Total Maximum Daily Load

Evaluation

for

Four Stream Segments

in the

Tallapoosa 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 2004

Table of Contents

List of Tables

List of Figures

Appendixes

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 three categories with respect to designated uses: 1) supporting, 2) partially supporting, or 3) 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* every two years (GA EPD, 2000-2001).

Some of the 305(b) partially and 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 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 four stream segments located in the Tallapoosa River Basin as water quality limited due to fecal coliform. A stream is placed on the partial support list if more than 10% of the samples exceed the fecal coliform criteria and on the not support list if more than 25% of the samples exceed the standard. 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 criteria (4000 counts per 100 milliliters) for the months of November through April. The water use classifications of all of the impacted streams are 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 accumulation of fecal coliform bacteria on land surfaces that wash off as a result of storm events.

The process of developing fecal coliform TMDLs for the Tallapoosa 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 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 Loads and Required Fecal Load Reductions

Stream Segment	Current Load (counts/ 30 days)	TMDL Components				Percent Reduction
		WLA (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Buffalo Creek	2.37E+15		6.58E+14	7.31E+13	7.31E+14	69
Little Tallapoosa River	1.57E+15		1.18E+15	1.31E+14	1.31E+15	17
Tallapoosa River - Water Mill Creek to Beach Creek	2.37E+15		1.74E+15	1.94E+14	1.94E+15	18
Tallapoosa River - Hwy 100 to Stateline	1.05E+16	5.32E+10	1.72E+15	1.91E+14	1.91E+15	82

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 placed into one of three categories with respect to designated uses: 1) supporting, 2) partially supporting, or 3) 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* every two years (GA EPD, 2000-2001).

Some of the 305(b) partially and 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 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 Environmental Protection Agency (EPA) Region 4 approved Georgia's final 2002 303(d) list on April 30, 2002. The list identifies the water bodies as either partially supporting or 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 streams of the Tallapoosa River Basin included on the 303(d) list for exceedances of the fecal coliform standard criteria. A total of 3 stream segments were listed as partially supporting their designated use, and 1 stream segment was listed as not supporting its designated use.

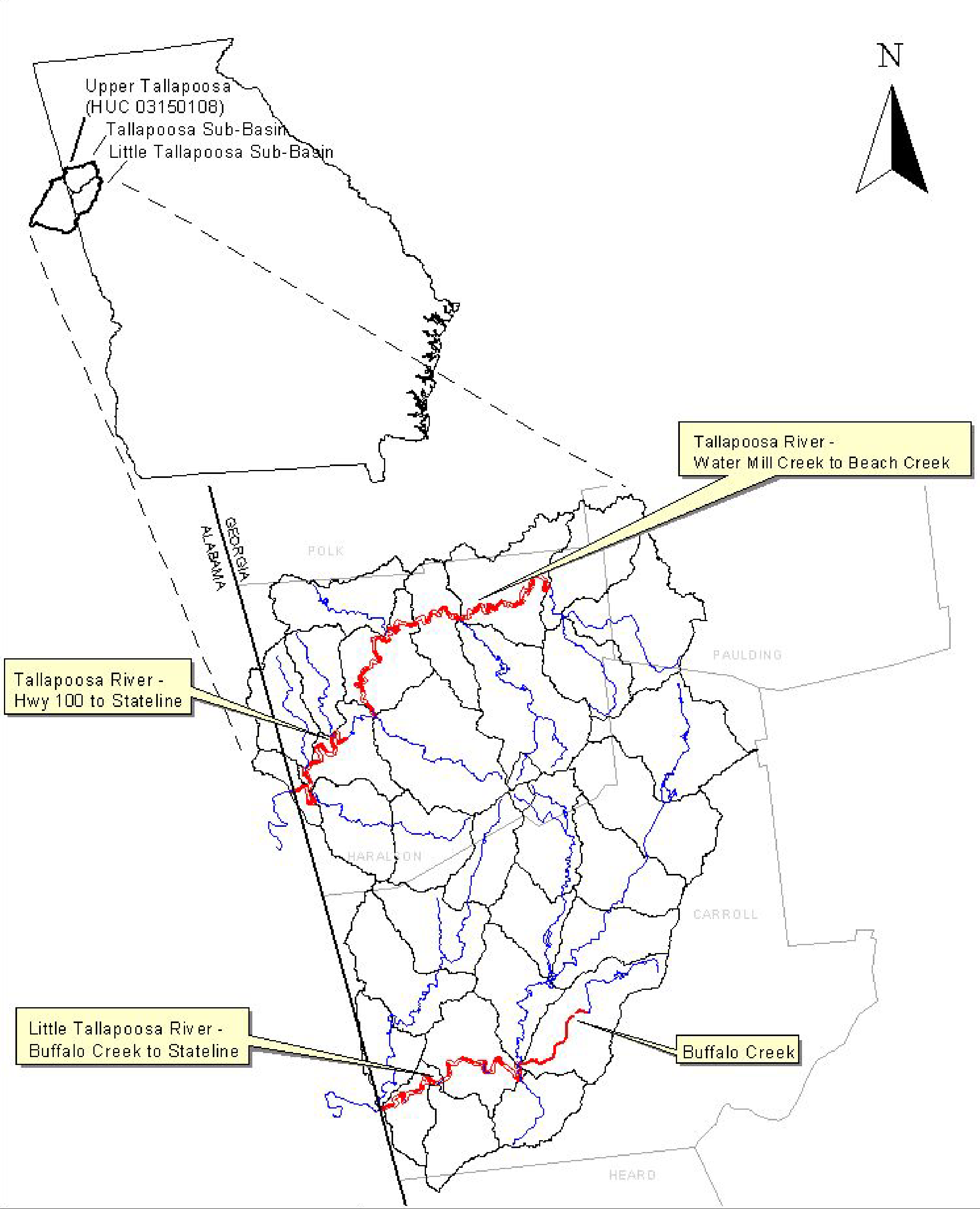
Table 1. Water Bodies Listed for Fecal Coliform Bacteria in the Tallapoosa River Basin

Stream Segment	Location	Segment Length (miles)	Designated Use	Listing
Buffalo Creek	Upstream Little Tallapoosa River (Carroll Co)	6	Fishing	NS
Little Tallapoosa River	Buffalo Creek to Stateline (Carroll Co.)	14	Fishing	PS
Tallapoosa River	Water Mill Creek to Beach Creek (Haralson Co)	21	Fishing	PS
Tallapoosa River	Hwy 100 to Stateline (Haralson Co.)	10	Fishing	PS

Notes:
NS = Not Supporting designated uses
PS = Partially Supporting designated uses

1.2 Watershed Description

The major streams of the Tallapoosa River Basin are the Tallapoosa River and the Little Tallapoosa River (Figure 1). The Tallapoosa River originates in southwest Paulding County. It flows west and then southwest across Haralson County where it then enters the State of



TMDL Evaluation - Fecal Coliform
Tallapoosa River Basin

Figure 1. Buffalo Creek, Little Tallapoosa River, and Tallapoosa River Impaired Stream Segments and Associated Watersheds

Alabama. The Little Tallapoosa River originates in southwest Paulding and northeast Carroll counties. It flows in a southwesterly direction, traveling just west of the City of Carrollton, and then enters Alabama from the southwest portion of Carroll County. The Tallapoosa and Little Tallapoosa Rivers join in eastern Alabama, and then continue in a southwesterly direction as the Tallapoosa River, which eventually flows into the Coosa River. The Tallapoosa River Basin is entirely located within the Piedmont physiographic province that extends throughout the southeastern United States.

