Guide to the UNDERC Stream Network

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Introduction

While the UNDERC lakes have been described extensively and are well-known, the UNDERC stream network has been largely unknown. This lack of knowledge about the stream network has hindered research of these streams, and the purpose of this study was to provide an overall description of each stream. The main goals of this study were to locate all the streams on property and then to describe the main physical characteristics of each stream. The biological information of each stream was noted when possible, but not studied extensively and should be the subject of further research in order to provide sufficient information to those wishing to study the stream network.

Methods

The methods used in this survey were very explorative in nature. In order to find the streams, several methods were used. The most obvious method was to drive and hike the property and look for any running water. I also used the *USGS Terrain Navigator* program to access topographical maps of the region. These maps were valuable mainly for tracing the drainage system of each lake. I would go out to the point where the lake was shown to drain and this led to the finding of many of the streams on property.

If a stream was found, I would use the GPS and plot the NAD-83 datum approximately every 5m. The distance between plots was reduced if a prominent feature such as a bend in the stream was encountered. I would take the pH, temperature, and velocity of the stream and I would note the riparian characteristics, substrate composition and any other unique features of the stream. I would also take the measurements of 3 cross-sections and then averaged these values to create the cross-sectional graphs that accompany the description of each stream.

After I had all the GPS points, I imported them to the *USGS Terrain Navigator* program and created routes using a route-making tool. I would then export these routes to a spreadsheet which could plot the points and make the graphs that accompany the description of each stream. Two notes should be made about these graphs. First, the spreadsheet had a method of converting the UTM coordinates to Lat/Long whole-numbers that could be graphed. The formula is as follows:

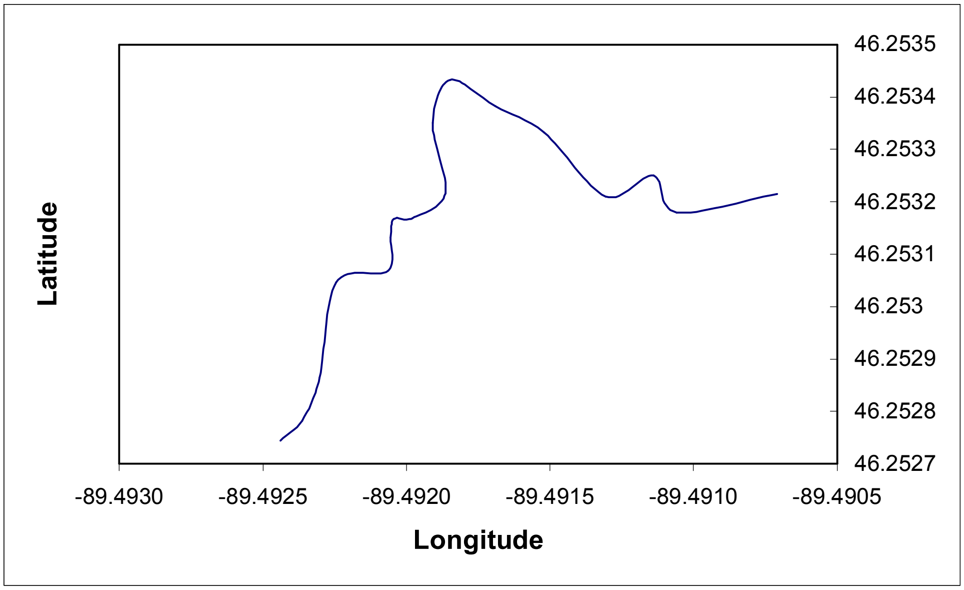
Degrees + (minutes/60) + (seconds/3600) = decimal places
For example, a latitude of 43 degrees 30 minutes 50 seconds would translate to:
43 + (30/60) + (50/3600) = 43.5138888

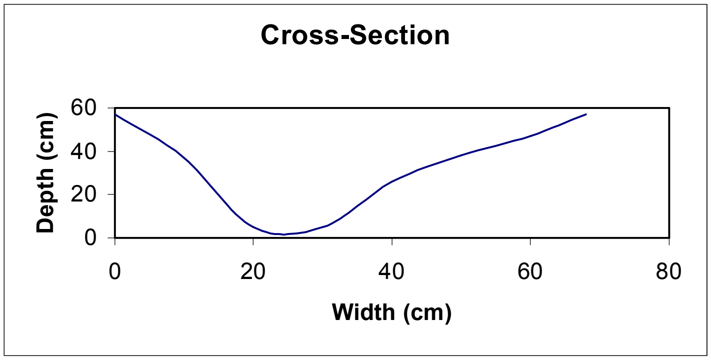
For longitude, West is entered as a negative value and East as positive.

The second note is that the graph of the cross-section is inverted. Along the Y-axis, it is labeled as depth, but one will notice that the "depth" at the ends is the highest number, which is obviously not true because this is the bank of the stream. This is because the graph is intended to give a visual reference to the reader as well as physical data. When one looks at the depth of the point, it is numerically correct to think of "depth" as the distance of the actual depth measured to the lowest point in the cross-section. For example, at a width of 0cm, the measured depth is 0cm because it is the stream bank. If on the graph the depth shows a value of 30cm, it means that that point (the stream bank) is 30cm from the lowest point in the cross-section. Likewise, the lowest point in the cross-section would have read on the graph as having a value of 0cm because its measured depth (30cm) minus the lowest point in the stream (30cm) is 0cm. This is how the cross-section values are inverted. While it is a minor complication, it is necessary in order to provide the visual cross-section of the stream as well as physical data.

Foggy Creek

Foggy Creek empties Foggy Bog into an unnamed marsh/wetland and can be accessed by a culvert. There is an inner riparian zone 1m wide on both banks that consists of tall grasses and the outer riparian zone is a coniferous forest. Unidentified minnows exist in the stream, and snakes and frogs are present around the banks, though they are most likely inhabitants of the marsh that the stream empties into. The channel is relatively uniform with minimal variation between cross-section measurements. The channel substrate consists of mainly sand, gravel, and some pebbles at the headwaters and converts to mostly compact mud towards the mouth of the stream.

