

Muskoka River Watershed IWM Natural Capital Inventory

Addendum 5: Aquatic Ecosystem Classification

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN

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November 9th, 2023

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DISCLAIMER

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1. INTRODUCTION AND OBJECTIVES

The Ontario Aquatic Ecosystem Classification (AEC) program was developed as a framework for characterizing the ecological nature of streams and rivers based on their physical attributes (e.g., stream velocity) and watershed characteristics (e.g., drainage area) (Jones and Schmidt, 2022). The purpose of the AEC program is to reduce the complexity of viewing and understanding aquatic networks by utilizing a consistent and quantitative approach for standardized data collection and watershed analysis. Applications of the classification system include supporting planning and policy development, fisheries management, landscape planning, and overall decision-making.

The current AEC dataset for the Muskoka River Watershed is a course-scale adaptation of the Ontario Integrated Hydrology (OIH) data and Ontario Hydro Network (OHN), with headwater features being trimmed to include only those with an upstream catchment area of 1km^2. Attributes within the AEC are also calculated primarily from the OIH Digital Elevation Model (DEM), which has a cell size of 30m. This standardization of the data aids in province-wide analysis but leaves managers lacking information when it comes to fine-scale decision making and screening.

This report provides the methods and analysis results associated with the application of the AEC criteria to the detailed watercourse network developed for the Muskoka River Integrated Watershed Management study as part of the Natural Capital Inventory (NCI) project.

2. METHODS

Aquatic Ecosystem Classification mapping processes and techniques were applied to the Muskoka River Watershed LiDAR watercourses to quantify general attributes using a combination of existing data and modeling. Primary attributes were calculated including:

- Reach
- Reach Slope
- Reach Catchment Area
- Velocity Class
- Network Line Type

Spatial attributes were calculated using the 2019 LiDAR Digital Terrain Model (DTM) at a resolution of 0.5m. Given the high resolution of the LiDAR watercourses, a catchment area threshold was created at the pour point for 3rd order streams to minimize the processing requirement for higher order streams.

Phase 1 of the Muskoka River Integrated Watershed Management NCI saw the creation of a complete watershed from a newly acquired high resolution DTM (0.5m). These features were then merged with existing main channel features (3rd Strahler Order and greater) to ensure drainage paths retained the highest level of accuracy when AEC are applied.

At the core of the AEC are the attributes; segmenting the features based on reach, slope, catchment area, velocity class and network line class. Applying this framework to the newly created LiDAR watercourses will allow for a greater understanding of feature types across the watershed.

Reach & Network Line Type

Reach, or total length, is the distance between "nodes" within the network. Each line is split at every intersection with another feature, creating a network that branches out continuously from a single source, or sink. The total distance was calculated within ArcGIS Pro and applied to each individual feature. The features were then categorized into "real" or "virtual" flow depending on where they were found on the landscape. Watercourses that occur inside lakes or aquatic environments are considered virtual, while those in terrestrial environments are assumed to have a defined channel and represent "real" flow across the landscape.

Reach length was calculated based purely on the watercourses created in the Muskoka River IWM Natural Capital Study. As well, "pseudo-nodes" within the network, which are breaks in the lines not at a junction, were removed. The resulting network line type is based on whether the feature intersects with a "waterbody" in the Ontario Hydro Network data. Reaches were also broken at catchment area divides.

Slope & Velocity Class

Slope is an important factor for determining potential watercourse velocity, or current. Current class can influence sediment load as well as food availability and delivery within a feature. Slope was calculated as the rise over run, or the start elevation minus the final elevation divided by the reach length. Feature nodes were created at the ends of each watercourse and elevations were extracted from the LiDAR DTM (0.5m). The AEC velocity classification was then applied to individual features, with channel slopes equal to or less than 0.1% being "slow" moving, and those above 0.1% being considered "fast" (Jones and Schmidt, 2022).

Slope was calculated by taking the start and end nodes of each line (created using the "Points along Line" tool) and then using "Sample" to get the elevation at each point from the DEM. These points were then exported as a csv. In the table the downstream node value was subtracted from the upstream value, giving the drop in elevation along the line. Then this was joined back into the watercourse feature class by UID, divided by the reach distance (Rise over Run) and multiplied by 100 to get the % Slope. Velocity class was simply done using the select by attributes tool to apply the framework mentioned above.

Upstream Catchment Area

Feature catchments are an important factor in determining how water drains within a hyrdo-network and can be useful for calculating additional attributes at an individual level. Catchments were derived from the LiDAR DTM by utilizing the Watershed tool in ArcGIS Pro. "Watershed" requires the input of a Flow Direction raster, which shows where water is predicted to exit each 'cell' within the study area. The flow direction was computed using a "filled" DEM which removes all sinks, ensuring that there are no areas where flow cannot escape a cell. Feature "pour points" were also generated using the nodes created during the reach calculation. Pour points were snapped to cells with the highest flow based on a 10m radius, additionally ensuring catchments did not have incomplete drainage. Catchments were given a unique ID and area calculations were performed for each feature. Catchment pour points we placed at the start of 3rd order and higher reaches - starting where two 2nd order steams intersected. Pour points were snapped to the highest cell value in the flow accumulation raster within 20m. Catchments were then mapped using the flow direction raster and pour points.

Turbidity

Turbidity was calculated using Ontario Surficial Geology data and the aforementioned catchment feature class. All areas that primarily consist of clay within the watershed were extracted and formed the base of the turbidity calculations. Clay areas were applied to the catchment feature class, and the area of overlap of each was calculated as a percentage. The following framework was then be applied:

- Selected surficial geology types that contained clay in their primary material
- Calculate the percent of clay area within each catchment
- Streams in catchments with >= 10% clay were attributed as turbid

Temperature Class/ Average July Temp

Given the lack of climactic weather station data within the watershed, as well as the need for additional in-stream data loggers, this attribute could not be calculated for the majority of watercourse/stream reaches. When the province develops a valid predictive model for estimating temperature class utilizing various landcover characteristics, the model can be applied to the current network to attribute the predicted temperature class (Jones et al. 2001). Where available, temperature classes were pulled from the province's GeoHub and the District's mapping of cold streams.

