CHAPTER 5 – WATERSHED GOALS AND OBJECTIVES

The purpose of the Belle River Watershed Management Plan (WMP) is to provide a comprehensive management strategy for stakeholders and landowners to achieve the WMP goals and designated uses of the Belle River. Ecological goals are often the most complex and difficult to achieve. The goals and designated uses related to fisheries and aquatic biodiversity require other healthy river functions to support water quality. Therefore, the Belle River WMP uses the Stream Functions Pyramid as a framework for developing specific objectives during plan development and stakeholder involvement (Harman, et al., 2012). The Stream Functions Pyramid was developed for the USEPA as a tool for river restoration, compensatory mitigation, and watershed planning.

The Pyramid is a five-level hierarchical framework that categorizes stream functions and parameters that describe those functions. The hierarchical levels are: hydrology, hydraulics, geomorphology, physiochemical, and biology (Figure 5.1). Each level builds on the previous one (so Level 1 functions support Level 2 functions, etc.). In other words, biological functions cannot fully function without all the lower-level functions (Harman et al., 2012).

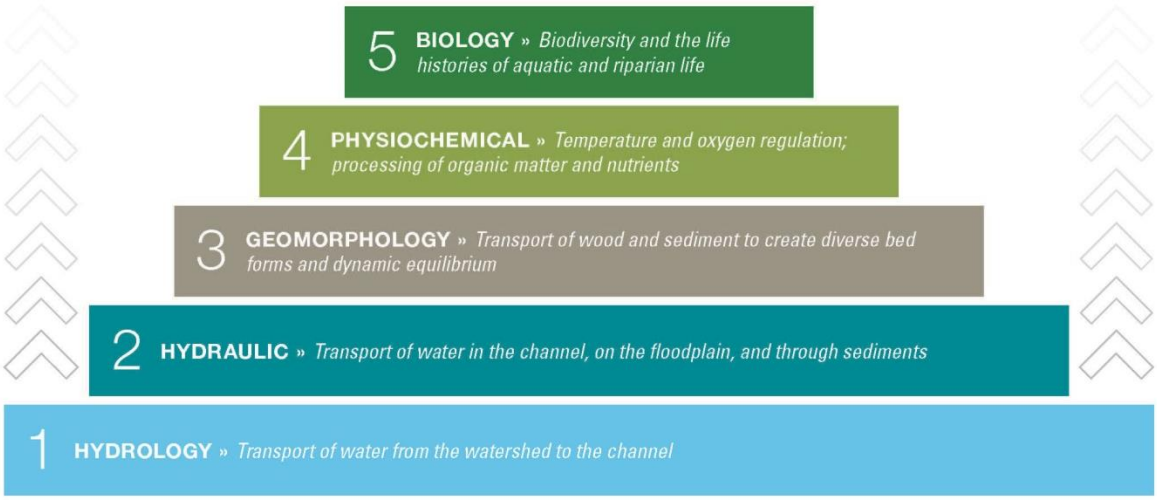

Figure 5.1 Broad-level view of the stream function pyramid

Figure 5.2 is an expanded view of the Stream Functions Pyramid, listing the critical functions and parameters of each level. Each level provides parameters that describe the overall function. Parameters in bold are both a parameter and a function because they are expressed as a rate, e.g., sediment transport capacity. However, the important point is that these parameters help to describe the overall functions within that category (Harman et al., 2012).

Figure 5.2 Detailed view of the stream functions pyramid

5.1 Long-Term Goals and Short-Term Objectives

Six (6) long-term watershed goals have been developed by the Belle River Watershed Advisory Group (WAG) after careful review of existing water quality and hydrologic data, stream inventory results, discussions held during WAG meetings, and public input (refer to Appendix L for a synopsis of the Public Participation Survey process). Each of the long-term goals is summarized in Table 5.1. These goals correlate to the applicable designated and desired uses of the Belle River Watershed identified in Chapter 4.

