Chapter 6 – Implementation Plan

6.1 Best Management Practices

6.2 Recommended Structural and Vegetative BMPs

6.3 Managerial Strategies

6.4 Wetland Restoration/Preservation

6.5 Land Use Planning

6.6 Accomplishment Assessment

6.7 Estimated Pollution Reductions from Proposed Actions and BMPs

6.8 Action Plan Implementation

6.0 IMPLEMENTATION PLAN

OBJECTIVES

- What is a BMP?
- What management strategies are needed to achieve the Watershed's goals?
- What results are expected after management strategies have been implemented?

6.1 BEST MANAGEMENT PRACTICES

A Best Management Practice (BMP) is a land management practice that is implemented to control sources or causes of pollution. Three types of BMPs can treat, prevent, or reduce water pollution:

- Structural BMPs are practices that require construction activities, such as installing livestock crossings, grade stabilization structures, or rock rip rap.
- Vegetative BMPs are practices that use plants to stabilize eroding areas, such as planting grasses, trees, or shrubs in a riparian buffer.
- Managerial BMPs are practices that involve changing the operating procedures at a site.

6.2 RECOMMENDED STRUCTURAL AND VEGETATIVE BMPS

Appendix 6.1a provides detailed information about individual structural and vegetative BMPs and Appendix 6.1b provides detailed information about individual managerial BMPs. The effectiveness of each BMP is included in the Appendix as well. BMPs were selected to be in this list from a review of existing practices compiled and recommended by the Michigan Department of Natural Resources and Environment (MDEQ, 1998), the Michigan Department of Transportation (MDOT) (FTC&H, 2002), Natural Resource Conservation Service (NRCS) *Field Office Technical Guide* (http://www.nrcs.usda.gov/technical/efotg/), the *State-wide Low Impact Development Manual* (Southeast Michigan Council of Governments [SEMCOG], 2008), and several other sources. Appendix 6.1C includes a description of the technical and financial assistance provided by the regulatory agencies identified in Tables 6.1a and 6.1b.

Appendix 6.2 contains a review of county ordinances, rules, and regulations that address water quality issues.

Appendix 6.3 includes Wetland Action plans for three subwatershed management units: (1) Rogue River, (2) Spring Lake-Norris Creek, and (3) Dickerson Creek.

The Steering Committee and Watershed Management Plan (WMP) Review Committee used the information from all of these appendices to determine the appropriate BMPs for the Lower Grand River Watershed (LGRW or Watershed) to meet the goals and objectives. A large number of BMPs are recommended to solve nonpoint source (NPS) pollution problems; however, certain specific BMPs will be critical to meeting the goals of the Watershed project.

Prioritized systems of BMPs and individual BMPs were selected to control NPS of pollution from areas in the Watershed based on prioritized causes and sources of pollutants. The quantities of recommended BMPs are based on data from field inventories, land use information, and recommendations from the Steering Committee and WMP Review Committee. Future inventories will need to be conducted on areas not fully assessed, illustrated in Figure 3.2, in order to quantify the BMPs for those areas. The Action Plan for Restoration, outlined in Table 6.1a, includes a detailed list of activities to achieve the project goals and objectives to restore designated uses. The actions include practices for the critical areas for restoration or areas in need of restoration to meet the designated uses. These areas are described in Section 4.4. Measurable milestones, monitoring components, evaluation criteria, and responsible partners for those actions listed in the Action Plan are listed in Table 6.2.

Overall, contamination from pathogens is the priority pollutant selected for the Watershed. Known sources of pathogens include runoff from cropland manure applications, uncontrolled livestock access, failing septic tanks, over abundance of ducks and geese, and an aging sanitary sewer infrastructure. As determined through the project, addressing improper cropland manure applications will be of top importance. The construction of waste storage and composting facilities and the completion of Comprehensive Nutrient Management Plans are the highest priority BMPs to address elevated pathogens and bacteria in the Watershed.

Table 6.1a – Action Plan for Restoration

Objectives	Recommended Prioritized BMPs	Estimated Quantities*	Estimated Unit Costs	Technical Assistance	Financial Assistance	Total Costs for Entire Watershed (Over 10 years)	Total Costs for Entire Watershed By Objective
Implement manure management planning and implementation.	Waste storage facility; composting facility	176 sites in LGRW. (23 sites in critical areas); assume 25% need waste facilities (NPS inventory),	$50,000 each	NRCS, CDs	USDA Farm Bill programs	$2,200,000	$2,860,000
	CNMPs; promote incorporation	176 sites in LGRW (23 sites in critical areas); assume 75% need CNMPs (NPS inventory)	$5,000 each			$660,000	
Implement livestock management practices at access sites.	Cattle exclusion or controlled access or cattle crossing	47 livestock access sites in LGRW (43 in critical areas); assume 250 ft/site (NPS inventory)	$1.50/ft	NRCS, CDs, MDA, MDNRE, local farmers	USDA Farm Bill programs	$17,625	$191,525
	Alternative water source	47 livestock access sites in LGRW (43 in critical areas) (NPS inventory)	$3,700/each	NRCS, CDs, MDA, MDNRE, local farmers	USDA Farm Bill programs	$173,900	
Implement vegetative buffering practices.	Buffer/filter strips; native plantings	1,203 miles of unvegetated riparian area in Watershed (563 miles in critical areas) (assumes 27%** of total stream miles are un-vegetated, ACOE report) 8 locations in Plaster Creek, 4 locations in Buck Creek, 14 locations in Sand Creek (NPS inventory)	$5,000/acre (assuming 50 ft wide = 7,291 acres)	NRCS, CDs, MSUE, DU, local units of government	USDA Farm Bill programs	$36,455,000	$36,455,000
Encourage proper septic tank management.	Repair or replace aging septic systems	KCHD estimated 8,740 septic systems in need of repair in Kent County (19%). US Census numbers estimated total of 16,473 septic systems in LGRW need repairs (19%)	$7,500/each	County Administration and Health Departments, local units of government	Rural Development, USEPA/ MDNRE 319 grant funding	$124,000,000	$124,000,000
	Identify and correct illicit discharge connections	No illicit connections found during 2003-2004 storm water outfall screening for, but potential exists	To be determined			To be determined	To be determined
	Cluster septic systems for small lot development	Number of small lot developments which could use cluster septic systems to be determined.	$50,000–$100,000			To be determined	To be determined

Table 6.1a – Action Plan for Restoration

Objectives	Recommended Prioritized BMPs	Estimated Quantities*	Estimated Unit Costs	Technical Assistance	Financial Assistance	Total Costs for Entire Watershed (Over 10 years)	Total Costs for Entire Watershed By Objective
Implement LID practices	Bioretention (rain gardens)	194 urban/residential sites in LGRW (147 sites in high critical areas); 7 locations in Buck Creek 2 locations in Plaster Creek, 5 locations in Sand Creek and 59 in Indian Mill Creek, 1,000 cft each	$5–$7/cft of storage to construct	County and Local Planning Commissions, Economic Development Committees; LID for Michigan manual; Material manufacturers	People and Land Grants, Rural Development funding, Community Foundation grants, Corporate donations; Downtown Development Authorities	$1,164,000	$1,514,000
	Capture/Reuse (rain barrels, cisterns)	194 urban/residential sites in LGRW (147 sites in high critical areas)	Rain barrel: $100–$250; Cistern–varies by mftr. and material			To be determined	
	Vegetated roof	194 urban/residential sites in LGRW (147 sites in high critical areas)	$8–$16/sft			To be determined	
	Vegetated swale	194 urban/residential sites in LGRW (147 sites in high critical areas)	$4.50–$20/linear foot			To be determined	
	Infiltration practices (dry wells, infiltration basins, infiltration berms, infiltration trenches, subsurface infiltration beds, bioretention, level spreader, leaching basins)	194 urban/residential sites in LGRW (147 sites in high critical areas). 12 street miles in Village of Spring Lake and 10 public parking lots (110 catchbasins)	Dry well: $4–$9/cft; infiltration basin: varies; Infiltration trench: $20–$30/cft; subsurface infiltration bed: $13/cft; Leach basin: $3,500 each			$350,000 for leach basins	
	Pervious pavement	2 sites in Sand Creek (one unpaved boat lot, and one gravel parking lot)	Porous asphalt: $4–$5/sft; Pervious concrete: $4–$6/sft			To be determined - no information on area to be paved.	
Implement MDNRE wildlife population management practices.	Egg shaking, buffer strips, birth control	Areas requiring wildlife population management to be determined.	To be determined	MDNRE, DU	MDNRE, DU	To be determined	To be determined
Implement sanitary sewer maintenance practices.	Maintain and repair sanitary sewer system as needed. Increase capacity at WWTPs as population growth increases to avoid overflows. State's infrastructure has been rated a D-	Areas needing sanitary sewer improvements to be determined. LGRW population 871,335, 25% would have to pay for infrastructure repair	$2,700/taxpayer[1]	Community engineers, Consulting engineers	State loans/grant programs	$588,151,125	$588,151,125

