

West Michigan Watershed Summary



West Michigan Prosperity Alliance
Region 4

Cover Photos

Top row, from left: Lighthouse, Muskegon County Convention and Visitors Bureau; Steelhead Trout on Rogue River, Todd McClelland; Duck Lake, West Michigan Shoreline Regional Development Commission; road-stream crossing inventory on Buck Creek, Christopher Struck

Second row, from left: Grand Haven Pier, Christopher Struck; sailboats: West Michigan Shoreline Regional Development Commission; fishermen in the Grand River, Brian Zuber; Lake Macatawa channel and lighthouse, Macatawa Area Coordinating Council

Bottom row from left: Grand Haven Pier; kayaking in the Macatawa River, Macatawa Area Coordinating Council; Kirk Park Beach, Kelly Goward

Table of Contents

| | |
|--|----|
| List of Tables | ii |
| List of Figures | ii |
| Acronyms | ii |
| Chapter 1: INTRODUCTION | 1 |
| 1.1 Purpose | 1 |
| 1.2 Background | 1 |
| 1.3 Goals and Objectives..... | 2 |
| Chapter 2: WEST MICHIGAN | 4 |
| 2.1 Current Collaboration Efforts..... | 5 |
| 2.2 West Michigan Water Quality Planning and Statewide and Regional Great Lakes Plans..... | 5 |
| Michigan Water Strategy | 5 |
| Lake Michigan Lakewide Management Plan..... | 6 |
| Great Lakes Restoration Initiative Action Plan II | 6 |
| West Michigan Areas of Concern..... | 7 |
| Chapter 3: WATERSHED MANAGEMENT | 8 |
| 3.1 Why Watershed Management?..... | 8 |
| 3.2 Status of Watershed Management in West Michigan..... | 9 |
| 3.3 Challenges of Watershed Management | 12 |
| Funding | 12 |
| Staffing | 12 |
| Community Participation | 13 |
| Policy and Decision Makers | 13 |
| Chapter 4: FUTURE NEEDS | 14 |
| 4.1 Regional Budget | 14 |
| 4.2 Summary and Conclusions | 14 |
| 4.3 Next Steps | 14 |
| REFERENCES | 15 |

Appendix A: Watershed Summaries

List of Tables

| | |
|---|----|
| Table 1. Summary of Approved Management Plans in the West Michigan Prosperity Alliance..... | 10 |
| Table 2. Approved TMDLs within the West Michigan Prosperity Alliance | 11 |

List of Figures

| | |
|--|---|
| Figure 1. State of Michigan Prosperity Regions | 1 |
| Figure 2. Major watersheds within Prosperity Region 4..... | 2 |

Acronyms

AOC – Area of Concern

BUI – Beneficial Use Impairment

CMI – Clean Michigan Initiative

GLITF – Great Lakes Interagency Task Force

GVMC – Grand Valley Metropolitan Council

HUC – Hydrologic Unit Code

LAMP – Lakewide Area Management Plan

LGROW – Lower Grand River Organizations of Watersheds

MACC – Macatawa Area Coordinating Council

MDEQ – Michigan Department of Environmental Quality

MOGL – Michigan Office of the Great Lakes

MS4 – Municipal Separate Storm Sewer System

NPS – nonpoint source pollution

NPDES – National Pollutant Discharge Elimination System

TMDL – Total Maximum Daily Load

RPI – Regional Prosperity Initiative

USACE – United States Army Corps of Engineers

USEPA – United States Environmental Protection Agency

WMPA – West Michigan Prosperity Alliance

WMSRDC – West Michigan Shoreline Regional Development Commission

Chapter 1: INTRODUCTION

1.1 Purpose

West Michigan community leaders are tasked with building and sustaining a healthy and vibrant economy while protecting the environment and maintaining social equity. Clean water is critical in this triple bottom line model supporting business, industry, agriculture, wildlife, recreation, and community health and safety. Maintaining Lake Michigan water quality will spur economic development, improve wildlife habitat and enhance our quality of life. Other areas in the United States have successfully prioritized water quality and environmental issues with the help of organizations that use broad-based, public/private partnership approaches that bring the financial support needed to meet watershed management objectives and protect water resources.

The state of Michigan recognized that a comprehensive strategy is needed to address challenges in the Great Lakes. The Office of the Great Lakes drafted *Michigan's Water Strategy* in response to that need. The accompanying Blue Economy papers have been presented all over the state, explaining the connection between water quality and its importance to Michigan's continued recovery and sustainability. The *West Michigan Watershed Summary* outlines how to strengthen existing watershed-based organizations and secure the necessary funding to conduct water quality improvement projects that will have the greatest impact in this region.

Watershed partners in West Michigan value the quality of life and the economic benefits that come from abundant recreational opportunities, fresh water resources, and amazing scenic beauty. Regional and Metropolitan Planning Organizations collaborate with watershed groups, local communities, private landowners, state and federal agencies, and non-governmental organizations to implement projects that protect and improve natural resources. The partnerships help build capacity for local champions and communities. These collaborative planning strategies consider the long-term impact and sustainability of these projects.

1.2 Background

The Regional Prosperity Initiative (RPI) is a voluntary process led by Governor Rick Snyder to create vibrant regional economies. The Governor has identified 10 regions throughout the state (Figure 1) and has asked leaders from the sectors of regional planning, adult education, workforce development, transportation, and higher education, to pursue activities that promote prosperity. Region 4, also known as the West Michigan Prosperity Alliance (WMPA), is comprised of 13 counties: Allegan, Barry, Ionia, Kent, Lake, Mason, Mecosta, Montcalm, Muskegon, Newaygo, Oceana, Osceola, and Ottawa.

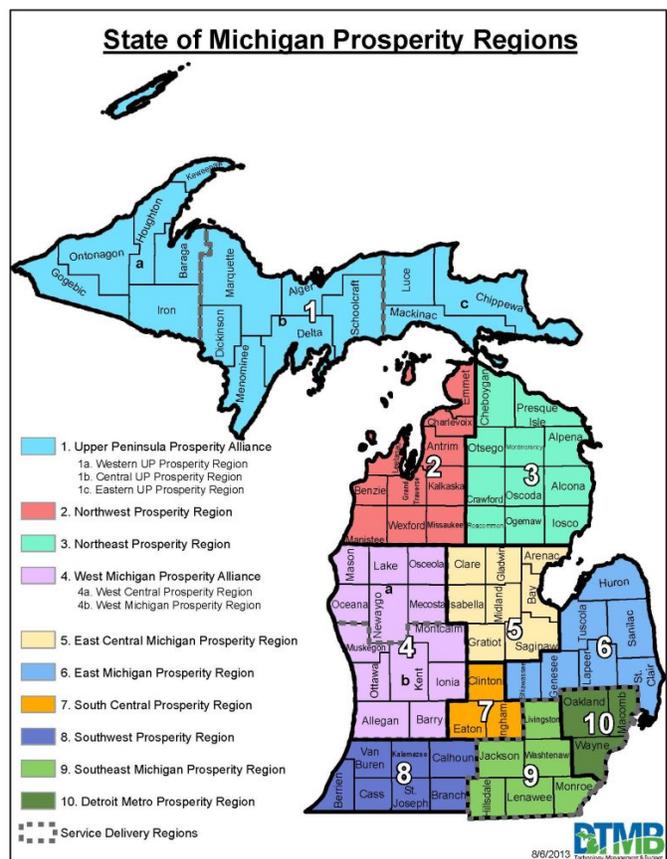


Figure 1. State of Michigan Prosperity Regions

In January 2014, the State of Michigan awarded the WMPA a \$250,000 grant to establish a 25-member Steering Committee. This Committee’s charge was to develop a *Regional Prosperity Plan* to identify projects of regional significance and fit the following criteria; long term impact and sustainability, regional impact, provide employment opportunities, recognize regional strengths and challenges, and promote public/private partnerships. Over the course of the year, more than 380 people participated in identifying and ranking the proposed projects, resulting in the selection of 5 projects.

The Macatawa Area Coordinating Council (MACC), in partnership with the Grand Valley Metropolitan Council (GVMC) and the West Michigan Shoreline Regional Development Commission (WMSRDC), submitted a project proposing the establishment of sustainable financial resources to protect Lake Michigan’s water quality. All 13 counties in the WMPA contain one or more watershed that drain into Lake Michigan (Figure 2). The Governor emphasized the importance of water as a competitive advantage for the state and for economic development. A dedicated region-wide revenue stream for watershed management is not only critical to support the Governor’s vision of clean water and economic development, but can also be used to attract additional state, federal, and private resources to the region.

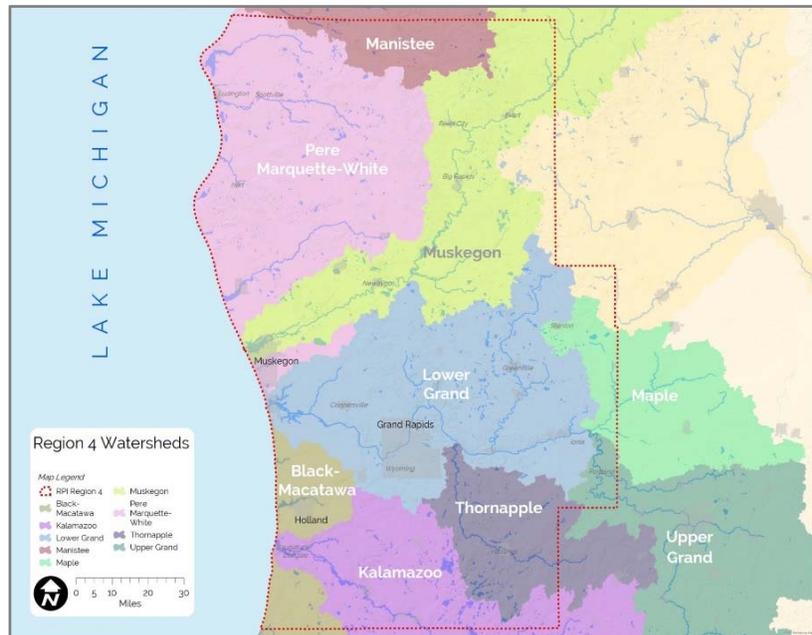


Figure 2. Major watersheds within Prosperity Region 4

1.3 Goals and Objectives

The process to complete this project began with the identification of the project team and defining its role. The team consists of staff from MACC, GVMC, and WMSRDC. The role of the team is to manage the project, recruit members and organize the West Michigan Watershed Collaborative (WMWC), coordinate the regional plan, hire and work with a funding consultant, and produce a final *Funding Strategies Report*.

The team’s focus was to seek solutions that could generate sustainable financial resources to help protect the water quality of Lake Michigan so that it remains a major economic asset. Funding generated will be distributed to local watershed organizations working under a federally approved watershed management plan. These plans, using both data and local stakeholder input, identified and prioritized the efforts that are needed most based on the unique challenges facing their individual watersheds.

The goals of the RPI sustainable funding study were identified as:

1. Develop a West Michigan Watershed Collaborative
2. Develop a Watershed Summary for West Michigan
3. Collect data to complete funding study
4. Draft a Funding Strategies Report

5. Engage local stakeholders and communities
6. Produce a Final Funding Strategies Report

The first meeting to form the WMWC was held June 23, 2015, in Grand Rapids, Michigan. The purpose of the meeting was to explain the goals of the project and gauge interest from watershed partners regarding the development of a regional watershed framework. Representatives from 23 watersheds within the WMPA attended the meeting and provided input on the project. The project team created a questionnaire to solicit information from each of the watersheds to use as the basis for assembling this *West Michigan Watershed Summary*. MACC staff used this information to create summaries for individual watersheds in the region with an approved management plan. Each summary includes a map of the watershed's location within the region, information about the management planning process, priority pollutants and goals, a brief implementation history, outreach and education strategies, financial needs, and more. Individual watershed summaries can be found in Appendix A.

An outcome of this project will be promoting and supporting public and private partnerships. Further, it will explore how to translate these partnerships into employment opportunities for people with a variety of skill levels in a variety of employment sectors, such as scientists, nursery operators, farmers, excavators, technicians, teachers, and program staff of watershed-based organizations. Sustainable funding sources will allow watershed-based organizations to expand the work that they are already doing to educate the public, conduct water quality monitoring, acquire key land for protection, and implement best management practices to protect high quality natural resources and water quality. Sustainable funding will also allow watershed-based organizations to go beyond these basic functions and enable them to address other pressing water quality issues in their local communities, including those related to social justice and reconnecting people with nature. Long-term economic payoffs could include greater fish abundance, lowered frequency of beach closures, reduced water treatment costs, improved water clarity, and increased recreational opportunities.

The *West Michigan Watershed Summary* provides the basis for a feasibility study of funding models to prepare the development of a sustainable watershed funding strategy. The WMWC serves as a Partnership Advisory Committee that ensures all watersheds' priorities are included in the process. A robust community engagement effort will be necessary to heighten the awareness of the residents and visitors on the importance of existing, functioning land coverage, natural resources, and water quality. This is needed to enhance what is currently being done for its protection.

As noted above, water resources are a strategic advantage for the state and are likely to become more so in the next 20-40 years. The state's effort can only be realized by implementation at a local and regional level. The West Michigan region has begun this work and will engage the Lake Michigan Watershed regions to the north and south to join and make sustainable funding for watershed restoration and natural resource protection a priority in their regional prosperity plans. As world demand for food and fiber continue to grow in the midst of extreme weather events, poor land use practices, stressed water resources, and lack of consistent environmental protections, Michigan and the Great Lakes regions need to be good stewards and implement the management of our water resources to the highest standards in order to meet these needs.

Chapter 2: WEST MICHIGAN

The West Michigan Watershed Collaborative is comprised of regional planning agencies, conservation organizations, and watershed groups who partner with local governments, state and federal agencies, and the public to improve water quality within the WMPA. The WMPA is an 8,163 square-mile area of the Lake Michigan Watershed with 130 miles of Lake Michigan shoreline. It is home to 13 counties extending from the lakeshore, 75 miles to the east, and into the heart of Michigan's Lower Peninsula.



Sand dunes near Saugatuck, MI. Photo credit: MACC.

Within the WMPA are 49 medium-sized watersheds (HUC 10) and significant portions of 10 major watersheds (HUC 8, see Figure 2), including the lower portions of the Muskegon River and the Grand River, Michigan's second longest and longest rivers, respectively. The rivers that enter Lake Michigan are unique drowned river mouth systems that are nestled within the largest assemblage of freshwater sand dunes in the entire world. The shoreline river mouths are classified as Great Lakes coastal wetlands, one of the most imperiled ecosystems in the nation (U.S. Fish and Wildlife Service). The West Michigan

Region 4: By the Numbers*

**According to the Regional Prosperity Plan for the West Michigan Prosperity Alliance Approved October, 2014*

- 341 Units of Government
- 1,532,851 people (15.5% of Michigan)
- 8,163 square miles, about the same size as the State of New Jersey
- 130 Miles of Lake Michigan Shoreline
- Over 10,000 employers
- Over \$5.7 billion in economic output
- From 2000-2012, gained 86,575 or 6% in population while overall Michigan lost 55,500 residents.
- Over 90,000 people commute into Region 4 to work
- 90+ school districts, 13 major colleges and universities, over 70,000 college students
- The 252-mile Grand River is the State's longest river.
- The Muskegon River is the State's second longest river at 216 miles.

drowned river mouths also provide critical habitat for the state threatened Lake Sturgeon as well as a number of other threatened or endangered fish species. Lake Michigan boasts the largest commercial fishery of any of the Great Lakes, harvesting an average of over 6.3 million pounds of fish each year at a value of over \$8.9 million (USACE, 2012).

West Michigan has a vibrant blue economy that relies on a healthy Lake Michigan and healthy rivers and streams. The City of Muskegon maintains the only major deep water port on Lake Michigan and is committed to expanding commercial use of the facility, making it central for economic development in West Michigan. Muskegon is also home of the Grand Valley State University's *Annis Water Resources Institute*, which provides opportunities for students and researchers to access Lake Michigan and the connected wetlands and streams. The Institute supports research, monitoring, and restoration efforts of many West Michigan Watersheds. Numerous Cities within the West Michigan Region, including Muskegon, Saugatuck, Allegan, Grand Rapids, and Kalamazoo, have been focusing on water placemaking. Many efforts have been undertaken by these cities to revitalize their waterfronts for the benefit of their residents, tourists, and economies. (Austin and Steinman, 2013)

2.1 Current Collaboration Efforts

West Michigan watershed groups have a long and successful history of collaboration and coordination among conservation organizations, local governments, and regional planning agencies who implement water quality plans and projects within the Lake Michigan Watershed. The organizations that are facilitating the coordination among the West Michigan Watershed Collaborative partners within the WMPA are the Macatawa Area Coordinating Council (MACC), Grand Valley Metropolitan Council (GVMC), and the West Michigan Shoreline Regional Development Commission (WMSRDC).

- The MACC is an inter-municipality study committee for the Holland urbanized area that encourages cooperation on issues of area wide importance. Among other responsibilities, the MACC oversees water quality planning and project implementation for the Macatawa Watershed. The Macatawa Watershed Project began in 1999 with the development of a phosphorus Total Maximum Daily Load for Lake Macatawa. The Watershed Project also provides assistance to six local communities in maintaining compliance with their State of Michigan Storm Water Discharge Permits.
- The GVMC is an alliance of governmental units in the West Michigan area that are appointed to plan for growth and development, improve the quality of the community's life, and coordinate governmental services. The Lower Grand River Organization of Watersheds (LGROW) is an agency of GVMC, dedicated to the preservation, monitoring, and improvement of the 2,909 square-mile Lower Grand River Watershed. LGROW oversees the implementation of the federally-approved *Lower Grand River Watershed Management Plan*, and provides planning and organizational assistance to watershed partners within the watershed. GVMC also provides assistance to 23 entities in meeting compliance requirements in their NPDES Storm Water Discharge Permits.
- The WMSRDC is a local, state, and federally recognized regional planning and development organization, designated to administer programs in transportation, economic development, hazard mitigation, land use, and water quality. As an area-wide water quality planning agency under section 208 of the Federal Clean Water Act. The WMSRDC provides information, planning assistance, and education for watershed partners to implement 12 watershed management plans. The WMSRDC develops plans and implements non-point source stormwater control and green infrastructure projects, reforestation, non-native invasive plant control, and large-scale fish and wildlife habitat restoration projects. The WMSRDC maintains a water quality inventory on the region's water quality plans, priorities, and watershed groups (WMSRDC, 2008).

