A Preliminary Survey of Old-Growth Forest Landscapes on the West Side of Algonquin Provincial Park, Ontario

Research Report No. 32
Ancient Forest Exploration & Research
www.ancientforest.org

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2006

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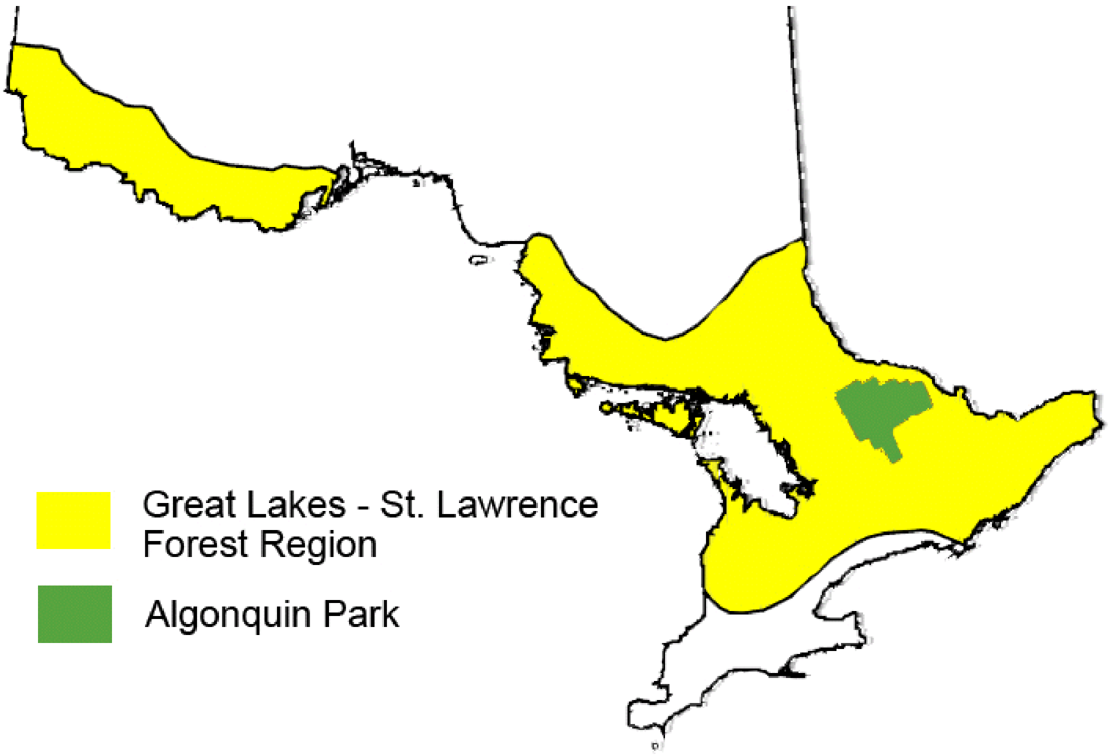
Executive Summary

Algonquin Park is one of the last refuges of original hemlock, yellow birch, and sugar maple forests in Ontario, and likely contains thousands of hectares of old-growth forest that could potentially be lost to logging. About 40% of forests over 140 years old in Ontario's Great Lakes-St. Lawrence Forest Region is located in Algonquin Park, while the Park occupies only 4% of the land in this region. A number of researchers have discovered trees in Algonquin's old-growth forests up to 430 years old using growth ring counts, and up to 610 years old using estimation techniques. Focusing on six of Algonquin Park's old-growth landscapes, we cored 21 old trees with a minimum age of 177 years, a maximum age of 433 years, and a mean age of 287 years. Within the recreation-utilization zone, where old-growth forests have no protection from logging we counted tree ages up to 304 years and estimated ages up to 375 years. Other researchers have found extremely old forests with trees as old as 387 years in the recreation-utilization zone of Algonquin Park. Hemlock trees to at least 240 years old have been harvested in the last few years north-east of Big Trout Lake, and a large block of old-growth forest near Erables Lake is allocated for logging in the current management plan. And yet, these very old forests in Ontario's first provincial park remain largely un-documented. Even more concerning is the continued logging of old-growth forests in Algonquin. To address the lack of adequate information and protection for old-growth forests in Algonquin Park, a detailed assessment of old-growth forests throughout the entirety of the Park should be carried out using digital forest resource inventory data and field inventories. As called for by many well-known ecological scientists and conservation organizations, all old-growth forests in Algonquin's recreation-utilization zone should be protected from logging, including the Erables Lake Forest. Old-growth stands that have been selectively logged but retain old-growth features should either be protected from logging or managed to restore or maintain representative size-class distributions, vertical structure, logs, and snags that are typical of Algonquin's old-growth forests. And finally, a province-wide conservation strategy for hemlock forests and yellow birch forests should be developed.

Introduction

In the process of researching our book: *Ontario's Old Growth Forests*, we were surprised at how little information is available for the old-growth forests in Algonquin Park - Ontario's flagship provincial park. Old-growth forests are valuable for a variety of reasons. To list just a few, they provide high quality wildlife habitat, they act as genetic reservoirs for the trees themselves, and they serve as scientific baseline ecosystems to monitor environmental change (Mosseler et al. 2003). In addition to containing 40% of the old-growth forests remaining in Ontario's Great Lakes-St. Lawrence Forest Region (Fig. 1) while occupying only 4% of the area in this region (AFA 2000, OMNR 2000), Algonquin plays an important role in providing ecological connectivity between Adirondack Park of northern New York State, which lies to the

Figure 1. Location of Algonquin Park in the Great Lakes - St. Lawrence Forest Region (adapted from OMNR 2002)



south of Algonquin and Lady Evelyn Park in Temagami, which lies to the north of Algonquin (Quinby et al. 2000, Quinby & Lee 2002). Given this lack of information and the regional ecological importance of Algonquin, we decided to investigate the location, integrity, and old trees in some of the larger old-growth landscapes in the Park. Given constraints on both time and resources we focussed on (1) ground-truthing portions of old-growth forest maps obtained from the Algonquin Forestry Authority (AFA 2004) and (2) rapid field assessment of the oldest class of forests in the Park - the forests over 180 years old.

The AFA maps turned out to be only partially accurate, but they lead us to a number of significant areas of old-growth forest in nature reserves, wilderness zones, and perhaps most significantly, in the recreation/utilization zone of Algonquin Park. Several of these old-growth areas do not appear to have been previously recognized. The field work that we conducted in 2005 was minimal and descriptive, but it is consistent with the findings of other researchers who have studied forests in Algonquin. Taken together, our map analysis, our field data, and the findings of other researchers make a compelling argument that further research needs to be done to locate, describe, and quantify the remaining old-growth forests throughout Algonquin Park, and most critically in the recreation/utilization zone where logging is permitted and may result in the loss of these rare ecosystems.

Algonquin Park Forests: A Brief Overview

Historically and to the present day, logging has significantly affected the forests in Algonquin Park. For instance, about 97% of the white pine and red pine forests in the Park today is now less than 140 years old primarily due to more than 150 years of logging (AFA 2000), whereas prior to logging, extensive old-growth pine stands with white pines living to ages greater than 500 years were common (Guyette & Cole 1999, AFA 2000). In fact, due primarily to logging and hot slash fires, Thompson et al. (2006) found that the number of white pine trees in mixed and deciduous stands in the Park has declined by as much as 88%. They estimate that this reduction translates into more than a million fewer white pine trees in Algonquin now compared with its pre-settlement abundance. This estimate is consistent with Frelich & Reich's (1996) finding that less than 1% remains of the original white and red pine forests in the United States.

Currently, the Algonquin Forestry Authority recognizes 16 working groups or forest dominance types in Algonquin Park (AFA 2000). In order of abundance, they include forests dominated by sugar maple (*Acer saccharum*) (40.9%), poplar (*Populus* spp.) (14.2%), white pine (*Pinus strobus*) (12.3%), hemlock (*Tsuga canadensis*), (6.6%), white birch (*Betula papyrifera*) (5.4%), balsam fir (*Abies balsamea*) (5.3%), yellow birch (*Betula allegheniensis*) (3.6%), red oak (*Quercus rubra*) (2.7%), black spruce *(Picea mariana*) (2.4%), red pine (*Pinus resinosa*) (2.3%), red maple (*Acer rubrum*) (1.5%), white spruce (*Picea glauca*) (1.4%), white cedar (*Thuja occidentalis*) (.8%), jack pine (*Pinus banksiana*) (.6%), ash (*Fraxinus* spp.) (.1%), and larch (*Larix americana*) (.1%) (Fig. 2; see also Appendix 1).

Despite this long history of logging, forest resource inventory (FRI) data indicate that Algonquin Park is still home to more old-growth forest than most other regions of Ontario. Almost 2,000 km^2 of forest in Algonquin is over 140 years old, making up about one third of the forest in the Park (AFA 2000). Likely because of its park status since the late 1800s, Algonquin contains about 40% of all forests over 140 years old found in the entire Ontario portion of the Great Lakes-St. Lawrence Forest Region, while the park occupies only 4% of the land in this region (OMNR 2002).

Considering only the 140-180 year age-class, which includes the minimum age for old growth of all forest types in the Algonquin Region (OMNR 2003), we found that 82% is made up of sugar maple-dominated forests (Fig. 3). The remaining forest dominance types in this age-class with a minimum of 1% relative abundance include hemlock (8.4%), yellow birch (6.2%), and white pine (1.2%) (Fig. 3). An examination of the oldest forests in Algonquin today - those greater than 180 years, shows that they make up 6.2% of the Park. The most abundant of these oldest forests are the hemlock and yellow birch dominance types, which account for 62.1% and 25.7%, respectively (Fig. 4). Almost half of the forest dominated by these two species is over 180 years old due to their longevity and also because hemlock, in particular, has never been as economically valuable as the pines and hardwood species. With the exception of extensive cutting in the 1950's and 60's for construction of the Toronto subway system, hemlock in Algonquin has remained under relatively low logging pressure. The sugar maple and white pine dominance types make up 9.8% and 1.4%, respectively, of this oldest age-class (Fig. 4).

