The Woodland Heritage of Southern Ontario

A Study of Ecological Change, Distribution and Significance

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No one who has a single atom of imagination can travel throughout these forest roads of Canada without being strongly impressed and excited. The seemingly interminable line of trees before you; the boundless wilderness around, the mysterious depths amid the multitudinous foliage where foot of man has never penetrated, and which partially gleams of the noontide sun, now seen, now lost, lit up with a changeful, magical beauty.

A. Jameson. 1838. *Winter Studies and Summer Rambles in Canada.*
From a stagecoach trip from Toronto to Detroit in 1837.

November 1999

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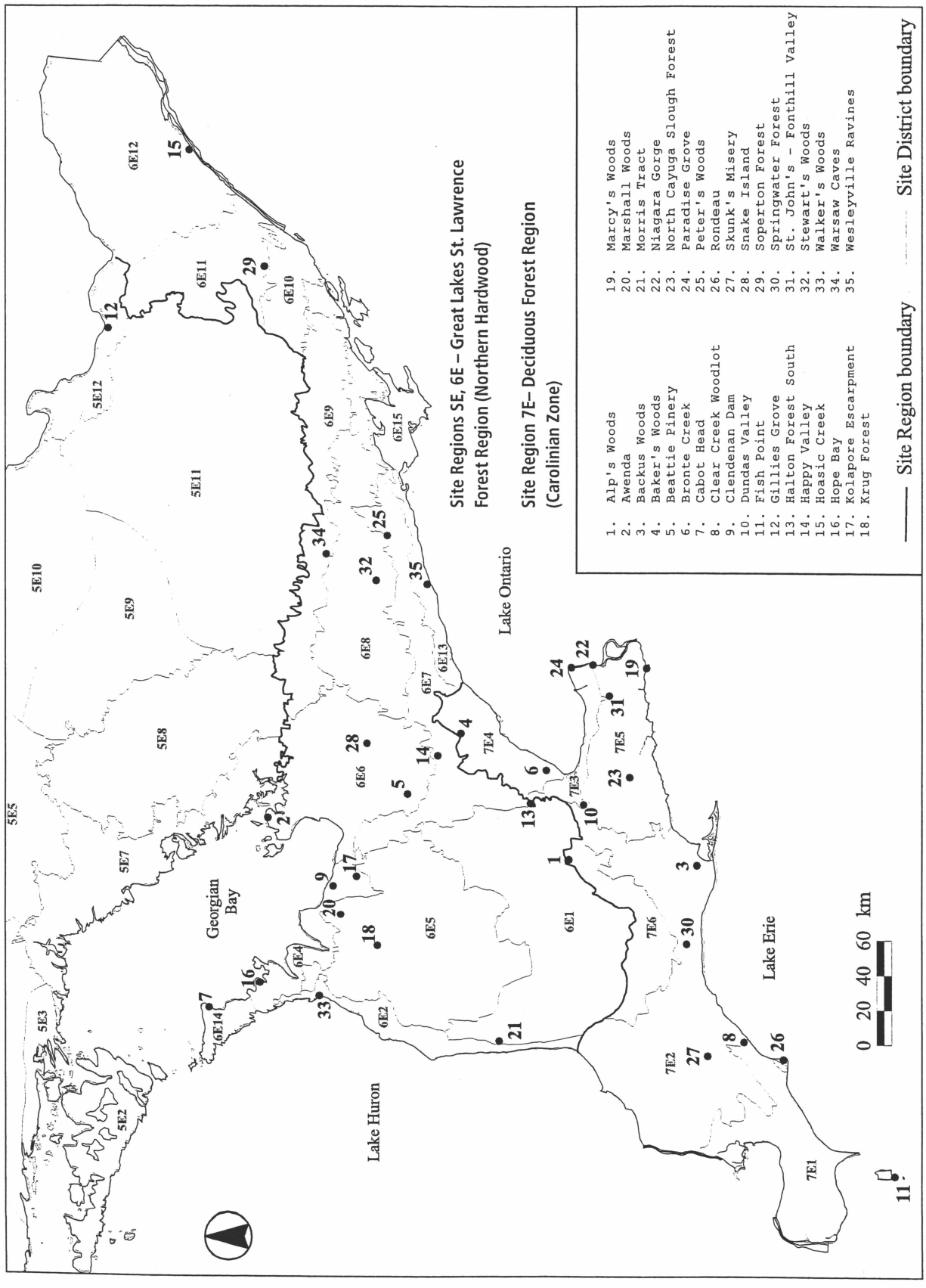


Figure 3. Ecological Regions and Districts, and Woodlands Surveyed

Bruce and Howard Krug set an extraordinary conservation standard for their properties. Virtually untouched since the 1920s, the Krug Forest is one of the premier older-growth upland woodlands in southern Ontario.

4.0
Heritage Woodlands in Southern Ontario

One or more high-quality woodlands were sampled in each ecological site district south and east of the Canadian Shield (see Figure 3, Table 3).A total of 35 woodlands were surveyed to test a series of woodland-evaluation criteria (see section 3.1) that can be used to identify "significant woodlands" to meet the intent of the natural-heritage policy of the Provincial Policy Statement (1996) released under Ontario's Planning Act.

In this section, we describe each of these woodlands in terms of these criteria.

Table 3 is a list of surveyed woodlands by ecological site districts south and east of the Canadian Shield (Jalava et al. 1997). No woodlands were selected in site district 6E-15 because reconnaissance investigations and earlier studies suggested that the state of upland woodlands was quite poor (Macdonald 1987).

Table 3. Index of Surveyed Woodlands South and East of the Canadian Shield (mapped on Figure 3).

4.1 *Interpretation of Comparative Results*

The test of woodland evaluation criteria resulted in data that reflect wide differences among older-growth woodlands across southern Ontario. The reported values are generally high-end values because they are from high-quality sites. Table 4 compares test results and section 4.2 indicates the ranges of test values.

ECOLOGICAL FUNCTIONS

1. Community Size. This area was the size of the community sampled, not the size of the woodland in which it was located, which is noted in site descriptions. Community sizes aren't comparable because their landscape setting and associated communities vary widely. The size of the overall site is more relevant to the ecology of the woodland, and comparisons of significant woodlands should be based on overall site size.

2. Community Context. Three indices of landscape context for surveyed communities were based on GIS analysis: (i) percent cover of natural area within 1 kilometre of the outer boundary of the community; (ii) total length of roads per hectare within 1 kilometre; and (iii) number of buildings per hectare within 1 kilometre.

UNCOMMON FEATURES

The criteria are adjusted to the number of points sampled. For example, 15 point-quarter sample points yields 60 trees, the sample size on which histograms and tree statistics are based; and plant frequencies (Appendix 4), logs and stumps are averaged for the number of sample points.

1. Tree Size. The Krug Forest, Peter's Woods and Clear Creek Woodlot had highest mean diameters of trees >10 cm dbh, and highest percentages of trees >49 cm dbh. Clear Creek, Peter's Woods, Gillies Grove and Paradise Grove had highest percentages of trees >69 cm dbh. Eleven sites had trees larger than 90 cm dbh noted in point-quarter sampling (other larger trees in the overall woodland are noted in the site summaries).

2. Basal Area. Only Stewart's Woods, Walker's Woods, Gillies Grove, Peter's Woods, Kolapore Escarpment and Clear Creek had total basal areas of about 45 or more square metres per hectare of trees greater than 10 cm dbh, in the community sampled. All but five of the stands had values greater than 29, a threshold for older-growth suggested by Keddy and Drummond (1996).

3. Size-Class Distribution. A few general patterns are evident from the size-class distributions of trees and saplings plotted in the site summaries.

a) The most prevalent pattern among the sampled communities is the occurrence in the canopy of large trees of mid-tolerant species, such as oaks, ashes, Black Cherry, Basswood and Tulip-tree, which require relatively high light intensities. Their occurrence only in the canopy suggests they are the result of canopy-opening disturbances such as blowdowns and fires; single-tree or few-tree openings are unlikely to provide the conditions needed for regeneration (Boerner and Cho 1987). Stand age is best dated by trees of these species.

   Examples of such woodlands are Backus Woods, Bronte Creek, Clear Creek Woodlot, Dundas Valley, Marcy's Woods, Morris Tract, Niagara Glen, North Cayuga Slough Forest, Peter's Woods and Springwater Forest. These are unlikely to be original or equilibrium old-growth, but they are certainly older growth and conform with old-growth in most features. Most of the trees aged from these stands (average 150–250 years) predate settlement of the regions where they are located.

