



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 riparian zones and total watershed land that is forested 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/Improving**

Rationale: **Trend information is not available for Component 1 (percent of riparian zones and watershed areas that are forested) at this time. Data for Component 2 show that the overall area of certified lands is increasing in Great Lakes states and the province of Ontario through numerous certification systems.**

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 EcosystemComponent (1): Percent of riparian zones and total watershed land that is forested by lake basin

Forests cover about 60% of the total land and 69% 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 60% of its riparian zones (as of 2001), 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 greatest coverage overall, with forested lands covering 96% of its riparian zones. Lake Michigan (63%), Lake Huron (73%) and Lake Ontario (59%) all have at least half of their total riparian zones covered with forests, while Lake Erie has only 29% 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).

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.

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

Sustainable forestry certification 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 the Sustainable Forestry Initiative (SFI®), American Tree Farm System (ATFS), the Canadian Standards Association (CSA), and the Forest Stewardship Council (FSC) certification systems were analyzed for this report. The SFI is a voluntary forest certification program that promotes sustainable forest management in North America and responsible procurement globally. The ATFS is geared towards 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 sustainable forest management standard operated thru CSA includes fulfillment of requirements at the local forest level, including public participation and adherence with the Canadian Council of Forest Ministers' (CCFM) set of Sustainable Forest Management criteria. The Forest Stewardship Council (FSC) is an international body that accredits certification organizations and guarantees their authenticity.

The acres certified under each program are not additive, because one area of land can be certified with more than one system at a time. It is still important to note that an increasing trend is evident in every certification system during the last several years in Great Lakes states and the province of Ontario (Figure 3). Additionally, forest landowners who only elect to enroll in the Sustainable Forestry Initiative (SFI®) 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.

These increases in the amount of certified forest lands can be interpreted as a greater commitment to sustainable forest management amongst forest industry professionals. Although data according to geographic coverage would be more useful for assessment purposes, it is obvious that progress has been made overall. 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.

Management Implications

Component (1)

The amount of non-forested area in riparian zones due to conversion to other land uses is a major issue that could be addressed with the development of policy directed towards increasing the area of forested lands in these zones. This active management approach to enhance forested buffers near surface waters could lead to possible improvements in local ecosystem health regardless of the land use classification in the rest of the watershed.

Component (2)

Increased reporting of certification data according to extent of geographical coverage 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 a standard value often used by the USDA Forest Service, Northeastern Area State and Private Forestry. 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 characteristics, 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)

Subsequent analyses would be improved if data were collected for the percent of forested riparian zones that lie within areas certified by sustainable forestry programs. Presently, certification data cannot be analyzed geospatially by watershed or riparian area, therefore analyses are restricted to assessments of changing trends in the programs' utilization. It is unlikely that U.S. spatial data for certified lands will be available in the near future.

Expanding this component to include the amount of non-forested area in riparian zones due to conversion to other land uses and 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

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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.

Assessing Data Quality

Component (1)

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: Data should be used for planning purposes only, as it may not reflect what is actually on the ground.						

Component (2)

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:

U.S. data includes all lands certified by the noted sustainable forestry programs in the states (not just the lands within the Great Lakes Basin). The Sustainable Forestry Initiative is the only certification scheme where comparable data are included for both U.S. and Canadian lands.

Acknowledgments

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

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Sources

Alliance for the Chesapeake Bay. 2004. Riparian Forest Buffers, Linking Land and Water. Chesapeake Bay Program, Forestry Workgroup, and USDA Forest Service.

American Forest Foundation. 2004. *American Tree Farm System*. <http://www.treefarmssystem.org/> (accessed August 15, 2006).

American Tree Farm System (ATFS) Program Statistics. January 2005. Data provided by Emily Chan, American Forest Foundation, on 11-4-2005, and reported via personal communication with Sherri Wormstead, USDA Forest Service.

