# Biological, Physical, and Chemical Characteristics of the Cloquet River from Indian Lake to Island Lake, 2000 - 2001

A Joint Effort of the 1854 Authority and the
Fond du Lac Division of Resource Management

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## INTRODUCTION

The Cloquet River runs through a relatively pristine area of northeastern Minnesota. It begins as a small stream and flows generally southwest approximately ninety-nine miles to its mouth at the St. Louis River. Several lakes and tributaries, including Fish Lake and Boulder Lake Reservoirs, feed the river along its route. The river is impounded, creating the Island Lake Reservoir, approximately 29 miles from the St. Louis River. The Cloquet River supports a variety of wildlife including numerous fish species and is surrounded by forest for most of its length. The river has a long history of use and is currently utilized for recreation by fishermen, canoeists, hunters, and campers.

The Bois Forte, Grand Portage, and Fond du Lac Bands of Lake Superior Chippewa retain off-reservation treaty rights within the 1854 Ceded Territory in northern Minnesota. The 1854 Authority and Fond du Lac Resource Management Division work to protect and enhance the natural resources of the 1854 Ceded Territory for the three Bands. Cooperating with local Minnesota Department of Natural Resources (DNR) offices, the 1854 Authority and Fond du Lac identify priority natural resource projects for areas within the Ceded Territory. One goal is to assist in the completion of necessary surveys that have been postponed by the DNR due to budget and staff limitations. The Cloquet River surfaced as a priority because a survey had not been done for thirty years and updated information about this resource was needed.

The Minnesota Department of Conservation (now DNR) previously surveyed the Cloquet River between 1942-1945. The results of that initiative were included in the *Biological Survey and Fishery Management Plan for the Streams of the St. Louis River* by Dr. J. Moyle and W. Kenyon in 1947. Determination of present and potential trout streams was the emphasis of that survey. The Minnesota Department of Conservation conducted a second biological survey during the summers of 1964-1967. A report entitled *The Cloquet River: Its Ecology and Recreation* was completed by Richard Hassinger in March 1967. The study collected information on the physical, chemical, and biological conditions of the Cloquet River to provide a basis for fish management and evaluate recreational potential (Hassinger 1967). In addition, *A Management Plan for the Cloquet River* was produced by the Minnesota DNR in October 1978 (preliminary draft). That document was developed in cooperation with the Cloquet River citizen's advisory board. The 1854 Authority and the Fond du Lac Resource Management Division completed a report entitled "*Biological, Physical, and Chemical Characteristics of the Cloquet River from the Island Lake Dam to the St. Louis River, 1996-1998*" (Borkholder et al. 1999). The report summarizes a survey conducted to collect physical, chemical, and biological information necessary to implement management plans and/or special designations by the Minnesota DNR. The study area included the portion of the Cloquet River from the Island Lake Reservoir downstream to its mouth at the St. Louis River. Phase I of the project was to identify and map the physical characteristics of this 28.9 mile stretch. Information gathered included locations and features of tributaries, beaver lodges, erosion sites, access sites, shoreline development, etc. In addition, channel width, maximum river depth, and water temperature were recorded at the location of each noted feature. Phase I of the survey was completed in the summer of 1996. Features documented in Phase I were incorporated into the 1854 Authority's Geographic Information System and a complete listing of those features can be found in Appendix 1 of the 1999 report (Borkholder et al. 1999). Phase II consisted of establishing sampling stations and collecting detailed data from each station. Water quality measurements and water temperature were recorded. Vegetation, aquatic invertebrates, and fish were sampled and identified. It should be noted that a survey of the fish population was of importance when conducting the Cloquet River project. Anecdotal evidence suggested that brook and brown trout reside in the river and/or its tributaries. Documentation of the makeup of the fishery was important for possible future management.

The material covered in this report represents a follow up to the 1999 report. In general, the 1854 Authority and Fond du Lac Resource Management Division followed the same procedures as outlined in the 1999 report, but worked on a section of the river from Indian Lake to Island Lake Reservoir.

## GENERAL SITE DESCRIPTION

### Watershed CharacteristicsWatershed Characteristics

The Cloquet River watershed (Figure 1) drains approximately 750 miles $^2$ in Lake and St. Louis counties. Drainage area above the Island Lake Reservoir (downstream boundary of this project) is about 572 miles $^2$. The Cloquet River generally flows southwest from its origin at Cloquet Lake to the St. Louis River, which in turn flows into Lake Superior. The watershed contains about 70 streams, totaling 423 miles in length, and about 164 lakes and marshes (Hassinger 1967). Watershed elevations range from 1,220 to 1,925 feet above sea level. Glacial action is responsible for most of the geology of the region. Few springs are present in the watershed, primarily due to the underlying rock and glacial soil layers. As a result, nearly all of the water comes from surface drainage. Accordingly, stream flows below the Island Lake Dam vary with rainfall, snowmelt, and manipulations at four power storage reservoirs operated by Minnesota Light and Power Company. However, upstream of the Island Lake Reservoir, the river is subject to natural flow events. River gradient from Indian Lake to Island Lake Reservoir is about 3.2 feet/mile. Hassinger (1967) and DNR (1978) provide historical settlement information and an extensive description of soil types, geology, and forest cover.

### River Stations

Five river sampling stations were established on the Cloquet River in winter 2000. River stations (RS) were chosen for their variety of habitat, location, and potential for sampling. All established stations were thought to be representative of the Cloquet River. Locations of river stations used for sampling are identified in Figure 1.

Within each of the five river stations, individual transects were established. A transect consisted of a single habitat type that was identified as a pool, riffle, or run. The *Minnesota Stream Survey Manual* (Sternberg 1978) was used as a guide for definitions of habitat types:

***pool***
- has low water velocity, usually <1cfs at normal summer flows
- smooth surface on calm days
- shallow or deep
- fine bottom materials such as silt, sand, and small gravel.

***riffle*** - has higher water velocities, usually >1cfs at normal summer flows
- shows at least slight turbulence on the surface on a calm day
- two feet or less in depth
- coarse bottom materials such as gravel, rubble, and boulder
- rapids are more turbulent than riffles and usually have greater velocities

***run*** - has a velocity of >1cfs at normal summer flows
- is usually deeper than two feet

Each river sampling station included three transects (one pool, one riffle, one run) (Figures 2 – 6). Physical characteristics of each transect within the five river stations, including stream width, mean water column velocity (MWCV) and substrate types, are outlined in Table 1. Position of each sampling transect (latitude/longitude) is provided in Table 2.

## WATER QUALITY

Water quality measurements were recorded at each transect. Measurements were taken once at each site in August 2001. Information gathered included pH, dissolved oxygen (mg/L), conductivity (micromho), total dissolved solids (ppm), and temperature (ºCelsius). A complete list of recorded measurements is presented in Table 2.

Effort was made to not disturb the river bottom before recording measurements. An Accumet Portable AP5 pH meter was used to record pH. The meter was calibrated prior to use with three buffer solutions. Measurements were taken near the water surface and reported pH values have an accuracy of ± 0.1. Dissolved oxygen was measured using a YSI Model 52 dissolved oxygen meter with a YSI Model 5718 probe. The probe was prepared according to manufacturer instructions and the meter was calibrated daily in air and adjusted for site elevation. Dissolved oxygen was measured at a water depth of one foot and recorded values have an accuracy of ± 0.1% of saturation value. Water conductivity and total dissolved solids (TDS) were measured with a Fisher Scientific digital conductivity meter. The instrument was calibrated according to manufacturer instructions and measurements were taken near the water surface.

Analyses of water quality measurements suggest no significant difference between readings in each habitat type (pool, riffle, run) for all categories. The average pH for all measurements was 7.79 and recorded values did not appear to vary significantly across the different river stations. The dissolved oxygen content averaged 6.57 mg/L. The average conductivity was 96.7 micromhos and the average TDS was 64.54 ppm for all measurements. The limited water quality measurements taken indicate nothing out of the ordinary and are well within the bounds required for most fish and invertebrate species. These values continuously change with the dynamic nature of the Cloquet River, affected by the chemical and physical nature of the river and watershed, the amount of water flow, and the time of year.

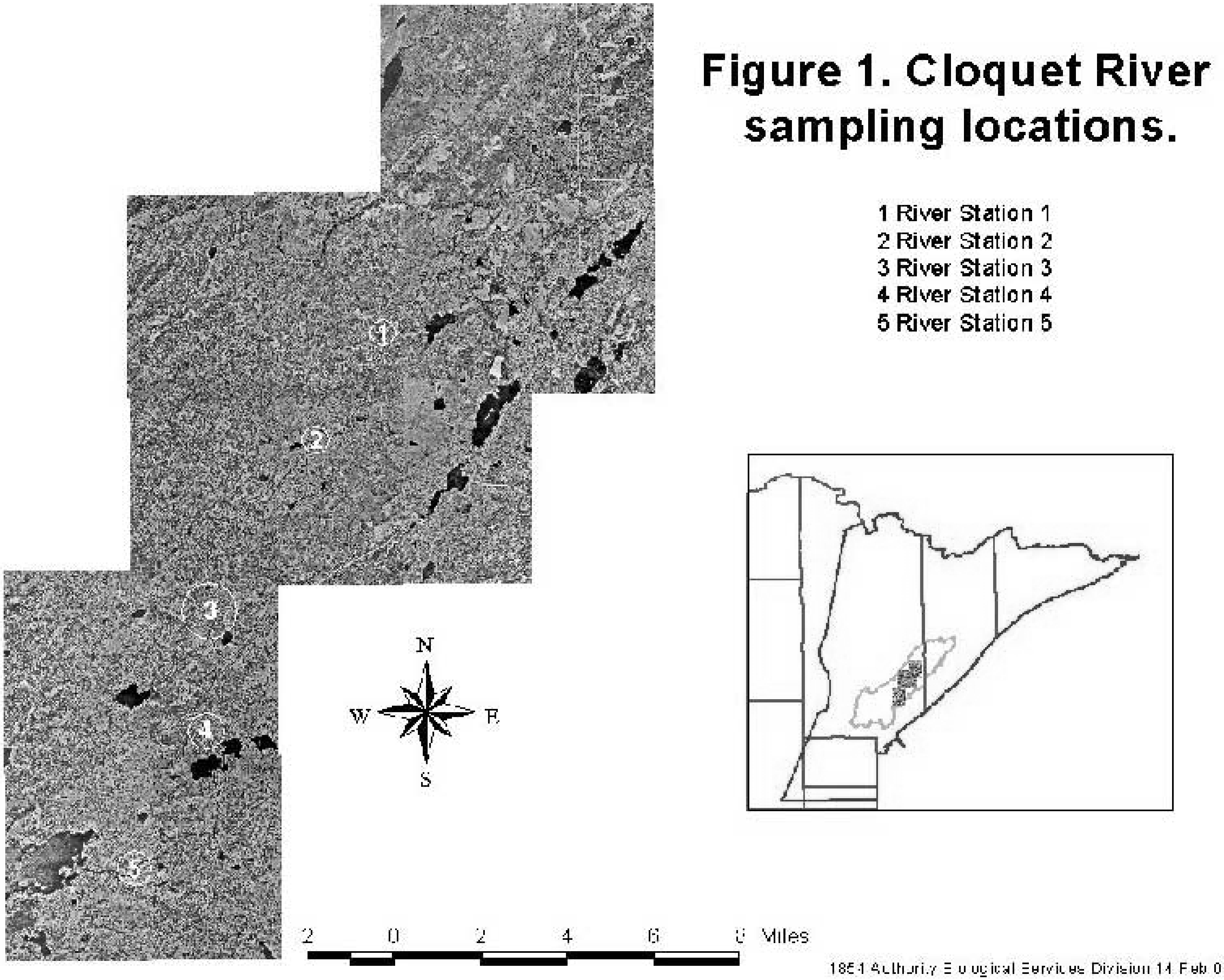
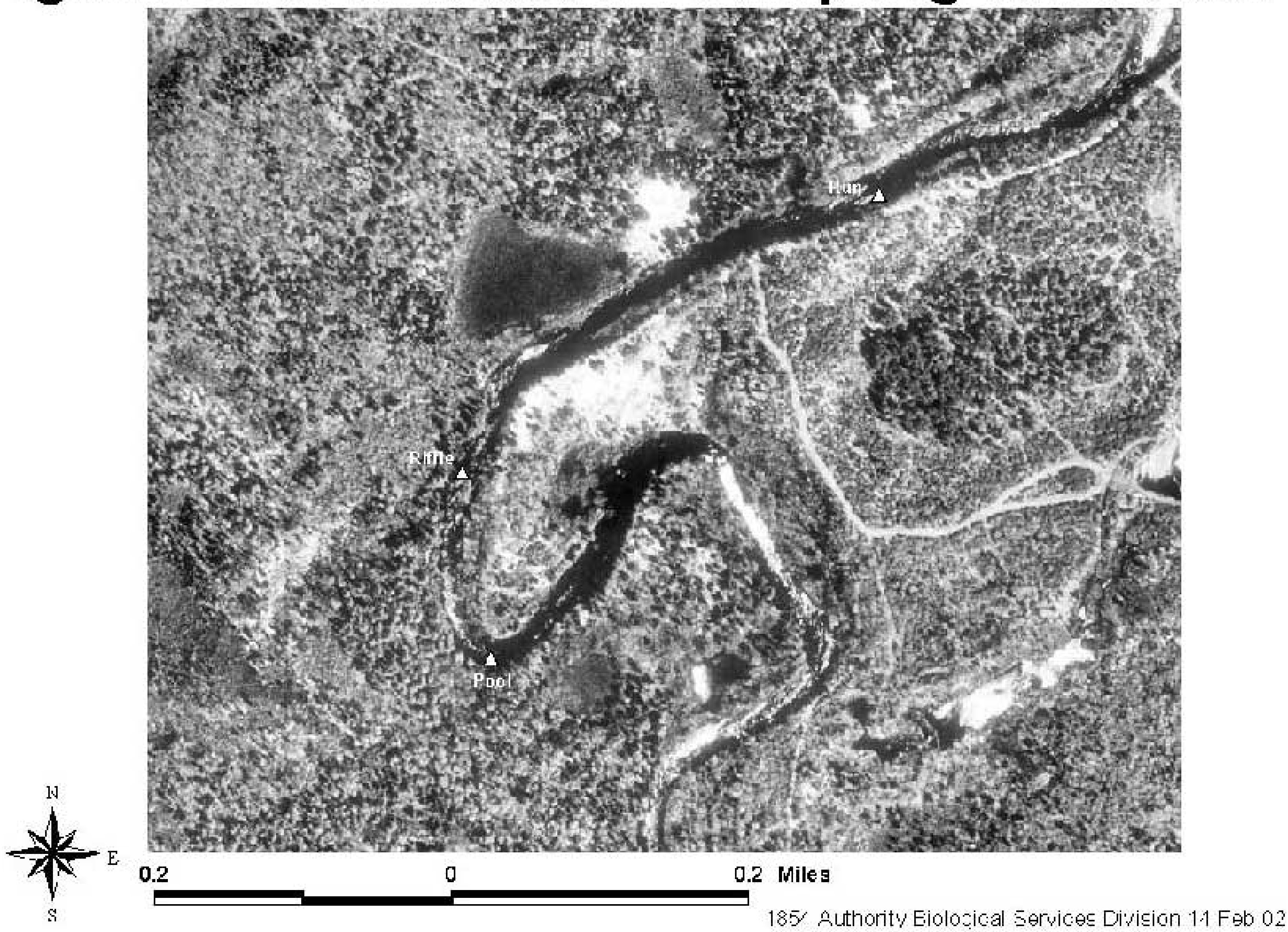



**Figure 1. Cloquet River sampling locations.**

Figure 2. River Station 1 sampling transects.