Figure 2. Area (ha) of All Working Groups in Algonquin Park for All Ages (Area of Larch and Ash Less Than 600 ha)

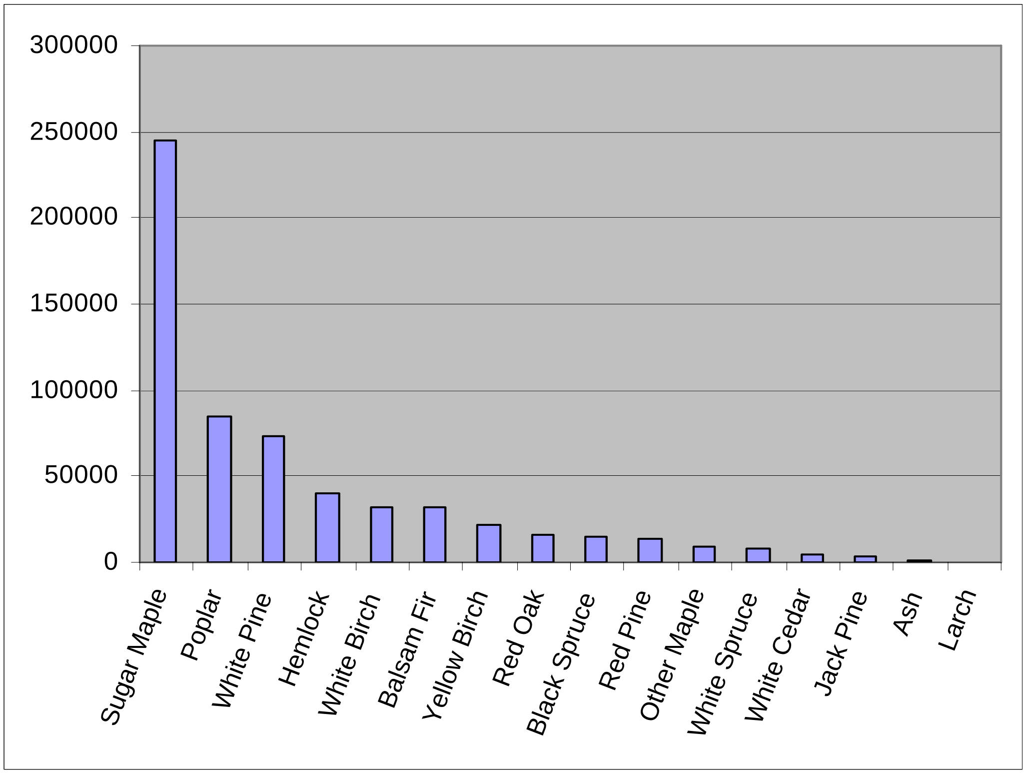


Figure 3. Area (ha) of All Working Groups in Algonquin Park for Ages 141-180 Years

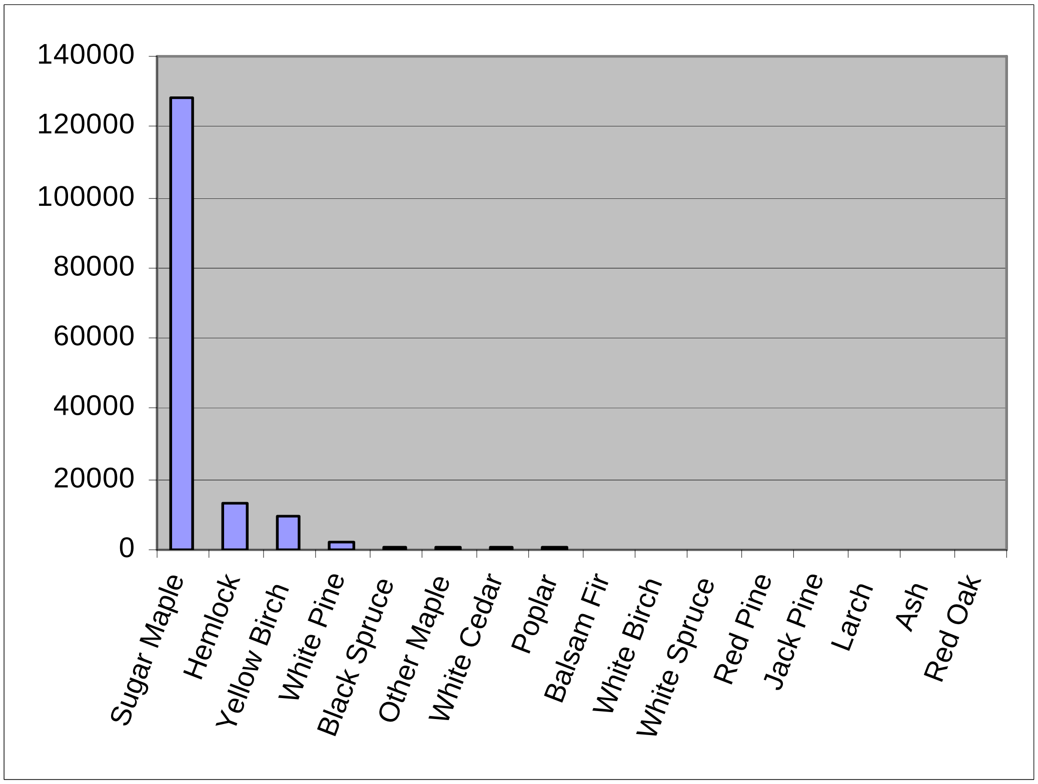
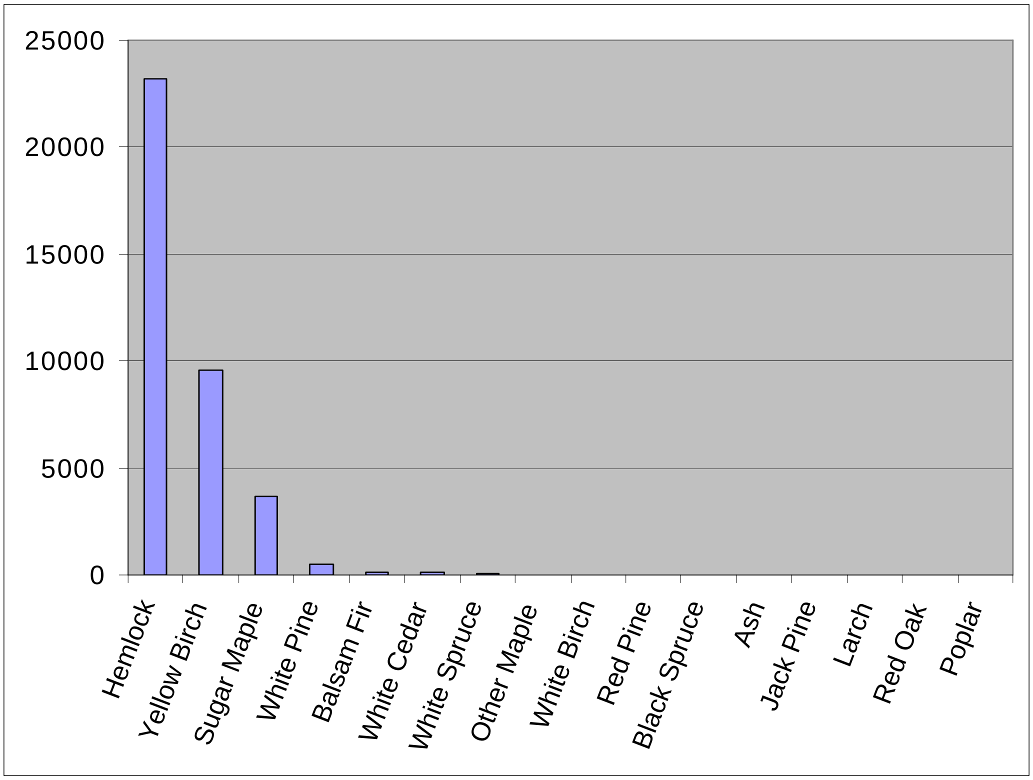


Figure 4. Area (ha) of All Working Groups in Algonquin Park for Ages >180 Years



In the context of the entire Province, the first and third most abundant tree species in the 180+ years age class - hemlock and sugar maple - have their highest relative occurrence in the Algonquin region (Figs. 5 & 6). Yellow birch, the second most abundant species in the oldest age-class, also has a high relative occurrence in the Algonquin region, second only to the eastern shore of Lake Superior (Fig. 7). Although Algonquin Park makes up only 1.8% of the productive forest area of the Province, it contains (1) 59.8% of Ontario's hemlock working group greater than the age of 140, (2) 54.1% of Ontario's sugar maple working group greater than the age of 140, and (3) 30.6% of Ontario's yellow birch working group greater than the age of 140 (Table 1). Taken together, forests greater than 140 years for these three working groups in Algonquin represent almost half (48.6%) of this age class for the entire area of these working groups in the Province.

The existence of very old hemlock and yellow birch forests in the Algonquin landscape is also supported by previous field studies. Martin & Martin (2001) found several yellow birch trees between 330 years old, and an extrapolated maximum age of 610 years old, near Cache Lake, however, the latter age was extrapolated from a relatively short section of core (Martin, 2006). Brunton (1991) estimated that hemlocks in Algonquin's Dickson Lake Nature Reserve exceed 300 years, and Vasiliauskus (1995) cored 1,576 hemlock trees (greater than 9.5 cm dbh) and calculated a mean age of 154 years. The oldest tree Vasiliauskus found was a hemlock with 430 growth rings (at dbh - 4.5 ft) near Pen Lake in the recreation/utilization zone (but within the shoreline buffer), which was about 454 years old at the time of coring. The second oldest tree found by Vasiliauskus (1995) was a yellow birch with a 387-year ring count, which was also found in the recreation/utilization zone, on a hill near Ralph Bice Lake.