- Binkley, D. and MacDonald, L. 1994. Forests as non-point sources of pollution, and effectiveness of best management practices. NCASI Technical bulletin No 672.
<http://www.warnercnr.colostate.edu/frws/people/faculty/macdonald/publications/ForestsasNonpointSourcesofPollution.pdf>
- Breunig, B., Gasser, D., and Holland, K. 2003. Wisconsin's Forestry Best Management Practices for Water Quality, The 2002 Statewide BMP Monitoring Report. Wisconsin Department of Natural Resources, Division of Forestry. PUB-FR-252-2003. <http://dnr.wi.gov/org/land/forestry/Usesof/bmp/2002MonitoringReport.pdf>
- Canadian Standards Association (CSA). 2008. Data for Ontario's Crown Lands supplied via personal communication with Greg Pawson, OMNR, September 2008.
- Canadian Sustainable Forestry Certification Coalition. 2006. *CSA – sustainable forest management standard*. <http://www.certificationcanada.org/english/csa/> (accessed September 2008).
- Carpenter, C., Giffen, C., and Miller-Weeks, M. 2003. Sustainability Assessment Highlights for the Northern United States. Newtown Square, PA: USDA Forest Service, Northeastern Area State and Private Forestry. NA-TP-05-03. http://www.na.fs.fed.us/sustainability/pubs/sus_assess/03/toc.pdf
- Eubanks, C.E. and Meadows, D. 2002. A Soil Bioengineering Guide for Streambank and Lakeshore Stabilization. San Dimas, CA: USDA Forest Service, Technology and Development Program. FS-683.
<http://www.fs.fed.us/publications/soil-bio-guide/>
- Forest Stewardship Council (FSC). 2008 FSC Certified Forests. FSC on-line database
http://www.fscus.org/certified_companies/ (accessed July 2, 2006 and July 18, 2008)
- Illinois Department of Natural Resources, Southern Illinois University Carbondale, University of Illinois, and Illinois Forestry Development Council. 2000. *Forestry Best Management Practices for Illinois*, 71 pp.
<http://www.siu.edu/%7eilbmp/> (accessed August 10, 2006).
- Indiana Department of Natural Resources. 2006. *Forestry BMP's*. Division of Forestry.
<http://www.in.gov/dnr/forestry/> (accessed August 10, 2006).
- Metafore Database. 2008. Ontario forest certification data supplied via personal communication with Greg Pawson, OMNR. <http://www.certifiedwoodsearch.org/searchforests.aspx> (accessed September 18, 2008)
- NCASI and UGA Warnell School of Forest Resources. *Forestry BMPs*. <http://www.forestrybmp.net/> (accessed August 10, 2006).
- Ohio Department of Natural Resources. 2006. *Best Management Practices for Logging Operations, Fact Sheet*. Division of Forestry, Columbus, OH. <http://www.dnr.ohio.gov/forestry/landowner/pdf/BMPlogging.pdf>
- Ontario Ministry of Natural Resources. 2002. State of the Forest Report, 2001. Ontario, Canada: Queen's Printer for Ontario.
- Ontario Ministry of Natural Resources. 2007. State of the Forest Report, 2006. Ontario, Canada: Queen's Printer for

Ontario. http://www.mnr.gov.on.ca/en/Business/Forests/2ColumnSubPage/STEL02_179267.html

Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section. Landsat Data based on Landcover 2002 (Landsat 7) classified imagery, Inventory data based on Forest Resources Planning Inventories, and several common NRVIS coverages such as watersheds, lakes and rivers etc. Data supplied by Larry Watkins, Ontario Ministry of Natural Resources.