   The relative absence of Hemlock from these sites may indicate factors other than incompatible site conditions, such as human disturbances that changed shade, humus, and microtopography of the sites, or selective removal of Hemlock for bark. The severe historic harvesting of this species, and its more specialized germination needs, make it a more challenging shade-tolerant species to interpret than Sugar Maple or Beech.

b) The Beattie Pinery, Gillies Grove, Stewart's Woods and Warsaw Caves have large White Pine and other shade-intolerant species in the canopy. In contrast to the sites mentioned in a) above, Hemlock regeneration is dense. This may indicate that the stand-initiating disturbance was natural, such as fire. Other sites, such as Awenda, had a pine overstorey that was selectively cut.

c) When shade-tolerant Sugar Maple, Beech and Hemlock are found throughout the size classes, the stand is more likely to be original old-growth woodland. The best example surveyed is Marshall Woods, which is noteworthy for its dense Hemlock regeneration. This site may be one of our best examples of forests that covered much of southern Ontario prior to European settlement, when large-scale disturbances were infrequent (see section 1.3). Woodlands at Clendenan Dam, Cabot Head, Gillies Grove, Happy Valley and Hoasic Creek also have a canopy mostly dominated by shade-tolerant species, but these forests are younger than Marshall Woods and Hemlock regeneration is less dense.

Table 4. Comparison of Evaluation Criteria for Heritage Woodlands

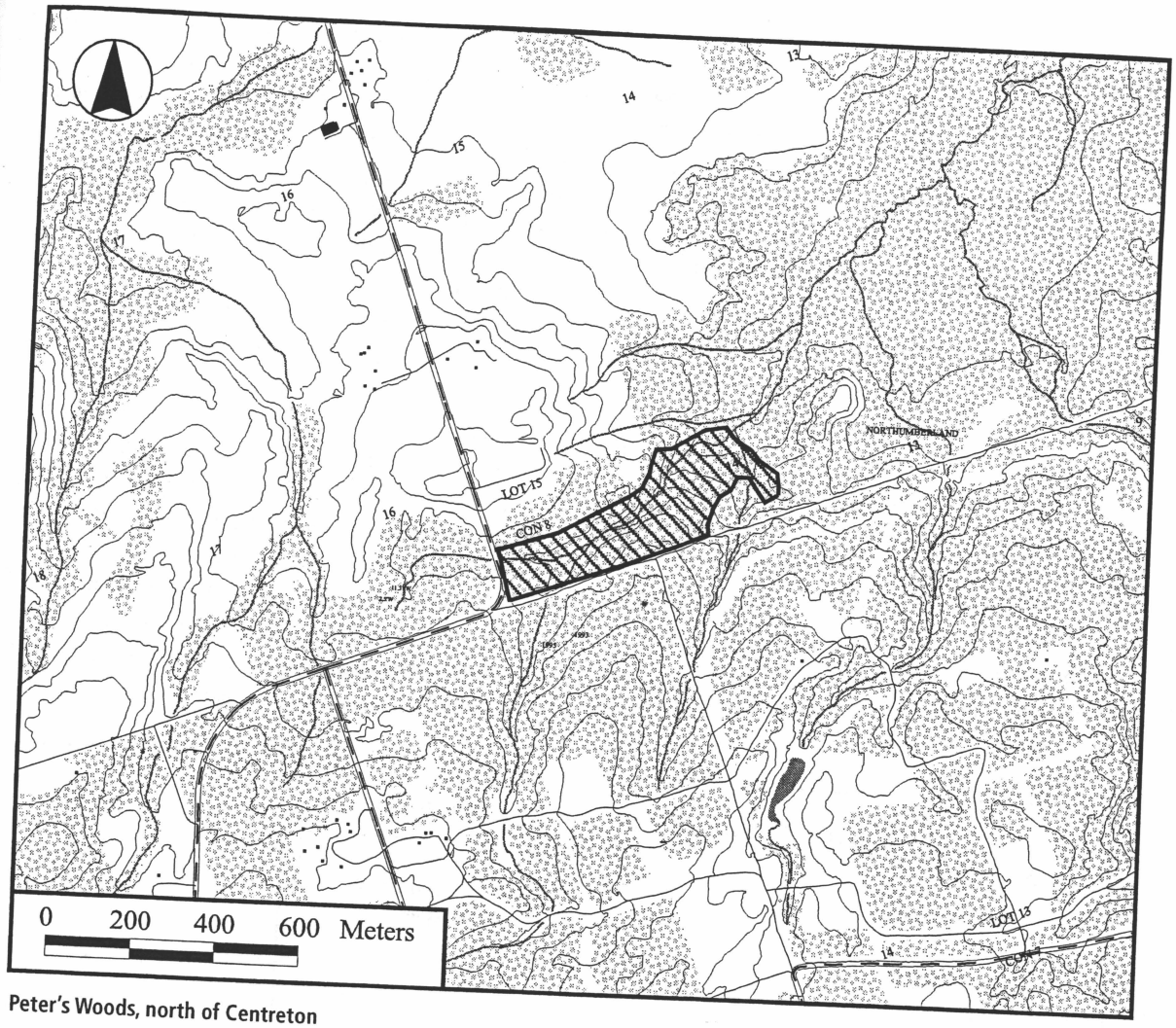
* includes 25 points sampled by W. J. Crins (pers.. comm.)
! data from S. Varga (pers. comm.)

		Alp's Woods	Awenda	Backus Woods	Baker's Woods	Beattie Pinery 1!	Beattie Pinery 2!	Bronte Creek	Cabot Head	Clear Creek Woodlot	Clendenan Dam	Dundas Valley	Fish Point
ECOLOGICAL FUNCTIONS													
1. Community Size	Area in ha	39.3	73.7	9.2	28.8	28.4	13.9	12.3	6.9	1.6	24.2	5.4	12.8
2. Community Context	Percent forest cover within 1 km buffer	18	97	66	16	15		26	90	34	35	69	31
	Roads within 1 km buffer (m/ha)	19	13	14	33	18		37	21	8	27	29	17
	Houses within 1 km buffer (no./ha)	0.09	0.01	0.07	0.37	0.08		0.11	0.09	0.02	0.33	0.13	0.01
UNCOMMON FEATURES													
1. Tree size	No. points sampled	15	18	24	30	50!	40!	18	15	12	15	20	15
	Mean dbh (cm)	33.4	34.8	37.2	33.8	33.2!	34.9!	32.5	29.2	43.3	34.5	38.3	30.4
	Max dbh (cm) in sample	65	76	85	100	79!	76!	81	65	115	67	85	93
	Percent of sampled trees > 49 cm dbh	10.0	23.6	24.0	25.0	12.5!	25!	19.4	5.0	39.6	16.7	21.3	13.3
	Percent of sampled trees > 69 cm dbh	0.0	6.9	10.4	7.5	2.5!	2.5!	2.8	0.0	12.5	0.0	2.5	1.7
2. Basal area	m^2/ha	31.2	33.9	39.4	30.1	47.0!	40.2!	32.0	34.6	44.8	39.0	35.4	20.9
3. Size class distribution			B	A	D	B	B	A	C	A	C	A	
4. Coarse woody debris (tree logs >10 cm diameter)	Mean no. logs within 10 m of pt.	0.7	1.6	0.5	0.1	2.9		1.3	0.7	0.3	1.2	1.0	1.8
	Mean log size (cm diameter)	24.8	27.1	35.4	26.0	26.7		35.2	25.4	38.0	28.9	34.4	29.1
	S.D. log size	10.5	16.5	19.9	15.7	8.8		10.8	6.6	12.8	11.9	12.1	9.6
	Mean no. logs > 40 cm dbh / pt.	0.1	0.3	0.2	0.0	0.3		0.6	0.0	0.2	0.3	0.4	0.3
	Mean no. logs > 50 cm dbh / pt.	0.0	0.2	0.1	0.0	0.1		0.2	0.0	0.0	0.1	0.2	0.1
	Maximum log size (cm)	44	80	77	44	50		55	38	49	54	55	54
	Mean log decomposition state	2.9	2.3	2.6		2.9		2.5	2.2	3.3	2.9	2.8	2.7
	S.D. log decomposition state	0.7	0.9	1.3		0.7		0.7	0.9	0.6	0.8	0.8	0.6
5 Rare woodland species in site (see Appendix 1)	No. VTE bird species		3	6	0	0		1	2	1		4	1
	No. S1-S3 bird species		2	5	0	0		1	1	1		4	1
	No. VTE plant species		0	4	0	1		1	0	1		3	2
	No. S1-S3 plant species		1	10	0	1		2	3	4		7	15
6. Conservative woodland species in site (see Appendix 1)	No. indicator bird species		23	32	11	13		13	32	7		26	5
	No. responsible bird species		20	36	12	17		21	29	14		34	15
	No. plant species with CV > 6		41	71	7	18		51	50	38		42	42
	No. plant species with CV > 7		13	29	0	4		11	19	13		11	21
7. Floristic quality of community (see Appendix 1)	No. plant species with CV > 6	5	3			7		5	8	7	8	13	13
	No. plant species with CV > 7+C95	2	1			1		0	1	0	1	2	8
	Mean conservatism value (CV)	4.7	5.1			4.8		4.7	5.0	4.8	4.8	5.3	5.4
	Floristic quality index (FQI)	38.2	29.7			35.3		33.9	38.3	42.3	41.9	46.5	37.5
8. Herb richness	No. native woodland herbs / 0.5 hr	65	34			53		51	60	79	76	77	49
	Mean no. native herbs / m^2 quadrat	1.3	1.7	3.5	1.3	2.9		1.2	1.6	3.5	3.5	2.5	4.4
9. Non-native plants	% of points with non-native species	26.7	0.0	0.0	3.3	0.0		11.1	33.3	33.3	6.7	0.0	40.0
	Mean % cover non-native species / m^2	0.3	0.0	0.0	0.3	0.0		0.9	0.8	4.4	0.1	0.0	8.1
10. Evidence of logging	Mean no. stumps within 10 m of pt.	1.9	0.0	2.0	1.6	1.3		0.8	0.9	0.0	0.5	0.2	0.1
11. Presence of trails	High, Medium, Low (H, M, L)	H	L	M	H	M		M	M	L	M	M	M