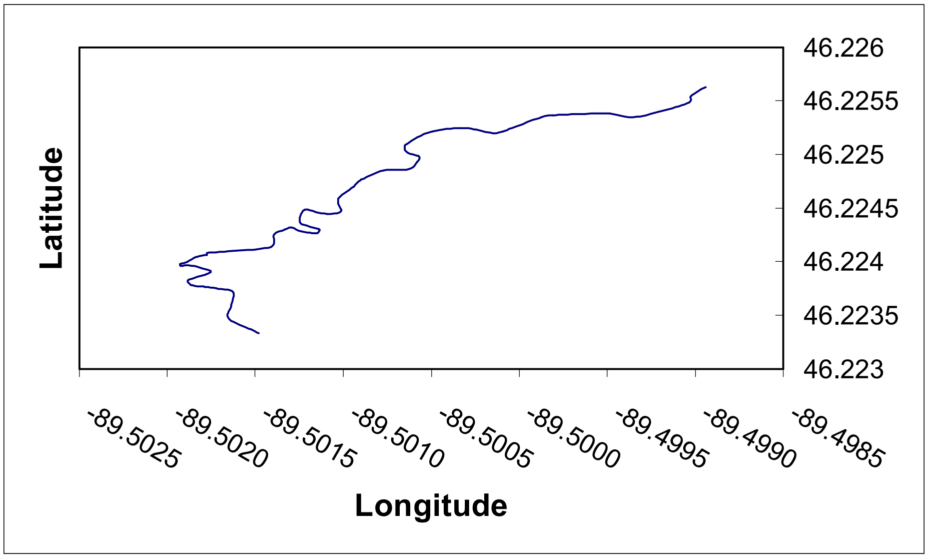


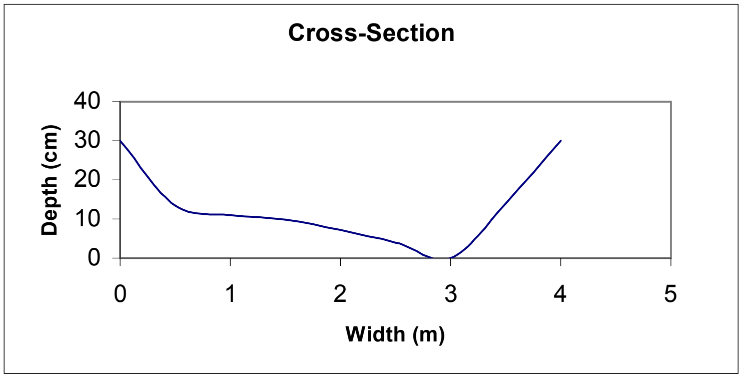


Ph	Temperature (Celsius)	Velocity (m/s)
6.2	19	0.2

Plum Creek

Plum Creek empties Plum Lake into Kickapoo Lake and can be accessed by a culvert. There is an inner riparian zone of 5m consisting of grasses and an outer riparian zone of mixed forest. While there is significant velocity at the headwaters, it is drastically reduced after the first 50 meters and becomes a meandering wetland more than a stream. There is obvious biotic activity, but this is mainly due to it being more of an aquatic "bridge" between two lakes rather than a one-direction stream. The substrate is mainly pebbles and sand at the headwaters, but it turns into 100% FPOM (more than 1m deep in some parts) where the velocity decreases.

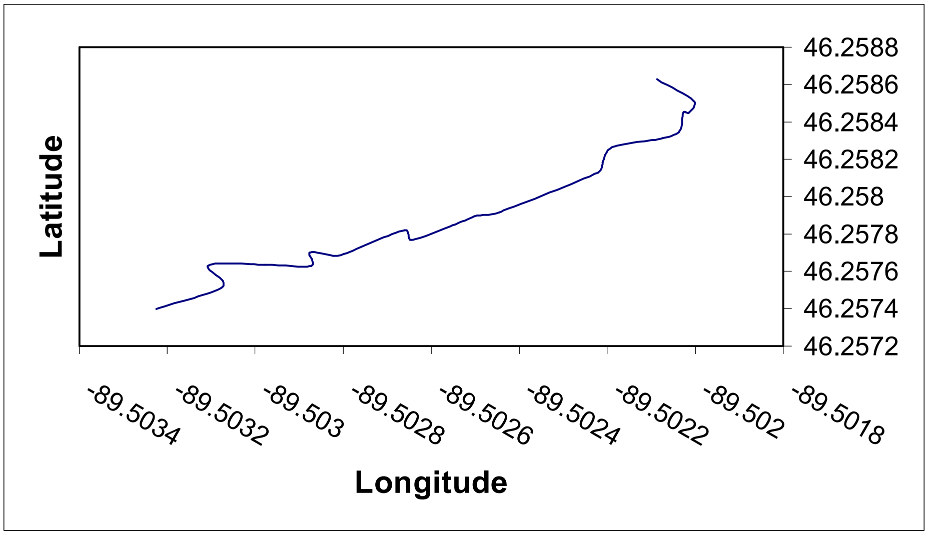


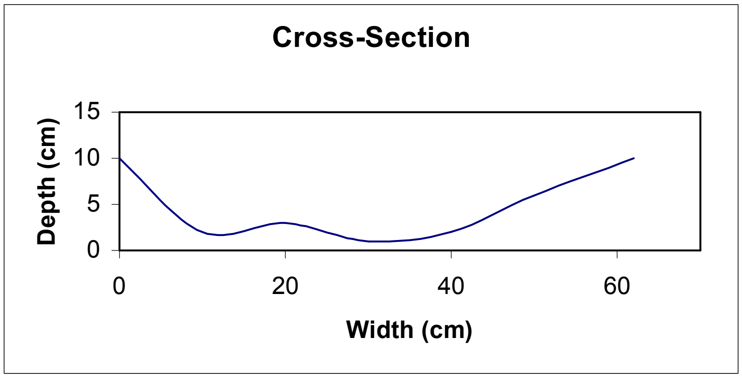


Ph	Temperature (Celsius)	Velocity (m/s)
7.7	19	2.33

Huckleberry Creek

Huckleberry creek is on the north end of the road leading to the NE gate and appears to drain the North Gate Bog into Ottawa National Forest. The first 50m consist of a mixed forest (aspen, fir, and maple) riparian zone and a substrate consisting of a 50/50 mix of pebble/sand. The forest ends abruptly and opens into a large grassland. This last 150m consists of a low-velocity, meandering channel with a 100% FPOM substrate. No aquatic life was observed, though the pH of 4.9 has a significant affect on the potential for biotic activity within the creek.