2.2 West Michigan Water Quality Planning and Statewide and Regional Great Lakes Plans

The Watershed Summary compiles watershed priorities, best management practice implementation needs, and associated costs from watersheds in the region with Watershed Management Plans approved under current Clean Water Act, Section 319 criteria. It also provides a framework for future planning and prioritization of implementation according to local needs and the goals and priorities of three important statewide and regional plans: the Michigan Water Strategy, Lake Michigan Lake Action Management Plan, and the Great Lakes Restoration Initiative Action Plan II.

Michigan Water Strategy

This plan lays out a vision that Michigan's water resources support a healthy environment, healthy citizens, vibrant communities, and sustainable economies (MOGL, 2015). The strategy's framework is organized around 9 goals and outcomes designed to ensure the viability and sustainability of Michigan's water resources over time. It places Michigan on the path to achieve its water vision while building

economic capacity and sustaining ecological integrity of crucial aquatic resources for future generations. The Water Strategy includes 62 recommendations. They are a set of interconnected ideas designed to drive a new relationship between Michigan’s communities, governments, and residents to solve complex water challenges and create greater opportunities for economic and social well-being.

Lake Michigan Lake-wide Management Plan

The *Lake Michigan Lake-wide Management Plan* (LAMP) vision is of “a sustainable Lake Michigan ecosystem that ensures environmental integrity and that supports, and is supported by economically viable, healthy human communities” (USEPA, 2000). The primary goal “is to restore and protect the integrity of the Lake Michigan ecosystem through collaborative, place-based partnerships.” The LAMP focuses its efforts by collaborating to meet the vision and goals through monitoring the changing environmental conditions and adapting management strategies by addressing the following:

1. Can we eat any fish?
2. Can we drink the water?
3. Can we swim in the water?
4. Are habitats healthy, naturally diverse, and sufficient enough to sustain viable biological communities?
5. Does the public have access to abundant open space, shorelines, and natural areas, and does the public have enhanced opportunities for interaction with the Lake Michigan ecosystem?
6. Are land use, recreation, and economic activities sustainable and supportive of a healthy ecosystem?
7. Are sediment, air, land, and water sources or pathways of contamination that affect the integrity of the ecosystem?
8. Are aquatic and terrestrial nuisance species controlled and prevented?
9. Are ecosystem stewardship activities common and undertaken by public and private organizations in communities around the basin?
10. Is collaborative ecosystem management the basis for decision-making in the Lake Michigan basin?
11. Do we have enough information, data, understanding, and indicators to inform the decision-making process?
12. What is the status of the 33 Lake Michigan sub-watersheds?

The recently released LAMP Annual Report 2015 explains the status of activities that are working toward meeting its goals. The accomplishments related to fish & wildlife, habitat restoration, data and monitoring, and areas of concern are highlighted, in addition to how other challenges are being addressed in the basin. The full report can be accessed here:

<http://binational.net/wp-content/uploads/2016/01/LM-2015-Annual-Report-EN.pdf>

Great Lakes Restoration Initiative Action Plan II

The Great Lakes Restoration Initiative Action Plan II summarizes the actions that federal agencies plan to implement during FY 15-19 using Great Lakes Restoration Initiative funding – actions to protect and restore the largest fresh surface water system in the world (GLITF, 2014). These actions will focus on restoring fish and wildlife habitat, protecting native species and biodiversity, preventing and controlling invasive species, reducing nutrient runoff that contributes to harmful/nuisance algal blooms, and cleaning up Great Lakes Areas of Concern.

Great Lakes Areas of Concern

Great Lakes Areas of Concern (AOC) are designated under the Great Lakes Water Agreement as geographic areas “where significant impairment of beneficial uses has occurred as a result of human activities at the local level.” There were originally 31 AOCs in the Great Lakes Basin, but 4 have been delisted, including 1 recently within West Michigan, the White Lake AOC. There are 2 other AOCs within West Michigan: the Kalamazoo River and Muskegon Lake.

West Michigan Areas of Concern

White Lake

White Lake lies at the mouth of the White River. It is one of several West Michigan drowned river mouth, coastal wetland lakes, connected to Lake Michigan. The lake lies within the largest assemblage of freshwater dunes in the world. Because of historic industrial land use and waste disposal practices, the lake was declared an AOC in 1985. Due to intensive local, state and federal restoration and cleanup efforts, it was removed from the list of AOCs in 2014. Restoration efforts addressed contaminated sediments, algal blooms, the loss of fish and wildlife habitat, degraded populations and benthos.

Muskegon Lake

Muskegon Lake lies at the mouth of the Muskegon River, the second longest river in Michigan. It is one of several West Michigan drowned river mouth, coastal wetland lakes, connected to Lake Michigan. The lake lies within the largest assemblage of freshwater dunes in the world. Because of past industrial land use and waste disposal practices, the lake was declared an AOC in 1985. Due to intensive local, state and federal restoration and cleanup efforts, all cleanup and restoration projects needed to delist Muskegon Lake as an AOC have been completed, with final projects currently underway. Restoration efforts addressed contaminated sediments, the loss of fish and wildlife habitat, degraded populations, benthos, beach closings and algal blooms. The AOC is scheduled for delisting in 2019.

Kalamazoo River

An 80-mile stretch of the Kalamazoo River extending from Lake Michigan upstream to Morrow Dan was designated as an AOC in 1987. The primary reason for the listed was historic releases of PCBs, primarily from de-inking operations and paper mills located along the river. The Kalamazoo River is also listed as a Superfund site pursuant to the Michigan Natural Resources and Environmental Protection Act 451. There were 8 BUIs identified for the Kalamazoo River.

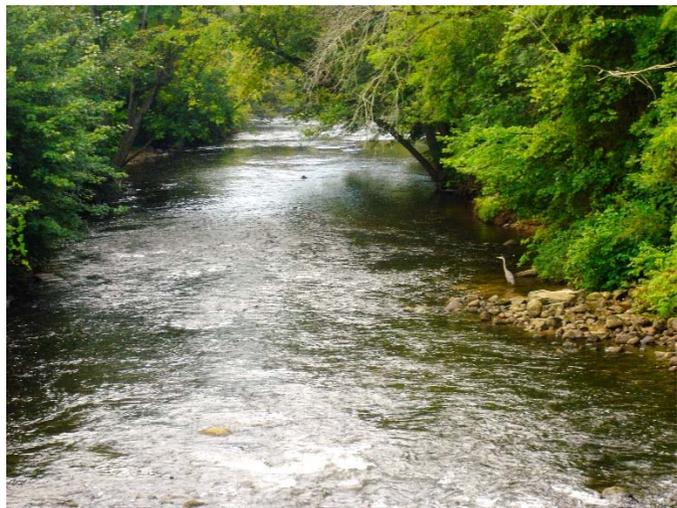
A Remedial Action Plan was developed in 1987. In the following 8 years, hundreds of thousands of tons of contaminated sediment were removed from the river. In 2001 a Total Maximum Daily Load for phosphorus was issued to address excessive algae growth in Lake Allegan, included within the AOC. The first BUI of beach closings was removed in 2011 and the second BUI of degradation of aesthetics was removed in 2012. The Kalamazoo River experienced a new threat to water quality in 2010 when over 840,000 gallons of crude oil was discharged from a failed Enbridge pipeline near Tallmadge Creek, a tributary of the Kalamazoo River. The EPA issued a dredging order to Enbridge in 2013 to remove the remaining submerged oil and contaminated sediment. Much work has been done to restore portions of the river and adjacent habitats affected by the oil spill.

Chapter 3: WATERSHED MANAGEMENT

Watershed management is defined as the process of implementing land and water management practices in order to protect and/or improve water quality and natural resources within a watershed. Watershed management is both comprehensive and complex; it must consider all factors across all land uses that contribute to both water quality problems and the solutions. Watershed management is guided by a collaborative planning process and usually takes several years in order to adequately investigate and analyze sources of water quality problems and their potential solutions. Research, water quality monitoring, and education and outreach strategies are an important part of watershed management. Watershed management cannot be completed by a single entity; rather it is the product of diverse partnerships working toward common goals of water quality improvement and community enhancement.

3.1 Why Watershed Management?

Watershed management planning is essential for explaining the impacts and extent of nonpoint source (NPS) pollution and other impairments in our waterways, and for guiding restoration and protection actions both in the water and on the land. Planning allows watershed groups to take a closer look at the diverse land uses and issues within their watershed. Public engagement is critical to the process, bringing together units of government, citizens, farmers, non-profit organizations, and other interested stakeholders. It provides a basis for sharing information and an opportunity to work together to develop a common vision for the watershed and its community. Watershed-based planning encourages collaboration across political jurisdictions and can result in uniform local environmental regulations that are designed to protect the land and water. The plan forms the foundation upon which all watershed protection and restoration projects are built.



Rogue River. Photo by Nichol DeMol, Trout Unlimited.

The Michigan NPS Program promotes the development of watershed management plans to protect and restore designated uses from the impacts of NPS pollution. The Michigan Department of Environmental Quality's NPS Program provides technical and financial assistance for the development of watershed management plans. Plans are reviewed and approved by the NPS Program based on both the State's Clean Michigan Initiative and the US EPA's nine-element criteria.

Watershed Management Plans (WMPs) provide a roadmap for the protection of high quality waters and for the restoration of impaired or threatened bodies of water. Many success stories of water quality protection and restoration lie in the foundation of a strong management plan. In the period from 2007 to 2012 the work to implement recommended actions described in the approved WMPs in Michigan resulted in the restoration of 34 water bodies, partial restoration of 25 water bodies and restoration of 5 subwatersheds (MDEQ, 2014a). During this 5-year period the State of Michigan also approved 60 WMPs, bringing the total number of approved plans in the state to 137.

3.2 Status of Watershed Management in West Michigan

Virtually all of the watersheds within the West Michigan Region have watershed management plans in place (Table 1). They have been state and federally-approved under Section 319 of the Clean Water Act and the State of Michigan Nonpoint Source (NPS) Program rules. A few of the small watersheds in coastal areas along Lake Michigan are in need of planning assistance. All of the plans seek to meet similar clean water goals in the areas of natural resource protection and restoration, NPS runoff, nutrient reduction, aquatic habitat protection and restoration, education, and monitoring. Diverse local organizations and agencies have partnered to develop plans and lead implementation efforts. Appendix A provides detailed information about the history and current status of the WMPA watersheds and their WMPs.

Watersheds within the WMPA are very diverse in terms of land use, population, water quality concerns, and watershed priorities. As of 2015, the WMPA has 9 approved Total Maximum Daily Loads (TMDLs) for *E. coli*, 8 for sediment, 4 for phosphorus, and 1 for PCBs (Table 2). TMDLs are defined under the Clean Water Act as the maximum amount of a pollutant that a water body can receive and still meet water quality standards. All of the major watersheds within the region have water bodies that do not support certain designated uses (specific uses of water as defined by the US Environmental Protection Agency), and many are scheduled to develop TMDLs for pollutants such as PCBs, mercury, *E. coli*, sediment, phosphorus, chlordane, and petroleum hydrocarbons (MDEQ, 2014b). Designated use impairments and the schedule for TMDLs are found in the *State of Michigan's Integrated Report*, a list of all water bodies that are not attaining one or more designated uses and require TMDLs in order to meet water quality standards.

Watersheds within the WMPA are unified in that they all have common goals of addressing land use to protect and improve water quality in their watersheds that will ultimately protect the water quality of Lake Michigan. A second uniting factor is that funding watershed restoration and land protection activities has been, is, and will continue to be, a primary concern and major barrier to successful management plan implementation. Individually, groups have been successful at securing funding from local, regional, state, and national sources, however competitive grant funding is not sustainable for long-term water quality restoration and land protection. Grant funds are limited and highly competitive, leading to many critical projects not being implemented. Rather than continue to compete for the same limited sources of grant funding, the West Michigan Watershed Collaborative aims to develop a sustainable revenue source to fund restoration and protection activities throughout the region.

Table 1. Summary of Approved Management Plans in the West Michigan Prosperity Alliance

| Watershed Name | CMI¹ only | Year | 319² and CMI | Year | Other | MS4³ Communities? |
|--|---------------------------------|-------------|------------------------------------|-------------|---|---|
| Bear Creek (Lower Grand) | | | | | Bear Creek Stewardship Plan – 1992 Also included in Lower Grand | X |
| Bear Creek (Muskegon) | | | X | 2004 | Also included in Muskegon River | X |
| Black River | | | X | 2009 | | |
| Buck Creek | X | 2003 | X | 2008 | Also included in Lower Grand | X |
| Coldwater River | | | X | 2009 | Also included in Lower Grand | X |
| Duck Creek | | | X | 2013 | | |
| Flat River* | | | X | 2016 | Also included in Lower Grand | |
| Four Townships (Gull and Augusta Creeks) | | | X | 2010 | Also included in Kalamazoo | |
| Gun River | | | X | 2004 | Also included in Kalamazoo | |
| Hamlin Lake/Big Sable* | X | | | | | |
| Kalamazoo River* | | | X | 2011 | | X |
| Lake Creek | | | X | 2016 | Plan is in process of being approved | |
| Lower Grand River | | | X | 2011 | | X |
| Macatawa | | | X | 2012 | | X |
| Middle Grand River | | | X | 2010 | | X |
| Mona Lake* | | | X | 2006 | | X |
| Muskegon Lake | X | 2005 | X | 2002 | Also included in Muskegon River | X |
| Muskegon River | | | X | 2002 | | X |
| Pere Marquette River* | | | X | 2011 | | |
| Pigeon River | X | 1997 | | | | |
| Plaster Creek | | | X | 2008 | Also included in Lower Grand | X |
| Rabbit River | | | X | 2009 | Also included in Kalamazoo River | |
| Rogue River | | | X | 2000 | Rogue River Natural River Management Plan, also included in Lower Grand | X |
| Sand Creek | X | 2003 | | | Also included in Lower Grand | X |
| Spring Lake* | X | 2001 | | | Also included in Lower Grand | X |
| Thornapple River* | | | X | 2016 | Also included in Lower Grand | X |
| Upper Maple River | | | X | 2010 | | |
| White River | | | X | 2009 | | |

¹ CMI = Clean Michigan Initiative, meets criteria established by the Michigan DEQ

² 319 = Section 319 of the Clean Water Act, meets EPA Nine Minimum Elements

³ MS4 = Municipal Separate Storm Sewer System, Storm Water Management Plans required for compliance with MDEQ Storm Water permits

*Watershed summary not yet available

Table 2. Approved TMDLs within the West Michigan Prosperity Alliance

| Water Body | Watershed (County) | <i>E. coli</i> | Phosphorus | Sediment | PCBs |
|--------------------------------------|---|-----------------------|-------------------|-----------------|-------------|
| Bass River | Lower Grand River (Ottawa) | 2005 | | 2005 | |
| Bear Lake | Muskegon River (Muskegon) | | 2008 | | |
| Black Creek | Mona Lake (Muskegon) | | | 2003 | |
| Buck Creek | Lower Grand River (Kent) | 2006 | | | |
| Coldwater River and Bear/Tyler Creek | Thornapple River (Kent) | 2005 | | | |
| Deer, Little Deer and Beaver Creeks | Lower Grand River (Ottawa and Muskegon) | 2013 | | | |
| Grand River | Lower Grand River (Kent) | 2006 | | | |
| Grand River Tributary | Lower Grand River (Kent) | | | 2005 | |
| Lake Allegan | Kalamazoo River (Allegan) | | 2001 | | |
| Lake Macatawa | Macatawa (Ottawa) | | 2000 | | |
| Lincoln Lake | Lower Grand River (Kent) | 2006 | | | |
| Little Black Creek | Mona Lake (Muskegon) | | | 2003 | |
| Morrison Lake | Lower Grand River (Ionia) | | 2008 | | |
| Pere Marquette River | Pere Marquette (Lake, Mason, Oceana, and Newaygo) | | | | 2008 |
| Plaster Creek | Lower Grand River (Kent) | 2002 | | 2002 | |
| Rio Grande Creek | Lower Grand River (Ottawa) | 2003 | | | |
| Ruddiman Creek | Muskegon Lake (Muskegon) | 2010 | | | |
| Sand Creek | Lower Grand River (Ottawa) | | | 2005 | |
| Strawberry Creek | Lower Grand River (Kent) | | | 2005 | |
| York Creek | Lower Grand River (Kent) | | | 2005 | |
| TOTAL | | 9 | 4 | 8 | 1 |

3.3 Challenges of Watershed Management

Watershed groups in West Michigan face many challenges as they work to protect and restore their watersheds. These challenges are not unique to West Michigan but are faced by watershed groups across the nation. Many of these challenges can be overcome with proper tools, resources, and collaboration. The following describe some common challenges faced by watersheds within the WMPA.

Funding

Funding has historically been and continues to be the greatest challenge to successful WMP implementation. Most watershed groups or organizations within the region rely heavily on grants, which are limited and competitive, to support watershed management planning and implementation. Some watersheds are fortunate to have partnerships with metropolitan or regional planning organizations or are organized as non-profit organizations supported by member donations. However, these types of organizations only provide a basic level of operational funding that is not adequate to carry out full-scale restoration and protection actions.

Grant funding for the development or update of WMPs is much more limited than opportunities for implementation. While some newer grant opportunities are available to assist with planning, the funding ends once the plan is approved and the process of seeking a new grant for implementation begins. When an organization does receive a grant to fund a project, much of the work is completed by volunteers or in-kind services, many grants limit the amount of funding that can be used to pay staff salaries and benefits.

Funding is also needed for other activities such as research and monitoring. Similar to watershed management planning, grant opportunities to fund these activities is becoming increasingly more limited. However, these activities are a critical component of watershed management in order to evaluate the effectiveness of actions taken and to share the findings with the public.

Staffing

Many watershed partners within the region have identified a lack of permanent staff or lack of professional expertise as a challenge to implementing their WMP; much of this relates back to limitations in funding. Without a sustainable source of funding, it is nearly impossible to retain qualified staff to implement a WMP. Some watershed partners within the region rely solely on volunteers and do not have any paid staff. While the power of volunteers is beneficial beyond calculation, relying on volunteers usually results in a group of very passionate, dedicated people that do not have adequate training or expertise in the science and practice of watershed management. Many of the region's volunteer-based watershed organizations partner with Conservation Districts, universities, and regional planning organizations for the staff support needed to sustain watershed management planning, implementation, educational, and monitoring activities. Limited staffing and volunteer commitment leads to a more limited amount of time to implement watershed restoration and protection actions. This can result in little or very slow implementation of management plans after they are approved.

