



Forest Lands - Conservation of Biological Diversity

Indicator #8500

Note: This indicator includes four components that correspond to Montreal Process Criterion #1, Indicators 1, 2, 3, and 5.

Indicator #8500 Components:

- Component (1) – Extent of area by forest type relative to total forest area
- Component (2) – Extent of area by forest type and by age-class or successional stage
- Component (3) – Extent of area by forest type in protected area categories
- Component (4) – Extent of forest land conversion, parcelization, and fragmentation (*still under development for future analysis; data not presented in this report*)

Overall Assessment

Status: **Mixed**

Trend: **Undetermined**

Rationale: **There is a moderate distribution of forest types in the Great Lakes basin by age-class and seral stage. Overall, the region surrounding the upper Great Lakes is doing good, while areas in the lower Great Lakes have a status that is fair/poor. The lack of a baseline against which to measure the current state complicates a definite status and trend assessment. Additional analysis is required by forestry professionals.**

Lake-by-Lake Assessment

Status: Not Assessed

Trend: Undetermined

Rationale: Data by individual lake basin were not available for the U.S. at this time.

Purpose

- To describe the extent, composition and structure of Great Lakes basin forests
- To address the capacity of forests to perform the hydrologic functions and host the organisms and processes that are essential to protecting the biological diversity, physical integrity and water quality of the watershed

Ecosystem Objective

To have a forest composition and structure that most efficiently conserves the natural biological diversity of the region.

State of the Ecosystem

Component (1): Extent of area by forest type relative to total forest area

Forests cover over half (60%), of the land in the Great Lakes basin. The U.S. portion of the basin has forest coverage on 51% of its land, while the Canadian portion has coverage on 73% of its land.

According to data from 2006, maple-beech-birch is the most extensive forest type in the U.S. portion of the basin, representing 7.5 million hectares (18.5 million acres), or 37% of total U.S. forest area in the basin. Aspen-birch

forests constitute the 2nd largest forest type, representing 19% of the U.S. total. Complete data are available in Table 1 and are visually represented in Figure 1.

According to data from 2002, the Canadian portion of the basin is dominated by mixed forest, representing 39% of the total Canadian forest area, followed by hardwoods, covering 23% of the total Canadian forest area analyzed from satellite data (Table 2A). The most extensive provincial forest type is the upland mixed conifer, representing 23% of the forested area available for analysis, followed by the mixedwoods, tolerant hardwoods, white birch, and poplars (Table 2B, Figure 2).

Implications for the health of Great Lakes forests and the basin ecosystem are difficult to establish. There is no consensus on how much land in the basin should be forested, or on how much land should be covered by each forest type. Generally speaking, maintenance of the variety of forest types is important in species preservation, and long-term changes in forest type proportions are indicative of changes in forest biodiversity patterns (OMNR 2007).

Comparisons to historical forest cover, although of limited utility in developing landscape goals, can illustrate the range of variation experienced within the basin since the time of European settlement. (See supplemental section entitled “Historical Range of Variation in the Great Lakes Forests of Minnesota, Wisconsin and Michigan” in Indicator #8500, Canada and United States (2005) for more information). Analysis of similar historical forest cover data for the entire Great Lakes basin over the past several years would be useful in establishing current trends to help assess potential changes to ecosystem function and community diversity.

Component (2): Extent of area by forest type and by age-class or successional stage

Succession is technically defined as “the natural sequence of plant community replacement beginning with bare ground and resulting in a final, stable community in which a climax forest is reached. Foresters, wildlife biologists, and farmers battle succession to try to maintain a particular vegetative cover,” (USDA 1989). Current data, although not reported by actual successional stage for this report, is available according to age-class.

In the U.S. portion of the basin, the 41 to 60 and 61 to 80 year age-classes are dominant and together represent about 58% of total timberland area. Forests 40 years of age and under make up a further 28%, while those in the 81-plus year age-classes constitute 13% of total timberland area. Table 3 contains complete U.S. data (in hectares) for age-class distribution by U.S. forest type.

Because forests are dynamic and different tree species have different growth patterns, depending on the disturbance regime and regeneration type, age distribution varies by forest type. In the U.S. portion of the basin, aspen-birch forests tend to be younger, being more concentrated than other forest types in age classes under 40 years, while the maple-beech-birch forests are more concentrated in the 41 to 60 and 61 to 80 year age classes, comparatively. Spruce-fir and white-red-jack pine forests have a well-distributed age structure, and also have the highest proportion of old trees, with about 10% and 5% of the total area of their forest type in the 100-plus year age class respectively (Figure 3).

