

SECTION 3 - CHARACTERISTICS OF THE WATERSHED

SUBWATERSHEDS

The Upper Flint River Watershed needed to be divided into subwatersheds each with an area from 2mi² to 22mi². This would allow specific areas within the Upper Flint River Watershed to be looked at based on their unique conditions. This assisted with Total Maximum Daily Loads (TMDL) & identifying problems that may be specific to that location. Half of the Upper Flint watershed area within Genesee County contained existing drainage districts. The drainage districts are created when a watercourse is dedicated as county drain or new ditch is dug. These existing drainage districts were used to divide the Butternut Creek and the Main Flint River watersheds into subwatersheds. Any drainage districts smaller than 2 mi² were incorporated within the larger drainage districts. Where drainage districts were not established, the areas along the watercourses were divided using contours whenever possible to divide areas. Otherwise a jurisdictional boundary was used when necessary. In total 6 subwatersheds were developed.

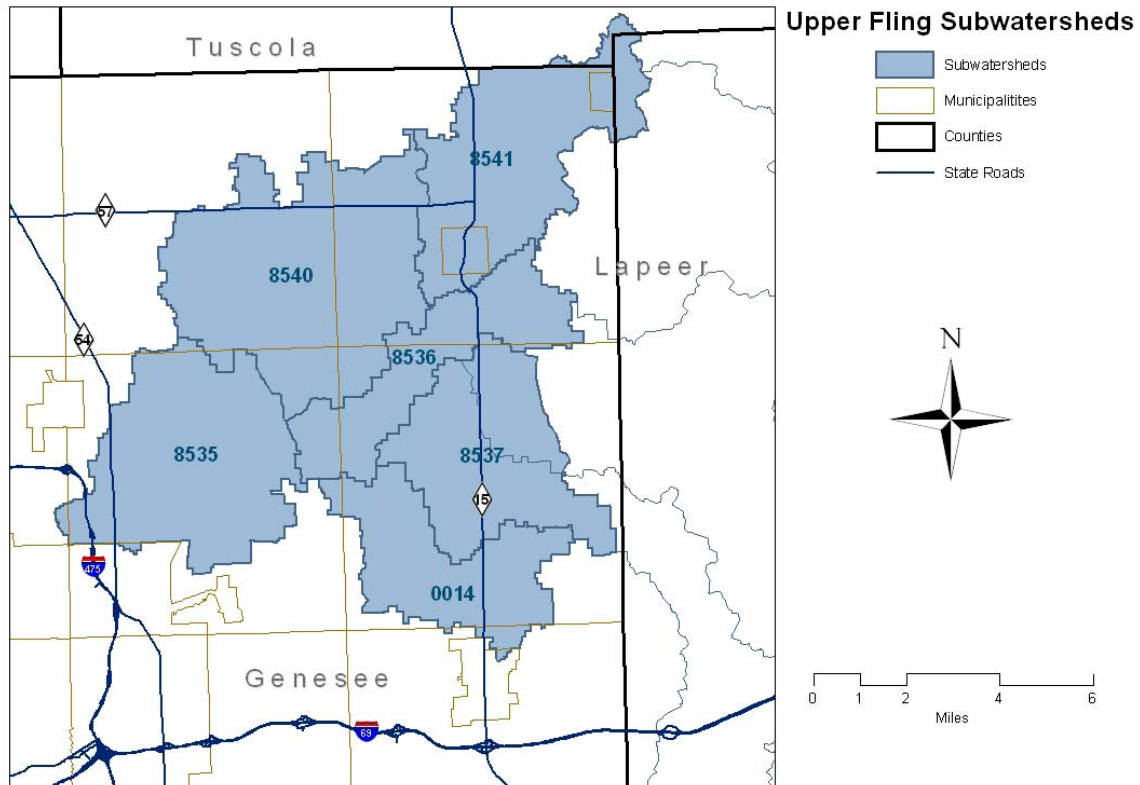


Figure 3-1 Subwatersheds

POLITICAL JURISDICTIONS

Table 3-1 Political Jurisdiction by Subwatershed

		City of Davison	Davison Twp	* City of Flint	Forest Twp	Genesee Twp	Marathon Twp	Millington Twp
8540	Butternut 1				7.31	2.23		
8541	Butternut 2				12.15		1.30	0.34
	Butternut Total				19.46	2.23	1.30	0.34
8535	Flint River Upper 1			0.08		16.57		
8536	Flint River Upper 2				4.65	1.57		
8537	Flint River Upper 3				0.09			
0014	Cullen and Powers	0.06	0.47			0.27		
	Flint River Total	0.06	0.47	0.08	4.75	18.40		
	Upper Flint Total area in Mi²	0.06	0.47	0.08	24.20	20.63	1.30	0.34
	% of Watershed	0.07%	0.53%	0.09%	27.36%	23.33%	1.47%	0.38%

Political jurisdiction regarding the Flint River and its 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 Upper Flint River Watershed alone there are 13 Cities, Townships, and Villages, Genesee County, Tuscola County and Lapeer County. Of the 13 communities, only 7 are Phase II communities. The City of Flint is included in the *Upper Flint* River Watershed area calculations, but it is a Phase I community.

Mt Morris Twp	Richfield Twp	Thetford Twp	Village of Otter Lake	Village of Otisville	Watertown Twp	Total Area in Square miles	% of Watershed
	1.03	12.26				22.83	25.81%
			0.42	0.98	0.15	15.34	17.35%
	1.03	12.26	0.42	0.98	0.15	38.17	
0.14		0.17				16.95	11.71%
	3.70					9.92	19.17%
	12.95					13.04	11.22%
	9.56					10.36	14.74%
0.14	26.20	0.17				50.27	
0.14	27.24	12.43	0.42	0.98	0.15	88.44	100.00%
0.16%	30.80%	14.05%	0.47%	1.11%	0.17%	100.00%	

Upper Flint Jurisdiction by Percent

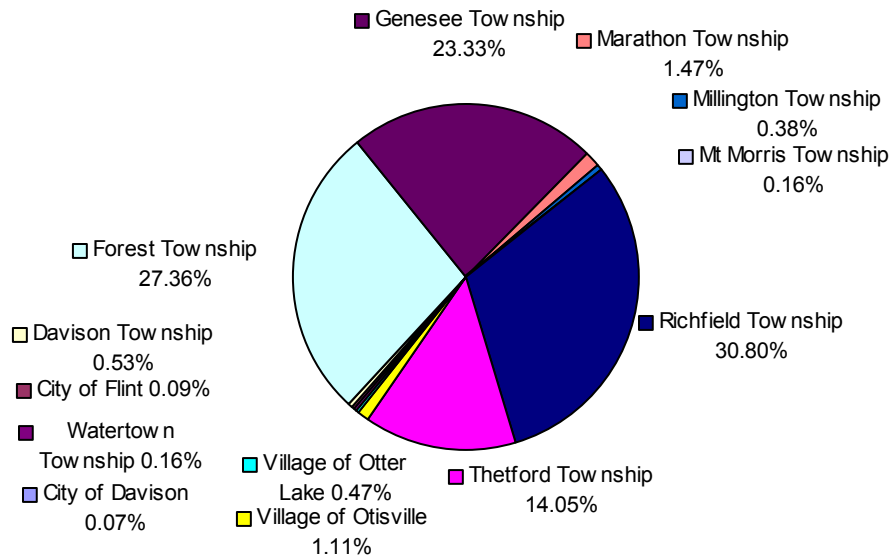


Figure 3-2 Political Jurisdiction by percentage

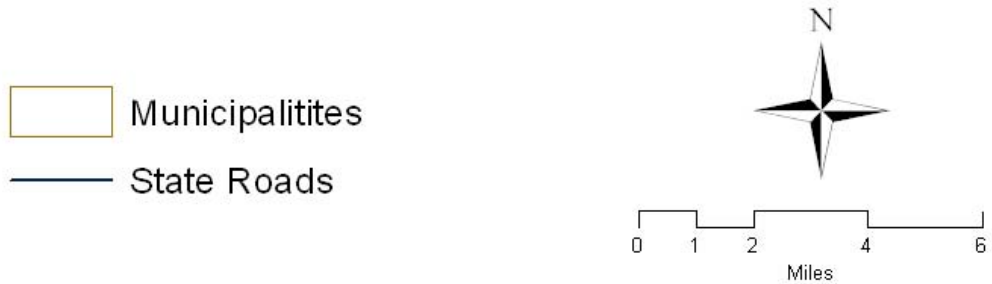
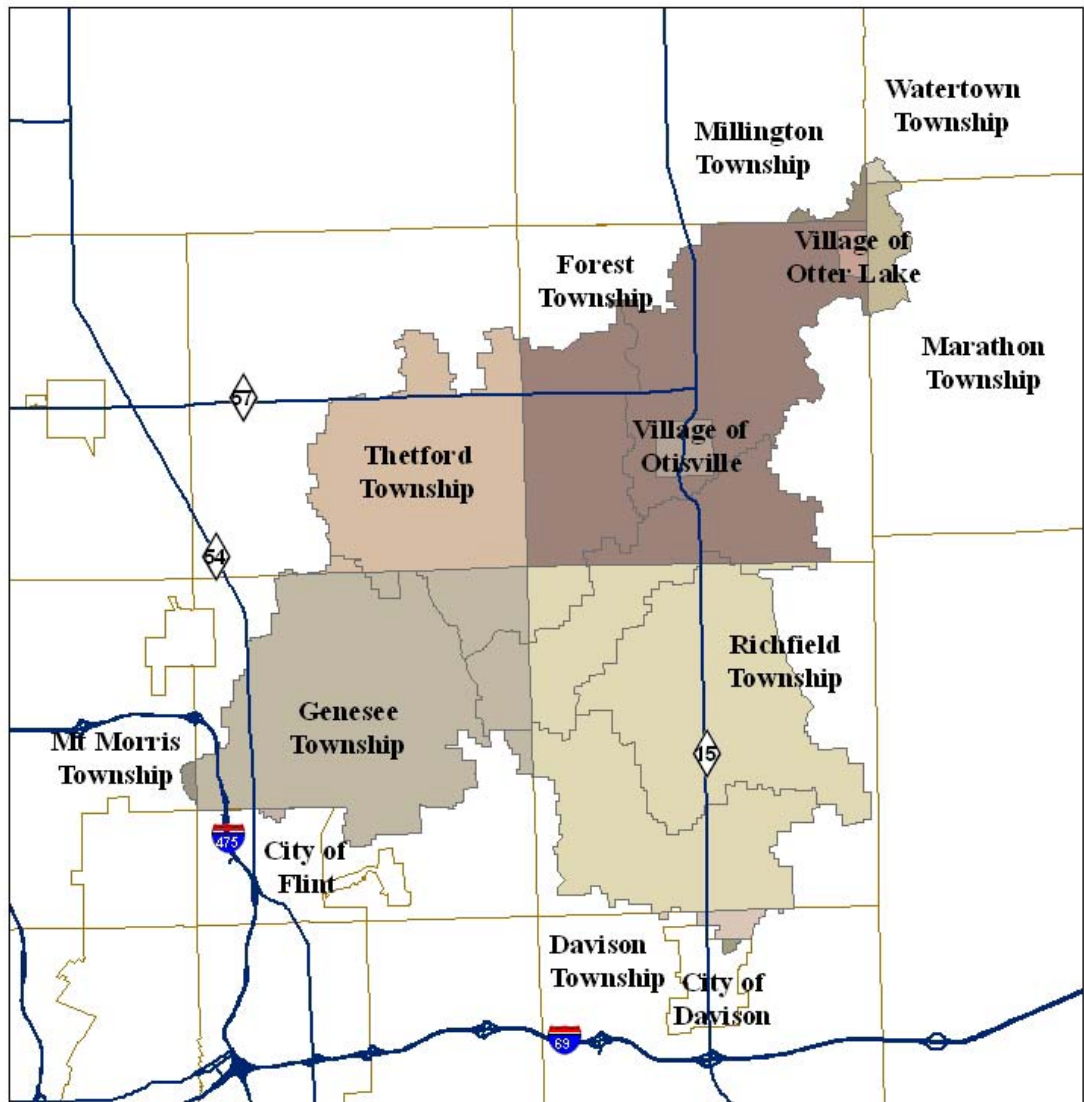


Figure 3-3 Local Units of Government

DEMOGRAPHICS

The Upper Flint River Watershed population has slightly increased in the last 10 years. This increase is concentrated along M-15 (State Road) corridor.

Table 3-2 Population Changes

Community	1990 Population within watershed	2000 Population within watershed	% Change from 1990 - 2000	Area within UPPER FLINT watershed in square miles
City of Davison	190	185	-2.63%	0.06
Davison Twp	205	249	21.46%	0.47
Forest Twp	3077	3307	7.47%	24.20
Genesee Twp	14455	14476	0.15%	20.63
Marathon Twp	162	178	9.88%	1.30
Millington Twp	40	42	5.00%	0.34
Mt Morris Twp	104	98	-5.77%	0.14
Richfield Twp	5611	6305	12.37%	27.24
Thetford Twp	2989	2969	-0.67%	12.43
Village of Otisville	724	882	21.82%	0.98
Village of Otter Lake	534	437	-18.16%	0.42
Watertown Twp	10	11	10.00%	0.15
Total	28101	29139	3.69%	88.36

Source: 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 Upper Flint Watershed consisted of forested land with mostly Beech-Sugar Forest (sugar maple, basswood, red oak, and white ash) throughout the watershed with small isolated pockets of Oak-Hickory Forest (red oak, white oak, hickory). Isolated pockets of White Pine, mixed hardwood forest were present along the north bank of the Flint River in Genesee and Richfield and also within the Butternut watershed on Forest Township. A White Pine-White Oak Forest area is just outside the City of Flint. Swamp Forest are scattered throughout the watershed in depressed areas, but most of the deeper water bodies are located in the headwaters of the Butternut Creek, in the Northeast corner of the watershed.

When the first European explorers arrived in the Saginaw Valley, 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.

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

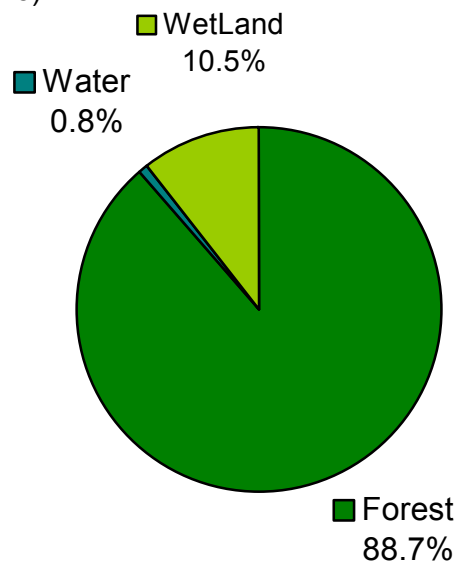
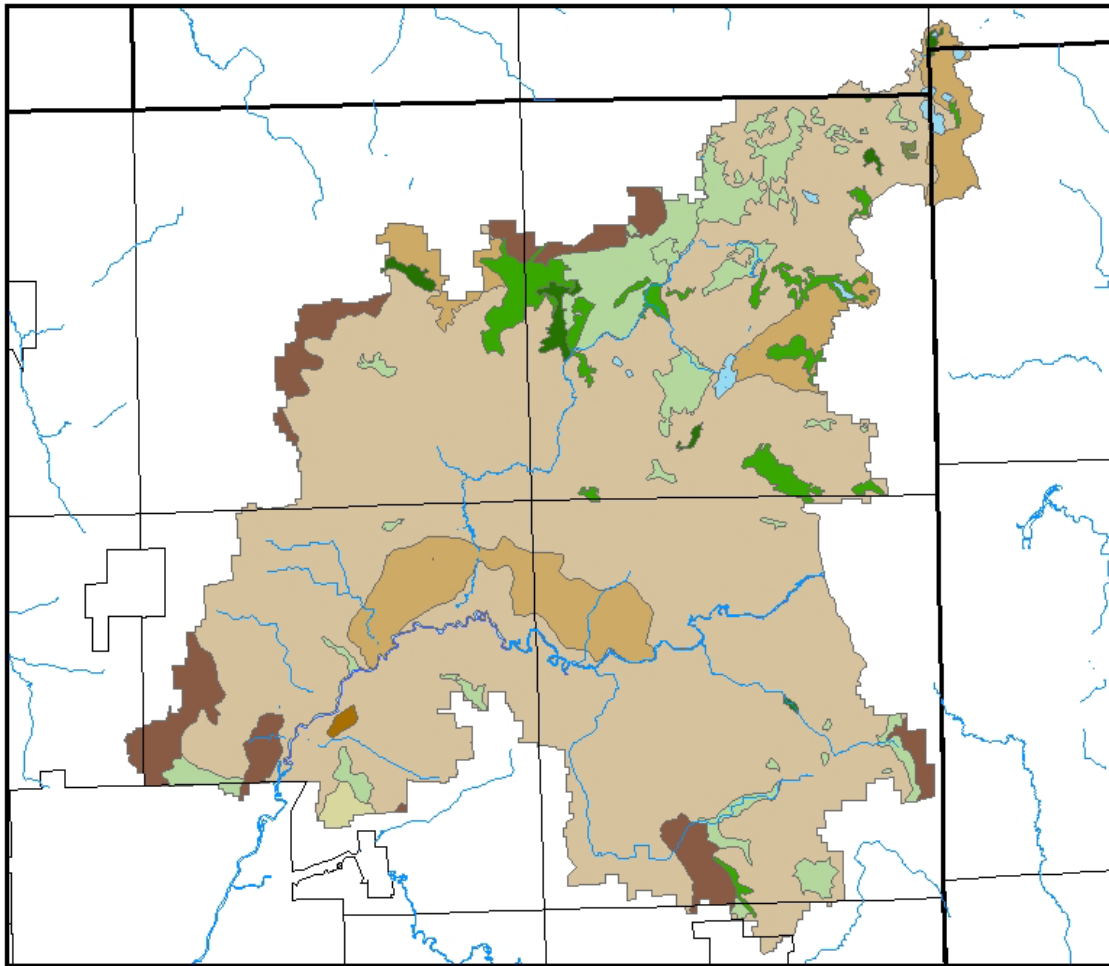


Figure 3-4 Ecosystems, circa 1830s by percentage



COVERTYPE

- BEECH-SUGAR MAPLE FOREST
- BLACK ASH SWAMP
- LAKE/RIVER
- MIXED CONIFER SWAMP
- MIXED HARDWOOD SWAMP
- MUSKEG/BOG
- OAK-HICKORY FOREST
- SHRUB SWAMP/EMERGENT MARSH
- WHITE PINE-MIXED HARDWOOD FOREST
- WHITE PINE-RED PINE FOREST
- WHITE PINE-WHITE OAK FOREST
- County
- Municipalities
- River_All



Figure 3-5 Ecosystems, circa 1830s

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

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

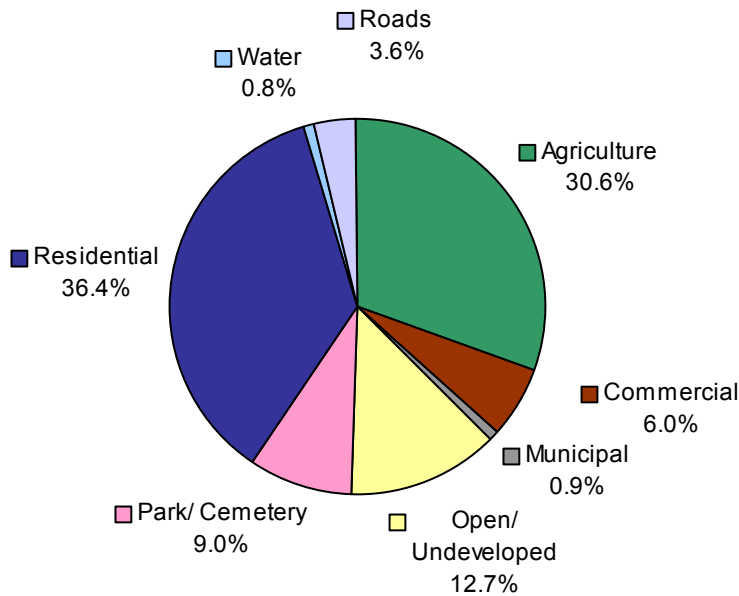
Although Michigan was primarily an agricultural state, including much of Genesee County, before the Civil War, lumbering became the principal economic activity in the new state during the second half of the 19th century. Within Genesee County, the completion of the railroad in 1862 afforded practicable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

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

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

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

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. Open water and recreation were merged with the parcel map and given their own classifications. The Recreational land was determined to be County/ Municipal Parks only, golf courses are considered developed property. Within Lapeer and Tuscola Counties, arials were used to determine land use.

City of Flint is a NPDES Phase I community and was not included. Within the City of Flint boundaries, the land within the Lower Flint Watershed is largely developed with residential and some commercial.

Current parcel information for Lapeer County was not available to determine land use. Based on 1998 aeriels, Marathon Township within the Upper Flint River watershed is predominantly park with open water. In Millington and Watertown Townships in Tuscola, the area within the Upper Flint River watershed is predominantly open undeveloped.

There is no consistent source for future land cover within the Upper Flint River Watershed. Currently 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. Below is a list of Community Master Plans with future land use and when they were prepared. Each community has their master plan on file at their offices.

1995
Richfield Township

2002
City of Davison
Davison Township
Forest Township

2003
Mt Morris Township
Thetford Township

2001
Genesee Township

2004
Village of Otisville

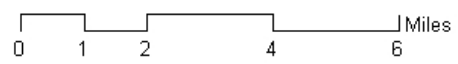
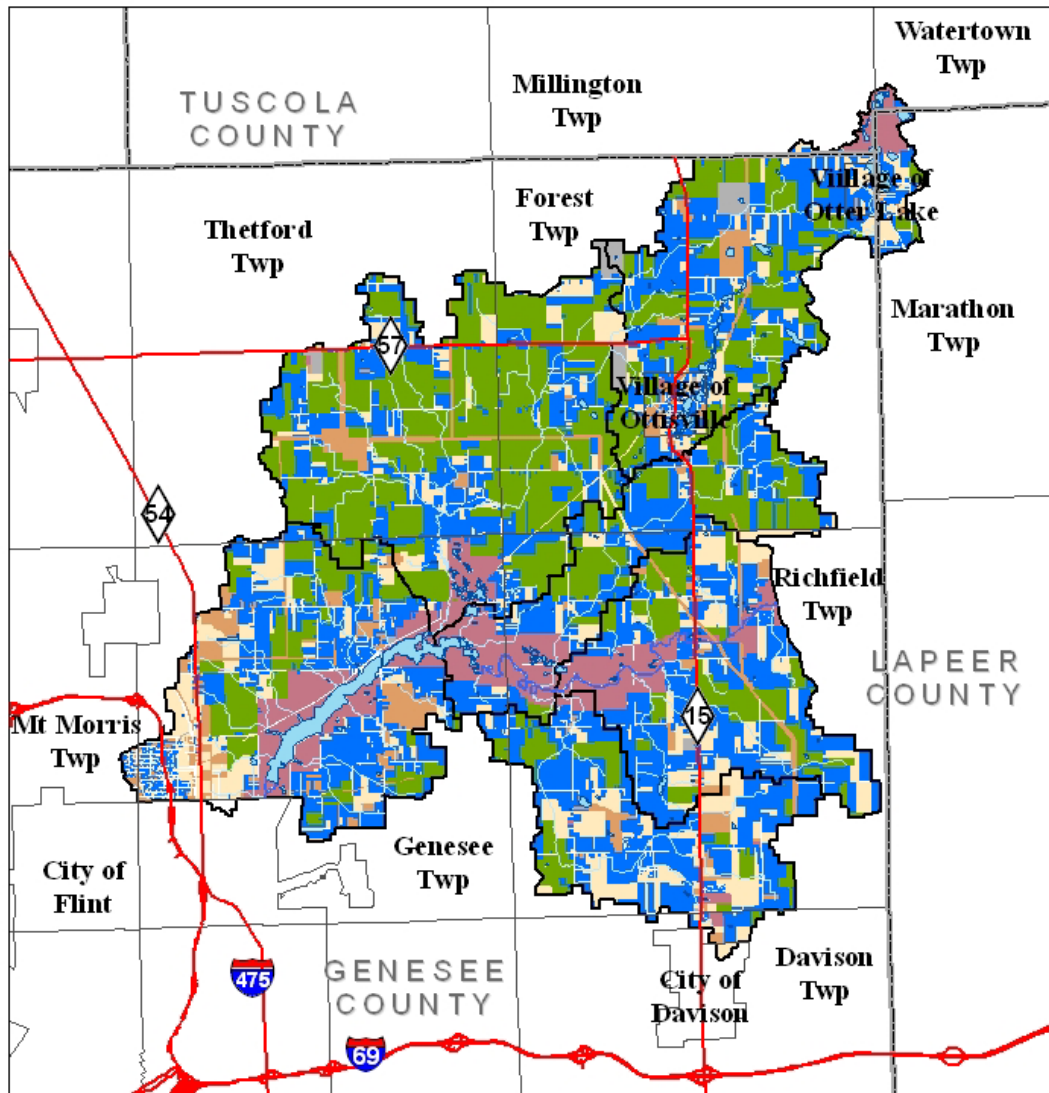


Figure 3-7 Current Land Covers

Urbanized Land Use

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

Agricultural Land Use

Throughout the Upper Flint River Watershed, the watershed has areas of agricultural land. According to the USDA office the 2 predominant cash crops are corn and soybean. On a much smaller scale other cash crops within the watershed are hay, wheat, and small grains.

Based on Conversations with the local USDA office, of the 15 dairy operations in Genesee County approximately 3 of them are within the Upper Flint. Most of the dairy farms have an average of 50-150 head with the largest operation being 250 head of cattle.

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

Table 3-3 Livestock

Beef Cattle	208
Dairy Cattle	290
Swine	330
Sheep	148
Horse	461
Chicken	236
Turkey	32

USDA Census of Agriculture 1997

Riparian Buffer

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

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

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

Wetlands

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

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

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

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

As the following map shows, most of the wetlands are concentrated along the Flint River corridor between stepping stones falls and Holloway Dam and the Northeast corner of the watershed. The wetlands on the below map were identified in the Wetland Inventory Map from 1979. By then much of the City of Flint and surrounding area had already been developed and the land had been altered.

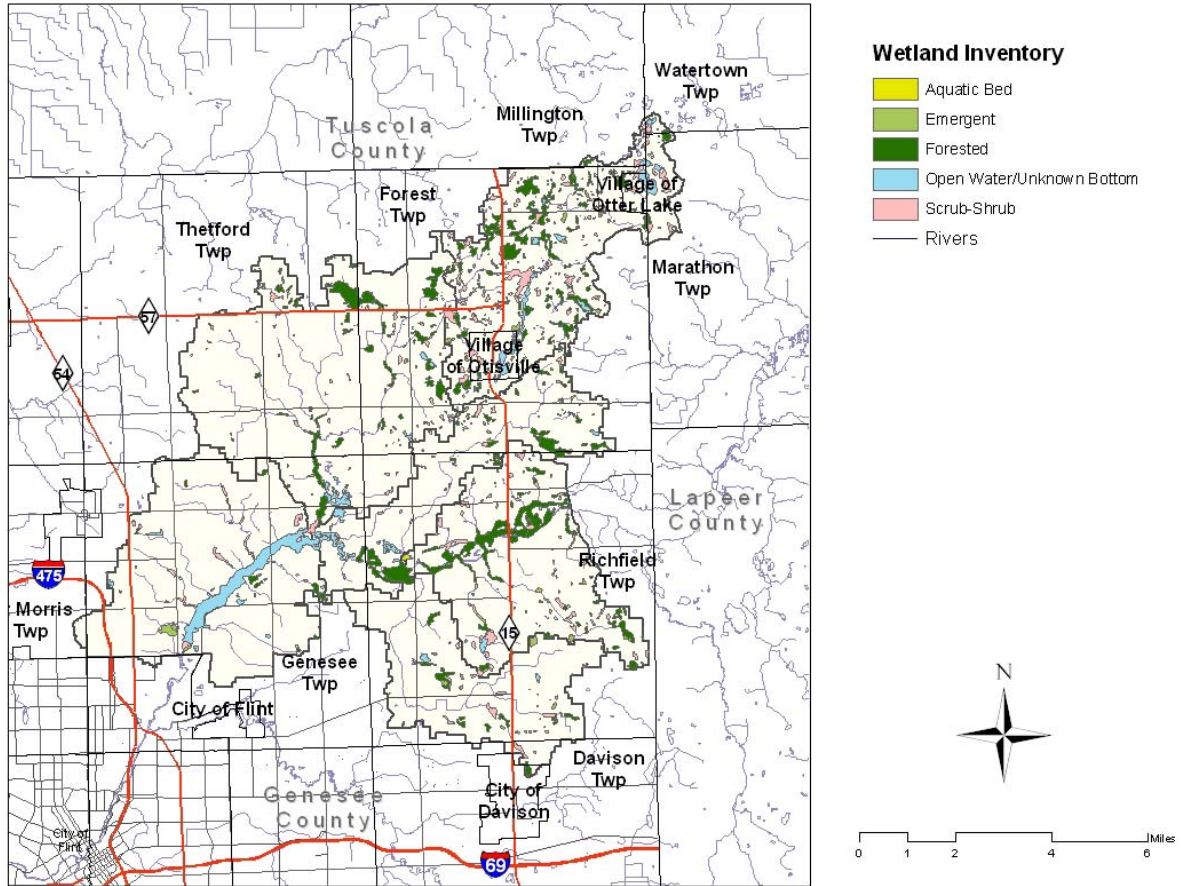


Figure 3-8 Wetlands

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 Upper Flint River Watershed is predominantly made up of relatively flat areas. The land along the Flint River itself experience steeper slopes. Also the northeast corner of Forest along with Lapeer and Tuscola Counties also contain a rolling lanscape. The highest elevation is in Forest Township at 910 per the USGS 5' contour map. As it enters the City of Flint to the west, the lowest elevation is 705. Water erosion of the glacial formations produced the present landscape.

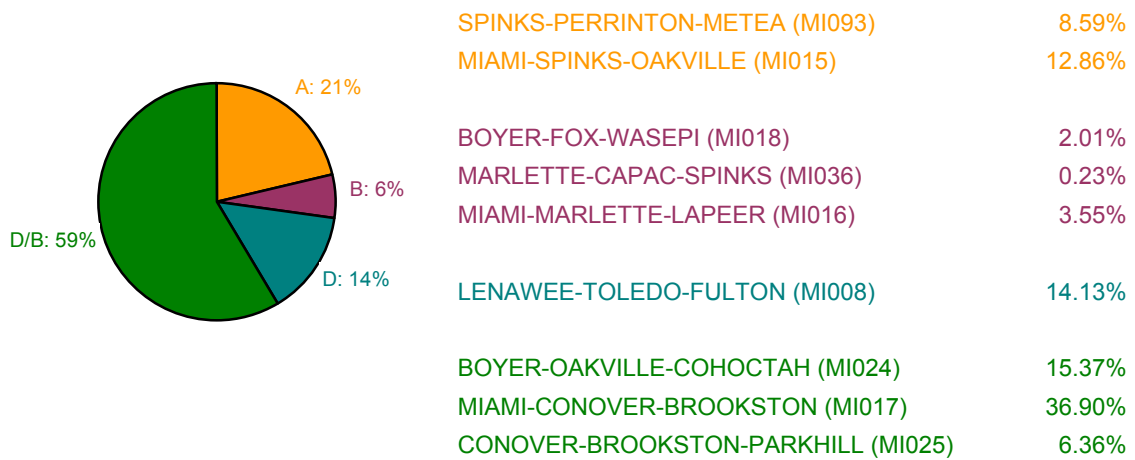
GEOLOGY AND SOILS

Several ice sheets advanced over Genesee County and retreated during the glacial period. The most recent ice sheet or glacier was during the Late Wisconsin glacial period, some 9,000 or more years ago. Several distinctive geological features were formed in Genesee County during this last period of glaciation. Soon after the southernmost part of Genesee County emerged from the retreating Saginaw ice lobe, the lobe halted and built the Fowler Moraine. This moraine starts in Lapeer County, continues southwesterly across Genesee County making up part of the southern watershed line. Masses of material known as glacial till were deposited from the melt off. Later the climate changed again, and the Saginaw lobe halted and built the Flint Moraine. This moraine is marked by a line running through Forest, Thetford and Genesee Townships and Tuscola County to create the North and west border of the Upper Flint River Watershed.

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

The Upper Flint River Watershed is made up of the following soils.

Figure 3-9 Hydrologic Soil Groups by percentage



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

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

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 Upper Flint River Watershed contains more than 80 lakes (greater than 1 acre), covering approximately 1090 acres and more than 199 miles of rivers and drains. Over half of the total acreage of lakes in the Upper Flint Watershed is comprised of Mott Lake, which was created by damming the Flint River in Section 21 of Genesee Township. The major watercourses within this watershed are the Flint River and the Butternut Creek. Each of these watercourses is fed through a series of swales, road ditches and county drains. Many of the smaller drains and watercourses have intermittent flow and are dry most of the time. Some of the smaller tributaries that feed into the Flint River and the Butternut Creek 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 Upper Flint River Watershed were agricultural there are many unmapped private farm tiles that drain low areas within the watershed.

The USGS has 1 stream gauge within the watershed, located on the Flint River in Richfield Township, Section 9. Details on this gauge are located in Chapter 4.

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

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

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

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

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

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

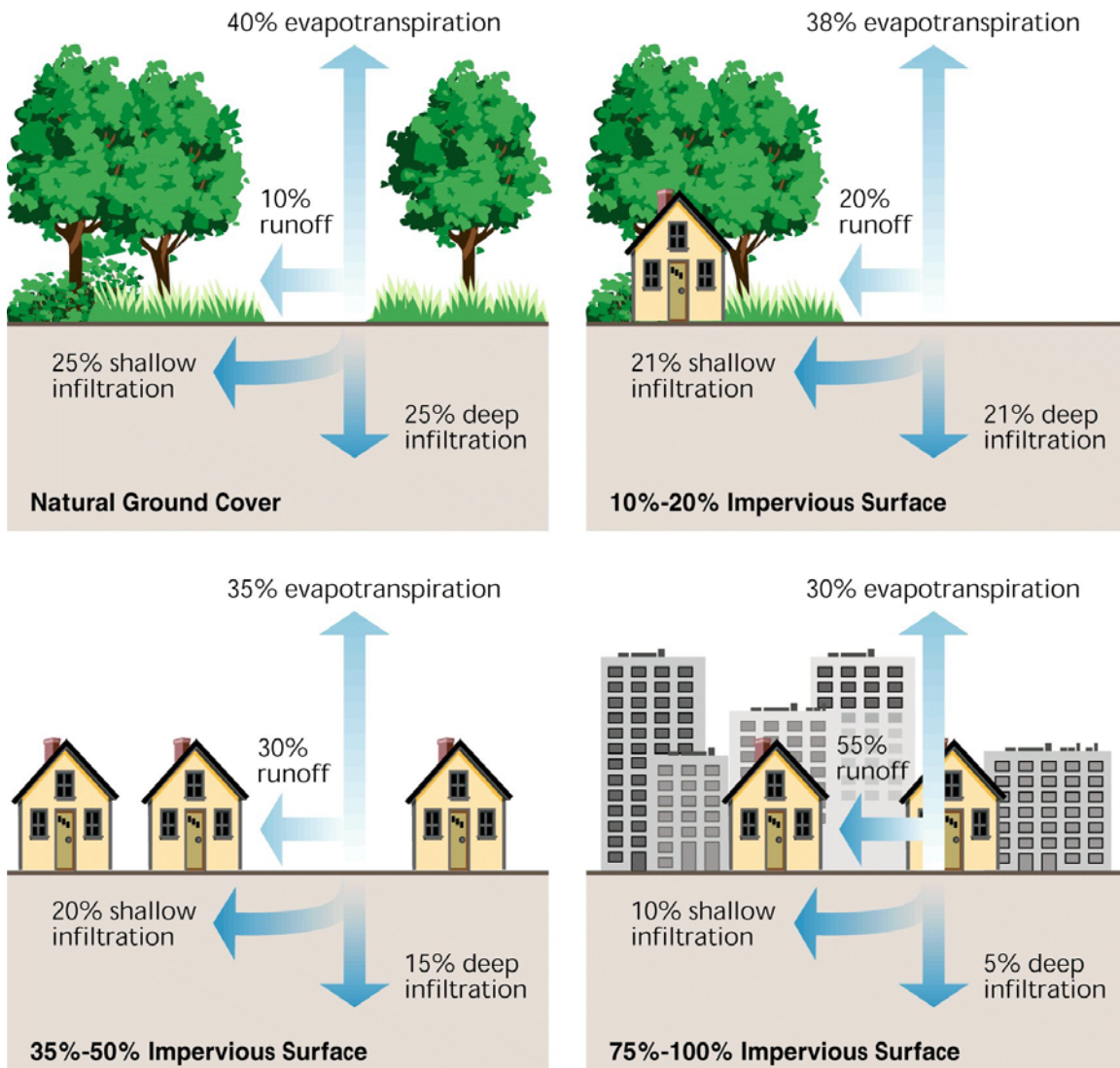


Figure 3-10 Effect of urbanization on runoff
Source: FISRWG, 1998

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

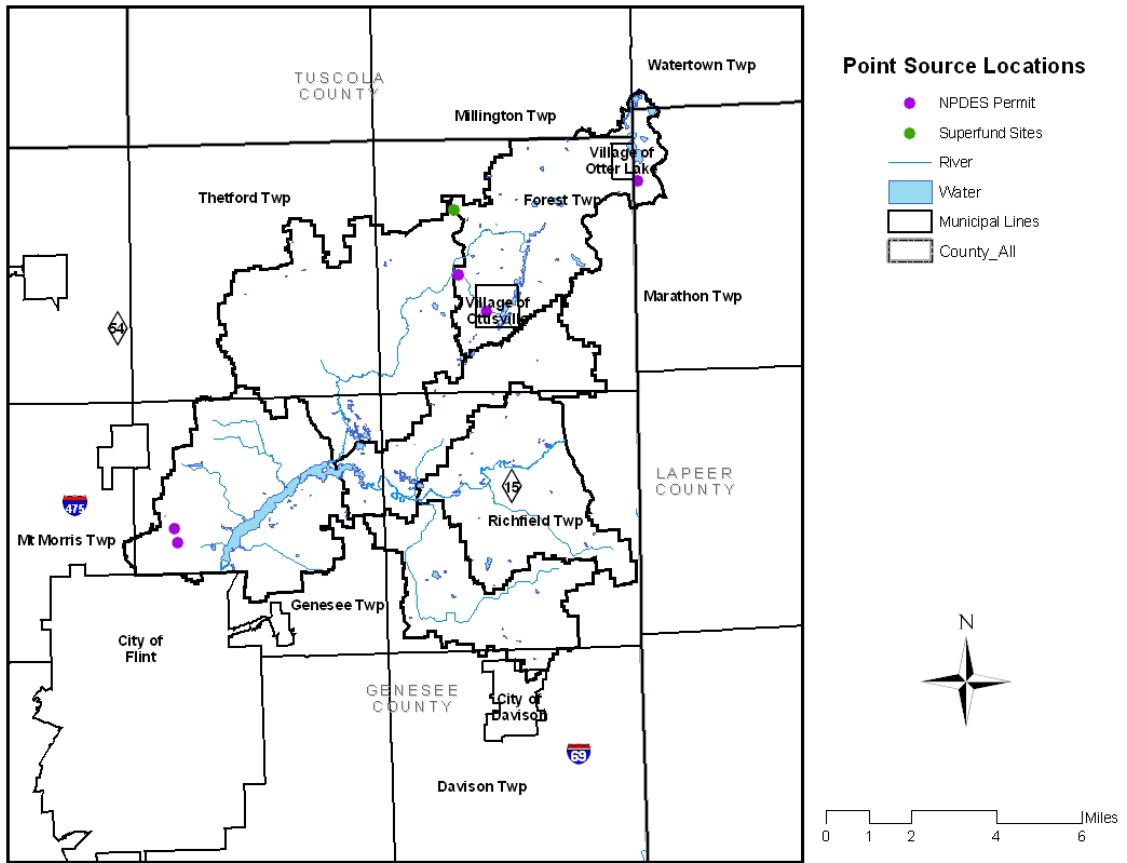


Figure 3-11 Point Sources

POINT SOURCES OF POTENTIAL POLLUTANTS

Table 3-5 Point Sources

Description	Permit # (if applicable)	Owner- ship	Status	Sub- watershed	Municipality	Receiving Waters
Superfund Sites						
Forest Waste Products	MID980410	Public		8541	Forest Twp	Butternut
Brownfield Sites/ Underground Storage Tanks (UST) field Sites						
Speedway GC	00021610	Private	Open	8535	Genesee Twp	Flint River
Associates	00019454	Private	Open	8535	Genesee Twp	Flint River
Marathon Oil	00018012	Private	Open	8535	Genesee Twp	Flint River
Conlee oil Co.	00000571	Private	Open	8541	Otisville	Butternut
Leemon Oil Co.	00012650	Private	Open	8535	Genesee Twp	Flint River
Nash Tire	50002019	Private	Open	8535	Genesee Twp	Flint River
RMD LLC Citgo	00008104	Private	Open	8535	Genesee Twp	Flint River
Jones Sign Co.	00036141	Private	Open	8535	Genesee Twp	Flint River
Shell	00004168	Private	Open	8535	Genesee Twp	Flint River
Davison Oil & Gas	00033255	Private	Open	0014	Richfield Twp	Cullen Powers
Davison Oil & Gas	00033566	Private	Open	8537	Richfield Twp	Flint River
Sherwin Ltd.	00003765	Private	Open	8537	Richfield Twp	Flint River
Active NPDES Permits						
Exxon Mobil Oil Corp.	MIG670290	Private		8535	Flint	Flint River
Marathon Ashland Petroleum LLC	MIG670001	Private		8535	Mount Morris	Flint River
Orchard Cove MHP WW	MI0054755	Private		8541	Otisville	Butternut Creek
Village of Otisville	MI0028720	Public		8541	Otisville	Butternut Creek
Village of Otter Lake	MI0056979	Public		8541	Otter Lake	Butternut Creek

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

SEWER AND SEPTIC SYSTEM SERVICE AREAS

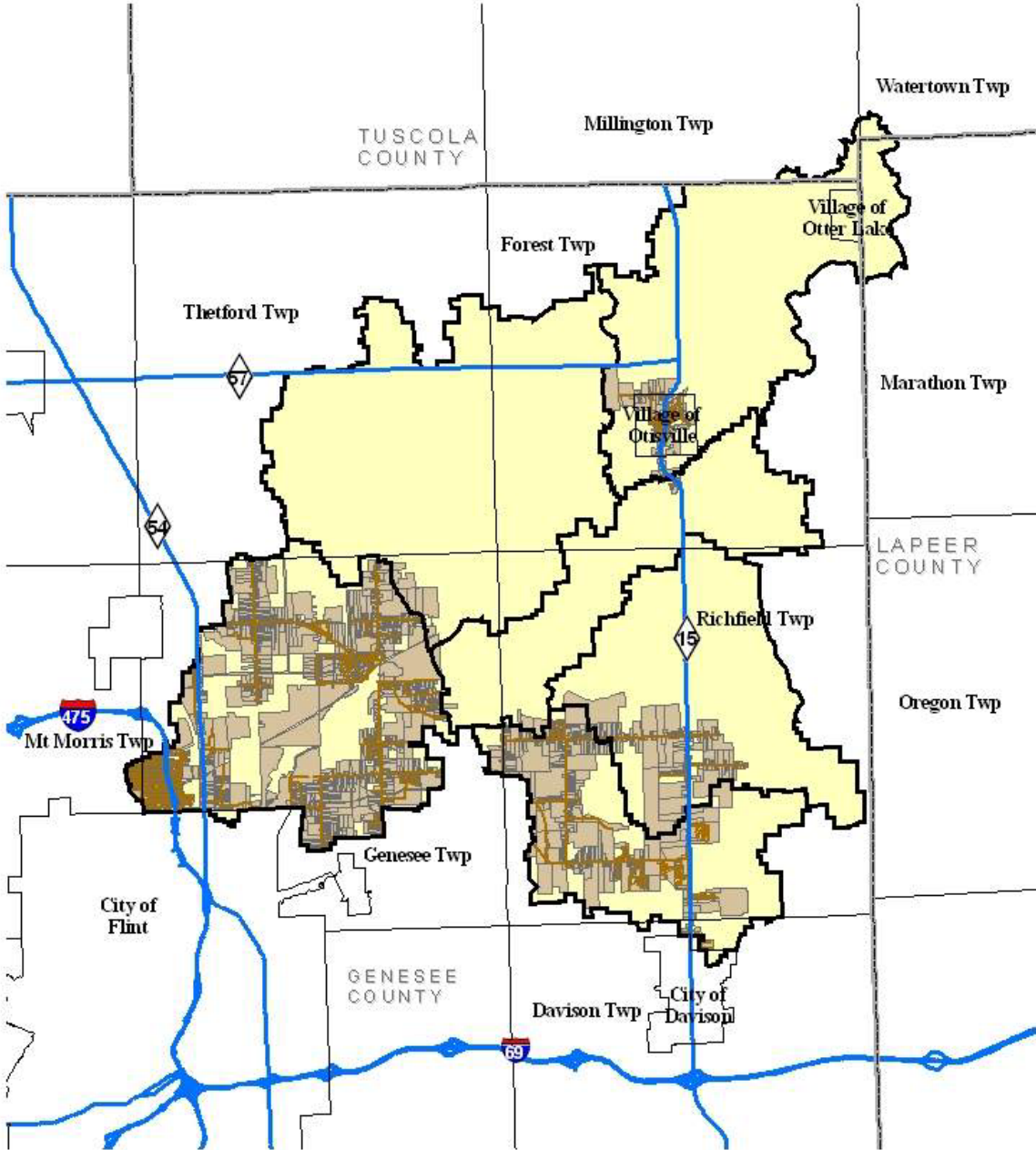
Wastewater is dealt with by either a system of sanitary sewers leading to a wastewater treatment plant or by on-site sewage disposal systems (OSDS). On-site sewage disposal systems typically include a septic tank and an absorption field. OSDS typically serve single-family residences in less urbanized settings, although community septic systems are becoming more common in newer developments. The Sewer Service Areas Map Figure 3-12 depicts the areas within the watershed that currently have access to sanitary sewers.

Within Genesee County the sanitary sewer systems has been predominantly constructed since 1960's. Within Lapeer and Tuscola Counties only OSDS are available within the watershed.




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

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

Figure 3-12 Sewer Service Areas



Sewer Service Areas

-  Sewer Lines
-  Sewer Service
-  No Sewer Available



SIGNIFICANT NATURAL FEATURES TO BE PROTECTED

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

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

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

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

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

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

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

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

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.

The Upper Flint River does not have any areas to have verified sightings of threatened, endangered or special concern species.