4. Chapter 4 - Defining the Scope of the Kawkawlin Watershed Plan

4.1 *Goals for the Kawkawlin River Watershed*

The stakeholders group and the subcommittees have used reports generated by the MDEQ and various consultants along with past studies and the results of the inventory of the Kawkawlin Watershed to determine goals for the watershed or to strengthen the goals that have been presented through the years. The goals are related to each of the impaired or threatened uses of the Kawkawlin River and are based on the reduction or elimination of pollutants that are mostly nonpoint source (NPS) in origin. The goals have been developed on a watershed wide scheme and prioritized by the members of the various subcommittees. The overall goal is for the restoration or protection of the designated uses of the Kawkawlin River. The goals are as follows:

- Provide and improve land / water recreational opportunities and public access to the river
- Determine causes and correction of sediment loading in the river
- Protect and improve habitat and conditions for other aquatic life and wildlife along the river
- Provide for flood management
- Protect and improve the warmwater fisheries and conditions for the river system
- Identify and protect quality natural features including forested areas, floodplains, wetlands, riparian buffers and contiguous greenway buffers
- Preserve rural character (farmland and open spaces) of the watershed
- Maintain and/or increase the aesthetics of the water resources for human appreciation and use

4.2 *Objectives for the Kawkawlin River Watershed Goals*

Each goal will be met by a series of short-term, measurable objectives that will be based on addressing the causes identified as the sources of pollution either direct or NPS. Ultimately, the attainment of the goals and objectives of the Kawkawlin Watershed Management Plan will be accomplished through the process of adaptive management. As changes in the watershed occur

over time and programs and BMPs are assessed for their effectiveness, the strategies to attain the watershed goals and objectives are likely to change and will need to be periodically reassessed and revised. Stakeholders and subcommittee members have had an opportunity to review the objectives. In Table 4.1, on the following pages, the pollutants were prioritized based on their impairment and the ability to reduce the pollutant to either a recommended level or a desirable level based on the knowledge available at this time. The pollutants that are known (K) or possible (P) are labeled throughout the table. As the table is reviewed, it will be noted that prioritization is provided three times in order to develop a better ranking of the pollutant or degree to which the pollutant is felt to impact the watershed. The overall affect of the pollutant and how easily the pollutant moved from its source into the river was considered during the ranking process.

Kawkawlin River Watershed Property Owners Association – White Paper

The KRWPOA has issued a white paper to communicate its position with regard to this watershed management plan and what its members feel are major concerns. Their position paper is in Appendix I of this document and will serve to support the findings and concerns of this plan. In summary, their document would like the plan to consider the following issues:

- Sedimentation abatement to address many issues
- Resolution of the *E.coli* issue from all perspectives
- Habitat restoration for the fisheries, waterfowl and flood control
- Flood control through sedimentation abatement and wetland restoration
- Insure the "sustainability" of the restoration through the use of sediment traps, filter strips and other methods
- Provide safe access for boating, fishing and other recreation

The KRWPOA has demonstrated that public access and water quality is an important component of their mission.

Table 4.1 – Goals and Objectives

Priority	Designated Uses	Goals	Priority	Pollutants and Impairments to Designated Uses (P) = Possible (K) = Known	Priority	Sources (P) = Possible (K) = Known	Causes	Objectives
1	**Partial and Total Body Contact Recreation**	Restore and protect surface water for partial and total body contact	1	Pathogens (*E. coli*) (K^1)	3	Livestock (K^2)	Unlimited livestock access; lack of manure storage; runoff from land near drain or river	Exclude livestock from stream; follow manure application rates; work topical manure application into soil; construct waste storage systems; education of hobby farms with domestic animals.
					1	Faulty onsite treatment systems (K^1)	Leaking, poorly maintained, failing, and over capacity septic systems	Determine location of failing systems; Develop a program to identify and replace failing systems; Identify districts where sanitary main extensions are possible; Encourage proper installation and maintenance of septic systems; educate public concerning septic treatment system maintenance
					4	Municipal wastewater (P)	Poorly maintained, leaking sanitary sewer systems	Repair/replace municipal wastewater system; minimize discharges and sanitary sewer overflows
					2	Storm Water Drainage Systems (P^3)	Anthropomorphic and natural sources	Continues IDEP program implementation in municipal areas; Perform IDEP screening during drain maintenance activities as "sewage" can be controlled in PA 40 of 1956, Michigan Drain Code (Chapter 18, 280.423); education of the public; use of vegetation. Filter and store runoff by maintaining natural landscape processes.
					5	Wildlife (P) examples; water fowl, deer, raccoons, muskrats, other mammals	Overpopulation in open areas	Control water fowl and other mammal populations
			2	Nutrients (K^1) (Algal Blooms)	2	Urbanized area practices (K)	Over-fertilization of lawns and vegetated properties; lack of riparian buffer; faulty onsite treatment systems (K)	Establish vegetated filter strips or other riparian buffer; educate the public on proper disposal of yard waste; educate public on lawn care practices and fertilizing; encourage proper installation and maintenance of onsite treatment systems; Continue implementation of a phosphorus ban on commercial lawn fertilizers; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for storm water
					1	Agricultural practices (K)	Over-fertilization of fields; lack of riparian buffer; livestock in streams	Identify livestock operations on drains/tribs; establish filter strips or other riparian buffer; increase canopy cover on drains/tribs; encourage reduced tillage practices; exclude livestock from drains/tribs; Determine if wildlife is source of problems in specific areas; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for agriculture. Education of hobby farms on manure management for domestic animals (use of program developed in Huron County)
					3	Sediment Deposition areas (P)	Phosphorus and other nutrient recycling from sediment during anoxic conditions	Identify sediment deposition with high concentrations of nutrients; Research how to remove excessive sediment; implement actions to remove excessive nutrients; Filter and store runoff by maintaining natural landscape processes to address nutrient loads.

Table 4.1 – Goals and Objectives (cont.)

