FINAL

Alabama Department of Environmental Management

Fecal Coliform TMDL Development

Eightmile Creek	AL/03160204-050_01
Gum Tree Branch	AL/03160204-050_02

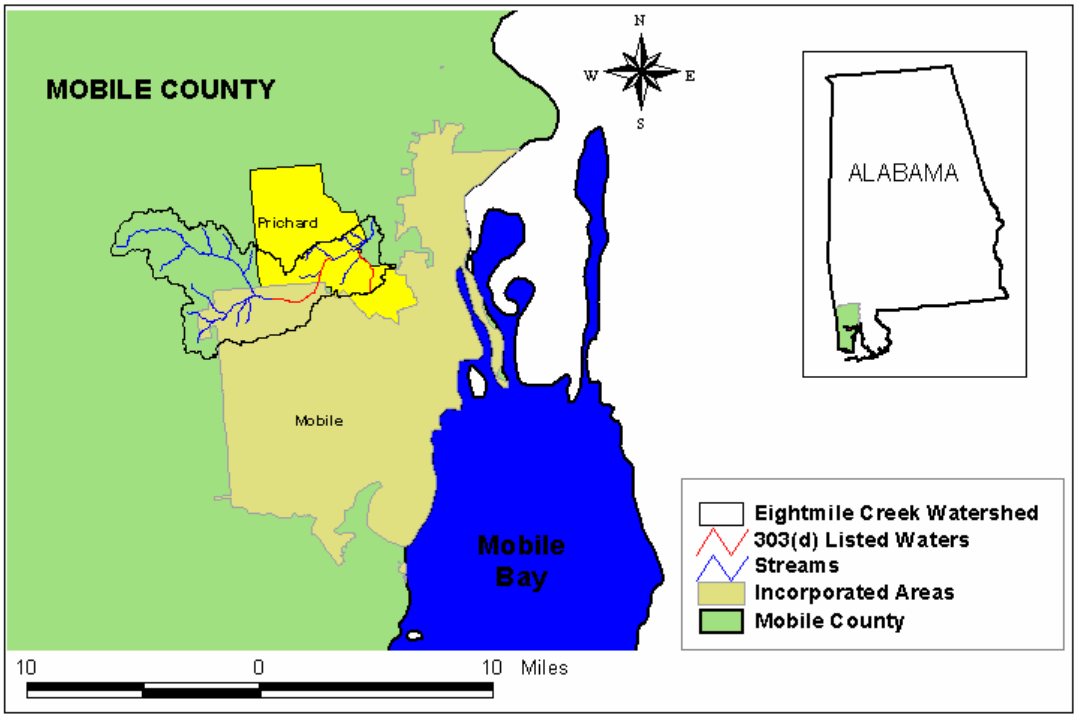
Water Quality Branch
Water Division
October 2004

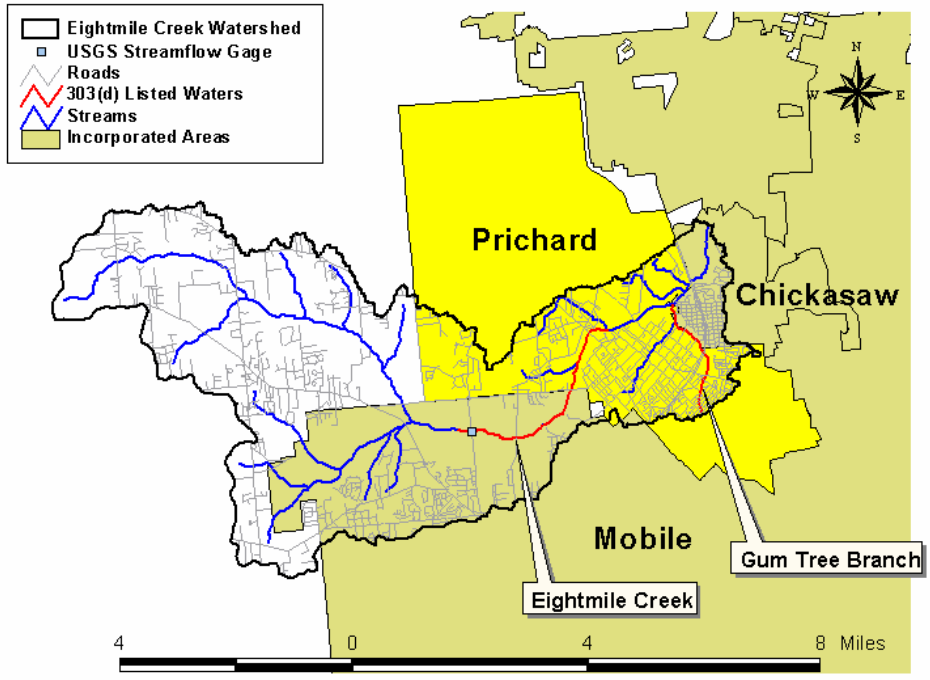
Table of Contents

List of Figures

List of Tables

Eightmile Creek Watershed (03160204050-01) in the Mobile-Tensaw Basin (03160204)





List of Abbreviations

ADEM	Alabama Department of Environmental Management
BMP	Best Management Practices
CFS	Cubic Feet per Second
DEM	Digital Elevation Model
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
GIS	Geographic Information System
HSPF	Hydrological Simulation Program - FORTRAN
HUC	Hydrologic Unit Code
LA	Load Allocation
LSPC	Loading Simulation Program C++
MAWSS	Mobile Area Water and Sewer Service
MGD	Million Gallons per Day
MOS	Margin of Safety
MPN	Most Probable Number
MRLC	Multi-Resolution Land Characteristic
MS4	Municipal Separate Stormwater System
NED	National Elevation Database
NHD	National Hydrography Dataset
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
RF3	Reach File 3
SSOs	Sanitary Sewer Overflows
STORET	Storage Retrieval database
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
WCS	Watershed Characterization System
WLA	Waste Load Allocation

1.0 Executive Summary

Eightmile Creek and Gum Tree Branch are situated in the southwest portion of Alabama in Mobile County. The majority of the 37 square mile Eightmile Creek watershed, including Gum Tree Branch, is located within the incorporated areas of the City of Prichard (pop. 28,633), the City of Mobile (pop. 198,915), or the City of Chickasaw (pop. 6,364). Approximately two-thirds of the 3.2 square mile Gum Tree Branch is within the city limits of Prichard; the remainder is incorporated in Chickasaw.

Eightmile Creek and Gum Tree Branch have been included on the State of Alabama's §303(d) list of impaired waters since 1998. Both are categorized as impaired by pathogen pollution (fecal coliform) due to urban runoff/storm sewers and sanitary sewer collection system failure. Use classification of the listed segments is Fish and Wildlife, except for a segment of Eightmile Creek, which is classified as Public Water Supply because of the presence of the water intake of the City of Prichard near the confluence of Gum Tree Branch.

The following report presents the results of the Total Maximum Daily Load (TMDL) analysis for fecal coliform bacteria for Eightmile Creek and the Gum Tree Branch segments. In accordance with ADEM water quality criteria, "the bacteria of the fecal coliform group shall not exceed a geometric mean of 1,000/100 mL October-May or 200/100ml June-September, nor exceed a maximum of 2,000/100 mL" in any sample in a stream classified as Fish and Wildlife or Public Water Supply. The calculated TMDL is shown in Tables 1-1 and 1-2.

Table 1-1 TMDL Allocations for Eightmile Creek and Gum Tree Branch

Impaired Segment	Existing load (counts/day)	MS4 WLA (percent reduction)	LA (percent reduction)	MOS (counts/day)	TMDL (counts/day)	TMDL (percent reduction)
Eightmile Creek	5.43 E +12	72%	72%	1.70 E+11	1.70 E+12	72%
Gum Tree Branch	5.30 E +12	78%	78%	1.32 E+11	1.32 E+12	78%

2.0 Basis for §303(d) Listing

2.1 Introduction

Section 303(d) of the Clean Water Act (CWA) as amended by the Water Quality Act of 1987 and EPA's Water Quality Planning and Management Regulations [(Title 40 of the Code of Federal Regulations (CFR), Part 130)] require states to identify waterbodies that do not meet water quality criteria applicable to their designated use classifications. The identified waters are prioritized based on severity of pollution with respect to designated use classifications. TMDLs for all pollutants causing violation of applicable water quality criteria are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality criteria with seasonal variations and margins of safety. The TMDL process establishes the allowable loading of pollutants, or other quantifiable parameters for a waterbody, based on the relationship between pollution sources and instream water quality conditions, so that states can establish water-quality based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified Eightmile Creek as being impaired by pathogens for a length of 3.2 miles as reported on the 1998 §303(d) list of impaired waters. Gum Tree Branch is also listed as impaired by pathogens for a length of 2.2 miles. Table 2-1 shows characteristics of the listed segments.

Table 2-1 Segments on the 303(d) List Impaired by Pathogens

Waterbody Name (ID)	Support Status	Use Classification(s)	Sources of Impairment	Size (Miles)	Downstream/ Upstream Locations
Eightmile Creek (03160204-050_01)	Partial	Public Water Supply Fish & Wildlife	Urban runoff/ Storm sewers Collection system failure	3.2	AL Hwy. 45 / Highpoint Blvd.
Gum Tree Branch (03160204-050_02)	Non	Fish & Wildlife	Urban runoff/ Storm sewers Collection system failure	2.2	Eightmile Creek/ Its Source

The TMDLs developed for Eightmile Creek and Gum Tree Branch illustrate the steps that can be taken to address a waterbody impaired by pathogens. These TMDLs are consistent with a phased-approach: estimates are made of needed pollutant reductions, load reduction controls are implemented, and the water quality is monitored for plan effectiveness. Flexibility is built into the plan so that load reduction targets and control actions can be reviewed if monitoring indicates continuing water quality problems.

The U.S. Fish and Wildlife Service has noted that the endangered Alabama redbelly turtle (*pseudemys alabamensis*) may be found in Eightmile Creek and Gum Tree Branch.

2.2 Problem Definition

The Eightmile Creek watershed, including the Gum Tree Branch watershed, is approximately 37 square miles. The downstream portion of the watershed, including Gum Tree Branch, is heavily urbanized while the headwaters of Eightmile Creek originate in rural and suburban land.

For many years, both watersheds have experienced major and frequent sanitary sewer overflows (SSOs) from the collection systems of both the Prichard Water Works and Sewer Board and the Mobile Area Water and Sewer Service (MAWSS). In addition, Eightmile Creek has been impacted by illicit discharges of effluent pumped from septic tanks. High levels of fecal coliform bacteria have been measured at all sites in both watersheds.

Waterbodies Impaired: Eightmile Creek and Gum Tree Branch

Water Quality Criterion Violation: Bacteria

Pollutant of Concern: Fecal Coliform

Water Use Classification: Fish and Wildlife, and Public Water Supply

All of the Gum Tree Branch and part of the Eightmile Creek impaired stream segments are classified as Fish and Wildlife. Usage of waters in this classification is described in ADEM Admin. Code R. 335-6-10-.09(5)(a), (b), (c), and (d).

(a) Best usage of waters:

Fishing, propagation of fish, aquatic life, and wildlife, and any other usage except for swimming and water-contact sports or as a source of water supply for drinking or food processing purposes.

(b) Conditions related to best usage:

The waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs.

(c) Other usage of waters:

It is recognized that the waters may be used for incidental water contact and recreation during June through September, except that water contact is strongly discouraged in the vicinity of discharges or other conditions beyond the control of the Department or the Alabama Department of Public Health.

(d) Conditions related to other usage:

The waters, under proper sanitary supervision by the controlling health authorities, will meet accepted criteria of water quality for outdoor swimming

places and will be considered satisfactory for swimming and other whole body water-contact sports.

Alabama's water quality criteria document (ADEM Admin. Code R. 335-6-10-.09-(5)(e)(7.)) states:

"Bacteria of the fecal coliform group shall not exceed a geometric mean of 1,000/100 mL; nor exceed a maximum of 2,000/100 mL in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. For incidental water contact and recreation during June through September, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean fecal coliform organism density does not exceed 100/100 mL in coastal waters and 200/100 mL in other waters. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric mean fecal coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole body water-contact sports."

An impaired stream segment of Eightmile Creek from U.S. Highway 45 to its confluence with Gum Tree Branch is classified as Public Water Supply. Usage of waters in this classification is described in ADEM Admin. Code R. 335-6-10-.09(2)(a), (b), (c), and (d).

(a) Best usage of waters:

Source of water supply for drinking or food-processing purposes. In determining the safety or suitability of waters for use as sources of water supply for drinking or food-processing purposes after approved treatment, the Commission will be guided by the physical and chemical standards specified by the Department.

(b) Conditions related to best usage:

The waters, if subjected to treatment approved by the Department equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to remove naturally present impurities, and which meet the requirements of the Department, will be considered safe for drinking or food-processing purposes.

(c) Other usage of waters:

It is recognized that the waters may be used for incidental water contact and recreation during June through September, except that water contact is strongly discouraged in the vicinity of discharges or other conditions beyond the control of the Department or the Alabama Department of Public Health.

(d) Conditions related to other usage:

The waters, under proper sanitary supervision by the controlling health authorities, will meet accepted criteria of water quality for outdoor swimming places and will be considered satisfactory for swimming and other whole body water-contact sports.

Alabama's water quality criteria document (ADEM Admin. Code R. 335-6-10-.09-(2)(e)(7.)) states:

"Bacteria of the fecal coliform group shall not exceed a geometric mean of 1,000/100 ml; nor exceed a maximum of 2,000/100 mL in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. For incidental water contact and recreation during June through September, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean fecal coliform organism density does not exceed 100/100 mL in coastal waters and 200/100 mL in other waters. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric mean fecal coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole body water-contact sports."

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

The water quality target for pathogen TMDLs is determined by the stream's use classification and the water quality criteria described in Section 2.2. The water quality criteria for pathogens, or bacteria, in impaired segments are based on fecal coliform bacteria concentrations. Due to the potential for recreational contact in the summer months, there is a seasonal variation in the water quality criteria. The criteria consider two forms of compliance. First, the instantaneous fecal coliform concentration may not exceed a maximum of 2,000 per 100 mL. Second, the geometric mean of the fecal coliform concentration may not exceed 1,000 per 100 mL during November to May or 200 per 100 mL during June to September.

3.2 Source Assessment

A source assessment is an important part of defining the TMDL for any pollutant. The data and sources must be understood to be able to distinguish between point and nonpoint source impacts. Typically, point source impacts can be quantified through permit limits and/or direct measurements at a certain location. The potential for nonpoint source pollution can be assessed by examining the extent of human activity in a watershed. This nonpoint source assessment can include evaluation of maps of land use classification, population density, numbers of onsite wastewater systems, and the amount of agricultural activity.

3.2.1 General Sources of Fecal Coliform

Fecal coliform loadings originate from either point or nonpoint sources. A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source contributions can typically be attributed to the following sources:

- Municipal wastewater facilities,
- Municipal Separate Storm Sewers (MS4s),
- Illicit discharges, and
- Leaking or overflowing sewers.

Municipal wastewater treatment facilities are permitted through the National Pollutant Discharge Elimination System (NPDES). Larger treatment facilities have disinfection systems that remove fecal coliform bacteria in the effluent before it is discharged. Treatment facilities treat human waste received from the collection system and then discharge their effluent into a nearby stream.

Municipal Separate Stormwater Systems (MS4s) are point sources also regulated by the NPDES program. Discharge from stormwater pipes or conveyances potentially include urban runoff high in bacteria and other pollutants.

Illicit discharges are made when facilities or persons discharge fecal coliform bacteria without a permit, or violate their defined permit discharge limit by exceeding the fecal coliform concentration.

In urban settings, sewer lines typically run parallel to the stream in the floodplain. If there is a leaking or overflowing sewer line, high concentrations of fecal coliform can flow into the stream or leach into the groundwater. Groundwater monitoring wells can signal if there are leaking sewer lines contributing to the problem.

Nonpoint sources of fecal coliform bacteria do not have one discharge point, but rather, occur over the entire length of a stream or waterbody. On the land surface, fecal coliform bacteria accumulate over time and wash off during rain events. As the runoff transports the sediment over the land surface, more fecal coliform bacteria are collected and carried to the stream. While the concentrations of bacteria are accumulating, they also die and decay. The net loading into the stream is determined by the local watershed hydrology. Nonpoint sources of fecal coliform can be quantified from the following list of contributors:

- Urban runoff,

- Onsite wastewater (septic) systems in urban or rural areas,
- Wildlife in forested areas,
- Manure application to row crops and/or pasture, and
- Confined Animal Feeding Operations (CAFOs) and livestock grazing.

Fecal coliform loading from urban areas is potentially attributable to multiple sources, including storm water runoff, illicit discharges of sanitary waste, runoff from improper disposal of waste materials and domestic animals. Onsite wastewater (septic) systems are common in unincorporated areas, may exist in some urban areas, and may be direct or indirect sources of bacterial pollution via ground and surface waters. Onsite wastewater systems have the potential to deliver fecal coliform bacteria loads to surface waters due to system failure and malfunction.

Wildlife deposit feces onto land surfaces where it can be transported during storm events to nearby streams. Wildlife deposits can be from a wide range of species in Alabama, but the most common are deer, raccoons and waterfowl.

3.2.2 Point Sources in the Eightmile Creek Watershed

ADEM maintains a database of current NPDES permits and GIS files that locate each permitted outfall. This database includes municipal, semi-public/private, industrial, mining, and industrial storm water. For Eightmile Creek and Gum Tree Branch, there are no facilities permitted to discharge within the watersheds, although serving the area there are municipal sanitary sewer collection systems delivering waste to facilities discharging elsewhere. Table 3-1 shows the permitted municipal point sources in the watershed that have collection systems upstream of the impaired segments.

Table 3-1 Point Sources with Collection System Failures Within the Eightmile Creek Watershed, Including Gum Tree Branch

NPDES Permit	Type of Facility	Facility Name or Permittee	Significant Contributor of Fecal Coliform
AL0023205	Municipal	Prichard Carlos A. Morris WWTP	Yes
AL0055204	Municipal	Prichard Stanley Brooks WWTP	Yes
AL0020885	Municipal	Chickasaw Lagoon	No
AL0023094	Municipal	Mobile Smith WWTP	No
ALS000002	MS4	Mobile Co. Commission; City of Saraland; City of Creola; City of Pritchard; City of Saraland; City of Satsuma; City of Chickasaw; AL DOT	Yes*
ALS000007	MS4	City of Mobile; AL DOT	Yes*

* Note: In the MS4 service area, pollutant loads which could include urban runoff and/or failing septic systems are considered in the Load Allocations. Unpermitted sources such as illicit discharges and sanitary sewer overflows have a 100% reduction and are not considered part of the Wasteload Allocations or Load Allocations.

