

"OLD-GROWTH EASTERN WHITE PINE FOREST: AN ENDANGERED ECOSYSTEM"

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Introduction

The 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). The excessive exploitation of old-growth eastern white pine (*Pinus strobus* L.) forest in North America is no exception. A few specific inventories of old-growth eastern white pine forest have been conducted, however, none of these surveys address the entire range of the species which covers most of eastern North America because of their local focus, lack of field verification or preliminary nature. The lack of a comprehensive inventory for all 31 political jurisdictions where white pine forest is found precludes a determination of its status and value as an ecosystem within any one political jurisdiction. Some have argued that the identification of endangered ecosystems should be a routine component of modern forest management (Crow 1988) and others say that it should become a legislated component of endangered species acts (Orians 1993). The three major objectives of this project are as follows: (1) to locate and determine the amount of old-growth eastern white pine forest left within its natural range, (2) to determine what is protected and what is not, and (3) to determine the status of old-growth eastern white pine forest within each political jurisdiction where it occurs naturally.

Methods

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) shows three levels of abundance in eastern North America including "best development", "important admixture" and "extension of botanical range". Next, the Great Lakes Pine Forest (GLPF) map 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.

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 it was necessary to estimate the percentage of area dominated by eastern white pine forest for the two WPR map categories "important admixture" and "range extension". 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. van Wagner (1978) estimated that 50 years was a realistic figure for pre-settlement fire rotation in the boreal forest of Ontario. The mean pre-settlement fire rotation for the GLSL white pine forest from four studies was about 100 years (Heinselman 1973, Cwynar 1977, Cwynar 1978, and Whitney 1986) - 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.

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%. 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.

Ecological Interpretation

According to the information gathered for this eastern North American survey, approximately .4% of the pre-settlement amount of old-growth eastern white pine forest currently remains. Using the definition of an endangered ecosystem put forth in this paper, old-growth eastern white pine forest is an **endangered ecosystem**. In fact, they have been extirpated (eliminated) in 11 political jurisdictions. Twice as much remains in Canada (15,136 ha) than in the United States (8,827 ha), however, almost twice as much is protected in the United States (8,145 ha) compared to Canada (4,435 ha). Mean stand size is more than seven times greater in Canada (196 ha) compared to the United States (26 ha). Three times more is located in Ontario (14,764 ha) compared to Minnesota (5,173 ha) yet, more is protected in Minnesota (4,921 ha) than in Ontario (4,313 ha). The largest old-growth eastern white pine forest is located at Obabika Lake in Temagami, Ontario (2,400 ha).

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

POLITICAL JURISDICTION	ORIGINAL OLD-GROWTH WHITE PINE FOREST AREA	TOTAL AREA	STAND SIZE RANGE	% ORIGINAL FOREST REMAINING	NO. OF STANDS	MEAN STAND AREA	AREA PROTECTED	% PROTECTED ORIGINAL	STATUS
CANADA									
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
TOTAL CANADA	2,803,853	15,136	2-2,400	0.54	73	196	4,435	0.16	Endangered
UNITED STATES									
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	09-May	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
TOTAL U.S.	3,178,991	8,827	1-1,091	0.28	337	26	8,145	0.26	Endangered
TOTAL NATURAL RANGE	5,982,844	23,963	1-2,400	0.4	410	56	13,183	0.22	Endangered

Policy Implications

Endangered species in both Canada and the United States are legally protected and many endangered species populations are or have been the focus of active rehabilitation efforts. Recently, these efforts have recognized the importance of maintaining quality habitat for these precarious populations. Even with this recognition of the value of maintaining ecosystems in order to protect species, the application of status assessments for ecosystems and legal designation recognizing these assessments has yet to be applied to ecosystems.

Endangered old-growth eastern white pine forests are still being logged in Ontario and in fact, the endangered status of these forest ecosystems has recently been ignored by Ontario's Old Growth Policy Advisory Committee (1993) in their policy recommendations. In addition, the Ontario Government views old-growth forests as "renewable resources" (OMNR 1991) - in other words, they believe that old-growth forests can be logged and re-created using forestry techniques. This contradicts Society of American Foresters (1984) policy that has been in place for almost 10 years stating that, "Old-growth management, for the foreseeable future, will be predicated on preservation of existing old-growth stands." In addition, the Ontario Round Table on Environment and Economy (1990) came to the same conclusion regarding the renewability of old-growth forests stating that, "old-growth forest habitats should be viewed as non-renewable and essential parts of our natural heritage."

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