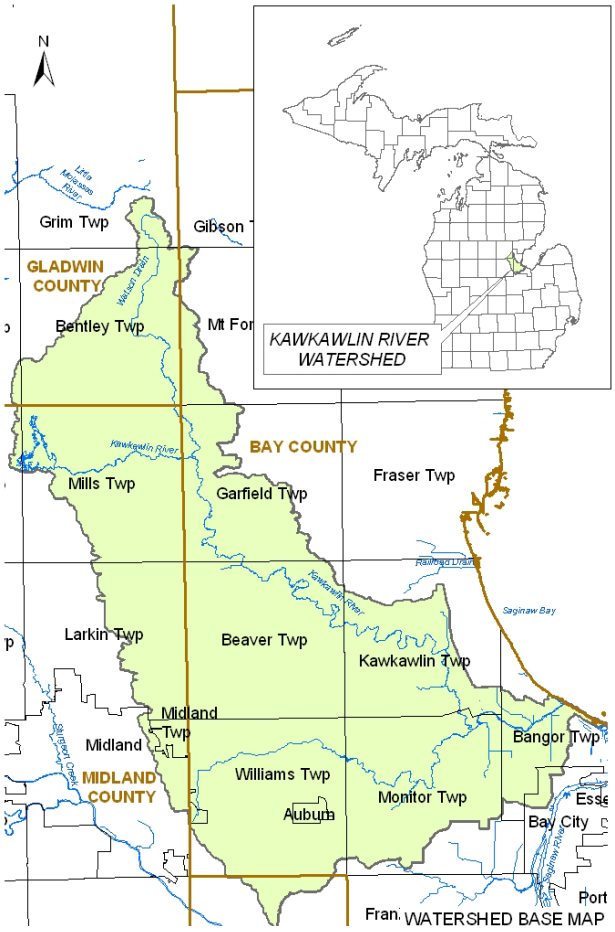
Kawkawlin River Watershed

Impervious Surfaces Build-out Analysis

The Kawkawlin River Watershed, located within the greater Saginaw Bay Watershed, drains nearly 250 square miles and encompasses areas in Bay, Gladwin, Midland, and Saginaw Counties. The Kawkawlin River Watershed Partnership initiated a project to investigate the effects of future development on water quality.



The Kawkawlin River Watershed project used Geographic Information System (GIS) software to analyze potential land cover scenarios. Current land cover, estimated from satellite imagery, was compared to future land use maps. This build-out analysis allows township officials to visualize a possible future of their community, not in the conventional terms of populations or buildings, but in terms of impervious surface cover and its impact on local water resources.

What Are Impervious Surfaces?

In an undeveloped watershed, the vast majority of the landscape is pervious surface, such as farmland, forests, wetlands, and meadows. Most rain and snow falling on the watershed either infiltrates into the ground or is taken up by vegetation. Impervious surfaces are surfaces

such as rooftops, roads, driveways, sidewalks, and parking lots that are hard enough to prevent rainfall and snowmelt from soaking into the ground. Water runs off of them, not through them, and with that runoff comes a host of problems.

This increase in runoff affects the hydrology, morphology, water quality, and ecology of surface waters in a watershed. Therefore, the level of imperviousness in a watershed can be linked to stream degradation. As little as 10% watershed impervious surface cover has been linked to stream degradation in many regions of the country (Schueler and Holland, 2000).

Why Is Storm Water Runoff a Problem?

Storm water runoff is rainwater and snowmelt that runs off land and enters rivers, lakes, streams, or wetlands. Effective management of storm water runoff helps to provide watershed protection and is a critical need for the communities of the Kawkawlin River Watershed. Storm water runoff increases as land is developed and the rainwater can no longer soak into the ground. In addition, storm water runoff picks up pollutants as it flows across the urban, suburban, and agricultural environments, and then delivers them into downstream waters, causing water quality problems. Storm water runoff impacts local communities through flooding, stream channel erosion, damage to property, water quality impairment, habitat destruction, and diminished quality of life.

How Can Storm Water Runoff Be Controlled?

Proper storm water runoff policies are vital in controlling the impacts of development on watersheds and water resources. Best Management Practices (BMPs) are often used to either reduce runoff volume by infiltration or detain and treat storm water to reduce pollutant levels and control the peak flow rate of runoff.