# Figure 3. River Station 2 sampling transects.

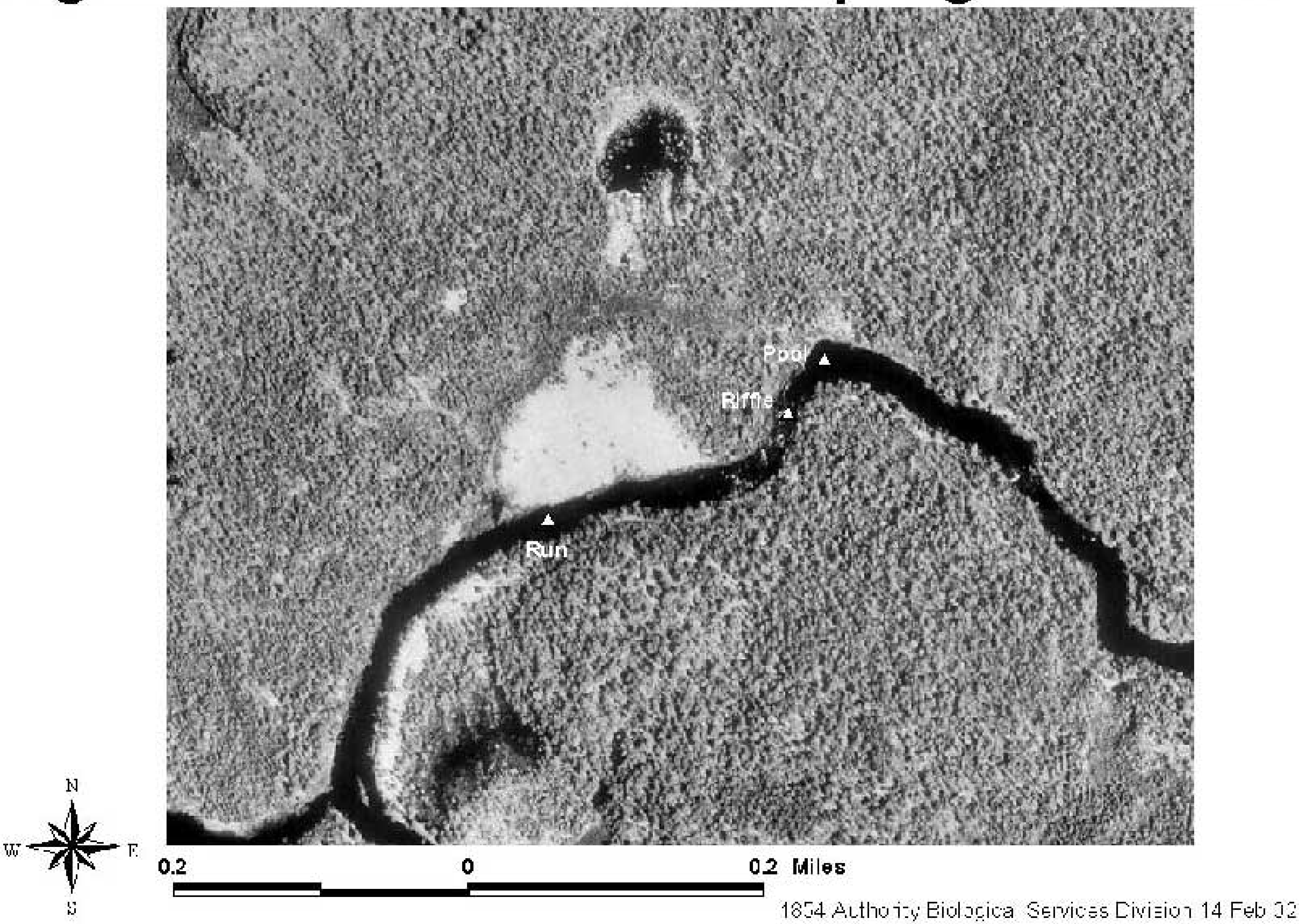
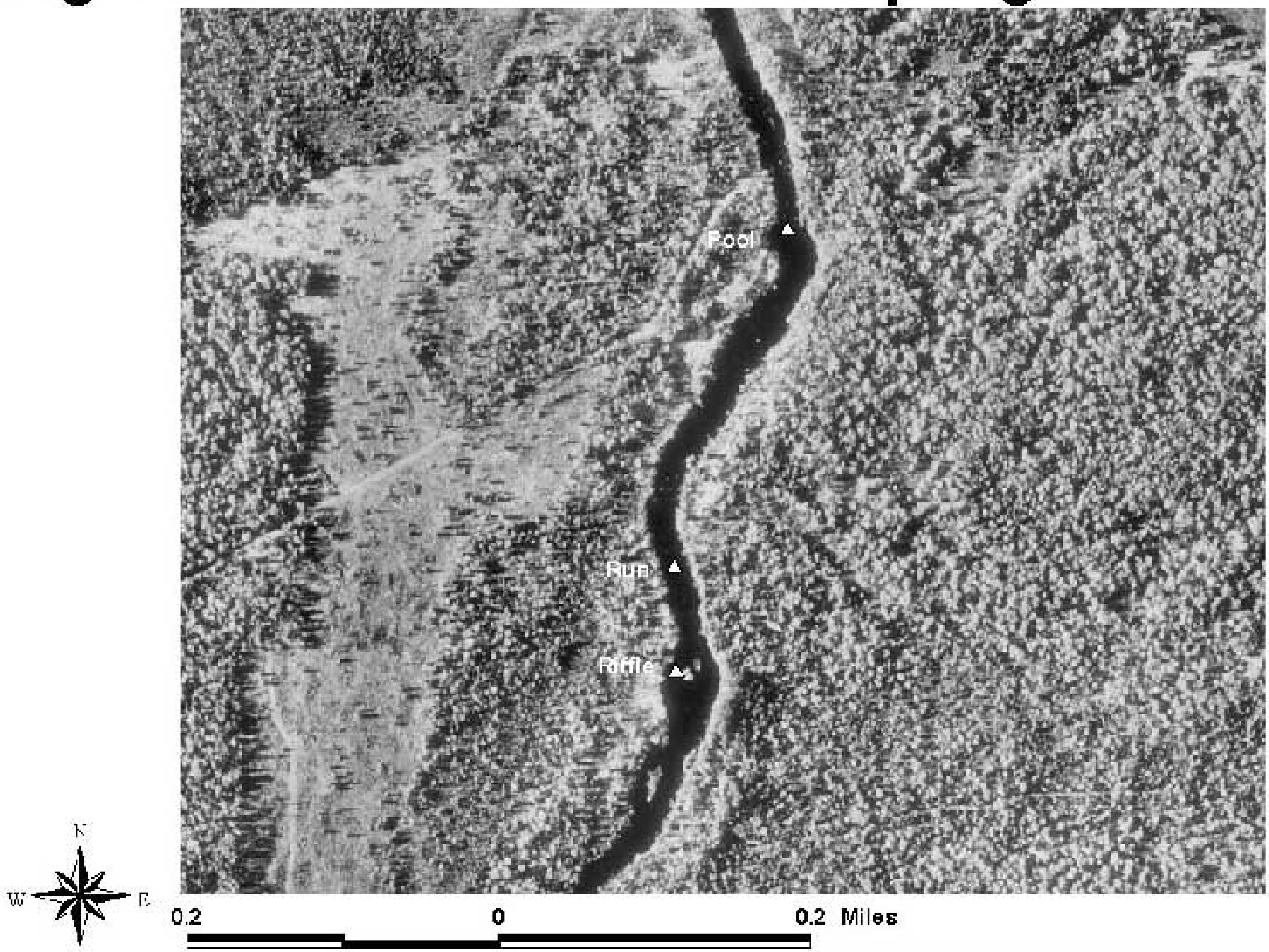


Figure 4. River Station 3 sampling transects.

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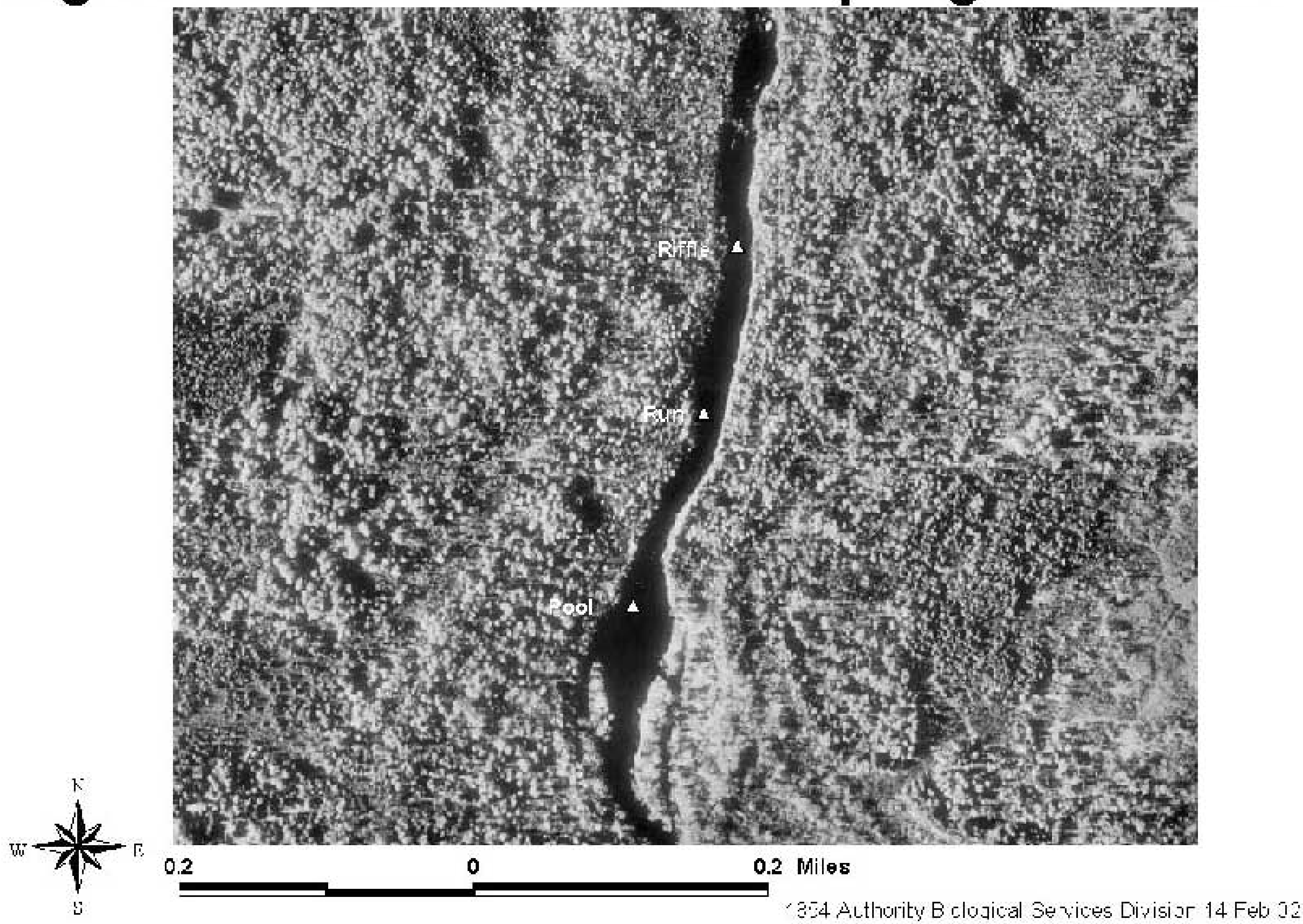
# Figure 5. River Station 4 sampling transects.



# Figure 6. River Station 5 sampling transects.

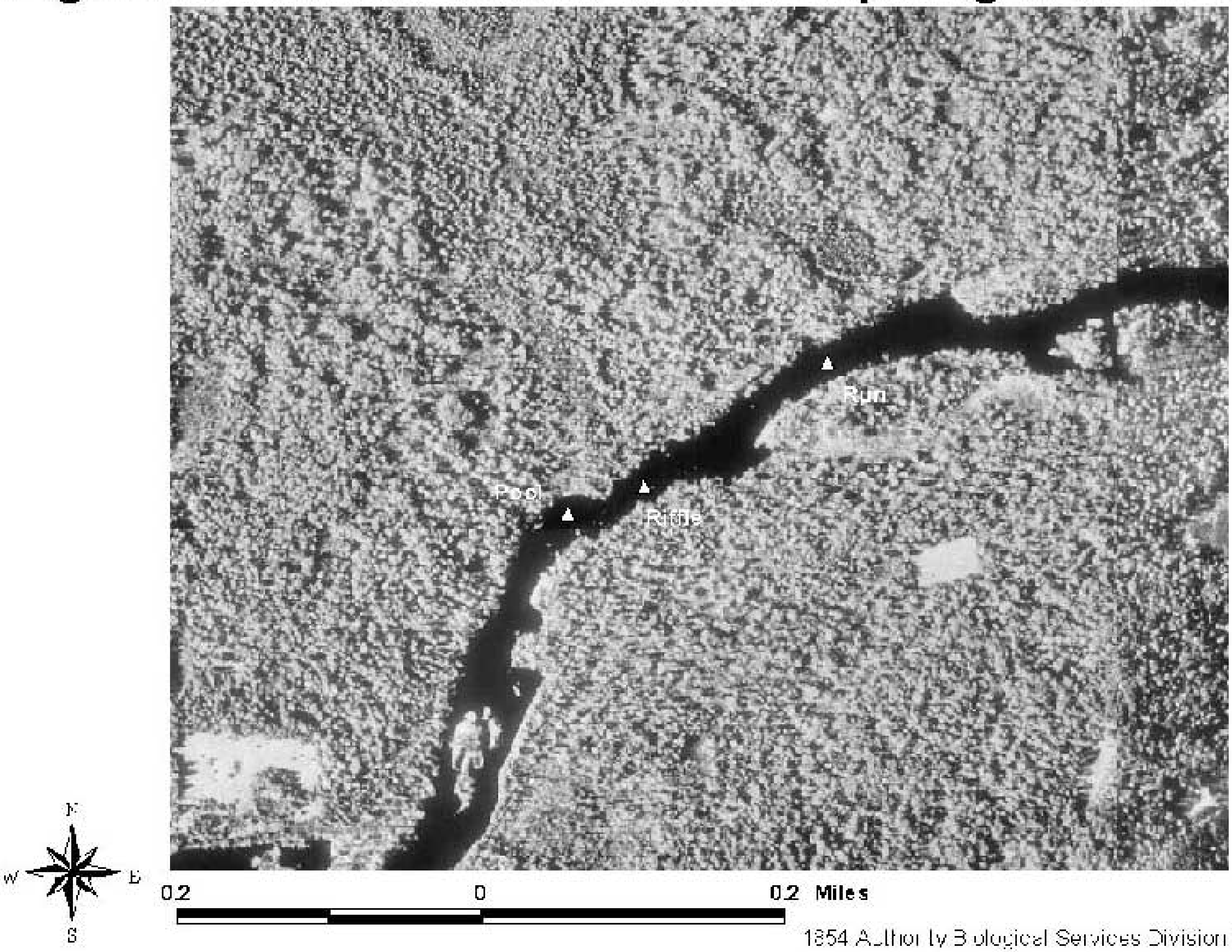



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Table 1. Stream width, mean water column velocity (MWCV), and substrate composition at each river station sampled in the Cloquet River, 2001. 1 = detritus, 2 = muck, 3 = clay, 4 = silt, 5 = sand, 6 = gravel, 7 = coble, 8 = boulder, 9 = bedrock.

| | Stream Width (m) | MWCV (m/s) | Organic Substrate Composition (%) | | Inorganic Substrate Composition (%)* | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| RS1 | | | | | | | | | | | |
| Pool | 35 | 0.00 | 50 | | | 8 | 32 | 5 | 2.5 | 2.5 | |
| Riffle | 20 | 0.98 | 15 | | | | 42 | 38 | 5 | | |
| Run | 20 | 0.29 | 10 | | | | 63 | 22 | 5 | | |
| RS2 | | | | | | | | | | | |
| Pool | 60 | 0.00 | 20 | 15 | 3 | 45 | 7 | | 3 | 7 | |
| Riffle | 28 | 1.05 | | | | | 5 | 5 | 70 | 15 | 5 |
| Run | 25 | 0.25 | 5 | | | 5 | 62 | 5 | 14 | 9 | |
| RS3 | | | | | | | | | | | |
| Pool | 40 | 0.00 | | | 20 | 5 | 35 | 15 | 15 | 10 | |
| Riffle | 50 | 1.03 | | | | | 15 | 40 | 40 | 5 | |
| Run | 40 | 0.35 | | | | | 80 | 10 | 5 | 5 | |
| RS4 | | | | | | | | | | | |
| Pool | 70 | 0.00 | | | | | 65 | | 20 | 15 | |
| Riffle | 25 | 1.74 | | | | | | 10 | 60 | 30 | |
| Run | 30 | 0.30 | | | | | 30 | 10 | 40 | 20 | |
| RS5 | | | | | | | | | | | |
| Pool | -- | 0.00 | 15 | | | 4 | 21 | 13 | 13 | 34 | |
| Riffle | 45 | 0.87 | 5 | | | | 10 | 57 | 14 | 14 | |
| Run | 30 | 0.27 | | | | | 50 | 40 | 10 | | |

Table 2. Water quality measurements from the Cloquet River, August 2001.

| Station | Lat. / Long. | Date | pH | Dissolved Oxygen mg / L | Conductivity µmhos | Total Dissolved Solids ppm | Temperature °Celsius |
|---|---|---|---|---|---|---|---|
| RS1 | | | | | | | |
| Pool | N 47° 12' 13.017" W -91° 56' 42.809” | 10 August | 7.74 | 5.88 | 101.8 | 66.1 | 20.7 |
| Riffle | N 47° 12' 19.688" W -91° 56' 43.618” | | 7.68 | 6.90 | 99.9 | 66.7 | 21.3 |
| Run | N 47° 12' 29.441" W -91° 56' 22.144” | | 7.68 | 6.85 | 101.3 | 66.8 | 21.0 |
| RS2 | | | | | | | |
| Pool | N 47° 10' 26.354" W -91° 58' 26.405” | 8 August | 8.06 | 4.25 | 103.8 | 67.9 | 25.6 |
| Riffle | N 47° 10' 24.040" W -91° 58' 28.250” | | 7.15 | 6.13 | 99.3 | 67.3 | 25.6 |
| Run | N 47° 10' 20.808" W -91° 58' 40.481” | | 8.46 | 6.10 | 99.7 | 67.5 | 26.1 |
| RS3 | | | | | | | |
| Pool | N 47° 06' 55.230" W -92° 01' 29.150” | 14 August | 7.89 | 6.13 | 87.3 | 58.2 | 19.0 |
| Riffle | N 47° 06' 40.334" W -92° 01' 34.104” | | 7.688 | 6.98 | 86.7 | 57.9 | 19.6 |
| Run | N 47° 06' 43.874" W -92° 01' 35.376” | | 7.81 | 7.43 | 85.2 | 57.5 | 19.5 |
| RS4 | | | | | | | |
| Pool | N 47° 04' 23.186" W -92° 02' 03.681” | 7 August | 7.71 | 6.25 | 105.9 | 69.7 | 27.2 |
| Riffle | N 47° 04' 35.840" W -92° 01' 58.250” | | 7.73 | 6.63 | 102.8 | 68.9 | 26.1 |
| Run | N 47° 04' 29.971" W -92° 02' 00.453” | | 7.84 | 6.12 | 78.9 | 52.6 | 26.7 |
| RS5 | | | | | | | |
| Pool | N 47° 01' 45.045" W -92° 03' 56.530” | 14 August | | | | | |
| Riffle | N 47° 01' 44.919" W -92° 03' 52.569” | | 7.90 | 8.09 | 99.8 | 68.3 | 22.3 |
| Run | N 47° 01' 48.924" W -92° 03' 43.263” | | 7.79 | 8.27 | 101.6 | 68.2 | 23.0 |

## TEMPERATURE

One of our goals during the study of the lower Cloquet from 1996-1998 was to investigate the potential of several tributaries to serve as thermal refuges for trout. To help answer that question we utilized temperature data loggers to record temperature profiles of both the main stem of the Cloquet River and the tributaries in question. Since this was not a goal of this study, we did not get temperature profiles of either the river itself or tributaries. However, we did record both tributary temperature and river temperature during our initial scouting period in 2000. Those temperatures can be found in Appendix 1 and may be useful in the future if investigators are interested in thermal refuge sites for trout or other species.

