

Ancient Forest Exploration & Research
Powassan, Ontario, Canada

Rare, Threatened and Endangered Forest Ecosystems in Ontario's Temperate Forest Region

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)

Introduction

Globally, 1.5 million square kilometers of forests were lost to human activity between 2000 and 2012. In fact, 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). Noss et al. (1995) reported that old-growth and other natural forests of all types throughout the eastern USA have declined by 98% or more. Of all countries, Canada lost the greatest amount of primary, natural (old-growth) forest between 2000 and 2014 representing 20% of global primary deforestation during that time (Beaudry 2019).

The fate of natural forested landscapes in Ontario is following the pathway of forest loss that has characterized most of the forested landscapes in the USA (Noss et al. 1995). In particular, this problem in Ontario has reached an extreme in the southern parts of the province. For example, the Environmental Commissioner of Ontario (ECO) (2018) stated that,

“Since European settlement, southern Ontario has lost most of its forest cover to land clearing for agriculture and development – and forests continue to disappear. Today, many watersheds have below the 30% forest cover required to ensure marginally functional ecosystems... southern Ontario as a whole has only about 25% forest cover, which is less than the minimum needed to support healthy wildlife and ecosystems”.

Although Drever et al. (2010) identified six rare forest types in central Ontario, including stands dominated by eastern hemlock, white cedar, eastern white pine, red oak, red pine and yellow birch, no other work has been done to identify and determine the conservation status (rare, threatened, endangered) of the forest types and forest community types in Ontario’s temperate forests.

The purpose of this work was to utilize data available from the provincial government to determine the conservation status of the variety of forest types and forest communities in Ontario’s Temperate Forest Region (Figure 1). In particular, the results of this work will be used to help guide the identification, mapping, description and conservation of old-growth forests in northern Peterborough County, Ontario. However, these results can also be applied to forest conservation issues in any portion of the Temperate Forest Region of Ontario.

Methods

Data used to determine the conservation status of forest types within Ontario’s temperate forests were obtained from Watkins (2011) and were only available for forest types on the Canadian Shield. The southern boundary of the Shield closely matches the southern boundary of Forest Resources Inventory mapping, which was used by Watkins (2011). Forest stands of all ages and with a dominant tree species greater than 59% overstory abundance were used for the calculations. The data used to produce a list of forest community types at risk was obtained from the NHIC (2019).

Results and Discussion

Temperate Forest Types on the Shield

Based on Watkins (2011), a total of 13 temperate forest types occur on the Canadian Shield in Ontario (Table 1). Using our criteria, we have identified eight forest types “at-risk” within four conservation categories including forests dominated by the following species.

- Critically Endangered (<1%): American basswood (0.01%), American beech (0.03%), yellow birch (0.4%)
- Endangered (1 - 2.9%): eastern hemlock (1.5%), red maple (1.6%), ash (black and white) (2.2%)
- Threatened (3 - 4.9%): oak (all native spp., mainly red) (3.0%)
- Special Concern (5 - 7%): red pine (5.7%)

Figure 1. Ontario's Temperate Forest Region (within pink boundary; from MNRF (2019))



Figure 2: The ecozones, ecoregions, and ecodistricts of Ontario.

Table 1. Conservation Status of Temperate Forest Types in Central Ontario on the Canadian Shield (>60% dominance in the overstory; all ages; based on FRI data; from Watkins (2011))

Forest Type	2001		2006		2011		10-yr Change	Conservation Status
	Ha	%	Ha	%	Ha	%		
American Basswood	263	0.02	177	0.02	177	0.01	declined (33%)	Critically Endangered
American Beech	2,261	0.2	388	0.2	404	0.03	declined (82%)	
Yellow Birch	4,913	0.3	5,670	0.4	5,366	0.4	increased (9%)	
Eastern Hemlock	20,236	1.4	18,140	1.5	18,618	1.5	declined (8%)	Endangered
Red Maple	165,213	11.6	21,043	12.5	20,930	1.6	declined (87%)	
Ash (Black & White)	24,575	1.7	29,792	1.9	27,580	2.2	increased (12%)	Threatened
Oak (all; primarily Red)	52,671	3.7	37,271	4.0	38,902	3.0	declined (26%)	
Red Pine	59,193	4.2	67,195	4.5	73,025	5.7	increased (36%)	Special Concern
Balsam Fir	102,838	7.2	127,316	7.8	100,940	7.9		Common
White Spruce	99,007	7.0	115,953	7.5	108,785	8.5		
Eastern White Pine	110,607	7.8	121,607	8.4	130,916	10.2		
Northern White Cedar	237,805	16.8	253,444	18.0	237,691	18.6		
Sugar Maple	539,900	38.0	521,883	40.9	515,099	40.3		
Total	1,419,482		1,319,879		1,278,433			

