CHAPTER 6 – BEST MANAGEMENT PRACTICES

A series of general water quality treatment, managerial, planning, and restoration options are described in this chapter as recommended "Best Management Practices" or BMPs. This chapter defines a wide range of BMPs that can be implemented to work towards achieving the goals and objectives established in Chapter 5. These practices were selected to specifically address the causes of pollutants, impairments, and concerns that are affecting the designated and desired uses in the Belle River Watershed. The timeline for implementation will be determined based on the characterization and landownership of each source area and funding resources. Each site should be further evaluated to confirm the best treatment, management, or restoration options.

6.1 Management Alternatives

BMPs are the main tools to help control the quality and quantity of storm water runoff from construction sites, urban areas, agricultural areas, roadways, and recreational areas—the most common areas that nonpoint source pollutants can be picked up by storm water runoff. There are four main goals associated with the effective use of BMPs:

1. To minimize or treat the pollutants picked up by runoff before it enters surface waters and groundwater,
2. To promote pollution prevention,
3. To minimize the amount of impervious surfaces and directly-connected impervious areas, thereby reducing runoff quantities, and
4. To promote infiltration.

BMPs can be grouped into two main categories—non-structural and structural:

Non-Structural BMPs: These practices aim to prevent or reduce runoff problems in receiving waters by reducing potential pollutants or managing runoff at the source. These BMPs may include regulatory controls (codes, ordinances, regulations, standards, or rules) or voluntary pollution prevention practices. The regulatory controls typically apply to land use practices and the voluntary pollution prevention practices primarily involve education and outreach activities. Non-structural BMPs can be divided into two main types: managerial (operational) BMPs and education and outreach BMPs.

Managerial (operational) BMPs include the modification or enhancement of municipal operations and land use planning. Land use planning BMPs involve the adoption and enforcement of development codes, ordinances and other regulations that aim to preserve natural resources that promote effective storm water management, or encourage development procedures that address storm water quality and quantity issues.

Educational and outreach BMPs involve strategies that employ public education of residents, visitors, businesses, contractors, industries, developers and municipal officials and employees on storm water pollution prevention and protection of natural resources.

Structural BMPs: These practices involve "brick and mortar" technologies and "vegetative" practices that are designed and engineered to manage or alter flow, velocity, duration, and other characteristics of runoff by physical means. These BMPs aim to control volume, peak discharge rates, and in some cases, improve water quality. Installation of these BMPs may also reduce downstream erosion, provide flood control, filter pollutants from runoff, and promote groundwater recharge. These BMPs are typically categorized as site controls, as opposed to source controls.

In order to address the critical pollutants and sources in the Belle River Watershed, this plan groups BMPs into eight categories:

1. Managerial & Structural Actions: Agricultural Runoff Controls
2. Managerial & Structural Actions: Stream and Drain Runoff Controls
3. Structural & Vegetative Actions: Post-Construction Stormwater Management
4. Managerial Actions: Illicit Discharge Elimination
5. Managerial Actions: Public Education, Outreach, and Participation
6. Managerial Actions: Ordinances and Policies
7. Managerial Actions: Studies and Plans
8. Watershed Plan Implementation

No single BMP can address all stormwater problems. Each practice has certain limitations based on drainage area served, available land space, cost, pollutant removal efficiency, as well as a variety of site specific factors such as soil types, slopes, depth of groundwater table, etc. Careful consideration of these factors is necessary in order to select the appropriate group of BMPs for a particular location or situation.

6.1.1 Managerial & Structural Actions: Agricultural Runoff Controls

Agriculture and cropland are a source of sediment, pathogens, and nutrients in the Belle River Watershed. As agricultural land is the dominant land cover in the watershed, specific BMPs that address these areas must be utilized. Structural and vegetative BMPs and educational programs can be used to reduce pollutant loading from agricultural lands.

BMP 1: Encourage the Use of Generally Accepted Agricultural Management Practices (GAAMPs)
Considering that the watershed is predominately agricultural, efforts to protect water quality from excess nutrients, bacteria and soil erosion from agricultural lands is a significant consideration in watershed management. State agencies have chosen to manage agricultural practices through measures known as Generally Accepted Agricultural Management Practices (GAAMPs). These practices provide agricultural landowners with guidelines to follow in regard to nutrient and pesticide application and storage, manure management, groundwater protection, and many other BMPs to protect surface and groundwater supplies, as well as habitat. Municipalities are encouraged to send notification letters to agricultural landowners in violation of GAAMPs and encourage compliance through communication and education. The NRCS District Conservationist for St. Clair County recommends that these letters be copied to the local Conservation Districts, the NRCS office, and the MSU-extension office for follow-up contact and information regarding available assistance and funding sources. The SCC's District Conservationist has identified cattle exclusion as the first priority to educate agricultural landowners, followed by encouraging conservation buffers as the second priority. Other practices that may be encouraged include conservation tillage, crop nutrient management, weed and pest management—or integrated pest management (IPM), and the use of waste storage facilities on agricultural lands.

Additional information on GAAMPs can be obtained at:
http://www.michigan.gov/mda/0,1607,7-125-1567_1599_1605---,00.html.

BMP 2: Encourage Conservation Crop Rotation with Cover Crop and Mulch/No-till
This BMP involves a system of three individual practices that aim to reduce soil erosion and sedimentation. Conservation crop rotation describes the practice of growing crops in a recurring sequence on the same field. The crops may be grasses, legumes, forbs or other herbaceous plants established for

seasonal cover and conservation purposes. Residue management as mulch till is the practice of managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round, while growing crops where the entire field is tilled prior to planting. Residue management as no-till and/or strip till is the practice of managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-around, while growing crops in previously untilled soil and residue.

Figure 6.1 Examples of Michigan cover crops, crimson clover and buckwheat (Source: MSU Extension)

BMP 3: Develop Manure Management Plans

Lack of manure management plans or lack of enforcement of manure management plans lead to nutrients and pathogens entering the waterways. As bacteria levels, particularly *E. coli*, exceed acceptable levels, manure management plans may help to prevent excess pathogens entering the upstream tributaries. Manure management plans could be used in conjunction with livestock exclusion. NRCS may be able to assist with reviewing maps of field tiles in critical areas, locating tile outfalls, and identifying sources of discharge. Plans should be developed for farms in priority areas first.

BMP 4: Install Exclusion Fencing

Livestock exclusion fencing can include a system of permanent fencing (board, barbed, high tensile, or electric wire) installed to exclude livestock from streams and critical areas not intended for grazing in order to improve water quality. Benefits may include reduced soil erosion, sedimentation, pathogen contamination, and pollution from dissolved, particulate, and sediment-attached substances. Some funding and technical assistance may be available to agricultural landowners through NRCS.

Figure 6.2 Livestock exclusion fencing protects riparian vegetation and prevents excessive streambank erosion (Source: Virginia Department of Conservation)

BMP 5: Promote Conservation Tillage Practices and Appropriate Nutrient Management Practices (Crop*A*Syst)

Conservation tillage is any method of soil cultivation that leaves the previous year's crop residue (such as corn stalks or wheat stubble) on fields before and after planting the next crop, to reduce soil erosion and runoff. To provide these conservation benefits, at least 30% of the soil surface must be covered with residue after planting the next crop. Some conservation tillage methods forego traditional tillage entirely and leave 70% residue or more. Conservation tillage is especially suitable for erosion-prone cropland. NRCS provides educational materials about conservation tillage practices on the web at: http://afsic.nal.usda.gov/soil-and-water-management/conservation-tillage-practices-and-erosion-control.

Figure 6.3 Crop residue prevents soil from washing away during precipitation events (Source: US EPA)

The Michigan Agriculture Environmental Assurance Program Cropping System focuses on field-related environmental issues, such as irrigation, soil conservation, and nutrient management. Crop*A*Syst helps develop and implement plans to prevent water resource contamination while maintaining economic crop production. Plans conform to applicable Michigan Right-to-Farm guidelines and comply with applicable state and federal environmental regulations. More information about Crop*A*Syst is available at: http://www.maeap.org/get_verified/cropping_system.

BMP 6: Restore Historic Wetlands

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. Restoring the hydrology, plants, and soils of degraded or historic wetlands can have environmental and practical benefits. As referenced in Chapter 1, many of the functions wetlands provide have been lost throughout the watershed, including the ability to retain sediment, other particulates, nutrients, pathogens, and flood waters. These functions lead to improved surface and ground water quality. Wetlands also provide important habitat for many species and reduce soil erosion and downstream flooding. Restoring wetland hydrology usually involves breaking drainage tile lines and possibly building embankments to retain water. To restore wetland vegetation, mixes of native grasses, sedges, rushes, and forbs are often used.

MDEQ provides assistance to agencies and organizations with established wetland restoration programs. More information can be found at: http://www.michigan.gov/deq/0,4561,7-135-3313_3687-10419--,00.html.

6.1.2 Stream and Drain Runoff Controls

Stream and river conditions in the Belle River Watershed have been degraded due to channelization, inadequate erosion control, historic dams, dredging, road crossings, floodplain fill, and bank armoring. Additionally, drains have played a major role in the watershed and have impacts on water quality and erosion. BMPs to address stream, river, and drain conditions are essential in order to meet the designated uses and goals of the WMP.

BMP 7: Continue Stream/Drain Inventories and Water Quality Monitoring throughout the Watershed

The Watershed Assessment of River Stability and Supply (WARSSS) completed as part of the WMP planning process assessed the hydrologic conditions of the steams and drains throughout the Belle River Watershed. Continued inventories of the physical conditions of watercourses (streams, drains, rivers, etc.) and road/stream crossings conducted on a scheduled basis can aid dramatically in assessing watershed conditions in terms of the status of hydrological conditions that may be impacting water quality and aquatic habitat. Water quality monitoring could also be conducted during the inventories (Great Lakes Road and Inventory Datasheet and Instructions available from USFS et al. 2011 at https://www.michigan.gov/documents/dnr/Great_Lakes_Road_Stream_Crossing_Inventory_Instructions_419327_7.pdf). Performing additional inventories and gathering monitoring data will greatly enhance this understanding and help to determine additional restoration or prevention measures that should be taken to achieve many of the goals and objectives of this WMP. These types of inventories, and water quality monitoring strategies, could be coordinated by the WAG or conducted within a single community to establish a long-term source of monitoring data. The MDEQ will provide training for these types of inventories although the expertise of an engineering consultant will most likely be needed to provide recommendations on actions that should be taken based on the data collected.

BMP 8: Implement Tile Drain Controls

Tile drainage is important to lower the water table in agricultural areas. However, tile drains have negative ecological impacts, including wetland degradation and destruction and loss of waterfowl habitat. Drains also tend to leach more fertilizer (nutrients) into watercourses. Tile drain controls can allow for adjustments in the flow of water throughout the year rather than draining wide open year-round. System managers can let water drain in the spring to dry out the soil for planting and they can close a gate in the discharge pipe in the summer to back water up. The gates can be opened again in the fall for harvest and closed in the winter to limit leaching and to conserve fertilizer. These practices can help prevent excessive nutrient and sediment runoff. Compared to conventional, unmanaged drainage, controlled drainage has been shown to significantly reduce the nutrients that flow to ditches and streams from tile drains.

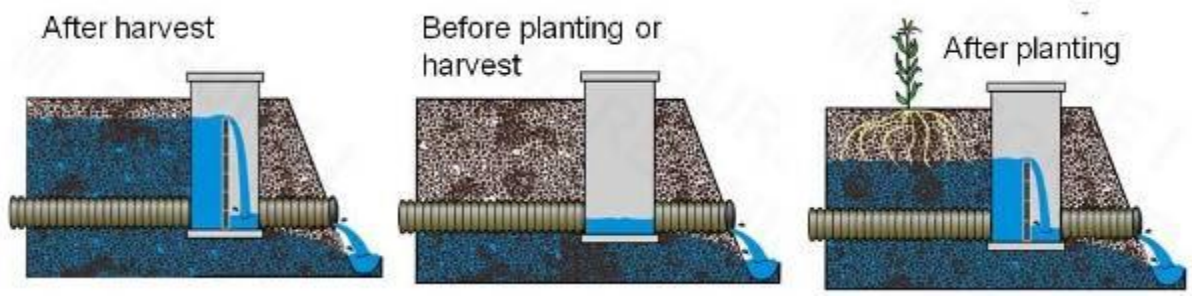


Figure 6.4 Drainage management practices allow farmers to drain only as needed (Source: Purdue University)

BMP 9: Prevent and Remove Stream Flow Obstructions and Barriers to Aquatic Organism Passage
Prevention and removal of stream flow obstructions (log jams) involves the detection of stream blockages caused by debris such as sediment, trash, and branches or trees that have fallen into the waterway. While removal of blockages is not always necessary or desirable (many blockages provide important in-stream habitat for aquatic wildlife), any necessary clean-up practices should cause the least amount of upset to in-stream habitat. The removal of flow obstructions should not include practices such as snagging, channelization, or other severe hydromodifications. In addition, removal should be completed before major obstructions are formed. To achieve adequate maintenance measures, periodic monitoring of waterway conditions should be made to ensure that flows are unobstructed. In the case of flow obstructions in natural waterways, since there is no federal, state or local government that is responsible for removing blockages of natural waterways, this work typically falls on volunteers. The WAG or local governments can coordinate volunteer groups to perform this work but will need a Resources Unit of the Water Resources Divsion construction permit from the MDEQ.

Dams and other barriers to aquatic organism passage are also of concern in the Belle River Watershed. Misplaced or misaligned culverts often do not provide adequate passage for aquatic organisms; culverts should be replaced or removed to allow for passage. Any existing dams that are impacting stream flow or aquatic organism passage should be considered for removal, depending on the current uses of the dam and local impacts of dam removal.

