Total Maximum Daily Load

Evaluation

for

Twenty-Nine Stream Segments

in the

Coosa River Basin

for

Fecal Coliform

Submitted to:
The U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

Submitted by:
The Georgia Department of Natural Resources
Environmental Protection Division
Atlanta, Georgia

January 2009

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EXECUTIVE SUMMARY

The State of Georgia assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are placed into one of two categories with respect to designated uses: supporting or not supporting. These water bodies are found on Georgia's 305(b) list as required by that section of the CWA that defines the assessment process, and are published in *Water Quality in Georgia* (Draft GA EPD, 2006 – 2007). This document is available on the Georgia Environmental Protection Division (GA EPD) website.

Some of the 305(b) not supporting water bodies are also assigned to Georgia's 303(d) list, also named after that section of the CWA. Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard. The TMDLs in this document are based on the 2008 303(d) listing, which is available on the GA EPD website. The TMDL process establishes the allowable pollutant loadings or other quantifiable parameters for a water body based on the relationship between pollutant sources and instream water quality conditions. This allows water quality-based controls to be developed to reduce pollution and restore and maintain water quality.

The State of Georgia has identified twenty-nine stream segments located in the Coosa River Basin as water quality limited due to fecal coliform bacteria. A stream is placed on the not support list if more than 10% of the samples exceed the fecal coliform criteria. Water quality samples collected within a 30-day period that have a fecal coliform geometric mean in excess of 200 counts per 100 milliliters during the period May through October, or in excess of 1,000 counts per 100 milliliters during the period November through April, are in violation of the bacteria water quality standard. There is also a single sample maximum criteria (4,000 counts per 100 milliliters) for the months of November through April. The water use classification of the impacted streams is Fishing.

An important part of the TMDL analysis is the identification of potential source categories. Sources are broadly classified as 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. Nonpoint sources are diffuse, and generally, but not always, involve accumulated fecal coliform bacteria that wash off land surfaces as a result of storm events.

The process of developing fecal coliform bacteria TMDLs for the Coosa River Basin listed segments includes the determination of the following:

- The current critical fecal coliform load to the stream under existing conditions;
- The TMDL for similar conditions under which the current critical load was determined; and
- The percent reduction in the current critical fecal coliform load necessary to achieve the TMDL.

The calculation of the fecal coliform load at any point in a stream requires the fecal coliform concentration and stream flow. The availability of water quality and flow data varies considerably among the listed segments. The Loading Curve Approach was used to determine the current fecal coliform load and TMDL. The fecal coliform loads and required reductions for each of the listed segments are summarized in the table below.

Fecal Coliform Loads and Required Fecal Coliform Load Reductions

Stream Segment	Current Load (counts/ 30 days)	TMDL Components					Percent Reduction
		WLA (counts/ 30 days)[1]	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Camp Creek	1.70E+12			1.34E+12	1.49E+11	1.49E+12	12
Chattooga River	1.75E+16	1.11E+12		1.80E+15	2.01E+14	2.01E+15	89
Coahulla Creek	1.24E+13		1.59E+11	5.84E+12	6.66E+11	6.66E+12	46
Cochran Creek	1.61E+14			2.66E+13	2.96E+12	2.96E+13	82
Conasauga River	1.13E+14			5.93E+13	6.59E+12	6.59E+13	42
Dozier Creek	2.51E+12		1.90E+10	7.97E+11	9.06E+10	9.06E+11	64
Drowning Bear Creek	6.40E+11		2.10E+11	3.06E+11	5.73E+10	5.73E+11	11
Duck Creek	1.58E+13			3.30E+12	3.67E+11	3.67E+12	77
Dykes Creek	3.66E+12			1.72E+12	1.91E+11	1.91E+12	48
Etowah River	6.59E+16	5.56E+11	2.51E+14	2.61E+16	2.93E+15	2.93E+16	56
Heath Creek	1.60E+12			4.33E+11	4.81E+10	4.81E+11	70
Holly Creek - Headwaters to Amicalola Creek	7.86E+12			1.17E+12	1.30E+11	1.30E+12	83
Holly Creek - Downstream Chatsworth	1.96E+13	2.97E+11		4.36E+12	5.17E+11	5.17E+12	74
Horseleg Creek	3.98E+12		4.44E+11	1.17E+12	1.79E+11	1.79E+12	55
Jacks River	9.95E+12			8.16E+12	9.06E+11	9.06E+12	9
Johns Creek	3.77E+12			1.08E+12	1.20E+11	1.20E+12	68
Kings Creek	3.44E+12			2.94E+11	3.27E+10	3.27E+11	90
Little Amicalola Creek	9.81E+12			4.39E+12	4.88E+11	4.88E+12	50
Little River	2.99E+16	8.24E+11	7.12E+14	3.78E+15	4.99E+14	4.99E+15	83

Stream Segment	Current Load (counts/ 30 days)	TMDL Components					Percent Reduction
		WLA (counts/ 30 days)[1]	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Mill Creek	1.09E+13			3.67E+12	4.07E+11	4.07E+12	63
Noonday Creek	8.97E+13	6.26E+11	6.33E+12	5.20E+12	1.35E+12	1.35E+13	85
Oostanaula River	5.30E+14	1.42E+12	1.12E+12	3.24E+14	3.63E+13	3.63E+14	32
Oothkalooga Creek	3.10E+13	1.58E+11		9.82E+12	1.11E+12	1.11E+13	64
Pettit Creek	1.08E+14			1.84E+13	2.04E+12	2.04E+13	81
Polecat Creek	1.86E+12			1.49E+12	1.65E+11	1.65E+12	11
Salacoa Creek	8.04E+13			2.77E+13	3.08E+12	3.08E+13	62
Snake Creek	1.48E+12			1.06E+12	1.17E+11	1.17E+12	21
Swamp Creek	7.91E+12		2.96E+10	3.63E+12	4.06E+11	4.06E+12	49
Toms Creek	1.16E+12			6.27E+11	6.97E+10	6.97E+11	40

Notes: [1] The assigned fecal coliform load from each NPDES permitted facility for WLA was determined as the product of the fecal coliform permit limit and the facility average monthly discharge at the time of the critical load.

Management practices that may be used to help reduce fecal coliform source loads include:

- Compliance with NPDES permit limits and requirements;
- Adoption of NRCS Conservation Practices; and
- Application of Best Management Practices (BMPs) appropriate to reduce nonpoint sources.

The amount of fecal coliform delivered to a stream is difficult to determine. However, by requiring and monitoring the implementation of these management practices, their effects will improve stream water quality, and represent a beneficial measure of TMDL implementation.

1.0 INTRODUCTION

1.1 Background

The State of Georgia assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are categorized with respect to designated uses as supporting or not supporting. These water bodies are found on Georgia's 305(b) list as required by that section of the CWA that addresses the assessment process, and are published in *Water Quality in Georgia* (draft, GA EPD, 2006 – 2007). This document is available on the Georgia Environmental Protection Division (GA EPD) website.

Some of the 305(b) not supporting water bodies are also assigned to Georgia's 303(d) list, also named after that section of the CWA. Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard. The TMDLs in this document are based on the 2008 303(d) listing, which is available on the GA EPD website. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and in-stream water quality conditions. This allows water quality based controls to be developed to reduce pollution and restore and maintain water quality.

The list identifies the waterbodies that are not supporting their designated use classifications, due to exceedances of water quality standards for fecal coliform bacteria. Fecal coliform bacteria are used as an indicator of the potential presence of pathogens in a stream. Table 1 presents the twenty-nine streams of the Coosa River Basin included on the 2008 303(d) list for exceedances of the fecal coliform standard criteria.

1.2 Watershed Description

The Coosa River originates in Tennessee as the Conasauga River and in the north Georgia mountains as the Etowah, Coosawattee, and Chattooga Rivers. The Conasauga River flows south from Tennessee where it converges with the Coosawattee River near Resaca, Georgia, to form the Oostanaula River. The Coosawattee River originates in Ellijay, Georgia, by the merging of the Ellijay and Cartecay Rivers. The Coosawattee flows west from Ellijay, joins with Mountain Creek and then flows into Carter's Lake. From Carter's Lake, the Coosawattee River flows west toward Resaca where it meets the Conasauga to form the Oostanaula River The Etowah River flows southwest from Lumpkin County to Lake Allatoona. From there it flows west toward Rome, Georgia, where it merges with the Oostanaula River to form the Coosa River. The Coosa River then flows west into Alabama to Lake Weiss. The Chattooga River originates in Walker County and flows southwest into Alabama to Lake Weiss. The Coosa River flows south from Lake Weiss through a series of lakes and eventually joins the Tallapoosa River to form the Alabama River, which ultimately discharges to the Gulf of Mexico. The Coosa River Basin occupies a total area of about 10,059 square miles, of which 4,579 square miles (46 percent) lie in Georgia. The Coosa River Basin contains parts of the Blue Ridge, Piedmont, and Ridge and Valley physiographic provinces that extend throughout the southeastern United States.

Table 1. Water Bodies Listed on the 2008 303(d) List for Fecal Coliform Bacteria in the Coosa River Basin

Stream Segment	Location	Segment Length (miles)	Designated Use
Camp Creek	Dry Creek to Oostanaula River (Gordon County)	3	Fishing
Chattooga River	Lyerly to Stateline (Chattooga County)	7	Fishing
Coahulla Creek	Mill Creek to Conasauga River (Whitfield County)	5	Fishing
Cochran Creek	Gab Creek to Amicalola Creek (Dawson County)	5	Fishing
Conasauga River	Stateline to Hwy 286 (Murray and Whitfield Counties)	20	Fishing/ Drinking Water
Dozier Creek	Oostanaula River Tributary (Floyd County)	3	Fishing
Drowning Bear Creek	Tar Creek to Little Creek (Whitfield Co.)	4	Fishing
Duck Creek	Headwaters to Chattooga River (Walker County)	13	Fishing
Dykes Creek	Headwaters to Etowah River (Floyd County)	7	Fishing
Etowah River	Sharp Mountain Creek to Lake Allatoona (Cherokee County)	20	Fishing/ Drinking Water
Heath Creek	Downstream Rocky Mountain Project (Floyd County)	5	Fishing
Holly Creek	Headwaters to Amicalola Creek (Dawson Co.)	4	Fishing
Holly Creek	Downstream Chatsworth (Murray County)	4	Fishing
Horseleg Creek	Rome (Floyd County)	4	Fishing
Jacks River	Rough Creek to Stateline (Fannin and Murray Counties)	9	Fishing
Johns Creek	Oostanaula River Tributary (Floyd County)	6	Fishing
Kings Creek	Coosa River Tributary (Floyd County)	4	Fishing
Little Amicalola Creek	Headwaters to Amicalola Creek (Dawson Co.)	5	Fishing
Little River	Hwy 140 to Lake Allatoona (Fulton and Cherokee Counties)	12	Fishing
Mill Creek	Crandall Ellijay Rd (C.R. 27) to Conasauga River (Murray County)	10	Fishing
Noonday Creek	Little Noonday Creek to Lake Allatoona (Cobb and Cherokee Counties)	8	Fishing
Oostanaula River	Conasauga/Coosawattee to Oothkalooga Creek (Gordon County)	11	Drinking Water
Oothkalooga Creek	U/S Bartow Co. Line to Oostanaula River (Bartow and Gordon Counties)	14	Fishing

Stream Segment	Location	Segment Length (miles)	Designated Use
Pettit Creek	Satterfield Branch to Nancy Creek (Bartow County)	3	Fishing
Polecat Creek	Headwaters to Conasauga River (Murray and Gordon County)	10	Fishing
Salacoa Creek	Pine Log Creek to Coosawattee River (Gordon County)	6	Fishing
Snake Creek	Headwaters to Oostanaula River (Gordon and Walker Counties)	11	Fishing
Swamp Creek	Little Swamp Creek to Conasauga River (Whitfield County)	3	Fishing
Toms Creek	Headwaters to Etowah River (Bartow County)	7	Fishing

The United States Geologic Survey (USGS) has divided the Coosa basin into five sub-basins, or Hydrologic Unit Codes (HUCs). These are numbered as HUCs 03150101 through 03150105. Figure 1 shows the locations of these sub-basins, and Figures 2 through 4 show the impaired segments within each sub-basin.

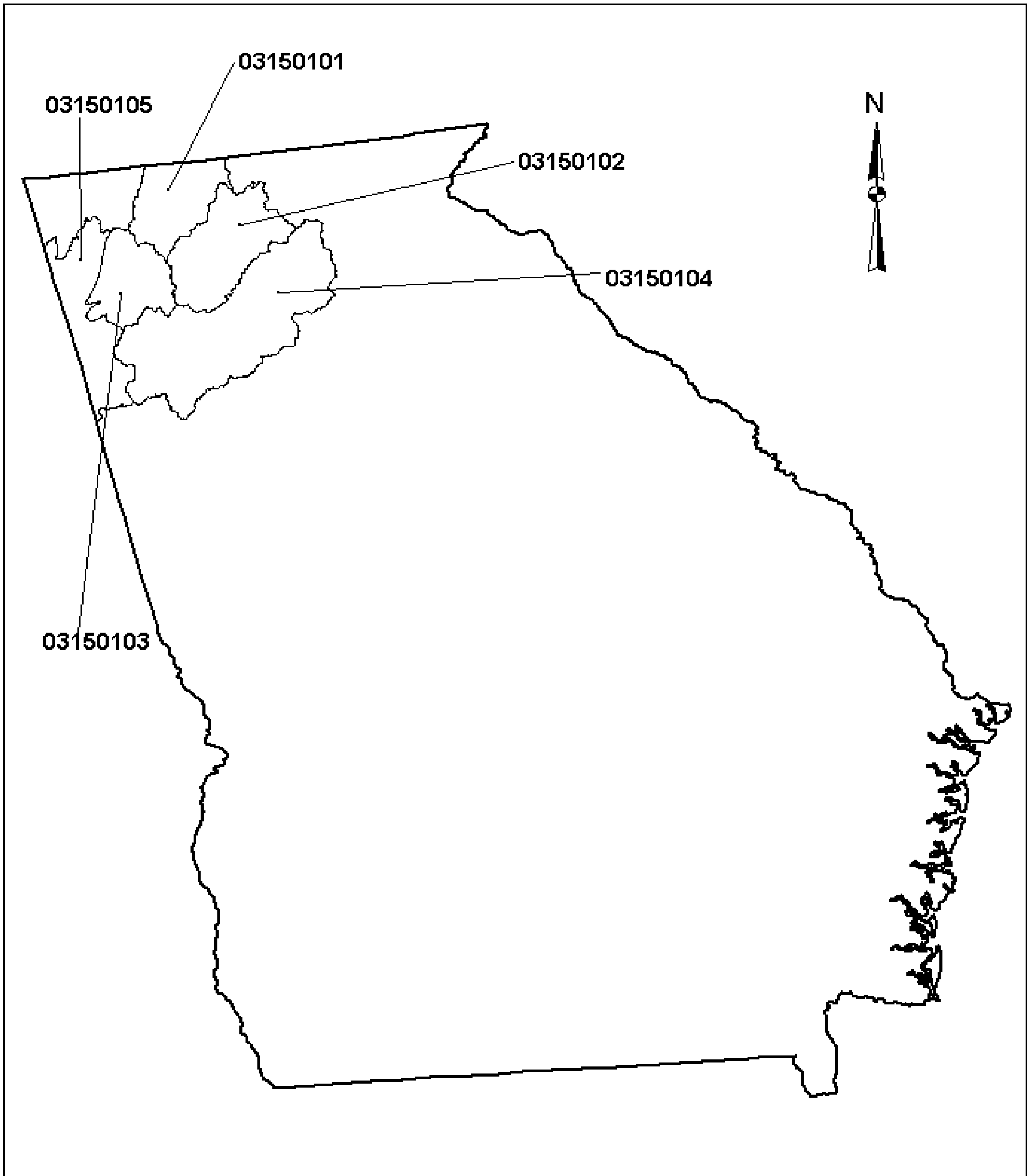
The land use characteristics of the Coosa River Basin watersheds were determined using data from the National Land Cover Dataset (NLCD) for Georgia. This coverage was produced from Landsat Thematic Mapper digital images developed in 2001. Land use classification is based on a modified Anderson level one and two system. Table 2 lists the watershed land coverage distribution of the twenty- nine stream segments.

1.3 Water Quality Standard

The water use classification for the listed stream segments in the Coosa River Basin is Fishing. The criterion violated is listed as fecal coliform. The potential cause(s) listed include urban runoff, nonpoint sources, and municipal facilities. The use classification water quality standards for fecal coliform bacteria, as stated in the *State of Georgia's Rules and Regulations for Water Quality Control*, Chapter 391-3-6-.03(6)(c)(iii) (GA EPD, 2007), are:

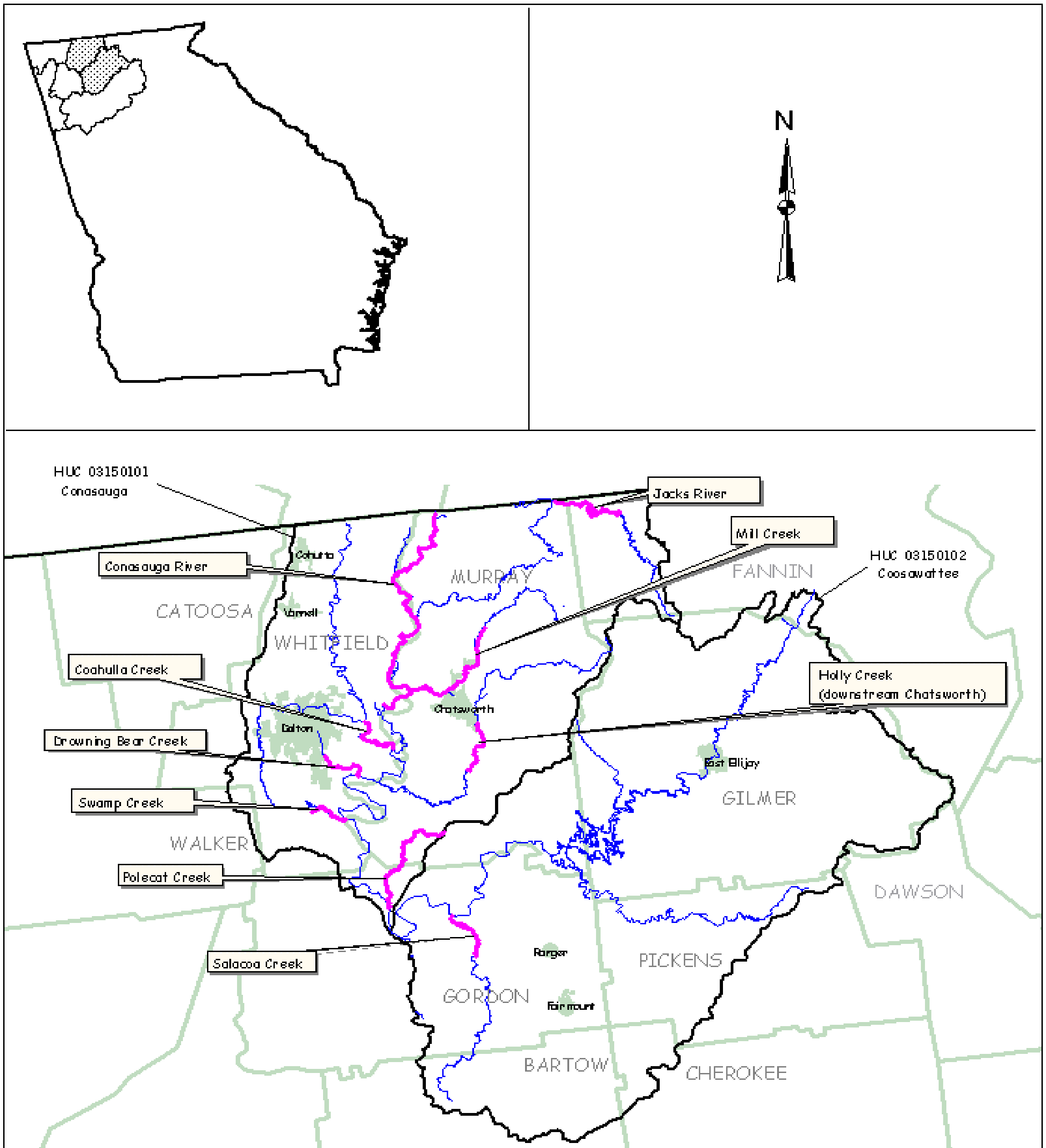
(c) Fishing: Propagation of Fish, Shellfish, Game and Other Aquatic Life; secondary contact recreation in and on the water; or for any other use requiring water of a lower quality:

(iii) Bacteria: For the months of May through October, when water contact recreation activities are expected to occur, fecal coliform not to exceed a geometric mean of 200 per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200/100 ml (geometric mean) occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 per 100 ml in lakes and reservoirs and 500 per 100 ml in free flowing freshwater streams. For the months of November through April, fecal coliform not to exceed a geometric mean of 1,000 per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours and not to exceed a maximum of 4,000 per 100 ml for any sample. The State does not encourage swimming in surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of fecal coliform. For waters designated as approved shellfish harvesting waters by the appropriate State agencies, the requirements will be consistent with those established by the State and Federal agencies responsible for the National Shellfish Sanitation Program. The requirements are found in the National Shellfish Sanitation Program Manual of Operation, Revised 1988, Interstate Shellfish Sanitation Conference, U. S. Department of Health and Human Services (PHS/FDA), and the Center for Food Safety and Applied Nutrition. Streams designated as generally supporting shellfish are listed in Paragraph 391-3-6-.03(14)



TMDL Evaluation - Fecal Coliform
Coosa River Basin

Figure 1. USGS 8-Digit HUCS for Coosa River Basin



TMDL Evaluation - Fecal Coliform
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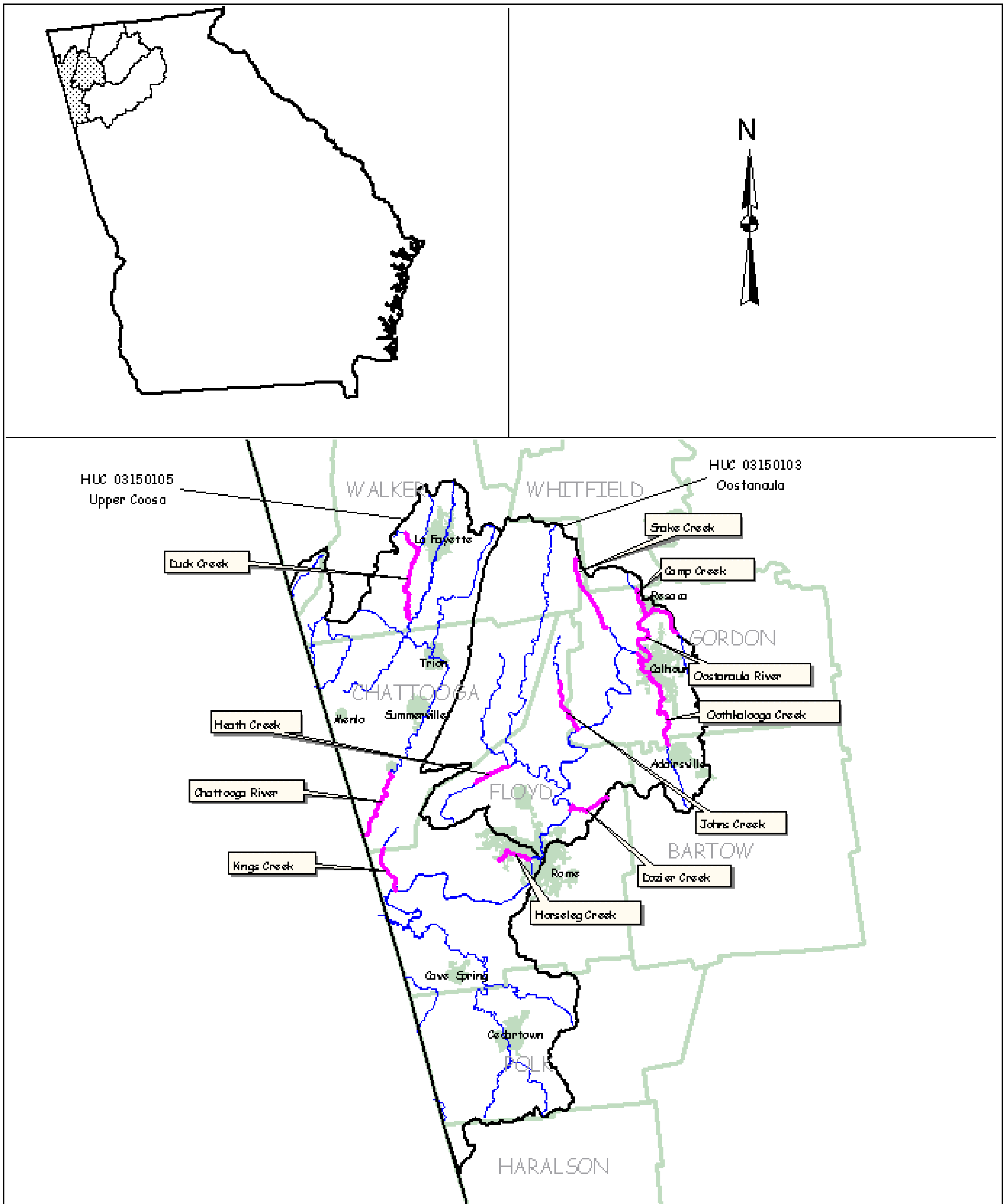
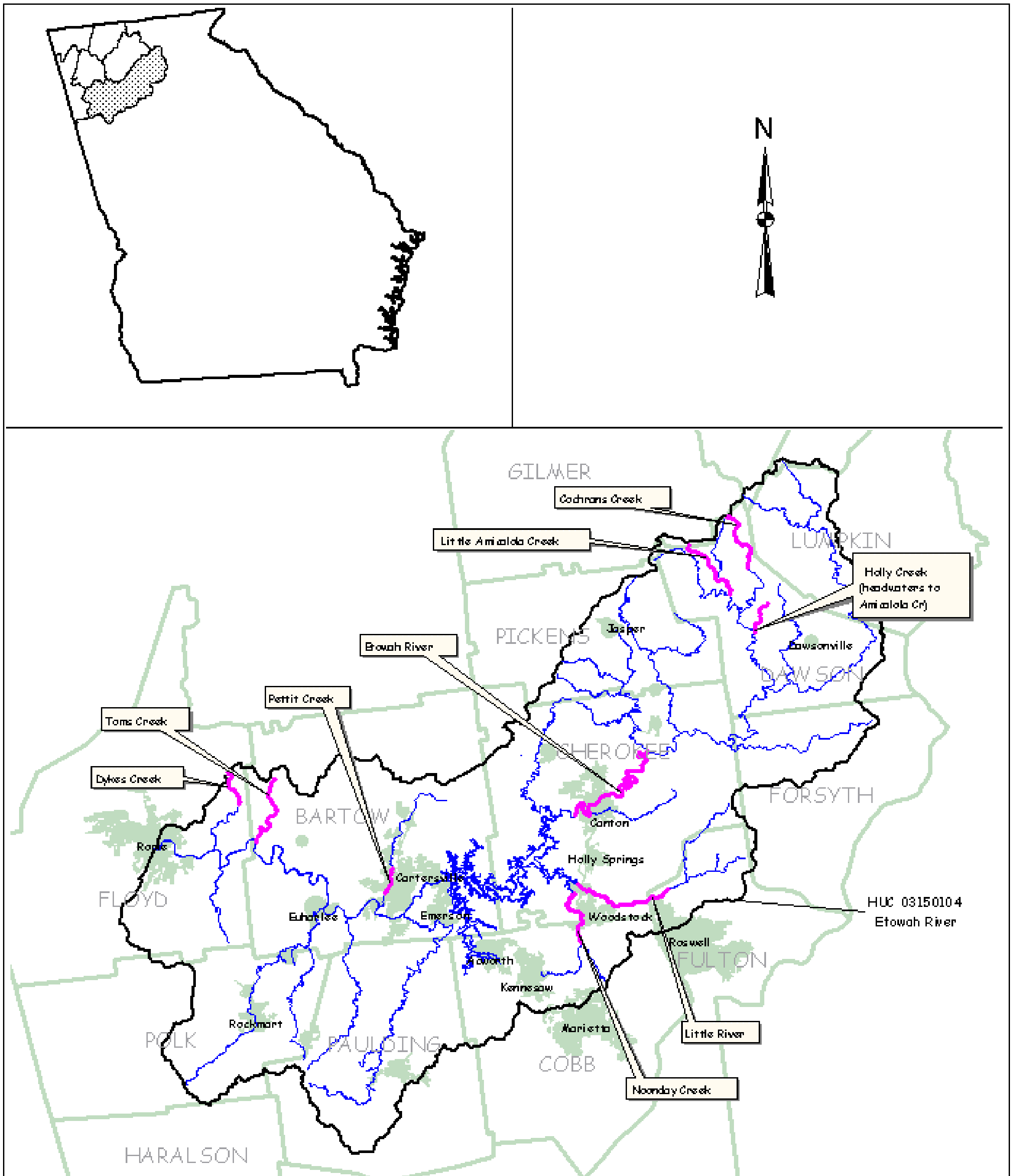
Figure 2. 303d Listed Streams in HUCs 03150101 and 03150102



TMDL Evaluation - Fecal Coliform Coosa River Basin

Figure 3. 303d Listed Streams in HUCs 03150103 and 03150105



TMDL Evaluation - Fecal Coliform Coosa River Basin

Figure 4. 303d Listed Streams in HUC 03150104

Table 2. Coosa River Basin Land Coverage

Stream/Segment	Landuse Categories - Acres (Percent)												
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial, Industrial, Transportation	Bare Rock, Sand, Clay	Quarries, Strip Mines, Gravel Pits	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total
Camp Creek	78.95 (0.8)	208.60 (2.2)	27.58 (0.3)	5.11 (0.1)	5.56 (0.1)		6436.55 (67.3)	1920.76 (20.1)	185.03 (1.9)	633.14 (6.6)	65.60 (0.7)	1.33 (0.01)	9568.20 (100.0)
Chattooga River	833.95 (0.5)	3184.14 (1.7)	707.86 (0.4)	312.01 (0.2)	110.08 (0.1)	138.99 (0.1)	117826.17 (64.7)	40114.38 (22.0)	4481.32 (2.5)	13314.08 (7.3)	946.70 (0.5)	20.68 (0.01)	181990.36 (100.0)
Coahulla Creek	482.58 (0.4)	5345.29 (4.8)	1546.48 (1.4)	667.61 (0.6)	350.26 (0.3)	199.48 (0.2)	59037.73 (52.9)	28332.99 (25.4)	2720.46 (2.4)	11632.84 (10.4)	1242.25 (1.1)	10.01 (0.01)	111567.98 (100.0)
Cochran Creek	30.69 (0.2)	44.03 (0.2)	39.58 (0.2)	11.79 (0.1)	142.11 (0.7)		14334.62 (73.9)	3866.86 (19.9)	2.22 (0.01)	886.88 (4.6)	36.25 (0.2)		19395.03 (100.0)
Conasauga River	312.90 (0.2)	493.03 (0.3)	131.88 (0.1)	21.79 (0.01)	227.50 (0.1)	4.45 (0.01)	119194.29 (74.6)	27237.06 (17.1)	5051.30 (3.2)	6334.91 (4.0)	722.54 (0.5)	12.90 (0.01)	159744.55 (100.0)
Dozier Creek	18.90 (0.3)	300.89 (4.4)	75.39 (1.1)	53.82 (0.8)	47.15 (0.7)		3606.23 (52.4)	1776.43 (25.8)	123.20 (1.8)	869.31 (12.6)	9.12 (0.1)		6880.43 (100.0)
Drowning Bear Creek	46.92 (0.5)	1804.67 (18.4)	914.46 (9.3)	819.05 (8.4)	6.45 (0.1)		3342.03 (34.1)	521.05 (5.3)	46.92 (0.5)	2222.31 (22.7)	66.94 (0.7)		9790.81 (100.0)
Duck Creek	42.25 (0.2)	61.60 (0.3)	18.01 (0.1)		12.68 (0.1)	93.40 (0.4)	15115.86 (71.6)	4445.74 (21.0)	268.20 (1.3)	979.84 (4.6)	85.62 (0.4)		21123.20 (100.0)
Dykes Creek	21.57 (0.2)	86.06 (0.8)	10.01 (0.1)	6.00 (0.1)	1.78 (0.02)		7213.57 (65.9)	2247.89 (20.5)	211.71 (1.9)	1090.59 (10.0)	53.37 (0.5)	1.56 (0.01)	10944.11 (100.0)
Etowah River	1637.66 (0.4)	5999.56 (1.5)	1275.61 (0.3)	306.67 (0.1)	1827.58 (0.4)	511.71 (0.1)	312143.89 (76.3)	52040.10 (12.7)	477.24 (0.1)	30288.21 (7.4)	2456.26 (0.6)		408964.50 (100.0)
Heath Creek	983.40 (6.5)	26.02 (0.2)	4.23 (0.03)		43.81 (0.3)	223.94 (1.5)	11747.81 (77.8)	1468.64 (9.7)	142.11 (0.9)	341.14 (2.3)	115.42 (0.8)	0.22 (0.004)	15096.74 (100.0)
Holly Creek - Headwaters to Amicalola Creek	4.45 (0.2)	10.23 (0.6)	6.23 (0.3)	2.22 (0.1)	3.11 (0.2)		1241.59 (69.6)	389.62 (21.8)		125.87 (7.1)	0.89 (0.05)		1784.21 (100.0)
Holly Creek - Downstream Chatsworth	64.94 (0.2)	540.40 (1.3)	209.04 (0.5)	74.50 (0.2)	11.56 (0.03)		33422.09 (82.4)	3806.15 (9.4)	250.41 (0.6)	2071.98 (5.1)	118.75 (0.3)	1.11 (0.01)	40570.94 (100.0)
Horseleg Creek	8.90 (0.3)	730.10 (20.7)	92.29 (2.6)	84.51 (2.4)			1701.04 (48.1)	67.16 (1.9)	4.45 (0.1)	831.06 (23.5)	14.23 (0.4)		3533.73 (100.0)
Jacks River							25310.75 (99.6)	12.01 (0.01)		86.95 (0.3)	4.23 (0.01)		25413.94 (100.0)