Table 6.1a – Action Plan for Restoration

Objectives	Recommended Prioritized BMPs	Estimated Quantities*	Estimated Unit Costs	Technical Assistance	Financial Assistance	Total Costs for Entire Watershed (Over 10 years)	Total Costs for Entire Watershed By Objective
Implement cropland management practices.	Crop residue management; cover crop; field tile management; critical area planting; wetland restoration	951,791 acres of cropland in LGRW. (360,302 acres in high critical areas); 50% need additional practices	$300/acre	NRCS, CDs, MSUE	USDA Farm Bill programs, US FWS grant funding, DU funding	$142,768,650	$142,768,650
Implement proper SESC techniques.	SESC measures following approved SESC plan.	13 construction sites in Watershed (11 in critical areas)	$500/site	County Soil Enforcing Agent	Private - owners of construction sites	$6,500	$6,500
Implement channel stabilization and erosion control techniques.	LID storm water criteria or ordinance for new development/ redevelopment projects/ capital improvement projects	5 counties need LID storm water criteria (Kent, Ottawa, and Montcalm Counties are adopting LID criteria)	$20,000/ordinance	County and Local Planning Commissions, Drain Commissioners, Economic Development Committees	People and Land Grants, Rural Development funding	$100,000	$50,000

Table 6.1a – Action Plan for Restoration

Objectives	Recommended Prioritized BMPs	Estimated Quantities*	Estimated Unit Costs	Technical Assistance	Financial Assistance	Total Costs for Entire Watershed (Over 10 years)	Total Costs for Entire Watershed By Objective
Implement streambank stabilization, bio-engineering, and erosion control techniques.	Streambank stabilization	112 streambank erosion sites in LGRW (82 streambank erosion sites in high critical areas) (from NPS inventory, assuming 1,000 ft/site).	$100/ft	NRCS, CDs, consultants, Drain Commissioners, Road Commissions, MDNRE, County and Local Planning Commissions, Drain Commissioners, Economic Development Committees, City engineers	CMI, GLRI, USFWS, SESC grants, GLC	$11,200,000	$52,295,000
	Hydrologic and morphologic studies	14 of 31 subwatershed management units need a hydrologic and/or morphologic studies	$20,000/study			$280,000	
	LID storm water criteria or ordinance for new development/ redevelopment projects/capital improvement projects	5 counties (Kent, Ottawa, and Montcalm Counties are adopting LID criteria)	$20,000/ordinance			$100,000	
	Channel restoration; streambank stabilization	5 sites with down-cutting, 41 road crossing sites in the Watershed (5 sites with down-cutting and 25 crossing sites in critical areas); 1,000 ft/site	$100/ft			$4,600,000	
	Streambank stabilization, storm water runoff control structures	200 ft streambank erosion site in ravine to Brandywine Creek	$200/ft			$40,000	
	Buffer/filter strips; native plantings	1,203 miles of unvegetated riparian area in Watershed (563 miles in critical areas) (assumes 27%** of total stream miles are unvegetated)	$5,000/acre (assuming 50 ft wide = 7,291 acres)			$36,455,000	
Reduce and control rill and gully erosion.	Slope stabilization	3 rill erosion sites in LGRW (all in high critical areas) (250 ft/site)	$5,000/acre (assuming 50 ft wide = 0.86 acres	NRCS, CDs, MSUE	USDA Farm Bill programs, GLC	$4,300	$10,675
	Grassed waterways	15 gully erosion sites (all in high critical areas); 250 ft/site	$1.70/ft (assuming 50 ft wide)			$6,375	
Reduce and control lakeshore erosion.	Shoreline stabilization	339,216 ft of lake shoreline in LGRW (approx. 100,386 ft in critical areas) (assumes 5% of total lake shoreline in Watershed needs stabilization)	$200–500/ft	NRCS, CDs, MSUE	Private owners, Lake Association Fees, GLC	$8,480,400	$8,480,400

Table 6.1a – Action Plan for Restoration

Objectives	Recommended Prioritized BMPs	Estimated Quantities*	Estimated Unit Costs	Technical Assistance	Financial Assistance	Total Costs for Entire Watershed (Over 10 years)	Total Costs for Entire Watershed By Objective
Implement proper fertilizer application practices.	Nutrient Management Plans	951,791 acres of cropland in LGRW (360,302 acres in high critical areas); 30% need additional practices	$250/acre	NRCS, CDs, MSU Extension	USDA Farm Bill programs	$71,384,325	$71,384,325
Restore and protect wetlands.	Wetland restoration; constructed wetlands	170,003 acres of lost wetland in LGRW (81,805 acres of lost wetland in critical areas) (17 average acres/wetland)	$5,000/acre	County and Local Planning Commissions, Economic Development Committees	Wetland Enhancement Reserve Program, People and Land Grants, Rural Development funding	$850,015,000	$850,015,000
Minimize the impact of tiles and drainage networks on hydrology.	Field tile management	951,791 acres of cropland in Watershed (360,302 acres in critical areas); 30% need additional practices	$250/acre	NRCS, CDs, MSUE	USDA Farm Bill programs	$71,384,325	$71,420,325
	Tile outlet repair	80 tile outlet erosion sites in LGRW (12 tile outlet erosion sites in high critical areas)	$450/each	NRCS, CDs, MSUE	USDA Farm Bill programs	$36,000	
Restore and protect floodplains.	Floodplain management strategies	49 of 107 communities located in critical areas do not have hazard mitigation plans (plans can include floodplain management strategies)	$5,000/plan	County and Local Planning Commissions, Economic Development Committees	People and Land Grants, Rural Development funding	$245,000	$245,000
	Reconnect floodplains	To be determined (19,447 floodplain acres in Kent County, data for the rest of LGRW is not available)	$5,000/acre			Unknown, floodplain reconnections to be determined	

Table 6.1a – Action Plan for Restoration

Objectives	Recommended Prioritized BMPs	Estimated Quantities*	Estimated Unit Costs	Technical Assistance	Financial Assistance	Total Costs for Entire Watershed (Over 10 years)	Total Costs for Entire Watershed By Objective
Use alternative techniques and stream restoration practices (e.g. 2-stage channel design, in-stream structures) when drain maintenance is necessary.	Alternative drain maintenance and stream restoration techniques (e.g., 2-stage channel design, in-stream structures)	13,140,715 ft of drains in the Watershed (approx. 1,658,778 ft of drains in critical areas)	$100/ft	Drain Commissioners, MDNRE	Drain assessment fees, grants	Unknown, depends on maintenance schedule	To be determined
Restore and protect the stream buffer and canopy.	Buffer/filter strips; native plantings; land acquisition	1,203 miles of unvegetated riparian area in Watershed (563 miles in critical areas) (assumes 27%** of total stream miles are unvegetated)	$5,000/acre (assuming 50 ft wide = 7,291 acres)	NRCS, CDs, MSUE	USDA Farm Bill programs, West Michigan Land Conservancy	$36,455,000	$36,455,000
Implement turf management practices.	Turf management practices	194 urban/residential nonpoint source pollution sites in the Watershed (165 sites in high critical areas)	Potential cost savings due to less fertilizer/ herbicide/mowing	NRCS, MSUE	Rural Development, USDA Farm Bill programs	To be determined	To be determined
Reduce and control industrial emissions and discharges.	Follow appropriate guidelines/ regulations	10,555 acres of industrial land use in the Watershed (8,844 acres of industrial land use in critical areas)	To be determined	MDNRE	Industries	To be determined	To be determined
						Total	**$1,913,567,525**

* Table 3.3 and quantities identified using Geographic Information System (GIS) and field inventories. Policy review document, etc.

**Percentage was calculated using Figure 3.11 from the *Grand River Sediment Transport Modeling Study*, completed by the U.S. Army Corps of Engineers, Detroit District. Figure 3.11 assumes a linear relationship between the percentage of cropland in the buffer zone and the percentage of stream length having no buffer.

[1] Water Efficiency, March/April 2010. www.waterefficiency.com\

BMP	Best Management Practices
CDs	Conservation Districts
cft	cubic foot
CMI	Clean Michigan Initiative
CNMP	Comprehensive Nutrient Management Plan
DU	Ducks Unlimited
GLC	Great Lakes Commission
GLRI	Great Lakes Restoration Initiative
KCHD	Kent County Health Department
LGRW	Lower Grand River Watershed
LID	Low Impact Development
MDA	Michigan Department of Agriculture
MSUE	Michigan State University Extension
MDNRE	Michigan Department of Natural Resources and Environment
NPS	Nonpoint Source
NRCS	USDA Natural Resources Conservation Service
SESC	Soil Erosion and Sedimentation Control
sft	square foot
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WWTP	Wastewater Treatment Plant

6.3 MANAGERIAL STRATEGIES

The Steering Committee and WMP Review Committee determined the needed managerial strategies for the Watershed based on the existing land use policies, agricultural management practices, and government regulations. Numerous strategies can be used to protect land and water in the Watershed; however, specific preservation techniques will be critical to meeting the goals of the Watershed project.

Beyond federal, state, and local laws to conserve and preserve lands, the greatest opportunity to protect and preserve water quality and natural resources rests with the landowner in how they manage their lands. Most of the land in the Watershed is private ownership. According to United Growth for Kent County (http://www.unitedgrowth.org/preservation/methods.php?id=1), seven main tools are available for land preservation in Michigan: conservation easements, purchase of development rights, open space/conservation development, public purchase, U.S. Department of Agriculture (USDA) Land Conservation Programs, PA 116, and land donations.

