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SUBJECT: VALLEY SEGMENTS, ETOBICOKE, MIMICO AND HUMBER WATERSHEDS

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Introduction

As part of the natural science investigations currently underway along the watercourses within the Toronto and Region Conservation Authority, a study has been initiated to investigate stream geomorphology. This work involves the collection of baseline geomorphic information from representative stream sections within the Humber River, Etobicoke Creek and Mimico Creek watersheds. In order to complete this task, it was first necessary to stratify the watercourses into relatively homogenous geomorphic units or "valley segments". These segments will facilitate the selection of representative sub samples to permit a meaningful comparison of like units between and within the various watersheds.

Methods

Valley segments are defined as relatively homogenous sections of watercourse that exhibit distinct physical elements. As such, valley segment boundaries are determined by three factors as specified in Kilgour and Stanfield (2000): differences in hydrography (catchment size), stream slope and surficial geology.

This work consisted of two components:

1. Partitioning of the watercourses into valley segments.
2. Classification of these segments into distinct morphological units.

Valley Segment Partitioning:

Catchment area was one parameter used as the basis to divide valleys into segments. This approach was further refined to incorporate stream order, as specified by Strahler (1952) and hydrological considerations, such as major confluences. Topographic mapping (1:50,000) was used to determine the stream order. All third order (and larger) streams were considered in the assessment. Segment boundaries were placed at channel confluences with adjoining streams of equal or higher order.

As per Kilgour and Stanfield (2000) the topographic maps were also utilized to measure stream gradients. Watercourses with pronounced differences in slope were considered as distinct entities.

Surficial geology data were referenced to further refine the valley segment delineation (Sharpe, 1980; Russell and White, 1997). Segment boundaries were placed where watercourses crossed a boundary that separated to distinct geological units (e.g. sandy material to clayey material).

Valley Segment Classification

Following the delineation of the valley segments, the next step was to classify the segments into distinct geomorphic units (Kilgour and Stanfield, 2000). Catchment area, the percentage of coarse soils in the watershed and the slope of the main watercourse represented the key aspects used to categorize the valley segments. The first step in the classification was to group valley segments into units based on catchment size and slope, resulting in a total of nine possible classes (Table 1). Geological information (percent coarse-textured soil in the sub watershed) was incorporated into the classification using a letter designation for a total of 27 possible segment categories.

Table 1. Classification of valley segments based on Catchment area and channel gradient.

		Catchment area (km^2)		
		Small (< 10)	Medium (10-200)	Large (> 200)
Slope (%)	Low (0-0.39)	**Class 1**	**Class 4**	**Class 7**
	Moderate (0.40-1.09)	**Class 2**	**Class 5**	**Class 8**
	High (1.10 – 5.00)	**Class 3**	**Class 6**	**Class 9**

Geology:
H – high (> 25% coarse material)
M – moderate (10-25% coarse material)
L – low (<10% coarse material)

Site Selection and Location

A total of 140 valley segments were established in all of the watersheds; 102 for the Humber River watershed (Figure1). The Etobicoke Creek and Mimico Creek watersheds, being considerably smaller, had 29 and 7 segments respectively (Table 2). Based on the potential combinations of the above categories, a total of 19 valley segment categories were found to be present within the watersheds. Overall, 496 kilometres of watercourse were analysed. Figure 2 illustrates the distribution of valley segments in the Etobicoke Creek and Mimico Creek watersheds.

Based on the identified valley segments, 50 sites will undergo detailed field investigation, as specified in Table 3. A representative sample of segments was selected for detailed field study, with an emphasis on acquiring a mix of urban and rural settlings and consideration of the length of stream present in each segment category. Over one quarter (25.7%) of the delineated segments fall into class 5M (moderate slope, medium catchment size and moderate amounts of coarse deposits in the sub watershed). As such, 16 of the field sites are situated in this category of valley segment. Figure 3 shows the location of the field sampling sites in the Humber River watershed whereas those in the Etobicoke Creek and Mimicoke Creek watersheds are presented in Figure 4.

Table 2. Number of valley segments in each watershed and subwatershed.

Watershed	Subwatershed	No. Valley Segments
Humber	West Branch	32
	Main Branch	43
	East Branch	17
	Lower Humber	6
	Black Creek	4
	Sub total	102
Etobicoke	Main Branch	22
	Spring Creek	7
	Sub total	29
Mimico	Main Branch	9
	Total	140

Table 3. Valley segments of given category and the number of sites where field data will be collected.

