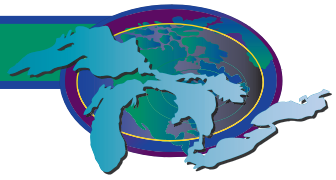

Forest Lands - Conservation and Maintenance of Soil and Water Resources

Indicator #8503

Note: This indicator includes two components and corresponds to Montreal Process Criterion 4, Indicator 19.

Indicator #8503 Components:

Component (1) – Percent of forested land within riparian zones by watershed and percent of forested land within watershed by Lake basin

Component (2) – Change in area of forest lands certified under sustainable forestry programs in Great Lakes states and Ontario

Overall Assessment

Status:	**Mixed**
Trend:	**Undetermined**
Rationale:	**Trend information is not available for forested areas at this time. Data for the area of certified forest lands can not be analyzed according to Great Lakes Basin boundaries at this time, but the overall area of certified lands is increasing across the region.**

Lake-by-Lake Assessment

Lake Superior

Status: Good
Trend: Undetermined
Rationale: A large proportion of the basin's riparian zones and watersheds are forested. Certification data do not exist specific to this individual lake basin.

Lake Michigan

Status: Mixed
Trend: Undetermined
Rationale: Over half of the basin's riparian zones and watersheds are forested. Certification data do not exist specific to this individual lake basin.

Lake Huron

Status: Mixed
Trend: Undetermined
Rationale: Over half of the basin's riparian zones and watersheds are forested. Certification data do not exist specific to this individual lake basin.

Lake Erie

Status: Poor
Trend: Undetermined
Rationale: Only a small portion of the basin's riparian zones and watersheds are forested. Certification data do not exist specific to this individual lake basin.

Lake Ontario

Status: Mixed
Trend: Undetermined
Rationale: Over half of the basin's riparian zones and watersheds are forested. Certification data do not exist specific to this individual lake basin.

Purpose

- To describe the extent to which Great Lakes basin forests aid in the conservation of the basin's soil resources and protection of water quality
- To describe the level of participation by Great Lakes states and Ontario in sustainable forestry certification programs

Ecosystem Objective

Improved soil and water quality within the Great Lakes basin.

State of the Ecosystem

Component (1): Percent of forested land within riparian zones by watershed and percent of forested land within watershed by Lake basin

Forests cover about 61% of the total land and 70% of the riparian zones (defined as the 30 meter buffer around all surface waters) within the Great Lakes basin. The U.S. portion of the basin (including the upper St. Lawrence River watersheds) has forest coverage on 61% of its riparian zones (as of 1992), and the Canadian portion of the basin (excluding the upper St. Lawrence River watersheds) has forest coverage on 76% of its riparian zones (as of 2002) (Table 1). Lake Superior has the best coverage overall, with forested lands covering 96% of its riparian zones. Lake Michigan (62%), Lake Huron (74%) and Lake Ontario (61%) all have at least half of their total riparian zones covered with forests, while Lake Erie has only 30% coverage. The percentages of forested riparian zones by watershed are visually represented in Figure 1 and are summarized by Lake Basin in Figure 2. In each major lake basin and the upper St. Lawrence River watersheds, a slightly greater percentage of forested land existed within riparian zones than was observed within the overall watershed (Figure 2).

Basin	U.S. (1992)		Ontario (2002)	
	% Forested (Entire Watershed)	% Forested (Riparian Areas)	% Forested (Entire Watershed)	% Forested (Riparian Areas)
Lake Superior	87.73%	88.44%	98.60%	98.05%
Lake Michigan	51.54%	61.90%		
Lake Huron	55.07%	54.28%	74.65%	77.04%
Lake Erie	22.90%	36.24%	14.30%	19.95%
Lake Ontario	52.15%	63.25%	49.99%	59.28%
St. Lawrence River	84.10%	87.03%		
Totals	**53.13%***	**60.43%***	**73.05%****	**75.67%****

Table 1. Percent of Land Forested within U.S. and Canadian Great Lakes Watersheds and Riparian Zones by Lake Basin.