Table 1. Abundance of Forests Older than 140 Years for the Hemlock, Sugar Maple, and Yellow Birch Working Groups: A Comparison of Algonquin Park to the Rest of Ontario (from AFA 2000 and OMNR 2002)

Working Group	**Area**		
	Algonquin Park (ha)	**Ontario (ha)**	**Algonquin as % of Ontario**
Hemlock (He)	36,315	60,700	59.8
Sugar Maple (Mh)	132,141	244,300	54.1
Yellow Birch (By)	19,282	63,100	30.6
He+Mh+By	178,738	368,100	48.6
All	600,000	33,683,000	1.8

Although the existence of these very old forests is well-documented, their location and extent outside of nature reserves, which make up only 5% of Algonquin Park, appears to be largely unknown. Some of these field studies document ages and provide locations for at least a few old-growth forests as a component of their study (e.g., Martin 1959, Vasiliauskas 1995, Martin & Martin 2001), however, we were unable to find any studies that specifically set out to identify old-growth forests beyond the nature reserve system. This search included communication with Algonquin Park staff (Steinberg 2005) and other Ontario Parks personnel.

Locating old-growth forests is often difficult because old trees are not necessarily large and as such, can be overlooked. For instance, the 610 year-old yellow birch tree found by Martin & Martin (2001) was only 71 cm dbh. In addition, Martin (1959) found a 231 year-old hemlock tree that was only 33 cm dbh compared with a younger 161 year-old hemlock that was larger with a 38 cm dbh. From 1,576 hemlock tree cores in Algonquin, Vasiliauskus (1995) found a mean age (for complete cores) of 154 years with a mean dbh (from 1,999 trees, including those too rotten to include ages) of only 32.5 cm. Other physical characteristics of trees that may indicate older tree age include bark characteristics (e.g., plated bark on yellow birch), branch morphology (e.g., large branches; all branching high in canopy), trunk shape (e.g., little taper), and leaning trees or buttressed trunks. These characteristics are summarized by Kershner & Leverett (2004) and should be used to select trees for coring, and counting growth rings, to estimate age of old-growth forests.

Figure 5. Relative Occurrence of Hemlock in Ontario (from OMNR 2002)

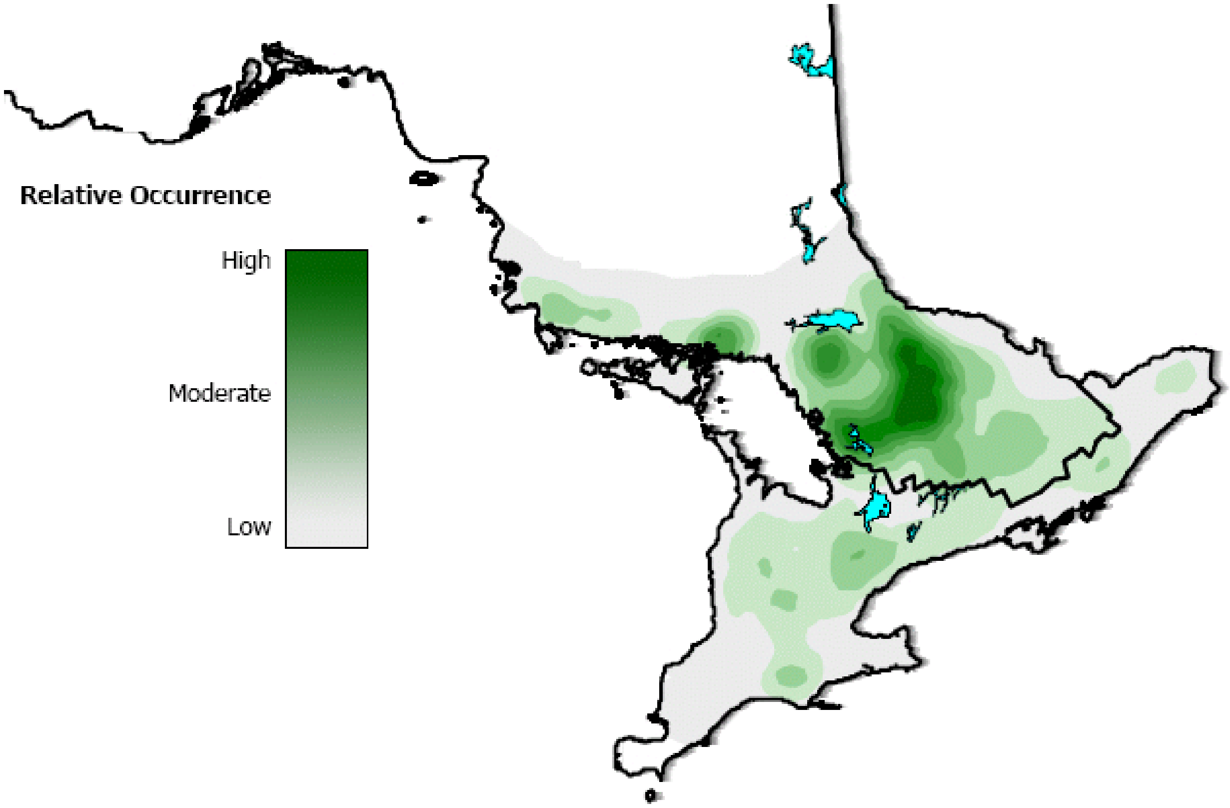


Figure 6. Relative Occurrence of Sugar Maple in Ontario (from OMNR 2002)

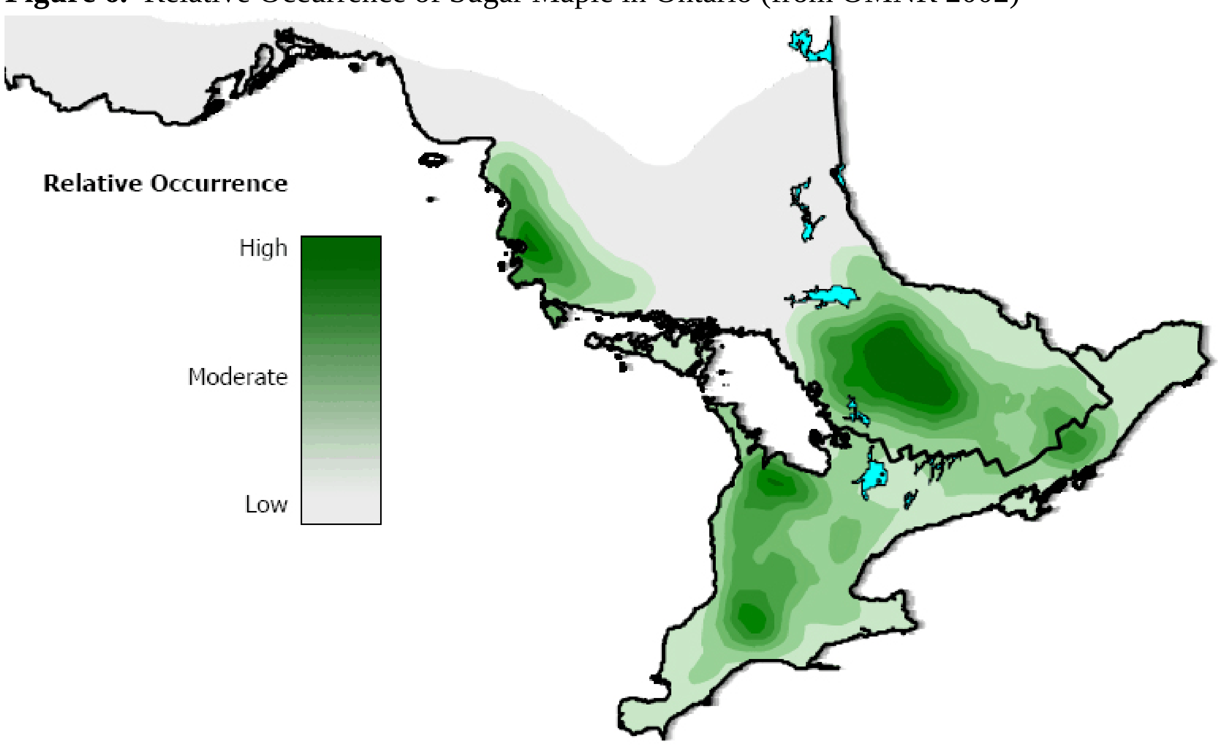
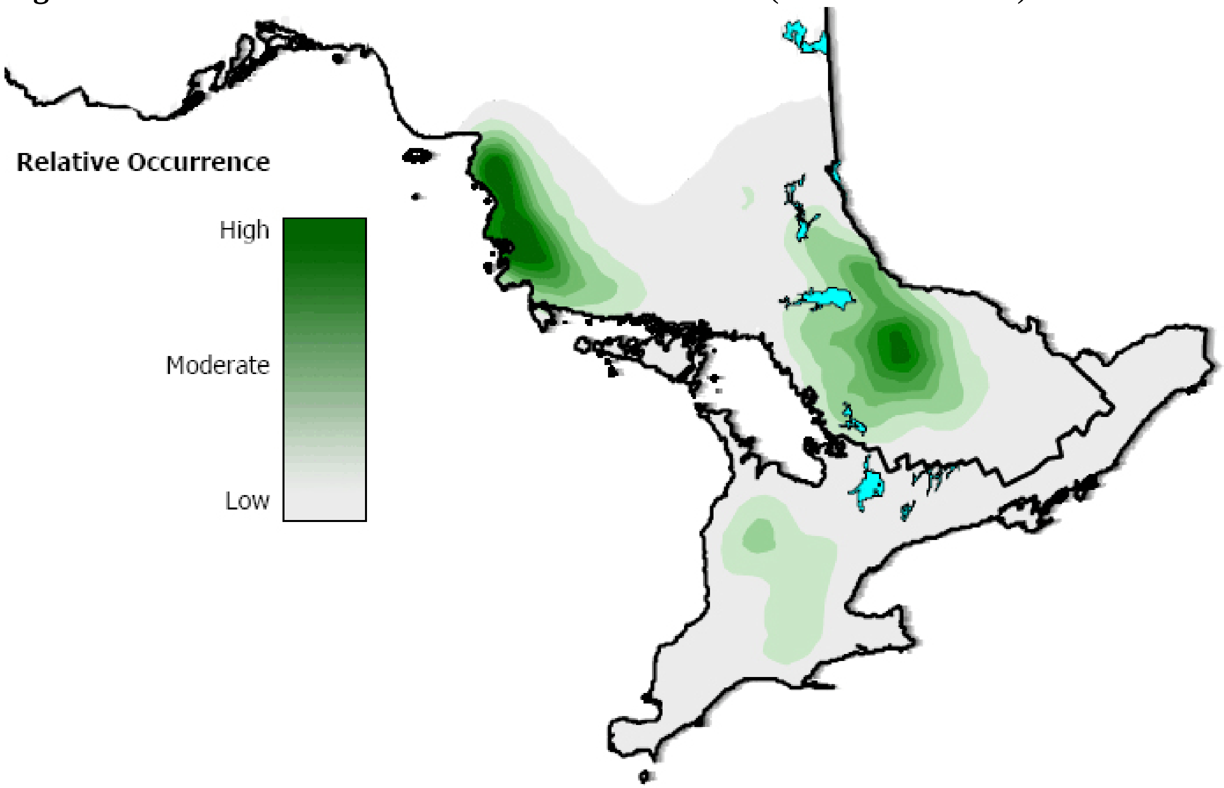


