

# STATUS UPDATE FOR ENDANGERED OLD-GROWTH EASTERN WHITE PINE AND RED PINE FORESTS

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Powassan, Ontario



World's Largest Stand of Old-growth Eastern White Pine Forest at Lake Obabika, Temagami, Ontario

by P. A. Quinby

*“In the short-term, individual groups and societies might profit from forest destruction. However, with old-growth forest vanishing at an unprecedented pace, mankind as a whole loses the ecosystem services provided by these forests... [including their] spiritual and/or aesthetic nature, genetic resources, non-timber products, habitat for wildlife, the sequestration of carbon, the prevention of floods and erosion, to name only a few... Data on old-growth forests are generally scarce... NGOs involved in the protection of old growth or primary forests need fast and efficient survey methods and, given the land-use pressure on the remaining areas, they cannot afford to waste time.”*

**(Old-Growth Forests, Wirth et al. 2009)**

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## Introduction

The excessive exploitation of timber throughout the world has resulted in the rarity and even the extinction of some forest types (Franklin 1988, Maser 1990, Norse 1990) including old-growth eastern white pine (*Pinus strobus*) and red pine (*Pinus resinosa*) forests in North America. Prior to 1993, a few specific inventories of these old-growth ecosystems had been conducted, however, none of these surveys addressed the entire range of these species because of their local focus, lack of field verification or preliminary nature.

The lack of a comprehensive inventory (in Canada and the U.S.) for the 31 political jurisdictions with white pine forest (Figure 1) and for the 21 political jurisdictions with red pine forest precluded determination of the conservation status for old growth of both species within any one political jurisdiction and for the entire geographic range of each species. Some have argued that the identification of endangered ecosystems should be a routine component of modern forest management (e.g., Crow 1988) and others say it should become a component of endangered species legislation (e.g., Orians 1993).

The issue of old-growth forest protection in eastern Canada began in Temagami, Ontario (Quinby 1988, 1989, 1991a, 1991b). As stated in Killan (1993, pg. 372), "*Only when Quinby and the Temagami Wilderness Society initiated the Talls Pines Project in 1988 did anyone attempt to identify the specific qualities of an old-growth forest in northeastern North America... the Society's strategy of focussing on the need to preserve "old growth" values paid dividends*".

In the fall of 1989, the Province of Ontario halted the construction of the Red Squirrel Logging Road and scrapped plans to log the Obabika Lake Old-Growth Pine Forest. The decision to protect this forest was supported by the results of our range-wide surveys to assess the conservation status of old-growth red and eastern white pine forests. Our surveys also contributed to the development of an old-growth policy for Ontario, and for protection of additional old-growth pine stands.

One year after completion of these surveys (Quinby 1993, Quinby and Giroux 1993, Quinby 1996), the Ontario Environmental Assessment Board (EAB) of the Ministry of the Environment confirmed old-growth forest protection as a legitimate government mandate in Ontario as described in the quote below (EAB 1994, pg. 385).

"Old growth forests, a topic of hot controversy on the West Coast of Canada and the United States, have also been the subject of growing attention... especially in the Temagami area. There is a broad public concern about the potential loss of these ecosystems. While old trees have historical and cultural significance to many people, others place tremendous value on protecting and studying the diversity of organisms in an "old growth" ecosystem. Still others regard "old growth" forests as over-mature trees that should be harvested".

"MNR has been slow to respond to this interest. It did not propose any actions on old growth in its original proposed terms and conditions in June 1989, or in its amended proposals in August 1990. Subsequently, MNR has taken some initiatives and proposed other steps, but its apparent reluctance has left some people doubting its good faith".

"Dr. Peter Quinby, a witness for Northwatch, told us that only 0.2% of the original white pine Forest in the United States and Canada is still standing, and less than 1% of Ontario's original white pine forest remains. We do not quarrel with this estimate; it is clear that not much original white pine forest is left. We are persuaded that steps need to be taken to protect it."