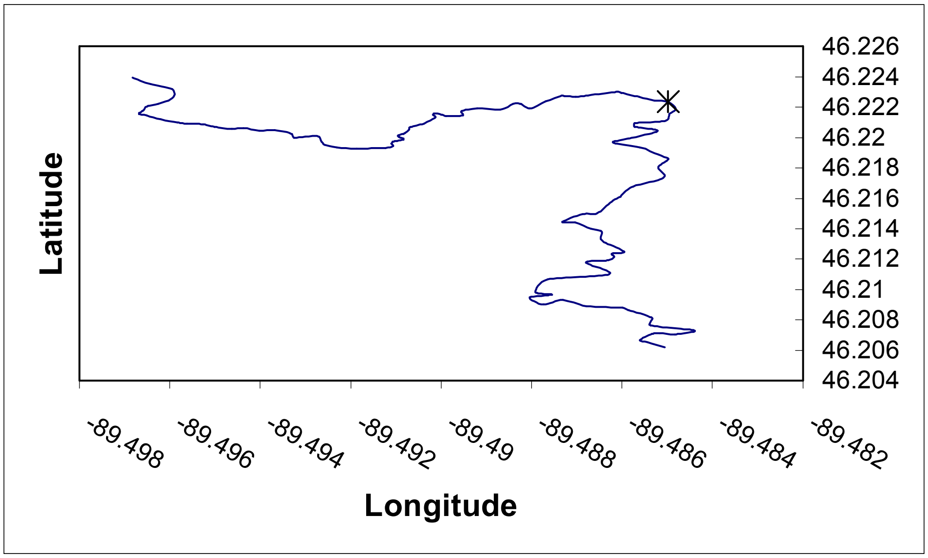


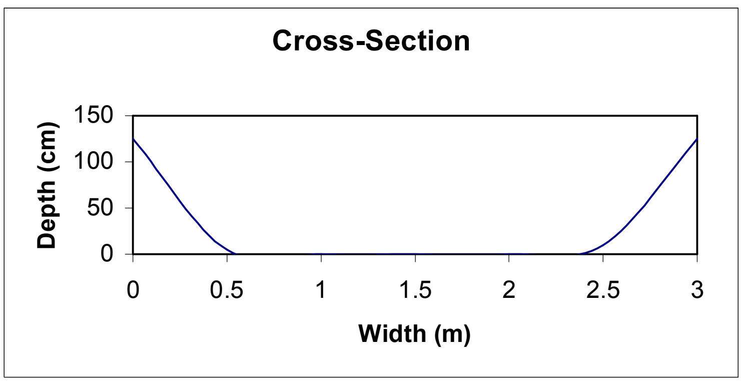


Ph	Temperature (Celsius)	Velocity (m/s)
4.9	20	0.3 to 0.1

Brown Creek

Brown Creek is actually a combined drainage of both Kickapoo and Brown lakes. The graph below begins at the northernmost point, which is Kickapoo Lake, and merges with the drainage from Brown Lake at the X marked below and together flow into Plum Lake. The two drainages are treated the same and denoted as Brown Creek due to nearly identical abiotic conditions. The channel has minimal variation in its dimensions and is characterized by nearly-stagnant flow and extensive beaver activity. More than 20 beaver damns (active and inactive) exist along or across the creek. Throughout the entire channel, the substrate is 100%FPOM (more than 1m deep at many points) and has an inner riparian zone 10-15m wide consisting of tall grasses and an outer riparian zone of mixed forest. Significant frog activity and some fish presence has been observed.