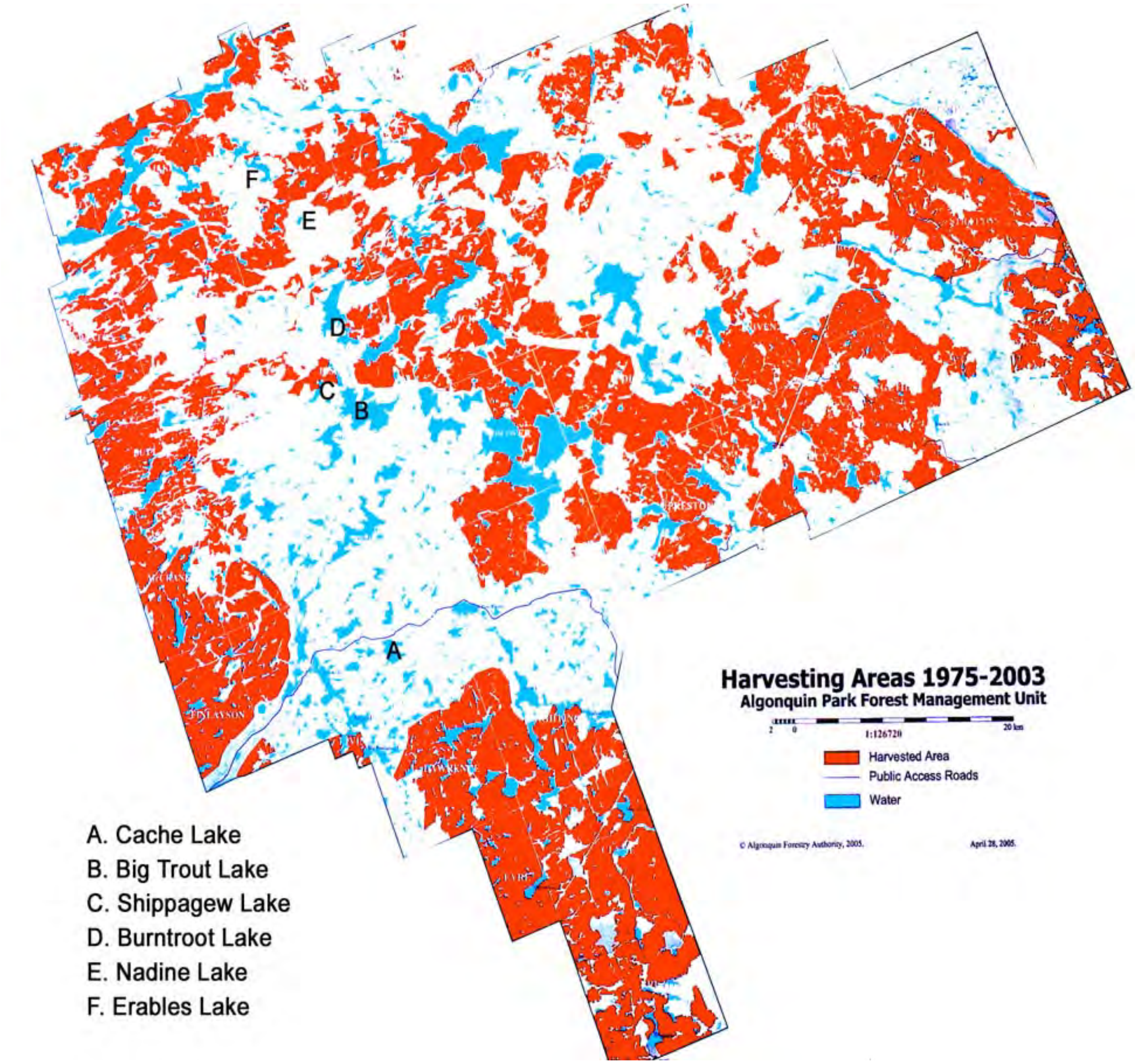
Figure 7. Relative Occurrence of Yellow Birch in Ontario (from OMNR 2002)



Methods

Sites were selected for field sampling using the maps, *Harvesting Areas 1975-2003: Algonquin Park Forest Management Unit* (AFA 2005; Fig. 8) and *Algonquin Park: FRI stands by working group that are greater than 120 years of age* (AFA 2004). Forest cover type maps have also been used by Schmidt et al. (1996) and Thompson et al. (2006) to characterize forest composition and forest age. The largest unlogged areas with the greatest number of old-growth stands (preference for 180+ year-old stands) were selected as potential areas for field visits. These areas were prioritized according to accessibility along canoe routes. Areas near the railway were avoided because of the likelihood of pre-1975 logging having occurred there. Based on this site selection analysis, we found that there is much less old-growth forest on the east side of the Park compared to the west side of the Park. For those few areas that do exist on the east side, access is difficult, therefore we focussed this study on the west side of the Park.

Figure 8. Harvesting Areas 1975-2003 and Old-Growth Sites Visited in 2005



For each forest stand visited, we walked a transect through the centre of the stand using either a compass line or a portage trail. In the case of portage trails, we scouted some areas off-trail to verify the presence or absence of historical logging. For this rapid assessment we selected a few of what appeared to be the oldest trees in the stand as indicators of stand age. Most likely these stands are actually older because of the small sample of trees selected. The degree to which the sampled tree was representative of the other large and/or old trees in the stand was assessed and recorded as common (more than three individuals in sight within a 50 m radius), uncommon (one to three individuals in sight in a 50 m radius), or rare (only a few such trees might appear in a forest stand). Tree dbh was recorded for standing trees, diameter at the point where growth rings were counted was recorded for logs, and species was recorded for both. Tree height was normally measured by using a clinometer and a laser rangefinder using the method described by the Eastern Native Tree Society (Blozan 2004), where total tree height= [(SIN) angle to top of tree * distance to top of tree] + [(SIN) angle to bottom of tree * distance to bottom of tree]. However, in some cases due to thickness of the canopy during the sampling season, we simply sighted to the highest visible branch or foliage using a laser rangefinder to obtain a minimum height, which was recorded as " >height".

Tree cores used for ring counts were often extracted from class 1 (recent) logs or snags instead of living trees, and occasionally tree rings were counted on freshly cut logs along portages. It was not uncommon for cores to be taken at a point several metres up the tree stem to avoid heart rot. In these cases, we added years to account for the height growth below the core. We added 24 years for hemlock trees to reach breast height (4.5 ft.), which was the mean found by Vasiliauskus (1995) in Algonquin, and beyond that we assumed that hemlock requires 4.5 years to attain one metre of height growth and that yellow birch requires 3 years to attain one metre of height growth, both of which are typical growth rates reported by Webster and Lorimer (2002) for unsuppressed trees of these species. Use of these growth rates could lead to significant underestimates of tree ages for any trees that were suppressed.

Age corrections for heart rot are more problematic since we had few complete cores from any one site and growth rates of hemlocks may be quite variable. Some trees that exhibited characteristics of old age (e.g., very large branches high on tree; trunk holding diameter into crown) had extreme heart rot, yielding in one case as little as 6.8 cm of core from a 75.1 cm dbh tree. To estimate the missing portion of hemlock cores due to heart rot, we used the mean growth rate from mean diameter (N=1,999) and average age (N=1,576 cores) for hemlocks in Algonquin Park (Vasiliauskus 1995). The resulting growth rate of 9.5 years/cm of core is less than the growth rate of any of our partial cores, which had growth rates between 9.7 and 18.9 years/cm of core, and is therefore a reasonably conservative estimate.

Results and Discussion

Based on analysis of the 1975-2003 logging map (AFA 2005) and the map showing forests over 120 yrs old (AFA 2004), we identified six forest landscapes in Algonquin Park that represented the largest unlogged areas with the greatest number of old-growth stands. All of these landscapes are located on the west side of the Park and included Cache Lake and areas to the south, areas around Big Trout Lake, the area between Shippagew Lake and Blue Lake, the Burntroot Lake area, the Nadine Lake Nature Reserve, and the area around Erables Lake. Within these six landscapes, we travelled more than 140 km by canoe and on foot, we measured 44 trees (diameter and height) in about 20 different FRI stands, and we cored and aged 21 forest trees and two dwarfed ancient cedars. The forest trees, which were mostly hemlock, had a mean age of 287 years, with a minimum age of 177 years, a maximum age of 433 years. The ancient cedars had partial ring counts of 220 and 440 years (Table 2).

