

Kawkawlin River Watershed Improvement Project

Summary of Project Plan

The Kawkawlin River Watershed, located within the greater Saginaw Bay Watershed, drains nearly 250 square miles of land. It has been impaired by cropping and animal agriculture, failing septic systems, channelization, riparian encroachment, soil erosion and land development. The Kawkawlin River suffers many water quality concerns including E.coli, phosphorous, dissolved oxygen, sediment and lack of habitat diversity.

Restoration goals for the Kawkawlin River are: (a) to reduce of E.coli levels in the river to achieve Water Quality Standards, (b) to improve habitat and water quality by reducing sediment and nutrient input to reduce average phosphorus concentrations to an acceptable level (c) to implement low impact development (LID) practices in developing areas of the watershed, and (d) to protect and restore the natural river channel habitat and riparian greenway floodplain corridor. Several efforts over the past five years have identified the areas of concerns and helped develop the implementation activities proposed.

Watershed Characteristics

The Kawkawlin River is 37 miles long with 450 miles of tributary watercourses and a watershed area of nearly 250 square miles in Bay, Midland, Gladwin and Saginaw Counties. The watershed consists of flat, lacustrine clay soils that have been artificially drained for agricultural purposes. Over 85% of the naturally occurring soils in the watershed area are classified by the United States Department of Agriculture as poorly drained.

Agriculture is the primary economic activity and land use in the predominately rural watershed. The watershed includes urbanized areas, animal and cropping agriculture and a mix of woodlands, wetlands and low density residential. In the headwaters, the Kawkawlin River riparian corridor is bordered mostly by forested floodplain. Land use in the watershed is summarized below.

LAND USE	NORTH BRANCH KAWKAWLIN RIVER	SOUTH BRANCH KAWKAWLIN RIVER
Urban	2.6%	12.6%
Agriculture	43.1%	73.3%
Forested	40.2%	7.5%
Water	0.1%	0.3%
Nonformal	6.1%	4.7%
Wetland	7.9%	1.6%

Recreational use including hunting, fishing and boating in the Saginaw Bay and lower reach of river contribute tremendously to the local economy. The Saginaw Bay is primarily used for walleye fishing and boating. The lower Kawkawlin River is utilized for boating and recreation. The river provides spawning areas for walleye and northern pike.

Population in the Kawkawlin River watershed is concentrated in Bangor, Kawkawlin, and Monitor Townships. The north and west portions of the watershed are primarily rural. Populations of the municipalities in Bay County along the Kawkawlin River are summarized below:

- Bangor Township – 15,547
- Monitor Township – 10,037
- Kawkawlin Township – 5,104
- Williams Township – 4,492
- Beaver Township – 2,806
- Garfield Township – 1,775
- Mt Forest Township – 1,405

The Kawkawlin River responds rapidly to storm events lacking adequate riparian storage to attenuate flood flows. It has low base flows and is a warm water fishery. The elevation of the watershed ranges from 580 feet at Lake Huron to 680 feet (mean sea level). It lacks a diverse combination of pools, riffles zones, runs and bends. Sediment deposition has covered stable habitat that could otherwise support microinvertebrate diversity. Currently, the river supports primarily tolerant species.

Problems, Threats, and Need for Project

Over the past three years there has been substantial public unrest regarding human health concerns related to elevated E.coli levels in the Kawkawlin River. There is currently great local support for a holistic approach to restoring this river system. The Kawkawlin River plan is designed to reduce pollutant loading to the Saginaw Bay by addressing the following: known livestock access sites, failing septic systems, erosion sites, and abandoned oil pipelines.

Monitoring by the Bay County Health Department and the Kawkawlin River Watershed Property Owners Association indicate elevated phosphorus levels and human health concerns due to regular E.coli Water Quality Standard violations.

In 1997, the Kawkawlin River Property Owners Association initiated a 5-year monitoring program to evaluate water quality on the river. The results indicate that there are sporadic occurrences of fecal coliform levels that exceed Michigan Water Quality Standards by 30% to 40%. Fecal coliform counts seem to be highest and most frequent near Chip Road and Wheeler Road.

