Draft

Total Maximum Daily Load

Evaluation

for

Forty-Seven Stream Segments

in the

Flint River Basin

for

Bacteria

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

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EXECUTIVE SUMMARY

The State of Georgia Environmental Protection Division (GA EPD) assesses its waterbodies for compliance with water quality criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed waterbodies are placed into one of three categories, supporting designated use, not supporting designated use, or assessment pending, depending on water quality assessment results. These waterbodies are found on Georgia's 2022 305(b) list as required by that section of the CWA that defines the assessment process and are published in *Water Quality in Georgia 2020-2021* (GA EPD, 2022). This document is available on the Georgia Environmental Protection Division (GA EPD) website.

The subset of the waterbodies that do not meet designated uses on the 305(b) list are also assigned to Georgia's 303(d) list, named after that section of the CWA. Although the 305(b) and 303(d) lists are two distinct requirements under the CWA, Georgia reports both lists in one combined format called the Integrated 305(b)/303(d) List, which is found in Appendix A of *Water Quality in Georgia 2020-2021* (GA EPD, 2022). Waterbodies on the 303(d) list are denoted as Category 5, and are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard(s).

The TMDL formulations in this document are based on impaired segments contained in the 2022 305(b)/303(d) List. The TMDL process establishes the allowable pollutant loadings or other quantifiable parameters for a waterbody 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.

Every waterbody in the State has one or more designated uses, and each designated use has water quality criteria established to protect it. Waterbodies in Georgia are assessed based on the 305(b/303(d) Listing Assessment Methodology included in Appendix A of *Water Quality in Georgia 2020-2021*, as such GA EPD has placed thirty-three (33) stream segments in the Flint River Basin on the 303(d) list of impaired waters because it was assessed as "not supporting" its designated use of of "Drinking Water" and "Fishing" due to violation of the fecal coliform water quality criteria. This document also establishes revised TMDLs for fourteen (14) stream segments in the Flint River Basin. Twelve (12) of these segments have the designated use of "Fishing" and two segments have the designated uses of "Fishing" and "Drinking Water. A waterbody is assessed as "not supporting" its use if more than ten percent of the geometric means are greater than their seasonal waterbody specific criteria or if more than ten percent of the samples exceed the single sample criteria. The EPA approved water quality criteria in place when these streams were listed are as follows:

(a) Drinking Water Supplies: Those waters approved as a source for public drinking water systems permitted or to be permitted by the Environmental Protection Division. Waters classified for drinking water supplies will also support the fishing use and any other use requiring water of a lower quality.

(i) 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.

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

(i) 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 shellfish growing areas by the Georgia DNR Coastal Resources Division, 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 National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

In January 2022, the Georgia DNR Board adopted new bacteria criteria for “Fishing” and “Drinking Water” designated uses using the bacterial indicators *E. coli* and enterococci. These bacteria are better indicators for human health illnesses. The adopted criteria have the same estimated illness rate (8 per 1000 swimmers) as the previously established fecal coliform criteria. EPA approved these proposed revisions to Georgia’s water quality standards on August 31, 2022. The bacteria water quality criteria for "Drinking Water”, and “Fishing” designated uses, as stated in the *State of Georgia’s Rules and Regulations for Water Quality Control*, Chapter 391-3-6-.03(6) (GA EPD, 2022), are as follows:

(a) Drinking Water Supplies: Those waters approved as a source for public drinking water systems permitted or to be permitted by the Environmental Protection Division. Waters classified for drinking water supplies will also support the fishing use and any other use requiring water of a lower quality.

(i) Bacteria:

1. For the months of May through October, when primary water contact recreation activities are expected to occur, culturable E. coli not to exceed a geometric mean of 126 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 410 counts per 100 mL in the same 30-day interval.

2. For the months of November through April, culturable E. coli not to exceed a geometric mean of 265 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 861 counts per 100 mL in the same 30-day interval.

3. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

c) Fishing: Propagation of Fish, Shellfish, Game and Other Aquatic Life; primary contact recreation in and on the water for the months of May – October, secondary contact recreation in and on the water for the months of November – April; or for any other use requiring water of a lower quality.

(i) Bacteria:

1. Estuarine waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable enterococci not to exceed a geometric mean of 35 counts 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. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 130 counts per 100 mL the same 30-day interval.

   For the months of November through April, culturable enterococci not to exceed a geometric mean of 74 counts 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. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 273 counts per 100 mL in the same 30-day interval.

2. All other fishing waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable E. coli not to exceed a geometric mean of 126 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 410 counts per 100 mL in the same 30-day interval.

   For the months of November through April, culturable E. coli not to exceed a geometric mean of 265 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 861 counts per 100 mL in the same 30-day interval.

3. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

4. For waters designated as shellfish growing areas by the Georgia DNR Coastal Resources Division, 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 National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

Since this TMDL was written after EPA approved the new bacteria criteria, the TMDL will use both fecal coliform and the appropriate indicator identified above based on estuarine/non-estuarine status. Where fecal coliform and *E. coli* were sampled concurrently, the *E. coli* current load can be determined, and the percentage reduction calculated. For impaired waters where only fecal coliform was sampled, the current *E. coli* or enterococci load cannot be determined. In this case the TMDL will use a conversion factor to convert from fecal coliform criteria to *E. coli* or enterococci criteria*,* based on the respective 30-day geometric mean water quality criteria. For non-estuarine waters, a conversion factor of 0.63 will be used to translate the fecal coliform TMDL to *E. coli*. For estuarine waters, a conversion factor of 0.175 will be used to translate the fecal coliform TMDL to enterococci.

A waterbody is assessed as “not supporting” its use if more than ten percent of the geometric means are greater than their seasonal criteria or if more than ten percent of the samples exceeded the STV water quality criteria cited above. 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 following storm events.

The process of developing fecal coliform bacteria TMDLs for listed segments in the Flint River Basin involved the determination of the following:

- The current critical bacterial 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 bacterial load necessary to achieve the TMDL.

The calculation of the bacterial load at any point in a stream requires the bacterial 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 bacterial loads and required reductions for each of the listed segments are summarized in Table 1 below.

This document also includes revised TMDLs for stream segments that had TMDLs developed by USEPA using the BASINS watershed modeling approach. In the mid-2000s, GA EPD revised a majority of fecal coliform TMDLs that had been developed using BASINS. The revised TMDLs are being included to ensure that all previously issued fecal coliform TMDL calculations use the Loading Curve Approach and include WLAs and TMDLs for the new bacterial indicators. The bacterial loads for each revised segment are summarized in Table 1 below.

Point and nonpoint source management practices should be used to help reduce bacteria source loads. The amount of bacteria delivered to a stream is difficult to determine. However, the use of management practices should improve stream water quality, and future monitoring will provide a measurement of TMDL implementation.

Table 1: Bacterial Loads and Required Bacterial Load Reductions

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)[1]	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031300050903	Basin Creek	Headwaters to Hightower Lake	Fecal coliform	8.99E+10			2.99E+10	3.32E+09	3.32E+10	63.10%
			E. coli	[3]			1.88E+10	2.09E+09	2.09E+10	Undetermined [2]
GAR031300051313	Beaver Creek	Headwaters to Patsiliga Creek, Butler	Fecal coliform	9.99E+10			7.41E+10	8.23E+09	8.23E+10	17.60%
			E. coli	[3]			4.67E+10	5.19E+09	5.19E+10	Undetermined [2]
GAR031300050711	Big Turkey Creek	Hurricane Creek to the Flint River	Fecal coliform	6.88E+10			2.24E+10	2.49E+09	2.49E+10	63.80%
			E. coli	[3]			1.41E+10	1.57E+09	1.57E+10	Undetermined [2]
GAR031300070306	Choctahatchee Creek	Rabbit Branch to Kinchafoonee Creek	Fecal coliform	5.91E+11			1.23E+11	1.37E+10	1.37E+11	76.87%
			E. coli	[3]			7.76E+10	8.62E+09	8.62E+10	Undetermined [2]
GAR031300100205	Dry Creek	Breastworks Branch to tributary 1 mile downstream GA Hwy 200	Fecal coliform	9.85E+10	2.34E+09		5.24E+10	6.08E+09	6.08E+10	38.27%
			E. coli	[3]	1.48E+09		3.30E+10	3.83E+09	3.83E+10	Undetermined [2]
GAR031300051604	Flint River	Patsiliga Creek to Horse Creek	Fecal coliform	2.97E+13	7.03E+08		2.04E+13	2.27E+12	2.27E+13	23.58%
			E. coli	[3]	4.43E+08		1.29E+13	1.43E+12	1.43E+13	Undetermined [2]
GAR031300070204	Harrel Mill Creek	Headwaters to Kinchafoonee Creek	Fecal coliform	8.51E+13			1.91E+12	2.13E+11	2.13E+12	97.50%
			E. coli	[3]			1.96E+11	2.18E+10	2.18E+11	Undetermined [2]
GAR031300051602	Horse Creek	Taylor Mill Lake to Flint River	Fecal coliform	2.81E+11	1.41E+08		2.32E+11	2.58E+10	2.58E+11	8.11%
			E. coli	[3]	8.85E+07		1.46E+11	1.62E+10	1.62E+11	Undetermined [2]
GAR031300090602	Ichawaynochaway Creek	Calhoun County Line to Chickasawhatchee Creek	Fecal coliform	1.16E+13	9.96E+08		9.47E+12	1.05E+12	1.05E+13	9.58%
			E. coli	[3]	6.27E+08		5.97E+12	6.63E+11	6.63E+12	Undetermined [2]
GAR031300090902	Keel Creek	Headwaters to Spring Creek	Fecal coliform	1.72E+13	1.17E+08		1.24E+13	1.37E+12	1.37E+13	20.00%
			E. coli	[3]	7.38E+07		1.27E+12	1.41E+11	1.41E+12	Undetermined [2]
GAR031300050511	Kennel Creek	Headwaters to Walnut Creek	Fecal coliform	4.38E+10	2.93E+08		1.09E+09	1.53E+08	1.53E+09	96.50%
			E. coli	[3]	1.84E+08		6.85E+08	9.66E+07	9.66E+08	Undetermined [2]

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031300070205	Kinchafoonee Creek	Marion County Line to Lanahassee Creek	Fecal coliform	1.47E+12			7.10E+11	7.89E+10	7.89E+11	46.18%
			E. coli	(3)			4.48E+11	4.97E+10	4.97E+11	Undetermined (2)
GAR031300070305	Kinchafoonee Creek	Lanahassee Creek to Terrell County Line	Fecal coliform	8.26E+12			1.10E+12	1.22E+11	1.22E+12	85.17%
			E. coli	(3)			6.94E+11	7.72E+10	7.72E+11	Undetermined (2)
GAR031300090707	Kiokee Creek	Unnamed tributary 0.25 miles upstream of Old Dawson Road to Tallahassee Creek	Fecal coliform	5.64E+10			3.57E+10	3.97E+09	3.97E+10	29.58%
			E. coli	(3)			2.25E+10	2.50E+09	2.50E+10	Undetermined (2)
GAR031300070202	Lanahassee Creek	Headwaters to West Fork Lanahassee Creek	Fecal coliform	2.12E+11			4.41E+10	4.90E+09	4.90E+10	76.86%
			E. coli	(3)			2.78E+10	3.09E+09	3.09E+10	Undetermined (2)
GAR031300050803	Lazer Creek (formerly Lazar Creek)	Mossy Branch to Rush Creek	Fecal coliform	3.87E+10			1.99E+10	2.21E+09	2.21E+10	42.99%
			E. coli	(3)			1.25E+10	1.39E+09	1.39E+10	Undetermined (2)
GAR031300060203	Mill Creek	Unnamed tributary 200 ft upstream Clifton Bradley Drive to tributary to Flint River 0.4 miles downstream of Chatham Street	Fecal coliform	6.42E+10			9.90E+09	1.10E+09	1.10E+10	82.87%
			E. coli	(3)			6.24E+09	6.93E+08	6.93E+09	Undetermined (2)
GAR031300070502	Mossy Creek	Tributary 0.5 miles upstream of John Martin Road to Kinchafoonee Creek	Fecal coliform	1.25E+11			3.65E+10	4.06E+09	4.06E+10	67.62%
			E. coli	(3)			2.30E+10	2.56E+09	2.56E+10	Undetermined (2)
GAR031300071001	Muckalee Creek	Sumter Co. Line to tributary at Pirates Cove Nature Park, Leesburg	Fecal coliform	2.03E+12	5.76E+09	1.72E+09	1.16E+12	1.29E+11	1.29E+12	36.35%
			E. coli	(3)	3.63E+09	1.08E+09	7.28E+11	8.14E+10	8.14E+11	Undetermined (2)
GAR031300090403	Pachitla Creek	Goffs Mill Creek to Carter Creek	Fecal coliform	7.82E+11			3.77E+11	4.19E+10	4.19E+11	46.49%
			E. coli	(3)			2.37E+11	2.64E+10	2.64E+11	Undetermined (2)
GAR031300051314	Patsiliga Creek	Headwaters to McCants Mill Pond	Fecal coliform	4.04E+11			2.01E+11	2.23E+10	2.23E+11	44.81%
			E. coli	(3)			1.27E+11	1.41E+10	1.41E+11	Undetermined (2)
GAR031300050706	Pigeon Creek	Tributary to the Flint River	Fecal coliform	3.35E+10			2.12E+10	2.36E+09	2.36E+10	29.51%
			E. coli	(3)			1.34E+10	1.49E+09	1.49E+10	Undetermined (2)