Table 2. Individual Tree Height, Diameter and Age in Selected Areas of Algonquin Park (2005 Field Season)

Tree #	Area	Location	Tree Species	Tree DBH (cm)	Tree Height (m)	Age	Abundance
1	Cache	Bonnechere Lake	Hemlock	71.5	>22		C
2	Cache	Bonnechere Lake	Hemlock	75.5	>27		C
3	Cache	Cradle-Plough L	Hemlock	60		200	C
4	Cache	Plough-Little Mohawk	Hemlock	89.5			U
5	Cache	Plough-Little Mohawk	Hemlock	55.5			C
6	Cache	L. Mohawk-Mohawk	Hemlock	63		344	C
7	Cache	L. Mohawk-Mohawk	Hemlock	60		274	C
8	Cache	S. Canisbay-Delano Lake	Sugar Maple	72	>26		C
9	Cache	S. Canisbay-Delano Lake	Hemlock			263	C
10	Cache	Delano-Hilliard	Yellow Birch	92	>20		U
11	Cache	Delano-Hilliard	Hemlock	45		200	C
12	Cache	Hilliard	Hemlock			177	C
13	Cache	Head-Kenneth	Yellow Birch	50		299	C
14	Cache	Head-Kenneth	Hemlock			213	C
15	Cache	Kenneth	Hemlock	66	25.7	219	C
16	Cache	Little Island Lake	Hemlock			295+	C
17	Big Trout	Big Trout Lake	Hemlock	79.9	24	395*	C
18	Shippagew	Shippagew Lake	Hemlock	75.1	20	368*	U
19	Shippagew	Shippagew Lake	Hemlock	72.1	21	349*	U
20	Shippagew	Shippagew Lake	White Cedar	28.9	5.5	440+	R

21	Shippagew	Shippagew Lake	White Cedar	65.2	9	220+	R
22	Burntroot	Petawawa inlet	Hemlock	52.5	20	284	C
23	Burntroot	Petawawa inlet	Hemlock	61.6	18	307*	C
24	Burntroot	Red Pine Bay	Hemlock	63.1	24.1	349	C
25	Burntroot	Red Pine Bay	Hemlock	63.7	24.8	213	C
26	Burntroot	Red Pine Bay	Yellow Birch	78	>21		U
27	Burntroot	Red Pine Bay	Yellow Birch	94.4	20		U
28	Burntroot	Red Pine Bay	Hemlock	82.7	27	253	U
29	Burntroot	Burntroot L.	Hemlock	63		375*	C
30	Burntroot	Burntroot L.	White Pine	89	>37		R
31	Nadine	Little Nadine Lake	White Pine	111	38.2		R
32	Nadine	Little Osler	Hemlock			220+	C
33	Nadine	Nadine Lake	Hemlock	92	25.1		U
34	Nadine	Nadine Lake	White Pine	93.3	33.4		U
35	Nadine	Nadine Lake	Sugar Maple	83.3	27.6		C
36	Nadine	Nadine Lake	Hemlock	84.5	27.6		C
37	Nadine	Nadine Lake	Hemlock			433	C
38	Erables	Erables Lake	White Pine	105.5	39.1		R
39	Erables	Erables Lake	Hemlock	75.5			C
40	Erables	Erables Lake	Sugar Maple	65.6	>28		C
41	Erables	Erables Lake	Yellow Birch	72.7	>23		C
42	Erables	Erables Lake	Sugar Maple	76	>27		C
43	Erables	Erables Lake	Yellow Birch	82.5	>22		C
44	Erables	Erables Lake	Hemlock	77.7	27.4		C

C = common, U = uncommon; R = rare

* Age estimated from an incomplete core, due to heart rot

Cache Lake South

The Cache Lake South area (Fig. 9) includes the forest around Cache Lake, as well as south-west from Hilliard Lake to Bonnechere Lake, and east to Kenneth and Head Lakes. This area is within the wilderness zone, and therefore protected from logging. The exact areas of old growth forest in this region are unknown, but our preliminary survey suggests that significant portions of this area may be dominated by old-growth forests. We found that tree ages in the 200 to 300 year range are typical for larger trees, and of the nine trees that were aged here the oldest was 344 years. The 295 year-old tree on Little Island Lake is a minimum age, since it was one of the benches at the campsite and it was impossible to determine the height at which this section of trunk was cut. Little Island Lake seems to be largely surrounded by very old hemlock forest - probably 300 years would be a common age for these hemlocks. Martin & Martin (2001) report finding several yellow birches over 300 years old on a peninsula in Cache Lake, with a maximum extrapolated age of 610 years, however this exceptional age was extrapolated from a relatively short section of core (Martin 2006). In stark contrast to areas just to the west such as

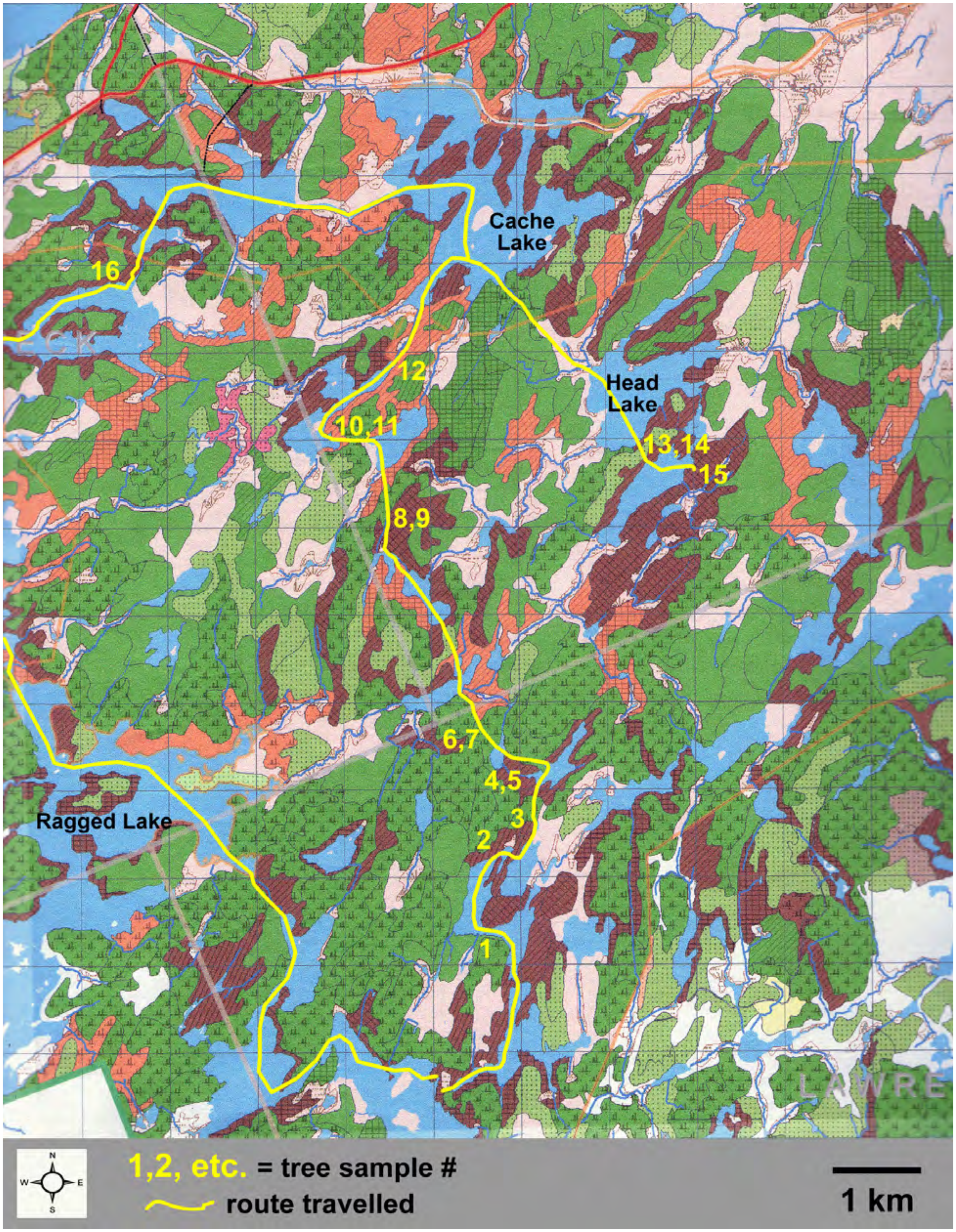
Smoke Lake, it appears that historical logging was limited in the area of Cache Lake South, and may have often been restricted to white pine. Stumps were generally uncommon, but areas of more intensive historical logging, including stumps of species other than pine, were observed between Mohawk and Little Mohawk Lakes, and around parts of Cache Lake and Head Lake. Cache Lake South is an area that appears to be dominated by relatively undisturbed mature and old-growth forests, which may cover as much as 4,000 hectares. However, additional field work is required to verify any estimate of remaining old-growth in this area.

