5. Chapter 5 - Identifying Best Management Practices, Initiatives or Strategies for Implementation

To meet the watershed goals and objectives outlined in Chapter 4, a series of tasks, strategies or initiatives known as Best Management Practices (BMPs) are to be selected to address pollutants, impairments or concerns. A variety of management approaches are available to address water quality problems and more are being researched every year for implementation. These practices include regulatory and non-regulatory approaches to address point sources of pollutants and nonpoint sources (NPS) of pollutants. In general, management strategies or practices are groups or categories of cost effective management practices to be implemented to achieve comprehensive goals, such as reducing sediment loads from upland areas to surface waters. Individual management practices are site-specific and often based on existing conditions, actions or structures for controlling pollutant sources.

These management practices can be implemented for various purposes, such as:

- Protecting water resources and downstream areas from increased pollutant loads and flood risks
- Conserving, protecting and restoring priority habitats
- Setting aside permanent terrestrial and aquatic buffer areas
- Establishment of hydrologic infiltration or reserve zones
- Acquiring conservation easements or property rights to protect natural features

Management measures can also help control the pollutant loads to receiving surface waters by:

- Reducing the availability of pollutants
- Reducing the pollutants generated (erosion control)
- Slowing the transport or delivery of pollutants by reducing the amount of water transported or by causing the pollutant to be deposited near the point of origin (e.g. detention basins for impervious areas, vegetated buffers to filter sheet flow, etc.)
- Causing the deposition of pollutants off-site before it reaches surface water.
- Treating the pollutant before or after it reaches the surface water by mechanical, chemical or biological intervention or transformation

Structural, managerial and vegetative BMPs were selected from the MDEQ, MDOT, OMB, MACDC, Michigan LID Design Manual, NRCS and MDA manuals or from specific BMPs developed by subcommittees for the watershed in cooperation with the Bay County Farm Bureau representatives. The BMPs are grouped into categories as they relate to practices for municipal zoning, land use and planning policies, municipal operations related to vegetative management practices, maintenance and operations procedures, recycling and composting on a county-wide scale and finally agriculture practices as related to managerial practices. The structural and vegetative management practices were grouped by LID (vegetated, infiltration, filtration), agricultural, detention and retention and pretreatment. The following website has the LID manual available for reference

http://library.semcog.org/InmagicGenie/DocumentFolder/LIDManualWeb.pdf

The tables are available in Appendix N.

5.1 *BMPs to Achieve Goals and Objectives of the Watershed*

5.1.1 *BMPs for Warmwater Fisheries*

The typical BMPs that will improve fisheries deal with water quality issues and improvement in aquatic habitat. The warmwater species of concern are walleye, northern pike, sunfish, rock bass, suckers, catfish, bullhead and others found commonly in the watershed. Reducing the amount of sediment entering the surface waters and protecting the river corridors with vegetative buffers and other buffer zones will assist in meeting goals of river restoration. Sediment removal BMPs will also aid in keeping the water temperatures down to a level that is conducive to the management of a warmwater fishery in the Kawkawlin. As stated before if sediment is floating in the water column it will absorb energy from the sun and increase the water temperature. Removal of as much sediment as possible will help decrease the temperature of the river system. Managing the overstory will help with temperature issues and provide assistance with DO issues during summer months.

5.1.2 *BMPs for Wetland Preservation*

Wetland function restoration is a goal for this watershed; relative to wetland functions what is desirable is floodplain protection along certain areas of the Kawkawlin River. Development of high-quality wetlands that can serve as nutrient sinks for phosphorus, nitrogen, pathogens and filter out suspended solids is another function. The MDEQ's wetland staff, lead by Rob Zbiciak, have put together a Landscape Level Wetland Assessment of the Kawkawlin River Watershed. This compilation of data is available on CD for use by county, municipal and township planners to assess areas for restoration and to help make decisions in land use planning for the future. The following managerial BMPs for corridor protection should be used to obtain or direct people for land donations, conservation easements or other land acquirement options.

Providing education on wetlands to raise awareness regarding the loss and historical functions of the wetlands and why the existing wetlands are important in this ecosystem.

5.1.3 *Preservation of Critical Areas*

The goal for protection of existing natural features in the Kawkawlin River Watershed will help ensure water quality consistent with the watershed management plan. Areas for protection have been determined by local land conservancies working in the watershed to improve the overall health of water quality and habitat.

A framework for developing preservation critical areas have been based on the Saginaw Bay Greenway's Collaborative Vision of Green for Bay, Midland and Saginaw Counties which was completed in 2005. The Saginaw Bay Greenways Collaborative used a scientific and community-based approach to identify land best suited for conservation and recreation throughout Bay, Midland and Saginaw counties. These lands are the basis for a green infrastructure network and provide a strategic framework for the resource protection and conservation activities.

Additionally, the preservation critical areas have been identified using the Little Forks Conservancy's Priority Land Conservation Strategy which identified areas in the Saginaw, Bay and Midland counties for permanent land protection. This Priority Conservation Lands

Assessment was based on the Little Forks Conservancy's objectives of protecting the natural resources of our region. The assessment was developed using the Little Forks Conservancy's land criteria which is heavily weighted for protection of our regions waterways, wildlife habitat and undeveloped lands.

Both the green infrastructure plan and priority land assessment provide a crucial framework for identifying lands vital to conservation our regions natural resources. The maps in Appendix A identify the critical preservation areas. Protecting these critical areas provide habitat and migration corridors, reduces non-point source pollution, and preserves scenic lands within the watershed.

Land conservation options are available to ensure that these areas are protected to provide a healthy ecosystem for the Kawkawlin River Watershed. Unlike Best Management Practices (BMPs) which will work to repair sites assessed during the watershed inventory, land conservation options will work to minimize future negative impacts on water quality in the Kawkawlin River Watershed.