## AQUATIC AND TERRESTRIAL MACROPHYTES

At each station and transect, the in-stream and bank plant communities were identified. Table 3 lists the plant species identified within the stream, while Table 4 lists the plant species found on the bank. Both tables are located at the end of this report.

Following are a few notes related to some of the plant species identified:

The following plants are sensitive to human disturbance as described by Gernes and Helgen (1999):

| Plant Species | Common Name | RS Locations |
|---|---|---|
| *Carex stipata* Muhl. | Common Fox Sedge | 2 |
| *Glyceria striata* (Lam.) A. Hitchc. | Fowl Mannagrass | 1, 2, 3, 4, 5 |
| *Iris versicolor* L. | Northern Blue Flag Iris | 3, 4 |
| *Scutellaria galericulata* L. | Marsh Skullcap | 3 |
| *Spirea alba* DuRoi | Meadowsweet | 1, 2, 3, 5 |

The following plants are adversely affected by stressors such as excessive siltation, hydrologic alteration, and nutrient enrichment (Gernes and Helgen 1999):

| Plant Species | Common Name | RS Locations |
|---|---|---|
| *Carex intumescens* | Shining Bur Sedge | 2 |
| *Carex psuedocyperus* | False Bristly Sedge | 2, 3, 4, 5 |
| *Carex rostrata* | Beaked Sedge | 1, 2, 3, 4, 5 |
| *Carex stipata* | Common Fox Sedge | 2, 3 |
| *Carex stricta* | Common Tussock Sedge | 3, 4 |

The following plants are intolerant of sedimentation (Waldrop and Brooks 1998):

| Plant Species | Common Name | RS Locations |
|---|---|---|
| *Eupatorium maculatum* L. | Spotted Joe-Pye Weed | 1, 2, 3, 4, 5 |
| *Onoclea sensibilis* L. | Sensitive Fern | 1, 2, 3, 4, 5 |

*Equisetum arvense* L. (Field Horsetail), was found in stations 1 and 3, and is only slightly tolerant of sedimentation (Waldrop and Brooks 1998).

*Sagittaria latifolia* Willd. (Common Arrowhead), found in all five stations, contributes significantly to decreased biological oxygen demand (BOD) and increased dissolved oxygen (DO) in the water (Reddy et al. 1989).

*Ceratophyllum demersum* L. (Common Coontail), found in stations 1, 2, 3, and 4, is a hyperaccumulator of metals (Rai et al. 1995; and Zayed et al. 1998).

*Cicuta maculata* L. (Common Water Hemlock), found only in station 5, produces alkaloids and toxins that are highly poisonous to animals and humans (Voss 1996).

## BIO-MONITORING

Diverse and abundant benthic macroinvertebrate and fish communities are normally indicative of high stream quality. Repeated sampling or comparisons to reference streams will often indicate changes in stream water and habitat quality (Michigan Department of Environmental Quality (MDEQ 1997). Biomonitoring and biosurvey techniques, such as the Rapid Bioassessment Protocols (RBPs) described by Barbour et al. (1999), are often used for detecting the effects and severity of pollution and other water quality problems on aquatic life. Aquatic surveys of the fish and invertebrate fauna may be used by managers to identify and prioritize water quality problems for further study and assessments.

There are many advantages for surveying the fish and invertebrate communities to assess water quality issues (Barbour et al. 1999):

- Fish and invertebrate communities reflect the overall ecological integrity of the river system.
- Biological communities integrate the effects of different environmental stressors, providing a broad measure of their aggregate impact.
- Routine monitoring of biological communities can be relatively inexpensive, particularly when compared to the cost of assessing toxic pollutants.
- The status of biological communities is of direct interest to the public as a measure of a pollution free environment.
- Fish and invertebrate communities may be the only practical means of evaluating the impacts of nonpoint-source pollution that degrades habitat quality.

Biosurveys focus on the two main components of any river system: macroinvertebrates and fishes. Bioassessments of benthic macroinvertebrates provides greater information than is available from other assessments, e.g. chemical assessments or toxicity testing of pollutants (Hove 1997). Benthic macroinvertebrate communities have been used for a variety of reasons (Barbour et al. 1999). Even in streams that lack diverse fish communities, benthic macroinvertebrates will usually be abundant. Sampling is relatively easy, and requires few people and inexpensive gear. Benthic macroinvertebrate communities are made up of species that constitute a broad range of trophic levels and pollution tolerances. Macroinvertebrates are relatively easy to identify to family; degraded conditions can often be detected with only a cursory examination of the benthic macroinvertebrate community. Invertebrates are particularly good indicators of localized conditions, because most have limited migration patterns. This makes invertebrate communities perfect for the assessment of site-specific impacts, i.e. upstream-downstream studies (Hove 1997). Most species have a complex life cycle of approximately one year or more, and will respond quickly to environmental stressors.

Assessing the fish communities in a biosurvey provides additional information (Barbour et al. 1999). While some invertebrate species respond quickly to environmental stressors, fish communities are good indicators of long-term effects and broad habitat conditions (Karr et al. 1986). Fish communities generally represent a variety of trophic levels (omnivores, herbivores, insectivores, planktivores, piscivores). Thus, they tend to integrate effects of lower trophic levels and are reflective of integrated environmental health. Fish are relatively easy to collect and identify to the species level in the field, and subsequently released unharmed. Environmental requirements of most fish are comparatively well known, allowing managers to make inferences concerning habitat quality based upon the fish community. And finally, assessing fish communities provides direct evaluation of "fishability" and "fish propagation", which emphasizes the importance of fish to anglers.

**Benthic Macroinvertebrate Community**

While we have data on the benthic macroinvertebrate community of the lower Cloquet River (Borkholder et al. 1999), no previous reports were found that addressed surveys of the benthic invertebrate community in the upper Cloquet River. For our survey, EPA Rapid Bioassessment Protocols were used as a guideline (Barbour et al. 1999). This protocol focuses on riffle / run habitats, though for this survey pool habitats were also included, as suggested by the MDEQ (1997).

At each sampling station, two kicknet samples were each taken from approximately a 1 $m^2$ area using a 1000 micron mesh kick net. Sampling was attempted in areas with cobble and gravel substrate, when available. Both samples were combined and preserved in alcohol for later identification in the lab. In addition, at each station, 18 rocks or pieces of wood were collected and sampled by handpicking each invertebrate observed. Rock collections were combined separate from the net samples, and preserved for later identification. Rock and wood samples allowed for the sampling of the scrapers and filtering collectors (Benke et al. 1984).

At the lab, each individual was identified to the family level, as per Hilsenhoff (1988). Subsampling was not used, as suggested by (Plafkin 1989) and Hilsenhoff (1987).

Plafkin (1989) and Barbour et al. (1999) report that riffle stations with relatively fast current and cobble /

gravel substrates have the most diverse invertebrate communities. Total abundance of benthic invertebrates sampled in riffle sections of each station is presented in Figure 7. A complete listing of all invertebrates sampled can be found in Appendix 2.

Analysis of the benthic macroinvertebrate community followed that of Plafkin et al. (1989), Barbour et al. (1999), Hilsenhoff (1977 & 1982), and the MDEQ (1997). Nine metrics were calculated, and are described as follows:

**Total Family Richness**: This metric is simply the total number of macroinvertebrate Families observed in each sample. This metric reflects the health of the benthic invertebrate community, and generally increases with increasing water quality, habitat diversity, and habitat suitability. Referred to by MDEQ (1997) as the **Total # of Taxa**, but which includes data collected from the pool stations.

**EPT Family Richness**: This index is the total number of distinct Families within theOrders Ephemeroptera, Plecoptera, and Trichoptera. This metric describes richness within the Orders that are generally considered to be pollution intolerant. MDEQ (1997) further breaks this metric down, and reports the number of Families observed within each Order.

**Modified Family Biotic Index**: This metric summarizes the pollution tolerance of the benthic community. Each Family is assigned a pollution tolerance value from 0 - 10, with 0 being intolerant and present only in very high water quality, and 10 being the most tolerant, present in severely polluted and disturbed sites. This metric sums the pollution tolerances for each Family, then computes and reports the average.

**% Composition of Selected Major Groups**: This metric calculates the percent of the sample in the selected groups of Ephemeroptera, Plecoptera, Trichoptera, Coleoptera, Chironomidae, Oligochaeta, and other, which includes all other Orders not previously mentioned. These percentages can then be compared with other sites.

**% Mayfly Composition**: This metric is simply the ratio of the number of individuals in the Order Ephemeroptera to the total number of individuals identified. Mayflies are typically intolerant of pollution, and are often the first to disappear with declining water quality. Mayflies are common in high quality streams. The percent abundance can change rapidly to even minor environmental disturbances.

**% Caddisfly Composition**: This metric is the ratio of the number of individuals in the Order Tricoptera to the total number of individuals identified. Caddisflies are often the predominant invertebrate component in unimpacted streams.

**% Contribution of Dominant Taxon**: This is the ratio of the number of individuals in the most abundant taxon to the total number of individuals identified. A community dominated by relatively few taxa would indicate environmental stress.

**% Isopods, Snails, and Leeches**: This metric is the ratio of the sum of the number of individuals in the Order Isopoda, Class Gastropoda and Class Hirundinea, to the total number of individuals observed. These organisms show a high tolerance to pollution. High percentages at a site are good evidence for stream degradation.

**% Surface Dependent**: This is the ratio of the number of macroinvertebrates which obtain oxygen directly from atmosheric air, usually at the surface, to the total number of individuals observed. High percentages of surface breathers may indicate large diurnal dissolved oxygen shifts, or other oxygen demanding contraints.

Table 5 presents the results and metrics for the Cloquet River based upon all samples, while Table 6 presents the data from *only* the riffle and run samples. Between 24 (RS#2) and 33 (RS#3) different families were identified in the five sampling stations of the Cloquet River (Table 5). Bivalves were not included in these metrics, but are listed in Appendix 2. The most dominant families observed in all five stations belonged to the Orders Trichoptera and Ephemeroptera (Figure 7, Appendix 2). EPT richness ranged from 11 to 16 (Table 6). Total Family richness values in excess of 12, and EPT values greater than 8 suggest that a site is not, or only slightly impaired (Tables 5 and 6) (River Monitors Manual, 1997). These results suggest that the Cloquet River benthic invertebrate community is not impaired.

Modified family biotic index values (pollution tolerances) calculated ranged from 1.60 to 1.99 (Table 6). Pollution tolerance values used were those assigned to each family by Hilsenhoff (1977, 1982, 1988) for the western Great Lakes region. Interpretations of the biotic index value is provided by Hilsenhoff (1982) in a survey of 53 streams in Wisconsin, and presented in Table 6. The samples collected from the upper Cloquet River suggest the water quality is very good. The biotic index is a very sensitive and effective means to evaluate water quality (Hilsenhoff 1977). This index is described as being quicker, more economical, and more sensitive than physical or chemical procedures, and can detect past perturbations, while physical and chemical procedures can only detect present pollution (Hilsenhoff 1977).

Large numbers of families, in particular those the orders Ephemeroptera and Trichoptera, were observed from samples collected in June and July 2001 from the Cloquet River (Tables 5 and 6). Including the pool transects, 66.7% of all invertebrates sampled were in the orders Ephemeroptera and Trichoptera (Table 5). Combined with biotic index values, the data suggests that the invertebrate community is not, or only slightly impaired, and the water quality is very good.

Percent Composition of Major Groups sampled at riffle sites is presented in Table 6. Minnesota does not have a suitable reference stream available for comparison. Thus, we were not able to calculate community similarity indices, comparing the benthic community of the Cloquet River to a non-impacted reference community. The values are reported here for comparison with future assessments or surveys from other rivers.

**Fish Sampling**

Fish species were inventoried with a variety of methods. The shallow, rocky river prevented use of an electrofishing boat, so backpack electroshocking, trap nets, trotlines, and angling were all used to sample various locations. All fish were sorted to species and counted. Game fish were individually measured (total length, nearest mm). Representative samples of specimens that could not be identified in the field were preserved in 70% isopropanol and returned to the lab for positive identification. Catch-per-unit-effort metrics were calculated to provide a comparison of relative abundance between sites, both between and within species.

A total of 323 fish representing 9 families were captured using the various gear types (Table 7). The greatest diversity was observed in the Cyprinidae and Percidae families with four species each. Three species of Centrarchids were observed, along with two species each of Catostomids and Ictalurids. All other Families were represented by a single species.

Modified Windermere trap nets (Edwards et. al 1998) were also fished at each sampling station. Effort ranged from three net-nights (1 net-night = 1 trap/24 hours) to six net-nights per station. Forty-six fish representing 8

Table 5. Benthic Macroinvertebrate scores for nine metrics for each sampling station, and for the upper section of the Cloquet River, between Indian Lake and Island Lake. Metrics are taken from the Michigan Department of Environmental Quality, Report #51 (1997), which suggests using pool, riffle, and run stations within each sampling site. Data from each transect was combined within each station.

| Metric | RS1 | RS2 | RS3 | RS4 | RS5 | Total for Upper Cloquet River |
|---|---|---|---|---|---|---|
| Total # of Taxa | 27 | 24 | 33 | 29 | 29 | 61 |
| Total # Mayfly Taxa | 5 | 5 | 7 | 6 | 7 | 12 |
| Total # Caddisfly Taxa | 5 | 4 | 8 | 7 | 6 | 13 |
| Total # Stonefly Taxa | 3 | 2 | 3 | 3 | 3 | 6 |
| Percent Mayfly Composition | 0.101 | 0.611 | 0.299 | 0.254 | 0.229 | 0.318 |
| Percent Caddisfly Composition | 0.589 | 0.166 | 0.366 | 0.271 | 0.386 | 0.349 |
| Percent Contribution of Dominant Taxon | 0.479 | 0.329 | 0.169 | 0.154 | 0.196 | 0.206 |
| Percent Isopods, Snails, and Leeches | 0.025 | 0.068 | 0.035 | 0.000 | 0.065 | 0.038 |
| Percent Surface Dependent | 0.000 | 0.008 | 0.000 | 0.000 | 0.007 | 0.003 |

Table 6. Metrics taken from River Monitors Manual (1997) and Hilsenhoff (1982), followed by family richness, EPT richness, pollution tolerance values, and % composition of major groups from benthic macroinvertebrate survey of the Cloquet River, 2001. Metrics summarized data collected from *only* the run and riffle transects of each station, except for the Total Pollution Tolerance indices.

| **Level of Impairment** | **Relative Abundance (River Monitors Manual 1997)** | **Richness** |
|---|---|---|
| **Seriously Impaired** | Mayflies (Ephem) and Stoneflies (Plecop) not Present<br>*And*<br>Sample is Dominated by Worms, Leeches, Midges, Sowbugs, Scuds, Clams, or Snails | Total < 8<br>EPT < 4 |
| **Not or Slightly Impaired** | Sample is Dominated by Mayflies (Ephem), Stoneflies (Plecop) and / or Caddisflies (Trichop)<br>If Caddisflies Dominate, then Mayflies or stoneflies are common<br>*If Sample doesn't fall into either category, then classify it as "Moderately Impaired"* | Total > 12<br>EPT > 8 |
| **Biotic Index** | **Family Biotic Index (Hilsenhoff 1982)**<br>Degree of Organic Pollution | **Water Quality** |
| 0.00 - 1.75 | No Organic Pollution | Excellent |
| 1.76 - 2.25 | Possible Slight Organic Pollution | Very Good |
| 2.26 - 2.75 | Some Organic Pollution | Good |
| 2.76 - 3.50 | Significant Organic Pollution | Fair |
| 3.51 - 4.25 | Very Significant Organic Pollution | Poor |
| 5.26 - 5.00 | Severe Organic Pollution | Very Poor |