3. RESULTS AND DELIVERABLES

The associated reach length of each preliminary AEC class is documented in Table 1. Mapping for the preliminary AEC is presented at the watershed scale (Map 1) and within each subwatershed (Map 2). The resulting AEC for the refined watercourse network resulted in attributing the associated temperature class for a restricted number of features, and turbidity class and channel slope class for all features (Table 1).

In total, temperature class was identified for approximately 892 km of the watercourse network; 658.5 km as Cold, 194.6 km as Cold-Cool transitional, and 39.2 km as Warm. Cool or Cool-Warm transitional classes were not identified in any subwatershed. The remaining 16,745 km of the watercourse network did not have temperature class identified (13,166 km) or included 'virtual' watercourses associated with waterbodies (3579 km).

Among the other broader class types across the watercourse network was classified as:

- 13,010 km as Clear and 1048 km as Turbid
- 12299 km as Fast and 1759 km as Slow
- 11372.5 km was identified as Clear/Fast and 1637.5 km as Clear/Slow
- 927 km as Turbid/Fast and 121 km as Turbid/Slow

As noted in the methodology, temperature classes could not be delimited for the majority of the watercourse network given the lack of available data on climatic weather stations and/or data from in-stream data loggers. Where AEC data was available from the province or District, it was included for reaches that are identified as Cold, Cool-Warm Transitional, or Warm. Cold watercourses were present in all but four subwatersheds and generally decreased in representation within subwatersheds moving from the upper watershed to the lower watershed (notably, absent in the lower subwatersheds). The representation

of the Cool-Warm Transitional class increased in the middle subwatersheds. Warm watercourses were only represented in lower subwatersheds (Moon River Bay and Musquash River).

The general trend for Turbidity classes was that Clear watercourses had the highest representation in the upper subwatersheds, followed by the lower subwatersheds. The lower representation of Clear watercourses, and conversely higher representation of Turbid watercourse, within the middle subwatersheds was largely affected by the Turbidity classes for Lake Rosseau, and Lake Muskoka – Muskoka River subwatersheds where the contribution of Turbid watercourses was over 20%.

The general trend for Slope classes was a progressive decrease in representation of Fast watercourse class from the upper watershed to lower watershed. The upper subwatersheds had approximately 94% Fast and 6% Slow, middle subwatersheds approximately 86% Fast and 13% Slow, and the lower subwatersheds approximately 78% Fast and 22% Slow.

Table 1. Aquatic Ecosystem Classification summary for each Muskoka River subwatershed. Subwatersheds are organized by their relative positive in the watershed from the lower watershed (west), middle watershed, and upper watershed (east).

Aquatic Ecosystem Classification Characteristics				Watercourse Network Length (km)													
				Lower Subwatersheds			Middle Subwatersheds							Upper Subwatersheds				
Temperature Class	Turbidity	Slope	Classification Code	Blackstone Harbour	Moon River Bay	Musquash River	Lake Rosseau	Lake Muskoka - Muskoka River	Lake Vernon	North Branch Muskoka River	South Branch Muskoka River Outlet	Little East River - Big East River	Baysville Narrows - South Branch Muskoka River	Distress Pond - Big East River	Oxtongue River Outlet	Hollow River	Tea Lake - Oxtongue River	Classification Type Total
Cold	Clear	Fast	CDCF				28.0	31.8	46.0	162.2	39.3	67.0	57.5	36.6	17.0	0.3		*485.5*
		Slow	CDCS				12.9	12.6	25.1	12.6	22.2	9.4	9.1	6.8	2.7			*113.4*
	Turbid	Fast	CDTF				14.1	9.4	1.6	14.1	1.0	5.0	1.7					*46.9*
		Slow	CDTS				7.9	1.5		0.3		2.7	0.2					*12.7*
Cold-Cool Transitional	Clear	Fast	CWCF					4.8	0.1	38.0	46.2	3.6	0.4					*93.3*
		Slow	CWCS				0.0	16.0		30.1	33.0	7.1						*86.2*
	Turbid	Fast	CWTF							5.0	2.1	0.4						*7.5*
		Slow	CWTS						<0.1	2.9	2.1	2.6						*7.6*
Warm	Clear	Fast	WMCF		21.9	0.5												*22.4*
		Slow	WMCS		16.8													*16.8*
Not Classified	Clear	Fast	XXCF	287.0	483.4	697.4	1280.2	668.9	865.8	898.4	883.6	603.4	703.6	1110.4	669.0	890.5	729.7	*10771.3*
		Slow	XXCS	60.5	145.4	209.5	177.6	144.0	144.3	100.0	118.0	56.7	51.7	51.1	75.1	47.5	39.7	*1421.1*
	Turbid	Fast	XXTF	14.6	32.3	20.3	331.1	214.5	50.3	125.6	11.5	13.2	31.6			24.9	2.5	*872.3*
		Slow	XXTS	2.2	5.7	10.2	32.1	29.9	3.9	10.5	0.1	4.1	0.5			1.6	<0.1	*101.0*
Waterbody			WBDY	149.6	166.4	212.0	526.4	360.7	144.6	186.8	152.3	125.6	273.9	345.9	174.2	378.8	381.7	*3578.9*
Subwatershed Total				*514.0*	*871.9*	*1149.8*	*2410.3*	*1494.1*	*1281.7*	*1586.5*	*1311.5*	*900.8*	*1130.3*	*1550.7*	*938.0*	*1343.6*	*1153.6*	*17636.8*

Respectfully Submitted,



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Ecology Manager

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Jones, N.E. and B.J. Schmidt. 2022. Aquatic ecosystem classification for Ontario's rivers and streams, version 2. Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Science and Research Technical Report TR-47. 30 p. + appendices.

