



Shoreline Development in The Land Between:

An analysis of Forest Resource Inventory data



Prepared for:

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Project 07025

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BACKGROUND

The Land Between is a recently recognized transition zone or “ecotone” between the hilly Canadian Shield and the farmland of southern Ontario’s Mixedwood Plains. Representing a mosaic of patches of different edge habitats mottled with numerous wetlands, bare rock open spaces, and pockets of grasslands, it extends from the southeast corner of Georgian Bay in the west to the Frontenac Axis in the east. The main geological features are low hills, thin soil and shallow lakes on granite barrens on the southern slope of the Canadian Shield, and thin soils on limestone plains, with alvars. Aquatic resources are generally connected, with a very high percentage of shoreline-to-area throughout.

In an effort to better comprehend the significance of this ecotone and ensure its sustainability, research is underway with the following objectives:

- To document the distinctiveness of The Land Between;
- To identify gaps in knowledge;
- To identify ecological threats and understand declining species/spaces;
- To identify areas of interest for future field inventory and conservation activity;
- To document land ownership/land use patterns to assess opportunities for securement or stewardship on private lands; and
- To develop and support land protection projects consistent with emerging priority areas.

PURPOSE AND SCOPE OF STUDY

As development continues to expand northward, the importance of identifying priority stewardship areas increases. One focal area for development is waterfront, as it is one of the core natural features of The Land Between and preferable for the recreational opportunities it provides. The Land Between collaborative recognized that natural shorelines may be limited in



the Land Between and initiated a study to assess the state of the shorelines based on available digital spatial data.

The Ontario Ministry of Natural Resources (OMNR) maintains a Forest Resource Inventory (FRI) database of forest structure across much of Central Ontario. This valuable dataset is based on aerial photograph interpretation and classifies the forests based on tree species composition, forest age, site class and numerous other variables. Although exceptionally detailed on forested components of our landscape, classification of non-forested components is available, though somewhat limited. However the landscape distinctions provided allow for a snapshot assessment of cover and development around shorelines. This report will compile and summarize existing FRI data across The Land Between with the intent of determining the extent of natural shoreline.



SHORELINE DEVELOPMENT ASSESSMENT

SHORELINE DEVELOPMENT ASSESSMENT

Forest Resource Inventory (FRI) data was secured for the OMNR districts of Parry Sound, Bancroft, the north-western portion of Peterborough, and the north-eastern portion of Kemptville (See Figure 1) thereby covering approximately 68 % of The Land Between. Digital FRI data was not available for the southern and north-eastern portions of The Land Between.

METHODOLOGY

For the purposes of this assessment the most valuable attribute of the digital FRI is the MNR CODE, which assigns a value to each feature in the dataset based on the most applicable description in Table 1. Glenside Ecological Services Limited categorized the MNR CODE's for adjacent land uses as Natural Forested, Natural Non-forested, Unnatural and Unknown. This categorization is based on a desktop interpretation of the FRI data conducted in Haliburton¹ where the known extent of development in a select few lakes was cross-referenced with the MNR CODE. It should be noted that no ground-truthing has been conducted.

The portion of The Land Between covered by FRI data contains approximately 56,000 polygons classified in the FRI data as lake (MNR CODE = 64 or 265). However, many of these polygons lie immediately adjacent to each other with a common boundary and therefore a single lake may be made up of many lake polygons. As the intent of this project was to focus on lakes ≥ 10 ha and ≥ 100 ha, all lake polygons were merged into one feature and then reverted back into single parts to eliminate internal boundaries. Accurate areas were then calculated for each lake and further analysis focused only on lakes ≥ 10 ha.

All lakes ≥ 10 ha were buffered by 0.5 m and this buffer was used to clip the FRI data to capture adjacent land uses. Many lake polygons are doughnut shaped with internal islands or floating

¹Heaven, Paul C. 2007. County of Haliburton Natural Heritage Mapping: A Compilation and Preliminary Assessment. Prepared for the Haliburton Highlands Land Trust. Glenside Ecological Services Limited Project 07009. 62pp.



wetland mats. Although adjacent land use is of interest on islands, an internal floating wetland mat should not be considered shoreline and therefore these had to be removed from the analysis. In further regard to islands, the data is somewhat limited as the FRI delineates forest structure on large islands but not smaller ones and therefore it is not possible to discern development on smaller islands.