Priority	Designated Uses	Goals	Priority	Pollutants and Impairments to Designated Uses	Priority	Sources	Causes	Objectives
2	**Other Indigenous Aquatic Life and Wildlife**	Restore and protect surface water for indigenous aquatic life and other wildlife	1	Loss of Habitat (K^9) (Wetlands and Fragmentation)	1	Creation of private ag drains / county drain maintenance (P)	Channelization to drain wetlands	Net gain of wetland acres; utilization of buffers
					2	Agricultural practices (K)	Wetlands drained for agriculture	Net gain of wetland acres; utilization of buffers; education of property owners
					3	Urbanized area expansion (K)	Wetlands filled for development	Net gain of wetland acres; utilization of buffers; education of property owners
			2	Sediment (Turbidity) (K^5)	1	Streambank erosion (K)	Fluctuating hydrology	Stabilize drain flows to moderate hydrology; reduce suspended solids; prevent sediments from being transported out of drains into river, use of large manmade wetlands with a meandering channel at terminal end of drains as they outlet into river; maintain the floodplain.
					3	Urbanized area sheet and rill erosion when soils are exposed or sediment in runoff from impervious surfaces (K)	Urbanized sheet and rill erosion, exposed soils with no BMPs in place	Maintain pervious surfaces and encourage infiltration. Filter and store runoff by maintaining natural landscape processes; Reduce public costs associated with runoff treatment, flood protection and air quality.
					5	Channelization (P) NOTE: this does not refer to dredging a new channel, it refers to former practices	Straightening of waterways; channel improvements	Reduce suspended solids; implement low flow channel and vegetated shelves. Use recent aerial photos to determine areas where flow impediments can create stream restoration and use "green" channel restoration methods to correct.
					6	Livestock (K)	Unrestricted livestock access	Exclude livestock from drains/tribs; education of domestic animal owners
					4	Construction and development (K)	Lack of SESC practices and enforcement	Reduce suspended solids from construction sites; Filter and store runoff by maintaining natural landscape processes.
					2	Agricultural sheet, rill, and gully erosion (K)	Conventional tillage; plowing up to edge of drains or tribs at surface outlets, surface drainage of fields, lack of vegetated buffers, lack of flexibility of buffer programs	Encourage cover crops and reduced tillage; Implement programs to promote grassed waterways, variable width buffers, windbreaks; Education of hobby farm owners; Assist Farm Bureau with outreach programs
			3	Nutrients (K)	1	Urbanized area practices	Over-fertilization of lawns, parks and other vegetated properties; lack of riparian buffer; faulty onsite treatment systems	Continue implementation of a phosphorus ban on commercial lawn fertilizers; Establish filter strips or other riparian buffer; educate the public on proper disposal of yard waste; encourage proper installation and maintenance of onsite treatment systems; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for storm water. Filter and store runoff by maintaining natural landscape processes to help removal of nutrients.
					2	Agricultural practices	Over-fertilization of fields; lack of riparian buffer; livestock in streams	Identify livestock operations adjacent to rivers; establish filter strips or other riparian buffer; increase canopy cover; reduce tillage; exclude livestock from stream; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for agriculture
			4	Pesticides & Herbicides (P)	1	Urbanized area practices	Improper pesticide/herbicide application and no calibration; impervious surface runoff from improper application	Installing riparian buffers such as filter strips; grassed waterways; Education on proper use; Assure applicators are properly trained. Filter and store runoff by maintaining natural landscape processes.
					2	Agricultural practices	Improper pesticide/herbicide application and calibration; leaching; runoff	Increase of farms using Integrated Pest / weed Management; installing riparian buffers such as filter strips; grassed waterways; Education of hobby farm owners; Use of professional ag applicators from Co-ops and elevators

Table 4.1 – Goals and Objectives (cont.)

Priority	Designated Uses	Goals	Priority	Pollutants and Impairments to Designated Uses	Priority	Sources	Causes	Objectives
3	Navigation	Restore and protect surface water for navigation	3	Obstruction (K[6])	2	Log jams/snags in upper reach of South and North Branch (see maps for locations)	High flow events; Ice jams and blockages that move or create debris; streambank erosion	Manage woody debris; stabilize streambanks; Continued managed clean up of Main Branch after major events (ice or water) or annual clean-up
					1	Petroleum Pipe river-crossings	Old petroleum pipeline crossings over the river;	Identify sites, Identify owners of pipelines. Remove pipe crossings that are in navigable waters to prevent hydrocarbon spills.
					3	Lack of maintenance (sedimentation)	No designated entities responsible for removing obstructions and maintaining navigable waters; depositional areas in the river create nutrient deposits and blocking / obstructing navigation and recreational use.	Continue to manage debris; continue volunteer stream clean-up activities Feasibility study to identify sediment deposits and removal costs to restore recreational opportunities
					4	Dumping	General misunderstanding of how humans negatively impact the watershed by discarding trash; lack of signs or threat of enforcement	Hold an Annual River Clean-Up Day to remove trash from the river/streams/ditches; increase visibility of "No Dumping" signs; Education of county on detrimental effects of dumping in drains, tribs or river.
			2	Low Base Flow (K[4]) Altered Hydrology	1	Modified Great Lake's hydrology; drain modifications; naturally occurring	Re-directed stream flow; irrigation; low precipitation or (high / low) lake levels	Conduct hydrologic assessment prior to modifying drain hydrology or re-directing stream flow; Determine if a project can increase baseflow.
			1	Sediment (K[5])	6	Wake action in Main Branch (K)	Fluctuating hydrology, wake action caused by boat traffic and naturally occurring	Minimal speed for boat traffic to reduce re-suspending solids and stirring up nutrients
					1	Streambank erosion	Fluctuating hydrology (k)	Stabilize stream flows to moderate hydrology, reduce suspended solids and maintain the floodplain; use of large manmade wetlands with a meandering channel at terminal end of drains as they outlet into river
					2	Agricultural sheet, gully and rill erosion	Conventional tillage, plowing up to edge of stream (s)	Encourage cover crops and reduced tillage, as well as grassed waterways and windbreaks
					5	Channelization or stream restoration (P)	Straightening of waterways; channel improvements	Reduce suspended solids; implement low flow channel and vegetated shelves
					4	Livestock (K)	Unrestricted livestock access	Exclude livestock from drains/tribs; education of domestic animal owners
					3	Construction and development (K)	Lack of SESC practices and enforcement actions	Reduce suspended solids from construction sites; Utilize appropriate BMPs, Develop a civil infraction enforcement ability for SESC compliance
			4	Trash & Debris (K[7])	1	Dumping	General misunderstanding of how humans negatively impact the watershed by discarding trash; lack of signs or threat of enforcement	Hold an Annual River Clean-Up Day to remove trash from the rivers/streams/ditches; increase visibility of "No Dumping" signs; Education of county on detrimental effects of dumping in drains, tribs or river.
			5	Access Sites (P) Channel blockage (K[6])	1	Limited places to enter the upper reaches of the river	Much of the area is private property; not many access sites to the river	MDEQ develop access sites on conservation easements; connect a water trail to the Mouth of Kawkawlin; Implement Visions of Green as a connection
					2	Sediment accumulation in channel, woody debris blockage	Sediment bedload from upper reaches or trees falling into river creating log jams impeding navigation of the channel	Study and implementation of a plan to identify sediment deposition areas and log jams that impede the navigable channel of the river. Removal of the sediment. Removal or relocation of the woody debris blocking the navigable channel.

Table 4.1 – Goals and Objectives (cont.)