Figure 6.5 Large woody material removal and bank stabilization in Columbus County Park

BMP 10: Utilize In-stream/Shoreline Habitat Restoration Techniques
Habitat restoration techniques include in-stream structures that may be used to correct and/or improve fish and wildlife habitat deficiencies over a broad range of conditions. Examples of these techniques include: channel blocks, boulder clusters, covered logs, tree cover, bank cribs, log and bank shelters, channel constrictors, cross logs and revetment, and wedge and "K" dams. The majority of these structures require trained installation with hand labor and tools. After construction, a maintenance program must be implemented to ensure long-term success of the habitat structures. In areas that experience high storm

water peak flows, in-stream habitat restoration should be installed after the desired flow target is reached so as to ensure the success of the habitat improvement project.

In addition, the water quality benefits of utilizing vegetative buffers should be emphasized. For publicly-owned lands, the methods outlined below should be utilized to ensure improved aquatic habitat, water quality, stabilization, and increased public access to the water resource should also be considered in the design.

- **Vegetation**: Shoreline vegetation (with preference to native plant species) protects property naturally, effectively, and inexpensively. Trees offer excellent erosion control because of their deep root systems, which bind the soil, and their leaves, which intercept rain before it impacts and erodes the soil. Trees and shrubs not only hold soil and nutrients that may otherwise pollute area waterways, but also provide an aesthetically pleasing screen to protect the privacy of waterfront property owners. Nearshore water plants protect the shoreline against waves and provide excellent fish habitat. Invasive plant species such as purple loosestrife, reed canary grass, and *Phragmites* should be avoided.

Figure 6.6 Example of a vegetative buffer in E. China Township

- **Bioengineering**: In cases where steeper slopes need to be stabilized along shorelines, property owners may need to utilize innovative engineering techniques known as "bioengineering" to restore shoreline vegetation. Bioengineering can cost more than either vegetation or riprap alone. However, bioengineering methods can effectively protect highly vulnerable shorelines less expensively than seawalls or retaining walls. Also, unlike a solid seawall, bioengineering also maintains the valuable shoreline habitat and increases in strength over time as the plants grow.

- **Stone or Riprap**: Large stones placed on top of gravel or a filter blanket will stabilize gradual to moderately sloped shorelines by holding soils and dissipating wave action. Use of large stones also provides a rocky, natural-appearing shoreline with some habitat value, particularly if vegetation grows up with it. Variations in depth along the shoreline provide diverse habitat for

different species of plants and animals. Fish, turtles, crayfish, and other animals look for food and protect their eggs and young among vegetation and gaps in the rocks.

Figure 6.7 Example of riprap shoreline stabilization practices

BMP 11: Implement Alternative (Two-Stage) Drain Practices and Rehabilitation

While the primary responsibility of the Drain Commissioner is drainage and conveyance, there are many opportunities to accomplish this goal in more sustainable ways where drains are particularly suitable for alternative practices. Drains that may fall under this category may be ones that were at one time streams and agricultural land has been or will soon be converted to a new development. In contrast to conventional methods, such as cutting vegetation and dredging which have been shown to increase erosion and sedimentation, destroy habitat, and increase long-term maintenance costs to drainage district residents, these alternative drain practices attempt to return drains to more natural systems that are self-maintaining. These methods require little maintenance, improve habitat, and may include restoration of floodplains, two-stage ditching, tree planting in the riparian corridors to prevent vegetation growth in the middle of drains, and construction of regional wetland retention systems. The Road Commission should also consider incorporating a two-stage ditch design for roadside ditches if adequate space is available in the road right-of-way. This design can help to reduce maintenance costs by providing additional capacity for increased runoff quantities while reducing bank erosion.

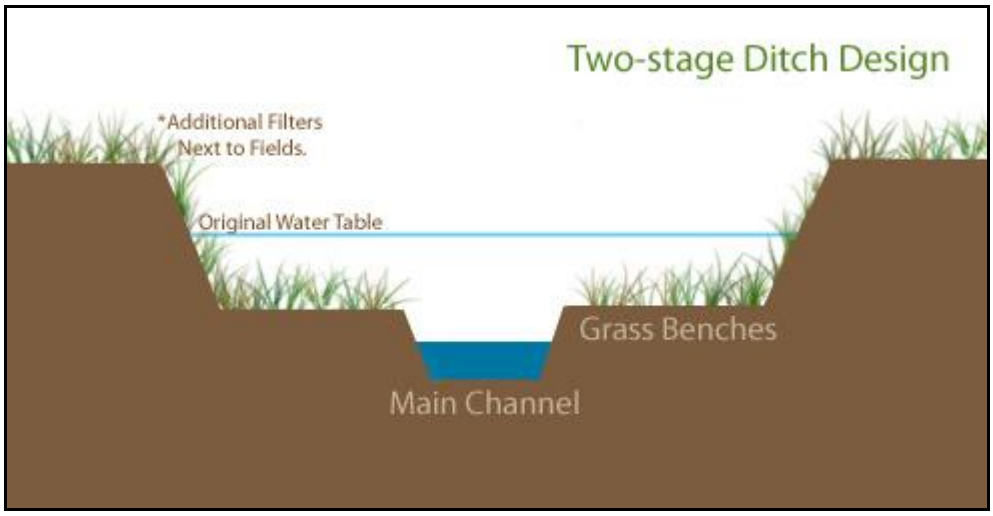


Figure 6.8 Typical two-stage drainage ditch design (Source: The Nature Conservancy)

BMP 12: Install and Maintain Streambank Stabilization Measures

Streambank stabilization measures are treatments used to stabilize and protect banks of streams or constructed channels, and shorelines of lakes and reservoirs. Understanding the cause of the erosion problem should be addressed before implementing any streambank stabilization measure. If the cause of erosion is due to extreme peak storm water flows, then the issue of peak flow problems should be addressed before stabilization measures can be expected to mitigate the problem. 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 also provides important ecological benefits such as shading water and providing crucial habitat for both terrestrial and aquatic wildlife species.

Three types of streambank stabilization methods exist: engineered, bioengineered and biotechnical, as outlined below.

- Engineered structures include riprap, gabions, deflectors and revetments, such as j-hook vanes and cross-vanes.

- Bioengineering refers to the use of live plants that are embedded and arranged in the ground where they serve as soil reinforcement, hydraulic drains, and barriers to the earth movement and/or hydraulic pumps. Examples of bioengineering techniques include: live stakes, live fascines, brush mattresses, live crib walls and branch packing. Additional information on these structures is available at: http://www.crjc.org/pdffiles/streamstab.pdf.

- Biotechnical measures include the 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. Bioengineered or biotechnical methods should be implemented in lieu of engineered methods, where possible, so as to increase habitat and aesthetics.

BMP 13: Install and Maintain Gage Stations

There have been three United State Geological Survey (USGS) gage stations in the Belle River Watershed: North Branch Belle River at Imlay City (10/1/1965-9/30/2001), Belle River at Memphis (10/1/1962-present), and Belle River near Marine City (6/1/2004-10/31/2005). Only the Belle River gage

station at Memphis is still in operation. Gage stations provide invaluable data on the range of flow fluctuations and peak flows related to wet weather events in stream reaches. This type of data can be very valuable as an indicator of how stream velocities respond to wet weather events and can help to delineate where excessive storm water quantities may be coming from in an upstream reach. The availability of this data can be helpful to mitigate the source of storm water runoff quantities that can lead to a series of costly problems downstream (i.e. streambank erosion from flashy hydrology). The watershed partners are encouraged to explore the options of applicable gage sites, particularly in coordination with the local USGS offices. If a suitable site is present, the watershed partners should consider installing the station. The station would likely be maintained by USGS office personnel, but could be maintained by a group effort or the Drain Commissioner's office.

6.1.3 Structural & Vegetative Actions: Stormwater Runoff Controls

BMP 14: Replace Undersized Culverts/Repair Misaligned or Obstructed Culverts
In the case of undersized, perched, or obstructed road culverts, problems such as streambank erosion due to altered flow patterns can occur. Culverts should be replaced using a recommended six step approach known as "MESBOA" (Verry, 2000):

Match Culvert Width to Bankfull Stream Width
Extend Culvert Length through Side Slope Toe
Set Culvert Slope the same as the Stream Slope
Bury Culvert 4" to 1' (2' – 6' Culverts, dig 10" – 1.5' below bottom)
Offset Multiple Culverts (one at floodplain level; the other about 1' higher than lower culvert)
Align Culvert with Stream (or dig approach using stream sinuosity)

Additional information on Roadway BMPs can be found on the US EPA's website at: http://water.epa.gov/polwaste/nps/roadshwys.cfm.

Figure 6.9 Culvert in poor condition on Rayment Drain in Subwatershed 5

BMP 15: Install and Maintain Storm Water Management Structures
This BMP encompasses the installation and maintenance of structural storm water management BMPs that will reduce the amount of pollutants that may be present in storm water discharges off of a site after passing through these structures. These BMPs would either be installed on municipal properties, or encouraged or required as storm water management BMPs for new development/redevelopment. Several BMPs to consider include:

- **Sediment Trapping Devices**: Sediment trapping devices such as a barrier, basin or other devices are designed to remove sediment from runoff by slowing the water enough so that the heavier soil particles (such as sand) can settle out of the water column. Sediment basins should be located at the downstream end of drainage areas larger than 5 acres, and before a treatment train of other BMPs such as a wet detention pond or constructed wetland that is built to treat excess sediments and other pollutants. Dikes, temporary channels and pipes should be used to divert runoff from disturbed areas into the basin and runoff from undisturbed areas around the basin. Simpler devices for areas less than 5 acres include a sediment trap and sand bag barrier, and silt fences. Silt fences can be placed along level contours downstream of exposed areas where only sheet flow is anticipated. Sediment trapping devices can also be used on storm drain inlets and can include filter fabric, excavated drop traps, gravel filters and sandbags. Maintenance is a key requirement of any of these soil erosion control BMPs and requirements for their maintenance should be part of the design standards or rules requiring these devices. Sediment traps, barriers, basins and filters should be inspected frequently for repairs and sediment removal.

- **Catch Basin Inserts**: A catch basin is an inlet to the storm drain system that typically includes a grate or curb inlet and a sump to capture sediment, debris, and associated pollutants. A number of proprietary technologies are now available to augment the pollutant capture of these systems. These technologies generally employ additional sump chambers to enhance the capture of solids, and many employ filtering media to capture additional pollutants or fractions of the pollutant inflows. The generic term "catch-basin inserts" is used here to describe a variety of in-sump or in-line designs.

- **Media/Sand and Organic Filters**: Sand filters have proven effective in removing several common pollutants from storm water runoff. Sand filters generally control storm water quality, providing very limited flow rate control. A typical sand filter system consists of two or three chambers or basins. The first is the sedimentation chamber, which removes floatables and heavy sediments. The second is the filtration chamber, which removes additional pollutants by filtering the runoff through a sand bed. The third is the discharge chamber. The treated filtrate normally is then discharged through an underdrain system either to a storm drainage system or directly to surface waters. Sand filters take up little space and can be used on highly developed sites and sites with steep slopes. They can be added to retrofit existing sites. Sand filters are able to achieve high removal efficiencies for sediment, biochemical oxygen demand (BOD), and fecal coliform bacteria. Total metal removal, however, is moderate, and nutrient removal is often low.

- **Oil/Grit Separators**: These structures are multi-chambered structures designed to remove coarse sediment and oils from storm water prior to delivery to a storm drain network, the ground, or other treatment system. Separators are often used as pretreatment for infiltration BMPs such as Porous Asphalt Pavements, Modular Pavement or Infiltration Trenches. They are generally used on parking lots, streets or other areas which receive vehicular traffic. Each separator would generally receive runoff from a drainage area of less than 1 acre.

- **Oil and Grease Traps**: Oil and grease traps remove high concentrations of petroleum products, grease and grit by gravity and coalescing plates. These devices are particularly useful on industrial sites, vehicle maintenance and washing facilities, areas where heavy mobile equipment is used, restaurant kitchens, and restaurant dishwashing equipment. Conventional oil/water separators have the appearance of septic tanks, but are much longer in relationship to the width. Separators for large facilities have the appearance of a municipal wastewater primary sedimentation tank. These devices are only effective for reducing abnormally high concentrations

of oils and greases. Their performance is unproven for urban storm water runoff; however, communities with Phase II storm water permits must address grease pollution so traps may be an appropriate tool to employ as part of a device necessary when designing or retrofitting storm water management facilities.

BMP 16: Install and Maintain Detention/Retention Systems

The installation and maintenance of detention/retention ponds is a storm water management practice that controls runoff quantities and improves runoff quality from areas of new development/redevelopment. These BMPs would either be installed on municipal properties, or encouraged or required as storm water management BMPs for new development/redevelopment.

Wet detention ponds are small man-made ponds or shallower areas with emergent wetland vegetation around the banks designed to capture and remove particulate and certain dissolved constituents. Wet ponds and wetlands are ideal for large, regional tributary areas (10 to 300 acres) where there is a need to achieve high levels of particulate and some dissolved nutrient removal. They can be used on individual sites, as well. The pond or wetland should be sized to treat runoff, accumulate sediment, and route floods. The outlet should be sized based on the design method. The pond should be configured for aesthetics, safety, and maintenance. Landscaping design requirements should include a natural vegetated buffer around the pond/wetland to reduce pollutants entering the area as well as decrease waterfowl habitat, and increase aesthetics. Floating vegetation should be used in the pond to shade water and prevent algae blooms as opposed to using chemical herbicides. It should be noted that the successful establishment of emergent and other wetland plants, and specific wetland hydrology, will only be achieved with proper monitoring and maintenance for approximately five to ten years after construction.