Table 1: MNR CODE Descriptions

MNR CODE	MNR CODE Description	Categorization
62	Island	Unknown
64	Lake	Not applicable
94	Railway	Unnatural
102	Reservoir	Not applicable
152	River	Natural Non-forested
265	Waterbody - update	Not applicable
266	Island - update	Unknown
300	Productive Forest	Natural Forested
302	UCL buffer	Unnatural
303	Stream buffer	Natural Non-forested
305	Road buffer/water	Unnatural
308	Road buffer	Unnatural
310	Treed muskeg	Natural Non-forested
311	Open muskeg	Natural Non-forested
312	Brush & alder	Natural Non-forested
313	Rock	Natural Non-forested
314	Other non-productive	Not applicable
315	Developed agricultural land	Unnatural
316	Grass & meadow	Natural Non-forested
317	UCL - Unclassified land	Unnatural
318	Other non-forested	Unknown
333	Miscellaneous and non typed	Unknown



RESULTS

A summary of the adjacent land uses produced the results as outlined in Table 2.

Table 2: Adjacent Land Use Results

MNR CODE	MNR CODE Description	10 ha Lakes		100 ha Lakes	
		Shoreline (m)	Percent	Shoreline (m)	Percent
0		63466.76	0%	38379.70	0%
62	Island	3973927.54	16%	3246204.74	23%
152	River	19702.60	0%	11573.53	0%
300	Productive Forest	12823657.56	53%	6823889.83	48%
302	UCL buffer	178246.33	1%	122553.52	1%
303	Stream buffer	73809.83	0%	21065.30	0%
305	Road buffer/water	26.95	0%	26.95	0%
308	Road buffer	99984.37	0%	65438.65	0%
310	Treed muskeg	139743.88	1%	42914.05	0%
311	Open muskeg	1618535.46	7%	403333.67	3%
312	Brush & alder	454486.39	2%	184964.14	1%
313	Rock	1929004.80	8%	902132.96	6%
315	Developed agri. land	108423.90	0%	57858.02	0%
316	Grass & meadow	130634.56	1%	73235.53	1%
317	UCL - Unclassified land	2453160.49	10%	2052592.86	14%
318	Other non-forested	34556.56	0%	31899.96	0%
320	Unknown Description	134.39	0%	0.00	0%
333	Misc. and non typed	200130.46	1%	111393.11	1%
Total		24301632.84		14189456.52	

Summarizing these data using the categorization of Natural, Unnatural and Unknown produced the results as outlined in Table 3.

Table 3: Adjacent Land Use Summary

	10 ha Lakes		100 ha Lakes	
	Shoreline (m)	Percent	Shoreline (m)	Percent
Natural Forested Shoreline	12823657.56	53%	6823889.83	48%
Natural Non-forested Shoreline	4365917.53	18%	1639219.18	12%
Unnatural Shoreline	2839842.03	12%	2298470.01	16%
Unknown	4272215.71	18%	3427877.51	24%
Total	24301632.84		14189456.52	



The Georgian Bay shoreline represents approximately 4000 km of shoreline categorized primarily as Natural or Unknown shoreline and therefore influences the results significantly. The high component of shoreline categorized as Unknown is reflective of the numerous small islands with no further categorization other than “island”. Removing Georgian Bay from the analysis resulted in the extent of Unnatural Shoreline rising from 16% to 22% and the shoreline with an Unknown categorization dropping from 24% to 13% (See Table 4).

Table 4: Adjacent Land Use Summary (without Georgian Bay)

	10 ha Lakes		100 ha Lakes	
	Shoreline (m)	Percent	Shoreline (m)	Percent
Natural Forested Shoreline	11665136.24	58%	5665368.51	56%
Natural Non-forested Shoreline	3649290.19	18%	922591.83	9%
Unnatural Shoreline	2705980.64	13%	2164608.61	22%
Unknown	2156138.18	11%	1311799.97	13%
Total	20176545.24		10064368.92	