Priority	Designated Uses	Goals	Priority	Pollutants and Impairments to Designated Uses	Priority	Sources	Causes	Objectives
4	**Warmwater Fishery**	Restore and protect surface water as warmwater fishery	1	Nutrients (K) (Low Dissolved Oxygen)	1	Urbanized area practices	Over-fertilization of lawns, parks and vegetated properties; lack of riparian buffer; faulty onsite treatment systems	Establish filter strips or other riparian buffer and promote conservation easements; educate the public on proper disposal of yard waste and application of fertilizers; encourage proper installation and maintenance of onsite treatment systems; implement sanitary sewer projects where population can support action.
					2	Agricultural practices	Over-fertilization of fields; lack of riparian buffer; livestock in streams	Establish filter strips or other riparian buffer; increase canopy cover; reduce tillage; install livestock exclusion fencing; education of hobby farm owners; support Farm Bureau programs; develop efficient incentive programs for compliance strategies when areas show non-attainment
			2	Loss of Habitat (K^8) (Aquatic habitat)	3	Creation of new drains or implementing drain maintenance	Excavation of the drain channel and bank for drain maintenance removes stable natural habitat	If excavating new drain or maintaining and existing channel establish low flow channels and shelves when applicable; establish filter strips; build and restore banks to reduce sedimentation, use of large manmade wetlands with a meandering channel at terminal end of drains as they outlet into river; use sediment traps and other MACDC approved BMPs.
					1	Urbanized area expansion	Influx of people building next to surface waterbodies and drainage systems and removing riparian canopy and undergrowth.	Install filter strips; establish forest or other appropriate vegetated buffers to increase shade canopy; education on riparian responsibilities and effects of practices on watercourses. Filter and store runoff by maintaining natural landscape processes. Provide a sense of place by connecting people to the nature, history, and culture of the watershed.
					2	Agricultural practices	Plowing up to edge of drains or tribs at surface outlets, surface drainage of fields, lack of vegetated buffers, lack of flexibility of buffer programs	Implement innovative buffer programs with incentives and concentration on surface outlets; Implement Farm Bureau programs; Education of hobby and non-attainment farm owners
			3	Removal/Lack of Food Sources (P)	1	Sediment loading	Erosion	Stabilize streambanks to reduce sedimentation; establish filter strips and vegetated surface outlets, improve programs for vegetated channels for storm water conveyance; use of large manmade wetlands with a meandering channel at terminal end of drains as they outlet into river
					2	Nutrients	Over-fertilization of urban green areas or ag fields; lack of vegetated buffer	Establish filter strips establish forest or other appropriate vegetated buffers to increase shade canopy; education on riparian responsibilities and effects of practices on watercourses; implement surface outlet BMPs to decrease sediment loading in drains; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for agriculture and storm water
					3	Pesticide loading	Improper pesticide application and calibration; leaching; runoff	Increase of farms using Integrated Pest Management or using ag applicators from local co-op or elevators; installing riparian buffers such as filter strips; grassed waterways; Education of urbanized area residents on proper applications.
			4	Invasive Species vegetative (k)	1	Phragmites, Canary grass, purple loosestrife, Eurasian milfoil, coontail, etc.	Introduced from various sources on the Great Lakes shoreline and have moved up the coastal regions of Lake Huron; have various transmission vectors but are establishing themselves	Minimize the spread of these species; education of landowners on eradication. Develop and implement eradication programs.
			5	Low Base Flow (K^4) (Temperature)	1	Altered or Modified hydrology, drain modifications, naturally occurring	Re-directed stream flow; irrigation; low precipitation or low lake levels; lack of vegetative cover	Conduct hydrologic assessment prior to modifying drain hydrology or re-directing stream flow; increase tree canopy. Encourage projects that improve hydrology in the watershed. Use recent aerial photos to determine where blockages or split flow or hydraulic inhibitions exist and intervene with natural methods to correct flow problems.

1) Bay County Health Department and KRWPOA studies and monitoring
2) Agricultural survey in the Kawkawlin Watershed 2009.
3) Bay County IDEP report
4) USGS Report 98-579
5) Watershed Assessment of the Lower Western Coastal Basin of Saginaw Bay, SB RC&D, 1998
6) Low Level Flight Aerial Photos, April 2010
7) Anecdotal information from KRWPOA and inspections
8) Saginaw Bay RAP
9) MDEQ Wetland Landscape Level Study, 2010

4.3 *Pollutant Causes and Sources to Be Restricted*

The causes and sources of the impairments or pollutants associated to the designated uses are acknowledged in Table 4.1. The prioritization by the stakeholders group and subcommittees of the pollutant sources needing to be constrained is listed in the table. It is based on the inventory as presented in Chapter 3 and applying that information generically across the other sub-watersheds. This was done because of similar land use features and homogeneous nature of the mid and lower reaches of the watershed. The high priority sub-watersheds have been identified where subsequent actions need to be concentrated for future results.

4.4 *Final Water Quality Summary*

The water quality summary describes the relationship between the current goals and objectives related to the designated uses and displays the pollutants, sources and causes as they are prioritized by the stakeholders group and subcommittees.

The stakeholders as noted in Table 4.1 prioritized *E.coli* (pathogens) as a high priority impairment to the Kawkawlin River. This river is listed on the MDEQ's non-attainment list as being impaired for *E.coli.* A TMDL study is scheduled for 2017. This is one of the three critical items to address in this plan. They place a high value on being able to use the river as a recreational resource in the urbanized area. To this end they wish to have the designated uses of full and partial body contact in the river restored as soon as possible. Additionally, the stakeholders wish to see the amount of beach closures at the mouth of the Kawkawlin River and the boat launch area reduced to zero closures.

It must be noted also that there is a TMDL that was established in 2007 for Low Dissolved Oxygen for the North Branch Kawkawlin River. The reach affected is from the confluence with the Main Branch of the Kawkawlin River (T14N-R4E, Section 2) to the crossing at 8 Mile Road (T15N-R4E, Section 18). This is listed on the 303(d) list as KAWKAWLIN RIVER, N.Br.,

WBID# 210501G, Bay County, HUC: 4080102, with a reach length of 13 miles. Addressing the low DO TMDL will help with the desire to restore the warmwater fishery for the watershed and to eliminate fish kills related to low DO in the water column. This impairment will be discussed in more detail later in this chapter.

As noted in the inventory of various spots on the lower reaches of the Kawkawlin, the macroinvertebrate community is generally poor to fair in most cases and rarely acceptable. This has been reported in the MDEQ habitat studies and in the rapid assessment performed in late 2008 for this watershed management plan. The stream habitat since 2000 has been rated as severely to moderately impaired in the lower reaches, and only slightly impaired in the upper reaches. The stakeholders have a strong desire to restore fish habitat. With a restoration of the benthic community in the watershed the fish habitat will be restored by access to a critical link in the food chain.

The hydrology and land use (mostly agriculture) lends itself to runoff conditions that are not conducive to a healthy watershed.

Hydrologic impacts in the watershed have been documented in a study by the USGS related to low flow conditions in the watershed. This has been exacerbated by the loss of wetlands throughout the watershed. Without the restoration and preservation of wetland storage areas in the watershed, there will be less contributions to base flow through the drier times the season. Improved base flow or stream restoration in some reaches may also improve the low DO impairment. Another aspect of addressing the low DO will be improvement in the benthic community.

