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Assessment of the Biological Assemblages, Water Quality, and Habitat in the Red River of the North, 2010

U.S. Mainstem Portion: Wahpeton to Pembina, ND

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MBI Technical Report 2015-7-8

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Foreword

A systematic approach to the assessment of biological assemblages, water quality, and habitat in the Red River of the North was undertaken in 2010. Fish were sampled using a single-gear sampling approach using boat mounted electrofishing methods developed and described in a Quality Assurance Project Plan (MBI 2010a). The methods were modeled after those previously used by practitioners in Midwestern large river tributaries to the upper Ohio and upper Mississippi Rivers (Emery et al. 2007; MBI 2010b). Chemical (dissolved oxygen, conductivity) and physical (temperature, qualitative habitat) data were collected alongside the fish assemblage data at each site. Macroinvertebrate assemblages were assessed using dip nets following a modification of the National Rivers and Streams Assessment (NRSA) methodology. Water quality was determined by analyses of grab samples collected at the midpoint of each site and at the same time as the biological sampling. Habitat was assessed using the Qualitative Habitat Evaluation Index (QHEI).

A principal objective of this project is the applicability of bioassessment methods for fish and macroinvertebrate assemblages in the development of tiered aquatic life use goals in the Red River of the North. The development and testing of biological assessment methods and biological criteria for large rivers is also a principal objective of the EPA National Biocriteria Program and this project is indirectly tied to that effort. This project also represents an initial testing of calibrated multimetric indices for fish (MPCA Southern Rivers fIBI) and macroinvertebrates (MPCA Prairie Forest Rivers mIBI). Lastly, an effort was made to determine the factors that determine the make-up and quality of the biological assemblages in the Red River.

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INTRODUCTION

The Midwest Biodiversity Institute (MBI) in collaboration with the North Dakota Department of Health (NDDH) and U.S. EPA, Region 8 designed and conducted a biological assessment of the fish and macroinvertebrate assemblages, water quality, and habitat as a first step to developing a conceptual and technical basis for applying biocriteria and tiered aquatic life uses (TALU; U.S. EPA 2005) in the Red River of the North (Red River) mainstem. The project was conducted in cooperation with the North Dakota Department of Health as the project sponsor and the Minnesota Pollution Control Agency (MPCA) and the International Water Institute (IWI) as key cooperators. NDDH personnel collected macroinvertebrates and sampled water chemistry in conjunction with the fish and habitat collections and the analysis of that data is also included in this report.

A cost-effective, doable, and reliable sampling method is essential to any biological assessment program. The selection of a methodology is a fundamental decision or "cornerstone" in using biological assemblages as part of an environmental monitoring and assessment effort. While a variety of possible methods and techniques are available, the choice of which one(s) to use is influenced by the objectives of the monitoring program and the conditions that exist in the particular study area or region. Regarding the former, the objective of the type of bioassessment that we employed means using methods that meet the previously described objectives (i.e., can be accomplished with reasonable cost and effort, is relatively rapid, multiple sites can be sampled each day, etc.). An important goal of this study was to utilize fish, macroinvertebrate, and habitat sampling methods that meet these criteria and which produces adequate data across a sufficiently representative cross-section of the biological assemblages at a site with a reasonable sampling effort (i.e., 2-3 hours/site). As such, this type of bioassessment is distinguished from the more resource intensive efforts that employ multiple types of sampling gear that attempt to produce estimates of population(s), standing crop, and/or a virtual inventory of all species/taxa present. The applicability of the methods and sampling design were judged against the following criteria outlined by Karr et al. (1986). Such methods should:

- monitor biotic integrity at specific sites, within river reaches, and between different sites, reaches, and rivers;
- sample and screen large numbers of sites in order to identify those that require further attention;
- assess changes in biological assemblage parameters and attributes over space and time; and,

- interpret large amounts of data from complex biological assemblages where an objective is to assess biotic integrity.

Meeting these criteria requires methods and designs that can be used to sample multiple sites during a day and tens of sites within a summer-early fall seasonal index period measured in weeks. The sampling equipment needs to be transportable and permit access to multiple points along the length of mainstem rivers. For fish, single-gear electrofishing approaches have been successfully tested and used in many parts of the U.S. and elsewhere to fulfill similar objectives (Yoder and Kulik 2003). For macroinvertebrates, a modification of the U.S. EPA National Rivers and Streams Assessment (NRSA; U.S. EPA 2008) methodology was utilized. For habitat, a qualitative assessment was used. Thus it was a primary goal of this project to test and evaluate the potential for their routine application to the Red River of the North. The Quality Assurance Project Plan (QAPP; MBI 2010a) describes all field, laboratory, and data management procedures in detail along with the rationale and methodological issues on which this study is based.

This project was originally envisioned as a result of discussions after the International Water Institute sponsored Red River of the North Ecosystem Assessment Workshop held November 2-3, 2005 in Moorhead, MN. The presentations that we heard at this conference suggested that there have been difficulties in sampling the biological assemblages of the Red River mainstem. Given our prior experiences in using fish and macroinvertebrates to assess the quality of similarly sized and larger rivers throughout Region V (Emery et al. 2007; MBI 2010b) and actually seeing the Red River while at the conference we developed a proposal to conduct an intensive biological assemblage and habitat survey of the U.S. portion of the Red River mainstem. A parallel proposal to sample the Canadian portion of the Red River was also developed, but funding for this effort did not materialize. In 2008 the U.S. EPA NRSA included sites on the Red River mainstem and selected tributaries. As a contractor for U.S. EPA, MBI sampled these sites in accordance with the NRSA protocols for fish, macroinvertebrates, periphyton, and a number of water quality and other stressor and exposure indicators. Prior to this effort the MPCA had sampled fish and macroinvertebrate using MPCA protocols (Niemela et al. 1998) and these data eventually were used to develop calibrated multimetric indices and numerical biological criteria for a class of large rivers that includes the Red River.

METHODS

Initially there was a choice of available methods and sampling designs including the National River and Streams Assessment (NRSA; U.S. EPA 2008) as the Red River had previously been sampled following these protocols. However, in keeping with the goal of the project to develop a supporting tool for the development and implementation of biocriteria and TALUs, we opted for methods that had previously been used for the same purposes in large rivers throughout the upper Ohio and upper Mississippi River basins (Emery et al. 2007; MBI 2010b). This included fixed sampling site distances of 0.5 km based on those methodologies and partially to increase the number of discrete sites that could be sampled in a field day in keeping with the preferred pollution survey type of sampling design. The NRSA employed a fundamentally

different fish sampling design with the site being based on disjunct transects and multiples of river width which required a full day to sample.

Survey Design

An intensive pollution survey design (Yoder et al. 2005) was used in the selection of sampling sites throughout the Red River mainstem (Appendix C). This spatially intensive design is employed to sample biological assemblages, habitat, and water quality in large river mainstems to comprehensively assess all major discharges, disturbances, and physical modifications. The design includes multiple sampling sites that are positioned upstream, near, and downstream from each source such that results can be analyzed and displayed in a longitudinal context. Both the spatial design and results interpretation relative to pollution sources are based on that described earlier by Bartsch (1948) and Doudoroff and Warren (1951) to facilitate the detection and quantification of pollution influences along a river (i.e., the delineation of "pollution zones"). Reaches upstream from major sources of disturbance, in areas of immediate impact and potentially acute effects, through zones of increasing or lessening degradation, and zones of recovery are sampled at multiple sites positioned at intervals ranging from 0.5-1.0 miles in near-field impact zones to 5-10 miles in far-field zones. A primary goal is to visualize the impact of specific sources and the cumulative effects of multiple sources. Additional tools based on indices like the IBI and MIwb can then be used to quantify the extent (longitudinal distance) and severity (departure from a goal or criterion) of the impact within a reach (Yoder et al. 2005).

Following this design, river segments are treated as contiguous units in order to observe how changes take place along a longitudinal continuum with respect to both natural and anthropogenic influences. In this study we included the entire U.S. portion of the Red River mainstem. Important in the delineation of multiple assessment units with such an extended study area are natural features and transitional boundaries (e.g., thermal, ecological, and geological boundaries) and clusters of anthropogenic sources (e.g., major urban/industrial areas, impoundments, etc.). Study areas generally include entire river lengths in order to capture all relevant influences, including zones of impact and recovery, and to provide a sufficient longitudinal context for interpreting the results. This design yields a detailed assessment of status, the extent and severity of biological, chemical, and physical indicator responses, and temporal changes when multiple years of sampling are included. This produces assessments of the severity (departure from the desired state) and extent (lineal extent of the departures) of biological impairments in a river (Yoder et al. 2005). We did not target specific sources directly, such as discharge mixing zones, but rather bracketed major aggregations of point sources, urban areas, and changes in habitat both natural and man-made, such that sampling sites were oftentimes positioned within 1-3 miles of each other. In the more monotypic reaches with few identifiable stressors, sampling sites occurred at 10-20 mile intervals. As such, fifty-four 0.5 km sites were sampled in 393.7 miles of the Red River in 2010.

Sampling Site Delineation

Sampling site locations were delineated using the GPS mechanism and indexed to latitude/longitude and UTM coordinates at the beginning, mid-point, and terminus of each

zone and subzone if applicable. Sites were also delineated by river mile in accordance with Minnesota DNR maps for the Red River (Appendix D). A detailed description of the river channel, habitat features, and sampling track was also recorded on the QHEI data sheet. The description of each sampling location also included proximity to a fixed local landmark such as a bridge, road, discharge outfall, railroad crossing, park, tributary, dam, etc. The field crews involved with the sampling were also noted on the field sheet with crew duties listed (boat driver, netters, crew leader, etc.).

Fish Field Sampling Procedures

Individual electrofishing sites were located along the shoreline with the most diverse habitat features in accordance with established methods (Gammon 1973, 1976; Ohio EPA 1989; Lyons et al. 2001). This is generally along the gradual outside bends of large rivers, but this is not invariable. In free-flowing habitats, a portion of each zone included run-riffle habitat in addition to shoal and pool habitats when each was available. Sampling distance was measured with a GPS unit and/or a laser range finder. When using the GPS unit each zone is measured by determining lineal distance using intermediate waypoints to account for non-linear features of the river channel and the sampling track. The sampling track was also recorded and as an indicator of the thoroughness of the sampling at each site. Exact sampling locations were determined in the field and included a representative proportion of reaches along the mainstem with respect to pollution sources, habitat modifications (i.e., mostly impounded sections behind dams, channelized and leveed reaches), and relatively unmodified, free-flowing reaches.

A boat-mounted, pulsed D.C. electrofishing apparatus was the single gear type employed in this study. This consisted of a 16’ john boat that was specifically constructed and modified for electrofishing. Electric current was converted, controlled, and regulated by a Smith-Root 5.0 GPP alternator-pulsator that produces up to 1000 volts DC at 2-20 amperes depending on the relative conductivity. The pulse configuration consists of a fast rise, slow decay wave that can be adjusted to 30, 60, or 120 Hz (pulses per second). Generally, electrofishing was conducted at 120 Hz depending on which selection produced the optimum combination of voltage and amperage output and most effectively stunned fish. This was initially determined on a trial and error basis at the beginning of each survey and the same setting held for all similar reaches. The voltage range was also selected based on what percentage of the power range produced the highest amperage readings. Generally, the high range is used at conductivity readings less than 50-100 $\mu S/cm^2$ and the low range is used at higher conductivities up to 1200 $\mu S/cm^2$. Hence all sites in the study area were sampled in the low range.

The electrode array consisted of four 8-10’ long cathodes (negative polarity; 3/4” diameter flexible steel conduit) which were suspended from the bow and 4 anodes (positive polarity) suspended from a retractable boom, the number of anodes being dependent on the conductivity of the water. Each anode consists of a 3/8” woven steel cable strand 4’ in length that are spaced equally on the boom cross member. Anodes can be added or detached as conductivity conditions change; anodes are increased at low conductivity and reduced at high

conductivity. The anodes are suspended from a retractable boom that extends 2.75 meters in front of the bow. The width of the array is 0.9 meters. Anodes and cathodes are replaced when they are lost, damaged, or become worn.

The boat electrofishing crew consisted of a boat driver, a single bow netter, and one assist netter standing behind the primary netter. All 3 crew members have nets and each can capture all fish sighted. Reasonable attempts are made to capture all fish sighted including those that appear behind the boat. Limited access to the Red River frequently necessitated launching at an upstream location and recovering at a downstream location. Put-in and take-out sampling was conducted where barriers precluded contiguous navigation.

The accepted sampling procedure is to slowly and methodically maneuver the electrofishing boat in a ***down current*** direction along the shoreline maneuvering in and around submerged cover to advantageously position the netter(s) to pick up stunned and immobilized fish. This required frequent turning, backing, shifting between forward and reverse, changing speed, etc. depending on current velocity and cover density and variability. The boat driver's task was to maneuver the electrofishing boat in a manner that positions the netters advantageously to pick up stunned and immobilized fish. The driver also monitors and adjusts the 5.0 GPP pulsator to provide the maximum yet safe operational mode in terms of voltage range, pulse setting, and amperage. In areas with extensive woody debris and submergent aquatic macrophytes, it was necessary to maneuver the boat in and out of these "pockets" of habitat and wait for fish to appear within the netters field of view. In moderately swift to fast current the procedure is to maneuver the boat with or slightly ahead of the current through the fast water sections and then return upstream to more thoroughly sample the eddies and side edges of the faster water. It is often necessary to pass over these swift water areas twice to ensure an adequate sample. Electrofishing efficiency is enhanced by keeping the boat and electric field moving with or at a slightly faster rate than the prevailing current velocity. Fish are usually oriented into the current and must turn sideways or swim into the approaching electric field to escape. As such they present an increased voltage gradient making the fish more susceptible to being immobilized by the electric current. Sampling in an upstream direction is prohibited as this compresses the electrical field towards the surface, which significantly diminishes sampling effectiveness. Although sampling effort is measured by distance, the time fished is an important indicator of adequate effort. Time fished can legitimately vary over the same distance as dictated by cover, current velocities, and the number of fish encountered. In all cases, there is a minimum time that should be spent sampling each zone regardless of the catch. In our experience this is generally in the range of 2000-2500 seconds for a 0.5 km site, but could range upwards to 3500-4500 seconds where there is extensive instream cover and slack flows.

Safety features include easily accessible toggle switches on the pulsator unit located next to the driver and a foot pedal switch operated by the primary netter. The netters wore jacket style life preservers, rubber gloves, and all crew members wore chest waders. Netters were required to wear polarized sunglasses to facilitate seeing stunned fish in the water during each daytime boat electrofishing run. Boat nets with a 2.5 m long handle and 7.62 mm Atlas mesh knotless

netting were used to capture stunned fish as they were attracted to the anode array and/or stunned within sight of the netters. A concerted effort was made to capture every fish sighted by both the netters and driver. Since the ability of the netters to see stunned and immobilized fish was partly dependent on water clarity, sampling was conducted only during periods of "normal" water clarity and flows. Periods of unusually high turbidity and high flows were avoided due to their negative influence on sampling efficiency.

Fish Sample Processing Procedures

Captured fish were immediately placed in an on-board live well for processing. Water was replaced regularly to maintain adequate dissolved oxygen levels and to minimize handling mortality. Special handling procedures were used for species of special concern. Fish not retained for voucher or other purposes were released back into the river after they were identified to species, examined for external anomalies, weighed and, if necessary, measured for total length. Every effort was made to minimize holding and handling times. The majority of captured fish were identified to species in the field; however, any uncertainty about the field identification of individual fish required their preservation for later laboratory identification. Individual fish that were too large to preserve were photographed in detail. A QA/QC sample that involved the taxonomic verification of all fish collected was accomplished at two locations following NRSA procedures (U.S. EPA 2008).

Fish vouchers were preserved in borax buffered 10% formalin and labeled by date, river, and geographic identifier (e.g., river mile). Large specimens (>100 mm) required visceral incision (lower right abdominal) to permit proper preservation of internal spaces and organs. After an initial fixation period of 3-4 weeks, specimens are washed in plain water and then transferred to increasing dilutions of non-denatured ethyl alcohol and water (35%, 50%) with a final solution of 70% ethyl alcohol. This process takes approximately 4-5 weeks to complete. Identification was performed to the species level at a minimum. Regional ichthyology keys were used. Assistance with the verification of voucher specimens was provided by The Ohio State University Museum of Biodiversity (OSUMB). Representative fish voucher specimens were retained at MBI for the purpose of confirming later identifications and at the OSUMB to serve as a permanent record. Photographs were also used to record species occurrences, particularly larger species that were not as easily preserved and stored. Photographs are maintained by MBI in an archived electronic file.

The sample from each 0.5 km electrofishing zone was processed by enumerating and recording weights by species or by three species age classes when this was distinguished. Fish weighing less than 1000 grams were weighed to the nearest gram on a spring dial scale (1000 g x 1 g) or a 1000 g hand held spring scale. Fish weighing more than 1000 grams were weighed to the nearest 25 grams on a 12 kg spring dial scale (12 kg x 50 g) or a 50 kg hand held spring scale. Species with a large number of individuals were batch weighed. Samples comprised of two or more distinct size classes of fish (e.g., y-o-y, juveniles, and adults) were processed separately. These were recorded on the field data sheet by designating an A (adult), B (1+ year), or Y (young-of-year) to the numeric species code. For example, if both adult and juvenile white suckers occurred in the same sample the adult numbers and weights were recorded as family-

species code 40-016A with juvenile numbers and weights recorded as 40-016B. Although each was listed separately on the fish data sheet they can be treated in the aggregate as a single sample of the same species in any subsequent data analyses or as distinct size class entities. The data management programs used by MBI are designed to calculate relative numbers and biomass data based on the input of weighted subsamples. Larval and/or post-larval fish measuring less than 15-20 mm in length were generally not included in the data recording as a matter of practice following the recommendations of Angermeier and Karr (1986).

The incidence of external anomalies is recorded following procedures outlined by Ohio EPA (1989) and refinements made by Sanders et al. (1999). The frequency of DELT anomalies (deformities, eroded fins and body parts, lesions, and tumors) is a good indication of chronic stress caused by biological agents, intermittent stresses, and chemical contaminants. The percentage of DELT anomalies is a metric that is included in most of the large river fish assemblage IBIs that have been developed across the U.S.

Habitat Assessment

A qualitative habitat assessment using an appropriate modification of the Qualitative Habitat Evaluation Index (QHEI; Rankin 1989; Ohio EPA 1989, 2006) for large rivers was completed by the crew leader at each electrofishing site. The QHEI is a physical habitat index designed to provide an empirical, qualitative evaluation of the lotic macrohabitat characteristics that are important to fish assemblages. The QHEI was developed as a rapid assessment tool and in recognition of the constraints associated with the practicalities of conducting a large-scale monitoring program (i.e., the need for a rapid assessment tool that yields meaningful information and which takes advantage of the knowledge and insights of experienced field biologists who are conducting biological assessments). This index has been used throughout U.S. EPA, Region V and similar habitat evaluation techniques are in widespread existence throughout the U.S. The QHEI incorporates the types and quality of bottom substrates, the types and amounts of instream cover, several characteristics of channel morphology, riparian zone extent and quality, bank stability and condition, and pool-run-riffle quality and characteristics. Slope or gradient is also factored into the QHEI score. We followed the guidance and scoring procedures outlined in Ohio EPA (1989, 2006) and Rankin (1989) with some additional modifications made specifically for large rivers by MBI.

Macroinvertebrate Field Sampling Procedures

Macroinvertebrate data were collected at each site as composite samples using a D-frame net with 500 µm mesh. Samples were collected from each of 11 transects equally distributed throughout each sampling reach as follows. Each sampling transect was a 10 m x 15 m plot, which extended 15 m from the water's edge and 5 m upstream and 5 m downstream of the center of the plot. The process for selecting the first sampling station (left or right bank) was chosen at random. The first three transects (A-C) were sampled on the same bank, followed by alternating banks, in transect pairs, for the remainder of the sampling reach (D-E, F-G, H-I, J-K) (Figure 1). All benthic samples were collected from the dominant habitat type within the 10 m

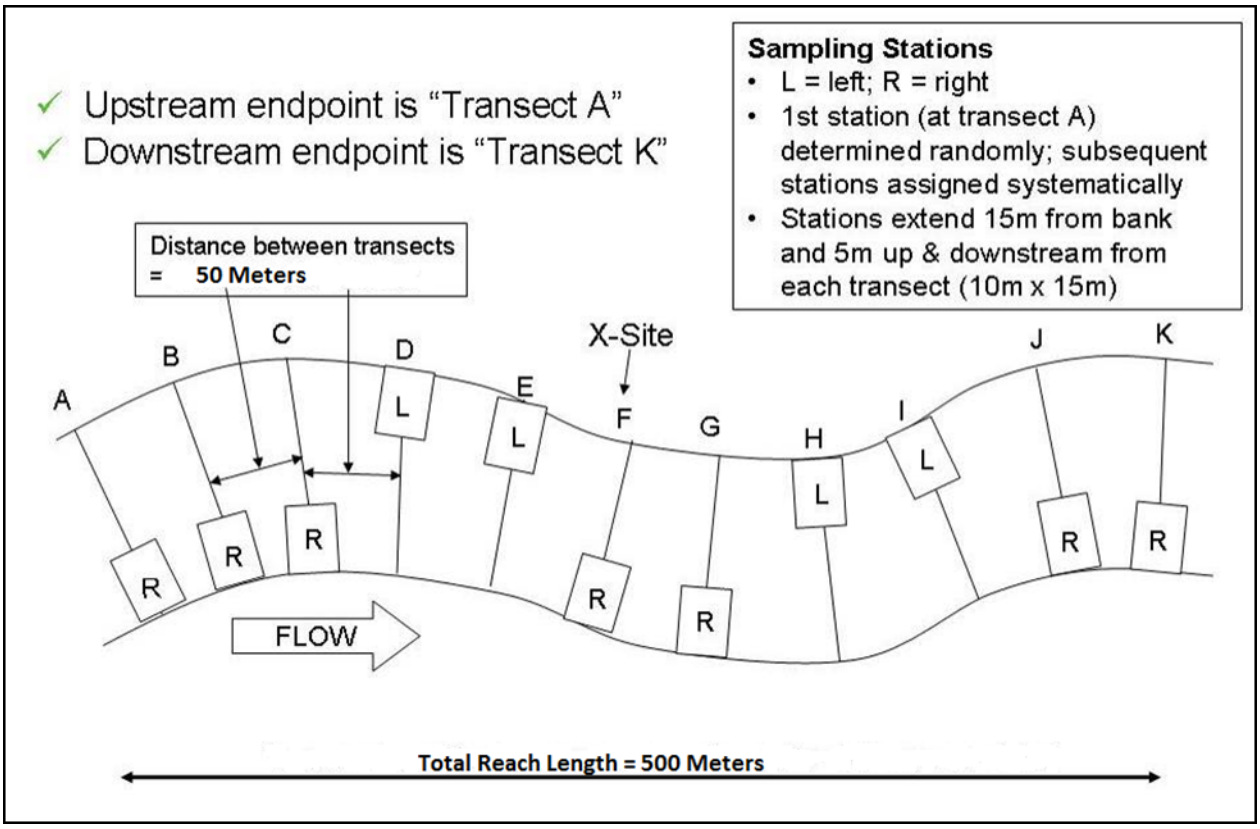


Figure 1*. The sampling process for collecting macroinvertebrate samples in the Red River mainstem. Adapted from the National Rivers and Streams Assessment field manual (U.S. EPA 2008).*

x 15 m sampling station at each transect as well as a 1 m linear sweep of the dominant habitat type.

Total sampling reach length was 500 m and it coincided with each 500 m fish sampling site. Transect samples were composited and preserved with 95% ethanol. This sampling method is a modification of the 2008-2009 National Rivers and Streams Assessment macroinvertebrate sampling protocol for non-wadeable rivers in that the site is a condensed reach length of 500 m.

Macroinvertebrate Laboratory Procedures

Laboratory processing included washing, rinsing, sub-sampling, sorting, identification, and enumeration of organisms. In cases where the sample contained large numbers of organisms, sub-sampling was employed using a 500 organism sub-sample. All samples were logged into the laboratory using standard North Dakota Department of Health procedures. Samples were rinsed in a 500 µm-mesh sieve to remove fine debris and fine sediment. Large organic material (whole leaves, twigs, algae, or macrophyte mats, etc.) were rinsed, visually inspected, and discarded. Each sample was soaked in water for 15 minutes to hydrate the organisms. Samples were gently mixed by hand while rinsing to produce a homogeneous sample.

After washing, samples were spread evenly across a pan marked with numbered grids approximately 6 cm^2. Numbered specimen vials were lined-up along the sides and top of the gridded pan to hold the sorted organisms. Organisms were preserved in 70% ethanol.

Macroinvertebrate Sample Enumeration

Grids for further sample processing were randomly selected using a deck of cards that contains numbers corresponding to the numbered grids in the pan. Organisms were picked from that square and placed in the numbered vials. Any organism that was lying over a line separating two grids was considered to be on the grid containing its head. In those instances where it was not possible to determine the location of the head (worms for instance), the organism was considered to be in the grid containing most of its body. When all organisms were removed from the selected grid, another card was drawn and the organisms were removed from that grid in the same manner. After 10 grids were picked we determined the average number of organisms per grid and determined approximately how many total grids would need to be picked to total 500 organisms. Picking was completed in the last grid even if this caused the sample to exceed 500 organisms.

Macroinvertebrate Sample Identification

Organism identifications were performed to the lowest taxonomic level practicable (genus/species preferred). In order to provide accurate taxonomic identification, midge (Chironomidae) larvae and pupae and worms (Oligochaeta) were mounted on slides. A voucher collection was also established for quality assurance purposes. Voucher collections were cataloged and placed in the North Dakota River and Stream Macroinvertebrate Collection located at Valley City State University by Dr. Andre DeLorme.

Data Management and Analysis

Data were analyzed using routines available in the Ohio ECOS data management system that was adapted for use by MBI in this and other fish and macroinvertebrate assemblage assessment projects. Ohio ECOS produces standardized data outputs and reports on fish species and macroinvertebrate taxa relative abundance and condition that includes assemblage attributes such as numbers, biomass (fish), functional and tolerance guilds, condition metrics, and compositional expressions. These outputs can also be exported as Excel files. These reports were used to produce the data summaries reported in Appendices A and B. For fish relative abundance data is reported as numbers and biomass per kilometer. While several types of data expressions and indices are possible, we focused our fish analyses on two principal assessment tools; the modified Index of Well-Being (MIwb) and two versions of an Index of Biotic Integrity (IBI) and for macroinvertebrates the Minnesota large river macroinvertebrate IBI (MIBI) which was calibrated for use in large Minnesota Rivers including the Red River.

Fish Indices of Biotic Integrity (IBI)

Two fish IBIs were calculated for the 2010 Red River sites. A regionally derived index termed the Fish Assemblage Condition Index (FACI; Emery et al. 2007) which is based on a regional

***Table 1**. Fish Assemblage Community Index (FACI; Emery et al. 2007) metrics and description.*

Metric	Description	Stress Response	Scoring
Ind-T	Number of fish less tolerant species	Decrease	CALU[1]
Unique Sp	Total number of unique species	Decrease	CALU
Prop X_Sp	Proportion unique species that are exotic	Increase	CALU
Prop #T	Proportion of individuals that are tolerant	Increase	CALU
Prop #Int	Proportion of individuals that are intolerant	Decrease	CALU
Prop #Suck	Proportion individuals round-bodied suckers	Decrease	CALU
Prop DB	Proportion individuals deep-bodied suckers	Decrease	CALU
#Darter	Number of darter individuals	Decrease	CALU
Prop #Carni	Proportion of individuals that are carnivores	Decrease	CALU
Prop Gen_Sp	Proportion of species that are generalists	Increase	CALU
Prop #Herb	Proportion of individuals that are herbivores	Increase	CALU
Invert kg	Total biomass of all invertivore individuals	Decrease	CALU

CALU – Continuous All sites Upper and Lower threshold calibration method (Blocksom 2003).

***Table 2**. Southern Rivers IBI developed by the MPCA.*

Metric	Description	Floor 5th %ile	Ceiling 95th %ile	Stress Response
Insect TolPct	% of insectivore species (excludes tolerants)	12.01	81.99	Decrease
Piscivore	Number of piscivorous species	1	7.9	Decrease
Sensitive TXPct	% of all taxa that are sensitive	-23.59	15.81	Decrease
SLithop	Number of species that are simple lithophils	-6.71	2.59	Decrease
SLvdPct	% of individuals that are short lived	0.83	60.10	Increase
SSpnTXPct	% of all taxa that are serial spawners	14.39	38.04	Increase
TolPct	% of individuals that are tolerant	5.37	82.30	Increase
VtolTXPct	% of all taxa that are very tolerant	5.04	33.33	Increase
DetNWQTXpct	% of all taxa that are detritivorous	15.38	41.62	Increase
GeneralPct	% of individuals that are generalists	5.63	64.72	Increase
DomTwoPct	% of individuals of the two dominant species	30.39	75.00	Increase

assessment of the large river tributaries of the Upper Ohio and Upper Mississippi Rivers based on sampling conducted in 2004-6. The FACI consists of 12 metrics that were selected based on screening 113 candidate metrics against a regionally derived stressor gradient. The final metrics were based on a combination of responsiveness, redundancy elimination, and ecological representativeness (Table 1). Metric scoring is done on a continuous scale following the CALU (Continuous All sites Upper and Lower threshold) method of Blocksom (2003) and the FACI is normalized to a range of 0-100. The MPCA recently developed a set of fish IBIs based on ichthyofaunal classification regions and stream and river sizes as part of their biocriteria and TALU developmental process. The MPCA Southern Rivers IBI included the Red River mainstem and is hence applicable to our study. The MPCA IBI was developed based on a process in which

hundreds of candidate metrics were identified and tested against a human disturbance gradient. The most responsive and representative metrics were selected and in the case of the MPCA IBI included 11 metrics (Table 2). Each metric is scored on a continuous scale and the summed score is normalized to a scale of 0-100. Metric scores can be adjusted according to the guidelines in Appendix E.

Modified Index of Well-Being

Gammon (1976) and Gammon et al. (1981) originally developed and tested the Index of Well-Being (Iwb) as a multiparameter evaluation of large river fish assemblages. The Iwb is based on four measures of diversity, abundance, and biomass and represents an attempt to produce an integrated evaluation of these baseline assemblage attributes. The individual performance of numbers, biomass, and the Shannon index as consistent indicators of the quality of fish communities has historically been disappointing. However, when combined in the Iwb these individual community attributes respond in a more complimentary and intuitively predictable manner. For example, an increase in total numbers and/or biomass caused by one or two predominant species is usually offset by a corresponding decline in the Shannon index. In addition, the $\log_e$ transformation of the numbers and biomass components acts to reduce much of the variability inherent to these parameters alone. Gammon (1976) found the variability of each of the four Iwb components as measured by a coefficient of variation to range from 20-50%, yet the composite variability reflected by the Iwb was only 7%. High numbers and/or biomass are commonly, and at times inaccurately, perceived as a positive attribute of a fish assemblage. High numbers and biomass result in a high Iwb score only if a relative "evenness" is maintained between the abundance of the common species. However, this is not invariable, especially with environmental perturbations which tend to restructure fish assemblages without corresponding decreases in diversity (e.g., nutrient enrichment, habitat modification). Fish assemblages in habitat modified streams can frequently exhibit very high numbers, biomass, and moderate species richness. Such assemblages are usually predominated by tolerant species. Species intolerant of such disturbances either decline in abundance or are eliminated altogether. In such cases the Iwb can yield an inflated result that does not reflect true assemblage condition.

A modification of the original Iwb was developed by Ohio EPA (1987) and further explained by Yoder and Smith (1999). The Modified Iwb retains the same computational formula as the original Iwb, but eliminates species designated as highly tolerant or alien and all hybrids from the numbers and biomass metrics; these species are retained in the Shannon index calculations. This modification eliminates the "undesired" effect caused by a high abundance of tolerant species, but retains their "desired" influence in the Shannon indices. The computational formula used is as follows:

Modified Index of Well-Being (MIwb) = 0.5 ln N + 0.5 ln B + H (no.) + H (wt.);
where:

N = CPUE; relative numbers minus species designated highly tolerant (Ohio EPA 1987);

B = CPUE; relative biomass minus species designated highly tolerant (Ohio EPA 1987);
H (no.) = Shannon diversity index based on numbers (version which uses $\log_e$);
H (wt.) = Shannon diversity index based on weight (version which uses $\log_e$).

We used the MIwb to assess the assemblage level properties of the 2010 results as an additional assessment tool to the IBI, not as an alternate or replacement.

MPCA Macroinvertebrate IBI

We used the MPCA macroinvertebrate index of biotic integrity (MIBI) derived for large rivers as a key indicator for the 2010 Red River study area sites. The Large Rivers mIBI development included the Red River mainstem and is hence applicable herein. The mIBI was developed based on a process in which hundreds of candidate metrics were identified and tested against a human disturbance gradient. The most responsive and representative metrics were selected and in the case of the mIBI includes 8 metrics (Table 3). Each metric is scored on a continuous scale and the sum score is normalized to a scale of 0-100. The data was collapsed to the genus level prior to calculating the mIBI.

Table 3*. Metrics of the MPCA statewide rivers mIBI. This includes the Northern and Prairie Forest River stream and classes (after MPCA 2013c).*

Metric Name	Metric Description	Category	Response	p-value	S:N	Ceiling	Floor
DomFiveCHPct	Relative abundance (%) of dominant five taxa in subsample (Chironomid genera treated individually)	Composition	Increase	<0.001	2.49	41.7	82.3
HBI_MN	A measure of pollution based on tolerance values assigned to each individual taxon within Minnesota developed by Chirhart	Tolerance	Increase	<0.001	5.92	5.5	8.3
Intolerant2lessCh	Taxa richness of macroinvertebrates with tolerance values less than or equal to 4, using MN TVs	Tolerance	Decrease	<0.001	13.23	18.2	0
Odonata	Taxa richness of Odonata	Richness	Decrease	<0.001	2.02	5	0
PredatorCh	Taxa richness of predators	Richness	Decrease	<0.001	2.64	18.3	3.5
TaxaCountAllChir	Total taxa richness of macroinvertebrates	Richness	Decrease	<0.001	3.69	57.6	24
TrichwoHydroPct	Relative abundance (%) of non-hydropsychid Trichoptera individuals in subsample	Composition	Decrease	0.001	2.32	22.8	0
VeryTolerant2Pct	Relative abundance (%) of macroinvertebrate individuals in subsample with tolerance values equal to or greater than 8; metric	Tolerance	Increase	0.002	4.18	12.8	78.7

STUDY AREA

The Red River originates at the confluence of the Bois de Sioux and Otter Tail Rivers at the state boundary between Wahpeton, ND and Breckenridge, MN and flows due north to Lake Winnipeg, MB. The river is low gradient and meandering through the clay and silt sediments left by glacial Lake Agassiz roughly 10,000 years ago. The fine grained sediments in the historic lake bed comprise some of the most productive agricultural land in the U.S. As such land use in the Red River basin is predominated by agriculture at 74% (66 % cropland and 8% pasture and rangeland) followed by 12% forest, 4% water and wetlands, 3% urban and 7% other (MPCA 2006). The Red River flows through three major urban areas along its northward course including Fargo-Moorhead and Grand Forks in the U.S. and Winnipeg in Canada. The mainstem is 550 miles long of which ≈394 miles are in the U.S. The river drops 230 feet between Wahpeton-Breckenridge and Lake Winnipeg where it spreads into a deltaic wetland known as Netley Marsh.

While the Red River drains a large area the river valley is no wider than a few hundred feet and the much-wider floodplain is the former bed of glacial Lake Agassiz. It is remarkably flat; from its origin in Wahpeton-Breckenridge to the international border near Emerson, MB, the average gradient is <1 foot per mile. The river is slow flowing and restricted to its channel in the warmer and dry weather months. It lacks the energy to cut a deeper valley; instead it meanders across the silty bottomlands on its course northward. As a consequence, high flows spread across the former lake bed resulting in "overland flooding". Heavy snows or rains, on saturated or frozen soil, have caused a number of catastrophic floods, which are oftentimes made worse by the fact that snowmelt starts in the warmer south and water flowing northward is dammed or slowed by ice jams. These periodic floods have the effect of partially refilling the former lake bed. Major floods in contemporary times include 1826, 1897, 1950, 1997, 2009, and 2011, and many years in between have seen lesser, but nonetheless serious flooding. There were flood events in prehistoric times that were of equal or even greater magnitude. Termed "paleofloods" these are known from their effects on shaping local landforms. To cope with the effects of frequent flooding the city of Winnipeg constructed the Red River Floodway, which diverts flood flows through an artificially constructed bypass channel around the city. Grand Forks, ND took a similar precaution after the flood of 1997, constructing a removable flood wall. More recently, a bypass channel is now being studied to relieve the effects of flooding in the Fargo-Moorhead metropolitan area.

The survey included a total of 52 sampling locations on the Red River mainstem between Wahpeton-Breckenridge and the U.S.-Canada border at Pembina, ND (Figure 1). No tributaries, except for one location each near the mouths of the Bois de Sioux and Otter Tail Rivers, were included bringing the total sampling locations for the 2010 survey to 54. Selected tributaries were assessed in 2005 by the MPCA and North Dakota Department of Health, by the NRSA in 2008, and the North Dakota Department of Health in 2009-11.

Potential Sources of Stress and Impact

A major goal of this study was to assess the effect of all potential sources of stress on the biological assemblages, water quality, and habitat throughout the study area. As part of the survey design all possible stressors including point source discharges, concentrations of nonpoint source impacts (e.g., urban/industrial stormwater), major tributaries, and physical modifications such as flow alterations and impoundments by dams were inventoried (Table 3; Figure 1). Point sources include major NPDES permitted facilities and include wastewater treatment plants (WWTPs) in the major metropolitan areas of Wahpeton-Breckenridge, Fargo-Moorhead, Grand Forks-East Grand Forks, and at smaller towns in between. Major industrial discharges also occur in these same areas and include both direct process and stormwater discharges. There are 8 dams all of which are either low head "roller" type dams (4) or rock slopeways (4), the latter of which were formerly roller dams that were converted to facilitate fish passage and alleviate safety issues for navigation by recreational watercraft such as canoes and small boats. There are 7 major tributaries and numerous other smaller streams that discharge to the Red River mainstem. In the Fargo-Moorhead and Grand Forks metropolitan areas small tributaries act as conveyances for stormwater runoff and discharges from major industries. All of these sources are listed and summarized in Table 4.

Table 4. Red River of the North source locations and descriptions.

RM	Type	Source	Description	Characteristics
548.7, 0.5	WWTP	Breckenridge WWTP	Muncipal wastewater treatment (MN0022900)	Lagoon discharge to Otter Tail R.
546.5	Dam	Kidder Dam	Rock slopeway	Modified former low head dam
544.5	WWTP	Wahpeton WWTP	Muncipal wastewater treatment (ND0020320)	Lagoon discharge (350-450 MGD/year)
540.0	Industry	Minn-Dak Farmers Coop	Industrial process discharge (ND0024368) & stormwater runoff	Sugar beet processing - toxic releases
539.5	Industry	Cargill Corn Milling	Industrial process discharge (ND0026000)	Corn milling waste
523.5	WWTP	Abercrombie WWTP	Municipal wastewater treatment (NDG122659) - via drainage ditch	Lagoon discharge
496.5	Dam	Christine Dam (low head)	Low head roller dam	Marked as "dangerous"
482.7	Dam	Hickson Dam (low head)	Low head roller dam	Marked as "dangerous"
470.2	Trib.	Wild Rice River	Major tributary (ND)	2233 $mi.^2$ drainage area
458.1	Dam	Fargo South Dam	Low head roller dam	Marked as "dangerous"
452.2	Dam	Fargo Midtown Dam (rock slopeway)	Rock slopeway	Modified former low head dam
448.9	Dam	Fargo North Dam (rock slopeway)	Rock slopeway	Modified former low head dam
448.8	WWTP	Moorhead WWTP	Muncipal wastewater treatment (MN0049069)	4.5 MGD anaerobic digestion process
446.5	Industry	American Crystal Sugar	Industrial process discharge (MN0001945)	Sugar beet processing
445.5	Trib.	Drainge Ditch #41 - Stormwater Discharges	Tributary - industrial stormwater coveyance	Sormwater runoff
440.1	WWTP	Fargo WWTP	Muncipal wastewater treatment (ND0022870)	15 MGD biological treatment - standby lagoons
436.5	Trib.	ND Ditch with Fargo impacts	Tributary - industrial stormwater coveyance	Stormwater runoff
427.5	Trib.	Sheyenne River	Major tributary (ND)	4063 $mi.^2$ drainage area; Devils Lake WQ issue
403.7	WWTP	Perely WWTP	Muncipal wastewater treatment (MN0024481)	Lagoon discharge
386.5	WWTP	Hendrum WWTP	Muncipal wastewater treatment (MN0021644)	Lagoon discharge
380.4	Trib.	Wild Rice River (MN)	Major tributary (ND)	2233 $mi.^2$ drainage area
357.9	Trib.	Goose River (ND); Hillsboro WWTP; American Crystal Sugar WWTP	Major Tributary (ND)	Lagoon discharge & stormwater runoff
357.2	Trib.	Marsh River (MN); Shelly WWTP	Muncipal wastewater treatment (MN0024864)	Lagoon discharge
298.3	Trib.	Red Lake River	Major tributary (MN)	5998 $mi.^2$ drainage area
297.3	WWTP	East Grand Forks WWTP (MN0021814)	Muncipal wastewater treatment	Controlled lagoon discharge
297.2	WWTP	Grand Forks WWTP (ND0022888)	Muncipal wastewater treatment	7 MGD (annual) activated sludge & lagoons
296.1	Dam	Riverside Dam (rock slopeway)	Rock slopeway	Modified former low head dam
294.4	Trib.	English Coulee; 2 NPDES Facilities	Tributary - 2 industries (ND0024023 & NDR800004)	Defense Fuel Supply; Residual Materials
290.7	Trib.	English Coulee diversion (ND)	Drainage ditch	Stormwater runoff
266.5	WWTP	Oslo WWTP (MN0024431)	Muncipal wastewater treatment (MN	Lagoon discharge
206.0	Industry	Assoc. of Potato Growers (ND0026204)	Industrial process discharge (ND0026204)	Potato processing wastewater
203.4	Dam	Drayton Dam (low head)	Low head roller dam	Marked as "dangerous"
203.4	WWTP	Drayton WWTP (ND0000183)	Muncipal wastewater treatment	Lagoon discharge
201.3	Industry	American Crystal Sugar	Industrial process discharge (ND0000094) via ditch	Sugar beet processing waste
158.0	Trib.	Pembina River	Major tributary (ND)	3282 $mi.^2$ drainage area

WWTP - municipal wastewater treatment plant

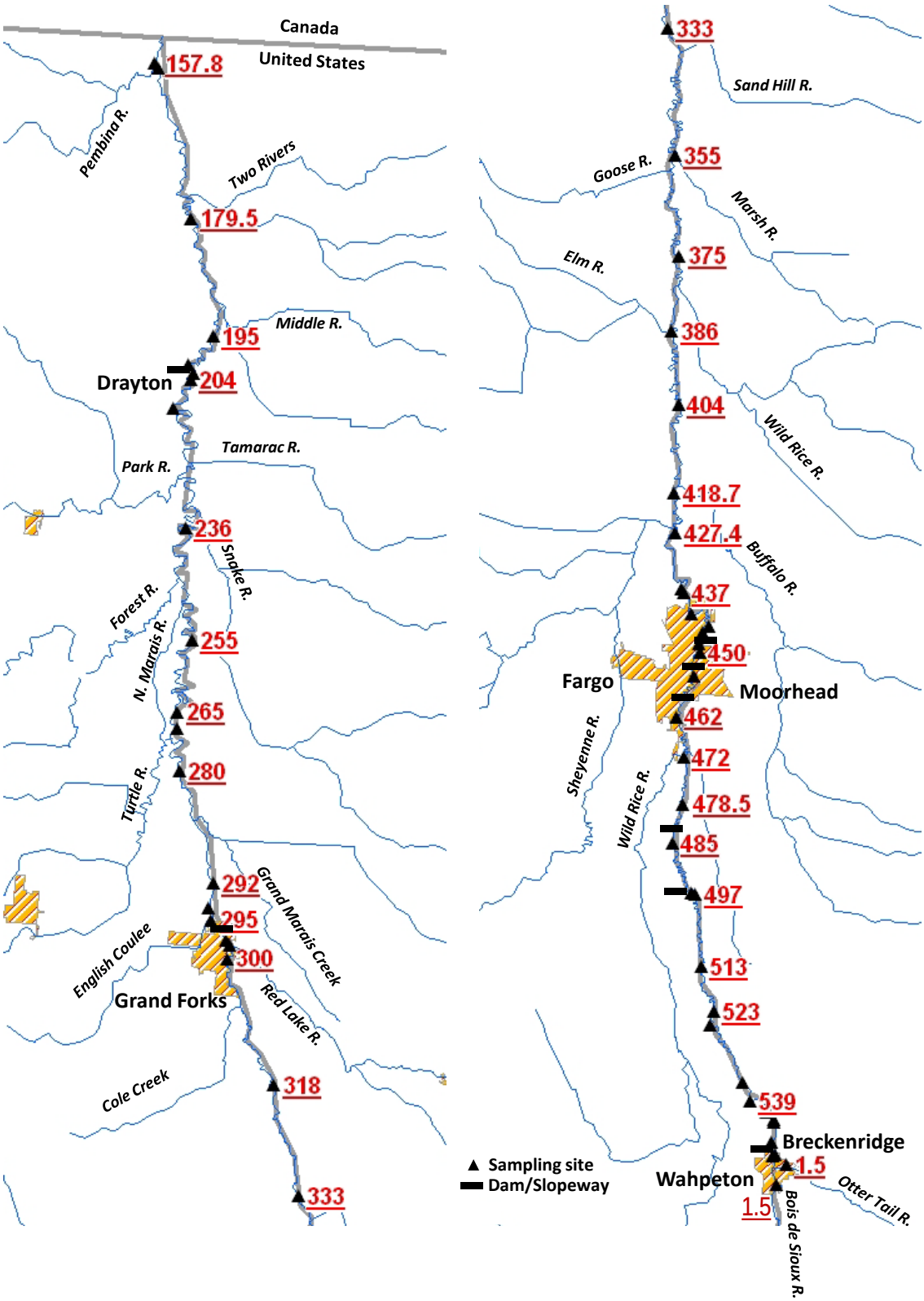


***Figure 2**. Red River of the North 2010 study area showing sampling locations (by river mile), major metropolitan areas, tributaries, and dams.*

RESULTS

Fish, macroinvertebrates, habitat, and water quality sampling were conducted at 54 locations during August 18 – September 1, 2010 and are the focus of this report.

Flow Conditions

Flows were well above the historical median at all USGS gages on the Red River during the August 18 – September 1 survey. Figure 3 depicts daily flows at the Wahpeton, ND and Pembina, ND gages compared to historical median flows. Although flows were elevated beyond the median, conditions were conducive to effective sampling and were within the specifications of the project QAPP (MBI 2010a).

Water Quality

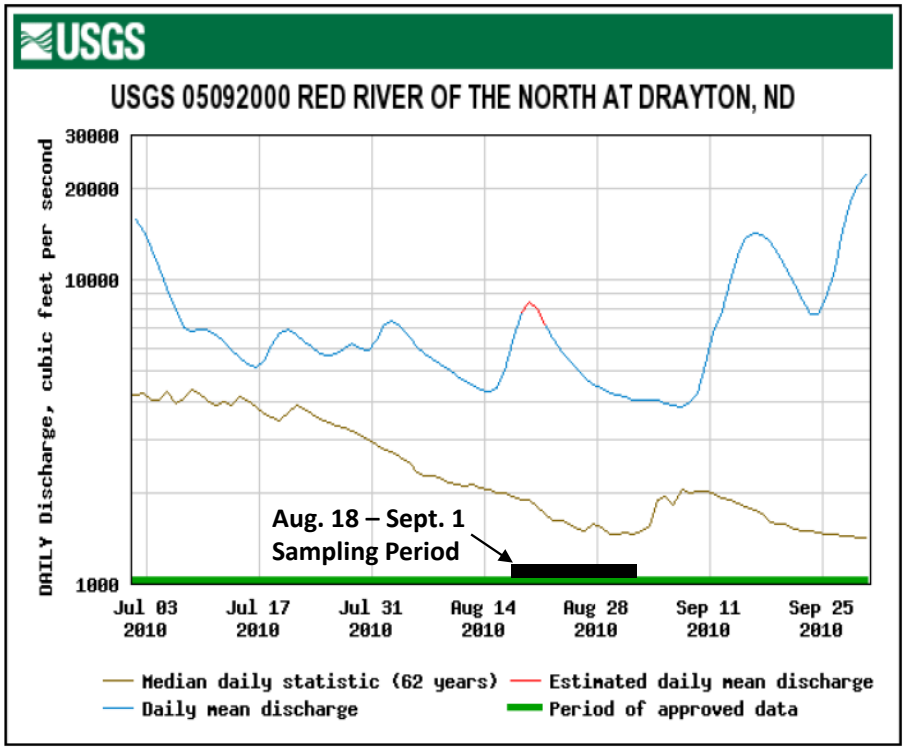
Water quality data were collected at each sampling location and included subsurface measurements of daytime dissolved oxygen (D.O.), temperature, conductivity, pH, and Secchi depth. Water quality grab samples were also collected at the same time location and time field measurements were taken and analyzed at the North Dakota Department of Health laboratory for major cations and anions, nutrients, and trace elements. While the sampling was spatially intense, the single samples provide a snapshot in time for the chemical constituents. The longitudinal pattern observed, however, was similar to that of studies with more temporal frequency of samples (e.g., MPCA 2006). Other than during intense storms, the chemical signatures in the Red River during normal summer-fall low flow periods are not so episodic in nature thus this pattern is likely representative of low flow conditions throughout the summer-fall period. The results for key parameters were plotted by sampling location indexed to river mile and shown from upstream to downstream (Figures 4-14). Major sources and tributaries are depicted as they occurred along the longitudinal continuum.

Dissolved Oxygen (D.O.)

Daytime D.O. concentrations in the mainstem ranged from a low of 3.47 mg/L at RM 539.0 to 13.31 mg/L at RM 497.0 in the reach downstream from the Wahpeton- Breckenridge area (Figure 4). Most values throughout the remainder of mainstem were within 1.0-1.5 mg/L of the mean of 7.64 mg/L. The longitudinal profile in the approximate 50 mile reach downstream of the Wahpeton-Breckenridge area and the concentration of point sources and stormwater discharges suggests an effect from excessive loadings of oxygen demanding wastes and the assimilation of those wastes. Three recorded daytime values were below the North Dakota 5.0 mg/L minimum water quality criterion.

Temperature (°C)

Temperature values were fairly uniform throughout the mainstem ranging from 21.4°C at RM 157.8 to 24.7°C at RM 450.0 with a mean of 22.8°C (Figure 5). The maximum temperatures observed during the study occurred in the Fargo-Moorhead area declining slightly for the remainder of the mainstem. The slight decline could well have been due to the initial decline in



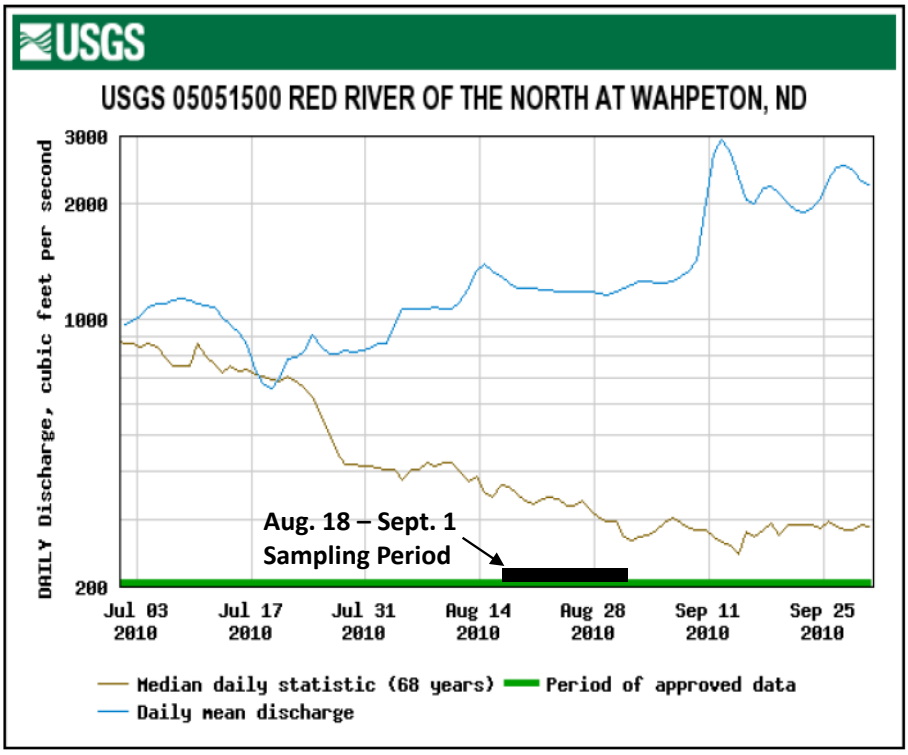


***Figure 3**. Flow hydrograph during July 1 – September 30, 2010 at the Wahpeton, ND and Drayton, ND flow gages operated by USGS. The August 18-September 1 sampling period is indicated on each.*

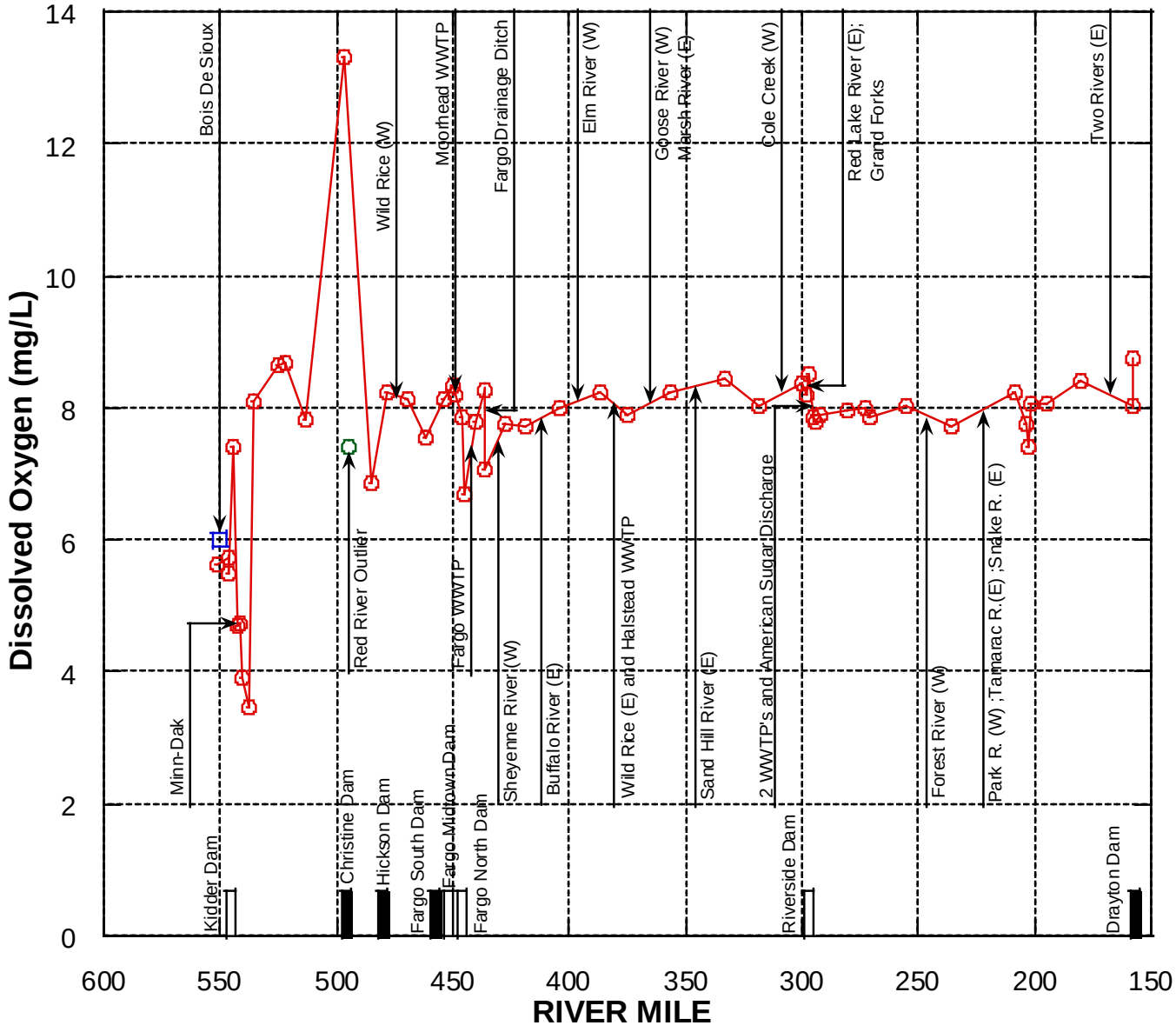


Figure 4. *Dissolved oxygen (D.O.) values (mg/L) at all 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010***.**

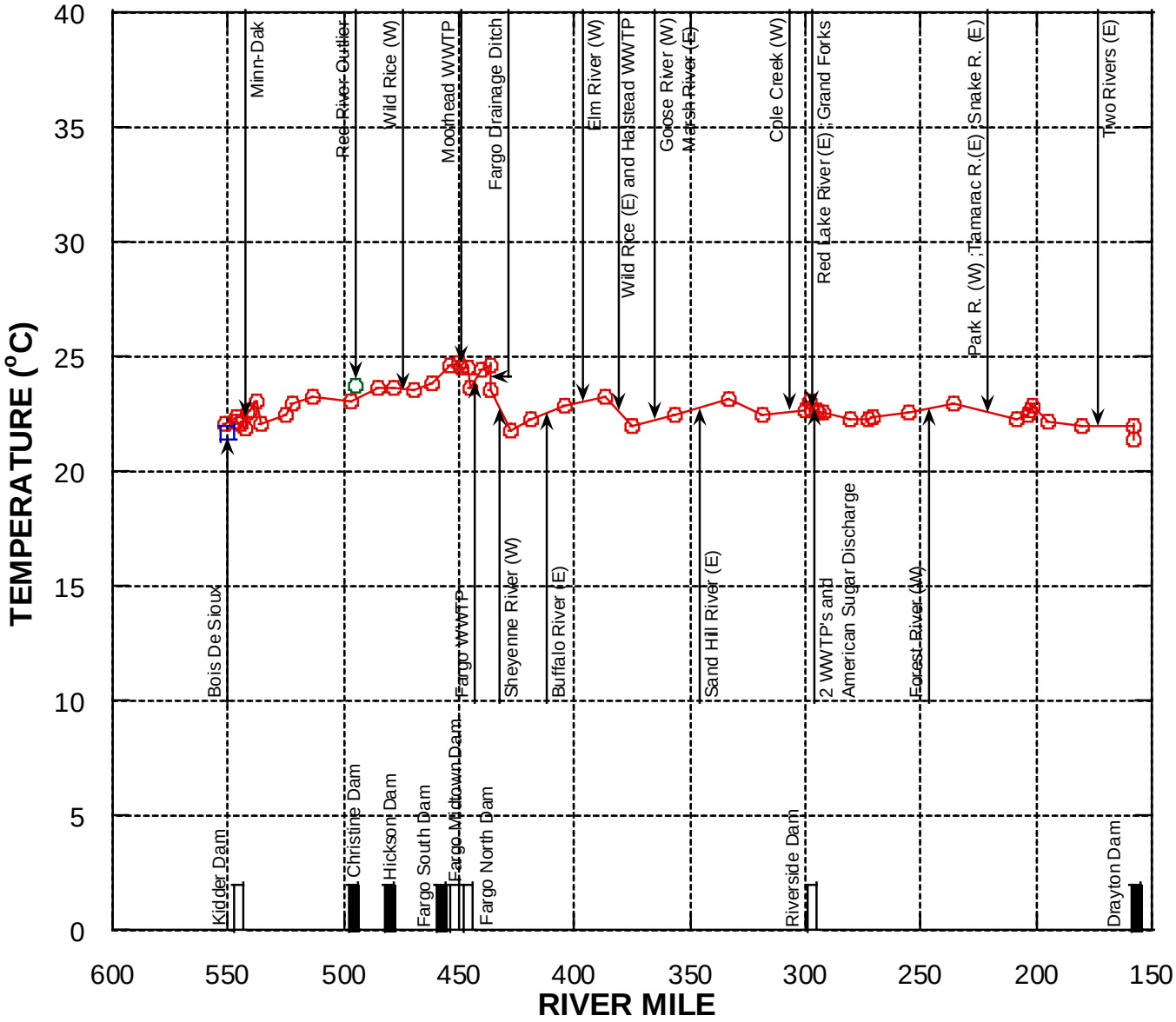


Figure 5. *Temperature (°C) values at all 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

seasonal temperatures that occurs in late August and September. No exceedances of North Dakota or Minnesota water quality criteria for temperature were observed.