The land preservation tools are defined as follows:

- Conservation Easement: A voluntary legal agreement between a landowner and a land trust, conservancy, or government agency that permanently limits the uses of the property.
- Purchase of Development Rights (PDR): Compensates landowners for the appraised, fair market value of their development rights in exchange for a permanent agricultural conservation easement on the property.
- Open Space/Conservation Development: Usually results in smaller, clustered lots and an area of permanently protected open space.
- Public Purchase: Where a governmental unit purchases land. It includes a binding agreement authorized by a public body and recorded with the Register of Deeds for property to be removed from the tax rolls.
- USDA Land Conservation Programs: Land conservation programs through the USDA Natural Resources Conservation Service include Conservation Reserve Program, Wetland Reserve Program, Farmland Preservation Program, and many more.
- PA 116: PA 116, called the Farmland and Open Space Preservation Program, is designed to preserve farmland and open space through agreements that restrict development for a temporary period, and provide tax incentives for participation.
- Land Donation: Total or partial gift of land, possibly with restrictions on future use.

Each land preservation tool can be configured to fit the landowner's idea of what to do with the land. However, each tool differs from the others in significant ways that must be kept in mind when making decisions about how to preserve land. Also, because the specific land conservancy or organization may have a specific mission in what type of land they protect, a discussion must be had to determine the best tool to protect the land.

Many organizations are willing to provide technical assistance to landowners on how to better manage their lands to protect natural resources and water quality. These organizations include Conservation Districts, Michigan State University (MSU) County Extension Offices, Natural Resources Conservation Services, Land Conservancies, Department of Natural Resources and Environment, Department of Agriculture, and U.S. Fish and Wildlife Service.

The management strategies outlined in Table 6.1b are prioritized based on prioritized pollutants. The table includes a detailed list of management activities that need to be completed to achieve the project goals and objectives.

Management practices include protection measures for priority areas for preservation or areas identified for protection to prevent future impacts to water quality, as described in Section 4.5.

6.4 WETLAND RESTORATION/PRESERVATION

Wetlands slow and retain surface water, providing water storage and streambank/shoreline stabilization. Therefore, restoring and preserving wetlands is a critical step toward maintaining and improving water quality within the Watershed.

The Annis Water Resources Institute (AWRI) was awarded funds through the U.S. Environmental Protection Agency (USEPA) to complete a Landscape Level Wetland Functional Assessment (LLWFA) for the Watershed. This project, known as the Lower Grand River Watershed Wetland Initiative, was fortunately taking place at the same time as the Lower Grand River WMP was being updated. Incorporating the results of the wetland investigation effort into the WMP goals for improving water quality has provided an essential planning tool that will help drive wetland conservation and restoration strategies in the Watershed.

The LLWFA was conducted to determine how the wetland resources in the LGRW have changed in geographic extent over the decades since Pre-European settlement of the region, and how this wetland loss has impacted the ecological services provided by those wetlands. The project goal was to use this technique to produce an inventory and analysis of historic wetlands and their functions in the Watershed and to compare these findings to present-day conditions. The process of this landscape level assessment is based on the *Watershed-based Preliminary Assessment of Wetland Function* (W-PAWF) technique developed by the U.S. Fish and Wildlife Services' Northeast Region. This technique applies general knowledge about wetlands and their functions to produce a watershed profile highlighting wetlands of potential significance for a variety of functions. This type of analysis assumes that given sufficient information on geomorphic setting, water source, and water movement, it should be possible to make reasonable judgments on how these physical properties can be translated into wetland functions (Fizzell, 2007). The process was applied to the entire 2,909 square miles of the LGRW.

Specific details regarding the findings of the LLWFA can be located in Section 3.3.6 of the Plan.

For three subwatersheds in the basin, Rogue River, Spring Lake/Norris Creek, and Dickerson Creek, the results of this process were used to create Wetland Action Plans that established priorities for specific conservation and restoration activities (Appendix 6.3). The goals of the Wetland Initiative Action Plans were to: (1) summarize the results of the LLWFA, (2) establish priorities for wetland restoration and preservation, and (3) detail approaches for wetland restoration and preservation for selected subwatersheds.

The information in the Wetland Action Plans can be used to develop policies and practices for wetland restoration and preservation. Wetland preservation/protection can be accomplished in several different ways, such as conservation easements and local wetland ordinances. Additional information on protection tools can be found in Section 6.5.

6.5 LAND USE PLANNING

The way land is managed, through its patterns, relationship to natural resources, and how water is managed onsite, all have impacts on the water quality in the Watershed. Land management generally occurs at the local level. Ordinances can be used as a foundation for the institutionalization of Watershed stewardship behavior.

A preliminary review of current County regulations and policies was conducted to identify local standards and ordinances that impact water quality in the Watershed. Selected plans, ordinances, and policies related to water resource protection that have been adopted in Barry, Eaton, Ionia, Kent, Montcalm, and Ottawa Counties are listed in Appendix 6.2. A spreadsheet was also created to begin a more detailed review for the 77 communities located within High Priority Critical Areas for Restoration. Initial information about their Master Plans and Zoning Ordinances is included on the spreadsheet, but specific information about other rules and regulations for each community has yet to be collected. The information included in Appendix 6.2 for the communities was obtained from a database maintained by the Grand Valley Metropolitan Council. The results of this limited review reveal areas in which Watershed protection is

present or lacking. The information presented in the policy review spreadsheets can be used as a basis to start reviewing the other communities, which can then be referenced to develop goals and objectives for the community Master Plans in the Watershed.

Table 6.1b – Action Plan for Preservation

Objectives	Recommended Prioritized BMPs	Estimated Quantities*	Estimated Unit Costs	Technical Assistance	Financial Assistance	Total Costs for Entire Watershed (Over 10 years)	Total Costs for Entire Watershed By Objective
Implement vegetative buffering practices.	Buffer overlay zone	98 communities in priority areas need buffer overlay zones (communities that include the Rogue River, Flat River, Cities of Grand Haven and Hastings already have buffer zoning)	$5,000/ordinance	County and Local Planning Commissions, Economic Development Committees	People and Land Grants, Rural Development funding, MDNRE (319 Grants)	$490,000	$490,000
	Conservation Easements	7,400 acres (over ten years, based on previous 10 years accomplishments)	To be determined	NRCS, CDs, MSUE	USDA Farm Bill programs, West Michigan Land Conservancy, MDNRE (319 Grants)	To be determined	
Encourage septage ordinance.	Recommend regular inspection and maintenance of septic systems through septic ordinance	5 counties need a septic system ordinance (Muskegon, Newaygo, Montcalm, Kent, Ionia)	$10,000/ordinance	County and Local Planning Commissions, Economic Development Committees, Health Departments	MDNRE (319 Grants), GLRI	$50,000	$50,000
Implement watershed focused land-use planning.	Storm water criteria or ordinance	5 counties need LID storm water criteria (Kent, Ottawa, and Montcalm Counties are adopting LID criteria)	$20,000/ordinance	County and Local Planning Commissions, Economic Development Committees	People and Land Grants, Rural Development funding	$100,000	$548,000
	Floodplain management strategies	49 of 107 communities located in critical areas do not have hazard mitigation plans (plans can include floodplain management strategies)	$2,000/ordinance			$98,000	

Table 6.1b – Action Plan for Preservation

Objectives	Recommended Prioritized BMPs	Estimated Quantities*	Estimated Unit Costs	Technical Assistance	Financial Assistance	Total Costs for Entire Watershed (Over 10 years)	Total Costs for Entire Watershed By Objective
Implement streambank stabilization, bio-engineering, and erosion control techniques.	LID storm water criteria or ordinance for new development / redevelopment projects / capital improvement projects	5 counties need LID storm water criteria (Kent, Ottawa, and Montcalm Counties are adopting LID criteria)	$20,000/ordinance	County and Local Planning Commissions, Drain Commissioners, Economic Development Committees	People and Land Grants, Rural Development funding	$100,000	$590,000
	Buffer overlay zone	98 communities in critical areas need buffer overlay zones. (Rogue River Natural River communities and Grand Haven already have zoning)	$5,000/ordinance			$490,000	
Reduce and control lakeshore erosion.	No wake zone ordinance	118 communities with inland lakes (no wake zone known)	$2,000/ordinance	County and Local Planning Commissions, Lake Associations	People and Land Grants, Rural Development funding; Lake Association Fees, Local Units of Government	$236,000	$236,000
Implement proper fertilizer application practices.	Fertilizer (phosphorus reduction) ordinance	6 counties (Newaygo, Montcalm, Kent, Ionia, Barry, Eaton) need fertilizer (phosphorus reduction) ordinance	$7,000/ordinance	NRCS, MSUE, Ottawa County, Muskegon County	Rural Development, USDA Farm Bill programs	$35,000	$35,000
Restore and protect wetlands.	Wetlands ordinance	141 communities without wetlands ordinance to protect existing wetlands	$5,000/ordinance	County and Local Planning Commissions, Economic Development Committees	Wetland Enhancement Reserve Program, People and Land Grants, Rural Development funding	$350,000	$350,000