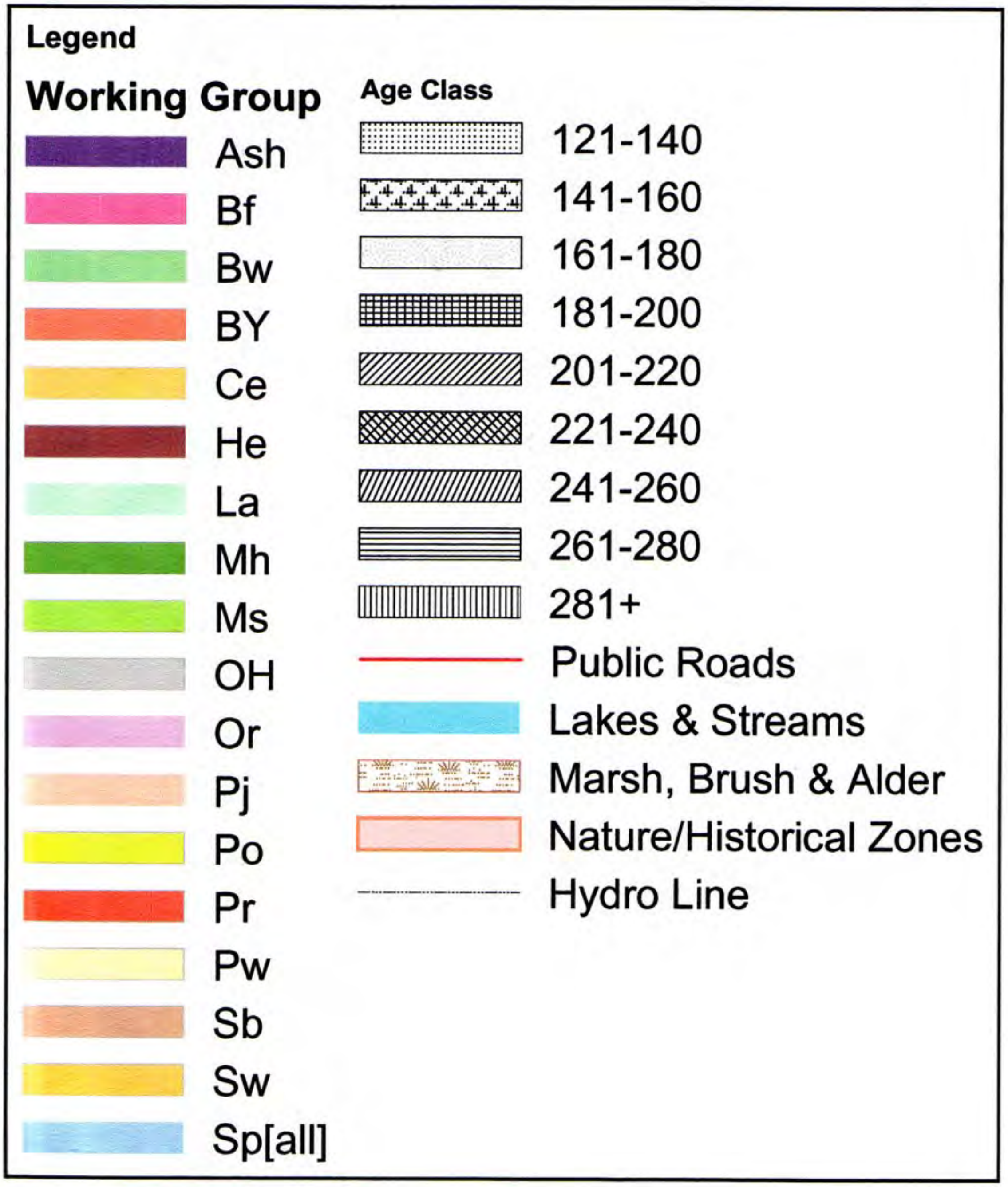
Big Trout-Shippagew Lakes Area

The Big Trout Lake Area (Fig. 10), which is in the wilderness zone, appears to support significant old-growth forest, including some of the oldest age classes of hemlock forest in the Park (AFA 2004). Ontario's largest hemlock was found at Big Trout Lake, measuring 105.4 cm dbh and 30 m in height (Vasiliauskus 1998). Due to time constraints, minimal reconnaissance was carried out in this area, however, some shoreline scouting showed that the forests do appear to be largely pristine (very few stumps were seen) and quite old. The only core, which was taken at the narrows to White Trout Lake, was aged at 395 years. While driving on Algonquin's forest access roads near Big Trout Lake, we counted 237 growth rings on a cut stump, indicating that hemlock trees to at least 240 years old have been harvested in the last few years in this area.

The area between Shippagew Lake and Blue Lake (Fig. 10), which is in the recreation/utilization zone, appears on the maps as a large area that has been free of logging since 1975. When we visited the area, we discovered that it has extensive historical logging, and appears to have a much higher density of stumps than most other areas we visited. We chose not to place a transect here, however, we did notice a residual patch of older hemlock trees and cored two of them. Both trees had extensive heart rot, but there is little doubt that both were very old trees, with estimated ages of 349 and 368 years. These residual patches, which may be as small as one hectare or less, could be a fairly common occurrence on the west side of Algonquin Park, even in some heavily logged areas. We also stopped at a small island on Shippagew Lake and cored two of the cedar trees, which had classic characteristics of stunted ancient cedars. The smaller of the two cedars appears to be the oldest, with a minimum age of 440 years (the centres of both trees were missing).

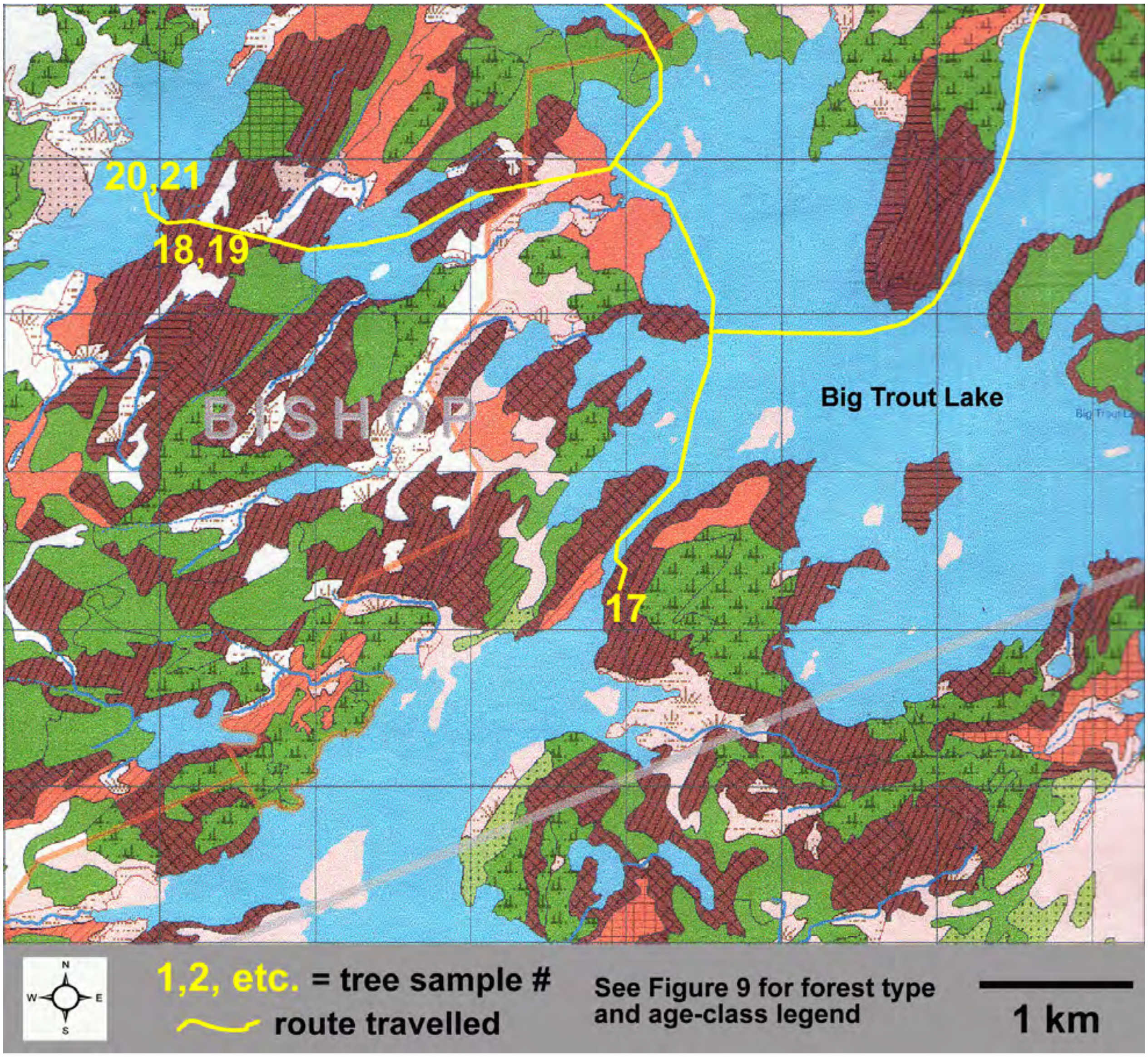
Figure 9. Cache Lake South Area (see Table 2 for tree data by tree number)





Ash = ash species, Bf = balsam fir, Bw = white birch, By = yellow birch, Ce = eastern white cedar, He = eastern hemlock, La = larch, Mh = hard maple (sugar maple), Ms = soft maple (red maple), OH = other hardwood, Or = red oak, Pj = jack pine, Po = poplar species, Pr = red pine, Pw = white pine, Sb = black spruce, Sw = white spruce

Figure 10. Big Trout - Shippagew Lakes Area (see Table 2 for tree data by tree number)