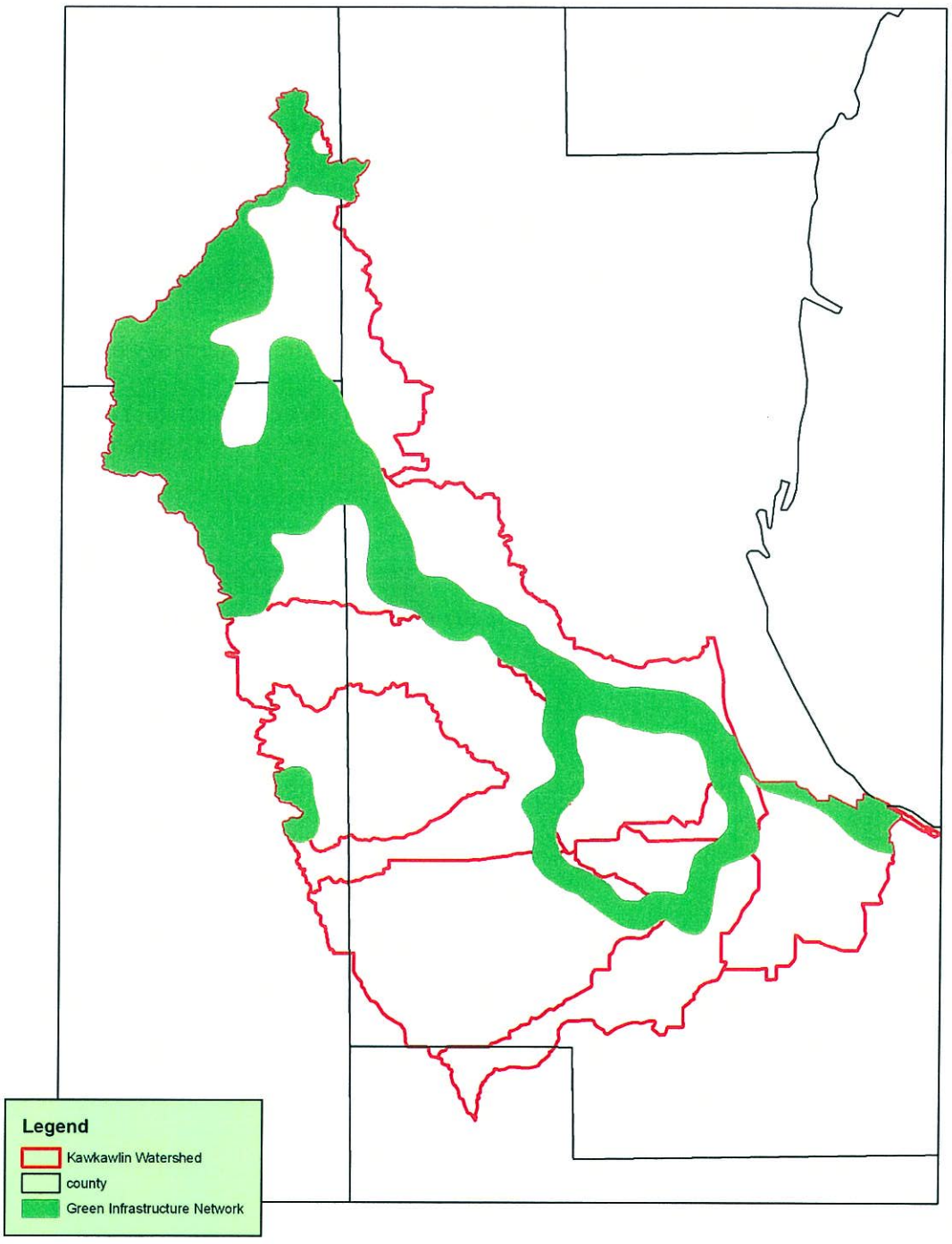
The organizations working to protect land within Kawkawlin River Watershed are The Little Forks Conservancy and Saginaw Basin Land Conservancy. Both organizations are private, non-profit land conservancies and are recognized as charitable organizations by the IRS. These organizations provide the legal mechanism through which watershed landowners can permanently protect the conservation values of their land that are important to sustaining the quality of the watershed. The conservancies provide landowners with a number of options, ranging from limited development to acquisition of the property. By protecting properties in the Kawkawlin Watershed, landowners can leave a legacy to future generations. Table 1 below outlines some of the possible conservation options available to achieve land protection in the Kawkawlin Watershed's Areas of Protection.

Table 5.1. Land Protection Options

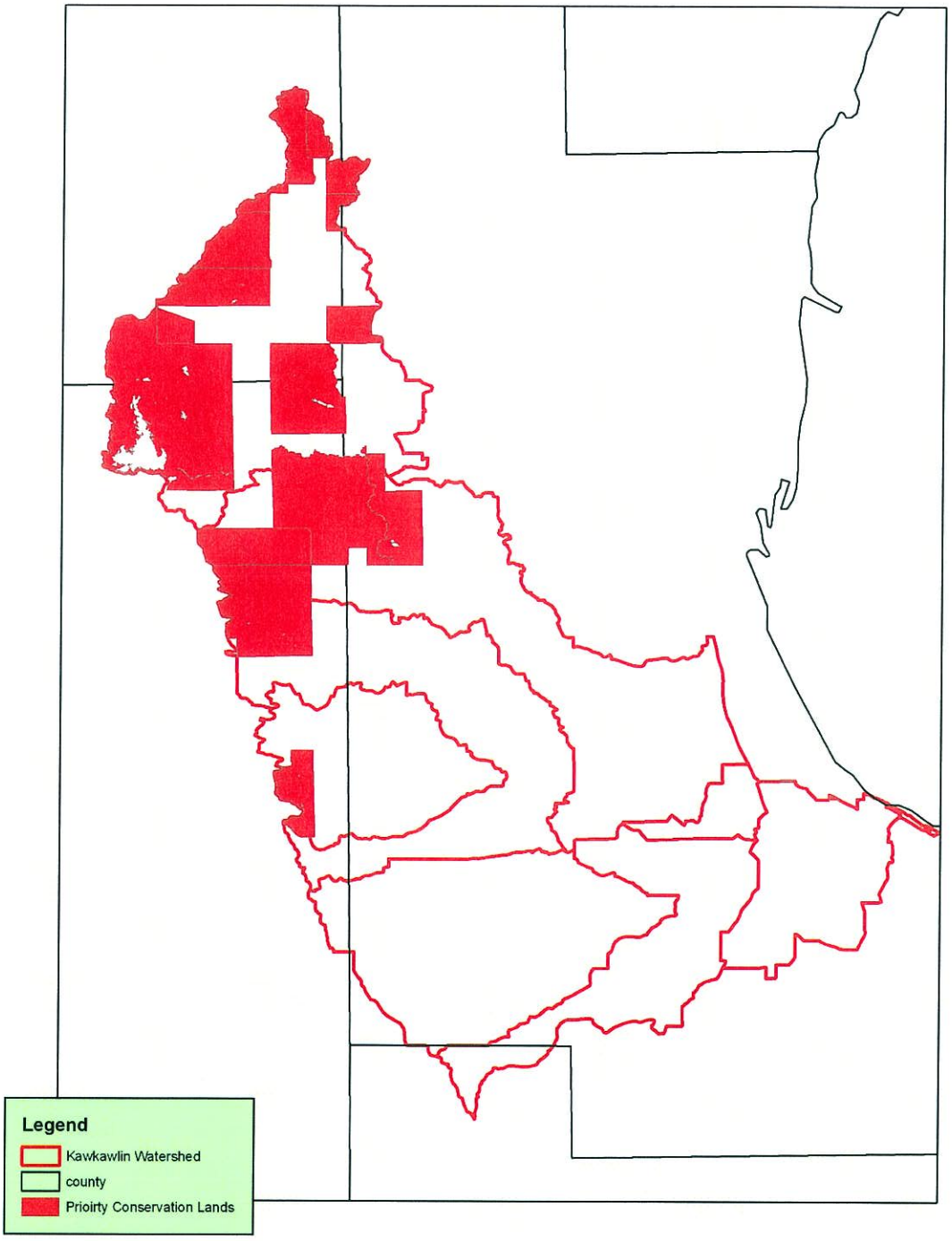
Land Protection Option	Description
Conservation easement	Legal agreement between a landowner and a land conservancy permanently limiting a property's uses.
Donation of Land	Land is donated to the conservancy
Remainder interest and reserved life estate	Land is donated to the conservancy but owner (or others designated) continue to live there until death
Bequest	Land is bequeathed to the conservancy by will
Bargain sale of land	Land is sold to the conservancy below fair market value
Purchase of land	In situations where protection of a property is important enough to justify purchase at fair market value.