Figure 6.10 Example of a wet detention pond to detain stormwater (Source: US EPA)

BMP 17: Install and Maintain Storm Water Infiltration Practices

Infiltration practices may be structural or vegetative BMPs that promote infiltration of surface water runoff thereby reducing runoff quantities, recharging groundwater supplies, and minimizing the discharge of pollutants in storm water runoff. These BMPs would either be installed on municipal properties, or encouraged or required as storm water management BMPs for new development/redevelopment. Several BMPs to consider include:

- **Storm Water Retention/Infiltration Basins and other Infiltration Devices:** Storm water infiltration basins are any storm water device or system which causes the majority of runoff from small storms to infiltrate into the ground rather than be discharged to a stream. Most infiltration devices also remove waterborne pollutants by filtering water through the soil. Storm water infiltration can provide a means of maintaining the hydrologic balance by reducing impervious areas. Infiltration devices can include any of the following: basins, trenches, permeable pavement, modular pavement or other systems that collect runoff and discharge it into the ground. Infiltration devices should only be used on locations with gentle slopes, permeable soils and relatively deep water tables and bedrock levels and thus are not ideal for most portions of the Belle. New developments that are located in areas of sandy soils would be candidates for these types of practices.

- **Grassed Swales:** Grassed swales are open channel management practices designed to treat and attenuate storm water runoff. As storm water runoff flows through these channels, it is filtered first by the vegetation in the channel, then through a subsoil matrix, and finally infiltrates into the underlying soils. Grassed swales are improvements on the traditional drainage ditch and are well suited for treating highway or residential road runoff. Grassed channels are the most similar to a conventional drainage ditch, with the major differences being flatter side and longitudinal slopes and a slower design velocity for water quality treatment of small storm events. The type and coverage of vegetation grown in the swales will influence pollutant treatment. Pollutant reduction values in this analysis assume the use of well-established turf grasses consistent with traditional residential settings. Other plantings may provide greater pollutant reduction, but may also alter conveyance hydraulics. Swales planted with native plantings are termed bioswales and are preferable for most areas of the Belle due to the heavy clay soils and the plantings ability to increase infiltration due to their extensive root systems. Another type of swale is a depressed median—a recessed, landscaped area within paved areas. Using vegetation in these applications is important in order to filter contaminants that may enter the median from the surrounding pavement. Drainage swales are applicable on virtually all development sites.

- **Vegetated ("Green") Roofs:** Rooftop greening is a technique that uses vegetation on roof tops which may provide many benefits including increased quality and decreased quantity of storm water runoff from roof tops, reduced temperature of storm water runoff, reduced air conditioning costs, and significant reduction of the life-cycle maintenance costs of the roof. It has been estimated that green roofs can reduce cadmium, copper and lead in runoff by over 95% and zinc by 16%. Nitrogen levels may also be lowered. Green roofs can also provide improved aesthetic appeal and can also provide the benefit of transforming rooftops into usable open space for building tenants. Key considerations for implementing green roofs include the structural and load-bearing capacity of the building, plant selection, waterproofing, and drainage or water storage systems.

  There are two types of green roofs that can be constructed: extensive and intensive systems. Extensive systems are made of 2-4 inches of soil and weigh an estimated 12 to 40 pounds per square foot of roof area. Short plants with shallow root systems that are easy to maintain make up the plant species. On the other hand, intensive systems are similar to gardens on the ground. They are made up of a minimum of 6 to 12 inches of soil, weigh 80-150 pounds per square foot, host deep-rooted plant species—including trees, shrubs, which require more maintenance. The more intensive systems will result in more storm water benefits. Both systems are appropriate for residential, commercial, industrial and institutional properties. The Ford Rouge Plant in Dearborn, Michigan installed 10.4 acres of green roof and it is expected to retain half the annual

rainfall that falls on the site per year (Figure 6.11). The first residential green roof was installed in St. Clair County in 2005.

Figure 6.11 Vegetated green roof at the Ford Motor Company River Rouge Plant

- **Rain Gardens (Bioinfiltration):** The term "rain garden" refers to a constructed depressional area that is used as a small landscape tool, usually located in residential yards or roadway ditches, to improve water quality. Rain gardens are sometimes also referred to as bioinfiltration systems on a larger scale. Rain gardens should be placed strategically to intercept water runoff, and typically are placed beside impervious surfaces such as driveways, sidewalks, or below downspouts. Rain gardens are designed to allow for ponding "first flush" and increased infiltration. Nutrient removal occurs as the water comes in contact with the soil and the roots of the trees, shrubs or other vegetation planted in the depression. To enhance nutrient removal, plant choices should center on native wildflowers and grasses that are adapted to local conditions. Suitable applications for bioinfiltration systems, or rain gardens, are parking lot islands, residential developments utilizing swale drainage for pre-treatment, commercial developments utilizing filter strips adjacent to parking lots for pre-treatment, and campus developments utilizing swale drainage and filter strips for pre-treatment. Rain gardens are not ponds and should be designed to drain within 48 hours. Engineered soil mixes should be incorporated into the design to facilitate drainage in areas with less suitable soil conditions (such as clay or clay loam). Under-drainage is also typically installed to facilitate drainage.

Figure 6.12 An example of a rain garden to increase rainwater infiltration

- **Pervious Pavements**: Pervious pavements can be made of concrete, stone or plastic and promote the absorption of rain and snowmelt. The most common type of permeable pavement is paving blocks and grids which are modular systems that contain openings filled with sand and/or soil. Some can support grass or other suitable vegetation providing a green appearance. Permeable paving can be effective in reducing the quantity of surface runoff for small to moderate-sized storms, and may also reduce the amount of pollutants associated with these events. Typically, these systems will work better when overlaid on sandy, permeable soils (as opposed to less permeable clay soils). Effectiveness of these pavements can be improved by maximizing the opening in the paving material and providing an effective sub-layer of at least 12 inches that helps to promote greater infiltration capacity. This type of pavement is particularly applicable for overflow and special event parking, driveways, utility and access roads, emergency access lanes, fire lanes and alleys.

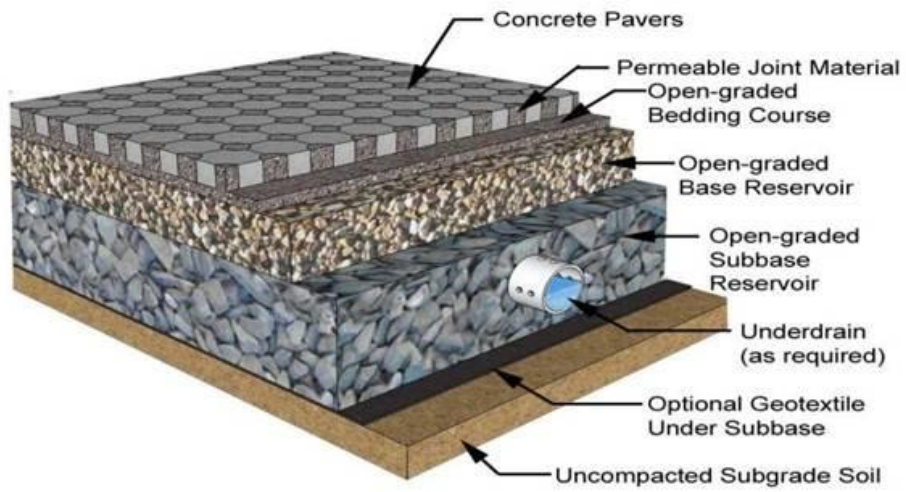


Figure 6.13 Typical permeable pavement design (Source: Smith, 2009)

- **Rain Barrels:** Rain barrels are used to collect and store rooftop runoff from moderate storms that can be reused for irrigation. The effectiveness of rain barrels (or cisterns) is a function of their storage volume in comparison to the size of the roof. For example, a standard residential home with a 1,200 square foot roof could utilize 55-gallon barrels to store runoff from downspouts at the four corners of the house. The storage is equivalent to about 0.3 inches of runoff. The limitation with rain barrels is that they would be typically emptied when used as irrigation for lawns and landscaping—as such, storage capacity would be closely linked to the growing season. These systems are appropriate for residential, commercial and institutional properties.

- **Dry Wells:** A dry well is a small excavated trench filled with stone to capture and infiltrate rooftop runoff.

BMP 18: Stabilize Eroding Road and Bridge Surfaces

In the Belle River Watershed, soil erosion at road/stream crossings and along roadside ditches has been observed along both paved and unpaved (sand/gravel) roadways. The gravel and sand/gravel composite used for the road surface can be the source of sediment pollution to surface waters when precipitation washes it into the stream or when road grading builds piles of the surface along the sides of the road. In some cases, the roadside ditches may be inadequately stabilized with vegetation, may not exist, or were poorly constructed to move roadside drainage to discharge points without transporting excess sediment to

the waterway. In addition, some unimproved roads have constructed bridges with scupper drains that provide a direct conduit for storm water laden with sediment to fall directly to the stream below. Stabilization of eroding road and bridge surfaces may involve structural techniques such as retrofitting the bridge to prevent runoff from entering the stream, or managerial techniques such as altering grading practices and selecting a different road and bridge surface, or sweeping bridge surfaces to remove sediment buildup from its surface.

BMP 19: Install and Maintain Native Landscaping

"Native" plant species are those that have evolved and are adapted to a specific geographic region. Many have very deep root systems which help break up heavy clay soils, provide a source of infiltration for stormwater, and don't require watering during droughts. Because they have adapted to the soils in their geographic zone, they also don't need fertilizers, pesticides or other harmful chemicals once established to thrive. In addition, native landscaping provides habitat for native and migrating birds, butterflies, and insects. Using native plants is a low-cost alternative to traditional landscaping that typically utilizes turf grass and non-native ornamental plantings. Because of these qualities, native plants help to reduce storm water runoff quantities, filter pollutants in stormwater, promote infiltration of water, and effectively stabilize soils to reduce soil erosion and protect streambanks or the banks along the waterline of wet detention basins from erosion. Suitable applications for native plantings include river or wetland edges, detention basin and drainage features, parks, green roofs, residential and garden areas, and commercial, industrial, and institutional developments.

Municipalities are encouraged to install and maintain native landscaping on their publicly-owned properties, as well as encourage or require native landscaping be used in new developments/redevelopments (i.e. incorporate into design standards or storm water management ordinance). Installing native plants and educational signage on municipal properties has been an extremely successful way other southeastern Michigan municipalities have educated residents about the storm water management benefits of native plants.

Figure 6.14 Example of Michigan native grasses and wildflowers (Source: Native Connections)

BMP 20: Install and Maintain Riparian Buffers

The effects of urbanization on low order streams (1st-3rd order, which represent headwater and small to moderately sized streams) are well documented, and include alterations that result in degraded stream habitat and aquatic communities. Riparian buffers consist of streamside vegetation managed for the enhancement of water quality through control of nonpoint source pollution and protection of the stream environment. Riparian buffers may be placed along a lake or pond shoreline, stream or wetland. The primary function of this practice is to physically protect and separate the natural feature from future disturbance or encroachment by development. Buffers remove storm water pollutants such as sediment, nutrients and bacteria, slow runoff velocities, and also deter Canadian Geese from moving in. The degree to which buffer systems remove pollutants is dependent on loading rates from upland land uses, stream order and size, and the successful establishment and sustainability of the practice. Design and size of the buffer also plays a large role in effectiveness. It has been discussed in the WAG that a good starting point for sizing buffers is requiring 25 feet of buffer along any waterbody. A more detailed approach to sizing buffers is the three-tiered system recommended by the Center for Watershed Protection. This method is detailed in their publication, "Better Site Design: A Handbook for Changing Development Rules in Your Community", which is summarized at the following website: http://www.cwp.org/online-watershed-library/cat_view/64-manuals-and-plans/82-stormwater-management-manuals-plans-and-guidance. On agricultural lands, land owners can be eligible for USDA programs that provide cost share to install the practices and provide rental payment for the land taken out of production.

Figure 6.15 A riparian buffer lining a farm creek (Source: USDA NRCS)

BMP 21: Develop and Implement Invasive Species Control Program
Invasive species threaten the diversity and abundance of native species due to uncontrollable population growth. Of particular concern is *Phragmites* which grows prolifically in drains throughout the Belle River Watershed. The SCCRC has a program to control invasive species along roadways with a priority focus on removing visual obstructions at intersections. SEMCOG has developed a regional program for invasive species control and is interested in developing subwatershed committees throughout the region to tackle invasive species issues. Beyond simply finding the means to treat BMPs, a subcommittee could develop a program to track invasive species populations and management efforts throughout the watershed. Invasive species removal has the potential improve drain function, improve terrestrial and aquatic habitat, and provide space for native species growth.

BMP 22: Perform Curb/Street Sweeping
Street sweeping is a managerial practice employed by municipal operations that involves cleaning pavement of debris such as sediment, trash, and other solid particles that may get picked up by storm water runoff and get deposited into surface waters through storm sewer systems or by overland flow. Street sweeping can also be useful prior to spring snowmelt to remove the buildup of residual road salt from roadways before it is carried off by storm water into area lakes and streams.

BMP 23: Perform Retrofitting of Storm Water Management Facilities
Over time, storm water management facilities may experience reduced capacities to handle the storm water runoff quantities that they were originally designed to handle due to a lack of maintenance (overgrown vegetation or excessive sedimentation), or other structural modifications (i.e. outlet/inlet failures or modifications). Facilities may need to be evaluated on a scheduled basis to ensure proper water quality and quantity functions; if those facilities are found to no longer be adequate, improvements such as retrofitting may need to be considered. Retrofits may include resizing, re-planting with native plantings or establishing buffer strips to reduce nutrient, sediment, and bacteria loadings, and/or to increase aquatic and wildlife habitat opportunities. Such improvements may also enhance passive recreation opportunities.

BMP 24: Implement Catch Basin Cleaning Program
As part of a regular maintenance schedule of the municipality, Road Commission or Drain Commissioner, catch basins should be cleaned of accumulated sediment, trash, and other debris on a scheduled basis to reduce the concentration of pollutants during the first flush of storms, prevent obstructions of downstream systems, restore the catch basin sediment trapping ability, and allow the in-system storage capacity of the structures to be maximized. Catch basin cleaning requires the use of a high-power vacuum truck (vactor truck) to clean debris from the sumps of catch basins and should be properly disposed of to avoid the particulates from re-entering the storm sewer system. This program can be augmented by the utilization of catch basin inserts.