Table 6.1b – Action Plan for Preservation

Objectives	Recommended Prioritized BMPs	Estimated Quantities*	Estimated Unit Costs	Technical Assistance	Financial Assistance	Total Costs for Entire Watershed (Over 10 years)	Total Costs for Entire Watershed By Objective
Restore and protect floodplains.	Floodplain management strategies	49 of 107 communities located in critical areas do not have hazard mitigation plans (can include floodplain mgmt strategies)	$2,000/ordinance	County and Local Planning Commissions, Economic Development Committees	People and Land Grants, Rural Development funding	$98,000	$98,000
Restore and protect the stream buffer and canopy.	Buffer overlay zone	98 communities in critical areas need buffer overlay zones (Rogue River Natural River communities and Grand Haven already have zoning)	$5,000/ordinance	County and Local Planning Commissions, Economic Development Committees	People and Land Grants, Rural Development funding	$490,000	$490,000
					Total Cost of Individual BMPs (not by objective)		**$1,459,000**

* Quantities identified using Geographic Information System (GIS) and field inventories. Policy review document, etc.
** Percentage was calculated using Figure 3.11 from the Grand River Sediment Transport Modeling Study, completed by the U.S. Army Corps of Engineers, Detroit District. Figure 3.11 assumes a linear relationship between the percentage of cropland in the buffer zone and the percentage of stream length having no buffer.

BMP Best Management Practices
CNMP Comprehensive Nutrient Management Plan
GLRI Great Lakes Restoration Initiative
LID Low Impact Development
MDNRE Michigan Department of Natural Resources and Environment
NRCS USDA Natural Resources Conservation Service
MSUE Michigan State University Extension
USDA U.S. Department of Agriculture

6.6 ACCOMPLISHMENT ASSESSMENT

Partners in the Watershed have received grants and other funding assistance in the last several years to implement practices to improve water quality. A few of those are highlighted below.

2002 – USEPA Section 319 Planning Grant: The reauthorization of the Clean Water Act in 1987 proposed new regulations to control storm water discharges in designated urban areas. All entities that own or operate municipal separate storm sewer systems within these regulated communities are required to obtain National Pollutant Discharge Elimination System (NPDES) storm water permits. The MDEQ offered two approaches for permit coverage: a jurisdictional approach and a watershed approach. The regulated communities in Kent and Ottawa County opted to pursue the watershed approach. The City of Grand Rapids revised their existing permit to join this effort. Communities in West Michigan were awarded a Clean Water Act Section 319 Nonpoint Source Grant in 2002 though which the watershed project and the NPDES requirements merged to develop a Lower Grand River WMP that incorporates targeted pilot project areas for in-depth study of pollutants, sources, and causes in subwatersheds of the LGRW. Counties included are: Kent, Ottawa, Ionia, Barry, Eaton, Montcalm, Newaygo, and Muskegon.

2004 – Urban Cooperation Board Grant: The Urban Cooperation Board Grant was awarded to the Grand Valley Metropolitan Council (GVMC) to continue the work of developing a sustainable LGRW Council.

2004 – USEPA Section 319 Implementation Grant: A 319 grant was awarded in 2004 to study *E. coli* contamination in three watersheds and update those WMPs to meet federal criteria. WMPs were approved for Buck Creek, Plaster Creek, and the Coldwater River Watershed. Sources of *E. coli* were identified and communities are continuing to implement practices to reduce contamination.

2004 – Clean Michigan Initiative (CMI) Nonpoint Source Grant: The Rogue River Conservation Easements Project created a thorough database of all the land in the Watershed and prioritized which parcels were of highest importance for protection with a conservation easement. The 600 highest priority landowners were identified and contacted through multiple letters, invitations to events, and two project-specific newsletters.

2005 – USEPA Section 319 Implementation Grant: The Low Impact Development (LID) Campaign for Greater Grand Rapids addressed pollutant sources typically found in urban runoff and caused by construction activities. The goal of this project was to increase the use of LID techniques in Greater Grand Rapids.

2005 – CMI Nonpoint Source Grant: The primary goal of this project was to restore and improve the cold water fishery by implementing BMPs that addressed both water quantity and water quality issues at four sites within the Watershed.

2007 – USEPA Section 319 Implementation Grant: An additional 319 grant was awarded to GVMC in 2007 to develop a model storm water ordinance, create a green infrastructure strategy, and continue Information & Education activities. The WMP was updated to comply with the NPDES storm water regulations and develop tools for urban and rural communities to use to manage storm water.

2007 – CMI Phase II Storm Water Funding: Funds were awarded to the NPDES permitees to augment the information and education efforts related to the storm water regulations. Regional educational efforts included the creation of lamp post banners, Watershed boundary signs, bus ads, displays, radio ads, and storm drain markers.

In 2010, the MDNRE, with assistance from a University of Florida Graduate Intern (Mr. Stewart Whitney) and the GVMC, worked to assess the progress and status of BMP implementation in the Watershed from 2004 to 2009. Due to limited time and resources, analysis focused on four counties: Barry, Ionia, Kent, and Ottawa. Watershed stakeholders were divided into nine groups. These groups included: (1) NRCS/Farm Service Agency, (2) Conservation Districts, (3) Land Conservancies, (4) County Drain Commissioners, (5) County Road Commissions, (6) County Health Departments, (7) County Parks and Recreation Departments, (8) Subwatershed Groups, and (9) Local Governments/Counties. A draft questionnaire was developed specifically for each group. Recommended activities from the 2004 WMP were combined with BMP implementation measurement goals from local municipal separate storm sewer system (MS4) projects to develop the initial draft questionnaires. MDNRE staff met with a few individuals in each stakeholder group to get feedback on draft questionnaires. Based on this feedback, the questionnaires were revised, downloaded into an online survey tool, and sent to the stakeholder groups.

The results from this qualitative assessment are compiled in Table 6.2. Future assessments will be needed in order to document progress in BMP implementation, behavioral changes, and water quality protection and restoration. Additional information regarding this issue is further described in Chapters 8 and 9.

Note: Through a meeting and phone conversations with the NRCS and the Farm Service Agency, it was discovered that implemented agricultural structural BMPs are incorporated into a database organized by watershed. A questionnaire was not required for this stakeholder group because the NRCS was able to send an Excel spreadsheet listing the agricultural BMPs that have been implemented in the Watershed from 2004 to 2009.

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6-10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Implement manure management planning and implementation.	Waste storage facility; composting facility	41 waste storage facilities; 4 composting facilities	Install 22 waste storage and composting facilities	Install an additional 22 waste storage and composting facilities	Number of facilities constructed using USDA-NRCS practice summary documentation, 44 waste storage facilities installed (100% of waste storage facilities needed in critical areas are installed)	Water quality monitoring	USDA-NRCS
	CNMPs; promote incorporation	12,620 acres under nutrient management	14,080 acres under nutrient management - assist with completion of CNMPs	An additional 14,080 acres under nutrient management- assist with completion of CNMPs	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation, 28,160 acres, assuming 160 acres per site (176 sites) using CNMPs - 100% of sites using CNMPs	Water quality monitoring	USDA-NRCS

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6-10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Implement livestock management practices at access sites.	Cattle exclusion or controlled access or cattle crossing	167,802 ft of fencing; 1,211 acres of access controls	Install 5,750 ft of fencing	Install an additional 6,000 ft of fencing	Number of ft/acres on which BMPs were implemented using USDA-NRCS practice summary documentation, 11,750 ft of fencing installed (100% of the livestock access sites identified in NPS inventory addressed [assuming 250 ft/site needed])	USDA-NRCS yearly status reviews; before and after photos; pollutant reduction calculations; water quality monitoring; TMDL report	USDA-NRCS
	Alternative water source	37 watering facilities	Install alternative watering sources on 23 sites	Install alternative watering sources on 24 sites	Number of facilities constructed using USDA-NRCS practice summary documentation, number of sites where alternative watering sources were installed (100% of sites identified in NPS inventory addressed)	USDA-NRCS yearly status reviews; before and after photos; pollutant reduction calculations; water quality monitoring; TMDL report	USDA-NRCS

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6-10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Implement vegetative buffering practices.	Buffer/filter strips; native plantings	781 acres of filter strips 8 acres of riparian forest buffer	Install 601 miles of buffer/filter strips (assuming buffer = 50 ft wide, approx. 3,642 acres); native plantings	Install an additional 602 miles of buffer/filter strips (assuming buffer = 50 ft wide, approx. 3,648 acres); native plantings	Number of miles on which BMPs were implemented (100% of riparian area noted as bare in NPS inventories is buffered)	USDA NRCS yearly status reviews; photos of BMPs installed; pollutant reduction calculations; water quality monitoring, water temperature	USDA-NRCS
		2,643 lft/87 acres of riparian land in preserves	Preserve 100 acres	Preserve an additional 100 acres	Number of lft/acres of riparian land in preserves	Pollutant reductions following conservation easement calculations	Land Conservancies
		50+ people trained on the use of native vegetation	Train 50 people on the use of native vegetation	Train 50 people on the use of native vegetation.	Number of employees trained on the use of native vegetation	Water quality monitoring	County Parks
		100+ people trained on reduced mowing	Train 50 people on reduced mowing	Train 50 people on reduced mowing	Number of employees trained on reduced mowing	Water quality monitoring	County Parks
	Buffer overlay zone	2 governments adopted stream buffer ordinance	Buffer ordinance adopted by 4 counties in LGRW	Buffer ordinance adopted by an additional 4 counties in LGRW	Adoption of stream buffer ordinances by 100% of the counties in the LGRW (total 10 counties)	Water quality monitoring	Drain Commissioners/ Local Governments
	Conservation Easements	32,696 lft/3,744 acres of riparian land in conservation easements	3,700 acres in conservation easements	3,700 acres in conservation easements	Number of lft/acres of riparian land in conservation easements	Pollutant reductions following conservation easement calculations	Land Conservancies