Community Participation

An essential component of all watershed management planning is public education and participation. Yet this can also be one of the biggest challenges. How do watershed groups engage their local citizens and maintain the necessary momentum to affect change? All WMPs in the region include public education and outreach as a component, some with extremely detailed plans that include target audiences, messages, and delivery mechanisms. Watershed outreach and education can be a very involved and time consuming process. Most people will not act after the first time they hear a message, they need to hear it multiple times and in different ways. Providing guidance through the educational information and individual involvement to restore or protect water quality will likely ensure a person to follow up with personal actions later. All of this takes patience, persistence, and an adequate amount of funding, staffing, and time in order to take a substantial difference.



Kanoe the Kazoo event, 2012. Photo by Kenneth Kornheiser, Four Townships Water Resources Council.

Policy and Decision Makers

Much of the watershed restoration and protection action needs to be done at the local policy level. There is only so much that can be done to improve water quality by implementing BMPs when new developments are being built that continue to contribute to the problem. Many tools and resources are available to assist local decision makers and planners for incorporating water quality protections into their codes, ordinances, and review process. Even with this host of valuable planning tools and local watershed experts, it can be difficult for change to occur, especially when it is voluntary at all policy levels. This type of resistance at the government level also occurs in various non-government sectors such as agricultural organizations. The first step to affect positive change within municipal governments and agricultural organizations is outreach and education. Much like with the public, policy and decision makers need to be led through a process of education and involvement first before they are ready and willing to make the necessary changes that support water quality improvement and protection. Just as with the public, this process takes a large amount of patience and persistence, coupled with adequate time, staffing, and funding resources, to realize measureable results.

Chapter 4: FUTURE NEEDS

Based on the challenges summarized in Chapter 3, the primary need, both short and long term, is a consistent and sustainable source of funding in order to successfully implement approved WMPs. Several watersheds are also in short-term need of funding to develop or update WMPs before they can move forward with implementation.

4.1 Regional Budget

Based on information provided by the watershed partners within the region, quite a bit of variability exists in the annual funding needs of each watershed. On average, each watershed within the region needs about \$470,000 annually in order to implement their management plan. This includes staffing and administrative costs, restoration and protection activities, information and education programs, equipment, and monitoring. In order to adequately fund watershed plan implementation within the West Michigan region, annual funding needs are approximately \$13.6 million.

4.2 Summary and Conclusions

West Michigan is a diverse landscape filled with a myriad of unique natural resources. Water quality is extremely important within the region to support economic activities such as tourism, agriculture, and industry. West Michigan's water quality is also threatened by these same activities and others because of the NPS pollution they generate. Many water bodies within the region are impaired by too much *E. coli*, sediment, phosphorus, heavy metals, and other contaminants. Fortunately, a large number of watershed groups, non-profit organizations, regional planning agencies, and local units of government are working together to protect West Michigan's water quality. However, there are still a number of challenges that must be overcome in order to restore and protect these water bodies. At the core of all these challenges is an inadequate level of funding.

The critical question then becomes where is all of that funding going to come from? Most watersheds do not have regular annual revenue outside of volunteer donations and competitive grants, and watershed projects are not currently being supported by direct state revenue. Some watershed groups are fortunate to have agreements with local units of government that financially support their watershed projects, but it is not enough to make significant improvements in the water quality. It is difficult to implement WMPs when funding is inconsistent and unreliable. Therefore, it is imperative to the future improvement of Lake Michigan's water quality that a model for sustainable funding of watershed projects in West Michigan be developed.

4.3 Next Steps

The West Michigan Watershed Collaborative will continue to work toward sustainable funding solutions by hiring a financial consultant to complete a *Funding Feasibility Study*. This study will include an assessment of possible sources and mechanisms of funding at the local, state, and federal level. An evaluation will be completed of the feasibility of adopting these potential funding strategies in West Michigan. The study will also seek examples for innovative funding approaches that have been successfully implemented in watersheds throughout the United States. The plan will also recommend options for securing future sustainable funding within the region.

Beyond the results of the funding study, the collaborative will continue to work together to build further watershed partnerships throughout the region. In order to support healthy watersheds, a healthy economy, and a better way of life in West Michigan the support and cooperation of the people is desperately needed.

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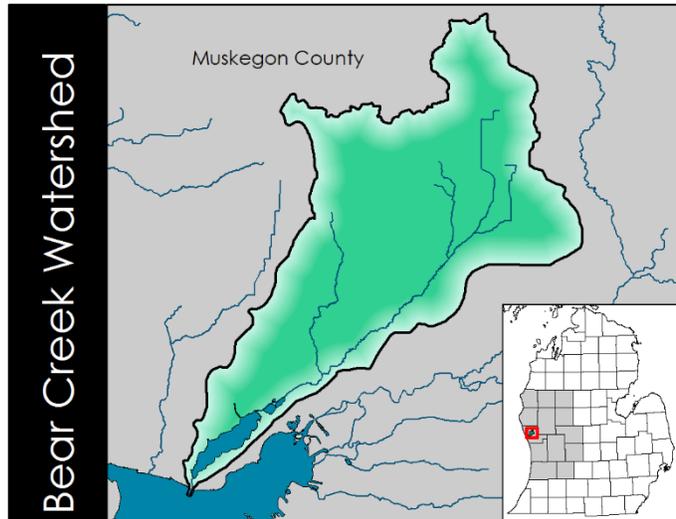
APPENDIX A

WATERSHED SUMMARIES

Bear Creek – HUC code: 040601021003 (Muskegon River)

Size and Location

The Bear Creek / Bear Lake Watershed is located north of Muskegon Lake and is approximately 11.5 miles long from its start in Dalton Township down to its mouth at Bear Lake Channel at Muskegon Lake. The Bear Creek and Bear Lake Watershed covers a land area of 19,058 acres or approximately 29 square miles. The watershed lies entirely within Muskegon County and is shared by five local governments: the Townships of Dalton, Laketon, Cedar Creek, and Muskegon, and the City of North Muskegon. Land use in the watershed is 44% forest, 27% other, 22% urban, 6% agriculture, and 1% wetland.



Watershed Management

The Bear Creek and Bear Lake Watershed Management Plan was completed by the Muskegon River Watershed Assembly and the Muskegon Conservation District in 2005. It was approved under the CMI administrative rules and was funded under section 319. Goals include improving water quality by reducing non-point source pollutants to restoring warm-water and cold-water fisheries. The plan includes an information and education strategy that identifies audiences, messages and delivery mechanisms. The Watershed Management Plan was updated in 2013. The original management plan is available online at http://www.michigan.gov/documents/deq/ess-nps-wmp-bear-creek-lake-1_210617_7.pdf

Stormwater Management:

Of the five local governments in the Bear Creek Watershed, only the City of North Muskegon is a designated MS4 Community. The City of North Muskegon developed a Phase II storm water permit program independently from the Muskegon Area Municipal Stormwater Committee.

TMDL and/or designated use impairments

The Bear Creek / Bear Lake watershed lies within the boundary of the Muskegon Lake Area of Concern (AOC). In 2006, the Muskegon Lake Watershed Partnership set a water quality improvement target to restore water quality and to remove eutrophication as one of the AOC's Beneficial Use Impairments.

The MDEQ developed a phosphorus total maximum daily load (TMDL) for Bear Lake that was approved by the USEPA in December 2008. The TMDL calls for a 56% reduction (from 3,387 to 1,458 lb/yr) in phosphorus loading to Bear Lake. The primary sources of phosphorus to Bear Lake are internal loading (release of phosphorus from existing sediment), and agricultural and residential land uses.

The designated use of fish consumption is impaired for several tributaries due to PCBs, and navigation is impaired in a tributary to Bear Lake due to petroleum hydrocarbons. Statewide TMDLs have been drafted by the MDEQ to address PCBs and a TMDL is scheduled to address petroleum hydrocarbons.

Management Plan Priorities

The existing management plan does not prioritize implementation actions. However, the Bear Creek Management Plan does prioritize stream bank / road-stream crossing sites for restoration. Some were addressed with an implementation project in 2007. Watershed priorities have not changed since the plan was first developed in 2004. Watershed partners have a better understanding of nutrient loading to Bear Lake as a result of AWRI's internal phosphorus loading study completed in 2013 as part of the Bear Creek Implementation II Project. This information allows partners to better focus resources to identify/address external nutrient sources.

Implementation history

The Bear Creek Implementation Project was funded through a Section 319 grant in 2007. This project restored 4 streambank sites and 4 road/stream crossings that were identified in the management plan. The Bear Creek Implementation 2 Project was funded through a Section 319 grant in 2010-2014. This project included an update of the management plan, the completion of an internal phosphorus loading study in Bear Lake and the installation of best management practices (BMPs) at the West Michigan Equestrian Center. The Reducing Sediment and Nutrients in Bear Creek & Bear Lake Project is currently underway and is being funded by the Great Lakes Restoration Initiative. This project will include the installation of agricultural BMPs, one road stream crossing restoration, one stream bank restoration, installation of shoreline buffers, and wetland restoration.

Tracking Progress

Significant progress has been made, as indicated above, in addressing high/medium sites identified as part of the original watershed inventory. Further monitoring as well as an updated watershed inventory is needed to identify additional priority pollutant sources. Progress is reported annually to the MDEQ as part of the TMDL voluntary agreement.

Future Needs

More extensive water quality monitoring is needed to locate external nutrient loading sources. In addition to monitoring, an updated watershed inventory is necessary for watershed partners to further prioritize needs. The annual estimated budget is \$113,438.00.

Contact

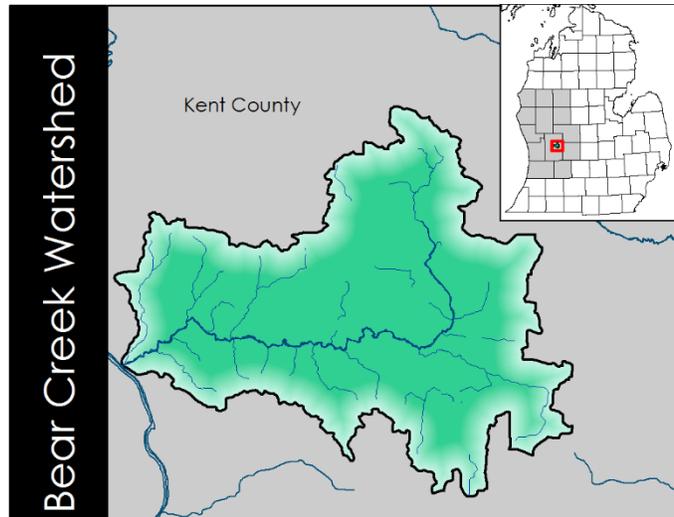
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Bear Creek Watershed – HUC Code: 040500060501 (Grand River)

Size and location

The Bear Creek Watershed is a subwatershed of the Grand River Watershed. Bear Creek enters the Grand River about 45 miles upstream of Lake Michigan. By area, the Bear Creek Watershed is about 0.6% of the Grand River Watershed.

The Bear Creek Watershed drains 20,096 acres of rolling hills and steep slopes in northeastern Kent County, Michigan. Although the watershed is located primarily within Cannon Township, approximately 15% lies within Grattan Township, and significantly smaller amounts are within Ada, Vergennes and Plainfield Townships. Slightly more than half of Cannon Township (55%) is encompassed by this watershed.



Watershed Management

Bear Creek has a Stewardship Plan that was developed in 1992 by the Bear Creek Committee. The plan outlines four objectives (reduce sediment, reduce bacteria, improve habitat, and evaluate nutrient and biocide loading) and includes a public education and participation strategy. The plan can be found on the Cannon Township website: <http://www.cannontwp.org/department/board.php?structureid=82>

The Bear Creek Watershed Council was formed in 2009, meets as needed and is convened by Cannon Township.

TMDL and/or designated use impairments

There are no approved TMDLs in the Bear Creek Watershed. Two streams in the watershed are not meeting the designated uses of fish consumption due to mercury and PCBs and Statewide TMDLs have been drafted by the MDEQ to address these pollutants.

According to the Bear Creek Watershed Project Stewardship Plan, the primary water quality concerns are sedimentation and bacterial contamination (fecal coliform). These concerns stem from the history of land use and urbanization. The plan also includes a list of potential sources and a description of the impacts of water quality problems.

Management Plan Priorities

The Stewardship Plan identified critical areas, priority sites and implementation areas. Critical areas included buffers adjacent to streams, lakes and wetlands. Priority sites were locations where nonpoint sources pollution issues had already been documented or were likely to occur based on land use characteristics. Six implementation areas were identified to focus restoration efforts.

Tracking Progress

The Bear Creek Watershed participates in the MiCorps volunteer stream monitoring program to evaluate and track the status of aquatic macroinvertebrate communities. Data is available through the MiCorps Data Exchange: <https://micorps.net/about-data-exchange/>

Future Needs

The total estimated budget needed to fully implement the plan, as of 1992, was about \$2.3 million. Due to the age of the management plan, an updated plan is needed.

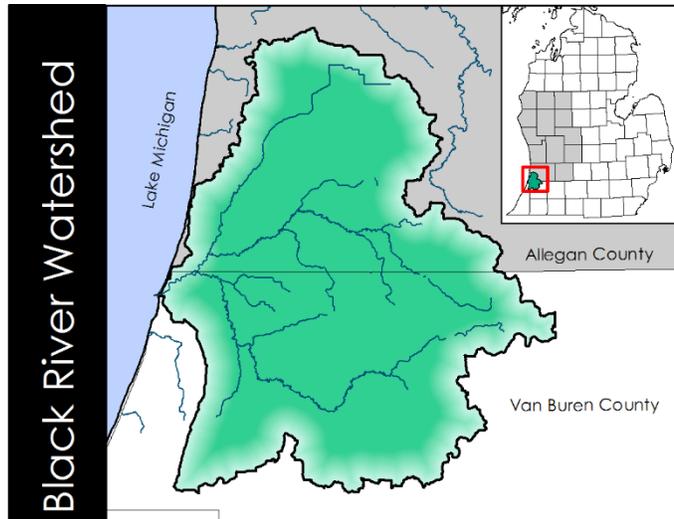
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Black River Watershed – HUC code: 04050002 (Allegan and Van Buren County)

Size and location

The Black River watershed is about 287 square miles and located in southwestern Allegan and northwestern Van Buren Counties. The following water bodies are designated as cold water fisheries: Black River main stream, Middle Branch, North Branch, and South Branch of Black River. The landscape of the Black River Watershed has changed dramatically since the 1800s. The watershed was nearly entirely forested, while recent forest cover is about 33%. Wetlands were also a significant portion of the pre-settlement landscape (20.4 %). Recent wetland land cover is between 2.8% and 6.7%, representing a 65% to 85% loss. Most of the native habitat remaining in the Black River Watershed is a variety of forest types. Most of this forest is deciduous some areas with evergreen and mixed forests. Most remaining wetlands consist of woody vegetation, though a few contain herbaceous emergent vegetation. The 1992 land use in the watershed was 57.4% agriculture, 32.9% forest, 6.7% wetland, 1.5% open water, 1.2% urban, 0.1% open space and 0.1% other.



Watershed Management

The Black River Watershed Management Plan was completed through a Section 319 grant awarded to the Van Buren Conservation District in the fall of 2002. Before this, a locally driven group of individuals and organizations known as the Black River Watershed Assembly had united in efforts to improve and protect the natural resources of the Black River Watershed. The management plan focuses specifically on nonpoint source pollution. The primary goal of the plan is to protect and improve surface water quality in the Black River Watershed. Other goals include educating watershed residents on how they can work to improve and protect water quality, improving recreational opportunities on the river and developing land use strategies that will protect water quality in the future. In particular, this plan serves to restore and protect the designated uses of the Black River. The information and education strategy identifies target audiences, messages and potential activities. The management plan is available online at <http://vanburencd.org/programs-services/watershed-projects/black-river-watershed/>

TMDL and/or designated use impairments

Many designated uses are impaired and threatened for various water bodies in the Black River Watershed. The causes of the impairments are related to habitat loss or fragmentation rather than specific pollutants. The 2014 MDEQ integrated report lists causes of impairments to other indigenous aquatic life and wildlife in the Black River Drain and Cedar Drain as anthropogenic

substrate alterations and flow regime alterations. There are no active TMDLs in the Black River Watershed. The designated use of fish consumption is not supported in Hutchins Lake due to mercury and Statewide TMDL has been drafted by the MDEQ to address this pollutant.

Management Plan Priorities

The Southwest Michigan Land Conservancy, along with local volunteers, completed a GIS-based land protection priority model for the watershed. The model identifies natural areas and agricultural areas for protection. The model will be used to guide land protection efforts in the watershed. The priority preservation areas are primarily located in undeveloped, headwaters areas. Areas around the Allegan State Game Area scored high as did wetland complexes in the Pullman area, undeveloped river corridors, the area around Upper and Lower Jephtha Lakes, and many lakes with little development, including Lake 11, Lake 14, Little Bear Lake, Spring Brook Lake, and others in the headwaters of the Middle Branch.

Implementation history

The Paw Paw and Black Rivers Wetland Protection and Restoration project was funded by a Section 319 Grant from 2009-2013. Funds were used to protect and restore wetlands and conduct outreach and education. The Two Rivers Coalition (non-profit organization) was formed in 2009 as a citizen based group “working to protect the health of the Black River and Paw Paw River Watersheds through conservation, education, and advocacy.”

Future Needs

It will take 15 years to fully implement the Black River Watershed Management Plan and address major concerns including delisting impairments. The estimated annual budget is \$201,500.00. The greatest challenge, other than funding, faced when implementing the management plan is having a permanent staff to provide consistency and institutional knowledge.