BMP 25: Perform Storm Sewer System Maintenance and Drain Cleaning
As part of the regular maintenance schedule of the municipality, Road Commission or Drain Commissioner, storm sewer systems should be evaluated on a scheduled basis to ensure proper working order. This could be performed as part of the IDEP dry weather screening work (i.e. perform visual inspections and look for degraded infrastructure or leaking infrastructure). In addition, the storm sewer system and/or open drains should be cleared of the buildup of sediment, trash, or other debris on a regular basis to ensure the reduction of pollutants carried off by storm water inputs to the conveyances to the maximum extent practicable.

BMP 26: Manage Public Facilities
Public agencies must have programs in place to effectively manage facilities to treat, control, or eliminate any sources of environmental degradation from these sites. Facilities should have management plans to

address the containment of potential pollutants such as salt storage, hazardous chemicals, oil and gasoline, fertilizers, herbicides, pesticides, stockpiles of particulate (sand/gravel, etc.) or organic (mulch) matter. In addition, programs should address the proper application rates, times and locations of such potential pollutants as fertilizers, pesticides, herbicides and salt, etc. Public facilities might also address the elimination of sources of pathogens/nutrients from pet waste or waterfowl by putting up "don't feed the waterfowl" signage or assembling pet waste pickup stations in parks.

BMP 27: Maintain Sanitary Sewer Infrastructure
As part of a regular maintenance schedule of the municipality, sanitary sewer infrastructure should be evaluated on a scheduled basis to ensure that there are no leaks or breaks in the system that provides a conduit for excess nutrients and pathogens to the surrounding environment. Sanitary sewer infrastructure may also be evaluated to ensure that storm water or groundwater is not infiltrating the sanitary system providing an added burden of treatment to the municipal wastewater treatment plant. Infiltration studies, sanitary sewer televising, smoke testing or dye testing may all be necessary to identify failures of cross-connections in a sanitary sewer system.

6.1.4 Managerial Actions: Illicit Discharge Elimination

Illicit discharges are generally any discharge into a storm drain system this is not composed entirely of stormwater. Illicit discharges are a problem because stormwater generally flows to waterways without any additional treatment and often include pathogens, nutrients, surfactants, and various toxic pollutants. Actions to address these discharges include education programs and planning initiatives.

BMP 28: Implement Employee Training Programs
Education is an integral component of nonpoint source pollution prevention. Training municipal staff in the following subject areas can be useful:

- Illicit discharge detection and elimination,
- Soil erosion and sedimentation control,
- Operation, inspection, and maintenance procedures of structural and nonstructural storm water management BMPs that are publically owned,
- Operation and maintenance of roadways, parking lots, storage yards, and maintenance garages,
- Practices related to grounds and fleet maintenance such as mowing practices, fertilizer and pesticide applications, hazardous materials storage, and methods for servicing and washing vehicles, and
- Disposal practices of operation and maintenance wastes.

In order to achieve many of these training objectives, SEMCOG has created a variety of training materials available at: http://www.semcog.org/MunicipalTraining.aspx.

BMP 29: Sanitary System Planning—Manage Lagoon Systems and Package Wastewater Treatment Plants
There are several lagoon systems in operation throughout the Belle River Watershed. Evidence of excess nutrients and aesthetic concerns has been documented for some of the lagoon systems. Typically, these types of systems are used in areas where septic system failures have occurred or where other waste treatment options were not viable. Though these types of systems can adequately treat and release discharges to surface waters, there may be times when discharges may not be in compliance. In the event that state regulatory agencies are unable to provide adequate oversight of compliance activities due to lack of funding or personnel constraints, local units of government should consider a regulatory

mechanism (such as a Community Sewer System ordinance) to ensure that operations, maintenance and discharges from these systems are in compliance with water quality standards. If a facility is found to be in non-compliance, an enforcement mechanism should be in place to remedy the situation. Currently, the St. Clair County Drain Office (SCCDO) reviews new discharge permits from these types of facilities and provides comments, as necessary.

Other options for local communities to manage the probability of developments having to use these types of systems are to utilize land use planning tools such as mapping soils with limitations for septic systems and using this information to determine zoning designations, mapping sewer service areas, and limiting higher-density developments to areas where sewer services are available.

BMP 30: Implement Illicit Discharge Elimination Plan (IDEP)
Illicit discharge detection and elimination requires: 1) the prevention, detection, and removal of all physical connections to the storm water drainage system that conveys any material other than storm water; 2) the implementation of measures to detect, correct, and enforce against illegal dumping of materials into streets, storm drains, and streams; and 3) implementation of spill prevention, containment, cleanup, and disposal techniques of spilled materials to prevent or reduce the discharge of pollutants into stormwater.

To fulfill the requirements, municipalities may require dye-testing at the time of Certificate of Occupancy or develop a program to inspect local waterways. Currently, the SCCHD is grant funded to inspect all county drains, road drains and natural waterways. If funding is lost, the SCCHD may limit future inspections to county roads and drains only, leaving local waterway inspections up to local governments or watershed-funded initiatives. For inspection of local waterways, crews must be trained on how to identify illicit discharges and locate illicit connections. Although this effort can be labor intensive, the payoff is a reduction in the amount sanitary sewage and chemicals that enters surface waters.

A component of education of both the public and private sectors on illicit discharge detection and elimination is also factored into the plan. Implementation of an IDEP addresses public education and the detection/elimination of illicit discharges from OSDS, industrial/business connections, recreational sewage (travel trailer sanitary wastes), wastewater connections to storm drains, and illegal dumping.

Figure 6.16 SCCHD sanitarians investigating an illicit discharge

BMP 31: Eliminate Sanitary Sewer Overflow Events
Sanitary sewer overflow (SSO) events should be eliminated. Sanitary sewer overflows discharged to the North Branch Belle River in Imlay City during 2000, due to grease build up in sanitary sewers. No details of the SSO events, such as volume and duration, are known (MDEQ, 2004). Pinnacle Foods in Imaly City reported an overflow event in 2012 due to mechanical and electrical failures of a sewage transfer pump. SSO events are fairly rare in the Belle River Watershed, communities and entities should implement programs to eliminate all SSO events including:

- Infiltration and Inflow (I & I) Studies to determine where storm water and/or groundwater inputs are over-burdening the sanitary sewer systems, and
- Upgrading infrastructure to eliminate surface and groundwater inputs. Practices such as manhole rehabilitation and replacement, sewer lining and replacement, and downspout disconnection programs should be implemented to reduce extra burdens on sanitary sewer infrastructure.

BMP 32: Implement St. Clair County Public Bathing Beach and Water Quality Monitoring Program
The SCCHD conducts water quality monitoring at the Marine City public beach and several tributary sites throughout the Belle River Watershed. Sampling is conducted at the beach weekly from Memorial Day to Labor Day and tributary sites sampling on a weekly, monthly or as needed basis. Samples are generally taken one foot below the water surface in water that is between three and six feet deep. The SCCHD maintains a 24-hour Water Quality Hotline which provides quick, accurate information and advisories on beach conditions. Individuals can contact the hotline at "877-504-SWIM", go online to www.deq.state.mi.us/beach, or follow the Facebook page at "St. Clair County Beaches"

6.1.5 Managerial Actions: Public Education, Outreach, & Participation

Since most of the land use activities and behaviors associated with activities on the land lie in the public's hands, the public is the audience that is largely responsible for the health of the water and natural resources of a watershed. The goal of public education BMPs is to help people understand the watershed impact of some of their day-to-day activities and help them implement actions that will improve and protect water quality. The plan addresses educating the public in the Belle River Watershed about pollution prevention activities and other key topics in regards to:

- Raising awareness and knowledge among residents of the Belle River Watershed and how daily activities impact this resource;
- Educating the public regarding the importance of watersheds as a significant natural resource and community asset by fostering watershed stewardship and enthusiasm for the resource;
- Improving understanding of the impacts of individual and group behaviors on water quality; and
- Increasing the number of individuals, schools, and other organizations participating in water education and stewardship activities.

BMP 33: Develop and Distribute Outreach Materials on Watershed Awareness, Stormwater Management, Floodplain Management, and Large Woody Material Management
There are a number of educational approaches to increasing the public's knowledge of storm water management principles, increasing watershed awareness, and how individual actions can impact the watershed. The approaches that are or will be developed to share this information are available through newsletters, brochures, websites, workshops, presentations, public events/fairs, and television and newspaper media. Communities are encouraged to call the SCCHD for more information on any of the programs or go to their website at www.sccwater.org. Additionally, large woody materials and floodplain

management are major concerns in the Belle River Watershed. The WAG should consider methods for proper education, such as the development of brochures or utilization of existing materials about large wood and floodplain management to integrate into websites and newsletters.

BMP 34: Utilize the "Seven Simple Steps to Clean Water" Campaign Materials and Mass Media Efforts

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. Seven Simple Step tip cards and posters are available for free download on SEMCOG's website at: http://www.semcog.org/OursToProtect_7SimpleSteps.aspx.

BMP 35: Encourage Reduced Fertilizer, Pesticide and Herbicide Usage

Information should be provided to the public regarding the negative impacts from the overuse and misuse of fertilizers/pesticides/herbicides to area waterways and aquatic life. In addition, communities should implement programs that aim to reduce the amount of fertilizers and pesticides/herbicides used for grounds maintenance.

Staff that maintains publicly-owned lands should implement nutrient and pesticide reduction programs in order to protect water quality and aquatic habitat. Staff should be educated on the proper rates, times, and methods of applying both fertilizers and pesticides. Approaches such as soil testing to determine the right types of fertilizers to use, and an approach known as Integrated Pest Management (IPM) should be utilized to reduce the need for the use of harmful pesticides and herbicides. Additional information on IPM is available at: www.ipm.msu.edu. Practices such as installing and maintaining native landscaping and establishing no-mow zones along riparian corridors will aid in reducing the need for these chemical applications.

BMP 36: Encourage the Use of Household Hazardous Waste Disposal and Electronics Recycling Programs

The St. Clair County Environmental Services (SCCES) Department offers a free household hazardous waste disposal program for county residents that is available throughout the year six days a week. An appointment must be made before drop off. The program allows residents to safely dispose of harmful household, lawn/garden, and workshop chemicals that cannot be disposed of by regular means. Communities should encourage the use of the program through various media (brochures, newsletter, website, etc.) SCC hosts a website that explains the program, and is available at: http://www.stclaircounty.org/offices/landfill/hhw_drop.aspx.

Electronics often contain harmful metals that can contaminate soils and groundwater when disposed of in landfills. Recycling of electronic waste should be encouraged to reduce the environmental impacts from these materials. For a small fee, the SCCES will accept a variety of electronic materials for recycling at the landfill; however, twice a year a large-scale free collection event is held at Goodells County Park. Information on the materials accepted and fees charged by the SCCES is available at: http://www.stclaircounty.org/Offices/landfill/electronics.aspx.

BMP 37: Install Watershed Signage

Communities are encouraged to install watershed signage in order to increase the public's awareness of their location in a watershed and increase awareness on the location of area waterways. The SCCHD has developed a design template for watershed signage that should be used for a consistent look throughout the county. As similar program and watershed sign exists for Macomb County communities. Information on placement, ordering, and installation of the signs is available from the SCCHD. The SCCRC will install signs for Cities/Township's for a standard fee if the sign falls within the road right-of-way.

Figure 6.17 A watershed road sign installed on King Road at the Baird Drain bridge crossing, China Township

BMP 38: Promote the Adopt-A-Stream Program and Stream Leaders Program

The St. Clair County MSU-Extension office offers an Adopt-A-Stream program through their 4-H Youth Program which helps promote watershed education by providing education and tools to civic groups for monitoring of a local waterway. The program is designed to encourage community involvement and is open to youth clubs, schools, churches, neighborhood associations, lake associations, businesses, civic organizations, etc. Local municipalities can encourage local residents or civic groups to participate in this program and provides them with an effective way to involve and educate residents, as well as obtain local water quality monitoring data. As part of the program, volunteers can implement streambank clean ups, conduct streambank surveys, monitor stream insects and gauge water quality, and learn about the watershed as a whole. At no cost, group leaders are trained and provided with all equipment necessary prior to spring and fall monitoring dates. These activities are generally conducted twice a year in the spring and fall. More information is available at:
https://www.stclaircounty.org/Offices/msue/4H/AdoptAStream.aspx.

The Friends of the St. Clair River Stream Leaders program helps keep tabs on the health of waterways across St. Clair County. Twice a year, under a Stream Leader's instruction, volunteers meet at an assigned stream or river to collect macroinvertebrates. These scores help track the health of a waterway over time and give clues as to which areas need improvement or protection. These activities should be promoted throughout the watershed. More information is available at: http://www.scriver.org/.

Figure 6.18 Volunteers collecting macroinvertebrates as part of the Stream Leaders program (Source: Friends of the St. Clair River)

BMP 39: Promote the Adopt-A-County Road Program

This program is offered through the St. Clair County Road Commission and is designed to bring the community together to beautify the county's roadsides and reduce the amount of trash, litter, and debris that can enter area waterways in surface water runoff. Implementation of this program can help protect water quality and aquatic habitat, as well as increase aesthetics throughout the watershed.

The program requires that a group of at least six (6) people and three (3) alternate participants should be formed. Groups commonly associated with the program include scout troops, activity and youth groups, businesses, clubs, and service organizations. Crew members must be a minimum of 12 years old, and children between the ages of 12 to 15 must have adult supervision at a ratio of one adult for every three (3) children. Participants are asked to pick up litter a minimum of three (3) times per year from the primary roadsides in their designated area. There is no fee to be a part of the program and safety vests, required to be worn by participants, are provided at no cost by the Road Commission. Litter bags and pickup service of the filled bags is also provided. Additional information on the Adopt-A-County Road Program is available at: http://www.sccrc-roads.org/adoptahwy.htm.