Gillies Grove 1*	Gillies Grove 2*	Halton Forest South	Happy Valley 1	Happy Valley 2	Hoasic Creek	Hope Bay	Kolapore Escarpment	Krug Forest	Marcy's Woods	Marshall Woods	Morris Tract	Niagara Gorge	North Cayuga Slough Forest	Paradise Grove	Peter's Woods	St. John's-Fonthill Valley
7.6	14.8	31.7	6.3	9.5	9.7	5.3	12.6	162.4	33.3	2.4	7.7	11.2	55.0	26.0	10.2	11.8
26		64	65		72	89	80	62	64	41	41	5	52	7	59	29
92		35	24		27	15	3	9	25	3	16	32	10	81	28	45
4.61		0.11	0.07		0.02	0.03	0.03	0.07	0.45	0.03	0.21	0.07	0.03	0.97	0.05	0.52
12	12	12	12	12	15	12	15	18	23	24	16	18	20	12	24	12
38.5*	35.3*	30.2	26.6	33.6	28.5	31.5	29.5	41.8	37.5	33.0	34.4	31.3	29.6	40.4	41.2	37.5
105*	87*	51	61	66	58	89	76	83	92	94	90	81	70	94	99	87
32.5*	22.5*	2.1	6.3	16.7	10.0	16.7	6.7	38.9	21.7	18.8	17.2	16.7	10.0	37.5	34.4	27.5
17.5 *	5*	0.0	0.0	0.0	0.0	2.1	1.7	4.2	6.5	5.2	1.6	4.2	1.3	14.6	11.5	5.0
51.9	28.3	29.8	35.0	34.6	23.5	30.7	44.8	37.6	29.8	40.4	38.7	21.4	27.9	32.0	44.2	41.8
B	C		C	C	C	C		D	A	C	A	A	A		A	C
0.2	0.4	0.3	2.6	2.6	1.9	0.8	1.5	0.4	1.2	1.1	1.6	2.1	0.6	0.3	1.3	1.4
51.5	45.8	19.5	28.5	27.3	32.6	21.8	23.8	29.3	35.7	44.4	29.0	30.9	25.1	41.3	41.4	29.8
2.1	6.0	2.5	7.4	8.9	11.5	4.0	7.1	5.5	14.9	18.7	6.4	7.6	7.6	9.5	14.6	11.1
0.2	0.3	0.0	0.3	0.3	0.5	0.0	0.1	0.0	0.4	0.5	0.1	0.3	0.0	0.2	0.7	0.4
0.2	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.0	0.1	0.4	0.1
53	52	22	46	52	62	30	40	37	80	85	42	48	35	51	75	55
2.0	2.0	2.5	3.0	2.5	2.6	2.3	2.0	2.4	2.5	2.6	2.7	3.0	2.3	2.7	2.6	2.7
0.0	0.7	1.0	1.1	1.3	0.9	0.5	1.0	1.2	0.9	1.0	1.1	0.9	1.0	1.5	1.0	1.0
1		3	3		1	2	0	2	4	1	1	0	1	1	1	3
0		2	2		0	1	0	1	4	1	1	0	1	3	1	3
0		0	1		0	1	1	1	1	1	1	2	0		0	4
0		1	1		0	5	2	2	6	2	4	11	8		0	7
23		29	29		20	28	22	28	21	22	14	4	14	7	25	17
16		33	34		19	29	21	30	34	22	23	11	20	16	22	34
15		43	32		24	56	45	45	64	38	42	66	59		29	54
3		14	11		1	21	18	18	24	16	14	30	19		5	19
8		9		4	6	9	15	9	14	8		12		1	12	15
2		0		1	0	6	9	5	4	1		4		1	2	6
4.6		4.9		5.0	4.7	5.3	5.7	5.3	5.3	4.9		5.2		3.8	5.2	5.3
40.1		44.1		39.1	39.0	38.0	43.3	38.6	49.0	36.8		40.8		24.7	46.0	48.1
75		82		61	68	52	58	53	84	57		61		42	79	81
4.0	2.3	6.3	1.0	2.1	1.5	2.6	2.9	5.4	8.2	1.4	3.3	1.6	0.7	1.3	2.7	2.6
25.0	8.3	25.0	0.0	25.0	16.7	8.3	6.7	0.0	70.0	11.1	6.3	0.0	0.0	75.0	12.5	50.0
0.7	0.1	0.6	0.0	0.3	0.2	0.1	0.1	0.0	1.3	0.1	0.1	0.0	0.0	8.9	0.1	1.3
0.3	0.9	0.8	0.5	0.5	0.3	0.0	0.3	0.6	0.1	0.1	0.3	0.1	1.1	0.1	0.7	0.1
H	M	M	L	M	H	M	M	L	H	M	M	H	L	L	H	H

Table 4. Continued

		Skunk's Misery	Snake Island	Soperton Forest	Springwater Forest	Stewart's Woods	Walker's Woods	Warsaw Caves	Wesleyville Ravines	Mean	Minimum	Maximum
ECOLOGICAL FUNCTIONS												
1. Community Size	Area in ha	3.2	16.3	6.5	72.4	7.1	3.0	32.0	2.1	**22.1**	**1.6**	**162.4**
2. Community Context	Percent forest cover within 1 km buffer	59	79	64	32	56	60	55	29	**49.6**	**5.4**	**97.0**
	Roads within I km buffer (m/ha)	15	14	5	25	5	77	20	33	**25.7**	**3.0**	**92.0**
	Houses within I km buffer (no./ha)	0.03	1.62	0.04	0.28	0.05	2.04	0.22	0.02	**0.4**	**0.0**	**4.6**
UNCOMMON FEATURES												
	No. points sampled	15	22	12	20	20	20	1.5	1.2			
I. Tree size	Mean dbh (cm)	33.7	30.4	38.1	40.6	38.2	29.8	31.2	36.2	**34.3**	**26.6**	**43.3**
	Max dbh (cm) in sample	84	73	95	96	76	70	63	6.1	**80.0**	**51.0**	**115.0**
	Percent of sampled trees > 49 cm dbh	21.7	11.4	33.3	33.8	26.3	7.5	6.7	17.5	**19.3**	**2.1**	**39.6**
	Percent of sampled trees > 69 cm dbh	3.3	2.5	6.3	7.5	5.0	1.3	0.0	0.0	**3.9**	**0.0**	**14.6**
2. Basal area	m^2/ha	28.9	31.1	31.7	39.0	65.2	58.1	31.7	41.8	**36.0**	**20.9**	**65.2**
3. Size class distribution			C	C	A	B		B				
4. Coarse woody debris (tree logs >10 cm diameter)	Mean no. logs within 10 m of pt.	0.1	0.5	0.8	1.0	2.8	2.3	2.3	2.0	**1.2**	**0.1**	**2.9**
	Mean log size (cm diameter)	28.0	34.3	38.1	43.5	29.4	25.1	25.5	29.6	**31.7**	**19.5**	**51.5**
	S.D. log size		12.6	15.2	18.0	10.5	10.1	9.0	10.0	**10.5**	**2.1**	**19.9**
	Mean no. logs > 40 cm dbh / pt.	0.0	0.2	0.4	0.7	0.5	0.3	0.3	0.4	**0.3**	**0.0**	**0.7**
	Mean no. logs > 50 cm dbh / pt.	0.0	0.0	0.3	0.3	0.1	0.0	0.1	0.1	**0.1**	**0.0**	**0.4**
	Maximum log size (cm)	28	60	65	80	60	43	54	5.5	**53.1**	**22**	**85**
	Mean log decomposition state	3.0		2.3	3.0	2.7	3.1	2.7	2.8	**2.6**	**2.0**	**3.3**
	S.D. log decomposition state			1.2	0.9	0.8	1.2	0.8	0.8	**0.9**	**0.0**	**1.5**
5 Rare woodland species in site (see Appendix 1)	No. VTE bird species	4	0		2	0	0	1		**1.6**	**0**	**6**
	No. SI-S3 bird species	4	0		3	0	0	0		**1.4**	**0**	**5**
	No. VTE plant species	2	0		2			0	0	**1.0**	**0**	**4**
	No. SI-S3 plant species	6	1		9			0	1	**3.9**	**0**	**15**
6. Conservative woodland species in site (see Appendix 1)	No. indicator bird species	22	11		18	20	19	24		**19.3**	**4**	**32**
	No. responsible bird species	32	11		25	17	13	19		**22.6**	**11**	**36**
	No. plant species with CV > 6	47	15		34			18	26	**39.7**	**7**	**71**
	No. plant species with CV > 7	14	3		17			5	6	**13.5**	**0**	**30**
7. Floristic quality of community (see Appendix 1)	No. plant species with CV > 6	13		8		10		6	8	**8.7**	**1**	**15**
	No. plant species with CV > 7+C95	3		2		0		0	2	**2.4**	**0**	**9**
	Mean conservatism value (CV)	5.0		5.0		5.1		4.9	4.8	**5.0**	**3.8**	**5.7**
	Floristic quality index (FQI)	43.4		43.9		43.1		35.5	40.5	**39.9**	**24.7**	**49.0**
8. Herb richness	No. native woodland herbs / 0.5 hr	76		77		71		52	72	**64.6**	**34**	**84**
	Mean no. native herbs / m^2 quadrat	4.7	4.5	4.6	2.5	5.0	3.8	1.9	1.8	**2.9**	**0.7**	**8.2**
9. Non-native plants	% of points with non-native species	6.7	31.8	0.0	0.0	6.7	6.7	6.7	25.0	**16.0**	**0.0**	**75.0**
	Mean % cover non-native species / m^2	0.1	0.3	0.0	0.0	0.3	0.1	0.1	0.3	**0.8**	**0.0**	**8.9**
10. Evidence of logging	Mean no. stumps within 10 m of pt.	0.3	0.1	0.6	0.6	1.2	1.0	0.5	0.1	**0.6**	**0.0**	**2.0**
11. Presence of trails	High, Medium, Low (H, M, L)	M	M	L	M	M	H	L	H		**Mode=M**	