Table 6. Continued.

| Cloquet River Index | River Station #1 | RS #2 | RS #3 | RS #4 | RS #5 |
|---|---|---|---|---|---|
| **Family Richness** | 23 | 23 | 33 | 26 | 29 |
| **EPT Richness** | 13 | 11 | 16 | 12 | 15 |
| **Pollution Tolerances** | | | | | |
| *Total* | 1.73 | 1.63 | 1.65 | 1.99 | 1.83 |
| *Riffle / Run Samples* | 1.71 | 1.67 | 1.60 | 1.99 | 1.84 |
| **% Composition of Major Groups** | *Riffle Sections Only* | | | | |
| *Ephemeroptera* | 7.20 | 52.17 | 40.99 | 19.18 | 8.08 |
| *Plecoptera* | 16.80 | 1.74 | 9.32 | 2.74 | 6.06 |
| *Trichoptera* | 48.80 | 23.48 | 36.65 | 34.93 | 61.62 |
| *Coleoptera* | 1.60 | 0.00 | 0.62 | 0.00 | 7.07 |
| *Chironomidae* | 3.20 | 1.74 | 3.11 | 13.70 | 2.02 |
| *Oligochaeta* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| *Other* | 22.40 | 20.87 | 9.32 | 29.45 | 15.15 |

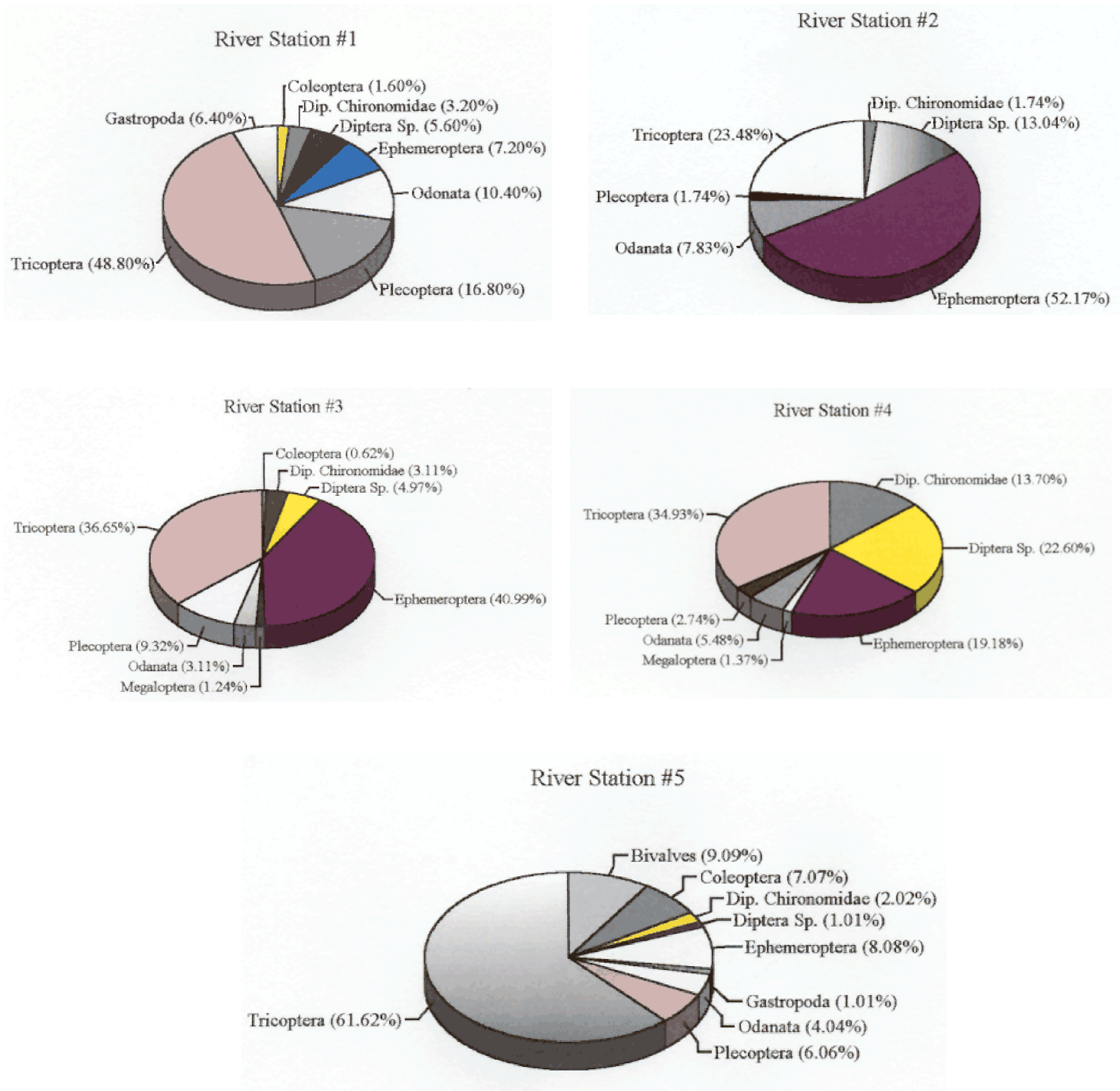


Figure 7. Total abundance of benthic macroinvertebrates within riffle sections of the Cloquet River, 2001.

Table 7. Number and percentage of total catch for fish species collected in the Cloquet River using backpack electrofishing, trotlines, trapnets, minnow traps, seines, and angling, summer 2001.

| Family | Common Name | Scientific Name | Number | Percent |
|---|---|---|---|---|
| Cyprinidae | Longnose Dace | *Rhinichthys cataractae* | 69 | 21.36 |
| | Blacknose Dace | *Rhinichthys atratulus* | 1 | 0.31 |
| | Finescale Dace | *Chrosomus neogaeus* | 1 | 0.31 |
| | Creek Chub | *Semotilus atriculatus* | 1 | 0.31 |
| Centrarchidae | Smallmouth Bass | *Micropterus dolomieu* | 33 | 10.22 |
| | Rock Bass | *Ambloplites rupestris* | 25 | 7.74 |
| | Bluegill | *Lepomis machrochirus* | 4 | 1.24 |
| Percidae | Johnny Darter | *Etheostoma nigrum* | 28 | 8.67 |
| | Logperch | *Percina caprodes* | 17 | 5.26 |
| | Yellow Perch | *Perca flavescens* | 17 | 5.26 |
| | Walleye | *Stizostedion vitreum* | 12 | 3.72 |
| Ictaluridae | Channel Catfish | *Ictalurus punctatus* | 1 | 0.31 |
| | Tadpole Madtom | *Noturus gyrinus* | 1 | 0.31 |
| Catostomidae | Shorthead Redhorse | *Moxostoma macrolepidotum* | 10 | 3.10 |
| | White Sucker | *Catostomus commersoni* | 7 | 2.17 |
| Esocidae | Northern Pike | *Esox lucius* | 58 | 17.96 |
| Cottidae | Sculpin | *Cottus sp.* | 8 | 2.48 |
| Umbridae | Mudminnow | *Umbra limi* | 3 | 0.93 |
| Gadidae | Burbot | *Lota lota* | 27 | 8.36 |
| | | | N = 323 | |

species were captured in the traps (Table 8). Rockbass (*Ambloplites rupestris*) was the most abundant species (22 individuals), followed by yellow perch (*Perca flavescens*, 11 individuals).

Trotlines baited with chicken liver were used very successfully below Island Lake Reservoir in 1998 to capture channel catfish (*Ictalurus punctatus*). We did not expect to capture many catfish above the reservoir, so we utilized a wider variety of baits in 2001 to try and capture additional species. Hooks were baited with fresh chicken liver, nightcrawlers, or dead minnows. Effort ranged from 60 to 64 hook-nights (1 hook-night = 1 hook/24 hours) per sampling station (Table 8). Shorthead redhorse (*Moxostoma macrolepidotum*) was the most common species captured (9 individuals), followed by northern pike (*Esox lucius*) and smallmouth bass (*Micropterus dolomieu*) with 6 individuals each. Only 1 channel catfish was captured. Many hooks lacked bait after the 24 hour set, but there was no way to tell if the bait had been removed by fish, turtles, crayfish, or current.

Angling was used for the purpose of obtaining data on larger specimens of game fish. Angling was conducted at all five stations previously established for other sampling gears. All angling was done with artificial lures. Angling effort (hours) and catch were recorded (Table 9). Thirty northern pike, 22 smallmouth bass, 11 walleye (*Stizostedion vitreum*), 2 rock bass, and 1 bluegill (*Lepomis macrochirus*) were collected. Total angling effort and catch were tabulated for these sections of the river. Catch per unit effort (# fish/angler hour) was then calculated for northern pike, smallmouth bass, walleye, rockbass and bluegill (Table 9). When possible, scale/spine samples were collected from each fish for aging. The fish were then released after being measured.

Backpack electrofishing was the most productive method of sampling the fish community in terms of species diversity and catch rates (Table 10). Sixteen species representing 9 families were collected. Longnose dace (*Rhinichthys cataractae*) was the most abundant species sampled (66 individuals), collected at all locations but Station 4. Johnny darters (*Etheostoma nigrum*) (28 individuals) and burbot (*Lota lota*) (27 individuals) were also common in electrofishing catches. Number of species per location varied from 2 to 10, although only the riffle was sampled at River Station 5 due to an equipment problem. For stations where all 3 habitat types were sampled, the minimum number of species collected was 5.

Although electrofishing was the best of the methods used in this study, strong current velocities and river depth severely limited effective sampling area. Most pool and run sampling efforts were conducted along the margins of the habitat. Riffles and rapids were shocked in midstream when current velocities and footing allowed. Hassinger (1967) utilized boat mounted boomshocking equipment to sample areas below the Island Lake Dam. Neither Fond du Lac's nor the 1854 Authority's boomshocking boats are small enough to be launched and utilized in the portion of the river where sampling occurred.

Table 8. Trotline and trapnet catches by sampling station, expressed as catch / hook-night (trotline) and catch / net-night (trapnet). One hook-night equals one baited hook set for 24 hours, and one net-night equals one net set for 24 hours.

| | Trotline (Catch / Hook-night) | | | | | Trapnet (Catch / Net-night) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Station | | | | | Station | | | | |
| Species | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Shorthead Redhorse | — | — | — | 0.10 | 0.05 | 0.33 | — | — | — | — |
| White Sucker | — | — | — | — | — | 0.33 | 0.33 | 0.67 | — | — |
| Northern Pike | — | 0.09 | — | — | — | — | 0.33 | 0.17 | — | — |
| Smallmouth Bass | — | — | — | 0.03 | 0.07 | — | — | — | — | 0.33 |
| Rock Bass | — | — | — | — | — | 2.00 | — | 1.00 | — | — |
| Bluegill | — | — | — | 0.02 | — | — | 0.67 | — | — | — |
| Yellow Perch | — | — | — | — | 0.03 | 0.33 | 3.33 | — | — | — |
| Walleye | — | — | — | — | — | — | — | — | — | 0.33 |
| Channel Catfish | — | — | — | 0.02 | — | — | — | — | — | — |

Table 9. Comparison of angling catch per unit effort (# fish/hour) data for northern pike, smallmouth bass, walleye, rockbass, and bluegill in each station and transect of the Cloquet River, summer 2001.

| River Segment | Angler Effort (hours) | (N) # fish/hour N. Pike | S. Bass | Walleye | Rockbass | Bluegill |
|---|---|---|---|---|---|---|
| RS1 Pool | | | | | | |
| Riffle | | | | | | |
| Run | 7.5 | (7) 0.9 | (1) 1.0 | | | |
| RS2 Pool | 2.0 | (3) 1.5 | | | | |
| Riffle | 1.0 | | | | | |
| Run | 1.0 | (5) 5.0 | | | | |
| RS3 Pool | 2.8 | (3) 1.1 | (1) 0.4 | | | |
| Riffle | | | | | | |
| Run | 1.8 | (3) 1.7 | | (3) 1.7 | | |
| Backwater | 2.0 | (2) 1.0 | | | | |
| RS4 Pool | 1.0 | | (1) 1.0 | | (1) 1.0 | (1) 1.0 |
| Riffle | | | | | | |
| Run | | | | | | |
| RS5 Pool | 6.0 | (7) 1.2 | (11) 1.8 | (8) 1.3 | (1) 0.2 | |
| Riffle | 1.7 | | (8) 4.7 | | | |
| Run | | | | | | |

Table 10. Backpack electrofishing catches by sampling location expressed as catch per unit effort in # fish / hour of on-time, and sample size (N). Data from all transects, i.e. pool, riffle and run, were combined for each river sampling station (RS). In RS5, only the riffle transect was sampled due to equipment problems.

| Location | RS 1 | RS 2 | RS 3 | RS 4 | RS 5 |
|---|---|---|---|---|---|
| Electrofishing On-Time (sec) | 1133 | 792 | 1050 | 979 | 309 |
| *Species Observed* | | | | | |
| Longnose Dace | 50.8 (N=16) | 100.0 (22) | 92.6 (27) | ---- | 11.6 (1) |
| Blacknose Dace | ---- | ---- | 3.4 (1) | ---- | ---- |
| Finescale Dace | ---- | ---- | ---- | 3.7 (1) | ---- |
| Creek Chub | 3.2 (1) | ---- | ---- | ---- | ---- |
| Smallmouth Bass | ---- | ---- | 3.4 (1) | 22.1 (6) | ---- |
| Bluegill | ---- | ---- | ---- | 3.7 (1) | ---- |
| Johnny Darter | 41.3 (13) | 13.6 (3) | 34.3 (10) | ---- | 23.3 (2) |
| Logperch | ---- | 13.6 (3) | 48.0 (14) | ---- | ---- |
| Yellow Perch | 3.2 (1) | 4.5 (1) | 3.4 (1) | 3.7 (1) | ---- |
| Walleye | 3.2 (1) | ---- | ---- | ---- | ---- |
| Tadpole Madtom | 3.2 (1) | ---- | ---- | ---- | ---- |
| White Sucker | ---- | ---- | ---- | 18.4 (5) | ---- |
| Northern Pike | 12.7 (4) | ---- | 3.4 (1) | ---- | ---- |
| Sculpin | 3.2 (1) | 9.1 (2) | 17.1 (5) | ---- | ---- |
| Mudminnow | 6.4 (2) | 4.5 (1) | ---- | ---- | ---- |
| Burbot | 34.9 (11) | 40.9 (9) | 24.0 (7) | ---- | ---- |

**Notes on selected species**

*Northern Pike*—Fifty-eight northern pike were captured with various gears (Tables 7 - 10). These fish ranged in size from 3.5 to 28.7 inches (Figure 8). These results are similar to those reported by Hassinger (1967) when he reported northern pike sizes from 3 to 27 inches and the range of 4 to 23 inches observed by the authors in the 1996-1998 study of the lower Cloquet. Northern pike were captured with electrofishing gear at stations 1 and 3 (Table 10). Several small northern pike were also observed while canoeing and wading. Angling efforts captured fish at all stations except station 4 (Table 9). Catch per angler hour was highest at station 2 (2.0 fish/hour). Trot-line captures of northern pike were also highest at station 2 (Table 8). Many of the shallow river areas, bays, and side lakes provide suitable spawning habitat for northern pike. Small forage fish appear to be present in sufficient abundance.

*Walleye* — Eleven walleyes were captured by angling (Tables 7 - 10). These fish ranged in size from 11.3 to 16.7 inches (Figure 9) with most in the 11 to 14 inch range. Hassinger (1967) reported average walleye size to be 12 inches and the authors found most walleye in the 1996-1998 study of the lower Cloquet to fall within the 12 to 14 inch range. Walleyes were only captured at stations 1, 3, and 5, with the most angling success coming at stations 3 and 5 (Table 9). Most walleyes were captured in pools immediately below rapids. Age classes identified for walleye ranged from age 3 to 7 years (Figure 10). Walleyes are a popular gamefish in Island Lake Reservoir, where a strong naturally reproducing population is present. Some suitable spawning habitat exists in the river above the reservoir, however, no young walleye were captured. This likely is an artifact of sampling difficulties, timing, or unsuitable sampling sites for young-of-the-year walleye. Many of the rapids are likely impassable to walleyes during the spawning run and probably limit spawning movements and activity.

*Smallmouth Bass*—A total of 33 smallmouth bass were captured using all gear types (Tables 7 - 10). These fish ranged in size from 3.2 to 14.2 inches (Figure 11). Specimens aged ranged from 2 to 6 years (Figure 12), although the 3.2 inch fish was a young of the year, and probable age-1 were also observed. Smallmouth were captured with electrofishing gear only at stations 3 and 4 (Table 10). However, smallmouth bass were captured at all locations but station 2 with angling gear (Table 9). Angler CPUE was highest at station 5 and in general smallmouth bass were more abundant as we approached Island Lake Reservoir.