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)[1]	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031300060516	Po Joe Branch	Tributary 0.6 miles upstream Lamar Road to Lime Creek	Fecal coliform	1.00E+10			7.99E+09	8.88E+08	8.88E+09	11.21%
			E. coli	[3]			5.04E+09	5.60E+08	5.60E+09	Undetermined [2]
GAR031300050805	Russell Branch	Headwaters to Lazer Creek	Fecal coliform	5.92E+10			1.39E+10	1.55E+09	1.55E+10	73.81%
			E. coli	[3]			8.79E+09	9.76E+08	9.76E+09	Undetermined [2]
GAR031300050714	Sheep Rock Hollow	Headwaters to the Flint River	Fecal coliform	8.33E+09			2.60E+09	2.89E+08	2.89E+09	65.27%
			E. coli	[3]			1.64E+09	1.82E+08	1.82E+09	Undetermined [2]
GAR031300050215	Shoal Creek	Unnamed Tributary 1 mile upstream Andrew Bailey Road to Rock Branch	Fecal coliform	2.74E+11		1.40E+10	4.53E+10	6.60E+09	6.60E+10	75.95%
			E. coli	[3]		8.85E+09	2.85E+10	4.16E+09	4.16E+10	Undetermined [2]
GAR031300051006	Tobler Creek	Headwaters to Swift Creek	Fecal coliform	3.80E+11			2.67E+11	2.96E+10	2.96E+11	22.11%
			E. coli	[3]			1.68E+11	1.87E+10	1.87E+11	Undetermined [2]
GAR031300050610	Town Branch	Zebulon WPCP to Elkins Creek	Fecal coliform	1.65E+10	3.35E+08		4.71E+09	5.61E+08	5.61E+09	66.06%
			E. coli	[3]	2.11E+08		2.97E+09	3.53E+08	3.53E+09	Undetermined [2]
GAR031300090505	Tributary to Bay Branch	Pond 0.3 miles downstream Bay Street to Bay Branch	Fecal coliform	1.06E+11	2.93E+08		1.01E+10	1.13E+09	1.13E+10	89.36%
			E. coli	[3]	1.84E+08		6.10E+09	7.10E+08	7.10E+09	Undetermined [2]
GAR031300060904	Tributary to Mill Creek	Headwaters to tributary 0.5 miles downstream Fowler Road	Fecal coliform	2.32E+11			2.35E+10	2.63E+09	2.63E+10	88.65%
			E. coli	[3]			1.49E+10	1.66E+09	1.66E+10	Undetermined [2]
GAR031300050922	Tributary to the Red River	Lake Julia to the Red River	Fecal coliform	8.46E+09			8.27E+08	9.19E+07	9.19E+08	89.13%
			E. coli	[3]			5.21E+08	5.79E+07	5.79E+08	Undetermined [2]
GAR031300060409	Turkey Creek	Little Creek to Jalappa Branch	Fecal coliform	3.09E+12			5.17E+11	5.74E+10	5.74E+11	81.42%
			E. coli	[3]			3.26E+11	3.62E+10	3.62E+11	Undetermined [2]
GAR031300050918	Womble Creek	Headwaters to Jerry Reeves Creek	Fecal coliform	2.11E+10			1.89E+10	2.10E+09	2.10E+10	0.59%
			E. coli	[3]			1.19E+10	1.32E+09	1.32E+10	Undetermined [2]

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)[1]	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
Revised TMDLs [4]										
GAR031300100402	Aycocks Creek	Kaney Head Creek to Spring Creek	Fecal coliform	1.45E+12			1.01E+12	1.12E+11	1.12E+12	23.08%
			E. coli	[3]			6.34E+11	7.04E+10	7.04E+11	Undetermined [2]
GAR031300060101	Beaver Creek	Headwaters to Spring Hill Creek, SW Marshallville	Fecal coliform	5.49E+10			4.85E+10	5.39E+09	5.39E+10	2.00%
			E. coli	[3]			3.05E+10	3.39E+09	3.39E+10	Undetermined [2]
GAR031300060201	Buck Creek	Fox Branch to Flint River near Oglethorpe	Fecal coliform	1.86E+12	4.68E+08		1.68E+12	1.86E+11	1.86E+12	Undetermined [2]
			E. coli	[3]	2.95E+08		1.06E+12	1.17E+11	1.17E+12	Undetermined [2]
GAR031300090804	Chickasawhatchee Creek	Dougherty County (Terrell County Line to Baker County Line)	Fecal coliform	3.82E+12	2.93E+09		1.20E+12	1.34E+11	1.34E+12	65.03%
			E. coli	[3]	1.84E+09		7.55E+11	8.41E+10	8.41E+11	Undetermined [2]
GAR031300100704	Fishpond Drain	U.S. Hwy. 84, Donalsonville to Wash Pond	Fecal coliform	5.99E+12	1.17E+09		5.58E+11	6.21E+10	6.21E+11	89.63%
			E. coli	[3]	7.38E+08		3.51E+11	3.92E+10	3.92E+11	Undetermined [2]
GAR031300070604	Kinchafoonee Creek	Ga. Hwy. 45 (Webster Co. Line) to Lake Chehaw/Worth	Fecal coliform	8.58E+12	2.31E+09	2.68E+10	4.75E+12	5.31E+11	5.31E+12	38.08%
			E. coli	[3]	1.71E+09	1.69E+10	2.99E+12	3.35E+11	3.35E+12	Undetermined [2]
GAR031300050801	Lazer Creek	Marshall Creek to Flint River near Talbotton	Fecal coliform	3.13E+12	1.29E+08		1.17E+12	1.30E+11	1.30E+12	58.33%
			E. coli	[3]	8.12E+07		7.38E+11	8.20E+10	8.20E+11	Undetermined [2]
GAR031300070801	Muckalee Creek	Little Muckalee Creek to Americus	Fecal coliform	4.14E+11	4.68E+08		3.51E+11	3.90E+10	3.90E+11	5.66%
			E. coli	[3]	2.95E+08		2.21E+11	2.46E+10	2.46E+11	Undetermined [2]
GAR031300050923	Potato Creek	Drake Branch to Hoyle Branch	Fecal coliform	2.10E+12	9.37E+06	5.61E+09	1.28E+12	1.43E+11	1.43E+12	31.74%
			E. coli	[3]	5.90E+06	3.53E+09	8.08E+11	9.01E+10	9.01E+11	Undetermined [2]
GAR031300050924	Potato Creek	Hoyle Branch to the Flint River, near Thomaston	Fecal coliform	2.60E+12	2.35E+09	1.67E+10	1.57E+12	1.77E+11	1.77E+12	31.74%
			E. coli	[3]	1.48E+09	1.05E+10	9.91E+11	1.12E+11	1.12E+12	Undetermined [2]
GAR031300050116	Tributary to Nash Creek	Fayetteville Pennahatchee Creek, NW	Fecal coliform	6.75E+09		4.66E+09	2.83E+09	8.33E+08	8.33E+09	0.00%
			E. coli	[3]		2.94E+09	1.78E+09	5.25E+08	5.25E+09	Undetermined [2]

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031300060405	Turkey Creek	Cordele to Flint River	Fecal coliform	7.73E+11	1.22E+08		1.11E+12	1.24E+11	1.24E+12	0.00%
			E. coli	(3)	7.67E+07		7.01E+11	7.79E+10	7.79E+11	Undetermined (2)
GAR031300050307	White Oak Creek	Little White Oak Creek to Flint River near Alvaton	Fecal coliform	7.95E+12	7.11E+09	5.74E+11	7.20E+11	1.45E+11	1.45E+12	81.82%
			E. coli	(3)	4.48E+09	3.62E+11	4.54E+11	9.11E+10	9.11E+11	Undetermined (2)
GAR031300050308	White Oak Creek	Newnan - I-85 to Chandlers Creek	Fecal coliform	1.99E+11	7.07E+09	1.01E+10	1.85E+11	2.25E+10	2.25E+11	0.00%
			E. coli	(3)	4.46E+09	6.36E+09	1.17E+11	1.42E+10	1.42E+11	Undetermined (2)

(1) The assigned bacterial load from the NPDES permitted facility for WLA was determined as the product of the permitted flow and bacteria permit limit.
(2) Percent reduction could not be determined due to absence of current load calculation.
(3) Critical loading could not be determined due to no samples collected.
(4) The original EPA TMDL model was run for a critical time period using the "calibrated" fecal and flow parameters. The model run resulted in a summer fecal coliform 30 day geometric mean concentration. The existing load was calculated using this concentration times the annual flow.

1.0 INTRODUCTION

1.1 Background

The State of Georgia assesses its waterbodies for compliance with water quality criteria established for their designated uses as required by the CWA. Assessed waterbodies are placed into one of three categories, supporting designated use, not supporting designated use, or assessment pending, depending on water quality assessment results. These waterbodies are found on Georgia's 2022 305(b) list as required by that section of the CWA that defines the assessment process and are published in *Water Quality in Georgia 2020-2021* (GA EPD, 2022). This document is available on the GA EPD website.

The subset of the waterbodies that do not meet designated uses on the 305(b) list are also assigned to Georgia's 303(d) list, named after that section of the CWA. Although the 305(b) and 303(d) lists are two distinct requirements under the CWA, Georgia reports both lists in one combined format called the Integrated 305(b)/303(d) List, which is found in Appendix A of *Water Quality in Georgia 2020-2021* (GA EPD, 2022). Waterbodies on the 303(d) list are denoted as Category 5, and are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard(s).

The TMDL formulations in this document are based on impaired segments contained in the 2022 305(b)/303(d) List. The TMDL process establishes the allowable pollutant loadings or other quantifiable parameters for a waterbody 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 303(d) list identifies the stream segments that are not supporting its designated use classification due to exceedances of water quality criteria for bacteria. Fecal coliform, *E. coli,* and enterococci bacteria are used as indicators of the potential presence of pathogens in a stream. Table 2 presents the thity-three (33) stream segments in the Flint River Basin included on the 2022 303(d) list for exceedances of the fecal coliform criteria.

Table 3 lists the fourteen (14) stream segments in the Flint River Basin where the previously approved TMDLs are being revised. These TMDLs were developed by USEPA using the BASINS watershed modeling approach. In the mid-2000s, GA EPD redid a majority of fecal coliform TMDLs that had been developed using BASINS. The revised TMDLs are being included to ensure that all previously issued fecal coliform TMDL calculations use the Loading Curve Approach and include WLAs and TMDLs for the new bacterial indicators.

Table 2: Stream Segments Listed on the 2022 303(d) List for Bacteria in the Flint River Basin

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use
Basin Creek	Headwaters to Hightower Lake	GAR031300050903	6	Fishing
Beaver Creek	Headwaters to Patsiliga Creek, Butler	GAR031300051313	6	Fishing
Big Turkey Creek	Hurricane Creek to the Flint River	GAR031300050711	3	Fishing

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use
Choctahatchee Creek	Rabbit Branch to Kinchafoonee Creek	GAR031300070306	4	Fishing
Dry Creek	Breastworks Branch to tributary 1 mile downstream GA Hwy 200	GAR031300100205	1	Fishing
Flint River	Patsiliga Creek to Horse Creek	GAR031300051604	20	Fishing
Harrel Mill Creek	Headwaters to Kinchafoonee Creek	GAR031300070204	3	Fishing
Horse Creek	Taylor Mill Lake to Flint River	GAR031300051602	10	Fishing
Ichawaynochaway Creek	Calhoun County Line to Chickasawhatchee Creek	GAR031300090602	13	Fishing
Keel Creek	Headwaters to Spring Creek	GAR031300090902	9	Fishing
Kennel Creek	Headwaters to Walnut Creek	GAR031300050511	4	Fishing
Kinchafoonee Creek	Marion County Line to Lanahassee Creek	GAR031300070205	18	Fishing
Kinchafoonee Creek	Lanahassee Creek to Terrell County Line	GAR031300070305	8	Fishing
Kiokee Creek	Unnamed tributary 0.25 miles upstream of Old Dawson Road to Tallahassee Creek	GAR031300090707	5	Fishing
Lanahassee Creek	Headwaters to West Fork Lanahassee Creek	GAR031300070202	8	Fishing
Lazer Creek (formerly Lazar Creek)	Mossy Branch to Rush Creek	GAR031300050803	4	Drinking Water, Fishing
Mill Creek	Unnamed tributary 200 ft upstream Clifton Bradley Drive to tributary to Flint River 0.4 miles downstream of Chatham Street	GAR031300060203	1	Fishing
Mossy Creek	Tributary 0.5 miles upstream of John Martin Road to Kinchafoonee Creek	GAR031300070502	5	Fishing
Muckalee Creek	Sumter Co. Line to tributary at Pirates Cove Nature Park, Leesburg	GAR031300071001	28.9	Fishing
Pachitla Creek	Goffs Mill Creek to Carter Creek	GAR031300090403	8	Fishing
Patsiliga Creek	Headwaters to McCants Mill Pond	GAR031300051314	15.4	Fishing
Pigeon Creek	Tributary to the Flint River	GAR031300050706	8	Fishing