These conservation options in addition to providing the benefit of permanently preserving their land may also yield potential financial benefits in the form of income tax and estate tax reduction.

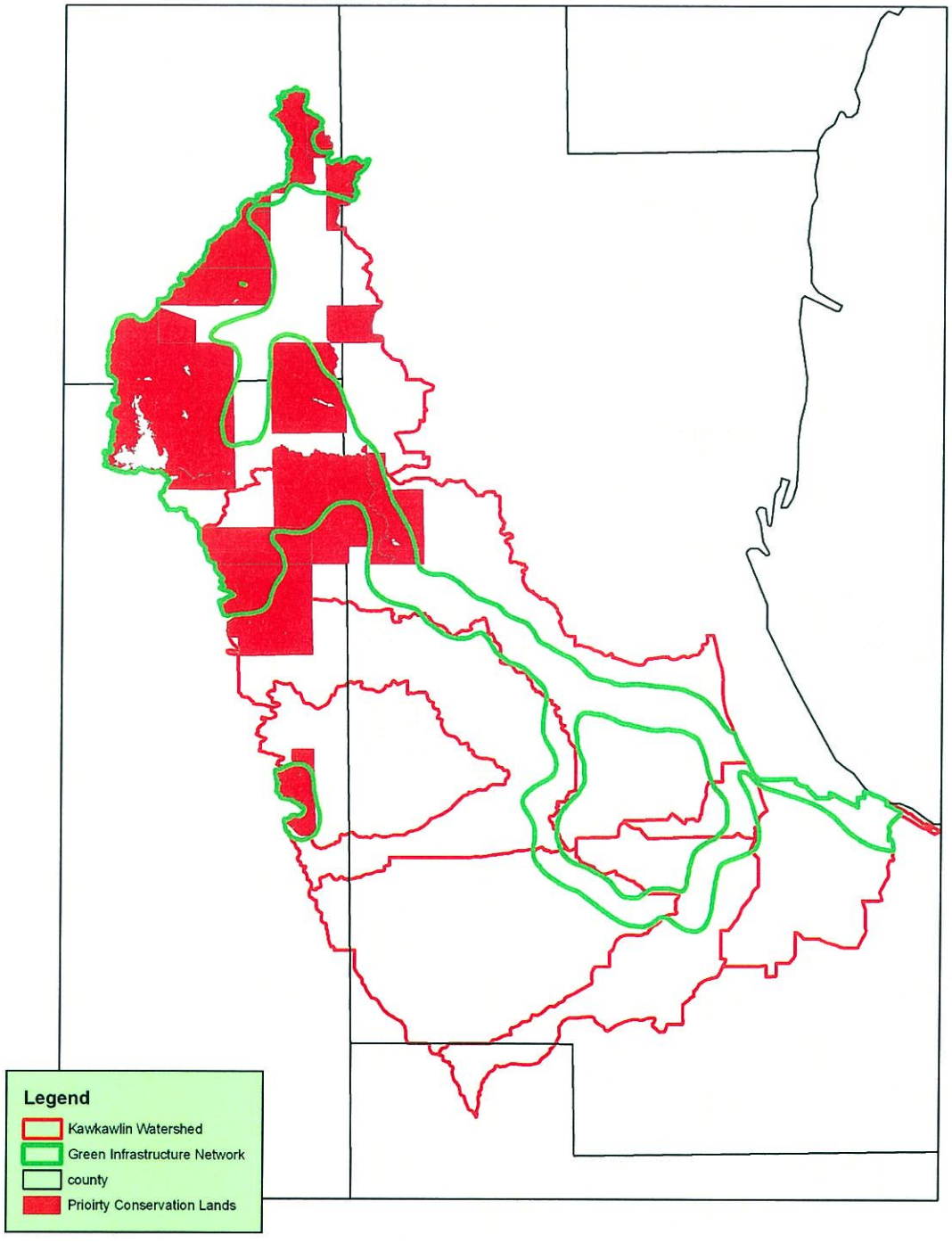
Map 1. Kawkawlin River Watershed Green Infrastructure Network



Map 2. Kawkawlin River Watershed Priority Conservation Lands



Map 3. Kawkawlin River Watershed Preservation Critical Areas



5.1.4 *Managerial BMPs for Corridor Protection*

Managerial BMPs and acquisition of lands for conservation easements will be the focus point for these strategies. The Little Forks Conservancy and the Saginaw Bay Land Conservancy has been instrumental in the Corridor Assessment Committee and provided information on protecting private land for conservation through:

- Conservation Easements
- Donation
- Acquisition of Land
- Willed Donations

A private landowner can donate conservation easement or land either format can be accommodated. If the landowner wishes to retain usage of the land and forgo developmental rights, the tool of a conservation easement is an option. A conservation easement protects the conservation value of the land while limiting activities which may be detrimental to what is being protected. The land remains in private ownership and these agreements are recorded at the county register of deeds. A conservation easement can be donated or sold to a qualified conservation organization. The landowner may qualify for federal income tax, estate tax or property tax benefits.

The best types of properties for this method of conservation are high quality habitat, riparian areas, open spaces, agricultural lands that were former wetlands, floodplains, natural habitats, historical lands or general lands positioned in the landscape for outdoor recreation/education (riparian property for boat launches or interpretive wetlands).

Conservation easements and other land donation mechanisms are available for landowners such as donation through a will or a donation structured to provide income to the property owner via an annuity payment or charitable remainder trust structure. The land in this instance would not belong to the donor, but they would have some negotiated benefits from it during their remaining lifetime. Numerous aspects of these donations are variable and need to be researched and talked over with family and advisors to the families. If the route decided upon is a land donation, then

the receiving land trust will need to be consulted before making any stipulations. The owners need to have all facts about the donation options communicated effectively to them. Ultimately, the landowner will want to make sure the land trust agrees to the care of the land and the have the ability to complete the care agreed upon in perpetuity.