Peter's Woods, north of Centreton

Peter's Woods

Site District: 6E-7
OBM Map: 10 17 7350 48850
NTS Map: 31D/1
UTM Reference: 736800 4889700
Site Area: 33 hectares
Aerial Photographs: 78 36 4409 134-136
Ownership: Public (Provincial Nature Reserve)

Peter's Woods, also known as Settler's Woods, is one of the most mature deciduous woodlands in southern Ontario. Its large trees provide a glimpse of how our woodlands would have appeared at settlement. It was acquired through joint action by the Willow Beach Field Naturalists Club and the OMNR, and is named after the late A. B. "Peter" Schultz of Port Hope. Its undulating ridges are covered in mesic deciduous forest dominated by Sugar Maple and Beech, with intermingled, large Red Oak and White Pine, and a variety of other tree species.

Representation

Peter's Woods represents mature deciduous woodland on the Peterborough Drumlin Field physiographic region of site district 6E-7 (Lindsay 1984). It is on the margins of this region and the Oak Ridges Moraine.

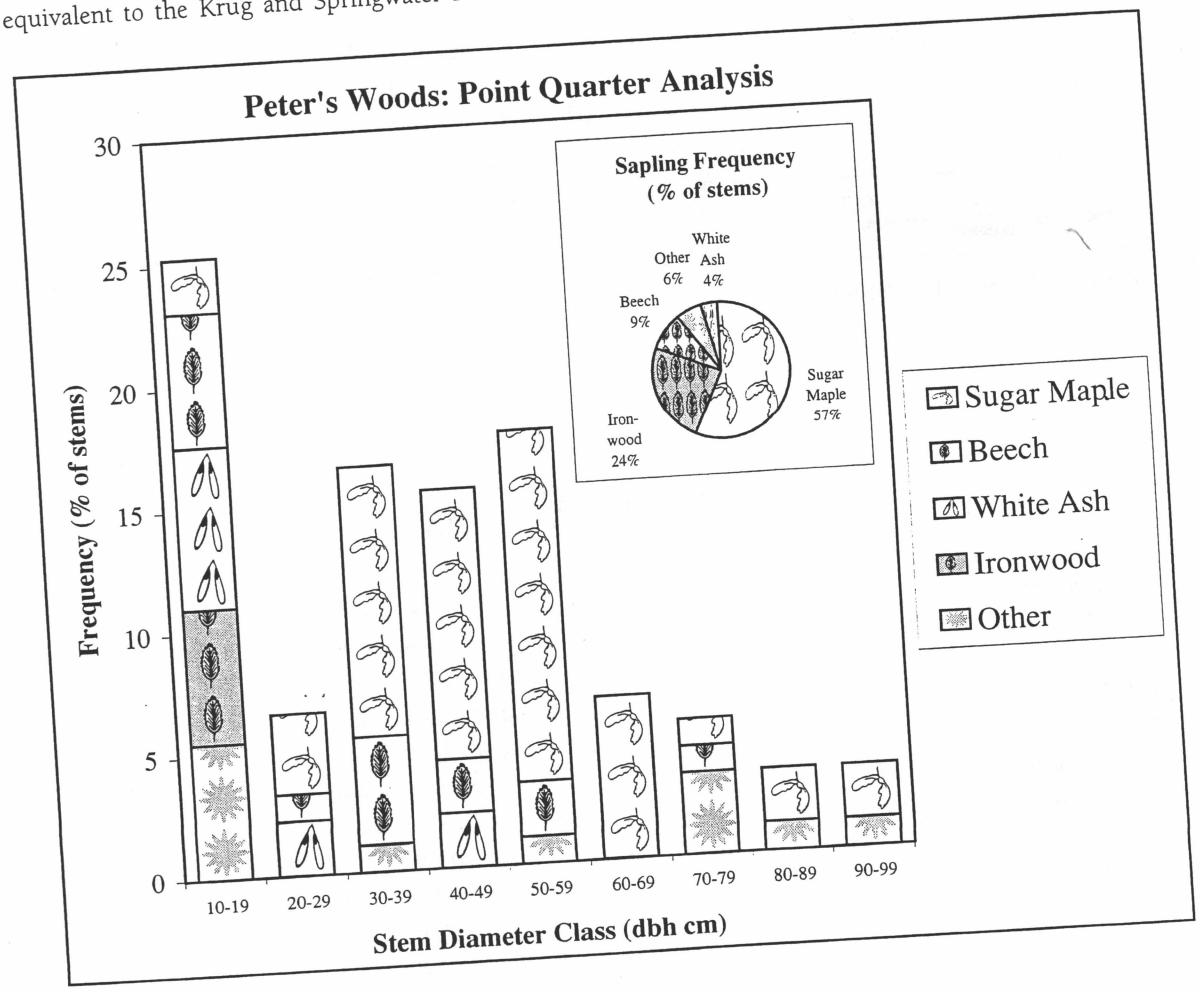
Ecological Functions—Landscape Context

Overall, Peter's Woods is a small stand of trees that is subject to the influences of its surrounding landscape. It is flanked to the east by young conifer swamp and wetlands, to the north by regenerating old fields and active agriculture, and to the south and west by young woodland and plantation (Brownell and Blaney 1995, and pers. obs.) There is a road allowance along its southern boundary that will be maintained, but which will also serve as a buffer (OMNR 1990).

Uncommon Features

Although much smaller in extent, Peter's Woods is equivalent to the Krug and Springwater Forests in terms of the size of individual trees but its high numbers of very large individuals (>69 cm dbh) is certainly noteworthy. Large individuals include a 105-centimetre dbh White Oak, 99-centimetre Sugar Maple and White Pine, and an 89 centimetre Red Oak. The size-class distribution is somewhat J-shaped, but an absence of trees in the 20 to 29 centimetre class may connote past logging.

The age of the forest is estimated at 200 to 300 years (J. McAndrews, cited in Brownell and Blaney 1995), and may date to stand-initiating open conditions denoted by its large Red Oak and White Pine. Stumps were relatively frequent, but were generally older and near the edge of the stand. Dougan (1975) suggests that there has likely been little cutting in the past 50 years. Regeneration patterns suggest continued dominance by Sugar Maple and Beech, and local regeneration of White Pine was observed. Peter's Woods also exemplifies other features of older-growth woodlands—multiple canopy gaps, numerous large



fallen logs and prevalent snags.

Given its small size, a startling diversity of rare and conservative woodland birds have been recorded from Peter's Woods. During May 1995, a singing Kentucky Warbler was found in Peter's Woods (Brownell and Blaney 1995). This species is an unconfirmed vagrant breeder in Ontario, and it is provocative that it selected a territory in one of our most mature woodlands. Woodland indicator plants are not well represented, but overall herb richness was among the highest of woodlands sampled. The only non-native species encountered at the site were scattered Helleborine.