The USGS has divided the Tallapoosa basin into three sub-basins, or Hydrologic Unit Codes (HUCs). However, the entire Georgia portion of the watershed is contained within the Upper Tallapoosa HUC (HUC 03150108). Figure 1 shows the location of the impaired stream segments in Tallapoosa and Little Tallapoosa sub-basins and the associated watersheds and counties within the sub-basins.

The land use characteristics of the Tallapoosa River Basin watersheds were determined using data from Georgia's National Land Cover Dataset (NLCD). This coverage was produced from Landsat Thematic Mapper digital images developed in 1995. Land use classification is based on a modified Anderson level one and two system. Table 2 lists the watershed land coverage distribution of the 4 stream segments on the 303(d) list.

1.3 Water Quality Standard

The water use classification for the listed stream segments in the Tallapoosa River Basin is fishing. The criterion violated is listed as fecal coliform. The potential cause(s) listed include urban runoff and nonpoint sources. The use classification water quality standards for fecal coliform bacteria, as stated in *Georgia's Rules and Regulations for Water Quality Control*, Chapter 391-3-6-.03(6)(c), is:

(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).

Table 2. Tallapoosa 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	Transitional	Forest	Row Crops	Pasture, Hay	Other Grasses (Urban, recreational; e.g. parks, lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total	Landuse Source
Buffalo Creek	283	0	834	736	0	0	39	8,698	1,361	4,551	319	790	22	17,633	MRLC
	(1.6)	(0.0)	(4.7)	(4.2)	(0.0)	(0.0)	(0.2)	(49.3)	(7.7)	(25.8)	(1.8)	(4.5)	(0.1)	(100.0)	
Little Tallapoosa River	2,342	0	4,164	3,506	0	0	776	128,875	13,838	43,450	1,899	5,325	128	204,303	MRLC
	(1.1)	(0.0)	(2.0)	(1.7)	(0.0)	(0.0)	(0.4)	(63.1)	(6.8)	(21.3)	(0.9)	(2.6)	(0.1)	(100.0)	
Tallapoosa River - Water Mill Creek to Beach Creek	573	0	367	256	1	0	3,056	95,272	6,209	13,297	168	2,963	26	122,188	MRLC
	(0.5)	(0.0)	(0.3)	(0.2)	(0.0)	(0.0)	(2.5)	(78.0)	(5.1)	(10.9)	(0.1)	(2.4)	(0.0)	(100.0)	
Tallapoosa River - Hwy 100 to Stateline	707	0	1,219	913	1	129	4,263	160,792	10,156	19,055	419	3,156	32	200,842	MRLC
	(0.4)	(0.0)	(0.6)	(0.5)	(0.0)	(0.1)	(2.1)	(80.1)	(5.1)	(9.5)	(0.2)	(1.6)	(0.0)	(100.0)	

2.0 WATER QUALITY ASSESSMENT

Stream segments are placed on the 303(d) list as partially supporting or not supporting their water use classification based on water quality sampling data. A stream is placed on the partial support list if more than 10% of the samples exceed the fecal coliform criteria and on the not support list if more than 25% of the samples exceed the standard. 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 were collected during calendar years 2000 and 2001. Sources of these data include the following:

- United States Geological Survey (USGS) basin water quality data, 2001 and 2002; and
- Georgia Environmental Protection Division (GA EPD) Trend Monitoring data, 2001 and 2002.

These sources had enough information to calculate a 30-day geometric mean and the data used for these TMDLs 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.

Municipal and industrial wastewater treatment facilities discharges may contribute fecal coliform to receiving waters. There are 6 NPDES permitted discharges with effluent limits for fecal coliform bacteria identified in the Tallapoosa River Basin Watershed upstream from the listed segments. Table 3 provides the monthly average discharge flows and fecal coliform concentrations for the municipal and industrial treatment facilities, obtained from calendar year 2001 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 Tallapoosa River Basin.

Table 3. NPDES Facilities Discharging Fecal Coliform in the Tallapoosa River Basin

Facility Name	NPDES Permit No.	Receiving Stream	Actual 2001 Discharge		NPDES Permit Limits		Number of Violations July 1998-June 2001
			Average Monthly Flow (MGD)[1]	Geometric Mean (No./100 mL)[2]	Average Monthly Flow (MGD)	Average Monthly FC (No./100 mL)	
Bowdon WPCP	GA0023493	Indian Creek	0.22	31	0.4	200	0
Bremen Baxter Creek WPCP	GA0021008	Baxter Creek Tributary	0.17	1439	0.2	200	11
Bremen Buck Creek WPCP	GA0037435	Buck Creek	0.27	11	0.9	200	2
Buchanan WPCP	GA0021512	Cochran Creek	0.08	85	0.17	200	3
Tallapoosa WPCP	GA0020982	Green Creek	0.27	17	1	200	0
Villa Rica Tallapoosa WPCP	GA0027162	Little Tallapoosa River	0.28	42	0.78	200	0

Source: EPA PCS Website (2001) and the GA EPD Regional Offices

Notes: [1] Values shown are the annual average of the monthly average flows.
[2] Values shown are the annual average of the monthly geometric means.

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 five acres or greater, and large and medium municipal separate storm sewer systems (MS4s) that serve populations of 100,000 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. 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 no Phase I MS4 permits in the Tallapoosa River Basin.

On March 10, 2003, small MS4s serving urbanized areas were required to obtain a storm water permit under the Phase II storm water regulations. An urbanized area is defined as an entity with a residential population of at least 50,000 people and an overall population density of at least 1,000 people per square mile. It is estimated that 30 counties and 56 communities will be permitted under the Phase II regulations. There are no counties or communities located in the Tallapoosa River Basin that will be covered by the Phase II General Storm Water Permit.

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 contained within a limited area. Processed agricultural manure from confined hog, dairy cattle, and some 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 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 (number of animal units). There are no CAFOs located in the Tallapoosa River Basin that are registered or have land application permits.

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 septic systems
  - Land Application Systems
  - Landfills

In urban areas, a large portion of storm water runoff may be collected to 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 subwatersheds. Based on information provided by the Wildlife Resources Division (WRD) of DNR, the animals that spend a large portion of their time in or around aquatic habitats are considered to be 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. Population estimates of these animal species in Georgia are currently not available.

White-tailed deer have a significant presence throughout the Tallapoosa River Basin. The 2001 deer census for counties in the Tallapoosa River Basin is presented in Table 4. Fecal coliform bacteria contributions from deer to water bodies are generally considered less significant than that of waterfowl, racoon, and beaver. 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 terrestrial birds (Georgia 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. This is especially true in the warm, humid environments typical of the southeast.