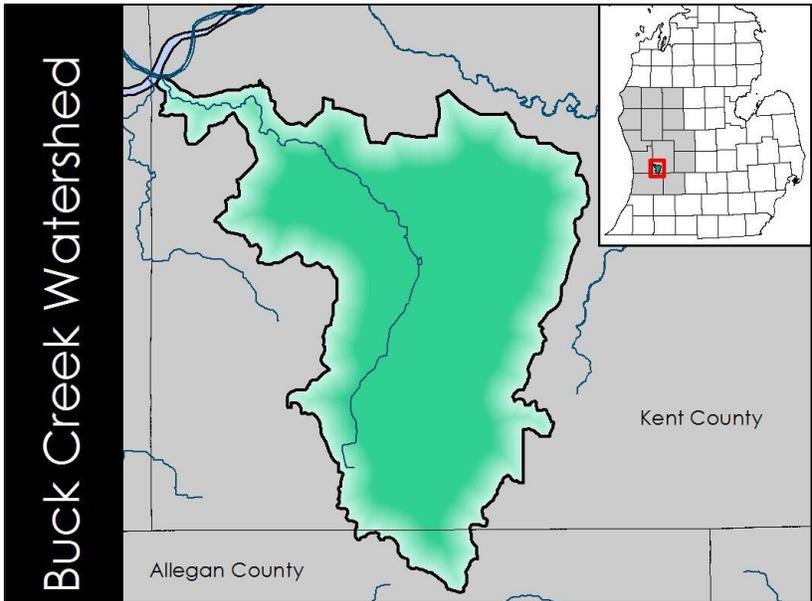
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Buck Creek – HUC code: 40500060510

Size and Location

The Buck Creek Watershed is a tributary of the Grand River and is in Kent and Allegan counties stretching 20.3 miles long. It rises in northern Allegan County, flows through rural areas of Byron and Gaines Townships, and then through the cities of Kentwood and Wyoming as an urban stream to enter the Grand River in Grandville. The Grand River is a tributary of Lake Michigan. The creek



drains portions of Byron Township, Gaines Township, the City of Kentwood, the City of Wyoming, the City of Grandville, and Grand Rapids. Pine Hill Creek and Sharps Creek enter Buck Creek in the city of Wyoming. Other tributaries have been incorporated into the Kent County drain system. The Buck Creek Watershed covers 23,392 acres. Land use in the Watershed is 95% urban, 3% agricultural, 2% other, <1% open space, and <1% open water.

The City of Grandville and the City of Wyoming teamed up to build a trail system that follows Buck Creek. The project started over 30 years ago and has developed into a system of beautiful trails along the creek. The trail is currently in three segments: 1) from the Baldwin Street Trailhead in Jenison, Michigan, to Broadway Street in Grandville, 2) down Canal St. to the Grandville segment, which goes through Wedgewood Park, and 3) the Wyoming segment which starts at Lemery Park, goes through the Buck Creek Nature preserve, and finishes out at Palmer Park.

Watershed Management

The Buck Creek Watershed Management Plan (WMP) was completed in 2003 and revised in 2007. The priorities have not changed and there have been no changes to water quality conditions since the addendum. LGROW and the Friends of Buck Creek are currently responsible for the implementation of the WMP. The full management plan can be found at http://www.michigan.gov/documents/deq/ess-nps-wmp-buck-creek_208920_7.pdf.

TMDL and/or designated use impairments

Buck Creek has designated warm water and cold water fisheries. The Watershed has two waterbodies listed in the Michigan section 303(d), as shown in the table below. High priority designated uses are cold water fishery, partial body contact, total body contact, and cool water

fishery. Medium priority designated use is warm water fishery. Low priority designated use is for habitats for other indigenous aquatic life and wildlife.

| Waterbody | Impaired Use | Cause | TMDL Year |
|------------------|------------------------------|----------------|------------------|
| 040500060510-01 | Total & partial body contact | <i>E. coli</i> | 2006 |
| 040500060510-02 | Total & partial body contact | <i>E. coli</i> | 2006 |

Management Plan Priorities

The goals and objectives for the Buck Creek Watershed establish priority levels, designated uses, goals, sources and causes, and known pollutants. High priority pollutants were identified in the management plan as sediment, *E. coli*, and trash. Medium priority pollutants include nutrients. Temperature and use of road salt were listed as suspect pollutants in both high and medium priorities.

1. Improve or restore the cold water and cool water fisheries.
2. Improve and protect the safety and enjoyment of recreational activities.
3. Improve or restore the warm water fishery.
4. Improve and protect the habitats for other indigenous aquatic life and wildlife.
5. Incorporation of smart growth techniques.
6. Increased education about watersheds and stewardship.
7. Use Buck Creek as demonstration area of urban Best Management Practices (BMP's) as example for entire Lower Grand River Watershed.

Information and Education Strategy

The Buck Creek Watershed Information & Education (I&E) Strategy is based on the larger I&E Strategy for the Lower Grand River WMP. Key target audiences whose support is needed to achieve the Buck Creek WMP goal have been identified. Although the overall audience is extremely broad, there are two major categories of audiences: (1) users of the resource within the Watershed and (2) local decision-makers (elected officials, planners) both within and outside the Watershed. Category 1 is broken down into 2 sub-categories; Sub-category 1: Residents of the Watershed, agricultural community, business owners, builders/developers, homeowners, riparian/corridor residents; Sub-category 2: Locally elected officials and municipal employees. See chapter 9 in the management plan and addendum chapter 6.

Objectives

| | | |
|----------------------------|---|--------------------|
| Objective 1 - Awareness | Make the target audience aware that they live in a watershed with unique resources and that their day-to-day activities affect the quality of those resources | Categories 1 and 2 |
| Objective 2 | Educate target audiences on the link between urban development, | Categories |

| | | |
|-------------------------|--|------------|
| - Education | agricultural activities and water quality impacts, and highlight what actions can be taken to reduce impacts | 1 and 2 |
| Objective 3 - Action | Motivate the audience to adopt and implement practices that will result in water quality improvements. These practices may include homeowner activities such as reducing fertilizer application, maintaining septic systems, purchasing properties with low-impact design elements, maintaining stream buffers on their properties, or supporting land use planning practices in the Watershed | Category 1 |
| Objective 4- Action | Incorporate watershed protection activities into land-use planning decisions | Category 2 |

Implementation history

The Buck Creek WMP was created in 2003 and amended in 2007. Schrem’s Trout Unlimited was awarded the Water Quality Monitoring Grant of \$26,450 from the MDEQ for the Buck Creek WMP. The first annual “Buck Creek Clean-up” project was held in the summer of 2014. In 2015, the “Friends of Buck Creek” group was formally established. A current 2-year water quality monitoring project by Schrem’s TU is underway, developing baseline data for coldwater fishery analysis and projected future projects.

Partners

| Organization | Contact Person | Email | Phone |
|--------------------------------|------------------|--|----------------|
| Friends of Buck Creek | Martha Vermeulen | Erma00@sbcglogal.net | (616) 498-0133 |
| LGROW | Wendy Ogilvie | Wendy.ogilvie@gvmc.org | (616) 776-7605 |
| KCRC | Wayne Harrell | wharrall@kentcountyroads.net | (616) 242-6914 |
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| City of Wyoming | Aaron Vis | avis@wyomingmi.gov | (616) 530-7260 |
| City of Kentwood | James Beke | bekej@ci.kentwood.mi.us | (616) 665-0737 |
| City of Grand Rapids | Carrie Rivette | crivette@grcity.us | (616) 456-3057 |
| Schrem’s Trout Unlimited | Jeff Edwards | Jedwards27@msn.com | (616) 293-8684 |
| Streamside Ecological Services | Aaron Snell | snell@streamsideeco.com | (616) 238-7372 |

MS4 communities in the Watershed who are currently in collaboration with the Lower Grand River Organization of Watersheds (LGROW) include the Kent County Road Commission, Kent County Drain Commissioner, Cities of Kentwood, Wyoming, Grandville and Grand Rapids.

Future Needs

The annual budget needed to fully implement the WMP is \$397,600. Due to the size of the watershed and significant urbanization, it is estimated that the WMP will be completed in 20

years. Other than funding the greatest challenge for the implementation of the Buck Creek WMP is time.

Contact

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Friends of Buck Creek

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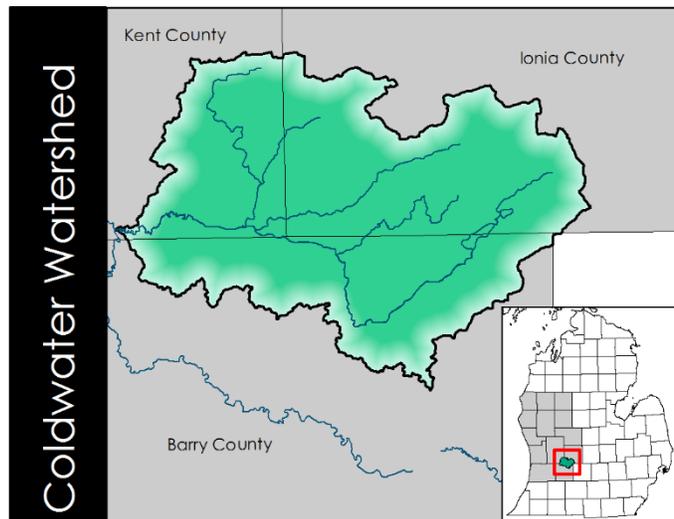
(616) 498-0133

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Coldwater River Watershed – HUC Code: 0405000703

Size and Location

The Coldwater River begins in Odessa Township of Ionia County, just north of Tupper and Jordan Lakes. This River is approximately 34 miles in length and runs southwesterly to the Thornapple River, which empties into the Grand River. The watershed is about 120,737 acres and includes portions of Kent, Ionia and Barry Counties. Land use as of 2014 was predominately agriculture (70.6%), with some forestland (17.8%) and minimal urban area (2.6%).



Watershed Management

The primary tributaries of Tyler Creek, Duck Creek and Little Thornapple River, as well as the main body of the Coldwater River were studied for the development of the watershed management plan (2004). The main body of the Coldwater River, from the Thornapple River upstream to M-43 is classified as a cold-water fishery. The Coldwater River, Little Thornapple River, Tyler Creek, and Duck Creek primarily have average cold-water temperatures. Many agricultural areas are in need of best management practices for improving and protecting water quality. Improved field drainage has historically been necessary, so many drains still exist and much of the river has been channelized, particularly in Ionia County. Few, if any, water storage sites are present in the watershed. The watershed is a valued resource as a prime trout fishery, for recreational and educational activities and wildlife habitat. The watershed management plan is available online at <http://www.coldwaterriver.org/home/watershed-managment-plan>

The Coldwater River Watershed Council (CRWC) was formed in 1997. Members of the Council are all watershed residents and volunteer their time. This council has performed numerous activities in the watershed, including physical repairs, information and education activities and overseeing the development of the watershed management plan. The management plan includes an information and education strategy that identifies and prioritizes target audiences as well as outlines messages specific to each audience.

TMDL and/or designated use impairments

The designated uses of partial and total body contact are impaired in the Coldwater River due to *E. coli*. A TMDL was approved in 2006. Sixteen tributaries (subwatersheds) in the Coldwater Watershed are not supporting the designated use of fish consumption due to mercury in fish tissue, PCBs in fish tissue, PCBs in the water column, or a combination of the previous. Statewide TMDLs have been drafted by the MDEQ to address these pollutants.

Management Plan Priorities

The primary goal is to restore the designated uses of partial and total body contact. The second goal is to protect threatened designated uses of “cold-water fishery” and “other indigenous aquatic life and wildlife”. The third goal is to fulfill the watershed’s desired uses of protected stream corridors and wetlands, established vegetative buffers and healthy fish habitat. The protection of stream corridors and wetlands will help to preserve the beauty of the watershed, protect wildlife habitat, and provide water storage and filtration. Restoring stream banks and vegetative buffers will decrease sedimentation and thermal pollution as well as provide wildlife habitat. By developing a stronger cold water fishery the watershed will remain a valued recreational resource and could spark more support for maintaining water quality. The management plan includes two methods to rank the impairments of each subwatershed in order to better focus restoration efforts. The plan also identifies pollutants, their sources and proposes structural and managerial best management practices.

Future Needs

Estimated annual funding needs to conduct information and education and provide technical assistance to landowners is about \$368,000.00. This does not include funding for the implementation of best management practices or other restoration activities.

Contact

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Duck Creek Watershed – HUC code: 040601011008 (White River)

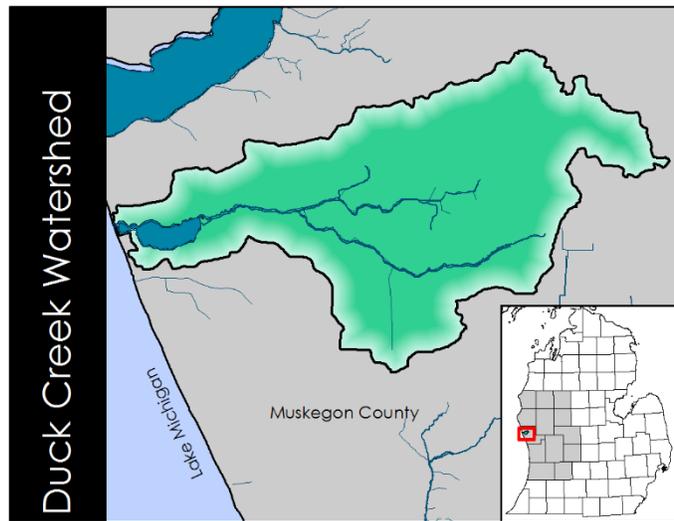
Size and location

Duck Creek Watershed is located in Muskegon County and is 13,950 acres in size. Duck Lake is designated as a Type F Trout Lake and Duck Creek is designated as a Trout Stream. Land use in the watershed is 70.9% forest, 17.3% Urban, 5.0% open field, 4.2% agriculture, 2.2% water, 0.3% wetland, and 0.1% other.

Watershed Management

The Duck Creek Watershed Management Plan was approved in 2012 under both the Clean Michigan Initiative and USEPA nine element criteria. The Duck Creek Watershed Assembly (DCWA) and the Muskegon Conservation District (MCD) are responsible for implementing the plan. The plan is available at

<http://duckcreekwatershedassembly.wikispaces.com/Watershed+Management+Plan>



TMDL and/or designated use impairments

The Duck Creek Watershed does not have any water bodies included on the Michigan Sections 303(d), 304(d) and 314 integrated report or on the EPA list of Areas of Concern.

Management Plan Priorities

High priority water quality concerns include sediment and temperature and a medium priority concern is nutrient pollution. The management plan identifies the sources and causes of each pollutant of concern. The plan also identifies priority areas for preservation and implementation actions to address the priority pollutants. The information and education strategy identifies target audiences, messages and delivery tools.

Implementation history

The Land Conservancy of West Michigan, in partnership with the Muskegon Conservation District and the Duck Creek Watershed Assembly, received funding from the Michigan DEQ 319 Program in 2015 to implement activities outlined in the management plan. The project will focus on permanently protecting property in the Duck Creek Watershed. The project also has an information and education component to increase public awareness of priority pollutants in the watershed.

Tracking Progress

The DCWA participates in the MiCorps Cooperative Lakes Monitoring program. The DCWA and MCD also work in partnership to monitor temperature in Duck Creek as well as annual

macroinvertebrate sampling per MiCorps protocol. Data is available through the MiCorps Data Exchange and also posted on the DCWA website.

Future Needs

It will take approximately 10 years to fully implement the management plan and/or address water quality concerns. The estimated annual budget necessary to implement the management plan is \$92,500. The greatest challenges, other than funding, that we face in order to implement the management plan is finding the time to complete all of the watershed plan's goals, since the DCWA is made up entirely of volunteers.



Duck Lake State Park, August 2010

Contacts

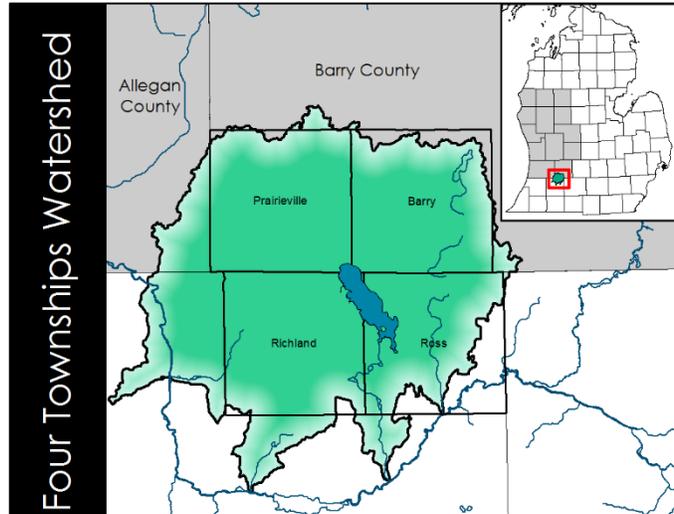
Duck Creek Watershed Assembly
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Glenn Hayden, Vice-chair
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Gull and Augusta Creeks (Kalamazoo River) – HUC Codes: 0405000306 (-01, -05, -07) and 0405000305 (-05, -06, -07)

Size and location

Gull and Augusta Creeks are located primarily within four townships around Gull Lake in Kalamazoo and Barry counties: Prairieville and Barry in Barry County and Richland and Ross in Kalamazoo County. The Four Townships Watershed Area (FTWA) is 169 square miles and encompasses the four townships plus additional watershed areas beyond the township boundaries. The Four Townships Water Resources Council, created in 1994, is the primary entity responsible for developing and implementing the Gull and Augusta Creek Watershed Management Plan.



The following are designated cold water trout streams in the Four Townships Watershed Area: Augusta Creek, Prairieville Creek, Silver Creek, and Spring Book. Land use in the watershed is of 44.46% agriculture, 25.12% forest, 12.16% wetland, 8.79% open space, 4.82% open water, 2.81% other, and 1.84% urban.

Watershed Management

The *Gull and August Creek Watershed Management Plan: the Four Township Watershed Area* was developed by the Four Township Water Resources Council in 2010 and funded by a Section 319 grant. Goals of the plan are to preserve or manage riparian areas to prevent pollution, mitigate known areas or nonpoint source pollution and restore hydrology. The plan ranks the pollutants and impairments within each of these 3 goals and identifies the sources, causes and remediation actions. The management plan also identifies critical areas for implementation. The management plan includes an information and education program that identified target audiences, messages and distribution formats. The plan is available online at: http://www.ftwrc.org/publications/FTWA_WMP_final.pdf

TMDL and/or designated use impairments

The following table provides a summary of the designated use impairments and pollutants in the Four Townships Watershed Area. No TMDLs have been developed for these as of 2016. Statewide TMDLs have been drafted by the MDEQ to address mercury and PCBs.

| Waterbody | Impaired Use | Cause |
|------------------|---------------------|----------------------|
| Augusta Creek | Total Body Contact | <i>E. coli</i> |
| Augusta Creek | Fish Consumption | PCB |
| Gull Lake | Fish Consumption | Mercury, PCB |
| Spring Brook | Fish Consumption | Dioxin, PCB |
| Silver Creek | Fish Consumption | Dioxin, Mercury, PCB |
| Pine Lake | Fish Consumption | Mercury |

Management Plan Priorities

The management plan includes the prioritization of critical areas in the watershed for implementation as well as a prioritization of the pollutants and their sources. High priority pollutants are phosphorus, sediment and microbial pathogens.

