

Target of Delisting the Beach Closings Beneficial Use Impairment in the Muskegon Lake Area of Concern

Introduction

In 1999, 2000, and 2001, excessive quantities of raw sewage were discharged into Muskegon Lake due to the failure of sewers and lift stations. Human contact advisories were posted during these events and millions of gallons of untreated sewage were discharged. In addition to sewage overflows, a tributary of Muskegon Lake, Ruddiman Creek, is on the MDEQ 303(d) list for pathogens. High levels of *E. coli* have been historically reported in this tributary and the source is unknown.

Available Guidance

The Michigan Department of Environmental Quality has established the following restoration criteria for the Beach Closings Beneficial Use Impairment:

“This BUI will be considered restored when no waterbodies within the AOC are included on the list of impaired waters in the most recent Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report.”

Delisting Target

Ruddiman Creek is currently on the Section 303(d) list for pathogens. Identification of the sources of *E. coli* and their remediation will be required for delisting. Because of the importance of Muskegon Lake as a recreational resource and the history of sewage infrastructure failures in its immediate watershed, the Muskegon Lake Public Advisory Council (PAC) voted to adopt a target for delisting the Beach Closings BUI that is more restrictive than the State of Michigan guidance. In addition to the identification of the source(s) and remediation of the pathogen problem on Ruddiman Creek, the PAC will require that contact advisories are not placed on Muskegon Lake due to sewage infrastructure failure.

The **Beach Closings BUI** will be considered restored when: (1) no waterbodies within the AOC are included on the list of impaired waters in the most recent Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report and (2) contact advisories have not placed on Muskegon Lake due to sewage infrastructure failure for three consecutive years beginning in 2006. Ruddiman Creek is the only waterbody in the Muskegon Lake AOC listed in the 2006 Integrated Report for pathogens. Compliance with the first part of the target will be achieved when Ruddiman Creek is no longer included in the 303(d) list of impaired waters.

The PAC will work with the MDEQ to develop the monitoring and assessment program for Ruddiman Creek as part of the TMDL process.

Functional Equivalence

The proposed targets for the Muskegon Lake AOC are functionally equivalent to the MDEQ guidance as they require that no waterbodies within the AOC are included on the list of impaired waters in the most recent Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report as a condition for delisting. Ruddiman Creek is the only waterbody within the AOC that is listed in the 2006 Integrated Report and delisting of the BUI requires restoration to the extent that it is removed from the 303(d) list. The targets exceed the MDEQ guidance as they require that contact advisories are not placed on Muskegon Lake due to sewage infrastructure failure for three consecutive years beginning in 2006. Muskegon Lake is not included in the 2006 Integrated Report for pathogens.

Programs for Monitoring and Assessing Restoration Success

Funding for the monitoring and assessment of Ruddiman Creek will be provided by the MDEQ as part of the TMDL process. If necessary, additional funds will be solicited by the PAC and/or Annis Water Resources Institute from the MDEQ CMI Program and GLNPO for supplemental monitoring and outreach programs. Quality Assurance Project Plans will be prepared for all supplemental assessment activities and agency approval will be obtained for all monitoring programs. All releases of sewage are reported to the Muskegon County Health Department and consequently, a specialized monitoring program is not necessary for Muskegon Lake.

Once three successive years of no contact advisories being placed on Muskegon Lake from sewage infrastructure failure has been achieved, the MLPAC will submit a status report to the MDEQ along with the acknowledgement that the BUI no longer applies to Muskegon Lake. The MLPAC will submit a request for formal delisting of the Beach Closings BUI to the MDEQ when the TMDL process results in the removal of Ruddiman Creek from the 303(d) list and no contact advisories were placed on Muskegon Lake from sewage infrastructure failure for three consecutive years.

Target for Delisting the Degradation of Aesthetics Beneficial Use Impairment in the Muskegon Lake Area of Concern

Introduction

Improvements in the water quality of Muskegon Lake have resulted in increased public usage of the resource and community interest in the enhancement of both access and habitat quality of the shoreline. At the time of AOC listing, the Michigan Department of Environmental Quality (MDEQ) did not include the Degradation of Aesthetics Beneficial Use Impairment (BUI) however mentioned the environmental impact of excessive shoreline filling. The BUI was listed by the PAC in 2002 because excessive amounts of metal scrap and concrete rubble were discarded along the shoreline and in the lake by historical industrial activity. These deposits impede the safe access and enjoyment of Muskegon Lake by the public and the ability to conduct shoreline habitat improvement efforts.