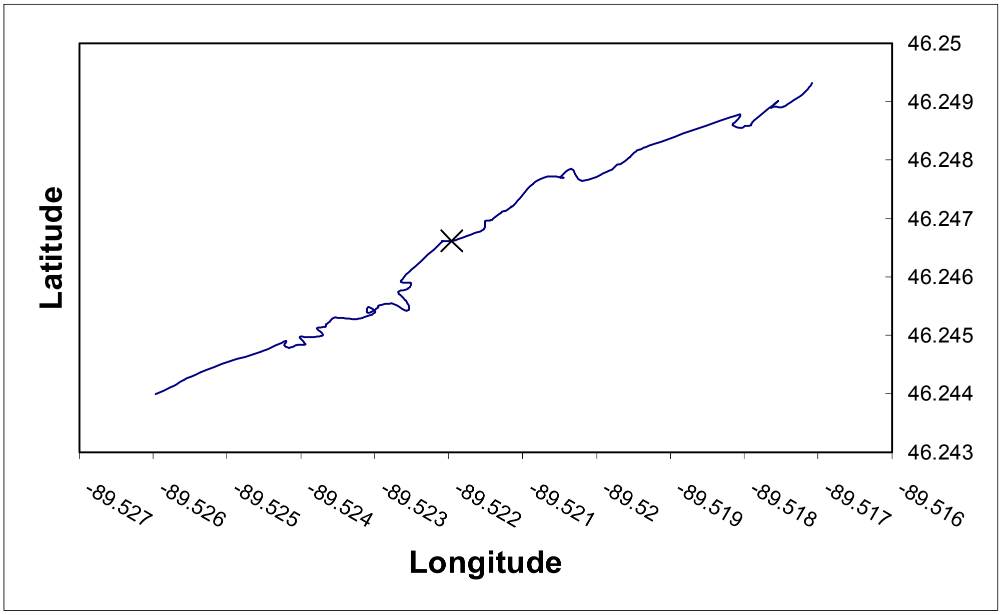


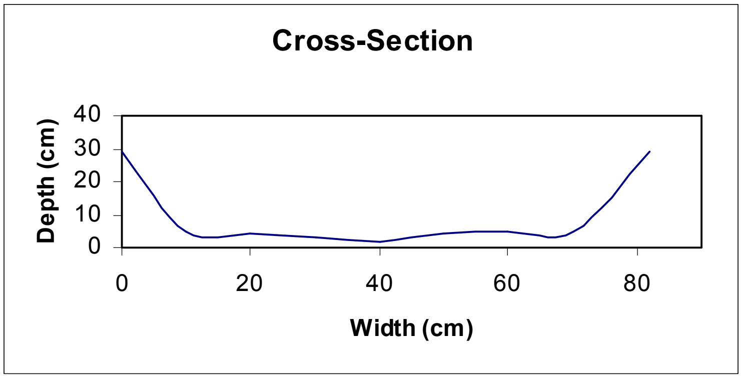


Ph	Temperature (Celsius)	Velocity (m/s)
7.8	21	0.1

Buck Creek

Buck Creek empties Bergner Lake into Tenderfoot Creek, and is a low-velocity stream with interspersed wetlands until it crosses the road. After this point, it becomes a well developed channel with minimal beaver activity, making it one of the better streams on property due to biotic activity and ease of access. There are many spots along this later-portion of the stream where large boulders line the bank. There is a well-developed riffle approx. 15m long at the X indicated below. It supports rooted macrophytes and a cobble/boulder substrate, and a dragon-fly molt was found along the bank, an indicator of increased aquatic insect activity along the stream. This later portion of the stream is also characterized by a 10m inner riparian zone of tall grasses and an outer riparian zone of mixed forest with conifers dominating the edge. The stream makes another major change once it enters very dense vegetation approx. 50m from Tenderfoot, and this change results in less pebbles and much more FPOM accumulation along bottom.

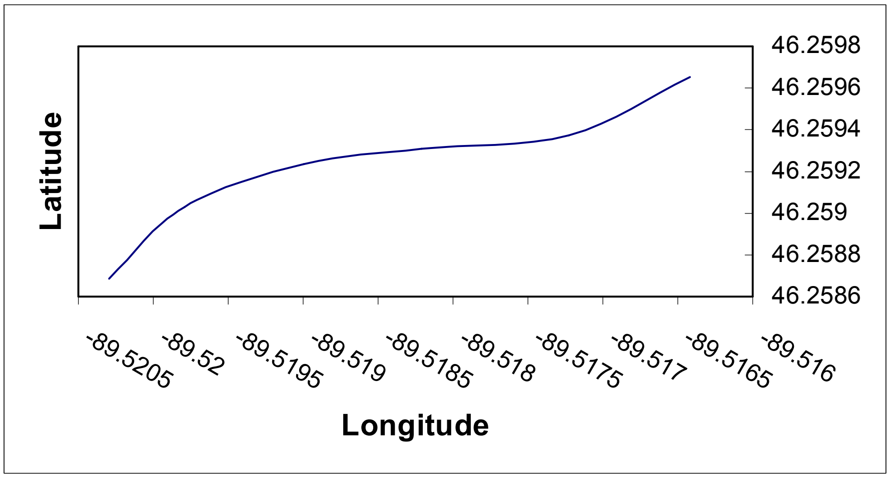


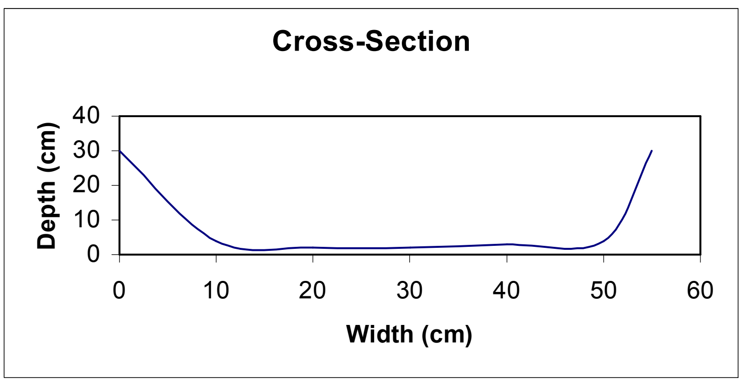


Ph	Temperature (Celsius)	Velocity (m/s)
6.3	22	0.3

Reddington Creek

Reddington Creek empties Reddington Lake into Morris Lake and the mouth of the creek can be accessed by canoeing across Morris. At the headwaters, the creek goes through a large wetland 50m wide and then becomes well developed for about 75m and is lined with tall grasses and some cattails. Along the final 100m, at the mouth of the creek, there is an eastern riparian zone consisting of shrubs and brush and occasional cedar, and the western riparian zone has an inner zone (15m) of shrubs, brush, and cedar and an outer zone of mixed forest. Water lilies line the channel for the last 25m of the creek. The substrate consists of 100% FPOM. There is obvious beaver activity within the region, though only 3 dams were visible along the channel. With the exception of frogs, no biotic activity was observed.

