

Results of Pre-Treatment Habitat and Biota Surveys from the Knife River, MN Watershed



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Executive Summary

This report follows the same layout and data summaries as the report provided to the Lake Superior Steelhead Association (LSSA) in 2017 (Dumke and Wellard-Kelly, 2017). Thus, much of the text from introduction and methods sections are repeated because each report has been written as a stand-alone document. The Natural Resources Research Institute (NRRI) was contracted in 2017 by LSSA to conduct pre-treatment stream habitat, fish, invertebrate, and water chemistry surveys on three segments of the Knife River mainstem anticipated to have channel restoration work applied in the future. The reaches were named 'Reach 4.5,' 'Reach 4_ED,' and 'Reach 4_CB' to match section labels used in planning by LSSA. We also measured all the same parameters in an upstream reach not expected to undergo any treatment, which serves as the control for later comparisons. This before-after-control-impact (BACI) design is our standard for attributing changes over time to specific treatments applied to the stream and is very useful in evaluating changes caused by habitat improvement projects. In total, four river segments (Reach 4.5, Reach 4_ED, Reach 4_CB, and Reference) were surveyed by NRRI with the full suite of options. In addition, three upper-watershed reaches (McCarthy, Red Dot, and White Landing) were surveyed via electrofishing only with the goal of detecting age0 Rainbow Trout presence, and two reaches on the Knife River mainstem were surveyed with rapid-response thermometers to detect ground-water inputs which would be important trout refuge during hot summer periods.

We found that all reaches had water quality parameters acceptable for all salmonid species present in the Knife River watershed. In fact, we found a ground-water spring within one of temperature survey reaches. The pre-treatment reaches had lower MSHA habitat scores than the Reference, which was largely due to the presence of large eroding stream banks, but all reaches had fish habitat in the form of woody debris and pools. Brown Trout were present in the lower segments, but absent in upper watershed reaches. Brook Trout comprised more of the fish community as surveys progressed into the upper Knife River watershed, which is typical. Rainbow Trout were present in every electrofished river section, but only one age0 Rainbow Trout was collected within White Landing, and no age0 were detected in Red Dot. Red Dot and White Landing were not far apart, and the low capture of age0 Rainbow Trout indicates there was very little spawning activity, or poor spawning success, of Rainbow Trout in these upper sections during spring 2017. Macroinvertebrate communities were similar among the four reaches sampled for bugs, but the Reference had slightly fewer sensitive taxa, likely due to that reach being a steeper slope and dominated by larger boulders that were half-buried in the stream bed by smaller rocks (which offers fewer spaces between rocks for invertebrates to hide).

Introduction

Minnesota's Lake Superior shoreline offers about 180 river-miles that are accessible to anadromous salmonids, although much of this habitat is unsuitable for reproduction (Schreiner, 2003). The Knife River and its tributaries provide 70 accessible river-miles and contain 43% of the total available habitat suitable for spawning of all Minnesota North Shore streams (Hassinger *et al.*, 1974; Schreiner, 1992). The Knife River watershed has received considerable attention by the Lake Superior Steelhead Association (LSSA) because it has a history of supporting salmonid populations, and it is one of the larger watersheds flowing from Minnesota into the Western arm of Lake Superior. Most segments of the Knife River watershed have experienced various amounts of logging, beaver activity, bank erosion, and migratory fish passage obstructions in the past.

The University of Minnesota Duluth, Natural Resources Research Institute (NRRI) has been requested by LSSA to perform various Knife River assessments over the years (Dumke *et al.*, 2014; Dumke and Brady, 2016; Dumke and Wellard-Kelly, 2017). The general goal of all these surveys is to find the most suitable locations for steelhead (aka Rainbow Trout *Oncorhynchus mykiss*) recruitment and to create a record of stream conditions before restoration work was initiated by LSSA and their collaborators. Pre-restoration surveys are important for demonstrating the effectiveness of restoration activities. Good documentation of stream condition and the organisms that live there allow post-restoration comparisons, assessment of the most cost-effective restoration activities, and the ability to track trends over time.

Several sections of the Knife River and its tributaries have been surveyed by NRRI in prior years (Figure 1). Our earliest electrofishing surveys (as well as a mix of habitat and invertebrate surveys) were in 2013 on the Knife River West Branch (Dumke *et al.*, 2014). In 2015 we intended to perform our complete suite of surveys (i.e., fish, bugs, habitat, and water chemistry) within Stanley Creek, but we found in mid-August that the stream was not flowing. Therefore, survey effort was diverted into four reaches of the Knife River mainstem (Dumke and Brady, 2016). A lower section of the Knife River mainstem was surveyed in 2016 following our standard Before-After-Control-Impact (BACI) survey design, where we collected the 'before' data on two 'impact' reaches, as well as a control (Dumke and Wellard-Kelly, 2017). The BACI design allows evaluation of change caused by an applied treatment by comparing repeated post-treatment surveys (aka 'after impact') with pre-treatment measures. Reference reaches (aka 'controls') define how much natural stream change occurs over time.

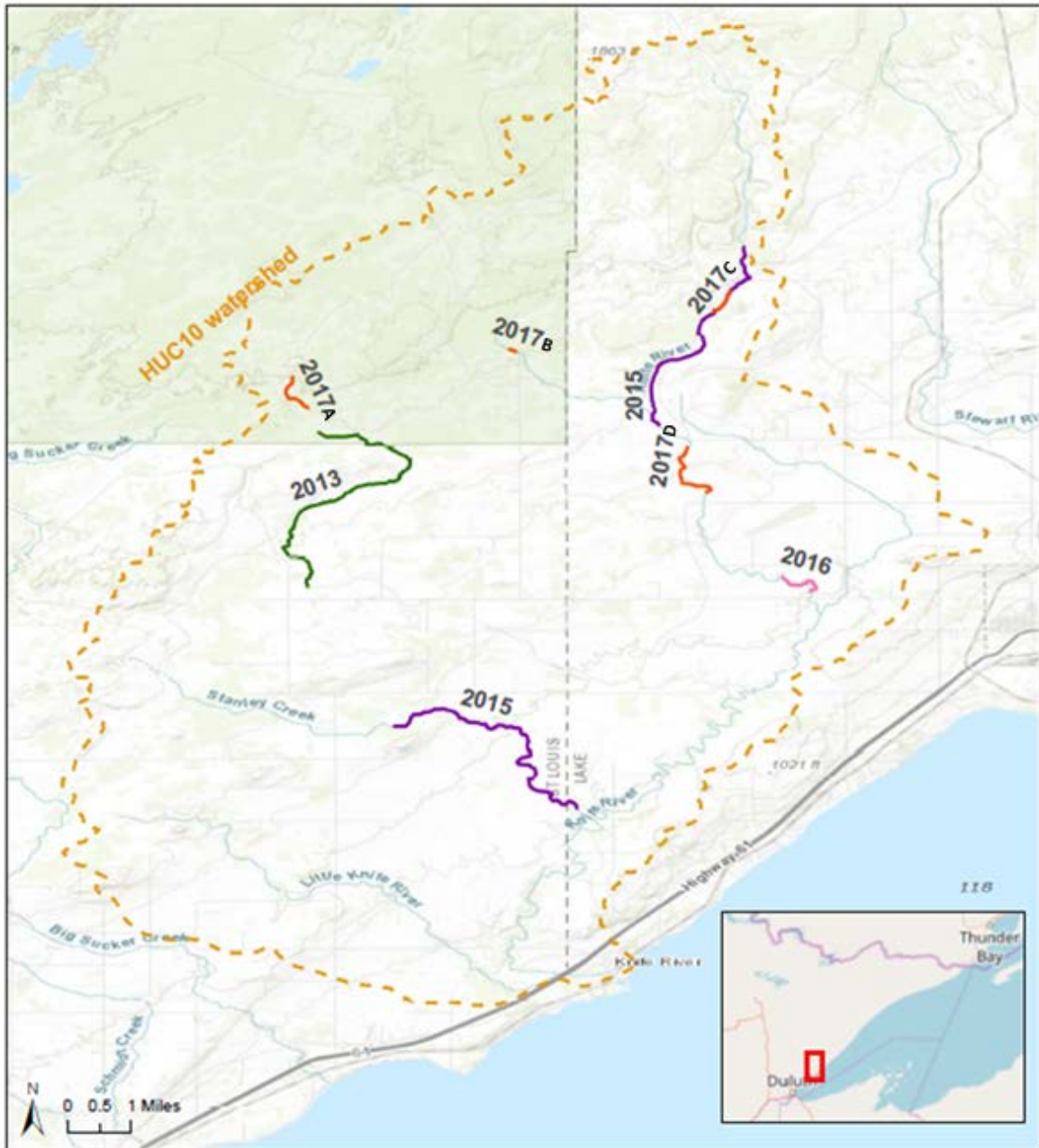


Figure 1. Knife River watershed which includes river segments surveyed by NRRI in prior years. Several river sections were sampled in 2017, which are identified by sub-letters: A) Red Dot and White Landing, B) Mcarthy Tributary, C) stream temperature surveys, and D) Reaches 4.5, 4_ED, 4_CB, and Reference.

The work NRRI performed in 2017 was split among several sections of the Knife River watershed and among several goals. We investigated the fish community of three upper watershed reaches for presence of age0 Rainbow Trout (Figure 1; 2017a & 2017b). These upper watershed surveys were concerned with fish only. Similarly, another section of the Knife River mainstem was of interest for a

temperature-only investigation to locate ground-water inflows (Figure 1; 2017c). Lastly, a section of river was identified as being a likely candidate for future channel restoration or habitat improvement work (Figure 1; 2017d). Three specific reaches were established named 'Reach 4.5,' 'Reach 4_ED,' and 'Reach 4_CB' to match section labels used in planning by LSSA. We also measured all the same parameters in an upstream Reference reach not expected to undergo any treatment (Figure 2). In total, four river segments (Reach 4.5, Reach 4_ED, Reach 4_CB, and Reference) were surveyed by NRRI with the full suite of survey options: fish, bugs, habitat, and water chemistry. See Table 1 for coordinates.

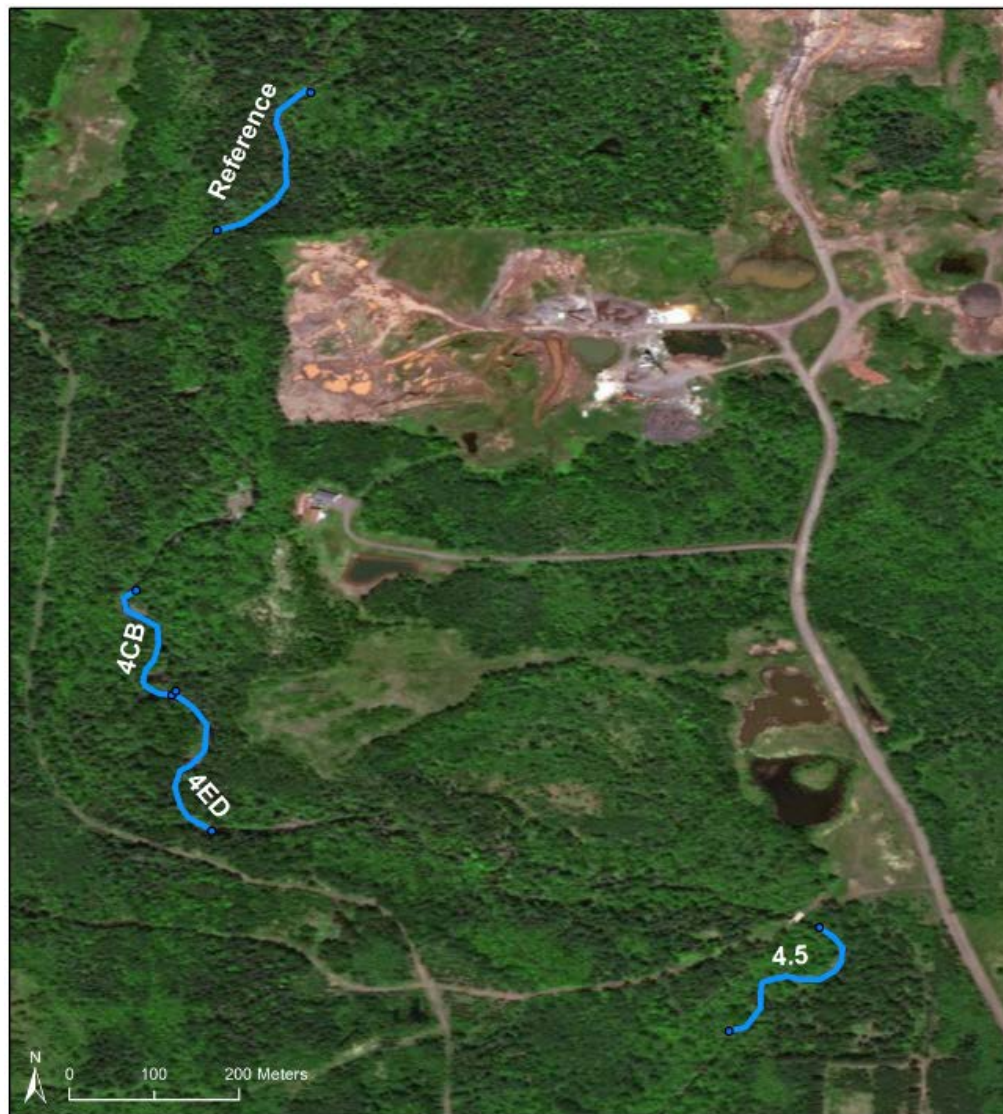


Figure 2. Reach locations sampled by NRRI on the Knife River mainstem in 2017. These four reaches were surveyed for habitat, fish, and aquatic macroinvertebrates (i.e., complete surveys). Refer to Figure 1 for the extent of this map within the Knife River watershed.

Table 1. GPS coordinates (WGS84) of reach beginning and endpoints for 2017 Knife River surveys.

Reach	Start Location		End Location	
	Latitude	Longitude	Latitude	Longitude
Reach 4.5	N47.05674	W091.76256	N47.05784	W091.76160
Reach 4_ED	N47.05886	W091.76804	N47.06034	W091.76842
Reach 4_CB	N47.06034	W091.76842	N47.06146	W091.76889
Reference	N47.06522	W091.76798	N47.06668	W091.76699
Mcarthy	N47.08891	W091.80606	N47.08907	W091.80760
Red Dot	N47.07603	W091.85338	N47.07646	W091.85423
White Landing	N47.08181	W091.85694	N47.08311	W091.85694
Temp1	N47.09763	W091.76094	N47.09933	W091.75883
Temp2	N47.10144	W091.75786	N47.10270	W091.75751

Methods

Habitat Survey

Habitat surveys were conducted within the Reference reach on September 12, 2017, which was followed by Reaches 4.5 and 4_ED on September 13th and Reach 4_CB on September 14th. Stream surveys need to be conducted at or near baseflow, so we performed all habitat surveys quickly while the weather was cooperative. Stream width was measured ten times across different features (riffle, run, pool) and averaged to calculate the mean stream width (MSW) for each reach. Total reach length was determined by multiplying MSW by 35, which is a standard method for stream surveys because this stream length generally includes 3 riffles and 3 pools habitats (Leopold *et al.*, 1964). The minimum reach length for habitat surveys is 100 m and the maximum is 350 m. A long and shallow riffle served as a nice location to divide Reach 4_ED from Reach 4_CB. Reaches 4_ED and 4_CB were placed consecutively to ensure we captured data from the entire river segment receiving treatment. When possible, we place reach endpoints 10x MSW from road crossings, bridges, tributaries, or other features that may influence channel or habitat conditions. However, the end location of Reach 4.5 was only 20 m downstream from a snowmobile bridge, but we had little room to shift this reach because we wanted to ensure the entire length of eroding banks were included in our survey. Start and end locations of all reaches were marked using handheld GPS using datum WGS84 (Table 1).

Habitat surveys were conducted walking from downstream to upstream within the reach to limit our own disturbance during the survey. Start locations were chosen at the downstream end of reaches in glides immediately upstream of a riffle, where water movement was relatively homogenous and at a depth that was sufficient for water velocity measurement. Water velocity was also measured during all biotic surveys (fish and macroinvertebrates) near reach start locations. Discharge (total volume of flowing water) was calculated following the methods of Platts *et al.* (1983). Water chemistry was measured just upstream of each reach's start location using a Hydrolab MS5 sonde and surveyor to record stream temperature (°C), dissolved oxygen (percent saturation and concentration (mg/L)), specific conductivity ($\mu\text{S}/\text{cm}$), and pH. Readings were taken in slow moving water (avoiding turbulent flow as well as slack water). Water clarity (cm) was measured with a transparency tube near each reach's start location.

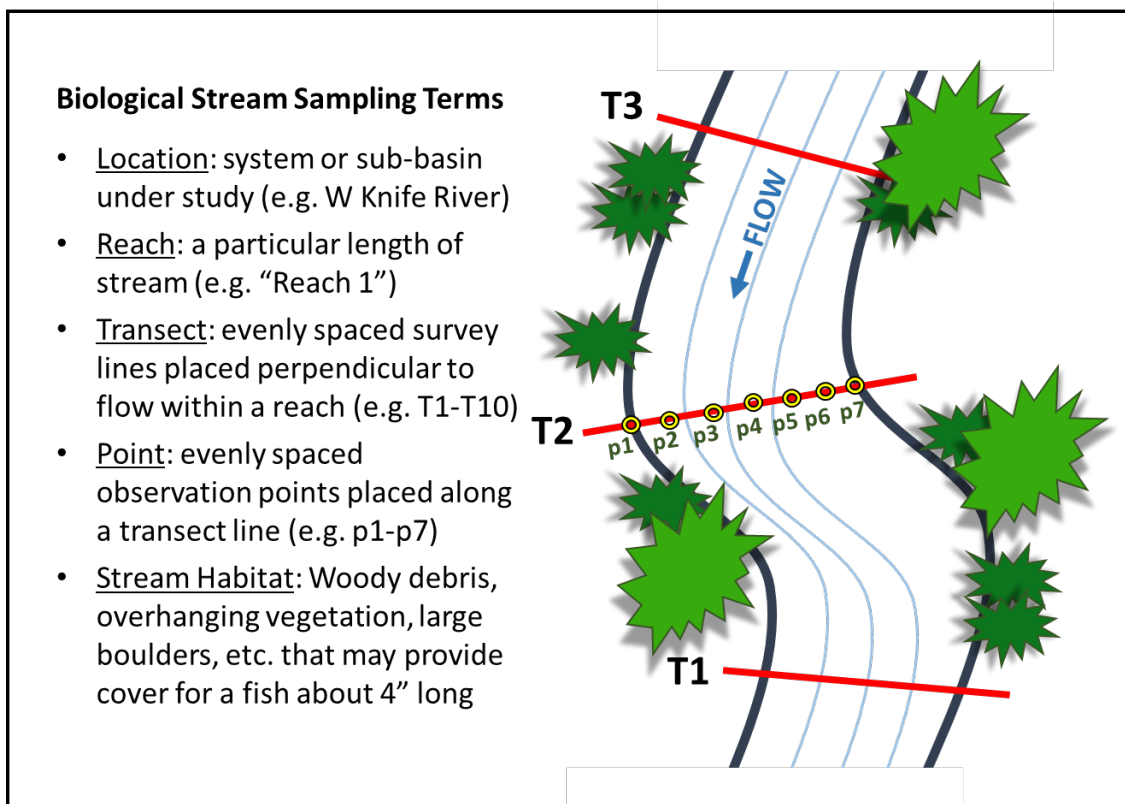


Figure 3. Definitions of survey terminology and example diagram of transect and point measure placements within reaches.

Within each reach we established 10 evenly-spaced transects for measurements across the stream channel (Figure 3). At each transect the stream channel feature type was noted (riffle, run, pool, or other), and measurements were recorded for wetted stream width (m), bankfull width and bankfull

depth, lowest bank height (measures the ability of the stream to connect with its floodplain), count of large wood (>10 cm diameter; good fish cover), and nearest tree diameter at breast height (DBH) on left and right banks (indicates time since last major flood or beaver occupancy). All of these measurements are important for characterizing stream channel shape and habitat for stream fish. The percent of the stream channel shaded by trees, bushes, or even tall streamside grass was measured at several positions on each transect with a densiometer. A densiometer is a handheld foresters tool that measures canopy cover (amount of shade is inferred) using a dome-shaped mirror with overlain gridlines. Streamside vegetation type was noted next to the stream (0-10 m from each bank) and further away from the stream (10-30 m from water's edge) on left and right banks. Percent slope of left and right banks was estimated with a clinometer; this helps assess bank stability and danger of erosion (in combination with bank substrate type). Digital photographs were taken of each transect.

We counted pieces of coarse woody debris (CWD) within 1 m up and downstream of each transect. We defined CWD as any pieces >10 cm diameter and 1 m length. At each transect we evaluated stream conditions by evenly spacing 7 points across the wetted channel (Figure 3). Points 1 and 7 are the left and right waters-edge, respectively, and points 2 through 6 are within the wetted channel. At every point across each transect we measured water depth (m) and visually estimated the percent composition of bottom substrates within a 0.5 m² area. Substrates types were boulder (>256 mm), cobble (256-64 mm), large gravel (64-32 mm), small gravel (32-2 mm), sand (2-0.062 mm), silt (0.062-0.004 mm), and clay (<0.004 mm) (Dumke *et al.*, 2013).

When coarse substrates (gravels, cobble, and boulder) were present along with fine substrates (sand, silt, and clay), we visually estimated the percentage that large substrates were embedded (buried or surrounded) by fine substrates. This shows the amount of habitat space available under and around the rocks for fish eggs, small fish, and the aquatic macroinvertebrates that fish feed on. At each point we also measured the depth of fine substrates (sand, silt, and clay), called refusal depth, with a 1 m long rod. This is another measure of the amount of fine particles burying the more preferred rocky substrates in each stream reach. At each point we also recorded any boulder, CWD, overhanging bank, vegetation, or other type of functional cover available for larger trout (about 4" long, or >100 mm). For CWD to be considered fish habitat, they need to be in water >0.2 m deep and partially fixed to the stream bank or bottom so that they are relatively stable and not easily dislodged by flow.

We sketched a stream map (Appendix I) and counted the pieces of large wood present in the entire reach to get a better measure of large wood available as fish habitat. Acquiring an accurate

stream slope (%) is difficult within small streams with an overhead canopy. We used three different methods of acquiring elevation of reach beginning and endpoints: elevation recorded on handheld GPS units, from MnTOPO, and from the vertical datum NAVD88 in our GIS lab. The elevations that appeared to be most accurate were used to calculate the change in elevation over the measured stream distance (rise/run). We used the measurements from the habitat survey to calculate a habitat quality score using the MPCA Stream Habitat Assessment (MSHA) protocol (MPCA, 2014). The MSHA differs slightly from the Ohio EPA Qualitative Habitat Evaluation Index (Rankin, 2006) that NRRI used in the past. The MSHA contains scoring criteria selected to be of importance in Minnesota streams and should be more representative of our region than a scoring system developed for Ohio. We used one-way analysis of variance (ANOVA) in the R statistical program ($\alpha \leq 0.05$; R Core Team, 2015) to determine if differences between means were statistically significant.

Temperature Survey

We conducted temperature surveys on two adjacent reaches in the Knife River watershed (Figure 1) using a wand constructed of $\frac{3}{4}$ " PVC, an AquaTuff waterproof thermocouple thermometer (#35200-K), and a blunt-tip temperature probe (#50316). These temperature wands display near-instantaneous changes in water temperature. Baseline, or "average," stream water temperature is determined with the wand at the beginning of the temperature survey. A cold-water spot was identified as any location where the temperature was 2°C below the baseline stream temperature (Torgersen *et al.*, 2012). Following establishment of the baseline stream temperature, technicians moved upstream with the wand in the water to search for cold-water locations like tributaries, ground water springs, or pockets of cool water in deep pools or undercut banks. We surveyed all areas of the stream including both the left and right banks (Figure 4). We continued to record the baseline stream temperature every 15 minutes and marked these locations on a GPS. When we identified a cold-water location, we recorded the stream temperature, GPS location, type of cold water (i.e., spring, tributary, pool, etc.), and measured the area of the cold-water location, if possible. The reach furthest downstream was surveyed using a canoe because it started at a beaver pond and was very mucky, but technicians were able to wade the second reach. Air temperature was recorded at the beginning and end of each survey. We also recorded dissolved oxygen within beaver impoundments, as temperature and oxygen content are important habitat suitability criteria for trout and salmon that can shift to unsuitable levels within beaver ponds.



Figure 4. Technician collecting instantaneous temperature data from a MN Lake Superior tributary using a temperature wand constructed at NRRI.

Macroinvertebrate Survey

Aquatic macroinvertebrates are animals without backbones (snails, crayfish, insects, worms) that are larger than plankton and live all or much of their life in the water. Aquatic macroinvertebrates are important food for fish, and the different types found can tell us a lot about year-round environmental conditions because they are less mobile than fish and cannot easily move to other sections of the stream if conditions become suboptimal. Aquatic macroinvertebrates were collected from four segments (Reaches 4.5, 4_ED, 4_CB, and Reference) with different sampling devices, as each type of device performs optimally in different sampling conditions. We took three quantitative samples (sampling a known area of stream bed) using a Hess sampler (Figure 5), as well as one qualitative D-frame dip net (D-net) from each of the four reaches. The Hess sampler functions properly in 15-35 cm water depth with gravel bottom substrates where the bottom of the Hess can be pushed into the streambed to create a seal. The Hess is an excellent quantitative sampling device for calculating the

abundance of macroinvertebrates per unit area, which is one way to compare productivity and quality of forage available to fish. Qualitative D-net samples capture organisms occupying a variety of other habitat types so we can collect species from places that a Hess cannot sample. D-net samples are collected by sweeping vegetation hanging or growing in the water, undercut banks, large wood, organic material, turning over large boulders, and other unique habitat types.



Figure 5. A Hess sampler similar to the equipment used by NRRI. Rocks are thoroughly scrubbed to dislodge macroinvertebrates, which are captured in an attached catch net.

All samples were sieved (250 μm mesh) to remove fine (silty) sediment, and the remaining sample was preserved with 95% ethyl alcohol. Preserved samples were labeled and logged into a chain of custody to ensure all samples were tracked from the field to the laboratory. In the laboratory we use standard identification guides (Thorp and Covich, 2010; Merritt *et al.*, 2008; Wiggins, 1996) to identify macroinvertebrates as completely as possible, which was usually to genus. Macroinvertebrate sample processing, identification, and quality control procedures are explained in the NRRI Standard Operating Procedures (Dumke *et al.*, 2013).

Fish Survey

Fish were sampled by NRRI field crews with a single-pass removal in MCarthy, Red Dot, and White Landing to detect presence of age0 Rainbow Trout, and two-pass removals in Reach 4.5, Reach 4_ED, Reach 4_CB, and Reference so we could calculate population estimates. All electrofishing surveys

were completed between September 7, 2017 and September 14, 2017. Timing of electrofishing surveys typically must fall between July 1 and September 15. July is late enough that steelhead fry have emerged from stream gravels, and the later date is important not to exceed for two reasons: 1) to limit disruption of Brook Trout *Salvelinus fontinalis* reproduction, and 2) leaf-off for deciduous trees in our area is usually near the end of September, and leaves flowing down the stream during electrofishing surveys make spotting fish more difficult. Multiple-depletions are a standard survey method used by NRRI, which allows estimation of fish populations within the surveyed reaches.

However, a “closed” population of fish is required to meet the population estimate assumptions. This can be attempted by setting up 3/16” mesh block nets on the downstream and upstream ends of each reach. In this case, there was too much flow and the Knife River was too large for nets to be deployed effectively (which is typically the case). We used natural barriers (riffles) as locations to begin and end our electrofishing reaches. We calculated stream discharge at the beginning of each reach before electrofishing. We also recorded temperature, dissolved oxygen, pH, and specific conductivity. A holding pen held the fish captured in each electrofishing pass until they could be processed. The holding pen was divided into three separate compartments, one for each electrofishing pass. Each electrofishing pass was timed so we could standardize fish capture as catch per unit effort (CPUE) to allow comparison among stream reaches.

We used two different direct current (DC) backpack electrofishing units: an ETS APB-3 and Smith-Root 12-B. The pulse rate of both units was set at 30 Hertz (Hz), which is the rate recommended for safe collection of salmonids (AFMD, 2004). We calibrated the voltage for units within each reach by increasing voltage when fish were observed escaping the electrical field, and decreasing voltage if fish were immediately paralyzed. We continued adjusting within the voltage endpoints of “too little” and “too much” until we had a good electrotaxis response (involuntary swimming toward the anode) of a distance about 1 m from each anode. Inducing a proper electrotaxis response greatly increases the capture rate of fish because the operator can “pull” fish from cover or the stream bottom and guide them to a capture net. Fish can be injured by voltage settings which are too high, so we constantly inspected fish for signs of injury or distress during sampling to ensure that voltage settings were in the correct range.

Electrofishing began at the downstream end of each reach and continued while working upstream, shocking all habitats and collecting all stunned fish in Reaches 4.5, 4_ED, 4_CB, and Reference. However, we only collected the stunned trout in Mcarthy, Red Dot, and White Landing.

Special attention was given to deep pools, overhanging banks or vegetation, scour-pools underneath logs, or other habitats where fish could find refuge. All collected fish were identified during processing, and 20 individuals from each size class of 0-100, 101-250, and >251 mm were measured for total length (TL) in millimeters. Trout species were also weighed (g) after their length was measured. After 20 individuals were measured, we counted fish within each of the three size classes. Any dead fish were noted so we could calculate a mortality rate, and a few fish were preserved for positive laboratory identification. All other fish were released back into the stream after processing.

Population estimates are usually only calculated for game fish, and electrofishing gear samples larger individuals more effectively than small fish, so a field technician kept count of trout ≥ 100 mm TL collected in each pass. Our depletion efficiency of trout ≥ 100 mm TL was greater than 50% between passes 1 and 2 for all reaches, so we stopped electrofishing after two passes. Had depletion between the 1st and 2nd passes been under 50% for larger trout, we would have performed a 3rd depletion pass to improve the accuracy of population estimates. Population estimates of trout species were calculated using the Fisheries Stock Analysis (FSA) package (Ogle, 2016a) in R statistical program.

Results and Discussion

Habitat

Among all reaches we found the water quality parameters such as dissolved oxygen, pH, temperature, and water clarity to be acceptable for trout (Table 2). Habitat surveys were conducted among all reaches at nearly the same discharge, and all reaches had forested riparian areas. However, we found that the channel dimensions of this section of the Knife River did not fit conventional norms. Bankfull is the corresponding stream flow that creates and maintains the shape of the stream channel, with a recurrence interval of approximately every 1.5 years (Rosgen, 1994). This means about every year-and-a-half storm flows fill the stream to the bankfull amount, and this is the discharge event that creates the general shape and form of the stream channel. Typically, streams get smaller as you progress upstream because the watershed area that contributes storm runoff also gets smaller, but we did not find that pattern in our measurements of stream or bankfull width. This is likely due to the bank erosion and channel instability of the lower reaches, but also because our reaches were not very far apart and there may not be enough distance between reaches to adequately compare channel development.

Table 2. Summary of habitat survey measurements. Means are displayed in bold, with their associated standard error in parenthesis: **mean** (SE). MCD = mixed conifer and deciduous forest, CWD = large (coarse) wood (>10 cm diameter and >1 m long), DBH = tree diameter at breast height.

Survey Measure	Reach 4.5	Reach 4_ED	Reach 4_CB	Reference
Station Length (m)	185	186	171.5	198
Habitat Survey Date	9/13/2017	9/13/2017	9/14/2017	9/12/2017
Discharge (m ³ /sec)	0.157	0.164	0.150	0.160
Discharge (ft ³ /sec)	5.55	5.81	5.29	5.66
Riparian Type (0-10 m)	MCD	MCD	MCD	MCD
Riparian Type (10-30 m)	MCD	MCD	MCD	MCD
MSHA Score ¹	76.0	71.5	70.0	86.7
Temperature °C	12.55	13.72	13.25	11.51
Temperature °F	54.59	56.70	55.85	52.72
Specific Conductivity (µS/cm)	158.5	158.6	155.5	149.3
Dissolved Oxygen (%)	100.5	100.7	102.3	104.1
Dissolved Oxygen (mg/L)	10.18	9.97	10.19	10.89
pH	7.23	7.23	7.47	7.52
Secchi Tube (cm)	> 100 cm	> 100 cm	> 100 cm	> 100 cm
Percent Slope	0.81%	1.53%	1.11%	2.37%
Width/Depth Ratio	11.69	10.27	13.22	15.12
Cross-sectional Area (m ²) ²	0.79	0.69	0.70	0.95
Total Coarse Woody Debris (CWD)	29	32	19	14
Mean Pieces CWD	1.80 (0.76)	1.90 (1.07)	0.50 (0.31)	0.90 (0.35)
Mean Stream Fish Cover	2.30 (0.45)	1.90 (0.59)	1.40 (0.52)	3.10 (0.53)
Mean Bank Fish Cover	0.60 (0.15)	0.90 (0.18)	0.70 (0.21)	0.70 (0.30)
Mean Stream Canopy Cover (%)	71.9 (3.56)	55.0 (4.45)	52.1 (5.79)	63.1 (3.29)
Mean Bank Canopy Cover (%)	91.9 (1.11)	81.3 (4.17)	85.2 (7.93)	95.8 (1.09)
Mean Stream Width (m)	3.04 (0.31)	2.67 (0.40)	3.04 (0.74)	3.78 (0.39)
Mean Water Depth (m)	0.26 (0.02)	0.26 (0.03)	0.23 (0.02)	0.25 (0.02)
Mean Thalweg Water Depth (m)	0.39 (0.06)	0.41 (0.10)	0.38 (0.04)	0.35 (0.05)
Mean Bank Slope (%)	82.4 (8.98)	175.0 (63.6)	292.0 (94.2)	83.7 (6.64)
Mean Tree DBH (cm)	6.94 (2.08)	9.20 (1.92)	9.62 (2.98)	17.50 (3.06)
Mean Embeddedness (%)	9.9 (2.04)	10.1 (3.69)	2.70 (1.79)	7.46 (3.11)
Mean Refusal Depth (cm)	1.25 (0.30)	0.59 (0.22)	0.14 (0.12)	0.84 (0.34)
Mean Bankfull Width (m)	6.53 (0.26)	7.24 (0.37)	7.25 (0.41)	7.47 (0.35)
Mean Bankfull Depth (m)	0.59 (0.06)	0.60 (0.10)	0.59 (0.5)	0.65 (0.05)
Mean Low Bank Height (m)	0.88 (0.06)	0.93 (0.08)	0.87 (0.7)	0.80 (0.07)
Floodprone Height (2xBFD) (m)	1.18	1.20	1.18	1.30

¹ See Appendix II for all sub-scores. ² Calculated from mean stream width and mean water depth.

Bankfull height and low bank height were measured as distance above the water's surface, so mean thalweg water depth was added to mean bankfull height and to low bank height to calculate the height above the stream channel within a floodprone area (Table 2). The thalweg is the area of fastest current velocity. While it is sometimes in the center of the stream, particularly in a straight reach, this fast-flow area meanders from side to side as the stream rounds bends. The floodprone area is the portion of the flood plain that would be flooded if the water depth was twice as high as the maximum bankfull depth. This water depth should include flood events up to a 50-year flood (occurs on average only once every 50 years; Rosgen, 1994). An entrenchment ratio indicates vertical channel confinement, or in other words, how much the stream channel is confined within high banks or valley walls that do not allow flood waters to spill out onto a floodplain. Entrenchment ratio is calculated as the width of the floodprone area divided by the bankfull width (Rosgen, 1996), with higher values indicating lower levels of entrenchment. The low bank height in all reaches was lower than the height of the floodprone area, which means floods are frequently able to top the low bank height and access an expansive floodplain. None of the surveyed reaches were entrenched.

Eroding banks and were present within Reaches 4.5, 4_ED, and 4_CB, but that did not seem to affect fish cover too much when compared to the Reference. There was significantly ($p < 0.05$) more in-stream fish cover in the Reference reach than Reach 4_CB, on average, but no difference when compared to Reach 4.5 or Reach 4_ED. The occurrence of fish cover along banks did not differ much among reaches (Table 2). In-stream fish cover in the Reference reach was largely influenced by the presence of large boulders and plunge pools, while the other reaches had more diverse mixes of wood, vegetation, and pools. Pieces of wood large enough for fish cover, or coarse woody debris (CWD), were present in all reaches. The Reference reach had the least total observed pieces of CWD, but it was fairly evenly distributed. Reach 4.5 and Reach 4_ED had the most total pieces of CWD (Table 2), but there was also more "clumping" of many pieces of CWD in small patches. One transect in Reach 4.5 had a debris pile with 8 pieces of CWD, and another debris pile in Reach 4_ED had 11 pieces, which is typical of river segments with unstable channels and bank erosion. Mean bank slopes were highest in Reaches 4_ED and 4_CB due to eroding outside bends that had nearly-vertical bank slopes, but Reach 4.5 had very similar bank slopes to the Reference.

The percent canopy cover near the banks was significantly greater than the percent canopy cover over the center of the stream among all reaches, which is typical, as this measure captures small trees and tall grasses as well as the overhead canopy. On average, canopy over the center of the steam

was 28% less than the canopy measures taken near banks. Reaches 4_ED and 4_CB had the least percent canopy cover, and factors influencing this are likely the eroding banks and evidence of recent channel movement (particularly in Reach 4_CB). Instability and erosion along stream banks diminish the presence of riparian vegetation tall enough to cover the majority of the stream channel. Riparian trees were largest on average in the Reference reach (Table 2), which would be expected as this segment of the Knife River was the least influenced by channel migration and bank erosion. Mature trees are desirable in riparian areas because their canopy blocks solar radiation in the summertime and reduces rates of stream warming (a known stressor of concern in Minnesota trout streams). Mature forests also supply allochthonous inputs of coarse woody debris to the channel, which is important for macroinvertebrates and fish.

Table 3. Summary of all stream bottom substrate compositions from within the wetted stream width of each reach. Displayed as means in bold with standard error in parenthesis: **mean** (SE).