Stream/Segment	Landuse Categories - Acres (Percent)												
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial, Industrial, Transportation	Bare Rock, Sand, Clay	Quarries, Strip Mines, Gravel Pits	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total
Johns Creek	143.66 (0.5)	7.12 (0.03)	8.45 (0.03)		5.34 (0.02)		24206.82 (85.5)	3135.66 (11.1)	215.94 (0.8)	477.02 (1.7)	126.98 (0.4)	1.11 (0.01)	28328.09 (100.0)
Kings Creek	52.48 (0.7)	16.46 (0.2)			6.89 (0.1)		6472.13 (82.5)	803.93 (10.3)	184.14 (2.3)	200.15 (2.6)	104.08 (1.3)	1.11 (0.01)	7841.36 (100.0)
Little Amicalola Creek	16.23 (0.2)	24.69 (0.3)	8.01 (0.1)		0.89 (0.01)		7307.86 (89.3)	413.20 (5.0)	14.01 (0.2)	376.28 (4.6)	26.24 (0.3)		8187.40 (100.0)
Little River	1145.29 (1.3)	8155.15 (9.0)	936.03 (1.0)	306.89 (0.3)	993.40 (1.1)		45493.03 (50.4)	14597.03 (16.2)	8.45 (0.01)	17387.32 (19.3)	1270.72 (1.4)		90293.33 (100.0)
Mill Creek	57.38 (0.2)	557.52 (2.2)	250.63 (1.0)	227.95 (0.9)	8.90 (0.04)		14430.47 (57.5)	6685.84 (26.7)	616.01 (2.5)	2162.94 (8.6)	85.84 (0.3)		25083.47 (100.0)
Noonday Creek	319.35 (1.0)	7837.14 (25.3)	2749.37 (8.9)	1665.68 (5.4)	237.06 (0.8)	169.68 (0.5)	7794.00 (25.1)	1360.79 (4.4)		8483.84 (27.4)	387.62 (1.3)		31004.52 (100.0)
Oostanaula River	3871.53 (0.5)	14791.40 (1.9)	5192.07 (0.6)	2879.91 (0.4)	1463.75 (0.2)	502.82 (0.1)	529538.70 (66.2)	21227.28 (19.8)	21227.28 (2.7)	56104.67 (7.0)	5709.79 (0.7)	74.94 (0.01)	799345.21 (100.0)
Oothkalooga Creek	165.68 (0.4)	2117.12 (5.2)	824.83 (2.0)	688.29 (1.7)	100.74 (0.2)	285.10 (0.7)	20313.49 (49.5)	10214.23 (24.9)	1051.22 (2.6)	5154.26 (12.6)	132.54 (0.3)	1.11 (0.003)	41048.63 (100.0)
Pettit Creek	277.54 (1.1)	2484.06 (10.0)	911.12 (3.7)	467.01 (1.9)	10.01 (0.04)		12458.56 (50.2)	4234.91 (17.1)	534.17 (2.2)	3385.62 (13.6)	62.94 (0.3)		24825.95 (100.0)
Polecat Creek	35.58 (0.3)	54.71 (0.5)	23.57 (0.2)	5.78 (0.1)	(0.0)		5397.33 (52.2)	3485.69 (33.7)	463.45 (4.5)	773.24 (7.5)	92.29 (0.9)	4.23 (0.04)	10335.88 (100.0)
Salacoa Creek	495.48 (0.3)	1071.46 (0.7)	305.56 (0.2)	65.60 (0.04)	188.36 (0.1)	158.56 (0.1)	103577.39 (67.2)	34546.26 (22.4)	3721.87 (2.4)	9371.61 (6.1)	547.52 (0.4)	7.78 (0.01)	154057.45 (100.0)
Snake Creek	4.45 (0.04)	61.60 (0.6)	20.24 (0.2)	14.68 (0.1)	1.78 (0.02)	42.48 (0.4)	7246.70 (73.2)	1656.78 (16.7)	433.65 (4.4)	387.62 (3.9)	30.69 (0.3)	1.11 (0.01)	9901.78 (100.0)
Swamp Creek	39.14 (0.3)	628.24 (4.2)	408.08 (2.7)	267.09 (1.8)	12.23 (0.1)		11355.97 (75.6)	1225.35 (8.2)	156.56 (1.0)	746.55 (5.0)	172.79 (1.2)		15012.01 (100.0)
Toms Creek	14.01 (0.1)	18.01 (0.2)	5.34 (0.1)	2.67 (0.03)	4.00 (0.04)		7134.40 (71.6)	1793.55 (18.0)	205.71 (2.1)	739.21 (7.4)	43.14 (0.4)		9960.04 (100.0)

2.0 WATER QUALITY ASSESSMENT

Stream segments are placed on the 303(d) list as not supporting their water use classification based on water quality sampling data. A stream is placed on the not support list if more than 10% of the samples exceed the fecal coliform criteria. Water quality samples collected within a 30-day period that have a geometric mean in excess of 200 counts per 100 milliliters during the period May through October, or in excess of 1000 counts per 100 milliliters during the period November through April, are in violation of the bacteria water quality standard. There is also a single sample maximum criterion (4000 counts per 100 milliliters) for the months of November through April.

Fecal coliform data used for TMDLs developed in this document were collected during calendar years 2001 through 2007 by GA EPD as part of the trend monitoring program. In addition, Upper Etowah Adopt-A-Stream data that was collected during calendar years 2002 and 2003 was used for TMDL development for a small number of stream segments. These data are presented in Appendix A.

3.0 SOURCE ASSESSMENT

An important part of the TMDL analysis is the identification of potential source categories. Sources are broadly classified as 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. Nonpoint sources are diffuse, and generally, but not always, involve accumulation of fecal coliform bacteria on land surfaces that wash off as a result of storm events.

3.1 Point Source Assessment

Title IV of the Clean Water Act establishes the National Pollutant Discharge Elimination System (NPDES) permit program. Basically, there are two categories of NPDES permits: 1) municipal and industrial wastewater treatment facilities, and 2) regulated storm water discharges.

3.1.1 Wastewater Treatment Facilities

In general, industrial and municipal wastewater treatment facilities have NPDES permits with effluent limits. These permit limits are either based on federal and state effluent guidelines (technology-based limits) or on water quality standards (water quality-based limits).

The EPA has developed technology-based guidelines, which establish a minimum standard of pollution control for municipal and industrial discharges without regard for the quality of the receiving waters. These are based on Best Practical Control Technology Currently Available (BPT), Best Conventional Control Technology (BCT), and Best Available Technology Economically Achievable (BAT). The level of control required by each facility depends on the type of discharge and the pollutant.

The EPA and the states have also developed numeric and narrative water quality standards. Typically, these standards are based on the results of aquatic toxicity tests and/or human health criteria and include a margin of safety. Water quality-based effluent limits are set to protect the receiving stream. These limits are based on water quality standards that have been established for a stream based on its intended use and the prescribed biological and chemical conditions that must be met to sustain that use.

Discharges from municipal and industrial wastewater treatment facilities can contribute fecal coliform to receiving waters. There are 12 NPDES permitted discharges with flows greater than 0.1 MGD identified in the Coosa River Basin that discharge treated municipal wastewater and that potentially impact streams on the 2008 303(d) list for fecal coliform bacteria. Table 3 provides the monthly average discharge flows and fecal coliform concentrations for the municipal and industrial treatment facilities, obtained from calendar year 2007 Discharge Monitoring Report (DMR) data. The permitted flow and fecal coliform concentrations for these facilities are also included in this table.

Combined sewer systems convey a mixture of raw sewage and storm water in the same conveyance structure to the wastewater treatment plant. These are considered a component of municipal wastewater treatment facilities. When the combined sewage exceeds the capacity of the wastewater treatment plant, the excess is diverted to a combined sewage overflow (CSO) discharge point. There are no permitted CSO outfalls in the Coosa River Basin.

Table 3. NPDES Facilities Discharging Fecal Coliform Bacteria into Coosa River Basin 303(d) Listed Stream Segments

Facility Name	NPDES Permit No.	Receiving Stream	Actual 2007 Discharge		NPDES Permit Limits		Number of Fecal Coliform/ Flow Violations 2005 –2007
			Average Monthly Flow (MGD)[a]	Geometric Mean (No./100 ml)[b]	Average Monthly Flow (MGD)	Average Monthly FC (No./100mL)	
Adairsville North	GA0033243	Chattooga River	0.29	29.1	0.5	200	4[d]
Adairsville South	GA0032514	Chattooga River	0.29[c]	29.1[c]	0.5	200	3[d]
Calhoun WPCP	GA0020516	Etowah River	5.46	35.8	16.0	200	0
Canton WPCP	GA0000973	Etowah River	1.66	29.9	1.89	200	9[e]
Chatsworth Judson F Vick WPCP	GA0000973	Holly Cr Trib/Conasuaga R Trib/Oostanaula R Trib/Coosa R	1.0	21.9	3.0	200	1[d]
Cherokee Co/Fitzgerald Creek	GA0021504	Rubes Creek Trib/Little River	1.74	1.7	2.0	200	0
Cobb Co Noonday Creek	GA0026077	Little River To Lake Allatoona	9.51	1.0	12.0	50	2[e]
Fulton Co Little River	GA0032506	Little River	0.72	1.2	1.0	200	1[e]
Goldkist Poultry Byproducts	GA0024333	Noonday Cr Trib To Lake Allatoona	0.16	1.3	NA	400[f]	0
Summerville WPCP	GA0030686	Oostanaula River	0.77	51.0	2.5	200	2[d]
Trion WPCP	GA0026433	Oothkalooga Cr Trib To Oostanaula R	4.8	7.9	5.0	200	1[d]
Woodstock Wpcp (2006 Data)	GA0026263	Rubes Creek Trib/Little River	1.0	1.1	1.0	200	0

Source: GA EPD Regional Offices

Notes: [a] Values shown are the annual average of the monthly average flows.
[b] Values shown are the annual average of the monthly geometric means.
[c] Values are for Year 2005. Flow has been diverted to the Adairsville North facility (GA0033243) since 2006.
[d] Violation of fecal coliform bacteria limits
[e] Violation of flow limits
[f] Facility maximum limit; does not have an average monthly limit
NA = Not Applicable

3.1.2 Regulated Storm Water Discharges

Some storm water runoff is covered under the NPDES Permit Program. It is considered a diffuse source of pollution. Unlike other NPDES permits that establish end-of-pipe limits, storm water NPDES permits establish controls "to the maximum extent practicable" (MEP). Currently, regulated storm water discharges that may contain fecal coliform bacteria consist of those associated with industrial activities including construction sites disturbing one acre or greater, and large, medium, and small municipal separate storm sewer systems (MS4s) that serve populations of 50,000 or more.

Storm water discharges associated with industrial activities are currently covered under a General Storm Water NPDES Permit. This permit requires visual monitoring of storm water discharges, site inspections, implementation of Best Management Practices (BMPs), and record keeping.

Storm water discharges from MS4s are very diverse in pollutant loadings and frequency of discharge. At present, all cities and counties within the state of Georgia that had a population of greater than 100,000 at the time of the 1990 Census, are permitted for their storm water discharge under Phase I. This includes 60 permittees in Georgia.

Phase I MS4 permits require the prohibition of non-storm water discharges (i.e., illicit discharges) into the storm sewer systems and controls to reduce the discharge of pollutants to the maximum extent practicable, including the use of management practices, control techniques and systems, as well as design and engineering methods (Federal Register, 1990). A site-specific Storm Water Management Plan (SWMP) outlining appropriate controls is required by and referenced in the permit. There are five Phase I MS4s in the Coosa River Basin (Table 4).

Table 4. Phase I Permitted MS4s in the Coosa River Basin

Name	Permit No.	Watershed
Acworth	GAS000101	Coosa
Cobb County	GAS000108	Chattahoochee, Coosa
Fulton County	GAS000117	Chattahoochee, Coosa, Flint, Ocmulgee
Forsyth County	GAS000300	Chattahoochee, Coosa
Kennesaw	GAS000121	Coosa

Source: Nonpoint Source Permitting Program, GA DNR, 2007

Small MS4s serving urbanized areas are required to obtain a storm water permit under the Phase II storm water regulations. An urbanized area is defined as an area with a residential population of at least 50,000 people and an overall population density of at least 1,000 people per square mile. Thirty counties and 56 communities are permitted under the Phase II regulations in Georgia. There are fifteen counties or communities located in the Coosa River Basin that are covered by the Phase II General Storm Water Permit (Table 5).

Table 5. Phase II Permitted MS4s in the Coosa River Basin

Name	Watershed
Bartow County	Coosa
Canton	Coosa
Cherokee County	Coosa
Dallas	Coosa
Dalton	Coosa
Emerson	Coosa
Floyd County	Coosa
Holly Springs	Coosa
Mountain Park	Coosa
Paulding County	Chattahoochee, Coosa, Tallapoosa
Rome	Coosa
Varnell	Coosa
Walker County	Coosa, Tennessee
Whitfield County	Coosa, Tennessee
Woodstock	Coosa

Source: Nonpoint Source Permitting Program, GA DNR, 2007

Those watersheds located within Phase I or Phase II MS4 city or county urbanized areas are listed in Table 6. The table provides the total area of each of these watersheds, and the percentage of the watersheds that is MS4 city or county urbanized area.

Table 6. Percentage of Watersheds in the Coosa River Basin Located in MS4 City or County Urbanized Areas

Stream Segment	Location	Total Area (square miles)	% in MS4 area
Coahulla Creek	Mill Creek to Conasauga River	174.3	20.0
Dozier Creek	Oostanaula River Tributary	10.8	15.8
Drowning Bear Creek	Tar Creek to Little Creek	15.3	88.7
Etowah River	Sharp Mountain Creek to Lake Allatoona	639.0	13.6
Horseleg Creek	Rome	5.5	72.3
Little River	Hwy 140 to Lake Allatoona	141.1	67.9
Noonday Creek	Little Noonday Creek to Lake Allatoona	48.4	100.0
Oostanaula River	Conasauga/Coosawattee to Oothkalooga Creek	1,249.3	4.4
Swamp Creek	Little Swamp Creek to Conasauga River	1,117.1	7.4

3.1.3 Confined Animal Feeding Operations

Confined livestock and confined animal feeding operations (CAFOs) are characterized by high animal densities. This results in large quantities of fecal material being contained in a limited area. Processed agricultural manure from confined hog, dairy cattle, and select poultry operations is generally collected in lagoons. It is then applied to pastureland and cropland as a fertilizer during the growing season, at rates that often vary monthly.

In 1990, the State of Georgia began registering CAFOs. Many of the CAFOs using liquid manure handling systems were issued land application or NPDES permits for treatment of wastewaters generated from their operations. The type of permit issued depends on the operation size (i.e., number of animal units). Table 7 presents the swine and non-swine (primarily dairies) liquid manure CAFOs located in the Coosa River Basin that are registered or have land application permits.

Table 7. Registered Liquid Manure CAFOs in the Coosa River Basin

Name	County	Animal Type	Total Number of Animals	Permit No.
Bridges Brothers Farms, Inc.	Floyd	Swine	2460	GAU700000
Franklin B. Wright, Company, Inc.	Gilmer	Dairy	300	GAU700000
Larry Thomason Egg Farm, Inc.	Gordon	CL	100,000	GAG930000
Petty Dairy, Inc.	Murray	Dairy	210	GAU700000

Source: GA Dept. of Agriculture, 2008

Georgia is consistently among the top three states in the U.S. in terms of poultry operations. The majority of poultry farms are dry manure operations where the manure is land applied. This can be a nonpoint source for fecal coliform bacteria. Current federal regulations require that large poultry farms operate under an NPDES permit. Table 8 presents the dry manure poultry operations in the Coosa River Basin that have submitted an application for the General NPDES Permit GAG930000. Of these, one has been issued a permit, 32 will be issued a permit in the near future, and 59 are submitting additional information to complete the application process.

Table 8. Registered Dry Manure Poultry Operations in the Coosa River Basin

Name	County	Number of Animals (thousands)	Permit Number
Bar. A Farms	Bartow	- - -	NAI
Cook, Burt	Bartow	- - -	NAI
Dennis Sutton	Bartow	- - -	NAI
Ima Jewel Nally	Bartow	126	P
Jane L. Reynolds	Bartow	- - -	NAI
The Bird Farm, Inc.	Bartow	- - -	NAI
Cumberland Pltry, Autum Farm, Cripple Creek	Cherokee	175.5	P
Bok-Bok Poultry	Dawson	138	NAI
Circle R	Dawson	140	NAI
Danny Fausett #1,#2,#3	Dawson	223	P
Eagle Creek	Dawson	193.2	NAI
Git-R-Done#1 & Git-R-Done # 2	Dawson	157.8	NAI
Juno Farm	Dawson	146.4	NAI
Little Mtn, Jerry Waters, & J&B	Dawson	152.6	NAI
M & T Farm	Dawson	138	NAI
Pigeon Creek Laroge Rocky Ridge	Dawson	127	P
Powell Poultry#1/ Cochran Creek	Dawson	146.4	NAI
Alan Ray	Floyd	170	P
Blackfoot Ridge Farm	Floyd	130	NAI
Grogan Farm	Floyd	145	NAI
Highlander Poultry Farm	Floyd	180	P
John W. Shaw	Floyd	180	P
Roving Farms	Floyd	180	P
Wayne Merritt	Floyd	180	NAI
Won's Poultry (McPherson Poultry)	Forsyth	143.4	P
Yellow Creek Poultry Farm (1 & 2)	Forsyth	208	NAI
Curtis Davis	Gilmer	129	GAG930000
David Pierce	Gilmer	266.5	NAI
Double K Poultry	Gilmer	39	NAI
F.D. Whitaker	Gilmer	196	NAI
Frady Farms	Gilmer	137	NAI
Greg Wright	Gilmer	277	NAI
Hy-View Farm	Gilmer	146.4	P
James Cantrell (Clukaluck)	Gilmer	149	NAI
James Gene	Gilmer	148	NAI
Jim Logan Poultry	Gilmer	129	NAI
John Reece	Gilmer	125	NAI
Kenny McClure	Gilmer	138	NAI
Little Brook Farms #1 & #2	Gilmer	199	P
Lofton Farms	Gilmer	138	P
Mack Logan #1 & #2	Gilmer	158.2	P

Name	County	Number of Animals (thousands)	Permit Number
Newell H. May	Gilmer	170	NAI
Patsy Sandford	Gilmer	142	P
Pine Ridge Poultry	Gilmer	78	P
Ralston Creek Farm	Gilmer	138.8	P
Ray Reece Farm Cartecay Poultry	Gilmer	154.1	NAI
Rich Mountain #2 North Cutt #2	Gilmer	131	P
Ronald West Farm	Gilmer	95.6	NAI
Round Top Ridge & Windy Ridge	Gilmer	146.8	NAI
Ruth Ann T Reece Farm	Gilmer	52.2	NAI
Sam West Farm	Gilmer	58.5	NAI
Steelman Poultry (Ellington Poultry and CAT?)	Gilmer	176	NAI
Truman Reece Farm, Triple Farm, & T & B Farm	Gilmer	119.6	NAI
Valley Creek ,Green Meadows, D&B, W&R, Dasrew Broswell Farm	Gilmer	188.1	NAI
Wendell Teague	Gilmer	140	P
Charles Long	Gordon	- - -	NAI
CS Buchanan- Hoptar Farm	Gordon	180.8	P
David West	Gordon	- - -	NAI
Donnie Ralston	Gordon	- - -	NAI
E & P Farm	Gordon	190	NAI
Faulkner Poultry Farm	Gordon	174	P
Gary M. Moore	Gordon	30	NAI
H & H Farms	Gordon	106	NAI
Jeff Knight	Gordon	- - -	NAI
Johnny Jernigan (Rolling Hill Poultry)	Gordon	- - -	NAI
Keith Bagwell	Gordon	- - -	NAI
Larry Jones (Jones Poultry Farm)	Gordon	228.8	P
Metzger Poultry	Gordon	133.8	P
Mickey Moore	Gordon	- - -	NAI
Richard Kimble Hall	Gordon	20.5	NAI
Robert W. Miller	Gordon	133.8	NAI
Truman Webb	Gordon	- - -	NAI
William W. Carr	Gordon	125	NAI
A & D Poultry	Murray	188	NAI
DPL Farm	Murray	132	NAI
Ed Hall	Murray	- - -	P
James Brindle	Murray	173	NAI
Patterson Poultry	Murray	132	NAI
Pleasant Valley Poultry	Murray	176	NAI
B & B Broilers	Pickens	152.4	P
Buchanan Livestock #2	Pickens	176	P
Buchanan Livestock- Jerusalem Farm	Pickens	148	P
Buchanan Livestock- Spring Farm	Pickens	155	P

Name	County	Number of Animals (thousands)	Permit Number
G & G Farm #1; G & G Farm #2	Pickens	184	NAI
Kenneth Burton (K Dee Farm)	Pickens	135.6	NAI
Duane West, Jr.	Polk	156	P
D & S Farms	Walker	240	P
John Howard	Walker	235	P
Jones Farm	Walker	180	P
Queen Farm, LLC	Walker	171	NAI
BB & J Poultry	Whitfield	123.8	NAI
Bettilee Int. Poultry Div.	Whitfield	360	P

Source: GA Dept. of Agriculture, 2008
Notes: P = permit pending
NAI = needs additional information for application

3.2 Nonpoint Source Assessment

In general, nonpoint sources cannot be identified as entering a waterbody through a discrete conveyance at a single location. Typical nonpoint sources of fecal coliform bacteria include:

- Wildlife
- Agricultural Livestock
  - Animal grazing
  - Animal access to streams
  - Application of manure to pastureland and cropland
- Urban Development
  - Leaking sanitary sewer lines
  - Leaking septic systems
  - Land Application Systems
  - Landfills

In urban areas, a large portion of storm water runoff may be collected in storm sewer systems and discharged through distinct outlet structures. For large urban areas, these storm sewer discharge points may be regulated as described in Section 3.1.2.

3.2.1 Wildlife

The importance of wildlife as a source of fecal coliform bacteria in streams varies considerably, depending on the animal species present in the watersheds. Based on information provided by the Wildlife Resources Division (WRD) of GA DNR, the animals that spend a large portion of their time in or around aquatic habitats are the most important wildlife sources of fecal coliform. Waterfowl, most notably ducks and geese, are considered to potentially be the greatest contributors of fecal coliform. This is because they are typically found on the water surface, often in large numbers, and deposit their feces directly into the water. Other potentially important animals regularly found around aquatic environments include racoons, beavers, muskrats, and to a lesser extent, river otters and minks. Recently, rapidly expanding feral swine populations have become a significant presence in the floodplain areas of all the major rivers in Georgia. Population estimates of these animal species in Georgia are currently not available.

White-tailed deer populations are significant throughout the Coosa River Basin. Fecal coliform bacteria contributions from deer to water bodies are generally considered less significant than that of waterfowl, racoons, and beavers. This is because a greater portion of their time is spent in terrestrial habitats. This also holds true for other terrestrial mammals such as squirrels and rabbits, and for terrestrial birds (GA WRD, 2002). However, feces deposited on the land surface can result in the introduction of fecal coliform to streams during runoff events. It should be noted that between storm events, considerable decomposition of the fecal matter might occur, resulting in a decrease in the associated fecal coliform numbers.

3.2.2 Agricultural Livestock

Agricultural livestock are a potential source of fecal coliform to streams in the Coosa River Basin. The animals grazing on pastureland deposit their feces onto land surfaces, where it can be transported during storm events to nearby streams. Animal access to pastureland varies monthly, resulting in varying fecal coliform loading rates throughout the year. Beef cattle spend all of their time in pastures, while dairy cattle and hogs are periodically confined. In addition, agricultural livestock will often have direct access to streams that pass through their pastures, and can thus impact water quality in a more direct manner (USDA, 2002).

Table 9 provides the estimated number of beef cattle, dairy cattle, goats, horse, swine, sheep, and chickens by category reported by county. These data were provided by the Natural Resources Conservation Service (NRCS).

Table 9. Estimated Agricultural Livestock Populations in the Coosa River Basin

County	Livestock							
	Beef Cattle	Dairy Cattle	Swine	Sheep	Horses	Goats	Chickens Layers	Chickens-Broilers Sold
Bartow	15,000	130	250	225	4,925	1,600	220,000	32,175,000
Chattooga	9,300	85	40	-	1,070	400	80,000	825,000
Cherokee	3,000	100	-	-	3,000	1,000	-	18,161,000
Cobb	-	-	-	-	1,320	-	-	-
Dade	3,800	-	-	50	350	450	140,000	5,863,000
Dawson	3,700	-	-	75	950	300	40,000	22,687,500
Fannin	1,900	-	-	15	695	100	160,000	6,476,800
Floyd	8,250	-	3,500	170	560	470	20,000	23,400,000
Forsyth	1,600	-	-	-	2,700	50	72,000	9,052,800
Fulton	3,000	-	-	24	560	350	-	-
Gilmer	5,500	800	-	-	510	100	400,000	72,192,000
Gordon	13,700	-	120	80	980	800	786,900	61,776,000
Haralson	6,500	-	300	25	550	500	-	17,248,000
Lumpkin	3,300	200	-	80	390	329	140,000	12,531,200
Murray	2,300	275	-	60	125	526	18,000	31,174,000
Paulding	3,000	45	-	250	1,200	650	-	7,865,000
Pickens	3,330	-	240	30	735	345	80,000	23,000,000
Polk	4,200	175	-	25	1,050	450	-	7,150,000
Walker	9,700	630	-	150	1,100	800	30,000	19,305,000
Whitfield	7,500	180	-	10	2,000	300	60,000	15,730,000

Source: NRCS, 2008

3.2.3 Urban Development

Fecal coliform from urban areas are attributable to multiple sources, including: domestic animals, leaks and overflows from sanitary sewer systems, illicit discharges, leaking septic systems, runoff from improper disposal of waste materials, and leachate from both operational and closed landfills.

Urban runoff can contain high concentrations of fecal coliform from domestic animals and urban wildlife. Fecal coliform bacteria enter streams by direct washoff from the land surface, or the runoff may be diverted to a storm water collection system and discharged through a discrete outlet structure. For large, medium, and small urban areas (populations greater than 50,000), the storm water outlets are regulated under MS4 permits (see Section 3.1.2). For smaller urban areas, the storm water discharge outlets currently remain unregulated.

In addition to urban animal sources of fecal coliform, there may be illicit connections to the storm sewer system. As part of the MS4 permitting program, municipalities are required to conduct dry-weather monitoring to identify and then eliminate these illicit discharges. Fecal coliform bacteria may also enter streams from leaky sewer pipes, or during storm events when combined sewer overflows discharge.

3.2.3.1 Leaking Septic Systems

A portion of the fecal coliform contributions in the Coosa River Basin may be attributed to failure of septic systems and illicit discharges of raw sewage. Table 10 presents the number of septic systems in each county of the Coosa River Basin existing in 2001 and the number existing in 2006, based on the Georgia Department of Human Resources, Division of Public Health data. In addition, an estimate of the number of septic systems installed and repaired during the five-year period from 2001 through 2006 is given. These data show that a substantial increase in the number of septic systems has occurred in some counties. Often, this is a reflection of population increases outpacing the expansion of sewage collection systems during this period. Hence, a large number of septic systems are installed to contain and treat the sanitary waste.

Table 10. Number of Septic Systems in the Coosa River Basin

County	Existing Septic Systems (2001)	Existing Septic Systems (2006)	Number of Septic Systems Installed (2001 to 2006)	Number of Septic Systems Repaired (2001 to 2006)
Bartow	22,361	24656	2295	800
Chattooga	7,625	8083	458	314
Cherokee	35,624	39089	3465	631
Cobb	33,557	35010	1453	1417
Dade	5,342	5714	372	124
Dawson	8,515	9827	1312	151
Fannin	11,999	14476	2477	178
Floyd	16,981	17881	900	988
Forsyth	40,882	45395	4513	1106
Fulton	30,312	31936	1624	512
Gilmer	12,538	15242	2704	123
Gordon	13,888	15687	1799	829
Haralson	8,933	9701	768	347
Lumpkin	8,525	10061	1536	78
Murray	14,606	15856	1250	324
Paulding	29,629	36429	6800	1237
Pickens	10,467	12287	1820	214
Polk	10,073	11009	936	434
Walker	19,097	20425	1328	662
Whitfield	23,385	24718	1333	698

Source: The Georgia Dept. of Human Resources, Division of Public Health, 2007

3.2.3.2 Land Application Systems

Many smaller communities use land application systems (LAS) for treatment of their sanitary wastewaters. These facilities are required through LAS permits to treat all their wastewater by land application and are to be properly operated as non-discharging systems that contribute no runoff to nearby surface waters. However, runoff during storm events may carry surface residual containing fecal coliform bacteria to nearby surface waters. Some of these facilities may also exceed the ground percolation rate when applying the wastewater, resulting in surface runoff from the field. If not properly bermed, this runoff, which probably contains fecal coliform bacteria, may discharge to nearby surface waters. There are 13 permitted LAS systems with flows of 0.1 MGD or greater located in the Coosa River Basin (Table 11).

Table 11. Permitted Land Application Systems in the Coosa River Basin

LAS Name	County	Permit No.	Type	Flow (MGD)
Anheuser Busch Inc.	Bartow	GA01-568	Industrial	N/A
Cherokee Co. WSA Rose Creek	Cherokee	GA02-015	Municipal	4.0
Cherokee Little River/Fitzger	Cherokee	GA02-278	Municipal	0.33
Dalton Utilities	Whitfield	GA02-056	Municipal	40
Dawson Forest Water Reclamation Facility	Dawson	GA02-232	Municipal	0.3
Dawsonville LAS	Dawson	GA02-179	Municipal	0.12
Fulton Co. Settingdown Creek	Cherokee	GA02-170	Municipal	0.2
Gold Creek Urban Water Reuse Facility	Dawson	GA02-025	Municipal	0.5
Lake Arrowhead Utility Co.	Cherokee	GA03-819	Private	0.3
Manor Water Reclamation Facility	Forsyth	GA03-921	Private	0.5
Parkstone at the Bridges	Forsyth	GA03-936	Private	0.1
Paulding Co. - Pumpkinvine	Paulding	GA02-296	Municipal	0.5
Terra Renewal Services	Gordon	GA01-445	Industrial	1.5

Source: Permitting Compliance and Enforcement Program, GA EPD, Atlanta, Georgia, 2008

3.2.3.3 Landfills

Leachate from landfills may contain fecal coliform bacteria that may at some point discharge into surface waters. Sanitary (or municipal) landfills are the most likely to serve as a source of fecal coliform bacteria. These types of landfills receive household wastes, animal manure, offal, hatchery and poultry processing plant wastes, dead animals, and other types of wastes. Older sanitary landfills were not lined and most have been closed. Those that remain active and have not been lined operate as construction/demolition landfills. Currently active sanitary landfills are lined and have leachate collection systems. All landfills, excluding inert landfills, are now required to install environmental monitoring systems for groundwater and methane sampling. There are 109 known landfills in the Coosa River Basin (Table 12). Of these, 19 are active landfills, 3 are in the process of being closed and 87 are inactive or closed. As shown in Table 12, many of the older, inactive landfills were never permitted.

