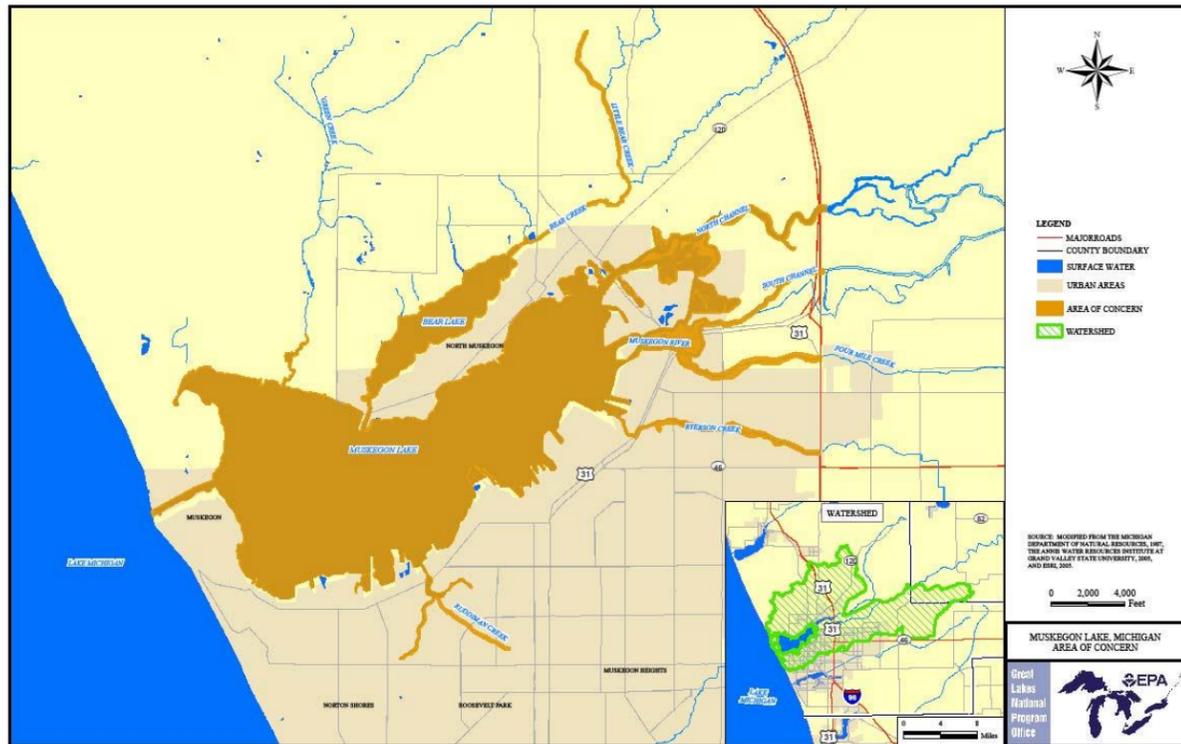


Muskegon Lake – A Legacy of Improvement

AOC Background and Boundary:

Muskegon Lake is one of 42 Great Lakes Areas of Concern (AOC) in the United States and Canada and one of the original 14 located in Michigan. The AOC surface water boundary includes Muskegon Lake, Bear Lake and portions of Bear Creek, Ruddiman Creek, Four Mile Creek, Ryerson Creek and the North and South Branches of Muskegon River.



WMSRDC
WEST MICHIGAN SHORELINE
REGIONAL DEVELOPMENT COMMISSION

Great Lakes
Commission
des Grands Lacs



MLWP
Muskegon Lake
Watershed Partnership

OGL
MICHIGAN OFFICE OF THE GREAT LAKES

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Path to Delisting

Muskegon Lake - A Great Lakes Areas of Concern

Path to Delisting: What is needed to complete restoration to de-list the AOC?

Two final Great Lakes Legacy Act contaminated sediment cleanups for:



- 1) the Lower Muskegon River at the former Zephyr Oil Refinery and
- 2) Muskegon Lake near the mouth of Ryerson Creek



Four, final habitat restoration projects



Bear Lake water quality and aesthetic improvement projects



We are on the path to de-listing!

**All management actions needed to cleanup, restore and delist the Muskegon Lake Area of Concern (AOC) have been identified. Virtually all of the projects are in the final engineering/design or construction phase.
(Project details are inside/ page 2 and 3)**

Muskegon Lake – A Legacy of Improvement

AOC Background:

Muskegon Lake is one of 42 Great Lakes Areas of Concern (AOC) in the United States and Canada and one of the original 14 in Michigan. The AOC includes Muskegon Lake, Bear Lake and portions of Bear Creek, Ruddiman Creek, Four Mile Creek, Ryerson Creek and the North and South Branches of Muskegon River.

Learning from the Past:

Beginning in the early/mid-1800s, with the Muskegon River lumber logging era, nearly 100 years of industrial, commercial and municipal waste disposal practices filled nearly 1000 acres of shallow waters, stream corridors and sensitive wetlands. Historic sawmill slab-wood and sawdust, municipal and industrial wastewater, and spent foundry sand and slag degraded water quality and smothered the lake bottom, harming aquatic life. These legacy practices, along with shoreline hardening with broken concrete from commercial building demolitions, led to the 1985 designation of Muskegon Lake as one of fourteen Great Lakes AOCs in Michigan.

Making Improvements:

In 1973, prior to the AOC designation, the Muskegon County Wastewater System came on line. By the mid-1970s, the lake's water quality had significantly improved. Throughout the 1970s and 1980s, many waterfront industries closed and the City of Muskegon and Muskegon County took full advantage of state and federal brownfield cleanup and redevelopment programs. This greatly improved the appearance of shoreline properties, spurring redevelopment and making recreational waterfront uses more popular.