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use
Po Joe Branch	Tributary 0.6 miles upstream Lamar Road to Lime Creek	GAR031300060516	2	Fishing
Russell Branch	Headwaters to Lazer Creek	GAR031300050805	7	Fishing
Sheep Rock Hollow	Headwaters to the Flint River	GAR031300050714	3	Fishing
Shoal Creek	Unnamed Tributary 1 mile upstream Andrew Bailey Road to Rock Branch	GAR031300050215	4	Fishing
Tobler Creek	Headwaters to Swift Creek	GAR031300051006	23	Fishing
Town Branch	Zebulon WPCP to Elkins Creek	GAR031300050610	1	Fishing
Tributary to Bay Branch	Pond 0.3 miles downstream Bay Street to Bay Branch	GAR031300090505	2	Fishing
Tributary to Mill Creek	Headwaters to tributary 0.5 miles downstream Fowler Road	GAR031300060904	9	Fishing
Tributary to the Red River	Lake Julia to the Red River	GAR031300050922	1	Fishing
Turkey Creek	Little Creek to Jalappa Branch	GAR031300060409	2.6	Fishing
Womble Creek	Headwaters to Jerry Reeves Creek	GAR031300050918	6	Fishing

Table 3: Stream Segments with Revised TMDLs for Bacteria in the Flint River Basin

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Original TMDL Action ID Number, Agency, and Year
Aycocks Creek	Kaney Head Creek to Spring Creek	GAR031300100402	15	Fishing	40 US EPA 1998
Beaver Creek	Headwaters to Spring Hill Creek, SW Marshallville	GAR031300060101	4.9	Fishing	90 US EPA 1998
Buck Creek	Fox Branch to Flint River near Oglethorpe	GAR031300060201	16	Fishing	1445 US EPA 1998
Chickasawhatchee Creek	Dougherty County (Terrell County Line to Baker County Line)	GAR031300090804	17.6	Fishing	264 US EPA 1998

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Original TMDL Action ID Number, Agency, and Year
Fishpond Drain	U.S. Hwy. 84, Donalsonville to Wash Pond	GAR031300100704	9.6	Fishing	437 US EPA 1998
Kinchafoonee Creek	Ga. Hwy. 45 (Webster Co. Line) to Lake Chehaw/Worth	GAR031300070604	40	Fishing	605 US EPA 1998
Lazer Creek	Marshall Creek to Flint River near Talbotton	GAR031300050801	17	Fishing	666 US EPA 1998
Muckalee Creek	Little Muckalee Creek to Americus	GAR031300070801	5	Fishing	829 US EPA 1998
Potato Creek	Drake Branch to Hoyle Branch	GAR031300050923	5.2	Fishing, Drinking Water	944 US EPA 1998
Potato Creek	Hoyle Branch to the Flint River, near Thomaston	GAR031300050924	10.8	Fishing	944 US EPA 1998
Tributary to Nash Creek	Fayetteville	GAR031300050116	1	Fishing	1218 US EPA 1998
Turkey Creek	Pennahatchee Creek, NW Cordele to Flint River	GAR031300060405	4	Fishing	1233 US EPA 1998
White Oak Creek	Little White Oak Creek to Flint River near Alvaton	GAR031300050307	9	Fishing	1323 US EPA 1998
White Oak Creek	Newnan - I-85 to Chandlers Creek	GAR031300050308	6	Drinking Water, Fishing	1323 US EPA 1998

1.2 Watershed Description

The Flint River Basin is located in the western third of the State of Georgia and is entirely within the boundaries of the State. The River drains an area of approximately 8,460 square miles. The Basin contains parts of the Piedmont and Coastal Plain physiographic provinces that extend throughout the southeastern United States. The Flint River originates in the south side of Fulton County, in metropolitan Atlanta, by Hartsfield-Jackson International Airport. The river flows south to Lake Blackshear and then to Lake Seminole. At this point, the Flint converges with the Chattahoochee River in Lake Seminole at the Georgia-Florida border. The outflow from Lake Seminole forms the Apalachicola River in Florida, which ultimately discharges to the Gulf of Mexico.

The Flint River basin includes six United States Geologic Survey (USGS) eight-digit hydrologic units, HUC 03130005 – 03130010. Figure 1 shows the location of the Flint River Basin in the State of Georgia. Figure 2 shows the locations of the six hydrologic units within the Flint River Basin. Figure 3 through Figure 910 indicate the location of the 303(d) listed stream segments and revised TMDL stream segments in the Flint River Basin.

The land use characteristics of the Flint River Basin watersheds were determined using data from the Georgia Land Use Trends (GLUT) for Year 2015. This raster land use trend product was developed by the University of Georgia – Natural Resources Spatial Analysis Laboratory (NARSAL) and follows land use trends for years 1974, 1985, 1991, 1998, 2001, 2005, 2008 and 2015. Some of the NARSAL land use types were reclassified, aggregated into similar land use types, and used in the final watershed characterization. Table 4 lists the watershed land use distribution for the drainage areas of the two stream segments.

1.3 State Water Planning

The Georgia Legislature enacted the Metropolitan North Georgia Water Planning District Act in 2001 to create the Metropolitan North Georgia Water Planning District (MNGWPD) to preserve and protect water resources in the 15-county metropolitan Atlanta area. The MNGWPD is charged with the development of comprehensive regional and watershed specific water resource management plans to be implemented by local governments in the metropolitan Atlanta area. The MNGWPD issued its first water resource management plan documents in 2003.

In 2004, the Georgia Legislature enacted the Comprehensive State-wide Water Management Planning Act to ensure management of water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens on a state-wide level. GA EPD later developed the 2008 Comprehensive State-wide Water Management Plan, which established Georgia's ten Regional Water Planning Councils (RWPCs) and laid the groundwork for the RWPCs to develop their own Regional Water Plans. The boundaries of these ten RWPCs, in addition to the MNGWPD, are shown in Figure 11. All waterbodies covered by the TMDL are located within the boundaries of either the MNGWPD, Upper Flint Regional Water Planning, Lower Flint-Ochlocockonee Regional Water Planning Council, Middle Chattahoochee Regional Water Planning Council, and Middle Ocmulgee Regional Water Planning Council.

In 2011, each RWPC developed and adopted Regional Water Plans, which identify ranges of actions or management practices to help meet the State's water quality challenges. Implementation of these plans is critical in meeting Georgia's water resource challenges. The Upper Flint RWPC, Lower Flint-Ochlockonee RWPC, Middle Chattahoochee RWPC and Middle Ocmulgee RWPC updated their Regional Water Plans in June 2023, which were adopted by GA EPD in July 2023. The next set of updated Regional Water Plans should be adopted by adopted by GA EPD in June 2028. These Regional Water Plans are available here.