The two municipal wastewater plants operated by the Prichard Water Works and Sewer Board are the Carlos A. Morris WWTP and the Stanley Brooks WWTP. The Brooks plant is located within the Eightmile Creek watershed, but discharges into Chickasaw Creek upstream of the confluence with Eightmile Creek. The Morris WWTP is located to the south and discharges into Threemile Creek. In addition, the Mobile Smith WWTP, operated by MAWSS, receives wastewater from a collection system partially located within the Eightmile Creek watershed. Table 3-2 contains the permit limitations for the point sources that have collection systems within the Eightmile Creek and Gum Tree Branch watersheds. Figure 3-1 shows the location of each facility serving areas within the impaired watershed.

Table 3-2 NPDES Permit Limits for Point Sources

NPDES Permit	Facility Name or Permittee	Flow (mgd)	Receiving Waterbody
AL0023205	Prichard Carlos A. Morris WWTP	4.0	Threemile Creek
AL0055204	Prichard Stanley Brooks WWTP	1.5	Chickasaw Creek
AL0020885	Chickasaw Lagoon	1.5	Chickasaw Creek
AL0023094	Mobile Smith WWTP	12.8	Threemile Creek
ALS000002	Mobile County Commission and associated permittees (see Table 3-1)	---	Numerous
ALS000007	City of Mobile and AL DOT	---	Numerous

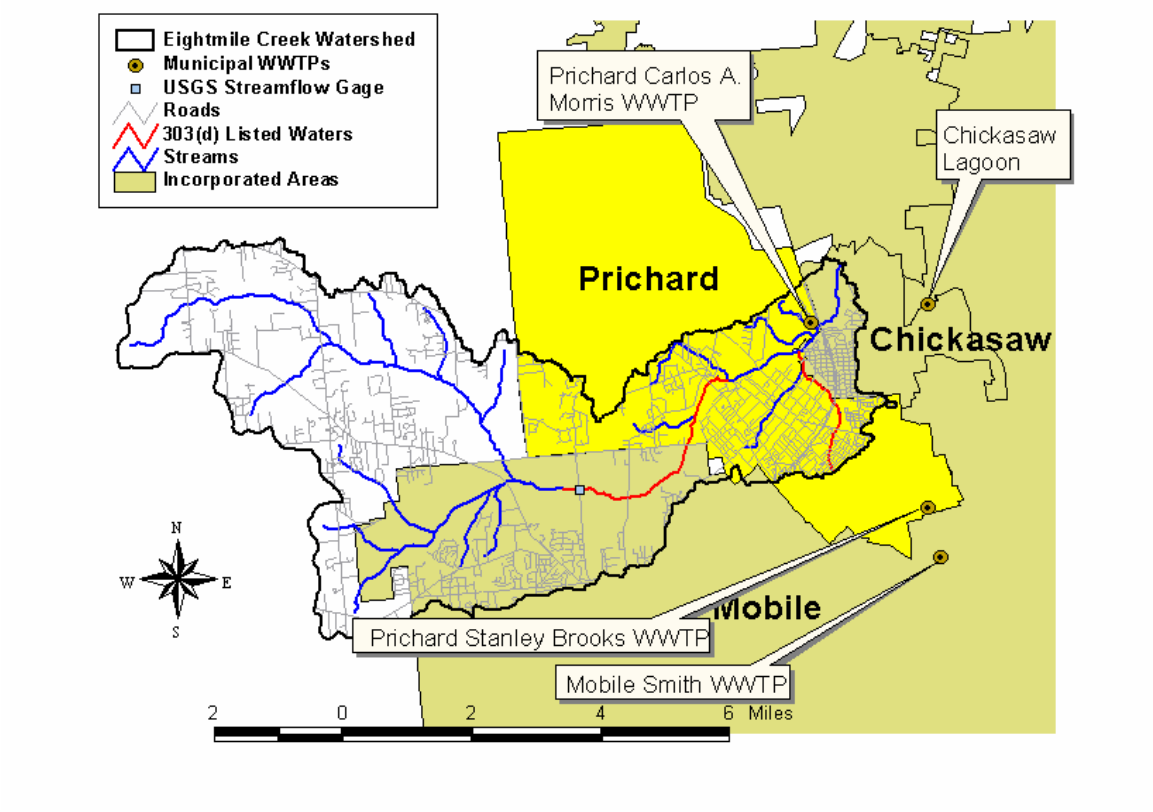


Figure 3-1 Municipal WWTPs with Collection Systems in the Eightmile Creek Watershed, Including Gum Tree Branch

Although all of the municipal plants serving the Eightmile Creek and Gum Tree Branch watershed discharge to other waterbodies, their collection systems have failed frequently, resulting in overflows and leaks discharging untreated sewage to drainage ditches and streams draining to the impaired segments. Collection system operators are required to report these non-permitted discharge events to ADEM.

Figure 3-2 shows sanitary sewer overflows from the Prichard and MAWSS collection systems from 1997 to April 2002. A list of these overflows as reported to ADEM is shown in Appendix 9.3 in Tables 9-5 and 9-6.

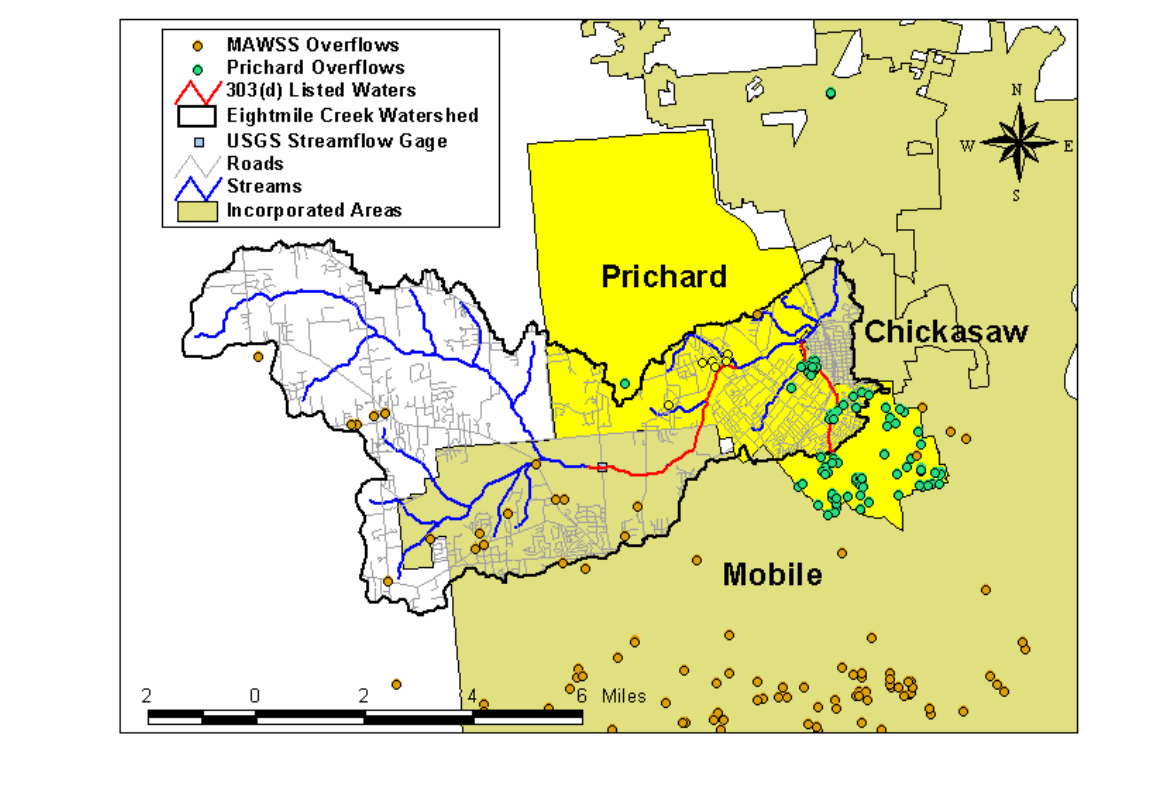


Figure 3-2 Sanitary Sewer Overflows Reported from 1997 to April 2002

Based upon the reports, the overflow events shown in Figure 3-2 resulted from blockage in lines due to grease, infiltration and inflow due to heavy rain, and pump failure.

The Prichard Water Works and Sewer Board was served with a Consent Decree handed down in the Mobile County Circuit Court in December 1996 requiring the Board to take "all appropriate steps necessary to eliminate further non-permitted discharges of untreated or partially treated wastewater (ADEM, 1997)." Furthermore, MAWSS was also served with a Consent Decree signed in April 2002. The MAWSS Consent Decree is discussed in further detail in Section 6.2.

It is believed that overflows from municipal collection systems are the greatest source of fecal coliform bacteria in the Prichard reaches of Eightmile Creek watershed, including Gum Tree Branch.

3.2.3 Nonpoint Sources in the Eightmile Creek Watershed

Urban land areas are a potential source of fecal coliform runoff from failing septic systems, failing sanitary sewer collection systems, urban animals, and illicit discharges. As shown in Table 3-3, the urban component is 14 percent of the land use. The land use coverage is dominated by forest at 57 percent with row crops and pasture comprising the rest at 7 percent and 18 percent, respectively. Table 3-3 displays all of the land use coverages by subwatershed. Figure 3-3 shows the distribution of the land use for areas contributing to Eightmile Creek and Gum Tree Branch. The Gum Tree Branch watershed includes subwatersheds 2, 3, and 4 in Table 3-3 and Figure 3-4.

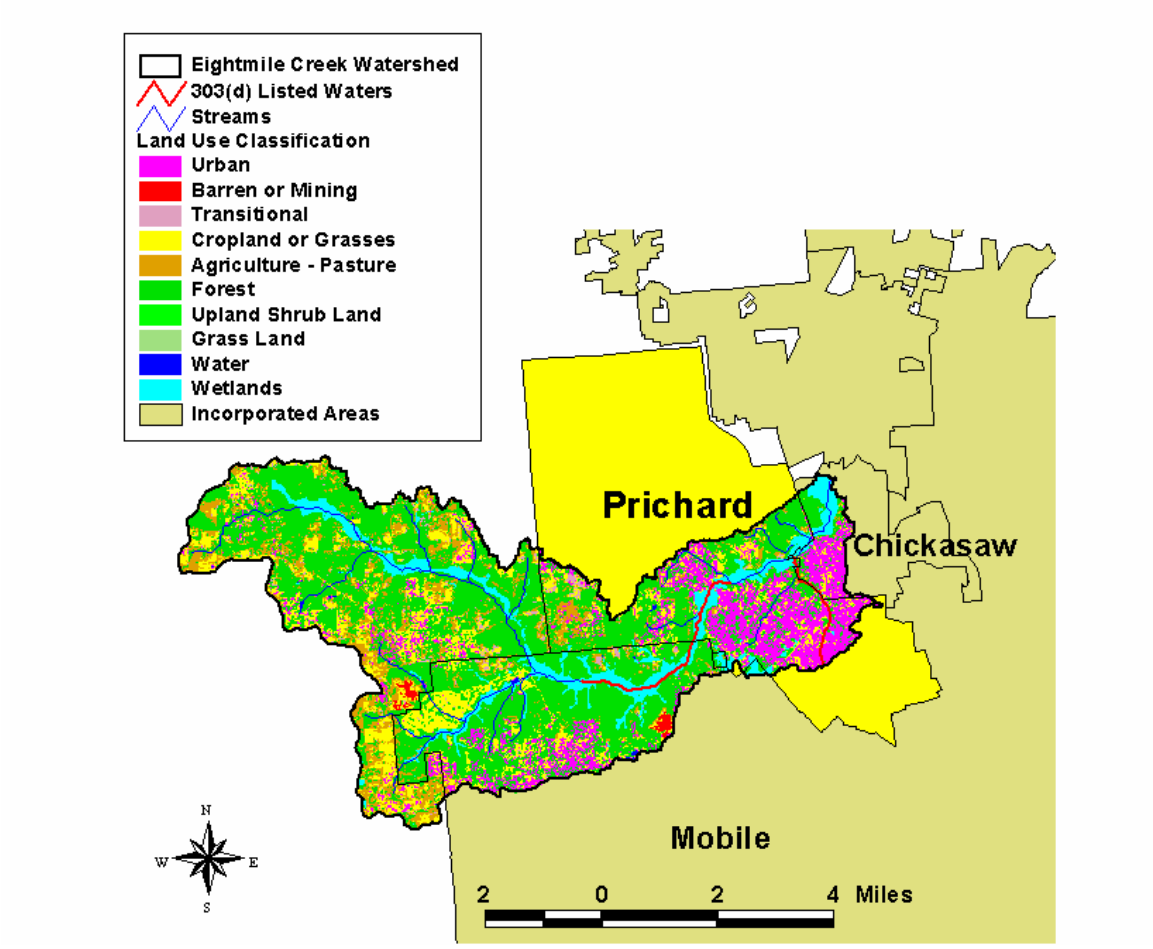


Figure 3-3 Land Use Classification of the Eightmile Creek Watershed, Including Gum Tree Branch

Table 3-3 Land Use Distribution in the Eightmile Creek Watershed, Including Gum Tree Branch

Subwatershed	Crop-land	High Density Urban	High Density Residential	Low Density Residential	Bare Rock/ Mining	Trans-itional	Forest	Pasture	Water	Total Acres
1	23.13	8.01	44.26	117.87	7.78	36.47	773.49	94.07	0.00	1105
2 (Gum Tree Br)	0.44	1.33	6.89	29.36	0.00	4.23	29.36	4.67	0.00	76
3 (Gum Tree Br)	18.90	14.90	60.71	246.86	12.90	47.15	547.76	204.60	0.00	1154
4 (UT to Gum Tree Br)	26.69	132.32	216.39	617.81	8.01	45.37	253.08	153.01	0.00	1453
5	10.90	44.48	56.27	184.59	2.00	17.57	139.44	52.04	0.00	507
6	26.02	28.24	42.25	227.73	14.46	48.04	740.13	157.68	5.12	1290
7	62.49	30.25	17.57	116.31	88.74	65.16	1770.03	203.71	11.12	2365
8	70.72	26.91	18.68	201.49	41.59	64.27	874.23	231.51	0.00	1529
9	595.57	54.49	49.82	349.38	112.53	169.69	2393.63	1424.43	11.34	5161
10	288.00	37.36	19.13	118.54	115.64	203.27	2650.94	873.79	0.22	4307
11	175.47	20.91	0.44	55.15	32.02	81.84	911.82	360.95	7.12	1646
12	318.47	14.68	0.89	34.03	57.16	160.35	1937.72	537.97	4.00	3065
Total Acres	1616.80	413.88	533.30	2299.11	492.83	943.40	13021.61	4298.43	38.92	23658
Percentage	**7%**	**2%**	**2%**	**10%**	**2%**	**4%**	**55%**	**18%**	**0%**	**100%**

The anthropogenic inputs of fecal coliform can be categorized by estimates of the population connected to sewer in addition to the population with onsite wastewater (septic) systems. The population data are summarized by city in Table 3-4 from US Census resources. Table 3-5 summarizes the US Census information by tract and lists the number of septic systems within each subwatershed from the 1990 Census reports. Figure 3-4 shows the US Census tracts to correspond with Table 3-5. Given the percent of population change in the area, the 2000 population and number of septic systems are estimated by tract for each subwatershed, Figure 3-6, and presented in Table 3-6. If the population decreased between 1990 and 2000, the number of septic systems was assumed to be constant for this analysis.

Table 3-4 Population Data for the Eightmile Creek Watershed*

Municipal Designation	1990 Population	2000 Population	% Change
City of Prichard	34,311	28,633	-16.50%
City of Mobile	196,278	198,915	1.30%
City of Chickasaw	6,649	6,364	-4.30%
City of Saraland	11,751	12,288	4.60%
Unincorporated County	114,711	137,767	20.10%
Mobile County	378,643	399,843	5.60%

*Data provided by the Mobile County Chamber of Commerce based on US Census Bureau data.