Table 4. 2001 Deer Census Data in the Tallapoosa River Basin

County	Deer Density (number/sq mi)
Carroll	50
Haralson	40
Heard	50
Paulding	40
Polk	40

Source: Wildlife Resource Division, GA DNR, 2001

3.2.2 Agricultural Livestock

Agricultural livestock are a potential source of fecal coliform to streams in the Tallapoosa 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 5 provides the estimated number of beef cattle, dairy cattle, swine, sheep, goats and horses reported by county. These data were provided by the Natural Resources Conservation Service (NRCS) and are based on 2001 data.

Table 5. Estimated Agricultural Livestock Populations in the Tallapoosa River Basin

County	Livestock							
	Beef Cattle	Dairy Cattle	Swine	Sheep	Horses	Goats	Chickens Layers	Chickens-Broilers Sold
Carroll	27,000	150	NA	100	700	5,000	NA	7,800,000
Haralson	6,350	100	NA	50	150	300	NA	2,080,000
Heard	6,500	NA	NA	15	150	125	100,000	2,504,000
Paulding	3,100	100	NA	200	750	500	NA	NA
Polk	7,153	370	NA	25	950	500	NA	1,300,000

Source: NRCS, 2001

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 of sanitary waste, 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 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 larger urban areas (populations greater than 100,000), 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 sanitary sewer 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 may also enter streams from leaky sewer pipes, or during storm events when the combined sewer overflows discharge.

3.2.3.1 Leaking Septic Systems

Some fecal coliform in the Tallapoosa River Basin may be attributed to failure of septic systems and illicit discharges of raw sewage. Table 6 presents the number of septic systems in each county of the Tallapoosa River Basin existing in 1990, based on U.S. 1990 Census Data, and the number existing in 2001, based on the Georgia Department of Human Resources, Division of Public Health data. In addition, an estimate of the number of septic systems repaired during the eleven-year period from 1990 to 2001 is given.

Table 6. Number of Septic Systems in the Tallapoosa River Basin

County	Total Septic Systems	No. of Septic Systems Installed 1990 to 2001	No. of Septic Systems Repaired 1990 to 2001
Carroll	29,858	12,791	2,508
Haralson	8,933	3,369	365
Heard	4,581	1,703	46
Paulding	29,629	16,544	578
Polk	10,073	2,384	217

Source: 1990 Census Data, and the GA Dept. of Human Resources, Div. of Public Health, 2001

These data show that a substantial increase in the number of septic systems has occurred in several counties. This is generally 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. It is estimated that there are approximately 2.37 people per household on septic systems (EPA, personal communication).

3.2.3.2 Land Application Systems

Many smaller communities use land application systems (LASs) 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 likely contains fecal coliform bacteria, may discharge to nearby surface waters. There are four permitted LASs located in the Tallapoosa River Basin (Table 7).

Table 7. Permitted Land Application Systems in the Tallapoosa River Basin

LAS Name	County	Permit No.	Type
City of Bremen	Carroll	GAU020142	Municipal
City of Carrollton	Carroll	GAU020126	Municipal
City of Temple	Carroll	GAU020134	Municipal
Waco LAS	Haralson	GA02-251	Municipal

Source: Permitting and Compliance Program, GA EPD, 2003

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, except inert landfills, are now required to install environmental monitoring systems for groundwater sampling and methane. There are 8 known landfills in the Tallapoosa River Basin (Table 8). Of these, all are landfills that are inactive or closed. As shown in the Table 8, many of these landfills were never permitted.

Table 8. Landfills in the Tallapoosa River Basin

Name	County	Permit No.	Type	Status
A.J. Black Landfill	Carroll		Not Applicable	No Record
Carrollton SR 166	Carroll	022-008D	Sanitary Landfill	Ceased Accepting Waste
Ed Smith	Carroll		Not Applicable	No Record
McGukin - Cedar Heights Rd.	Carroll		Not Applicable	No Record
Nobles Sludge Disposal Co.	Carroll	022-004D	Not Applicable	No Record
Southwire Company	Carroll		Not Applicable	No Record
US 78 Bremen PH1	Haralson	071-004D	Sanitary Landfill	Closed
US 78 Bremen PH2	Haralson	071-005D	Sanitary Landfill	Ceased Accepting Waste

Source: Land Protection Branch, GA DNR, 1999 (GA EPD, 2000)

4.0 ANALYTICAL APPROACH

The process of developing fecal coliform TMDLs for the Tallapoosa 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 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 to have 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 9 lists those segments for which no flow data were available and indicates the gaged station that was used to estimate the flow. If a gaged stream was available within the same watershed, it was used.

Table 9. Monitoring Stations with Estimated Flow

Stream Name	USGS Station Name	Station No.
Tallapoosa River below Tallapoosa, GA	Two Run Creek near Kingston, GA	02395120

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 accumulation loads with units of counts per 30 days. This is described by the equation below:

$$L_{critical} = C_{geomean} * Q_{mean}$$

Where:
- $L_{critical}$ = current critical fecal coliform load
- $C_{geomean}$ = fecal coliform concentration as a 30-day geometric mean
- Q_{mean} = stream flow as 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 events 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 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 line represents the winter TMDL for the period November through April when the 30-day geometric mean standard is 1000 counts/ 100 mL. The equations for these two TMDL curves are:

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

$$TMDL_{winter} = 1000 \text{ counts (as a 30-day geometric mean)}/100 \text{ mL} * Q$$

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 most exceeds the TMDL curve. This critical TMDL can be represented by the following equation:

$$TMDL_{critical} = C_{standard} * Q_{mean}$$

Where:
- $TMDL_{critical}$ = critical fecal coliform TMDL load
- $C_{standard}$ = seasonal fecal coliform standard as 30-day geometric mean
  - summer - 200 counts/100 mL
  - winter - 1000 counts/ 100 mL
- Q_{mean} = stream flow as 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.

In addition, if a single sample is in excess of 4000 counts per 100 milliliters during the period November through April, this can also provide a current critical load. This load is calculated based on the measured fecal coliform concentration and flow.

$$L_{critical} = C_{measured} * Q_{measured}$$

Where:
$L_{critical}$ = current critical fecal coliform load
$C_{measured}$= fecal coliform concentration greater than 4000 counts per 100 mL
$Q_{measured}$ = stream flow

The equation for the winter instantaneous TMDL is given below:

$$TMDL_{critical} = 4000 \text{ counts/100 mL} * Q_{measured}$$

The difference between the current critical load and the TMDL represents the load reduction required for the stream segment to meet the appropriate instream fecal coliform standard. The load reduction can thus be expressed as follows:

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

If both the 30-day geometric mean and instantaneous maximum fecal coliform standards were violated, then the critical load was based on the one that required the greatest load reduction.