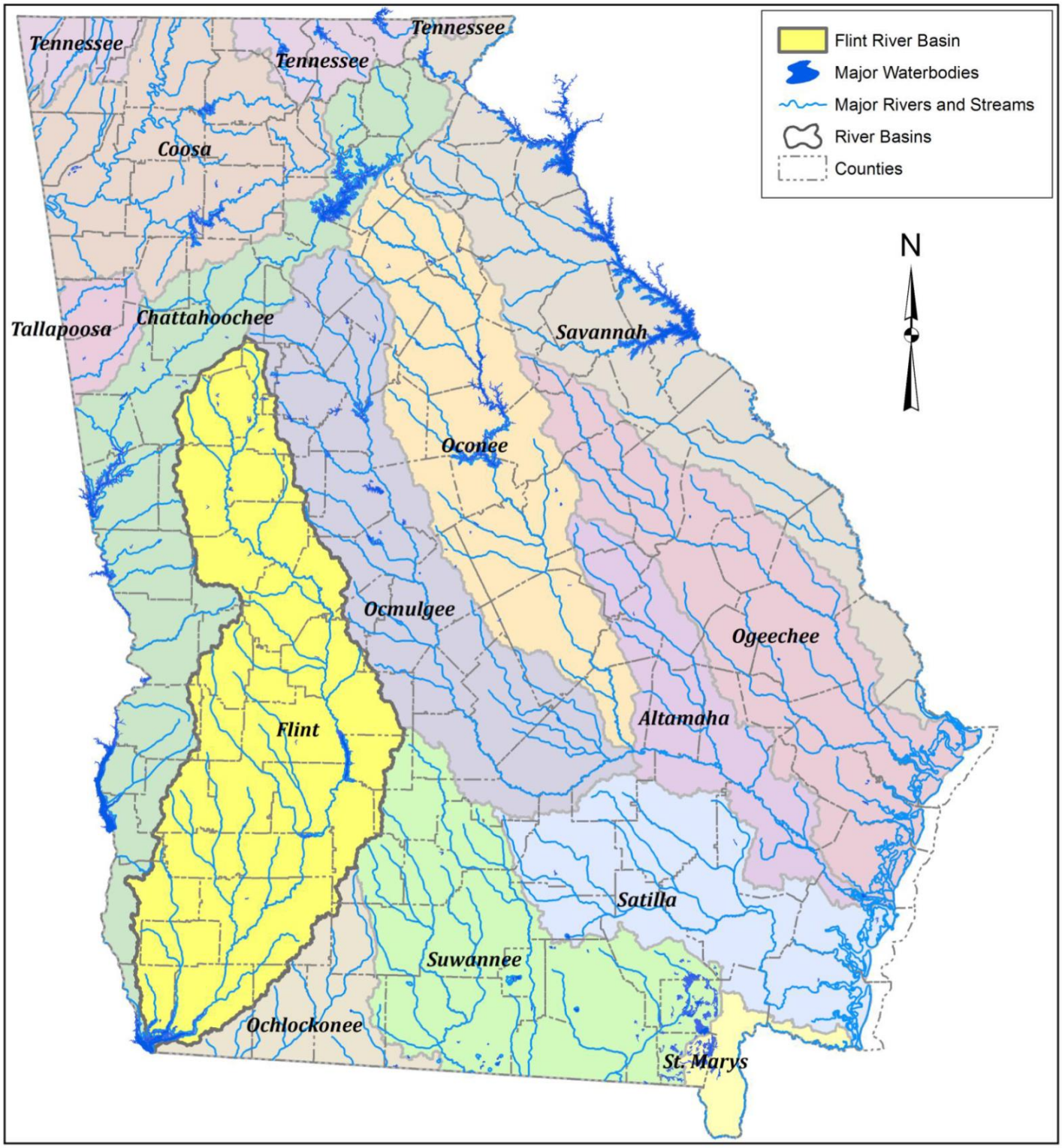

Figure 1: Location of the Flint River Basin in Georgia

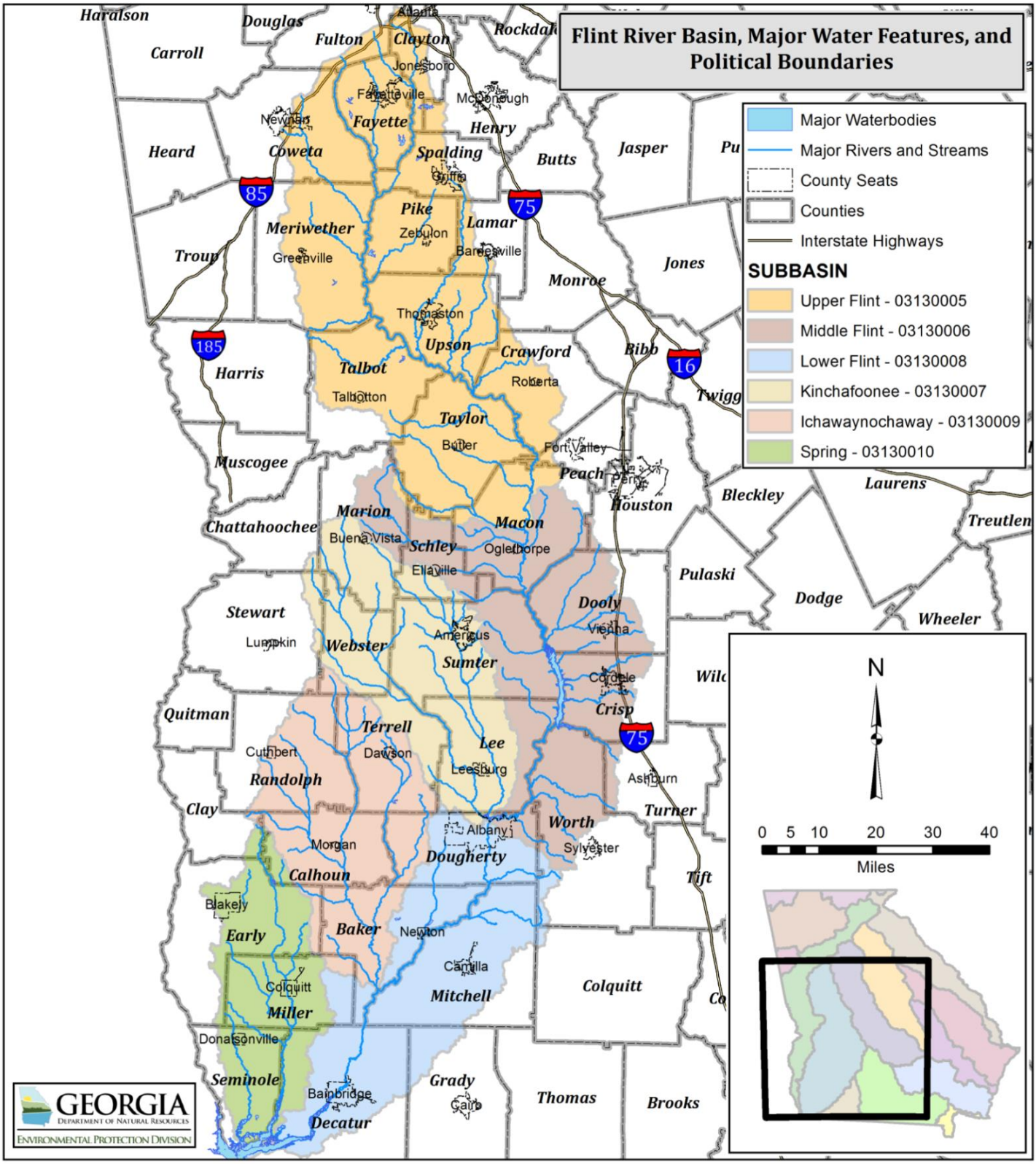

Figure 2: Major Political Boundaries, Water Features, and U.S.G.S. 12-digit HUC

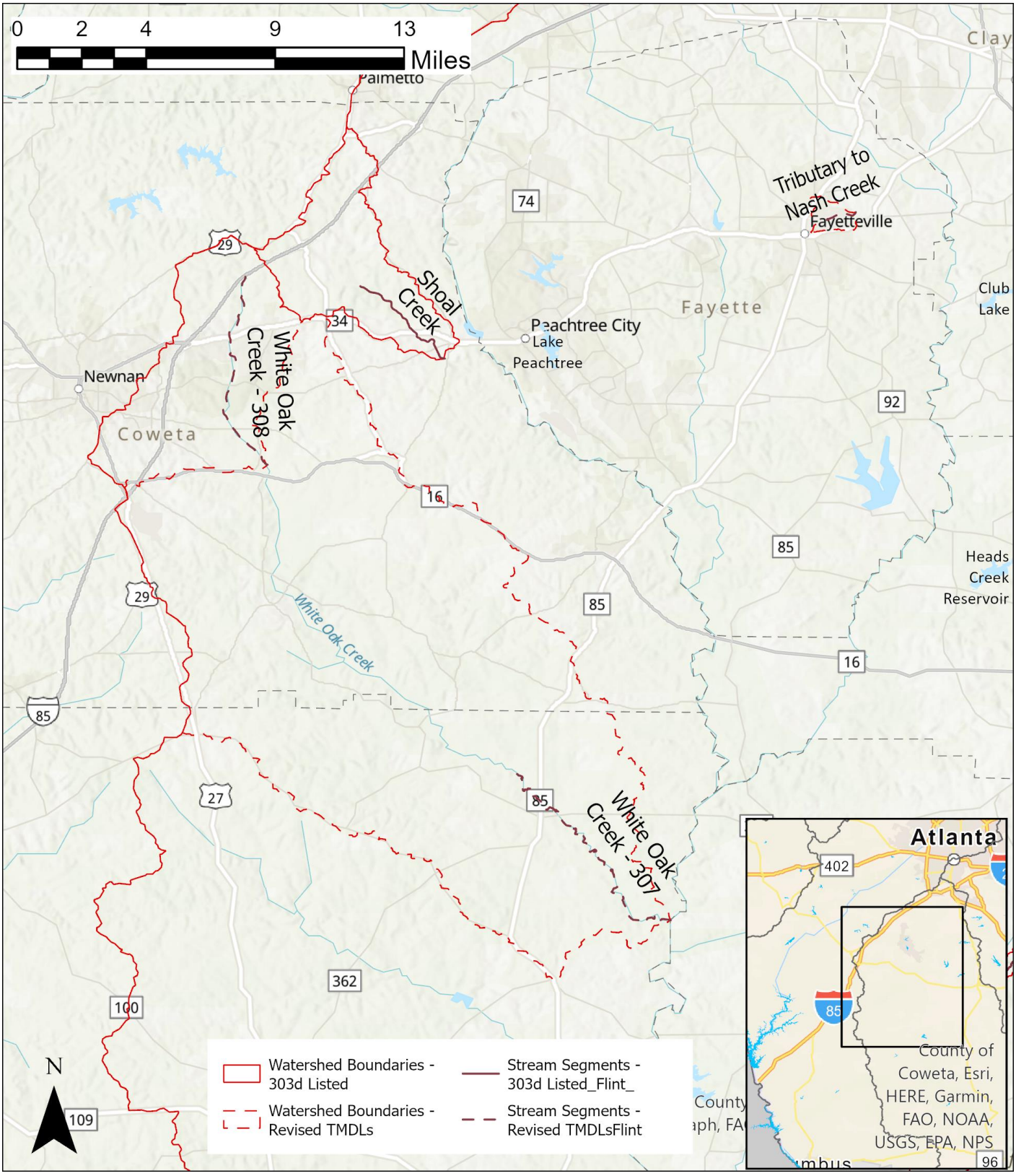

Figure 3: Stream Segments of Shoal Creek, Tributary to Nash Creek, White Oak Creek - upstream, and White Oak Creek - downstream

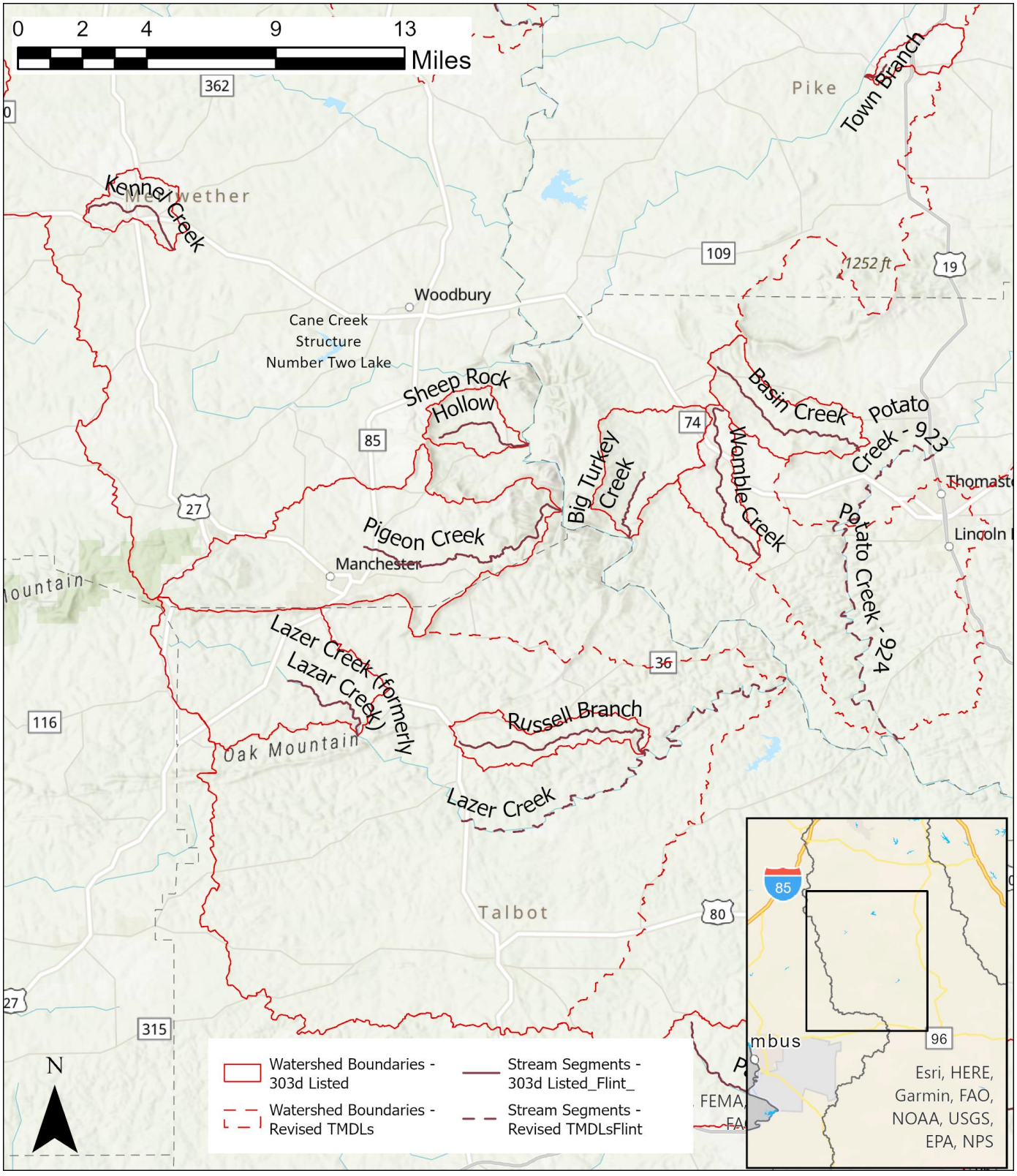

Figure 4: Stream Segments of Basin Creek, Big Turkey Creek, Kennel Creek, Lazer Creek – upstream, Lazer Creek – downstream, Pigeon Creek, Potato Creek – upstream, Potato Creek – downstream, Russell Creek, Sheep Rock Hollow, Town Creek, and Womble Creek