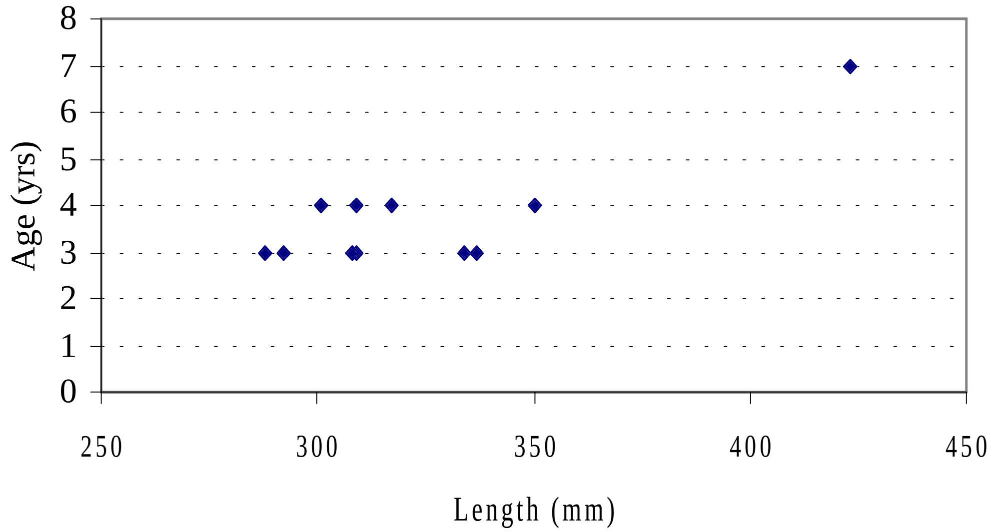


Figure 10. Length at age observed for walleye, *Stizostedion vitreum*, in the Cloquet River, August 2001.

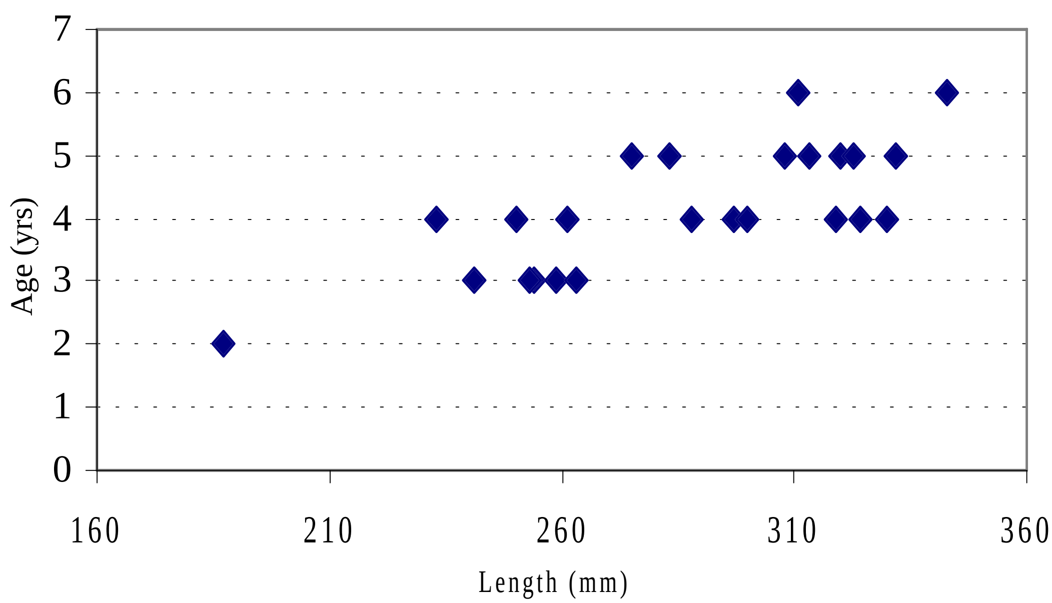


Figure 12. Length at age observed for smallmouth bass, *Micropterus dolomieu*, in the Cloquet River, August 2001.

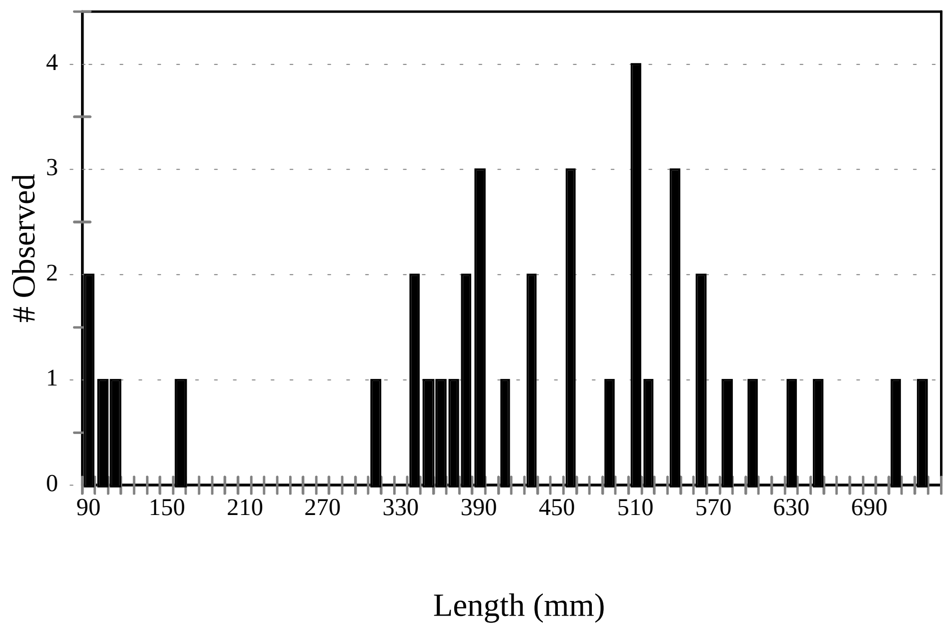


Figure 8.  Length frequency distribution of northern pike, *Esox lucius*, observed in the Cloquet River, summer 2002.

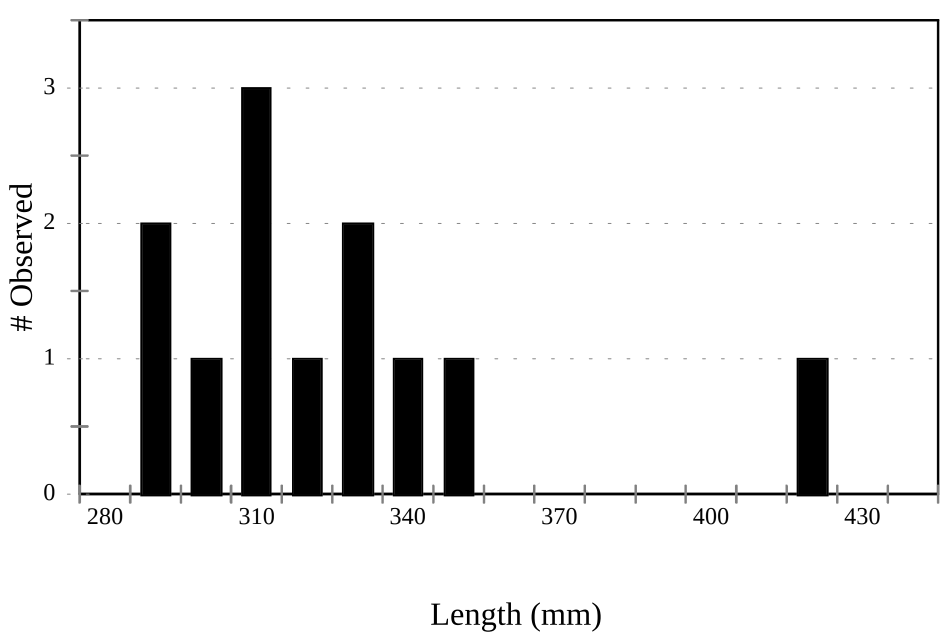


Figure 9.  Length frequency distribution of walleye, *Stizostedion vitreum*, observed in the Cloquet River, summer 2002.

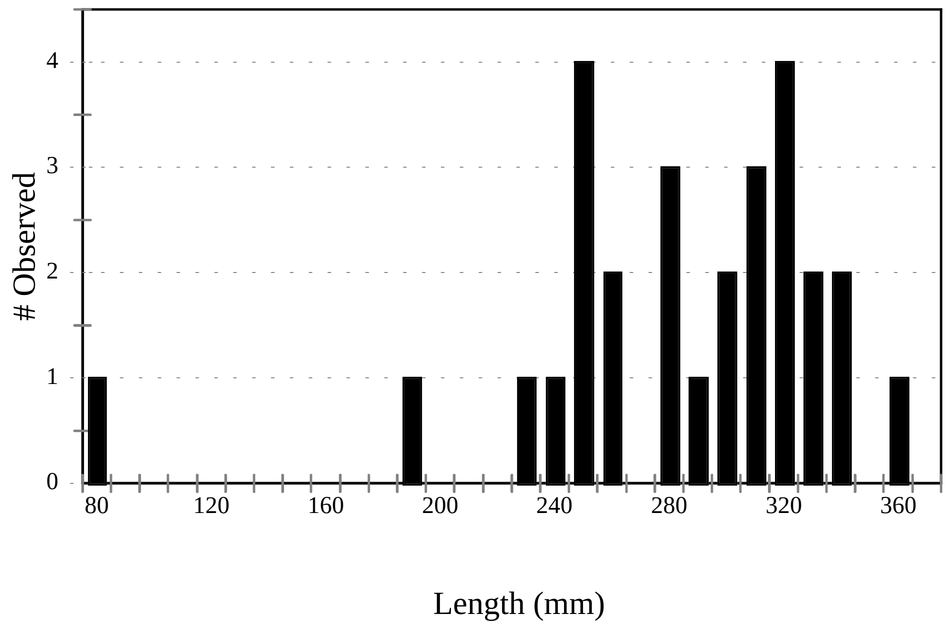


Figure 11. Length frequency distribution of smallmouth bass, *Micropterus dolomieu*, observed in the Cloquet River, summer 2002.

**Index of Biotic Integrity (IBI)**

The fish survey protocol is based largely on Karr's Index of Biotic Integrity (IBI) (Karr 1981, Karr et al. 1986, Miller et al. 1988), which uses the structure of the fish assemblage to evaluate water quality, and was designed to evaluate the quality of small Midwestern warmwater streams. We used the Wisconsin IBI for the Cloquet River fish community (Lyons 1992). The IBI compares the values of various metrics with values expected in similar streams of high environmental quality (Lyons 1992). Observed values that are close to those expected suggest that the environmental quality is high. A complete description of the Wisconsin IBI can be found in Lyons (1992).

For the Cloquet River, the following metrics were used, with substitutions made as per those suggested by Lyons (1992):

**Total number of native species**: Total number of species collected, minus hybrids and exotics.

**Number of darter species**: Darters are benthic species, and tend to be intolerant of many types of degradation. In the Lake Superior Basin, sculpins and madtoms are also included in this metric.

**Number of sucker species**: Total number observed.

**Number of sunfish species**: Total number observed (family Centrarchidae), including rock bass and crappie, but excluding hybrids and smallmouth and largemouth bass. In the Lake Superior Basin, yellow perch are included in this metric, since they occupy an ecological niche similar to the sunfishes'. Most are moderately tolerant of environmental degradation.

**Number of intolerant species**: Total number of species observed that are intolerant to environmental degradation, including poor water quality, siltation, increased turbidity, and reduced habitat heterogeneity. Lyons (1992) classified fishes for the Lake Superior Basin that fit this category, and included, for this survey, rock bass, smallmouth bass, and slimy sculpin.

**Percent that are tolerant species**: The number of individuals classified as tolerant species (Lyons 1992), expressed as a percentage of the total number of fish captured, including central mudminnow, blacknose dace, creek chub, and white sucker.

**Percent that are omnivores**: The number of individuals classified as omnivorous (Lyons 1992), expressed as a percentage of the total number of fish captured. Omnivores can utilize a variety of food resources, and are generally more insensitive to changes in the food base of a stream due to environmental degradation.

**Percent that are insectivores**: The number of individuals classified as insectivorous (Lyons 1992), expressed as a percentage of the total number of fish captured. Creek chub and blacknose dace are not considered in this metric (Lyons 1992). Examples include central mudminnow, finescale dace, longnose dace, shorthead redhorse, tadpole madtom, bluegill, johnny darter, yellow perch, logperch, and slimy sculpin.

**Percent that are top carnivores**: The number of individuals classified as top carnivores (Lyons 1992), expressed as a percentage of the total number of fish captured. Those included in this metric were northern pike, channel catfish, burbot, rock bass, smallmouth bass, and walleye.

**Percent that are simple lithophilous spawners**: The number of individuals classified as simple lithophilous spawners (Lyons 1992), expressed as a percentage of the total number of fish captured. These species lay their eggs on clean gravel or cobble, and do not build nests nor provide any parental care. Those included in this metric were blacknose dace, longnose dace, white sucker, shorthead redhorse, burbot, logperch, and walleye.

Scores were calculated for each of the ten metrics, and scoring criteria used for sites in the Lake Superior Basin with stream widths greater than 12.2 m (Lyons 1992). Scores are presented in Table 11, with an overall IBI score of 85. A score between 100 - 65 indicates excellent biotic integrity. This suggests that the fish community consists of a balanced trophic structure, and is comparable to the best situations with little human - induced disturbance (Lyons 1992). The score of 85 is comparable to the score of 82 computed for the stretch of the Cloquet River downstream from Island Lake to the St. Louis River (Borkholder et al. 1999).

Lyons (1992) cautions against using the IBI on streams that are too deep or wide to be effectively sampled by wading, or when multiple gear types are used to sample the fish communities. There were sections that were too deep to be sampled effectively with backpack electrofishing gear, and thus multiple gear types were used in this study. Therefore, the Wisconsin IBI may not be the most appropriate model to use. Given these limitations, even if the actual IBI score may be suspect, an IBI value of 85 is sufficient to at least suggest that the Cloquet River fish community is balanced and does not suffer from any serious effects due to environmental degradation.

Table 11.. Observed values and IBI scores for ten metrics describing the fish community of the Cloquet River. Metrics used are taken from Lyons (1992) for sites within the Lake Superior Basin with mean stream widths greater than 12.2 meters.

| Metric | Observed Value | IBI Score |
|---|---|---|
| # Native Species | 19 | 10 |
| # Darter Species[1] | 4 | 10 |
| # Sucker Species | 2 | 5 |
| # Sunfish Species[2] | 3 | 10 |
| # Intolerant Species | 3 | 10 |
| % Tolerant Species | 3.72% | 10 |
| % Omnivore Species | 2.17% | 10 |
| % Insectivorous Species | 49.23% | 5 |
| % Top Carnivores | 48.30% | 10 |
| % Lithophilous Species | 22.91% | 5 |
| | **IBI SCORE** | 85 |

[1]For sites within the Lake Superior basin, the Darters metric includes all darters plus any sculpin and madtom species (Lyons 1992).
[2]For sites within the Lake Superior basin, the Sunfish metric includes all sunfish plus yellow perch (Lyons 1992).