Mean Substrate	Reach 4.5	Reach 4_ED	Reach 4_CB	Reference
% Bedrock	0.0 (na)	0.0 (na)	0.0 (na)	0.0 (na)
% Boulder	1.8 (1.0)	7.8 (2.3)	10.4 (2.7)	29.5 (3.9)
% Cobble	33.3 (3.8)	39.5 (3.4)	47.3 (3.8)	38.5 (3.4)
% Gravel, lg	31.7 (2.6)	30.0 (2.7)	23.1 (2.8)	10.8 (1.5)
% Gravel, sm	25.6 (2.7)	17.1 (2.4)	18.5 (2.9)	15.8 (2.8)
% Sand	6.7 (1.5)	3.3 (1.8)	0.2 (0.1)	2.9 (1.8)
% Silt	0.3 (0.2)	0.9 (0.7)	0.5 (0.4)	2.5 (1.5)
% Clay	0.5 (0.4)	1.6 (1.2)	0.0 (na)	0.0 (na)

The Reference reach had the highest MPCA Stream Habitat Assessment (MSHA) score at 86.7 (higher is better). The MSHA scores integrate multiple stream characteristics into one value and can be used to compare streams. Scoring is based on adding sub-scores for categories of 1) Watershed Land use, 2) Riparian Zone, 3) Instream Substrate, 4) Instream Cover, and 5) Channel Morphology; the Reference reach ranked highly in all of these. Appendix II includes full scoring criteria for all reaches. The Reference was dominated by cobbles and boulders (Table 3) and had the most stable stream conditions. Reaches 4.5, 4_ED, and 4_CB also had lots of cobble substrate, but much more of the stream bottom composition was comprised of large and small gravels. The ability of fish to move gravel is a function of body size, so the prevalence of large gravels and cobbles in all surveyed reaches indicate this section of the Knife River aligns best with the spawning activities of large-bodied migratory fish, which use larger substrates. Sand, silt, and clay were very sparse among all four reaches (Table 3), and the refusal depth

and percent which coarse substrates were embedded was very low (10.1% or less) among all reaches (Table 2). Relatively-clean gravels indicate the stream has enough power, and low enough amounts of sand, silt, and clay entering it (even despite eroding banks), to transport most fine sediment downstream rather than allowing it to accumulate on the stream bed.

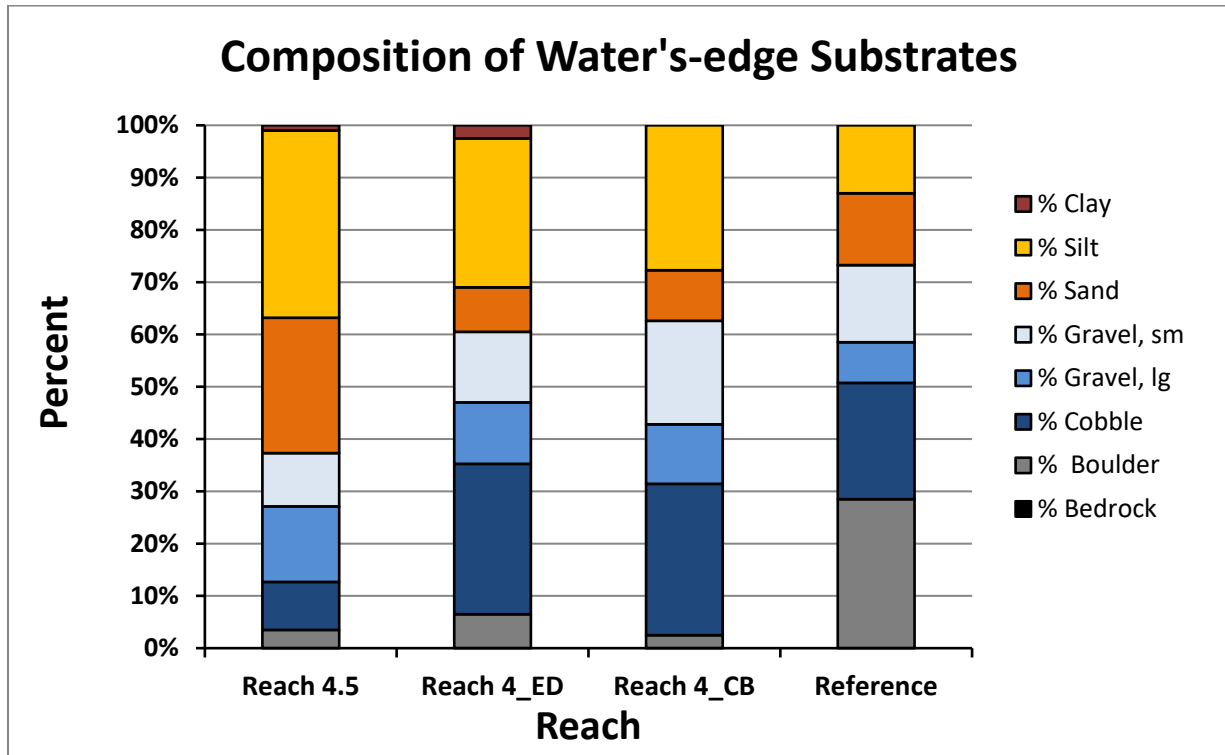


Figure 6. Cumulative percent composition of substrates located on the water’s edge. Sand, silt, and clay are more likely than rockier substrates to erode during high flows.

Retention of some fine sediment is normal, improves habitat variability, and indicates there are slower-flowing areas within a reach that can be important habitat for young and small fish, particularly along the stream edges. The substrate along the water’s edge is typically dominated by fine substrates (sands, silts, clays) since these locations are where stream power is very low and deposition of fines occurs. Among all reaches we still found 35-70% of the wetted-edge substrates to be coarse substrates rather than fines (Figure 6). Pool habitats also tend to hold more fine sediment than faster-flowing sections of river. We compared substrate composition within reaches by the transect feature types of Pool/Glide or Riffle/Run combinations, which separates the typically slow water velocity (pool/glide) from the typically fast (riffle/run) sections. There were not many Pool/Glide feature types to use in this analysis (Reach 4.5: n=2, Reach 4_ED: n=2, Reach 4_CB: n=3, Reference: n=2), but in general, pools tended to hold more fine sediments (Figure 7).

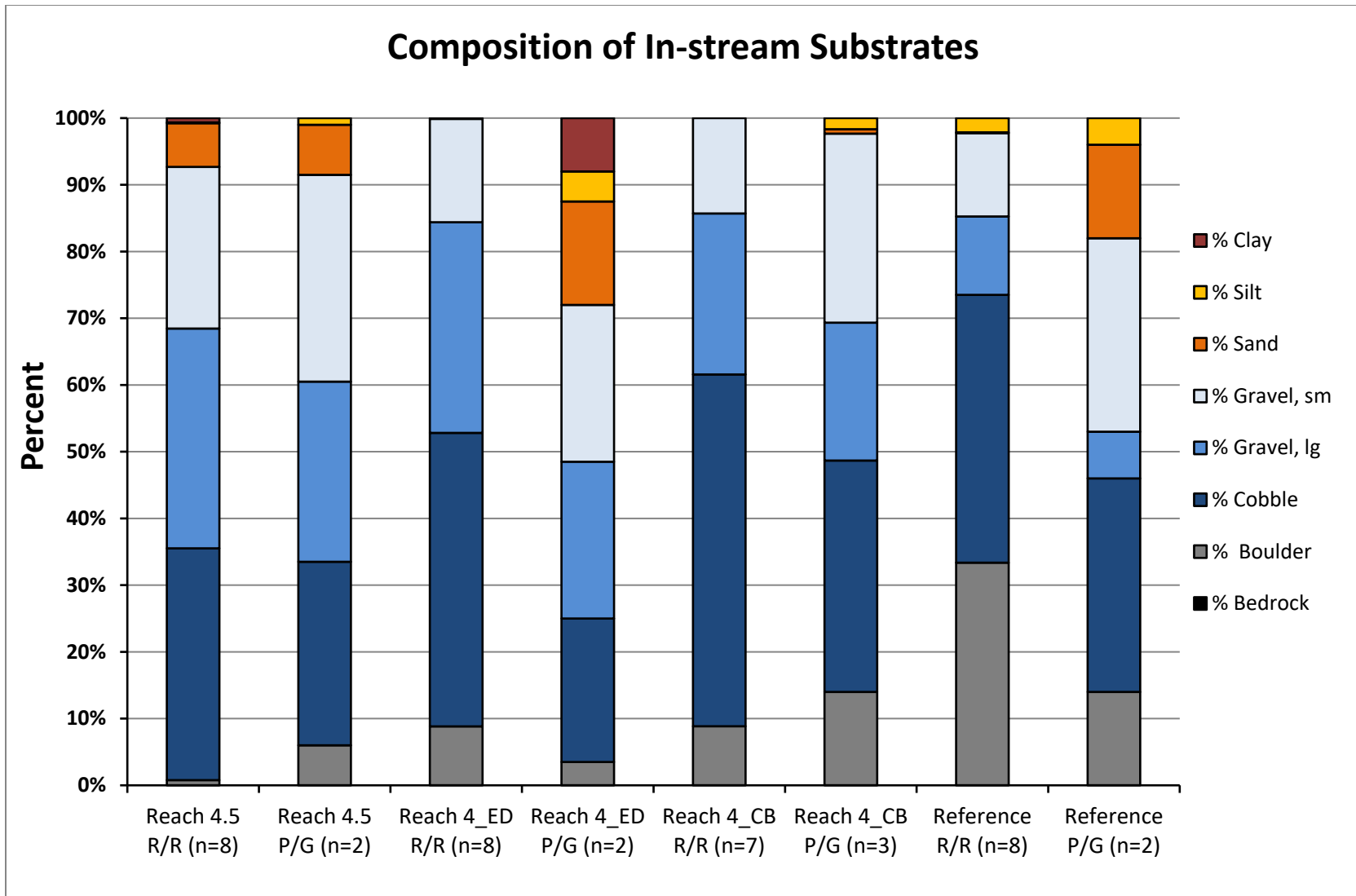


Figure 7. Cumulative percent composition of stream bottom substrates within the wetted channel by feature type: **R/R**=riffles/runs, **P/G**=pools/glides. Number of occurrences of each feature type in each reach is shown as **n=x**. See methods section for size ranges of each substrate.

Temperature Survey

Temperature surveys were conducted on the afternoon of 9/1/2017, which was a sunny day with average air temperature of 16.1°C (61°F) measured on-site. Records on that date near Two Harbors indicated air temperatures were closer to 70°F, so the river likely had a cooling effect on our air temperature measurements. Our field staff conducted temperature surveys on two reaches that were old beaver impoundments: Temp1 (lower) and Temp2 (upper). Temp1 was approximately 290 m in length, and the Temp2 survey distance was approximately 200 m. Locations of stream temperatures are provided in Table 4.

Table 4. GPS coordinates (WGS84) of measured stream temperatures.

Segment ID	Feature	Temp °C	Temp °F	Latitude	Longitude
Temp1	Stream-start	13.3	55.9	N47.09763	W091.76094
Temp1	Stream-interval	12.0	53.6	N47.09869	W091.75983
Temp1	Stream-end	12.0	53.6	N47.09933	W091.75883
Temp1	Cold Spot	7.7	45.9	N47.09842	W091.76098
Temp2	Stream-start	12.7	54.9	N47.10144	W091.75786
Temp2	Stream-interval	12.0	53.6	N47.10268	W091.75756
Temp2	Stream-end	12.0	53.6	N47.10270	W091.75751
Temp2	Cool Spot	11.0	51.8	N47.10239	W091.75732
Temp2	Cool Spot	11.1	52.0	N47.10260	W091.75759

We found only one spot which met the criteria for a cold-water location, and it was located about 90 m upstream from an old beaver pond and off in a side channel (Figure 8). This spot was a spring with multiple bubbling outflows that substantially lowered local stream temperature in an area of about 30 square feet. Temperature surveys in the upper segment were fairly consistent, and while no spots were identified that met the criteria of a “cold” spot, we did find some places where temperatures were about 1°C less than the average stream temperature. These “cool” spots were found in a pool and undercut bank. Overall, the average stream temperature for this entire section of river was 12.3°C (54.2°F). One of the warmest temperatures collected was at the beaver impoundment at the beginning of the temperature survey (Figure 9). However, the temperature measured there was still within optimal ranges for trout, and the measured dissolved oxygen remained high at 9.9 mg/L and 110% saturation. The high daytime dissolved oxygen in the abandoned beaver pond is due to photosynthetic activity of aquatic vegetation rather than riffles creating surface water turbulence. High daytime oxygen

concentration can sometimes be offset by night-time lows, and since these surveys were conducted only on one afternoon it is uncertain whether this inactive beaver pond would have favorable conditions for trout throughout an entire summer. Longer-term dissolved oxygen and temperature instrumentation would need to be installed to determine if there are periods over the summertime when this inactive beaver pond becomes unsuitable for trout.

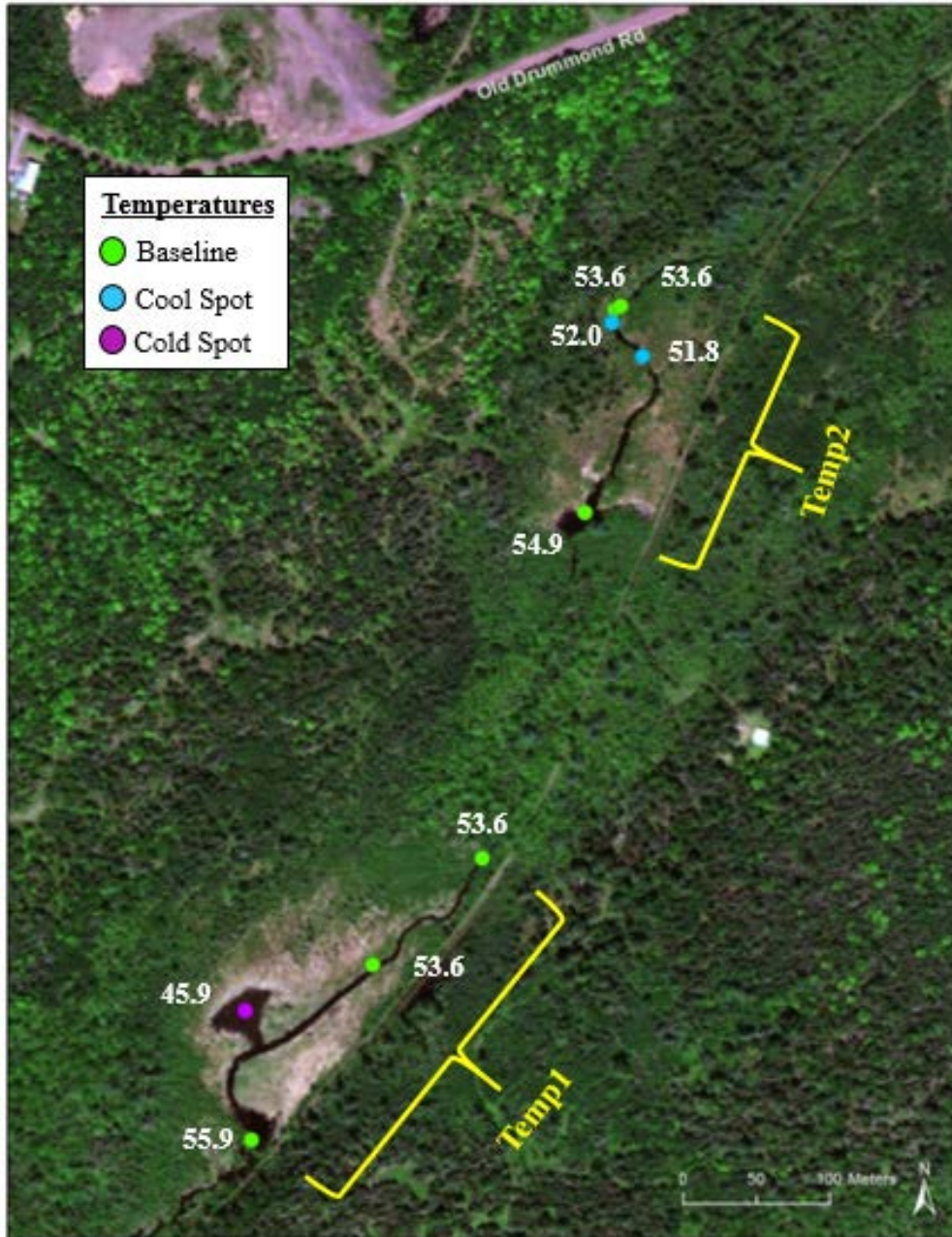


Figure 8. Map of measured stream temperatures (°F) from the Knife River. The average stream temperature was about 54°F. One ground-water spring was located with water temperature of 45.9°F.



Figure 9. Image of a beaver impoundment where the temperature surveys began. The perspective is looking upstream from the East bank near an inactive dam. Technicians used a canoe to perform the temperature survey of this segment.

Macroinvertebrates

Aquatic macroinvertebrates include snails, crayfish, insects, worms, and other small animals without vertebrae. Many are the larval life stages of insects that will eventually emerge and become flying adults. These larval life stages are often difficult to identify, so most identification is only to genus, not species. Macroinvertebrates that are very young and undeveloped (i.e., early instars), or those that are damaged, are left at the taxonomic resolution of family. Aquatic worms are even more difficult to identify and are often left at very coarse identification (e.g., roundworms are left at the phylum level). Larvae of non-biting midges (family Chironomidae) require extra processing and cost to identify to genus, so these are typically left at tribe or subfamily taxonomic resolution. Thus, the different types of

macroinvertebrates are simply called “taxa,” rather than “species,” because of this uneven level of identification.

To characterize the aquatic macroinvertebrates of a stream reach, we attempt to sample all of the major habitat types using a variety of sampling equipment. Riffle areas that have rocks smaller than cobble (softball-size) and deep-enough water were sampled quantitatively with a Hess sampler, allowing us to estimate the number of macroinvertebrates available to support the stream food web in a square meter of riffle. Other habitats were sampled qualitatively using a D-net, which allowed us to sample all possible habitat types, thus providing a more complete inventory of stream macroinvertebrates present in each reach. The locations and types of samples taken in each reach are shown in Table 5.

Table 5. GPS coordinates (WGS84) of sample locations. Taxonomic richness (number of different types of macroinvertebrates collected) and EPT (mayfly, stonefly, and caddisfly) sample percent compositions. EPT taxa are considered the most sensitive groups of aquatic macroinvertebrates.

Site	Sample	Latitude	Longitude	Type	Habitat	%EPT	Richness
Reach 4.5	1	N47.05696	W091.76221	Hess	Run	47	41
Reach 4.5	2	N47.05720	W091.76160	Hess	Riffle	47	38
Reach 4.5	3	N47.05752	W091.76141	Hess	Run	44	45
Reach 4.5	4	NA	NA	Dnet	Qualitative (all)	61	62
Reach 4_ED	1	N47.05906	W091.76838	Hess	Riffle	34	43
Reach 4_ED	2	N47.05956	W091.76827	Hess	Riffle	45	43
Reach 4_ED	3	N47.06015	W091.76826	Hess	Run	48	45
Reach 4_ED	4	NA	NA	Dnet	Qualitative (all)	42	55
Reach 4_CB	1	N47.06038	W091.76878	Hess	Run	24	40
Reach 4_CB	2	N47.06084	W091.76852	Hess	Riffle	44	41
Reach 4_CB	3	N47.06121	W091.76900	Hess	Run	28	38
Reach 4_CB	4	NA	NA	Dnet	Qualitative (all)	34	61
Reference	1	N47.06533	W091.76770	Hess	Riffle	13	38
Reference	2	N47.06612	W091.76723	Hess	Riffle	33	43
Reference	3	N47.06658	W091.76725	Hess	Run	23	42
Reference	4	NA	NA	Dnet	Qualitative (all)	35	58

Macroinvertebrates were sampled in four reaches of this project. Over 100 different taxa were collected and identified across all reaches (Appendix III). One way to evaluate the condition of streams using macroinvertebrates is to use metrics that have been shown to indicate particular things about stream ecosystem condition. Typically, metrics are selected to help examine whether or not there have been human impacts to a stream, or to examine if the stream condition is poor for macroinvertebrates for some reason. As expected in a North Shore stream, there were many taxa in groups considered

sensitive to human impacts and poor habitat conditions. Mayflies (Ephemeroptera; 16 taxa), caddisflies (Trichoptera; 35 taxa), stoneflies (Plecoptera; 11 taxa), dragonflies and damselflies (Odonata; 7 taxa), and fishflies and alderflies (Megaloptera; 2 taxa) have members that are considered among the least tolerant of stressors (Appendix III). Stoneflies and some mayflies are particularly intolerant of low dissolved oxygen.

The metric EPT (Ephemeroptera, Plecoptera, and Trichoptera) combines all the mayflies, stoneflies, and caddisflies into one group of particularly sensitive insects. All damselflies and dragonflies, and most stoneflies, are predators; their hunting lifestyle and specific habitat requirements can make them sensitive to habitat loss. The members of these groups that live in streams often prefer to live under rocks in areas of higher current velocity. Thus, they need areas that provide relatively unembedded riffle habitat. As riffles become filled with fine sediments, these fauna lose their habitat space and are present in smaller numbers. Finally, giant stoneflies (*Pteronarcys*) have slow-growing, long-lived nymphs that specialize in shredding up leaves from the fall. Their presence in all four reaches indicates sufficient stable habitats are present to allow *Pteronarcys* nymphs to complete their three-year life cycle.

All streams, even those in the best condition, also contain macroinvertebrates that are tolerant of harsher conditions. Most streams have some lower quality habitats such as muddy, silty, sandy areas or areas of slower-moving water that these taxa can tolerate and where they are better competitors than more sensitive taxa. These opportunistic, shorter-lived tolerant taxa serve as a food resource for predatory macroinvertebrates. One of these groups is the non-biting midges of family Chironomidae. Chironomidae midge adults superficially resemble mosquitoes but have no proboscis with which to bite, and the males have antennae that resemble bottle brushes. These larval flies are ubiquitous in aquatic environments (it is unusual not to find many of them); they are often one of the most abundant groups, and they are incredibly diverse. Some species have hemoglobin and are tolerant of slower-moving water, lower oxygen conditions, and higher amounts of nutrients.

On the other end of the spectrum, some species require flowing water to capture algae, and others are active predators. As is often the case, Chironomidae midge larvae were generally the most abundant group in all stream habitats sampled, composing between 14-45% of the communities by abundance. However, several sample groups did have a larger composition of EPT taxa than midges (Figure 10), which is largely due to the prevalence of exposed rocks within all these reaches (Table 3). Other tolerant taxa that we collected included snails (Gastropoda), beetles (Coleoptera), and aquatic

worms (Oligochaeta and Nematoda). We summarized macroinvertebrate data by habitat type within each reach. Mayflies, stoneflies, and caddisflies (EPT; sensitive taxa) made up 23-61% of the total macroinvertebrates collected in all habitats and stream reaches. The percent EPT taxa amongst habitats (riffle, run, or all-habitats) was similar. Riffles are typically where the most sensitive macroinvertebrates are found due to the higher quality habitats, including more stable substrates, such as gravel and cobbles; however, in these reaches 'all-habitat' and 'run' samples had similar or higher percentages of sensitive macroinvertebrates (Figure 10).

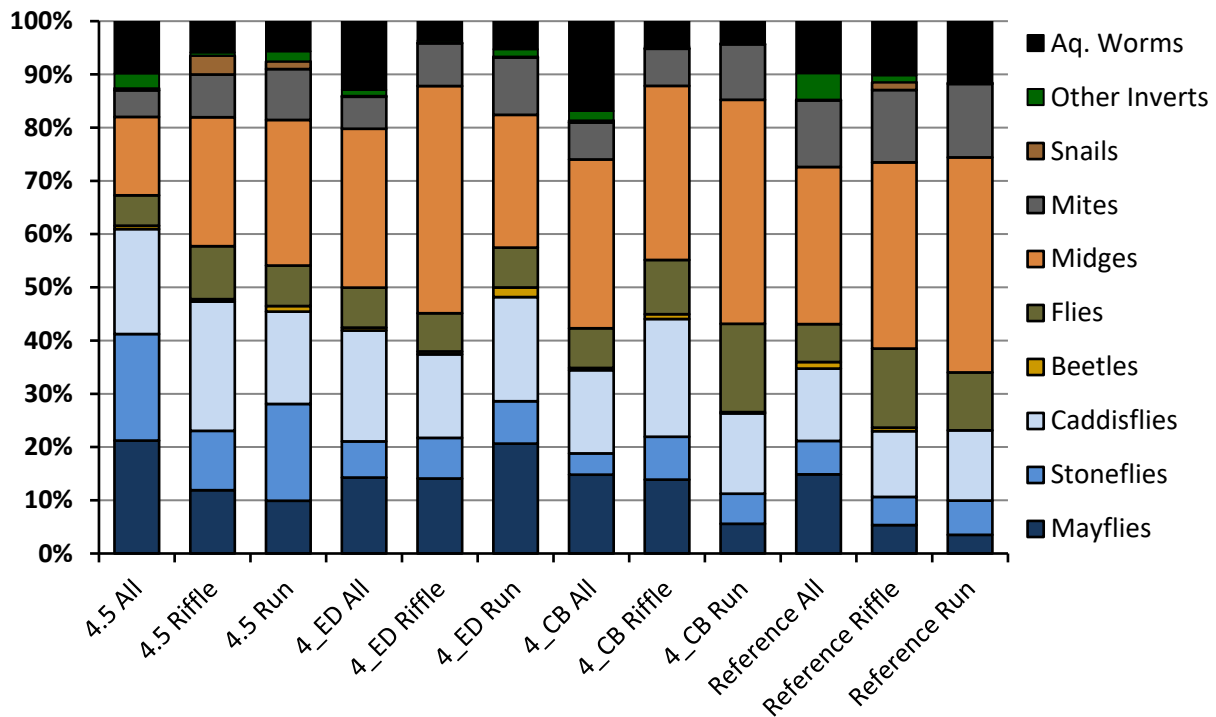


Figure 10. Macroinvertebrate assemblages of each Knife River reach and major habitat type sampled, presented as proportions of all macroinvertebrates collected. Greater proportions of mayflies, stoneflies, and caddisflies typically indicate better stream conditions.

Among reaches, the percent EPT taxa was highest in Reach 4.5 (44-61% of inverts were EPT) followed by the Reach 4_ED (40-48% EPT) (Figure 10). The Reference had the lowest percent EPT taxa at 23-35%. The Reference reach had a higher percent of boulder substrate and lower percent of cobble and gravel substrates than the other three reaches (Figure 7). In addition, the stream slope was greatest in the Reference reach (Table 2), which explains why smaller coarse substrates were limited. Reaches dominated by boulder-sized coarse substrates, which tend to be half-buried in the stream bed by smaller rocks, do not have the density of interstitial spaces (gaps between rocks) compared with cobbles

and gravels. The lower prevalence of interstitial spaces in the Reference reach may have contributed to the lower percent of EPT taxa. Finally, the Reference reach had the lowest amount of coarse woody debris (again, likely due to increased stream slope), which is also important habitat for EPT taxa.

Mayflies, stoneflies, and caddisflies (EPT), typically considered the most sensitive macroinvertebrate orders, made up 13-61% of macroinvertebrates in all habitats sampled (Table 5). EPT taxa composed 13-47% of 'riffle' habitat samples, 23-48% of 'run' habitat samples, and 34-61% of 'all-habitat' samples (Table 5). Riffles have faster-flowing water and often contain more stable cobble or gravel substrates; these areas typically provide abundant living space among crevices and crannies, along with higher dissolved oxygen and more frequent replenishment of food particles carried by the current. Thus, riffles are typically where the most sensitive macroinvertebrates are found due to the higher quality habitats. However, we found that 'riffles,' 'runs,' and 'all-habitat' samples were generally similar. Therefore, we combined all samples to provide another picture of the total macroinvertebrate richness by reach (Table 6). In this comparison, richness was slightly higher in Reach 4.5 but still relatively similar across all reaches.

Table 6. Macroinvertebrate taxa richness by reach for all habitats combined.

	Reach 4.5	Reach 4_ED	Reach 4_CB	Reference
Mayflies (Ephemeroptera)	13	15	14	14
Stoneflies (Plecoptera)	9	8	9	9
Caddisflies (Trichoptera)	14	13	13	14
Dragon/damselflies (Odonata)	6	5	4	4
Beetles (Coleoptera)	3	2	3	4
Flies (Diptera)	18	14	16	16
Other insects	4	2	2	3
Snails (Gastropoda)	3	1	3	1
Other invertebrates	6	5	5	5
Total	76	65	69	70

In terms of tolerant macroinvertebrates, non-biting midges (Chironomidae) composed between 14-45% of total macroinvertebrates collected from each habitat at each site (Figure 10). Midge larvae are often the most abundant and taxa-rich group in aquatic ecosystems, and the percentage of these larvae was similar to other North Shore streams that are considered to be in good condition. A variety of other types of flies were collected, but they did not compose a large part of most macroinvertebrate assemblages. Other macroinvertebrate groups (snails, clams, worms, etc.) made up quite minor

components of the community. Finally, at least 70% of all macroinvertebrates collected in each habitat were insects of some type.

Cumulatively, this information indicates moderate quality macroinvertebrate assemblages in the four reaches sampled. The macroinvertebrate assemblage most dominated by macroinvertebrates considered sensitive was collected in the reach furthest downstream, Reach 4.5, but assemblages were fairly similar among all reaches, which makes sense because habitat conditions were also generally similar across reaches. Reach 4.5 had the highest percent of EPT taxa, and this reach had a combination of habitat characteristics and conditions that are important for EPT taxa. For example, Reach 4.5 contained high total pieces of coarse woody debris, which provides additional habitat and potential food resources for some taxa. This reach also had the highest mean stream canopy cover. Those trees may contribute more leaf litter (an important food resource) to the reach. Its riffle and run habitats were also dominated by substrates such as cobbles and large gravel, which contribute to stable stream conditions and offer the living spaces important for macroinvertebrates. Although the Reference reach had the highest MHSAs (86.7 versus 76, 71.5, and 70), it had the lowest percentages of EPT taxa. The higher percent of boulder substrates (therefore, fewer cobbles and gravels), few slow-flowing pools (most were plunge-pools with rapid flow), and lower occurrence of coarse woody debris (an important habitat and food resource to some EPT) may all have contributed to the lower EPT percentages in the Reference reach.

Another way to examine macroinvertebrate communities is to assign them to their trophic (feeding) levels. This was done at the whole reach level across all habitats (Figure 11). As expected, detritivores (macroinvertebrates that feed on the leftover litter and particles, such as leaf fragments) were the most abundant of the four trophic levels, composing 58-66% of the macroinvertebrates in each reach, followed by herbivores (12-17%), carnivores (10-17%), and finally omnivores (4-9%). These reaches all had canopy cover greater than 50%, so likely receive enough shade to limit the algae that would grow to support herbivores such as snails. In contrast, the trees and shading provide leaves for the detritivores, particularly those that are “shredders” and chew up these leaves for food (Figure 12). Reach 4.5 and the Reference, the most reaches with the most canopy cover, contained the highest percentage of shredders, while Reach 4_ED and Reach 4_CB contained the fewest shredders (Figure 12). Carnivores, the predators, are by necessity less abundant than their prey. They range from the obvious and large (e.g., dragonfly larvae) to the surprisingly small (e.g., some midge larvae, tiny mites).

Macroinvertebrate Trophic Levels

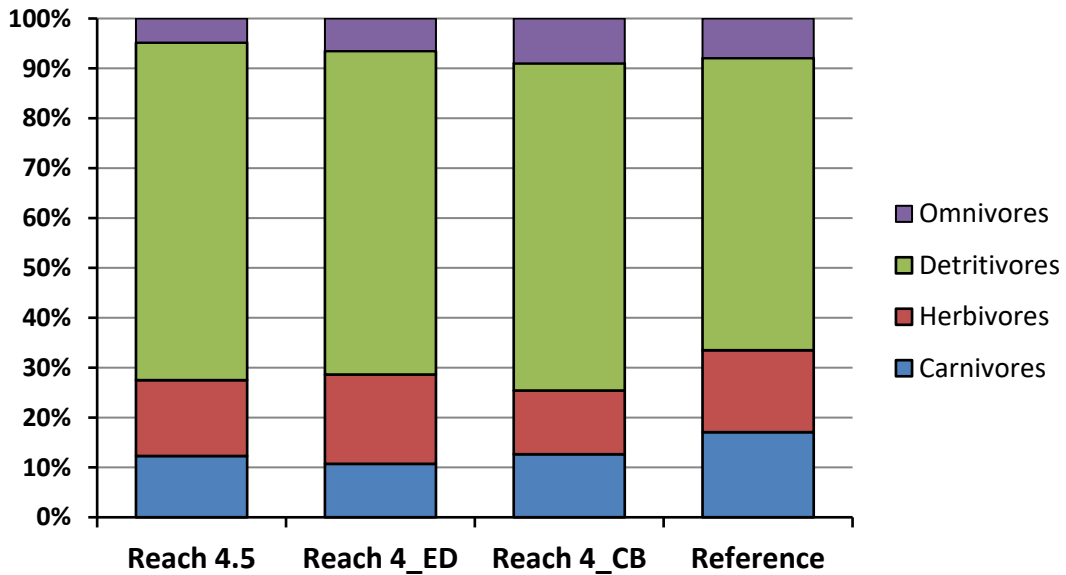


Figure 11. Macroinvertebrate trophic levels of each Knife River reach sampled, presented as proportions of all macroinvertebrates collected. Generally, the more carnivores a system supports, and the fewer detritivores and omnivores, the higher the quality of the stream.

Macroinvertebrate Functional Feeding Groups

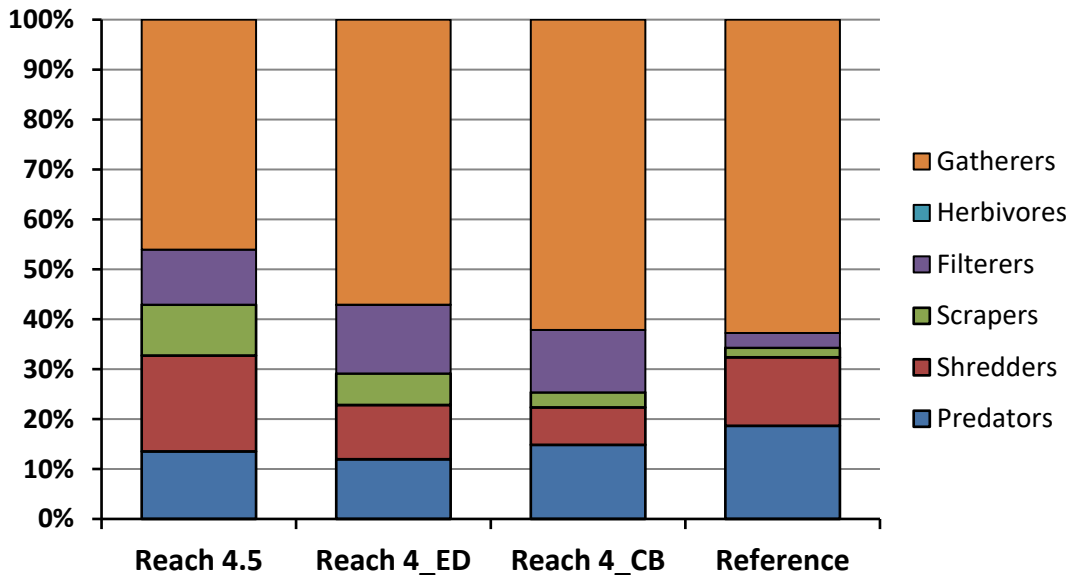


Figure 12. Macroinvertebrate functional feeding groups of each Knife River reach sampled, presented as proportions of all macroinvertebrates collected. While gatherers are often most abundant, better-condition streams have quite a few predators and shredders.

The mechanisms that macroinvertebrates use to get their food can provide additional clues about the stream and habitat. These “functional feeding groups” (Figure 12) include the herbivores that graze on plant material or scrapers they may scrape algae off of stream rocks and other hard surfaces. Since the stream is shaded enough to limit algae growth, neither the grazer nor scraper functional feeding mechanisms are common in these Knife River reaches. This indicates that the base of the food web for these reaches is primarily materials from outside the stream that fall into it, most obviously the leaves that drop in the fall and which get colonized by bacteria and fungi and eaten by the detritivores. The tiny pieces of broken down leaves and other food bits are collected from the current by filterers that spin tiny nets or use special fans to filter out food. Slightly larger food particles that settle to the bottom are collected by gatherers (basically scavengers). Because most midge larvae are gatherers, this feeding mechanism will usually be the most common when midges dominate the system. Predators and shredders were the second most common feeding groups (Figure 12).

Organisms within the shredder functional feeding group can make use of very low-quality food (dead leaves, wood) that other macroinvertebrates cannot digest. This poor-quality food often causes their larval stages to be quite extended. For example, between the poor food quality and the short summer season in our region, giant *Pteronarcys* stonefly larvae (a large, leaf-shredding stonefly) require three years to reach the adult stage. In streams with good leaf litter, good water quality and habitat, and reaches that do not quit flowing in the summer, it is possible to find all three age-classes of *Pteronarcys* in the same accumulation of fall leaves. *Pteronarcys* larvae are a substantial meal to stream fish and are good indicators; they were found in all four reaches, with the highest proportions (2-3 times higher than the other reaches) in Reach 4.5. Reach 4.5 may have supported the most *Pteronarcys* due to higher amounts of leaf litter (% canopy) and wood (CWD count) in various stages of decomposition (Table 2).

To ensure that samples are comparable when sampled by other methods, and in order to compare absolute numbers (rather than just proportions) collected in each reach, we often extrapolate and convert the numbers collected to number of macroinvertebrates per square meter of stream bottom (Table 7). Macroinvertebrate densities can be quite high, both in good- and poor-quality habitat, with the difference being whether most of the macroinvertebrates are tolerant or sensitive individuals. Examining absolute densities shows that Reach 4_CB had the highest densities, followed by Reach 4_ED, the Reference, and lastly Reach 4.5. The number of macroinvertebrates supported in a square meter of Reach 4_CB riffle habitat is approximately double that of Reach 4.5 and the Reference, and 25% higher than Reach 4_ED. However, densities are a relatively poor estimator of food web support because they

do not take into account the size of the macroinvertebrates, which varies from tiny worms about the size of an eyelash to very large alderflies, dragonflies, and stoneflies that may be nearly the size of a small pinky finger. Thus, biomass is the preferred estimate for food web support, but this requires extra laboratory effort and destroys the macroinvertebrates in the process. We are not able to provide biomass estimates; however, because the types of macroinvertebrates were similar in all four reaches, it is reasonable to assume that greater abundances likely indicate greater biomass.