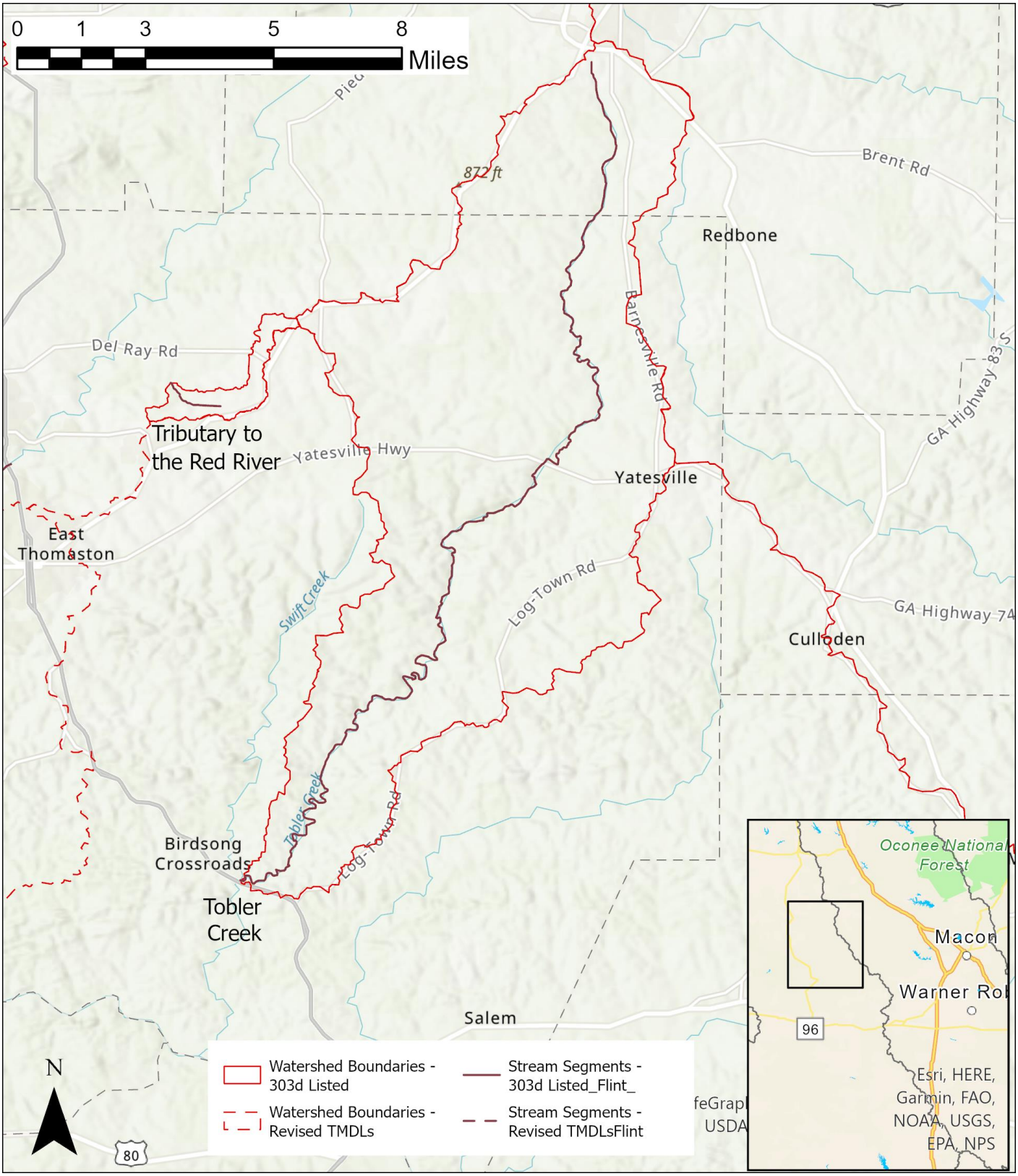

Figure 5: Stream Segments of Tobler Creek and Tributary to Red River

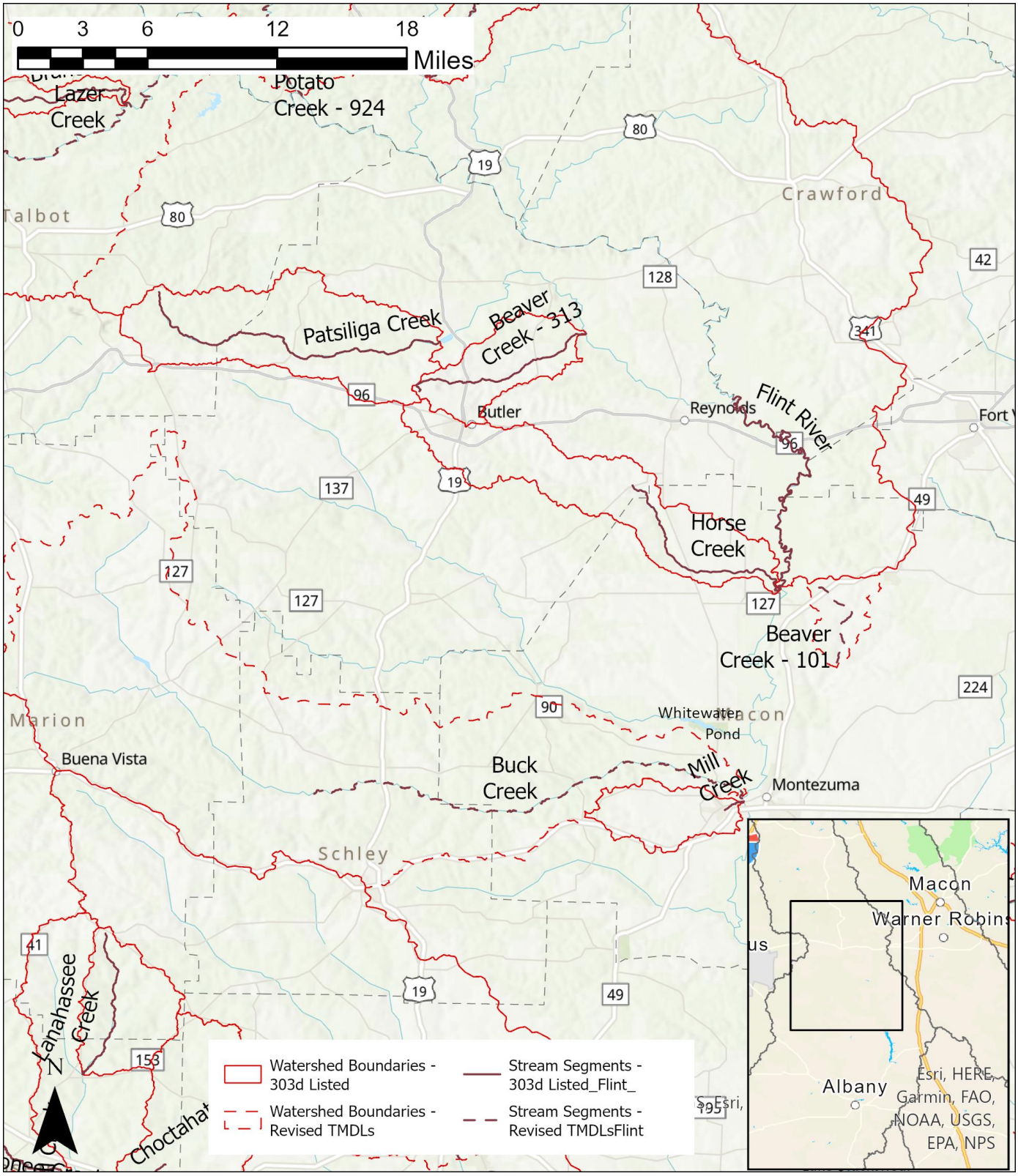

Figure 6: Stream Segments of Beaver Creek (Headwaters to Patsiliga Creek), Beaver Creek (Headwaters to Spring Hill Creek), Buck Creek, Flint River, Horse Creek, Mill Creek, and Patsiliga Creek

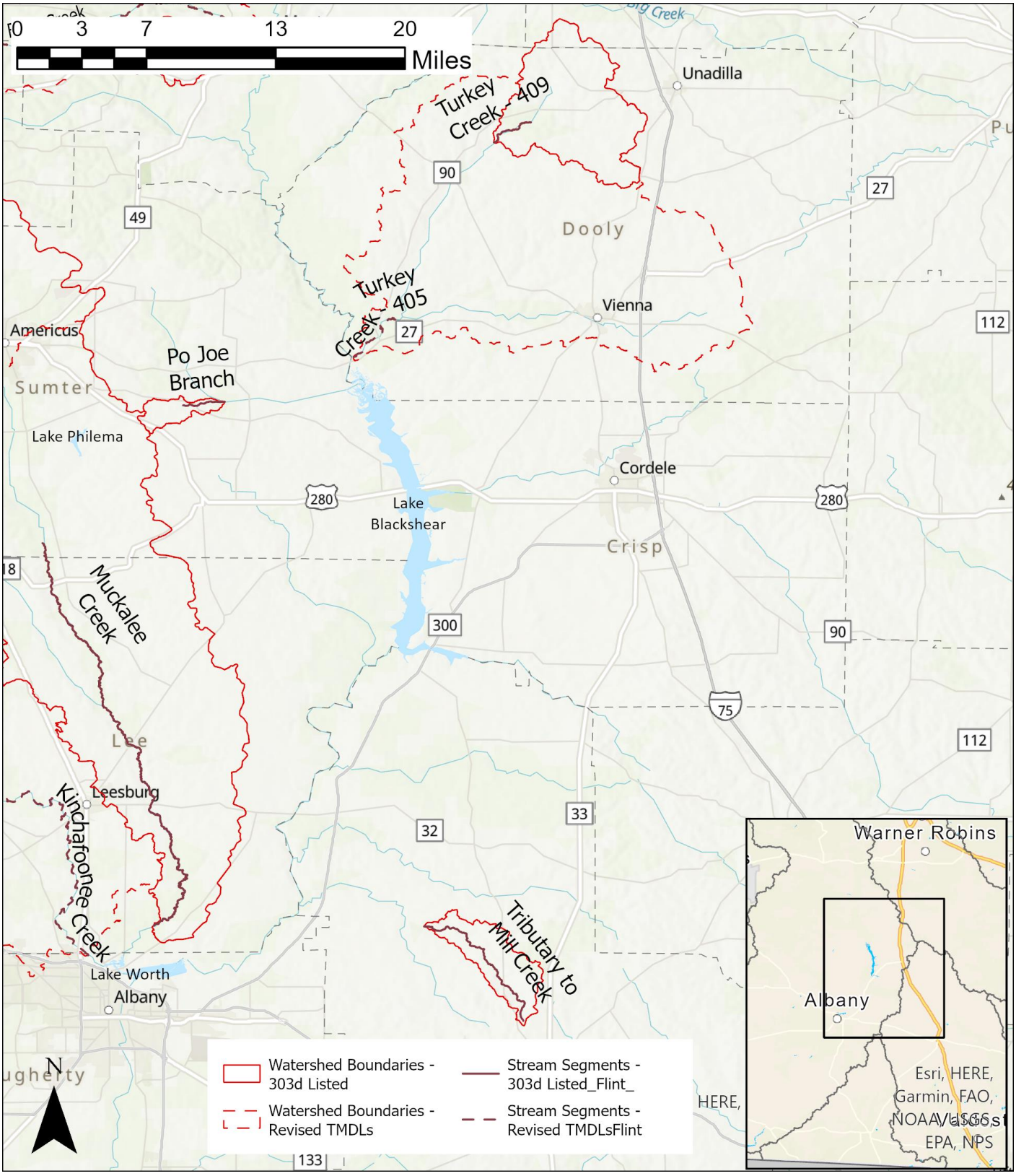

Figure 7: Stream Segments of Po Joe Branch, Turkey Creek (Little Creek to Jalappa Branch), Turkey Creek (Pennahatchee Creek, NW Cordele to Flint River), and Tributary to Mill Creek

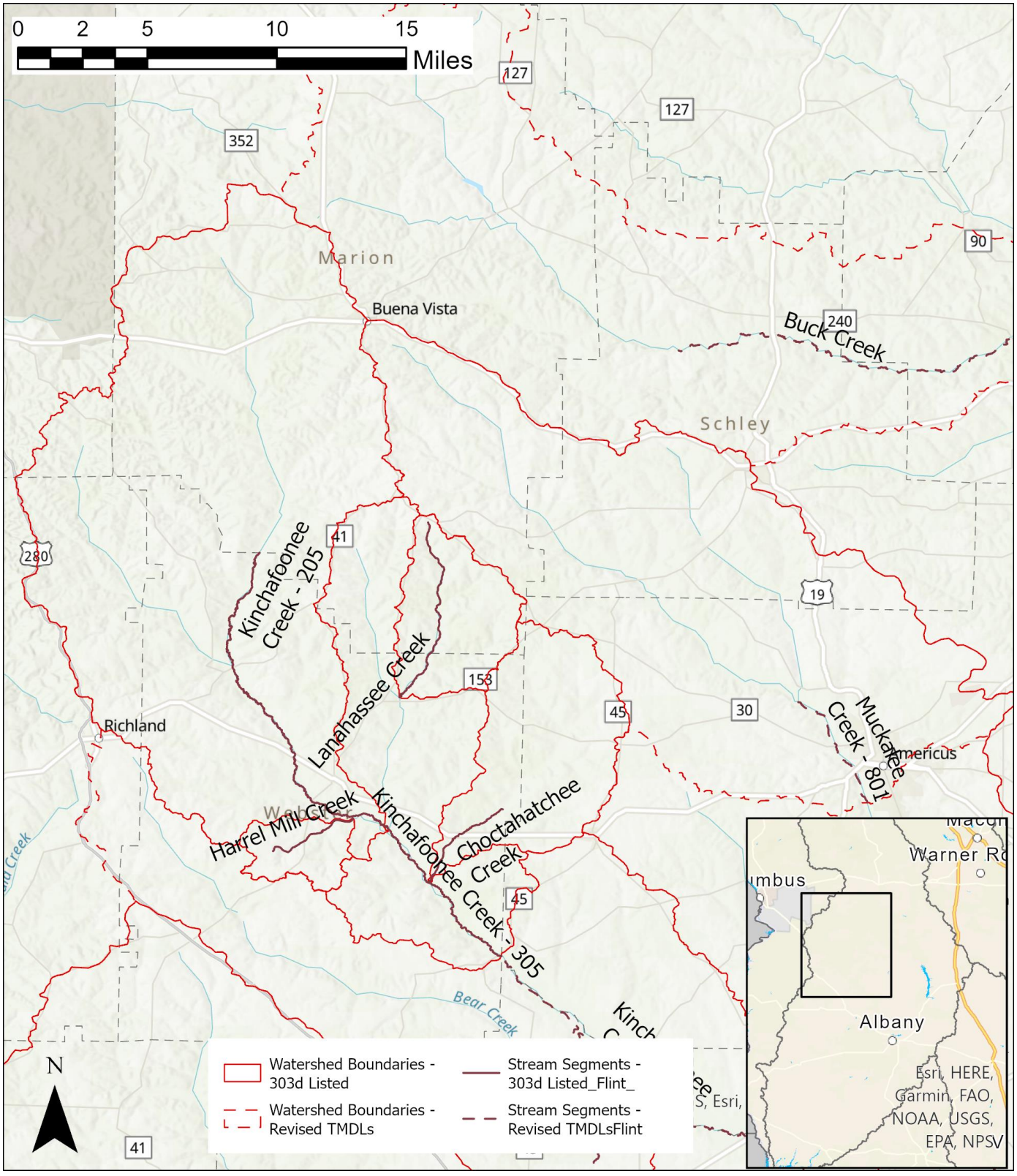

Figure 8: Stream Segments of Choctahatchee Creek, Harrell Mill Creek, Kinchafoonee Creek (Marion County Line to Lanahassee Creek), Kinchafoonee Creek (Lanahassee Creek to Terrell County Line), Lanahassee Creek, and Muckalee Creek (Little Muckalee Creek to Americus)

