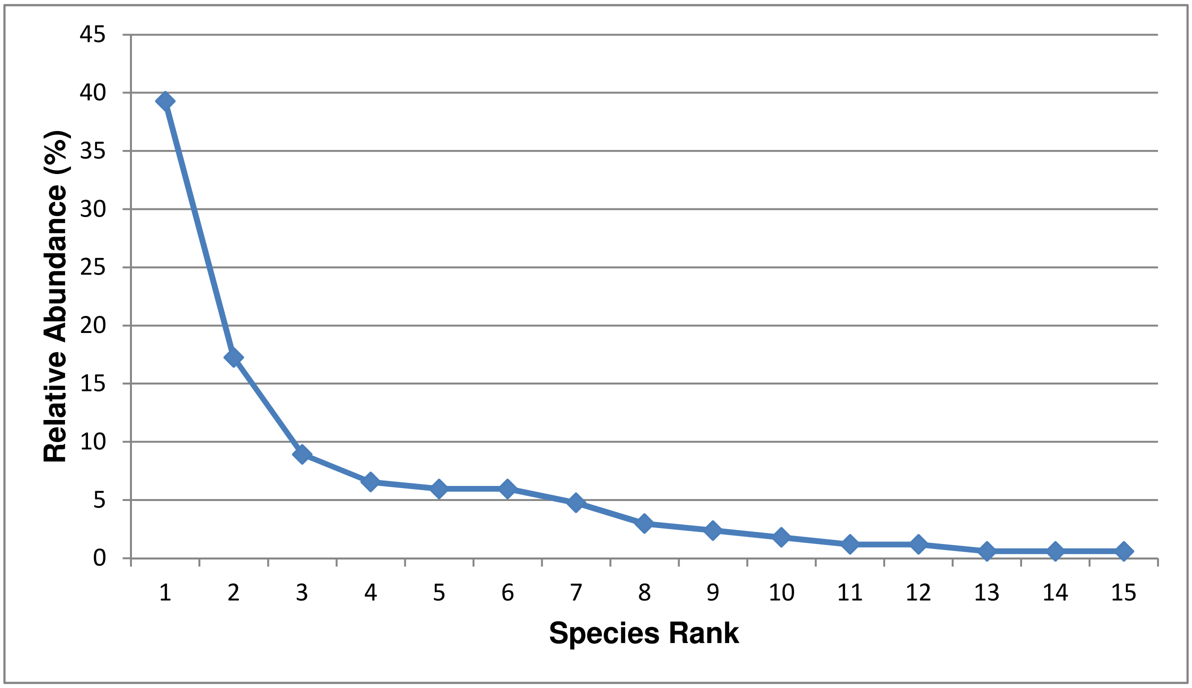
Study Reach 2 - Red River of the North

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Channel Catfish	68	41.98	45.71	5356.00
Spotfin Shiner	39	24.07	26.21	
Sand Shiner	20	12.35	13.44	
Common Carp	6	3.70	4.03	
Emerald Shiner	5	3.09	3.36	
Bluegill	4	2.47	2.69	
Goldeye	4	2.47	2.69	
Shorthead Redhorse	4	2.47	2.69	
Freshwater Drum	3	1.85	2.02	
Orangespotted Sunfish	3	1.85	2.02	
Quillback	3	1.85	2.02	
Golden Redhorse	1	0.62	0.67	
Northern Pike	1	0.62	0.67	
Walleye	1	0.62	0.67	



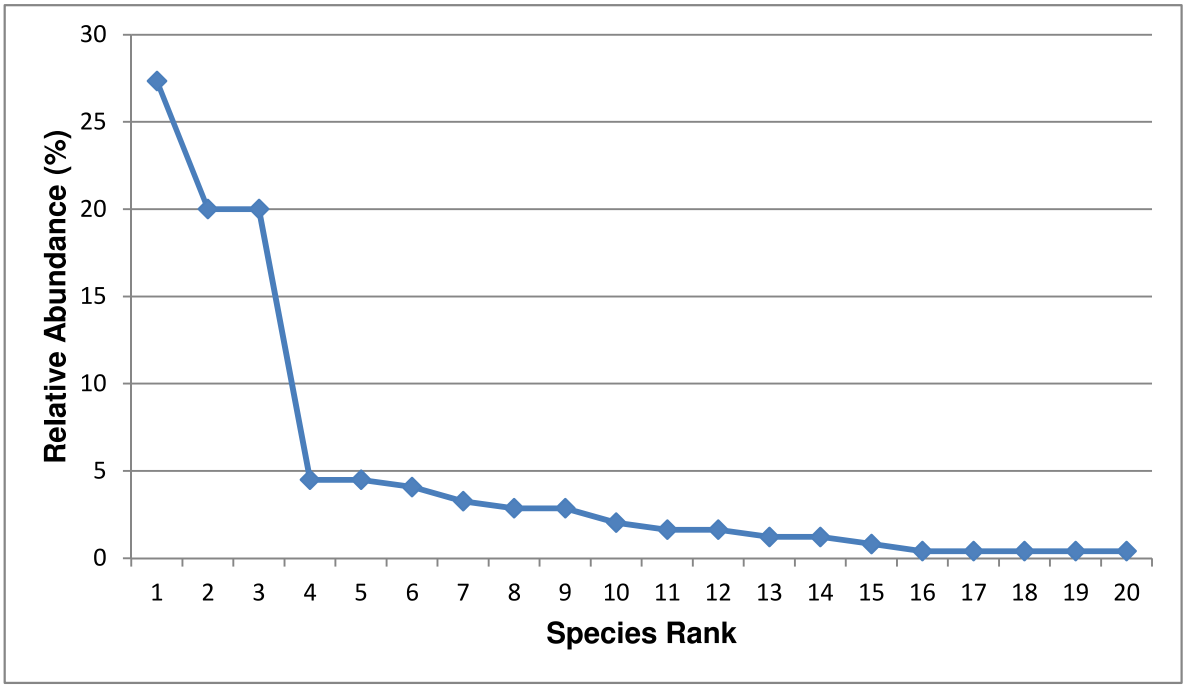
Study Reach 3 - Red River of the North

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Channel Catfish	66	39.29	44.11	5386.00
Spotfin Shiner	29	17.26	19.38	
Spottail Shiner	15	8.93	10.03	
Common Carp	11	6.55	7.35	
Emerald Shiner	10	5.95	6.68	
Sand Shiner	10	5.95	6.68	
Orangespotted Sunfish	8	4.76	5.35	
Goldeye	5	2.98	3.34	
Golden Redhorse	4	2.38	2.67	
Shorthead Redhorse	3	1.79	2.01	
Bluegill	2	1.19	1.34	
Freshwater Drum	2	1.19	1.34	
Quillback	1	0.60	0.67	
Rock Bass	1	0.60	0.67	
Sauger	1	0.60	0.67	



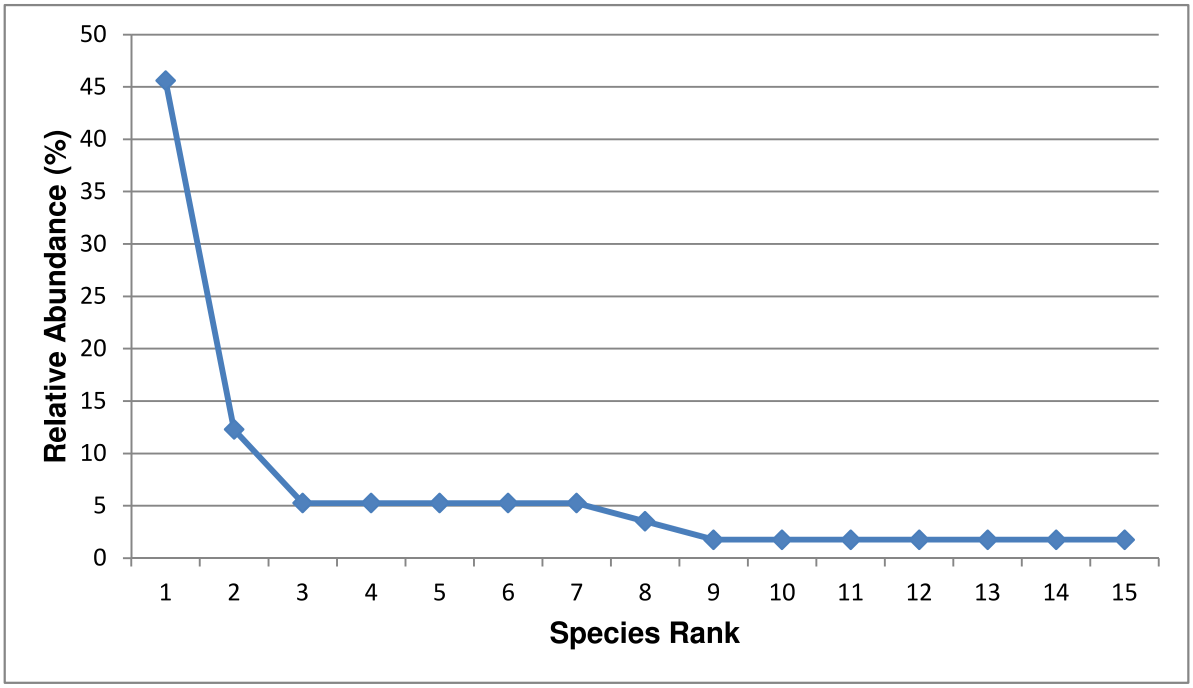
Study Reach 4 - Red River of the North

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Spotfin Shiner	67	27.35	39.61	6089.00
Channel Catfish	49	20.00	28.97	
Sand Shiner	49	20.00	28.97	
Common Carp	11	4.49	6.50	
Quillback	11	4.49	6.50	
Shorthead Redhorse	10	4.08	5.91	
Golden Redhorse	8	3.27	4.73	
Fathead Minnow	7	2.86	4.14	
Spottail Shiner	7	2.86	4.14	
Goldeye	5	2.04	2.96	
Emerald Shiner	4	1.63	2.36	
Trout Perch	4	1.63	2.36	
Northern Pike	3	1.22	1.77	
Orangespotted Sunfish	3	1.22	1.77	
Freshwater Drum	2	0.82	1.18	
Rock Bass	1	0.41	0.59	
Sauger	1	0.41	0.59	
Smallmouth Bass	1	0.41	0.59	
White Bass	1	0.41	0.59	
White Sucker	1	0.41	0.59	



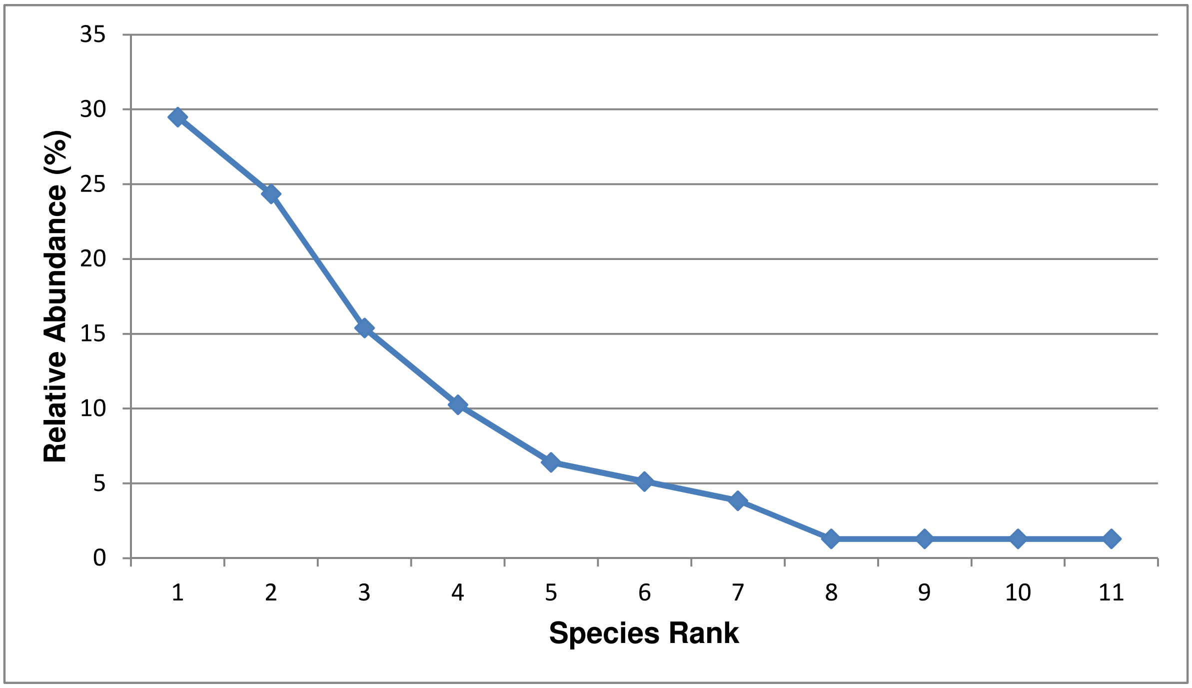
Study Reach 5 - Red River of the North

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Channel Catfish	26	45.61	24.11	3882.00
Sand Shiner	7	12.28	6.49	
Common Carp	3	5.26	2.78	
Goldeye	3	5.26	2.78	
Orangespotted Sunfish	3	5.26	2.78	
Shorthead Redhorse	3	5.26	2.78	
Stonecat	3	5.26	2.78	
Quillback	2	3.51	1.85	
Fathead Minnow	1	1.75	0.93	
Freshwater Drum	1	1.75	0.93	
Golden Redhorse	1	1.75	0.93	
Rock Bass	1	1.75	0.93	
Sauger	1	1.75	0.93	
Spotfin Shiner	1	1.75	0.93	
Walleye	1	1.75	0.93	



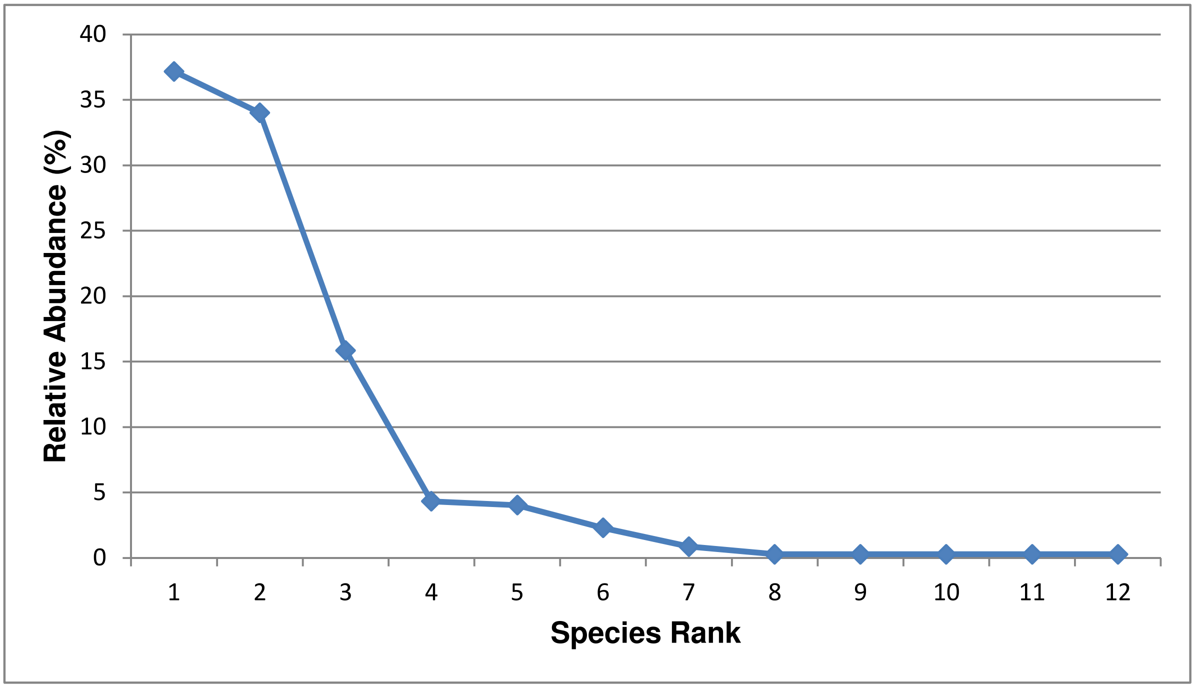
Study Reach 6 - Red River of the North

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Channel Catfish	23	29.49	13.56	6105.00
Spotfin Shiner	19	24.36	11.20	
Sand Shiner	12	15.38	7.08	
Goldeye	8	10.26	4.72	
Common Carp	5	6.41	2.95	
Shorthead Redhorse	4	5.13	2.36	
Quillback	3	3.85	1.77	
Fathead Minnow	1	1.28	0.59	
Freshwater Drum	1	1.28	0.59	
Sauger	1	1.28	0.59	
Trout Perch	1	1.28	0.59	



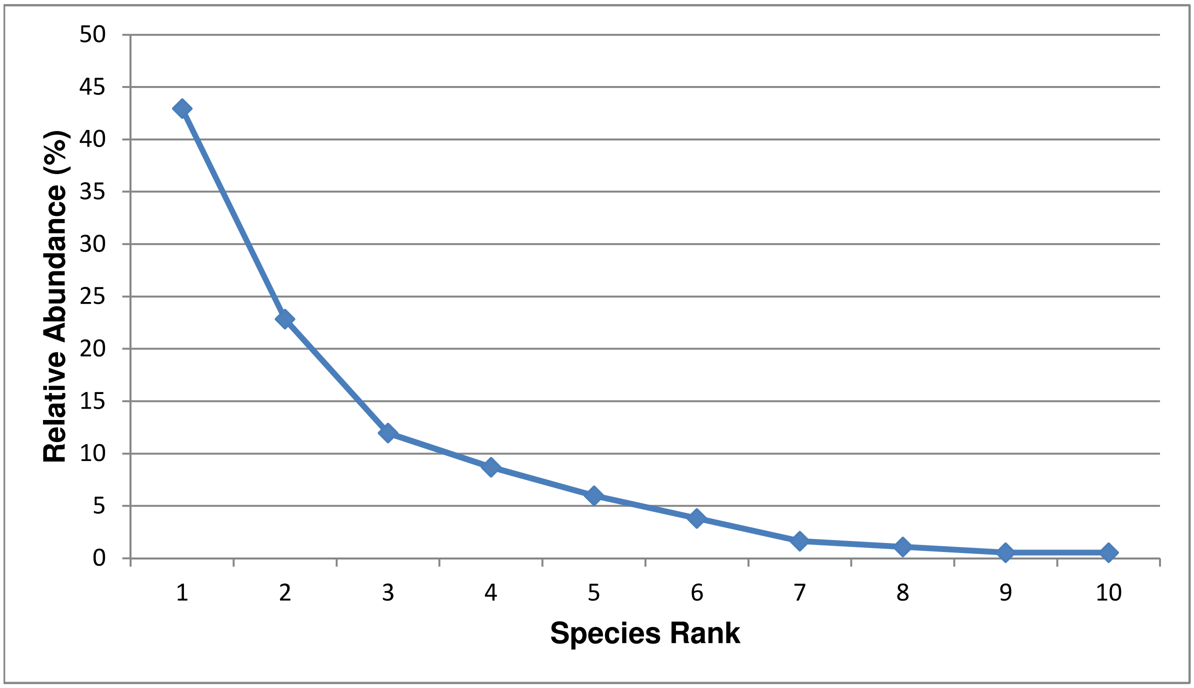
Study Reach 7 - Wild Rice River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Orangespotted Sunfish	129	37.18	133.14	3488.00
Spotfin Shiner	118	34.01	121.79	
Sand Shiner	55	15.85	56.77	
Channel Catfish	15	4.32	15.48	
Common Carp	14	4.03	14.45	
Fathead Minnow	8	2.31	8.26	
Walleye	3	0.86	3.10	
Goldeye	1	0.29	1.03	
Sauger	1	0.29	1.03	
Shorthead Redhorse	1	0.29	1.03	
Stonecat	1	0.29	1.03	
Trout Perch	1	0.29	1.03	



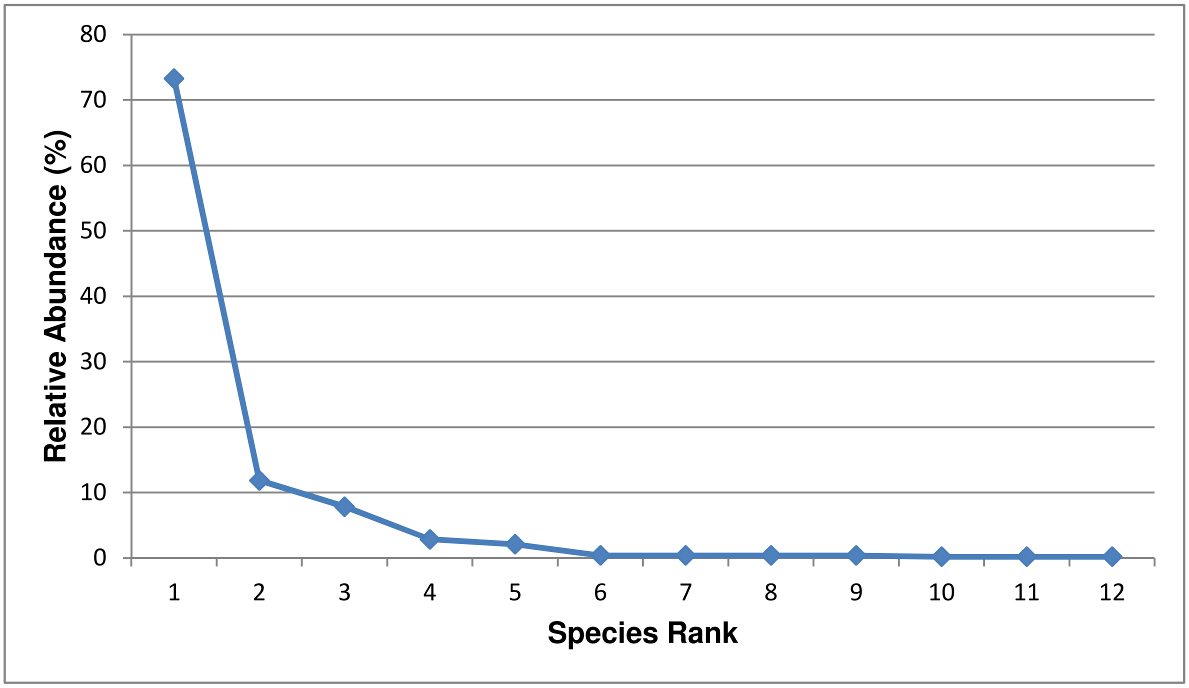
Study Reach 8 - Wild Rice River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Orangespotted Sunfish	79	42.93	74.49	3818.00
Fathead Minnow	42	22.83	39.60	
Common Carp	22	11.96	20.74	
Sand Shiner	16	8.70	15.09	
Spotfin Shiner	11	5.98	10.37	
Channel Catfish	7	3.80	6.60	
Bluegill	3	1.63	2.83	
Quillback	2	1.09	1.89	
Golden Redhorse	1	0.54	0.94	
Shorthead Redhorse	1	0.54	0.94	



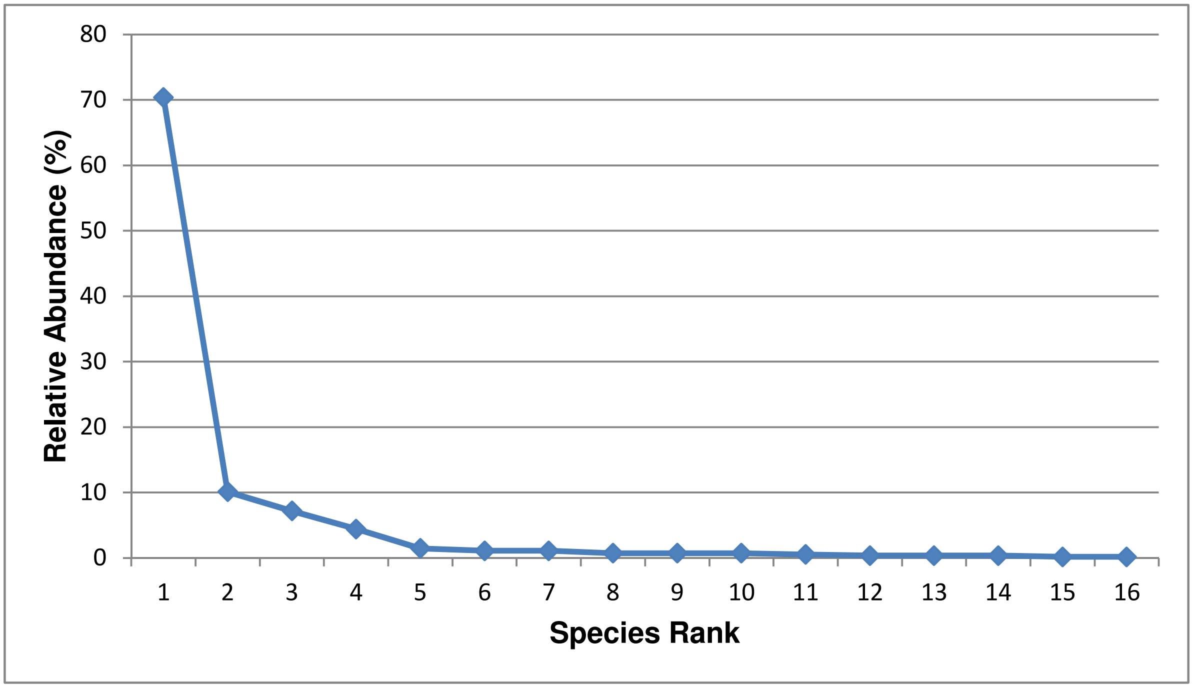
Study Reach 9 - Wild Rice River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Orangespotted Sunfish	383	73.23	255.76	5391.00
Fathead Minnow	62	11.85	41.40	
Common Carp	41	7.84	27.38	
Channel Catfish	15	2.87	10.02	
Sand Shiner	11	2.10	7.35	
Shorthead Redhorse	2	0.38	1.34	
Spotfin Shiner	2	0.38	1.34	
Walleye	2	0.38	1.34	
White Sucker	2	0.38	1.34	
Black Crappie	1	0.19	0.67	
Stonecat	1	0.19	0.67	
Trout Perch	1	0.19	0.67	