Table 7. Extrapolated estimates of numbers of macroinvertebrates in a square meter of stream bottom in each Knife River reach and major habitat type.

Reach	Habitat	Number per square meter
Reach 4.5	Riffle	24,544
Reach 4.5	Run	25,806
Reach 4_ED	Riffle	37,478
Reach 4_ED	Run	24,044
Reach 4_CB	Riffle	50,367
Reach 4_CB	Run	34,994
Reference	Riffle	26,439
Reference	Run	33,633

The Knife River reaches sampled for macroinvertebrates all exhibited moderate taxonomic richness, percentages of sensitive macroinvertebrates, and percentages of tolerant macroinvertebrates. Furthermore, trophic level and functional feeding group compositions were generally dominated by the more tolerant groups. Although we did not analyze their status specifically, these reaches would likely rank moderately in macroinvertebrate community quality. Despite one large eroding bank, Reach 4.5 had high amounts of coarse woody debris and stream canopy cover, which may contribute to the slightly higher quality macroinvertebrate community in this reach. Appendix IV contains complete identifications of all macroinvertebrates.

Fish

Two backpack electrofishing units were used simultaneously to sample fish among all reaches except Red Dot and White Landing, which were surveyed with one backpack unit. Mcarthy, Red Dot, and White Landing were surveyed with one removal pass to detect presence of age0 Rainbow Trout.

However, no age0 Rainbow Trout were detected on the first pass in Red Dot, so we performed another electrofishing pass to confirm their absence. Reaches 4.5, 4_ED, 4_CB, and Reference were sampled with two electrofishing passes so we could perform population estimates, but it should be noted that one backpack ran out of battery power during the second pass when sampling Reach 4.5 and the Reference. Electrofishing units used by NRRI field teams were an ABP-3 electrofishing backpack (aka “Wisconsin pack”) from ETS Electrofishing Systems, and a Smith-Root model 12-B. Electrofishing effectiveness is influenced by ambient conductivity of the water, rather than specific conductivity (specific conductivity is standardized to 25°C), which is typically recorded during water chemistry surveys. Ambient conductivity can be calculated from specific conductivity in the equation below (T is water temperature in Celsius):

$$\textit{Ambient conductivity} = \frac{\textit{Scond}}{1.023^{(25-T)}}$$

Ambient conductivities were low for electrofishing surveys but not abnormal for MN North Shore streams (Table 8). The NRRI field crew operated the Smith-Root 12-B backpack electrofisher set at 30 hertz, 4 milliseconds, and 500 volts, and the ETS backpack unit was set at 30 hertz, 20% duty, and 400 volts. These settings allowed us to adequately capture fish and keep mortality low (generally, less than 1% of collected fish; Table 8).

All fish surveys were completed after two removal passes because depletion efficiency of large trout (≥ 100 mm TL) between first and second passes was over 50% among all reaches (Table 8); thus, a 3rd removal pass was not performed in any reach. Reach 4_CB had the highest numbers of total fish, total trout, and greatest relative abundance of fishes measured as total CPUE (Table 8). Reach 4_CB had the most pools in close association with woody debris (Appendix I). Large pools tend to explain a lot about the total abundance and species richness of surveyed stream reaches, so it was not surprising that Reach 4_CB had some of the greatest number of observed fish species (Table 9). The largest fish, which was a 14.4” Brown Trout *Salmo trutta*, was captured in Reach 4_ED in a pool around an exposed root-wad near the start of the electrofishing reach. Northern Redbelly Dace, Blacknose Dace, Central Mudminnow, and White Sucker are all typical non-game fish species of North Shore trout streams, but they tend to inhabit large pools or slack water areas. As a result, they are commonly found in reaches with big pools or within beaver-influenced segments with reduced stream flow.

Table 8. Summary of electrofishing surveys among reaches. Mcarthy and White Landing only had a single electrofishing pass, while the others had 2.

Electrofishing Measure	Mcarthy	Red Dot	White Landing	Reach 4.5	Reach 4_ED	Reach 4_CB	Reference
Fish Survey Date	9/7/2018	9/8/2018	9/8/2017	9/11/2017	9/12/2017	9/13/2017	9/14/2017
Discharge (m ³ /sec)	0.066	0.082	0.073	0.190	0.183	0.137	0.131
Discharge (ft ³ /sec)	2.3	2.9	2.6	6.7	6.4	4.8	4.6
Temperature °C	9.37	9.87	9.99	13.32	11.94	12.85	14.1
Temperature °F	48.9	49.8	50.0	56.0	53.5	55.1	57.4
Specific Conductivity (µS/cm)	150.8	101.6	103.5	147.9	146.0	149.4	153.7
Ambient Conductivity (µS/cm)	105.7	72.0	73.6	113.4	108.5	113.3	120.0
Dissolved Oxygen (%)	95.4	101.7	98.7	103.4	104.5	103.1	101.6
Dissolved Oxygen (mg/L)	10.42	10.96	10.66	10.35	10.76	10.42	9.96
pH	7.19	7.55	7.13	7.76	7.64	7.61	7.84
Electrofishing Effort (hr)	1.13	0.78	1.00	3.25	3.33	3.73	3.78
Depletion % (pass1 - pass2)	na	na	na	52.6%	71.0%	76.7%	50.1%
Total Fish	na	na	na	292	551	677	621
Total Trout	97	35	39	239	483	562	518
Mean CPUE _{fish} (all fish/hr)	na	na	na	94.8	156.6	177.1	160.3
Mean CPUE _{trout} (all trout/hr)	85.8	44.9	39.0	77.6	136.5	146.9	133.2
% Mortality _{total}	na	na	na	0.7%	0.2%	0.4%	0.5%

Table 9 Sum of fish captured from all electrofishing passes. A “P” indicates a species was present, but not counted. Species Richness is the count of fish species.

Station	Brook Trout	Rainbow Trout	Brown Trout	Blacknose Dace	Brook Stickleback	Central Mudminnow	Common Shiner	Creek Chub	Longnose Dace	Northern Redbelly	Pearl Dace	White Sucker	Hornyhead Chub	Species Richness
Reach 4.5	28	129	82	21	7	0	0	1	24	0	0	0	0	7
Reach 4_ED	44	386	53	12	0	0	0	1	46	1	0	8	0	8
Reach 4_CB	44	484	34	38	0	3	0	0	67	3	0	3	1	9
Reference	62	427	29	12	0	3	0	0	82	1	2	3	0	9
Mcarthy	61	36	0	P	0	0	0	0	0	0	0	0	0	3
Red Dot	22	13	0	P	0	P	0	P	0	0	P	P	0	7
White Landing	35	4	0	P	P	0	P	P	0	0	P	P	0	8

Blacknose Dace and Longnose Dace were the most abundant non-game fish species encountered among all reaches, which is typical of the Knife River (Dumke *et al.*, 2014; Dumke and Brady, 2016; Dumke and Wellard-Kelly, 2017) and other North Shore streams (Hassinger *et al.*, 1974). Longnose dace have long streamlined bodies and prefer swift riffles with large gravel and cobble substrates with low rates of embeddedness. White Sucker, Common Shiner, Creek Chub, and Hornyhead Chub were infrequently observed among reaches (Table 9). White sucker are benthic invertivores and can grow to very large size if they find large pools to inhabit. Stream connectivity is also important to White sucker because they typically migrate from lakes or larger rivers to upstream tributaries to spawn in the spring. All measured non-trout species are summarized together (Table 10). Appendix V contains the total counts of fish species by each electrofishing pass, and Appendix VI includes data for all measured fish.

Table 10. Summary of all non-trout species captured and measured during electrofishing. Included are mean total length (TL) in mm, standard error of the mean (SE), and minimum and maximum length. An asterisk (*) following number collected indicates these are minimum counts, as non-trout species in MCarthy, Red Dot, and White Landing reaches were noted as present, but not individually counted.

Common Name	Collected	Measured	Mean TL	SE	Min TL	Max TL
Blacknose Dace	83*	66	77	2	61	113
Brook Stickleback	7*	7	51	5	40	79
Central Mudminnow	6*	6	71	2	67	80
Common Shiner	1	0	na	na	na	na
Creek Chub	2*	2	62	10	52	72
Longnose Dace	219	98	89	1	64	130
Northern Redbelly Dace	5	5	53	2	50	59
Pearl Dace	2*	2	92	7	85	98
White Sucker	14*	14	160	8	89	212
Hornyhead Chub	1	1	88	na	88	88

Since all fish species were not collected in MCarthy, Red Dot, or White Landing, we can only compute proportions of our fish catches for Reaches 4.5, 4_ED, 4_CB, and Reference. Examination of the proportions of fish species collected within these four reaches demonstrates fish assemblages were similar amongst reaches (Figure 13), but the most Brown Trout were found in Reach 4.5. The proportion of trout to non-trout was nearly identical, and about 85% of our total fish catch were comprised of salmonids (Figure 13). The proportions of just trout species displayed a very interesting trend of more Brown Trout in lower reaches and more Brook Trout in upper Knife River sections (Figure 14). Brown

Trout prefer to occupy the lower segments of the Knife River, where there is more sustained flow compared to upstream tributaries. In contrast, Brook Trout were encountered in relatively low numbers throughout our 2017 survey, but they comprised more of the total trout catch as we progressed upstream. This matches data from prior surveys, which indicate Brook Trout become proportionally more dominant as surveys progress from the mainstem into small tributaries (Dumke *et al.*, 2014; Dumke and Brady, 2016; Dumke and Wellard-Kelly, 2017). Rainbow Trout were the most abundant salmonid encountered in both total numbers (Table 9) and proportion (Figures 13 & 14) among Reaches 4.5, 4_ED, 4_CB, and Reference.

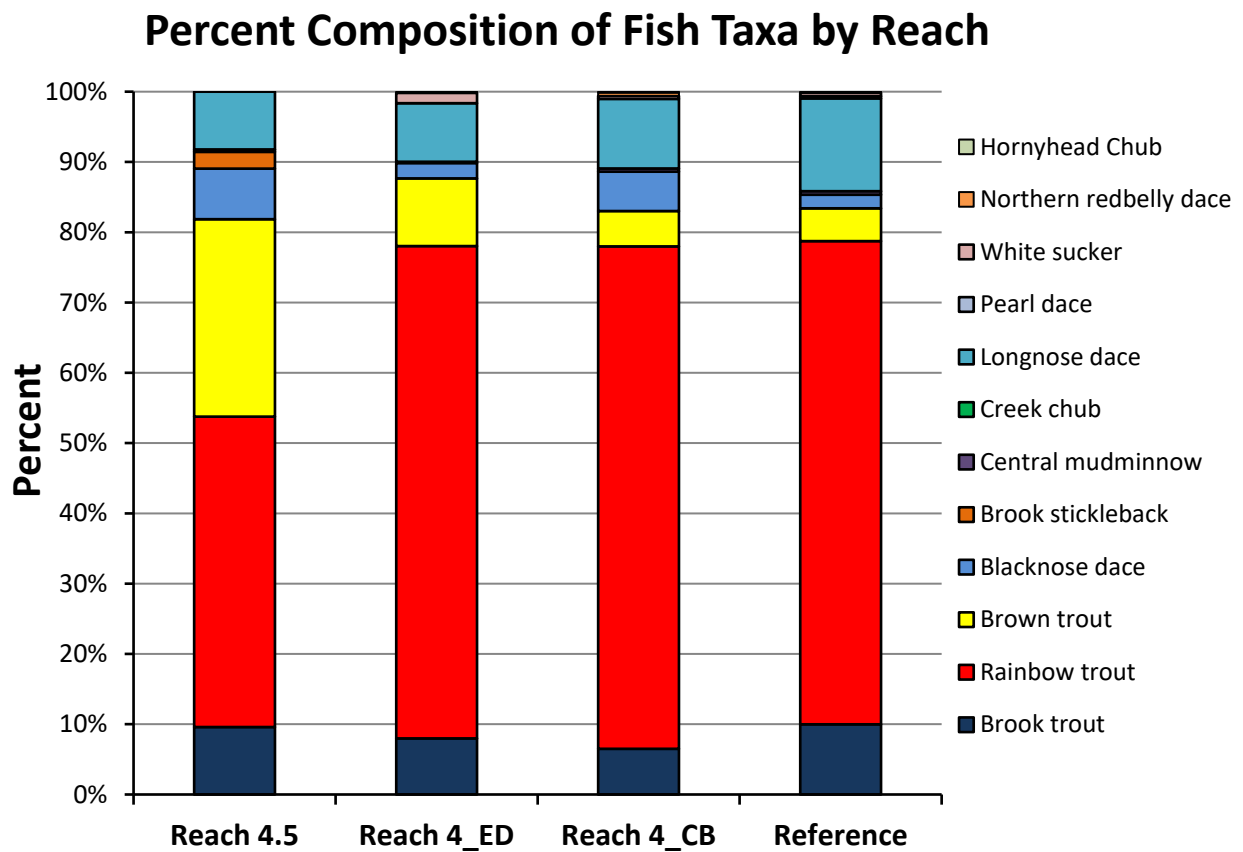


Figure 13. Percent composition of fish taxa collected from two electrofishing passes of the four reaches where all fish observed were collected.

Percent Composition of Trout by Reach

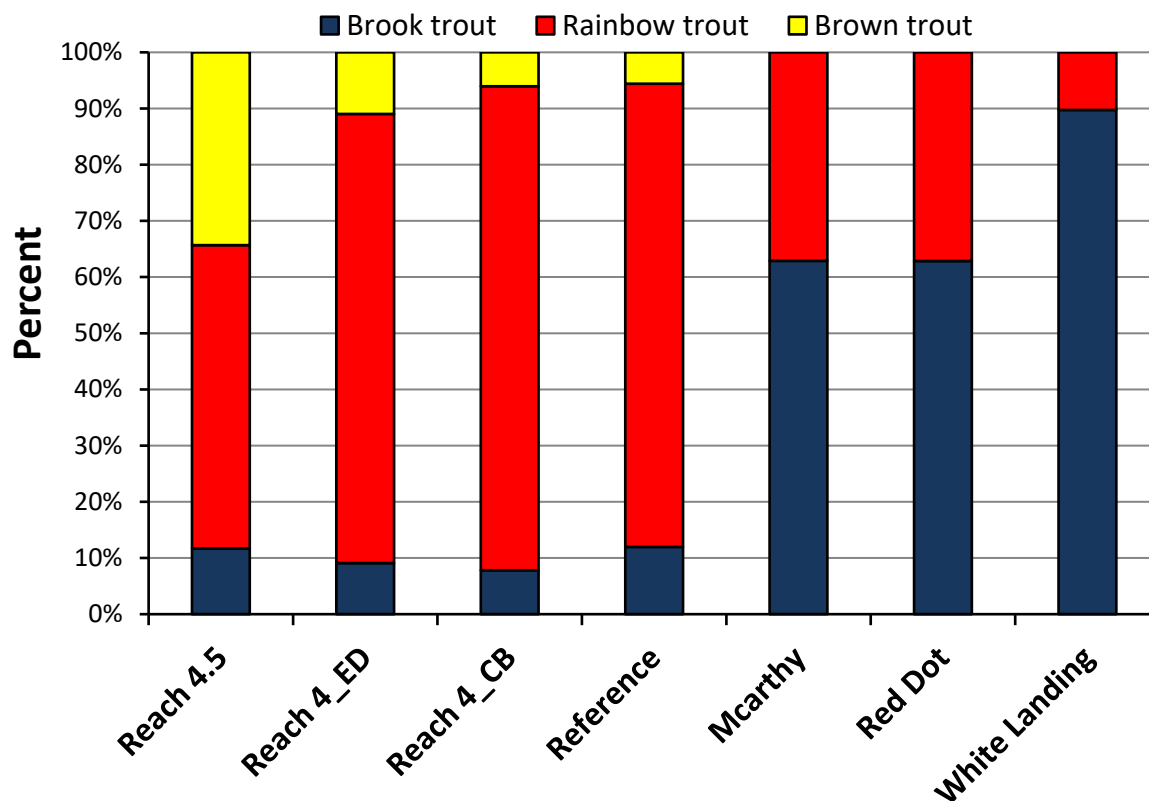


Figure 14. Percent composition of just trout species collected from two electrofishing passes on all reaches except Mcarthy and White Landing, which only received one electrofishing pass.

Lengths and weights of trout were recorded so additional analyses would be possible. Since we did not age fish directly, we used the total length of trout from all reaches to create histograms that allowed us to estimate abundance of age0 (young-of-year) and age1+ (all fish age 1 and older) trout. A histogram is a graph that displays the frequency at which the same values occur in a dataset, and can be used to identify 'breaks' in the length frequencies which indicate transitions in age class. We pooled the length data from all reaches by trout species, as there were not always enough fish collected within each reach to create reach-specific histograms. When the frequency of measured trout from all reaches was plotted in 5 mm length bins, we found that the correct length to separate age0 and age1+ trout in our September 2017 survey was at about 100 mm TL for all species (Figure 15).

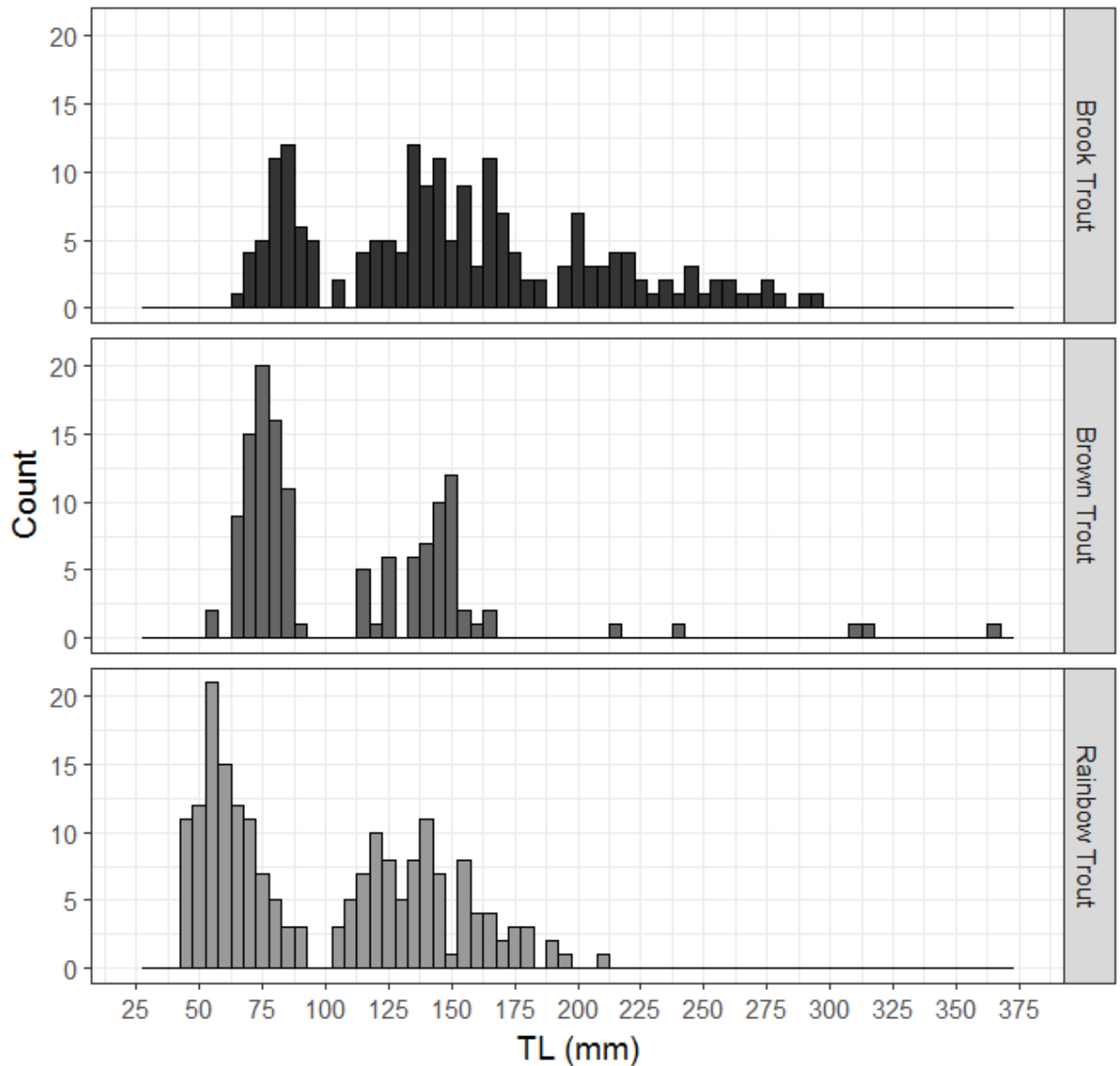


Figure 15. Histogram of all trout measured among all reaches in 5 mm length bins. Total measured Brook Trout = 184, Brown Trout = 131, and Rainbow Trout = 193.

The number of trout present in stream reaches is often not accurately estimated by only comparing total numbers of individuals captured. This is because a two-pass removal does not deplete all fish from a reach, so we use a model to estimate the total number of fish likely to be in the population based on how effective we were at capturing fish from passes 1 and 2. Population estimates and 95% confidence intervals were calculated for all trout and age class's using the FSA package in R statistical software, which uses a maximum likelihood model from Carle and Strub (1978) that was

determined to be more accurate and robust against assumption violations (Ogle, 2016b). Population estimates are only possible when there are two or more removal passes, and estimates improve when the depletion between passes is greater. Therefore, our depletions in Reach 4.5 and Reference, 52.6 and 50.1%, respectively, produce more erroneous population estimates because we could not operate two backpack units for the entirety of the second removal pass. The greatest Brook Trout age1+ population estimates were in the Reference reach, which was the farthest upstream reach surveyed in this comparison (Figure 16). However, there were very few age0 Brook Trout captured in any of these reaches, which indicates this segment of the Knife River is not being heavily selected by Brook Trout for reproduction, though they were proportionally more dominant in upstream reaches of MCarthy, Red Dot, and White Landing (Figure 14).

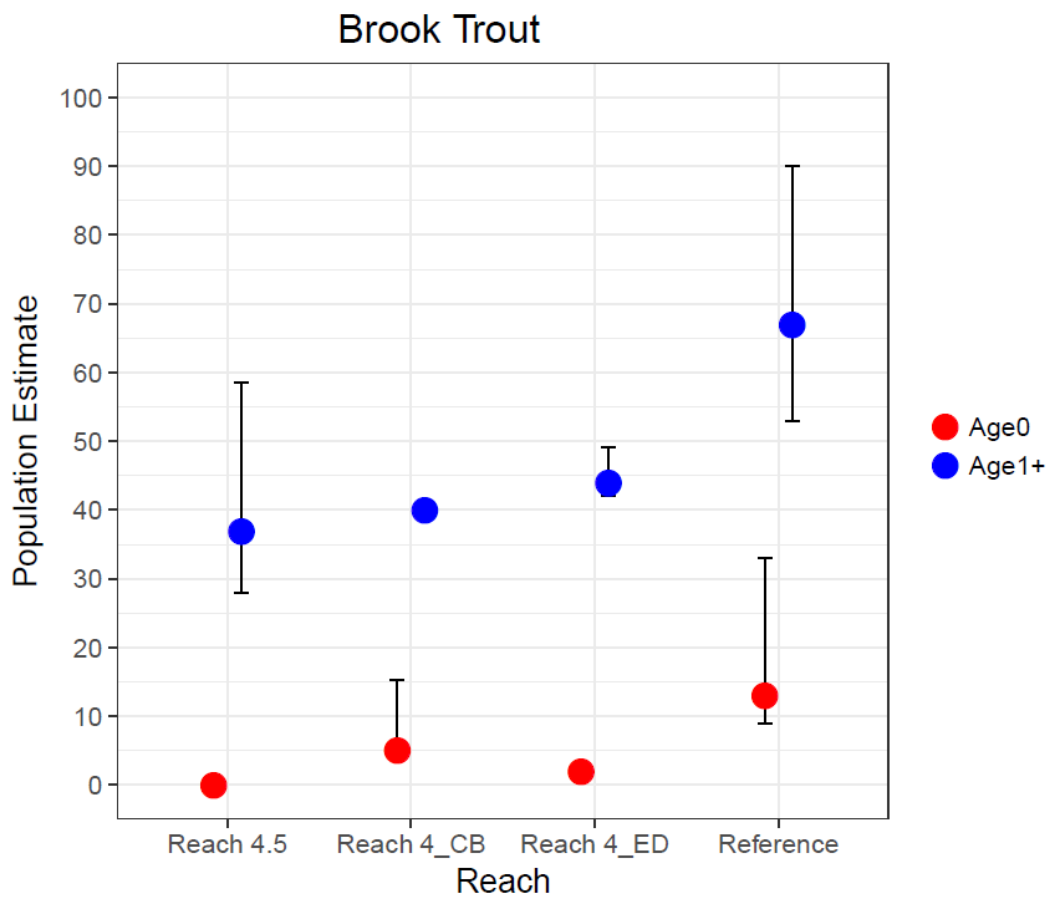


Figure 16. Population estimates of Brook Trout age0 and age1+ fish from reaches with 2 electrofishing passes. Upper error bars are 95% confidence intervals, and lower error bars are the actual number of fish collected.

Brown Trout age0 and age1+ fish were present in Reaches 4.5, 4_ED, 4_CB, and Reference, but absent in the upstream reaches of MCarthy, Red Dot, or White Landing. Over the years we have observed the trend of Brown Trout living in the lower/larger river segments, so there is likely a habitat preference they are responding to. The presence of 15-65 age0 Brown Trout among these lower reaches indicates adults are utilizing these segments of the Knife River mainstem for spawning (Figure 17).

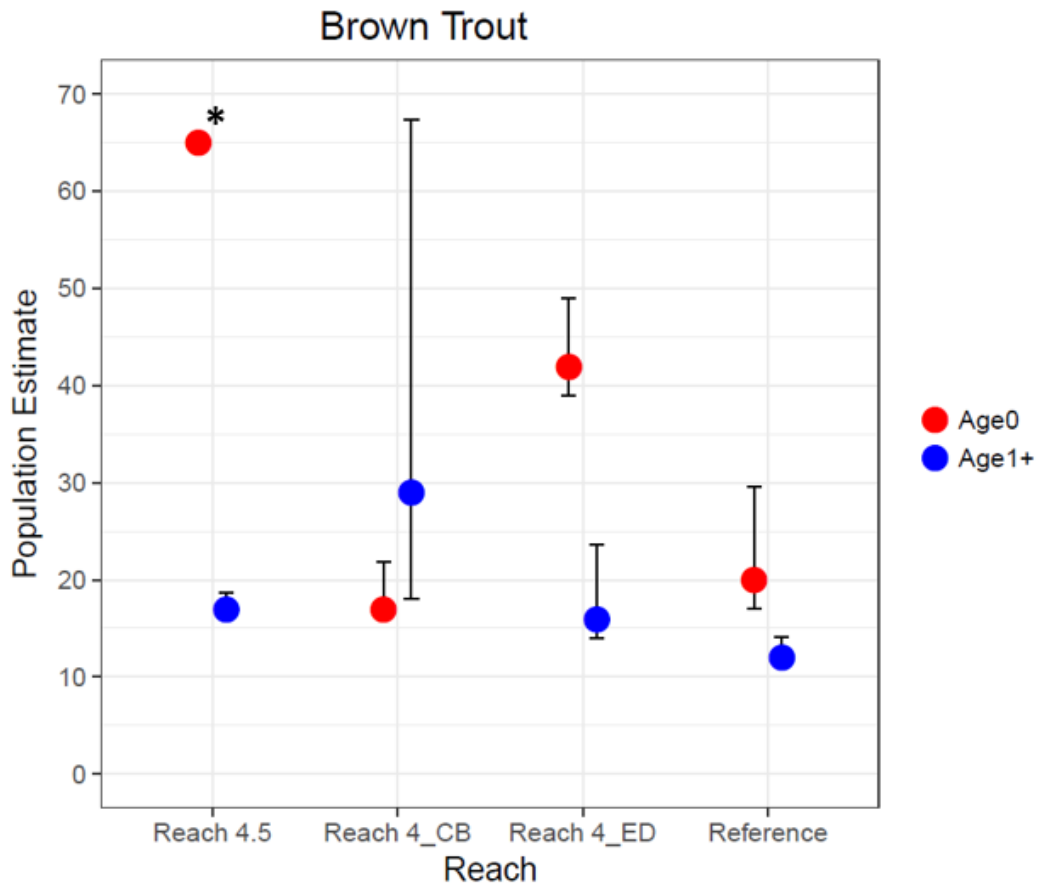


Figure 17. Population estimates of Brown Trout age0 and age1+ fish. Upper error bars are 95% confidence intervals, and lower error bars are the actual number of fish collected. Asterisk (*) denotes age0 actual fish collected in Reach 4.5, as the population estimate had too much error to be useful.

Rainbow Trout were the most abundant salmonid among all lower reaches (Figure 14). Reach 4.5 had the lowest estimate of age0 Rainbow Trout, but it was estimated to still be around 100 fish (Figure 18). Our capture efficiency was high for age1+ individuals (hence the small margin of error) because they were easier to see and the electrofishing method of capture works better on large fish than small fish. Many of the small age0 fish were very difficult to see, or effectively electrofish, which

reduced our capture efficiency of this age class. However, even with an estimate error spanning several hundred fish, it is clear that Reaches 4_ED, 4_CB, and Reference are important Rainbow Trout spawning areas.

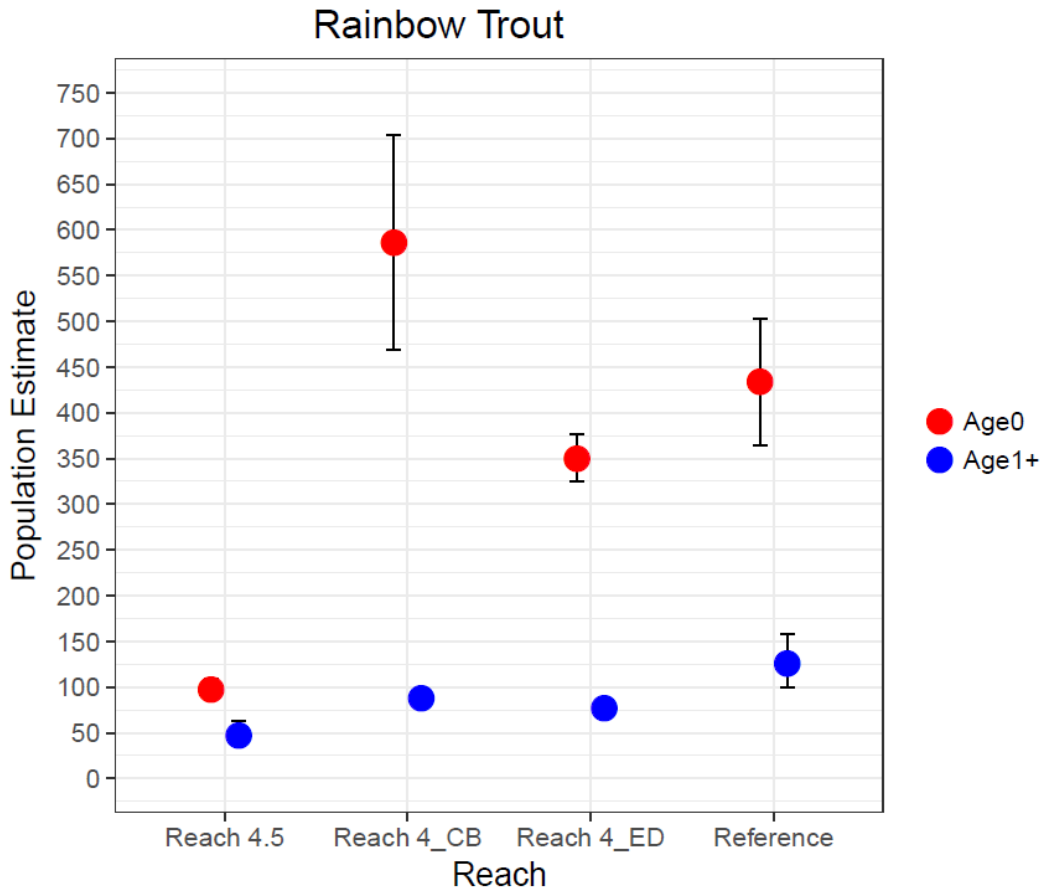


Figure 18. Population estimates of Rainbow Trout age0 and age1+ fish from reaches with two electrofishing passes. Upper error bars are 95% confidence intervals among both age groups. The lower error bars of age1+ fish are the actual number of fish collected, while lower error bars of age0 fish are the 95% confidence interval (because the number of age0 fish collected was less than the 95% CI range).

There are other ways to compare trout populations among reaches besides the observed totals or estimated population size. Comparing the mean lengths and weights of fish from each reach by age class can provide information about whether the habitat, food abundance, and water temperatures may influence growth. Separation between age0 and age1+ for all trout was determined to be at 100 mm TL for all species (Figure 15). Little information can be inferred from age0 Brook Trout in the lower reaches, as only a few individuals were captured among these four survey locations (Table 11). Some of the

smallest age1+ Brook Trout were found in Reach 4_CB, which coincided with some of the largest age1+ Brown Trout (Table 12). Brown Trout age0 fish were fairly similar in length and weight among all reaches where they were present (Table 12). However, some of the smallest age1+ Brown Trout were measured in the Reference reach, which was the farthest upstream segment of the Knife River where we collected them. The largest age0 Rainbow Trout were found in the Reference reach (Table 13), followed by MCarthy (excluding White Landing, where only 1 individual was captured).

Table 11. Mean total length (TL) and total weight (TW) of Brook Trout age0 and age1+ fish measured by reach. Sample size of measured fish (n) is provided, with means in bold and standard error in parentheses: **mean** (SE). A difference in n between TL and TW indicates fish escaped before weighing.

	Brook Trout age0				Brook Trout age1+			
	n	TL (mm)	n	TW (g)	n	TL (mm)	n	TW (g)
Reach 4.5	0	na (na)	0	na (na)	21	180.4 (9.4)	21	69.9 (11.5)
Reach 4_ED	2	79.0 (3.0)	2	5.0 (1.4)	23	190.0 (10.8)	23	84.4 (15.8)
Reach 4_CB	4	78.5 (2.5)	4	4.1 (0.4)	21	156.4 (5.3)	21	38.5 (4.9)
Reference	9	85.3 (1.5)	9	5.2 (0.3)	24	191.4 (10.7)	24	97.6 (16.7)
MCarthy	5	78.2 (3.6)	4	4.1 (0.8)	20	155.8 (8.4)	20	46.7 (7.4)
Red Dot	13	83.2 (2.5)	13	4.8 (0.6)	9	180.1 (14.5)	9	66.4 (17.6)
White Landing	12	84.8 (1.8)	12	5.3 (0.3)	22	160.9 (8.4)	22	49.3 (10.1)

Table 12. Mean total length (TL) and total weight (TW) of Brown Trout age0 and age1+ fish measured by reach. Sample size of measured fish (n) is provided, with means in bold and standard error in parentheses: **mean** (SE). A difference in n between TL and TW indicates fish escaped before weighing.

	Brown Trout age0				Brown Trout age1+			
	n	TL (mm)	n	TW (g)	n	TL (mm)	n	TW (g)
Reach 4.5	20	71.0 (1.7)	20	3.3 (0.3)	16	159.4 (10.1)	15	33.7 (5.6)
Reach 4_ED	20	76.1 (1.7)	20	3.8 (0.2)	14	154.9 (16.4)	14	61.4 (36.8)
Reach 4_CB	16	77.9 (1.6)	16	4.2 (0.3)	18	159.6 (15.1)	18	65.0 (25.1)
Reference	17	76.0 (1.3)	17	4.1 (0.2)	11	136.5 (3.4)	11	22.6 (1.8)
MCarthy	0	na (na)	0	na (na)	0	na (na)	0	na (na)
Red Dot	0	na (na)	0	na (na)	0	na (na)	0	na (na)
White Landing	0	na (na)	0	na (na)	0	na (na)	0	na (na)

Table 13. Mean total length (TL) and total weight (TW) of Rainbow Trout age0 and age1+ fish measured by reach. Sample size of measured fish (n) is provided, with means in bold and standard error in parentheses: **mean** (SE). A difference in n between TL and TW indicates fish escaped before weighing.

	Rainbow Trout age0				Rainbow Trout age1+			
	n	TL (mm)	n	TW (g)	n	TL (mm)	n	TW (g)
Reach 4.5	20	53.4 (1.3)	20	1.5 (0.1)	20	137.0 (5.4)	16	24.7 (5.0)
Reach 4_ED	20	55.8 (1.8)	20	1.6 (0.2)	20	132.6 (4.8)	19	23.8 (2.8)
Reach 4_CB	20	58.4 (1.3)	20	1.8 (0.1)	20	133.7 (4.9)	20	24.4 (3.4)
Reference	20	74.0 (2.3)	20	3.8 (0.3)	20	150.5 (5.6)	20	34.5 (4.0)
Mcarthy	20	67.8 (2.4)	19	3.0 (0.3)	2	137.0 (1.0)	2	24.7 (0.7)
Red Dot	0	na (na)	0	na (na)	13	150.9 (4.3)	13	33.4 (3.3)
White Landing	1	77.0 (na)	1	3.9 (na)	3	156.0 (12.7)	3	39.2 (10.6)

In the Dumke and Wellard-Kelly (2017) report we included comparisons of trout condition among survey reaches for select ages of fish; however, we have not performed that analysis with these data, as it really is more appropriate to compare the condition of fish before and after treatment within the same reach. Fish condition factors (Froese, 2006) will be possible to compute in the future with post-treatment length and weight data and would contribute to the evaluation of how some kind of change has affected the trout living there. In lieu of condition factor, we can simply plot the lengths and weights of measured trout to identify dataset errors and observe if Knife River trout species accumulate body mass equally (which they do). We have found in prior investigations that trout weight is predicted very well by fish length (Dumke and Brady, 2016; Dumke and Wellard-Kelly, 2017). We found similar results from the length and weight data collected during our 2017 surveys, with R^2 values above 0.99 (which means 99% of the variability in trout weight is explained by their length) among all observed trout species. Trout length and weight are plotted with length in inches in Figure 19, so sizes of fish captured are easier to review.