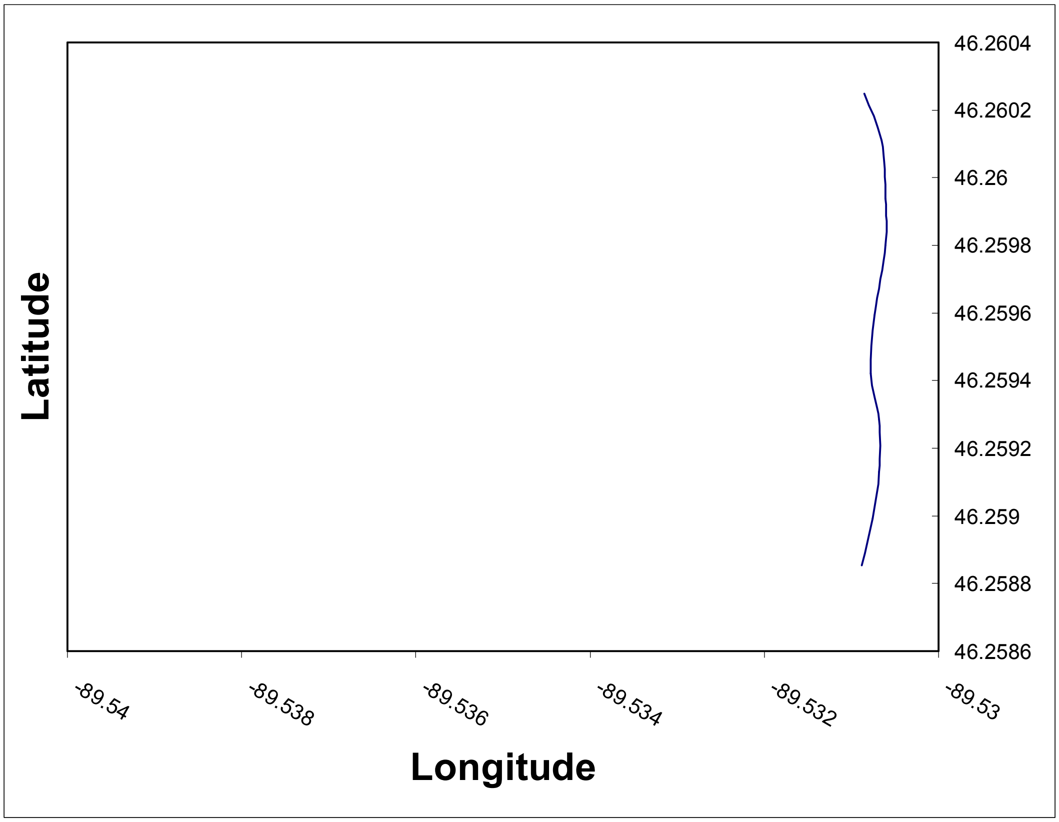


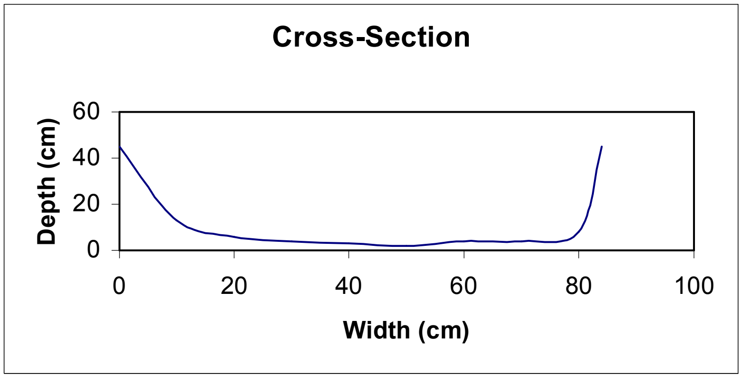


Ph	Temperature (Celsius)	Velocity (m/s)
6.8	21	0.05

Holiday Creek

Holiday Creek empties an extensive wetland (created partially by drainage of Morris Lake) into Tenderfoot Creek and begins at a culvert between Tenderfoot Creek and the North Gate. Dense brush with interspersed conifers makes up the riparian zone and is extremely difficult to maneuver through. A slight waterfall and a riffle are present at the headwaters and has a cobble substrate, but it tapers off to a less-stable, higher FPOM concentration after 50m.