Catchment/ slope class	% coarse material	Number of segments	Number of survey sites
1	Low	0	0
	Moderate	2	0
	High	0	0
2	Low	12	2
	Moderate	13	2
	High	0	0
3	Low	4	1
	Moderate	1	0
	High	3	0
4	Low	2	2
	Moderate	10	6
	High	13	3
5	Low	9	3
	Moderate	36	16
	High	18	8
6	Low	1	1
	Moderate	2	0
	High	1	0
7	Low	0	0
	Moderate	2	1
	High	7	3
8	Low	0	0
	Moderate	1	0
	High	3	2
9	Low	0	0
	Moderate	0	0
	High	0	0
Total		**140**	**50**

Summary

To facilitate the appropriate location of field sampling sites, the watercourses of the Humber River, Etobicoke Creek and Mimico Creek watersheds were delineated into valley segments. Each segment represents a distinct physical unit as defined by classification methodology of Kilgour and Stanfield (2000). A total of 140 segments were identified falling into 19 distinct segment classes. Based on this classification, a total of 49 field sites have been established that represent the various physical environments of the three watersheds.

References

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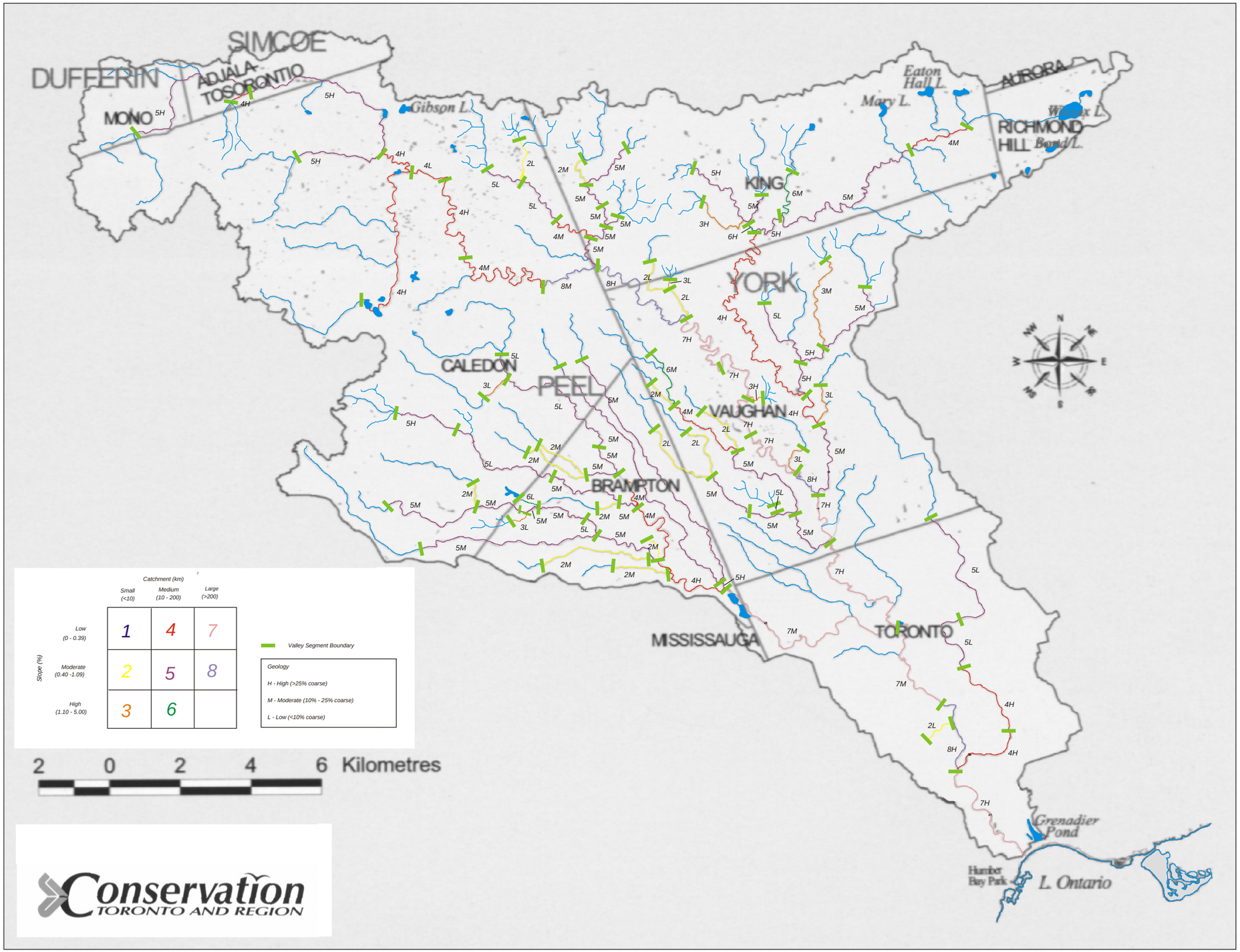