The Bay County Health Department reviewed sewage systems in 2003. The review identified many-failed septic sewage systems in Bay County. It indicated that 80% were "trench systems" typically installed below the seasonal high water table and most likely prior to 1977. Twenty percent (20%) of the remainder were "drain field" systems installed above the seasonal high water table. Trench systems that were still in working condition were on the average 45% larger than those that failed.

The Kawkawlin River Property Owner's Association monitoring program measured phosphorus levels over the past five years at several monitoring stations, including Wheeler Road, Seven Mile Road and Chip Road, to be from 0.11 mg/l to 0.14mg/l as a five-year average, exceeding EPA water quality standard of 0.05 mg/l.

Livestock in the Kawkawlin River watershed contributes to the water quality problem. Fourteen sites have been identified where livestock have direct access to the river. Additional sites exist in which livestock are managed in close proximity to the waters. Uncontrolled livestock access is a significant source of erosion and increased sediment load. In addition, E.coli, nutrients, and other pathogens in animal waste enter the river and its tributaries as runoff during storm events from these livestock operations.

Monitoring by the Kawkawlin River Property Owners Association and biological surveys conducted by MDEQ 200 identified violations of Water Quality Standards for dissolved oxygen. At the Seven Mile Road station, dissolved oxygen was as low as 0.68 mg/l in one sample and there were seven violations noted from 1998-2001. In 2000, a biological survey by MDEQ attributed fish kills on the river near Beaver Road to low dissolved oxygen levels.

The biological survey also found that habitat such as walleye spawning areas has been destroyed due to the on-going sedimentation. The biological survey states that portions of the river lack stable habitat and is homogenous in nature, lacking the diversity of pools, riffles, runs and bends. In addition, the deposition of sediment has covered existing stable habitat and the river no longer provides the niche spaces for a well balanced, diverse macro invertebrate community. Furthermore, highly variable stream flows contribute to the erosion of banks along the river resulting in increased sedimentation and further limiting the availability of niche space.

E.coli, sediment, and other pollutants have degraded the river channel habitat and riparian corridor, diminished the recreational uses of the river and created health safety concerns. A negative impact on the local economy and surrounding property values demonstrate a need for this project.

E.coli is the highest priority threat and immediate, widespread measures must be implemented to control E.coli on the Kawkawlin River. It is also critical that BMPs including buffer zones and conservation easements be implemented to control the inflow of sediment and nutrients, and, the river channel habitat be restored by stabilizing bank erosion and removing detrimental sedimentation and obstructions.

The desired outcome for this project is for the Kawkawlin River to meet water quality standards for E.coli and phosphorus established by the MDEQ. Buffer strips, conservation easements, and BMPs along the river corridor are proposed to improve water quality. The installation of demonstration low impact development (LID) practices in the watershed will serve as a model for future development. An additional outcome is the restoration of the Kawkawlin River to a more natural state, the increased recreational use of the river, decreased threat to human health, and an improved local economy.

Project Plan

This project implements four (4) primary goals. Efforts will be tracked, monitored and reported on according to these primary goals. Providing market based approaches and incentives to the general public, agriculture, and the development industry is paramount in the sustained restoration of the Kawkawlin River. Work plans for each goal are provided in following paragraphs.

(a) Reduce E.coli levels in the Kawkawlin River

Addressing failing septic systems and reducing agricultural encroachment / impact on the river is expected to reduce E.coli levels in the Kawkawlin River.

Failing septic systems are located along the river at many homes and farms. The locations of the known and observed failing systems will be input into county GIS, prioritized and tracked. Priority areas will be established based on river water quality. Residents in priority areas will be invited to attend septic system education courses that will be offered three times per year. Home sewerage best management practices will be

developed and discussed including (1) education and cost sharing incentives, (2) market options and alternatives for sewage management and (3) professional septic maintenance training.

Residents living in the priority areas who attend one or more education course will receive a cost share for septic inspection, maintenance, repairs and replacement. Cost shares will include reimbursement of up to 50 percent. Operation and Maintenance (O&M) Agreements will be encouraged and facilitated through Bay County Health Department. The County will provide training and will work with professionals and landowners.