These age-class data can serve as a coarse surrogate for the vegetative structure (height and diameter) of a forest, and they can be combined with data from other indicators to provide insight on forest sustainability.

U.S data on the extent of forest area by successional or seral stage are not available, although data can be obtained according to forest size class, which is directly comparable to the age-class data presented here. Certain tree species can be associated with the various successional stages, but a standard and quantifiable protocol for identifying

successional stage has not yet been developed therefore complicated reporting according to this metric. It is expected, however, that in the absence of disturbance, the area covered by early-successional forest types, such as aspen-birch, is likely to decline as forests convert to more late-successional types, such as maple-beech-birch.

Ontario's forests have a distribution leaning towards mature stages, representing about 50% of the total forest area analyzed. Forests in the immature stage make up the next largest group with 20% of the total, followed by those in late successional with 14%. Every Canadian forest type distribution follows this general trend except for jack pine. Complete available data for Ontario can be viewed in Table 4 and are visually represented in Figure 4.

Although the implications of these age-class data for forest and basin health overall are unclear, water quality is generally most affected immediately following a disturbance from harvest or natural event when increased concentrations of nutrients in stream water can sometimes be detected. Following such disturbances, however, concentrations of nutrients often remain within acceptable limits for drinking water quality. In landscapes containing a mosaic of forest successional stages, use of forestry Best Management Practices (e.g., retention of forested buffers along streams) ensures that any increases in flow, sediment, or nutrients are minor and short-term and that increases are similar to those following natural disturbance (Comerford et al. 1992, Fisher and Binkley 2000, Ice 2004, McBroom et al. 2003).

Component (3): Extent of area by forest type in protected area categories

It is difficult to assess the implications of the extent of protected forest area, since there is no consensus on how "protected" should be defined or what the actual proportion should be. Differences among the U.S., Canadian, and International Union for the Conservation of Nature (IUCN) definitions of protected areas should be noted. The IUCN standard contains six categories of protected areas—strict nature reserves/wilderness areas, national parks, natural monuments, habitat/species management areas, protected landscapes/seascapes, and managed resource protection areas. The U.S. Forest Service Forest Inventory and Analysis Program defines protected areas as forests "reserved from harvest by law or administrative regulation," including designated Federal Wilderness areas, National Parks and Lakeshores, and state designated areas (Smith 2004). Ontario defines protected areas as national parks, conservation reserves, and its six classes of provincial parks – wilderness, natural environment, waterway, nature reserve, historical and recreational (OMNR 2002). There is substantial overlap among the specific U.S., Ontario and IUCN definitions, and a more consistent classification system would ensure proper accounting of protected areas.

Common to the U.S., Ontario and IUCN definitions is that they only include forests in the public domain. However, there are privately-owned forests similarly reserved from harvest by land trusts, conservation easements and other initiatives. Inclusion of these forests under this indicator would provide a more complete definition of protected forest areas.

Moreover, there is debate on how protected status relates to forest sustainability, water quality, and ecosystem health. Protected area status does not necessarily imply that natural disturbance regimes are allowed to function. In many cases, protected status was bestowed onto forests for their scenic or recreational value, which may not contribute significantly to conservation or watershed management goals. On the other hand, forests available for harvest, whether controlled by the national forest system, state or local governments, tribal governments, industry or private landowners, can be managed with the stated purpose of conserving forest and basin health through the implementation of Best Management Practices and certification under sustainable forestry programs. (For more information, refer to Indicator #8503, Forest Lands—Conservation and Maintenance of Soil and Water Resources).

In the U.S. basin, 6.8% of forested land is in a protected area category. Forest types with the highest proportion considered to have protected status are maple-beech-birch (9.98%), white-red-jack-pine (7.35%), spruce fir (7.32%) and aspen-birch (5.73%) Please refer to Table 1 for complete U.S. data.

In the entire Canadian portion of the basin, 10.6% of forest area, or 1.6 million hectares (4.0 million acres), are protected (Table 2A). For the region of Ontario that has available forest type data, protection rates range from 15.4% for red and white pine and 11% for white birch, to 6.4% for poplar and 5.7% for mixed conifer lowland forests (Table 2B).

National forest protection rates are estimated to be 8.4% in Canada (WWF 1999) and 14% in the U.S. (USDA Forest Service 2004). Despite the fact that updated trend data for protected status are not available at this time for the Great Lakes basin, earlier analyses have shown a recent general increase in protected areas (indicator reports #8500 in Canada and the United States 2005 and 2007).