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Table 3. Aquatic macrophytes identified within the stream channel on the Cloquet River, August 2001.

| | | RS1 | | | RS2 | | | RS3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Scientific Name | Common Name | Pool | Riffle | Run | Pool | Riffle | Run | Pool | Riffle | Run | Backwater |
| Alge Spp. | | | X | X | | X | X | X | X | X | X |
| Alysma Spp. | | | X | X | | | | X | X | X | |
| *Acer saccharinu L.* | Silver maple | X | | X | | | | | | | |
| *Agrostis stolonifer L.* | Redtop | | | | | | | | | | |
| *Alisma triviale Pursh.* | Northern water-plantain | X | | X | | | | | | | |
| *Amelanchier bartramia (Tausch) Roemer* | Mountain serviceberry | | | X | | | | | | | |
| *Callitriche palustri L.* | Spiny water-starwort | | | | | | | | | X | |
| *Carex Spp.* | | | | | | | | X | X | X | X |
| *Carex intumescen Rudge* | Shining bur sedge | | | | | | X | | | | |
| *Carex rostrat J. Stokes* | Beaked sedge | | X | | | | | | | X | |
| *Carex strict Lam.* | Common tussock sedge | | | | | | | | X | | |
| *Ceratophyllum demersu L.* | Common coontail | | X | | | X | | | | | X |
| *Eleocharis palustr L.* | Creeping spike-rush | | | | | | | | | | |
| *Elodea Spp.* | | | | | | | | | | | |
| *Elodea canadens Michx.* | Water weed | X | | | | | X | | | | X |
| *Elymus virginicu L.* | Virginia wildrye | | | | | | | | X | | |
| *Eupatorium Spp.* | | | | | | | X | | | | |
| *Equisetum Spp.* | | | | | | | | | | | |
| *Equisetum arvens L.* | Field horsetail | | X | | | | | | X | | X |
| *Equisetum pratens Ehrh.* | Meadow horsetail | | | | | | | X | | | |
| *Eupatorium maculatu L.* | Spotted joe-pye weed | | | | | X | | | | | |
| *Galium Spp.* | | | | | X | | | | | | |
| *Glyceria striat (Lam.) A. Hitchc.* | Fowl-mannagrass | | X | | | X | | | X | X | X |
| *Juncus Spp.* | on boulder | | | | | X | | | X | | |
| *Juncus effusu L.* | Soft rush | | | | | | X | | | | |
| *Lichen Spp.* | | | | | | X | | | | | |
| *Lycopus americanu Muhl.* | American water-horehound | | | | | X | | | | | |
| *Mimulus ringen L.* | Allegheny monkey-flower | | | | | | | | | X | |
| *Nuphar microphyl (Pers.) Fern.* | Yellow water-lily | | | | | | | | | | X |
| *Onoclea sensibil L.* | Sensitive fern | | | X | | | X | | | | |
| *Poaceae Spp.* | Grass | | | | | | | | | | |
| *Potamogeton Spp.* | Broadleaf Pondweed | | | X | X | | | | | | |
| *Potamogeton Spp.* | Narrow Leaf Pondweed | | X | X | X | | X | X | | | X |
| *Potamogeton nata L.* | Floating pondweed | | | | | | | X | | | X |
| *Potamogeton robbin Oakes* | Fern pondweed | | | | | | | | X | | X |
| *Potamogeton spirill Tuckerman* | Northern snailseed pondwe | X | | | | | | | | | |
| *Rybus Spp.* | Bramle | | X | | | | | | | | |
| *Sagittaria gramine Michx.* | Grass-leaved arrowhead | | | | | | | | | | X |
| *Sagittaria latifol Willd.* | Common arrowhead | X | X | X | X | | X | X | X | X | X |
| *Salix sp.* | A species of willow | | | | | X | | | | | |
| *Scirpus cyperinu (L.) Kunth.* | Woolgrass | | | | | | | | | | X |
| *Sium suave Walter* | Water parsnip | | | | | | X | | X | | X |
| *Sparganium Spp.* | | | X | | | | | | X | | |
| *Sparganium americanu Nutt.* | American bur-reed | | | | | | | | | | X |
| *Sparganium chlorocarp Rydb.* | Dwarf bur-reed | | | | | | X | | | | X |
| *Sparganium spp.* | | X | | | | | | | | | |
| *Sphagnum sp.* | Sphagnum moss species | | | | | | | | | | |
| *Spirea alb DuRoi* | Meadowsweet | | | | | | | X | | | X |
| *Stellaria longifoli Muhl.* | Long-leaved stitchwort | | | | | | | X | | | |
| *Utricularia intermed Hayne* | Northern bladderwort | | | | | | X | | | | |
| *Vallisneria Spp.* | | | X | X | | | | | | | |
| *Vallisneria america L.* | Water celery | X | | | | X | X | X | X | X | X |
| *Viburnum opul L.* | High-bush cranberry | | | | | | | | | | |
| *Zizania palustris* | Wild Rice | | | | | | | | | | |

Table 3. Continued.

| Scientific Name | Common Name | RS4 Pool | RS4 Riffle | RS4 Run | RS5 Pool | RS5 Riffle | RS5 Run |
|---|---|---|---|---|---|---|---|
| Alge Spp. | | | X | X | X | X | X |
| Alysma Spp. | | X | | | | X | X |
| *Acer saccharinum L.* | Silver maple | | X | | | | |
| *Agrostis stolonifera L.* | Redtop | | | | | | |
| *Alisma triviale Pursh.* | Northern water-plantain | | | | X | | |
| *Amelanchier bartramiana (Tausch) Roemer* | Mountain serviceberry | | | | | | |
| *Callitriche palustris L.* | Spiny water-starwort | | | | | | X |
| *Carex Spp.* | | | | | | | |
| *Carex intumescens Rudge* | Shining bur sedge | | | | | | |
| *Carex rostrata J. Stokes* | Beaked sedge | | | | | | |
| *Carex stricta Lam.* | Common tussock sedge | | | | | | |
| *Ceratophyllum demersum L.* | Common coontail | X | | | | | |
| *Eleocharis palustris L.* | Creeping spike-rush | | | | | X | |
| *Elodea Spp.* | | | | X | | | |
| *Elodea canadensis Michx.* | Water weed | | | | | | |
| *Elymus virginicus L.* | Virginia wildrye | | | | | | |
| *Eupatorium Spp.* | | | | | | | |
| *Equisetum Spp.* | | X | X | X | | X | |
| *Equisetum arvense L.* | Field horsetail | | | | | | |
| *Equisetum pratense Ehrh.* | Meadow horsetail | | | | | | |
| *Eupatorium maculatum L.* | Spotted joe-pye weed | | | | | | X |
| *Galium Spp.* | | | | | | | |
| *Glyceria striata (Lam.) A. Hitchc.* | Fowl-mannagrass | X | | | X | X | |
| *Juncus Spp.* | on boulder | | X | X | | | |
| *Juncus effusus L.* | Soft rush | | | | X | | |
| *Lichen Spp.* | | | | | | | |
| *Lycopus americanus Muhl.* | American water-horehound | | | | | X | X |
| *Mimulus ringens L.* | Allegheny monkey-flower | | | | | | |
| *Nuphar microphylla (Pers.) Fern.* | Yellow water-lily | | | | | X | X |
| *Onoclea sensibilis L.* | Sensitive fern | | | | | | |
| *Poaceae Spp.* | Grass | | X | | | | X |
| *Potamogeton Spp.* | Broadleaf Pondweed | X | X | X | | | |
| *Potamogeton Spp.* | Narrow Leaf Pondweed | X | | | X | X | |
| *Potamogeton natans L.* | Floating pondweed | | | | | | |
| *Potamogeton robbinsii Oakes* | Fern pondweed | | | | X | X | |
| *Potamogeton spirillus Tuckerman* | Northern snailseed pondweed | | | | | | |
| *Rybus Spp.* | Bramle | | | | | | |
| *Sagittaria graminea Michx.* | Grass-leaved arrowhead | | | | | | |
| *Sagittaria latifolia Willd.* | Common arrowhead | X | | X | X | X | X |
| *Salix sp.* | A species of willow | | | | | | |
| *Scirpus cyperinus (L.) Kunth.* | Woolgrass | | | | | | |
| *Sium suave Walter* | Water parsnip | X | X | | | X | |
| *Sparganium Spp.* | | | | X | | X | X |
| *Sparganium americanum Nutt.* | American bur-reed | | | | | | |
| *Sparganium chlorocarpum Rydb.* | Dwarf bur-reed | | | | | | |
| *Sparganium spp.* | | | | | | | |
| *Sphagnum sp.* | Sphagnum moss species | X | | | | | |
| *Spirea alba DuRoi* | Meadowsweet | | | | | | |
| *Stellaria longifolia Muhl.* | Long-leaved stitchwort | | | | | | |
| *Utricularia intermedia Hayne* | Northern bladderwort | | | X | | | |
| *Vallisneria Spp.* | | | | X | X | | |
| *Vallisneria americana L.* | Water celery | X | X | | | X | |
| *Viburnum opulus L.* | High-bush cranberry | | | | | | |
| *Zizania palustris* | Wild Rice | X | | X | | | |

Table 4. Aquatic macrophytes identified along the shoreline of the Cloquet River, August 2001.

| | | RS1 | | | RS2 | | | RS3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Scientific Name | Common Name | Pool | Riffle | Run | Pool | Riffle | Run | Pool | Riffle | Run | Backwater |
| Acer Spp. | | | X | | X | | | | | | |
| *Acer saccharinum L.* | Silver maple | X | X | | | X | X | X | X | X | |
| *Agrostis stolonifera L.* | Redtop | | | | | | | X | X | X | |
| *Alopecurus Spp.* | Fox Tail spp. | | | | X | | | | | | |
| *Alisma triviale Pursh.* | Northern water-plantain | | | | | | | | | | |
| *Alnus incana (L.) Moench.* | Speckled alder/tag alder | | | X | X | X | X | X | X | X | |
| *Amelanchier bartramiana (Tausch) Roemer* | Mountain serviceberry | | | | | | | | X | | |
| *Aster Spp.* | | | | | | | | X | X | X | |
| *Aster borealis Prov.* | Northern bog aster | X | | | | | | | | | |
| *Bidens Spp.* | | | | | | | | | | | |
| *Bidens cernua L.* | Nodding beggar-ticks | X | | | | | X | | | | |
| *Brassica sp.* | Mustard species | X | | | | | | | | | |
| *Carex Spp.* | | | | | | | | X | X | X | |
| *Carex psuedocyperus L.* | False bristly sedge | | | | | X | X | X | | X | X |
| *Carex rostrata J. Stokes* | Beaked sedge | X | | | | X | | | | | |
| *Carex stipata Muhl.* | Common fox sedge | | | | | X | | | | | X |
| *Carex stricta Lam.* | Common tussock sedge | | | | | | | | | | |
| *Ceratophyllum demersum L.* | Common coontail | X | | | X | | | | | | |
| *Chelone glabra L.* | White turtlehead | X | | | | | | X | | | |
| *Cicuta maculata L.* | Common water-hemlock | | | | | | | | | | |
| *Convolvulus Spp.* | | | | | X | | | | | | |
| *Convolvulus arvensis L.* | Field bindweed | X | | | | | | | | | |
| *Cornus stolonifera L.* | Red-osier dogwood | X | X | X | | X | | | X | | |
| *Chelone glabra L.* | White turtlehead | | | | | | X | | | | |
| *Eleocharis palustris L.* | Creeping spike-rush | | X | X | | | | | | | |
| *Equisetum pratense Ehrh.* | Meadow horsetail | | | | X | X | | | | | |
| *Equisetum sylvaticum L.* | Woodland horsetail | | X | | | | | | | | |
| *Erigeron Spp.* | Daisy Fleabane | | X | X | | | X | | | | |
| *Eupatorium maculatum L.* | Spotted joe-pye weed | | X | X | X | X | X | X | X | X | |
| *Fraxinus pennsylvanica Marshall* | Green ash | X | X | X | | X | | | X | X | |
| *Galium Spp.* | | | | | | | | | X | | |
| *Galium asprellum Michx.* | Rough bedstraw | X | | | | | | X | | | |
| *Galium trifidum L.* | Northern three-lobed bedstraw | X | X | | | | | | | | |
| *Geum macrophyllum Willd.* | Large-leaf avens | X | | | | | | | | | |
| *Glyceria striata (Lam.) A. Hitchc.* | Fowl-mannagrass | X | X | X | X | X | X | X | X | | |
| *Hippuris vulgaris L.* | Mare's-tail | | | | | | | | | | |
| *Iris versicolor L.* | Northern blue flag | | | | | | | X | X | X | |
| *Juncus effusus L.* | Soft rush | | | | | | | | | | |
| *Juncus tenuis Willd.* | Path rush | | | | X | | | | | | |
| *Leersia oryzoides (L.) Swartz* | Rice cut-grass | X | | | | | | | | | |
| *Lobelia siphilitica L.* | Great blue lobelia | X | | | | | | | | | |
| *Lycopus americanus Muhl.* | American water-horehound | X | X | X | X | X | X | X | X | X | |
| *Lysimachia ciliata L.* | Fringed loosestrife | | | X | | | | | | | |
| *Mimulus ringens L.* | Allegheny monkey-flower | X | | | | | X | | | | |
| *Onoclea sensibilis L.* | Sensitive fern | X | X | | X | X | X | X | X | X | |
| *Osmunda regalis L.* | Royal fern | | | | | | | | | | |
| *Oxalis acetosella L.* | Northern wood sorrel | X | | | | | | | | | |
| *Phalaris arundinacea L.* | Reed canary-grass | | X | X | | X | X | X | | | |
| *Picea mariana (Miller) BSP* | Black spruce | | | X | | | | | | | |
| *Pinus strobus L.* | White pine | | | | | | X | | | | |
| *Plantago major L.* | Common plantain | X | | | | | | | | | |
| *Poaceae Spp.* | Grasses | X | | | | | | | | | |
| *Populus balsamifera L.* | Balsam poplar | | | X | | | | X | | | |
| *Potamogeton Spp.* | Broadleaf Pondweed | | | X | | | | | | | |
| *Potamogeton natans L.* | Floating pondweed | | | X | | | | | | | |
| *Rorippa palustris (L.) Besser* | Common yellow-cress | X | | | | | | | | | |
| *Rosa Spp.* | | | | X | | | | | | | |
| *Rubus Spp.* | Bramle | | | | | X | | | | | |
| *Sagittaria SPP.* | | | | | | | | | | | |
| *Salix exigua Nutt.* | Sandbar willow | | | X | | | | | | | |
| *Salix sp.* | A species of willow | | | X | | | | | | X | |
| *Scirpus Spp.* | Green Bullrush | | | | X | | | | | X | |
| *Scirpus atrovirens Willd.* | Black bulrush | X | X | X | | X | X | | X | | X |
| *Scirpus cyperinus (L.) Kunth.* | Woolgrass | | X | X | | X | | | | | |
| *Scutellaria galericulata L.* | Marsh/hooded skullcap | | | | | | | X | | | |
| *Scutellaria laterifolia L.* | Blue skullcap | | | | | X | | | | | |
| *Sitaria Spp.* | | | | | | | | | | | |
| *Sium suave Walter* | Water parsnip | | | | | X | | X | | X | |
| *Solidago gigantea Aiton.* | Smooth goldenrod | X | | | | | | | | | |
| *Solidago sp.* | Goldenrod species | | X | X | | X | X | | | | |
| *Sonchus sp.* | A species of sow thistle | | | | | | X | | | | |

Table 4. Continued.

| Scientific Name | Common Name | RS4 Pool | RS4 Riffle | RS4 Run | RS5 Pool | RS5 Riffle | RS5 Run |
|---|---|---|---|---|---|---|---|
| Acer Spp. | | | | | | | |
| *Acer saccharinum L.* | Silver maple | X | | X | X | X | X |
| *Agrostis stolonifera L.* | Redtop | | | | X | | |
| *Alopecurus Spp.* | Fox Tail spp. | | | | | | |
| *Alisma triviale Pursh.* | Northern water-plantain | | | | | | X |
| *Alnus incana (L.) Moench.* | Speckled alder/tag alder | X | X | X | X | X | X |
| *Amelanchier bartramiana (Tausch) Roemer* | Mountain serviceberry | | | X | | X | |
| *Aster Spp.* | | | | X | X | X | X |
| *Aster borealis Prov.* | Northern bog aster | | | | | | |
| *Bidens Spp.* | | | | | | X | |
| *Bidens cernua L.* | Nodding beggar-ticks | | | | | | |
| *Brassica sp.* | Mustard species | | | | | | |
| *Carex Spp.* | | X | | | | | |
| *Carex psuedocyperus L.* | False bristly sedge | X | X | X | X | X | X |
| *Carex rostrata J. Stokes* | Beaked sedge | X | | | X | X | X |
| *Carex stipata Muhl.* | Common fox sedge | | | | | | |
| *Carex stricta Lam.* | Common tussock sedge | X | | | | | |
| *Ceratophyllum demersum L.* | Common coontail | | | | | | |
| *Chelone glabra L.* | White turtlehead | | | | | | |
| *Cicuta maculata L.* | Common water-hemlock | | | | X | | X |
| *Convolvulus Spp.* | | | | | | | |
| *Convolvulus arvensis L.* | Field bindweed | | | | | | |
| *Cornus stolonifera L.* | Red-osier dogwood | X | | | X | X | X |
| *Chelone glabra L.* | White turtlehead | | | | | | |
| *Eleocharis palustris L.* | Creeping spike-rush | | | | | | |
| *Equisetum pratense Ehrh.* | Meadow horsetail | | | | | | |
| *Equisetum sylvaticum L.* | Woodland horsetail | | | | | | |
| *Erigeron Spp.* | Daisy Fleabane | X | | | X | | |
| *Eupatorium maculatum L.* | Spotted joe-pye weed | X | | | X | | |
| *Fraxinus pennsylvanica Marshall* | Green ash | X | X | X | X | X | X |
| *Galium Spp.* | | | | | | | |
| *Galium asprellum Michx.* | Rough bedstraw | | | | | | |
| *Galium trifidum L.* | Northern three-lobed bedstraw | | | | | | |
| *Geum macrophyllum Willd.* | Large-leaf avens | | | | | | |
| *Glyceria striata (Lam.) A. Hitchc.* | Fowl-mannagrass | | | X | | | X |
| *Hippuris vulgaris L.* | Mare's-tail | | | | | | |
| *Iris versicolor L.* | Northern blue flag | X | | | | | |
| *Juncus effusus L.* | Soft rush | X | | | | | |
| *Juncus tenuis Willd.* | Path rush | | | | | | |
| *Leersia oryzoides (L.) Swartz* | Rice cut-grass | | | | | | |
| *Lobelia siphilitica L.* | Great blue lobelia | | | | | | |
| *Lycopus americanus Muhl.* | American water-horehound | | | | X | X | |
| *Lysimachia ciliata L.* | Fringed loosestrife | | | X | | X | |
| *Mimulus ringens L.* | Allegheny monkey-flower | | | | X | X | X |
| *Onoclea sensibilis L.* | Sensitive fern | X | X | X | X | | X |
| *Osmunda regalis L.* | Royal fern | | | | X | X | |
| *Oxalis acetosella L.* | Northern wood sorrel | | | | | | |
| *Phalaris arundinacea L.* | Reed canary-grass | X | | | X | X | X |
| *Picea mariana (Miller) BSP* | Black spruce | | | | | | |
| *Pinus strobus L.* | White pine | | | | | | |
| *Plantago major L.* | Common plantain | | | | | X | |
| *Poaceae Spp.* | Grasses | | | | | | |
| *Populus balsamifera L.* | Balsam poplar | | | | | | |
| *Potamogeton Spp.* | Broadleaf Pondweed | | | | | | |
| *Potamogeton natans L.* | Floating pondweed | | | | | | |
| *Rorippa palustris (L.) Besser* | Common yellow-cress | | | | | | |
| *Rosa Spp.* | | | | | | | |
| *Rubus Spp.* | Bramle | | | | | | |
| *Sagittaria SPP.* | | | | | | X | |
| *Salix exigua Nutt.* | Sandbar willow | | | | | | |
| *Salix sp.* | A species of willow | | | | | | |
| *Scirpus Spp.* | Green Bullrush | X | | | | | |
| *Scirpus atrovirens Willd.* | Black bulrush | | | X | | | |
| *Scirpus cyperinus (L.) Kunth.* | Woolgrass | X | X | | X | | X |
| *Scutellaria galericulata L.* | Marsh/hooded skullcap | | | | | | |
| *Scutellaria laterifolia L.* | Blue skullcap | X | | | | | X |
| *Sitaria Spp.* | | | | | | X | X |
| *Sium suave Walter* | Water parsnip | X | | | X | X | X |
| *Solidago gigantea Aiton.* | Smooth goldenrod | | | | X | X | X |
| *Solidago sp.* | Goldenrod species | X | | | | | |
| *Sonchus sp.* | A species of sow thistle | | | | | | |
| *Sparganium americanum Nutt.* | American bur-reed | | | | | X | |