Available Guidance

The IJC criteria for listing the Degradation of Aesthetics are provided below:

“When any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum).”

The MDEQ provides the following guidance for delisting:

“This BUI will be considered restored when monitoring data for two successive monitoring cycles indicates that water bodies in the AOC do not exhibit persistent, high levels of the following “unnatural physical properties” (as defined by Rule 323.1050 of the Michigan WQS) in quantities which interfere with the State’s designated uses for surface waters:

- turbidity
- color
- oil films
- floating solids
- foams
- settleable solids
- suspended solids
- deposits

For the purposes of this criteria, these 8 unnatural properties impair aesthetic values if they are unnatural – meaning those that are manmade (e.g., garbage, sewage), or natural properties which are exacerbated by human-induced activities (e.g., excessive algae growth from high nutrient loading). Persistent, high levels are those defined as long enough in duration, or elevated to the point of being injurious, to any designated use listed under Rule 323.1100 of the Michigan WQS.”

Delisting Target

Because of the importance of Muskegon Lake as a recreational resource and the presence of excessive deposits of metal and concrete scrap in shoreline areas, the Muskegon Lake Public Advisory Council (MLPAC) voted to adopt a target for delisting the Degradation of Aesthetics BUI that is functionally equivalent to the State of Michigan criteria. The PAC has identified priority restoration sites for the BUI that enhance public access and enjoyment of Muskegon Lake and are consistent with future habitat improvement projects and municipal planning. The target is presented below:

The **Degradation of Aesthetics BUI** will be considered restored when monitoring data for two successive monitoring cycles indicates that Muskegon Lake AOC does not exhibit persistent, high levels of the following “unnatural physical properties” (as defined by Rule 323.1050 of the Michigan WQS) in quantities which interfere with the State’s designated uses for surface waters:

- turbidity
- color
- oil films
- floating solids
- foams
- settleable solids
- suspended solids
- deposits

Important public locations in Muskegon Lake where aesthetics are degraded include: Ruddiman Creek (including the Amoco property), Ryerson Creek, Grand Trunk, Heritage Landing, and the Michigan Steel Bay. Special emphasis will be placed on the removal and restoration of areas at the above locations where deposits of submerged rubble, and metallic debris impede the safe access and enjoyment of Muskegon Lake.

Programs for Monitoring and Assessing Restoration Success

The MLPAC will solicit funding for assessment and restoration activities by the submission of grants and requests for assistance from the following sources:

- Michigan Department of Environmental Quality Clean Michigan Initiative (CMI) Fund
- Environmental Protection Agency Great Lakes National Program Office (GLNPO)
- Local foundations, conservation groups, municipalities, business, and industry.

The MLPAC will obtain approval from the MDEQ for all restoration activities involving the removal of submerged rubble and debris. The MLPAC will request that MDEQ conduct the final monitoring of these locations as part of their 5 Year Basin Program. If this request is not possible, additional funds will be solicited by the MLPAC from the MDEQ CMI Program and GLNPO for supplemental monitoring and outreach programs. Quality Assurance Project Plans will be prepared for all supplemental assessment activities and agency approval will be obtained for all monitoring programs.

The MLPAC will submit a report of the monitoring data and documentation that the restoration activities at each site were completed. The report will include quality assurance data demonstrating that the data quality objectives of the QAPP and delisting targets were achieved. The MLPAC will submit a request for formal delisting of the Degradation of Aesthetics BUI to the MDEQ along with the above report.