Jones, N.E., B.J. Schmidt, I.A. Sutton, and K. Ghunowa. 2021. Thermal habitat of flowing waters in Ontario: prediction and classification. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Science and Research Technical Report TR-43. 23 p.

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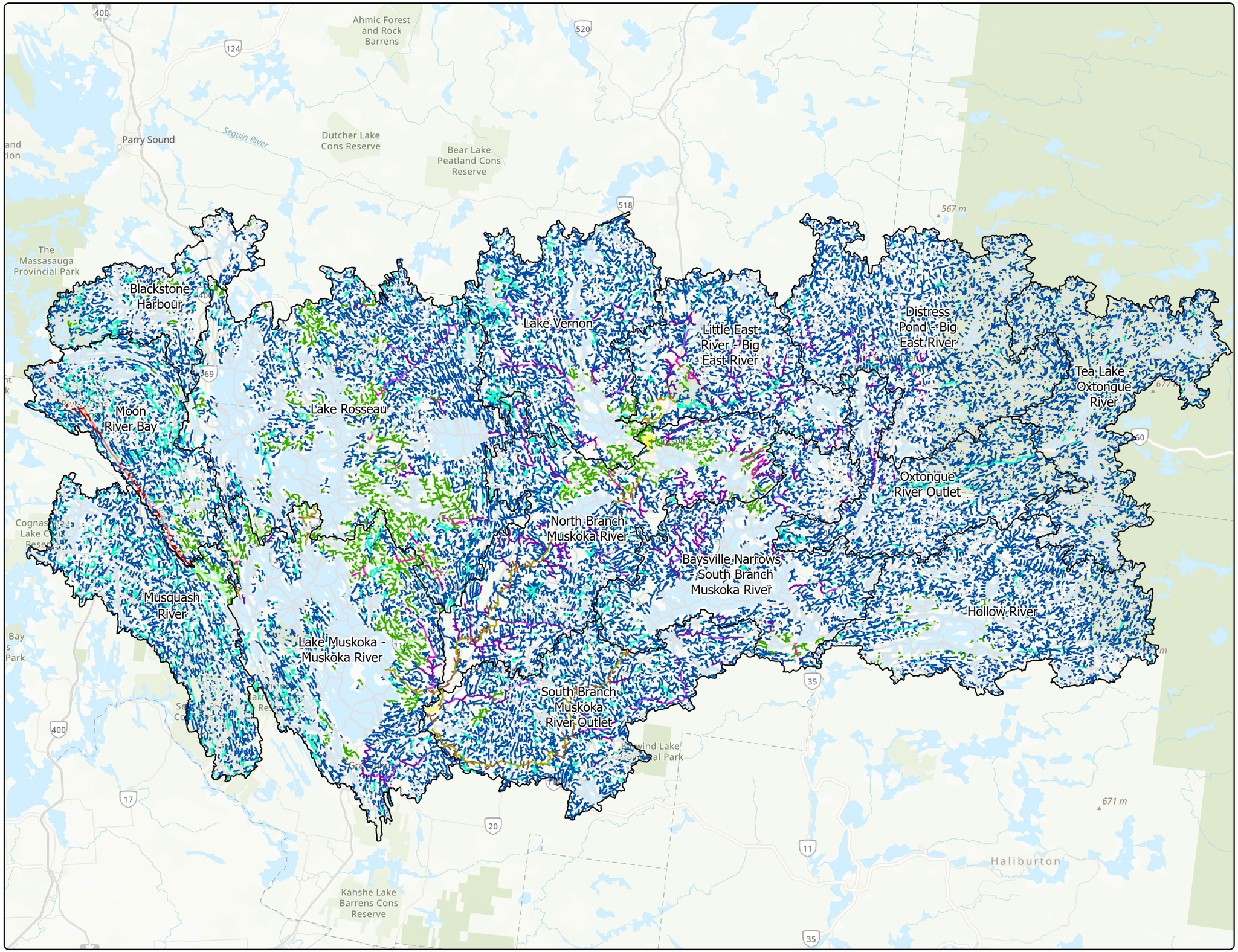

Map 1: Aquatic Ecosystem Classification

Muskoka River Watershed IWM -
Natural Capital Inventory
Addendum 5: Aquatic Ecosystem Classification

Aquatic Ecosystem Classification

- CDCF (Cold, Clear, Fast)
- CDCS (Cold, Clear, Slow)
- CDTF (Cold, Turbid, Fast)
- CDTS (Cold, Turbid, Slow)
- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 3,500 7,000 14,000
Metres

1:380,000

North American 1983 CSRS UTM Zone 17N

Basemap Source: Province of Ontario, Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, NRCan, Parks Canada