As for the range of variation in protection rates by forest types, protected areas should be representative of the diversity in forest composition within a larger area. However, defining what constitutes this “larger area” is problematic. Policymakers often have a different jurisdiction than the Great Lakes basin in mind when deciding where to locate protected areas. Also, the tree species and forest types found on an individual plot of protected land can change over time due to successional processes.

Component (4): Extent of forest land conversion, parcelization, and fragmentation

This component is still under development, as consensus has not been reached on definitions of forest fragmentation metrics and which ones are therefore suitable for reporting. The proposed structure is split into the forces that drive fragmentation, (land conversion and parcelization) and a series of forest spatial pattern descriptions based on (as yet to be agreed upon) fragmentation metrics.

Conversion of forest land to other land-use classes is considered to be a major cause of fragmentation. Proposed metrics to describe this include the percent of forest lands converted to and from developed, agricultural, and pasture land uses. Both Canadian and U.S. data are available and can be obtained from the Ontario Ministry of Natural Resources and the USDA Natural Resources Conservation Service, Natural Resources Inventory, respectively.

Parcelization of large areas of forest lands in single ownerships into smaller separately owned tracts of land can lead to a disruption of continuous ecosystems and habitats and, therefore, increased fragmentation. A proposed metric is the average size of land holdings. Canada does not have available data for this metric, while the U.S. data are available through the USDA Forest Service, Forest Inventory and Analysis National Woodland Owner Survey.

Data for various fragmentation metrics exists for both Canada and the U.S., but the way these metrics are viewed is drastically different. According to sources that have compiled U.S. data, fragmentation, “. . . is viewed as a property of the landscape that contains forest... [as opposed to] a property of the forest itself.” (Riitters *et. al* 2002). Ontario data are compiled according the latter view of fragmentation and exist for the following metrics: area, patch density and size, edge, shape, diversity and interspersion, and core area. U.S. data exist for patchiness, perforation, connectivity, edge, and interior or core forest, and they are available from the USDA Forest Service. They are also being compiled by U.S. EPA. Substantial discussion is still required to refine these metrics before reporting and analysis of this component can continue on a basin-wide scale.

Pressures

Urbanization, seasonal home construction and increased recreational use (driven in part by the desire of an aging and more affluent population to spend time near natural settings) are among the general demands being placed on forest resources nationwide. Climate change in the Great Lakes region will also affect forest biodiversity and distribution of forest types by shifting the ranges of various tree species.

Additional disturbances caused by lumber removal and forest fires can also alter the structure of Great Lakes basin forests.

Management Implications

Increased communication and agreement regarding the definitions, data collection methods, and reporting methods for forest type, successional stage, protected area category and fragmentation metrics between the United States and Canada would facilitate more effective basin-wide analyses.

Reporting of U.S. forest data according to watershed as opposed to county would enable analysis by individual lake basin, therefore increasing the data's value in relation to specific water quality and biodiversity objectives.

Canadian data by forest type and seral stage for the entire Great Lakes basin in Ontario, as opposed to just the Area of the Undertaking (AOU, see definition below in "Comments" section), would allow for a more complete analysis. This can only be accomplished if managers decide to extend forest planning inventories into the private lands in the southern regions of the province.

Managing forest lands in ways that protect the continuity of forest cover can allow for habitat protection and wildlife species mobility, therefore maintaining natural biodiversity.

Comments from the author(s)

Stakeholder discussion will be critical for identifying pressures and management implications, particularly those on a localized basis, that are specific to Great Lakes basin forests. These discussions will add to longstanding debates on strategies for sustainable forest management.

There are significant discrepancies within and between Canadian and U.S. data that made the analysis of data across the entire Great Lakes basin difficult. The most pervasive problems are related to the time frame, frequency and location of forest inventories and differences in metric definitions.

Canadian Great Lakes data for provincial forest type and seral stage are only available in areas of Ontario where Forest Resources Planning Inventories occur. This region is commonly referred to as the Area of the Undertaking (AOU) and only represents about 72% of Ontario's total Great Lakes basin land area. The remainder of Ontario's forests can only be analyzed using satellite data, which is meant for general land use/land cover analysis and does not have a fine enough resolution to allow for more detailed investigation. As for inventory in the area south of the AOU, there are still no concerted efforts in place to complete a forest resource inventory like the one within the AOU.