Sedell, J., Sharpe, M., Dravnieks Apple, D., Copenhagen, M. and Furniss, M.. 2000. Water and the Forest Service. Washington, DC: USDA Forest Service, Policy Analysis. FS-660. <http://www.fs.fed.us/publications/policy-analysis/water.pdf>

Sustainable Forestry Initiative. Data for 2003-2005 supplied via personal communication with Jason Metnick, SFI Label and Licensing, Sustainable Forestry Board, June 30, August 1 and 15, 2006. Data for 2008 data obtained thru a SFI Certified Forests, On-line Search: <http://www.certifiedwoodsearch.org/sfiprogram/searchforests.aspx> (accessed 7/29/2008).

Stednick, J.D. 2000. Effects of Vegetation Management on Water Quality: Timber Management. In Drinking Water from Forests and Grasslands: A Synthesis of the Scientific Literature, ed. G.E. Dissmeyer, pp.103-119. Asheville, NC: USDA Forest Service, Southern Research Station. SRS-39.

USDA Forest Service. 2004. National Report on Sustainable Forests – 2003. FS-766. <http://www.fs.fed.us/research/sustain/documents/SustainableForests.pdf>

USDA Forest Service, Northeastern Area State and Private Forestry, Office of Knowledge Management. 2008. Percent watershed and riparian zone forest cover based on the 2001 National Land Cover Dataset (USGS 2007). http://www.mrlc.gov/nlcd_multizone_map.php. Forested riparian zones map also used the USGS 1999 National Hydrography Dataset, and 1994 USGS 8-digit HUCs. Mapped riparian areas created by the USDA FS North Central Research Station (2005). Data supplied by Rebecca Whitney, USDA Forest Service.

List of Tables

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

Note: Upper St. Lawrence watersheds are not included with Canadian data

Sources: USDA Forest Service, Northeastern Area State and Private Forestry, Office of Knowledge Management and Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section

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

Upper St. Lawrence data are only presented for the U.S.

Sources: USDA Forest Service, Northeastern Area State and Private Forestry, Office of Knowledge Management and Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section.

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, Office of Knowledge Management and Ontario Ministry of Natural Resources, Forest Standards and Evaluation Section.

Figure 3. Trends in Forest Lands Certified Under SFI, ATFS, FSC, and CSA in the Great Lakes Region*

* = Data for SFI and FSC are from U.S. Great Lakes states and the province of Ontario. Data for ATFS are only from U.S. Great Lakes states. Data for CSA are only from Ontario's Crown Lands.

Sources: Sustainable Forestry Initiative, American Tree Farm System (ATFS), Program Statistics and Forest Stewardship Council (FSC), Canadian Standards Association (CSA), Metafore Database.

Last Updated

State of the Lakes Ecosystem Conference (SOLEC 2008)

Basin	U.S. (2001)		Ontario (2002)	
	% Forested (Entire Watershed)	% Forested (Riparian Areas)	% Forested (Entire Watershed)	% Forested (Riparian Areas)
Lake Superior	86.42%	88%	98.60%	98.05%
Lake Michigan	49.41%	63%		
Lake Huron	50.54%	52%	74.65%	77.04%
Lake Erie	21.20%	35%	14.30%	19.95%
Lake Ontario	47.30%	59%	49.99%	59.28%
St. Lawrence River	81.42%	83%		
Totals	50.77%	59.61%	73.05%	75.67%