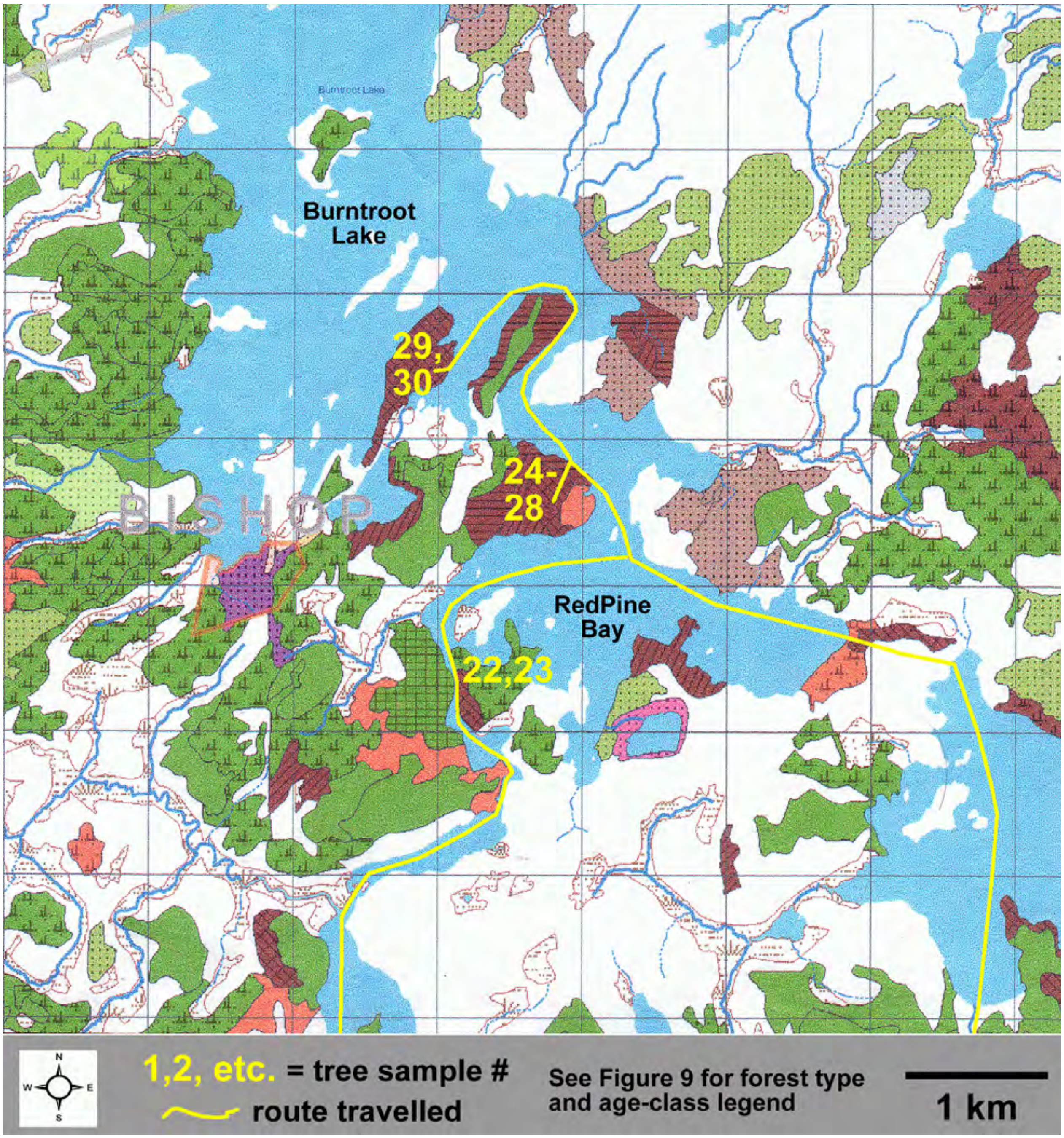
Burntroot Lake Area

The Burntroot Lake Area (Fig. 11) is located within the recreation/utilization zone. Old-growth forests in this zone are not protected from logging. In general, Burntroot Lake and Red Pine Bay appear to be surrounded by younger mature forest, but there are significant patches of relatively undisturbed old-growth forest remaining, particularly on the peninsulas jutting into the lake on the west side. We visited three portions of this area. Two were planned ahead based on map work and the third (Petawawa Inlet) was evaluated because it is adjacent to a portage trail and exhibited obvious old-growth characteristics. All three of these sites had exceptionally old trees, with maximum ages between 284 and 375 years. The total area of FRI stands that appear to be dominated by old growth in these three areas totals not less than 230 hectares.

The northern-most site was visited only briefly due to time constraints, however, we saw no signs of stumps and found a hemlock tree that we estimated from a partial core to be about

375 years old. At Red Pine Bay we placed a transect through the centre of an old-growth hemlock stand and found hemlocks up to 349 years old (germination around 1656 AD). We attempted to core two yellow birch trees, one of which was 94.4 cm in diameter, but heart rot was too advanced to estimate age for these trees. White pine stumps were found scattered throughout this forest, but pine did not appear to have been a major component and it appears that no other species were cut. This is a relatively intact forest. A narrow stand of hemlock near the inlet of the Petawawa River into Red Pine Bay also has trees over 300 years old with no evidence of logging.

Figure 11. Burntroot Lake Area (see Table 2 for tree data by tree number)



Nadine Lake Area

The Nadine Lake Nature Reserve (Fig. 12) was described by Brunton (1991) as, "the largest mature tolerant deciduous forest zone in Algonquin Provincial Park". The Nature Reserve is dominated by old-growth hardwood forests, areas of old-growth hemlock forest, scattered old-growth white pines, and black ash up to 96 cm dbh (Brunton, 1991). A boundary expansion to the Nature Reserve was proposed in 1991 that would have extended its area as far as the shores of Osler and Little Osler Lakes, but this expansion was never enacted. The Nature Reserve is currently 1,105 ha in size.

Our field observations confirm that the Nature Reserve is almost entirely pristine. A few stumps were found on the northeast shore of the lake, which may have resulted from pine logging about 100 years ago. If this was the case, for some reason impressive white pines around the rest of the lake were left untouched. Almost all of the forest that we explored was completely free of stumps and commonly dominated by old-growth forest. Growth rings were counted on one fallen hemlock, which yielded a ring count of 392 years and an estimated age of 433 years. Although forests around Osler and Little Osler Lakes have been selectively logged, hemlock forests along the lake shores appear to have very old individual trees. One stump at a campsite was aged at 220+ years, but this did not appear to have been one of the oldest trees.

Figure 12. Nadine Lake Area (see Table 2 for tree data by tree number)

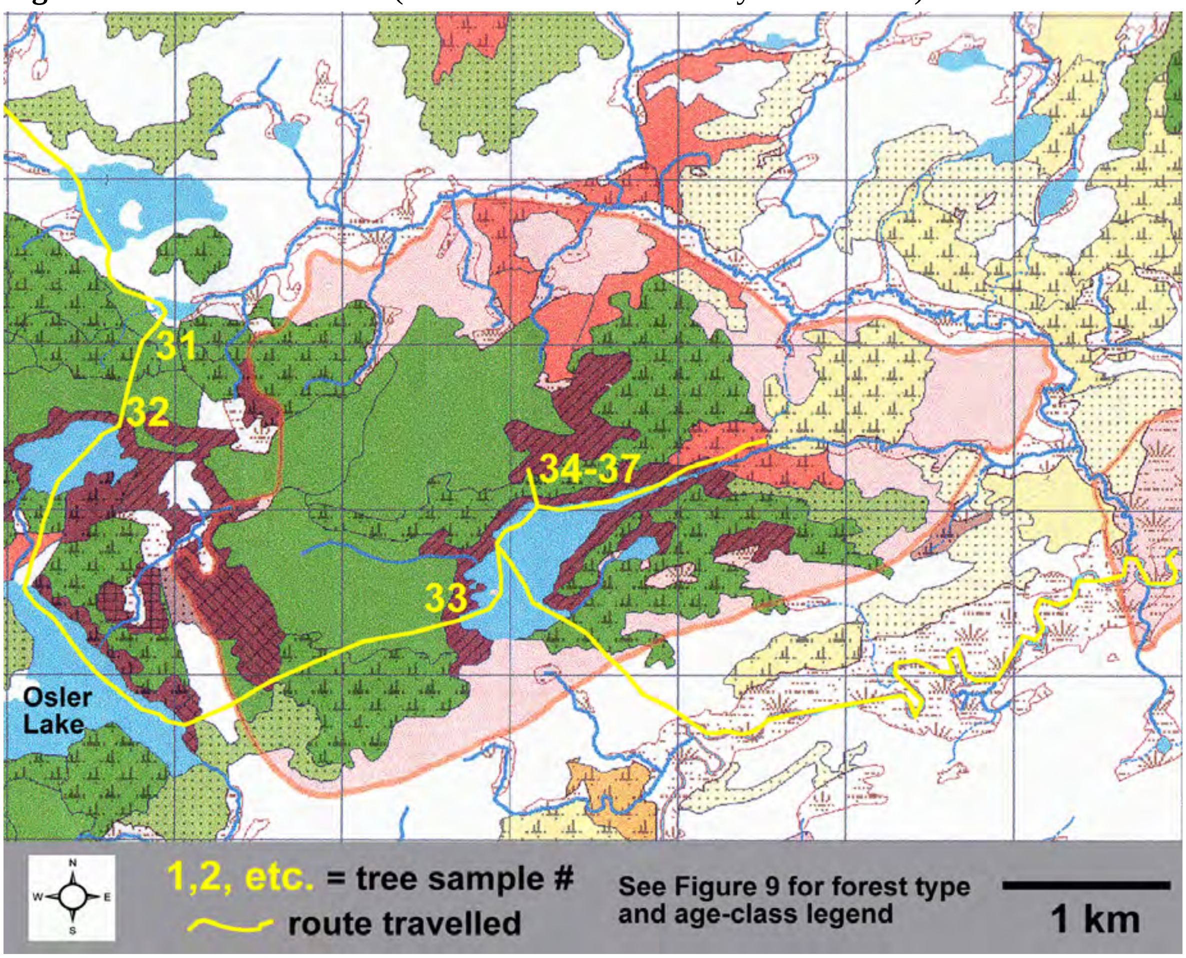
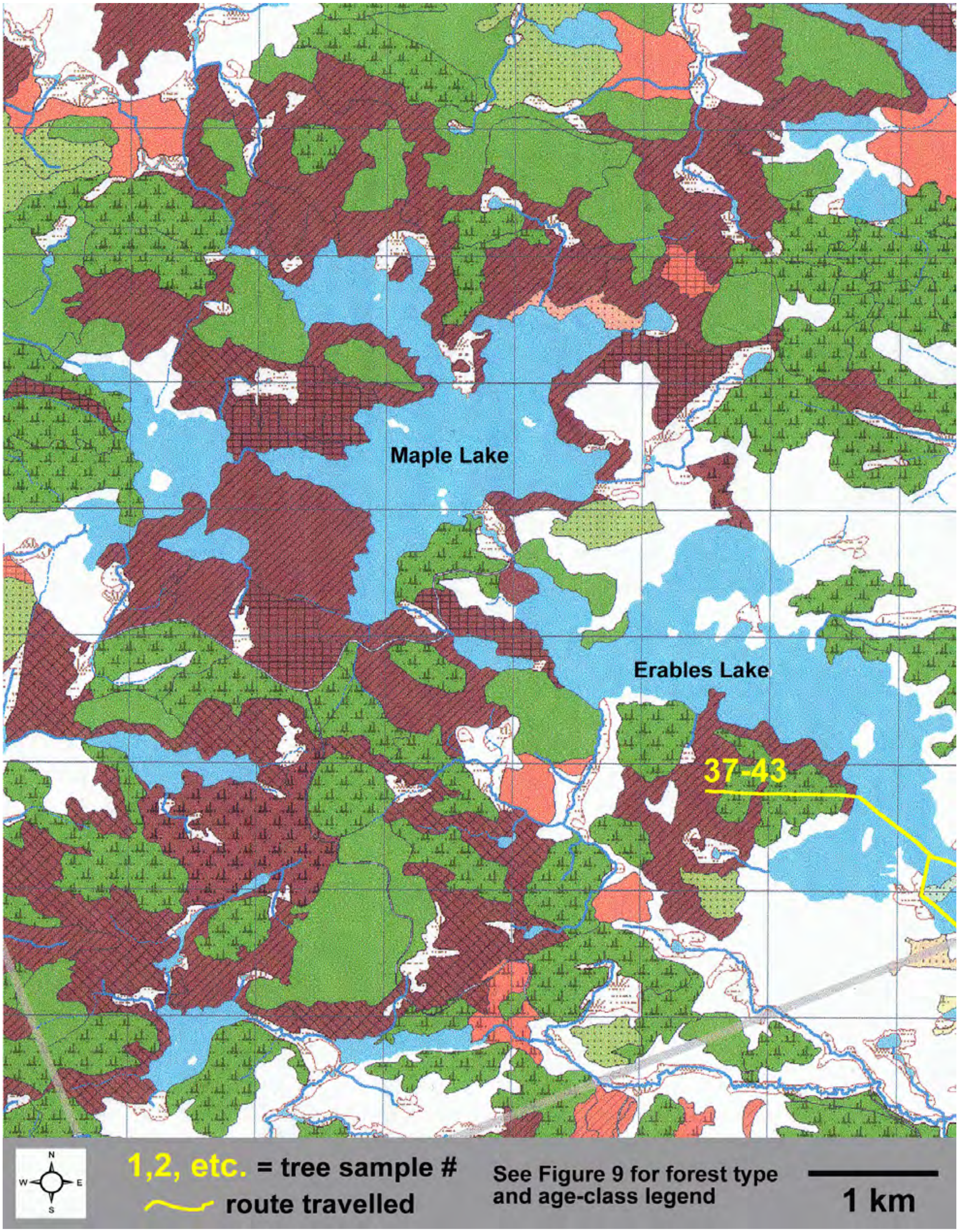