Appendix 1. List of all physical features documented along the Cloquet River, and incorporated into the 1854 Authority's GIS database.

| Site | River Mile | Location | Description | Latitude | Longitude | Max Depth | Channel Width (yrds) | River Temp | Trib Temp | Quad |
|---|---|---|---|---|---|---|---|---|---|---|
| L20 | 37.66 | L37.660 | inactive beaver lodge | 470136.229 | 920434.028 | 7 | 52 | 75 | | Thompson |
| T38 | 37.71 | T37.710 | concrete unnamed dam | 470133.745 | 920431.615 | 4 | 48 | 75 | 76 | Thompson |
| I34 | 37.86 | I37.860 | with snowmobile bridge | 470131.000 | 920420.456 | 1 | 77 | 75 | | Thompson |
| L19 | 37.98 | L37.980 | active beaver lodge | 470132.334 | 920411.440 | 8 | 37 | 75 | | Thompson |
| NS3 | 38.08 | NS38.080 | nesting box | 470131.147 | 920404.868 | 6 | 51 | 75 | | Thompson |
| T37 | 38.15 | T38.150 | intermittent tributary | 470133.910 | 920400.553 | 2 | 67 | 75 | | Thompson |
| I32 | 38.23 | I38.230 | cluster of three islands | 470137.841 | 920400.222 | 3 | 82 | 75 | | Thompson |
| L18 | 38.33 | L38.330 | active beaver lodge | 470142.839 | 920357.186 | 8 | 54 | 75 | | Thompson |
| I31 | 38.74 | I38.740 | cluster of three islands | 470150.992 | 920329.351 | 3 | 36 | 75 | | Thompson |
| I30 | 38.94 | I38.940 | cluster of three islands | 470153.114 | 920314.962 | 2 | 53 | 75 | | Thompson |
| I29 | 39.12 | I39.120 | | 470159.412 | 920304.801 | 3 | 69 | 75 | | Thompson |
| L17 | 39.31 | L39.310 | active beaver lodge | 470207.689 | 920303.508 | 4 | 56 | 75 | | Thompson |
| L15 | 39.63 | L39.630 | active beaver lodges on both sides of river | 470220.791 | 920316.822 | 3 | 95 | 74 | | Thompson |
| T36 | 39.65 | T39.650 | trib little flow | 470221.527 | 920316.302 | 3 | 95 | 74 | 71 | Thompson |
| I28 | 40.09 | I40.090 | with activer beaver dam across stream | 470216.148 | 920244.555 | 3 | 37 | 75 | | Thompson |
| L14 | 40.15 | L40.150 | inactive beaver lodge | 470215.467 | 920240.345 | 5 | 32 | 75 | | Thompson |
| I27 | 40.23 | I40.230 | | 470216.126 | 920234.971 | 2 | 73 | 75 | | Thompson |
| S1 | 40.42 | S40.420 | natural spring, 43 degrees | 470221.500 | 920222.400 | 2 | 62 | 74 | | Thompson |
| I25 | 40.47 | I40.470 | two islands | 470220.716 | 920217.814 | 2 | 60 | 74 | | Thompson |
| I24 | 40.66 | I40.660 | cluster of small islands | 470219.809 | 920204.277 | 2 | 52 | 74 | | Thompson |
| T35 | 41.19 | T41.190 | trib low flow with beaver dam up from mouth | 470222.400 | 920137.500 | 2 | 90 | 72 | 75 | Thompson |
| L12 | 41.35 | L41.350 | active beaver lodge | 470230.596 | 920142.244 | 4 | 56 | 73 | | Thompson |
| L11 | 41.71 | L41.710 | inactive beaver lodge | 470248.512 | 920134.193 | 8 | 86 | 72 | | Thompson |
| L10 | 41.89 | L41.890 | beaver food stash | 470257.191 | 920132.770 | 2 | 55 | 72 | | Thompson |
| L9 | 41.95 | L41.950 | beaver food stash, 10' X 4' | 470258.699 | 920135.904 | 2 | 68 | 72 | | Thompson |
| I23 | 41.99 | I41.990 | | 470300.750 | 920136.401 | 3 | 81 | 72 | | Thompson |
| L8 | 42.03 | L42.03 | inactive beaver lodge | 470302.314 | 920135.867 | 7 | 56 | 72 | | Thompson |
| I22 | 42.03 | I42.030 | with inactive beaver lodge | 470302.314 | 920135.867 | 7 | 56 | 72 | | Thompson |
| I21 | 42.21 | I42.210 | large island | 470311.236 | 920132.192 | 9 | 80 | 72 | | Thompson |
| NS2 | 42.25 | NS42.250 | nesting box | 470313.154 | 920130.139 | 9 | 80 | 72 | | Thompson |
| I20 | 42.38 | I42.380 | with nesting box on east side | 470317.775 | 920137.578 | 6 | 111 | 72 | | Thompson |
| I19 | 42.41 | I42.410 | 10 square yards | 470319.555 | 920138.214 | 3 | 119 | 72 | | Thompson |
| T34 | 42.42 | T42.420 | sparse rice at mouth, with an inactive dam followed by an active dam | 470320.019 | 920135.446 | 3 | 119 | 72 | 68 | Thompson |
| I18 | 42.49 | I42.490 | 30 yards X 5 yards | 470323.832 | 920138.887 | 4 | 87 | 73 | | Thompson |
| L32 | 42.90 | L42.900 | inactive beaver lodge | 470342.716 | 920133.913 | 4 | 77 | 74 | | Thompson |
| L31 | 43.36 | L43.360 | active beaver lodge | 470356.274 | 920126.458 | 5 | 59 | 76 | | Thompson |
| E26 | 43.76 | E43.760 | 51yards, 45 degree angle | 470414.011 | 920144.266 | 11 | 56 | 75 | | Thompson |
| T57 | 43.79 | T43.790 | small trib, some flow | 470413.511 | 920147.211 | 9 | 42 | 75 | 82 | Thompson |
| L30 | 43.93 | L43.930 | inactive beaver lodge | 470407.970 | 920152.303 | 5 | 40 | 75 | | Thompson |
| T56 | 43.96 | T43.960 | intermittent drainage with old dam | 470408.169 | 920153.955 | 6 | 42 | 75 | 80 | Thompson |
| T55 | 44.05 | T44.050 | trib no flow | 470410.828 | 920158.776 | 2 | 55 | 74 | 76 | Thompson |
| I39 | 44.24 | I44.240 | | 470419.812 | 920203.298 | 12 | 86 | 75 | | Thompson |
| I38 | 44.27 | I44.270 | | 470421.137 | 920205.346 | 12 | 86 | 75 | | Thompson |
| T54 | 45.03 | T45.030 | trib slow flow | 470453.185 | 920213.976 | 6 | 57 | 73 | 82 | Thompson |
| T53 | 45.16 | T45.160 | intermittent wetland drainage | 470458.961 | 920207.630 | 6 | 45 | 74 | 78 | Thompson |
| L28 | 45.40 | L45.400 | active on I37 | 470511.867 | 920207.535 | 4 | 32 | 72 | | Thompson |
| I37 | 45.40 | I45.400 | large island | 470511.848 | 920207.555 | 4 | 32 | 72 | | Thompson |
| T52 | 45.52 | T45.52 | intermittent, trickle | 470517.277 | 920206.486 | 2 | 62 | 71 | 72 | Thompson |
| L27 | 45.72 | L45.720 | active beaver lodge | 470525.771 | 920156.495 | 4 | 50 | 71 | | Thompson |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| T51 | 45.72 | T45.720 | trib with beaver dam (2-3' head) | 470526.463 | 920158.588 | 6 | 50 | 71 | 67 | Thompson |
| L26 | 45.82 | L45.82 | active beaver lodg | 470530.522 | 920154.058 | 6 | 36 | 74 | | Thompson |
| T50 | 45.82 | T45.820 | across from L26 | 470530.314 | 920152.765 | 6 | 36 | 74 | 76 | Thompson |
| T49 | 45.92 | T45.920 | dammed up trib/bay from Thompson Lake | 470535.383 | 920149.754 | 4 | 47 | 71 | 63 | Thompson |
| L25 | 45.99 | L45.990 | 2 beaver lodges, 1 active | 470534.140 | 920143.740 | 6 | 32 | 71 | | Thompson |
| L24 | 46.28 | L46.280 | inactive beaver lodge | 470534.586 | 920128.403 | 2 | 31 | 71 | | Thompson |
| T48 | 46.28 | T46.280 | small trib, little flow | 470535.344 | 920130.043 | 2 | 34 | 71 | 67 | Thompson |
| T47 | 46.37 | T46.370 | drains small pond with beaver dam | 470536.516 | 920121.290 | 7 | 30 | 71 | 67 | Thompson |
| T46 | 46.39 | T46.390 | drains same pond as T47 with beaver dam | 470537.161 | 920120.765 | 8 | 29 | 71 | 72 | Thompson |
| L23 | 46.43 | L46.430 | active beaver lodge | 470538.888 | 920119.306 | 5 | 29 | 71 | | Thompson |
| T45 | 46.59 | T46.590 | wetland drainage | 470540.247 | 920106.979 | 5 | 31 | 70 | 72 | Thompson |
| T44 | 46.72 | T46.720 | Little Cloquet River with rice at mouth | 470546.368 | 920107.972 | 7 | 38 | 70 | 71 | Thompson |
| L22 | 46.72 | L46.720 | inactive beaver lodge | 470546.220 | 920109.507 | 3 | 24 | 70 | | Thompson |
| T43 | 47.07 | T47.070 | intermittent, no flow | 470549.100 | 920129.500 | 4 | 26 | 70 | | Thompson |
| T42 | 47.25 | T47.250 | no flow | 470553.507 | 920119.588 | 4 | 34 | 71 | | Thompson |
| T41 | 47.38 | T47.380 | trib from Lost Lake | 470558.254 | 920127.362 | 1 | 35 | 71 | 70 | Thompson |
| T40 | 47.59 | T47.590 | trib trickle flow near Lost Lake | 470607.344 | 920136.029 | 1 | 36 | 70 | 67 | Thompson |
| T39 | 48.01 | T48.010 | intermittent, tiny trickle of flow from pond | 470627.050 | 920146.289 | 3 | 37 | 70 | 59 | Thompson |
| PBL4 | 48.21 | PBL48.210 | Carrol Truck Trail (Doc Barney's) | 470656.900 | 920130.100 | 4 | 32 | 65 | | Thompson |
| I36 | 48.23 | I48.230 | 30 yards long, just down stream from Rosalyn Kelly Campsite | 470635.971 | 920135.882 | 3 | 39 | 70 | | Thompson |
| PBL5 | 48.30 | PBL48.300 | Doc Barneys | 470701.746 | 920132.404 | 3 | 65 | 70 | | Thompson |
| I35 | 48.32 | I48.320 | small island just upstream from Rosalyn Kelly Campsite | 470640.124 | 920133.999 | 3 | 66 | 70 | | Thompson |
| T31 | 48.37 | T48.370 | trib | 470705.100 | 920135.900 | 10 | 61 | 65 | 68 | Thompson |
| L21 | 48.47 | L48.470 | active beaver lodge | 470648.129 | 920132.915 | 4 | 38 | 70 | | Thompson |
| T30 | 48.48 | T48.480 | trib | 470709.900 | 920136.400 | 6 | 40 | 65 | 64 | Thompson |
| T29 | 48.73 | T48.730 | small beaver dam at mouth | 470721.061 | 920128.904 | 6 | 29 | 65 | 63 | Thompson |
| T28 | 48.94 | T48.940 | trib with flow | 470716.880 | 920117.907 | 8 | 33 | 65 | 60 | Thompson |
| I17 | 49.04 | I49.040 | large island with large trees | 470722.555 | 920118.377 | 5 | 33 | 65 | | Thompson |
| T32 | 49.30 | T49.300 | trib | 470734.614 | 920124.846 | 4 | 39 | 65 | 65 | Boulder Lake NE |
| L7 | 50.17 | L50.170 | small active beaver lodge | 470805.013 | 920134.824 | 11 | 34 | 66 | | Boulder Lake NE |
| T27 | 50.42 | T54.420 | trib with flow | 470813.270 | 920137.804 | 4 | 40 | 66 | 59 | Boulder Lake NE |
| T26 | 50.91 | T50.910 | wetland drainage with active dam | 470828.553 | 920121.907 | 2 | 114 | 67 | 65 | Boulder Lake NE |
| T25 | 51.27 | T51.270 | trib with beaver dam | 470820.706 | 920105.665 | 4 | 35 | 66 | 67 | Boulder Lake NE |
| T24 | 51.54 | T51.540 | trib | 470829.346 | 920107.459 | 3 | 32 | 66 | 66 | Boulder Lake NE |
| T23 | 51.86 | T51.860 | trib with flow | 470831.049 | 920046.605 | 4 | 41 | 66 | 59 | Boulder Lake NE |
| E26 | 52.30 | E52.300 | erosion site | 470843.072 | 920024.601 | 5 | 19 | 66 | | Boulder Lake NE |
| T22 | 53.09 | T53.090 | trib with beaver dam at mouth and some flow | 470901.700 | 920011.100 | 7 | 25 | 66 | 65 | Boulder Lake NE |
| E25 | 53.19 | E53.190 | large erosion site | 470906.600 | 920007.900 | 5 | 20 | 66 | | Boulder Lake NE |
| T21 | 53.25 | T53.250 | trib with noticeable flow | 470908.800 | 920012.900 | 5 | 46 | 66 | 66 | Boulder Lake NE |
| E24 | 53.71 | E53.710 | long erosion site | 470909.700 | 915946.200 | 3 | 24 | 66 | | Pequaywan Lake |
| T20 | 53.94 | T53.940 | trib | 470915.100 | 915933.900 | 2 | 52 | 66 | 66 | Pequaywan Lake |
| E16 | 54.11 | E54.110 | erosion site | 470923.626 | 915932.346 | 2 | 42 | 65 | | Pequaywan Lake |
| E15 | 54.24 | E54.240 | large erosion site with trees | 470929.542 | 915928.417 | 2 | 37 | 65 | | Pequaywan Lake |
| E23 | 54.72 | E54.720 | erosion site | 470944.191 | 915859.472 | 1 | 42 | 65 | | Pequaywan Lake |
| I14 | 54.85 | I54.850 | island | 470944.382 | 915850.670 | 5 | 44 | 65 | | Pequaywan Lake |
| T19 | 55.31 | T55.310 | trib | 471005.223 | 915840.177 | 5 | 42 | 65 | 55 | Pequaywan Lake |
| L6 | 55.35 | L55.350 | active beaver lodge | 471006.469 | 915841.546 | 6 | 46 | 65 | | Pequaywan Lake |
| L5 | 55.40 | L55.400 | active beaver lodge | 471008.042 | 915845.403 | 3 | 26 | 65 | | Pequaywan Lake |
| T18 | 55.48 | T55.480 | trib from Marion Lake, ATV trail crosses creek bed | 471010.610 | 915851.765 | 4 | 45 | 65 | 69 | Pequaywan Lake |
| I13 | 55.51 | I55.510 | island in front of Marion Lake | 471011.598 | 915850.524 | 4 | 43 | 65 | | Pequaywan Lake |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| L2 | 55.78 | L55.780 | | 471021.404 | 915836.657 | 2 | 27 | 64 | | Pequaywan La |
| T17 | 56.30 | T56.300 | wetland drainage, beaver dam 20' up from mouth | 471014.926 | 915804.103 | 3 | 52 | 64 | 61 | Pequaywan La |
| T16 | 56.64 | T56.640 | intermittent drainage | 471024.528 | 915742.070 | 2 | 38 | 64 | | Pequaywan La |
| T15 | 56.99 | T56.990 | trib with flow | 471031.263 | 915724.296 | 3 | 48 | 64 | 64 | Pequaywan La |
| T14 | 57.63 | T57.630 | trib with beaver dam 5 yards up from mouth | 471058.117 | 915706.939 | 2 | 35 | 63 | 62 | Pequaywan La |
| T13 | 57.88 | T57.88 | wetlands drainage | 471110.418 | 915712.381 | 3 | 24 | 63 | 63 | Pequaywan La |
| I12 | 57.94 | I57.940 | large island with trees | 471113.746 | 915712.345 | 3 | 35 | 63 | | Pequaywan La |
| E22 | 58.19 | E58.190 | erosion site, 135 yards long | 471115.797 | 915658.105 | 7 | 24 | 63 | | Pequaywan La |
| T12 | 58.36 | T58.360 | wetlands drainage | 471122.840 | 915703.719 | 3 | 38 | 63 | 58 | Pequaywan La |
| E21 | 58.40 | E58.400 | 80 yards long | 471121.087 | 915700.852 | 4 | 21 | 63 | | Pequaywan La |
| NS1 | 59.05 | NS59.050 | nesting box | 471143.756 | 915643.665 | 3 | 31 | 63 | | Pequaywan La |
| T11 | 59.25 | T59.250 | trib with flow from beaver pond | 471153.403 | 915640.691 | 3 | 29 | 63 | 63 | Pequaywan La |
| T10 | 59.30 | T59.300 | trib | 471204.710 | 915631.253 | 3 | 32 | 63 | 62 | Pequaywan La |
| E20 | 59.55 | E59.550 | erosion site | 471213.602 | 915640.261 | 5 | 22 | 63 | | Pequaywan La |
| E19 | 59.58 | E59.580 | erosion site | 471217.716 | 915644.446 | 3 | 23 | 63 | | Pequaywan La |
| T33 | 59.59 | T59.590 | unnamed perennial | 471219.300 | 915644.700 | 3 | 31 | 63 | | Pequaywan La |
| I11 | 59.60 | I59.600 | large island with trees | 471219.906 | 915642.973 | 2 | 38 | 63 | | Pequaywan La |
| I10 | 59.76 | I59.760 | 40 yds x 10 yds, 2 islands | 471228.982 | 915623.389 | 3 | 25 | 63 | | Pequaywan La |
| PBL3 | 59.80 | PBL59.800 | Cedar Bay access (Bear Lake Road) | 471231.024 | 915616.826 | 5 | 31 | 59 | | Pequaywan La |
| E18 | 60.82 | E60.820 | erosion site | 471314.071 | 915525.517 | 9 | 38 | 59 | | Pequaywan La |
| T9 | 60.92 | T60.920 | wetlands drainage | 471228.912 | 915626.151 | 3 | 33 | 63 | 57 | Pequaywan La |
| E17 | 62.62 | E62.620 | 35 yards long | 471334.692 | 915416.937 | 4 | 18 | 59 | | Pequaywan La |
| E16 | 62.84 | E62.840 | erosion site 69 yards long | 471338.298 | 915407.121 | 6 | 22 | 59 | | Pequaywan La |
| E15 | 62.99 | E62.990 | erosion site 50 yards long | 471341.500 | 915416.900 | 5 | 22 | 59 | | Pequaywan La |
| E14 | 63.16 | E63.160 | erosion site 115 yards long | 471344.349 | 915405.136 | 5 | 27 | 59 | | Pequaywan La |
| T7 | 63.77 | T63.770 | West Branch Cloquet River | 471405.682 | 915423.859 | 5 | 24 | 59 | 58 | Pequaywan La |
| T8 | 64.84 | T64.840 | unnamed perennial, short trib from small pond/lake | 471439.200 | 915403.800 | 5 | 20 | 59 | | Pequaywan La |
| E12 | 65.46 | E65.460 | erosion site 20 yards long | 471454.400 | 915329.800 | 4 | 15 | 59 | | Pequaywan La |
| T6 | 65.90 | T65.900 | trib with good flow | 471513.120 | 915307.428 | 4 | 20 | 59 | 51 | Fairbanks |
| T5 | 66.39 | T66.390 | intermittent flow | 471500.863 | 915257.700 | 5 | 20 | 59 | 58 | Fairbanks |
| E11 | 66.48 | E66.480 | erosion site 30 yards long | 471503.358 | 915253.390 | 6 | 15 | 59 | | Fairbanks |
| E10 | 66.66 | E66.660 | erosion site 70 yards long | 471501.848 | 915246.119 | 4 | 15 | 60 | | Fairbanks |
| T4 | 66.74 | T66.740 | Pine Creek, strong flow | 471500.800 | 915239.300 | 4 | 15 | 60 | | Fairbanks |
| E9 | 66.88 | E66.880 | erosion site 117 yards long | 471506.142 | 915241.090 | 4 | 23 | 60 | | Fairbanks |
| T3 | 66.91 | T66.910 | back water | 471507.889 | 915240.777 | 3 | 27 | 60 | 60 | Fairbanks |
| T2 | 67.40 | T67.400 | trib | 471520.504 | 915209.163 | 5 | 15 | 60 | 60 | Brimson |
| E8 | 67.45 | E67.450 | erosion site 50 yards long | 471522.723 | 915207.239 | 5 | 21 | 60 | | Brimson |
| E7 | 67.58 | E67.580 | erosion site 100 yards long, just below PBL2 | 471522.700 | 915202.200 | 4 | 17 | 61 | | Brimson |
| PBL2 | 67.60 | PBL67.600 | accessed from CR 44, dirt road with "Bridge Out" sign | 471523.529 | 915202.625 | 7 | 12 | 60 | | Brimson |
| E6 | 67.63 | E67.630 | erosion site | 471525.211 | 915202.043 | 4 | 15 | 61 | | Brimson |
| E5 | 67.67 | E67.670 | erosion site 120 yards long | 471527.272 | 915203.508 | 5 | 20 | 61 | | Brimson |
| E2 | 68.24 | E68.240 | erosion site 40 yards long | 471539.988 | 915146.440 | 4 | 12 | 61 | | Brimson |
| E1 | 68.28 | E68.280 | erosion site | 471542.193 | 915148.603 | 3 | 15 | 61 | | Brimson |
| L4 | 68.33 | L68.330 | inactive beaver lodge | 471544.429 | 915150.540 | 5 | 12 | 61 | | Brimson |
| L3 | 68.45 | L68.450 | active beaver lodge | 471547.566 | 915144.469 | 5 | 10 | 61 | | Brimson |
| T1 | 68.58 | T68.580 | trip from Papoose Lake | 471549.488 | 915149.290 | 4 | 11 | 61 | 61 | Brimson |
| PBL1 | 69.40 | PBL69.400 | Indian Lake access | 471618.600 | 915123.200 | 3 | 10 | 59 | | Brimson |