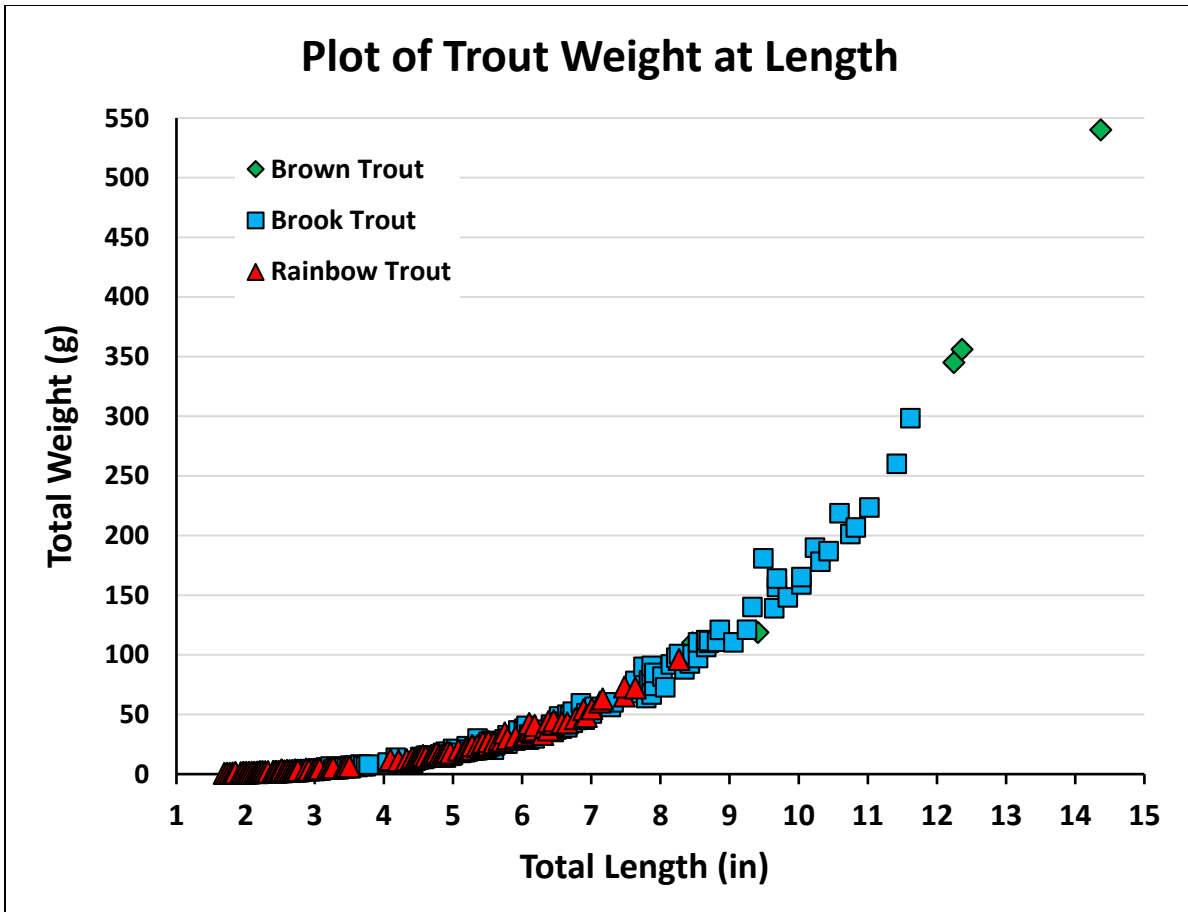


Figure 19. All measured Brook, Brown, and Rainbow Trout length and weight XY scatter plot, with length converted to inches. Numbers of trout included in plot: Rainbow Trout = 193, Brook Trout = 182, and Brown Trout = 131. The largest fish, a 14.4" Brown Trout, was captured in Reach 4_ED.

Reach Summaries

Most habitat measures were not very different among the four lower reaches (Reach 4.5 4_ED, 4_CB, and Reference), so it is logical that the macroinvertebrate and fish communities are also relatively comparable. The Reference reach received the highest MSHA habitat score, but that was mostly due to having a more stable channel than Reaches 4.5, 4_ED, or 4_CB, which all had bank erosion and observed channel instability. Brown Trout preferred the lower sections of the Knife River, and Brook Trout became more dominant in the upstream reaches, which is a fairly typical transition and has been observed in prior years. Rainbow Trout selected the lower reaches heavily for reproduction, which was evident by hundreds of age0 fish collected. The objectives for surveying the reaches in the upper watershed (Mcarthy, Red Dot, and White Landing) were to determine if Rainbow Trout were using these sections of the river for reproduction. We found age0 Rainbow Trout in Mcarthy, but none in Red Dot and only one in White Landing. This suggests that the reaches of Red Dot and White Landing were either: 1) not selected by adult Rainbow Trout for reproduction, 2) not accessible by most adult Rainbow Trout in spring 2017, or 3) not supporting good recruitment success through displacement or mortality of young fish. However, Red Dot and White Landing did have some age1+ Rainbow Trout, so at least limited reproduction occurred in 2016. During our temperature survey we located a groundwater spring where outflow temperatures were 45.9°F.

One of the most important reasons for performing these surveys on the lower reaches was to collect pre-treatment data, which will be invaluable in the future. When these surveys of habitat and biota are repeated in a post-treatment analysis, it will be possible to use the pre-treatment data reported here to examine how the stream modifications affect the channel and the creatures that live within it. Streams undergo natural change over time, but we can account for natural change by resurveying the Reference reach in conjunction with the post-treatment survey and analysis of Reaches 4.5, 4_ED, and 4_CB. Long-term valuation of stream construction projects intended to improve aquatic habitat are not often performed, so this is a unique opportunity to evaluate results through a pre-to-post comparison. However, it would not be possible to attribute observed changes in the stream channel or biota to the treatment without the Reference reach.

Acknowledgements

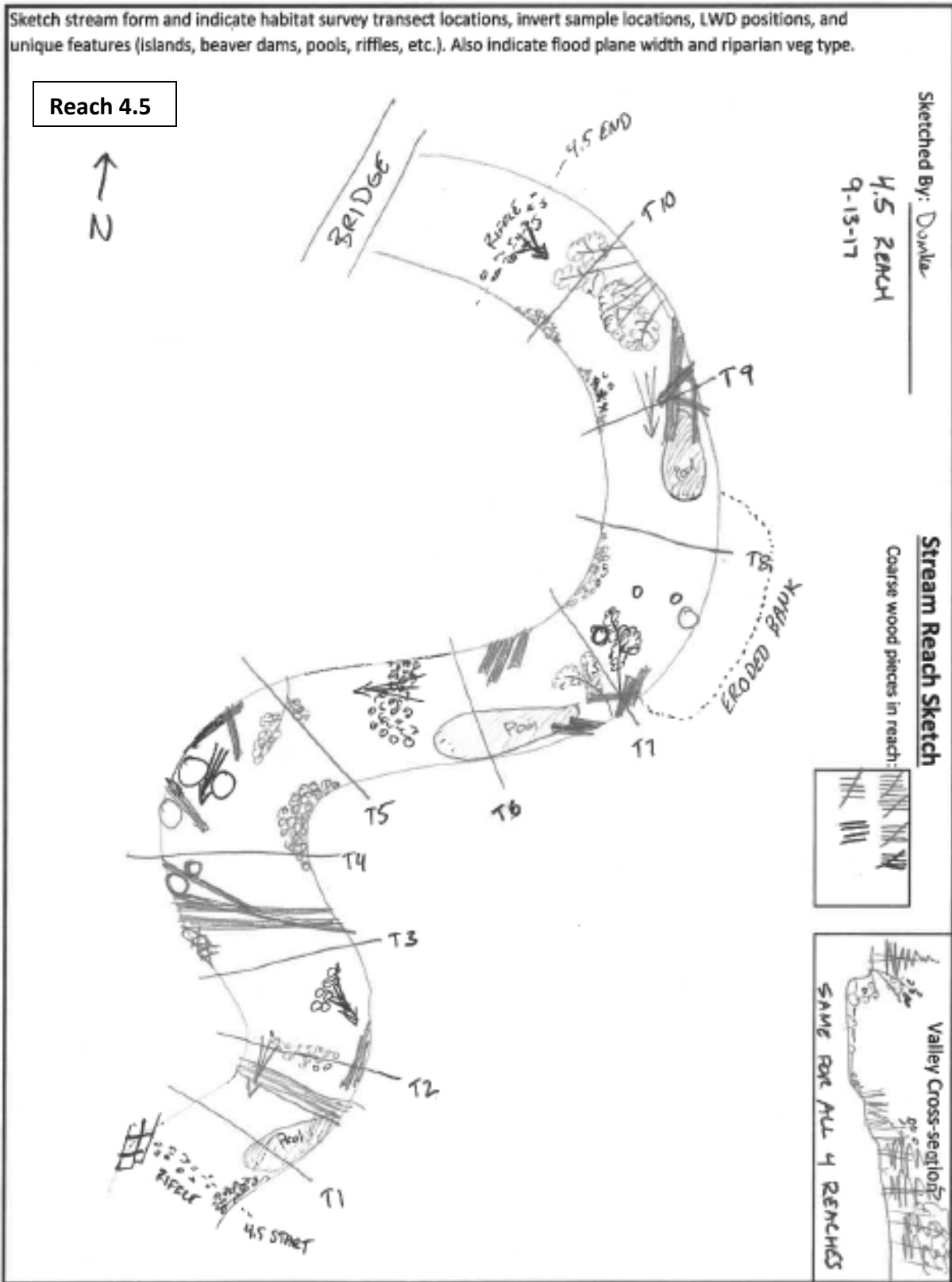
This work was permitted through Minnesota Department of Natural Resources Scientific Collector Permit 23285 and University of Minnesota Institutional Animal Care and Use Committee Protocol ID 1702-34612A. We were grateful to have LSSA member Kevin Bovee volunteer his time during preliminary stream walks to identify sections of the Knife River considered for treatment. We also thank our NRRI field technicians: Bob Hell, Kari Hansen, Nick Pierce, Matt Santo, Alex Quinn, and Jon Utecht.

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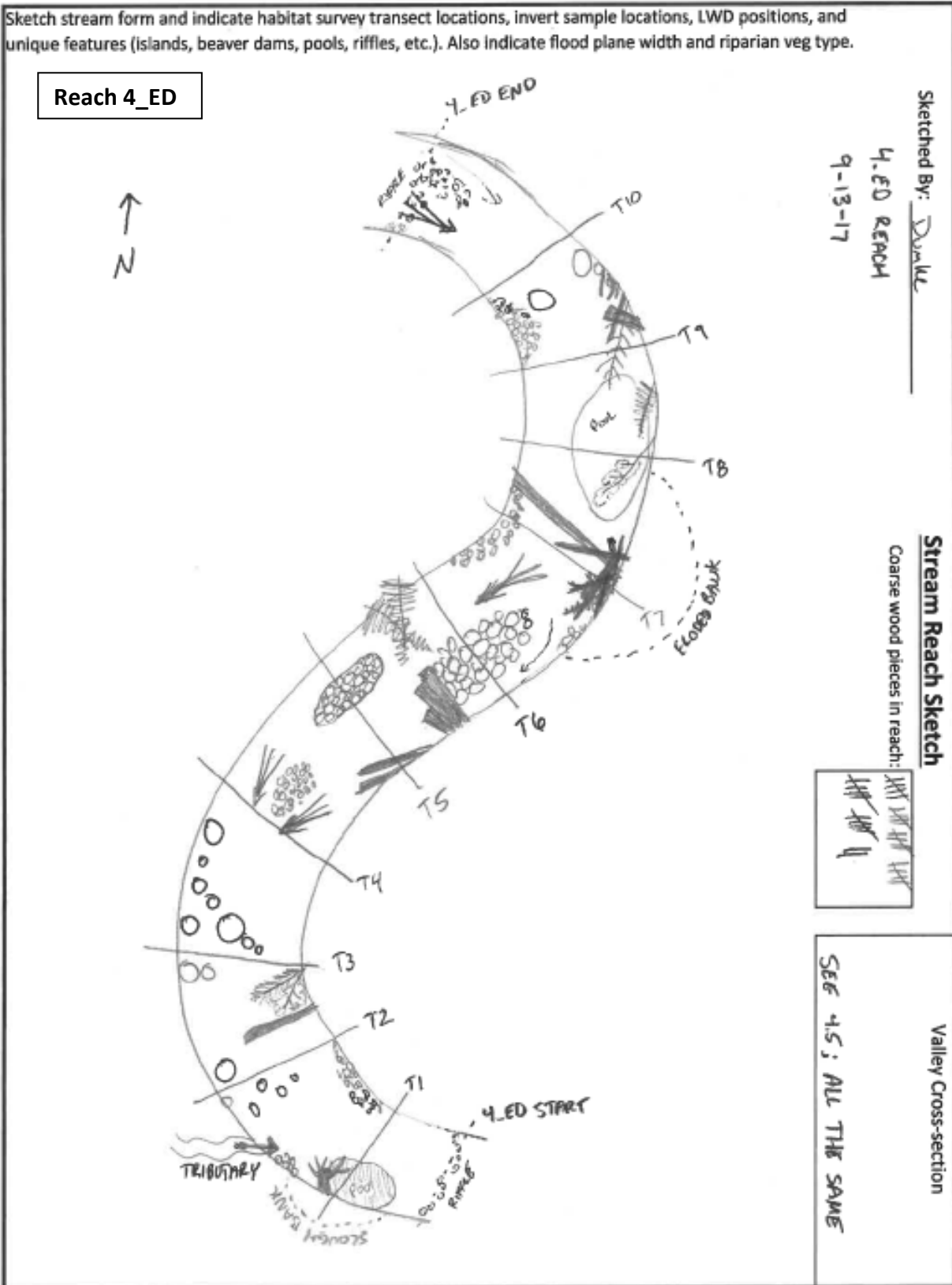
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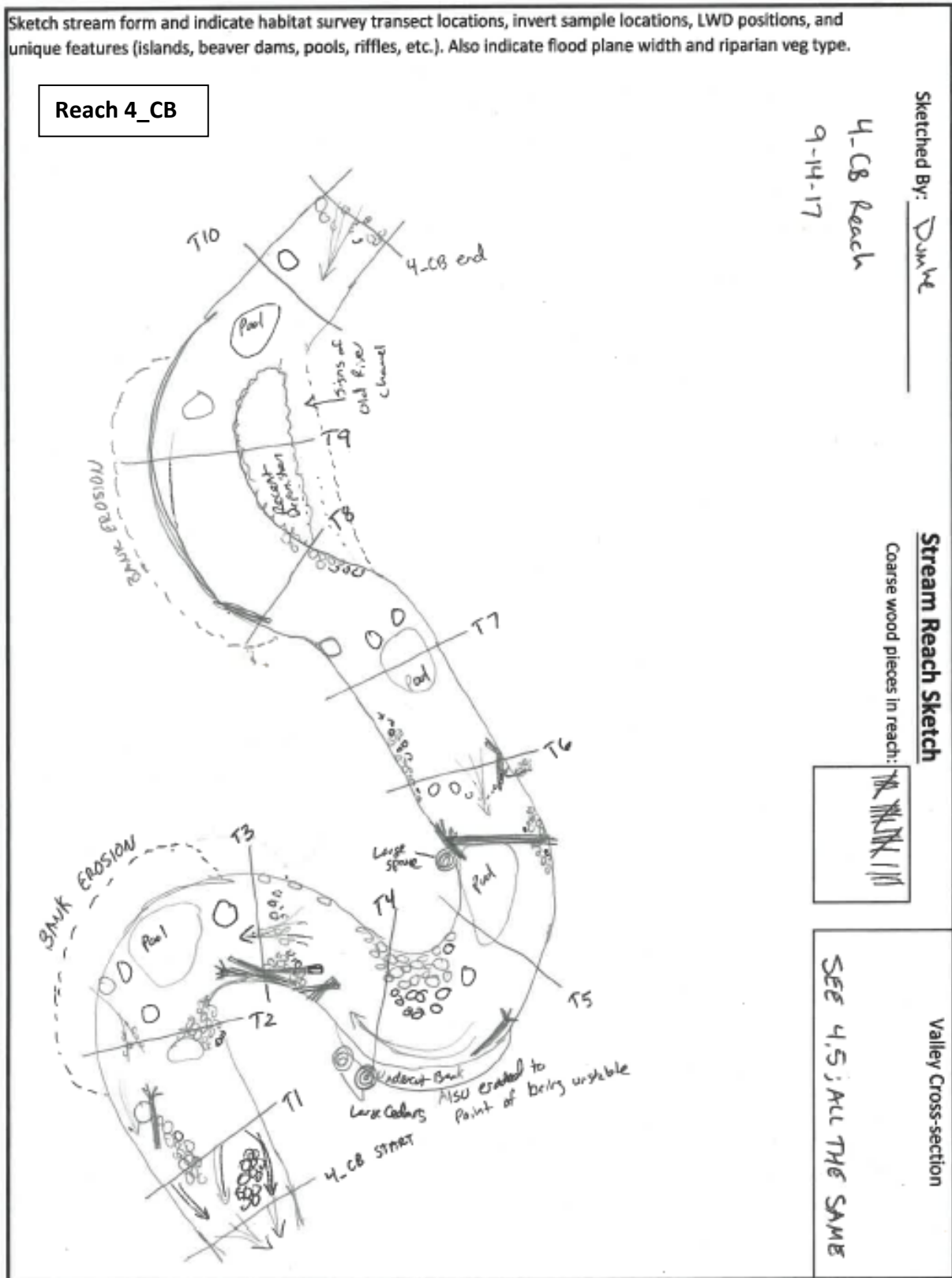
Appendix I. Stream reach sketch maps made during habitat surveys of mainstem Knife River.



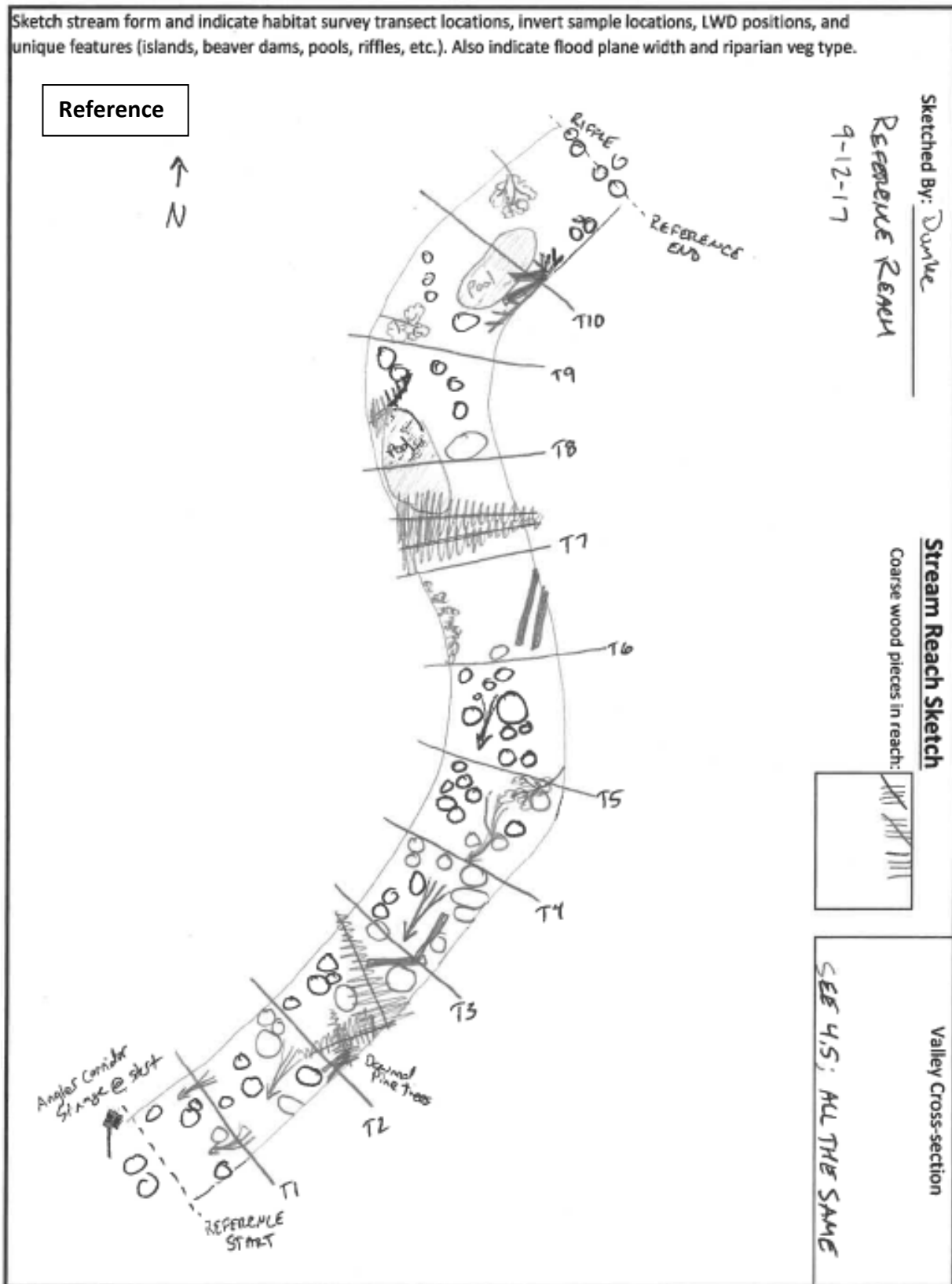
Appendix I. (continued)



Appendix I. (continued)



Appendix I. (continued)



Appendix II. MPCA Stream Habitat Assessment (MSHA) scoring datasheets

MPCA STREAM HABITAT ASSESSMENT (MSHA) (revised April 2014)

1. Stream Documentation

Field Number: 4.5 Stream Name: Knife River Date: 9-13-17 MSHA SCORE: 76

Person Scoring: Dumke Water Level (circle one): Flood / High / Normal / Low / Interstitial Max=100

2. Surrounding Land Use (Streams) or Floodplain Quality (Rivers)
(check the most predominant or check two and average scores) [L=left bank/R=right bank, facing UP-stream]

<table border="0"> <tr><td><input checked="" type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Forest, Wetland, Prairie, Shrub</td><td>[5]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Old Field/Hay Field</td><td>[3]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Fenced Pasture</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Residential/Park</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Conservation Tillage, No Till</td><td>[2]</td></tr> </table>	<input checked="" type="checkbox"/> L	<input type="checkbox"/> R	Forest, Wetland, Prairie, Shrub	[5]	<input type="checkbox"/> L	<input type="checkbox"/> R	Old Field/Hay Field	[3]	<input type="checkbox"/> L	<input type="checkbox"/> R	Fenced Pasture	[2]	<input type="checkbox"/> L	<input type="checkbox"/> R	Residential/Park	[2]	<input type="checkbox"/> L	<input type="checkbox"/> R	Conservation Tillage, No Till	[2]	<table border="0"> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Diked Wetland</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Urban/Industrial</td><td>[0]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Open Pasture</td><td>[0]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input checked="" type="checkbox"/> R</td><td>Mining/Construction</td><td>[0]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Row Crop</td><td>[0]</td></tr> </table>	<input type="checkbox"/> L	<input type="checkbox"/> R	Diked Wetland	[2]	<input type="checkbox"/> L	<input type="checkbox"/> R	Urban/Industrial	[0]	<input type="checkbox"/> L	<input type="checkbox"/> R	Open Pasture	[0]	<input type="checkbox"/> L	<input checked="" type="checkbox"/> R	Mining/Construction	[0]	<input type="checkbox"/> L	<input type="checkbox"/> R	Row Crop	[0]
<input checked="" type="checkbox"/> L	<input type="checkbox"/> R	Forest, Wetland, Prairie, Shrub	[5]																																						
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<input type="checkbox"/> L	<input type="checkbox"/> R	Urban/Industrial	[0]																																						
<input type="checkbox"/> L	<input type="checkbox"/> R	Open Pasture	[0]																																						
<input type="checkbox"/> L	<input checked="" type="checkbox"/> R	Mining/Construction	[0]																																						
<input type="checkbox"/> L	<input type="checkbox"/> R	Row Crop	[0]																																						

Land Use Max=5 2.5

3. Riparian Zone (check the most predominant)

<p>A. Riparian Width = <u>4.5</u></p> <table border="0"> <tr><td><input checked="" type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Extensive > 100 m</td><td>[5]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input checked="" type="checkbox"/> R</td><td>Wide 50-100 m</td><td>[4]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Moderate 10-50 m</td><td>[3]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Narrow 5-10 m</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Very Narrow 1-5 m</td><td>[1]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>None</td><td>[0]</td></tr> </table>	<input checked="" type="checkbox"/> L	<input type="checkbox"/> R	Extensive > 100 m	[5]	<input type="checkbox"/> L	<input checked="" type="checkbox"/> R	Wide 50-100 m	[4]	<input type="checkbox"/> L	<input type="checkbox"/> R	Moderate 10-50 m	[3]	<input type="checkbox"/> L	<input type="checkbox"/> R	Narrow 5-10 m	[2]	<input type="checkbox"/> L	<input type="checkbox"/> R	Very Narrow 1-5 m	[1]	<input type="checkbox"/> L	<input type="checkbox"/> R	None	[0]	<p>B. Bank Erosion = <u>1.0</u></p> <table border="0"> <tr><td><input checked="" type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>None</td><td>[5]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Little 5-25%</td><td>[4]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input checked="" type="checkbox"/> R</td><td>Moderate 25-50%</td><td>[3]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Heavy 50-75%</td><td>[1]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Severe 75-100%</td><td>[0]</td></tr> </table>	<input checked="" type="checkbox"/> L	<input type="checkbox"/> R	None	[5]	<input type="checkbox"/> L	<input type="checkbox"/> R	Little 5-25%	[4]	<input type="checkbox"/> L	<input checked="" type="checkbox"/> R	Moderate 25-50%	[3]	<input type="checkbox"/> L	<input type="checkbox"/> R	Heavy 50-75%	[1]	<input type="checkbox"/> L	<input type="checkbox"/> R	Severe 75-100%	[0]	<p>C. Shade = <u>4.0</u></p> <table border="0"> <tr><td><input checked="" type="checkbox"/> L</td><td><input checked="" type="checkbox"/> R</td><td>Heavy >75%</td><td>[4]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Substantial 50-75%</td><td>[3]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Moderate 25-50%</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>Light 5-25%</td><td>[1]</td></tr> <tr><td><input type="checkbox"/> L</td><td><input type="checkbox"/> R</td><td>None</td><td>[0]</td></tr> </table>	<input checked="" type="checkbox"/> L	<input checked="" type="checkbox"/> R	Heavy >75%	[4]	<input type="checkbox"/> L	<input type="checkbox"/> R	Substantial 50-75%	[3]	<input type="checkbox"/> L	<input type="checkbox"/> R	Moderate 25-50%	[2]	<input type="checkbox"/> L	<input type="checkbox"/> R	Light 5-25%	[1]	<input type="checkbox"/> L	<input type="checkbox"/> R	None	[0]
<input checked="" type="checkbox"/> L	<input type="checkbox"/> R	Extensive > 100 m	[5]																																																															
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<input type="checkbox"/> L	<input type="checkbox"/> R	Light 5-25%	[1]																																																															
<input type="checkbox"/> L	<input type="checkbox"/> R	None	[0]																																																															

Riparian Max=14 12.5

4. Instream Zone

<p>A. Substrate (check two for each channel type)</p> <table border="0"> <tr><td>[10]</td><td>[9]</td><td>[8]</td><td>[6]</td><td>[5]</td><td>[5]</td><td>[2]</td><td>[1]</td><td>[1]</td><td>[0]</td></tr> <tr><td></td><td>Boulder</td><td>Cobble</td><td>Gravel</td><td>Sand</td><td>Clay</td><td>Bedrock</td><td>Silt</td><td>Muck</td><td>Debris</td><td>Sludge</td></tr> <tr><td>Pool</td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td>Riffle</td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td>Run</td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td>Glide</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> <tr><td>Note</td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td></tr> </table> <p>Channel Type % <u>20</u> <u>3.9</u> <u>20</u> <u>3.4</u> <u>60</u> <u>10.2</u> Presence = <u>17.0</u></p>	[10]	[9]	[8]	[6]	[5]	[5]	[2]	[1]	[1]	[0]		Boulder	Cobble	Gravel	Sand	Clay	Bedrock	Silt	Muck	Debris	Sludge	Pool	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Riffle	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Run	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Glide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Note	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>B. Embeddedness</p> <table border="0"> <tr><td><input checked="" type="checkbox"/></td><td>None <25%</td><td>[5]</td></tr> <tr><td><input type="checkbox"/></td><td>Light 25-50%</td><td>[3]</td></tr> <tr><td><input type="checkbox"/></td><td>Moderate 50-75%</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Severe 75-100%</td><td>[-1]</td></tr> <tr><td><input type="checkbox"/></td><td>No coarse substrate</td><td>[0]</td></tr> </table> <p>D. Substrate Types</p> <table border="0"> <tr><td><input checked="" type="checkbox"/></td><td>≥4</td><td>[2]</td></tr> <tr><td><input type="checkbox"/></td><td><4</td><td>[0]</td></tr> </table>	<input checked="" type="checkbox"/>	None <25%	[5]	<input type="checkbox"/>	Light 25-50%	[3]	<input type="checkbox"/>	Moderate 50-75%	[1]	<input type="checkbox"/>	Severe 75-100%	[-1]	<input type="checkbox"/>	No coarse substrate	[0]	<input checked="" type="checkbox"/>	≥4	[2]	<input type="checkbox"/>	<4	[0]	<p>C. Siltation</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>Silt Free</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Silt Normal</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>Silt Moderate</td><td>[-1]</td></tr> <tr><td><input type="checkbox"/></td><td>Silt Heavy</td><td>[-2]</td></tr> </table>	<input type="checkbox"/>	Silt Free	[1]	<input checked="" type="checkbox"/>	Silt Normal	[0]	<input type="checkbox"/>	Silt Moderate	[-1]	<input type="checkbox"/>	Silt Heavy	[-2]
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Pool	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																																																																					
Riffle	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																																																																					
Run	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																																																																					
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Note	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>																																																																																																					
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<input type="checkbox"/>	Silt Moderate	[-1]																																																																																																													
<input type="checkbox"/>	Silt Heavy	[-2]																																																																																																													

Substrate Max=28 24.0

<p>E. Cover Type (check all that apply)</p> <table border="0"> <tr><td><input checked="" type="checkbox"/></td><td>Undercut Banks</td><td>[1]</td><td><input type="checkbox"/></td><td>Oxbows, Backwaters</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Overhanging Vegetation</td><td>[1]</td><td><input checked="" type="checkbox"/></td><td>Shallows (in slow water)</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Deep Pools</td><td>[1]</td><td><input checked="" type="checkbox"/></td><td>Macrophytes</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Logs or Woody Debris</td><td>[1]</td><td><input type="checkbox"/></td><td>Submergent</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Boulders</td><td>[1]</td><td><input type="checkbox"/></td><td>Emergent</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Rootwads</td><td>[1]</td><td><input type="checkbox"/></td><td>Floating Leaf</td><td>[1]</td></tr> </table>	<input checked="" type="checkbox"/>	Undercut Banks	[1]	<input type="checkbox"/>	Oxbows, Backwaters	[1]	<input checked="" type="checkbox"/>	Overhanging Vegetation	[1]	<input checked="" type="checkbox"/>	Shallows (in slow water)	[1]	<input checked="" type="checkbox"/>	Deep Pools	[1]	<input checked="" type="checkbox"/>	Macrophytes	[1]	<input checked="" type="checkbox"/>	Logs or Woody Debris	[1]	<input type="checkbox"/>	Submergent	[1]	<input checked="" type="checkbox"/>	Boulders	[1]	<input type="checkbox"/>	Emergent	[1]	<input checked="" type="checkbox"/>	Rootwads	[1]	<input type="checkbox"/>	Floating Leaf	[1]	<p>F. Cover Amount (check one)</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>Extensive >50%</td><td>[9]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Moderate 25-50%</td><td>[7]</td></tr> <tr><td><input type="checkbox"/></td><td>Sparse 5-25%</td><td>[3]</td></tr> <tr><td><input type="checkbox"/></td><td>Nearly Absent</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>Choking Vegetation only</td><td>[-1]</td></tr> </table>	<input type="checkbox"/>	Extensive >50%	[9]	<input checked="" type="checkbox"/>	Moderate 25-50%	[7]	<input type="checkbox"/>	Sparse 5-25%	[3]	<input type="checkbox"/>	Nearly Absent	[0]	<input type="checkbox"/>	Choking Vegetation only	[-1]
<input checked="" type="checkbox"/>	Undercut Banks	[1]	<input type="checkbox"/>	Oxbows, Backwaters	[1]																																															
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<input type="checkbox"/>	Nearly Absent	[0]																																																		
<input type="checkbox"/>	Choking Vegetation only	[-1]																																																		

Cover Max=18 15

5. Channel Morphology

<p>A. Depth Variability</p> <table border="0"> <tr><td><input checked="" type="checkbox"/></td><td>Greatest Depth >4X Shallow Depth</td><td>[4]</td></tr> <tr><td><input type="checkbox"/></td><td>Greatest Depth 2-4X Shallow Depth</td><td>[2]</td></tr> <tr><td><input type="checkbox"/></td><td>Greatest Depth <2X Shallow Depth</td><td>[0]</td></tr> </table> <p>D. Sinuosity</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>Excellent</td><td>[4]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Good</td><td>[3]</td></tr> <tr><td><input type="checkbox"/></td><td>Fair</td><td>[2]</td></tr> <tr><td><input type="checkbox"/></td><td>Poor</td><td>[0]</td></tr> </table> <p>F. Channel Development</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>Excellent</td><td>[9]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Good</td><td>[6]</td></tr> <tr><td><input type="checkbox"/></td><td>Fair</td><td>[3]</td></tr> <tr><td><input type="checkbox"/></td><td>Poor</td><td>[0]</td></tr> </table>	<input checked="" type="checkbox"/>	Greatest Depth >4X Shallow Depth	[4]	<input type="checkbox"/>	Greatest Depth 2-4X Shallow Depth	[2]	<input type="checkbox"/>	Greatest Depth <2X Shallow Depth	[0]	<input type="checkbox"/>	Excellent	[4]	<input checked="" type="checkbox"/>	Good	[3]	<input type="checkbox"/>	Fair	[2]	<input type="checkbox"/>	Poor	[0]	<input type="checkbox"/>	Excellent	[9]	<input checked="" type="checkbox"/>	Good	[6]	<input type="checkbox"/>	Fair	[3]	<input type="checkbox"/>	Poor	[0]	<p>B. Channel Stability</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>High</td><td>[9]</td></tr> <tr><td><input type="checkbox"/></td><td>Moderate/High</td><td>[6]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Moderate</td><td>[3]</td></tr> <tr><td><input type="checkbox"/></td><td>Low</td><td>[0]</td></tr> </table> <p>E. Pool Width/Riffle Width</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>Pool Width > Riffle Width</td><td>[2]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Pool Width = Riffle Width</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Pool Width < Riffle Width</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>No Riffle</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>No Pool</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>Impounded</td><td>[-2]</td></tr> </table>	<input type="checkbox"/>	High	[9]	<input type="checkbox"/>	Moderate/High	[6]	<input checked="" type="checkbox"/>	Moderate	[3]	<input type="checkbox"/>	Low	[0]	<input type="checkbox"/>	Pool Width > Riffle Width	[2]	<input checked="" type="checkbox"/>	Pool Width = Riffle Width	[1]	<input type="checkbox"/>	Pool Width < Riffle Width	[0]	<input type="checkbox"/>	No Riffle	[0]	<input type="checkbox"/>	No Pool	[0]	<input type="checkbox"/>	Impounded	[-2]	<p>C. Velocity Types (check all that apply)</p> <table border="0"> <tr><td><input checked="" type="checkbox"/></td><td>Fast</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Moderate</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Slow</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Eddies</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Torrential</td><td>[-1]</td></tr> <tr><td><input type="checkbox"/></td><td>None</td><td>[-1]</td></tr> <tr><td><input type="checkbox"/></td><td>Interstitial</td><td>[-1]</td></tr> <tr><td><input type="checkbox"/></td><td>Intermittent</td><td>[-2]</td></tr> </table> <p>G. Modifications (check all that apply)</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>Leveed</td><td>[-1]</td><td><input type="checkbox"/></td><td>Rip Rap</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Dredged</td><td>[-1]</td><td><input type="checkbox"/></td><td>Const. Island</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Bank Shaping</td><td>[-1]</td><td><input type="checkbox"/></td><td>Wood Pilings</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Railroad Ties</td><td>[-1]</td><td></td><td></td><td></td></tr> <tr><td><input type="checkbox"/></td><td>Cemented</td><td>[-2]</td><td></td><td></td><td></td></tr> <tr><td><input type="checkbox"/></td><td>Bulkheads</td><td>[-2]</td><td></td><td></td><td></td></tr> </table>	<input checked="" type="checkbox"/>	Fast	[1]	<input checked="" type="checkbox"/>	Moderate	[1]	<input checked="" type="checkbox"/>	Slow	[1]	<input checked="" type="checkbox"/>	Eddies	[1]	<input type="checkbox"/>	Torrential	[-1]	<input type="checkbox"/>	None	[-1]	<input type="checkbox"/>	Interstitial	[-1]	<input type="checkbox"/>	Intermittent	[-2]	<input type="checkbox"/>	Leveed	[-1]	<input type="checkbox"/>	Rip Rap	[1]	<input type="checkbox"/>	Dredged	[-1]	<input type="checkbox"/>	Const. Island	[1]	<input type="checkbox"/>	Bank Shaping	[-1]	<input type="checkbox"/>	Wood Pilings	[1]	<input type="checkbox"/>	Railroad Ties	[-1]				<input type="checkbox"/>	Cemented	[-2]				<input type="checkbox"/>	Bulkheads	[-2]			
<input checked="" type="checkbox"/>	Greatest Depth >4X Shallow Depth	[4]																																																																																																																											
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<input type="checkbox"/>	Leveed	[-1]	<input type="checkbox"/>	Rip Rap	[1]																																																																																																																								
<input type="checkbox"/>	Dredged	[-1]	<input type="checkbox"/>	Const. Island	[1]																																																																																																																								
<input type="checkbox"/>	Bank Shaping	[-1]	<input type="checkbox"/>	Wood Pilings	[1]																																																																																																																								
<input type="checkbox"/>	Railroad Ties	[-1]																																																																																																																											
<input type="checkbox"/>	Cemented	[-2]																																																																																																																											
<input type="checkbox"/>	Bulkheads	[-2]																																																																																																																											