BMP 40: Provide Information on the Soil Testing Program

The SCC MSU-Extension office offers a soil testing program for county residents for a minimal fee to ensure the proper use and application of the right type of fertilizers for their lawn, gardens, and farm fields in order to reduce the amount of nutrient loading in the watershed. Communities are encouraged to advertise the program to area residents through flyers, newsletters, websites, and other applicable media.

BMP 41: Encourage Participation in the Citizen Planner Program

Several MSU-Extension offices surrounding the SCC area offer the Citizen Planner Program including Macomb County Extension office Sanilac County Extension office, and SCC Extension office. The Citizen Planner Program is designed to address the basic ongoing training needs of citizens appointed to serve on local land use planning boards and commissions. A primary goal of the program is to equip

community leaders and interested citizens with the technical knowledge and understanding of the legal framework of planning and zoning, and leadership skills to perform their duties more effectively and to create a forum to build a volunteer core of program participants/graduates to advance good land use education within their communities. Additional details on program offerings are available at:http://msue.anr.msu.edu/program/info/michigan_citizen_planner. Participants in the Belle are highly encouraged to support attendance of their local planning boards to stay informed on emerging land use issues and to gather and implement the most useful tools to achieve many of the goals and objectives of this WMP.

BMP 42: Provide Education on the Identification of Failing Onsite Sewage Disposal Systems
Failing onsite sewage disposal systems (OSDS) provide a conduit for excess nutrients and harmful pathogens to enter surface waters or groundwater supplies by overland flow or through infiltration. A number of educational materials are available to area residents regarding proper OSDS operation and maintenance. The SCCHD offers an informational brochure on OSDS operation and maintenance guidelines, and a variety of education assistance programs are available, including the local MSU-extension office's Home*A*Syst program. Communities in the Belle are encouraged to educate area residents on the proper operation and maintenance of OSDS through the various media available (websites, newsletters, brochures, etc.). Brochures on OSDS operation and maintenance can be obtained by calling the SCCHD.

BMP 43: Encourage Reduced Use of Road Salt and Promote Alternative Deicing Chemicals
Conventional road salt (sodium chloride) is highly soluble in water and can easily wash off pavement into surface waters and leach into soil and groundwater. High concentrations of salt can damage and kill vegetation, disrupt fish spawning in streams, reduce oxygen solubility in surface water, interfere with the chemical and physical characteristics of a lake, pollute groundwater making well water undrinkable, disintegrate pavement, and cause metal corrosion of bridges, cars, and plumbing. Managers are encouraged to consider the use of alternatives to conventional salt, such as calcium chloride, or to ensure proper calibration of salt spreaders to reduce the amount of salt needed to the maximum extent practicable. Education regarding alternative materials can also be passed on to residents and business owners that commonly use these materials. In addition, information regarding safe application rates can also be provided through various means via website, newsletters, news articles, brochures, training programs, and workshops.

BMP 44: Encourage Golf Course Nutrient Management
There are several golf courses throughout the Belle and management of these lands is important to minimize input of nutrients to surface waters. There are a number of voluntary programs available to educate golf course managers about nutrient management. Organizations such as the United States Golf Association conduct research and publish BMPs for environmentally-sound turf management practices. The local MSU Extension office also has educational resource materials available.

BMP 45: Encourage the Use of Conservation Easements
A conservation easement is a method of preserving open space without purchasing all rights to a parcel of property. A community or non-profit land trust or land conservancy can purchase (similar to the purchase of development rights programs) or acquire by gift an easement to the property. Initiation of easements by a landowner is voluntary; however, after signing, the easement is an enforceable document binding both parties. Under Michigan law, conservation easements may extend for a limited period of time (i.e. 10 or 20 years), or they may be permanent. To benefit from Federal income tax and estate tax deductions, a permanent conservation easement must be in place. Conservation easements must be donated to a government agency, a university, or a non-profit organization to be eligible for tax deductions.

Local governments can encourage the use of conservation easements by:

- Identifying priority resource areas where conservation easements would be beneficial for the protection of water quality, wildlife habitat, and environmentally sensitive lands and resources.
- Contacting landowners in the selected areas, informing them of the option of easements and related financial incentives, and
- Encouraging the participation of local land trust and land conservancy organizations (such as the Blue Water Land Conservancy or the Southeast Michigan Land Conservancy) to promote the easement concept and to receive conservation easements if there is a high degree of citizen interest for the preservation of open space. Land trusts and land conservancies are non-profit organizations directly involved in protecting land for its natural, recreational, scenic, historical, or agricultural value.

BMP 46: Perform Storm Drain/Catch Basin Marking

Storm drain marking is an inexpensive way to help the public become more aware of storm drain systems, and gain understanding of how storm water runoff gets collected into these systems and is discharged to area waterways untreated. The messages conveyed in the markers outline the importance of pollution prevention for catch basins and storm sewer systems to protect water quality downstream. Template storm drain markers with a common SCC design have been created by the SCCHD. Communities are encouraged to call the SCCHD for information on ordering these markers and how a volunteer event to place the markers can be organized and conducted.

Figure 6.19 An example of a volunteer placing a permanent storm drain marker to increase watershed awareness

BMP 47: Seek Input from the Public on Development of Ordinances for Water Quality and Quantity Protection

The municipalities and agencies will follow regular protocol for obtaining public input whenever a new or amended ordinance is pending in their community.

BMP 48: Seek Participation from the Public at Belle River Watershed Advisory Group Meetings
During implementation of the Belle River Watershed management plan (WMP), the public should be invited to provide input and recommendations on all components. Citizens should be invited to WAG meetings where a topic relevant to their interests is discussed. In addition, the public should be solicited for input during selection for revisions of the WMP in the future.

BMP 49: Promote the county's 24-Hour Water Quality Pollution Reporting Hotline
The SCCHD maintains a 24-hour hotline for the public to report failing on-site septic disposal systems, illicit discharges or illegal dumping. This hotline also provides information on current beach closures and an option for the caller to leave a water quality question. The phone number is "**877-504-SWIM**". Permittees should advertise the hotline on their website, in newsletters or brochures, or via other media.

BMP 50: Seek Participation from the Public for St. Clair County's Earth Fair and River Day Events
The public will be educated about pollution prevention and watershed awareness and stewardship at the annual Earth Fair and River Day events. The public will also be encouraged to participate in watershed awareness activities such as storm drain marking, adopt-a-stream, and adopt-a-road programs during these events. More information on participating in these activities can be obtained from the SCCHD which helps coordinate these events on an annual basis.

Figure 6.20 The SCCHD hosts an annual River Day event in June across St. Clair County's waterways

BMP 51: Seek Participation from the Public in River Clean-Up Events
Hosting a stream cleanup event is an effective way to promote watershed awareness.. A stream cleanup allows concerned citizens to become directly involved in water pollution prevention. As large woody material and illegal dumping are of major concerns in the Belle River Watershed, river clean-up days can be focused on managing large wood in addition to trash and debris.

6.1.6 Managerial Actions: Ordinances & Policies

BMP 52: Study, Develop, Adopt, and Implement Aquatic (Riparian) Buffer Ordinance
Aquatic or riparian buffers are made up of the vegetation that grows along streambanks and lakeshores. The plants help protect water quality by filtering pollutants, sediment, and nutrients from runoff. Other benefits of buffers include flood control, streambank stabilization, stream temperature control, and room for lateral movement of the stream channel. Effective aquatic buffer ordinances require this natural boundary between local waterways and existing or proposed development. These ordinances usually specify the size and management of the stream buffer and are a specific planning tool to protect stream

quality and aquatic habitat. Adopting a natural feature setback ordinance will also aim to achieve the same objectives of a buffer ordinance and is often used interchangeably. A model ordinance is available: http://ped.macombgov.org/PED-LandAndWater-About-ModelEnvironmentalOrdinances.

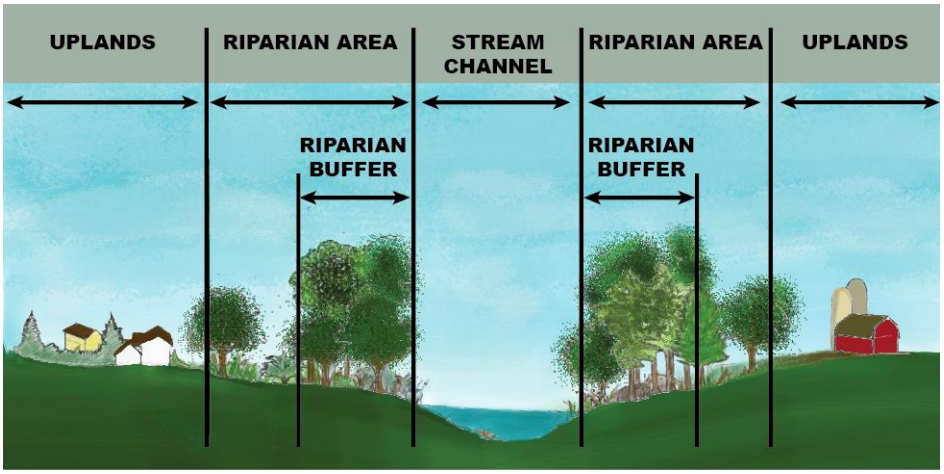


Figure 6.21 Example of a riparian buffer (Source: USDA NRCS)

BMP 53: Study, Develop, Adopt, and Implement Floodplain Management Ordinance
Floodplains perform vital natural functions such as temporary storage of floodwaters, moderation of peak flood flows, maintenance of water quality, groundwater recharge, prevention of erosion, and provide habitat for diverse natural wildlife populations, recreational opportunities, and aesthetic quality. These functions are best served if floodplains are kept in their natural state. Wherever possible, the natural characteristics of floodplains and their associated wetlands and water bodies should be preserved and enhanced. A floodplain management ordinance identifies floodplain protection as important to protect the health, safety, and welfare of residents, as well as to protect the water and natural resources associated with floodplain areas. This ordinance will ensure that floodplain protection is achieved through the review of all activities proposed within both FEMA-mapped floodplains, as well as floodplains associated with smaller tributaries, and by the issuance of permits for those activities that comply with the objectives of the ordinance.

BMP 54: Study, Develop, Adopt, and Implement Wetland Protection Ordinance
Wetlands provide many benefits to our environment by reducing storm water runoff velocities and peak flows, promoting infiltration of surface runoff to recharge groundwater supplies, and wetland plants absorb some pollutants from runoff. Wetlands also provide habitat for numerous wildlife species. A subset of all wetlands is regulated by state and federal authorities if they meet the following criteria: if they are located in counties with 100,000 people or more, are 5 acres or larger, and/or are located within 500 feet of a waterbody. A local wetland protection ordinance that is more stringent than the state or federal government regulations is necessary to protect the smaller, isolated wetlands from impairment or destruction. A model ordinance can be found at:
http://ped.macombgov.org/PED-LandAndWater-About-ModelEnvironmentalOrdinances.

BMP 55: Study, Develop, Adopt, and Implement a Woodlands/Tree Protection Ordinance
A woodland/tree protection ordinance is a common regulatory measure used by communities striving to attain healthy, vigorous, and well-managed trees. Ordinances can be used to protect individual trees, such as trees in an urban community, or tree-rows and woodlands in a more rural community. Tree protection ordinances can also be used to promote creative design and construction techniques that maximize preservation. To enhance its effectiveness, an ordinance should be supported by the goals and objectives

of a community's Master Plan, and other report(s) or inventories that identify tree resources to be protected. Inventories, maps, and other information of a community's tree resources can be used to identify areas for priority protection and to measure the effectiveness of the ordinance based on the change in tree resources over time. A model ordinance can be found at: http://ped.macombgov.org/PED-LandAndWater-About-ModelEnvironmentalOrdinances.

BMP 56: Study, Develop, Adopt, and Implement Agricultural Buffer Zoning Ordinance
Agricultural buffer zoning is a transitional zoning technique that can be used to help protect the long-term integrity of prime or unique agricultural lands. A rural residential/agricultural zone is created in appropriate areas of the community, between more intensive development and large tracts of agricultural land. This transitional area, or buffer zone, allows for rural residential lifestyle opportunities and isolates agricultural operations from higher intensity uses. The buffer district should be placed in all agricultural areas in areas with prime or unique agriculture lands that are near more intense development. This BMP should be used in conjunction with BMP 65 and/or BMP 66, both of which can be used to protect existing farmland.

- The nature of regulations of these buffer districts will vary with each community. Minimum lot sizes typically range from 1 to 3 acres in these districts. Supplementary regulations that should be considered include:
- Minimum lot width-to-depth ratios (to prevent excessively long, narrow lots);
- Clustering options (to preserve open space and reduce cost of providing public services);
- Regulation of lot splits;
- Regulation of private roads (to prevent creation of substandard roads that the community may eventually be responsible for).

BMP 57: Study, Develop, Adopt, and Implement Rural Clustering Ordinance
Rural clustering is a set of techniques (primarily zoning) that focus on preservation of open space in rural areas by encouraging new residential development to cluster in a few selected areas on a parent parcel, rather than being spread across the entire site. This permits large portions of the parent parcel to remain open. The dwelling units are clustered in areas that are screened from roads (unless there is no other location), and in locations where they can be effectively provided with services. Open spaces remaining after clustering are protected in perpetuity through a range of legal mechanisms (such as conservation easements).