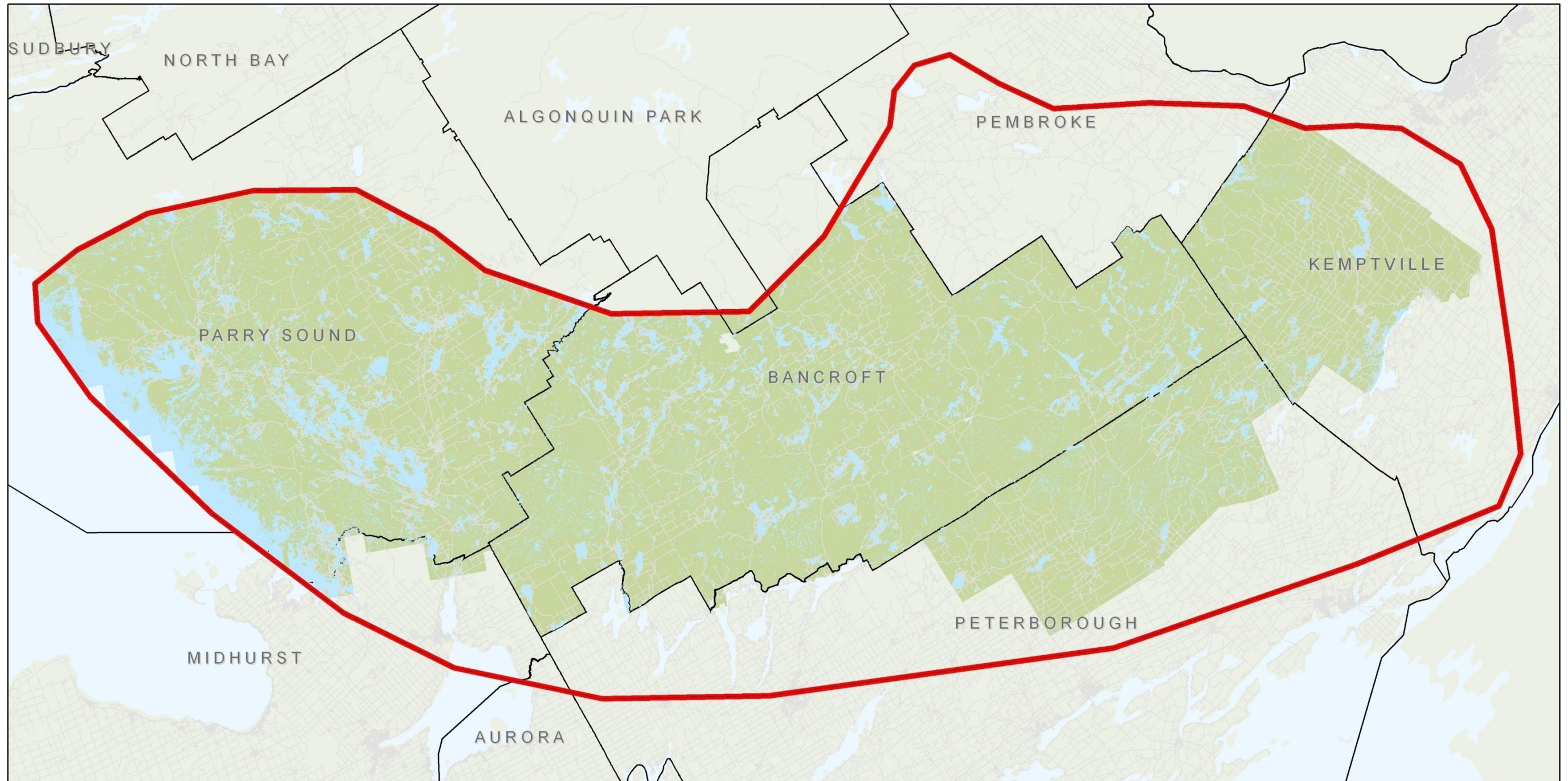
The data was also queried by County to allow for a comparison across The Land Between. Although coverage was not complete in the Counties of Lennox & Addington, Frontenac, Hastings, City of Kawartha Lakes and Peterborough, the data covered the majority of the area found within The Land Between. Table 5 details the level of shoreline development by county, ranked by percent of natural shoreline.