Forest inventory time frames for the U.S. also have an effect on data consistency. Although the 2006 Resource Planning Act assessment was used as the data source for the U.S. portion of this report, it actually draws data from a compilation of numerous state inventory years as follows: Illinois (2002-2006), Indiana (2002-2006), Michigan (2002-2006), Minnesota (2002-2006), New York (2002-2005), Ohio (2001-2006), Pennsylvania (2002-2006), and

Wisconsin (2002-2006). Additional forest types are now measured, that were not in 2002, therefore complicating trend analysis over time. Some challenges related to consistency should diminish as the FIA Program completes its switch to an annualized survey cycle and future analyses incorporate these data.

Also, U.S. data provided for this report were compiled by county and not by watershed, so the area of land analyzed is not necessarily completely within the Great Lakes basin and all related values are therefore skewed. This factor also made it impossible to represent the data by individual lake basin. Additional GIS analysis of the raw inventory data would be required to provide forest data by watershed.

Definition of forest type differs between the U.S. and Canada as well. In the U.S., forest cover type is defined according to the predominant tree species and is divided into fifteen major groups. The Canadian provincial forest type classifications reported here, however, are based on a combination of ecological factors including dominant tree species, understory vegetation, soil, and associated tree species (OMNR 2002). The definitions of each provincial forest type are available in Table 5.

Standardization of forest type definitions between the U.S. and Ontario may be necessary for analysis across the entire Great Lakes basin; however, data standardization may not be achievable because programs have evolved to meet the needs of each agency. Establishing clear objectives and bringing data to bear on the objectives would be a step in targeting achievements.

As previously mentioned in this report, the forest fragmentation component of this indicator needs additional refining before it can be included for analysis. In addition, the successional/seral stage discussion needs to continue in order to further clarify this indicator.

Assessing Data Quality

Insert “x” under the statement that best corresponds with each data characteristic

Data Characteristics	Strongly Agree	Agree	Neutral or Unknown	Disagree	Strongly Disagree	Not Applicable
1. Data are documented, validated, or quality-assured by a recognized agency or organization	X					
2. Data are traceable to original sources	X					
3. The source of the data is a known, reliable and respected generator of data	X					
4. Geographic coverage and scale of data are appropriate to the Great Lakes basin				X		
5. Data obtained from sources within the U.S. are comparable to those from Canada				X		
6. Uncertainty and variability in the data are documented and within acceptable limits for this indicator report	X					

Clarifying Notes:
 For the U.S. data, to accurately report on this indicator for the Great Lakes basin, GIS analysis is necessary (data presented are for all counties within the Great Lakes basin).

Acknowledgments

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List of Tables

Table 1. Total forest area and protected area by forest type in U.S. Great Lakes basin counties

Non-stocked = timberland less than 10% stocked with live trees

* = "Other" category includes: Loblolly-Shortleaf Pine, Oak-Gum-Cypress, Pinyon-Juniper, Douglass-Fir, Fir-Spruce-Mountain Hemlock, Exotic Softwood, and Exotic Hardwood

Source: USDA Forest Service, Forest Inventory and Analysis National Program, 2006 Resource Planning Act (RPA) Assessment Database

Table 2. Total forest area and protected area by forest type in, A) Canadian Great Lakes basin, B) AOU* portion of Ontario

* The Area of the Undertaking (AOU) land area represents 72% of the total land area analyzed in Ontario's portion of the Great Lakes basin.

Source: Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section

Table 3. Age-class distribution as a percentage of forested area within forest type on timberland for U.S. Great Lakes basin counties

Non-stocked = timberland less than 10% stocked with live trees

* = "Other" category includes: Loblolly-Shortleaf Pine, Oak-Gum-Cypress, Pinyon-Juniper, Douglass-Fir, Fir-Spruce-Mountain Hemlock, Exotic Softwood, and Exotic Hardwood

Source: USDA Forest Service, Forest Inventory and Analysis National Program, 2006 Resource Planning Act (RPA) Assessment Database

Table 4. Seral stage distribution of provincial forest types (in hectares) in AOU* portion of Canadian Great Lakes Basin

* The Area of the Undertaking (AOU) land area represents 72% of the total land area analyzed in Ontario's portion of the Great Lakes basin.