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DATE: 03, November 2023

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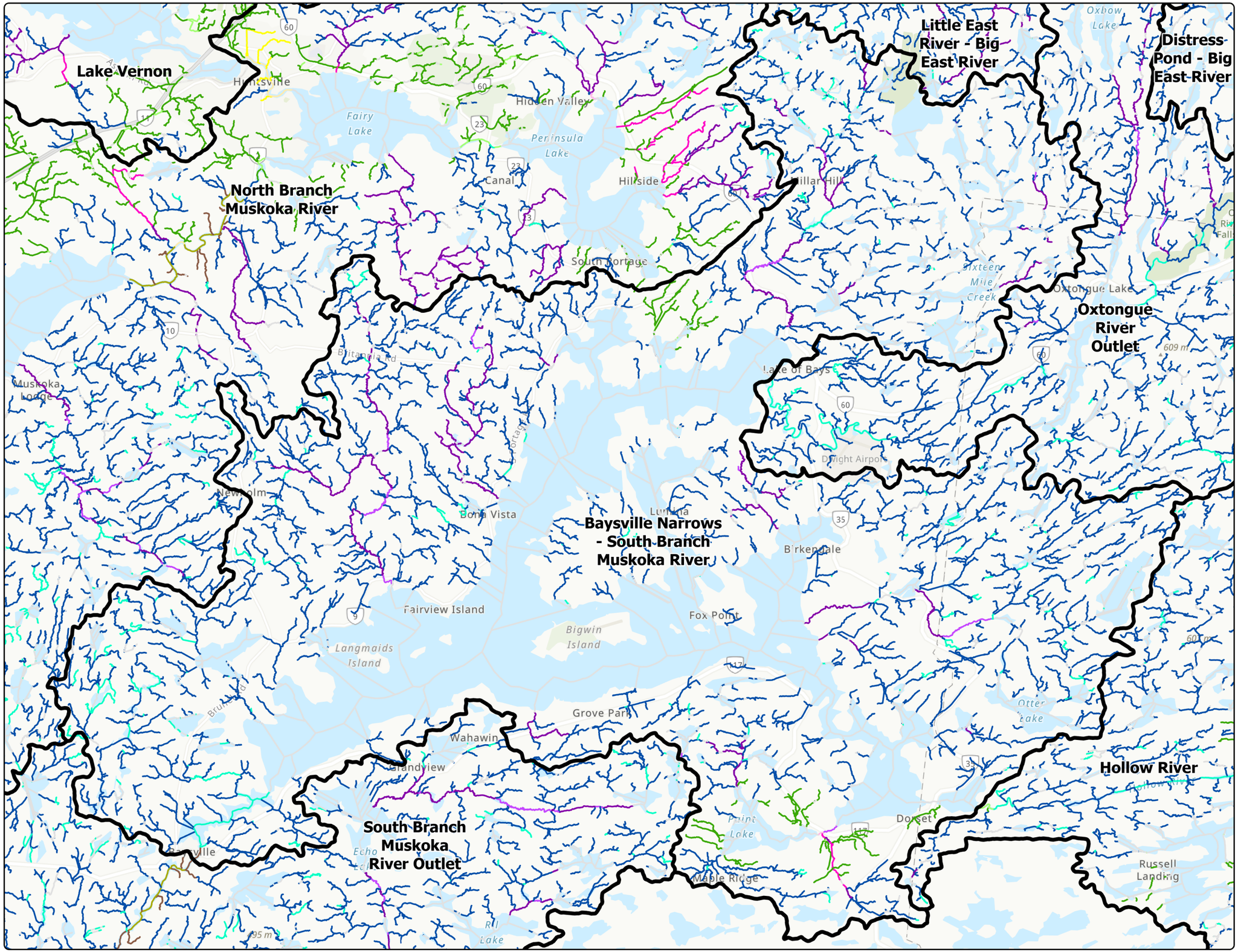

Map 2-1: Aquatic Ecosystem Classification Baysville Narrows - South Branch Muskoka River

Muskoka River Watershed IWM -

Aquatic Ecosystem Classification

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- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 500 1,000 2,000
Metres

1:99,000

North American 1983 CSRS UTM Zone 17N

Basemap Source: Province of Ontario, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

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Map 2-2: Aquatic Ecosystem Classification Blackstone Harbour

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Addendum 5: Aquatic Ecosystem Classification

Aquatic Ecosystem Classification

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- CWTS (Cool-warm, Turbid, Slow)
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- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 500 1,000 2,000
Metres

1:77,000

North American 1983 CSRS UTM Zone 17N

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Map 2-3: Aquatic Ecosystem Classification
Distress Pond - Big East River

Muskoka River Watershed IWM -
Natural Capital Inventory
Addendum 5: Aquatic Ecosystem Classification

Distress Pond - Big East River

Little East River - Big East River

North Branch Muskoka River

Baysville Narrows South Branch Muskoka River

Oxtongue River Outlet

Tea Lake - Oxtongue River

Aquatic Ecosystem Classification

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- CDTS (Cold, Turbid, Slow)
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- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 1,000 2,000 4,000
Metres

1:105,000

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Map 2-4: Aquatic Ecosystem Classification Hollow River

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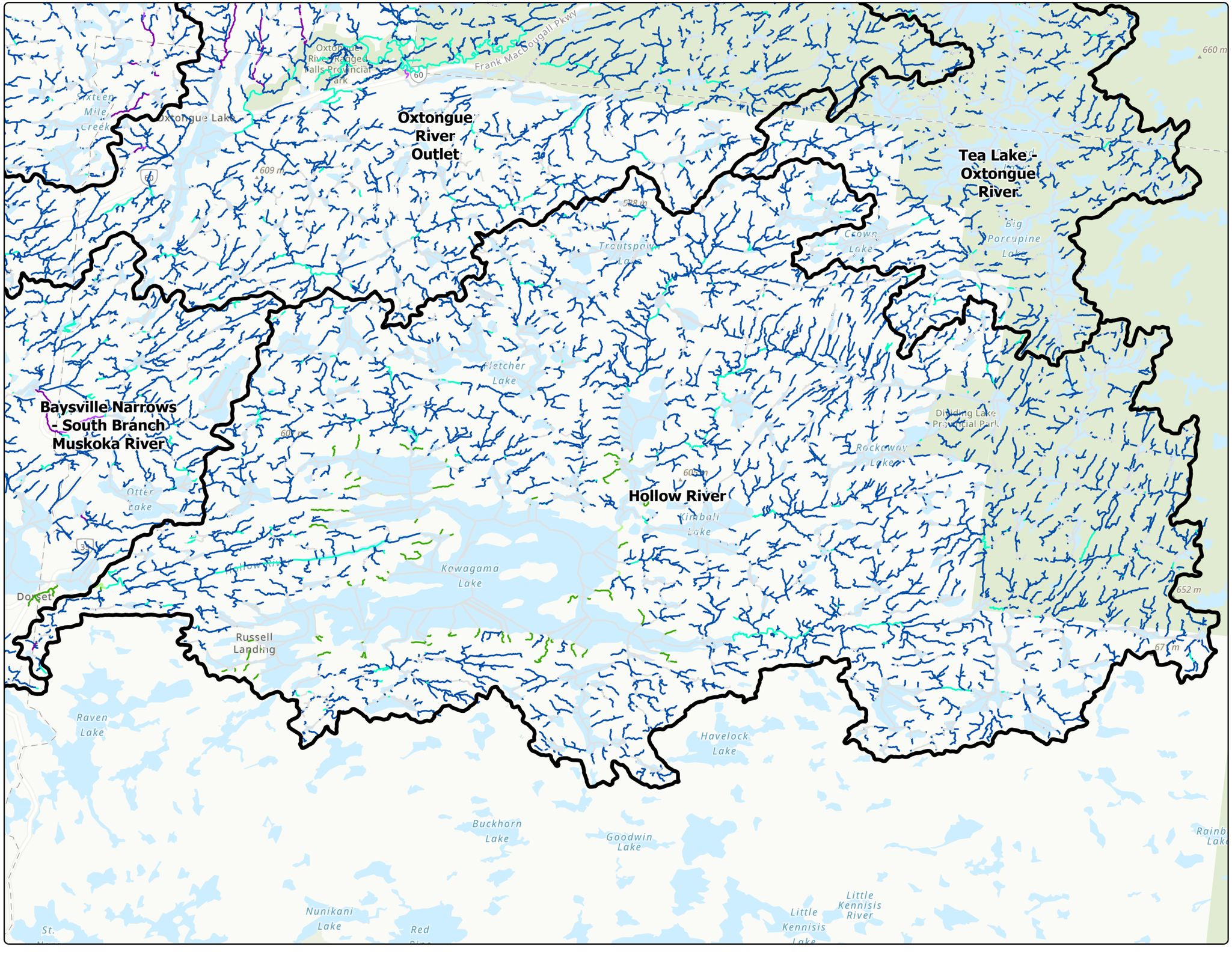
Addendum 5: Aquatic Ecosystem Classification