Porous pavement is an example of a BMP to control storm water runoff. Porous pavement materials include open-jointed pavers that can be filled with turf or aggregate, soft paving materials such as wood mulch and crushed shell, and traditional decking. Porous concretes and asphalts are being developed which provide solid, safe surfaces for foot and vehicle traffic, but also allow rainwater to percolate down into subsurface soils.

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What a Build-out Analysis Tells Us About a Watershed

The Kawkawlin River Watershed was divided into subwatersheds of about 10 square miles. The existing level of imperviousness was determined for those subwatersheds, and they were placed into one of the following three categories:

Protected streams have watersheds that are under 10% impervious and typically have good water quality, good habitat structure, and diverse biological communities if riparian zones are intact and other stresses are absent. Protected streams typically will be in rural areas that have not seen a great deal of development and may contain significant natural areas.

Protected Stream

Degraded Stream

Degraded streams have watersheds that are 10% to 25% impervious and show clear signs of degradation and only fair in-stream biological diversity. Degraded streams have already seen some measure of development.

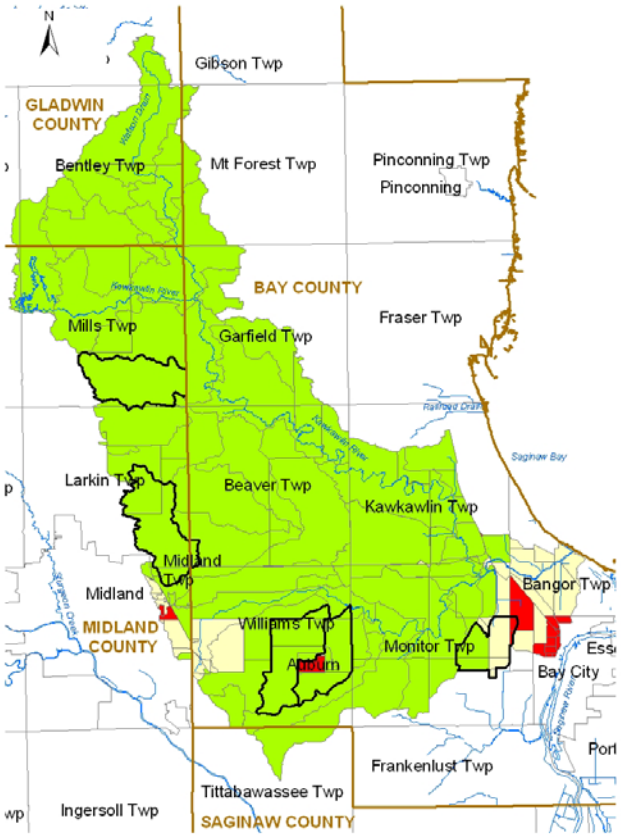
Impacted streams have watersheds that are more than 25% impervious, a highly unstable channel, and poor biological conditions supporting only pollutant-tolerant fish and insects.

Impacted Stream

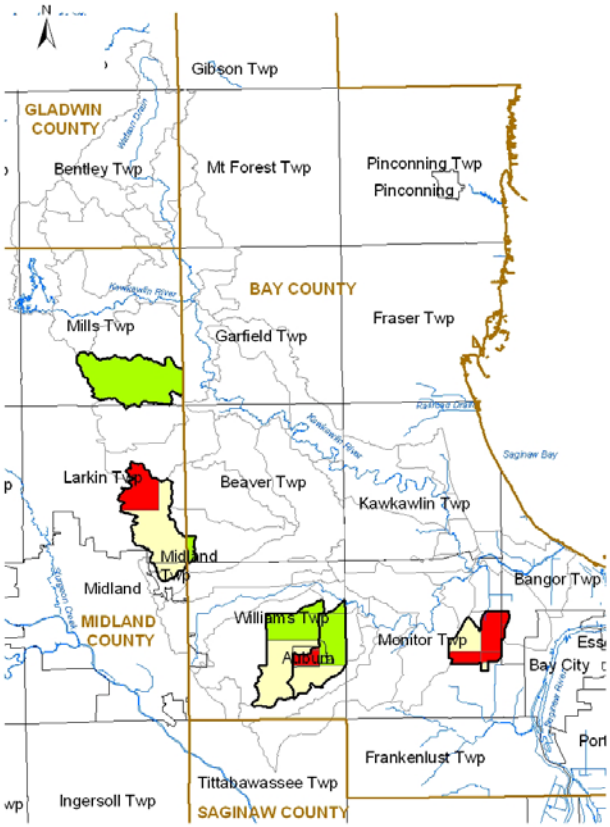
In the Kawkawlin River Watershed, a build-out analysis was used to determine the effects of impending land cover change on five selected subwatersheds. The analysis used population density, land cover, and land use intensities to determine changes in impervious surfaces that would occur if communities developed according to future land use plans.