Table 5: County Comparison of Shoreline Development Adjacent to Lakes ≥ 10 ha


County	Natural			Unnatural	Unknown
	Forested	Non-forested	Total		
Parry Sound	66%	17%	84%	7%	9%
Lennox & Addington	59%	23%	83%	5%	12%
Frontenac	61%	20%	82%	7%	11%
Hastings	57%	22%	79%	11%	10%
City of Kawartha Lakes	30%	45%	75%	9%	16%
Muskoka	57%	16%	72%	17%	11%
Peterborough	58%	13%	72%	16%	12%
Haliburton	58%	12%	70%	24%	6%
Lanark	46%	22%	68%	19%	11%



Figure 1: Extent of FRI coverage in The Land Between










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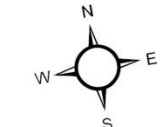
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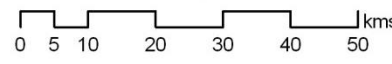
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Legend

-  The Land Between
-  Forest Resource Inventory Data (available)
-  Forest Resource Inventory Lakes
-  OMNR Districts
-  Canada
-  Lakes/Water

 Ontario Road Network





Data Sources:
 FRI Data - Ontario Ministry of Natural Resources
 Base Data - Ontario Ministry of Natural Resources
 Great Lakes - ESRI Canada

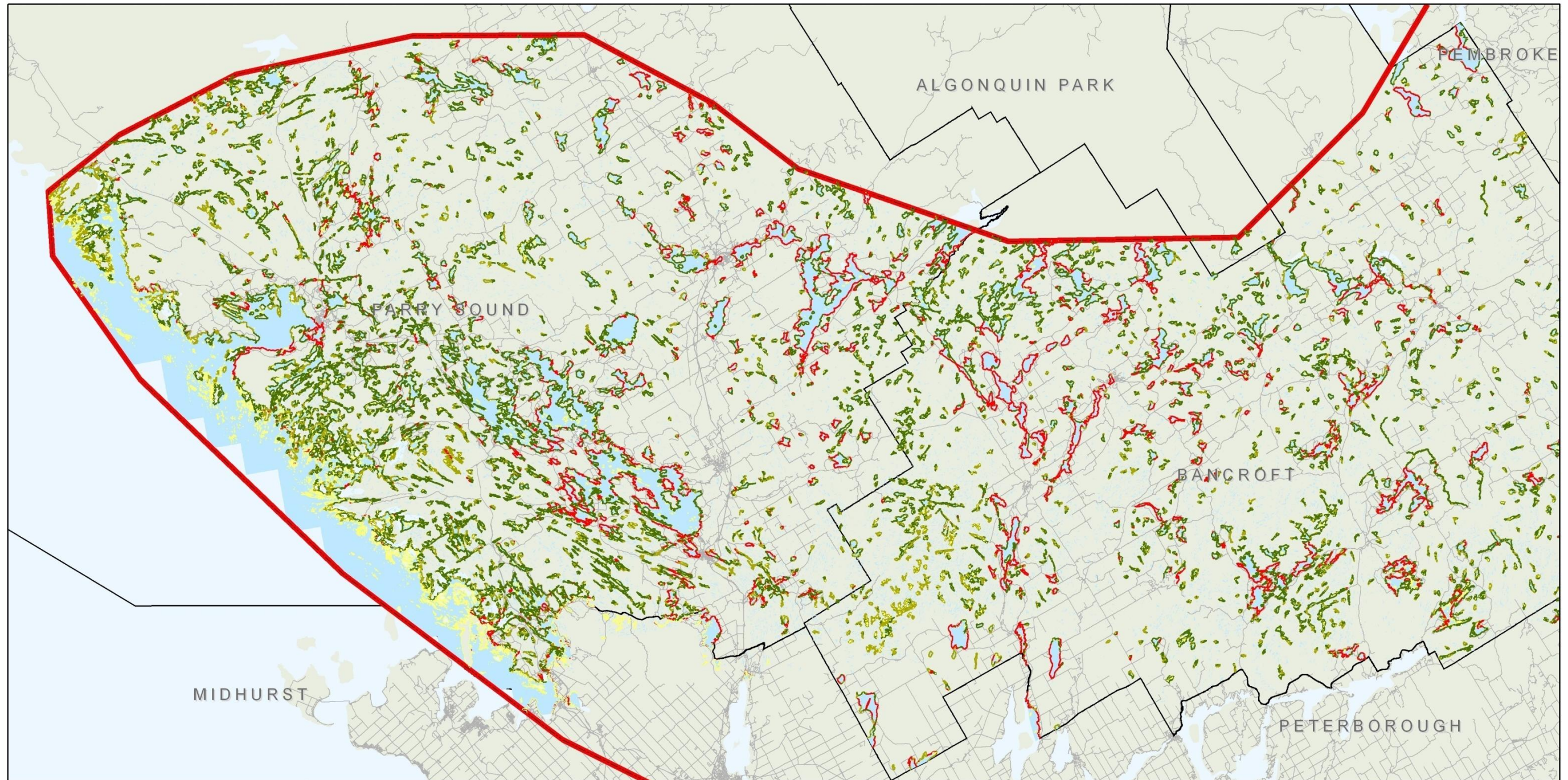
Projection: UTM Zone 17 (North American Datum 1983)