0 1,000 2,000 4,000
Metres

1:109,000

North American 1983 CSRS UTM Zone 17N

Aquatic Ecosystem Classification

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Map 2-5: Aquatic Ecosystem Classification
Lake Muskoka - Muskoka River

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Quaternary Watersheds

Moon River Bay

Lake Rosseau

North Branch Muskoka River

Musquash River

Lake Muskoka - Muskoka River

South Branch Muskoka River Outlet

0 1,250 2,500 5,000
Metres

1:142,000

North American 1983 CSRS UTM Zone 17N

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Map 2-6: Aquatic Ecosystem Classification Lake Rosseau

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- XXTS (Unknown, Turbid, Slow)
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Quaternary Watersheds

0 1,250 2,500 5,000
Metres

1:145,000

North American 1983 CSRS UTM Zone 17N

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PROJECT: DA21-086-02

CLIENT: District of Muskoka

DATE: 03, November 2023

DRAWN BY: J. Lacsamana / J. Sauder

Map 2-7: Aquatic Ecosystem Classification Lake Vernon

Muskoka River Watershed IWM - Natural Capital Inventory
Addendum 5: Aquatic Ecosystem Classification

Aquatic Ecosystem Classification

- CDCF (Cold, Clear, Fast)
- CDCS (Cold, Clear, Slow)
- CDTF (Cold, Turbid, Fast)
- CDTS (Cold, Turbid, Slow)
- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 1,000 2,000 4,000
Metres

1:106,000

North American 1983 CSRS UTM Zone 17N

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DATE: 03, November 2023

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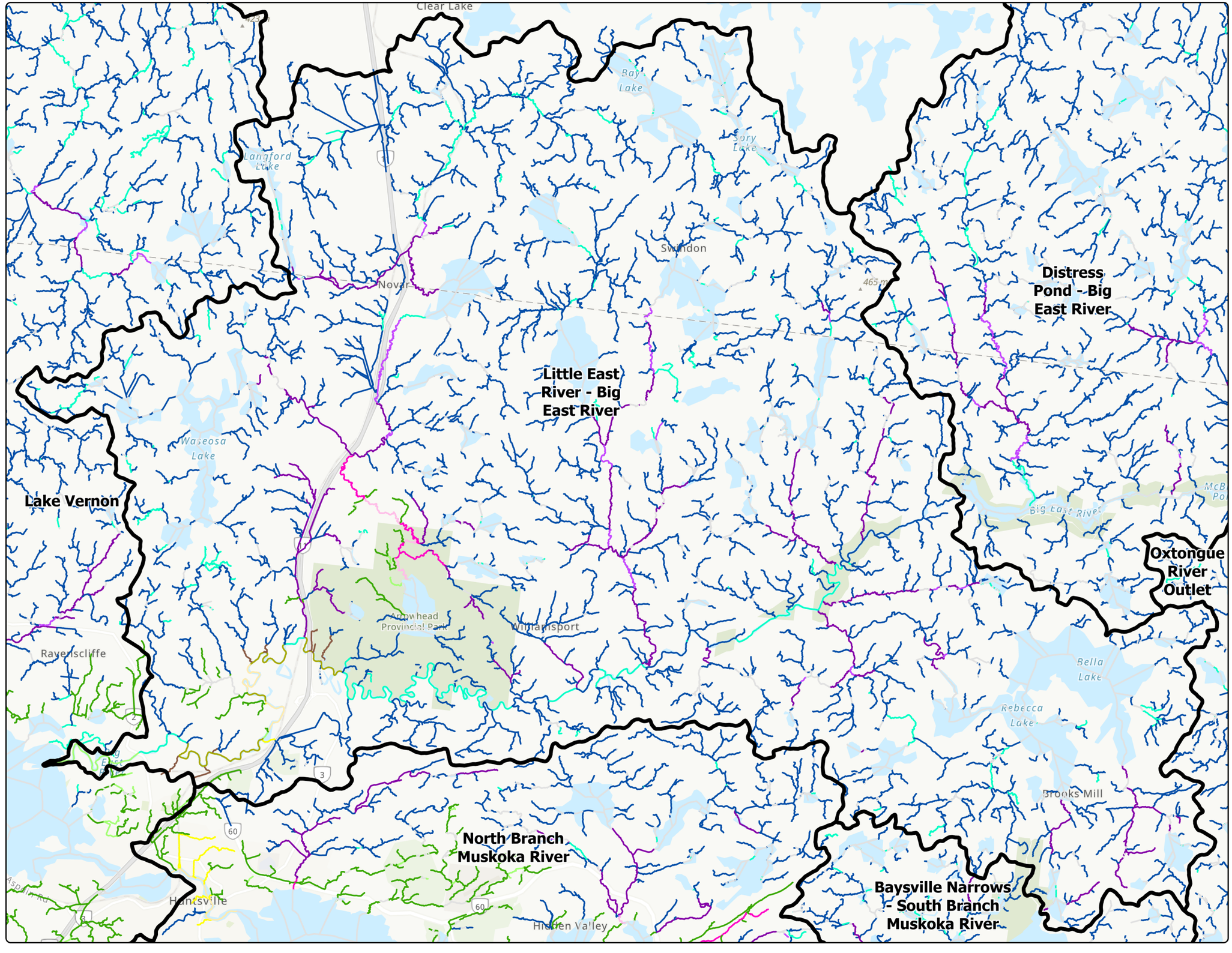