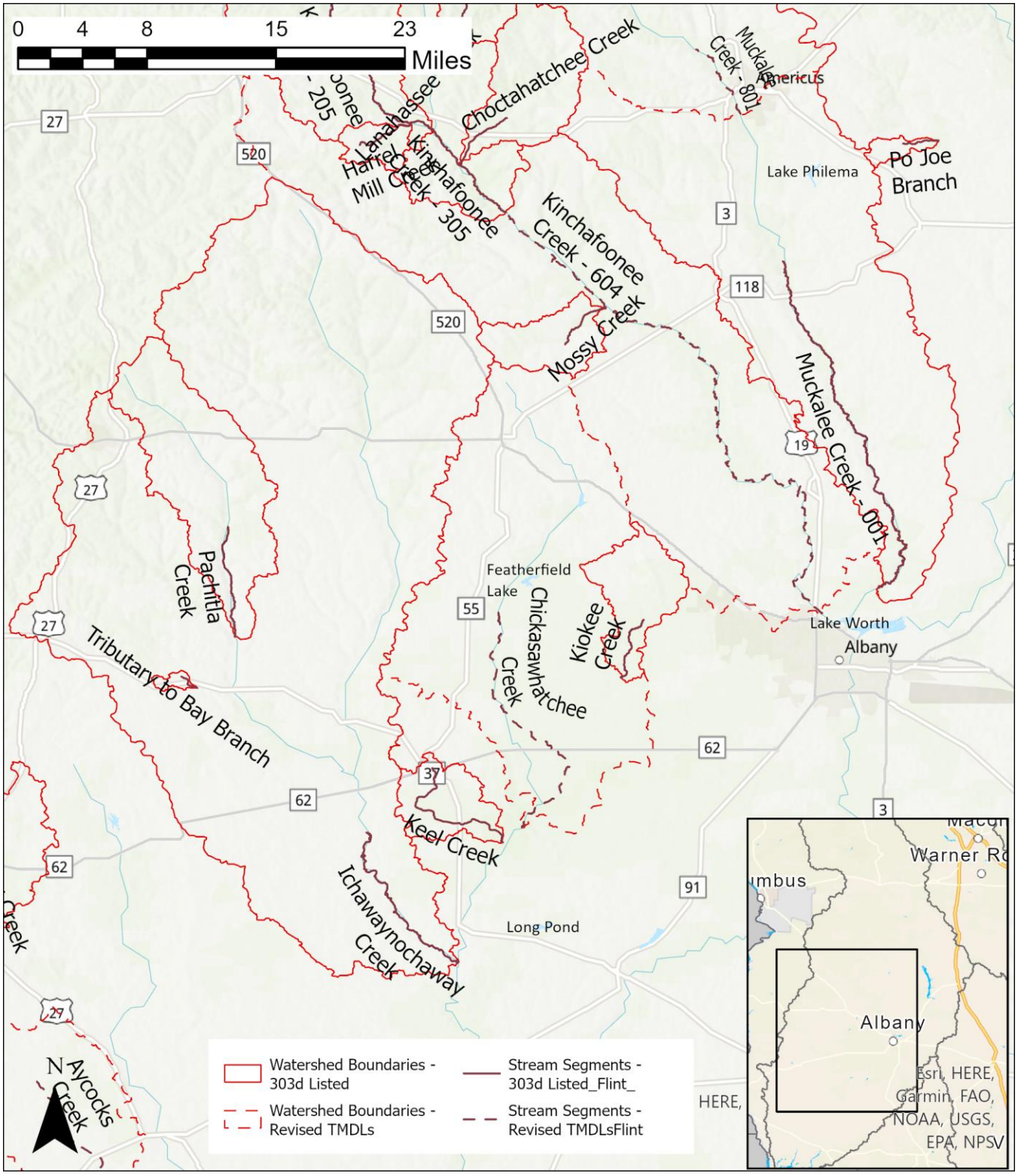

Figure 9: Stream Segments of Chickasawhatchee Creek, Ichawaynochaway Creek, Keel Creek, Kinchafoonee Creek (Ga. Hwy. 45 (Webster Co. Line) to Lake Chehaw/Worth), Kiokee Creek, Mossy Creek, Muckalee Creek (Sumter Co. Line to tributary at Pirates Cove Nature Park), Pachitla Creek, and Tributary to Bay Creek

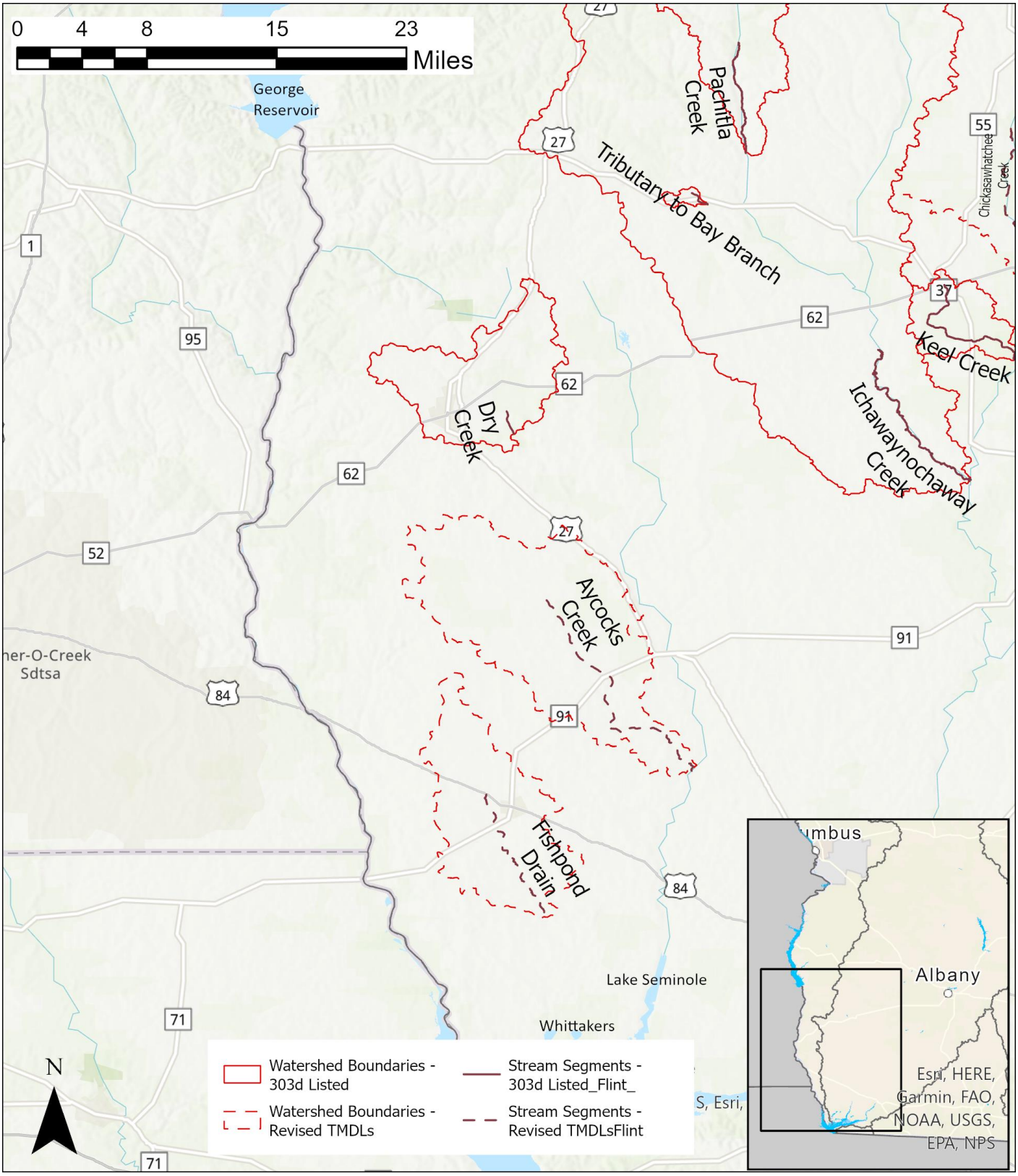

Figure 10: Stream Segments of Aycocks Creek, Dry Creek, and Fishpond Drain

1.4 Water Quality Standard

Every waterbody in the State has one or more designated uses, and each designated use has water quality criteria established to protect it. Waterbodies in Georgia are assessed based on the 305(b/303(d) Listing Assessment Methodology, as such GA EPD has placed thirty-three (33) stream segments in the Flint River Basin on the 2022 303(d) list of impaired waters because it was assessed as "not supporting" its designated use of "Drinking Water" and "Fishing" due to violation of the fecal coliform water quality criteria. This document also establishes revised TMDLs for fourteen (14) stream segments in the Flint River Basin. Twelve (12) of these segments have the designated use of "Fishing" and two segments have the designated uses of "Fishing" and "Drinking Water. A waterbody is assessed as "not supporting" its use if more than ten percent of the geometric means are greater than their seasonal waterbody specific criteria or if more than ten percent of the samples exceed the single sample criteria. The EPA approved water quality criteria in place when these streams were listed are as follows:

(a) Drinking Water Supplies: Those waters approved as a source for public drinking water systems permitted or to be permitted by the Environmental Protection Division. Waters classified for drinking water supplies will also support the fishing use and any other use requiring water of a lower quality.

(i) 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.

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

(i) 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 shellfish growing areas by the Georgia DNR Coastal Resources Division, 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 National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

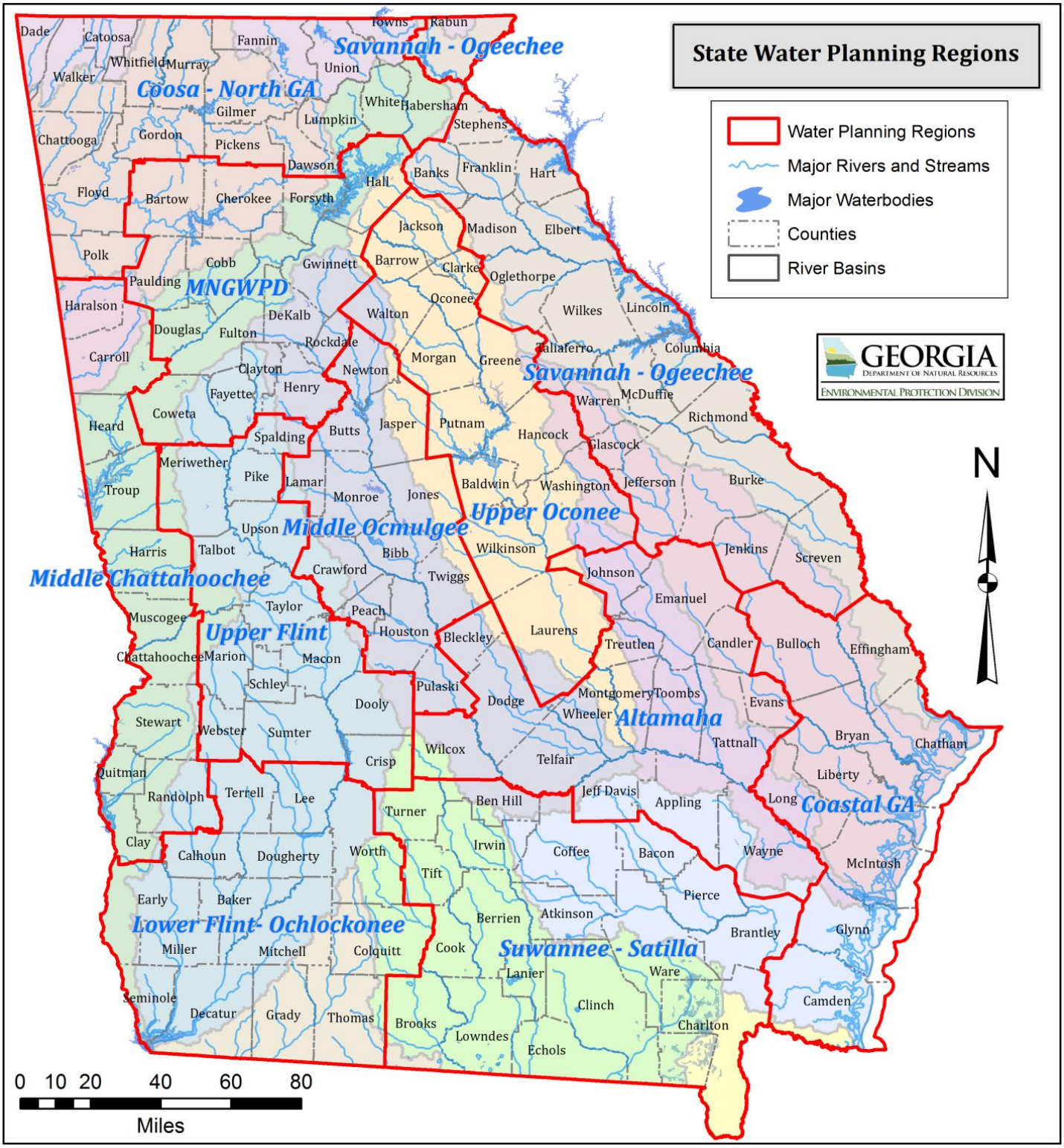

Figure 11: Boundaries of the Regional Water Planning Councils and the Metropolitan North Georgia Water Planning District

In addition to establishing TMDLs for the thirty-three (33) segments discussed above, this document establishes revised TMDLs for fourteen (14) stream segments in the Flint River Basin as presented in Table 3. These fourteen (14) segments have the designated use of "Fishing,"
In January 2022, the Georgia DNR Board adopted new bacteria criteria for "Fishing" and "Drinking Water" designated uses using the bacterial indicators *E. coli* and enterococci. These bacteria are better indicators for human health illnesses. The adopted criteria have the same estimated illness rate (8 per 1000 swimmers) as the previously established fecal coliform criteria. EPA approved the proposed revisions to Georgia's water quality standards August 31, 2022. The current bacteria water quality criteria for "Fishing" and "Drinking Water" designated uses, 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, 2022), are as follows:

In January 2022, the Georgia DNR Board adopted new bacteria criteria for "Fishing" and "Drinking Water" designated uses using the bacterial indicators *E. coli* and enterococci. These bacteria are better indicators for human health illnesses. The adopted criteria have the same estimated illness rate (8 per 1000 swimmers) as the previously established fecal coliform criteria. EPA approved these proposed revisions to Georgia's water quality standards on August 31, 2022. The bacteria water quality criteria for "Drinking Water", and "Fishing" designated uses, as stated in the *State of Georgia's Rules and Regulations for Water Quality Control*, Chapter 391-3-6-.03(6) (GA EPD, 2022), are as follows:

(a) Drinking Water Supplies: Those waters approved as a source for public drinking water systems permitted or to be permitted by the Environmental Protection Division. Waters classified for drinking water supplies will also support the fishing use and any other use requiring water of a lower quality.