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, in this case, the seasonal fecal coliform standards. A TMDL is the sum of the individual waste load allocations (WLAs) from 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:

$$\text{TMDL} = \Sigma\text{WLAs} + \Sigma\text{LAs} + \text{MOS}$$

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 that have NPDES effluent limits. There is only 1 active

NPDES permitted facility with fecal coliform permit limits in the Tallapoosa River Basin watershed that discharges into a listed segment or has permit violations upstream of a listed segment. The maximum allocated fecal coliform load for this municipal wastewater treatment facility is given in Table 10. The WLA load was calculated based on the permitted flow and permitted fecal coliform concentrations. The WLA is expressed as an accumulated load over a 30-day period, and presented in units of counts per 30 days. If the facility expands its capacity and its permitted flow increases, the wasteload allocation for the facility would increase in proportion to the flow.

Table 10. WLA for Tallapoosa River Basin

Facility Name	Permit No.	Receiving Stream	Listed Stream Segment	WLA (counts/30 days)
Tallapoosa WPCP	GA0020982	Green Creek	Tallapoosa River – Hwy. 100 to Stateline	2.28E+11

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 try 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. There are no permitted storm water discharges associated with MS4s in the Tallapoosa River Basin

This TMDL will use an iterative 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: 1) 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 2) 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 11 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 Tallapoosa 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 11 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 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 11.

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. In the Tallapoosa River Basin, there are streams included on Georgia's 305(b)/303(d) list for violations of the fecal coliform standards that flow directly into Alabama. Fecal coliform TMDLs were developed for these streams so that Alabama's fecal coliform standards would be met.

The maximum seasonal fecal loads for Georgia are given below:

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

$$TMDL_{winter} = 1000 \text{ counts (as a 30-day geometric mean)/100 mL} * Q$$

$$TMDL_{winter} = 4000 \text{ counts (instantaneous) /100 mL} * Q$$

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 11, 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, LAs, MOSs, and percent load reductions for the Tallapoosa River Basin 303(d) listed streams are presented in Table 11.

The relationships of the current critical loads to the current critical 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 current critical TMDL given in Table 11 s based on the instantaneous maximum standard. As a consequence of the localized nature of the load evaluations, the calculated fecal 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 11. Fecal Loads and Required Fecal Load Reductions

Stream Segment	Current Load (counts/ 30 days)	TMDL Components				Percent Reduction
		WLA (counts/ 30 days)[1]	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Buffalo Creek	2.37E+15		6.58E+14	7.31E+13	7.31E+14	69
Little Tallapoosa River	1.57E+15		1.18E+15	1.31E+14	1.31E+15	17
Tallapoosa River - Water Mill Creek to Beach Creek	2.37E+15		1.74E+15	1.94E+14	1.94E+15	18
Tallapoosa River - Hwy 100 to Stateline	1.05E+16	5.32E+10	1.72E+15	1.91E+14	1.91E+15	82

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 303(d) listed stream segments subwatersheds to identify, as best as possible, the sources of the fecal coliform loads causing the stream to exceed instream standard criteria. 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 the first phase 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 were the subjects of focused monitoring in 2001 and will again receive focused monitoring in 2006.

The TMDL Implementation Plan will outline an appropriate water quality monitoring program for the listed streams in the Tallapoosa River Basin. The monitoring program will be developed to help identify the various fecal coliform sources. This will be especially valuable for those segments where old data or spill data resulted in the listing. The monitoring program should include scheduled quarterly geometric mean sampling to evaluate listed waters and to determine if there has been improvement in the water quality of the listed stream segments.

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 these 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 and waterfowl can be an important 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, whichever applies.

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 or less.

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:

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

The 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, 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 Tallapoosa 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. Georgia is working with both federal and state agencies, such as the NRCS and the GSWCC, and with local governments, to foster the implementation of BMPs to address nonpoint sources. In addition, public education efforts will be targeted at individual stakeholders to provide information regarding the use of BMPs to protect water quality.

6.4 Public Participation

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

7.0 INITIAL TMDL IMPLEMENTATION PLAN

GA EPD has coordinated with EPA to prepare this Initial TMDL Implementation Plan for this TMDL. GA EPD has also established a plan and schedule for development of a more comprehensive implementation plan after this TMDL is established. 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. 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. 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 category of contribution of the pollutant(s) of concern for the respective River Basin as identified in the TMDLs of the stream segments in the River Basin. 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, and 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 a 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 2005.

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 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 when GA EPD approves 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	—	—			—			—	

REFERENCES

Carter, R.F., 1982. *Storage Requirements for Georgia Streams*, USGS, Water Resources Investigations, Open File Report 82-557.

Federal Register, 1990. *Federal Register, Part II: Environmental Protection Agency*, Vol. 55, No. 222, November 16, 1990.

GA EPD, 1998. *Tallapoosa River Basin Management Plan 1998,* State of Georgia, Department of Natural Resources, Environmental Protection Division, Water Protection Branch.

GA EPD, 2000. *Combined Databases Of Landfills In Georgia; Historic And Current Through 1999.* State of Georgia, Department of Natural Resources, Environmental Protection Division, Geologic Survey Branch.

GA EPD, 2002. *Final Georgia 2002 §303(d) / §305(b) List,* March 2002*,* State of Georgia, Department of Natural Resources, Environmental Protection Division, Water Protection Branch.

GA EPD, 2002. *State of Georgia Rules and Regulations for Water Quality Control, Chapter 391-3-6 Revised, June 2002,* State of Georgia, Department of Natural Resources, Environmental Protection Division, Water Protection Branch.

Georgia WRD, 2002. Personal Communications with a representative from the Wildlife Resources Division, Georgia Department of Natural Resources, Thomson, GA, February-May 2002.

USDA, 2002. Personal Communications with Mr. Jimmy Bramblett, Water Resources Specialist, U.S. Department of Agriculture, NRCS, 355 East Hancock Ave., Athens, GA, January-May 2002.

USEPA, 1991. *Guidance for Water Quality Based Decisions: The TMDL Process*, EPA 440/4-91-001. U.S. Environmental Protection Agency, Assessment and Watershed Protection Division, Washington, D.C.