Table 12. Landfills in the Coosa River Basin

Name	County	Permit No.	Type	Status
3 - Way Campers	Cobb		NA	Inactive
Adairsville	Bartow		NA	Inactive
Anglin-Francis Rd	Forsyth	058-005D(L)	Construction and Demolition Landfill	Closed
Ballground	Cherokee		NA	Inactive
Bartow Co. - SR 294 Emerson PH 1	Bartow	008-008D(SL)	Construction and Demolition Landfill	Operating
Bartow Co. - SR 294 Emerson PH 2&3	Bartow	008-016D(SL)	Municipal Solid Waste Landfill	Operating
Bartow Co. - SR 140 Adairsville	Bartow	008-012D(SL)	Sanitary Landfill	Closed
Blalock Rd. PH 6	Cherokee	028-041D(SL)	Sanitary Landfill	Inactive
Brookfield West - Mtn. Park	Fulton		NA	Inactive
Brown-SR 92 W Woodstock	Cherokee	028-012D(L)	Dry Trash Landfill	Closed
Calhoun	Gordon		NA	Inactive
Calhoun - Harris Rd., Ph. 4	Gordon	064-013D(SL)	Sanitary Landfill	Inactive
Calhoun - SR 156	Gordon	064-003D(L)	Dry Trash Landfill	Inactive
Calhoun - Harris Rd PH 4	Gordon	064-014D(L)	Construction and Demolition Landfill	In-Closure
Camp Merrill-U S ARMY	Lumpkin	093-004D(SL)	Sanitary Landfill	Closed
Canton - Ridge Road	Cherokee	028-004D(SL)	Sanitary Landfill	Inactive
Canton - Ridge Rd PH 2	Cherokee	028-014D(SL)	Sanitary Landfill	Closed
Carter - Bascomb Road	Cherokee		NA	Inactive
Cartersville	Bartow		NA	Inactive
Cave Spring	Floyd		NA	Inactive
Cave Spring - Hwy 411	Floyd		NA	Inactive
Cave Spring - Perry Road	Floyd		NA	Inactive
Cedartown	Polk		NA	Inactive
Chadwick Rd Landfill, Inc.	Fulton	060-072D(L)	Construction and Demolition Landfill	Operating
Chatsworth	Murray		NA	Inactive
Chattooga Co. - Penn Bridge Rd PH 1	Chattooga	027-006D(SL)	Sanitary Landfill	Closed
Cheatham Road Balefill (area 1) & PH 2	Cobb	033-005D(SL)	Sanitary Landfill	Inactive
Cheatham Road Balefill (area 1) & PH 2	Cobb	033-027D(SL)	Sanitary Landfill	Inactive
Chemical products Corp - Old Mill RD	Bartow	008-007D(LI)	Industrial Landfill	Operating
Cherokee Co. - Woodstock - Blalock Rd.	Cherokee	028-006D(SL)	Sanitary Landfill	Inactive
Cherokee Co. - Blalock Rd PH 3	Cherokee	028-015D(SL)	Sanitary Landfill	Closed
Cherokee Co. - Blalock Rd PH 4	Cherokee	028-017D(SL)	Sanitary Landfill	Closed
Cherokee C & D Landfill	Cherokee	028-043D(C&D)	Construction and Demolition Landfill	Operating
Cherokee Co. - Pine Bluff landfill, Inc.	Cherokee	028-039D(SL)	Municipal Solid Waste Landfill	Operating
Cherokee Co. - SWIMS - SR 92 PH 4	Cherokee	028-040D(L)	Construction and Demolition Landfill	Operating
Cherokee Co. - SWIMS - SR 92 PH 5	Cherokee	028-040D(C&D)	Construction and Demolition Landfill	Operating
Cherokee Co. - Univeter Rd	Cherokee	028-007D(L)	Dry Trash Landfill	Closed
City of Rome	Floyd	057-004D(SL)	Sanitary Landfill	Inactive
Cove Rd	Pickens		NA	Inactive
Cobb Co. - Cheatham Rd PH 2	Cobb	033-038D(SL)	Sanitary Landfill	Closed
D.C. McCoy Landfill	Floyd		NA	Inactive

Table 12. Landfills in the Coosa River Basin

Name	County	Permit No.	Type	Status
Dalton	Whitfield		NA	Inactive
Dalton - McGaughey Ch/Coahulla Cr	Whitfield	155-043D(L)	Construction and Demolition Landfill	Closed
Dalton - Old Dixie Hwy PH 2	Whitfield	155-021D(SL)	Sanitary Landfill	Closed
Dalton - Old Dixie Hwy PH 4	Whitfield	155-027D(SL)	Sanitary Landfill	Closed
Dalton - Old Dixie Hwy PH 5	Whitfield	155-044D(SL)	Sanitary Landfill	Closed
Dalton - Waugh St PH 1	Whitfield	155-034D(L)	Dry Trash Landfill	Closed
Dalton - Waugh St PH 2	Whitfield	155-037D(L)	Construction and Demolition Landfill	Closed
Dawson Co. (Hwy. 19)	Dawson		NA	Inactive
Dawson Co. - Shoal Hole Rd	Dawson	042-002D(SL)	Sanitary Landfill	Closed
Eagle Point Landfill	Forsyth	058-012D(MSWL)	Municipal Solid Waste Landfill	Operating
Fairmount	Gordon		NA	Inactive
Floyd Co. - Rome Walker Mtn Rd	Floyd	057-021D(C&D)	Construction and Demolition Landfill	Operating
Floyd Co. - Berry Hill Rd	Floyd	057-009D(SL)	Sanitary Landfill	Closed
Forsyth Co. - Highhtower Rd PH 1	Forsyth	058-006D(L)	Sanitary Landfill	Closed
Forsyth Co. - Highhtower Rd PH 3	Forsyth	058-009D(SL)	Sanitary Landfill	Closed
Forsyth Co. - Highhtower Rd PH 4	Forsyth	058-010D(SL)	Municipal Solid Waste Landfill	Closed
Garland Lumber	Gilmer		NA	Inactive
Gilmer Co. - US 76 N, TV Tower Ph. 4	Gilmer	061-003D(SL)	Sanitary Landfill	Inactive
Gilmer Co. - SR 52 N/TV Tower PH 1-5	Gilmer	061-010D(SL)	Sanitary Landfill	Closed
Gordon Co. - Harris Rd.	Gordon	064-008D(SL)	Sanitary Landfill	Inactive
Gordon Co. - US 411	Gordon	064-002D(SL)	Sanitary Landfill	Inactive
Gordon Co. - Harris Rd.	Gordon	064-011D(SL)	Sanitary Landfill	Closed
Gordon Co. – Lick Creek Rd Ranger	Gordon	064-010D(SL)	Sanitary Landfill	Closed
Gordon Co. - Redbone Ridges Rd	Gordon	064-016D(SL)	Municipal Solid Waste Landfill	Operating
Gravely - Bells Ferry Road	Cherokee		NA	Inactive
Honea-C & R Landfill Francis Rd	Fulton	060-059D(L)	Dry Trash Landfill	Closed
Hwy 92, Old Acworth site	Paulding		NA	Inactive
Inland Rome-Turner Bend Rd	Floyd	057-017D(LI)	Industrial Landfill	Operating
Jack Morgan	Floyd		NA	Inactive
Jasper - Hood Rd.	Pickens		NA	Inactive
Jones Mill Rd.	Floyd	057-011D(L)	Dry Trash Landfill	Inactive
Kendrick - Arnold Mill Rd PH 1	Cherokee	028-013D(L)	Dry Trash Landfill	Closed
Kuykendall - Earney Rd	Cherokee	028-032D(L)	Dry Trash Landfill	Closed
LaFayette	Walker		NA	Inactive
LaFayette - Coffman Springs Rd	Walker	146-013D(L)	Construction and Demolition Landfill	Operating
McGaughey Chapel Road	Whitfield	155-012D(SL)	Sanitary Landfill	Inactive
Murray Co. - US 411 Westside Site 2	Murray	105-014D(MSWL)	Municipal Solid Waste Landfill	Operating
Murray Co. - US 411 Dennis Mill Rd	Murray	105-004D(SL)	Sanitary Landfill	Closed
Murray Co. - US 411 Westside	Murray	105-011D(SL)	Sanitary Landfill	Closed
Murray Co. - US 411 Westside	Murray	105-012D(L)	Dry Trash Landfill	Closed
Old Dixie Highway	Whitfield	155-018D(SL)	Sanitary Landfill	Inactive
Paulding Co. - SR 92 Spur, Holden Rd.	Paulding		NA	Inactive

Table 12. Landfills in the Coosa River Basin

Name	County	Permit No.	Type	Status
Paulding Co. - Guilledge Rd N Tract 1	Paulding	110-005D(SL)	Construction and Demolition Landfill	Operating
Pickens Co. - Ludville	Pickens		NA	Inactive
Pickens Co. - Jasper	Pickens		NA	Inactive
Pickens Co. - Long Branch Rd.	Pickens		NA	Inactive
Pickens Co. - Jones Mtn Rd PH 2	Pickens	112-005D(SL)	Sanitary Landfill	Closed
Pickens Co. - Jones Mtn Rd PH 3	Pickens	112-006D(SL)	Sanitary Landfill	Closed
Pickens Co-Jones Mtn Rd Westside	Pickens	112-007D(SL)	Sanitary Landfill	Closed
Polk Co. - US278, Cedartown, Ph. 2	Polk	115-003D(SL)	Sanitary Landfill	Inactive
Polk Co. - Grady Rd	Polk	115-008D(SL)	Municipal Solid Waste Landfill	Operating
Polk Co. - US 278 Cedartown PH 2	Polk	115-005D(SL)	Sanitary Landfill	Closed
Potts Road	Floyd		NA	Inactive
R.B. Ingram - Old Hwy 41	Cobb		NA	Inactive
Rockmart	Polk		NA	Inactive
Rome - Walker Mtn Rd, Site 2	Floyd	057-020D(MSWL)	Municipal Solid Waste Landfill	Operating
Rome - Walker Mtn Rd PH 1, 2 & 3	Floyd	057-013D(SL)	Sanitary Landfill	Closed
Sarah Chandler Property - Disp Areas 1 & 3	Floyd	057-012D(L)(I)	NA	Inactive
South Side	Whitfield		NA	Inactive
SWIMS-SR 92 (Dixie) PH 1&2	Cherokee	028-030D(L)	Dry Trash Landfill	Closed
SWIMS-SR 92 (Dixie) PH 3	Cherokee	028-034D(L)	Construction and Demolition Landfill	In-Closure
Tidwell Plumbing Inc.	Bartow	008-017P(INC)		Closed
U S ARMY-Camp Merrill #6	Lumpkin	093-005D(SL)	Sanitary Landfill	In-Closure
US 411	Gordon	064-009D(SL)	Sanitary Landfill	Inactive
Voyles - Hwy 5	Cherokee		NA	Inactive
Whitfield Co. - DWRSWA Old Dixie Hwy Baled Carpet	Whitfield	155-048D(LI)	Industrial Landfill	Operating
Whitfield Co. - Dalton, Old Dixie Hwy, PH 6	Whitfield	155-047D(SL)	Municipal Solid Waste Landfill	Operating
Woodstock	Cherokee		NA	Inactive

Source: Land Protection Branch, GA DNR, 2008

4.0 ANALYTICAL APPROACH

The process of developing fecal coliform TMDLs for the Coosa River Basin listed segments includes the determination of the following:

- The current critical fecal coliform load to the stream under existing conditions;
- The TMDL for similar conditions under which the current load was determined; and
- The percent reduction in the current critical fecal coliform load necessary to achieve the TMDL.

The calculation of the fecal coliform load at any point in a stream requires the fecal coliform concentration and stream flow. The Loading Curve Approach was used to determine the current fecal coliform load and the TMDL. For the listed segments, fecal coliform sampling data were sufficient to calculate at least one 30-day geometric mean to compare with the regulatory criteria (see Appendix A).

4.1 Loading Curve Approach

For those segments in which sufficient water quality data were collected to calculate at least one 30-day geometric mean that was above the regulatory standard, the loading curve approach was used. This method involves comparing the current critical load to summer and winter seasonal TMDL curves.

As mentioned in Section 2.0, the USGS monitored many of the listed segments and collected stream flow information concurrently with water quality samples. Stream depths were measured and used to determine stream flows, based on rating curves developed by the USGS for each sampling location.

In cases where no stream flow measurements were available, flow on the day the fecal coliform samples were collected was estimated using data from a nearby gaged stream. The nearby stream had relatively similar watershed characteristics, including landuse, slope, and drainage area. The stream flows were estimated by multiplying the gaged flow by the ratio of the listed stream drainage area to the gaged stream drainage area. Table 13 lists those segments for which no flow data were available and indicates the gaged station that was used to estimate the flow.

Table 13. Stream Segments with Estimated Flows and Corresponding USGS Flow Gages

Stream Segment	Location	USGS Station Name	Station No.
Chattooga River	Lyerly to Stateline	Chattooga River At Summerville, Ga	02331600
Cochran Creek	Gab Creek to Amicalola Creek	Amicalola Creek At Ga Hwy 53 Bridge	02331600
Holly Creek	Headwaters to Amicalola Creek	Amicalola Creek At Ga Hwy 53 Bridge	02335000
Little Amicalola Creek	Headwaters to Amicalola Creek	Amicalola Creek At Ga Hwy 53 Bridge	02343801
Noonday Creek	Little Noonday Creek to Lake Allatoona	Two Run Creek Near Kingston, Ga	02333500
Oostanaula River	Conasauga/Coosawattee to Oothkalooga Creek	Oostanaula River At Resaca, Ga	02333500

The current critical loads were determined using fecal coliform data collected within a 30-day period to calculate the geometric means, and multiplying these values by the arithmetic means of the flows measured at the time the water quality samples were collected. Georgia's instream fecal coliform standards are based on a geometric mean of samples collected over a 30-day period, with samples collected at least 24 hours apart. To reflect this in the load calculation, the fecal coliform loads are expressed as 30-day accumulated loads with units of counts per 30 days. This is described by the equation below:

$$L_{critical} = C_{geomean} \times Q_{mean}$$

Where:

$L_{critical}$ = current critical fecal coliform load
$C_{geomean}$ = fecal coliform concentration as a 30-day geometric mean
Q_{mean} = stream flow as an arithmetic mean

The current estimated critical load is dependent on the fecal coliform concentrations and stream flows measured during the sampling events. The number of events sampled is usually 16 per year. Thus, these loads do not represent the full range of flow conditions or loading rates that can occur. Therefore, it must be kept in mind that the current critical loads used only represent the worst-case scenario that occurred among the time periods sampled.

The maximum fecal coliform load at which the instream fecal coliform criteria will be met can be determined using a variation of the equation above. By setting C equal to the seasonal, instream fecal coliform standards, the load will equal the TMDL. However, the TMDL is dependent on stream flow. Figures in Appendix A graphically illustrate that the TMDL is a continuum for the range of flows (Q) that can occur in the stream over time. There are two TMDL curves shown in these figures. One represents the summer TMDL for the period May through October when the 30-day geometric mean standard is 200 counts/100 mL. The second curve represents the winter TMDL for the period November through April when the 30-day geometric mean standard is 1,000 counts/100 mL. The equations for these two TMDL curves are:

$$TMDL_{summer} = 200 \text{ counts (as a 30-day geometric mean)/100 mL} \times Q$$

$$TMDL_{winter} = 1{,}000 \text{ counts (as a 30-day geometric mean)/100 mL} \times Q$$

The graphs show the relationship between the current critical load ($L_{critical}$) and the TMDL. The TMDL for a given stream segment is the load for the mean flow corresponding to the current critical load. This is the point where the current load exceeds the TMDL curve by the greatest amount. This critical TMDL can be represented by the following equation:

$$TMDL_{critical} = C_{standard} \times Q_{mean}$$

Where:

$TMDL_{critical}$ = critical fecal coliform TMDL load
$C_{standard}$ = seasonal fecal coliform standard (as a 30-day geometric mean)
summer - 200 counts/100 mL
winter - 1,000 counts/ 100 mL
Q_{mean} = stream flow as an arithmetic mean (same as used for $L_{critical}$)

A 30-day geometric mean load that plots above the respective seasonal TMDL curve represents an exceedance of the instream fecal coliform standard. The difference between the current critical load and the TMDL curve represents the load reduction required for the stream segment to meet the appropriate instream fecal coliform standard. There is also a single sample maximum criterion (4,000 counts per 100 milliliters) for the months of November through April. If a single sample exceeds the maximum criterion, and the seasonal geometric mean criteria is also exceeded, then the TMDL is based on the criteria exceedance requiring the largest load reduction. The load reduction can be expressed as follows:

$$\text{Load Reduction} = \frac{L_{critical} - TMDL_{critical}}{L_{critical}} \times 100$$

5.0 TOTAL MAXIMUM DAILY LOADS

A Total Maximum Daily Load (TMDL) is the amount of a pollutant that can be assimilated by the receiving waterbody without exceeding the applicable water quality standard, which in this case, is the seasonal fecal coliform standards. A TMDL is the sum of the individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources, as well as natural background (40 CFR 130.2) for a given waterbody. The TMDL must also include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the water quality response of the receiving water body. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measures. For fecal coliform bacteria, the TMDLs are expressed as counts per 30 days as a geometric mean.

A TMDL is expressed as follows:

$$TMDL = \Sigma WLAs + \Sigma LAs + MOS$$

The TMDL calculates the WLAs and LAs with margins of safety to meet the stream's water quality standards. The allocations are based on estimates that use the best available data and provide the basis to establish or modify existing controls so that water quality standards can be achieved. In developing a TMDL, it is important to consider whether adequate data are available to identify the sources, fate, and transport of the pollutant to be controlled.

TMDLs may be developed using a phased approach. Under a phased approach, the TMDL includes: 1) WLAs that confirm existing limits and controls or lead to new limits, and 2) LAs that confirm existing controls or include implementing new controls (USEPA, 1991). A phased TMDL requires additional data be collected to determine if load reductions required by the TMDL are leading to the attainment of water quality standards.

The TMDL Implementation Plan establishes a schedule or timetable for the installation and evaluation of point and nonpoint source control measures, data collection, assessment of water quality standard attainment, and if needed, additional modeling. Future monitoring of the listed segment water quality will then be used to evaluate this phase of the TMDL, and if necessary, to reallocate the loads.

The fecal coliform loads calculated for each listed stream segment include the sum of the total loads from all point and nonpoint sources for the segment. The load contributions to the listed segment from unlisted upstream segments are represented in the background loads, unless the unlisted segment contains point sources that had permit violations for fecal coliform. In these cases, the upstream point sources are included in the wasteload allocations for the listed segment. In situations where two or more adjacent segments are listed, the fecal coliform loads to each segment are individually evaluated on a localized watershed basis. Point source loads originating in upstream segments are included in the background loads of the downstream segment. The following sections describe the various fecal coliform TMDL components.

5.1 Waste Load Allocations

The waste load allocation is the portion of the receiving water's loading capacity that is allocated to existing or future point sources. WLAs are provided to the point sources from municipal and industrial wastewater treatment systems with NPDES effluent limits. There are 12 active

NPDES permitted facilities that have flows greater than 0.1 MGD with fecal coliform permit limits in the Coosa River Basin watershed that discharge into listed segments or have permit violations upstream of a listed segment. The maximum allocated fecal coliform loads for these municipal wastewater treatment facilities are given in Table 14. These WLA loads were calculated from the permitted or design flows and permitted fecal coliform concentrations. If the permit had no fecal coliform limit, a concentration of 200 counts/100 mL was used. These were expressed as accumulated loads over a 30-day period, and presented in units of counts per 30 days. If a facility expands its capacity and the permitted flow increases, the wasteload allocation for the facility would increase in proportion to the flow.

Table 14. WLAs for the Coosa River Basin

Facility Name	Permit No.	Receiving Stream	Listed Stream Segment	WLA (counts/30 days)
Adairsville North	GA0046035	Oothkalooga Cr Trib To Oostanaula River	Oothkalooga Creek U/S Bartow Co. Line to Oostanaula River	7.67E+10
Adairsville South	GA0032832	Oothkalooga Cr Trib To Oostanaula River	Oothkalooga Creek U/S Bartow Co. Line to Oostanaula River	8.10E+10
Calhoun Wpcp	GA0030333	Oostanaula River	Oostanaula River Conasauga/Coosawattee to Oothkalooga Creek	1.42E+12
Canton Wpcp	GA0025674	Etowah River	Etowah River Sharp Mountain Creek to Lake Allatoona	4.60E+11
Chatsworth Judson F Vick Wpcp	GA0032492	Holly Cr Trib/Conasuaga R Trib/Oostanaula R Trib/Coosa R	Holly Creek Downstream Chatsworth	2.97E+11
Cherokee Co/Fitzgerald Creek	GA0038555	Little River To Lake Allatoona	Little River Hwy 140 to Lake Allatoona	4.28E+11
Cobb Co Noonday Creek	GA0024988	Noonday Cr Trib To Lake Allatoona	Noonday Creek Little Noonday Creek to Lake Allatoona	6.26E+11
Fulton Co Little River	GA0033251	Little River	Little River Hwy 140 to Lake Allatoona	1.69E+11
Goldkist Poultry Byproducts	GA0000728	Etowah R	Etowah River Sharp Mountain Creek to Lake Allatoona	9.64E+10
Summerville Wpcp	GA0025704	Chattooga R	Chattooga River Lyerly to Stateline	2.00E+11
Trion Wpcp	GA0025607	Chattooga R	Chattooga River Lyerly to Stateline	9.10E+11
Woodstock Wpcp (2006 Data)	GA0026263	Rubes Creek Trib/Little R	Little River Hwy 140 to Lake Allatoona	2.28E+11

(a) Seasonal fecal coliform limit 100 cnts/100 ml
(b) Seasonal fecal coliform limit 200 cnts/100 ml

State and Federal Rules define storm water discharges covered by NPDES permits as point sources. However, storm water discharges are from diffuse sources and there are multiple storm water outfalls. Storm water sources (point and nonpoint) are different than traditional NPDES permitted sources in four respects: 1) they do not produce a continuous (pollutant loading) discharge; 2) their pollutant loading depends on the intensity, duration, and frequency of rainfall events, over which the permittee has no control; 3) the activities contributing to the pollutant loading may include the various allowable activities of others, and control of these activities is not solely within the discretion of the permittee; and 4) they do not have wastewater treatment plants that control specific pollutants to meet numerical limits.

The intent of storm water NPDES permits is not to treat the water after collection, but to reduce the exposure of storm water to pollutants by implementing various controls. It would be infeasible and prohibitively expensive to control pollutant discharges from each storm water outfall. Therefore, storm water NPDES permits require the establishment of controls or BMPs to reduce the pollutants entering the environment.

The waste load allocations from storm water discharges associated with MS4s (WLAsw) are estimated based on the percentage of urban area in each watershed covered by the MS4 storm water permit. At this time, the portion of each watershed that goes directly to a permitted storm sewer and that which goes through non-permitted point sources, or is sheet flow or agricultural runoff, has not been clearly defined. Thus, it is assumed that approximately 70 percent of storm water runoff from the regulated urban area is collected by the municipal separate storm sewer systems.

Wet and dry manure CAFOs are located within the Coosa River Basin (see Section 3.1.3). These facilities are either included under or have applied for an LAS General Permit or an NPDES General Permit. A small number have an individual NPDES permit. Presently no CAFOs discharge wastewater, and therefore, they were not provided a WLA.

This TMDL will use a phased approach. Future phases of TMDL development will attempt to further define the sources of pollutants and the portion that enters the permitted storm sewer systems. As more information is collected and these TMDLs are implemented, it will become clearer as to which BMPs are needed and how the water quality standards can be achieved.

5.2 Load Allocations

The load allocation is the portion of the receiving water’s loading capacity that is attributed to existing or future nonpoint sources or to natural background sources. Nonpoint sources are identified in 40 CFR 130.6 as follows:

- Residual waste;
- Land disposal;
- Agricultural and silvicultural;
- Mines;
- Construction;
- Saltwater intrusion; and
- Urban storm water (non-permitted).

The LA is calculated as the remaining portion of the TMDL load available, after allocating the WLA and the MOS, using the following equation:

$$\Sigma \text{ LA} = \text{TMDL} - (\Sigma \text{ WLA} + \Sigma \text{ WLAsw} + \Sigma \text{MOS})$$

As described above, there are two types of load allocations: loads to the stream independent of precipitation, including sources such as failing septic systems, leachate from landfills, animals in the stream, and leaking sewer system collection lines, or background loads; and loads associated with fecal coliform accumulation on land surfaces that is washed off during storm events, including runoff from saturated LAS fields. At this time, it is not possible to partition the various sources of load allocations. Table 15 presents the total load allocation expressed as counts per 30 days, or as winter instantaneous maximum counts for the 303(d) listed streams located in the Coosa River Basin for the current critical condition. In the future, after additional data has been collected, it may be possible to partition the load allocation by source.

5.3 Seasonal Variation

The Georgia fecal coliform criteria are seasonal. One set of criteria applies to the summer season, while a different set applies to the winter season. To account for seasonal variations, the critical loads for each listed segment were determined from sampling data obtained during both summer and winter seasons, when possible. However, in some cases, the available data was limited to a single season for the calculation of the critical load. The TMDL and percent reduction given in Table 15 for each listed segment was based on the season in which the critical load occurred. The TMDLs for each season, for any given flow, are presented as equations in Section 5.5.

Analyses of the available fecal coliform data and corresponding flows were performed to determine if the fecal coliform violations occurred during wet weather (high flow) or dry weather (low flow) conditions. The flow data from each sampling site were normalized by dividing the measured flow by the product of the average annual runoff (cfs/sq mile), published in Open-File Report 82-577, and the appropriate drainage area (Carter, 1982). Plots of the normalized flows (Q/Q_o) versus fecal coliform are shown in Appendix B. The plots do not show a consistent relationship between fecal coliform concentrations and flow. The summer and winter plots show that the fecal coliform violations occur during both high (wet weather) and low (dry weather) flow conditions.

5.4 Margin of Safety

The MOS is a required component of TMDL development. There are two basic methods for incorporating the MOS: 1) implicitly incorporate the MOS using conservative modeling assumptions to develop allocations; or 2) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. For this TMDL, an explicit MOS of 10 percent of the TMDL was used. The MOS values are presented in Table 15.

5.5 Total Fecal Coliform Load

The fecal coliform TMDL for the listed stream segment is dependent on the time of year, the stream flow, and the applicable state water quality standard.

The total maximum daily seasonal fecal coliform loads for Georgia are given below:

$TMDL_{summer}$ = 200 counts (as a 30-day geometric mean)/100 mL x Q

$TMDL_{winter}$ = 1,000 counts (as a 30-day geometric mean)/100 mL x Q

$TMDL_{winter}$ = 4,000 counts (instantaneous) /100 mL x Q

For purposes of determining necessary load reductions required to meet the instream water quality criteria, the current critical TMDL was determined. This load is the product of the applicable seasonal fecal coliform standard and the mean flow used to calculate the current critical load. It represents the sum of the allocated loads from point and nonpoint sources located within the immediate drainage area of the listed segment, the NPDES-permitted point discharges with recorded fecal coliform violations from the nearest upstream subwatersheds, and a margin of safety (MOS). For these calculations, the fecal load contributed by each facility to the WLA was not the maximum presented in Table 14, but rather was the product of the fecal coliform permitted limit and the average monthly discharge at the time of the critical load. The current critical loads and corresponding TMDLs, WLAs (WLA and WLA_{sw}), LAs, MOSs, and percent load reductions for the Coosa River Basin listed stream segments are presented in Table 15.

The relationships of the current critical loads to the TMDLs are shown graphically in Appendix A. The vertical distance between the two values represents the load reductions necessary to achieve the TMDLs. If no TMDL or Critical Load is given on the graphs in Appendix A, the TMDL given in Table 15 is based on the instantaneous maximum standard. As a consequence of the localized nature of the load evaluations, the calculated fecal coliform load reductions pertain to point and nonpoint sources occurring within the immediate drainage area of the listed segment. These current critical values represent a worst-case scenario for the limited set of data. Thus, the load reductions required are conservative estimates, and should be sufficient to prevent exceedances of the instream fecal coliform standard for a wide range of conditions.

Evaluation of the relationship between instream water quality and the potential sources of pollutant loading is an important component of TMDL development, and is the basis for later implementation of corrective measures and BMPs. For the current TMDLs, the association between fecal coliform loads and the potential sources occurring within the subwatersheds of each segment was examined on a qualitative basis.

Table 15. Fecal Coliform Loads and Required Fecal Coliform Load Reductions

Stream Segment	Current Load (counts/ 30 days)	TMDL Components					Percent Reduction
		WLA (counts/ 30 days)[1]	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Camp Creek	1.70E+12			1.34E+12	1.49E+11	1.49E+12	12
Chattooga River	1.75E+16	1.11E+12		1.80E+15	2.01E+14	2.01E+15	89
Coahulla Creek	1.24E+13		1.59E+11	5.84E+12	6.66E+11	6.66E+12	46
Cochran Creek	1.61E+14			2.66E+13	2.96E+12	2.96E+13	82
Conasauga River	1.13E+14			5.93E+13	6.59E+12	6.59E+13	42
Dozier Creek	2.51E+12		1.90E+10	7.97E+11	9.06E+10	9.06E+11	64
Drowning Bear Creek	6.40E+11		2.10E+11	3.06E+11	5.73E+10	5.73E+11	11
Duck Creek	1.58E+13			3.30E+12	3.67E+11	3.67E+12	77
Dykes Creek	3.66E+12			1.72E+12	1.91E+11	1.91E+12	48
Etowah River	6.59E+16	5.56E+11	2.51E+14	2.61E+16	2.93E+15	2.93E+16	56
Heath Creek	1.60E+12			4.33E+11	4.81E+10	4.81E+11	70
Holly Creek - Headwaters to Amicalola Creek	7.86E+12			1.17E+12	1.30E+11	1.30E+12	83
Holly Creek - Downstream Chatsworth	1.96E+13	2.97E+11		4.36E+12	5.17E+11	5.17E+12	74
Horseleg Creek	3.98E+12		4.44E+11	1.17E+12	1.79E+11	1.79E+12	55
Jacks River	9.95E+12			8.16E+12	9.06E+11	9.06E+12	9
Johns Creek	3.77E+12			1.08E+12	1.20E+11	1.20E+12	68
Kings Creek	3.44E+12			2.94E+11	3.27E+10	3.27E+11	90
Little Amicalola Creek	9.81E+12			4.39E+12	4.88E+11	4.88E+12	50
Little River	2.99E+16	8.24E+11	7.12E+14	3.78E+15	4.99E+14	4.99E+15	83
Mill Creek	1.09E+13			3.67E+12	4.07E+11	4.07E+12	63

Stream Segment	Current Load (counts/ 30 days)	TMDL Components					Percent Reduction
		WLA (counts/ 30 days)[1]	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Noonday Creek	8.97E+13	6.26E+11	6.33E+12	5.20E+12	1.35E+12	1.35E+13	85
Oostanaula River	5.30E+14	1.42E+12	1.12E+12	3.24E+14	3.63E+13	3.63E+14	32
Oothkalooga Creek	3.10E+13	1.58E+11		9.82E+12	1.11E+12	1.11E+13	64
Pettit Creek	1.08E+14			1.84E+13	2.04E+12	2.04E+13	81
Polecat Creek	1.86E+12			1.49E+12	1.65E+11	1.65E+12	11
Salacoa Creek	8.04E+13			2.77E+13	3.08E+12	3.08E+13	62
Snake Creek	1.48E+12			1.06E+12	1.17E+11	1.17E+12	21
Swamp Creek	7.91E+12		2.96E+10	3.63E+12	4.06E+11	4.06E+12	49
Toms Creek	1.16E+12			6.27E+11	6.97E+10	6.97E+11	40

Notes: [1] The assigned fecal coliform load from each NPDES permitted facility for WLA was determined as the product of the fecal coliform permit limit and the facility average monthly discharge at the time of the critical load.