Area of sampled community (ha)	10.2
Mean tree dbh (cm)	41.2
Percent of sampled trees >49 cm dbh	34.4
Mean no. logs within 10 m of points	1.3
Mean tree log size (cm diameter)	41.4
Mean no. logs >40 cm dbh/point	0.7
No. indicator bird species in site	24
No. plant species with CV >7 in site	5
Mean conservatism value (CV)	5.2
% of points with non-native species	12.5
Mean no. stumps within 10 m of points	0.7

Conclusions

Peter's Woods is a critical piece of Ontario's natural heritage from aesthetic, scientific and educational perspectives. The most recent management plan recommends that the forest be left untouched, and it also initiated long-term monitoring (OMNR 1990). The current trail does not seem to compromise natural heritage values, but interpretive signage could perhaps be enhanced.

Because of its small size, the integrity of Peter's Woods is inextricably linked to the extent of surrounding woodlands. Shockingly, the bordering property to the south was recently logged. It thus appears that land purchases are necessary to increase the survival prospects for Peter's Woods, by maintaining and restoring its current landscape context.

The structure of Peter's Woods has seen surprisingly little documentation and should be researched further and compared with other mature woodlands in eastern North America. In particular, the sample plots established around 1970 should be resurveyed.

The protection of Peter's Woods is the remarkable achievement of a community naturalist group, the Willow Beach Field Naturalists Club, who have also recently stepped forward to directly manage this provincial nature reserve on behalf of Ontario Parks.

References

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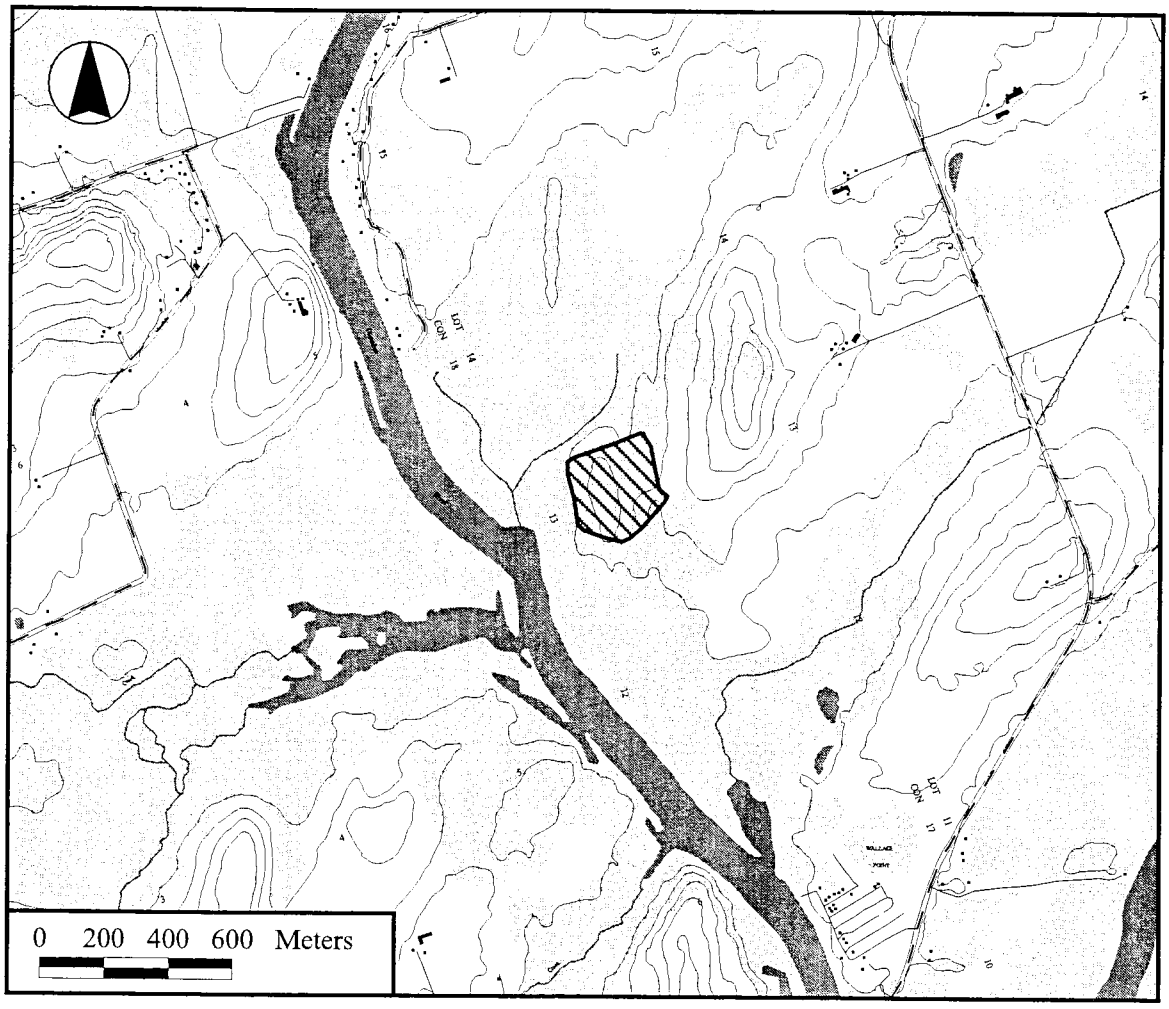
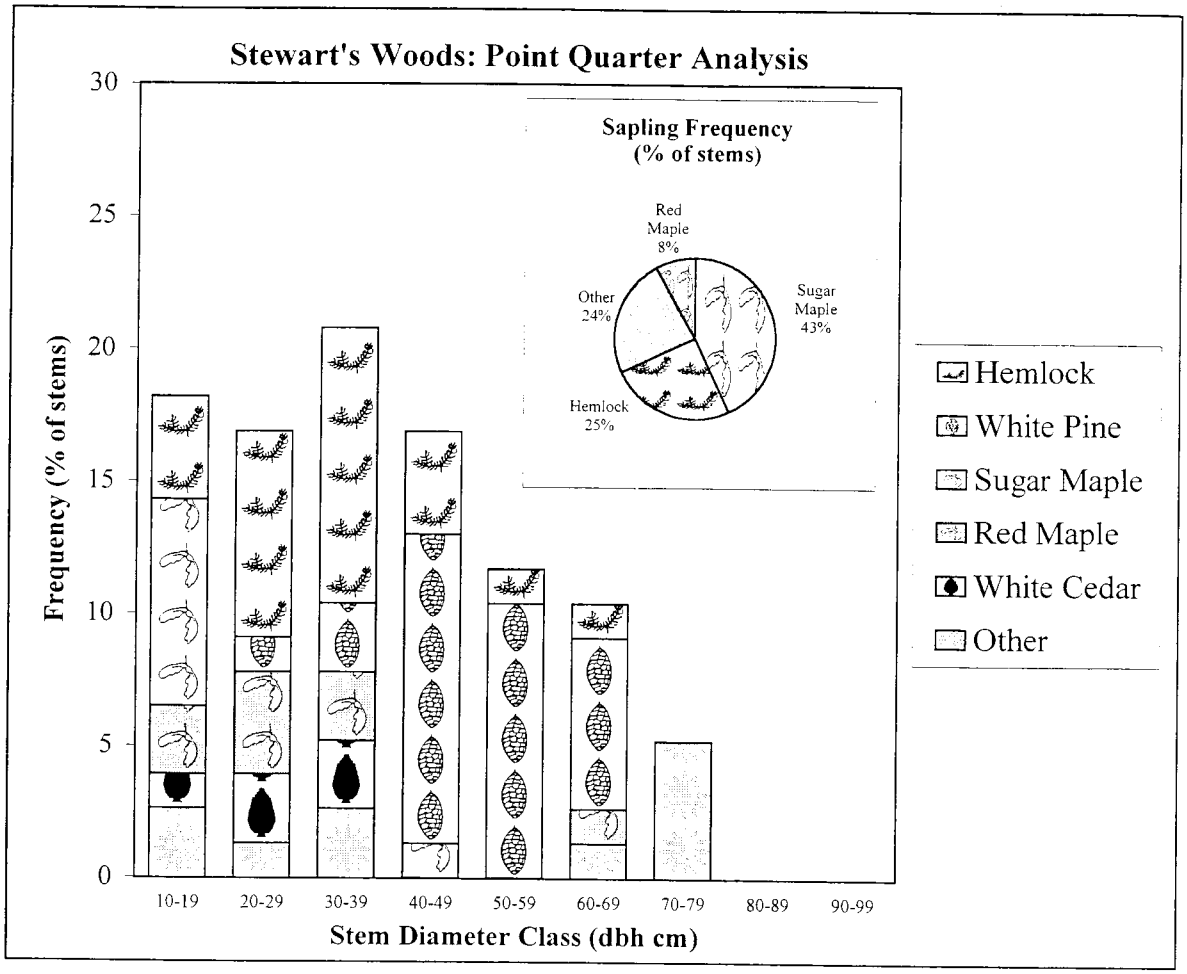


Stewart's Woods, southwest of Stewart Hall

Stewart's Woods

Site District: 6E-8
OBM Map: 10 17 7100 48950
NTS Map: 31D/1
UTM Reference: 712300 4897400
Site Area: 27 hectares
Aerial Photographs: 78 22 4414 121-123
Ownership: Public (Otonabee Conservation Authority)

Stewart's Woods is a beautiful mixed forest on sandy loam soils. It is dominated by enormous White Pine that form a classic supercanopy over a mixed canopy of Hemlock–Red Maple and Sugar Maple. It was allegedly never clearcut (P. Burke, pers. comm. with neighbouring farmer), and has not been selectively logged at least since it was donated to the Conservation Authority by Mr. Stewart in 1969 (J.Williams, pers. comm.)