The farmers that are good stewards of their lands are outnumbered by those not instituting soil saving practices. There are elevated levels of phosphorus and total suspended solids (TSS). The watershed inventory did identify areas of sedimentation in the drains and in the river itself, eroding streambanks causing tree debris in many stretches, nutrient sources from agricultural fields and failing on-site treatment systems. These sediments that are in the riverine system as a bedload are a constant source of nutrients into the water column especially during anoxic times.

Additionally, the excess sediments in the lower reaches of the three branches are a source of navigation impairments in the river's watershed. Removal of these sediments can enhance and improve navigation and restore habitat for fish and the benthic community in many areas of the river, getting back to original gravel beds in some reaches.

4.5 *Impairments to Water Quality*

Impairment – Pathogens (*E.coli*)

Description:

Escherichia coli (*E.coli*) has been an ongoing and increasing problem in the Kawkawlin Watershed. The river is on the State of Michigan's 303(d) list for Non-attainment. The KRWPOA and the Bay County Health Department (BCHD) has summarized and documented the problem for many years by sampling at many locations. The sampling results have been above water quality standards at many times over the years and have forced beach closures and water contact warnings. Because the numbers of pathogenic organisms present in wastes and polluted waters are few and difficult to isolate and identify, the coliform organism, which is more numerous and easily tested for, is used as an indicator organism.

Sources:

E. coli is found in the digestive systems of warm-blooded animals. The detection of *E.coli* in the water column can often indicate there may be a presence of other enteric forms of bacillus in the water which are harmful to humans and can cause waterborne disease such as diarrhea, vomiting, fever, jaundice and dysentery. Most of these pathogens cannot live for extended periods of time outside of the host organism, indicating that the source may be close by. Sources include waterfowl; domestic animals such as horses, dogs, cattle and cats; failing on-site treatment systems and wildlife, both dead and alive.

Causes:

Storm water runoff from areas where domestic livestock is located in proximity to the river or have access to the river can allow the pathogens a vector to pollute. The inventory of the agricultural areas did not indicate large feeding operations; however, a significant amount of "hobby" farms were discovered to be in proximity to drains and the river. Research indicates

that just one horse can excrete 9.1 tons of manure per year with a loading of 0.08 lbs of Phosphorus and 0.36 lbs of Nitrogen per day or 29.2 lbs/yr – P and 131.4 lbs/ yr – N. (source US Department of Agriculture, 1990 and University of Minnesota-St Paul, 1997)

As indicated in the record inventory completed by the BCHD, the median age of on-site treatment systems is 36 years. This is well beyond the useful life of such a treatment system; so failing, older on-site treatment systems are allowing pathogens to enter surface water and groundwater in areas where the soils are lighter and permeable. These pathogens can attach themselves to sediments and enter the river through the sediment transport process also.

Sanitary sewer maintenance can also be a cause for pathogens to enter into surface water and groundwater tables. The existing municipal and private wastewater systems that are on the river can be a source of the pathogens if treatment protocols are not followed well and if maintenance issues (leakage or overflow) cause the systems to fail in their proper operation.

Wildlife cannot be overlooked as a source; the waterfowl and deer populations have increased dramatically over the past two decades. The numbers of animals, especially waterfowl that can concentrate in areas almost year-round now, can be a substantial source of pathogens. Along with muskrat, raccoons, skunks and other "critters," some of these species have begun to use storm sewers as shelter and dens and thus become a source of pathogens into surface water.

Priorities:

Pathogens can be the vector of many waterborne illnesses in humans and animals. Consequently, this is a high-priority impairment to the partial and total body contact recreation for the watershed. Also, by addressing this issue in the Kawkawlin River, this plan will be addressing the beneficial use impairment (BUI) for the Saginaw Bay related to beach closures.

Goal:

- Restore and protect the surface water for partial and total body contact recreation

Objectives:

- Eliminate all beach closures in the immediate area by the mouth of the Kawkawlin River
- Develop and implement a program for obtaining as close to "real-time" monitoring results on pathogens as possible to decrease beach closures incidents
- Implement a program to identify failing, leaking onsite treatment systems or detect direct connection through use of infrared or heat resolution aerial or land-based photography to eliminate pathogen vector to the surface water or groundwater
- Implement a program to replace and/or repair onsite treatment systems in areas identified by BCHD
- Complete categorization of record keeping function of BCHD for tracking onsite treatment systems
- Develop education programs for rural areas that address onsite treatment systems
- Develop and implement a program to inspect and certify existing onsite treatment systems at time of sale of real estate or when a system is constructed or reconstructed
- Develop and implement a record database system through BCHD to notify homeowners with existing onsite treatment systems of routine maintenance to be performed, with a confirmation ability of the maintenance
- Identify areas where sanitary sewer lines can be extended to address failing onsite treatment systems
- Develop or continue to adhere to a maintenance plan to repair or replace municipal sanitary sewer systems
- Control waterfowl and other domestic or wild mammals that can be a nuisance source of pathogens to surface water
- Implement a watershed-wide road kill program to pick up and dispose of dead animals in an environmentally safe manner
- Provide education to the public on issues of pathogens in surface water

Impairment – Sediments

Description:

Excess sediment creates many problems for the surface water environment. It can cover the river or streambed habitat necessary for macroinvertebrates. Also, sediment can cover the gravel beds

necessary for fish reproduction or cover fish and amphibian eggs and destroy reproduction ability of the warmwater fishery and fringe wetland habitat. Deposition of large amounts of sediment as point bars, middle bars, tributary bars or alternate bars will impede navigation. Also, the suspended sediment creates turbidity; the suspended particles can absorb heat from sunlight making turbid waters even warmer thereby reducing the concentration of dissolved oxygen in the water. Some macroinvertebrates can't survive in the warmer water. Also, macroinvertebrate larvae are covered and suffocated and the gill structures of fish become clogged and damaged.

Sources:

Sediment is a naturally occurring material from weathering and erosion and is transported by the action of water, wind or ice. In the Kawkawlin watershed, it primarily originates from runoff from urbanized and rural areas. The watershed land use is predominately agricultural; therefore, at certain times of the year, the source is from adjacent fields, but can also be from sheet, rill and gully erosion at new construction sites and other urban pervious and impervious settings. The watershed inventory, windshield surveys and subcommittees identified areas of erosion, such as drains with gully and rill erosion, surface drains for agricultural fields transporting sheet erosion to point source discharges and drain, stream and river bank erosion, channelization, and tributary deposition. These are all to be considered as major sources or contributors to sedimentation. In the county drains these areas are generally addressed during routine maintenance of the systems.

But without adequate vegetated buffering along watercourses the sediment load will continue to be a long term source.