6.0 RECOMMENDATIONS

The TMDL process consists of an evaluation of the subwatersheds for each 303(d) listed stream segment to identify, as best as possible, the sources of the fecal coliform loads causing the stream to exceed instream standards. The TMDL analysis was performed using the best available data to specify WLAs and LAs that will meet fecal coliform water quality criteria so as to support the use classification specified for each listed segment.

This TMDL represents part of a long-term process to reduce fecal coliform loading to meet water quality standards in the Coosa River Basin. Implementation strategies will be reviewed and the TMDLs will be refined as necessary in the next phase (next five-year cycle). The phased approach will support progress toward water quality standards attainment in the future. In accordance with USEPA TMDL guidance, these TMDLs may be revised based on the results of future monitoring and source characterization data efforts. The following recommendations emphasize further source identification and involve the collection of data to support the current allocations and subsequent source reductions.

6.1 Monitoring

Water quality monitoring is conducted at a number of locations across the State each year. The GA EPD has adopted a basin approach to water quality management that divides Georgia's major river basins into five groups. This approach provides for additional sampling work to be focused on one of the five basin groups each year and offers a five-year planning and assessment cycle. The Coosa, Tallapoosa, and Tennessee River Basins will again receive focused monitoring in 2011.

The TMDL Implementation Plan will outline an appropriate water quality monitoring program for the listed streams in the Coosa River Basin. The monitoring program will be developed to help identify the various fecal coliform sources. The monitoring program may be used to verify the 303(d) stream segment listings. This will be especially valuable for those segments where no data, old data, or spill data resulted in the listing.

6.2 Fecal Coliform Management Practices

Based on the findings of the source assessment, NPDES point source fecal coliform loads from wastewater treatment facilities do not significantly contribute to the impairment of the listed stream segments. This is because most facilities are required to treat to levels corresponding to instream water quality criteria. Fecal coliform loads from NPDES permitted MS4 areas may be significant, but these sources cannot be easily segregated from other storm water runoff. Other sources of fecal coliform in urban areas include wastes that are attributable to domestic animals, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, leaking septic systems, runoff from improper disposal of waste materials, and leachate from both operational and closed landfills. In agricultural areas, potential sources of fecal coliform may include CAFOs, animals grazing in pastures, dry manure storage facilities and lagoons, chicken litter storage areas, and direct access of livestock to streams. Wildlife, especially waterfowl can be a significant source of fecal coliform bacteria.

Management practices are recommended to reduce fecal coliform source loads to the listed 303(d) stream segments, with the result of achieving the instream fecal coliform standard criteria. These recommended management practices include:

- Compliance with NPDES permit limits and requirements;
- Adoption of NRCS Conservation Practices; and
- Application of Best Management Practices (BMPs) appropriate to agricultural or urban land uses, where applicable.

6.2.1 Point Source Approaches

Point sources are defined as discharges of treated wastewater or storm water into rivers and streams at discrete locations. The NPDES permit program provides a basis for municipal, industrial and storm water permits, monitoring and compliance with limitations, and appropriate enforcement actions for violations.

In accordance with GA EPD rules and regulations, all discharges from point source facilities are required to be in compliance with the conditions of their NPDES permit at all times. In the future, all municipal and industrial wastewater treatment facilities with the potential for the occurrence of fecal coliform in their discharge will be given end-of-pipe limits equivalent to the water quality standard of 200 counts/100 mL. An exception is constructed wetland systems, which have a natural level of fecal coliform input from animals attracted to the artificial wetlands. In addition, the permits will include routine monitoring and reporting requirements.

6.2.2 Nonpoint Source Approaches

The GA EPD is responsible for administering and enforcing laws to protect the waters of the State. The GA EPD is the lead agency for implementing the State's Nonpoint Source Management Program. Regulatory responsibilities that have a bearing on nonpoint source pollution include establishing water quality standards and use classifications, assessing and reporting water quality conditions, and regulating land use activities that may affect water quality. Georgia is working with local governments, agricultural and forestry agencies such as the Natural Resources Conservation Service, the Georgia Soil and Water Conservation Commission, and the Georgia Forestry Commission, to foster the implementation of BMPs to address nonpoint source pollution. In addition, public education efforts are being targeted to individual stakeholders to provide information regarding the use of BMPs to protect water quality. The following sections describe, in more detail, recommendations to reduce nonpoint source loads of fecal coliform bacteria in Georgia's surface waters.

6.2.2.1 Agricultural Sources

The GA EPD should coordinate with other agencies that are responsible for agricultural activities in the state to address issues concerning fecal coliform loading from agricultural lands. It is recommended that information (e.g., livestock populations by subwatershed, animal access to streams, manure storage and application practices, etc.) be periodically reviewed so that watershed evaluations can be updated to reflect current conditions. It is also recommended that BMPs be utilized to reduce the amount of fecal coliform bacteria transported to surface waters from agricultural sources to the maximum extent practicable.

The following three organizations have primary responsibility for working with farmers to promote soil and water conservation, and to protect water quality:

- University of Georgia (UGA) - Cooperative Extension Service;
- Georgia Soil and Water Conservation Commission (GSWCC); and
- Natural Resources Conservation Service (NRCS).

UGA has faculty, County Cooperative Extension Agents, and technical specialists who provide services in several key areas relating to agricultural impacts on water quality.

The GA EPD designated the GSWCC as the lead agency for agricultural Nonpoint Source Management in the State. The GSWCC develops nonpoint source management programs and conducts educational activities to promote conservation and protection of land and water devoted to agricultural uses.

The NRCS works with federal, state, and local governments to provide financial and technical assistance to farmers. The NRCS develops standards and specifications for BMPs that are to be used to improve, protect, and/or maintain our state's natural resources. In addition, every five years, the NRCS conducts the National Resources Inventory (NRI). The NRI is a statistically based sample of land use and natural resource conditions and trends that covers non-federal land in the United States.

The NRCS is also providing technical assistance to the GSWCC and the GA EPD with the Georgia River Basin Planning Program. Planning activities associated with this program will describe conditions of the agricultural natural resource base once every five years. It is recommended that the GSWCC and the NRCS continue to encourage BMP implementation, education efforts, and river basin surveys with regard to river basin planning.

6.2.2.2 Urban Sources

Both point and nonpoint sources of fecal coliform bacteria can be significant in the Coosa River Basin urban areas. Urban sources of fecal coliform can best be addressed using a strategy that involves public participation and intergovernmental coordination to reduce the discharge of pollutants to the maximum extent practicable. Management practices, control techniques, public education, and other appropriate methods and provisions may be employed. In addition to water quality monitoring programs, discussed in Section 6.1, the following activities and programs conducted by cities, counties, and state agencies are recommended:

- Uphold requirements that all new and replacement sanitary sewage systems be designed to minimize discharges into storm sewer systems;

- Further develop and streamline mechanisms for reporting and correcting illicit connections, breaks, surcharges, and general sanitary sewer system problems;

- Sustained compliance with storm water NPDES permit requirements; and

- Continue efforts to increase public awareness and education towards the impact of human activities in urban settings on water quality, ranging from the consequences of industrial and municipal discharges to the activities of individuals in residential neighborhoods.

6.3 Reasonable Assurance

Permitted discharges will be regulated through the NPDES permitting process described in this report. An allocation to a point source discharger does not automatically result in a permit limit or a monitoring requirement. Through its NPDES permitting process, GA EPD will determine whether a new or existing discharger has a reasonable potential of discharging fecal coliform levels equal to or greater than the total allocated load. The results of this reasonable potential analysis will determine the specific type of requirements in an individual facility's NPDES permit. As part of its analysis, the GA EPD will use its EPA approved 2003 NPDES Reasonable Potential Procedures to determine whether monitoring requirements or effluent limitations are necessary.

Georgia is working with local governments, agricultural and forestry agencies, such as the Natural Resources Conservation Service, the Georgia Soil and Water Conservation Commission, and the Georgia Forestry Commission, to foster the implementation of best management practices to address nonpoint sources. In addition, public education efforts will be targeted to individual stakeholders to provide information regarding the use of best management practices to protect water quality.

6.4 Public Participation

A thirty-day public notice is being provided for this TMDL. During this time, the availability of the TMDL will be public noticed, a copy of the TMDL will be provided on request, and the public is invited to provide comments on the TMDL.

7.0 INITIAL TMDL IMPLEMENTATION PLAN

The GA EPD has coordinated with EPA to prepare this Initial TMDL Implementation Plan for this TMDL. The GA EPD has also established a plan and schedule for development of a more comprehensive implementation plan after this TMDL is established. The GA EPD and EPA have executed a Memorandum of Understanding that documents the schedule for developing the more comprehensive plans. This Initial TMDL Implementation Plan includes a list of best management practices and provides for an initial implementation demonstration project to address one of the major sources of pollutants identified in this TMDL while State and/or local agencies work with local stakeholders to develop a revised TMDL implementation plan. It also includes a process whereby GA EPD and/or Regional Development Centers (RDCs) or other GA EPD contractors (hereinafter, "GA EPD Contractors") will develop expanded plans (hereinafter, "Revised TMDL Implementation Plans").

This Initial TMDL Implementation Plan, written by GA EPD and for which GA EPD and/or the GA EPD Contractor are responsible, contains the following elements.

1. EPA has identified a number of management strategies for the control of nonpoint sources of pollutants, representing some best management practices. The "Management Measure Selector Table" shown below identifies these management strategies by source category and pollutant. Nonpoint sources are the primary cause of excessive pollutant loading in most cases. Any wasteload allocations for wastewater treatment plant facilities will be implemented in the form of water-quality based effluent limitations in NPDES permits. Any wasteload allocations for regulated storm water will be implemented in the form of best management practices in the NPDES permits. NPDES permit discharges are a secondary source of excessive pollutant loading, where they are a factor, in most cases.

2. The GA EPD and the GA EPD Contractor will select and implement one or more best management practice (BMP) demonstration projects for each River Basin. The purpose of the demonstration projects will be to evaluate by River Basin and pollutant parameter the site-specific effectiveness of one or more of the BMPs chosen. The GA EPD intends that the BMP demonstration project be completed before the Revised TMDL Implementation Plan is issued. The BMP demonstration project will address the major pollutant categories of concern for the respective River Basin as identified in the TMDLs. The demonstration project need not be of a large scale, and may consist of one or more measures from the Table or equivalent BMP measures proposed by the GA EPD Contractor and approved by GA EPD. Other such measures may include those found in EPA's "*Best Management Practices Handbook*," the *"NRCS National Handbook of Conservation Practices*," or any similar reference, or measures that the volunteers, etc., devise that GA EPD approves. If for any reason the GA EPD Contractor does not complete the BMP demonstration project, GA EPD will take responsibility for doing so.

3. As part of the Initial TMDL Implementation Plan, the GA EPD brochure entitled *"Watershed Wisdom -- Georgia's TMDL Program*" will be distributed by GA EPD to the GA EPD Contractor for use with appropriate stakeholders for this TMDL. Also, a copy of the video of that same title will be provided to the GA EPD Contractor for its use in making presentations to appropriate stakeholders on TMDL implementation plan development.

4. If for any reason the GA EPD Contractor does not complete one or more elements of a Revised TMDL Implementation Plan, GA EPD will be responsible for getting that (those) element(s) completed, either directly or through another contractor.

5. The deadline for development of a Revised TMDL Implementation Plan is the end of December 2011.

6. The GA EPD Contractor helping to develop the Revised TMDL Implementation Plan, in coordination with GA EPD, will work on the following tasks involved in converting the Initial TMDL Implementation Plan to a Revised TMDL Implementation Plan:

   A. Generally characterize the watershed;
   B. Identify stakeholders;
   C. Verify the present problem to the extent feasible and appropriate (e.g., local monitoring);
   D. Identify probable sources of pollutant(s);
   E. For the purpose of assisting in the implementation of the load allocations of this TMDL, identify potential regulatory or voluntary actions to control pollutant(s) from the relevant nonpoint sources;
   F. Determine measurable milestones of progress;
   G. Develop a monitoring plan, taking into account available resources, to measure effectiveness; and
   H. Complete and submit to GA EPD the Revised TMDL Implementation Plan.

7. The public will be provided an opportunity to participate in the development of the Revised TMDL Implementation Plan and to comment on it before it is finalized.

8. The Revised TMDL Implementation Plan will supersede this Initial TMDL Implementation Plan once GA EPD accepts the Revised TMDL Implementation Plan.

Management Measure Selector Table

Land Use	Management Measures	Fecal Coliform	Dissolved Oxygen	pH	Sediment	Temperature	*Toxicity*	*Mercury*	Metals (copper, lead, zinc, cadmium)	PCBs, toxaphene
Agriculture	1. Sediment & Erosion Control	_	_		_	_				
	2. Confined Animal Facilities	_	_							
	3. Nutrient Management	_	_							
	4. Pesticide Management		_							
	5. Livestock Grazing	_	_		_	_				
	6. Irrigation		_		_	_				
Forestry	1. Preharvest Planning				_	_				
	2. Streamside Management Areas	_	_		_	_				
	3. Road Construction & Reconstruction		_		_	_				
	4. Road Management		_		_	_				
	5. Timber Harvesting		_		_	_				
	6. Site Preparation & Forest Regeneration		_		_	_				
	7. Fire Management	_	_	_	_	_				
	8. Revegetation of Disturbed Areas	_	_	_	_	_				
	9. Forest Chemical Management		_			_				
	10. Wetlands Forest Management	_	_	_		_		_		

Land Use	**Management Measures**	**Fecal Coliform**	**Dissolved Oxygen**	**pH**	**Sediment**	**Temperature**	***Toxicity***	***Mercury***	**Metals (copper, lead, zinc, cadmium)**	**PCBs, toxaphene**
Urban	1. New Development	–	–		–	–			–	
	2. Watershed Protection & Site Development	–	–		–	–		–	–	
	3. Construction Site Erosion and Sediment Control		–		–	–				
	4. Construction Site Chemical Control		–							
	5. Existing Developments	–	–		–	–			–	
	6. Residential and Commercial Pollution Prevention	–	–							
Onsite Wastewater	1. New Onsite Wastewater Disposal Systems	–	–							
	2. Operating Existing Onsite Wastewater Disposal Systems	–	–							
Roads, Highways and Bridges	1. Siting New Roads, Highways & Bridges	–	–		–	–			–	
	2. Construction Projects for Roads, Highways and Bridges		–		–	–				
	3. Construction Site Chemical Control for Roads, Highways and Bridges		–							
	4. Operation and Maintenance- Roads, Highways and Bridges	–	–			–			–	

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Appendix A

30-day Geometric Mean Fecal Coliform Monitoring Data

2001 Though 2007 Monitoring Water Quality Stations

Stream Segment	Location	USGS Monitoring Station No.	Monitoring Station Description
Camp Creek	Dry Creek to Oostanaula River (Gordon County)	02387510	Camp Creek u/s SR136 near Resaca, GA
Chattooga River	Lyerly to Stateline (Chattooga County)	02398037	Chattooga River at Holland-Chattoogaville Road (FAS1363) near Lyerly, Georgia
Coahulla Creek	Mill Creek to Conasauga River (Whitfield County)	02385170	Coahulla Creek at Keiths Mill Rd (FAS 2354) East Of Dalton
Cochran Creek	Gab Creek to Amicalola Creek (Dawson County)	NA	NA
Conasauga River	Stateline to Hwy 286 (Murray and Whitfield Counties)	02384000	Conasauga River at State Road 61 near Tennga, Georgia
		02384175	Conasauga River at Carlton Petty Road near Gregory, Ga.
		02384500	Conasauga River at SR 286 near Eton, GA
Dozier Creek	Oostanaula River Tributary (Floyd County)	02388450	Dozier Creek at Bells Ferry Road near Rome, GA
Drowning Bear Creek	Tar Creek to Little Creek (Whitfield Co.)	02386500	Drowning Bear Creek near Dalton, GA
Duck Creek	Headwaters to Chattooga River (Walker County)	02397810	Duck Creek at State Road 337 near LaFayette, Georgia
Dykes Creek	Headwaters to Etowah River (Floyd County)	02395550	Dykes Creek at Norton Road near Kingston, GA
Etowah River	Sharp Mountain Creek to Lake Allatoona (Cherokee County)	02392000	Etowah River at State Road 5 spur near Canton, Georgia
Heath Creek	Downstream Rocky Mountain Project (Floyd County)	02388322	Heath Creek at Texas Valley Road NW near Rome, Georgia
Holly Creek	Headwaters to Amicalola Creek (Dawson Co.)	NA	NA
Holly Creek	Downstream Chatsworth (Murray County)	02385795	Holly Creek at State Road 61 near Chatsworth, Georgia
Horseleg Creek	Rome (Floyd County)	02396690	Horeseleg Creek at South Hanks Street at Rome, GA
Jacks River	Rough Creek to Stateline (Fannin and Murray Counties)	02383800	Jacks River at Old Highway 2 near Tennga, Georgia
Johns Creek	Oostanaula River Tributary (Floyd County)	02387690	Johns Creek at State Road 156 near Curryville, Georgia
Kings Creek	Coosa River Tributary (Floyd County)	02397150	Kings Creek at SR 20 near Coosa, GA

Stream Segment	Location	USGS Monitoring Station No.	Monitoring Station Description
Little Amicalola Creek	Headwaters to Amicalola Creek (Dawson Co.)	NA	NA
Little River	Hwy 140 to Lake Allatoona (Fulton and Cherokee Counties)	02392780	Little River at Georgia Highway 5 near Woodstock, Georgia
Mill Creek	Crandall Ellijay Rd (C.R. 27) to Conasauga River (Murray County)	02384550	Mill Creek at U.S. Hwy 411 at Eton, GA
Noonday Creek	Little Noonday Creek to Lake Allatoona (Cobb and Cherokee Counties)	02393000	Noonday Creek at Georgia Highway 92 (prorate for North Rope Mill Rd.) near Woodstock, Georgia
Oostanaula River	Conasauga/Coosawattee to Oothkalooga Creek (Gordon County)	02387500	Oostanaula River at U.S. Highway 41 near Resaca, Georgia
		02387530	Oostanaula River at GA Hwy 136C at Calhoun, GA
Oothkalooga Creek	U/S Bartow Co. Line to Oostanaula River (Bartow and Gordon Counties)	02387600	Oothkalooga Creek at SR53 Spur at Calhoun, GA
		02387605	Oothkalooga Creek at State Road 156 near Calhoun, Georgia
Pettit Creek	Satterfield Branch to Nancy Creek (Bartow County)	02394612	Pettit Creek at CR450 near Cartersville, GA
Polecat Creek	Headwaters to Conasauga River (Murray and Gordon County)	02387225	Polecat Creek at County Line Road near Nickelsville, GA
Salacoa Creek	Pine Log Creek to Coosawattee River (Gordon County)	02383180	Salacoa Creek at Lovebridge Road NE near Redbud, Georgia
Snake Creek	Headwaters to Oostanaula River (Gordon and Walker Counties)	02387624	Snake Creek at Pocket Road at Sugar Valley, GA
Swamp Creek	Little Swamp Creek to Conasauga River (Whitfield County)	02386865	Swamp Creek at Old Tilton Road at Tilton, GA
Toms Creek	Headwaters to Etowah River (Bartow County)	02395330	Toms Creek at Norton Road near Kingston, GA

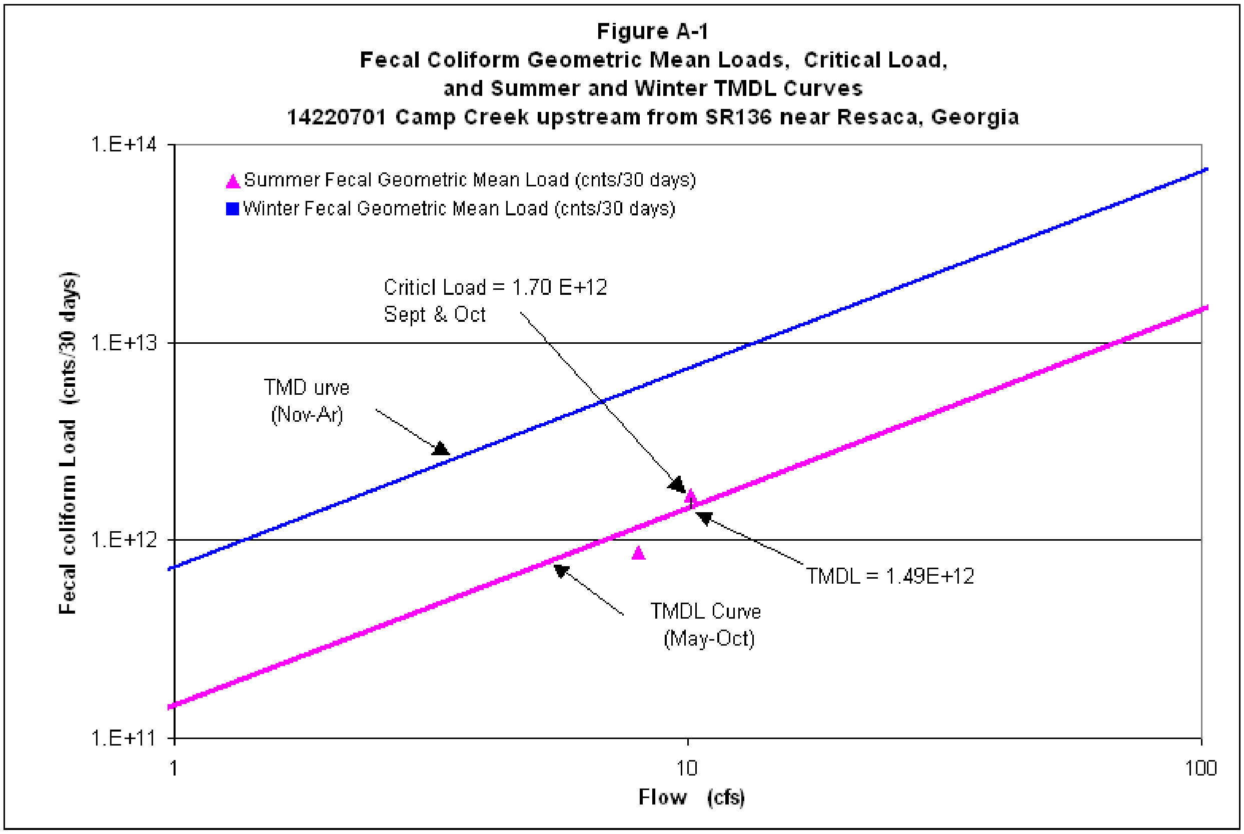


Table A-1. Data for Figure A-1

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
7/20/2005	80	8.0				
7/27/2005	500	8.9				
8/3/2005	70	8.7				
9-Aug-05	170	6.4	147.7	8.0	8.67E+11	1.17E+12
9/13/2005	230	8.2				
9/20/2005	300	11.0				
9/27/2005	170	14.0				
4-Oct-05	**230**	**7.4**	**227.9**	**10.2**	**1.70E+12**	**1.49E+12**

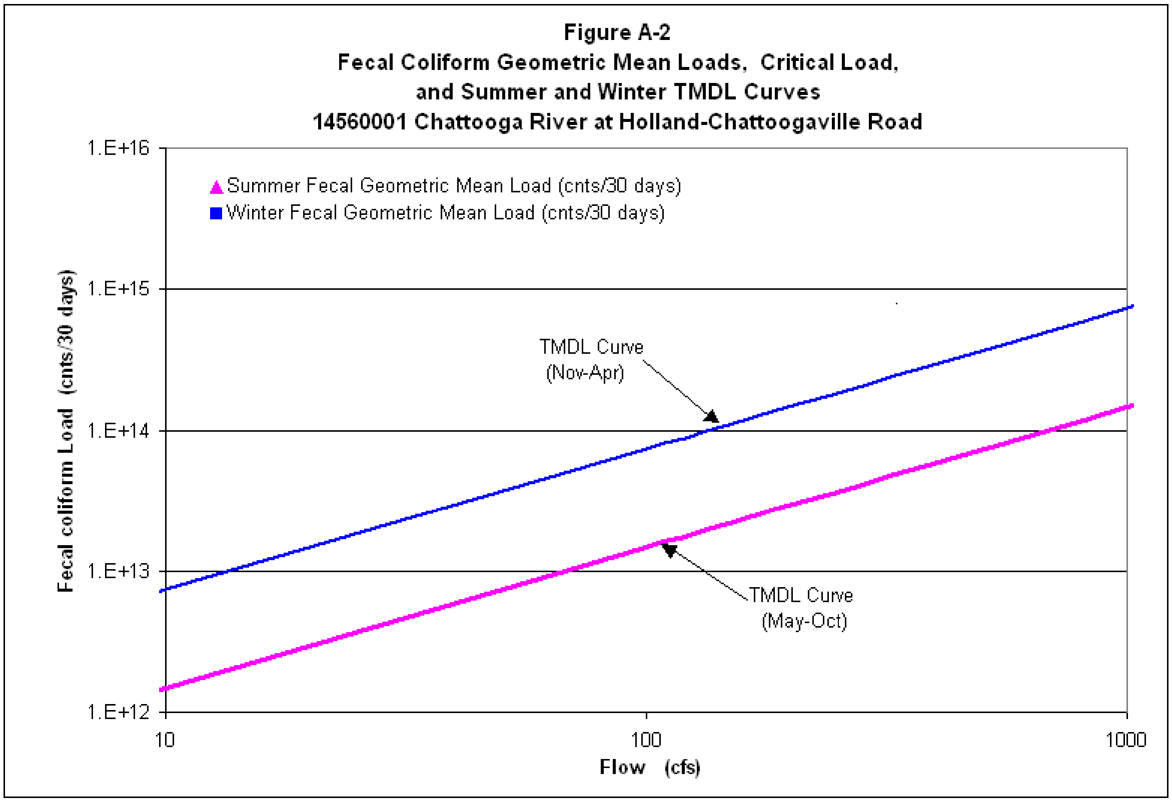


Figure A-2
Fecal Coliform Geometric Mean Loads, Critical Load, and Summer and Winter TMDL Curves
14560001 Chattooga River at Holland-Chattoogaville Road
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
TMDL Curve
(Nov-Apr)
TMDL Curve
(May-Oct)
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
Fecal coliform Load (cnts/30 days)
10
100
1000
Flow (cfs)

Table A-2. Data for Figure A-2

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
1/8/2002	490	170.0				
1/15/2002	20	137.0				
2/5/2002	105	311.0				
2/7/2002	4600	876.0	262.3	373.5	7.19E+13	2.74E+14
4/2/2002	170	1170.0				
4/9/2002	330	427.0				
4/16/2002	80	314.0				
4/30/2002	700	178.0	236.7	522.3	9.08E+13	3.83E+14
7/9/2002	110	103.0				
7/16/2002	70	105.0				
7/23/2002	70	92.0				
8/6/2002	130	85.0	91.5	96.3	6.46E+12	1.41E+13
11/5/2002	490	256.0				
11/13/2002	20	603.0				
11/19/2002	130	547.0				
12/3/2002	95	269.0	104.9	418.8	3.22E+13	3.07E+14
1/8/2003	90	380.0				
1/15/2003	70	300.0				
1/29/2003	130	253.0				
2/5/2003	230	563.0	117.2	374.0	3.22E+13	2.75E+14
5/29/2003	170	550.0				
6/2/2003	20	417.0				
6/11/2003	130	309.0				
6/18/2003	3100	445.0	192.4	430.3	6.08E+13	6.32E+13
7/23/2003	490	317.0				
7/30/2003	130	326.0				
8/6/2003	80	347.0				
8/13/2003	3500	300.0	365.4	322.5	8.65E+13	4.73E+13
11/19/2003	35000	683.0				
12/4/2003	20	329.0				
12/10/2003	130	187.0				
12/16/2003	20	417.0	206.5	404.0	6.12E+13	2.97E+14
2/9/2004	155	924.0				
2/16/2004	500	887.0				
2/18/2004	20	617.0				
2/24/2004	1700	398.0	226.6	706.5	1.17E+14	5.19E+14
3/9/2004	230	641.0				
3/17/2004	170	363.0				
3/22/2004	170	299.0				
4/7/2004	70	254.0	146.9	389.3	4.20E+13	2.86E+14
7/7/2004	1100	436.0				
7/14/2004	80	216.0				
7/21/2004	40	142.0				
8/3/2004	34	146.0	104.6	235.0	1.80E+13	3.45E+13
9/15/2004	17	151.0				
9/21/2004	220	402.0				
9/28/2004	70	226.0				
10/5/2004	80	181.0	67.6	240.0	1.19E+13	3.52E+13
4/7/2005	230	655.0				
4/11/2005	230	677.0				
4/18/2005	130	374.0				
4/26/2005	40	299.0	128.8	501.3	4.74E+13	3.68E+14
5/17/2005	40	238.0				
5/24/2005	500	217.0				
6/7/2005	1300	245.0				
6/16/2005	70	208.0	206.5	227.0	3.44E+13	3.33E+13
3/20/2006	20	189.0				
3/28/2006	40	275.0				
4/4/2006	40	243.0				
4/11/2006	80	275.0	40.0	245.5	7.21E+12	1.80E+14
5/10/2006	220	197.0				
5/17/2006	20	192.0				
5/23/2006	20	175.0				
6/6/2006	20	140.0	36.4	176.0	4.71E+12	2.58E+13
6/27/2006	40	148.0				
8/29/2006	80	98.0				
9/5/2006	80	121.0				
9/12/2006	70	110.0				
9/19/2006	230	142.0	100.8	117.8	8.71E+12	1.73E+13
11/7/2006	230	172.0				
11/15/2006	1100	281.0				
11/29/2006	40	169.0				
12/6/2006	40	137.0	141.8	189.8	1.98E+13	1.39E+14
1/31/2007	40	266.6				
2/6/2007	20	287.4				
2/13/2007	20	241.4				
2/20/2007	20	207.4				
2/21/2007	20	208.9	23.0	242.3	4.09E+12	1.78E+14
3/14/2007	20	256.3				
3/20/2007	20	254.8				
3/28/2007	110	213.3				
4/9/2007	20	241.4	30.6	241.4	5.43E+12	1.77E+14
6/21/2007	220	103.7				
6/26/2007	800	93.3				
7/10/2007	170	131.8				
7/19/2007	40	117.0	186.0	111.5	1.52E+13	8.18E+13
8/13/2007	80	84.4				
8/20/2007	110	71.1				
8/28/2007	80	83.0				
9/11/2007	80	75.5	86.6	78.5	4.99E+12	1.15E+13
11/19/2003	**35000**	**683.0**	**35000.0**	**683.0**	**1.75E+16**	**2.01E+15**