Table 5.1 Summary of long-term goals

		1. Agricultural water use	2. Industrial water supply	3. Public water supply sources	4. Navigation	5. Warmwater Fishery	6. Other indigenous aquatic life and wildlife	7. Partial body contact recreation	8. Total body contact recreation	9. Coldwater fishery	1. Manage large woody material in priority areas	2. Support the river as a recreational asset	3. Protect properties from flooding	4. Improve watershed knowledge
	Goals	**Designated Uses**									**Desired Uses**			
1	Restore dissolved oxygen levels to remove TMDL					X	X			X				
2	Restore hydrologic stability				X	X	X			X			X	
3	Protect critical ecosystems					X	X			X			X	
4	Improve water quality knowledge and engagement of residents					X	X	X	X			X		X
5	Implement a sustainable woody debris management program				X	X	X				X		X	
6	Improve public recreation opportunities							X	X			X		X
7.	Reduce *E. coli* levels							X	X			X		

Each long-term goal is met by a series of short-term measurable objectives. The short-term designation in this case means that each objective will begin to be achieved through actions implemented in the first five (5) years, with many actions ongoing in subsequent years. Communities in the Belle River Watershed will encourage vegetative, structural, and non-structural (managerial) best management practices (BMPs) designed to treat, prevent, or reduce water pollution. The actions that communities are already implementing that will achieve the watershed goals and objectives are described in Chapter 7. Progress in achieving these goals will be defined by monitoring the physical and biological conditions of the river.

Ultimately, the attainment of goals and objectives of this WMP will be accomplished through the process of adaptive management. As the watershed changes and management strategies are evaluated for effectiveness, the strategies to meet watershed goals and objectives are likely to change. Additionally, the watershed goals and objectives are likely to change over the lifetime of the plan implementation. These changes will be reflected in periodic updates to this WMP. The overall goal is that the watershed

planning process becomes a self-sustaining process with increased participation and drive from stakeholders over time.

Goal 1: Restore Dissolved Oxygen Levels to Remove the Total Maximum Daily Load (TMDL)

1.1 Implement Two-Stage Drain Design

Natural channels exist in two or more stages. Restoration of existing channels should explore the opportunity to return the channel to a two-stage cross section. This restoration will help reduce the flows at bank-full conditions that lead to higher shear stresses and erosion potential. Streambank stabilization measures work by either reducing the force of flowing water and/or by increasing the resistance of the bank to erosion. Vegetating streambanks and constructing riparian buffers also provide important ecological benefits such as shading water and providing crucial habitat for both terrestrial and aquatic wildlife species.

1.2 Implement Erosion Control around Tiled Fields

Soil eroded from agricultural land can be transported to surface waters through direct runoff or through in-field tile intake to sub-surface drainage tile systems. Reducing soil erosion on agricultural land requires a combination of understanding soil properties, field conditions and land management practices to protect the soil from wind and water. Establishing and promoting best management practices (BMP's) including buffer strips, filter strips, grassed waterways, tillage practices, water retention and other proven BMP's are important activities.

The Natural Resources Conservation Service (NRCS), MSU Extension, and local Conservation Districts can provide technical expertise for erosion control. These agencies will need to work closely with local communities and agricultural producers to promote erosion control to limit sediment loading to surface waters.

1.3 Implement Drainage Water Management Practices for Tile Lines

State agencies have the authority to manage agricultural practices through voluntary measures called GAAMPs. GAAMPs provides agricultural landowners with guidelines to follow in regard to nutrient and pesticide application and storage, manure management, groundwater protection, and a host of other agricultural BMPs to protect surface and groundwater as well as habitat. Established outreach programs are available to educate landowners about these recommended practices, which should be utilized as much as possible to control potential pollutants from this land use. The WAG should work closely with the NRCS and the conservation districts to identify and promote the use of GAAMPs in problem areas. On agricultural lands, land owners can be eligible for USDA programs such as Environmental Quality Incentives Program (EQIP) and Conservation Reserve Program (CRP) to help pay for these practices. Additionally, this practice could be potentially funded by 319/CMI funding for fiscal year 2016.