(from EAB 1994, pg. 385)

In their 1994 decision (EAB 1994), the Ontario EAB used the Environmental Assessment Act to require the Ministry of Natural Resources (MNR) to develop an old-growth forest policy for the province. However, during the 25 years since this EAB decision, the MNR: (1) continues to allow endangered old-growth forests to be logged in Ontario, (2) has not developed an effective, operational old-growth policy that protects old-growth forests (OMNR 2003a) similar to what has been done in Nova Scotia

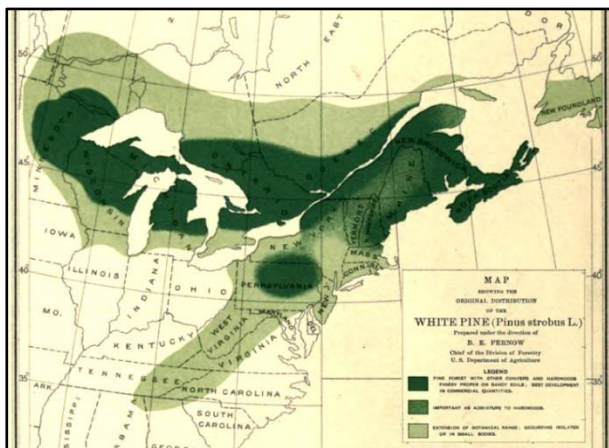
(NSNR 2012), (3) has not refined old-growth forest definitions to include their unique ecological features other than tree age (OMNR 2003b), (4) has not determined the conservation status of Ontario's remaining old-growth forests, and (5) does not have an established research and extension program to conduct inventories, study Ontario's remaining old-growth forests, identify priorities and threats, and provide outreach to landowners.

This report combines two reports that addressed the status of old-growth red and eastern white pine forests roughly 25 years ago (Quinby 1993, 1996) and includes some updates using information that was not originally available. The major objectives of these studies were as follows: (1) to locate and determine the amount of old-growth red and eastern white pine forest left within its natural range, (2) to determine what is protected and what is not, (3) to determine the status of old-growth red and eastern white pine forest within each political jurisdiction where it occurs naturally and (4) to identify the largest remaining stands of these forest types.

## Methods

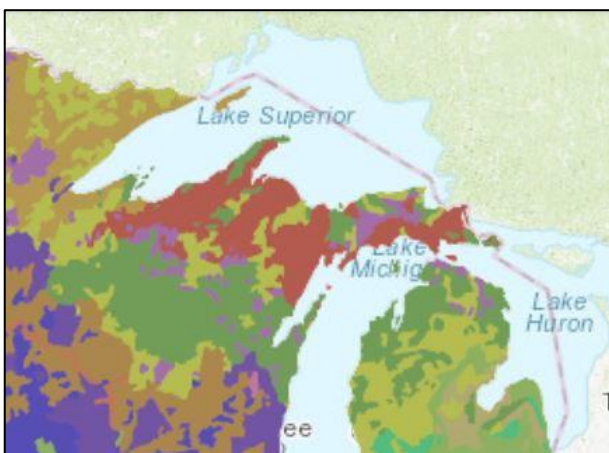
### White Pine

Two maps showing the location of eastern white pine forest were used to estimate the original (pre-settlement) amount of old-growth eastern white pine forest. First, the eastern white pine range (WPR) map produced by Spaulding and Fernow (1899, Figure 1) shows three levels of abundance in eastern North America including "best development", "important admixture" and "extension of botanical range".



**Figure 1. Original Distribution of the White Pine** (from Spaulding and Fernow 1899)

Next, the Great Lakes Pine Forest (GLPF) map (Figure 2) provided by the Minnesota Natural Heritage Program (1989) as adapted from Kuchler (1964), was used to estimate the area dominated by eastern white pine forest for the "best development" category on the WPR map. From the GLPF map, it was estimated that 43% of the "best development" category in Minnesota, Wisconsin and Michigan was dominated by Great Lakes Pine Forest, which included forests composed primarily of eastern white, red and jack pine.