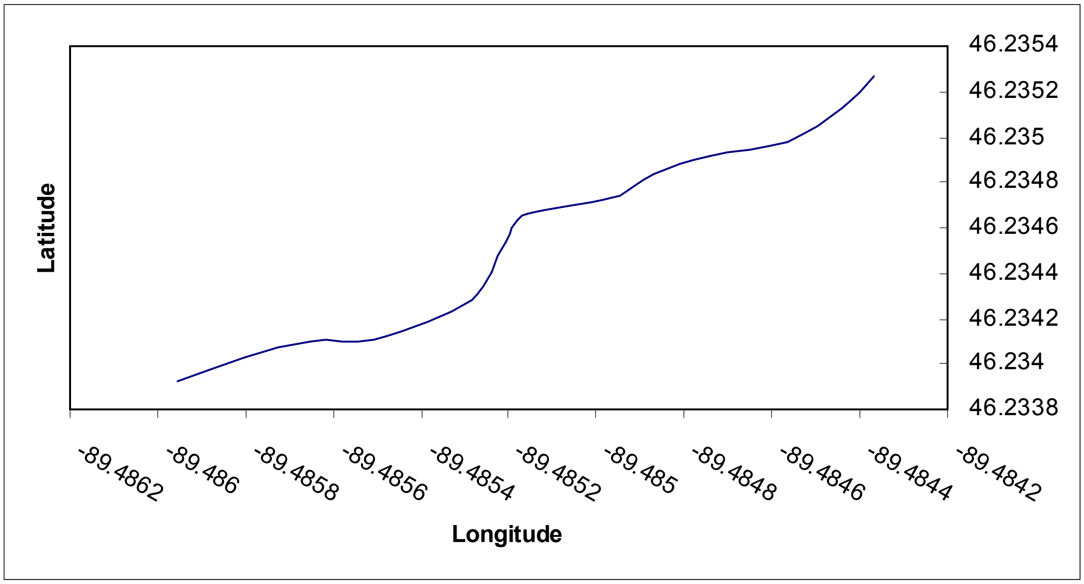


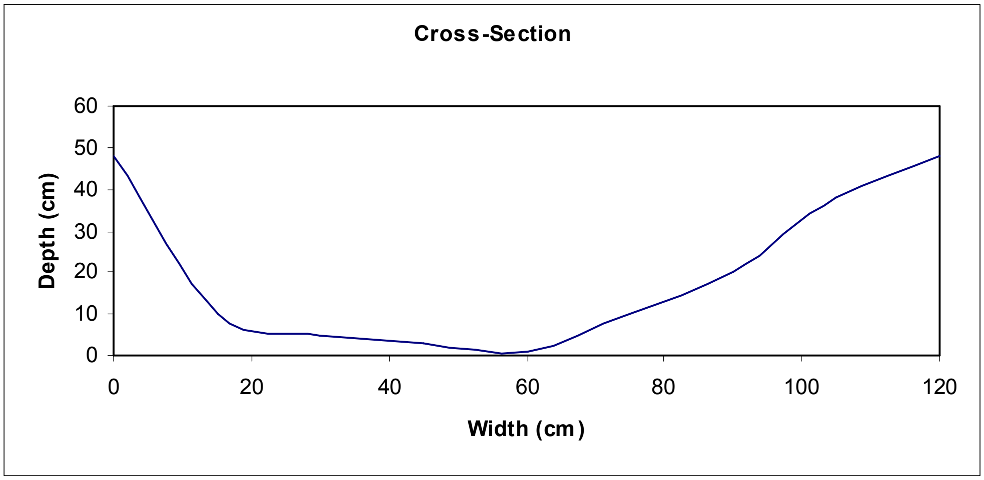


Ph	Temperature (Celsius)	Velocity (m/s)
7.1	18	3.5 at initial riffle, 1.2 avg.

Emiline Creek

Emiline Creek empties Emiline Lake into Kickapoo Lake. While most of this creek is a swampy wetland, there exists a portion of well-developed channel (approx 200m) at the headwaters, and this is the only section graphed and described below. The portion of the well-developed channel is actually off of Notre Dame property and within Ottawa National Forest, but the fact that it is one of the few true creeks found in the region would lend itself to a high potential for study and is therefore included within this survey. Emiline Creek's riparian zone consists of a mixed forest composed of mostly maple and some conifers. The first 175m are characterized by a shallow riffle with cobble (80%) and pebble (20%) substrate and has various log-jams within the channel and occasional sand-bar depositions along and within the stream. The stream varies from 1-2m in length and has no recorded depth due to the numerous cobbles that are above the surface. The last 25m are significantly deeper and this is the portion from which the cross-section below was taken. A waterfall approx 40cm high exists at this end of the stream. The stream empties into an extensive wetland with abundant beaver presence.