Map 2-8: Aquatic Ecosystem Classification
Little East River - Big East River

Muskoka River Watershed IWM -
Natural Capital Inventory
Addendum 5: Aquatic Ecosystem Classification

Aquatic Ecosystem Classification

- CDCF (Cold, Clear, Fast)
- CDCS (Cold, Clear, Slow)
- CDTF (Cold, Turbid, Fast)
- CDTS (Cold, Turbid, Slow)
- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 500 1,000 2,000
Metres

1:77,000

North American 1983 CSRS UTM Zone 17N

Basemap Source: Province of Ontario, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

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Map 2-9: Aquatic Ecosystem Classification Moon River Bay

Muskoka River Watershed IWM - Natural Capital Inventory
Addendum 5: Aquatic Ecosystem Classification

Aquatic Ecosystem Classification

- CDCF (Cold, Clear, Fast)
- CDCS (Cold, Clear, Slow)
- CDTF (Cold, Turbid, Fast)
- CDTS (Cold, Turbid, Slow)
- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 500 1,000 2,000
Metres

1:97,000

North American 1983 CSRS UTM Zone 17N

Basemap Source: Province of Ontario, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

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Map 2-10: Aquatic Ecosystem Classification Musquash River

Muskoka River Watershed IWM - Natural Capital Inventory
Addendum 5: Aquatic Ecosystem Classification

Aquatic Ecosystem Classification

- CDCF (Cold, Clear, Fast)
- CDCS (Cold, Clear, Slow)
- CDTF (Cold, Turbid, Fast)
- CDTS (Cold, Turbid, Slow)
- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

Moon River Bay

Musquash River

Lake Rosseau

Lake Muskoka - Muskoka River

0 1,000 2,000 4,000
Metres

1:127,000

North American 1983 CSRS UTM Zone 17N

Basemap Source: Province of Ontario, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

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Map 2-11: Aquatic Ecosystem Classification North Branch Muskoka River

Muskoka River Watershed IWM - Natural Capital Inventory
Addendum 5: Aquatic Ecosystem Classification

Aquatic Ecosystem Classification

- CDCF (Cold, Clear, Fast)
- CDCS (Cold, Clear, Slow)
- CDTF (Cold, Turbid, Fast)
- CDTS (Cold, Turbid, Slow)
- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