Implementation history

Some conservation easements have been secured in the Prairieville Creek and Augusta Creek Watersheds since the plan management was approved.

Numerous other studies were completed and educational materials developed prior to the completion of the management plan. All materials are available on the FTWC website: <http://www.ftwrc.org/publications.htm>

Future Needs

The management plan establishes goals for implementation by 2015 and 2020. Beyond implementation, protection becomes critical and will continue well beyond implementation and remediation efforts. The greatest challenges, other than funding, that are faced with implementing the management plan is maintaining momentum and citizen involvement.

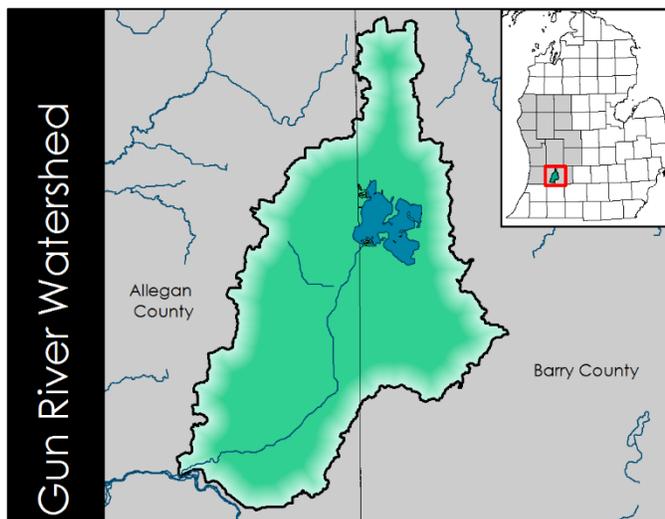
Contact Information

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Gun River Watershed – HUC Code: 0405000307

Size and location

The Gun River Watershed covers an area of 73,272 acres in Allegan and Barry Counties. The Gun River, formed by the outflow of Gun Lake, flows south through agricultural and urbanizing areas before entering the Kalamazoo River in Otsego Township. The Watershed encompasses portions of Wayland, Martin, Gun Plain, and Otsego Townships in Allegan County, and portions of Thornapple, Yankee Springs, Orangeville, and Prairieville Townships in Barry County. The eastern half of the Village of Martin and the northeast section of the City of Plainwell (both within Allegan County) are also within the Watershed. The distance between the outlet at Gun Lake and the mouth of the Gun River where it enters the Kalamazoo River is about 12 miles. Land use in the watershed is predominately agriculture but a large part of the eastern part of the watershed is forested state land. There is very little urban area, primarily focused around the City of Otsego.



Watershed Management

The Gun River Watershed Management Plan was developed with Section 319 funding and approved by the DEQ in 2004. Identified pollutants include phosphorus, of which the Gun River is the third highest contributor to the Kalamazoo River/Lake Allegan system. Biological surveys conducted by the MDEQ found area in the Watershed with poor macroinvertebrate communities due to excessive sedimentation. A portion of the Gun River near its mouth is identified as a coldwater fishery, supporting a trout habitat that has been sustained with annual fish stocking by the MDNR. Land use activities that increase storm water runoff intensify NPS pollution problems in the Watershed. The management plan includes a community outreach plan that identifies key audiences, messages and outreach tools. The plan is available online at http://www.michigan.gov/documents/deg/ess-nps-wmp-gun-river_208913_7.pdf

TMDL and/or designated use impairments

Gun River and its tributaries have suffered impairments over the years due to human-based land use activities. All designated uses within the watershed are impaired due to pollutants and other issues. Biosurveys conducted by the Michigan Department of Environmental Quality (MDEQ) indicate that habitats and biological communities in the Gun River Watershed are significantly degraded due to nonpoint source pollution. There are 10 tributaries or lakes that are not supporting fish consumption due to PCBs in fish tissue and the water column. Two additional lakes are not supporting fish consumption due to mercury in fish tissue. Statewide TMDLs have been drafted by the MDEQ to address mercury and PCBs. One area of Gun Lake does not support

total body contact due to *E. coli* and a portion of the Gun River is not supporting fish and other wildlife habitat due to altered substrate and flow regimes. TMDLs have not been established for any of these pollutants.

As a tributary to the Kalamazoo River, the Gun River is subject to the Kalamazoo River phosphorus TMDL. The Gun River ranks as the third highest contributor of phosphorus loads to the Kalamazoo River/Lake Allegan system according to MDEQ's sampling results.

Management Plan Priorities

The watershed management plan identifies critical areas in which to target the implementation of best management practices. The goals of the management plan were based on high, medium and low priority impairments, with the highest priorities including the reduction of sediment, phosphorus and *E. coli* loading, restoring hydrology and removing obstructions.

Implementation history

Following the development of the watershed management plan, a project was completed in 2004-2005 under Section 319 funding to develop a quality assurance plan for monitoring and to conduct policy reviews of all townships in the watershed. Another 319 funded project followed to implement widespread soil testing in the watershed and to provide technical assistance to implement agricultural best management practices. This project also worked with local units of government to update land use planning maps and was instrumental in the passing of the Allegan County Phosphorus ban. A third Section 319 project in 2009-2011 was successful in installing riparian buffer strips on Gun Lake and assisting with wetland restorations.



Soft shoreline stabilization and buffer strip at Gun Lake County Park, 2010

Future Needs

One major challenge for the Gun River Watershed is the lack of an established watershed group or consistent project staff (due to a lack of stable funding). Historically, the Gun River Watershed has been managed by the Allegan Conservation District when grant funding has allowed for staff costs as well as best management practice implementation.

Contacts

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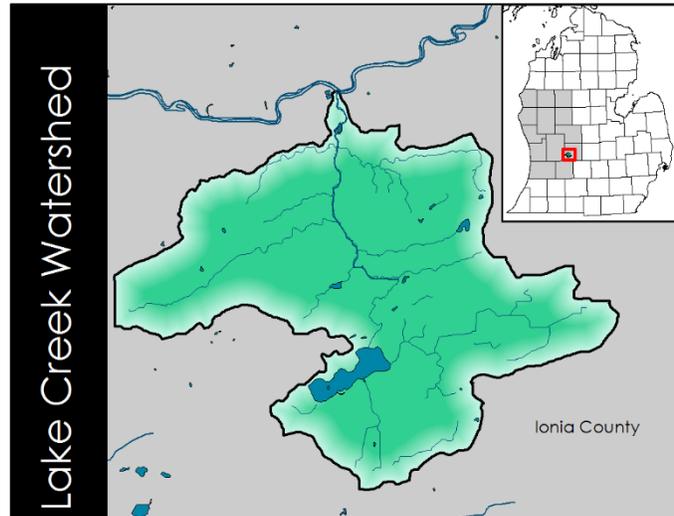
Lake Creek Watershed – HUC Code: 040500060311

Size and Location

The Lake Creek watershed is 185,806 acres in size and located entirely in Ionia County. Lake Creek is a designated trout stream and a tributary of the Grand River. Land use in the watershed is 69.8% agriculture, 23.7% forest, 4.1% urban, and 2.3% other.

Watershed Management

The Lake Creek Watershed Management Plan was in the process of being approved as of fall 2015. Once approved, it will meet both Michigan CMI and EPA 319 nine-element criteria. The draft information and education strategy identifies target audiences based on pollutants and their sources/causes. The strategy also includes key messages, delivery mechanisms and evaluation methods.



TMDL and/or designated use impairments

Designated use impairments and causes are summarized in the table below.

| Waterbody | Impaired Use | Cause |
|---|--|---|
| Lake Creek, Little Creek, Leary Drain, Unnamed Tributary to Morrison Lake, and Unnamed Tributary near Clarksville Rd. | Fish Consumption | Mercury and PCB in fish tissue, PCB in water column |
| Morrison Lake | Fish Consumption | PCB in fish tissue. |
| Morrison Lake | Warmwater Fishery | Total phosphorus. |
| Morrison Lake | Other Indigenous Aquatic Life and Wildlife | Total phosphorus and excess algal growth. |

A phosphorus TMDL was approved for Morrison Lake in 2008. Statewide TMDLs have been drafted by the MDEQ to address mercury and PCBs.

Management Plan Priorities

Phosphorus has been identified as a high priority pollutant. Medium priority concerns include sediment pollution, unstable hydrology, bacteria and pathogens, and thermal pollution. The management plan will include the identification of critical areas for preservation and restoration. The plan will also include a prioritization of restoration actions for both managerial and structural BMPs.

Future Needs

The estimated annual budget necessary to implement the management plan is \$141,500. It will take 7-10 years to fully implement the plan and address major concerns. The Ionia Conservation District is actively seeking grants to fund implementation projects related to natural shoreline restoration, internal loading study, information and education program, and agricultural best management practice implementation.



Morrison Lake

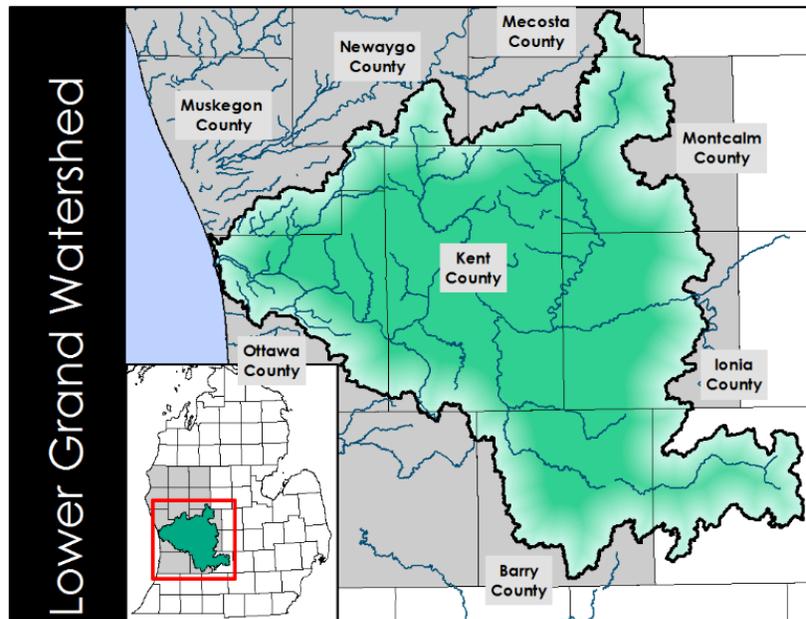
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Lower Grand River – HUC code: 04050006

Size and Location

The Lower Grand River Watershed encompasses 1,861,468 acres (2,909 square miles) and includes large portions of Ottawa, Muskegon, Kent, Montcalm, Ionia, Barry, and Eaton Counties. Counties with very small portions in the Watershed include Newaygo, Allegan, and Mecosta. The Lower Grand River originates below the Looking Glass River confluence, near the City of Portland, flowing northwest to its convergence with Lake Michigan. The main branch of the Lower



Grand River is 51 miles long, and the major tributaries flow for a total of 209 miles. In addition to the many subwatersheds with direct drainage to the Grand River, the Watershed includes three major subwatersheds: Thornapple River, Flat River, and Rogue River. These major subwatersheds include 31 smaller subwatershed management units. Land use in the Lower Grand River watershed is 51% agriculture, 21% forest, 12% urban, 11% wetland, 3% open space, and 2% open water.

Watershed Management

The Lower Grand River Watershed Management Plan outlines an action-oriented approach to address the needs and proposed solutions for effectively managing and restoring all of the designated uses in the watershed. The current plan is an update of the initial 2004 CMI approved plan and 2007 Phase II plan. The current plan meets both Michigan CMI and EPA nine-element criteria. The information and education strategy includes detailed information about target audiences, a process for developing messages and selecting delivery mechanisms, and an implementation strategy. The management plan is available online at <https://www.gvsu.edu/wri/isc/lower-grand-river-watershed-management-plan-312.htm>

The Lower Grand River Organizations of Watersheds (LGROW) was officially formed in 2009 to provide watershed-wide oversight of the management plan, to implement watershed-wide initiatives and to prioritize watershed concerns. LGROW's members include municipalities with the watershed, subwatershed groups and other interested stakeholders. LGROW is administered by an executive board and has numerous committees to address individual watershed concerns.

TMDL and/or designated use impairments

The following table provide a summary of all designated use impairment and TMDLs throughout the Lower Grand River Watershed. In addition, numerous tributaries are listed as not meeting the designated use for fish consumption due to mercury in fish tissue and/or PCBs in fish tissue and the water column. A Statewide TMDL has been drafted to address these pollutants.

| Waterbody | Impaired Use | Cause | TMDL Year |
|---|------------------------------|---------------------------|------------------|
| Bass River | Warm water Fishery | SS | 2005 |
| Bass River | Partial & Total Body Contact | <i>E. coli</i> | 2005 |
| Bass Creek, Bass River, Bear Creek, and Little Bass Creek | Warm water Fishery | SS | 2005 |
| Bass Creek, Bass River, Bear Creek, and Little Bass Creek | Partial & Total Body Contact | <i>E. coli</i> | 2005 |
| Buck Creek and Pine Hill Creek | Partial & Total Body Contact | <i>E. coli</i> | 2006 |
| Little Thornapple River and Woodland Creek | OIALW | Unknown | 2016 |
| Tyler/Bear Creek | Partial & Total Body Contact | <i>E. coli</i> | 2005 |
| Coldwater River | Partial & Total Body Contact | <i>E. coli</i> | 2005 |
| Lincoln Lake Pine Resort Beach-NW of Greenville | Total Body Contact | <i>E. coli</i> | 2006 |
| Rio Grande Creek | Partial Body Contact | NA | |
| Rio Grande Creek | Total Body Contact | <i>E. coli</i> | 2003 |
| Beaver Creek, Deer Creek, and Little Deer Creek | Warm water Fishery | Phosphorus | 2012 |
| Beaver Creek, Deer Creek, and Little Deer Creek | Partial & Total Body Contact | <i>E. coli</i> | 2012 |
| York Creek | Cold Water Fishery | AWH & SS | 2005 |
| Direct Drainage Area - Grand River | Partial & Total Body Contact | <i>E. coli</i> | 2006 |
| Direct Drainage Area - Unnamed Tributary to Grand River | Cold Water Fishery | OASA, OFRA | 2016 |
| Direct Drainage Area - Unnamed Tributary to Grand River | Cold Water Fishery | SS | 2005 |
| Direct Drainage Area - Grand River | Partial & Total Body Contact | <i>E. coli</i> | 2006 |
| Maplewood Lake Park Beach | Partial Body Contact | Insufficient Data | |
| Maplewood Lake Park Beach | Partial & Total Body Contact | <i>E. coli</i> | 2021 |
| Ottawa Creek | OIALW | Bacterial Slimes | 2016 |
| Grand River Grand Haven Boaters Park Beach | Partial & Total Body Contact | <i>E. coli</i> | 2016 |
| Indian Mill Creek | OIALW | SS | 2016 |
| Morrison Lake | OIALW | Excess Algae & Phosphorus | 2008 |

| Waterbody | Impaired Use | Cause | TMDL Year |
|--|------------------------------|------------------|------------------|
| Morrison Lake | Warm water Fishery | Phosphorus | 2008 |
| Lower Thornapple River - Unnamed Tributary to Thornapple River | OIALW | Bacterial Slimes | 2016 |
| Strawberry Creek | Cold Water Fishery | OASA, OFRA, SS | 2005 |
| Mill Creek | OIALW | OASA, OFRA | NA |
| Mill Creek | Cold Water Fishery | OASA, OFRA | NA |
| Gravel Brook, Hagar Creek , and Mud Creek | Warm water Fishery | OASA, OFRA | NA |
| Plaster Creek | OIALW | SS | 2002 |
| Plaster Creek | Partial & Total Body Contact | <i>E. coli</i> | 2002 |
| Little Plaster Creek, Plaster Creek, and Whisky Creek | OIALW | SS | 2002 |
| Little Plaster Creek, Plaster Creek, and Whisky Creek | Partial & Total Body Contact | <i>E. coli</i> | 2002 |
| Rush Creek | OIALW | OASA, OFRA | NA |
| East Fork Sand Creek and Unnamed Tributaries to East Fork Sand Creek | Cold Water Fishery | OFRA & SS | 2005 |
| Sand Creek | Cold Water Fishery | OFRA & SS | 2005 |
| Unnamed Tributary to Butternut Creek | OIALW | Unknown | 2016 |
| Little Thornapple River | OIALW | OASA, OFRA | NA |
| Upper Thornapple River - Thornapple River | Warm water Fishery | Dissolved Oxygen | 2023 |

* NA = Not Assessed; OIALW = Other Indigenous Aquatic Life & Wildlife; SS = Sedimentation/Siltation; OASA = Other anthropogenic substrate alterations; OFRA = Other flow regime alterations; AWH = Alterations in wetland habitats

Management Plan Priorities

High priority pollutant were identified in the management plan as pathogens and bacteria, sediment, nutrients, and unstable hydrology. Temperature was identified as a medium priority water quality concern. Critical areas for restoration were ranked based on sediment and nutrient loadings, TMDLs, wetland restoration sites, and nonpoint source pollution sites. Priority areas were also identified for preservation and protection. There are implementation actions recommended in the plan that are non-traditional or innovative practices that are unable to be funded by most state and federal grants.

Implementation history

Several MDEQ Section 319 grants have been awarded to subwatersheds to complete the work outlined in the Lower Grand Watershed Management Plan. They include:

- Bass River/Deer Creek (2 implementation grants)
- Lake Creek (planning grant to develop a watershed management plan)

- Flat River (planning grant to develop a watershed management plan)
- Plaster Creek (Implementation grant)
- Groundswell (information and education grant)

A grant from the Wege, Frey and Grand Rapids Community Foundations helped to develop a Communications Strategy and Business Plan. Through this grant, the Lower Grand River Organizations of Watersheds (LGROW) was able to develop a Business Plan and Strategic Plan to help direct activities and focus on the goals of the organization.