(i) Bacteria:

1. For the months of May through October, when primary water contact recreation activities are expected to occur, culturable E. coli not to exceed a geometric mean of 126 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 410 counts per 100 mL in the same 30-day interval.

2. For the months of November through April, culturable E. coli not to exceed a geometric mean of 265 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 861 counts per 100 mL in the same 30-day interval.

3. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

c) Fishing: Propagation of Fish, Shellfish, Game and Other Aquatic Life; primary contact recreation in and on the water for the months of May – October, secondary contact recreation in and on the water for the months of November – April; or for any other use requiring water of a lower quality.

(i) Bacteria:

1. Estuarine waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable enterococci not to exceed a geometric mean of 35 counts 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. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 130 counts per 100 mL the same 30-day interval.

For the months of November through April, culturable enterococci not to exceed a geometric mean of 74 counts 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. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 273 counts per 100 mL in the same 30-day interval.

2. All other fishing waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable E. coli not to exceed a geometric mean of 126 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 410 counts per 100 mL in the same 30-day interval.

   For the months of November through April, culturable E. coli not to exceed a geometric mean of 265 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 861 counts per 100 mL in the same 30-day interval.

3. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

4. For waters designated as shellfish growing areas by the Georgia DNR Coastal Resources Division, 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 National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

Since this TMDL was written after EPA approved the new bacteria criteria, the TMDL will use both fecal coliform and the appropriate indicator identified above based on estuarine/non-estuarine status. Where fecal coliform and *E. coli* were sampled concurrently, the *E. coli* current load can be determined, and the percentage reduction calculated. For impaired waters where only fecal coliform was sampled, the current *E. coli* or enterococci load cannot be determined. In this case the TMDL will use a conversion factor to convert from fecal coliform criteria to *E. coli* or enterococci criteria*,* based on the respective 30-day geometric mean water quality criteria. For non-estuarine waters, a conversion factor of 0.63 will be used to translate the fecal coliform TMDL to *E. coli*. For estuarine waters, a conversion factor of 0.175 will be used to translate the fecal coliform TMDL to enterococci.

Table 4: Flint River Basin Land Coverage

Stream Segment and Station ID	Land Uses (acres)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
Basin Creek	2.0	11.3	114.5	6.9	2.4	143.9	3429.3	6.4	896.7	253.1	219.3	0.0	0.0	5086.0
GAR031300050903	0.0%	0.2%	2.3%	0.1%	0.0%	2.8%	67.4%	0.1%	17.6%	5.0%	4.3%	0.0%	0.0%	100%
Beaver Creek	10.9	113.2	234.0	123.4	85.8	1236.3	5754.5	448.3	1577.7	406.5	1088.2	6.4	0.7	11353.0
GAR031300051313	0.1%	1.0%	2.1%	1.1%	0.8%	10.9%	50.7%	3.9%	13.9%	3.6%	9.6%	0.1%	0.0%	100%
Big Turkey Creek	1.8	3.8	123.7	11.8	0.9	391.2	4038.0	5.8	571.8	266.2	58.9	0.0	0.0	5473.8
GAR031300050711	0.0%	0.1%	2.3%	0.2%	0.0%	7.1%	73.8%	0.1%	10.4%	4.9%	1.1%	0.0%	0.0%	100%
Choctahatchee Creek	2.2	191.0	86.7	3.8	0.7	934.3	14563.1	3791.8	1168.0	647.4	1897.5	15.1	4.9	23306.6
GAR031300070306	0.0%	0.8%	0.4%	0.0%	0.0%	4.0%	62.5%	16.3%	5.0%	2.8%	8.1%	0.1%	0.0%	100%
Dry Creek	11.3	99.6	749.9	196.8	198.2	955.6	9265.2	9194.7	2643.4	1739.1	7148.4	7.1	94.7	32304.2
GAR031300100205	0.0%	0.3%	2.3%	0.6%	0.6%	3.0%	28.7%	28.5%	8.2%	5.4%	22.1%	0.0%	0.3%	100%
Flint River	919.6	13896.6	84282.8	29139.1	23089.3	67948.3	799756.9	31357.3	202933.7	96543.7	129141.2	38.9	773.0	1482427.2
GAR031300051604	0.1%	0.9%	5.7%	2.0%	1.6%	4.6%	53.9%	2.1%	13.7%	6.5%	8.7%	0.0%	0.1%	100%
Harrel Mill Creek	2.2	42.0	33.8	3.1	0.9	110.5	2500.2	1546.8	165.7	148.8	329.6	3.1	0.0	4886.7
GAR031300070204	0.0%	0.9%	0.7%	0.1%	0.0%	2.3%	51.2%	31.7%	3.4%	3.0%	6.7%	0.1%	0.0%	100%
Horse Creek	0.7	74.3	597.8	219.7	123.9	1466.7	11291.9	4542.6	3962.6	998.8	2356.9	1.8	19.3	25657.0
GAR031300051602	0.0%	0.3%	2.3%	0.9%	0.5%	5.7%	44.0%	17.7%	15.4%	3.9%	9.2%	0.0%	0.1%	100%

Stream Segment and Station ID	Land Uses (acres)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
Ichawaynochaway Creek	192.1	1998.4	3797.2	456.1	168.4	8051.4	168729.8	139141.4	27603.0	11914.6	63186.9	190.8	654.7	426084.8
GAR031300090602	0.0%	0.5%	0.9%	0.1%	0.0%	1.9%	39.6%	32.7%	6.5%	2.8%	14.8%	0.0%	0.2%	100%
Keel Creek	0.2	4.2	143.7	28.7	8.5	257.3	4650.3	1979.5	677.9	296.5	4284.0	0.9	26.5	12358.0
GAR031300090902	0.0%	0.0%	1.2%	0.2%	0.1%	2.1%	37.6%	16.0%	5.5%	2.4%	34.7%	0.0%	0.2%	100%
Kennel Creek	0.2	4.4	193.7	54.7	24.2	114.8	1547.9	1.3	292.9	165.5	163.7	0.0	0.0	2563.3
GAR031300050511	0.0%	0.2%	7.6%	2.1%	0.9%	4.5%	60.4%	0.1%	11.4%	6.5%	6.4%	0.0%	0.0%	100%
Kinchafoonee Creek	16.7	297.3	593.6	103.9	43.1	5192.9	95110.1	9142.4	6578.9	3325.0	13525.4	43.1	10.5	133983.0
GAR031300070205	0.0%	0.2%	0.4%	0.1%	0.0%	3.9%	71.0%	6.8%	4.9%	2.5%	10.1%	0.0%	0.0%	100%
Kinchafoonee Creek	20.9	585.3	878.9	134.8	68.9	9995.5	141869.3	17903.5	10096.3	5087.7	21302.3	68.5	19.8	208031.8
GAR031300070305	0.0%	0.3%	0.4%	0.1%	0.0%	4.8%	68.2%	8.6%	4.9%	2.4%	10.2%	0.0%	0.0%	100%
Kiokee Creek	1.3	8.9	48.5	6.4	1.8	272.9	7518.7	2406.3	918.0	431.9	4145.2	1.8	11.8	15773.6
GAR031300090707	0.0%	0.1%	0.3%	0.0%	0.0%	1.7%	47.7%	15.3%	5.8%	2.7%	26.3%	0.0%	0.1%	100%
Lanahassee Creek	0.2	13.3	44.0	2.2	0.7	1017.5	9068.8	779.9	557.8	258.9	1128.4	2.9	0.0	12874.7
GAR031300070202	0.0%	0.1%	0.3%	0.0%	0.0%	7.9%	70.4%	6.1%	4.3%	2.0%	8.8%	0.0%	0.0%	100%
Lazer Creek (formerly Lazar Creek)	1.3	10.9	332.5	25.1	11.3	949.6	9116.4	0.4	1525.4	956.5	514.8	0.0	2.7	13447.1
GAR031300050803	0.0%	0.1%	2.5%	0.2%	0.1%	7.1%	67.8%	0.0%	11.3%	7.1%	3.8%	0.0%	0.0%	100%
Mill Creek	0.2	77.6	263.8	59.6	40.5	190.4	3394.4	2872.0	477.7	508.4	764.4	5.8	4.4	8659.2
GAR031300060203	0.0%	0.9%	3.0%	0.7%	0.5%	2.2%	39.2%	33.2%	5.5%	5.9%	8.8%	0.1%	0.1%	100%

Stream Segment and Station ID	Land Uses (acres)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
Mossy Creek	12.9	56.5	87.8	2.9	0.0	179.5	5552.8	3239.0	921.8	437.9	1390.4	2.7	3.6	11887.7
GAR031300070502	0.1%	0.5%	0.7%	0.0%	0.0%	1.5%	46.7%	27.2%	7.8%	3.7%	11.7%	0.0%	0.0%	100%
Muckalee Creek	113.6	1169.1	5549.9	1109.1	1121.8	6705.7	111086.5	71615.6	28384.3	11320.4	37101.7	59.4	501.1	275838.1
GAR031300071001	0.0%	0.4%	2.0%	0.4%	0.4%	2.4%	40.3%	26.0%	10.3%	4.1%	13.5%	0.0%	0.2%	100%
Pachitla Creek	14.7	146.1	150.1	9.3	6.0	659.2	20997.6	13849.2	3370.4	1084.0	3738.2	5.6	7.3	44037.8
GAR031300090403	0.0%	0.3%	0.3%	0.0%	0.0%	1.5%	47.7%	31.4%	7.7%	2.5%	8.5%	0.0%	0.0%	100%
Patsiliga Creek	25.1	188.8	337.2	59.2	15.8	2034.7	18853.8	962.3	2864.4	824.9	3946.0	3.8	4.4	30731.4
GAR031300051314	0.1%	0.6%	1.1%	0.2%	0.1%	6.6%	61.4%	3.1%	9.3%	2.7%	12.8%	0.0%	0.0%	100%
Pigeon Creek	15.3	119.2	1265.6	273.3	202.8	625.4	12733.4	24.7	3006.3	1468.5	968.3	0.0	18.5	20721.4
GAR031300050706	0.1%	0.6%	6.1%	1.3%	1.0%	3.0%	61.5%	0.1%	14.5%	7.1%	4.7%	0.0%	0.1%	100%
Po Joe Branch	0.9	8.2	37.6	2.4	0.0	30.9	468.6	1017.5	211.3	111.4	349.8	0.9	1.1	2240.6
GAR031300060516	0.0%	0.4%	1.7%	0.1%	0.0%	1.4%	20.9%	45.4%	9.4%	5.0%	15.6%	0.0%	0.0%	100%
Russell Branch	0.0	39.1	87.0	11.3	1.3	323.8	2282.9	0.0	676.3	218.4	156.8	0.0	0.0	3796.9
GAR031300050805	0.0%	1.0%	2.3%	0.3%	0.0%	8.5%	60.1%	0.0%	17.8%	5.8%	4.1%	0.0%	0.0%	100%
Sheep Rock Hollow	0.0	2.2	61.6	4.4	1.3	139.0	1778.3	23.1	313.8	132.8	97.6	0.0	0.0	2554.2
GAR031300050714	0.0%	0.1%	2.4%	0.2%	0.1%	5.4%	69.6%	0.9%	12.3%	5.2%	3.8%	0.0%	0.0%	100%
Shoal Creek	3.6	109.9	2142.1	378.3	352.1	358.5	4490.8	0.2	709.7	1566.1	789.7	0.0	4.2	10992.5
GAR031300050215	0.0%	1.0%	19.5%	3.4%	3.2%	3.3%	40.9%	0.0%	6.5%	14.2%	7.2%	0.0%	0.0%	100%
Tobler Creek	16.7	193.9	727.9	124.8	51.2	2222.6	25569.2	429.0	7674.4	2164.1	1575.0	0.0	1.3	40750.1
GAR031300051006	0.0%	0.5%	1.8%	0.3%	0.1%	5.5%	62.7%	1.1%	18.8%	5.3%	3.9%	0.0%	0.0%	100%