Source: Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section

Table 5. Description of Canadian provincial forest types

Source: Forest Resources of Ontario 2001: State of the Forest Report, Appendix 1, p. 41, (OMNR 2002)

List of Figures

Figure 1. Proportion of forested area by forest type in U.S. Great Lakes basin

"Other" category includes: Loblolly-Shortleaf Pine, Oak-Gum-Cypress, Pinyon-Juniper, Douglass-Fir, Fir-Spruce-Mountain Hemlock, Exotic Softwood, and Exotic Hardwood

Source: USDA Forest Service, Forest Inventory and Analysis National Program, 2006 Resource Planning Act (RPA) Assessment Database

Figure 2. Proportion of forested area by provincial forest type in AOU* portion of Canadian Great Lakes basin

* The Area of the Undertaking (AOU) land area represents 72% of the total land area analyzed in Ontario's portion of the Great Lakes basin.

Source: Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section

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Source: USDA Forest Service, Forest Inventory and Analysis National Program, 2006 Resource Planning Act (RPA) Assessment Database

Figure 4. Seral stage distribution as a percentage of forested area within provincial forest type in AOU* portion of Canadian Great Lakes Basin

* The Area of the Undertaking (AOU) land area represents 72% of total land area analyzed in Ontario's portion of the Great Lakes basin.

Source: Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section

Last Updated

State of the Lakes Ecosystems Conference (SOLEC) 2008

Forest Type	Forest Area (ha)	% of Total Forest Area	Protected Area (ha)	% Protected
Maple-Beech-Birch	7,482,643	36.74%	747,033	9.98%
Aspen-Birch	3,791,691	18.62%	217,304	5.73%
Oak-Hickory	2,482,436	12.19%	41,890	1.69%
Spruce-Fir	2,476,314	12.16%	181,385	7.32%
White-Red-Jack Pine	1,691,484	8.30%	124,304	7.35%
Elm-Ash-Cottonwood	1,485,361	7.29%	25,420	1.71%
Oak-Pine	509,163	2.50%	16,701	3.28%
Other*	224,481	1.10%	10,167	4.53%
Nonstocked	224,503	1.10%	9,880	4.40%
Total	20,368,076		1,374,084	6.75%

Table 1. Total forest area and protected area by forest type in U.S. Great Lakes basin counties

Non-stocked = timberland less than 10% stocked with live trees

* = "Other" category includes: Loblolly-Shortleaf Pine, Oak-Gum-Cypress, Pinyon-Juniper, Douglass-Fir, Fir-Spruce-Mountain Hemlock, Exotic Softwood, and Exotic Hardwood

Source: USDA Forest Service, Forest Inventory and Analysis National Program, 2006 Resource Planning Act (RPA) Assessment Database

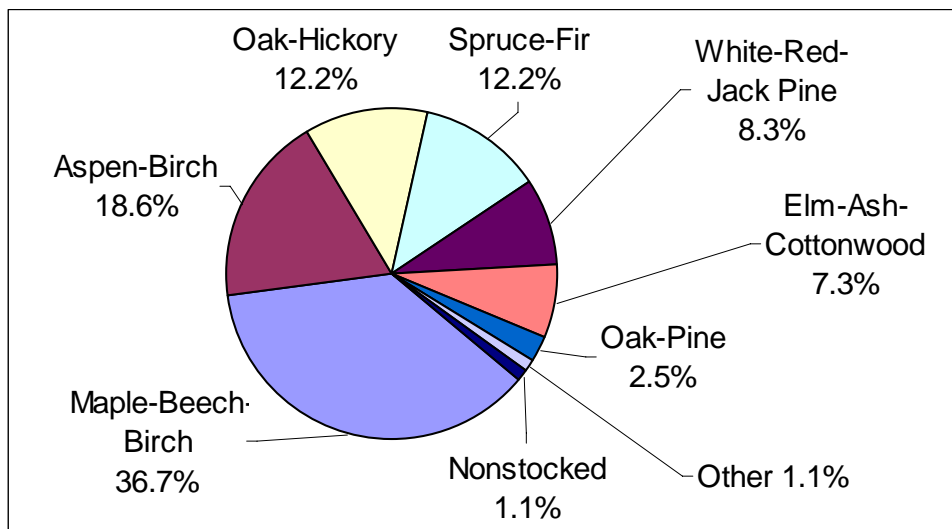


Figure 1. Proportion of forested area by forest type in U.S. Great Lakes basin

“Other” category includes: Loblolly-Shortleaf Pine, Oak-Gum-Cypress, Pinyon-Juniper, Douglass-Fir, Fir-Spruce-Mountain Hemlock, Exotic Softwood, and Exotic Hardwood

Source: USDA Forest Service, Forest Inventory and Analysis National Program, 2006 Resource Planning Act (RPA) Assessment Database