A grant from the Wege Foundation was used to develop the Community Engagement Program, an effort to attain the outcomes identified in LGROW's Strategic Plan of having the watershed understood by the community resulting in increased excitement and involvement in protecting and improving the Grand River. The outcomes of the program will be 1) an increased understanding of the subwatersheds; 2) at least 1 meeting in each subwatershed; 3) local stewardship for a healthy watershed; 4) an increase in social media interaction with LGROW; 5) descriptive profiles of all subwatersheds; 6) increased volunteer base, improved water quality, restored habitat, and cleaner waterways; and 7) an increased interest in the watershed and changes in personal behavior toward stewardship.

In 2015 the City of Grand Rapids completed the separation of its municipal storm sewer system. Plans for removing the Sixth Street damn as well as the beautification dams in the Grand River in the City of Grand Rapids are under way.

Tracking Progress

There are several lakes within the Lower Grand River Watershed that participate in the MiCorps Lake Monitoring Program. Data is available through the MiCorps Data Exchange: <https://micorps.net/about-data-exchange/>

Future Needs

Progress has been made in small areas around the watershed, but overall, there have been no measurable changes to water quality. To address the entire Lower Grand River Watershed, the work will take decades, and will never be done since this area will continue to grow and put pressure on the water resources. Until agricultural runoff is controlled, pollutants will continue to impair the waterways. The total estimated annual budget that is necessary to fully implement the management plan is \$25,880,000. The sheer size of the Lower Grand River Watershed provides a significant challenge to full plan implementation. Funding, staff capacity and limited time are also critical challenges.

Contact

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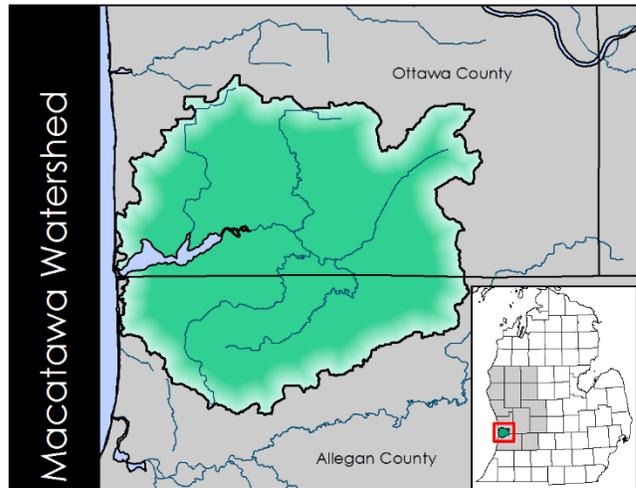
Macatawa Watershed – HUC Code 04050002 (Ottawa and Allegan Counties)

Size and location

Lake Macatawa, in southern Ottawa County, Michigan, is a 1,780-acre drowned river mouth that empties into Lake Michigan near the City of Holland. The Macatawa Watershed extends 175 mi² across southern Ottawa County and northern Allegan County and includes Lake Macatawa, the Macatawa River and numerous tributaries. Land use in the watershed is about 46% agriculture, 33% urban, 19% natural areas, and 2% water.

Watershed Management

The Macatawa Watershed Project started in 1999 just prior to the approval of a phosphorus TMDL for Lake Macatawa. The project is housed at the Macatawa Area Coordinating Council (MACC), who was responsible for the development of the initial Phosphorous Reduction Plan that was approved in 2002. The MACC updated the plan in 2009-2012 to bring it into compliance with both Michigan CMI and EPA nine-element criteria. The goals of the Macatawa Watershed Management Plan are to restore water quality to meet standards, protect remaining natural areas and enhance desired uses. The information and education strategy identifies target audiences, key messages and delivery mechanisms. The plan is available online at <http://www.the-macc.org/watershed/overview/>



Project Clarity is an initiative of the Outdoor Discovery Center Macatawa Greenway (ODCMG) that was launched publicly in 2013. The goal of Project Clarity is to restore water quality in Lake Macatawa and the watershed. The Project Clarity plan outlines 5 objectives that will make significant improvements in water quality. Project Clarity is complementary to the Macatawa Watershed Management Plan and has helped to increase awareness of the water quality issues. Project Clarity includes a private-public fundraising initiative and as of December 2015, 84% of the nearly \$12 million goal had been pledged.

Stormwater Management

A Storm Water Committee was formed in 2000 and comprised of representatives from all regulated communities in the watershed. Together, this committee worked on developing the application and associated plans required for submittal to the MDEQ in 2003. Representatives from regulated communities continue to meet with the committee on a quarterly basis to discuss permit compliance and related storm water issues. The current regulated communities as of 2016 are the Cities of Holland and Zeeland, the Counties of Ottawa and Allegan and the Ottawa and Allegan County Road Commissions.

TMDL and/or designated use impairments

The designated uses of warm water fishery and other indigenous aquatic life and wildlife are impaired in eight streams in the Macatawa Watershed due to sediment/sedimentation and total phosphorus. A TMDL was approved in 2000 to address these pollutants. Two beaches on Lake Macatawa are listed as not supporting total and partial body contact due to E. coli. A statewide TMDL is being drafted by the MDEQ to address E. coli. Fish consumption is also impaired in Lake Macatawa due to mercury and PCBs in fish tissue and in the South Branch of the Macatawa River due to mercury in the water column. Statewide TMDLs have been drafted to address these pollutants.

Management Plan Priorities

The management plan identified nutrients, sediment, hydrology, and temperature as high priority pollutants, *E. coli* as a medium priority pollutant and other chemicals, invasive species, chloride and trash as low priority pollutants. The plan identifies high, medium and low priority sources and causes for all high and medium priority pollutants. Best management practices, both structural and non-structural, are recommended to address each high and medium priority pollutant. Critical areas were identified for both agricultural and urban restoration and protection actions.

Implementation history

The Macatawa Area Coordinating Council and other local partners have been very successful in securing grants and implementing significant restoration projects throughout the watershed. The ODCMG manages the Macatawa Greenway and has restored or protected many significant riparian areas along the Macatawa River. The Ottawa County Parks completed two major wetland restorations. The MACC has helped install best management practice (BMP) demonstration projects on both public and private property, and secured state and federal grants to incentivize the installation of agricultural BMPs, such as cover crops, reduced tillage and gypsum application. The Macatwa Watershed was one of 3 watersheds in Michigan selected by NRCS for the Conservation Reserve Enhancement Program, under which several local farmers installed BMPs.



Paw Paw Park (Ottawa County Parks) wetland after significant rain event in April 2015

Tracking Progress

The Macatawa Watershed has participated in the MiCorps Volunteer Stream Monitoring program since 2012. Data is available through the MiCorps Data Exchange. Both Hope College and the Grand Valley State University Annis Water Resources Institute (GVSU-AWRI) have conducted monitoring programs in the watershed. Hope developed a protocol for measuring sediment loads that resulted in the development of a critical areas map for restoration. As part of Project Clarity, GVSU-AWRI is conducting pre- and post-monitoring of significant restoration projects. GVSU-AWRI graduate students are also investigating dissolved phosphorus transport in the watershed and phosphorus uptake within two-stage ditches.

Future Needs

There is still a long way to go to meet water quality standards in the Macatawa Watershed. It is estimated that with Project Clarity, implementation of practices will be completed within about 5 years, but monitoring and maintenance of practices will need to continue indefinitely. Current annual estimated budget needs for Macatawa Area Coordinating Council to administer the Macatawa Watershed Project (excluding Project Clarity efforts) are about \$771,000 per year for at least the next 5 years.

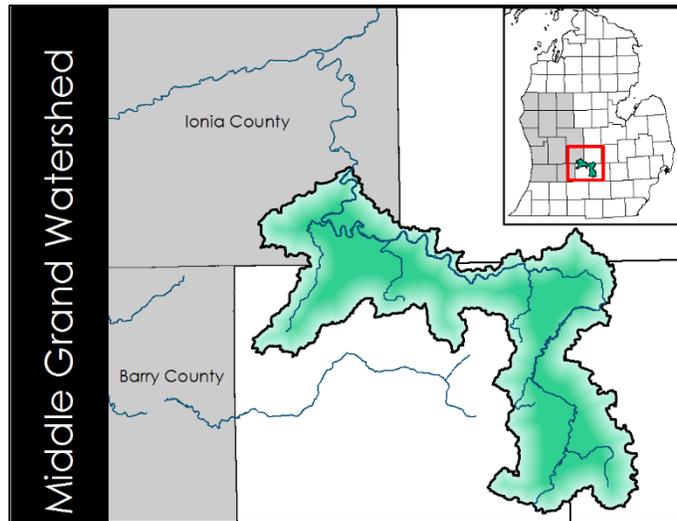
Contact

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Middle Grand River Watershed – HUC Code: 04050004

Size and location

The Middle Grand River Watershed encompasses approximately 258 square miles (165,000 acres) in Mid-Michigan's Eaton, Ingham, Clinton, and Ionia counties. Twenty-one local units of government make decisions that influence the land uses, and subsequent water quality, in the Watershed. The Middle Grand River section is approximately 129 miles in stream length, has nine subwatersheds (HUC 12) and it



joins together the Upper and Lower Grand River. Together, the entire Grand River Watershed, comprising the Upper, Middle, Lower, Red Cedar, Looking Glass, Thornapple, Flat, Rogue, and Maple rivers, make up the second largest watershed in Michigan. The Middle Grand River Watershed is only one part of the entire Grand River Watershed; however, there are several nonpoint source pollutants that this section is contributing to the overall water quality of the Grand River and Lake Michigan.

Watershed Management

The goals of the watershed management plan (2013?) are to achieve designated uses and desired uses by meeting water quality standards that are not currently being met. The specific goals to achieve the designated uses are to (1) reduce *E.coli* from contaminating the surface waters for restoration of total and partial body contact recreation, (2) improve dissolved oxygen levels for restoration of warmwater fishery and other indigenous and aquatic life and wildlife, and (3) reduce sedimentation from degrading other indigenous aquatic life and wildlife. The information and education strategy includes educational goals for each target audience, key messages and potential delivery mechanisms. The management plan is available online at <http://www.eatoncd.org/middle-grand-river-watershed.html>

The Middle Grand River Organizations of Watersheds (MGROW) is a not for profit organization that was established in 2011 to provide oversight of the Middle Grand Watershed Management Plan. MGROW is administered by a board of directors and is working to promote education, conservation, restoration, and wise use of resources within the watershed.

TMDL and/or designated use impairments

All nine subwatersheds have tributaries that are listed as impaired for fish consumption due to mercury in fish tissue and PCBs in fish tissue and the water column. Statewide TMDLs have been

drafted by the MDEQ to address these pollutants. Additional designated use impairments and TMDLs are summarized in the following table.

| Waterbody | Impaired Use | Cause | TMDL Year |
|--------------------------------|--|----------------------|------------------|
| Carrier Creek | Other indigenous aquatic life and wildlife | Sediment | 2002 |
| Carrier Creek | Warmwater fishery | Low dissolved oxygen | 2016 |
| Carrier Creek and Silver Creek | Total body contact | <i>E. coli</i> | 2012 |
| Skinner Extension Drain | Partial and Total body contact | <i>E. coli</i> | 2012 |

Management Plan Priorities

The management plan identifies pathogens (*E. coli*) as the highest priority pollutant and the priority sources as agriculture and human. Sediment is the second pollutant and the priority sources are croplands, livestock and storm water. The third pollutant is total suspended solids (TSS) which is contributing to low dissolved oxygen. The priority sources of TSS are septic systems, construction sites and storm water. The management plan also identifies priority actions and critical areas for implementation for each priority pollutant.

Implementation History

The Eaton Conservation District received a MDEQ Section 319 grant in 2013 to complete source tracking of *E. coli* in the watershed. The project including environmental monitoring in surface water as well as source tracking completed by Environmental Canine Services.

Future Needs

Estimated annual funding needs to fully implement the watershed management plan are \$345,500.

Contact

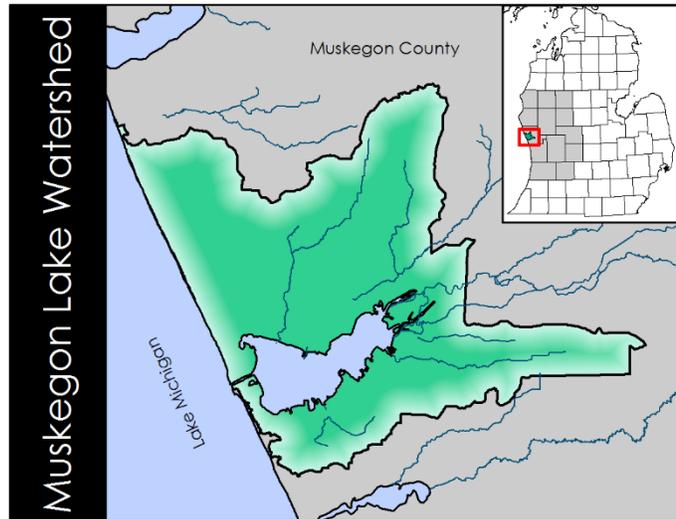
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Middle Grand River Organization of
 Watersheds
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<http://mgrow.org/>

Muskegon Lake Watershed – HUC code: 040601021004

Size and Location

Muskegon Lake is a 4,150-acre coastal lake (drowned river mouth). The Muskegon Lake Watershed drains approximately 130 square miles and covers all or parts of two counties, nine townships, and five cities. Land use in the watershed is 38% forest, 17% developed land, 13% agriculture, 12% wetlands, 10% grassland/shrubland, and 10% open water/barren land.



Watershed Management

In 2000, a Ryerson Creek Stormwater Plan and a MDEQ Hydrologic Study identified NPS BMP needs for the Ryerson Creek sub-watershed. A Muskegon Lake Watershed Management Plan was developed in 2005 and defined the watershed boundary as the vicinity drained by the urbanized area in Muskegon County excluding Mona Lake and the Grand River. The overall goal of the management plan is to improve the impaired and threatened designated uses. It identified a range of minimal, moderate and high cost/benefit nonpoint source pollution (NPS) best management practices (BMPs) that can be implemented to meet minimum Phase II NPDES regulatory requirements. The plan is available online at http://www.michigan.gov/documents/deq/ess-nps-muskegon-lake-wmp_198337_7.pdf In 2008, the Muskegon Lake Area Of Concern Habitat Restoration Plan was developed. Implementation of habitat restoration projects has also helped address some of the NPS BMP needs along the shoreline. The Ruddiman Creek Implementation-Ready TMDL was developed with support from GLRI in 2013. It identified a range of NPS BMPs and cost/benefit estimates.

TMDLs and/or designated use impairments

Muskegon Lake was designated as an EPA area of concern (AOC) in 1985 due to sediment contaminated with excessive nutrients, heavy metals, petrochemicals, pesticides, and polychlorinated biphenyls from historical municipal and industrial wastewater discharges. The AOC includes the entire Lake and the tributaries of Mosquito Creek, Ryerson Creek, Ruddiman Creek, Green Creek, and Four Mile Creek. Nine beneficial uses are impaired in Muskegon Lake: beach closings, restrictions on fish and wildlife consumption, eutrophication or undesirable algae, restrictions on drinking water consumption, or taste and odor, degradation of fish and wildlife populations, degradation of aesthetics, degradation of benthos, restrictions on dredging activities, and loss of fish and wildlife habitat.

State of Michigan designated use impairments are summarized in the following table.

| Water Body | Impaired designated use | Cause |
|--|---|---|
| Middle Channel Muskegon River (-03) | Fish consumption | Chlordane, mercury in fish tissue, PCBs in fish tissue and water column |
| Ruddiman Creek (-04), Ruddiman Creek wetland (-08), West and North Branch Ruddiman Creek (-10) | Total and partial body contact recreation | <i>E. coli</i> |
| Ruddiman Creek (-04) | Warm water fishery | PCBs, PAH, sediment |

| Water Body | Impaired designated use | Cause |
|--|--|--|
| Ruddiman Creek (-04) | Other indigenous aquatic life and wildlife | PCBs in water column, PCBs, PAHs, sediment |
| Ruddiman Creek (-04) | Fish consumption | PCBs in fish tissue and water column |
| Green Creek (-05) | Fish consumption | PCBs in water column |
| Ruddiman Creek Wetland (-08) | Fish consumption | PCBs in fish tissue |
| West and North Branch Ruddiman Creek (-10) | Warm water fishery | Sediment |
| West and North Branch Ruddiman Creek (-10) | Other indigenous aquatic life and wildlife | PCBs in water column, sediment |
| West and North Branch Ruddiman Creek (-10) | Fish consumption | PCBs in fish tissue and water column |

An E. coli TDML was approved in 2010. TMDLs are scheduled for the rest of the pollutants.

Management Plan Priorities

The Muskegon Lake Watershed Management Plan prioritized pollutants to address in Muskegon Lake and its tributaries. The highest priority pollutants for the lake are heavy metals, hydrocarbons and toxic substances. The highest priority pollutants for the tributaries are nutrients, pathogens, unstable hydrology, and excessive sediment. Sources and causes were identified for each pollutant as well as recommended best management practices.

Implementation History

The Muskegon Lake Watershed Partnership (MLWP), Muskegon Area Municipal Stormwater Committee (MAMSC) and the West Michigan Regional Shoreline Development Commission (WMSRDC) have worked collaboratively to develop projects and implement BMPs under the plans summarized above. The MLWP, MAMSC and WMSRDC have tracked implementation progress.

Future Needs

Cost estimates for the Muskegon Lake Watershed are derived from the BMPs identified in these documents with input from the watershed stakeholders responsible for implementation. About \$22 million is needed to fully implement the Muskegon Lake Watershed Management Plan plus an addition \$248,000 for an information and education program.