Channel Max=35 22

Appendix II. (continued)

MPCA STREAM HABITAT ASSESSMENT (MSHA)

(revised April 2014)

1. Stream Documentation			MSHA SCORE								
Field Number: <u>4-ED</u>	Stream Name: <u>Knife River</u>	Date: <u>9-13-17</u>	71.5								
Person Scoring: <u>Dumbe</u>	Water Level (circle one): Flood / High / <u>Normal</u> / Low / Interstitial										
Max=100											
2. Surrounding Land Use (Streams) or Floodplain Quality (Rivers)											
(check the most predominant or check two and average scores)											
		[L=left bank/R=right bank, facing UP-stream]									
L	R										
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Forest, Wetland, Prairie, Shrub	[5]								
<input type="checkbox"/>	<input type="checkbox"/>	Old Field/Hay Field	[3]								
<input type="checkbox"/>	<input type="checkbox"/>	Fenced Pasture	[2]								
<input type="checkbox"/>	<input type="checkbox"/>	Residential/Park	[2]								
<input type="checkbox"/>	<input type="checkbox"/>	Conservation Tillage, No Till	[2]								
		Diked Wetland	[2]								
		Urban/Industrial	[0]								
		Open Pasture	[0]								
		Mining/Construction	[0]								
		Row Crop	[0]								
			Land Use								
			2.5								
Max=5											
3. Riparian Zone (check the most predominant)											
A. Riparian Width = 4.5											
L	R										
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Extensive > 100 m	[5]								
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Wide 50-100 m	[4]								
<input type="checkbox"/>	<input type="checkbox"/>	Moderate 10-50 m	[3]								
<input type="checkbox"/>	<input type="checkbox"/>	Narrow 5-10 m	[2]								
<input type="checkbox"/>	<input type="checkbox"/>	Very Narrow 1-5 m	[1]								
<input type="checkbox"/>	<input type="checkbox"/>	None	[0]								
B. Bank Erosion = 3.5											
L	R										
<input type="checkbox"/>	<input type="checkbox"/>	None	[5]								
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Little 5-25%	[4]								
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Moderate 25-50%	[3]								
<input type="checkbox"/>	<input type="checkbox"/>	Heavy 50-75%	[1]								
<input type="checkbox"/>	<input type="checkbox"/>	Severe 75-100%	[0]								
C. Shade = 3											
L	R										
<input type="checkbox"/>	<input type="checkbox"/>	Heavy >75%	[4]								
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Substantial 50-75%	[3]								
<input type="checkbox"/>	<input type="checkbox"/>	Moderate 25-50%	[2]								
<input type="checkbox"/>	<input type="checkbox"/>	Light 5-25%	[1]								
<input type="checkbox"/>	<input type="checkbox"/>	None	[0]								
			Riparian								
			11								
Max=14											
4. Instream Zone											
A. Substrate (check two for each channel type)											
	[10]	[9]	[8]	[6]	[5]	[5]	[2]	[1]	[1]	[0]	
											Channel Type %
Pool	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20 = 3.4
Riffle	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50 = 8.5
Run	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	30 = 5.1
Glide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Note	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Presence = 1
											Substrate
											24
											Max=28
B. Embeddedness				C. Siltation							
<input checked="" type="checkbox"/>	None < 2.5" [5]			<input type="checkbox"/>	Silt Free [1]						
<input type="checkbox"/>	Light 25-50% [3]			<input checked="" type="checkbox"/>	Silt Normal [0]						
<input type="checkbox"/>	Moderate 50-75% [1]			<input type="checkbox"/>	Silt Moderate [-1]						
<input type="checkbox"/>	Severe 75-100% [-1]			<input type="checkbox"/>	Silt Heavy [-2]						
<input type="checkbox"/>	No coarse substrate [0]										
D. Substrate Types											
<input checked="" type="checkbox"/>	≥4 [2]										
<input type="checkbox"/>	<4 [0]										
E. Cover Type (check all that apply)				F. Cover Amount (check one)							
<input type="checkbox"/>	Undercut Banks [1]			<input type="checkbox"/>	Extensive >50% [9]						
<input checked="" type="checkbox"/>	Overhanging Vegetation [1]			<input checked="" type="checkbox"/>	Moderate 25-50% [7]						
<input checked="" type="checkbox"/>	Deep Pools [1]			<input type="checkbox"/>	Sparse 5-25% [3]						
<input checked="" type="checkbox"/>	Logs or Woody Debris [1]			<input type="checkbox"/>	Nearly Absent [0]						
<input checked="" type="checkbox"/>	Boulders [1]			<input type="checkbox"/>	Choking Vegetation only [-1]						
<input checked="" type="checkbox"/>	Rootwads [1]			<input type="checkbox"/>							
<input type="checkbox"/>	Oxbows, Backwaters [1]										
<input checked="" type="checkbox"/>	Shallows (in slow water) [1]										
<input checked="" type="checkbox"/>	Macrophytes [1]										
<input checked="" type="checkbox"/>	Submergent										
<input type="checkbox"/>	Emergent										
<input type="checkbox"/>	Floating Leaf										
			Cover								
			14								
											Max=18
5. Channel Morphology											
A. Depth Variability				B. Channel Stability				C. Velocity Types (check all that apply)			
<input checked="" type="checkbox"/>	Greatest Depth >4X Shallow Depth [4]			<input type="checkbox"/>	High [9]			<input checked="" type="checkbox"/>	Fast [1]		
<input type="checkbox"/>	Greatest Depth 2-4X Shallow Depth [2]			<input type="checkbox"/>	Moderate/High [6]			<input checked="" type="checkbox"/>	Moderate [1]		
<input type="checkbox"/>	Greatest Depth <2X Shallow Depth [0]			<input checked="" type="checkbox"/>	Moderate [3]			<input checked="" type="checkbox"/>	Slow [1]		
				<input type="checkbox"/>	Low [0]			<input type="checkbox"/>	Eddies [1]		
								<input type="checkbox"/>	Torrential [-1]		
								<input type="checkbox"/>	None [-1]		
								<input type="checkbox"/>	Interstitial [-1]		
								<input type="checkbox"/>	Intermittent [-2]		
D. Sinuosity				E. Pool Width/Riffle Width				G. Modifications (check all that apply)			
<input type="checkbox"/>	Excellent [4]			<input type="checkbox"/>	Pool Width > Riffle Width [2]			<i>none</i>			
<input checked="" type="checkbox"/>	Good [3]			<input checked="" type="checkbox"/>	Pool Width = Riffle Width [1]						
<input type="checkbox"/>	Fair [2]			<input type="checkbox"/>	Pool Width < Riffle Width [0]			<input type="checkbox"/>	Leveed [-1]		
<input type="checkbox"/>	Poor [0]			<input type="checkbox"/>	No Riffle [0]			<input type="checkbox"/>	Dredged [-1]		
				<input type="checkbox"/>	No Pool [0]			<input type="checkbox"/>	Bank Shaping [-1]		
				<input type="checkbox"/>	Impounded [-2]			<input type="checkbox"/>	Railroad Ties [-1]		
								<input type="checkbox"/>	Cemented [-2]		
								<input type="checkbox"/>	Bulkheads [-2]		
F. Channel Development											
<input type="checkbox"/>	Excellent [9]										
<input checked="" type="checkbox"/>	Good [6]										
<input type="checkbox"/>	Fair [3]										
<input type="checkbox"/>	Poor [0]										
			Channel								
			20								
											Max=35

Appendix II. (continued)

MPCA STREAM HABITAT ASSESSMENT (MSHA)

(revised April 2014)

1. Stream Documentation Field Number: <u>4-28</u> Stream Name: <u>Knife River</u> Date: <u>9-14-17</u> Person Scoring: <u>Dunkle</u> Water Level (circle one): Flood / High / <u>Normal</u> / Low / Interstitial Max=100		MSHA SCORE <div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">70</div>																																																																																																																																																										
2. Surrounding Land Use (Streams) or Floodplain Quality (Rivers) (check the most predominant or check two and average scores) [L=left bank/R=right bank, facing UP-stream]																																																																																																																																																												
<table style="width:100%; border-collapse: collapse;"> <tr><td><input checked="" type="checkbox"/> L <input type="checkbox"/> R</td><td>Forest, Wetland, Prairie, Shrub</td><td>[5]</td></tr> <tr><td><input type="checkbox"/> L <input type="checkbox"/> R</td><td>Old Field/Hay Field</td><td>[3]</td></tr> <tr><td><input type="checkbox"/> L <input type="checkbox"/> R</td><td>Fenced Pasture</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> L <input type="checkbox"/> R</td><td>Residential/Park</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> L <input type="checkbox"/> R</td><td>Conservation Tillage, No Till</td><td>[2]</td></tr> </table>	<input checked="" type="checkbox"/> L <input type="checkbox"/> R	Forest, Wetland, Prairie, Shrub	[5]	<input type="checkbox"/> L <input type="checkbox"/> R	Old Field/Hay Field	[3]	<input type="checkbox"/> L <input type="checkbox"/> R	Fenced Pasture	[2]	<input type="checkbox"/> L <input type="checkbox"/> R	Residential/Park	[2]	<input type="checkbox"/> L <input type="checkbox"/> R	Conservation Tillage, No Till	[2]	<table style="width:100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/> L <input type="checkbox"/> R</td><td>Diked Wetland</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> L <input type="checkbox"/> R</td><td>Urban/Industrial</td><td>[0]</td></tr> <tr><td><input type="checkbox"/> L <input type="checkbox"/> R</td><td>Open Pasture</td><td>[0]</td></tr> <tr><td><input type="checkbox"/> L <input checked="" type="checkbox"/> R</td><td>Mining/Construction</td><td>[0]</td></tr> <tr><td><input type="checkbox"/> L <input type="checkbox"/> R</td><td>Row Crop</td><td>[0]</td></tr> </table>	<input type="checkbox"/> L <input type="checkbox"/> R	Diked Wetland	[2]	<input type="checkbox"/> L <input type="checkbox"/> R	Urban/Industrial	[0]	<input type="checkbox"/> L <input type="checkbox"/> R	Open Pasture	[0]	<input type="checkbox"/> L <input checked="" type="checkbox"/> R	Mining/Construction	[0]	<input type="checkbox"/> L <input type="checkbox"/> R	Row Crop	[0]	Land Use <div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">2.5</div> Max=5																																																																																																																												
<input checked="" type="checkbox"/> L <input type="checkbox"/> R	Forest, Wetland, Prairie, Shrub	[5]																																																																																																																																																										
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3. Riparian Zone (check the most predominant)																																																																																																																																																												
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Substrate (check two for each channel type) <table style="width:100%; border-collapse: collapse;"> <tr><td>[10]</td><td>Boulder</td><td>[9]</td><td>Cobble</td><td>[8]</td><td>Gravel</td><td>[6]</td><td>Sand</td><td>[5]</td><td>Clay</td><td>[5]</td><td>Bedrock</td><td>[2]</td><td>Silt</td><td>[1]</td><td>Muck</td><td>[1]</td><td>Detritus</td><td>[1]</td><td>Sludge</td><td>[0]</td></tr> <tr><td>Pool</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input 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</table>	[10]	Boulder	[9]	Cobble	[8]	Gravel	[6]	Sand	[5]	Clay	[5]	Bedrock	[2]	Silt	[1]	Muck	[1]	Detritus	[1]	Sludge	[0]	Pool	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Riffle	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Run	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Glide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input 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Embeddedness <table style="width:100%; border-collapse: collapse;"> <tr><td><input checked="" type="checkbox"/></td><td>None <25%</td><td>[5]</td></tr> <tr><td><input type="checkbox"/></td><td>Light 25-50%</td><td>[3]</td></tr> <tr><td><input type="checkbox"/></td><td>Moderate 50-75%</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Severe 75-100%</td><td>[-1]</td></tr> <tr><td><input type="checkbox"/></td><td>No coarse substrate</td><td>[0]</td></tr> </table>	<input checked="" type="checkbox"/>	None <25%	[5]	<input type="checkbox"/>	Light 25-50%	[3]	<input type="checkbox"/>	Moderate 50-75%	[1]	<input type="checkbox"/>	Severe 75-100%	[-1]	<input type="checkbox"/>	No coarse substrate	[0]	C. Siltation <table style="width:100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/></td><td>Silt Free</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Silt Normal</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>Silt Moderate</td><td>[-1]</td></tr> <tr><td><input type="checkbox"/></td><td>Silt Heavy</td><td>[-2]</td></tr> </table>	<input type="checkbox"/>	Silt Free	[1]	<input checked="" type="checkbox"/>	Silt Normal	[0]	<input type="checkbox"/>	Silt Moderate	[-1]	<input type="checkbox"/>	Silt Heavy	[-2]	Substrate <div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">24</div> Max=28
[10]	Boulder	[9]	Cobble	[8]	Gravel	[6]	Sand	[5]	Clay	[5]	Bedrock	[2]	Silt	[1]	Muck	[1]	Detritus	[1]	Sludge	[0]																																																																																																																																								
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D. Substrate Types <table style="width:100%; border-collapse: collapse;"> <tr><td><input checked="" type="checkbox"/></td><td>≥4</td><td>[2]</td></tr> <tr><td><input type="checkbox"/></td><td><4</td><td>[0]</td></tr> </table>	<input checked="" type="checkbox"/>	≥4	[2]	<input type="checkbox"/>	<4	[0]			Cover <div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">15</div> Max=18																																																																																																																																																			
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E. Cover Type (check all that apply) <table style="width:100%; border-collapse: collapse;"> <tr><td><input checked="" type="checkbox"/></td><td>Undercut Banks</td><td>[1]</td><td><input type="checkbox"/></td><td>Oxbows, Backwaters</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Overhanging Vegetation</td><td>[1]</td><td><input checked="" type="checkbox"/></td><td>Shallows (in slow water)</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Deep Pools</td><td>[1]</td><td><input checked="" type="checkbox"/></td><td>Macrophytes</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Logs or Woody Debris</td><td>[1]</td><td><input checked="" type="checkbox"/></td><td>Submergent</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Boulders</td><td>[1]</td><td><input type="checkbox"/></td><td>Emergent</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Rootwads</td><td>[1]</td><td><input type="checkbox"/></td><td>Floating Leaf</td><td>[1]</td></tr> </table>	<input checked="" type="checkbox"/>	Undercut Banks	[1]	<input type="checkbox"/>	Oxbows, Backwaters	[1]	<input checked="" type="checkbox"/>	Overhanging Vegetation	[1]	<input checked="" type="checkbox"/>	Shallows (in slow water)	[1]	<input checked="" type="checkbox"/>	Deep Pools	[1]	<input checked="" type="checkbox"/>	Macrophytes	[1]	<input checked="" type="checkbox"/>	Logs or Woody Debris	[1]	<input checked="" type="checkbox"/>	Submergent	[1]	<input checked="" type="checkbox"/>	Boulders	[1]	<input type="checkbox"/>	Emergent	[1]	<input checked="" type="checkbox"/>	Rootwads	[1]	<input type="checkbox"/>	Floating Leaf	[1]	F. Cover Amount (check one) <table style="width:100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/></td><td>Extensive >50%</td><td>[9]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Moderate 25-50%</td><td>[7]</td></tr> <tr><td><input type="checkbox"/></td><td>Sparse 5-25%</td><td>[3]</td></tr> <tr><td><input type="checkbox"/></td><td>Nearly Absent</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>Choking Vegetation only</td><td>[-1]</td></tr> </table>	<input type="checkbox"/>	Extensive >50%	[9]	<input checked="" type="checkbox"/>	Moderate 25-50%	[7]	<input type="checkbox"/>	Sparse 5-25%	[3]	<input type="checkbox"/>	Nearly Absent	[0]	<input type="checkbox"/>	Choking Vegetation only	[-1]																																																																																																								
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D. Sinuosity <table style="width:100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/></td><td>Excellent</td><td>[4]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Good</td><td>[3]</td></tr> <tr><td><input type="checkbox"/></td><td>Fair</td><td>[2]</td></tr> <tr><td><input type="checkbox"/></td><td>Poor</td><td>[0]</td></tr> </table>	<input type="checkbox"/>	Excellent	[4]	<input checked="" type="checkbox"/>	Good	[3]	<input type="checkbox"/>	Fair	[2]	<input type="checkbox"/>	Poor	[0]	E. Pool Width/Riffle Width <table style="width:100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/></td><td>Pool Width > Riffle Width</td><td>[2]</td></tr> <tr><td><input type="checkbox"/></td><td>Pool Width = Riffle Width</td><td>[1]</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Pool Width < Riffle Width</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>No Riffle</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>No Pool</td><td>[0]</td></tr> <tr><td><input type="checkbox"/></td><td>Impounded</td><td>[-2]</td></tr> </table>	<input type="checkbox"/>	Pool Width > Riffle Width	[2]	<input type="checkbox"/>	Pool Width = Riffle Width	[1]	<input checked="" type="checkbox"/>	Pool Width < Riffle Width	[0]	<input type="checkbox"/>	No Riffle	[0]	<input type="checkbox"/>	No Pool	[0]	<input type="checkbox"/>	Impounded	[-2]	G. Modifications (check all that apply) <table style="width:100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/></td><td>Leveed</td><td>[-1]</td><td><input type="checkbox"/></td><td>Rip Rap</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Dredged</td><td>[-1]</td><td><input type="checkbox"/></td><td>Const. Island</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Bank Shaping</td><td>[-1]</td><td><input type="checkbox"/></td><td>Wood Piling</td><td>[1]</td></tr> <tr><td><input type="checkbox"/></td><td>Railroad Ties</td><td>[-1]</td><td></td><td></td><td></td></tr> <tr><td><input type="checkbox"/></td><td>Cemented</td><td>[-2]</td><td></td><td></td><td></td></tr> <tr><td><input type="checkbox"/></td><td>Bulkheads</td><td>[-2]</td><td></td><td></td><td></td></tr> </table>	<input type="checkbox"/>	Leveed	[-1]	<input type="checkbox"/>	Rip Rap	[1]	<input type="checkbox"/>	Dredged	[-1]	<input type="checkbox"/>	Const. Island	[1]	<input type="checkbox"/>	Bank Shaping	[-1]	<input type="checkbox"/>	Wood Piling	[1]	<input type="checkbox"/>	Railroad Ties	[-1]				<input type="checkbox"/>	Cemented	[-2]				<input type="checkbox"/>	Bulkheads	[-2]				Channel <div style="border: 1px solid black; padding: 5px; width: 40px; margin: 0 auto;">19</div> Max=35																																																																																							
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Appendix II. (continued)

MPCA STREAM HABITAT ASSESSMENT (MSHA)

(revised April 2014)

1. Stream Documentation		MSHA SCORE																																																																																																												
Field Number: <u>Reference</u>	Stream Name: <u>Knife River</u>	Date: <u>9-12-17</u>																																																																																																												
Person Scoring: <u>Dunne</u>	Water Level (circle one): Flood / High <u>Normal</u> / Low / Interstitial	Max=100 86.7																																																																																																												
2. Surrounding Land Use (Streams) or Floodplain Quality (Rivers)																																																																																																														
(check the most predominant or check two and average scores) [L=left bank/R=right bank, facing UP-stream]																																																																																																														
<table style="width:100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/> L <input checked="" type="checkbox"/> R</td><td>Forest, Wetland, Prairie, Shrub</td><td>[5]</td></tr> <tr><td><input type="checkbox"/> <input type="checkbox"/></td><td>Old Field/Hay Field</td><td>[3]</td></tr> <tr><td><input type="checkbox"/> <input type="checkbox"/></td><td>Fenced Pasture</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> <input type="checkbox"/></td><td>Residential/Park</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> <input type="checkbox"/></td><td>Conservation Tillage, No Till</td><td>[2]</td></tr> </table>	<input type="checkbox"/> L <input checked="" type="checkbox"/> R	Forest, Wetland, Prairie, Shrub	[5]	<input type="checkbox"/> <input type="checkbox"/>	Old Field/Hay Field	[3]	<input type="checkbox"/> <input type="checkbox"/>	Fenced Pasture	[2]	<input type="checkbox"/> <input type="checkbox"/>	Residential/Park	[2]	<input type="checkbox"/> <input type="checkbox"/>	Conservation Tillage, No Till	[2]	<table style="width:100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/> L <input type="checkbox"/> R</td><td>Diked Wetland</td><td>[2]</td></tr> <tr><td><input type="checkbox"/> <input type="checkbox"/></td><td>Urban/Industrial</td><td>[0]</td></tr> <tr><td><input type="checkbox"/> <input type="checkbox"/></td><td>Open Pasture</td><td>[0]</td></tr> <tr><td><input checked="" type="checkbox"/> <input type="checkbox"/></td><td>Mining/Construction</td><td>[0]</td></tr> <tr><td><input type="checkbox"/> <input type="checkbox"/></td><td>Row Crop</td><td>[0]</td></tr> </table>	<input type="checkbox"/> L <input type="checkbox"/> R	Diked Wetland	[2]	<input type="checkbox"/> <input type="checkbox"/>	Urban/Industrial	[0]	<input type="checkbox"/> <input type="checkbox"/>	Open Pasture	[0]	<input checked="" type="checkbox"/> <input type="checkbox"/>	Mining/Construction	[0]	<input type="checkbox"/> <input type="checkbox"/>	Row Crop	[0]	Land Use Max=5 2.5																																																																														
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Appendix III. Macroinvertebrate taxa collected in each reach of the Knife River mainstem.

	Taxa	Reach 4.5	Reach 4CB	Reach 4ED	Reference
1	Annelida (Segmented worms)				
2	Oligochaeta (Aquatic earthworms)	X	X	X	X
3	Arthropoda				
4	Acari (Aquatic mites)	X	X	X	X
5	Collembola (Springtails)	X	X	X	X
6	Insecta (Insects)				
7	Coleoptera (Beetles)				
8	Elmidae (Riffle beetles)	X	X	X	X
9	Dubiraphia				X
10	Optioservus	X	X	X	X
11	Stenelmis		X		
12	Hydrophilidae (Diving beetles)				
13	Anacaena				X
14	Tropisternus	X			
15	Diptera (Flies)				
16	Athericidae (Watersnipe flies)				
17	Atherix	X	X	X	X
18	Ceratopogonidae (Biting midges)	X	X	X	X
19	Bezzia/Palpomya				X
20	Ceratopogon		X		X
21	Probezzia		X		
22	Chironomidae (Non-biting midges)	X	X	X	X
23	Chironominae	X	X		
24	Chironomini or Pseudochironomini	X	X	X	X
25	Diamesinae	X	X	X	X
26	Orthocladiinae	X	X	X	X
27	Tanypodinae	X	X	X	X
28	Tanytarsini	X	X	X	X
29	Dixidae (Dixid midges)				
30	Dixa	X	X		
31	Empididae (Dance flies)	X		X	
32	Hemerodromia	X	X	X	X
33	Neoplasta	X	X	X	X
34	Phoridae (Humpbacked flies)				X
35	Simuliidae (Black flies)				
36	Simulium	X		X	X
37	Tabanidae (Deer flies and horse-flies)				
38	Chrysops		X		

Appendix III. (Continued)

	Taxa	Reach 4.5	Reach 4CB	Reach 4ED	Reference
39	Tipulidae (Crane flies)	X		X	
40	Antocha	X	X	X	X
41	Dicranota	X			
42	Tipula	X			X
43	Ephemeroptera (Mayflies)	X	X	X	X
44	Baetidae (Small minnow mayflies)	X	X	X	X
45	Baetis	X	X	X	X
46	Heterocloeon	X	X	X	X
47	Ephemerellidae (Spiny crawlers)	X	X	X	X
48	Eurylophella	X	X	X	X
49	Ephemerella	X	X	X	X
50	Ephemeridae (Hexes and Big drakes)				
51	Ephemera				X
52	Hexagenia	X		X	X
53	Heptageniidae (Flat-headed mayflies)	X	X	X	X
54	Leucrocuta		X	X	
55	Maccaffertium	X	X	X	X
56	Epeorus	X	X	X	
57	Leptohyphidae (Little stout crawler)				
58	Tricorythodes		X	X	X
59	Leptophlebiidae (Pronggills)	X	X	X	X
60	Paraleptophlebia	X	X	X	X
61	Hemiptera (True bugs)				
62	Belostomatidae (Giant water bugs)				
63	Belostoma	X			
64	Lepidoptera (Moths)	X			
65	Megaloptera (Alderflies and Dobsonflies)				
66	Corydalidae				
67	Nigronia (Dobsonflies, hellgrammites)	X	X	X	X
68	Sialidae (Alderflies)				
69	Sialis				X
70	Odonata (Dragonflies and damselflies)				
71	Zygoptera (Damselflies)				X
72	Aeshnidae (Darners)				
73	Boyeria	X		X	
74	Calopterygidae (Broadwinged damselflies)	X			
75	Calopteryx	X	X	X	

Appendix III. (Continued)

	Taxa	Reach 4.5	Reach 4CB	Reach 4ED	Reference
76	Cordulegastridae (Biddies)				
77	Cordulegaster	X	X	X	X
78	Gomphidae (Clubtails)	X	X	X	X
79	Ophiogomphus	X	X	X	X
80	Plecoptera (Stoneflies)	X	X	X	X
81	Capniidae (Slender winter stoneflies)	X	X	X	X
82	Chloroperlidae (Sallflies)	X			
83	Leuctridae (Rolledwing stoneflies)	X	X	X	X
84	Leuctra			X	X
85	Perlidae (Common stoneflies)	X	X	X	X
86	Acroneuria	X	X	X	X
87	Paragnetina		X		
88	Perlodidae (Springflies & Stripetails)	X	X		X
89	Pteronarcyidae (Giant stoneflies)				
90	Pteronarcys	X	X	X	X
91	Taeniopterygidae (Broadbacks)				
92	Taeniopteryx	X	X	X	X
93	Trichoptera (Caddisflies)	X	X	X	X
94	Brachycentridae (Humpless case makers)	X			
95	Brachycentrus	X	X	X	X
96	Micrasema	X	X	X	X
97	Glossosomatidae (Saddlecase makers)	X			
98	Glossosoma	X	X	X	X
99	Hydropsychidae (Common netspinners)	X	X	X	X
100	Hydropsyche	X	X	X	X
101	Hydroptilidae (Microcaddisflies)				
102	Oxyethira			X	
103	Lepidostomatidae				
104	Lepidostoma	X	X	X	X
105	Leptoceridae (Longhorned case makers)				
106	Mystacides		X		
107	Oecetis		X	X	X
108	Limnephilidae (Northern case makers)			X	
109	Hydatophylax	X		X	X
110	Hesperophylax		X		
111	Molannidae (Hooded case makers)				
112	Molanna		X		
113	Philopotamidae (Fingernet caddisflies)				
114	Dolophilodes		X		

Appendix III. (Continued)

	Taxa	Reach 4.5	Reach 4CB	Reach 4ED	Reference
115	Phryganeidae (Giant casemakers)				X
116	Polycentropodidae (Trumpetnets)				X
117	Nyctiophylax	X			
118	Polycentropus	X			
119	Psychomyiidae (Nettube caddisflies)			X	X
120	Lype	X			X
121	Psychomyia	X	X	X	X
122	Cnidaria				
123	Hydrozoa				
124	Hydridae (Freshwater polyps)				
125	Hydra	X			
126	Mollusca (Snails and clams)				
127	Bivalvia (Clams)				
128	Pisidiidae				
129	Pisidium	X	X	X	X
130	Gastropoda (Snails)	X			
131	Ancylidae				
132	Ferrissia	X	X	X	X
133	Lymnaeidae		X		
134	Planorbidae	X			
135	Succineidae				
136	Succinea		X		
137	Nematoda (Roundworms)	X	X	X	X
138	Turbellaria (Flatworms)	X	X	X	X
Total Taxa Count		76	69	65	70

Appendix IV. Macroinvertebrate identifications and taxa counts for each Knife River mainstem sample.

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
1	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	200	Acari		
2	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	8	Gastropoda		
3	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	88	Nematoda		
4	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	306	Oligochaeta		
5	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	8	Planorbidae	Planorbidae	Basommatophora
6	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	24	Optioservus	Elmidae	Coleoptera
7	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	1	Tropisternus	Hydrophilidae	Coleoptera
8	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	64	Collembola		Collembola
9	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	24	Atherix	Athericidae	Diptera
10	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	24	Ceratopogonidae	Ceratopogonidae	Diptera
11	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	16	Chironomidae	Chironomidae	Diptera
12	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	74	Chironomini/ Pseudochironomini	Chironomidae	Diptera
13	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	16	Diamesinae	Chironomidae	Diptera
14	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	195	Orthoclaadiinae	Chironomidae	Diptera
15	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	98	Tanypodinae	Chironomidae	Diptera
16	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	192	Tanytarsini	Chironomidae	Diptera
17	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	8	Dixa	Dixidae	Diptera
18	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	16	Hemerodromia	Empididae	Diptera
19	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	8	Neoplasta	Empididae	Diptera
20	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	80	Simulium	Simuliidae	Diptera
21	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	48	Antocha	Tipulidae	Diptera
22	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	5	Tipula	Tipulidae	Diptera
23	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	16	Tipulidae	Tipulidae	Diptera
24	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	8	Ephemeroptera		Ephemeroptera
25	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	80	Baetidae	Baetidae	Ephemeroptera
26	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	9	Baetis	Baetidae	Ephemeroptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
27	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	16	Heterocloeon	Baetidae	Ephemeroptera
28	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	41	Ephemerella	Ephemerellidae	Ephemeroptera
29	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	96	Ephemerellidae	Ephemerellidae	Ephemeroptera
30	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	136	Eurylophella	Ephemerellidae	Ephemeroptera
31	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	8	Hexagenia	Ephemeridae	Ephemeroptera
32	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	88	Heptageniidae	Heptageniidae	Ephemeroptera
33	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	40	Maccaffertium	Heptageniidae	Ephemeroptera
34	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	225	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
35	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	104	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
36	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	1	Belostoma	Belostomatidae	Hemiptera
37	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	2	Nigronia	Corydalidae	Megaloptera
38	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	2	Boyeria	Aeshnidae	Odonata
39	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	16	Calopterygidae	Calopterygidae	Odonata
40	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	6	Calopteryx	Calopterygidae	Odonata
41	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	9	Cordulegaster	Cordulegastridae	Odonata
42	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	2	Gomphidae	Gomphidae	Odonata
43	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	1	Ophiogomphus	Gomphidae	Odonata
44	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	88	Plecoptera		Plecoptera
45	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	104	Capniidae	Capniidae	Plecoptera
46	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	200	Leuctridae	Leuctridae	Plecoptera
47	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	3	Acroneuria	Perlidae	Plecoptera
48	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	24	Perlidae	Perlidae	Plecoptera
49	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	16	Perlodidae	Perlodidae	Plecoptera
50	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	30	Pteronarcys	Pteronarcyidae	Plecoptera
51	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	337	Taeniopteryx	Taeniopterygidae	Plecoptera
52	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	80	Trichoptera		Trichoptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
53	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	67	Brachycentrus	Brachycentridae	Trichoptera
54	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	16	Micrasema	Brachycentridae	Trichoptera
55	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	256	Glossosoma	Glossosomatidae	Trichoptera
56	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	65	Hydropsyche	Hydropsychidae	Trichoptera
57	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	201	Hydropsychidae	Hydropsychidae	Trichoptera
58	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	64	Lepidostoma	Lepidostomatidae	Trichoptera
59	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	10	Hydatophylax	Limnephilidae	Trichoptera
60	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	8	Nyctiophylax	Polycentropodidae	Trichoptera
61	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	24	Lype	Psychomyiidae	Trichoptera
62	4.5	9/13/2017	D-net_ALL	ALL	1	Dnet	8	Pisidium	Pisidiidae	Veneroida
63	4.5	9/13/2017	Hess_1	Run	1	Hess	268	Acari		
64	4.5	9/13/2017	Hess_1	Run	1	Hess	8	Nematoda		
65	4.5	9/13/2017	Hess_1	Run	1	Hess	92	Oligochaeta		
66	4.5	9/13/2017	Hess_1	Run	1	Hess	4	Turbellaria		
67	4.5	9/13/2017	Hess_1	Run	1	Hess	4	Ferrissia	Ancyliidae	Basommatophora
68	4.5	9/13/2017	Hess_1	Run	1	Hess	20	Elmidae	Elmidae	Coleoptera
69	4.5	9/13/2017	Hess_1	Run	1	Hess	5	Optioservus	Elmidae	Coleoptera
70	4.5	9/13/2017	Hess_1	Run	1	Hess	28	Collembola		Collembola
71	4.5	9/13/2017	Hess_1	Run	1	Hess	25	Atherix	Athericidae	Diptera
72	4.5	9/13/2017	Hess_1	Run	1	Hess	4	Ceratopogonidae	Ceratopogonidae	Diptera
73	4.5	9/13/2017	Hess_1	Run	1	Hess	4	Chironomidae	Chironomidae	Diptera
74	4.5	9/13/2017	Hess_1	Run	1	Hess	8	Chironomini/ Pseudochironomini	Chironomidae	Diptera
75	4.5	9/13/2017	Hess_1	Run	1	Hess	164	Orthoclaadiinae	Chironomidae	Diptera
76	4.5	9/13/2017	Hess_1	Run	1	Hess	13	Tanypodinae	Chironomidae	Diptera
77	4.5	9/13/2017	Hess_1	Run	1	Hess	434	Tanytarsini	Chironomidae	Diptera
78	4.5	9/13/2017	Hess_1	Run	1	Hess	25	Hemerodromia	Empididae	Diptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
79	4.5	9/13/2017	Hess_1	Run	1	Hess	4	Neoplasta	Empididae	Diptera
80	4.5	9/13/2017	Hess_1	Run	1	Hess	63	Antocha	Tipulidae	Diptera
81	4.5	9/13/2017	Hess_1	Run	1	Hess	24	Baetidae	Baetidae	Ephemeroptera
82	4.5	9/13/2017	Hess_1	Run	1	Hess	4	Heterocloeon	Baetidae	Ephemeroptera
83	4.5	9/13/2017	Hess_1	Run	1	Hess	8	Ephemerella	Ephemerellidae	Ephemeroptera
84	4.5	9/13/2017	Hess_1	Run	1	Hess	12	Ephemerellidae	Ephemerellidae	Ephemeroptera
85	4.5	9/13/2017	Hess_1	Run	1	Hess	4	Eurylophella	Ephemerellidae	Ephemeroptera
86	4.5	9/13/2017	Hess_1	Run	1	Hess	56	Heptageniidae	Heptageniidae	Ephemeroptera
87	4.5	9/13/2017	Hess_1	Run	1	Hess	80	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
88	4.5	9/13/2017	Hess_1	Run	1	Hess	32	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
89	4.5	9/13/2017	Hess_1	Run	1	Hess	1	Boyeria	Aeshnidae	Odonata
90	4.5	9/13/2017	Hess_1	Run	1	Hess	72	Plecoptera		Plecoptera
91	4.5	9/13/2017	Hess_1	Run	1	Hess	105	Capniidae	Capniidae	Plecoptera
92	4.5	9/13/2017	Hess_1	Run	1	Hess	4	Chloroperlidae	Chloroperlidae	Plecoptera
93	4.5	9/13/2017	Hess_1	Run	1	Hess	69	Leuctridae	Leuctridae	Plecoptera
94	4.5	9/13/2017	Hess_1	Run	1	Hess	4	Acroneuria	Perlidae	Plecoptera
95	4.5	9/13/2017	Hess_1	Run	1	Hess	8	Perlidae	Perlidae	Plecoptera
96	4.5	9/13/2017	Hess_1	Run	1	Hess	24	Perlodidae	Perlodidae	Plecoptera
97	4.5	9/13/2017	Hess_1	Run	1	Hess	96	Taeniopteryx	Taeniopterygidae	Plecoptera
98	4.5	9/13/2017	Hess_1	Run	1	Hess	92	Trichoptera		Trichoptera
99	4.5	9/13/2017	Hess_1	Run	1	Hess	52	Glossosoma	Glossosomatidae	Trichoptera
100	4.5	9/13/2017	Hess_1	Run	1	Hess	61	Hydropsyche	Hydropsychidae	Trichoptera
101	4.5	9/13/2017	Hess_1	Run	1	Hess	232	Hydropsychidae	Hydropsychidae	Trichoptera
102	4.5	9/13/2017	Hess_1	Run	1	Hess	12	Lepidostoma	Lepidostomatidae	Trichoptera
103	4.5	9/13/2017	Hess_1	Run	1	Hess	8	Polycentropus	Polycentropodidae	Trichoptera
104	4.5	9/13/2017	Hess_2	Riffle	2	Hess	108	Acari		