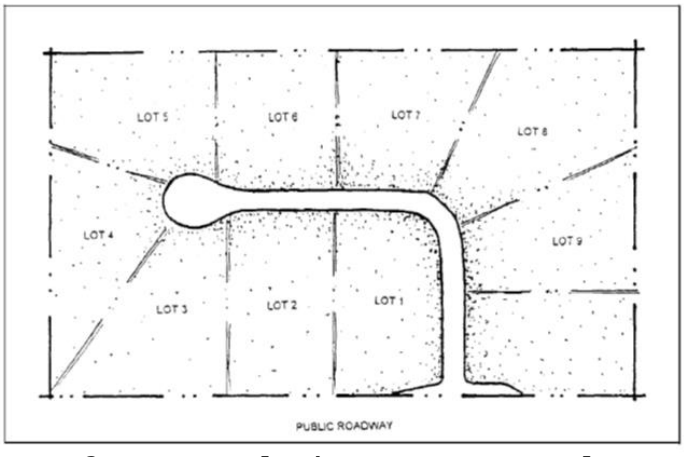
While the development rights of open space on a parcel approved for rural clustering will have been permanently retired, the land can still be actively farmed, used for woodlots, nurseries, pasture, or recreation. Ownership typically remains with a property owners association, a condominium association, or the open space can be transferred to a conservancy or the community. Two principal variations include:

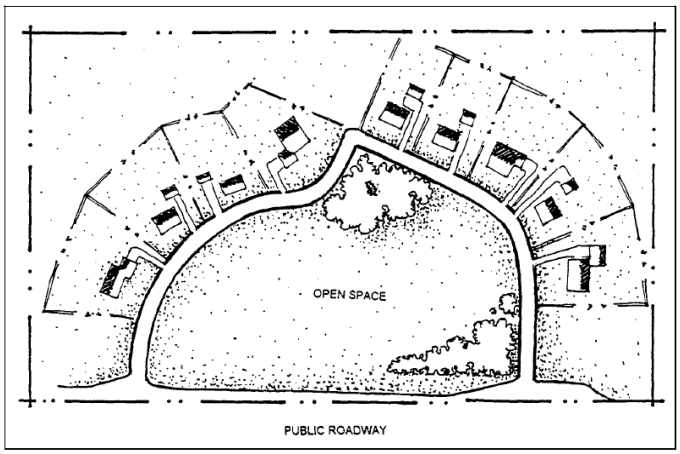
- Clustering options that create common landscaped open space for recreation by residents of clustered units in addition to the larger, more natural (unaltered) open space; and,
- Cluster layouts that focus more on individual lot open space that is integrated with the larger, more natural open space area.

Guidelines for rural clustering recommend that:

- Rural cluster zoning is most suitable in rural-to-suburban transition areas.
- Cluster district boundaries should be consistent with the boundaries of resource production areas and natural features.

- Total development in the district should be limited by gross density restrictions.
- Cluster projects should be carefully sited to minimize impact on neighbors, infrastructure systems, and the environment.
- Procedures for review and approval should be no more difficult than for subdivisions. Where they are a necessary contribution to an open space network, they should be mandatory.
- Protected open space should be large enough and usable to achieve intended purposes.
- Residential development should be confined to identified cluster areas.
- Lot dimensions, building heights, and setbacks should be compatible with rural character and provide the privacy, seclusion, and access to open space that are normally expected in rural areas





BMP 58: Study, Develop, Adopt, and Implement Mixed Use Zoning Ordinance
Mixed use zoning allows residential, office, and retail buildings in the same development which allows for a greater intensity of development on a more compact scale. This reduces the total amount of land needed on a per unit basis. Mixing uses also allows for a greater range of transportation options and opportunities for shared parking, which will potentially reduce the amount of impervious surfaces constructed for roads and parking lots.

BMP 59: Study, Develop, Adopt, and Implement Private Road Ordinance
A private road ordinance complements efforts to reduce directly connected impervious surfaces by permitting roads to be built that are narrower and have greater allowable slopes than county road standards. Narrower, steeper roads produce a smaller area of impervious surface and require less clearing of roadside vegetation. The ordinance can promote rural character by allowing narrow roads in certain development.

BMP 60: Study, Develop, Adopt, and Enforce an Illegal Dumping Ordinance
The adoption and enforcement of an illegal dumping ordinance will ensure that violators will be assessed a fine for introducing contaminants such as household hazardous waste, litter, trash and debris into the environment that is not only aesthetically unpleasing, but can also cause water quality and habitat degradation. Washtenaw County's illegal dumping ordinance is available online at: http://www.ewashtenaw.org/government/departments/environmental_health/pollution_prevention/illegal_dumping/eh_illegaldumpreg.html.

BMP 61: Study, Develop, Adopt and Implement Illicit Discharge/Connection Elimination Ordinance

An illicit discharge is defined as any discharge to the municipal separate storm sewer system that is not composed entirely of stormwater, except for discharges allowed under a NPDES permit or waters used for firefighting operations. These non-storm water discharges occur due to illegal connections to the storm drain system from residential, business, or commercial establishments. As a result of these illicit connections, contaminated wastewater can enter into storm drains, open conveyance systems or directly into local surface waters before receiving treatment from a wastewater treatment plant. Illicit connections may be intentional or may be unknown to the owner. Additional sources of illicit discharges can be failing septic systems, illegal dumping practices, and the improper disposal of sewage from recreational practices such as boating or camping. Illicit discharge detection and elimination programs are designed to prevent contamination of ground and surface water supplies by monitoring, inspection and removal of these illegal non-storm water discharges. An essential element of these programs is an ordinance granting the authority to inspect properties suspected of releasing contaminated discharges into storm drain systems. Another important factor is the establishment of enforcement actions for those properties found to be in noncompliance or that refuse to allow access to their facilities.

BMP 62: Support County-Wide Onsite Sewage Disposal System Ordinance

At present, there is no county-wide or local municipal ordinance that requires regular inspection of onsite sewage disposal systems (OSDS) to ensure that they are not failing and introducing excess nutrients and pathogens to surface water and groundwater. The SCCHD oversees programs to properly locate and construct OSDS in new developments and has a "water quality hotline" for residents to refer failing systems to the SCCHD for follow-up inspections. They also provide a number of educational print materials on proper OSDS operation and maintenance. The county or municipalities may want to consider the adoption of an OSDS inspection ordinance requiring regular inspections of OSDS. There are several counties in southeast Michigan, such as Macomb, Wayne, and Washtenaw, which currently have a "Time-of-Sale" ordinance which requires OSDS inspection when a house is sold (or in cases of title transfer).

BMP 63: Study, Develop, Adopt and Implement Post-Construction Storm Water Management Ordinance

To ensure protection of water quality and minimize increase in runoff quantities from areas of new development and redevelopment, design criteria for storm water management systems should be developed to provide guidance for designers on what kinds of practices they can implement on a site to achieve the designated criteria.

A comprehensive set of design standards for storm water management should address three key principles:

1. Protection of water quality,
2. Stream channel protection, and
3. Flood control.

The standards should also outline specifications for the non-structural and structural storm water practices that are allowed on development sites, especially as it pertains to buffer requirements, landscaping requirements, and operation and maintenance requirements.

BMP 64: Implement and Enforce the Soil Erosion and Sedimentation Control Ordinance and the SESC Program

Sediment is the product of uncontrolled erosion and is the greatest pollutant by volume entering watercourses annually. Typically, the most environmentally dangerous period of development is the initial construction phase when land is cleared of vegetation and graded to create a proper surface for construction. The removal of natural vegetation and topsoil creates an area particularly susceptible to erosion by altering existing drainage patterns and exposing unprotected soil.

The St. Clair County Board of Commissioners adopted Resolution 03-40, The St. Clair County Soil Erosion and Sedimentation Control Ordinance on November 12, 2003 which "provides procedures, standards, and enforcement mechanisms to manage soil erosion and sedimentation to promote the safety, public health and general welfare of the community through effectively sustaining the goal of clean water in St. Clair County and the State of Michigan." The St. Clair County Board of Commissioners originally designated the St. Clair County Department of Public Works (SCCDPW) as the County Enforcing Agency (CEA) responsible for the administration and enforcement of this Ordinance under the authority of the rules promulgated in Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Subsequently, the program was turned over to the SCCHD in 2008. SCCHD personnel perform plan reviews, issue SESC permits, conduct site and final stabilization inspections. A soil erosion and sedimentation control permit is required for an earth change within 500 feet of a lake or stream, or which disturbs one acre or more of land. Additional details on the SESC Program, including permit fees and approved best management practices can be found on the SCCHD's website at: www.scchealth.co**.**

Figure 6.23 A silt fence is an example of a Soil Erosion and Sedimentation Control BMP (Soucre: SCCHD)

BMP 65: Encourage Participation in the Purchase of Development Rights Program

A purchase of development rights (PDR) program is a means of compensating farmers for their willingness to accept a deed restriction on their land which limits or prohibits future development of the land for non-agricultural purposes (i.e. giving up the development rights). Generally, landowners are

compensated for the fair market value of their land, based on the difference between what it could be sold for on the open market with no restrictions and what it could be sold for once an easement restricting development is placed on the land. An easement is a restriction on private property which is legally binding on present and future landowners. It is recommended that PDR be used as part of a storm water management strategy that focuses on headwater areas and areas of intense value (i.e. high-quality natural areas).

The St. Clair County Board of Commissioners voted unanimously to approve a PDR ordinance in 2004 which can be used to complement the program offered by the State. A copy of the ordinance and applicable program materials is available at: http://cis.stclaircounty.org/planning3059553.asp**.**

BMP 66: Encourage Participation in the Farmland Preservation Program (P.A. 116 Program)
An important tool used across the State in protecting farmland from urban development is the Farmland and Open Space Preservation Act, P.A. 116 of 1974. Under the terms of this Act, an owner of certain kinds of agricultural lands may enter into a Development Rights Agreement with the State, whereby the landowner agrees to keep the land in question in agricultural use for at least ten (10) years (or up to 99 years, as established in the agreement). In return for this Agreement, all property taxes paid in excess of 7% of the landowner's income will be refunded in the form of a State income tax credit. In addition, the property in question will be exempt from any local special assessments. If the landowner breaks the Agreement before it expires, all benefits received up to that point must be repaid to the State, plus interest (except for special cases, where repayment terms may differ). Agreements may be renewed for a minimum 7-year term. Eligible agricultural lands include:

- An operating farm of more than 40 acres in size;
- An operating farm of 5 to 40 acres with a gross annual income of $200 per tilled and cleared acre; or
- An operating specialty farm (as designated by the Michigan Department of Agriculture [MDA]) of at least 15 acres with a gross annual income of at least $2,000.

At least 51% of the land in an operating farm must be under active cultivation or in pasture. The property owner does not have to provide public access to the land and the property may be sold. New owners, however, are bound by the agreement until it expires.

Although this is a State program, local communities are responsible for processing and approving applications to enroll in the program. Furthermore, the community can encourage owners of prime and unique agricultural land with the community (and lands designated for agricultural use in the Master Plan) to enroll in the program. Some communities in the Belle are already utilizing this program.

6.1.7 Managerial Actions: Studies and Plans

BMP 67: Update Master Plans to Incorporate Watershed Management Plan Goals and Objectives
Incorporation of the goals and objectives of the WMP into a community's Master Plan will ensure that the supporting language is present for resource protection BMPs that will be implemented to achieve compliance with watershed management plan. I. St. Clair County, Lapeer County, and Macomb County Master Plans contain goals for protecting the environment (see Chapter 1). Adding further language that incorporates the direct goals of the WMP will help to insure that the Belle River is protected in the future. Also, specific measures to accomplish these goals should be included. The county Master Plans should be used by local governments and municipalities to update their Master Plans to ensure a coordinated watershed management approach.

BMP 68: Perform High-Quality Natural Features Inventories throughout the Watershed
To ensure the protection of high-quality natural features such as woodlands, wetlands, lakes, streams and wildlife habitat, it is important that community Master Plans include inventories of these assets. The inventories provide the basis for goals and policies in the Master Plan that help the community reach its vision for natural feature preservation. They also identify where these special features are located, allowing the planning officials to protect them during site plan review. The inventories also provide the legal basis for ordinance language that works to preserve these features.

BMP 69: Incorporate High-Quality Natural Features Inventories into Master Plan
Once high-quality natural features inventories are completed throughout the watershed, the data and maps generated from the inventories should be incorporated into a community's Master Plan. A variety of zoning ordinances should then be implemented to protect the priority natural features identified, such as adopting a Resource Protection Overlay District Standard.

BMP 70: Study, Develop, Adopt and Implement Resource Protection Overlay District Standards
Once a community has updated its Master Plan with natural feature inventories, an Overlay District can be adopted into the zoning ordinance to ensure that property is developed in a manner consistent with its zoning designation, and the proposed physical elements are designed and arranged to protect the priority resource protection areas both on the site and in the vicinity of the site as identified by the community. The Overlay District establishes procedures to enable the applicant and community to achieve the mutually compatible objectives of reasonable use of land and protection of vital natural resources. A model ordinance can be found at:
http://www.partnershipsforchange.cc/planningeduc0136.asp.

BMP 71: Develop/Update Natural Areas Plan
The purpose of a Natural Areas Plan is to identify environmentally significant areas of a community that should be preserved in their natural state and those that can be compatibly integrated with development. Furthermore, the Natural Areas Plan works toward creating a system of open spaces that are linked to one another through naturally-occurring or human-made corridors. This plan represents an ecosystem approach to open space planning that will help preserve both the natural areas themselves, and as importantly, the functioning of the systems these areas represent. A Natural Areas Plan combines data from natural feature inventories (such as wetlands, water features, woodlands, steep slopes, and other significant features) on a map to see where areas with the most sensitive features overlap. These areas then become "Priority Preservation" areas. Connections, or wildlife and non-motorized transportation corridors, between these areas are then identified and mapped. The Natural Areas Plan then provides implementation strategies and action items (such as conservation easements, land conservancy donations, and preservation techniques like ordinance regulations for buffers, water quality protection, etc.) on how to keep these areas preserved and functioning.

BMP 72: Identify Areas for Recreation Enhancement
Residents and other stakeholders in the Belle have identified a desire to have additional parkland along water features for passive and active uses. Each municipality is encouraged to explore the options for the acquisition of open space for riparian recreational uses. Opportunities for additional recreational areas will help to increase public awareness and stewardship for area rivers, wetlands, streams and lakes, as well as the surrounding wildlife habitats associated with open spaces. Park land could also be used as demonstration sites to increase public awareness and education on the environmental benefits of storm water pollution prevention (i.e. install native vegetation areas or a rain garden) and protection of natural resources.