A) Canadian Great Lakes Basin				
Satellite Classes	Forest Area (ha)	% of Total Forest Area	Protected Area (ha)	% Protected
Forest - Sparse	2,053,869	13.78%	245,118	11.93%
Forest - Hardwood	3,468,513	23.27%	361,147	10.41%
Forest - Mixed	5,750,313	38.57%	649,342	11.29%
Forest - Softwood	2,407,729	16.15%	268,753	11.16%
Swamp - Treed	49,933	0.33%	1,413	2.83%
Fen - Treed	30,197	0.20%	3,726	12.34%
Bog - Treed	436,083	2.93%	28,128	6.45%
Disturbed Forest - cuts	578,450	3.88%	8,973	1.55%
Disturbed Forest - burns	97,545	0.65%	18,628	19.10%
Disturbed Forest - regenerating	35,987	0.24%	381	1.06%
Totals	14,908,617		1,585,608	10.64%
B) AOU* Portion of Ontario				
Provincial Forest Type	Forest Area (ha)	% of Total Forest Area	Protected Area (ha)	% Protected
White Birch	1,593,114	13.73%	175,261	11.00%
Mixed Conifer Lowland	1,048,126	9.03%	60,192	5.74%
Mixed Conifer Upland	2,657,086	22.90%	239,194	9.00%
Mixedwood	2,099,760	18.10%	194,682	9.27%
Jack Pine	714,165	6.15%	54,991	7.70%
Poplar	1,189,573	10.25%	75,538	6.35%
Red & White Pine	685,124	5.90%	105,682	15.43%
Tolerant Hardwoods	1,616,502	13.93%	108,993	6.74%
Totals	11,603,450		1,014,533	8.74%

Table 2. Total forest area and protected area by forest type in, A) Canadian Great Lakes basin, B) AOU* portion of Ontario

* The Area of the Undertaking (AOU) land area represents 72% of the total land area analyzed in Ontario's portion of the Great Lakes basin.

Source: Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section

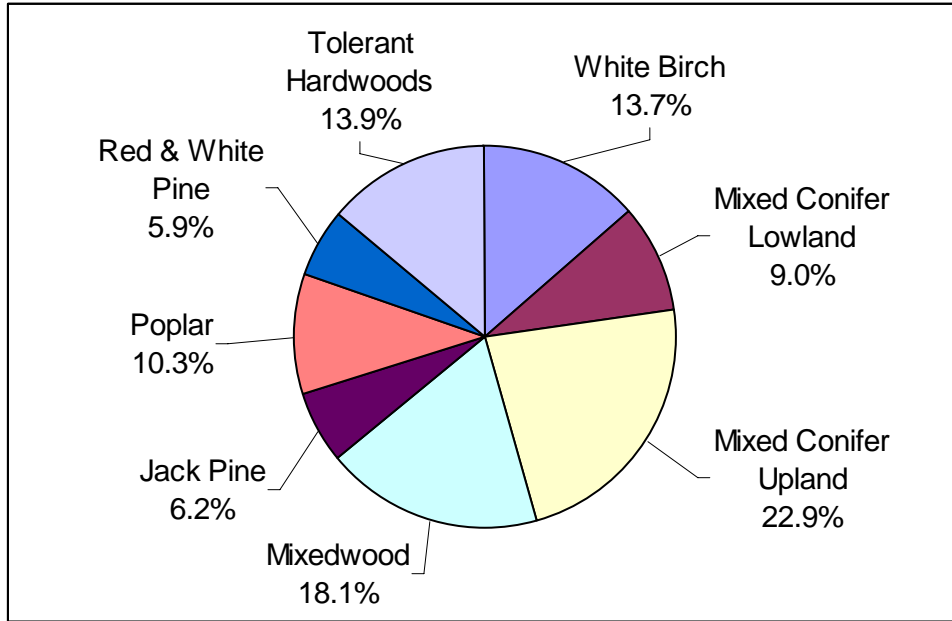


Figure 2. Proportion of forested area by provincial forest type in AOU* portion of Canadian Great Lakes basin
 * The Area of the Undertaking (AOU) land area represents 72% of the total land area analyzed in Ontario's portion of the Great Lakes basin.