Field Conductivity (µS/cm^2)

Conductivity values ranged from 409 µS/cm^2 at RM 1.5 in the Otter Tail River to 1338 µS/cm^2 at RM 1.5 in the Bois de Sioux River (Figure 6). The comparatively high value in the Bois de Sioux River is a reflection of soils, flow management, and land use in that watershed. The comparatively low value in the Otter Tail River is likewise a reflection of those same attributes in that watershed. The mean conductivity value of 495 µS/cm^2 in the Red River between Wahpeton- Breckenridge and Fargo-Moorhead reflects the diluting influence of the Otter Tail River on the upper mainstem. Conductivity values increased to 806 µS/cm^2 downstream from Fargo-Moorhead beginning at RM 427.4 which is immediately downstream from the confluence with the Sheyenne River. Again, this result is a reflection of the background conditions in the Sheyenne River and the residual effect remained until the Grand Forks area where a slight decline was noted downstream from the Red Lake River. These results suggest that conductivity values are the result of both natural conditions and the influence of selected tributaries.

pH (S.U.)

pH values were similar throughout the mainstem ranging from 7.68 S.U. at RM 1.5 in the Bois de Sioux River to 8.45 S.U. at RM 294.0 with a mean of 8.33 S.U. (Figure 7). There were no longitudinal patterns in the data that suggest any type of spatial influences on the pH regime. All values were within the 6.5-9.0 S.U. which is the water quality criterion range.

Secchi Depth (cm)

Secchi depth is a measure of light penetration and transparency and is correlated with the amount of suspended sediments and/or solids in the water column. Values ranged from 11 cm at RM 418.7 downstream from Fargo-Moorhead to 45 at RM 546.4 downstream of the Kidder Dam in Wahpeton with an overall mean of 24.5 cm (Figure 8). Secchi readings showed the widest range of any of the chemical/physical parameters that were measured. The highest values occurred in Wahpeton- Breckenridge downstream from the Otter Tail–Bois de Sioux confluence and declined in a general downstream direction from there. Outside of this segment Secchi depth averaged 19.4 cm which is a reflection of the high suspended sediment load that is carried by the Red River once the diluting influence of the Otter Tail River has subsided. Minnesota PCA (2007) uses a benchmark of 20 centimeters for flagging an "impairment" in streams and rivers, but this requires multiple samples over time. Regardless, even the comparatively "high" values in the 40s are a reflection of the inherent turbidity of the Red River which is a reflection of the soils and land uses with the basin.

Nutrient Parameters

Nutrient parameters are components of most state nutrient criteria for streams and rivers and can function as indicators of the potential effects of eutrophication. Combined criteria would also include chlorophyll α (benthic and sestonic), turbidity, and direct measures of effects in fish, macroinvertebrate, and/or algal assemblages. Minnesota (Heiskary et al. 2010) adopted

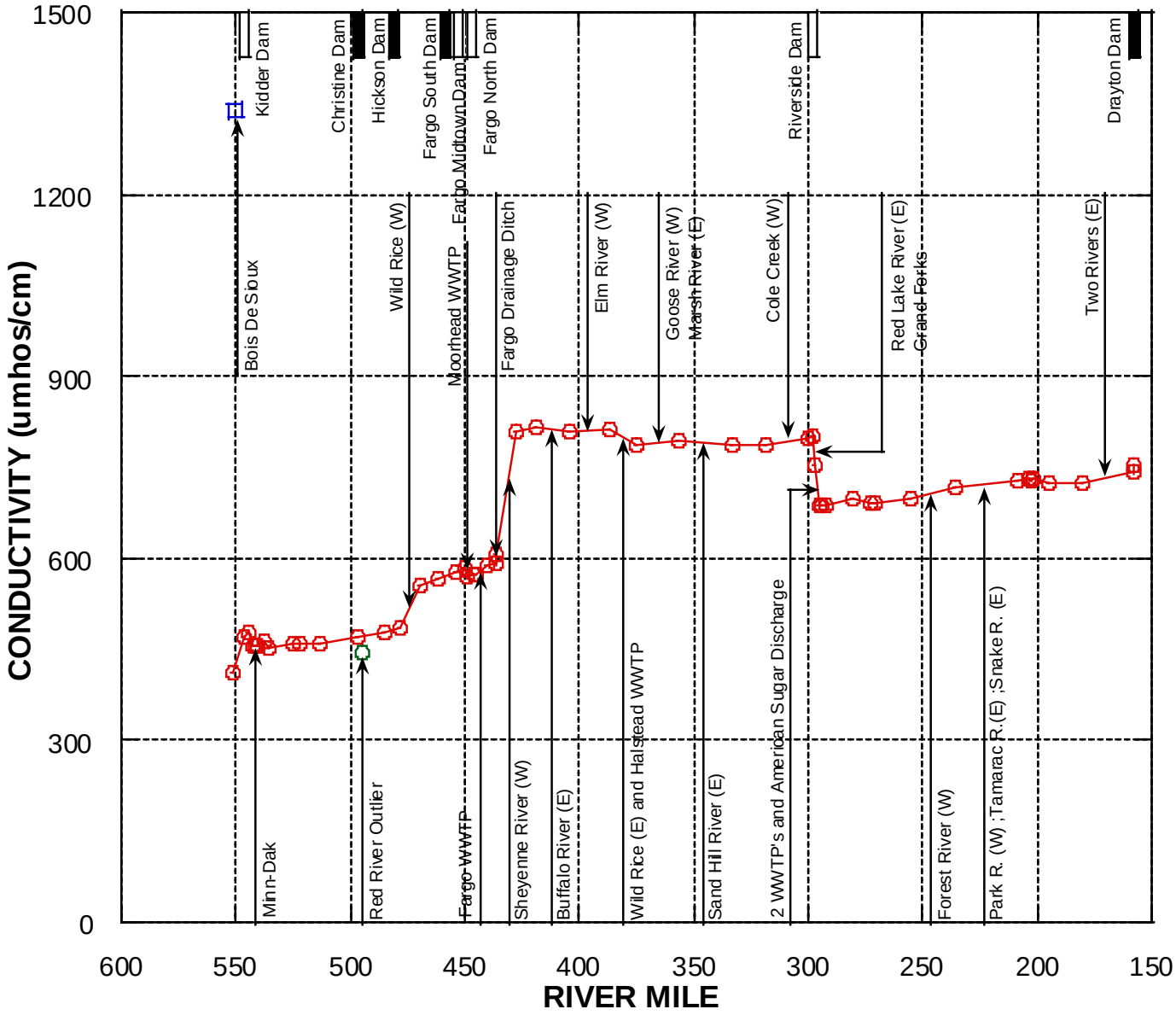


Figure 6. *Conductivity (µS/cm²) values at all 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

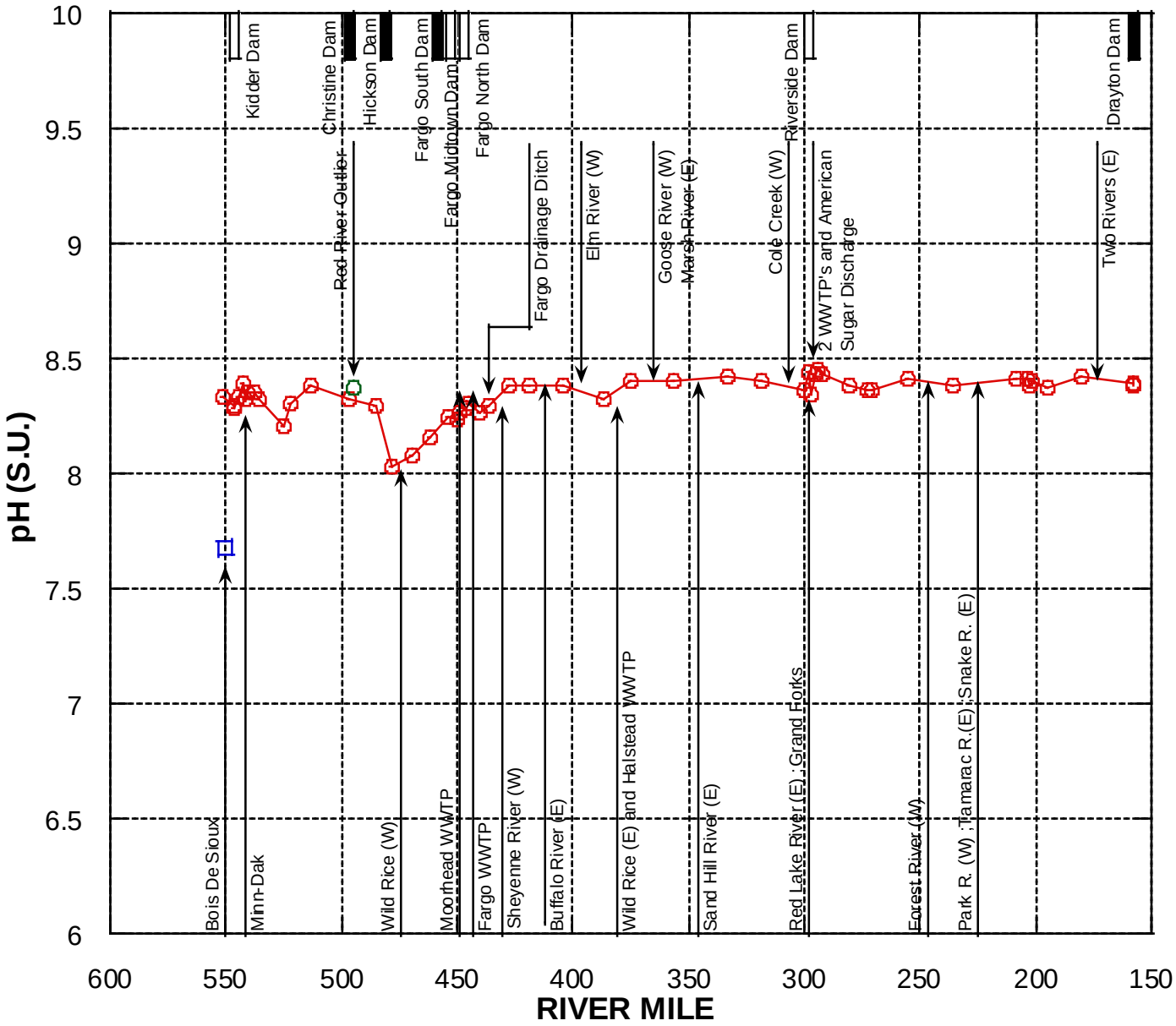


Figure 7. *pH (S.U.) values at all 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

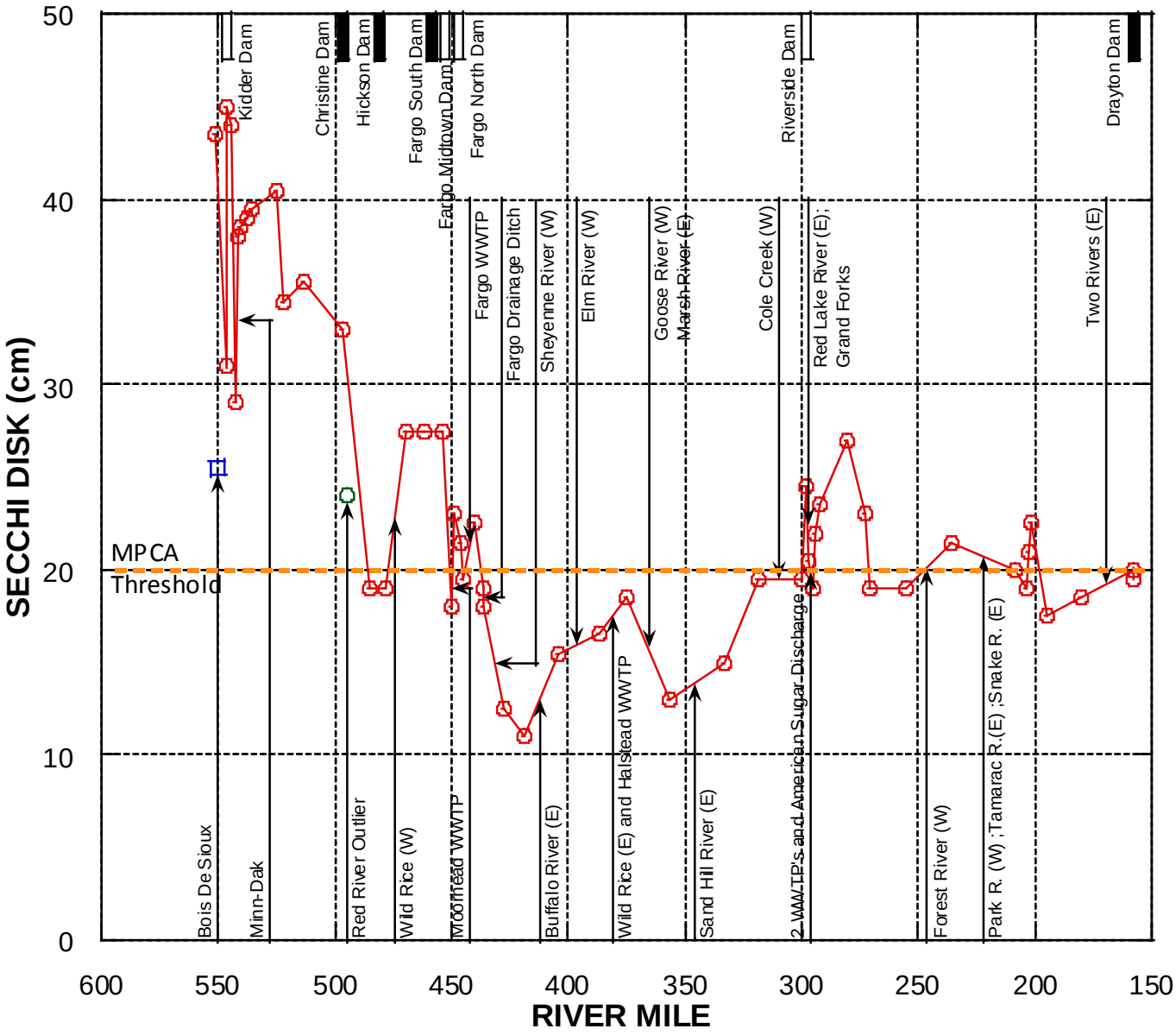


Figure 8. *Secchi depth (cm) values at all 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

eutrophication criteria for their rivers; North Dakota is in the process of developing their approach to setting eutrophication criteria for streams and rivers (Deutschman and Saunder-Peace, undated).

Total Phosphorus (TP)

Phosphorus is often the most limiting nutrient parameter in streams and rivers and has frequently been associated with aquatic life impairments. Patterns in concentrations of TP in the Red River (Figure 9) were the inverse of Secchi disk readings with the lowest values in the upper mainstem, high values in the middle mainstem and intermediate values in the lower mainstem. In their derivation of eutrophication criteria for Minnesota Heiskary et al. (2010) found that the high turbidity in the Red River limited the predictability of chlorophyll α values from TP concentrations in the river.

Nitrate/Nitrogen

While total nitrogen and nitrate can have near-field effects on aquatic assemblages, they are also responsible for eutrophication problems in far-field habitats such as Lake Winnipeg. MPCA (2013b) estimated that 37 million pounds of total nitrogen are exported from the Red River at the U.S.-Canada border, with about equal contributions from Minnesota and the Dakotas. MPCA estimated that the largest proportion of this load originates from tile drainage. The load has increased from the 1970s and 1980s (MPCA 2013a). As with TP, nitrate and total nitrogen concentrations were lowest in the upper mainstem, highest in the middle mainstem, and intermediate in the lower mainstem (Figures 10 and 11). The U.S. EPA ecoregion based approach results in a nitrate benchmark of 1.17 mg/L for the Lake Agassiz Plain ecoregion. This benchmark was exceeded only at the site on the Bois de Sioux River although it is likely it would be exceeded in the Red River and certain tributaries from time to time during and immediately following runoff events. Nitrates were generally below 0.1 in the upper mainstem, increased markedly downstream from the Fargo WWTP, and then declined to a level of 0.2-0.3 mg/L in the remainder of the mainstem.

Total Kjeldahl Nitrogen (TKN)

TKN is an indicator of organic enrichment as it includes organic forms of nitrogen including ammonia. Organic forms of nitrogen are found in proteins, amino acids, urea, dead algae and bacteria, decaying plant material, and it can be attached to soil particles. TKN is oftentimes elevated where there is high P in rivers related to high algal growth (Heiskary et al. 2010; Heiskary and Lindon 2010). MBI (2010) identified a threshold of about 1 mg/L that coincided with fish IBIs reflecting evidence of impairment. With the exception of the Bois de Sioux River values in the Red River were well below this threshold as well as the 0.8-1.1 mg/L range associated with aquatic life impacts in large rivers in Ohio (Figure 12; Ohio EPA 1999). Like nitrates, total nitrogen was the lowest in the upper mainstem (<0.6 mg/L) increasing to >0.9 mg/L downstream from the Fargo WWTP and remaining at 0.8-0.9 mg/L in the remainder of the mainstem.

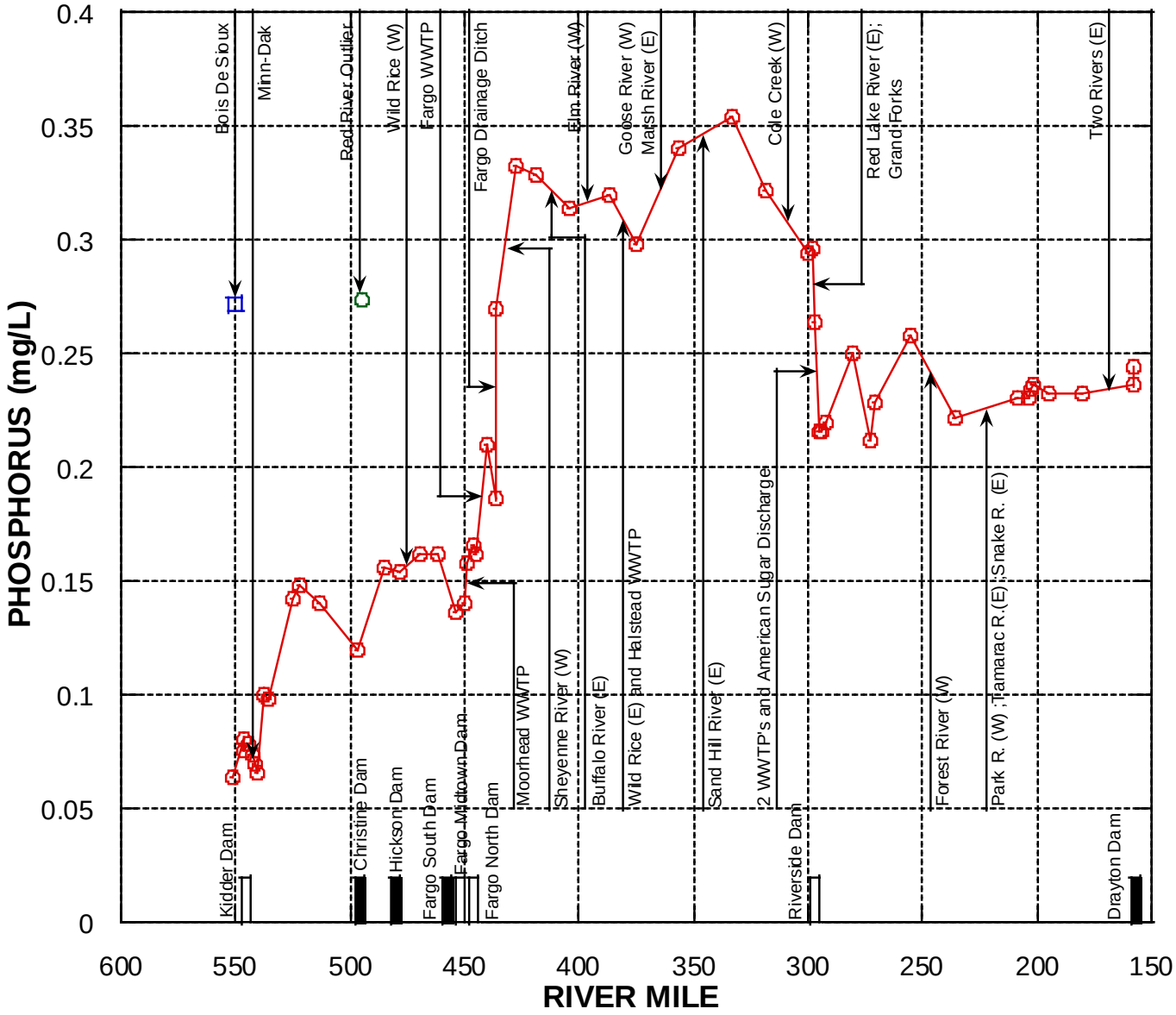


Figure 9. *Total phosphorus values at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

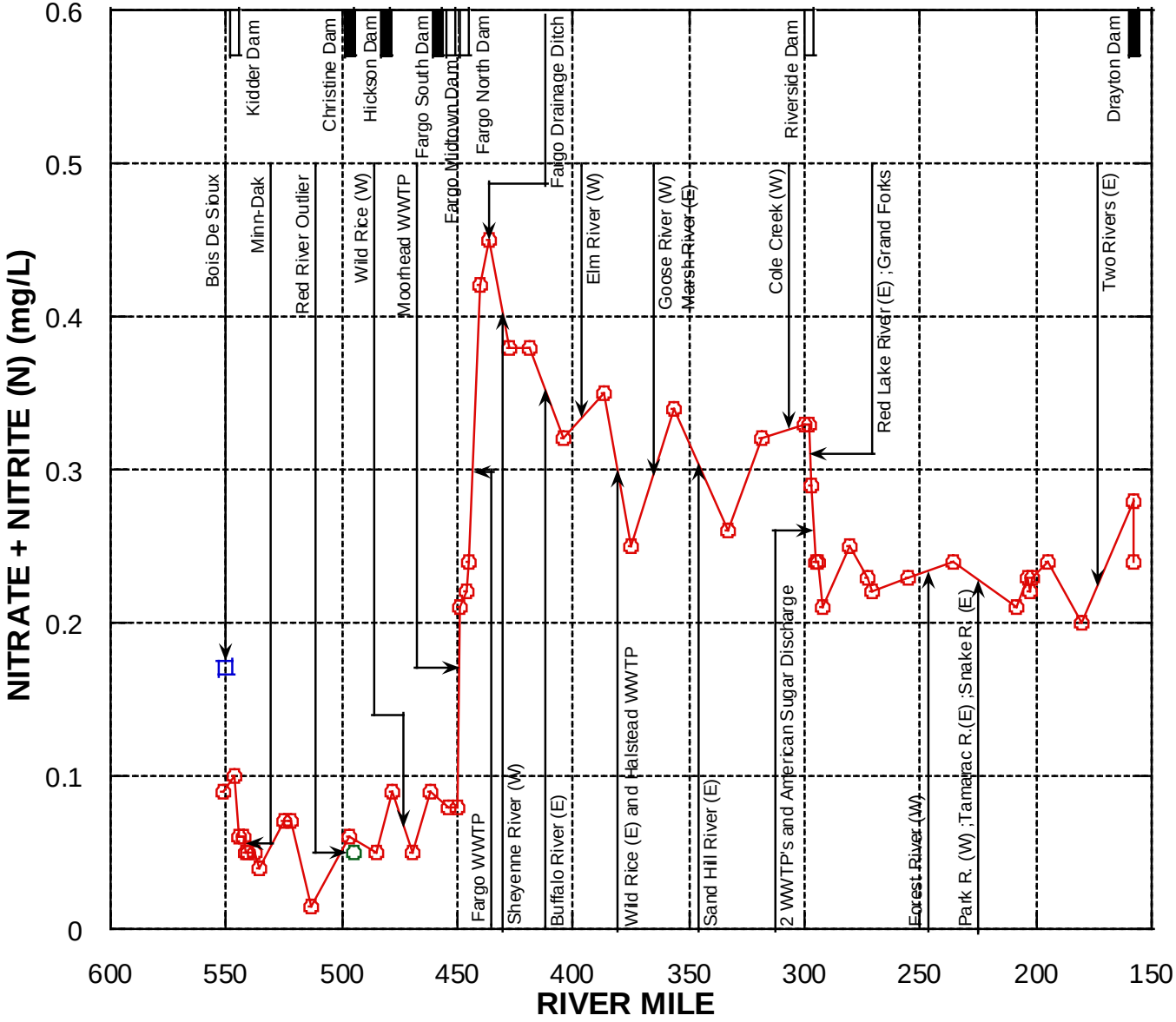


Figure 10. *Total nitrate-nitrite values at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 9, 2010***.**

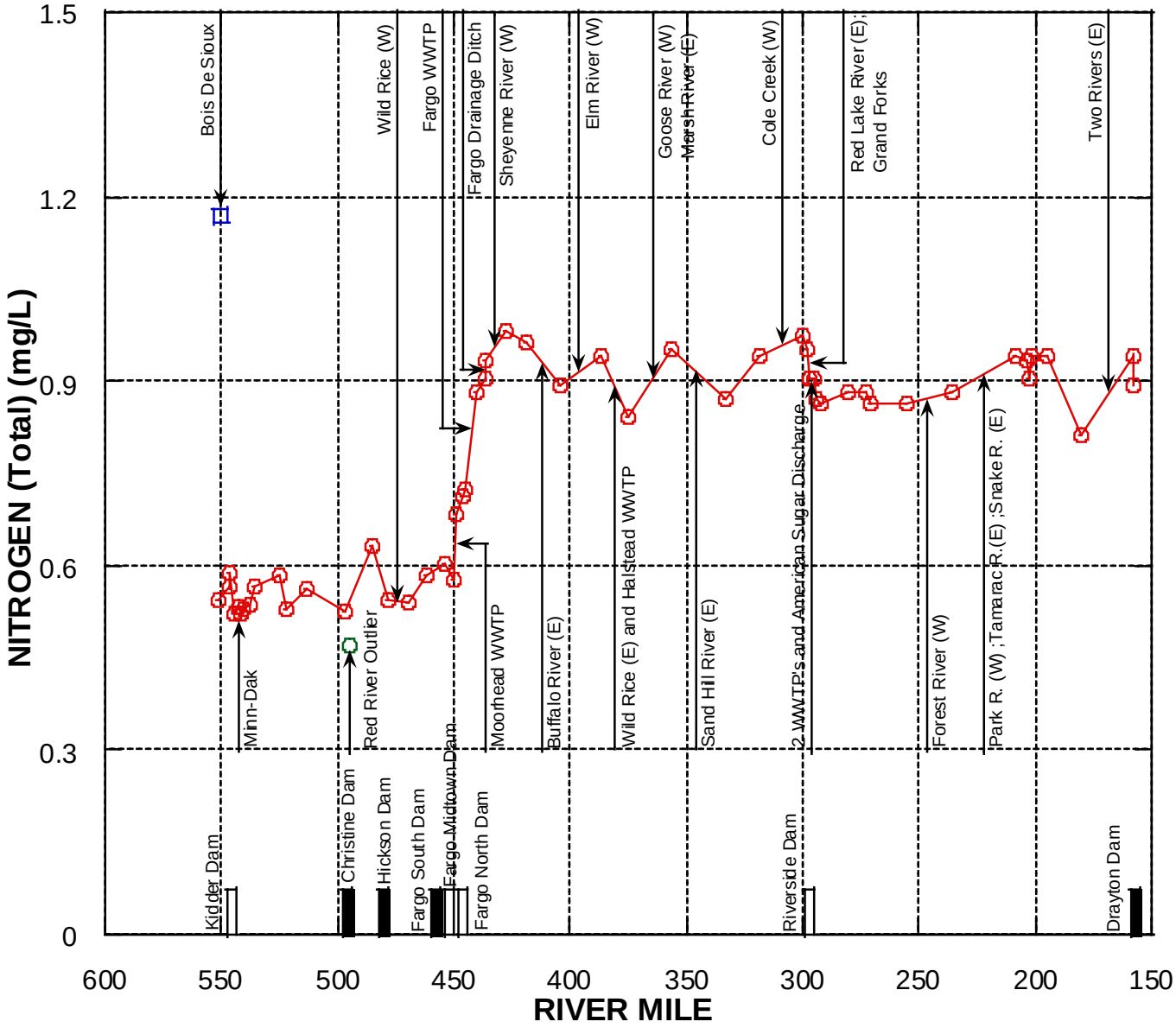


Figure 11. *Total nitrogen values at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 9, 2010***.**

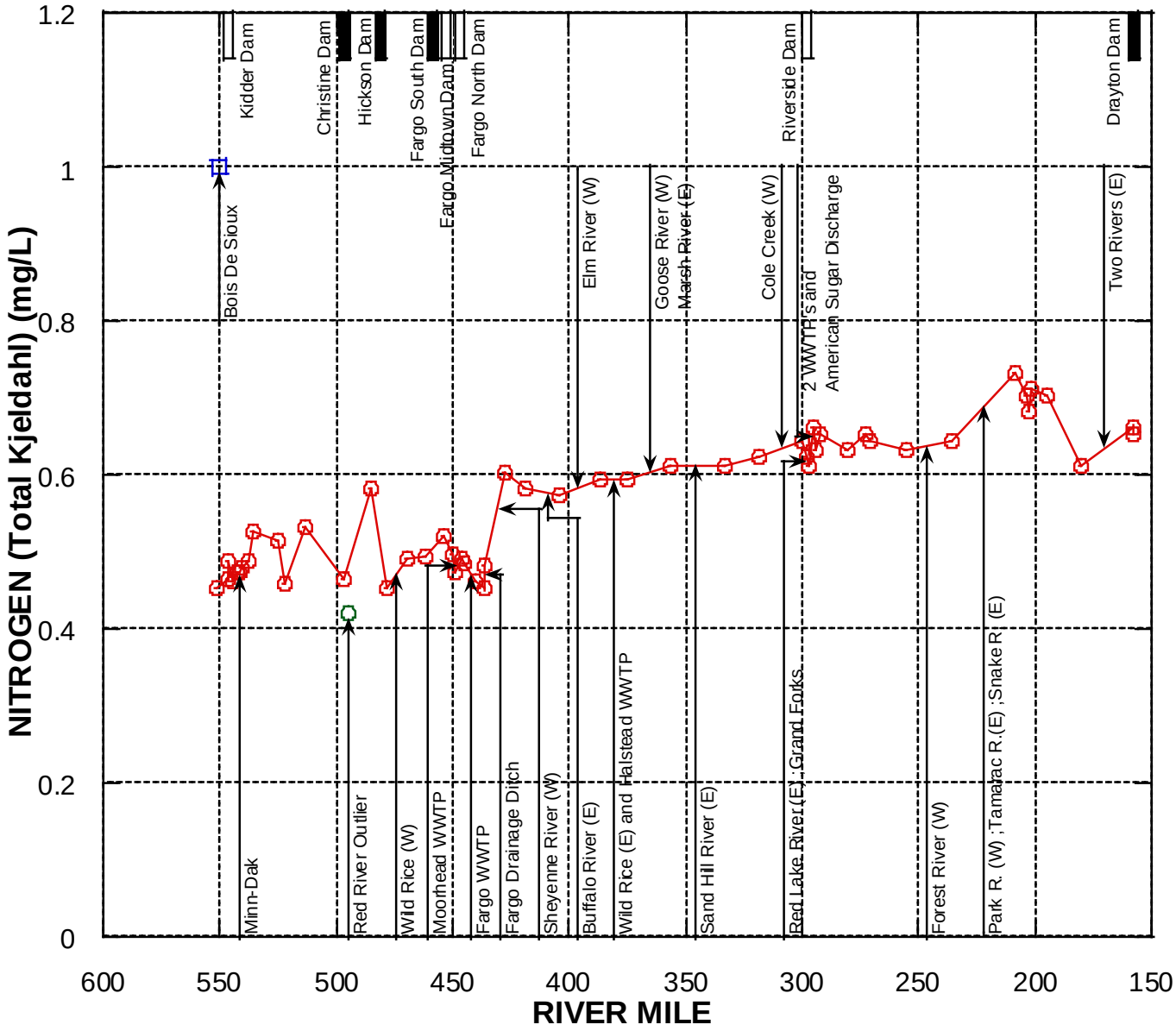


Figure 12. *Total Kjeldahl nitrogen values at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

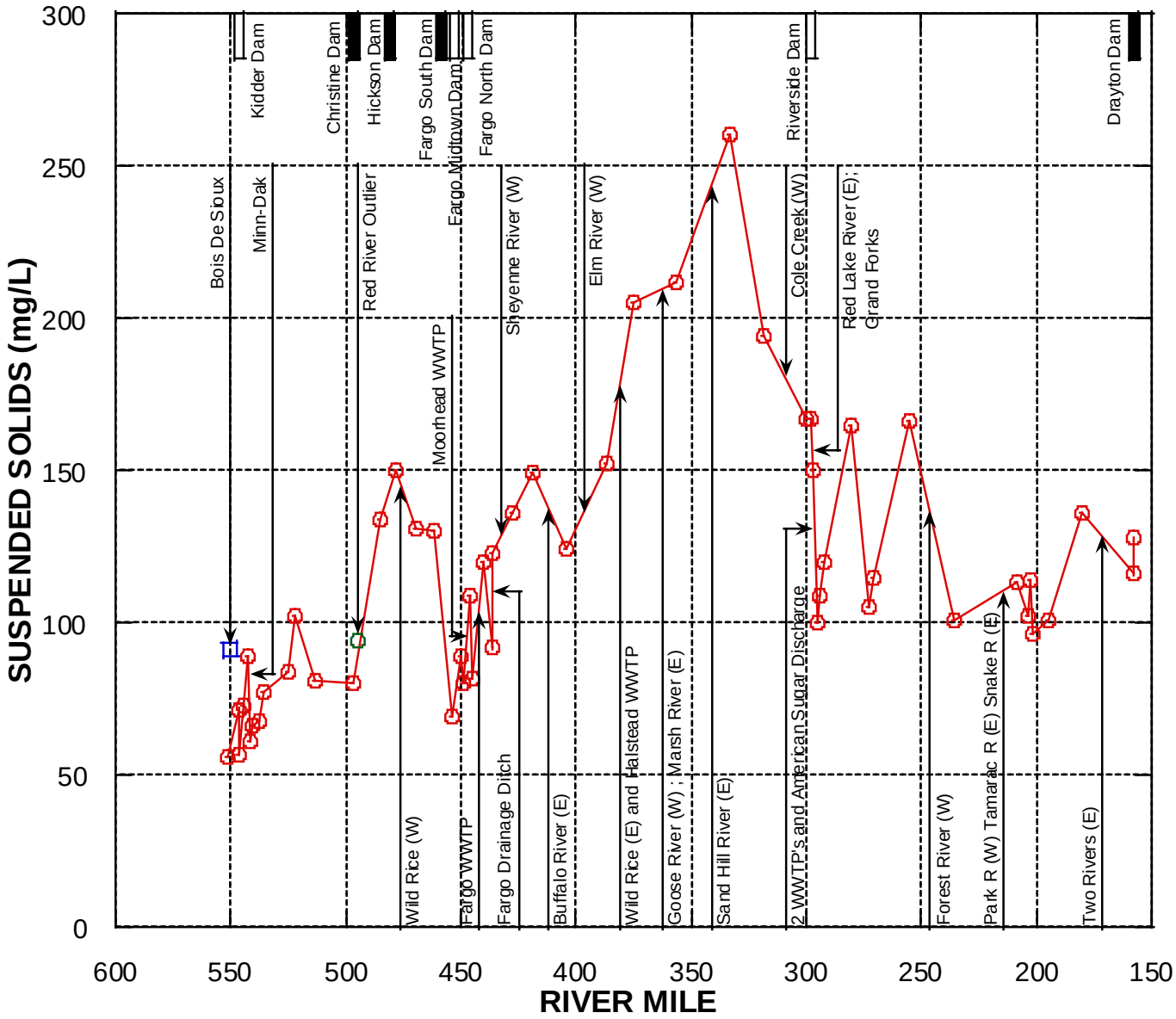


Figure 13. *Total suspended solids values at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

Total Suspended Solids

Total suspended solids (TSS) were collected and analyzed as a surrogate for suspended sediment. TSS/suspended sediment reflects the loading of fine sediments due to erosion and runoff in the Red River watershed. Similar to Secchi depth concentrations, TSS concentrations were lowest in the Ottertail River and the upper mainstem gradually increasing with distance downstream to a high value >250 mg/L downstream from the Sand Hill River, then declining sharply to 100-150 mg/L in the remainder of the mainstem (Figure 13). In a study of suspended sediment loads in the upper Red River near Fargo, Galloway and Nustard (2012) identified the Sheyenne River as the greatest contributor from the tributaries in the area.

Ionic Strength Parameters

Ionic strength parameters include dissolved ions in surface water and are an important constituent that can influence aquatic life in streams. The total dissolved ions in most surface waters are mostly composed of four negative ions (bicarbonate, carbonate, chloride, and sulfate) and four positive ions (calcium, magnesium, sodium and potassium). Although dissolved materials can originate from mining, urban runoff, and wastewater, the majority of dissolved ions in the Red River originate from agricultural lands in the tributary watersheds.

Total Chloride

The increases in total chloride observed across the northern U.S. are a result of the application of salt in the winter months to de-ice roads and highways. The chronic water quality criteria for streams and rivers in most states is ≈250 mg/L although work sampling chlorides year-round has associated summer-fall chloride levels above 100 mg/L with exceedances of the 250 mg/L level during the late winter early spring period. Aquatic life responses (fish and macroinvertebrates) to summer-fall chloride concentrations have identified effect thresholds at between 112–141 mg/L. The pattern in chloride concentrations in the Red River is one of lowest levels in the upper mainstem increasing downstream of Fargo and the Sheyenne River, a decline below the Red Lake River, and another increase downstream of the Forest and Park Rivers (Figure 14). However, all of the chloride concentrations in the Red River were generally well below levels associated with adverse effects to aquatic assemblages.

Total Sulfate

The pattern of sulfate in the Red River mirrors the plot of conductivity with the lowest levels in the upper mainstem, the highest levels in the middle mainstem, and intermediate levels in the lower mainstem. Major sources of sulfate in the Red River are the western (N. Dakota) tributaries, in particular the Sheyenne River (Figure 15); concentrations in the lower mainstem are diluted by eastern (Minnesota) tributaries, in particular the Red Lake River.

Total Sodium

Sodium followed the longitudinal pattern for other dissolved ions with lowest values in the upper mainstem, highest values in the middle reach and intermediate concentrations in the lower river (Figure 16). North Dakota has a water quality criteria for sodium that is 60% of the cations as mEq/L. Data on this percentage indicates that the maximum percentage was 21.7% and the average percentage was 14.4% all well below the criteria.

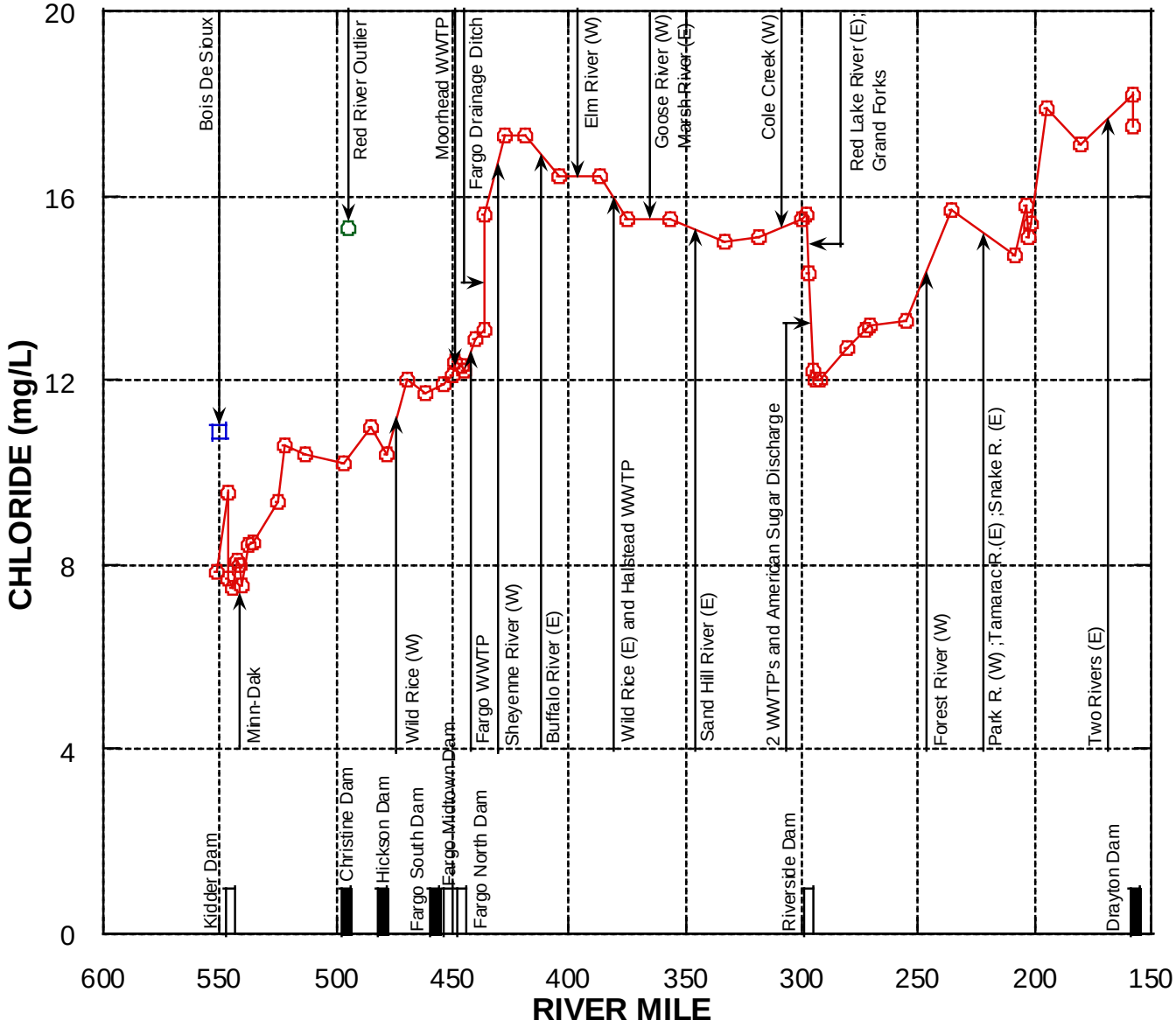


Figure 14. *Total chloride values at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

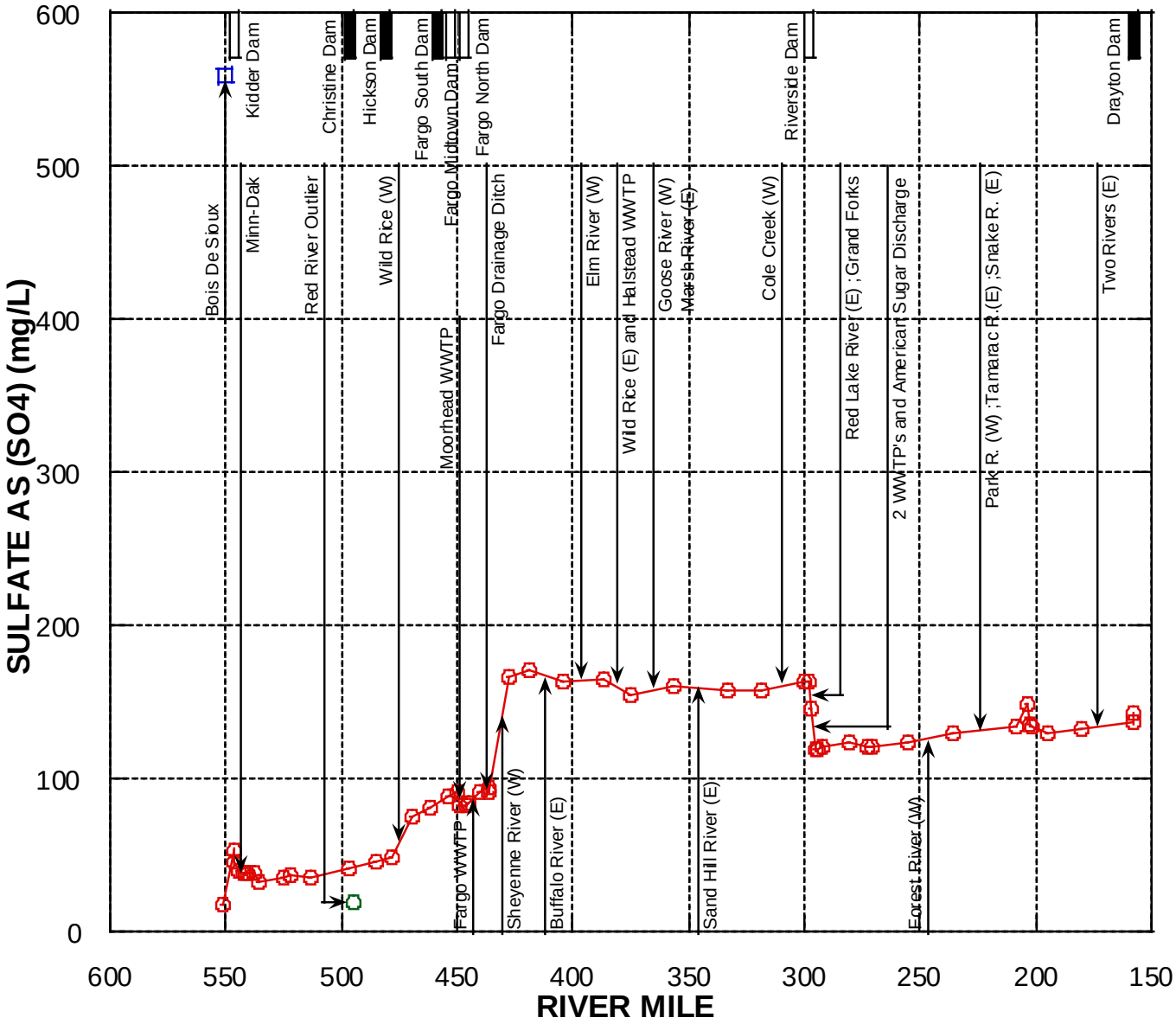


Figure 15. *Total sulfate values at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

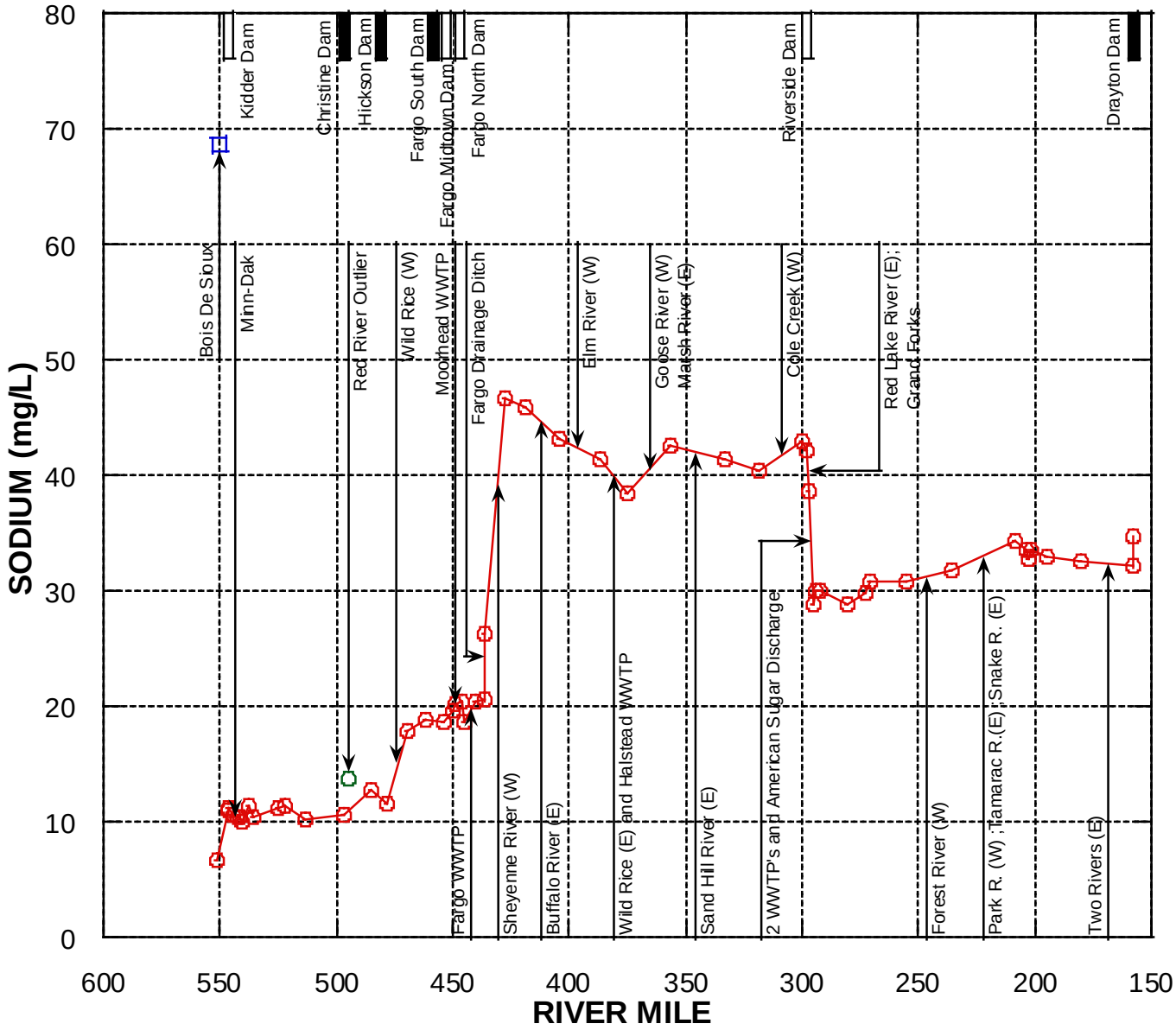


Figure 16. *Total sodium values at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010*

Other Chemical Parameters

Other chemical parameters were also sampled including metals. Aluminum followed the same pattern as many other parameters being lowest in the upper mainstem, highest in the middle mainstem, and intermediate levels in the lower mainstem. Aluminum is typically associated with clayey soils and it is correlated with suspended sediment concentrations. Arsenic was below detection in most of the upper mainstem, exceeded 8 µg/L in the middle mainstem (the drinking water criteria is 10 µg/L), declining slightly in the lower mainstem. Metals such as zinc, copper, and chromium were all below detection levels in the upper mainstem, increasing and remaining elevated downstream from Fargo, but all were well below water quality criteria. A number of other parameters were below detection throughout the river and included total ammonia, antimony, beryllium, cadmium, lead, selenium and thallium. The low levels of total ammonia indicate that municipal point sources did not have an extensive impact on the mainstem.

Habitat Quality

The quality of physical habitat was determined visually using the Qualitative Habitat Evaluation Index (QHEI; Rankin 1989, 1995; Ohio EPA 2006). QHEI scores sites based on the numbers and types of habitat attributes that are important for aquatic life, fish assemblages in particular. The QHEI is scored on a 0-100 scale and has an effective range of 20-100 depending on the quality of the habitat. Values above 60 are generally regarded as being sufficient to support fish assemblages that meet the minimum goal of the CWA and values >75 indicate exceptional quality habitat. QHEI scores <45 reflect modifications and deficiencies that do not support CWA goals. Narrative ratings are; exceptional (>75), good (>60), fair (45-60), poor (30-45), and very poor (<30) quality. In addition to the QHEI scores, a QHEI matrix that depicts the occurrence of attributes that favor higher quality fish assemblages (termed good attributes) and those that have the opposite effect (termed modified attributes) based on analyses by Rankin (1989, 1995) was also examined. The occurrence of modified:good ratios >2:1 indicates that habitat quality is likely unsuitable for supporting assemblages reflective of CWA goals, hence this was examined in addition to the QHEI scores themselves.

QHEI scores ranged from 39.0 (poor) at RM 204.0 in the Drayton Dam impoundment to 79.75 (exceptional) at RM 539.0 downstream from the Cargill discharge north of Wahpeton (Figure 17). The mean across all sites was 56.7. Five sampling sites were located in the impoundments formed by dams or slopeways. The mean QHEI for these impounded sites was 47.0 (range 39.0–56.5) compared to a mean of 57.9 (range 49.5-79.75) for all other sites that were considered to be free flowing. The longitudinal pattern in QHEI scores showed a general decline downstream from the Wahpeton-Breckenridge area where scores were mostly good to exceptional (Figure 16). Downstream of this reach, which ends at the Christine Dam (RM 496.5), QHEI scores were at or below 60 at all except one site in Grand Forks (RM 295.0) for the remainder of the mainstem. This overall pattern corresponds to a decrease in gradient that also occurs in a general downstream direction (Figure 18).