Table 3-5 Number of Septic Systems in 1990 by US Census Tract

Census Tract	1990 Population	Persons per Household	Number of Housing Units	Using Public Sewer	Onsite Wastewater System	Other	Area (sq. mi.)	2000 Population*
34.01	780	2.79	296	255	41	0	2.0	790
34.02	2,752	2.82	1,007	784	223	0	3.5	2,789
34.04	2,455	2.84	921	779	142	0	0.9	2,488
34.05	2,040	2.72	754	711	43	0	0.8	2,067
34.07	6,165	2.91	2,249	743	1,498	8	8.4	6,248
34.08	3,789	2.82	1,409	1300	109	0	3.1	3,840
40	4,957	3.08	1,812	1776	31	5	0.7	4,137
48	3,258	3.04	1,345	1329	11	5	0.8	2,719
49	4,688	3.00	1,666	1546	106	14	2.0	3,912
50	2,179	2.96	822	792	30	0	1.2	1,818
51	1,581	2.65	640	630	10	0	0.4	1,513
53	2,393	2.22	1,093	1086	7	0	2.1	2,290
61.01	8,745	2.97	3,118	650	2,461	7	75.1	7,298
61.02	2,987	2.92	1,132	103	1,023	6	10.4	2,493
61.03	3,446	3.09	1,197	156	1,019	22	6.5	2,876
63.01	5,621	2.98	1,972	61	1,881	30	33.0	6,751
63.02	4,483	2.98	1,566	124	1,428	14	11.4	5,384
64.02	4,368	3.05	1,582	178	1,379	25	6.2	5,246
161.03	1,372	2.79	506	124	382	0	1.3	1,145

*Estimated

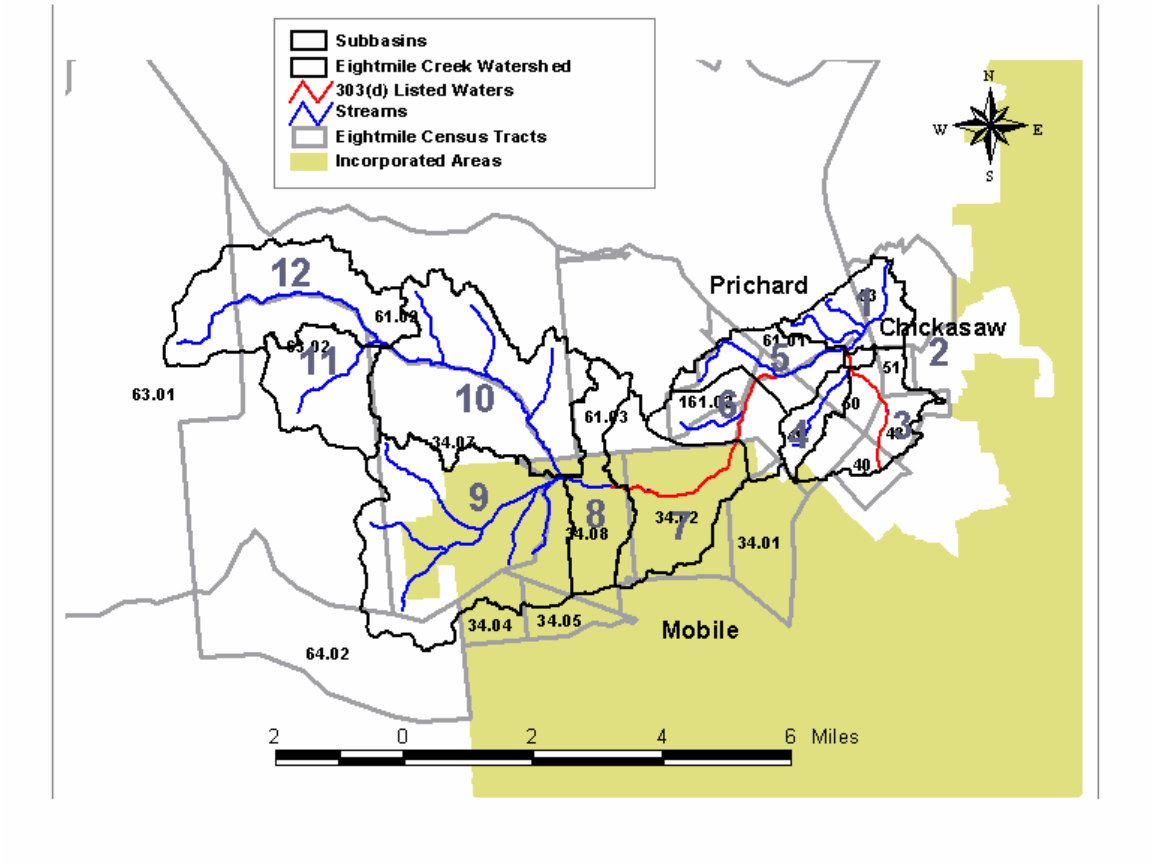


Figure 3-4 US Census Tracts Used for Estimating the Number of Septic Systems

Table 3-6 Number of Septic Systems by Subwatershed

Subbasin	1990 Population	Number of Housing Units	Using Public Sewer	Septic System	Other	2000 Population*	2000 Septic System*
1	1,273	558	527	31	0	1,188	31
2	216	82	79	3	0	180	3
3	8,305	3,204	3,122	72	10	7,071	72
4	1,721	621	582	35	4	1,437	35
5	1,943	708	479	226	3	1,622	226
6	2,437	875	550	319	6	2,065	319
7	2,855	1,041	765	275	2	2,840	275
8	2,391	879	697	179	3	2,350	179
9	7,147	2,622	1,348	1,266	8	7,371	1305
10	3,506	1,291	385	900	6	3,362	900
11	1,028	360	33	324	3	1,226	388
12	1,354	493	40	449	4	1,387	460

*Estimated

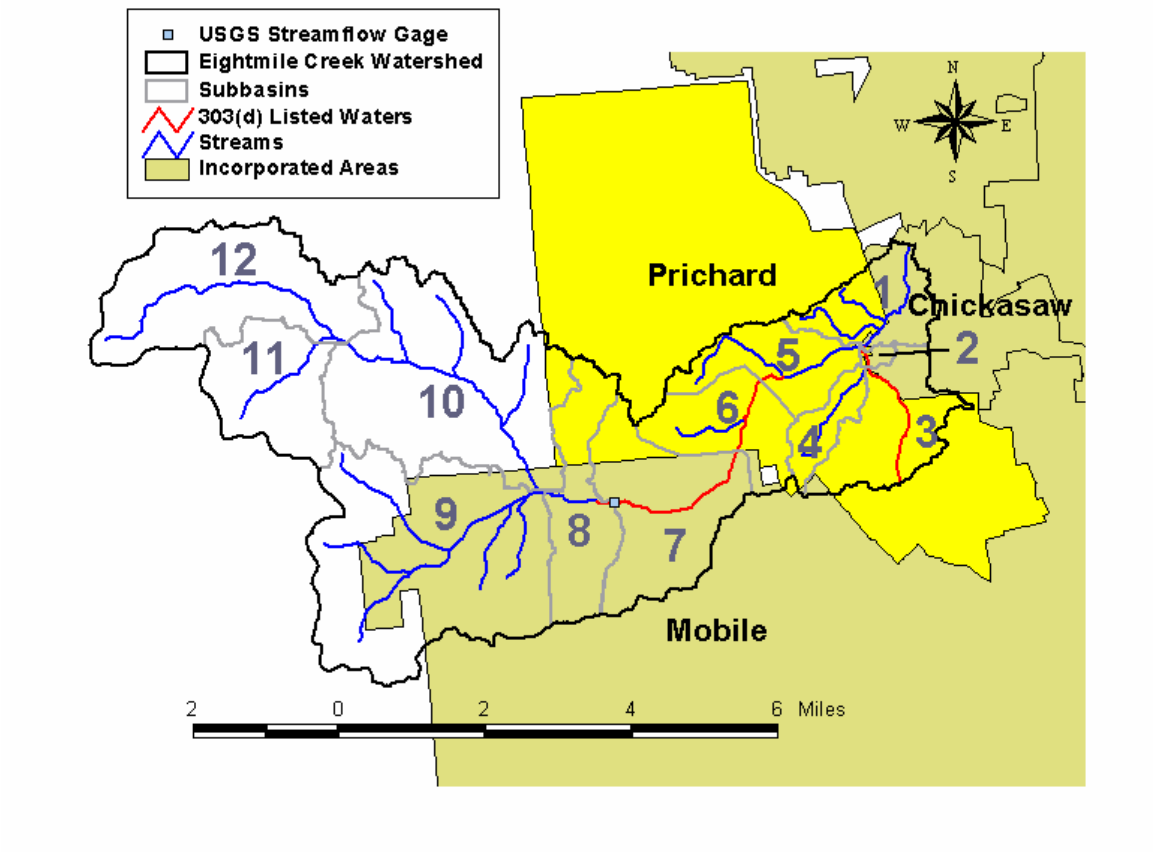


Figure 3-5 Subwatersheds Used for Estimating the Number of Septic Systems

Sanitary sewer overflows are a predominant source of fecal coliform into Eightmile Creek and the Gum Tree Branch. Due to the large contribution of loadings into the system, an inventory of reported overflows were summarized into Tables 3-7 and 3-8. Figure 3-6 shows pictures of an overflow event captured by ADEM on the Gum Tree Branch in 1998.

Figure 3-6 Gum Tree Branch Sanitary Sewer Overflows

Table 3-7 Reported Events and Estimated Volumes of Sanitary Sewer Overflows

YEAR	Gum Tree Branch		Eightmile Creek	
	No. of Reported Overflows	Volume (gallons)	No. of Reported Overflows	Volume (gallons)
1996	1	40,000		
1997	12	1,985,000	2	31,200
1998	3	138,000	2	26,750
1999	2	21,000	2	19,000
2000	10	423,000	7	24,300
2001	1	500	11	40,139
2002	4	21,000	4	8,320

Table 3-8 Reported Causes for Sanitary Sewer Overflows in 2000 and 2001

Reporting Agency Reason for Spill	Prichard		MAWSS	
	Number of Spills	Percent of Total	Number of Spills	Percent of Total
Infiltration & Inflow	55	44	79	33.8
Grease / Blockage	26	20.8	109	46.6
Broken Line	21	16.8	38	16.2
Pump Station Failure	19	15.2	8	3.4
Other	4	3.2	0	0.0
Total	125	100	234	100

3.3 Loading Capacity – Linking Numeric Water Quality Targets and Pollutant Sources

EPA regulations define the TMDL loading, or assimilative capacity, as the greatest amount of loading that a waterbody can receive without violating water quality criteria (40 CFR Part 130.2(f)). TMDL endpoints represent the instream water quality targets used in quantifying TMDLs and their individual components.

The endpoints for the Eightmile Creek and Gum Tree Branch TMDLs are the fecal coliform water quality criteria. The maximum instantaneous concentration is 2,000 counts per 100 mL. The maximum geometric mean is 1,000 counts per 100 mL from October through May, and 200 counts per 100 mL from June through September.

In the TMDL analysis, a loading curve approach was developed as a result of the sufficient amount of data and information available in the watershed. With the known sources of fecal coliform loads such as septic system failures, sanitary sewer overflows, leaking sewer lines, and illicit discharges, a loading curve was the most appropriate method of analyzing existing data on a consistent scale (load duration). The sources of fecal coliform mentioned above are events that

cannot be predicted through modeling or statistical methods; therefore, a more data-based approach was selected.

For Eightmile Creek and the Gum Tree Branch, an instantaneous fecal coliform load was selected as the appropriate endpoint for the TMDL. Geometric mean data were collected during 1996, 1997, and 1998, on Eightmile Creek but the violations of the instantaneous versus the geometric mean were more prevalent during 1996 and 1997. Even though the 1998 dataset was limited, the existing loads were included in the loading curve approach. For these two TMDLs, a reduction based on the geometric mean criteria would not be protective of the instantaneous criteria for the critical conditions period. Therefore, the TMDL is expressed as counts per day based on the instantaneous criteria.

3.4 Data Availability and Analysis

A wide range of data and information were used to characterize the Eightmile Creek watershed and instream conditions. The categories of data used include physiographic data that describe the physical conditions of the watershed, environmental monitoring data that identify potential pollutant sources and their contribution, and instream water quality monitoring data.

Digital Elevation Maps (DEMs) by USGS were used in the hydrology model to calculate longitudinal stream slopes. Figure 3-7 shows the elevations in the Eightmile Creek watershed.

Data were retrieved from ADEM and from volunteer monitoring water quality studies conducted the in Mobile Bay basin. The primary water quality stations for the TMDL analyses are shown in Figure 3-8. Long-term hourly rainfall collected at the National Climatic Data Center (NCDC) weather station located at the Mobile Regional Airport was applied in this TMDL.

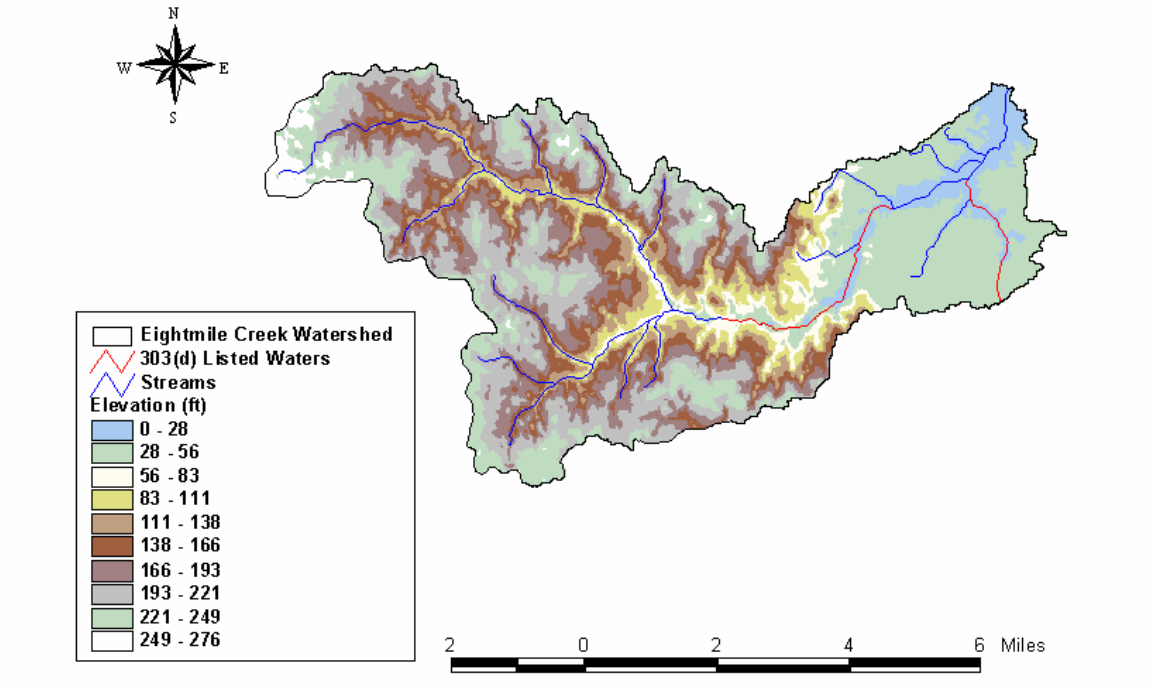


Figure 3-7 Digital Elevation Model (DEM) for the Eightmile Creek Watershed

USGS Station No. 0247100500 collected daily flow data from 1996 to 2000 in Eightmile Creek at High Point Boulevard. ADEM performed three water quality assessments that are being used to develop these TMDLs. The studies are as follows:

- Eightmile Watershed Assessment, ADEM Mobile Field Operations, 1998,
- Prichard Water Supply Study, ADEM Mobile Field Operations, 1996-1997, and
- Chickasaw Creek Watershed Study, ADEM Mobile Field Operations, 1996.

Figures 9-1 through 9-3 show the locations of the stations for each of the studies mentioned above. The data used in the TMDLs are presented in Tables 9-1 through 9-4. Table 9-1 summarizes the water quality stations by year and shows the overlapping (or duplicate) station identifications for each of the studies. These data were used in developing fecal coliform loading curves for geometric means and seasonal concentrations. Figure 3-8 combines the water quality stations from the three studies during 1996 through 1998.

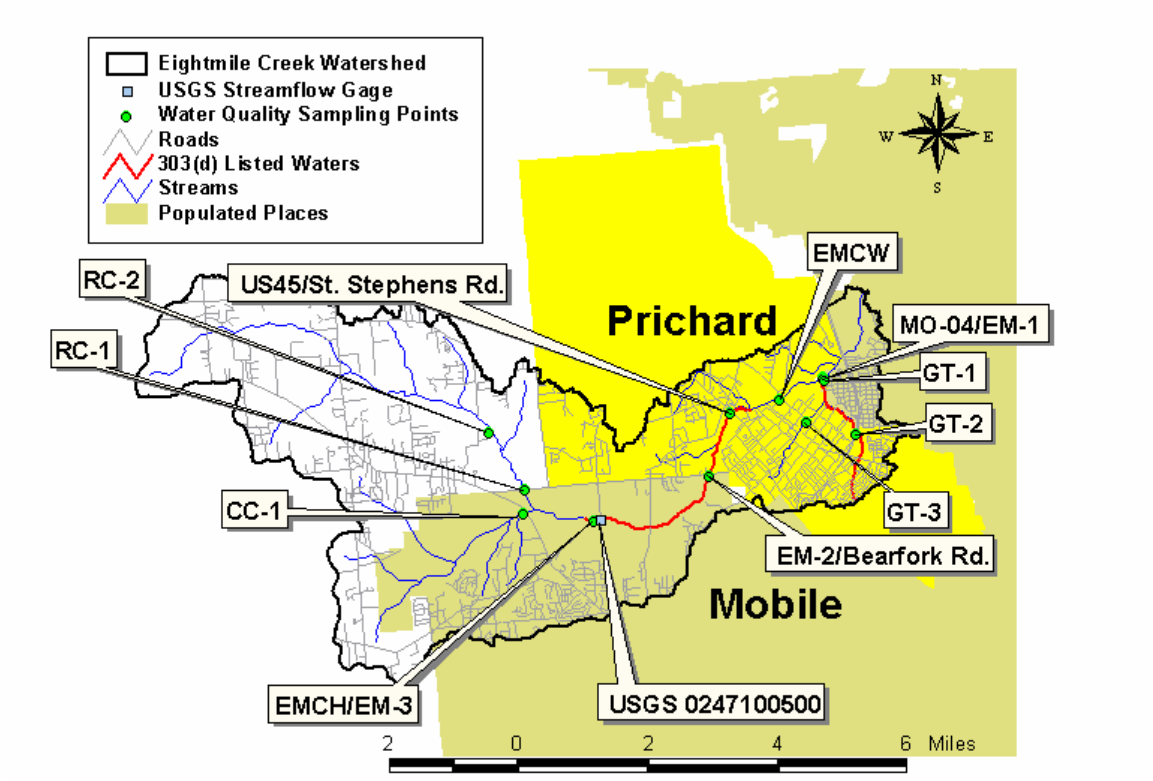


Figure 3-8 Locations of Flow and Fecal Coliform Stations in the Eightmile Creek Watershed

The significance of illicit discharges to fecal coliform loading is stated in *A Survey of The Chickasaw Creek Watershed* (ADEM, 1997):

"During the course of the survey of the CCW, personnel of the Mobile Branch of ADEM and the U.S. Department of Justice conducted an investigation of illegal discharges of wastes from a septic tank pump-out operation to Red Creek, a tributary of Eightmile Creek, off Schillinger Rd. Agents from the Federal Bureau of Investigation (FBI) and field investigators from ADEM documented the discharge of thousands of gallons of untreated septic tank wastes from pump-out trucks which by law should have been transported to a wastewater treatment plant for proper disposal. Discharge of such materials presents a threat for exposing swimmers downstream to serious threats from pathogenic bacteria and viruses. The investigation led to convictions and incarcerations for those involved with the crime."

ADEM has seen evidence of recent illegal dumping, but was unable to apprehend the violator.

Water Quality monitoring data from 1997 and 1998 were also collected for a Prichard Water Supply study. Many of the fecal coliform data collected where reported as TNTC or Too Numerous To Count. In the data analysis, these samples were assumed to be greater than 1,000,000 counts/100 mL.