1.4 Maintain Riparian Buffers

Sheet or overland runoff can carry large amounts of contaminants into streams and directly into the river during wet weather events. Proper maintenance of areas adjacent to riparian corridors left in their natural state or are established as buffer strips, provide an excellent filtering mechanism that removes suspended materials contained in the runoff. By establishing minimum buffers or setbacks from wetlands and watercourses, nonpoint source pollutants will be minimized. In addition, these buffers also enhance and protect habitat areas associated with the natural resources. Buffers or riparian corridors along watercourses also help to slow and filter stormwater runoff.

Figure 5.3 A riparian buffer is needed to stabilize this streambank at Musiel Park, Memphis

1.5 Stabilize Streambanks

In many cases, streambank erosion can be a direct source of sedimentation within streams. However, streambank erosion is often related to peak storm flows, therefore it is important to address storm flows upstream of sites to be stabilized if the projects are to succeed over the long-term.

A streambank erosion inventory was conducted as part of the watershed planning process. This inventory was then assessed to develop best management practices based on erosion severity and location (private versus public lands). More details on this inventory can be found in Chapter 2.

Several types of streambank stabilization methods exist, such as engineered methods, bioengineered methods, and biotechnical methods. Engineered methods include structures, such as riprap, gabions, deflectors, and revetments. Bioengineering methods use live plants that are embedded and arranged in

the ground where they serve as soil reinforcement, hydraulic drains, and barriers to earth movement. Examples of bioengineering techniques include live stakes, live fascines, brush mattresses, live cribwall, and branch packing. Biotechnical methods include integrated use of plants and inert structural components to stabilize channel slopes, prevent erosion, and provide a natural appearance. Examples of biotechnical techniques include joint plantings, vegetated gabion mattresses, vegetated cellular grids, and reinforced grass systems.

Figure 5.4 SCC PARC streambank stabilization demonstration project using large woody material from the Belle River, Columbus County Park

1.6 Provide Lawn Care Education

Nitrogen, phosphorus, potassium, and other nutrients are necessary to maintain optimum growth of most vegetation. Fertilizer management addresses the proper selection, use, application, storage, and disposal of fertilizers. Nutrients that are applied beyond what plants require will wash off the soil and runoff into lakes, streams, and wetlands, or leach into groundwater. When nutrients, such as phosphorus runoff into surface waters, they have a detrimental effect and can cause algae blooms and excessive aquatic plant growth. Statewide restrictions in Michigan have been put in place to prohibit the use of phosphorus fertilizers on residential or commercial lawns, starting in January 2012.

Programs that address specific practices on individual properties can have a major impact on nutrient reduction. Lawn care education programs should include information about fertilizer, watering, and mowing practices. In addition, assistance can be provided on reducing turf grass through the establishment of native plant alternatives. Organizations such as the St. Clair Health Department, SEMCOG, MSU Extension, and Wild Ones currently offer some materials and programs. Lawn care programs should focus on residential and commercial lawns as well as maintenance of common areas and

landscaped areas around detention basins. These areas often require different types of maintenance to keep them functioning properly.

1.7 Educate Agricultural Producers on Nutrient Management

Agricultural land encompasses 57.5% of the watershed. Proper agricultural practices and education are critical to reduce nutrient loads in Belle River. Educational materials could be developed that target agricultural producers. A SIDMA public opinion survey was distributed as part of the watershed planning process with a portion of these sent to the farming community. Results showed that a high percentage of agriculture survey respondents were generally willing to undertake nutrient related BMPs. Workshops presenting Comprehensive Nutrient Management Plans development may be held for agricultural producers..

Goal 2: Restore Hydrologic Stability

In addition to the following practices, some actions under Goal 1 will also help restore hydrologic stability in the watershed, including implementing two-stage drain designs, implementing drainage management practices, and maintaining riparian buffers.

2.1 Implement Infiltration and Detention Practices

In developed areas where detention basins were originally designed for flood control, opportunities exist for various enhancements or retrofits to incorporate sediment and nutrient removal capabilities. Outlet structures may be reconfigured to handle the smaller storm events provided adequate volume still exists in the basin for the design storm event necessary for flood control. These improvements, combined with native plantings and buffer strips along the basin will reduce nutrient, sediment, and bacteria loadings, discourage geese populations, encourage populations of other types of wildlife such as birds, fish, and insects, and ultimately create a more aesthetic environment for the property owner. Such enhancements may also provide passive recreation opportunities.

