



Ground Surface Hardening

Indicator #7054

Note: This is a progress report towards implementing this indicator. It was last updated in 2005.

Overall Assessment

Status: Not Assessed
Trend: Not Assessed
<i>The available information is incomplete or outdated.</i>

Lake-by-Lake Assessment

<i>Separate lake assessments were not included in the last update of this report.</i>

Purpose

- To indicate the degree to which development is affecting natural water drainage and percolation processes, thus causing erosion and other effects through high water levels during storm events and reducing natural groundwater regeneration processes
- To measure the impacts of land development on aquatic systems

Ecosystem Objectives

A goal for the ecosystem is sustainable development. This would entail minimizing the quantities of impervious surface by using alternatives for replacement and future development.

State of the Ecosystem

Background

Ground surface hardening, or imperviousness, is the sum of area of roads, parking lots, sidewalks, roof tops and other impermeable surfaces of the urban landscape and is a useful indicator with which to measure the impacts of land development on aquatic ecosystems (Center for Watershed Protection 1994).

Information on ground surface hardening in the Great Lakes basin is currently in the development stage. Different organizations are working towards developing effective systems of analyzing the status of this indicator. The use of technology such as Landsat imagery and Geographic Information Systems (GIS) applications are being utilized in efforts to evaluate the current state. The instruments on the Landsat satellites have acquired millions of images. These images form a unique resource for applications in agriculture, geology, forestry, regional planning, education, mapping, and global change research. This type of information will help illustrate the land use qualities of the Great Lakes basin.

Many avenues were explored in attempts to obtain information for this indicator. Within Ontario, the Ontario Ministry of the Environment, Conservation Authorities and municipalities of different sizes were contacted for a random survey to see what information was available. Each organization had very little available information on impervious surfaces.

The Ontario Ministry of Natural Resources is in the process of implementing a project called Southern Ontario Land Resource Information System (SOLRIS). SOLRIS is a mapping program designed to accurately measure the nature and extent of Southern Ontario's natural resources and will be used to track changes to the natural, rural and urban landscape (Mussakowski 2004). SOLRIS integrates existing base resource information and advanced GIS and remote sensing techniques to derive a comprehensive land cover database. SOLRIS is attempting to complete the assembly of all layers into comprehensive land cover/use mapping by 2006 and will continue to upgrade on 5 or 10 year intervals.

Recently, Christopher Elvidge of the U.S. National Oceanic and Atmospheric Administration's National Geophysical Data Center in Boulder, Colorado, along with colleagues from several universities and agencies produced the first national map and inventory of impervious surface areas (ISA) in the United States. The new map is important, because impervious surface areas affect the environment. The qualities of impervious materials that make them ideal for construction also create urban heat islands by reducing heat transfer from the Earth's surface to the atmosphere. The replacement of heavily vegetated areas by ISA also reduces

the sequestration of carbon from the atmosphere (Elvidge 2004).

Pressures

Growth patterns in North America can be generalized, with few exceptions, as urban sprawl. As our cities continue to grow out-wards there is a growing dependency on personal transportation. This creates a demand for more roads, parking lots and driveways. Impervious surfaces collect and accumulate pollutants deposited from the atmosphere, leaked from vehicles or derived from other sources. Imperviousness represents the imprint of land development on the landscape (Center for Watershed Protection 1994).

A long-term, adverse impact to water quality could occur as a result of the continued and likely increase of non-point source pollution discharge to stormwater runoff from roads, parking lots, and other impervious surfaces introduced into the area to accommodate visitor use. If parking lots, roads, and other impervious surfaces are established where none currently exist, then vehicle-related pollutants and refuse may accumulate. This impact could be mitigated to a negligible level through the use of permeable surfaces and vegetated or natural filters or traps for filtering stormwater runoff (National Park Service 2001).

Management Implications

Ground surface hardening is an important indicator in the Great Lakes basin that needs to be explored further. The information available for this indicator is incomplete, or outdated. With current technological advancements there are emerging methods of monitoring impervious surfaces, and hopefully within 5 years the data required for this report will be complete. Ground surface hardening has many detrimental effects on the environment; thus, it is essential to monitor and seek alternatives.

Acknowledgments

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Sources

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Last Updated

State of the Great Lakes 2005