Causes:

Anthropomorphic or natural activities that disrupt the riparian environment can cause erosion in the banks of the river or tributaries. For example, ice formation then the movement of ice as it melts creates bank erosion, or if an ice dam forms at downed trees in upper reaches, at crossings, or bridges, the movement of water under the ice dam can erode the silty river bed or erode banks as water moves around the ice buildup. Conservation, no till or low tillage practices leave less soil exposed to wind and water erosion than conventional tillage practices. The construction practice of completely stripping vegetation from a site or use of properly maintained soil erosion and sediment control (SESC) practices on a site can contribute significant amount of sediment into storm systems and ultimately the river. Sediment transport from impervious surfaces into storm sewer systems without proper BMPs such as filtering systems, use of vegetated swale collection systems, infiltration practices or detention basins to settle out sediment particles create problems. Unrestricted access by livestock into rivers or drains can deteriorate the banks and lead to erosion of the bank. Wave action by boats or Saginaw Bay can move sediments at the mouth of the river to impede navigation or cause bank erosion at sites with no bank armoring in the main branch. The backwater effect of the Saginaw Bay can cause sediment loads to drop out of the water column in the upper reach of the Main Branch and create sediment banks. The sediment itself can cause a significant demand on the dissolved oxygen in the water column. Some of the major fluvial river environments for deposition of sediments include areas of a river that are braided, such as on the North Branch.

Priorities:

Sediment is a very high priority with regard to navigation and warmwater fisheries on the North Branch and South Branch.

Goals:

- Restoration and protection of surface water for navigation by reducing sediment loading in the watershed
- Improve or restore the warmwater fisheries by reduction of sediment loading
- Improve or restore the aquatic environment by reduction of sediment loading
- Improve or restore base flow by reduction of sediment loads creating channel flow blockages in river and tributaries

Objectives:

- Develop or implement programs for cover crops to help prevent sedimentation
- Encourage and develop programs to provide education on cover crops and low/no till practices to targeted groups in rural setting
- Develop a program for cover crops for agricultural fields within 10%, 20% or 50% recurrence interval floodplain
- Stabilize river and tributary flows to moderate altered hydrology, increase baseflow, reduce TSS and maintain floodplain to prevent sedimentation
- Establish a filter strip program with shorter time commitments and adaptive techniques that will get more "buy-in" by the agricultural industry to improve the quantity of filter strips in place
- Implement programs to develop a green zone in riparian areas using the Vision of Green objectives and goals
- Implement a program to reduce sedimentation from channelization and channel improvements
- Install livestock exclusion fencing and livestock crossing on drains and tributaries or river
- Develop a civil infraction ordinance for the SESC program in Bay County
- Assure "No Wake" enforcement on the Main Branch

- Implement BMPs to address sediment collection or entrapment during drain maintenance activities
- Assess areas in river channel for sediment traps

Impairment – Nutrients

Description:

High levels of nutrients are a known issue in the Kawkawlin Watershed. These excess nutrients, especially phosphorus, can lead to eutrophication in the river and ultimately Saginaw Bay. When describing nutrients in this watershed we are generally referring to phosphorus as the chief problem. The excess nutrients are already creating problems with explosive aquatic plant growth on the Main Branch. The South Branch has excessive algae growths in the channels and tributary drains indicating excess nutrients. There is a braided channel section of the North Branch that also has algae and aquatic plant growth east and west of the I-75 crossing called the White Bayou in 1905. During the night, when these plants cannot get light to carry out photosynthesis, they deplete oxygen from the water column rather than restore it to the water. The extreme growth rates fueled by nutrients create a situation that can deplete dissolved oxygen and many species of fish and other aquatic life cannot survive. The aquatic plant and algae organic matter dies and decays and increases the biological oxygen demand (BOD) leading to fish kills.

Sources:

The urban sources of nutrients are lawn clippings and leaf disposal in the river and tributary streams and drains. Residential lawn fertilizers, specifically when all purpose fertilizers are used, such as 10 – 10 – 10 or 12 – 12 – 12. Other nutrient sources are failing onsite treatment systems, direct sanitary connections to drains or the river, domestic and wildlife animal wastes.

In rural areas, nutrient sources are livestock waste products, agricultural fertilizing both historical and misapplied or misinformed applications and manure applications to fields

without consideration of surface runoff before incorporation into the soil.

The sediment in the channels of the tributary drains, streams and the river itself is a source of nutrient loading to the river's surface water. During anoxic cycles, the sediments will release phosphorus into the water column.

Causes:

In urbanized, areas the lawn clippings, leaves and mulch have high levels of phosphorus that enter the storm water drainage system by surface runoff during precipitation events or snowmelt. The residential lawns and other sources of turf grass such as parks, athletic fields, cemeteries and golf courses that maintain turf grass to the edge of the river or tributary stream or drain add nutrients to the surface water through runoff and infiltration. Failing or leaking onsite treatment systems are a source of nutrients. Waterfowl and domestic animals are a source of nutrients to surface water from their fecal waste.

The Saginaw Bay Coastal Initiative Phosphorus Committee Report of June, 2009, estimated that point sources of phosphorus in 1991 were 50% of the total. By the 2002 update of the Saginaw Bay RAP, it was noted that communities in the Saginaw Bay watershed had invested over $700 million since 1972 to improve wastewater treatment and the point source loading were reduced by 80 - 90%. A more recent study using the SPARROW model showed point source loads from phosphorus at 29%.

In Non Point Source (NPS) loading by land use category, it has been determined that agricultural lands contribute about 0.55 lbs/acre, whereas commercial contributes about 0.79 lbs/acre and HD residential contributes 0.69 lbs/acre of phosphorus to the watershed.

In rural areas, domestic livestock can be a source of nutrients if their holding areas have surface drainage toward tributary drains, streams or the river itself. Misinformed agricultural growers can be a source of nutrients by adding concentrated amounts of nutrients to fields or misapplication to fields or applications done before a storm creating runoff.

The periods of anoxic water conditions existing in the Kawkawlin River and some of its tributary streams are a cause of nutrient loading. Phosphorus is released into the water column from the sediment/water interface during anoxic periods. Efforts need to be made to either keep higher levels of dissolved oxygen in the water column or remove sources of nutrients from the river to prevent their release during periods of anoxia.

Priorities:

Nutrients are a high priority to partial and total body contact, warmwater fisheries and aquatic habitat. The nutrients are a low level priority to wildlife and riverside habitat.

Goals:

- Restore and protect surface water for partial and total body contact
- Restore and protect surface water for aquatic life and wildlife
- Restore and protect surface water for warmwater fisheries

Objectives:

- Implement a program to identify failing, leaking onsite treatment systems
- Implement a program to replace and/or repair onsite treatment systems in areas identified by BCHD
- Develop education programs for urban and rural areas that address onsite treatment systems
- Identify areas where sanitary sewer lines can be extended to address failing onsite treatment systems
- Control waterfowl and other domestic or wild mammals that can be a nuisance source of nutrients to surface water
- Identify livestock operations adjacent to river or tributaries