Figure 1. Valley segment classification in the Humber River watershed.

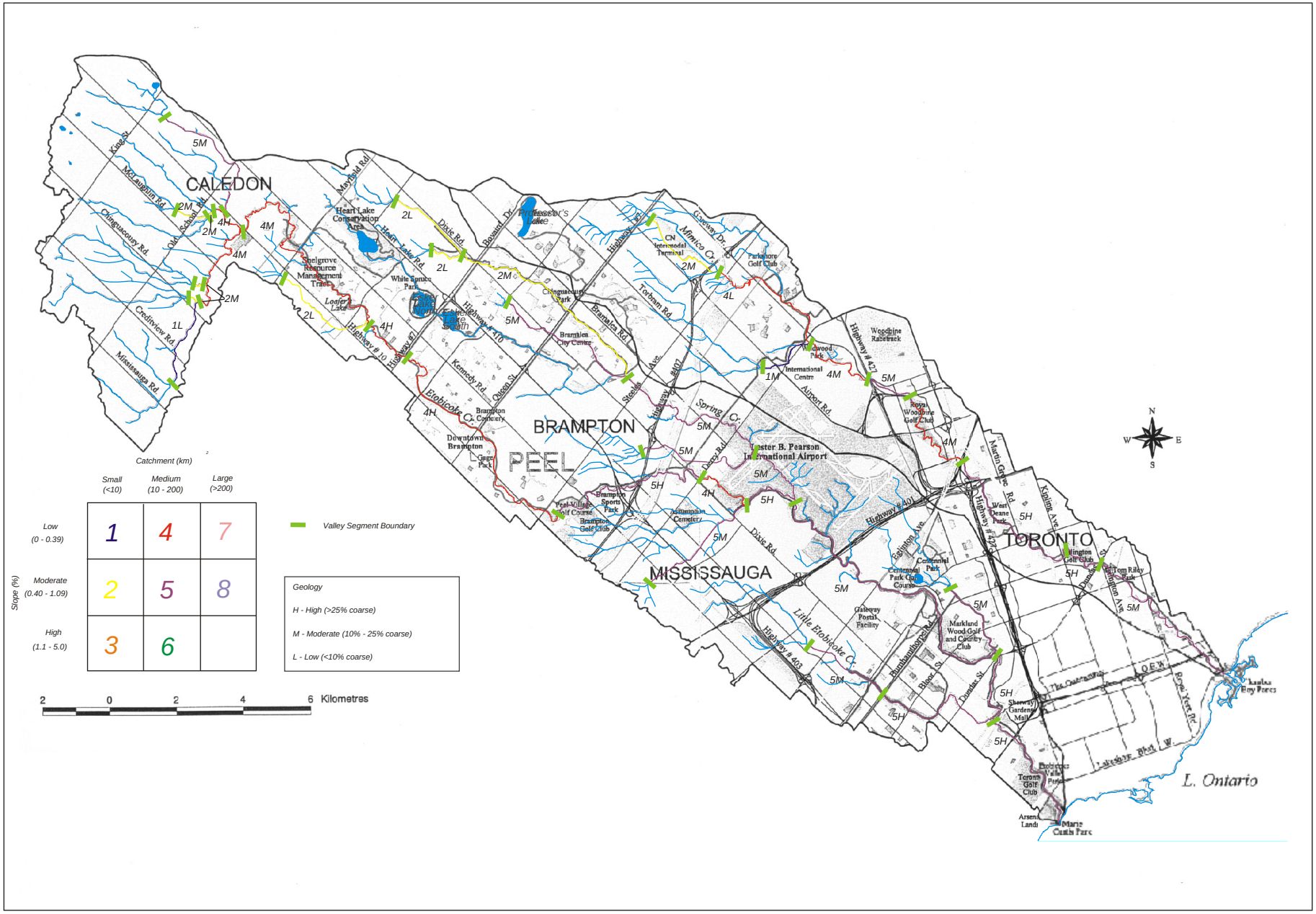

Figure 2. Valley segment classification in the Etobicoke Creek and Mimico Creek watersheds.