There are three options for land preservation:

- Conservation easements,
- Land donations, or
- Bargain sale of land or conservation easements.

Each of these options can be customized to the property owner's concept of what to do with the land. However, each option has a different way of achieving the intent. These options can vary in significant ways which must be carefully considered by the donor when making decisions about land preservation.

Conservation Easements

Conservation easements can assist people who want to maintain ownership and use of the land or even sell it, but they ultimately wish to preserve the land in either its present condition or have it revert back to its previous land use (i.e. farmland to wetlands). With a conservation easement, development rights are donated to preserve the other rights or values inherent in the land. Donation of these rights can prevent future owners from using the land in a manner not specified in the agreement. For example, a farmland cannot become a high-density residential area or commercial development. The main benefit of a conservation easement is that ownership is maintained and they can do whatever else they want with the property as long as the legally established agreement is upheld. So farms can continue land use practices; the buildings for a farm are allowed to remain a preserved forest will remain as it is if that is what the landowner has agreed to in establishing the agreement.

There are many financial incentives associated with conservation easements such as lower property taxes for those who have waived development rights. Estate taxes for the heirs of

property can be greatly reduced; they can be reduced from the high of 55% to a much lower percentage when development rights are forfeited. An income tax deduction can be obtained for one time by having made sure the criteria meets federal tax requirements ensuring public benefit through preservation of land. The donation amount will equal the difference between the values of the land with the easement versus value without the easement.

Land Donations

The donation of land by a landowner can have many benefits. If the land is set aside in a manner where it is maintained as a preserve, it will be, in perpetuity, available for the public's benefit. Certain landowners like this type of arrangement as some people like to know they have given something back to their community or region and will be remembered by the action. Of course, this can also be done anonymously by the landowner if so desired. This option can be used when land is no longer useable or has property taxes that have increased significantly for the landowner.

If a property owner wishes to donate, they must pick an organization that can be responsible for the land and ensure its protection. There are regional land conservancies in the Saginaw Bay Region that can accept such land or assist or educate the owner before such a donation takes place. During the process of donation, negotiations can be completed that will give the owner the right to live on the land until the end of their life or other agreed upon arrangement. For example, the owner may designate a spouse or other heir to live on the property during their lifetime. The land trust only receives control of the land when the heirs pass away. At the time of donation, the landowner may receive some income tax benefits. These should be discussed with an accountant before hand to assure understanding of the tax benefits; this donation may also reduce estate taxes.

This type of donation can also be done by a will. This allows the owner to have complete control over the land while they are alive, and the will specifies the release of control to the designated land trust agency.

There is also an opportunity available to donate land to a trust where the owner can receive an income from the land; they can use a land donation that establishes a life income. This type of donation mechanism involves a charitable gift annuity where the property owner moves the land into a land trust's care and has the land trust make annuity payments to the designated beneficiaries for life or other specified time period. This type of arrangement can have tax benefits associated with the donation based on the value of the land versus the anticipated annuity payments.

A final donation mechanism is a charitable remainder unitrust. The land has a conservation easement placed on it, which is then given to a land trust. A trustee then sells the land and invests the profits from the sale. These funds are then partially paid to designated beneficiaries for a negotiated time frame. Any profits remaining from the sale go to the land trust to protect more land. Again, there are tax benefits for this type of donation depending on property values and payments to the beneficiaries. It is important to get good advice when doing these types of donations and work with local or regional staff in the Saginaw Bay Region.

Bargain Sale of Land or Conservation Easement

If a landowner does not desire to donate property or a conservation easement outright, it is possible to conduct a bargain sale. This land protection option allows a conservancy to purchase the property or a conservation easement below fair market value. This preserves the land while providing the landowner with some funds as well as a potential income tax deduction. This can also make it more affordable to the Conservancy when purchasing the land or a conservation easement. A qualified appraisal is required to determine the purchase price.

5.1.5 *Structural BMPs for Agriculture*

This planning process was fortunate to have active participation from the members of the Bay County Farm Bureau. These professionals spent time at meetings and shared their thoughts and

concerns. They helped with design of BMPs and provided education as to why some BMPs would not work in certain areas of the watershed. The following pictures are a look at V-ditches used for surface drainage and how a well placed BMP can all but eliminate sedimentation in roadside ditches.