Target for Delisting the Degradation of Benthos Beneficial Use Impairment in the Muskegon Lake Area of Concern

Introduction

Muskegon Lake is a 16.8 km² drowned river mouth lake located in western Michigan. The lake was listed as an Area of Concern (AOC) by the Environmental Protection Agency in 1987 because of severe environmental impairments related to the historic discharge of municipal and industrial wastes. The Beneficial Use Impairment (BUI), Degradation of Benthos, was listed because of sediment toxicity related to heavy metals and organic chemicals and impacts to species diversity from the discharge of municipal sewage. Data from 1972 (Evans 1976) showed that pollution tolerant oligochaete worms comprised 89% of the total benthic population, chironomid numbers were low (< 200/m²), and species diversity was only 0.68 (Shannon Weaver). In 1974, the direct discharge of municipal and industrial wastewater to Muskegon Lake was eliminated by the construction of an advanced tertiary treatment facility. In addition, industrial pretreatment programs, hazardous waste site remediation projects, and numerous conservation and non point source reduction efforts have resulted in large improvement in water quality. In 1999, Shannon Weaver diversity improved to 1.66, oligochaetes were reduced to 68% of the total population, and chironomid numbers increased to over 600/m² (Carter 2002; Rediske et al. 2002).

In addition to problems in Muskegon Lake, the 1987 Remedial Action Plan identified Ruddiman Creek, Ryerson Creek, the Division Street Outfall, Bear Lake, Little Bear Creek (including the unnamed tributary) and the Muskegon River (South Branch near Teledyne and North Branch at the mouth) as having degraded benthic communities.

Available Guidance

The International Joint Commission (IJC) criteria for listing the Degradation of Benthos are provided below:

“When the benthic macroinvertebrate community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when toxicity (as defined by relevant, field-validated, bioassays with appropriate quality assurance/quality controls) of sediment associated contaminants at a site is significantly higher than controls”

The Michigan Department of Environmental Quality (MDEQ) provides the following guidance for delisting:

“This BUI will be considered restored when:

An assessment of benthic community, using either MDEQ’s SWAS Procedure #51 for wadeable streams or MDEQ’s pending rapid assessment procedure for non-

wadeable rivers yields a score for the benthic metrics which meets the standards for aquatic life in any 2 successive monitoring cycles (as defined in the two procedures).

OR, in cases where MDEQ procedures are not applicable and benthic degradation is caused by contaminated sediments, this BUI will be considered restored when:

All remedial actions for known contaminated sediment sites with degraded benthos are completed (except for minor repairs required during operation and maintenance) and monitored according to the approved plan for the site. Remedial actions and monitoring are conducted under authority of state and federal programs, such as Superfund, Resource Conservation and Recovery Act, Great Lakes Legacy Act, or Part 201 of Michigan's National Resource and Environmental Protection Act (NREPA) of 1994."

Delisting Target

The MDEQ provides two options for target development: using SWAS Procedure #51 and completing all necessary remedial actions. SWAS Procedure #51 is applicable to Ruddiman Creek (stream channel), Ryerson Creek, Little Bear Creek (including the unnamed tributary) and the Muskegon River (South Branch near Teledyne and North Branch at the mouth). Sediment contamination in Ruddiman Pond was remediated in 2006 and will be monitored according to the approved plan for the site. Since SWAS Procedure #51 is not applicable to lakes, specialized targets need to be developed for Bear Lake and Muskegon Lake. Evans (1981) described the benthic community in Bear Lake as degraded, due to the abundance of pollution tolerant organisms present in the sediments (primarily oligochaete worms). Benthic invertebrates will be collected in the spring of 2007 as part of a Total Daily Maximum Load (TMDL) evaluation for the lake. The MLPAC will consider a decreasing trend in the % oligochaetes and an increasing trend in the % chironomids as an indication of benthic community recovery. Bear Lake is scheduled for a nutrient TMDL in 2007 and a program will be developed to improve water quality. Since the status of the benthic community is linked to water quality, improvements to the structure of the macroinvertebrate community should result from the TMDL. While completing sediment remediation projects at individual sites is important, Muskegon Lake has been impacted on a system-wide basis by chemical and nutrient pollution. Because of the importance of Muskegon Lake as a recreational resource and public concern related to sustaining the current trend of improving water quality, the Muskegon Lake Public Advisory Council (MLPAC) voted to adopt a target for delisting the Degradation of Benthos BUI that exceeds the State of Michigan criteria. The target is presented below:

The **Degradation of Benthos BUI** will be considered restored when SWAS Procedure #51 yields a score for the benthic metrics which meets the standards for aquatic life in 2 successive monitoring cycles for Ruddiman Creek (stream channel), Ryerson Creek, Little Bear Creek (including the unnamed tributary, and the Muskegon River (South Branch near Teledyne and North Branch at the mouth) and in cases where MDEQ procedures are not applicable and benthic degradation is caused

by contaminated sediments, this BUI will be considered restored when all remedial actions for known contaminated sediment sites with degraded benthos are completed (except for minor repairs required during operation and maintenance) and monitored according to the approved plan for the sites. The known contaminated sediment sites in the Muskegon Lake AOC are the Division Street Outfall, Ruddiman Creek, and Ryerson Creek. In addition, average benthic macroinvertebrate populations in Muskegon Lake and Bear Lake should reflect the following conditions:

Muskegon Lake	
Indicator	Target
Sediment Toxicity	Amphipod Survival >60%
<i>Hexagenia</i>	Present in river mouth littoral zone
% Oligochaeta	< 75%
Chironomidae (#/m²)	> 500
Diversity (SW)	> 1.5
Bear Lake	
% Oligochaeta	Decreasing Trend from 1972
% Chironomidae	Increasing Trend from 1972

For Muskegon Lake, compliance with the sediment toxicity indicator will be determined by review of pre and post remediation toxicity and benthic invertebrate data for Ruddiman Creek, Ryerson Creek, and the Division Street Outfall. Compliance with the indicators for Muskegon Lake will be based on a benthic survey conducted at a group of the same stations sampled in 1999 (Figure 1). If any station shows an indication of significant degradation ($> \pm 3$ standard deviations), the area will require resampling and analysis to determine the source of the problem. Benthic invertebrates will be collected in Bear Lake in the spring of 2007 as part of the approved work plan for the TMDL evaluation. Compliance for Bear Lake targets will be determined by a comparison of the data sets from 1972 and 2007. For the remaining tributary sites, compliance with SWAS Procedure #51 will be determined by 2 successive monitoring cycles that yield a scores for benthic metrics which meets the standards for aquatic life in Ruddiman Creek (stream channel), Ryerson Creek, Little Bear Creek (including the unnamed tributary) and the Muskegon River (South Branch near Teledyne and North Branch at the mouth.)

Functional Equivalence

The proposed targets for the Muskegon Lake AOC are functionally equivalent to the MDEQ guidance in that it requires that all remedial actions at Ruddiman Creek, Ryerson Creek, and the Division Street Outfall are completed (except for minor repairs required during operation and maintenance) and monitored according to the approved plan. No other locations in the AOC are currently being considered for the removal/remediation of contaminated sediments. In addition, the targets require that SWAS Procedure #51