Source: Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section

Forest Type	Age Class (in years)					
	0-20	21-40	41-60	61-80	81-100	100+
Maple-Beech-Birch	6.26%	11.51%	30.23%	37.35%	12.26%	2.39%
Aspen-Birch	24.37%	25.16%	28.68%	18.18%	3.11%	0.50%
Oak-Hickory	7.23%	17.27%	30.63%	27.55%	14.09%	3.22%
Spruce-Fir	5.57%	11.45%	28.29%	30.91%	14.23%	9.55%
White-Red-Jack Pine	11.16%	23.35%	32.62%	20.29%	7.54%	5.05%
Elm-Ash-Cottonwood	7.97%	20.53%	36.82%	22.82%	8.28%	3.58%
Oak-Pine	13.76%	25.01%	32.94%	20.37%	6.43%	1.48%
Other*	11.82%	34.11%	38.21%	15.27%	0.58%	0.00%
Nonstocked East	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total	11.51%	16.96%	30.29%	28.13%	9.90%	3.22%

Table 3. Age-class distribution as a percentage of forested area within forest type on timberland for U.S. Great Lakes basin counties

Non-stocked = timberland less than 10% stocked with live trees

* = "Other" category includes: Loblolly-Shortleaf Pine, Oak-Gum-Cypress, Pinyon-Juniper, Douglass-Fir, Fir-Spruce-Mountain Hemlock, Exotic Softwood, and Exotic Hardwood

Source: USDA Forest Service, Forest Inventory and Analysis National Program, 2006 Resource Planning Act (RPA) Assessment Database

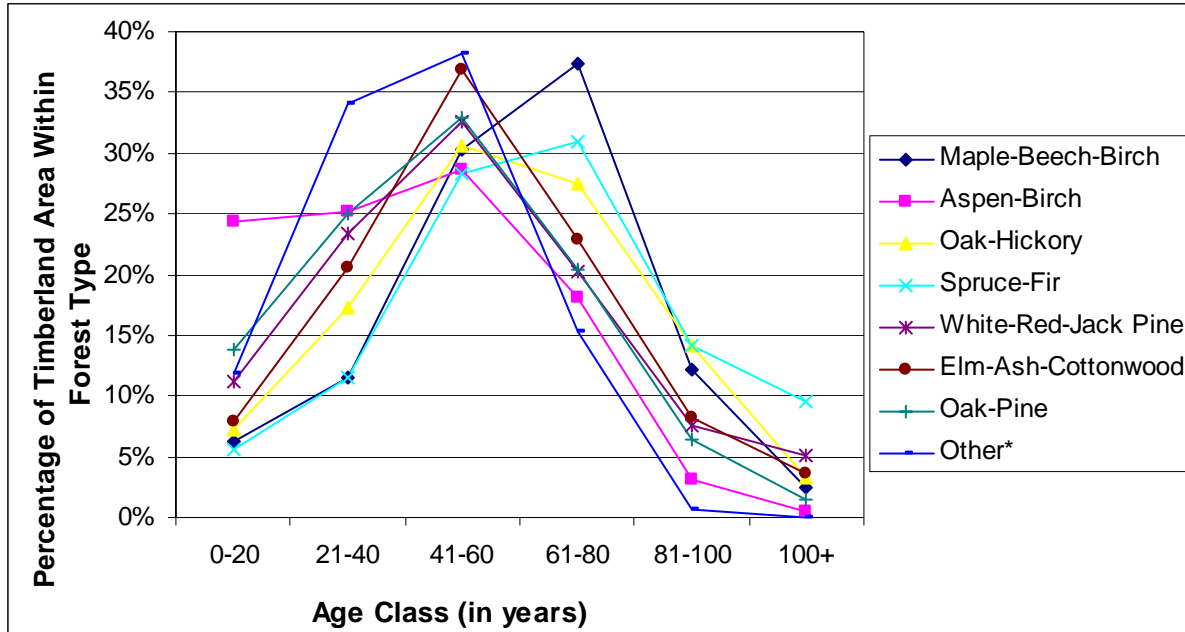


Figure 3. Age-class distribution as a percentage of forested area within forest type on timberland for U.S. Great Lakes basin counties

* = “Other” category includes: Loblolly-Shortleaf Pine, Oak-Gum-Cypress, Pinyon-Juniper, Douglass-Fir, Fir-Spruce-Mountain Hemlock, Exotic Softwood, and Exotic Hardwood

Source: USDA Forest Service, Forest Inventory and Analysis National Program, 2006 Resource Planning Act (RPA) Assessment Database

Provincial Forest Type	Seral Stage				
	Presapling	Sapling	Immature	Mature	Late Successional
White Birch	3.49%	4.52%	15.55%	63.58%	12.87%
Mixed Conifer Lowland	13.81%	9.31%	13.38%	47.00%	16.50%
Mixed Conifer Upland	5.91%	13.12%	22.51%	42.11%	16.36%
Mixedwood	4.60%	7.92%	26.06%	51.03%	10.39%
Jack Pine	8.60%	31.96%	29.24%	27.51%	2.69%
Poplar	6.60%	10.45%	18.97%	52.55%	11.43%
Red & White Pine	4.94%	3.77%	23.28%	62.95%	5.06%
Tolerant Hardwoods	1.23%	0.87%	6.40%	60.13%	31.37%
Totals	6.00%	10.14%	20.12%	49.84%	13.91%

Table 4. Seral stage distribution of provincial forest types (in hectares) in AOU* portion of Canadian Great Lakes Basin

* The Area of the Undertaking (AOU) land area represents 72% of the total land area analyzed in Ontario’s portion of the Great Lakes basin.

Source: Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section

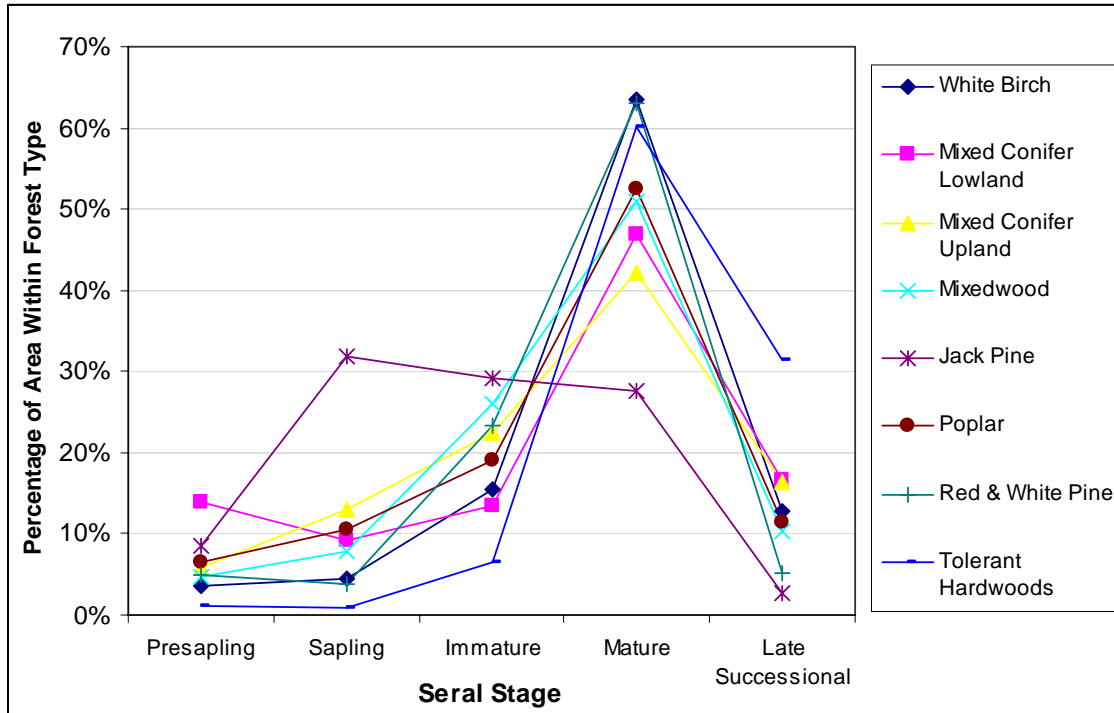


Figure 4. Seral stage distribution as a percentage of forested area within provincial forest type in AOU* portion of Canadian Great Lakes Basin

* The Area of the Undertaking (AOU) land area represents 72% of total land area analyzed in Ontario’s portion of the Great Lakes basin.

Source: Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section

Provincial Forest Type	Description
White Birch	predominantly white birch stands
Upland Conifers	predominantly spruce and mixed jack pine/spruce stands on upland sites
Lowland Conifers	predominantly black spruce stands on low, poorly drained sites
Mixedwood	mixed stands made up mostly of spruce, jack pine, fir, poplar and white birch
Jack Pine	predominantly jack pine stands
Poplar	predominantly poplar stands
White and Red Pine	all red and white pine mixedwood stands
Tolerant Hardwoods	predominantly hardwoods such as maple and oak, found mostly in the Great Lakes forest region

Table 5. Description of Canadian provincial forest types

Source: Forest Resources of Ontario 2001: State of the Forest Report, Appendix 1, p. 41, (OMNR 2002)