The Land Between

Title
**Extent of FRI in
 The Land Between
 (lakes shown)**

Date: August 2007

Figure 2: Land Use Adjacent to 10 ha Lakes in the Western Portion of The Land Between













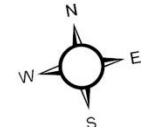
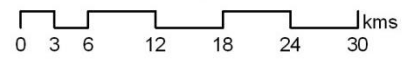
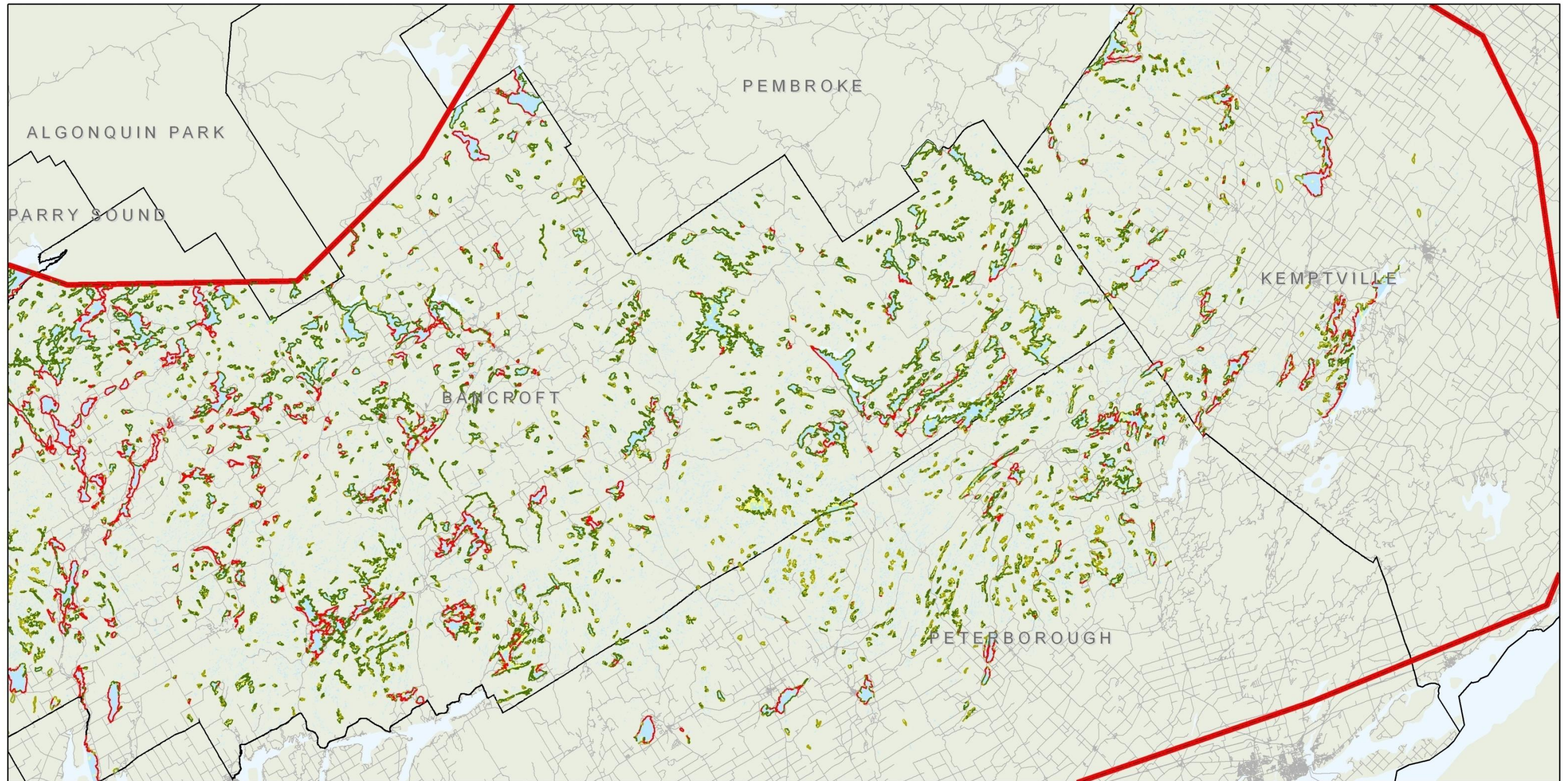