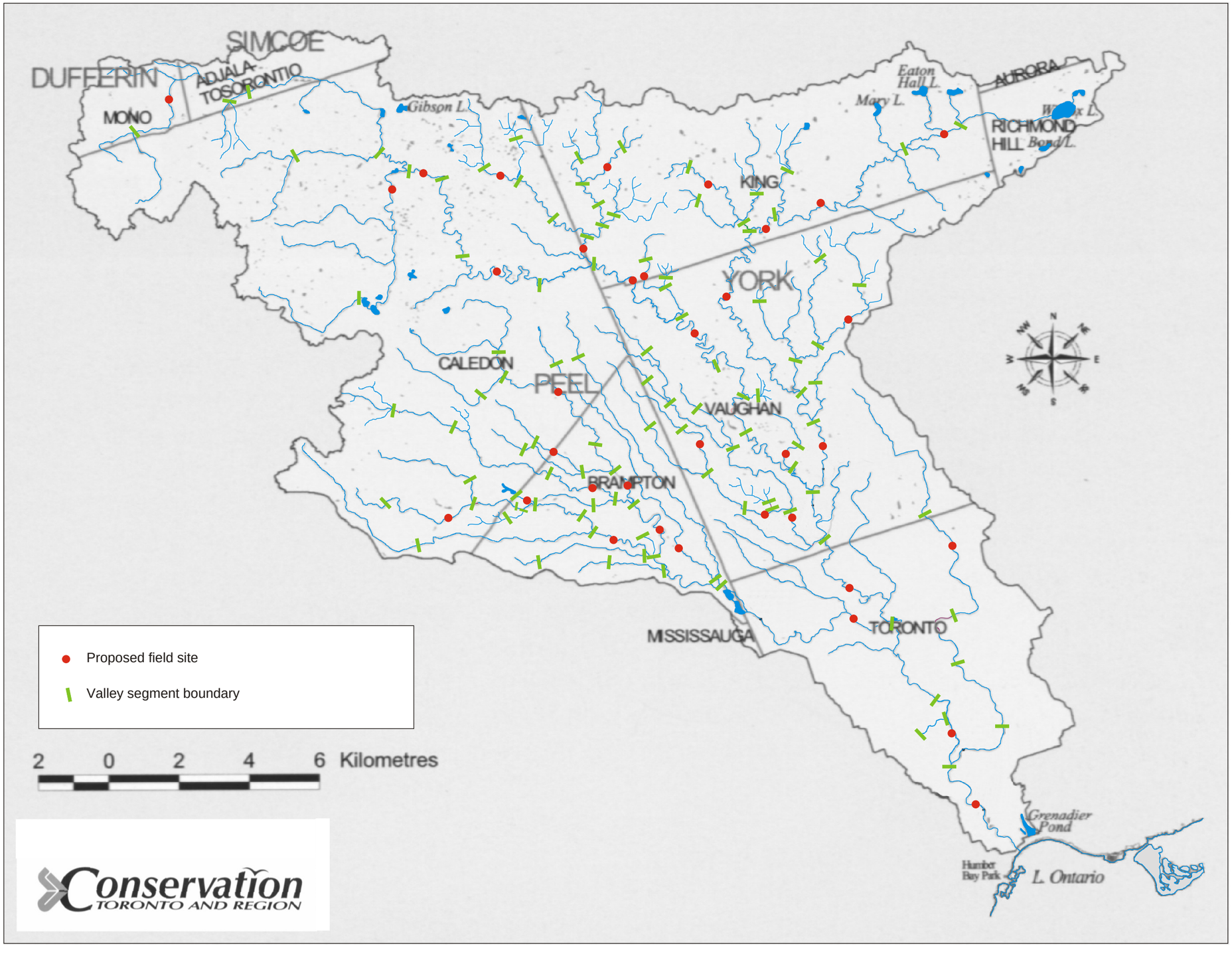

Figure 3.