* = Including Upper St. Lawrence, ** = Not including Upper St. Lawrence

Sources: USDA Forest Service, Northeastern Area State and Private Forestry, Information Management and Analysis and Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section Lake basin boundaries refined by U.S. EPA, Great Lakes National Program Office

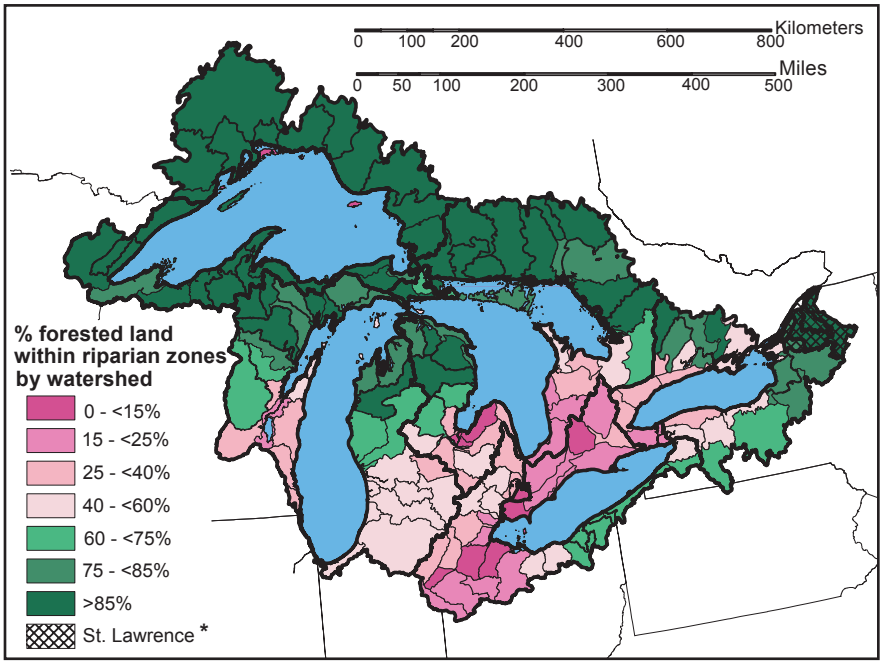

Figure 1. Percent Forested Land within Riparian Zones by Watershed in the Great Lakes Basin.

Area is technically part of the St. Lawrence River drainage, but included in the Great Lakes basin by definition in the Clean Water Act and Great Lakes Water Quality Agreement.

Sources: USDA Forest Service, Northeastern Area State and Private Forestry, Information Management and Analysis and Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section. Lake basin boundaries refined by U.S. EPA, Great Lakes National Program Office

While good water quality is generally associated with heavily forested or undisturbed watersheds, (USDA 2004) the existence of a forested buffer near surface water features can also protect soil and water resources despite the land use class present in the rest of the watershed (Carpenter *et. al* 2003). As the percentage of forest coverage within a riparian zones increases, the amount of runoff and erosion (and therefore nutrient loadings, non-point source pollution and sedimentation) decreases, and the capacity of the ecosystem to store water increases. Studies show that heavy forest cover is capable of reducing total runoff by as much as 26% as compared to treeless areas with equivalent land-use conditions (Sedell *et. al* 2000) and that riparian forests can reduce nutrient and sediment loadings by 30 to 90% (Alliance for the Chesapeake Bay

2004).

Biodiversity of aquatic species is further maintained in riparian areas with increased forest coverage by an increase in the amount of large woody debris (which affects stream configuration, regulation of organic matter and sediment storage, and aquatic habitat availability) and decreased water temperatures (Eubanks *et. al* 2002). A study completed in Pennsylvania in 1985 claimed that complete commercial clear cutting of a riparian zone allowed a 10˚C (18˚F) rise in stream water temperatures, but the retention of a forested buffer strip only allowed an increase of about 1˚C (1.8˚F) (Binkley and MacDonald 1994). This regulation of water temperatures can be critical to the maintenance of assorted cold-water fish populations, e.g., trout.

The lack of consensus on the desired percentage of forested land in the basin or riparian zone (and the desired size of the riparian zone itself) makes it difficult to determine the specific implications of the presented data. Comparisons to historical forest cover in riparian zones and manipulative experiments would be useful for trend establishment.