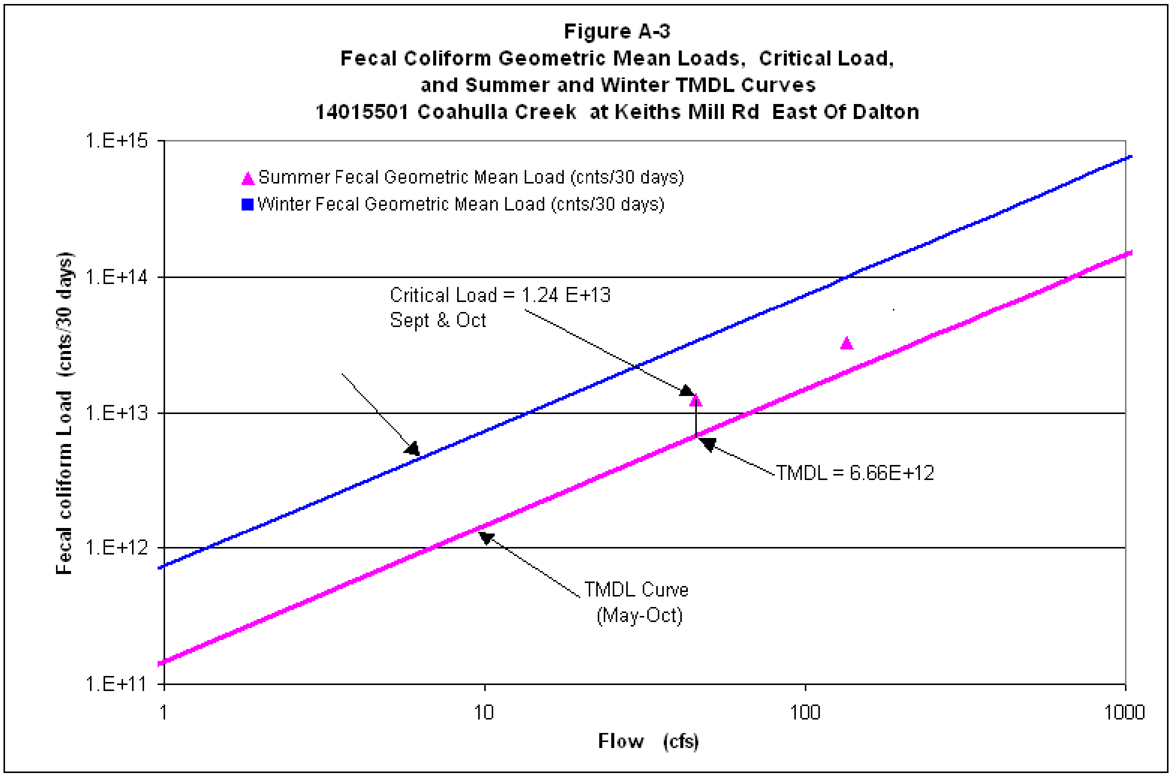


Table A-3. Data for Figure A-3

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
6/14/2005	110	69.0				
6/21/2005	170	59.0				
6/29/2005	800	59.0				
7/14/2005	800	353.0	330.8	135.0	3.28E+13	1.98E+13
9/7/2005	80	42.0				
9/15/2005	170	39.0				
9/20/2005	800	47.0				
9/27/2005	1300	52.0				
10/4/2005	**500**	**47.0**	**371.5**	**45.4**	**1.24E+13**	**6.66E+12**

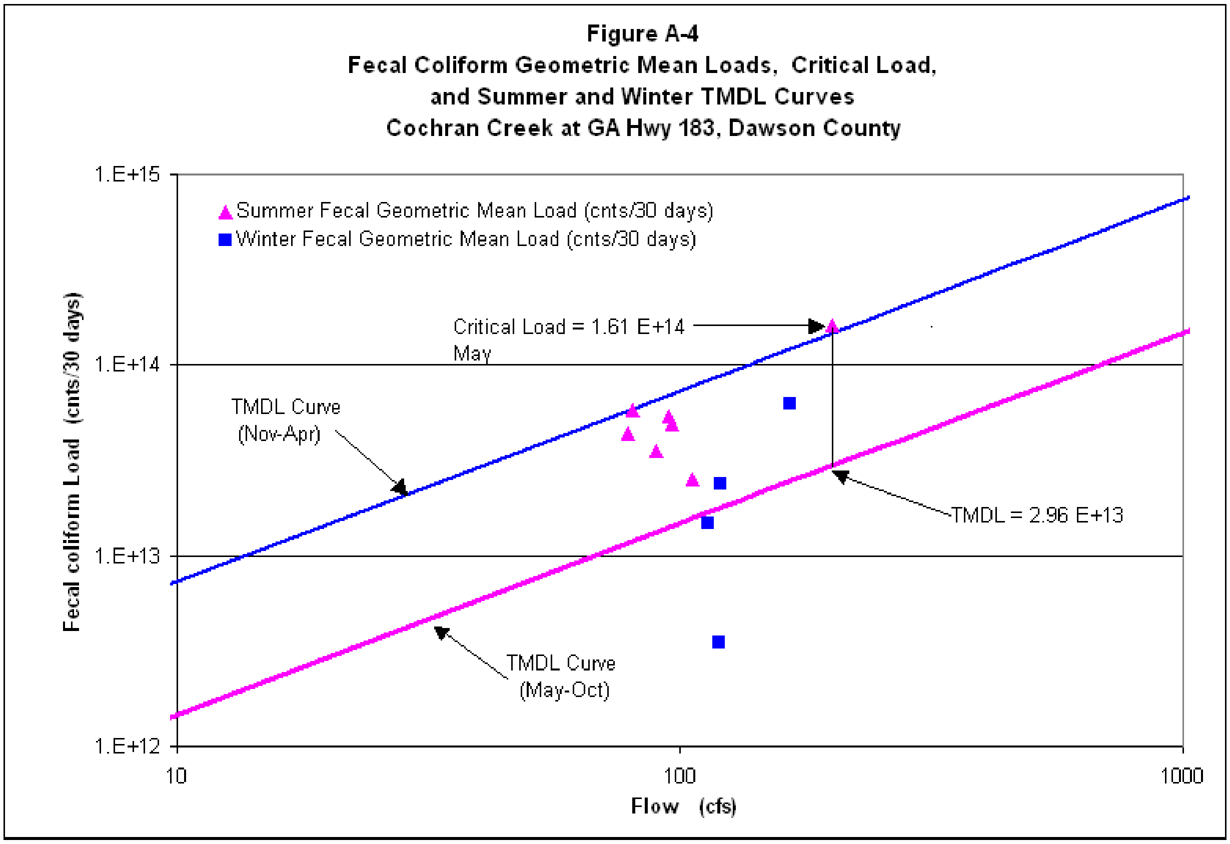


Figure A-4
Fecal Coliform Geometric Mean Loads, Critical Load, and Summer and Winter TMDL Curves
Cochran Creek at GA Hwy 183, Dawson County
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
Critical Load = 1.61 E+14
May
TMDL Curve
(Nov-Apr)
TMDL = 2.96 E+13
TMDL Curve
(May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+15
1.E+14
1.E+13
1.E+12
10
100
1000
Flow (cfs)

Table A-4. Data for Figure A-4

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
5/9/2002	325	113.4				
5/16/2002	110	106.6				
5/23/2002	360	102.4				
5/30/2002	850	101.1	323.4	105.9	2.51E+13	1.55E+13
6/5/2002	2730	105.9				
6/13/2002	1035	93.2				
6/25/2002	440	94.9				
6/27/2002	180	90.7	687.8	96.2	4.85E+13	1.41E+13
7/2/2002	250	95.6				
7/10/2002	1155	87.0				
7/18/2002	805	87.7				
7/25/2002	375	88.3	543.4	89.6	3.57E+13	1.32E+13
8/1/2002	680	82.2				
8/8/2002	422	76.0				
8/15/2002	1058	74.9				
8/21/2002	720	78.4				
8/28/2002	1080	82.2	749.2	78.7	4.33E+13	1.16E+13
9/4/2002	733	72.5				
9/12/2002	423	66.3				
9/19/2002	830	91.8				
9/25/2002	3500	91.8	974.2	80.6	5.76E+13	1.18E+13
10/2/2002	740	90.1				
10/9/2002	1010	84.6				
10/16/2002	1460	103.5				
10/23/2002	860	85.9				
10/30/2002	300	110.7	776.1	94.9	5.41E+13	1.39E+13
11/6/2002	760	135.8				
11/13/2002	170	109.6				
11/20/2002	90	104.8				
11/26/2002	84	104.8	176.8	113.8	1.48E+13	8.35E+13
12/5/2002	500	177.7				
12/18/2002	5	114.8				
1/16/2003	65	114.8				
2/5/2003	20	115.8				
2/12/2003	32	118.6				
2/20/2003	46	117.2				
2/26/2003	83	126.8	39.5	119.6	3.47E+12	8.78E+13
3/6/2003	735	274.0				
3/12/2003	148	130.6				
3/19/2003	1850	134.7				
3/27/2003	340	122.7	511.4	165.5	6.21E+13	1.21E+14
4/2/2003	90	120.0				
4/9/2003	1305	127.9				
4/16/2003	130	115.8				
4/23/2003	172	121.3				
4/30/2003	520	118.6	267.3	120.7	2.37E+13	8.86E+13
5/7/2003	3050	369.9				
5/14/2003	225	129.2				
5/22/2003	13750	180.1				
5/27/2003	**150**	**126.8**	**1090.7**	**201.5**	**1.61E+14**	**2.96E+13**

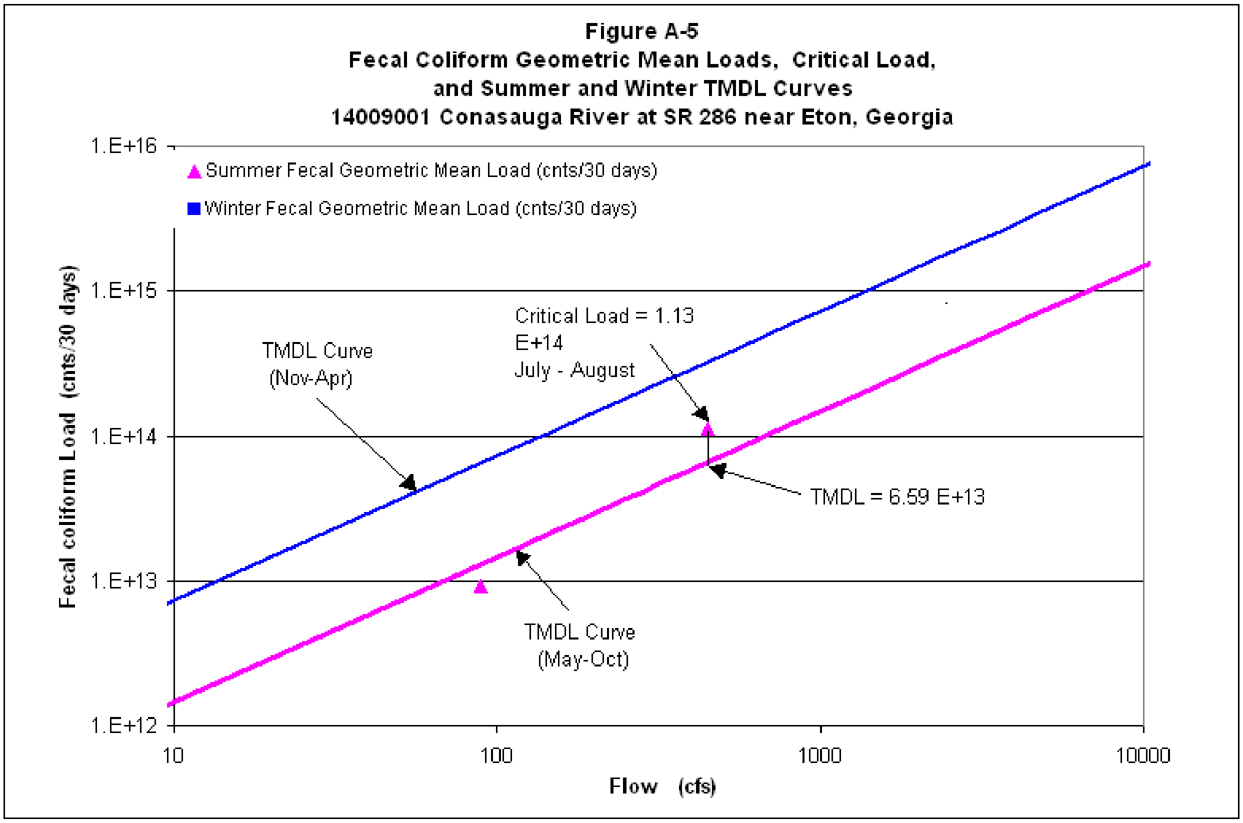


Table A-5. Data for Figure A-5

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
7/19/2005	9000	893				
7/26/2005	40	203				
8/2/2005	300	399				
8/9/2005	**130**	**301**	**344**	**449**	**1.13E+14**	**6.59E+13**
9/7/2005	80	103				
9/15/2005	130	86				
9/20/2005	170	87				
9/27/2005	220	81	140	89	9.20E+12	1.31E+13

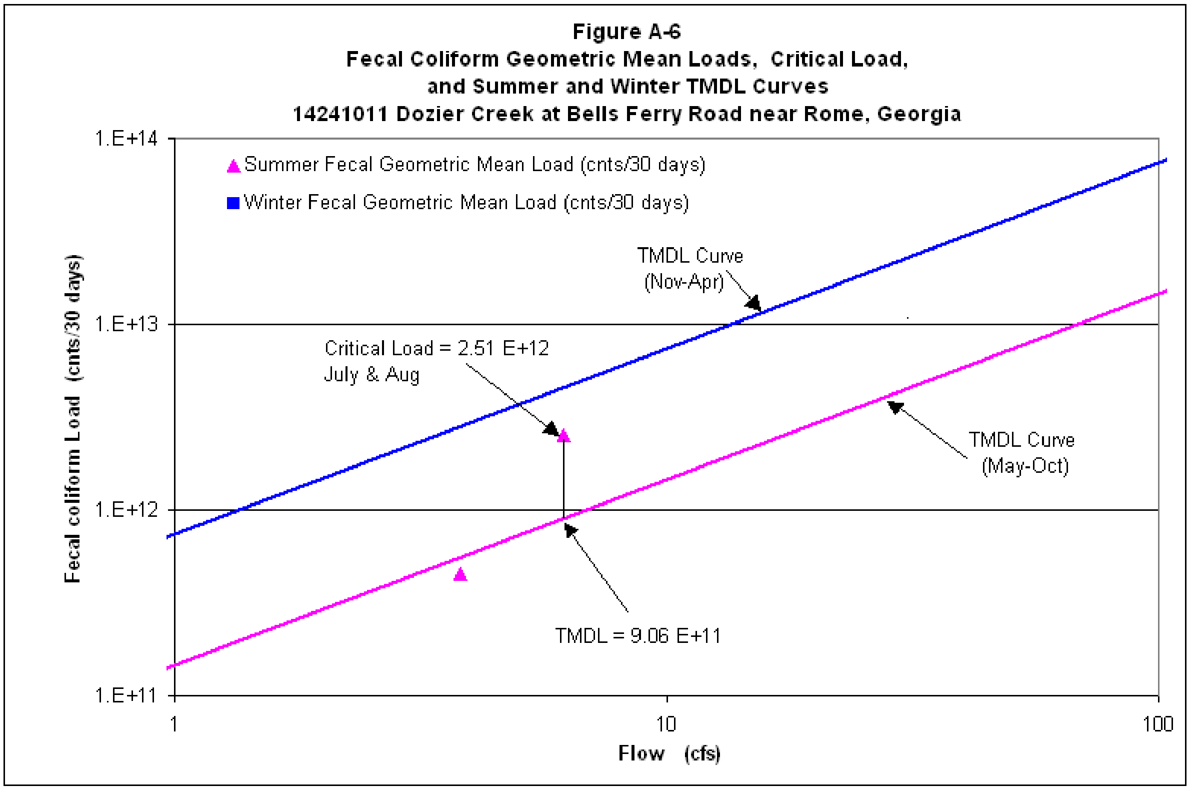


Table A-6. Data for Figure A-6

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
7/20/2005	300	8				
7/27/2005	300	6				
8/3/2005	1300	6				
8/10/2005	**800**	**4**	**553**	**6**	**2.51E+12**	**9.06E+11**
9/13/2005	300	4				
9/20/2005	230	4				
9/27/2005	130	4				
10/4/2005	80	4	164	4	4.57E+11	2.79E+12

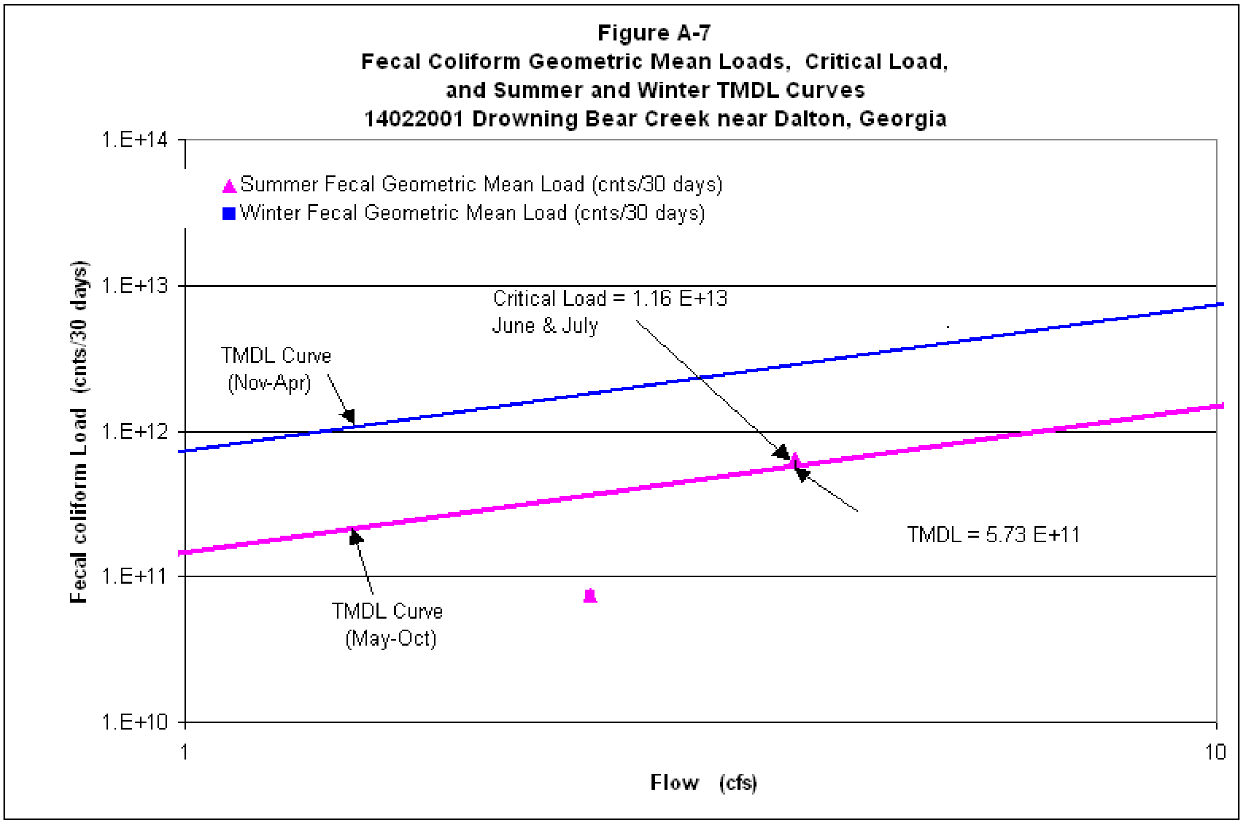


Table A-7. Data for Figure A-7

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
6/14/2005	40	1.6				
6/21/2005	300	1.3				
6/29/2005	800	1.7				
14-Jul-05	**260**	**11.0**	**223.5**	**3.9**	**6.40E+11**	**5.73E+11**
9/14/2005	40	1.8				
9/20/2005	20	1.8				
9/27/2005	170	4.3				
5-Oct-05	20	2.0	40.6	2.5	7.38E+10	3.63E+11

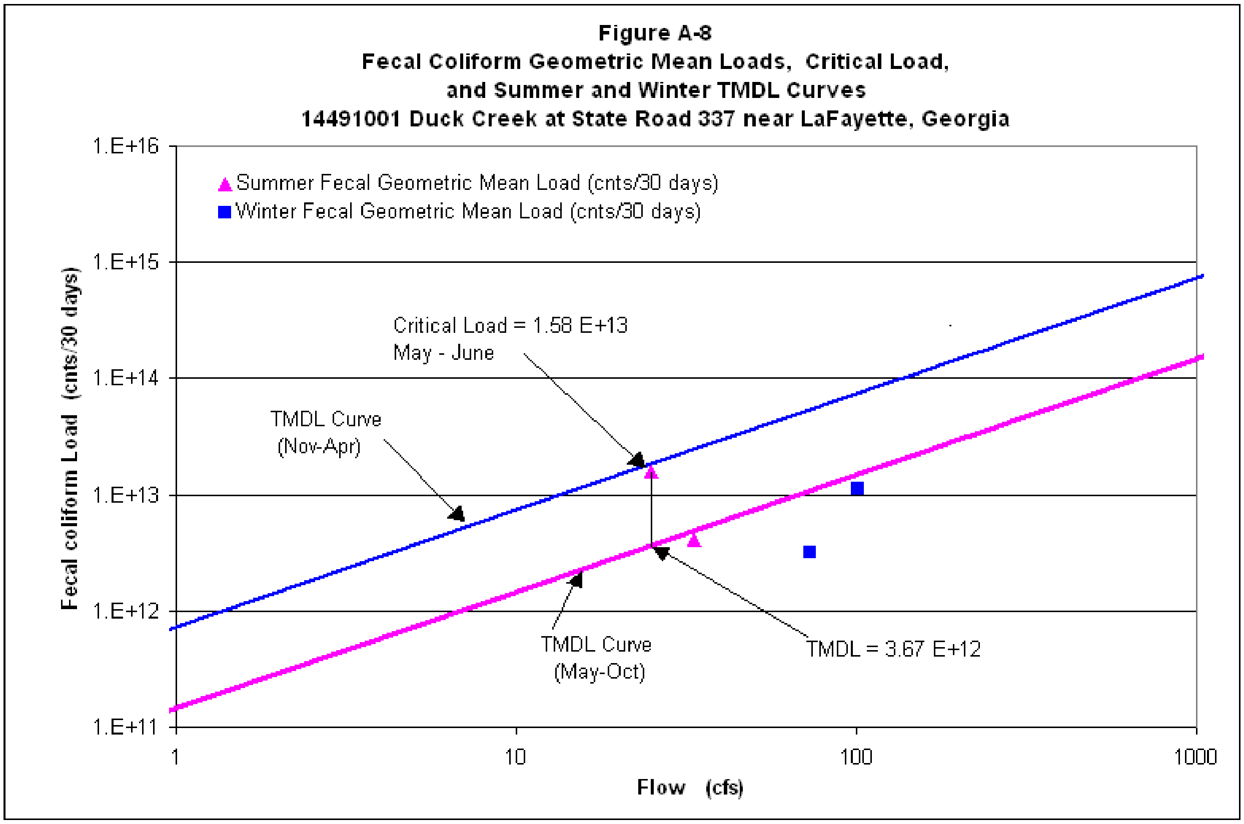


Table A-8. Data for Figure A-8

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
2/20/2001	220	110.0				
2/26/2001	80	177.0				
3/5/2001	130	76.0				
3/12/2001	220	42.0	149.8	101.3	1.11E+13	7.43E+13
5/14/2001	700	9.8				
5/21/2001	490	8.1				
5/29/2001	4900	30.0				
6/14/2001	**330**	**52.0**	**863.0**	**25.0**	**1.58E+13**	**3.67E+12**
8/22/2001	170	14.0				
8/28/2001	70	29.0				
9/5/2001	490	50.0				
9/10/2001	130	40.0	165.9	33.3	4.05E+12	4.88E+12
11/5/2001	130	97.0				
11/13/2001	220	80.0				
11/28/2001	20	61.0				
12/5/2001	20	56.0	58.2	73.5	3.14E+12	5.39E+13

Figure A-9
Fecal Coliform Geometric Mean Loads, Critical Load, and Summer and Winter TMDL Curves
14345181 Dykes Creek at Norton Road near Kingston, Georgia

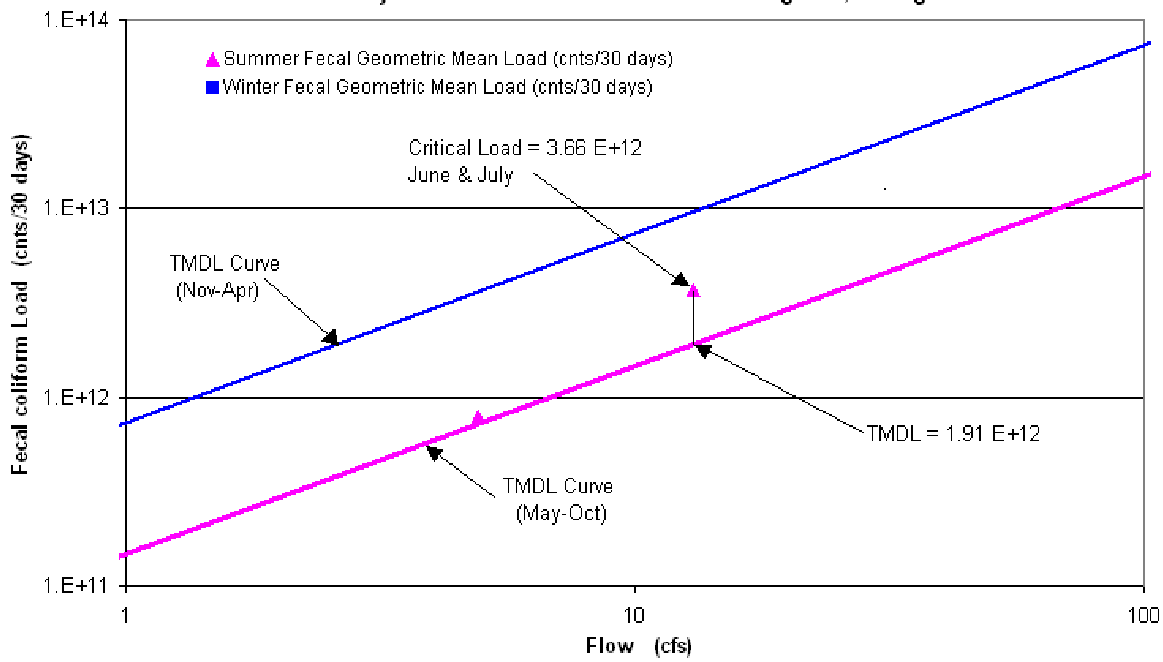


Table A-9. Data for Figure A-9

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
6/14/2005	80	6.5				
6/21/2005	130	6.7				
6/29/2005	230	6.8				
7/12/2005	**9000**	**32.0**	**383.0**	**13.0**	**3.66E+12**	**1.91E+12**
9/15/2005	70	5.5				
9/21/2005	220	4.9				
9/28/2005	300	4.7				
10/5/2005	500	4.6	219.2	4.9	7.93E+11	7.23E+11

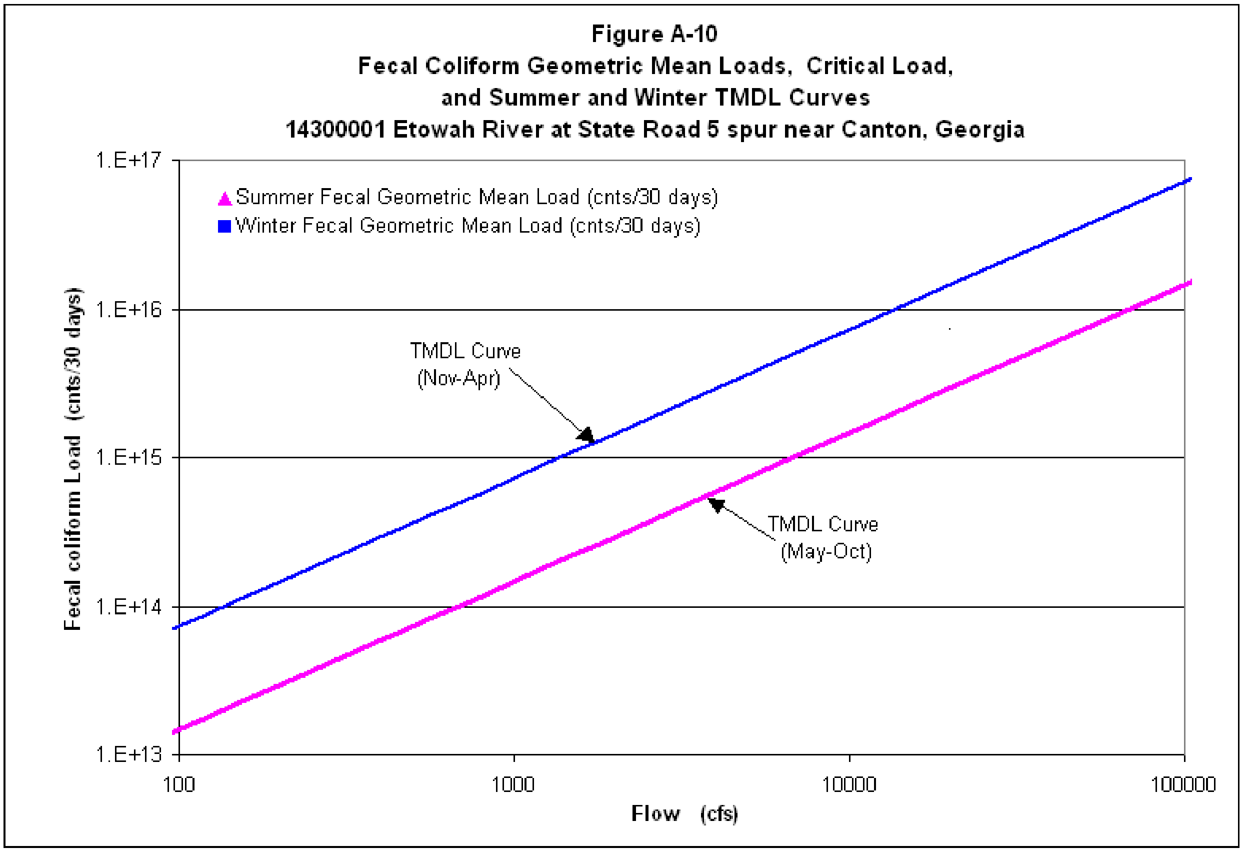


Figure A-10
Fecal Coliform Geometric Mean Loads, Critical Load,
and Summer and Winter TMDL Curves
14300001 Etowah River at State Road 5 spur near Canton, Georgia
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
TMDL Curve
(Nov-Apr)
TMDL Curve
(May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+17
1.E+16
1.E+15
1.E+14
1.E+13
100
1000
10000
100000
Flow (cfs)

Table A-10. Data for Figure A-10

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
1/7/2002	490	675.0				
1/14/2002	220	521.0				
1/28/2002	169	1310.0				
2/4/2002	50	784.0	173.7	822.5	1.05E+14	6.04E+14
4/1/2002	4900	3340.0				
4/8/2002	20	1010.0				
4/15/2002	170	971.0				
4/29/2002	75	732.0	188.0	1513.3	2.09E+14	1.11E+15
7/8/2002	170	274.0				
7/15/2002	60	446.0				
7/22/2002	70	217.0				
8/5/2002	50	171.0	77.3	277.0	1.57E+13	4.07E+13
11/4/2002	310	604.0				
11/12/2002	3300	1800.0				
11/18/2002	490	1400.0				
12/2/2002	70	753.0	432.8	1139.3	3.62E+14	8.36E+14
1/7/2003	40	1220.0				
1/14/2003	170	1030.0				
1/28/2003	20	837.0				
2/6/2003	20	1110.0	40.6	1049.3	3.13E+13	7.70E+14
5/28/2003	80	1460.0				
6/3/2003	80	1200.0				
6/10/2003	80	1340.0				
6/17/2003	24000	8010.0	332.9	3002.5	7.34E+14	4.41E+14
7/22/2003	70	1240.0				
7/29/2003	230	1040.0				
8/5/2003	1700	1890.0				
8/12/2003	110	1130.0	234.2	1325.0	2.28E+14	1.95E+14
2/3/2004	80	1360.0				
2/11/2004	40	1260.0				
2/16/2004	140	1830.0				
2/23/2004	130	1040.0	87.4	1372.5	8.80E+13	1.01E+15
3/9/2004	170	1060.0				
3/17/2004	80	988.0				
3/23/2004	20	853.0				
4/6/2004	20	774.0	48.3	918.8	3.26E+13	6.74E+14
7/13/2004	40	573.0				
7/20/2004	130	493.0				
7/27/2004	900	769.0				
8/3/2004	21	577.0	99.6	603.0	4.41E+13	8.85E+13
9/14/2004	240	599.0				
9/20/2004	1100	3360.0				
9/29/2004	800	1480.0				
10/4/2004	170	737.0	435.3	1544.0	4.93E+14	2.27E+14
4/5/2005	20	2280.0				
4/12/2005	110	1920.0				
4/18/2005	20	1520.0				
4/28/2005	80	1490.0	43.3	1802.5	5.73E+13	1.32E+15
5/10/2005	20	1200.0				
5/24/2005	40	1010.0				
5/31/2005	40	1030.0				
6/9/2005	900	1390.0	73.3	1157.5	6.22E+13	1.70E+14
8/15/2005	3000	1310.0				
2/22/2006	130	993.0				
2/27/2006	20	1120.0				
3/6/2006	20	853.0				
3/14/2006	20	939.0	31.9	976.3	2.29E+13	7.17E+14
5/8/2006	40	784.0				
5/15/2006	40	711.0				
5/22/2006	80	711.0				
6/5/2006	20	485.0	40.0	672.8	1.98E+13	9.88E+13
6/26/2006	16000	2410.0				
8/21/2006	2400	226.0				
8/28/2006	40	203.0				
9/11/2006	80	238.0				
9/18/2006	40	298.0	132.4	241.3	2.34E+13	3.54E+13
11/6/2006	20	430.0				
11/16/2006	9000	9970.0				
11/28/2006	20	637.0				
12/4/2006	40	737.0	109.5	2943.5	2.37E+14	2.16E+15
1/31/2007	20	832.0				
2/6/2007	20	880.0				
2/13/2007	20	763.0				
2/20/2007	20	727.0				
2/21/2007	20	800.0	20.0	800.4	1.17E+13	5.87E+14
3/15/2007	70	821.0				
3/20/2007	20	827.0				
3/27/2007	20	760.0				
4/11/2007	20	732.0	27.4	785.0	1.58E+13	5.76E+14
6/19/2007	40	314.0				
6/25/2007	40	253.0				
7/9/2007	130	298.0				
7/17/2007	800	316.0	113.6	295.3	2.46E+13	2.17E+14
8/15/2007	40	161.0				
8/20/2007	220	123.0				
8/28/2007	230	179.0				
9/11/2007	130	96.0	127.4	139.8	1.31E+13	2.05E+13
4/1/2002	4900	3340.0	4900.0	3340.0	1.20E+16	9.81E+15
11/16/2006	**9000**	**9970.0**	**9000.0**	**9970.0**	**6.59E+16**	**2.93E+16**