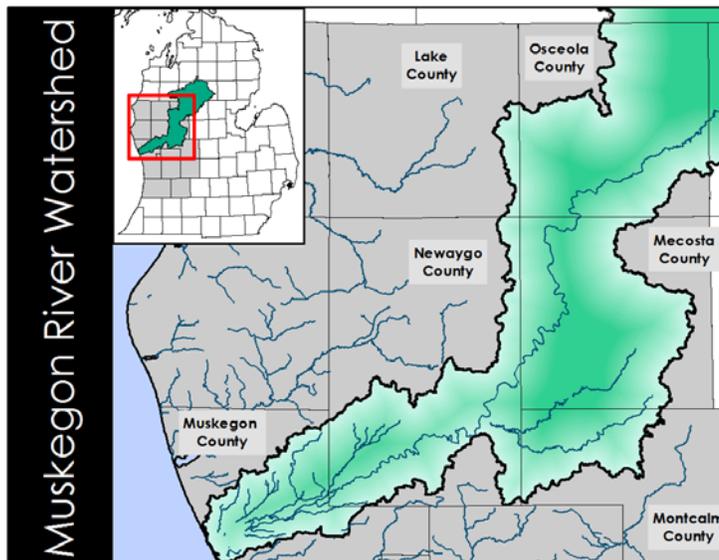
Contact

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Muskegon River Watershed - HUC code: 04060102

Size and Location

The Muskegon River Watershed is a large watershed in central Lower Michigan that drains into Lake Michigan. There are forty sub-basins within the 2,500-square mile Muskegon River Watershed and an estimated ninety- four tributaries that flow into the main trunk of the Muskegon River. The primary tributaries include the West Branch of the Muskegon River, Butterfield Creek, Clam River, Middle Branch River, Hersey River, Little Muskegon River, Bigelow Creek, Brooks Creek, and Cedar Creek. Land use in the watershed is 47.6% forest, 33.4% agriculture, 11.3% wetland, 3.7% water, 2.8% urban, and 1.2% barren land.



Watershed Management

The Muskegon River Watershed Management Plan was approved in 2002 under Michigan CMI criteria and updated in 2007 to meet the EPA nine-element criteria. The goal of the plan is to improve and protect the Muskegon River Watershed designated uses. The plan identifies pollutants that are impairing designated and desired uses and the sources of those pollutants. The information and education strategy identified key audiences, products and resources needed to delivery those products. The plan is available online at <https://www.gvsu.edu/wri/isc/muskegon-river-watershed-337.htm>

TMDLs and/or designated use impairments

There are numerous designated use impairments throughout the Muskegon River Watershed. Many tributaries are impaired for fish consumption due to PCBs in the water column and several lakes are impaired for fish consumption due to mercury in fish tissue. Statewide TMDLs have been developed for these pollutants. Several streams or lakes are also impaired for fish consumption due to chlordane. A TMDL is scheduled for chlordane in 2023. Additional impairments are summarized in the following table. Not included in the table are impairments and TMDLs for the Bear Lake and Muskegon Lake Watersheds. Summaries of these watersheds are included separately.

| Water body | Designated use impaired | Pollutant |
|--|--|--|
| Houghton Lake Denton Township Public Beach (0104-03), Houghton Lake Heights Beach (0104-05) | Total body contact recreation | <i>E. coli</i> |
| Houghton Lake DNR Boat Launch (0104-04), Houghton Lake State Forest Campground Beach (0104-08) | Total and Partial body contact recreation | <i>E. coli</i> |
| Crooked Lake (0305-04) | Other indigenous aquatic life and wildlife | Copper, PAHs, Zinc |
| Weatherby Drain (0805-02) | Other indigenous aquatic life and wildlife | Other anthropogenic substrate alterations, other flow regime alterations |

| Water body | Designated use impaired | Pollutant |
|--|--|---|
| Muskegon River from Hardy Dam downstream 1 mile (0901-03) | Warm water fishery | Dissolved oxygen |
| Muskegon River from Croton dam downstream 1 mile (0903-05) | Cold water fishery | Dissolved oxygen |
| Cedar Creek, Markle Drain (1001-05) | Other indigenous aquatic life and wildlife | Other anthropogenic substrate alterations |

A statewide TMDL is being drafted to address *E. coli*. Dissolved oxygen goals are expected to be met by 2020.

Management Plan Priorities

High priority pollutants were identified as thermal pollution and nutrients in the 2002 management plan. The 2002 plan identified critical areas in the watershed in which to focus restoration efforts to address these pollutants. The plan also provided pollutant reduction goals and recommended implementation actions. The 2007 update of the management plan includes a refined prioritization of pollutants and their sources and causes. Thermal pollution and nutrients remain the highest priority followed by hydrologic flow, sediment, toxic substances, invasive species, and pathogens.

Implementation History

Numerous habitat improvement and restoration projects have been implemented in the Muskegon River watershed since 2004 and numerous project are currently active. A complete list can be found on the MRWA website: <http://mrwa.org/projects/>

Tracking Progress

Two lakes in the Muskegon River Watershed, Hicks Lake in Osceola County and Blue Lake in Mecosta County, participate in the MiCorps Cooperative Lake Management Program. MiCorps volunteer stream monitoring is conducted throughout the watershed to monitor aquatic macroinvertebrates. Data is available for both programs through the MiCorps Data Exchange.

Future Needs

It is estimated that it will take about 30 years to fully implement the management plan. Over that time period, annual operating expenses are estimated to be \$903,500 per year not including information and education and BMP installation. Funding needs to implement the information and education strategy is approximately \$2.3 mil. Funding to implement BMPs are estimated to be \$52.3 mil in two highly critical subwatersheds in the upper and middle portion of the watershed, \$98.6 mil for all other highly critical areas and \$50.2 mil for moderately critical areas.

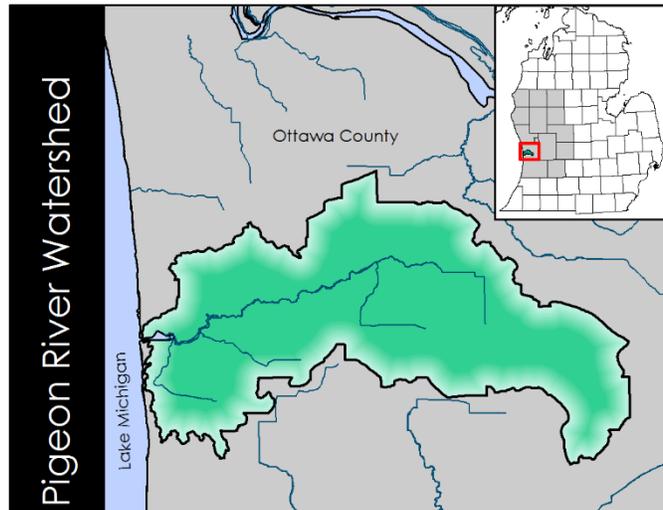
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Pigeon River Watershed – HUC code: 0405000203

Size and location

The Pigeon River Watershed is located in west central lower Michigan in the central portion of Ottawa County. The watershed is 41,395 acres in size and includes portions of seven townships. The Pigeon River flows from east to west and discharges into Pigeon Lake and eventually Lake Michigan. Land use (1992) in the watershed is 49% agriculture, 36% forested, 9% other, 5% urban, and 1% wetland.



Little Pigeon Creek, Ten Hagen Creek and Pigeon Creek downstream of 120th Avenue are listed by the State of Michigan as designated trout streams.

Watershed Management

The *Pigeon River Watershed Project: Comprehensive Nonpoint Source Watershed Management Plan* was completed in 1997 and approved under Michigan CMI criteria. The plan has not been updated since then. The goal of the plan is to enhance designated uses by reducing nonpoint source pollution. The information and education program identified goals, objectives and action items to be carried out for the four year period after the management plan was completed. Target audiences were also identified. The management plan is available online at http://ottawacd.org/pdfs/Pigeon_River_Management_Plan.pdf

TMDL and/or designated use impairments

The designated use of total body contact recreation in a tributary in the Headwaters of Pigeon River is listed on Michigan's integrated report as "insufficient information", but E. coli is included as a pollutant. A TMDL is not scheduled. Three tributaries in the watershed are not supporting the designated uses of other aquatic life and wildlife and fish consumption due to mercury and PCBs in the water column and in fish tissue. Statewide TMDLs have been drafted for these pollutants.

Management Plan Priorities

The plan lists sedimentation, nutrients and thermal pollution as primary water quality concerns and identified both existing and potential sources of each. Action items are included to address each source of pollution. The plan includes a method of identifying critical areas that have the greatest potential to deliver pollutants to watercourses. Sources of pollutants were inventoried, quantified and prioritized within the critical areas

Implementation History

An implementation project was completed in 1998-2001 that resulted in WHAT?

Tracking Progress

Water quality monitoring was conducted in the Pigeon River from 1996-2008 as part of a course at Grand Valley State University. Macroinvertebrates were monitored from 2005-2008

Future Needs

A primary need for the Pigeon River Watershed is an updated management plan that meets EPA nine-element criteria. Along with this, more monitoring is needed to determine the current status of water quality in the watershed. Due to the age of the plan and time that has passed since any implementation work has been done, it is difficult to estimate funding needs. Approximately \$500,000 would be needed over a period of several years to conduct monitoring, appropriate studies and modeling in order to update the management plan.

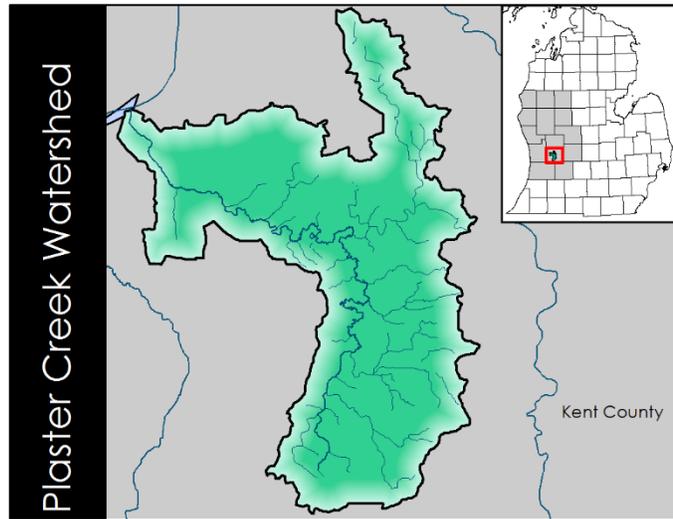
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Plaster Creek - HUC #: 405000605 (-05 and -06)

Size and location

The Plaster Creek Watershed has a drainage area of 58 square miles and is located entirely in Kent County on the south and east sides of the Grand Rapids Metropolitan Area. Plaster Creek's headwaters begin in Gaines Township and flow north and then west to its confluence with the Grand River. A major tributary, Little Plaster Creek, flows from the north, joining Plaster Creek in the City of Kentwood. The watershed occupies portions of the cities of East Grand Rapids, Grand Rapids, Kentwood, and Wyoming, and the townships of Gaines Charter, Cascade, Grand Rapids Charter, Caledonia, and Ada. Land use in the watershed is 38% agriculture, 38% urban, 15% forest, 5% open space, 2% wetland, and 1% water.



Watershed Management

A Steering Committee was formed to involve watershed stakeholders in the Lower Grand River Watershed Implementation Project and the development of the Plaster Creek Watershed Management Plan. Members met at a project kick-off meeting on May 20, 2005 to review the work plan and timetable and begin defining partner roles and assigning tasks required to complete the project. Steering Committee members were involved in stakeholder meetings in 2006 to address the MDEQ's TMDL for *E. coli* in the Grand River. The Steering Committee also participated in meetings in 2007 regarding specific *E. coli* monitoring in the Plaster Creek and other Lower Grand subwatersheds.

Steering Committee members participated in the development and review of the Plaster Creek Watershed Management Plan in 2007. The plan was approved in 2008 and meets both Michigan CMI and EPA nine-element criteria. The goals of the management plan are to address designated use impairments to improve water quality for fish and other wildlife and for recreational use. The information and education strategy includes target audiences, activities and delivery mechanisms, and critical areas to target messages for each cause of pollution. http://www.michigan.gov/documents/deq/wb-nps-plaster_cr_wmp_293403_7.pdf

Plaster Creek Watershed is also included within the Lower Grand River Watershed Management Plan that was completed in 2004.

TMDL and/or designated use impairments

Designated uses that are impaired in Plaster Creek include partial and total body contact due to *E. coli* and other indigenous aquatic life and wildlife due to sediment. TMDLs were developed for

both pollutants in 2002. Fish consumption is also an impaired designated use due to mercury in fish tissue and PCBs in fish tissue and the water column. Statewide TMDLs have been drafted by the MDEQ to address these pollutants.

Management Plan Priorities

The Plaster Creek Watershed Management Plan includes a prioritization of pollutants and the sources and causes. The top three pollutants were identified as sediment from streambank erosion, urban runoff, agricultural runoff, and construction sites; *E. coli* from animal waste, septic systems and sanitary sewer connections; and nutrients from lawn inputs, animal waste, septic system, and sanitary sewer connections. The management plan also prioritizes best management practices for implementation.

Implementation history

Below is a list of major grants received and information about the project.

- MDEQ Section 319 grant (2000-2003) that funded retrofitting two detention basins to increase capacity, filtration and biological uptake of nutrients
- River Network grant (\$58,000) that established Plaster Creek Stewards through Calvin College. The project included capacity building through the Urban Waters Learning Network
- EPA Urban Waters Small Grant (\$60,000) funded a Green Team and Regional Rainscaping Planning project
- MDEQ Section 319 grant (\$849,000) funded the Plaster Creek Implementation 2 project

Tracking Progress

Calvin College is conducting hydrologic modeling (HEC-HMS) to characterize/develop hydrographs of storm events. They evaluate storage capacity of the projects and their impacts on the hydrographs. Pollutant reduction estimates are determined through STEPL.

Future Needs

Plaster Creek has been declining for over 100 years and it is anticipated that it will take 15-20 years to see measureable improvement in the watershed. The estimated annual budget for Plaster Creek watershed is \$987,000.

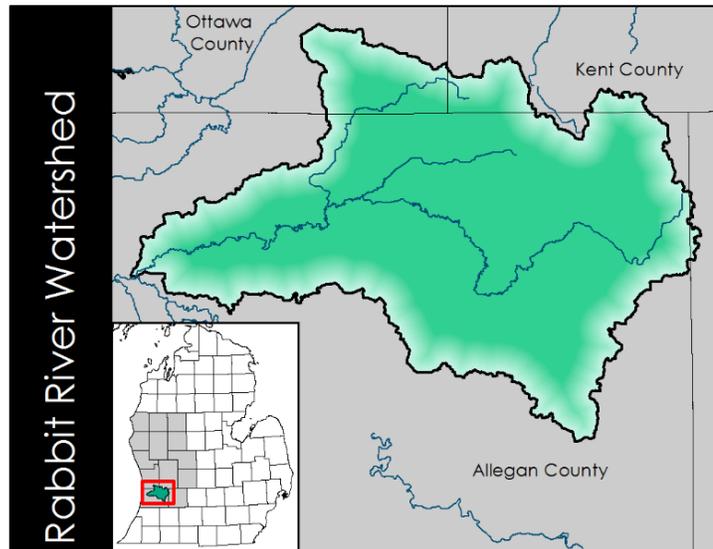
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Rabbit River Watershed – HUC code: 0405000308

Size and Location

The Rabbit River Watershed is located primarily in Allegan County, with parts extending into Barry, Ottawa, and Kent Counties. The Watershed is about 187,200 acres, primarily agricultural, forested, and urban land. The Rabbit River originates east of Wayland, Michigan, in Leighton Township, and flows westerly to join the Kalamazoo River at New Richmond, which then flows on to Lake Michigan north of the City of Saugatuck. Land use in the watershed is 63% agriculture, 16% forest, 9% wetland, 6% urban, 5% open space, and 1% open water.



Watershed Management

In the late 1980s residents in the Upper Rabbit River banded together to prevent areas of the Rabbit from being dredged or straightened and to keep the Rabbit River a natural system. The Friends of the Rabbit River was formed in 1992. The Allegan Conservation District (ACD) developed a Watershed Management Plan (WMP) for the Little Rabbit River that was approved under Michigan CMI rules in 1997. The ACD also completed a WMP for the Upper Rabbit River under CMI rules in 2005. In 2006, a grant was awarded to the ACD to complete a WMP for the entire Watershed to meet both Michigan CMI and EPA nine-element criteria. The Rabbit River Watershed Management Plan was completed in 2009. The goals of the Rabbit River plan are to restore and maintain designated use impairments, protect and preserve threatened designated uses, educate stakeholders, and create a sustainable strategy for implementation. The information and education strategy includes target audiences, key messages and specific activities and delivery mechanisms. The management plan is available online at <http://allegancd.org/programs/rabbit-river-watershed-project/rabbit-river-watershed-management-plan/>

TMDL and/or designated use impairments

The designated use of other indigenous aquatic life and wildlife is impaired in the Headwaters of the Little Rabbit River due to unknown causes, direct habitat alterations, other flow regime alterations, and sedimentation. A TMDL is scheduled for 2021 to address sediment and unknown causes. Several streams and small lakes are also impaired for fish consumption due to mercury or PCBs in fish tissue or the water column. Statewide TMDLs have been drafted by the MDEQ to address these pollutants.

Management Plan Priorities

The Rabbit River WMP includes the identification of critical areas in the watershed in which to focus restoration and protection efforts. Priority pollutants, sources and causes were identified as well as best management practices and management strategies. Priority pollutants that are impairing the use of other indigenous aquatic life and wildlife were identified as sediment, nutrients, high flow, habitat fragmentation, and pesticides and chemicals. Priority pollutants that are impairing the designated use of warm water fishery were identified as low dissolved oxygen, sediment and high flow. Numerous tributaries are not supporting the designated use of fish consumption due to mercury or PCBs in fish tissue or the water column.

Implementation history

The Upper Rabbit River Watershed Implementation Project (MDEQ 319, 2002-2006) installed urban and agricultural best management practices and was successful in assisting all 6 townships in the watershed to adopt riparian overlay ordinances. The Rabbit River Watershed Implementation Project (MDEQ 319, 2006-2008) included the update of the Rabbit River Watershed Management Plan, modeling and hydrologic analysis and restoring 34 acres of wetland. The Rabbit River Habitat, Wetland and Hydrologic Restoration project (MDEQ 319, 2010-2014) was successful in replacing two eroding stream culverts, installing a two-stage channel design and implementing several agricultural best management practices.

Future Needs

The greatest challenges, other than funding, faced with implementing the Rabbit River WMP is identifying landowners willing to implement best management practices and continued support from local agencies such as the Road Commission and Drain Commissioner to carry out projects.

The estimated annual budget is \$520,000 in order to implement the management plan. It will take approximately 10 years to fully implement the plan provided there is consistent staffing at the Allegan Conservation District and reliable funding sources.