Guides to assist landowners in deciding upon sewage management systems will be provided. The guide will provide cost outlines of sewage management of conventional systems and alternative community systems and their life cycle costs. Potential implementation mechanisms will be discussed.

Agricultural exclusion in proximity to the Kawkawlin River will be addressed closest to prioritized sites. Farmers will be invited to education courses that will be offered once a year. The attending landowners will meet with conservation agencies to develop cost sharing programs with 50% reimbursement. Implementation is expected to include a combination of comprehensive nutrient management planning, fencing, natural riparian buffers, filter strips, and limited-access crossings to address soil erosion concerns as necessary. The combination of these actions will reduce the waste reaching the drain while stimulating the local economy, and making conservation a profitable business.

(b) Reduce sediment and nutrient input to the Kawkawlin River and protect riparian greenway floodplain corridor.

The riparian corridor will be improved to reduce sediment and nutrient loading through implementation of up to 100 foot grass filter strips or riparian forested buffers, exclusionary practices for both animal and human activities, and outreach to educate the community of the benefits of establishing and protecting a riparian corridor. In addition, where deemed vital and appropriate, the corridor will be protected on a permanent basis through the use of Easements. Either a public agency or a local land conservancy will hold the easements for restoring the river channel habitat, reducing non-point source pollution, restoration of eroded banks, riparian corridor establishment or protection, and or exclusion of either human or animal activities.

Focus groups including specific landowners / operations that contribute to the impairment of the river system, local officials, and other stakeholders will be held. These focus groups, combined with existing knowledge, will prioritize the identified sites for BMP implementation. Conceptual plans will be developed for each site. Execution of the plans include technical assistance for landowners to prepared comprehensive nutrient management programs, creation or establishment of buffer practices, and installation of BMPs.

Activities that may be required include:

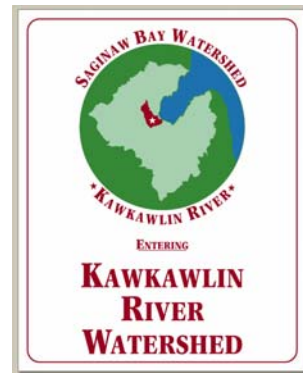
- Hydrology and hydraulic calculation
- Stream bed character and stream bank stability analysis
- Land owner and stakeholder access agreements

- BMP management and maintenance activity
- Downstream and upstream impact analysis
- Preparation of easements
- Topographic survey, site and grading design
- Structural integrity and design of
 - Cross vanes
 - J-hooks
 - Revetments
 - Live stakes
 - Grade control structures
 - Etc.
- Selection and layout of appropriate planting species
- Location of tile breaks
- Design level control devices
- Specification of materials and methods of implementing practices
- Coordination with
 - Farm Services Agency
 - National Resources Conservation Services
 - Michigan Department of Agriculture staff on project needs.

Securing approximately 6 linear miles of riparian corridor (approximately 70 to 100 acres) will be completed. This activity may require the preparation of Easements Options, acquisition of title insurance, land owner onsite negotiation of the limits, surveying and describing of easements, coordination and subordination of interested parties.

Increasing the Kawkawlin River Watershed signage will be completed as part of this project. Signs currently appear along major roads at the boundary of the watershed. The number of signs planned to be added is 25.

In addition, these signs will be installed at key locations in the watershed where implementation practices, as well as where information, education, outreach and demonstration project activities occur. These signs are intended to promote a consistent image of all the Kawkawlin River Watershed and Restoration Activities under implementation to the public.



Locations of abandoned oil and gas lines will be identified and recorded as part of this project. This will minimize associated threats to the watershed in the future.

(c) Implement low impact development (LID) practices in developing areas

Implementation of Low Impact Development (LID) in the Kawkawlin River watershed will reduce flooding and filter storm water runoff before it reaches natural waterways. LID techniques will be made accessible and reasonable to developers in the watershed. A combination of education, training, and demonstration will be used to research a combination of cold-climate Best Management Practices (BMPs) in the Kawkawlin River watershed.

LID principals and a basic understanding of design will be introduced at educational seminars. A conference with LID professionals will introduce the concept through targeted sessions for groups including engineers and architects, contractors and landscapers, developers, and municipal planners and directors. These sessions will provide a toolkit for the development industry to change the future of the watershed.