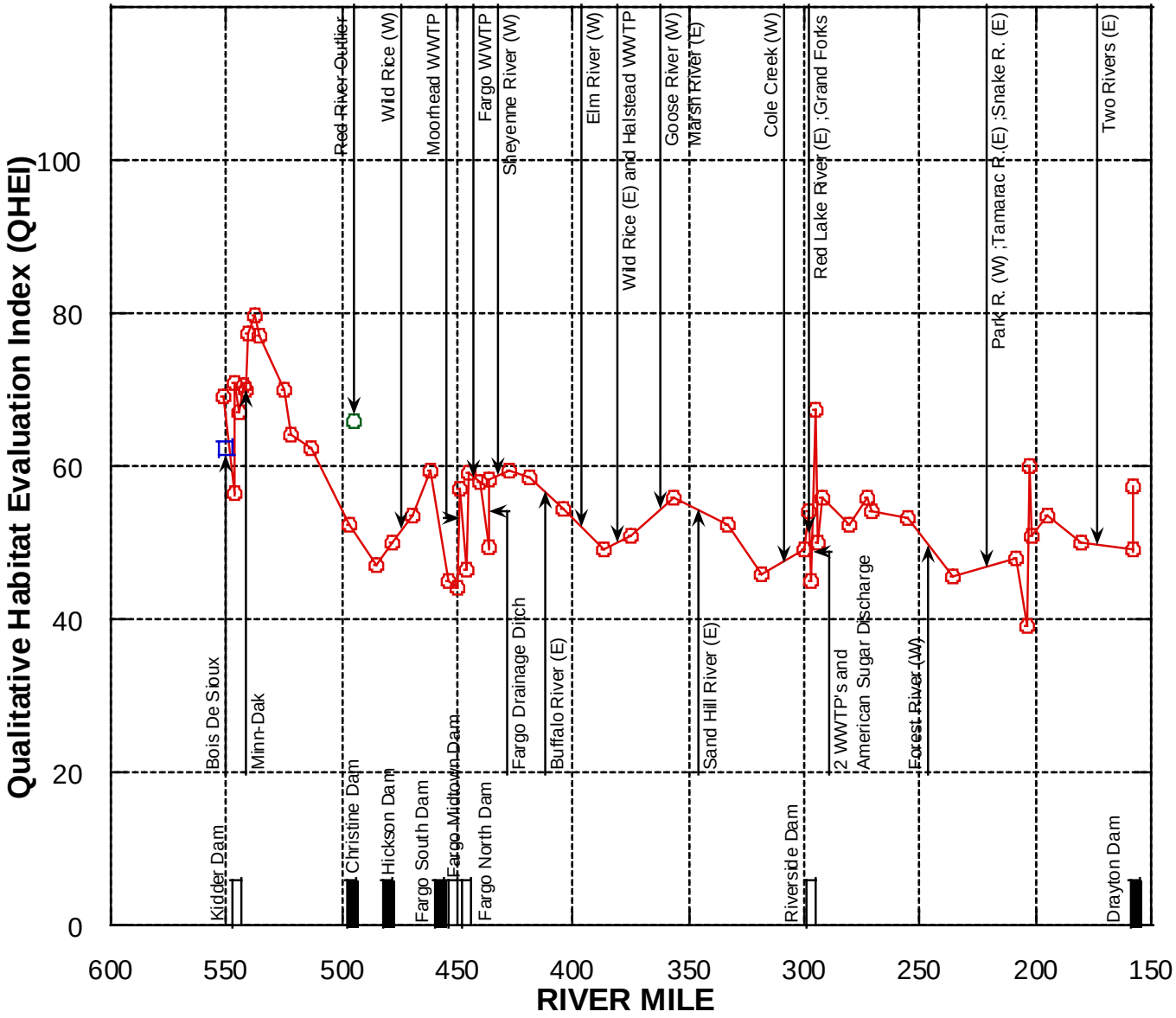


Figure 17. *QHEI scores at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

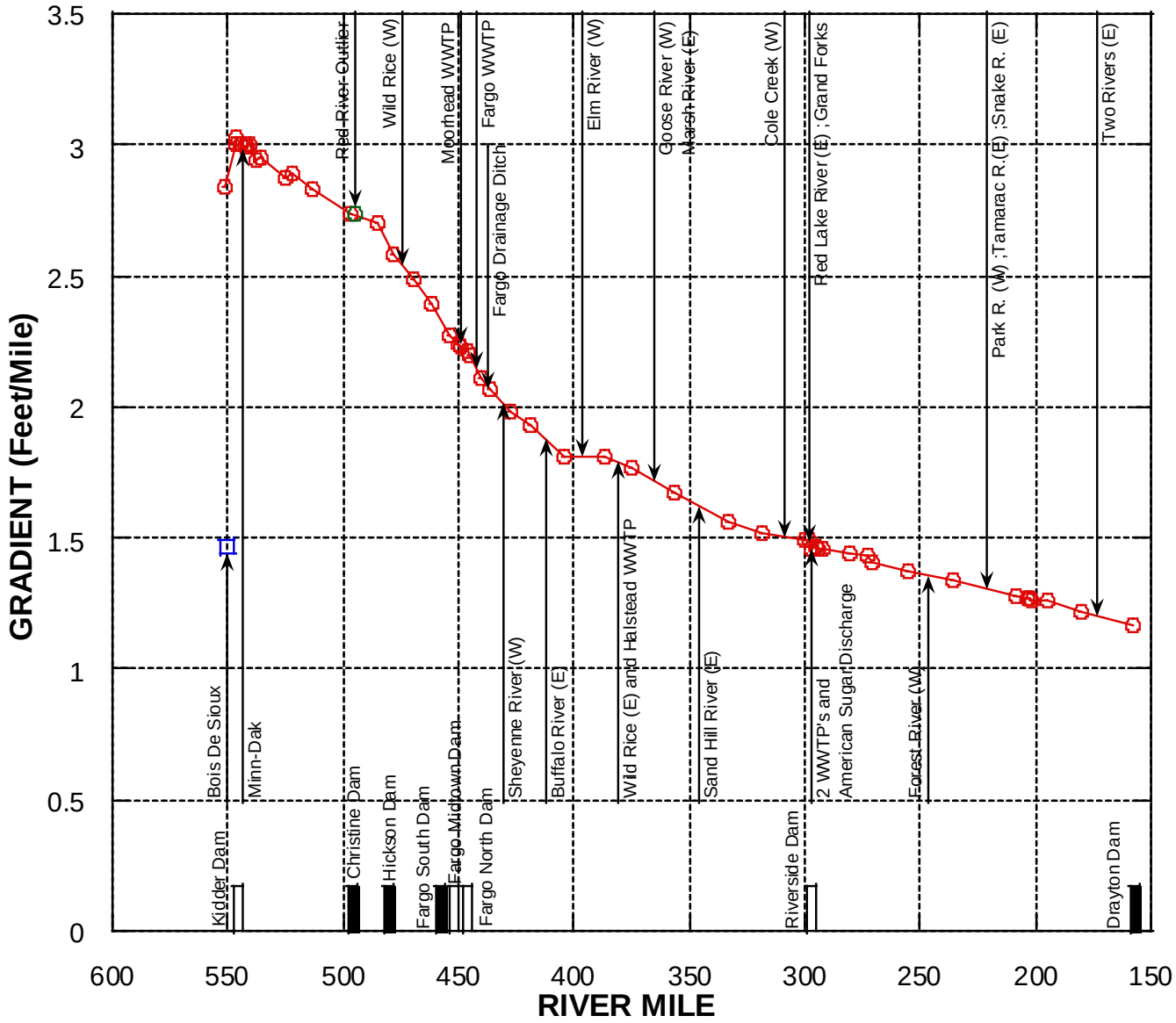


Figure 18. *Gradient (feet/mile) calculated for 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

Table 5. QHEI scores and metric values for sites sampled in the Red River mainstem during 2010.

River Mile	QHEI	Gradient (ft/mile)	WWH Attributes: No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max Depth > 40 cm	Low-Normal Riffle Embeddedness	Total WWH Attributes	MWH Attributes: High Influence: Channelization Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WD, HW)	Total H.I. MWH Attributes	Moderate Influence: Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	Total M.I. MWH Attributes	(MWH H.I.+1)/(WWH+1) Ratio	(MWH M.I.+1)/(WWH+1) Ratio
(98200) Red River of the North																																	
Year: 2010																																	
546.80	56.50	3.00	■				■	■		■		■	4			◆			1		■								■		■	3	0.40	1.00
546.40	71.00	3.03					■			■	■	■	5			◆			1	■				■								2	0.33	0.67
544.40	67.00	3.00	■				■	■		■		■	5			◆			1		■								■	■		3	0.33	0.83
541.00	70.50	2.99	■	■			■	■		■	■	■	8			◆			1													0	0.22	0.22
540.50	70.00	2.99	■	■			■	■		■	■	■	8			◆			1													0	0.22	0.22
539.90	77.50	3.00	■	■			■	■	■	■	■	■	9						0													0	0.10	0.10
539.00	79.75	2.94	■	■			■	■	■	■	■	■	9						0									■				1	0.10	0.20
536.30	77.00	2.95	■	■			■	■	■	■	■	■	9						0									■				1	0.10	0.20
525.00	70.00	2.87	■	■			■	■		■	■		7			◆			1	■										■		2	0.25	0.50
523.00	64.00	2.89	■				■	■		■		■	5			◆			1									■	■	■		3	0.33	0.83
513.00	62.50	2.83	■				■	■		■		■	5			◆			1	■									■	■		3	0.33	0.83
497.00	52.25	2.74						■		■		■	3			◆			1	■		■							■		■	4	0.50	1.50
496.20	66.00	2.74	■				■	■	■	■	■	■	7						0									■		■		2	0.13	0.38
485.00	47.00	2.70						■				■	2			◆			1	■		■						■	■		■	5	0.67	2.33
478.50	50.00	2.58	■					■				■	3			◆			1	■		■						■	■		■	5	0.50	1.75
472.00	53.50	2.49	■					■				■	3			◆			1			■						■	■		■	4	0.50	1.50
462.00	59.50	2.39	■					■	■	■		■	5			◆			1	■		■						■	■		■	5	0.33	1.17
454.00	45.00	2.27										■	1			◆			1	■		■	■					■	■		■	6	1.00	4.00
450.00	44.00	2.24	■					■				■	3			◆			1	■		■						■	■		■	5	0.50	1.75
448.80	57.00	2.23							■	■	■	■	4			◆			1	■			■	■							■	4	0.40	1.20
446.40	46.50	2.21	■					■				■	3	◆		◆			2	■		■						■	■		■	5	0.75	2.00
445.30	59.00	2.20	■						■	■		■	4						0	■			■	■				■	■	■		6	0.20	1.40
440.00	58.00	2.11	■					■	■	■		■	5						0	■			■					■	■	■		5	0.17	1.00
437.00	49.50	2.07	■					■			■	■	4			◆			1				■					■			■	3	0.40	1.00
436.40	58.25	2.07	■					■	■	■		■	5						0	■			■					■	■	■		5	0.17	1.00
427.40	59.50	1.98	■					■	■	■		■	5						0	■			■					■	■	■		5	0.17	1.00
418.70	58.50	1.93	■					■	■	■		■	5						0	■			■						■	■		4	0.17	0.83
404.00	54.50	1.81	■						■	■		■	4						0	■				■	■			■	■	■		6	0.20	1.40
386.00	49.00	1.81	■							■		■	3			◆			1	■				■	■			■	■	■		6	0.50	2.00

Table 5. Continued.

River Mile	QHEI	Gradient (ft/mile)	WWH Attributes: No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max Depth > 40 cm	Low-Normal Riffle Embeddedness	Total WWH Attributes	MWH Attributes: High Influence: Channelization or Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WD, HW)	Total H.I. MWH Attributes	Moderate Influence: Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	Total M.I. MWH Attributes	(MWH H.I.+1)/(WWH+1) Ratio	(MWH M.I.+1)/(WWH+1) Ratio
(98200) Red River of the North																																	
Year: 2010																																	
375.00	51.00	1.77	■					■	■		■		4						0	■		■	■					■	■	■	6	0.20	1.40
355.00	56.00	1.67	■	■					■		■		4				◆		1	■		■	■					■	■	■	6	0.40	1.60
333.00	52.50	1.56	■				■	■	■		■		5			◆			1	■		■						■	■	■	5	0.33	1.17
318.00	46.00	1.52	■						■		■		3			◆	◆		2	■		■	■					■	■	■	6	0.75	2.25
300.00	49.00	1.49	■				■			■	■		4				◆		1			■						■		■	3	0.40	1.00
298.00	54.25	1.49					■		■	■	■		4				◆		1	■		■						■		■	4	0.40	1.20
296.50	45.00	1.46					■	■	■		■		4				◆		1	■		■						■	■	■	5	0.40	1.40
295.50	67.50	1.47	■		■	■	■	■	■	■	■		7				◆		1									■	■		2	0.25	0.50
294.30	50.00	1.46	■				■		■	■	■		5				◆		1			■						■		■	3	0.33	0.83
292.00	56.00	1.46	■				■		■	■	■		5				◆		1	■		■						■		■	4	0.33	1.00
280.00	52.50	1.44	■				■		■	■	■		5				◆		1	■		■						■		■	4	0.33	1.00
271.00	55.75	1.43	■				■		■	■	■	■	6				◆		1			■									1	0.29	0.43
265.00	54.00	1.41	■				■			■	■		4				◆		1			■						■		■	3	0.40	1.00
255.00	53.25	1.37	■				■		■		■		5				◆		1	■		■						■	■	■	5	0.33	1.17
236.00	45.50	1.34	■						■		■		3			◆	◆		2	■		■	■					■	■	■	6	0.75	2.25
208.60	48.00	1.28	■						■		■		3				◆		1	■		■	■	■				■	■	■	7	0.50	2.25
204.00	39.00	1.27							■		■		2				◆		1	■		■	■	■				■	■	■	7	0.67	3.00
203.30	60.00	1.27	■		■	■	■	■	■	■	■		7				◆		1									■		■	2	0.25	0.50
201.20	51.00	1.26	■				■		■	■	■		5				◆		1			■	■	■				■		■	5	0.33	1.17
195.00	53.50	1.26	■				■		■	■	■		5				◆		1			■								■	2	0.33	0.67
179.50	50.00	1.22	■				■		■	■	■		5				◆		1			■			■			■		■	4	0.33	1.00
158.30	49.00	1.17	■				■		■		■		4				◆		1	■		■				■		■	■	■	6	0.40	1.60
157.80	57.50	1.17	■				■		■	■	■		5				◆		1			■						■		■	3	0.33	0.83
(98250) Bois de Sioux																																	
Year: 2010																																	
1.50	62.25	1.47	■			■				■	■		4				◆		1	■				■				■		■	4	0.40	1.20
(96225) Otter Tail River																																	
Year: 2010																																	
1.50	69.00	2.84	■	■			■	■	■		■		6						0				■						■	■	3	0.14	0.57

The analysis of QHEI attributes for each site (Table 5) shows that all except 3 sites had one or more modified attributes. More importantly, the modified:good ratios were less than 2.0 at all except 6 sites. The highest ratio of 4.0 occurred at RM 454.0 which is in the impoundment formed by the Fargo Midtown Dam (RM 452.2) and the next highest ratio of 3.0 occurred at RM 204.0 which is in the Drayton Dam impoundment. The most frequently occurring modified attributes were sparse or no cover, heavy/moderate siltation, fair/poor development, no fast current, high/moderate embeddedness, and no riffle/run habitats. These represent a mix of naturally occurring conditions and modifications ranging from impoundment to the direct and indirect effects of the predominant agricultural land uses, controlling the latter of which is key to improving overall habitat conditions in the Red River mainstem.

Fish Assemblage Results

An average of 186.4 individual fish/km with an average weight of 31.51 kg/km were collected at 54 boat electrofishing sites in the Red River mainstem between Wahpeton and Pembina, ND. Of the 41 species that were collected, those that predominated in terms of numbers and biomass are listed in Tables 6 and 7. The results for each site appear in Appendix A.

***Table 6**. Numerically predominant fish species (>1.0% by numbers) collected by boat electrofishing in the U.S. portion of Red River of the North mainstem, 2010. N is the number of locations at which a species occurred.*

Species	Number/km	%Number	N
Channel catfish *(Ictalurus punctatus)*	46.1/km	24.7%	52
Spotfin shiner *(Cyprinella spiloptera)*	35.0/km	18.8%	48
Goldeye *(Hiodon tergisus)*	18.0/km	9.6%	50
Common carp *(Cyprinus carpio)*	17.9/km	9.6%	48
Spottail shiner *(Notropis hudsonius)*	5.7/km	3.0%	15
Shorthead redhorse *(Moxostoma macrolepidotum)*	5.6/km	3.0%	44
Freshwater drum *(Aplodinotus grunniens)*	5.0/km	2.7%	42
Emerald shiner *(Notropis atherinoides)*	4.8/km	2.6%	25
Fathead minnow *(Pimephales promelas)*	4.8/km	2.6%	24
Sauger *(Sander canadensis)*	4.8/km	2.6%	36
White bass *(Morone chrysops)*	4.7/km	2.5%	34
Silver chub *(Macrhybopsis storeriana)*	4.0/km	2.1%	19
Golden redhorse *(Moxostoma erythrurum)*	3.9/km	2.1%	17
Orangespotted sunfish *(Lepomis humilis)*	3.5/km	1.9%	22
Silver redhorse *(Moxostoma anisurum)*	3.3/km	1.8%	27
Quillback carpsucker (Carpiodes cyprinus)	2.7/km	1.5%	33
Trout-perch *(Percopsis omiscomaycus)*	2.7/km	1.5%	23
Smallmouth bass *(Micropterus dolomieu)*	2.1/km	1.1%	23
Sand shiner *(Notropis stramineus)*	2.0/km	1.1%	17
Northern pike *(Esox lucius)*	1.9/km	1.0%	27

Table 7*. Predominant fish species in terms of biomass (>1.0% by weight) collected by boat electrofishing in the U.S. portion of Red River of the North mainstem, 2010. N is the number of locations at which a species occurred.*

Species	Kg/km	%Biomass	N
Common carp *(Cyprinus carpio)*	10.14/km	32.2%	48
Channel catfish *(Ictalurus punctatus)*	7.11/km	22.5%	52
Goldeye *(Hiodon tergisus)*	3.44/km	10.9%	50
Quillback carpsucker (Carpiodes cyprinus)	1.77/km	5.6%	33
Freshwater drum *(Aplodinotus grunniens)*	1.63/km	5.2%	42
Bigmouth buffalo *(Ictiobus cyprinellus)*	1.60/km	5.1%	13
Shorthead redhorse *(Moxostoma macrolepidotum)*	1.45/km	4.6%	44
Silver redhorse *(Moxostoma anisurum)*	1.09/km	3.5%	27
Golden redhorse *(Moxostoma erythrurum)*	0.67/km	2.1%	17
Northern pike *(Esox lucius)*	0.57/km	1.8%	27
Walleye *(Sander vitreum)*	0.35/km	1.1%	23
Sauger *(Sander canadensis)*	0.35/km	1.1%	36

Channel catfish *(Ictalurus punctatus),* spotfin shiner *(Cyprinella spilopterus),* goldeye *(Hiodon tergisus),* and common carp *(Cyprinus carpio)* were numerically predominant comprising more than 60% of the collections by numbers. In terms of biomass, common carp, channel catfish, goldeye, quillback carpsucker *(Carpiodes cyprinus),* freshwater drum *(Aplodinotus grunniens),* and bigmouth buffalo *(Ictiobus cyprinellus)* comprised more than 80% of biomass. The Red River fish assemblage is comprised mostly of a mix of species that are tolerant of turbid water and soft or fine substrates with the presence of some large river obligate species.

Species Richness

The number of species ranged from 8-20 at all sites with a mean of 14 species (Figure 19A). There was a perceptible decline from Wahpeton- Breckenridge to downstream from Fargo-Moorhead followed by a general increase to and through Grand Forks. Species richness declined below Grand Forks and with one exception remained at 10-14 species.

Density (number/km)

Density ranged from 42-390/km with an overall mean of 186.4/km (Figure 19B). There was an overall decline in numbers in a downstream direction with numbers <200/km and up to near 400/km in and immediately below Wahpeton- Breckenridge. With the exception of higher numbers in and below Fargo-Moorhead and Grand Forks most sites had numbers <200/km.

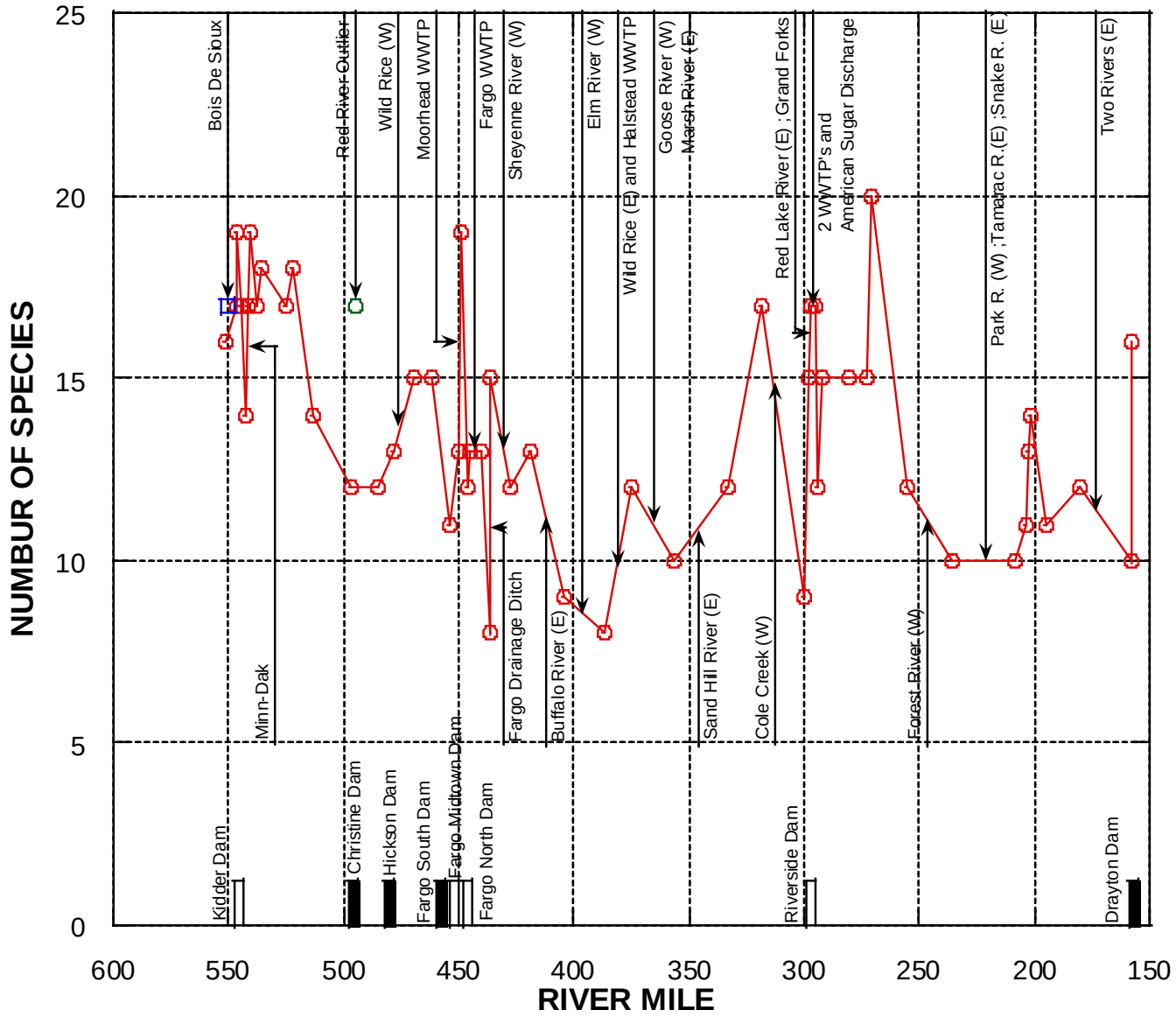


Figure 19A. *Fish species richness at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

Biomass (kg/km)

Biomass ranged from 7.1-264 kg/km with an overall mean of 74.7 kg/km (Figure 19C). There was an overall decline through the study area with the highest values in and below Wahpeton-Breckenridge and in Fargo-Moorhead. Biomass was consistently <40-50 kg/km throughout the remainder of the mainstem.

Deformities, Erosions, Lesions, and Tumors (DELT Anomalies)

The proportion of fish with DELT anomalies ranged from 0-7.2% with a mean of 0.97% (Figure 19D). The highest value of 7.2% occurred at the Bois de Sioux River site which contrasts with 0% at the Otter Tail River site. The incidence of DELTs ranged from 2-4% at various locations, but most sites had 0% as evidenced by the median value of 0%.

Modified Index of Well-Being (MIwb)

Modified Iwb (MIwb) scores ranged from 5.72-9.49 with a mean of 7.63 (Figure 19E). Being an index comprised of transformed abundance parameters (numbers, biomass, and diversity) it was not nearly as spatially variable as its individual components. Visually there was a slight decline in a downstream direction with the highest values >8.0-9.0 in and immediately below Wahpeton- Breckenridge. Downstream from that area MIwb values were infrequently >8.0 and some values were <6.0.

Indices of Biotic Integrity (IBI)

Two indices of biotic integrity were calculated for the 2010 data. The Fish Assemblage Condition Index (FACI; Emery et al. 2007) was developed from a regional assessment of large river tributaries to the Upper Ohio and Upper Mississippi Rivers in 2004-2006. The metrics were derived by examining many more candidate metrics than those that comprise the final index and by testing metrics for responsiveness, redundancy, and ecological relevance. The second IBI was recently developed by MPCA and specifically for the ichthyofaunal region within which the Red River occurs (MPCA, unpublished analyses). This IBI is termed the Southern Rivers IBI and it applies to large rivers across Minnesota that lay within the MPCA southern ichthyofaunal region. Like the FACI, the Southern Rivers IBI was developed based on an examination of a large number of candidate metrics and by testing for metric responsiveness in keeping with the process described by Whittier et al. 2007. Both indices have a 0-100 scoring range and tentative biological criteria have been determined for each following a reference condition/stressor gradient approach, however the geographic domains of each were different.

FACI scores ranged from 34.7-53.3 with an overall mean of 45.4 (Figure 20A). The 25th percentile reference value is 48 and could serve as a biological criterion for a preliminary status assessment. Unlike the prior observations about the assemblage abundance, diversity, and condition parameters there was little evidence of any overall trend along the longitudinal continuum. There were some local changes, but none suggested any spatially significant impacts. Most of the FACI scores were below the 25th percentile reference value of 48 which is based on the FACI stressor gradient.

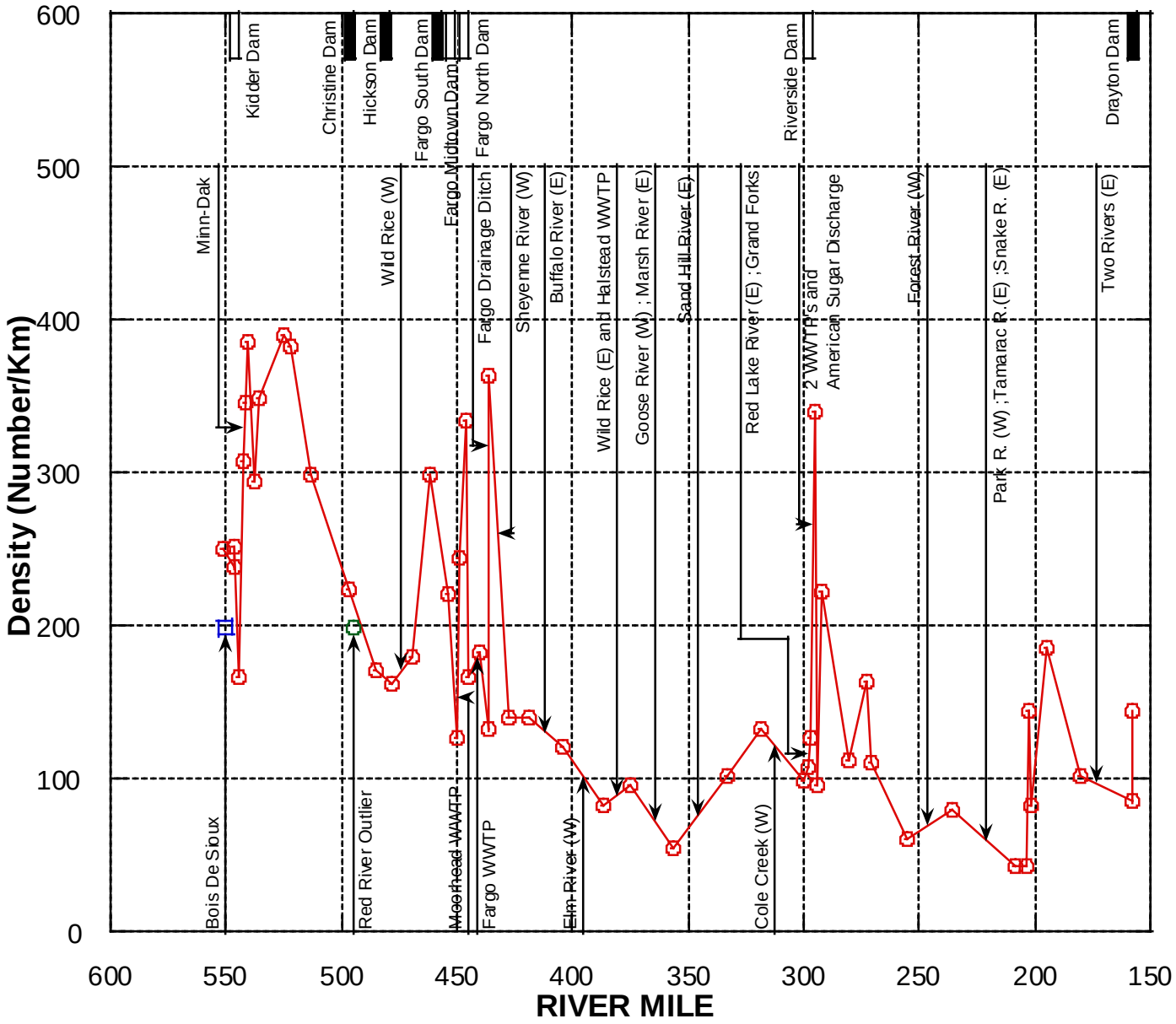


Figure 19B. *Fish relative numbers (density) at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

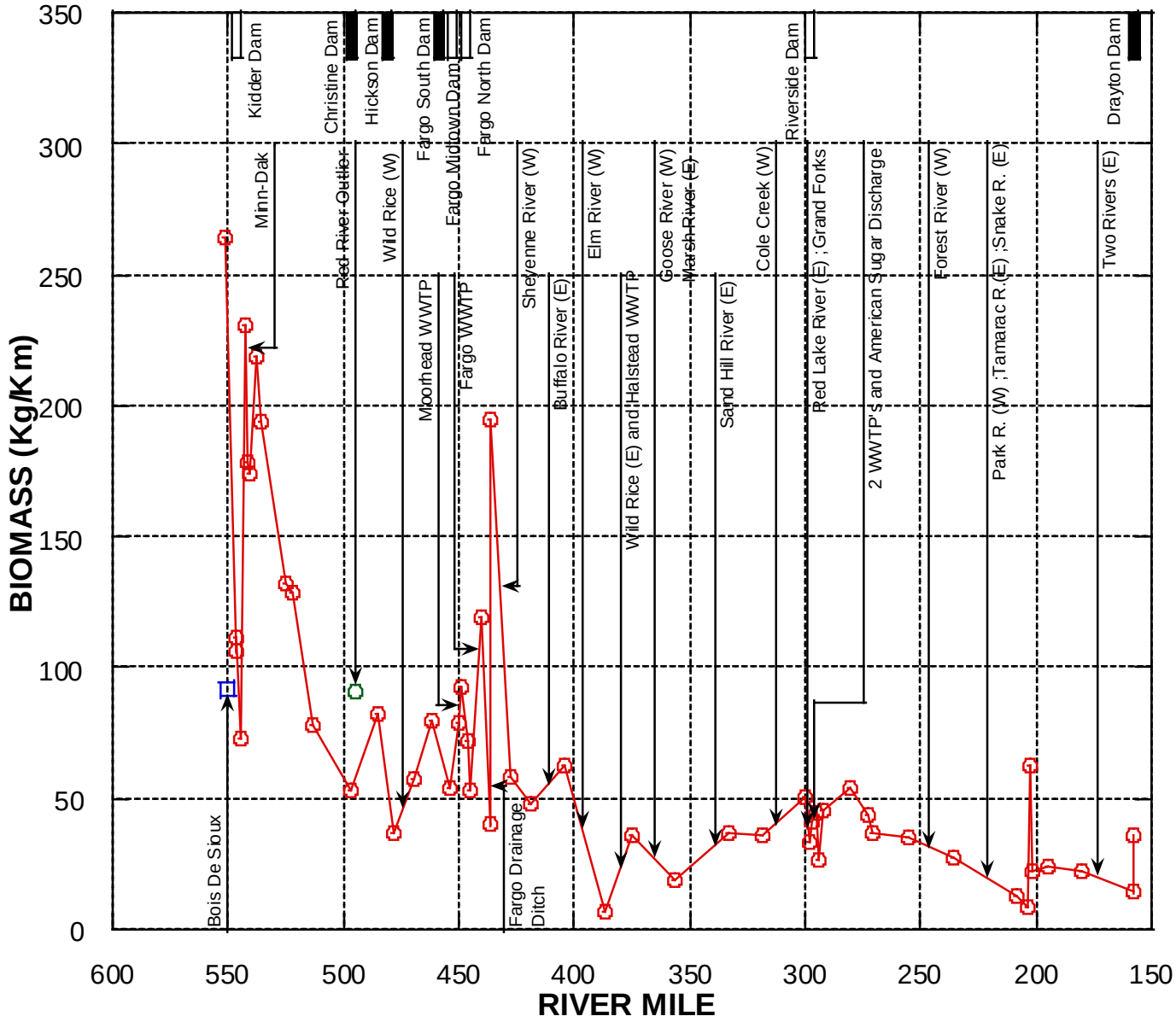


Figure 19C. *Fish relative weight (biomass) at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

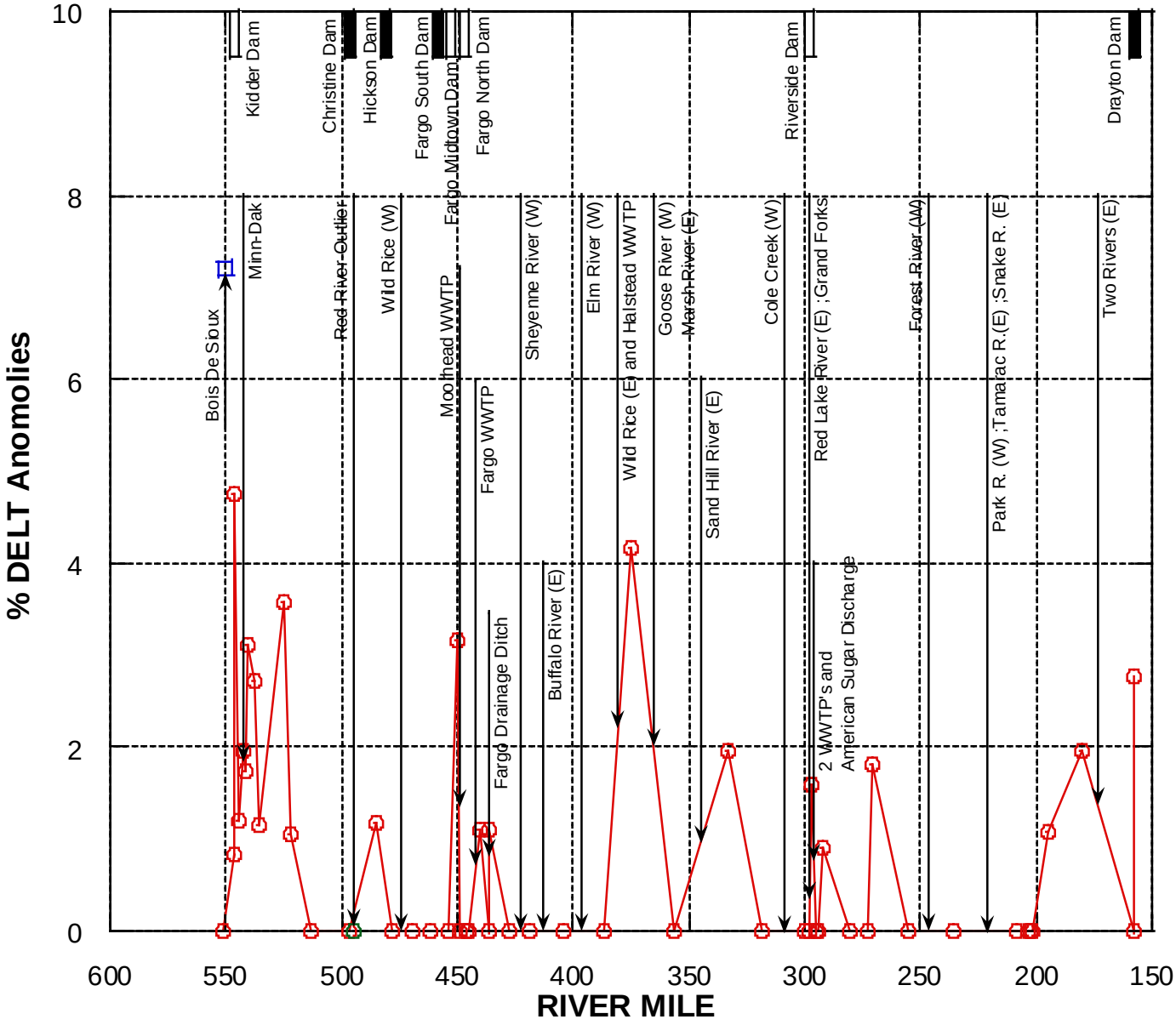


Figure 19D. *Percentage of fish with deformities, erosions, lesions, and tumors (DELT anomalies) at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

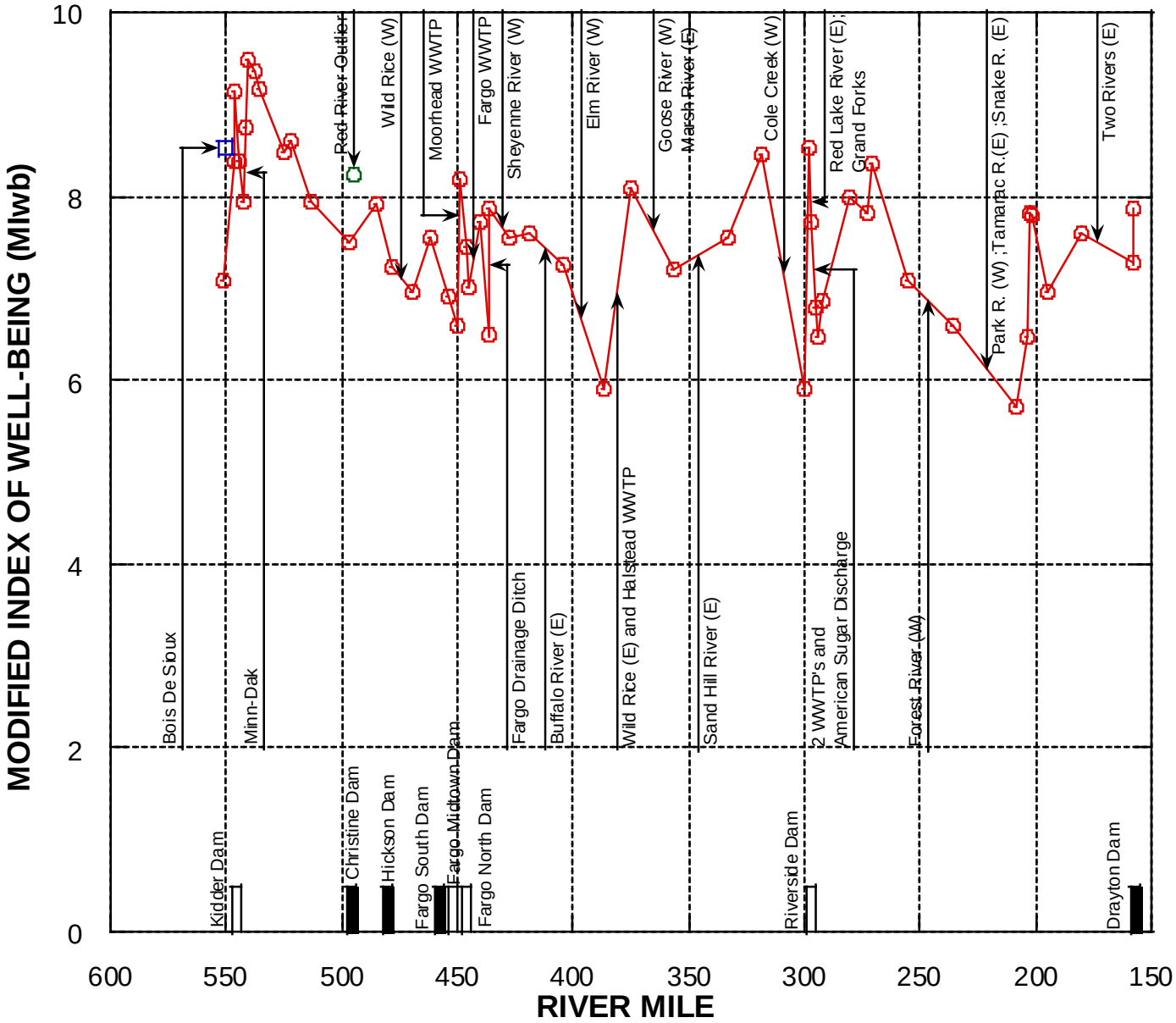


Figure 19E. *Modified Index of Well-Being scores (MIwb lower left) at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

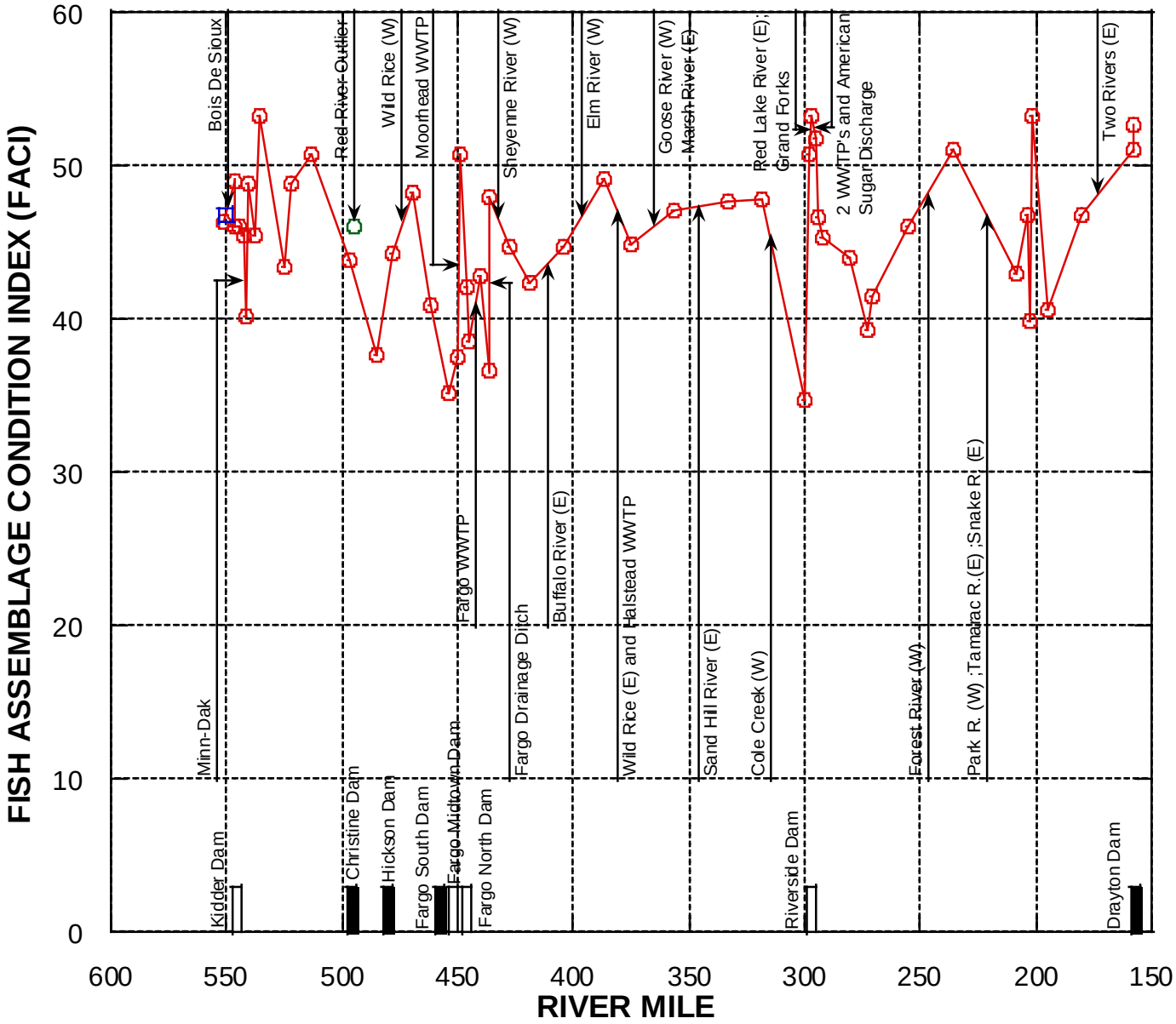


Figure 20A. *Fish Assemblage Condition Index (FACI) at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010. Potential biological criteria are indicated for each index.*

The MPCA Southern Rivers IBI scores ranged from 39.9-75.3 with an overall mean of 62.9 (Figure 20B). The variation in scores was greater than the FACI and some general longitudinal patterns were evident. MPCA IBI scores declined in a general downstream direction from Wahpeton- Breckenridge then increased with much variation between sites through the remainder of the study area. Most MPCA IBI scores were above the interim MPCA General Use biological criterion with only 4 sites below that threshold. A few sites were above the interim threshold for an "exceptional" or upper tier biocriterion with most of these occurring in Wahpeton- Breckenridge and in and below the greater Grand Forks area.

Macroinvertebrate Assemblage Results

Macroinvertebrate sampling at 52 sites in the Red River mainstem resulted in 18 orders, 54 families, and 114 total taxa (at the family, genus, or species level) during the 2010 survey. For an overall assessment of macroinvertebrate assemblage quality we used the recently developed MPCA mIBI and in recognition that the methods used herein are somewhat different than those used by MPCA. However, each method relies on multihabtat samples using dipnets.

The Red River failed to attain the proposed MPCA General Use criterion for the Prairie River Class (mIBI = 31) at all but four sites in the upstream most reach (including the Otter Tail R., but excluding the Bois de Sioux R.), one site downstream of the Sheyenne River, and one site upstream of the Forest River (Figure 21). In general the condition was good in the very upper reaches (excluding the Bois de Sioux R.) and gradually declined downstream until making an improvement upstream and past the confluence with the Sheyenne River. Another reach of relative improvement occurred downstream of the Red Lake River with further declines past the Forest River and the Park River (Figure 21).

We also analyzed longitudinal plots of key metrics and other macroinvertebrate indicators (EPT taxa) with river mile (Figures 21-27). Although there was some variability in metric scores the pattern in these indicators were generally similar to the mIBI declining through the first 100 miles followed by improvements downstream from the Sheyenne River and downstream from the Red Lake River (Figures 21-27). The lower 100 miles showed some variability between metrics, but there was generally a decline downstream of the western-draining Forest River and improvements downstream of the eastern-draining Red Lake River (Figures 21-27). The western draining rivers (Forest, Turtle, Park, and Pembina) have naturally elevated levels of arsenic and other trace metals at some sites (North Dakota Dept. of Health 2014.).

In addition to the use of the MPCA mIBI we conducted a multivariate ordination with the raw data using Non-metric Multidimensional Scaling (NMS), an ordination method that is well suited to data that are non-normal and it is generally the best ordination method for biological assemblage data. We grouped the data by major reach of the mainstem (upper, RM <427; middle, RM 428-296; lower RM <296). The ordination bi-plot is illustrated on Figure 28 with each river reach bounded by a convex hull or envelope and vectors indicating significantly correlated environment variables.

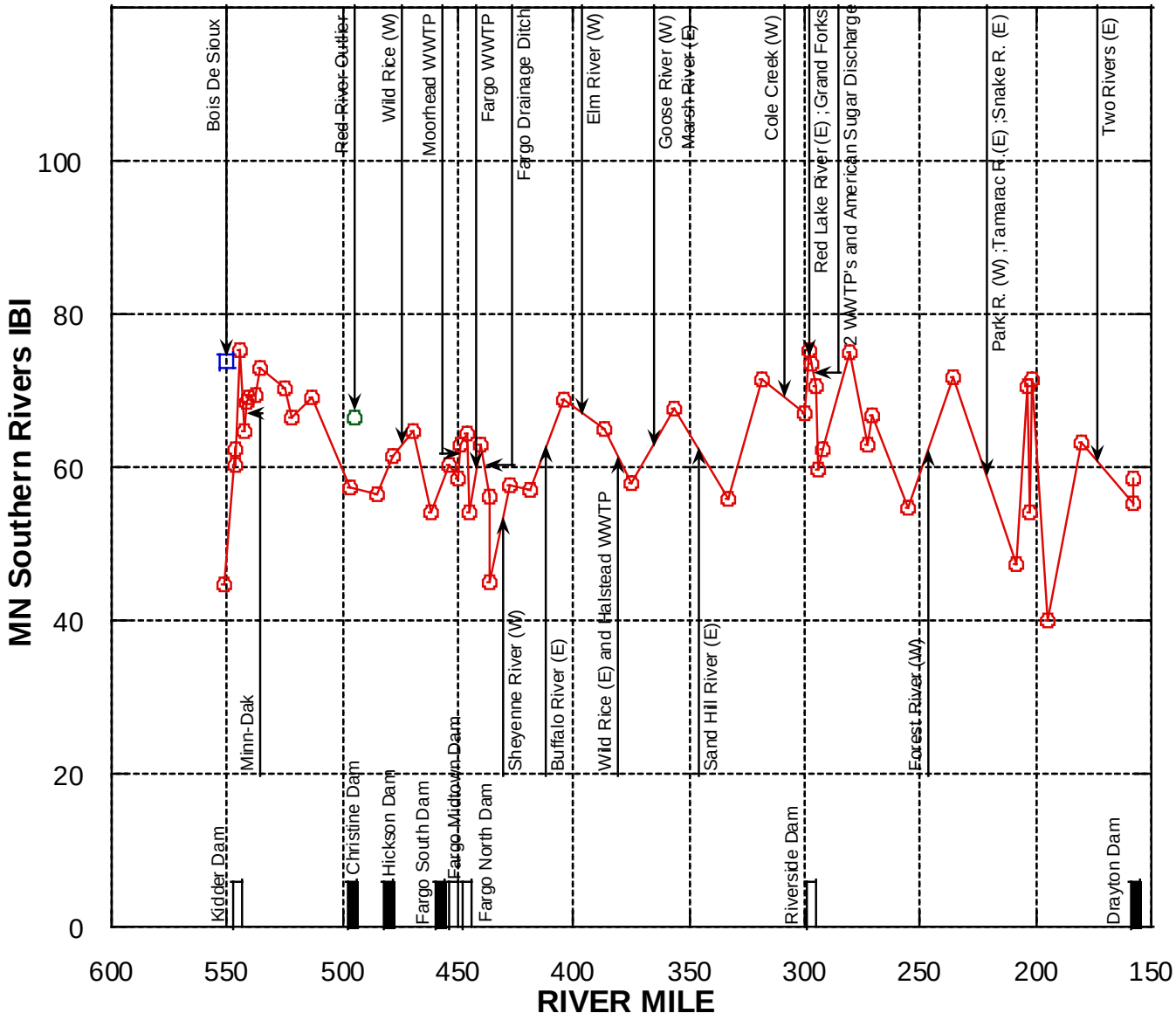


Figure 20B. *MPCA Southern Rivers IBI at 54 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010. Potential biological criteria are indicated for each index.*

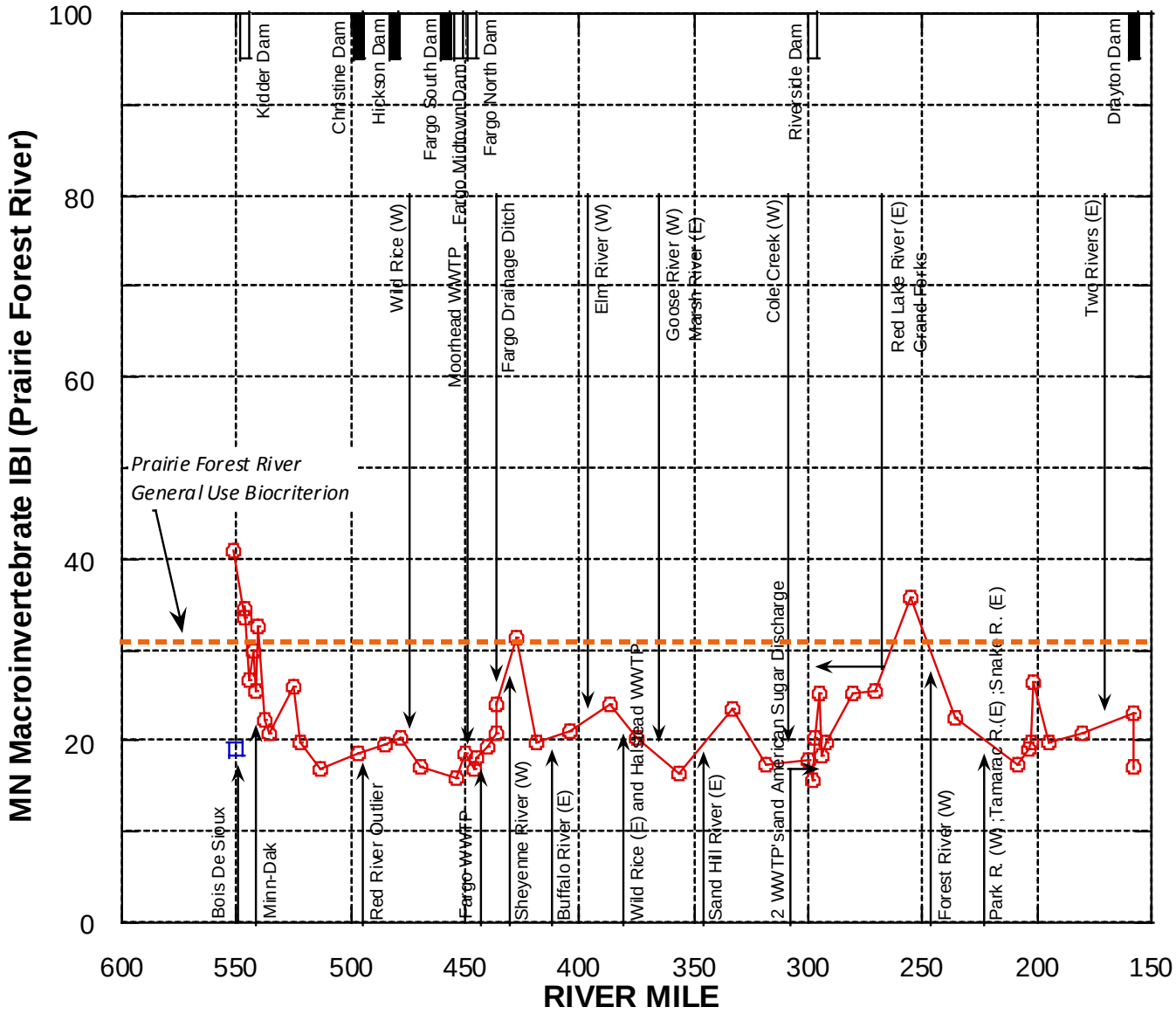


Figure 21*. MPCA mIBI vs. river mile for the Red River at 52 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010. Potential biological criteria are indicated for Prairie Forest region which includes the Red River.*

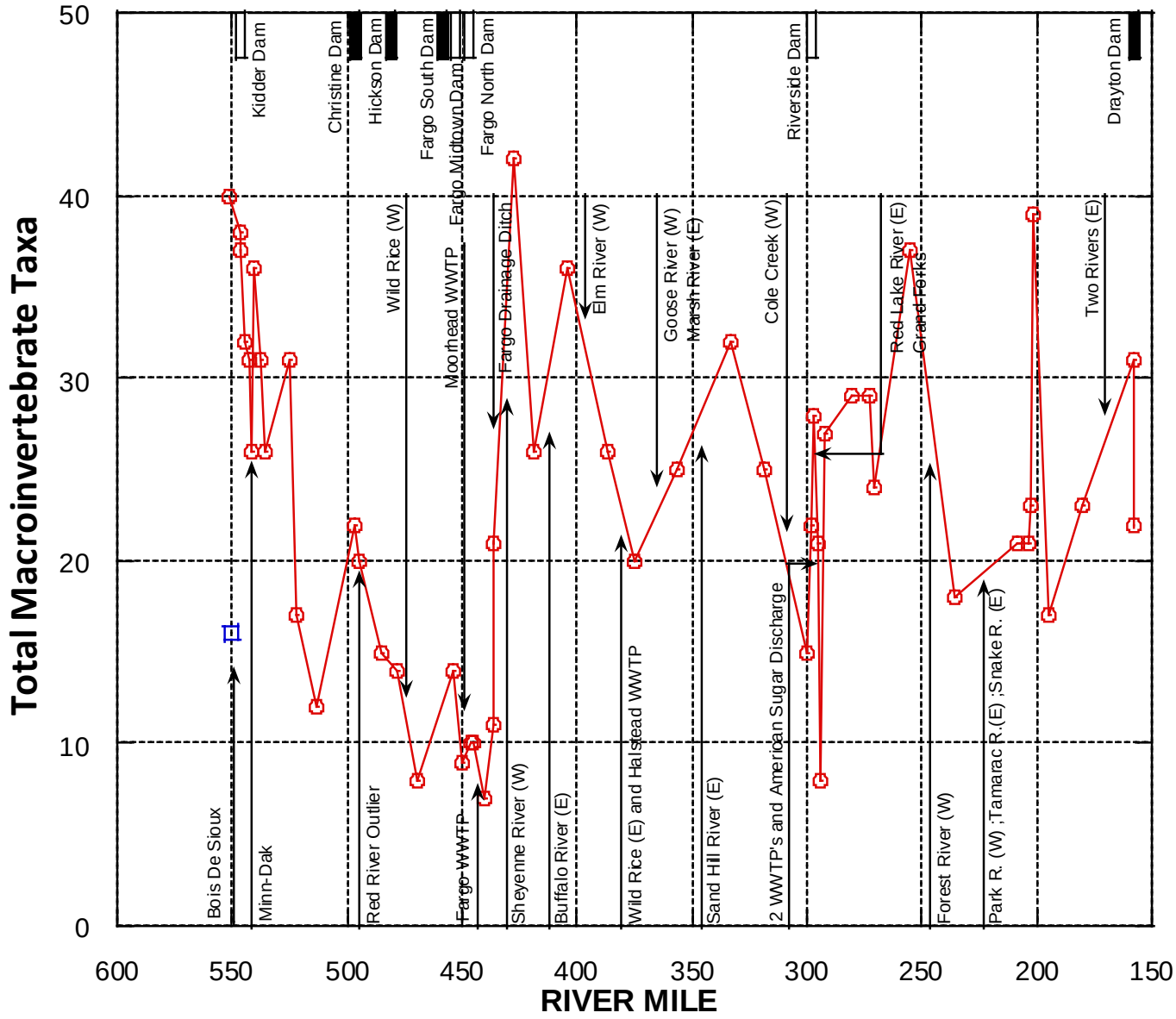


Figure 22*. Total macroinvertebrate taxa vs. river mile for the Red River at 52 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

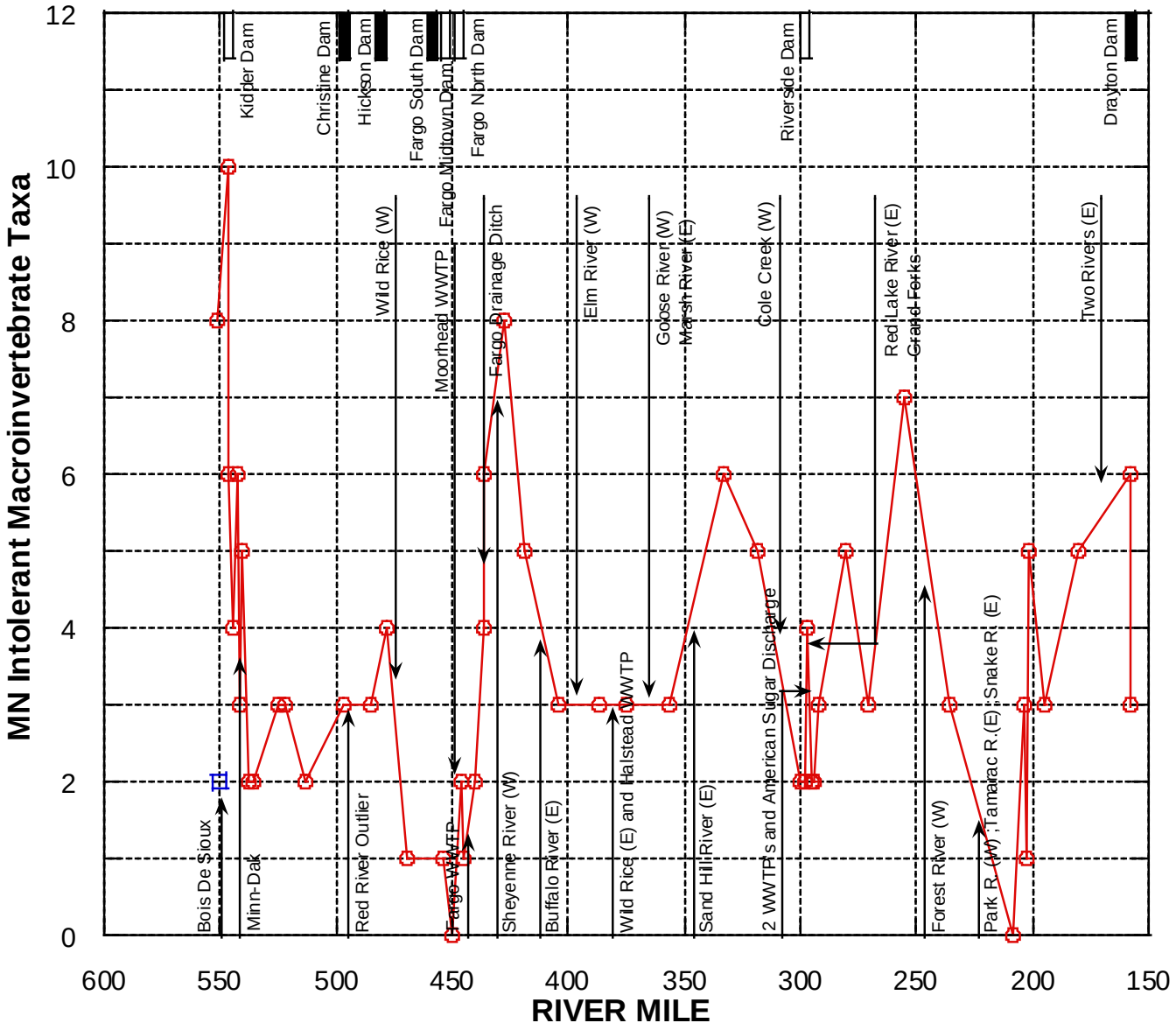


Figure 23*. MPCA intolerant taxa vs. river mile for the Red River at 52 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