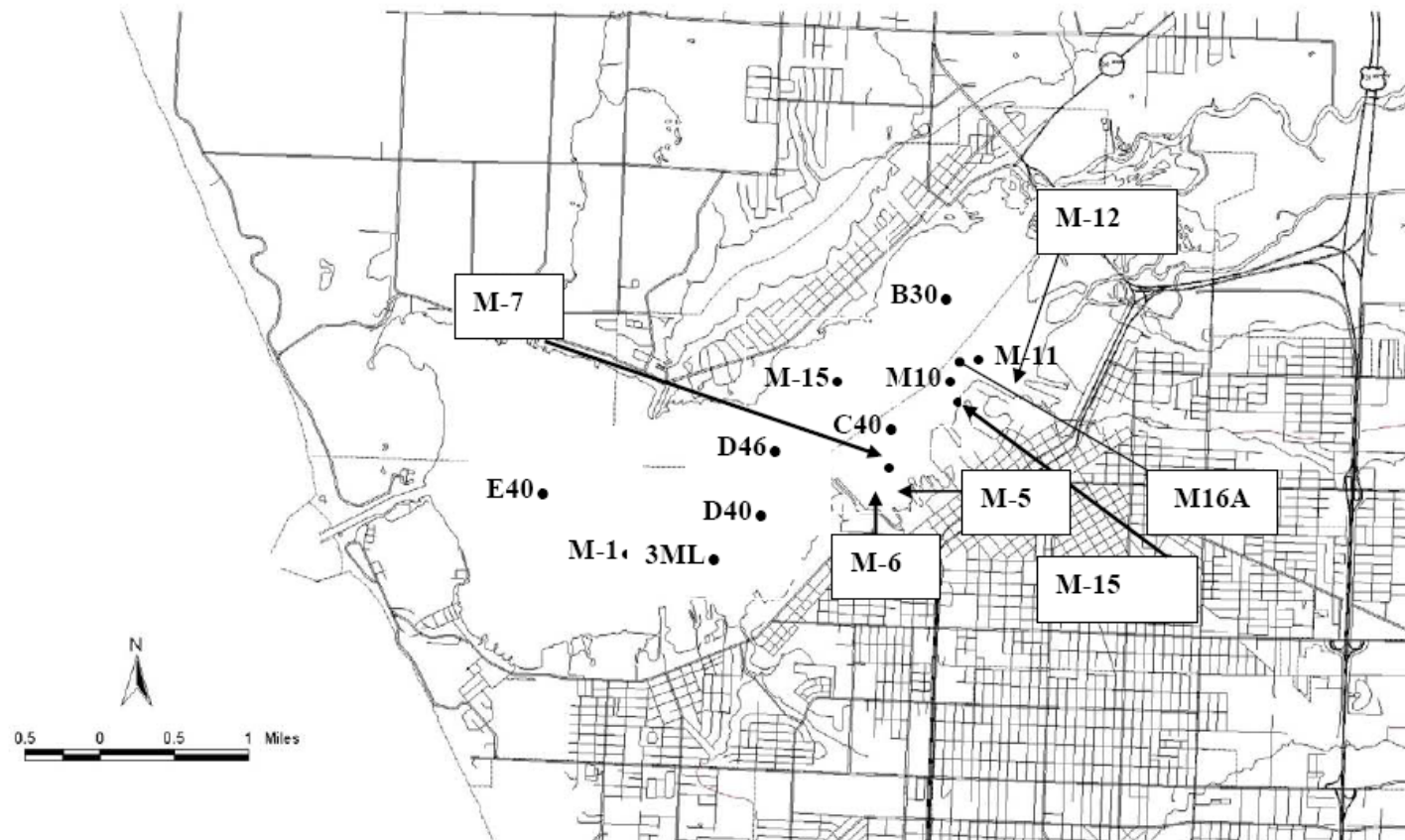


Figure 1. Muskegon Lake Benthos Sampling Locations.

scores meet the standards for aquatic life for 2 consecutive monitoring cycles in Ruddiman Creek (stream channel), Ryerson Creek, Little Bear Creek (including the unnamed tributary) and the Muskegon River (South Branch near Teledyne and North Branch at the mouth.) The targets exceed the MDEQ guidance as they require specific conditions in the benthic macroinvertebrate community of Muskegon Lake and Bear Lake be achieved prior to delisting.

Programs for Monitoring and Assessing Restoration Success

The MDEQ will conduct the monitoring of Ruddiman Creek (stream channel), Ryerson Creek, Little Bear Creek (including the unnamed tributary) and the Muskegon River (South Branch near Teledyne and North Branch at the mouth.) using SWAS Procedure #51. The MLPAC and/or the Annis Water Resources Institute (AWRI) will obtain funding for the monitoring of Muskegon Lake and Bear Lake by the submission of grants and requests for assistance from the following sources:

- Michigan Department of Environmental Quality Clean Michigan Initiative (CMI) Fund Local Monitoring Grants
- Environmental Protection Agency Great Lakes National Program Office (GLNPO) and the Great Lakes Legacy Act.

The Annis Water Resources Institute (AWRI) will conduct the monitoring and assessment of Muskegon Lake in 2006 as part of the program developed for a CMI grant. AWRI will prepare a Quality Assurance Project Plan for Muskegon Lake monitoring activities and obtain MDEQ approval for the methods and data quality objectives associated with the program. If the data show that additional monitoring is required to achieve the Muskegon Lake targets, the MLPAC and/or AWRI will submit a supplementary grant request to the above agencies. Monetary support for the monitoring and assessment of Ruddiman Creek, Ryerson Creek, and the Division Street Outfall will be provided by the EPA and the MDEQ as part of the Great Lakes Legacy Act and other agency funds allocated to the individual projects. Benthic invertebrates will be collected in the spring of 2007 (by AWRI?) in Bear Lake as part of a Total Daily Maximum Load (TMDL) evaluation for the lake. If necessary, additional funds will be solicited by the PAC and/or AWRI from the MDEQ CMI Program and GLNPO for supplemental monitoring and outreach programs. Quality Assurance Project Plans will be prepared for all supplemental assessment activities and agency approval will be obtained for all monitoring programs. Tributary monitoring will be conducted by MDEQ as part of their 5 year basin cycle.