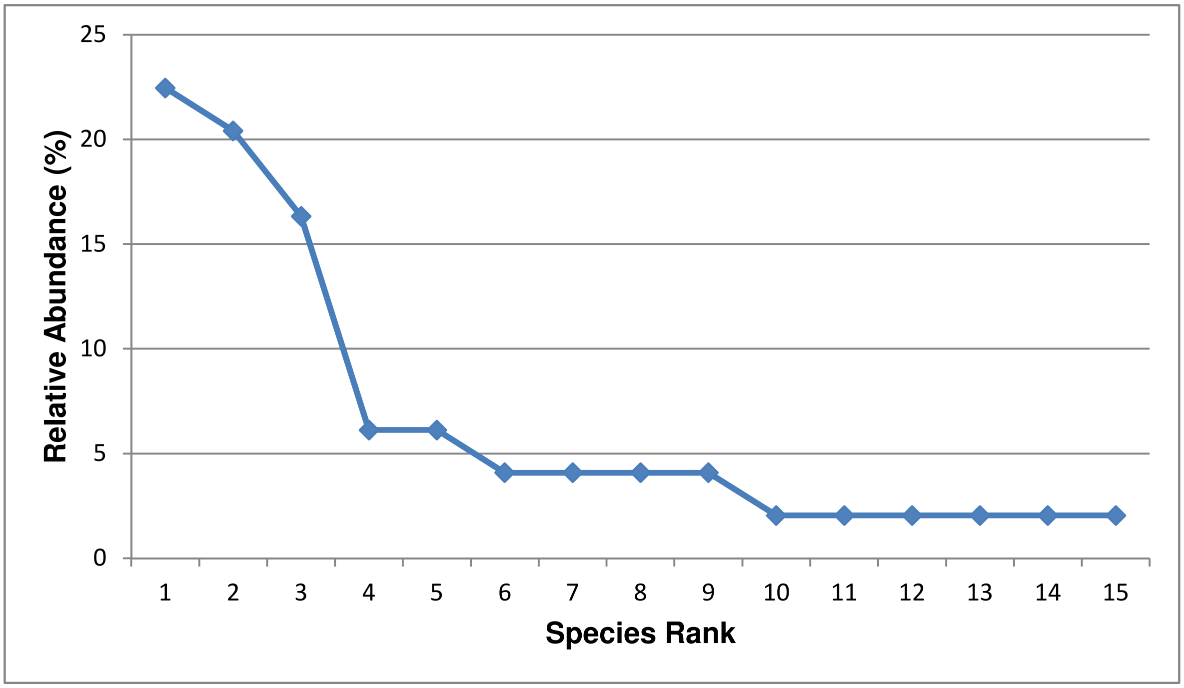
Study Reach 10 - Wild Rice River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Orangespotted Sunfish	382	70.35	311.41	4416.00
Spotfin Shiner	55	10.13	44.84	
Channel Catfish	39	7.18	31.79	
Sand Shiner	24	4.42	19.57	
Goldeye	8	1.47	6.52	
Freshwater Drum	6	1.10	4.89	
Shorthead Redhorse	6	1.10	4.89	
Common Carp	4	0.74	3.26	
Fathead Minnow	4	0.74	3.26	
Quillback	4	0.74	3.26	
Golden Redhorse	3	0.55	2.45	
Black Bullhead	2	0.37	1.63	
Sauger	2	0.37	1.63	
Walleye	2	0.37	1.63	
Rock Bass	1	0.18	0.82	
White Bass	1	0.18	0.82	



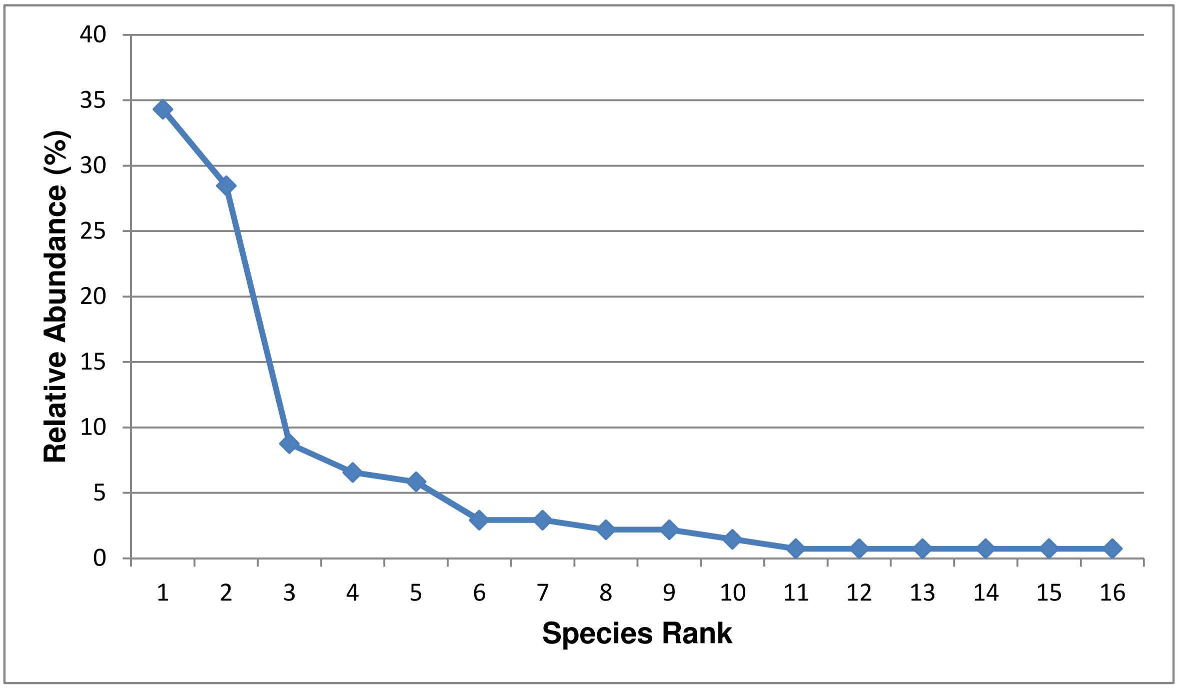
Study Reach 11 - Sheyenne River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Channel Catfish	11	22.45	8.26	4797.00
Sand Shiner	10	20.41	7.50	
Spotfin Shiner	8	16.33	6.00	
Orangespotted Sunfish	3	6.12	2.25	
Shorthead Redhorse	3	6.12	2.25	
Fathead Minnow	2	4.08	1.50	
Quillback	2	4.08	1.50	
White Bass	2	4.08	1.50	
White Sucker	2	4.08	1.50	
Golden Redhorse	1	2.04	0.75	
Goldeye	1	2.04	0.75	
Rock Bass	1	2.04	0.75	
Smallmouth Bass	1	2.04	0.75	
Trout Perch	1	2.04	0.75	
Walleye	1	2.04	0.75	



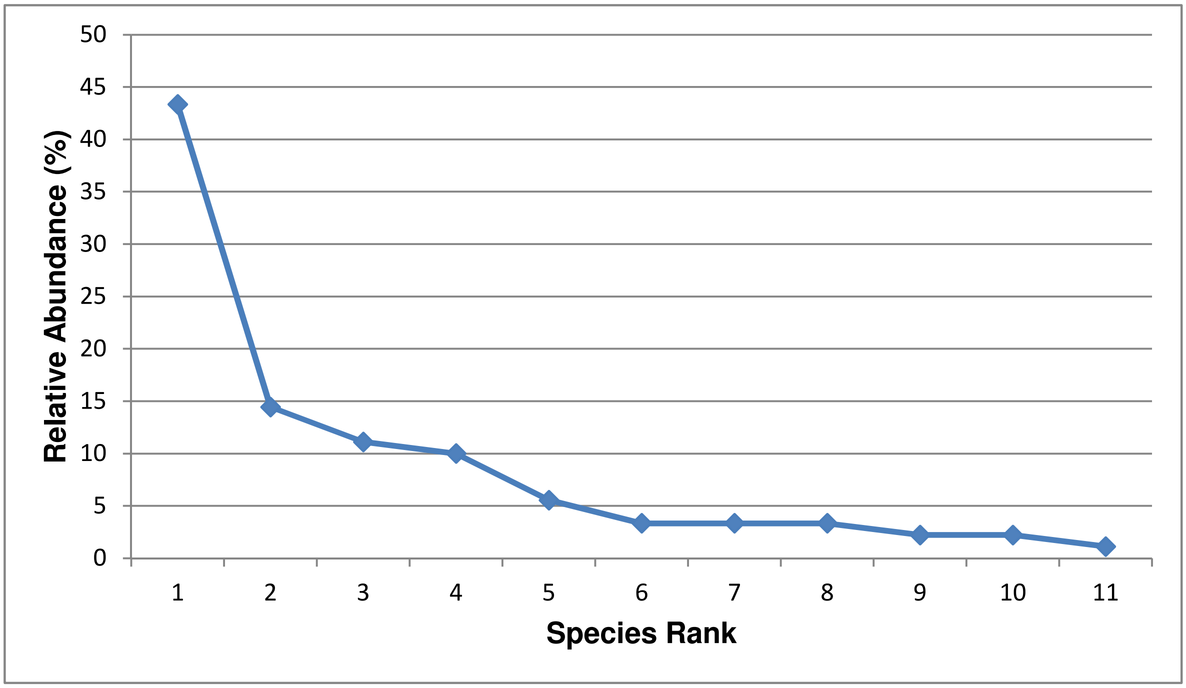
Study Reach 12 - Sheyenne River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Sand Shiner	47	34.31	27.20	6220.00
Spotfin Shiner	39	28.47	22.57	
Channel Catfish	12	8.76	6.95	
White Sucker	9	6.57	5.21	
Fathead Minnow	8	5.84	4.63	
Black Crappie	4	2.92	2.32	
Goldeye	4	2.92	2.32	
Shorthead Redhorse	3	2.19	1.74	
Trout Perch	3	2.19	1.74	
Orangespotted Sunfish	2	1.46	1.16	
Black Bullhead	1	0.73	0.58	
Common Carp	1	0.73	0.58	
Golden Redhorse	1	0.73	0.58	
Smallmouth Bass	1	0.73	0.58	
Walleye	1	0.73	0.58	
White Bass	1	0.73	0.58	



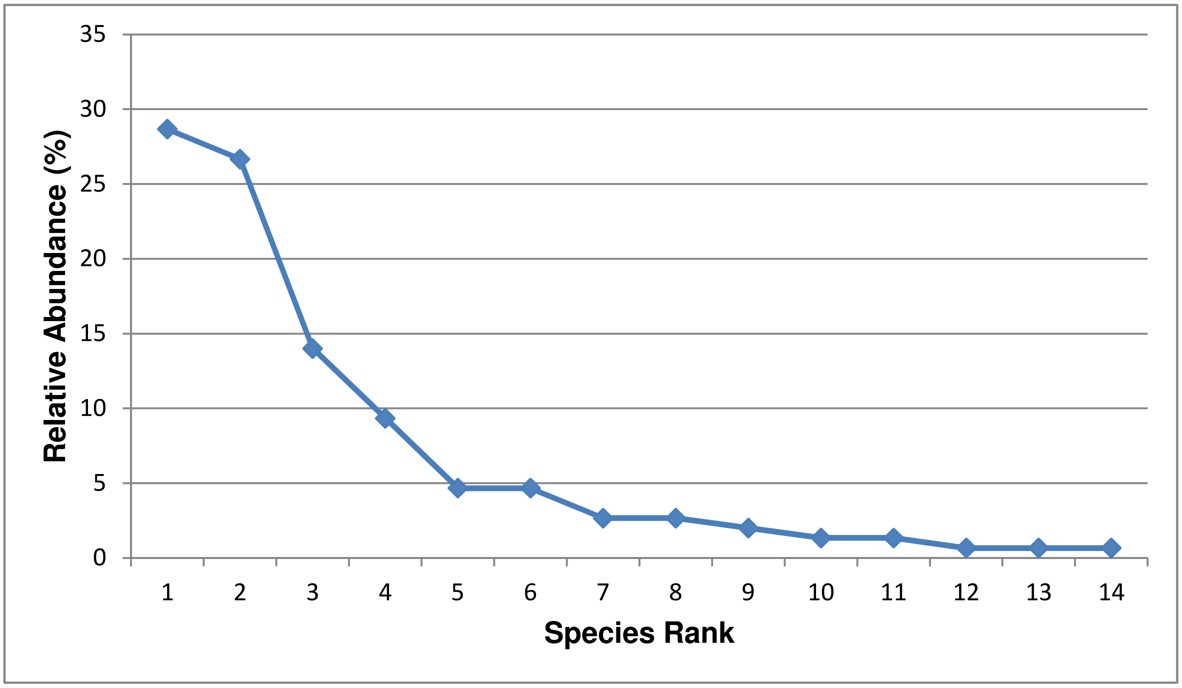
Study Reach 13 - Sheyenne River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Sand Shiner	39	43.33	29.68	4731.00
Channel Catfish	13	14.44	9.89	
Spotfin Shiner	10	11.11	7.61	
Shorthead Redhorse	9	10.00	6.85	
Fathead Minnow	5	5.56	3.80	
Black Crappie	3	3.33	2.28	
Golden Redhorse	3	3.33	2.28	
Goldeye	3	3.33	2.28	
Orangespotted Sunfish	2	2.22	1.52	
Walleye	2	2.22	1.52	
Common Carp	1	1.11	0.76	



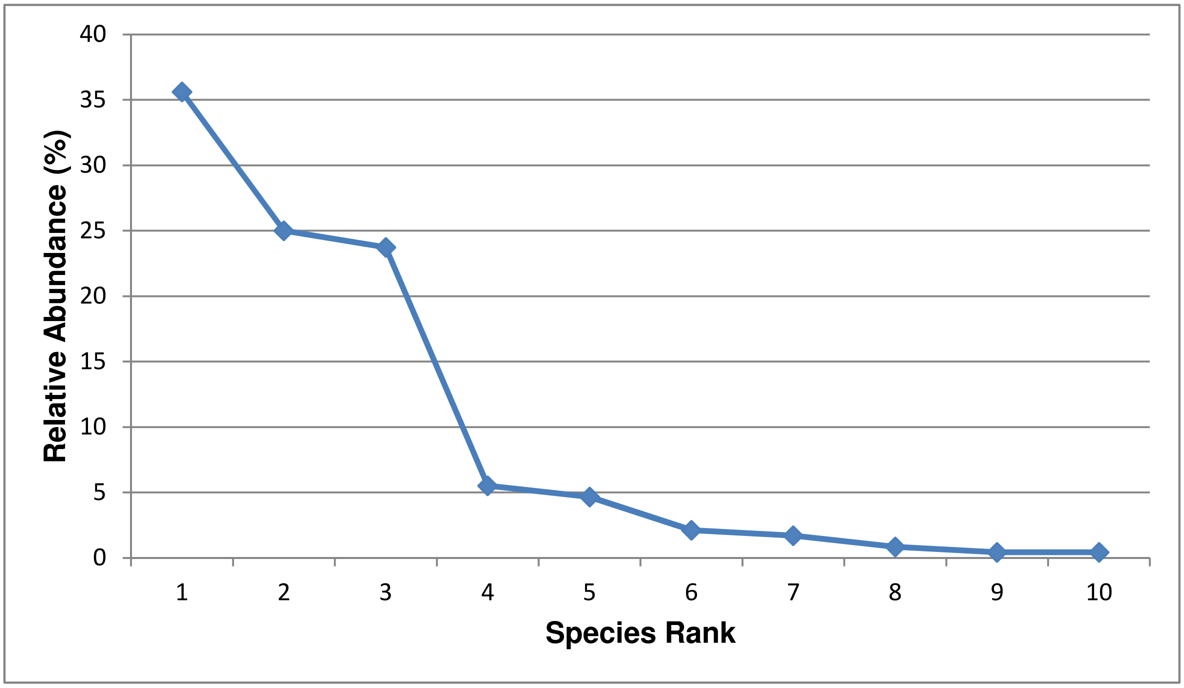
Study Reach 14 - Sheyenne River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Spotfin Shiner	43	28.67	32.02	4834.00
Sand Shiner	40	26.67	29.79	
Goldeye	21	14.00	15.64	
Fathead Minnow	14	9.33	10.43	
Channel Catfish	7	4.67	5.21	
Orangespotted Sunfish	7	4.67	5.21	
Quillback	4	2.67	2.98	
White Sucker	4	2.67	2.98	
Shorthead Redhorse	3	2.00	2.23	
Common Carp	2	1.33	1.49	
Trout Perch	2	1.33	1.49	
Sauger	1	0.67	0.74	
Walleye	1	0.67	0.74	
White Bass	1	0.67	0.74	



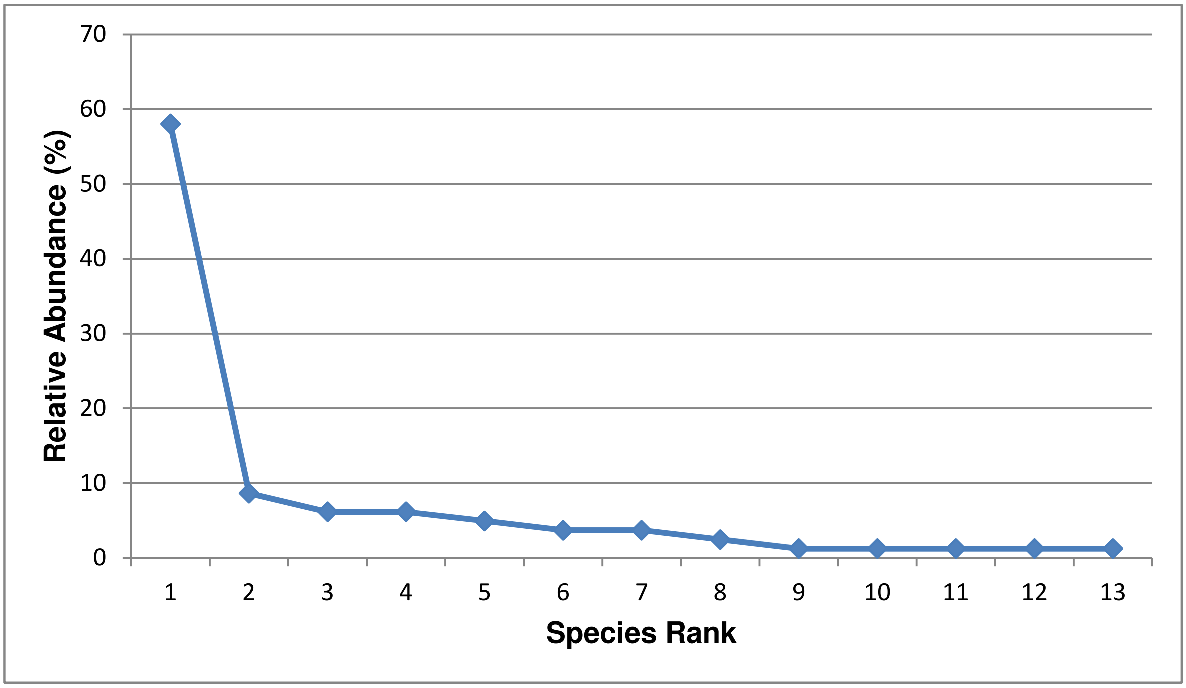
Study Reach 15 - Sheyenne River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Sand Shiner	84	35.59	61.26	4936.00
Spotfin Shiner	59	25.00	43.03	
Fathead Minnow	56	23.73	40.84	
Channel Catfish	13	5.51	9.48	
Orangespotted Sunfish	11	4.66	8.02	
White Sucker	5	2.12	3.65	
Goldeye	4	1.69	2.92	
Trout Perch	2	0.85	1.46	
Quillback	1	0.42	0.73	
Walleye	1	0.42	0.73	



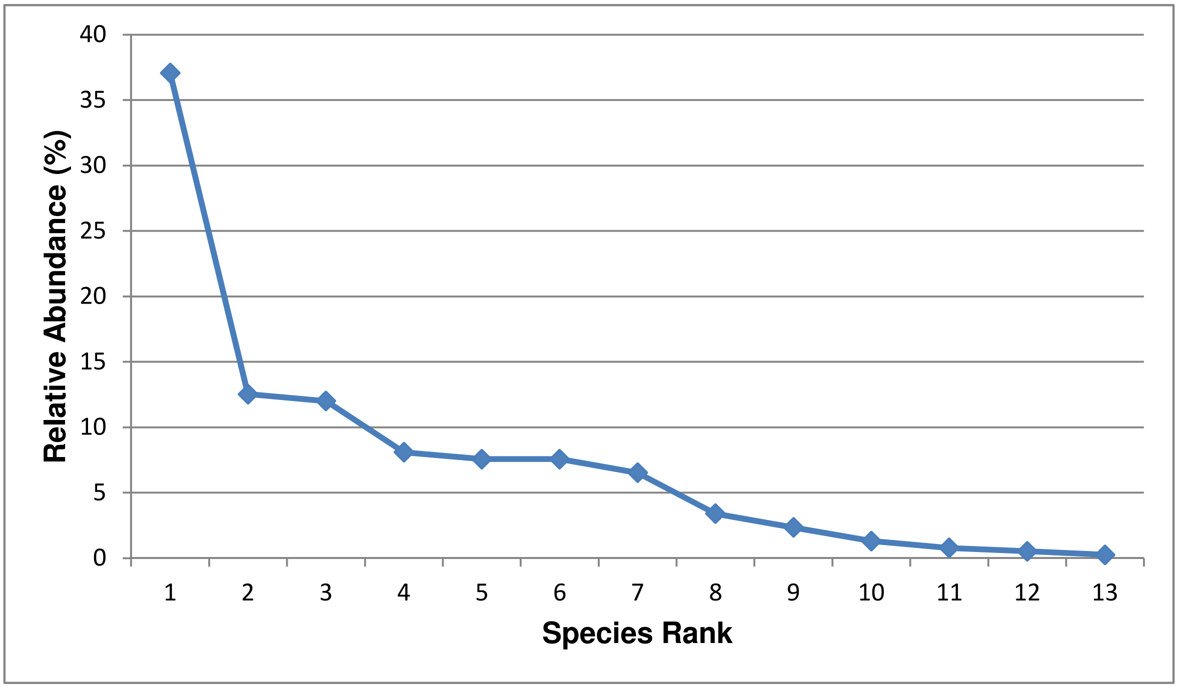
Study Reach 16 - Maple River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Orangespotted Sunfish	47	58.02	52.78	3206.00
Common Carp	7	8.64	7.86	
Spotfin Shiner	5	6.17	5.61	
White Sucker	5	6.17	5.61	
Rock Bass	4	4.94	4.49	
Fathead Minnow	3	3.70	3.37	
Sand Shiner	3	3.70	3.37	
Trout Perch	2	2.47	2.25	
Black Redhorse	1	1.23	1.12	
Bluegill	1	1.23	1.12	
Channel Catfish	1	1.23	1.12	
Quillback	1	1.23	1.12	
Shorthead Redhorse	1	1.23	1.12	



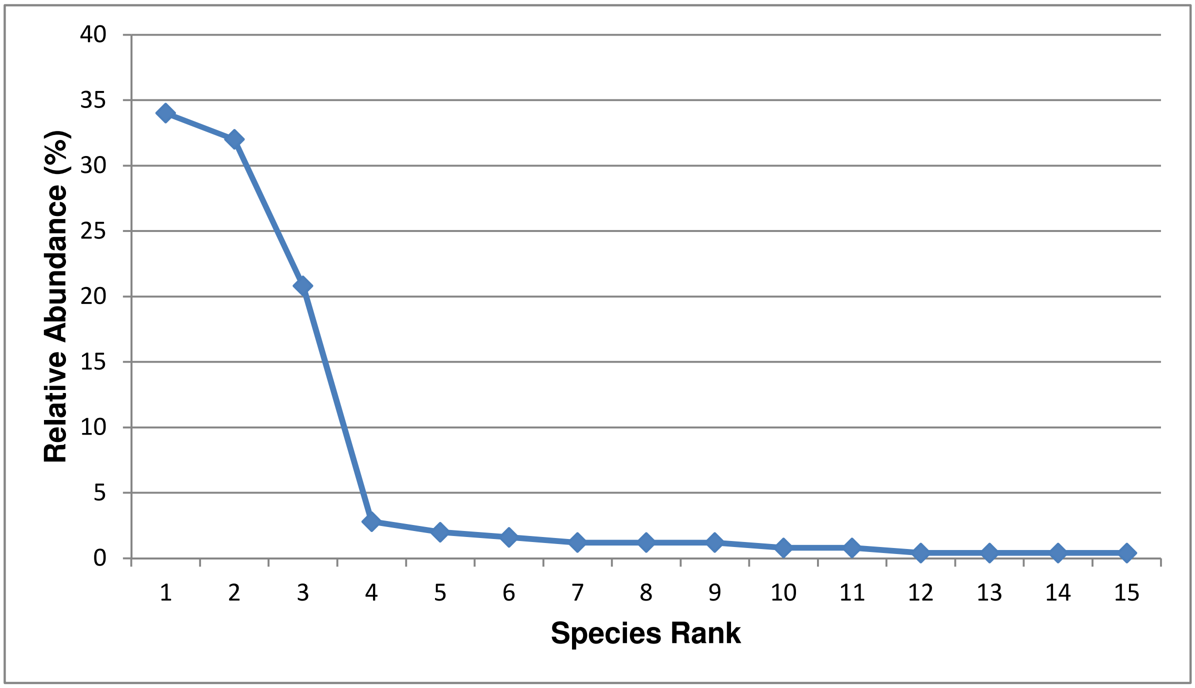
Study Reach 17 - Maple River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Orangespotted Sunfish	142	37.08	90.48	5650.00
Common Carp	48	12.53	30.58	
White Sucker	46	12.01	29.31	
River Carpsucker	31	8.09	19.75	
Spotfin Shiner	29	7.57	18.48	
Trout Perch	29	7.57	18.48	
Sand Shiner	25	6.53	15.93	
Freshwater Drum	13	3.39	8.28	
Channel Catfish	9	2.35	5.73	
Quillback	5	1.31	3.19	
Fathead Minnow	3	0.78	1.91	
Black Bullhead	2	0.52	1.27	
Rock Bass	1	0.26	0.64	