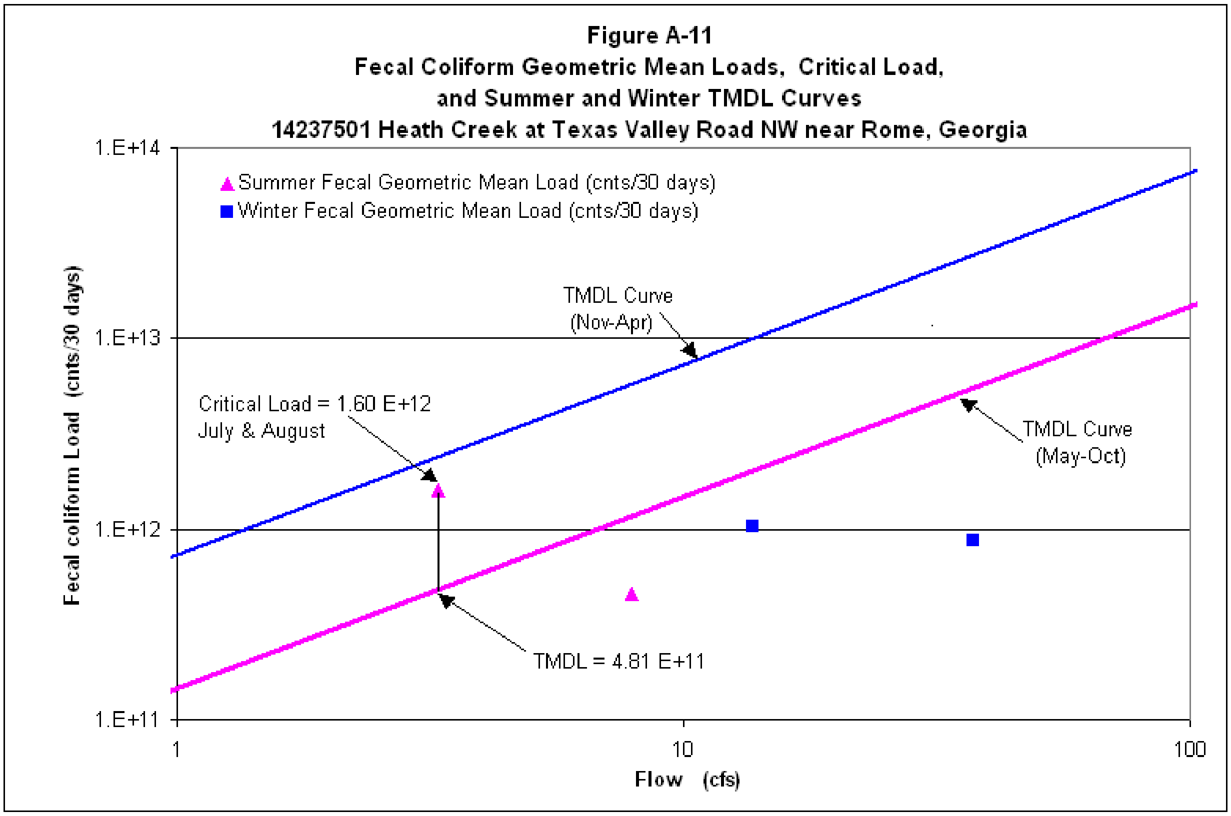


Table A-11. Data for Figure A-11

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
2/12/2001	20	38.0				
2/26/2001	50	49.0				
2/27/2001	50	20.0				
3/7/2001	20	42.0	31.6	37.3	8.65E+11	2.73E+13
4/16/2001	50	32.0				
4/18/2001	80	12.0				
4/23/2001	170	5.2				
4/25/2001	170	5.4	103.7	13.7	1.04E+12	1.00E+13
7/17/2001	790	3.5				
7/23/2001	460	0.3				
8/6/2001	1100	4.9				
8-Aug-01	**490**	**4.4**	**665.3**	**3.3**	**1.60E+12**	**4.81E+11**
10/3/2001	330	5.8				
10/10/2001	20	6.4				
10/18/2001	40	9.6				
22-Oct-01	140	9.8	78.0	7.9	4.52E+11	1.16E+12

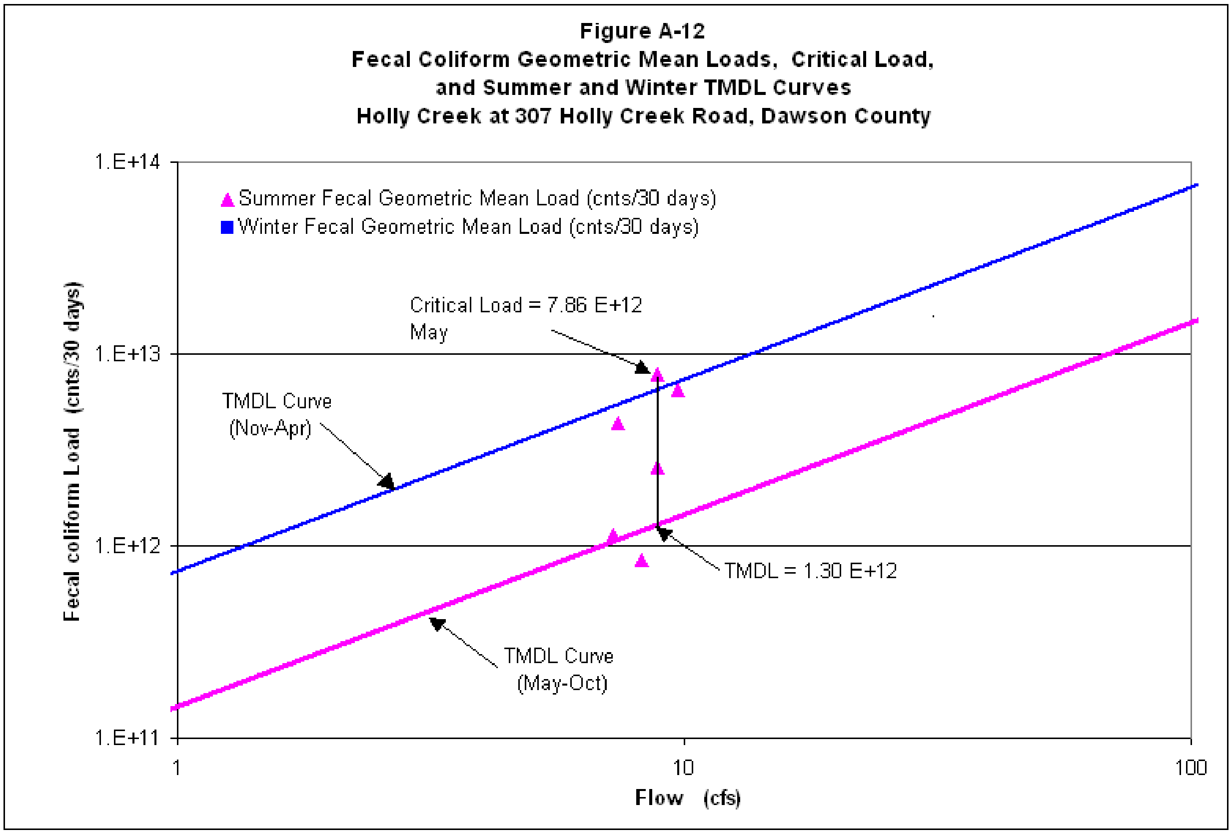


Table A-12. Data for Figure A-12

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
5/9/2002	1950	10.4				
5/16/2002	240	9.8				
5/23/2002	798	9.4				
5/30/2002	1768	9.3	901.4	9.7	6.45E+12	1.43E+12
6/5/2002	1670	9.7				
6/13/2002	1115	8.6				
6/25/2002	165	8.7				
6/27/2002	80	8.4	396.0	8.9	2.57E+12	1.30E+12
7/2/2002	335	8.8				
7/10/2002	182	8.0				
7/18/2002	115	8.1				
7/25/2002	52	8.1	138.2	8.3	8.37E+11	1.21E+12
8/1/2002	100	7.6				
8/8/2002	144	7.0				
8/15/2002	292	6.9				
8/21/2002	491	7.2				
8/28/2002	228	7.6	216.0	7.2	1.15E+12	1.06E+12
9/4/2002	310	6.7				
9/12/2002	330	6.1				
9/19/2002	1005	8.4				
9/25/2002	3975	8.4	799.5	7.4	4.35E+12	1.09E+12
10/2/2002	3850	8.3				
10/9/2002	1725	7.8				
10/16/2002	690	9.5				
10/23/2002	640	7.9				
10/30/2002	**885**	**10.2**	**1210.2**	**8.9**	**7.86E+12**	**1.30E+12**
11/6/2002	550	12.5				
11/13/2002	790	10.1				

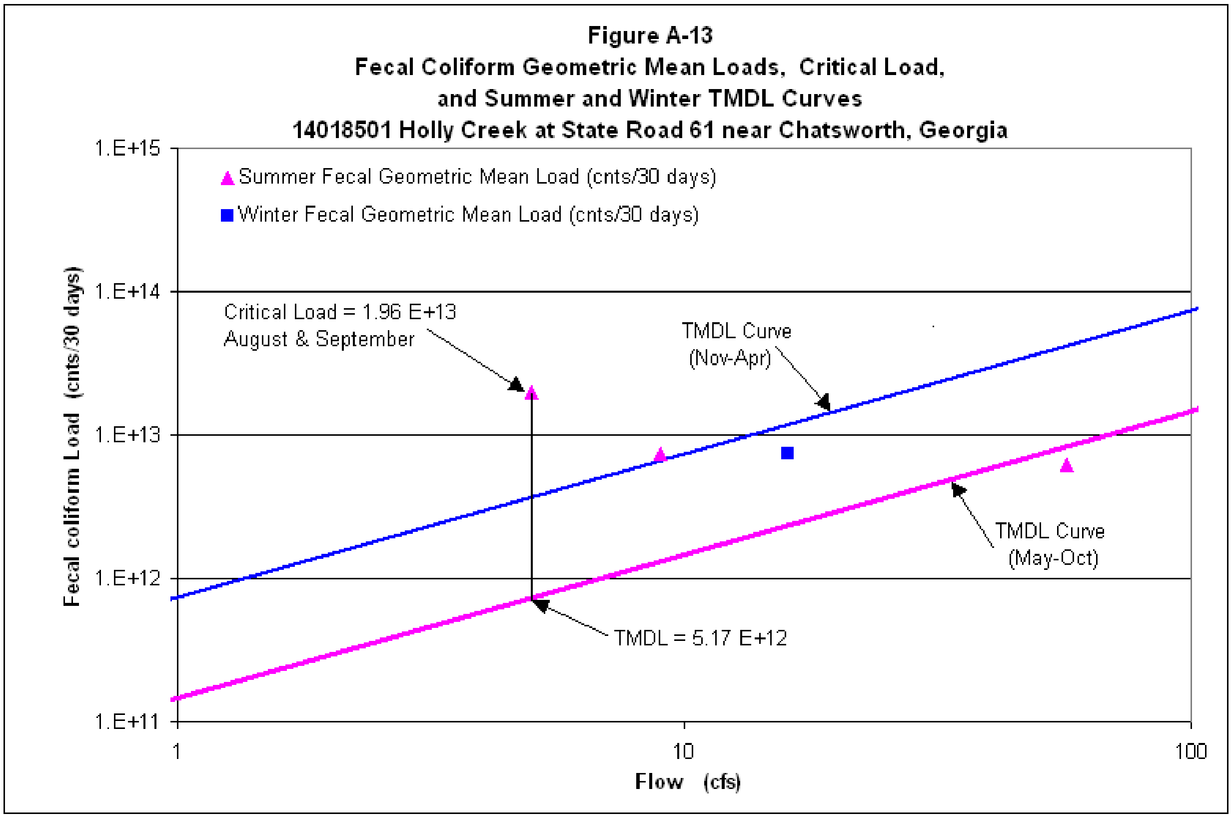


Table A-13. Data for Figure A-13

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
2/28/2001	80	171.0				
3/6/2001	130	239.0				
3/13/2001	790	333.0				
3/20/2001	7900	620.0	504.7	340.8	1.26E+14	2.50E+14
5/16/2001	170	23.0				
5/23/2001	130	27.0				
5/30/2001	110	116.0				
6/11/2001	210	61.0	150.3	56.8	6.26E+12	8.33E+12
8/29/2001	4900	18.0				
9/6/2001	790	37.0				
9/11/2001	50	19.0				
9/20/2001	**1700**	**67.0**	**757.4**	**35.3**	**1.96E+13**	**5.17E+12**
10/1/2001	1800	14.0				
10/3/2001	330	17.0				
10/10/2001	210	13.0				
10/15/2001	1300	20.0	634.6	16.0	7.45E+12	2.35E+12
3/20/2001	7900	620.0	7900.0	620.0	3.60E+15	1.82E+15

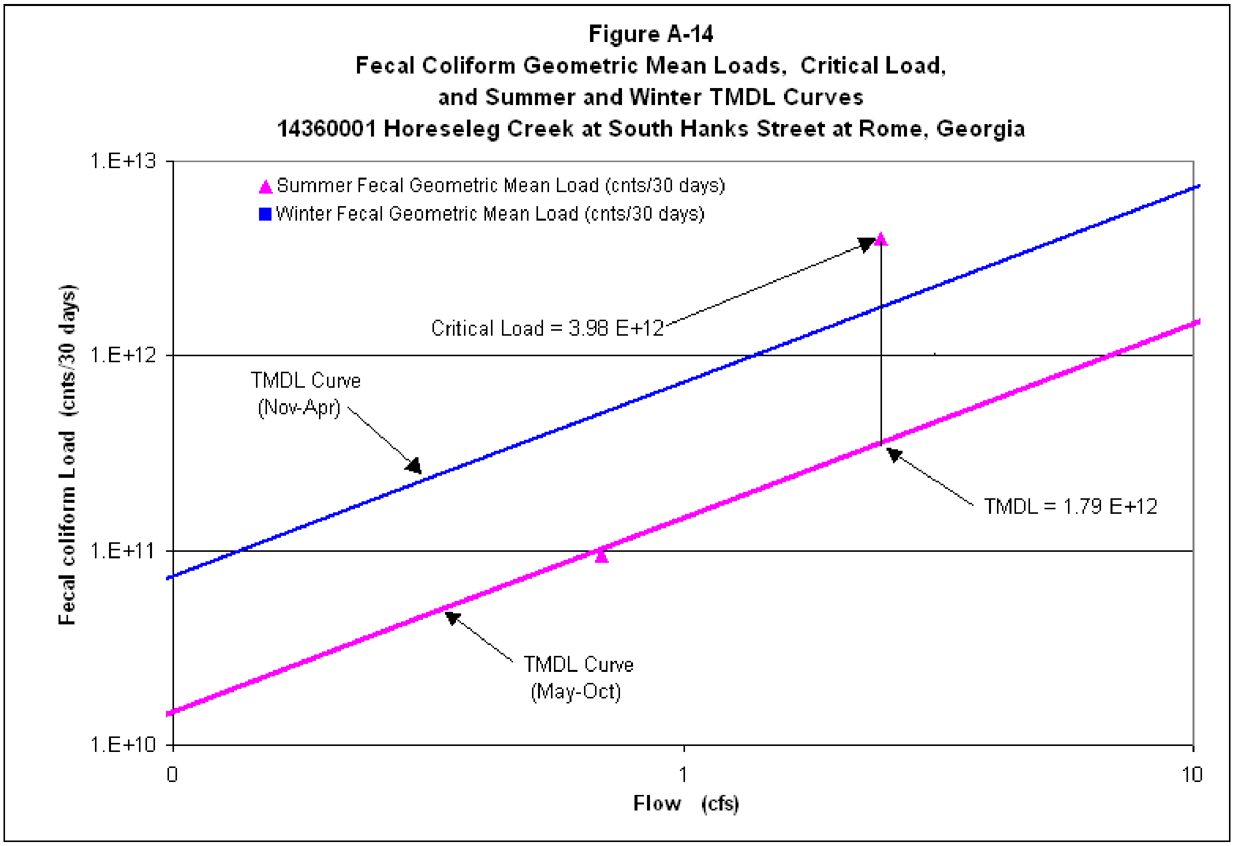


Table A-14. Data for Figure A-14

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
6/21/2005	16000					
6/23/2005	300	0.6				
6/29/2005	1700	0.9				
7/12/2005	**3000**	**5.8**	**2224.3**	**2.4**	**3.98E+12**	**1.79E+12**
8/17/2005	1300	0.8				
9/6/2005	300	0.6				
9/15/2005	40	0.6				
9/21/2005	40	0.6				
9/29/2005	2400	1.1	184.2	0.7	9.40E+10	1.02E+11

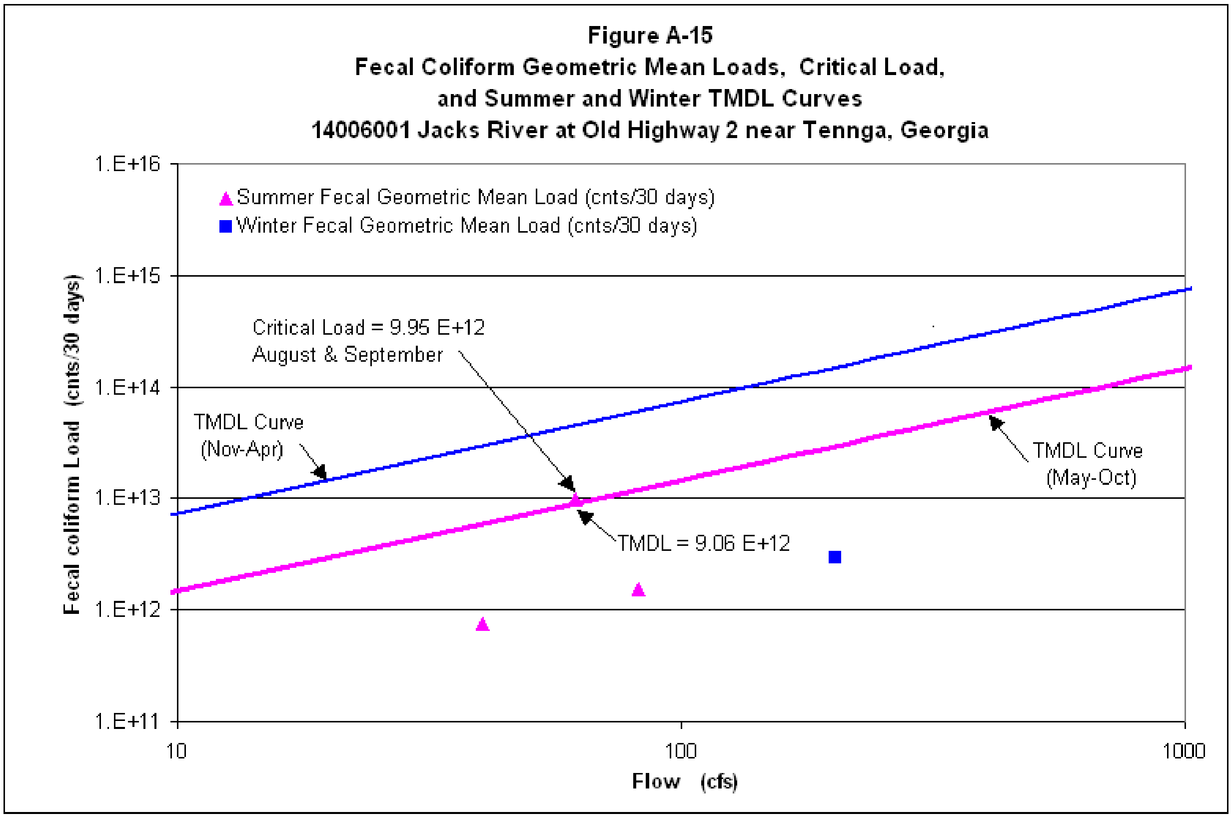


Table A-15. Data for Figure A-15

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
2/26/2001	20	300.0				
3/6/2001	20	204.0				
3/13/2001	20	183.0				
3/19/2001	20	123.0	20.0	202.5	2.97E+12	1.49E+14
5/16/2001	50	45.0				
5/21/2001	20	38.0				
5/30/2001	20	183.0				
6/12/2001	20	63.0	25.1	82.3	1.52E+12	1.21E+13
8/30/2001	310	25.0				
9/5/2001	110	86.0				
9/11/2001	40	35.0				
9/20/2001	**1700**	**101.0**	**219.4**	**61.8**	**9.95E+12**	**9.06E+12**
10/1/2001	20	41.0				
10/3/2001	20	36.0				
10/10/2001	20	32.0				
10/15/2001	50	53.0	25.1	40.5	7.48E+11	5.95E+12

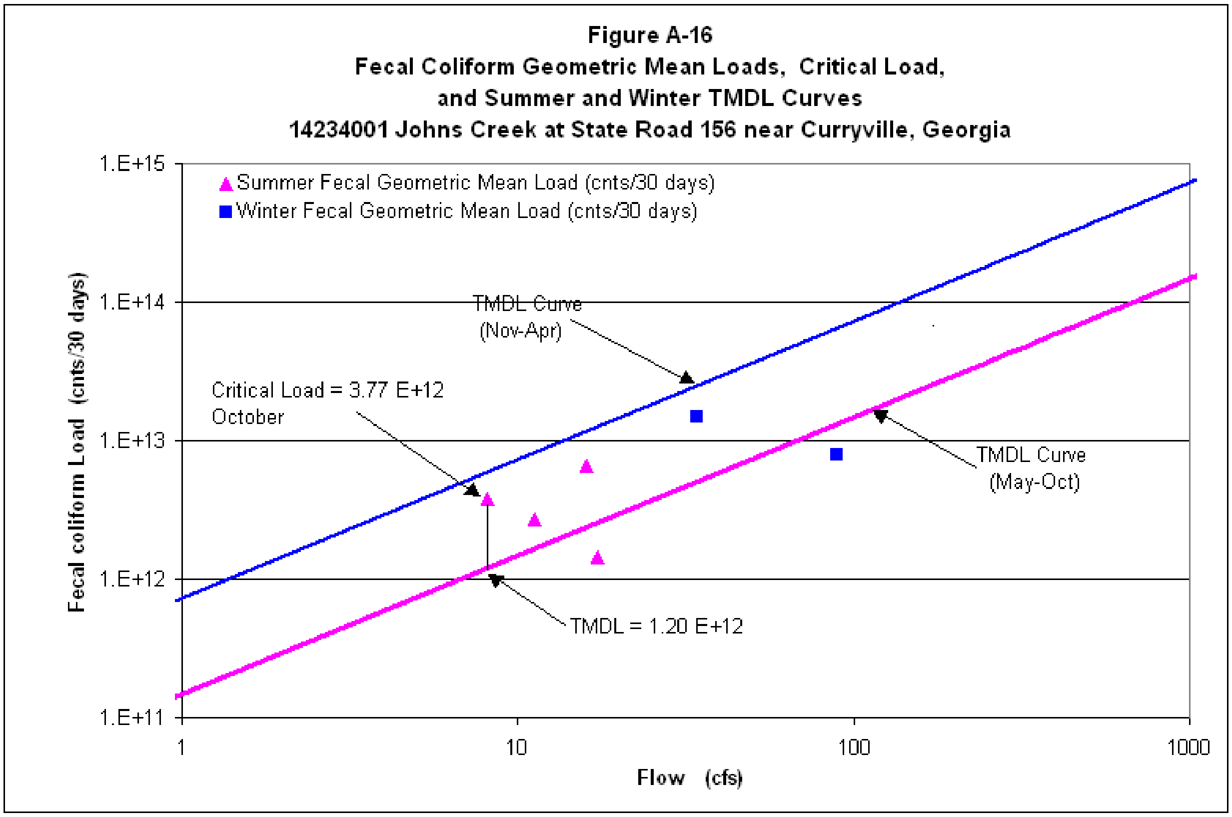


Table A-16. Data for Figure A-16

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
2/12/2001	130	39.0				
2/26/2001	490	149.0				
2/27/2001	80	106.0				
3/7/2001	40	62.0	119.5	89.0	7.81E+12	6.53E+13
4/16/2001	790	47.0				
4/18/2001	700	37.0				
4/23/2001	940	27.0				
4/25/2001	230	25.0	588.0	34.0	1.47E+13	2.50E+13
7/17/2001	80	11.0				
7/24/2001	170	16.0				
8/6/2001	430	18.0				
8/8/2001	16000	19.0	553.1	16.0	6.50E+12	2.35E+12
10/2/2001	460	7.6				
10/10/2001	940	8.9				
10/18/2001	1100	6.4				
10/22/2001	**330**	**9.7**	**629.4**	**8.2**	**3.77E+12**	**1.20E+12**
6/15/2005	40	16.0				
7/20/2005	110	35.0				
7/27/2005	170	19.0				
8/3/2005	230	1.4				
8/10/2005	40	14.0	114.5	17.4	1.46E+12	2.55E+12
9/6/2005	170	12.0				
9/13/2005	170	11.0				
9/20/2005	500	11.0				
9/27/2005	800	11.0	327.9	11.3	2.71E+12	1.65E+12

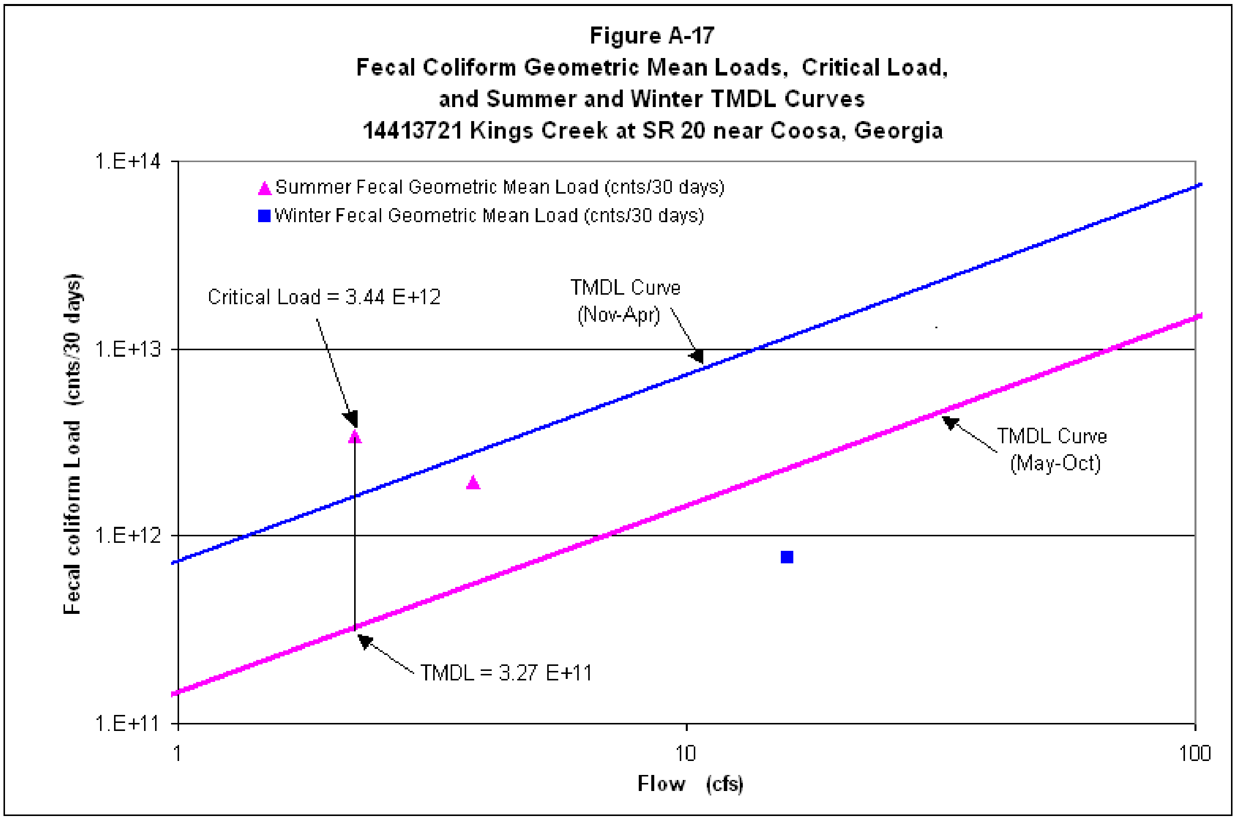


Table A-17. Data for Figure A-17

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
4/7/2005	130	30.0				
4/12/2005	70	21.0				
4/21/2005	20	6.1				
4/26/2005	110	5.9	66.9	15.8	7.73E+11	1.16E+13
5/17/2005	700	40.0				
5/24/2005	800	4.1				
5/31/2005	140	1.0				
6/8/2005	1300	6.6				
6/20/2005	500	3.5				
6/23/2005	2200	3.8	693.3	3.8	1.93E+12	5.58E+11
9/7/2005	300	2.8				
9/13/2005	1700	2.6				
9/20/2005	800	2.4				
9/27/2005	900	2.2				
10/4/2005	**16000**	**1.7**	**2103.7**	**2.2**	**3.44E+12**	**3.27E+11**