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Figure 3: Land Use Adjacent to 10 ha Lakes in the Eastern Portion of The Land Between








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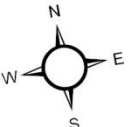
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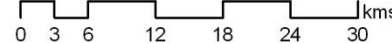
Legend

-  The Land Between
-  Forest Resource Inventory Lakes
-  Lakes/Water
-  OMNR Districts
-  Ontario Road Network

Adjacent Land Use

-  Natural Forested Shoreline
-  Natural Non-forested
-  Unnatural
-  Unknown





Data Sources:
 FRI Data - Ontario Ministry of Natural Resources
 Base Data - Ontario Ministry of Natural Resources
 Great Lakes - ESRI Canada

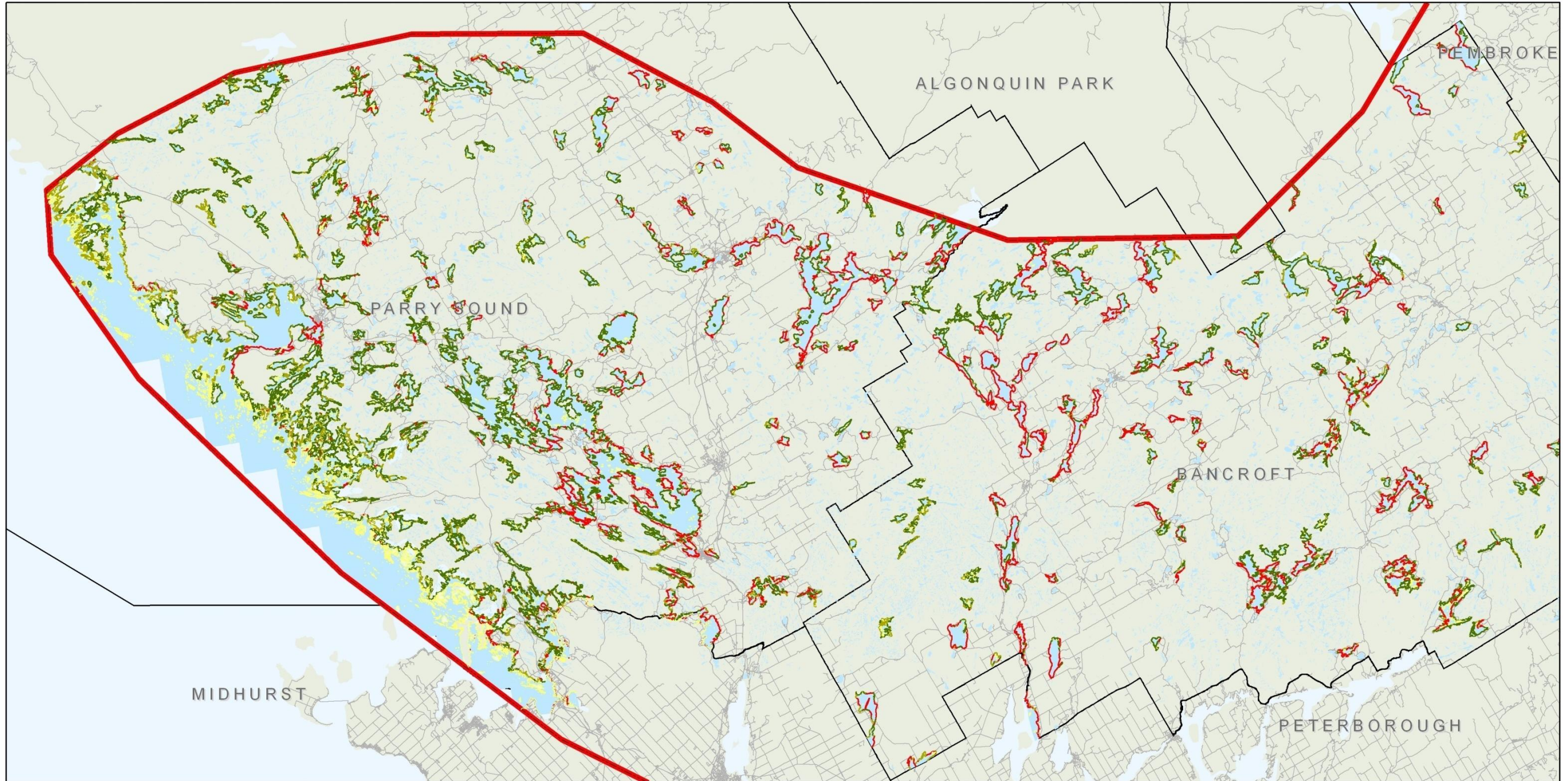
Projection: UTM Zone 17 (North American Datum 1983)