BMP 73: Develop/Update Recreation Plans
Each year the Michigan Department of Natural Resources (MDNR) offers recreation grants for the acquisition and development of parks and recreation facilities through the Michigan Natural Resources Trust Fund and the Land and Water Conservation Fund. Any local unit of government that has a current recreation plan approved by the MDNR is eligible to apply for one of these recreation grants. To be approved by the MDNR, a recreation plan must determine the community's recreation needs and develop a five-year action plan of proposed recreation projects to meet those needs. Only those recreation projects included in the five-year action plan are eligible for recreation grant financing. Additional information on the available MDNR grant programs is available at:
http://www.michigan.gov/dnr/0,1607,7-153-10366_37984_37985---,00.html.

BMP 74: Implement Greenway Corridor Vision Plans
Greenway corridors provide unfragmented, linearly connected woodlands, wetlands, and other natural features that provide protected habitat for wildlife, protect water quality, and provide recreational and public access opportunities to the natural resources throughout the watershed. The St. Clair County Metropolitan Planning Commission (SCCMPC) has identified the existing, planned, and concept greenway corridors in its county-wide Master Plan. Each community should consider adding a greenway plan to their planning documents, and include the County's concept greenway corridors in their plan. A source of funding for recreation areas, especially bike trails, is through the Greenways initiative. Additional information is available at:
https://cfsem.org/initiatives-and-programs/greenways-initiative-connecting-people-communities-and-nature-throughout-so.

BMP 75: Implement Blueways Trail Vision Plans
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) developed 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. The Belle River Route is a 14.5 mile blueway trail that winds through Marine City, East China Township, and China Township. (Figure 3.2 in Chapter 3). 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. More information about the program can be found at: www.bluewaysofstclair.org.

6.1.8 Watershed Plan Implementation

BMP 76: Implement Financial Solutions
The programs and projects that will be implemented upon approval of this Belle River WMP will inherently depend on the financial resources available to do so. Forming partnerships with other agencies and resource protection groups throughout the watershed will also be crucial to the success of the implementation process due to the benefits of resource-sharing. With the obligations that need to be met in the Phase II storm water management program, funding will need to be allocated from existing budgets, or opportunities for new funding sources will need to be realized. Opportunities for funding sources should be constantly researched throughout the implementation phase.

Funding sources, such as Section 319 or CMI grants that often require matching funds, are available but are often limited to short-term, one time projects. The US EPA reported that over 40% of section 319 funding is typically used to help design and build management approaches to prevent and control nonpoint source pollution from agricultural lands. Some projects may need to be funded through fundraising, citizens, industries, or municipalities in the watershed. Other opportunities for funding could come from the following sources:

- Implementation of a storm water utility fee (incurred by users of the storm water system);
- Calculating user fees based on the amount of impervious cover produced in developments;
- Establishing wetland or tree mitigation banking systems; or
- Charging fees based on the amount of unstabilized soils (per-day, per-acre fee) on exposed land at construction sites.

BMP 77: Provide Sufficient Enforcement Capability
After ordinances and regulations to address land use planning and nonpoint source pollution prevention measures are adopted, there must be sufficient resources and personnel available to enforce them. Stakeholders have expressed a high degree of concern in regards to lack of enforcement of local regulations. To address these concerns, measures such as additional personnel dedicated to inspection and enforcement, as well as follow-through for administration and payment of fines may be necessary. An option to consider may involve allocating staff devoted to other tasks to take on additional duties as an enforcement officer, as opposed to hiring a dedicated, full-time officer.

BMP 78: Implement Institutional Framework for Watershed-Wide Actions
In order to ensure watershed management is most effective, actions should be taken to ensure that planning, project, and program opportunities are shared across jurisdictional boundaries to include federal, state, county, and local government involvement. Management of water and natural resources on a watershed-scale can be an overwhelming endeavor and the establishment of a central working group dedicated to watershed issues and implementation of action plans is a highly recommended strategy. This group may consist of continued meetings of the Belle River Watershed Advisory Group as a whole, or separate, more detailed working groups may be formed to help direct various components of the WMP. This framework should be established early on in the implementation process of the WMP to ensure a program that is as time and cost effective as possible for all entities involved. This group would also work to evaluate WMP effectiveness over time by compiling the evaluation components of the methods for measuring progress and providing feedback on recommended updates to the WMP every two years, or as needed.

6.2 Estimated Costs of Management Alternatives

Table 6.1 provides a summary of the various BMPs and their estimated costs that will address the watershed pollutants, impairments, and concerns addressed in the Belle River WMP. The BMPs are not listed in any particular order of importance. Additional detail on applicable BMPs, maintenance schedules and costs can be found on the US EPA's website at: http://water.epa.gov/polwaste/npdes/swbmp/.

Table 6.1 This table outlines each BMP, pollutants and sources addressed, estimated costs, and ability of each BMP to meet plan goals. The letter following the BMP number indicates the pollutant(s) addressed: N=nutrients, P=pathogens, S=sediment, TDS= total dissolved solids, TP=toxic pollutant, A=All.

BMP # (pollutant addressed)	Management Alternative	Sources Addressed	Remove TMDL (reduce sediment/nutrients)	Restore hydrologic stability	Protect critical ecosystems	Improve public knowledge	Improve large wood management	Increase recreational opportunities	Reduce E. coli levels	Estimated Cost	Technical Assistance
1. Managerial & Structural Actions: Agricultural Runoff Controls											
1 (N, P)	Encourage use of GAAMPs	Agricultural runoff	X						X	Costs limited to providing resource/informational materials on website or availability of brochures (available through the local NRCS office). Professional printing costs average $10 per 50 flyers or $15 per 25 brochures.	MDARD, NRCS, Conservation Districts, local units of government
2 (N, P, S)	Encourage conservation crop rotation with cover crop	Agricultural runoff	X						X	Costs limited to providing resource/informational materials on website or availability of brochures (available through the local NRCS office). Professional printing costs average $10 per 50 flyers or $15 per 25 brochures.	NRCS, Conservation Districts, MSU Extension
3 (N, P)	Develop manure management plans	Agricultural runoff	X						X	Approximately $5,000-$8,000 per plan.	NRCS
4 (N, P, S)	Install exclusion fencing	Agricultural runoff, animal waste	X		X				X	The NRCS estimates that fencing costs approximately $20.00 per rod and $1.20 per foot of fencing material. An estimate of $1,200 was made for a stream crossing for livestock. This included preparing a 20-foot wide by 4-foot deep crossing area with ramps 10-feet wide on a 6:1 slope.	NRCS, Conservation Districts
5 (N,S)	Promote conservation tillage practices and appropriate nutrient management practices (Crop*A*Syst)	Agricultural runoff	X							Costs limited to providing education opportunities with local NRCS office. Professional printing costs average $10 per 50 flyers or $15 per 25 brochures.	NRCS, MSU Extension

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BMP # (pollutant addressed)	Management Alternative	Sources Addressed	Remove TMDL (reduce sediment/nutrients)	Restore hydrologic stability	Protect critical ecosystems	Improve public knowledge	Improve large wood management	Increase recreational opportunities	Reduce E. coli levels	Estimated Cost	Technical Assistance
6 (N, S)	Restore historic wetlands	Agricultural runoff, hydromodification	X	X	X				X	Cost depends on land and/or easement acquisition and extent of grading and earthwork. Donated land with no easements could cost between $1,500 and $3,000/acre. Purchase land with extensive grading and plantings approximately $9,000 to $25,000.	USFWS, MDEQ, NRCS
2. Managerial & Structural Actions: Stream and Drain Runoff Controls											
7 (S)	Continued stream/drain inventories throughout watershed	Hydromodification	X	X						MDEQ provides trainings to complete inventories; consultant assistance $150/hour for development and/or review of data.	MDEQ
8 (P, S)	Implement tile drain controls	Hydromodification, agricultural runoff	X	X	X				X	Costs would fall on agricultural landowners. Create possible partnerships to seek funding to assist landowners. Implementing tile drain controls costs an average of $65-$90 per acre.	NRCS, MSU Extension, Conservation Districts
9 (A)	Prevent and remove streamflow obstructions and barriers to aquatic organism passage	Hydromodification		X			X			Minimal cost: implement woody debris plan. Partner with non-profits or other local organizations to implement volunteer work days to remove and manage large woody debris. Volunteer events may range from $100-$1,500 depending on the scope and scale. Costs to assess and identify areas were aquatic organism passage may be blocked will require staff hours ranging from $50-$100 per hour (can be combined with BMP 6) .	MDEQ, MDNR

Table 6.1 This table outlines each BMP, pollutants and sources addressed, estimated costs, and ability of each BMP to meet plan goals. The letter following the BMP number indicates the pollutant(s) addressed: N=nutrients, P=pathogens, S=sediment, TDS= total dissolved solids, TP=toxic pollutant, A=All.

BMP # (pollutant addressed)	Management Alternative	Sources Addressed	Remove TMDL (reduce sediment/nutrients)	Restore hydrologic stability	Protect critical ecosystems	Improve public knowledge	Improve large wood management	Increase recreational opportunities	Reduce E. coli levels	Estimated Cost	Technical Assistance
10 (S)	Utilize instream habitat restoration techniques	Hydromodification, streambank erosion	X	X	X			X		$50-$250 per foot; can vary widely depending on length, height and scope of restoration project.	NRCS, USFWS, MDEQ, MDNR
11 (N, S)	Implement alternative (two-stage) drain practices and rehabilitation	Hydromodification, streambank erosion	X	X						Depending on project type, costs would be associated with mobilization, design, construction, and maintenance as noted above in other applicable BMP costs. The cost averages $25 per linear foot.	NRCS, Conservation Districts, MDEQ, Drain Commissions
12 (S)	Install and maintain streambank stabilization measures	Hydromodification, streambank erosion	X	X						Construction: $1.20-$2.50/live stake (2 to 3 feet spacing in grid pattern); $2.00-$7.00/joint planting stake (2 to 3 feet spacing in grid pattern); $5.00-$8.00/foot of live fascine (spaced at 3 to 5 feet up the slope); $10.00-$25.00/square foot of live cribwall (typically requires 4 square feet per lineal foot of streambank); $25.00-$35.00/square yard (for plain 8” rip-rap); $30.00-$45.00/square yard (for plain 16” rip-rap); $20.00-$30.00/foot (for 3X1 gabion baskets).	MDEQ, NRCS
13 (S)	Install and maintain gage stations	Hydromodification		X						USGS Gage Station: For continuous record stream gauge station—Installation: $13,000-$15,000; Annual Operation: $12,000	USGS

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BMP # (pollutant addressed)	Management Alternative	Sources Addressed	Remove TMDL (reduce sediment/nutrients)	Restore hydrologic stability	Protect critical ecosystems	Improve public knowledge	Improve large wood management	Increase recreational opportunities	Reduce E. coli levels	Estimated Cost	Technical Assistance
3. Structural & Vegetative Actions: Post-Construction Stormwater Management											
14 (S)	Replace undersized culverts / repair misaligned or obstructed culverts	Streambank erosion	X	X						Prices vary depending on size of culvert needed and culvert material type (i.e. concrete, metal, plastic, etc.). Prices could range from a few thousand to hundreds of thousands of dollars. Culverts on small, gravel roads may cost an average of $5,000 while culverts on highways may cost $1,500,000 or more.	SCCRC, local units of government
15 (A)	Install and maintain storm water management structures	Urban runoff, roadways	X							**Sediment trapping devices**: Design, legal and contingencies are typically 25%-30% of construction costs. Construction—Mobilization: 3%-5% of construction costs; Site Preparation: $5.00-$10.00/cubic yard for basin and sediment excavation; $1.30/lin. foot for silt fence $60.00/each on average for stone or gravel at inlet; Maintenance: 3%-5% of construction costs. **Catch basin inserts**: $800-$1,000 per insert **Media/sand and organic filters**: Construction:$3.00-$6.00/cubic foot for media filter; $5.30/cubic foot for vegetated filter; Maintenance: $0.36-$0.72/cubic foot/year. Typical filter size is 10 cubic feet per impervious acre.	Local units of government

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16 (A)	Install and maintain detention/retention systems	Urban runoff, roadways	X	X						**Wet detention ponds**: Design: $7,000-$14,000/acre (permitting, design and contingency). Construction: $26,000-$55,000/acre (excluding land purchase—land purchase may be negligible if constructed as part of new development, if incorporated into existing parklands or donated). Maintenance: $600-$1,100/acre/year. **Wetland restoration**: $500-$3,000/acre depending on scale.	Local units of government

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17 (A)	Install and maintain storm water infiltration practices	Urban runoff, roadways	X	X						**Retention/infiltration basins**: Design, legal and contingencies are typically 25%-30% of construction costs. Construction—Mobilization: 3%-5% of construction costs; Site Preparation: $3,000-$5,000/acre for clearing; $5.50-$8.00/cubic yard for earth excavation; $3,000-$7,000/each for inlet/outlet structures; Maintenance: 3%-5% of construction costs. **Grassed swales**: Construction: $0.30/square foot. Maintenance: $0.02/square foot. **Vegetated roofs**: $15-25/sq.ft. **Rain gardens**: $3-4/sq.ft. **Pervious pavement**: $2.00-$3.00/square foot as opposed to $0.50-$1.00/square foot for traditional pavement. **Rain barrels**: $50-150 each **Dry wells**: $900-$1,400 each	SEMCOG, MDEQ
18 (S, N)	Stabilize eroding road and bridge surfaces	Roadways, urban runoff	X							Costs vary greatly based on design and construction required at each site. Costs for bridge retrofitting and grading, paving, and/or re-paving of roads and bridges will depend on the size and condition of the existing infrastructure. Road and bridge re-surfacing or re-paving costs an average of $5.00 per square foot.	SCCRC