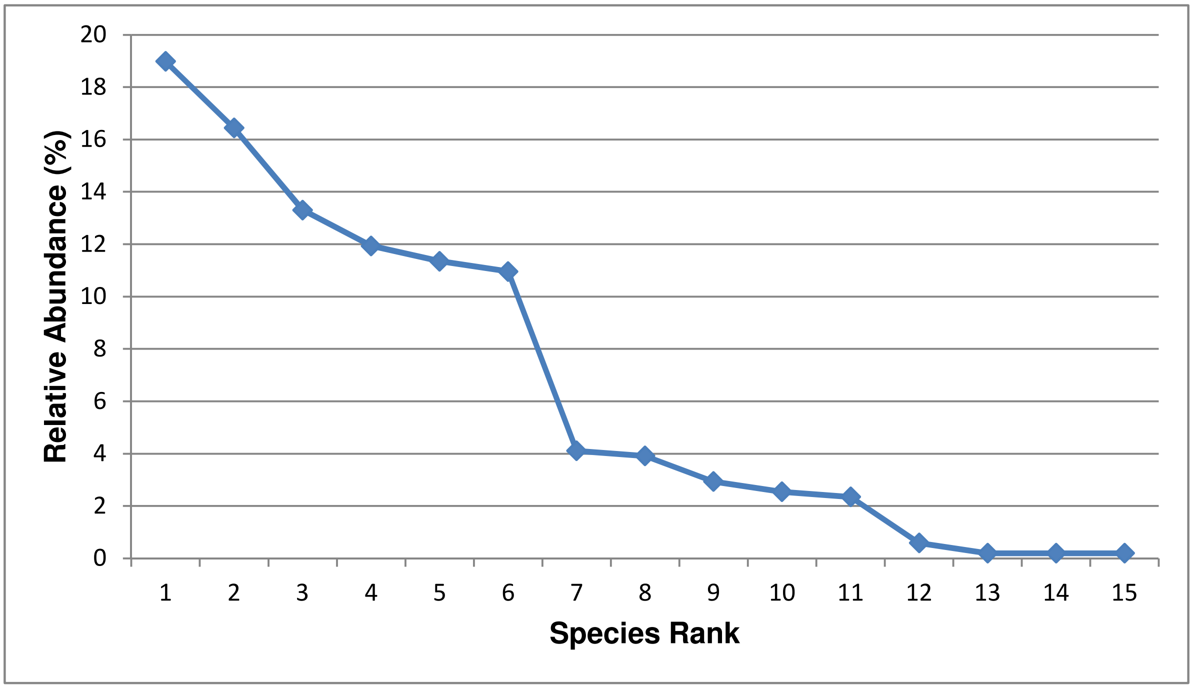
Study Reach 18 - Maple River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Fathead Minnow	85	34.00	130.21	2350.00
Orangespotted Sunfish	80	32.00	122.55	
Common Carp	52	20.80	79.66	
Shorthead Redhorse	7	2.80	10.72	
Rock Bass	5	2.00	7.66	
Channel Catfish	4	1.60	6.13	
Black Bullhead	3	1.20	4.60	
Freshwater Drum	3	1.20	4.60	
River Carpsucker	3	1.20	4.60	
Spotfin Shiner	2	0.80	3.06	
White Sucker	2	0.80	3.06	
Black Redhorse	1	0.40	1.53	
Golden Redhorse	1	0.40	1.53	
Trout Perch	1	0.40	1.53	
Walleye	1	0.40	1.53	



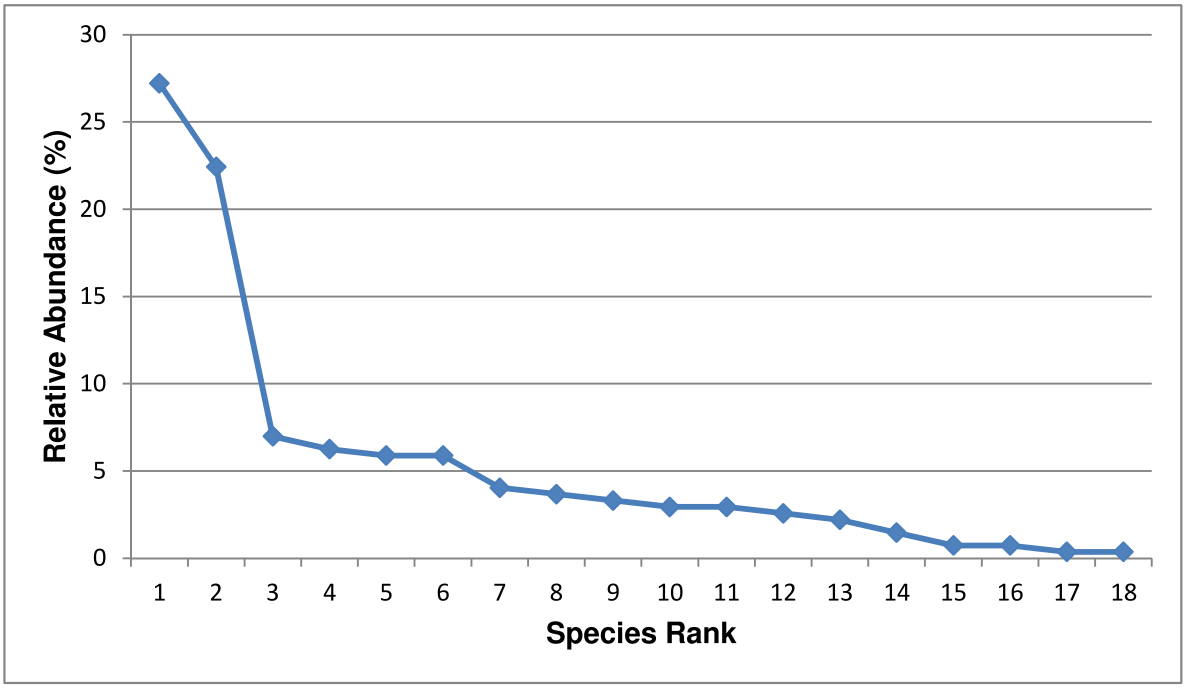
Study Reach 21 - Rush River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Blackside Darter	97	18.98	102.37	3411.00
Creek Chub	84	16.44	88.65	
Fathead Minnow	68	13.31	71.77	
Common Carp	61	11.94	64.38	
Sand Shiner	58	11.35	61.21	
Spotfin Shiner	56	10.96	59.10	
Channel Catfish	21	4.11	22.16	
Black Bullhead	20	3.91	21.11	
White Sucker	15	2.94	15.83	
Tadpole Madtom	13	2.54	13.72	
Common Shiner	12	2.35	12.66	
Trout Perch	3	0.59	3.17	
Longnose Dace	1	0.20	1.06	
Rock Bass	1	0.20	1.06	
Stonecat	1	0.20	1.06	



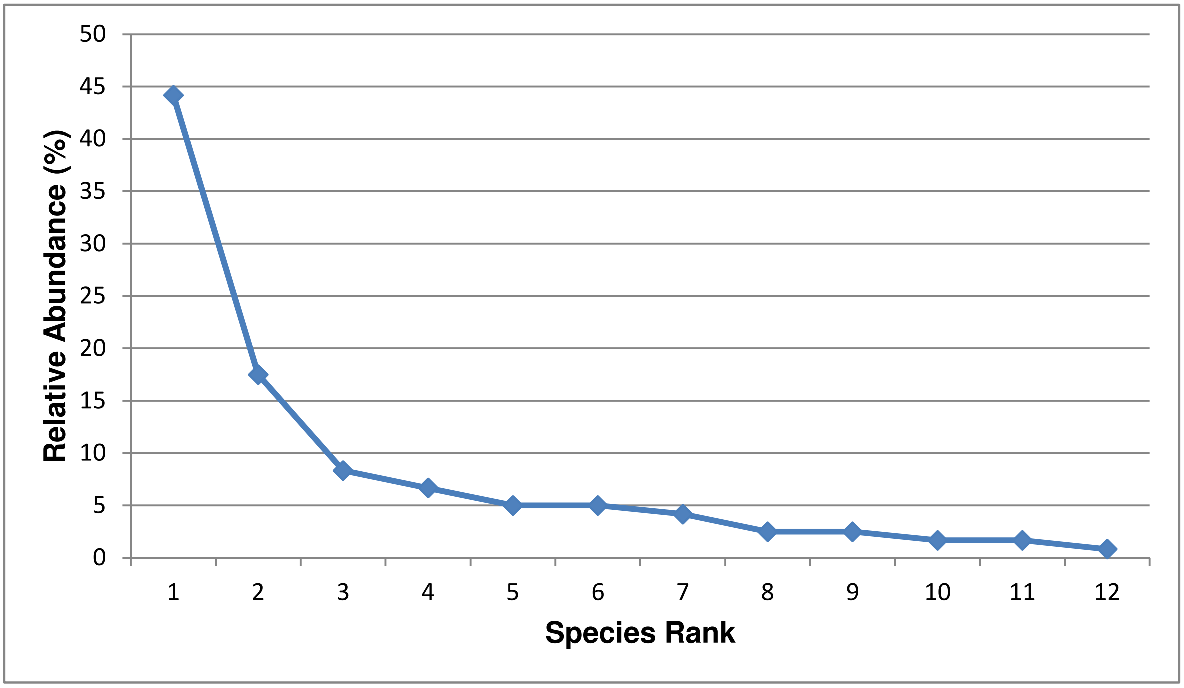
Study Reach 22 - Rush River

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Common Carp	74	27.21	91.96	2897.00
Freshwater Drum	61	22.43	75.80	
Trout Perch	19	6.99	23.61	
Black Bullhead	17	6.25	21.13	
Quillback	16	5.88	19.88	
Sand Shiner	16	5.88	19.88	
Bluegill	11	4.04	13.67	
Walleye	10	3.68	12.43	
White Sucker	9	3.31	11.18	
Blackside Darter	8	2.94	9.94	
White Bass	8	2.94	9.94	
Tadpole Madtom	7	2.57	8.70	
Yellow Perch	6	2.21	7.46	
Northern Pike	4	1.47	4.97	
Channel Catfish	2	0.74	2.49	
Orangespotted Sunfish	2	0.74	2.49	
Black Crappie	1	0.37	1.24	
Brown Bullhead	1	0.37	1.24	



Study Reach 23 - Wolverton Creek

Species	# of individuals	% relative abundance	Catch / hour	Effort (sec)
Black Bullhead	53	44.17	58.93	3238.00
Orangespotted Sunfish	21	17.50	23.35	
Common Carp	10	8.33	11.12	
Blackside Darter	8	6.67	8.89	
Green Sunfish	6	5.00	6.67	
Spotfin Shiner	6	5.00	6.67	
Walleye	5	4.17	5.56	
Northern Pike	3	2.50	3.34	
White Bass	3	2.50	3.34	
Rock Bass	2	1.67	2.22	
White Sucker	2	1.67	2.22	
Freshwater Drum	1	0.83	1.11	



