Shiawassee River Watershed

Stormwater Management Plan

GENESEE COUNTY

NPDES Phase II Watershed Management Planning

February 27, 2008

GENESEE COUNTY DRAIN COMMISSIONER

ACKNOWLEDGEMENTS

Prepared by the Shiawassee River Watershed Work Group:

Argentine Township
- *Bob Cole, Supervisor*

Burns Township
- *David Mitchell, Supervisor*

City of Fenton
- *Leslie Bland, DPW Director*

City of Linden
- *Dale Martin*

Clayton Township
- *Rod Shumaker, Supervisor*
- *Sally Lurvey, Clerk*

Deerfield Township
- *Thomas Green, Supervisor*

Fenton Township
- *Bonnie Mathis, Supervisor*
- *Lorraine Zimmer, Trustee*

Flint River Watershed Coalition
- *Steve Montle: Executive Director*

Gaines Township
- *Paul Fortino, Supervisor*

Genesee County Drain Commissioner
- *Jeffrey Wright; Commissioner*
- *Susanne Kubic P.E., Drain Engineer*

Genesee County Health Department
- *Greg Cumpata, Environmental Health Services*

Genesee County Parks & Recreation
- *Ron Walker*

Genesee County Road Commission
- *Mike Mansfield, Director of Traffic Engineering and Permits*

Holly Township
- *Dale M. Smith, Supervisor*

Livingston County Drain Commissioner
- *Brian Jonckheere*

Oakland County Drain Commissioner
- *Jim Wineka, Environmental Unit Supervisor*

Rose Township
- *Chester Koop, Supervisor*

Shiawassee County Drain Commissioner
- *Gary Holzhausen*

Tyrone Township
- *Michael Lewis, Supervisor*

Village of Byron
- *Gordon Green, President*

Village of Gaines
- *Russell Morse, President*

With Guidance From:

Michigan Department of Environmental Quality
- *Stephanie Barney, Water Division*

Tetra Tech MPS Staff
- *Dan Christian*
- *Stephen Pennington*

With Technical Assistance From:

University of Michigan Flint Center for Applied Environmental Research
- *Brent Nickola*
- *Sara McDonnell*

Tetra Tech MPS Staff
- *Valerie Sangler*

Doug Pullman: Aquest
Thomas Jones: Genesee County Drain Commissioner's Office, SWM

Main Author:
Susanne Kubic P.E., Genesee County Drain Commissioner's Office, SWM

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Argentine Township
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Fenton Township
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**Gaines Township*
Genesee County
**Village of Gaines*

**Non Phase II community*

For copies of the plan, please contact:
Genesee County Drain Commissioner's Office 810-732-1590
4608 Beecher Road
Flint MI 48532

www.GCDCWWS.com/SWM

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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 Informational 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 Pollutant 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 Shiawassee River Watershed Management Plan is to recognize and catalog the current conditions impacting the water quality of the Shiawassee River, its tributaries and lakes, address actions that can be taken to resolve existing problems and prevent future degradation. Over the last two years, 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, Livingston & Oakland Counties' and those Phase II community's requirements under the Michigan Department of Environmental Quality (MDEQ) Phase II Watershed-based Stormwater Permit. Shiawassee County is not a Phase 2 Community and their participation in the watershed planning process is completely voluntary.

Livingston County through the Livingston County Drain Commissioner's Office has produced a Stormwater Management Plan for the South Branch of the Shiawassee River. That plan is referred to as " Upper-2 Shiawassee River Watershed Management Plan'. Since much of the watershed originally part of this plan has been included under the Upper-2 Watershed plan the watershed boundary line was moved, with a few exceptions to the jurisdiction boundary to minimize duplication. This reduced this 149 mi^2 watershed to 92 mi^2.

BACKGROUND

The initial emphasis of the National Pollutant 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 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 have signed a contract under 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 SWPPIs
- Coordinating between the communities and the school districts that have signed contracts as nested jurisdictions.

The Oakland County Drain Commissioner's Office (OCDC) is the agency for the Oakland County Phase II Stormwater Permit. The OCDC coordinates communication between Oakland County departments, as well as acting as a resource for watershed and sub watershed groups. Phase II communities within Oakland County are either implementing the watershed plan(s) on their own or are contracting to partner with watershed groups within adjoining watersheds to meet their requirements.

The Livingston County Drain Commission (LCDC) has taken the lead on the upstream areas through their separate "Upper-2 Shiawassee River Watershed Management Plan". This plan has been completed and submitted to the Michigan Department of Environmental Quality (MDEQ) for review. The Phase 2 communities within Livingston are implementing the watershed plans on their own with the Livingston County Drain Commissioner's Office (LCDC) providing assistance by coordinating implementation efforts. The Phase 2 Communities can also contract with the LCDC for IDEP work.

Shiawassee County and its communities are not regulated under the NPDES Phase II program, but are invited to participate in the development of the Stormwater Management Plan.

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

SHIAWASSEE RIVER WATERSHED

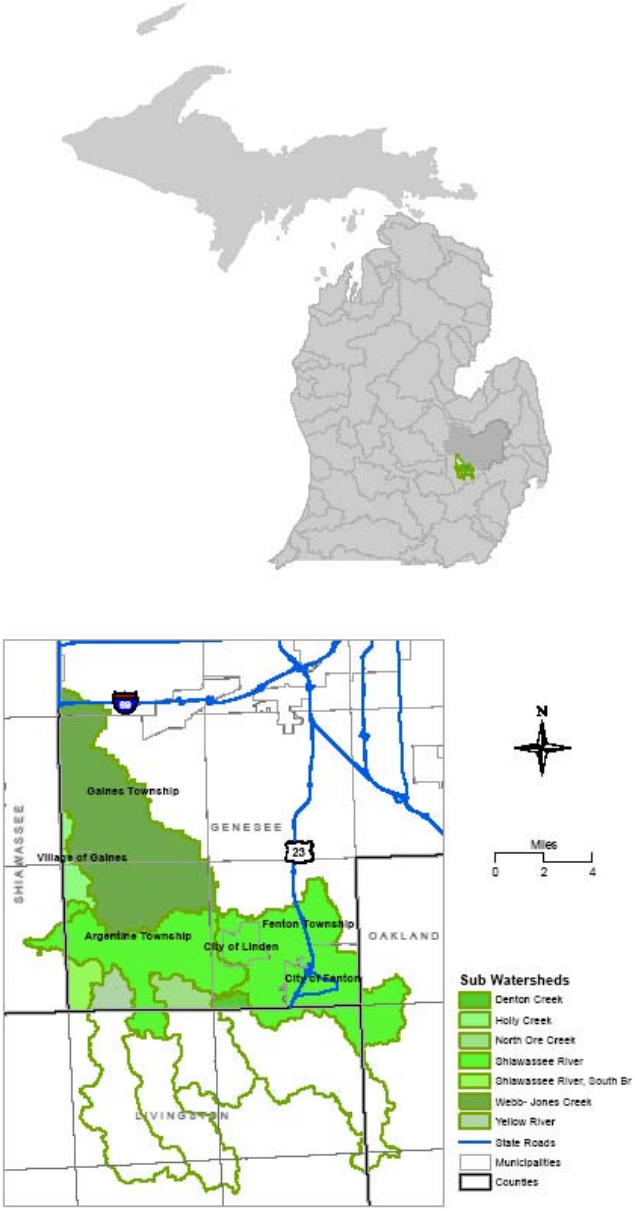


Figure 2-1 Location Map (not to scale)

The Upper I Shiawassee River has several tributaries that have headwaters located in northern Livingston County and the northwest corner of Oakland County flowing north through the southwest corner of Fenton Township into the main Shiawassee River. Then continues west across Genesee County into Shiawassee County in Michigan's lower peninsula. The tributaries that flow thru the 92.12 square-mile (58,956 acres) watershed studied here are comprised of 7 smaller watersheds. From north to south the watersheds are the Webb-Jones Creek, Holly Creek (head waters), Shiawassee River, South Branch of the Shiawassee, Yellow River, North Ore Creek & Denton Creek. The Upper I Shiawassee River Watershed contains over 5.5 square miles of lakes, and more than 234 miles of rivers, creeks and drains, providing many values, including water quality, habitat for indigenous species and recreation opportunities where access is available to the public.

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

Land use in the Shiawassee River watershed varies from commercial and residential concentrated in the center of the watershed, to rural residential clustered around the lakes and agricultural throughout much of the headwaters in the southeast and Argentine. Over time, the agricultural/ undeveloped land uses are being converted to urban and suburban uses by increased development. The change in land use this basin is facing has had, and will have profound effects on the Shiawassee River and Lakes 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 Shiawassee River and it's 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 Shiawassee River and Lakes 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 Shiawassee River and lakes 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.

The Shiawassee River Watershed has gone through many changes throughout the years, most recently a significant portion of this watershed has been changed from agricultural to developed residential and commercial land around US-23 and the Fenton area.

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

PURPOSE OF THE WATERSHED MANAGEMENT PLAN

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

Watershed planning is an innovative way to address Phase II NPDES 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.

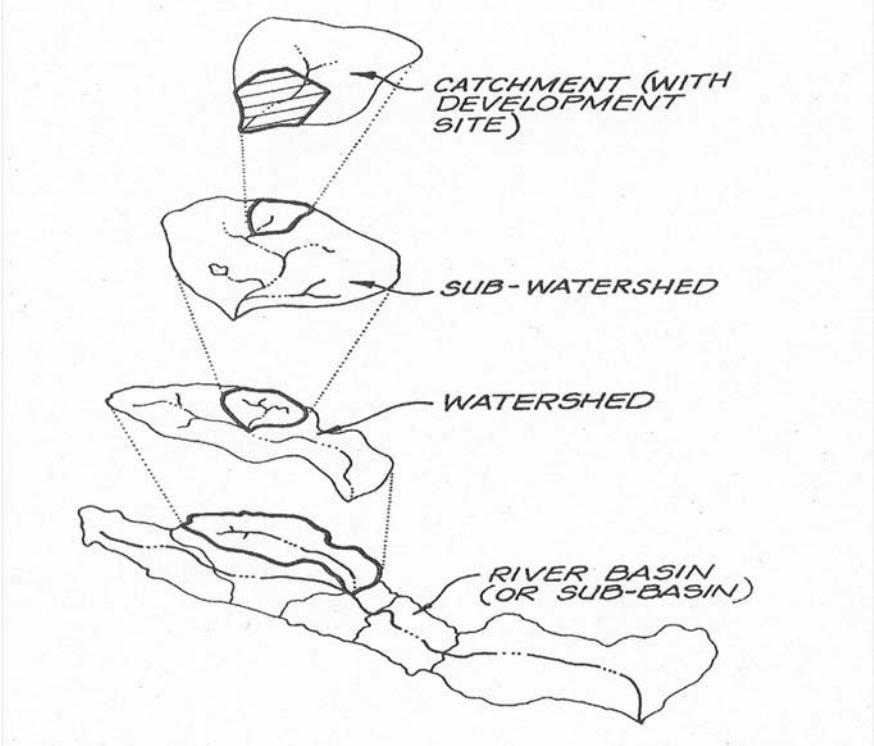
The largest watershed management unit is the basin. A basin drains to a major receiving water, such as a large river, estuary or lake. Within each basin are a group of sub-basins, that are a mosaic of many diverse land uses, including forest, agriculture, range and urban areas. Sub-basins are composed 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
Subbasin	100 to 1,000	Weak	Basin planning
Basin	1,000 to 10,000	Very weak	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 lakes 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

Due to the difficulty in working with a watershed as large as 92 acres, the Shiawassee River Watershed was divided into subwatersheds. Ideally each subwatershed has an area from 2mi^2 to 20mi^2. Geographically there are 3 tributaries along the south and west Genesee County line that were divided along this county border. Although these areas are part of larger subwatersheds, the area remaining in Genesee County had areas smaller than 2mi^2. By dividing a watershed this way, it allows specific areas within the Shiawassee River Watershed to be looked at based on their unique conditions. This assisted with Total Maximum Daily Loads (TMDL) and identifying problems that may be specific to that location. All of the Webb and Jones Creeks within Genesee County are county drains and their watersheds were already defined as existing drainage districts. Most of the Shiawassee River is still a natural watercourse. Whenever possible, within the Shiawassee River Watershed, existing drainage districts were used to divide it into subwatersheds. Areas without a drainage district used contours, whenever possible, to divide districts. Otherwise a jurisdictional boundary was used, when necessary. In total, 13 subwatersheds were developed.

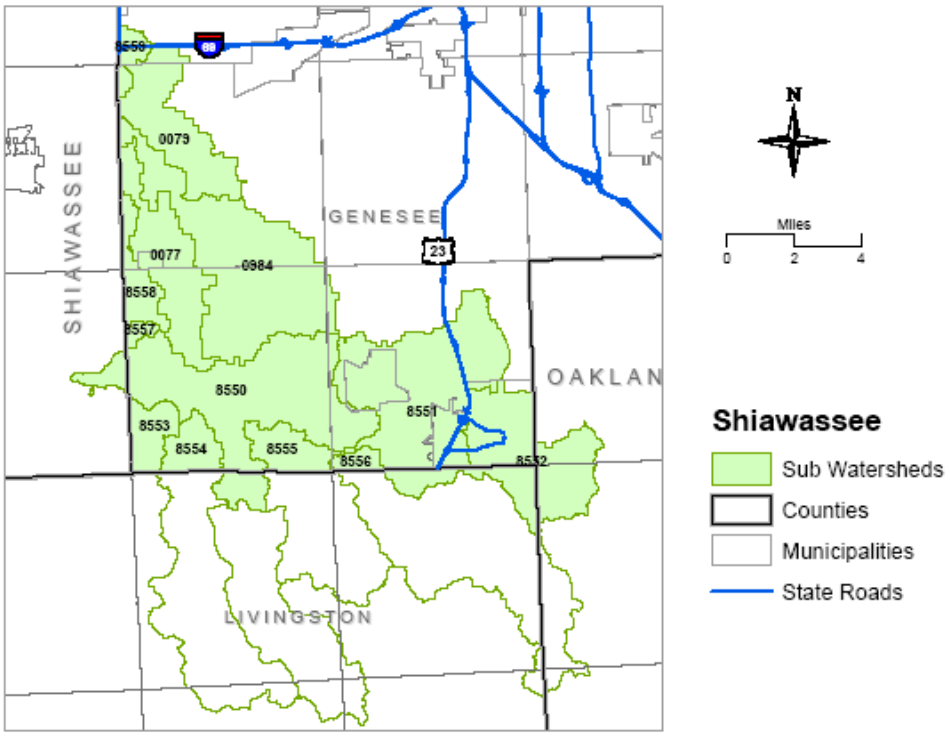


Figure 3-1 Subwatersheds

POLITICAL JURISDICTIONS

Table 3-1 Political Jurisdiction by Subwatershed

		Argentine Twp	Burns Twp	Clayton Twp	Deerfield Twp	City of Fenton	Fenton Twp	Gaines Twp
0984	Jones	8.54					0.42	8.45
0079	Webb			0.58				6.68
8559	Webb outlet 1			0.88				0.35
0077	Corregal Drain	3.54						3.62
	Webb Jones Cr Total	12.08	0.00	1.46	0.00	0.00	0.42	19.10
8550	Shiawassee River 1	14.45	0.72		1.50		2.00	
8551	Shiawassee River 2					2.12	11.97	
8552	Shiawassee River 3					4.50		
8553	Shiawassee South Br	2.43						
8554	Yellow River	2.34						
8555	North Ore Creek	2.72					0.11	
8556	Denton Creek	0.02					0.83	
8557	Shiawassee Outlet 1	0.50						
8558	Shiawassee Outlet 2	1.73						0.82
	Shiawassee Total	24.19	0.72	0.00	1.50	6.62	14.91	0.82
	Shiawassee River Total area in square mile	**36.27**	**0.72**	**1.46**	**1.50**	**6.62**	**15.33**	**19.92**
	% of Watershed	**39.37%**	**0.78%**	**1.58%**	**1.63%**	**7.19%**	**16.64%**	**21.62%**

Shiawassee River Political Jurisdiction by Percentage

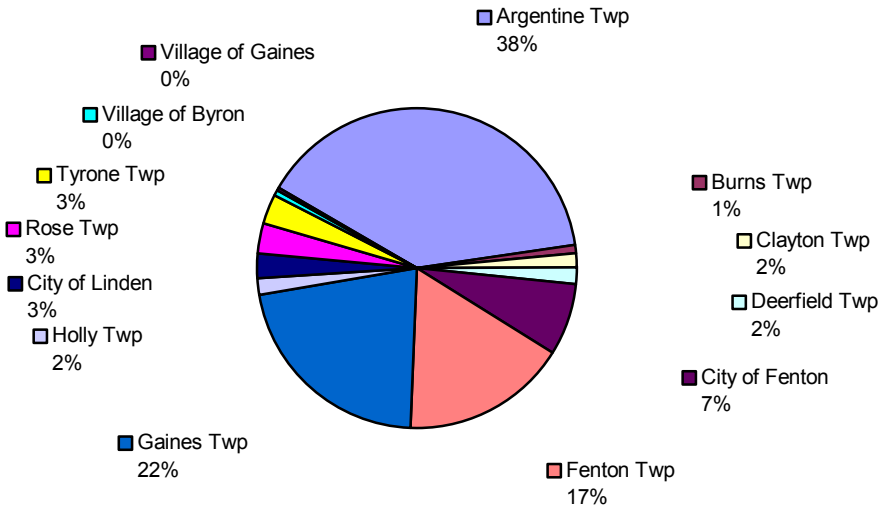


Figure 3-2 Political Jurisdiction by percentage

Holly Twp	City of Linden	Rose Twp	Tyrone Twp	Village of Byron	Village of Gaines	**Total Area in Square mile**	**% of Watershed**
						17.41	**18.90%**
						7.26	**7.88%**
						1.23	**1.34%**
					0.37	**7.53**	**8.17%**
0.00	0.00	0.00	0.00	0.00	0.37	**33.43**	
	0.07			0.27		**19.01**	**20.63%**
	2.35		1.25			**17.69**	**19.20%**
1.54		2.68	1.78			**10.50**	**11.40%**
						2.43	**2.64%**
						2.34	**2.54%**
						2.83	**3.07%**
						0.85	**0.92%**
						0.50	**0.54%**
						2.55	**2.77%**
1.54	2.42	2.68	3.03	0.27	0.00	**58.70**	
1.54	**2.42**	**2.68**	**3.03**	**0.27**	**0.37**	**92.13**	**100.00%**
1.67%	**2.63%**	**2.91%**	**3.29%**	**0.29%**	**0.40%**	**100.00%**	

Political jurisdiction, regarding the Shiawassee River and it's tributaries, are controlled by federal and state laws, county and municipal ordinance, and municipal by-laws. Regulatory and enforcement responsibility for water quantity and quality is multi-layered. Within the Shiawassee River Watershed alone, there are 13 cities, townships, and villages and 4 counties. Of the 13 communities, only 7 are Phase 2 communities.

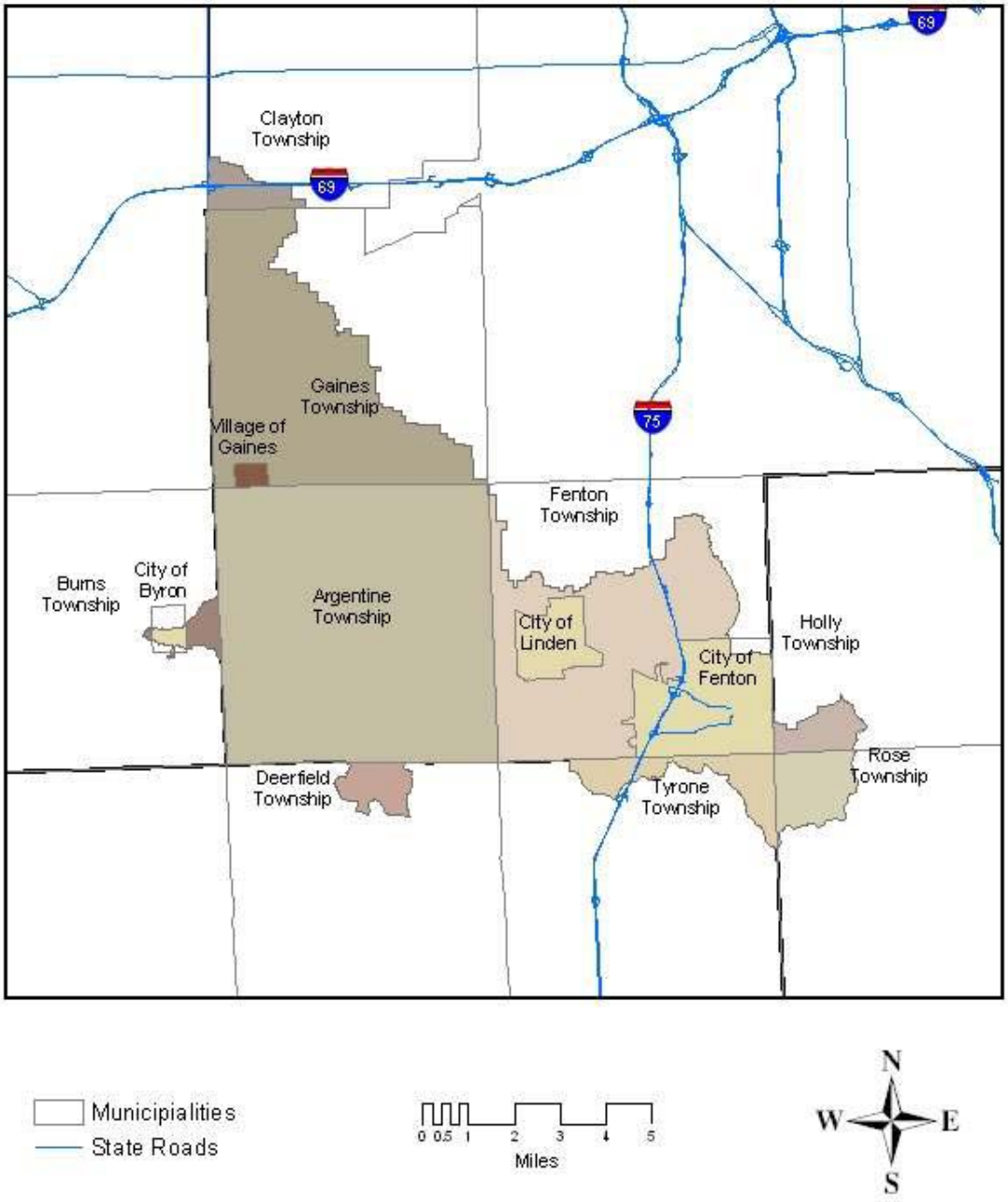


Figure 3-3 Local Units of Government

DEMOGRAPHICS

The Shiawassee River Watershed population has grown in the last 15 years. Although the population has increased in all the municipalities except one, most of that growth has occurred along the major state road corridors. Just within Fenton Township and the City of Fenton borders alone, there has been a population increase of 3858; half of the total population increase. Development has grown along the expressway corridors, outward from the urban areas. Within the last 15 years, the developed area along interstate 23 has been moving south from Flint and north from Ann Arbor within the Shiawassee River Watershed.

Table 3-2 Population Changes

Community	1990 Population within watershed	2000 Population within watershed	% Change from 1990 - 2000	Area within watershed Square Miles
Argentine Township	4,651	6,521	40.2%	36.27
Burns Township	49	58	18.4%	0.72
Clayton Township	356	363	2.0%	1.46
Deerfield Township	120	163	35.8%	1.50
City of Fenton	7,991	10,014	25.3%	6.62
Fenton Township	6,337	8,172	29.0%	15.33
Gaines Township	2,793	3,511	25.7%	19.92
Holly Township	150	306	104.0%	1.54
City of Linden	2,415	2,861	18.5%	2.42
Rose Township	365	460	26.0%	2.68
Tyrone Township	565	697	23.4%	3.03
Village of Byron	205	213	3.9%	0.27
Village of Gaines	427	366	-14.3%	0.37
Total	**26,424**	**33,705**		**92.13**

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 Shiawassee River Watershed consisted of predominantly forested land with Beech-Sugar Forest (sugar maple, basswood, red oak, and white ash) to the north, in Gaines Township, and Oak-Hickory Forest (red oak, white oak, hickory) in the south of Genesee County, Livingston County and Oakland County. Large isolated pockets of Mixed Oak Savannah were present in the southeast quarter of Argentine extending into Fenton Township and along the south City of Fenton and Tyrone Township border. Pockets of forested swamps were scattered throughout Argentine and Fenton Township, although this watershed contains large areas of lakes and wetlands, many of these lakes were either created or enhanced after settlement through the use of lake levels controls.

When the first European explorers entered this area after the war of 1812, they found it 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. Indian villages and encampments developed along the River from Saginaw Bay. So attached were the Indians to this "Land of Lakes" on the Shiawassee that it was their desire to be laid to rest on the border of the lake. Multiple burial grounds were found, the principle one on Mudd Lake.

When Settlers moved into the Shiawassee River watershed, they found a land rich with lakes and plentiful game. Many settlers, mostly from Wayne County, Oakland County and New York State, relocated to the area in the mid 1830's. Fenton was briefly named Dibbleville after it's first settler. Two years later he sold it to William Fenton and Robert LeRoy, and the settlement was known as Fentonville before finally, as we know it today, as the City of Fenton. West of Fenton, Linden was called Warner's Mill until 1840. The Mill still stands and is known as Linden Mill.

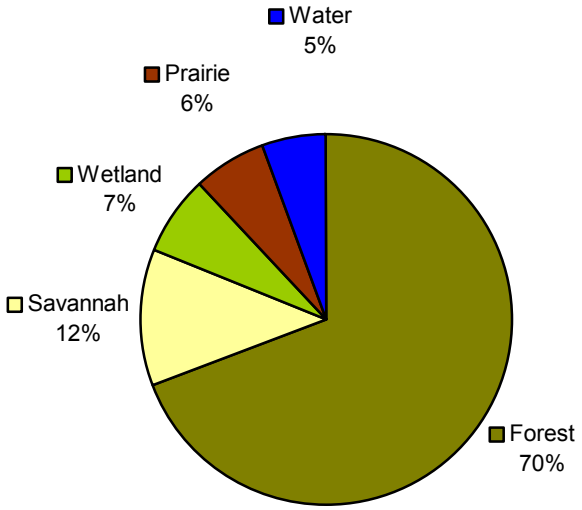


Figure 3-4 Ecosystems, circa 1830s by percentage

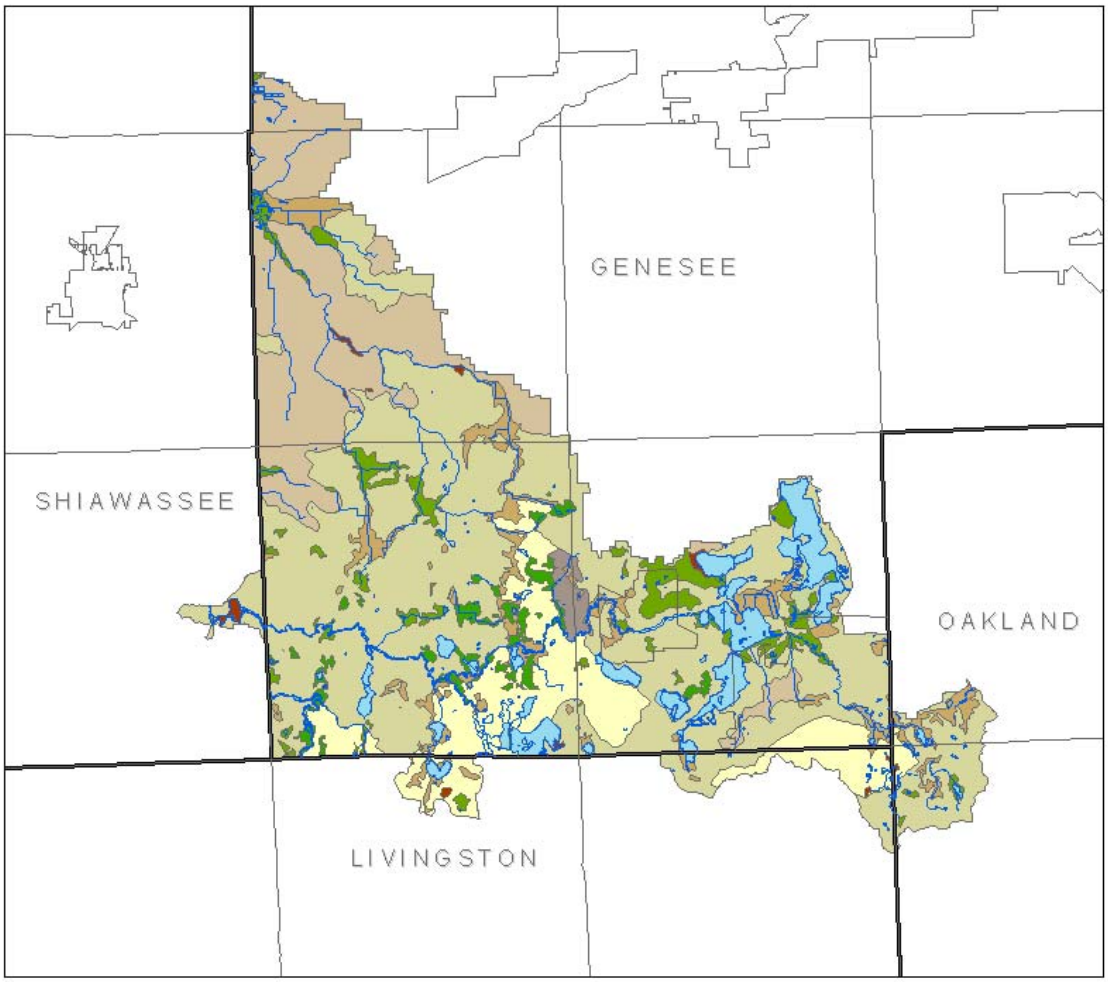


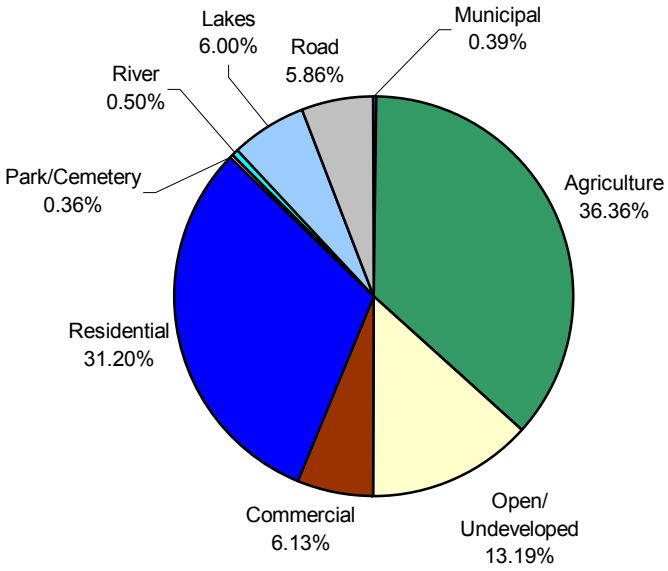
Figure 3-5 Ecosystems, circa 1830s

Settlers' spread out within the area purchasing 40 acre to 240 acre plots for farmland. Several mills were built along the Shiawassee River, performing necessary services such as cutting lumber or grinding grain (grist). Permanent human settlement brought great change to the landscape as the land began to be altered for human benefit. Although Michigan was primarily an agricultural state before the Civil War, lumbering became the principal economic activity in the new state during the second half of the 19th century (Fitting 1975). Other changes included the building of the Detroit and Milwaukee Railroad through Fenton, Linden and the Village of Gaines, this helped establish these as areas of commerce in an agriculturally dominated watershed. Growth was also encouraged nearly 100-years later with the construction of a new highway, US 23, was built to improve the connection between Flint and Ann Arbor.

Localized areas were experiencing growth through residential development concentrated around the lakes. Despite slow but steady growth, half of the watershed remains agricultural or undeveloped.

Figure 3-6 Current Land Cover by percentage

Current land use for Genesee was determined by using the assessment classification for each parcel of land. Open/ Undeveloped areas are undeveloped residential and commercial properties. Parkland was to be considered municipal owned parks. Cemeteries could be public or privately owned. Golf courses are considered developed commercial property. Within Oakland, Livingston and Shiawassee Counties, the land use was determined using the aerial and land cover maps.



There is no consistent source for future land cover within the Shiawassee 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.

Each Municipal Master Plan may have a future land use. It may be for ultimate build out or for a defined period of time. Currently there is no standardized method for classifying current or future land use among the municipalities. Following is a list of Community Master Plans with future land use and when they were prepared. Each community has their master plan on file.

1989
Village of Byron

2000
Burns Township

2001
City of Linden
Clayton Township

2002

Fenton Township
Tyrone Township

2004
Holly Township
City of Fenton

2005
Rose Township

2007
Gaines Township

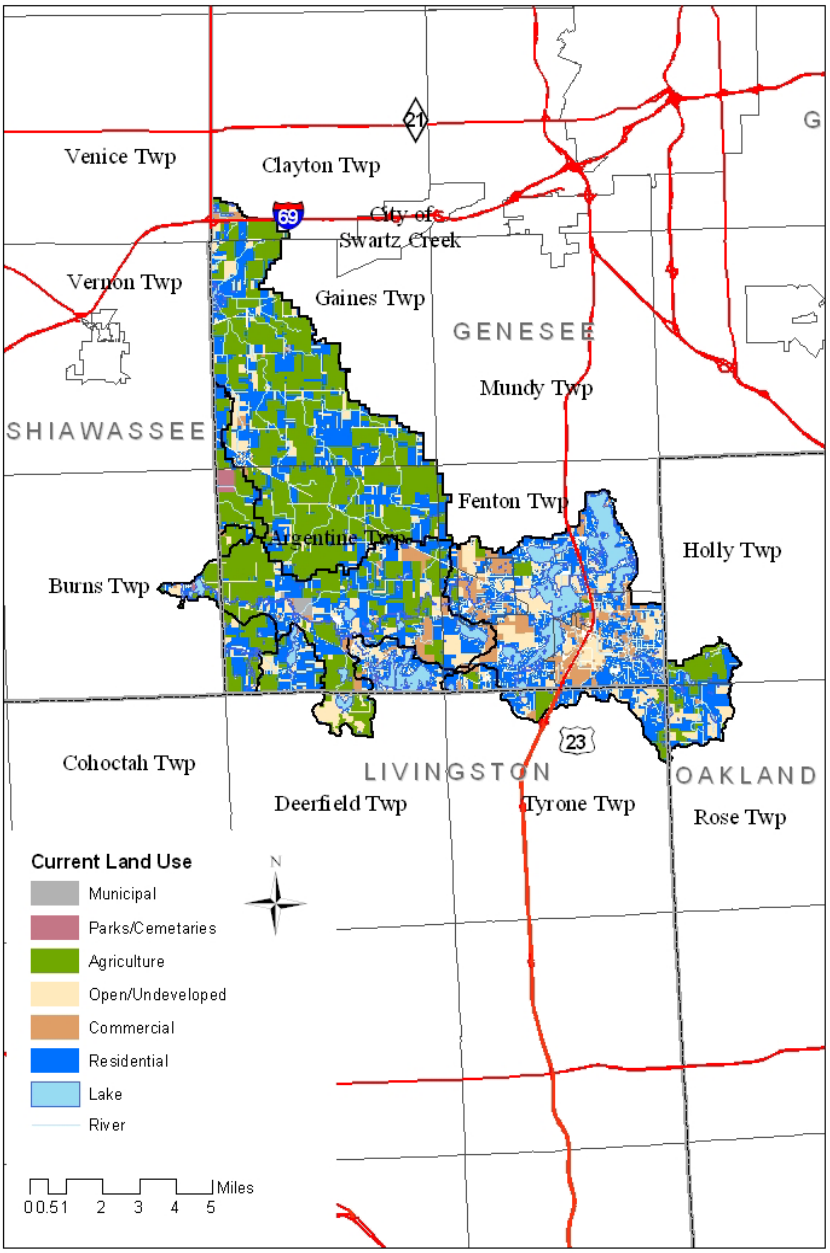


Figure 3-7 Current Land Covers

Urbanized Land Use

Within the Shiawassee 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 Shiawassee 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 diary operations in Genesee County, approximately 1 of them are within the Shiawassee River. Most of the dairy farms have an average of 50-150 head with the largest operation being 250 head of cattle.

The census of agricultural data for the table below is based on the entire Shiawassee River Watershed.

Within the Shiawassee River Watershed, as we defined here, there are no known Concentrated Animal Feeding Operations (CAFO's). A CAFO is an agricultural business where animals are raised in confined situations and fed an unnatural diet, instead of allowing them to roam and graze.

Table 3-3 Livestock in the Shiawassee River Watershed

Beef Cattle	159
Dairy Cattle	222
Swine	29
Sheep	184
Horse	475
Chicken	871
Turkey	119

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.

Within the Shiawassee River Watershed, any conservation practices along watercourses or lakes are done voluntarily or through an agriculture stewardship program.

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 capture, and water quality protection and, as part of a healthy riparian corridor, may dampen the effects of added impervious cover such as pavement, 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).

There are not any local wetland inventories or assessments. The National Wetland Inventory maps are produced by the U.S. Department of Interior, Fish and Wild Life Division. These maps show where wetland's could be. The Michigan Department of Environmental Quality (MDEQ) reviews sites as they are developed to certify or evaluate the presence and limits of a wetland. A wetland is regulated under the MDEQ if it is more than 5 acres or within 500 feet of an inland lake or stream. 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 following map shows, most of the wetlands are concentrated along and around the streams, rivers and lakes. The wetlands on the following map were identified in the Wetland Inventory Map from 1979. By then, much of the land within the watershed had already been altered through agricultural development.

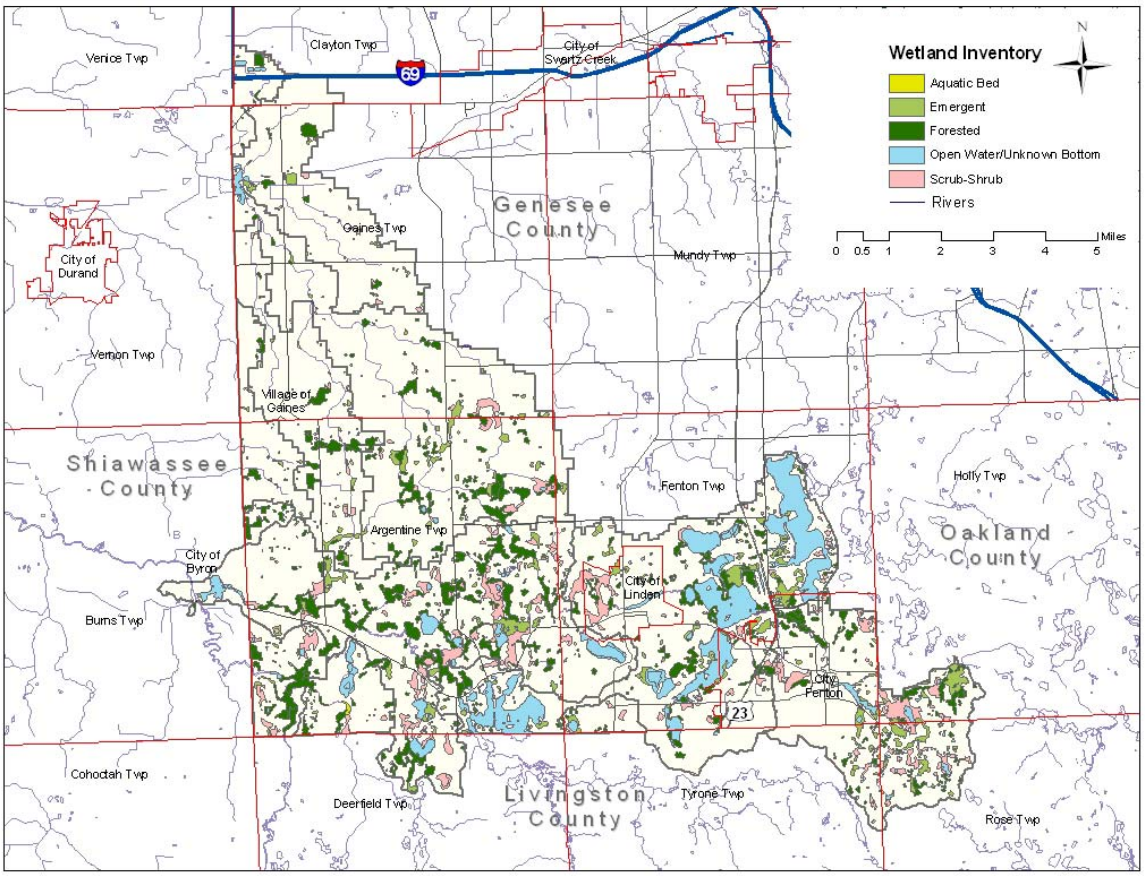


Figure 3-8 Wetlands
Source: National Wetland Inventory

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)

The Shiawassee River Watershed is predominantly made up of gently rolling hills with large relatively flat areas. The highest elevation is in Holly Township at 1150 feet above sea level, per the USGS 5' contour map. The Shiawassee River travels westerly through Genesee County and into Shiawassee County. The Shiawassee River converges with the south branch outlet in Burns Township where the lowest elevation is 760 feet.

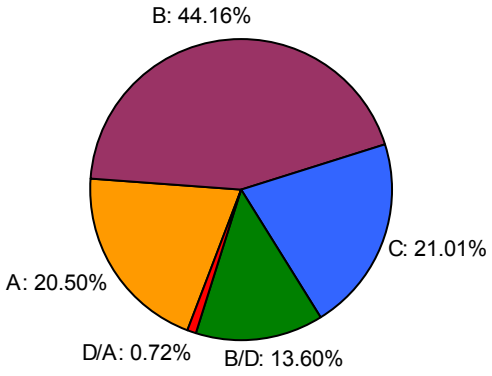
GEOLOGY AND SOILS

Several ice sheets advanced over Mid Michigan and retreated during the glacial period. The most recent ice sheet or glacier was during the late Wisconsin glacial period, some 9,000 or more years ago. Soon after, the Shiawassee River Watershed 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. This would be the northeast border of the Shiawassee River Watershed. The lakes of this region were also formed from melt water.

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 Shiawassee River Watershed is made up of the following soils.

Figure 3-9 Hydrologic Soil Groups by percentage



SPINKS-HOUGHTON-BOYER (MI014)	3.87%
BOYER-OAKVILLE-COHOCTAH (MI024)	16.63%
MIAMI-SPINKS-OAKVILLE (MI015)	16.91%
MIAMI-CONOVER-BROOKSTON (MI017)	1.07%
MIAMI-HILLSDALE-EDWARDS (MI023)	21.55%
MARLETTE-CAPAC-PARKHILL (MI035)	0.86%
MARLETTE-CAPAC-SPINKS (MI036)	3.77%
CONOVER-BROOKSTON-PARKHILL (MI025)	13.60%
LENAWEE-DEL REY-KIBBIE (MI009)	21.01%
HOUGHTON-CARLISLE-ADRIAN (MI022)	0.72%

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.

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.

HYDROLOGY

The Shiawassee River Watershed contains 91 lakes, (1 acre or larger) covering approximately 3509 acres. The largest of these lakes are Fenton Lake, Lobdell Lake, Silver Lake, and Lake Ponemah. Also the Shiawassee River Watershed has more than 234 miles of rivers, creeks and drains. Of the larger watercourses that have base flow all year long there is the Main Shiawassee, the Jones Creek and Webb Creek. Each of these watercourses is fed through a series of swales, road ditches, county drains, and underground pipes. 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 Shiawassee River Watershed were agricultural, there are many unmapped private farm tiles that drain low areas within the watershed.

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.

The USGS has no stream gauges within this watershed. The closest stream gauge is located in Owasso on the main channel of the Shiawassee. Although we are unable to measure the flow in the river, several observations can be made. Within this watershed there are over 5 Mi^2 of lakes and almost as many wetlands. Most of the large lakes have a dam or impoundments that control the water level. The lakes and wetlands, making up a large percentage of this watershed, help to provide: Storage for rain events and since the water is being released over a longer period of time, a stable base flow for habitat.

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. 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.

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 subbasin 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)

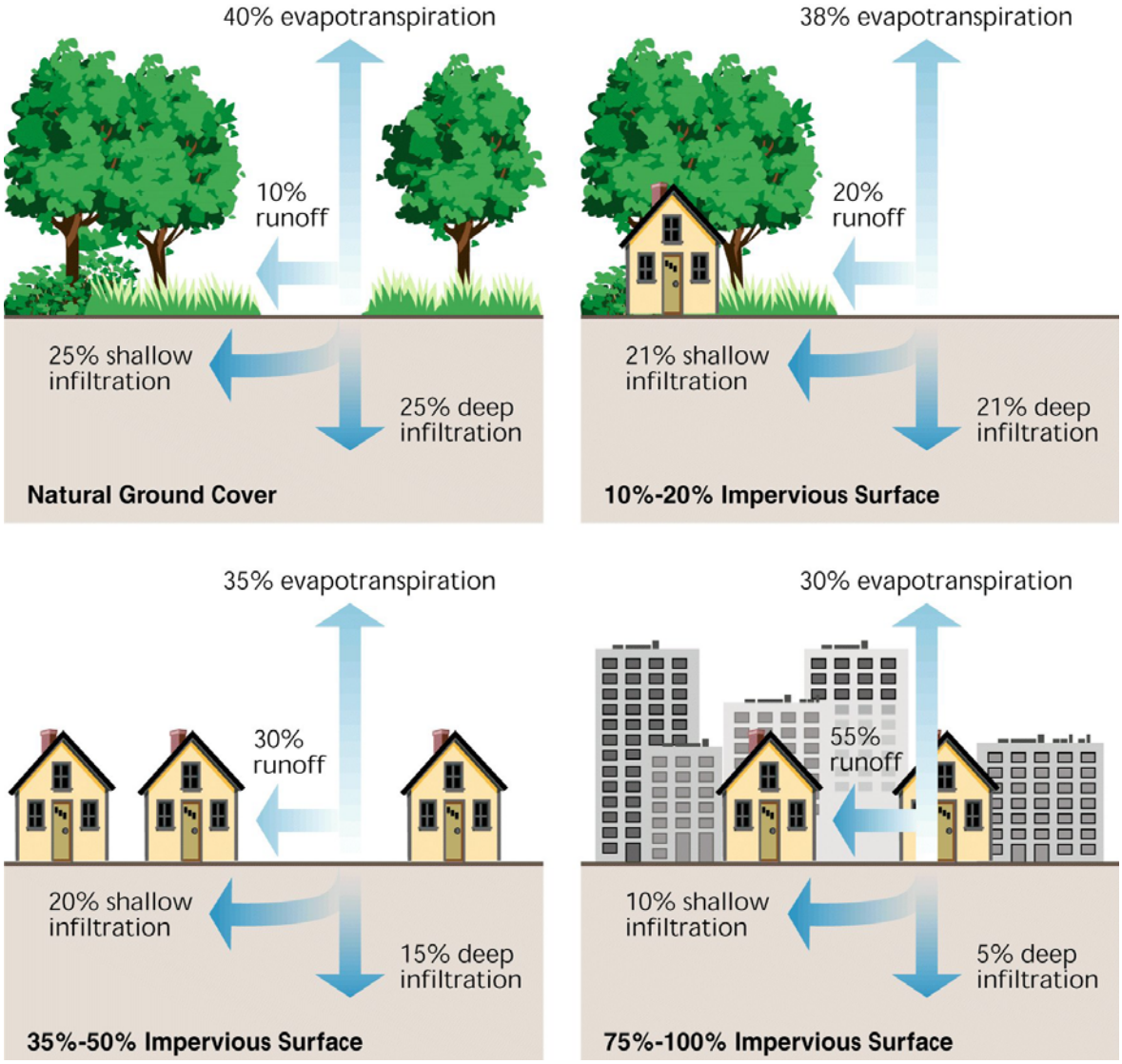


Figure 3-10 Effect of urbanization on runoff
Source: FISRWG, 1998

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).

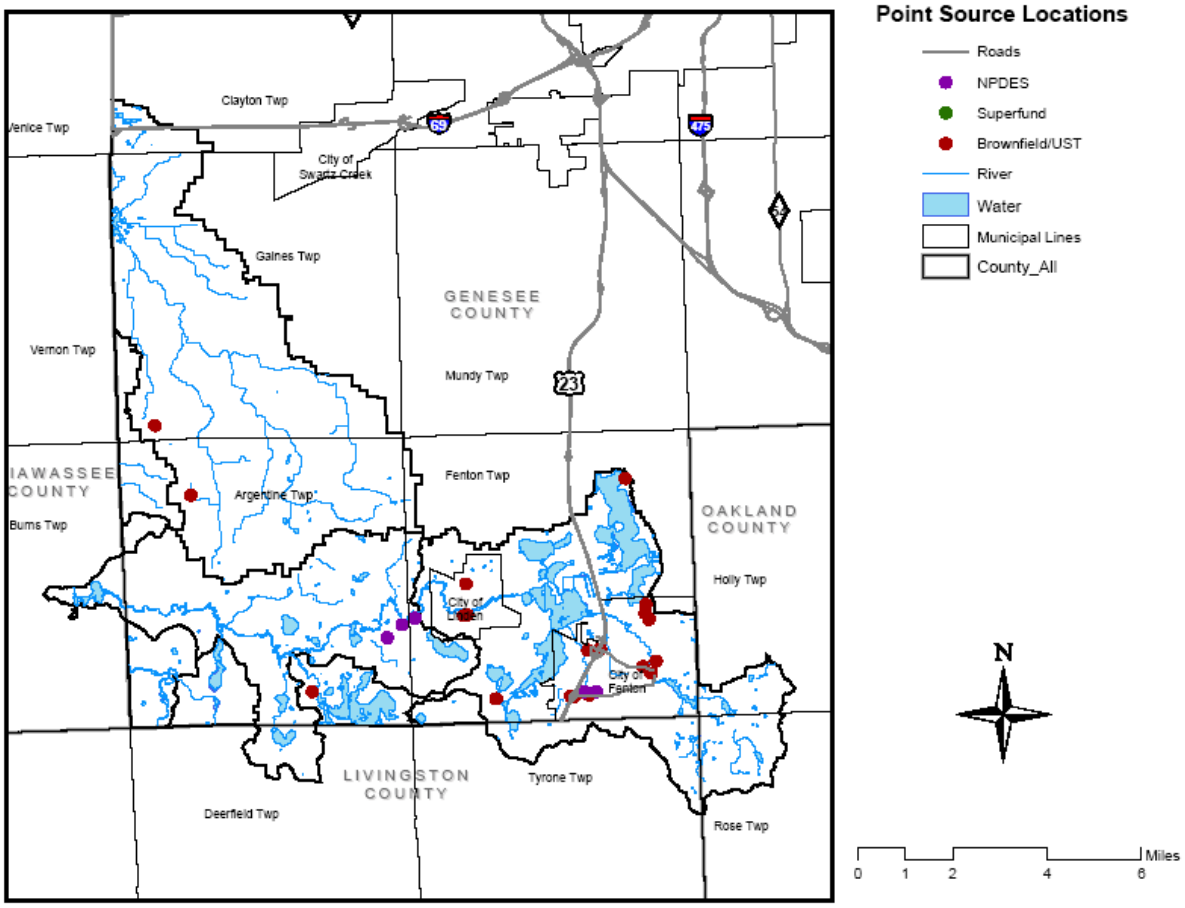


Figure 3-11 Point Sources

POINT SOURCES OF POTENTIAL POLLUTANTS

Table 3-5 Point Sources

Description	Permit #	Owneship	Status	Sub-Watershed	Municipality	Receiving Waters
Active Superfund Sites						
Active Brownfield LUST UST						
Newcor, Inc.	25000342	Private	Inactive	8552	Fenton	Shiawassee River
Kovacs, Emil	1474	Private	Open	8555	Linden	North Ore
Vek's Auto Service	3770	Private	Open	8552	Fenton	Shiawassee River
1st United Methodist Church	41787	Private	Open	8552	Fenton	Shiawassee River
Proposed Fenton Fire Station	41082	Private	Open	8552	Fenton	Shiawassee River
Action Auto #7	12970	Private	Open	8552	FENTON	Shiawassee River
Clark Service Station #824	12190	Private	Open	8552	West Bloomfiel	Shiawassee River
Total Station #2023	16380	Private	Open	8552	San Antonio	Shiawassee River
Genesee County Linden Park	14946	Public	Open	8550	Flint	Shiawassee River
Exit 80, Inc.	7061	Private	Open	8552	Fenton	Shiawassee River
Nagy Excavating Inc.	9805	Private	Open	8551	Fenton	Shiawassee River
Best Self Storage	50001646	Private	Open	8552	Unknown	Shiawassee River
Waldon. Melvin	50001222	Private	Open	8552	Unknown	Shiawassee River
Cms Fenton Bulk Plant	13384	Private	Open	8552	Lapeer	Shiawassee River
Fisherman's Landing	50001992	Private	Open	8551	East Lansing	Shiawassee River

Lake Side Party Store	18485	Private	Open	8551	Fenton	Shiawassee River
Quick Sav Foods Stores #30	10887	Private	Open	8551	Flushing	Shiawassee River
Langs Marine	5159	Private	Open	8551	Fenton	Shiawassee River
Fenton Township Fire Department	14953	Public	Open	8551	Fenton	Shiawassee River
Montrose Express	00014012	Private		8551	Montrose	Shiawassee River
Knight Enterprises K-78	00004159	Private		8551	Fenton	Shiawassee River
Speedway #8405	00008917	Private		8551	Fenton	Shiawassee River
Speedway #5509	00016617	Private		8551	Fenton	Shiawassee River
Owen Rd BP	00005664	Private		8551	Fenton	Shiawassee River
Fenton Area Public Schools	00040760	Public		8551	Fenton	Shiawassee River
Nasser Inc	00033413	Private		8555	Linden	North Ore
Fenton Co (M22215)	00041467	Private		8552	Fenton	Shiawassee River
Revana Gaz Station	00008551	Private		8552	Fenton	Shiawassee River
Mr J's Petroleum Inc	00012190	Private		8552	Fenton	Shiawassee River
Auto City Service	00040524	Private		8551	FENTON	Shiawassee River
Exit 80 Inc	00007061	Private		8552	FENTON	Shiawassee River
#39 North Fenton Mgmt	00019465	Private		8552	Fenton	Shiawassee River
Fairbanks Marathon Station	00003005	Private		8551	Linden	Shiawassee River
Quick-sav #8	00002778	Private		8551	LINDEN	Shiawassee River
Leroy Investment LLC	00034344	Private		8552	Fenton	Shiawassee River
Mobil 1-Stop Food Store	00000505	Private		8552	Fenton	Shiawassee River
Fire Station #2	00036539	Public		8551	Flint	Shiawassee River
Sill Farms	00002732	Private		0077	Gaines	Webb- Jones
Charter Twp Of Fenton	00014953	Private		8551	Fenton	Shiawassee River
Village Of Gaines Fire Dept	00008642	Private		0077	GAINES	Webb- Jones
Active NPDES						
Atlas Tech-Copper Ave-Fenton	MIS210773	Private		8551	Fenton	Shiawassee River
Ring Screw LLC-Fenton Oper	MIS210250	Private		8551	Fenton	Shiawassee River
Laidlaw Transit-Linden	MIS210160	Private		8550	Linden	Shiawassee River
GCRC-Linden Maint Garage	MIS210001	Public		8550	Linden	Shiawassee River
Genesee Co #3 WWTP	MIS710019	Public		8550	Linden	Shiawassee River

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

Note: Although there are no Superfund sites within this Watershed boundary, there is a Superfund site upstream in the South Branch of the Shiawassee that affects the water quality of the stream. Table 4-1 has the fish advisories on the South Branch of the Shiawassee River and the Main Shiawassee River, due to the presence of *PCB's*.

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 in 2006.

Within Genesee County the sanitary sewer systems had been predominantly constructed since 1960's. This system has been extended into Oakland County & Livingston County 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 municipal sanitary and OSDS.

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

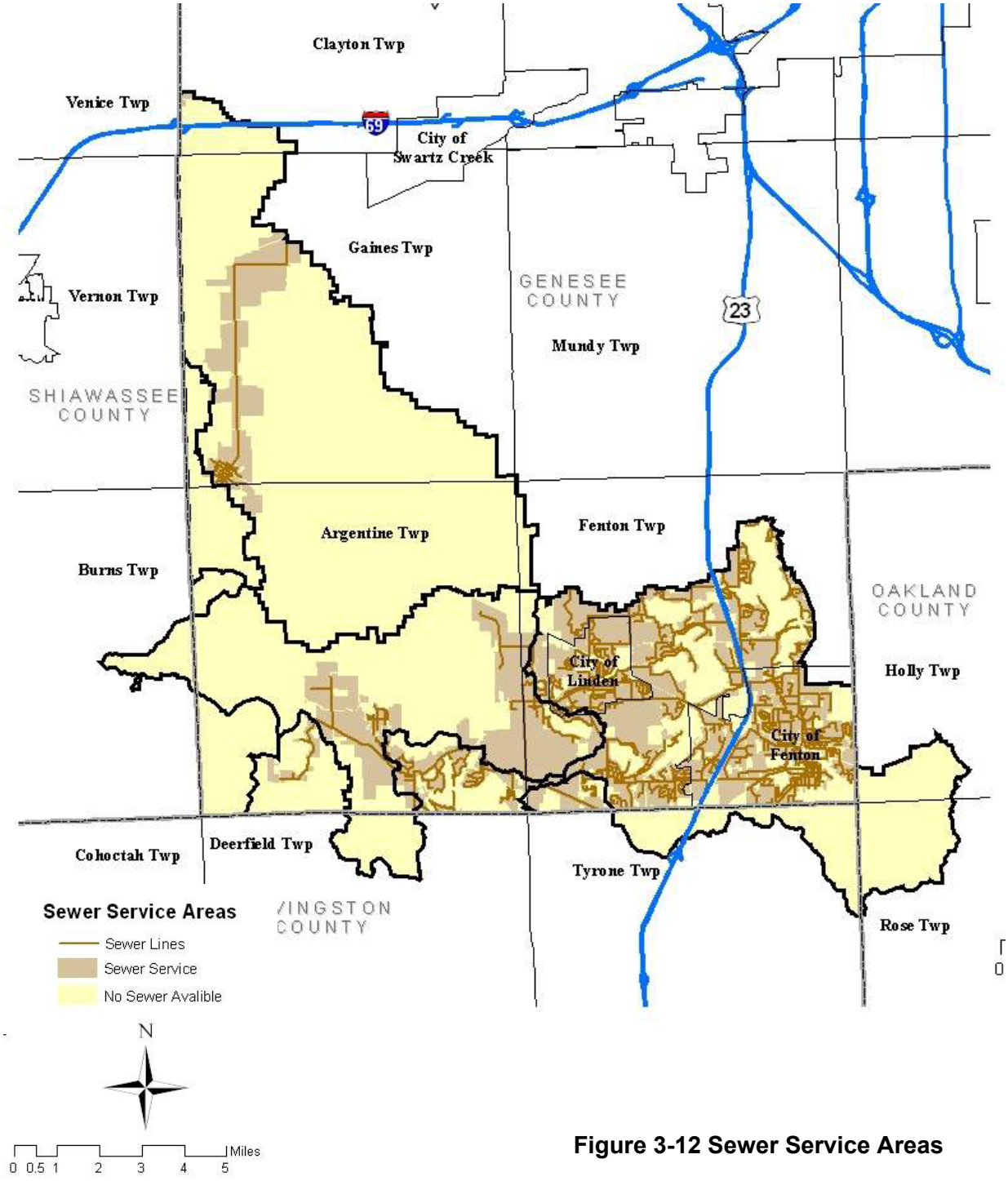


Figure 3-12 Sewer Service Areas

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.

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.

This list is based on known and verified sightings of threatened, endangered, and special concern species and represents the most complete data set available. It should not be considered a comprehensive listing of every potential species found within a watershed. Because of the inherent difficulties in surveying for threatened, endangered, and special concern species and inconsistent of inventory effort across the State species may be present in a watershed and not appear on this list.

Table 3-6 Threatened and Endangered Species

Scientific Name	Common Name	Federal Status	State Status
Angelica venenosa	Hairy Angelica		SC
Clemmys guttata	Spotted Turtle		T
Cypripedium candidum	White Lady-slipper		T
Emys blandingii	Blanding's Turtle		SC
Great Blue Heron Rookery	Great Blue Heron Rookery		
Intermittent wetland	Infertile Pond/marsh, Great Lakes Type		
Microtus pinetorum	Woodland Vole		SC
Morus rubra	Red Mulberry		T
Myotis sodalis	Indiana Bat or Indiana Myotis	LE	E
Oarisma poweshiek	Poweshiek Skipperling		T
Prairie fen	Alkaline Shrub/herb Fen, Midwest Type		
Sistrurus catenatus catenatus	Eastern Massasauga	C	SC

(Source: Michigan Natural Features Inventory)

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

Threatened and endangered species information was taken from the Michigan Natural Features Inventory. Those animals/plants listed above are within the Shiawassee River Watershed. As shown in Figure 3-13 the areas where these plants and animals are found are along the south and west watershed lines.

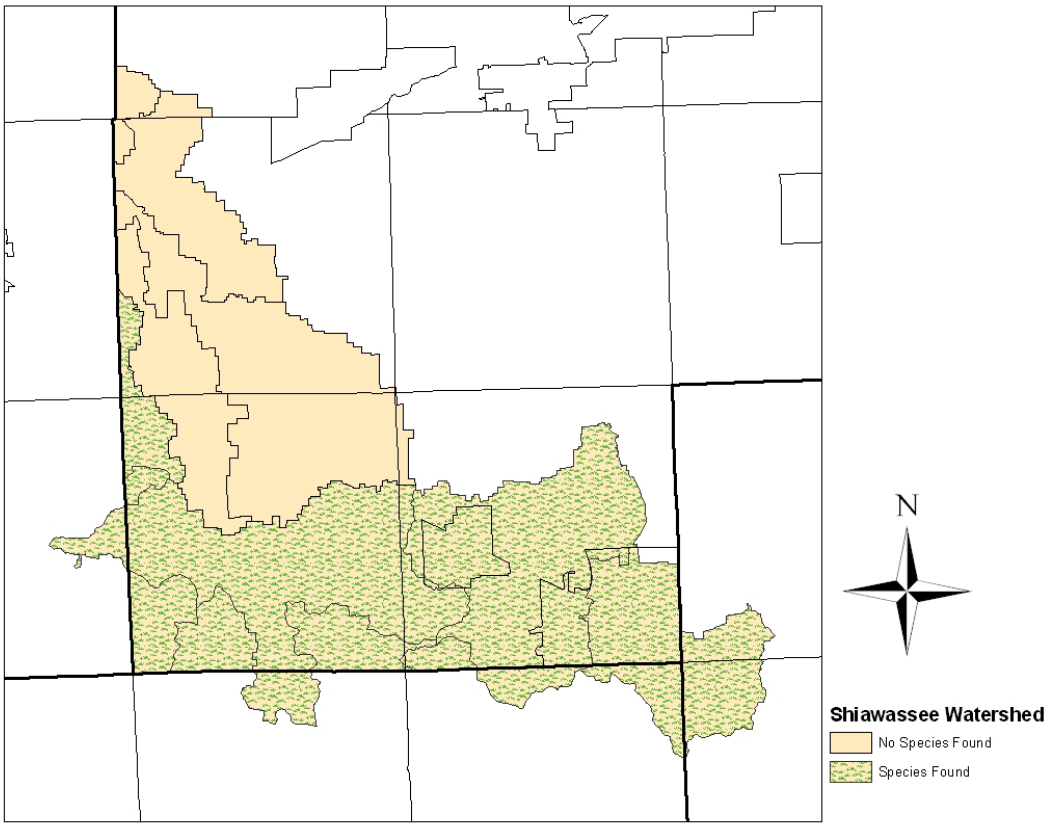


Figure 3-13 Natural Features Area(s)

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 Wisconsinan glacier created aquatic environments for fish. Original fish gained access through migration from connecting waterways. A description of the fish community in the Shiawassee River Watershed at the time of European settlement (early 1800's) is not available. However, anecdotal accounts of the time mention several species. In 1858, the commercial basin fish trade was based on sturgeon, trout, muskellunge, pickerel (walleye), mullet (Sucker sp.), whitefish, perch, roach (sunfish), black bass, bill fish (gar), and catfish. (MDNR, Fishery Division). The Original fish habitat of the Shiawassee River watershed has been greatly altered by human settlement. The 1900's gave rise to the industrial era and the urbanization of the Shiawassee River watershed. Cities 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 biologic communities in the Shiawassee River and Lakes 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.

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 Michigan Department of Natural Resources (MDNR), Fisheries Division has focused on improving recreational fishing opportunities, specifically with stocking walleye in Lake Fenton, Lake Ponemah and Lobdell Lake.

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 Shiawasse River and the South Branch of Shiawassee River for PCB's, (downstream of the Superfund site). 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 the whole Shiawassee Watershed.

Table 4-1 Fish Advisory Information

Water Body	Location	Fish Species	Restricted Population	Restriction
Shiawassee River	Below Owosso	Carp	Women and children	<22 inches - One meal per week
			Women and children	22+ inches - One meal per month
	Below Owosso	Rock Bass	Women and children	6-18 inches - One meal per week
	Below Owosso	Smallmouth Bass	Women and children	14-30 inches - One meal per week
Shiawassee River	Byron to Owosso	Carp	General population	Do not eat these fish
	Byron to Owosso	Northern Pike	Women and children	22-30 inches – One meal per month
			Women and children	30+ inches – 6 meals per year
	Byron to Owosso	Smallmouth Bass	Women and children	14-30 inches – One meal per month
Shiawassee River, South Br	M-59 to Byron	All species	General Population	Do not eat these fish
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
	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
	Entire watershed	Muskellunge	General population	30+ inches - One meal per week
			Women and children	30+ inches - One meal per month
	Entire watershed	Northern Pike	General population	22-30+inches - One meal per month
			Women and children	22-30+ inches - One meal per month
	Entire watershed	Rock Bass	General population	8-18 inches - One meal per week
			Women and children	8-18 inches - One meal per month
	Entire watershed	Walleye	General population	14-30+ inches - One meal per week
			Women and children	14-30+ inches - One meal per month
	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, 2001. Michigan 2001 Fish Advisory., Michigan 2001 Flint River Assessment

Macroinvertebrate Studies

Benthic monitoring assesses the quality of a water body, specifically the Shiawassee River. The volunteer monitoring program uses trained volunteers to gather information about the relative health of the area's streams and rivers. The major element of the program is the collection and analyzing of benthic macroinvertebrates. 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.

An added benefit to this kind of program is there is a built in education component. Because volunteers do the testing they must be trained. The volunteers have also helped to build awareness of pollution problems.

Currently the Shiawassee River does not have an existing benthic monitoring program. After discussions with the Flint River Watershed Coalition (FRWC), it is the intent of the Monitoring and Mapping Committee to partner with the FRWC program to expand their program in the future to include at least 2 sites in the Shiawassee Watershed. One Located near the headwaters and another near where the Shiawassee leaves Genesee County.

Lake Studies

Within the Shiawassee Watershed there are at least 10 lake associations. These private associations are made up of concerned lake property owners that have come together to protect and preserve their lakes. The threats to a lake are going to be unique to that lake, but the threats can be grouped into the following categories:

- Man made pollutants: oil, chemicals, litter, heavy metals such as mercury …
- Natural pollutants: High nutrients such as phosphorus or naturally occurring elements such as arsenic
- Sediment or water clarity
- Temperature and dissolved Oxygen
- Nuisance plants and animals
- Biodiversity (Lack of)
- Restricted recreation

Each association has volunteers that donate time or money so water testing can be done. There are several types of testing that can be done. The most common is to test the water's chemistry. Volunteers will take samples of water at different locations and have it tested. Some of the tests that can be done are:

- Transparency
- Phosphorus
- Nitrogen
- Chlorophyll
- Dissolved Oxygen
- Temperature

Some of these tests must be done on site; others have to be sent to a lab. For example volunteers for the Lake Fenton Property Owners Association collect water samples and have them sent to a lab for chemical testing through a program called Cooperative Lakes Monitoring Program (CLMP). This is a program run by Michigan Lakes & Stream Association. This is a non-profit corporation comprised of individuals and associations who desire to conserve and improve Michigan's lakes, rivers and streams, and their watersheds.

In a different approach, Lobdell-Bennett Lake Association has contracted the services of Dr. Pullman to perform a biodiversity assessment. This is where a trained professional will identify plant species in the lake then maps the location and quantity to get a picture of the lake's biodiversity. This assessment is similar to benthic monitoring because certain plant species are more sensitive to changes in the water conditions and are "**intolerant**" of pollution. By mapping the types of plants present and their quantity it can be inferred that the water quality is **poor** or **good**. Other information gathered by this method is the absence or presence of invasive species such as Millfoil or Curly Leaf Pond Weed, to name a couple. By reducing invasive species, this allows good or desired plants habitat. The more diverse the plant biology the more divers the animals that are supported by them can be.

Regardless of the testing methods used, the information gathered becomes valuable in identifying problems, and over time shows the changes in water quality. This change or trend becomes valuable because every lake has what is referred to as a turnover rate. This is the time it would take for a lake to replace all of its water. If the lake is small or has a large inlet and outlet allowing more water to pass through it, the turnover rate could be measured in months. More often in the larger lakes where the water is regulated by relatively small outlets the turnover rate is measured in years. For example, Fenton Lake has a turnover rate of about ten years. If a lake is polluted the time it takes to dilute or eliminate that pollution can also take years.

Once the problems have been identified the association can then implement management techniques to reduce or manage threats. Many lakes associations have programs to reduce invasive plant species either through harvesting or targeted herbicide treatment. Plants are not the only invasive species identified. Certain fish, invertebrates or algae can be considered invasive or detrimental. One example is: approximately 3 years ago zebra muscles were identified in Lobdell Lake.

WATER TESTING WITH PROJECT GREEN

Global Rivers Environmental Education Network (GREEN) is a curriculum based, mentored program designed to propose solutions to local environmental problems using water quality testing. This project has been in existence for fourteen years in Genesee County under the direction of the Genesee County Intermediate School District (GISD). In late 2003 the Flint River Watershed Coalition was approached by Earth Force Green and General Motors to be the coordinator of the GREEN in the Flint River Watershed. FRWC was identified as the primary organization that could help improve program participation and effectiveness because of its focus on water quality monitoring and environmental education. The FRWC Board of Directors has endorsed this vision and has agreed to take full administrative control over the next two years. In 2004 the Genesee County Drain Office on behalf of the Phase II program partnered with the FRWC with funding and mentors. In the spring of 2005 and 2006, Hundereds of students had a combination of class time and field experience on the local rivers. The students learned about water quality and testing procedures and went to various sites on the Flint River and tributaries to take water samples for the following indicators.

- Dissolved Oxygen
- Nitrates
- PH
- Fecal Coliform
- Temperature
- Total Solids
- Turbidity
- Total Phosphorus

By testing for the above indicators the students can compare the results to the "norm" and draw conclusions on the health of the water. Chemical testing is a snapshot of water health, and the results should not be taken alone. By using chemical testing and other water quality indicators such as benthic monitoring or photo/ physical observations, changes to the water can be shown.

Although the data has not compiled at this time within Genesee County there was 16 school (24 teachers) and hundreds of students that had the opportunity to participate.

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:

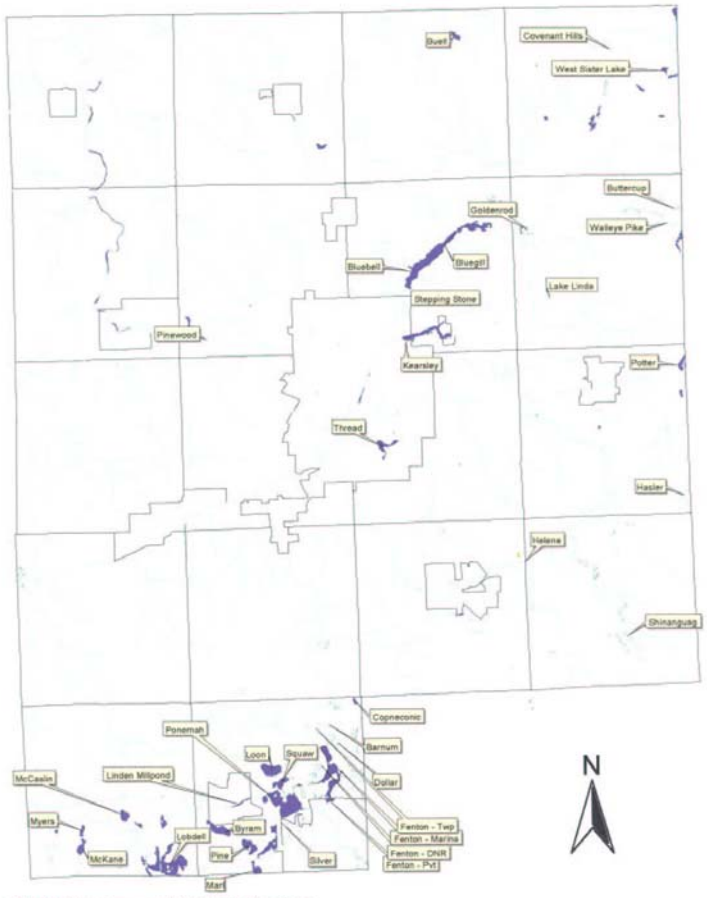
> *"R 323.1062 Microorganisms.*
>
> *Rule 62. (1) All waters of the state protected for total body contact recreation shall not contain more than 130 Escherichia coli (E. coli) per 100 milliliters, as a 30-day geometric mean. Compliance shall be based on the geometric mean of all individual samples taken 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 Shiawassee River Watershed:

- Barnum
- Byram Lake
- Copneconic
- Dollar
- Fenton Lake (4)
- Linden Mill Pond
- Lobdell
- Loon
- Marl Lake
- McCaslin Lake
- McKane Lake
- Myers Lake
- Pine Lake
- Ponemah Lake
- Silver Lake
- Squaw Lake

Genesee County Health Department
Surface Water Sampling Locations



8/11/99 Environmental Health Services

Figure 4-1 E. Coli Test Sites Within Genesee County **WATER CHEMISTRY AND HYDROLOGY STUDIES**

Table 4-3 Michigan Section 303d TMDL Water Bodies

Water Body	Waterbody Decription	Pollutants	Expected TMDL Date
FENTON LAKE	Vicinity of Fenton.	Fish Tissue-Mercury.	2011
LOBDELL LAKE	2 miles SW of Linden (Argentine Twp.)	FCA-PCBs; Fish Tissue-Mercury.	2010
LAKE PONEMAH	NW of Fenton.	FCA-PCBs; Fish Tissue-Mercury.	2010
SHIAWASSEE RIVER & S. BR. SHIAWASSEE RIVER	Saginaw River confluence u/s to Byron Millpond Dam; including the S. Br. Shiawassee River from the Shiawassee River confluence at Byron u/s to M-59 (vicinity of Howell)	FCA-PCBs	2010
SHIAWASSEE RIVER WATERSHED	Saginaw River confluence to include all tributaries	WQS exceedances for PCBs	

USGS Monitoring

There are no USGS stream gauges within the Shiawassee River Watershed. The closest gauge is located in Owosso MI, approximately 26 river miles downstream of this watershed's outlet.

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). 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 Figure 4-2 through Figure 4-4 and numerically in .

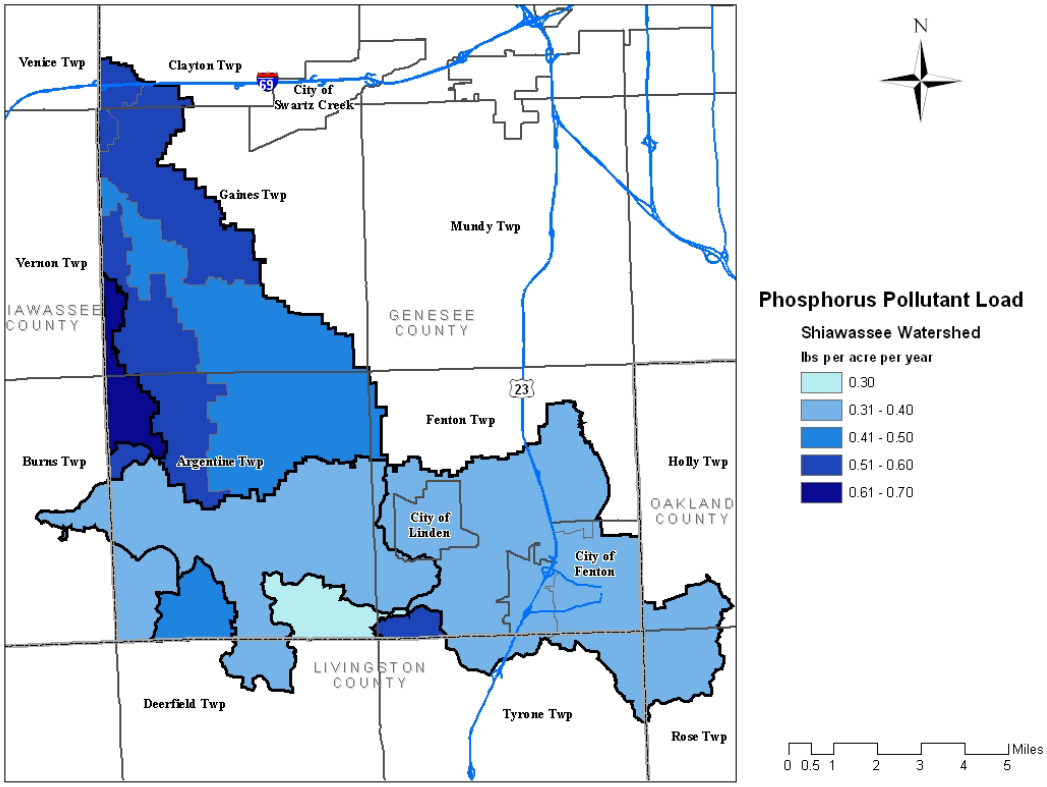


Figure 4-2 Phosphorus Pollutant Load

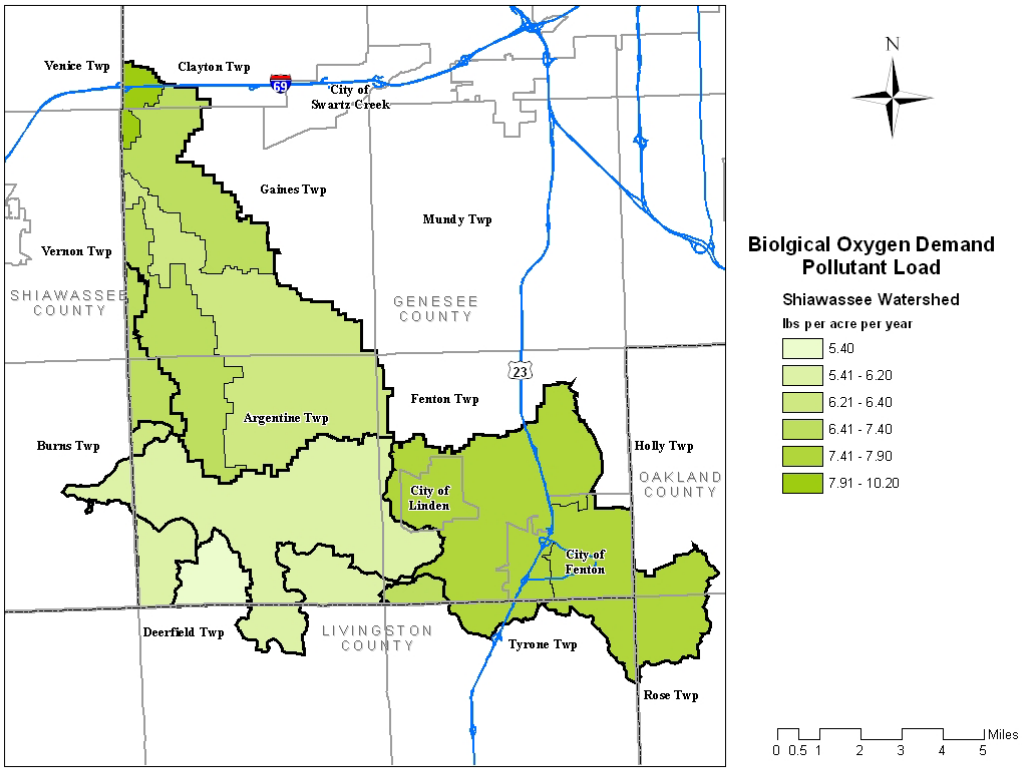


Figure 4-3 BOD Pollutant Load

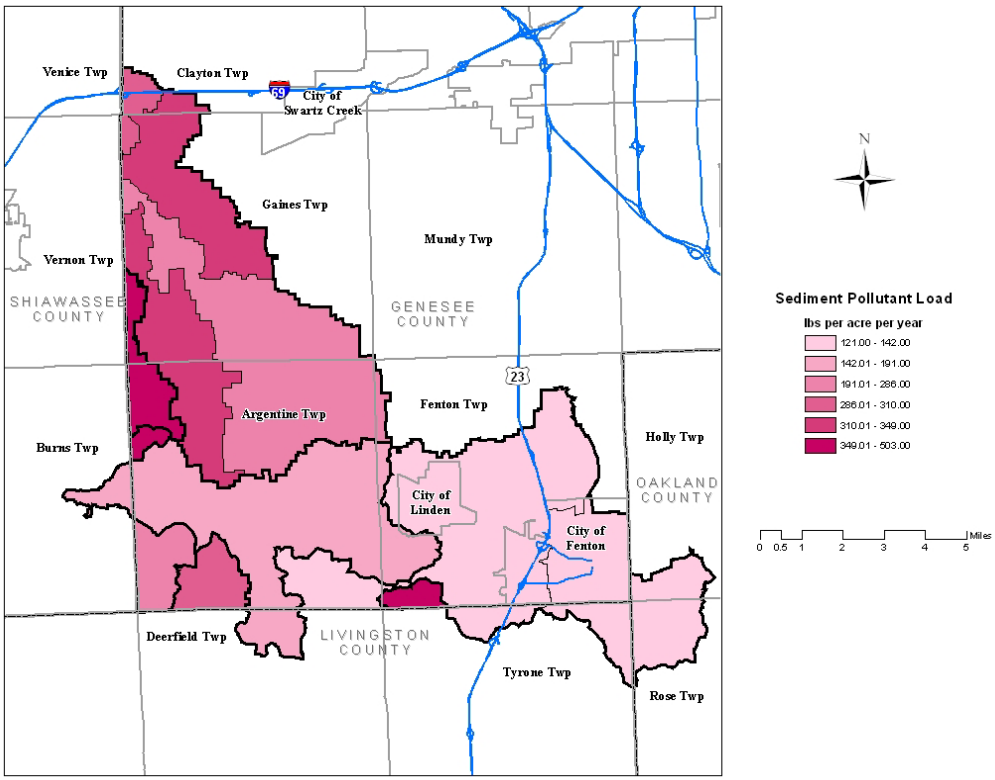


Figure 4-4 Sediment Pollutant Load

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
Corrigal Drain	0077	3.0	0.6	7.0	346
Denton Creek	0546	3.1	0.6	7.4	444
Jones	0984	2.8	0.5	6.4	286
North Ore	8555	1.9	0.3	6.2	121
Shiawassee Outlet 1	0559	3.4	0.6	10.2	303
Shiawassee Outlet 2	8558	3.3	0.7	7.4	495
Shiawassee Outlet 3	8557	2.9	0.6	6.4	503
Shiawassee River 1	8550	2.4	0.4	6.1	191
Shiawassee River 2	8551	2.4	0.4	7.7	142
Shiawassee River 3	8552	2.4	0.4	7.9	132
Shiawassee, S. Branch	8553	2.4	0.4	6.0	275
Webb	0079	3.1	0.6	7.3	349
Yellow River	8554	2.2	0.5	5.4	310

Source: Tetra Tech

SECTION 5 - COMMUNITY OUTREACH

PUBLIC PARTICIPATION PROCESS

The Public Participation Plan (PPP) for the Shiawassee River was submitted as part of the Combined 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 a total of 6 **stakeholder meetings** for the Shiawassee River Watershed. 2 were just for the Shiawassee. Part way through the process it was combined with the Lower Flint and the Upper Flint 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 500 residents, split between 240 riparian landowners, 160 lake property owners, and 100 were random property owners. The survey was limited to residential properties. Sixty-seven 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.

Shiawasse Watershed Survey Results
Jones Creek 10+%

Responses to Survey
10 out of 100 2 returns

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

Rank the following goals with a score of 1 to 5,	**1**	**2**	**3**	**4**	**5**	**Did not rank**
Remove paper/trash/debris in the river and tributaries to improve its appearance	3	1	3		3	
Better control soil erosion and limit sediments entering the water.	4	3	2		1	
Improve habitat conditions for fish and wildlife in the water	5	1	2	2		
Minimize excessive flows that cause flooding, bank erosion and habitat loss	5	2		2	1	
Encourage investments in land along water for recreation/wildlife protection	1	1	5	1	2	
Expand public education about the benefits of protecting the SRW	2	5		1	1	
Better control sources of fertilizer reaching the Watershed & the Great Lakes	4	2	4			
Remove sources of human waste in the Watershed that threaten public health	7	3				
Protect the quality and accessibility of drinking water (wells)	7	2			1	
Increase community planning to address development & protection of water qual	4		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 Shiawassee 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 Shiawassee River Watershed interest you most? (Check as many as apply)

Water quality	9	How I can volunteer to help restore Watershed	3
Bacteria levels	6	How businesses can prevent pollution	4
Fish and wildlife	8	How homeowners can help prevent pollution	5
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 Shiawassee River Watershed?

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

Shiawassee Watershed Survey Results **Responces to Survey**

Lakes **11+%** 18 out of 160 2 returned

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

Rank the following goals with a score of 1 to 5,	**1**	**2**	**3**	**4**	**5**	**Did not rank**
Remove paper/trash/debris in the river and tributaries to improve its appearance	7	2	5	4		
Better control soil erosion and limit sediments entering the water.	8	4	2		2	2
Improve habitat conditions for fish and wildlife in the water	7	1	6	2		2
Minimize excessive flows that cause flooding, bank erosion and habitat loss	4	6	4	1	1	2
Encourage investments in land along water for recreation/wildlife protection	5	5	2	2	3	1
Expand public education about the benefits of protecting the SRW	6	3	2	2	2	3
Better control sources of fertilizer reaching the Watershed & the Great Lakes	10	2	2	1		3
Remove sources of human waste in the Watershed that threaten public health	16	1			1	
Protect the quality and accessibility of drinking water (wells)	13	3			1	1
Increase community planning to address development & protection of water qual	5	3	3	3	3	1

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 Shiawassee 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 Shiawassee River Watershed interest you most? (Check as many as apply)

Water quality	14	How I can volunteer to help restore Watershed	
Bacteria levels	11	How businesses can prevent pollution	5
Fish and wildlife	12	How homeowners can help prevent pollution	5
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 Shiawassee River Watershed?

Public meetings/workshops	2		
Newspaper articles	11	Direct mailings to your home or business	6
Cable TV	4	Community newsletters	4
Web page	4	Other (specify) . Posters in local businesses, Flood Control	2

Shiawassee Watershed Survey Results
Random **9%**

Responces to Survey
9 out of 100 0 returned

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

Rank the following goals with a score of 1 to 5,	**1**	**2**	**3**	**4**	**5**	**Did not rank**
Remove paper/trash/debris in the river and tributaries to improve its appearance	1	3	3			2
Better control soil erosion and limit sediments entering the water.	1	2	3	1		2
Improve habitat conditions for fish and wildlife in the water	1	2	4			2
Minimize excessive flows that cause flooding, bank erosion and habitat loss	1	2	4	1	1	
Encourage investments in land along water for recreation/wildlife protection	2	1	1	1	2	2
Expand public education about the benefits of protecting the SRW	1	2	3		1	2
Better control sources of fertilizer reaching the Watershed & the Great Lakes	3	3	1	1	1	
Remove sources of human waste in the Watershed that threaten public health	5	2	1		1	
Protect the quality and accessibility of drinking water (wells)	7	1			1	
Increase community planning to address development & protection of water qual	2	1	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 Shiawassee 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 Shiawassee Watershed interest you most? (Check as many as apply)

Water quality	7	How I can volunteer to help restore Watershed	1
Bacteria levels	5	How businesses can prevent pollution	3
Fish and wildlife	5	How homeowners can help prevent pollution	3
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 Shiawassee River Watershed?

Public meetings/workshops	1		
Newspaper articles	6	Direct mailings to your home or business	5
Cable TV	1	Community newsletters	2
Web page	1	Other (specify) . local news	

Shiawassee Watershed Survey Results
Shiawassee River 16+%

Responces to Survey
16 out of 100 2 returns

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

Rank the following goals with a score of 1 to 5,	**1**	**2**	**3**	**4**	**5**	**Did not rank**
Remove paper/trash/debris in the river and tributaries to improve its appearance	5	3	2	2	3	1
Better control soil erosion and limit sediments entering the water.	5	6	1	2	1	1
Improve habitat conditions for fish and wildlife in the water	6	4	2	1	3	
Minimize excessive flows that cause flooding, bank erosion and habitat loss	4	7	1	1	2	1
Encourage investments in land along water for recreation/wildlife protection	4	1	1		9	1
Expand public education about the benefits of protecting the SRW	3	2	6	3	2	
Better control sources of fertilizer reaching the Watershed & the Great Lakes	7	4	1	1	2	1
Remove sources of human waste in the Watershed that threaten public health	11	1			4	
Protect the quality and accessibility of drinking water (wells)	8	4		1	3	
Increase community planning to address development & protection of water qual	3	4	4	3	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 Shiawassee 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 Shiawassee Watershed interest you most? (Check as many as apply)

Water quality	14	How I can volunteer to help restore Watershed	6
Bacteria levels	13	How businesses can prevent pollution	4
Fish and wildlife	10	How homeowners can help prevent pollution	7
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 Shiawassee River Watershed?

Public meetings/workshops	1		
Newspaper articles	6	Direct mailings to your home or business	13
Cable TV	4	Community newsletters	4
Web page	2	Other (specify) _____	

Shiawassee Watershed Survey Results
Yellow River **35%**

Responces to Survey
14 out of 40 1 returns

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

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

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 Shiawassee 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 Shiawassee River Watershed interest you most? (Check as many as apply)

Water quality	13	How I can volunteer to help restore Watershed	6
Bacteria levels	13	How businesses can prevent pollution	6
Fish and wildlife	12	How homeowners can help prevent pollution	9
Parks and public recreation areas	4	Other	

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

Public meetings/workshops	2		
Newspaper articles	2	Direct mailings to your home or business	10
Cable TV	1	Community newsletters	5
Web page	3	Other (specify) Local News (2), email (1)	3

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		20th			2nd		
October 2004		5th &13th	25th				
November 2004	17th		29th				
December 2004	15th						
January 2005			3rd & 19th			31st	
February 2005	16th		7th				
March 2005	23rd		2nd & 21st				
April 2005	20th		18th &25th				
May 2005	18th		5th & 17th			23rd	
June 2005					29th (2)		
July 2005					27th (2)		
August 2005	17th				31st (2)		29th (2)
September 2005	21st			10th & 24th	28th (2)		
October 2005	19th				26th (2)		
November 2005	16th						30th (2)
December 2005							
January 2006	18th		23rd		4th (2) & 23rd		
February 2006	15th		27th				1st (2)
March 2006	15th		20th				
April 2006	19th						
May 2006	17th		15th		31st		
June 2006	21st		19th				
July 2006			17th				
August 2006						2nd	
September 2006	20th		18th				
October 2006	18th		16th		25th		
November 2006	22nd						
December 2006	20th		18th				
January 2007	17th		22nd				
February 2007	21st		26th		16th		
March 2007	28th		19th				
April 2007	18th	23rd					
May 2007	16th		21st	15th			
June 2007	20th	5th		19th			
July 2007		24th	16th	17th			
August 2007				21st			
September 2007	19th	25th	17th	18th			
October 2007	17th		15th				

SECTION 6 - CHALLENGES AND GOALS

"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

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.

Photo courtesy of
Michigan State University, 2005.

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 Shiawassee River vary from lake associations to stakeholders that represent the whole County to stakeholders that represent an entire watershed. All efforts were made to make sure the concerns were specifically for the Shiawassee River.

Water Quality Issues

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

- The loss of agricultural land by development to residential and commercial
- The loss 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 use

Water Quality Concerns

Water quality concerns were solicited from the public and stakeholders though 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.

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

DESIGNATED USES

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
- Industrial Water Supply
- Warm water Fishery
- Partial Body Contact
- Coldwater Fisheries (specifically identified waterbodies only)
- Total Body Contact (May 1st – October 31st)
- Navigation

Source: NCSU, 2004.

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.

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.

The coldwater fishery use does not apply to any waters within the watershed as none have been designated as such by the MDEQ.

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 the Shiawassee River, the South Branch of the Shiawassee River, and Lake Ponemah and Lobdell Lake due to exceedances for PCBs.
- **Warm Water Fishery** and **Other Aquatic Life and Wildlife** are impaired in Lake Ponemeh (found in fish tissue) and Fenton Lake due to presents of Mercury.

Threatened Designated Uses

Additionally, the following designated uses are being met but are threatened (meaning they may not be met in the foreseeable future):

- **Agricultural Water Supply** is impaired in the Shiawassee River, the South Branch of the Shiawassee River, Lake Ponemah and Fenton Lake either due to exceedances for PCBs and/or the presents of Mercury (see above).

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. Water bodies 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 6-1 Impaired Waterbodies in the Shiawassee River Watershed

Waterbody ID	Waterbody Name	Waterbody Description	COUNTY	Waterbody Type	Waterbody Size	PROBLEM	TMDLYR
210416X	FENTON LAKE	Vicinity of Fenton.	GENESEE	L	845.0 A	Fish Tissue-Mercury.	2011
210416Y	LOBDELL LAKE	2 miles SW of Linden (Argentine Twp.)	GENESEE	L	545.0 A	FCA-PCBs; Fish Tissue-Mercury.	2010
210416Z	LAKE PONEMAH	NW of Fenton.	GENESEE	L	380.0 A	FCA-PCBs; Fish Tissue-Mercury.	2010
210417A	SHIAWASSEE RIVER & S. BR. SHIAWASSEE RIVER	Saginaw River confluence u/s to Byron Millpond Dam; including the S. Br. Shiawassee River from the Shiawassee River confluence at Byron u/s to M-59 (vicinity of Howell)	SHIAWASSEE	R	107 M	FCA-PCBs	2010
210417F	SHIAWASSEE RIVER WATERSHED	Saginaw River confluence to include all tributaries	SHIAWASSEE	W	847 M	WQS exceedances for PCBs	

Waterbody Type Classification Descriptions: L=Lake, R=River and W=Watershed
Waterbody Unit of Size Classification Descriptions: A=Acres, and M=Miles
Through the revision process, the watershed plan will be updated to address any new TMDL's as they become available

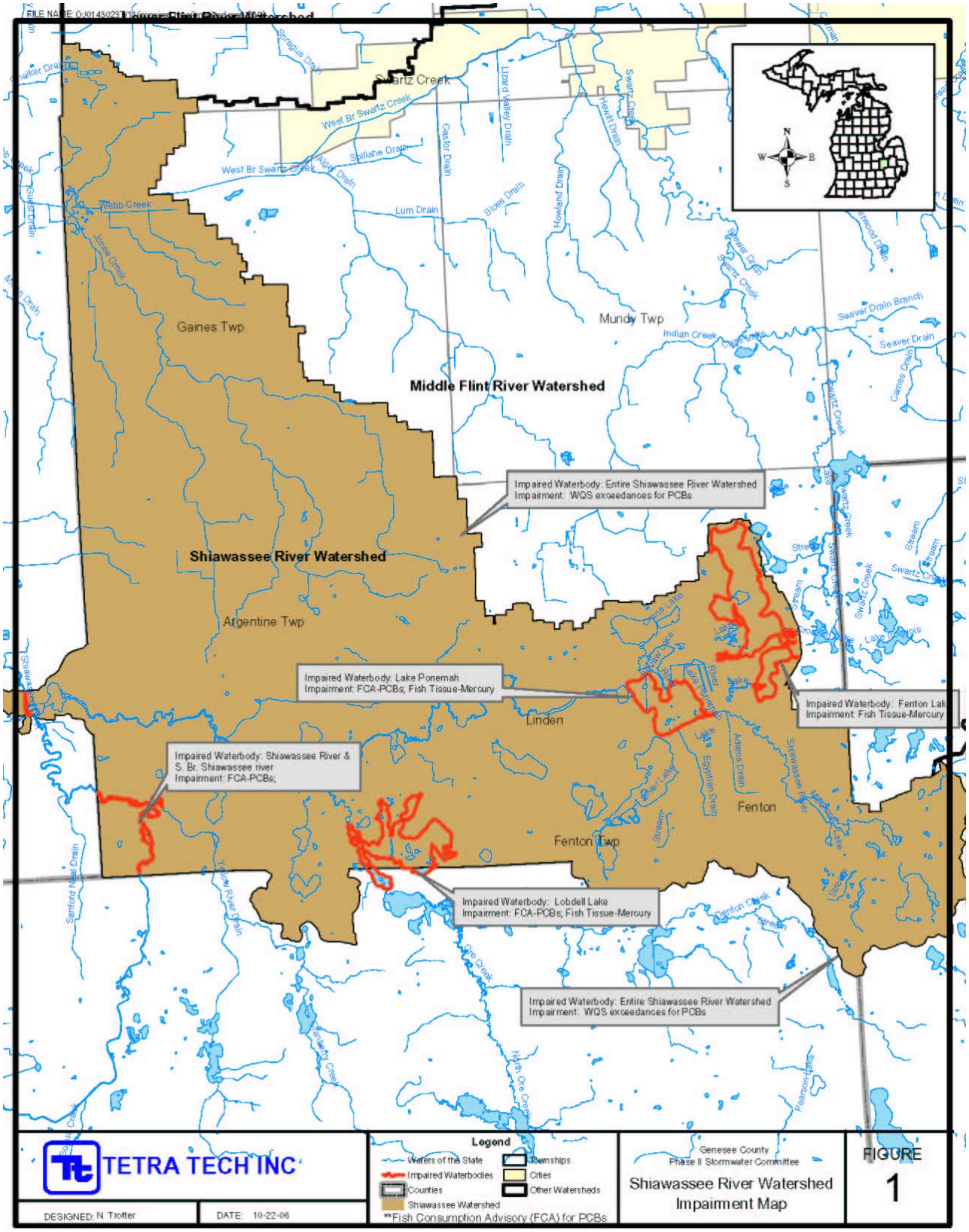


Figure 6-1 Impaired Waterbodies

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:

Kettering Duck Race

- Protect Public Health
- Develop funding mechanism
- Allow “watershed friendly development”
- Assure all development meets minimum standards
- Increase recreational use of river
- Develop innovative projects
- Allow asphalt alternatives-pervious pavement
- Promote protection of Shiawassee Tributaries
- Provide clean water resources for wildlife
- Protect wildlife habitat
- Reduce parking lot allotments for certain business
- Beautification of watershed

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 **P**athogens, **N**utrients, and **S**edimentation that threaten public health and recreation. It also seeks to:
1) Protect **D**rinking 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 ordnance 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 **U**nderstanding of their role in protecting the watershed. It seeks to promote the Flint River as a viable public **R**esource (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 **C**ommunication 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 **F**lows 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 **O**bjectives**.**

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, **W**ildlife and habitat by protecting high quality wetlands and floodplains. Also of interest are areas with **T**hreatened 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 permitees' good housekeeping activities. Goal 6 aims to directs 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 permitees regulated area.

Goal 7: Adopt requirements for Post Construction Controls

This goal is comprised of the permit requirements on how the permitees handle third party or private development within their jurisdiction. It directs permitees 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 Shiawassee 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	
Protect Public Health	1a-1f
Develop funding mechanism	8a
Allow “watershed friendly development	3a, 3e, 7a-b
Assure all development meets minimum standards	3a, 7a-b
Increase recreational use of river	4a-b
Develop innovative projects	3e
Allow asphalt alternatives-pervious pavement	3e
Promote protection of Shiawassee Tributaries	2a-b
Provide clean water resources for wildlife	5a-b
Protect wildlife habitat	5a-b
Reduce parking lot allotments for certain business	3a, 3e
Beautification of watershed	3b, 5b

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 Shiawassee River 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 Shiawassee River Watershed is one of five watersheds within Genesee 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; over three hundred 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 1	2	3	4	Never 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 1	2	3	4	Not likely at all 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 1	2	3	4	NCAA 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%*	*43%*
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 1	2	3	4	NC 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 Heath 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 1	2	3	4	Not likely at all 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 1	2	3	4	NCAA 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 1	2	3	4	None 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 Not Confident at all

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 1	2	3	4	Not at all 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)
32.4% Middle and high school age children (11 to 18)
18.1% Young adults 19 – 25
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)
2.9% Getting much better
22.1% Getting somewhat better
37.3 Staying the same
25.0% Getting somewhat worse
12.7% Getting much worse
0.0% *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?
9.4% Wastewater treatment plant discharges
36.7% Factories / industrial discharges
17.6% Stormwater (rainwater) runoff into storm drains and roadside ditches
30.3% Sewage overflows
6.0% 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 1	2	3	4	Strongly Disagree 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=*17.4%* 2=*31.7%* 3=*20.3%* 4=*14.6%* 5=*8.5%* >5=*7.5%*

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)
2.2% Less than high school
*30.1%*High School
*35.8%*Some college
*21.9%*Undergraduate degree
2.2% Some Graduate courses
7.9% 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 Shiawassee Watershed.

<u>Benthic Macroinvertebrate Monitoring</u>

- 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
- Having the FRWC include at least 2 Shaiwassee River sites for Benthic Monitoring
- 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.

- Set the timeframe of Spring 2009 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

Stream Crossing Watershed Survey with Photographs

- DEQ (Department of Environmental Quality) has procedure that they recommend
- Can be built into already existing municipal efforts
  - GCRC, GCDC, and Consultants
- 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

The Illicit Discharge Elimination Program (IDEP) is part of the Monitoring and mapping program. Every 5-years the natural watercourses must be walked and any connections to the system tested for dry-weather flow. Dry weather flow is water that flows during a period of no rain. The water is then physically and chemically tested to determine if there are any indicator of illicit discharges, such as failed septic or other pollutants. Within the Shiawassee River Watershed, the IDEP program began spring 2006 and is nearly complete. See the Annual report for details concerning the IDEP program.

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 and significant redevelopment. 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 I 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

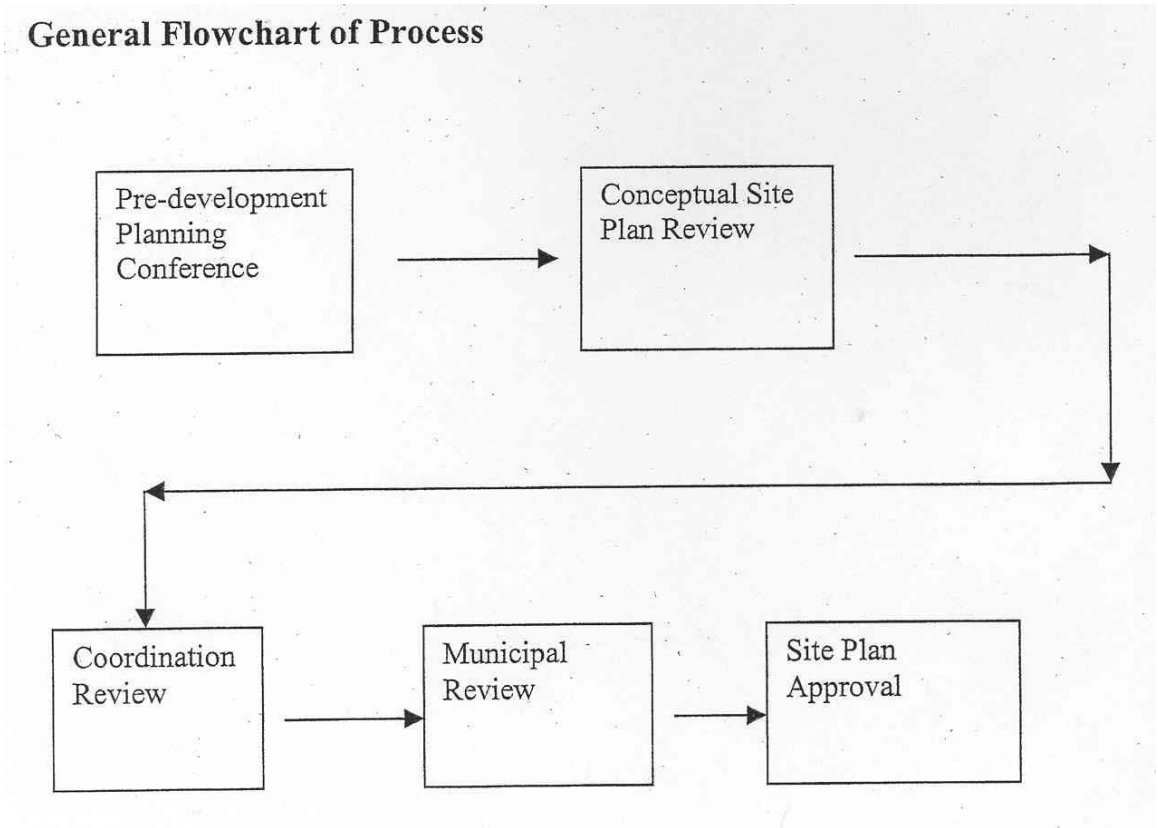


Figure 7-2 Flowchart for new development

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 no 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:
    - Planning considerations: Should serve impervious areas of less than 1 acre or per manufacturers recommendation.
    - 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
    - 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.

- ES31Check 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

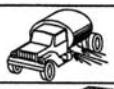
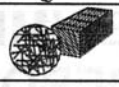
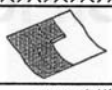
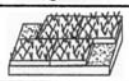
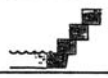
SOIL EROSION AND SEDIMENTATION CONTROL GUIDEBOOK

DETAILS AND SPECIFICATIONS

February 2002

MICHIGAN DEPARTMENT OF MANAGEMENT AND BUDGET

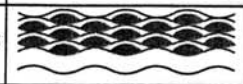
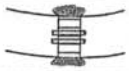
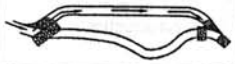
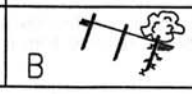
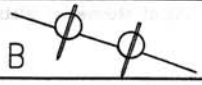
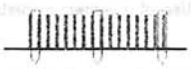
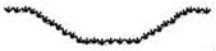
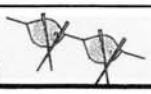
S-E-S-C KEYING SYSTEM

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, gullying, and reduce sheet flow velocity or where clear vision corridors are necessary.
E3	SLOPE ROUGHENING AND SCARIFICATION		Where created grades cause increased erosive velocites. 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

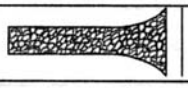
S–E–S–C KEYING SYSTEM

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 PILINGS		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.

B = BIOENGINEERING

SECTION 8 - ACTION PLAN

The Broad Goals were refined by the Shiawassee River Watershed workgroup. They were then ranked reviewed by stakeholders and the public. Throughout the process, specific actions or concerns were proposed by the public or stakeholders and implemented whenever possible to create Goals 1 through 5, their objectives and specific actions. Goal 6 and 7 is taken from the NPDES Ph 2 permit language. Goal 8 was added to address sustainability issues that did not fit under the other goals.

Public Act (PA) 342 of 1939

In 2001, the Board of Commissioners of Genesee County made a resolution to establish the Genesee County Drain Commissioner's Office the agency for the County to provided for the management and operation of a system of storm water management services pursuant to the above act, to enable the County and cities, townships and charter townships located within the County to comply with the requirements of the Phase II regulations and also to engage in other watershed management activities necessary for the public health and welfare of the residents of those cities, townships and charter townships. Because of the PA 342, the Drain office was able to sign a contract with the communities to provide services.
(See Section 7 for details)

Throughout the action plan under the Labor Hours & Material cost estimate section many of the line items indicate E342C. This code indicates that these are services provided or costs included in the contract between the Drain office & the communities.

Although all Genesee County Communities have signed a contract with the Drain office to provide services, only those Phase II communities that have a certificate of coverage (permitees) are shown in the action plan.

Genesee County is the NPDES permit holder. Within the action plan, various County departments are named as the responsible agency for specific actions.

Specific actions within the action table that must be performed or done by each permitee are highlighted in gray. Other actions are done by committee or when necessary, by contract with a third party.

Schedule: Definitions of terms

S	Short term (Before May 1, 2009)
L	Long term (after May 1, 2009)
W	Wish List (no commitment or means)
N/A	Not Applicable
C	Complete (specific action complete)
O	Ongoing (currently being done and will continue being done)

Other Definitions

E342C	Contract for Services between Communities and Drain Office
TBD	To be Determined
BMP	Best Management Practices
MM	Monitoring & Mapping
PE	Public Education
NRCS	Natural Resources Conservation Service
FRWC	Flint River Watershed Coalition
SWM	Genesee County Drain Commissioner's Office- Surface Water Management
WWS	Genesee County Drain Commissioner's Office-Water and Waste Management
Ad hoc	The Ad hoc Committees are formed to work on a specific objective until complete.

*Livingston & Oakland Counties made commitments under different WMP's see page 117 for details

GOAL #1 – PROTECT PUBLIC HEALTH

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Ordinance to have septic systems inspected at "time of sale"'	Draft an ordinance requiring inspection of septic systems at time of property sale. (County Wide)	Health Dept WWS BMP Committee	S	E342C 80-100 hours $5,000 - $10,000
	Develop fee structure options for septic ordinance.	Health Dept WWS BMP Committee	S	E342C 80-200 hours $5,000 - $10,000
	Responsible permitees will adopt new ordinance for septic inspection. Non Responsible Permitees will support the ordinance.	County Phase II Permitees	S	E342C 20-100 hours legal fees per comm.
	Responsible permitees will make appropriate staff available to be trained on enforcement.	Health Dept or responsible permitee	S	E342C $300-$2000 100-400 hours
	Enforcement of the new septic ordinance	Health Dept or responsible permitee	L	Cost and Hours TBD
	Develop & implement septic system tracking program for evaluation purposes.	Health Dept SWM	L	Cost and Hours TBD
Develop Educational Materials For Homeowners With Septic Systems to be Given at "Time of Sale" Main Topic: Septic System Maintenance. Other Topics: Include Lawn Maintenance, Auto Care, Well Water, Household Hazardous Waste Disposal, and well protection	Explore funding options. Potentially use advertising to fund costs.	PE Committee	S	40-200 hours of prioritizing and finding funding
	Develop partnership with local organizations, such as real estate agents. to promote and distribute information on septic systems.	SWM PE Committee	S	$1-$3 ea 500 - 1000 packets $500 - $3000 Total 40-100 hours of development, 20-50 hours of distribution
	Implement distribution of booklet for new homeowners with septic systems.	PE Committee Phase II Permitees	S	Costs TBD, dependent on distribution method
	Develop tracking mechanism for evaluation purposes.	PE Committee	S	Brochures $2000-$10,000; 120 hours of organizing mailing

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
1	a	1	Draft ordinance is produced and adopted by Committee	**Y**	Dec 08'	Dec 08'	Dec 08'	Dec 08'	Dec 08'			Dec 08'
		2	Document that outlines fee options and evaluates the practicality of each of them. Adoption of a funding options)	**Y**	Dec 08'	Dec 08'	Dec 08'	Dec 08'	Dec 08'			Dec 08'
		3	No. of communities supporting ordinance.	**Y**	May 09'	May 09'	May 09'	May 09'	W			May 09'
		4	Attendance to Training	**Y**	N/A	N/A	N/A	N/A	N/A			May 09'
		5	No. of Inspections Long Term Failure Rate Trend. Improvement in water quality, especially in rural areas.	**Y**	N/A	N/A	N/A	N/A	N/A			2011
		6	No. of Inspections Long Term Failure Rate Trend	**Y**	N/A	N/A	N/A	N/A	N/A			2011
1	b	1	Memo on options Presentations to appropriate authorities Adoption of a funding option	**Y**	Dec 08'	Dec 08'	Dec 08'	Dec 08'	Dec 08'			Dec 08'
		2	Distribution channels are established and maintained. No. of packets distributed by partners.	**Y**	Dec 08'	Dec 08'	Dec 08'	Dec 08'	Dec 08'			Dec 08'
		3	Count # packets distributed Targeted Public Survey by PEP No. of Volunteers	**Y**	May 09'	May 09'	May 09'	May 09'	May 09'			May 09'
		4	No. of packets printed and distributed by Permitees and organization. Social Survey	**Y**	May 09'	May 09'	May 09'	May 09'	May 09'			May 09'

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Ordinance for Disconnecting of Footing Drains From Sanitary to Reduce Sanitary Sewer Overflows	Draft ordinance to disconnect footing drains.	WWS BMP Committee	W	E342C 100-200 hours $5,000 - $10,000
	Develop fee structure options to fund ordinance.	WWS BMP Committee	W	E342C 80-200 hours $5,000 - $10,000
	Responsible Permitees will Adopt new footing drain ordinance. Non- responsible Permitees will support ordinance.	Phase II Permitees	W	E342C 20-100 hours legal fees per comm.
	Responsible permitees will make appropriate staff available to be trained on enforcement.	WWS Phase II Permitees	W	E342C Advertising: $300-$2000 100-400 hours
	Provide Permitees with education material for homeowners outlining disconnection options that promote storm water infiltration.	PE Committee	W	E342C
	Distribute education material through municipalities	PE Committee Phase II Permitees	W	Cost and Hours TBD
	Enforce new footing drains ordinance.	WWS Phase II Permitees	W	Cost and Hours TBD
	Develop database and track disconnecting footing drains throughout the community.	WWS Phase II Permitees	W	Cost and Hours TBD
Identify Existing Wellhead Protection Programs	Work with MDEQ to identify existing wellhead protection programs within watershed	MM Committee Ad hoc Committee	W	Cost and Hours TBD
	Identify responsible parties that would benefit from a Wellhead protection program	MM Committee Ad hoc Committee	W	Cost and Hours TBD
	Communities will examine potential to participate in the development of new wellhead protection program	MM Committee Ad hoc Committee	W	Cost and Hours TBD

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
1	c	1	Draft ordinance is produced and adopted by Committee		W	W	W	W	W			W
		2	Document that outlines fee options and evaluates the practicality of each of them. Adoption of a funding options)		W	W	W	W	W			W
		3	No. of ordinances supported locally		W	W	W	W	W			W
		4	Attendance to Training		W	W	W	W	W			W
		5	Number of disconnections. Percent of those that encourage storm water infiltration.		W	W	W	W	W			W
		6	Number of education material distributed by each permitee		W	W	W	W	W			W
		7	No. of footing drains removed. Long Term SSO Trend		W	E	E	E	W			W
		8	Creation of tracking system. Statistics on "disconnections" No. of Disconnections		W	W	E	E	W			W
1	d	1	Done		W	W	E	W	W			W
		2	List of potential Wellhead protection programs		W	W	E	W	W			W
		3	New wellhead protection program adoption. Future recognition of WHP in WMP		W	W	E	W	W			W

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Ordinance for testing drinking water wells at time of sale	Draft ordinance requiring testing of drinking water wells at time of sale.	Health Dept BMP Committee	W	E342C 100-500 hours $5,000 - $15,000
	Develop fee structure options for ordinance.	Health Dept WWS BMP Committee	W	E342C 80-200 hours $5,000 - $10,000
	Permitees to adopt new drinking water well ordinance.	Phase II Permitees	W	E342C 20-100 hours legal fees per community
	Responsible permitees will make appropriate staff available to be trained on new ordinance.	Health Dept or Phase II Permitees	W	E342C Advertising: $300-$2000 100-400 hours
	Permitees to enforce new ordinance.	Health Dept or designated permitee	W	TBD as part of ordinance
	Develop and implement tracking system	Phase II Permitees	W	Cost and hours TBD
Map arsenic levels for drinking wells	Identify existing arsenic levels that have been tested in the watershed	Health Dept M&M Committee	W	Cost and Hours TBD
	Make information available to decision makers and general public	To be Determined	W	Cost and Hours TBD

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
1	e	1	Draft ordinance is produced and adopted by Committee		W	W	W	W	W			W
		2	Document that outlines fee options and evaluates the practicality of each of them. Adoption of a funding options)		W	W	W	W	W			W
		3	No. of ordinances supported locally		W	W	W	W	W			W
		4	Attendance to Training No. of advertisements.		W	W	W	W	W			W
		5	# of Inspections Long Term Trend. Improvement in water quality, especially in rural areas.		W	W	W	W	W			W
		6	Number of tests performed Test results		W	W	W	W	W			W
1	f	1	Production of a County map indicating arsenic levels		W	W	W	W	W			W
		2	# of hits on website No. of maps distributed. No. of drinking water tests requested.		W	W	W	W	W			W

GOAL #2 – ESTABLISH A WATERSHED STEWARDSHIP ETHIC AMONG THE PUBLIC

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Educate the public about the 7 required education elements (As outlined on page 54)	Update www.ClearGeneseeWater.org with watershed wide educational material, monitoring results, permit information, meeting information and committees as needed.	PE Committee	O	E342C Part of Education Media Campaign Budget 80-200 hours/ year
	Place link on website connecting to above website if available.	Phase II Permitees	S	Cost Varies Time Varies
	Develop print media to educate public.	PE Committee	C	E342C $2000-$5000 60 hours
	Distribute media through municipalities.	SWM Phase II Permitees	O	E342C Part of Public Ed Budget 20 hours/ year
	Develop evaluation method to track effectiveness of media	PE Committee	S	Cost and Hours TBD
Direct Mailing to Riparian Land owners (Rivers/Lakes)	Design riparian landowner educational materials emphasizing protecting and managing the riparian corridor.	PE Committee	S	Brochures Part of Education Media Campaign Budget $2,000-$10,000
	Develop & maintain a list of riparian landowners.	PE Committee	S	Develop Cost Analysis 20 hours per community
	Implement direct mailings to land owners and updating public education materials.	PE Committee	S	$4,000 - $8000 30+ hours
	Develop evaluation method to track effectiveness of program	PE Committee	S	Cost and Hours TBD

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
2	a	1	No. of hits on website and downloads. List of information kept on website.	**Y**	E	E	E	E	E			E
		2	Counters recording number of hits on permitees websites	**Y**	Jun 08'	Jun 08'	Jun 08'	Jun 08'	Jun 08'			E
		3	Print material developed	**Y**	E	E	E	E	E			E
		4	No. of ad's, print material and units distributed (etc.) by each permitee Social survey	**Y**	E	E	E	E	E			E
		5	No. of ad's, print material and units distributed (etc.) by each permitee Social survey	**Y**	Jun 08'	Jun 08'	Jun 08'	Jun 08'	Jun 08'			Jun 08'
2	b	1	Creation of riparian landowner brochure.	**Y**	Jun 08'	Jun 08'	Jun 08'	Jun 08'	Jun 08'			Jun 08'
		2	List developed with regularly scheduled updates (5 yrs)	**Y**	Jun 08'	Jun 08'	Jun 08'	Jun 08'	Jun 08'			Jun 08'
		3	No. of information packets distributed No. of hits on web site. Returned postcard from newsletter	**Y**	Jun 08'	Jun 08'	Jun 08'	Jun 08'	Jun 08'			Jun 08'
		4	No. of information packets distributed No. of hits on web site. Specific Survey	**Y**	Jun 08'	Jun 08'	Jun 08'	Jun 08'	Jun 08'			Jun 08'

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Partner with existing household hazardous waste (HHW) program committee to increase awareness and use	Meet with existing household hazardous waste program committee. Investigate options to assist program.	PE Committee HHW committee	W	10- 20 hours
	Conduct needs assessment that includes determining collection dates (annually, monthly or weekly) and locations.	Program Organizers PE Committee	W	Cost TBD 40-80 hours
	Determine feasibility of implementing recommendations from needs assessment.	Program Organizers PE Committee	W	$1000 - $5000
	Implement recommendations from needs study as completely as is feasible and identify future opportunities and actions.	SWM HHW Organizer	W	Cost and time TBD
Enhance Existing Benthic Monitoring Program (Description and results on pg 33-35)	Meet with Flint River Watershed Coalition (FRWC) to identified opportunities to develop partnership(s).	MM Committee	C	Cost negligible 5 hours
	Identify additional stream segments that would be desirable to gather macroinvertebrate sampling data on.	FRWC	C	Costs Negligible 10-20 hours
	Determine what additional resources are needed to expand the monitoring program.	MM Committee FRWC	O	20 hours to meet to negotiate contract with FRWC
	Implement a yearly schedule and set up dead lines displaying when stream sections will be inventory yearly.	FRWC SWM MM Committee	O	E342C contract done by FRWC
	Sign contract with FRWC to provide Benthic Monitoring	FRWC SWM MM Committee	C	$5150.00 / yr
	Review Results from past seasons. Current results will be reviewed each year after monitoring.	MM Committee SWM	S	E342C Costs and hours TBD
	Conduct monitoring	FRWC	O	Done by FRWC

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
2	c	1	Increased demand/use of HHW program		W	W	W	W	W			W
		2	List of potential improvements		W	W	W	W	W			W
		3	Document that outlines fee options and evaluates the practicality of each of them. Adoption of a funding options)		W	W	W	W	W			W
		4	Long-term: reduction of the presence of HH chemical in water quality monitoring samples.		W	W	W	W	W			W
2	d	1	The 16 sites in Genesee county are tested consistently twice a year	**Y**	E	E	E	E	E			E
		2	Additional sites are identified.	**Y**	E	E	E	E	E			E
		3	Report of estimated additional resources needed.	**Y**	E	E	E	E	E			E
		4	Schedule set	**Y**	E	E	E	E	E			E
		5	Sign Contract	**Y**	E	E	E	E	E			E
		6	Trend data is entered and analyzed All monitoring activities should be related together (e.g. road/stream, WQ)	**Y**	E	E	E	E	E			E
		7	Track WQ improvements over the permit cycle	**Y**	E	E	E	E	E			E

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Enhance Existing Project GREEN Program (for further information see page 36).	Sign Contract with FRWC to administer program	SWM FRWC	C	$7500 / yr
	Identify local schools to participate. Meet with school district representatives	FRWC	O	E342C Done by contract with FRWC
	Increase number of classes involved with program	FRWC	O	
	Conduct monitoring	FRWC Participating Schools	O	120+ hours/year
	Review Results	FRWC MM Committee	S	E342C Up to $5000 20 hours/mo
Stream Crossing Watershed Survey with Photography.	Develop road stream inspection program. (Identify road/stream crossings, information collected)	MM Committee GCRC	C	Partner w/ existing GCRC bridge program. Total Additional Cost $500-$2000
	Determine implementation options and responsibilities.	MM Committee GCRC	C	E342C 20 hours
	Provide training to personnel responsible for completing survey	MM Committee Consultant	O	E342C 20 hours
	Conduct survey based on a schedule developed	MM Committee GCRC Consultant	S	E342C 80 hours
	Review results	MM Committee SWM	S	E342C Costs and hours TBD

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
2 e		1	Contract Signed	**Y**	E	E	E	E	E			E
		2	Organizations that participate are identified No. of classes participating in project Green.	**Y**	E	E	E	E	E			E
		3	Number of classes participating increase	**Y**	E	E	E	E	E			E
		4	Samples of DO, Ammonia, Nitrate, PH, Phosphate, and temperature are collected regularly. Monitoring is completed and results are compiled	**Y**	E	E	E	E	E			E
		5	Results provided for all sites. Trend data is entered and analyzed	**Y**	E	E	E	E	E			E
2 f		1	Documentation of water and stream characteristics, plant life, foam, trash, etc.	**Y**	E	E	E	E	E			E
		2	Memo on options Presentations to appropriate authorities	**Y**	E	E	E	E	E			E
		3	No. of people trained. Program sustained over time.	**Y**	E	E	E	E	E			E
		4	Schedule is created and implemented. Photos are taken, reports are written	**Y**	Dec 08’	Dec 08’	Dec 08’	Dec 08’	Dec 08’			Dec 08’
		5	Data entered and analysis performed.	**Y**	Dec 08’	Dec 08’	Dec 08’	Dec 08’	Dec 08’			Dec 08’

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Hot Spot Water Quality Monitoring for MS4's as needed	Identify initial list of target sites, chemical tests, parameters and collection method.	MM Committee	O	Cost are as needed, comes out of E342C
	Determine testing needed for each site.	MM Committee	C	Costs and time will vary
	Create a protocol manual for fieldwork crews (lab results parameters and collection methods).	Consultant	C	E342C 10 hours
	Schedule and conduct field work done by professionals (Consultants)	Consultant	O	$1000-$1500 per site.
	Review Results	MM Committee Consultant	O	Database costs are part of contract with Tetra Tech

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
2	g	1	Documentation of water quality associated with hot spots.	**Y**	E	E	E	E	E			E
		2	Plan and needs assessment created Advanced sample collection needs to be done by professionals	**Y**	E	E	E	E	E			E
		3	Sites and protocols established	**Y**	E	E	E	E	E			E
		4	Schedule established, WQ samples collected	**Y**	E	E	E	E	E			E
		5	Trend data is entered and analyzed All monitoring activities should be related together (e.g. road/stream, WQ)	**Y**	E	E	E	E	E			E

GOAL #3 – REDUCE IMPACT FROM PEAK FLOWS

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Storm Water Ordinance	Create a storm water design standards/site plan manual.	SWM	S	E342C 200 - 2000 hrs
	Develop table that will show how much the installed BMP's will reduce or prevent post-construction impacts on water quality	BMP Committee	L	Budget and time will vary for each permitee
	Draft a stormwater ordinance that refers to the design/site plan manual that considers quantity and quality BMP's.	BMP Committee	S	E342C Costs TBD 40 -200 hrs per committee members
	Develop new County site plan review process with the following steps: Step 1: Pre-Development Step 2: Prepare site plan Step 3: Coordinated County Review Step 4: Municipal Review Step 5: Site Plan Step 6: Approval	BMP Committee	L	E342C Costs- $5000 Hours 200+
	Develop permit fee structure to cover the cost of processing and enforcement with provision for future adjustments.	BMP Committee	L	E342C 20-100 hours $2.500 - $3,000
	Facilitate community acceptance through public forms and information packets.	Phase II Permitees	L	40 -200 hrs per community
	Permitees to approve/adopt ordinance.	Phase II Permitees	L	Budget and time will vary
	Responsible permitees will make appropriate staff available to be trained on the storm water ordinance, process and design manual.	BMP Committee	L	$500 10 hours
	SWM Permitees to enforce new storm water ordinance.	Phase II Permitees	L	3 - 4 staff $120-160 K/yr

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
3	a	1	Creation of a design manual	**Y**	Aug 08'	Aug 08'	Aug 08'	Aug 08'	Aug 08'			Aug 08'
		2	Mechanism developed to track quantity and types of pollutants removed by various BMP's	**Y**	2009	2009	2009	2009	2009			2009
		3	Draft ordinance is produced	**Y**	May 08'	May 08'	May 08'	May 08'	May 08'			May 08'
		4	Process is adopted and followed by county and communities. New development begins to take different form.	**Y**	2009	2009	2009	2009	2009			2009
		5	Document that outlines fee options and evaluates the practicality of each of them. Adoption of a funding option(s)	**Y**	2009	2009	2009	2009	2009			2009
		6	Information sessions. No. of information packets distributed by Permitees	**Y**	2009	2009	2009	2009	2009			2009
		7	No. of Communities that adopt ordinance,	**Y**	2009	2009	2009	2009	2009			2009
		8	No. of participants in training Advertising of training	**Y**	2010	2010	2010	2010	2010			2010
		9	No. of citations No. of developments going thru the process.	**Y**	2010	2010	2010	2010	2010			2010

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Pursue restoration projects on natural watercourses	Develop list of pollution problems along Natural Watercourses not covered by IDEP. (I.E.Bank erosion…)	MM Committee	W	Negligible
	Identify problem areas and prioritize.	MM Committee	W	Negligible
	Determine mechanism under which maintenance/repair can be done to Natural Watercourses	MM Committee	W	Will have to be funded outside of E342C. Grants are most likely
	Provide maintenance or repair to natural watercourse	MM Committee Phase II Permittees	W	E342C 200+ hours Costs TBD
Preserve existing floodplains and wetlands from being filled or developed	Establish criteria that will be used to Identify and prioritize existing wetlands and floodplains	SWM	W	100 + hours Cost nominal
	Identify existing floodplains and wetlands	SWM	W	E342C 120 hrs @ $50 hr =$6000 FEMA floodplain is start
	Prioritize existing floodplains and wetlands based on amenity and ability to protect	SWM	W	E342C 40 hrs @ $50 hr=$2000
	Determine mechanism under which floodplains & wetlands can be preserve (May include ordinances)	Ad hoc Committee Phase II Permitees	W	Cost shared, TBD
	County and communities implement recommended mechanism's).	County Phase II Permitees	W	Cost shared, TBD
Monitor water quantity to measure hydraulic change within watercourses	Gather data from existing stream gauges and corresponding rain gauges.	MM Committee	W	E342C Costs and hours TBD
	Track water flows as they relate to rain events	SWM	W	E342C Costs and hours TBD
	Review Results	SWM	W	E342C Costs and hours TBD
	Add stream/ precipitation gages as needed in key locations.	MM Committee WWS	W	E342C Costs and hours TBD

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
3	b	1	Work list is developed. Regular updating of inventory		W	W	W	W	W			W
		2	List problem areas as committee becomes aware of them. Problems ranked.		W	W	W	W	W			W
		3	List of options is created		W	W	W	W	W			W
		4	Corrective measures proposed and implemented		W	W	W	W	W			W
3	c	1	Criteria created		W	W	W	W	W			W
		2	List created		W	W	W	W	W			W
		3	Prioritization list is developed.		W	W	W	W	W			W
		4	List of options is created.		W	W	W	W	W			W
		5	Plan for protection is devised. Permitees follow plan. Reduction in the rate of loss of wetlands / floodplain dev.		W	W	W	W	W			W
3	d	1	Establish baseline measure		W	W	W	W	W			W
		2	Use baseline measure to gage future flows vs. current flows		W	W	W	W	W			W
		3	Trend data is entered & analyzed All monitoring activities should be related together (e.g. road/stream, WQ)		W	W	W	W	W			W
		4	Gauges added.		W	W	W	W	W			W

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Produce demonstration projects for (Low Impact Development) for new and retrofit sites	Identify potential existing sites for retrofit with bio-retention. Either on permittee property or by education of private development.	BMP Committee	W	Costs and hours TBD
	Create education materials for permitees and developers	BMP Committee	W	
	Educate developers on the benefits of incorporating low impact development into their site design.	BMP Committee	W	Costs and hours TBD
	Develop mechanism for providing funding or incentives to implement low impact development.	BMP Committee	W	Not part of the E342C Budget
	Have demonstration sites built.	Developer or Permittee	W	Costs and hours TBD
	Track reduction of flow/pollutants	SWM	W	Costs and hours TBD

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
3	e	1	Sites identified and opportunities for redevelopment evaluated.		W	W	W	W	W			W
		2	Relationships have been developed and an indication of their willingness to partner on a project.		W	W	W	W	W			W
		3	Documentation of potential funding schemes and sources.		W	W	W	W	W			W
		4	# of sites built		W	W	W	W	W			W
		5	Flow meters or other measurement devices.		W	W	W	W	W			W
		6	# of Field trips, Presentations, signage, etc.		W	W	W	W	W			W

GOAL #4 - CREATE, RESTORE & ENHANCE RECREATIONAL USE

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Educate Public about recreational opportunities near/ on the water	Promote recreational programs (website, brochures, and community news.)	PE Committee Phase II Permitees	S	E342C – Costs and hours TBD
	Distribute materials on recreational programs through municipalities	PE Committee Phase II Permitees	S	E342C- Costs and hours TBD
Protect /Expand Parks Trails and River Walk System	Coordinate with existing Greenways Initiative to compile a list of existing and proposed greenways	PE Committee	W	E342C Costs and hours TBD
	Prioritize list for protection and for future enhancements (e.g. increased accesses)/ acquisition of property- if necessary	PE Committee	W	- Costs TBD 80 200 hours for committee & contractor
	Develop plan for acquiring land (along water) for recreation/ Wildlife protection	PE Committee	W	E342C - Costs TBD 80 200 hours for committee & contractor
	Implement plan based on list of priorities and sign contracts if necessary	PE Committee SWM Phase II Permitees	W	E342C - Costs TBD 80 200 hours for committee & contractor

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
4	a	1	# of hits on recreation page of website # of flyers distributed	**Y**	Jan 09'	Jan 09'	Jan 09'	Jan 09'	Jan 09'			E
		2	No. of brochures, web hits, etc. Social survey.	**Y**	Jan 09'	Jan 09'	Jan 09'	Jan 09'	Jan 09'			E
4	b	1	Meeting with Greenways List of proposed areas compiled.		W	W	W	W	W			W
		2	List of prioritized areas is created.		W	W	W	W	W			W
		3	Acres of Land Acquired. List of methods developed		W	W	W	W	W			W
		4	Acres of Land Acquired. Natural land vs. developed land calculations		W	W	W	W	W			W

GOAL #5 - RESTORE & PROTECT AQUATIC LIFE, WILDLIFE & HABITAT

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Establish vegetative buffer areas adjacent to sensitive areas	Draft Buffer Strip Ordinance	BMP Committee	L	E342C 100-500 hours $5,000 - $15,000
	Develop fee structure options for buffer strip ordinance.	BMP Committee	L	E342C $5000
	Permitees adopt new ordinance.	County Phase II Permitees	L	20- 100 hours legal fees vary by community
	Responsible permitees will make appropriate staff available to be trained about the new buffer ordinance.	To be determined	L	10 hours per community staff costs vary by community
	Permitees to enforce new stream buffer strip ordinance.	Phase II Permitees	L	Enforcement costs will vary by community
	Develop tracking method for enforcement	Phase II Permitees	L	Costs and hours TBD
Protect key locations of threatened and endangered species and habitat	Identify key locations of threatened and endangered species and habitat. using Natural Features Inventory	MM Committee	W	Ongoing Program with MSUE 60 hours for committee, 100 hours for contractors
	Develop plan to protect areas, or stabilize and enhance habitat	MM Committee	W	E342C 200 = hours Costs TBD
	Adopt plan	Phase II Permitees	W	Costs and hours TBD
	Permitees to implement protection plan for threatened/endangered species.	Phase II Permitees	W	Costs and hours TBD

Goal	Objective	Action	Evaluation Mechanism(	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
5	a	1	Draft ordinance is produced	**Y**	2010	2010	2010	2010	2010			2010
		2	Document that outlines fee options and evaluates the practicality of each of them. Adoption of a funding option(s)	**Y**	2010	2010	2010	2010	2010			2010
		3	No. of ordinances supported locally	**Y**	2011	2011	E	2011	2011			2011
		4	Attendance to Training	**Y**	2011	2011	2011	2011	2011			2011
		5	Citations issued. No. of miles of buffer strips implemented.	**Y**	2012	2012	E	2012	2012			2012
		6	Citations issued. No. of miles of buffer strips implemented	**Y**	2012	2012	E	2012	2012			2012
5	b	1	List created		W	W	W	W	W			W
		2	Develop Plan and Options for implementation		W	W	W	W	W			W
		3	Plan is adopted		W	W	W	W	W			W
		4	Plan is implemented locally. No. of Acres of habitat areas are preserved.		W	W	W	W	W			W

GOAL #6 – MDEQ REQUIREMENT – GOOD HOUSEKEEPING ACTIVITIES

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Ensure Maintenance activities, schedules, and inspection procedures for storm water structural controls (SWSC) as appropriate.	Develop or adopt a BMP manual to provide Permitees with maintenance procedures to be implemented for Good Housekeeping Activities	Phase II Permitees	S	Budget and time will vary for each permitee
	Develop schedule for inspection & maintenance procedures of SWSC owned by permitee	Phase II Permitees	S	Budget and time will vary for each permitee
	Permitees will make appropriate staff available to be trained	BMP Committee Phase II Permitees	S	TBD
	Inspect all SWSC owned by permitee according to schedule	Phase II Permitees	S	Budget and time will vary for each permitee
	Perform maintenance / repair to SWSC owned by permitee (including but not limited to)	Phase II Permitees	S	Budget and time will vary for each permitee
	• Pipes / culverts			Per procedure
	• Ditches			Per procedure
	• Catch Basins			Per procedure
	• Oil-Grit Separators			Per procedure
	• Detention (wet/dry)			Per procedure
	• Vaults or tanks			Per procedure
	• Infiltration Basin			Per procedure
	• Rain Gardens			Per procedure
	• Porous Pavement			Per procedure
	• Vegetated Swales			Per procedure
	• Constructed wetlands			Per procedure
	• Filter Strips			Per procedure
	Track inspection and maintenance	Phase II Permitees	S	Budget and time will vary for each permitee

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
6	a	1	BMP manual developed or adopted	**Y**	Aug 08'	Aug 08'	Aug 08'	Aug 08'	Aug 08'			Aug 08'
		2	Structural controls Identified. Maintenance and inspection schedule developed	**Y**	Jan 09'	Jan 09'	E	Jan 09'	Jan 09'			Jan 09'
		3	appropriate staff trained	**Y**	Mar 09'	Mar 09'	Mar 09'	Mar 09'	Mar 09'			Mar 09'
		4	Inspections done according to schedule	**Y**	Mar 09'	Mar 09'	Mar 09'	Mar 09'	Mar 09'			Mar 09'
		5	Maintenance of structural controls owned or operated by permitee as needed according to inspection	**Y**	May 09'	May 09'	May 09'	May 09'	May 09'			May 09'
			Pipes / culverts	**Y**	N/A	5/09	5/09	5/09	5/09			5/09
			Ditches	**Y**	N/A	N/A	5/09	N/A	5/09			5/09
			Catch Basins	**Y**	N/A	5/09	5/09	5/09	5/09			5/09
			Oil-Grit Separators	**Y**	N/A	N/A	5/09	N/A	N/A			5/09
			Detention (wet/dry)	**Y**	N/A	N/A	N/A	5/09	N/A			5/09
			Vaults or tanks	**Y**	N/A	N/A	N/A	N/A	N/A			5/09
			Infiltration Basin	**Y**	N/A	N/A	N/A	N/A	N/A			N/A
			Rain Gardens	**Y**	N/A	N/A	N/A	N/A	N/A			N/A
			Porous Pavement	**Y**	N/A	N/A	N/A	N/A	N/A			N/A
			Vegetated Swales	**Y**	N/A	N/A	N/A	N/A	N/A			N/A
			Constructed wetlands	**Y**	N/A	N/A	N/A	N/A	N/A			N/A
			Filter Strips	**Y**	N/A	N/A	N/A	N/A	N/A			N/A
		6	Inspection findings recorded, maintenance performed Track quantity of pollutants removed or reduced.	**Y**	May 09'	May 09'	E	May 09'	May 09'			May 09'

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Implement Controls for reducing or eliminating the discharges of pollutants from streets, roads, highways, parking lots, and storage yards	Develop schedule & procedures for the following controls on pavement that is owned or operated by permitee	Phase II Permitees	S	Budget and time will vary for each permitee
	• Street Sweeping			Per schedule
	• Road Salt Application & Storage			Per Procedure
	• Dust Control			Per Procedure
	• Snow Removal			Per Procedure
	• Maintenance Garage / Storage Yards			Per Procedure
	• Road & Bridge Maintenance			Per schedule
	• Gravel Road Maintenance			Per schedule
	• Roadside Vegetation			Per Procedure
	Track inspection and maintenance of Controls	Phase II Permitees	S	Budget and time will vary for each permitee
Institute Procedures for the proper disposal of operation and maintenance waste from the separate storm water drainage system (from street sweeping, catch basin clean out, etc)	Develop procedure for proper disposal of the following waste collected from maintenance of the storm system owned or operated by permitees	Phase II Permitees	S	Budget and time will vary for each permitee
	• Spoils / sediments			
	• Floatables / oil			
	• Other Debris / Pollutants			
	Document disposal method for operation and maintenance waste	Phase II Permitees	S	

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
6 b		1	Schedule and O & M procedures developed	**Y**	Jan 09'	Jan 09'	Jan 09'	Jan 09'	Jan 09'			Jan 09'
		•	Street Sweeping	**Y**	N/A	Mar 09'	Mar 09'	N/A	Mar 09'			Mar 09'
		•	Road Salt Application & Storage	**Y**	Mar 09'	Mar 09'	Mar 09'	Mar 09'	Mar 09'			Mar 09'
		•	Dust Control	**Y**	N/A	N/A	Mar 09'	N/A	Mar 09'			Mar 09'
		•	Snow Removal	**Y**	Mar 09'	Mar 09'	Mar 09'	N/A	Mar 09'			Mar 09'
		•	Maintenance Garage / Storage Yards	**Y**	N/A	N/A	Mar 09'	Mar 09'	Mar 09'			Mar 09'
		•	Road & Bridge Maintenance	**Y**	Mar 09'	N/A	Mar 09'	N/A	Mar 09'			Mar 09'
		•	Gravel Road Maintenance	**Y**	N/A	N/A	Mar 09'	Mar 09'	Mar 09'			Mar 09'
		•	Roadside Vegetation	**Y**	N/A	N/A	Mar 09'	N/A	Mar 09'			Mar 09'
		2	Inspection findings recorded, maintenance performed Track quantity of pollutants removed or reduced.	**Y**	Mar 09'	Mar 09'	Mar 09'	Mar 09'	Mar 09'			Mar 09'
6 c		1	Procedure developed and implemented	**Y**	Jan 09'	Jan 09'	E	Jan 09'	Jan 09'			Jan 09'
		•	Spoils / sediments	**Y**	May 09'	May 09'	E	Jan 09'	Jan 09'			May 09'
		•	Floatables / oil	**Y**	May 09'	May 09'	E	Jan 09'	Jan 09'			May 09'
		•	Other Debris / Pollutants	**Y**	May 09'	May 09'	E	Jan 09'	Jan 09'			May 09'
		2	Track quantity of pollutants removed or reduced	**Y**	Mar 09'	Mar 09'	E	Mar 09'	Mar 09'			May 09'

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Ensure that flood management projects assess the impacts on the water quality of the receiving waters.	Evaluate current or create new procedures to place water quality measures on storm water facilities owned by permitee.	Phase II Permitees	L	Budget and time will vary for each permitee
	Implement procedures on permitee owned facilities	Phase II Permitees	L	Budget and time will vary for each permitee
	Install BMP's were appropriate on permitee owned facilities pursuant BMP manual	Phase II Permitees	L	Budget and time will vary for each permitee
	Assess new projects owned by permitee for water quality impact.	Phase II Permitees	L	Negligible
Reduce the discharge of pollutants related to application of pesticides, herbicides, and fertilizers applied in the permitees regulated area.	If fertilizers are used, permitee will have soil testing performed, prior to application, and fertilizer application will be based on soil testing results.	Phase II Permitees	S	Budget and time will vary for each permitee
	If fertilizers are used, permitee will have fertilizer applied by a licensed individual	Phase II Permitees	S	Budget and time will vary for each permitee
	If herbicides are used, permitee will have herbicides applied by a licensed individual and the herbicides applied should be appropriate for use.	Phase II Permitees	S	Budget and time will vary for each permitee
	If pesticides are used outside, permitee will apply sparingly by a licensed individual	Phase II Permitees	S	Budget and time will vary for each permitee
	Pesticides, herbicides and fertilizers kept on site will be stored appropriately in dry, self contained areas that are not connected to the storm water drainage system.	Phase II Permitees	S	Budget and time will vary for each permitee

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
6 d		1	Procedures for determining water quality measures has been evaluated / developed	**Y**	2009	2009	2009	2009	2009			2009
		2	Identified procedures implemented	**Y**	2010	2010	2010	2010	2010			2010
		3	Identified BMP's Installed	**Y**	2010	2010	2010	2010	2010			2010
		4	Assessment done on site plan. Appropriate BMP's shown in design.	**Y**	2009	2009	2009	2009	2009			2009
6 e		1	Fertilizer use policy changed if necessary	**Y**	N/A	N/A	W	Jan 09'	N/A			May 09'
		2	Measure reduction or elimination of phosphorous and or fertilizer due to permitee's change in procedure.	**Y**	Jan 09'	Jan 09'	May 09'	E	Jan 09'			E
		3	Herbicide use policy changed if necessary Reduce use of herbicide by Permitees	**Y**	Jan 09'	N/A	N/A	N/A	N/A			E
		4	Pesticide use policy changed if necessary Reduce use of pesticides by Permitees	**Y**	N/A	N/A	May 09'	N/A	N/A			N/A
		5	Procedures reviewed and adjusted if necessary. Material handling SOP adjusted	**Y**	N/A	N/A	N/A	N/A	N/A			E

GOAL #7 – MDEQ REQUIREMENT – POST CONSTRUCTION CONTROLS

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Evaluate and implement site appropriate, cost-effective structural and nonstructural best management practices (BMPs) that prevent or minimize post construction impacts on water quality.	Adopt BMPs manual from Objective 3a or develop and adopt a BMP manual to protect water quality in both new development and significant redevelopment	Phase II Permitees	S	Budget and time will vary for each permitee
	Adopt the Objective 3a Stormwater ordinance to enforce BMP manual or develop and adopt individual Stormwater ordinance.	Phase II Permitees	L	Budget and time will vary for each permitee
	Responsible permitees will make appropriate staff available to be trained on enforcement	Phase II Permitees	L	Budget and time will vary for each permitee
	Develop tracking system	Phase II Permitees	L	Budget and time will vary for each permitee
Establish long-term operation and maintenance practices for storm water BMPs for new development and significant redevelopment on private property.	Review existing O&M practices as it relates to the adopted BMP manual.	Phase II Permitees	S	Budget and time will vary for each permitee
	Develop a procedure to enforce new O & M practices on private storm water systems.	Phase II Permitees	L	Budget and time will vary for each permitee
	Adopt necessary ordinances to enforce new O & M practices on private storm water systems.	Phase II Permitees	L	Budget and time will vary for each permitee
	Responsible permitees will make appropriate staff available to be trained on enforcement	Phase II Permitees	L	Budget and time will vary for each permitee
	Develop tracking system	Phase II Permitees	L	Budget and time will vary for each permitee

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
7 a		1	Assessment is completed. BMP Manual created and adopted by permitees No. of people that use the manual. SOP are adjusted	**Y**	Aug 08'	Aug 08'	Aug 08'	Aug 08'	Aug 08'			Aug 08'
		2	Necessary ordinances developed and adopted	**Y**	2009	2009	2009	2009	2009			N/A
		3	Number trained Number of sites enforced	**Y**	2010	2010	2010	2010	2010			2010
		4	Mechanism developed to track number of sites, types of BMP's quantity of pollutants removed reduced	**Y**	2010	2010	2010	2010	2010			2010
7 b		1	Completion of review. Ability to determine needed O&M procedures	**Y**	Mar 09'	Mar 09'	Mar 09'	Mar 09'	Mar 09'			N/A
		2	O&M procedures developed and supported by local communities.	**Y**	2009	2009	2009	2009	2009			N/A
		3	Necessary ordinances developed and adopted O&M manual/ procedures reflect new requirements	**Y**	2010	2010	2010	2010	2010			N/A
		4	Number trained Number of sites enforced	**Y**	2010	2010	2010	2010	2010			2010
		5	Mechanism developed to track number of sites, types of BMP's quantity of pollutants removed reduced	**Y**	2010	2010	2010	2010	2010			2010

GOAL #8 –OPPORTUNITIES FOR SUSTAINABILITY

Objective	Action	Responsible Parties	Schedule	Labor Hours & Material cost estimate
Secure funding options available for implementation	Sign E342C contract (through May 1, 2008)	Phase II Permitees	C	
	Review E342C contract for renewal	Phase II Permitees	S	TBD
	Sign new contract or develop funding mechanism to support independent program	Phase II Permitees	S	TBD
	Identify existing federal, state, and local funding opportunities.	Ad hoc Committee	W	10,000 250-500 Hrs (includes action 3)
	Coordinate the development of grant proposals.	SWM	W	100-150 hrs
Institutionalize the committee structure.	Phase II permitee representative to site on PE Committee.	Phase II Permitees GISD	O	100+ hrs/yr for administrator 24+ hrs/yr for members.
	Phase II permitee representative to site on BMP Committee.	Phase II Permitees	O	100+ hrs/yr for administrator 24+ hrs/yr for members.
	Phase II permitee representative to site on MM Committee.	Phase II Permitees	O	100+ hrs/yr for administrator 24+ hrs/yr for members.
	Phase II permitee representative to site on an Ad hoc Committee.	Phase II Permitees	S	TBD

Goal	Objective	Action	Evaluation Mechanism	Included in SWPPI	Argentine Township	Clayton Township	City of Fenton	Fenton Township	City of Linden	Livingston County	Oakland County	Genesee County
8 a		1	Permitee sign contract- see application	**Y**	E	E	E	E	E			E
		2	Contract has been reviewed by permitee	**Y**	Mar 08'	Mar 08'	Mar 08'	Mar 08'	Mar 08'			Mar 08'
		3	Permitee either signs new contract based on new permit cycle or permitee pursue implementation of permit with independent funding.	**Y**	May 08'	May 08'	May 08'	May 08'	May 08'			May 08'
		4	Funding Strategies and opportunity document created.		W	W	W	W	W			W
		5	Multi-jurisdictional grants are applied for and received.		W	W	W	W	W			W
8 b		1	Meeting Minutes Action plan items are implemented. Attendance	**Y**	N/A	E	N/A	N/A	N/A			E
		2	Meeting Minutes Action plan items are implemented. Attendance	**Y**	N/A	N/A	N/A	N/A	E			E
		3	Meeting Minutes Action plan items are implemented. Attendance	**Y**	E	N/A	E	E	N/A			E
		4	Meeting Minutes Action plan items are implemented. Attendance	**Y**	W	W	W	W	W			E

Table 8-1: Benefits of each Objective

	Objectives	***Benefits***
1a	Ordinance to have septic systems inspected at time of sale	• Reduction in bacteria levels in waterways. (D)
1b	Develop education materials for homeowners with septic systems to be given at time of sale	• Increase in level of public awareness of homeowner actions on the health of local waters. (D) • Reductions in pollutants generated by homeowners from reaching waterways. (I)
1c	Ordinance to disconnect footing drains from Sanitary	• Reduced SSO events. (D) • Reduced flashiness in waterways. (D)
1d	Identify existing wellhead protection programs	• Avoid duplication of effort, Maximize between program efficiencies. (D)
1e	Drinking water well test at time of sale ordinance	• Protect public health. (D) • Record of polluted groundwater. (D, if a database is maintained)
1f	Map arsenic levels for drinking wells	• Protect public health. (D) • Adjust development priorities. (I)
2a	Educate public on 7 required education elements	• Raise public awareness about water quality and quality of life. (D)
2b	Direct mailing to riparian land owners (Rivers/Lakes)	• Change behavior of those having greatest impact on waterways. (D)
2c	Partner with existing household hazardous waste program committee to evaluate existing program and expand program if necessary.	• Additional reductions in volume of household hazardous waste entering waterways. (D)
2d	Enhance existing benthic monitoring program	• Improved understanding on the health of local waterways. (D)
2e	Enhance existing Project GREEN program	• Improved understanding on the health of local waterways. (D)
2f	Stream crossing watershed survey with photography.	• Improved understanding on the health of local waterways. (D)
2g	Hot spot water quality monitoring for MS4's as needed	• Improved understanding on the health of local waterways. (D)
3a	Storm Water Ordinance	• Ongoing structural changes to improve the management of stormwater throughout the watershed. (D)
3b	Pursue restoration projects on natural watercourses	• Ongoing structural changes to improve the management of stormwater and minimize flooding throughout the watershed. (D) • Reduce volume of sediments entering local waterways (D) • Increases in water quality (D)

3c	Preserve existing floodplains and wetlands from being filled or developed	• Protection of excess natural storage capacity on the landscape. (D) • Protection of vital components of the landscape that provide habitat connectivity and environmental services. (D) • Reduced financial burden on communities (floodplain). (D) •
3d	Monitor water quantity to measure hydraulic change within watercourses	• Improved understanding on the health of local waterways. (D) • Provide information that will help prioritize future activities. (I)
3e	Produce demonstration projects for Low Impact Development for new and retrofit sites	• Help public and developers visualize some of the infrastructure actions being proposed under Phase II. (D) • Improve water quality in immediate vicinity. (D)
4a	Promote local recreational opportunities	• Increase public awareness/appreciation and use of local natural resources. (D) • Increase desire to protect these resources. (I)
4b	Protect /expand parks trails and river walk system	• Increase public awareness/appreciation and use of local natural resources. (D) • Increase desire to protect these resources. (I)
5a	Establish vegetative buffer areas adjacent to sensitive areas	• Reduce pollutant loadings reaching waterways. (D) • Allow for more natural stream processes to occur. (D) • Wetland/ floodplain protection (D)
5b	Protect key locations of threatened and endangered species and habitat	• Protection of vital components of the landscape that provide habitat connectivity and environmental services. (D) • Increases species populations and diversity. (D)
6a	Ensure maintenance activities, schedules, and inspection procedures for storm water structural controls are appropriate.	• Reductions in pollutants generated by municipal activities from reaching waterways. (D)
6b	Implement controls for reducing or eliminating the discharges of pollutants from streets, roads, highways, parking lots, and maintenance.	• Reductions in pollutants generated by municipal activities on municipal property from reaching waterways. (D)

6c	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.	• Reductions in pollutants generated by municipal activities on municipal property from reaching waterways. (D)
6d	Ensure that flood management projects assess the impacts on the water quality of the receiving waters.	• Improved water quality over previous flood management project/infrastructure. (D) • Reductions in pollutants generated by municipal activities on municipal property from reaching waterways. (D)
6e	Reduce the discharge of pollutants related to application of pesticides, herbicides, and fertilizers applied in the permitees regulated area.	• Reductions in pollutants generated by municipal activities on municipal property from reaching waterways. (D)
7a	Evaluate and implement site appropriate, cost-effective structural and nonstructural best management practices (BMPs) that prevent or minimize the impacts on water quality. *	• Reductions in pollutants generated by municipal activities on municipal property from reaching waterways. (D)
7b	Establish long-term operation and maintenance practices for storm water BMPs on private property.	• Long-term maintenance of privately operated stormwater structures this reducing the public's future financial burden. (D) •
8a	Secure funding options available for implementation.	• Stormwater control will be implemented at a more rapid rate. (D) • Stormwater management will become common practice. (I)
8b	Institutionalize the committee structure.	• Permitees will deliver a uniform program throughout the County. (D) • Savings will be realized through the cooperative effort. (D) • Action Items will be implemented. (D)

D = Direct Benefit as a result of implementing the objective.
I = Indirect Benefit as a result of implementing the objective.

Livingston County has produced the Upper 2 Shiawassee River WMP & the Huron Channel Lakes WMP. The Livingston County Road and Drain Commissioner's office are using both of these watershed plans as their primary watershed plans. The SWPPI for both has been submitted and revised January 1, 2008 to comply with their NPDES Ph II permit. Any required actions within this watershed (Shiawassee main channel) will comply with the submitted SWPPI for the Upper 2 Shiawassee.

Oakland County is involved in 5 watersheds. The Rouge, Middle Flint River, Shiawassee (Upper 2 and Main), Huron and **Clinton Main**. The Clinton Main is the primary watershed plan Oakland County is functioning under. Having reviewed the various WMPs they have developed and submitted a SWPPI on May 1, 2007 to comply with their NPDES Ph II permit. The SWPPI was approved for the above 5 watersheds. Please see Oakland County approved SWPPI for their individual commitments. Furthermore, Oakland County does not have any urbanized area within the Shiawassee River WMP.

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 in 2003 with the Genesee County Drain Commissioner's Office were:

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

Bold= Municipalities within watershed

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.

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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 (IDEP), 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.

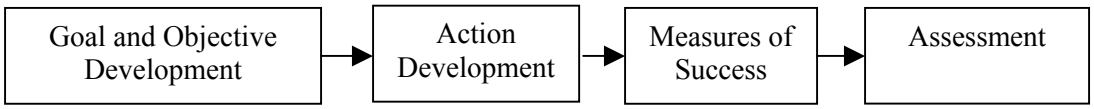
(c) the **New Construction Standards Subcommittee**, with responsibility for construction standards, redevelopment standards, oversight of all watersheds and the preparation of the pollution prevention program known as the Storm Water Pollution Prevention Initiative; and for those Services relating to 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, Middle Flint, Lower 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.

Outside Genesee County each NPDES Phase II Community has its own arrangement either to do their own IDEP and education or have contracted with another watershed group to mange it for them. Oakland County Drain Commissioner's Office is responsible for doing their own IDEP for county drains.

Within the Shiawassee River Watershed, there are 3 grant projects. The Genesee County Drain Commissioner's Office has received 2 of those grants. There is a 319-grant for watershed planning specifically for the Kearsley Creek and a CMI grant was received to pilot an IDEP program for the Gibson Drain, which is located within the Swartz Creek Watershed. U of M CAER has received a 319 grant for the Swartz Creek Watershed.

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:



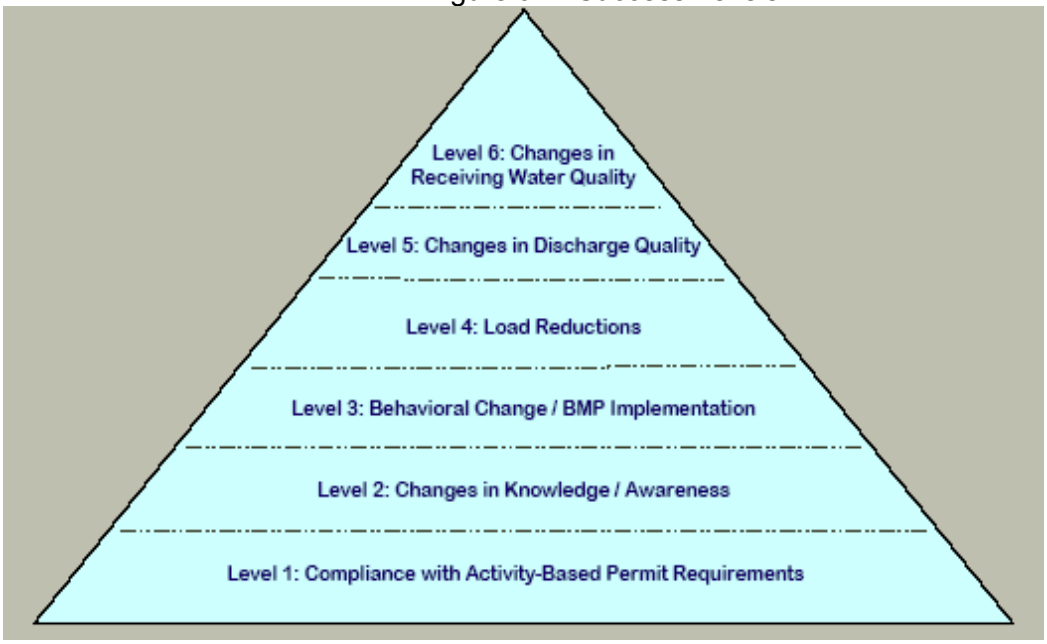
While the elements of program planning interact in a cyclical manner, developing goals and objectives typically initiates the cycle. However, program planning also occurs following the effectiveness assessment phase if changes to the WMP are necessary.

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 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 Macroinvertibrate 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 from 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 Shiawassee 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)	• Public Health Projects using Chapter 20	Separate projects each drain requires petition/notice
2	Inter-Municipal Committee Act	200 (1957)	• Resolutions to study issues or problems	Studies only
3	Municipal Sewerage and Water Systems Act	233 (1955)	• Incorporate an Authority • Sewage disposal system includes storm sewers	Intended for water and wastewater services
4	County Public Improvement Act	342 (1939)	• 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)	• 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	• 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.

SHIAWASSEE RIVER WATERSHED

However, this group is moving forward with implementation plans under Act 342 (Option #4). Not all the communities within the Shiawassee River Watershed have signed contracts with the Genesee County Drain Commissioner's Office, but all those communities within Genesee County have. All the school districts within Genesee County also have signed contracts to be nested jurisdiction under their communities Certificate of Coverage.

SECTION 11 - REFERENCES

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