The MLPAC will submit a status report and request for formal delisting of the Degradation of Benthos BUI to the MDEQ when:

- post remediation monitoring at Ruddiman Creek, Ryerson Creek, and the Division Street Outfall show that sediment toxicity is not present at these locations,
- the tributaries listed above yield a scores for benthic metrics that meet the standards for aquatic life in 2 successive monitoring cycles life, and

- the results of benthic macroinvertebrate monitoring in Muskegon Lake and Bear Lake meet the proposed targets.

The report will include the monitoring data, numerical analyses, and quality assurance information demonstrating that the data quality objectives of the project QAPPs and delisting targets were achieved.

References

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<http://www.epa.gov/glnpo/sediment/muskegon/index.html>

Target for Delisting the Eutrophication and Undesirable Algae Beneficial Use Impairment in the Muskegon Lake Area of Concern

Introduction

Improvements in the water quality of Muskegon Lake have resulted in increased public usage of the resource and community interest in sustaining the progress of restoration and preventing future adverse environmental impacts. At the time of AOC listing, the Michigan Department of Environmental Quality (MDEQ) did not include the Eutrophication or Undesirable Algae Beneficial Use Impairment (BUI) however mentioned historical water quality degradation. Surface water total phosphorus (TP) concentrations averaged nearly 70 µg/L in 1972, chlorophyll *a* averaged 25 µg/L, and Secchi disk transparencies were below 1.5 m (Freedman et al 1979). The lake also experienced frequent, late summer, blooms of cyanobacteria. The BUI for the AOC was listed by the PAC in 2002 because of concerns related to historical non point source pollution in the Muskegon Lake watershed and the water quality of Bear Lake. Current water quality data for Muskegon Lake and Bear Lake was not available at the time of the BUI listing. Due to the establishment of an endowment by the community for the monitoring of Muskegon Lake in 2003, recent water quality data are available (AWRI 2006). Muskegon Lake was in the middle of the eutrophic range as listed by the Carlson Index (Carlson 1977). The lake also experienced frequent, late summer blooms of cyanobacteria. Surface water TP concentrations in 2003-05 averaged < 30 µg/L, chlorophyll *a* averaged 5 µg/L, and Secchi disk transparency was greater than 2 m, indicating that water quality had improved in the lake. Transparency in Muskegon Lake during 2003-05 exceeded that of nearby Pentwater Lake while total phosphorus and chlorophyll *a* concentrations were similar. Pentwater is a drowned river mouth lake with a rural watershed that can be considered as a reference site. Based on the above data, Muskegon Lake is currently at the mesotrophic/eutrophic border line based on the Carlson index (Carlson 1977). The preliminary results of water quality sampling by the MDEQ in 2006 indicated that surface water total phosphorus concentrations averaged 48 µg/l (range 33 µg/l –76 µg/l).

Available Guidance

The IJC criteria for listing the Eutrophication or Undesirable Algae is provided below:

“When there are persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication.”

The MDEQ provides the following guidance for delisting:

“This BUI will be considered restored when:

- no waterbodies within the AOC are included on the list of impaired waters due to nutrients or excessive algal growths in the most recent Clean Water Act *Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report* (Integrated Report), which is submitted to U.S. EPA every two years.”

Delisting Target

Muskegon Lake is currently not included on the 303(d) listing as requiring a TMDL or on the 305(b) lists for nutrient pollution or algal growths. Bear Lake, however, is included on the 303(d) listing as not meeting standards due to elevated phosphorus concentrations and nuisance algal growths. Because of the importance of Muskegon Lake as a recreational resource and public concern related to sustaining the current trend of improving water quality, the Muskegon Lake Public Advisory Council (MLPAC) voted to adopt targets for delisting the Eutrophication and Undesirable Algae BUI that exceed the State of Michigan Delisting Guidance. The target is presented below:

The **Eutrophication and Undesirable Algae BUI** will be considered restored when will be considered restored when: (1) no waterbodies within the AOC are included on the list of impaired waters due to nutrients or excessive algal growths in the current Clean Water Act Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report and (2) the following average annual concentrations/values are achieved in Muskegon Lake for two consecutive annual monitoring events:

Indicator	Target	Reasoning
Surface Total Phosphorus Concentration	30 µg/l	MDNR Recommendation for the 1987 RAP¹
Chlorophyll <i>a</i>	10 µg/l	U.S. EPA²
Secchi Disk depth	~ 2.0 m	Pentwater Lake as reference
Trophic Status Index	50-55	Pentwater Lake as reference

¹ A total phosphorus concentration of 30 µg/l (during spring and fall turnover) was recommended to maintain water quality at levels that will not produce nuisance algal blooms.

² A Chlorophyll *a* target of 10 µg/l (during the summer) was recommended to maintain water quality at levels that will not produce nuisance algal blooms.

Bear Lake is the only waterbody listed in the AOC on the 2006 303(d) and 305(b) Integrated Report for nutrients or excessive algal growths. The MLPAC will use the 2006 Integrated Report as the reference document to determine which waterbodies require restoration to meet the MDEQ delisting guidance.

- The proposed locations of water quality monitoring sites are shown in Figure 2. The sites in Muskegon Lake currently are monitored by the Annis Water Resources Institute (AWRI) in May, July, and late September (since 2003) as part of program supported by the Muskegon Lake Monitoring Endowment Fund. The MLPAC will work with the MDEQ to develop the monitoring and