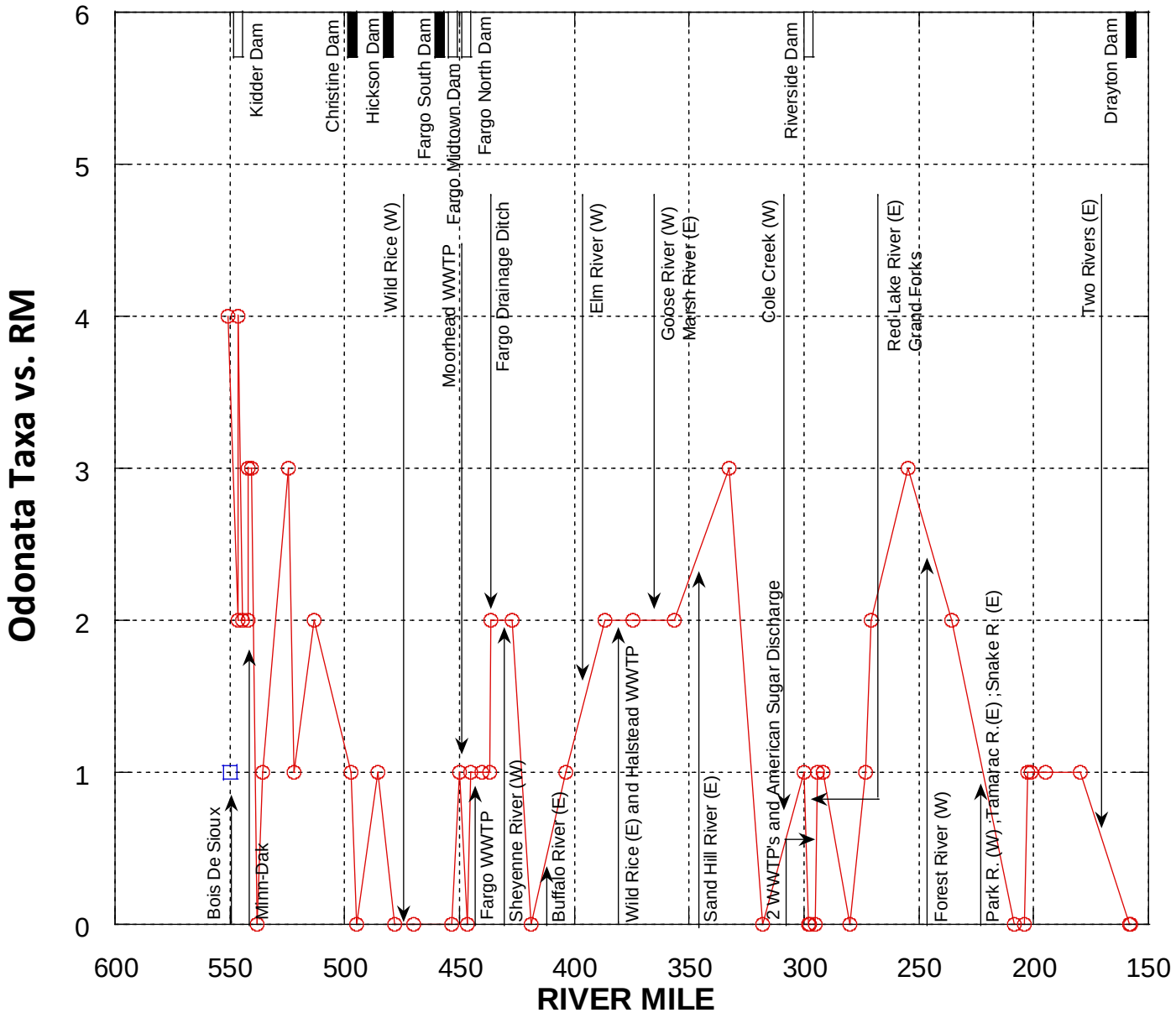


Figure 24*. Odonata taxa richness vs. river mile for the Red River at 52 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

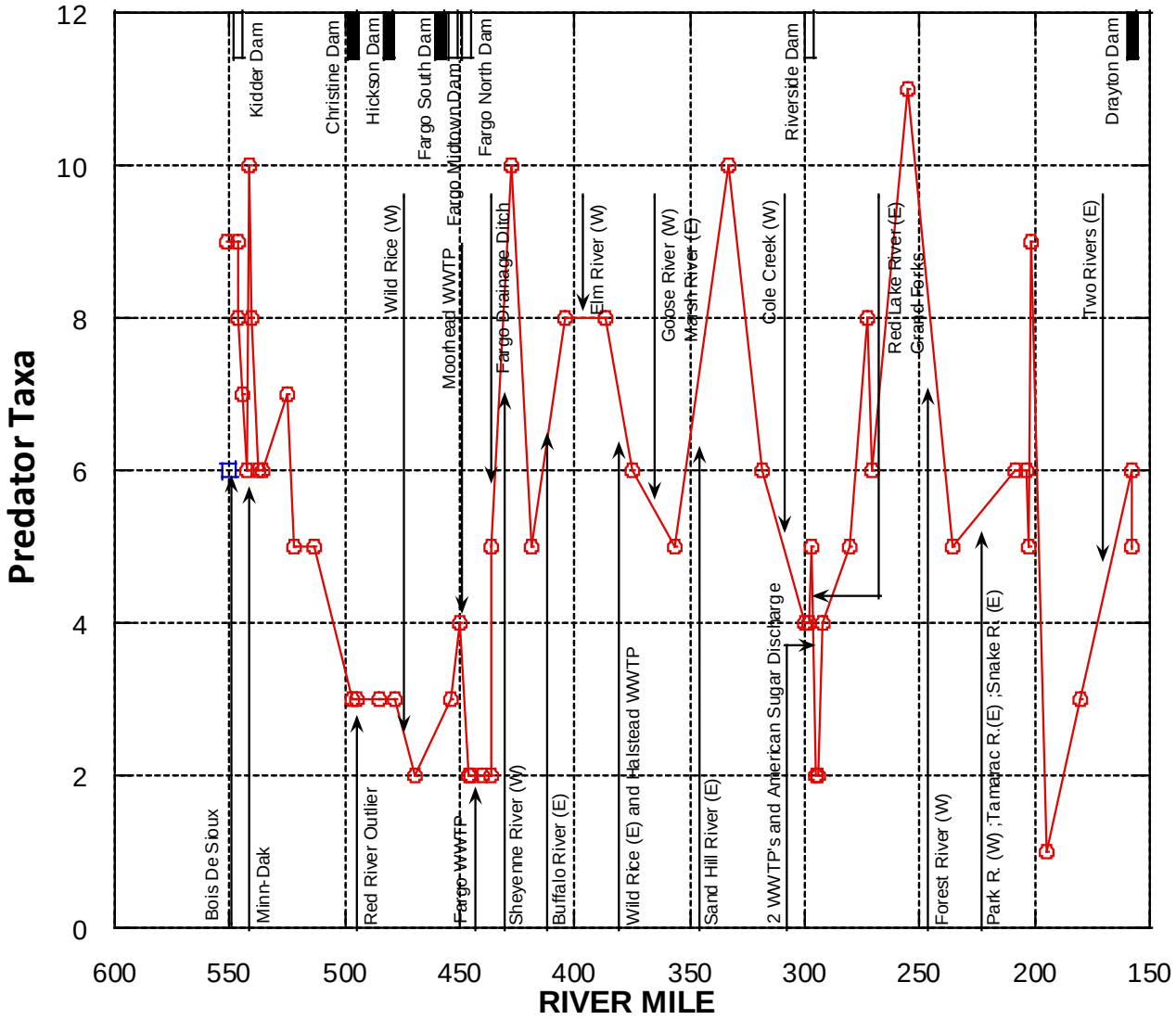


Figure 25. *Predator taxa richness vs. river mile for the Red River at 52 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

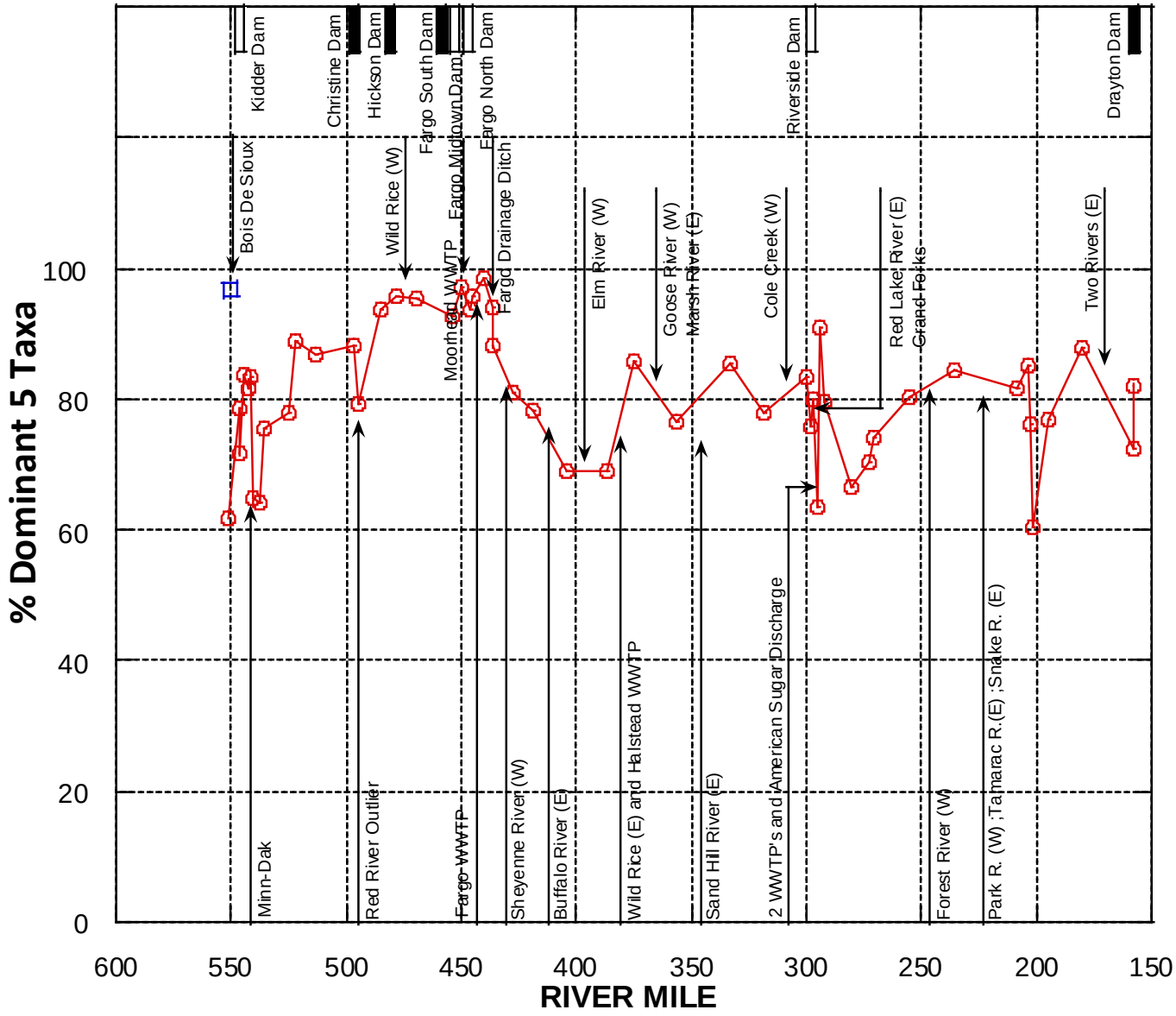


Figure 26*. Percent dominant five taxa vs. river mile for the Red River at 52 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

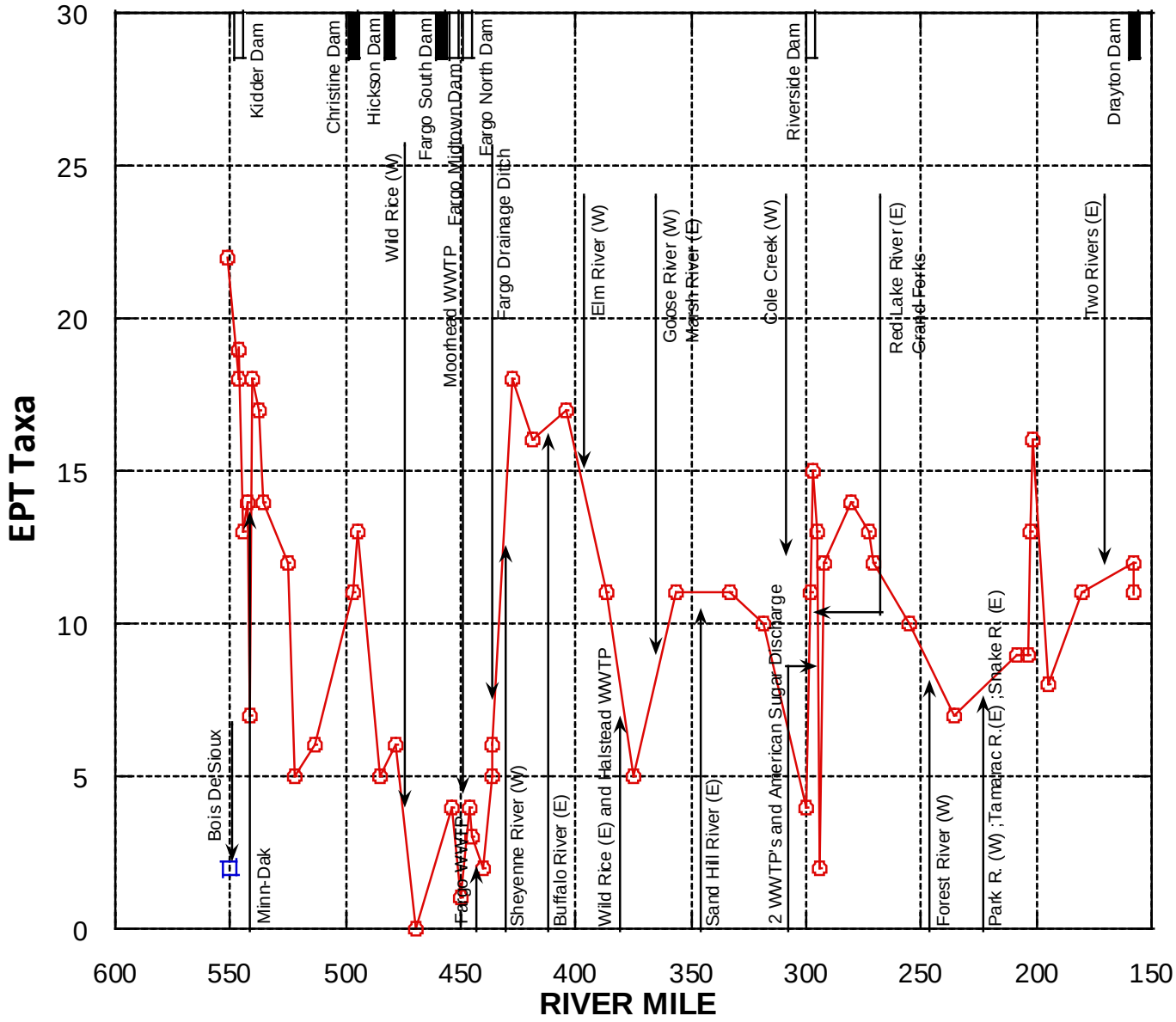


Figure 27. *EPT taxa richness vs. river mile for the Red River at 52 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

The ordination identified a relatively unique macroinvertebrate assemblage in the upper reach with more overlap in between the middle and lower reaches (Figure 28, upper). Key environmental variables included higher QHEI cover scores and the upper mainstem reach and higher chloride, alkalinity, and river size within the lower reach. When the data were grouped by QHEI range (Figure 28, lower) a similar pattern to high QHEI scores in the upper mainstem was observed indicating the QHEI as a key variable associated with assemblage differences between segments.

DISCUSSION

One of the goals of this study was to evaluate the applicability of the bioassessment methods for fish and macroinvertebrate assemblages in the development and management of TALUs for the Red River. As such there are two tasks that we attempted to accomplish:

1) Assess the proportion of the mainstem that is meeting biological index thresholds that could potentially serve as arbiters for attainment of the CWA 101[a][2] goals (i.e., the protection of fish, shellfish, and wildlife or designated aquatic life use goals); and

2) Determine the potential stressors that are associated with non-attainment of these thresholds and/or which correspond to changes in the biological indices or their component metrics.

The availability of two regionally calibrated fish IBIs and the MPCA Prairie Forest macroinvertebrate IBI also allowed us to evaluate the efficacy of each regarding their applicability to the Red River. Each of the two fish IBIs had substantially different calibration domains. The FACI was calibrated over a large regional area encompassing parts of the Upper Ohio and Upper Mississippi River basins whereas the MPCA Prairie Forest River fish and macroinvertebrate IBIs were calibrated over a smaller region that included the southern and western portions of Minnesota.

Use Attainment Status

Use attainment status is the result of a process where a criterion is compared to an index threshold to determine if a waterbody is meeting that standard and hence the goal of the CWA. In this study we are using the fish and macroinvertebrate assemblages in a preferred two-assemblage approach to determine aquatic life use attainment (Yoder and Barbour 2009). Fish and macroinvertebrates were assessed separately then together to compare aquatic life attainment results.

Fish Assemblage Condition Index (FACI)

We used the 25th percentile of "reference condition" as determined by Emery et al. (2007) which translated to a FACI value of 48. Using this as a biocriterion 11 of the 54 sites were at or above this threshold. As such, most of the Red River mainstem would be considered to be impaired although not severely so as most FACI values were within 10 points of this threshold.

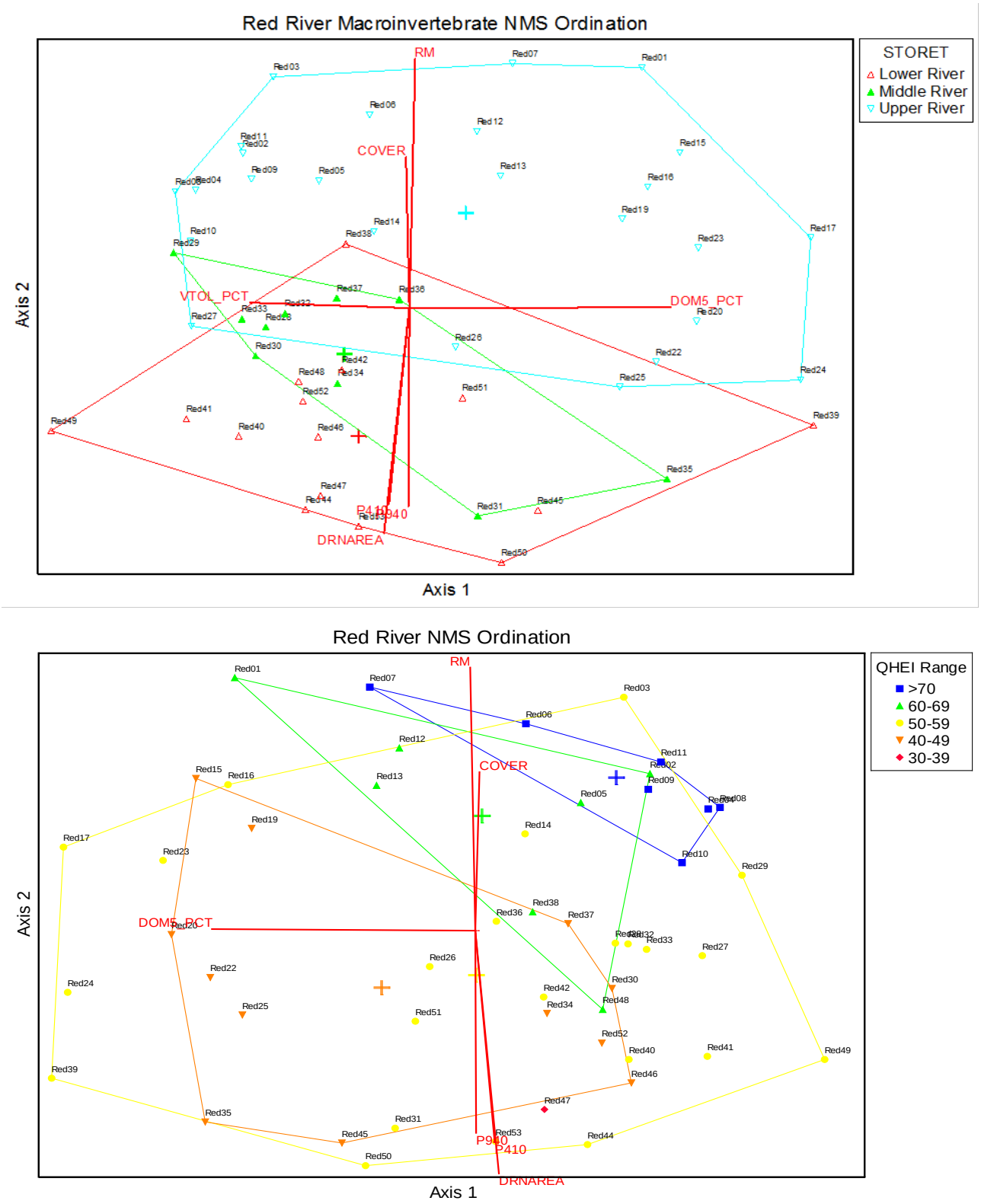


***Figure 28**. NMS ordinations of Red River macroinvertebrate taxa data by site and grouped by river reach (top) and by QHEI range (bottom) for all data at 52 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

The relevance of the Emery et al. (2007) reference threshold might well be questionable since the ichthyofaunas of the rivers in their study have a fundamentally different origin in terms of the baseline expectations along the Biological Condition Gradient (BCG; Davies and Jackson 2006). The geographically and perhaps ecologically closest river to the Red in that study was the Minnesota River. In addition, the comparisons that Emery et al. (2007) made with other states biocriteria for the rivers included in their study showed a tendency for the FACI to result in higher proportion of sites not meeting the FACI threshold as compared to state-based thresholds for their own IBIs. As such applying the FACI to the Red River seems to be showing a similar outcome in terms of failing to meet that reference based threshold.

MPCA Southern Rivers Fish IBI

We used the MPCA Southern Rivers fIBI threshold of 49 that MPCA has estimated as meeting their proposed general use biocriterion (MPCA 2013c). At this threshold only 4 sites *did not* meet the interim CWA goal, almost the opposite result as the FACI, but consistent with the previously described findings of Emery et al. (2007). The MPCA approach also offers an upper tier threshold for "exceptional" assemblages which is an MPCA IBI score of 72. Nine (9) Red River sites were above this upper tier threshold which is in line with the results for the FACI and is consistent with the comparisons of the FACI with more "locally" derived IBI thresholds. The comparisons made by Emery et al. (2007) showed that thresholds based on state derived indices revealed a higher rate of attainment than did the regionally derived FACI. This raises an important question about which "domain" is the more appropriate context for deriving and calibrating indices and deriving biological criteria. MPCA at least partially addressed this issue with the MPCA IBI by formally developing a Biological Condition Gradient (BCG) for this particular class of rivers (Gerritsen et al. 2013). While we did not calculate the corresponding BCG classes in accordance with a draft fuzzy set model (MPCA, in preparation), that step should be taken to determine the efficacy of the MPCA IBI as it is applied to the Red River.

MPCA Prairie Forest Rivers Macroinvertebrate IBI

We used the MPCA Prairie Forest Rivers general use biocriterion of 31 as the benchmark for the mIBI (MPCA 2013c). Of the 52 sites with macroinvertebrate data only 6 sites (11.5%) met the proposed biocriterion; 46 of 52 sites were in non-attainment (88.5%). This rate of impairment is similar to the FACI results for fish. Unlike the FACI however, many of the sites were not very close to the mIBI threshold of 31.

Exploration of Stressor Relationships: Fish Assemblage

Another important objective of the study is the identification of potential causes and sources of impact from current or past physical modifications, water quality gradients, and proximity to pollution sources. The spatial design was specifically intended to convey if there were any localized impacts and also to determine the spatial extent of any observed departures in the biological or chemical/physical results along the longitudinal continuum of the mainstem from upriver to downriver. Visual patterns were evident in the results that suggested the existence of a combination of both natural and human caused changes in the fish assemblage, habitat, and water quality. The observed longitudinal patterns in the results were analyzed using simple

linear correlation. At this point more complex analyses are beyond the scope of the currently available data and spatial context.

Longitudinal Patterns in Chemical Stressors

We correlated the single sample water quality parameters (D.O., conductivity, water temperature, and Secchi depth) that were collected in the Red River during 2010 with distance downriver from the confluence of the Bois de Sioux and Otter Tail Rivers. pH and temperature were not analyzed because the results showed little variation along the mainstem (see **RESULTS**). Secchi depth, which is significantly correlated with turbidity and TSS/ suspended sediment, showed the strongest relationship with the MIwb, but little relationship with either of the FACI or the MPCA IBI (Table 8). This, too, seemed to be more of a natural gradient with values declining in a downriver direction.

Table 8*. Correlation coefficients between selected stressor variables and the MIwb, the MPCA Southern Rivers IBI, and the FACI for the entire Red River mainstem and for the upper Red River between the origin and RM 440 just downstream from Fargo-Moorhead. Significance at p<0.05* or at p<0.01**.*

Dependent Variable	MIwb		MPCA IBI		FACI	
	Entire River	Upper River	Entire River	Upper River	Entire River	Upper River
Dissolved Oxygen	0.24**	0.25**	0.001 ns	0.000 ns	0.002 ns	0.004 ns
Conductivity	0.07ns	0.00 ns	0.01 ns	0.05 ns	0.01 ns	0.00 ns
Secchi Depth	0.32**	0.36**	0.06 ns	0.08*	0.02 ns	0.20**
QHEI	0.44**	0.62**	0.02 ns	0.17**	0.04 ns	0.29**
Poor Attributes	0.29**	0.58**	0.02 ns	0.24**	0.00 ns	0.25**
Poor-Good Ratio	0.25**	0.46**	0.01 ns	0.15**	0.03 ns	0.39**
Substrate	0.25**	0.63**	0.04 ns	0.18**	0.04 ns	0.32**
Channel	0.13**	0.29**	0.00 ns	0.22**	0.03 ns	0.25**

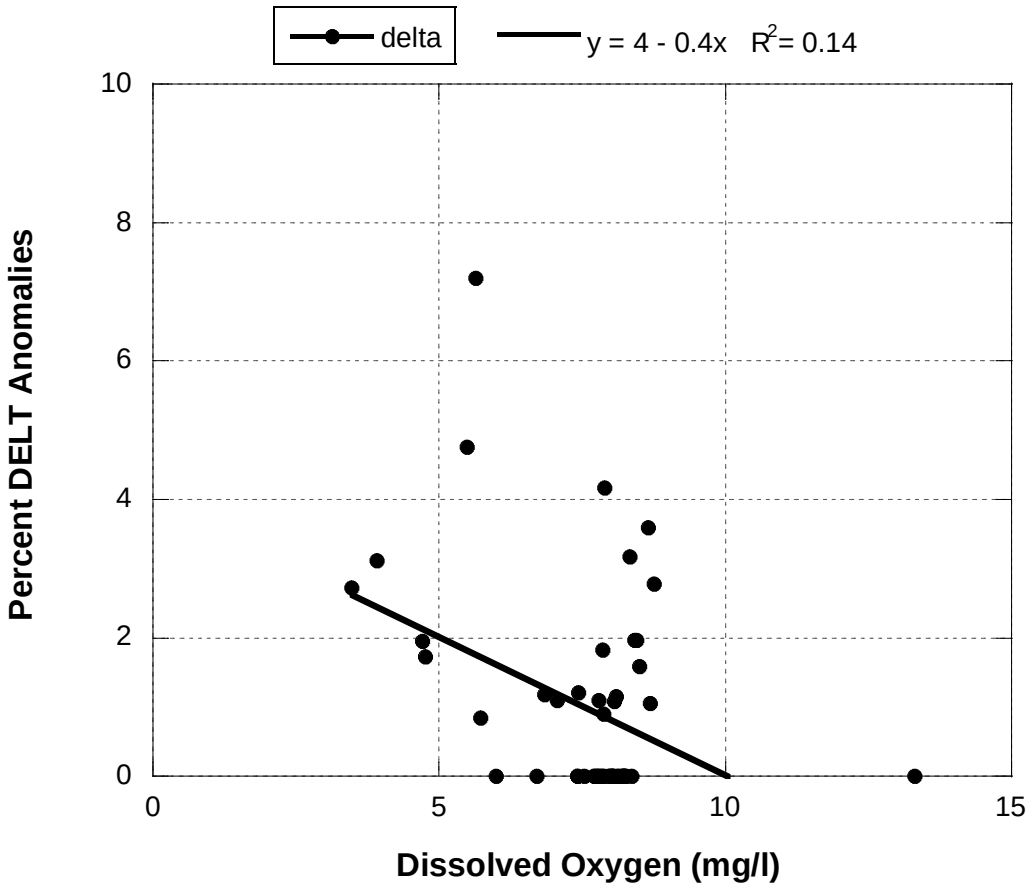


***Figure 29**. Plot of D.O. (mg/L) vs. percent DELT anomalies in the Red River during 2010.*

Both D.O. and conductivity showed variations along the mainstem, but analyses of the entire dataset showed little correlation with the MIwb, FACI, or MPCA IBI (Table 8). The visual patterns with D.O. in particular seemed strongest in the upper mainstem between Breckenridge- Wahpeton and Fargo-Moorhead hence the analyses were truncated to that segment of the mainstem (Table 8). However, this only slightly strengthened some of the correlations and others not at all. Conductivity patterns were clearly related to tributary inputs being lowered by the entry of the Otter Tail River and then increasing below the Wild Rice (ND) and Sheyenne Rivers. The biological indices and attributes occurred along the mainstem independent of these changes. There was little overall correlation between measured D.O. levels and the fish assemblage indices as well. Single measures of D.O. can potentially be misleading and the lowest values may not have been serious enough to elicit a response in the fish assemblage. In addition the upper reaches of the river where the lowest D.O. values occurred were in areas with the best habitat which may have been a compensating factor. In fact, the MIwb was inversely correlated with D.O. (i.e., the highest MIwb values occurred at sites with the lowest D.O. values). The correlation was even stronger when the single highest D.O. value of 13.13 mg/L (RM 497.0) was removed (r^2=-0.24). There was also a weak association with D.O. and DELT anomalies (Figure 29). Most of the sites with the lowest D.O. values had >2% DELTs, but some sites with higher D.O. levels also had elevated DELTs. While

this may seem to be a confounding pattern, higher daytime D.O. values can be a reflection of wider diel swings and this can be associated with increased DELTs as a reflection of the sublethal stresses caused by diel swings. However, a more rigorous evaluation of the D.O. regime is needed to determine if this is indeed happening in the Red River. While the highest %DELTs occurred in the uppermost reach of the river, additional sites with elevated anomalies were also scattered along the remainder of the mainstem.

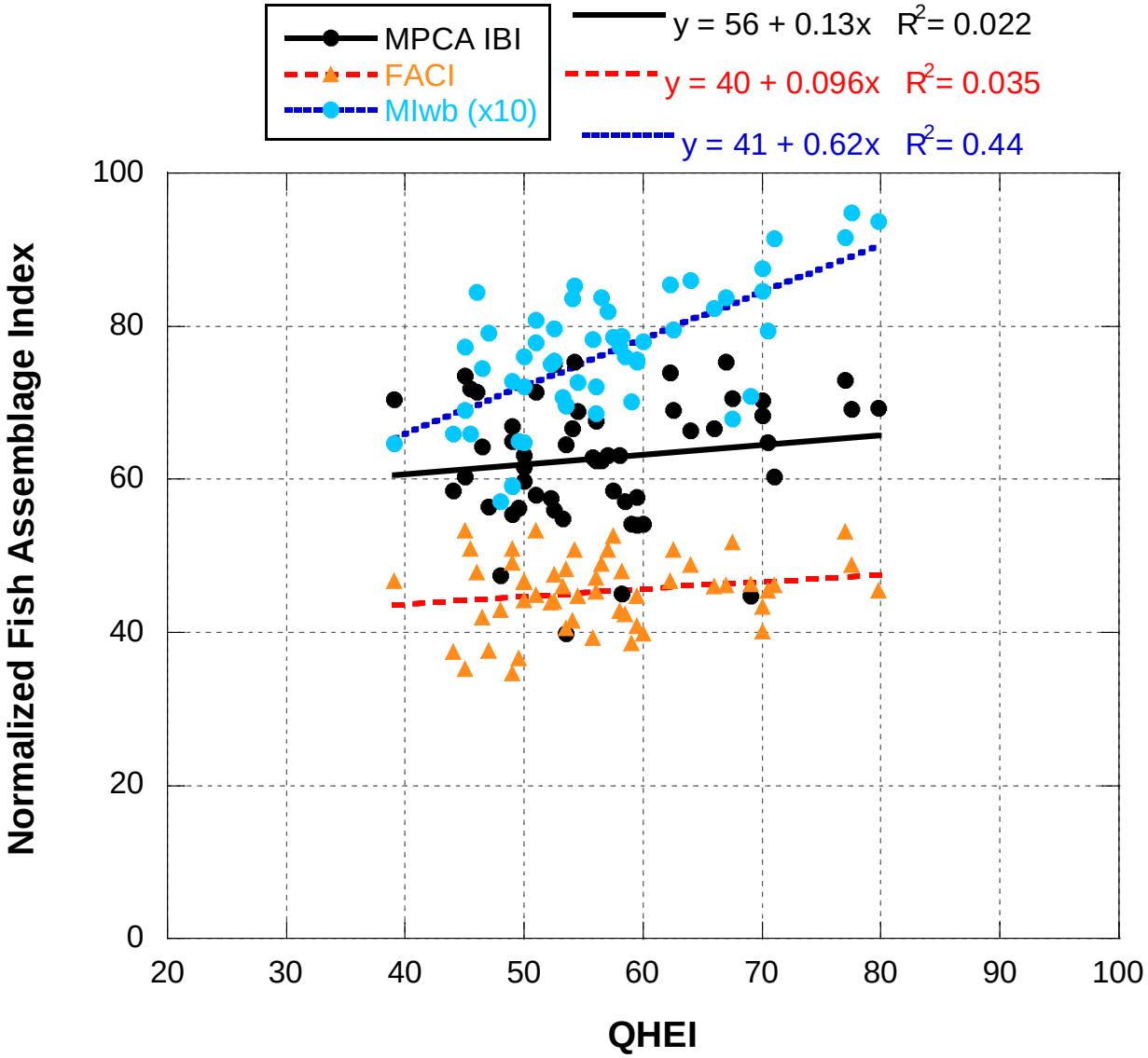


Figure 30. *Correlations between QHEI and the MPCA IBI, the FACI, and the MIwb in the Red River during 2010.*

Longitudinal Patterns in Habitat

Habitat was the other dependent measure that we recorded and it provides a number of important variables to examine for relationships with fish assemblage indices and attributes. Frequently it is the most highly correlated of stressor variables with fish assemblage condition

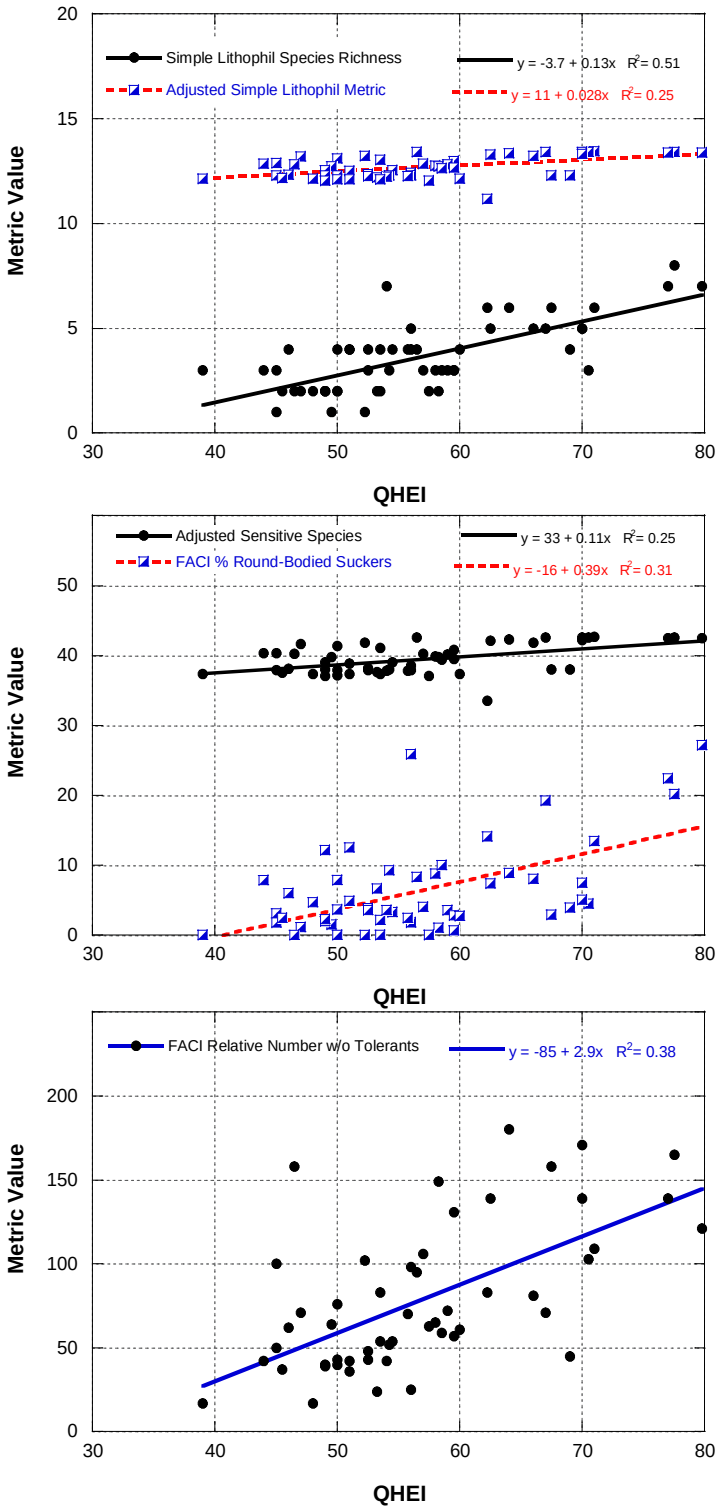


Figure 31. *Plots of QHEI vs. selected IBI metrics; raw and adjusted simple lithophils metric of the MPCA IBI (upper), adjusted IBI sensitive species and FACI % round-bodied sucker metrics (middle), and FACI relative numbers less tolerant species metric (lower).*

measures and attributes in large scale studies. The correlation between the QHEI and the MPCA IBI, FACI, and MIwb (Figure 30) were only slightly stronger than with any of the chemical stressors. The MIwb showed the strongest relationship with QHEI and it was strengthened when correlated with the upper river results only (Table 8). Most of the QHEI metrics were similarly correlated with the MIwb, instream cover in particular. Correlations with selected IBI metrics were also more strongly correlated with the QHEI than the indices themselves. Sensitive fish species and simple lithophilic species showed a stronger association with habitat as did the proportion of round-bodied suckers and relative abundance excluding tolerant species (Figure 31). An examination of longitudinal plots of these metrics with distance downriver showed a general association with the upper reaches where D.O. levels exhibited the strongest pattern of change. Gradient is a component of the QHEI and there was a weak relationship with the MIwb (r^2=0.30), but no relationship with either of the IBIs.

Analysis of Important Habitat Attributes

Our analyses thus far have focused on QHEI metrics. Each QHEI metric is comprised of specific attributes, e.g., instream cover includes the extent and quality of specific cover types such as logs and woody debris, boulders, rootwads, undercut banks, aquatic vegetation, etc. Anecdotal observations by the field crew spurred analyses of these attributes and first focused on logs and woody debris. We first extracted the "logs or woody debris" attribute from the QHEI cover metric. Each cover attribute is given a score of between 0 and 3 where zero is where that cover type is absent, a "1" indicates the cover type is present in very small amounts and/or is of marginal quality, a "2" indicates if the cover type present in moderate amounts, but is not of highest quality and/or in small amounts of the highest quality, and a "3" indicates where the cover type is of the highest quality in moderate or extensive amounts. Thus it attempts to provide a gradient of the extent and quality for each cover attribute. There were no sites in the study area with zero logs or woody debris. A box-and-whisker plot of MIwb scores by logs and woody debris attribute scores did not show a strong pattern except that sites scoring a 1 had a wider range of MIwb scores with lower scores being more frequent when the attribute score was 1 (Figure 32). More than one-half of the sites had an attribute score of 1 and only 6 sites had a score of 3 indicating that the extent and quality of woody debris is poor to marginal in most of the mainstem.

Next we combined the scores from all of the QHEI cover attributes. A scatter plot of these scores with the biological indices showed a significant correlation with the MIwb (r^2 = 0.21), but only weak correlations with the two IBIs. Thus it appears that structure is correlated with

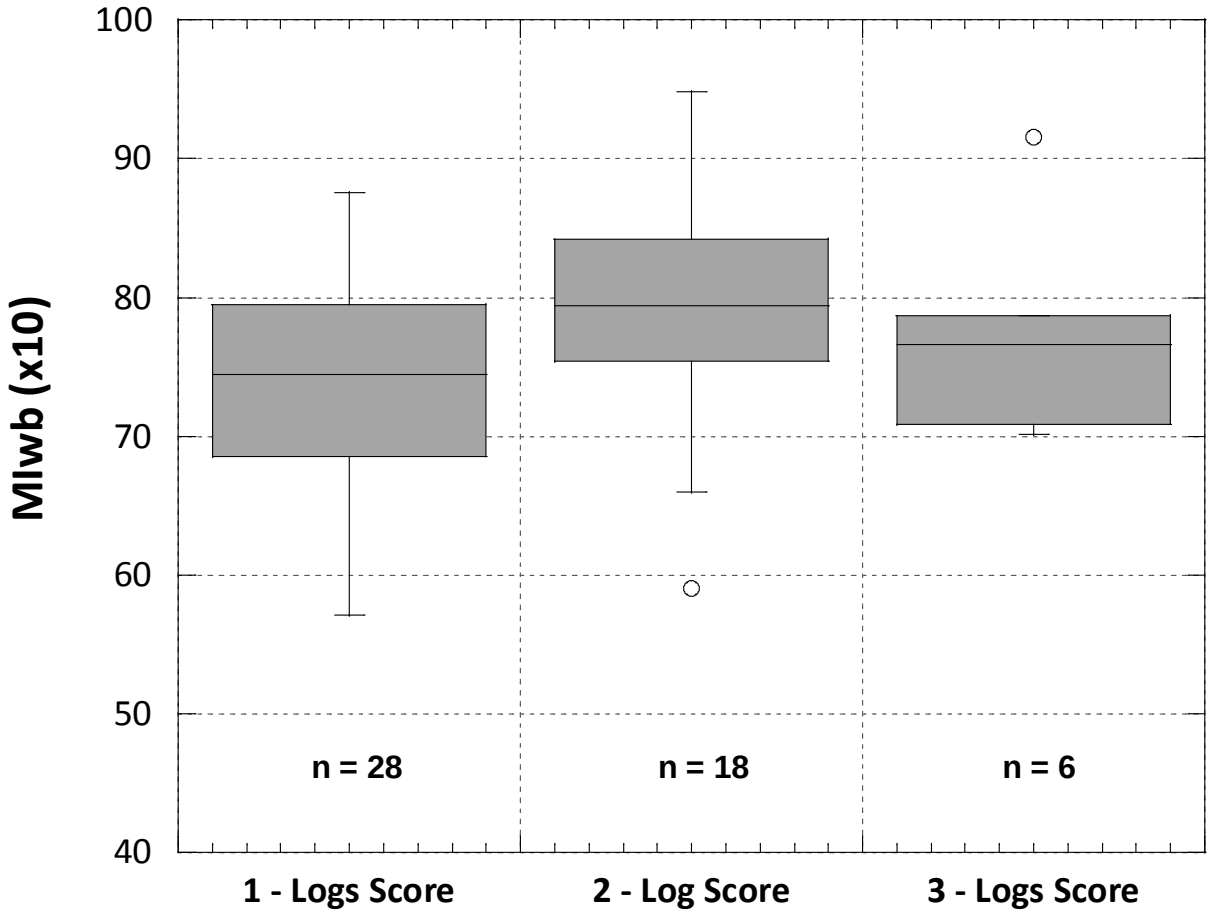


Figure 32*. Box and whisker plot of MIwb (x10) by the logs and woody debris attribute scores.*

increased biomass and abundance associated with the extent and quality of instream cover, but that it is not correlated with the Southern Rivers IBI or FACI. This observation is also supported by the stronger correlation between the cover attribute score and the relative numbers and relative weight of fish assemblage (Figure 33). It should be noted, however that the range of total cover scores were somewhat truncated in the study area. The highest scores were below the cover metric maximum of 20 and most were below 10 which indicate rather poor to mediocre overall cover throughout the study area.

We also ran the correlation for the upper river only and the r^2 value decreased slightly (0.21 to 0.17) in contrast to the other QHEI attribute relationships. We also examined attributes of substrate that indicate the extent of sedimentation and embeddedness given the high suspended sediment load that is carried by the Red River. High levels of fine sediments can also result in adverse impacts to riverine fish assemblages related to alteration of feeding and spawning habitats. The overall QHEI substrate score was correlated with all of the fish indices, but was strongest with the MIwb (r^2=0.63) in the upper mainstem (Figure 34). A comparison of the QHEI embeddedness and silt cover attributes suggests that more of the variation is due to embeddedness (Figure 36) rather than silt cover (Figure 35). Again, the relationships were strongest in the upper mainstem.

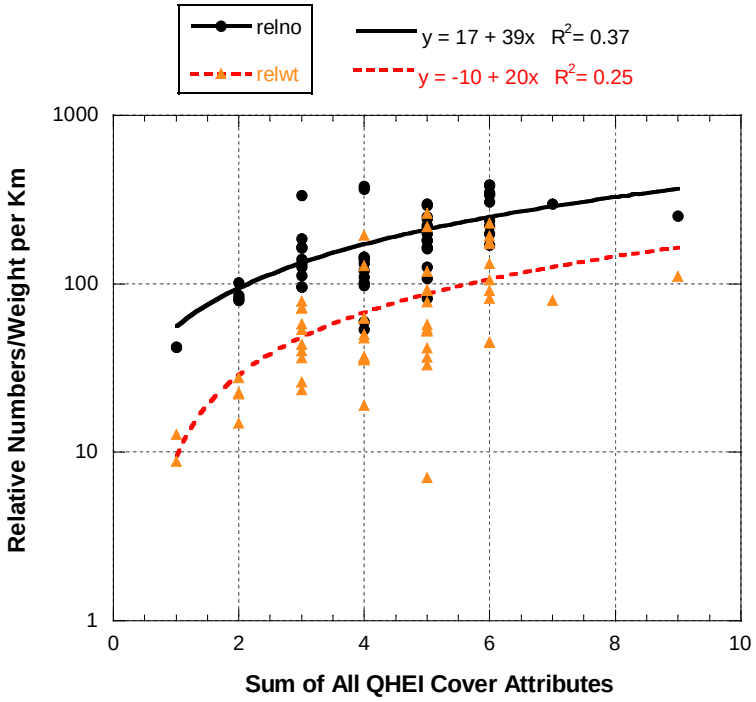


***Figure 33**. Correlations between the sum of all QHEI cover scores and relative numbers and biomass in the upper Red River during 2010 (relno = relative numbers; relwt = relative weight.*

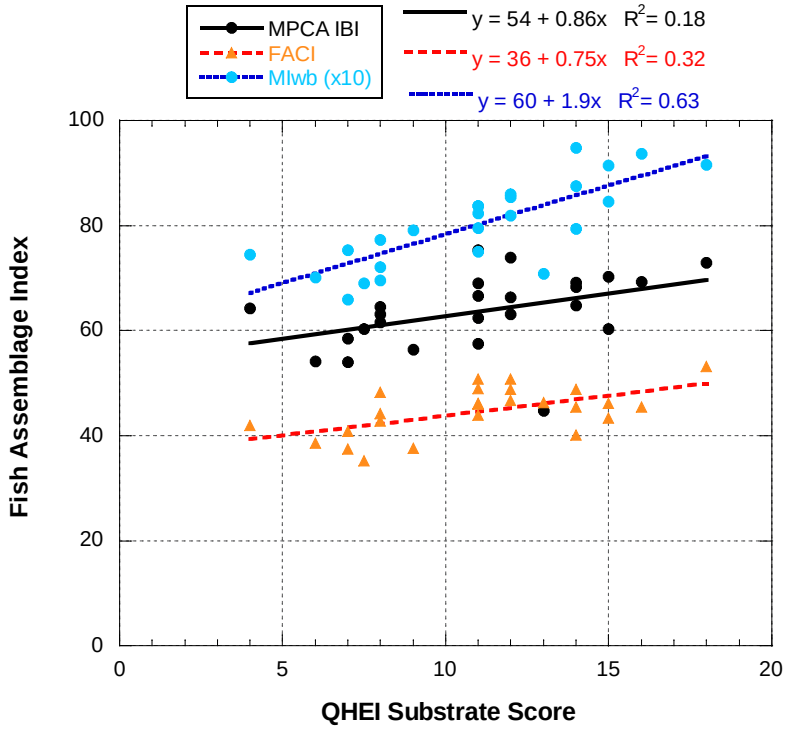


***Figure 34**. Correlations between the QHEI substrate metric score and the MPCA Southern Rivers IBI, the FACI, and the MIwb in the upper Red River during 2010.*

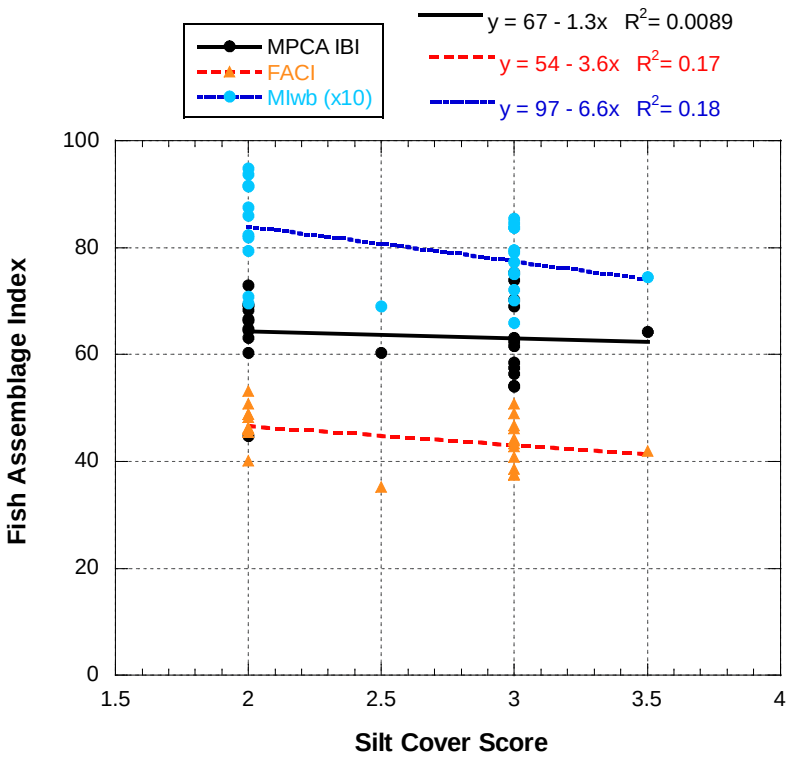


***Figure 35**. Correlations between the QHEI silt cover score and the MPCA Southern Rivers IBI, the FACI and the MIwb in the upper Red River during 2010.*

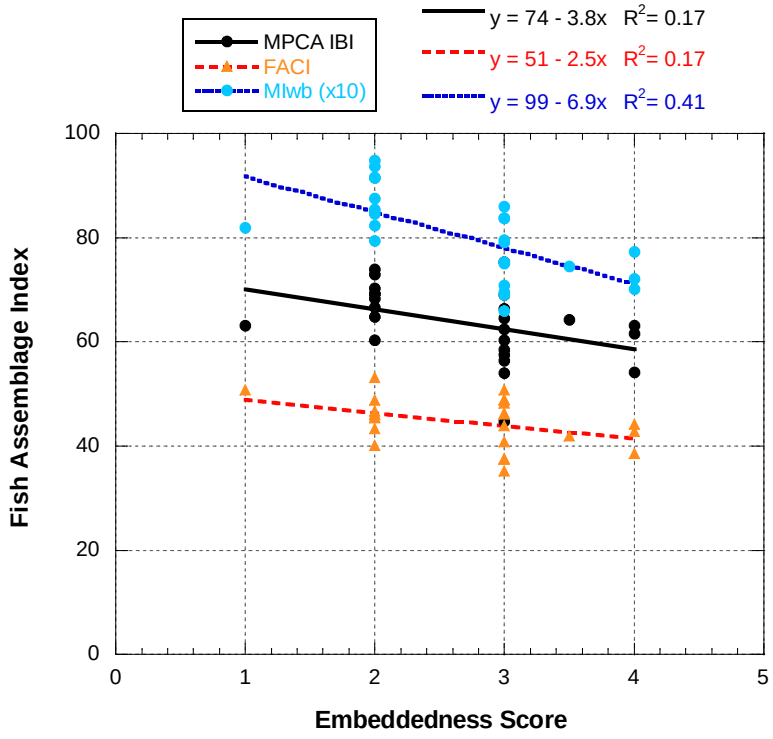


***Figure 36**. Correlations between the QHEI embeddedness score and the MPCA Southern Rivers IBI, the FACI and the MIwb in the upper Red River during 2010.*

Exploration of Stressor Relationships: Macroinvertebrate Assemblage

As with the fish we conducted simple linear regression analysis between the selected habitat and chemical parameters to gain insights into potential factors limiting the performance of the mIBI on the Red River. We calculated Pearson Correlation Coefficients for the entire river and for upper mainstem upstream of RM 440[1] and, similar to the fish, correlations were stronger for the upper mainstem than the entire river (Table 9). Part of the reason for this stronger correlation in the upper mainstem is that habitat shows a wider range of quality, declining sharply from good to exceptional quality and then leveling off to a consistent fair quality throughout the remainder of the mainstem. In the middle mainstem the Sheyenne River adds a large suspended sediment load to the mainstem (Galloway and Nustard 2012) and the western tributaries contribute dissolved constituents. The result is a suite of stressors with little variation in quality that suppress biological condition for several hundred miles of river. For

***Table 9**. Pearson correlation coefficients (r^2) between stressor variables and the mIBI and a key metric the percent of individuals as the dominant 5 taxa for the entire Red River mainstem and for the upper Red River between the origin and RM 440 just downstream from Fargo-Moorhead. Significance at p<0.05* or at p<0.01**.*

Dependent Variable	mIBI		Dominant 5 Taxa %		% Very Tolerant	
	Entire River	Upper River	Entire River	Upper River	Entire River	Upper River
Dissolved Oxygen	0.22**	0.28**	0.07 ns	0.27**	0.05 ns	0.27**
Conductivity	0.08*	0.09**	0.00 ns	0.18**	0.00 ns	0.14**
Secchi Depth	0.16**	0.38**	0.05 ns	0.66**	0.01 ns	0.61**
Total Phosphorus	0.12*	0.48**	0.00 ns	0.56**	0.04 ns	0.38**
Alkalinity	0.07ns	0.43**	0.06 ns	0.43**	0.06 ns	0.35**
QHEI	0.21**	0.66**	0.15**	0.30**	0.12*	0.72**
Substrate	0.11*	0.28**	0.11*	0.59**	0.00 ns	0.52**
Channel	0.09*	0.13**	0.15**	0.28**	0.15**	0.52**

[1] This reach includes the Fargo and Moorhead WWTPs.

example, high turbidity in the lower reaches likely suppresses algal activity (Plevin and Blackburn 2013) and associated impacts related to nutrients that may be expressed more strongly in the upper river where turbidity is lower. In a single variable, rather than a multivariate correlation approach, data from the lower mainstem tends to confound rather than resolve these associations. In addition, the lower river tends to "average" or accumulate impacts over a longer distance making smaller, local variations less able to influence or alter assemblage condition.

Figure 37 illustrates several of the correlations in Table 9 showing Secchi disk values and QHEI substrate scores vs. the percent of individuals of the five most dominant taxa, a metric of the mIBI. For both of these plots the correlation coefficients were strongest for the upper mainstem and the slopes and intercepts of the relationships differed suggesting that the relationships are more complex and influenced by other stressors.

Associations Between Macroinvertebrate and Fish Assemblages

The fish IBIs and the MPCA mIBI were poorly correlated in the Red River (Table 10). The highest correlation between the mIBI and any of the fish indices was with the MIwb. The mIBI was better correlated with the number of fish species (r^2 =0.34) than with either of the two fish IBIs. There were also some stronger correlations between selected macroinvertebrate metrics and the MIwb and the number of fish species (Table 10). Correlations between these metrics and the fish IBIs were all very weak (Table 10).