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6-10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Encourage proper septic tank management.	Repair or replace aging septic systems	899 permits were issued for system repairs	3,468 septic systems repaired or replaced	An additional 3,468 septic systems repaired or replaced	Number of system repairs (total of 6,936 septic systems needing repair/replacement, 100% repaired/ replaced)	Water quality monitoring, photos of BMP installation	Health Departments
	Recommend regular inspection and maintenance of septic systems through septic ordinance	12,344 inspections (2,720 showed signs of failure/health risks)	12,000 inspections	12,000 inspections	Number of inspections	Number of repairs made to septic systems identified as needing repair, water quality monitoring	Health Departments
	Identify and correct illicit discharge connections	27 illicit connection correction	Identify and correct all illicit connections found in future NPS inspections	Identify and correct all illicit connections found in future NPS inspections	Number of illicit connection corrections	Water quality monitoring	Drain Commissioners/ Local Governments
	Cluster septic systems for small lot development	Unknown	Identify areas needing cluster septic systems	Install systems in identified areas	Number of cluster septic systems installed	Water quality monitoring	Health Departments
Encourage septage ordinance.	Recommend regular inspection and maintenance of septic systems through septic ordinance	Barry-Eaton District Health Department enacted regulations to inspect septic systems	Draft septage ordinance	Adopt and implement ordinance for communities in the Watershed	Number of communities in the Watershed adopting the ordinance	Ordinance status	Local Governments, Health Departments

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6-10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Implement LID practices	Bioretention (Rain Gardens)	Unknown	Install 13 rain gardens (1,000 cft each)	Install 14 rain gardens (1,000 cft each)	Number of rain gardens planted, rain gardens installed in Buck Creek, Sand Creek and Indian Mill Creek, as identified in NPS inventory	Water quality monitoring	Subwatersheds
	Capture/Reuse (Rain barrels, cisterns)	Unknown	Install 6 rain barrels	Install 7 rain barrels	Number of practices implemented for storm water recapture/reuse, rain barrels installed on sites in Sand Creek and Plaster Creek which were identified in NPS inventory as having erosion problems from residential drain pipes	Pollutant reduction calculations	Local Governments
	Vegetated roof	Unknown	Install 1 vegetated roof	Install 1 vegetated roof	Number of vegetated roofs planted	Pollutant reduction calculations, water quality monitoring	Local Governments
	Vegetated swale	13 acres of grassed waterways	Install 13 acres of grassed waterways (approx. 11,326 ft long x 50 ft wide)	Install 13 acres of grassed waterways (approx. 11,326 ft long x 50 ft wide)	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Water quality monitoring	USDA-NRCS
	Infiltration practices (dry wells, infiltration basins, infiltration berms, infiltration trenches, subsurface infiltration beds, bioretention, level spreaders)	Unknown	Install 5 infiltration BMPs	Install 5 infiltration BMPs	Number of BMPs installed using infiltration practices	Water quality monitoring	Drain Commissioners
	Pervious pavement	Unknown	Install pervious pavement at 1 site in Sand Creek Subwatershed (area to be determined)	Install pervious pavement at 1 site in Sand Creek Subwatershed (area to be determined)	Acres of pervious pavement installed, 100% of the sites identified in NPS inventory are addressed	Reduction of percent imperviousness in urbanized area	Local Governments

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6-10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Implement MDNR wildlife population management practices.	Egg shaking, buffer strips, birth control	2 "no feeding" signs; 3 shore buffers	Control geese and other wildlife populations by inventorying subwatersheds to identify problem sites	Control geese and other wildlife populations at 50% of sites identified in inventory	Number of “no feeding” signs installed; lft of shore buffers installed	Adoption/enforcement of goose management practices, Water quality monitoring	County Parks/ Local Governments
Implement sanitary sewer maintenance practices.	Maintain and repair sanitary sewer system as needed. Increase capacity at WWTPs as population growth increases to avoid overflows	7.3 miles and 17 additional repairs	Repair 5 miles of sanitary sewer system	Repair 5 miles of sanitary sewer system	Number of repairs or miles of sanitary sewer repair. Increases in WWTP capacity	Water quality monitoring	Local Governments
Implement cropland management practices.	Crop residue management; cover crop; field tile management; critical area planting; wetland restoration	5,346 acres of residue management	Address 5,405 acres through BMP implementation (approx. 3% of cropland in critical areas needing additional practices)	Address 5,405 acres through BMP implementation (approx. 3% of cropland in critical areas needing additional practices)	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Pollutant reduction calculations	USDA-NRCS
		1,849 acres of cover crop	Implement 2,000 acres of cover crop	Implement 2,000 acres of cover crop	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Pollutant reduction calculations	USDA-NRCS
		11.6 acres of critical area plantings	Implement 50 acres of critical area plantings	Implement 50 acres of critical area plantings	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Pollutant reduction calculations	USDA-NRCS
		467 acres of wetland restoration	Construct 600 acres of wetland restoration	Construct 600 acres of wetland restoration	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Pollutant reduction calculations	USDA-NRCS

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6-10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Implement Proper SESC techniques.	SESC measures following approved SESC plan.	144 SESC violations	Inspect construction sites in the Watershed, work with site manager so there are no SESC violations	Inspect construction sites in the Watershed, work with site manager so there are no SESC violations	Number of SESC violations corrected	Pollutant reduction calculations	Local Governments
Implement streambank stabilization, bio-engineering, and erosion control techniques.	Streambank stabilization	4,700 ft of streambank and shoreline protection	4,700 ft of streambank and shoreline protection (approx. 4% of streambank erosion sites identified in NPS inventories)	4,700 ft of streambank and shoreline protection (approx. 4% of streambank erosion sites identified in NPS inventories)	Number of ft on which BMPs were implemented using USDA-NRCS practice summary documentation	Pollutant reduction calculations	USDA-NRCS
	Hydrologic and morphologic studies; storm water design criteria	Unknown	Complete a hydrologic and morphologic study for 2 Watershed management units (approx. 14% of studies needed in Watershed)	Complete a hydrologic and morphologic study for 2 Watershed management units (approx. 14% of studies needed in Watershed)	Number of hydrologic and morphologic studies completed; number of storm water design criteria adopted	Meeting acceptable ratings in P51 in downstream waterbodies	MDNRE; Local Governments
	LID storm water criteria or ordinance for new development/redevel-opment projects/capital improvement projects	Ottawa County developed a modified ordinance, that allows or promotes LID techniques	Adopt and implement ordinance for communities in the Watershed	Policy Review Document – moving all highlighted items to addressed items	Adoption of a modified ordinance, that allows or promotes LID techniques	Ordinance status	Drain Commissioners
		3 governments adopted a storm water ordinance for channel protection	Adopt and implement ordinance for communities in the Watershed	Policy Review Document – moving all highlighted items to addressed items.	Adoption of storm water ordinances	Ordinance status	Local Governments
	Channel restoration; streambank stabilization	4,700 ft of streambank and shoreline protection	4,800 ft of streambank and shoreline protection (approx. 16% of channel restoration needed in critical areas in the Watershed)	4,800 ft of streambank and shoreline protection (approx. 16% of channel restoration needed in critical areas in the Watershed)	Number of ft on which BMPs were installed using USDA-NRCS practice summary documentation	Pollutant reduction calculations	USDA-NRCS

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6-10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Continued Implement streambank stabilization, bio-engineering, and erosion control techniques.	Buffer/filter strips	781 acres of filter strips	Install 820 acres of buffer/filter strips; native plantings (approx. 24% of un-vegetated riparian area in critical areas)	Install 820 acres of buffer/filter strips; native plantings (approx. 24% of un-vegetated riparian area in critical areas)	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Water quality monitoring	USDA-NRCS
		8 acres of riparian forest buffer	20 acres of riparian forest buffer installed	20 acres of riparian forest buffer installed	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Water quality monitoring	USDA-NRCS
		50+ people trained on the use of native vegetation	Train 50 people on the use of native vegetation	Train 50 people on the use of native vegetation	Employee trainings on native vegetation	Water quality monitoring	County Parks
		100+ people trained on reduced mowing	Train 50 people on reduced mowing	Train 50 people on reduced mowing	Employee trainings on reduced mowing	Water quality monitoring	County Parks
Reduce and control gully erosion.	Slope Stabilization	11 grade stabilization structures	Install 10 grade stabilization structures	Install 10 grade stabilization structures	Number of structures installed using USDA-NRCS practice summary documentation	Pollutant reduction calculations	USDA-NRCS
	Grassed waterways	13 acres of grassed waterways	Install 13 acres of grassed waterways (100% of gully erosion sites identified in NPS inventory are addressed)	Install 13 acres of grassed waterways	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Pollutant reduction calculations, water quality monitoring	USDA-NRCS