Figure 13. Erables Lake Area (see Table 2 for tree data by tree number)



Erables Lake Area

The Erables Lake Area (Fig. 13) is in the recreation/utilization zone and is also currently allocated to be logged in the 2005-2010 Forest Management Plan. No trees were cored at Erables Lake Area, and no signs of historical logging were found along the first 980 meters of a 1,090 meter transect through the middle of the Area. Diameter and height measurements were taken for some of the mature trees along this transect (Table 2), which show that larger trees in this forest are commonly 60 to 80 cm in diameter. This stand, which appears to be a relatively pristine old-growth sugar maple-yellow birch dominated forest, also had abundant logs throughout the stand. The extent of old-growth forest found in the Erables Lake Area is unknown, but based on maps alone, it could amount to more than 1,000 hectares.

Summary and Recommendations

Old-growth forests in Algonquin occur in a variety of landscape configurations including small patches (e.g., Shippagew Lake Area), complete stands (e.g., Burntroot Lake Area; Erables Lake Area), and large landscapes (Nadine Lake Nature Reserve; Cache Lake South). Small patches and complete stands of old growth are likely scattered throughout the recreation/utilization zone and are best identified using digital map analysis, which we did not use for this study. The only large landscape within the recreation/utilization zone that we identified in this study was the Erables Lake Area, however, the extent of this area is unknown. It is difficult to estimate how much old growth forest remains in the recreation/utilization zone of Algonquin Park, but the Burntroot Lake and Erables Lake stands combined likely total over 1000 hectares. Based on this study, and on two field seasons of vegetation inventories conducted in more than 200 plots (10 x 30 m) throughout the older forests of the recreation/utilization zone of Algonquin (Quinby 1988), we believe that the amount of old-growth forest remaining in the recreation/utilization zone totals in the thousands of hectares.

We have concerns about the continuing allocation of old-growth forests for logging in the Park as well as the changes in species composition within Algonquin's forests. In addition to a decline of up to 88% for white pine in mixed and hardwood stands in the Park (Thompson et al. 2006), hemlock has declined by almost 75% in the landscape adjacent to and west of the Park (Leadbitter et al. 2002) and has been virtually eliminated in many parts of southern Ontario where it was once a dominant tree and a common forest type (Suffling et al. 2003). In addition, changes in species composition may extend beyond the decline of hemlock to other species that use hemlock forests as habitat. For example, in the northeastern United States, 96 bird species and 47 mammal species are associated with hemlock forests (Yamasaki et al. 1999). Finally, yellow birch, American beech and red oak forests, which are also relatively common in Algonquin, have also declined throughout the central Ontario region (Leadbitter et al. 2002, Brisson & Bouchard 2003, Suffling et al. 2003).

Although hemlock forests are extremely stable ecosystems with intervals of 1,500-3,000 years or more between moderate to heavy natural disturbance events (Bormann & Likens 1979, Frelich & Lorimer 1991, Frelich & Reich 1996, Ziegler 2000) and have persisted for as long as 8,000 years (Foster & Zebryk 1993), there are many threats to the health of these ecosystems in addition to logging. These threats include browsing by deer (Mladenoff & Stearns 1993) and moose (Vasiliauskas & Aarssen 1999), alien pests such as the hemlock wooly adelgid (Orwig & Foster 1998), climate change (Davis 1989), and fire facilitated by climate change (He et al.

2002). As more of these ancient hemlock ecosystems are lost to logging, this ecosystem type will become more vulnerable to the array of additional threats.

The following steps should be taken as a starting point to address the lack of adequate information and protection for old-growth forests in Algonquin Park.

1. A complete and detailed assessment of old-growth forest throughout the entirety of Algonquin Park should be undertaken and completed within the next five years. This needs to be done using GIS, digital FRI data, and field inventory work.
2. Further field work should be conducted immediately to determine the extent and conservation value of potential old-growth forest in the Erables Lake Area, and the current logging allocation should be reviewed in light of the results.
3. All old-growth forests in the recreation/utilization zone should be identified and protected from logging. Both E. O. Wilson of Harvard University and Paul Ehrlich of Stanford University have called for a complete ban on the logging of old-growth forests world-wide (Wilson 1992, Ehrlich 1996).
4. Old-growth stands that have been selectively logged but retain old growth features should either be protected from logging or managed experimentally to maintain representative size-class distributions, vertical structure, logs, and snags that are typical of Algonquin's old-growth forests.
5. A province-wide conservation strategy for hemlock forests and yellow birch forests should be developed and a ban on harvesting of these two species in the Park should be considered.

Acknowledgements

Special thanks to the Plymouth Hill Foundation for financial support, and to Kathrin Streit, Patrick Henry and Karla Holland for field assistance. Thanks also to Gord Cumming, Brad Steinberg, Rob Davis, Stan Vasiliauskus, Norman Martin, Evan Ferrari, and others for providing information.

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Appendix 1. Abundance of Working Groups or Forest Dominance Types by Three Age Classes in Algonquin Park (from AFA 2000)

Working Group	1-140 yrs		140-180 yrs		>180 yrs		All Ages	
	ha	%	ha	%	ha	%	ha	%
Ash	573	0.14	0	0.00	8	0.02	581	0.10
Balsam Fir	31405	7.74	176	0.11	152	0.41	31733	5.29
Black Spruce	13545	3.34	864	0.55	8	0.02	14417	2.40
Hemlock	3320	0.82	13141	8.39	23174	62.05	39635	6.61
Jack Pine	3780	0.93	0	0.00	0	0.00	3780	0.63
Larch	205	0.05	0	0.00	0	0.00	205	0.03
Poplar	84727	20.87	536	0.34	0	0.00	85263	14.21
Red Maple	8149	2.01	847	0.54	27	0.07	9023	1.50
Red Oak	16157	3.98	0	0.00	0	0.00	16157	2.69
Red Pine	13470	3.32	51	0.03	11	0.03	13532	2.26
Sugar Maple	113236	27.89	128487	82.06	3654	9.78	245377	40.90
White Birch	32189	7.93	91	0.06	23	0.06	32303	5.38
White Cedar	3687	0.91	716	0.46	151	0.40	4554	0.76
White Pine	71122	17.52	1912	1.22	512	1.37	73546	12.26
White Spruce	8383	2.06	68	0.04	34	0.09	8485	1.41
Yellow Birch	2016	0.50	9689	6.19	9593	25.69	21298	3.55
All	405964	100.00	156578	100.00	37347	100.00	599889	100.00

Appendix 2. Photos from 2005 Field Season

Hemlock Stand, Kenneth Lake M. Henry

Yellow Birch, Head Lake M. Henry

Hemlock, Burntroot Lake M. Henry

Trembling Aspen 105.0 cm Patrick Henry

Growth Form of Old Hemlock M. Henry

440 Year Old Cedar Patrick Henry

Island on Shippagew Lake with Cedars Patrick Henry