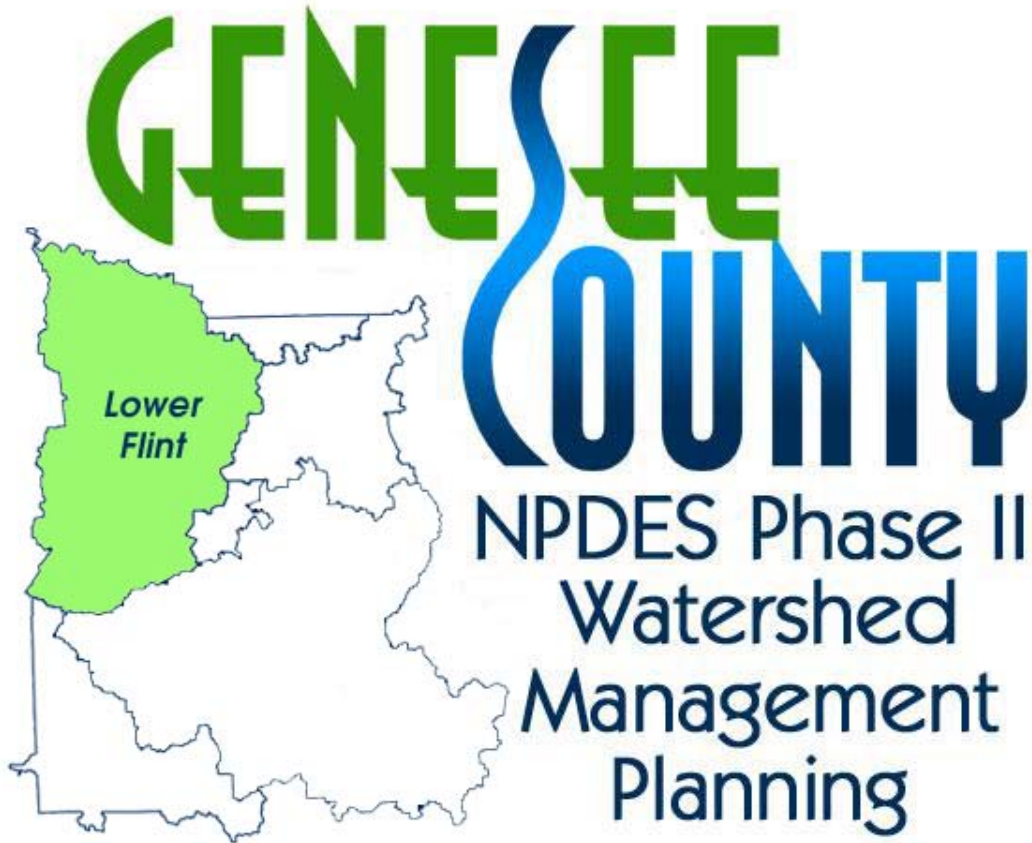


Lower Flint River
Watershed

Stormwater Management Plan



February 29, 2008



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ACRONYMNS

The following is a list of acronyms and definitions that are useful for understanding the contents of this report:

AOC	Area of Concern
BMP	Best Management Practice
BOD	Biological Oxygen Demand
CAER	Center for Applied Environmental Research
CAFOs	Concentrated Animal Feeding Operations
CMI	Clean Michigan Initiative
COC	Certificate of Coverage
CREP	Conservation Reserve Enhancement Program
CVT	City, Village or Township
CWA	Clean Water Act
CWP	Center for Watershed Protection
EPA	Environmental Protection Agency
ERP	Evaluation and Revision Plan
FCAs	Fish Contaminant Advisories
FRWC	Flint River Watershed Coalition
GCDC	Genesee County Drain Commissioner's Office
GIS	Geographic Information System
GLNPO	Great Lakes National Program Office
GPS	Global Positioning System
GREEN	Global Rivers Environmental Education Network
IDEP	Illicit Discharge Elimination Plan
JPA	Joint Permit Application
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MS4s	Municipal Separate Storm Sewer Systems
NRCS	Natural Resources Conservation Service
NPDES	National Pollution Discharge Elimination System
OCDC	Oakland County Drain Commission
PEP	Public Education Plan
POTWs	Publicly Owned Treatment Works
PPP	Public Participation Plan
RAP	Remedial Action Plan
SESC	Soil Erosion Sedimentation Control
STEPL	Spreadsheet Tool for Estimating Pollutant Loads
SWPPI	Storm Water Pollution Prevention Initiative
SWAG	Subwatershed Advisory Group
SWM	Surface Water Management
TMDL	Total Maximum Daily Load
UAW	United Auto Workers
USACE	United States Army Corp of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USLE	Universal Soil Loss Equation
WAG	Watershed Advisory Group
WIMS	Watershed Information Management System
WMP	Watershed Management Plan
WQS	Water Quality Standards

SECTION 1 - EXECUTIVE SUMMARY

The goal of the Lower Flint River Watershed Management Plan is to recognize and catalog the current conditions impacting the water quality of The Flint River and its tributaries, address actions that can be taken to resolve existing problems and prevent future degradation. Over the last year, representatives from both county and local communities have worked together to develop this plan by:

- Developing a Public Participation Plan
- Identifying stakeholders
- Gathering available information on: water quality, stormwater flow, habitat
- Identifying known impairments to the river and its tributaries
- Identifying and prioritizing the sources of the pollutants
- Obtaining input from community officials, stakeholders and the general public
- Establishing and prioritizing goals for the watershed
- Identifying the actions for which the communities would take responsibility
- Highlighting areas where gaps existed between the goals and the actions
- Developing a list of recommended activities to be implemented by the local governmental agencies
- Presenting this information to stakeholders and the general public

This planning process resulted in a Stormwater Management Plan that fulfills Genesee County's and those Phase II community's requirements under the Michigan Department of Environmental Quality (MDEQ) Phase II Watershed-based Stormwater Permit.

BACKGROUND

The initial emphasis of the National Pollution Discharge Elimination System (NPDES) under the Federal Clean Water Act of 1972 was to control discharges from industrial and large municipal wastewater treatment plants. Once these discharges were substantially under control, it became apparent that the combined impact of various smaller widespread (non-point) pollution sources was preventing many streams and receiving waters from meeting state water quality standards. These diffuse sources include failing septic systems, stormwater runoff from residential lawns, agricultural fields, parking lots, roadways and construction sites, illegal dumping, and airborne deposition. Adequate control of all these point and non-point sources is necessary to restore and maintain the use of the nation's water resources.

Instead of imposing discharge limitations and stormwater control programs, the Michigan Department of Environmental Quality is allowing local units of government to establish goals to improve water quality through development and implementation of a watershed management plan. In 2001, Genesee County designated the Drain Commissioner's Office as the county agency responsible to engage in watershed management activities and establish a system of stormwater management services under Public Act 342, Public Acts of Michigan, 1939, as amended ("Act 342"). Although not all of the communities located within Genesee County are regulated under the NPDES Phase II program, all the communities (except City of Flint: Phase I Community) have signed a

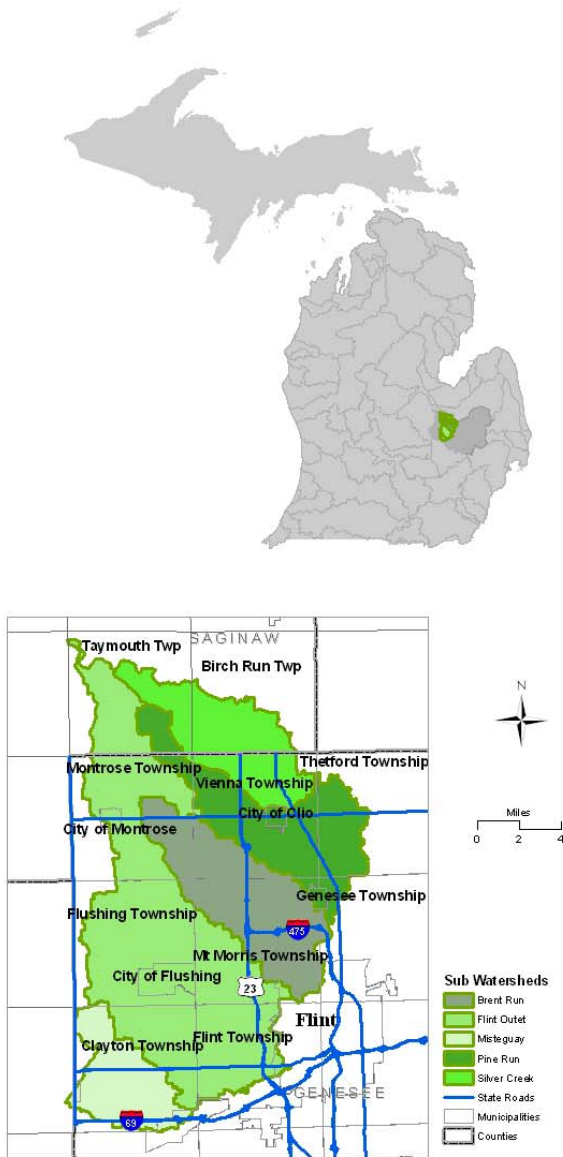
contract under Public Act 342 with the Genesee County Drain Commissioner's Office to provide stormwater management services which includes:

- Applying for Certificate of Coverage for the communities and Genesee County under Michigan's Phase II Watershed-based Stormwater Permit.
- Organize and direct the development of a Public Participation Plan
- Organize and oversee the Public Education and Participation Sub Committee
- Organize and oversee the New Construction Standards and Post Construction Practices Sub Committee
- Organize and oversee the Monitoring and Mapping Sub Committee
- Organize and direct the watershed workgroup in developing the Stormwater Management Plan.
- Organize and oversee planning and implementation of the above programs
- Assist the contract communities in preparing individual SWIPPIs
- Coordinating between the communities and the school districts that have signed contracts as nested jurisdictions.

By working together, these public agencies designed a watershed management plan that is built on the strengths of existing programs, resources, and addresses local water quality concerns.

SECTION 2 - INTRODUCTION

LOWER FLINT RIVER WATERSHED



The **Lower Flint River Watershed** located in the Northwest corner of Genesee County. The 205 square-mile (130,994 acres) watershed is comprised of 4 smaller watersheds and the Flint River. Located downstream from the City of Flint. From east to west the watersheds are the Silver Creek and the Pine Run that both flow north into Saginaw County before outletting in to the Flint River. The Brent Run Creek flows north into the Flint River entirely within Genesee County. The Main Flint River flows from the southeast, at the City of Flint border, to the northwest out of Montrose Township at the county line into Saginaw. Finally the Misteguay Creek flows northwest into Shiawassee County before flowing north through Saginaw County to outlet to the Flint River. The Lower Flint River Watershed contains 310 acres of lakes and more than 211 miles of rivers and an additional 300 miles of creeks, ditches and drains, providing many values, including water quality, habitat for indigenous species and recreation opportunities, although access to the public is limited.

Everything in this watershed is connected from the rain that falls on the ground until it flows to the swales that drain to the ditches into the creeks and finally into the Flint River. From there it flows northwest out of Genesee County where it joins the Shiawassee River in Saginaw County. The Shiawassee, Tittabawassee, and Cass rivers merge to form the Saginaw River, near Saginaw. The Saginaw River flows into Saginaw Bay and Lake Huron.

Figure 2-1 Location Map

Land use in the Lower Flint River Watershed varies greatly, from the commercial areas at the upstream end, coming out of the City of Flint, through residential areas in Flint Township and Flushing City and Township, to agricultural areas in the northwest corner of Montrose where the Flint River leaves Genesee County. Within the last decade the agricultural land uses are being converted to urban and suburban uses by increased development. The change in land use this basin is facing today will have profound effects on the Flint River and its tributaries for many decades to come. Through watershed planning, there is the opportunity for consideration of alternative strategies for protection, rehabilitation, and enhancement of the health of the Flint River and its tributaries with the hope of also raising its recreational and aesthetic aspects. Much like the watershed planning process, which is developed through many sources, from political entities to stakeholders and the general public's input, the health of the Flint River and its tributaries are determined by many sources from hydrologic, geomorphic, and biologic realities to ordinances, land changes and the release of pollutants into the watershed. What the Flint River and its tributaries become in the future will depend not only on our actions and desires, but also on the nature of its catchments and its connections to larger, regional systems.

Problems within the watershed include bank erosion, increased sediment carried into the watercourses from both new development and agricultural runoff. As areas are urbanized there is a reduction or loss of wetlands and low areas that hold or detain water.

PURPOSE OF THE WATERSHED MANAGEMENT PLAN

The goal of the Lower Flint River Watershed Management Plan is to recognize and catalog the current conditions impacting the water quality of the Flint River and its tributaries, address actions that can be taken to resolve existing problems and prevent future degradation.

Watershed planning is an innovative way to address NPDES Phase II permit requirements. Michigan is one of the few states to offer this permitting option. With over 300 communities in Michigan needing to apply for Phase II Permit coverage, over 250 have decided to use the watershed planning option, due to its many benefits over a traditional permitting program.

Some benefits of the watershed approach include, access to grant funding including the State Bond Fund known as Clean Michigan Initiative (CMI), expanded schedules for watershed management planning, and choices on how and when implementation will occur. A watershed approach involves coordination with both public and private sectors, focusing efforts to address the highest priority problems.

WHAT IS A WATERSHED

A watershed is any area of land that drains to a common point. That common point may be a lake, the outlet of a river, or any point within a river system. Throughout this Watershed Management Plan, the terms basin, sub-basin, watershed, sub-watershed, and catchment are used to describe the drainages of the river.

The largest watershed management unit is the basin. A basin drains to a major receiving water, such as a large river, estuary or lake. Within each basin a+

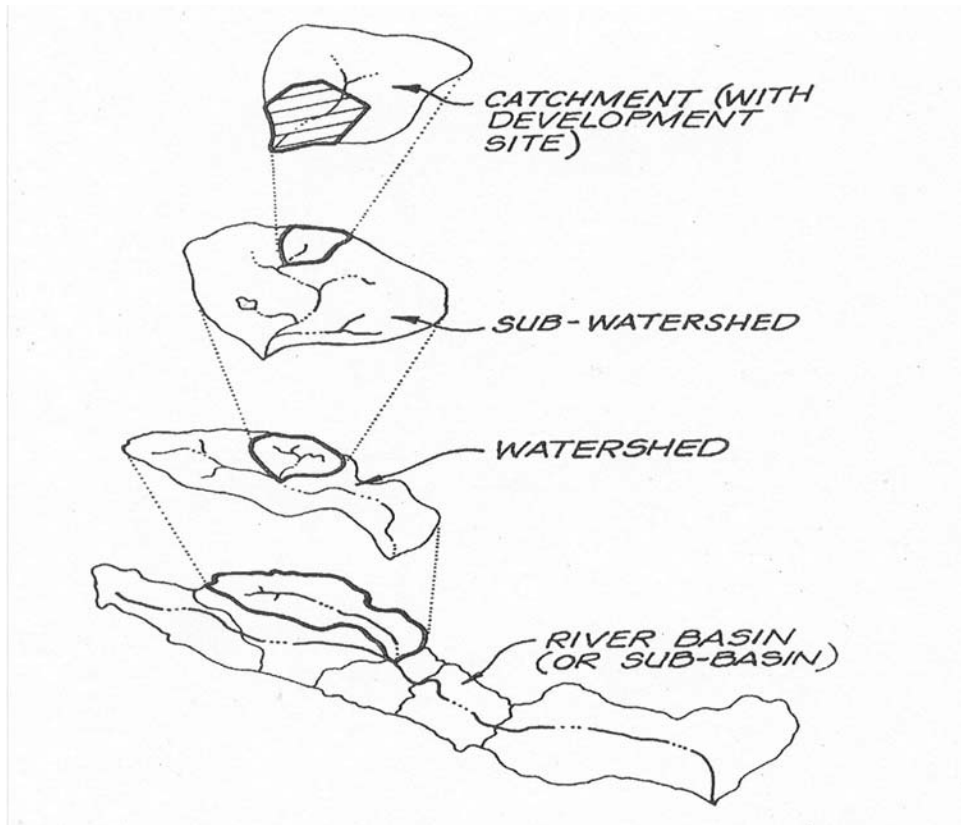
re a group of sub-basins that are a mosaic of many diverse land uses, including forest, agriculture, range and urban areas. Sub-basins are composed of a group of watersheds, which, in turn, are composed of a group of sub-watersheds. Within sub-watersheds are catchments, which are the smallest units in a watershed, defined as the area that drains an individual development site to its first intersection with a stream (Center for Watershed Protection)

Table 2-1 Description of the Various Watershed Management Units

Watershed Management Unit	Typical Area (square miles)	Influence of Impervious Cover	Sample Management Measures
Catchment	0.05 to 0.50	Very strong	BMP and site design
Subwatershed	1 to 10	Strong	Stream Classification and management
Watershed	10 to 100	Moderate	Watershed-based zoning
Sub-basin Basin	100 to 1,000 1,000 to 10,000	Weak Very weak	Basin planning Basin planning

(CWP, 1998)

Figure 2-2 Watershed Management Units



PLAN REQUIREMENTS

According to the MDEQ NPDES Permit for Storm Water Discharges from municipal separate storm sewer systems, subject to watershed plan requirements, the WMP shall contain the following, at a minimum:

- *an assessment of the nature and status of the watershed ecosystem to the extent necessary to achieve the purpose of the WMP;*
- *short-term measurable objectives for the watershed;*
- *long-term goals for the watershed (which shall include both the protection of designated uses of the receiving waters as defined in Michigan's Water Quality Standards, and attaining compliance with any TMDL established for a parameter within the watershed);*
- *determination of the actions needed to achieve the short-term measurable objectives for the watershed;*
- *determination of the actions needed to achieve the long-term goals for the watershed;*
- *assessment of both the benefits and costs of the actions identified above (a "cost/benefit analysis" is not required);*
- *commitments, identified by specific permittee or others as appropriate, to implement actions by specified dates necessary to achieve the short-term measurable objectives;*
- *commitments, identified by specific permittee or others as appropriate, to implement actions by specified dates necessary to initiate achievement of the long-term goals; and*
- *methods for evaluation of progress, which may include chemical or biological indicators, flow measurements, erosion indices, and public surveys.*

RELEVANT FEDERAL, STATE AND REGIONAL PROGRAMS

Clean Water Act

Growing public awareness and concern for controlling water pollution led to enactment of the Clean Water Act (CWA). The Act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gave EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The CWA also continued requirements to set water quality standards for all contaminants in surface waters. The Act made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. It also funded the construction of sewage treatment plants under the construction grants program and recognized the need for planning to address the critical problems posed by nonpoint source pollution.

Subsequent enactments modified some of the earlier CWA provisions. Revisions in 1981 streamlined the municipal construction grants process, improving the capabilities of treatment plants built under the program. Changes in 1987 phased out the construction grants program, replacing it with the State Water Pollution Control Revolving Fund, more

commonly known as the Clean Water State Revolving Fund. This new funding strategy addressed water quality needs by building on EPA-State partnerships.

NPDES Municipal Storm Water Phase II

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating discharges of pollutants into waters of the United States. Phase I of the NPDES storm water program required permit coverage for large or medium municipalities that had populations of 100,000 or more. Phase II of the NPDES Storm Water program builds upon the existing Phase I program by requiring smaller communities, also known as small municipal separate storm sewer systems (MS4s), to be permitted.

Once a permit application is submitted by the operator of a regulated small MS4 and a permit is obtained, the conditions of the permit must be satisfied and periodic reports must be submitted on the status and effectiveness of the program. The Final Phase II Rule requires small MS4 operators to design programs for permit compliance to:

- reduce the discharge of pollutants to the “maximum extent practicable” (MEP);
- protect water quality; and
- satisfy the appropriate water quality requirements of the Clean Water Act.

Michigan’s Department of Environmental Quality (MDEQ) has developed a strong permitting process for Phase II and is the responsible permitting agency for the State of Michigan. Michigan developed two permitting options including a jurisdictional based permit and a watershed based general permit. PA 451 of 1994 sections 3103 and 3106 Part 21 R 323.2161a of Michigan Law regulate municipal storm water discharge requirements and the minimum permit requirements for the State of Michigan.

Michigan is unique nationally as one of the few states that have formalized their NPDES Storm Water Phase II compliance through the use of a general permit based on watershed management planning. This special permitting approach has resulted in a large majority of Michigan’s regulated Phase II communities using watershed management planning as a tool to implement their Phase II Program.

Total Maximum Daily Load Program (TMDLs)

A TMDL is an acronym used to describe a scientific study conducted on how much pollutant load a lake or stream can assimilate. TMDLs are conducted when a lake or stream does not meet water quality standards (WQS). The TMDL takes into account point source discharges, such as discharge from a wastewater treatment plan, and nonpoint source discharges, such as stormwater runoff.

The Clean Water Act, section 303, establishes the water quality standards and TMDL programs. Water quality standards are set by States, Territories, and Tribes. They identify the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use.

The State of Michigan administers the TMDL Program in Michigan. These rules define the water quality goals for a lake or stream. MDEQ defines Water quality standards as “state rules established to protect the Great Lakes, the connecting waters, and all other surface waters of the state”. The goals are in three areas, including the uses of the lake or stream, such as swimming and fishing; safe levels to protect the uses, such as the minimum oxygen level needed for fish to live; and procedures to protect high quality waters.” (MDEQ website summary)

Public Act 451 of 1994 – Natural Resources and Environmental Protection Act

Michigan Act 451 of 1994 is an act to protect the environment and natural resources of the state; to codify, revise, consolidate, and classify laws relating to the environment and natural resources of the state; to regulate the discharge of certain substances into the environment; to regulate the use of certain lands, waters, and other natural resources of the state; to prescribe the powers and duties of certain state and local agencies and officials; to provide for certain charges, fees, and assessments; to provide certain appropriations; to prescribe penalties and provide remedies; to repeal certain parts of this act on a specific date; and to repeal certain acts and parts of acts.

Notable parts of the act relating to storm water include: Part 41 – Sewerage Systems; Part 31 – Water Resources Protection; Part 91 – Soil Erosion & Sedimentation Control; Part 87 – Groundwater and Freshwater Protection; Part 301 – Inland Lakes and Streams; Part 303 – Wetland Protection; and Part 305 – Natural Rivers Act.

Public Act 40 of 1956 – The Drain Code

Michigan Act 40 of 1956 in an act to codify the laws relating to the laying out of drainage districts, the consolidation of drainage districts, the construction and maintenance of drains, sewers, pumping equipment, bridges, culverts, fords, and the structures and mechanical devices to properly purify the flow of drains; to provide for flood control projects; to provide for water management, water management districts, and subdistricts, and for flood control and drainage projects within drainage districts; to provide for the assessment and collection of taxes; to provide for the investment of funds; to provide for the deposit of funds for future maintenance of drains; to authorize public corporations to impose taxes for the payment of assessments in anticipation of which bonds are issued; to provide for the issuance of bonds by drainage districts and for the pledge of the full faith and credit of counties for payment of the bonds; to authorize counties to impose taxes when necessary to pay principal and interest on bonds for which full faith and credit is pledged; to validate certain acts and bonds; and to prescribe penalties.

State Programs and Permits

State programs that directly enforce and assist in compliance with federal and state storm water regulations include the following MDEQ Water Division groups: Storm Water, Soil Erosion and Sedimentation Control, NPDES Permits, and Nonpoint Source Pollution. State-level funding programs that support storm water related projects include: the Water Pollution Control Revolving Fund, the Strategic Water Quality Initiative Fund, and the Clean Michigan Initiative.

Despite the NPDES permitting process that covers storm water-specific issues, other permits may apply for a specific case. Many state and federal permits are covered

under the MDEQ/U.S. Army Corps of Engineers Joint Permit Application (JPA) package. The JPA covers activities relating to: wetlands, floodplains, marinas, dams, inland lakes and streams, Great Lake bottomlands, critical dunes, and high-risk erosion areas. Other permits not included in the JPA include: the Sewerage System Construction Permit and the Groundwater Discharge Permit.

Additional Programs

The MDEQ maintains a number of programs that may relate to storm water issues, including: Dam Safety, National Flood Insurance, Wetlands Protection, Watersheds, Surface Water Enforcement, Source Water Assessment, Septage, Sanitary and Combined Sewer Overflow, Land Development, Inland Lakes, and Groundwater Discharge. Other MDEQ, Michigan Department of Natural Resources, regional, or local programs may also relate to storm water issues.

Specific situations may invoke numerous other federal, state, and local programs that directly or indirectly relate to storm water issues. The following list presents some of these:

- The Federal Safe Drinking Water Act establishes wellhead protection provisions that are implemented at the state (MDEQ Water Wellhead Protection Program) or local level. Wellhead protection may involve managing and treating storm water to prevent aquifer pollution.
- Coastal and shoreline areas invoke numerous federal laws such as the Shoreline Erosion Protection Act and the Coastal Zone Act, state laws, and state programs such as Coastal Management, Sand Dune Protection, and Shoreland Management.
- Commercial/industrial facilities (mines, landfills, agriculture facilities, etc.) have numerous laws and regulations controlling on-site materials use and site-related runoff control requirements that are designed to minimize environmental impacts. Example laws include: the Surface Mining Control & Reclamation Act, the Resource Conservation and Recovery Act, and the Federal Insecticide, Fungicide, and Rodenticide Act.

SECTION 3 - CHARACTERISTICS OF THE WATERSHED

SUBWATERSHEDS

It was decided that each of the 5 watersheds that comprise the Lower Flint River Watershed needed to be divided into subwatersheds each with an area from approximately 2mi² to 20mi². This would allow specific areas within the Lower Flint River Watershed to be looked at based on their unique conditions. This assisted with Total Maximum Daily Loads (TMDL) & identifying problems that may be specific to that location. Most of the Lower Flint watershed within Genesee County contained existing drainage districts. These existing drainage districts were used to divide the 5 watersheds into subwatersheds. Where drainage districts were not established, the areas along the watercourses were divided using contours to divide areas. Sometimes a jurisdictional boundary was used when necessary. Such as the north and west County line. In total the Lower Flint River was divided into 18 subwatersheds.

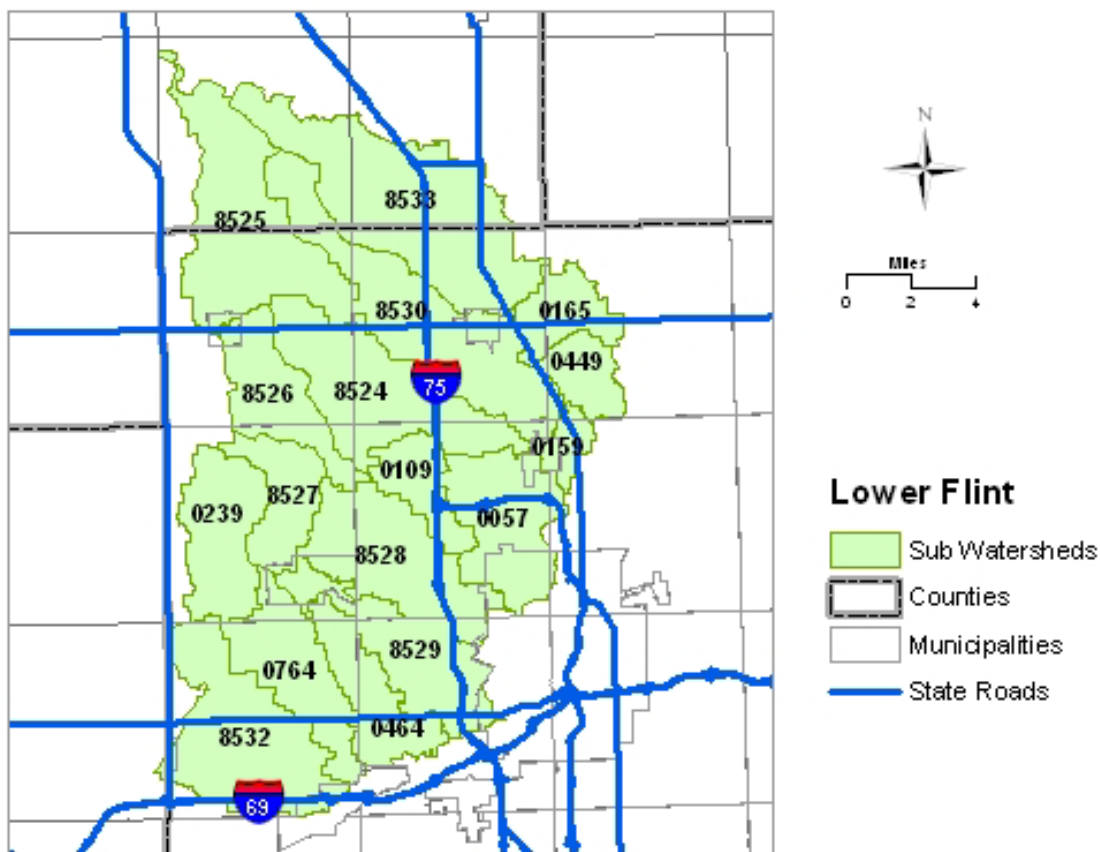


Figure 3-1 Subwatersheds

POLITICAL JURISDICTIONS

Table 3-1 Political Jurisdiction by Subwatershed

		Birch Run Twp	City of Clio	City of Flint	City of Flushing	City of Montrose	City of Mt Morris	City of Swartz Creek	Clayton Twp
0057	Lake Drain	0	0	3.3	0	0	0.42	0	0
0109	Central Drain	0	0	0	0	0	0	0	0
8524	Brent Run	0	0	0	0	0	0	0	0
Brent Run Total		0	0	3.3	0	0	0.42	0	0
0239	Freeman Drain	0	0	0	0	0	0	0	0
0464	Messmore and Cronk	0	0	0	0.09	0	0	0	2.57
0764	Cole Creek	0	0	0	0.51	0	0	0.03	10.03
8525	Flint River 1	0	0	0	0	0.39	0	0	0
8526	Flint River 2	0	0	0	0	0.43	0	0	0
8527	Flint River 3	0	0	0	0.27	0	0	0	0
8528	Flint River 4	0	0	0.44	1.1	0	0	0	0
8529	Flint River 5	0	0	0.61	1.75	0	0	0	0.01
Flint River, Lower Total		0	0	1.05	3.72	0.82	0	0.03	12.61
8532	Misteguay 1	0	0	0	0	0	0	0.97	18.14
Misteguay Total		0	0	0	0	0	0	0.97	18.14
0159	Mason Drain	0	0	0	0	0	0.72	0	0
0165	Pine Run & Tryon	0	0	0	0	0	0	0	0
0449	Boutell & Branch	0	0	0	0	0	0	0	0
8530	Pine Run 1	0	1.04	0	0	0	0	0	0
Pine Run Total		0	1.04	0	0	0	0.72	0	0
8533	Silver Creek1	11.57	0.08	0	0	0	0	0	0
Silver Creek Total		11.57	0.08	0	0	0	0	0	0
Lower Flint Total Area in Square Mile		11.57	1.12	4.35	3.72	0.82	1.14	1	30.75
% of Watershed		5.21%	0.50%	1.96%	1.67%	0.37%	0.51%	0.45%	13.83%

*The City of Flint is a Phase 1 Community

Political jurisdictions regarding the Flint River and its tributaries are controlled by federal and state laws, county and municipal ordinances, and municipal by-laws. Regulatory and enforcement responsibility for water quantity and quality is multi-layered. Within the Lower Flint River Watershed alone, there are 15 Cities, Townships, and Villages in Genesee County and 3 Townships in Saginaw County. Of the 18 communities, only 12 are Phase 2 communities. The City of Flint is included in the *Lower Flint* River Watershed area calculations, but it is a Phase I community.

Flint Twp	Flushing Twp	Genesee Twp	Montrose Twp	Mt Morris Twp	Taymouth Twp	Thetford Twp	Venice Twp	Vienna Twp	Village of Lennox	Lower Flint Total Area in Square Mile	% of Watershed
0	0	0.64	0	9.03	0	0	0	0	0	13.39	6.02%
0	0	0	0	5.88	0	0	0	0	0	5.88	2.65%
0	0.68	0	6.7	4.32	0	0	0	6.96	0	18.66	8.40%
0	0.68	0.64	6.7	19.23	0	0	0	6.96	0	37.93	17.06%
0	11.24	0	0	0	0	0	0	0	0	11.24	5.06%
5.65	0.58	0	0	0	0	0	0	0	0	8.89	4.00%
0.03	1.17	0	0	0	0	0	0	0	0	11.77	5.30%
0	0	0	11.38	0	10.21	0	0	0.3	0	22.28	10.02%
0	2.48	0	6.97	0.17	0	0	0	0	0	10.05	4.52%
0	7.41	0	0	0	0	0	0	0	0	7.68	3.46%
0.75	2.86	0	0	10.66	0	0	0	0	0	15.81	7.11%
9.37	0.5	0	0	0.88	0	0	0	0	0	13.12	5.90%
15.8	26.24	0	18.35	11.71	10.21	0	0	0.3	0	100.84	45.37%
0	0.13	0	0	0	0	0	0.19	0	0.19	19.62	8.83%
0	0.13	0	0	0	0	0	0.19	0	0.19	19.62	8.83%
0	0	1.77	0	0.58	0	0.29	0	0.02	0	3.38	1.52%
0	0	0	0	0	0	4.19	0	1.93	0	6.12	2.75%
0	0	0.02	0	0	0	4.67	0	0.16	0	4.85	2.18%
0	0	0.11	1.28	0	3.3	0.55	0	15.13	0	21.41	9.63%
0	0	1.9	1.28	0.58	3.3	9.7	0	17.24	0	35.76	16.09%
0	0	0	0.14	0	6.65	0.03	0	9.65	0	28.12	12.65%
0	0	0	0.14	0	6.65	0.03	0	9.65	0	28.12	12.65%
15.8	27.05	2.54	26.47	31.52	20.16	9.73	0.19	34.15	0.19	222.27	100.00%
7.11%	12.17%	1.14%	11.91%	14.18%	9.07%	4.38%	0.09%	15.36%	0.09%	100.00%	

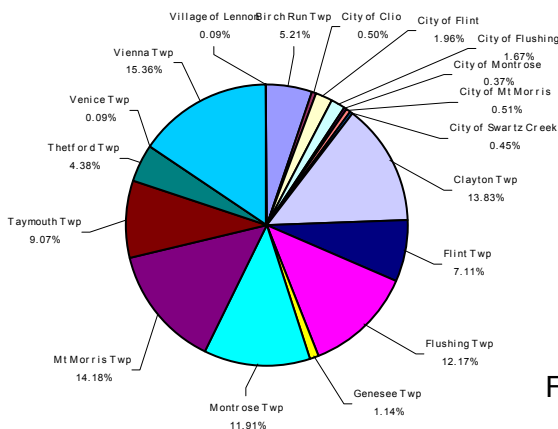
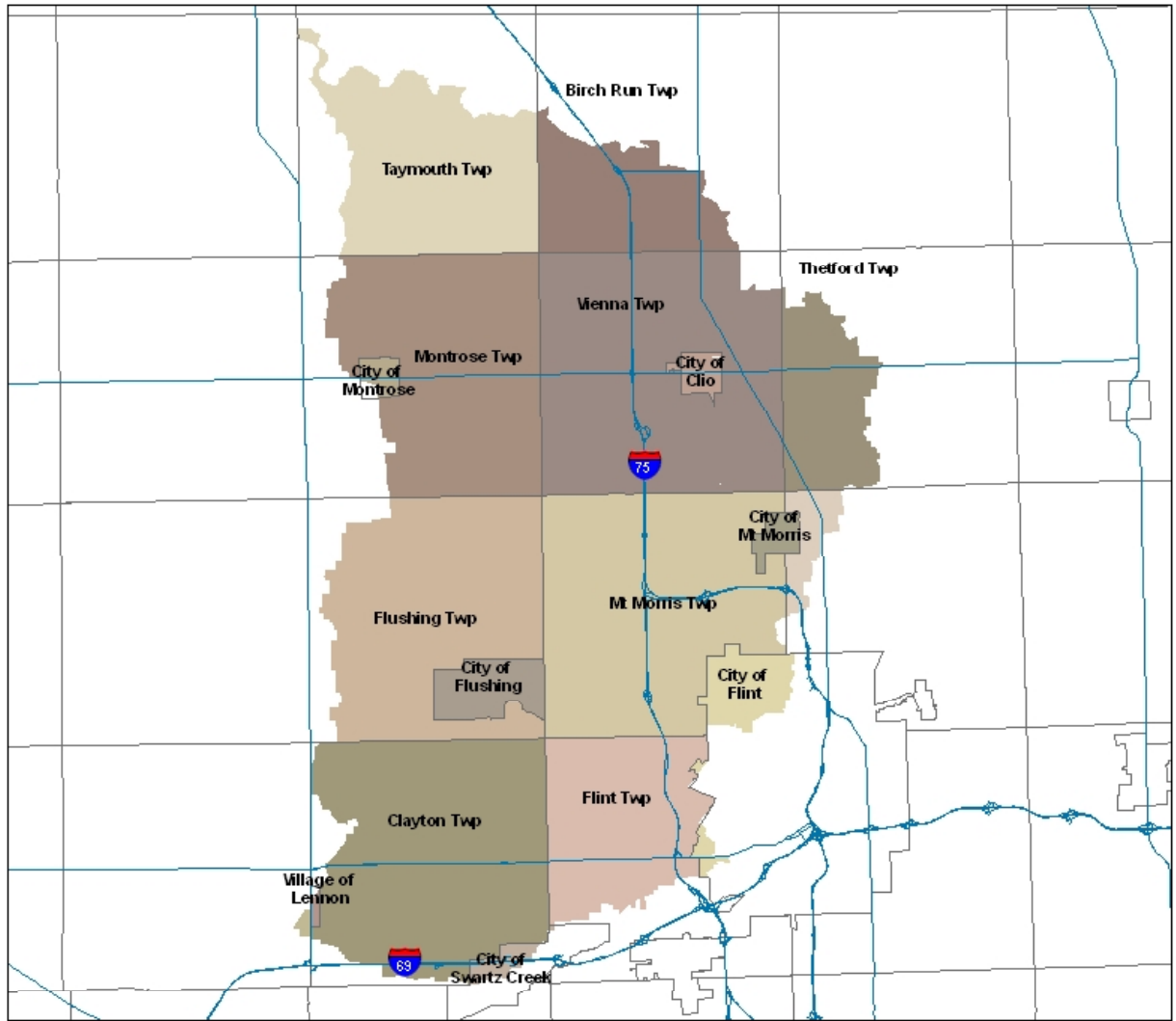


Figure 3-2 Political Jurisdiction by percentage



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Figure 3-3 Local Units of Government

DEMOGRAPHICS

The Lower Flint River Watershed population has not significantly changed since 1990. The development that has occurred in this watershed has been largely commercial and concentrated along the major state road corridors of I75 and M57 (Vienna Road).

Table 3-2 Population Changes

Community	1990 Population within watershed	2000 Population within watershed	% Change from 1990 - 2000	Area within LOWER FLINT watershed in square miles
Birch Run Township	1742	2014	15.61%	11.57
Clayton Township	6493	6620	1.96%	30.75
City of Clio	2629	2483	-5.55%	1.12
City of Flint	17956	15938	-11.24%	4.35
Flint Township	23853	23576	-1.16%	15.80
City of Flushing	8542	8348	-2.27%	3.72
Flushing Township	9223	10230	10.92%	20.75
Genesee Township	1779	1782	0.17%	2.54
Village of Lennon	474	517	9.07%	0.19
City of Montrose	1811	1619	-10.60%	0.82
Montrose Twp	6236	6336	1.60%	26.47
City of Mt Morris	3292	3194	-2.98%	1.14
Mt Morris Township	25094	23627	-5.85%	31.52
City of Swartz Creek	1169	1229	5.13%	1.00
Taymouth Township	2563	2620	2.22%	20.16
Thetford Township	2381	2365	-0.67%	9.73
Venice Township	14	13	7.14%	0.19
Vienna Township	13019	12919	-0.77%	34.15
Total	130260	127430	-2.17%	222.27

U.S. Census Bureau Data,

LAND USE AND GROWTH TRENDS

Land Cover – Past, Present and Future

Prior to European settlement of the area, vegetation of the Lower Flint Watershed consisted of forested land with Beech-Sugar Forest (sugar maple, basswood, red oak, and white ash) with isolated pockets of Swamp Forest are scattered throughout the watershed in depressed areas.

When the first European explorers arrived around 1812 “it is probable that not more than a dozen white men had penetrated into the country of the *Saginaws*”. The Saginaw Valley was populated by Chippewa and Ottawa Indians, with the Chippewas being more numerous (Ellis 1879). However, Chippewa history tells that when they came into the area the Sauks and Onottoways inhabited the valley.

When early French fur traders moved into the Flint River Valley, they established an encampment at a natural river crossing used by Native Americans. The Indian name for this river was Pewonigowink meaning “river of fire stone” or river of flint. The crossing was located on the “southern bend” of the Flint River on the “Saginaw Trail” that ran between villages at the outlet of Lake St. Clair (Detroit) and encampments at the mouth of the Saginaw River. It was located very near the mouth of the Swartz Creek. This crossing became known as the “Grand Traverse” or great crossing place. A permanent trading post was established when Jacob Smith arrived in 1819 (Crowe 1945).

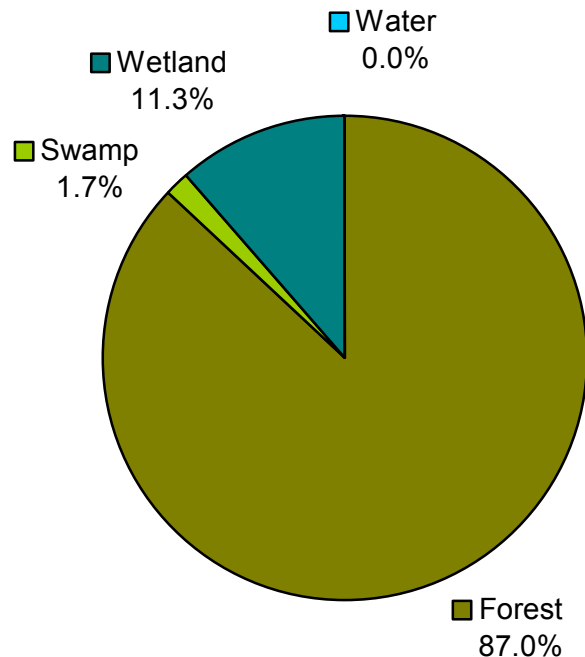
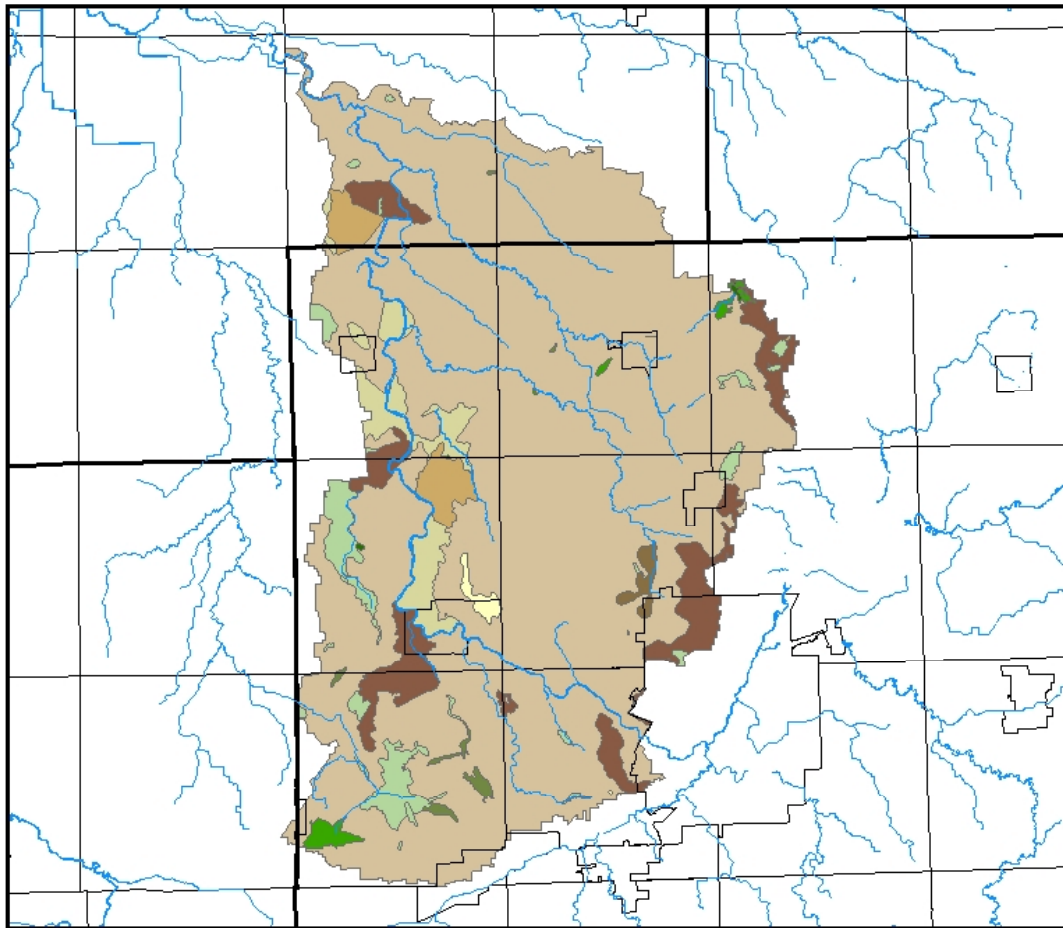


Figure 3-4 Ecosystems, circa 1830s by percentage



COVERTYPE

- BEECH-SUGAR MAPLE FOREST
- BLACKASH SWAMP
- LAKE/RIVER
- MIXED CONIFER SWAMP
- MIXED HARDWOOD SWAMP
- MIXED OAK FOREST
- OAK-HICKORY FOREST
- SHRUB SWAMP/EMERGENT MARSH
- WET PRAIRIE
- WHITE PINE-MIXED HARDWOOD FOREST
- WHITE PINE-WHITE OAK FOREST
- County
- Municipalities
- River

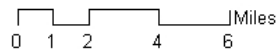


Figure 3-5 Ecosystems, circa 1830s

The City of Flint grew up at the site of the “Grand Traverse” and the pioneer immigrants who were largely from the “Genesee Country” of Western New York, concentrated along the banks of the Flint River, taking up farming, lumbering, and manufacturing. Permanent human settlement brought great change to the landscape as the land began to be altered for human benefit.

In the 1830’s, much of the County of Genesee, including most of the Lower Flint River Watershed, had been sectioned off and land sold, mostly in parcels of 80 to 200 acres. Much of this area was first logged for personal use and farming. Through the 1800’s and most of the 1900’s farming remained the predominant land use in the Lower Flint River.

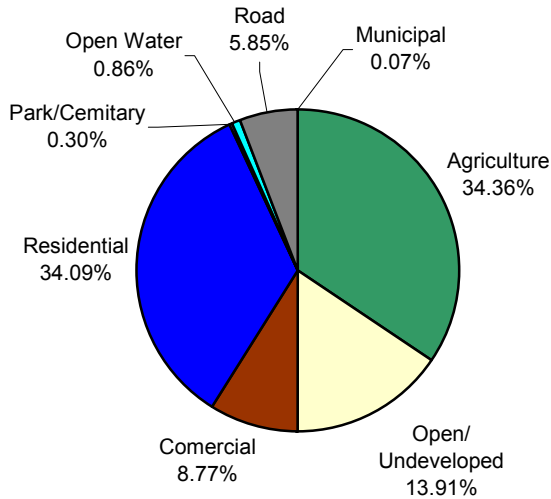
Although Michigan was primarily an agricultural state, including much of Genesee County, before the Civil War, lumbering became the principal economic activity in the new state during the second half of the 19th century. Within Genesee County, the completion of the railroad in 1862 afforded practicable communication with outside markets; and this, with increased demand created by the great civil war, inaugurated for the lumber interests an era of prosperity from 1866 to 1873, such as they had never known before.

With a good supply of high quality lumber and the ability to move supplies from town to lumbering camps, it is not surprising that Flint became a center for transportation producing horses, horse harnesses, horse drawn vehicles and ox carts. By 1900, Flint was building 150,000 vehicles per year, both wagons and carts. As the pine forests were exhausted, Flint’s attention turned to other industries and the transition to automobile manufacturing was natural (Crowe 1945). In 1903, Buick Motor Company began production of the Buick automobile. Under the business genius of Will Durant, formerly of Durant-Dort Carriage Company, Buick Motor Company convinced suppliers such as Champion Spark Plug Company, Weston-Mott (Axle) Company, and Fisher Body Company to relocate in Flint. Flint became the birthplace of General Motors and the United Auto Workers (UAW) union. Even today, Flint is often referred to as Buick City and its prosperity centered on the manufacture of automobiles.

After World War II, prosperity fostered population increase and diversifying communities. Gasoline was inexpensive, new highways were built, and General Motors, the UAW and Flint flourished. Outlying communities of Flint, Flushing & Vienna Townships experienced growth and were desirable locations to live and work. Advancements in the gasoline engine allowed for increased agriculture and farming dominated watershed land use.

Presently the Lower Flint River Watershed is changing. A community, whose economic welfare traditionally was tied to the prosperity of General Motors, has had to seek economic stability through diversification. New businesses have become important and development of industrial properties to attract new business has been a challenge. More recently, the increased demand for new residential and small commercial development is replacing agriculture.

Figure 3-6 Current Land Cover by percentage



Current land use for Genesee County was determined by using the assessment classification for each parcel of land. Open/Undeveloped areas are undeveloped residential and commercial properties. Open water and recreation were merged with the parcel map and given their own classifications. In Genesee County the recreational land was determined to be County/Municipal Parks only, golf courses are considered developed property.

City of Flint is a NPDES Phase I community and was not included. Within the City of Flint boundaries, the land is largely developed with residential and some commercial. There are several City Parks spread throughout the populated areas.

There is no consistent source for future land cover within the Lower Flint River Watershed. The Genesee County Land Bank has been compiling a comprehensive inventory of Master Plans and Ordinances for Municipalities within Genesee County. The inventory covers all ordinances including environmental. This can provide a resource to measure a community's ordinance for effectiveness against what other communities are doing. This inventory will be made available once it is complete.

Currently each Municipal Master Plan may have a different future land use. The land use may be for the ultimate developed condition or for a defined period of time. Such as what the development will look like in 2020. Currently there is no standardized method for classifying Current or Future Land Use among the Municipalities. Below is a list of Community Master Plans with future land use and when they were prepared. Each community has their master plan on file.

1978
Village of Lennon

2000
City of Flushing

2004
Flushing Township
Mt. Morris Township
City of Swartz Creek

1995
City of Mt Morris

2001
Genesee Township
Clayton Township

2005
City of Montrose

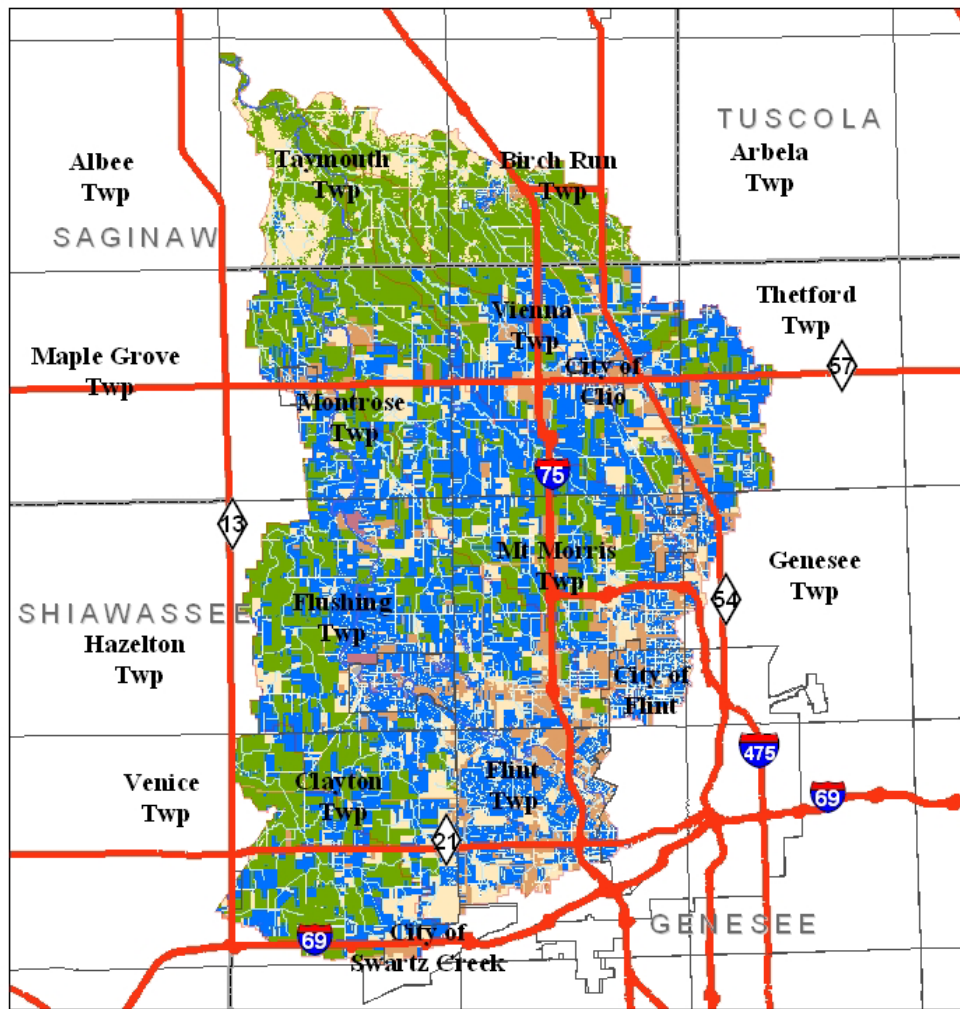
1998
Montrose Township

2002
Vienna Township

2008
Flint Township

1999
City of Clio

2003
Thetford Township



- State Roads
- Lake
- River
- Current Land Use**
- Municipal
- Parks/Cemeteries
- Agriculture
- Open/Undeveloped
- Commercial
- Residential

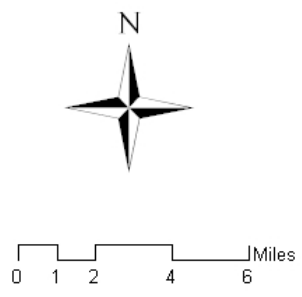


Figure 3-7 Current Land Covers

Urbanized Land Use

Within the Lower Flint River Watershed the largest increases to population within the watershed have been along the state road corridors. When comparing the individual communities current land uses to future land use, many areas that are current open areas or agriculture are classified in the future land use as residential or commercial. Many of the open/undeveloped areas in figure 3-7 are already zoned and assessed as residential or commercial but as of 2003, they have not been developed.

Agricultural Land Use

Around the edges of the Lower Flint River Watershed, the land becomes more agricultural. According to the USDA office the 2 predominant cash crops are corn and soybean. On a much smaller scale other cash crops within the watershed are hay, wheat, and small grains.

Based on Conversations with the local USDA office, of the 15 dairy operations in Genesee County only one is within the Lower Flint River Watershed. It has an average of 50-150 head of cattle.

The census of agricultural data for the below table is based on the entire Flint River watershed. Within Genesee County the numbers below reflect the Upper, Middle and Lower Flint River Watersheds combined.

There are no known Concentrated Animal Feeding Operations (CAFO's) in the Lower Flint River Watershed.

Table 3-3 Livestock in the Lower Flint River Watershed

Beef Cattle	384
Dairy Cattle	536
Swine	1168
Sheep	184
Horse	1063
Chicken	1223
Turkey	166

USDA Census of Agriculture 2002

Riparian Buffer

Studies of impervious cover impacts to surface waters indicate that one of the key variables influencing watershed response is the presence or absence of an intact (wooded) riparian corridor or buffer. These riparian buffers act as a filter for storm water entering the stream corridor through overland flow. The riparian buffers are able to reduce erosive water velocities; extract sediment, nutrients, and other contaminants; and allow additional storm water to be infiltrated into the soil.

The Conservation Reserve Enhancement Program (CREP) has stabilized over 400 acres of erodible soil within Genesee County. The CREP program seeks to improve water quality and wildlife habitat by bringing conservation practices onto agricultural land. Of the 400 acres half has been stabilized by installed buffer strips and the other half has stabilized highly erodible soil with steep slopes by a practice called solid field. Most of the 400 acres that has been entered into CREP has been in the Lower and Upper Flint River Watersheds.

Currently buffer strips along sensitive areas are recommended as a Best Management Practice (BMP), but there are no current requirements. Within the Action Plan in Chapter 8 there is an action item to draft a buffer strip ordinance.

Wetlands

Wetlands can play critical roles in flood storage, nutrient transformation, and water quality protection and, as part of a healthy riparian corridor, may dampen the effects of impervious cover within the watershed. Important wetland functions and values include:

- Flood prevention and temporary flood storage, allowing the water to be slowly released, evaporated, or percolate into the ground and recharging groundwater.
- Sediment capture and storage.
- Wildlife habitat for a wide diversity of plants, amphibians, reptiles, fish birds, mammals, and related recreational values.
- Water quality improvement by filtering pollutants out of water.
- The support of approximately 50 percent of Michigan's endangered or threatened species (Cwikiel, 2003).

Other than the National Wetland Inventory maps (NWI) or the Michigan Department of Environmental Quality (MDEQ) assessments, locally there are not any wetland inventories or assessments. The Drain Commissioner's Office has on file MDEQ permits and wetland assessments for individual development properties that have been submitted for review. This information has not been compiled.

Another action item that is being proposed is to identify existing floodplains and wetlands that will then be ranked for value. This would allow a mechanism to choose which areas need to be protected first.

As the below map shows, there are very few wetlands in the Lower Flint River Watershed. One third to one half of those wetlands shown are adjacent to the watercourses. The wetlands on the below map were identified in the Wetland Inventory Map from 1979. By then much of the City of Flint and surrounding area had already been developed and the land had been altered.

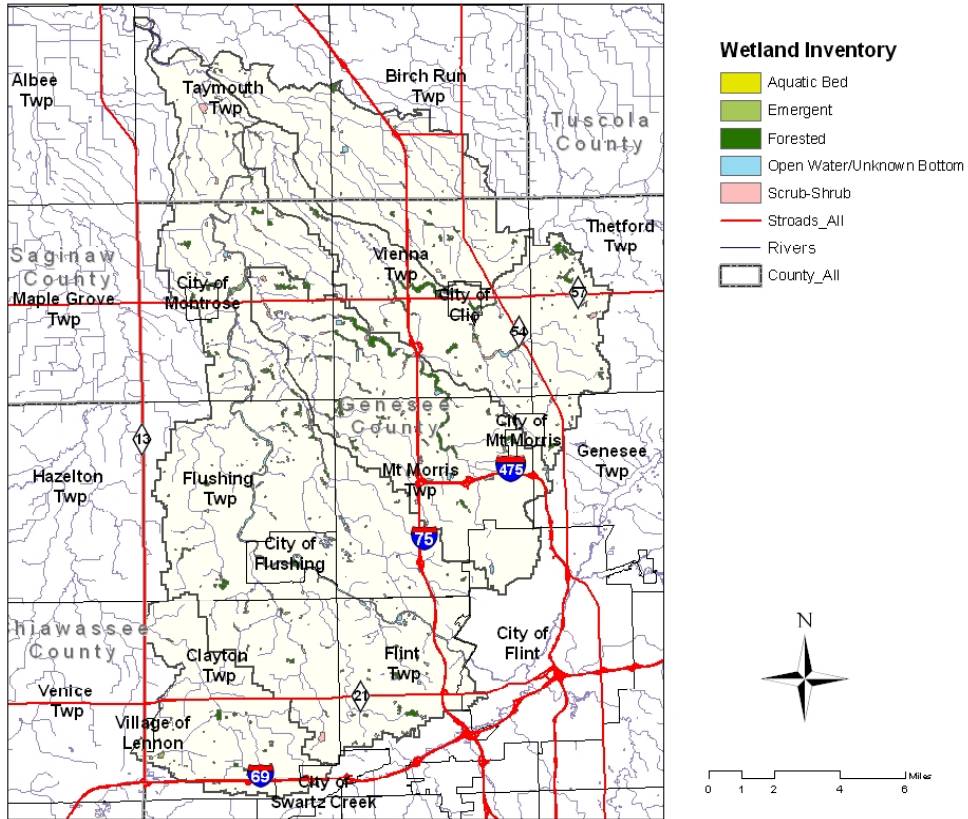


Figure 3-8 Wetlands
Source: National Wetland Inventory

CLIMATE AND TOPOGRAPHY

Table 3-4 Temperature & Precipitation

	Average High	Average Low	Average Precipitation	Record High	Record Low
January	29°F	13°F	1.57 in	65°F (1950)	-25°F (1976)
February	32°F	15°F	1.35 in	63°F (1984)	-22°F (1967)
March	43°F	24°F	2.22 in	78°F (1990)	-12°F (1978)
April	56°F	34°F	3.13 in	87°F (1990)	6°F (1982)
May	69°F	45°F	2.74 in	93°F (1988)	22°F (1966)
June	78°F	55°F	3.07 in	101°F (1988)	33°F (1998)
July	82°F	59°F	3.17 in	101°F (1995)	40°F (1965)
August	80°F	58°F	3.43 in	98°F (1988)	37°F (1982)
September	72°F	50°F	3.76 in	97°F (1953)	26°F (1991)
October	60°F	39°F	2.34 in	89°F (1963)	19°F (1974)
November	47°F	30°F	2.65 in	79°F (1950)	-7°F (1949)
December	34°F	19°F	2.18 in	67°F (1982)	-12°F (1989)

Source: AccuWeather

The land in the Lower Flint River Watershed descends gradually from the southeast to the northwest (leaving out of account the surface undulations) (Ellis). The highest elevation is in The City of Flint at 750 above sea level, per the USGS 5' contour map The Flint River itself is at elevation 690 as it leaves the City of Flint to the west. Near the Northwest corner of Montrose the Flint River leaves the County and the Lower Flint River Watershed at elevation 620 above sea level and approximately 50 ft above Lake Huron. Water erosion of the glacial formations produced the present landscape.

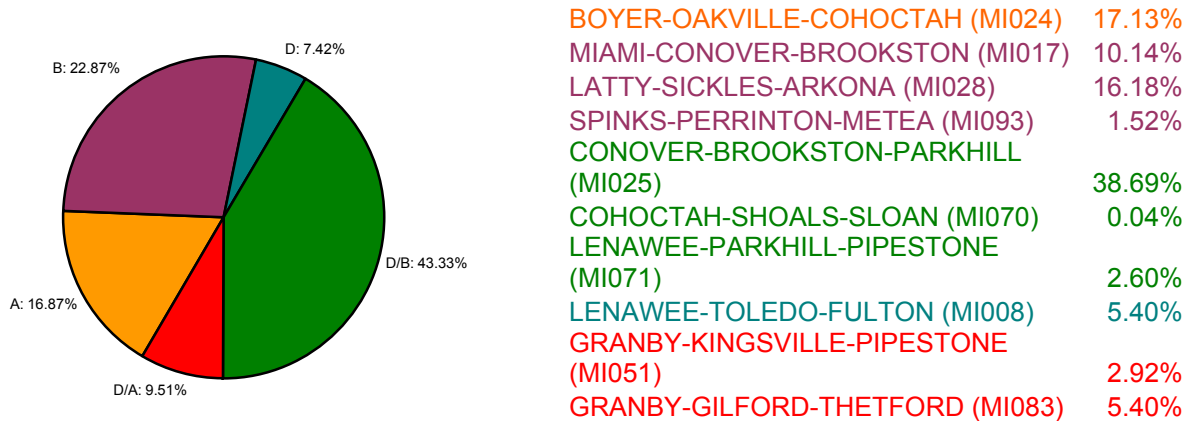
GEOLOGY AND SOILS

Several ice sheets advanced over Genesee County and retreated during the glacial period. The most recent ice sheet or glacier was during the end of the Wisconsin glacial period, some 9,000 or more years ago. Several distinctive geological features were formed in Genesee County during this last period of glaciation. Soon after the southernmost part of Genesee County emerged from the retreating Saginaw ice lobe, the lobe halted and built the Fowler Moraine. This moraine starts in Lapeer County, continues southwesterly across Genesee County until it reaches the western part of Grand Blanc Township, and then turns west. Melt waters from the ice lobe were dammed up by the Portland Moraine, and following the path of least resistance, they flowed westward to form the Shiawassee River. Masses of material known as glacial till were deposited from the melt off. Later the climate changed again, and the Saginaw lobe halted and built the Flint Moraine. This moraine is marked by a line running through Forest, Thetford, Genesee, and Flint Townships and through the corner of Clayton and perhaps Gaines Townships. Creating the east and south border of the Lower Flint River Watershed.

Soil is produced by the action of soil-forming processes on materials deposited or accumulated by geological forces. The characteristics of a soil are determined by 1) the physical and mineral composition of the parent material; 2) the climate under which the soil material has accumulated and existed since accumulation; 3) the plant and animal life on and in the soil; 4) the relief or lay of the land; 5) the length of time the forces of soil development have acted on the soil material.

The Lower Flint River Watershed is made up of the below soils.

Figure 3-9 Hydrologic Soil Groups by percentage



The USDA Natural Resources Conservation Service (Formerly the Soil Conservation Service) produced a soil survey for each county. The survey has classified and named the soils. Adjacent soils have been grouped into soil associations based on their landscape that has a distinctive proportional pattern of soils. These soil associations are useful for a general idea of what kinds of soils are present over a large area. Each soil has a corresponding hydraulic classification ranging from A-D and is referred to as hydraulic soil groups. The hydraulic soil groups are defined as:

A: (low runoff potential). Soils having high infiltration rate even when thoroughly wetted and consisting chiefly of deep, well to excessively drained soils with moderately fine to moderately coarse texture. (Will drain well in all weather conditions)

B: Soils having a moderate infiltration rate when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse texture.

C: Soils having a slow infiltration rate when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water or soils with moderately fine to fine textures.

D: (High Runoff potential). Soils having a very slow infiltration rate when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. (Will drain poorly in all weather conditions)

HYDROLOGY

The Lower Flint River Watershed contains only 310 acres of lakes. Most of these are comprised of small isolated pockets of open water on private land. More than half are less than 1 acre and would be considered ponds. Only 17 lakes are larger than 5 acres, and one of those is an old gravel pit. There are 145 miles of rivers with an additional 245 miles of creeks and drains. Of the larger watercourses that have base flow all year long there is the Brent Run, Misteguay, Pine Run, and Silver Creek. All these watercourses flow into the Flint River that flows through the watershed from the Southeast to the northwest. Refer to Figure 3-8. Each of these watercourses is fed through a series of swales, road ditches and county drains. Many of the smaller drains and watercourses have intermittent flow and are dry most of the time. Many of the watercourses have been dedicated as county drains over the years and have had maintenance done on them. As areas are developed, it is common for enclosures to be placed to cross the drain watercourse or sometimes relocations are made. Some of the drains that have been petitioned for are entirely man made, meaning a ditch may be constructed where one did not exist before or a new storm system is placed in pipes. Historically since large areas of the Lower Flint River Watershed were agricultural there are many unmapped private farm tiles that drain low areas within the watershed.

The USGS has 1-stream gauge within the watershed. This gauge is located in section 4 of Flint Township. Details on this gauge are located in Chapter 4. When reviewing the flows from a Flint River gauge located downstream of the City of Flint there were some dramatic flow changes. (Flow data reviewed from 2001) On several occasions a rapid increase in flow was recorded in the Flint River. The flow increase was compared to nearby rain gauge data located upstream of the stream gauge. During times where there were 3 or more days of no rain followed by a quick 0.5-inch rain event this resulted in a rapid increase of flow. For example the flow went from 401cfs on April 5, 2001 to 1450 cfs on April 6, 2001. In May the flow went from 420cfs to 1360cfs in 1 day under

similar conditions. In June of the same year the flow went from 1180cfs to 2030cfs for a 0.8-inch rain event. The Flint River has doubled or tripled its flow very quickly in response to what are relatively small rain events. This is called flashiness. This is a problem because stream flow is linked to and regulates ecological integrity. Changes in stream flows and flow regimes limit and sometimes eliminate many aquatic species within a stream system. Flow stability is critical to support balanced diverse fish communities and is an important component of habitat suitability.

There are four characteristics to hydrology, which become important for a watershed plan: volume, peak flow, time to peak (flashiness), and frequency of flows (particularly bankfull conditions). Development typically increases the volume, the peak, and the frequency and decreases the time to peak.

Development in a watershed changes the hydraulic characteristics. Urbanization tends to fill in low areas, that previously provided storage and pave over pervious areas, that had provided infiltration into the soil. Less flow is available to recharge ground water. Storm sewer pipe systems along with curb and gutter speed up how fast the water is concentrated and transported to the outlet. These activities change the four characteristics to hydrology. Volume and the peak flow are increased. The time to peak occurs quicker. And smaller rain events produce a larger frequency of flows. In addition, channels experience more bankfull flood events each year and are exposed to critical erosive velocities for longer intervals.

The physical, chemical, and biological integrity of a given stream system has been shown to be strongly correlated to the amount of impervious cover (the area covered by rooftops, streets, parking facilities, and other hard surfaces) in the sub-basin or watershed (Schueler, 1994). Imperviousness appears to be one of the principal indicators of watershed "health," and analysis of stream systems across the country seems to indicate that there are thresholds at which watershed imperviousness results in degradation of water quality and physical stream processes.

The conversion of natural landscapes (i.e. farmland, forests, and wetlands) into urban landscapes creates a layer of impervious surface. Urbanization has a significant impact on hydrology, morphology, water quality and ecology of surface waters. The amount of impervious cover in a watershed can be used as an indicator to predict how severe differences are in character of urban watersheds and natural watersheds.

In natural settings, there is very little runoff, with most of the rainfall being filtered by the soils, and supplying deep-water aquifers. In urbanized areas, however, less and less rainfall is infiltrated, and as a result, less water is available to streams. Additional changes in urban streams due to increased impervious cover includes enlarged channels, upstream channel erosion contributing greater sediment load to the stream, in stream habitat structure degrades and declining water quality.

"Even small increases in impervious change stream morphology and degradation of aquatic habitat. The relationship between impervious cover and Subwatershed quality can be predicted by a simple model, projecting current and future quality of streams and other water resources." (CWP)

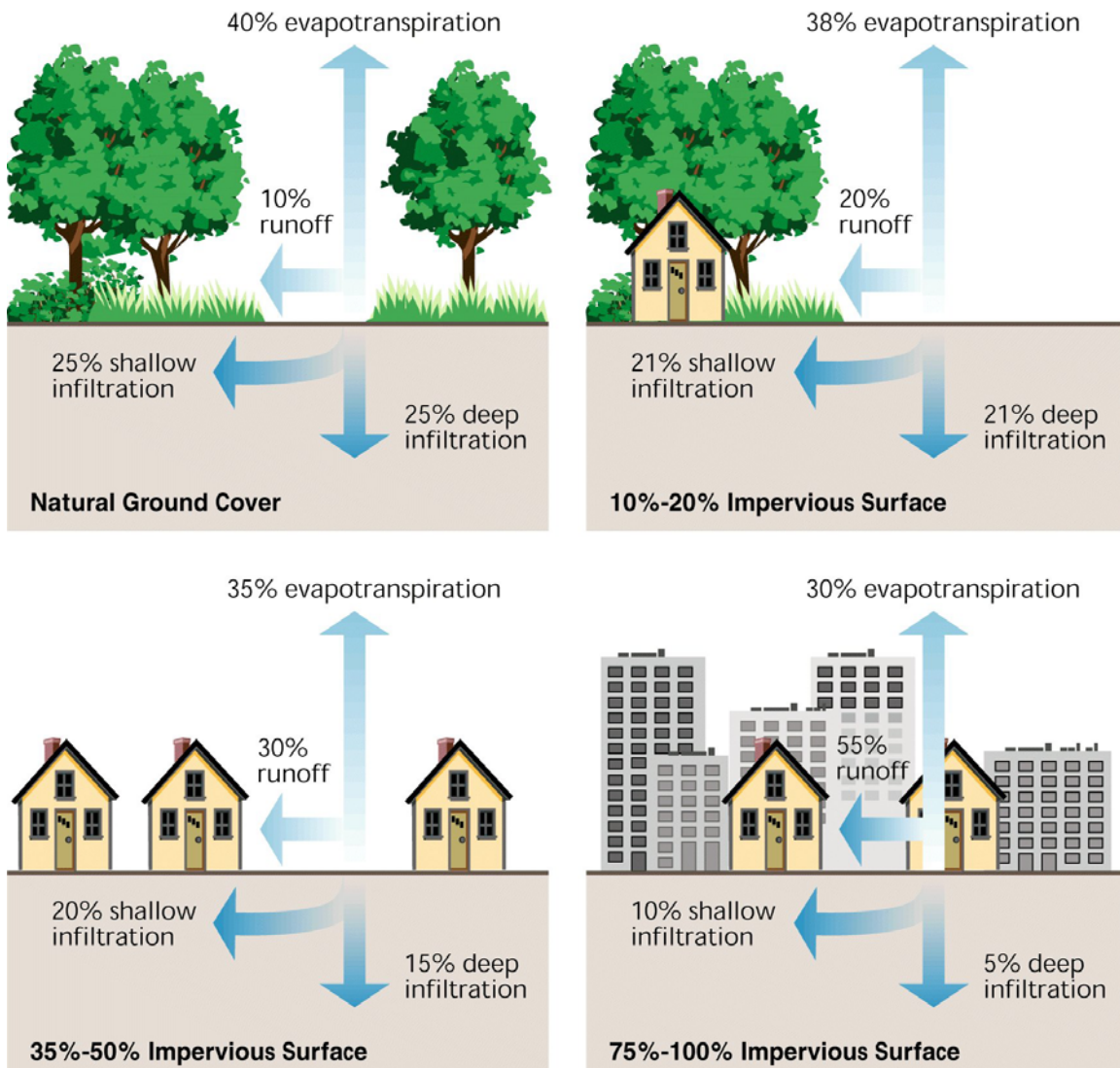


Figure 3-10 Effect of urbanization on runoff
Source: FISRWG, 1998

Research indicates that zones of stream quality exist, most noticeably beginning around 10% impervious cover, with a second threshold appearing at around 25-30% impervious cover. These thresholds are powerfully modeled in The Impervious Cover Model, classifying streams into three categories, sensitive, impacted, and non-supporting. Watersheds with less than 10 percent imperviousness appear to exhibit natural chemical, physical, and biological quality. Between 10 and 25 percent imperviousness river systems show signs of degradation. Beyond 25 percent imperviousness, the damage to physical, chemical, and biological integrity may be irreversible it is important to understand the Impervious Cover Model, a powerful model predicting quality of streams based on impervious cover change, is not without its limitations. (Schueler, 1994).

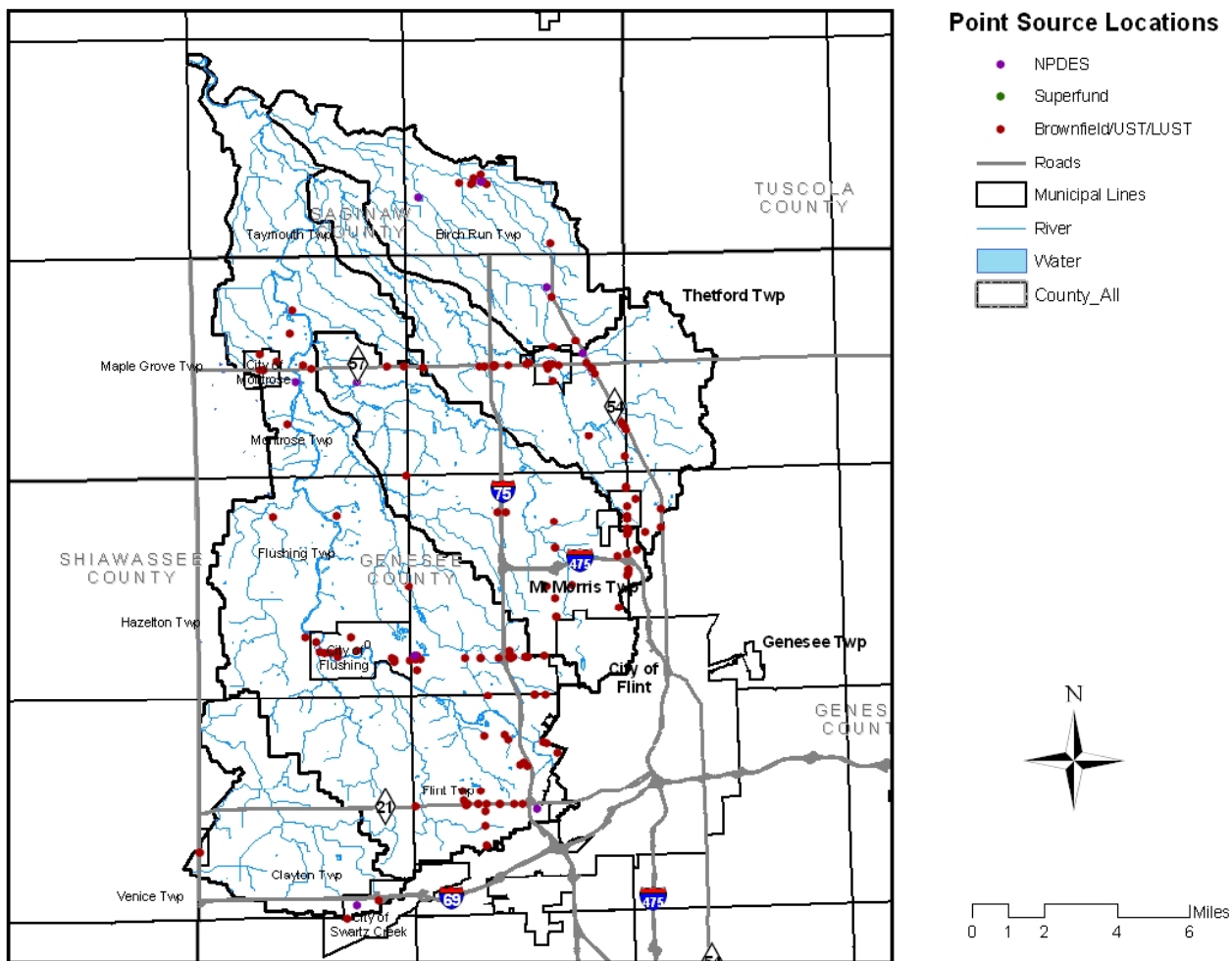


Figure 3-11 Point Sources

POINT SOURCES OF POTENTIAL POLLUTANTS

Table 3-5 Point Sources

DESCRIPTION	PERMIT	OWNER-SHIP	STATUS	SUB-WATERSHED	MUNICIPALITY	RECEIVING WATERS
Superfund Sites						
BrownField Sites / Underground Storage Tanks (UST/LUST)						
Dye Rd Dump	25000008	Private	Interim	8529	Flint	Flint River, Lower
Linden Road LF	25000016	Private	Interim	8529	Flint	Flint River, Lower
Al's Furniture	25000044	Private	Interim	8529	Flushing	Flint River, Lower
GMC Fisher Guide Coldwater Rd	25000012	Private	Contact Lead Dist	57	Flint	Brent Run
Mt Morris Dumpsite	25000056	Private	Delisted	159	Mt Morris	Pine Run
Clio Johnson St. Plating	25000019	Private	Inactive	8530	Vienna	Pine Run
McKinley and M57 Dump Site	25000017	Private	Interim	8526	Montrose	Flint River, Lower
Kish Landfill	25000015	Private	Contact Lead Dist	8525	Montrose	Flint River, Lower
Birch Run Gasoline Contam	73000128	Private	Inactive	8533	Birch Run	Silver Creek 1
Total Superstop, Lennon	8103	Private	Open	8532	Springfield	Misteguay
Toys R US	50001177	Private	Open	464	Unknown	Flint River, Lower

DESCRIPTION	PERMIT	OWNER-SHIP	STATUS	SUB-WATERSHED	MUNICIPALITY	RECEIVING WATERS
BrownField Sites / Underground Storage Tanks (UST/LUST)						
Union Super Stop #13	8090	Private	Open	464	Novi	Flint River, Lower
Kessel Food Market -	39957	Private	Open	8529	Westerville	Flint River, Lower
NRT	50005499	Private	Open	8529	Unknown	Flint River, Lower
Conex Inc	50002453	Private	Open	8529	Unknown	Flint River, Lower
Amoco Oil #5861	5665	Private	Open	8528	Flint	Flint River, Lower
Sunshine Food Stores,	2197	Private	Open	8528	Not Recorded	Flint River, Lower
Total Station #1820	8091	Private	Open	8529	Southfield	Flint River, Lower
Amoco Oil, #0194	5708	Private	Open	8528	Livonia	Flint River, Lower
Super Flite Oil Company	21661	Private	Open	8528	Saginaw	Flint River, Lower
Speedway #8756	20106	Private	Open	8528	Springfield	Flint River, Lower
Former Archies Service	50005636	Private	Open	8529	Unknown	Flint River, Lower
Northwest Marathon	16720	Private	Open	8528	Flint	Flint River, Lower
Davison Oil - Shell	39740	Private	Open	8528	Davison	Flint River, Lower
Flushing Dpw	1314	Private	Open	8529	Flushing	Flint River, Lower
Amoco Oil #5762	5690	Private	Open	8528	Birmingham	Flint River, Lower
K-mart #3069, Pierson Road	813	Private	Open	8528	Troy	Flint River, Lower
Mattis Fuel Co	1654	Private	Open	8528	Flushing	Flint River, Lower
Mooney Oil #14	35380	Private	Open	8528	Melvindale	Flint River, Lower
Hasman Auto Sales	40484	Private	Open	8528	FLINT	Flint River, Lower
Central Concrete Products	5136	Private	Open	8528	Flint	Flint River, Lower
Mattis Car Wash	40644	Private	Open	57	Flushing	Brent Run
Central Distributor	18546	Private	Open	8529	Flushing	Flint River, Lower
NRT Owner	50002171	Private	Open	8529	Unknown	Flint River, Lower
Union Super Stop #11	8092	Private	Open	764	Flushing	Flint River, Lower
Quick-save Food Store #12	2200	Private	Open	8529	Flushing	Flint River, Lower
Moore's Mobil Service	7692	Private	Open	8528	Flushing	Flint River, Lower
Mt Morris Twp Fire Dept	1342	Private	Open	57	Mount Morris	Brent Run
Union Super Stop #16	1655	Private	Open	57	Lansing	Brent Run
K-mart #4099, Saginaw Road	769	Private	Open	57	Troy	Brent Run
Action Auto #8, 3/11/92	12977	Private	Open	57	Mount Morris	Brent Run
Amoco - Stanley Rd, Phil Flint	19451	Private	Open	57	Mount Morris	Brent Run
Scharrer Corners	33857	Private	Open	57	Mount Morris	Brent Run
Louie's Service	35771	Private	Open	57	MT MORRIS	Brent Run
Jenkins Service Inc	17712	Private	Open	159	Mount Morris	Pine Run
Former Fedchenko Site	35764	Private	Open	159	Flushing	Pine Run
Former O'brien Cleaners	50002329	Private	Open	159	Unknown	Pine Run
Brentcreek Country Store	34710	Private	Open	239	Flushing	Flint River, Lower
Autozone Inc	39352	Private	Open	159	MEMPHIS	Pine Run
Khourys Market	50000485	Private	Open	8524	Unknown	Brent Run
Mcdonalds Restaurant	50001706	Private	Open	8530	Unknown	Pine Run
Water Wonderland S C	3721	Private	Open	8530	CLIO	Pine Run
Rolison's Service	16819	Private	Open	8530	Clio	Pine Run
Bill Voorhers	41559	Private	Open	165	Clio	Pine Run
Quick Stop Food Store	38039	Private	Open	8526	Clio	Flint River, Lower
Shannons Diversified	1549	Private	Open	8526	Montrose	Flint River, Lower
Short, George	50001440	Private	Open	165	Unknown	Pine Run
Vienna Rd Nrt	50001962	Private	Open	8526	Unknown	Flint River, Lower
Former Clio Filling Station	50005124	Private	Open	8525	Unknown	Flint River, Lower
Midway Market	1845	Private	Open	8524	Flushing	Brent Run
Sunshine Food Store, Clio	2201	Private	Open	8524	Not Recorded	Brent Run
Amoco #137	5837	Private	Open	8530	Flint	Pine Run
Conlee Country Store	567	Private	Open	8530	Clio	Pine Run
Sunoco #0354-5605	4156	Private	Open	8530	Clio	Pine Run
Action Auto #41	20108	Private	Open	8530	Grand Rapids	Pine Run

DESCRIPTION	PERMIT	OWNER-SHIP	STATUS	SUB-WATERSHED	MUNICIPALITY	RECEIVING WATERS
BrownField Sites / Underground Storage Tanks (UST/LUST)						
	2195	Private	Open	8530	Flushing	Pine Run
Vienna Rd Alley Way	40655	Private	Open	8530	CLIO	Pine Run
Conlee Oil Co	41992	Private	Open	8530	Clio	Pine Run
Webster & Garner	17688	Private	Open	8530	Clio	Pine Run
Montrose D P Health	14739	Private	Open	8525	MONTROSE	Flint River, Lower
Mill Street Station	1477	Private	Open	8533	Clio	Silver Creek 1
Blue Lakes Charters	35902	Private	Open	8533	Clio	Silver Creek 1
Storage Garage	41625	Private	Open	8533	Frankenmuth	Silver Creek 1
Birch Run Express Stop	1699	Private	Open	8533	Saginaw	Silver Creek 1
Super Stop #19	8086	Private	Open	8533	Birch Run	Silver Creek 1
Dunkin Donut #2318	19034	Private	Open	8533	Flint	Silver Creek 1
Miller Property - Birch Run	37410	Private	Open	8533	Davison	Silver Creek 1
Bader Bros Inc	40669	Private	Open	8533	Reese	Silver Creek 1
Speedway #8862	13413	Private		8532	Swartz Creek	Misteguay
BP Gas Station	5836	Private		8532	Swartz Creek	Misteguay
Speedway #8797	8103	Private		8532	Lennon	Misteguay
N & J Oil Inc	40388	Private		464	Flint	Flint River, Lower
Used Car Mega Lot	39235	Private		464	Flint	Flint River, Lower
Speedway #2210	17515	Private		464	Flint	Flint River, Lower
K-317	8090	Private		464	Flint	Flint River, Lower
Patsy Lou Williamson	37740	Private		464	FLINT	Flint River, Lower
Mobil/1-stop Food Store	38601	Private		8529	Flint	Flint River, Lower
Sam's Club #8291	41001	Private		8529	Flint	Flint River, Lower
Corunna Road Amoco	19459	Private		8529	Flint	Flint River, Lower
#69 Corunna & Maxwell Shell	40262	Private		8529	Flint	Flint River, Lower
Kroger #413	39957	Private		8529	Flint	Flint River, Lower
Speedway #8745	12961	Private		8529	Flint	Flint River, Lower
Corunna Road Sunoco	18958	Private		8529	Flint	Flint River, Lower
Flint Twp Fire Dept	7027	Private		464	Flint	Flint River, Lower
Mobil	506	Private		8529	FLINT	Flint River, Lower
Flint Osteopathic Hospital	9454	Private		8529	Flint	Flint River, Lower
Ballenger Hwy Mobil Inc	508	Private		8529	FLINT	Flint River, Lower
Flushing 400 Inc	18962	Private		8529	FLINT	Flint River, Lower
Container Specialties Inc	13434	Private		8529	FLINT	Flint River, Lower
Flint Nw	11698	Private		8529	Flint	Flint River, Lower
GCDC	8226	Private		8529	FLINT	Flint River, Lower
Sarakl Inc	39464	Private		8529	Flint	Flint River, Lower
R & D Oil Inc	5665	Private		8528	Flint	Flint River, Lower
Dalton Airport Assoc Inc	34260	Private		8529	FLUSHING	Flint River, Lower
Flushing Marathon	8091	Private		8529	Flushing	Flint River, Lower
Speedway #2346	17548	Private		8528	Flushing	Flint River, Lower
Frank McNally Inc	7972	Private		8529	Flushing	Flint River, Lower
Mattis Car Wash	35216	Private		8528	Mount Morris	Flint River, Lower
Meijer Gas Station #28	17052	Private		8528	Flint	Flint River, Lower
Northwest Marathon	16720	Private		8528	Flint	Flint River, Lower
Pierson Rd Shell	39740	Private		8528	Flint	Flint River, Lower
I-75 & Pierson Rd BP Inc	5690	Private		8528	Flint	Flint River, Lower
Mattis Fuel Co	1654	Private		8528	Flint	Flint River, Lower
Rich Oil #8754	35380	Private		8528	Flint	Flint River, Lower
Flushing Sunoco	4161	Private		8529	Flushing	Flint River, Lower
Flushing ESS	11697	Private		8529	Flushing	Flint River, Lower
Quick-sav #12	2200	Private		8529	Flushing	Flint River, Lower
General Electric Co	13465	Private		8528	FLINT	Flint River, Lower
City of Flushing Fire Dept	33935	Private		8529	Flushing	Flint River, Lower

DESCRIPTION	PERMIT	OWNER-SHIP	STATUS	SUB-WATERSHED	MUNICIPALITY	RECEIVING WATERS
BrownField Sites / Underground Storage Tanks (UST/LUST)						
Waste Water Treatment Plant	8797	Private		8527	Flushing	Flint River, Lower
Flushing Warehouse	36342	Private		8527	Flushing	Flint River, Lower
Albert Chevrolet	7057	Private		57	Flint	Brent Run
Albert Chevrolet	7057	Private		57	Flint	Brent Run
Summit Middle School	36156	Public		57	Flint	Brent Run
Reliable Investment LLC	19457	Private		57	Flint	Brent Run
Mona Z Fuel Inc	12215	Private		57	Mt Morris	Brent Run
TA Stations, Inc	12977	Private		57	Mt Morris	Brent Run
Riley Building	36155	Private		57	Mount Morris	Brent Run
Ghotra Petroleum LLC	19451	Private		57	Mt Morris	Brent Run
Scharrer Corners	33857	Private		57	MT MORRIS	Brent Run
Kroger #407	40983	Private		57	Mount Morris	Brent Run
Eid Gas Station	40552	Private		57	Mount Morris	Brent Run
Mobil 1-Stop Food Store	509	Private		159	Mount Morris	Pine Run
Kelly's Investments LLC	8087	Private		8527	Flushing	Flint River, Lower
F & M Petroleum	19458	Private		109	Mt Morris	Brent Run
Quick-sav #7	13025	Private		109	Mount Morris	Brent Run
Sunshine Foods #121	2203	Private		159	MT MORRIS	Pine Run
Mt Morris Citgo	4165	Private		159	Mount Morris	Pine Run
Mt Morris Con. Schools	35507	Private		159	Mount Morris	Pine Run
Speedway #8386	33540	Private		159	Mount Morris	Pine Run
Montague Tool & Mfg Co	7634	Private		8530	Clio	Pine Run
M L Taylor Landscaping & Excavat	8799	Private		8526	Montrose	Flint River, Lower
Northpointe Marathon #1	35560	Private		8530	Clio	Pine Run
Clio Co	11680	Private		449	Clio	Pine Run
Conlee Oil	533	Private		8530	Clio	Pine Run
Conlee Mart	38039	Private		8526	Montrose	Flint River, Lower
Clio Mini Mart	38625	Private		165	Clio	Pine Run
Murphy USA # 7387	41954	Private		8530	Clio	Pine Run
Dunkin Donuts/amoco 2296	5837	Private		8530	CLIO	Pine Run
Conlee Oil Mobil	567	Private		8530	Clio	Pine Run
I-75 & Vienna Sunoco Inc	4156	Private		8530	Clio	Pine Run
#66 Clio Shell	38627	Private		8530	Clio	Pine Run
Fast Track	19464	Private		8530	Clio	Pine Run
Clio Area Schools	12457	Public		8530	CLIO	Pine Run
Webster & Garner Inc	17688	Private		8530	Clio	Pine Run
Aldrich Citgo	40288	Private		165	CLIO	Pine Run
Montrose Community Schools	6700	Private		8526	Montrose	Flint River, Lower
Clio Marathon	1477	Private		8533	Clio	Silver Creek 1
Blue Lakes Charters & Tours	35902	Private		8533	Clio	Silver Creek 1
Genesee County W&W	15552	Public		8525	MONTROSE	Flint River, Lower
Birch Run/ Amoco #6	38786	Private		8533	Birch Run	Silver Creek 1
USF Holland Inc	15919	Private		8533	Birch Run	Silver Creek 1
Active NPDES Permits						
GCRC-Swartz Cr M. Garage	MIS510237	Private		8532	Swartz Creek	Misteguay
Venture Automotive-Flint	MIS510103	Private		8529	Flint	Flint River, Lower
Central Concrete Products Inc	MIS510487	Private		8528	Flushing	Flint River, Lower
GCRC-Montrose M Garage	MIS510238	Private		8526	Montrose	Flint River, Lower
Brent Run Landfill	MIS510151	Private		8524	Montrose	Brent Run
Blue Lakes Charters & Tours	MIS510154	Private		8530	Clio	Pine Run
R & R Ready Mix-Clio	MIS510644	Private		8533	Clio	Silver Creek 1
Birch Run WWSL	0	Private		8533	Birch Run	Silver Creek 1
Mooney Oil Corp-Birch Run	0	Private		8533	Birch Run	Silver Creek 1

Data from USEPA National Priorities list; MDEQ Brownfields- USTfields Database; MDEQ Active NPDES permits list.

SEWER AND SEPTIC SYSTEM SERVICE AREAS

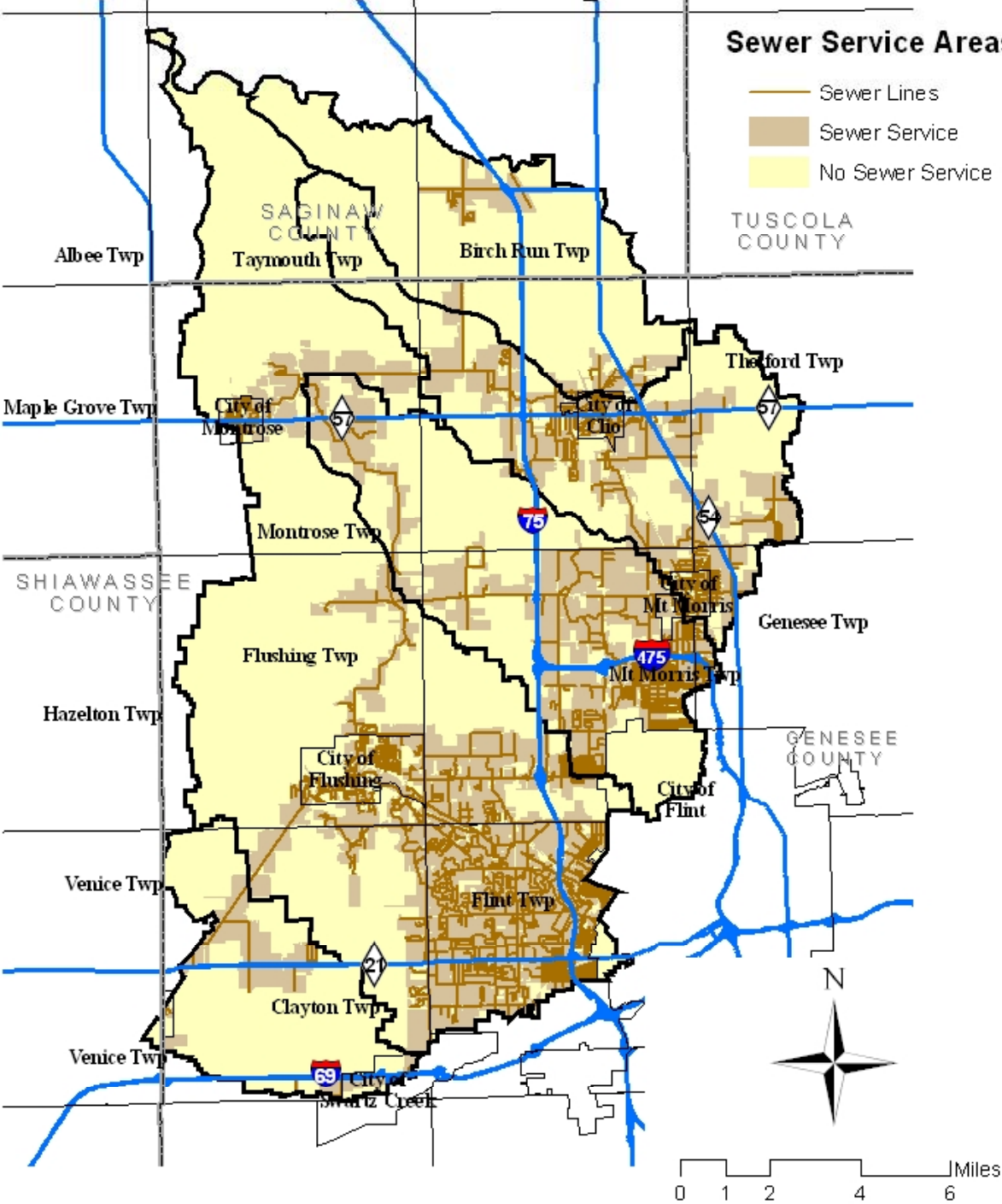
Wastewater is dealt with by either a system of sanitary sewers leading to a wastewater treatment plant or by on-site sewage disposal systems (OSDS). On-site sewage disposal systems typically include a septic tank and an absorption field. OSDS typically serve single-family residences in less urbanized settings, although community septic systems are becoming more common in newer developments. The Sewer Service Areas Map Figure 3-11 depicts the areas within the watershed that currently have access to sanitary sewers.

Within Genesee County the sanitary sewer systems has been predominantly constructed since 1960's. . This system has been extended outside the County by contract, to serve isolated developments.

If properly designed, constructed and maintained, both OSDS and sanitary sewers can provide for disposal of sewage in a safe and environmentally responsible manner. If either type of system fails, inadequately treated sewage can be a threat to aquatic ecosystems and human health due to harmful bacteria and excess nutrients. Along with regulation, education is often considered central to addressing potential issues with OSDS. Owners, particularly those moving from areas with sanitary sewers to those with OSDS, often have limited understanding of the functioning and maintenance of OSDS. This lack of knowledge can lead to poor function and premature failure, leading to contamination of the ground and surface waters. Several action items in chapter 8 have been proposed to address both sanitary and OSDS.

The installation and maintenance of septic systems within the watershed are regulated by the County Health Department; however there is no system currently in place to monitor the functioning and maintenance of these systems following installation.

Figure 3-12 Sewer Service Areas



SIGNIFICANT NATURAL FEATURES TO BE PROTECTED

Michigan has a number of significant natural features located across the State. These natural features can provide a number of public benefits, which may include recreation, bird watching, hunting, fishing, camping, hiking, off-roading, and water sports. These areas also include critical habitat for different species of plants, mammals, amphibians, reptiles, birds, fish, and macroinvertebrates.

The Michigan Department of Natural Resources provides information on threatened and endangered species in Michigan by watershed. This work is coordinated by the Michigan Natural Features Inventory.

A species is classified as **endangered** if it is near extinction throughout all or a significant portion of its range in Michigan.

A species is **threatened** if it is likely to become classified as endangered within the foreseeable future, throughout all or a significant portion of its range in Michigan.

A species is of **special concern** if it is extremely uncommon in Michigan or if it has a unique or highly specific habitat requirement and deserves careful monitoring of its status. A species on the edge or periphery of its range that is not listed as threatened may be included in this category along with any species that was once threatened or endangered but now has an increasing or protected, stable population.

A species is **extinct** if it can no longer be found anywhere in the world. An **extirpated** species is one, which doesn't exist in Michigan, but can be found elsewhere in the world.

A species is **stable** if it is not included in the above categories and the population is not declining drastically. A stable species is breeding and reproducing well enough to maintain current population in a given area.

A review of the Michigan Natural Features Inventory did not show any occurrence of species of plants or animals, which are listed as threatened, endangered, or of special concern within the Lower Flint River Watershed.

Table 3-6 shows the species of plants and animals, which are listed as threatened, endangered, or of special concern. Since the watershed has experienced urbanization and population growth, certain types of land are less common than in the past. In order to protect these areas and species, sensitive areas in the watershed have been identified.

Threatened and endangered species information was taken from the Michigan Natural Features Inventory. Those animals/plants listed above are within the Lower Flint River Watershed. Most of the above animals/plants are found in the Brent Run Watershed and the Silver Creek Watershed.

Table 3-6 Threatened and Endangered Species

Scientific Name	Common Name	Sub Watershed Found	Federal Status	State Status
<i>Elaphe vulpine gloydi</i>	Eastern Fox Snake	Silver Creek		T
<i>Galearis spectabilis</i>	Showy Orchis	Silver Creek		T
<i>Jeffersonia diphylla</i>	Twinleaf	Brent Run		SC
<i>Ludwigia alternifolia</i>	Seedbox	Brent Run		SC

(Source: Michigan Natural Features Inventory)

Key: SC = Special Concern E = Endangered T = Threatened
 PE = Proposed Endangered C2/C3 = Candidate

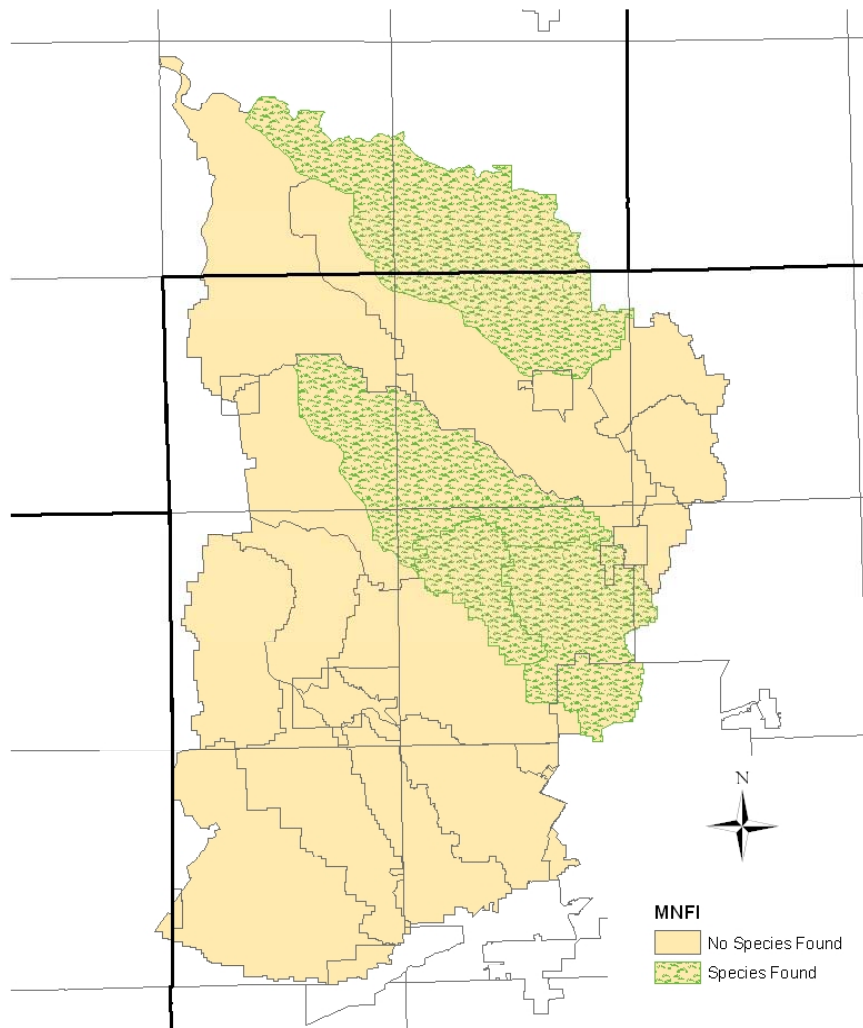


Figure 3-13 Natural Features Area(s)

Source: Michigan Natural Features Inventory

SECTION 4 - WATER QUALITY INDICATORS

RIVERINE HABITAT STUDIES

Fisheries Studies

The original fish communities of the Great Lakes region are of recent origin. Melt water from the Wisconsin glacier created aquatic environments for fish. Original fish gained access through migration from connecting waterways. A description of the fish community in the Flint River Watershed at the time of European settlement (early 1800's) is not available. However anecdotal accounts of the time mention several species. Surveys on the Flint River and several tributaries in 1927 provide a reasonable account for additional indigenous fish species (MDNR, Fishery Division). Seventy-seven species are believed to be indigenous to the Flint River Watershed. The original fish habitat of the Flint River watershed has been greatly altered by human settlement. The 1900's gave rise to the industrial era and the urbanization of the Flint River watershed. City's and towns located near the river became more developed as their population increased. The discharge of human wastes and synthetic pollutants into the river degraded water quality to the extent that only the most tolerant fish species could survive. Dams were built for flood control, flow augmentation, and water supply to municipalities and industry. The biological communities in the Flint River and its tributaries have improved significantly since the 1970's with water quality improvements. Continued efforts to improve water quality will most probably result in greater biological integrity and diversity. Although 77 species of fish remain present, at least 5 fish species that once used the Flint River for spawning (lake sturgeon, muskellunge, lake trout, lake herring, lake whitefish) are believed extirpated from the river. The status of 8 other fish species remains unknown. Present day biological communities must adapt to human alteration of the watershed. The geological and hydrological characteristics of the watershed and the development of an extensive drainage system result in an unstable flow and reduce habitat and only biological communities that can adapt will persist. Management options are available to minimize stream degradation and preserve biological integrity.

Fish communities have been altered through intentional and inadvertent introduction of exotic species. Fish stockings by the MDNR, Fisheries Division has focused on improving recreational fishing opportunities. In the early 1920's, many headwaters tributaries were stocked with brook trout. Although brook trout are indigenous to Michigan, no evidence exists to suggest they were native to the Flint River. Brown trout stocking in the Kearsley and Thread Creeks continue as successful recreational fishery programs. No other non-indigenous species introduction has altered or affected the Flint River watershed fish communities like the common carp. This exotic was first introduced into Michigan waters in 1885 and spread rapidly.

Advisories to limit the consumption of certain fish species and sizes (fish contaminant advisories [FCAs]) have been published by MDEQ and the Michigan Department of Community Health for portions of the Flint River. All inland lakes, reservoirs, and impoundments within the State of Michigan are also under a fish advisory for mercury contamination. The latter is a general advisory applied to all inland lakes in Michigan since not all inland lakes, reservoirs, and impoundments have been tested or monitored. Table 4-1 lists the FCAs published for watershed.

Table 4-1 Fish Advisory Information

Water Body	Location	Fish Species	Restricted Population	Restriction
Flint River	Downstream of City of Flint	Carp	Women and children	<30 inches - One meal per month
Flint River	Downstream of City of Flint	Small Mouth Bass	Women and children	12-30 inches – One meal per week
All inland lakes, reservoirs, and impoundments	Entire watershed	Crappie	General population	8-22inches - One meal per week
			Women and children	8-22 inches - One meal per month
All inland lakes, reservoirs, and impoundments	Entire watershed	Largemouth and Smallmouth Bass	General population	14-30+ inches - One meal per week
			Women and children	14-30+ inches - One meal per month
All inland lakes, reservoirs, and impoundments	Entire watershed	Muskellunge	General population	30+ inches - One meal per week
			Women and children	30+ inches - One meal per week
All inland lakes, reservoirs, and impoundments	Entire watershed	Northern Pike	General population	22-30+inches - One meal per month
			Women and children	22-30+ inches - One meal per month
All inland lakes, reservoirs, and impoundments	Entire watershed	Rock Bass	General population	8-18 inches - One meal per week
			Women and children	8-18 inches - One meal per month
All inland lakes, reservoirs, and impoundments	Entire watershed	Walleye	General population	14-30+ inches - One meal per week
			Women and children	14-30+ inches - One meal per month
All inland lakes, reservoirs, and impoundments	Entire watershed	Yellow Perch	General population	8-18 inches - One meal per week
			Women and children	8-18 inches - One meal per month

* Michigan Department of Community Health, 2004. Michigan 2004 Fish Advisory.,

Macroinvertebrate Studies

In the spring of 1999 the Flint River Watershed Coalition (FRWC) and the Center for Applied Environmental Research (CAER) at UM-Flint established a twice-yearly volunteer monitoring program for the Flint River watershed. The program was funded originally by a grant from MDEQ. Benthic monitoring assesses the quality of the Flint River watershed and educates the public. The volunteer monitoring program uses trained volunteers to gather information about the relative health of the areas stream and rivers. In the past six years over 100 volunteer monitors have participated in the program. The volunteers have helped to build awareness of pollution problems, been trained in pollution prevention, provided valuable data for waters that may otherwise be unassessed, and increased the amount of water quality information available to citizens and decision makers. The data collected thus far has been used to characterize various watersheds, screen for water quality problems, and measure existing conditions and trends.

The major element of the program is the collection and analyzing of benthic macroinvertebrates at 30 locations across the whole **Flint River Watershed**, 5 of those sites are within the Lower Flint River Watershed. Invertebrates are valuable subjects for water quality studies because they stay put. They are not very mobile and unlike fish they cannot move to avoid pollution. Using these creatures to identify water quality conditions is based on the fact that every species has a certain range of physical and chemical conditions in which it can survive. The kinds of benthic invertebrates living in a stream indicate conditions within the stream because they cannot migrate to a different location if conditions are not conducive to survival. Some organisms can survive in a wide range of conditions and are more tolerant of pollution, and so are labeled “**tolerant**”. Other species are very sensitive to changes in conditions and are “**intolerant**” of pollution. These are labeled “**sensitive**”. The presence of tolerant organisms and few or no sensitive organisms indicates the presence of pollution, because pollution tends to reduce the number of species in a community by eliminating the organisms that are sensitive to changes in water quality.

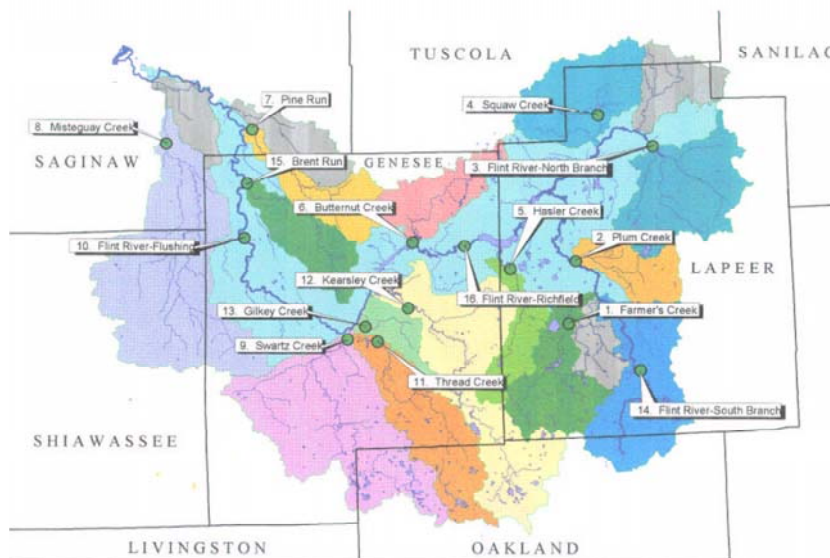


Figure 4-1 Flint River Watershed

Table 4-2 Benthic Monitoring Results

Site/Location	Jun 1999	Sep 1999	May 2000	Oct 2000	Apr 2001	Oct 2001
Brent Run Montrose Twp	43.3 Good	38.6 Good	31.8 Fair	33.4 Fair	33.6 Fair	38.6 Good
Brent Run Headwaters Mt. Morris Twp	N/M	20.2 Fair	17.2 Poor	10.2 Poor	N/M	N/M
Butternut Creek Genesee Twp	31.5 Fair	10.5 Poor	39.4 Good	N/M	39.9 Good	49.4 Excellent
Butternut Creek, Headwaters Forest Twp	N/M	N/M	42.8 Good	N/M	47.9 Good	34.7 Good
Flint River, Flushing Twp	N/M	34.8 Good	26.0 Fair	N/M	27.5 Fair	N/M
Flint River, Richfield Twp	41.1 Good	41.6 Good	43.0 Good	22.4 Fair	16.5 Poor	29.9 Fair
Gilkey Creek City of Flint	29.5 Fair	11.2 Poor	13.3 Poor	18.8 Poor	5.1 Poor	15.3 Poor
Gilkey Creek Headwaters Burton Twp	N/M	N/M	N/M	N/M	N/M	N/M
Kearsley Creek Burton Twp	23.5 Fair	36.5 Good	N/M	N/M	23.2 Fair	N/M
Kearsley Creek Headwaters Atlas Twp	N/M	21.2 Fair	10.1 Poor	32.6 Fair	40.8 Good	43.5 Good
Misteguay Creek Headwaters Clayton Twp	N/M	32.0 Fair	40.0 Good	N/M	N/M	N/M
Pine Run Headwaters Vienna Twp	N/M	22.7 Fair	39.5 Good	N/M	N/M	N/M
Swartz Creek Flint Twp	26.9 Fair	5.1 Poor	11.3 Poor	41.5 Good	15.0 Poor	10.2 Poor
Swartz Creek Headwaters Fenton Twp	N/M	30.4 Fair	25.7 Fair	51.0 Excellent	N/M	N/M
Thread Creek Burton Twp	23.2 Fair	33.4 Fair	11.2 Poor	N/M	24.3 Fair	28.3 Fair
Thread Creek Headwaters Grand Blanc Twp	N/M	41.7 Good	44.1 Good	46.8 Good	40.8 Good	37.3 Good

Apr 2002	Oct 2002	Apr 2003	Oct 2003	Apr 2004	Oct 2004	Apr 2005	Oct 2005	Apr 2006
38.1 Good	53.0 Excellent	28.8 Fair	10.1 Poor	N/M	N/M	31.9 Fair	30.3 Fair	35.3 Good
N/M	N/M	N/M	N/M	4.3 Poor	N/M	30.1 Fair	N/M	26.7 Fair
26.6 Fair	45.0 Good	40.5 Good	45.0 Good	33.4 Fair	38.0 Good	40.2 Good	35.5 Good	36.3 Good
49.2 Excellent	24.8 Fair	43.4 Good	31.0 Fair	38.2 Good	46.4 Good	45.5 Good	51.6 Excellent	60.9 Excellent
29.5 Fair	N/M	40.1 Good	24.5 Fair	26.8 Fair	40.0 Good	34.1 Good		27.2 Fair
26.5 Fair	N/M	28.2 Fair	24.7 Fair	26.3 Fair	N/M	23.4 Fair	N/M	N/M
9.5 Poor	23.8 Fair	11.3 Poor	4.4 Poor	16.4 Poor	N/M	15.6 Poor	17.5 Poor	19.4 Fair
N/M	24.5 Fair	N/M	30.9 Fair	N/M	35.8 Good	44.2 Good	N/M	34.8 Good
42.0 Good	43.2 Good	54.0 Excellent	N/M	32.1 Fair	N/M	17.2 Poor	N/M	35.2 Good
49.7 Excellent	18.1 Poor	N/M	31.2 Fair	N/M	N/M	26.4 Fair	N/M	N/M
N/M	N/M	N/M	N/M	35.5 Good	27.0 Fair	30.1 Fair	N/M	15.4 Poor
N/M	N/M	18.1 Poor	N/M	35.7 Good	N/M	19.3 Fair	N/M	25.6 Fair
11.2 Poor	18.5 Poor	30.8 Fair	N/M	9.4 Poor	N/M	40.6 Good	N/M	31.7 Fair
N/M	11.3 Poor	18.4 Poor	N/M	33.6 Fair	N/M	N/M	30.4 Fair	30.4 Fair
37.5 Good	33.4 Fair	19.4 Fair	17.2 Poor	23.4 Fair	N/M	19.3 Fair	24.1 Fair	12.2 Poor
48.8 Excellent	N/M	37.8 Good	21.2 Fair	31.5 Fair	N/M	22.2 Fair	N/M	40.0 Good

Source: Flint River Watershed Coalition

WATER CHEMISTRY AND HYDROLOGY STUDIES

Table 4-3 Michigan Section 303d TMDL Water Bodies

Water Body	Observations and Conditions	Pollutants	Suspected Pollution Source	Expected TMDL Date
Brent Run		Habitat	Modification	
Cole Creek		Habitat	Modification	
Flint River	Water tests	FCA-PCB's	Historic	2010
Mud Creek		Habitat	modification	

E. Coli Water Sampling (Health Department or Local Agencies)

The following language from the Michigan Water Quality Standards regulates the allowable limits of *E. coli* bacteria in surface waters of the State:

"R 323.1062 Microorganisms.

Rule 62. (1) All waters of the state protected for total body contact recreation shall not contain more than 130 Escherichia coli (E. coli) per 100 milliliters, as a 30-day geometric mean. Compliance shall be based on the geometric mean of all individual samples taken during 5 or more sampling events representatively spread over a 30-day period. Each sampling event shall consist of 3 or more samples taken at representative locations within a defined sampling area. At no time shall the waters of the state protected for total body contact recreation contain more than a maximum of 300 E. coli per 100 milliliters. Compliance shall be based on the geometric mean of 3 or more samples taken during the same sampling event at representative locations within a defined sampling area.

(2) All waters of the state protected for partial body contact recreation shall not contain more than a maximum of 1,000 E. coli per 100 milliliters. Compliance shall be based on the geometric mean of 3 or more samples, taken during the same sampling event, at representative locations within a defined sampling area."

The Genesee County Health Department performs weekly e. coli test from May through September on the following water bodies within the Lower Flint River Watershed:

- Pinewood Lake

Genesee County Health Department Surface Water Sampling Locations

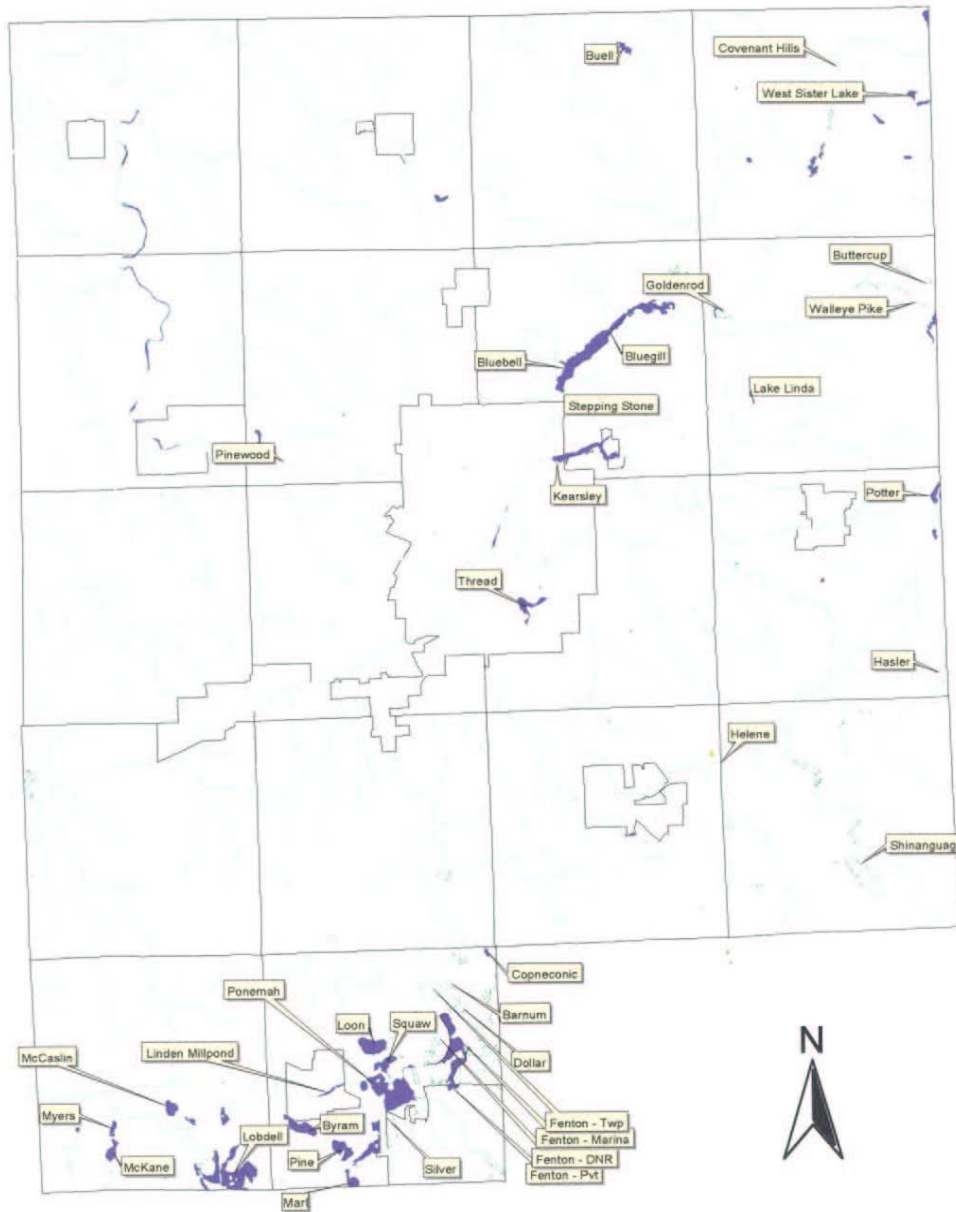


Figure 4-2 E. Coli Test Sites within Genesee County

USGS Monitoring

There is only 1 USGS stream gauges within the Lower Flint River Watershed.

04148500 Flint River Near Flint, MI	SW1/4 sec.4 Flint Township	September 1903 to March 1904 (gauge Heights only) August 1932 to Current. Water-stage recorder. Gauge-height records for flood seasons collected in this vicinity 1911-1932.
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POLLUTANT LOAD ANALYSIS

The pollutant load analysis was conducted utilizing the Environmental Protection Agency's Spreadsheet Tool for Estimating Pollutant Loads (STEPL). Phosphorus, 5-day Biological Oxygen Demand (BOD), and sediment loadings were all calculated on a subwatershed basis, using this program. The methods used to calculate urban loadings of phosphorus, sediment, and BOD primarily utilized the runoff volume and land use specific pollutant concentrations for each Subwatershed to provide an average annual loading. Agricultural sediment calculations utilized the universal soil loss equation (USLE), widely used to calculate average annual soil losses from sheet and rill erosion (EPA, 2004). Rill erosion is when the water eats away deep trenches in the ground. Phosphorus and BOD were calculated for agricultural areas by multiplying the soil load by a pollutant concentration for nutrients in the sediment. Graphical results of these calculations are presented in the following Figures. The table lists all the Potential pollutant loads. Figure3-1 shows the corresponding subwatersheds.

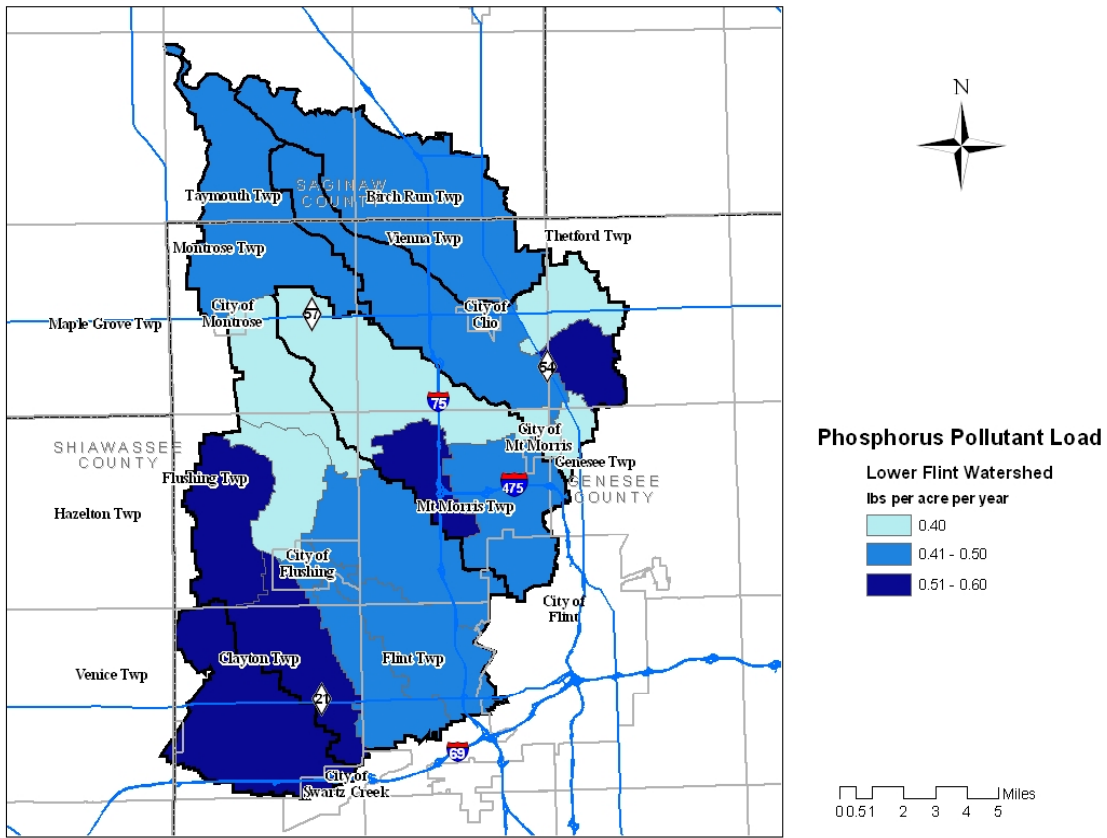


Figure 4-3 Phosphorus Pollutant Load

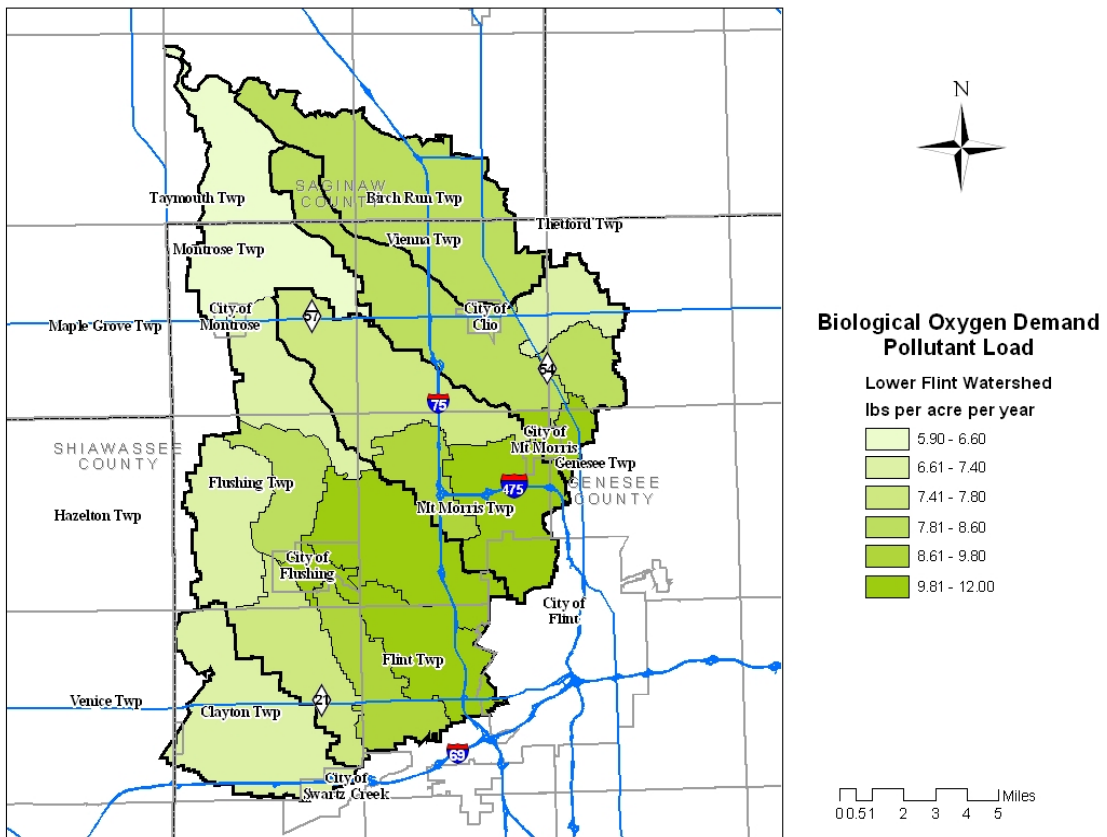


Figure 4-4 BOD Pollutant Load

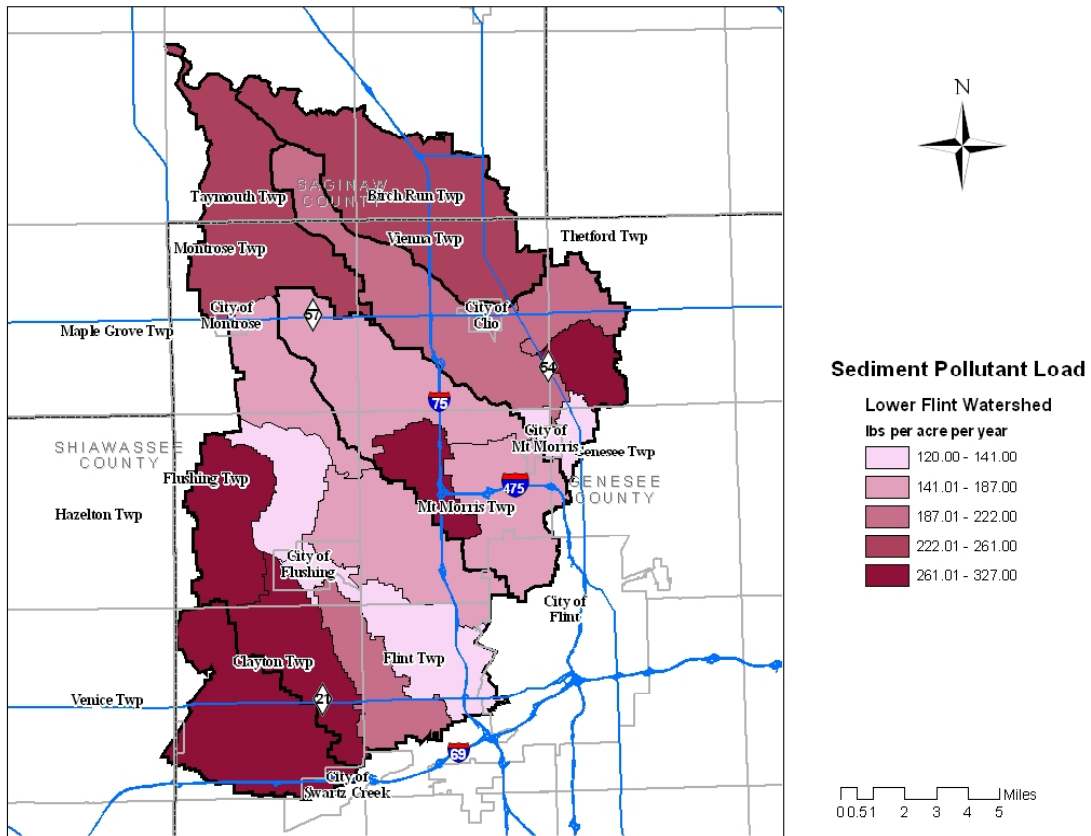


Figure 4-5 Sediment Pollutant Load

Table 4-4 Unit Area Storm Water Loading Data

Watershed	No.	N Load	P Load	BOD Load	Sediment Load
		lb/ac/yr	lb/ac/yr	lb/ac/yr	lb/ac/yr
Boutell & Branch	0449	3.1	0.6	8.3	327
Brent Run	8524	2.7	0.4	7.8	187
Central Drain	0109	3.6	0.6	9.8	317
Cole Creek	0764	3.0	0.6	7.7	295
Flint River 1	8525	2.6	0.5	6.6	261
Flint River 2	8526	2.4	0.4	7.2	163
Flint River 3	8527	2.6	0.4	8.5	141
Flint River 4	8528	3.3	0.5	10.8	180
Flint River 5	8529	3.1	0.5	11.8	133
Freeman Drain	0239	2.9	0.6	7.0	320
Lake Drain	0057	3.2	0.5	11.3	175
Mason Drain	0159	3.1	0.4	12.0	120
Messmore and Cronk	0464	3.1	0.5	9.7	221
Misteguay 1	8532	3.1	0.6	7.4	294
Misteguay 2	8531	2.4	0.5	5.9	246
Pine Run & Tryon	0165	2.6	0.4	7.3	222
Pine Run 1	8530	2.9	0.5	8.6	202
Silver Creek1	8533	2.9	0.5	8.2	257

Source: Tetra Tech

SECTION 5 - COMMUNITY OUTREACH

PUBLIC PARTICIPATION PROCESS

The Public Participation Plan (PPP) for the Lower Flint River was submitted in Feb 2004. Many of the Stakeholders expressed a concern about the repetition between the watershed plans. To streamline the process this plan was updated and resubmitted as part of the Combined Watershed PPP in September 2005. The Combined PPP was for the Lower Flint River, the Upper Flint River and the Shiawassee River. This Plan outlines the roles of the steering committee, stakeholder groups, and the general public in developing the watershed management plan and how the information would be used during the decision-making process.

The goal of the PPP was to effectively involve stakeholders and the public throughout the watershed management planning process so that they contribute during the process and understand the plan recommendations to gain support for implementation. Key stakeholders in the watershed were identified. Materials for stakeholders to use, to educate their constituents was developed. Lastly, the plan sought to obtain useful, measurable social feedback information throughout the public participation process.

One criteria was that the Public Participation Process needed to be flexible to allow for changes along the way. Obtaining sufficient public input on watershed projects takes creativity, persistence, and commitment. While the PPP for this watershed outlines specific activities that were to be completed, the activities were modified as needed.

The following list summarizes the main venues in which public involvement will be sought.

- Public Briefing
- Stakeholder Workshops
- Focus Groups: as needed
- Report to Municipal Officials

There have been 3 **stakeholder meetings** for the Lower Flint River Watershed. Part way through the process it was combined with the Upper Flint and the Shiawassee Watersheds. There were an additional 4 combined **stakeholder/ public** meetings. Attendances had been hit and miss for the combined meetings. Because there was poor public turnout at the combined meetings, it was decided, a survey would be used to solicit public opinion. A citizen survey was developed based on a survey done in the Anchor Bay Watershed. The Survey was mailed to 560 residents, 410 of those were riparian landowners and was limited to residential properties. Seventy-five residents responded to the survey, (results below). Regular updates on the progress of the program are given to the **Municipal officials** at their regular Advisory meeting. Part of reporting to the Municipal officials was education. The Public Education survey was given to the elected and appointed municipal officials. This was to determine what their educational needs were. The first of an Update Report was sent out to the municipal officials in May of 2005. The purpose of the update is to discuss what all the workgroups and subcommittees are doing. It is the intent that regular updates will follow on a regular basis.

**Middle Flint Survey Results
 Kearsley Creek**

Responses to Survey

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Rank the following goals with a score of 1 to 5, with 1 being most important and 5 being the least important:

	1	2	3	4	5	Did not rank
Remove paper/trash/debris in the river and tributaries to improve its appearance	9	2	4	4	2	2
Better control soil erosion and limit sediments entering the water.	2	6	9	1	3	1
Improve habitat conditions for fish and wildlife in the water	6	7	5	1	1	2
Minimize excessive flows that cause flooding, bank erosion and habitat loss	8	4	6	2	1	1
Encourage investments in land along water for recreation/wildlife protection	5	4	2	4	5	
Expand public education about the benefits of protecting the MFRW	4	4	4	2	6	1
Better control sources of fertilizer reaching the Watershed & the Great Lakes	7	5	6	1	1	2
Remove sources of human waste in the Watershed that threaten public health	14	3	1	3	3	
Protect the quality and accessibility of drinking water (wells)	12	4	2	2	3	1
Increase community planning to address development & protection of water qual	5	8	3	4		

Are there any other goals that you feel should be included in this list? Please indicate any additional goals you would like to see added. How would you rank them from 1 (most important) to 5 (least important)?

What issues concerning the management of the Middle Flint River Watershed are most important to you?

What is the single most important improvement to the Watershed and its tributaries that you would like to see?

What types of information about the Middle Flint Watershed interest you most? (Check as many as apply)

Water quality	17	How I can volunteer to help restore Watershed	5
Bacteria levels	13	How businesses can prevent pollution	8
Fish and wildlife	11	How homeowners can help prevent pollution	6
Parks and public recreation areas	5	Other	

Which of the following is the best approach to keep you informed regarding the progress in developing a plan to restore the Middle Flint River Watershed?

Public meetings/workshops	5	Direct mailings to your home or business	12
Newspaper articles	9	Community newsletters	3
Cable TV	2	Other (specify) EMAIL	1
Web page	4		

with 1 being most important and 5 being the least important:

Rank the following goals with a score of 1 to 5,
Remove paper/trash/debris in the river and tributaries to improve its appearance
Better control soil erosion and limit sediments entering the water.
Improve habitat conditions for fish and wildlife in the water
Minimize excessive flows that cause flooding, bank erosion and habitat loss
Encourage investments in land along water for recreation/wildlife protection
Expand public education about the benefits of protecting the MFRW
Better control sources of fertilizer reaching the Watershed & the Great Lakes
Remove sources of human waste in the Watershed that threaten public health
Protect the quality and accessibility of drinking water (wells)
Increase community planning to address development & protection of water qual

	1	2	3	4	5	Did not rank
Remove paper/trash/debris in the river and tributaries to improve its appearance	6	1	5	1	2	2
Better control soil erosion and limit sediments entering the water.	1	6	5	2	2	2
Improve habitat conditions for fish and wildlife in the water	4	3	1	5	2	2
Minimize excessive flows that cause flooding, bank erosion and habitat loss	2	5	5	3	2	2
Encourage investments in land along water for recreation/wildlife protection	1	2	4	3	4	1
Expand public education about the benefits of protecting the MFRW	2	4	5	3	2	2
Better control sources of fertilizer reaching the Watershed & the Great Lakes	2	6	2	3	1	2
Remove sources of human waste in the Watershed that threaten public health	10	1	2	2	2	2
Protect the quality and accessibility of drinking water (wells)	9	2	3	3	2	2
Increase community planning to address development & protection of water qual	3	5	3	3	1	2

Are there any other goals that you feel should be included in this list? Please indicate any additional goals you would like to see added. How would you rank them from 1 (most important) to 5 (least important)?

What issues concerning the management of the Middle Flint River Watershed are most important to you?

What is the single most important improvement to the Watershed and its tributaries that you would like to see?

What types of information about the Middle Flint Watershed interest you most? (Check as many as apply)

Water quality	14	How I can volunteer to help restore Watershed	3
Bacteria levels	12	How businesses can prevent pollution	4
Fish and wildlife	6	How homeowners can help prevent pollution	8
Parks and public recreation areas	5	Flooding	1
		insect control	1
		Stream bank restoration	1

Which of the following is the best approach to keep you informed regarding the progress in developing a plan to restore the Middle Flint River Watershed?

Public meetings/workshops	2	Direct mailings to your home or business	10
Newspaper articles	10	Community newsletters	
Cable TV	3	Other (specify)	
Web page	2		

with 1 being most important and 5 being the least important:

	1	2	3	4	5	Did not rank
1	4	4	3	2	1	
2	2	2	1	3	1	
3	1	2	3	2	1	
4	2	4	1	2	1	
5	1	5	2	3	1	
6	2	2	3	1	2	1
7	1	1	1	1	1	1
8	10	1			1	1
9	10	1			1	1
10	2	6	1	1	1	1

Rank the following goals with a score of 1 to 5,

- Remove paper/trash/debris in the river and tributaries to improve its appearance
- Better control soil erosion and limit sediments entering the water.
- Improve habitat conditions for fish and wildlife in the water
- Minimize excessive flows that cause flooding, bank erosion and habitat loss
- Encourage investments in land along water for recreation/wildlife protection
- Expand public education about the benefits of protecting the MFRW
- Better control sources of fertilizer reaching the Watershed & the Great Lakes
- Remove sources of human waste in the Watershed that threaten public health
- Protect the quality and accessibility of drinking water (wells)
- Increase community planning to address development & protection of water qual

Are there any other goals that you feel should be included in this list? Please indicate any additional goals you would like to see added. How would you rank them from 1 (most important) to 5 (least important)?

What issues concerning the management of the Middle Flint River Watershed are most important to you?

What is the single most important improvement to the Watershed and its tributaries that you would like to see?

What types of information about the Middle Flint Watershed interest you most? (Check as many as apply)

Water quality	12	How I can volunteer to help restore Watershed	3
Bacteria levels	9	How businesses can prevent pollution	8
Fish and wildlife	9	How homeowners can help prevent pollution	7
Parks and public recreation areas	3	Other	

Which of the following is the best approach to keep you informed regarding the progress in developing a plan to restore the Middle Flint River Watershed?

Public meetings/workshops	4	Direct mailings to your home or business	6
Newspaper articles	3	Community newsletters	2
Cable TV	3	Other (specify) EMAIL	1

**Middle Flint Survey Results
 Totals**

Responses to Survey

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with 1 being most important and 5 being the least important:

	1	2	3	4	5	Did not rank
Rank the following goals with a score of 1 to 5,						
Remove paper/trash/debris in the river and tributaries to improve its appearance	27	8	15	5	8	5
Better control soil erosion and limit sediments entering the water.	11	17	20	5	6	4
Improve habitat conditions for fish and wildlife in the water	17	17	11	12	4	5
Minimize excessive flows that cause flooding, bank erosion and habitat loss	19	14	20	7	3	4
Encourage investments in land along water for recreation/wildlife protection	8	14	12	10	15	2
Expand public education about the benefits of protecting the MFRW	12	12	17	7	10	4
Better control sources of fertilizer reaching the Watershed & the Great Lakes	21	17	12	5	4	5
Remove sources of human waste in the Watershed that threaten public health	50	5	0	3	6	6
Protect the quality and accessibility of drinking water (wells)	47	8	2	1	7	4
Increase community planning to address development & protection of water qual	15	22	11	8	3	3

Are there any other goals that you feel should be included in this list? Please indicate any additional goals you would like to see added. How would you rank them from 1 (most important) to 5 (least important)?

What issues concerning the management of the Middle Flint River Watershed are most important to you?

What is the single most important improvement to the Watershed and its tributaries that you would like to see?

What types of information about the Middle Flint Watershed interest you most? (Check as many as apply)	
Water quality	57
Bacteria levels	43
Fish and wildlife	30
Parks and public recreation areas	17
How I can volunteer to help restore Watershed	14
How businesses can prevent pollution	24
How homeowners can help prevent pollution	28
Other	1

Which of the following is the best approach to keep you informed regarding the progress in developing a plan to restore the Middle Flint River Watershed?

Public meetings/workshops	5
Newspaper articles	13
Cable TV	5
Web page	7
Direct mailings to your home or business	25
Community newsletters	20
Other (specify) EMAIL	2

Table 5-1 Meeting Dates

	Surface Water Advisory Committee	Monitoring and Mapping	Public Education and Participation	BMP Committe	Work Group	Stakeholders Workshops	Combined Stakeholder/ Public Meetings
September 2004		20 th			2 nd		
October 2004		5 th & 13 th	25 th				
November 2004	17 th		29 th				
December 2004	15 th						
January 2005			3 rd & 19 th			31 st	
February 2005	16 th		7 th				
March 2005	23 rd		2 nd & 21 st				
April 2005	20 th		18 th & 25 th				
May 2005	18 th		5 th & 17 th			23 rd	
June 2005					29 th (2)		
July 2005					27 th (2)		
August 2005	17 th				31 st (2)		29 th (2)
September 2005	21 st			10 th & 24 th	28 th (2)		
October 2005	19 th				26 th (2)		
November 2005	16 th						30 th (2)
December 2005							
January 2006	18 th		23 rd		4 th (2) & 23 rd		
February 2006	15 th		27 th				1 st (2)
March 2006	15 th		20 th				
April 2006	19 th						
May 2006	17 th		15 th		31 st		
June 2006	21 st		19 th				
July 2006			17 th				
August 2006						2 nd	
September 2006	20 th		18 th				
October 2006	18 th		16 th		25 th		
November 2006	22 nd						
December 2006	20 th		18 th				
January 2007	17 th		22 nd				
February 2007	21 st		26 th		16 th		
March 2007	28 th		19 th				
April 2007	18 th	23 rd					
May 2007	16 th		21 st	15 th			
June 2007	20 th	5 th		19 th			
July 2007		24 th	16 th	17 th			
August 2007				21 st			
September 2007	19 th	25 th	17 th	18 th			
October 2007	17 th		15 th				

SECTION 6 - CHALLENGES AND GOALS

As more and more people live, work and interact within a watershed, maintaining a healthy, sustainable environment becomes a challenge. To address these challenges, goals and objectives are developed to direct the actions within the watershed that will improve and protect the environment.

The purpose of this chapter is to:

1. Outline the water quality issues discussed in Chapter 4, summarize public and stakeholder concerns, and identify which pollutants are perceived to be of most concern.
2. Define designated uses and identify the impaired or threatened water bodies within the watershed that do not meet their designated uses.
3. Define and identify the watershed desires identified through the stakeholder workshops.
4. List the goals and objectives and identify how they were developed.

“Water is the most critical resource of our lifetime and our children’s lifetime. The health of our waters is the principal measure of how we live on the land.”

-Luna Leopold



Photo Courtesy:
FRWC River Cleanup

WATER QUALITY ISSUES AND CONCERNS

It is important to distinguish between water quality issues and water quality concerns. Water quality issues are those water quality problems that have been identified through water quality monitoring, macroinvertebrate and fish sampling, and habitat surveys. Water quality concerns are problems that are observed or perceived to exist by residence and stakeholders within the watershed. **Note:** stakeholders in the Lower Flint River vary from lake associations to stakeholders that represent the whole County to stakeholders that represent an entire watershed such as the FRWC. All efforts were made to make sure the concerns were specifically for the Lower Flint River.

Water Quality Issues

Water quality issues were extrapolated from chapters 3 & 4 are listed below:

- The loss of open space land by development to Residential and Commercial property
- Shortage of Wetlands, either naturally or through human intervention
- The availability and demand on the sewer and water systems
- Potential danger to endangered species
- Restriction on fish consumption due to pollutants
- Potential pollutant loading from developed land

Water Quality Concerns

Water quality concerns were solicited from the public and stakeholders through a series of workshops and meetings, Described in Section 5.

A list of the public's concerns is provided below:

- Flooding Problems
- Concerns Affecting Drainage Ditches
- Parking Lot Spills
- Landfill Runoff/Groundwater Leachate
- Car Wash
- Groundwater pumping, irrigation affecting local wells
- Over-fertilization
- Sedimentation and soil erosion
- Source of Funding to Address the Above Concerns
- Wetland Destruction
- Need for Ordinance and Permit Compliance Enforcement for Environmental Protections
- Development Concerns
- Negative Public Perception of Flint River
- Need for Cooperation with Health Department
- Lack of Citizen and Municipal Education
- Lack of access to recreational opportunities

The concerns identified by the stakeholders are ranked and presented below. The public and stakeholders ranked their concerns to determine which issues they felt were more important. Each Concern is labeled as Rural (R), Urban (U) or Both (B) to indicate where in the watershed the concern is of most relevance.

- Funding (B)
- Education for planning commissions and zoning boards-municipals, government officials (B)
- Need innovative ideas and solutions implemented locally-pilot project w/education component (B)
- Sanitary Connections to storm sewer (U)
- Education for builders and developers (B)
- Stormwater treatment with BMPs must be maintained (U)
- Streets directly discharge into river within minutes of rain events (U)
- Flooding due to new development (B)
- Master Gardeners-Volunteer Work link to projects (U)
- Promote education at a publicly planned event (B)
- Time of Sale Homeowner Packet (U)
- Education (B)
- More recreational opportunities (B)

DESIGNATED USES IN THE STATE

The Michigan Department of Environmental Quality (MDEQ), acting under authority of the federal Clean Water Act, aims to make waters in the state meet certain designated uses (State of Michigan, 1999):

- Agricultural Water Supply
- Public Water Supply
- Other Aquatic Life / Wildlife
- Coldwater Fisheries (specifically identified waterbodies only)
- Total Body Contact (May 1st – October 31st)
- Navigation
- Industrial Water Supply
- Warm water Fishery
- Partial Body Contact



Source: NCSU, 2004.

The designated uses are intended to:

- Protect health and public welfare
- Enhance and maintain the quality of water
- Protect the state’s natural resources
- Meet the requirements of state and federal law (including international agreements)

One of the first things people envision when discussing water quality is drinking water. It is extremely important for communities to have a clean source of drinking water that is free from contaminants.

Communities in the subwatershed use groundwater for drinking water supplies, and although the designated uses apply to surface waters, the uses also help protect groundwater-drinking supplies because these two water sources are implicitly linked.

Contaminants in water can also affect human health when the water is used to irrigate food sources, when fish living in these waters are eaten, or when humans come in contact with these waters through swimming or boating.

While human health is the most important reason for protecting these resources, the designated uses are also intended to protect wildlife, commerce, and recreation. For example:

- The ‘warmwater and coldwater fisheries’ uses also ensure healthy fish populations, increases recreational enjoyment of fishing, and ensures a thriving fishing industry that results in fishing related consumer spending, travel, and tourism.
- The ‘industrial water supply’ use ensures that businesses have an inexpensive and sustainable process water supply that helps keep them competitive and providing jobs to Michigan’s citizens.
- The ‘navigation’ use ensures that the state’s waterways are passable and the ‘body contact’ uses ensure that people can safely swim. These uses contribute to the lure of many travelers vacationing during the summer.

Two locations in the Lower Flint Watershed are designated coldwater fisheries. These locations include the Kearsley Creek from Oakland County Line (T5N, R8E, Sect 1) upstream and the Thread Creek from Bristol Road (T7N, R7E, Sect 33) upstream to Groveland Road in Oakland County (T7N, R8E, Sect 5)

Example Pollutants Affecting Designated Uses

Agricultural Water Supply

- Hydrology (too little flow)
- Excess nutrients
- Toxic contaminants

Industrial Water Supply

- Hydrology (too little flow)
- Suspended solids

Public Water Supply

- Excess nutrients (nitrates)
- Pesticide contaminants

Warm Water Fishery

- Sediment
- Hydrology (flow variability)
- Dissolved oxygen (too little)

Cold Water Fishery

- Sediment
- Hydrology (flow variability)
- Dissolved oxygen (too little)

Other Aquatic Life / Wildlife

- Sediment
- Pesticides
- Temperature

Partial Body Contact

- Pathogens
- Nutrients

Total Body Contact

- Pathogens
- Nutrients

Navigation

- Obstructions
- Source: MDEQ, 2000.

Designated Uses Not Being Met

As a result of the State’s defined designated uses and the water quality data and impairments discussed in Section 4, the following designated uses are not being met:

- **Warm Water Fishery** and **Other Aquatic Life and Wildlife** are impaired in Flint River and Entire Flint River Watershed due to exceedances of PCBs.
- **Habitat modification** in the Brent Run, Cole Creek and Mud Creek due to channelization and insufficient habitat to support an acceptable biological community.

Threatened Designated Uses

Additionally, the following designated uses are being met but are threatened (meaning they may not be met in the foreseeable future) or insufficient documentation exists to classify items listed below as *designated uses not being met*:

- **Agricultural Water Supply** is impaired in the Flint River due to exceedances for PCBs.

Meeting the state-defined designated uses is important to meet legal requirements to protect public health, provide a high quality of life, and protect natural resources. Programs such as the MDEQ TMDL program seek to obtain the restoration of these uses with the ultimate goal of restoring and maintaining the chemical, physical, and biological integrity of the state’s waters.

It is important to note that the assessments presented herein are subject to change. Additional data, new pollution sources, changing use locations, and updated water quality standards all may affect the assessment. Waterbodies may be listed or de-listed on Michigan’s 303d or 305b list, and the associated status of designated uses may change. Below is a summary of the impaired waterbodies in the Lower Flint River Watershed:

Table -1 Impaired Waterbodies in the Lower Flint River Watershed

Water body ID	Water body Name	Water body Description	Water body Type	Water body Size	Water body Unit of Size	PROBLEM	TMDL YR
201409I	Brent Run	Flint River confluence u/s; Vicinity of Montrose off of McKinley Rd.	River	25	M	Habitat modification - channelization.	
210409B	Cole Creek	Flint River confluence u/s.	River	2.3	M	Habitat modification - channelization.	
210409C	Flint River	Flint River u/s between C.S. Mott impoundment and Holloway impoundment.	River	54	Miles	FCA-PCB’s	2010
210409D	Flint River (Entire Watershed)	Shiawassee River confluence upstream to include all tributaries.	River	847	M	WQS exceedances for PCBs	2010
210409G	Mud Creek	From Flint River confluence u/s (S. of Flushing) vicinity of River Rd.	River	7	M	Habitat modification - channelization.	

Through the revision process, the watershed plan will be updated | address any new TMDL’s as they become available

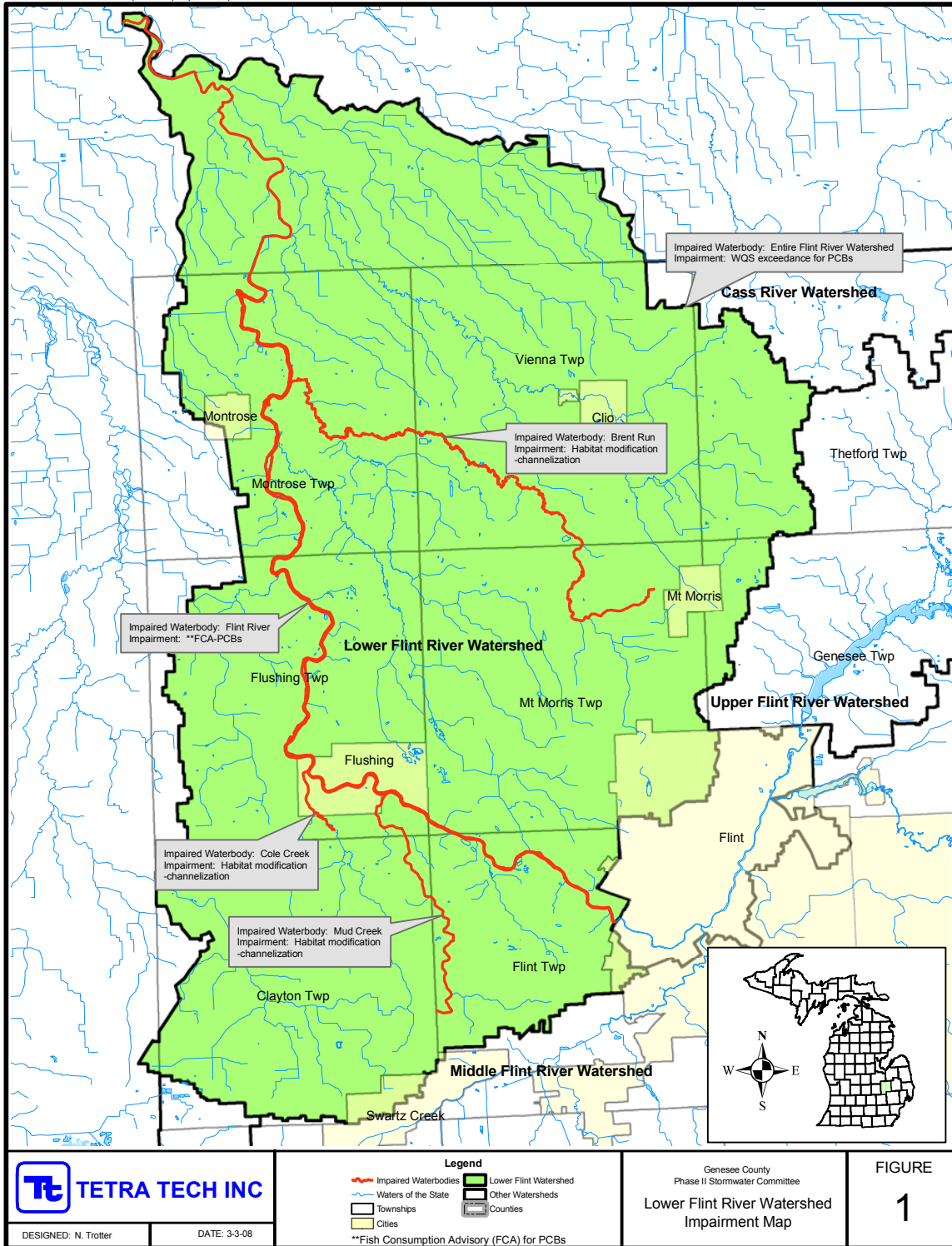


Figure 6-1 Impaired Waterbodies

WATERSHED DESIRES

The term “watershed desire” is meant to invoke a vision of what watershed stakeholders would like their watershed to look like. The watershed planning committee members and the stakeholders have participated in determining goals and desires for the watershed, such as, developing a recreational trail along the river.

During the public participation process, the public was given the opportunity to express their watershed desires. The public identified the following watershed desires:

- Provide Demonstration projects for Bio-retention, Low Impact Development
- Enhanced recreational opportunity: (Access/opportunities)
 - Fishing/ Hunting: increase access and opportunities
- Coordinate with Michigan Lakes & Streams Program
- Enact Wetland Protection Ordinances & require County Road Commission to address impacts from Road projects.
- Change Local and County development standards and goals
- Protect natural features when developing new sites
- Restore/ prevent bank erosion, reestablish stream bank buffers



GOALS AND OBJECTIVES

Identified known pollutants, water quality concerns and desires of the public and stakeholders were used to develop a set of goals and objectives. The goals reflect the mission statement and are accompanied by a set of objectives and actions which when implemented will assist in meeting the corresponding goal. The actions associated with these objectives are listed in Section 8. Goals 1 through 5 were developed by the desires and concerns of the public and stakeholders during goal and objective development. Permit requirements were taken into account and make up Goals 6 through 8. The watershed management plan as a whole must contain the following:

- An assessment of the nature and status of the watershed ecosystem (Section 3 and 4)
- Long-term goals to include the protection of designated uses of the receiving waters and compliance with TMDLs (Sections 6 and 8)
- Short-term objectives (Sections 6 and 8)
- Action items to achieve goals and objectives (Section 8)
- The benefit and cost of the action items (Section 8)
- A responsible party, schedule, and evaluation mechanism for each action item (Section 8)

Minimum Permit Requirements

The objectives in this plan meet the Watershed-Based NPDES Permit requirements, but because of the significant public and stakeholder response, many additional objectives are included in the plan to expand on voiced desires. These additional objectives go beyond the jurisdictional permit requirements.

Because the Watershed-Based NPDES Permit has broad requirement language, and because of the implication that any implemented objective, directly or indirectly, must help protect the designated uses of the receiving water body, it was necessary to include the requirements from other sources. These sources include the U.S. Environmental Protection Agency (US-EPA) Storm Water Phase II Final Rule requirements and the Michigan Jurisdictional-Based NPDES Permit. These two sources were chosen because the Watershed-Based NPDES Permit is based on their requirements.

The Federal and State requirements as well as each specific Watershed-Based NPDES Permit requirement was reviewed to assure that at least one objective correlated with it. In the section below, each goal is prioritized according to what stakeholders deemed important. In Section 8, objectives are included in the table under each goal. A 'Yes' indicates that the objective fulfills one or more permit requirements at a minimum level. A 'No' indicates that the objective is considered beyond the minimum requirement of the permit, or that it extends a general effort beyond the minimum requirement of the permit, and may be eligible for certain types of grant funds. During goal and objective development, it became clear that some objectives fulfill minimum requirements, some objectives go beyond the minimum requirements, and some objectives are difficult to categorize. Discretion was used to determine how the uncategorical objectives are classified.

Note that each goal and objective should be considered in association with other goals and objectives, as applicable. For example, one of the aims of Goal 1 is to remove sources of pollutants including sedimentation. Goal 3 is to reduce impacts from peak flows and high volumes. Objective 3a addresses both of these goals. Through a Stormwater Ordinance, pollutants such as sediment can be reduced or removed and also reduce peak flows and high volumes.

Goal 1: Protect Public Health

This aim of Goal 1 is to remove sources of **Pathogens**, **Nutrients**, and **Sedimentation** that threaten public health and recreation. It also seeks to:

- 1) Protect **D**inking water supply (groundwater recharge areas)
- 2) Reduce **I**nfiltration and inflow to decrease sanitary sewage overflows

Objectives Associated with Goal 1:

- a. Draft, adopt and implement Time of sale septic ordinance: **P,N**
- b. Deliver homeowner education at time of sale (public education about Septic, lawn, leaves, grass, carwash, etc) **P,N,S**
- c. Draft, adopt and implement Disconnect footing drains from sanitary sewers ordinance **I**
- d. Identify existing wellhead protection programs **D**
- e. Draft, adopt & implement a ordinance to test Drinking water well at time of sale **D**
- f. Map arsenic Levels for drinking wells **D**

Goal 2: Establish Watershed Stewardship Awareness and Responsibility among the Public

Goal 2 aims to increase public participation and the Understanding of their role in protecting the watershed. It seeks to promote the Flint River as a viable public Resource (i.e. dispel the myth of poor water quality in the Flint River to bring people back to the river). The Goal also recognizes the need for improved Communication of existing water quality and potential threats to public must occur to promote this goal.

Objectives Associated with Goal 2:

- a. Educate public about 7 required education elements. **R, C, P, N, S, O**
- b. Undertake a Direct mailing to riparian land owners (Rivers/Lakes) **U, R, C, N, O**
- c. Partner with existing household hazardous waste program committee to increase awareness and use **U,**
- d. Enhance existing benthic monitoring Program (see Section 4) **U, R, C, O**
- e. Enhance existing project GREEN Program (see Section 7) **U, R, C, O**
- f. Conduct a Stream Crossing watershed survey with photography **C**
- g. Conduct Hot Spot water quality monitoring as needed **C**

Goal 3: Reduce Impacts from Peak Flow and High Volumes

This goal seeks to minimize excessive Flows that cause flooding, bank erosion and habitat loss. This will be accomplished through environmentally friendly drain maintenance, community planning, ordinance development, and water quality monitoring. Establish minimum standards for stormwater infrastructure design countywide.

Objectives Associated with Goal 3:

- a. Draft, adopt and implement a county Storm Water Ordinance **F, P,N,S**
- b. Pursue restoration projects on natural watercourses **F, W, S**
- c. Preserve existing floodplains and wetlands from being filled or developed **F, N, S**
- d. Monitor Water Quantity to measure hydraulic change within watercourse **F**
- e. Produce demonstration projects for Low Impact Development. **F, N, S, U**

Goal 4: Create, Restore, and Enhance Recreational Use

This goal seeks to restore and enhance recreational uses through a variety of specific Objectives.

Objectives Associated with Goal 4:

- a. Promote Local Recreational Opportunities **O**
- b. Protect /Expand Parks Trails and River Walk System **O**

Goal 5: Restore and Protect Aquatic Life, Wildlife, and Habitat

Goal 5 aims to restore and protect aquatic life, Wildlife and habitat by protecting high quality wetlands and floodplains. Also of interest are areas with Threatened and endangered species and protect against invasive species.

Objectives Associated with Goal 5:

- a. Establish vegetative buffer areas adjacent to sensitive areas **W, N, S**
- b. Protect key locations of threatened and endangered species and habitat **T**

Goal 6: Conduct Municipal Good Housekeeping Activities

This goal is comprised of the permit requirements on the permittees' good housekeeping activities. Goal 6 aims to direct communities to undertake activities that manage their operations and activities in a manner that considers stormwater runoff and the pollution and flow associated with it. It is also intended to have local jurisdictions "lead by example" in an effort to change how stormwater is managed in the private sector as well.

Objectives Associated with Goal 6:

- a. Ensure Maintenance activities, schedules, and inspection procedures for storm water structural controls are appropriate
- b. Implement controls for reducing or eliminating the discharges of pollutants from streets, roads, highways, parking lots, and maintenance.
- c. Institute procedures for the proper disposal of operation and maintenance waste from the separate storm water drainage system (dredge spoil, accumulated sediments, floatables, and other debris) by street sweeping, catch basin clean out and vacuuming debris.
- d. Ensure that flood management projects assess the impacts on the water quality of the receiving waters.
- e. Reduce the discharge of pollutants related to application of pesticides, herbicides, and fertilizers applied in the permittees regulated area.

Goal 7: Adopt requirements for Post Construction Controls

This goal is comprised of the permit requirements on how the permittees handle third party or private development within their jurisdiction. It directs permittees to ensure that there are stormwater controls on private land and that there are provisions for their future maintenance.

Objectives Associated with Goal 7:

- a. Evaluate and implement site appropriate, cost-effective structural and nonstructural best management practices (BMPs) that prevent or minimize the impacts on water quality.
- b. Establish long-term operation and maintenance practices for storm water BMPs on private property.

Goal 8: Plan for long-term sustainability of the Phase II program

This last goal is intended to establish an institutional structure and to seek financial resources necessary to sustain the Phase II program.

Objectives Associated with Goal 8:

- a. Secure funding available for implementation.
- b. Institutionalize the committee structure.

PUTIING IT ALL TOGETHER

Table 6-2: Concerns, Desires, Goals & Objectives of the Lower Flint River Watershed

Concerns	Goal_Objective
Funding	1b, 8a
Education for planning commissions and zoning boards- municipals, government officials	1a & c, 2a, 3a & e, 6a-e, goal 7a-b
Need innovative ideas and solutions implemented locally-pilot project w/education component	3e
Sanitary Connections to storm sewer	IDEP
Education for builders and developers	3a, 7a-b
Stormwater treatment with BMPs must be maintained	3a, 6a-e, 7a-b
Streets directly discharge into river within minutes of rain events	3a, 6b-d
Flooding due to new development	3a, 7a-b
Master Gardeners-Volunteer Work link to projects	2a
Promote education at a publicly planned event	2a
Time of Sale Homeowner Packet	1b
Education	1b, 2a-c, 6a-e, 7a-b
More recreational opportunities	4a-b
Desires	
Provide Demonstration projects for Bio-retention, Low Impact Development	3e
Enhanced recreational opportunity: (Access/opportunities)	4a-b
Fishing/ Hunting: increase access and opportunities	4a-b
Coordinate with Michigan Lakes & Streams Program	5a-c
Enact Wetland Protection Ordinances & require County Road Commission to address impacts from Road projects.	3c
Change Local and County development standards and goals	3a, 7a-b
Protect natural features when developing new sites	3a, 7a-b
Restore/ prevent bank erosion, reestablish stream bank buffers	3b, 5a

SECTION 7 - WATERSHED PLANNING PROCESS

Under County Public Improvement Act (PA 342, 1939) in Section 10, the communities of Genesee County have signed a contract to supply time and money to Developing the Watershed plan and implementation. Phase II communities within the Lower Flint Watershed but outside Genesee have made other arrangements for implementation to satisfy their Certificate of Coverage.



Figure 7-1 Organizational Chart

Besides the watershed workgroup there are several other committees that are responsible for various aspects of the planning and implementation. The Lower Flint River Watershed is one of five watersheds within Genesee County under this committee. Because of this many of the decisions and timelines are county wide.

The **Advisory Committee** is the decision making body made up of those communities that have signed a contract. This group is responsible for voting on the proposed implementations developed by the subcommittees and workgroups. The members of the Advisory Committee were split into one of three groups to serve on one of the subcommittees. The **Public Education and Participation Subcommittee** is responsible for the development of the Public Education Plan. The **Construction**

Standards and Practices Subcommittee is responsible for establishing a unified review process and adopting a standard for best management practices. The **Monitoring and Mapping Subcommittee** is responsible for the methods that are going to be used to monitor the water for improvement or degradation. Each of these groups have workgroups made up of stakeholders, the public, and the municipal officials.

Public Education Plan

Required Elements

- Encourage Public to report Illicit Discharges or improper disposal into storm sewer
- Education of public on the availability, location and requirements of facilities for disposal or drop off of:
 - Household Hazardous Waste
 - Grass Clippings
 - Leaf Litter
 - Motor Vehicle Fluids
- Public education concerning application and disposal of pesticides and fertilizers
- Public education concerning materials and procedures for residential car washing
- Public education concerning the ultimate discharge point & potential impacts from the separate storm water drainage system serving their place of residence
- Public education for citizen responsibility and stewardship
- Public education concerning management of riparian lands to protect water quality

PUBLIC EDUCATION PLAN

The Public Education Subcommittee is responsible for the complete storm water education plan. The committee works with the Genesee County drain office and U of M's Center for Applied Environmental Research (CAER) Department to draft the Education Plan. Using the Michigan Department of Environmental Quality's (MDEQ) required elements as a starting point the committee has been working on the following items:

- Identify existing programs and organizations that are already educating on required elements
- Identify gaps in existing programs
- Develop baseline survey of
 - General publics knowledge
 - Focus groups knowledge
 - Quantify behaviors that need to be changed
 - Marketing preferences and influences
 - Demographics
- Identify target audiences and the behaviors that need to be changed.
- Draft Media Campaign
- Implementing the Website and resources for the educational campaign

The Public Education Workgroup developed a table of existing education programs that could possibly meet some or all our education requirements. More importantly the table can identify those requirements that are not being met at all. It is the intent of the Advisory Committee and the Public Education Workgroup to partner with existing programs whenever possible.

With the help of U of M CAER the Public Education Workgroup developed a baseline survey; 300+ random residents within Genesee County have responded to the survey by phone. Also the survey was sent in written form to the planning Boards and Elected officials for all Genesee County Communities. This will assist the Public Education workgroup in determining what education is needed for the communities. The results from the public survey are compiled below except the fill in responses. *The final results of the survey will be summarized and made available to the public on the Center for Applied Environmental Research (CAER) website at www.umflint-outreach/caer*

Storm Water Education Planning Project Survey Results

- 1) In your opinion, whose job is it to maintain the quality of the water in your community?

- 2) Is your residence connected to a municipal sewer system or does it include a septic system? (check only one)
79.8% Sewer 20.2% Septic 0.0% Don't Know

3) Regarding the maintenance of the vehicles you own...how often do you...
Every time it is done Never

	1	2	3	4	5
Change your own oil?	15.4%	3.5%	4.6%	3.5%	73.5%
Change your own antifreeze?	14.8%	2.5%	4.6%	1.8%	76.4%
Change you transmission fluid?	10.9%	2.1%	2.5%	1.4%	83.2%
Change your own brake fluid?	12.6%	3.9%	3.2%	0.4%	80.0%

- 4) How many cars do you have in the household? 42.5% have 2 cars
- 5) On average, how many times per year do you wash your cars? _____ Times per year
0=6.7%, 1-5=17%, 12= 10.2%, 24=8.1%, 52=8.8%

6) Are they washed at ? 57% At a car wash 6.8% At home 36.2% Both
→ **6 a) If you answered at home or both**

	Always	Usually	Sometimes	Never
How often do you wash your car in the driveway?	25.4%	10.5%	57.9%	6.1%
How often do you wash your car in the street?	0.9%	0%	4.4%	94.7%
How often do you wash your car on the lawn or other unpaved surface?	4.4%	7%	14.9%	73.7%

- 7) On a scale of 1 to 5, with 1 being *Very likely* and 5 being *not likely at all*, if you learned that your typical car washing behavior is **not** the recommended method for protecting the waterways in your community, how likely would you be to change?
- | Very Likely | | | | | Not likely at all |
|-------------|-------|------|------|-------|-------------------|
| 1 | 2 | 3 | 4 | 5 | |
| 68.3% | 11.1% | 7.6% | 2.7% | 10.3% | |

- 8) On a scale of 1 to 5, with 1 being Very Concerned (VC) and 5 being Not Concerned At All (NCAA), how concerned would you be if you saw your neighbor do each of the following...

	VC			NCAA	
	1	2	3	4	5
Dumping liquid chemical waste to the dirt/lawn?	87.9%	6.8%	2%	<1%	2.6%
Dumping liquid chemical waste into a storm drain on the street?	89.3%	4.6%	3.6%	<1%	2%
Dumping liquid chemical waste onto his driveway?	79.7%	11.4%	4.2%	<1%	3.9%
Dumping used oil from vehicles on his driveway?	80.1%	9.2%	5.9%	1.6%	3.3%
Dumping used oil from vehicles on his lawn?	83.7%	6.8%	3.9%	2%	3.6%
Dumping used oil from vehicles into a storm drain?	90.2%	4.9%	1.3%	1%	2.6%
Pushing grass clippings into a pile at the curb?	25.5%	7.5%	19.3%	8.2%	39.7%
Raking leaves into a pile on the street?	24.3%	6.2%	17.4%	9.5%	42.6%
Raking leaves into a ditch?	33.1%	11.9%	12.3%	5.6%	37.1%
Burn leaves	47.9%	8.9%	13.8%	3%	26.6%
Dumping travel trailer waste into drain sewers?	86.8%	4%	3.3%	1.3%	4.6%
Dumping travel trailer waste onto a roadside?	85.4%	5.3%	2.6%	2%	4.6%
Dumping household cleaning products into a storm drain in the street	84.4%	6.3%	3.6%	1.3%	4.3%
Dumping household cleaning products into a sink or toilet	43.9%	6%	15.6%	9%	25.6%
Dumping household cleaning products onto the dirt/grass.	62.8%	9.6%	11%	6.3%	10.3%
Disposing of animal manure by burying	24.8%	6.7%	13.4%	7.7%	47.3%
Disposing of animal manure by throwing in ditch	49.5%	11.5%	11.2%	4.7%	23.1%
Disposing of animal manure by throwing in garbage	24.7%	6.8%	10.8%	8.1%	49.5%
Don't dispose of animal waste (leave where it falls)	56.1%	10.8%	9.8%	7.1%	16.2%

- 9) Which of the following possible methods of disposal is recommended for each of the following materials?

Unused garden pesticides? _____
 Unused garden fertilizers? _____
 Antifreeze? _____
 Used engine oil? _____
 Animal manure/pet waste? _____
 Latex paint? _____
 Oil based paint? _____
 Household cleaning products? _____

- 10) If you discovered that your current method of disposal of these products was different than what is recommended, which of the following is most accurate? (check one)

- a) 35.1% I would comply with the recommendations, regardless of cost (e.g. disposal fees)
 b) 49.8% I would comply with the recommendations if there were little or no cost associated
 c) 12.7% I would comply with the recommendations only if there was no cost associated
 d) 2.4% I would not comply with the recommendations.

- 11) If you discovered that your current method of disposal of these products was different that what is recommended, which of the following is most accurate? (check one)

- a) 52.2% I would comply with the recommendations regardless of inconvenience
 b) 36.1% I would comply with the recommendations as long as there is little inconvenience
 c) 10.0% I would comply with the recommendations only if it is convenient
 d) 1.7% I would not comply with the recommendations.

- 12) On a scale of 1 to 5, 1=*Very Convenient* and 5=*Not convenient at all*, how convenient do you think each of the following would be for you to use as a drop off site for your hazardous household waste?

	VC					NC				
	1	2	3	4	5	1	2	3	4	5
Local township/city hall	66%	10.3%	9%	1.7%	12.4%					
Local water treatment plant	34.3%	8.1%	12.7%	7.4%	37.5%					
County extension office (MSUE)	21.0%	9.8%	12%	9.4%	47.8%					
Local Business	70.7%	13.4%	3.8%	0.7%	11.4%					
Local University	42.8%	13.1%	16.6%	5.9%	21.7%					
County Health Department	38.9%	10.9%	15.8%	6.7%	27.7%					
Local fire station	78.3%	12.1%	1.7%	1%	6.9%					

- a. If you have a question about how to dispose of a product you suspect is hazardous, how likely are you to find out the recommended method of disposal? (circle one)

Very likely Not likely at all

1 2 3 4 5

67% 11.7% 8.9% 4.1% 8.2%

- 13) Who would you contact to find out a recommended method of disposal for a product?
-

- 14) On a scale of 1 to 5, 1=*Very Convenient* and 5=*Not convenient at all*, how convenient do you think each of the following would be as a place or method to find out this information?

	VC					NCAA				
	1	2	3	4	5	1	2	3	4	5
Internet	58.3%	7.6%	6.9%	1%	26.2%					
Telephone Hotline	77.2%	11%	3.4%	1.4%	6.9%					
Educational flyers/mailers	49.1%	15.7%	17.8%	6.3%	11.1%					
Radio	43.3%	14.9%	16.3%	7.6%	18%					
Local Paper	47.1%	15.6%	14.9%	4.5%	18%					
Place of purchase	62.1%	11.9%	9.8%	5.3%	10.9%					
As part of local news broadcasting	49.8%	14.5%	19.7%	6.2%	9.7%					
Product label	79.6%	9%	5.5%	0%	5.9%					
Community/school newsletter	41.9%	16.3%	13.5%	10%	18.3%					
Billboard	39.1%	13.5%	17%	10.4%	20.1%					

- 15) Are fertilizers, pesticides, herbicides used on your home's landscape?

46.5% yes 44.1% no 8.3% Don't know 1.0% N/A

If yes

→16 a) How many times per year do you estimate these products are applied to your yard?
_____ times per year

0=1.5% 1=19.8% 2=32.1% 3=19.1% 4=10.7% >4=16.8%

→16 b) Who applies these products?

34.8% you 21.2% A member of your household 43.9% A lawn care professional

→16 c) How do you determine things like **what** needs to be applied, when the products should be applied and how much to apply to your yard?

- 16) Does your community have an ordinance regarding fertilizer application?

7.7% yes 92.3% no 0% Don't Know

- 17) What two bodies of water are located closest to your home?

Approximately how far away is each of these from your home?

Name of body of water:	Distance from home:
1) _____	_____
2) _____	_____

18) On a scale of 1 to 5, with 1 being *A great deal* and 5 being *None at all*, in your opinion, how much responsibility do each of the following have in maintaining a community's water quality?

	A Great Deal					None				
	1	2	3	4	5					
Area Businesses	69.3%	12.0%	8.1%	6.0%	4.6%					
Residents whose homes are located directly on a body of water	80.9%	7.4%	4.2%	3.9%	3.5%					
Residents who live in a home located within 1Mile of a body of water	59.2%	21.3%	11.3%	4.3%	3.9%					
Residents who live in a home located more than 1Mile from a body of water	44.3%	16.8%	22.1%	7.5%	9.3%					
Elected officials in a community	82%	9.2%	5.6%	1.1%	2.1%					
The Environmental Protection Agency (EPA)	89.8%	4.6%	1.8%	1.1%	2.8%					
The Department of Environmental Quality (DEQ)	89.3%	4.3%	2.9%	.7%	2.9%					
Local law enforcement	51.4%	16.5%	18%	5.6%	8.5%					
The Department of Natural Resources (DNR)	82.1%	10%	3.2%	2.1%	2.5%					
Local Conservation/Environmental groups	75.6%	11.8%	7.2%	2.5%	2.9%					
County Drain Commissioner	89.2%	6.8%	2.2%	0%	1.8%					
County Health Department	84.4%	7.8%	4.3%	1.4%	2.1%					

20) On a scale of 1 to 5, 1 being *Very Confident* and 5 being *Not Confident At All*, how confident are you that you understand the concept of a "watershed"? Very Confident

1	2	3	4	5
18.9%	11.1%	20.7%	7.8%	41.5%

21) Is your residence located in a watershed? 12.0% yes 23.9% no 64.1% Don't know

If yes,

21a)→Which one? _____

21b)→How do you know this? _____

22) If hazardous chemicals are dumped into the street, where does that material ultimately end up?

23) Can you think of any other places they may end up? _____

24) On a scale of 1 to 5, with 1 being *Very Much* and 5 being *Not at all*, please indicate how much you would trust information about stormwater pollution from each of the following sources:

	Very Much					Not at all				
	1	2	3	4	5					
Michigan Department of Environmental Quality	67.4%	13.6%	13.6%	0.7%	4.8%					
Drain Commissioner's Office	48.7%	18.6%	22.6%	4.3%	5.7%					
UM-Flint	60.5%	18.1%	13.4%	2.9%	5.1%					
Local Government	27.2%	16.8%	31.9%	10%	14%					
Conservation District	46.8%	26.8%	16.4%	2.2%	7.8%					
Private Companies	8.9%	8.9%	27.5%	21.8%	32.9%					
County Extension Service	40.6%	23.0%	20.3%	6.5%	9.6%					
Flint River Watershed Coalition	44.5%	19.1%	17.2%	6.6%	12.5%					
County Health Department	58.6%	20.5%	12.6%	4.3%	4.0%					

25) In your opinion, which of the following age groups MOST needs to learn more about protecting local waterways?

37.4% Elementary age children (0 to 11) 18.1% Young adults 19 – 25

32.4% Middle and high school age children (11 to 18) 10.3% Adults 26-55

1.8% Adults > 55

26) Have you spent leisure time on a water body in Genesee County in the past 12 months?

27.1% yes 72.9% no 0% Don't Know

→*If yes,* What water bodies? _____

	Yes	No
Do you canoe or kayak in Genesee County?	15.6%	84.4%
Do you fish in Genesee County?	48.1%	51.9%
Do you boat, water ski, or use personal watercraft in Genesee County?	54.5%	45.5%
Do you hike along shorelines or stream banks in Genesee County?	48.1%	51.9%
Do you swim in Genesee County lakes or streams?	48.1%	51.9%

- 27) Regarding the quality of the water in the lakes, rivers, and streams in your community...is it...(please select one)
- | | |
|--------------------------------------|-------------------------------------|
| <u>2.9%</u> Getting much better | <u>25.0%</u> Getting somewhat worse |
| <u>22.1%</u> Getting somewhat better | <u>12.7%</u> Getting much worse |
| <u>37.3%</u> Staying the same | <u>0.0%</u> Don't know |

- 28) Which ONE of the following do you think contributes the **most** pollution to lakes, rivers and streams in the community where you live?
- | |
|---|
| <u>9.4%</u> Wastewater treatment plant discharges |
| <u>36.7%</u> Factories / industrial discharges |
| <u>17.6%</u> Stormwater (rainwater) runoff into storm drains and roadside ditches |
| <u>30.3%</u> Sewage overflows |
| <u>6.0%</u> Dirt eroded from stream banks and surrounding areas |

- 29) Where does stormwater (rainwater) go after it enters a storm drain or roadside ditch in your community? _____

- 30) On a scale of 1 to 5, with 1 being Strongly Agree and 5 being Strongly Disagree, please indicate your level of agreement with the following statement:

	Strongly Agree		Strongly Disagree		
	1	2	3	4	5
“The quality of local streams where I live affects Saginaw Bay.”	47.0%	11.6%	15.3%	6.0%	20.1%
“The quality of local streams where I live affects the Great Lakes.”	55.8%	8.8%	14.2%	6.5%	14.6%

- 31) Is your residence located directly on a...
- | | Yes | No | Don't Know |
|-------------|-------|-------|------------|
| Lake? | 1.4% | 98.6% | 0 |
| Wetland? | 4.6% | 95.4% | 0 |
| Swamp? | 3.9% | 96.1% | 0 |
| Marsh? | 1.4% | 98.6% | 0 |
| River? | 2.5% | 97.5% | 0 |
| Stream? | 5.0% | 95.0% | 0 |
| Road Ditch? | 27.0% | 73.0% | 0 |

- 32) How many people live in your household? _____ # of people
- | | | | | | |
|-----------------|-----------------|-----------------|-----------------|----------------|-----------------|
| 1= <u>17.4%</u> | 2= <u>31.7%</u> | 3= <u>20.3%</u> | 4= <u>14.6%</u> | 5= <u>8.5%</u> | >5= <u>7.5%</u> |
|-----------------|-----------------|-----------------|-----------------|----------------|-----------------|

- 33) Are there any children under the age of 18 living in your household? 45.2% yes 54.8% no
 →If yes, What are their ages? _____

- 34) What is the highest level of education you have completed? (check one)
- | | | |
|-----------------------------------|-----------------------------------|-----------------------------------|
| <u>2.2%</u> Less than high school | <u>35.8%</u> Some college | <u>2.2%</u> Some Graduate courses |
| <u>30.1%</u> High School | <u>21.9%</u> Undergraduate degree | <u>7.9%</u> Graduate degree |

- 35) Do you own or rent your home? 74.6% own 25.4% rent

- 36) Do you live in a single-family residence or a multiple family dwelling (e.g. an apartment building)? (check one) 87.5% single family 12.5% multiple family

Currently the Public Education Committee is in the implementation phase. Target audiences are identified for the required elements. The survey results provide a baseline for knowledge about the watershed and also help direct the development of the media campaign. In chapter 8 there are several action items that came out of the public/stakeholder goals and concerns. These action items will be integrated into the overall media campaign. The media campaign is being developed on a countywide basis and will be implemented on behalf of those Phase II Communities that have signed an Act 342 contract.

MONITORING AND MAPPING

The Monitoring and Mapping Committee evaluated a list of possible monitoring activities. Example activities that were discussed include:

- Aesthetic monitoring via canoe trip
- Biomonitoring
- Benthic monitoring
- Frog and toad monitoring (MDNR)
- Stream crossing watershed survey with photograph
- Water quality monitoring
- Photographic survey
- Meta/toxin/hydrocarbon constituents monitoring
- Streamwalk observation and education.

After reviewing their various options with their costs, advantages and disadvantages the Monitoring and Mapping Committee had decided on the following 5 options to monitor the water quality within the Lower Flint River Watershed.

Benthic Macroinvertebrate Monitoring

- Since the Flint River Watershed Coalition (FRWC) is already doing this at approximately 30 sites (some of them outside the areas we're looking at) we should look at promoting, enhancing and expanding the current activity through:
 - Advertising
 - Purchasing equipment
 - Providing volunteers
 - Providing a place to summarize information
 - Expanding to more parts of the watershed
 - Providing funding for administrative costs (current coordinator is a volunteer)
 - Updating volunteer training
 - Adding sampling sites
 - Correlate all information (from all 5 monitoring activities) onto one centralized mapping site
- Have a joint meeting between the FRWC board members and members of this committee to assess the limitations of the current program and see where we could improve the quality of the program. This falls in line with the philosophy of partnering with existing community programs to comply with the NPDES Phase II Permit.
- Get public involved in collecting data.
- Brent Nickola explained how benthic macroinvertebrates are good indicators of the quality of water in a stream.

- Set the timeframe of Spring 2005 to determine what enhancements are most needed by FRWC and how they may be implemented.
- Deciding what percentage of the available funds should be allocated for this.

Basic Water Quality Monitoring

- “Snapshot” of the water quality
- Great for public involvement
 - School classes
 - Scouting groups
 - Senior citizens
 - Project GREEN (Global Rivers Environmental Education Network)
- Use same sights as for macroinvertebrate testing

Frog and Toad Survey

- DNR (Department of Natural Resources) program already in place
- Enhance program or fill gaps
- Use available data

Stream Crossing Watershed Survey with Photographs

- DEQ (Department of Environmental Quality) has procedure that they recommend
- Can be built into already existing municipal efforts
 - Mostly GCRC and GDC
- 1,100 crossings in Genesee County
 - DEQ suggests 30% of crossings
- Drain office will handle the data base
- Results must be measurable
- Includes IDEP (Illicit Discharge Elimination Program)

Hot Spot Water Quality Monitoring

- Done by professionals

DESIGN REVIEW PROCESS & BMP'S

Standards and Practices Subcommittee is responsible for establishing a unified review process and adopting a standard for best management practices. This group did much of their work in 2003. The below proposed review process was developed to allow environmental concerns to be addressed prior to the design phase. Currently many environmental concerns are treated as an afterthought if they are even considered in the design.

PROPOSED FUNCTIONAL FLOW OF PROJECT REVIEW FOR STORMWATER COMPLIANCE

INTRODUCTION

A county-wide ordinance will be developed to specify the general guidelines for stormwater management in new developments. The following document outlines the major events and their sequence constituting the project review process.

STEP 1: Pre Development

For each project, developers, their designated design representatives (engineers or architects), representatives from the County Road Commission, Health Department, municipal officials (zoning, planner, engineer, DPW, building official), and Drain Commissioner's office (Water and Waste Services and Surface Water) will attend a pre-planning conference. The purpose will be to provide design standards, development guidelines, and to identify the type of information developers and their representatives must furnish to comply with the new development procedures. Communication between the project designer and developer, as well as the relevant local officials and developer are two key components of this framework.

Note: different scheduling scenarios will be required for each development type (e.g., PUD, plat, mobile home park, site plans). Each development type has been provided a specific flow chart.

Inputs

- Location map
- Development description. Verbal with supporting maps (conceptual)
- 2 ft contour map
- Federal Wetland map -NWI (National Wetland Inventory)
- Drainage district ID
- Aerials - Genesee County Planning Commission - 1" = 200' w/ ¼ mile buffer around site
- Zoning Map
- Soils Map (from County soil survey)
- Floodplain maps - FEMA & Available plats
- Traffic & utility information, including: sanitary, storm, water supply, gas, electric, road width, existing capacity

Outputs

Design Standards & Specifications, including:

- BMP Specifications
- Construction Standards and Methods
- Current fee & meeting schedules
- Permit Applications

STEP 2: Conceptual Site Plan

Review of the conceptual site plan for approval at County level by the appropriate personnel in Water & Waste Services, soil erosion, surface water, and the Road Commission and Health Department. Comments are returned to the owner/client and designer.

STEP 3: Coordination Review

- Designer
- Owner/Client
- Reviewers from agencies

NOTE: Review of BMP compliance will occur at the same time as the review of the construction prints.

STEP 4: Municipal Review

Guided by Zoning and general ordinances (design standards)
Local planning commission members will be educated about the new construction standards, and will be given a checklist for reference during site plan review.

STEP 5: Site Plan Approval

- Submit construction plans and documents for approval
- Obtain Permits: Federal, State, and County
- Obtain Building Permit from municipality

General Flowchart of Process

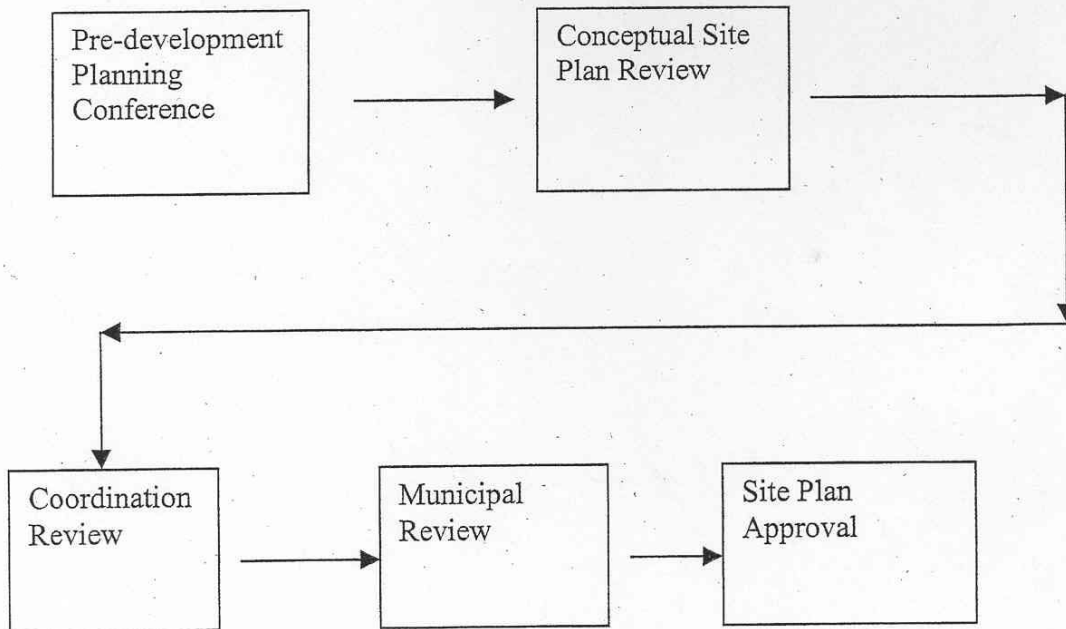


Figure 7-2 Flowchart for new development

Another responsibility of the BMP committee was to review available BMP's for both new construction and good housekeeping of existing sites. Currently once a private storm system is installed there is mechanism to ensure that it is properly maintained.

The BMP sub-committee has adopted the Soil Erosion & Sedimentation Control Guidebook from the Michigan Department of Management and Budget as the basis for the BMP requirements. Below are amendments to individual BMP's to bring those best management practices into line with existing County requirements.

- E4: If the back slope of the Terrace is to be used as an access point the minimum width for the back slope will be 15' not 6'.
- E7: Temporary seeding should be applied to any areas that have earth changes that have been initiated but will not be completed within 2 weeks or disturbed areas on a site that have been cleared but are not worked for more than a week.
- E8: If preferable vegetation is proposed such as indigenous planting will be reviewed & approved on an individual site basis.
- E12: Filter fabric is required for riprap areas. If riprap smaller than that specified in the Guidebook is to be used then the riprap must be mortared together in place.
- E14: In addition to the Energy Dissipater choices provided, a spillway or drop structure may be used as an acceptable energy dissipater either in combination with the other methods outlined in the Guidebook or as a stand-alone measure.
- E15 & E16: Slope drains will be designed to have a non-erosive velocity at the discharge point.
- ES31: The distance between check dams will be such that the bottom of the upstream check dam will be at the same elevation as the top of the downstream check dam as Referenced in CD-exhibit 1 of the MDEQ guidebook for BMP's.
- ES32: the upstream sump for the Stone filter berm will be sized to accommodate the sediment for the contributing area by using The Universal Soil Loss Equation in Developing Areas. Reference Appendix 2D of the MDEQ guidebook for BMP's.
- ES35: For dewatering, an acceptable alternative to the gravel inlet protection could be a floated inlet with a filter bag.
- S55: The minimum requirements considered acceptable for permanent and temporary sediment basin design include:
 - Capacity of basin must be designed to be equal or greater to the volume of the sediment expected to be trapped at the site plus the volume of the 10-year rain event. The Oakland County Surface Area Method or The MDEQ BMP Guidebook: SB-5 Basin Capacity can be modified to meet this requirement. Other methods may be submitted with supporting documentation for consideration. Permanent basins will be designed to be dry. Temporary basins will be filled and stabilized once the construction site is stabilized, and prior to release of soil erosion permit.
- S56: The Sediment Trap length to width ratio shall be 5:1 not 2:1.
- S57: Grass Buffer/Filter Strip shall be a minimum of 30' from top of bank or edge of critical resource area.

Below are additional BMP Guidelines that are not addressed in the Soil Erosion & Sedimentation Control Guidebook.

- Stand Pipe: Should be designed to filter sediment. This structure should not to be designed as the outlet restrictor. Rim should be set at the elevation of the 10-year storage. The overflow cover will have to be designed to pass the design flow.

- Excavated drop inlet sediment trap The MDEQ BMP Guidebook: Fil-6. An acceptable alternative to weep holes is edge drain set within a sand or stone bedding.
- Equipment Maintenance & Storage The MDEQ BMP Guidebook: EMS
- Stockpile Location: Must be set away from any critical areas or steep grades. Appropriate Filter and or Seeding BMP's to be applied.
- Vortex Separator: To separate debris from discharge.
- Oil & Grit Separator: This BMP is not to be used as a sediment basin during construction. Specific systems with supporting documentation may be submitted for approval. General Criteria:
 - o Planning considerations: Should serve impervious areas of less than 1 acre or per manufacturers recommendation.
 - o Design: supporting documentation will need to show method & capacity of suspended solids removed and buoyant contaminants removed. Low flow capacity of system and method used to bypass the high flow.
- Outlet: From the MDEQ BMP Guidebook; There should be no overfall from the end of the pipe/outlet to the outlet structure (i.e. the pipe/outlet should not be suspended above the outlet structure)
- Detention Basins: The MDEQ BMP Guidebook: EDB
- Underground detention basins: Specific systems with supporting documentation may be submitted for approval. General Criteria
 - o Cleanout is needed for maintenance.
- Infiltration Basins with underdrain: The MDEQ BMP Guidebook: IB.
- Construction Access Roads:
- Street Sweeping:
- Parking Lot Storage in Recessed Landscape

A Maintenance Schedule for the following permanent BMP's should be developed and included in the site plan or construction drawings to implement once the construction is complete.

- ES31 Check Dams: Should be checked annually. Accumulated upflow sediment removed and any noted problems repaired.
- ES32 Stone Filter Berm: Should be checked annually. Accumulated upflow sediment removed and any noted problems repaired.
- ES37 Diversion Ditch: Sediment removed and any noted problems repaired.
- ES39 Streambank biostabilization: Should be checked annually. Check for additional eroding or deteriorating of the anchors or trees. Replace trees or anchors as needed.
- ES41 Wattles: Should be checked annually. Periodic pruning and replanting of live stake may be required.
- S55 Sediment Basin: Annual inspection. Keep outlet clear of debris and excess vegetation. Remove sediment when the design volume exceeds 50% of the sediment expected to be trapped.
- S57 Buffer Strip: Should be checked annually. Clip unwanted and invasive vegetation.
- Stand Pipe: Annual inspection. Keep outlet clear of debris and excess vegetation and any noted problems repaired.
- Excavated drop inlet sediment trap Annual inspection. Keep outlet clear of debris and excess vegetation and any noted problems repaired.

- Vortex Separator: Clean out bi-annually or as recommended by manufacturer.
- Oil & Grit Separator: Clean out bi-annually or as recommended by manufacturer.
- Detention basin: Annual inspection. Keep outlet clear of debris and excess vegetation and any noted problems repaired. Proper disposal of contaminants
- Underground detention basins: Annual inspection. Jet and vacuum any excess debris or sediment and any noted problems repaired.
- Catchbasins: Annual inspection. Keep outlet clear of debris and excess vegetation. Clean sumps and any noted problems repaired.



STATE OF MICHIGAN

DMB Infrastructure Services, Design and Construction Division
Soil Erosion and Sedimentation Control Program

SOIL EROSION AND SEDIMENTATION CONTROL GUIDEBOOK

















DETAILS AND SPECIFICATIONS

February 2002





MICHIGAN DEPARTMENT OF MANAGEMENT AND BUDGET
S-E-S-C KEYING SYSTEM

KEY	BEST MANAGEMENT PRACTICES	SYMBOL	WHERE USED
EROSION CONTROLS			
E1	SELECTIVE GRADING AND SHAPING		To reduce steep slopes and erosive velocities.
E2	GRUBBING OMITTED		For use on steep slopes to prevent rilling, gullyng, and reduce sheet flow velocity or where clear vision corridors are necessary.
E3	SLOPE ROUGHENING AND SCARIFICATION		Where created grades cause increased erosive velocities. Promotes infiltration and reduces runoff velocity.
E4	TERRACES		On relatively long slopes up to 8% grades with fairly stable soils.
E5	DUST CONTROL		For use on construction sites, unpaved roads, etc. to reduce dust and sedimentation from wind and construction activities.
E6	MULCH		For use in areas subject to erosive surface flows or severe wind or on newly seeded areas.
E7	TEMPORARY SEEDING		Stabilization method utilized on construction sites where earth change has been initiated but not completed within a 2 week period.
E8	PERMANENT SEEDING		Stabilization method utilized on sites where earth change has been completed (final grading attained).
E9	MULCH BLANKETS		On exposed slopes, newly seeded areas, new ditch bottoms, or areas subject to erosion.
E10	SODDING		On areas and slopes where immediate stabilization is required.
E11	VEGETATED CHANNELS		For use in created stormwater channels. Vegetation is used to slow water velocity and reduce erosion within the channel.
E12	RIPRAP		Use along shorelines, waterways, or where concentrated flows occur. Slows velocity, reduces sediment load, and reduces erosion.
E13	GABION WALLS		On newly created or denuded stream banks to reduce velocity until permanent stabilization is achieved or on existing banks to retard erosive velocities.
E14	ENERGY DISSIPATOR		Where the energy transmitted from a concentrated flow of surface runoff is sufficient to erode receiving area or watercourse.
E15	TEMPORARY SLOPE DRAIN		Where surface runoff temporarily accumulates or sheet flows over the top of a slope and must be conveyed down a slope in order to prevent erosion.
E16	SLOPE DRAIN		Where concentrated flow of surface runoff must be permanently conveyed down a slope in order to prevent erosion.

B = BIOENGINEERING



MICHIGAN DEPARTMENT OF MANAGEMENT AND BUDGET

S-E-S-C KEYING SYSTEM

KEY	BEST MANAGEMENT PRACTICES	SYMBOL	WHERE USED
E17	CELLULAR CONFINEMENT SYSTEMS		Used on steep slopes and high velocity channels.
E18	PLASTIC SHEETS		Used on exposed slopes, seeded areas, new ditch bottoms, and areas subject to surface runoff and erosion. Used as a liner in temporary channels and to stabilize stockpiles.
E19	TEMPORARY DRAINAGEWAY/ STREAM CROSSING		Use on construction sites where stream/drainageway crossings are required.
E20	TEMPORARY BYPASS CHANNEL		Use within existing stream corridors when existing flow cannot be interrupted, and at culvert and bridge repair sites
E21	LIVE STAKING	 B	In areas requiring protection of slopes against surface erosion and shallow mass wasting.
EROSION / SEDIMENT CONTROLS			
ES31	CHECK DAM		Used to reduce surface flow velocities within constructed and existing flow corridors.
ES32	STONE FILTER BERM		Use primarily in areas where sheet or rill flow occurs and to accommodate dewatering flow.
ES33	FILTER ROLLS	 B	In areas requiring immediate protection of slopes against surface erosion and gully formation and for perimeter sediment control.
ES34	SAND FENCE		For use in areas susceptible to wind erosion, especially where the ground has not yet been stabilized by other means.
ES35	DEWATERING		Use where construction activities are limited by the presence of water and dry work is required.
ES36	DIVERSION DIKE/BERM		Within existing flow corridors to address or prevent erosion and sedimentation, or on disturbed or unstable slopes subject to erosive surface water velocities.
ES37	DIVERSION DITCH		In conjunction with a diversion dike, or where diversion of upslope runoff is necessary to prevent damage to unstabilized or disturbed construction areas.
ES38	COFFERDAM/SHEET PILING		Constructed along or within water corridor or waterbody to provide dry construction area.
ES39	STREAMBANK BIOSTABILIZATION	 B	For use along banks where stream and riparian zones may have difficulty recovering from the long-term effects of erosion.
ES40	POLYMERS		To minimize soil erosion and reduce sedimentation in water bodies by increasing soil particle size.
ES41	WATTLES	 B	In areas requiring protection of slopes against surface erosion and gully formation.

B = BIOENGINEERING



MICHIGAN DEPARTMENT OF MANAGEMENT AND BUDGET
S-E-S-C KEYING SYSTEM

KEY	BEST MANAGEMENT PRACTICES	SYMBOL	WHERE USED
SEDIMENT CONTROLS			
S51	SILT FENCE		Use adjacent to critical areas, to prevent sediment laden sheet flow from entering these areas.
S52	CATCH BASIN SEDIMENT GUARD		Use in or at stormwater inlets, especially at construction sites.
S53	STABILIZED CONSTRUCTION ACCESS		Used at every point where construction traffic enters or leaves a construction site.
S54	TIRE WASH		For use on construction sites where vehicular traffic requires sediment removed from its tires in highly erosive areas.
S55	SEDIMENT BASIN		At the outlet of disturbed areas and at the location of a permanent detention basin.
S56	SEDIMENT TRAP		In small drainage areas, along construction site perimeters, and above check dams or drain inlets.
S57	VEGETATED BUFFER/FILTER STRIP		Use along shorelines, waterways, or other sensitive areas. Slows velocity, reduces sediment load, and reduces erosion in areas of sheet flow.
S58	INLET PROTECTION FABRIC DROP		Use at stormwater inlets, especially at construction sites.
S59	INLET PROTECTION FABRIC FENCE		Use at stormwater inlets, especially at construction sites.
S60	INLET PROTECTION STONE		Use around urban stormwater inlets.

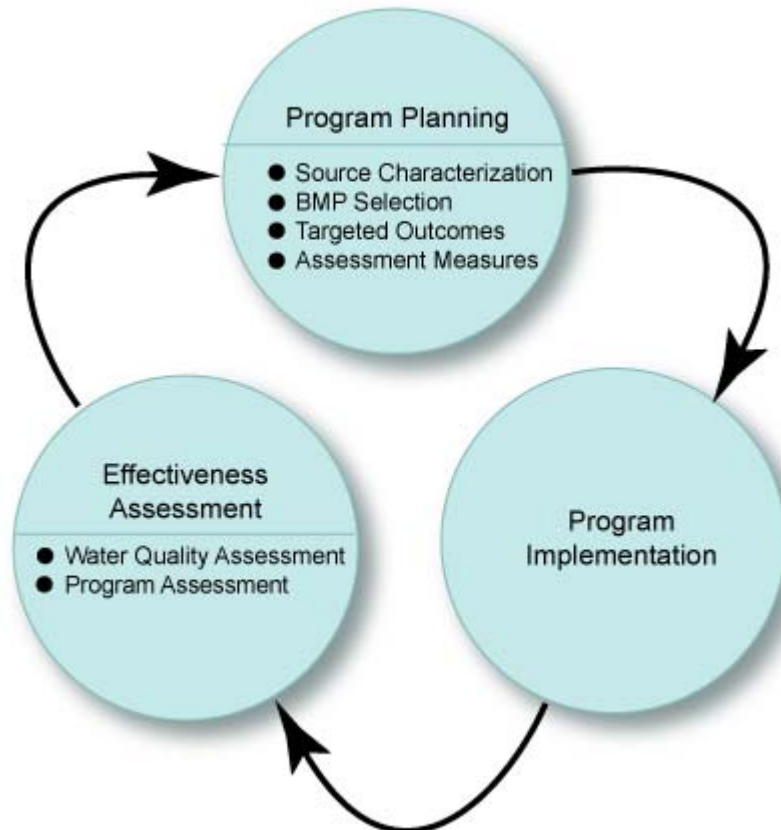
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SECTION 9 - EVALUATION METHODS FOR MEASURING SUCCESS

INTRODUCTION

Watershed planning is meant to be an iterative process that will be continually revised and updated. This Watershed Management Plan (WMP) is a living document and is meant to be used, revised as new information becomes available, and altered to fit the changing needs of the watershed. This section establishes an overall program framework which emphasizes the importance of an on-going iterative process that consists of three elements: Program Planning, Program Implementation, and Effectiveness Assessment. The relationship between the three elements is presented in Figure 9-1. Portions of this chapter are based on “A Framework for Assessing the Effectiveness of Jurisdictional Urban Runoff Management Programs” developed by the San Diego Municipal Storm Water Co-Permittees (October 16, 2003).

Figure 9-1 Program Elements



PERMIT REQUIREMENTS

Watershed management is intended to be a tool in a comprehensive and systematic approach to balancing land uses and human activities to meet mutually agreed upon social, economic, and environmental goals and objectives in a drainage basin. As required by the NPDES Wastewater Discharge General Permit, the WMP must include the following, all of which are intended to be done in the context of significant public participation:

1. Assess the nature and status of the watershed ecosystem. (Section 3)
2. Define long-term goals and short-term objectives for the system. (Section 6)
3. Determine actions needed to achieve long-term goals and short-term objectives. (Section 8)
4. Assess both benefits and costs of each action. (Section 8 and 9)
5. Implement desired actions by a specified schedule and permittee commitments.
6. Evaluate the effects of the implemented actions and progress toward goals and objectives.
7. Re-evaluate goals and objectives as part of an interactive process (MDEQ, 1997).

Development of this document has included Steps 1, 2 and 3 above, and some elements of Step 4. As communities and agencies review this document, and opportunities arise, site or program-specific information will be generated to develop greater detail regarding the costs and benefits of each action. The implemented actions presented in Section 8 will be assessed for cost-benefit and effectiveness based on volunteer watershed monitoring as presented in this section. Based on the results of the assessment, planned actions will be revised.

Communities must develop funding mechanisms to implement the WMP. Arrangements will be made to provide start-up funding for implementing recommendations. Development of proposals should involve the creation of detailed information regarding what BMPs are to be implemented, the locations of these BMPs, anticipated costs, and information regarding who will be responsible for implementation.

Under Public Act 342, Genesee County established a Storm Water Management System. Those Communities in Genesee County that signed a contract with the Genesee County Drain Commissioner's Office were:

Township of Argentine	Township of Thetford
Township of Atlas	Charter Township of Vienna
Charter Township of Clayton	City of Burton
Township of Davison	City of Clio
Charter Township of Fenton	City of Davison
Charter Township of Flint	City of Fenton
Charter Township of Flushing	City of Flushing
Township of Forest	City of Grand Blanc
Township of Gaines	City of Linden
Charter Township of Genesee	City of Montrose
Charter Township of Grand Blanc	City of Mt. Morris
Charter Township of Montrose	City of Swartz Creek
Charter Township of Mt. Morris	Village of Gaines
Charter Township of Mundy	Village of Goodrich
Township of Richfield	Village of Otisville

As part of the PA 342 contract these communities and Genesee County have pledged contribute monetarily to fund the various aspects of the Watershed Plans from fiscal year 2004 through 2008. A new contract will be negotiated upon the completion of this cycle.

The annual budget not to exceed \$500,000.00 has been set countywide. Currently the budget is set with the Public Education Program budgeted up to \$80,000/year, the Monitoring and Mapping program budgeted up to \$40,000/year and IDEP program and other minor expenses is allocated the remainder of the annual budget. The budget is broken up among the following responsibilities:

- (a) the Public Education Program Subcommittee, with responsibility for public education and participation; For those Services relating to Implementation Activities for which the Public Education Program Subcommittee is responsible, the Local Share thereof shall be allocated to each Municipality on the basis of a fraction, the numerator of which is the population for such Municipality at the beginning of such Fiscal Year and the denominator of which is the population for all Municipalities at the beginning of such Fiscal Year
- (b) the Monitoring and Mapping Subcommittee, with responsibility for the illicit discharge program, which will identify and map all municipal discharges to open waters; and for those Services relating to Implementation Activities for which the Monitoring and Mapping Subcommittee is responsible, the Local Share thereof shall be allocated to each Municipality on the basis of a fraction, the numerator of which is the weighted sum (determined as hereinafter provided) of the developed parcels in such Municipality at the beginning of such Fiscal Year and the denominator of which is the weighted sum of the developed parcels in all Municipalities at the beginning of such Fiscal Year. For purposes of this subsection (b), the weighted sum of developed parcels in each Municipality shall be determined by assigning one (1) unit for each developed residential parcel and four (4) units for each developed commercial

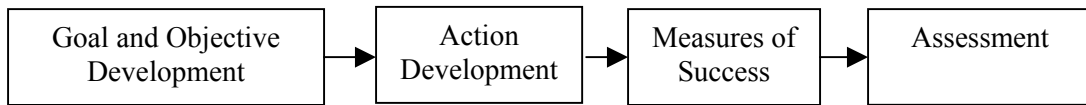
and industrial parcel and then adding the total number of assigned units for all developed parcels in such Municipality.

- (c) the New Construction Standards Subcommittee, with responsibility for construction standards, redevelopment standards, oversight of all watersheds and the preparation of the pollution prevention program known as the Storm Water Pollution Prevention Initiative; and for those Services relating to Implementation Activities for which the New Construction Standards Subcommittee is responsible, the Local Share thereof shall be allocated as follows: The Local Share of the cost of such Services that consist of administrative costs relating to the establishment of the five planning areas for the System (Cass River, Lower Flint, Middle Flint, Upper Flint and Shiawassee, hereinafter individually referred to as a "Planning Area" and collectively as the "Planning Areas") and the development of the standardized templates for the Planning Areas shall be allocated equally among the Planning Areas, and within each Planning Area shall be allocated to each Municipality therein on the basis of the equivalent acreage in each Municipality, using the same methodology for calculating equivalent acreage that the County Drain Commissioner would use for purposes of establishing drain assessments for benefiting parcels in a drainage district under Chapter 7 of the Drain Code (hereinafter referred to as the "Equivalent Acreage Methodology"). The Local Share of the cost of all other Services for which the New Construction Standards Subcommittee is responsible shall be allocated to the specific Planning Area to which such Services relate and within such Planning Area shall be allocated to each Municipality therein on the basis of the Equivalent Acreage Methodology.

Within the Lower Flint River Watershed, This is the only watershed planning going on.

PROGRAM PLANNING

The program planning phase requires a significant amount of public participation as public input is sought to characterize the watershed and develop and prioritize goals and objectives for the watershed. This phase can be broken down into the four steps shown below:



While the elements of program planning interact in a cyclical manner, developing goals and objectives typically initiates the cycle. However, program planning also occurs following the effectiveness assessment phase if changes to the WMP are necessary.

Goal and Objective Development (Section 6)

Goal and Objective development was completed as part of this WMP and was accomplished through activities outlined in the Public Participation Plan (PPP). Discussions at watershed committee meetings and stakeholder workshops helped to prioritize long-term watershed goals that would impact water quality within the watershed. It was important to involve the public as much as possible in the development process to gain support for implementation.

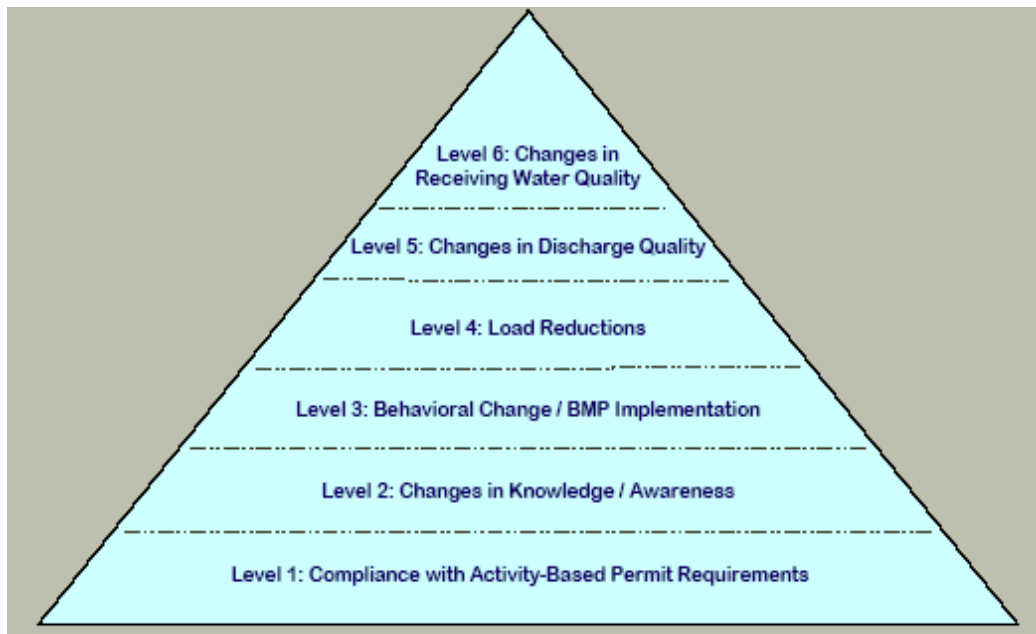
Action Development (Section 8)

To implement the goals and objectives, specific actions were developed for each objective. Action development was completed as part of this WMP. The actions were assigned a schedule, responsible party, cost, and measure of success. The measure of success establishes a way to assess the completion or progress of an action. More details concerning measuring the effectiveness of actions are included later in this section.

Measures of Success

Measures of success are essential to assessing the effectiveness of the overall program. Identification of quantifiable measures provides measurability and accountability within the program. To help organize successes and provide a relationship between success types, six success levels are established as shown in Figure 9-2.

Figure 9-2 Success Levels



Level One: Compliance with Activity-Based Permit Requirements- Activities conducted under this level include those that are described or required in the permit. These activities are expected to be beneficial to water quality because they are part of a successful watershed management plan. The watershed will be addressing these permit requirements including specific requirements of the Storm Water Pollution Prevention Initiative (SWPPI).

Level Two: Changes in Knowledge/Awareness- Changes in knowledge and awareness are targeted through the PPP and Public Education Plan (PEP), such as conducting stakeholder workshops and public briefings. Currently surveys are being used to receive a baseline for public knowledge that can be compared to future surveys.

Level Three: Behavioral Change/BMP Implementation- The desired success of Level Three is behavioral change due to an increase in knowledge. This may be documented through the use of a survey or tracking the number of BMPs installed or retrofitted.

Level Four: Load Reductions- BMPs are used to reduce the amount of pollutants entering local water bodies from storm water runoff. Load reductions may be calculated based on information provided once a BMP is installed. Load reductions may also be estimated for illicit discharges that are removed.

Level Five: Changes in Discharge Quality- Changes in the water quality of storm water discharge show the direct environmental benefit gained by the installation of BMPs and pollution prevention practices. The watershed will be working on this task through their Illicit Discharge Elimination Program (IDEP), which seeks to correct illicit discharges that are discovered through outfall screening and investigation. Should a sample show poor water quality, further sampling and testing will take place to pinpoint the source and work to remove it.

Level Six: Changes in Receiving Water Quality- The ultimate goal of Phase II NPDES Storm Water Legislation is to show improvement in water quality of receiving water bodies. Monitoring will be conducted on a periodic basis to show change in water quality and environmental benefit.

Assessment

Assessment is the process of evaluating the attainment of the measures of success. Measures of success fall within two categories, direct and indirect. Indirect measures deal with degrees of activity or program implementation, while direct measures focus on characterizing water quality and quantifying pollutant loads. Measures of Success Levels One through Three are primarily indirect measures while Levels Four through Six are direct measures.

PROGRAM IMPLEMENTATION

Program implementation is the second phase of the cycle and consists of applying the WMP which was developed or updated during the program planning phase.

Lessons learned and comments on the WMP are compiled during the implementation phase and are subsequently addressed in the effectiveness assessment phase to consider the suggested changes and comments.

EFFECTIVENESS ASSESSMENT

The effectiveness assessment phase consists of a water quality assessment, a program assessment, and an integrated assessment. The integrated assessment facilitates examining the causal relationships between program implementation and changes in water quality.

Water Quality Assessment

Water quality assessment is the analysis of water quality data to draw conclusions on the condition of or changes to the condition of receiving waters or discharges to those waters. The water quality assessment provides a way to assess the attainment of direct measures of success. Long-term assessment is also necessary to ensure that seasonal, annual, and other variables can be identified and are considered when interpreting the results.

Five watershed monitoring methods will be used throughout the watershed to help evaluate the effectiveness of WMP implementation. (Section 7) The five methods include the following:

- Benthic macroinvertebrate monitoring
- Frog and toad survey
- Stream crossing watershed survey and photographs
- Water quality monitoring
- Hot spot testing at hazardous sites

The different monitoring activities will be conducted in close proximity to one another in order to develop relationships between them and a holistic view of a particular area. For example, the photographic monitoring will be done at the macroinvertebrate sites along with the basic water quality monitoring. The road/stream crossing surveys will be done immediately upstream and downstream of the macroinvertebrate sites and will include photographic log files.

Volunteers from the general public will be trained to carry out the monitoring program. The benefits of using general volunteers to conduct monitoring include increasing public participation, increasing public education and decreasing the cost of the monitoring program. Including established volunteer programs in the monitoring effort may be beneficial. Established groups include the adopt-a-stream program, public school projects such as GREEN (Global Rivers Environmental Education Network), or other organized activities such as 4H clubs, scouting groups, and senior citizen groups.

Benthic Macroinvertebrate Study

The presence or absence of certain species of benthic macroinvertebrates is a good indicator of the health of a stream. A benthic macroinvertebrate is an organism having no backbone that dwells on the bottom of a water body. The presence of organisms tolerant to pollution and few or no organisms sensitive to pollution indicates pollution in the water.

The Flint River Watershed Coalition (FRWC) in partnership with the University of Michigan – Flint (UM-F) Center for Applied Environmental Research (CAER) has an existing benthic macroinvertebrate volunteer monitoring program in the Flint River Watershed. The watershed will seek to partner with the FRWC to enhance and expand the existing program. Helping to enhance the existing program may include activities such as advertising, soliciting volunteers, providing equipment, providing additional technical help, public education, analyzing the collected data, or publicizing the results.

Basic Water Quality Monitoring

Typical water quality monitoring parameters may include dissolved oxygen, ammonia, nitrate, pH, phosphate, and temperature. Volunteers will take grab samples at pre-determined locations and use simple test kits to conduct the analysis.

There is no existing water quality monitoring program.

Frog and Toad Survey

Like benthic macroinvertebrates, frogs and toads are sensitive to changes in water quality. The absence or decline of a frog and toad population indicates a loss of the

quality of their wetland habitat and ultimately their ecosystem. As a result of the concern for the rarity, decline, and population die-off of several species, the Michigan Department of Natural Resources (MDNR) developed the Michigan Frog and Toad Survey.

Genesee County has an existing frog and toad survey program which uses volunteers to monitor wetland sites three times annually during early spring, late spring, and summer. At each site, the volunteer listens for frog and toad breeding season calls and makes a simple estimate on the population size. Detailed information is given to the volunteer including how to establish a survey route and a tape or CD of frog and toad calls.

Stream Crossing Watershed Survey with Photograph

The stream crossing watershed survey is an approach used to collect information about the quality of a stream. A standard data collection form is used to ensure uniformity throughout the watersheds. The physical habitat of the site including water characteristics, stream characteristics, plant life, foam and trash presence, substrate type, stream morphology, land use, and corridor description are recorded. Also potential sources of pollution upstream and downstream of the site are identified if apparent.

There is no existing stream crossing watershed survey program.

Hot Spot Water Quality Monitoring

Much of the Flint River Watershed encompasses land which has a history of heavy industrialization. Many large companies settled in this area to begin mass production of cars, auto parts, trucks, metal manufacturing, and other industries. These types of activities have had a host of regulations to promote their cleanup since the promulgation of the Clean Water Act. Prior to this Act however, a number of pollutants were released without realizing their potential impacts on public health and safety and water quality in aquatic environments. In addition to historical pollution, various hot spots of pollution are believed to exist around the five major watersheds in Genesee County.

There is no existing hot spot water quality monitoring program.

Program Assessment

Program assessment involves reviewing the attainment of primarily the indirect measures of success. Measures of success will be reviewed for achievement and if the desired level of achievement is not attained, an investigation will be conducted to determine possible factors causing failure.

The PEP has developed and administered a phone survey to the public. Besides as a tool to direct the education committee, it can be used as a baseline assessment of where the public's knowledge is now. Future surveys can be used to measure change in knowledge and behavior. Other methods can provide measurable quantities like counting number of hits on the website or how many pounds of household hazardous waste have been dropped off.

Assessing the attainment of the measures of success is a yearly task that will be reported in the annual progress reports. The annual progress report is required to cover decisions made, actions performed, and results for the IDEP, PEP, SWPPI, and any other storm water actions conducted during the previous permit year (The IDEP and PEP are separate documents containing additional actions and measures of success not

covered in this WMP.) The annual report must also cover updates of nested drainage system agreements and point source discharges to the storm water system.

Integrated Assessment

The integrated assessment incorporates the water quality assessment and program assessment and evaluates the entire watershed management plan as a whole. The integrated assessment identifies and addresses data gaps in the water quality monitoring program and finds causal relationships between actions taken through the WMP and changes in load reductions, discharge quality, and receiving water quality.

As a result of the integrated assessment, targeted updates and revisions will be made to the WMP for submittal to the MDEQ by the March 1, 2007 deadline indicated on the certificate of coverage.

SUMMARY

The framework presented here is not meant to be inclusive, but rather a guide illustrating the embodiment of the watershed management plan. The emphasis of the plan is to focus on high priority constituents, sources, benefits etc. rather than all potential problems. Attention is given to the importance of long-term assessments that boast strategy rather than ambition.

SECTION 10 - STEPS FOR PLAN SUSTAINABILITY

Below are various ways that the implementation of the watershed plan can be sustained. More than one method is being used in the Lower Flint River Watershed.

OPTIONS FOR SUSTAINABILITY

Analyzing methods for sustainability is a critical component of watershed management planning. Especially since this watershed management plan is being used for Phase II permit compliance. Sustainability means finding a way to keep going to implement the WMP once it is complete. It also means that the plan is being continuously updated and improved to meeting local needs.

Watershed Councils- Michigan's Local River Management

Watershed Councils can be formed through Michigan's Natural Resources and Environmental PA 451 of 1994, Part 311 Local River Management. Watershed groups such as the Clinton River Watershed Council and the Huron River Watershed Council were formed under this act. The Clinton River Watershed Council eventually reorganized to become a 501(c)3 nonprofit organization. This allowed the council to receive additional revenue from grants, businesses and individual membership contributions.

Watershed Councils- Voluntary Partnerships

Watershed groups can also be formed through other means such as a voluntary association of local governments organized to promote cooperative action on water management issues. Watershed groups such as the Partnership for the Saginaw Bay Watershed are formed in this manner.

A key component of sustainability is obtaining and keeping a wide variety of local support. This support and public involvement will keep momentum for implementing this watershed management plan. Local support will also help maintain funding through all available means and open doors for partnerships in areas where other groups have similar missions.

PHASE II LEGAL RELATIONSHIP

Michigan has a number of different methods available for community groups to form into a legal entity. At least six approaches are available under Michigan statutes to lead and assign funding responsibilities for Phase II permitting. These options include the following:

- 1) Drain Code – Public Act 40 (1956)
- 2) Inter-Municipal Committee Act – Public Act 200 (1957)
- 3) Municipal Sewerage and Water Systems - Public Act 233 (1955)
- 4) County Public Improvement Act – Public Act 342 (1939)

- 5) County Department and Board of Public Works – Public Act 185 (1957)
- 6) Voluntary Cooperation

This section provides a brief summary of how each of these options can be used, and some limitations or considerations for using each option. Any of these options could be used independently or in combination to handle a specific project area.

A summary of the possible Phase II storm water permit leadership options is presented in Table 10-1 Summary of Phase II Storm Water Leadership Options. The title of each option is listed in this table along with the appropriate Michigan Public Act, a statement on how the approach works, limitations, and some areas where these approaches are either in use or are being considered for use.

Table 10-1 Summary of Phase II Storm Water Leadership Options

Option	Title	Public Act	Approach	Limitations
1	Drain Code	40 (1956)	<ul style="list-style-type: none"> • Public Health Projects using Chapter 20 	Separate projects each drain requires petition/notice
2	Inter-Municipal Committee Act	200 (1957)	<ul style="list-style-type: none"> • Resolutions to study issues or problems 	Studies only
3	Municipal Sewerage and Water Systems Act	233 (1955)	<ul style="list-style-type: none"> • Incorporate an Authority • Sewage disposal system includes storm sewers 	Intended for water and wastewater services
4	County Public Improvement Act	342 (1939)	<ul style="list-style-type: none"> • County Board resolution and/or contracts with any unit of government • Sewers include storm water 	Difficult to start storm water limited to
5	County Department and Board of Public Works	185 (1957)	<ul style="list-style-type: none"> • County Board action and contract with local government units • Sewers include storm water 	Difficult to start if limited to storm water
6	Voluntary Cooperation or Agreements	None	<ul style="list-style-type: none"> • Attitude of trust and agree to work together 	Requires trust and individual accountability

Option 4: County Public Improvement Act (PA 342, 1939)

A County Board of Commissioners can use this act to authorize and provide water, sewer, sewage disposal, and garbage collection and disposal services. As defined in the Act, sewers can include storm sewers to transport and collect storm water. The County Board resolution must designate the county agency to supervise, control, manage, and operate the improvements, and facilities and to provide services. The County agencies eligible for designation include the County Road Commission, the Drain Commissioner, or the Board of Public Works. Services of the County Agency can be provided by contract with any other unit of local government.

The County Agency designated by the County Board is responsible to establish just, equitable, and uniform rates, charges, or assessments to be paid for the services provided. Any contracting unit of government may use the following methods of raising funds to pay for services:

- 1) Annual property tax levy
- 2) Special assessments on property
- 3) Rates or charges to service users
- 4) Tax revenue from the state
- 5) Other funds, which may validly be used for the contracted purpose

This method is currently being used in Genesee County to prepare a watershed permit for the county, except for the City of Flint, which is covered by a Phase I permit.

LOWER FLINT RIVER WATERSHED

However, this group is moving forward with implementation plans under Act 342 (Option #4). All the communities within the Lower Flint River Watershed have signed contracts with the Genesee County Drain Commissioner's Office. All the school districts within Genesee County also have signed contracts to be nested jurisdiction under their communities Certificate of Coverage.

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