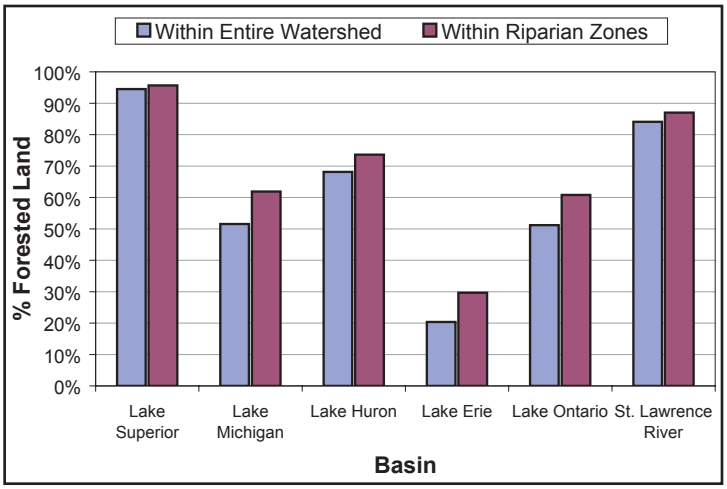

Figure 2. Percent of Land Forested within Great Lakes Watersheds and Riparian Zones by Lake Basin.

* = Upper St. Lawrence data only available for U.S.

Sources: USDA Forest Service, Northeastern Area State and Private Forestry, Information Management and Analysis and Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section. Lake basin boundaries refined by U.S. EPA, Great Lakes National Program Office

Component (2): Change in area of forest lands certified under sustainable forestry programs in Great Lakes states and Ontario

Sustainable forestry management programs are designed to ensure timber can be grown and harvested in ways that protect the local ecosystem. Participation is often voluntary, but once certification is gained, compliance with management protocols is required. Data from three different certification programs were analyzed for this report. Their numbers are not additive, because one area of land can be certified under more than one program at a time.

The area of forest lands certified under the Sustainable Forestry Initiative (SFI®) program increased by 855% from 2003 to 2005 across the Great Lakes region (Figure 3). Forest landowners who only elect to enroll in the program, but not go through the formal certification process, often choose to follow the forest management protocols, but are not required to do so until they seek certification. It is therefore possible that a much greater amount of forest lands are being managed according to these sustainable practices than are represented by the given data.

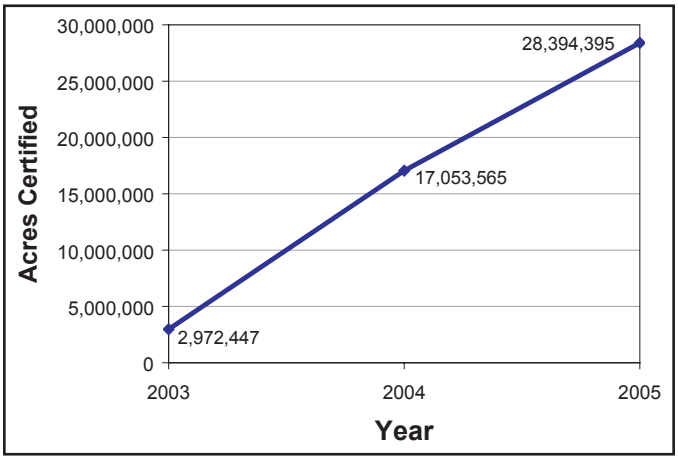

Figure 3. Forest Lands Certified Under SFI in the Great Lakes region (U.S. States and province of Ontario), 2003-2005.

Source: Sustainable Forestry Initiative

Certification in two other sustainable forestry programs also grew in the U.S. Great Lakes states over the past few years. The acres of forest lands certified by the American Tree Farm System (ATFS) rose by 47% between 2004 and 2005 (Figure 4). The ATFS is a voluntary certification program for non-industrial, private landowners, and its mission is "to promote the growing of renewable forest resources on private lands while protecting environmental benefits and increasing public understanding of all benefits of productive forestry" (American Forest Foundation 2004). The Forest Stewardship Council (FSC) is an international body that accredits certification organizations and guarantees their authenticity. Acres of forest lands certified under this organization grew by 50% between 2005 and 2006 (Figure 4).

This increase in the area of certified forest lands under all three programs can be interpreted as a greater commitment to sustainable forest management amongst forest industry professionals. The assumption is that continued growth in

sustainable management practices will lead to improved soil and water resources in the areas where they are implemented.

Pressures

Component (1)

The same pressures exerted on all forest resources also apply here. Development of forest lands to other land use classes (such as developed, agricultural, or pasture) decreases the amount of forest area across watersheds and in riparian zones. Urbanization and seasonal home construction can specifically impact riparian areas since they are among the most desirable development locations.