Table 5.2 - Implementation Plan

Sources, Pollutants and Impairments to Designated Uses (P) = Possible (K) = Known	Causes (P) = Possible (K) = Known	Objectives	BMPs	Technical Assistance	Financial Assistance	Estimated Costs for Installation	Schedule for Implementation	Estimated Total Cost	Critical Areas (Priority Sub-Watersheds)
Livestock (K) - Pathogens, Sediment	Unlimited livestock access (K)*	Exclude livestock from stream access	Livestock exclusion, water course crossing	NRCS, CD	Farm Bill Programs, 319, CMI, Landowner	$15,000	BMPs installed on 50% of critical sub-watershed sites by 2013 and 90% by 2017	$45,000	1, 2, 4, 5, 6, 7
			Alternative water source	NRCS, CD	Farm Bill Programs, 319, CMI, Landowner	$2,500	BMPs installed on 50% of critical sub-watershed sites by 2013 and 90% by 2017	$7,500	
	Lack of manure storage (K)[1]	Construct waste storage systems or other BMPs to prevent pathogens from accessing surface water	Agricultural waste storage facility	NRCS, CD	Farm Bill Programs, 319, CMI, Landowner	$10,000-$250,000	BMPs installed on 50% of critical sub-watershed sites by 2013 and 90% by 2017	$1,250,000	1, 2, 4, 5, 6, 7
			Nutrient management, CNMP	TSP, NRCS, Ag Consultant	Landowner, CMI, Farm Bill Programs	$1,300	75% of operations have manure and nutrient management BMPs and CNMPs by 2017	$76,000	
	Lack of Education (P)	Provide Domestic animal education for riparian dwellers or those along drains	Education Brochures	NRCS, Drain Comm., Ag Consultant	Landowner, CMI, Watershed Education Grants from GLRI	$2,500	Develop templates for brochures and implement by 2013. Update brochures every three years.	$2,500	1, 2, 4, 5, 6, 7
Faulty on- site treatment systems (K) - Pathogens	Leaking, poorly maintained and over capacity on--site treatment systems (K)	Encourage proper installation and maintenance of on-site treatment systems	On-site treatment system education	B.C.H.D.	Great Lakes Restoration Initiative (GLRI); landowner; CMI	$6,000 - $8,000	Begin on-site educational outreach by 2013	$6,000 - $8,000	3, 7, 8
		Conduct public information sessions concerning on-site treatment system maintenance and mailing of surveys to specific sites.	Septic system education	B.C.H.D., MDEQ, MSUE	319, GLRI	See I&E Costs	Begin on-site educational outreach by 2013	See I&E Costs	
Municipal wastewater (P) - Pathogens	Poorly maintained, old sanitary sewer systems (P)	Repair/replace municipal wastewater system based on a Risk Assessment	Improve system	MDEQ	Bonds, loans, grants	$2 million +	Repair or replace 50% of failing systems by 2013 and 100% by 2017	$2 million+	7, 8
		Minimize discharges and sanitary sewer overflows	O&M	MDEQ, Waste Water Treatment Plants (WWTP)	Utility Fees	Fee Based	Repair or replace 50% of failing systems by 2013 and 100% by 2017	Fee Based	
	Lack of access to sanitary main line (P)	Provide access to districts or clusters of houses without access to a sanitary main	Extend existing system	WWTP	Utility Fees	Fee Based	Repair or replace 50% of failing systems by 2013 and 100% by 2017	Fee Based	
Inadequate sewer treatment (P) - Pathogens	Lack of regulation oversight; equipment or human error (P)	Encourage proper oversight for water quality	O&M	MDEQ, WWTP	Utility Fees	Fee Based	Begin educational outreach by 2011	Fee Based	
	Municipal overflows; timing of discharges (P)	Regulate timing of discharges	O&M	MDEQ, WWTP	Utility Fees	Fee Based	Repair or replace 50% of failing systems by 2013 and 100% by 2017	Fee Based	
Wildlife & Waterfowl (P) - Pathogens	Overpopulation in open water areas (P)	Control waterfowl and other wildlife populations	waterfowl and wildlife management	MDEQ	Ducks Unlimited	Varies	Address 30% of problem areas by 2013 and 75% by 2017	$50,000	8, Main Branch of Kawkawlin
Road kill (P) - Pathogens	Overpopulations and excessive amounts of road kill in ditches and drains (P)	Manage deer populations	Deer management	MDEQ, Whitetails Unlimited	MDEQ	Varies	Address 30% of problem areas by 2013 and 75% by 2017	$10,000	2, 3, 5, 6, 7
		Improve county pick-up program, education of county staff	Improve county program; I&E - Hazards of road kill	Bay County Road Commission, Board of Commissioners, MDEQ	Road Commissions	$6,000/year /county	Design and begin educational program by 2012	$18,000/yr	
Agricultural sheet, gully and rill erosion; sediment loading (K) - sediment, removal/lack of food sources	Conventional tillage, plowing up to edge of stream(s), erosion, improper or failing tile outlets (K)[1]	Encourage cover crops and reduced tillage, grassed waterways and windbreaks, stabilize streambanks and tile outlets	Cover crops, crop residue management, conservation tillage, streambank stabilization, vegetated buffer or filter strip, stabilized outlets, grassed waterways, windbreaks	NRCS, CD, MDA, Bay County Farm Bureau	Farm Bill Programs, 319, CMI, GLRI Landowner	$20,000	Address 30% of sub-watershed sites by 2013 and 90% by 2017	$25 million	2, 3, 5, 6, 7

Table 5.2 - Implementation Plan (cont.)

Sources, Pollutants and Impairments to Designated Uses (P) = Possible (K) = Known	Causes (P) = Possible (K) = Known	Objectives	BMPs	Technical Assistance	Financial Assistance	Estimated Costs for Installation	Schedule for Implementation	Estimated Total Cost	Critical Areas (Priority Sub-Watersheds)
Streambank erosion (K)[1] - Sediment	Altered hydrology (P)	Stabilize stream flows to moderate hydrology, reduce suspended solids and maintain the floodplain	Restore wetlands, floodplain management, storm water ordinance, conservation easement	NRCS, CD, Bay County Farm Bureau, MDA	Farm Bill Programs, 319, CMI, GLRI Landowner	$8,000 for adoption of ordinance	Increase management practices and number of conservation easements to include every sub-watershed by 2013 with a post construction regulatory mechanism by 2017	$8,000	2, 3, 4, 5, 6, 7
Stream restoration, creation of drains/drain maintenance, modified hydrology/drain modifications/naturally occurring (P) - sediment, water depth, loss of aquatic habitat	Straightening of waterways; channel improvements (P)	Reduce suspended solids	SESC plans, Two stage channel design, critical area treatment, stream-bank stabilization	BCDC & MCDC	Fees	Bid Process, Fee based	Conduct a sediment study and address 30% of hot spots by 2013 and 70% by 2017	Bid Process, Fee based	2, 5, 6, 7
	Channelization drains wetlands (P)	Net gain of wetland acres; belt width; buffers; preserve natural areas	Wetland restoration, vegetated buffer or filter strip, conservation easements	MDEQ, DU, FWS, NRCS, CD, LFC, private engineering firm	Farm Bill Programs, SBLC, Landowner	$18 million	Install practices on 50% of identified sub-watershed sites by 2013 and 90% by 2017	$16 million	
	Re-directed stream flow; irrigation; low precipitation or low lake levels (Sub-watershed 1); lack of vegetative cover (P)	Conduct hydrologic assessment prior to modifying drain hydrology or re-directing stream flow; increase tree canopy	Hydrologic study, vegetated buffer or filter strip, irrigation mgt.	BCDC, MDEQ, NRCS, CD	319 grants	$60,000 study, $460,000 filter strip	Conduct hydrologic study by 2012 and add buffer/filter strips to 50% of problem areas by 2015 and 70% by 2018	$380,000	
	Scouring of the stream bottom for drain maintenance removes stable natural habitat (P)	Conduct two-stage channel construction; establish buffer strips; build and restore in-stream habitat	Two stage channel design, vegetated buffer or filter strip, grade stabilization	BCDC, NRCS, MDEQ	Drain assessments	Bid Process, Fee based	Install practices on 50% of identified sub-watershed sites by 2013 and 90% by 2017	Bid Process, Fee based	
Construction and development (K)[2] - Sediment	Lack of SESC controls (K)	Improve use of BMPs to reduce suspended solids, use of more controls	SESC plans and approval process, inspections	County Enforcement Agency (e.g. BCDC or MCDC)	Fees	Fee based	Address 30% of sub-watershed sites by 2013 and 90% by 2017	Fee based	All sub-watersheds
Urban sheet and rill erosion (K)[3] - Sediment	Loss of pervious surfaces (K)[3]	Maintain and encourage pervious surfaces in development and encourage infiltration. Encourage LID	LID practices	MDEQ, NRCS, CD	Municipalities, 319/CMI grants	Varies	Increase infiltration by 15% by 2013 and 30% by 2017	Varies	All sub-watersheds
Agricultural practices (K)[4] - Nutrients, pesticides, loss of habitat, removal/lack of food sources	Over-fertilization of fields; lack of riparian buffer; livestock in streams (K)	Identify livestock operations adjacent to rivers; establish buffer or filter strips or other riparian buffer; increase canopy cover or canopy maintenance; reduce tillage; increase crop residue, exclude livestock from stream	Vegetated buffer or filter strip, crop residue management, PSNT, nutrient mgmt., livestock exclusion	NRCS, CD	Farm Bill Programs, Landowner	$10,000/site	Install practices on 50% of identified sub-watershed sites by 2013 and 90% by 2017	$700,000	2, 3, 5, 6, 7
	Improper pesticide application and calibration; leaching; runoff (P)	Increase of farms using Integrated Pest Management; installing riparian buffers such as filter strips, grassed waterways, other vegetative practices, cover crops	Integrated Pest Management, vegetated buffers or filter strips, grassed waterways	NRCS, CD	Farm Bill Programs, Landowner	$15,000/site	Address 10 sub-watershed sites by 2013 and 40 by 2017	$150,000	
	Wetlands drained for farming (K)[3]	Net gain of wetland acres	Wetland restoration, conservation easements	MDEQ, DU, FWS	Farm Bill Programs, Landowner	$250,000	Restore 5 critical wetland areas by 2013 and 20 by 2017	$5,000,000	2, 3, 4, 5, 6, 7
	Preservation of restored wetlands (K)[3]	Preserve natural areas	Wetland protection, conservation easements	MDEQ, DU, FWS	Farm Bill Programs, Landowner	$125,000	Preserve 5 critical wetland areas by 2013 and 20 by 2017	$2,500,000	1, 8
	Farming to the edge of the drains, streams or river; moving farming equipment across drains, streams (K)[1]	Keep farming equipment out of surface waters; stabilize drain banks to reduce sedimentation	Watercourse crossing, streambank stabilization, vegetated buffer or filter strip	NRCS, CD	Farm Bill Programs, Landowner	$240/mile	Install 200 miles of practices in critical sub-watershed sites by 2013 and 400 miles by 2017	$96,000	1, 2, 3, 5, 6, 7
Urban practices (K) - nutrients, pesticides	Over-fertilization of lawns and golf courses; lack of riparian buffer, faulty septic systems (P)	Establish filter strips or other riparian buffer; grassed waterways; educate the public on proper disposal of yard waste; encourage proper installation and maintenance of septic systems, initiate a phosphorus ban on commercial lawn fertilizers	Vegetated buffer or filter strip, grassed waterways, public education program, septic system ordinance, enforce or support phosphorus free fertilizer ordinance, (Bay and Saginaw County have them) Home*A*Syst	NRCS, CD, Bay Co. Board of Commissioners, Bay County Health Dept. (BCHD)	GLRI, Farm Bill Programs, Landowner	Varies	Begin public education program by 2013. I&E materials distributed and 100% participation in program by 2017	Varies	8
	Improper pesticide application and no calibration; runoff (P)	Educate homeowners on proper application	Lawn pest mgt., Home*A*Syst	BCHD, BCD, MSUE	MDEQ, County	Varies	Begin public education program by 2013	Varies	8