Proposed field monitoring sites in the Humber River watershed.

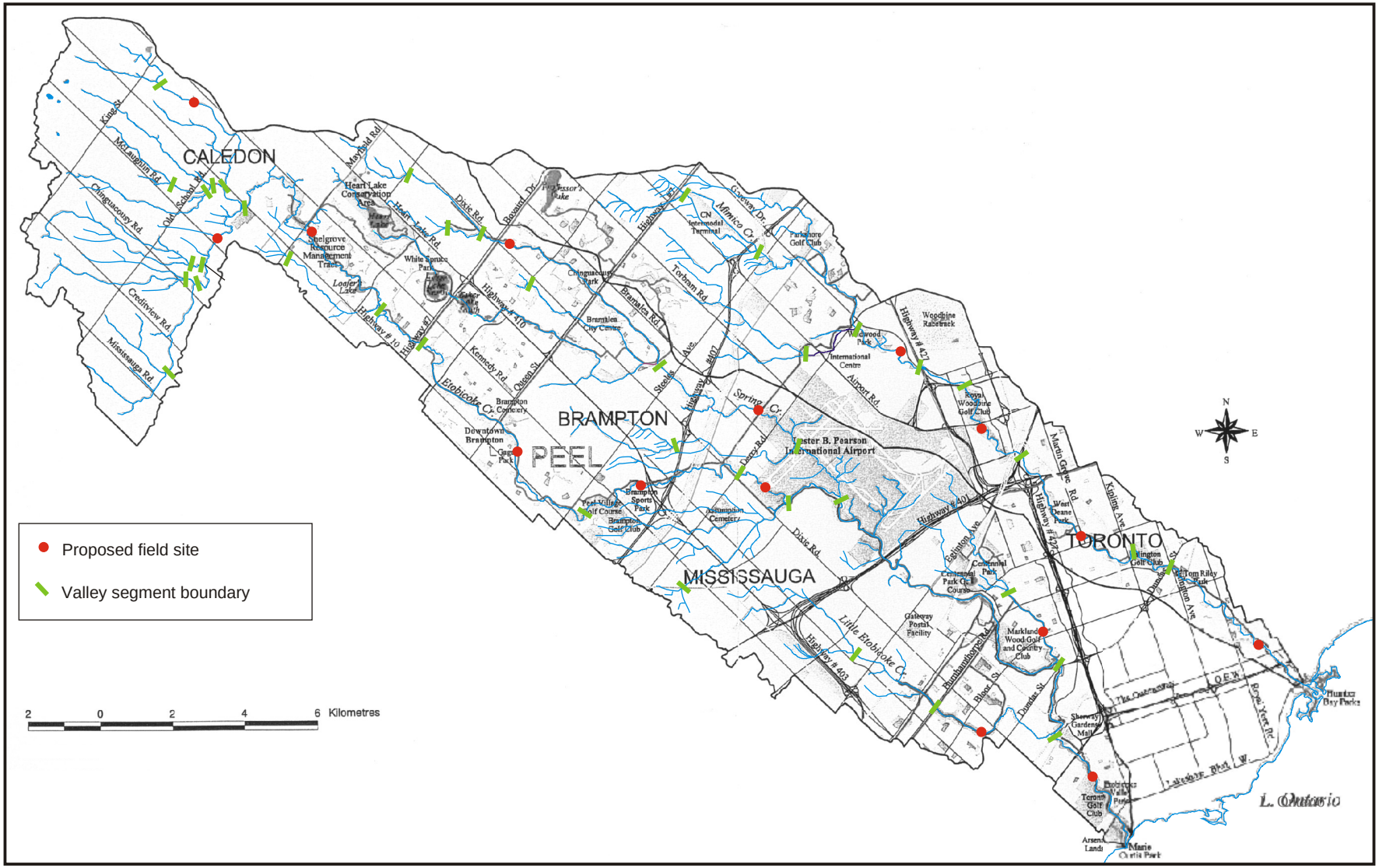

Figure 4. Proposed field monitoring sites in the Etobicoke Creek and Mimico Creek watersheds.