APPENDIX H

Fish Lengths, Weights and Anomalies

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
1	9/4/12	Channel Catfish	720	4500	Individual	
1	9/4/12	Channel Catfish	435	610	Individual	
1	9/4/12	Channel Catfish	215	77	Individual	
1	9/4/12	Channel Catfish	365	390	Individual	
1	9/4/12	Channel Catfish	450	830	Individual	
1	9/4/12	Channel Catfish	360	310	Individual	
1	9/4/12	Channel Catfish	330	220	Individual	
1	9/4/12	Channel Catfish	330	220	Individual	
1	9/4/12	Channel Catfish	350	300	Individual	
1	9/4/12	Channel Catfish	480	930	Individual	
1	9/4/12	Channel Catfish	200	63	Individual	
1	9/4/12	Channel Catfish	215	74	Individual	
1	9/4/12	Channel Catfish	355	240	Individual	
1	9/4/12	Channel Catfish	310	210	Individual	
1	9/4/12	Channel Catfish	250	110	Individual	
1	9/4/12	Channel Catfish	225	83	Individual	
1	9/4/12	Channel Catfish	255	124	Individual	
1	9/4/12	Channel Catfish	220	78	Individual	
1	9/4/12	Channel Catfish	210	69	Individual	
1	9/4/12	Common Carp	460	1600	Individual	
1	9/4/12	Common Carp	490	2300	Individual	
1	9/4/12	Common Carp	465	2400	Individual	
1	9/4/12	Common Carp	110	19	Individual	
1	9/4/12	Common Carp	480	1400	Individual	
1	9/4/12	Common Carp	70	6	Individual	
1	9/4/12	Common Carp	520	2000	Individual	
1	9/4/12	Common Carp	525	1700	Individual	
1	9/4/12	Walleye	590	1850	Individual	
1	9/4/12	Walleye	325	220	Individual	
1	9/4/12	Goldeye	320	200	Individual	
1	9/4/12	Goldeye	335	200	Individual	
1	9/4/12	Goldeye	320	220	Individual	
1	9/4/12	Goldeye	345	220	Individual	L
1	9/4/12	Goldeye	315	200	Individual	
1	9/4/12	Goldeye	310	200	Individual	
1	9/4/12	Freshwater Drum	290	260	Individual	
1	9/4/12	Freshwater Drum	330	500	Individual	
1	9/4/12	Freshwater Drum	300	350	Individual	
1	9/4/12	Quillback	320	390	Individual	
1	9/4/12	Quillback	370	500	Individual	
1	9/4/12	Shorthead Redhorse	380	590	Individual	
1	9/4/12	Shorthead Redhorse	380	590	Individual	
1	9/4/12	Shorthead Redhorse	80	6	Individual	
1	9/4/12	Rock Bass	215	190	Individual	
1	9/4/12	Rock Bass	210	170	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
1	9/4/12	Bluegill	50	6	Batch	
1	9/4/12	Bluegill	40	6	Batch	
1	9/4/12	Bluegill	30	6	Batch	
1	9/4/12	Bluegill	30	6	Batch	
1	9/4/12	Orangespotted Sunfish	45	2	Individual	
1	9/4/12	Orangespotted Sunfish	70	5	Individual	
1	9/4/12	Orangespotted Sunfish	80	10	Individual	
1	9/4/12	Spotfin Shiner	60	26	Batch	
1	9/4/12	Spotfin Shiner	65	26	Batch	
1	9/4/12	Spotfin Shiner	45	26	Batch	
1	9/4/12	Spotfin Shiner	65	26	Batch	
1	9/4/12	Spotfin Shiner	55	26	Batch	
1	9/4/12	Spotfin Shiner	45	26	Batch	
1	9/4/12	Spotfin Shiner	55	26	Batch	
1	9/4/12	Spotfin Shiner	65	26	Batch	
1	9/4/12	Spotfin Shiner	55	26	Batch	
1	9/4/12	Spotfin Shiner	60	26	Batch	
1	9/4/12	Spotfin Shiner	55	26	Batch	
1	9/4/12	Spotfin Shiner	50	26	Batch	
1	9/4/12	Spotfin Shiner	65	26	Batch	
1	9/4/12	Spotfin Shiner	55	26	Batch	
1	9/4/12	Spotfin Shiner	70	26	Batch	
1	9/4/12	Spotfin Shiner	55	26	Batch	
1	9/4/12	Sand Shiner	43	1	Batch	
1	9/4/12	Sand Shiner	45	1	Batch	
1	9/4/12	Fathead Minnow	35	1	Batch	
1	9/4/12	Fathead Minnow	35	1	Batch	
1	9/4/12	Fathead Minnow	47	1	Batch	
1	9/21/12	Channel Catfish	355	325	Individual	
1	9/21/12	Channel Catfish	330	225	Individual	
1	9/21/12	Channel Catfish	85	5	Individual	
1	9/21/12	Channel Catfish	305	175	Individual	
1	9/21/12	Channel Catfish	345	275	Individual	
1	9/21/12	Channel Catfish	50	1	Individual	
1	9/21/12	Channel Catfish	495	275	Individual	
1	9/21/12	Channel Catfish	310	175	Individual	
1	9/21/12	Channel Catfish	775	4700	Individual	
1	9/21/12	Channel Catfish	350	300	Individual	
1	9/21/12	Channel Catfish	400	500	Individual	
1	9/21/12	Channel Catfish	50	1	Individual	
1	9/21/12	Common Carp	660	4200	Individual	
1	9/21/12	Common Carp	495	1450	Individual	
1	9/21/12	Common Carp	510	2000	Individual	
1	9/21/12	Common Carp	480	1350	Individual	
1	9/21/12	Common Carp	680	4600	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
1	9/21/12	Common Carp	595	3400	Individual	
1	9/21/12	Common Carp	505	2100	Individual	
1	9/21/12	Common Carp	745	5100	Individual	
1	9/21/12	Common Carp	595	3400	Individual	
1	9/21/12	Common Carp	765	5500	Individual	
1	9/21/12	Shorthead Redhorse	410	675	Individual	
1	9/21/12	Smallmouth Buffalo	320	450	Individual	
1	9/21/12	Smallmouth Buffalo	320	425	Individual	
1	9/21/12	Freshwater Drum	265	225	Individual	
1	9/21/12	Freshwater Drum	240	125	Individual	
1	9/21/12	Goldeye	315	225	Individual	
1	9/21/12	White Sucker	80	3	Individual	
1	9/21/12	Black Crappie	130	26	Individual	
1	9/21/12	Black Crappie	70	5	Individual	
1	9/21/12	Orangespotted Sunfish	75	38	Batch	
1	9/21/12	Orangespotted Sunfish	40	38	Batch	
1	9/21/12	Orangespotted Sunfish	35	38	Batch	
1	9/21/12	Orangespotted Sunfish	40	38	Batch	
1	9/21/12	Orangespotted Sunfish	40	38	Batch	
1	9/21/12	Orangespotted Sunfish	45	38	Batch	
1	9/21/12	Orangespotted Sunfish	70	38	Batch	
1	9/21/12	Orangespotted Sunfish	50	38	Batch	
1	9/21/12	Orangespotted Sunfish	95	38	Batch	
1	9/21/12	Orangespotted Sunfish	30	38	Batch	
1	9/21/12	Orangespotted Sunfish	45	38	Batch	
1	9/21/12	Bluegill	50	10	Batch	
1	9/21/12	Bluegill	40	10	Batch	
1	9/21/12	Bluegill	45	10	Batch	
1	9/21/12	Bluegill	45	10	Batch	
1	9/21/12	Bluegill	45	10	Batch	
1	9/21/12	Spotfin Shiner	70	59	Batch	
1	9/21/12	Spotfin Shiner	60	59	Batch	
1	9/21/12	Spotfin Shiner	55	59	Batch	
1	9/21/12	Spotfin Shiner	70	59	Batch	
1	9/21/12	Spotfin Shiner	65	59	Batch	
1	9/21/12	Spotfin Shiner	60	59	Batch	
1	9/21/12	Spotfin Shiner	55	59	Batch	
1	9/21/12	Spotfin Shiner	50	59	Batch	
1	9/21/12	Spotfin Shiner	40	59	Batch	
1	9/21/12	Spotfin Shiner	45	59	Batch	
1	9/21/12	Spotfin Shiner	65	59	Batch	
1	9/21/12	Spotfin Shiner	65	59	Batch	
1	9/21/12	Spotfin Shiner	65	59	Batch	
1	9/21/12	Spotfin Shiner	55	59	Batch	
1	9/21/12	Spotfin Shiner	60	59	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
1	9/21/12	Spotfin Shiner	45	59	Batch	
1	9/21/12	Spotfin Shiner	50	59	Batch	
1	9/21/12	Spotfin Shiner	40	59	Batch	
1	9/21/12	Spotfin Shiner	65	59	Batch	
1	9/21/12	Spotfin Shiner	45	59	Batch	
1	9/21/12	Spotfin Shiner	50	59	Batch	
1	9/21/12	Spotfin Shiner	45	59	Batch	
1	9/21/12	Spotfin Shiner	65	59	Batch	
1	9/21/12	Spotfin Shiner	60	59	Batch	
1	9/21/12	Spotfin Shiner	65	59	Batch	
1	9/21/12	Spotfin Shiner	50	59	Batch	
1	9/21/12	Spotfin Shiner	55	59	Batch	
1	9/21/12	Spotfin Shiner	30	59	Batch	
1	9/21/12	Spotfin Shiner	35	59	Batch	
1	9/21/12	Spotfin Shiner	60	59	Batch	
1	9/21/12	Spotfin Shiner	45	59	Batch	
1	9/21/12	Spotfin Shiner	75	59	Batch	
1	9/21/12	Spotfin Shiner	40	59	Batch	
1	9/21/12	Spotfin Shiner	50	59	Batch	
1	9/21/12	Spotfin Shiner	40	59	Batch	
1	9/21/12	Spotfin Shiner	30	59	Batch	
1	9/21/12	Spotfin Shiner	30	59	Batch	
1	9/21/12	Spotfin Shiner	45	59	Batch	
1	9/21/12	Spotfin Shiner	60	59	Batch	
1	9/21/12	Sand Shiner	60	31	Batch	
1	9/21/12	Sand Shiner	60	31	Batch	
1	9/21/12	Sand Shiner	45	31	Batch	
1	9/21/12	Sand Shiner	30	31	Batch	
1	9/21/12	Sand Shiner	60	31	Batch	
1	9/21/12	Sand Shiner	50	31	Batch	
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Sand Shiner	50	31	Batch	
1	9/21/12	Sand Shiner	40	31	Batch	
1	9/21/12	Sand Shiner	50	31	Batch	
1	9/21/12	Sand Shiner	50	31	Batch	
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Sand Shiner	40	31	Batch	
1	9/21/12	Sand Shiner	30	31	Batch	
1	9/21/12	Sand Shiner	55	31	Batch	
1	9/21/12	Sand Shiner	55	31	Batch	
1	9/21/12	Sand Shiner	40	31	Batch	
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Sand Shiner	45	31	Batch	
1	9/21/12	Sand Shiner	30	31	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Sand Shiner	45	31	Batch	
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Sand Shiner	25	31	Batch	
1	9/21/12	Sand Shiner	45	31	Batch	
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Sand Shiner	30	31	Batch	
1	9/21/12	Sand Shiner	30	31	Batch	
1	9/21/12	Sand Shiner	55	31	Batch	
1	9/21/12	Sand Shiner	45	31	Batch	
1	9/21/12	Sand Shiner	30	31	Batch	
1	9/21/12	Sand Shiner	40	31	Batch	
1	9/21/12	Sand Shiner	45	31	Batch	
1	9/21/12	Sand Shiner	40	31	Batch	
1	9/21/12	Sand Shiner	30	31	Batch	
1	9/21/12	Sand Shiner	40	31	Batch	
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Sand Shiner	30	31	Batch	
1	9/21/12	Sand Shiner	35	31	Batch	
1	9/21/12	Fathead Minnow	50	11	Batch	
1	9/21/12	Fathead Minnow	30	11	Batch	
1	9/21/12	Fathead Minnow	35	11	Batch	
1	9/21/12	Fathead Minnow	40	11	Batch	
1	9/21/12	Fathead Minnow	55	11	Batch	
1	9/21/12	Fathead Minnow	45	11	Batch	
1	9/21/12	Fathead Minnow	40	11	Batch	
1	9/21/12	Fathead Minnow	35	11	Batch	
1	9/21/12	Fathead Minnow	45	11	Batch	
1	9/21/12	Fathead Minnow	50	11	Batch	
1	9/21/12	Fathead Minnow	40	11	Batch	
2	8/31/12	Channel Catfish	315	175	Individual	
2	8/31/12	Channel Catfish	510	1150	Individual	
2	8/31/12	Channel Catfish	305	175	Individual	
2	8/31/12	Channel Catfish	300	175	Individual	
2	8/31/12	Channel Catfish	305	200	Individual	
2	8/31/12	Channel Catfish	510	1325	Individual	
2	8/31/12	Channel Catfish	305	150	Individual	
2	8/31/12	Channel Catfish	380	450	Individual	
2	8/31/12	Channel Catfish	215	80	Individual	
2	8/31/12	Channel Catfish	300	190	Individual	
2	8/31/12	Channel Catfish	195	55	Individual	
2	8/31/12	Channel Catfish	145	23	Individual	
2	8/31/12	Channel Catfish	65	3	Individual	
2	8/31/12	Channel Catfish	40	1	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
2	8/31/12	Common Carp	470	1950	Individual	
2	8/31/12	Common Carp	450	975	Individual	
2	8/31/12	Shorthead Redhorse	415	875	Individual	
2	8/31/12	Shorthead Redhorse	365	550	Individual	
2	8/31/12	Shorthead Redhorse	285	225	Individual	
2	8/31/12	Spotfin Shiner	55	30	Batch	
2	8/31/12	Spotfin Shiner	70	30	Batch	
2	8/31/12	Spotfin Shiner	65	30	Batch	
2	8/31/12	Spotfin Shiner	65	30	Batch	
2	8/31/12	Spotfin Shiner	60	30	Batch	
2	8/31/12	Spotfin Shiner	50	30	Batch	
2	8/31/12	Spotfin Shiner	55	30	Batch	
2	8/31/12	Spotfin Shiner	55	30	Batch	
2	8/31/12	Spotfin Shiner	65	30	Batch	
2	8/31/12	Spotfin Shiner	65	30	Batch	
2	8/31/12	Spotfin Shiner	55	30	Batch	
2	8/31/12	Spotfin Shiner	65	30	Batch	
2	8/31/12	Spotfin Shiner	55	30	Batch	
2	8/31/12	Spotfin Shiner	68	30	Batch	
2	9/8/12	Channel Catfish	310	200	Individual	
2	9/8/12	Channel Catfish	350	225	Individual	
2	9/8/12	Channel Catfish	340	250	Individual	
2	9/8/12	Channel Catfish	475	950	Individual	
2	9/8/12	Channel Catfish	710	4200	Individual	
2	9/8/12	Channel Catfish	405	525	Individual	
2	9/8/12	Channel Catfish	340	250	Individual	
2	9/8/12	Channel Catfish	335	275	Individual	
2	9/8/12	Channel Catfish	385	425	Individual	
2	9/8/12	Channel Catfish	330	250	Individual	
2	9/8/12	Channel Catfish	320	225	Individual	
2	9/8/12	Channel Catfish	285	150	Individual	
2	9/8/12	Channel Catfish	310	175	Individual	
2	9/8/12	Channel Catfish	340	275	Individual	
2	9/8/12	Channel Catfish	455	750	Individual	
2	9/8/12	Channel Catfish	485	1125	Individual	
2	9/8/12	Channel Catfish	470	950	Individual	
2	9/8/12	Channel Catfish	340	250	Individual	
2	9/8/12	Channel Catfish	335	250	Individual	
2	9/8/12	Channel Catfish	385	425	Individual	
2	9/8/12	Channel Catfish	420	650	Individual	
2	9/8/12	Channel Catfish	320	200	Individual	
2	9/8/12	Channel Catfish	400	500	Individual	
2	9/8/12	Channel Catfish	275	125	Individual	
2	9/8/12	Channel Catfish	340	250	Individual	
2	9/8/12	Channel Catfish	355	275	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
2	9/8/12	Channel Catfish	350	300	Individual	
2	9/8/12	Channel Catfish	410	550	Individual	
2	9/8/12	Channel Catfish	645	3300	Individual	
2	9/8/12	Channel Catfish	360	350	Individual	
2	9/8/12	Channel Catfish	250	80	Individual	
2	9/8/12	Channel Catfish	280	152	Individual	
2	9/8/12	Channel Catfish	305	175	Individual	
2	9/8/12	Channel Catfish	295	165	Individual	
2	9/8/12	Channel Catfish	180	54	Individual	
2	9/8/12	Channel Catfish	310	150	Individual	
2	9/8/12	Channel Catfish	295	200	Individual	
2	9/8/12	Channel Catfish	315	200	Individual	
2	9/8/12	Channel Catfish	265	123	Individual	
2	9/8/12	Channel Catfish	340	250	Individual	
2	9/8/12	Channel Catfish	225	80	Individual	
2	9/8/12	Channel Catfish	205	58	Individual	
2	9/8/12	Channel Catfish	280	140	Individual	
2	9/8/12	Channel Catfish	310	215	Individual	
2	9/8/12	Channel Catfish	310	205	Individual	
2	9/8/12	Channel Catfish	315	250	Individual	
2	9/8/12	Channel Catfish	195	60	Individual	
2	9/8/12	Channel Catfish	275	160	Individual	
2	9/8/12	Channel Catfish	195	60	Individual	
2	9/8/12	Channel Catfish	280	170	Individual	
2	9/8/12	Channel Catfish	140	21	Individual	
2	9/8/12	Channel Catfish	300	190	Individual	
2	9/8/12	Channel Catfish	350	300	Individual	
2	9/8/12	Channel Catfish	200	50	Individual	
2	9/8/12	Channel Catfish	155	30	Individual	
2	9/8/12	Channel Catfish	170	32	Individual	
2	9/8/12	Channel Catfish	135	20	Individual	
2	9/8/12	Channel Catfish	205	62	Individual	
2	9/8/12	Channel Catfish	205	69	Individual	
2	9/8/12	Channel Catfish	165	35	Individual	
2	9/8/12	Channel Catfish	185	47	Individual	
2	9/8/12	Channel Catfish	700	3650	Individual	
2	9/8/12	Channel Catfish	490	1200	Individual	
2	9/8/12	Channel Catfish	470	925	Individual	
2	9/8/12	Channel Catfish	63	3	Individual	
2	9/8/12	Channel Catfish	60	3	Individual	
2	9/8/12	Channel Catfish	50	2	Individual	
2	9/8/12	Channel Catfish	50	3	Individual	
2	9/8/12	Northern Pike	700	1375	Individual	L
2	9/8/12	Golden Redhorse	435	825	Individual	
2	9/8/12	Freshwater Drum	310	275	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
2	9/8/12	Freshwater Drum	260	200	Individual	
2	9/8/12	Freshwater Drum	148	36	Individual	
2	9/8/12	Common Carp	505	1525	Individual	
2	9/8/12	Common Carp	615	2700	Individual	
2	9/8/12	Common Carp	545	2500	Individual	
2	9/8/12	Common Carp	520	1675	Individual	
2	9/8/12	Common Carp	645	3600	Individual	
2	9/8/12	Common Carp	525	2550	Individual	
2	9/8/12	Quillback	410	825	Individual	
2	9/8/12	Quillback	415	1050	Individual	
2	9/8/12	Quillback	129	24	Individual	
2	9/8/12	Walleye	360	325	Individual	
2	9/8/12	Goldeye	325	175	Individual	
2	9/8/12	Goldeye	330	200	Individual	
2	9/8/12	Goldeye	365	375	Individual	
2	9/8/12	Goldeye	310	150	Individual	
2	9/8/12	Shorthead Redhorse	370	500	Individual	
2	9/8/12	Shorthead Redhorse	195	95	Individual	
2	9/8/12	Shorthead Redhorse	105	15	Individual	
2	9/8/12	Shorthead Redhorse	60	3	Individual	
2	9/8/12	Bluegill	40	2	Individual	
2	9/8/12	Bluegill	30	2	Individual	
2	9/8/12	Bluegill	30	2	Individual	
2	9/8/12	Bluegill	30	1	Individual	
2	9/8/12	Orangespotted Sunfish	40	4	Batch	
2	9/8/12	Orangespotted Sunfish	40	4	Batch	
2	9/8/12	Orangespotted Sunfish	30	4	Batch	
2	9/8/12	Emerald Shiner	50	8	Batch	
2	9/8/12	Emerald Shiner	55	8	Batch	
2	9/8/12	Emerald Shiner	60	8	Batch	
2	9/8/12	Emerald Shiner	55	8	Batch	
2	9/8/12	Emerald Shiner	70	8	Batch	
2	9/8/12	Spotfin Shiner	65	78	Batch	
2	9/8/12	Spotfin Shiner	55	78	Batch	
2	9/8/12	Spotfin Shiner	65	78	Batch	
2	9/8/12	Spotfin Shiner	60	78	Batch	
2	9/8/12	Spotfin Shiner	50	78	Batch	
2	9/8/12	Spotfin Shiner	65	78	Batch	
2	9/8/12	Spotfin Shiner	70	78	Batch	
2	9/8/12	Spotfin Shiner	55	78	Batch	
2	9/8/12	Spotfin Shiner	50	78	Batch	
2	9/8/12	Spotfin Shiner	60	78	Batch	
2	9/8/12	Spotfin Shiner	60	78	Batch	
2	9/8/12	Spotfin Shiner	50	78	Batch	
2	9/8/12	Spotfin Shiner	45	78	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
2	9/8/12	Spotfin Shiner	55	78	Batch	
2	9/8/12	Spotfin Shiner	65	78	Batch	
2	9/8/12	Spotfin Shiner	65	78	Batch	
2	9/8/12	Spotfin Shiner	55	78	Batch	
2	9/8/12	Spotfin Shiner	65	78	Batch	
2	9/8/12	Spotfin Shiner	60	78	Batch	
2	9/8/12	Spotfin Shiner	50	78	Batch	
2	9/8/12	Spotfin Shiner	55	78	Batch	
2	9/8/12	Spotfin Shiner	55	78	Batch	
2	9/8/12	Spotfin Shiner	60	78	Batch	
2	9/8/12	Spotfin Shiner	30	78	Batch	
2	9/8/12	Spotfin Shiner	60	78	Batch	
2	9/8/12	Spotfin Shiner	70	78	Batch	
2	9/8/12	Spotfin Shiner	60	78	Batch	
2	9/8/12	Spotfin Shiner	60	78	Batch	
2	9/8/12	Spotfin Shiner	60	78	Batch	
2	9/8/12	Spotfin Shiner	65	78	Batch	
2	9/8/12	Spotfin Shiner	55	78	Batch	
2	9/8/12	Spotfin Shiner	55	78	Batch	
2	9/8/12	Spotfin Shiner	50	78	Batch	
2	9/8/12	Spotfin Shiner	55	78	Batch	
2	9/8/12	Spotfin Shiner	45	78	Batch	
2	9/8/12	Spotfin Shiner	40	78	Batch	
2	9/8/12	Spotfin Shiner	50	78	Batch	
2	9/8/12	Spotfin Shiner	35	78	Batch	
2	9/8/12	Spotfin Shiner	40	78	Batch	
2	9/8/12	Sand Shiner	55	18	Batch	
2	9/8/12	Sand Shiner	35	18	Batch	
2	9/8/12	Sand Shiner	50	18	Batch	
2	9/8/12	Sand Shiner	55	18	Batch	
2	9/8/12	Sand Shiner	45	18	Batch	
2	9/8/12	Sand Shiner	40	18	Batch	
2	9/8/12	Sand Shiner	40	18	Batch	
2	9/8/12	Sand Shiner	50	18	Batch	
2	9/8/12	Sand Shiner	50	18	Batch	
2	9/8/12	Sand Shiner	25	18	Batch	
2	9/8/12	Sand Shiner	35	18	Batch	
2	9/8/12	Sand Shiner	50	18	Batch	
2	9/8/12	Sand Shiner	35	18	Batch	
2	9/8/12	Sand Shiner	25	18	Batch	
2	9/8/12	Sand Shiner	25	18	Batch	
2	9/8/12	Sand Shiner	50	18	Batch	
2	9/8/12	Sand Shiner	50	18	Batch	
2	9/8/12	Sand Shiner	45	18	Batch	
2	9/8/12	Sand Shiner	40	18	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
2	9/8/12	Sand Shiner	45	18	Batch	
3	8/30/12	Channel Catfish	290	125	Individual	
3	8/30/12	Channel Catfish	430	600	Individual	
3	8/30/12	Channel Catfish	435	625	Individual	
3	8/30/12	Channel Catfish	410	525	Individual	
3	8/30/12	Channel Catfish	305	175	Individual	
3	8/30/12	Channel Catfish	310	175	Individual	
3	8/30/12	Channel Catfish	375	400	Individual	
3	8/30/12	Channel Catfish	350	300	Individual	
3	8/30/12	Channel Catfish	365	325	Individual	
3	8/30/12	Channel Catfish	350	275	Individual	
3	8/30/12	Channel Catfish	300	125	Individual	
3	8/30/12	Channel Catfish	310	175	Individual	
3	8/30/12	Channel Catfish	200	25	Individual	
3	8/30/12	Channel Catfish	60	4	Individual	
3	8/30/12	Shorthead Redhorse	420	675	Individual	
3	8/30/12	Golden Redhorse	455	875	Individual	
3	8/30/12	Spotfin Shiner	65	10	Batch	
3	8/30/12	Spotfin Shiner	55	10	Batch	
3	8/30/12	Spotfin Shiner	50	10	Batch	
3	8/30/12	Spotfin Shiner	30	10	Batch	
3	8/30/12	Spotfin Shiner	60	10	Batch	
3	8/30/12	Spotfin Shiner	45	10	Batch	
3	8/30/12	Spotfin Shiner	50	10	Batch	
3	8/30/12	Spotfin Shiner	65	10	Batch	
3	8/30/12	Spotfin Shiner	55	10	Batch	
3	9/9/12	Channel Catfish	650	3400	Individual	
3	9/9/12	Channel Catfish	590	2400	Individual	
3	9/9/12	Channel Catfish	585	1950	Individual	
3	9/9/12	Channel Catfish	460	725	Individual	
3	9/9/12	Channel Catfish	390	450	Individual	
3	9/9/12	Channel Catfish	335	225	Individual	
3	9/9/12	Channel Catfish	280	150	Individual	
3	9/9/12	Channel Catfish	335	225	Individual	
3	9/9/12	Channel Catfish	335	225	Individual	
3	9/9/12	Channel Catfish	350	250	Individual	
3	9/9/12	Channel Catfish	535	1475	Individual	
3	9/9/12	Channel Catfish	610	2800	Individual	
3	9/9/12	Channel Catfish	425	600	Individual	
3	9/9/12	Channel Catfish	460	925	Individual	
3	9/9/12	Channel Catfish	340	275	Individual	
3	9/9/12	Channel Catfish	300	125	Individual	
3	9/9/12	Channel Catfish	440	675	Individual	
3	9/9/12	Channel Catfish	440	675	Individual	
3	9/9/12	Channel Catfish	340	275	Individual	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
3	9/9/12	Channel Catfish	460	850	Individual	
3	9/9/12	Channel Catfish	480	1100	Individual	
3	9/9/12	Channel Catfish	365	325	Individual	
3	9/9/12	Channel Catfish	410	550	Individual	
3	9/9/12	Channel Catfish	405	500	Individual	
3	9/9/12	Channel Catfish	320	225	Individual	
3	9/9/12	Channel Catfish	340	250	Individual	
3	9/9/12	Channel Catfish	295	150	Individual	
3	9/9/12	Channel Catfish	260	110	Individual	
3	9/9/12	Channel Catfish	385	450	Individual	
3	9/9/12	Channel Catfish	280	135	Individual	
3	9/9/12	Channel Catfish	395	450	Individual	
3	9/9/12	Channel Catfish	385	400	Individual	
3	9/9/12	Channel Catfish	300	190	Individual	
3	9/9/12	Channel Catfish	235	95	Individual	
3	9/9/12	Channel Catfish	250	120	Individual	
3	9/9/12	Channel Catfish	255	115	Individual	
3	9/9/12	Channel Catfish	255	113	Individual	
3	9/9/12	Channel Catfish	240	120	Individual	
3	9/9/12	Channel Catfish	270	160	Individual	
3	9/9/12	Channel Catfish	480	1050	Individual	
3	9/9/12	Channel Catfish	365	350	Individual	
3	9/9/12	Channel Catfish	250	120	Individual	
3	9/9/12	Channel Catfish	400	475	Individual	
3	9/9/12	Channel Catfish	415	450	Individual	
3	9/9/12	Channel Catfish	360	350	Individual	
3	9/9/12	Channel Catfish	210	65	Individual	
3	9/9/12	Channel Catfish	235	100	Individual	
3	9/9/12	Channel Catfish	190	56	Individual	
3	9/9/12	Channel Catfish	310	220	Individual	
3	9/9/12	Channel Catfish	285	170	Individual	
3	9/9/12	Channel Catfish	190	50	Individual	
3	9/9/12	Channel Catfish	190	48	Individual	
3	9/9/12	Channel Catfish	230	100	Individual	
3	9/9/12	Channel Catfish	210	70	Individual	
3	9/9/12	Channel Catfish	200	60	Individual	
3	9/9/12	Channel Catfish	200	50	Individual	
3	9/9/12	Channel Catfish	215	70	Individual	
3	9/9/12	Channel Catfish	130	15	Individual	
3	9/9/12	Channel Catfish	120	14	Individual	
3	9/9/12	Channel Catfish	320	235	Individual	
3	9/9/12	Channel Catfish	260	125	Individual	
3	9/9/12	Channel Catfish	180	45	Individual	
3	9/9/12	Channel Catfish	185	47	Individual	
3	9/9/12	Channel Catfish	130	20	Individual	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
3	9/9/12	Channel Catfish	190	60	Individual	
3	9/9/12	Channel Catfish	65	5	Individual	
3	9/9/12	Common Carp	445	1700	Individual	
3	9/9/12	Common Carp	520	1775	Individual	
3	9/9/12	Common Carp	520	1600	Individual	
3	9/9/12	Common Carp	715	4400	Individual	N
3	9/9/12	Common Carp	600	3200	Individual	
3	9/9/12	Common Carp	500	1400	Individual	
3	9/9/12	Common Carp	600	3300	Individual	
3	9/9/12	Common Carp	475	1550	Individual	
3	9/9/12	Common Carp	600	3000	Individual	L
3	9/9/12	Common Carp	565	2600	Individual	
3	9/9/12	Common Carp	520	2300	Individual	L
3	9/9/12	Golden Redhorse	430	775	Individual	
3	9/9/12	Golden Redhorse	440	925	Individual	
3	9/9/12	Golden Redhorse	500	1275	Individual	
3	9/9/12	Golden Redhorse	230	130	Individual	
3	9/9/12	Freshwater Drum	340	400	Individual	
3	9/9/12	Freshwater Drum	330	350	Individual	
3	9/9/12	Shorthead Redhorse	395	625	Individual	
3	9/9/12	Shorthead Redhorse	100	10	Individual	
3	9/9/12	Shorthead Redhorse	75	7	Individual	
3	9/9/12	Goldeye	355	225	Individual	
3	9/9/12	Goldeye	315	150	Individual	
3	9/9/12	Goldeye	310	200	Individual	
3	9/9/12	Goldeye	300	195	Individual	
3	9/9/12	Goldeye	330	300	Individual	
3	9/9/12	Sauger	315	250	Individual	
3	9/9/12	Quillback	330	450	Individual	
