

MUSKEGON COUNTY  
MS4 NPDES APPLICATION

Total Maximum Daily Load Implementation Plan  
Mona Lake Watershed: Black Creek (biota), Little Black Creek (biota), and  
Muskegon Lake Watershed: Ruddiman Creek (E.coli)

I. Procedure to identify and prioritize BMPs being implemented or to be implemented during the permit cycle to achieve TMDL load reductions

The Mona Lake Watershed Management Plan (MLWMP) and Total Maximum Daily Load (TMDL) include recommendations of best management practices to address the TMDL for Black Creek and Little Black Creek. Sources and causes for the biota TMDL were identified and prioritized using the MLWMP (Section III in the Management Plan). Sources of biota were identified as agricultural runoff, storm sewer drains, outfalls, un-vegetated roadside swales, and industrial runoff. BMPs were identified based on the sources and causes of the biota using guidelines from the LID manual and prioritized using a cost benefit method. The MLWMP includes detailed information about the individual practices and their effectiveness at reducing pollutant loads.

The Mona Lake Watershed Management Plan is available at:  
[www.mcecc.org/documents/Mona\\_Lake\\_Watershed\\_Mgt\\_Plan.pdf](http://www.mcecc.org/documents/Mona_Lake_Watershed_Mgt_Plan.pdf)

The Muskegon Lake Watershed Management Plan (MLWMP) and Total Maximum Daily Load (TMDL) include recommendations of best management practices to address the E. coli TMDL for Ruddiman Creek. Sources and causes for E. coli were identified and prioritized in the MLWMP (Chapter 4 and 5 in the Management Plan). Sources of E. coli were identified as failing septic systems, impervious surfaces, and animal waste. BMPs were identified based on the sources and causes of the E. coli using guidelines from LID manual and prioritized using a cost benefit method. The MLWMP includes detailed information about the individual practices and their effectiveness at reducing pollutant loads.

The Muskegon Lake Watershed Management Plan is available at:  
[www.michigan.gov/documents/deq/ess-nps-muskegon-lake-wmp\\_198337\\_7.pdf](http://www.michigan.gov/documents/deq/ess-nps-muskegon-lake-wmp_198337_7.pdf)

II. List of prioritized BMPs being implemented or to be implemented during the permit cycle to achieve TMDL reductions

Table I provides a summary of BMPs from MLWMP (Mona) that address the TMDL for biota as well as BMPs from the MLWMP (Muskegon) that address the E. coli. In addition to the BMPs recommended in the

MLWMP (Mona) and TMDL, the MS4 community will be conducting activities as part of pollution prevention and good housekeeping and illicit discharge elimination that will affect the TMDL biota. Catch basin inspection/cleaning, dry weather screening, and outreach & education conducted by MS4 communities will provide early detection and elimination of sediment pollution. In addition to the BMPs recommended in the MLWMP (Muskegon) and TMDL, the MS4 communities will be conducting activities as part of PEP/PPP that will affect the E. coli TMDL through outreach and education components such as the Public Involvement Program and the Public Education Program that will be used to increase knowledge and awareness.

### **III. Monitoring plan to assess the effectiveness of BMPs being implemented or to be implemented during the permit cycle to achieve TMDL load reductions**

Monitoring will be conducted mainly by MDEQ to assess progress towards meeting the biota TMDL targets, following implementation of applicable BMPs and other control measures. Subsequently, annual sampling of the fish and macroinvertebrate community, and habitat quality at set locations listed in the TMDL, as a minimum, will be conducted until assessment results from two consecutive years demonstrate attainment of TMDL targets at the given sites. For best comparative purposes, follow-up biological and habitat assessments will be conducted in a June to August period, during stable flow conditions. Every effort will be made to sample during similar stream conditions and assess the same sampling locations.

Once BMPs are in place to minimize the effects of runoff and flashy conditions that exist, stream flow and total suspended solids (TSS) sampling can be implemented to measure progress towards the secondary numeric target of 80 mg/l as a mean annual TSS value during wet-weather runoff events. Multiple sampling during critical high flow events, as well as low flow events, will be conducted to better estimate TSS loads.

The following studies have been used:

Steinman, A., R. Rediske, X. Chu, R. Denning, L. Nemeth, D. Uzarski, B. Biddanda, and M. Luttenton. Preliminary watershed assessment: Mona Lake watershed. Muskegon (MI): Annis Water Resources Institute; 2003 Dec. AWRI Publication Number: MR-2003-114.  
<http://www.lkmichiganforum.org/documents/Mona%20Lake%20Stewardship%20Assessment%2011.17.03.PDF>

Michigan Department of Environmental Quality (MDEQ). Total maximum daily load for biota for Little Black Creek, Muskegon County, Michigan. Lansing (MI): MDEQ Water Division; 2003 Jul.  
<http://www.deq.state.mi.us/documents/deq-wd-water-tmdlittleblack.Pdf>

Sylvester, S. Water quality and biological survey of Little Black Creek. Lansing (MI): MDNR Water Quality Division; 1977 Dec.

E. coli will be monitored through dry weather screening conducted by the MS4 communities and sampling by the Muskegon County Health Department. MS4 communities and the Association of Realtors also help to monitor and correct failing septic systems thereby reducing E. coli contamination. The MDEQ monitors all TMDL water bodies every other year in order to track progress toward meeting TMDL goals.

Table 1. Prioritized BMPs to reduce biota pollution in Little Black Creek and Black Creek Watershed

Pollutant of Concern	Source of Pollution (by priority)	Cause of Pollution (by priority)	Recommended BMPs
Sediment	1. Agricultural	1. Limited buffer strips	Plant buffer/filter strips, On-farm wetland restoration and nutrient management
		2. Tillage practices	Residue management, Cover crop, Critical area
		3. Improper application of manure	Waste storage facilities, Comprehensive Nutrient Management Plans
		4. Ditch maintenance	Marshes with sediment traps
	2. Storm Sewer Drains	1. Impervious surface runoff	LID practices: Bioretention, Capture/reuse, Vegetated roof, Vegetated swale, Infiltration practices, Pervious pavement
		2. Instream erosion from outfalls	Bank stabilization and Outfall retrofit
		3. Stormwater management practices	Outreach and Education (PEP/PPP) and Illicit Discharge Elimination Programs (IDEPs)
		4. Increased development	Implement proper Soil Erosion and Sedimentation Control (SESC) measures
	3. Stream Bank Undercutting/Erosion	1. Discharge practices	Ordinances, Zoning, and
		2. Ditch maintenance	Marshes with sediment traps and Grassed
		3. Storm event erosion & natural base flow erosion	Enhance wetland areas and Plant buffers
	4. Municipal/Industrial	1. Lack of regulation	Ordinances, Zoning, IDEP, and SESC
Pathogens and Bacteria (E. coli)	1. Septic Systems	1. Failing septic system	Repari/replace, Identify and correct illicit discharge connections
		2. Lack of septic system regulation	Septic codes and Regulations
	2. Animal Waste	1. Improper disposal of pet waste	Pet waste disposal sites, Ordinance
		2. Animals in sewer	Pest Management
	3. Urban Landscape	1. Impervious surfaces	LID practices: Bioretention, Capture/reuse, Vegetated swale, Pervious pavement