Representation

Stewart's Woods represents upland woodland in the Peterborough Drumlin Field physiographic region (Chapman and Putnam 1984) of site district 6E-8, in which few other older-growth woodlands have been noted (Hanna 1984). This is also likely the most mature coniferous example (Burke and Burke 1998).

Ecological Functions–Landscape Context

This woodland is relatively small and located within a predominantly agricultural landscape. It is separated from fields to its east by a narrow poplar buffer, but is otherwise well ensconced within young, naturally regenerating woodland.

Uncommon Features

Stewart's Woods has very large trees, and a marked concentration of stems more than 49 centimetres in diameter. It was remarkable in having the highest basal area of any woodland sampled. Its age is unknown, but a White Pine 50 centimetres in diameter was a minimum of 114 years old. The large oak and White Pine suggest that the stand was disturbed or opened more than 120 years ago but the prevalence of Hemlock suggests that any initiating disturbance was relatively slight, or it would likely be absent. White Pine seedlings, but not saplings, were observed. Although downed logs were not large they were very frequent, and snags were occasional. Old stumps were widespread.

No rare or conservative birds are known from the Woods but, for its size, it has a good complement of indicator species. Plant diversity in the sampled stand was relatively high, but conservativeness was typical. Both Helleborine and Common Buckthorn were scattered throughout.

Area of sampled community (ha)	7.1
Mean tree dbh (cm)	38.2
Percent of sampled trees >49 cm dbh	26.3
Mean no. logs within 10 m of points	2.8
Mean tree log size (cm diameter)	29.4
Mean no. logs >40 cm dbh/point	0.5
Mean conservatism value (CV)	5.1
% of points with non-native species	6.7
Mean no. stumps within 10 m of points	1.2

Conclusions

Stewart's Woods is an exceptional place to experience all that a woodland has to offer. It was one of the best conifer woodlands examined during this study. Its White Pine supercanopy and dense Hemlock regeneration suggest that it is original old growth. The Conservation Authority plans to conserve the site as old growth (J.Williams, pers. comm.) and they and the original donor should be commended for doing so.

References

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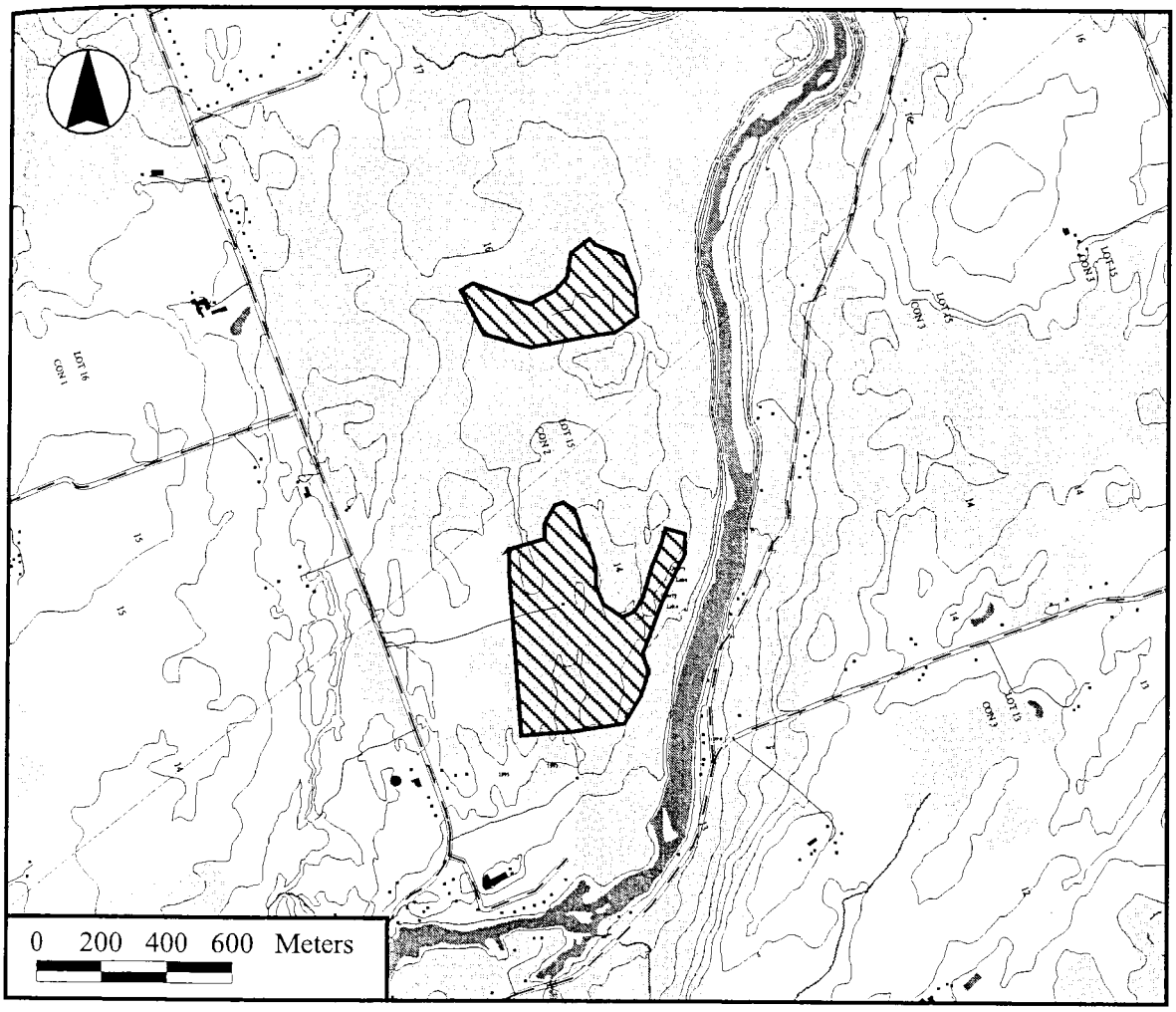


Mature woodland communities at Warsaw Caves, northeast of Warsaw

Warsaw Caves

Site District: 6E-9
OBM Map: 10 17 7250 49250
NTS Map: 31D/8
UTM Reference: 728500 4925400
Site Area: 270 hectares
Aerial Photos: 78 121 4431 57-59; 138 4432 161-162
Ownership: Public (Otonabee Conservation Authority) and private

Young conifer woodlands on limestone prevail at Warsaw Caves, but there are two sections of mature deciduous forest (Brunton 1990). The southern section is older, but has been heavily managed for maple syrup production. Here, we describe the northern stand— dominated by Sugar Maple, Hemlock and White Pine.

Representation

Warsaw Caves represents upland woodland on the Dummer Moraine, the predominant physiographic region in site district 6E-9 (Lindsay 1986). Upland deciduous woodland is poorly represented in the site district, and other woodlands that were considered relatively mature, including Oak Orchard (B. Larson and D. Sutherland pers. obs.) and Collins Lake (R.Snetsinger, pers. comm.), have since been selectively logged.