Component (2)

Participation in sustainable forestry programs can be affected by marketplace popularity. Political climate, status of the economy, and public opinion can all influence forest managers decisions to gain certification.

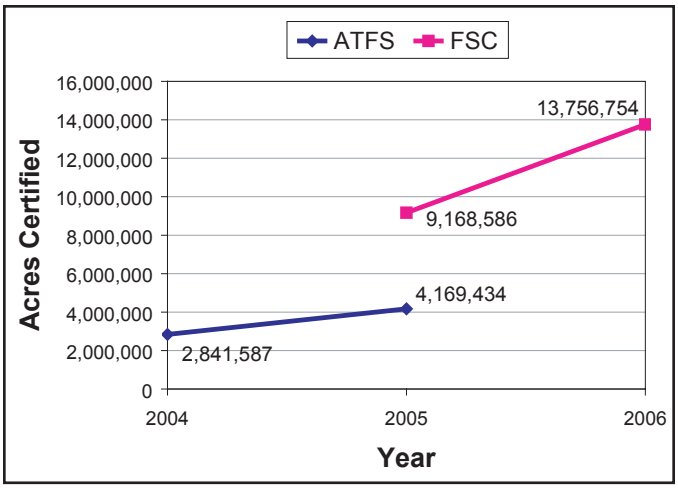

Figure 4. Forest Lands Certified Under ATFS and FSC in the Great Lakes States (U.S. only).

Sources: American Tree Farm System (ATFS) Program Statistics and Forest Stewardship Council (FSC)

Management Implications

Component (1)

Development of policy directed towards protecting forested lands within riparian zones would help maintain forested buffers near surface waters, thereby leading to a possible improvement of local ecosystem health regardless of the land use classification in the rest of the watershed.

Component (2)

Increased reporting of certification data by watershed would make corresponding analyses easier. Greater participation in sustainable forestry certification programs would ensure that all timberland is managed in a sustainable manner.

Comments from the author(s)

Component (1)

For the purposes of this report, riparian zone was defined as 30 meters (98 ft) on each side of a surface water feature. Research shows that a forested buffer of this size achieves the widest range of water quality objectives, (Alliance for the Chesapeake Bay, 2004), and is the standard value used in USGS Forestry Service, Northeastern Area. Other sources quote different amounts of forested buffer needed near surface water features to achieve the highest level of soil and water resources protection, ranging anywhere from 8 to 150 meters (26 to 492 feet) from the water's edge (Illinois Department of Natural Resources *et al.* 2000, Indiana Department of Natural Resources 2006, Ohio Department of Natural Resources 2006). The ideal riparian zone size can be affected by a variety of factors such as stream, vegetation and soil type, geomorphology, slope of land, and season (Eubanks *et. al*. 2002).

The resolution of the US landcover dataset used in this analysis was coarse enough to cause slight inaccuracies, but the data were determined as suitable for summarization at the watershed scale.

Additional research of existing literature would be helpful in further quantifying the effects of riparian forests on erosion, run-off, water temperatures, and nutrient and pollutant storage. Although specific studies have been done on these topics, the differences in metrics and sample locations complicate comparisons for the Great Lakes basin.

Component (2)

In subsequent analyses, data should be collected for the percent of forested riparian zones that lie within areas also certified in sustainable forestry programs. Presently, certification data cannot be analyzed by watershed or riparian area, and they are therefore less useful for any analyses other than assessment of changing trends in the programs' utilization.

Expanding this component to include rates of compliance with Forestry Best Management Practices (BMPs) would provide valuable information for additional analyses. While certification in sustainable forestry programs often includes the implementation of

BMPs, not all forest lands managed according to BMPs are also certified. Forestry BMPs have been developed in all Great Lakes states and provinces, so obtaining the relevant audit data would provide a greater and more detailed information base relating to the conservation of forest, soil and water resources.

Many BMPs are directed at reducing non-point source pollution, and some states even have monitoring data relating to issues such as water quality. For example, Wisconsin's Forestry Best Management Practices for Water Quality report stated that, when BMPs were correctly applied to areas where they were needed, 96% of the monitored area showed no adverse impact on water quality (Breunig *et al.* 2003). It is generally accepted that this trend exists in other states as well. For although individual states' BMPs may differ, studies have shown that their correct implementation results in effective protection of water quality overall.

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