Table 5.2 - Implementation Plan (cont.)

Sources, Pollutants and Impairments to Designated Uses (P) = Possible (K) = Known	Causes (P) = Possible (K) = Known	Objectives	BMPs	Technical Assistance	Financial Assistance	Estimated Costs for Installation	Schedule for Implementation	Estimated Total Cost	Critical Areas (Priority Sub-Watersheds)
Urban expansion (K)[3] - loss of habitat	Wetlands filled for development (K)[3]	Net gain of wetland acres; greenways width; buffers	Wetland restoration, wetland ordinances, planning commission use of LLWFA, match state statute, increase awareness	MDEQ, DU, FWS	Farm Bill Programs, SBLC, Landowner	$145,000	Begin public education program by 2013 and enact ordinance by 2018 Train planning commissions in LLWFA usage by 2013	$145,000	8,3,2,5,6,7,4
	Influx of people building next to the surface waters, and removing riparian canopy and undergrowth (K)[3]	Install filter strips; establish forest buffers to increase tree canopy	Stream buffer ordinance	NRCS, CD	Farm Bill Programs, 319, CMI, Landowner, Municipalities	$8,000 for adoption of ordinance	Implement by 2015	$8,000	2, 3, 8
	Fragmentation of habitat (P)	Preserve habitats	Conservation Easements, Green space protection ordinances or planning	Saginaw Basin Land Conservancy, Little Forks Conservancy	CMI, GLRI, SBLC, LFC	$15.4 million acquisition; $8,000 for adoption of ordinance	Address 30% of problem areas by 2013 and 75% by 2017	$11.5 million	2, 3, 5, 6, 7
Improper disposal of materials (P) - pharmaceuticals	Lack of education (P)	Clean sweep collection for pharmaceuticals	Clean sweep program for pharmaceuticals	Bay County Health Dept.	EPA, GLRI	$50,000	Implement by 2013	$50,000	All sub-watersheds
Zebra Mussels (K)[4] – invasive species	Introduction from ship ballast waters on the Great Lakes and have moved up the Pinnebog from Lake Huron; boats carry mussels that have adhered to the boat and introduce them into new water bodies (K)[4]	Support invasive species bills; encourage involvement; minimize the spread of Zebra Mussels by conducting boat checks before launching	Invasive species management, I&E	NRCS, MDEQ	MDEQ, EPA	Unknown	Begin public education and boat check program by 2013. I&E materials distributed and 100% participation in program by 2017	Unknown	8
Gobies, Invasive carp, other invasive fish (K)[4]	Ballast waters of ocean going ships dumping into Great Lakes, Chicago Canal (K)[4]	Support invasive species bills; encourage involvement; minimize the spread of invasive fish species. Determine how to decrease population and improve establishment of native fish. Closure of Chicago canal	Invasive species management	MDEQ	MDEQ	Unknown	Ongoing effort	Unknown	All sub-watersheds
Invasive vegetation (phragmites, purple loosestrife) (K)[4]	Invasive and opportunistic plants (K)[4]	Develop eradication program. Education people on recognizing the plants. Elimination of the plants whenever possible	Herbicides, and biological BMPs or mechanical removal	MDEQ, BCDC	Landowner, GLRI, MDEQ	$10,000	Begin public education program by 2013. I&E materials distributed and 100% participation in program by 2017	$50,000	All sub-watersheds
Invasive aquatic vegetation (K)[4]	Invasive and opportunistic aquatic plants (K)[4]	Develop eradication program. Education of people on recognizing the plants. Elimination of the plants whenever possible	Herbicides, and biological BMPs or mechanical removal	MDEQ, Consultants	Landowners, Assessment district by township	Bid out, check with KRWPOA	Begin public education program by 2013. I&E materials distributed and 100% participation in program by 2017	$100,000	3, 7, 8
Log jams/snags (Woody Debris) (K)-trash and debris	High flow events; streambank erosion (K)	Manage woody debris; stabilize streambanks	Woody debris management, stream-bank stabilization	BCDC, BCD	BCDC assessments	$54,000	Continue annual stream clean-ups and reduce navigation obstructions by 75% by 2017	$40,000	1, 2, 3, 5, 6, 7
Pipe crossings (K) - trash and debris	Old petroleum pipe crossings over the river; depositional areas in the river (K)[1]	Remove Pipe crossings that block navigable waters	Obstruction removal	MDEQ	MDEQ	$50,000	Implement by 2015	$350,000	3, 7, 8
Lack of restoration (K)[1] - trash and debris	No designated entities responsible for removing obstructions and maintaining navigable waters (K)	Manage woody debris; organize volunteer stream clean-up activities	Woody debris management, volunteer clean up-public education	BCDC, BCD, MDEQ	BCDC Assessments, MDEQ	$25,000	Begin public education by 2013 and start volunteer clean up by 2015	$25,000	1, 2, 3, 5, 6, 7, 8
Beaver dams (K)[1] - trash and debris	Naturally occurring (K)[1]	Manage woody debris; remove if necessary	Woody debris management, dam removal, wildlife mgt.	MDEQ	MDEQ	$4,500	Continue annual stream clean-ups and reduce navigation obstructions by 75% by 2017	$4,500	1
Dumping (P) - trash and debris, obstructions	General misunderstanding of how humans negatively impact the watershed by discarding trash; lack of signs or threat of enforcement (P)	Hold Annual River or Drain Clean-Up Days to remove trash from the rivers/streams/drains; increase visibility of "No Dumping" signs	Volunteer clean up-public education, dumping ordinance	MDEQ, BCD	MDEQ, County	$6,000 for ordinance adoption; $2,000 for Clean up days	Begin public education by 2013 and start volunteer clean up by 2015	$6,000 plus $2,000/year for cleanup	All sub-watersheds
Limited places to enter the river (K)[3] - access sites	Much of the area is private property; not many access sites to Kawkawlin River (K)[3]	MDEQ to develop access sites on conservation easements; connect a water trail to the area Trail systems	Public access ordinance, conservation easements	MDEQ, Consultants	MDEQ	$20,000	Increase access by 30% by 2013 and 90% by 2017	$60,000	2, 5, 6, 7
							Estimated Total Cost for Watershed Implementation	**$70 million**	