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
105	4.5	9/13/2017	Hess_2	Riffle	2	Hess	11	Nematoda		
106	4.5	9/13/2017	Hess_2	Riffle	2	Hess	68	Oligochaeta		
107	4.5	9/13/2017	Hess_2	Riffle	2	Hess	48	Ferrissia	Ancyliidae	Basommatophora
108	4.5	9/13/2017	Hess_2	Riffle	2	Hess	6	Elmidae	Elmidae	Coleoptera
109	4.5	9/13/2017	Hess_2	Riffle	2	Hess	26	Atherix	Athericidae	Diptera
110	4.5	9/13/2017	Hess_2	Riffle	2	Hess	10	Ceratopogonidae	Ceratopogonidae	Diptera
111	4.5	9/13/2017	Hess_2	Riffle	2	Hess	8	Chironomidae	Chironomidae	Diptera
112	4.5	9/13/2017	Hess_2	Riffle	2	Hess	2	Chironominae	Chironomidae	Diptera
113	4.5	9/13/2017	Hess_2	Riffle	2	Hess	2	Chironomini/ Pseudochironomini	Chironomidae	Diptera
114	4.5	9/13/2017	Hess_2	Riffle	2	Hess	42	Orthoclaadiinae	Chironomidae	Diptera
115	4.5	9/13/2017	Hess_2	Riffle	2	Hess	2	Tanypodinae	Chironomidae	Diptera
116	4.5	9/13/2017	Hess_2	Riffle	2	Hess	270	Tanytarsini	Chironomidae	Diptera
117	4.5	9/13/2017	Hess_2	Riffle	2	Hess	14	Hemerodromia	Empididae	Diptera
118	4.5	9/13/2017	Hess_2	Riffle	2	Hess	84	Antocha	Tipulidae	Diptera
119	4.5	9/13/2017	Hess_2	Riffle	2	Hess	18	Baetidae	Baetidae	Ephemeroptera
120	4.5	9/13/2017	Hess_2	Riffle	2	Hess	6	Ephemerella	Ephemerellidae	Ephemeroptera
121	4.5	9/13/2017	Hess_2	Riffle	2	Hess	12	Ephemerellidae	Ephemerellidae	Ephemeroptera
122	4.5	9/13/2017	Hess_2	Riffle	2	Hess	14	Eurylophella	Ephemerellidae	Ephemeroptera
123	4.5	9/13/2017	Hess_2	Riffle	2	Hess	2	Epeorus	Heptageniidae	Ephemeroptera
124	4.5	9/13/2017	Hess_2	Riffle	2	Hess	52	Heptageniidae	Heptageniidae	Ephemeroptera
125	4.5	9/13/2017	Hess_2	Riffle	2	Hess	6	Maccaffertium	Heptageniidae	Ephemeroptera
126	4.5	9/13/2017	Hess_2	Riffle	2	Hess	36	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
127	4.5	9/13/2017	Hess_2	Riffle	2	Hess	14	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
128	4.5	9/13/2017	Hess_2	Riffle	2	Hess	2	Lepidoptera		Lepidoptera
129	4.5	9/13/2017	Hess_2	Riffle	2	Hess	6	Gomphidae	Gomphidae	Odonata
130	4.5	9/13/2017	Hess_2	Riffle	2	Hess	12	Plecoptera		Plecoptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
131	4.5	9/13/2017	Hess_2	Riffle	2	Hess	36	Capniidae	Capniidae	Plecoptera
132	4.5	9/13/2017	Hess_2	Riffle	2	Hess	57	Leuctridae	Leuctridae	Plecoptera
133	4.5	9/13/2017	Hess_2	Riffle	2	Hess	2	Acroneuria	Perlidae	Plecoptera
134	4.5	9/13/2017	Hess_2	Riffle	2	Hess	1	Pteronarcys	Pteronarcyidae	Plecoptera
135	4.5	9/13/2017	Hess_2	Riffle	2	Hess	42	Taeniopteryx	Taeniopterygidae	Plecoptera
136	4.5	9/13/2017	Hess_2	Riffle	2	Hess	20	Trichoptera		Trichoptera
137	4.5	9/13/2017	Hess_2	Riffle	2	Hess	113	Glossosoma	Glossosomatidae	Trichoptera
138	4.5	9/13/2017	Hess_2	Riffle	2	Hess	42	Hydropsyche	Hydropsychidae	Trichoptera
139	4.5	9/13/2017	Hess_2	Riffle	2	Hess	140	Hydropsychidae	Hydropsychidae	Trichoptera
140	4.5	9/13/2017	Hess_2	Riffle	2	Hess	10	Lepidostoma	Lepidostomatidae	Trichoptera
141	4.5	9/13/2017	Hess_2	Riffle	2	Hess	2	Psychomyia	Psychomyiidae	Trichoptera
142	4.5	9/13/2017	Hess_3	Run	3	Hess	102	Acari		
143	4.5	9/13/2017	Hess_3	Run	3	Hess	16	Nematoda		
144	4.5	9/13/2017	Hess_3	Run	3	Hess	81	Oligochaeta		
145	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Hydra	Hydridae	Anthoathecatae
146	4.5	9/13/2017	Hess_3	Run	3	Hess	38	Ferrissia	Ancylidae	Basommatophora
147	4.5	9/13/2017	Hess_3	Run	3	Hess	4	Elmidae	Elmidae	Coleoptera
148	4.5	9/13/2017	Hess_3	Run	3	Hess	10	Optioservus	Elmidae	Coleoptera
149	4.5	9/13/2017	Hess_3	Run	3	Hess	7	Atherix	Athericidae	Diptera
150	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Ceratopogonidae	Ceratopogonidae	Diptera
151	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Chironomidae	Chironomidae	Diptera
152	4.5	9/13/2017	Hess_3	Run	3	Hess	18	Chironomini/ Pseudochironomini	Chironomidae	Diptera
153	4.5	9/13/2017	Hess_3	Run	3	Hess	50	Orthoclaadiinae	Chironomidae	Diptera
154	4.5	9/13/2017	Hess_3	Run	3	Hess	6	Tanypodinae	Chironomidae	Diptera
155	4.5	9/13/2017	Hess_3	Run	3	Hess	305	Tanytarsini	Chironomidae	Diptera
156	4.5	9/13/2017	Hess_3	Run	3	Hess	4	Empididae	Empididae	Diptera
157	4.5	9/13/2017	Hess_3	Run	3	Hess	14	Hemerodromia	Empididae	Diptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
158	4.5	9/13/2017	Hess_3	Run	3	Hess	4	Neoplasta	Empididae	Diptera
159	4.5	9/13/2017	Hess_3	Run	3	Hess	104	Antocha	Tipulidae	Diptera
160	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Dicranota	Tipulidae	Diptera
161	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Tipulidae	Tipulidae	Diptera
162	4.5	9/13/2017	Hess_3	Run	3	Hess	8	Baetidae	Baetidae	Ephemeroptera
163	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Baetis	Baetidae	Ephemeroptera
164	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Ephemerellidae	Ephemerellidae	Ephemeroptera
165	4.5	9/13/2017	Hess_3	Run	3	Hess	6	Eurylophella	Ephemerellidae	Ephemeroptera
166	4.5	9/13/2017	Hess_3	Run	3	Hess	42	Heptageniidae	Heptageniidae	Ephemeroptera
167	4.5	9/13/2017	Hess_3	Run	3	Hess	8	Maccaffertium	Heptageniidae	Ephemeroptera
168	4.5	9/13/2017	Hess_3	Run	3	Hess	50	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
169	4.5	9/13/2017	Hess_3	Run	3	Hess	24	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
170	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Lepidoptera		Lepidoptera
171	4.5	9/13/2017	Hess_3	Run	3	Hess	3	Gomphidae	Gomphidae	Odonata
172	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Ophiogomphus	Gomphidae	Odonata
173	4.5	9/13/2017	Hess_3	Run	3	Hess	10	Plecoptera		Plecoptera
174	4.5	9/13/2017	Hess_3	Run	3	Hess	92	Capniidae	Capniidae	Plecoptera
175	4.5	9/13/2017	Hess_3	Run	3	Hess	99	Leuctridae	Leuctridae	Plecoptera
176	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Acroneuria	Perlidae	Plecoptera
177	4.5	9/13/2017	Hess_3	Run	3	Hess	22	Perlidae	Perlidae	Plecoptera
178	4.5	9/13/2017	Hess_3	Run	3	Hess	12	Perlodidae	Perlodidae	Plecoptera
179	4.5	9/13/2017	Hess_3	Run	3	Hess	36	Taeniopteryx	Taeniopterygidae	Plecoptera
180	4.5	9/13/2017	Hess_3	Run	3	Hess	24	Trichoptera		Trichoptera
181	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Brachycentridae	Brachycentridae	Trichoptera
182	4.5	9/13/2017	Hess_3	Run	3	Hess	85	Glossosoma	Glossosomatidae	Trichoptera
183	4.5	9/13/2017	Hess_3	Run	3	Hess	2	Glossosomatidae	Glossosomatidae	Trichoptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
184	4.5	9/13/2017	Hess_3	Run	3	Hess	22	Hydropsyche	Hydropsychidae	Trichoptera
185	4.5	9/13/2017	Hess_3	Run	3	Hess	46	Hydropsychidae	Hydropsychidae	Trichoptera
186	4.5	9/13/2017	Hess_3	Run	3	Hess	22	Lepidostoma	Lepidostomatidae	Trichoptera
187	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	425	Acari		
188	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	424	Nematoda		
189	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	609	Oligochaeta		
190	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Ferrissia	Ancylidae	Basommatophora
191	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Lymnaeidae	Lymnaeidae	Basommatophora
192	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Elmidae	Elmidae	Coleoptera
193	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	9	Optioservus	Elmidae	Coleoptera
194	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Collembola		Collembola
195	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	79	Atherix	Athericidae	Diptera
196	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Ceratopogon	Ceratopogonidae	Diptera
197	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	146	Ceratopogonidae	Ceratopogonidae	Diptera
198	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Probezzia	Ceratopogonidae	Diptera
199	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	40	Chironomidae	Chironomidae	Diptera
200	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	313	Chironomini/ Pseudochironomini	Chironomidae	Diptera
201	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	658	Orthoclaadiinae	Chironomidae	Diptera
202	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	266	Tanypodinae	Chironomidae	Diptera
203	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	664	Tanytarsini	Chironomidae	Diptera
204	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Dixa	Dixidae	Diptera
205	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	72	Hemerodromia	Empididae	Diptera
206	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	24	Neoplasta	Empididae	Diptera
207	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Chrysops	Tabanidae	Diptera
208	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	96	Antocha	Tipulidae	Diptera
209	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Ephemeroptera		Ephemeroptera
210	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	72	Baetidae	Baetidae	Ephemeroptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
211	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Baetis	Baetidae	Ephemeroptera
212	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Heterocloeon	Baetidae	Ephemeroptera
213	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	17	Ephemerella	Ephemerellidae	Ephemeroptera
214	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	120	Ephemerellidae	Ephemerellidae	Ephemeroptera
215	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	209	Eurylophella	Ephemerellidae	Ephemeroptera
216	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	88	Heptageniidae	Heptageniidae	Ephemeroptera
217	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	9	Maccaffertium	Heptageniidae	Ephemeroptera
218	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Tricorythodes	Leptohyphidae	Ephemeroptera
219	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	272	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
220	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	80	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
221	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	11	Nigronia	Corydalidae	Megaloptera
222	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	3	Calopteryx	Calopterygidae	Odonata
223	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	2	Cordulegaster	Cordulegastridae	Odonata
224	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Gomphidae	Gomphidae	Odonata
225	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	4	Ophiogomphus	Gomphidae	Odonata
226	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	32	Plecoptera		Plecoptera
227	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	72	Capniidae	Capniidae	Plecoptera
228	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	24	Leuctridae	Leuctridae	Plecoptera
229	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	3	Acroneuria	Perlidae	Plecoptera
230	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	1	Paragnetina	Perlidae	Plecoptera
231	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Perlidae	Perlidae	Plecoptera
232	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Perlodidae	Perlodidae	Plecoptera
233	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	9	Pteronarcys	Pteronarcyidae	Plecoptera
234	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	80	Taeniopteryx	Taeniopterygidae	Plecoptera
235	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	224	Trichoptera		Trichoptera
236	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Brachycentrus	Brachycentridae	Trichoptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
237	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Micrasema	Brachycentridae	Trichoptera
238	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	37	Glossosoma	Glossosomatidae	Trichoptera
239	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	154	Hydropsyche	Hydropsychidae	Trichoptera
240	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	393	Hydropsychidae	Hydropsychidae	Trichoptera
241	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	20	Lepidostoma	Lepidostomatidae	Trichoptera
242	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Mystacides	Leptoceridae	Trichoptera
243	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	36	Oecetis	Leptoceridae	Trichoptera
244	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	1	Hesperophylax	Limnephilidae	Trichoptera
245	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	44	Molanna	Molannidae	Trichoptera
246	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Dolophilodes	Philopotamidae	Trichoptera
247	4CB	9/11/2017	D-net_ALL	ALL	1	Dnet	57	Pisidium	Pisidiidae	Veneroida
248	4CB	9/11/2017	Hess_1	Run	1	Hess	352	Acari		
249	4CB	9/11/2017	Hess_1	Run	1	Hess	48	Nematoda		
250	4CB	9/11/2017	Hess_1	Run	1	Hess	90	Oligochaeta		
251	4CB	9/11/2017	Hess_1	Run	1	Hess	4	Turbellaria		
252	4CB	9/11/2017	Hess_1	Run	1	Hess	4	Ferrissia	Ancylidae	Basommatophora
253	4CB	9/11/2017	Hess_1	Run	1	Hess	8	Elmidae	Elmidae	Coleoptera
254	4CB	9/11/2017	Hess_1	Run	1	Hess	28	Atherix	Athericidae	Diptera
255	4CB	9/11/2017	Hess_1	Run	1	Hess	8	Ceratopogonidae	Ceratopogonidae	Diptera
256	4CB	9/11/2017	Hess_1	Run	1	Hess	12	Chironomidae	Chironomidae	Diptera
257	4CB	9/11/2017	Hess_1	Run	1	Hess	24	Chironominae	Chironomidae	Diptera
258	4CB	9/11/2017	Hess_1	Run	1	Hess	12	Chironomini/ Pseudochironomini	Chironomidae	Diptera
259	4CB	9/11/2017	Hess_1	Run	1	Hess	41	Diamesinae	Chironomidae	Diptera
260	4CB	9/11/2017	Hess_1	Run	1	Hess	349	Orthocladiinae	Chironomidae	Diptera
261	4CB	9/11/2017	Hess_1	Run	1	Hess	8	Tanypodinae	Chironomidae	Diptera
262	4CB	9/11/2017	Hess_1	Run	1	Hess	1285	Tanytarsini	Chironomidae	Diptera
263	4CB	9/11/2017	Hess_1	Run	1	Hess	52	Hemerodromia	Empididae	Diptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
264	4CB	9/11/2017	Hess_1	Run	1	Hess	28	Neoplasta	Empididae	Diptera
265	4CB	9/11/2017	Hess_1	Run	1	Hess	509	Antocha	Tipulidae	Diptera
266	4CB	9/11/2017	Hess_1	Run	1	Hess	80	Baetidae	Baetidae	Ephemeroptera
267	4CB	9/11/2017	Hess_1	Run	1	Hess	8	Heterocloeon	Baetidae	Ephemeroptera
268	4CB	9/11/2017	Hess_1	Run	1	Hess	4	Ephemerella	Ephemerellidae	Ephemeroptera
269	4CB	9/11/2017	Hess_1	Run	1	Hess	12	Ephemerellidae	Ephemerellidae	Ephemeroptera
270	4CB	9/11/2017	Hess_1	Run	1	Hess	8	Eurylophella	Ephemerellidae	Ephemeroptera
271	4CB	9/11/2017	Hess_1	Run	1	Hess	84	Heptageniidae	Heptageniidae	Ephemeroptera
272	4CB	9/11/2017	Hess_1	Run	1	Hess	12	Maccaffertium	Heptageniidae	Ephemeroptera
273	4CB	9/11/2017	Hess_1	Run	1	Hess	36	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
274	4CB	9/11/2017	Hess_1	Run	1	Hess	8	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
275	4CB	9/11/2017	Hess_1	Run	1	Hess	12	Plecoptera		Plecoptera
276	4CB	9/11/2017	Hess_1	Run	1	Hess	8	Capniidae	Capniidae	Plecoptera
277	4CB	9/11/2017	Hess_1	Run	1	Hess	32	Leuctridae	Leuctridae	Plecoptera
278	4CB	9/11/2017	Hess_1	Run	1	Hess	1	Acroneuria	Perlidae	Plecoptera
279	4CB	9/11/2017	Hess_1	Run	1	Hess	4	Perlidae	Perlidae	Plecoptera
280	4CB	9/11/2017	Hess_1	Run	1	Hess	100	Taeniopteryx	Taeniopterygidae	Plecoptera
281	4CB	9/11/2017	Hess_1	Run	1	Hess	48	Trichoptera		Trichoptera
282	4CB	9/11/2017	Hess_1	Run	1	Hess	16	Micrasema	Brachycentridae	Trichoptera
283	4CB	9/11/2017	Hess_1	Run	1	Hess	26	Glossosoma	Glossosomatidae	Trichoptera
284	4CB	9/11/2017	Hess_1	Run	1	Hess	88	Hydropsyche	Hydropsychidae	Trichoptera
285	4CB	9/11/2017	Hess_1	Run	1	Hess	306	Hydropsychidae	Hydropsychidae	Trichoptera
286	4CB	9/11/2017	Hess_1	Run	1	Hess	4	Lepidostoma	Lepidostomatidae	Trichoptera
287	4CB	9/11/2017	Hess_1	Run	1	Hess	24	Psychomyia	Psychomyiidae	Trichoptera
288	4CB	9/11/2017	Hess_2	Riffle	2	Hess	220	Acari		
289	4CB	9/11/2017	Hess_2	Riffle	2	Hess	16	Nematoda		
290	4CB	9/11/2017	Hess_2	Riffle	2	Hess	132	Oligochaeta		

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	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
291	4CB	9/11/2017	Hess_2	Riffle	2	Hess	12	Turbellaria		
292	4CB	9/11/2017	Hess_2	Riffle	2	Hess	24	Elmidae	Elmidae	Coleoptera
293	4CB	9/11/2017	Hess_2	Riffle	2	Hess	4	Optioservus	Elmidae	Coleoptera
294	4CB	9/11/2017	Hess_2	Riffle	2	Hess	37	Atherix	Athericidae	Diptera
295	4CB	9/11/2017	Hess_2	Riffle	2	Hess	1	Ceratopogonidae	Ceratopogonidae	Diptera
296	4CB	9/11/2017	Hess_2	Riffle	2	Hess	21	Chironomidae	Chironomidae	Diptera
297	4CB	9/11/2017	Hess_2	Riffle	2	Hess	32	Chironomini/ Pseudochironomini	Chironomidae	Diptera
298	4CB	9/11/2017	Hess_2	Riffle	2	Hess	261	Orthoclaadiinae	Chironomidae	Diptera
299	4CB	9/11/2017	Hess_2	Riffle	2	Hess	12	Tanypodinae	Chironomidae	Diptera
300	4CB	9/11/2017	Hess_2	Riffle	2	Hess	706	Tanytarsini	Chironomidae	Diptera
301	4CB	9/11/2017	Hess_2	Riffle	2	Hess	28	Hemerodromia	Empididae	Diptera
302	4CB	9/11/2017	Hess_2	Riffle	2	Hess	8	Neoplasta	Empididae	Diptera
303	4CB	9/11/2017	Hess_2	Riffle	2	Hess	248	Antocha	Tipulidae	Diptera
304	4CB	9/11/2017	Hess_2	Riffle	2	Hess	8	Ephemeroptera		Ephemeroptera
305	4CB	9/11/2017	Hess_2	Riffle	2	Hess	48	Baetidae	Baetidae	Ephemeroptera
306	4CB	9/11/2017	Hess_2	Riffle	2	Hess	8	Baetis	Baetidae	Ephemeroptera
307	4CB	9/11/2017	Hess_2	Riffle	2	Hess	1	Heterocloeon	Baetidae	Ephemeroptera
308	4CB	9/11/2017	Hess_2	Riffle	2	Hess	24	Ephemerella	Ephemerellidae	Ephemeroptera
309	4CB	9/11/2017	Hess_2	Riffle	2	Hess	20	Ephemerellidae	Ephemerellidae	Ephemeroptera
310	4CB	9/11/2017	Hess_2	Riffle	2	Hess	24	Epeorus	Heptageniidae	Ephemeroptera
311	4CB	9/11/2017	Hess_2	Riffle	2	Hess	76	Heptageniidae	Heptageniidae	Ephemeroptera
312	4CB	9/11/2017	Hess_2	Riffle	2	Hess	4	Leucrocuta	Heptageniidae	Ephemeroptera
313	4CB	9/11/2017	Hess_2	Riffle	2	Hess	24	Maccaffertium	Heptageniidae	Ephemeroptera
314	4CB	9/11/2017	Hess_2	Riffle	2	Hess	89	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
315	4CB	9/11/2017	Hess_2	Riffle	2	Hess	112	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
316	4CB	9/11/2017	Hess_2	Riffle	2	Hess	20	Plecoptera		Plecoptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
317	4CB	9/11/2017	Hess_2	Riffle	2	Hess	88	Capniidae	Capniidae	Plecoptera
318	4CB	9/11/2017	Hess_2	Riffle	2	Hess	81	Leuctridae	Leuctridae	Plecoptera
319	4CB	9/11/2017	Hess_2	Riffle	2	Hess	1	Acroneuria	Perlidae	Plecoptera
320	4CB	9/11/2017	Hess_2	Riffle	2	Hess	1	Perlidae	Perlidae	Plecoptera
321	4CB	9/11/2017	Hess_2	Riffle	2	Hess	16	Perlodidae	Perlodidae	Plecoptera
322	4CB	9/11/2017	Hess_2	Riffle	2	Hess	3	Pteronarcys	Pteronarcyidae	Plecoptera
323	4CB	9/11/2017	Hess_2	Riffle	2	Hess	44	Taeniopteryx	Taeniopterygidae	Plecoptera
324	4CB	9/11/2017	Hess_2	Riffle	2	Hess	4	Succinea	Succineidae	Stylommatophora
325	4CB	9/11/2017	Hess_2	Riffle	2	Hess	70	Glossosoma	Glossosomatidae	Trichoptera
326	4CB	9/11/2017	Hess_2	Riffle	2	Hess	153	Hydropsyche	Hydropsychidae	Trichoptera
327	4CB	9/11/2017	Hess_2	Riffle	2	Hess	412	Hydropsychidae	Hydropsychidae	Trichoptera
328	4CB	9/11/2017	Hess_2	Riffle	2	Hess	64	Lepidostoma	Lepidostomatidae	Trichoptera
329	4CB	9/11/2017	Hess_3	Run	3	Hess	360	Acari		
330	4CB	9/11/2017	Hess_3	Run	3	Hess	40	Nematoda		
331	4CB	9/11/2017	Hess_3	Run	3	Hess	102	Oligochaeta		
332	4CB	9/11/2017	Hess_3	Run	3	Hess	8	Optioservus	Elmidae	Coleoptera
333	4CB	9/11/2017	Hess_3	Run	3	Hess	1	Stenelmis	Elmidae	Coleoptera
334	4CB	9/11/2017	Hess_3	Run	3	Hess	12	Atherix	Athericidae	Diptera
335	4CB	9/11/2017	Hess_3	Run	3	Hess	20	Ceratopogonidae	Ceratopogonidae	Diptera
336	4CB	9/11/2017	Hess_3	Run	3	Hess	24	Chironomidae	Chironomidae	Diptera
337	4CB	9/11/2017	Hess_3	Run	3	Hess	25	Chironomini/ Pseudochironomini	Chironomidae	Diptera
338	4CB	9/11/2017	Hess_3	Run	3	Hess	301	Orthoclaadiinae	Chironomidae	Diptera
339	4CB	9/11/2017	Hess_3	Run	3	Hess	12	Tanypodinae	Chironomidae	Diptera
340	4CB	9/11/2017	Hess_3	Run	3	Hess	833	Tanytarsini	Chironomidae	Diptera
341	4CB	9/11/2017	Hess_3	Run	3	Hess	12	Hemerodromia	Empididae	Diptera
342	4CB	9/11/2017	Hess_3	Run	3	Hess	8	Neoplasta	Empididae	Diptera

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	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
343	4CB	9/11/2017	Hess_3	Run	3	Hess	466	Antocha	Tipulidae	Diptera
344	4CB	9/11/2017	Hess_3	Run	3	Hess	16	Ephemeroptera		Ephemeroptera
345	4CB	9/11/2017	Hess_3	Run	3	Hess	8	Baetidae	Baetidae	Ephemeroptera
346	4CB	9/11/2017	Hess_3	Run	3	Hess	8	Heterocloeon	Baetidae	Ephemeroptera
347	4CB	9/11/2017	Hess_3	Run	3	Hess	4	Ephemerella	Ephemerellidae	Ephemeroptera
348	4CB	9/11/2017	Hess_3	Run	3	Hess	29	Ephemerellidae	Ephemerellidae	Ephemeroptera
349	4CB	9/11/2017	Hess_3	Run	3	Hess	4	Eurylophella	Ephemerellidae	Ephemeroptera
350	4CB	9/11/2017	Hess_3	Run	3	Hess	8	Heptageniidae	Heptageniidae	Ephemeroptera
351	4CB	9/11/2017	Hess_3	Run	3	Hess	36	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
352	4CB	9/11/2017	Hess_3	Run	3	Hess	28	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
353	4CB	9/11/2017	Hess_3	Run	3	Hess	1	Ophiogomphus	Gomphidae	Odonata
354	4CB	9/11/2017	Hess_3	Run	3	Hess	8	Plecoptera		Plecoptera
355	4CB	9/11/2017	Hess_3	Run	3	Hess	20	Capniidae	Capniidae	Plecoptera
356	4CB	9/11/2017	Hess_3	Run	3	Hess	44	Leuctridae	Leuctridae	Plecoptera
357	4CB	9/11/2017	Hess_3	Run	3	Hess	1	Acroneuria	Perlidae	Plecoptera
358	4CB	9/11/2017	Hess_3	Run	3	Hess	8	Perlidae	Perlidae	Plecoptera
359	4CB	9/11/2017	Hess_3	Run	3	Hess	12	Perlodidae	Perlodidae	Plecoptera
360	4CB	9/11/2017	Hess_3	Run	3	Hess	128	Taeniopteryx	Taeniopterygidae	Plecoptera
361	4CB	9/11/2017	Hess_3	Run	3	Hess	60	Trichoptera		Trichoptera
362	4CB	9/11/2017	Hess_3	Run	3	Hess	16	Micrasema	Brachycentridae	Trichoptera
363	4CB	9/11/2017	Hess_3	Run	3	Hess	80	Hydropsyche	Hydropsychidae	Trichoptera
364	4CB	9/11/2017	Hess_3	Run	3	Hess	342	Hydropsychidae	Hydropsychidae	Trichoptera
365	4CB	9/11/2017	Hess_3	Run	3	Hess	8	Lepidostoma	Lepidostomatidae	Trichoptera
366	4CB	9/11/2017	Hess_3	Run	3	Hess	12	Psychomyia	Psychomyiidae	Trichoptera
367	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	272	Acari		
368	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	136	Nematoda		

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
369	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	445	Oligochaeta		
370	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Ferrissia	Ancylidae	Basommatophora
371	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Elmidae	Elmidae	Coleoptera
372	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Optioservus	Elmidae	Coleoptera
373	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	24	Collembola		Collembola
374	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	91	Atherix	Athericidae	Diptera
375	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	48	Ceratopogonidae	Ceratopogonidae	Diptera
376	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	56	Chironomidae	Chironomidae	Diptera
377	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	113	Chironomini/ Pseudochironomini	Chironomidae	Diptera
378	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	40	Diamesinae	Chironomidae	Diptera
379	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	540	Orthoclaadiinae	Chironomidae	Diptera
380	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	89	Tanypodinae	Chironomidae	Diptera
381	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	505	Tanytarsini	Chironomidae	Diptera
382	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	24	Hemerodromia	Empididae	Diptera
383	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Neoplasta	Empididae	Diptera
384	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	64	Simulium	Simuliidae	Diptera
385	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	88	Antocha	Tipulidae	Diptera
386	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Tipulidae	Tipulidae	Diptera
387	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	32	Baetidae	Baetidae	Ephemeroptera
388	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	16	Baetis	Baetidae	Ephemeroptera
389	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	40	Heterocloeon	Baetidae	Ephemeroptera
390	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Ephemerella	Ephemerellidae	Ephemeroptera
391	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	88	Ephemerellidae	Ephemerellidae	Ephemeroptera
392	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	104	Eurylophella	Ephemerellidae	Ephemeroptera
393	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	1	Hexagenia	Ephemeridae	Ephemeroptera
394	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Epeorus	Heptageniidae	Ephemeroptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
395	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	72	Heptageniidae	Heptageniidae	Ephemeroptera
396	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	9	Maccaffertium	Heptageniidae	Ephemeroptera
397	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	224	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
398	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	41	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
399	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	1	Nigronia	Corydalidae	Megaloptera
400	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	2	Calopteryx	Calopterygidae	Odonata
401	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	2	Cordulegaster	Cordulegastridae	Odonata
402	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	4	Ophiogomphus	Gomphidae	Odonata
403	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	48	Plecoptera		Plecoptera
404	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	48	Capniidae	Capniidae	Plecoptera
405	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	32	Leuctridae	Leuctridae	Plecoptera
406	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	3	Acroneuria	Perlidae	Plecoptera
407	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Perlidae	Perlidae	Plecoptera
408	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	14	Pteronarcys	Pteronarcyidae	Plecoptera
409	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	152	Taeniopteryx	Taeniopterygidae	Plecoptera
410	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	96	Trichoptera		Trichoptera
411	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	48	Brachycentrus	Brachycentridae	Trichoptera
412	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Micrasema	Brachycentridae	Trichoptera
413	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	66	Glossosoma	Glossosomatidae	Trichoptera
414	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	140	Hydropsyche	Hydropsychidae	Trichoptera
415	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	512	Hydropsychidae	Hydropsychidae	Trichoptera
416	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	8	Oxyethira	Hydroptilidae	Trichoptera
417	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	48	Lepidostoma	Lepidostomatidae	Trichoptera
418	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	10	Oecetis	Leptoceridae	Trichoptera
419	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	2	Hydatophylax	Limnephilidae	Trichoptera
420	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	1	Limnephilidae	Limnephilidae	Trichoptera
421	4ED	9/11/2017	D-net_ALL	ALL	1	Dnet	17	Pisidium	Pisidiidae	Veneroida

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
422	4ED	9/11/2017	Hess_1	Riffle	1	Hess	220	Acari		
423	4ED	9/11/2017	Hess_1	Riffle	1	Hess	56	Nematoda		
424	4ED	9/11/2017	Hess_1	Riffle	1	Hess	82	Oligochaeta		
425	4ED	9/11/2017	Hess_1	Riffle	1	Hess	4	Turbellaria		
426	4ED	9/11/2017	Hess_1	Riffle	1	Hess	4	Ferrissia	Ancyliidae	Basommatophora
427	4ED	9/11/2017	Hess_1	Riffle	1	Hess	16	Elmidae	Elmidae	Coleoptera
428	4ED	9/11/2017	Hess_1	Riffle	1	Hess	8	Optioservus	Elmidae	Coleoptera
429	4ED	9/11/2017	Hess_1	Riffle	1	Hess	48	Atherix	Athericidae	Diptera
430	4ED	9/11/2017	Hess_1	Riffle	1	Hess	24	Ceratopogonidae	Ceratopogonidae	Diptera
431	4ED	9/11/2017	Hess_1	Riffle	1	Hess	28	Chironomidae	Chironomidae	Diptera
432	4ED	9/11/2017	Hess_1	Riffle	1	Hess	16	Chironomini/ Pseudochironomini	Chironomidae	Diptera
433	4ED	9/11/2017	Hess_1	Riffle	1	Hess	12	Diamesinae	Chironomidae	Diptera
434	4ED	9/11/2017	Hess_1	Riffle	1	Hess	253	Orthoclaadiinae	Chironomidae	Diptera
435	4ED	9/11/2017	Hess_1	Riffle	1	Hess	20	Tanypodinae	Chironomidae	Diptera
436	4ED	9/11/2017	Hess_1	Riffle	1	Hess	709	Tanytarsini	Chironomidae	Diptera
437	4ED	9/11/2017	Hess_1	Riffle	1	Hess	4	Hemerodromia	Empididae	Diptera
438	4ED	9/11/2017	Hess_1	Riffle	1	Hess	216	Antocha	Tipulidae	Diptera
439	4ED	9/11/2017	Hess_1	Riffle	1	Hess	8	Ephemeroptera		Ephemeroptera
440	4ED	9/11/2017	Hess_1	Riffle	1	Hess	12	Heterocloeon	Baetidae	Ephemeroptera
441	4ED	9/11/2017	Hess_1	Riffle	1	Hess	12	Ephemerellidae	Ephemerellidae	Ephemeroptera
442	4ED	9/11/2017	Hess_1	Riffle	1	Hess	12	Epeorus	Heptageniidae	Ephemeroptera
443	4ED	9/11/2017	Hess_1	Riffle	1	Hess	108	Heptageniidae	Heptageniidae	Ephemeroptera
444	4ED	9/11/2017	Hess_1	Riffle	1	Hess	4	Leucrocuta	Heptageniidae	Ephemeroptera
445	4ED	9/11/2017	Hess_1	Riffle	1	Hess	8	Maccaffertium	Heptageniidae	Ephemeroptera
446	4ED	9/11/2017	Hess_1	Riffle	1	Hess	72	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
447	4ED	9/11/2017	Hess_1	Riffle	1	Hess	44	Paraleptophlebia	Leptophlebiidae	Ephemeroptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
448	4ED	9/11/2017	Hess_1	Riffle	1	Hess	1	Ophiogomphus	Gomphidae	Odonata
449	4ED	9/11/2017	Hess_1	Riffle	1	Hess	9	Plecoptera		Plecoptera
450	4ED	9/11/2017	Hess_1	Riffle	1	Hess	76	Capniidae	Capniidae	Plecoptera
451	4ED	9/11/2017	Hess_1	Riffle	1	Hess	28	Leuctra	Leuctridae	Plecoptera
452	4ED	9/11/2017	Hess_1	Riffle	1	Hess	20	Leuctridae	Leuctridae	Plecoptera
453	4ED	9/11/2017	Hess_1	Riffle	1	Hess	3	Acroneuria	Perlidae	Plecoptera
454	4ED	9/11/2017	Hess_1	Riffle	1	Hess	4	Perlidae	Perlidae	Plecoptera
455	4ED	9/11/2017	Hess_1	Riffle	1	Hess	2	Pteronarcys	Pteronarcyidae	Plecoptera
456	4ED	9/11/2017	Hess_1	Riffle	1	Hess	49	Taeniopteryx	Taeniopterygidae	Plecoptera
457	4ED	9/11/2017	Hess_1	Riffle	1	Hess	92	Trichoptera		Trichoptera
458	4ED	9/11/2017	Hess_1	Riffle	1	Hess	8	Brachycentrus	Brachycentridae	Trichoptera
459	4ED	9/11/2017	Hess_1	Riffle	1	Hess	20	Micrasema	Brachycentridae	Trichoptera
460	4ED	9/11/2017	Hess_1	Riffle	1	Hess	25	Glossosoma	Glossosomatidae	Trichoptera
461	4ED	9/11/2017	Hess_1	Riffle	1	Hess	32	Hydropsyche	Hydropsychidae	Trichoptera
462	4ED	9/11/2017	Hess_1	Riffle	1	Hess	188	Hydropsychidae	Hydropsychidae	Trichoptera
463	4ED	9/11/2017	Hess_1	Riffle	1	Hess	40	Lepidostoma	Lepidostomatidae	Trichoptera
464	4ED	9/11/2017	Hess_1	Riffle	1	Hess	4	Psychomyiidae	Psychomyiidae	Trichoptera
465	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Oligochaeta		
466	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Turbellaria		
467	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Elmidae	Elmidae	Coleoptera
468	4ED	9/11/2017	Hess_2	Riffle	2	Hess	30	Atherix	Athericidae	Diptera
469	4ED	9/11/2017	Hess_2	Riffle	2	Hess	9	Ceratopogonidae	Ceratopogonidae	Diptera
470	4ED	9/11/2017	Hess_2	Riffle	2	Hess	44	Chironomidae	Chironomidae	Diptera
471	4ED	9/11/2017	Hess_2	Riffle	2	Hess	28	Chironomini/ Pseudochironomini	Chironomidae	Diptera
472	4ED	9/11/2017	Hess_2	Riffle	2	Hess	9	Diamesinae	Chironomidae	Diptera
473	4ED	9/11/2017	Hess_2	Riffle	2	Hess	481	Orthocladiinae	Chironomidae	Diptera
474	4ED	9/11/2017	Hess_2	Riffle	2	Hess	16	Tanypodinae	Chironomidae	Diptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
475	4ED	9/11/2017	Hess_2	Riffle	2	Hess	461	Tanytarsini	Chironomidae	Diptera
476	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Empididae	Empididae	Diptera
477	4ED	9/11/2017	Hess_2	Riffle	2	Hess	20	Hemerodromia	Empididae	Diptera
478	4ED	9/11/2017	Hess_2	Riffle	2	Hess	16	Neoplasta	Empididae	Diptera
479	4ED	9/11/2017	Hess_2	Riffle	2	Hess	2	Antocha	Tipulidae	Diptera
480	4ED	9/11/2017	Hess_2	Riffle	2	Hess	68	Baetidae	Baetidae	Ephemeroptera
481	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Baetis	Baetidae	Ephemeroptera
482	4ED	9/11/2017	Hess_2	Riffle	2	Hess	13	Heterocloeon	Baetidae	Ephemeroptera
483	4ED	9/11/2017	Hess_2	Riffle	2	Hess	16	Ephemerella	Ephemerellidae	Ephemeroptera
484	4ED	9/11/2017	Hess_2	Riffle	2	Hess	28	Ephemerellidae	Ephemerellidae	Ephemeroptera
485	4ED	9/11/2017	Hess_2	Riffle	2	Hess	12	Epeorus	Heptageniidae	Ephemeroptera
486	4ED	9/11/2017	Hess_2	Riffle	2	Hess	92	Heptageniidae	Heptageniidae	Ephemeroptera
487	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Leucrocuta	Heptageniidae	Ephemeroptera
488	4ED	9/11/2017	Hess_2	Riffle	2	Hess	24	Maccaffertium	Heptageniidae	Ephemeroptera
489	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Tricorythodes	Leptohyphidae	Ephemeroptera
490	4ED	9/11/2017	Hess_2	Riffle	2	Hess	24	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
491	4ED	9/11/2017	Hess_2	Riffle	2	Hess	104	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
492	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Nigronia	Corydalidae	Megaloptera
493	4ED	9/11/2017	Hess_2	Riffle	2	Hess	1	Gomphidae	Gomphidae	Odonata
494	4ED	9/11/2017	Hess_2	Riffle	2	Hess	12	Plecoptera		Plecoptera
495	4ED	9/11/2017	Hess_2	Riffle	2	Hess	52	Capniidae	Capniidae	Plecoptera
496	4ED	9/11/2017	Hess_2	Riffle	2	Hess	33	Leuctridae	Leuctridae	Plecoptera
497	4ED	9/11/2017	Hess_2	Riffle	2	Hess	3	Acroneuria	Perlidae	Plecoptera
498	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Perlidae	Perlidae	Plecoptera
499	4ED	9/11/2017	Hess_2	Riffle	2	Hess	1	Pteronarcys	Pteronarcyidae	Plecoptera
500	4ED	9/11/2017	Hess_2	Riffle	2	Hess	76	Taeniopteryx	Taeniopterygidae	Plecoptera
501	4ED	9/11/2017	Hess_2	Riffle	2	Hess	60	Trichoptera		Trichoptera