Lake Rosseau

Lake Vernon

Little East River - Big East River

North Branch Muskoka River

Oxtongue River Outlet

Baysville Narrows - South Branch Muskoka River

Lake Muskoka - Muskoka River

South Branch Muskoka River Outlet

Hollow River

0 1,000 2,000 4,000
Metres

1:124,000

North American 1983 CSRS UTM Zone 17N

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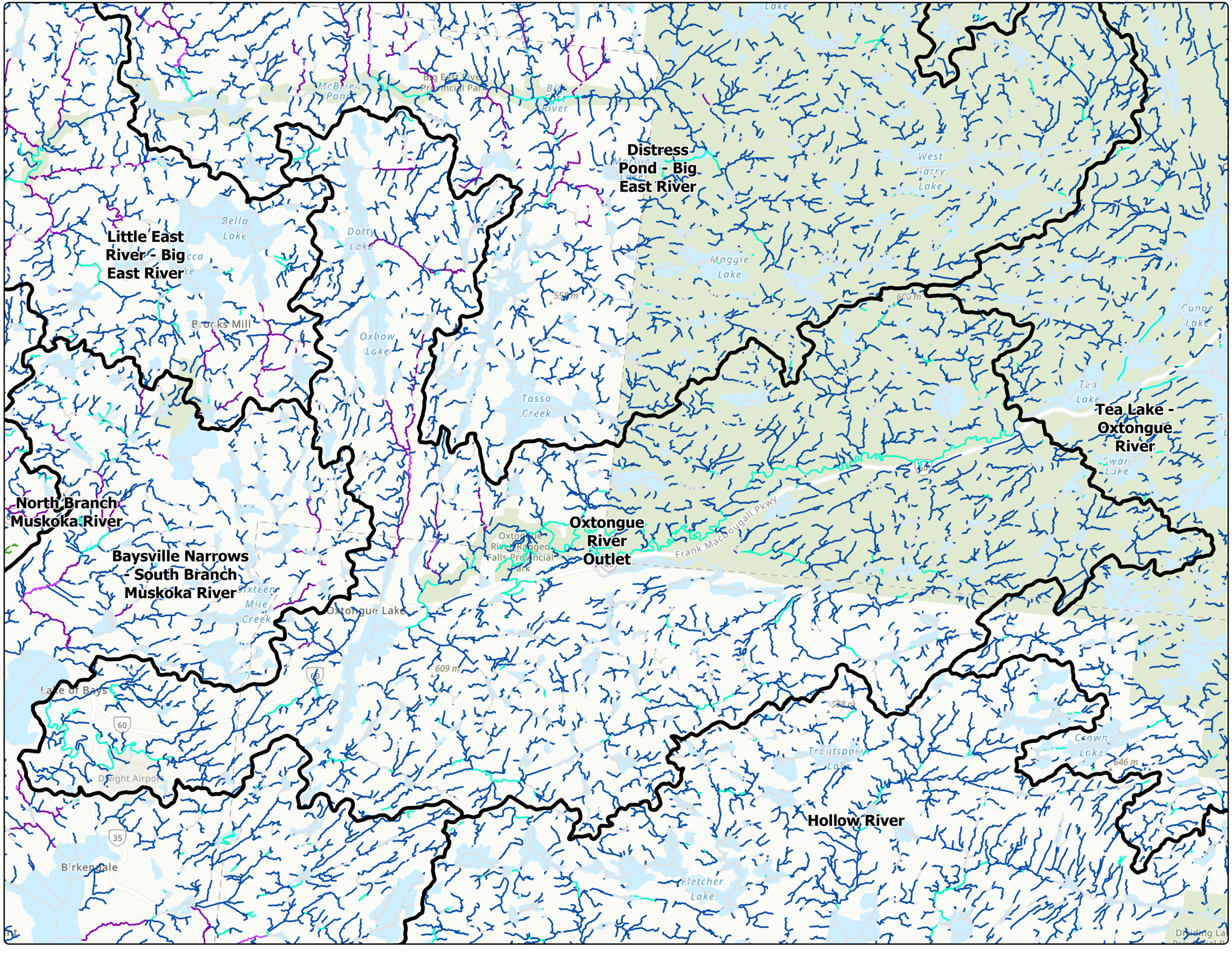
Map 2-12: Aquatic Ecosystem Classification Oxtongue River Outlet

Muskoka River Watershed IWM - Natural Capital Inventory
Addendum 5: Aquatic Ecosystem Classification



Aquatic Ecosystem Classification

- CDCF (Cold, Clear, Fast)
- CDCS (Cold, Clear, Slow)
- CDTF (Cold, Turbid, Fast)
- CDTS (Cold, Turbid, Slow)
- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 500 1,000 2,000
Metres

1:100,000

North American 1983 CSRS UTM Zone 17N

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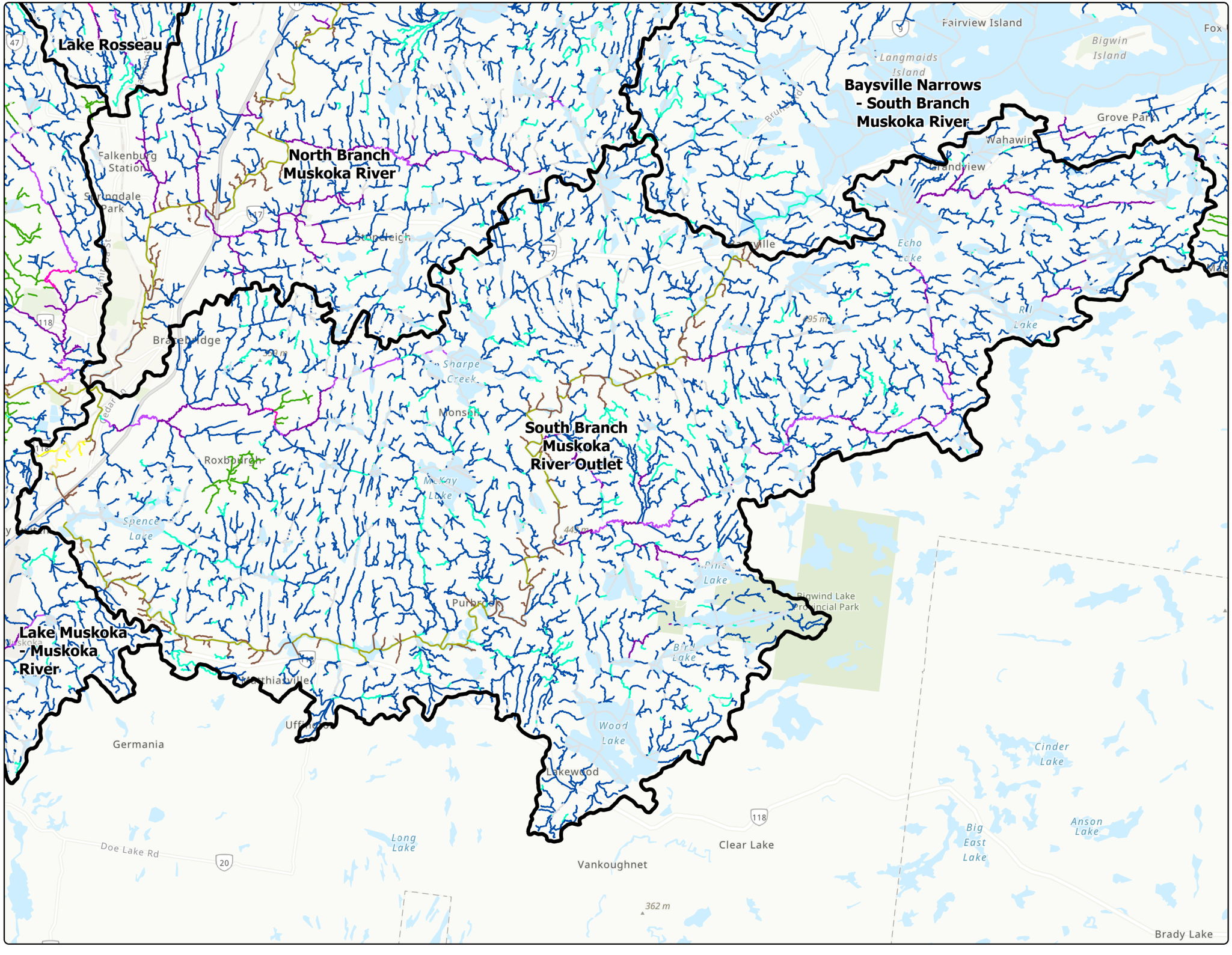