3	9/9/12	Rock Bass	140	62	Individual	
3	9/9/12	Orangespotted Sunfish	30	14	Batch	
3	9/9/12	Orangespotted Sunfish	40	14	Batch	
3	9/9/12	Orangespotted Sunfish	70	14	Batch	
3	9/9/12	Orangespotted Sunfish	30	14	Batch	
3	9/9/12	Orangespotted Sunfish	40	14	Batch	
3	9/9/12	Orangespotted Sunfish	30	14	Batch	
3	9/9/12	Orangespotted Sunfish	25	14	Batch	
3	9/9/12	Orangespotted Sunfish	35	14	Batch	
3	9/9/12	Bluegill	25	1	Batch	
3	9/9/12	Bluegill	30	1	Batch	
3	9/9/12	Emerald Shiner	55	6	Batch	
3	9/9/12	Emerald Shiner	40	6	Batch	
3	9/9/12	Emerald Shiner	45	6	Batch	
3	9/9/12	Emerald Shiner	30	6	Batch	
3	9/9/12	Emerald Shiner	45	6	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
3	9/9/12	Emerald Shiner	45	6	Batch	
3	9/9/12	Emerald Shiner	50	6	Batch	
3	9/9/12	Emerald Shiner	40	6	Batch	
3	9/9/12	Emerald Shiner	40	6	Batch	
3	9/9/12	Emerald Shiner	40	6	Batch	
3	9/9/12	Sand Shiner	40	4	Batch	
3	9/9/12	Sand Shiner	30	4	Batch	
3	9/9/12	Sand Shiner	35	4	Batch	
3	9/9/12	Sand Shiner	40	4	Batch	
3	9/9/12	Sand Shiner	25	4	Batch	
3	9/9/12	Sand Shiner	40	4	Batch	
3	9/9/12	Sand Shiner	30	4	Batch	
3	9/9/12	Sand Shiner	30	4	Batch	
3	9/9/12	Sand Shiner	25	4	Batch	
3	9/9/12	Sand Shiner	40	4	Batch	
3	9/9/12	Spottail Shiner	50	10	Batch	
3	9/9/12	Spottail Shiner	40	10	Batch	
3	9/9/12	Spottail Shiner	50	10	Batch	
3	9/9/12	Spottail Shiner	50	10	Batch	
3	9/9/12	Spottail Shiner	40	10	Batch	
3	9/9/12	Spottail Shiner	45	10	Batch	
3	9/9/12	Spottail Shiner	50	10	Batch	
3	9/9/12	Spottail Shiner	50	10	Batch	
3	9/9/12	Spottail Shiner	40	10	Batch	
3	9/9/12	Spottail Shiner	40	10	Batch	
3	9/9/12	Spottail Shiner	35	10	Batch	
3	9/9/12	Spottail Shiner	40	10	Batch	
3	9/9/12	Spottail Shiner	40	10	Batch	
3	9/9/12	Spottail Shiner	35	10	Batch	
3	9/9/12	Spottail Shiner	45	10	Batch	
3	9/9/12	Spotfin Shiner	60	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
3	9/9/12	Spotfin Shiner	70	48	Batch	
3	9/9/12	Spotfin Shiner	55	48	Batch	
3	9/9/12	Spotfin Shiner	60	48	Batch	
3	9/9/12	Spotfin Shiner	55	48	Batch	
3	9/9/12	Spotfin Shiner	55	48	Batch	
3	9/9/12	Spotfin Shiner	65	48	Batch	
3	9/9/12	Spotfin Shiner	60	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
3	9/9/12	Spotfin Shiner	65	48	Batch	
3	9/9/12	Spotfin Shiner	55	48	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
3	9/9/12	Spotfin Shiner	55	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
3	9/9/12	Spotfin Shiner	65	48	Batch	
3	9/9/12	Spotfin Shiner	65	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
3	9/9/12	Spotfin Shiner	65	48	Batch	
3	9/9/12	Spotfin Shiner	55	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
3	9/9/12	Spotfin Shiner	55	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
3	9/9/12	Spotfin Shiner	45	48	Batch	
3	9/9/12	Spotfin Shiner	55	48	Batch	
3	9/9/12	Spotfin Shiner	55	48	Batch	
3	9/9/12	Spotfin Shiner	50	48	Batch	
4	8/29/12	Common Carp	680	4500	Individual	
4	8/29/12	Common Carp	550	2400	Individual	
4	8/29/12	Common Carp	540	2200	Individual	
4	8/29/12	Channel Catfish	315	225	Individual	
4	8/29/12	Channel Catfish	420	600	Individual	
4	8/29/12	Channel Catfish	520	1225	Individual	
4	8/29/12	Channel Catfish	410	475	Individual	
4	8/29/12	Channel Catfish	340	275	Individual	
4	8/29/12	Smallmouth Bass	385	725	Individual	
4	8/29/12	Shorthead Redhorse	285	200	Individual	
4	8/29/12	Goldeye	325	200	Individual	
4	8/29/12	Goldeye	355	300	Individual	
4	8/29/12	Black Crappie	73	6	Individual	
4	8/29/12	Spotfin Shiner	60	2	Batch	
4	8/29/12	Spotfin Shiner	50	2	Batch	
4	9/11/12	Common Carp	780	7100	Individual	
4	9/11/12	Common Carp	575	2900	Individual	
4	9/11/12	Common Carp	510	2200	Individual	
4	9/11/12	Common Carp	530	2500	Individual	
4	9/11/12	Common Carp	570	2700	Individual	
4	9/11/12	Common Carp	560	2900	Individual	
4	9/11/12	Common Carp	540	2400	Individual	
4	9/11/12	Common Carp	520	2000	Individual	
4	9/11/12	Common Carp	510	2100	Individual	
4	9/11/12	Common Carp	470	1500	Individual	
4	9/11/12	Common Carp	85	10	Individual	
4	9/11/12	Channel Catfish	420	600	Individual	
4	9/11/12	Channel Catfish	455	725	Individual	
4	9/11/12	Channel Catfish	365	350	Individual	
4	9/11/12	Channel Catfish	450	775	Individual	
4	9/11/12	Channel Catfish	460	950	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
4	9/11/12	Channel Catfish	505	1075	Individual	
4	9/11/12	Channel Catfish	470	875	Individual	
4	9/11/12	Channel Catfish	490	900	Individual	
4	9/11/12	Channel Catfish	470	875	Individual	
4	9/11/12	Channel Catfish	575	2500	Individual	
4	9/11/12	Channel Catfish	405	550	Individual	
4	9/11/12	Channel Catfish	435	700	Individual	
4	9/11/12	Channel Catfish	420	500	Individual	
4	9/11/12	Channel Catfish	435	725	Individual	
4	9/11/12	Channel Catfish	270	140	Individual	
4	9/11/12	Channel Catfish	410	550	Individual	
4	9/11/12	Channel Catfish	770	4700	Individual	
4	9/11/12	Channel Catfish	400	450	Individual	
4	9/11/12	Channel Catfish	480	1000	Individual	
4	9/11/12	Channel Catfish	335	700	Individual	
4	9/11/12	Channel Catfish	435	675	Individual	
4	9/11/12	Channel Catfish	510	1000	Individual	
4	9/11/12	Channel Catfish	430	650	Individual	
4	9/11/12	Channel Catfish	370	325	Individual	
4	9/11/12	Channel Catfish	445	775	Individual	
4	9/11/12	Channel Catfish	295	160	Individual	
4	9/11/12	Channel Catfish	150	22	Individual	
4	9/11/12	Channel Catfish	255	133	Individual	
4	9/11/12	Channel Catfish	80	2	Individual	
4	9/11/12	Channel Catfish	50	2	Individual	
4	9/11/12	Channel Catfish	55	2	Individual	
4	9/11/12	Channel Catfish	60	2	Individual	
4	9/11/12	Channel Catfish	65	3	Individual	
4	9/11/12	Channel Catfish	55	1	Individual	
4	9/11/12	Shorthead Redhorse	430	700	Individual	L
4	9/11/12	Shorthead Redhorse	385	575	Individual	L
4	9/11/12	Shorthead Redhorse	405	625	Individual	
4	9/11/12	Shorthead Redhorse	330	300	Individual	
4	9/11/12	Shorthead Redhorse	360	400	Individual	
4	9/11/12	Shorthead Redhorse	375	400	Individual	
4	9/11/12	Shorthead Redhorse	360	400	Individual	
4	9/11/12	Shorthead Redhorse	380	475	Individual	
4	9/11/12	Shorthead Redhorse	440	725	Individual	
4	9/11/12	Shorthead Redhorse	355	425	Individual	
4	9/11/12	Golden Redhorse	490	1275	Individual	
4	9/11/12	Golden Redhorse	405	700	Individual	
4	9/11/12	Golden Redhorse	490	1600	Individual	
4	9/11/12	Golden Redhorse	370	425	Individual	
4	9/11/12	Golden Redhorse	410	700	Individual	
4	9/11/12	Golden Redhorse	80	10	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
4	9/11/12	Golden Redhorse	105	10	Individual	
4	9/11/12	Golden Redhorse	85	8	Individual	
4	9/11/12	Quillback	360	575	Individual	
4	9/11/12	Quillback	270	225	Individual	
4	9/11/12	Quillback	470	1800	Individual	
4	9/11/12	Quillback	460	1700	Individual	
4	9/11/12	Quillback	440	1075	Individual	
4	9/11/12	Quillback	330	400	Individual	
4	9/11/12	Quillback	395	700	Individual	
4	9/11/12	Quillback	405	775	Individual	
4	9/11/12	Quillback	275	225	Individual	
4	9/11/12	Quillback	270	225	Individual	
4	9/11/12	Quillback	295	275	Individual	
4	9/11/12	Northern Pike	505	525	Individual	
4	9/11/12	Northern Pike	500	400	Individual	
4	9/11/12	Northern Pike	510	500	Individual	
4	9/11/12	Goldeye	330	250	Individual	
4	9/11/12	Goldeye	325	200	Individual	
4	9/11/12	Goldeye	315	225	Individual	
4	9/11/12	Goldeye	330	250	Individual	
4	9/11/12	Goldeye	205	82	Individual	
4	9/11/12	Sauger	325	250	Individual	
4	9/11/12	Freshwater Drum	435	1025	Individual	
4	9/11/12	Freshwater Drum	340	450	Individual	
4	9/11/12	Smallmouth Bass	110	20	Individual	
4	9/11/12	Rock Bass	120	35	Individual	
4	9/11/12	White Bass	135	30	Individual	
4	9/11/12	Orangespotted Sunfish	75	8	Individual	
4	9/11/12	Orangespotted Sunfish	30	1	Individual	
4	9/11/12	Orangespotted Sunfish	40	1	Individual	
4	9/11/12	Trout Perch	70	3	Individual	
4	9/11/12	Trout Perch	65	2	Individual	
4	9/11/12	Trout Perch	65	3	Individual	
4	9/11/12	Trout Perch	65	3	Individual	
4	9/11/12	White Sucker	80	5	Individual	
4	9/11/12	Sand Shiner	25	36	Batch	
4	9/11/12	Sand Shiner	30	36	Batch	
4	9/11/12	Sand Shiner	30	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	35	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	50	36	Batch	
4	9/11/12	Sand Shiner	50	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
4	9/11/12	Sand Shiner	35	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	50	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	50	36	Batch	
4	9/11/12	Sand Shiner	50	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	50	36	Batch	
4	9/11/12	Sand Shiner	35	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	35	36	Batch	
4	9/11/12	Sand Shiner	35	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	30	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	35	36	Batch	
4	9/11/12	Sand Shiner	50	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	55	36	Batch	
4	9/11/12	Sand Shiner	30	36	Batch	
4	9/11/12	Sand Shiner	55	36	Batch	
4	9/11/12	Sand Shiner	35	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	30	36	Batch	
4	9/11/12	Sand Shiner	40	36	Batch	
4	9/11/12	Sand Shiner	45	36	Batch	
4	9/11/12	Sand Shiner	55	36	Batch	
4	9/11/12	Spotfin Shiner	60	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	70	105	Batch	
4	9/11/12	Spotfin Shiner	70	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	55	105	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
4	9/11/12	Spotfin Shiner	60	105	Batch	
4	9/11/12	Spotfin Shiner	30	105	Batch	
4	9/11/12	Spotfin Shiner	70	105	Batch	
4	9/11/12	Spotfin Shiner	60	105	Batch	
4	9/11/12	Spotfin Shiner	75	105	Batch	
4	9/11/12	Spotfin Shiner	35	105	Batch	
4	9/11/12	Spotfin Shiner	40	105	Batch	
4	9/11/12	Spotfin Shiner	35	105	Batch	
4	9/11/12	Spotfin Shiner	75	105	Batch	
4	9/11/12	Spotfin Shiner	60	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	70	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	60	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	55	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	60	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	45	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	45	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	55	105	Batch	
4	9/11/12	Spotfin Shiner	40	105	Batch	
4	9/11/12	Spotfin Shiner	35	105	Batch	
4	9/11/12	Spotfin Shiner	70	105	Batch	
4	9/11/12	Spotfin Shiner	35	105	Batch	
4	9/11/12	Spotfin Shiner	55	105	Batch	
4	9/11/12	Spotfin Shiner	45	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	45	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	75	105	Batch	
4	9/11/12	Spotfin Shiner	55	105	Batch	
4	9/11/12	Spotfin Shiner	40	105	Batch	
4	9/11/12	Spotfin Shiner	65	105	Batch	
4	9/11/12	Spotfin Shiner	40	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	40	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
4	9/11/12	Spotfin Shiner	35	105	Batch	
4	9/11/12	Spotfin Shiner	30	105	Batch	
4	9/11/12	Spotfin Shiner	45	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	30	105	Batch	
4	9/11/12	Spotfin Shiner	60	105	Batch	
4	9/11/12	Spotfin Shiner	55	105	Batch	
4	9/11/12	Spotfin Shiner	45	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	45	105	Batch	
4	9/11/12	Spotfin Shiner	40	105	Batch	
4	9/11/12	Spotfin Shiner	50	105	Batch	
4	9/11/12	Spotfin Shiner	40	105	Batch	
4	9/11/12	Spotfin Shiner	70	105	Batch	
4	9/11/12	Spotfin Shiner	70	105	Batch	
4	9/11/12	Spotfin Shiner	70	105	Batch	
4	9/11/12	Emerald Shiner	75	6	Batch	
4	9/11/12	Emerald Shiner	40	6	Batch	
4	9/11/12	Emerald Shiner	55	6	Batch	
4	9/11/12	Emerald Shiner	40	6	Batch	
4	9/11/12	Fathead Minnow	55	7	Batch	
4	9/11/12	Fathead Minnow	60	7	Batch	
4	9/11/12	Fathead Minnow	40	7	Batch	
4	9/11/12	Fathead Minnow	55	7	Batch	
4	9/11/12	Fathead Minnow	40	7	Batch	
4	9/11/12	Fathead Minnow	60	7	Batch	
4	9/11/12	Fathead Minnow	30	7	Batch	
4	9/11/12	Spottail Shiner	50	5	Batch	
4	9/11/12	Spottail Shiner	45	5	Batch	
4	9/11/12	Spottail Shiner	40	5	Batch	
4	9/11/12	Spottail Shiner	40	5	Batch	
4	9/11/12	Spottail Shiner	50	5	Batch	
4	9/11/12	Spottail Shiner	45	5	Batch	
4	9/11/12	Spottail Shiner	40	5	Batch	
5	9/1/12	Quillback	260	175	Individual	
5	9/1/12	Spotfin Shiner	55	4	Individual	
5	9/1/12	Channel Catfish	85	9	Individual	
5	9/1/12	Channel Catfish	60	3	Individual	
5	9/1/12	Channel Catfish	205	75	Individual	
5	9/1/12	Channel Catfish	155	30	Individual	
5	9/1/12	Channel Catfish	55	3	Individual	
5	9/1/12	Channel Catfish	45	1	Individual	
5	9/1/12	Rock Bass	138	61	Individual	
5	9/10/12	Common Carp	575	3050	Individual	
5	9/10/12	Common Carp	590	3000	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
5	9/10/12	Common Carp	650	4300	Individual	
5	9/10/12	Channel Catfish	480	900	Individual	
5	9/10/12	Channel Catfish	470	875	Individual	
5	9/10/12	Channel Catfish	490	1050	Individual	
5	9/10/12	Channel Catfish	360	350	Individual	
5	9/10/12	Channel Catfish	475	875	Individual	
5	9/10/12	Channel Catfish	205	66	Individual	
5	9/10/12	Channel Catfish	320	225	Individual	
5	9/10/12	Channel Catfish	460	750	Individual	
5	9/10/12	Channel Catfish	580	1750	Individual	
5	9/10/12	Channel Catfish	515	1325	Individual	
5	9/10/12	Channel Catfish	415	650	Individual	
5	9/10/12	Channel Catfish	440	650	Individual	
5	9/10/12	Channel Catfish	450	800	Individual	
5	9/10/12	Channel Catfish	555	2000	Individual	
5	9/10/12	Channel Catfish	440	725	Individual	
5	9/10/12	Channel Catfish	485	875	Individual	
5	9/10/12	Channel Catfish	525	1275	Individual	
5	9/10/12	Channel Catfish	485	1025	Individual	
5	9/10/12	Channel Catfish	480	975	Individual	
5	9/10/12	Channel Catfish	365	425	Individual	
5	9/10/12	Channel Catfish	205	71	Individual	
5	9/10/12	Channel Catfish	160	68	Individual	
5	9/10/12	Channel Catfish	210	68	Individual	
5	9/10/12	Channel Catfish	205	65	Individual	
5	9/10/12	Channel Catfish	50	2	Individual	
5	9/10/12	Channel Catfish	55	2	Individual	
5	9/10/12	Walleye	465	800	Individual	
5	9/10/12	Quillback	370	575	Individual	
5	9/10/12	Quillback	400	775	Individual	
5	9/10/12	Stonecat	195	53	Individual	
5	9/10/12	Stonecat	155	30	Individual	
5	9/10/12	Stonecat	200	65	Individual	
5	9/10/12	Golden Redhorse	150	27	Individual	
5	9/10/12	Orangespotted Sunfish	50	4	Batch	
5	9/10/12	Orangespotted Sunfish	55	4	Batch	
5	9/10/12	Orangespotted Sunfish	25	4	Batch	
5	9/10/12	Freshwater Drum	100	10	Individual	
5	9/10/12	Rock Bass	135	65	Individual	
5	9/10/12	Spotfin Shiner	60	1	Individual	
5	9/10/12	Sand Shiner	55	5	Batch	
5	9/10/12	Sand Shiner	40	5	Batch	
5	9/10/12	Sand Shiner	40	5	Batch	
5	9/10/12	Sand Shiner	35	5	Batch	
5	9/10/12	Sand Shiner	35	5	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
5	9/10/12	Sand Shiner	30	5	Batch	
5	9/10/12	Sand Shiner	40	5	Batch	
5	9/10/12	Fathead Minnow	50	2	Individual	
6	9/2/12	Goldeye	320	200	Individual	
6	9/2/12	Goldeye	330	250	Individual	
6	9/2/12	Quillback	360	675	Individual	
6	9/2/12	Quillback	260	175	Individual	
6	9/2/12	Quillback	285	175	Individual	
6	9/2/12	Shorthead Redhorse	290	200	Individual	
6	9/2/12	Channel Catfish	290	180	Individual	
6	9/2/12	Channel Catfish	160	33	Individual	
6	9/2/12	Channel Catfish	215	78	Individual	
6	9/2/12	Channel Catfish	160	31	Individual	
6	9/2/12	Common Carp	360	600	Individual	
6	9/2/12	Black Crappie	205	130	Individual	
6	9/2/12	Freshwater Drum	120	17	Individual	
6	9/2/12	Orangespotted Sunfish	28	1	Individual	
6	9/2/12	Spotfin Shiner	55	4	Batch	
6	9/2/12	Spotfin Shiner	50	4	Batch	
6	9/2/12	Stonecat	205	84	Individual	
6	9/10/12	Common Carp	655	4300	Individual	E
6	9/10/12	Common Carp	555	2600	Individual	
6	9/10/12	Common Carp	545	2200	Individual	
6	9/10/12	Common Carp	505	1800	Individual	
6	9/10/12	Common Carp	310	325	Individual	
6	9/10/12	Channel Catfish	290	180	Individual	
6	9/10/12	Channel Catfish	315	250	Individual	
6	9/10/12	Channel Catfish	500	1175	Individual	
6	9/10/12	Channel Catfish	245	110	Individual	
6	9/10/12	Channel Catfish	370	400	Individual	
6	9/10/12	Channel Catfish	355	275	Individual	
6	9/10/12	Channel Catfish	365	375	Individual	
6	9/10/12	Channel Catfish	430	600	Individual	
6	9/10/12	Channel Catfish	490	1025	Individual	
6	9/10/12	Channel Catfish	490	1050	Individual	
6	9/10/12	Channel Catfish	335	300	Individual	
6	9/10/12	Channel Catfish	310	275	Individual	
6	9/10/12	Channel Catfish	440	700	Individual	
6	9/10/12	Channel Catfish	520	1225	Individual	
6	9/10/12	Channel Catfish	475	975	Individual	
6	9/10/12	Channel Catfish	350	275	Individual	
6	9/10/12	Channel Catfish	305	250	Individual	
6	9/10/12	Channel Catfish	450	750	Individual	
6	9/10/12	Channel Catfish	210	75	Individual	
6	9/10/12	Channel Catfish	45	1	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
6	9/10/12	Channel Catfish	40	1	Individual	
6	9/10/12	Channel Catfish	45	1	Individual	
6	9/10/12	Channel Catfish	45	1	Individual	
6	9/10/12	Quillback	420	875	Individual	
6	9/10/12	Quillback	430	925	Individual	
6	9/10/12	Quillback	430	1000	Individual	
6	9/10/12	Shorthead Redhorse	395	550	Individual	
6	9/10/12	Shorthead Redhorse	320	300	Individual	
6	9/10/12	Shorthead Redhorse	370	450	Individual	
6	9/10/12	Shorthead Redhorse	355	425	Individual	
6	9/10/12	Goldeye	310	200	Individual	
6	9/10/12	Goldeye	350	250	Individual	
6	9/10/12	Goldeye	310	225	Individual	
6	9/10/12	Goldeye	320	200	Individual	
6	9/10/12	Goldeye	340	225	Individual	
6	9/10/12	Goldeye	370	250	Individual	
6	9/10/12	Goldeye	330	250	Individual	
6	9/10/12	Goldeye	335	250	Individual	
6	9/10/12	Freshwater Drum	240	150	Individual	
6	9/10/12	Sauger	320	230	Individual	
6	9/10/12	Spotfin Shiner	65	15	Batch	
6	9/10/12	Spotfin Shiner	60	15	Batch	
6	9/10/12	Spotfin Shiner	35	15	Batch	
6	9/10/12	Spotfin Shiner	30	15	Batch	
6	9/10/12	Spotfin Shiner	40	15	Batch	
6	9/10/12	Spotfin Shiner	25	15	Batch	
6	9/10/12	Spotfin Shiner	25	15	Batch	
6	9/10/12	Spotfin Shiner	35	15	Batch	
6	9/10/12	Spotfin Shiner	20	15	Batch	
6	9/10/12	Spotfin Shiner	45	15	Batch	
6	9/10/12	Spotfin Shiner	25	15	Batch	
6	9/10/12	Spotfin Shiner	35	15	Batch	
6	9/10/12	Spotfin Shiner	40	15	Batch	
6	9/10/12	Spotfin Shiner	45	15	Batch	
6	9/10/12	Spotfin Shiner	40	15	Batch	
6	9/10/12	Spotfin Shiner	25	15	Batch	
6	9/10/12	Spotfin Shiner	25	15	Batch	
6	9/10/12	Spotfin Shiner	30	15	Batch	
6	9/10/12	Spotfin Shiner	40	15	Batch	
6	9/10/12	Sand Shiner	45	9	Batch	
6	9/10/12	Sand Shiner	50	9	Batch	
6	9/10/12	Sand Shiner	55	9	Batch	
6	9/10/12	Sand Shiner	50	9	Batch	
6	9/10/12	Sand Shiner	40	9	Batch	
6	9/10/12	Sand Shiner	30	9	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
6	9/10/12	Sand Shiner	35	9	Batch	
6	9/10/12	Sand Shiner	30	9	Batch	
6	9/10/12	Sand Shiner	30	9	Batch	
6	9/10/12	Sand Shiner	25	9	Batch	
6	9/10/12	Sand Shiner	25	9	Batch	
6	9/10/12	Sand Shiner	20	9	Batch	
6	9/10/12	Fathead Minnow	50	1	Individual	
6	9/10/12	Trout Perch	60	2	Individual	
7	9/13/12	Common Carp	135	52	Individual	
7	9/13/12	Common Carp	150	56	Individual	
7	9/13/12	Common Carp	140	49	Individual	
7	9/13/12	Common Carp	145	55	Individual	
7	9/13/12	Common Carp	125	39	Individual	
7	9/13/12	Common Carp	150	57	Individual	
7	9/13/12	Common Carp	65	6	Individual	
7	9/13/12	Common Carp	420	1300	Individual	
7	9/13/12	Common Carp	375	1100	Individual	
7	9/13/12	Common Carp	670	4100	Individual	
7	9/13/12	Common Carp	640	3800	Individual	
7	9/13/12	Common Carp	515	2000	Individual	
7	9/13/12	Common Carp	640	4300	Individual	E
7	9/13/12	Common Carp	540	2500	Individual	
7	9/13/12	Channel Catfish	65	3	Individual	
7	9/13/12	Channel Catfish	140	24	Individual	
7	9/13/12	Channel Catfish	115	15	Individual	
7	9/13/12	Channel Catfish	185	54	Individual	
7	9/13/12	Channel Catfish	165	38	Individual	
7	9/13/12	Channel Catfish	50	1	Individual	
7	9/13/12	Channel Catfish	605	2400	Individual	
7	9/13/12	Channel Catfish	570	2200	Individual	
7	9/13/12	Channel Catfish	465	800	Individual	
7	9/13/12	Channel Catfish	370	325	Individual	
7	9/13/12	Channel Catfish	710	3900	Individual	
7	9/13/12	Channel Catfish	520	1150	Individual	
7	9/13/12	Channel Catfish	430	725	Individual	
7	9/13/12	Channel Catfish	355	380	Individual	
7	9/13/12	Channel Catfish	390	550	Individual	
7	9/13/12	Goldeye	335	300	Individual	
7	9/13/12	Shorthead Redhorse	425	800	Individual	
7	9/13/12	Sauger	370	350	Individual	
7	9/13/12	Walleye	265	125	Individual	
7	9/13/12	Walleye	285	125	Individual	
7	9/13/12	Walleye	295	175	Individual	
7	9/13/12	Fathead Minnow	55	7	Batch	
7	9/13/12	Fathead Minnow	45	7	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
7	9/13/12	Fathead Minnow	30	7	Batch	
7	9/13/12	Fathead Minnow	45	7	Batch	
7	9/13/12	Fathead Minnow	45	7	Batch	
7	9/13/12	Fathead Minnow	50	7	Batch	
7	9/13/12	Fathead Minnow	45	7	Batch	
7	9/13/12	Fathead Minnow	45	7	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	
7	9/13/12	Spotfin Shiner	65	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	35	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	35	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	60	136	Batch	
7	9/13/12	Spotfin Shiner	60	136	Batch	
7	9/13/12	Spotfin Shiner	55	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	55	136	Batch	
7	9/13/12	Spotfin Shiner	35	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	60	136	Batch	
7	9/13/12	Spotfin Shiner	60	136	Batch	
7	9/13/12	Spotfin Shiner	70	136	Batch	
7	9/13/12	Spotfin Shiner	60	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	65	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	55	136	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	65	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	60	136	Batch	
7	9/13/12	Spotfin Shiner	60	136	Batch	
7	9/13/12	Spotfin Shiner	55	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	35	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	50	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	30	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	25	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Spotfin Shiner	40	136	Batch	
7	9/13/12	Spotfin Shiner	45	136	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	45	38	Batch	
7	9/13/12	Sand Shiner	45	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	40	38	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	35	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	40	38	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	40	38	Batch	
7	9/13/12	Sand Shiner	40	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	45	38	Batch	
7	9/13/12	Sand Shiner	45	38	Batch	
7	9/13/12	Sand Shiner	45	38	Batch	
7	9/13/12	Sand Shiner	35	38	Batch	