Table 10*. Pearson correlation coefficients (r^2) between the MPCA mIBI and selected metrics and fish indices and metrics used in this study. Significance at p<0.05* or at p<0.01**.*

Index	MN mIBI	% 5 Dom. Taxa	Intolerant Taxa	Very Tolerant Taxa
MPCA fIBI	0.04 ns	0.01 ns	0.04 ns	0.12*
MIwb	0.13**	0.43**	0.09*	0.52**
FACI	0.05 ns	0.00 ns	0.08*	0.00 ns
Fish Species	0.34**	0.53**	0.19**	0.58**

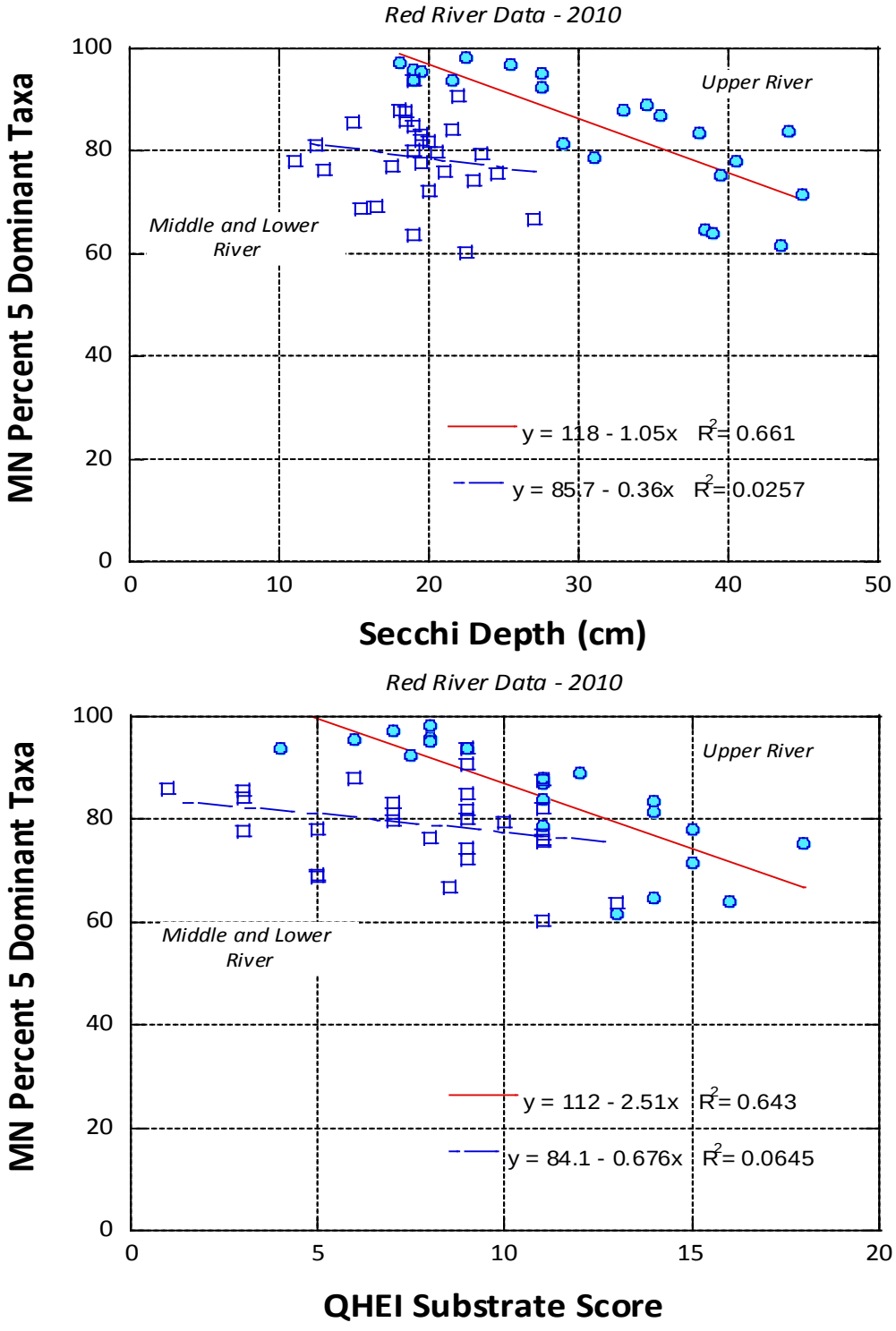


Figure 37*. Linear regression of Secchi Depth (cm) of Red River taxa data by site grouped by river reach (top) and by QHEI range (bottom) for all data at all 52 locations in the Red River mainstem between Wahpeton and Pembina, ND during the period August 18-September 1, 2010.*

SYNTHESIS

While the level of analysis accomplished herein was constrained by the single chemical grab sampling, there were some important tendencies in the results both visually and statistically. Analyses of the chemical variables indicated there were similar longitudinal patterns in nutrients, turbidity, and dissolved constituents with the upper mainstem having the lowest values, the middle mainstem generally with the highest values, and the lower mainstem with intermediate concentrations. Tributaries such as the Otter Tail and Red Lake Rivers essentially diluted what would have otherwise been elevated concentrations among all of these chemical constituents.

Habitat variables were the strongest correlates with selected fish assemblage attributes and with the MIwb in particular. Habitat variables were also correlated with the MPCA mIBI and key metrics of this index as were certain chemical/physical variables such as Secchi depth, total P, and alkalinity. The lack of even a weak correlation with either of the fish IBIs may likely be due to a lack of sufficient "range" in Red River water quality and habitat. Emery et al. (2007) found a significant correlation between the FACI and QHEI in their upper Midwest U.S. regional rivers study which included a much wider range of habitat quality across a greater diversity of both modified and natural riverine habitats. The Red River offers a comparatively "constrained" range of habitat as evidenced by almost all of the QHEI scores in the fair quality range (45-60). The comparatively stronger association between habitat and the MIwb is a result of the MIwb reflecting fish assemblage numbers, biomass, and evenness rather than the functional characteristics of the two fish IBIs. In most cases the MIwb will show an "earlier" response than an IBI, especially in recovering systems where the MIwb generally increases before the IBI (Yoder and Smith 1999). Because the MIwb can reflect the increased abundance of moderately tolerant and facultative species such a response is consistent for riverine systems with an inherently tolerant fish assemblage, which seems to apply to the Red River better than does the recovering assemblage explanation.

In terms of potential pollution impacts, the evidence for this was most apparent in the DELT anomalies results which were negatively associated with D.O. levels. There are several sources of organic enrichment in and downstream from each of the major urban centers and some of these have the potential for toxic pollutant releases. It is likely that none of these presently exert overtly acute impacts based on the absence of toxic response signatures (Yoder and DeShon 2003; Yoder and Rankin 1995) in the fish assemblage results. However, the potential for chronic impacts that even slightly elevated DELTs can indicate will require the analysis of more detailed chemical data, source effluent data, and a closer inspection of the longitudinal profile of the results in proximity to these sources. In addition, we note that the FACI used herein did not include DELT anomalies. However, the MPCA IBI does include threshold adjustments for DELTs consisting of 5 or 10 point reductions depending on the %DELT values (Appendix E). Most other large river IBIs include DELTs either directly as a metric or indirectly as an adjustment factor and it has been shown to be an important diagnostic property of the biological responses to certain impact types (Yoder and DeShon 2003; Yoder and Rankin 1995; Sanders et al. 1999), hence we recommend that the FACI either be modified to directly include

DELTs or be adjusted in a rationale manner when they are encountered if it is used to assess the Red River.

The apparent conflicting results in terms of serving as biological impairment thresholds between the MPCA IBI and the FACI is similar to the original findings of Emery et al. (2007) in which the FACI was a more conservative arbiter of fish assemblage condition than the more localized state IBIs to which it was compared. However, the question of which one is the most "correct" to use may lie in considering the origins of the FACI and the MPCA IBI. The MPCA IBI is specifically calibrated to the Southern Rivers ichthyofaunal region that MPCA delineated (MPCA 2014) which includes the Red River. The FACI was developed over a much wider geographic region that encompassed the Upper Mississippi and Ohio River basins from Minnesota to Ohio. It could be argued that this is too extensive and in effect homogenizes important regional differences inherent to the ichthyofaunas of the region to which it has been applied. We believe this case can be made here in that the Red River is more unlike the Upper Ohio River tributaries and even some Upper Mississippi River tributaries than the Red River is compared to Southern Minnesota rivers. Hence we are inclined to conclude that the MPCA IBI is a more appropriate arbiter of fish assemblage condition in the Red River than is the FACI. In this case the Red River fish assemblage is meeting and in some cases exceeding the biocriteria expectations that are proposed by the MPCA for their Southern Rivers (MPCA 2013c). The impairments that we identified with the MPCA IBI were localized and not on a systemwide scale.

Nutrients (nitrate and phosphorus) are slightly elevated above ecoregional expectations in the middle section of the river. For example reference interquartile ranges in the Red River were 14-33 µg/L. Habitat and sediment issues currently appear to be most limiting to aquatic life in the Red River with effects of nutrients somewhat moderated by high turbidity and TSS which may limit algal activity in the Red River (Heiskary et al. 2010), particular in the lower two thirds of the river. A major concern with nutrients in the Red River, particularly nutrient loading, are their impact on Lake Winnipeg, the 10th largest freshwater lake in the world. It is estimated that the Red River accounts for about 68% and 34% of the average phosphorus and nitrogen loading, respectively, to the lake between 1999 and 2007 (Environment Canada 2011). Thus, although nutrients do not appear to be exerting large effects on existing aquatic communities, the loading to Lake Winnipeg will drive the need to control nutrients. Because much total phosphorus is often attached to fine sediment particles, the need to address sedimentation and silt loads should at least partially address nutrient loadings particularly for total phosphorus.

The MPCA mIBI, in contrast to the fish IBI, attained the proposed MPCA biocriterion at only 11% of the sites on the Red River and most of these were in the upper mainstem. It may be that the levels of sedimentation and dissolved ions have a greater influence on macroinvertebrates than fish. This may also be exacerbated by the order of magnitude changes in suspended sediment across seasons (Galloway and Nustard 2012; Galloway 2014) which can be more limiting to organisms such as macroinvertebrates that are less able to adapt to large fluctuations in sediments.

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Appendix A: 2010 Red River Fish Species Summaries by Sampling Site

Midwest Biodiversity Institute
Fish Species List

Rivers: *Otter Tail River; Red River of the North; Bois de Sioux River*

Years: 2010

Number of Samples: 54 Data Sources: 99 Data Types: A

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
47-002	CHANNEL CATFISH			HG	C	1245	46.1	24.74	7112	22.57	154.4
43-032	SPOTFIN SHINER	I		FD	M	945	35.0	18.78	57	0.18	1.6
18-001	GOLDEYE	I	R	FD	M	485	18.0	9.64	3435	10.90	191.4
43-001	COMMON CARP	O	T	HG	M	484	17.9	9.62	10136	32.17	566.0
43-028	SPOTTAIL SHINER	I	P	HG	M	153	5.7	3.04	5	0.02	0.9
40-011	SHORTHEAD REDHORSE	I	M	FD	S	150	5.6	2.98	1448	4.60	261.0
85-001	FRESHWATER DRUM		P	HG	M	135	5.0	2.68	1625	5.16	325.3
43-020	EMERALD SHINER	I		HG	M	130	4.8	2.58	15	0.05	3.2
43-042	FATHEAD MINNOW	O	T	HG	C	130	4.8	2.58	5	0.02	1.0
80-001	SAUGER	P		FD	S	130	4.8	2.58	347	1.10	72.3
74-001	WHITE BASS	P		FD	M	128	4.7	2.54	100	0.32	21.1
43-006	SILVER CHUB	I		FS	M	107	4.0	2.13	49	0.16	12.5
40-010	GOLDEN REDHORSE	I	M	FD	S	104	3.9	2.07	667	2.12	173.3
77-010	ORANGESPOTTED SUNFISH	I		HG	C	94	3.5	1.87	10	0.03	2.9
40-008	SILVER REDHORSE	I	M	FD	S	90	3.3	1.79	1089	3.46	327.2
40-005	QUILLBACK CARPSUCKER	O		HG	M	73	2.7	1.45	1773	5.63	656.7
63-001	TROUT-PERCH	I		HG	M	73	2.7	1.45	7	0.02	2.7
77-004	SMALLMOUTH BASS	C	M	FD	C	57	2.1	1.13	257	0.82	122.1
43-034	SAND SHINER	I	M	FS	M	55	2.0	1.09	3	0.01	1.6
37-003	NORTHERN PIKE	P		HG	M	50	1.9	0.99	570	1.81	308.5
80-002	WALLEYE	P		HG	S	46	1.7	0.91	354	1.13	208.5
77-003	ROCK BASS	C		FD	C	31	1.2	0.62	102	0.32	89.2
40-002	BIGMOUTH BUFFALO	I		HG	M	22	0.8	0.44	1598	5.07	1963.6
40-016	WHITE SUCKER	O	T	FD	S	19	0.7	0.38	174	0.56	248.8
18-002	MOONEYE	I	R	FD	M	17	0.6	0.34	86	0.27	137.0
77-002	BLACK CRAPPIE	I		HG	C	12	0.4	0.24	36	0.11	81.2
77-009	BLUEGILL SUNFISH	I	P	HG	C	12	0.4	0.24	5	0.02	12.0
43-013	CREEK CHUB	G	T	HG	N	10	0.4	0.20	0	0.00	2.3
77-008	GREEN SUNFISH	I	T	HG	C	9	0.3	0.18	5	0.02	16.5
77-001	WHITE CRAPPIE	I		HG	C	7	0.3	0.14	3	0.01	15.2
43-026	COMMON SHINER	I		FD	S	6	0.2	0.12	0	0.00	1.8
80-003	YELLOW PERCH			HG	M	6	0.2	0.12	5	0.02	24.1
40-012	GREATER REDHORSE	I	R	FD	S	3	0.1	0.06	249	0.79	2250.0
01-008	CHESTNUT LAMPREY	P	P	FD	N	2	0.1	0.04	1	0.01	25.0
15-001	BOWFIN	P		HG	C	2	0.1	0.04	114	0.36	1550.0
47-006	BLACK BULLHEAD	I	P	HG	C	2	0.1	0.04	7	0.02	105.0
47-008	STONECAT MADTOM	I	I	FS	C	2	0.1	0.04	2	0.01	30.0
60-001	BURBOT				S	2	0.1	0.04	2	0.01	30.0
80-011	LOGPERCH	I	M	FD	S	2	0.1	0.04	0	0.00	3.5
40-013	RIVER REDHORSE	I	I	FD	S	1	0.0	0.02	27	0.09	740.0

Midwest Biodiversity Institute
Fish Species List

Rivers: *Otter Tail River; Red River of the North; Bois de Sioux River*

Years: 2010

Number of Samples: 54 Data Sources: 99 Data Types: A

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
47-005	BROWN BULLHEAD	I	T	HG	C	1	0.0	0.02	10	0.03	280.0
80-005	BLACKSIDE DARTER	I		FD	S	1	0.0	0.02	0	0.00	3.0

Nat. Species: 41 **Hybrids:** 0 **Total Counted:** 5033 **Total Wt (kg) :** 851.654

Mean Rel. No: 186.40 **Mean Rel. Wt (kg):** 31.51

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 157.80 Date: 08/31/2010

Time Fished: 1506 Distance: 0.500 Drainge (sq mi): 38100.0 Depth: 0

Location: Dst. Pembina River- St. Vincent Lat: 48.96907 Long: -97.23970

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		8	16.0	11.11	340	0.93	21.2
37-003	NORTHERN PIKE	P		HG	M		1	2.0	1.39	50	0.14	25.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	1.39	450	1.23	225.0
43-001	COMMON CARP	O	T	HG	M		1	2.0	1.39	3600	9.87	1800.0
43-006	SILVER CHUB	I		FS	M		7	14.0	9.72	130	0.36	9.2
43-013	CREEK CHUB	G	T	HG	N		2	4.0	2.78	8	0.02	2.0
43-026	COMMON SHINER	I		FD	S		1	2.0	1.39	4	0.01	2.0
43-028	SPOTTAIL SHINER	I	P	HG	M		1	2.0	1.39	2	0.01	1.0
43-032	SPOTFIN SHINER	I		FD	M		10	20.0	13.89	22	0.06	1.1
43-034	SAND SHINER	I	M	FS	M		6	12.0	8.33	12	0.03	1.0
43-042	FATHEAD MINNOW	O	T	HG	C		4	8.0	5.56	8	0.02	1.0
47-002	CHANNEL CATFISH			HG	C		8	16.0	11.11	21600	59.19	1350.0
77-003	ROCK BASS	C		FD	C		3	6.0	4.17	1040	2.85	173.3
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	1.39	14	0.04	7.0
80-001	SAUGER	P		FD	S		16	32.0	22.22	5710	15.65	178.4
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	2.78	3500	9.59	875.0

No Species: 0 **Nat. Species:** 15 **Hybrids:** 0 **Total Counted:** 72 **Total Rel. Wt. :** 36490

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 158.30 Date: 08/31/2010

Time Fished: 1367 Distance: 0.500 Drainge (sq mi): 36100.0 Depth: 0

Location: Ust. Pembina River Lat: 48.96437 Long: -97.23438

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-002	MOONEYE	I	R	FD	M		8	16.0	18.60	720	4.80	45.0
37-003	NORTHERN PIKE	P		HG	M		1	2.0	2.33	2200	14.66	1100.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		2	4.0	4.65	3600	23.99	900.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	2.33	980	6.53	490.0
43-006	SILVER CHUB	I		FS	M		9	18.0	20.93	160	1.07	8.8
43-032	SPOTFIN SHINER	I		FD	M		7	14.0	16.28	44	0.29	3.1
43-034	SAND SHINER	I	M	FS	M		5	10.0	11.63	20	0.13	2.0
43-042	FATHEAD MINNOW	O	T	HG	C		2	4.0	4.65	4	0.03	1.0
80-001	SAUGER	P		FD	S		6	12.0	13.95	2080	13.86	173.3
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	4.65	5200	34.65	1300.0

No Species: 0 **Nat. Species:** 10 **Hybrids:** 0 **Total Counted:** 43 **Total Rel. Wt. :** 15008

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 179.50 Date: 08/31/2010

Time Fished: 1850 Distance: 0.500 Drainge (sq mi): 34900.0 Depth: 0

Location: at MN St. Rte. 175 boat ramp Lat: 48.78672 Long: -97.15932

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		3	6.0	5.88	1140	5.03	190.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		4	8.0	7.84	5800	25.57	725.0
43-006	SILVER CHUB	I		FS	M		12	24.0	23.53	326	1.44	13.5
43-013	CREEK CHUB	G	T	HG	N		1	2.0	1.96	4	0.02	2.0
43-032	SPOTFIN SHINER	I		FD	M		3	6.0	5.88	20	0.09	3.3
43-034	SAND SHINER	I	M	FS	M		2	4.0	3.92	4	0.02	1.0
43-042	FATHEAD MINNOW	O	T	HG	C		7	14.0	13.73	10	0.04	0.7
47-002	CHANNEL CATFISH			HG	C		6	12.0	11.76	8300	36.59	691.6
74-001	WHITE BASS	P		FD	M		2	4.0	3.92	260	1.15	65.0
77-003	ROCK BASS	C		FD	C		1	2.0	1.96	120	0.53	60.0
80-001	SAUGER	P		FD	S		7	14.0	13.73	2100	9.26	150.0
85-001	FRESHWATER DRUM		P	HG	M		3	6.0	5.88	4600	20.28	766.6

No Species: 0 **Nat. Species:** 12 **Hybrids:** 0 **Total Counted:** 51 **Total Rel. Wt. :** 22684

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 195.00 Date: 08/31/2010

Time Fished: 1322 Distance: 0.500 Drainge (sq mi): 34400.0 Depth: 0

Location: Dst. American Crystal Sugar Lat: 48.64789 Long: -97.10765

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		4	8.0	4.30	140	0.59	17.5
40-005	QUILLBACK CARPSUCKER	O		HG	M		2	4.0	2.15	5000	21.13	1250.0
43-006	SILVER CHUB	I		FS	M		18	36.0	19.35	370	1.56	10.2
43-020	EMERALD SHINER	I		HG	M		4	8.0	4.30	28	0.12	3.5
43-032	SPOTFIN SHINER	I		FD	M		4	8.0	4.30	20	0.08	2.5
43-034	SAND SHINER	I	M	FS	M		7	14.0	7.53	32	0.14	2.2
43-042	FATHEAD MINNOW	O	T	HG	C		37	74.0	39.78	24	0.10	0.3
47-002	CHANNEL CATFISH			HG	C		10	20.0	10.75	14000	59.17	700.0
74-001	WHITE BASS	P		FD	M		1	2.0	1.08	6	0.03	3.0
80-001	SAUGER	P		FD	S		4	8.0	4.30	840	3.55	105.0
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	2.15	3200	13.52	800.0

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 93 **Total Rel. Wt. :** 23660

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 201.20 Date: 08/30/2010

Time Fished: 1311 Distance: 0.500 Drainge (sq mi): 34400.0 Depth: 0

Location: Dst American Crystal Sugar outfall Lat: 48.61224 Long: -97.15071

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		2	4.0	4.88	200	0.90	50.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	2.44	2800	12.60	1400.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		2	4.0	4.88	660	2.97	165.0
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	2.44	8	0.04	4.0
43-001	COMMON CARP	O	T	HG	M		2	4.0	4.88	4420	19.89	1105.0
43-006	SILVER CHUB	I		FS	M		8	16.0	19.51	204	0.92	12.7
43-028	SPOTTAIL SHINER	I	P	HG	M		1	2.0	2.44	2	0.01	1.0
43-032	SPOTFIN SHINER	I		FD	M		5	10.0	12.20	24	0.11	2.4
47-002	CHANNEL CATFISH			HG	C		3	6.0	7.32	6600	29.71	1100.0
47-008	STONECAT MADTOM	I	I	FS	C		1	2.0	2.44	60	0.27	30.0
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	2.44	160	0.72	80.0
80-001	SAUGER	P		FD	S		9	18.0	21.95	2540	11.43	141.1
80-002	WALLEYE	P		HG	S		3	6.0	7.32	740	3.33	123.3
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	4.88	3800	17.10	950.0

No Species: 0 **Nat. Species:** 13 **Hybrids:** 0 **Total Counted:** 41 **Total Rel. Wt. :** 22218

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 203.30 Date: 08/30/2010

Time Fished: 1602 Distance: 0.500 Drainge (sq mi): 34300.0 Depth: 0

Location: Dst. Drayton WWTP; Ust American Crystal Sugar Lat: 48.60105 Long: -97.14040

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		2	4.0	2.78	120	0.19	30.0
37-003	NORTHERN PIKE	P		HG	M		2	4.0	2.78	6700	10.64	1675.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		3	6.0	4.17	9200	14.61	1533.3
40-011	SHORTHEAD REDHORSE	I	M	FD	S		2	4.0	2.78	1880	2.98	470.0
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	1.39	1100	1.75	550.0
43-001	COMMON CARP	O	T	HG	M		5	10.0	6.94	29900	47.47	2990.0
43-006	SILVER CHUB	I		FS	M		16	32.0	22.22	466	0.74	14.5
43-020	EMERALD SHINER	I		HG	M		3	6.0	4.17	30	0.05	5.0
43-032	SPOTFIN SHINER	I		FD	M		19	38.0	26.39	72	0.11	1.8
43-034	SAND SHINER	I	M	FS	M		6	12.0	8.33	26	0.04	2.1
43-042	FATHEAD MINNOW	O	T	HG	C		5	10.0	6.94	10	0.02	1.0
47-002	CHANNEL CATFISH			HG	C		6	12.0	8.33	12900	20.48	1075.0
80-001	SAUGER	P		FD	S		2	4.0	2.78	580	0.92	145.0

No Species: 0 **Nat. Species:** 12 **Hybrids:** 0 **Total Counted:** 72 **Total Rel. Wt. :** 62984

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 204.00 Date: 08/30/2010

Time Fished: 1551 Distance: 0.500 Drainge (sq mi): 34300.0 Depth: 0

Location: Ust. Drayton dam; Ust Drayton WWTP Lat: 48.59418 Long: -97.14359

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		7	14.0	33.33	1530	17.27	109.2
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	4.76	1400	15.80	700.0
43-006	SILVER CHUB	I		FS	M		1	2.0	4.76	20	0.23	10.0
43-020	EMERALD SHINER	I		HG	M		1	2.0	4.76	8	0.09	4.0
43-028	SPOTTAIL SHINER	I	P	HG	M		2	4.0	9.52	4	0.05	1.0
43-042	FATHEAD MINNOW	O	T	HG	C		2	4.0	9.52	10	0.11	2.5
47-002	CHANNEL CATFISH			HG	C		2	4.0	9.52	3808	42.98	952.0
74-001	WHITE BASS	P		FD	M		1	2.0	4.76	100	1.13	50.0
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	4.76	120	1.35	60.0
80-001	SAUGER	P		FD	S		2	4.0	9.52	460	5.19	115.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	4.76	1400	15.80	700.0

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 21 **Total Rel. Wt. :** 8860

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 208.60 Date: 08/30/2010

Time Fished: 1479 Distance: 0.500 Drainge (sq mi): 34300.0 Depth: 0

Location: Ust. Hastings landing; ust Drayton impacts Lat: 48.55855 Long: -97.17184

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		8	16.0	38.10	4640	36.15	290.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	4.76	140	1.09	70.0
43-001	COMMON CARP	O	T	HG	M		1	2.0	4.76	6600	51.42	3300.0
43-006	SILVER CHUB	I		FS	M		1	2.0	4.76	40	0.31	20.0
43-028	SPOTTAIL SHINER	I	P	HG	M		3	6.0	14.29	6	0.05	1.0
43-032	SPOTFIN SHINER	I		FD	M		1	2.0	4.76	2	0.02	1.0
43-034	SAND SHINER	I	M	FS	M		1	2.0	4.76	2	0.02	1.0
43-042	FATHEAD MINNOW	O	T	HG	C		3	6.0	14.29	6	0.05	1.0
47-002	CHANNEL CATFISH			HG	C		1	2.0	4.76	920	7.17	460.0
80-001	SAUGER	P		FD	S		1	2.0	4.76	480	3.74	240.0

No Species: 0 **Nat. Species:** 9 **Hybrids:** 0 **Total Counted:** 21 **Total Rel. Wt. :** 12836

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 236.00 Date: 08/29/2010

Time Fished: 2035 Distance: 0.500 Drainge (sq mi): 32100.0 Depth: 0

Location: at USGS gaging station ND St. Rte 17 Lat: 48.41647 Long: -97.13805

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		25	50.0	62.50	14970	54.11	299.4
37-003	NORTHERN PIKE	P		HG	M		1	2.0	2.50	140	0.51	70.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	2.50	1800	6.51	900.0
43-001	COMMON CARP	O	T	HG	M		1	2.0	2.50	2600	9.40	1300.0
43-032	SPOTFIN SHINER	I		FD	M		1	2.0	2.50	4	0.01	2.0
47-002	CHANNEL CATFISH			HG	C		5	10.0	12.50	4410	15.94	441.0
63-001	TROUT-PERCH	I		HG	M		1	2.0	2.50	4	0.01	2.0
74-001	WHITE BASS	P		FD	M		1	2.0	2.50	30	0.11	15.0
80-001	SAUGER	P		FD	S		2	4.0	5.00	710	2.57	177.5
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	5.00	3000	10.84	750.0

No Species: 0 **Nat. Species:** 9 **Hybrids:** 0 **Total Counted:** 40 **Total Rel. Wt. :** 27668

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 255.00 Date: 08/29/2010

Time Fished: 1455 Distance: 0.500 Drainge (sq mi): 30400.0 Depth: 0

Location: Ust Big Woods Lat: 48.28303 Long: -97.11711

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		2	4.0	6.67	480	1.35	120.0
37-003	NORTHERN PIKE	P		HG	M		1	2.0	3.33	460	1.30	230.0
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	3.33	7400	20.87	3700.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		2	4.0	6.67	1340	3.78	335.0
43-001	COMMON CARP	O	T	HG	M		2	4.0	6.67	10400	29.34	2600.0
43-028	SPOTTAIL SHINER	I	P	HG	M		2	4.0	6.67	4	0.01	1.0
43-032	SPOTFIN SHINER	I		FD	M		1	2.0	3.33	12	0.03	6.0
43-042	FATHEAD MINNOW	O	T	HG	C		3	6.0	10.00	8	0.02	1.3
47-002	CHANNEL CATFISH			HG	C		13	26.0	43.33	12804	36.12	492.4
77-003	ROCK BASS	C		FD	C		1	2.0	3.33	4	0.01	2.0
80-001	SAUGER	P		FD	S		1	2.0	3.33	340	0.96	170.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	3.33	2200	6.21	1100.0

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 30 **Total Rel. Wt. :** 35452

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 265.00 Date: 08/29/2010

Time Fished: 1460 Distance: 0.500 Drainge (sq mi): 30400.0 Depth: 0

Location: Dst. Oslo WWTP Lat: 48.19682 Long: -97.13551

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		3	6.0	5.45	1100	2.97	183.3
37-003	NORTHERN PIKE	P		HG	M		3	6.0	5.45	380	1.02	63.3
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	1.82	17000	45.83	8500.0
40-010	GOLDEN REDHORSE	I	M	FD	S		1	2.0	1.82	600	1.62	300.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	1.82	20	0.05	10.0
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	1.82	450	1.21	225.0
43-001	COMMON CARP	O	T	HG	M		4	8.0	7.27	8606	23.20	1075.7
43-006	SILVER CHUB	I		FS	M		1	2.0	1.82	20	0.05	10.0
43-013	CREEK CHUB	G	T	HG	N		4	8.0	7.27	20	0.05	2.5
43-020	EMERALD SHINER	I		HG	M		2	4.0	3.64	4	0.01	1.0
43-026	COMMON SHINER	I		FD	S		3	6.0	5.45	10	0.03	1.6
43-028	SPOTTAIL SHINER	I	P	HG	M		7	14.0	12.73	10	0.03	0.7
43-032	SPOTFIN SHINER	I		FD	M		5	10.0	9.09	20	0.05	2.0
43-042	FATHEAD MINNOW	O	T	HG	C		3	6.0	5.45	6	0.02	1.0
47-002	CHANNEL CATFISH			HG	C		4	8.0	7.27	4700	12.67	587.5
63-001	TROUT-PERCH	I		HG	M		4	8.0	7.27	16	0.04	2.0
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	1.82	660	1.78	330.0
80-001	SAUGER	P		FD	S		4	8.0	7.27	1390	3.75	173.7
80-002	WALLEYE	P		HG	S		2	4.0	3.64	820	2.21	205.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	1.82	1260	3.40	630.0

No Species: 0 **Nat. Species:** 19 **Hybrids:** 0 **Total Counted:** 55 **Total Rel. Wt. :** 37092

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 271.00 Date: 08/29/2010

Time Fished: 1826 Distance: 0.500 Drainge (sq mi): 30300.0 Depth: 0

Location: Ust. Oslo City landing; Ust Oslo WWTP Lat: 48.17745 Long: -97.13548

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		4	8.0	4.88	2600	5.91	325.0
37-003	NORTHERN PIKE	P		HG	M		2	4.0	2.44	1800	4.09	450.0
40-010	GOLDEN REDHORSE	I	M	FD	S		2	4.0	2.44	1420	3.23	355.0
43-001	COMMON CARP	O	T	HG	M		2	4.0	2.44	13800	31.38	3450.0
43-006	SILVER CHUB	I		FS	M		9	18.0	10.98	204	0.46	11.3
43-013	CREEK CHUB	G	T	HG	N		1	2.0	1.22	4	0.01	2.0
43-020	EMERALD SHINER	I		HG	M		2	4.0	2.44	22	0.05	5.5
43-028	SPOTTAIL SHINER	I	P	HG	M		15	30.0	18.29	24	0.05	0.8
43-032	SPOTFIN SHINER	I		FD	M		5	10.0	6.10	16	0.04	1.6
43-034	SAND SHINER	I	M	FS	M		2	4.0	2.44	6	0.01	1.5
43-042	FATHEAD MINNOW	O	T	HG	C		9	18.0	10.98	22	0.05	1.2
47-002	CHANNEL CATFISH			HG	C		19	38.0	23.17	22180	50.43	583.6
63-001	TROUT-PERCH	I		HG	M		4	8.0	4.88	16	0.04	2.0
80-001	SAUGER	P		FD	S		4	8.0	4.88	1690	3.84	211.2
80-002	WALLEYE	P		HG	S		2	4.0	2.44	180	0.41	45.0

No Species: 0 **Nat. Species:** 14 **Hybrids:** 0 **Total Counted:** 82 **Total Rel. Wt. :** 43984

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 280.00 Date: 08/28/2010

Time Fished: 1668 Distance: 0.500 Drainge (sq mi): 30300.0 Depth: 0

Location: Dst. Far Fields; Dst. Grand Forks, ND area Lat: 48.12661 Long: -97.12661

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		6	12.0	10.71	3300	6.12	275.0
37-003	NORTHERN PIKE	P		HG	M		4	8.0	7.14	2580	4.79	322.5
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	1.79	2400	4.45	1200.0
40-008	SILVER REDHORSE	I	M	FD	S		1	2.0	1.79	1220	2.26	610.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	1.79	340	0.63	170.0
43-001	COMMON CARP	O	T	HG	M		6	12.0	10.71	24800	46.00	2066.6
43-006	SILVER CHUB	I		FS	M		5	10.0	8.93	260	0.48	26.0
43-020	EMERALD SHINER	I		HG	M		1	2.0	1.79	4	0.01	2.0
43-028	SPOTTAIL SHINER	I	P	HG	M		6	12.0	10.71	20	0.04	1.6
43-032	SPOTFIN SHINER	I		FD	M		3	6.0	5.36	20	0.04	3.3
47-002	CHANNEL CATFISH			HG	C		11	22.0	19.64	15860	29.42	720.9
63-001	TROUT-PERCH	I		HG	M		1	2.0	1.79	4	0.01	2.0
74-001	WHITE BASS	P		FD	M		3	6.0	5.36	100	0.19	16.6
80-001	SAUGER	P		FD	S		5	10.0	8.93	1480	2.75	148.0
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	3.57	1520	2.82	380.0

No Species: 0 **Nat. Species:** 14 **Hybrids:** 0 **Total Counted:** 56 **Total Rel. Wt. :** 53908

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 292.00 Date: 08/28/2010

Time Fished: 2061 Distance: 0.500 Drainge (sq mi): 29900.0 Depth: 0

Location: Dst. Grand Forks, ND area Lat: 47.99407 Long: -97.05634

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		1	2.0	0.90	70	0.15	35.0
40-010	GOLDEN REDHORSE	I	M	FD	S		1	2.0	0.90	1600	3.54	800.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	0.90	70	0.15	35.0
43-001	COMMON CARP	O	T	HG	M		9	18.0	8.11	30800	68.16	1711.1
43-006	SILVER CHUB	I		FS	M		5	10.0	4.50	180	0.40	18.0
43-013	CREEK CHUB	G	T	HG	N		1	2.0	0.90	10	0.02	5.0
43-020	EMERALD SHINER	I		HG	M		1	2.0	0.90	10	0.02	5.0
43-028	SPOTTAIL SHINER	I	P	HG	M		41	82.0	36.94	102	0.23	1.2
43-032	SPOTFIN SHINER	I		FD	M		21	42.0	18.92	130	0.29	3.1
43-042	FATHEAD MINNOW	O	T	HG	C		3	6.0	2.70	30	0.07	5.0
47-002	CHANNEL CATFISH			HG	C		6	12.0	5.41	11000	24.34	916.6
63-001	TROUT-PERCH	I		HG	M		15	30.0	13.51	64	0.14	2.1
77-004	SMALLMOUTH BASS	C	M	FD	C		2	4.0	1.80	50	0.11	12.5
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	0.90	2	0.00	1.0
80-001	SAUGER	P		FD	S		3	6.0	2.70	1070	2.37	178.3

No Species: 0 **Nat. Species:** 14 **Hybrids:** 0 **Total Counted:** 111 **Total Rel. Wt. :** 45188

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 294.30 Date: 08/28/2010

Time Fished: 1696 Distance: 0.500 Drainge (sq mi): 29900.0 Depth: 0

Location: Dst. English Coulee outfall Lat: 47.96479 Long: -97.06224

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-001	COMMON CARP	O	T	HG	M		4	8.0	8.33	14600	55.58	1825.0
43-006	SILVER CHUB	I		FS	M		3	6.0	6.25	220	0.84	36.6
43-020	EMERALD SHINER	I		HG	M		1	2.0	2.08	6	0.02	3.0
43-028	SPOTTAIL SHINER	I	P	HG	M		9	18.0	18.75	20	0.08	1.1
43-032	SPOTFIN SHINER	I		FD	M		15	30.0	31.25	40	0.15	1.3
43-034	SAND SHINER	I	M	FS	M		1	2.0	2.08	4	0.02	2.0
43-042	FATHEAD MINNOW	O	T	HG	C		1	2.0	2.08	4	0.02	2.0
47-002	CHANNEL CATFISH			HG	C		2	4.0	4.17	9980	37.99	2495.0
63-001	TROUT-PERCH	I		HG	M		3	6.0	6.25	8	0.03	1.3
74-001	WHITE BASS	P		FD	M		5	10.0	10.42	160	0.61	16.0
77-001	WHITE CRAPPIE	I		HG	C		1	2.0	2.08	6	0.02	3.0
80-001	SAUGER	P		FD	S		3	6.0	6.25	1220	4.64	203.3

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 48 **Total Rel. Wt. :** 26268

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 295.50 Date: 08/28/2010

Time Fished: 1641 Distance: 0.500 Drainge (sq mi): 29700.0 Depth: 0

Location: Ust. English Coulee; Dst. Dam Lat: 47.95075 Long: -97.05572

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		1	2.0	0.59	40	0.09	20.0
37-003	NORTHERN PIKE	P		HG	M		6	12.0	3.53	9470	21.07	789.1
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	0.59	80	0.18	40.0
40-010	GOLDEN REDHORSE	I	M	FD	S		4	8.0	2.35	1360	3.03	170.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	0.59	80	0.18	40.0
43-001	COMMON CARP	O	T	HG	M		10	20.0	5.88	29780	66.27	1489.0
43-006	SILVER CHUB	I		FS	M		2	4.0	1.18	34	0.08	8.5
43-020	EMERALD SHINER	I		HG	M		4	8.0	2.35	12	0.03	1.5
43-026	COMMON SHINER	I		FD	S		1	2.0	0.59	2	0.00	1.0
43-028	SPOTTAIL SHINER	I	P	HG	M		11	22.0	6.47	32	0.07	1.4
43-032	SPOTFIN SHINER	I		FD	M		112	224.0	65.88	300	0.67	1.3
43-042	FATHEAD MINNOW	O	T	HG	C		2	4.0	1.18	10	0.02	2.5
60-001	BURBOT				S		2	4.0	1.18	250	0.56	62.5
63-001	TROUT-PERCH	I		HG	M		4	8.0	2.35	30	0.07	3.7
77-003	ROCK BASS	C		FD	C		1	2.0	0.59	60	0.13	30.0
77-004	SMALLMOUTH BASS	C	M	FD	C		3	6.0	1.76	1320	2.94	220.0
80-001	SAUGER	P		FD	S		5	10.0	2.94	2080	4.63	208.0

No Species: 0 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 170 **Total Rel. Wt. :** 44940

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 296.50 Date: 08/27/2010

Time Fished: 1569 Distance: 0.500 Drainge (sq mi): 29900.0 Depth: 0

Location: Dst. Grand Forks, ND WWTP Lat: 47.92698 Long: -97.02768

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
01-008	CHESTNUT LAMPREY	P	P	FD	N		1	2.0	1.59	60	0.14	30.0
18-001	GOLDEYE	I	R	FD	M		2	4.0	3.17	1420	3.41	355.0
37-003	NORTHERN PIKE	P		HG	M		3	6.0	4.76	910	2.19	151.6
40-005	QUILLBACK CARPSUCKER	O		HG	M		3	6.0	4.76	4470	10.75	745.0
40-008	SILVER REDHORSE	I	M	FD	S		2	4.0	3.17	920	2.21	230.0
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	1.59	100	0.24	50.0
43-001	COMMON CARP	O	T	HG	M		9	18.0	14.29	22860	54.96	1270.0
43-006	SILVER CHUB	I		FS	M		1	2.0	1.59	60	0.14	30.0
43-028	SPOTTAIL SHINER	I	P	HG	M		18	36.0	28.57	22	0.05	0.6
47-002	CHANNEL CATFISH			HG	C		1	2.0	1.59	1100	2.64	550.0
74-001	WHITE BASS	P		FD	M		1	2.0	1.59	30	0.07	15.0
77-003	ROCK BASS	C		FD	C		3	6.0	4.76	420	1.01	70.0
77-004	SMALLMOUTH BASS	C	M	FD	C		9	18.0	14.29	2200	5.29	122.2
77-009	BLUEGILL SUNFISH	I	P	HG	C		1	2.0	1.59	2	0.00	1.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		2	4.0	3.17	2	0.00	0.5
80-001	SAUGER	P		FD	S		4	8.0	6.35	1520	3.65	190.0
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	3.17	5500	13.22	1375.0

No Species: 0 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 63 **Total Rel. Wt. :** 41596

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 298.00 Date: 08/27/2010

Time Fished: 1896 Distance: 0.500 Drainge (sq mi): 24000.0 Depth: 0

Location: Ust. Grand Forks, ND WWTP Lat: 47.92171 Long: -97.02152

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		1	2.0	1.85	600	1.81	300.0
37-003	NORTHERN PIKE	P		HG	M		3	6.0	5.56	2340	7.04	390.0
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	1.85	5400	16.25	2700.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		5	10.0	9.26	5380	16.19	538.0
40-008	SILVER REDHORSE	I	M	FD	S		3	6.0	5.56	1300	3.91	216.6
40-011	SHORTHEAD REDHORSE	I	M	FD	S		2	4.0	3.70	980	2.95	245.0
43-001	COMMON CARP	O	T	HG	M		1	2.0	1.85	5800	17.45	2900.0
43-028	SPOTTAIL SHINER	I	P	HG	M		17	34.0	31.48	40	0.12	1.1
47-002	CHANNEL CATFISH			HG	C		4	8.0	7.41	6200	18.66	775.0
63-001	TROUT-PERCH	I		HG	M		2	4.0	3.70	12	0.04	3.0
74-001	WHITE BASS	P		FD	M		2	4.0	3.70	140	0.42	35.0
77-003	ROCK BASS	C		FD	C		3	6.0	5.56	720	2.17	120.0
77-004	SMALLMOUTH BASS	C	M	FD	C		4	8.0	7.41	620	1.87	77.5
80-001	SAUGER	P		FD	S		5	10.0	9.26	2520	7.58	252.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	1.85	1180	3.55	590.0

No Species: 0 **Nat. Species:** 14 **Hybrids:** 0 **Total Counted:** 54 **Total Rel. Wt. :** 33232

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 300.00 Date: 08/27/2010

Time Fished: 1728 Distance: 0.500 Drainge (sq mi): 24000.0 Depth: 0

Location: Ust. Lincoln Park landing Lat: 47.90563 Long: -97.02496

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	NORTHERN PIKE	P		HG	M		1	2.0	2.04	420	0.83	210.0
40-008	SILVER REDHORSE	I	M	FD	S		1	2.0	2.04	280	0.56	140.0
43-001	COMMON CARP	O	T	HG	M		9	18.0	18.37	37200	73.92	2066.6
43-028	SPOTTAIL SHINER	I	P	HG	M		19	38.0	38.78	20	0.04	0.5
43-032	SPOTFIN SHINER	I		FD	M		6	12.0	12.24	20	0.04	1.6
47-002	CHANNEL CATFISH			HG	C		9	18.0	18.37	11000	21.86	611.1
63-001	TROUT-PERCH	I		HG	M		1	2.0	2.04	4	0.01	2.0
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	2.04	460	0.91	230.0
80-001	SAUGER	P		FD	S		2	4.0	4.08	920	1.83	230.0

No Species: 0 **Nat. Species:** 8 **Hybrids:** 0 **Total Counted:** 49 **Total Rel. Wt. :** 50324

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 318.00 Date: 08/27/2010

Time Fished: 1857 Distance: 0.500 Drainge (sq mi): 23800.0 Depth: 0

Location: Ust. Thompsons Rd. bridge Lat: 47.75699 Long: -96.93051

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		9	18.0	13.64	5200	14.57	288.8
37-003	NORTHERN PIKE	P		HG	M		2	4.0	3.03	880	2.46	220.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		3	6.0	4.55	2400	6.72	400.0
40-008	SILVER REDHORSE	I	M	FD	S		2	4.0	3.03	1680	4.71	420.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		2	4.0	3.03	1080	3.03	270.0
43-001	COMMON CARP	O	T	HG	M		3	6.0	4.55	10400	29.13	1733.3
43-006	SILVER CHUB	I		FS	M		4	8.0	6.06	200	0.56	25.0
43-028	SPOTTAIL SHINER	I	P	HG	M		1	2.0	1.52	2	0.01	1.0
43-032	SPOTFIN SHINER	I		FD	M		6	12.0	9.09	12	0.03	1.0
43-034	SAND SHINER	I	M	FS	M		8	16.0	12.12	20	0.06	1.2
47-002	CHANNEL CATFISH			HG	C		13	26.0	19.70	10640	29.80	409.2
63-001	TROUT-PERCH	I		HG	M		3	6.0	4.55	28	0.08	4.6
77-003	ROCK BASS	C		FD	C		1	2.0	1.52	60	0.17	30.0
80-001	SAUGER	P		FD	S		5	10.0	7.58	1520	4.26	152.0
80-002	WALLEYE	P		HG	S		1	2.0	1.52	580	1.62	290.0
80-003	YELLOW PERCH			HG	M		2	4.0	3.03	100	0.28	25.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	1.52	900	2.52	450.0

No Species: 0 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 66 **Total Rel. Wt. :** 35702

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 333.00 Date: 08/26/2010

Time Fished: 2009 Distance: 0.500 Drainge (sq mi): 23600.0 Depth: 0

Location: Belmont Park/ Frog Point Park Lat: 47.62690 Long: -96.87753

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		7	14.0	13.73	4360	11.94	311.4
37-003	NORTHERN PIKE	P		HG	M		2	4.0	3.92	360	0.99	90.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	1.96	1000	2.74	500.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		2	4.0	3.92	1700	4.65	425.0
40-016	WHITE SUCKER	O	T	FD	S		5	10.0	9.80	4120	11.28	412.0
43-001	COMMON CARP	O	T	HG	M		2	4.0	3.92	9800	26.83	2450.0
43-032	SPOTFIN SHINER	I		FD	M		3	6.0	5.88	8	0.02	1.3
43-034	SAND SHINER	I	M	FS	M		2	4.0	3.92	4	0.01	1.0
47-002	CHANNEL CATFISH			HG	C		23	46.0	45.10	11060	30.28	240.4
77-003	ROCK BASS	C		FD	C		1	2.0	1.96	650	1.78	325.0
80-001	SAUGER	P		FD	S		2	4.0	3.92	1060	2.90	265.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	1.96	2400	6.57	1200.0

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 51 **Total Rel. Wt. :** 36522

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 355.00 Date: 08/26/2010

Time Fished: 2181 Distance: 0.500 Drainge (sq mi): 22700.0 Depth: 0

Location: Dst. Marsh River Lat: 47.47568 Long: -96.85364

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		8	16.0	29.63	4800	25.10	300.0
40-008	SILVER REDHORSE	I	M	FD	S		2	4.0	7.41	3480	18.20	870.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		5	10.0	18.52	2780	14.54	278.0
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	3.70	800	4.18	400.0
43-001	COMMON CARP	O	T	HG	M		1	2.0	3.70	2700	14.12	1350.0
43-034	SAND SHINER	I	M	FS	M		1	2.0	3.70	4	0.02	2.0
47-002	CHANNEL CATFISH			HG	C		6	12.0	22.22	2800	14.64	233.3
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	3.70	620	3.24	310.0
80-001	SAUGER	P		FD	S		1	2.0	3.70	520	2.72	260.0
80-002	WALLEYE	P		HG	S		1	2.0	3.70	620	3.24	310.0

No Species: 0 **Nat. Species:** 9 **Hybrids:** 0 **Total Counted:** 27 **Total Rel. Wt. :** 19124

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 375.00 Date: 08/26/2010

Time Fished: 1970 Distance: 0.500 Drainge (sq mi): 21400.0 Depth: 0

Location: Halstead boat Ramp Lat: 47.35601 Long: -96.83732

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		4	8.0	8.33	2200	6.03	275.0
37-003	NORTHERN PIKE	P		HG	M		3	6.0	6.25	2160	5.92	360.0
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	2.08	8800	24.12	4400.0
40-008	SILVER REDHORSE	I	M	FD	S		1	2.0	2.08	1500	4.11	750.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		5	10.0	10.42	2640	7.23	264.0
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	2.08	420	1.15	210.0
43-001	COMMON CARP	O	T	HG	M		1	2.0	2.08	2200	6.03	1100.0
43-032	SPOTFIN SHINER	I		FD	M		6	12.0	12.50	20	0.05	1.6
47-002	CHANNEL CATFISH			HG	C		16	32.0	33.33	11200	30.69	350.0
77-009	BLUEGILL SUNFISH	I	P	HG	C		1	2.0	2.08	30	0.08	15.0
80-001	SAUGER	P		FD	S		6	12.0	12.50	2660	7.29	221.6
85-001	FRESHWATER DRUM		P	HG	M		3	6.0	6.25	2660	7.29	443.3

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 48 **Total Rel. Wt. :** 36490

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 386.00 Date: 08/25/2010

Time Fished: 1839 Distance: 0.500 Drainge (sq mi): 19700.0 Depth: 0

Location: Dst. Hendenrum WWTP; Norman Co Hwy 25 boat ramp Lat: 47.26554 Long: -96.84341

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		1	2.0	2.44	1440	20.29	720.0
37-003	NORTHERN PIKE	P		HG	M		1	2.0	2.44	70	0.99	35.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		5	10.0	12.20	2380	33.53	238.0
43-032	SPOTFIN SHINER	I		FD	M		25	50.0	60.98	100	1.41	2.0
43-042	FATHEAD MINNOW	O	T	HG	C		1	2.0	2.44	2	0.03	1.0
47-002	CHANNEL CATFISH			HG	C		2	4.0	4.88	584	8.23	146.0
63-001	TROUT-PERCH	I		HG	M		2	4.0	4.88	12	0.17	3.0
80-001	SAUGER	P		FD	S		4	8.0	9.76	2510	35.36	313.7

No Species: 0 **Nat. Species:** 8 **Hybrids:** 0 **Total Counted:** 41 **Total Rel. Wt. :** 7098

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 404.00 Date: 08/25/2010

Time Fished: 2093 Distance: 0.500 Drainge (sq mi): 19700.0 Depth: 0

Location: CR 39 near Perley, MN Lat: 47.17770 Long: -96.82589

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		22	44.0	36.67	14000	22.28	318.1
40-008	SILVER REDHORSE	I	M	FD	S		1	2.0	1.67	1600	2.55	800.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	1.67	1500	2.39	750.0
43-001	COMMON CARP	O	T	HG	M		5	10.0	8.33	19200	30.55	1920.0
47-002	CHANNEL CATFISH			HG	C		25	50.0	41.67	18900	30.08	378.0
74-001	WHITE BASS	P		FD	M		2	4.0	3.33	200	0.32	50.0
80-001	SAUGER	P		FD	S		2	4.0	3.33	1240	1.97	310.0
80-002	WALLEYE	P		HG	S		1	2.0	1.67	5800	9.23	2900.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	1.67	400	0.64	200.0

No Species: 0 **Nat. Species:** 8 **Hybrids:** 0 **Total Counted:** 60 **Total Rel. Wt. :** 62840

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 418.70 Date: 08/25/2010

Time Fished: 2465 Distance: 0.500 Drainge (sq mi): 17900.0 Depth: 0

Location: Dst. Fargo Diverstion Lat: 47.07269 Long: -96.82642

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		28	56.0	40.00	16140	33.57	288.2
40-008	SILVER REDHORSE	I	M	FD	S		1	2.0	1.43	3200	6.66	1600.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		6	12.0	8.57	3260	6.78	271.6
43-001	COMMON CARP	O	T	HG	M		4	8.0	5.71	3560	7.40	445.0
43-013	CREEK CHUB	G	T	HG	N		1	2.0	1.43	4	0.01	2.0
43-032	SPOTFIN SHINER	I		FD	M		2	4.0	2.86	8	0.02	2.0
43-042	FATHEAD MINNOW	O	T	HG	C		5	10.0	7.14	12	0.02	1.2
47-002	CHANNEL CATFISH			HG	C		16	32.0	22.86	20300	42.22	634.3
63-001	TROUT-PERCH	I		HG	M		1	2.0	1.43	4	0.01	2.0
77-003	ROCK BASS	C		FD	C		1	2.0	1.43	600	1.25	300.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		3	6.0	4.29	28	0.06	4.6
80-001	SAUGER	P		FD	S		1	2.0	1.43	470	0.98	235.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	1.43	490	1.02	245.0

No Species: 0 **Nat. Species:** 12 **Hybrids:** 0 **Total Counted:** 70 **Total Rel. Wt. :** 48076

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 427.40 Date: 08/25/2010

Time Fished: 1861 Distance: 0.500 Drainge (sq mi): 17800.0 Depth: 0

Location: Dst. Sheyenne River Lat: 47.02464 Long: -96.82101

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		21	42.0	30.00	11300	19.39	269.0
40-008	SILVER REDHORSE	I	M	FD	S		1	2.0	1.43	3800	6.52	1900.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	1.43	580	1.00	290.0
43-001	COMMON CARP	O	T	HG	M		1	2.0	1.43	13700	23.51	6850.0
43-032	SPOTFIN SHINER	I		FD	M		1	2.0	1.43	4	0.01	2.0
43-042	FATHEAD MINNOW	O	T	HG	C		8	16.0	11.43	26	0.04	1.6
47-002	CHANNEL CATFISH			HG	C		24	48.0	34.29	24950	42.81	519.7
63-001	TROUT-PERCH	I		HG	M		1	2.0	1.43	6	0.01	3.0
74-001	WHITE BASS	P		FD	M		3	6.0	4.29	100	0.17	16.6
77-009	BLUEGILL SUNFISH	I	P	HG	C		3	6.0	4.29	8	0.01	1.3
80-001	SAUGER	P		FD	S		5	10.0	7.14	3410	5.85	341.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	1.43	400	0.69	200.0

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 70 **Total Rel. Wt. :** 58284

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 436.40 Date: 08/24/2010

Time Fished: 1563 Distance: 0.500 Drainge (sq mi): 6690.0 Depth: 0

Location: Dst. NoDak Ditch and discharge Lat: 46.95812 Long: -96.80397

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		29	58.0	15.93	15190	7.81	261.9
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	0.55	300	0.15	150.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	0.55	1000	0.51	500.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		2	4.0	1.10	1630	0.84	407.5
43-001	COMMON CARP	O	T	HG	M		7	14.0	3.85	31800	16.34	2271.4
43-032	SPOTFIN SHINER	I		FD	M		2	4.0	1.10	14	0.01	3.5
43-034	SAND SHINER	I	M	FS	M		1	2.0	0.55	6	0.00	3.0
43-042	FATHEAD MINNOW	O	T	HG	C		21	42.0	11.54	50	0.03	1.1
47-002	CHANNEL CATFISH			HG	C		104	208.0	57.14	137940	70.89	663.1
47-005	BROWN BULLHEAD	I	T	HG	C		1	2.0	0.55	560	0.29	280.0
74-001	WHITE BASS	P		FD	M		2	4.0	1.10	60	0.03	15.0
77-003	ROCK BASS	C		FD	C		1	2.0	0.55	460	0.24	230.0
77-009	BLUEGILL SUNFISH	I	P	HG	C		1	2.0	0.55	2	0.00	1.0
80-001	SAUGER	P		FD	S		6	12.0	3.30	3890	2.00	324.1
85-001	FRESHWATER DRUM		P	HG	M		3	6.0	1.65	1680	0.86	280.0

No Species: 0 **Nat. Species:** 14 **Hybrids:** 0 **Total Counted:** 182 **Total Rel. Wt. :** 194582

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 437.00 Date: 08/23/2010

Time Fished: 1625 Distance: 0.500 Drainge (sq mi): 6690.0 Depth: 0

Location: Ust. NoDak ditch; Dst. Fargo, ND WWTP Lat: 46.95403 Long: -96.80033

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		7	14.0	10.61	4000	10.01	285.7
40-005	QUILLBACK CARPSUCKER	O		HG	M		2	4.0	3.03	2600	6.51	650.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	1.52	60	0.15	30.0
43-032	SPOTFIN SHINER	I		FD	M		21	42.0	31.82	60	0.15	1.4
43-042	FATHEAD MINNOW	O	T	HG	C		2	4.0	3.03	6	0.02	1.5
47-002	CHANNEL CATFISH			HG	C		24	48.0	36.36	33020	82.66	687.9
63-001	TROUT-PERCH	I		HG	M		5	10.0	7.58	20	0.05	2.0
74-001	WHITE BASS	P		FD	M		4	8.0	6.06	180	0.45	22.5

No Species: 0 **Nat. Species:** 8 **Hybrids:** 0 **Total Counted:** 66 **Total Rel. Wt. :** 39946

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 440.00 Date: 08/23/2010

Time Fished: 2168 Distance: 0.500 Drainge (sq mi): 6690.0 Depth: 0

Location: Dst. Fargo, ND WWTP Lat: 46.92895 Long: -96.78480

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		15	30.0	16.48	8500	7.15	283.3
37-003	NORTHERN PIKE	P		HG	M		1	2.0	1.10	4400	3.70	2200.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	1.10	120	0.10	60.0
40-008	SILVER REDHORSE	I	M	FD	S		1	2.0	1.10	4000	3.36	2000.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		7	14.0	7.69	2900	2.44	207.1
43-001	COMMON CARP	O	T	HG	M		21	42.0	23.08	69800	58.69	1661.9
43-032	SPOTFIN SHINER	I		FD	M		15	30.0	16.48	30	0.03	1.0
43-042	FATHEAD MINNOW	O	T	HG	C		3	6.0	3.30	10	0.01	1.6
47-002	CHANNEL CATFISH			HG	C		20	40.0	21.98	25200	21.19	630.0
63-001	TROUT-PERCH	I		HG	M		2	4.0	2.20	16	0.01	4.0
74-001	WHITE BASS	P		FD	M		1	2.0	1.10	20	0.02	10.0
80-001	SAUGER	P		FD	S		2	4.0	2.20	1540	1.29	385.0
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	2.20	2400	2.02	600.0

No Species: 0 **Nat. Species:** 12 **Hybrids:** 0 **Total Counted:** 91 **Total Rel. Wt. :** 118936

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 445.30 Date: 08/24/2010

Time Fished: 1575 Distance: 0.500 Drainge (sq mi): 6680.0 Depth: 0

Location: Dst. MB Johnson boat ramp Lat: 46.91468 Long: -96.75436

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		1	2.0	1.20	450	0.85	225.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	1.20	1800	3.40	900.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		3	6.0	3.61	160	0.30	26.6
43-001	COMMON CARP	O	T	HG	M		6	12.0	7.23	23500	44.44	1958.3
43-032	SPOTFIN SHINER	I		FD	M		42	84.0	50.60	100	0.19	1.1
43-042	FATHEAD MINNOW	O	T	HG	C		3	6.0	3.61	20	0.04	3.3
47-002	CHANNEL CATFISH			HG	C		16	32.0	19.28	23420	44.29	731.8
63-001	TROUT-PERCH	I		HG	M		1	2.0	1.20	6	0.01	3.0
77-009	BLUEGILL SUNFISH	I	P	HG	C		1	2.0	1.20	2	0.00	1.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		2	4.0	2.41	20	0.04	5.0
80-001	SAUGER	P		FD	S		2	4.0	2.41	630	1.19	157.5
80-002	WALLEYE	P		HG	S		4	8.0	4.82	2270	4.29	283.7
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	1.20	500	0.95	250.0