The results of the analysis run on existing conditions identified small areas in the Cities of Midland, Auburn, and Bay City that are currently surpassing impacted threshold levels and may be experiencing adverse water quality effects. The results of the analysis using future land use maps illustrated the effects of development, showing the selected subwatershed areas within Larkin Township and Monitor Township reaching impacted threshold levels when developed.

Existing Level of Imperviousness



Future Level of Imperviousness



LEGEND

Watershed < 10% Impervious, protected streams

Watershed 10%-25% Impervious, degraded streams

Watershed > 25% Impervious, impacted streams

How to Use the Results of the Build-out Analysis at the Local Level

Land use planners interested in preventing and/or mitigating the impacts of urbanization on water resources need to be aware of the extent of impervious surfaces in their community and ways to use this information for better community planning and site design. The relationship of impervious surface cover to water quality and quantity can be used on large and small areas, even if specific pollutants and sources are not identified. Impervious surface analysis is a practical planning tool for reviewing existing land use and the potential effects of future development on water quality, because it can be easily measured and recognized in the landscape. It allows for a variety of future land use scenarios to be reviewed and compared, thus supporting the decision-making processes of planning and enforcement of zoning, subdivision, and wetland regulations.

Land use planners can use this information to critically analyze the degree and location of future development that is expected to happen in a watershed. Land use planning ranks as perhaps the single most important watershed protection tool. A goal of a land use planner should be to plan for development toward subwatershed that can support a particular type of land use and/or density. The basic goal of a watershed management plan is to apply land use planning techniques to redirect development, preserve sensitive areas, and maintain or reduce the impervious cover within a given subwatershed.

Many of the subwatersheds in the Kawkawlin River Watershed are entirely contained within the same political jurisdiction, which helps to establish a clear and direct regulatory authority. This study was conducted on a subwatershed and census block group scale to provide management units that are

meaningful to the planners and the public. These subwatersheds are also small enough in which to perform monitoring and evaluation to assess the effectiveness and success of a project.

Stream Protection Goals

The classification of the subwatersheds as *protected, degraded*, and *impacted* can assist the communities in developing goals and criteria for development. With these goals and criteria in place, developers and consultants can refer to the subwatershed and determine applicable site requirements for that particular subwatershed (Schueler and Holland, 2000 - Article 29).

Protected subwatersheds, with less than 10% impervious cover, should have a goal of maintaining predevelopment hydrology and biodiversity and set limits on site development impervious cover to less than 10%. To protect the streams, wide buffers are recommended through land acquisition or conservation easements.

Degraded subwatersheds, with 10% to 25% impervious cover, should have a goal of limiting degradation of stream habitat and quality through mitigating the impacts of existing and new development through site design, setting an upper limit for the watershed imperviousness, implementing stormwater BMPs, and restoring natural areas. Implementation practices should focus on pollutant removal and channel protection measures.

Impacted subwatersheds, with over 25% impervious cover, should have a goal of minimizing downstream pollutant loads by preventing flooding and creating preservation areas to reduce the effects of flooding. Many planners recommend that these watersheds be target areas for urban infill development.

Creating a plan based on these goals can protect rivers, lakes, and streams from the effects of development in a watershed. This method of classifying and managing urbanizing watersheds can improve the effectiveness of practices implemented by limiting the amount of new impervious cover that can be created. But further change will require a shift in how runoff is thought about. Planners have begun, and must continue, to get away from the idea that rain is wastewater, something to get rid of, to pass along to our neighbors downstream. Storm water needs to be kept where it falls, and the way to keep it is to get it back into the ground.

Several tools are available that can be used to meet stream protection goals. One of those tools involves working with local land conservancies and the variety of conservation options that are available to preserve existing natural areas within the Kawkawlin River Watershed. A land conservancy is a non-profit 501(c)3 community-based land conservation organization working to protect land. In the Kawkawlin River Watershed, The Little Forks Conservancy, and the Saginaw Basin Land Conservancy work with landowners who voluntarily choose to protect their lands.

The conservation and preservation of public lands is the responsibility of local governments. The use of the available tools and additional actions by local governments can minimize the impact of impervious surfaces and result in better water quality for all watersheds.

For more information about the Kawkawlin River Watershed project, contact:

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