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6-10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Reduce and control lakeshore erosion.	No wake zone ordinance	Unknown	Draft "no wake zone" ordinance	Adopt ordinance.	Number of no wake ordinances adopted	Ordinance status	Local Governments
	Shoreline stabilization	4,700 ft of streambank and shoreline protection	5,020 ft of shoreline protection installed (approx. 5% of shoreline in critical areas needing stabilization)	5,020 ft of shoreline protection installed (approx. 5% of shoreline in critical areas needing stabilization)	Number of ft on which BMPs were implemented using USDA-NRCS practice summary documentation	Pollutant reduction calculations	USDA-NRCS
Implement proper fertilizer application practices.	Nutrient Management Plans	Unknown	Develop 5 Nutrient Management Plans	Develop 5 Nutrient Management Plans	Number of nutrient management plans developed	Water quality monitoring	USDA-NRCS
Restore and protect wetlands.	Wetland restoration; constructed wetlands	467 acres of wetland restoration, 2.2 acres of created wetland, 1.9 acres of wetland enhancement	Construct 600 acres of wetland restoration	Construct 600 acres of wetland restoration	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Pollutant reduction calculations	USDA-NRCS
	Wetlands ordinance	Unknown	Draft wetland ordinance	Adopt wetlands ordinance	Number of communities that have adopted the wetlands ordinances	Water quality monitoring, wetland functional assessment	Local Governments
Encourage proper pet waste management.	Pet waste ordinance	Unknown	Draft ordinance	Adopt ordinance	Number of communities that have adopted the ordinance	Pollutant reduction calculations	Local Governments

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6 -10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Minimize the impact of tiles and drainage networks on hydrology.	Field tile management	Unknown	Identify extent of field tile impacted water bodies	Install field tile management practices at 10 identified sites	Number of field tile management systems used	Pollutant reduction calculations, water quality monitoring	USDA-NRCS
	Tile outlet repair	Unknown	Repair/replace 40 tile outlets (50% of sites identified in NPS inventory)	Repair/replace 40 tile outlets (50% of sites identified in NPS inventory)	Number of tile outlet repairs, 100% of sites identified in NPS inventory are addressed	Pollutant reduction calculations, water quality monitoring	USDA-NRCS
Restore and protect floodplains.	Floodplain mapping overlay district	2 governments adopted floodplain ordinance	Adopt hazard mitigation plans in 10 communities (approx. 20% of communities located in Watershed that need a hazard mitigation plan)	Adopt hazard mitigation plans in 10 communities (approx. 20% of communities located in Watershed that need a hazard mitigation plan)	Adoption of floodplain ordinances/plans	Status of ordinance	Local Governments
	Reconnect floodplains	1,437 acres of parks acquired that protect water quality	Identification of areas to acquire that protect water quality	1,500 acres acquired of parkland to protect water quality	Number of acres of protected floodplain	Pollutant reductions based on conservation easement calculations	County Parks
Use alternative techniques and stream restoration practices (e.g., two-stage channel design, in-stream structures) when drain maintenance is necessary.	Alternative drain maintenance and stream restoration techniques (e.g., two-stage channel design, in-stream structures)	None	10,000 ft of alternative drain maintenance and stream restoration techniques	10,000 ft of alternative drain maintenance and stream restoration techniques	Number of ft of alternative drain maintenance and stream restoration techniques installed	Pollutant reduction calculations, water quality monitoring	Drain Commissioners

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6 -10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Restore and protect the stream buffer and canopy.	Buffer/filter strips; native plantings	781 acres of filter strips	Install 820 acres of buffer/filter strips; native plantings (approx. 24% of un-vegetated riparian area in critical areas)	Install 820 acres of buffer/filter strips; native plantings (approx. 24% of un-vegetated riparian area in critical areas)	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Water quality monitoring	USDA-NRCS
		8 acres of riparian forest buffer	20 acres of riparian forest buffer installed	20 acres of riparian forest buffer installed	Number of acres on which BMPs were implemented using USDA-NRCS practice summary documentation	Water quality monitoring	USDA-NRCS
	Buffer overlay zone	2 governments adopted stream buffer ordinance	Buffer ordinance adopted by 4 counties in LGRW	Buffer ordinance adopted by an additional 4 counties in LGRW	Adoption of stream buffer ordinances by 100% of the counties in the LGRW (total 10 counties)	Water quality monitoring	Drain Commissioners/ Local Governments
Implement turf management practices.	Turf management practices	100+ people trained on turf management practices	Train 50 people on turf management practices	Train 50 people on turf management practices	Number of employee training sessions on proper use of pesticides, herbicides, and fertilizers	Water quality monitoring	County Parks/ Local Governments
		3 training sessions in Walker on proper storage and disposal of chemicals and other O&M materials	5 training sessions in Watershed on proper storage and disposal of chemicals and other O&M materials	5 training sessions in Watershed on proper storage and disposal of chemicals and other O&M materials	Number of employee training sessions on proper storage and disposal of chemicals and other O&M materials	Water quality monitoring	Local Governments

Table 6.2 – Measurable Milestones

Objectives	Recommended Prioritized BMPs*	BMPs Installed Between 2004 to 2009	Measurable Milestones (1-5 years) Based on Column C	Measurable Milestones (6 -10 years) Based on Column C	Components for Monitoring Progress on Implementation	Evaluation Criteria for Determining Water Quality Improvements	Responsible Evaluation Partner
Implement invasive species management practices	Invasive species management practices	Unknown	Train 50 people on invasive species management practices	Train 50 people on invasive species management practices	Number of employee training sessions on managing invasive species	Water quality monitoring	County Parks/ Local Governments
Reduce and control industrial emissions and discharges.	Follow appropriate guidelines/regulations.	Unknown	5 training sessions in Watershed on guidelines for industrial emissions and discharges	5 training sessions in Watershed on guidelines for industrial emissions and discharges	Number of training sessions, number of held permits	Water quality monitoring	MDNRE
*Sources from BMP selection in Appendix 6.1a & 6.1b.							
Measurements from accomplishment questionnaires							
Measurements from NRCS data sheets							

BMP	Best Management Practices
CDs	Conservation Districts
cft	cubic foot
CNMP	Comprehensive Nutrient Management Plan
LID	Low Impact Development
lft	linear feet
LGRW	Lower Grand River Watershed
MSUE	Michigan State University Extension
MDNRE	Michigan Department of Natural Resources and Environment
NPS	Nonpoint Source
NRCS	USDA Natural Resources Conservation Service
O&M	Operation and Maintenance
SESC	Soil Erosion and Sedimentation Control
sft	square foot
USDA	U.S. Department of Agriculture
WWTP	Wastewater Treatment Plant

6.7 ESTIMATED POLLUTION REDUCTIONS FROM PROPOSED ACTIONS AND BMPS

WMPs need to set goals for reductions and a methodology for reaching reductions where an approved or pending total maximum daily loads (TMDL) exists, which includes 16 subwatershed management units as listed in Table 3.2. WMPs also need to establish goals for reductions for other impairments found or known in the Watershed. Conserving and preserving waterbodies that are currently meeting water quality standards is also a goal of this WMP.

The general MS4 Permit requirements for a TMDL in the Watershed General Permit, Part I.A.b.1, indicate that the Storm Water Pollution Prevention Initiative (SWPPI) or Storm Water Management Program (SWMP) shall identify and prioritize actions to reduce pollutants in storm water discharges from the MS4 to make progress in meeting Water Quality Standards (WQS). These prioritized actions shall be reported to the Department as indicated in their Certificates of Coverage.

6.7.1 Pollutant Loadings and Reduction Goals

6.7.1.1 TMDL Goals

TMDL reports completed by the MDNRE address the water bodies currently listed as impaired, as previously listed in Table 3.2. For these areas where an NPS TMDL for the affected waters has already been developed and approved or is being developed, the goal is to achieve the load reductions called for in the NPS TMDL report.

6.7.1.2 Subwatershed Goals

In subwatersheds where an NPS TMDL has not yet been developed and approved or is not yet being developed, the goal is to reduce NPS pollutant loadings that are contributing to water quality threats and impairments. Where feasible, the goal is to meet water quality standards.

6.7.2 Calculated Pollutant Loadings and Reductions

Pollutant loadings for all 31 subwatershed management units are identified in Table 6.3. These loadings were calculated using the P-LOAD model and data from previous NPS pollution inventories. The estimated pollutant reductions from the NPS sites are included.

Twelve of these management units also have stream reaches with approved TMDLs. Pollutant loads, TMDLs, and needed pollutant reductions for these stream reaches are listed in Table 6.4 for subwatersheds with approved TMDLs for phosphorus, Table 6.5 for subwatersheds with approved TMDLs for biota, and Table 6.6 for subwatersheds with pending TMDLs for phosphorus. For the subwatersheds with approved TMDLs for pathogens, needed pollutant reductions are for all waters to meet water quality standards for *E. coli*.