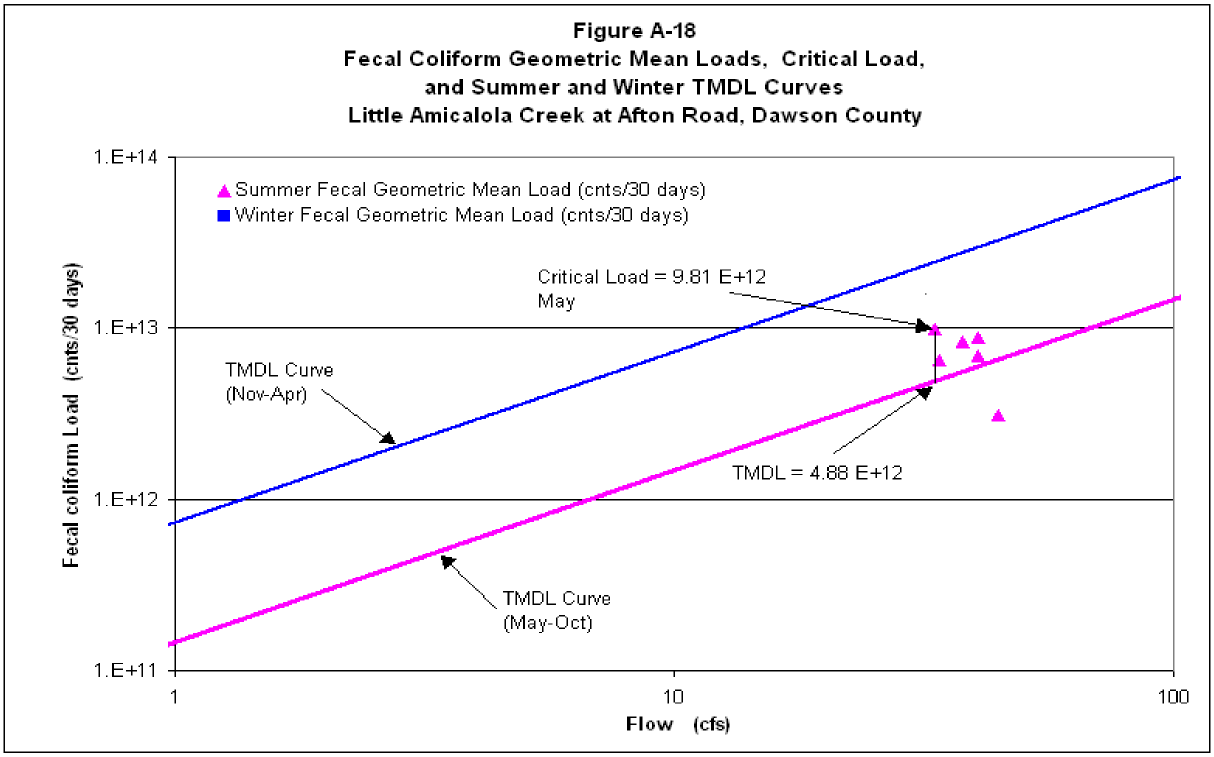


Table A-18. Data for Figure A-18

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
5/9/2002	70	47.9				
5/16/2002	74	45.0				
5/23/2002	94	43.2				
5/30/2002	160	42.6	93.9	44.7	3.08E+12	6.56E+12
6/5/2002	305	44.7				
6/13/2002	174	39.3				
6/25/2002	248	40.0				
6/27/2002	214	38.3	230.4	40.6	6.86E+12	5.96E+12
7/2/2002	679	40.3				
7/10/2002	246	36.7				
7/18/2002	160	37.0				
7/25/2002	305	37.3	300.5	37.8	8.34E+12	5.55E+12
8/1/2002	222	34.7				
8/8/2002	252	32.1				
8/15/2002	205	31.6				
8/21/2002	278	33.1				
8/28/2002	**3312**	**34.7**	**402.5**	**33.2**	**9.81E+12**	**4.88E+12**
9/4/2002	185	30.6				
9/12/2002	125	28.0				
9/19/2002	340	38.7				
9/25/2002	590	38.7	261.0	34.0	6.52E+12	4.99E+12
10/2/2002	410	38.0				
10/9/2002	195	35.7				
10/16/2002	580	43.7				
10/23/2002	175	36.3				
10/30/2002	270	46.7	293.9	40.6	8.75E+12	5.96E+12
11/6/2002	220	57.3				
11/13/2002	95	46.3				

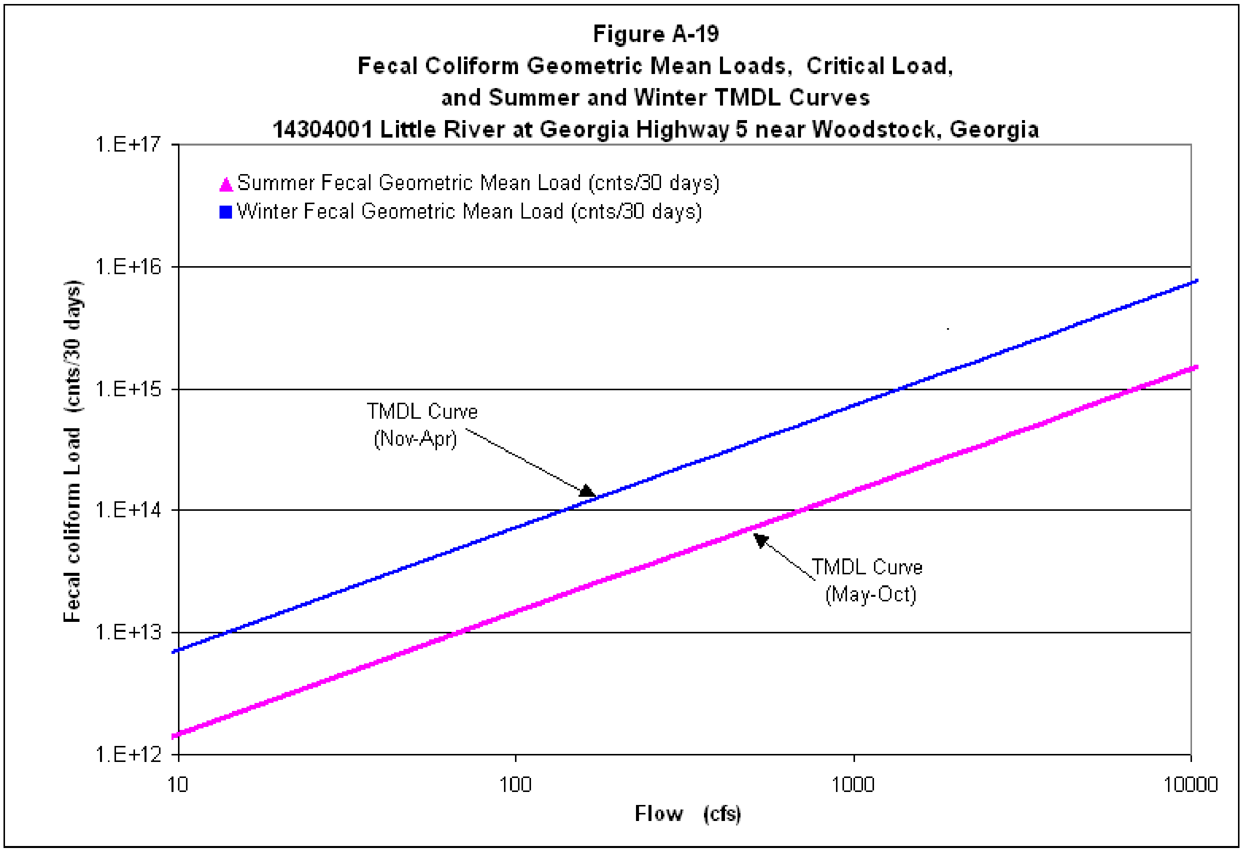


Figure A-19
Fecal Coliform Geometric Mean Loads, Critical Load,
and Summer and Winter TMDL Curves
14304001 Little River at Georgia Highway 5 near Woodstock, Georgia
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
TMDL Curve
(Nov-Apr)
TMDL Curve
(May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+17
1.E+16
1.E+15
1.E+14
1.E+13
1.E+12
10
100
1000
10000
Flow (cfs)

Table A-19. Data for Figure A-19

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
1/8/2002	330	106.0				
1/15/2002	80	100.0				
2/5/2002	130	110.0				
2/7/2002	1300	336.0	258.4	163.0	3.09E+13	1.20E+14
4/2/2003	220	486.0				
4/9/2002	490	130.0				
4/16/2002	490	117.0				
4/30/2002	700	113.0	438.5	211.5	6.81E+13	1.55E+14
7/9/2002	490	46.0				
7/16/2002	20	50.0				
7/23/2002	170	72.0				
8/6/2002	110	44.0	116.4	53.0	4.53E+12	7.78E+12
11/5/2002	1700	204.0				
11/13/2002	20	253.0				
11/19/2002	1100	231.0				
12/3/2002	2300	110.0	541.6	199.5	7.93E+13	1.46E+14
1/8/2003	7900	127.0				
1/5/2003	1700	120.0				
1/29/2003	20	141.0				
2/5/2003	895	181.0	700.2	142.3	7.31E+13	1.04E+14
5/29/2003	1300	187.0				
6/2/2003	40	129.0				
6/11/2003	140	165.0				
6/18/2003	4900	590.0	434.6	267.8	8.54E+13	3.93E+13
7/23/2003	3500	123.0				
7/30/2003	140	116.0				
8/6/2003	700	127.0				
8/13/2003	790	104.0	721.5	117.5	6.22E+13	1.72E+13
11/19/2003	24000	1700.0				
12/4/2003	260	107.0				
12/10/2003	13000	319.0				
12/16/2003	20	159.0	1128.6	571.3	4.73E+14	4.19E+14
2/9/2004	230	293.0				
2/11/2004	300	205.0				
2/16/2004	500	462.0				
2/24/2004	230	142.0	298.5	275.5	6.04E+13	2.02E+14
3/9/2004	230	145.0				
3/18/2004	70	122.0				
3/23/2004	130	114.0				
4/6/2004	20	95.0	80.4	119.0	7.03E+12	8.73E+13
7/14/2004	500	83.0				
7/21/2004	230	81.0				
7/27/2004	1600	366.0				
8/3/2004	1600	51.0	736.6	145.3	7.85E+13	2.13E+13
9/14/2004	80	80.0				
9/20/2004	800	913.0				
9/29/2004	3000	528.0				
10/4/2004	1600	137.0	744.5	414.5	2.27E+14	6.08E+13
4/5/2005	80	316.0				
4/12/2005	300	210.0				
4/18/2005	220	176.0				
4/28/2005	270	188.0	194.3	222.5	3.17E+13	1.63E+14
5/10/2005	220	133.0				
5/24/2005	130	99.0				
5/31/2005	170	121.0				
6/9/2005	230	841.0	182.9	298.5	4.01E+13	4.38E+13
8/15/2005	2400	841.0				
2/22/2006	300	1630.0				
2/27/2006	80	146.0				
3/6/2006	20	157.0				
3/14/2006	300	185.0	109.5	529.5	4.26E+13	3.89E+14
5/8/2006	1300	100.0				
5/15/2006	800	83.0				
5/22/2006	700	61.0				
6/5/2006	300	120.0	683.6	91.0	4.57E+13	1.34E+13
6/26/2006	1300	85.0				
8/21/2006	9000	33.0				
8/28/2006	300	44.0				
9/11/2006	230	46.0				
9/18/2006	170	30.0	570.0	38.3	1.60E+13	5.62E+12
11/6/2006	300	63.0				
11/16/2006	5000	1560.0				
11/28/2006	90	95.0				
12/4/2006	500	103.0	509.7	455.3	1.70E+14	3.34E+14
1/30/2007	40	105.0				
2/6/2007	40	121.0				
2/13/2007	40	111.0				
2/20/2007	40	97.0				
2/21/2007	1700	558.0	84.7	198.4	1.23E+13	1.46E+14
3/13/2007	70	93.0				
3/20/2007	110	89.0				
3/27/2007	20	84.0				
4/11/2007	500	76.0	93.7	85.5	5.88E+12	6.28E+13
6/19/2007	110	28.0				
6/25/2007	110	20.0				
7/9/2007	80	36.0				
7/16/2007	230	41.0	122.2	31.3	2.80E+12	4.59E+12
8/15/2007	170	8.0				
8/20/2007	110	88.0				
8/28/2007	110	28.0				
9/11/2007	170	28.0	136.7	38.0	3.81E+12	5.58E+12
1/8/2003	7900	127.0	7900.0	127.0	7.36E+14	3.73E+14
11/19/2003	**24000**	**1700.0**	**24000.0**	**1700.0**	**2.99E+16**	**4.99E+15**
12/10/2003	13000	319.0	13000.0	319.0	3.04E+15	9.37E+14
11/16/2006	5000	1560.0	5000.0	1560.0	5.73E+15	4.58E+15

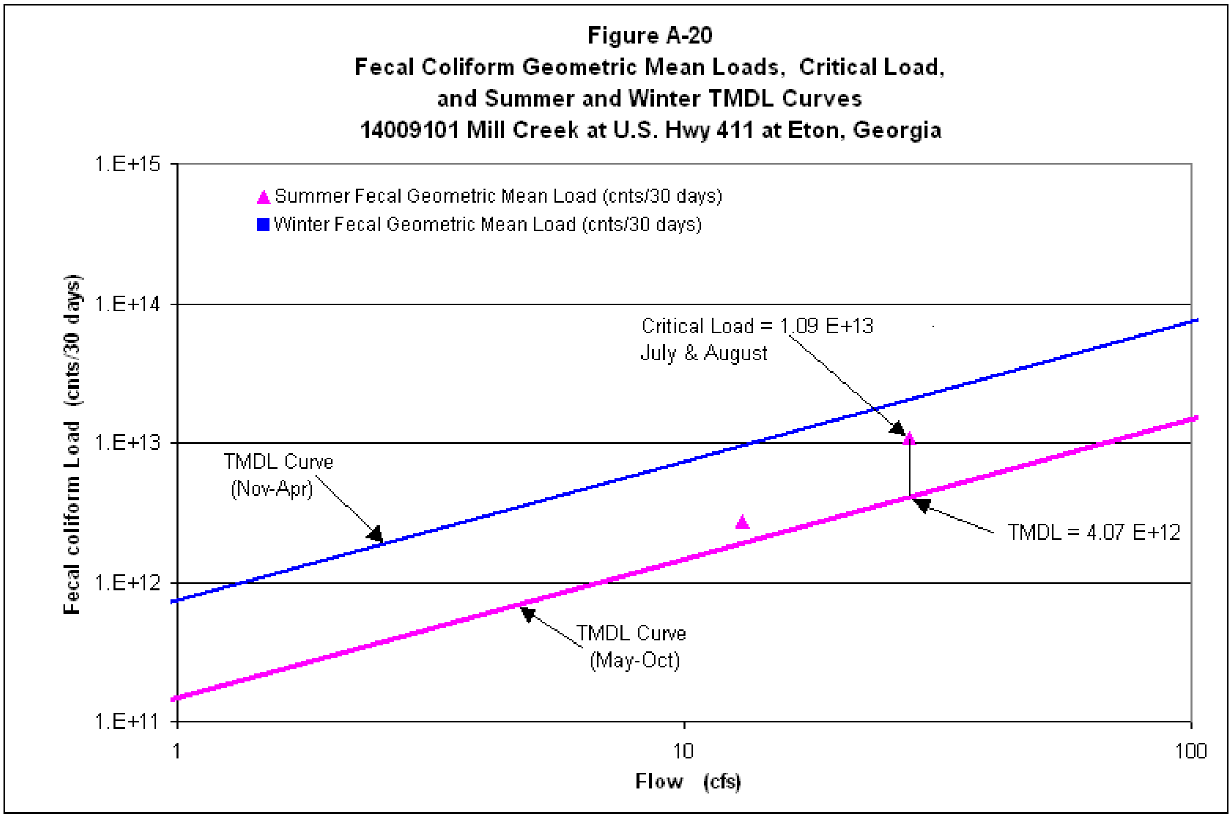


Table A-20. Data for Figure A-20

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
7/19/2005	1100	35.0				
7/26/2005	500	15.0				
8/2/2005	500	19.0				
8/9/2005	**300**	**42.0**	**535.9**	**27.8**	**1.09E+13**	**4.07E+12**
9/15/2005	130	11.0				
9/20/2005	130	11.0				
9/27/2005	800	16.0				
10/4/2005	500	14.0	286.7	13.0	2.74E+12	1.91E+12

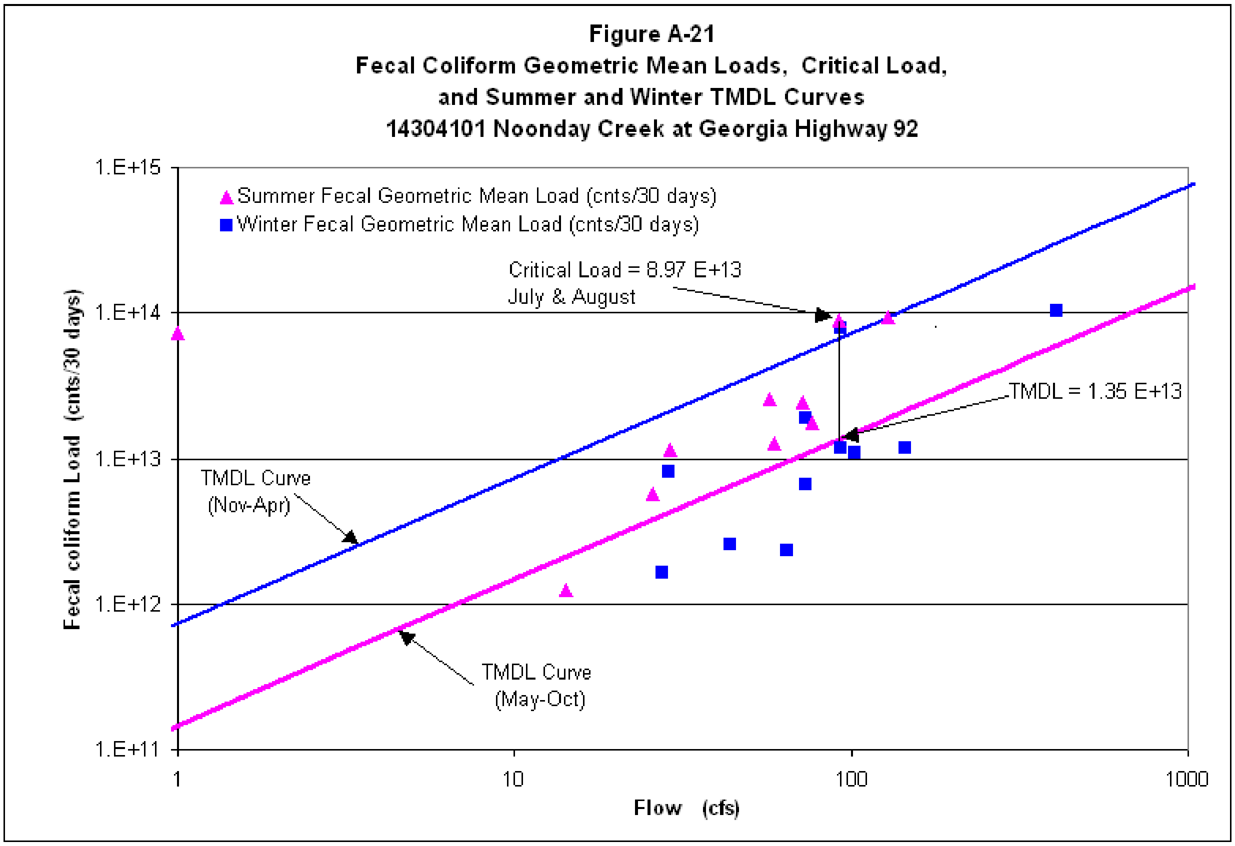


Figure A-21
Fecal Coliform Geometric Mean Loads, Critical Load, and Summer and Winter TMDL Curves
14304101 Noonday Creek at Georgia Highway 92
Summer Fecal Geometric Mean Load (cnts/30 days)
Winter Fecal Geometric Mean Load (cnts/30 days)
Critical Load = 8.97 E+13
July & August
TMDL = 1.35 E+13
TMDL Curve
(Nov-Apr)
TMDL Curve
(May-Oct)
Fecal coliform Load (cnts/30 days)
1.E+15
1.E+14
1.E+13
1.E+12
1.E+11
1
10
100
1000
Flow (cfs)

Table A-21. Data for Figure A-21

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
1/8/2002	95	54.0				
1/15/2002	20	39.0				
2/5/2002	70	57.0				
2/7/2002	1700	143.0	122.6	73.3	6.59E+12	5.38E+13
4/2/2003	294	132.0				
4/9/2002	220	51.0				
4/16/2002	170	51.0				
4/30/2002	330	49.0	245.4	70.8	1.27E+13	5.19E+13
7/9/2002	330	26.0				
7/16/2002	210	40.0				
7/23/2002	1700	29.0				
8/6/2002	700	21.0	535.9	29.0	1.14E+13	4.26E+12
11/5/2002	3300	161.0				
11/13/2002	20	100.0				
11/19/2002	80	92.0				
12/3/2002	80	58.0	143.4	102.8	1.08E+13	7.54E+13
1/8/2003	70	59.0				
1/5/2003	20	56.0				
1/29/2003	20	71.0				
2/5/2003	220	71.0	49.8	64.3	2.35E+12	4.72E+13
5/29/2003	2200	70.0				
6/2/2003	50	56.0				
6/11/2003	1700	63.0				
6/18/2003	4900	325.0	978.4	128.5	9.23E+13	1.89E+13
7/23/2003	3500	94.0				
7/30/2003	2300	68.0				
8/6/2003	490	71.0				
8/13/2003	**790**	**135.0**	**1328.6**	**92.0**	**8.97E+13**	**1.35E+13**
11/19/2003	11000	1000.0				
12/4/2003	20	64.0				
12/10/2003	3300	500.0				
12/16/2003	20	75.0	347.1	409.8	1.04E+14	3.01E+14
2/9/2004	460	83.0				
2/11/2004	110	74.0				
2/16/2004	230	148.0				
2/24/2004	80	66.0	174.7	92.8	1.19E+13	6.81E+13
3/9/2004	330	54.0				
3/18/2004	80	46.0				
3/23/2004	40	39.0				
4/6/2004	40	35.0	80.6	43.5	2.57E+12	3.19E+13
7/14/2004	500	50.0				
7/21/2004	500	46.0				
7/27/2004	1600	163.0				
8/3/2004	110	29.0	458.0	72.0	2.42E+13	1.06E+13
9/14/2004	170	48.0				
9/20/2004	1100	136.0				
9/29/2004	170	76.0				
10/4/2004	300	46.0	312.5	76.5	1.75E+13	1.12E+13
4/5/2005	600	110.0				
4/12/2005	230	72.0				
4/18/2005	800	53.0				
4/28/2005	130	59.0	346.1	73.5	1.87E+13	5.39E+13
5/10/2005	300	51.0				
5/24/2005	400	31.0				
5/31/2005	500	51.0				
6/9/2005	2200	97.0	602.8	57.5	2.54E+13	8.44E+12
8/15/2005	1700	68.0				
2/22/2006	1400	69.0				
2/27/2006	300	127.0				
3/6/2006	1300	56.0				
3/14/2006	3000	121.0	1131.3	93.3	7.74E+13	6.84E+13
5/8/2006	1100	89.0				
5/15/2006	300	54.0				
5/22/2006	130	47.0				
6/5/2006	170	47.0	292.2	59.3	1.27E+13	8.70E+12
6/26/2006	300	59.0				
8/21/2006	1300	27.0				
8/28/2006	90	22.0				
9/11/2006	900	18.0				
9/18/2006	80	36.0	303.0	25.8	5.73E+12	3.78E+12
11/6/2006	20	30.0				
11/16/2006	2400	486.0				
11/28/2006	80	34.0				
12/4/2006	40	31.0	111.3	145.3	1.19E+13	1.07E+14
1/30/2007	700	27.8				
2/6/2007	3000	32.2				
2/13/2007	80	26.3				
2/20/2007	40	22.0				
2/21/2007	1300	35.1	387.5	28.7	8.16E+12	2.11E+13
3/13/2007	40	32.2				
3/20/2007	80	33.7				
3/27/2007	80	22.0				
4/10/2007	170	22.0	81.2	27.4	1.64E+12	2.01E+13
6/19/2007	210	11.9				
6/25/2007	80	14.3				
7/9/2007	40	19.0				
7/16/2007	300	11.7	119.2	14.2	1.24E+12	2.09E+12
8/15/2007	40	7.6				
8/28/2007	80	7.0				

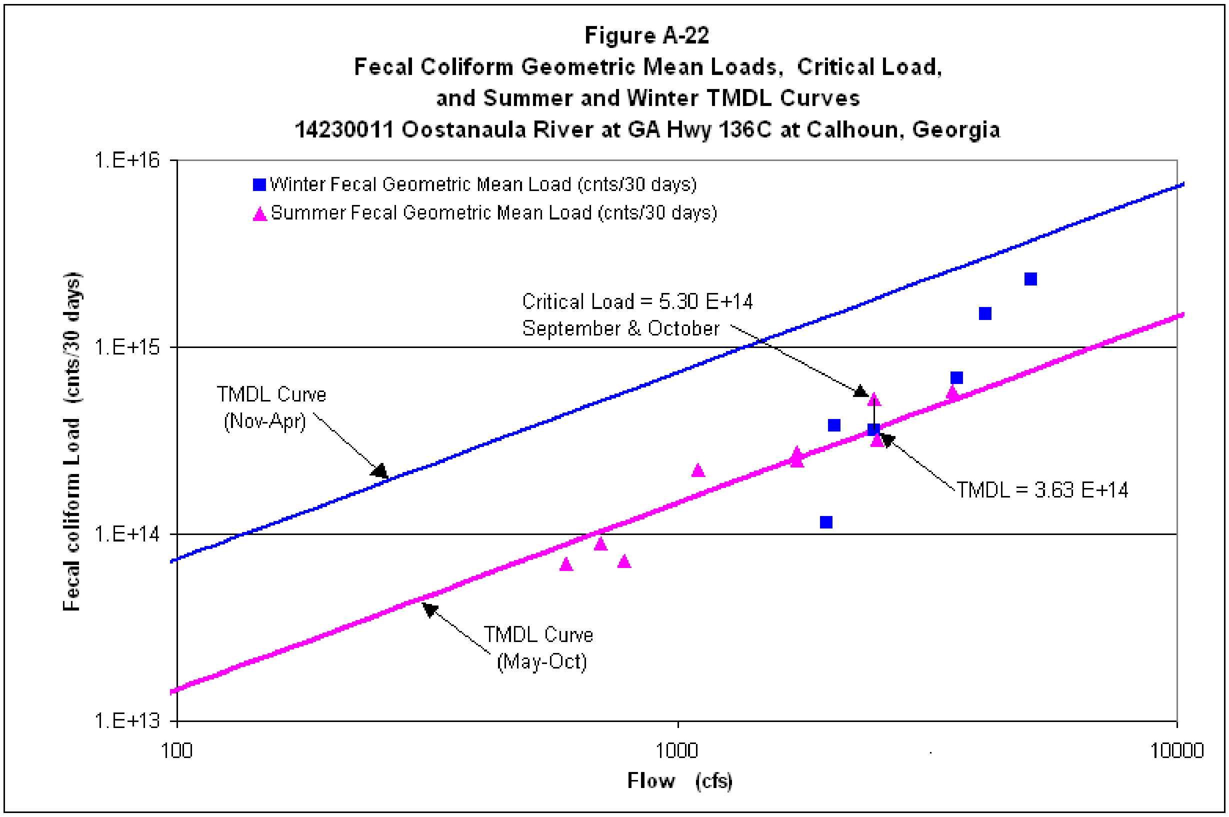


Figure A-22
Fecal Coliform Geometric Mean Loads, Critical Load,
and Summer and Winter TMDL Curves
14230011 Oostanaula River at GA Hwy 136C at Calhoun, Georgia
Winter Fecal Geometric Mean Load (cnts/30 days)
Summer Fecal Geometric Mean Load (cnts/30 days)
Critical Load = 5.30 E+14
September & October
TMDL Curve
(Nov-Apr)
TMDL = 3.63 E+14
TMDL Curve
(May-Oct)
1.E+16
1.E+15
1.E+14
1.E+13
Fecal coliform Load (cnts/30 days)
100
1000
10000
Flow (cfs)

Table A-22. Data for Figure A-22

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
2/13/2001	80	2460				
2/26/2001	2300	7510.0				
2/27/2001	2400	6380.0				
3/6/2001	330	4100.0	617.85	5112.50	2.32E+15	3.75E+15
4/17/2001	1300	2850.0				
4/19/2001	490	2060.0				
4/24/2001	80	1690.0				
4/26/2001	80	1670.0	252.69	2067.50	3.83E+14	1.52E+15
7/16/2001	940	784.0				
7/23/2001	20	983.0				
7/30/2001	1700	1370.0				
8/7/2001	170	1260.0	271.50	1099.25	2.19E+14	1.61E+14
10/1/2001	330	670.0				
10/9/2001	110	520.0				
10/17/2001	330	737.0				
10/23/2001	50	472.0	156.44	599.75	6.89E+13	8.80E+13
3/5/2002	80	1860.0				
3/12/2002	40	1530.0				
3/19/2002	70	2420.0				
3/26/2002	170	2140.0	78.56	1987.50	1.15E+14	1.46E+15
6/4/2002	130	950.0				
6/11/2002	300	915.0				
6/18/2002	80	793.0				
6/25/2002	80	484.0	125.69	785.50	7.25E+13	1.15E+14
9/4/2002	170	671.0				
9/18/2002	300	702.0				
9/25/2002	330	1030.0				
12/4/2002	330	1760.0				
12/11/2002	1700	7010.0				
12/16/2002	1300	4710.0				
12/18/2002	80	3100.0	491.47	4145.00	1.50E+15	3.04E+15
3/18/2003	790	3540.0				
3/25/2003	40	3180.0				
4/8/2003	1700	4580.0				
4/14/2003	80	3220.0	256.04	3630.00	6.82E+14	2.66E+15
6/17/2003	70	2980.0				
6/24/2003	40	2770.0				
7/1/2003	1700	3770.0				
7/8/2003	500	4730.0	220.87	3562.50	5.78E+14	5.23E+14
9/17/2003	20	1150.0				
9/24/2003	5000	2980.0				
10/8/2003	110	1380.0				
10/15/2003	130	1460.0	194.46	1742.50	2.49E+14	2.56E+14
12/8/2003	500	1990.0				
12/10/2003	140	2820.0				
12/16/2003	300	2960.0				
12/22/2003	70	2120.0	195.81	2472.50	3.55E+14	1.81E+15
7/20/2005	230	4540.0				
7/27/2005	80	1690.0				
8/3/2005	20	1680.0				
8/9/2005	2400	2160.0	172.39	2517.50	3.19E+14	3.70E+14
9/8/2005	20	931.0				
9/13/2005	40	687.0				
9/20/2005	70	638.0				
9/27/2005	16000	558.0	173.01	703.50	8.93E+13	1.03E+14
7/21/2005	800	1150.0				
7/28/2005	80	2980.0				
8/3/2005	140	1380.0				
8/9/2005	230	1460.0	213.06	1742.50	2.73E+14	2.56E+14
9/15/2005	140	1990.0				
9/22/2005	80	2820.0				
9/29/2005	5000	2960.0				
10/6/2005	**130**	**2120.0**	**292.10**	**2472.50**	**5.30E+14**	**3.63E+14**

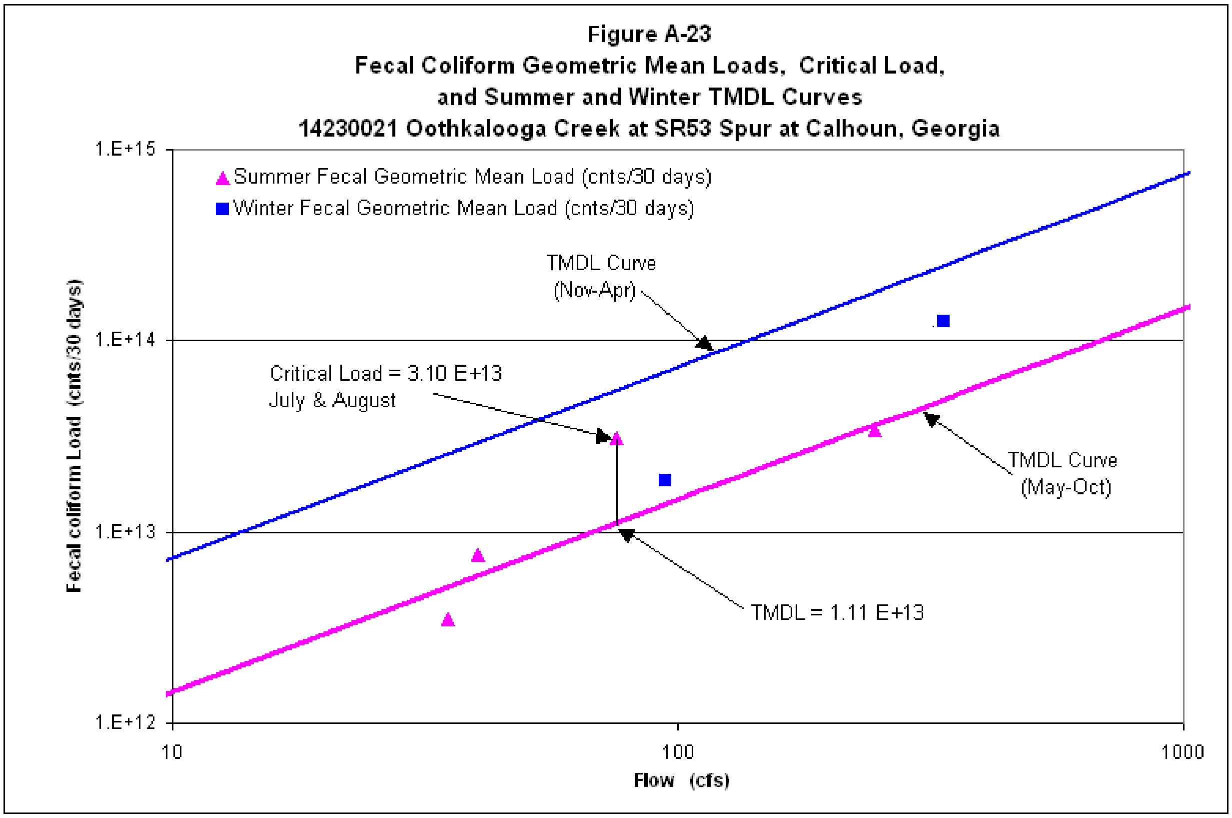


Table A-23. Data for Figure A-23

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
2/12/2001	80	73.0				
2/26/2001	3300	684.0				
2/27/2001	3300	475.0				
3/7/2001	80	108.0	513.8	335.0	1.26E+14	2.46E+14
4/16/2001	490	130.0				
4/18/2001	170	90.0				
4/23/2001	90	85.0				
4/26/2001	700	72.0	269.2	94.3	1.86E+13	6.92E+13
7/16/2001	290	52.0				
7/23/2001	80	830.0				
7/30/2001	330	58.0				
8/7/2001	170	43.0	189.9	245.8	3.43E+13	3.61E+13
10/2/2001	170	42.0				
10/10/2001	310	45.0				
10/18/2001	170	36.0				
10/22/2001	490	38.0	257.4	40.3	7.60E+12	5.91E+12
7/20/2005	**500**	85.0				
7/27/2005	500	66.0				
8/4/2005	1300	85.0				
8/9/2005	**300**	**66.0**	**558.8**	**75.5**	**3.10E+13**	**1.11E+13**
9/8/2005	80	27.0				
9/13/2005	140	31.0				
9/20/2005	130	37.0				
9/27/2005	230	45.0	135.3	35.0	3.48E+12	5.14E+12