Appendix A

30-day Geometric Mean Fecal Coliform Monitoring Data

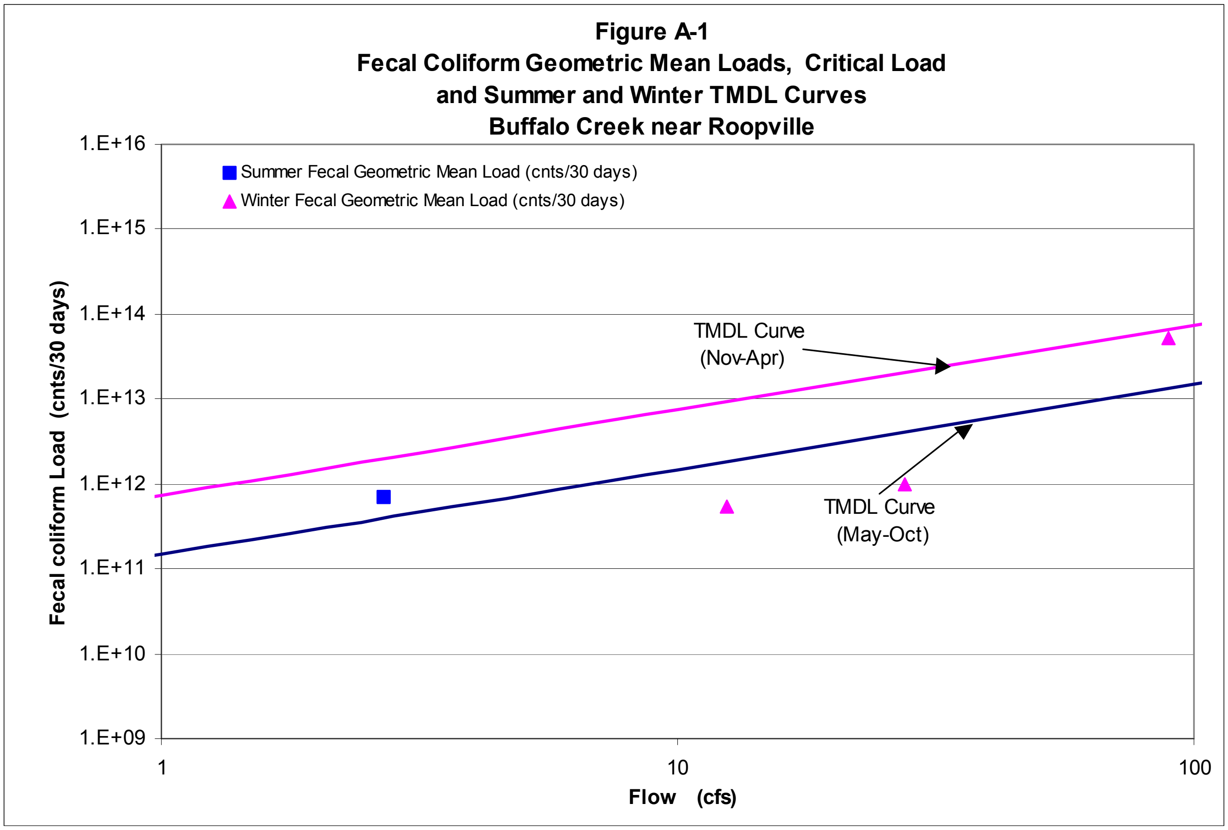


Table A-1. Data for Figure A-1, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (cnts/30 days)
10-Jan-01	20	12.00				
24-Jan-01	20	22.00				
31-Jan-01	270	66.00				
7-Feb-01	50	9.80	48	27	9.71E+11	2.01E+13
2-Apr-02	140	33.00				
4-Apr-02	13000	249.00				
16-Apr-02	790	65.00				
26-Apr-02	270	11.00	789	90	5.19E+13	6.57E+13
16-Jul-02	220	2.50				
23-Jul-02	260	2.00				
30-Jul-02	5400	3.50				
7-Aug-02	50	2.80	353	3	6.99E+11	3.96E+11
6-Nov-02	110	8.80				
13-Nov-02	110	11.00				
27-Nov-02	20	15.00				
5-Dec-02	50	15.00	59	12	5.39E+11	9.14E+12

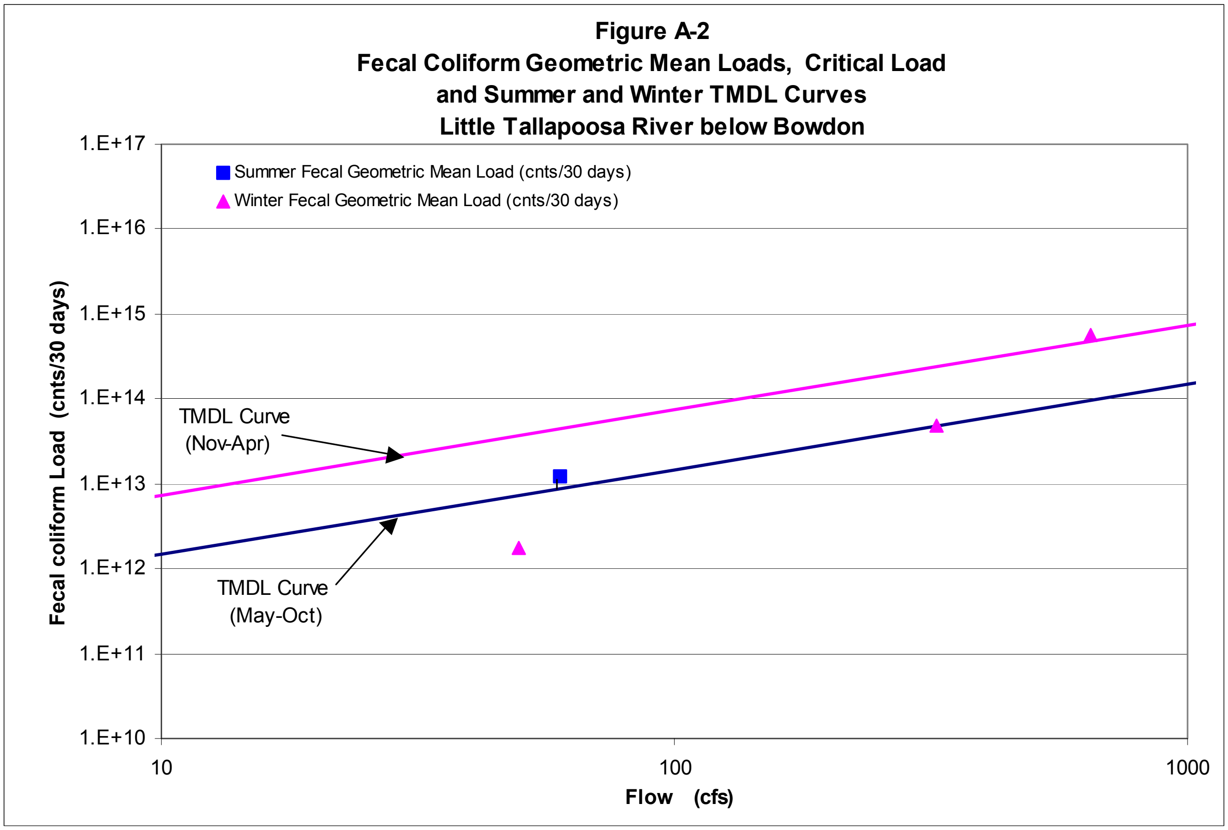


Table A-2. Data for Figure A-2, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (cnts/30 days)
10-Jan-01	330	142.00				
24-Jan-01	220	361.00				
31-Jan-01	490	624.00				
7-Feb-01	50	167.00	205	324	4.88E+13	2.37E+14
2-Apr-02	170	400.00				
4-Apr-02	11000	1300.00				
16-Apr-02	1300	648.00				
26-Apr-02	790	247.00	1177	649	5.61E+14	4.76E+14
16-Jul-02	490	70.00				
23-Jul-02	220	57.00				
30-Jul-02	330	60.00				
7-Aug-02	170	53.00	279	60	1.23E+13	8.81E+12
6-Nov-02	130	45.00				
13-Nov-02	20	38.00				
27-Nov-02	20	62.00				
5-Dec-02	110	54.00	49	50	1.79E+12	3.65E+13