6.7.3 Recommended Actions to Meet TMDL Goals

Tables 6.4 through 6.6 list the BMPs recommended to address the pollutant sources identified in the TMDL reports. Pollutant reductions were determined by site and for each subwatershed management unit. Tables 6.4 through 6.6 also indicate whether each TMDL in the Watershed will be met if the recommended BMPs are implemented. Calculations for the tables are included in Appendix 6.4.

6.7.4 Recommended Actions to Address Other Identified Impairments

Actions to reduce pollutants in subwatersheds without TMDL targeted reductions will strive to meet water quality standards as the measurement of success. Table 6.3 lists the estimated reductions in subwatersheds with found or known impairments.

As practices are implemented, as recommended in Table 6.1, pollutant reductions will continue to be calculated, and water quality assessed to determine progress toward meeting the TMDL goals and attaining water quality standards. Table 6.2 identifies the “Responsible Evaluation Partner”, who will take the lead in monitoring specific BMPs during implementation. Chapter 8 provides additional information about the approach to the evaluation measures. The feasible and attainable goals for BMP implementation were set for each objective, and measureable milestones were described for 5 years and 10 years. If substantial progress toward meeting the TMDL goals is not being made, implementation schedules and practices will then be adjusted to ensure that the TMDL goals will be met.

Table 6.3 – Pollutant Loadings and Expected Reductions from NPS Sites

Subwatershed Management Unit (SMU) **(BOLD = approved TMDL exists in SMU)**	Sediment	Phosphorus	Nitrogen	BMPs Recommended (Information only for those SMUs inventoried, from Table 6.1)	Reductions Expected from NPS Sites		
	Total Sediment Loading (NPS + P-LOAD) (tons/yr)	Total Phosphorus Loading (NPS + P-LOAD) (lbs/yr)	Total Nitrogen Content Loading (NPS + P-LOAD) (lbs/yr)		Sediment (tons/yr)	Phosphorus (lbs/yr)	Nitrogen (lbs/yr)
Direct Drainage to Lower Grand River (includes Sediment TMDL for York Creek and *E. coli* TMDL for the Grand River)	4,676	118,380	686,410				
Rogue River (Lower & Upper Rogue)	4,049	50,936	291,252	Cattle exclusion, controlled access, cattle crossing, alternative watering source, crop residue management, cover crop, field tile management, critical area planting, wetland restoration, streambank stabilization, and channel restoration	2,148	1,826	3,652
Coldwater River	1,620	21,846	129,374	Cattle exclusion, controlled access, cattle crossing, alternative watering source, buffer/filter strips, turf management practices, bioretention, capture/reuse, vegetated roof, pervious pavement, crop residue management, cover crop, field tile management, critical area planting, wetland restoration, streambank stabilization, slope stabilization, grassed waterways	483	427	854
Upper Thornapple River	1,584	32,689	198,190				
Lower Thornapple River	1,452	22,890	133,690				
Plaster Creek	1,347	16,077	89,154	Buffer/filter strips, turf management practices, bioretention, capture/reuse, vegetated roof, pervious pavement, crop residue management, cover crop, field tile management, SESC measures following approved SESC plan, streambank stabilization, slope stabilization, grassed waterways, tile outlet repair	32	27	54
Upper Flat River	1,239	29,150	174,000				
Buck Creek	1,025	28,061	153,436	Cattle exclusion, controlled access, cattle crossing, alternative watering source, buffer/filter strips, turf management practices, bioretention, capture/reuse, vegetated roof, pervious pavement, SESC measures following approved SESC plan, streambank stabilization, slope stabilization, grassed waterways, tile outlet repair	25	21	36
Crockery Creek	850	18,340	107,730				
Lower Flat River	833	24,920	144,320				
Rush Creek	742	18,330	103,000				
Coopers, Clear, and Black Creeks	637	16,680	100,640				
Prairie Creek	600	23,430	143,660				

Table 6.3 – Pollutant Loadings and Expected Reductions from NPS Sites

Subwatershed Management Unit (SMU) **(BOLD = approved TMDL exists in SMU)**	Sediment	Phosphorus	Nitrogen	BMPs Recommended (Information only for those SMUs inventoried, from Table 6.1)	Reductions Expected from NPS Sites		
	Total Sediment Loading (NPS + P-LOAD) (tons/yr)	Total Phosphorus Loading (NPS + P-LOAD) (lbs/yr)	Total Nitrogen Content Loading (NPS + P-LOAD) (lbs/yr)		Sediment (tons/yr)	Phosphorus (lbs/yr)	Nitrogen (lbs/yr)
Sand Creek	457	12,620	75,200				
Dickerson Creek	422	16,800	101,300				
Spring Lake/Norris Creek	371	8,930	52,600				
Mud Creek	350	6,384	38,765				
Libhart Creek	339	9,280	55,440				
Bass River	303	6,380	38,801	Buffer/filter strips, turf management practices, bioretention, capture/reuse, vegetated roof, pervious pavement, crop residue management, cover crop, field tile management, critical area planting, wetland restoration, streambank stabilization, slope stabilization, grassed waterways, tile outlet repair	1	0	1
Wabasis and Beaver Dam Creek	294	6,230	36,500				
Indian Mill Creek	395	7,545	42,689	Cattle exclusion, controlled access, cattle crossing, alternative watering source, buffer/filter strips, turf management practices, bioretention, capture/reuse, vegetated roof, pervious pavement, crop residue management, cover crop, field tile management, critical area planting, wetland restoration, SESC measures following approved SESC plan, streambank stabilization, slope stabilization, grassed waterways, tile outlet repair	113	95	189
Deer Creek	251	3,600	20,913	Cattle exclusion, controlled access, cattle crossing, alternative watering source, buffer/filter strips, turf management practices, bioretention, capture/reuse, vegetated roof, pervious pavement, crop residue management, cover crop, field tile management, critical area planting, wetland restoration, SESC measures following approved SESC plan, streambank stabilization, slope stabilization, grassed waterways, tile outlet repair	7	0	13
Cedar Creek	238	9,690	57,600				
Bear Creek	209	3,690	21,600				
Lake Creek	202	3,330	19,200				
Mill Creek	200	7,420	43,300				
Total:	**25,388**	**536,088**	**3,134,443**		**2,809**	**2,396**	**4,798**

6.4 – Reduction Goals for Phosphorus in Approved TMDL Subwatershed

Subwatershed Management Unit (SMU)	Source (Identified in TMDL Report)	BMPs Needed Based on Table 6.1	Percent of Total Acres Where BMP Is Proposed	BMP Efficiency*	Loading Estimates** (lbs/year)	Estimated Reduction (lbs/year) from BMPs ***	Reduction Needed	TMDL Met
Morrison Lake (Lake Creek)	MDOT MS4 (WLA)	No MDOT BMPs identified	NA	NA	0.09	0	NA	
	3,428 acres of agriculture, 1,143 acres of forest, grass & pasture (LA)	Cropland management (50% of acres need additional management practices)	50%	100%	801.92	400.5[D]	529	
		Waste storage facility (No CAFOs, approx. 21 smaller farms (avg. 160 acres), 25% need mgt practices	24.5%[A]	100%		200.3[E]		
		CNMP (No CAFOs, approx. 21 smaller farms (avg. 160 acres), 75% need management practices	73.5%[B]	100%		588.7[F]		
		Buffer strips (43 miles of stream, 27% riparian area unbuffered, 11 miles of buffer needed)****	1.2 %[C]	80%		7.7[G]		
	59 acres residential direct drainage (LA)	Vegetated filter strips (buffers needed on 7 acres of residential land)[#]	NA	NA	4.7	2	2.35	
	5 acres residential - high density (LA)	Rain gardens	NA	NA		1		
		Porous pavement	NA	NA		1		
	59 acres of commercial (LA)	Infiltration basins (8 acres managed by infiltration basins)[#]	NA	NA	12.83	8	6.42	
	Precipitation	NA	NA	NA	99	NA	NA	
Total:					919	1,209.2	538	Yes

*See Appendix 6.1 for BMP efficiencies

**Reported in TMDL Report (http://www.michigan.gov/documents/deq/wb-swas-tmdl-morrisonlake_257835_7.pdf) Table 10

*** Agricultural practices calculated from efficiencies, urban reductions calculated from STEPL Model (Worksheets in Appendix 6.4)

****ACOE Sediment Transport study estimate (USACE, W.F. Baird & Associates Ltd., *Grand River Sediment Transport Modeling Study,* May 23, 2007**.)**

[#]Estimated quantity based on Phosphorus load in TMDL report to enter into STEPL

A: 21*160*0.25 = 840 acres need mgt practices; 840/3428*100 = 24.5%

B: 21*160*0.75 = 2520 acres need mgt practices: 2520/3428*100 = 73.5%

C: (11 miles*5280 ft/mi*30 ft wide buffer)/43560 ft/ac = 40 acres; 40/3428 = 1.2%