Of these eight forest types at-risk, five were in decline in 2011 including those dominated by American basswood, American beech, eastern hemlock, red maple and oak species. Both American beech and red maple declined severely between 2001 and 2011 by 82% and 87%, respectively. In 2011, these eight forest types at-risk made up a total of approximately 14.5% of the temperate forests on the Shield in Ontario.

Temperate Forest Community Types

Although the Natural Heritage Information Centre (NHIC) does not provide range information for the forest community types shown in Table 2, it appears that most of these “at risk” temperate forest community types are found primarily south of the Canadian Shield. The NHIC uses four categories to denote conservation status from most to least imperiled as follows, (1) critically imperiled, (2) imperiled, (3) vulnerable, and (4) apparently secure (see Table 2 for definitions).

- Critically Imperiled: only upland types - 14 oak forest community types, 3 other community types including 3 red cedar community types
- Imperiled: 8 upland types - mostly oak communities (4 types); 6 wetland (swamp) types, 3 oak community types
- Vulnerable: 18 upland types - 5 oak community types, 4 maple community types, 3 hickory community types, 3 white cedar community types; 7 wetland types - 2 red maple-hemlock community types, 2 white cedar-hemlock community types
- Apparently Secure: 11 upland types - 4 oak community types, 4 maple community types

Using provincial Forest Resource Inventory data, it was determined that a total of eight forest types are “at-risk” in the Shield portion of Ontario’s Temperate Forest Region including forests dominated (>59%) by American basswood (0.01%), American beech (0.03%), yellow birch (0.4%), eastern hemlock (1.5%), red maple (1.6%), ash (black and white) (2.2%), oak (all native spp., mainly red) (3.0%), and red pine (5.7%). Five of these forest types were in decline between 2001 and 2011 (Table 1).

Most of these tree species also dominate in Ontario’s rare temperate forest communities (Table 2). The oak forest community type has the greatest number of types “at-risk” with 30 types. Other forest communities with a high number of at-risk types include red cedar, maple, hickory, white cedar and eastern hemlock.

These results represent the initial stages of developing and refining a comprehensive list of rare, threatened and endangered forest ecosystems in Ontario’s Temperate Forest Region. According to Dreever et al. (2010), conservation status data can be used for (1) the conservation of rare forests, (2) the development of conservation forestry, (3) increased protection of at-risk stand types, and (4) guidance on the conservation of biodiversity. Additional work is required to further develop this field of study, which is imperative as the foundation of a scientifically-based approach to forest conservation in Ontario.

Table 2. Conservation Status of Forest Community Types in Ontario’s Temperate Forest Region (see table notes for definitions of categories; from NHIC (2019))

Critically Imperiled Forested Ecosystems (S1)
<i>Upland Types</i>
Hickory Forests
Shagbark Hickory-Prickly Ash - Philadelphia Panic Grass Treed Alvar Grassland
Oak Forests
Black Oak Tallgrass Dry Savannah
Black Oak-Pine Tallgrass Dry Savannah
Black Oak-White Oak Tallgrass Dry Woodland
Black Oak-White Oak Tallgrass Moist-Fresh Woodland
Bur Oak Northern Tallgrass Moist-Fresh Savannah
Black Oak Tallgrass Moist-Fresh Savannah
Bur Oak Treed Alvar
Bur Oak-Shagbark Hickory Tallgrass Dry Woodland
Chinquapin Oak - Nodding Onion Treed Alvar Grassland
Chinquapin Oak Carbonate Treed Dry-Fresh Talus
Oak Treed Limestone Barren
Oak-Pitch Pine Mixed Dry Forest
Pin Oak - Bur Oak Tallgrass Moist-Fresh Savannah
Pin Oak Tallgrass Fresh-Moist Woodland
Pine Forests
Pitch Pine Treed Granite Barren
Red Cedar Forests
Red Cedar Basic Treed Rock Barren
Red Cedar Treed Granite Barren
Red Cedar Treed Limestone Barren
Imperiled (S2)
<i>Upland Types</i>
Basswood - White Ash - Butternut Moist Treed Limestone Talus Type
Bur Oak - Saskatoon Berry Dry Deciduous Woodland Type
Bur Oak Basic Treed Rock Barren Type
Dry Chinquapin Oak – Pine Mixed Forest Type
Hemlock - Sugar Maple Moist Limestone Talus Type
Moist - Fresh Black Walnut Deciduous Forest Type
Moist - Fresh Bur Oak - Green Ash - Trembling Aspen Deciduous Forest Type
Red Cedar - Early Buttercup Treed Alvar Grassland Type
<i>Wetland Types</i>
Gray Birch Treed Fen Type
Pin Oak Mineral Deciduous Swamp Type
Red Maple - White Pine Mineral Mixed Swamp Type
Shumard's Oak Mineral Deciduous Swamp Type
Swamp White Oak Mineral Deciduous Swamp Type
White Pine-Coniferous Mineral Swamp Type