No Species: 0 **Nat. Species:** 12 **Hybrids:** 0 **Total Counted:** 83 **Total Rel. Wt. :** 52878

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 446.40 Date: 08/23/2010

Time Fished: 1981 Distance: 0.500 Drainge (sq mi): 6650.0 Depth: 0

Location: Dst. American Crystal Sugar Lat: 46.90770 Long: -96.76409

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		4	8.0	2.40	2160	3.00	270.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	0.60	1820	2.52	910.0
43-001	COMMON CARP	O	T	HG	M		6	12.0	3.59	16600	23.02	1383.3
43-006	SILVER CHUB	I		FS	M		3	6.0	1.80	120	0.17	20.0
43-020	EMERALD SHINER	I		HG	M		3	6.0	1.80	20	0.03	3.3
43-032	SPOTFIN SHINER	I		FD	M		84	168.0	50.30	200	0.28	1.1
47-002	CHANNEL CATFISH			HG	C		39	78.0	23.35	48360	67.07	620.0
63-001	TROUT-PERCH	I		HG	M		9	18.0	5.39	52	0.07	2.8
74-001	WHITE BASS	P		FD	M		1	2.0	0.60	300	0.42	150.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		13	26.0	7.78	8	0.01	0.3
80-001	SAUGER	P		FD	S		1	2.0	0.60	420	0.58	210.0
85-001	FRESHWATER DRUM		P	HG	M		3	6.0	1.80	2040	2.83	340.0

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 167 **Total Rel. Wt. :** 72100

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 448.80 Date: 08/23/2010

Time Fished: 2383 Distance: 0.500 Drainge (sq mi): 6650.0 Depth: 0

Location: Dst. Moorehead, MN WWTP; Ust. Amercian Crystal Sugar Lat: 46.89381 Long: -96.77077

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		2	4.0	1.64	1000	1.08	250.0
37-003	NORTHERN PIKE	P		HG	M		2	4.0	1.64	680	0.73	170.0
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	0.82	4800	5.18	2400.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	0.82	2200	2.38	1100.0
40-008	SILVER REDHORSE	I	M	FD	S		1	2.0	0.82	1900	2.05	950.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		4	8.0	3.28	1980	2.14	247.5
43-001	COMMON CARP	O	T	HG	M		9	18.0	7.38	57000	61.54	3166.6
43-032	SPOTFIN SHINER	I		FD	M		46	92.0	37.70	150	0.16	1.6
43-042	FATHEAD MINNOW	O	T	HG	C		2	4.0	1.64	30	0.03	7.5
47-002	CHANNEL CATFISH			HG	C		13	26.0	10.66	13000	14.03	500.0
47-008	STONECAT MADTOM	I	I	FS	C		1	2.0	0.82	60	0.06	30.0
63-001	TROUT-PERCH	I		HG	M		6	12.0	4.92	70	0.08	5.8
74-001	WHITE BASS	P		FD	M		13	26.0	10.66	800	0.86	30.7
77-003	ROCK BASS	C		FD	C		1	2.0	0.82	440	0.48	220.0
77-004	SMALLMOUTH BASS	C	M	FD	C		3	6.0	2.46	2020	2.18	336.6
77-008	GREEN SUNFISH	I	T	HG	C		2	4.0	1.64	40	0.04	10.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		8	16.0	6.56	100	0.11	6.2
80-001	SAUGER	P		FD	S		4	8.0	3.28	3660	3.95	457.5
85-001	FRESHWATER DRUM		P	HG	M		3	6.0	2.46	2700	2.91	450.0

No Species: 0 **Nat. Species:** 18 **Hybrids:** 0 **Total Counted:** 122 **Total Rel. Wt. :** 92630

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 450.00 Date: 08/22/2010

Time Fished: 1899 Distance: 0.500 Drainge (sq mi): 6650.0 Depth: 0

Location: Ust. Moorehead, MN WWTP Lat: 46.88312 Long: -96.76716

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		5	10.0	7.94	2860	3.62	286.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		4	8.0	6.35	3400	4.30	425.0
40-010	GOLDEN REDHORSE	I	M	FD	S		3	6.0	4.76	92	0.12	15.3
40-011	SHORTHEAD REDHORSE	I	M	FD	S		2	4.0	3.17	440	0.56	110.0
43-001	COMMON CARP	O	T	HG	M		17	34.0	26.98	63200	79.99	1858.8
43-006	SILVER CHUB	I		FS	M		1	2.0	1.59	60	0.08	30.0
43-032	SPOTFIN SHINER	I		FD	M		13	26.0	20.63	30	0.04	1.1
47-002	CHANNEL CATFISH			HG	C		8	16.0	12.70	6600	8.35	412.5
63-001	TROUT-PERCH	I		HG	M		1	2.0	1.59	12	0.02	6.0
74-001	WHITE BASS	P		FD	M		3	6.0	4.76	76	0.10	12.6
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	1.59	80	0.10	40.0
80-002	WALLEYE	P		HG	S		1	2.0	1.59	80	0.10	40.0
85-001	FRESHWATER DRUM		P	HG	M		4	8.0	6.35	2080	2.63	260.0

No Species: 0 **Nat. Species:** 12 **Hybrids:** 0 **Total Counted:** 63 **Total Rel. Wt. :** 79010

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 454.00 Date: 08/22/2010

Time Fished: 2053 Distance: 0.500 Drainge (sq mi): 6650.0 Depth: 0

Location: Ust. Fargo, ND; Gooseberry Park Lat: 46.85546 Long: -96.77595

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		2	4.0	1.82	1160	2.13	290.0
37-003	NORTHERN PIKE	P		HG	M		1	2.0	0.91	580	1.07	290.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		4	8.0	3.64	5000	9.19	625.0
40-010	GOLDEN REDHORSE	I	M	FD	S		2	4.0	1.82	28	0.05	7.0
43-001	COMMON CARP	O	T	HG	M		10	20.0	9.09	30680	56.40	1534.0
43-032	SPOTFIN SHINER	I		FD	M		55	110.0	50.00	160	0.29	1.4
47-002	CHANNEL CATFISH			HG	C		25	50.0	22.73	16104	29.61	322.0
63-001	TROUT-PERCH	I		HG	M		2	4.0	1.82	24	0.04	6.0
74-001	WHITE BASS	P		FD	M		2	4.0	1.82	100	0.18	25.0
77-003	ROCK BASS	C		FD	C		1	2.0	0.91	540	0.99	270.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		6	12.0	5.45	20	0.04	1.6

No Species: 0 **Nat. Species:** 10 **Hybrids:** 0 **Total Counted:** 110 **Total Rel. Wt. :** 54396

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 462.00 Date: 08/22/2010

Time Fished: 2721 Distance: 0.500 Drainge (sq mi): 6600.0 Depth: 0

Location: Dst. Convent Landing Fargo, ND Lat: 46.80534 Long: -96.80323

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-002	MOONEYE	I	R	FD	M		9	18.0	6.04	4780	5.99	265.5
37-003	NORTHERN PIKE	P		HG	M		1	2.0	0.67	140	0.18	70.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		4	8.0	2.68	6010	7.53	751.2
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	0.67	1000	1.25	500.0
43-001	COMMON CARP	O	T	HG	M		16	32.0	10.74	53080	66.52	1658.7
43-032	SPOTFIN SHINER	I		FD	M		31	62.0	20.81	100	0.13	1.6
43-034	SAND SHINER	I	M	FS	M		2	4.0	1.34	6	0.01	1.5
43-042	FATHEAD MINNOW	O	T	HG	C		2	4.0	1.34	6	0.01	1.5
47-002	CHANNEL CATFISH			HG	C		32	64.0	21.48	12766	16.00	199.4
63-001	TROUT-PERCH	I		HG	M		2	4.0	1.34	12	0.02	3.0
74-001	WHITE BASS	P		FD	M		6	12.0	4.03	100	0.13	8.3
77-003	ROCK BASS	C		FD	C		1	2.0	0.67	100	0.13	50.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		40	80.0	26.85	110	0.14	1.3
80-001	SAUGER	P		FD	S		1	2.0	0.67	580	0.73	290.0
80-002	WALLEYE	P		HG	S		1	2.0	0.67	1000	1.25	500.0

No Species: 0 **Nat. Species:** 14 **Hybrids:** 0 **Total Counted:** 149 **Total Rel. Wt. :** 79790

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 472.00 Date: 08/22/2010

Time Fished: 1902 Distance: 0.500 Drainge (sq mi): 6550.0 Depth: 0

Location: Dst. Wild Rice River Lat: 46.75780 Long: -96.78702

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		1	2.0	1.11	580	1.01	290.0
40-008	SILVER REDHORSE	I	M	FD	S		1	2.0	1.11	640	1.12	320.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	1.11	140	0.24	70.0
43-001	COMMON CARP	O	T	HG	M		4	8.0	4.44	11600	20.27	1450.0
43-032	SPOTFIN SHINER	I		FD	M		7	14.0	7.78	30	0.05	2.1
47-002	CHANNEL CATFISH			HG	C		58	116.0	64.44	39880	69.68	343.7
63-001	TROUT-PERCH	I		HG	M		2	4.0	2.22	10	0.02	2.5
74-001	WHITE BASS	P		FD	M		4	8.0	4.44	100	0.17	12.5
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	1.11	360	0.63	180.0
77-009	BLUEGILL SUNFISH	I	P	HG	C		1	2.0	1.11	4	0.01	2.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		2	4.0	2.22	24	0.04	6.0
80-001	SAUGER	P		FD	S		1	2.0	1.11	240	0.42	120.0
80-002	WALLEYE	P		HG	S		4	8.0	4.44	2886	5.04	360.7
80-003	YELLOW PERCH			HG	M		1	2.0	1.11	60	0.10	30.0
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	2.22	680	1.19	170.0

No Species: 0 **Nat. Species:** 14 **Hybrids:** 0 **Total Counted:** 90 **Total Rel. Wt. :** 57234

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 478.50 Date: 08/21/2010

Time Fished: 2250 Distance: 0.500 Drainge (sq mi): 4200.0 Depth: 0

Location: proposed Fargo, ND diverstion Lat: 46.70168 Long: -96.78398

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		4	8.0	4.94	1780	4.84	222.5
40-005	QUILLBACK CARPSUCKER	O		HG	M		2	4.0	2.47	3000	8.15	750.0
40-010	GOLDEN REDHORSE	I	M	FD	S		1	2.0	1.23	10	0.03	5.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		2	4.0	2.47	1900	5.16	475.0
43-001	COMMON CARP	O	T	HG	M		2	4.0	2.47	3700	10.05	925.0
43-020	EMERALD SHINER	I		HG	M		1	2.0	1.23	2	0.01	1.0
43-032	SPOTFIN SHINER	I		FD	M		16	32.0	19.75	60	0.16	1.8
47-002	CHANNEL CATFISH			HG	C		42	84.0	51.85	23720	64.45	282.3
47-006	BLACK BULLHEAD	I	P	HG	C		1	2.0	1.23	240	0.65	120.0
74-001	WHITE BASS	P		FD	M		1	2.0	1.23	20	0.05	10.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		3	6.0	3.70	20	0.05	3.3
80-002	WALLEYE	P		HG	S		4	8.0	4.94	1930	5.24	241.2
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	2.47	420	1.14	105.0

No Species: 0 **Nat. Species:** 12 **Hybrids:** 0 **Total Counted:** 81 **Total Rel. Wt. :** 36802

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 485.00 Date: 08/21/2010

Time Fished: 1602 Distance: 0.500 Drainge (sq mi): 4190.0 Depth: 0

Location: Between the dams Lat: 46.65372 Long: -96.79913

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		19	38.0	22.35	9820	11.90	258.4
40-002	BIGMOUTH BUFFALO	I		HG	M		5	10.0	5.88	17800	21.56	1780.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		2	4.0	2.35	3200	3.88	800.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	1.18	1200	1.45	600.0
43-001	COMMON CARP	O	T	HG	M		12	24.0	14.12	32800	39.74	1366.6
43-020	EMERALD SHINER	I		HG	M		4	8.0	4.71	26	0.03	3.2
43-032	SPOTFIN SHINER	I		FD	M		11	22.0	12.94	32	0.04	1.4
47-002	CHANNEL CATFISH			HG	C		25	50.0	29.41	17204	20.84	344.0
47-006	BLACK BULLHEAD	I	P	HG	C		1	2.0	1.18	180	0.22	90.0
74-001	WHITE BASS	P		FD	M		3	6.0	3.53	60	0.07	10.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	1.18	2	0.00	1.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	1.18	220	0.27	110.0

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 85 **Total Rel. Wt. :** 82544

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 496.20 Date: 09/01/2010

Time Fished: 2233 Distance: 0.500 Drainge (sq mi): 4170.0 Depth: 0

Location: Dst. Christen dam MPCA site Lat: 46.60691 Long: -97.46941

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		28	56.0	28.28	15160	16.63	270.7
40-002	BIGMOUTH BUFFALO	I		HG	M		2	4.0	2.02	6900	7.57	1725.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	1.01	600	0.66	300.0
40-008	SILVER REDHORSE	I	M	FD	S		4	8.0	4.04	3450	3.78	431.2
40-011	SHORTHEAD REDHORSE	I	M	FD	S		4	8.0	4.04	3720	4.08	465.0
43-001	COMMON CARP	O	T	HG	M		12	24.0	12.12	36800	40.36	1533.3
43-020	EMERALD SHINER	I		HG	M		1	2.0	1.01	14	0.02	7.0
43-026	COMMON SHINER	I		FD	S		1	2.0	1.01	6	0.01	3.0
43-032	SPOTFIN SHINER	I		FD	M		1	2.0	1.01	90	0.10	45.0
47-002	CHANNEL CATFISH			HG	C		31	62.0	31.31	20840	22.86	336.1
74-001	WHITE BASS	P		FD	M		4	8.0	4.04	80	0.09	10.0
77-001	WHITE CRAPPIE	I		HG	C		1	2.0	1.01	160	0.18	80.0
77-008	GREEN SUNFISH	I	T	HG	C		1	2.0	1.01	30	0.03	15.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	1.01	40	0.04	20.0
80-001	SAUGER	P		FD	S		1	2.0	1.01	650	0.71	325.0
80-003	YELLOW PERCH			HG	M		1	2.0	1.01	30	0.03	15.0
85-001	FRESHWATER DRUM		P	HG	M		5	10.0	5.05	2600	2.85	260.0

No Species: 0 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 99 **Total Rel. Wt. :** 91170

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 497.00 Date: 08/21/2010

Time Fished: 2267 Distance: 0.500 Drainge (sq mi): 4170.0 Depth: 0

Location: Ust. Christine dam Lat: 46.59385 Long: -96.75513

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		9	18.0	8.04	4640	8.78	257.7
40-005	QUILLBACK CARPSUCKER	O		HG	M		4	8.0	3.57	8400	15.89	1050.0
43-001	COMMON CARP	O	T	HG	M		8	16.0	7.14	26100	49.37	1631.2
43-020	EMERALD SHINER	I		HG	M		5	10.0	4.46	40	0.08	4.0
43-032	SPOTFIN SHINER	I		FD	M		44	88.0	39.29	120	0.23	1.3
43-042	FATHEAD MINNOW	O	T	HG	C		1	2.0	0.89	2	0.00	1.0
47-002	CHANNEL CATFISH			HG	C		19	38.0	16.96	11710	22.15	308.1
74-001	WHITE BASS	P		FD	M		17	34.0	15.18	320	0.61	9.4
77-002	BLACK CRAPPIE	I		HG	C		2	4.0	1.79	80	0.15	20.0
77-003	ROCK BASS	C		FD	C		1	2.0	0.89	240	0.45	120.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	0.89	10	0.02	5.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	0.89	1200	2.27	600.0

No Species: 0 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 112 **Total Rel. Wt. :** 52862

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 513.00 Date: 08/21/2010

Time Fished: 2188 Distance: 0.500 Drainge (sq mi): 4150.0 Depth: 0

Location: At Todds Farm; adj US Rte 75 Lat: 46.50865 Long: -96.73882

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		17	34.0	11.41	9260	11.83	272.3
40-008	SILVER REDHORSE	I	M	FD	S		8	16.0	5.37	3720	4.75	232.5
40-010	GOLDEN REDHORSE	I	M	FD	S		2	4.0	1.34	2600	3.32	650.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		1	2.0	0.67	1000	1.28	500.0
43-001	COMMON CARP	O	T	HG	M		8	16.0	5.37	17800	22.74	1112.5
43-020	EMERALD SHINER	I		HG	M		1	2.0	0.67	2	0.00	1.0
43-032	SPOTFIN SHINER	I		FD	M		24	48.0	16.11	100	0.13	2.0
47-002	CHANNEL CATFISH			HG	C		76	152.0	51.01	40748	52.05	268.0
74-001	WHITE BASS	P		FD	M		4	8.0	2.68	80	0.10	10.0
77-003	ROCK BASS	C		FD	C		1	2.0	0.67	160	0.20	80.0
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	0.67	260	0.33	130.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	0.67	20	0.03	10.0
80-002	WALLEYE	P		HG	S		3	6.0	2.01	520	0.66	86.6
85-001	FRESHWATER DRUM		P	HG	M		2	4.0	1.34	2020	2.58	505.0

No Species: 0 **Nat. Species:** 13 **Hybrids:** 0 **Total Counted:** 149 **Total Rel. Wt. :** 78290

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 523.00 Date: 08/20/2010

Time Fished: 1868 Distance: 0.500 Drainge (sq mi): 3990.0 Depth: 0

Location: Dst. Abercrombi WWTP outfall Lat: 46.45542 Long: -96.71458

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		18	36.0	9.42	10380	8.05	288.3
37-003	NORTHERN PIKE	P		HG	M		1	2.0	0.52	80	0.06	40.0
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	0.52	1800	1.40	900.0
40-008	SILVER REDHORSE	I	M	FD	S		8	16.0	4.19	8400	6.51	525.0
40-010	GOLDEN REDHORSE	I	M	FD	S		3	6.0	1.57	1240	0.96	206.6
40-011	SHORTHEAD REDHORSE	I	M	FD	S		6	12.0	3.14	5320	4.13	443.3
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	0.52	300	0.23	150.0
43-001	COMMON CARP	O	T	HG	M		9	18.0	4.71	32400	25.12	1800.0
43-020	EMERALD SHINER	I		HG	M		9	18.0	4.71	100	0.08	5.5
43-032	SPOTFIN SHINER	I		FD	M		38	76.0	19.90	180	0.14	2.3
43-034	SAND SHINER	I	M	FS	M		3	6.0	1.57	24	0.02	4.0
47-002	CHANNEL CATFISH			HG	C		83	166.0	43.46	65480	50.78	394.4
77-003	ROCK BASS	C		FD	C		4	8.0	2.09	900	0.70	112.5
77-004	SMALLMOUTH BASS	C	M	FD	C		2	4.0	1.05	780	0.60	195.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	0.52	16	0.01	8.0
80-002	WALLEYE	P		HG	S		2	4.0	1.05	1480	1.15	370.0
80-003	YELLOW PERCH			HG	M		1	2.0	0.52	40	0.03	20.0
85-001	FRESHWATER DRUM		P	HG	M		1	2.0	0.52	40	0.03	20.0

No Species: 0 **Nat. Species:** 17 **Hybrids:** 0 **Total Counted:** 191 **Total Rel. Wt. :** 128960

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 525.00 Date: 08/20/2010

Time Fished: 2090 Distance: 0.500 Drainge (sq mi): 3980.0 Depth: 0

Location: Ust Abercrombie WWTP Lat: 46.43941 Long: -96.71828

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
01-008	CHESTNUT LAMPREY	P	P	FD	N		1	2.0	0.51	40	0.03	20.0
18-001	GOLDEYE	I	R	FD	M		31	62.0	15.90	15580	11.75	251.2
37-003	NORTHERN PIKE	P		HG	M		1	2.0	0.51	1000	0.75	500.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		2	4.0	1.03	3280	2.47	820.0
40-008	SILVER REDHORSE	I	M	FD	S		3	6.0	1.54	1212	0.91	202.0
40-010	GOLDEN REDHORSE	I	M	FD	S		3	6.0	1.54	2204	1.66	367.3
40-011	SHORTHEAD REDHORSE	I	M	FD	S		4	8.0	2.05	6600	4.98	825.0
43-001	COMMON CARP	O	T	HG	M		17	34.0	8.72	58200	43.90	1711.7
43-020	EMERALD SHINER	I		HG	M		5	10.0	2.56	20	0.02	2.0
43-032	SPOTFIN SHINER	I		FD	M		58	116.0	29.74	180	0.14	1.5
47-002	CHANNEL CATFISH			HG	C		57	114.0	29.23	41900	31.61	367.5
74-001	WHITE BASS	P		FD	M		2	4.0	1.03	40	0.03	10.0
77-002	BLACK CRAPPIE	I		HG	C		1	2.0	0.51	220	0.17	110.0
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	0.51	340	0.26	170.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	0.51	16	0.01	8.0
80-002	WALLEYE	P		HG	S		1	2.0	0.51	620	0.47	310.0
85-001	FRESHWATER DRUM		P	HG	M		7	14.0	3.59	1120	0.84	80.0

No Species: 0 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 195 **Total Rel. Wt. :** 132572

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 536.30 Date: 08/20/2010

Time Fished: 1900 Distance: 0.500 Drainge (sq mi): 0.0 Depth: 0

Location: Lat: 0.00000 Long: 0.00000

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		17	34.0	9.77	9300	4.79	273.5
37-003	NORTHERN PIKE	P		HG	M		2	4.0	1.15	4080	2.10	1020.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		2	4.0	1.15	2340	1.21	585.0
40-008	SILVER REDHORSE	I	M	FD	S		7	14.0	4.02	7008	3.61	500.5
40-010	GOLDEN REDHORSE	I	M	FD	S		23	46.0	13.22	32000	16.48	695.6
40-011	SHORTHEAD REDHORSE	I	M	FD	S		8	16.0	4.60	7400	3.81	462.5
40-012	GREATER REDHORSE	I	R	FD	S		1	2.0	0.57	3500	1.80	1750.0
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	0.57	540	0.28	270.0
43-001	COMMON CARP	O	T	HG	M		19	38.0	10.92	77800	40.07	2047.3
43-006	SILVER CHUB	I		FS	M		1	2.0	0.57	170	0.09	85.0
43-020	EMERALD SHINER	I		HG	M		6	12.0	3.45	80	0.04	6.6
43-032	SPOTFIN SHINER	I		FD	M		1	2.0	0.57	10	0.01	5.0
47-002	CHANNEL CATFISH			HG	C		63	126.0	36.21	42606	21.94	338.1
77-002	BLACK CRAPPIE	I		HG	C		2	4.0	1.15	240	0.12	60.0
77-003	ROCK BASS	C		FD	C		3	6.0	1.72	980	0.50	163.3
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	0.57	740	0.38	370.0
80-002	WALLEYE	P		HG	S		2	4.0	1.15	1300	0.67	325.0
85-001	FRESHWATER DRUM		P	HG	M		15	30.0	8.62	4060	2.09	135.3

No Species: 0 **Nat. Species:** 17 **Hybrids:** 0 **Total Counted:** 174 **Total Rel. Wt. :** 194154

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 539.00 Date: 08/19/2010

Time Fished: 1802 Distance: 0.500 Drainge (sq mi): 3970.0 Depth: 0

Location: Dst. Cargill Discharge Lat: 46.35027 Long: -96.64502

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		24	48.0	16.33	14200	6.49	295.8
37-003	NORTHERN PIKE	P		HG	M		2	4.0	1.36	1480	0.68	370.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		4	8.0	2.72	7600	3.47	950.0
40-008	SILVER REDHORSE	I	M	FD	S		5	10.0	3.40	7040	3.22	704.0
40-010	GOLDEN REDHORSE	I	M	FD	S		19	38.0	12.93	25900	11.84	681.5
40-011	SHORTHEAD REDHORSE	I	M	FD	S		14	28.0	9.52	14800	6.76	528.5
40-012	GREATER REDHORSE	I	R	FD	S		2	4.0	1.36	10000	4.57	2500.0
40-016	WHITE SUCKER	O	T	FD	S		3	6.0	2.04	3000	1.37	500.0
43-001	COMMON CARP	O	T	HG	M		18	36.0	12.24	77500	35.42	2152.7
43-020	EMERALD SHINER	I		HG	M		1	2.0	0.68	4	0.00	2.0
43-032	SPOTFIN SHINER	I		FD	M		12	24.0	8.16	90	0.04	3.7
47-002	CHANNEL CATFISH			HG	C		33	66.0	22.45	55460	25.35	840.3
74-001	WHITE BASS	P		FD	M		2	4.0	1.36	80	0.04	20.0
77-002	BLACK CRAPPIE	I		HG	C		1	2.0	0.68	140	0.06	70.0
77-008	GREEN SUNFISH	I	T	HG	C		1	2.0	0.68	4	0.00	2.0
80-002	WALLEYE	P		HG	S		2	4.0	1.36	1370	0.63	342.5
85-001	FRESHWATER DRUM		P	HG	M		4	8.0	2.72	140	0.06	17.5

No Species: 0 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 147 **Total Rel. Wt. :** 218808

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 539.90 Date: 08/19/2010

Time Fished: 1440 Distance: 0.500 Drainge (sq mi): 3970.0 Depth: 0

Location: Dst. Minn-Dak farmers coop. Lat: 46.33761 Long: -96.61503

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		12	24.0	6.22	6480	3.72	270.0
37-003	NORTHERN PIKE	P		HG	M		1	2.0	0.52	80	0.05	40.0
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	0.52	6800	3.91	3400.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		4	8.0	2.07	7800	4.48	975.0
40-008	SILVER REDHORSE	I	M	FD	S		4	8.0	2.07	8000	4.60	1000.0
40-010	GOLDEN REDHORSE	I	M	FD	S		19	38.0	9.84	19900	11.44	523.6
40-011	SHORTHEAD REDHORSE	I	M	FD	S		16	32.0	8.29	16360	9.40	511.2
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	0.52	580	0.33	290.0
43-001	COMMON CARP	O	T	HG	M		21	42.0	10.88	53200	30.57	1266.6
43-020	EMERALD SHINER	I		HG	M		5	10.0	2.59	40	0.02	4.0
43-032	SPOTFIN SHINER	I		FD	M		49	98.0	25.39	220	0.13	2.2
43-034	SAND SHINER	I	M	FS	M		3	6.0	1.55	20	0.01	3.3
47-002	CHANNEL CATFISH			HG	C		42	84.0	21.76	47608	27.36	566.7
74-001	WHITE BASS	P		FD	M		3	6.0	1.55	200	0.11	33.3
77-004	SMALLMOUTH BASS	C	M	FD	C		3	6.0	1.55	2200	1.26	366.6
80-001	SAUGER	P		FD	S		1	2.0	0.52	1020	0.59	510.0
80-002	WALLEYE	P		HG	S		1	2.0	0.52	40	0.02	20.0
80-005	BLACKSIDE DARTER	I		FD	S		1	2.0	0.52	6	0.00	3.0
85-001	FRESHWATER DRUM		P	HG	M		6	12.0	3.11	3460	1.99	288.3

No Species: 0 **Nat. Species:** 18 **Hybrids:** 0 **Total Counted:** 193 **Total Rel. Wt. :** 174014

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 540.50 Date: 08/19/2010

Time Fished: 2027 Distance: 0.500 Drainge (sq mi): 3960.0 Depth: 0

Location: Dst. Minn-Dak Stormwater outfall Lat: 46.32874 Long: -96.60255

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		11	22.0	6.36	6300	3.53	286.3
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	0.58	11400	6.38	5700.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		5	10.0	2.89	9200	5.15	920.0
40-008	SILVER REDHORSE	I	M	FD	S		5	10.0	2.89	5120	2.87	512.0
40-010	GOLDEN REDHORSE	I	M	FD	S		3	6.0	1.73	3100	1.74	516.6
40-011	SHORTHEAD REDHORSE	I	M	FD	S		5	10.0	2.89	4484	2.51	448.4
43-001	COMMON CARP	O	T	HG	M		27	54.0	15.61	98200	54.97	1818.5
43-020	EMERALD SHINER	I		HG	M		25	50.0	14.45	140	0.08	2.8
43-032	SPOTFIN SHINER	I		FD	M		40	80.0	23.12	120	0.07	1.5
47-002	CHANNEL CATFISH			HG	C		31	62.0	17.92	35900	20.10	579.0
74-001	WHITE BASS	P		FD	M		9	18.0	5.20	2720	1.52	151.1
77-002	BLACK CRAPPIE	I		HG	C		2	4.0	1.16	600	0.34	150.0
77-004	SMALLMOUTH BASS	C	M	FD	C		1	2.0	0.58	20	0.01	10.0
77-008	GREEN SUNFISH	I	T	HG	C		3	6.0	1.73	186	0.10	31.0
77-009	BLUEGILL SUNFISH	I	P	HG	C		1	2.0	0.58	20	0.01	10.0
80-011	LOGPERCH	I	M	FD	S		1	2.0	0.58	10	0.01	5.0
85-001	FRESHWATER DRUM		P	HG	M		3	6.0	1.73	1120	0.63	186.6

No Species: 0 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 173 **Total Rel. Wt. :** 178640

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 541.00 Date: 08/19/2010

Time Fished: 2347 Distance: 0.500 Drainge (sq mi): 3960.0 Depth: 0

Location: Ust. Minn-Dak Farmers Coop. Lat: 46.32706 Long: -96.60197

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
15-001	BOWFIN	P		HG	C		1	2.0	0.65	3400	1.47	1700.0
18-001	GOLDEYE	I	R	FD	M		16	32.0	10.39	9200	3.99	287.5
40-008	SILVER REDHORSE	I	M	FD	S		4	8.0	2.60	4940	2.14	617.5
40-011	SHORTHEAD REDHORSE	I	M	FD	S		3	6.0	1.95	3440	1.49	573.3
43-001	COMMON CARP	O	T	HG	M		43	86.0	27.92	146080	63.29	1698.6
43-032	SPOTFIN SHINER	I		FD	M		28	56.0	18.18	84	0.04	1.5
47-002	CHANNEL CATFISH			HG	C		39	78.0	25.32	58000	25.13	743.5
74-001	WHITE BASS	P		FD	M		4	8.0	2.60	68	0.03	8.5
77-003	ROCK BASS	C		FD	C		1	2.0	0.65	340	0.15	170.0
77-004	SMALLMOUTH BASS	C	M	FD	C		5	10.0	3.25	3940	1.71	394.0
77-009	BLUEGILL SUNFISH	I	P	HG	C		1	2.0	0.65	220	0.10	110.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	0.65	16	0.01	8.0
80-002	WALLEYE	P		HG	S		1	2.0	0.65	40	0.02	20.0
85-001	FRESHWATER DRUM		P	HG	M		7	14.0	4.55	1060	0.46	75.7

No Species: 0 **Nat. Species:** 13 **Hybrids:** 0 **Total Counted:** 154 **Total Rel. Wt. :** 230828

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 544.40 Date: 08/19/2010

Time Fished: 1333 Distance: 0.500 Drainge (sq mi): 3880.0 Depth: 0

Location: Dst. Wahpeton, ND WWTP Lat: 46.30248 Long: -96.60389

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		3	6.0	3.61	3700	5.08	616.6
37-003	NORTHERN PIKE	P		HG	M		1	2.0	1.20	370	0.51	185.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	1.20	2200	3.02	1100.0
40-008	SILVER REDHORSE	I	M	FD	S		2	4.0	2.41	1320	1.81	330.0
40-010	GOLDEN REDHORSE	I	M	FD	S		10	20.0	12.05	10560	14.49	528.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		4	8.0	4.82	4900	6.72	612.5
43-001	COMMON CARP	O	T	HG	M		8	16.0	9.64	26400	36.22	1650.0
43-020	EMERALD SHINER	I		HG	M		7	14.0	8.43	40	0.05	2.8
43-032	SPOTFIN SHINER	I		FD	M		9	18.0	10.84	30	0.04	1.6
47-002	CHANNEL CATFISH			HG	C		28	56.0	33.73	20530	28.17	366.6
63-001	TROUT-PERCH	I		HG	M		1	2.0	1.20	20	0.03	10.0
74-001	WHITE BASS	P		FD	M		1	2.0	1.20	40	0.05	20.0
77-002	BLACK CRAPPIE	I		HG	C		1	2.0	1.20	240	0.33	120.0
77-004	SMALLMOUTH BASS	C	M	FD	C		2	4.0	2.41	970	1.33	242.5
77-008	GREEN SUNFISH	I	T	HG	C		1	2.0	1.20	40	0.05	20.0
80-002	WALLEYE	P		HG	S		1	2.0	1.20	380	0.52	190.0
85-001	FRESHWATER DRUM		P	HG	M		3	6.0	3.61	1150	1.58	191.6

No Species: 0 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 83 **Total Rel. Wt. :** 72890

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 546.40 Date: 08/18/2010

Time Fished: 1786 Distance: 0.500 Drainge (sq mi): 3880.0 Depth: 0

Location: Dst. Kidder Dam; Ust. Wahpeton WWTP Lat: 46.28765 Long: -96.59665

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
15-001	BOWFIN	P		HG	C		1	2.0	0.79	2800	2.52	1400.0
18-001	GOLDEYE	I	R	FD	M		9	18.0	7.14	5320	4.78	295.5
40-002	BIGMOUTH BUFFALO	I		HG	M		1	2.0	0.79	6800	6.11	3400.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	0.79	1080	0.97	540.0
40-008	SILVER REDHORSE	I	M	FD	S		13	26.0	10.32	19820	17.82	762.3
40-010	GOLDEN REDHORSE	I	M	FD	S		1	2.0	0.79	20	0.02	10.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		3	6.0	2.38	3960	3.56	660.0
40-016	WHITE SUCKER	O	T	FD	S		1	2.0	0.79	960	0.86	480.0
43-001	COMMON CARP	O	T	HG	M		11	22.0	8.73	29400	26.43	1336.3
43-020	EMERALD SHINER	I		HG	M		17	34.0	13.49	100	0.09	2.9
43-032	SPOTFIN SHINER	I		FD	M		11	22.0	8.73	50	0.04	2.2
43-034	SAND SHINER	I	M	FS	M		1	2.0	0.79	4	0.00	2.0
47-002	CHANNEL CATFISH			HG	C		38	76.0	30.16	33580	30.19	441.8
74-001	WHITE BASS	P		FD	M		3	6.0	2.38	100	0.09	16.6
77-002	BLACK CRAPPIE	I		HG	C		2	4.0	1.59	1280	1.15	320.0
77-004	SMALLMOUTH BASS	C	M	FD	C		3	6.0	2.38	2780	2.50	463.3
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	0.79	10	0.01	5.0
80-002	WALLEYE	P		HG	S		4	8.0	3.17	2280	2.05	285.0
85-001	FRESHWATER DRUM		P	HG	M		5	10.0	3.97	880	0.79	88.0

No Species: 0 **Nat. Species:** 18 **Hybrids:** 0 **Total Counted:** 126 **Total Rel. Wt. :** 111224

Midwest Biodiversity Institute
Fish Species List

River: 98-200 Red River of the North RM: 546.80 Date: 08/18/2010

Time Fished: 1725 Distance: 0.500 Drainge (sq mi): 3880.0 Depth: 0

Location: Kidder Dam impoundment Lat: 46.28559 Long: -96.60112

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		3	6.0	2.52	1600	1.51	266.6
40-005	QUILLBACK CARPSUCKER	O		HG	M		2	4.0	1.68	2040	1.92	510.0
40-008	SILVER REDHORSE	I	M	FD	S		6	12.0	5.04	7060	6.65	588.3
40-011	SHORTHEAD REDHORSE	I	M	FD	S		4	8.0	3.36	3520	3.32	440.0
43-001	COMMON CARP	O	T	HG	M		13	26.0	10.92	51400	48.41	1976.9
43-020	EMERALD SHINER	I		HG	M		19	38.0	15.97	100	0.09	2.6
43-032	SPOTFIN SHINER	I		FD	M		8	16.0	6.72	24	0.02	1.5
43-042	FATHEAD MINNOW	O	T	HG	C		1	2.0	0.84	2	0.00	1.0
47-002	CHANNEL CATFISH			HG	C		34	68.0	28.57	32780	30.87	482.0
74-001	WHITE BASS	P		FD	M		8	16.0	6.72	120	0.11	7.5
77-001	WHITE CRAPPIE	I		HG	C		1	2.0	0.84	20	0.02	10.0
77-004	SMALLMOUTH BASS	C	M	FD	C		8	16.0	6.72	2060	1.94	128.7
77-008	GREEN SUNFISH	I	T	HG	C		1	2.0	0.84	4	0.00	2.0
77-009	BLUEGILL SUNFISH	I	P	HG	C		2	4.0	1.68	4	0.00	1.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		1	2.0	0.84	2	0.00	1.0
80-002	WALLEYE	P		HG	S		1	2.0	0.84	640	0.60	320.0
85-001	FRESHWATER DRUM		P	HG	M		7	14.0	5.88	4800	4.52	342.8

No Species: 0 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 119 **Total Rel. Wt. :** 106176

Midwest Biodiversity Institute
Fish Species List

River: 98-250 Bois de Sioux River RM: 1.50 Date: 08/18/2010

Time Fished: 2995 Distance: 0.500 Drainge (sq mi): 1970.0 Depth: 0

Location: Ust. Breckenridge WWTP Lat: 46.25230 Long: -96.59238

Species Code:	Species Name:	Feed Guild	Toler-ance	Fluv. Group	Breed Guild	Thermal Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
18-001	GOLDEYE	I	R	FD	M		2	4.0	1.60	1000	0.38	250.0
37-003	NORTHERN PIKE	P		HG	M		1	2.0	0.80	2000	0.76	1000.0
40-002	BIGMOUTH BUFFALO	I		HG	M		5	10.0	4.00	27300	10.33	2730.0
40-005	QUILLBACK CARPSUCKER	O		HG	M		1	2.0	0.80	1400	0.53	700.0
40-008	SILVER REDHORSE	I	M	FD	S		2	4.0	1.60	4200	1.59	1050.0
40-011	SHORTHEAD REDHORSE	I	M	FD	S		3	6.0	2.40	2020	0.76	336.6
43-001	COMMON CARP	O	T	HG	M		64	128.0	51.20	208820	79.02	1631.4
43-020	EMERALD SHINER	I		HG	M		2	4.0	1.60	6	0.00	1.5
47-002	CHANNEL CATFISH			HG	C		9	18.0	7.20	11000	4.16	611.1
74-001	WHITE BASS	P		FD	M		9	18.0	7.20	100	0.04	5.5
77-001	WHITE CRAPPIE	I		HG	C		3	6.0	2.40	40	0.02	6.6
77-002	BLACK CRAPPIE	I		HG	C		1	2.0	0.80	100	0.04	50.0
77-010	ORANGESPOTTED SUNFISH	I		HG	C		3	6.0	2.40	42	0.02	7.0
80-002	WALLEYE	P		HG	S		3	6.0	2.40	1460	0.55	243.3
80-003	YELLOW PERCH			HG	M		1	2.0	0.80	60	0.02	30.0
85-001	FRESHWATER DRUM		P	HG	M		16	32.0	12.80	4710	1.78	147.1

No Species: 0 **Nat. Species:** 15 **Hybrids:** 0 **Total Counted:** 125 **Total Rel. Wt. :** 264258

Appendix B: 2010 Red Macroinvertebrate IBI Metrics and Taxa Summaries by Sampling Site

Appendix B-1. Summary MPCA Large River mIBI and metrics values for sites sampled in the Red River of the North duiring 2010.

Site_iD	Basin	Stream	River	Date	RM	mIBI	tot_taxa	ttax_scr	dom5_pct	dom_scr	intol4	int4_scr	odon_sp	odon_scr	predators	pred_scr	tri_nonhyd	tri_scr	vtol_pct	vtol_scr	ept	ept_pct	poet_pct	hbi_mn	hbi_scr	total_ct	total_kt
Red02	96	225	Otter Tail	18-Aug-10	551.0	40.9	40	4.76	61.667	5.08	8	4.372	4	8	9	3.72	4	2.273	24	8.3	22	49	51	7.082	4.35	300	300
Red01	98	250	Bois de Sioux	18-Aug-10	550.0	19.2	16	0	96.806	0	2	1.093	1	2	6	1.69	0.2	0	4.99	10	2	0.399	2.196	7.071	4.39	501	501
Red03	98	200	Red River	18-Aug-10	546.6	33.6	38	4.17	78.696	0.89	10	5.464	2	4	9	3.72	3.478	1.68	17.609	9.27	18	27.391	30	7.064	4.41	460	460
Red04	98	200	Red River	18-Aug-10	546.3	34.6	37	3.87	71.735	2.6	6	3.279	4	8	8	3.04	3.899	2.158	25.731	8.038	19	49.123	50.292	7.279	3.65	513	513
Red05	98	200	Red River	19-Aug-10	544.4	26.8	32	2.38	83.77	0	4	2.186	2	4	7	2.36	3.665	1.892	15.707	9.559	13	18.325	19.11	7.056	4.44	382	382
Red06	98	200	Red River	19-Aug-10	542.3	29.9	31	2.08	81.69	0.15	6	3.279	2	4	6	1.69	7.042	5.73	18.31	9.164	14	22.066	24.413	7.221	3.85	213	213
Red07	98	200	Red River	19-Aug-10	542.0	25.4	26	0.6	83.537	0	3	1.639	3	6	10	4.39	1.829	0	19.512	8.981	7	9.146	12.195	7.241	3.78	164	164
Red08	98	200	Red River	19-Aug-10	540.7	32.5	36	3.57	64.815	4.31	5	2.732	3	6	8	3.04	4.861	3.251	33.796	6.814	18	62.731	64.12	7.515	2.8	432	432
Red09	98	200	Red River	19-Aug-10	538.1	22.3	31	2.08	64.063	4.49	2	1.093	0	0	6	1.69	3.516	1.723	30.469	7.319	17	59.375	59.375	7.199	3.93	256	256
Red10	98	200	Red River	20-Aug-10	535.9	20.9	26	0.6	75.365	1.71	2	1.093	1	2	6	1.69	2.714	0.811	17.537	9.281	14	72.86	74.113	7.266	3.69	479	479
Red11	98	200	Red River	20-Aug-10	524.6	26.0	31	2.08	77.959	1.07	3	1.639	3	6	7	2.36	4.694	3.061	32.449	7.018	12	45.102	46.122	7.525	2.77	490	490
Red12	98	200	Red River	20-Aug-10	522.0	19.8	17	0	89.051	0	3	1.639	1	2	5	1.01	2.92	1.045	13.139	9.949	5	15.328	16.058	7.126	4.19	137	137
Red13	98	200	Red River	21-Aug-10	513.2	17.0	12	0	86.957	0	2	1.093	2	4	5	1.01	2.174	0.198	23.913	8.314	6	71.739	78.261	7.645	2.34	46	46
Red14	98	200	Red River	21-Aug-10	497.2	18.7	22	0	88.169	0	3	1.639	1	2	3	0	0.282	0	5.352	10	11	21.972	22.254	6.88	5.07	355	355
Red55	98	200	Red River	01-Sep-10	494.9	16.8	20	0	79.348	0.73	4	2.186	0	0	3	0	0	0	15.217	9.633	13	39.13	39.13	7.118	4.22	184	184
Red15	98	200	Red River	21-Aug-10	485.5	19.6	15	0	93.836	0	3	1.639	1	2	3	0	0.685	0	2.055	10	5	3.425	4.11	6.638	5.94	146	146
Red16	98	200	Red River	21-Aug-10	478.4	20.4	14	0	95.833	0	4	2.186	0	0	3	0	0	0	4.167	10	6	5.208	5.208	6.011	8.18	192	192
Red17	98	200	Red River	22-Aug-10	470.0	17.1	8	0	95.349	0	1	0.546	0	0	2	0	0	0	4.651	10	0	0	0	6.476	6.51	43	43
Red19	98	200	Red River	22-Aug-10	453.6	15.9	14	0	92.593	0	1	0.546	0	0	3	0	0	0	2.778	10	4	8.333	8.333	6.812	5.31	108	108
Red20	98	200	Red River	22-Aug-10	449.9	18.6	9	0	97.115	0	0	0	1	2	4	0.34	0	0	2.885	10	1	0.962	1.923	6.559	6.22	104	104
Red22	98	200	Red River	23-Aug-10	446.6	16.9	10	0	93.75	0	2	1.093	0	0	2	0	0	0	10	10	4	12.5	12.5	6.664	5.84	80	80
Red23	98	200	Red River	23-Aug-10	445.3	18.1	10	0	95.699	0	1	0.546	1	2	2	0	1.075	0	10.753	10	3	11.828	12.903	6.752	5.53	93	93
Red24	98	200	Red River	23-Aug-10	440.1	19.3	7	0	98.438	0	2	1.093	1	2	2	0	0	0	1.563	10	2	3.125	4.688	6.551	6.25	64	64
Red25	98	200	Red River	23-Aug-10	436.8	20.9	11	0	93.939	0	4	2.186	1	2	2	0	0.758	0	1.515	10	5	9.848	10.606	6.411	6.75	132	132
Red26	98	200	Red River	24-Aug-10	436.4	24.0	21	0	88.186	0	6	3.279	2	4	5	1.01	0	0	8.439	10	6	13.502	14.346	6.692	5.74	237	237
Red27	98	200	Red River	25-Aug-10	427.4	31.5	42	5.36	81.01	0.32	8	4.372	2	4	10	4.39	1.01	0	17.778	9.245	18	63.232	63.636	7.244	3.77	495	495
Red28	98	200	Red River	25-Aug-10	418.9	19.9	26	0.6	78.199	1.01	5	2.732	0	0	5	1.01	2.37	0.42	17.062	9.353	16	50.237	50.237	6.962	4.78	211	211
Red29	98	200	Red River	25-Aug-10	404.0	21.2	36	3.57	68.938	3.29	3	1.639	1	2	8	3.04	1.002	0	40.681	5.769	17	59.319	59.519	7.767	1.9	499	499
Red30	98	200	Red River	25-Aug-10	386.9	24.0	26	0.6	69.032	3.27	3	1.639	2	4	8	3.04	0.645	0	23.871	8.32	11	39.355	40.645	7.415	3.16	155	155
Red31	98	200	Red River	26-Aug-10	374.6	20.5	20	0	85.938	0	3	1.639	2	4	6	1.69	0	0	20.313	8.86	5	24.219	27.344	7.101	4.28	128	128
Red32	98	200	Red River	26-Aug-10	356.4	16.4	25	0.3	76.549	1.42	3	1.639	2	4	5	1.01	3.982	2.252	50.442	4.288	11	59.292	62.389	7.893	1.45	226	226
Red33	98	200	Red River	26-Aug-10	332.8	23.4	32	2.38	85.494	0	6	3.279	3	6	10	4.39	1.852	0	42.901	5.432	11	52.16	53.086	7.758	1.94	324	324
Red34	98	200	Red River	27-Aug-10	318.1	17.5	25	0.3	77.907	1.08	5	2.732	0	0	6	1.69	4.07	2.352	34.884	6.649	10	47.674	47.674	7.558	2.65	172	172
Red35	98	200	Red River	27-Aug-10	300.2	18.0	15	0	83.333	0	2	1.093	1	2	4	0.34	0	0	7.407	10	4	7.407	9.259	7.022	4.56	54	54
Red36	98	200	Red River	27-Aug-10	298.1	15.6	22	0	75.862	1.59	2	1.093	0	0	4	0.34	1.724	0	20.69	8.803	11	30.172	30.172	7.234	3.81	116	116
Red37	98	200	Red River	27-Aug-10	297.6	20.3	28	1.19	79.909	0.59	4	2.186	0	0	5	1.01	1.37	0	11.416	10	15	26.941	26.941	6.81	5.32	219	219
Red38	98	200	Red River	28-Aug-10	295.2	25.2	21	0	63.636	4.6	2	1.093	0	0	2	0	9.091	8.058	24.242	8.264	13	50	50	7.415	3.16	66	66
Red39	98	200	Red River	28-Aug-10	294.0	18.4	8	0	90.909	0	2	1.093	1	2	2	0	0	0	9.091	10	2	13.636	18.182	6.807	5.33	22	22
Red40	98	200	Red River	28-Aug-10	291.8	19.9	27	0.89	79.5	0.69	3	1.639	1	2	4	0.34	1	0	7.5	10	12	22	22.5	7.087	4.33	200	200
Red41	98	200	Red River	28-Aug-10	280.2	25.3	29	1.49	66.667	3.85	5	2.732	0	0	5	1.01	0.498	0	11.94	10	14	29.353	29.353	6.553	6.24	201	201
Red42.5	98	200	Red River	29-Aug-10	273.0	30.4	29	1.49	70.455	2.92	5	2.732	1	2	8	3.04	7.576	6.336	28.788	7.574	13	37.879	39.394	7.084	4.34	132	132
Red42	98	200	Red River	29-Aug-10	270.9	25.6	24	0	74.172	2	3	1.639	2	4	6	1.69	2.649	0.738	7.285	10	12	40.397	41.722	6.754	5.52	151	151
Red44	98	200	Red River	29-Aug-10	255.0	35.7	37	3.87	80.268	0.5	7	3.825	3	6	11	5.07	4.013	2.288	18.395	9.151	10	27.425	29.431	6.891	5.03	299	299
Red45	98	200	Red River	29-Aug-10	235.8	22.5	18	0	84.426	0	3	1.639	2	4	5	1.01	0.82	0	13.115	9.952	7	13.934	15.574	6.636	5.94	122	122
Red46	98	200	Red River	30-Aug-10	208.6	17.3	21	0	81.746	0.14	0	0	0	0	6	1.69	0	0	8.73	10	9	23.81	23.81	6.757	5.51	252	252
Red47	98	200	Red River	30-Aug-10	204.1	19.2	21	0	85.024	0	3	1.639	0	0	6	1.69	0	0	8.696	10	9	31.884	31.884	6.661	5.85	207	207
Red48	98	200	Red River	30-Aug-10	202.8	19.9	23	0	76.166	1.51	1	0.546	1	2	5	1.01	1.036	0	14.508	9.741	13	41.451	41.969	6.878	5.08	193	193
Red49	98	200	Red River	30-Aug-10	201.2	26.5	39	4.46	60.377	5.4	5	2.732	1	2	9	3.72	1.572	0	36.478	6.407	16	78.931	79.245	7.801	1.78	318	318
Red50	98	200	Red River	31-Aug-10	194.8	19.9	17	0	77.049	1.29	3	1.639	1	2	1	0	1.639	0	13.115	9.952	8	27.869	29.508	6.898	5.01	61	61
Red51	98	200	Red River	31-Aug-10	179.8	20.8	23	0	87.719	0	5	2.732	1	2	3	0	0	0	2.339	10	11	32.164	32.749	6.603	6.06	171	171
Red52	98	200	Red River	31-Aug-10	158.2	23.1	31	2.08	72.388	2.44	6	3.279	0	0	6	1.69	0	0	19.403	8.998	12	34.328	34.328	7.012	4.6	134	134
Red53	98	200	Red River	31-Aug-10	157.8	17.2	22	0	82.039	0.06	3	1.639	0	0	5	1.01	0	0	16.019	9.512	11	47.573	47.573	6.916	4.94	206	206

Appendix B-2. Macroinvertebrate taxa collected in the Red River of the North study area during 2010.