7	9/13/12	Sand Shiner	35	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	45	38	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	40	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	45	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	50	38	Batch	
7	9/13/12	Sand Shiner	40	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Sand Shiner	30	38	Batch	
7	9/13/12	Sand Shiner	25	38	Batch	
7	9/13/12	Trout Perch	65	3	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
7	9/13/12	Stonecat	75	5	Individual	
7	9/13/12	Orangespotted Sunfish	50	214	Batch	
7	9/13/12	Orangespotted Sunfish	60	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	50	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	50	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	50	214	Batch	
7	9/13/12	Orangespotted Sunfish	55	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	60	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	20	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	60	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	20	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	20	214	Batch	
7	9/13/12	Orangespotted Sunfish	20	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	55	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	60	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	50	214	Batch	
7	9/13/12	Orangespotted Sunfish	55	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	55	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	50	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	80	214	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
7	9/13/12	Orangespotted Sunfish	75	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	20	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	60	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	60	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	35	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	45	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
7	9/13/12	Orangespotted Sunfish	40	214	Batch	
7	9/13/12	Orangespotted Sunfish	30	214	Batch	
7	9/13/12	Orangespotted Sunfish	25	214	Batch	
8	9/12/12	Channel Catfish	585	1600	Individual	
8	9/12/12	Channel Catfish	445	800	Individual	
8	9/12/12	Channel Catfish	330	225	Individual	
8	9/12/12	Channel Catfish	355	300	Individual	
8	9/12/12	Channel Catfish	320	275	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
8	9/12/12	Channel Catfish	65	3	Individual	
8	9/12/12	Channel Catfish	55	2	Individual	
8	9/12/12	Common Carp	610	3200	Individual	
8	9/12/12	Common Carp	590	3100	Individual	
8	9/12/12	Common Carp	685	5400	Individual	
8	9/12/12	Common Carp	520	2300	Individual	
8	9/12/12	Common Carp	580	3000	Individual	
8	9/12/12	Common Carp	510	2100	Individual	
8	9/12/12	Common Carp	155	55	Individual	
8	9/12/12	Common Carp	150	65	Individual	
8	9/12/12	Common Carp	140	56	Individual	
8	9/12/12	Common Carp	160	45	Individual	
8	9/12/12	Common Carp	140	45	Individual	
8	9/12/12	Common Carp	95	13	Individual	
8	9/12/12	Common Carp	60	3	Individual	
8	9/12/12	Common Carp	55	2	Individual	
8	9/12/12	Common Carp	50	2	Individual	
8	9/12/12	Common Carp	60	3	Individual	
8	9/12/12	Common Carp	45	1	Individual	
8	9/12/12	Common Carp	40	1	Individual	
8	9/12/12	Common Carp	50	1	Individual	
8	9/12/12	Common Carp	45	1	Individual	
8	9/12/12	Common Carp	45	1	Individual	
8	9/12/12	Common Carp	50	1	Individual	
8	9/12/12	Golden Redhorse	310	300	Individual	
8	9/12/12	Shorthead Redhorse	220	130	Individual	
8	9/12/12	Quillback	170	70	Individual	
8	9/12/12	Quillback	115	20	Individual	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	60	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	60	125	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	70	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	35	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	35	125	Batch	
8	9/12/12	Orangespotted Sunfish	35	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	70	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	35	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	60	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	60	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
8	9/12/12	Orangespotted Sunfish	55	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	30	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	35	125	Batch	
8	9/12/12	Orangespotted Sunfish	30	125	Batch	
8	9/12/12	Orangespotted Sunfish	50	125	Batch	
8	9/12/12	Orangespotted Sunfish	35	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Orangespotted Sunfish	35	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	25	125	Batch	
8	9/12/12	Orangespotted Sunfish	40	125	Batch	
8	9/12/12	Orangespotted Sunfish	45	125	Batch	
8	9/12/12	Bluegill	55	3	Batch	
8	9/12/12	Bluegill	25	3	Batch	
8	9/12/12	Bluegill	30	3	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	55	35	Batch	
8	9/12/12	Fathead Minnow	40	35	Batch	
8	9/12/12	Fathead Minnow	60	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	55	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	40	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	55	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	35	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	40	35	Batch	
8	9/12/12	Fathead Minnow	40	35	Batch	
8	9/12/12	Fathead Minnow	30	35	Batch	
8	9/12/12	Fathead Minnow	35	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	40	35	Batch	
8	9/12/12	Fathead Minnow	55	35	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
8	9/12/12	Fathead Minnow	40	35	Batch	
8	9/12/12	Fathead Minnow	40	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	35	35	Batch	
8	9/12/12	Fathead Minnow	40	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	45	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	50	35	Batch	
8	9/12/12	Fathead Minnow	55	35	Batch	
8	9/12/12	Fathead Minnow	40	35	Batch	
8	9/12/12	Fathead Minnow	30	35	Batch	
8	9/12/12	Sand Shiner	60	15	Batch	
8	9/12/12	Sand Shiner	50	15	Batch	
8	9/12/12	Sand Shiner	45	15	Batch	
8	9/12/12	Sand Shiner	55	15	Batch	
8	9/12/12	Sand Shiner	55	15	Batch	
8	9/12/12	Sand Shiner	55	15	Batch	
8	9/12/12	Sand Shiner	50	15	Batch	
8	9/12/12	Sand Shiner	55	15	Batch	
8	9/12/12	Sand Shiner	40	15	Batch	
8	9/12/12	Sand Shiner	40	15	Batch	
8	9/12/12	Sand Shiner	50	15	Batch	
8	9/12/12	Sand Shiner	50	15	Batch	
8	9/12/12	Sand Shiner	45	15	Batch	
8	9/12/12	Sand Shiner	50	15	Batch	
8	9/12/12	Sand Shiner	35	15	Batch	
8	9/12/12	Sand Shiner	30	15	Batch	
8	9/12/12	Spotfin Shiner	70	22	Batch	
8	9/12/12	Spotfin Shiner	70	22	Batch	
8	9/12/12	Spotfin Shiner	65	22	Batch	
8	9/12/12	Spotfin Shiner	70	22	Batch	
8	9/12/12	Spotfin Shiner	55	22	Batch	
8	9/12/12	Spotfin Shiner	60	22	Batch	
8	9/12/12	Spotfin Shiner	55	22	Batch	
8	9/12/12	Spotfin Shiner	60	22	Batch	
8	9/12/12	Spotfin Shiner	50	22	Batch	
8	9/12/12	Spotfin Shiner	40	22	Batch	
8	9/12/12	Spotfin Shiner	40	22	Batch	
9	9/14/12	Common Carp	645	4100	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Common Carp	600	3300	Individual	
9	9/14/12	Common Carp	645	4200	Individual	
9	9/14/12	Common Carp	635	3900	Individual	
9	9/14/12	Common Carp	60	3	Individual	
9	9/14/12	Common Carp	60	3	Individual	
9	9/14/12	Common Carp	65	4	Individual	
9	9/14/12	Common Carp	60	3	Individual	
9	9/14/12	Common Carp	80	8	Individual	
9	9/14/12	Common Carp	50	2	Individual	
9	9/14/12	Common Carp	55	2	Individual	
9	9/14/12	Common Carp	55	2	Individual	
9	9/14/12	Common Carp	60	4	Individual	
9	9/14/12	Common Carp	55	2	Individual	
9	9/14/12	Common Carp	60	4	Individual	
9	9/14/12	Common Carp	100	12	Individual	
9	9/14/12	Common Carp	55	2	Individual	
9	9/14/12	Common Carp	60	3	Individual	
9	9/14/12	Common Carp	60	3	Individual	
9	9/14/12	Common Carp	60	3	Individual	
9	9/14/12	Common Carp	50	2	Individual	
9	9/14/12	Common Carp	60	4	Individual	
9	9/14/12	Common Carp	65	4	Individual	
9	9/14/12	Common Carp	60	3	Individual	
9	9/14/12	Common Carp	65	5	Individual	
9	9/14/12	Common Carp	85	9	Individual	
9	9/14/12	Common Carp	65	4	Individual	
9	9/14/12	Common Carp	55	2	Individual	
9	9/14/12	Common Carp	55	3	Individual	
9	9/14/12	Common Carp	55	3	Individual	
9	9/14/12	Common Carp	60	3	Individual	
9	9/14/12	Common Carp	85	9	Individual	
9	9/14/12	Common Carp	65	4	Individual	
9	9/14/12	Common Carp	60	4	Individual	
9	9/14/12	Common Carp	60	3	Individual	
9	9/14/12	Common Carp	55	3	Individual	
9	9/14/12	Common Carp	50	3	Individual	
9	9/14/12	Common Carp	65	4	Individual	
9	9/14/12	Common Carp	55	3	Individual	
9	9/14/12	Common Carp	45	2	Individual	
9	9/14/12	Common Carp	55	3	Individual	
9	9/14/12	Channel Catfish	440	900	Individual	
9	9/14/12	Channel Catfish	140	22	Individual	
9	9/14/12	Channel Catfish	120	11	Individual	
9	9/14/12	Channel Catfish	115	11	Individual	
9	9/14/12	Channel Catfish	150	25	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Channel Catfish	80	4	Individual	
9	9/14/12	Channel Catfish	60	2	Individual	
9	9/14/12	Channel Catfish	50	1	Individual	
9	9/14/12	Channel Catfish	60	2	Individual	
9	9/14/12	Channel Catfish	55	2	Individual	
9	9/14/12	Channel Catfish	55	2	Individual	
9	9/14/12	Channel Catfish	50	1	Individual	
9	9/14/12	Channel Catfish	55	2	Individual	
9	9/14/12	Channel Catfish	55	2	Individual	
9	9/14/12	Channel Catfish	45	1	Individual	
9	9/14/12	Walleye	285	200	Individual	
9	9/14/12	Walleye	240	120	Individual	
9	9/14/12	Black Crappie	220	168	Individual	
9	9/14/12	Shorthead Redhorse	100	10	Individual	
9	9/14/12	Shorthead Redhorse	100	13	Individual	
9	9/14/12	White Sucker	110	14	Individual	
9	9/14/12	White Sucker	95	9	Individual	
9	9/14/12	Stonecat	70	4	Individual	
9	9/14/12	Trout Perch	75	4	Individual	
9	9/14/12	Fathead Minnow	60	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	40	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	40	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	40	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	60	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	40	82	Batch	
9	9/14/12	Fathead Minnow	40	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	60	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	40	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	40	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	55	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	40	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	45	82	Batch	
9	9/14/12	Fathead Minnow	50	82	Batch	
9	9/14/12	Fathead Minnow	35	82	Batch	
9	9/14/12	Spotfin Shiner	55	1	Individual	
9	9/14/12	Spotfin Shiner	75	3	Individual	
9	9/14/12	Sand Shiner	55	7	Batch	
9	9/14/12	Sand Shiner	35	7	Batch	
9	9/14/12	Sand Shiner	40	7	Batch	
9	9/14/12	Sand Shiner	50	7	Batch	
9	9/14/12	Sand Shiner	40	7	Batch	
9	9/14/12	Sand Shiner	40	7	Batch	
9	9/14/12	Sand Shiner	45	7	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Sand Shiner	45	7	Batch	
9	9/14/12	Sand Shiner	40	7	Batch	
9	9/14/12	Sand Shiner	35	7	Batch	
9	9/14/12	Sand Shiner	20	7	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	70	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	65	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	80	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	80	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	65	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	55	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	20	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	85	595	Batch	
9	9/14/12	Orangespotted Sunfish	75	595	Batch	
9	9/14/12	Orangespotted Sunfish	95	595	Batch	
9	9/14/12	Orangespotted Sunfish	90	595	Batch	
9	9/14/12	Orangespotted Sunfish	90	595	Batch	
9	9/14/12	Orangespotted Sunfish	80	595	Batch	
9	9/14/12	Orangespotted Sunfish	85	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	80	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	75	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	60	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	75	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	25	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	50	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	30	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	35	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	40	595	Batch	
9	9/14/12	Orangespotted Sunfish	45	595	Batch	
9	9/14/12	Orangespotted Sunfish	125	595	Batch	
9	9/14/12	Orangespotted Sunfish	95	595	Batch	
10	9/15/12	Channel Catfish	770	5500	Individual	
10	9/15/12	Channel Catfish	675	3600	Individual	
10	9/15/12	Channel Catfish	730	4600	Individual	
10	9/15/12	Channel Catfish	460	720	Individual	
10	9/15/12	Channel Catfish	320	230	Individual	
10	9/15/12	Channel Catfish	575	2300	Individual	
10	9/15/12	Channel Catfish	415	590	Individual	
10	9/15/12	Channel Catfish	620	2600	Individual	
10	9/15/12	Channel Catfish	315	240	Individual	
10	9/15/12	Channel Catfish	580	1760	Individual	
10	9/15/12	Channel Catfish	555	1530	Individual	
10	9/15/12	Channel Catfish	470	800	Individual	
10	9/15/12	Channel Catfish	400	490	Individual	
10	9/15/12	Channel Catfish	350	320	Individual	
10	9/15/12	Channel Catfish	350	300	Individual	
10	9/15/12	Channel Catfish	350	230	Individual	
10	9/15/12	Channel Catfish	300	200	Individual	
10	9/15/12	Channel Catfish	350	300	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Channel Catfish	340	320	Individual	
10	9/15/12	Channel Catfish	350	320	Individual	
10	9/15/12	Channel Catfish	290	140	Individual	
10	9/15/12	Channel Catfish	330	240	Individual	
10	9/15/12	Channel Catfish	310	240	Individual	
10	9/15/12	Channel Catfish	380	400	Individual	
10	9/15/12	Channel Catfish	350	300	Individual	
10	9/15/12	Channel Catfish	380	380	Individual	
10	9/15/12	Channel Catfish	430	580	Individual	
10	9/15/12	Channel Catfish	320	200	Individual	
10	9/15/12	Channel Catfish	260	106	Individual	
10	9/15/12	Channel Catfish	250	100	Individual	
10	9/15/12	Channel Catfish	240	95	Individual	
10	9/15/12	Channel Catfish	270	136	Individual	
10	9/15/12	Channel Catfish	320	210	Individual	
10	9/15/12	Channel Catfish	240	100	Individual	
10	9/15/12	Channel Catfish	350	340	Individual	
10	9/15/12	Channel Catfish	220	75	Individual	
10	9/15/12	Channel Catfish	400	580	Individual	
10	9/15/12	Channel Catfish	65	1	Individual	
10	9/15/12	Channel Catfish	55	1	Individual	
10	9/15/12	Common Carp	560	2000	Individual	
10	9/15/12	Common Carp	360	580	Individual	
10	9/15/12	Common Carp	500	1620	Individual	
10	9/15/12	Common Carp	300	320	Individual	
10	9/15/12	Walleye	505	1100	Individual	
10	9/15/12	Walleye	415	720	Individual	
10	9/15/12	Golden Redhorse	525	510	Individual	
10	9/15/12	Golden Redhorse	75	4	Individual	
10	9/15/12	Golden Redhorse	80	7	Individual	
10	9/15/12	Shorthead Redhorse	410	760	Individual	
10	9/15/12	Shorthead Redhorse	420	620	Individual	
10	9/15/12	Shorthead Redhorse	370	610	Individual	
10	9/15/12	Shorthead Redhorse	115	14	Individual	
10	9/15/12	Shorthead Redhorse	100	11	Individual	
10	9/15/12	Shorthead Redhorse	110	13	Individual	
10	9/15/12	White Bass	370	460	Individual	
10	9/15/12	Quillback	450	1100	Individual	
10	9/15/12	Quillback	420	1040	Individual	
10	9/15/12	Quillback	320	400	Individual	
10	9/15/12	Quillback	270	280	Individual	
10	9/15/12	Goldeye	365	320	Individual	
10	9/15/12	Goldeye	350	360	Individual	
10	9/15/12	Goldeye	360	310	Individual	
10	9/15/12	Goldeye	320	260	Individual	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Goldeye	330	240	Individual	
10	9/15/12	Goldeye	310	220	Individual	
10	9/15/12	Goldeye	360	240	Individual	
10	9/15/12	Goldeye	320	200	Individual	
10	9/15/12	Rock Bass	250	380	Individual	
10	9/15/12	Sauger	325	210	Individual	
10	9/15/12	Sauger	380	390	Individual	
10	9/15/12	Freshwater Drum	290	300	Individual	
10	9/15/12	Freshwater Drum	300	280	Individual	
10	9/15/12	Freshwater Drum	480	1300	Individual	
10	9/15/12	Freshwater Drum	310	220	Individual	
10	9/15/12	Freshwater Drum	220	100	Individual	
10	9/15/12	Freshwater Drum	220	100	Individual	
10	9/15/12	Black Bullhead	130	30	Individual	
10	9/15/12	Black Bullhead	125	25	Individual	
10	9/15/12	Spotfin Shiner	50	44	Batch	
10	9/15/12	Spotfin Shiner	40	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	45	44	Batch	
10	9/15/12	Spotfin Shiner	60	44	Batch	
10	9/15/12	Spotfin Shiner	50	44	Batch	
10	9/15/12	Spotfin Shiner	60	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	70	44	Batch	
10	9/15/12	Spotfin Shiner	60	44	Batch	
10	9/15/12	Spotfin Shiner	45	44	Batch	
10	9/15/12	Spotfin Shiner	55	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	50	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	25	44	Batch	
10	9/15/12	Spotfin Shiner	60	44	Batch	
10	9/15/12	Spotfin Shiner	50	44	Batch	
10	9/15/12	Spotfin Shiner	75	44	Batch	
10	9/15/12	Spotfin Shiner	60	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	40	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	45	44	Batch	
10	9/15/12	Spotfin Shiner	50	44	Batch	
10	9/15/12	Spotfin Shiner	40	44	Batch	
10	9/15/12	Spotfin Shiner	40	44	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	40	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	45	44	Batch	
10	9/15/12	Spotfin Shiner	50	44	Batch	
10	9/15/12	Spotfin Shiner	50	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	40	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	30	44	Batch	
10	9/15/12	Spotfin Shiner	25	44	Batch	
10	9/15/12	Spotfin Shiner	55	44	Batch	
10	9/15/12	Spotfin Shiner	35	44	Batch	
10	9/15/12	Spotfin Shiner	40	44	Batch	
10	9/15/12	Spotfin Shiner	25	44	Batch	
10	9/15/12	Sand Shiner	50	22	Batch	
10	9/15/12	Sand Shiner	50	22	Batch	
10	9/15/12	Sand Shiner	50	22	Batch	
10	9/15/12	Sand Shiner	30	22	Batch	
10	9/15/12	Sand Shiner	45	22	Batch	
10	9/15/12	Sand Shiner	35	22	Batch	
10	9/15/12	Sand Shiner	40	22	Batch	
10	9/15/12	Sand Shiner	45	22	Batch	
10	9/15/12	Sand Shiner	55	22	Batch	
10	9/15/12	Sand Shiner	40	22	Batch	
10	9/15/12	Sand Shiner	55	22	Batch	
10	9/15/12	Sand Shiner	60	22	Batch	
10	9/15/12	Sand Shiner	60	22	Batch	
10	9/15/12	Sand Shiner	35	22	Batch	
10	9/15/12	Sand Shiner	60	22	Batch	
10	9/15/12	Sand Shiner	50	22	Batch	
10	9/15/12	Sand Shiner	55	22	Batch	
10	9/15/12	Sand Shiner	40	22	Batch	
10	9/15/12	Sand Shiner	40	22	Batch	
10	9/15/12	Sand Shiner	40	22	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Sand Shiner	55	22	Batch	
10	9/15/12	Sand Shiner	50	22	Batch	
10	9/15/12	Sand Shiner	40	22	Batch	
10	9/15/12	Sand Shiner	40	22	Batch	
10	9/15/12	Fathead Minnow	40	2	Batch	
10	9/15/12	Fathead Minnow	40	2	Batch	
10	9/15/12	Fathead Minnow	40	2	Batch	
10	9/15/12	Fathead Minnow	40	2	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	25	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	60	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	60	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	60	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	65	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	80	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	60	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	80	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	60	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	60	431	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	85	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	70	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	65	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	55	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	50	431	Batch	
10	9/15/12	Orangespotted Sunfish	40	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	25	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	45	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
10	9/15/12	Orangespotted Sunfish	35	431	Batch	
10	9/15/12	Orangespotted Sunfish	30	431	Batch	
11	9/17/12	Channel Catfish	355	300	Individual	
11	9/17/12	Channel Catfish	290	150	Individual	
11	9/17/12	Channel Catfish	410	500	Individual	
11	9/17/12	Channel Catfish	280	125	Individual	
11	9/17/12	Channel Catfish	55	1	Individual	
11	9/17/12	Channel Catfish	280	150	Individual	
11	9/17/12	Channel Catfish	650	4000	Individual	
11	9/17/12	Channel Catfish	70	2	Individual	
11	9/17/12	Channel Catfish	65	2	Individual	
11	9/17/12	Channel Catfish	65	2	Individual	
11	9/17/12	Channel Catfish	65	2	Individual	
11	9/17/12	Quillback	450	1100	Individual	
11	9/17/12	Quillback	380	700	Individual	
11	9/17/12	Shorthead Redhorse	355	425	Individual	
11	9/17/12	Shorthead Redhorse	330	325	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
11	9/17/12	Shorthead Redhorse	375	450	Individual	L
11	9/17/12	Goldeye	310	225	Individual	
11	9/17/12	Walleye	360	275	Individual	
11	9/17/12	Smallmouth Bass	205	115	Individual	
11	9/17/12	Rock Bass	235	250	Individual	
11	9/17/12	White Bass	125	50	Individual	
11	9/17/12	White Bass	130	26	Individual	
11	9/17/12	Orangespotted Sunfish	105	19	Individual	
11	9/17/12	Orangespotted Sunfish	80	8	Individual	
11	9/17/12	Orangespotted Sunfish	70	6	Individual	
11	9/17/12	Golden Redhorse	110	17	Individual	
11	9/17/12	White Sucker	130	25	Individual	
11	9/17/12	White Sucker	75	4	Individual	
11	9/17/12	Trout Perch	70	4	Individual	
11	9/17/12	Fathead Minnow	55	2	Batch	
11	9/17/12	Fathead Minnow	45	2	Batch	
11	9/17/12	Spotfin Shiner	45	9	Batch	
11	9/17/12	Spotfin Shiner	45	9	Batch	
11	9/17/12	Spotfin Shiner	45	9	Batch	
11	9/17/12	Spotfin Shiner	65	9	Batch	
11	9/17/12	Spotfin Shiner	40	9	Batch	
11	9/17/12	Spotfin Shiner	50	9	Batch	
11	9/17/12	Spotfin Shiner	65	9	Batch	
11	9/17/12	Spotfin Shiner	40	9	Batch	
11	9/17/12	Sand Shiner	30	7	Batch	
11	9/17/12	Sand Shiner	50	7	Batch	
11	9/17/12	Sand Shiner	40	7	Batch	
11	9/17/12	Sand Shiner	40	7	Batch	
11	9/17/12	Sand Shiner	50	7	Batch	
11	9/17/12	Sand Shiner	30	7	Batch	
11	9/17/12	Sand Shiner	45	7	Batch	
11	9/17/12	Sand Shiner	35	7	Batch	
11	9/17/12	Sand Shiner	40	7	Batch	
11	9/17/12	Sand Shiner	45	7	Batch	
12	9/18/12	Channel Catfish	300	200	Individual	
12	9/18/12	Channel Catfish	480	950	Individual	
12	9/18/12	Channel Catfish	240	110	Individual	
12	9/18/12	Channel Catfish	305	200	Individual	
12	9/18/12	Channel Catfish	305	175	Individual	
12	9/18/12	Channel Catfish	335	250	Individual	
12	9/18/12	Channel Catfish	390	400	Individual	
12	9/18/12	Channel Catfish	270	150	Individual	
12	9/18/12	Channel Catfish	75	4	Individual	
12	9/18/12	Channel Catfish	60	3	Individual	
12	9/18/12	Channel Catfish	70	4	Individual	