D: (load*percent total acres addressed*BMP efficiency): 801*0.5*1 = 400.5

E: (load*percent total acres addressed*BMP efficiency): 801*0.25*1 = 200.3

F: (load*percent total acres addressed*BMP efficiency): 801*0.735*1 = 588.7

G: (load*percent total acres addressed*BMP efficiency): 801*0.012*0.8 = 7.7

BMP best management practices

CNMP Comprehensive Nutrient Management Plan

SMU subwatershed management unit

TMDL total maximum daily loads

Table 6.5 – TMDL Reduction Goals for Biota

Subwatershed Management Unit (SMU)	Source (Identified in TMDL Report [WLA or LA] and NPS Inventory)	BMPs (All BMPs Recommended Go Above & Beyond the MS4 Permit)	Sediment Load from TMDL Report (tons/yr)	Estimated Reduction (tons/yr) from BMPs on NPS Sites	Estimated Reduction (tons/yr) from BMPs Over Entire SMU	Reduction Needed from TMDL Report (tons/yr)	TMDL Load Met
York Creek (Direct Drainage to Lower Grand River)	Urban Storm Water (WLA)	84 acres of residential contribution identified in Table 2 of TMDL report (10% of 838) treated with infiltration basins	154.41	NA	9.7 [A]	2.81	**Yes** (Total of 11.7 tons reduced from Agricultural and Urban sources exceeds the WLA and LA reductions needed from the TMDL report of 7.80 tons)
	Agricultural Runoff (LA)	Buffer strips (0.5 miles of stream identified in Figure 2 of TMDL report, 27% riparian area unbuffered [1], 0.135 miles of buffer needed*0.01 miles contributing width = 0.00135 sq.mi. = 0.864 acres)	16.04	NA	2 [A]	4.99	
Plaster Creek	Urban Storm Water (WLA)	14 rain gardens (average 0.5 acres contributing area with storm sewers)	1,676.26	NA	0.8 [A]	406.23	**Yes** (Total of 771.1 tons reduced from Agricultural and Urban sources exceeds the WLA and LA reductions needed from the TMDL report of 406.23 tons)
	Urban Storm Water (WLA)	6 sites of Soil Erosion and Sedimentation Control practice – settling basins (avg. 0.5 acres)		NA	0.4 [A]		
	Urban Storm Water (WLA)	100 contributing acres of transportation for water quality inlets		NA	41.8 [A]		
	Agricultural Runoff (LA)	Buffer strips (91 miles of stream identified in WMP, 27% riparian area unbuffered [1], 25 miles of buffer needed*25% implementation = 6.25 miles*0.01 miles contributing width = 0.0625 sq.mi. = 40 acres)		NA	63 [A]		
	Cropland – Gully Erosion (LA)	1 grassed waterway [2]		1.1 [B]	NA		
	Cropland – Tile Outlet Erosion (LA)	2 tile outlet repair [2]		0.2 [B]	NA		
	Cropland Erosion (LA)	2 fields (avg. 40 acres) reduced tillage practices [2]		NA	623 [A]		
	Road/Stream Crossings (LA)	6 stream crossing stabilizations [2]		15.8 [B]	NA		
	Streambank Erosion (LA)	8 streambank stabilization [2]		31 [B]	NA		

Table 6.5 – TMDL Reduction Goals for Biota

Subwatershed Management Unit (SMU)	Source (Identified in TMDL Report [WLA or LA] and NPS Inventory)	BMPs (All BMPs Recommended Go Above & Beyond the MS4 Permit)	Sediment Load from TMDL Report (tons/yr)	Estimated Reduction (tons/yr) from BMPs on NPS Sites	Estimated Reduction (tons/yr) from BMPs Over Entire SMU	Reduction Needed from TMDL Report (tons/yr)	TMDL Load Met
Sand Creek	Urban Storm Water (WLA)	No urban BMPs identified	1,053.17	NA	NA	134.73	**Yes** (Total of 1,204.5 tons reduced from NPS Agricultural sources exceeds WLA and LA reductions needed from the TMDL report of 395.68 tons)
	NPS Agriculture (LA)	19 streambank erosion sites treated with stream stabilizations	582.13	997.5 [A]	NA	260.95	
		6 gully erosion treated with grassed waterways		207 [A]	NA		
Bass River	Urban Storm Water (WLA)	653 acres of unsewered residential contribution identified in Table 2 of TMDL report (10% of 6,537) treated with infiltration basins	731.00	NA	37.7 [A]	25.62	**Yes** (Total of 647.4 tons reduced from Agricultural and Urban sources exceeds the WLA and LA reductions needed from the TMDL report of 264.55 tons)
	Urban Storm Water (WLA)	19 sites of urban runoff - vegetated buffer strip (7 miles of urban stream, identified by NPS inventory, 27% riparian area unbuffered [1], 1.9 miles of buffer needed*0.01 miles contributing width = 0.019 sq.mi. = 12.2 acres)		NA	0.7 [A]		
	NPS Agriculture (LA)	2 tile outlet repair, 1 stream crossing stabilization	626.13	1 [B]	NA	238.92	
	NPS Agriculture – Cropland (LA)	123 acres of Cropland (1% of 12,349 acres in TMDL report) with reduced tillage practices		NA	609 [A]		
Strawberry Creek (Mill Creek)	Urban Storm Water (WLA)	TMDL report indicated 93 acres impervious pavement, treat 15% (14 acres) with porous pavement	72.07	NA	8 [A]	7.27	**Yes** (Total of 8 tons reduced from Urban sources exceeds the WLA reduction needed from the TMDL report of 7.27 tons)
	NPS Agriculture (LA)	Buffer strips (3 miles of stream identified in Figure 2 of TMDL report as unbuffered*0.01 miles contributing width = 0.03 sq.mi. = 19.2 acres)	31.53	NA	33 [A]	11.63	**Yes** (Total of 33 tons reduced from Agricultural sources exceeds the LA reductions needed from the TMDL report of 11.63 tons)

[1] ACOE Sediment Transport study estimate. (USACE, W.F. Baird & Associates Ltd., *Grand River Sediment Transport Modeling Study*, May 23, 2007)
[2] From NPS Inventory, See Table 3.3 [3] From Plaster Creek WMP, 2007
[A] Calculated from STEPL (See Appendix 6.4 for TMDL spreadsheets and calculations)
[B] Calculated from MDEQ Pollutant Reduction Calculation Manual, See Table 4.1b.

BMP Best Management Practices
MS4 Municipal Separate Storm Sewer System
NPS Nonpoint Source
SMU Subwatershed Management Unit
TMDL Total Maximum Daily Loads

Table 6.6 – TMDL Reduction Goals for Phosphorus

Subwatershed Management Unit (SMU)	P-LOAD Phosphorus Load	Source (Identified in TMDL Report)	BMPs	BMP Efficiency[1]	Estimated Reduction from BMPs on NPS Sites[2]	Estimated Reduction from BMPs Over Entire SMU	Reduction Needed[3]	TMDL Met
Deer Creek	3,600	Urban runoff	7 sites for buffers on urban stream, 2 SESC enforcement	80%	NA	unknown	TBD	TBD
		NPS Agriculture	9 sites of residue management, 2 streambank erosion, 4 tile outlet repair, 2 stream crossing stabilization	100%	2,880	NA	TBD	TBD
		NPS Animal Feeding Operations	9 sites of manure management, 4 livestock exclusion	100%				
Total:	**3,600**				2,880	0	0	

[1]See References in Appendix 6.1
[2]Using P-LOAD if no NPS calculated
[3]TMDL is scheduled for 2012 and the reduction needed will be determined at that time.

BMP Best Management Practice
NPS Nonpoint Source
SESC Soil Erosion and Sedimentation Control
SMU Subwatershed Management Unit
TBD To Be Determined
TMDL Total Maximum Daily Load

6.8 ACTION PLAN IMPLEMENTATION

The Action Plans outlined in Tables 6.1a and 6.1b present a long-term implementation strategy for LGRW to begin installing and adopting measures to restore, protect, and maintain the designated uses in the Watershed. The following steps outline the basic strategy and include references to specific sections, figures, or appendices of this WMP to assist in its user friendliness.

1. Select the high priority subwatershed management unit for restoration and areas for protection/preservation of interest. (Sections 4.4 and 4.5, Figures 4.1 and 4.2, Appendices).
2. Review the prioritized pollutants, sources, and causes for that subwatershed (Table 4.1).
3. Select the top priority pollutant to address.
4. Contact LGROW with assistance in establishing a Watershed organization for this subwatershed management unit if one does not exist.
5. Organize a meeting of a Steering Committee to review selection (Chapter 1, Appendix 1.1, and Chapter 9).
6. Review the BMPs identified for the selected subwatershed management unit (Tables 6.1a and 6.1b).
7. Consider which of these BMPs is the most feasible to implement based on pollutant removal efficiency, available funding, and public interests (Appendix 6.2).
8. Select a BMP or a system of BMPs to implement and evaluation measures (Table 6.3 and Table 8.1). Solicit participation from community partners for technical and financial assistance (Table 6.1a and Table 6.1b).
9. Apply for funding. (Table 6.1a, Table 6.1b, Chapter 9).