- Provide education to the property owners defined above on the issues of nutrients in surface water
- Educate the public on proper disposal of yard waste materials, no disposal in surface water or county or municipal storm systems
- Identify, educate and promote to the public the Vision of Green
- Educate and promote to the public the use of conservation easements
- Implement tasks to address issues of excessive nutrients and low DO in North Branch (White Bayou), excessive nutrients in Main Branch, excessive nutrients in South Branch
- Identify areas with high concentrations of nutrients in Main Branch and South Branch and North Branch and determine best removal methods to eliminate the loadings
- Implement nutrient removal methods in areas identified above
- Implement a nutrient monitoring program at tributary inlets to the river throughout the watershed for a two year period
- Use information from the above task to implement BMPs for nutrient removal from tributary streams and drains
- Implement BMPs to address nutrient collection or entrapment during drain maintenance activities
- Implement BMPs to increase DO in surface water in areas with historical low DO
- Educate agricultural industry on nutrient removal BMPs
- Implement education program on phosphorus for the urban public
- Implement a program in the watershed that discourages commercial and retail sellers of fertilizers from selling fertilizer with phosphorus without proof of need by the public (a soil test)
- Implement a program to have commercial or retail businesses provide a brochure when selling 10-10-10 or 12-12-12 fertilizers
- Continue to support the county wide phosphorus ban in Bay County and seek support from neighboring counties without such a ban
- Pressure state law makers to initiate statewide phosphorus ban

- Implement feasible portions of the *Saginaw Bay Coastal Initiative Phosphorus Committee Report (June 5, 2009)* as it relates to urban storm water and agricultural phosphorus issues. This report is located at:

  http://www.michigan.gov/documents/deq/sagbayphosrep_283289_7.pdf

At the end of this chapter are the recommendations and discussions from the Agricultural Phosphorus Work Group and the Stormwater Phosphorus Work Group from the above-mentioned report, which should be considered as action items for the watershed.

Impairment – Low Dissolved Oxygen (DO)

Description:

Low DO is a known concern and has been documented since the 1990s. Excess nutrients, especially phosphorus, can lead to eutrophication by generating excessive aquatic plant growth and algae blooms, as the plant material dies and decomposes it lowers the DO in the river. The excess plants are already creating problems with explosive aquatic plant growth on the Main Branch. The South Branch has excessive algae growths in the channels and tributary drains indicating excess nutrients. The braided channel section of the North Branch east and west of the I-75 crossing called the White Bayou does not have sufficient flow. Without this steady base flow of water the aquatic plants can deplete oxygen from the water column at night, rather than restore oxygen to the water. The aquatic plant and algae organic matter dying and decaying increases the biological oxygen demand (BOD) leading to fish kills that have been documented in this area (Morse, 1994).

Sources:

Potential sources of DO demanding pollutants to the NB of the Kawkawlin River such as carbonaceous biochemical oxygen demand (CBOD), ammonia nitrogen, sediments and indirectly nutrients include point sources and non point sources (NPS). Per the TMDL report CBOD and ammonia can be oxidized in the water column, depleting DO in the water column. Decay of deposited organic sediments also negatively impacts DO. This is known as SOD or sediment

oxygen demand. Also, nutrients such as nitrogen and phosphorus can stimulate aquatic plant growth thereby reducing DO through respiration.

There is one non-stormwater general NPDES permit point source on the NB of the Kawkawlin, White Birch Mobile Home Park Wastewater Stabilization Lagoon (WWSL). Additionally, there is one industrial stormwater and four MS4 general NPDES permitted point sources.

Table 4.2: Permitted Daily and Annual Conventional Pollutant Loads for White Birch Village MHP WWSL (source Low DO TMDL, MDEQ, 2007)

Pollutant	Daily Load (lbs/day)	Annual Load (lbs/yr)
$CBOD_5$	6.11	2,230
TSS	11.2	4,080
Ammonia Nitrogen	3.26	1,190
Total Phosphorus	0.20	74.0

Table 4.3 Estimated NB Kawkawlin River conventional pollutant loads from industrial storm water and MS4 General NPDES Permitted point sources

Pollutant	Daily Load (lbs/day)	Annual Load (lbs/yr)
Biochemical Oxygen Demand (BOD)	17.9	6,539
TSS	38.1	13,923
Ammonia Nitrogen	1.12	409
Total Phosphorus	0.30	108

Table 4.4 Estimated Daily and Annual Non Point Source Conventional Pollutant Loads

Pollutant	Daily Load (lbs/day)	Annual Load (lbs/yr)
Biochemical Oxygen Demand (BOD)	123	44,700
TSS	3,230	1,180,000
Ammonia Nitrogen	135	49,400
Total Phosphorus	39.3	14,300

Causes:

The periods of anoxic water conditions existing in the Kawkawlin River and some of its tributary streams are caused by sediment and nutrient loadings. These loadings bring about oxygen demands on the water column based on differing variables but with the same outcome, low DO or anoxic conditions in the river. Efforts need to be made to either keep higher levels of dissolved oxygen in the water column or remove sources of sediments, to decrease CBOD, and nutrients from the river to prevent their release during periods of low DO, which would trigger more aquatic plant growth. The low base flow in this reach also is a cause of the low DO, if flow is increased or at least directed to a main channel that passes through the "multi-channel" reach of the North Branch. By improving the flow through and eliminating the stagnant flow of this reach the low DO may improve and lessen the chance of fish kills or impacts on the warmwater fishery. Also, by addressing the anoxic conditions, there will be less release of phosphorus which will address the nutrient issues on the Kawkawlin River as a whole.

Priorities:

Addressing the Low DO TMDL is a high priority for warmwater fisheries, aquatic habitat and a medium priority for conditions of partial and total body contact. The low DO is a low level priority to wildlife and riverside habitat.

Goals:

- Restore and protect surface water for warmwater fisheries
- Restore and protect surface water for aquatic habitat
- Restore flow through braided channels to decrease incidence of Low DO

Objectives:

- Implement a program to identify low flow reaches and sections for flow improvement engineering
- Develop education programs for rural areas that address the actions of sediment and nutrients on Low DO
- Educate the public on the Low DO TMDL that exists on the NB Kawkawlin
- Identify areas where flow can be improved

- Identify areas of high aquatic vegetation growth and address nutrient problems in those areas
- Educate the public on proper disposal of yard waste materials, no disposal in surface water or county storm systems
- Identify, educate and promote to the public the Vision of Green
- Educate and promote to the public the use of conservation easements
- Implement tasks to address issues of Low DO in North Branch (White Bayou)
- Implement BMPs to increase DO in surface water in areas with historical low DO
- Educate agricultural industry on BMPs to address Low DO TMDL

Impairment – Pesticides & Herbicides

Description:

Pesticides and herbicides are used to prevent or destroy pests or nuisance weeds to prevent either damage by the insects or pests or competition by weeds for soil nutrients and moisture. These chemicals are used in urban residential settings or in agriculture areas.

Sources:

The predominant source by volume of pesticides and herbicides is agriculture in this watershed. Usually it is under managed conditions and applied by trained applicators as more agricultural practitioners outsource this type of work because of regulations. However, urbanized utilization of the same chemicals is not regulated as stringently unless the homeowner is using a lawn service for applications. Homeowner application could be improper due to lack of knowledge. Another source is municipal or private operations of large turf grass areas such as parks, cemeteries, athletic fields and other large areas of turf grass that exist in the watershed. Other urban applications are in commercial and business districts for the landscaping in those areas.