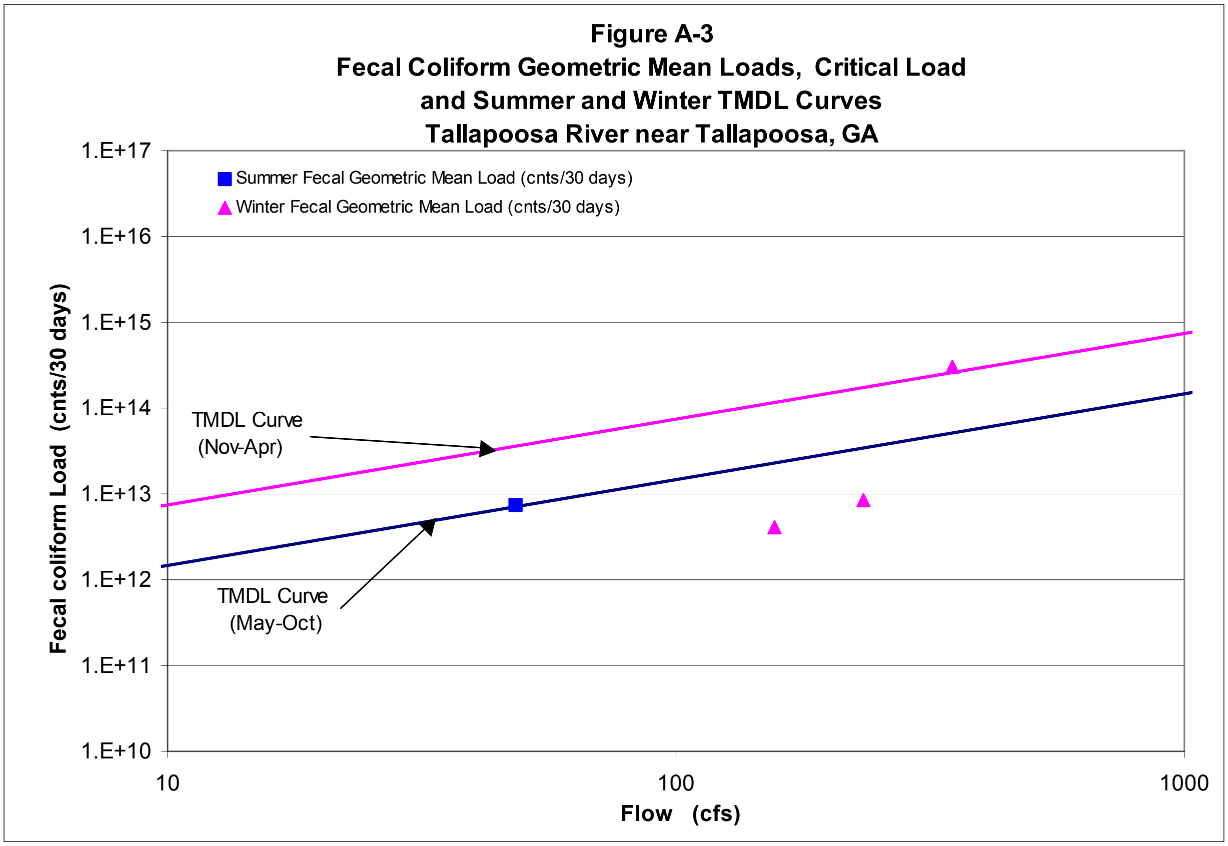


Table A-3. Data for Figure A-3, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (cnts/30 days)
18-Jan-01	20	94.00				
25-Jan-01	20	168.00				
1-Feb-01	80	251.00				
7-Feb-01	50	111.00	36	156	4.07E+12	1.15E+14
3-Apr-01	490	230.00				
5-Apr-01	4900	660.00				
17-Apr-01	1700	372.00				
30-Apr-01	460	133.00	1171	349	3.00E+14	5.12E+13
17-Jul-01	430	45.00				
24-Jul-01	130	24.00				
31-Jul-01	130	82.00				
8-Aug-01	260	43.00	208	49	7.42E+12	7.12E+12
13-Nov-01	50	31.00				
15-Nov-01	20	25.00				
28-Nov-01	20	605.00				
11-Dec-01	270	277.00	48	235	8.30E+12	3.44E+13