*Noted through either field visualization / verification or aerial reconnaissance of 2010
[1] Visualized during field assessment of 2009
[2] Observations at construction sites
[3] Historical observations
[4] Based on visual observations in the field and existing reports

5.1.6 *Agencies Involved in Implementation of BMPs*

A Technical Committee for the Kawkawlin Watershed will be developed for implementation of the BMPs recommended in this chapter. Its membership will consist of members from the stakeholders committee consisting of the Bay County Drain Commissioner or designee, MDEQ representatives (Surface Water and ESSD), Bay County Conservation District, Saginaw Bay RC&D, USDA-NRCS, USDS-FSA, Bay County Farm Bureau, local government officials, Kawkawlin River Watershed Property Owners Association representatives, Saginaw Bay Land Conservancy, Saginaw Bay WIN, Little Forks Conservancy, landowners in the watershed, private consultants and qualified watershed engineers.

5.1.7 *Technical and Financial Assistance*

The technical and financial assistance needed for the implementation effort of this watershed management plan and its BMPs are listed in Table 5.1 and in the Appendix N. The majority of the future funding will come from many different sources: Michigan's CMI, the Federal governments Great Lakes Restoration Initiative (GLRI funds), Federal Section 319 funds, NRCS programs such as EQIP and WHIP, local funding from community foundations, Saginaw Bay WIN, county departments and various conservation organizations.

5.1.8 *Estimated Pollution Reductions from Proposed Actions, Strategies and BMPs*

Non -Point Sources

When using the tables in Appendix H developed from the 2010 Aerial Survey and if all sites are addressed through the years of plan implementation we anticipate that **4,206 Tons of sediment** will be removed from the watershed which includes a **reduction of Phosphorus loading** of an additional **4,626 pounds** and a **reduction of 9,252 pounds of Nitrogen**. The proposed pollutant reductions using the table representing the Watershed Assessment completed by the Saginaw Bay RC & D in 1998 and estimating the pollutants in the sediment along with the observations of domestic animals with access to the Kawkawlin and its tributaries provides the following, a **reduction of 46,058 pounds of Phosphorus** and **45,867 pounds of Nitrogen**. A total of **11,823 Tons of sediment** could be removed from the Kawkawlin and its tributaries with this source reduction plan.

If the assumption that the pollutant reductions from the implementation of BMPs on the identified NPS sites will be 100 percent for the sediment and nutrients listed, the total pollutant reductions from those sites listed will be 16,029 tons of sediment, 50,684 pounds of phosphorus and 55,119 pounds of nitrogen.

A goal was established in Table 5.2 to reduce sediment and nutrients by 30 percent in over the first 3 years and 90 percent in 15 years from the identified sites. A targeted reduction of 30 percent was established based on the current MDEQ water quality standard for total suspended solids of 30 mg/L as a 30-day average. USGS base flow data indicates that roughly 100 cfs is produced from the Kawkawlin River. The following calculation is used to estimate the acceptable sediment loading to the river.

Baseflow:

$100cfs = 2{,}800L/s$

TSS:

$$30\frac{mg}{L}\cdot\frac{kg}{1{,}000{,}000mg}\cdot 9.8\frac{m}{s^2} = 0.000294\frac{N}{L}$$

$$0.000294\frac{N}{L}\cdot\frac{lb}{4.45N} = 0.000066\frac{lb}{L}$$

$$Sed\ Rate = 0.000066\frac{lb}{L}\cdot 2{,}800\frac{L}{s}\cdot\frac{86{,}400s}{day}\cdot\frac{365day}{yr}\cdot\frac{ton}{2{,}000lb} = 2{,}900\frac{tons}{yr}$$

This information was compared to sediment data from the HIT2 model in Table 5.3 estimates a sediment load of about 4,400 tons/yr for the Kawkawlin River Watershed. Therefore, this needs to be reduced by 1,500 tons/year or about 30% to achieve the target TSS load of 30 mg/L. This level of reduction was met when the 30 foot grass buffers were applied to all agricultural streams in the HIT2 model.

Table 5.3 - HIT 2 Model results for sediment removal by 30 foot grass buffer on all agricultural streams and sediment removal associated with removed sediment.