Appendix 2. List of benthic macroinvertebrates collected from the Cloquet River, 2001. Families are listed, with numbers being the total number observed at each sampling station. The total observed in riffle and run collections is listed separately.

| Totals for RS1 | | | Totals for RS2 | | |
|---|---|---|---|---|---|
| **Taxonomic Classification** | **Total** | **Total Riffle / Run** | **Taxonomic Classification** | **Total** | **Total Riffle / Run** |
| Bivalves | 1 | 1 | *Coleoptera Dytiscidae* | 3 | |
| *Coleoptera Elmidae* | 8 | 5 | *Coleoptera Halipidae* | 2 | |
| *Diptera Athericidae* | 1 | 1 | *Coleoptera Psephenidae* | 1 | 1 |
| *Diptera Ceratopogonidae* | 2 | 2 | *Crustacea Amphipoda* | 25 | |
| *Diptera Nematocera Chironomidae* | 11 | 4 | *Diptera Nematocera Chironomidae* | 18 | 12 |
| *Diptera Simuliidae* | 6 | 6 | *Diptera Simuliidae* | 6 | 6 |
| *Diptera Tipulidae* | 4 | 4 | *Diptera Thaumaleidae* | 4 | 4 |
| *Ephemeroptera Baetidae* | 1 | 1 | *Diptera Tipulidae* | 1 | 1 |
| *Ephemeroptera Ephemerellidae* | 4 | | *Ephemeroptera Baetidae* | 50 | 50 |
| *Ephemeroptera Heptageniidae* | 21 | 13 | *Ephemeroptera Heptageniidae* | 42 | 30 |
| *Ephemeroptera Leptophlebiidae* | 5 | 1 | *Ephemeroptera Leptophlebiidae* | 8 | 8 |
| *Ephemeroptera Oligoneuriidae* | 2 | 2 | *Ephemeroptera Polymitarcyidae* | 4 | 4 |
| *Gastropoda* | 8 | 8 | *Ephemeroptera Tricorythidae* | 121 | 33 |
| *Odonata Anisoptera Aeshnidae* | 2 | 2 | *Megaloptera Corydalidae* | 4 | 4 |
| *Odonata Cordulegastridae* | 5 | 5 | *Megaloptera Sialidae* | 1 | 1 |
| *Odonata Gomphidae* | 20 | 16 | *Odonata Anisoptera Aeshnidae* | 1 | 1 |
| *Plecoptera Capniidae* | 12 | 12 | *Odonata Anisoptera Corduliidae libellulidae* | 4 | 4 |
| *Plecoptera Perlidae* | 12 | 12 | *Odonata Gomphidae* | 9 | 8 |
| *Plecoptera Perlodidae* | 10 | 9 | *Plecoptera Perlidae* | 1 | 1 |
| *Trichoptera Hydropsychidae* | 156 | 141 | *Plecoptera Perlodidae* | 3 | 1 |
| *Trichoptera Hydroptilidae* | 1 | 1 | *Trichoptera Hydropsychidae* | 31 | 23 |
| *Trichoptera Lepidostomatidae* | 1 | 1 | *Trichoptera Polycentropodidae* | 1 | 1 |
| *Trichoptera Polycentropodidae* | 12 | 12 | *Trichoptera Psychomyiidae* | 12 | 12 |
| *Trichoptera Psychomyiidae* | 22 | 2 | *Trichoptera Rhyacophilidae* | 17 | 17 |
| **Total # Organisms Observed** | **327** | **261** | **Total # Organisms Observed** | **352** | **205** |

Appendix 2. Continued.

Totals for RS3

| **Taxonomic Classification** | **Total** | **Total Riffle / Run** |
|---|---|---|
| *Annelida Hirudinea* | 1 | |
| Bivalves | 8 | 8 |
| *Coleoptera Elmidae* | 3 | 3 |
| *Coleoptera Psephenidae* | 1 | |
| *Diptera Athericidae* | 1 | 1 |
| *Diptera Nematocera Chironomidae* | 9 | 9 |
| *Diptera Simuliidae* | 9 | 8 |
| *Diptera Thaumaleidae* | 1 | |
| *Diptera Tipulidae* | 1 | 1 |
| *Ephemeroptera Baetidae* | 2 | |
| *Ephemeroptera Ephemerellidae* | 1 | |
| *Ephemeroptera Ephemeridae* | 7 | 7 |
| *Ephemeroptera Heptageniidae* | 19 | 15 |
| *Ephemeroptera Leptophlebiidae* | 6 | 6 |
| *Ephemeroptera Oligoneuriidae* | 6 | 4 |
| *Ephemeroptera Tricorythidae* | 53 | 53 |
| *Gastropoda* | 10 | |
| *Megaloptera Corydalidae* | 7 | 7 |
| *Odonata Anisoptera Aeshnidae* | 4 | 4 |
| *Odonata Anisoptera Corduliidae* | 2 | |
| *Odonata Gomphidae* | 11 | 11 |
| *Plecoptera* Adult | 1 | 1 |
| *Plecoptera Perlidae* | 20 | 20 |
| *Plecoptera Perlodidae* | 17 | 17 |
| *Plecoptera Pteronarcyidae* | 8 | 7 |
| *Trichoptera* Cases (empty) | 57 | 57 |
| *Trichoptera Glossosomatidae* | 25 | 24 |
| *Trichoptera Helicopsychidae* | 1 | 1 |
| *Trichoptera Hydropsychidae* | 50 | 44 |
| *Trichoptera Hydroptilidae* | 6 | 2 |
| *Trichoptera Leptoceridae* | 4 | 4 |
| *Trichoptera Limnephilidae* | 10 | 10 |
| *Trichoptera Polycentropodidae* | 17 | 6 |
| *Trichoptera Psychomyiidae* | 2 | 2 |
| **TOTAL # Organisms Observed** | **380** | **332** |

Totals for RS4

| **Taxonomic Classification** | **Total** | **Total Riffle / Run** |
|---|---|---|
| *Amphipoda Hyalella* | 19 | 2 |
| *Coleoptera Dryopidae* | 3 | 3 |
| *Crustacea Decapoda* | | lots |
| *Diptera Empididae* | 1 | 1 |
| *Diptera Nematocera Chironomidae* | 32 | 27 |
| *Diptera Simuliidae* | 44 | 33 |
| *Diptera Stratimyidae* | 1 | |
| *Diptera Tipulidae* | 2 | 1 |
| *Ephemeroptera Baetidae* | 3 | 2 |
| *Ephemeroptera Baetiscidae* | 1 | |
| *Ephemeroptera Ephemerellidae* | 34 | 10 |
| *Ephemeroptera Heptageniidae* | 12 | 11 |
| *Ephemeroptera Leptophilebiidae* | 17 | 17 |
| *Ephemeroptera Spp.* | 4 | 4 |
| *Megaloptera Corydalidae* | 5 | 5 |
| *Megaloptera Nigronia* | 2 | |
| *Odonata Anisoptera* | 5 | |
| *Odonata Coenagrionidae* | 1 | 1 |
| *Odonata Gomphidae* | 10 | 10 |
| *Plecoptera Perlidae* | 6 | 6 |
| *Plecoptera Perlodidae* | 2 | |
| *Plecoptera Spp.* | 1 | 1 |
| *Trichoptera Hydropsychidae* | 30 | 30 |
| *Trichoptera Hydroptilidae* | 1 | 1 |
| *Trichoptera Leptoceridae* | 14 | |
| *Trichoptera Philopotamidae* | 8 | 7 |
| *Trichoptera Polycentropodidae* | 2 | |
| *Trichoptera Psychomyiidae* | 13 | 13 |
| *Trichoptera Spp.* | 8 | 8 |
| **Total # Organisms Observed** | **281** | **193** |

Appendix 2.  Continued.

Totals for RS 5

| **Taxonomic Classification** | **Total** | **Total Riffle / Run** |
|---|---|---|
| *Annelida Hirudinae* | 1 | 1 |
| Bivalves | 11 | 11 |
| *Coleoptera Elmidae* | 9 | 9 |
| *Coleoptera Gyrinidae* | 2 | 2 |
| *Crustacea Amphipoda Gammaridae* | 3 | 3 |
| *Diptera Athericidae* | 1 | 1 |
| *Diptera Nematocera Chironomidae* | 10 | 7 |
| *Diptera Tipulidae* | 1 | 1 |
| *Ephemeroptera Baetidae* | 2 | 2 |
| *Ephemeroptera Caenidae* | 1 | 1 |
| *Ephemeroptera Ephemerellidae* | 7 | 7 |
| *Ephemeroptera Ephemeridae* | 5 | 5 |
| *Ephemeroptera Heptageniidae* | 16 | 15 |
| *Ephemeroptera Potamanthidae* | 1 | 1 |
| *Ephemeroptera Tricorythidae* | 3 | 3 |
| *Gastropoda* | 6 | 6 |
| *Hemiptera Nepidae* | 1 | 1 |
| *Megaloptera Corydalidae* | 1 | |
| *Odonata Anisoptera Aeshnidae* | 2 | 2 |
| *Odonata Gomphidae* | 6 | 3 |
| *Odonata Libellulidae* | 1 | 1 |
| *Plecoptera Peltoperlidae* | 4 | |
| *Plecoptera Perlidae* | 2 | 2 |
| *Plecoptera Pteronarcyidae* | 9 | 8 |
| *Trichoptera* Cases (empty) | 23 | 23 |
| *Trichoptera Glossosomatidae* | 2 | 2 |
| *Trichoptera Hydropsychidae* | 30 | 23 |
| *Trichoptera Hydroptilidae* | 2 | 2 |
| *Trichoptera Polycentropodidae* | 23 | 23 |
| *Trichoptera Psychomyiidae* | 1 | 1 |
| *Trichoptera Sericostomatidae* | 1 | 1 |
| | | |
| **Total # Organisms Observed** | **187** | **167** |