The potential for leaking or failing onsite septic systems was assessed by using the census data for household wastewater disposal extrapolated to the delineated subbasins. A typical septic flow rate of 70 gal/person/day and an average fecal coliform concentration reaching the stream (from septic overcharge) of 10000 colonies/100 mL was assumed (Horsely & Whitten, 1996). It was estimated that perhaps 10 percent of existing septic systems might be failing due to system age and improper maintenance. The results are shown in Table 3-9.

Table 3-9 Fecal Coliform Loads Due to Failing Septics

Subwater-shed	2000 Population	2000 Onsite Wastewater System	Failing Septic	People Served	Septic Flow (gal/day)	Fecal Load (counts/day)	Fecal Load (counts/yr)
1	1188	31	3	8	563	2.13E+08	7.78E+10
2	180	3	0	0	0	0	0
3	7071	72	7	21	1482	5.61E+08	2.05E+11
4	1437	35	4	10	727	2.75E+08	1.00E+11
5	1622	226	23	68	4726	1.79E+09	6.53E+11
6	2065	319	32	94	6550	2.48E+09	9.05E+11
7	2840	275	28	79	5503	2.08E+09	7.60E+11
8	2350	179	18	52	3665	1.39E+09	5.06E+11
9	7371	1305	130	380	26598	1.01E+10	3.67E+12
10	3362	900	90	263	18396	6.96E+09	2.54E+12
11	1226	388	39	122	8510	3.22E+09	1.18E+12
12	1387	460	46	135	9472	3.59E+09	1.31E+12

*Estimated

Figures 3-9 and 3-10 show the fecal coliform measurements on Eightmile Creek for 1996 and 1997, respectively. The fecal coliform data are plotted versus rainfall measured at the Mobile Airport for the same time period.

Hurricane Danny reached the Gulf of Mexico shoreline on July 18, 1997. Precipitation data collected at the Mobile International Airport during Hurricane Danny is illustrated in Figure 3-10, when the rainfall reached a maximum of approximately 10 inches per day. It is interesting to note that the fecal coliform concentrations were elevated for several weeks before the hurricane landed on the coast of Alabama and Mississippi. Additionally, the fecal concentrations remained elevated through the end of August 1997.

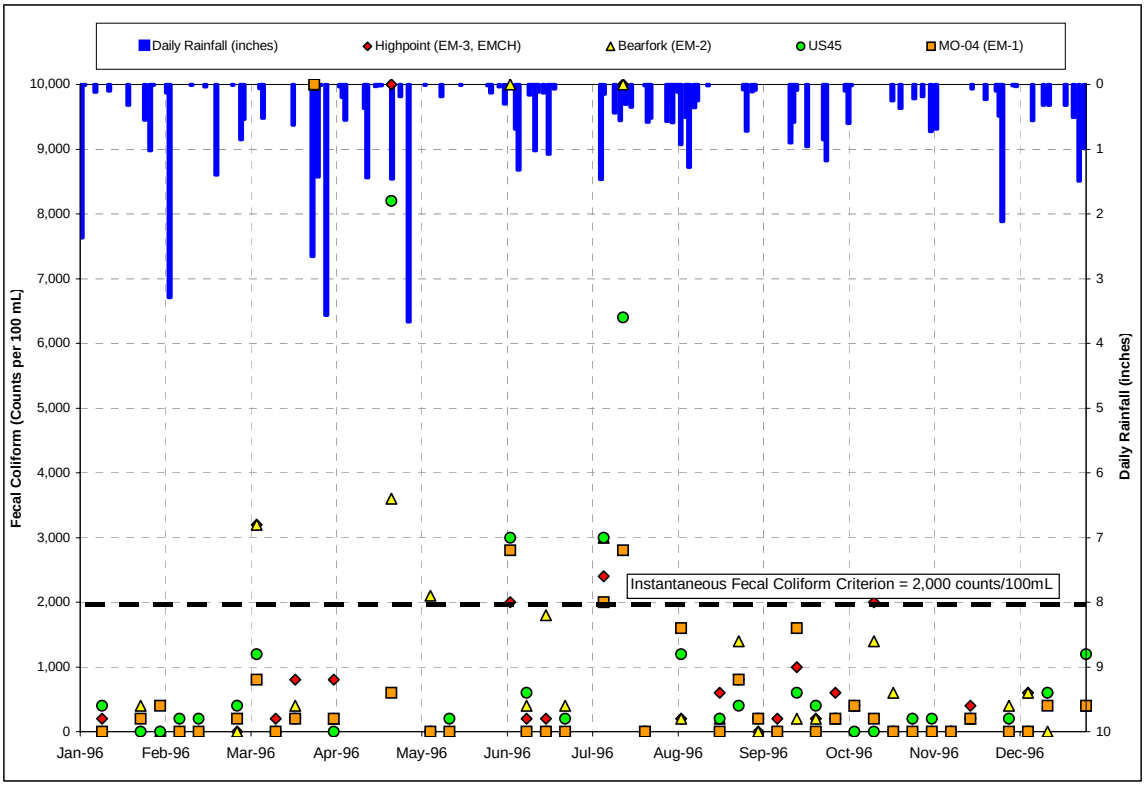


Figure 3-9 Fecal Coliform Data on Eightmile Creek versus Rainfall for 1996

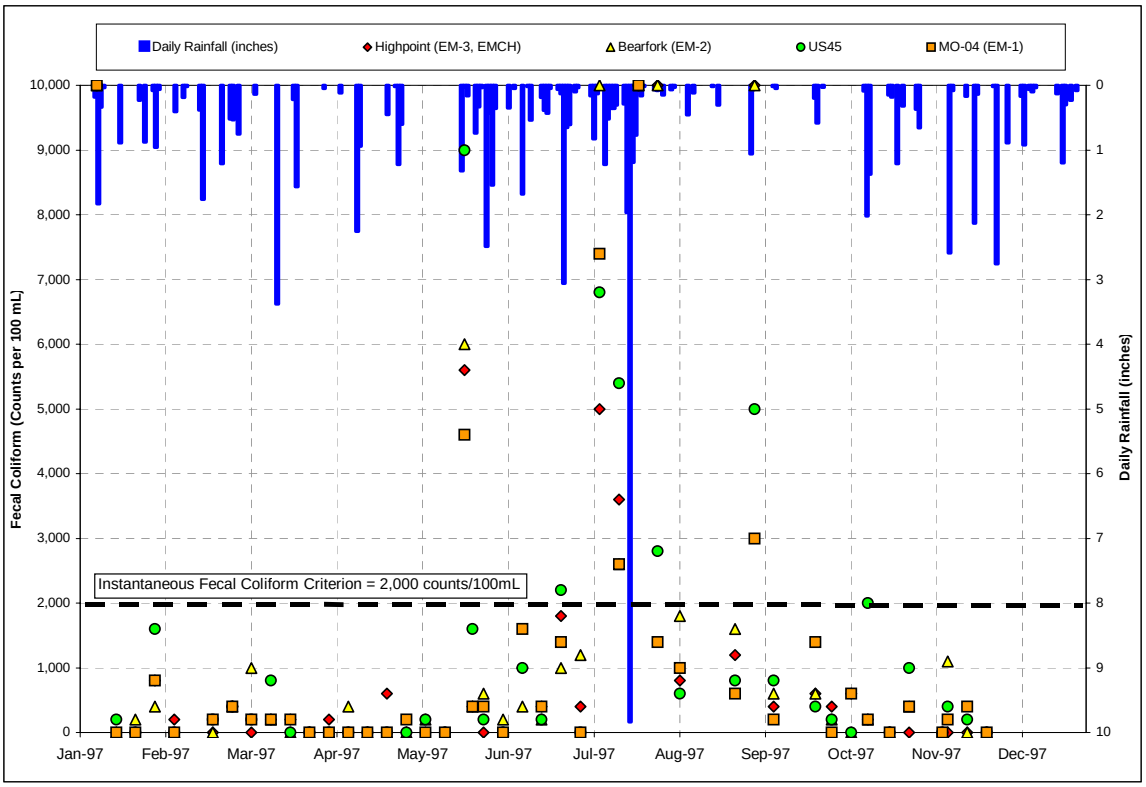


Figure 3-10 Fecal Coliform Data on Eightmile Creek versus Rainfall for 1997

3.5 Critical Conditions

The critical conditions for nonpoint source fecal coliform loading typically can occur during two time periods. One critical conditions scenario is an extended dry period followed by a rainfall runoff event. During the dry weather period, fecal coliform bacteria builds up on the land surface and is washed off by rainfall. The other critical conditions for point and direct sources (failing septic systems, leaking sewer lines, and illicit discharges) occur during periods of low stream flow when dilution is minimized. The one exception is sanitary sewer overflows, which are caused by groundwater infiltration, and inflow to the wastewater collection and treatment system following runoff events.

3.6 Margin of Safety (MOS)

There are two methods for incorporating a MOS in the analysis: 1) implicitly incorporate the MOS using conservative model assumptions to develop allocations, or 2) by explicitly specifying a portion of the TMDL as the MOS and using the remainder for allocations.

An explicit MOS was incorporated in this TMDL. The explicit MOS includes the uncertainty of the fecal coliform data used in this analysis and the uncertainty of selecting an appropriate critical condition from the existing fecal coliform loads. A margin of safety was applied to the TMDL by reducing the criterion concentration by ten percent and calculating a load duration target with measured flow data. For the instantaneous criterion, a target concentration of 1,800 counts per 100mL was used instead of 2,000 counts per 100mL. The winter and summer geometric mean criteria were also reduced by ten percent to achieve the target concentrations of 900 and 180 counts per 100mL, respectively.

4.0 Hydrology and Loading Curve Development

Establishing the relationship between instream water quality and source loading is an important component of TMDL development. It allows the determination of the relative contribution of sources to total pollutant loading and the evaluation of potential changes to water quality resulting from implementation of various management options. This relationship can be developed using a variety of techniques ranging from qualitative assumptions based on scientific principles to numerical computer modeling. For these applications, a hydrology model in combination with the loading curve approach was selected to determine the TMDLs for Eightmile Creek and Gum Tree Branch. In this section, the loading curve approach is discussed to present the existing and allocated loads for the system.

4.1 Hydrology Model Selection and Setup

Based on the considerations described above, analysis of the monitoring data, review of the literature, and past fecal coliform modeling experience, the Loading Simulation Program C++ (LSPC) was used to represent the hydrological conditions in the Eightmile Creek watershed. LSPC is a comprehensive data management and modeling system capable of representing loading from nonpoint and point sources found in the Eightmile Creek watershed and simulating instream processes.

LSPC is a system designed to support TMDL development for areas impacted by nonpoint and point sources. The most critical component of LSPC to TMDL development is the dynamic watershed model, because it provides the linkage between source contributions and instream response. The comprehensive watershed model is used to simulate watershed hydrology and pollutant transport as well as stream hydraulics and instream water quality. It is capable of simulating flow, sediment, metals, nutrients, pesticides and other conventional pollutants, as well as temperature and pH for pervious and impervious lands and waterbodies. LSPC was configured for the Eightmile Creek watershed to simulate a series of hydrologically connected subwatersheds. Configuration of the model involved subdivision of the Eightmile Creek watershed into modeling units and continuous simulation of flow for these units using meteorological, land use, point source loading and stream data. For these TMDL applications, the only simulated variable in the model was flow. Fecal coliform was not modeled in LSPC due to the episodic nature of the overflow events and unmonitored sources such as septic systems, leaking sewer lines, and illicit discharges.

4.1.1 Hydrology Model Summary

The hydrology was calibrated for a 4-year period from October 1996 through September 2000, comparing model predictions to daily mean flow values measured at the USGS streamflow gage at High Point Boulevard (Station 0247100500). The location of the USGS gage is shown in Figure 3-8. Model parameters used to represent characteristic soil types and variables in the hydrologic cycle were adjusted until acceptable agreement was achieved between simulated flows and historic streamflow data from the USGS gaging station. Model parameters adjusted include: evapotranspiration, infiltration, upper and lower zone storage, groundwater storage, recession, losses to the deep groundwater system, and interflow discharge.

4.2 Loading Curve Methodology

A loading curve approach was applied to develop the fecal coliform TMDLs for Eightmile Creek and Gum Tree Branch. This approach utilizes existing fecal coliform and flow data in the basins to calculate load duration curves to develop the TMDL. The following reasons specific to the Eightmile Creek watershed can support the use of a loading curve for these TMDLs:

- Existing USGS flow gage at the upstream point of the impaired segment of Eightmile Creek (see Figure 3-8).
- Intensive ADEM study during 1997 and 1998 to collect geometric mean and instantaneous fecal coliform data.
- Local datasets and information to help characterize the watershed and determine potential sources of fecal coliform.
- Calibrated hydrology model for the basin to appropriately simulate subwatershed flows in Gum Tree Branch.
- The known sources are not all influenced by predictable hydrological or meteorological events.

Therefore, the loading curve approach was determined to be the most appropriate and technically defensible approach for the application of these TMDLs. The source assessment information in Section 3.2 was used to help identify the leading contributors to the impairments and justify the required reductions.

For these TMDLs, the loading curve methodology required the following information:

- Existing fecal coliform measurements (geometric mean or instantaneous),
- USGS flow measurements or simulated flow values, and
- Instream fecal coliform criteria.

The TMDL is simply the flow multiplied by the instream criterion. Figure 4-1 shows three loading curves, one for each of the three criteria that would be applicable to the designated uses on these streams. The designated uses are Public Water Supply and Fish and Wildlife, which have the same fecal coliform criteria. In this analysis, the flow was provided from the USGS flow gage and was ranked as an exceedance probability. The exceedance probability would indicate the percentage of time in days that the flow (or load) is exceeded. This is a useful technique in examining loading events because it shows the load magnitude and also reveals the corresponding hydrological event. Therefore, since the load is the daily flow record multiplied by the instream fecal coliform criteria, the instream fecal coliform load is compared to the TMDL for that flow. The flow duration, or load duration, curve was developed for the time period of October 1996 through September 2000. Once the TMDL curve was established, the existing data were plotted with the appropriate curve based on the season and type of fecal coliform data collected. Due to the sufficient amount of fecal coliform data, the following three comparison plots were developed:

1. October to May, Geometric Mean (Figure 4-2),
2. June to September, Geometric Mean (Figure 4-3), and
3. Instantaneous All Year (Figure 4-4).

Figure 4-2 shows the existing geometric data versus the TMDL curve and demonstrates that there is only one exceedance of the loading capacity of Eightmile Creek. Typically,

there would be more dilution and more assimilative capacity during the winter periods because of more runoff. In contrast, runoff during the summer months (as shown in Figure 4-3), demonstrates that there are a considerable number of existing loads higher than the TMDL curve. The instantaneous comparison in Figure 4-4 shows that there are loads at the high and low flow time periods that are not meeting the instream criteria; therefore, these have a higher load than is allowable for the system.

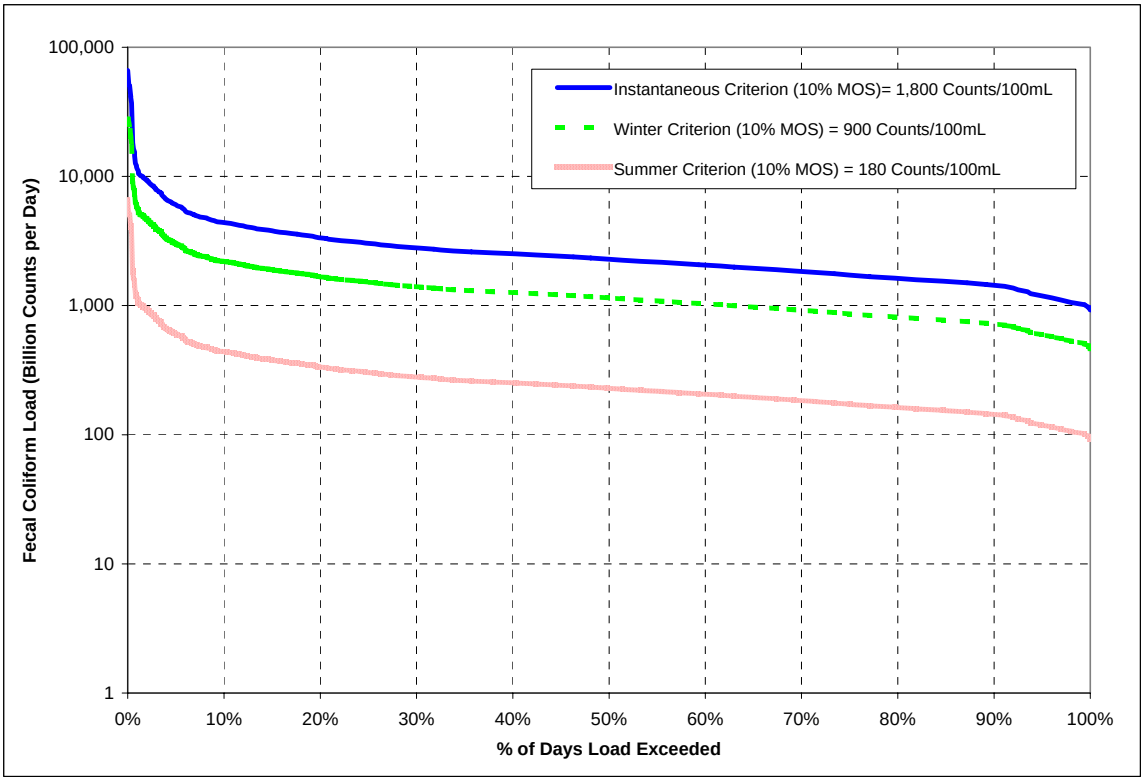


Figure 4-1 TMDL Loading Curves for the Eightmile Creek Segment

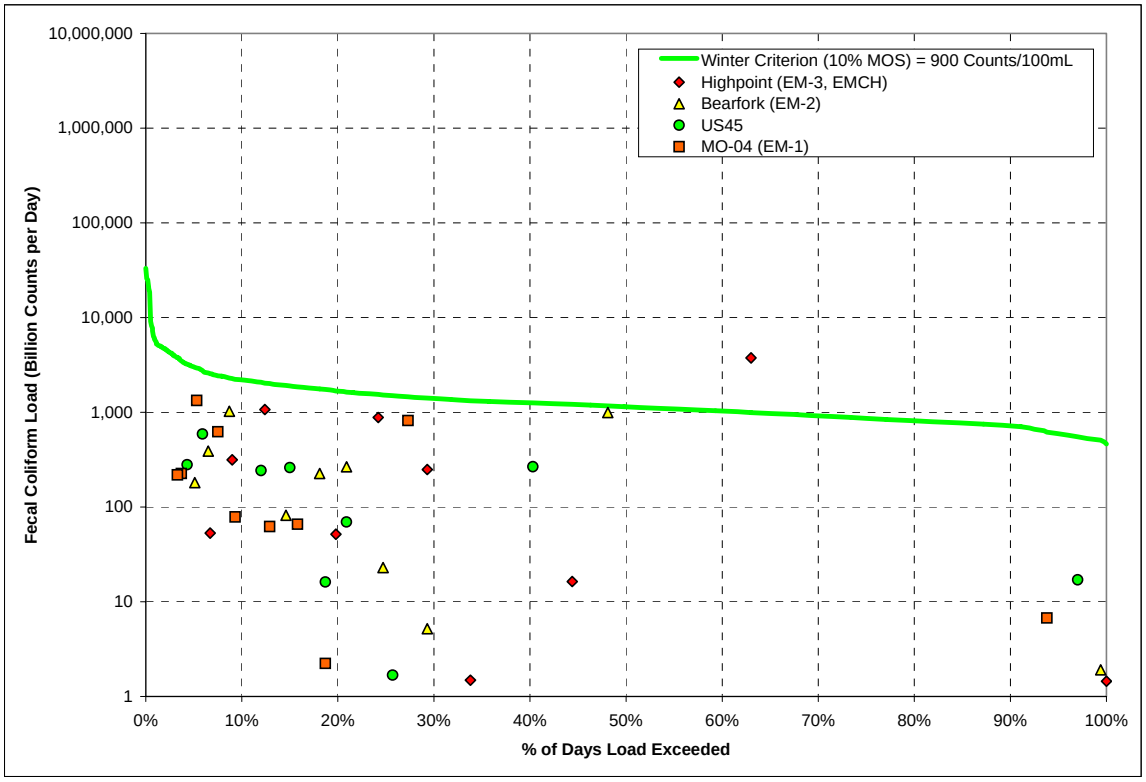


Figure 4-2 Winter (October through May) Geometric Mean Loading Curve versus Existing Loads