Table 2. continued

Vulnerable (S3)
Upland Types
Fresh - Moist Bitternut Hickory Deciduous Forest Type
Dry - Fresh Hickory Deciduous Forest Type
Fresh - Moist Shagbark Hickory Deciduous Forest Type
White Birch-Aspen Treed Limestone Cliff Type
White Birch-Dry Treed Limestone Talus Type
Sugar Maple - Black Maple Deciduous Forest Type - Moist-Fresh
Fresh - Moist Black Maple Lowland Deciduous Forest Type
Sugar Maple - Ironwood - White Ash Treed Limestone Cliff Type
Sugar Maple Moist Treed Limestone Talus Type
Dry - Fresh Mixed Oak Deciduous Forest Type
Dry Black Oak Deciduous Forest Type
Dry Oak - Hickory Deciduous Forest Type
Fresh - Moist Bur Oak Deciduous Forest Type
Hill's Oak - White Pine - Poplar Acidic Treed Rock Barren Type
Fresh - Moist Sassafras Deciduous Forest Type
White Cedar - White Spruce - Philadelphia Panic Grass Treed Alvar Grassland Type
White Cedar Dry Treed Limestone Talus Type
White Cedar Treed Limestone Cliff Type
Wetland Types
Bur Oak Mineral Deciduous Swamp Type
Red Maple - Hemlock Mixed Mineral Swamp Type
Red Maple - Hemlock Mixed Organic Swamp Type
Tamarack-Leatherleaf Treed Kettle Peatland Type
White Cedar-Hemlock Coniferous Mineral Swamp Type
White Cedar-Hemlock Coniferous Organic Swamp Type
White Pine-White Birch Mineral Mixed Swamp Type
Apparently Secure (S4)
Dry - Fresh Sugar Maple - Hickory Deciduous Forest Type
Dry - Fresh White Oak Deciduous Forest Type
Dry Red Cedar Coniferous Forest Type
Dry Red Pine - White Pine Coniferous Forest Type
Fresh - Moist Oak - Maple Deciduous Forest Type
Fresh - Moist Oak - Sugar Maple Deciduous Forest Type
Jack Pine Basic Treed Rock Barren Type
Maple-Yellow Birch - Hardwood and Mixedwood
Oak - Red Maple - Pine Basic Treed Rock Barren Type
Other Hardwoods and Mixedwoods Forest
Sugar Maple-Basswood/Leatherwood Forest

Table Notes: *Critically Imperiled* - due to extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation; *Imperiled* - rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation; *Vulnerable* - due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation; *Apparently Secure* - uncommon but not rare, some cause for long-term concern due to declines or other factors.

AFER's Mission and Guiding Principles

AFER is a non-profit scientific organization with a mission to carry out research and education that lead to the identification, description and protection of ancient (pristine) forested landscapes, including old-growth forests. The earth-stewardship principles that guide our work include the following.

- Many forest ecosystem types are now endangered. We consider these ecosystems and other ancient forests to be non-renewable resources, which is not consistent with the practice of mining or logging them.
- We consider biodiversity conservation needs at local, provincial, federal and international scales.
- We support the Government of Canada's official commitment to increase protected areas to 17% of the Canadian land base.
- We support the New York Declaration on Forests to end natural forest loss by 2030.

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Acknowledgements

This work was funded through an Ontario Trillium Foundation Seed Grant.