Kawk. WMP Sub-watershed	HUC-12 Watershed	Sediment (tons/yr)	P-Load (lbs/yr)	N-Load (lbs/yr)	% Reduce Sediment	Sed. Rem. (tons/yr)	P Rem. (lbs/yr)	N Rem. (lbs/yr)
1	40801020201	264	290	580	24%	63	70	139
2	40801020205	1,222	1344	2688	49%	599	659	1,317
3	40801020205	84	92	184	49%	41	45	90
4	40801020202	522	575	1149	58%	303	333	667
5	40801020203	764	840	1680	51%	389	428	857
6	40801020204	822	905	1809	48%	395	434	868
7	40801020206	434	477	954	50%	217	239	477
8	40801020206	339	373	745	50%	169	186	373
Totals		**4,450**	**4,890**	**9,790**	**49%**	**2,180**	**2,390**	**4,790**

For the **entire Kawkawlin River Watershed**, the goal is to reduce sediment and nutrients by 30 percent in 3 years and 90 percent in 15 years from the other areas identified in future investigations in the watershed. Additionally, one major goal is to reduce the potential for an oil spill in the River and Saginaw Bay by removal of the abandoned petroleum pipelines within 3 years (by 2014).

Estimated Load and Reduction from domestic livestock access or proximity areas:

This calculation is shown on the last page of Table H-1 of Appendix H and is summarized for cattle at 0.5lbs - P /cow/day and for horses at 0.2lbs –P/horse/day. The sources for the calculations for Phosphorus and Nitrogen were from the MDEQs *Pollutant Controlled Calculation and Documentation for Section 319 Watersheds Training Manual, June 1999* and literature from the University of Minnesota, 1997 Minnesota Cattle Feeder Report B-450 and USDA 1990 report. So for cattle this can be construed as a loading of 182.5 pounds of Phosphorus per year or 73 pounds per year for horses. The sites that were visualized in the Kawkawlin watershed were typically not concentrated animal feeding lots and there was modest area for the animals to range in and the waste material was buffered by vegetation before direct access to the surface water Table H-1 reflects these loading and reduction assumptions in the calculation. A summary of the estimated reduction in pollutant loadings from the livestock in the watershed is:

- Phosphorus Reduction of 36,719 pounds
- Nitrogen Reduction of 25,214 pounds
- Sediment Reduction of 3,336 Tons

Estimated Reduction in Fertilizer Usage – Urban Areas

Approximately 35,500 feet of frontage is along the urbanized area of the Main Branch on both sides of the River. If it assumed that an average width of 70 feet may drain or is sloped toward the River we have about:

Calculation for area of lawn fertilized at the river frontage:

35,500 ft * 70 ft = 2,485,000 ft^2

Fertilizer applications to home lawns are usually based on applying approximately 1 point of Nitrogen per 1,000 ft^2 per application (EPA, 2001). Based on the 1lbN/1,000 ft^2 application of 28:3 (low Phosphorus Fertilizer; 28 Nitrogen – 3 Phosphorus) fertilizer is used or has been used in the past before the ban. There would be 1lb N and 0.05 lb P/1000 ft^2 of lawn. If we assume 5% of the application reaches surface water from the lawn areas

Fertilizer phosphorus application calculation:

0.05 lb P * 2,485,000 ft^2 / 1000 ft^2 = 124 lbs P/application

Assuming 2 applications per year = 124 lbs P * 2 applications* 0.05 = 12.4 lbs / yr

Fertilizer nitrogen application calculation:

1 lb P * 2,485,000 ft^2 / 1000 ft^2 = 2,485 lbs N/application

Assuming 2 applications per year = 2,485 lbs N * 2 applications = 4,970 lbs / yr and again only 5% reaches the surface water, then 248.5 lbs/yr of nitrogen reaches the Kawkawlin River.

If the fertilizer ban is enforced along the river and since Bay County has a ban on Phosphorus containing fertilizers and the use of "no phosphorus" fertilizers prevails it is possible to eliminate all phosphorus from this source. Therefore, 12.4 lbs/yr of phosphorus is eliminated.

Estimated Load and Reduction from On-Site Disposal Systems (OSDS):

Determination of pollutant loading from on site disposal systems is difficult and many factors must be considered including soil type, age, condition, use of system and proximity of system to ground and surface water sources. The following table was documented from *Onsite Wastewater*

Treatment Systems Manual published by the EPA in 2002 and depicted numerous studies of effluent and pollutant levels.

Table 5.4 - Characteristics of Domestic Septic Tank Effluent					
Parameter	University of Wisconsin (1978)	Harkin, et al (1979)	Ronayne, et al (1982)	Ayres Associates (1993)	Ayres Associates (1996)
# tanks sampled	7	33	8	8	1
Location	Wisconsin	Wisconsin	Oregon	Florida	Florida
# samples	150	140-215	56	36	3
TN mgN/L	45	82	57.1	39	66
TP mgP/L	13	21.8	-	11	17
Fecal coliforms log/L	4.6	6.5	6.4	5.1-8.2	7.0

Using the data from the Bay County Health Department report for this WMP, where were potentially 191 parcels listed as not being connected to sanitary sewers and 177 parcels identified with On Site Disposal Systems and associated records. If we use the total of these parcels (368) and assume that 90% have on-site systems and are within 1,000 feet of the river or a tributary to the river. We will determine estimates to be calculated for the nutrients nitrogen and phosphorus for the Kawkawlin River. From the EPA document *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*, a conventional on site system has a TN reduction of 28% and a TP reduction of 57% and a Pathogens (logs) reduction of 3.5. The following table provides a estimated effluent load for a residential conventional system:

Table 5.5 - Estimated On-site Disposal System load estimate for a Conventional system			
Parameter	Sample Pollutant Load	# on-site disposal systems	Estimate effluent load
TN (mg/L)	82	368	30,176
TP (mg/L)	21.8	368	8,022
NOTE: these estimates are based on 1 L/day, typically effluent going to a drain field will be much more than this, though reliable estimates were not found.			

For TN this equates to 0.06 lb/Liter of effluent equates out to 24 lbs/yr of Nitrogen and for TP this would be equivalent of 6.5 lbs/yr of Phosphorus eliminated from the nutrient load.

Table 5.6 - On-Site Disposal System Load Reduction					
Parameter	Total Effluent loading	Conventional System		Sanitary System connection	
		% reduction	Amount	% reduction	Amount
TN (lb/yr)	24	28	6.72	100	24
TP (lb/yr)	6.5	57	3.7	100	6.5
		Cost/system	Overall costs		Cost of system
		$2,700 – $6,700	$993,600 – $2,465,600		Unknown-needs more study

Based on the above estimate and the % reduction noted from the EPA source listed above we have estimated that if all of the systems identified and were upgraded with new on-site disposal systems the following reduction would occur: