



Forest Lands - Maintenance of Productive Capacity of Forest Ecosystems

Indicator # 8501

Note: This indicator includes three components and corresponds to Montreal Process Criterion 2, Indicators 10, 11, and 13.

Indicator #8501 Components:

Component (1) – Area of forest land and area of forest land available for timber production

Component (2) – Total merchantable volume of growing stock on forest lands available for timber production

Component (3) – Annual removal of wood products compared to net growth, or the volume determined to be sustainable (*proposed for future analysis; data not presented in this report*)

Overall Assessment

Status: **Not Assessed**

Trend: **Undetermined**

Rationale: **Additional discussion amongst forestry experts is needed for an assessment determination.**

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 determine the capacity of Great Lakes forests to produce wood products
- To allow for future assessments of changes in productivity over time, which can be representative of social and economic trends affecting management decisions and can also be related to ecosystem health

Ecosystem Objective

To maximize the productive capacity of Great Lakes forests while maintaining the health and sustainability of the ecosystem.

State of the Ecosystem

Component (1): Area of forest land and area of forest land available for timber production

The total area of forest land analyzed in the Great Lakes basin for this report was 35,276,693 hectares (87 million acres). Of this area, about 89% (or a total of 31,556,015 hectares (78 million acres)) can be considered as available for timber production, as calculated from U.S. timber land estimates and Canadian productive forests not restricted from harvesting. In the U.S. portion of the basin, the proportion of land available for timber production was about 92%, while 86% of the entire Canadian forested portion of the basin was available. For just the managed portion of Ontario's forests, 91% was available for timber production. Complete U.S. data broken down by state and Canadian data broken down by lake basin can be viewed in Tables 1 and 2, respectively. These data include potentially inaccessible (areas with no roads) and inoperable areas (areas with steep slope, etc.), areas where landowners do not have timber production as an ownership objective, areas where no markets exist or where transportation costs to markets are prohibitive, or where other constraints exist (e.g., urbanization). Therefore, these data are an overestimate of the timberland actually available for timber harvest.

The amount of forest land available for timber production is directly related to the productive capacity of forests for harvestable goods. This proportion is affected by different types of management activities, which provides an indication of the balance between the need for wood products with the need to satisfy assorted environmental concerns aimed at conservation of biological diversity.

Component (2): Total merchantable volume of growing stock on forest lands available for timber production

In the analyzed area of Great Lakes basin forests that were available for timber production, 79% of the total wood volume was merchantable. This percentage of growing stock included 93% for the U.S. portion of the basin and 61% for Ontario's managed forests in the Canadian part of the basin. Complete U.S. data broken down by state and Canadian data broken down by lake basin can be viewed in Tables 3 and 4, respectively.

If the values of net merchantable volume are compared to the total area of forest land available for timber production, a rough estimate of the forests' productive capacity can be obtained. Calculations show the per-unit-area productivity of U.S. Great Lakes forests at 97.4 m³/ha and of Canadian Great Lakes forests at 90.2 m³/ha.

Changes in productivity values can be indicative of the ecosystem's health and vigor, as a lowered ratio of merchantable volume to available timber land can suggest reduced growth and ability of trees to absorb nutrients, water and solar energy and increased disease and tree mortality. Alternatively, changes in net merchantable volume can also occur due to changes in forest age structure following natural disturbance, harvest, or other events. In such cases, ecosystem health and vigor could still be high. Further assessment of productive capacity would require additional historical data and analysis by forestry experts.

Component (3): Annual removal of wood products compared to net growth, or the volume determined to be sustainable

The growth to removal ratio is often used as a coarse surrogate for the concept of sustainable production in the U.S. Although exact data for this measure have not been compiled for this report, nationwide U.S. studies have shown that timber growth has exceeded removals for several decades, and Ontario's wood removals on managed timber land is done within sustainable limits by definition of the forestry practices enacted in those areas. On Ontario Crown lands (lands owned by the public) an "Available Harvest Area" is calculated and an estimate of the volume associated with this area is determined. According to the Crown Forest Sustainability Act, one cannot harvest more area (and associated volume) than what is sustainable. Available harvest areas and volumes are determined in modeling and woodflow, with constraints for regeneration capacity, social, economic, and environmental concerns. Both Canada and the U.S. strive for sustainability as represented by the "Criteria and Indicators of Sustainable Forest Management" of the Montreal Process. The issue of sustainable forests on private lands is not well addressed in Ontario although there are voluntary programs available for private land forestry.

Pressures

Fluctuating marketplace demands for wood products and increased pressures to reserve forest lands for recreation, conservation of biodiversity, and wildlife habitat can affect the volume of timber available for harvest.

Disease and disturbance from fires or other events can also affect productivity capacity.

Management Implications

Timber productivity can be increased through the use of timber plantations and sustainable management of forests available for timber production.

Continued discussion of the meaning of sustainability and how it is affected by wood product removal is crucial to the effectiveness of future management decisions.

Comments from the author(s)

It can be difficult to analyze forest areas and growing stocks for a set moment in time, because inventory time frames can vary. U.S. 2006 Resource Planning Act (RPA) data are compiled from a range of different years (2001 through 2006 for Great Lakes states) depending on when the most recent state inventories were conducted. This issue should diminish as the U.S. Forest Service Forest Inventory and Analysis Program (FIA) completes its switch to an annualized survey cycle, and future analyses incorporate these data.

Canadian data are available by watershed. U.S. forest data are compiled by county for this report, so the area of U.S. land analyzed is not necessarily completely within the Great Lakes basin. Corresponding data may be skewed. This factor makes it difficult to represent the data by individual lake basin. Additional GIS analysis of the U.S. raw inventory data would be required to provide forest data by watershed.

Area of timber land in the U.S. is used as a proxy for the net area of land available for timber production in U.S. data calculations, but timber land area may include currently inaccessible and inoperable areas, areas where landowners do not have timber production as an ownership objective, areas where no markets exist or where are transportation costs to markets are prohibitive, or where other constraints exist (e.g., urbanization), and is therefore an overestimation of the net area available for timber production and associated merchantable wood volumes.

Canadian data for growing stock are only available for Ontario’s managed forests where Forest Resources Planning Inventories occur. This area is commonly referred to as the Area of the Undertaking (AOU), and only represents 72% of Ontario’s total Great Lakes basin land area and 78% of its total forest area. Analysis of the rest of the Canadian part of the basin is restricted to satellite data capabilities.

Data for annual removal of wood products as compared to net growth are available for Canada and a few of the U.S. Great Lakes states, but were not prepared for the Great Lakes basin at the time of this report. This information should be compiled for future analyses when available, and is an important ratio to monitor over time to ensure that wood harvesting is not reducing the total volume of trees on timber land at larger spatial scales. Unfortunately, this value does not add much insight to the detailed ecological attributes of sustainability, and must be analyzed with additional biological components to achieve this indicator’s ecosystem objective.

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					

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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:

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

Acknowledgments

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Sherri Wormstead, Sustainability & Planning, USDA Forest Service, Northeastern Area State and Private Forestry, Office of Knowledge Management, swormstead@fs.fed.us; (2008).

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Support in the preparation of this report was given by the members of the SOLEC Forest Land Criteria and Indicators Working Group. The following members aided in the development of SOLEC Forest Lands indicators, collection, reporting and analysis of data, and the review and editing of the text of this report:

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USDA Forest Service, Forest Inventory and Analysis National Program, 2006 Resource Planning Act (RPA) Assessment Database. Data supplied by Eric Wharton, Forest Inventory and Analysis, USDA Forest Service, Northern Research Station. July, 2008.

List of Tables

Table 1. Area of forest land available for timber production* in relationship to total area of forest land in U.S. Great Lakes basin counties.

*Timberland was used as proxy for net area available for timber production in the calculation of these values, but timberland area may include currently inaccessible and inoperable areas, or areas where timber production is not an objective, and is therefore an overestimate of the net area available for timber production.

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

Table 2. Area of forest land available for timber production in relationship to total area of forest land in, A) Canadian Great Lakes basin, and B) the AOU* portion of Ontario.

* The Area of the Undertaking (AOU) land area represents 72% of Ontario's total Great Lakes basin land area and 78% of its total forest area.

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

Table 3. Total volume of growing stock* in U.S. Great Lakes basin counties.

* Calculations do not take inaccessibility or inoperability of timber land into account, so resulting values are skewed high

† Non-merchantable timber includes rough and rotten cull

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

Table 4. Total volume of growing stock in Canadian Great Lakes basin*.

* Data only available for Ontario's managed forests (AOU portion of Ontario)

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

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State	Total Area of Forest land (ha)	Area of Forest Land Available for Timber Production* (ha)	% Available for Timber Production
Illinois	36,997	19,521	52.76%
Indiana	207,157	194,947	94.11%
Michigan	7,909,418	7,698,268	97.33%
Minnesota	3,301,085	2,886,868	87.45%
New York	4,860,816	3,984,963	81.98%
Ohio	719,884	671,463	93.27%
Pennsylvania	236,158	229,803	97.31%
Wisconsin	3,096,561	3,056,529	98.71%
Total	20,368,076	18,742,362	92.02%

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*Timberland was used as proxy for net area available for timber production in the calculation of these values, but timberland area may include currently inaccessible and inoperable areas, or areas where timber production is not an objective, and is therefore an overestimate of the net area available for timber production.

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

A) Canadian Great Lakes Basin			
Lake Basin	Total Area of Forest Land (ha)	Net area of Forest Land Available for Timber Production (ha)	% Available for Timber Production
Superior	7,061,238	6,006,356	85.06%
Huron	6,162,419	5,343,401	86.71%
Erie	322,317	291,107	90.32%
Ontario	1,362,643	1,172,788	86.07%
Totals	14,908,617	12,813,653	85.95%
B) AOU* Portion of Ontario			
Lake Basin	Total Area of AOU's Forest Land (ha)	Net area of AOU Forest Land Available for Timber Production (ha)	% Available for Timber Production
Huron	4,710,406	4,227,743	89.75%
Ontario	665,100	611,268	91.91%
Superior	6,227,943	5,749,905	92.32%
Totals	11,603,450	10,588,917	91.26%

Table 2. Area of forest land available for timber production in relationship to total area of forest land in, A) Canadian Great Lakes basin, and B) the AOU* portion of Ontario.

* The Area of the Undertaking (AOU) land area represents 72% of Ontario's total Great Lakes basin land area and 78% of its total forest area.

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

State	Total Live Volume* (m ³) on Forest Lands Available for Timber Production	Net Merchantable Volume (m ³) of Growing Stock*	Volume (m ³) of Non-merchantable Timber †	% Growing Stock* (of Total Vol. Available for Timber Production)
Illinois	3,360,453	3,110,770	249,684	92.57%
Indiana	26,407,920	23,129,912	3,278,009	87.59%
Michigan	853,962,360	793,711,687	60,250,673	92.94%
Minnesota	211,444,949	197,463,596	13,981,353	93.39%
New York	432,587,794	404,895,614	27,692,180	93.60%
Ohio	87,298,965	80,118,896	7,180,069	91.78%
Pennsylvania	34,179,733	32,387,008	1,792,725	94.76%
Wisconsin	311,159,345	290,277,011	20,882,334	93.29%
Total	1,960,401,519	1,825,094,493	120,826,036	93.10%

Table 3. Total volume of growing stock* in U.S. Great Lakes basin counties.

* Calculations do not take inaccessibility or inoperability of timber land into account, so resulting values are skewed high

† Non-merchantable timber includes rough and rotten cull

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

Lake Basin	Total Volume (m ³) on Forest Lands Available for Timber Production	Net Merchantable Volume (m ³) of Growing Stock	Volume (m ³) of Non-merchantable Timber	% Growing Stock (of Total Vol. Available for Timber Production)
Huron	667,854,390	421,077,634	246,776,756	63.05%
Ontario	114,963,698	72,717,983	42,245,715	63.25%
Superior	787,640,995	461,410,679	326,230,315	58.58%
Totals	1,570,459,083	955,206,296	615,252,787	60.82%

Table 4. Total volume of growing stock in Canadian Great Lakes basin*.

* Data only available for Ontario's managed forests (AOU portion of Ontario)

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