Causes:

Improper applications or calibration of equipment are in the main causes of herbicide/pesticide dosing in the watershed. Pesticides/herbicides are also subject to leaching into the groundwater and entering surface water. If misapplied in the urban setting or when a precipitation event is imminent, the chemicals can become a slug load in storm water runoff and, if near a storm water conveyance system, can enter the river in a short time of concentration.

Priorities:

Pesticides/herbicides are a medium priority as far as affects upon aquatic life, fisheries and wildlife.

Goals:

- Restore and protect surface water for aquatic life and wildlife in the watershed

Objectives:

- Increase knowledge about pesticide and herbicide application and usage for both agricultural and urban residents
- Increase the use of buffer strips to prevent misapplication too close to surface water; these buffer strips can either be vegetated or a known width or marked zone of non-application near surface water or storm water conveyance system
- Implement BMPs such as those for LID and infiltration/vegetated bio-systems

Impairment – Loss of Habitat

Description:

The restoration and protection of habitat in watershed is a very important concern for the health of the entire system. The Kawkawlin watershed had an extensive system of wetlands in the pre-settlement era; most of those wetlands have disappeared, or rather changed land use. When looking at the wetland study conducted by the MDEQ for this project, the wetland footprint in the watershed is significantly reduced and fragmented. Many of the functions of the wetlands have been lost or significantly diminished. The change in land use has changed the morphology of the environment. The loss of aquatic habitat for warmwater fisheries throughout the system is also a major concern.

Sources:

The stakeholder group and subcommittees have all identified the land use changes from forests to agriculture then the subsequent urbanization and increase in impervious surfaces as a source of the loss of habitats both for wetland and aquatic. The establishment of drainage systems had a significant effect on the reduction and fragmentation of the watersheds wetlands and their functions.

Causes:

Practices of farming to the edge of drains, streams and close to the river has resulted in the loss of habitat and connectivity of natural areas in some parts of the watershed. Farming in the low level floodplain (areas where recurrence flood intervals is high) is causing loss of habitat in the proximal areas of the river system. The agricultural areas near the river are also becoming prime home lots and this is creating habitat loss. Those who want a view of the river in the more forested areas may clear trees thereby affecting the canopy cover over surface water increasing water temperatures. The canopy, understory and woody debris help maintain a healthy aquatic system.

Priorities:

The loss of wetlands, their fragmentation and the loss of habitat is a high priority for wildlife and aquatic habitat. Aquatic habitat for the warmwater fisheries is considered to be a medium priority in the watershed.

Goals:

- Restore and protect wetland areas in the watershed especially those designated areas from the landscape level wetland assessment
- Restore and protect surface waters of all branches of the river and its stream tributaries for the warmwater fisheries
- Restore and protect floodplain areas of the riparian corridor
- Limit the conversion of forestland along the waterways to incompatible land uses

Objectives:

- Establish a Bay County Stream and Wetland Restoration Advisory Committee at the Drain Office
- Develop and implement a program for a net gain of wetlands in those areas defined in the wetland study for potential wetland restoration
- Establish a program for conservation easements in the watershed
- Educate the public on the need for conservation easements to protect lands and green ways in the watershed

- Utilize new drain maintenance techniques to enhance aquatic habitat (two stage channel development with sinuosity
- Develop and implement innovative vegetated buffer strip programs to enhance habitat along riparian areas of drains and tributaries
- Stabilize river banks using innovative "green armoring" techniques to prevent erosion and loss of riverine and aquatic habitat
- Develop overstory in areas of the watershed that are lacking such areas.
- Assess or target poor macroinvertebrate study areas for restoration techniques to improve habitat
- Educate the public on Stream Volunteer Monitoring programs and develop a group of volunteers to monitor sites in the Kawkawlin watershed
- Implement Adopt-a-Stream programs to help improve aquatic habitat
- Educate the public on aquatic habitat and wetland functions

Impairment – Low Water Flow / Altered Hydrology

Description:

In low water flow conditions in rivers and streams, the flow is minimal or depth is minimal for a functioning aquatic system. Therefore, the aquatic habitat and macroinvertebrates, amphibians and fish become threatened or prone to low oxygen conditions. Altered hydrology has many variables that affect it; weather is one of the unpredictable aspects of it. However, steps to inspire groundwater recharge in the watershed or enhance wetland storage of runoff may help improve base flows in the watershed.

Sources:

Low water flow conditions are dependent on many factors such as weather, the water cycle and other variables beyond control of humans. Altered hydrology by increased impervious surfaces in the lower Main Branch or runoff from agricultural fields in the North and South branch of the river can create flow disparity. Also, riverine areas where a single channel suddenly becomes three or more channel branches or spread out into one very wide shallow non-channelized reach can create low flow conditions as the flow of one channel now is divided into channels with similar cross sectional areas or spread out ten-fold in width.

Causes:

Low water flows can be caused by split flows as described above where one channel now feeds three similar sized channels. Low water levels in the Great Lakes have an effect on the river system. The reverse flow conditions experienced in the Main and South Branch of the river can have an effect on flows and water depth in the river. Additionally, in low flow situations, warm weather can cause water temperature increases especially in the agricultural drain areas which then discharge into the river and will increase water temperatures. Altered hydrology can contribute to flooding conditions in portions of the North Branch near the confluence and other areas.

Priorities:

Low flow/altered hydrology conditions can threaten fisheries by creating conditions for low DO and creating fish kill conditions or a threat to other aquatic organisms; so it is a high priority. These low flow conditions can also create a high priority for navigation on the Main Branch and interfere with future potential use of the other branches for recreational boating. Altered hydrology can contribute to flooding conditions in specific reaches and is a high priority on the lower reach of the North Branch of the river.

Goals:

- Restore base flow to the maximum extent practicable
- Restoration of wetlands to help with the base flow restoration
- Preservation of wetlands to help with base flow restoration
- Restore and protect surface water as a warmwater fishery
- Restore and protect surface water for navigation
- Protect areas prone to flooding.

Objectives:

- Implement drain maintenance BMPs to assist with stream flows
- Implement overstory strategies to protect river and river banks
- Implement understory strategies to protect river and banks
- Implement strategies to improve infiltration of groundwater from runoff to improve base flow for longer periods of time.

- Improve flow in lower reach of the North Branch to prevent flooding in that area

Impairment – Invasive Species

Description:

Invasive species are important to address in the watershed. Some have not established themselves to a great extent at this time and it is important to have initiatives in place to raise community awareness regarding them. If residents are aware of invasives and can recognize them they can be eliminated. For example, phragmites is a major problem along the Saginaw Bay shoreline and in some drains. It has not been widely established in the Kawkawlin Watershed and must not be allowed to establish itself. In the Main Branch reach there are invasive aquatic plants such as coontail that needs to be addressed for the long term. For establishing the fisher it is important to keep the round head goby in check in the watershed to prevent them from interfering with spawning runs as they are prodigious egg eaters.