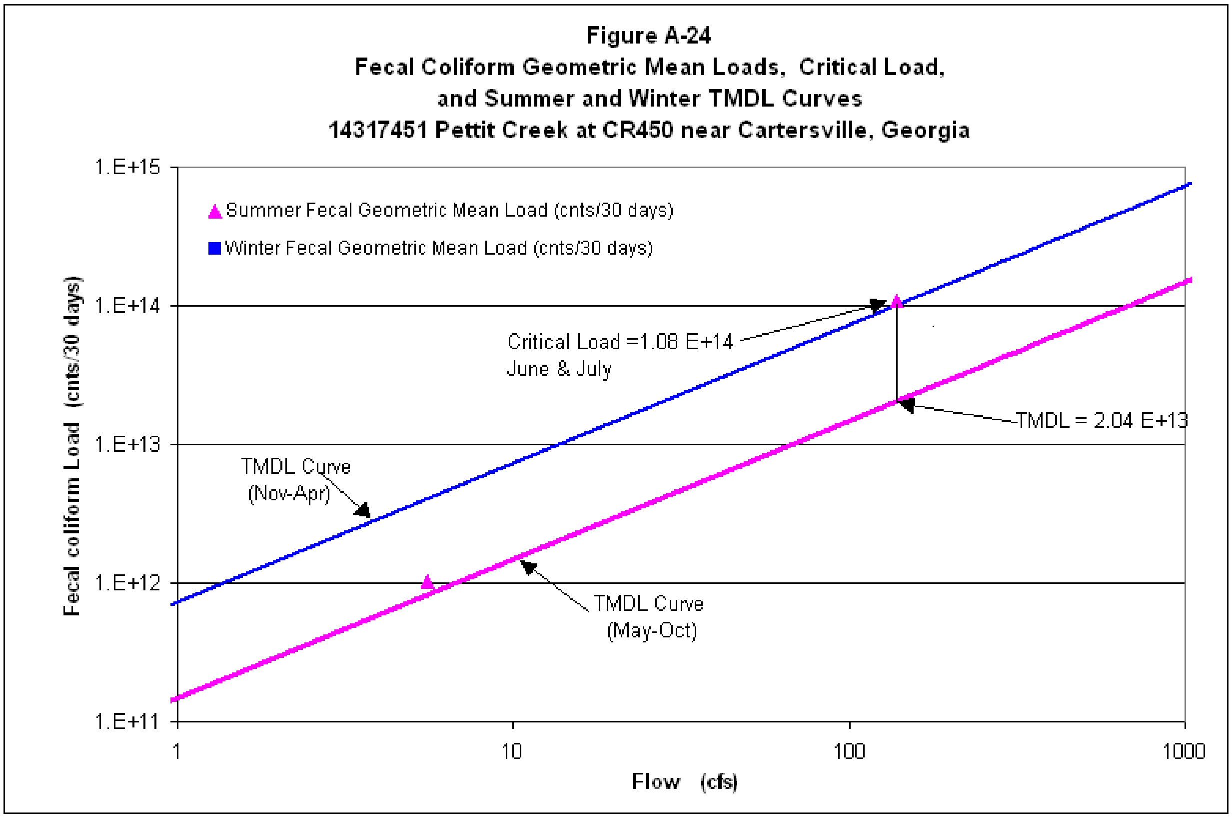


Table A-24. Data for Figure A-24

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
6/13/2005	300	20.0				
6/20/2005	110	13.0				
6/28/2005	16000	61.0				
7/12/2005	**2400**	**463.0**	**1061.0**	**139.3**	**1.08E+14**	**2.04E+13**
8/16/2005	700	15.0				
9/7/2005	80	6.1				
9/14/2005	170	7.0				
9/21/2005	220	4.1				
9/27/2005	1300	5.0	249.7	5.6	1.02E+12	8.15E+11

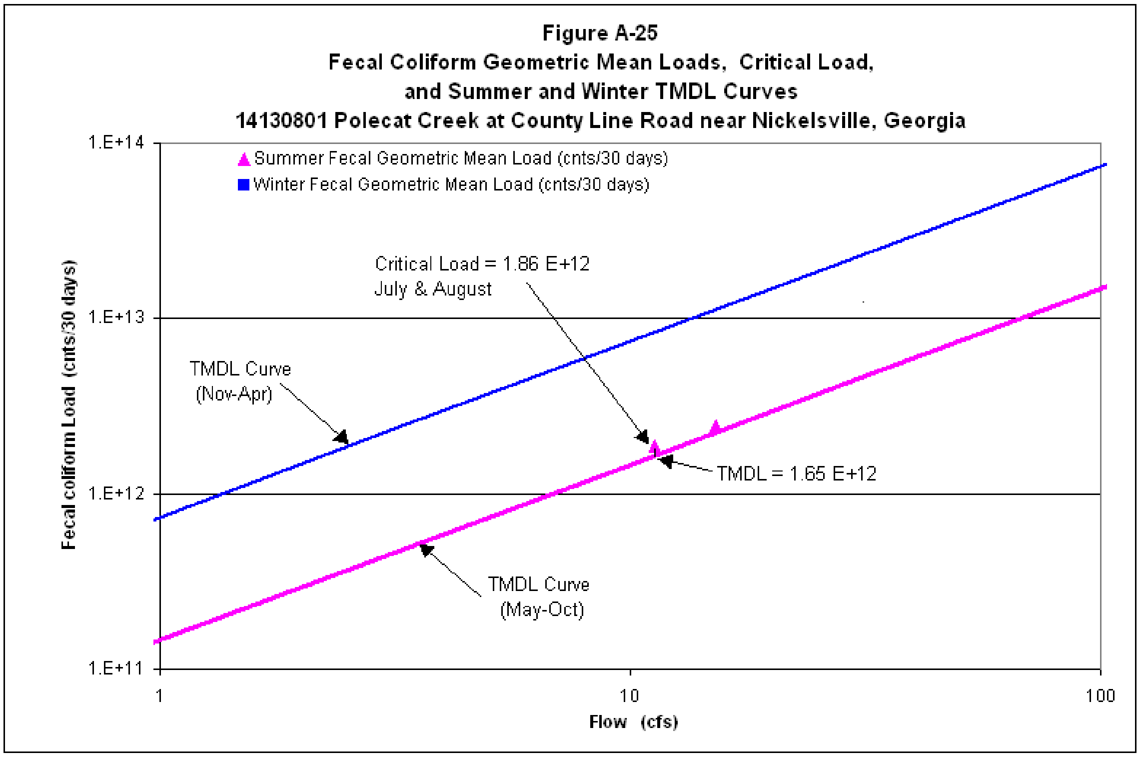


Table A-25. Data for Figure A-25

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
7/19/2005	170	12.0				
7/27/2005	300	9.0				
8/3/2005	170	11.0				
8/10/2005	**300**	**13.0**	**225.8**	**11.3**	**1.86E+12**	**1.65E+12**
9/13/2005	80	11.0				
9/21/2005	300	11.0				
9/29/2005	700	22.0				
10/6/2005	130	17.0	216.2	15.3	2.42E+12	2.24E+12

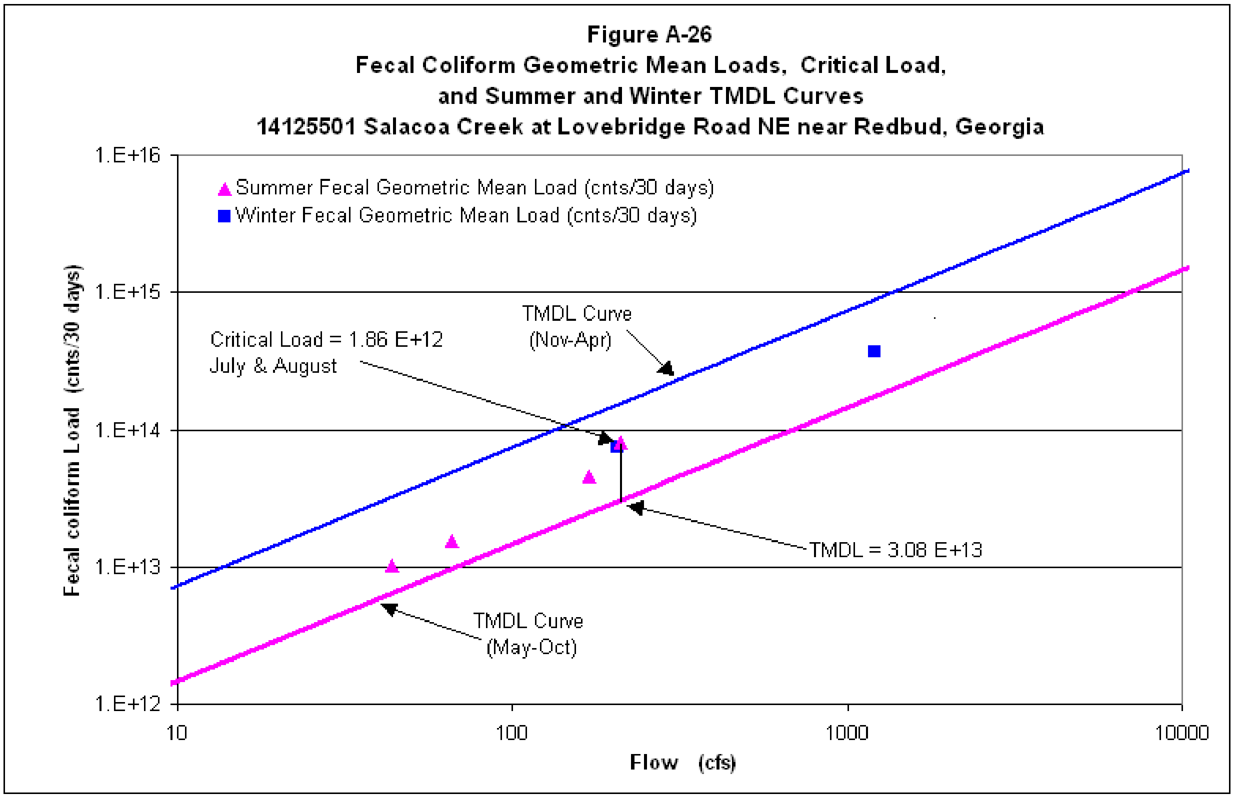


Table A-26. Data for Figure A-26

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
2/13/2001	210	222.0				
2/26/2001	2800	3230.0				
2/27/2001	230	856.0				
3/6/2001	210	544.0	410.5	1213.0	3.66E+14	8.90E+14
4/17/2001	490	288.0				
4/19/2001	230	223.0				
4/24/2001	630	161.0				
4/26/2001	790	152.0	486.7	206.0	7.36E+13	1.51E+14
7/16/2001	280	103.0				
7/23/2001	340	83.0				
7/30/2001	1700	526.0				
8/7/2001	**460**	**127.0**	**522.3**	**209.8**	**8.04E+13**	**3.08E+13**
10/1/2001	1100	49.0				
10/9/2001	490	75.0				
10/17/2001	80	62.0				
10/23/2001	230	77.0	315.6	65.8	1.52E+13	9.65E+12
7/20/2005	**300**	223.0				
7/27/2005	170	133.0				
8/3/2005	130	133.0				
8/10/2005	2800	187.0	369.1	169.0	4.58E+13	2.48E+13
9/6/2005	300	53.0				
9/13/2005	300	42.0				
9/22/2005	230	35.0				
9/28/2005	500	44.0	319.0	43.5	1.02E+13	6.39E+12

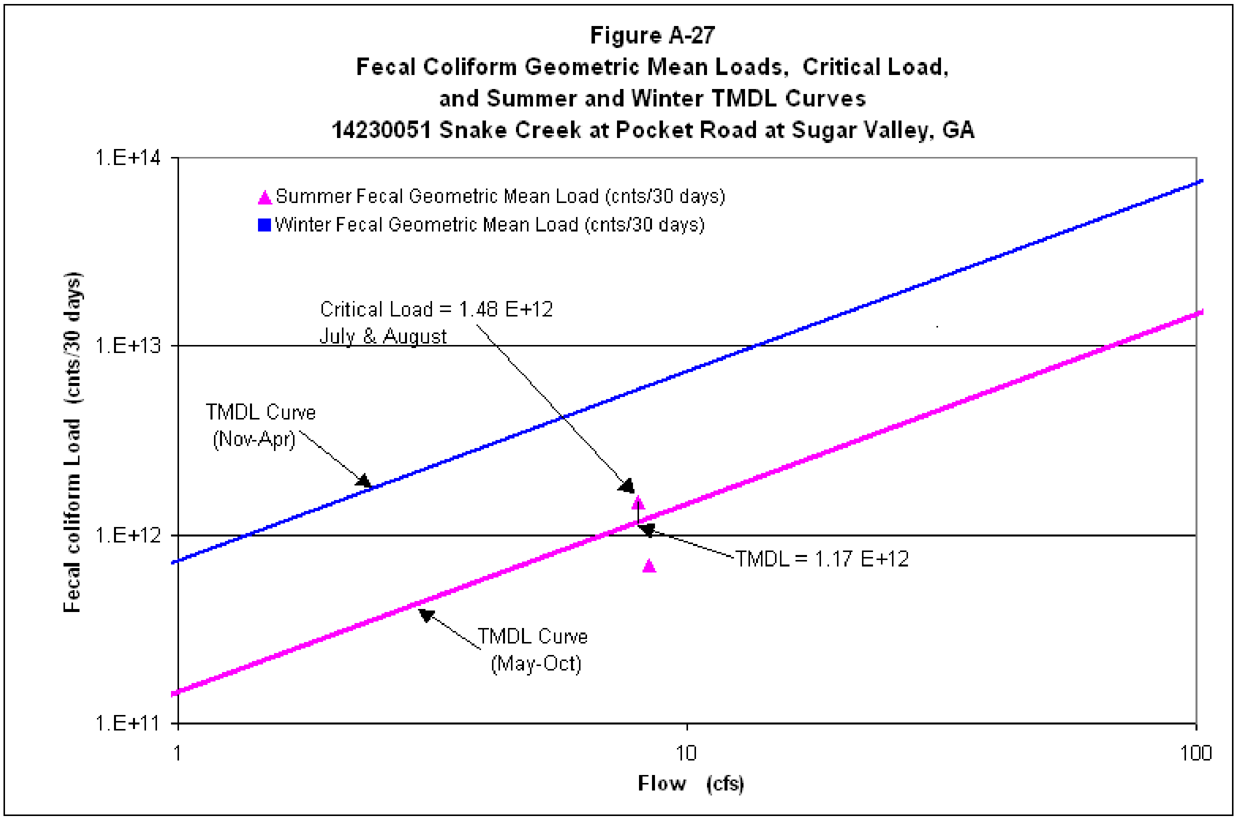


Table A-27. Data for Figure A-27

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
7/20/2005	1100	3.6				
7/27/2005	800	11.0				
8/3/2005	20	8.7				
8/9/2005	**230**	**8.7**	**252.2**	**8.0**	**1.48E+12**	**1.17E+12**
9/13/2005	110	3.6				
9/20/2005	130	7.1				
9/27/2005	130	10.0				
10/4/2005	80	13.0	110.4	8.4	6.83E+11	1.24E+12

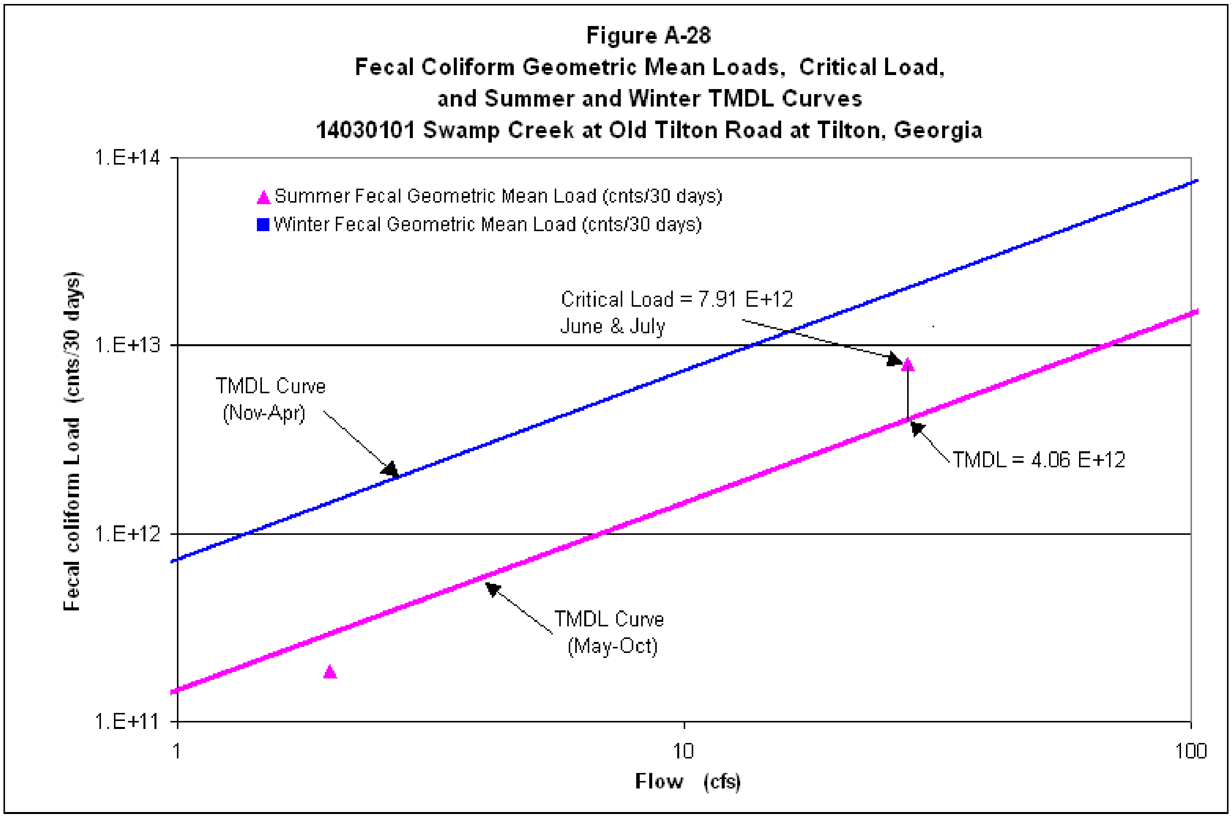


Table A-28. Data for Figure A-28

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
6/14/2005	230	4.8				
6/21/2005	130	2.7				
6/29/2005	700	5.2				
14-Jul-05	1100	98.0	389.5	27.7	7.91E+12	4.06E+12
9/7/2005	230	2.0				
9/13/2005	20	2.0				
9/21/2005	500	2.0				
29-Sep-05	110	2.0	126.1	2.0	1.85E+11	2.94E+11

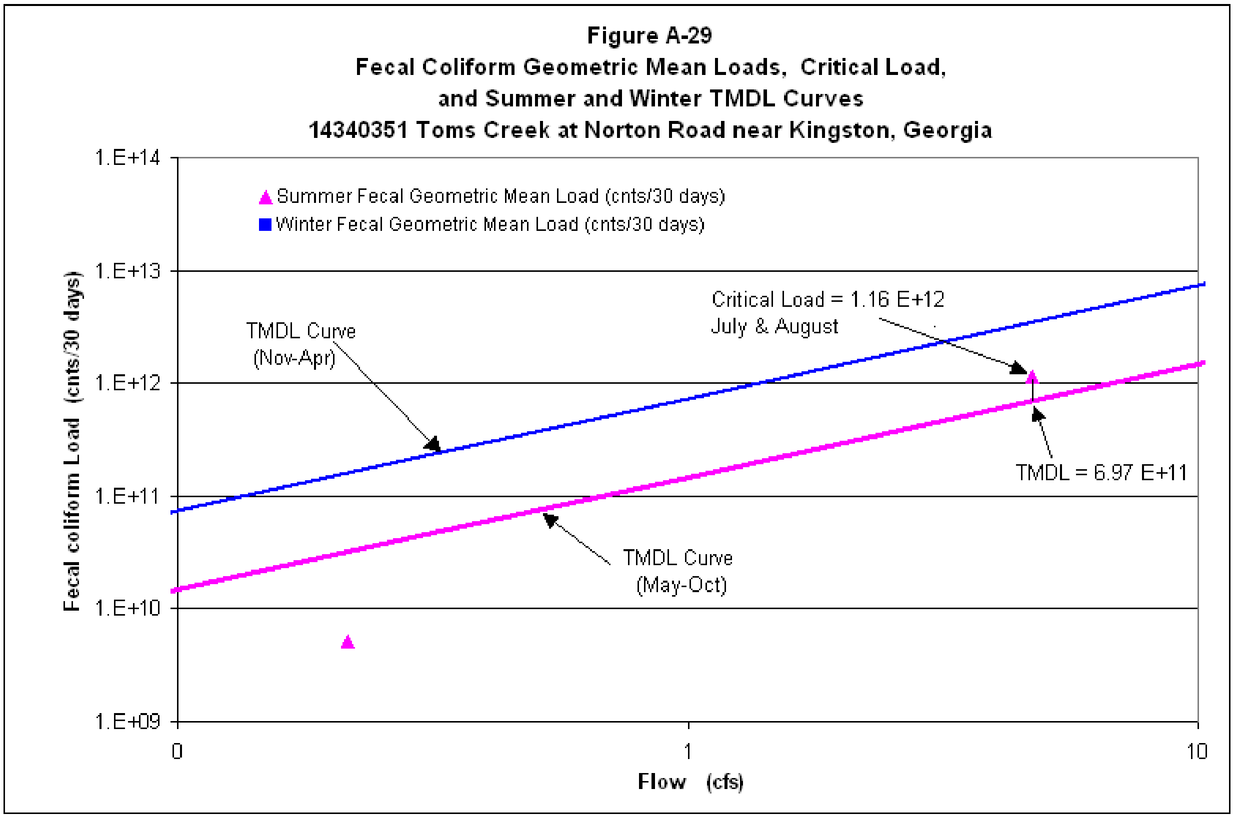
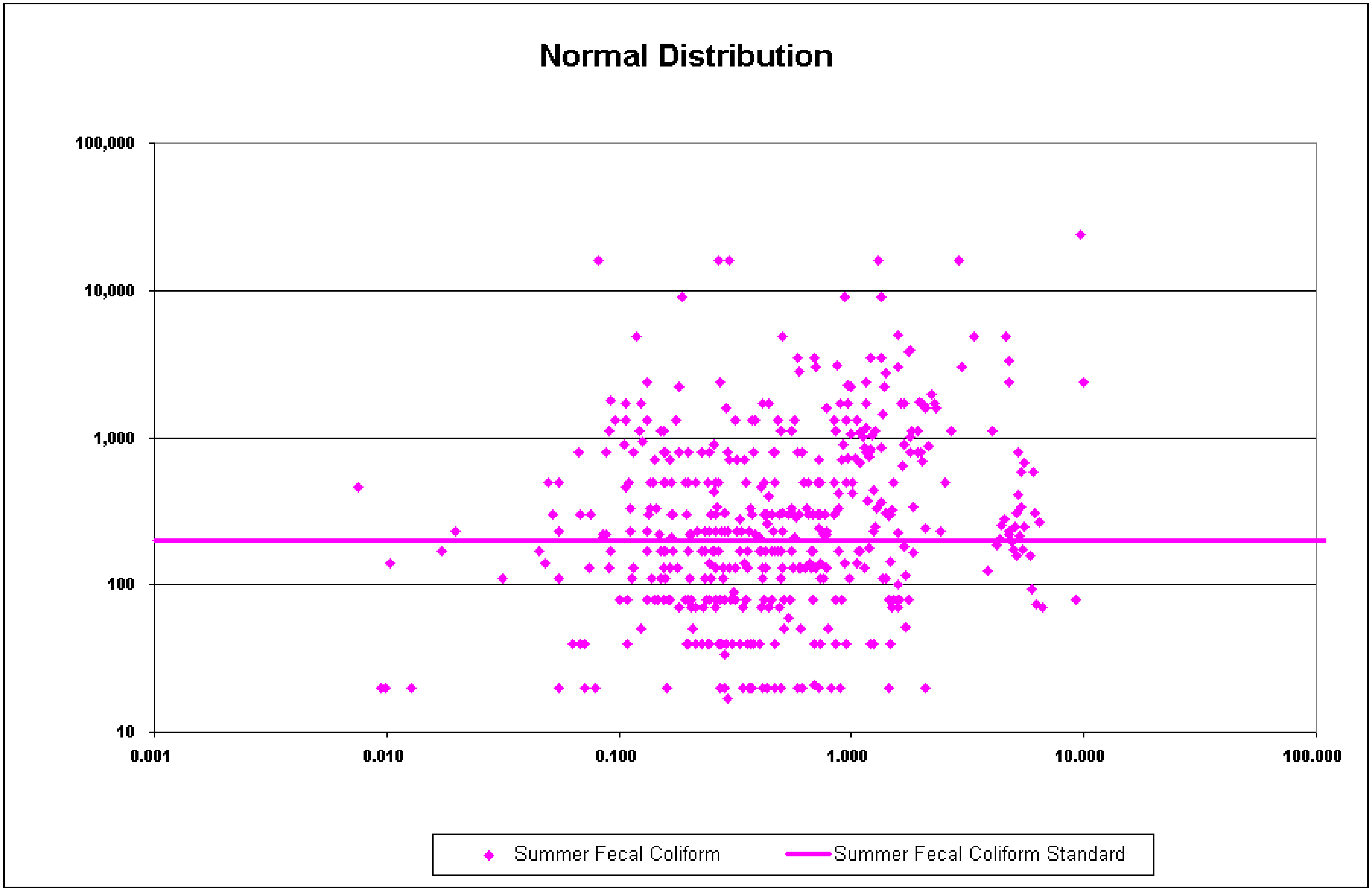


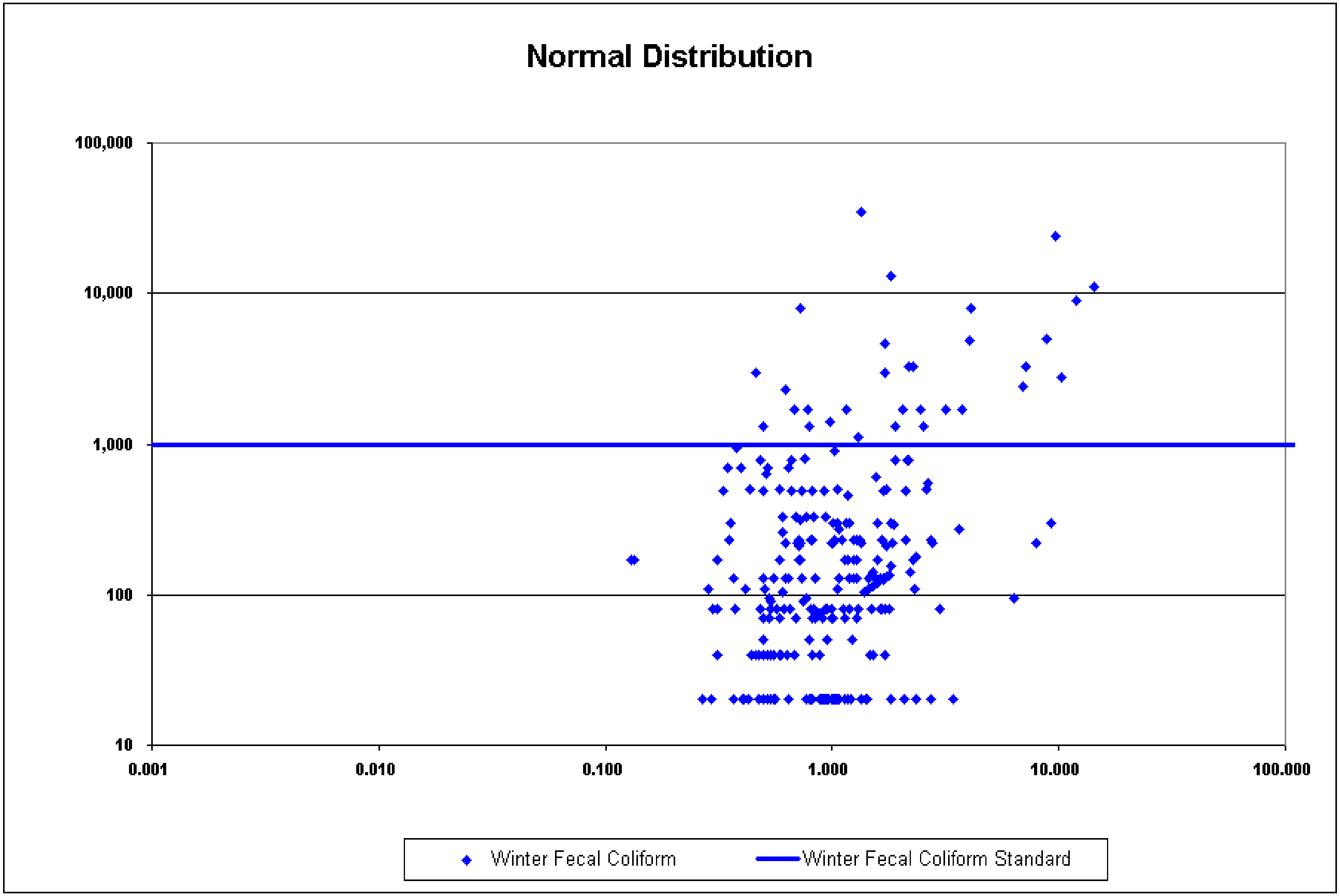
Table A-29. Data for Figure A-29

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (counts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
6/14/2005	110	0.6				
6/21/2005	170	0.4				
6/29/2005	500	1.0				
7/12/2005	**1300**	**17.0**	**332.0**	**4.7**	**1.16E+12**	**6.97E+11**
9/15/2005	20	0.3				
9/21/2005	140	0.2				
9/28/2005	20	0.2				
10/5/2005	20	0.2	32.5	0.2	5.13E+09	3.16E+10

Appendix B

Normalized Flows Versus Fecal Coliform Plots


Normal Distribution
100,000
10,000
1,000
100
10
0.001
0.010
0.100
1.000
10.000
100.000
Summer Fecal Coliform
Summer Fecal Coliform Standard


Normal Distribution
100,000
10,000
1,000
100
10
0.001
0.010
0.100
1.000
10.000
100.000
Winter Fecal Coliform
Winter Fecal Coliform Standard