Construction of LID demonstration projects in the watershed will follow this seminar. Developers who express an interest in implementing a demonstration site will be awarded funding to offset the additional cost of design and construction associated with these experimental practices. A maintenance and educational contract will be required for grant funding to be awarded. This will ensure the long-term success of the site and its availability as an educational tool. Design, construction, implementation, and maintenance costs will be tracked for use in a final educational publication. Demonstration sites will include: bio-detention (aka rain gardens), pervious concrete pavements, and open space land development techniques.

Monitoring and evaluation of these experimental sites will be conducted for a minimum of three (3) years after their implementation. Remote sensing equipment will monitor flow and water chemistry at each practice and a comparable "traditional" site. These sensors will be moved between sites in order to collect the maximum amount of data. Field monitoring of flow and sampling for analysis will be performed by local professionals or Saginaw Valley State University students.

(d) Implement practices to protect and restore the natural river channel habitat

At least 25 sites with moderate to severe bank erosion exist in the watershed. The majority of the river has experienced sedimentation that is detrimental to river channel habitat. Demonstration BMPs to restore the river channel habitat and stabilize eroding banks will be implemented. Coordination of access to these sites will be completed. It is expected that access to the sites will be coordinated with conservation easement.

Innovative bank stabilization technologies such as tree revetment, erosion control fabrics, geo-web, A-jacks, bank tapering, installing live stakes, planting shrubs, placement of bio-lunkers, log revetments, pool and riffle zones, cross vanes, and J-hooks will be considered. Channel restoration including removal of detrimental sediment, log jams, crossings and restoration of natural channel bottom with riffle and pools to promote the niche spaces for a well balanced, diverse macro invertebrate community. It is expected that at least five (5) sites will be prioritized and BMPs installed. The BMPs will then be used to educate the local agricultural community on river restoration alternatives.

Sites will be monitored by professionals with completion of biological surveys. Improvements to the river channel ecosystem will be reported on.

Anticipated Outcomes

Establishing the natural function of the Kawkawlin River will promote better flow throughout its length. Reports document that the North Branch of the Kawkawlin River and the Culver Creek tributary are currently impaired, with stagnant or low flow areas and the deposition of sediment covering stable habitat. Eroding banks and lack of riparian zones are present. Sites have been identified for impaired stream bank erosion, road crossings and livestock access points. Correction of these sites and a program to educate the residential and agricultural landowners will significantly reduce the sediment

loads to the river. This will be significant in the upper reaches where returning the river to its natural state of pools, riffles, runs and bends, improved riparian buffers will eliminate sediment deposition. Decreasing the sediment load with its accompanying pollutants (nutrients) and BOD will improve water quality. This will increase survival of spawning fish such as the northern pike and walleye that utilize the upper reaches of the river for hatching new generations of game fish for the Saginaw Bay. Improving oxygen levels in the water column will help with the survival of fish and improve the macro-invertebrate population.

Long term monitoring of macro-invertebrates and fish species at various times of the year will provide an indicator related to the actual outcome of the work performed. Improvement in the aquatic environment will mean increased survival rates for fish and improved fishing opportunities in the river and ultimately elimination of fish kills related to low DO (dissolved oxygen) levels. This sampling will be completed by either MDEQ staff that are familiar with the site or local professionals.

By addressing and significantly lowering the E.coli levels in the Kawkawlin River this project will address the public's demand for a cleaner river. Monitoring studies such as the *Kawkawlin River Volunteer Monitoring Report from 1997-2001* shows elevated E.coli at the Chip Road and Wheeler Road monitoring stations. Water advisory warnings occurred 56 days in 2005 and 37 days in 2006. Lowering E.coli levels will decrease the number of water contact advisory days and will therefore address water quality concerns of landowners and water recreation enthusiasts.

The LID demonstration project will be part of the public education and outreach for this project and will be marketed as such. Whenever seminars or conferences are held in this region on storm water BMPs or LID these sites will be used for the education. Implementation aspects, cost / benefit of this type of design and monitoring of Water Quality of the storm water runoff will be included in this outreach.

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