**Figure 2. Pre-settlement Great Lakes Pine Forest** (dark green; from Kuchler 1964)

To get an estimate just for the eastern white pine forest component, it was assumed that the GLPF map was dominated equally by the three pine forest types. In other words, it was assumed that one-third of 43% (GLPF aerial percentage), or 14%, of the WPR map category "best development" was dominated by eastern white pine forest. This 14% figure was then applied to all areas on the WPR map designated "best development". Next, the percentage of area dominated by eastern white pine forest for the two WPR map categories,

"important admixture" and "range extension", was determined.

To do this, it was assumed that the amount of forest dominated by eastern white pine in the "important admixture" category was 10% of the amount dominated by eastern white pine in the "best development" category, and that the amount in the "range extension" category was 10% of the amount in the "important admixture" category. Applying these assumptions resulted in an estimate of 1.4% eastern white pine forest dominance in the "important admixture" category and an estimate of .14% eastern white pine forest dominance in the "range extension" category. These percentages for the three categories of eastern white pine forest abundance on the WPR map were then used to estimate the area dominated by eastern white pine forest in all 31 political jurisdictions within the natural range of eastern white pine.

Carleton and Gordon's (1992) boreal forest "model of regional age-class distribution of even-aged stands over a fire-dominated landscape" (adapted from van Wagner (1978)) was used to estimate the proportion of the pre-settlement landscape dominated by old-growth (140+ years) eastern white pine forest throughout its natural range. According to Carleton and Gordon's (1992) model approximately 30% of the boreal landscape was dominated by the old-growth condition. Also, according to Carleton and Gordon (1992), the fire rotation is longer for the Great Lakes-St. Lawrence (GLSL) Forest Region compared to the Boreal Forest Region because of less frequent wildfire there.

For boreal forests in Ontario, van Wagner (1978) estimated that 50 years was a realistic figure for pre-settlement fire rotation. For the GLSL white pine forest, the mean pre-settlement fire rotation from four studies was about 100 years (Heinselman 1973, Cwynar 1977, Cwynar 1978, and Whitney 1986), which is twice the length of the boreal fire rotation. It was assumed then, that the amount of forest in the old-growth condition is directly proportional to the length of the fire rotation for that forest region.

According to this assumption, a two-fold difference in fire rotation between boreal forest and GLSL pine forest was applied to determine the pre-settlement amount of old-growth eastern white pine by doubling 30% cover for boreal old-growth forest to obtain 60% old-growth cover for GLSL eastern white pine forest. This estimate of 60% compares closely with estimates of old-growth percentage for Pacific Northwestern United States forests by Booth (1991) who estimated 62% and Franklin and Spies (1984) who estimated from 60 to 70% old-growth cover. Erring on the conservative side, 50% rather than 60% was used as the percentage of pre-settlement forest covered by old-growth eastern white pine for this study.

To estimate the amount of old-growth eastern white pine forest remaining in all 31 political jurisdictions, a survey was conducted (Quinby and Giroux 1993). Data for the category "Amount Remaining" in Table 1 were obtained from this survey. Endangered status was assigned when the amount remaining in each political jurisdiction was less than 1% of the amount of pre-settlement old-growth eastern white pine forest.

### *Red Pine*

Information provided by forest experts from a total of 21 political jurisdictions in Canada and the United States that coincide with the natural range of red pine forest was used for this survey (Quinby 1996). Using data from Burns and Honkala (1990), it was estimated that the size of the range of red pine is approximately 40% less than the size of the range of eastern white pine. It was also estimated that pre-settlement red pine abundance within its natural range was 50% of the amount for pre-settlement eastern white pine using pollen data from Gordon (1990).

## **Results and Discussion**

### *White Pine*

We estimated that original old-growth eastern white pine forests in eastern North America occupied

roughly 6 million hectares. Based on a survey of forest experts in 1993, we also estimated that 23,963 hectares of old-growth eastern white pine forest distributed among 410 stands remain in eastern North America (Table 1).

**Table 1. Status of Old-Growth Eastern White Pine (*Pinus strobus*) Forest in Canada and the United States (areas in ha; from Quinby 1993)**

POLITICAL JURISDICTION	ORIGINAL OLD-GROWTH WHITE PINE FOREST AREA	TOTAL AREA OF OLD GROWTH	STAND SIZE RANGE	% ORIGINAL FOREST REMAINING	NO. OF STANDS	MEAN STAND AREA	AREA PROTECTED	% PROTECTED of ORIGINAL	STATUS
<b><u>CANADA</u></b>									
MANITOBA	15,072	0	---	0	0	---	0	0	Extirpated
NEW BRUNSWICK	51,604	76	19-57	0.15	2	38	76	0.15	Endangered
NEWFOUNDLAND	4,290	250	---	6	10	25	0	0	Endangered
NOVA SCOTIA	38,994	32	---	0.08	1	32	32	0.08	Endangered
ONTARIO	1,406,102	14,764	2-2,400	1.05	58	241	4,313	0.31	Endangered
PRINCE EDWARD ISLAND	398	4	---	1	1	4	4	1.01	Endangered
QUEBEC	1,287,393	10	---	<0.01	1	10	10	<0.01	Endangered
<b>TOTAL CANADA</b>	<b>2,803,853</b>	<b>15,136</b>	<b>2-2,400</b>	<b>0.54</b>	<b>73</b>	<b>196</b>	<b>4,435</b>	<b>0.16</b>	<b>Endangered</b>
<b><u>UNITED STATES</u></b>									
CONNECTICUT	1,160	0	---	0	0	---	0	0	Extirpated
GEORGIA	580	0	---	0	0	---	0	0	Extirpated
INDIANA	232	12	---	5.17	1	12	12	5.17	Endangered
ILLINOIS	14,377	0	---	0	0	---	0	0	Extirpated
IOWA	18,667	43	42,016	0.23	12	4	33	0.18	Endangered
KENTUCKY	19,130	0	---	0	0	---	0	0	Extirpated
MAINE	207,532	235	42,032	0.11	31	8	138	0.07	Endangered
MARYLAND	1,855	0	---	0	0	---	0	0	Extirpated
MASSACHUSETTS	70,260	11	42,044	0	2	6	11	0.02	Endangered
MICHIGAN	714,188	1,145	3-876	0.16	8	143	1,086	0.15	Endangered
MINNESOTA	644,625	5,173	9-1,091	0.8	256	20	4,921	0.76	Endangered
NEW HAMPSHIRE	132,171	73	2-50	0.06	5	15	61	0.05	Endangered
NEW JERSEY	1,044	0	---	0	0	---	0	0	Extirpated
NEW YORK	252,864	265	5-65	0.1	2	133	265	0.1	Endangered
NORTH CAROLINA	2,667	96	12-60	3.6	4	24	60	2.25	Endangered
OHIO	6,957	3	---	0.04	1	3	3	0.04	Endangered
PENNSYLVANIA	386,079	1,578	4-480	0.41	13	121	1,372	0.34	Endangered
RHODE ISLAND	11,710	0	---	0	0	---	0	0	Extirpated
SOUTH CAROLINA	384	0	---	0	0	---	0	0	Extirpated
TENNESSEE	1,160	12	---	1.03	1	12	0	0	Endangered
VERMONT	16,232	14	5-9	0.09	2	7	14	0.09	Endangered
VIRGINIA	4,290	0	---	0	0	---	0	0	Extirpated
WEST VIRGINIA	36,637	0	---	0	0	---	0	0	Extirpated
WISCONSIN	634,190	160	6-234	0.03	10	16	152	0.02	Endangered
<b>TOTAL U.S.</b>	<b>3,178,991</b>	<b>8,827</b>	<b>1-1,091</b>	<b>0.28</b>	<b>337</b>	<b>26</b>	<b>8,145</b>	<b>0.26</b>	<b>Endangered</b>
<b>TOTAL NATURAL RANGE</b>	<b>5,982,844</b>	<b>23,963</b>	<b>1-2,400</b>	<b>0.4</b>	<b>410</b>	<b>56</b>	<b>13,183</b>	<b>0.22</b>	<b>Endangered</b>

Using these results, we determined that approximately 0.40% (23,963/5,982,844) of the pre-settlement amount of old-growth eastern white pine forest currently remains in North America. According to criteria provided by Noss et al. (1995), these pine ecosystems are critically endangered (<2% remaining) in 20 political jurisdictions, including Ontario. They have been extirpated (eliminated) in 11 political jurisdictions including Manitoba, Connecticut, Georgia, Illinois, Kentucky, Maryland, New Jersey, Rhode Island, South Carolina, Virginia, and West Virginia.

Using remote sensing data, Capmourteres et al. (2014) identified 4,196 more hectares of old-growth white pine forest (28,159 hectares) than we found using available documents and personal communication (Quinby 1993). This additional amount of existing old growth increased the percentage remaining within its natural range from 0.40 percent to 0.47 percent. Capmourteres et al. (2014) also found that old-growth white pine forests are endangered ecosystems using three international (IUCN) conservation status criteria.

Based on our 1993 work, we found that twice as much old-growth eastern white pine remains in Canada (15,136 ha) compared with the United States (8,827 ha), however, almost twice as much was protected in the United States (8,145 ha) compared to Canada (4,435 ha) in 1993. Mean stand size was roughly seven times greater in Canada (196 ha) compared to the United States (26 ha). Three times more was located in Ontario (14,764 ha) compared to Minnesota (5,173 ha) yet, more was protected in Minnesota (4,921 ha) than in Ontario (4,313 ha). The world's largest old-growth eastern white pine forest (2,400 ha) is located at the north end of Obabika Lake in Temagami, Ontario and was protected from logging in 1989. It is now a designated protected area.

In 2014, Capmourteres et al. (2014) estimated that 4,392 hectares of old-growth white pine forest occur in the Temagami region representing 18.2% of the global amount. In contrast, FRMG (2018) estimated that there are 21,938 hectares of old-growth white pine forest in Temagami, which is five times more than the amount identified by Capmourteres et al. (2014). This major discrepancy of 17,546 hectares indicates the need for a comprehensive, scientific inventory of old-growth forests in Temagami as well as for the entire Province of Ontario.

### *Red Pine*

We estimated that original old-growth red pine forests in eastern North America occupied roughly 1.8 million hectares and, based on a survey of forest experts in 1993, we estimated that 10,417 hectares of old-growth red pine forest distributed among 384 stands remain in eastern North America (Table 2). It is highly likely, however, that additional unidentified stands exist, primarily in Ontario. To account for these unidentified stands, the estimate of 10,417 hectares was doubled to an estimate of 20,834 hectares, which is 1.2 percent (20,834/1,800,000) of the estimated amount of original old-growth red pine forest. To our knowledge, no other range-wide survey of old-growth red pine forest has been done.

According to criteria provided by Noss et al. (1995), these pine ecosystems are critically endangered (<2% remaining) in 8 political jurisdictions, including Ontario. They have been extirpated (eliminated) in 13 political jurisdictions including Manitoba, New Brunswick, Nova Scotia, Quebec, Connecticut, Illinois, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Wisconsin, and West Virginia.

In 1993, there was 28% more known old-growth red pine forest in the U.S. (5,850 hectares) compared with Canada (4,567). In addition, in 1993 three times more of these endangered ecosystems was protected in the U.S. (5,504 hectares) compared with Canada (1,438 hectares). However, mean stand size was roughly an order of magnitude higher for stands in Canada compared with those in the U.S. Roughly 94% of the old-growth red pine forests in the U.S. are located in Minnesota and 81% of these ecosystems in Canada are located in Ontario. The world's largest old-growth red pine forest is located at Wolf Lake in Temagami, Ontario (1,600 ha) and is currently unprotected despite considerable attention to this issue (Anand et al. 2013, Quinby et al. 2013, see also [www.savewolflake.org/](http://www.savewolflake.org/)).

**Table 2. Status of Old-Growth Red Pine (*Pinus resinosa*) Forest in Canada and the United States**  
(areas in ha; from Quinby 1996)

Political Jurisdiction	No. of Stands	Total Area	Mean Stand Size	Stand Area Range	Area Protected	% Protected of Total	Conservation Status
<b><u>Canada</u></b>							
Manitoba	0	0	-	-	0	0	Extirpated
New Brunswick	0	0	-	-	0	0	Extirpated
Newfoundland	22	866	39	1-400	605	70	Endangered
Nova Scotia	0	0	-	-	0	0	Extirpated
Ontario	12+	3,697	308	25-1,600	833	22	Endangered
Prince Edward Island	1	4	4	-	4	100	Endangered
Quebec	0	0	-	-	0	0	Extirpated
<b><u>United States</u></b>							
Connecticut	0	0	-	-	0	0	Extirpated
Illinois	0	0	-	-	0	0	Extirpated
Maine	11	154	14	2-88	124	81	Endangered
Massachusetts	0	0	-	-	0	0	Extirpated
Michigan	2	71	36	7-64	71	100	Endangered
Minnesota	323	5,485	17	2-190	5,232	95	Endangered
New Hampshire	0	0	-	-	0	0	Extirpated
New Jersey	0	0	-	-	0	0	Extirpated
New York	0	0	-	-	0	0	Extirpated
Pennsylvania	4	40	10	10	0	0	Endangered
Rhode Island	0	0	-	-	0	0	Extirpated
Vermont	9	100	11	1-40	77	77	Endangered
Wisconsin	0	0	-	-	0	0	Extirpated
West Virginia	0	0	-	-	0	0	Extirpated
<b>Total</b>	<b>384</b>	<b>10,417</b>	<b>27</b>	<b>1-1,600</b>	<b>6,946</b>	<b>67</b>	<b>Endangered</b>

## Conclusions

Our old-growth surveys have: (1) contributed to the protection of the world's largest stand of old-growth white pine forest (Obabika Lake), (2) contributed to the designation of 40 new conservation reserves (~100,000 ha) since 1990, and (3) helped to facilitate the development of an old-growth policy for Ontario. However, endangered old-growth red and eastern white pine forests and old growth of other forest types are still being logged in Ontario. The endangered status of these forest ecosystems was ignored by the Ontario Old Growth Policy Advisory Committee in 1993 and continues to be ignored by the Government of Ontario (OMNR 2003a).

In addition, the Ontario government views old-growth forests as "renewable resources" (OMNR 1991; OMNR 2003a) – in other words, the OMNR believes that old-growth forests can be logged and re-created using forestry practices. This contradicts the 1984 Society of American Foresters policy (1984) stating that, "*Old-growth management, for the foreseeable future, will be predicated on preservation of existing old-growth stands.*"

Scientists consider old-growth forests to be "non-renewable resources" – once they are logged they are changed forever. It is generally accepted that to continue logging old-growth forests will result in the continuing loss of the ecological features and values that distinguish them from younger and degraded (e.g., logged) ecosystems. The Ontario Round Table on Environment and Economy (1990) came to the same conclusion stating that, "*old-growth forest habitats should be viewed as non-renewable and essential parts of our natural heritage.*"

Recent policy initiatives at national and international scales provide some hope for increased protection of old-growth forests in the future including the Government of Canada's official commitment to increase protected areas in Canada to 17% of the land base (Government of Canada 2018) and the New York Declaration on Forests to protect all global natural forests from logging, hydro-development and mining by the year 2030 (Climate Focus 2015).

To meet the new federal standard for biodiversity protection, Ontario will need to increase its protection by at least 6 percent of the land base or about 6 million hectares. Ancient Forest Exploration & Research has been calling for the Ontario government to conduct detailed inventories of Ontario's old-growth forests and increase their protection for the last 30 years – we continue with those recommendations and, because these endangered ecosystems continue to be logged, we stress the urgency of this issue.

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