2.2 Protect Floodplains

Sheet or overland runoff can carry large amounts of contaminants into streams and directly into the river during wet weather events. Proper maintenance of areas adjacent to riparian corridors and floodplain areas that are left in their natural state or are established as buffer strips, provide an excellent filtering mechanism that removes suspended materials contained in the runoff. At a minimum, buffer strips should be twenty feet wide on each side of the tributary and contain native plant materials in order to provide sufficient filtering.

2.3 Develop and Implement Wetlands Ordinances and Protection

Wetlands provide natural surface water storage and groundwater recharge, allowing water to infiltrate or evaporate instead of directly running off to lakes and streams. While natural wetlands should never be

used for direct discharge of storm water, they can help reduce peak flows and pollutants as the last step in a storm water treatment train. Wetlands also provide critical habitat for numerous wildlife species.

Preservation of wetlands is essential for the health of the watershed and many are increasingly being lost through fragmentation, reclamation for other purposes, and clear-cutting. Many of the wetlands are not regulated but even the regulated wetlands continue to be lost. Municipalities should implement their own wetlands ordinance and/or use programs such as Wetland Mitigation Banking or Wetland Conservation Banking, to ensure protection of wetlands. Implementation of wetland protection projects will provide numerous benefits; however funding mechanisms must be identified and secured.

2.4 Replace Undersized Culverts

Undersized culverts can result in increased flooding upstream, increased erosion downstream, and segmentation of habitat. Road-stream crossings should be improved over time in conjunction with other projects such as Road Commission projects to property size and configure crossings. In the Data Gap Analysis (Appendix F) the need to conduct a road culvert inventory across the watershed was identified.

Goal 3: Protect Critical Ecosystems

3.1 Educate Riparian Landowners where Priority Ecosystems are Located

The SCCHD and the Belle River WAG have discussed opportunities to engage riparian landowners in watershed stewardship and stormwater, floodplain, and woody debris management. Because the majority of the Belle River flows through private land, an effective riparian landowner education program is critical to long-term protection and restoration. A number of resources currently exist for developing this type of program. As part of the watershed planning development process, a public participation survey was developed gauge public awareness and gain input (Chapter 8).

3.2 Contact Residents with Fallow Farmlands that contain Priority Wetlands for Restoration

A restored wetland is the rehabilitation of a drained or degraded wetland where the soils, hydrology, vegetative community, and biological habitat are returned to the natural conditions to the greatest extent possible. As much as 79% of the historical wetlands have been lost in the Belle River Watershed, a program should be implemented to identify priority wetlands for restoration. Research should be completed to compile a list of the available properties with priority wetlands. Residents of fallow farmlands should be contacted with information about wetland restoration. Following identification of properties and conversations with landowners, appropriate parcels should be purchased or easements should be established. After attainment of property or easements, wetland restoration projects should be designed and implemented.

3.3 Restore Erosion Areas in Priority Ecosystems

Priority ecosystems are remaining natural resources of high quality and environmentally sensitive areas that require protection and preservation. As sedimentation is a primary pollutant in the watershed,

restoration efforts should focus on priority ecosystems. Erosion can be caused by increasing stream velocities, channel meandering, and improper riparian management. BMPs can be utilized which are best suited for each site.