Map 2-13: Aquatic Ecosystem Classification
South Branch Muskoka River Outlet

Muskoka River Watershed IWM -

Aquatic Ecosystem Classification

- CDCF (Cold, Clear, Fast)
- CDCS (Cold, Clear, Slow)
- CDTF (Cold, Turbid, Fast)
- CDTS (Cold, Turbid, Slow)
- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 1,000 2,000 4,000
Metres

1:108,000

North American 1983 CSRS UTM Zone 17N

Basemap Source: Province of Ontario, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

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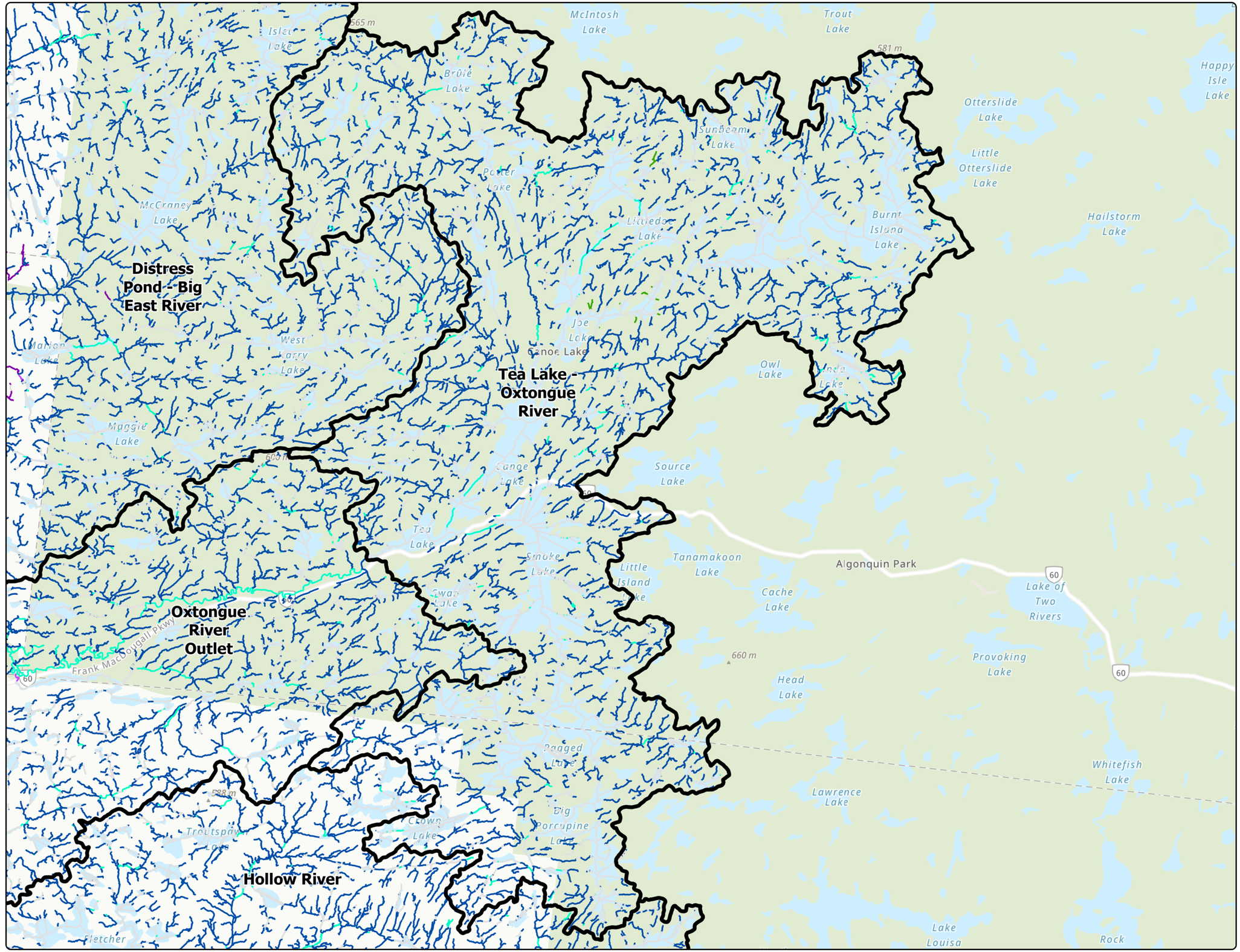
Map 2-14: Aquatic Ecosystem Classification
Tea Lake - Oxtongue River

Muskoka River Watershed IWM -
Natural Capital Inventory
Addendum 5: Aquatic Ecosystem Classification



Aquatic Ecosystem Classification

- CDCF (Cold, Clear, Fast)
- CDCS (Cold, Clear, Slow)
- CDTF (Cold, Turbid, Fast)
- CDTS (Cold, Turbid, Slow)
- CWCF (Cool-warm, Clear, Fast)
- CWCS (Cool-warm, Clear, Slow)
- CWTF (Cool-warm, Turbid, Fast)
- CWTS (Cool-warm, Turbid, Slow)
- WMCF (Warm, Clear, Fast)
- WMCS (Warm, Clear, Slow)
- XXCF (Unknown, Clear, Fast)
- XXCS (Unknown, Clear, Slow)
- XXTF (Unknown, Turbid, Fast)
- XXTS (Unknown, Turbid, Slow)
- WBDY (Waterbody)

Quaternary Watersheds

0 1,000 2,000 4,000
Metres

1:122,000

North American 1983 CSRS UTM Zone 17N

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