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	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
502	4ED	9/11/2017	Hess_2	Riffle	2	Hess	4	Brachycentrus	Brachycentridae	Trichoptera
503	4ED	9/11/2017	Hess_2	Riffle	2	Hess	16	Micrasema	Brachycentridae	Trichoptera
504	4ED	9/11/2017	Hess_2	Riffle	2	Hess	21	Glossosoma	Glossosomatidae	Trichoptera
505	4ED	9/11/2017	Hess_2	Riffle	2	Hess	42	Hydropsyche	Hydropsychidae	Trichoptera
506	4ED	9/11/2017	Hess_2	Riffle	2	Hess	173	Hydropsychidae	Hydropsychidae	Trichoptera
507	4ED	9/11/2017	Hess_2	Riffle	2	Hess	44	Lepidostoma	Lepidostomatidae	Trichoptera
508	4ED	9/11/2017	Hess_3	Run	3	Hess	236	Acari		
509	4ED	9/11/2017	Hess_3	Run	3	Hess	32	Nematoda		
510	4ED	9/11/2017	Hess_3	Run	3	Hess	84	Oligochaeta		
511	4ED	9/11/2017	Hess_3	Run	3	Hess	4	Ferrissia	Ancylidae	Basommatophora
512	4ED	9/11/2017	Hess_3	Run	3	Hess	16	Elmidae	Elmidae	Coleoptera
513	4ED	9/11/2017	Hess_3	Run	3	Hess	24	Optioservus	Elmidae	Coleoptera
514	4ED	9/11/2017	Hess_3	Run	3	Hess	4	Collembola		Collembola
515	4ED	9/11/2017	Hess_3	Run	3	Hess	10	Atherix	Athericidae	Diptera
516	4ED	9/11/2017	Hess_3	Run	3	Hess	8	Ceratopogonidae	Ceratopogonidae	Diptera
517	4ED	9/11/2017	Hess_3	Run	3	Hess	20	Chironomidae	Chironomidae	Diptera
518	4ED	9/11/2017	Hess_3	Run	3	Hess	8	Chironomini/ Pseudochironomini	Chironomidae	Diptera
519	4ED	9/11/2017	Hess_3	Run	3	Hess	62	Orthocladiinae	Chironomidae	Diptera
520	4ED	9/11/2017	Hess_3	Run	3	Hess	8	Tanypodinae	Chironomidae	Diptera
521	4ED	9/11/2017	Hess_3	Run	3	Hess	450	Tanytarsini	Chironomidae	Diptera
522	4ED	9/11/2017	Hess_3	Run	3	Hess	4	Empididae	Empididae	Diptera
523	4ED	9/11/2017	Hess_3	Run	3	Hess	12	Hemerodromia	Empididae	Diptera
524	4ED	9/11/2017	Hess_3	Run	3	Hess	36	Neoplasta	Empididae	Diptera
525	4ED	9/11/2017	Hess_3	Run	3	Hess	94	Antocha	Tipulidae	Diptera
526	4ED	9/11/2017	Hess_3	Run	3	Hess	4	Ephemeroptera		Ephemeroptera
527	4ED	9/11/2017	Hess_3	Run	3	Hess	37	Baetidae	Baetidae	Ephemeroptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
528	4ED	9/11/2017	Hess_3	Run	3	Hess	8	Heterocloeon	Baetidae	Ephemeroptera
529	4ED	9/11/2017	Hess_3	Run	3	Hess	20	Ephemerella	Ephemerellidae	Ephemeroptera
530	4ED	9/11/2017	Hess_3	Run	3	Hess	32	Ephemerellidae	Ephemerellidae	Ephemeroptera
531	4ED	9/11/2017	Hess_3	Run	3	Hess	4	Eurylophella	Ephemerellidae	Ephemeroptera
532	4ED	9/11/2017	Hess_3	Run	3	Hess	12	Epeorus	Heptageniidae	Ephemeroptera
533	4ED	9/11/2017	Hess_3	Run	3	Hess	180	Heptageniidae	Heptageniidae	Ephemeroptera
534	4ED	9/11/2017	Hess_3	Run	3	Hess	8	Maccaffertium	Heptageniidae	Ephemeroptera
535	4ED	9/11/2017	Hess_3	Run	3	Hess	104	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
536	4ED	9/11/2017	Hess_3	Run	3	Hess	44	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
537	4ED	9/11/2017	Hess_3	Run	3	Hess	13	Nigronia	Corydalidae	Megaloptera
538	4ED	9/11/2017	Hess_3	Run	3	Hess	1	Boyeria	Aeshnidae	Odonata
539	4ED	9/11/2017	Hess_3	Run	3	Hess	12	Gomphidae	Gomphidae	Odonata
540	4ED	9/11/2017	Hess_3	Run	3	Hess	8	Plecoptera		Plecoptera
541	4ED	9/11/2017	Hess_3	Run	3	Hess	64	Capniidae	Capniidae	Plecoptera
542	4ED	9/11/2017	Hess_3	Run	3	Hess	16	Leuctra	Leuctridae	Plecoptera
543	4ED	9/11/2017	Hess_3	Run	3	Hess	28	Leuctridae	Leuctridae	Plecoptera
544	4ED	9/11/2017	Hess_3	Run	3	Hess	7	Acroneuria	Perlidae	Plecoptera
545	4ED	9/11/2017	Hess_3	Run	3	Hess	3	Pteronarcys	Pteronarcyidae	Plecoptera
546	4ED	9/11/2017	Hess_3	Run	3	Hess	49	Taeniopteryx	Taeniopterygidae	Plecoptera
547	4ED	9/11/2017	Hess_3	Run	3	Hess	12	Trichoptera		Trichoptera
548	4ED	9/11/2017	Hess_3	Run	3	Hess	60	Glossosoma	Glossosomatidae	Trichoptera
549	4ED	9/11/2017	Hess_3	Run	3	Hess	93	Hydropsyche	Hydropsychidae	Trichoptera
550	4ED	9/11/2017	Hess_3	Run	3	Hess	224	Hydropsychidae	Hydropsychidae	Trichoptera
551	4ED	9/11/2017	Hess_3	Run	3	Hess	36	Lepidostoma	Lepidostomatidae	Trichoptera
552	4ED	9/11/2017	Hess_3	Run	3	Hess	4	Psychomyia	Psychomyiidae	Trichoptera
553	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	368	Acari		

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
554	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	16	Nematoda		
555	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	272	Oligochaeta		
556	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Ferrissia	Ancylidae	Basommatophora
557	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Dubiraphia	Elmidae	Coleoptera
558	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	8	Elmidae	Elmidae	Coleoptera
559	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	20	Optioservus	Elmidae	Coleoptera
560	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Anacaena	Hydrophilidae	Coleoptera
561	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	100	Collembola		Collembola
562	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	53	Atherix	Athericidae	Diptera
563	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	24	Ceratopogonidae	Ceratopogonidae	Diptera
564	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	37	Chironomidae	Chironomidae	Diptera
565	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	40	Chironomini/ Pseudochironomini	Chironomidae	Diptera
566	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	12	Diamesinae	Chironomidae	Diptera
567	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	466	Orthoclaadiinae	Chironomidae	Diptera
568	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	29	Tanypodinae	Chironomidae	Diptera
569	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	284	Tanytarsini	Chironomidae	Diptera
570	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Phoridae	Phoridae	Diptera
571	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	123	Antocha	Tipulidae	Diptera
572	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	6	Tipula	Tipulidae	Diptera
573	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	72	Baetidae	Baetidae	Ephemeroptera
574	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	12	Baetis	Baetidae	Ephemeroptera
575	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	28	Heterocloeon	Baetidae	Ephemeroptera
576	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	8	Ephemerella	Ephemerellidae	Ephemeroptera
577	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	12	Ephemerellidae	Ephemerellidae	Ephemeroptera
578	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	92	Eurylophella	Ephemerellidae	Ephemeroptera
579	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Hexagenia	Ephemeridae	Ephemeroptera
580	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	28	Heptageniidae	Heptageniidae	Ephemeroptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
581	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	12	Tricorythodes	Leptohyphidae	Ephemeroptera
582	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	116	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
583	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	53	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
584	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	13	Nigronia	Corydalidae	Megaloptera
585	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	5	Sialis	Sialidae	Megaloptera
586	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Zygoptera		Odonata
587	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	2	Cordulegaster	Cordulegastridae	Odonata
588	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	1	Ophiogomphus	Gomphidae	Odonata
589	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	12	Plecoptera		Plecoptera
590	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	48	Capniidae	Capniidae	Plecoptera
591	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	24	Leuctridae	Leuctridae	Plecoptera
592	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	2	Acroneuria	Perlidae	Plecoptera
593	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	1	Perlidae	Perlidae	Plecoptera
594	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	16	Perlodidae	Perlodidae	Plecoptera
595	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	10	Pteronarcys	Pteronarcyidae	Plecoptera
596	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	72	Taeniopteryx	Taeniopterygidae	Plecoptera
597	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	60	Trichoptera		Trichoptera
598	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Brachycentrus	Brachycentridae	Trichoptera
599	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	28	Micrasema	Brachycentridae	Trichoptera
600	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	16	Glossosoma	Glossosomatidae	Trichoptera
601	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	33	Hydropsyche	Hydropsychidae	Trichoptera
602	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	136	Hydropsychidae	Hydropsychidae	Trichoptera
603	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	94	Lepidostoma	Lepidostomatidae	Trichoptera
604	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Oecetis	Leptoceridae	Trichoptera
605	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	8	Hydatophylax	Limnephilidae	Trichoptera
606	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Phryganeidae	Phryganeidae	Trichoptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
607	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	1	Polycentropodidae	Polycentropodidae	Trichoptera
608	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	8	Lype	Psychomyiidae	Trichoptera
609	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	4	Psychomyiidae	Psychomyiidae	Trichoptera
610	Reference	9/12/2017	D-net_ALL	ALL	1	Dnet	21	Pisidium	Pisidiidae	Veneroida
611	Reference	9/12/2017	Hess_1	Riffle	1	Hess	536	Acari		
612	Reference	9/12/2017	Hess_1	Riffle	1	Hess	173	Nematoda		
613	Reference	9/12/2017	Hess_1	Riffle	1	Hess	216	Oligochaeta		
614	Reference	9/12/2017	Hess_1	Riffle	1	Hess	16	Turbellaria		
615	Reference	9/12/2017	Hess_1	Riffle	1	Hess	12	Ferrissia	Ancyliidae	Basommatophora
616	Reference	9/12/2017	Hess_1	Riffle	1	Hess	16	Atherix	Athericidae	Diptera
617	Reference	9/12/2017	Hess_1	Riffle	1	Hess	13	Ceratopogonidae	Ceratopogonidae	Diptera
618	Reference	9/12/2017	Hess_1	Riffle	1	Hess	40	Chironomidae	Chironomidae	Diptera
619	Reference	9/12/2017	Hess_1	Riffle	1	Hess	16	Chironomini/ Pseudochironomini	Chironomidae	Diptera
620	Reference	9/12/2017	Hess_1	Riffle	1	Hess	559	Orthocladiinae	Chironomidae	Diptera
621	Reference	9/12/2017	Hess_1	Riffle	1	Hess	20	Tanypodinae	Chironomidae	Diptera
622	Reference	9/12/2017	Hess_1	Riffle	1	Hess	823	Tanytarsini	Chironomidae	Diptera
623	Reference	9/12/2017	Hess_1	Riffle	1	Hess	8	Hemerodromia	Empididae	Diptera
624	Reference	9/12/2017	Hess_1	Riffle	1	Hess	531	Antocha	Tipulidae	Diptera
625	Reference	9/12/2017	Hess_1	Riffle	1	Hess	16	Ephemeroptera		Ephemeroptera
626	Reference	9/12/2017	Hess_1	Riffle	1	Hess	16	Baetidae	Baetidae	Ephemeroptera
627	Reference	9/12/2017	Hess_1	Riffle	1	Hess	8	Heterocloeon	Baetidae	Ephemeroptera
628	Reference	9/12/2017	Hess_1	Riffle	1	Hess	8	Ephemerella	Ephemerellidae	Ephemeroptera
629	Reference	9/12/2017	Hess_1	Riffle	1	Hess	5	Ephemerellidae	Ephemerellidae	Ephemeroptera
630	Reference	9/12/2017	Hess_1	Riffle	1	Hess	16	Heptageniidae	Heptageniidae	Ephemeroptera
631	Reference	9/12/2017	Hess_1	Riffle	1	Hess	36	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
632	Reference	9/12/2017	Hess_1	Riffle	1	Hess	8	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
633	Reference	9/12/2017	Hess_1	Riffle	1	Hess	4	Gomphidae	Gomphidae	Odonata

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
634	Reference	9/12/2017	Hess_1	Riffle	1	Hess	16	Plecoptera		Plecoptera
635	Reference	9/12/2017	Hess_1	Riffle	1	Hess	32	Capniidae	Capniidae	Plecoptera
636	Reference	9/12/2017	Hess_1	Riffle	1	Hess	36	Leuctridae	Leuctridae	Plecoptera
637	Reference	9/12/2017	Hess_1	Riffle	1	Hess	1	Acroneuria	Perlidae	Plecoptera
638	Reference	9/12/2017	Hess_1	Riffle	1	Hess	1	Perlidae	Perlidae	Plecoptera
639	Reference	9/12/2017	Hess_1	Riffle	1	Hess	1	Pteronarcys	Pteronarcyidae	Plecoptera
640	Reference	9/12/2017	Hess_1	Riffle	1	Hess	24	Taeniopteryx	Taeniopterygidae	Plecoptera
641	Reference	9/12/2017	Hess_1	Riffle	1	Hess	77	Trichoptera		Trichoptera
642	Reference	9/12/2017	Hess_1	Riffle	1	Hess	4	Brachycentrus	Brachycentridae	Trichoptera
643	Reference	9/12/2017	Hess_1	Riffle	1	Hess	28	Micrasema	Brachycentridae	Trichoptera
644	Reference	9/12/2017	Hess_1	Riffle	1	Hess	16	Glossosoma	Glossosomatidae	Trichoptera
645	Reference	9/12/2017	Hess_1	Riffle	1	Hess	9	Hydropsyche	Hydropsychidae	Trichoptera
646	Reference	9/12/2017	Hess_1	Riffle	1	Hess	64	Hydropsychidae	Hydropsychidae	Trichoptera
647	Reference	9/12/2017	Hess_1	Riffle	1	Hess	20	Lepidostoma	Lepidostomatidae	Trichoptera
648	Reference	9/12/2017	Hess_1	Riffle	1	Hess	4	Polycentropodidae	Polycentropodidae	Trichoptera
649	Reference	9/12/2017	Hess_2	Riffle	2	Hess	215	Acari		
650	Reference	9/12/2017	Hess_2	Riffle	2	Hess	41	Nematoda		
651	Reference	9/12/2017	Hess_2	Riffle	2	Hess	126	Oligochaeta		
652	Reference	9/12/2017	Hess_2	Riffle	2	Hess	48	Ferrissia	Ancylidae	Basommatophora
653	Reference	9/12/2017	Hess_2	Riffle	2	Hess	12	Elmidae	Elmidae	Coleoptera
654	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Collembola		Collembola
655	Reference	9/12/2017	Hess_2	Riffle	2	Hess	21	Atherix	Athericidae	Diptera
656	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Ceratopogon	Ceratopogonidae	Diptera
657	Reference	9/12/2017	Hess_2	Riffle	2	Hess	12	Ceratopogonidae	Ceratopogonidae	Diptera
658	Reference	9/12/2017	Hess_2	Riffle	2	Hess	14	Chironomini/ Pseudochironomini	Chironomidae	Diptera
659	Reference	9/12/2017	Hess_2	Riffle	2	Hess	200	Orthocladiinae	Chironomidae	Diptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
660	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Tanypodinae	Chironomidae	Diptera
661	Reference	9/12/2017	Hess_2	Riffle	2	Hess	294	Tanytarsini	Chironomidae	Diptera
662	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Hemerodromia	Empididae	Diptera
663	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Neoplasta	Empididae	Diptera
664	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Simulium	Simuliidae	Diptera
665	Reference	9/12/2017	Hess_2	Riffle	2	Hess	195	Antocha	Tipulidae	Diptera
666	Reference	9/12/2017	Hess_2	Riffle	2	Hess	8	Ephemeroptera		Ephemeroptera
667	Reference	9/12/2017	Hess_2	Riffle	2	Hess	5	Baetidae	Baetidae	Ephemeroptera
668	Reference	9/12/2017	Hess_2	Riffle	2	Hess	8	Baetis	Baetidae	Ephemeroptera
669	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Ephemerellidae	Ephemerellidae	Ephemeroptera
670	Reference	9/12/2017	Hess_2	Riffle	2	Hess	17	Eurylophella	Ephemerellidae	Ephemeroptera
671	Reference	9/12/2017	Hess_2	Riffle	2	Hess	37	Heptageniidae	Heptageniidae	Ephemeroptera
672	Reference	9/12/2017	Hess_2	Riffle	2	Hess	8	Maccaffertium	Heptageniidae	Ephemeroptera
673	Reference	9/12/2017	Hess_2	Riffle	2	Hess	34	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
674	Reference	9/12/2017	Hess_2	Riffle	2	Hess	16	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
675	Reference	9/12/2017	Hess_2	Riffle	2	Hess	2	Nigronia	Corydalidae	Megaloptera
676	Reference	9/12/2017	Hess_2	Riffle	2	Hess	17	Gomphidae	Gomphidae	Odonata
677	Reference	9/12/2017	Hess_2	Riffle	2	Hess	9	Plecoptera		Plecoptera
678	Reference	9/12/2017	Hess_2	Riffle	2	Hess	59	Capniidae	Capniidae	Plecoptera
679	Reference	9/12/2017	Hess_2	Riffle	2	Hess	30	Leuctridae	Leuctridae	Plecoptera
680	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Acroneuria	Perlidae	Plecoptera
681	Reference	9/12/2017	Hess_2	Riffle	2	Hess	8	Perlidae	Perlidae	Plecoptera
682	Reference	9/12/2017	Hess_2	Riffle	2	Hess	25	Taeniopteryx	Taeniopterygidae	Plecoptera
683	Reference	9/12/2017	Hess_2	Riffle	2	Hess	84	Trichoptera		Trichoptera
684	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Brachycentrus	Brachycentridae	Trichoptera
685	Reference	9/12/2017	Hess_2	Riffle	2	Hess	37	Micrasema	Brachycentridae	Trichoptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
686	Reference	9/12/2017	Hess_2	Riffle	2	Hess	12	Hydropsyche	Hydropsychidae	Trichoptera
687	Reference	9/12/2017	Hess_2	Riffle	2	Hess	12	Hydropsychidae	Hydropsychidae	Trichoptera
688	Reference	9/12/2017	Hess_2	Riffle	2	Hess	180	Lepidostoma	Lepidostomatidae	Trichoptera
689	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Oecetis	Leptoceridae	Trichoptera
690	Reference	9/12/2017	Hess_2	Riffle	2	Hess	1	Psychomyia	Psychomyiidae	Trichoptera
691	Reference	9/12/2017	Hess_2	Riffle	2	Hess	4	Psychomyiidae	Psychomyiidae	Trichoptera
692	Reference	9/12/2017	Hess_3	Run	3	Hess	632	Acari		
693	Reference	9/12/2017	Hess_3	Run	3	Hess	252	Nematoda		
694	Reference	9/12/2017	Hess_3	Run	3	Hess	274	Oligochaeta		
695	Reference	9/12/2017	Hess_3	Run	3	Hess	8	Ferrissia	Ancyliidae	Basommatophora
696	Reference	9/12/2017	Hess_3	Run	3	Hess	5	Atherix	Athericidae	Diptera
697	Reference	9/12/2017	Hess_3	Run	3	Hess	8	Bezzia/Palpomyia	Ceratopogonidae	Diptera
698	Reference	9/12/2017	Hess_3	Run	3	Hess	8	Ceratopogon	Ceratopogonidae	Diptera
699	Reference	9/12/2017	Hess_3	Run	3	Hess	116	Ceratopogonidae	Ceratopogonidae	Diptera
700	Reference	9/12/2017	Hess_3	Run	3	Hess	20	Chironomidae	Chironomidae	Diptera
701	Reference	9/12/2017	Hess_3	Run	3	Hess	81	Chironomini/ Pseudochironomini	Chironomidae	Diptera
702	Reference	9/12/2017	Hess_3	Run	3	Hess	28	Diamesinae	Chironomidae	Diptera
703	Reference	9/12/2017	Hess_3	Run	3	Hess	632	Orthocladiinae	Chironomidae	Diptera
704	Reference	9/12/2017	Hess_3	Run	3	Hess	101	Tanypodinae	Chironomidae	Diptera
705	Reference	9/12/2017	Hess_3	Run	3	Hess	986	Tanytarsini	Chironomidae	Diptera
706	Reference	9/12/2017	Hess_3	Run	3	Hess	24	Hemerodromia	Empididae	Diptera
707	Reference	9/12/2017	Hess_3	Run	3	Hess	4	Neoplasta	Empididae	Diptera
708	Reference	9/12/2017	Hess_3	Run	3	Hess	332	Antocha	Tipulidae	Diptera
709	Reference	9/12/2017	Hess_3	Run	3	Hess	16	Ephemeroptera		Ephemeroptera
710	Reference	9/12/2017	Hess_3	Run	3	Hess	4	Baetidae	Baetidae	Ephemeroptera
711	Reference	9/12/2017	Hess_3	Run	3	Hess	8	Ephemerellidae	Ephemerellidae	Ephemeroptera

Appendix IV. (Continued)

	Reach	Date	Sample ID	Habitat	Rep	Type	Total	Taxa	Family	Order
712	Reference	9/12/2017	Hess_3	Run	3	Hess	72	Eurylophella	Ephemerellidae	Ephemeroptera
713	Reference	9/12/2017	Hess_3	Run	3	Hess	1	Ephemera	Ephemeridae	Ephemeroptera
714	Reference	9/12/2017	Hess_3	Run	3	Hess	16	Heptageniidae	Heptageniidae	Ephemeroptera
715	Reference	9/12/2017	Hess_3	Run	3	Hess	8	Maccaffertium	Heptageniidae	Ephemeroptera
716	Reference	9/12/2017	Hess_3	Run	3	Hess	20	Leptophlebiidae	Leptophlebiidae	Ephemeroptera
717	Reference	9/12/2017	Hess_3	Run	3	Hess	16	Paraleptophlebia	Leptophlebiidae	Ephemeroptera
718	Reference	9/12/2017	Hess_3	Run	3	Hess	4	Nigronia	Corydalidae	Megaloptera
719	Reference	9/12/2017	Hess_3	Run	3	Hess	1	Cordulegaster	Cordulegastridae	Odonata
720	Reference	9/12/2017	Hess_3	Run	3	Hess	28	Plecoptera		Plecoptera
721	Reference	9/12/2017	Hess_3	Run	3	Hess	68	Capniidae	Capniidae	Plecoptera
722	Reference	9/12/2017	Hess_3	Run	3	Hess	36	Leuctra	Leuctridae	Plecoptera
723	Reference	9/12/2017	Hess_3	Run	3	Hess	76	Leuctridae	Leuctridae	Plecoptera
724	Reference	9/12/2017	Hess_3	Run	3	Hess	36	Perlodidae	Perlodidae	Plecoptera
725	Reference	9/12/2017	Hess_3	Run	3	Hess	49	Taeniopteryx	Taeniopterygidae	Plecoptera
726	Reference	9/12/2017	Hess_3	Run	3	Hess	500	Trichoptera		Trichoptera
727	Reference	9/12/2017	Hess_3	Run	3	Hess	12	Micrasema	Brachycentridae	Trichoptera
728	Reference	9/12/2017	Hess_3	Run	3	Hess	12	Hydropsyche	Hydropsychidae	Trichoptera
729	Reference	9/12/2017	Hess_3	Run	3	Hess	41	Hydropsychidae	Hydropsychidae	Trichoptera
730	Reference	9/12/2017	Hess_3	Run	3	Hess	16	Lepidostoma	Lepidostomatidae	Trichoptera
731	Reference	9/12/2017	Hess_3	Run	3	Hess	8	Oecetis	Leptoceridae	Trichoptera
732	Reference	9/12/2017	Hess_3	Run	3	Hess	12	Polycentropodidae	Polycentropodidae	Trichoptera
733	Reference	9/12/2017	Hess_3	Run	3	Hess	4	Psychomyiidae	Psychomyiidae	Trichoptera

Appendix V. Electrofishing pass totals from each reach sampled on the Knife River mainstem.

Reach	Date	Pass	Taxa	Age	Total
Reach 4.5	9/11/2017	1	Blacknose Dace	Other	18
Reach 4.5	9/11/2017	1	Brook Stickleback	Other	5
Reach 4.5	9/11/2017	1	Brook Trout	Other	17
Reach 4.5	9/11/2017	1	Brown Trout	Other	14
Reach 4.5	9/11/2017	1	Brown Trout	YOY	23
Reach 4.5	9/11/2017	1	Longnose Dace	Other	10
Reach 4.5	9/11/2017	1	Rainbow Trout	Other	26
Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	69
Reach 4.5	9/11/2017	2	Blacknose Dace	Other	3
Reach 4.5	9/11/2017	2	Brook Stickleback	Other	2
Reach 4.5	9/11/2017	2	Brook Trout	Other	11
Reach 4.5	9/11/2017	2	Brown Trout	Other	3
Reach 4.5	9/11/2017	2	Brown Trout	YOY	42
Reach 4.5	9/11/2017	2	Creek Chub	Other	1
Reach 4.5	9/11/2017	2	Longnose Dace	Other	14
Reach 4.5	9/11/2017	2	Rainbow Trout	Other	13
Reach 4.5	9/11/2017	2	Rainbow Trout	YOY	21
Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	10
Reach 4_ED	9/12/2017	1	Brook Trout	Other	33
Reach 4_ED	9/12/2017	1	Brook Trout	YOY	2
Reach 4_ED	9/12/2017	1	Brown Trout	Other	9
Reach 4_ED	9/12/2017	1	Brown Trout	YOY	29
Reach 4_ED	9/12/2017	1	Creek Chub	Other	1
Reach 4_ED	9/12/2017	1	Longnose Dace	Other	26
Reach 4_ED	9/12/2017	1	Northern Redbelly Dace	Other	1
Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	58
Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	234
Reach 4_ED	9/12/2017	1	White Sucker	Other	5
Reach 4_ED	9/12/2017	2	Blacknose Dace	Other	2
Reach 4_ED	9/12/2017	2	Brook Trout	Other	9
Reach 4_ED	9/12/2017	2	Brown Trout	Other	5
Reach 4_ED	9/12/2017	2	Brown Trout	YOY	10
Reach 4_ED	9/12/2017	2	Longnose Dace	Other	20
Reach 4_ED	9/12/2017	2	Rainbow Trout	Other	15
Reach 4_ED	9/12/2017	2	Rainbow Trout	YOY	79
Reach 4_ED	9/12/2017	2	White Sucker	Other	3

Appendix V. (Continued)

Reach	Date	Pass	Taxa	Age	Total
Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	20
Reach 4_CB	9/13/2017	1	Brook Trout	Other	38
Reach 4_CB	9/13/2017	1	Brook Trout	YOY	1
Reach 4_CB	9/13/2017	1	Brown Trout	Other	9
Reach 4_CB	9/13/2017	1	Brown Trout	YOY	11
Reach 4_CB	9/13/2017	1	Central Mudminnow	Other	3
Reach 4_CB	9/13/2017	1	Hornyhead Chub	Other	1
Reach 4_CB	9/13/2017	1	Longnose Dace	Other	50
Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	69
Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	253
Reach 4_CB	9/13/2017	1	White Sucker	Other	2
Reach 4_CB	9/13/2017	2	Blacknose Dace	Other	18
Reach 4_CB	9/13/2017	2	Brook Trout	Other	2
Reach 4_CB	9/13/2017	2	Brook Trout	YOY	3
Reach 4_CB	9/13/2017	2	Brown Trout	Other	9
Reach 4_CB	9/13/2017	2	Brown Trout	YOY	5
Reach 4_CB	9/13/2017	2	Longnose Dace	Other	17
Reach 4_CB	9/13/2017	2	Northern Redbelly Dace	Other	3
Reach 4_CB	9/13/2017	2	Rainbow Trout	Other	16
Reach 4_CB	9/13/2017	2	Rainbow Trout	YOY	146
Reach 4_CB	9/13/2017	2	White Sucker	Other	1
Reference	9/14/2017	1	Blacknose Dace	Other	9
Reference	9/14/2017	1	Brook Trout	Other	35
Reference	9/14/2017	1	Brook Trout	YOY	4
Reference	9/14/2017	1	Brown Trout	Other	9
Reference	9/14/2017	1	Brown Trout	YOY	11
Reference	9/14/2017	1	Central Mudminnow	Other	3
Reference	9/14/2017	1	Longnose Dace	Other	47
Reference	9/14/2017	1	Northern Redbelly Dace	Other	1
Reference	9/14/2017	1	Pearl Dace	Other	1
Reference	9/14/2017	1	Rainbow Trout	Other	66
Reference	9/14/2017	1	Rainbow Trout	YOY	218
Reference	9/14/2017	1	White Sucker	Other	2
Reference	9/14/2017	2	Blacknose Dace	Other	3
Reference	9/14/2017	2	Brook Trout	Other	18
Reference	9/14/2017	2	Brook Trout	YOY	5

Appendix V. (Continued)

Reach	Date	Pass	Taxa	Age	Total
Reference	9/14/2017	2	Brown Trout	Other	3
Reference	9/14/2017	2	Brown Trout	YOY	6
Reference	9/14/2017	2	Longnose Dace	Other	35
Reference	9/14/2017	2	Pearl Dace	Other	1
Reference	9/14/2017	2	Rainbow Trout	Other	33
Reference	9/14/2017	2	Rainbow Trout	YOY	110
Reference	9/14/2017	2	White Sucker	Other	1
Mcarthy	9/7/2017	1	Blacknose Dace	Other	Rare
Mcarthy	9/7/2017	1	Brook Trout	Other	56
Mcarthy	9/7/2017	1	Brook Trout	YOY	5
Mcarthy	9/7/2017	1	Rainbow Trout	Other	2
Mcarthy	9/7/2017	1	Rainbow Trout	YOY	34
Red Dot	9/8/2017	1	Blacknose Dace	Other	Common
Red Dot	9/8/2017	1	Brook Trout	Other	9
Red Dot	9/8/2017	1	Brook Trout	YOY	13
Red Dot	9/8/2017	1	Central Mudminnow	Other	Rare
Red Dot	9/8/2017	1	Creek Chub	Other	Common
Red Dot	9/8/2017	1	Pearl Dace	Other	Present
Red Dot	9/8/2017	1	Rainbow Trout	Other	13
Red Dot	9/8/2017	1	White Sucker	Other	Rare
White Landing	9/8/2017	1	Blacknose Dace	Other	Observed
White Landing	9/8/2017	1	Brook Stickleback	Other	Observed
White Landing	9/8/2017	1	Brook Trout	Other	22
White Landing	9/8/2017	1	Brook Trout	YOY	13
White Landing	9/8/2017	1	Common Shiner	Other	Observed
White Landing	9/8/2017	1	Creek Chub	Other	Observed
White Landing	9/8/2017	1	Pearl Dace	Other	Observed
White Landing	9/8/2017	1	Rainbow Trout	Other	3
White Landing	9/8/2017	1	Rainbow Trout	YOY	1
White Landing	9/8/2017	1	White Sucker	Other	Observed

Appendix VI. Individual fish measurements from by electrofishing pass among reaches on the Knife River mainstem. TL = total length in millimeters, W = weight in grams.