Notes:

D - deformities   E - eroded fins   L - lesions   N - blind   P - parasites   W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
12	9/18/12	Channel Catfish	70	4	Individual	
12	9/18/12	Golden Redhorse	305	275	Individual	
12	9/18/12	Shorthead Redhorse	365	475	Individual	
12	9/18/12	Shorthead Redhorse	375	500	Individual	
12	9/18/12	Shorthead Redhorse	340	375	Individual	
12	9/18/12	Goldeye	335	275	Individual	
12	9/18/12	Goldeye	370	375	Individual	
12	9/18/12	Goldeye	325	225	Individual	
12	9/18/12	Goldeye	350	325	Individual	
12	9/18/12	White Sucker	290	200	Individual	
12	9/18/12	White Sucker	65	4	Individual	
12	9/18/12	White Sucker	80	7	Individual	
12	9/18/12	White Sucker	65	4	Individual	
12	9/18/12	White Sucker	65	4	Individual	
12	9/18/12	White Sucker	65	4	Individual	
12	9/18/12	White Sucker	60	3	Individual	
12	9/18/12	White Sucker	70	4	Individual	
12	9/18/12	White Sucker	65	4	Individual	
12	9/18/12	Walleye	130	18	Individual	
12	9/18/12	Common Carp	120	24	Individual	
12	9/18/12	White Bass	125	25	Individual	
12	9/18/12	Smallmouth Bass	95	13	Individual	
12	9/18/12	Black Crappie	135	36	Individual	
12	9/18/12	Black Crappie	65	4	Individual	
12	9/18/12	Black Crappie	55	2	Individual	
12	9/18/12	Black Crappie	55	3	Individual	
12	9/18/12	Orangespotted Sunfish	70	7	Individual	
12	9/18/12	Orangespotted Sunfish	65	6	Individual	
12	9/18/12	Black Bullhead	110	17	Individual	
12	9/18/12	Trout Perch	70	3	Individual	
12	9/18/12	Trout Perch	75	4	Individual	
12	9/18/12	Trout Perch	65	4	Individual	
12	9/18/12	Spotfin Shiner	65	47	Batch	
12	9/18/12	Spotfin Shiner	70	47	Batch	
12	9/18/12	Spotfin Shiner	55	47	Batch	
12	9/18/12	Spotfin Shiner	65	47	Batch	
12	9/18/12	Spotfin Shiner	35	47	Batch	
12	9/18/12	Spotfin Shiner	70	47	Batch	
12	9/18/12	Spotfin Shiner	60	47	Batch	
12	9/18/12	Spotfin Shiner	65	47	Batch	
12	9/18/12	Spotfin Shiner	60	47	Batch	
12	9/18/12	Spotfin Shiner	60	47	Batch	
12	9/18/12	Spotfin Shiner	55	47	Batch	
12	9/18/12	Spotfin Shiner	40	47	Batch	
12	9/18/12	Spotfin Shiner	45	47	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
12	9/18/12	Spotfin Shiner	45	47	Batch	
12	9/18/12	Spotfin Shiner	45	47	Batch	
12	9/18/12	Spotfin Shiner	70	47	Batch	
12	9/18/12	Spotfin Shiner	50	47	Batch	
12	9/18/12	Spotfin Shiner	30	47	Batch	
12	9/18/12	Spotfin Shiner	35	47	Batch	
12	9/18/12	Spotfin Shiner	50	47	Batch	
12	9/18/12	Spotfin Shiner	50	47	Batch	
12	9/18/12	Spotfin Shiner	60	47	Batch	
12	9/18/12	Spotfin Shiner	50	47	Batch	
12	9/18/12	Spotfin Shiner	40	47	Batch	
12	9/18/12	Spotfin Shiner	35	47	Batch	
12	9/18/12	Spotfin Shiner	45	47	Batch	
12	9/18/12	Spotfin Shiner	55	47	Batch	
12	9/18/12	Spotfin Shiner	35	47	Batch	
12	9/18/12	Spotfin Shiner	40	47	Batch	
12	9/18/12	Spotfin Shiner	40	47	Batch	
12	9/18/12	Spotfin Shiner	45	47	Batch	
12	9/18/12	Spotfin Shiner	45	47	Batch	
12	9/18/12	Spotfin Shiner	35	47	Batch	
12	9/18/12	Spotfin Shiner	40	47	Batch	
12	9/18/12	Spotfin Shiner	30	47	Batch	
12	9/18/12	Spotfin Shiner	50	47	Batch	
12	9/18/12	Spotfin Shiner	25	47	Batch	
12	9/18/12	Spotfin Shiner	65	47	Batch	
12	9/18/12	Spotfin Shiner	60	47	Batch	
12	9/18/12	Sand Shiner	45	23	Batch	
12	9/18/12	Sand Shiner	60	23	Batch	
12	9/18/12	Sand Shiner	35	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	30	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	45	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	55	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	45	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	55	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	30	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	50	23	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	45	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	25	23	Batch	
12	9/18/12	Sand Shiner	25	23	Batch	
12	9/18/12	Sand Shiner	30	23	Batch	
12	9/18/12	Sand Shiner	25	23	Batch	
12	9/18/12	Sand Shiner	35	23	Batch	
12	9/18/12	Sand Shiner	45	23	Batch	
12	9/18/12	Sand Shiner	45	23	Batch	
12	9/18/12	Sand Shiner	50	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	35	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	35	23	Batch	
12	9/18/12	Sand Shiner	45	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	35	23	Batch	
12	9/18/12	Sand Shiner	30	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	30	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Sand Shiner	35	23	Batch	
12	9/18/12	Sand Shiner	25	23	Batch	
12	9/18/12	Sand Shiner	35	23	Batch	
12	9/18/12	Sand Shiner	30	23	Batch	
12	9/18/12	Sand Shiner	40	23	Batch	
12	9/18/12	Fathead Minnow	70	13	Batch	
12	9/18/12	Fathead Minnow	50	13	Batch	
12	9/18/12	Fathead Minnow	50	13	Batch	
12	9/18/12	Fathead Minnow	45	13	Batch	
12	9/18/12	Fathead Minnow	45	13	Batch	
12	9/18/12	Fathead Minnow	55	13	Batch	
12	9/18/12	Fathead Minnow	50	13	Batch	
12	9/18/12	Fathead Minnow	45	13	Batch	
13	9/16/12	Channel Catfish	310	210	Individual	
13	9/16/12	Channel Catfish	360	340	Individual	
13	9/16/12	Channel Catfish	260	120	Individual	
13	9/16/12	Channel Catfish	410	500	Individual	
13	9/16/12	Channel Catfish	440	800	Individual	
13	9/16/12	Channel Catfish	240	110	Individual	
13	9/16/12	Channel Catfish	520	2000	Individual	
13	9/16/12	Channel Catfish	70	4	Individual	
13	9/16/12	Channel Catfish	55	2	Individual	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
13	9/16/12	Channel Catfish	50	2	Individual	
13	9/16/12	Channel Catfish	45	1	Individual	
13	9/16/12	Channel Catfish	55	2	Individual	
13	9/16/12	Channel Catfish	40	1	Individual	
13	9/16/12	Goldeye	330	280	Individual	
13	9/16/12	Goldeye	330	280	Individual	
13	9/16/12	Goldeye	320	250	Individual	
13	9/16/12	Shorthead Redhorse	340	380	Individual	
13	9/16/12	Shorthead Redhorse	340	400	Individual	
13	9/16/12	Shorthead Redhorse	300	280	Individual	
13	9/16/12	Shorthead Redhorse	300	260	Individual	
13	9/16/12	Shorthead Redhorse	290	240	Individual	
13	9/16/12	Shorthead Redhorse	290	280	Individual	
13	9/16/12	Shorthead Redhorse	65	3	Individual	
13	9/16/12	Shorthead Redhorse	70	4	Individual	
13	9/16/12	Shorthead Redhorse	65	3	Individual	
13	9/16/12	Walleye	240	120	Individual	
13	9/16/12	Walleye	135	20	Individual	
13	9/16/12	Common Carp	640	3700	Individual	
13	9/16/12	Black Crappie	50	10	Batch	
13	9/16/12	Black Crappie	65	10	Batch	
13	9/16/12	Black Crappie	60	10	Batch	
13	9/16/12	Orangespotted Sunfish	70	13	Batch	
13	9/16/12	Orangespotted Sunfish	60	13	Batch	
13	9/16/12	Golden Redhorse	60	8	Batch	
13	9/16/12	Golden Redhorse	55	8	Batch	
13	9/16/12	Golden Redhorse	50	8	Batch	
13	9/16/12	Fathead Minnow	50	10	Batch	
13	9/16/12	Fathead Minnow	55	10	Batch	
13	9/16/12	Fathead Minnow	45	10	Batch	
13	9/16/12	Fathead Minnow	55	10	Batch	
13	9/16/12	Fathead Minnow	45	10	Batch	
13	9/16/12	Sand Shiner	40	15	Batch	
13	9/16/12	Sand Shiner	25	15	Batch	
13	9/16/12	Sand Shiner	25	15	Batch	
13	9/16/12	Sand Shiner	25	15	Batch	
13	9/16/12	Sand Shiner	35	15	Batch	
13	9/16/12	Sand Shiner	40	15	Batch	
13	9/16/12	Sand Shiner	40	15	Batch	
13	9/16/12	Sand Shiner	20	15	Batch	
13	9/16/12	Sand Shiner	25	15	Batch	
13	9/16/12	Sand Shiner	25	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	40	15	Batch	
13	9/16/12	Sand Shiner	20	15	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	35	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	25	15	Batch	
13	9/16/12	Sand Shiner	35	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	45	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	25	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	35	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	45	15	Batch	
13	9/16/12	Sand Shiner	30	15	Batch	
13	9/16/12	Sand Shiner	25	15	Batch	
13	9/16/12	Sand Shiner	40	15	Batch	
13	9/16/12	Spotfin Shiner	25	16	Batch	
13	9/16/12	Spotfin Shiner	55	16	Batch	
13	9/16/12	Spotfin Shiner	60	16	Batch	
13	9/16/12	Spotfin Shiner	50	16	Batch	
13	9/16/12	Spotfin Shiner	65	16	Batch	
13	9/16/12	Spotfin Shiner	65	16	Batch	
13	9/16/12	Spotfin Shiner	35	16	Batch	
13	9/16/12	Spotfin Shiner	55	16	Batch	
13	9/16/12	Spotfin Shiner	30	16	Batch	
13	9/16/12	Spotfin Shiner	55	16	Batch	
14	9/19/12	Goldeye	355	325	Individual	
14	9/19/12	Goldeye	320	250	Individual	
14	9/19/12	Goldeye	305	200	Individual	
14	9/19/12	Goldeye	325	225	Individual	
14	9/19/12	Goldeye	320	200	Individual	
14	9/19/12	Goldeye	330	225	Individual	
14	9/19/12	Goldeye	320	200	Individual	
14	9/19/12	Goldeye	315	200	Individual	
14	9/19/12	Goldeye	320	225	Individual	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
14	9/19/12	Goldeye	340	260	Individual	
14	9/19/12	Goldeye	330	250	Individual	
14	9/19/12	Goldeye	310	225	Individual	
14	9/19/12	Goldeye	320	200	Individual	
14	9/19/12	Goldeye	330	225	Individual	
14	9/19/12	Goldeye	310	200	Individual	
14	9/19/12	Goldeye	310	200	Individual	
14	9/19/12	Goldeye	355	325	Individual	
14	9/19/12	Goldeye	360	325	Individual	
14	9/19/12	Goldeye	340	250	Individual	
14	9/19/12	Goldeye	315	225	Individual	
14	9/19/12	Goldeye	325	275	Individual	
14	9/19/12	Channel Catfish	390	400	Individual	
14	9/19/12	Channel Catfish	515	1225	Individual	
14	9/19/12	Channel Catfish	375	375	Individual	
14	9/19/12	Channel Catfish	355	300	Individual	
14	9/19/12	Channel Catfish	245	105	Individual	
14	9/19/12	Channel Catfish	55	2	Individual	
14	9/19/12	Channel Catfish	50	1	Individual	
14	9/19/12	Shorthead Redhorse	400	525	Individual	
14	9/19/12	Shorthead Redhorse	390	550	Individual	
14	9/19/12	Shorthead Redhorse	385	525	Individual	
14	9/19/12	Walleye	420	625	Individual	
14	9/19/12	Sauger	235	114	Individual	
14	9/19/12	Common Carp	495	1750	Individual	
14	9/19/12	Common Carp	340	625	Individual	
14	9/19/12	White Bass	130	26	Individual	
14	9/19/12	Orangespotted Sunfish	70	16	Batch	
14	9/19/12	Orangespotted Sunfish	45	16	Batch	
14	9/19/12	Orangespotted Sunfish	60	16	Batch	
14	9/19/12	Orangespotted Sunfish	45	16	Batch	
14	9/19/12	Orangespotted Sunfish	35	16	Batch	
14	9/19/12	Orangespotted Sunfish	35	16	Batch	
14	9/19/12	Orangespotted Sunfish	35	16	Batch	
14	9/19/12	Quillback	115	15	Individual	
14	9/19/12	Quillback	110	17	Individual	
14	9/19/12	Quillback	105	14	Individual	
14	9/19/12	Quillback	110	16	Individual	
14	9/19/12	White Sucker	70	4	Individual	
14	9/19/12	White Sucker	70	4	Individual	
14	9/19/12	White Sucker	70	4	Individual	
14	9/19/12	White Sucker	65	3	Individual	
14	9/19/12	Trout Perch	75	5	Individual	
14	9/19/12	Trout Perch	80	6	Individual	
14	9/19/12	Sand Shiner	60	50	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	40	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	60	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	60	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	30	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	60	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	35	50	Batch	
14	9/19/12	Sand Shiner	60	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	45	50	Batch	
14	9/19/12	Sand Shiner	60	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	40	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	40	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	30	50	Batch	
14	9/19/12	Sand Shiner	55	50	Batch	
14	9/19/12	Sand Shiner	40	50	Batch	
14	9/19/12	Sand Shiner	50	50	Batch	
14	9/19/12	Sand Shiner	45	50	Batch	
14	9/19/12	Spotfin Shiner	65	58	Batch	
14	9/19/12	Spotfin Shiner	60	58	Batch	
14	9/19/12	Spotfin Shiner	55	58	Batch	
14	9/19/12	Spotfin Shiner	55	58	Batch	
14	9/19/12	Spotfin Shiner	50	58	Batch	
14	9/19/12	Spotfin Shiner	45	58	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
14	9/19/12	Spotfin Shiner	70	58	Batch	
14	9/19/12	Spotfin Shiner	55	58	Batch	
14	9/19/12	Spotfin Shiner	55	58	Batch	
14	9/19/12	Spotfin Shiner	35	58	Batch	
14	9/19/12	Spotfin Shiner	50	58	Batch	
14	9/19/12	Spotfin Shiner	60	58	Batch	
14	9/19/12	Spotfin Shiner	25	58	Batch	
14	9/19/12	Spotfin Shiner	50	58	Batch	
14	9/19/12	Spotfin Shiner	65	58	Batch	
14	9/19/12	Spotfin Shiner	50	58	Batch	
14	9/19/12	Spotfin Shiner	60	58	Batch	
14	9/19/12	Spotfin Shiner	50	58	Batch	
14	9/19/12	Spotfin Shiner	50	58	Batch	
14	9/19/12	Spotfin Shiner	45	58	Batch	
14	9/19/12	Spotfin Shiner	60	58	Batch	
14	9/19/12	Spotfin Shiner	55	58	Batch	
14	9/19/12	Spotfin Shiner	50	58	Batch	
14	9/19/12	Spotfin Shiner	55	58	Batch	
14	9/19/12	Spotfin Shiner	50	58	Batch	
14	9/19/12	Spotfin Shiner	60	58	Batch	
14	9/19/12	Spotfin Shiner	55	58	Batch	
14	9/19/12	Spotfin Shiner	45	58	Batch	
14	9/19/12	Spotfin Shiner	70	58	Batch	
14	9/19/12	Spotfin Shiner	40	58	Batch	
14	9/19/12	Spotfin Shiner	60	58	Batch	
14	9/19/12	Spotfin Shiner	65	58	Batch	
14	9/19/12	Spotfin Shiner	50	58	Batch	
14	9/19/12	Spotfin Shiner	55	58	Batch	
14	9/19/12	Spotfin Shiner	65	58	Batch	
14	9/19/12	Spotfin Shiner	45	58	Batch	
14	9/19/12	Spotfin Shiner	40	58	Batch	
14	9/19/12	Spotfin Shiner	45	58	Batch	
14	9/19/12	Spotfin Shiner	60	58	Batch	
14	9/19/12	Spotfin Shiner	30	58	Batch	
14	9/19/12	Spotfin Shiner	30	58	Batch	
14	9/19/12	Spotfin Shiner	25	58	Batch	
14	9/19/12	Spotfin Shiner	40	58	Batch	
14	9/19/12	Fathead Minnow	35	13	Batch	
14	9/19/12	Fathead Minnow	45	13	Batch	
14	9/19/12	Fathead Minnow	45	13	Batch	
14	9/19/12	Fathead Minnow	50	13	Batch	
14	9/19/12	Fathead Minnow	60	13	Batch	
14	9/19/12	Fathead Minnow	40	13	Batch	
14	9/19/12	Fathead Minnow	45	13	Batch	
14	9/19/12	Fathead Minnow	30	13	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
14	9/19/12	Fathead Minnow	45	13	Batch	
14	9/19/12	Fathead Minnow	50	13	Batch	
14	9/19/12	Fathead Minnow	50	13	Batch	
14	9/19/12	Fathead Minnow	55	13	Batch	
14	9/19/12	Fathead Minnow	60	13	Batch	
14	9/19/12	Fathead Minnow	70	13	Batch	
15	9/20/12	Channel Catfish	400	500	Individual	
15	9/20/12	Channel Catfish	345	250	Individual	
15	9/20/12	Channel Catfish	485	925	Individual	
15	9/20/12	Channel Catfish	595	1750	Individual	
15	9/20/12	Channel Catfish	570	1700	Individual	
15	9/20/12	Channel Catfish	290	130	Individual	
15	9/20/12	Channel Catfish	550	1475	Individual	
15	9/20/12	Channel Catfish	465	900	Individual	
15	9/20/12	Channel Catfish	50	2	Individual	
15	9/20/12	Channel Catfish	70	3	Individual	
15	9/20/12	Channel Catfish	65	2	Individual	
15	9/20/12	Channel Catfish	75	4	Individual	
15	9/20/12	Channel Catfish	55	2	Individual	
15	9/20/12	Goldeye	325	250	Individual	
15	9/20/12	Goldeye	310	175	Individual	
15	9/20/12	Goldeye	295	175	Individual	
15	9/20/12	Goldeye	325	250	Individual	
15	9/20/12	White Sucker	350	325	Individual	
15	9/20/12	White Sucker	60	4	Individual	
15	9/20/12	White Sucker	60	3	Individual	
15	9/20/12	White Sucker	60	3	Individual	
15	9/20/12	White Sucker	55	2	Individual	
15	9/20/12	Walleye	235	115	Individual	
15	9/20/12	Quillback	120	24	Individual	
15	9/20/12	Orangespotted Sunfish	40	5	Batch	
15	9/20/12	Orangespotted Sunfish	30	5	Batch	
15	9/20/12	Orangespotted Sunfish	30	5	Batch	
15	9/20/12	Orangespotted Sunfish	35	5	Batch	
15	9/20/12	Orangespotted Sunfish	30	5	Batch	
15	9/20/12	Orangespotted Sunfish	30	5	Batch	
15	9/20/12	Orangespotted Sunfish	25	5	Batch	
15	9/20/12	Orangespotted Sunfish	30	5	Batch	
15	9/20/12	Orangespotted Sunfish	25	5	Batch	
15	9/20/12	Orangespotted Sunfish	30	5	Batch	
15	9/20/12	Orangespotted Sunfish	25	5	Batch	
15	9/20/12	Trout Perch	70	2	Individual	
15	9/20/12	Trout Perch	65	2	Individual	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	35	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	30	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	60	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	60	86	Batch	
15	9/20/12	Sand Shiner	60	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	60	86	Batch	
15	9/20/12	Sand Shiner	30	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	30	86	Batch	
15	9/20/12	Sand Shiner	35	86	Batch	
15	9/20/12	Sand Shiner	60	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	60	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	25	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	35	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	60	86	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	30	86	Batch	
15	9/20/12	Sand Shiner	35	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	35	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	60	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	60	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Sand Shiner	50	86	Batch	
15	9/20/12	Sand Shiner	45	86	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
15	9/20/12	Sand Shiner	55	86	Batch	
15	9/20/12	Sand Shiner	30	86	Batch	
15	9/20/12	Sand Shiner	40	86	Batch	
15	9/20/12	Spotfin Shiner	75	82	Batch	
15	9/20/12	Spotfin Shiner	65	82	Batch	
15	9/20/12	Spotfin Shiner	75	82	Batch	
15	9/20/12	Spotfin Shiner	40	82	Batch	
15	9/20/12	Spotfin Shiner	35	82	Batch	
15	9/20/12	Spotfin Shiner	30	82	Batch	
15	9/20/12	Spotfin Shiner	45	82	Batch	
15	9/20/12	Spotfin Shiner	60	82	Batch	
15	9/20/12	Spotfin Shiner	65	82	Batch	
15	9/20/12	Spotfin Shiner	65	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	30	82	Batch	
15	9/20/12	Spotfin Shiner	30	82	Batch	
15	9/20/12	Spotfin Shiner	60	82	Batch	
15	9/20/12	Spotfin Shiner	45	82	Batch	
15	9/20/12	Spotfin Shiner	65	82	Batch	
15	9/20/12	Spotfin Shiner	70	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	45	82	Batch	
15	9/20/12	Spotfin Shiner	60	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	40	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	60	82	Batch	
15	9/20/12	Spotfin Shiner	60	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	45	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	35	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	60	82	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	60	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	40	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	45	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	55	82	Batch	
15	9/20/12	Spotfin Shiner	45	82	Batch	
15	9/20/12	Spotfin Shiner	35	82	Batch	
15	9/20/12	Spotfin Shiner	60	82	Batch	
15	9/20/12	Spotfin Shiner	50	82	Batch	
15	9/20/12	Spotfin Shiner	60	82	Batch	
15	9/20/12	Fathead Minnow	55	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	60	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	55	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	55	51	Batch	
15	9/20/12	Fathead Minnow	55	51	Batch	
15	9/20/12	Fathead Minnow	60	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	55	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	50	51	Batch	
15	9/20/12	Fathead Minnow	45	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
15	9/20/12	Fathead Minnow	40	51	Batch	
16	8/13/12	Common Carp	640	3600	Individual	
16	8/13/12	Common Carp	111	<25	Individual	
16	8/13/12	Rock Bass	91	<25	Individual	
16	8/13/12	Rock Bass	169	90	Individual	
16	8/13/12	Orangespotted Sunfish	35	<25	Batch	
16	8/13/12	Orangespotted Sunfish	30	<25	Batch	
16	8/13/12	Spotfin Shiner	55	<25	Batch	
16	8/13/12	Spotfin Shiner	36	<25	Batch	
16	9/5/12	Channel Catfish	465	1025	Individual	
16	9/5/12	Quillback	390	750	Individual	
16	9/5/12	Black Redhorse	510	1425	Individual	
16	9/5/12	Common Carp	720	5400	Individual	E
16	9/5/12	Common Carp	500	1725	Individual	
16	9/5/12	Common Carp	110	19	Individual	
16	9/5/12	Common Carp	75	5	Individual	
16	9/5/12	Common Carp	75	7	Individual	
16	9/5/12	Common Carp	70	6	Individual	
16	9/5/12	Common Carp	65	3	Individual	
16	9/5/12	White Sucker	325	375	Individual	
16	9/5/12	White Sucker	245	120	Individual	
16	9/5/12	White Sucker	90	12	Individual	
16	9/5/12	White Sucker	85	7	Individual	
16	9/5/12	White Sucker	85	10	Individual	
16	9/5/12	Bluegill	125	61	Individual	EP
16	9/5/12	Rock Bass	75	21	Individual	
16	9/5/12	Rock Bass	95	19	Individual	
16	9/5/12	Rock Bass	90	15	Individual	
16	9/5/12	Rock Bass	90	21	Individual	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
16	9/5/12	Orangespotted Sunfish	85	12	Individual	
16	9/5/12	Orangespotted Sunfish	85	13	Individual	
16	9/5/12	Orangespotted Sunfish	70	6	Individual	
16	9/5/12	Orangespotted Sunfish	85	11	Individual	
16	9/5/12	Orangespotted Sunfish	70	5	Individual	
16	9/5/12	Orangespotted Sunfish	25	56	Batch	
16	9/5/12	Orangespotted Sunfish	40	56	Batch	
16	9/5/12	Orangespotted Sunfish	25	56	Batch	
16	9/5/12	Orangespotted Sunfish	35	56	Batch	
16	9/5/12	Orangespotted Sunfish	45	56	Batch	
16	9/5/12	Orangespotted Sunfish	35	56	Batch	
16	9/5/12	Orangespotted Sunfish	25	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	35	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	50	56	Batch	
16	9/5/12	Orangespotted Sunfish	45	56	Batch	
16	9/5/12	Orangespotted Sunfish	35	56	Batch	
16	9/5/12	Orangespotted Sunfish	45	56	Batch	
16	9/5/12	Orangespotted Sunfish	40	56	Batch	
16	9/5/12	Orangespotted Sunfish	35	56	Batch	
16	9/5/12	Orangespotted Sunfish	40	56	Batch	
16	9/5/12	Orangespotted Sunfish	25	56	Batch	
16	9/5/12	Orangespotted Sunfish	35	56	Batch	
16	9/5/12	Orangespotted Sunfish	40	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	40	56	Batch	
16	9/5/12	Orangespotted Sunfish	45	56	Batch	
16	9/5/12	Orangespotted Sunfish	70	56	Batch	
16	9/5/12	Orangespotted Sunfish	80	56	Batch	
16	9/5/12	Orangespotted Sunfish	65	56	Batch	
16	9/5/12	Orangespotted Sunfish	50	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	40	56	Batch	
16	9/5/12	Orangespotted Sunfish	35	56	Batch	
16	9/5/12	Orangespotted Sunfish	35	56	Batch	
16	9/5/12	Orangespotted Sunfish	40	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	35	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	25	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	30	56	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
16	9/5/12	Orangespotted Sunfish	30	56	Batch	
16	9/5/12	Orangespotted Sunfish	25	56	Batch	
16	9/5/12	Shorthead Redhorse	105	13	Individual	EW
16	9/5/12	Trout Perch	65	2	Individual	
16	9/5/12	Trout Perch	70	3	Individual	
16	9/5/12	Spotfin Shiner	45	8	Batch	
16	9/5/12	Spotfin Shiner	65	8	Batch	
16	9/5/12	Spotfin Shiner	55	8	Batch	
16	9/5/12	Spotfin Shiner	55	8	Batch	
16	9/5/12	Spotfin Shiner	50	8	Batch	
16	9/5/12	Fathead Minnow	51	1	Batch	
16	9/5/12	Fathead Minnow	48	1	Batch	
16	9/5/12	Fathead Minnow	42	1	Batch	
16	9/5/12	Sand Shiner	61	2	Batch	
16	9/5/12	Sand Shiner	57	2	Batch	
16	9/5/12	Sand Shiner	46	2	Batch	
17	9/6/12	Black Bullhead	135	36	Individual	
17	9/6/12	Black Bullhead	110	25	Individual	
17	9/6/12	Channel Catfish	60	2	Individual	
17	9/6/12	Channel Catfish	60	2	Individual	
17	9/6/12	Channel Catfish	70	3	Individual	
17	9/6/12	Channel Catfish	75	3	Individual	
17	9/6/12	Channel Catfish	55	2	Individual	
17	9/6/12	Channel Catfish	65	2	Individual	
17	9/6/12	Channel Catfish	55	2	Individual	
17	9/6/12	Channel Catfish	80	5	Individual	
17	9/6/12	Channel Catfish	60	2	Individual	
17	9/6/12	River Carpsucker	100	14	Individual	
17	9/6/12	River Carpsucker	100	17	Individual	
17	9/6/12	River Carpsucker	110	23	Individual	
17	9/6/12	River Carpsucker	100	14	Individual	
17	9/6/12	River Carpsucker	100	15	Individual	
17	9/6/12	River Carpsucker	85	11	Individual	
17	9/6/12	River Carpsucker	110	21	Individual	
17	9/6/12	River Carpsucker	75	6	Individual	
17	9/6/12	River Carpsucker	90	12	Individual	
17	9/6/12	River Carpsucker	90	10	Individual	
17	9/6/12	River Carpsucker	95	12	Individual	
17	9/6/12	River Carpsucker	75	6	Individual	
17	9/6/12	River Carpsucker	85	8	Individual	
17	9/6/12	River Carpsucker	100	14	Individual	
17	9/6/12	River Carpsucker	95	10	Individual	
17	9/6/12	River Carpsucker	105	16	Individual	
17	9/6/12	River Carpsucker	105	14	Individual	
17	9/6/12	River Carpsucker	105	16	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
17	9/6/12	River Carpsucker	115	22	Individual	
17	9/6/12	River Carpsucker	105	14	Individual	
17	9/6/12	River Carpsucker	180	7	Individual	
17	9/6/12	River Carpsucker	100	18	Individual	
17	9/6/12	River Carpsucker	85	7	Individual	
17	9/6/12	River Carpsucker	95	12	Individual	
17	9/6/12	River Carpsucker	95	11	Individual	
17	9/6/12	River Carpsucker	100	14	Individual	
17	9/6/12	River Carpsucker	100	15	Individual	
17	9/6/12	River Carpsucker	100	12	Individual	
17	9/6/12	River Carpsucker	90	10	Individual	
17	9/6/12	River Carpsucker	60	5	Individual	
17	9/6/12	River Carpsucker	60	4	Individual	
17	9/6/12	Freshwater Drum	125	20	Individual	
17	9/6/12	Freshwater Drum	115	16	Individual	
17	9/6/12	Freshwater Drum	120	18	Individual	
17	9/6/12	Freshwater Drum	125	19	Individual	
17	9/6/12	Freshwater Drum	125	19	Individual	
17	9/6/12	Freshwater Drum	135	26	Individual	
17	9/6/12	Freshwater Drum	130	21	Individual	
17	9/6/12	Freshwater Drum	130	24	Individual	
17	9/6/12	Freshwater Drum	115	13	Individual	
17	9/6/12	Freshwater Drum	120	17	Individual	
17	9/6/12	Freshwater Drum	115	14	Individual	
17	9/6/12	Freshwater Drum	110	16	Individual	
17	9/6/12	Freshwater Drum	90	7	Individual	
17	9/6/12	White Sucker	90	7	Individual	
17	9/6/12	White Sucker	95	9	Individual	
17	9/6/12	White Sucker	95	9	Individual	
17	9/6/12	White Sucker	105	11	Individual	
17	9/6/12	White Sucker	80	6	Individual	
17	9/6/12	White Sucker	90	10	Individual	
17	9/6/12	White Sucker	90	8	Individual	
17	9/6/12	White Sucker	100	12	Individual	
17	9/6/12	White Sucker	100	11	Individual	
17	9/6/12	White Sucker	85	6	Individual	
17	9/6/12	White Sucker	90	8	Individual	
17	9/6/12	White Sucker	75	5	Individual	
17	9/6/12	White Sucker	100	12	Individual	
17	9/6/12	White Sucker	95	7	Individual	
17	9/6/12	White Sucker	150	41	Individual	
17	9/6/12	White Sucker	135	27	Individual	
17	9/6/12	White Sucker	95	11	Individual	
17	9/6/12	White Sucker	95	9	Individual	
17	9/6/12	White Sucker	105	12	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
17	9/6/12	White Sucker	100	11	Individual	
17	9/6/12	White Sucker	95	8	Individual	
17	9/6/12	White Sucker	90	10	Individual	
17	9/6/12	White Sucker	95	10	Individual	
17	9/6/12	White Sucker	95	12	Individual	
17	9/6/12	White Sucker	170	44	Individual	
17	9/6/12	White Sucker	95	11	Individual	
17	9/6/12	White Sucker	95	11	Individual	
17	9/6/12	White Sucker	90	9	Individual	
17	9/6/12	White Sucker	95	8	Individual	
17	9/6/12	White Sucker	95	11	Individual	
17	9/6/12	White Sucker	115	18	Individual	
17	9/6/12	White Sucker	85	6	Individual	
17	9/6/12	White Sucker	80	7	Individual	
17	9/6/12	White Sucker	90	8	Individual	
17	9/6/12	White Sucker	90	6	Individual	
17	9/6/12	White Sucker	95	9	Individual	
17	9/6/12	White Sucker	80	5	Individual	
17	9/6/12	White Sucker	95	10	Individual	
17	9/6/12	White Sucker	85	8	Individual	
17	9/6/12	White Sucker	95	9	Individual	
17	9/6/12	White Sucker	100	17	Individual	
17	9/6/12	White Sucker	100	14	Individual	
17	9/6/12	White Sucker	160	47	Individual	
17	9/6/12	White Sucker	85	7	Individual	
17	9/6/12	White Sucker	80	6	Individual	
17	9/6/12	White Sucker	85	7	Individual	
17	9/6/12	Trout Perch	85	8	Individual	
17	9/6/12	Trout Perch	75	4	Individual	
17	9/6/12	Trout Perch	90	8	Individual	
17	9/6/12	Trout Perch	95	7	Individual	
17	9/6/12	Trout Perch	90	7	Individual	
17	9/6/12	Trout Perch	95	9	Individual	
17	9/6/12	Trout Perch	90	7	Individual	
17	9/6/12	Trout Perch	90	7	Individual	
17	9/6/12	Trout Perch	95	9	Individual	
17	9/6/12	Trout Perch	90	8	Individual	
17	9/6/12	Trout Perch	85	7	Individual	
17	9/6/12	Trout Perch	80	5	Individual	
17	9/6/12	Trout Perch	90	7	Individual	
17	9/6/12	Trout Perch	85	8	Individual	
17	9/6/12	Trout Perch	80	5	Individual	
17	9/6/12	Trout Perch	90	8	Individual	
17	9/6/12	Trout Perch	95	8	Individual	
17	9/6/12	Trout Perch	70	5	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
17	9/6/12	Trout Perch	85	5	Individual	
17	9/6/12	Trout Perch	90	7	Individual	
17	9/6/12	Trout Perch	105	14	Individual	
17	9/6/12	Trout Perch	70	4	Individual	
17	9/6/12	Trout Perch	90	9	Individual	
17	9/6/12	Trout Perch	100	10	Individual	
17	9/6/12	Trout Perch	90	8	Individual	
17	9/6/12	Trout Perch	75	5	Individual	
17	9/6/12	Trout Perch	75	5	Individual	
17	9/6/12	Trout Perch	90	8	Individual	
17	9/6/12	Trout Perch	90	8	Individual	
17	9/6/12	Quillback	145	43	Individual	
17	9/6/12	Quillback	155	54	Individual	
17	9/6/12	Quillback	160	60	Individual	
17	9/6/12	Quillback	150	52	Individual	
17	9/6/12	Quillback	160	68	Individual	
17	9/6/12	Rock Bass	45	2	Individual	
17	9/6/12	Orangespotted Sunfish	50	2	Individual	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	41	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	42	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	33	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	52	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	54	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	52	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	54	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	58	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	42	187	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
17	9/6/12	Orangespotted Sunfish	42	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	53	187	Batch	
17	9/6/12	Orangespotted Sunfish	54	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	54	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	37	187	Batch	
17	9/6/12	Orangespotted Sunfish	51	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	53	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	52	187	Batch	
17	9/6/12	Orangespotted Sunfish	51	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	42	187	Batch	
17	9/6/12	Orangespotted Sunfish	53	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	56	187	Batch	
17	9/6/12	Orangespotted Sunfish	54	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	42	187	Batch	
17	9/6/12	Orangespotted Sunfish	44	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	52	187	Batch	
17	9/6/12	Orangespotted Sunfish	55	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	57	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	56	187	Batch	
17	9/6/12	Orangespotted Sunfish	65	187	Batch	
17	9/6/12	Orangespotted Sunfish	52	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
17	9/6/12	Orangespotted Sunfish	42	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	51	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	52	187	Batch	
17	9/6/12	Orangespotted Sunfish	55	187	Batch	
17	9/6/12	Orangespotted Sunfish	42	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	38	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	63	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	44	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	41	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	36	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	53	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	53	187	Batch	
17	9/6/12	Orangespotted Sunfish	51	187	Batch	
17	9/6/12	Orangespotted Sunfish	40	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	38	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	49	187	Batch	
17	9/6/12	Orangespotted Sunfish	49	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
17	9/6/12	Orangespotted Sunfish	38	187	Batch	
17	9/6/12	Orangespotted Sunfish	37	187	Batch	
17	9/6/12	Orangespotted Sunfish	54	187	Batch	
17	9/6/12	Orangespotted Sunfish	48	187	Batch	
17	9/6/12	Orangespotted Sunfish	44	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	52	187	Batch	
17	9/6/12	Orangespotted Sunfish	47	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	42	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	41	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	46	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	50	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	45	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Orangespotted Sunfish	41	187	Batch	
17	9/6/12	Orangespotted Sunfish	43	187	Batch	
17	9/6/12	Common Carp	125	26	Individual	
17	9/6/12	Common Carp	105	11	Individual	
17	9/6/12	Common Carp	85	11	Individual	
17	9/6/12	Common Carp	130	33	Individual	
17	9/6/12	Common Carp	75	8	Individual	
17	9/6/12	Common Carp	130	30	Individual	
17	9/6/12	Common Carp	120	25	Individual	
17	9/6/12	Common Carp	120	26	Individual	
17	9/6/12	Common Carp	160	57	Individual	
17	9/6/12	Common Carp	135	34	Individual	
17	9/6/12	Common Carp	130	28	Individual	D
17	9/6/12	Common Carp	175	80	Individual	
17	9/6/12	Common Carp	80	7	Individual	
17	9/6/12	Common Carp	120	24	Individual	
17	9/6/12	Common Carp	85	11	Individual	
17	9/6/12	Common Carp	65	4	Individual	
17	9/6/12	Common Carp	140	41	Individual	
17	9/6/12	Common Carp	145	37	Individual	
17	9/6/12	Common Carp	135	36	Individual	
17	9/6/12	Common Carp	65	5	Individual	
17	9/6/12	Common Carp	55	3	Individual	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
17	9/6/12	Common Carp	110	21	Individual	
17	9/6/12	Common Carp	120	25	Individual	
17	9/6/12	Common Carp	140	38	Individual	
17	9/6/12	Common Carp	125	27	Individual	
17	9/6/12	Common Carp	60	5	Individual	
17	9/6/12	Common Carp	120	23	Individual	
17	9/6/12	Common Carp	80	9	Individual	
17	9/6/12	Common Carp	150	52	Individual	
17	9/6/12	Common Carp	125	27	Individual	
17	9/6/12	Common Carp	130	34	Individual	
17	9/6/12	Common Carp	65	6	Individual	
17	9/6/12	Common Carp	60	3	Individual	
17	9/6/12	Common Carp	75	8	Individual	
17	9/6/12	Common Carp	130	31	Individual	
17	9/6/12	Common Carp	110	22	Individual	
17	9/6/12	Common Carp	75	8	Individual	
17	9/6/12	Common Carp	75	7	Individual	
17	9/6/12	Common Carp	155	45	Individual	
17	9/6/12	Common Carp	120	21	Individual	
17	9/6/12	Common Carp	80	7	Individual	
17	9/6/12	Common Carp	80	10	Individual	
17	9/6/12	Common Carp	85	11	Individual	
17	9/6/12	Common Carp	75	7	Individual	
17	9/6/12	Common Carp	75	7	Individual	
17	9/6/12	Common Carp	65	4	Individual	
17	9/6/12	Common Carp	75	7	Individual	
17	9/6/12	Common Carp	10	19	Individual	
17	9/6/12	Fathead Minnow	50	1	Batch	
17	9/6/12	Fathead Minnow	46	1	Batch	
17	9/6/12	Fathead Minnow	29	1	Batch	
17	9/6/12	Sand Shiner	60	32	Batch	
17	9/6/12	Sand Shiner	60	32	Batch	
17	9/6/12	Sand Shiner	63	32	Batch	
17	9/6/12	Sand Shiner	58	32	Batch	
17	9/6/12	Sand Shiner	58	32	Batch	
17	9/6/12	Sand Shiner	62	32	Batch	
17	9/6/12	Sand Shiner	57	32	Batch	
17	9/6/12	Sand Shiner	62	32	Batch	
17	9/6/12	Sand Shiner	61	32	Batch	
17	9/6/12	Sand Shiner	57	32	Batch	
17	9/6/12	Sand Shiner	57	32	Batch	
17	9/6/12	Sand Shiner	57	32	Batch	
17	9/6/12	Sand Shiner	57	32	Batch	
17	9/6/12	Sand Shiner	60	32	Batch	
17	9/6/12	Sand Shiner	67	32	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
17	9/6/12	Sand Shiner	60	32	Batch	
17	9/6/12	Sand Shiner	47	32	Batch	
17	9/6/12	Sand Shiner	59	32	Batch	
17	9/6/12	Sand Shiner	60	32	Batch	
17	9/6/12	Sand Shiner	50	32	Batch	
17	9/6/12	Sand Shiner	50	32	Batch	
17	9/6/12	Sand Shiner	62	32	Batch	
17	9/6/12	Sand Shiner	47	32	Batch	
17	9/6/12	Sand Shiner	53	32	Batch	
17	9/6/12	Sand Shiner	45	32	Batch	
17	9/6/12	Spotfin Shiner	60	48	Batch	
17	9/6/12	Spotfin Shiner	60	48	Batch	
17	9/6/12	Spotfin Shiner	30	48	Batch	
17	9/6/12	Spotfin Shiner	35	48	Batch	
17	9/6/12	Spotfin Shiner	41	48	Batch	
17	9/6/12	Spotfin Shiner	46	48	Batch	
17	9/6/12	Spotfin Shiner	55	48	Batch	
17	9/6/12	Spotfin Shiner	65	48	Batch	
17	9/6/12	Spotfin Shiner	50	48	Batch	
17	9/6/12	Spotfin Shiner	65	48	Batch	
17	9/6/12	Spotfin Shiner	60	48	Batch	
17	9/6/12	Spotfin Shiner	60	48	Batch	
17	9/6/12	Spotfin Shiner	46	48	Batch	
17	9/6/12	Spotfin Shiner	47	48	Batch	
17	9/6/12	Spotfin Shiner	50	48	Batch	
17	9/6/12	Spotfin Shiner	48	48	Batch	
17	9/6/12	Spotfin Shiner	47	48	Batch	
17	9/6/12	Spotfin Shiner	45	48	Batch	
17	9/6/12	Spotfin Shiner	44	48	Batch	
17	9/6/12	Spotfin Shiner	50	48	Batch	
17	9/6/12	Spotfin Shiner	50	48	Batch	
17	9/6/12	Spotfin Shiner	47	48	Batch	
17	9/6/12	Spotfin Shiner	49	48	Batch	
17	9/6/12	Spotfin Shiner	46	48	Batch	
17	9/6/12	Spotfin Shiner	58	48	Batch	
17	9/6/12	Spotfin Shiner	42	48	Batch	
17	9/6/12	Spotfin Shiner	44	48	Batch	
17	9/6/12	Spotfin Shiner	43	48	Batch	
17	9/6/12	Spotfin Shiner	43	48	Batch	
18	8/14/12	Black Bullhead	142	<25	Individual	
18	8/14/12	Spotfin Shiner	56	<25	Batch	
18	8/14/12	Spotfin Shiner	67	<25	Batch	
18	8/14/12	Spotfin Shiner	52	<25	Batch	
18	8/14/12	Spotfin Shiner	41	<25	Batch	
18	8/14/12	Spotfin Shiner	35	<25	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
18	8/14/12	Spotfin Shiner	57	<25	Batch	
18	8/14/12	Channel Catfish	44	<25	Batch	
18	8/14/12	Channel Catfish	44	<25	Batch	
18	8/14/12	Orangespotted Sunfish	47	<25	Individual	
18	8/14/12	Bluegill	27	<25	Individual	
18	9/5/12	Common Carp	695	5400	Individual	
18	9/5/12	Common Carp	105	18	Individual	
18	9/5/12	Common Carp	125	26	Individual	
18	9/5/12	Common Carp	105	18	Individual	
18	9/5/12	Common Carp	125	27	Individual	
18	9/5/12	Common Carp	430	1400	Individual	E
18	9/5/12	Common Carp	150	43	Individual	
18	9/5/12	Common Carp	115	23	Individual	
18	9/5/12	Common Carp	140	38	Individual	
18	9/5/12	Common Carp	125	25	Individual	
18	9/5/12	Common Carp	120	24	Individual	
18	9/5/12	Common Carp	120	20	Individual	
18	9/5/12	Common Carp	155	52	Individual	
18	9/5/12	Common Carp	120	23	Individual	
18	9/5/12	Common Carp	135	36	Individual	
18	9/5/12	Common Carp	115	21	Individual	
18	9/5/12	Common Carp	110	20	Individual	
18	9/5/12	Common Carp	125	26	Individual	
18	9/5/12	Common Carp	120	25	Individual	
18	9/5/12	Common Carp	125	24	Individual	
18	9/5/12	Common Carp	160	665	Individual	
18	9/5/12	Common Carp	125	23	Individual	
18	9/5/12	Common Carp	130	38	Individual	
18	9/5/12	Common Carp	95	12	Individual	
18	9/5/12	Common Carp	115	21	Individual	
18	9/5/12	Common Carp	60	3	Individual	
18	9/5/12	Common Carp	60	3	Individual	
18	9/5/12	Common Carp	55	4	Individual	
18	9/5/12	Common Carp	130	34	Individual	
18	9/5/12	Common Carp	105	17	Individual	
18	9/5/12	Common Carp	65	4	Individual	
18	9/5/12	Common Carp	70	6	Individual	
18	9/5/12	Common Carp	135	28	Individual	
18	9/5/12	Common Carp	60	3	Individual	
18	9/5/12	Common Carp	140	38	Individual	
18	9/5/12	Common Carp	135	33	Individual	
18	9/5/12	Common Carp	110	20	Individual	
18	9/5/12	Common Carp	110	19	Individual	
18	9/5/12	Common Carp	125	26	Individual	
18	9/5/12	Common Carp	95	11	Individual	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
18	9/5/12	Common Carp	130	29	Individual	
18	9/5/12	Common Carp	145	40	Individual	
18	9/5/12	Common Carp	120	26	Individual	
18	9/5/12	Common Carp	55	2	Individual	
18	9/5/12	Common Carp	115	15	Individual	
18	9/5/12	Common Carp	45	2	Individual	
18	9/5/12	Common Carp	50	4	Individual	
18	9/5/12	Common Carp	140	40	Individual	
18	9/5/12	Common Carp	170	74	Individual	
18	9/5/12	Common Carp	125	26	Individual	
18	9/5/12	Common Carp	130	31	Individual	
18	9/5/12	Common Carp	140	41	Individual	
18	9/5/12	Shorthead Redhorse	400	590	Individual	
18	9/5/12	Shorthead Redhorse	400	690	Individual	
18	9/5/12	Shorthead Redhorse	315	240	Individual	
18	9/5/12	Shorthead Redhorse	365	500	Individual	
18	9/5/12	Shorthead Redhorse	355	500	Individual	
18	9/5/12	Shorthead Redhorse	310	280	Individual	
18	9/5/12	Shorthead Redhorse	100	10	Individual	
18	9/5/12	Black Redhorse	460	1240	Individual	
18	9/5/12	White Sucker	390	600	Individual	
18	9/5/12	White Sucker	85	9	Individual	
18	9/5/12	Golden Redhorse	470	1200	Individual	
18	9/5/12	Black Bullhead	135	36	Individual	
18	9/5/12	Black Bullhead	125	29	Individual	
18	9/5/12	Black Bullhead	165	60	Individual	
18	9/5/12	Rock Bass	155	84	Individual	
18	9/5/12	Rock Bass	180	123	Individual	
18	9/5/12	Rock Bass	115	32	Individual	
18	9/5/12	Rock Bass	110	26	Individual	
18	9/5/12	Rock Bass	55	6	Individual	
18	9/5/12	Walleye	215	98	Individual	
18	9/5/12	Freshwater Drum	130	22	Individual	
18	9/5/12	Freshwater Drum	115	14	Individual	
18	9/5/12	Freshwater Drum	140	31	Individual	
18	9/5/12	River Carpsucker	115	23	Individual	
18	9/5/12	River Carpsucker	125	34	Individual	
18	9/5/12	River Carpsucker	80	6	Individual	
18	9/5/12	Channel Catfish	60	2	Individual	
18	9/5/12	Channel Catfish	70	4	Individual	
18	9/5/12	Channel Catfish	60	3	Individual	
18	9/5/12	Channel Catfish	60	3	Individual	
18	9/5/12	Trout Perch	80	5	Individual	
18	9/5/12	Orangespotted Sunfish	60	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
18	9/5/12	Orangespotted Sunfish	75	146	Batch	
18	9/5/12	Orangespotted Sunfish	25	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	85	146	Batch	
18	9/5/12	Orangespotted Sunfish	75	146	Batch	
18	9/5/12	Orangespotted Sunfish	75	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	75	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	55	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	80	146	Batch	
18	9/5/12	Orangespotted Sunfish	75	146	Batch	
18	9/5/12	Orangespotted Sunfish	25	146	Batch	
18	9/5/12	Orangespotted Sunfish	25	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	70	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	30	146	Batch	
18	9/5/12	Orangespotted Sunfish	30	146	Batch	
18	9/5/12	Orangespotted Sunfish	50	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	30	146	Batch	