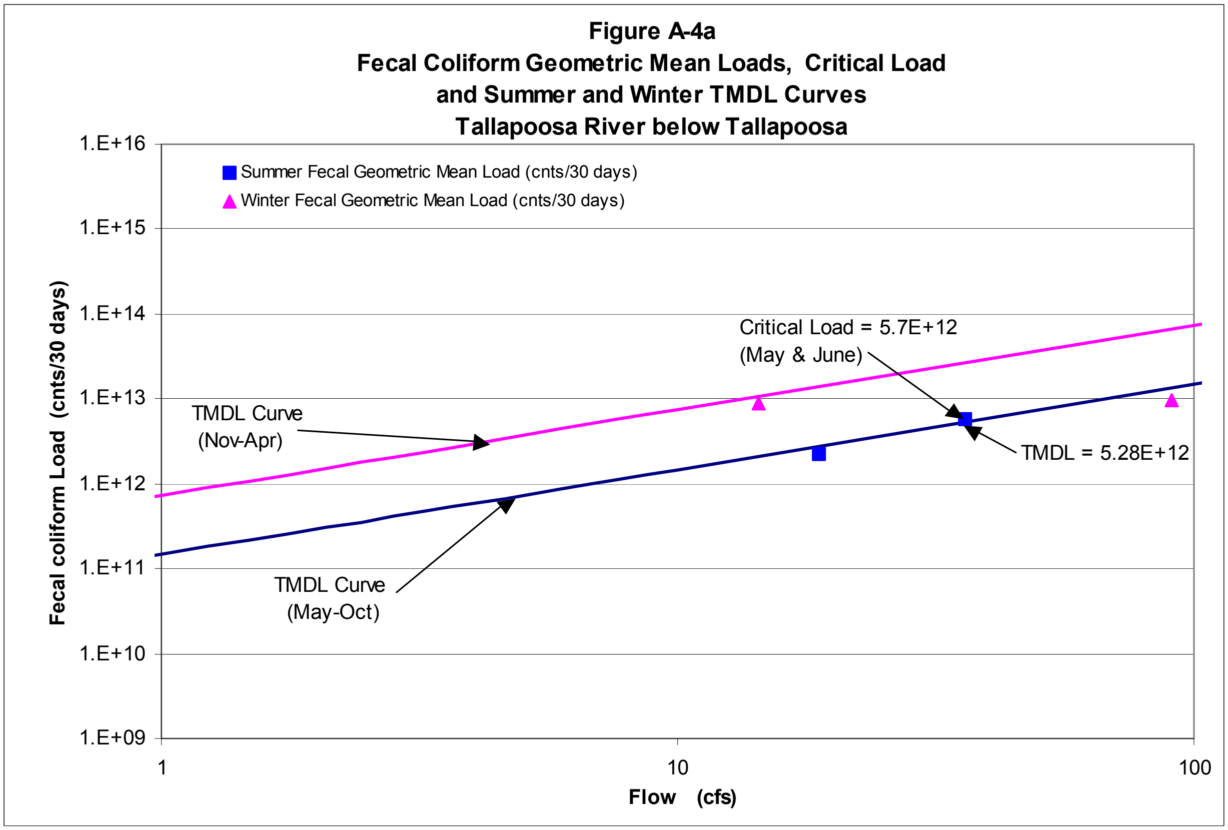


Table A-4a. Data for Figure A-4a, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (cnts/30 days)
20-Jan-00	95	260.00				
2-Feb-00	50	41.00				
9-Feb-00	80	26.00				
16-Feb-00	1300	35.00	149	91	9.90E+12	6.64E+13
10-May-00	330	17.00				
17-May-00	40	15.00				
24-May-00	110	16.00				
7-Jun-00	1500	96.00	216	36	5.71E+12	5.28E+12
9-Aug-00	80	24.00				
16-Aug-00	110	21.00				
6-Sep-00	490	15.00				
7-Sep-00	170	15.00	165	19	2.26E+12	2.75E+12
8-Nov-00	1700	15.81				
15-Nov-00	490	13.78				
29-Nov-00	700	13.47	835	14	8.80E+12	1.05E+13

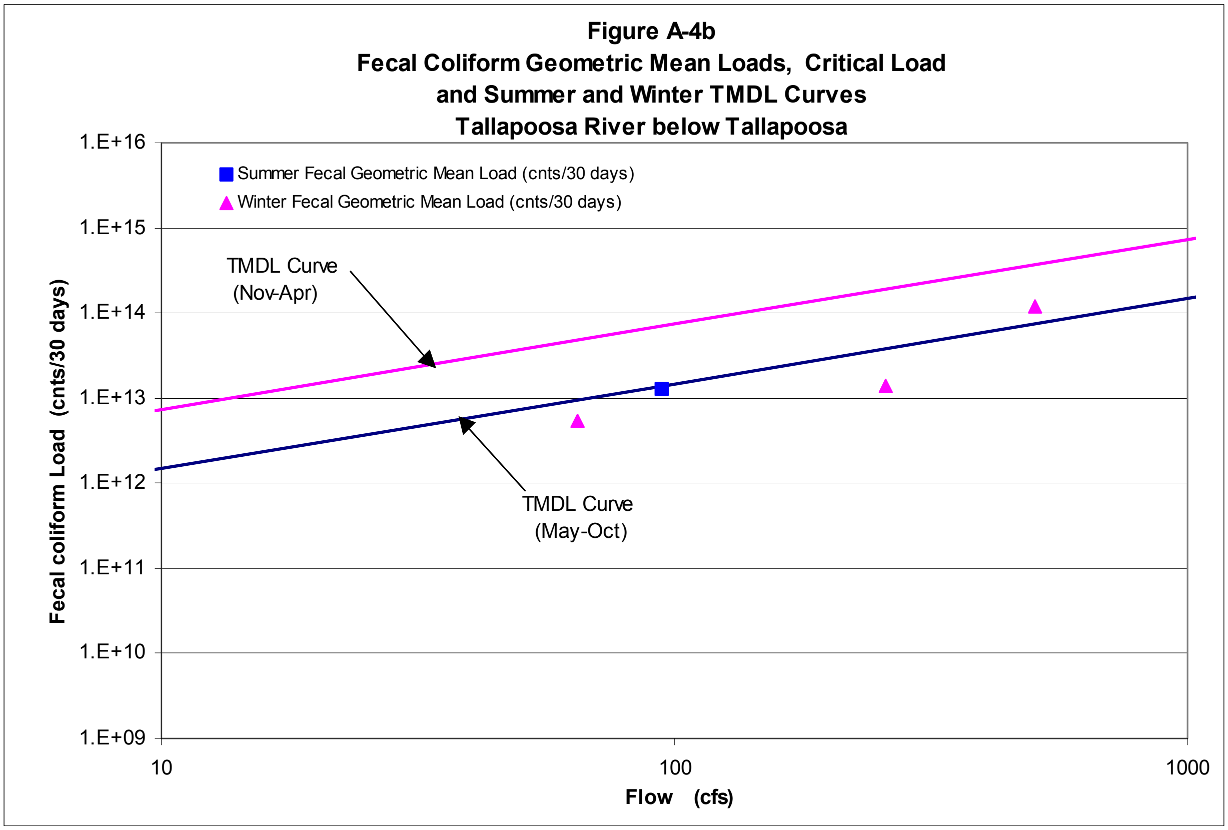
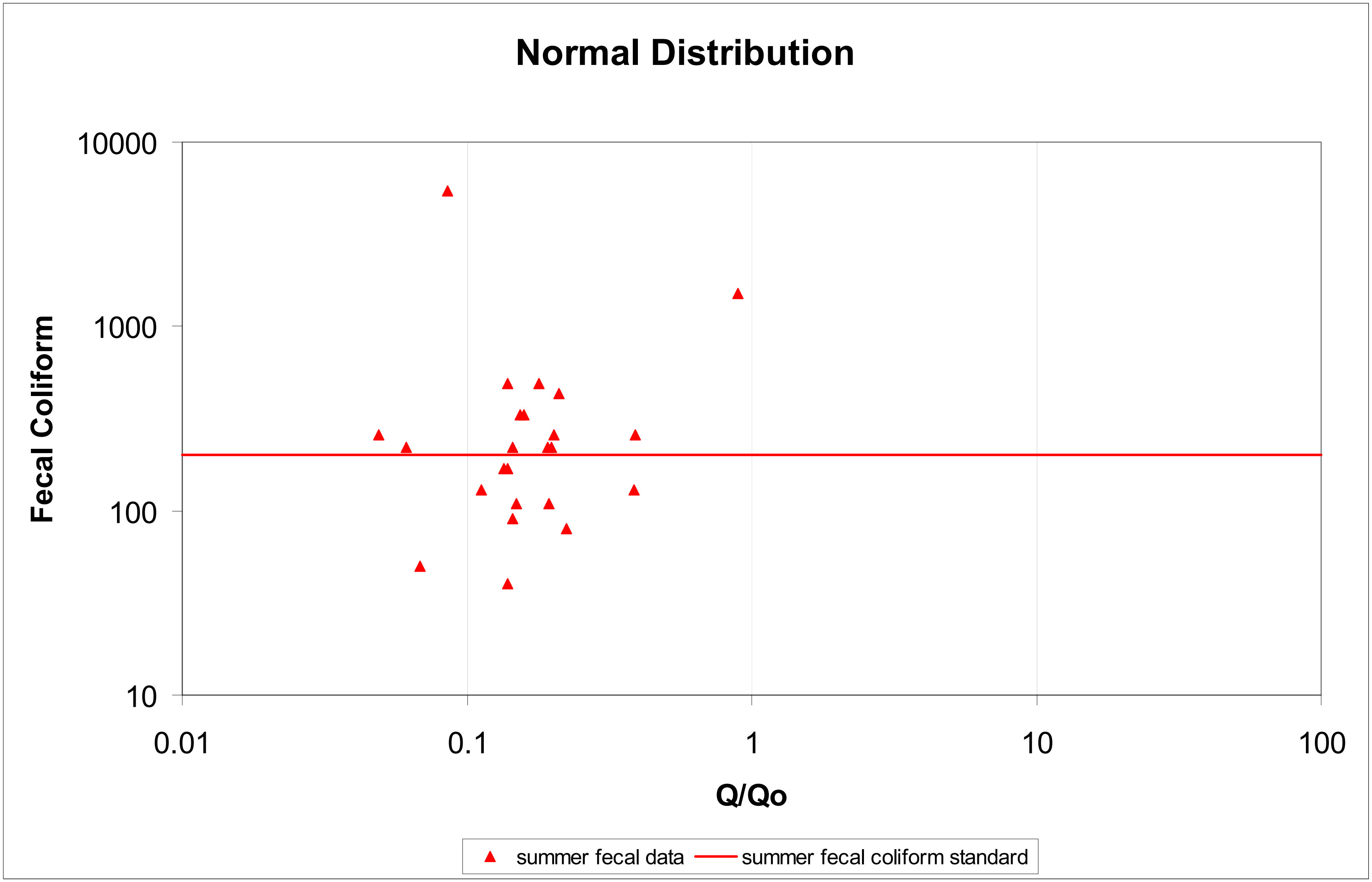