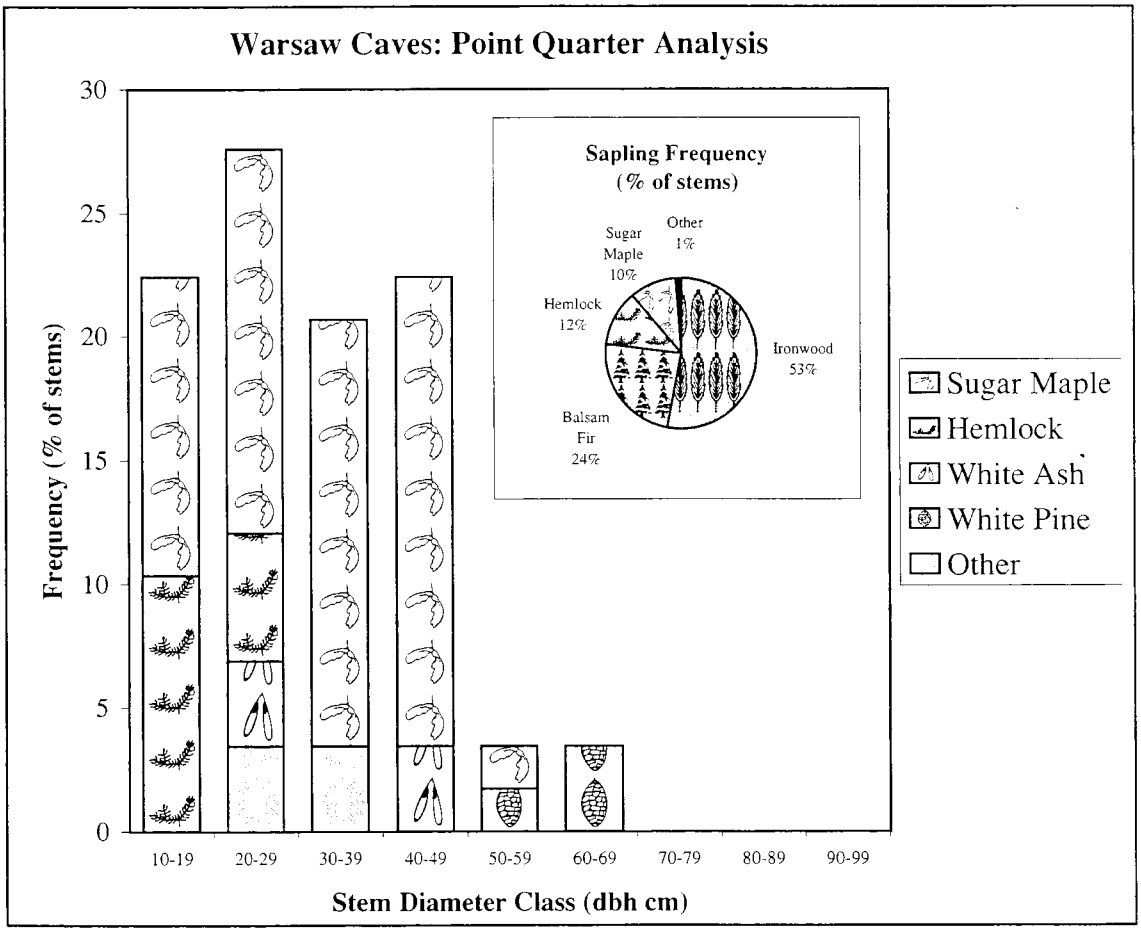
Ecological Functions–Landscape Context

The two blocks of deciduous forest at Warsaw Caves are mostly surrounded by young mixed woodland, but the southern block is partially bordered by agricultural field.

Uncommon Features

The trees in the sampled community at Warsaw Caves were below average size among woodlands studied. The age of these trees is unknown, but Brunton (1990) considered the mature deciduous forest here to be as old as 140 years. Pit-mound topography is relatively well-developed in the stand, and small logs and old stumps are common, and gaps and snags occasional. The large White Pine and White Ash suggest that they originated in more open conditions. Hemlock regeneration was locally dense. These characteristics suggest a mature forest, with relatively infrequent deer browse.

Few rare woodland birds and plants are known from Warsaw Caves. A variety of conservative woodland birds are known to breed here and the southern tract is particularly good despite (or because of) past management (P.Burke, pers. comm.) Plant conservatism and richness were both relatively low in the sampled community and for the site as a whole. Non-natives were relatively infrequent beside scattered Helleborine.



Total area (ha) of both sampled stands	32.0
Mean tree dbh (cm)	31.2
Percent of sampled trees >49 cm dbh	6.7
Mean no. logs within 10 m of points	2.3
Mean tree log size (cm diameter)	25.5
Mean no. logs >40 cm dbh/point	0.3
No. plant species with CV >7 in site	5
Mean conservatism value (CV)	4.9
% of points with non-native species	6.7
Mean no. stumps within 10 m of points	0.5

Conclusions

The deciduous woodlands at Warsaw Caves have a history of human disturbance but nevertheless may be the most mature woodland remaining in site district 6E-9. As recommended by Brunton (1990), as a means of securing protection the privately-owned southern section should be investigated.

References

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Appendix 3
Additional Noteworthy Upland Woodlands

This appendix lists additional sites that likely support ecologically representative woodlands containing a variety of uncommon features and site conditions. The list is drawn from a number of sources, including site district reports, ESA studies and personal communications, but it is not intended to be complete. Only a selection of woodlands could be surveyed during this project to test evaluation criteria, and, for some of the following sites, either there was insufficient information or recent impacts were known or suspected. Site districts are based on Riley et al. (1997), which also lists available sources of information for these sites.

SITE NAME	MAP	EASTING	NORTHING
Site District 5E-12			
Cody Creek Black Maple Forest	31F/8	401000	5023000
Site District 6E-1			
Bayfield River	40P/12	448000	4823000
Saratoga Swamp	40P/13	453000	4851000
Unopened 12th Woodlots	40P/2	500500	4776500
Trillium Woods Provincial Nature Reserve	40P/2	517869	4767564
Eramosa River Valley	40P/9	568500	4834500
Montgomery Woods	40P/7	529000	4797500
Crawford Lake – Milton Outlier Valley	30M/5	585500	4713500
Site District 6E-2			
Bayfield North	40P/12	444000	4827000
Bayfield South	40P/5	445000	4815000
Site District 6E-4			
Skinner Bluff	41A/14	497500	4959000
Pretty River Valley	41A/8	554000	4918000
Sucker Creek – Cape Rich	41A/10	523000	4950000
Inglis Falls C.A.	41A/10	505500	4930500
Kimberley Creek (Old Baldy C.A.)	41A/7	538000	4914000
Site District 6E-5			
Robson Lakes	41A/7	520500	4920000
Molesworth Woods	40P/14	499000	4846300
Traverston Creek Forest	41A/7	526500	4901500
Site District 6E-6			
Giant's Tomb Island Park Reserve	41A/16	578500	4972500
Fergusonvale North	31D/12	593200	4935300
Rugby West	31D/12	617000	4935000
Beausoleil and Associated Islands	31D/13	590000	4971000

SITE NAME	MAP	EASTING	NORTHING
Hope and Beckwith Island	41A/16	563000	4963000
Allandale Lake Algonquin Bluffs	31D/5	601000	4910000
Georgina Island	31D/6	636000	4915000
Site District 6E-7			
Halton Forest North	30M/12	584000	4823000
Speyside Forest	30M/12	582500	4827500
Cold Creek Complex	31C/4	273500	4888000
Murray Hills Headwater	31C/4	287300	4888300
Glen Major Forests	31D/3	654000	4874000
Devil's Glen	41A/8	561600	4911500
Brooklin Old-Growth Forest	30M/15	664300	4871900
Uxbridge Pine – Maple Uplands	31D/3	652000	4879000
Millvalley Hills Forest	31D/1	731000	4884000
Ganaraska Forest West of Carmel	31D/1	700500	4886500
Shelter Valley	31D/1	737800	4881500
Tyrone Valley	31D/2	680000	4875000
Glenville Hills Kame Moraine	31D/4	617500	4876500
Site District 6E-8			
Stirling Slope Complex	31C/4	294700	4901000
Morrow Bay Woods	31D/8	736500	4904500
Site District 6E-9			
Collins Lake Upland Forest	31C/8	384000	4912000
Bend Bay Valley	31C/5	299500	4923000
Big Island	31D/9	699000	4934500
Mark S. Burnham Park	31D/8	717500	4908500
Site District 6E-11			
Marlborough Forest	31G/4	434000	4992000
Richmond Fen	31G/4	434000	4998000
Stevens Creek Swamp	31G/4	438000	4989000
Marathon Forest	31F/8	409000	5022000
Site District 6E-12			
Rigaud River Headwaters Forest	31G/7	521000	5022000
Crysler Farm Battlefield Park Forest	31B/14	492500	4977000
Stony Swamp	31G/5	435000	5016000
Site District 6E-13			
Mayhew Creek Headwater	31C/4	285000	4885800
Soper Valley	30M/15	686000	4871000
Black – Farewell Wetland Complex	30M/15	677500	4866000
Otty Point Upland Woods	30M/15	612600	4867600