Goal 4: Improve Water Quality Knowledge and Engagement of Residents

4.1 Improve Storm Water Quality Knowledge of Residents

Increasing knowledge about storm water management practices and watershed awareness are important to improve water quality. Most communities are a member of SEMCOG, which offers the Southeast Michigan Partners for Clean Water program. As part of this program, each community participates in the Seven Simple Steps to Clean Water campaign by making available the program's educational materials through their website and cable television station, and distributing brochures, tip cards, and other print media to stakeholders and residents. These materials provide a means to convey the importance of the protection of water quality as it relates to seven key topics including: storm drain awareness, fertilizer usage, household hazardous waste disposal, pet waste disposal, water conservation, landscaping for water quality, and car wash/auto care

Figure 5.5 SEMCOG has developed the Seven Simple Steps to Clean Water campaign materials

4.2 Increase Floodplain and Woody Debris Education

Prevention and removal of stream flow obstructions involves the detection of stream blockages caused by debris, sediment, and branches or trees that have fallen into the river. If cleanup is required, it is important to do so in an environmentally friendly manner that minimizes habitat disruptions. Stream cleanup should be considered in lieu of clearing, snagging, channelization, or other more severe modifications. Communities and individuals are encouraged to become involved with removing smaller obstructions before they become a major problem. This involvement may include monitoring and maintaining stream flow conditions and checking for obstructions that are hindering the flow of the river and causing upstream ponding problems.

A floodplain is an area at risk for flooding from drains, streams, or rivers in the watershed. Residents that are at risk from flooding should be educated how to maintain floodplains in smart, safe ways that respect the environment. An education and outreach campaign should be established to educate watershed residents about at-risk flooding areas and floodplain management.

The WAG should consider methods for proper education, such as the development of brochures or flyers and the utilization of existing materials to integrate into websites and newsletters.

4.3 Educate Land Use Decision Makers

Educating land use decision makers is a critical component to the successful implementation of a watershed plan. These individuals are responsible for implementing many of the actions identified for protecting and restoring the Belle River, thus they must stay on top of the most current stormwater and watershed management tools and techniques.

Goal 5: Implement a Sustainable Large Woody Material Management Program

5.1 Implement Large Woody Material Management Plan in Priority Areas

Large woody material (also known as woody debris) in the river is not always detrimental and, if managed appropriately, can actually provide bank protection and enhance habitat. If removal is required to solve a flow, erosion, or flooding problem, it is important to keep habitat disruption to a minimum, recognizing that natural woody debris can be managed within the stream to provide habitat for aquatic organisms. Stream cleanup should always be considered before any drastic measures such as clearing and snagging, channelization, or other more severe modifications are made. Dam or weir removal to improve fish migration may also fall under this category. Annual management assessments are recommended to determine priority clean-up areas and removal techniques. The priority area for removal of large woody material is the established 14.5 mile Belle River Blueways Trail route.

A woody debris inventory was performed during the development of this WMP. Areas were prioritized based on the severity and scale of the woody debris in regard to flow obstructions and flooding issues. See Appendix I for the Belle River Management Plan for Large Woody Materials.

5.2 Develop Funding for Annual Assessments and River Clean-Ups

Litter and debris cleanup can be achieved through adopt-a-road, adopt-a-park, adopt-a-catch basin, and adopt-a-stream programs. The subwatershed groups can coordinate with the road commission, service clubs, schools, conservation clubs, and businesses to collect debris along local, county, and state roads, community parks, streambanks, and riparian corridors.

Figure 5.6 Volunteers conduct a stream clean-up, Cottrellville Township

Goal 6: Improve Public Recreation Opportunities

6.1 Install Appropriate Access Points for Fishermen and Kayaker/Canoers

A number of popular recreation areas are located on the Belle River and its tributaries, including Columbus County Park, Columbus Township Roadside Park, China Township Park, Musial Park in Memphis, and East China Township Park. In order to encourage public awareness and concern for rivers, streams, and wetlands, it is important to increase opportunities for people to access these water resources. The public will be able to experience the human benefits that water offers and, in turn, can work to protect the resource. Trail Towns, sponsored by Michigan State University Extension, is a concept that explains how communities can leverage trail-based tourism and recreation for economic and community development in communities linked by trails. The Trail Towns program has already been adopted by Marine City. Expanding on the current inventory of existing recreation resources through the Blueways of St. Clair and Trail Towns programs, an assessment of current and future needs will serve to establish a baseline of future improvements. SCC PARC has a program in place that it will give an ADA canoe/kayak launch free of charge to any municipality that agrees to maintain the river access point and the launch.