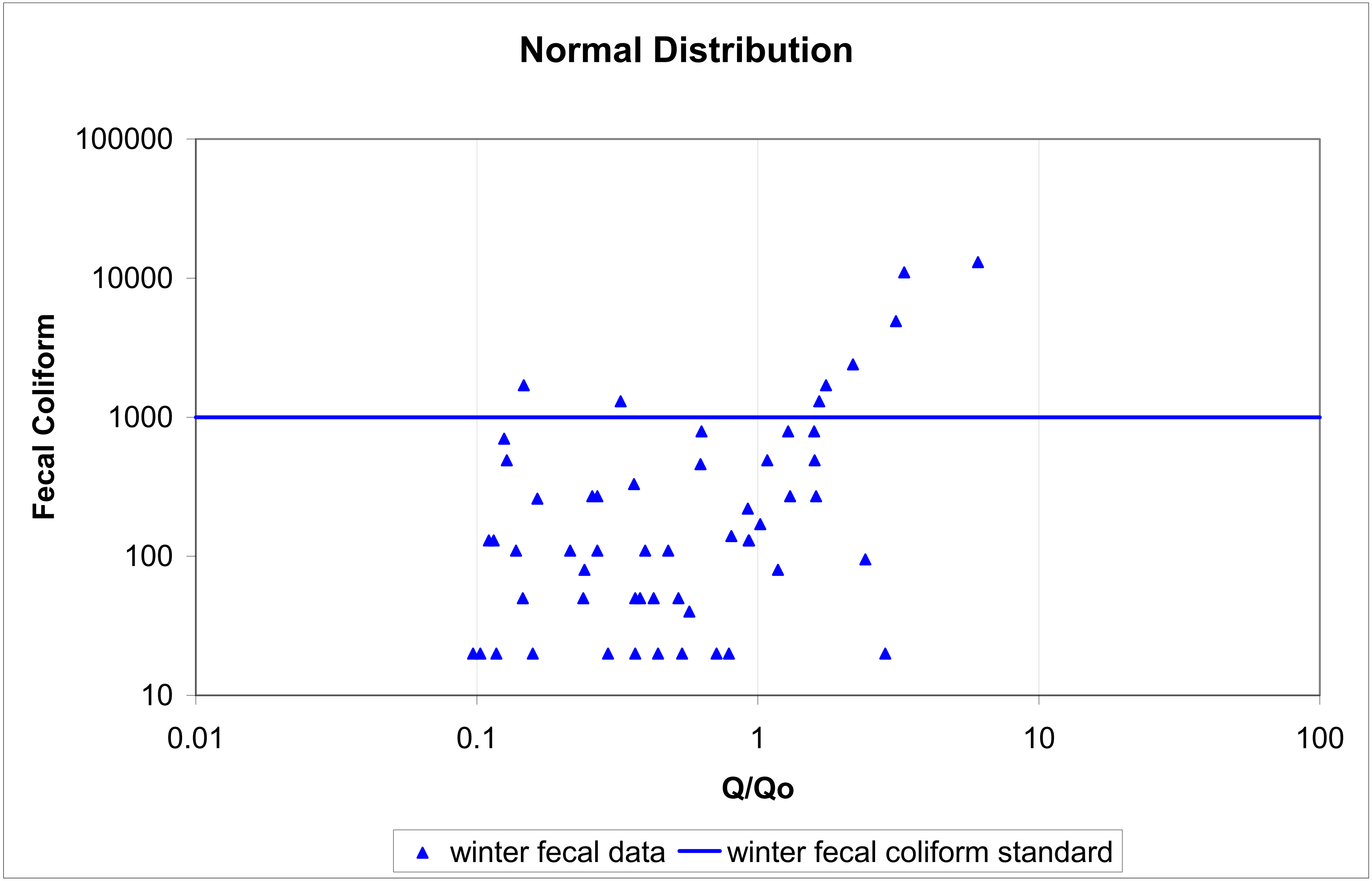
Table A-4b. Data for Figure A-4b, including: observed fecal coliform, instantaneous flow fecal coliform load, fecal coliform geometric mean, mean flow, fecal coliform geometric mean load.

Date	Observed Fecal Coliform (counts/100 ml)	Estimated Instantaneous Flow On Sample Day (cfs)	Geometric Mean (cnts/100 ml)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (cnts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (cnts/30 days)
18-Jan-01	110	162.00				
25-Jan-01	20	291.00				
1-Feb-01	130	380.00				
7-Feb-01	110	196.00	75	257	1.41E+13	1.89E+14
3-Apr-01	130	378.00				
5-Apr-01	2400	890.00				
17-Apr-01	790	523.00				
30-Apr-01	40	233.00	315	506	1.17E+14	3.71E+14
17-Jul-01	220	81.00				
24-Jul-01	90	59.00				
31-Jul-01	260	159.00				
8-Aug-01	220	78.00	183	94	1.27E+13	1.38E+13
13-Nov-01	130	45.00				
15-Nov-01	20	42.00				
28-Nov-01	260	67.00				
11-Dec-01	270	105.00	116	65	5.52E+12	4.75E+13

Appendix B

Normalized Flows Versus Fecal Coliform Plots


Normal Distribution
10000
1000
100
10
Fecal Coliform
0.01
0.1
1
10
100
Q/Qo
summer fecal data
summer fecal coliform standard


Normal Distribution
100000
10000
1000
100
10
Fecal Coliform
0.01
0.1
1
10
100
Q/Qo
winter fecal data
winter fecal coliform standard