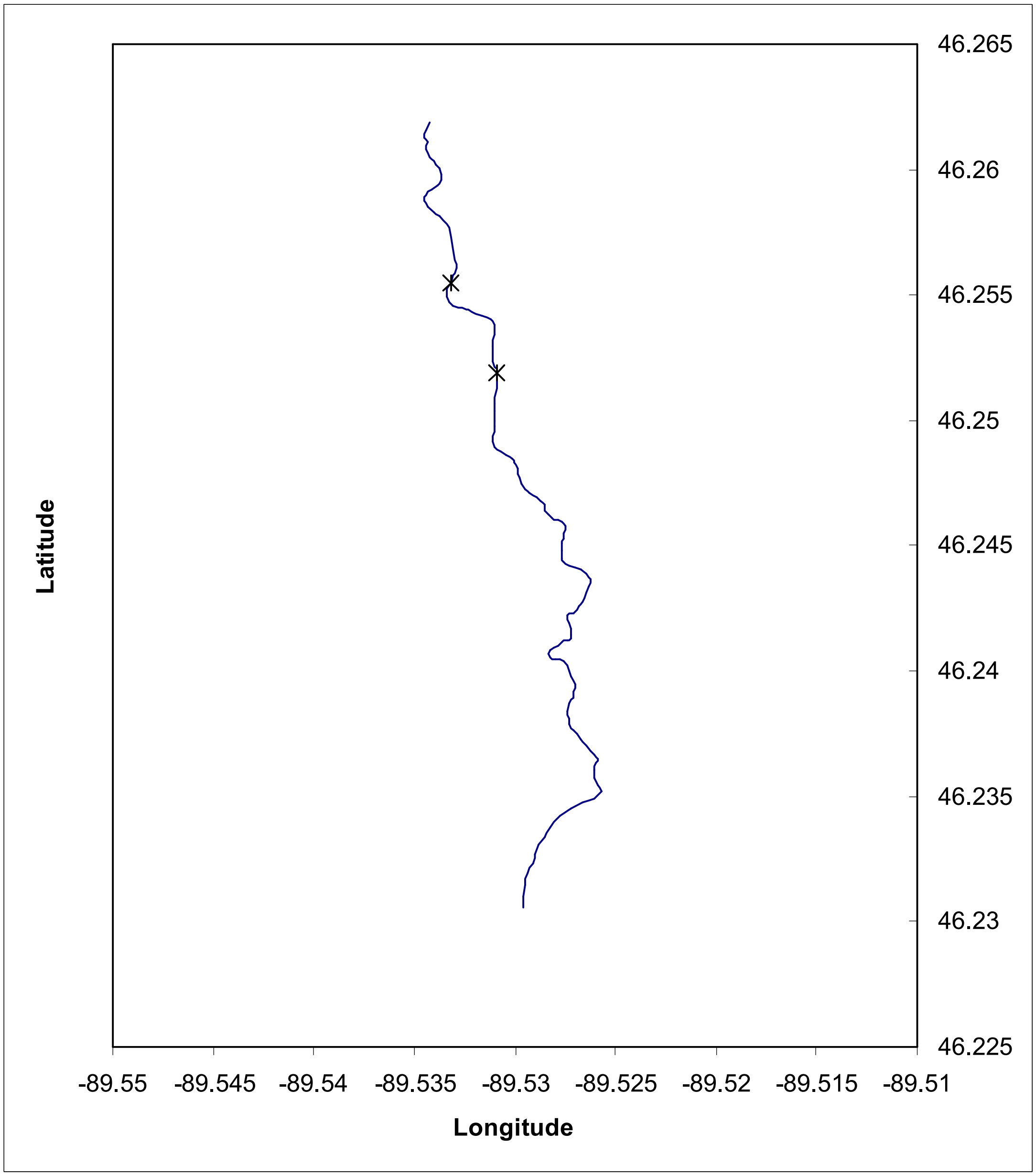


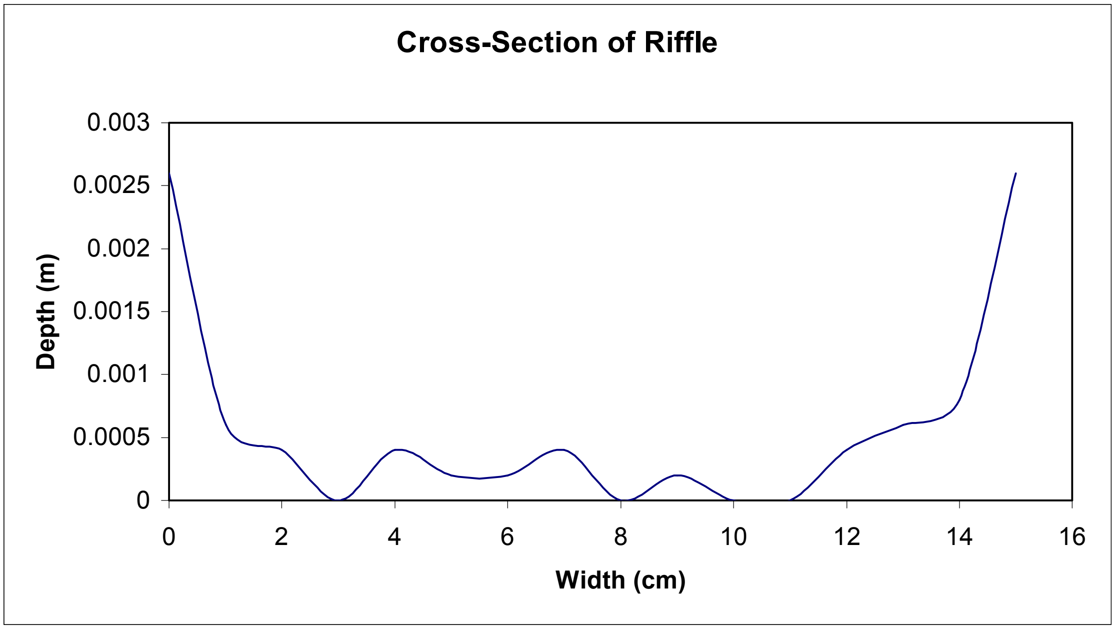


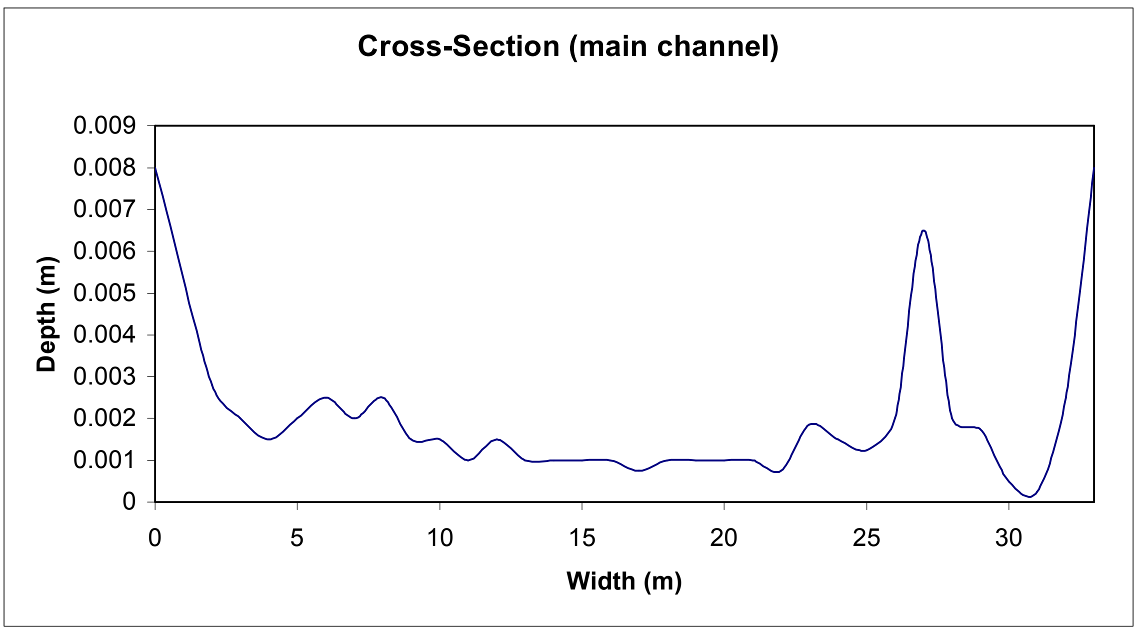
Ph	Temperature (Celsius)	Velocity (m/s)
7.2	21	3.46

Tenderfoot Creek

Tenderfoot Creek empties Tenderfoot Lake into the Ontonagon River. This is clearly the most prominent stream on property, and the graph/map below is the portion of the creek that exists on property, though it continues extensively beyond the graph. The entire stream has a riparian zone consisting of mixed forest, though conifers appear to dominate along the bank. Typha beds and water-lilies exist in fragmented segments along the bank and become more continuous towards the end of summer when they exist at nearly every point along the bank. The biological diversity of the flora and fauna is extremely high, as there are numerous minnows, tadpoles, turtles, snakes, and vegetation within the stream. There are two riffles on property (marked by X's below), and both can be accessed fairly easily by taking the road to the gravel pit on the north end of the property. Other than the riffles, the substrate consists of macrophytes and/or FPOM. The riffles are lined with boulders and brush and the substrate is 10% sand, 30% boulder, and 60% cobble.