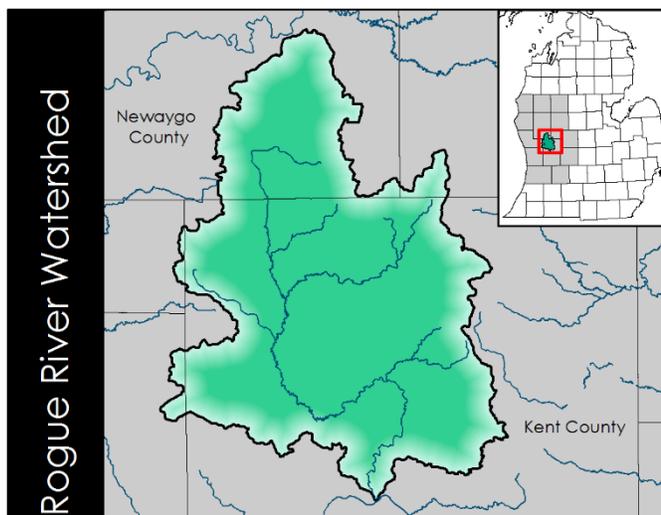
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ROGUE RIVER WATERSHED – HUC Code: 0405000604

Size and Location

The Rogue River is a major tributary of the Grand River. Its watershed is 167,625 acres in size, with the southern-most portion designated as a cold water fishery. Cold water tributaries include Spring, Cedar, Duke, Stegman, Rum, Shaw, and Barkely Creeks. These tributaries along with the Rogue River have Natural Rivers Designation. There are also warm-water tributaries such as Post, Hickory, Walter, and Ball Creeks. In addition, Ransom, Camp, Freska, Grass (Bella Vista), Indian, and Spring Lakes all have outlets flowing into the Rogue. Land use in the watershed is 58% agricultural, 30% forested, 8% urban, 3% open space, and 1% wetland.



Watershed Management

The Rogue River Watershed Management Plan was approved in 2000 under the CMI administrative rules and was updated in 2008 to meet the EPA nine-element criteria. The overall goal of the management plan is to improve and protect designated uses. The management plan includes an information and education strategy that identifies target audiences, key messages and delivery mechanisms. The plan is available online at <ftp://148.61.56.205/ISCWebDocuments/Rogueplan2-02.pdf> The Rogue River also has a 1973 Rogue River Natural River Management Plan that was revised and updated by the Michigan Department of Natural Resources Fisheries Division in March 2002. This plan is also available online at http://www.michigan.gov/dnr/0,4570,7-153-10364_52259_31442-95815--,00.html

TMDL and/or designated use impairments

Several water bodies in the Rogue River Watershed are not supporting the designated use of fish consumption either due to PCBs in fish tissue and the water column or mercury in fish tissue. Statewide TMDLs have been drafted by the MDEQ to address these pollutants. The greatest threat to the Rogue River Watershed is increased residential and commercial development. Development affects water quality by creating more storm water runoff and increasing the transport of sediments, resulting in warmer streams and a loss of biodiversity.

Management Plan Priorities

Critical areas that threaten designated uses (cold and warm water fishery and partial and total body contact) were identified in the Rogue River Watershed Management Plan. High priority pollutants that threaten the designated uses are sediment and temperature and medium priority pollutants are nutrients,

invasive species and *E.coli* and fecal coliform. Priority best management practices to be implemented include stream restoration, filter strips, stream channel stabilization, fencing out cattle, riparian buffer strips, restoring wetlands, and establishing conservation easements. Priority managerial practices to be implemented include working with local decision-makers to incorporate stormwater practices in to local master plans and codes and ordinances, holding workshops for riparian farmers and construction businesses on soil erosion best management practices, and holding landscaping workshops for riparian homeowners.

Implementation History

1. RRW Education Program (2004): increase awareness, education, and action
2. RRW CMI project (2004): restore areas of substantial erosion and re-create buffers
3. RRW Update and Easements Project (2009): update the management plan to meet EPA nine-element criteria and create conservation easements for high priority lands
4. Rogue River Home Rivers Initiative Project (ongoing): Trout Unlimited initiated this trademark project with support of local foundations. The objective is to educate local communities about the threats of urbanization to watershed health, guide responsible development and urban planning, and restore areas affected by stormwater runoff.
5. Development of Stormwater Guidebook for the RRW (2014): Trout Unlimited developed a stormwater guidebook to educate planning commissions and professional planners on placement and proper use of Low Impact Development.
6. RRW Baseline Monitoring Data for Future Restoration (2014) – Trout Unlimited conducted pre-project monitoring at several locations that are being affected by stormwater runoff to establish baseline data to determine the success of future restoration projects.

Future Needs:

The Rogue River Watershed Council is dedicated to the long-term protection and restoration of the Rogue River and its tributaries through community stewardship, education and watershed-based land-use planning. The estimated annual budget necessary to implement the management plan is \$492,100. It will likely take 20 years to fully implement the plan.

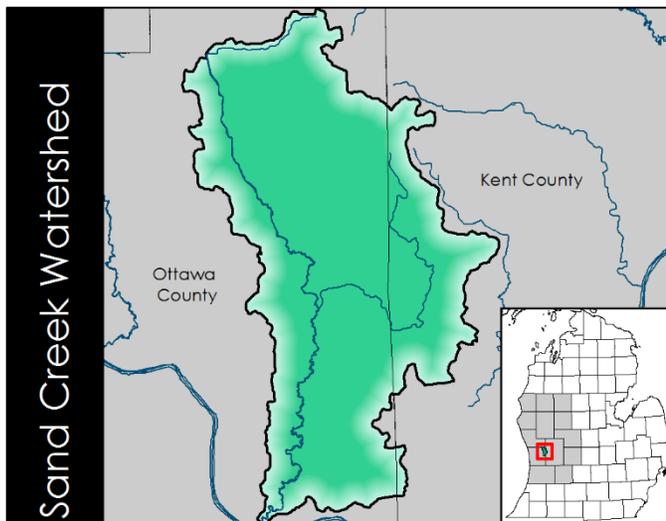
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Sand Creek Watershed – HUC Code: 0405000607 (-01, -02, -03; Lower Grand)

Size and location

Sand Creek is a third order designated cold water stream approximately 22 miles in length. It begins in the east-central portion of Ottawa County, near Conklin, and has been designated as a trout stream by the Michigan Department of Natural Resources. The creek flows through Marne to its confluence with the Grand River, west of Grand Rapids. Approximately 23 streams, most of which are intermittent, and drains flow directly into Sand Creek. The Sand Creek Watershed drains approximately 55 square miles and covers parts of four townships, one city, and two counties. The watershed itself is one of many subbasins of the Grand River Watershed. The northern portion is mostly agricultural while the southern portion is a mix of forested, residential, and agricultural areas. According to the 2003 watershed management plan, land use in the Sand Creek watershed is 40.5% pasture, 36.3% row crops, 16.3% forest, 4% wetlands, 2.6% urban, and 0.3% open water.



Watershed Management

The Sand Creek Watershed Management Plan (WMP) was developed in 2003 and approved under Michigan CMI criteria. The goal of the plan is to improve and protect the designated uses of the watershed. The plan includes an information and education strategy identifies target audiences, key messages and suggested delivery formats. The plan is available online at http://www.michigan.gov/documents/deq/ess-nps-wmp-sand-creek_208925_7.pdf

The development of the Sand Creek WMP was facilitated through a MDEQ Section 319 grant awarded to the the Grand Valley Metropolitan Council.

TMDL and/or designated use impairments

The designated use of cold water fishery is impaired in the Headwaters and East Fork of Sand Creek due to other flow regime alternations and sedimentation/siltation. A TMDL for sediment was approved for Sand Creek in 2005. Fish consumption is also impaired in both streams due to mercury in fish tissue and PCB in fish tissue and the water column. A statewide TMDL has been drafted by MDEQ to address these pollutants.

Management Plan Priorities

The overall goal of the Sand Creek Watershed Project is to improve and protect the designated uses of the watershed. In order to achieve this overall goal, and attain compliance with the TMDL

established in Sand Creek, four goals were been established and prioritized. They are to 1) restore or improve coldwater fishery, 2) protect and improve native habitat, 3) protect and improve partial body contact, and 4) protect and improve total body contact. The management plan includes the designation of geographic critical areas in which to focus restoration and protection efforts as well as suggested implementation actions.

Implementation history

The Sand Creek Watershed CMI Project (MDEQ funded, 2005-2007), managed by the Grand Valley State University Annis Water Resources Institute, installed 3 rain gardens and stabilized 178 linear feet of streambank.

Future Needs

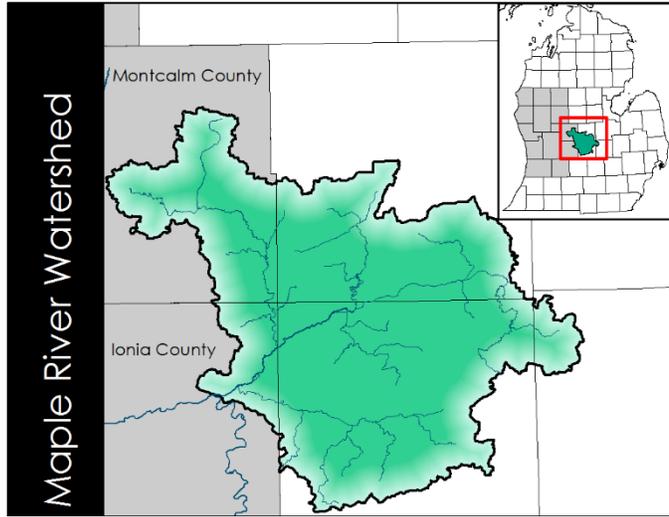
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Upper Maple River Watershed – HUC code: 0405000502 (Maple)

Size and location

The Upper Maple River Watershed is approximately 513 square miles and is part of the larger Maple River Watershed, one of six major tributaries of the Grand River. Major water bodies in the watershed are Pine Creek, Alder Creek Drain, Maple River Ferdon Creek, Collier Creek, and Peet Creek. Land use in the watershed is of 79% agriculture, 8% forest, <3% Urban, <3% Wetland, and <3% open water.



Watershed Management:

The Upper Maple River Watershed Management Plan was approved in 2010 under CMI and EPA nine-element criteria. The goals are based on reducing and/or eliminating the impacts of nonpoint source pollutants within the Watershed, restoring or maintaining the designated uses, and supporting desired uses. The information and education strategy identified target audiences, key messages and delivery mechanisms. The plan is available online at http://www.michigan.gov/documents/deq/wrd-nps-upper-maple-wmp_370632_7.pdf

TMDL and/or designated use impairments:

Designated use impairments included in the 2014 Michigan integrated report are provided in the following table.

| Waterbody | Impaired Use | Cause | TMDL Year |
|---|--|---|--------------|
| Pine Creek (-05-04) | Other Indigenous aquatic life and wildlife | Organic enrichment (sewage), total phosphorus | 2007 |
| Pine Creek (-07-02) | Other Indigenous aquatic life and wildlife | Organic enrichment (sewage), total phosphorus Physical substrate habitat alterations | 2007 2019 |
| Maple River (-02-02) | Other Indigenous aquatic life and wildlife | Aquatic plants - native, total phosphorus | 2009 |
| Ferdon Creek and Maple River (-04-02) | Other Indigenous aquatic life and wildlife | Excessive algal growth, total phosphorus | 2009 |
| Collier Creek and Maple River (-08-02) | Other Indigenous aquatic life and wildlife | Total phosphorus | 2009 |
| Maple River (-02-03) | Total body contact recreation | <i>E. coli</i> | 2019 |
| Unnamed tributaries to Pine Creek (-05-01), Newark Drain (-05-02), River Styx (-05-03) Pine Creek, (-05-04, -07-01, -07-02), North Shade Drain (-06-01), Otter Creek (-07-03) | Partial and total body contact recreation | <i>E. coli</i> | 2019 |

As of 2016, the MDEQ was in the process of drafting a statewide TMDL to address *E. coli* in watersheds that do not already have an approved TMDL.

Some of the tributaries listed in the table above as well as others in the Upper Maple are also not supporting the designated use of fish consumption due to PCBs in fish tissue and the water column. Statewide TMDLs have been drafted by the MDEQ to address these pollutants.

Management Plan Priorities

The highest priority nonpoint source pollutant in the watershed is sediment, followed by nutrients, pathogens and bacteria, high temperature, and pesticides. The plan includes a prioritization of the sources and causes of each pollutant. The plan outlines a method for determining critical areas for restoration based on the potential for contributing the most nonpoint source pollutants. Critical areas were also identified for preservation and protection.

Implementation history

A MDEQ 319 Implementation Grant (2012-2015) resulted in the installation of cattle exclusions and water control structures, stabilization of two streambanks, completion of several field days, and the formation of a stakeholder group to address wells and septic systems.

Michigan CMI grant (2015-2016) funding supported *E. coli* monitoring throughout the Upper Maple River Watershed

A MDEQ 319 Implementation Grant was started in October 2015 and will address best management practices and assist landowners with payments for installing approved practices. The project will also increase outreach and education regarding septic systems.

Tracking Progress:

Load reductions that resulted from the 319 implementation grant (2012-2015): 1,142 tons of sediment, 1,314 lbs of phosphorus and 2,626 lbs of nitrogen.

Future Needs:

Since the management plan was approved, *E. coli* monitoring has taken place. Monitoring indicated that it is a much bigger problem than identified in the management plan. Therefore, the plan needs to be updated to reflect this new information.

Challenges to implementing the management plan include time, limited staffing and identifying landowners willing to implement practices. Estimated annual budget needs are \$415,000. It will take approximately 30 years to fully implement the management plan and address major areas of concern.

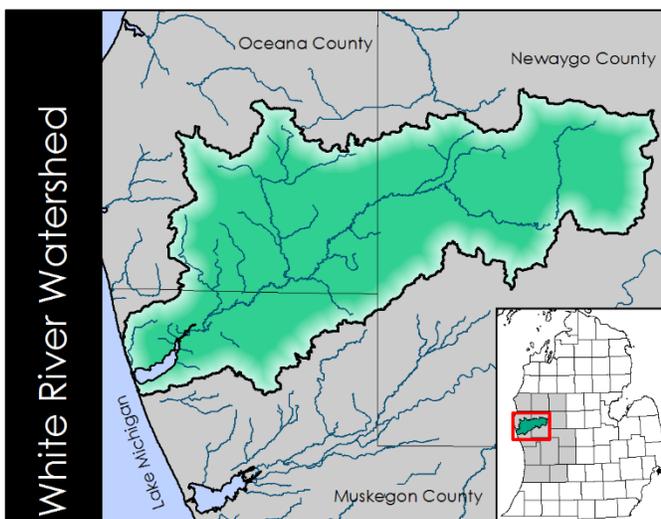
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White River Watershed – HUC code: 04060101 (-07, -08, -09)

Size and location

The White River flows 120 miles through west central Michigan before entering White Lake, a drowned river mouth of Lake Michigan. The White River Watershed covers 344,166 acres of mostly forested and agricultural land. The continued loss of stream-side vegetation and the resulting erosion is affecting the system. Much of the White River and its major tributaries have Natural River (Country-Scenic) designation. White Lake is a designated trout lake and many streams within the watershed are designated trout streams. Land use in the watershed is 58% forest, 20% agriculture, 11% open field, and 4% urban.



Watershed Management

Michigan's White River and its watershed comprise one of the few urban river systems in the United States that still contains large tracts of relatively pristine landscape. As pressure to develop this land increased, more than 40 local stakeholders worked together to develop preservation strategies to ensure the unique and irreplaceable assets of the river system would not be lost forever. In 2002, Alcoa Foundation provided a \$100,000 grant to initiate the preservation of this freshwater ecosystem, a task carried out by a diverse group of stakeholders.

The White River Watershed Management Plan was developed in 2006-2008 with MDEQ Section 319 funding by the GVSU Annis Water Resources Institute in partnership with the White River Watershed Partnership (WRWP), the White Lake Association, the Muskegon Conservation District, and the White Lake Public Advisory Council. The Plan was approved in 2009 under Michigan CMI and EPA nine-element criteria. Goals of the management plan are to restore and protect designated uses and desired uses. The plan includes and information and education strategy that identifies priority target audiences, messages and activities. The plan is available online at <http://www.white-river-watershed-partnership.org/id33.html>

TMDL and/or designated use impairments

The designated use of fish consumption is impaired in several tributaries in the White River watershed due to PBCs in the water column. Fish consumption is also impaired in White Lake and Robinson Lake due to mercury in fish tissue. Statewide TMDLs have been drafted for these pollutants. The designated use of other indigenous aquatic life and wildlife is impaired in Black (Delong) Creek due to other anthropogenic substrate alterations and other flow regime alterations. A TMDL is not scheduled to address these pollutants. White Lake was listed as an EPA area of concern in 1987 and was delisted as of October 2014.

Management Plan Priorities

High priority pollutants in the White River Watershed are hydrologic flow and temperature, medium priority pollutants are nutrients and sediment and low priority pollutants include exotic species, toxic substances and *E. coli*. The management plan identifies sources and causes of each pollutant and provides recommended management measures to reduce pollutants. The management plan includes critical areas/geographic priorities for targeting pollutant reductions and preservation.

Implementation history

The WRWP received both start-up and full grants from MiCorps to initiate benthic macroinvertebrate monitoring, habitat assessments and hydrological characterizations in the middle and upper watershed.

One of our principal partners, the Oceana County Road Commission, has undertaken major road-stream crossing improvements at several sites in the upper watershed.

Another major partner, the Muskegon Conservation District, has a grant application pending that deals with former agricultural lands in the lower watershed. If funded, the work will include monitoring and site characterization by the WRWP.

Tracking Progress

The WRWP is tracking in-stream conditions following road-stream crossing improvements using a combination of benthic macroinvertebrate monitoring, habitat assessment tools, and hydrological characterizations. However, we have yet to document load reductions or to carry out cost-benefit analyses.

Future Needs

Some updates are needed to the management plan, including the information and education strategy. In addition, the development of improved modeling tools for erosion and sediment transport suggests the need for revisions to earlier estimates of these parameters.

The estimated, realistic annual budget necessary to implement the management plan is \$84,000. The estimated time to fully implement the management plan and/or address major concerns is 10 years.

The greatest challenges, other than funding, faced with implementing our plan are lack of professional expertise, minimal volunteers and lack of paid staff.

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