WHAT ARE THE MAJOR STRESSORS IMPACTING LAKE SUPERIOR?

Chemical contamination, shoreline development, non-native invasive species, habitat loss, wetland loss and degradation, and forest fragmentation are among the major stressors impacting Lake Superior.

Pressures

Chemical contamination

Over the last 30 years, concentrations of nearly all measured contaminants in fish and the water column have declined in Lake Superior, with the exception of toxaphene. Between 1986 and 1997, concentrations of toxic organic contaminants in the water column declined more than 50 percent. However, concentrations of dieldrin, mercury, PCBs, and toxaphene in Lake Superior continue to exceed the most stringent water quality standards. Because of its remote location, limited industrial activity, and large surface area to watershed ratio, Lake Superior receives the majority of its contaminant loadings via atmospheric deposition, especially with regard to PCBs, mercury and toxaphene. Canada's prairie provinces and the southern United States appear to be sources of lindane to Lake Superior.

Shoreline development

Development of the shoreline, including construction of recreational homes, is one of the most pressing issues facing Lake Superior. For example, the Keweenaw Peninsula has seen unprecedented growth in the past 20 years with 50 percent of the homes now classified as recreational or second homes.

Non-native invasive species

Lake Superior has the highest ratio of non-native invasive species to native species of all the Great Lakes. Sea lampreys kill thousands of lake trout each year. Invasive round goby and ruffe fishes have colonized some nearshore habitats and could negatively impact the nearshore cool-water fish community. Other invasive species predicted to have significant impacts on the native community include the gypsy moth, emerald ash borer, Asian longhorned beetle, rusty crayfish, and exotic buckthorns.

Lake Superior

Lake Huron

Lake Ontario

Lake Michigan

Lake Erie
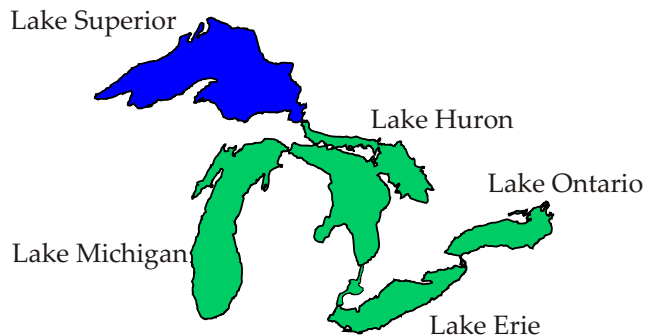
Habitat loss

Although nearshore and open water habitats of Lake Superior are of high quality and promote an abundance of trout, whitefish and herring, habitat loss in tributaries and embayments is a concern. Most of the habitat loss in Lake Superior has occurred in these areas, including the eight Areas of Concern. These tributaries are significantly degraded by stressors such as agriculture, mining, hydroelectric dams, industrial effluents and waste, wetland dredging and filling, non-point source pollution, shoreline development, and land use practices that increase surface runoff and erosion.

Habitat loss and harvest and management of select species have caused dramatic changes to wildlife communities over the past 150 years. Eighteen animal species in the Lake Superior watershed, including mammals, birds, insects, reptiles, and amphibians, are listed as endangered by the federal governments. In addition, 400 species (300 of which are plants) are listed by provincial or state jurisdictions as endangered, threatened, or of special concern.
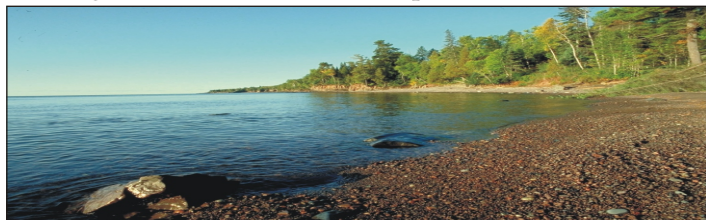
A Lake Superior cobble beach. Photo: U.S. EPA Great Lakes National Program Office.

Wetland loss and degradation

Wetlands account for 15 percent of the Lake Superior basin in the United States and up to 25 percent in Canada. The greatest threats to Lake Superior's remaining wetlands are wetland draining and filling, toxic contamination, water level regulation and site-specific stresses such as shoreline development. Other threats include invasive species and diminished water quality.

Forest fragmentation

Forest fragmentation and changes in forest composition are two of the seminal changes to the Lake Superior region since settlement times. Beginning in the 1880s, Lake Superior forests in the United States were almost entirely clear-cut. Aspen, birch, fir and poplar have increased since this time while spruce and pines have been severely reduced. Forest cover is anticipated to remain the same or to slightly increase in future years. Forest fragmentation of hardwoods will continue to increase due to development and road construction.

Current Actions

Canada and the United States are continuing their commitment to protect, restore, and maintain Lake Superior through activities outlined in the Lakewide Management Plan (LaMP) and implemented through the Binational Program to Restore and Protect the Lake Superior Basin. The LaMP addresses both a Zero Discharge Demonstration Program (ZDDP) for critical pollutants and a broader ecosystem program. The ZDDP targets nine critical pollutants for zero emissions and zero discharge to the Lake Superior basin. The eight designated Areas of Concern are addressed through the development of Remedial Action Plans.

Monitoring in Lake Superior in 2005 - 2006 emphasizes critical pollutants and the lower food web. Rehabilitation of critical aquatic habitats is underway and several wildlife and fish species have been restored.

Actions Needed

Critical actions needed to preserve, protect and maintain the Lake Superior ecosystem include better land use change modelling and monitoring; continued restoration and preservation efforts on degraded tributary and embayment aquatic habitat; protection of shoreline and other habitats from development; prevention of the introduction of non-native species; and continued monitoring of and reduction efforts for critical pollutants.

Global warming, climate change, increasing water temperature, large-scale water export, emerging chemicals (such as pharmaceuticals and personal health care products), and proposed new or expanded industrial facilities are critical issues for Lake Superior that need to be monitored.

For More Information

For further information related to the state of Lake Superior, refer to the *State of the Great Lakes 2005* report, which, along with other Great Lakes references, can be accessed at **www.epa.gov/glnpo/solec**. The Lake Superior Lakewide Management Plan 2004 can be accessed at **www.epa.gov/glnpo/lakesuperior/index.html**

Lake Superior's north shore. Photo: U.S. EPA Great Lakes National Program Office.