The Land Between


Title
**Land Use Adjacent to
 10 ha Lakes in
 The Land Between
 (eastern portion)**

Date: August 2007

Figure 4: Land Use Adjacent to 100 ha Lakes in the Western Portion of The Land Between



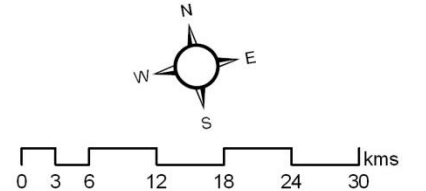
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Legend

-  The Land Between
-  Forest Resource Inventory Lakes
-  Lakes/Water
-  OMNR Districts
-  Ontario Road Network
-  Natural Forested Shoreline
-  Natural Non-forested
-  Unnatural
-  Unknown



Data Sources:
 FRI Data - Ontario Ministry of Natural Resources
 Base Data - Ontario Ministry of Natural Resources
 Great Lakes - ESRI Canada

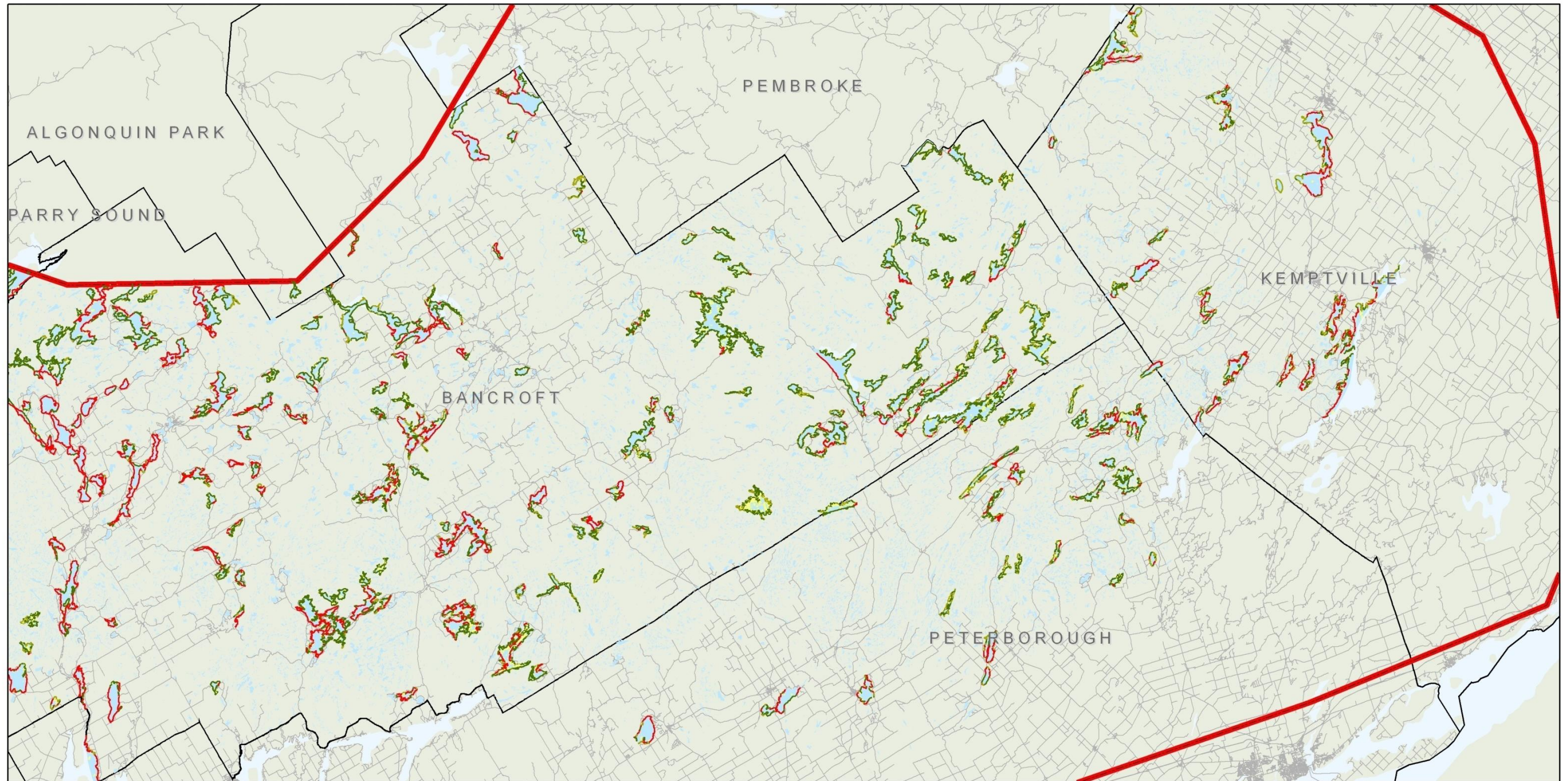
Projection: UTM Zone 17 (North American Datum 1983)