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
1	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	67	na
2	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	70	na
3	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	67	na
4	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	68	na
5	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	66	na
6	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	95	na
7	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	92	na
8	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	90	na
9	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	70	na
10	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	75	na
11	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	64	na
12	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	75	na
13	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	99	na
14	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	71	na
15	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	77	na
16	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	69	na
17	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	95	na
18	Reach 4.5	9/11/2017	1	Blacknose Dace	Other	89	na
19	Reach 4.5	9/11/2017	1	Brook Stickleback	Other	44	na
20	Reach 4.5	9/11/2017	1	Brook Stickleback	Other	40	na
21	Reach 4.5	9/11/2017	1	Brook Stickleback	Other	44	na
22	Reach 4.5	9/11/2017	1	Brook Stickleback	Other	49	na
23	Reach 4.5	9/11/2017	1	Brook Stickleback	Other	56	na
24	Reach 4.5	9/11/2017	1	Brook Trout	Other	119	14.5
25	Reach 4.5	9/11/2017	1	Brook Trout	Other	127	16.3
26	Reach 4.5	9/11/2017	1	Brook Trout	Other	125	16.8
27	Reach 4.5	9/11/2017	1	Brook Trout	Other	135	19.9
28	Reach 4.5	9/11/2017	1	Brook Trout	Other	142	24.9
29	Reach 4.5	9/11/2017	1	Brook Trout	Other	155	33.2
30	Reach 4.5	9/11/2017	1	Brook Trout	Other	151	33.7
31	Reach 4.5	9/11/2017	1	Brook Trout	Other	151	36.4
32	Reach 4.5	9/11/2017	1	Brook Trout	Other	170	43.6
33	Reach 4.5	9/11/2017	1	Brook Trout	Other	176	51
34	Reach 4.5	9/11/2017	1	Brook Trout	Other	179	56.4
35	Reach 4.5	9/11/2017	1	Brook Trout	Other	212	87.8
36	Reach 4.5	9/11/2017	1	Brook Trout	Other	215	100.3
37	Reach 4.5	9/11/2017	1	Brook Trout	Other	217	110.5
38	Reach 4.5	9/11/2017	1	Brook Trout	Other	225	120.9
39	Reach 4.5	9/11/2017	1	Brook Trout	Other	255	159
40	Reach 4.5	9/11/2017	1	Brook Trout	Other	241	180.9

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
41	Reach 4.5	9/11/2017	1	Brown Trout	Other	124	16.5
42	Reach 4.5	9/11/2017	1	Brown Trout	Other	126	19.2
43	Reach 4.5	9/11/2017	1	Brown Trout	Other	141	24.9
44	Reach 4.5	9/11/2017	1	Brown Trout	Other	144	25.5
45	Reach 4.5	9/11/2017	1	Brown Trout	Other	149	28.3
46	Reach 4.5	9/11/2017	1	Brown Trout	Other	145	28.4
47	Reach 4.5	9/11/2017	1	Brown Trout	Other	147	28.5
48	Reach 4.5	9/11/2017	1	Brown Trout	Other	153	32.2
49	Reach 4.5	9/11/2017	1	Brown Trout	Other	154	34.4
50	Reach 4.5	9/11/2017	1	Brown Trout	Other	160	34.6
51	Reach 4.5	9/11/2017	1	Brown Trout	Other	164	37.2
52	Reach 4.5	9/11/2017	1	Brown Trout	Other	215	110.1
53	Reach 4.5	9/11/2017	1	Brown Trout	Other	291	na
54	Reach 4.5	9/11/2017	1	Brown Trout	YOY	57	1.7
55	Reach 4.5	9/11/2017	1	Brown Trout	YOY	64	2.1
56	Reach 4.5	9/11/2017	1	Brown Trout	YOY	64	2.4
57	Reach 4.5	9/11/2017	1	Brown Trout	YOY	64	2.4
58	Reach 4.5	9/11/2017	1	Brown Trout	YOY	65	2.4
59	Reach 4.5	9/11/2017	1	Brown Trout	YOY	66	2.4
60	Reach 4.5	9/11/2017	1	Brown Trout	YOY	67	2.5
61	Reach 4.5	9/11/2017	1	Brown Trout	YOY	69	2.8
62	Reach 4.5	9/11/2017	1	Brown Trout	YOY	67	2.8
63	Reach 4.5	9/11/2017	1	Brown Trout	YOY	69	2.8
64	Reach 4.5	9/11/2017	1	Brown Trout	YOY	66	3
65	Reach 4.5	9/11/2017	1	Brown Trout	YOY	69	3.4
66	Reach 4.5	9/11/2017	1	Brown Trout	YOY	74	3.4
67	Reach 4.5	9/11/2017	1	Brown Trout	YOY	73	3.5
68	Reach 4.5	9/11/2017	1	Brown Trout	YOY	75	3.7
69	Reach 4.5	9/11/2017	1	Brown Trout	YOY	79	4.4
70	Reach 4.5	9/11/2017	1	Brown Trout	YOY	80	4.6
71	Reach 4.5	9/11/2017	1	Brown Trout	YOY	82	4.7
72	Reach 4.5	9/11/2017	1	Brown Trout	YOY	83	4.8
73	Reach 4.5	9/11/2017	1	Brown Trout	YOY	86	6.3
74	Reach 4.5	9/11/2017	1	Longnose Dace	Other	66	na
75	Reach 4.5	9/11/2017	1	Longnose Dace	Other	85	na
76	Reach 4.5	9/11/2017	1	Longnose Dace	Other	64	na
77	Reach 4.5	9/11/2017	1	Longnose Dace	Other	70	na
78	Reach 4.5	9/11/2017	1	Longnose Dace	Other	80	na
79	Reach 4.5	9/11/2017	1	Longnose Dace	Other	71	na
80	Reach 4.5	9/11/2017	1	Longnose Dace	Other	77	na
81	Reach 4.5	9/11/2017	1	Longnose Dace	Other	100	na

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
82	Reach 4.5	9/11/2017	1	Longnose Dace	Other	82	na
83	Reach 4.5	9/11/2017	1	Longnose Dace	Other	102	na
84	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	113	12.4
85	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	112	13.4
86	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	115	14.2
87	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	121	15.4
88	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	116	15.7
89	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	123	15.9
90	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	126	16.5
91	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	125	18.7
92	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	129	20.2
93	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	132	21.2
94	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	136	23.2
95	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	140	24.3
96	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	142	26.2
97	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	145	26.8
98	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	146	34.6
99	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	210	96.1
100	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	137	na
101	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	139	na
102	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	188	na
103	Reach 4.5	9/11/2017	1	Rainbow Trout	Other	145	na
104	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	47	0.6
105	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	46	0.8
106	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	47	0.9
107	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	50	0.9
108	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	47	0.9
109	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	47	1
110	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	51	1.1
111	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	51	1.1
112	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	49	1.2
113	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	52	1.3
114	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	50	1.4
115	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	57	1.5
116	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	56	1.5
117	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	54	1.6
118	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	58	1.7
119	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	56	1.7
120	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	56	1.8
121	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	64	2
122	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	65	2.5

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
123	Reach 4.5	9/11/2017	1	Rainbow Trout	YOY	64	3.5
124	Reach 4.5	9/11/2017	2	Blacknose Dace	Other	65	na
125	Reach 4.5	9/11/2017	2	Blacknose Dace	Other	65	na
126	Reach 4.5	9/11/2017	2	Brook Stickleback	Other	79	na
127	Reach 4.5	9/11/2017	2	Brook Stickleback	Other	48	na
128	Reach 4.5	9/11/2017	2	Brook Trout	Other	141	27.9
129	Reach 4.5	9/11/2017	2	Brook Trout	Other	199	78.7
130	Reach 4.5	9/11/2017	2	Brook Trout	Other	207	91.9
131	Reach 4.5	9/11/2017	2	Brook Trout	Other	246	164
132	Reach 4.5	9/11/2017	2	Brown Trout	Other	140	26.7
133	Reach 4.5	9/11/2017	2	Brown Trout	Other	150	29
134	Reach 4.5	9/11/2017	2	Brown Trout	Other	148	30
135	Reach 4.5	9/11/2017	2	Creek Chub	Other	52	na
136	Reach 4.5	9/11/2017	2	Longnose Dace	Other	89	na
137	Reach 4.5	9/11/2017	2	Longnose Dace	Other	90	na
138	Reach 4.5	9/11/2017	2	Longnose Dace	Other	81	na
139	Reach 4.5	9/11/2017	2	Longnose Dace	Other	96	na
140	Reach 4.5	9/11/2017	2	Longnose Dace	Other	93	na
141	Reach 4.5	9/11/2017	2	Longnose Dace	Other	84	na
142	Reach 4.5	9/11/2017	2	Longnose Dace	Other	77	na
143	Reach 4.5	9/11/2017	2	Longnose Dace	Other	75	na
144	Reach 4.5	9/11/2017	2	Longnose Dace	Other	85	na
145	Reach 4.5	9/11/2017	2	Longnose Dace	Other	88	na
146	Reach 4.5	9/11/2017	2	Longnose Dace	Other	79	na
147	Reach 4.5	9/11/2017	2	Longnose Dace	Other	130	na
148	Reach 4.5	9/11/2017	2	Longnose Dace	Other	123	na
149	Reach 4.5	9/11/2017	2	Longnose Dace	Other	109	na
150	Reach 4.5	9/11/2017	2	Longnose Dace	Other	109	na
151	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	67	na
152	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	69	na
153	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	69	na
154	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	74	na
155	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	74	na
156	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	62	na
157	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	69	na
158	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	75	na
159	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	77	na
160	Reach 4_ED	9/12/2017	1	Blacknose Dace	Other	97	na
161	Reach 4_ED	9/12/2017	1	Brook Trout	Other	120	15.2
162	Reach 4_ED	9/12/2017	1	Brook Trout	Other	136	20.3

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
163	Reach 4_ED	9/12/2017	1	Brook Trout	Other	142	20.5
164	Reach 4_ED	9/12/2017	1	Brook Trout	Other	135	22.1
165	Reach 4_ED	9/12/2017	1	Brook Trout	Other	139	22.3
166	Reach 4_ED	9/12/2017	1	Brook Trout	Other	132	23.4
167	Reach 4_ED	9/12/2017	1	Brook Trout	Other	147	25.5
168	Reach 4_ED	9/12/2017	1	Brook Trout	Other	143	26
169	Reach 4_ED	9/12/2017	1	Brook Trout	Other	157	30
170	Reach 4_ED	9/12/2017	1	Brook Trout	Other	163	39
171	Reach 4_ED	9/12/2017	1	Brook Trout	Other	169	39.2
172	Reach 4_ED	9/12/2017	1	Brook Trout	Other	186	60.1
173	Reach 4_ED	9/12/2017	1	Brook Trout	Other	204	81.8
174	Reach 4_ED	9/12/2017	1	Brook Trout	Other	201	84.9
175	Reach 4_ED	9/12/2017	1	Brook Trout	Other	217	97.3
176	Reach 4_ED	9/12/2017	1	Brook Trout	Other	209	97.6
177	Reach 4_ED	9/12/2017	1	Brook Trout	Other	221	110.1
178	Reach 4_ED	9/12/2017	1	Brook Trout	Other	230	110.5
179	Reach 4_ED	9/12/2017	1	Brook Trout	Other	237	140.1
180	Reach 4_ED	9/12/2017	1	Brook Trout	Other	246	156.9
181	Reach 4_ED	9/12/2017	1	Brook Trout	Other	273	201.3
182	Reach 4_ED	9/12/2017	1	Brook Trout	Other	269	218.7
183	Reach 4_ED	9/12/2017	1	Brook Trout	Other	295	298.4
184	Reach 4_ED	9/12/2017	1	Brook Trout	YOY	76	3.6
185	Reach 4_ED	9/12/2017	1	Brook Trout	YOY	82	6.4
186	Reach 4_ED	9/12/2017	1	Brown Trout	Other	115	13.4
187	Reach 4_ED	9/12/2017	1	Brown Trout	Other	119	14
188	Reach 4_ED	9/12/2017	1	Brown Trout	Other	133	19.9
189	Reach 4_ED	9/12/2017	1	Brown Trout	Other	144	25.4
190	Reach 4_ED	9/12/2017	1	Brown Trout	Other	139	25.8
191	Reach 4_ED	9/12/2017	1	Brown Trout	Other	145	27.5
192	Reach 4_ED	9/12/2017	1	Brown Trout	Other	147	27.8
193	Reach 4_ED	9/12/2017	1	Brown Trout	Other	151	29.8
194	Reach 4_ED	9/12/2017	1	Brown Trout	Other	365	540
195	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	54	1.2
196	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	72	2.5
197	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	70	2.8
198	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	70	2.9
199	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	75	3.1
200	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	70	3.2
201	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	69	3.3
202	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	75	3.5
203	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	74	3.5

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
204	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	75	3.5
205	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	79	3.6
206	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	81	3.9
207	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	80	4
208	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	77	4.5
209	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	78	4.6
210	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	81	4.6
211	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	84	4.8
212	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	84	5.1
213	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	87	5.4
214	Reach 4_ED	9/12/2017	1	Brown Trout	YOY	87	6
215	Reach 4_ED	9/12/2017	1	Creek Chub	Other	72	na
216	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	79	na
217	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	76	na
218	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	97	na
219	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	89	na
220	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	80	na
221	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	77	na
222	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	72	na
223	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	85	na
224	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	74	na
225	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	84	na
226	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	87	na
227	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	70	na
228	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	85	na
229	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	82	na
230	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	85	na
231	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	99	na
232	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	80	na
233	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	75	na
234	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	82	na
235	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	77	na
236	Reach 4_ED	9/12/2017	1	Longnose Dace	Other	110	na
237	Reach 4_ED	9/12/2017	1	Northern Redbelly Dace	Other	59	na
238	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	107	10.2
239	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	112	10.5
240	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	107	11.3
241	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	112	13.5
242	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	116	13.7
243	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	123	15.3
244	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	120	15.6

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
245	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	121	16.9
246	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	126	17.8
247	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	121	17.8
248	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	139	22.8
249	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	134	23.9
250	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	140	24.6
251	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	144	28.2
252	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	162	37.1
253	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	161	39.4
254	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	157	40.9
255	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	162	44
256	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	176	48.3
257	Reach 4_ED	9/12/2017	1	Rainbow Trout	Other	111	na
258	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	43	0.6
259	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	45	0.7
260	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	47	0.9
261	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	50	1
262	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	50	1.1
263	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	47	1.2
264	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	52	1.3
265	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	55	1.3
266	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	55	1.5
267	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	57	1.5
268	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	57	1.5
269	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	62	1.6
270	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	58	1.6
271	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	57	1.7
272	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	58	1.9
273	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	57	2
274	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	61	2
275	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	61	2.2
276	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	67	2.6
277	Reach 4_ED	9/12/2017	1	Rainbow Trout	YOY	77	4.1
278	Reach 4_ED	9/12/2017	1	White Sucker	Other	192	na
279	Reach 4_ED	9/12/2017	1	White Sucker	Other	163	na
280	Reach 4_ED	9/12/2017	1	White Sucker	Other	162	na
281	Reach 4_ED	9/12/2017	1	White Sucker	Other	212	na
282	Reach 4_ED	9/12/2017	1	White Sucker	Other	160	na
283	Reach 4_ED	9/12/2017	2	Blacknose Dace	Other	72	na
284	Reach 4_ED	9/12/2017	2	Blacknose Dace	Other	73	na
285	Reach 4_ED	9/12/2017	2	Brown Trout	Other	134	22

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
286	Reach 4_ED	9/12/2017	2	Brown Trout	Other	136	24
287	Reach 4_ED	9/12/2017	2	Brown Trout	Other	146	30
288	Reach 4_ED	9/12/2017	2	Brown Trout	Other	147	30
289	Reach 4_ED	9/12/2017	2	Brown Trout	Other	148	30
290	Reach 4_ED	9/12/2017	2	White Sucker	Other	173	na
291	Reach 4_ED	9/12/2017	2	White Sucker	Other	155	na
292	Reach 4_ED	9/12/2017	2	White Sucker	Other	107	na
293	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	65	na
294	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	70	na
295	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	67	na
296	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	89	na
297	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	66	na
298	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	75	na
299	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	66	na
300	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	66	na
301	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	87	na
302	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	100	na
303	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	74	na
304	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	96	na
305	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	65	na
306	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	65	na
307	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	100	na
308	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	70	na
309	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	84	na
310	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	100	na
311	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	80	na
312	Reach 4_CB	9/13/2017	1	Blacknose Dace	Other	105	na
313	Reach 4_CB	9/13/2017	1	Brook Trout	Other	120	14
314	Reach 4_CB	9/13/2017	1	Brook Trout	Other	118	14.7
315	Reach 4_CB	9/13/2017	1	Brook Trout	Other	130	17.8
316	Reach 4_CB	9/13/2017	1	Brook Trout	Other	136	21.7
317	Reach 4_CB	9/13/2017	1	Brook Trout	Other	146	26.6
318	Reach 4_CB	9/13/2017	1	Brook Trout	Other	146	27.4
319	Reach 4_CB	9/13/2017	1	Brook Trout	Other	150	28.1
320	Reach 4_CB	9/13/2017	1	Brook Trout	Other	155	28.9
321	Reach 4_CB	9/13/2017	1	Brook Trout	Other	146	29.2
322	Reach 4_CB	9/13/2017	1	Brook Trout	Other	136	29.9
323	Reach 4_CB	9/13/2017	1	Brook Trout	Other	164	35.3
324	Reach 4_CB	9/13/2017	1	Brook Trout	Other	157	36
325	Reach 4_CB	9/13/2017	1	Brook Trout	Other	159	36.4
326	Reach 4_CB	9/13/2017	1	Brook Trout	Other	154	39.2

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
327	Reach 4_CB	9/13/2017	1	Brook Trout	Other	163	41.5
328	Reach 4_CB	9/13/2017	1	Brook Trout	Other	171	43
329	Reach 4_CB	9/13/2017	1	Brook Trout	Other	167	43.7
330	Reach 4_CB	9/13/2017	1	Brook Trout	Other	166	48.4
331	Reach 4_CB	9/13/2017	1	Brook Trout	Other	185	56.3
332	Reach 4_CB	9/13/2017	1	Brook Trout	Other	194	78.2
333	Reach 4_CB	9/13/2017	1	Brook Trout	Other	221	111.5
334	Reach 4_CB	9/13/2017	1	Brook Trout	YOY	85	4.8
335	Reach 4_CB	9/13/2017	1	Brown Trout	Other	76	3.7
336	Reach 4_CB	9/13/2017	1	Brown Trout	Other	115	13.1
337	Reach 4_CB	9/13/2017	1	Brown Trout	Other	117	13.8
338	Reach 4_CB	9/13/2017	1	Brown Trout	Other	145	23.5
339	Reach 4_CB	9/13/2017	1	Brown Trout	Other	150	28.5
340	Reach 4_CB	9/13/2017	1	Brown Trout	Other	149	31.3
341	Reach 4_CB	9/13/2017	1	Brown Trout	Other	150	37.2
342	Reach 4_CB	9/13/2017	1	Brown Trout	Other	239	118.8
343	Reach 4_CB	9/13/2017	1	Brown Trout	Other	311	345
344	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	65	2.4
345	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	69	2.8
346	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	72	3.3
347	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	77	4
348	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	77	4.1
349	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	80	4.2
350	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	82	4.5
351	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	81	4.9
352	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	85	5
353	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	85	5.2
354	Reach 4_CB	9/13/2017	1	Brown Trout	YOY	84	5.2
355	Reach 4_CB	9/13/2017	1	Central Mudminnow	Other	69	na
356	Reach 4_CB	9/13/2017	1	Central Mudminnow	Other	69	na
357	Reach 4_CB	9/13/2017	1	Central Mudminnow	Other	80	na
358	Reach 4_CB	9/13/2017	1	Hornyhead Chub	Other	88	na
359	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	84	na
360	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	82	na
361	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	69	na
362	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	90	na
363	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	75	na
364	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	77	na
365	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	87	na
366	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	80	na
367	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	85	na

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
368	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	76	na
369	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	89	na
370	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	83	na
371	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	75	na
372	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	71	na
373	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	111	na
374	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	85	na
375	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	92	na
376	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	86	na
377	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	100	na
378	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	85	na
379	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	104	na
380	Reach 4_CB	9/13/2017	1	Longnose Dace	Other	116	na
381	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	110	12.2
382	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	112	12.8
383	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	114	13.2
384	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	115	14.3
385	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	117	14.7
386	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	120	15.2
387	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	121	16.7
388	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	120	16.8
389	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	124	17
390	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	124	17.5
391	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	131	19.4
392	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	133	20.8
393	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	134	20.9
394	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	137	22.5
395	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	138	23
396	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	139	23.6
397	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	155	42.4
398	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	164	44.7
399	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	175	54
400	Reach 4_CB	9/13/2017	1	Rainbow Trout	Other	190	65.5
401	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	46	0.7
402	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	51	1.2
403	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	52	1.2
404	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	50	1.3
405	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	55	1.4
406	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	57	1.5
407	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	59	1.5
408	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	57	1.7

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
409	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	56	1.7
410	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	57	1.7
411	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	59	1.8
412	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	56	1.8
413	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	61	2
414	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	61	2.2
415	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	63	2.2
416	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	62	2.2
417	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	64	2.3
418	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	66	2.5
419	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	66	2.5
420	Reach 4_CB	9/13/2017	1	Rainbow Trout	YOY	69	3
421	Reach 4_CB	9/13/2017	1	White Sucker	Other	180	na
422	Reach 4_CB	9/13/2017	1	White Sucker	Other	159	na
423	Reach 4_CB	9/13/2017	2	Blacknose Dace	Other	62	na
424	Reach 4_CB	9/13/2017	2	Blacknose Dace	Other	113	na
425	Reach 4_CB	9/13/2017	2	Brook Trout	YOY	73	3.2
426	Reach 4_CB	9/13/2017	2	Brook Trout	YOY	77	3.9
427	Reach 4_CB	9/13/2017	2	Brook Trout	YOY	79	4.6
428	Reach 4_CB	9/13/2017	2	Brown Trout	Other	117	13.5
429	Reach 4_CB	9/13/2017	2	Brown Trout	Other	123	16.5
430	Reach 4_CB	9/13/2017	2	Brown Trout	Other	126	17.1
431	Reach 4_CB	9/13/2017	2	Brown Trout	Other	134	22
432	Reach 4_CB	9/13/2017	2	Brown Trout	Other	142	25.2
433	Reach 4_CB	9/13/2017	2	Brown Trout	Other	149	31.6
434	Reach 4_CB	9/13/2017	2	Brown Trout	Other	149	32.5
435	Reach 4_CB	9/13/2017	2	Brown Trout	Other	166	40.2
436	Reach 4_CB	9/13/2017	2	Brown Trout	Other	314	356
437	Reach 4_CB	9/13/2017	2	Brown Trout	YOY	71	3.3
438	Reach 4_CB	9/13/2017	2	Brown Trout	YOY	75	3.6
439	Reach 4_CB	9/13/2017	2	Brown Trout	YOY	77	3.8
440	Reach 4_CB	9/13/2017	2	Brown Trout	YOY	78	4.3
441	Reach 4_CB	9/13/2017	2	Brown Trout	YOY	88	6.4
442	Reach 4_CB	9/13/2017	2	Northern Redbelly Dace	Other	53	na
443	Reach 4_CB	9/13/2017	2	Northern Redbelly Dace	Other	56	na
444	Reach 4_CB	9/13/2017	2	Northern Redbelly Dace	Other	50	na
445	Reach 4_CB	9/13/2017	2	White Sucker	Other	89	na
446	Reference	9/14/2017	1	Blacknose Dace	Other	68	na
447	Reference	9/14/2017	1	Blacknose Dace	Other	67	na
448	Reference	9/14/2017	1	Blacknose Dace	Other	61	na
449	Reference	9/14/2017	1	Blacknose Dace	Other	77	na

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
450	Reference	9/14/2017	1	Blacknose Dace	Other	74	na
451	Reference	9/14/2017	1	Blacknose Dace	Other	93	na
452	Reference	9/14/2017	1	Blacknose Dace	Other	67	na
453	Reference	9/14/2017	1	Blacknose Dace	Other	75	na
454	Reference	9/14/2017	1	Blacknose Dace	Other	105	na
455	Reference	9/14/2017	1	Brook Trout	Other	116	14.3
456	Reference	9/14/2017	1	Brook Trout	Other	136	20.9
457	Reference	9/14/2017	1	Brook Trout	Other	135	21.8
458	Reference	9/14/2017	1	Brook Trout	Other	136	22
459	Reference	9/14/2017	1	Brook Trout	Other	138	22.2
460	Reference	9/14/2017	1	Brook Trout	Other	136	23.1
461	Reference	9/14/2017	1	Brook Trout	Other	157	37
462	Reference	9/14/2017	1	Brook Trout	Other	167	38.1
463	Reference	9/14/2017	1	Brook Trout	Other	165	42.1
464	Reference	9/14/2017	1	Brook Trout	Other	170	48.5
465	Reference	9/14/2017	1	Brook Trout	Other	176	49.5
466	Reference	9/14/2017	1	Brook Trout	Other	178	50.8
467	Reference	9/14/2017	1	Brook Trout	Other	198	63.8
468	Reference	9/14/2017	1	Brook Trout	Other	214	92.7
469	Reference	9/14/2017	1	Brook Trout	Other	210	100.7
470	Reference	9/14/2017	1	Brook Trout	Other	220	112.3
471	Reference	9/14/2017	1	Brook Trout	Other	235	121.1
472	Reference	9/14/2017	1	Brook Trout	Other	250	148.1
473	Reference	9/14/2017	1	Brook Trout	Other	200	66.7
474	Reference	9/14/2017	1	Brook Trout	Other	147	na
475	Reference	9/14/2017	1	Brook Trout	YOY	81	4.3
476	Reference	9/14/2017	1	Brook Trout	YOY	81	4.6
477	Reference	9/14/2017	1	Brook Trout	YOY	86	5
478	Reference	9/14/2017	1	Brook Trout	YOY	95	6.7
479	Reference	9/14/2017	1	Brown Trout	Other	115	13.2
480	Reference	9/14/2017	1	Brown Trout	Other	125	16.7
481	Reference	9/14/2017	1	Brown Trout	Other	126	17
482	Reference	9/14/2017	1	Brown Trout	Other	135	20.4
483	Reference	9/14/2017	1	Brown Trout	Other	134	21.2
484	Reference	9/14/2017	1	Brown Trout	Other	139	23
485	Reference	9/14/2017	1	Brown Trout	Other	142	25
486	Reference	9/14/2017	1	Brown Trout	Other	145	26.7
487	Reference	9/14/2017	1	Brown Trout	YOY	68	2.8
488	Reference	9/14/2017	1	Brown Trout	YOY	69	3.1
489	Reference	9/14/2017	1	Brown Trout	YOY	71	3.3
490	Reference	9/14/2017	1	Brown Trout	YOY	73	3.4

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
491	Reference	9/14/2017	1	Brown Trout	YOY	75	3.8
492	Reference	9/14/2017	1	Brown Trout	YOY	74	3.9
493	Reference	9/14/2017	1	Brown Trout	YOY	77	4.2
494	Reference	9/14/2017	1	Brown Trout	YOY	77	4.2
495	Reference	9/14/2017	1	Brown Trout	YOY	78	4.3
496	Reference	9/14/2017	1	Brown Trout	YOY	81	4.7
497	Reference	9/14/2017	1	Brown Trout	YOY	80	4.8
498	Reference	9/14/2017	1	Central Mudminnow	Other	68	na
499	Reference	9/14/2017	1	Central Mudminnow	Other	67	na
500	Reference	9/14/2017	1	Central Mudminnow	Other	72	na
501	Reference	9/14/2017	1	Longnose Dace	Other	85	na
502	Reference	9/14/2017	1	Longnose Dace	Other	82	na
503	Reference	9/14/2017	1	Longnose Dace	Other	94	na
504	Reference	9/14/2017	1	Longnose Dace	Other	89	na
505	Reference	9/14/2017	1	Longnose Dace	Other	85	na
506	Reference	9/14/2017	1	Longnose Dace	Other	71	na
507	Reference	9/14/2017	1	Longnose Dace	Other	73	na
508	Reference	9/14/2017	1	Longnose Dace	Other	97	na
509	Reference	9/14/2017	1	Longnose Dace	Other	97	na
510	Reference	9/14/2017	1	Longnose Dace	Other	92	na
511	Reference	9/14/2017	1	Longnose Dace	Other	94	na
512	Reference	9/14/2017	1	Longnose Dace	Other	86	na
513	Reference	9/14/2017	1	Longnose Dace	Other	82	na
514	Reference	9/14/2017	1	Longnose Dace	Other	93	na
515	Reference	9/14/2017	1	Longnose Dace	Other	86	na
516	Reference	9/14/2017	1	Longnose Dace	Other	75	na
517	Reference	9/14/2017	1	Longnose Dace	Other	85	na
518	Reference	9/14/2017	1	Longnose Dace	Other	89	na
519	Reference	9/14/2017	1	Longnose Dace	Other	84	na
520	Reference	9/14/2017	1	Longnose Dace	Other	90	na
521	Reference	9/14/2017	1	Longnose Dace	Other	104	na
522	Reference	9/14/2017	1	Longnose Dace	Other	123	na
523	Reference	9/14/2017	1	Longnose Dace	Other	107	na
524	Reference	9/14/2017	1	Longnose Dace	Other	102	na
525	Reference	9/14/2017	1	Longnose Dace	Other	110	na
526	Reference	9/14/2017	1	Northern Redbelly Dace	Other	58	na
527	Reference	9/14/2017	1	Pearl Dace	Other	98	na
528	Reference	9/14/2017	1	Rainbow Trout	Other	104	12.3
529	Reference	9/14/2017	1	Rainbow Trout	Other	124	14.9
530	Reference	9/14/2017	1	Rainbow Trout	Other	120	14.9
531	Reference	9/14/2017	1	Rainbow Trout	Other	119	15.6

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
532	Reference	9/14/2017	1	Rainbow Trout	Other	122	16.1
533	Reference	9/14/2017	1	Rainbow Trout	Other	132	20.9
534	Reference	9/14/2017	1	Rainbow Trout	Other	142	26.3
535	Reference	9/14/2017	1	Rainbow Trout	Other	138	26.9
536	Reference	9/14/2017	1	Rainbow Trout	Other	153	32.2
537	Reference	9/14/2017	1	Rainbow Trout	Other	154	33
538	Reference	9/14/2017	1	Rainbow Trout	Other	160	33.4
539	Reference	9/14/2017	1	Rainbow Trout	Other	156	35.1
540	Reference	9/14/2017	1	Rainbow Trout	Other	155	36.4
541	Reference	9/14/2017	1	Rainbow Trout	Other	157	37.1
542	Reference	9/14/2017	1	Rainbow Trout	Other	164	41.6
543	Reference	9/14/2017	1	Rainbow Trout	Other	172	46.5
544	Reference	9/14/2017	1	Rainbow Trout	Other	175	46.7
545	Reference	9/14/2017	1	Rainbow Trout	Other	178	54.8
546	Reference	9/14/2017	1	Rainbow Trout	Other	194	72.2
547	Reference	9/14/2017	1	Rainbow Trout	Other	190	73
548	Reference	9/14/2017	1	Rainbow Trout	YOY	55	1.4
549	Reference	9/14/2017	1	Rainbow Trout	YOY	53	1.5
550	Reference	9/14/2017	1	Rainbow Trout	YOY	63	2.1
551	Reference	9/14/2017	1	Rainbow Trout	YOY	65	2.3
552	Reference	9/14/2017	1	Rainbow Trout	YOY	69	2.8
553	Reference	9/14/2017	1	Rainbow Trout	YOY	70	2.9
554	Reference	9/14/2017	1	Rainbow Trout	YOY	68	2.9
555	Reference	9/14/2017	1	Rainbow Trout	YOY	70	3
556	Reference	9/14/2017	1	Rainbow Trout	YOY	70	3
557	Reference	9/14/2017	1	Rainbow Trout	YOY	76	3.7
558	Reference	9/14/2017	1	Rainbow Trout	YOY	76	4.1
559	Reference	9/14/2017	1	Rainbow Trout	YOY	77	4.2
560	Reference	9/14/2017	1	Rainbow Trout	YOY	78	4.2
561	Reference	9/14/2017	1	Rainbow Trout	YOY	78	4.5
562	Reference	9/14/2017	1	Rainbow Trout	YOY	82	4.9
563	Reference	9/14/2017	1	Rainbow Trout	YOY	81	4.9
564	Reference	9/14/2017	1	Rainbow Trout	YOY	83	5
565	Reference	9/14/2017	1	Rainbow Trout	YOY	87	6
566	Reference	9/14/2017	1	Rainbow Trout	YOY	89	6.1
567	Reference	9/14/2017	1	Rainbow Trout	YOY	89	6.3
568	Reference	9/14/2017	1	White Sucker	Other	177	na
569	Reference	9/14/2017	1	White Sucker	Other	147	na
570	Reference	9/14/2017	2	Blacknose Dace	Other	75	na
571	Reference	9/14/2017	2	Blacknose Dace	Other	70	na
572	Reference	9/14/2017	2	Blacknose Dace	Other	68	na

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
573	Reference	9/14/2017	2	Brook Trout	Other	265	186.9
574	Reference	9/14/2017	2	Brook Trout	Other	275	206.7
575	Reference	9/14/2017	2	Brook Trout	Other	280	223.5
576	Reference	9/14/2017	2	Brook Trout	Other	290	260.2
577	Reference	9/14/2017	2	Brook Trout	YOY	80	4.2
578	Reference	9/14/2017	2	Brook Trout	YOY	85	5.2
579	Reference	9/14/2017	2	Brook Trout	YOY	87	5.4
580	Reference	9/14/2017	2	Brook Trout	YOY	86	5.5
581	Reference	9/14/2017	2	Brook Trout	YOY	87	5.6
582	Reference	9/14/2017	2	Brown Trout	Other	139	21.4
583	Reference	9/14/2017	2	Brown Trout	Other	152	30.8
584	Reference	9/14/2017	2	Brown Trout	Other	150	33.5
585	Reference	9/14/2017	2	Brown Trout	YOY	70	3
586	Reference	9/14/2017	2	Brown Trout	YOY	73	3.8
587	Reference	9/14/2017	2	Brown Trout	YOY	77	4.1
588	Reference	9/14/2017	2	Brown Trout	YOY	78	4.8
589	Reference	9/14/2017	2	Brown Trout	YOY	84	5.1
590	Reference	9/14/2017	2	Brown Trout	YOY	87	6
591	Reference	9/14/2017	2	Longnose Dace	Other	123	na
592	Reference	9/14/2017	2	Longnose Dace	Other	120	na
593	Reference	9/14/2017	2	Longnose Dace	Other	119	na
594	Reference	9/14/2017	2	Longnose Dace	Other	119	na
595	Reference	9/14/2017	2	Longnose Dace	Other	115	na
596	Reference	9/14/2017	2	Pearl Dace	Other	85	na
597	Reference	9/14/2017	2	White Sucker	Other	163	na
598	Mcarthy	9/7/2017	1	Brook Trout	Other	103	9.7
599	Mcarthy	9/7/2017	1	Brook Trout	Other	106	13.8
600	Mcarthy	9/7/2017	1	Brook Trout	Other	115	14.2
601	Mcarthy	9/7/2017	1	Brook Trout	Other	117	15.4
602	Mcarthy	9/7/2017	1	Brook Trout	Other	133	20.5
603	Mcarthy	9/7/2017	1	Brook Trout	Other	132	20.9
604	Mcarthy	9/7/2017	1	Brook Trout	Other	127	21.1
605	Mcarthy	9/7/2017	1	Brook Trout	Other	151	36.5
606	Mcarthy	9/7/2017	1	Brook Trout	Other	160	37
607	Mcarthy	9/7/2017	1	Brook Trout	Other	164	40.2
608	Mcarthy	9/7/2017	1	Brook Trout	Other	167	44
609	Mcarthy	9/7/2017	1	Brook Trout	Other	170	44.8
610	Mcarthy	9/7/2017	1	Brook Trout	Other	175	46.8
611	Mcarthy	9/7/2017	1	Brook Trout	Other	166	47.3
612	Mcarthy	9/7/2017	1	Brook Trout	Other	171	52.4
613	Mcarthy	9/7/2017	1	Brook Trout	Other	194	67.9

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
614	Mcarthy	9/7/2017	1	Brook Trout	Other	205	72.8
615	Mcarthy	9/7/2017	1	Brook Trout	Other	200	90.8
616	Mcarthy	9/7/2017	1	Brook Trout	Other	114	na
617	Mcarthy	9/7/2017	1	Brook Trout	Other	245	139
618	Mcarthy	9/7/2017	1	Brook Trout	YOY	72	2.9
619	Mcarthy	9/7/2017	1	Brook Trout	YOY	71	3.1
620	Mcarthy	9/7/2017	1	Brook Trout	YOY	75	3.9
621	Mcarthy	9/7/2017	1	Brook Trout	YOY	90	6.3
622	Mcarthy	9/7/2017	1	Brook Trout	YOY	83	na
623	Mcarthy	9/7/2017	1	Rainbow Trout	Other	136	24
624	Mcarthy	9/7/2017	1	Rainbow Trout	Other	138	25.4
625	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	44	0.7
626	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	55	1.5
627	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	56	1.5
628	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	59	1.8
629	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	62	2.2
630	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	62	2.2
631	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	62	2.2
632	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	64	2.3
633	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	64	2.4
634	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	68	2.9
635	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	70	2.9
636	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	70	3.2
637	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	69	3.2
638	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	70	3.2
639	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	74	3.4
640	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	73	4.2
641	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	82	5
642	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	83	5.4
643	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	88	6.5
644	Mcarthy	9/7/2017	1	Rainbow Trout	YOY	80	na
645	Red Dot	9/8/2017	1	Brook Trout	Other	139	21
646	Red Dot	9/8/2017	1	Brook Trout	Other	144	27
647	Red Dot	9/8/2017	1	Brook Trout	Other	140	27
648	Red Dot	9/8/2017	1	Brook Trout	Other	154	33
649	Red Dot	9/8/2017	1	Brook Trout	Other	160	37
650	Red Dot	9/8/2017	1	Brook Trout	Other	201	74
651	Red Dot	9/8/2017	1	Brook Trout	Other	197	90
652	Red Dot	9/8/2017	1	Brook Trout	Other	224	111
653	Red Dot	9/8/2017	1	Brook Trout	Other	262	178
654	Red Dot	9/8/2017	1	Brook Trout	YOY	66	2

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
655	Red Dot	9/8/2017	1	Brook Trout	YOY	71	2
656	Red Dot	9/8/2017	1	Brook Trout	YOY	73	3
657	Red Dot	9/8/2017	1	Brook Trout	YOY	79	4
658	Red Dot	9/8/2017	1	Brook Trout	YOY	85	4
659	Red Dot	9/8/2017	1	Brook Trout	YOY	83	4
660	Red Dot	9/8/2017	1	Brook Trout	YOY	79	4
661	Red Dot	9/8/2017	1	Brook Trout	YOY	86	5
662	Red Dot	9/8/2017	1	Brook Trout	YOY	88	5
663	Red Dot	9/8/2017	1	Brook Trout	YOY	92	6
664	Red Dot	9/8/2017	1	Brook Trout	YOY	90	7
665	Red Dot	9/8/2017	1	Brook Trout	YOY	93	8
666	Red Dot	9/8/2017	1	Brook Trout	YOY	96	8
667	Red Dot	9/8/2017	1	Rainbow Trout	Other	132	20
668	Red Dot	9/8/2017	1	Rainbow Trout	Other	133	21
669	Red Dot	9/8/2017	1	Rainbow Trout	Other	134	24
670	Red Dot	9/8/2017	1	Rainbow Trout	Other	142	26
671	Red Dot	9/8/2017	1	Rainbow Trout	Other	144	28
672	Red Dot	9/8/2017	1	Rainbow Trout	Other	145	28
673	Red Dot	9/8/2017	1	Rainbow Trout	Other	144	29
674	Red Dot	9/8/2017	1	Rainbow Trout	Other	150	31
675	Red Dot	9/8/2017	1	Rainbow Trout	Other	156	36
676	Red Dot	9/8/2017	1	Rainbow Trout	Other	164	42
677	Red Dot	9/8/2017	1	Rainbow Trout	Other	167	43
678	Red Dot	9/8/2017	1	Rainbow Trout	Other	169	43
679	Red Dot	9/8/2017	1	Rainbow Trout	Other	182	63
680	White Landing	9/8/2017	1	Brook Trout	Other	123	15.3
681	White Landing	9/8/2017	1	Brook Trout	Other	118	15.5
682	White Landing	9/8/2017	1	Brook Trout	Other	125	18.8
683	White Landing	9/8/2017	1	Brook Trout	Other	136	20.1
684	White Landing	9/8/2017	1	Brook Trout	Other	132	22.1
685	White Landing	9/8/2017	1	Brook Trout	Other	137	23.6
686	White Landing	9/8/2017	1	Brook Trout	Other	142	23.9
687	White Landing	9/8/2017	1	Brook Trout	Other	142	26.6
688	White Landing	9/8/2017	1	Brook Trout	Other	145	27.1
689	White Landing	9/8/2017	1	Brook Trout	Other	145	27.2
690	White Landing	9/8/2017	1	Brook Trout	Other	146	28.2
691	White Landing	9/8/2017	1	Brook Trout	Other	147	32.6
692	White Landing	9/8/2017	1	Brook Trout	Other	151	35
693	White Landing	9/8/2017	1	Brook Trout	Other	153	35.7
694	White Landing	9/8/2017	1	Brook Trout	Other	165	37.4
695	White Landing	9/8/2017	1	Brook Trout	Other	154	40.4

Appendix VI. (Continued)

UID	Reach	Date	Pass	Taxa	Age	TL (mm)	W (g)
696	White Landing	9/8/2017	1	Brook Trout	Other	169	49.8
697	White Landing	9/8/2017	1	Brook Trout	Other	174	59.4
698	White Landing	9/8/2017	1	Brook Trout	Other	200	83.1
699	White Landing	9/8/2017	1	Brook Trout	Other	220	106.6
700	White Landing	9/8/2017	1	Brook Trout	Other	255	165.2
701	White Landing	9/8/2017	1	Brook Trout	Other	260	189.9
702	White Landing	9/8/2017	1	Brook Trout	YOY	72	3.3
703	White Landing	9/8/2017	1	Brook Trout	YOY	81	4.3
704	White Landing	9/8/2017	1	Brook Trout	YOY	81	4.4
705	White Landing	9/8/2017	1	Brook Trout	YOY	84	4.7
706	White Landing	9/8/2017	1	Brook Trout	YOY	82	5.1
707	White Landing	9/8/2017	1	Brook Trout	YOY	82	5.3
708	White Landing	9/8/2017	1	Brook Trout	YOY	84	5.3
709	White Landing	9/8/2017	1	Brook Trout	YOY	85	5.6
710	White Landing	9/8/2017	1	Brook Trout	YOY	89	5.7
711	White Landing	9/8/2017	1	Brook Trout	YOY	90	6
712	White Landing	9/8/2017	1	Brook Trout	YOY	94	6.7
713	White Landing	9/8/2017	1	Brook Trout	YOY	93	7.6
714	White Landing	9/8/2017	1	Rainbow Trout	Other	140	27.4
715	White Landing	9/8/2017	1	Rainbow Trout	Other	147	29.7
716	White Landing	9/8/2017	1	Rainbow Trout	Other	181	60.4
717	White Landing	9/8/2017	1	Rainbow Trout	YOY	77	3.9