Figure 5.7 An ADA canoe/kayak launch provided by SCC PARC

6.2 Support Blueways Trails

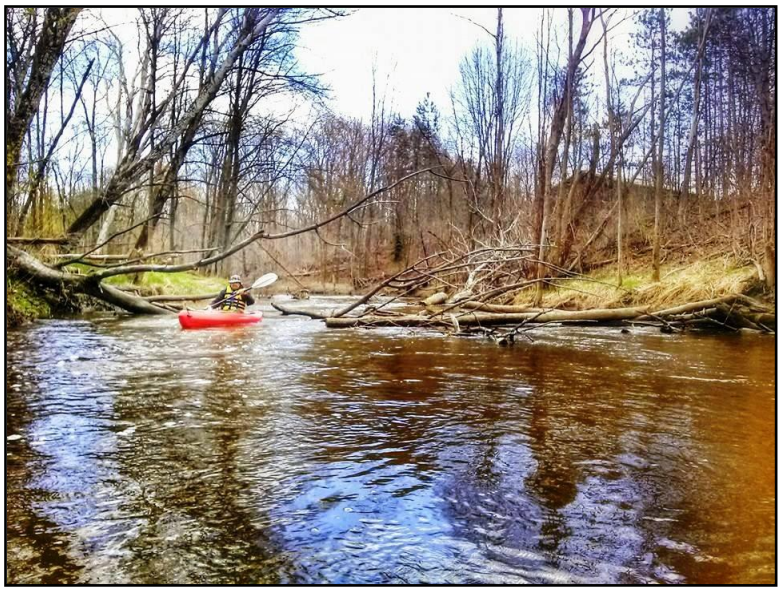

Figure 5.8 Paddler on the Belle River Blueway Trail (Source: Marine City)

A blueway is a water trail that is developed with launch points and points of interests for recreationists. The St. Clair County Metropolitan Planning Commission (SCCMPC) and the St. Clair County Parks and Recreation Commission (PARC) received a Michigan Coastal Zone Management, DEQ grant in 2010 to develop the Blueways of St. Clair, which has resulted in a comprehensive Blueways Trail system along the St. Clair River corridor, from Anchor Bay to Lake Huron. Communities can uphold the Blueways vision by assessing and developing existing public river access points, supporting existing mapped Blueways trails, and implementing the Blue Water Trail Towns Program were applicable. Promoting the Blueways of St. Clair will increase watershed awareness and local interest in protecting the watershed, as well as enticing locals and visitors to enjoy all our waterways.

Goal 7: Reduce *E. coli* Levels

7.1 Implement Programs to Identify and Correct Failing Septic Systems to Reduce *E. coli*

High concentrations of pathogenic bacteria can be hazardous for any full or partial body contact recreation and often results in beach closures. Failed on-site sewage disposal systems (OSDS) are a cause of increased *E. coli* levels in the Belle River watershed. Identifying failed on-site OSDS can be accomplished through regular inspections of the disposal system or by sampling the waterways. Inspections can occur during property transactions (a time-of-sale ordinance), during septic tank pump outs, or at specific periodic intervals. Surface water sampling to detect failing systems is often unreliable because the small volume of untreated sewage created by failing systems in comparison to total river flow may make it difficult to detect in surface waters. Once sewage is detected, sampling a source outfall or dye testing the suspect facility can identify the system that is failing.

Once a failing OSDS is identified, environmental health codes are in place at the SCCHD and in Macomb and Lapeer Counties that ensure correction of failed systems. Depending on local ordinances and sanitary sewer availability, some homeowners may be allowed to repair their failing systems, while others may be required to connect to the municipal sewer system if available. Any onsite corrections need to be performed under permit from the county health department and in conformance with their requirements.

Septic tank maintenance measures can be used to prevent, detect, and control spills, leaks, overflows, and seepage from occurring in the sanitary system. Onsite sewage disposal systems (OSDS) should be designed, sited, operated, and maintained properly to prevent nutrient and pathogen loadings to surface waters and to reduce loadings to groundwater. Septic tanks should be pumped at least every 3 to 5 years, depending on the size of the family or group using the tank. Education on private OSDS is critical to identifying problems and eliminating sources of bacteria. Information can be disseminated in community newsletters and on websites, as well as community events throughout the year.