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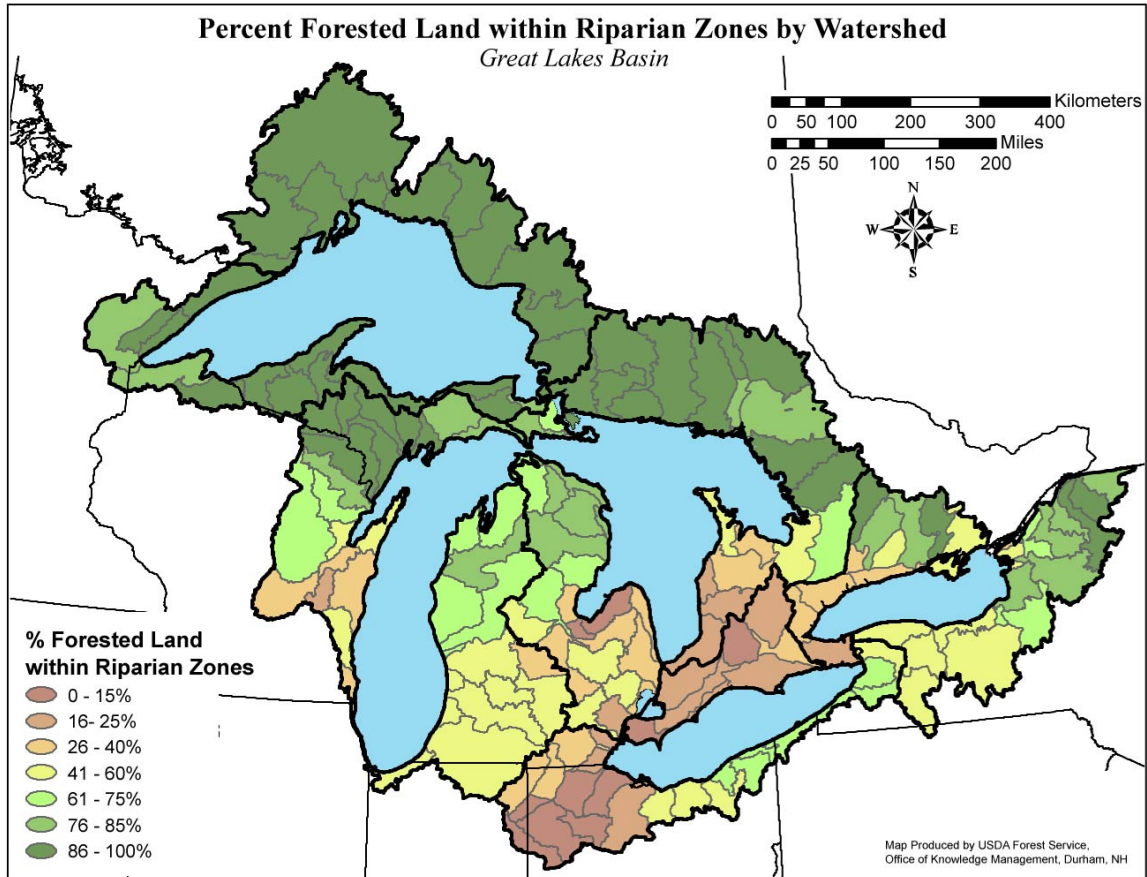


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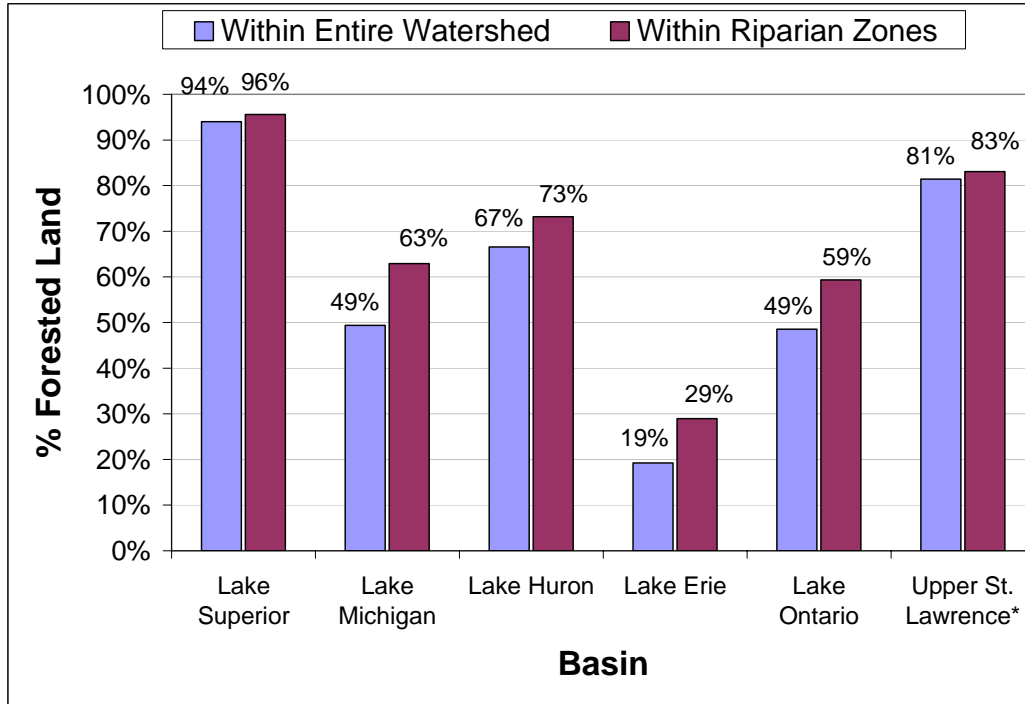