Muskegon Lake Area of Concern Monitoring Sites

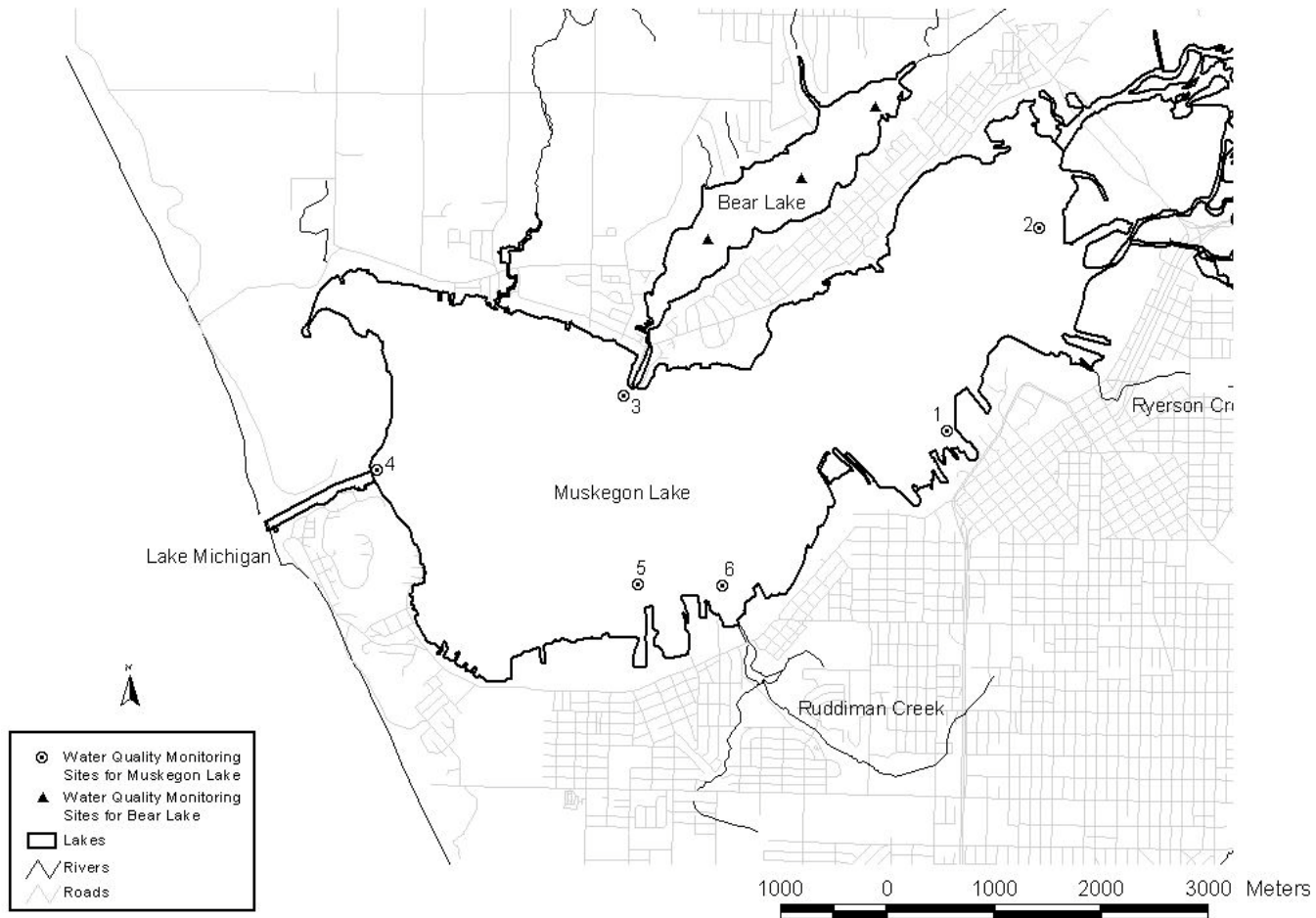


Figure 2. Proposed Water Quality Monitoring Sites in Muskegon Lake and Bear Lake.

assessment program for Bear Lake as part of the TMDL process. Targets for Bear Lake will be established to be consistent with the TMDL. Suggested monitoring locations for Bear Lake are shown in Figure 2.

Public concerns were expressed regarding the recent occurrence of late summer cyanobacteria blooms and the presence of the toxin, microcystin. Cyanobacteria blooms are becoming more frequent in the Great Lakes basin due to nonpoint source pollution, cultural eutrophication, and the selective feeding of zebra mussels. A detailed investigation of cyanobacteria and their toxins will be conducted by AWRI in 2006 as part of a MDEQ Grant. The MLPAC will review these data and determine if numerical targets for cyanobacteria and their toxins are necessary.

Functional Equivalence

The proposed targets for the Muskegon Lake AOC are functionally equivalent to the MDEQ guidance in that it requires the removal of Bear Lake from the 303(d) list as a condition for delisting. No other waterbodies in the AOC are included in the 2006 Integrated Report for phosphorus and/or excessive algal growth. The targets exceed the MDEQ guidance as they require specific concentrations/values for water quality parameters to be achieved in Muskegon Lake, which is not included on the 303(d) list.

Programs for Monitoring and Assessing Restoration Success

The MLPAC and/or the Annis Water Resources Institute (AWRI) will obtain funding for the monitoring program for the delisting targets by the submission of grants and requests for assistance from the following sources:

- Muskegon Lake Monitoring Endowment Fund
- Michigan Department of Environmental Quality Clean Michigan Initiative (CMI) Fund Local Monitoring Grants

Environmental Protection Agency Great Lakes National Program Office (GLNPO)

The Annis Water Resources Institute (AWRI) will conduct the monitoring and assessment of Muskegon Lake as part of the program developed for the Muskegon Lake Monitoring Endowment Fund. AWRI will prepare a Quality Assurance Project Plan for Muskegon Lake monitoring activities and obtain MDEQ approval for the methods and data quality objectives associated with the program. Funding for the monitoring and assessment of Bear Lake will be provided by the MDEQ as part of the TMDL process. If necessary, additional funds will be solicited by the MLPAC and/or AWRI from the MDEQ CMI Program and GLNPO for supplemental monitoring and outreach programs. Quality Assurance Project Plans will be prepared for all supplemental assessment activities and agency approval will be obtained for all monitoring programs.

After two successive years of monitoring data meet the above targets for Muskegon Lake, the MLPAC will submit a summary report to the MDEQ along with the acknowledgement that the BUI no longer applies to Muskegon Lake. The report will include monitoring and quality assurance data demonstrating that the data quality

objectives of the QAPP and the delisting targets were achieved. The MLPAC will submit a request for formal delisting of the Eutrophication and Undesirable Algae BUI to the MDEQ when the TMDL process results in the removal of Bear Lake from the 303(d) list and the targets for Muskegon Lake are achieved.

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