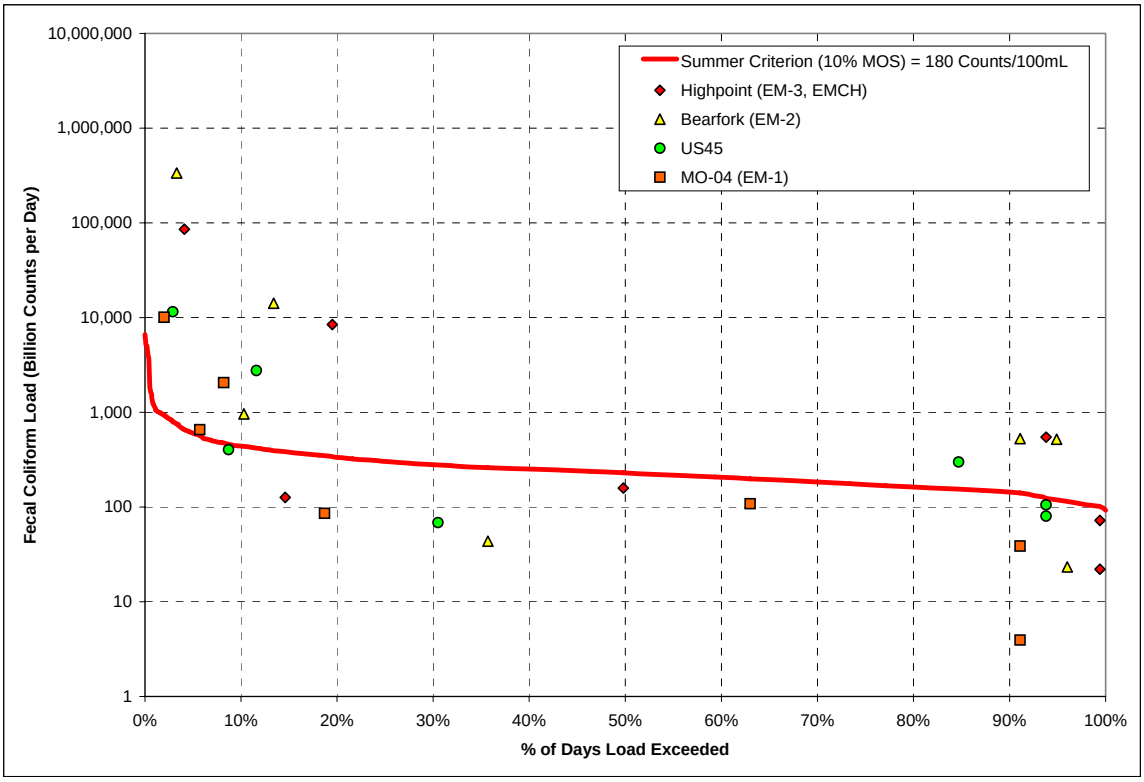


Figure 4-3 Summer (June through September) Geometric Mean Loading Curve versus Existing Loads

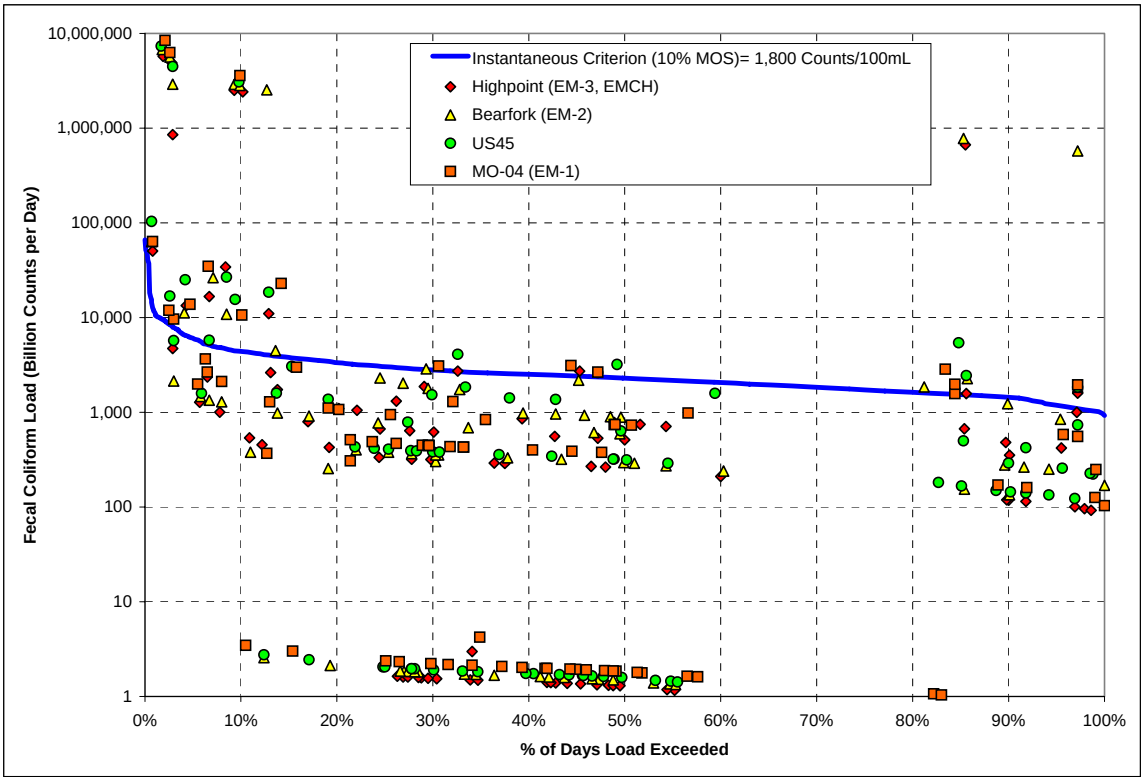


Figure 4-4 Instantaneous Loading Curve for Entire Year versus Existing Loads

The instantaneous loading curve plot in Figure 4-4 demonstrates the following key aspects of the fecal coliform impairment on Eightmile Creek:

- Existing Loads exceeded the TMDL loads at the high and low flow periods.
- All four water quality stations measured fecal coliform violations during 1996 and 1997, and therefore, had load exceedances above the TMDL curve.
- A consistent trend in existing fecal coliform loads compared to TMDL load duration curve, which would support some reasoning that the loads are hydrologically dependent.
- Extreme exceedances at the high and low flow ends of the load duration curve, which would support other phenomenon occurring in the watershed other than nonpoint source runoff.

The large fecal loads are identified in the plot in Figure 4-4 as the result of Hurricane Danny, July 1997. Flows in Eightmile Creek peaked at 1,160 cfs (daily average flow) on July 19, 1997. All four stations show significant fecal coliform loads during the extreme high flow period. The geometric mean data are elevated during this time period as seen in Figure 4-3 in the 0 percent to 5 percent load exceedance range. There are also large loading events at the Highpoint Boulevard and Bearfork stations shown in Figure 4-4 at the right-hand side of the plot indicating a low-flow problem. It is important to remember the source assessment section and verify that the sources identified to be contributing to the impaired segment can be explained by the loading curve in Figure 4-4. Illicit discharges are difficult to identify in the data because there is no information to document the location and volume of these discharges. The TMDL must address all of the known sources.

Figure 4-5 is the TMDL loading curve for the Gum Tree Branch segment. The calibrated watershed model (LSPC) was used to develop a time series of flow from October 1996 through September 2000. The modeled flows were utilized to develop a series of load duration curves, similar to Eightmile Creek, by multiplying the flow by the instream criteria and plotting the results as a percentage of load exceedance on the x-axis.

ADEM collected instantaneous fecal coliform data to compute geometric means on the Gum Tree Branch during October and November 1998. Figure 4-6 is a plot of the instantaneous TMDL load curve versus the existing data. The plot shows the existing load exceeding the TMDL load at least twice at each of the three Gum Tree Branch stations. A geometric mean was calculated for each of the three stations and they were 1,666 counts/100 mL, 2,247 counts/100 mL, and 3,813 counts/100 mL, for GT-1, GT-2, and GT-3, respectively. The GT water quality stations are shown in Figure 3-8. The City of Prichard's Consent Decree and SSOs reported to ADEM indicate that Gum Tree Branch has documented overflow issues.

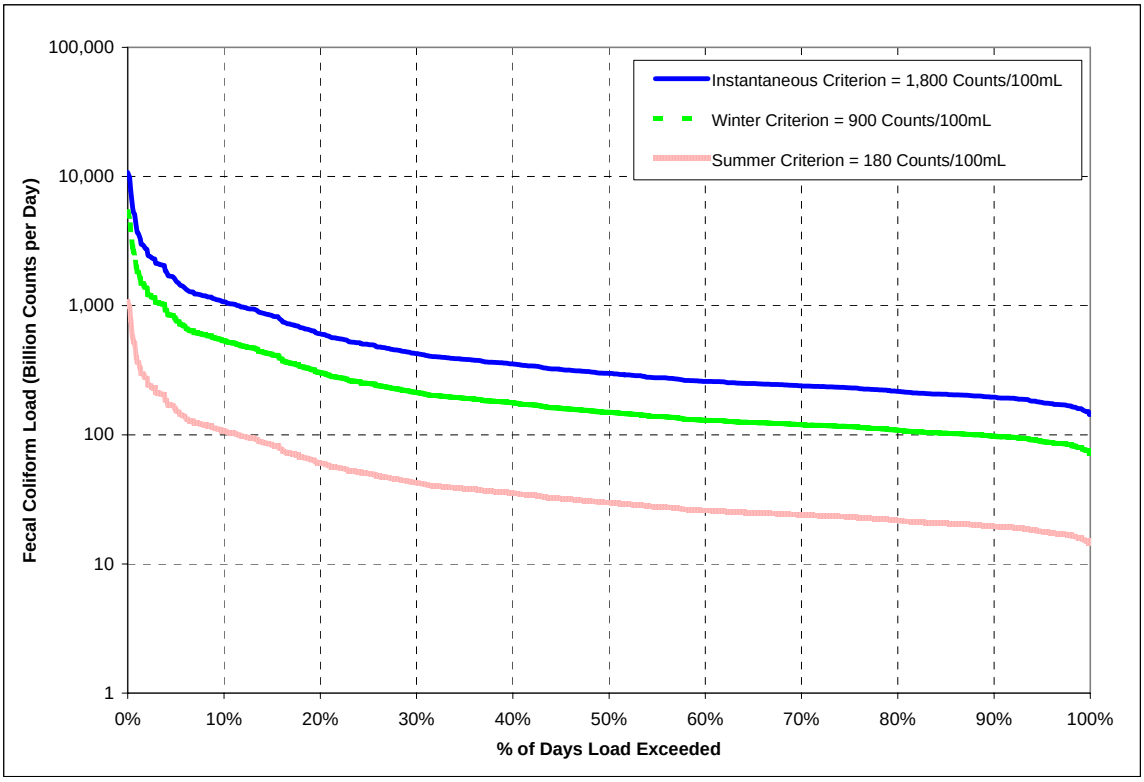


Figure 4-5 TMDL Loading Curves for the Gum Tree Branch Segment

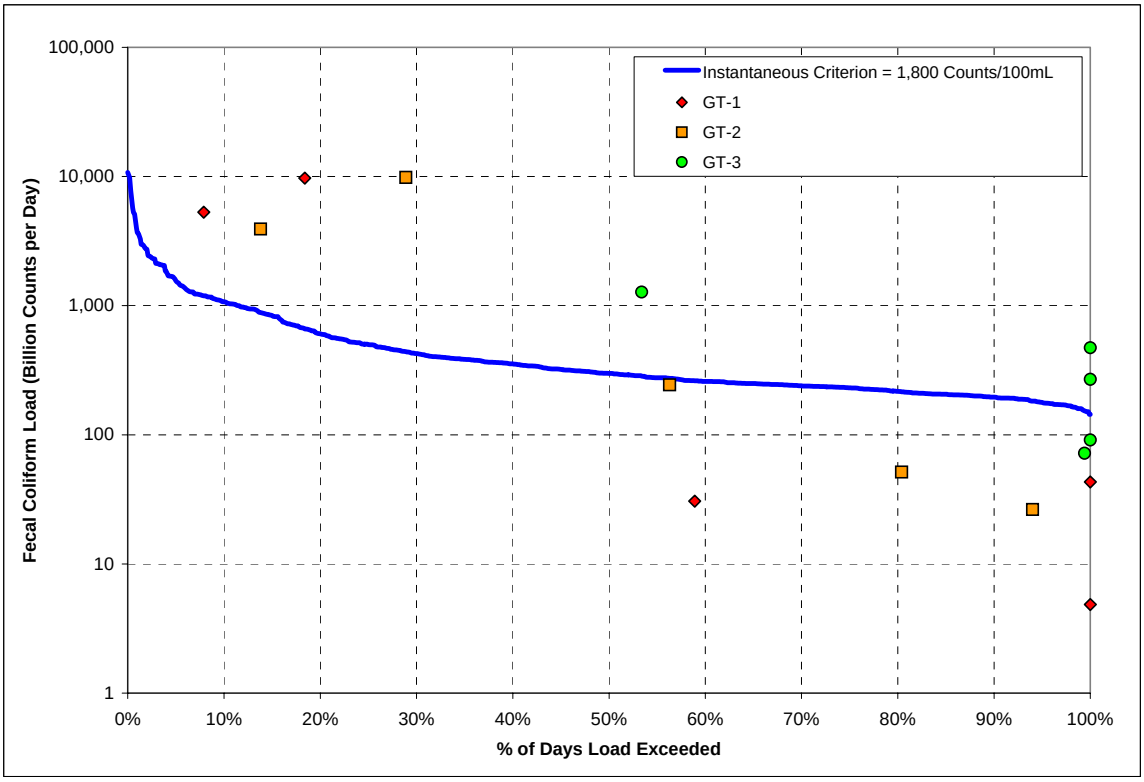


Figure 4-6 Gum Tree Branch Instantaneous Loading Curve for All Year versus Existing Loads

4.3 Required Reductions

Utilizing the loading curve approach that was presented in the previous section, the TMDL was developed by applying the critical conditions to the existing load, examining the difference between the existing load and TMDL, and calculating a percent reduction.

For the Eightmile Creek impaired segment, the instantaneous loading curve was used to determine the critical conditions. The critical condition was determined by removing the existing loads in the 0-10% and 90-100% load exceedance ranges. Essentially, removing the high and low flow periods. Following EPA Region 4's guidance on determining critical conditions and by disregarding extreme flow conditions for the allocations, the load exceedance ranges from 10-90% were examined. Figure 4-7 shows the events used for the critical conditions of the TMDL in Eightmile Creek. The existing load, TMDL, and the percent reduction are shown in Table 4-1. The high flows concurrent with SSOs and high fecal coliform loading shown on the left side of Figure 4-7 correspond to the wet-weather critical condition. Since sanitary sewer overflows and illicit discharges are not permitted activities, the TMDL calls for complete removal of both of these sources. The remaining sources of fecal coliform are leaking sewer lines and failing septic systems. The event of July 1996 indicated in Figure 4-7 was used to allocate to the remaining fecal coliform sources. A 72% reduction was determined from the loading curve below.