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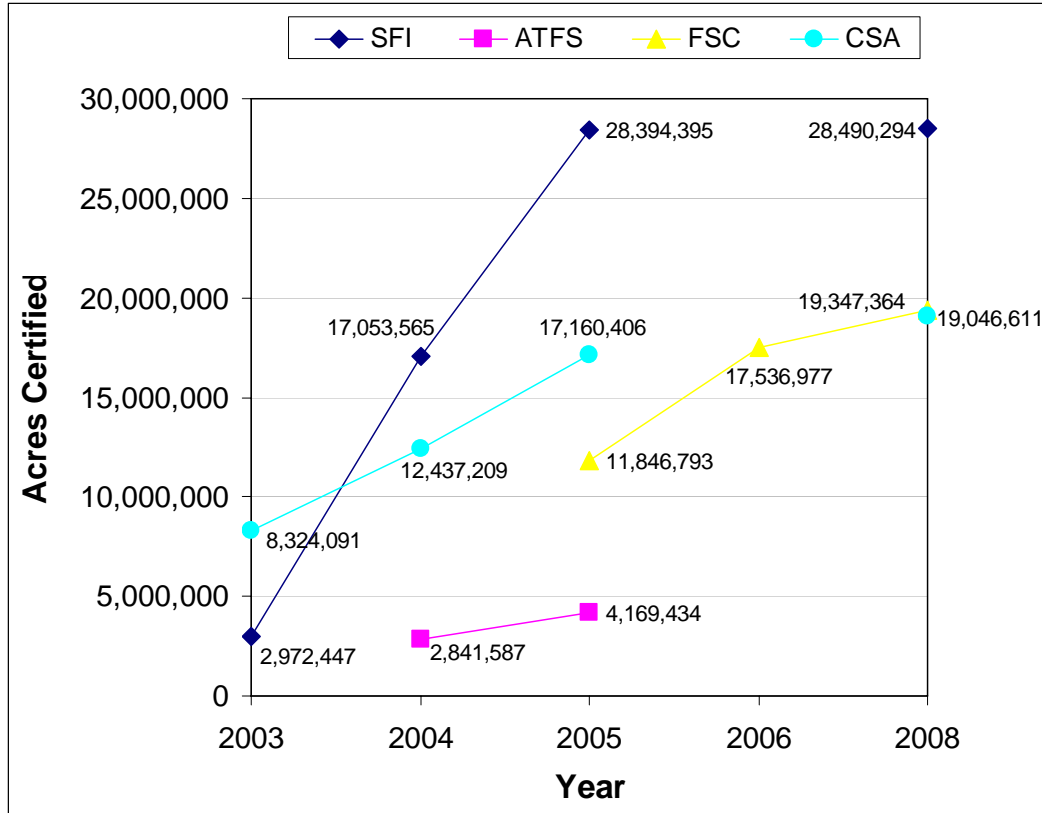


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