SITE NAME	MAP	EASTING	NORTHING
Site District 6E-14			
Flowerpot Island	41H/5	451000	5016500
Bear's Rump Island	41H/5&6	455500	5018000
Smoky Head – White Bluff	41H/3	478000	4989000
Site District 6E-15			
Lost Lake Escarpment Forests	31C/2	346500	4880500
Cape Vasey Escarpment Cliffs	31C/2	347500	4877500
Black Creek Valley Marshes and Forest	30N/14	334500	4867500
Sandbanks Provincial Park	30N/14	317000	4864000
Cataraqui River Marsh	31C/8	383000	4903000
Mcmahon Bluff Escarpment Forests	30N/14	337000	4869000
North Ameliasburg Escarpment Valley	31C/3	304000	4882000
Macaulay Mountain Escarpment Forests	31C/3	330000	4874000
Johnson Bay Coastal Wetland and Forests	31C/8	399000	4903000
Presqu'ile Provincial Park (Jobe's Woods)	30N/13	282184	4875245
Site District 7E-1			
Walpole Island Reserve	40J/10	372000	4710000
Point Pelee National Park	40G/15	374500	4646000
Cedar Creek	40J/2	350000	4653500
Sinclair's Bush	40I/5	422500	4685500
Leamington Sand Hills Complex	40J/2	373500	4656800
Kopegaron Woods	40J/1	376500	4659000
Middle Island	40G/10	360000	4615700
Wheatley Provincial Park	40J/1	380067	4659832
Site District 7E-2			
South Walsingham Sand Ridges	40I/10	536000	4720000
Big Creek Floodplain	40I/10	538000	4721000
Spooky Hollow	40I/9	555500	4730500
Plum Creek Upland Woodlots	40J/16	396600	4736500
Ausable River	40P/5	434500	4774000
Big Otter Creek	40I/15	519500	4740500
Delhi Big Creek Valley	40I/15	540000	4740000
John E. Pearce Provincial Park	40I/11	463800	4717000
Hawk Cliff	40I/11	485500	4723500
Site District 7E-3			
Ancaster Creek Valley	30M/5	585000	4789000
Sulphur Creek Valley	30M/4	581500	4787000
Niagara Section Escarpment	30M/4	613000	4783000
Two Mile – Four Mile Creek Plain	30M/3&6	653500	4791000
Beamsville Escarpment	30M/3&6	627000	4778500
Sassafras Woods	30M/5	591900	4797100

SITE NAME	MAP	EASTING	NORTHING
Fifteen and Sixteen Mile Valleys	30M/3&6	635800	4775000
Clear Creek Old Growth Forest	40I/10	528500	4717300
Site District 7E-4			
Rouge River Valley	30M/14	649000	4852200
Roy Ivor's Woodlot	30M/12	607500	4822000
Iroquois Shoreline Woods	30M/5	606500	4815700
Boyd Conservation Area	30M/13	614000	4852500
Kleinburg Woodlots	30M/13	612000	4855000
Site District 7E-5			
Willoughby Clay Plain Forest	30L/14	655000	4762000
North Pelham Valley	30M/3&6	636200	4769100
Caistor – Canborough Slough Forest	30M/4	609000	4763000
Six Nations Reserve	40P/1	574000	4766000
Oriskany Sandstone and Woodlands	30L/13	686000	4755600
Site District 7E-6			
Spottiswood Lakes	40P/8	550000	4790000
Grand River Forests	40P/8	552000	4790000
Zenda Tract	40I/15	523000	4760000
Byron Woodlot	40I/14	471500	4756000
Komoka Provincial Park	40I/14	467369	4755125
Coldstream Conservation Area	40P/3	459300	4762800
Hughes Tract	40I/15	523500	4749700

Appendix 4

Point-Quarter Sampling Data for Heritage Woodlands

1. Tree Data

The following tables supplement the tree histograms provided in the site summaries. The frequency values reported here correspond to those in the histograms, and represent the proportion of all trees (> 10 cm dbh) sampled within a given stem diameter class for each species. The specific data for the species lumped together in the histograms as "other" are also provided. Stems of each species in the "other" category comprised less than 5% of the total number of stems. The number of sample points are indicated for each stand (n=x).

The "importance value" for each tree species, out of a possible 300, indicates its dominance within the stand. Importance values were calculated as follows:

Importance Value = Relative Density + Relative Frequency + Relative Dominance

where

$$\text{Relative Density} = \frac{\text{number of stems measured for each species}}{\text{total number of stems of all species measured}} \times 100$$

$$\text{Relative Frequency} = \frac{\text{number of points at which each species occurred}}{\text{total number of points at which all species occurred}} \times 100$$

$$\text{Relative Dominance} = \frac{\text{total basal area of each species}}{\text{total basal area of all species}} \times 100$$

ALPS WOODS (n=15)	Importance Value	Stem Diameter Class (dbh cm) 10-19	20-29	30-39	40-49	50-59	60-69
Sugar Maple	108.7	15.0	6.7	10.0	1.7	3.3	5.0
Basswood	38.8		3.3	3.3	5.0		
Pignut Hickory	36.6	1.7		5.0	5.0		
Black Cherry	32.3			8.3	1.7		
Red Oak	30.8	1.7	1.7	1.7	5.0		
Other							
Red Maple	15.2	1.7	1.7	1.7			
White Oak	11.8			3.3			
White Pine	11.1			3.3			
White Ash	9.5						1.7
Shagbark Hickory	5.2			1.7			

NIAGARA GORGE (n=18)	Importance Value	Stem Diameter Class (dbh cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Sugar Maple	124.3	17.9	25.4	7.5	3.0	1.5			
Red Oak	47.3				3.0	3.0	1.5		1.5
Tulip-tree	46.1					1.5	3.0	3.0	
Black Maple	34.1	4.5	4.5		1.5	1.5			
Other									
Black Cherry	12.3				3.0				
Hemlock	10.3	3.0	1.5						
Beech	8.9	1.5	1.5						
Ironwood	8.5	1.5	1.5						
White Ash	8.3		1.5				1.5		

NORTH CAYUGA (n=20) SLOUGH FOREST	Importance Value	Stem Diameter Class (dbh cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-79
Sugar Maple	97.7	9.7	8.3	9.7	4.2	1.4	1.4	
Beech	95.4	18.1	11.1	6.9	2.8			
Red Oak	28.2				2.8	1.4	1.4	
Red Maple	26.5	1.4		4.2				1.4
Other								
White Oak	14.4			1.4			1.4	
Burr Oak	14.2					2.8		
Bitternut Hickory	9.1	1.4			1.4			
White Ash	7.0	1.4			1.4			
Shagbark Hickory	3.8		1.4					
Basswood	3.7	1.4						

PARADISE (n=12) GROVE	Importance Value	Stem Diameter Class (dbh cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Black Oak	180.1	8.5	4.3	2.1	6.4	8.5	12.8	10.6	2.1	2.1
White Oak	43.0			2.1	8.5		2.1			
Norway Maple	29.4	10.6			2.1					
Black Cherry	29.0	10.6								
Other										
Bird Cherry	11.6	4.3								
Sassafras	6.9			2.1						

PETER'S (n=24) WOODS	Importance Value	Stem Diameter Class (dbh cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Sugar Maple	163.3	2.2	3.3	11.0	11.0	14.3	6.6	1.1	2.2	2.2
Beech	43.3	5.5	1.1	4.4	2.2	2.2		1.1		
White Ash	26.3	6.6	2.2		2.2					
Ironwood	14.2	5.5								
Other										
White Pine	23.5							3.3		1.1
Red Oak	11.7					1.1			1.1	
Basswood	10.8	4.4								
Yellow Birch	3.7			1.1						
Bitternut Hickory	3.3	1.1								

STEWART'S WOODS (n=20)	Importance Value	Stem Diameter Class (dbh cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-79
White Pine	106.2		1.3	2.6	11.7	10.4	6.5	
Hemlock	74.1	3.9	7.8	10.4	3.9	1.3	1.3	
Red Maple	27.2	2.6	3.9	2.6			1.3	
Sugar Maple	24.2	7.8			1.3			
White Cedar	16.7	1.3	2.6	2.6				
Other								
White Oak	18.8			1.3				2.6
Red Oak	18.4						1.3	2.6
Large-toothed Aspen	4.2			1.3				
White Ash	3.6		1.3					
Green Ash	3.3	1.3						
Beech	3.2	1.3						

WALKER'S WOODS (n=20)	Importance Value	Stem Diameter Class (dbh cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-79
White Cedar	147.9	26.3	15.8	13.2	3.9	1.3		
Hemlock	91.7			5.3	10.5	3.9		1.3
Red Maple	39.6		5.3	3.9	1.3		1.3	
Other								
White Pine	6.8				1.3			
Balsam Fir	5.4	2.6						
Green Ash	4.4		1.3					
White Birch	4.1	1.3						

WARSWA CAVES (n=15)	Importance Value	Stem Diameter Class (dbh cm) 10-19	20-29	30-39	40-49	50-59	60-69
Sugar Maple	180.2	12.1	15.5	17.2	19.0	1.7	
Hemlock	41.5	10.3	5.2				
White Pine	31.6					1.7	3.4
White Ash	27.4		3.4		3.4		
Other							
Basswood	10.4			3.4			
Red Maple	8.9		3.4				

WESLEYVILLE RAVINES (n=12)	Importance Value	Stem Diameter Class (dbh cm) 10-19	20-29	30-39	40-49	50-59	60-69
Hemlock	156.5	2.3	18.2	11.4	9.1	11.4	2.3
Sugar Maple	75.2	4.5	6.8	6.8	6.8		
White Ash	22.9	2.3	2.3	2.3	2.3		
Other							
Yellow Birch	19.6				2.3	2.3	
Basswood	9.8					2.3	
Red Oak	8.4				2.3		
Red Maple	7.6			2.3			