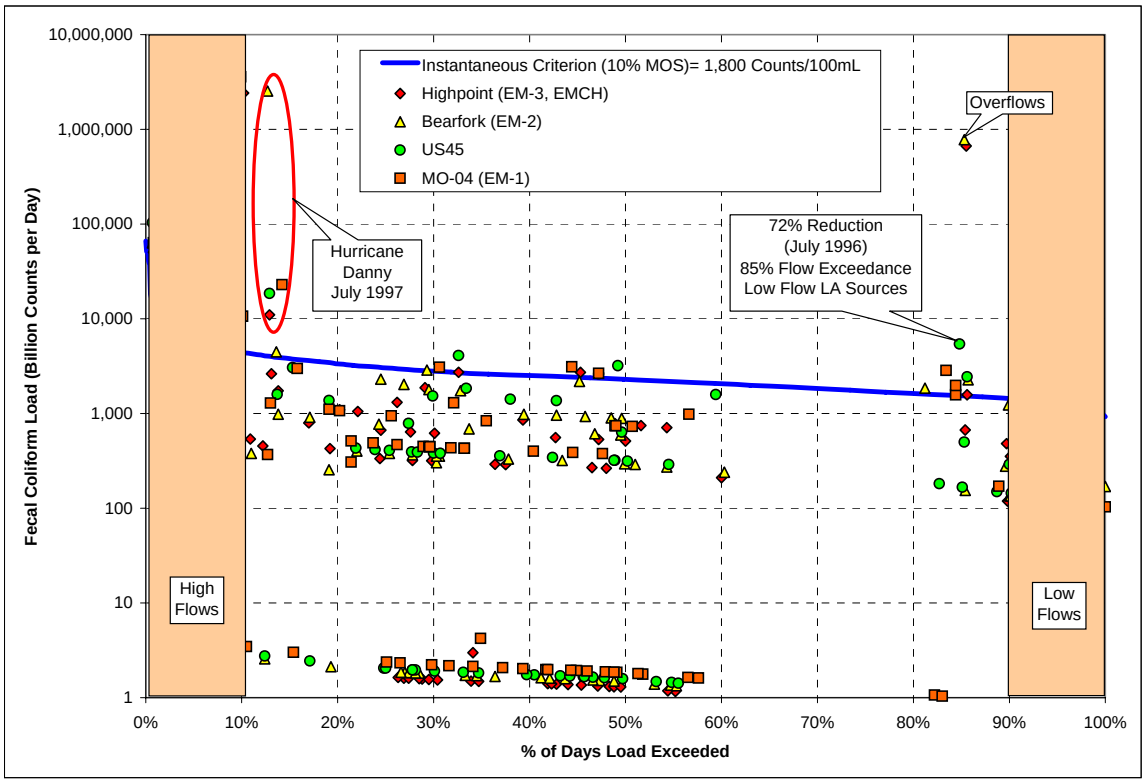


Figure 4-7 Percent Reduction for Critical Conditions in Eightmile Creek

In the Gum Tree Branch, the critical condition was determined at GT-1, the most downstream station before the confluence of Eightmile Creek. The flow conditions and existing

measurements of fecal coliform that were selected as representative loads were measured on October 7, 1998. Figure 4-8 shows the critical condition and percent reduction of 78%. The existing load, TMDL, and the percent reduction are shown in Table 4-1.

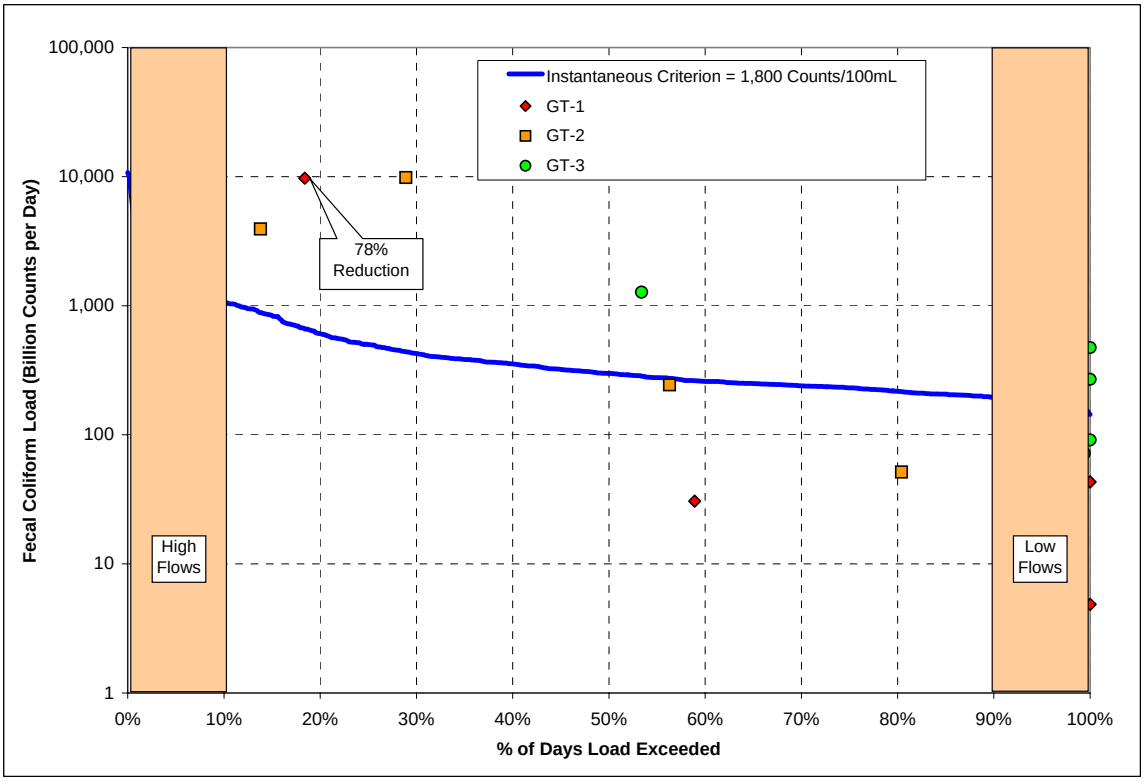


Figure 4-8 Percent Reduction for Critical Conditions in Gum Tree Branch

Table 4-1 Required Load Reductions for Eightmile Creek and Gum Tree Branch

Impaired Segment	Existing Load (counts/day)	TMDL (counts/day)	Required Percent Reduction for LA	Required Percent Reduction for MS4 WLA
Eightmile Creek	5.43 E+12	1.53 E+12	72%	72%
Gum Tree Branch	5.30 E+12	1.19 E+12	78%	78%

As shown in Table 4-1, the TMDL represents the total maximum daily load for the waterbodies to meet criteria for fecal coliform, including the 10 percent explicit margin of safety. Since it is impossible at this time to determine the proportion of the TMDL attributable to MS4 pipes and conveyances, the load allocation and MS4 wasteload allocation are designated as identical percent reductions from the existing condition. The required reductions will be sought through TMDL implementation with follow up monitoring to determine the effectiveness of implementation. Follow-up monitoring as discussed further in this document will be conducted according to ADEM's basin rotation schedule.

4.4 Seasonal Variation

Seasonal variation was incorporated in the modeling by including daily meteorological data in the hydrology model and a 4-year simulation time period. The loading curve addresses seasonal variation by examining all ranges of flow conditions and all ranges of measured fecal coliform data. By plotting the fecal coliform loads on the percent exceedance curve, the hydrology is automatically incorporated into the TMDL allocations. The wet weather and nonpoint source events are on the left side of the loading curve and the dry weather and point source discharges (including failing septic systems and leaking sewer lines) are on the right side of the curve.

For these TMDLs, the wet weather allocations were a complete removal of sanitary sewer overflows since they are not permitted to discharge into the impaired segments. The illicit discharges are not seasonally based and are also not permitted to discharge. The failing septic systems and leaking sewer lines occur all year but are more evident in the low-flow time periods as shown on the loading curves.

5.0 Conclusions

The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies sources of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality criteria based on the relationship between pollution sources and instream water quality conditions. A TMDL can be expressed as the sum of all point source loads (WLAs), nonpoint source loads (LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

TMDL = WLAs + LAs + MOS

The objective of a TMDL is to allocate loads among known pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality criteria achieved. 40 CFR §130.2 (i) states that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or other appropriate measures. For fecal coliform bacteria, the TMDLs are expressed as counts per day. The TMDL represents the maximum load that can occur over the year while maintaining the water quality criteria. The fecal coliform allocated load is more indicative of the TMDL because it represents daily fluctuations due to hydrology.

6.0 TMDL Implementation

6.1 Nonpoint Source Approach

For 303(d) listed waters impaired by nonpoint source (NPS) pollutants, necessary reductions will be sought during TMDL implementation using a phased approach. Voluntary, incentive-based mechanisms will be used to implement NPS management measures in order to assure that measurable reductions in pollutant loadings can be achieved for the targeted impaired water. Cooperation and active participation by the general public and various industry, business, and environmental groups is critical to successful implementation of TMDLs. Local citizen-led and implemented management measures offer the most efficient and comprehensive avenue for reduction of loading rates from nonpoint sources. Therefore, TMDL implementation activities will be coordinated through interaction with local entities in conjunction with Clean Water Partnership efforts.

TMDL implementation will employ concurrent education and outreach, training, technology transfer, and technical assistance with incentive-based pollutant management measures. The ADEM Office of Education and Outreach (OEO) will assist in the implementation of TMDLs in cooperation with public and private stakeholders. Planning and oversight will be provided by or coordinated with the Alabama Department of Environmental Management's Section 319 nonpoint source grant program in conjunction with other local, state, and federal resource management and protection programs and authorities. The CWA Section 319 grant program may provide limited funding to specifically ascertain NPS pollution sources and causes, identify and coordinate management programs and resources, present education and outreach opportunities, promote pollution prevention, and implement needed management measures to restore impaired waters.

Depending on the pollutant of concern, resources for corrective actions may be provided, as applicable, by the Alabama Cooperative Extension System (education and outreach); the USDA-Natural Resources Conservation Service (NRCS) (technical assistance) and Farm Services Agency (FSA) (federal cost-share funding); and the Alabama Soil and Water Conservation Committee (state agricultural cost share funding and management measure implementation assistance) through local Soil and Water Conservation Districts, or Resource Conservation and Development Councils (funding, project implementation, and coordination). Additional assistance from such agencies as the Alabama Department of Public Health (septic systems), Alabama Department of Agriculture and Industries (pesticides), and the Alabama Department of Industrial Relations and Dept of Interior - Office of Surface Mining (abandoned minelands), Natural Heritage Program and US Fish and Wildlife Service (threatened and endangered species), may also provide practical TMDL implementation delivery systems, programs, and information. Land use issues will be addressed through the Nonpoint Source Education for Municipal Officials (NEMO) program. Memorandums of Agreement (MOAs) may be used as a tool to formally define roles and responsibilities.

Additional public/private assistance is available through the Alabama Clean Water Partnership Program (CWP). The CWP program uses a local citizen-based environmental protection approach to coordinate efforts to restore and protect the state's resources in accordance with the goals of the Clean Water Act. Interaction with the state or river basin specific CWP will facilitate TMDL implementation by providing improved and timely communication and information

exchange between community-based groups, units of government, industry, special interest groups and individuals. The CWP can assist local entities to plan, develop, and coordinate restoration strategies that holistically meet multiple needs, eliminate duplication of efforts, and allow for effective and efficient use of available resources to restore the impaired waterbody or watershed.

Other mechanisms that are available and may be used during implementation of these TMDLs include local regulations or ordinances related to zoning, land use, or storm water runoff controls. Local governments can provide funding assistance through general revenues, bond issuance, special taxes, utility fees, and impact fees. If applicable, reductions from point sources will be addressed by the NPDES permit program. The Alabama Water Pollution Control Act empowers ADEM to monitor water quality, issue permits, conduct inspections, and pursue enforcement of discharge activities and conditions that threaten water quality. In addition to traditional "end-of-pipe" discharges, the ADEM NPDES permit program addresses animal feeding operations and land application of animal wastes. For certain water quality improvement projects, the State Clean Water Revolving Fund (SRF) can provide low interest loans to local governments.

Long-term physical, chemical, and biological improvements in water quality will be used to measure TMDL implementation success. As may be indicated by further evaluation of stream water quality, the effectiveness of implemented management measures may necessitate revisions of these TMDLs. The ADEM will continue to monitor water quality according to the rotational river basin monitoring schedule as allowed by resources. In addition, assessments may include local citizen-volunteer monitoring through the Alabama Water Watch Program and/or data collected by agencies, universities, or other entities using standardized monitoring and assessment methodologies. Core management measures will include, but not be limited to water quality improvements and designated use support, preserving and enhancing public health, enhancing ecosystems, pollution prevention and load reductions, implementation of NPS controls, and public awareness and attitude/behavior changes.

6.2 Point Source Approach

Point source reductions to meet the TMDLs for the Eightmile Creek watershed should begin with full compliance with the City of Prichard and MAWSS Consent Decrees to reduce SSOs. The Consent Decree issued to the Water and Sewer Board of City of Prichard in 1997 requires the Board to eliminate non-permitted discharges. The Board has not fully complied with the terms and further enforcement action is pending.

In April 2002, a Consent Decree was finalized against MAWSS for violation of the CWA due to SSOs. New programs are outlined in the Consent Decree to identify and repair leaky sewer connections and perform water quality monitoring. These programs are designed to eliminate non-permitted discharges and spills that will ultimately decrease fecal coliform loads to receiving streams.

In the first quarter of 2002, MAWSS began to develop programs outlined in the Consent Decree (MAWSS, 2002). These programs require MAWSS to identify and repair leaky sewer connections, provide service to low-income areas, and perform water quality monitoring.

MAWSS has proposed methods to determine wastewater collection and transmission capacity. A hydraulic model of the sewer basins served by MAWSS is being developed to determine the capacity of collection systems and what is require for future growth. New development may be

delayed until capacity assessments have been finalized for wastewater collection and treatment systems.

Preventative maintenance and rehabilitation of collection systems to decrease the occurrence of SSOs are already underway. Sewer lines are being cleaned after overflows to determine the cause of the SSO. A public service announcement to educate the public on proper grease disposal has aired on television. Force mains are being modeled to predict the location of air pockets. Levels of hydrogen sulfide are being measured at lift stations and manholes as a part of the Corrosion Control Program. The equipment on pump stations is also being inspected for preventative maintenance.

MAWSS has contracted with TAI Environmental Services to implement a water quality monitoring program. Monitoring will also be done to determine unknown sources of pollution and the impact of non-permitted discharges to receiving waters.

A long-term plan is being developed for a regional WWTP to provide service for the Cities of Mobile, Prichard, Chickasaw, and Saraland. The goal of this plan is to reduce the number of discharges and provide for growth over the next 50 years.

Final compliance of the Consent Decree, Civil Action 02-0058-CB-S, is scheduled for September 2007. Implementation of programs outlined in the Consent Decree should decrease pathogen loads in the Eightmile Creek watershed.

6.3 MS4 Considerations

A large area in Mobile and Baldwin Counties has been issued an MS4 Phase I Stormwater permit (NPDES ALS000002). According to NPDES Permit No. ALS000002, the Mobile Area MS4 permit area is defined below.

"This permit covers all areas within the corporate boundaries of Mobile and Baldwin Counties that were designated by the Department [ADEM] and all municipalities named as permittees. The designated area in Mobile and Baldwin Counties are as follows:

The portion of Mobile County designated as part of the Greater Mobile Area Storm Sewer System consists of all unincorporated areas of Mobile County within the boundaries defined as: beginning as the mouth of the south fork Deer River and extending west to southwest corner of Section 18, Township 6 South, Range 2 West, then north to northwest corner, Section 6, Township 2 South, Range 2 West, then east to the Mobile County line, then south along county line to U.S. Highway 90 bridge."

Figure 6-1 shows the boundaries of the MS4 service area within Mobile County.

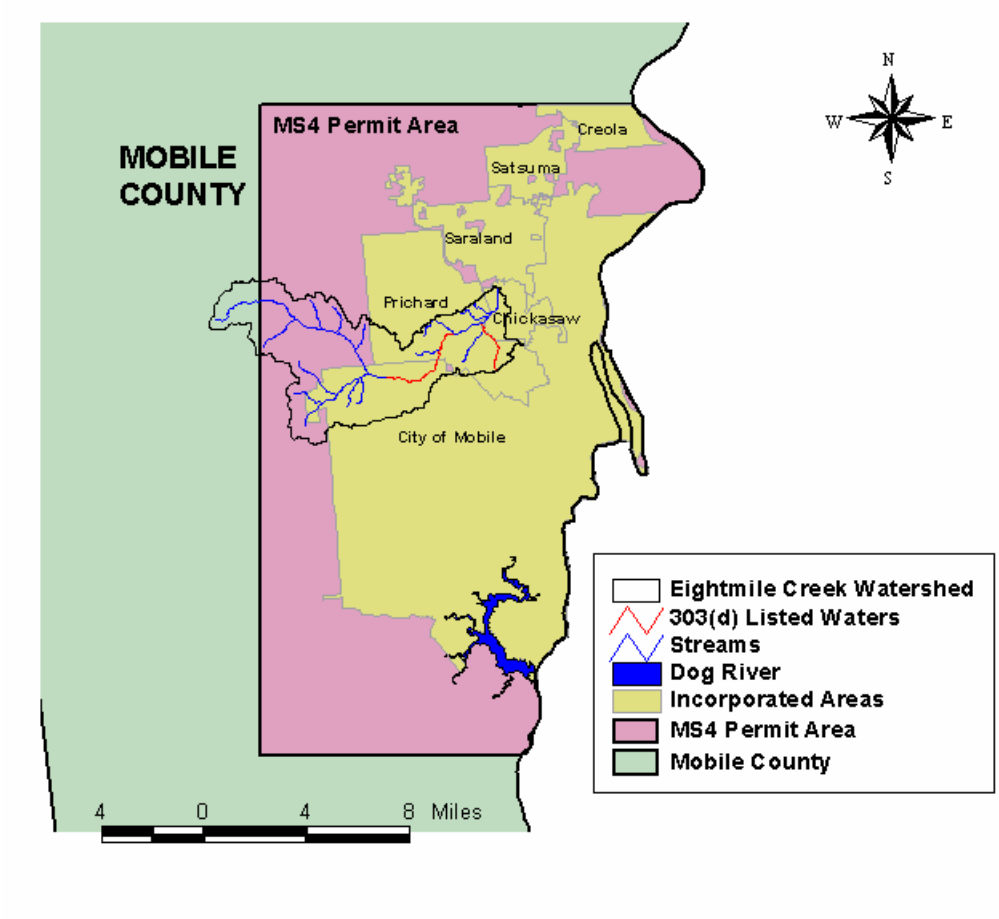


Figure 6-1 Mobile Area MS4 Permit Service Area

In the MS4 service area, pollutant loads which could include urban runoff and/or failing septic systems are considered in the Load Allocations. Unpermitted sources such as illicit discharges and sanitary sewer overflows have a 100% reduction and are not considered part of the Wasteload Allocations (WLAs) or Load Allocations (LAs).

7.0 Follow Up Monitoring

ADEM has adopted a basin approach to water quality management; an approach that divides Alabama's fourteen major river basins into five groups. Each year, the ADEM water quality resources are concentrated in one of the basin groups. One goal is to continue to monitor §303(d) listed waters. This monitoring will occur in each basin according to the following schedule:

Table 7-1 Monitoring Schedule for Alabama River Basins

River Basin Group	Schedule
Cahaba and Black Warrior	2002
Tennessee	2003
Choctawhatchee, Chipola, Perdido-Escambia and Chattahoochee	2004
Tallapoosa, Alabama and Coosa	2005
Escatawpa, Upper Tombigbee, Lower Tombigbee, and Mobile	2006

Monitoring will help further characterize water quality conditions resulting from the elimination of illicit discharges and sanitary sewer overflows.

8.0 Public Participation

As part of the public participation process, this TMDL was be placed on public notice and made available for review and comment. The public notice was prepared and published in the four major daily newspapers in Montgomery, Huntsville, Birmingham, and Mobile, as well as submitted to persons who have requested to be on ADEM's postal and electronic mailing distributions. In addition, the public notice and subject TMDL was made available on ADEM's Website: www.adem.state.al.us. The public can also request paper or electronic copies of the TMDL by contacting Mr. Chris Johnson at 334-271-7827 or clj@adem.state.al.us. The public was given an opportunity to review the TMDL and submit comments to the Department in writing. At the end of the public review period, all written comments received during the public notice period became part of the administrative record. ADEM considered all comments received by the public prior to finalization of this TMDL and subsequent submission to EPA Region 4 for final review and approval.

9.0 Appendices

9.1 References

American Society of Agricultural Engineers (ASAE), 1998. ASAE Standards, 45th Edition, Standards Engineering Practices Data.

ADEM. 1997. *A Survey of the Chickasaw Creek Watershed*. Alabama Department of Environmental Management – Water Quality Program, Mobile, Alabama, 1997.

ADEM. 1998. *Eightmile Watershed Study.* Alabama Department of Environmental Management – Water Quality Program, Mobile, Alabama, 1998.

ADEM. 1999. FY 1999 Clean Water Action Plan Workplan. Alabama Department of Environmental Management – Water Quality Program.

ADEM. 2000. Chapter 335-6-10 Water Quality Criteria. Alabama Department of Environmental Management Water Division - Water Quality Program.

ADEM. 2002. Sewer System Overflows for the City of Prichard. Alabama Department of Environmental Management – Municipal Water Division.

ADEM. 2002. Sewer System Overflows for Mobile Area Water and Sewer System (MAWSS). Alabama Department of Environmental Management – Municipal Water Division.

Baudisova, D. 1997. Evaluation of E. Coli as the main indicator of fecal pollution. Water Science Technology,35 (11-12): 333-336.

Bicknell, B.R., J.C. Imhoff, J. Kittle, A.S. Donigian, and R.C. Johansen. 1996. Hydrological Simulation Program - FORTRAN, User's Manual for Release H. U.S. Environmental Protection Agency, Environmental Research Laboratory, Athens, Ga.

Consent Decree. 1997. *Civil Action No. CV-95-002555.* ADEM vs. The Water Works and Sewer Board of the City of Prichard, Alabama.

Consent Decree. 2002. *Civil Action 02-0058-CB-S and 99-0647-CB-S.* ADEM vs. The Mobile Area Water and Sewer System.

Horner, 1992. *Water Quality Criteria/Pollutant Loading Estimation/Treatment Effectiveness Estimation*. In R.W. Beck and Associates, Covington Master Drainage Plan, King County Surface Water Management Division, Seattle, Washington.

Horsely and Witten, Inc., 1996. Identification and Evaluation of Nutrient Bacterial Loadings to Maquiot Bay, Brunswick and Freeport, Maine. Casco Bay Estuary Project.

MAWSS. 2002. Mobile Area Water and Sewer System. MAWSS 2002 Quarterly Report, Vol. 1, 2002.

Metcalf & Eddy, 1991. *Wastewater Engineering: Treatment, Disposal, Reuse,* Third Edition McGraw-Hill, Inc., New York.

Mobile County Chamber of Commerce. *Economic Development Page.* http://www.mobilechamber.com/economic/Stats/index.html (April, 2002).

NCDC. 2002. *National Climate Data for Mobile International Airport.* http://lwf.ncdc.noaa.gov/oa/ncdc.html (April, 2002).

NCSU, 1994. *Livestock Manure Production and Characterization in North Carolina,* North Carolina Cooperative Extension Service, North Carolina State University (NCSU) College of Agriculture and Life Sciences, Raleigh, January 1994.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, CO.
Stumm and Morgan. 1996. Aquatic Chemistry. John Wiley, New York.

US Census Bureau. 1990. *1990 Census of Population and Housing.* <http://govinfo.library.orst.edu/index.html> (April, 2002).

U.S. Census Bureau. 2000. *Census 2000 Summary File*. http://factfinder.census.gov (April, 2002).

USDA. 1986. Urban Hydrology for Small Watersheds. United States Department of Agriculture - Soil Conservation Service.

USEPA. 1991. Guidance for Water Quality Based Decisions: The TMDL Process. EPA 440/49 1-00 1. U. S. Environmental Protection Agency; Assessment and Watershed Protection Division.

USEPA, 2001. *Protocol for Developing Pathogen TMDLs, First Edition.* U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-841-R-00-002, January, 2001.

USGS. 2001. Water Resources of the United States. NWISweb online hydrologic data: **http://water.usgs.gov**.

9.2 Fecal Coliform Monitoring Stations

Table 9-1 Description of Water Quality Stations in the Eightmile Creek Watershed

Year	Station	Stream Section	Road Crossing	Latitude	Longitude	Duplicity
1996	247100500	Eightmile Creek	High Point Blvd	30.7416	-88.215	same as EM-3, EMCH
1996	BEARFORK	Eightmile Creek	Bearfork Rd.	30.74889	-88.1326	same as EM-2
1996	MO-04	Eightmile Creek	Prichard Water Intake	30.76763	-88.1015	same as EM-1, GT-1
1996	US45	Eightmile Creek	Hwy 45			
1997	BEARFORK	Eightmile Creek	Bearfork Rd.	30.74889	-88.1326	same as EM-2
1997	MO-04	Eightmile Creek	Prichard Water Intake	30.76763	-88.1015	same as EM-1, GT-1
1997	US45	Eightmile Creek	Hwy 45			
1998	CC-1	Clear Creek	Moffett Rd.	30.74347	-88.1808	
1998	EM-1	Eightmile Creek	Prichard Water Intake	30.76802	-88.1019	same as MO-04, GT-1
1998	EM-2	Eightmile Creek	Bearfork Rd.	30.74889	-88.1326	same as BearFork
1998	EM-3	Eightmile Creek	High Point Blvd	30.75056	-88.1613	same as 247100500, EMCH
1998	EMCH	Eightmile Creek	High Point Blvd	30.7416	-88.215	same as EM-3, 247100500
1998	EMCW	Eightmile Creek	Whistler Ave			
1998	GT-1	Gum Tree Branch	Prichard Water Intake	30.76722	-88.1016	same as MO-04, EM-1
1998	GT-2	Gum Tree Branch	I-65	30.75556	-88.0933	
1998	GT-3	Gum Tree Branch		30.75889	-88.1061	
1998	RC-1	Red Creek	Bearfork Rd.	30.74861	-88.1806	
1998	RC-2	Red Creek		30.76194	-88.1878	

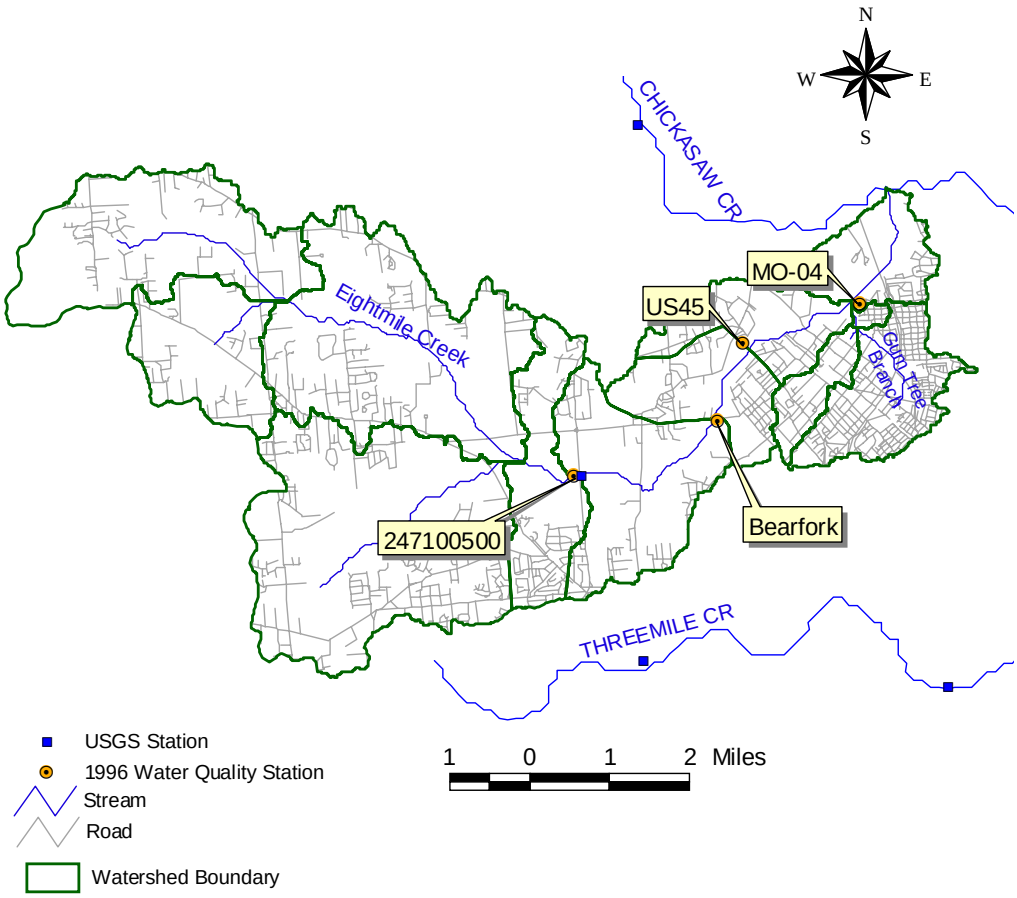


Figure 9-1 Locations of Water Quality Stations Monitored During 1996 in the Eightmile Creek Watershed

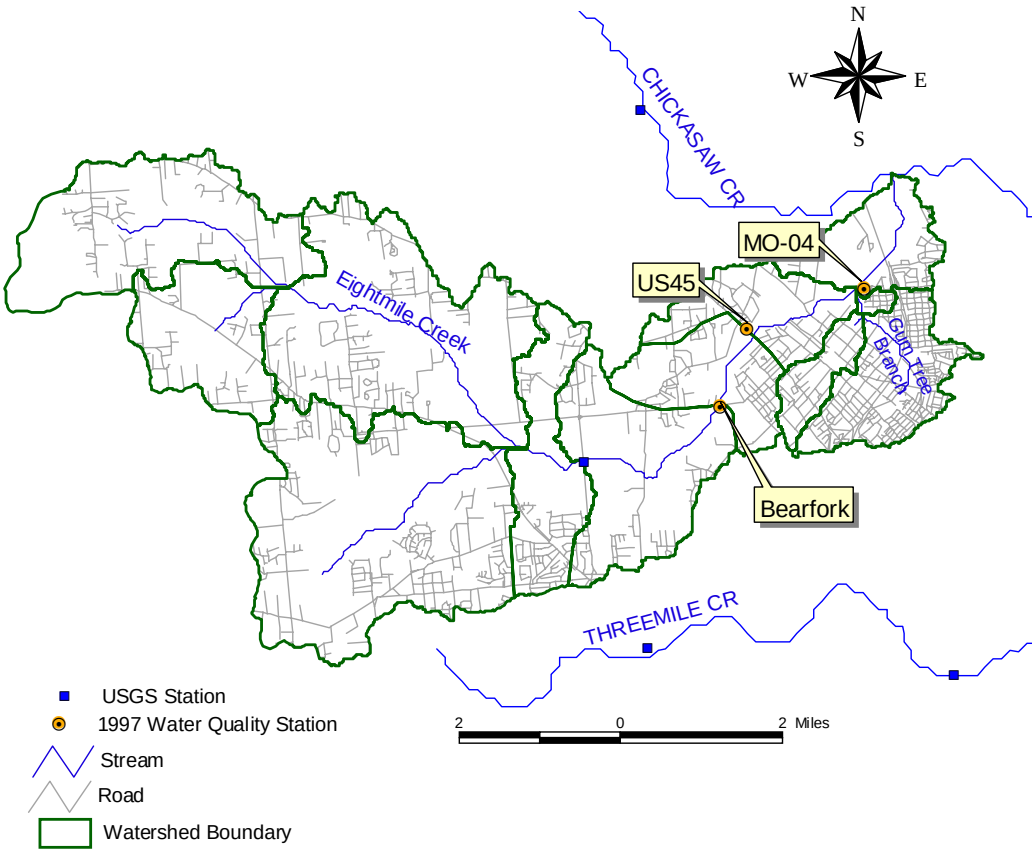


Figure 9-2 Locations of Water Quality Stations Monitored During 1997 in the Eightmile Creek Watershed

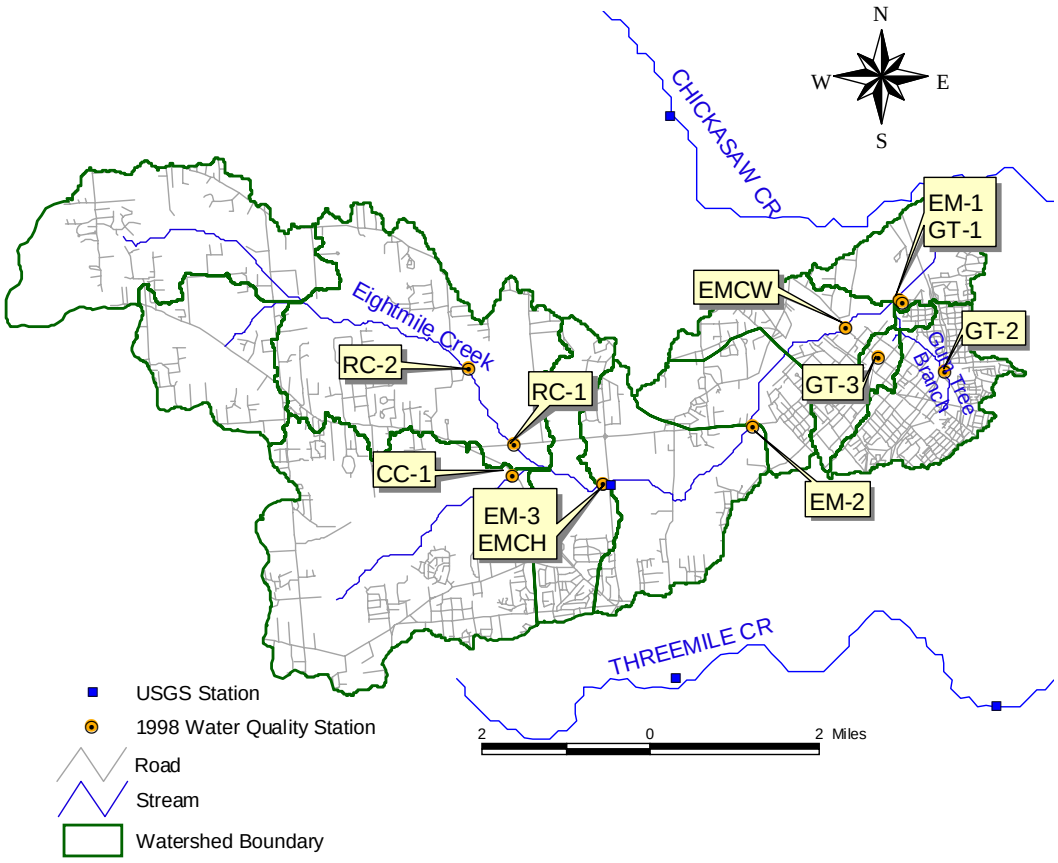


Figure 9-3 Locations of Water Quality Stations Monitored During 1998 in the Eightmile Creek Watershed

Table 9-2 Data collected as Part of the Eightmile Watershed Assessment, ADEM Mobile Field Operations, 1998

Station	Date/Time	Fecal Coliform (#/100ml)
CC-1	10/06/1998 10:40	187
CC-1	10/07/1998 13:05	>8000
CC-1	10/19/1998 10:25	130
CC-1	11/05/1998 12:10	100
CC-1	11/16/1998 10:50	520
EM-1	10/06/1998 9:10	113
EM-1	10/07/1998 11:50	>8000
EM-1	10/19/1998 9:10	120
EM-1	11/05/1998 11:05	200
EM-1	11/16/1998 9:40	530
EM-2	10/06/1998 10:00	140
EM-2	10/07/1998 12:25	>8000
EM-2	10/19/1998 9:40	120
EM-2	11/05/1998 11:40	170
EM-2	11/16/1998 10:20	410
EM-3	10/06/1998 10:20	228
EM-3	10/07/1998 12:40	5700
EM-3	10/19/1998 10:05	230
EM-3	11/05/1998 11:50	205
EM-3	11/16/1998 10:35	370
GT-1	10/06/1998 9:00	>1600
GT-1	10/07/1998 11:40	>8000
GT-1	10/19/1998 9:05	180
GT-1	11/05/1998 11:00	210
GT-1	11/16/1998 9:35	26500
GT-2	10/06/1998 8:40	>1600
GT-2	10/07/1998 11:25	>8000
GT-2	10/19/1998 8:40	430
GT-2	11/05/1998 10:45	260
GT-2	11/16/1998 9:20	>40000
GT-3	10/06/1998 9:35	>1600
GT-3	10/07/1998 12:05	>8000
GT-3	10/19/1998 9:30	6000
GT-3	11/05/1998 11:20	12500
GT-3	11/16/1998 9:55	840

Table 9-3 Data Collected as Part of the Prichard Water Supply Study

Date/Time	Fecal Coliform (No./100 mL)			
	EMCH	MO-04	US45	BEARFORK
1/9/1996 0:00	200	0	400	0
1/23/1996 0:00	0	200	0	400
1/30/1996 0:00	0	400	0	0
2/6/1996 0:00	0	0	200	0
2/13/1996 0:00	0	0	200	0
2/27/1996 0:00	0	200	400	0
3/5/1996 0:00	3200	800	1200	3200
3/12/1996 0:00	200	0	0	0
3/19/1996 0:00	800	200	200	400
3/26/1996 0:00	TNTC	TNTC	TNTC	TNTC
4/2/1996 0:00	800	200	0	200
4/23/1996 0:00	12800	600	8200	3600
5/7/1996 0:00	0	0	0	2100
5/14/1996 0:00	0	0	200	0
6/5/1996 0:00	2000	2800	3000	TNTC
6/11/1996 0:00	200	0	600	400
6/18/1996 0:00	200	0	0	1800
6/18/1996 9:15	--	110	--	--
6/25/1996 0:00	0	0	200	400
7/9/1996 0:00	2400	2000	3000	3000
7/16/1996 0:00	TNTC	2800	6400	TNTC
7/24/1996 0:00	0	0	0	0
8/1/1996 13:25	213	--	--	--
8/6/1996 0:00	200	1600	1200	200
8/20/1996 0:00	600	0	200	200
8/21/1996 10:50	110	--	--	--
8/27/1996 0:00	800	800	400	1400
9/3/1996 0:00	0	200	200	0
9/5/1996 13:30	350	--	--	--
9/10/1996 0:00	200	0	0	0
9/17/1996 0:00	1000	1600	600	200
9/24/1996 0:00	200	0	400	200
9/24/1996 12:00	198	--	--	--
9/25/1996 8:20	--	130	--	--
10/1/1996 0:00	600	200	200	200
10/8/1996 0:00	400	400	0	400
10/15/1996 0:00	2000	200	0	1400
10/22/1996 0:00	0	0	0	600

Table 9-3 (continued)

Date/Time	Fecal Coliform (No./100 mL)			
	EMCH	MO-04	US45	BEARFORK
11/5/1996 0:00	0	0	200	0
11/12/1996 0:00	0	0	0	0
11/19/1996 0:00	400	200	200	200
12/3/1996 0:00	200	0	200	400
12/10/1996 0:00	600	0	0	600
12/17/1996 0:00	600	400	600	0
12/31/1996 0:00	1200	400	1200	400
1/7/1997 0:00	180000	840000	780000	540000
1/14/1997 0:00	0	0	200	0
1/21/1997 0:00	0	0	0	200
1/28/1997 0:00	800	800	1600	400
2/4/1997 0:00	200	0	0	0
2/18/1997 0:00	0	200	200	0
2/25/1997 0:00	400	400	400	400
3/4/1997 0:00	0	200	200	1000
3/11/1997 0:00	200	200	800	200
3/18/1997 0:00	200	200	0	0
3/25/1997 0:00	0	0	0	0
4/1/1997 0:00	200	0	0	0
4/8/1997 0:00	0	0	0	400
4/15/1997 0:00	2	2	0	0
4/22/1997 0:00	600	0	0	0
4/29/1997 0:00	0	200	0	0
5/6/1997 0:00	0	0	200	200
5/13/1997 0:00	0	0	0	0
5/20/1997 0:00	5600	4600	9000	6000
5/23/1997 0:00	400	400	1600	400
5/27/1997 0:00	0	400	200	600
6/3/1997 0:00	0	0	0	200
6/10/1997 0:00	1000	1600	1000	400
6/17/1997 0:00	400	400	200	200
6/24/1997 0:00	1800	1400	2200	1000
7/1/1997 0:00	400	0	0	1200
7/8/1997 0:00	5000	7400	6800	TNTC
7/15/1997 0:00	3600	2600	5400	2600
7/22/1997 0:00	TNTC	TNTC	TNTC	TNTC
7/29/1997 0:00	TNTC	1400	2800	TNTC
8/6/1997 0:00	800	1000	600	1800

Table 9-3 (continued)

Date/Time	Fecal Coliform (No./100 mL)			
	EMCH	MO-04	US45	BEARFORK
9/2/1997 0:00	TNTC	3000	5000	TNTC
9/9/1997 0:00	400	200	800	600
9/24/1997 0:00	600	1400	400	600
9/30/1997 0:00	400	0	200	200
10/7/1997 0:00	600	600	0	0
10/13/1997 0:00	200	200	2000	200
10/21/1997 0:00	0	0	0	0
10/28/1997 0:00	0	400	1000	400
11/9/1997 0:00	0	0	0	0
11/11/1997 0:00	0	200	400	1100
11/18/1997 0:00	0	400	200	0
11/25/1997 0:00	0	0	0	0

Table 9-4 Data collected as Part of the Chickasaw Watershed Study, ADEM Mobile Field Operations, 1996

Station	Date/Time	Fecal Coliform (No./100 mL)
EMCH	11/8/1995 13:55	480
EMCH	08/01/1996 13:25	213
EMCH	08/21/1996 10:50	110
EMCH	09/05/1996 13:30	350
EMCH	09/24/1996 12:00	198
EMCW	10/26/1995 11:20	162
EMCW	11/08/1995 10:25	840
EMCW	08/01/1996 9:55	359
EMCW	08/09/1996 11:35	215
EMCW	08/21/1996 14:30	300
EMCW	08/21/1996 14:30	210
EMCW	09/05/1996 10:05	220

9.3 Sanitary Sewer Overflows Reports to ADEM

Table 9-5 Sewer Overflows Reported by Prichard Water Works and Sewer Board in the Eightmile Creek and Gum Tree Branch Watersheds as Determined by GIS

Date of Spill	Reported Cause	Duration	Estimated Reported Volume (gallons)	Location	Reported Stream Impacted
1/7/1996	rain	8 hours	40000	Gum Tree Branch at Wasson Ave	Eight-Mile Creek
1/24/1997	rain	32 hours	60000	Gum Tree Branch at Wasson Ave	Eight-Mile Creek
1/29/1997	blocked sewer line	2 weeks	10000	828 Walker Ave.	Mobile River
1/29/1997	I & I due to heavy rain	24 hours	150000	Wasson St. at Gum Tree Branch	Eight-Mile Creek
2/14/1997	I & I due to heavy rain	12 hours	60000	Wasson St. at Gum Tree Branch	Eight-Mile Creek
2/24/1997	I & I due to heavy rain	unknown	0	Wasson St. at Gum Tree Branch	Eight-Mile Creek
2/26/1997	I & I due to heavy rain	unknown	0	Wasson St. at Gum Tree Branch	Eight-Mile Creek
2/28/1997	I & I due to heavy rain	unknown	0	Wasson St. at Gum Tree Branch	Eight-Mile Creek
4/19/1997	mechanical failure pump station	48 hours	5000	Whatley St. pumping station	Gum Tree Branch
4/28/1997	heavy rain	48 hours	200000	Gum Tree Branch at Wasson Ave	Gum Tree Branch
7/19/1997	I & I due to heavy rain	48 hours	300000	Wasson St. at Gum Tree Branch	Eight-Mile Creek
10/13/1997	I & I due to heavy rain	72 hours	400000	Wasson St. at Gum Tree Branch	Eight-Mile Creek
11/29/1997	I & I due to heavy rain	24 hours	0	1917 Magee St.	Gum Tree Branch
1/26/1998	I & I due to heavy rain	24 hours	70000	Whistler at Patricia	Gum Tree Branch
5/1/1998	power failure at lift station	8 hours	20000	Lott Rd.	Eight-Mile Creek
9/30/1998	I & I due to heavy rain	24 hours	50000	Whistler St.	Gum Tree Branch
12/10/1998	line stopped up cleaned line	5 hours	10000	Baldwin Dr.	Mobile River

Table 9-5 (continued)

Date of Spill	Reported Cause	Duration	Estimated Reported Volume (gallons)	Location	Reported Stream Impacted
12/14/1998	I & I due to heavy rain	12 hours	18000	Lindley Ct.	Gum Tree Branch
5/3/1999	manhole overflow	unknown	10000	Lott Rd.	Eight-Mile Creek
7/12/1999	manhole overflow -rainwater	unknown	20000	Lindley Ct.	Gum Tree Branch
8/23/1999	force main bursted at Whattey St. lift station	unknown	1000	Whatley St.	Gum Tree Branch
9/3/1999	lightning struck pumping station	unknown	5000	Lott Rd. and Suncrest Rd.	Chickasaw Creek
2/19/2000	broken line	unknown	5000	3902 St. Stephens Rd.	Eight-Mile Creek
2/21/2000	broken line	unknown	5000	3902 St. Stephens Rd.	Eight-Mile Creek
2/22/2000	broken line	unknown	2000	3902 St. Stephens Rd.	Eight-Mile Creek
2/23/2000	broken line	5 days	2000	3902 St. Stephens Rd.	Eight-Mile Creek
3/29/2000	heavy rain	6 hours	50000	Whistler St. and Patricia Ave	Gum Tree Branch
5/11/2000	Whatley St. pump station failed due to new system	2 hours	40000	Wasson St.	Gum Tree Branch
5/16/2000	Whatley St. pump station failed due to new system	3 hours	50000	Wasson St.	Gum Tree Branch
7/3/2000	Whatley St. pump station failed due to new system	3 hours	60000	Wasson St.	Gum Tree Branch

Table 9-5 (continued)

Date of Spill	Reported Cause	Duration	Estimated Reported Volume (gallons)	Location	Reported Stream Impacted
7/17/2000	blockage caused by grease building in line	unknown	500	1004 Geneva St.	Gum Tree Branch
7/28/2000	Whatley St. pump station failed due to new system	2 hours	60000	Wasson St.	Gum Tree Branch
7/31/2000	Whatley St. pump station failed due to new system	2 hours	80000	Wasson St.	Gum Tree Branch
8/31/2000	Whatley St. pump station failed due to new system	3 hours	80000	Wasson St.	Gum Tree Branch
11/16/2000	stopped up line	1 hour	2000	Marengo Drive	Gum Tree Branch
11/29/2000	broke down clean out	2 hours	500	Bibb and Dallas	Gum Tree Branch
1/3/2001	grease in the mouth of the line	unknown	50	Shelton Beach Rd and Myers Rd	Eight-Mile Creek
10/17/2001	unknown	unknown	500	Gum Tree Branch at Turner Roa	Gum Tree Branch
10/21/2001	Alabama Power had a power outage on Shelton Beach	4 hours	2000	Winchester Blvd.	Eight-Mile Creek
1/20/2002	rain water	4 hours	5000	Winchester Road	Eight-Mile Creek
1/20/2002	rain water	4 hours	5000	Whistler St. at Patricia St.	Gum Tree Branch
1/20/2002	rain water	4 hours	8000	Wasson St.	Gum Tree Branch
3/12/2002	heavy rain	2 hours	3000	Whistler St. at Patricia St.	Gum Tree Branch
3/12/2002	heavy rain	4 hours	5000	Wasson Ave.	Gum Tree Branch
3/14/2002	pumps lost prime	3 hours	3000	Winchester Rd.	Eight-Mile Creek
3/28/2002	pump down	15 hours	200	Winchester St.	Eight-Mile Creek

Table 9-6 Sewer Overflows Reported by Mobile Area Water and Sewer System*

Date of Spill	Reported Cause	Duration	Estimated Reported Volume (gallons)	Location	Reported Stream Impacted
7/10/1998			6750	5745 Erhard Dr.	Clear Creek
4/12/1999			9000	Schillinger Rd & Howells Ferry Rd.	Clear Creek
1/24/1997			24000	1651 Woodley Rd.	Eight Mile Creek
8/25/1997			7200	6229 Summer Place Drive N.	Eight Mile Creek
4/29/1998			50000	1323 Forest Ridge Drive West	Sewer System
7/11/2000	Grease	3 hours	4500	4762 Pallister Place N.	Eight Mile Creek
7/28/2000	Hole in force main	3 hours	4000	Wards Ln. & Dubose Ave.	None
12/9/2000	Force main break	3 hours	1800	3333 Schillinger Rd.	Clear Creek
8/3/2001	Damaged force main	5 hours	2424	7630 Moffett Rd.	
8/6/2001	Broken main	3 hours	4240	6501 Moffett Rd.	
8/14/2001	Debris	3 hours	9000	2109 Luckner Ct.	Eight Mile Creek
8/14/2001	Debris	2 hours	4800	1407 Morlee Dr. W	Eight Mile Creek
8/27/2001	Grease	1 hour	600	145 Woodruff Ct.	Twelve Mile Creek
9/17/2001	Lift station failure	1 hour	1000	Allentown Schools, Howells Ferry Rd.	Clear Creek
9/28/2001	Lift station failure	1 hour	1250	QMS # 34	Clear Creek
10/24/2001	Force main break	1 hour	275	9173 Howells Ferry Rd.	
10/30/2001	Force main break	7 hours	14500	8075 Wards Ln.	Crooked Creek
2/20/2002	Grease	1 hour	120	1708 Princeton Woods Dr.	Eight Mile Creek

*Data provided by reports received by ADEM from the Mobile Area Water and Sewer Service.

9.4 Hydrology Calibration for Eightmile Creek

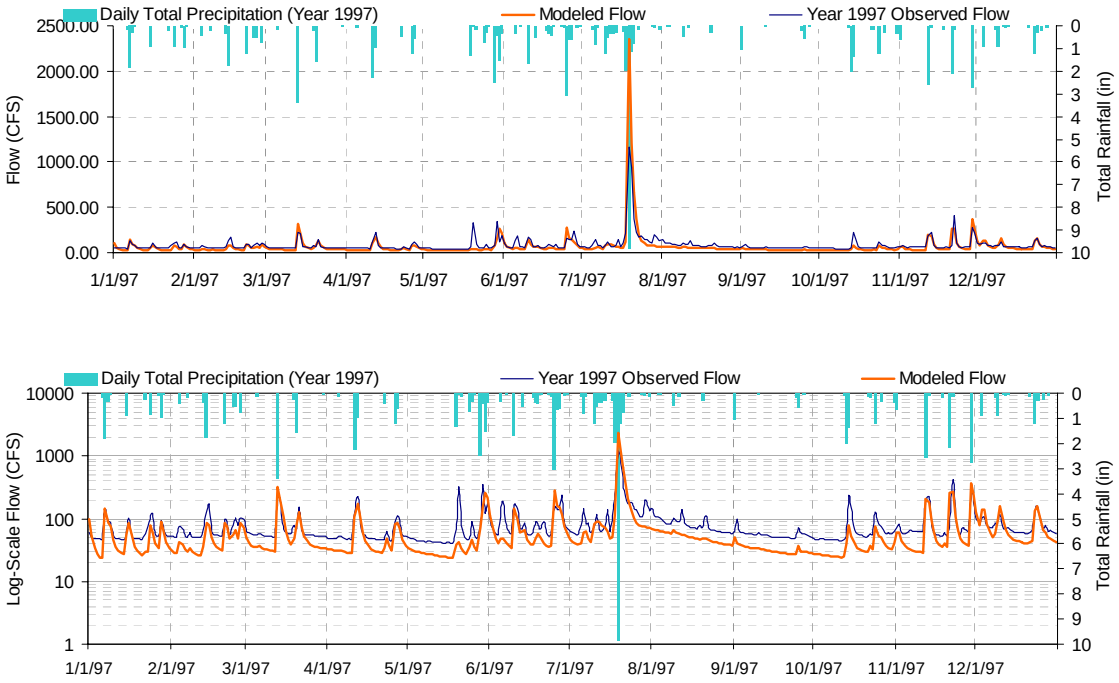


Figure 9-4. LSPC Model Hydrology Calibration at Eightmile Creek, 1997

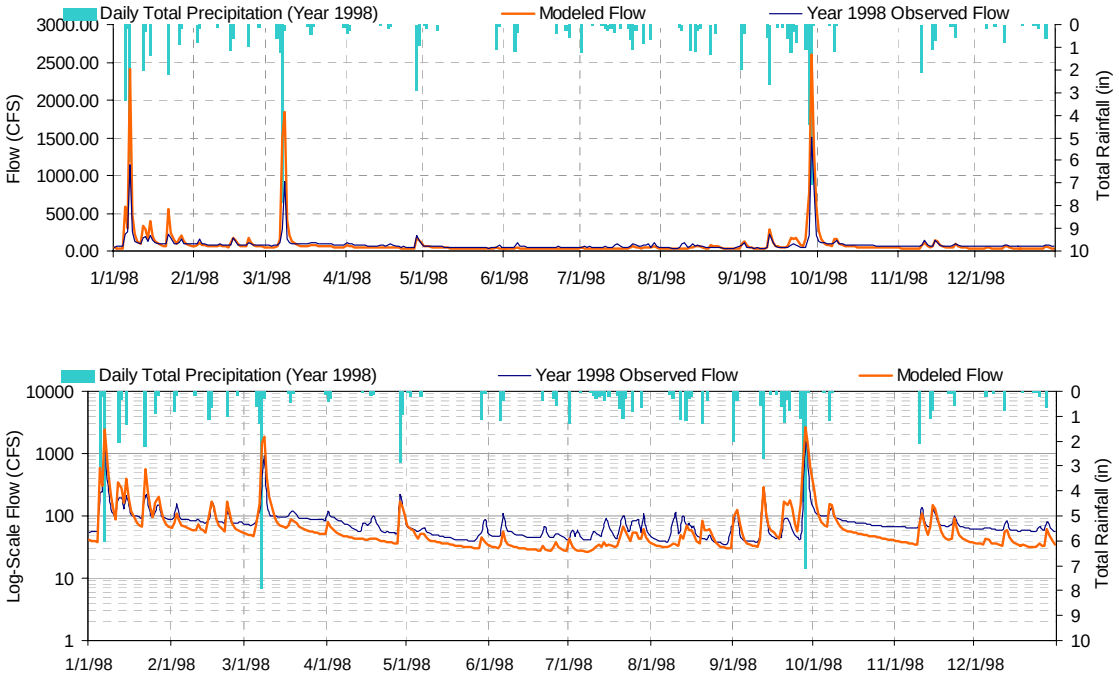


Figure 9-5. LSPC Model Hydrology Calibration at Eightmile Creek, 1998

Figure 9-6. LSPC Model Hydrology Calibration at Eightmile Creek, 1999

Figure 9-7. LSPC Model Hydrology Calibration at Eightmile Creek, 2000 (end of data).