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	733321	Acari	X	8	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	102139	Argia	L	9	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	101478	Caenis	L	1	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	127917	Chironomidae	P	4	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	129228	Chironominae	L	436	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	103364	Corixidae	N	9	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	88634	Cyclopidae	X	1	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	83872	Daphniidae	X	2	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	114126	Dubiraphia	L	3	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	111858	Haliplus	A	1	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	94025	Hyalella	X	1	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	116607	Oecetis	L	1	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	68422	Oligochaeta	X	3	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	1	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	127994	Tanypodinae	L	19	
Red01	98	250	Bois de Sioux	550.0	551478	18-Aug-10	Routine Sample	500	103423	Trichocorixa	A	2	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	733321	Acari	X	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	568559	Anthopotamus	L	5	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	100936	Apobaetis	L	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	102139	Argia	L	10	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	100755	Baetidae	L	3	Damaged
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	100800	Baetis	L	3	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	101478	Caenis	L	2	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	9	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	127917	Chironomidae	P	5	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	129228	Chironominae	L	182	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	103364	Corixidae	N	3	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	127340	Culicoides	L	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	114126	Dubiraphia	L	2	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	101664	Gomphidae	L	2	Early Instar
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	136327	Hemerodromia	P	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	100504	Heptageniidae	L	2	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	115453	Hydropsyche	L	3	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	50	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	115641	Hydroptila	L	2	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	8	Early Instar
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	100676	Leucrocuta	L	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	69165	Lumbricidae	X	1	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	116651	Nectopsyche	L	13	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	563956	Nemata	X	2	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	117095	Neureclipsis	L	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	68422	Oligochaeta	X	70	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	115551	Potamyia	L	9	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	127729	Probezzia	L	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	206622	Procloeon	L	2	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	126774	Simulium	L	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	127761	Sphaeromias	L	2	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	76534	Stagnicola	X	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	100713	Stenacron	L	2	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	114095	Stenelmis	A	15	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	114095	Stenelmis	L	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	127994	Tanypodinae	L	32	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	103348	Thysanoptera	A	1	
Red03	98	200	Red River of the North	546.6	551479	18-Aug-10	Routine Sample	500	101405	Tricorythodes	L	10	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	100801	Acentrella	L	25	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	100755	Baetidae	L	14	Damaged
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	100800	Baetis	L	18	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	116906	Brachycentrus	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	101478	Caenis	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	115570	Ceratopsyche	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	568556	Cercobrachys	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	9	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	127917	Chironomidae	P	7	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	129228	Chironominae	L	75	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	103364	Corixidae	N	3	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	83872	Daphniidae	X	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	114126	Dubiraphia	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	101664	Gomphidae	L	3	Early Instar
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	101665	Gomphus	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	100504	Heptageniidae	L	8	Damaged
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	101537	Hexagenia	L	6	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	115453	Hydropsyche	L	2	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	14	Early Instar/Damaged
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	115641	Hydroptila	L	8	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	6	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	100676	Leucrocuta	L	7	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	697957	Maccaffertium	L	6	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	114212	Macronychus	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	116651	Nectopsyche	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	68422	Oligochaeta	X	39	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	6	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	117044	Polycentropus	L	2	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	115551	Potamyia	L	2	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	127729	Probezzia	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	206622	Procloeon	L	4	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	126774	Simulium	L	3	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	76534	Stagnicola	X	1	Damaged
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	100713	Stenacron	L	2	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	114095	Stenelmis	L	2	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	101666	Stylurus	L	1	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	127994	Tanypodinae	L	3	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	103811	Trepobates	L	4	
Red02	96	225	Otter Tail River	551.0	551480	18-Aug-10	Routine Sample	500	101405	Tricorythodes	L	9	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	100801	Acentrella	L	6	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	100755	Baetidae	L	15	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	100800	Baetis	L	67	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	101468	Brachycercus	L	1	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	5	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	127917	Chironomidae	P	13	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	129228	Chironominae	L	164	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	102077	Coenagrionidae	L	1	Early Instar
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	103364	Corixidae	N	5	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	83872	Daphniidae	X	1	Damaged
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	135830	Empididae	P	1	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	101664	Gomphidae	L	2	Early Instar
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	101665	Gomphus	L	1	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	100504	Heptageniidae	L	11	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	101537	Hexagenia	L	1	Early Instar
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	115453	Hydropsyche	L	4	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	20	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	10	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	697957	Maccaffertium	L	8	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	114212	Macronychus	A	2	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	116651	Nectopsyche	L	18	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	68422	Oligochaeta	X	25	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	12	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	117044	Polycentropus	L	2	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	115551	Potamyia	L	5	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	206622	Procloeon	L	2	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	1	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	126774	Simulium	L	4	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	126774	Simulium	P	1	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	100713	Stenacron	L	1	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	114095	Stenelmis	A	14	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	130150	Stratiomyidae	L	1	Early Instar
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	101666	Stylurus	L	2	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	127994	Tanypodinae	L	11	
Red04	98	200	Red River of the North	546.3	551481	18-Aug-10	Routine Sample	500	101405	Tricorythodes	L	74	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	568546	Acerpenna	L	4	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	568559	Anthopotamus	L	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	100936	Apobaetis	L	2	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	102139	Argia	L	2	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	100800	Baetis	L	5	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	103684	Belostoma	A	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	4	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	127917	Chironomidae	P	5	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	129228	Chironominae	L	189	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	88634	Cyclopidae	X	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	114126	Dubiraphia	L	9	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	114126	Dubiraphia	A	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	101665	Gomphus	L	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	136327	Hemerodromia	L	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	136327	Hemerodromia	P	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	100504	Heptageniidae	L	2	Damaged
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	94025	Hyalella	X	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	115453	Hydropsyche	L	2	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	8	Early Instar
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	697957	Maccaffertium	L	3	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	114212	Macronychus	A	2	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	116651	Nectopsyche	L	14	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	68422	Oligochaeta	X	70	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	2	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	115551	Potamyia	L	3	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	103886	Rhagovelia	N	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	126774	Simulium	L	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	100713	Stenacron	L	2	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	114095	Stenelmis	A	5	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	127994	Tanypodinae	L	18	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	103348	Thysanoptera	X	1	
Red05	98	200	Red River of the North	544.4	551482	19-Aug-10	Routine Sample	500	101405	Tricorythodes	L	20	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	100801	Acentrella	L	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	568559	Anthopotamus	L	5	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	82732	Araneae	X	2	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	100755	Baetidae	L	2	Damaged
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	100800	Baetis	L	4	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	2	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	129228	Chironominae	L	117	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	102077	Coenagrionidae	L	1	Early Instar
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	99237	Collembola	X	2	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	127340	Culicoides	L	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	83872	Daphniidae	X	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	114126	Dubiraphia	L	2	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	101664	Gomphidae	L	4	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	136327	Hemerodromia	L	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	101537	Hexagenia	L	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	115453	Hydropsyche	L	3	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	1	Early Instar/Damaged
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	115641	Hydroptila	L	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	100676	Leucrocuta	L	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	697957	Maccaffertium	L	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	115811	Mayatrichia	L	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	69451	Mooreobdella fervida	X	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	116651	Nectopsyche	L	13	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	563956	Nemata	X	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	103603	Neoplea	A	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	68422	Oligochaeta	X	20	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	114095	Stenelmis	A	1	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	127994	Tanypodinae	L	8	
Red06	98	200	Red River of the North	542.3	551483	19-Aug-10	Routine Sample	500	101405	Tricorythodes	L	11	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	733321	Acari	X	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	568559	Anthopotamus	L	4	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	82708	Arachnida	X	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	127076	Ceratopogonidae	L	1	Early Instar
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	129228	Chironominae	L	94	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	102077	Coenagrionidae	L	1	Early Instar
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	103364	Corixidae	A	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	114126	Dubiraphia	L	7	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	101665	Gomphus	L	2	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	94025	Hyalella	X	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	2	Early Instar
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	115641	Hydroptila	L	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	116651	Nectopsyche	L	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	103603	Neoplea	A	8	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	68422	Oligochaeta	X	14	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	120830	Ormosia	L	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	117043	Polycentropodidae	L	1	Damaged
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	114095	Stenelmis	A	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	114095	Stenelmis	L	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	101666	Stylurus	L	2	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	127994	Tanypodinae	L	9	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	103423	Trichocorixa	A	1	
Red07	98	200	Red River of the North	542.0	551484	19-Aug-10	Routine Sample	500	101405	Tricorythodes	L	5	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	100801	Acentrella	L	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	568546	Acerpenna	L	4	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	568559	Anthopotamus	L	14	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	102139	Argia	L	3	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	100755	Baetidae	L	5	Damaged
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	100800	Baetis	L	57	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	12	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	127917	Chironomidae	P	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	129228	Chironominae	L	88	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	99237	Collembola	X	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	127340	Culicoides	L	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	114126	Dubiraphia	L	2	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	102102	Enallagma	L	1	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	101664	Gomphidae	L	2	Early Instar
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	100602	Heptagenia	L	2	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	100504	Heptageniidae	L	8	Damaged
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	115453	Hydropsyche	L	47	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	8	Early Instar
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	100676	Leucrocuta	L	3	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	697957	Maccaffertium	L	19	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	114212	Macronychus	A	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	103857	Metrobates	A	4	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	116651	Nectopsyche	L	21	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	103603	Neoplea	A	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	68422	Oligochaeta	X	18	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	4	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	115551	Potamyia	L	27	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	206622	Procloeon	L	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	103802	Rheumatobates	N	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	114095	Stenelmis	L	4	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	114095	Stenelmis	A	14	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	127994	Tanypodinae	L	14	
Red08	98	200	Red River of the North	540.7	551485	19-Aug-10	Routine Sample	500	101405	Tricorythodes	L	40	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	100801	Acentrella	L	8	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	568546	Acerpenna	L	10	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	568559	Anthopotamus	L	7	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	82732	Araneae	X	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	100755	Baetidae	L	4	Damaged
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	100800	Baetis	L	25	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	10	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	129228	Chironominae	L	41	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	136327	Hemerodromia	P	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	100504	Heptageniidae	L	4	Early Instar/Damaged
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	115453	Hydropsyche	L	8	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	25	Early Instar
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	115641	Hydroptila	L	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	100676	Leucrocuta	L	7	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	697957	Maccaffertium	L	2	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	114212	Macronychus	A	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	116651	Nectopsyche	L	7	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	116607	Oecetis	L	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	68422	Oligochaeta	X	41	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	115551	Potamyia	L	15	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	103886	Rhagovelia	N	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	76534	Stagnicola	X	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	100713	Stenacron	L	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	114095	Stenelmis	A	2	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	114095	Stenelmis	L	2	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	127994	Tanypodinae	L	8	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	103811	Trepobates	N	1	
Red09	98	200	Red River of the North	538.1	551486	19-Aug-10	Routine Sample	500	101405	Tricorythodes	L	17	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	102917	Acroneuria	L	1	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	100800	Baetis	L	52	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	115570	Ceratopsyche	L	2	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	26	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	129228	Chironominae	L	60	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	102077	Coenagrionidae	L	6	Early Instar
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	99237	Collembola	X	1	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	136327	Hemerodromia	L	1	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	100504	Heptageniidae	L	3	Damaged
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	115453	Hydropsyche	L	63	Voucher
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	69	Early Instar
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	115629	Hydroptilidae	L	9	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	697957	Maccaffertium	L	73	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	115811	Mayatrichia	L	1	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	103857	Metrobates	A	2	Voucher
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	116651	Nectopsyche	L	3	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	68422	Oligochaeta	X	44	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	3	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	115551	Potamyia	L	9	Voucher
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	103802	Rheumatobates	N	1	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	126774	Simulium	L	2	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	114095	Stenelmis	A	2	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	127994	Tanypodinae	L	7	
Red10	98	200	Red River of the North	535.9	551487	20-Aug-10	Routine Sample	500	101405	Tricorythodes	L	37	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	100755	Baetidae	L	3	Early Instar/Damaged
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	116906	Brachycentrus	L	1	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	16	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	127917	Chironomidae	P	7	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	129228	Chironominae	L	180	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	103364	Corixidae	A	1	Damaged
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	118831	Diptera	P	1	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	101664	Gomphidae	L	3	Early Instar
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	101665	Gomphus	L	1	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	136327	Hemerodromia	L	2	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	100504	Heptageniidae	L	9	Damaged
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	102048	Hetaerina	L	1	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	115453	Hydropsyche	L	18	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	41	Early Instar
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	115641	Hydroptila	L	1	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	101041	Isonychia	L	2	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	697957	Maccaffertium	L	3	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	114212	Macronychus	L	2	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	116651	Nectopsyche	L	21	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	563956	Nemata	X	2	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	130694	Nemotelus	L	1	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	103603	Neoplea	A	4	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	68422	Oligochaeta	X	34	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	1	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	115551	Potamyia	L	53	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	126774	Simulium	P	1	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	114095	Stenelmis	A	8	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	114095	Stenelmis	L	1	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	127994	Tanypodinae	L	18	
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	118840	Tipulidae	L	1	Damaged
Red11	98	200	Red River of the North	524.6	551488	20-Aug-10	Routine Sample	500	101405	Tricorythodes	L	53	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	568559	Anthopotamus	L	3	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	103684	Belostoma	A	1	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	129228	Chironominae	L	89	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	101664	Gomphidae	L	1	Early Instar
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	193642	Helophoridae	L	1	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	100504	Heptageniidae	L	2	Early Instar

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	147117	Hydrellia	L	1	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	6	Early Instar
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	116651	Nectopsyche	L	4	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	103603	Neoplea	A	1	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	68422	Oligochaeta	X	14	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	2	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	126774	Simulium	L	1	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	114095	Stenelmis	A	2	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	127994	Tanypodinae	L	2	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	103811	Trepobates	N	1	
Red12	98	200	Red River of the North	522.0	551489	20-Aug-10	Routine Sample	500	101405	Tricorythodes	L	6	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	129228	Chironominae	L	3	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	103364	Corixidae	A	1	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	101665	Gomphus	L	1	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	101537	Hexagenia	L	1	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	115453	Hydropsyche	L	14	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	9	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	116651	Nectopsyche	L	1	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	68422	Oligochaeta	X	5	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	102914	Perlidae	L	1	Damaged
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	115551	Potamyia	L	7	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	103748	Ranatra fusca	A	1	
Red13	98	200	Red River of the North	513.2	551490	21-Aug-10	Routine Sample	500	101666	Stylurus	L	2	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	100755	Baetidae	L	4	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	100800	Baetis	L	11	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	1	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	127917	Chironomidae	P	5	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	129228	Chironominae	L	174	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	99237	Collembola	X	1	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	101537	Hexagenia	L	6	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	115453	Hydropsyche	L	14	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	29	Early Instar
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	697957	Maccaffertium	L	5	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	114212	Macronychus	A	1	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	116651	Nectopsyche	L	1	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	68422	Oligochaeta	X	58	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	127729	Probezzia	L	5	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	206622	Procloeon	L	1	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	2	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	126774	Simulium	L	1	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	114095	Stenelmis	A	2	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	114095	Stenelmis	L	2	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	127994	Tanypodinae	L	27	
Red14	98	200	Red River of the North	497.2	551491	21-Aug-10	Routine Sample	500	101405	Tricorythodes	L	4	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	100936	Apobaetis	L	1	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	101468	Brachycercus	L	1	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	127917	Chironomidae	P	5	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	129228	Chironominae	L	88	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	94025	Hyalella azteca	X	1	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	115629	Hydroptilidae	P	1	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	1	Early Instar/Damaged
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	68422	Oligochaeta	X	26	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	2	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	115551	Potamyia	L	1	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	127729	Probezzia	L	4	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	126774	Simulium	L	1	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	76534	Stagnicola	X	1	
Red15	98	200	Red River of the North	485.5	551492	21-Aug-10	Routine Sample	500	127994	Tanypodinae	L	12	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	568559	Anthopotamus	L	1	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	100755	Baetidae	L	1	Early Instar
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	127917	Chironomidae	P	3	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	129228	Chironominae	L	78	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	99237	Collembola	X	1	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	101537	Hexagenia	L	5	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	1	Early Instar
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	68422	Oligochaeta	X	58	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	101588	Pentagenia	L	1	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	127729	Probezzia	L	31	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	114095	Stenelmis	A	1	
Red16	98	200	Red River of the North	478.4	551493	21-Aug-10	Routine Sample	500	127994	Tanypodinae	L	9	
Red17	98	200	Red River of the North	470.0	551494	22-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red17	98	200	Red River of the North	470.0	551494	22-Aug-10	Routine Sample	500	129228	Chironominae	L	24	
Red17	98	200	Red River of the North	470.0	551494	22-Aug-10	Routine Sample	500	118831	Diptera	L	1	
Red17	98	200	Red River of the North	470.0	551494	22-Aug-10	Routine Sample	500	146893	Ephydridae	L	1	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red17	98	200	Red River of the North	470.0	551494	22-Aug-10	Routine Sample	500	68422	Oligochaeta	X	4	
Red17	98	200	Red River of the North	470.0	551494	22-Aug-10	Routine Sample	500	127729	Probezzia	L	4	
Red17	98	200	Red River of the North	470.0	551494	22-Aug-10	Routine Sample	500	114095	Stenelmis	A	1	
Red17	98	200	Red River of the North	470.0	551494	22-Aug-10	Routine Sample	500	127994	Tanypodinae	L	6	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	100800	Baetis	L	4	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	129228	Chironominae	L	69	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	118831	Diptera	L	1	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	114126	Dubiraphia	L	1	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	101537	Hexagenia	L	1	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	1	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	697957	Maccaffertium	L	3	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	68422	Oligochaeta	X	5	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	1	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	81388	Pisidiidae	X	1	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	127729	Probezzia	L	1	
Red19	98	200	Red River of the North	453.6	551496	22-Aug-10	Routine Sample	500	127994	Tanypodinae	L	17	
Red20	98	200	Red River of the North	449.9	551497	22-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red20	98	200	Red River of the North	449.9	551497	22-Aug-10	Routine Sample	500	127338	Ceratopogoninae	L	1	
Red20	98	200	Red River of the North	449.9	551497	22-Aug-10	Routine Sample	500	127917	Chironomidae	P	5	
Red20	98	200	Red River of the North	449.9	551497	22-Aug-10	Routine Sample	500	129228	Chironominae	L	41	
Red20	98	200	Red River of the North	449.9	551497	22-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red20	98	200	Red River of the North	449.9	551497	22-Aug-10	Routine Sample	500	68422	Oligochaeta	X	50	
Red20	98	200	Red River of the North	449.9	551497	22-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red20	98	200	Red River of the North	449.9	551497	22-Aug-10	Routine Sample	500	127994	Tanypodinae	L	3	
Red20	98	200	Red River of the North	449.9	551497	22-Aug-10	Routine Sample	500	101405	Tricorythodes	L	1	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	568546	Acerpenna	L	3	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	100800	Baetis	L	5	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	129228	Chironominae	L	67	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	697957	Maccaffertium	L	2	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	117095	Neureclipsis	L	1	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	68422	Oligochaeta	X	44	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	127729	Probezzia	L	3	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	81391	Sphaerium	X	2	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	101666	Stylurus	L	1	
Red25	98	200	Red River of the North	436.8	551498	23-Aug-10	Routine Sample	500	101405	Tricorythodes	L	2	
Red24	98	200	Red River of the North	440.1	551499	23-Aug-10	Routine Sample	500	129228	Chironominae	L	35	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red24	98	200	Red River of the North	440.1	551499	23-Aug-10	Routine Sample	500	101537	Hexagenia	L	1	
Red24	98	200	Red River of the North	440.1	551499	23-Aug-10	Routine Sample	500	697957	Maccaffertium	L	1	
Red24	98	200	Red River of the North	440.1	551499	23-Aug-10	Routine Sample	500	68422	Oligochaeta	X	24	
Red24	98	200	Red River of the North	440.1	551499	23-Aug-10	Routine Sample	500	81400	Pisidium	X	1	
Red24	98	200	Red River of the North	440.1	551499	23-Aug-10	Routine Sample	500	127729	Probezzia	L	1	
Red24	98	200	Red River of the North	440.1	551499	23-Aug-10	Routine Sample	500	101666	Stylurus	L	1	
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	100755	Baetidae	L	1	
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	9	
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	129228	Chironominae	L	42	
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	115629	Hydroptilidae	L	1	Early Instar
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	114212	Macronychus	L	1	
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	68422	Oligochaeta	X	34	
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	114095	Stenelmis	L	1	
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	101666	Stylurus	L	1	
Red23	98	200	Red River of the North	445.3	551500	23-Aug-10	Routine Sample	500	127994	Tanypodinae	L	1	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	100800	Baetis	L	2	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	4	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	129228	Chironominae	L	38	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	68422	Oligochaeta	X	26	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	127729	Probezzia	L	1	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	81391	Sphaerium	X	2	
Red22	98	200	Red River of the North	446.6	551502	23-Aug-10	Routine Sample	500	101405	Tricorythodes	L	3	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	568546	Acerpenna	L	3	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	100755	Baetidae	L	3	Damaged
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	83935	Bosminidae	X	1	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	127917	Chironomidae	P	3	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	129228	Chironominae	L	96	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	102077	Coenagrionidae	L	1	Early Instar
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	103364	Corixidae	N	5	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	85779	Diaptomidae	X	1	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	118831	Diptera	X	1	Large and Rare
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	100504	Heptageniidae	L	3	Damaged
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	94025	Hyalella	X	2	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	115453	Hydropsyche	L	2	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	697957	Maccaffertium	L	9	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	563956	Nemata	X	1	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	68422	Oligochaeta	X	81	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	76677	Physa	X	2	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	127729	Probezzia	L	3	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	101666	Stylurus	L	1	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	127994	Tanypodinae	L	6	
Red26	98	200	Red River of the North	436.4	551503	24-Aug-10	Routine Sample	500	101405	Tricorythodes	L	12	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	102917	Acroneuria	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	82732	Araneae	X	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	100755	Baetidae	L	6	Damaged
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	100800	Baetis	L	87	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	103514	Callicorixa	A	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	109234	Carabidae	A	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	2	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	127917	Chironomidae	P	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	127917	Chironomidae	A	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	129228	Chironominae	L	101	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	85779	Diaptomidae	X	2	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	136327	Hemerodromia	L	3	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	100602	Heptagenia	L	3	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	100504	Heptageniidae	L	13	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	102048	Hetaerina	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	101537	Hexagenia	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	94025	Hyalella	X	8	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	115453	Hydropsyche	L	56	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	13	Early Instar
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	101041	Isonychia	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	697957	Maccaffertium	L	45	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	114212	Macronychus	A	2	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	116651	Nectopsyche	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	563956	Nemata	X	2	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	115833	Neotrichia	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	117095	Neureclipsis	L	2	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	68422	Oligochaeta	X	41	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	97421	Orconectes	X	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	76677	Physa	X	1	

Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	117044	Polycentropus	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	127729	Probezzia	L	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	103748	Ranatra	A	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	103886	Rhagovelia	A	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	103369	Sigara	A	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	81391	Sphaerium	X	2	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	76534	Stagnicola	X	1	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	100713	Stenacron	L	6	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	127994	Tanypodinae	L	6	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	101405	Tricorythodes	L	71	
Red27	98	200	Red River of the North	427.4	551504	25-Aug-10	Routine Sample	500	101405	Tricorythodes	A	3	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	102917	Acroneuria	L	1	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	100936	Apobaetis	L	1	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	100755	Baetidae	L	10	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	100800	Baetis	L	28	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	2	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	127917	Chironomidae	P	1	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	129228	Chironominae	L	34	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	101525	Ephemeridae	L	1	Early Instar
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	136327	Hemerodromia	L	1	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	100602	Heptagenia	L	4	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	100504	Heptageniidae	L	4	Damaged
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	115453	Hydropsyche	L	8	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	9	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	697957	Maccaffertium	L	6	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	114212	Macronychus	L	3	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	116651	Nectopsyche	L	3	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	117095	Neureclipsis	L	2	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	68422	Oligochaeta	X	59	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	97421	Orconectes	X	1	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	101588	Pentagenia	L	1	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	127729	Probezzia	L	1	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	103886	Rhagovelia	X	2	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	126774	Simulium	L	1	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	100507	Stenonema	A	1	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	127994	Tanypodinae	L	2	
Red28	98	200	Red River of the North	418.9	551505	25-Aug-10	Routine Sample	500	101405	Tricorythodes	L	25	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	102917	Acroneuria	L	1	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	100755	Baetidae	A	1	Damaged

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	100755	Baetidae	L	6	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	100800	Baetis	L	30	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	103684	Belostoma	A	1	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	101478	Caenis	L	2	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	20	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	127917	Chironomidae	P	10	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	129228	Chironominae	L	95	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	102077	Coenagrionidae	L	1	Early Instar
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	103364	Corixidae	N	4	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	100502	Ephemeroptera	X	2	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	136327	Hemerodromia	L	3	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	100504	Heptageniidae	L	25	Early Instar/Damaged
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	100504	Heptageniidae	A	1	Damaged
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	94025	Hyalella	X	7	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	115453	Hydropsyche	L	30	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	27	Early Instar
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	697957	Maccaffertium	L	11	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	114212	Macronychus	L	3	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	114212	Macronychus	A	1	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	116651	Nectopsyche	L	2	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	563956	Nemata	X	1	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	103603	Neoplea	A	1	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	115833	Neotrichia	L	3	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	68422	Oligochaeta	X	11	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	11	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	126774	Simulium	L	5	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	81391	Sphaerium	X	2	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	100713	Stenacron	L	2	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	114095	Stenelmis	A	3	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	114095	Stenelmis	L	3	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	127994	Tanypodinae	L	11	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	103423	Trichocorixa	A	30	
Red29	98	200	Red River of the North	404.0	551506	25-Aug-10	Routine Sample	500	101405	Tricorythodes	L	132	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	82708	Arachnida	X	3	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	100755	Baetidae	L	3	Damaged
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	100800	Baetis	L	6	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	109234	Carabidae	A	1	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	127076	Ceratopogonidae	L	3	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	3	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	129228	Chironominae	L	53	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	99237	Collembola	X	4	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	100602	Heptagenia	L	3	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	100504	Heptageniidae	L	7	Damaged
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	102048	Hetaerina	L	1	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	101537	Hexagenia	L	1	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	94025	Hyalella	X	4	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	8	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	112580	Liodessus	A	1	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	697957	Maccaffertium	L	7	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	103603	Neoplea	A	3	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	115833	Neotrichia	L	1	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	68422	Oligochaeta	X	11	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	103491	Palmacorixa	A	3	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	103748	Ranatra	A	1	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	126774	Simulium	L	1	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	100713	Stenacron	L	1	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	127994	Tanypodinae	L	4	
Red30	98	200	Red River of the North	386.9	551507	25-Aug-10	Routine Sample	500	101405	Tricorythodes	L	21	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	733321	Acari	X	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	82732	Araneae	X	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	100800	Baetis	L	4	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	103684	Belostoma	A	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	109234	Carabidae	A	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	115570	Ceratopsyche	L	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	129228	Chironominae	L	33	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	99237	Collembola	X	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	114666	Curculionidae	A	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	100504	Heptageniidae	L	4	Damaged
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	102048	Hetaerina	L	3	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	94025	Hyalella	X	4	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	68422	Oligochaeta	X	44	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	103491	Palmacorixa	A	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	81388	Pisidiidae	X	2	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	113265	Staphylinidae	A	1	
Red31	98	200	Red River of the North	374.6	551508	26-Aug-10	Routine Sample	500	101405	Tricorythodes	L	21	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	102139	Argia	L	3	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	100755	Baetidae	L	4	Damaged
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	101494	Baetisca	L	1	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	103684	Belostoma	A	2	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	5	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	127917	Chironomidae	P	1	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	129228	Chironominae	L	39	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	99237	Collembola	X	1	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	85779	Diaptomidae	X	1	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	118831	Diptera	P	6	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	100602	Heptagenia	L	2	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	100504	Heptageniidae	L	4	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	102048	Hetaerina	L	4	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	94025	Hyalella	X	8	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	115453	Hydropsyche	L	3	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	1	Early Instar
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	697957	Maccaffertium	L	14	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	116651	Nectopsyche	L	9	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	103603	Neoplea	A	3	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	68422	Oligochaeta	X	13	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	206622	Procloeon	L	1	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	126774	Simulium	P	1	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	81391	Sphaerium	X	2	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	127994	Tanypodinae	L	8	
Red32	98	200	Red River of the North	356.4	551509	26-Aug-10	Routine Sample	500	101405	Tricorythodes	L	90	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	100800	Baetis	L	4	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	103684	Belostoma	A	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	101478	Caenis	L	3	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	129228	Chironominae	L	108	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	102077	Coenagrionidae	L	1	Early Instar
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	99237	Collembola	X	2	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	114666	Curculionidae	A	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	85779	Diaptomidae	X	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	100602	Heptagenia	L	6	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	100504	Heptageniidae	L	12	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	102048	Hetaerina	L	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	94025	Hyalella	X	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	115453	Hydropsyche	L	4	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	1	Early Instar
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	112278	Laccophilus	A	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	112580	Liodessus	A	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	697957	Maccaffertium	L	16	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	114212	Macronychus	L	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	116651	Nectopsyche	L	6	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	103603	Neoplea	A	3	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	68422	Oligochaeta	X	20	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	103748	Ranatra	A	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	728253	Sanfilippodytes	A	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	103369	Sigara	A	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	126774	Simulium	L	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	101666	Stylurus	L	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	127994	Tanypodinae	L	6	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	103348	Thysanoptera	X	1	
Red33	98	200	Red River of the North	332.8	551510	26-Aug-10	Routine Sample	500	101405	Tricorythodes	L	115	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	568546	Acerpenna	L	2	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	100800	Baetis	L	9	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	1	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	127917	Chironomidae	P	3	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	129228	Chironominae	L	46	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	99237	Collembola	X	2	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	112371	Coptotomus	A	1	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	85779	Diaptomidae	X	1	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	100602	Heptagenia	L	14	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	100504	Heptageniidae	L	8	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	94025	Hyalella	X	2	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	115453	Hydropsyche	L	1	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	112278	Laccophilus	A	1	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	112580	Liodessus	A	1	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	697957	Maccaffertium	L	7	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	103953	Mesoveliidae	N	1	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	116651	Nectopsyche	L	5	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	563956	Nemata	X	2	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	115833	Neotrichia	L	2	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	112777	Ochthebius	A	1	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	68422	Oligochaeta	X	24	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	113265	Staphylinidae	A	2	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	127994	Tanypodinae	L	2	
Red34	98	200	Red River of the North	318.1	551511	27-Aug-10	Routine Sample	500	101405	Tricorythodes	L	33	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	101478	Caenis	L	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	129228	Chironominae	L	32	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	112371	Coptotomus	A	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	127340	Culicoides	L	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	88634	Cyclopidae	X	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	118831	Diptera	P	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	94025	Hyalella	X	5	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	697957	Maccaffertium	L	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	563956	Nemata	X	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	68422	Oligochaeta	X	4	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	127994	Tanypodinae	L	2	
Red35	98	200	Red River of the North	300.2	551512	27-Aug-10	Routine Sample	500	101405	Tricorythodes	L	1	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	100755	Baetidae	L	6	Damaged
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	1	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	127917	Chironomidae	P	1	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	129228	Chironominae	L	49	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	103364	Corixidae	N	3	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	118831	Diptera	X	1	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	136327	Hemerodromia	L	1	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	100602	Heptagenia	L	7	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	94025	Hyalella	X	2	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	115453	Hydropsyche	L	1	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	2	Early Instar
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	697957	Maccaffertium	L	9	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	116651	Nectopsyche	L	2	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	103603	Neoplea	A	3	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	68422	Oligochaeta	X	12	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	97421	Orconectes	X	3	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	206622	Procloeon	L	1	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	100713	Stenacron	L	1	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	114095	Stenelmis	A	1	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	127994	Tanypodinae	L	5	
Red36	98	200	Red River of the North	298.1	551513	27-Aug-10	Routine Sample	500	101405	Tricorythodes	L	4	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	100755	Baetidae	L	5	Damaged
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	100800	Baetis	L	9	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	101494	Baetisca	L	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	129228	Chironominae	L	61	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	103364	Corixidae	N	2	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	85779	Diaptomidae	X	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	100504	Heptageniidae	L	9	Damaged
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	101537	Hexagenia	L	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	94025	Hyalella	X	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	115453	Hydropsyche	L	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	3	Early Instar
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	697957	Maccaffertium	L	10	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	114212	Macronychus	A	2	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	116651	Nectopsyche	L	2	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	103603	Neoplea	A	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	115833	Neotrichia	L	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	68422	Oligochaeta	X	46	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	127729	Probezzia	L	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	206622	Procloeon	L	2	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	103748	Ranatra	A	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	103369	Sigara	A	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	100713	Stenacron	L	1	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	114095	Stenelmis	A	4	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	127994	Tanypodinae	L	37	
Red37	98	200	Red River of the North	297.6	551514	27-Aug-10	Routine Sample	500	101405	Tricorythodes	L	12	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	568546	Acerpenna	L	6	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	100755	Baetidae	L	6	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	100800	Baetis	L	5	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	101494	Baetisca	L	6	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	101478	Caenis	L	3	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	1	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	127917	Chironomidae	P	1	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	129228	Chironominae	L	48	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	103364	Corixidae	N	2	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	85779	Diaptomidae	X	5	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	100504	Heptageniidae	L	2	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	94025	Hyalella	X	3	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	115453	Hydropsyche	L	11	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	1	Early Instar
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	697957	Maccaffertium	L	10	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	114212	Macronychus	A	1	
Red41	98	200	Red River of the North	280.2	551515	28-Aug-10	Routine Sample	500	116651	Nectopsyche	L	1	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	563956	Nemata	X	2	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	112777	Ochthebius	A	1	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	68422	Oligochaeta	X	35	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	127729	Probezzia	L	15	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	206622	Procloeon	L	1	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	115002	Sialis	L	3	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	103369	Sigara	A	1	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	114095	Stenelmis	A	4	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	127994	Tanypodinae	L	15	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	103423	Trichocorixa	L	6	
Red38	98	200	Red River of the North	295.2	551515	28-Aug-10	Routine Sample	500	101405	Tricorythodes	L	5	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	568546	Acerpenna	L	2	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	100755	Baetidae	L	3	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	100800	Baetis	L	3	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	101478	Caenis	L	2	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	1	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	129228	Chironominae	L	114	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	114666	Curculionidae	L	2	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	85779	Diaptomidae	X	1	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	112654	Gyrinus	A	2	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	100602	Heptagenia	L	2	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	100504	Heptageniidae	L	8	Damaged
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	94025	Hyalella	X	7	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	115453	Hydropsyche	L	1	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	5	Early Instar
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	115629	Hydroptilidae	P	2	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	697957	Maccaffertium	L	10	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	114212	Macronychus	A	2	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	103603	Neoplea	A	2	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	112777	Ochthebius	A	1	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	68422	Oligochaeta	X	11	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	112909	Paracymus	A	1	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	103369	Sigara	A	9	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	103369	Sigara lineata	A	1	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	126774	Simulium	L	1	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	114095	Stenelmis	A	1	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	101666	Stylurus	L	1	
Red40	98	200	Red River of the North	291.8	551516	28-Aug-10	Routine Sample	500	101405	Tricorythodes	L	5	
Red39	98	200	Red River of the North	294.0	551517	28-Aug-10	Routine Sample	500	85258	Calanoida	X	1	
Red39	98	200	Red River of the North	294.0	551517	28-Aug-10	Routine Sample	500	129228	Chironominae	L	10	
Red39	98	200	Red River of the North	294.0	551517	28-Aug-10	Routine Sample	500	115453	Hydropsyche	L	1	
Red39	98	200	Red River of the North	294.0	551517	28-Aug-10	Routine Sample	500	68422	Oligochaeta	X	5	
Red39	98	200	Red River of the North	294.0	551517	28-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red39	98	200	Red River of the North	294.0	551517	28-Aug-10	Routine Sample	500	101666	Stylurus	L	1	
Red39	98	200	Red River of the North	294.0	551517	28-Aug-10	Routine Sample	500	127994	Tanypodinae	L	1	
Red39	98	200	Red River of the North	294.0	551517	28-Aug-10	Routine Sample	500	101405	Tricorythodes	L	2	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	100800	Baetis	L	3	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	101494	Baetisca	L	5	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	101478	Caenis	L	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	3	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	129228	Chironominae	L	21	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	100504	Heptageniidae	L	5	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	94025	Hyalella	X	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	115453	Hydropsyche	L	3	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	697957	Maccaffertium	L	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	116651	Nectopsyche	L	4	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	563956	Nemata	X	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	115833	Neotrichia	L	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	117095	Neureclipsis	L	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	68422	Oligochaeta	X	3	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	100713	Stenacron	L	2	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	114095	Stenelmis	A	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	130150	Stratiomyidae	L	1	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	127994	Tanypodinae	L	4	
Red38	98	200	Red River of the North	295.2	551518	28-Aug-10	Routine Sample	500	101405	Tricorythodes	L	3	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	102917	Acroneuria	L	2	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	101494	Baetisca	L	2	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	101478	Caenis	L	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	129228	Chironominae	L	38	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	101664	Gomphidae	L	2	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	112654	Gyrinus	A	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	111858	Haliplus	A	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	100504	Heptageniidae	L	3	Damaged
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	94025	Hyalella	X	4	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	115453	Hydropsyche	L	2	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	697957	Maccaffertium	L	7	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	116651	Nectopsyche	L	8	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	115833	Neotrichia	L	2	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	68422	Oligochaeta	X	13	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	112909	Paracymus	A	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	111923	Peltodytes	A	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	127729	Probezzia	L	5	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	81391	Sphaerium	X	2	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	114095	Stenelmis	A	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	130150	Stratiomyidae	L	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	127994	Tanypodinae	L	8	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	103423	Trichocorixa	A	1	
Red42.5	98	200	Red River of the North	273.0	551519	29-Aug-10	Routine Sample	500	101405	Tricorythodes	L	19	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	568546	Acerpenna	L	2	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	100755	Baetidae	L	8	Damaged
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	100800	Baetis	L	5	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	101478	Caenis	L	1	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	115408	Cheumatopsyche	L	2	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	129228	Chironominae	L	28	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	118831	Diptera	P	1	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	101664	Gomphidae	L	1	Early Instar
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	100504	Heptageniidae	L	3	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	94025	Hyalella	X	7	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	115453	Hydropsyche	L	12	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	6	Early Instar
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	112580	Liodessus	A	1	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	697957	Maccaffertium	L	16	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	116651	Nectopsyche	L	1	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	115833	Neotrichia	L	3	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	68422	Oligochaeta	X	41	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	112909	Paracymus	A	1	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	127729	Probezzia	L	2	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	126774	Simulium	L	2	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	81391	Sphaerium	X	2	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	127994	Tanypodinae	L	3	
Red42	98	200	Red River of the North	270.9	551520	29-Aug-10	Routine Sample	500	101405	Tricorythodes	L	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	102139	Argia	L	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	100755	Baetidae	L	1	Damaged
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	112812	Berosus	A	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	127778	Bezzia	L	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	101478	Caenis	L	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	109234	Carabidae	A	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	127917	Chironomidae	P	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	129228	Chironominae	L	42	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	114509	Chrysomelidae	A	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	85779	Diaptomidae	X	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	118831	Diptera	L	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	118831	Diptera	P	3	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	101665	Gomphus	L	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	112654	Gyrinus	A	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	100602	Heptagenia	L	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	100504	Heptageniidae	L	8	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	94025	Hyalella	X	6	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	113166	Hydrochus	A	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	112278	Laccophilus	A	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	112580	Liodessus	A	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	697957	Maccaffertium	L	23	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	116651	Nectopsyche	L	11	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	563956	Nemata	X	15	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	103603	Neoplea	A	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	115833	Neotrichia	L	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	68422	Oligochaeta	X	117	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	97421	Orconectes	X	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	1	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	127729	Probezzia	L	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	103748	Ranatra	A	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	103369	Sigara	A	4	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	81391	Sphaerium	X	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	101666	Stylurus	L	3	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	127994	Tanypodinae	L	2	
Red44	98	200	Red River of the North	255.0	551521	29-Aug-10	Routine Sample	500	101405	Tricorythodes	L	32	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	102139	Argia	L	1	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	103684	Belostoma	A	1	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	127778	Bezzia	L	1	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	101478	Caenis	L	2	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	129228	Chironominae	L	19	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	103364	Corixidae	N	4	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	101665	Gomphus	L	1	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	100504	Heptageniidae	L	1	Damaged
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	101537	Hexagenia	L	2	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	94025	Hyalella	X	5	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	697957	Maccaffertium	L	4	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	563956	Nemata	X	3	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	68422	Oligochaeta	X	65	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	81391	Sphaerium	X	3	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	115095	Trichoptera	P	1	
Red45	98	200	Red River of the North	235.8	551522	29-Aug-10	Routine Sample	500	101405	Tricorythodes	L	6	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	100755	Baetidae	L	3	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	100800	Baetis	L	3	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	103684	Belostoma	A	1	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	127917	Chironomidae	P	6	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	129228	Chironominae	L	33	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	103364	Corixidae	N	1	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	101570	Ephoron	L	1	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	112654	Gyrinus	A	6	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	136327	Hemerodromia	P	1	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	100602	Heptagenia	L	5	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	100504	Heptageniidae	L	12	Damaged
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	94025	Hyalella	X	30	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	112278	Laccophilus	A	2	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	697957	Maccaffertium	L	21	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	114212	Macronychus	L	3	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	68422	Oligochaeta	X	101	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	128457	Orthocladiinae	L	3	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	4	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	100713	Stenacron	L	2	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	127994	Tanypodinae	L	5	
Red46	98	200	Red River of the North	208.6	551523	30-Aug-10	Routine Sample	500	101405	Tricorythodes	L	9	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	733321	Acari	X	1	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	82732	Araneae	X	1	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	100755	Baetidae	L	10	Damaged
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	100800	Baetis	L	36	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	127076	Ceratopogonidae	L	1	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	129228	Chironominae	L	25	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	85779	Diaptomidae	X	4	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	136327	Hemerodromia	L	1	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	100602	Heptagenia	L	6	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	100504	Heptageniidae	L	2	Damaged
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	94025	Hyalella	X	10	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	115453	Hydropsyche	L	1	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	3	Early Instar
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	697957	Maccaffertium	L	4	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	68422	Oligochaeta	X	87	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	112909	Paracymus	A	1	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	113576	Stenus	A	8	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	127994	Tanypodinae	L	1	
Red47	98	200	Red River of the North	204.1	551524	30-Aug-10	Routine Sample	500	101405	Tricorythodes	L	3	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	568546	Acerpenna	L	2	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	100755	Baetidae	L	3	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	100800	Baetis	L	8	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	103684	Belostoma	A	1	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	127917	Chironomidae	P	3	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	129228	Chironominae	L	18	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	101570	Ephoron	L	1	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	101665	Gomphus	L	1	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	112654	Gyrinus	A	1	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	100602	Heptagenia	L	3	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	100504	Heptageniidae	L	8	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	115453	Hydropsyche	L	7	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	15	Eary Instar
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	697957	Maccaffertium	L	10	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	114212	Macronychus	L	2	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	116651	Nectopsyche	L	1	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	115833	Neotrichia	L	1	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	68422	Oligochaeta	X	83	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	10	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	113576	Stenus	A	1	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	127994	Tanypodinae	L	2	
Red48	98	200	Red River of the North	202.8	551525	30-Aug-10	Routine Sample	500	101405	Tricorythodes	L	11	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	733321	Acari	X	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	568546	Acerpenna	L	3	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	100755	Baetidae	L	26	Damaged
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	100800	Baetis	L	12	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	101478	Caenis	L	4	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	129228	Chironominae	L	10	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	102077	Coenagrionidae	L	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	83872	Daphniidae	X	14	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	85779	Diaptomidae	X	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	101570	Ephoron	L	2	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	112654	Gyrinus	A	6	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	111858	Haliplus	A	2	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	100602	Heptagenia	L	13	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	100504	Heptageniidae	L	18	Damaged
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	94025	Hyalella	X	10	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	113166	Hydrochus	A	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	115453	Hydropsyche	L	19	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	43	Early Instar
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	112278	Laccophilus	A	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	1	Damaged
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	112580	Liodessus	A	1	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	697957	Maccaffertium	L	22	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	114212	Macronychus	L	2	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	116651	Nectopsyche	L	4	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	117095	Neureclipsis	L	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	103557	Notonectidae	N	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	112777	Ochthebius	A	2	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	68422	Oligochaeta	X	3	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	112909	Paracymus	A	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	111923	Peltodytes	A	2	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	76677	Physa	X	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	30	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	126774	Simulium	L	2	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	100713	Stenacron	L	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	113576	Stenus	A	1	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	101405	Tricorythodes	L	52	
Red49	98	200	Red River of the North	201.2	551526	30-Aug-10	Routine Sample	500	112938	Tropisternus	A	1	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	82732	Araneae	X	2	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	129228	Chironominae	L	9	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	101665	Gomphus	L	1	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	100504	Heptageniidae	L	3	Damaged
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	103358	Heteroptera	N	2	Terrestrial?
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	101537	Hexagenia	L	3	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	94025	Hyalella	X	1	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	2	Early Instar
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	697957	Maccaffertium	L	5	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	116651	Nectopsyche	L	1	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	68422	Oligochaeta	X	24	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	111923	Peltodytes	A	1	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	1	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	114552	Pyrrhalta	L	3	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red50	98	200	Red River of the North	194.8	551527	31-Aug-10	Routine Sample	500	101405	Tricorythodes	L	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	568546	Acerpenna	L	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	101478	Caenis	L	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	109234	Carabidae	A	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	127917	Chironomidae	L	1	Damaged
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	129228	Chironominae	L	28	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	114509	Chrysomelidae	L	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	101570	Ephoron	A	2	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	101570	Ephoron	L	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	101664	Gomphidae	L	1	Early Instar
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	100504	Heptageniidae	L	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	115453	Hydropsyche	L	2	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	37	Early Instar
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	2	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	697957	Maccaffertium	L	6	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	68422	Oligochaeta	X	72	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	127729	Probezzia	L	2	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	103369	Sigara	A	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	103369	Sigara lineata	A	5	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	81391	Sphaerium	X	2	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	114095	Stenelmis	L	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	127994	Tanypodinae	L	1	
Red51	98	200	Red River of the North	179.8	551528	31-Aug-10	Routine Sample	500	101405	Tricorythodes	L	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	101494	Baetisca	L	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	103684	Belostoma	A	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	101478	Caenis	L	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	129228	Chironominae	L	13	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	109216	Coleoptera	L	1	Terrestrial?
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	99237	Collembola	X	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	118831	Diptera	L	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	101525	Ephemeridae	L	2	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	101570	Ephoron	L	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	112654	Gyrinus	A	3	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	100602	Heptagenia	L	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	100504	Heptageniidae	L	6	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	101537	Hexagenia	L	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	94025	Hyalella	X	2	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	7	Early Instar
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	112200	Hygrotus	A	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	697957	Maccaffertium	L	8	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	563956	Nemata	X	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	68422	Oligochaeta	X	51	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	97421	Orconectes	X	2	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	64223	Paragordius	X	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	101588	Pentagenia	L	4	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	127729	Probezzia	L	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	2	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	103369	Sigara	A	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	103369	Sigara lineata	A	2	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	81391	Sphaerium	X	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	114095	Stenelmis	A	2	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	103423	Trichocorixa	A	1	
Red53	98	200	Red River of the North	157.8	551529	31-Aug-10	Routine Sample	500	101405	Tricorythodes	L	12	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	102917	Acroneuria	L	1	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	100755	Baetidae	L	6	Damaged
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	127917	Chironomidae	P	2	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	129228	Chironominae	L	22	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	112654	Gyrinus	A	7	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	136327	Hemerodromia	L	2	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	100602	Heptagenia	L	3	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	100504	Heptageniidae	L	30	Damaged
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	94025	Hyalella	X	1	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	115453	Hydropsyche	L	3	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	115398	Hydropsychidae	L	4	Early Instar
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	101095	Leptophlebiidae	L	1	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	697957	Maccaffertium	L	21	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	114212	Macronychus	L	1	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	64183	Nematomorpha	X	1	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	68422	Oligochaeta	X	64	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	101588	Pentagenia	L	1	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	100771	Pseudocloeon	L	3	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	81391	Sphaerium	X	4	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	114095	Stenelmis	A	2	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	127994	Tanypodinae	L	2	
Red52	98	200	Red River of the North	158.2	551530	31-Aug-10	Routine Sample	500	101405	Tricorythodes	L	25	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	568546	Acerpenna	L	1	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	100936	Apobaetis	L	1	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	100755	Baetidae	L	5	Damaged
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	100800	Baetis	L	14	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	101478	Caenis	L	1	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	115408	Cheumatopsyche	L	1	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	127917	Chironomidae	P	2	

Site_ID	Basin	Stream	River	RM	Storet	Date	samptype	maxcount	tsn_common	taxaname	stage	number	stage_comm
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	129228	Chironominae	L	66	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	103364	Corixidae	N	5	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	100602	Heptagenia	L	1	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	101537	Hexagenia	L	9	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	115453	Hydropsyche	L	13	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	115398	Hydropsychidae	L	7	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	697957	Maccaffertium	L	8	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	68422	Oligochaeta	X	34	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	127729	Probezzia	L	2	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	100771	Pseudocloeon	L	1	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	127994	Tanypodinae	L	2	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	103348	Thysanoptera	X	1	
Red55	98	200	Red River of the North	494.9	551531	01-Sep-10	Routine Sample	500	101405	Tricorythodes	L	10	

Appendix C: 2010 Red River Water Quality Data

Appendix C. Water chemsitry results collected during 2010 in the Red River study area

Site_ID	Storet	Basin	Stream	River	Location	RM	Date	Alkalinity (mg/l)	Aluminum (ug/L)	Ammonia-N (mg/L)	Anions (me/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Bicarbonate (mg/L)	Boron (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Carbonate (mg/L)	Cations (me/L)	Chloride (mg/L)	Chromium (ug/L)	Conductivity (umhos/cm)	Copper (Cu) (ug/L)	Difference (me/L)
Red02	551480	96	225	Otter Tail	Upstream of Red River Confluen	551.0	18-Aug-10	180	685	Non-Detect	4.288	Non-Detect	0	82	Non-Detect	219	84	Non-Detect	40.3	0	4.624	7.83	Non-Detect	412	0	0.336
Red01	551478	98	250	Bois De Sioux	S. Side of Wahpeton, ND	550.0	18-Aug-10	180	2060	Non-Detect	15.66	Non-Detect	8.09	91	Non-Detect	220	205	Non-Detect	115	0	16.96	10.9	Non-Detect	1340	0	1.293
Red03	551479	98	200	Red River	Upstream of Wahpeton Dam	546.6	18-Aug-10	179	1130	Non-Detect	5.071	Non-Detect	0	90	Non-Detect	219	101	Non-Detect	47.9	0	5.577	9.54	Non-Detect	471	0	0.506
Red04	551481	98	200	Red River	Below Wahpeton Dam	546.3	18-Aug-10	179	1010	Non-Detect	4.856	Non-Detect	0	87.3	Non-Detect	219	92	Non-Detect	45.8	0	5.406	7.7	Non-Detect	471	0	0.549
Red05	551482	98	200	Red River	Downstream of Wahpeton	544.4	19-Aug-10	180	1200	Non-Detect	4.716	Non-Detect	0	92.4	Non-Detect	219	83	Non-Detect	47.2	0	5.473	7.49	Non-Detect	479	0	0.756
Red06	551483	98	200	Red River	Upstream of Minn-Dak Dischrg	542.3	19-Aug-10	182	1370	Non-Detect	4.763	Non-Detect	0	92.8	Non-Detect	222	91	Non-Detect	47.5	0	5.489	8.07	Non-Detect	457	0	0.726
Red07	551484	98	200	Red River	DwnStrm of Minn-Dak Discharge	542.0	19-Aug-10	180	975	Non-Detect	4.701	Non-Detect	0	83.9	Non-Detect	219	92	Non-Detect	46.8	0	5.446	8	Non-Detect	457	0	0.745
Red08	551485	98	200	Red River	Below Minn-Dak Diffuser	540.7	19-Aug-10	180	982	Non-Detect	4.699	Non-Detect	0	88.9	Non-Detect	220	88	Non-Detect	45.5	0	5.274	7.57	Non-Detect	457	0	0.575
Red09	551486	98	200	Red River	DwnStrm of Cargill Diffuser	538.1	19-Aug-10	183	1150	Non-Detect	4.731	Non-Detect	0	88.7	Non-Detect	220	91	Non-Detect	47.1	1	5.474	8.42	Non-Detect	463	0	0.742
Red10	551487	98	200	Red River	Below Brushvale Boat Ramp	535.9	20-Aug-10	182	1010	Non-Detect	4.611	Non-Detect	0	88	Non-Detect	220	77	Non-Detect	44.6	1	5.209	8.46	Non-Detect	452	0	0.598
Red11	551488	98	200	Red River	Above Abercrombie WWTP	524.6	20-Aug-10	184	1410	Non-Detect	4.731	Non-Detect	0	87.6	Non-Detect	222	91	Non-Detect	43.3	1	5.15	9.35	Non-Detect	460	0	0.419
Red12	551489	98	200	Red River	Dwnstrm of Abercrombie WWTP	522.0	20-Aug-10	183	1740	Non-Detect	4.777	Non-Detect	0	93.4	Non-Detect	221	104	Non-Detect	43.2	1	5.184	10.6	Non-Detect	459	0	0.407
Red13	551490	98	200	Red River	UpStream of Christine, ND	513.2	21-Aug-10	184	1500	Non-Detect	4.782	Non-Detect	0	84.8	Non-Detect	219	96	Non-Detect	43.4	3	5.184	10.4	Non-Detect	458	0	0.402
Red14	551491	98	200	Red River	Upstream of Christine, ND Dam	497.2	21-Aug-10	183	1500	Non-Detect	4.863	Non-Detect	0	84.8	Non-Detect	221	89	Non-Detect	44.5	1	5.295	10.2	Non-Detect	469	0	0.432
Red55	551531	98	200	Red River	3 mi NE of Christine, ND	494.9	01-Sep-10	186	1920	Non-Detect	4.597	Non-Detect	0	103	Non-Detect	224	89	Non-Detect	39.1	1	4.873	15.3	Non-Detect	446	0	0.276
Red15	551492	98	200	Red River	1 mi SE of Hickson, ND	485.5	21-Aug-10	186	2020	Non-Detect	5.049	Non-Detect	0	97	Non-Detect	223	95	Non-Detect	52.1	2	6.036	11	Non-Detect	478	0	0.988
Red16	551493	98	200	Red River	1.5 mi NE of Hickson, ND	478.4	21-Aug-10	185	3000	Non-Detect	5.07	Non-Detect	5.04	106	Non-Detect	224	107	Non-Detect	46	1	5.497	10.4	5.05	485	6.22	0.427
Red17	551494	98	200	Red River	1 mi NE of Wild Rice, ND	470.0	22-Aug-10	193	2280	Non-Detect	5.836	Non-Detect	5.14	93.5	Non-Detect	230	113	Non-Detect	51.2	3	6.37	12	Non-Detect	555	0	0.535
Red18	551495	98	200	Red River	South Side of Fargo, ND	461.6	22-Aug-10	195	2480	Non-Detect	5.981	Non-Detect	5.47	98.6	Non-Detect	233	107	Non-Detect	51.8	2	6.469	11.7	Non-Detect	568	5.08	0.488
Red19	551496	98	200	Red River	Upstrm of Gooseberry Park	453.6	22-Aug-10	194	2030	Non-Detect	6.106	Non-Detect	5.46	86.6	Non-Detect	228	108	Non-Detect	52.7	4	6.55	11.9	Non-Detect	577	0	0.444
Red20	551497	98	200	Red River	DwnStrm of Dike West Park	449.9	22-Aug-10	196	2010	Non-Detect	6.23	Non-Detect	5.53	88.4	Non-Detect	231	108	Non-Detect	53.5	4	6.706	12.1	Non-Detect	585	0	0.477
Red21	551501	98	200	Red River	1.5 mi SE of FargoDome, Fargo	448.7	23-Aug-10	197	2120	Non-Detect	6.076	Non-Detect	0	81.9	Non-Detect	234	121	Non-Detect	51.9	3	6.546	12.4	Non-Detect	571	0	0.471
Red22	551502	98	200	Red River	American Crystal Sugar Plant	446.6	23-Aug-10	197	2350	Non-Detect	6.072	Non-Detect	0	85.3	Non-Detect	234	115	Non-Detect	51.7	3	6.543	12.3	Non-Detect	572	0	0.472
Red23	551500	98	200	Red River	2.4 mi NE of FargoDome	445.3	23-Aug-10	195	2090	Non-Detect	6.075	Non-Detect	0	85.4	Non-Detect	232	102	Non-Detect	52.2	3	6.507	12.2	Non-Detect	574	0	0.432
Red24	551499	98	200	Red River	0.5 mi E of Fargo Airport	440.1	23-Aug-10	195	2830	Non-Detect	6.266	Non-Detect	5.54	97.1	Non-Detect	233	107	Non-Detect	52.9	3	6.668	12.9	Non-Detect	590	5.59	0.402
Red25	551498	98	200	Red River	4.2 mi SE of Harwood, ND	436.8	23-Aug-10	195	2280	Non-Detect	6.295	Non-Detect	5.28	85.4	Non-Detect	231	106	Non-Detect	53.1	3	6.708	13.1	Non-Detect	593	0	0.414
Red26	551503	98	200	Red River	2 mi N of Fargo Airport	436.4	24-Aug-10	200	3480	Non-Detect	6.453	Non-Detect	5.55	94.4	Non-Detect	244	133	Non-Detect	52.9	0	6.977	15.6	5.38	608	5.91	0.524
Red27	551504	98	200	Red River	4 mi NE of Harwood, ND	427.4	25-Aug-10	232	4340	Non-Detect	8.673	Non-Detect	6.93	98.5	Non-Detect	277	197	Non-Detect	71.2	3	9.391	17.3	6.04	809	7.08	0.718
Red28	551505	98	200	Red River	5.3 mi NE of Argusville, ND	418.9	25-Aug-10	231	3940	Non-Detect	8.74	Non-Detect	6.81	94.1	Non-Detect	276	176	Non-Detect	76.1	3	9.631	17.3	5.81	815	6.68	0.891
Red29	551506	98	200	Red River	6.8 mi NE of Gardner, ND	404.0	25-Aug-10	237	3830	Non-Detect	8.696	Non-Detect	7.3	95.1	Non-Detect	280	173	Non-Detect	77.7	5	9.611	16.4	5.59	808	8.03	0.915
Red30	551507	98	200	Red River	1.25 mi W of Hendrum, MN	386.9	25-Aug-10	234	4180	Non-Detect	8.657	Non-Detect	7.54	103	Non-Detect	279	178	Non-Detect	79.2	3	9.483	16.4	6.21	811	7.23	0.826
Red31	551508	98	200	Red River	NW Side of Halstad, MN	374.6	26-Aug-10	240	1110	Non-Detect	8.532	Non-Detect	7.8	105	Non-Detect	284	0	Non-Detect	71.2	4	8.87	15.5	6.67	786	7.33	0.338
Red32	551509	98	200	Red River	11 mi NE of Hillsboro, ND	356.4	26-Aug-10	240	5070	Non-Detect	8.68	Non-Detect	8.1	110	Non-Detect	283	174	Non-Detect	71	5	9.072	15.5	7.78	795	8.05	0.392
Red33	551510	98	200	Red River	10 mi E, 1 mi N of Buxton, ND	332.8	26-Aug-10	241	6100	Non-Detect	8.594	Non-Detect	8.46	123	Non-Detect	282	179	Non-Detect	72.2	6	9.124	15	8.91	787	8.94	0.53
Red34	551511	98	200	Red River	8 mi E, 1 mi S of Thompson, ND	318.1	27-Aug-10	241	4590	Non-Detect	8.605	Non-Detect	7.58	103	Non-Detect	283	166	Non-Detect	71.9	5	9.051	15.1	6.88	788	7.3	0.447
Red35	551512	98	200	Red River	DwnStrm of foot bridge	300.2	27-Aug-10	243	4130	Non-Detect	8.77	Non-Detect	7.48	98.7	Non-Detect	286	159	Non-Detect	72.7	5	9.248	15.5	5.94	797	7.26	0.478
Red36	551513	98	200	Red River	Above Red Lake River	298.1	27-Aug-10	240	4060	Non-Detect	8.708	Non-Detect	7.88	103	Non-Detect	280	168	Non-Detect	73.1	6	9.247	15.6	5.95	803	6.94	0.539
Red37	551514	98	200	Red River	DwnStrm of Red Lake River	297.6	27-Aug-10	232	3690	Non-Detect	8.167	Non-Detect	6.74	92.5	Non-Detect	271	159	Non-Detect	70.3	6	8.706	14.3	5.14	753	6.09	0.54
Red38	551518	98	200	Red River	N side of Grand Forks, ND	295.2	28-Aug-10	225	2390	Non-Detect	7.41	Non-Detect	6.16	82.3	Non-Detect	263	116	Non-Detect	70.1	6	8.008	12.2	Non-Detect	686	5.67	0.598
Red39	551517	98	200	Red River	1 mi N of the Northern edge of	294.0	28-Aug-10	221	2530	Non-Detect	7.306	Non-Detect	6.15	80.1	Non-Detect	259	133	Non-Detect	66	5	7.755	12	Non-Detect	686	5.3	0.45
Red40	551516	98	200	Red River	3 mi N of Northern Edge of	291.8	28-Aug-10	223	2560	Non-Detect	7.374	Non-Detect	6.3	85.3	Non-Detect	262	124	Non-Detect	66.9	5	7.825	12	Non-Detect	686	5.9	0.451
Red41	551515	98	200	Red River	4 mi NE of Manvel, ND	280.2	28-Aug-10	227	1840	Non-Detect	7.561	Non-Detect	6.61	97.4	Non-Detect	267	60	Non-Detect	67.3	5	7.811	12.7	5.83	697	6.58	0.25
Red42.5	551519	98	200	Red River	1 mi S of Oslo, MN	273.0	29-Aug-10	212	2210	Non-Detect	7.209	Non-Detect	6.3	83.2	Non-Detect	250	132	Non-Detect	65.7	5	7.703	13.1	Non-Detect	691	5.41	0.494
Red42	551520	98	200	Red River	In Oslo, MN	270.9	29-Aug-10	223	2720	Non-Detect	7.445	Non-Detect	6.08	85.1	Non-Detect	263	138	Non-Detect	67.2	5	7.914	13.2	Non-Detect	692	5.56	0.469
Red44	551521	98	200	Red River	11.5 mi E of Minto, ND	255.0	29-Aug-10	223	3590	Non-Detect	7.457	Non-Detect	6.55	94.7	Non-Detect	265	136	Non-Detect	67.2	3	7.904	13.3	5.99	698	6.58	0.448
Red45	551522	98	200	Red River	12 mi E of Grafton, ND	235.8	29-Aug-10	223	2540	Non-Detect	7.651	Non-Detect	6.23	84.4	Non-Detect	263	133	Non-Detect	73.1	4	8.419	15.7	Non-Detect	716	5.76	0.768
Red46	551523	98	200	Red River	At Drayton, ND	208.6	30-Aug-10	229	2590	Non-Detect	7.874	Non-Detect	7.43	98.9	Non-Detect	266	185	Non-Detect	70.3	7	8.344	14.7	Non-Detect	727	6.91	0.471
Red47	551524	98	200	Red River	2 mi NE of Drayton, ND	204.1	30-Aug-10	223	2350	Non-Detect	8.083	Non-Detect	7.29	99.2	Non-Detect	259	175	Non-Detect	74.1	7	8.625	15.8	Non-Detect	732	7.84	0.542
Red48	551525	98	200	Red River	2.65 mi NE of Drayton, ND	202.8	30-Aug-10	224	2830	Non-Detect	7.812	Non-Detect	6.9	96.3	Non-Detect	259	165	Non-Detect	73.2	7	8.472	15.1	Non-Detect	728	6.59	0.66
Red49	551526	98	200	Red River	3 mi NE of Drayton, ND	201.2	30-Aug-10	227	2660	Non-Detect	7.846	Non-Detect	7.14	97.9	Non-Detect	263	162	Non-Detect	74.6	7	8.665	15.4	Non-Detect	731	6.65	0.82
Red50	551527	98	200	Red River	6.2 mi NE of Drayton, ND	194.8	31-Aug-10	222	2600	Non-Detect	7.731	Non-Detect	6.95	93.6	Non-Detect	258	171	Non-Detect	71.4	7	8.334	17.9	Non-Detect	723	6.28	0.603
Red51	551528	98	200	Red River	13 mi E of Hamilton, ND	179.8	31-Aug-10	227	2240	Non-Detect	7.85	Non-Detect	7.03	94.8	Non-Detect	263	156	Non-Detect	73.1	7	8.426	17.1	Non-Detect	726	7.44	0.577
Red52	551530	98	200	Red River	In Pembina, ND	158.2	31-Aug-10	226	2830	Non-Detect	7.974	Non-Detect	6.91	98.7	Non-Detect	264	143	Non-Detect	73.5	6	8.485	18.2	Non-Detect	744	6.97	0.511
Red53	551529	98	200	Red River	In Pembina, ND	157.8	31-Aug-10	230	2820	Non-Detect	8.138	Non-Detect	7.47	101	Non-Detect	267	151	Non-Detect	75.6	7	8.77	17.5	Non-Detect	753	7.52	0.633

Appendix C. Water chemsitry results collected during 2010 in the Red River study area