Ph	Temperature (Celsius)	Velocity (m/s)
7.7	19.8	3-4.75

Ward Creek

Ward Creek empties Ward Lake into Morris Lake and can be accessed near the parking for Ward Lake. While it is mostly indistinguishable marshland, the first 50m are a significant, well-developed channel. The riparian zone consists of grasses and wooded shrubs. The substrate is mainly FPOM, though there is some cobble in the first 10m. Channel width is approximately 1m and depth is approx. 20cm.

Ph	Temperature (Celsius)	Velocity (m/s)
7.1	19	0.9

Tuesday Creek

Tuesday creek empties Tuesday Lake into Bay Lake. There is 25m of a .5m wide channel, but the channel quickly becomes fragmented into a wetland. After it crosses the now-closed road, there is extensive beaver activity, and more than 200m of damed-up wetlands. This continues until Bay Lake, as no single channel drains the beaver ponds and instead is fragmented into various drainage run-offs. No measurements of this practically non-existent stream were recorded.

Hummingbird Creek

Hummingbird Creek is a 30m long, 1m wide channel that empties Hummingbird Bog into Bay Lake. There is no recordable flow and biotic flow between the two lakes is restricted by a mesh fence that would only allow for the passage of small minnows. Frogs exist all along the channel. The stream was dried up along and fragmented into small pools mid-way through the summer. No measurements of this creek were recorded.

Acknowledgements

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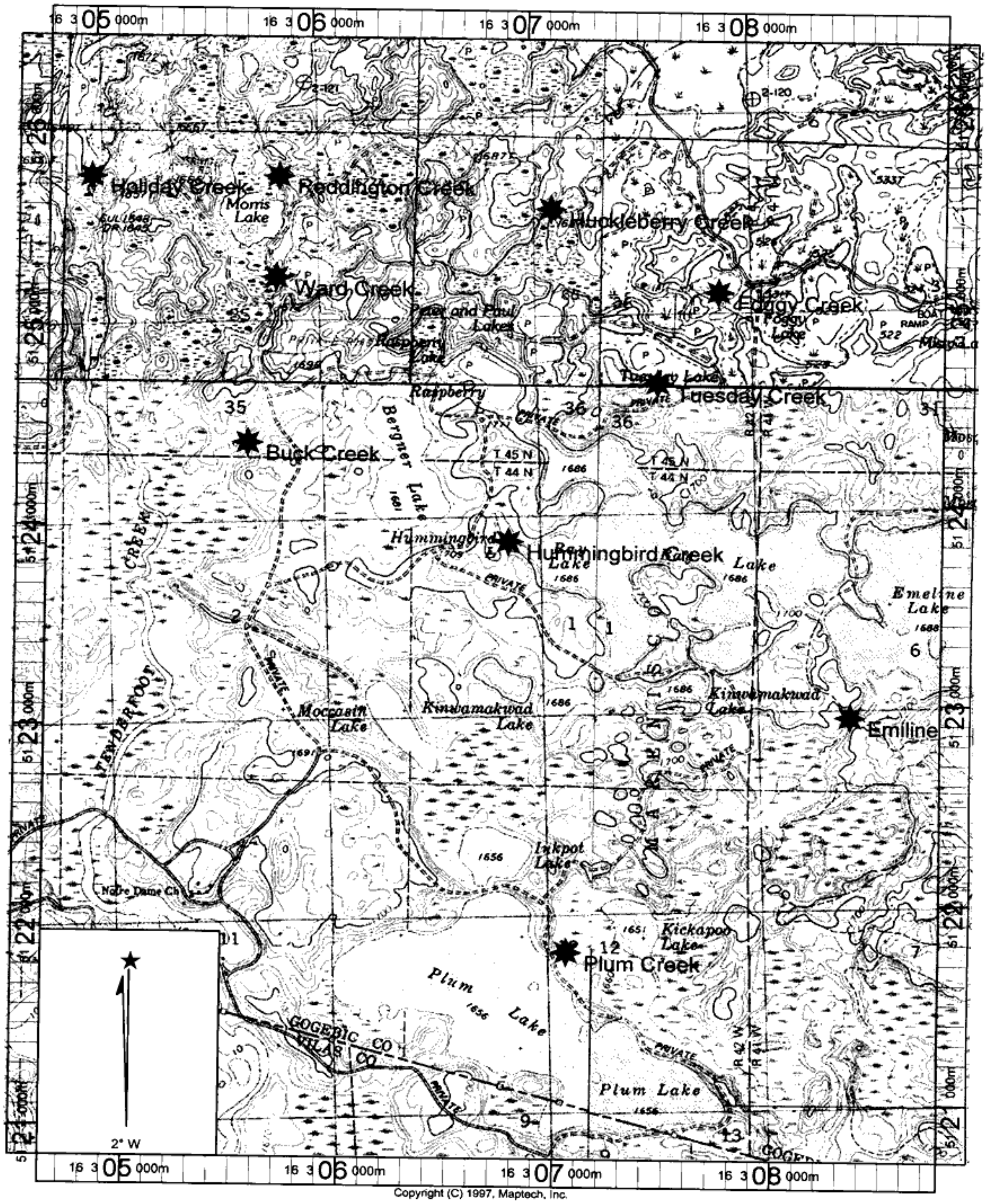

Figure 1. This figure shows the location of all the streams on property. Tenderfoot and Brown creeks are not included because their location has been previously recorded.