Public Involvement and Setting Goals:

During the early 1990s, the Muskegon Lake Watershed Partnership was established and studies of lake-bottom sediments, surface water quality and fish and wildlife habitat were completed by Grand Valley State University, state and federal natural resource agencies and local organizations. The studies determined that the legacy problems were still harming the health and ecologic integrity of the lake. The public was eager to improve the lake and to enjoy the many benefits its natural resources could provide for surrounding communities.

By 1995, the public had a good understanding of the problems and a growing sense that improvements were possible. This knowledge energized the Muskegon Lake Watershed Partnership (MLWP) and the voluntary group continued to engage local, state and federal agencies in the development of cleanup and restoration projects. By 2008, restoration and cleanup targets had been set for all nine of the AOC's Beneficial Use Impairments (BUIs). As each BUI target is met, the associated BUI is removed, ultimately resulting in AOC delisting.

Progress Made:

By 2013, three of Muskegon Lake's nine BUIs were removed: 1) Restrictions on Drinking Water Consumption, 2) Restrictions on Fish and Wildlife Consumption, and 3) Restrictions on Dredging. In 2014, the MLWP requested the removal of the Beach Closings BUI. Removal is expected in 2015. Plans are in place to complete the actions needed to remove the remaining BUIs: Degraded Aesthetics, Eutrophication and Undesirable Algae (Bear Lake only), Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations and Degraded Benthos. The remaining projects needed to cleanup and restore Muskegon Lake have been identified and virtually all of them are currently in the engineering and design or construction phases. Local, state and federal partners are eager to complete the projects and begin the formal process of delisting Muskegon Lake no later than 2018.

Muskegon Lake – A Great Lakes Areas of Concern

What has been accomplished?

Two Great Lakes Legacy Act cleanups removed more than 130,000 cubic yards of sediment contaminated with oil, grease, heavy- metals, PAHs and PCBs. In 2006, the Ruddiman Creek cleanup removed 90,000 cubic yards of contaminated mud, including 126,000 pounds of lead, 2,800 pounds of cadmium, 204,000 pounds of chromium and 320 pounds of PCBs. In 2012, a Muskegon Lake cleanup near Hartshorn Municipal Marina and the Division Street Outfall removed 43,000 cubic yards of sediment contaminated with mercury and polycyclic aromatic hydrocarbons (PAHs). In 2013, more than 30 acres of fish and wildlife wetland habitat was restored along 13,000 feet of Muskegon Lake shoreline and portions of Ruddiman Creek, Ryerson Creek and the South Branch of the Muskegon River.

Path to Delisting: What is needed to complete restoration and de-list the AOC?

Two Major Legacy Contamination Cleanups

There are two contaminated sediment cleanup projects in the planning and design stages under the Great Lakes Legacy Act (GLLA). They are located on the Muskegon River below the former Zephyr Oil Refinery and in Muskegon Lake near the mouth of Ryerson Creek. The Zephyr cleanup will begin in 2015 with EPA and DEQ support. Private sector partners are voluntarily working with EPA to design the Muskegon Lake Ryerson cleanup.

Four Major Habitat Restoration Projects

Projects are underway to meet the AOC habitat restoration goals at four major locations 1) Bear Creek at the mouth to Bear Lake, 2) Lower Muskegon River above the Causeway, 3) Muskegon River at Veterans Memorial Park, and 4) Muskegon Lake at several locations where historic sawmill debris continues to degrade aquatic habitats. Engineering is being completed and construction will begin at Veterans Memorial Park in early 2016. The Bear Creek Hydrologic Reconnection and Habitat Restoration Project and one of the Muskegon Lake mill debris locations will be under construction in 2015. All management actions for these final AOC habitat restoration projects are expected to be complete by 2017, making AOC delisting possible in 2018 or early 2019.

Bear Lake Water Quality Improvement Projects

Bear Lake water quality needs improvement to remove the Eutrophication and Undesirable Algae BUI. Over the past few years, the Muskegon Conservation District (MCD) has worked with Bear Creek Watershed landowners to implement Best Management Practices (BMP). WMSRDC worked with local governments to incorporate water quality improvement measures in zoning and ordinances. The Bear Creek Hydrologic Reconnection and Habitat Restoration Project is also designed to remove phosphorous from an area near the mouth of Bear Creek where a former celery farm operated for decades. Currently, a Great Lakes Restoration Initiative nutrient reduction project is underway with Delta Institute, MCD, WMSRDC, Muskegon River Watershed Assembly, Muskegon County Drain Commissioner, Muskegon County Road Commission, local governments, private landowners and the Muskegon Lake Watershed Partnership. and Watershed Implementation grant. Communities are working to prevent phosphorous from reaching the lake through water quality-related ordinances and zoning measures.

Aesthetic Improvements in Bear Lake

The Degraded Aesthetics BUI has local, state and federal agencies exploring ways to prevent a 1,300' deep, abandoned oil well from harming Bear Lake. A request for qualifications for a feasibility study was distributed by the DEQ in 2015. The feasibility will evaluate alternatives, including containment, plugging and no action.

Degraded Benthos Improvements in Muskegon Lake Tributaries

A monitoring plan to assess that status of the Degraded Benthos BUI in Muskegon Lake tributary streams was completed by GVSU Annis Water Resources Institute in 2015, with sampling to begin in 2015 or 2016.