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19 (A)	Install and maintain native landscaping	Urban runoff, roadways, streambank erosion	X							Native landscaping costs are similar to conventional costs: from $2,000-4,000/acre. Information booklets are available through the MDEQ and Center for Watershed Protection free of charge.	Center for Watershed Protection, MDEQ, Conservation Districts
20 (A)	Install and maintain riparian buffers	Streambank erosion	X		X				X	$1.25/sq. foot for installation. Maintenance costs for invasive species removal, undergrowth removal or sediment removal are minimal. There is little to no cost to preserve established native vegetation.	NRCS, Conservation Districts, MDEQ
21 (A)	Implement invasive species control program	Streambank erosion, urban runoff	X		X					Coordination with SEMCOG to create a subwatershed invasive species committee would require staff or volunteer time. Creating a GIS mapping program could cost $25,000-$50,000. A sustainable program to map and manage invasive species would require annual funding.	SEMCOG, MDNR, Conservation Districts
22 (N, S)	Perform curb/street sweeping	Roadways, urban runoff	X							$65/curb mile (excluding disposal costs). $150/curb mile for contractor (including disposal costs).	SCCRC
23 (N, P, S)	Perform retrofitting of stormwater management facilities	Urban runoff	X						X	Costs of retrofitting, including resizing, replanting with native vegetation, establishing buffer strips. See costs above.	Local units of government
24 (A)	Implement catch basin cleaning program	Urban runoff	X							Inspection: $3/catch basin, 10 catch basins per hour; Cleaning: $10-$40/catch basin (including disposal in an approved landfill).	Local units of government

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25 (N, S)	Perform storm sewer system maintenance and drain cleaning	Urban runoff	X							Sewer/drain jet cleaning: $79/hour Sewer/drain vactor cleaning: $96/hour Disposal costs will be reduced if a dewatering/drying area is available. Disposal costs for dry materials range from $10-20/cubic yard. Vactor trucks range in cost from $175,000-$200,000. Contracted sewer cleaning rates range from $125-$175 per hour and may or may not include disposal. Approximately 1,000-1,500 feet/day can be cleaned using jet cleaning or vactor equipment. Other sources indicate sewer cleaning to be $1.00-$2.00/foot.	Local units of government
26 (S, TP)	Manage public facilities	Urban runoff	X							Costs of $100/hour associated with development of management plans pertaining to containment of stored chemicals/possible pollutants and/or stockpiles of sand/gravel/salt. Implementation of plan would be included in daily management activities of current staff.	Local units of government
27 (N, P)	Maintain sanitary sewer infrastructure	SSOs	X						X	Costs incurred to implement a sewer management program would include labor, equipment, and materials and services.	Local units of government
4. Managerial Actions: Illicit Discharge Elimination											
28 (A)	Implement employee training programs	Urban runoff	X							Free trainings about pollution prevention and good housekeeping procedures provided at a county-level through SEMCOG.	Local units of government, SEMCOG

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29 (N, P)	Sanitary system planning – manage lagoon systems and wastewater treatment plants	Sewage lagoons/package treatment plants	X						X	Costs would be incurred for staff time allotted for permit reviews. Costs would also be associated with program development for the inspection and enforcement of violations of discharge permits from these facilities. Staff time would need to be allotted for this; if consultants were used for the program, costs would be at least $100/hour.	Local units of government
30 (N, P)	Implement Illicit Discharge Elimination Plan (IDEP)	Urban runoff	X						X	Costs associated with field surveys of open channels and closed systems to detect illicit connections/discharges: $2,000/lineal mile of open channel; $2,800/lineal mile of closed sewer (visual inspection, not TV); $660/individual building; $1-$2/lineal foot for TV inspection.	Local units of government
31 (N, P, TP)	Eliminate sanitary sewer overflow events	SSOs	X						X	Costs vary with community. Average of $700 per collection system.	Local units of government
32 (N, P)	Implement St. Clair County public beach water quality monitoring program	Agricultural runoff, urban runoff				X		X	X	No cost: program already exists. Would help identify illicit discharges to prevent them in the future.	SCCHD
5. Managerial Actions: Public Education, Outreach, and Participation											
33 (A)	Distribute outreach materials on watershed awareness, stormwater management, floodplain	Urban runoff, animal waste				X	X		X	Costs associated with developing or revising and printing education materials and public outreach information; would need to create flyers, newsletters, brochures, etc. Brochures through SEMCOG cost	MDEQ, SEMCOG, SCCHD, local units of government

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	management, and large wood management									approximately $0.10 each and posters cost $0.50 each.	
34 (A)	Promote the "Seven Simple Steps to Clean Water" campaign materials	Urban runoff, animal waste	X			X			X	Brochures: $0.01-$0.10/each; Posters: $0.50/each; Tip Cards: $0.01-$0.10/each; Display Panel: $43.75/each; Giveaways: $0.10-$1.20/each	SEMCOG
35 (N)	Encourage reduced fertilizer, herbicide, pesticide use	Urban runoff	X			X				No cost: could include in other outreach measures.	NRCS, MSU Extension
36 (TP)	Encourage use of household hazardous waste disposal	Urban runoff				X				No cost: offered free of charge through the SCC's household hazardous waste collection centers.	SCCHD
37 (A)	Install watershed signage	Urban runoff				X				Cost of sign production; some municipalities can do in-house. The SCCRC will install signs for Cities/Townships for a standard fee if sign falls within right-of-way. Costs range from $150 to $500.	SCCRC
38 (A)	Promote the county's Adopt-A-Stream and Stream Leaders programs	n/a			X	X				No cost: promote existing program through St. Clair County MSU-Extension and Friends of the St. Clair River.	MSU Extension, Friends of the St. Clair River
39 (A)	Promote Adopt-A-County Road program	Urban runoff				X				No cost: promote existing program though St. Clair County Road Commission	SCCRC
40 (N)	Information on soil testing program	Landscaped spaces	X			X				Little to no cost for municipalities/agencies to advertise/promote. Homeowner/residential test: $15 Farm/large acreage test: $15	MSU Extension, Conservation Districts

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										Organic matter test: $6 Greenhouse test: $25	
41 (A)	Encourage participation in citizen planner program	n/a				X				$295 per person for seven core sessions through MSU-Extension; group discounts available for four or more registrants of same municipality.	MSU Extension
42 (N, P)	Education on failing on-site septic disposal systems	Failing septic systems	X			X			X	No cost: The SCCHD offers brochures on OSDS maintenance and operation. The local MSU-Extension has a Home*A*Syst booklet free of charge that helps to educate on the proper operation and maintenance of OSDS.	SSCHD, MSU Extension
43 (TDS)	Education on reduced road salt and alternative deicers	Urban runoff	X			X				No cost: provide educational materials with other outreach materials	SEMCOG, SCCRC
44 (N)	Encourage golf course nutrient management	Landscaped spaces	X			X				Little to no cost to municipalities through information on websites or by providing brochures available through agencies such as the United States Golf Association and local MSU-Extension office.	MSU Extension
45 (A)	Encourage the use of conservation easements	n/a			X					Costs largely falls on private landowners for legal counsel, appraisal, etc. Partner with local non-profit land trusts or land conservancies (e.g. Blue Water Land Fund, Southeast Michigan Land Conservancy). Professional printing costs average $10 per 50 flyers or $15 per 25 brochures.	Southeast Michigan Land Conservancy, Blue Water Land Fund

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46 (A)	Perform storm drain/catch basin marking	Urban runoff	X			X				Little to no cost for volunteers to utilize storm drain stencils; catch basin markers that have been found to last longer can be purchased for $0.50-$2.00/each and placed by volunteer groups such as boy scouts, students, neighborhood associations, etc.	SSCHD
47 (A)	Seek input from public on development of water quality ordinances	n/a				X				No cost: publicize events through local newspapers and websites, events, and other outreach existing outreach materials.	WAG
48 (A)	Seek participation from public at WAG meetings	n/a				X				No cost: publicize WAG meetings through local newspapers and websites, events and other existing outreach materials.	WAG
49 (A)	Promote the county's 24-hour water quality pollution reporting hotline	Urban runoff	X			X				Hotline already established through the SCCHD. Promotion may consist of obtaining posters from the SCCHD or including information in other outreach materials or on websites. Posters cost an average of $0.50.	SCCHD
50 (A)	Seek participation from the public for St. Clair County's Earth Fair and River Day events	Urban runoff				X				No cost beyond staff time if advertise events through existing means (newsletters, website, posters, newspaper, etc.). Actual events cost from $1,500-$2,000 each.	SSCHD
51 (A)	Seek participation from the public in river clean-up events	Improper disposal of wastes				X				Volunteer events – minimal costs beyond staff time if advertise events through existing means (newsletters, website, posters, newspaper, etc.). Staff time and material costs range	SSCHD, Friends of the St. Clair River

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										from $50 to $100 per hour. Actual events cost from $250-$500 each.	
6. Managerial Actions: Ordinances & Policies											
52 (A)	Develop aquatic (riparian) buffer ordinance	Agricultural runoff, urban runoff, streambank erosion	X	X	X				X	$150/hour for development and/or review. 160-320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely.	Local units of government
53 (A)	Develop floodplain management ordinance	Agricultural runoff, urban runoff, streambank erosion		X	X			X		$150/hour for development and/or review. 160-320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely by community.	Local units of government
54 (A)	Implement wetland protection ordinance	Agricultural runoff, urban runoff		X	X			X		$150/hour for development and/or review. 160-320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity)	Local units of government

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55 (A)	Implement woodlands/tree protection ordinance	Agricultural runoff, urban runoff			X			X		$150/hour for development and/or review. 160-320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely by community.	Local units of government
56 (N, P, S)	Develop agricultural buffer zoning ordinance	Agricultural runoff			X				X	320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely by community.	Local units of government
57 (A)	Develop rural clustering ordinance	Urban runoff	X		X			X		320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely by community.	Local units of government
58 (A)	Develop mixed-use zoning ordinance	Urban runoff	X		X			X		320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting	Local units of government

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										(depending on size/volume/quantity). Publishing and distribution costs can vary widely by community.	
59 (S)	Develop private road ordinance	Roadways	X							320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity). Publishing and distribution costs can vary widely by community.	Local units of government
60 (TP)	Develop illegal dumping ordinance	Improper disposal of waste	X		X					$150/hour for development and/or review. 160-320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely by community.	Local units of government
61 (N, P)	Develop illicit discharge elimination ordinance	Illicit discharges			X				X	$150/hour for development and/or review. 160-320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely by community.	Local units of government

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62 (N, P)	Support county-wide onsite septic disposal system ordinance	Failing septic systems							X	$150/hour for development and/or review. 160-320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely by community.	Local units of government
63 (S, TP)	Develop post-construction stormwater management ordinance	Urban runoff	X							$150/hour for development and/or review. 160-320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely by community.	Local units of government
64 (N, S)	Implement and enforce soil erosion and sedimentation control ordinance (SESC) and the county SESC program	Construction, urban runoff	X		X					Existing ordinance: little to no cost for communities; permit program already in place.	SSCHD, MCPWO, LCHD
65 (A)	Encourage participation in purchase of development rights programs	n/a			X					State program, PDR program already exists in St. Clair County—no cost to municipalities.	SCC, local units of government

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66 (A)	Encourage participation in Farmland Preservation Program	n/a			X					State program—no cost to municipalities.	SCC, local units of government
7. Managerial Actions: Studies and Plans											
67 (A)	Update master plan to incorporate WMP goals	All	X							$150/hour for development and/or review. 160-320 hours for this task (may vary widely).	Local units of government
68 (A)	Perform high-quality natural features inventories	n/a			X			X		$100/hour if using a consultant for surveys. 160-320 hours for this task (may vary widely). Identify priority areas for natural features inventories. Costs vary based on size and scope of surveys.	MNFI , MDNR, MDEQ
69 (A)	Incorporate natural features inventory into Master Plan	n/a			X					$150/hour for development and/or review. 160-320 hours for this task (may vary widely).	Local units of government
70 (A)	Develop Resource Protection Overlay District Standards	n/a			X					$150/hour for development and/or review. 160-320 hours for this task (may vary widely). $200/hour for legal review. 80-200 hours for each ordinance (may vary widely). $500/public meeting (depending on size/volume/quantity) Publishing and distribution costs can vary widely by community.	Local units of government
71 (A)	Develop/update Natural Areas Plan	n/a			X			X		$150/hour for development and/or review. 160-320 hours to update or develop plans (may vary widely).	Local units of government
72 (A)	Identify areas for	n/a						X		$150/hour for development and/or	Local units of

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	recreation enhancement									review. 160-320 hours to update or develop plans (may vary widely).	government
73 (A)	Develop/update recreation plans	n/a						X		$150/hour for development and/or review. 160-320 hours to update or develop plans (may vary widely).	Local units of government
74 (A)	Implement Greenway Corridor Vision Plans	n/a						X		$150/hour for development and/or review. 160-320 hours to develop greenway plans (may vary widely).	Local units of government
75 (A)	Implement Blueways Trail Vision Plans	n/a						X		Little to no cost to support existing Belle River Route. Costs to assess existing public access points and implement the Master Plan will be $150 hour for assessment.	Local units of government
8. Watershed Plan Implementation											
76 (A)	Implement financial solutions	n/a								Research should be conducted on an on-going basis. Costs incurred would be for staff to research funding options, or if the services were needed for a consultant, estimated costs would be at least $100/hour.	Local units of government, WAG
77 (A)	Provide sufficient enforcement capacity	n/a								Costs would be associated with staff time to perform enforcement of ordinances and site plan reviews. Staff costs range from $50-$100/hour.	Local units of government
78 (A)	Implement institutional framework for watershed-wide actions	n/a								Costs would be associated with continued WAG meetings. Consultant fees would be at least $100/hour to aid with implementation efforts.	Local units of government, WAG