Table 5.2 Long-term goals and measurable objectives for the Belle River Watershed

Long-Term Goal	Measurable Objectives	Designated/Desired Use Addressed *(Table 5.1)*
1. Restore dissolved oxygen levels to remove TMDL designation	1.1 Implement two-stage drain design 1.2 Implement erosion control around field tiles 1.3 Implement drainage water management and erosion control practices for tile lines 1.4 Maintain riparian buffers 1.5 Stabilize streambanks 1.6 Provide lawn care education 1.7 Educate agricultural producers on nutrient management	• Warmwater fishery • Other indigenous aquatic life and wildlife • Coldwater fishery
2. Restore hydrologic stability	2.1 Implement infiltration and detention practices 2.2 Protect floodplains 2.3 Develop and implement wetlands ordinances and protections 2.4 Replace undersized culverts	• Coldwater fishery • Navigation • Warmwater fishery • Other indigenous aquatic life and wildlife • Coldwater fishery • Protect properties from flooding
3. Protect critical ecosystems	3.1 Educate riparian landowners where priority ecosystems are located 3.2 Contact residents with fallow farmlands that contain priority wetlands for restoration 3.3 Restore erosion areas in priority ecosystems	• Warmwater fishery • Other indigenous aquatic life and wildlife • Coldwater fishery • Protect properties from flooding
4. Improve water quality knowledge and engagement of residents	4.1 Improve storm water quality knowledge of residents 4.2 Increase floodplain and wood debris education 4.3 Educate land use decision makers	• Warmwater fishery • Other indigenous aquatic life and wildlife • Partial body contact recreation • Total body contact recreation • Support the river as a recreational asset • Improve watershed knowledge

Long-Term Goal	Measurable Objectives	Designated/Desired Use Addressed *(Table 5.1)*
5. Implement a sustainable woody debris management program	5.1 Implement large woody material management plan in priority areas 5.2 Develop funding for annual assessments and river clean-ups	• Navigation • Warmwater fishery • Other indigenous aquatic life and wildlife • Manage large woody material in priority areas • Protect properties from flooding
6. Improve recreational opportunities	6.1 Install appropriate access points for recreationists 6.2 Support Blueways Trails	• Partial body contact recreation • Total body contact recreation • Support the river as a recreational asset • Improve watershed knowledge
7. Reduce *E. coli* levels	7.1 Implement programs to identify and correct failing septic systems	• Partial body contact recreation • Total body contact recreation • Support the river as a recreational asset

5.2 Additional Considerations

Adjacent resources such as the St. Clair River should be considered during the implementation of the Belle River Watershed plan due to the economic, recreation, and ecological linkages. Recognizing that all tributaries in the Belle River Watershed ultimately discharge to the St. Clair River, reduction of both point and nonpoint sources of pollution from these areas, as well as protection of natural features (woodlands, wetlands, floodplains, etc.) throughout the watershed, will all provide a reduction in the amount of pollutants that may be contributing to the Beneficial Use Impairments (BUI's) of the St. Clair River on the U.S. side of the river. All of the goals developed for the Belle River Watershed will concurrently work towards the achievement of the goals outlined in the St. Clair River RAP pertaining to consumption of fish and wildlife, ecosystem health, beach closings, and sources of contaminants (both point and nonpoint).

Table 5.3 St. Clair River Remedial Action Plan (RAP) goals

Belle River Watershed Management Plan Goals Key: D = direct relationship I = indirect relationship **St. Clair River RAP Goals – U.S. BUI's**	Restore dissolved oxygen levels to remove the TMDL designation	Restore hydrologic stability	Protect critical ecosystems	Improve water quality knowledge and engagement of residents	Implement a sustainable woody debris management program	Improve public recreation opportunities	Reduce *E. coli* levels
Loss of fish and wildlife habitat	D	D	D		I		
Beach closings						D	D
Degradation of fish and wildlife populations	D	D	D		I		
Bird or animal deformities or reproduction problems							