The Land Between

Title
**Land Use Adjacent to
 100 ha Lakes in
 The Land Between
 (western portion)**

Date: August 2007

Figure 5: Land Use Adjacent to 100 ha Lakes in the Eastern Portion of The Land Between












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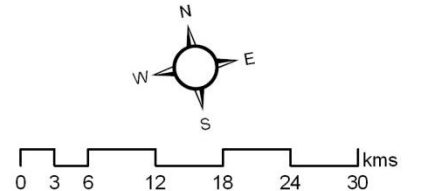
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Project: 07025

Legend

-  The Land Between
-  Forest Resource Inventory Lakes
-  Lakes/Water
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-  Natural Forested Shoreline
-  Natural Non-forested
-  Unnatural
-  Unknown



Data Sources:
 FRI Data - Ontario Ministry of Natural Resources
 Base Data - Ontario Ministry of Natural Resources
 Great Lakes - ESRI Canada

Projection: UTM Zone 17 (North American Datum 1983)

The Land Between

Title
**Land Use Adjacent to
 100 ha Lakes in
 The Land Between
 (eastern portion)**

Date: August 2007

SUMMARY

SUMMARY

Based on this analysis the majority of the shorelines in The Land Between remain in a natural state, however as the size of the lake increase so too does the level of development. Focusing on lakes ≥ 100 ha, it appears that much of the development occurs throughout the western portion of the Bancroft District and eastern portion of the Parry Sound District. This is consistent with an earlier analysis of the lakes in the County of Haliburton where development adjacent to lakes ≥ 100 ha was reported at 32% as compared to the 16% in the Land Between².

By focusing on lakes ≥ 10 ha a comparison by county was feasible and the process identified the Counties of Lanark, Haliburton, Peterborough and Muskoka as those Counties with the highest levels of shoreline development.

RECOMMENDATIONS

Currently the level of error associated with this analysis is unknown as ground-truthing has not been conducted. Therefore Glenside Ecological Services Limited recommends the following:

- Test the analysis by sampling individual lakes throughout the study area.
 - Sampling should be stratified across the three FRI datasets as the level of accuracy may vary based on the dataset.

Forest Resource Inventory data was secured for the Parry Sound, Bancroft, Kemptville and Peterborough Districts, however more Forest Resource Inventory data may exist, particularly in the northern Pembroke District. The Forest Resource Inventory data is a valuable dataset for this analysis as well as any investigation involving forest structure, tree species diversity and

² Heaven, Paul C. 2007. County of Haliburton Natural Heritage Mapping: A Compilation and Preliminary Assessment. Prepared for the Haliburton Highlands Land Trust. Glenside Ecological Services Limited Project 07009. 62pp.



Ecosite³ classification. Therefore Glenside Ecological Services Limited recommends the following:

- Continue to secure FRI data for areas throughout The Land Between;
- Look to other remote sensing data that is current and available for comparison and corroboration.

³ Chambers, B. A., Naylor, B.J., Nieppola, J., Merchant, B. and Uhlig, P. 1997. Field Guide to Forest Ecosystems of Central Ontario. Ontario Ministry of Natural Resources. Queen's Printer of Ontario. 200pp