Competition in the watershed habitat for native species from invasive species is becoming widespread. The native species are being subdued by many of the invasive species. These invasive species, most of the time, do not have an established natural predation to keep them in check and can aggressively compete with natives for niche spaces, food, nutrients or sunlight in the environment. Sometimes the invasive species will feed on native species eggs, interfere with reproduction or can simply reproduce faster and more often than the native species.

For example, the round goby is a bottom-dwelling fish that has great potential for causing impacts on Great Lakes fisheries. Originally, the round goby was introduced into the St. Claire River in 1990, probably via contaminated ballast water of transoceanic ships. It is thriving in Saginaw Bay. They are aggressive, voracious feeders and can take over prime spawning sites traditionally used by native species, competing with native fish for habitat. The goby can also survive in degraded water conditions and spawn more often and over a longer period than native fish. Unfortunately, they have shown a rapid range of expansion through the Great Lakes.

Others were described in Chapter 3, such as phragmites, canary grass, purple loosestrife, zebra mussels and others.

Sources:

Round goby, phragmites, purple loosestrife, zebra mussels, others.

Causes:

The round goby and zebra mussels were introduced from ballast waters of ocean going freighters, and Bay City had international shipping traffic up until the 1980s when American Brownhoist ceased operations.

Phragmites and canary grass have become common place in the coastal wetlands of Saginaw Bay and are in the drains of Bay County and the watershed of the Kawkawlin.

Priorities:

Control and elimination of invasive species is a high priority to protect the warmwater fisheries and aquatic habitat of the Kawkawlin Watershed.

Goals:

- Restore and protect surface waters for warmwater fisheries
- Restore and protect wetland, stream, drain and river habitat from invasive plants
- Restore and protect coastal river inlets to Saginaw Bay from invasive plants

Objectives:

- Educate people to recognize invasive species and report the location
- Implement phragmites eradication programs in the watershed as quick as possible
- Eradicate phragmites and other invasive plants during drain maintenance projects
- Educate the public on invasive species and how to identify and report their presence in areas not yet infested to begin early elimination of species
- Minimize the spread of zebra mussels and gobies
- Develop programs for elimination of invasive species such as boat inspections, certified bait stations and other innovative methods

Impairment – Public Access Sites

Description:

Access to surface waters of the Kawkawlin is important for recreational usage and, with increased usage more of the public will appreciate and protect the water resource.

Sources:

Limited or no public access sites on the South and North Branch of the Kawkawlin River.

Causes:

Almost all land along the Kawkawlin is private property. Access sites need to be located near roads and there are not many public road access points on either branch.

Priorities:

Recreational access and navigation of the Kawkawlin is a low priority at this time. As the other river restoration problems are assessed, this may rise in priority as people wish to access and use the river system.

Goal:

- Improve or enhance access to the Kawkawlin River's North and South Branches for recreational use

Objectives:

- Develop a plan and implement a "green" river trail system for paddlers and kayakers
- MDEQ or township recreation plans to develop access points on either conservation easements or through property acquisitions
- Educate the public on water trails to build interest in project.

Impairment – Trash and Debris

Description:

The accumulation of trash and debris can create problems with aesthetics of the watershed and can block or diverts the flow of surface water. When riverbank trees' root systems erode and fall into the river, they create logjams and collect other floating debris. Floatables, litter and trash is

thrown away by irresponsible people. With the interstate highway system and other county roads at a few locations, trash is a product of passing vehicles with trailers, open box trucks, etc. loosing cargo or people just throwing out litter.

In rural areas drains, tributary streams and river crossings are used as disposal sites for construction materials, "white" appliances, furniture, scrap materials and other large items people do not wish to pay for disposal or cannot afford to pay for disposal. In urban areas, people will take their large items to the rural areas to "drop" off into drains.

Sources:

Dumping of trash in rural drains has been observed in most watersheds especially in the wooded areas where visibility is limited. Once used, the dumping seems to escalate. When runoff events occur, these channel blockages can create sites for erosion. Logjams from tree falls create channel blockages and navigation hindrances. These were noted at numerous locations in the recent aerial photos and are documented with GPS locations for assessment and removal. In the upper reaches of the North Branch, nature may produce blockages by beaver dams; these need to be assessed by MDEQ staff.

Causes:

If ordinances are not enforced preventing illicit dumping of trash, some areas can become a literal dump site. Moderate or severe bank erosion can cause trees to fall into the river. Wind storms can also quickly dump many trees into the river and form impenetrable blockages to navigation and flow. These trees, when they fall into the river, can be a source of bank erosion and bed erosion. Beaver dams are naturally occurring and each needs to be assessed for suitability to the environment at their location. Most river obstructions are not removed because of property issues and responsibility issues.

Priorities:

Trash dumping and debris are a high priority for ensuring navigable surface waters.
The removal of trash and debris is a high priority for improving the aquatic habitat.

Goal:

- Restore and protect aquatic environment
- Restore and protect surface water navigation

Objectives:

- Remove trees and log jams from the navigational channel to improve aquatic habitat
- Implement green bank armoring BMPs to prevent erosion
- Monitor overstory and understory to prevent bank erosion
- Remove trash and illicit dumping of materials from river, stream or drain crossings or other locations as needed
- Develop and implement Stream Cleanup programs
- Apply for Stream Clean up Grants
- Educate the public on problems caused by illicit dumping
- Establish "No Dumping" sites at identified sites
- Promote trash pick up of large items (Note: this may not be a problem now with higher metal recycling payments.)
- Identify debris removal sites on a three-year plan basis by low level flights and high resolution aerial photography
- Develop a "hotline" to report dumping violations

Impairment – Petroleum products, brine, deicers, metals

Description:

Petroleum products, deicers and metals are byproducts of our countries transportation system and are found in large quantities of first flush storm water runoff events. Brine is source of chemicals for the region's chemical industry. There are wells throughout the region along with old pipelines. Petroleum products can also be introduced to the river from old wells and their transport pipe systems.

Sources:

The transportation systems are one source of these products. However, the runoff from impervious surfaces carries a substantial amount of petroleum byproducts, heavy metals, deicers

and other materials to the storm water systems and ultimately the river. Petroleum can also come from the abandoned oil field pipelines that cross the Kawkawlin River at various locations.

Causes:

Runoff from impervious surfaces can impair storm water quality during runoff events. The use of LID BMPs can improve water quality. The pipeline crossings can cause leakage of petroleum into the river if they fail or are struck by a motorized boat or farm implements.

Priorities:

Removal of oil pipelines is a high priority for aquatic habitat protection in the watershed. Addressing brine, heavy metals and deicers is a high priority for protection of warmwater fisheries and aquatic habitat. Removal of pipelines is a high priority for navigation.

Goals:

- Identify owners and remove oil pipeline crossings from river and banks
- Restore and protect aquatic environment from first flush pollutants listed above

Objectives:

- Identify locations of all petroleum pipeline crossings
- Implement a plan to remove all petroleum pipeline crossings
- Use LID BMPs to address first flush runoff for water quality
- Implement BMPs to address first flush in post construction controls in all NPDES communities in the watershed
- Educate public on use of deicers