Notes:
D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
18	9/5/12	Orangespotted Sunfish	30	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	25	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	25	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	30	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	30	146	Batch	
18	9/5/12	Orangespotted Sunfish	25	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	30	146	Batch	
18	9/5/12	Orangespotted Sunfish	45	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	35	146	Batch	
18	9/5/12	Orangespotted Sunfish	40	146	Batch	
18	9/5/12	Orangespotted Sunfish	30	146	Batch	
18	9/5/12	Spotfin Shiner	33	1	Batch	
18	9/5/12	Spotfin Shiner	41	1	Batch	
18	9/5/12	Fathead Minnow	40	54	Batch	
18	9/5/12	Fathead Minnow	38	54	Batch	
18	9/5/12	Fathead Minnow	43	54	Batch	
18	9/5/12	Fathead Minnow	39	54	Batch	
18	9/5/12	Fathead Minnow	37	54	Batch	
18	9/5/12	Fathead Minnow	40	54	Batch	
18	9/5/12	Fathead Minnow	43	54	Batch	
18	9/5/12	Fathead Minnow	46	54	Batch	
18	9/5/12	Fathead Minnow	33	54	Batch	
18	9/5/12	Fathead Minnow	38	54	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
18	9/5/12	Fathead Minnow	35	54	Batch	
18	9/5/12	Fathead Minnow	43	54	Batch	
18	9/5/12	Fathead Minnow	50	54	Batch	
18	9/5/12	Fathead Minnow	37	54	Batch	
18	9/5/12	Fathead Minnow	34	54	Batch	
18	9/5/12	Fathead Minnow	36	54	Batch	
18	9/5/12	Fathead Minnow	36	54	Batch	
18	9/5/12	Fathead Minnow	42	54	Batch	
18	9/5/12	Fathead Minnow	56	54	Batch	
18	9/5/12	Fathead Minnow	42	54	Batch	
18	9/5/12	Fathead Minnow	55	54	Batch	
18	9/5/12	Fathead Minnow	47	54	Batch	
18	9/5/12	Fathead Minnow	40	54	Batch	
18	9/5/12	Fathead Minnow	44	54	Batch	
18	9/5/12	Fathead Minnow	55	54	Batch	
18	9/5/12	Fathead Minnow	41	54	Batch	
18	9/5/12	Fathead Minnow	46	54	Batch	
18	9/5/12	Fathead Minnow	38	54	Batch	
18	9/5/12	Fathead Minnow	41	54	Batch	
18	9/5/12	Fathead Minnow	37	54	Batch	
18	9/5/12	Fathead Minnow	47	54	Batch	
18	9/5/12	Fathead Minnow	36	54	Batch	
18	9/5/12	Fathead Minnow	47	54	Batch	
18	9/5/12	Fathead Minnow	48	54	Batch	
18	9/5/12	Fathead Minnow	51	54	Batch	
18	9/5/12	Fathead Minnow	41	54	Batch	
18	9/5/12	Fathead Minnow	41	54	Batch	
18	9/5/12	Fathead Minnow	36	54	Batch	
18	9/5/12	Fathead Minnow	40	54	Batch	
18	9/5/12	Fathead Minnow	50	54	Batch	
18	9/5/12	Fathead Minnow	50	54	Batch	
18	9/5/12	Fathead Minnow	46	54	Batch	
18	9/5/12	Fathead Minnow	42	54	Batch	
18	9/5/12	Fathead Minnow	45	54	Batch	
18	9/5/12	Fathead Minnow	45	54	Batch	
18	9/5/12	Fathead Minnow	35	54	Batch	
18	9/5/12	Fathead Minnow	43	54	Batch	
18	9/5/12	Fathead Minnow	46	54	Batch	
18	9/5/12	Fathead Minnow	51	54	Batch	
18	9/5/12	Fathead Minnow	45	54	Batch	
18	9/5/12	Fathead Minnow	36	54	Batch	
18	9/5/12	Fathead Minnow	37	54	Batch	
18	9/5/12	Fathead Minnow	43	54	Batch	
18	9/5/12	Fathead Minnow	47	54	Batch	
18	9/5/12	Fathead Minnow	35	54	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Date	Species	Length (mm)	Weight (g)	Weight Type	Anomalies
18	9/5/12	Fathead Minnow	57	54	Batch	
18	9/5/12	Fathead Minnow	55	54	Batch	
18	9/5/12	Fathead Minnow	37	54	Batch	
18	9/5/12	Fathead Minnow	55	54	Batch	
18	9/5/12	Fathead Minnow	52	54	Batch	
18	9/5/12	Fathead Minnow	35	54	Batch	
18	9/5/12	Fathead Minnow	42	54	Batch	
18	9/5/12	Fathead Minnow	55	54	Batch	
18	9/5/12	Fathead Minnow	42	54	Batch	
18	9/5/12	Fathead Minnow	43	54	Batch	
18	9/5/12	Fathead Minnow	48	54	Batch	
18	9/5/12	Fathead Minnow	49	54	Batch	
18	9/5/12	Fathead Minnow	47	54	Batch	
18	9/5/12	Fathead Minnow	50	54	Batch	
18	9/5/12	Fathead Minnow	52	54	Batch	
18	9/5/12	Fathead Minnow	53	54	Batch	
18	9/5/12	Fathead Minnow	47	54	Batch	
18	9/5/12	Fathead Minnow	45	54	Batch	
18	9/5/12	Fathead Minnow	45	54	Batch	
18	9/5/12	Fathead Minnow	50	54	Batch	
18	9/5/12	Fathead Minnow	46	54	Batch	
18	9/5/12	Fathead Minnow	35	54	Batch	
18	9/5/12	Fathead Minnow	39	54	Batch	
18	9/5/12	Fathead Minnow	47	54	Batch	
18	9/5/12	Fathead Minnow	49	54	Batch	
18	9/5/12	Fathead Minnow	35	54	Batch	
18	9/5/12	Fathead Minnow	40	54	Batch	
18	9/5/12	Fathead Minnow	44	54	Batch	
18	9/5/12	Fathead Minnow	42	54	Batch	
18	9/5/12	Fathead Minnow	36	54	Batch	

Notes:

D - deformities E - eroded fins L - lesions N - blind P - parasites W - swirled scales

Appendix H - List of Fish Captured

Study Reach	Sample Date	Common name	Number of individuals of species	Min length (mm)	Max length (mm)	Bulk Weight (g)	Weight Type	Number of anomalies
21	9/13/11	Black Bullhead	20	105	160	850	Batch	0
21	9/13/11	Blackside Darter	97	45	75	195	Batch	0
21	9/13/11	Channel Catfish	21	50	600	8820	Batch	0
21	9/13/11	Common Carp	61	70	240	3725	Batch	0
21	9/13/11	Common Shiner	12	95	150	120	Batch	0
21	9/13/11	Creek Chub	84	55	160	670	Batch	0
21	9/13/11	Fathead Minnow	68	40	60	70	Batch	0
21	9/13/11	Longnose Dace	1	60	60	5	Batch	0
21	9/13/11	Rock Bass	1	175	175	400	Batch	0
21	9/13/11	Sand Shiner	58	40	65	90	Batch	0
21	9/13/11	Spotfin Shiner	56	40	105	170	Batch	0
21	9/13/11	Stonecat	1	50	50	5	Batch	0
21	9/13/11	Tadpole Madtom	13	35	85	30	Batch	0
21	9/13/11	Trout Perch	3	65	95	20	Batch	0
21	9/13/11	White Sucker	15	80	350	3075	Batch	0
22	9/12/11	Black Bullhead	17	50	230	1240	Batch	0
22	9/12/11	Black Crappie	1	95	95	40	Batch	0
22	9/12/11	Blackside Darter	8	50	65	25	Batch	0
22	9/12/11	Bluegill	11	85	100	260	Batch	0
22	9/12/11	Brown Bullhead	1	315	315	400	Batch	0
22	9/12/11	Channel Catfish	2	60	70	25	Batch	0
22	9/12/11	Common Carp	74	60	230	5320	Batch	5
22	9/12/11	Freshwater Drum	61	110	235	1600	Batch	0
22	9/12/11	Northern Pike	4	210	260	510	Batch	0
22	9/12/11	Orangespotted Sunfish	2	60	75	25	Batch	0
22	9/12/11	Quillback	16	135	240	2350	Batch	0
22	9/12/11	Sand Shiner	16	40	75	25	Batch	0
22	9/12/11	Tadpole Madtom	7	35	70	25	Batch	0
22	9/12/11	Trout Perch	19	60	90	100	Batch	0
22	9/12/11	Walleye	10	70	180	1600	Batch	1
22	9/12/11	White Bass	8	75	135	150	Batch	0
22	9/12/11	White Sucker	9	85	335	3000	Batch	0
22	9/12/11	Yellow Perch	6	65	80	25	Batch	0
23	9/14/11	Black Bullhead	53	45	150	675	Batch	0
23	9/14/11	Blackside Darter	8	50	65	10	Batch	0
23	9/14/11	Common Carp	10	100	270	550	Batch	2
23	9/14/11	Freshwater Drum	1	130	130	25	Batch	0
23	9/14/11	Green Sunfish	6	40	100	75	Batch	0
23	9/14/11	Northern Pike	3	180	470	700	Batch	0
23	9/14/11	Orangespotted Sunfish	21	60	85	150	Batch	0
23	9/14/11	Rock Bass	2	95	115	25	Batch	0
23	9/14/11	Spotfin Shiner	6	65	85	25	Batch	0
23	9/14/11	Walleye	5	125	160	100	Batch	0
23	9/14/11	White Bass	3	90	110	25	Batch	0
23	9/14/11	White Sucker	2	90	345	525	Batch	0