Site_ID	Storet	Basin	Stream	River	Location	RM	Date	Total Dissolved Solids (mg/L)	Hardness (mg/L)	Hydroxide (mg/L)	Iron (mg/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (mg/L)	Nickel (ug/L)	Nitrate + Nitrite-N (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Nitrogen (mg/L)	Total Organic Carbon (mg/L)	%Sodium	pH	Total Phosphorus (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silver (ug/L)
Red02	551480	96	225	Otter Tail	Upstream of Red River Confluen	551.0	18-Aug-10	214	211	Non-Detect	0.991	Non-Detect	26.9	0.09	0	0.09	0.453	0.543	6.6	6.3	8.16	0.064	3.7	Non-Detect	Non-Detect
Red01	551478	98	250	Bois De Sioux	S. Side of Wahpeton, ND	550.0	18-Aug-10	970	686	Non-Detect	2.54	Non-Detect	96.8	0.574	9.82	0.17	1	1.17	11.4	17.6	7.7	0.272	8.6	Non-Detect	Non-Detect
Red03	551479	98	200	Red River	Upstream of Wahpeton Dam	546.6	18-Aug-10	267	250	Non-Detect	1.58	Non-Detect	31.6	0.142	0	0.1	0.466	0.566	6.89	8.6	8.16	0.08	3.6	Non-Detect	Non-Detect
Red04	551481	98	200	Red River	Below Wahpeton Dam	546.3	18-Aug-10	255	240	Non-Detect	1.38	Non-Detect	30.6	0.126	0	0.1	0.489	0.589	6.94	9	8.15	0.076	3.9	Non-Detect	Non-Detect
Red05	551482	98	200	Red River	Downstream of Wahpeton	544.4	19-Aug-10	250	245	Non-Detect	1.65	Non-Detect	30.9	0.143	0	0.06	0.463	0.523	6.64	8.3	8.18	0.078	4	Non-Detect	Non-Detect
Red06	551483	98	200	Red River	Upstream of Minn-Dak Dischrg	542.3	19-Aug-10	251	246	Non-Detect	1.82	Non-Detect	31	0.154	0	0.06	0.473	0.533	6.63	8.2	8.22	0.074	3.9	Non-Detect	Non-Detect
Red07	551484	98	200	Red River	DwnStrm of Minn-Dak Discharge	542.0	19-Aug-10	248	244	Non-Detect	1.3	Non-Detect	30.9	0.119	0	0.05	0.474	0.524	6.89	8.3	8.25	0.07	3.9	Non-Detect	Non-Detect
Red08	551485	98	200	Red River	Below Minn-Dak Diffuser	540.7	19-Aug-10	245	236	Non-Detect	1.31	Non-Detect	29.8	0.12	0	0.05	0.481	0.531	6.88	8.3	8.27	0.066	3.8	Non-Detect	Non-Detect
Red09	551486	98	200	Red River	DwnStrm of Cargill Diffuser	538.1	19-Aug-10	250	243	Non-Detect	1.56	Non-Detect	30.5	0.131	0	0.05	0.487	0.537	6.55	9	8.3	0.1	4	Non-Detect	Non-Detect
Red10	551487	98	200	Red River	Below Brushvale Boat Ramp	535.9	20-Aug-10	239	232	Non-Detect	1.33	Non-Detect	29.4	0.116	0	0.04	0.526	0.566	6.74	8.7	8.28	0.098	3.8	Non-Detect	Non-Detect
Red11	551488	98	200	Red River	Above Abercrombie WWTP	524.6	20-Aug-10	243	228	Non-Detect	1.87	Non-Detect	29.1	0.154	0	0.07	0.515	0.585	6.3	9.4	8.3	0.142	3.8	Non-Detect	Non-Detect
Red12	551489	98	200	Red River	Dwnstrm of Abercrombie WWTP	522.0	20-Aug-10	246	229	Non-Detect	2.58	Non-Detect	29.5	0.192	5.21	0.07	0.458	0.528	6.32	9.5	8.3	0.148	3.7	Non-Detect	Non-Detect
Red13	551490	98	200	Red River	UpStream of Christine, ND	513.2	21-Aug-10	245	232	Non-Detect	2.15	Non-Detect	29.9	0.156	7.7	0	0.532	0.562	6.9	8.6	8.34	0.14	3.7	Non-Detect	Non-Detect
Red14	551491	98	200	Red River	Upstream of Christine, ND Dam	497.2	21-Aug-10	252	236	Non-Detect	2.07	Non-Detect	30.4	0.144	5.04	0.06	0.465	0.525	6.28	8.7	8.3	0.12	3.8	Non-Detect	Non-Detect
Red55	551531	98	200	Red River	3 mi NE of Christine, ND	494.9	01-Sep-10	230	208	Non-Detect	2.66	Non-Detect	26.9	0.153	6.64	0.05	0.422	0.472	5.91	12.3	8.32	0.274	3.7	Non-Detect	Non-Detect
Red15	551492	98	200	Red River	1 mi SE of Hickson, ND	485.5	21-Aug-10	272	269	Non-Detect	2.96	Non-Detect	33.6	0.192	6.58	0.05	0.582	0.632	6.79	9.1	8.3	0.156	4	Non-Detect	Non-Detect
Red16	551493	98	200	Red River	1.5 mi NE of Hickson, ND	478.4	21-Aug-10	265	244	Non-Detect	4.14	Non-Detect	31.3	0.251	7.52	0.09	0.454	0.544	6.2	9.1	8.28	0.154	4.3	Non-Detect	Non-Detect
Red17	551494	98	200	Red River	1 mi NE of Wild Rice, ND	470.0	22-Aug-10	314	273	Non-Detect	3.09	Non-Detect	35.2	0.194	6.58	0.05	0.491	0.541	6.37	12.2	8.34	0.162	4.8	Non-Detect	Non-Detect
Red18	551495	98	200	Red River	South Side of Fargo, ND	461.6	22-Aug-10	323	276	Non-Detect	3.31	Non-Detect	35.5	0.188	7.54	0.09	0.493	0.583	6.42	12.6	8.32	0.162	5	Non-Detect	Non-Detect
Red19	551496	98	200	Red River	Upstrm of Gooseberry Park	453.6	22-Aug-10	330	280	Non-Detect	2.31	Non-Detect	36.1	0.117	6.46	0.08	0.522	0.602	6.76	12.3	8.38	0.136	4.8	Non-Detect	Non-Detect
Red20	551497	98	200	Red River	DwnStrm of Dike West Park	449.9	22-Aug-10	338	286	Non-Detect	2.44	Non-Detect	36.9	0.125	6.62	0.08	0.496	0.576	6.28	12.7	8.38	0.14	4.9	Non-Detect	Non-Detect
Red21	551501	98	200	Red River	1.5 mi SE of FargoDome, Fargo	448.7	23-Aug-10	328	275	Non-Detect	2.49	Non-Detect	35.4	0.132	6.32	0.21	0.475	0.685	6.47	13.5	8.35	0.158	5.6	Non-Detect	Non-Detect
Red22	551502	98	200	Red River	American Crystal Sugar Plant	446.6	23-Aug-10	328	275	Non-Detect	2.68	Non-Detect	35.4	0.136	6.41	0.22	0.492	0.712	6.31	13.5	8.34	0.166	5.7	Non-Detect	Non-Detect
Red23	551500	98	200	Red River	2.4 mi NE of FargoDome	445.3	23-Aug-10	327	278	Non-Detect	2.5	Non-Detect	35.8	0.123	6.41	0.24	0.484	0.724	6.77	12.5	8.34	0.162	4.9	Non-Detect	Non-Detect
Red24	551499	98	200	Red River	0.5 mi E of Fargo Airport	440.1	23-Aug-10	339	282	Non-Detect	3.37	Non-Detect	36.3	0.162	7.71	0.42	0.463	0.883	6.39	13.3	8.35	0.21	5.3	Non-Detect	Non-Detect
Red25	551498	98	200	Red River	4.2 mi SE of Harwood, ND	436.8	23-Aug-10	342	283	Non-Detect	2.73	Non-Detect	36.6	0.135	7.05	0.45	0.453	0.903	6.45	13.3	8.35	0.186	5.2	Non-Detect	Non-Detect
Red26	551503	98	200	Red River	2 mi N of Fargo Airport	436.4	24-Aug-10	353	283	Non-Detect	4.02	Non-Detect	36.6	0.201	9.03	0.45	0.483	0.933	6.48	16.4	8.2	0.27	6.4	Non-Detect	Non-Detect
Red27	551504	98	200	Red River	4 mi NE of Harwood, ND	427.4	25-Aug-10	496	356	Non-Detect	5.08	Non-Detect	43.2	0.401	11.2	0.38	0.603	0.983	7.79	21.6	8.27	0.332	9	Non-Detect	Non-Detect
Red28	551505	98	200	Red River	5.3 mi NE of Argusville, ND	418.9	25-Aug-10	503	371	Non-Detect	4.55	Non-Detect	43.9	0.357	10.8	0.38	0.583	0.963	7.59	20.7	8.29	0.328	7.9	Non-Detect	Non-Detect
Red29	551506	98	200	Red River	6.8 mi NE of Gardner, ND	404.0	25-Aug-10	498	376	Non-Detect	4.32	Non-Detect	44.2	0.329	10.7	0.32	0.573	0.893	8.02	19.5	8.33	0.314	7.8	Non-Detect	Non-Detect
Red30	551507	98	200	Red River	1.25 mi W of Hendrum, MN	386.9	25-Aug-10	495	373	Non-Detect	4.85	Non-Detect	42.6	0.363	11.7	0.35	0.593	0.943	7.67	18.9	8.34	0.32	7.9	Non-Detect	Non-Detect
Red31	551508	98	200	Red River	NW Side of Halstad, MN	374.6	26-Aug-10	475	351	Non-Detect	0	Non-Detect	42.1	0	12.4	0.25	0.593	0.843	7.72	18.8	8.34	0.298	6.3	Non-Detect	Non-Detect
Red32	551509	98	200	Red River	11 mi NE of Hillsboro, ND	356.4	26-Aug-10	487	350	Non-Detect	5.95	Non-Detect	41.8	0.433	13.5	0.34	0.613	0.953	7.69	20.4	8.36	0.34	8.4	Non-Detect	Non-Detect
Red33	551510	98	200	Red River	10 mi E, 1 mi N of Buxton, ND	332.8	26-Aug-10	484	355	Non-Detect	8.75	Non-Detect	42.3	0.506	14.8	0.26	0.613	0.873	7.67	19.6	8.37	0.354	8.7	Non-Detect	Non-Detect
Red34	551511	98	200	Red River	8 mi E, 1 mi S of Thompson, ND	318.1	27-Aug-10	483	353	Non-Detect	5.46	Non-Detect	42.2	0.376	12.6	0.32	0.623	0.943	7.62	19.4	8.36	0.322	8.3	Non-Detect	Non-Detect
Red35	551512	98	200	Red River	DwnStrm of foot bridge	300.2	27-Aug-10	494	357	Non-Detect	4.8	Non-Detect	42.6	0.333	11.7	0.33	0.643	0.973	7.73	20.2	8.37	0.294	8.7	Non-Detect	Non-Detect
Red36	551513	98	200	Red River	Above Red Lake River	298.1	27-Aug-10	492	359	Non-Detect	4.7	Non-Detect	42.8	0.327	11.4	0.33	0.623	0.953	8.1	19.8	8.39	0.296	8.6	Non-Detect	Non-Detect
Red37	551514	98	200	Red River	DwnStrm of Red Lake River	297.6	27-Aug-10	459	340	Non-Detect	4.3	Non-Detect	40	0.296	10	0.29	0.613	0.903	8.41	19.2	8.38	0.264	8.1	Non-Detect	Non-Detect
Red38	551518	98	200	Red River	N side of Grand Forks, ND	295.2	28-Aug-10	412	329	Non-Detect	2.78	Non-Detect	37.3	0.189	9.44	0.24	0.663	0.903	9.9	15.7	8.39	0.216	6.4	Non-Detect	Non-Detect
Red39	551517	98	200	Red River	1 mi N of the Northern edge of	294.0	28-Aug-10	404	313	Non-Detect	2.9	Non-Detect	36	0.203	9.1	0.24	0.633	0.873	9.49	16.8	8.38	0.216	6.7	Non-Detect	Non-Detect
Red40	551516	98	200	Red River	3 mi N of Northern Edge of	291.8	28-Aug-10	408	317	Non-Detect	3.02	Non-Detect	36.3	0.208	9.13	0.21	0.653	0.863	9.4	16.7	8.36	0.22	6.7	Non-Detect	Non-Detect
Red41	551515	98	200	Red River	4 mi NE of Manvel, ND	280.2	28-Aug-10	414	320	Non-Detect	0	Non-Detect	36.8	0	10.9	0.25	0.633	0.883	8.76	16.1	8.36	0.25	5.8	Non-Detect	Non-Detect
Red42.5	551519	98	200	Red River	1 mi S of Oslo, MN	273.0	29-Aug-10	401	312	Non-Detect	2.64	Non-Detect	35.8	0.179	9.24	0.23	0.653	0.883	9.15	16.8	8.38	0.212	6.4	Non-Detect	Non-Detect
Red42	551520	98	200	Red River	In Oslo, MN	270.9	29-Aug-10	412	319	Non-Detect	3.26	Non-Detect	36.8	0.213	9.4	0.22	0.643	0.863	9.13	16.9	8.34	0.228	6.8	Non-Detect	Non-Detect
Red44	551521	98	200	Red River	11.5 mi E of Minto, ND	255.0	29-Aug-10	413	319	Non-Detect	4.27	Non-Detect	36.7	0.284	10.6	0.23	0.633	0.863	9.15	16.9	8.34	0.258	6.9	Non-Detect	Non-Detect
Red45	551522	98	200	Red River	12 mi E of Grafton, ND	235.8	29-Aug-10	431	343	Non-Detect	3.03	Non-Detect	38.9	0.199	8.81	0.24	0.643	0.883	9.2	16.4	8.36	0.222	6.5	Non-Detect	Non-Detect
Red46	551523	98	200	Red River	At Drayton, ND	208.6	30-Aug-10	439	333	Non-Detect	3.18	Non-Detect	38.1	0.19	10.6	0.21	0.733	0.943	9.16	17.8	8.42	0.23	7.4	Non-Detect	Non-Detect
Red47	551524	98	200	Red River	2 mi NE of Drayton, ND	204.1	30-Aug-10	455	348	Non-Detect	2.94	Non-Detect	39.6	0.175	9.89	0.23	0.703	0.933	9.12	16.9	8.42	0.23	7.3	Non-Detect	Non-Detect
Red48	551525	98	200	Red River	2.65 mi NE of Drayton, ND	202.8	30-Aug-10	440	343	Non-Detect	3.44	Non-Detect	38.8	0.187	9.92	0.22	0.683	0.903	9.29	16.7	8.43	0.234	7.2	Non-Detect	Non-Detect
Red49	551526	98	200	Red River	3 mi NE of Drayton, ND	201.2	30-Aug-10	443	350	Non-Detect	3.23	Non-Detect	39.8	0.186	10.2	0.23	0.713	0.943	9.19	16.8	8.42	0.236	7.4	Non-Detect	Non-Detect
Red50	551527	98	200	Red River	6.2 mi NE of Drayton, ND	194.8	31-Aug-10	432	336	Non-Detect	3.22	Non-Detect	38.2	0.177	9.63	0.24	0.703	0.943	9.16	17.1	8.43	0.232	6.9	Non-Detect	Non-Detect
Red51	551528	98	200	Red River	13 mi E of Hamilton, ND	179.8	31-Aug-10	439	341	Non-Detect	2.88	Non-Detect	38.5	0.185	9.44	0.2	0.613	0.813	8.76	16.7	8.42	0.232	6.9	Non-Detect	Non-Detect
Red52	551530	98	200	Red River	In Pembina, ND	158.2	31-Aug-10	445	344	Non-Detect	3.53	Non-Detect	39	0.182	10.5	0.28	0.663	0.943	9.29	16.5	8.41	0.236	7.3	Non-Detect	Non-Detect
Red53	551529	98	200	Red River	In Pembina, ND	157.8	31-Aug-10	458	352	Non-Detect	3.55	Non-Detect	39.6	0.251	11.4	0.24	0.653	0.893	9.04	17.2	8.41	0.244	8	Non-Detect	Non-Detect

Appendix C. Water chemsitry results collected during 2010 in the Red River study area.

Site_iD	Storet	Basin	Stream	River	Location	RM	Date	Sodium (mg/L)	Sodium Adsorp. Ratio	Sulfate (mg/L)	Suspended Sediment (mg/L)	Thallium (ug/L)	Zinc (ug/L)
Red02	551480	96	225	Otter Tail	Upstream of Red River Confluen	551.0	18-Aug-10	6.7	0.2	18.2	56	Non-Detect	0
Red01	551478	98	250	Bois De Sioux	S. Side of Wahpeton, ND	550.0	18-Aug-10	68.7	1.14	559	91	Non-Detect	10.6
Red03	551479	98	200	Red River	Upstream of Wahpeton Dam	546.6	18-Aug-10	11	0.3	53.4	71	Non-Detect	0
Red04	551481	98	200	Red River	Below Wahpeton Dam	546.3	18-Aug-10	11.2	0.31	45.6	57	Non-Detect	0
Red05	551482	98	200	Red River	Downstream of Wahpeton	544.4	19-Aug-10	10.5	0.29	39.3	73	Non-Detect	0
Red06	551483	98	200	Red River	Upstream of Minn-Dak Dischrg	542.3	19-Aug-10	10.4	0.29	38.4	89	Non-Detect	5.95
Red07	551484	98	200	Red River	DwnStrm of Minn-Dak Discharge	542.0	19-Aug-10	10.4	0.29	37.9	61	Non-Detect	0
Red08	551485	98	200	Red River	Below Minn-Dak Diffuser	540.7	19-Aug-10	10.1	0.29	37.6	66	Non-Detect	0
Red09	551486	98	200	Red River	DwnStrm of Cargill Diffuser	538.1	19-Aug-10	11.4	0.32	38	68	Non-Detect	0
Red10	551487	98	200	Red River	Below Brushvale Boat Ramp	535.9	20-Aug-10	10.4	0.3	32.2	77	Non-Detect	0
Red11	551488	98	200	Red River	Above Abercrombie WWTP	524.6	20-Aug-10	11.1	0.32	35.1	84	Non-Detect	6.51
Red12	551489	98	200	Red River	Dwnstrm of Abercrombie WWTP	522.0	20-Aug-10	11.3	0.32	36.4	102	Non-Detect	7.95
Red13	551490	98	200	Red River	UpStream of Christine, ND	513.2	21-Aug-10	10.3	0.29	35.4	81	Non-Detect	7.39
Red14	551491	98	200	Red River	Upstream of Christine, ND Dam	497.2	21-Aug-10	10.6	0.3	41.1	80	Non-Detect	6.65
Red55	551531	98	200	Red River	3 mi NE of Christine, ND	494.9	01-Sep-10	13.8	0.42	19.1	94	Non-Detect	12.8
Red15	551492	98	200	Red River	1 mi SE of Hickson, ND	485.5	21-Aug-10	12.7	0.34	45.8	134	Non-Detect	29
Red16	551493	98	200	Red River	1.5 mi NE of Hickson, ND	478.4	21-Aug-10	11.5	0.32	48.3	150	Non-Detect	12.7
Red17	551494	98	200	Red River	1 mi NE of Wild Rice, ND	470.0	22-Aug-10	17.9	0.47	75.1	131	Non-Detect	19.9
Red18	551495	98	200	Red River	South Side of Fargo, ND	461.6	22-Aug-10	18.8	0.49	81.6	130	Non-Detect	13.1
Red19	551496	98	200	Red River	Upstrm of Gooseberry Park	453.6	22-Aug-10	18.6	0.48	88.1	69	Non-Detect	7.11
Red20	551497	98	200	Red River	DwnStrm of Dike West Park	449.9	22-Aug-10	19.7	0.51	91.4	89	Non-Detect	7.9
Red21	551501	98	200	Red River	1.5 mi SE of FargoDome, Fargo	448.7	23-Aug-10	20.3	0.53	82.4	80	Non-Detect	12
Red22	551502	98	200	Red River	American Crystal Sugar Plant	446.6	23-Aug-10	20.4	0.53	82.3	109	Non-Detect	8.35
Red23	551500	98	200	Red River	2.4 mi NE of FargoDome	445.3	23-Aug-10	18.7	0.49	84.1	82	Non-Detect	44.2
Red24	551499	98	200	Red River	0.5 mi E of Fargo Airport	440.1	23-Aug-10	20.4	0.53	90.9	120	Non-Detect	11.5
Red25	551498	98	200	Red River	4.2 mi SE of Harwood, ND	436.8	23-Aug-10	20.6	0.53	93.5	92	Non-Detect	9.9
Red26	551503	98	200	Red River	2 mi N of Fargo Airport	436.4	24-Aug-10	26.3	0.68	90.7	123	Non-Detect	21.9
Red27	551504	98	200	Red River	4 mi NE of Harwood, ND	427.4	25-Aug-10	46.7	1.08	166	136	Non-Detect	16.8
Red28	551505	98	200	Red River	5.3 mi NE of Argusville, ND	418.9	25-Aug-10	45.9	1.04	170	149	Non-Detect	15
Red29	551506	98	200	Red River	6.8 mi NE of Gardner, ND	404.0	25-Aug-10	43.1	0.97	163	124	Non-Detect	14.3
Red30	551507	98	200	Red River	1.25 mi W of Hendrum, MN	386.9	25-Aug-10	41.4	0.93	165	152	Non-Detect	16.5
Red31	551508	98	200	Red River	NW Side of Halstad, MN	374.6	26-Aug-10	38.4	0.89	155	205	Non-Detect	17.4
Red32	551509	98	200	Red River	11 mi NE of Hillsboro, ND	356.4	26-Aug-10	42.6	0.99	161	212	Non-Detect	24.6
Red33	551510	98	200	Red River	10 mi E, 1 mi N of Buxton, ND	332.8	26-Aug-10	41.3	0.95	157	260	Non-Detect	22.6
Red34	551511	98	200	Red River	8 mi E, 1 mi S of Thompson, ND	318.1	27-Aug-10	40.4	0.93	158	194	Non-Detect	16.4
Red35	551512	98	200	Red River	DwnStrm of foot bridge	300.2	27-Aug-10	43	0.99	163	167	Non-Detect	14.8
Red36	551513	98	200	Red River	Above Red Lake River	298.1	27-Aug-10	42.2	0.97	163	167	Non-Detect	14.5
Red37	551514	98	200	Red River	DwnStrm of Red Lake River	297.6	27-Aug-10	38.6	0.91	146	150	Non-Detect	12.8
Red38	551518	98	200	Red River	N side of Grand Forks, ND	295.2	28-Aug-10	28.9	0.69	119	100	Non-Detect	14.8
Red39	551517	98	200	Red River	1 mi N of the Northern edge of	294.0	28-Aug-10	30.1	0.74	119	109	Non-Detect	9.4
Red40	551516	98	200	Red River	3 mi N of Northern Edge of	291.8	28-Aug-10	30.1	0.74	120	120	Non-Detect	44.7
Red41	551515	98	200	Red River	4 mi NE of Manvel, ND	280.2	28-Aug-10	28.9	0.7	124	165	Non-Detect	13.8
Red42.5	551519	98	200	Red River	1 mi S of Oslo, MN	273.0	29-Aug-10	29.8	0.73	120	105	Non-Detect	8.94
Red42	551520	98	200	Red River	In Oslo, MN	270.9	29-Aug-10	30.8	0.75	121	115	Non-Detect	10
Red44	551521	98	200	Red River	11.5 mi E of Minto, ND	255.0	29-Aug-10	30.7	0.75	123	166	Non-Detect	14.5
Red45	551522	98	200	Red River	12 mi E of Grafton, ND	235.8	29-Aug-10	31.8	0.75	129	101	Non-Detect	9.87
Red46	551523	98	200	Red River	At Drayton, ND	208.6	30-Aug-10	34.3	0.82	134	113	Non-Detect	22.9
Red47	551524	98	200	Red River	2 mi NE of Drayton, ND	204.1	30-Aug-10	33.6	0.78	148	102	Non-Detect	13.2
Red48	551525	98	200	Red River	2.65 mi NE of Drayton, ND	202.8	30-Aug-10	32.7	0.77	136	114	Non-Detect	31.8
Red49	551526	98	200	Red River	3 mi NE of Drayton, ND	201.2	30-Aug-10	33.5	0.78	134	96	Non-Detect	20.1
Red50	551527	98	200	Red River	6.2 mi NE of Drayton, ND	194.8	31-Aug-10	32.9	0.78	129	101	Non-Detect	13.3
Red51	551528	98	200	Red River	13 mi E of Hamilton, ND	179.8	31-Aug-10	32.5	0.77	132	136	Non-Detect	32.2
Red52	551530	98	200	Red River	In Pembina, ND	158.2	31-Aug-10	32.2	0.75	137	116	Non-Detect	14
Red53	551529	98	200	Red River	In Pembina, ND	157.8	31-Aug-10	34.8	0.81	142	128	Non-Detect	18.6

Appendix Table C-2. Chemical data collected during the Red River of the North study during 2010.

River Mile	Date	Temp. C	Diss. Oxy. (mg/l)	Field pH (SU)	Field Conduct, (umhos/cm)	Secchi Depth (cm)	Location
[98-200] - Red River of the North							
546.80	08/18/2010	22.4	5.72	8.29	469	31.0	Kidder dam impoundment
546.40	08/18/2010	22.2	5.49	8.28	469	45.0	Dst. Kidder dam; Ust. Wahpeton WWTP
544.40	08/19/2010	22.1	7.43	8.33	454	44.0	Dst. Wahpeton WWTP
541.00	08/19/2010	21.9	4.70	8.39	487	29.0	Ust. Minn-Dak Farmers Coop.
540.50	08/19/2010	22.6	4.75	8.32	455	38.0	Dst. Minn.-Dak Stormwater outfall
539.90	08/19/2010	22.7	3.91	8.35	455	38.5	Dst. Minn-Dak Farmers Coop.
539.00	08/19/2010	23.0	3.47	8.35	450	39.0	Dst. Cargill Discharge
536.30	08/20/2010	22.1	8.10	8.32	445	39.5	Dst. Brookvale Ramp
525.00	08/20/2010	22.5	8.66	8.21	480	40.5	Ust. Ambercrombie WWTP
523.00	08/20/2010	22.9	8.69	8.30	477	34.5	Dst. Abercrombie WWTP outfall
513.00	08/21/2010	23.2	7.83	8.38	477	35.5	(Todd's Farm) adj US. Rte 75
497.00	08/21/2010	23.0	13.31	8.32	487	33.0	Ust. Christine dam
496.20	09/01/2010	23.7	7.42	8.37	438	24.0	Dst. Christen dam MPCA site
485.00	08/21/2010	23.6	6.85	8.29	496	19.0	between the dams
478.50	08/21/2010	23.6	8.22	8.03	481	19.0	Proposed Fargo, ND diversion
472.00	08/22/2010	23.5	8.12	8.08	565	27.5	dst. Wild Rice River
462.00	08/22/2010	23.8	7.54	8.16	554	27.5	Dst. Convent Landing Fargo, ND
454.00	08/22/2010	24.6	8.13	8.25	565	27.5	Ust. Fargo, ND, Gooseberry Park
450.00	08/22/2010	24.7	8.33	8.24	575	18.0	Ust. Moorehead, MN WWTP
448.80	08/23/2010	24.5	8.19	8.27	568	23.0	Dst. Moorehead, MN WWTP, Ust. ACS
446.40	08/23/2010	24.5	7.85	8.28	560	21.5	Dst. American Crystal Sugar (ACS)
445.30	08/24/2010	23.6	6.70	8.30	551	19.5	Dst. MB Johnson boat ramp
440.00	08/23/2010	24.4	7.79	8.27	586	22.5	Dst. Fargo, ND WWTP
437.00	08/23/2010	24.6	8.27	8.29	581	19.0	Ust. NoDak ditch; Dst. Fargo WWTP
436.40	08/24/2010	23.5	7.06	8.29	565	18.0	Dst. Nodak Ditch; Discharge
427.40	08/25/2010	21.8	7.75	8.38	806	12.5	Dst. Sheyenne River
418.70	08/25/2010	22.3	7.73	8.38	791	11.0	Dst. Fargo, ND Diversion
404.00	08/25/2010	22.8	8.00	8.38	786	15.5	CR 39 near Perley, MN
386.00	08/25/2010	23.2	8.25	8.32	790	16.5	Dst. Henderson WWTP; Norman Co Hwy 25 ramp
375.00	08/26/2010	22.0	7.89	8.40	769	18.5	Halstead boat ramp
355.00	08/26/2010	22.5	8.25	8.40	781	13.0	Dst. Marsh River
333.00	08/26/2010	23.0	8.45	8.42	772	15.0	Belmont Park/ Frog Point Park
318.00	08/27/2010	22.5	8.04	8.40	773	19.5	Ust. Thompson Rd. bridge
300.00	08/27/2010	22.7	8.37	8.36	783	19.5	Ust. Lincoln Park Landing
298.00	08/27/2010	784.0	8.21	8.44	784	24.5	Ust. Grand Forks WWTP
296.50	08/27/2010	22.7	8.50	8.34	711	20.5	Dst. Grand Forks, ND WWTP
295.00	08/28/2010	22.7	7.87	8.43	673	19.0	Ust. English Coulee; dst dam
294.00	08/28/2010	22.6	7.79	8.45	673	22.0	Dst. English Coulee outfall
292.00	08/28/2010	22.6	7.88	8.43	673	23.5	Dst. Grand Forks, ND area
280.00	08/28/2010	22.3	7.95	8.38	683	27.0	Dst. Far Fields; Dst. Grand Forks, ND
271.00	08/29/2010	22.3	7.99	8.36	674	23.0	Ust Oslo City landing; Ust. Oslo, MN WWTP
265.00	08/29/2010	22.4	7.85	8.36	678	19.0	Dst. Oslo, MN WWTP
255.00	08/29/2010	22.6	8.03	8.41	684	19.0	Ust Big Woods
236.00	08/29/2010	22.9	7.71	8.38	702	21.5	at USGS gaging station ND St Rte. 17
208.60	08/30/2010	22.3	8.23	8.41	712	20.0	Ust. Hastings landing; Ust. Drayton impacts
204.00	08/30/2010	22.5	7.77	8.41	717	19.0	Ust. Drayton Dam; Ust. Drayton WWTP

Appendix Table C-2. Chemical data collected during the Red River of the North study during 2010.

River Mile	Date	Temp. C	Diss. Oxy. (mg/l)	Field pH (SU)	Field Conduct, (umhos/cm)	Secchi Depth (cm)	Location
[98-200] - Red River of the North							
203.30	08/30/2010	22.7	7.41	8.38	714	21.0	Dst. Drayton WWTP; Ust. ACS (american crystal su
201.20	08/30/2010	22.8	8.05	8.40	733	22.5	Dst. American Crystal Sugar (ACS)
195.00	08/31/2010	22.2	8.06	8.37	707	17.5	Dst. ACS
179.50	08/31/2010	22.0	8.41	8.42	710	18.5	at MN St. Rte 175 "boat ramp"
158.30	08/31/2010	22.0	8.02	8.39	728	20.0	ust. Pembina River
157.80	08/31/2010	21.4	8.76	8.38	741	19.5	Dst. Pembina River; St. Vincent
[96-225] - Otter Tail River							
1.50	08/18/2010	22.1	5.64	8.33	409	43.5	UST. SR 9 bridge; ust. confluence
[98-250] - Bois de Sioux River							
1.50	08/18/2010	21.7	6.00	7.68	1338	25.5	Ust. Breckenridge WWTP

Appendix D: 2010 Red River Sampling Sites and Source

Appendix Table C-1. Red River 2010 Study Area Sampling Sites and Discharger Locations

	RM	Site Type	Description	RorL?	Comments/Notes
1	1.5	F,H,M,WQ	Bois de Sioux R. - upstream Breckenridge WWTP		Upstream site ("control")
2	1.5	F,H,M,WQ	Otter Tail R. - upstream confluence		Upstream site ("control")
	0.5	WWTP	Breckenridge WWTP	R	Lagoon discharge (MN0022900) to Otter Tail R.
3	546.8	F,H,M,WQ	Kidder Dam impoundment		Habitat modified site
	546.5	Dam	Kidder Dam (rock slopeway)		
4	546.4	F,H,M,WQ	Dst. Dam: ust. Wahpeton WWTP		Tailwater site
	544.5	WWTP	Wahpeton WWTP	L	Lagoon discharge (ND0020320)
5	544.4	F,H,M,WQ	Dst. Wahpeton WWTP		Impact site
6	541.0	F,H,M,WQ	Ust. Minn-Dak Farmers Coop		Recovery site; MPCA site
7	54?.?	F,H,M,WQ	Minn-Dak Farmers Coop stormwater outfall		Impact site
	540.0	Industry	Minn-Dak Farmers Coop	L	Sugar beet processing (ND0024368) - toxic releases
8	539.9	F,H,M,WQ	Dst. Minn-Dak Farmers Coop		Dst. Minn-Dak discharge
	539.5	Industry	Cargill Corn Milling	L	Corn milling waste (ND0026000)
9	539.0	F,H,M,WQ	Dst. Cargill		Dst. Cargill discharge
10	534.0	F,H,M,WQ	2 mi. dst. Brushvale Rec. Area		Impact/recovery site
11	525.0	F,H,M,WQ	Ust. Abercrombie WWTP		Ust. Site
	523.5	WWTP	Abercrombie WWTP	L	Via drainage ditch (NDG122659)
12	523.0	F,H,M,WQ	Dst. Abercrombie WWTP		Impact site; MPCA site
13	513.0	F,H,M,WQ	adjacent U.S. Rt. 75		Recovery site
14	497.0	F,H,M,WQ	Ust. Christine Dam		Habitat modified site
	496.5	Dam	Christine Dam (low head)		
	496.2	F,H,M,WQ	Dst. Christine Dam; MPCA site		Ambient/longitudinal site
15	485.0	F,H,M,WQ	Between dams		Ambient/longitudinal site
	482.7	Dam	Hickson Dam (low head)		
16	478.5	F,H,M,WQ	Proposed Fargo diversion		Fargo diversion pre-construction
	470.2	Trib.	Wild Rice River (ND)		
17	469.5	F,H,M,WQ	Dst. Wild Rice River		Ambient/longitudinal site
18	462.0	F,H,M,WQ	Convent landing		Ambient/longitudinal site; MPCA site
	458.1	Dam	Fargo South Dam		
19	454.0	F,H,M,WQ	Ust. Fargo; Gooseberry Park		Upstream site; NAWQA site
	452.2	Dam	Fargo Midtown Dam (rock slopeway)		
20	450.0	F,H,M,WQ	Ust. Moorhead WWTP		Urban impacts site; habitat modified site
	448.9	Dam	Fargo North Dam (rock slopeway)		
	448.8	WWTP	Moorhead WWTP		
21	448.8	F,H,M,WQ	Dst. Moorhead WWTP; ust. ACS		Impact site
	446.5	Industry	American Crystal Sugar		Sugar beet processing (MN MN0001945)
22	446.4	F,H,M,WQ	Dst. ACS		Impact site
	445.5	Trib.	Drainge Ditch #41 - Stormwater Discharges		
23	445.3	F,H,M,WQ	Dst. Drainage Ditch #41; Ust. Fargo WWTP		Impact/recovery site; MDNR catfish site

Appendix Table C-1. continued

	RM	Site Type	Description	RorL?	Comments/Notes
	440.1	WWTP	Fargo WWTP		
24	440.0	F,H,M,WQ	Dst. Fargo WWTP		Impact site
25	437.0	F,H,M,WQ	Dst. Fargo WWTP; ust. ND Ditch		Impact site
	436.5	Trib.	ND Ditch with Fargo impacts		
26	436.4	F,H,M,WQ	Dst. ND Ditch with Fargo Impacts		Impact site
	427.5	Trib.	Sheyenne River		
27	427.4	F,H,M,WQ	Dst. Sheyenne River		Ambient/longitudinal site; MPCA @421.6
28	418.7	F,H,M,WQ	Proposed Fargo diversion		Fargo diversion pre-construction
29	404.0	F,H,M,WQ	Co. Rt. 39 near Perley, MN		Ambient/longitudinal site
	403.7	WWTP	Perely WWTP	R	Lagoon discharge (MN0024481)
	386.5	WWTP	Hendrum WWTP	R	Lagoon discharge (MN0021644)
30	386.0	F,H,M,WQ	Norman Co. Hwy. 25 Boat Ramp		Ambient/longitudinal site; MPCA site
	380.4	Trib.	Wild Rice River (MN)		
31	375.0	F,H,M,WQ	Halstead Boat Ramp		Ambient/longitudinal site; MPCA site
	357.2	Trib.	Marsh River (MN); Shelly WWTP	R	Lagoon discharge (MN0024864)
32	355.0	F,H,M,WQ	Dst. Marsh River		Ambient/longitudinal site
33	333.0	F,H,M,WQ	Belmont Park/Frog Pt. Park		Ambient/longitudinal site
34	318.0	F,H,M,WQ	Thompson Rd. bridge		Ambient/longitudinal site
35	300.0	F,H,M,WQ	Lincoln Park landing		
	298.3	Trib.	Red Lake River		
36	298.0	F,H,M,WQ	Dst. Red L. R.; Ust. Grand Forks WWTP		Ust. Grand Forks impacts; MPCA site
	297.3	WWTP	East Grand Forks WWTP	R	
	297.2	WWTP	Grand Forks WWTP	L	
37	296.5	F,H,M,WQ	Dst. Grand Forks WWTP		Impact site
	296.1	Dam	Riverside Dam (rock slopeway)		
38	295.5	F,H,M,WQ	Dst. Riverside Dam; ust. English Coulee		Impact/recovery site
	294.4	Trib.	English Coulee; 2 NPDES Facilities	L	Defense Fuel Supply (ND0024023); Residual Materials (NDR800004)
39	294.3	F,H,M,WQ	Dst. English Coulee		Impact site
40	292.0	F,H,M,WQ	Dst. Grand Forks area		Impact/recovery site
41	280.0	F,H,M,WQ	Far-field dst. Grand Forks		Recovery site
42	271.0	F,H,M,WQ	Oslo City Park; ust. Oslo WWTP		Ambient/longitudinal site; MPCA site
	266.5	WWTP	Oslo WWTP (MN0024431)	R	
43	265.0	F,H,M,WQ	Dst. Oslo WWTP		Impact site
44	255.0	F,H,M,WQ	Ust. Big Woods		Recovery/ambient/longitudinal site
45	236.0	F,H,M,WQ	ND St. Rt. 17		Ambient/longitudinal site
47	208.6	F,H,M,WQ	Dst. Hastings Landing; ust. Drayton impacts		Ambient/longitudinal site; MPCA site
	206.0	WWTP	Assoc. of Potato Growers (ND0026204)	L	
48	204.0	F,H,M,WQ	Ust. Drayton Dam; ust. Drayton WWTP		Habitat modified site
	203.4	Dam	Drayton Dam (low head)		
	203.4	WWTP	Drayton WWTP (ND0000183) - below dam?	L	
49	203.3	F,H,M,WQ	Dst. Drayton WWTP; ust. ACS		Impact site

Appendix Table C-1. continued

	RM	Site Type	Description	RorL?	Comments/Notes
	201.3	WWTP	American Crystal Sugar (ND0000094) - via ditch?	L	
50	201.2	F,H,M,WQ	Dst. American Crystal Sugar		Impact site
51	195.0	F,H,M,WQ	Dst. American Crystal Sugar		Impact/recovery site
52	179.5	F,H,M,WQ	Hwy 175 Boat Ramp		Ambient/longitudinal site; MDNR catfish site
53	158.3	F,H,M,WQ	Ust. Pembina River		MPCA site
	158.0	Trib.	Pembina River		
54	156.0	F,H,M,WQ	Dst. Pembina-St. Vincent		Impact site
	155.0	Boundary	U.S.-Canada Border		

Appendix E: Minnesota DNR Red River Maps and River Mileage

RED RIVER OF THE NORTH *A Water Trail Guide*

Section 1 of 3

RED RIVER ROUTE DESCRIPTION

Except during floods, the Red River of the North is slow-moving and picturesque with its tree-covered banks and frequent wildlife sightings. It is serene and quiet even as the Red passes through cities. Reminders of the past are found in the muddy banks where bison bones occasionally are exposed. These muddy banks may make access difficult. There are no rapids except at some of the dams.
Low flows expose rocks and snags creating hazards for motors and occasionally block the channel.

Note: River miles are counted beginning at the mouth of the Red River at Lake Winnipeg, Manitoba, and ending at Breckenridge, Minn., according to a system developed by the U.S. Army Corps of Engineers. Right (R) and left (L) refer to right and left bank, respectively, when facing downstream.

548.7 Headwaters Park. 100 Nebraska Avenue, Breckenridge, Minn. Water access with parking lot, Headwaters Monument, Friendship sculpture, interpretive kiosk, fishing pier, picnic shelter. Confluence of Bois de Sioux and Otter Tail Rivers which is navigable by canoe for about 160 miles. Connected to Welles Memorial Park by walking bridge.

548.7 Welles Memorial Park and Fairgrounds. Picnic shelter, 5 primitive campsites, 2 campsites with electricity, parking, fire ring with free wood, tables, flush toilets, historic cabin and school house.

548.6 Overflow (R). Otter Tail River overflows into the Red River at high flows.

547.7 Chahinkapa Campground (L). 8 trailer sites with hookups, tent sites, showers, restrooms, shelters, trails, zoo, golf course, fishing pier, shore fishing, sewer dump, playground and carousel.

547.7 Golf Course Pedestrian Bridge.

546.4 Kidder Dam. Retrofitted with rock slopeway, portage right. Use caution, portage is only 15' from dam.

546.3 Kidder Recreation Area (L). Concrete boat ramp with adjacent dock, 8 trailer sites with electrical and water hookups, tent areas, showers, restrooms, picnic shelters, fishing pier, shore fishing, fish cleaning station, sewer dump and world's largest catfish.

536.8 County Road 18 Bridge.

536.3 Brushvale Bridge Recreation Area (L). Concrete boat ramp, primitive camping, no facilities, shore fishing.

536.3 Lloyd's Park (R). Picnic area, shore fishing, monument.

523.6 County Road 27 bridge.

523.2 Abercrombie, ND (L) and **Fort Abercrombie** (L). Concrete boat ramp, parking, historic site, museum, picnic/rest area, shore fishing, primitive camping, self-contained RVs allowed. Short walk to telephone, restaurant and grocery store. www.state.nd.us/hist.

514.8 County 28/4 bridge.

503.0 Wolverton, MN (R). Proposed carry-in access and primitive campground.

503.0 Wolverton City Campground (R). Located approximately 1 mile from river. 4 campsites with water, sewer, electricity, picnic tables, tenting areas, shelter, seasonal restrooms available at nearby baseball diamond.

502.1 County Road 30/2 bridge.

496.5 Christine Dam. Dangerous lowhead dam. NO IDENTIFIED PORTAGE.

482.7 Hickson Dam. Dangerous lowhead dam. NO IDENTIFIED PORTAGE.

474.2 County Road 8/16 bridge.

462.0 Iwen Park/Convent Landing (L). Water access, parking, chemical toilet seasonal. County 74 bridge.

458.1 Fargo South Dam. Retrofitted with rock slopeway, portage left.

455.0 Lindenwood Park (L). Picnic shelters, tent and trailer sites with hookups, playgrounds, restrooms, bicycle rental, trails, and telephone.

454.4 Lindenwood Park (L). Carry-in access.

454.2 Lindenwood/Gooseberry Park Pedestrian Bridge. Seasonal.

454.2 Lindenwood Park (L). Carry-in access.

452.4 Midtown Dam Upstream Boat Ramp (L). Parking.

452.3 Floating Pedestrian Bridge. Seasonal. Portage Left.

452.2 Fargo Midtown Dam. Retrofitted with rock slopeway. Portage left.

452.0 Midtown Dam Downstream Boat Ramp (L). Parking.

451.7 Bridges.

451.4 Tour Boat Landing (R). Carry-in access, ADA ramp, canoe/kayak rental, tour boat, parking, trails, interpretive kiosk, interpretive center, museum, restrooms.

451.3 Minnesota's 2nd Largest Peach Leaf Willow Tree.

450.5 Oak Grove/Memorial Park Pedestrian Bridge. Seasonal.

449.2 Mickelson Field (L). Carry-in access south of toll bridge.

449.0 Private Toll Bridge. Minnesota and North Dakota's only privately owned toll bridge.

448.9 Fargo North Dam. Retrofitted with rock slopeway, portage left, reenter via boat access on north side.

445.7 MB Johnson Park (R). Two water accesses, parking, chemical toilets seasonal, picnic shelter, playground, nature trail, interpretive signage.

440.0 Bridge.
417.0 Hudson's Bay Fur Trading Post Park (R). Not open to public.

415.9 County 36 Bridge. Interpretive kiosk, carry-in access in right of way, parking on access road to Hudson's Bay Fur Trading Post Park, south of the bridge.

For more information about the Red River visit the River Keepers website at: **www.riverkeepers.org**

Map Key

- 540 River Mile
- Carry-in Access
- Water Access
- Campground
- Watercraft Campsite
- Dam
- Rest Area
- Interpretive Site
- Historic Site
- Restrooms
- Hospital
- Shore Fishing
- Fishing Pier
- Lodging
- 94 Interstate Highway
- 10 U.S. Highway
- 9 State Highway
- 18 County Road or Street

0 1 2 Miles
0 1 2 Kilometers

RED RIVER OF THE NORTH *A Water Trail Guide*

Section 2 of 3

RED RIVER ROUTE DESCRIPTION

Except during floods, the Red River of the North is slow-moving and picturesque with its tree-covered banks and frequent wildlife sightings. It is serene and quiet even as the Red passes through cities. Reminders of the past are found in the muddy banks where bison bones occasionally are exposed. These muddy banks may make access difficult. There are no rapids except at some of the dams. Low flows expose rocks and snags creating hazards for motors and occasionally block the channel.

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403.6 County Road 39 bridge.

386.4 County Roads 1/25 bridges.

386.3 Norman County Highway 25 Boat Ramp (R). Water Access. Located north of bridge. Parking. Shore fishing. No other facilities.

386 Hendrum Watercraft Campsite (R). 0.3 miles past the access. Access by road and from the Red River. No facilities. Hendrum is 1.5 miles to the east. For more information call Hendrum City Hall at 218-861-6210.

vicinity of 386 Hendrum Community Park. 1.7 miles east of the Red River on Norman County Highway 25. Electric and tent sites, shelter, picnic tables, playground, water, and restrooms. Depending upon water levels, can be accessed by canoeing up the Wild Rice River from the Red River. For more information call Hendrum City Hall at 218-861-6210.

380.4 Wild Rice River Outlet.

375.3 State Highway 200 bridge.

374.8 Halstad Boat Ramp (R). Located north of bridge off of MN Highway 200 (240th Ave.) Parking. Shore fishing. No other facilities. Halsted is 0.8 miles to the east. Call Valley Hardware at 218-456-2148 for current conditions.

358.8 County Highway 8 bridge.

357.9 Goose River Outlet.

357.1 Marsh River Outlet

347.6 County Roads 17/1 bridges.

336.4 Sand Hill River Outlet.

335.5 State Highway 220 bridge.

332.8 Belmont Park/Frog Point/Trail County Park Campground and Ramp (L). located east of Buxton, ND off of Trail County Highway 2 and west of Climax, MN. Concrete boat ramp, parking, camping, toilets, fire rings, electricity, water, and dock. Shore fishing. Historic site.

326.5 Buffalo Coulee Outlet

317.7 Thompson Road bridge.

306.0 Cole Creek outlet.

299.9 Lincoln Drive Park and Landing (L). Water access, restrooms, playground, picnic tables, shelter, water, access to hiking and biking trails. Shore fishing. For more information and current conditions call 701-746-4636. See note below.

vicinity of 298 Red Lake River Dam Rapids (R). Located 0.2 miles upstream from the confluence of the Red Lake River and the Red River. Shore fishing.

vicinity of 298 Red Lake River Water Acess (R). 0.5 miles upstream from the confluence with the Red River. Dam/rapids located between the confluence and the ramp. Parking. Shore fishing. No other facilities. For more information and current conditions call 218-773-8000. See note below.

297.8 Railroad trestle.

297.7 LaFave Park Water Access (R). Parking and dock. South of Demers Avenue Bridge. Shore fishing. Restroom and picnic tables at Sacred Heart Trailhead. For more information and current conditions call 218-773-8000. See note below.

297.6 Demers Avenue bridge.

297.2 Red River State Recreation Area, Sherlock Park Campground (R). 72 campsites, 48 with full hookups. Restrooms with showers, playground, picnic tables, access to hiking and biking trails. No direct river access but possible to beach a vessel on park property and walk a short distance to park office. Site of former neighborhood destroyed by flood of 1997. For more information call 218-773-4950 or visit http://www.dnr.state.mn.us/state_parks/red_river/index.html. Make reservations at website: www.stayatmnparks.com or 1-866-85PARKS.

296.9 Gateway Drive/US Hiwghway 2 bridge.

296.1 Riverside Dam/Rapids. This dam was retrofitted with a rock rapids to eliminate a dangerous undertow. The dam/rapids is marked with large signs. No identified portage but the ND side (left) has best elevation and access.

296 Whopper John Little Landing (L). Water acess, parking. Shore fishing. For current conditions call 701-746-4636. See note below.

NOTE: The Cities of Grand Forks and East Grand Forks have determined that on-the-river use is unsafe at flood stage and above, which is 28 feet. Ramps will be closed when the river reaches this level. See http://waterdata.usgs.gov/nd/nwis/uv?05082500 for current river elevation or call 218-773-8000 or 701-746-4636 or 218-773-4950 for more information.

Grand Forks and East Grand Forks have many more facilities adjacent to the Red River in their Greenway. See web sites for more information and maps.

The MN DNR is developing additional access points in this area. For the latest information contact MN DNR at 218-681-0889.

For more information about the Red River visit the River Keepers website at: www.riverkeepers.org

Look for this symbol along the Water Trail

red river of the north

Map Key

- 375 River Mile
- Water Access
- Campground
- Watercraft Campsite
- Dam
- Rest Area
- Historic Site
- Restrooms
- Hospital
- Shore Fishing
- Lodging
- Note
- Interstate Highway
- U.S. Highway
- State Highway
- County Road or Street

0 1 2 Miles

0 1 2 Kilometers

CONTINUED ON NEXT PANEL

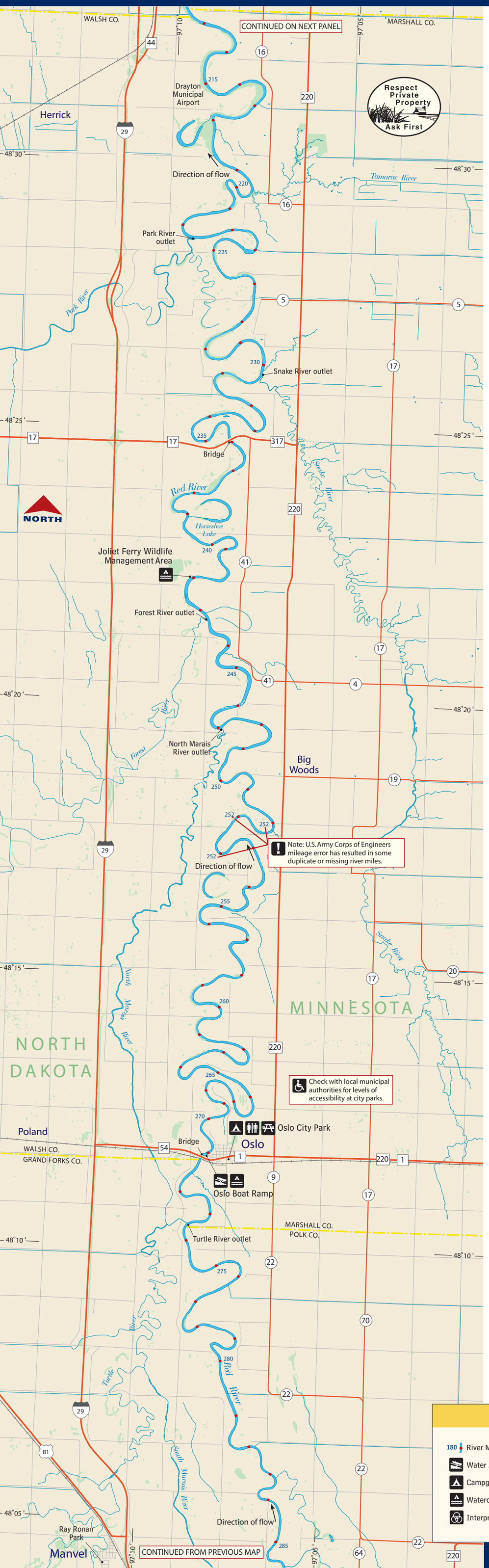
CONTINUED ON NEXT MAP

CONTINUED FROM PREVIOUS MAP

CONTINUED FROM PREVIOUS PANEL

RED RIVER OF THE NORTH *A Water Trail Guide*

Section 3 of 3



RED RIVER ROUTE DESCRIPTION

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271.1 Oslo, MN Water access (R). Concrete ramp. Primitive camping, fire ring, and parking. For more information call Oslo City Hall at 218-695-3841.

271.2 Highway 54/1 bridge.

vicinity of 271 Oslo City Park/Campground. 0.4 miles from the Oslo boat ramp. Campsites with electricity and water. Dump station, restrooms, no showers, shelters with picnic tables. For more information call Oslo City Hall at 218-695-3841.

242.0 Joliet Ferry Wildlife Management Area (L). Primitive camping allowed. No facilities or identified camping sites. Site is marked by rectangular signs "Wildlife Management Area". Call ND Game and Fish office at 701-662-3617 for more information. See http://gf.nd.gov/licenses/publicuse.html for current regulations.

The ND Game and Fish Department is acquiring other Wildlife Management Areas adjacent to the Red River in this area. Call the ND Game and Fish Department at 701-662-3617 for latest information.

208.2 Hastings Landing Water access (L). Downtown Drayton, ND. Parking, Fishing Platform. Short walk to downtown. 0.5 miles to Schumacher Park Campground. See www.Draytonnd.com and call 701-454-3590 or 701-454-3474 for current conditions.

vicinity of 208 Schumacher Park. 0.5 miles from Hastings Landing water access. Electric and water hookups, dump station, water, restrooms, showers, shelters, picnic tables, tennis court, swimming pool, basketball court, golf course, playground and baseball diamonds. Visit www.Draytonnd.com or call 701-454-3590 for more information.

206.7 Highway 17/317 bridge.

203.4 Drayton Dam. CAUTION: This dam is extremely dangerous with undertows that have caused several deaths. The dam is not marked. There is no identified portage but the ND side (left) has the best elevation for portaging. Adjacent to the dam on the ND side is a campground abandoned because of frequent flooding. Downstream of the dam is a popular fishing location with access from the ND side. No fishing is allowed within 150 feet of the dam.

203.3 Drayton Dam Water access (L) and Highways 5/175 bridges. Downstream of the dam. Parking. Bathroom. Shore fishing. Primitive camping. For more information and current conditions call 701-454-3590 or 701-454-3474.

179.6 Hwy 175 Water access (R). Parking. No facilities. Shore Fishing. Hallock, MN is 9 miles east which has 2 campgrounds and various facilities. See www.hallockmn.org.

158.4 Fort Daer Campground (L). Concrete boat ramp. Dock. 12 campsites with electricity and water plus additional tent pad sites. Restrooms with showers, picnic tables, shelters, fire rings, fish cleaning station, and playground. Located in Pembina, ND. A short walk takes you to North America's second oldest Icelandic Church. See www.cityofpembina.org.

vicinity of 158.4 Pembina State Museum. 0.8 miles west of landing. Exhibits, observation tower, museum store, meeting room and interpretive programs. For more information call 701-825-6840.

158.3 Highway 29 bridge.

155.0 International Border between the United States and Canada. Before crossing the border contact the US Customs and Border Protection www.cbp.gov and Pembina, ND office at 701-825-6551 and Canada Services Border Agency at web address www.cbsa-asfc.gc.ca and 204-983-3500. Be aware of current regulations concerning, but not limited to, boat/canoe registration and licensing, safety equipment required, firearms, prohibited foods, identification required, and passport/visa requirements before attempting to cross and recross the border. Usually an appointment is required to meet border crossing staff at the river.

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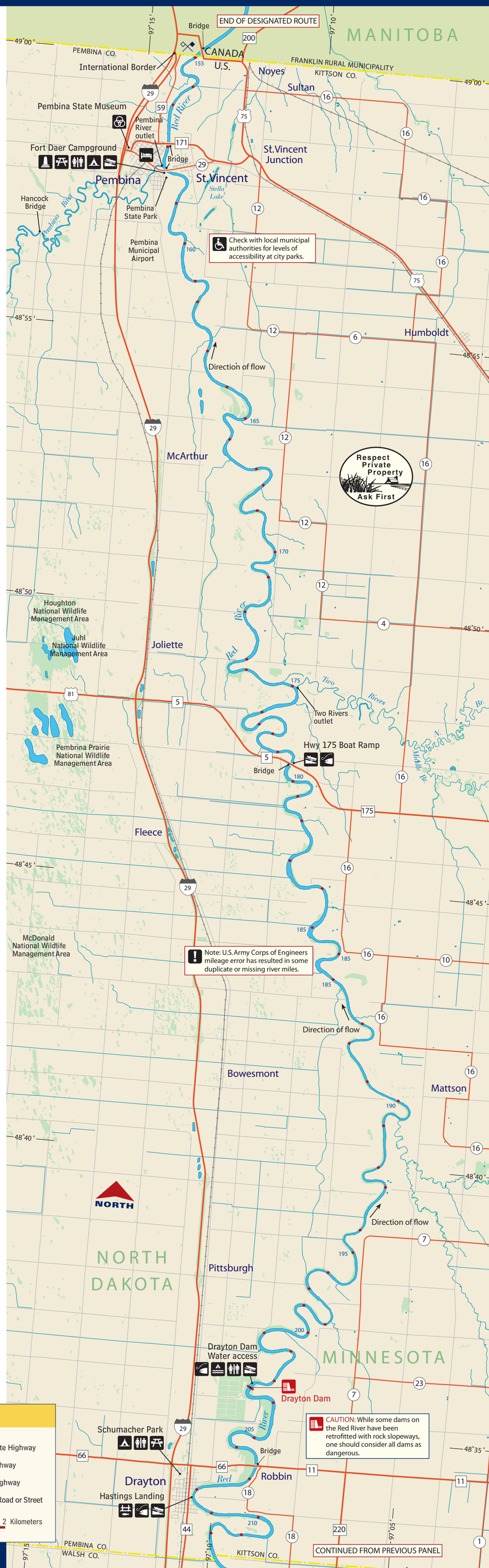
Look for this symbol along the Water Trail

red river of the north



Map Key

180 River Mile	Dam	Fishing Pier	94 Interstate Highway
Water Access	Rest Area	Shore Fishing	10 U.S. Highway
Campground	Historic Site	Lodging	9 State Highway
Watercraft Campsite	Restrooms	Note	18 County Road or Street
Interpretive Site			

0 1 2 Miles

0 1 2 Kilometers