Stream Segment and Station ID	Land Uses (acres)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
Town Branch	2.7	28.7	91.6	59.6	22.5	58.3	577.1	0.9	605.6	133.0	69.6	0.0	1.3	1650.8
GAR031300050610	0.2%	1.7%	5.6%	3.6%	1.4%	3.5%	35.0%	0.1%	36.7%	8.1%	4.2%	0.0%	0.1%	100%
Tributary to Bay Branch	3.6	30.2	46.3	32.0	23.6	9.3	145.7	242.6	330.7	87.2	27.8	0.0	6.0	985.0
GAR031300090505	0.4%	3.1%	4.7%	3.3%	2.4%	0.9%	14.8%	24.6%	33.6%	8.9%	2.8%	0.0%	0.6%	100%
Tributary to Mill Creek	0.0	3.8	75.8	22.9	13.1	36.7	161.5	269.8	224.8	98.3	91.4	0.2	2.4	1000.8
GAR031300060904	0.0%	0.4%	7.6%	2.3%	1.3%	3.7%	16.1%	27.0%	22.5%	9.8%	9.1%	0.0%	0.2%	100%
Tributary to the Red River	7.6	28.7	79.2	24.5	1.8	234.0	3359.9	2180.1	522.2	182.8	551.5	0.2	11.1	7183.6
GAR031300050922	0.1%	0.4%	1.1%	0.3%	0.0%	3.3%	46.8%	30.3%	7.3%	2.5%	7.7%	0.0%	0.2%	100%
Turkey Creek	26.0	57.8	225.5	18.0	6.2	409.4	4231.3	10748.6	1962.4	659.0	2128.8	0.2	36.0	20509.3
GAR031300060409	0.1%	0.3%	1.1%	0.1%	0.0%	2.0%	20.6%	52.4%	9.6%	3.2%	10.4%	0.0%	0.2%	100%
Womble Creek	0.0	21.3	60.7	5.1	3.3	52.5	2329.1	37.1	555.5	187.9	179.0	0.0	0.0	3431.8
GAR031300050918	0.0%	0.6%	1.8%	0.1%	0.1%	1.5%	67.9%	1.1%	16.2%	5.5%	5.2%	0.0%	0.0%	100%
	Revised TMDLs													
Aycocks Creek	9.3	16.9	712.3	81.8	11.8	936.1	19122.9	25019.0	5828.5	2364.7	13956.2	6.4	268.0	68334.0
GAR031300100402	0.0%	0.0%	1.0%	0.1%	0.0%	1.4%	28.0%	36.6%	8.5%	3.5%	20.4%	0.0%	0.4%	100%
Beaver Creek	0.9	26.5	20.2	8.7	0.0	198.2	1725.3	2157.9	424.1	210.4	407.9	0.4	2.4	5182.9
GAR031300060101	0.0%	0.5%	0.4%	0.2%	0.0%	3.8%	33.3%	41.6%	8.2%	4.1%	7.9%	0.0%	0.0%	100%
Buck Creek	17.6	270.2	960.7	177.9	114.1	6673.6	99900.3	11164.9	11421.8	4759.7	13461.6	24.7	12.0	149076.5
GAR031300060201	0.0%	0.2%	0.6%	0.1%	0.1%	4.5%	67.0%	7.5%	7.7%	3.2%	9.0%	0.0%	0.0%	100%

Stream Segment and Station ID	Land Uses (acres)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
Chickasawhatchee Creek	126.3	527.7	1821.2	324.7	208.6	2205.0	53558.3	36504.4	8044.0	4664.7	48224.4	56.5	396.1	156661.9
GAR031300090804	0.1%	0.3%	1.2%	0.2%	0.1%	1.4%	34.2%	23.3%	5.1%	3.0%	30.8%	0.0%	0.3%	100%
Fishpond Drain	21.3	19.1	1105.7	471.7	259.3	491.0	3807.6	22576.9	3747.6	1733.3	3551.0	3.1	147.0	37934.8
GAR031300100704	0.1%	0.1%	2.9%	1.2%	0.7%	1.3%	10.0%	59.5%	9.9%	4.6%	9.4%	0.0%	0.4%	100%
Kinchafoonee Creek	114.8	1448.7	4558.4	793.7	765.3	13842.8	217977.1	86888.8	26277.1	12688.5	54375.1	137.0	445.0	420490.2
GAR031300070604	0.0%	0.3%	1.1%	0.2%	0.2%	3.3%	51.8%	20.7%	6.2%	3.0%	12.9%	0.0%	0.1%	100%
Lazer Creek	7.3	387.2	1453.4	151.7	51.6	5823.0	82635.3	12.9	7674.6	5542.5	5119.5	0.0	124.5	108983.6
GAR031300050801	0.0%	0.4%	1.3%	0.1%	0.0%	5.3%	75.8%	0.0%	7.0%	5.1%	4.7%	0.0%	0.1%	100%
Muckalee Creek	19.3	583.3	2272.9	553.3	630.3	3157.3	62273.0	16529.5	10536.2	4677.4	8322.9	27.8	47.6	109630.9
GAR031300070801	0.0%	0.5%	2.1%	0.5%	0.6%	2.9%	56.8%	15.1%	9.6%	4.3%	7.6%	0.0%	0.0%	100%
Potato Creek	114.8	1305.9	7117.5	1938.2	1415.3	4953.0	59239.1	1347.7	28235.9	8907.8	10069.2	0.0	28.7	124685.1
GAR031300050923	0.1%	1.0%	5.7%	1.6%	1.1%	4.0%	47.5%	1.1%	22.6%	7.1%	8.1%	0.0%	0.0%	100%
Potato Creek	117.9	1425.1	8530.0	2328.0	1733.3	6098.5	78484.8	1384.9	30699.9	10651.4	11040.6	0.0	28.9	152535.2
GAR031300050924	0.1%	0.9%	5.6%	1.5%	1.1%	4.0%	51.5%	0.9%	20.1%	7.0%	7.2%	0.0%	0.0%	100%
Tributary to Nash Creek	0.0	0.0	218.2	121.9	78.3	19.1	106.7	0.0	4.4	112.3	7.6	0.0	0.0	668.5
GAR031300050116	0.0%	0.0%	32.6%	18.2%	11.7%	2.9%	16.0%	0.0%	0.7%	16.8%	1.1%	0.0%	0.0%	100%
Turkey Creek	127.0	369.6	2449.7	565.6	411.2	1873.5	22401.8	61876.1	10640.0	3795.8	13030.1	12.2	209.1	117761.7
GAR031300060405	0.1%	0.3%	2.1%	0.5%	0.3%	1.6%	19.0%	52.5%	9.0%	3.2%	11.1%	0.0%	0.2%	100%

Stream Segment and Station ID	Land Uses (acres)													
	Beaches, Dunes, Mud	Open Water	Developed, Low Intensity	Developed, Medium Intensity	Developed, High Intensity	Transitional, Clearcut, Sparse	Forest	Row Crops	Pasture, Hay	Other Grasses (Developed Open Space, Utility Swaths, Golf Courses)	Forested Wetlands	Non-Forested Wetlands (Salt/Brackish)	Non-Forested Wetlands (Freshwater)	Total
White Oak Creek	74.5	889.4	7399.7	2707.4	1656.4	5224.5	56770.1	392.7	19669.1	8694.8	11358.2	0.0	49.6	114886.4
GAR031300050307	0.1%	0.8%	6.4%	2.4%	1.4%	4.5%	49.4%	0.3%	17.1%	7.6%	9.9%	0.0%	0.0%	100%
White Oak Creek	8.9	229.3	2887.1	2104.3	1331.5	354.1	5727.6	14.7	950.1	2566.0	771.7	0.0	4.0	16949.2
GAR031300050308	0.1%	1.4%	17.0%	12.4%	7.9%	2.1%	33.8%	0.1%	5.6%	15.1%	4.6%	0.0%	0.0%	100%

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. Currently, a stream is placed on this list if more than ten percent of the calculated geometric means exceed their water quality criteria or if more than ten percent of the samples exceed the single sample 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 (mL) during the period May through October, or in excess of 1000 counts per 100 mL during the period November through April, are in violation of the bacteria water quality criteria. There is also a single sample criterion (4000 counts per 100 mL) not to be exceeded at any given time.

Fecal coliform data used for development of the TMDL in this document were collected during calendar years 2014 through 2021 by GA EPD as part of the trend monitoring program. A summary of sampling station locations and sampling dates is given in Table 5. The raw data are presented in Appendix A. Seven streams in which the TMDLs are being revised are currently meeting their water quality standards. These streams may have been listed on spill data, and that is no longer available. An alternative method for calculating the TMDL bacterial loading was developed and will be described in later sections with supporting information in Appendix A.

Table 5: Sampling Stations and Dates – Flint River Basin

Stream Segment	Location	Assessment Unit ID	GA EPD Monitoring Station No.	Monitoring Station Description	GPS Coordinates	Sample Date Range
Basin Creek	Headwaters to Hightower Lake	GAR031300050903	RV_11_16343	Basin Creek at Old Alabama Rd near Thomaston, GA	32.9266, -84.38077	2020
Beaver Creek	Headwaters to Patsiliga Creek, Butler	GAR031300051313	RV_11_17309	Beaver Creek at Hwy 137 near Butler, GA	32.60056, -84.18873	2018
Big Turkey Creek	Hurricane Creek to the Flint River	GAR031300050711	RV_11_3837	Turkey Creek nr Pasley Shoals Rd nr Thomaston, GA	32.881449, -84.477361	2016
Choctahatchee Creek	Rabbit Branch to Kinchafoonee Creek	GAR031300070306	RV_11_17568	Choctahatchee Creek at US Hwy 280 near Plains, GA	32.03432, -84.46729	2019
Dry Creek	Breastworks Branch to tributary 1 mile downstream GA Hwy 200	GAR031300100205	RV_11_3634	Dry Creek at Georgia Highway 200	31.373023, -84.882969	2016
Flint River	Patsiliga Creek to Horse Creek	GAR031300051604	RV_11_17563	Flint River at SR 96 near Reynolds, GA	32.543309, -84.014343	2019
Harrel Mill Creek	Headwaters to Kinchafoonee Creek	GAR031300070204	RV_11_17570	Harrel Mill Creek at Macedonia Church Rd near Preston, GA	32.03878, -84.54044	2019
Horse Creek	Taylor Mill Lake to Flint River	GAR031300051602	RV_11_17310	Horse Creek at Butler Mill Rd near Marshallville, GA	32.47858, -84.09992	2018
Ichawaynochaway Creek	Calhoun County Line to Chickasawhatchee Creek	GAR031300090602	RV_11_17321	Ichawaynochaway Creek @ Rentz Bridge Rd/ CR69	31.33918, -84.51716	2018
Keel Creek	Headwaters to Spring Creek	GAR031300090902	RV_11_16756	Keel Creek at S. Depot St. (SR 37) near Leary, Ga.	31.480181, -84.505528	2018
Kennel Creek	Headwaters to Walnut Creek	GAR031300050511	RV_11_17520	Kennel Creek at SR 18 near Greenville, GA	33.029549, -84.701843	2019
Kinchafoonee Creek	Marion County Line to Lanahassee Creek	GAR031300070205	RV_11_3538	Kinchafoonee Creek at State Road 41 near Preston, GA	32.0536, -84.548056	2018-2019
Kinchafoonee Creek	Lanahassee Creek to Terrell County Line	GAR031300070305	RV_11_17458	Kinchafoonee Creek at Ga Hwy. 45	31.967905, -84.445837	2018-2019
Kiokee Creek	Unnamed tributary 0.25 miles upstream of Old Dawson Road to Tallahassee Creek	GAR031300090707	RV_11_5103	Kiokee Creek at Old Dawson Road near Albany, GA	31.61222, -84.326491	2015
Lanahassee Creek	Headwaters to West Fork Lanahassee Creek	GAR031300070202	RV_11_3799	Lanahassee Creek nr SR153 Wasington St nr Preston, GA	32.112128, -84.498856	2016

Stream Segment	Location	Assessment Unit ID	GA EPD Monitoring Station No.	Monitoring Station Description	GPS Coordinates	Sample Date Range
Lazer Creek (formerly Lazar Creek)	Mossy Branch to Rush Creek	GAR031300050803	RV_11_3800	Lazar Creek at SR116 nr Shiloh, GA	32.790847, -84.606004	2014
Mill Creek	Unnamed tributary 200 ft upstream Clifton Bradley Drive to tributary to Flint River 0.4 miles downstream of Chatham Street	GAR031300060203	RV_11_5107	Mill Creek at GA Hwy 49 near Oglethorpe, GA	32.295999, -84.052	2015
Mossy Creek	Tributary 0.5 miles upstream of John Martin Road to Kinchafoonee Creek	GAR031300070502	RV_11_16330	Mossy Creek at Pleasant Hill Road near Bronwood, GA	31.87844, -84.375904	2016
Muckalee Creek	Sumter Co. Line to tributary at Pirates Cove Nature Park, Leesburg	GAR031300071001	RV_11_3550	Muckalee Creek at State Road 195 near Leesburg, GA	31.776111, -84.139444	2014
Pachitla Creek	Goffs Mill Creek to Carter Creek	GAR031300090403	RV_11_16294	Pachitla Creek at Robin Factory Rd. near Cuthbert, GA	31.664, -84.686999	2016
Patsiliga Creek	Headwaters to McCants Mill Pond	GAR031300051314	RV_11_17312	Patsiliga Creek at N Culverhouse Rd near Butler, GA	32.60207, -84.33327	2018
Pigeon Creek	Tributary to the Flint River	GAR031300050706	RV_11_16365	Pigeon Creek at Shirley Rd near Manchester, GA	32.86578, -84.57839	2016
Po Joe Branch	Tributary 0.6 miles upstream Lamar Road to Lime Creek	GAR031300060516	RV_11_17657	Po Joe Branch at Lamar Rd near Americus, Ga	32.0263, -84.09152	2020
Russell Branch	Headwaters to Lazer Creek	GAR031300050805	RV_11_16369	Russell Branch at Jeff Hendricks Rd. near Woodland, GA	32.78413, -84.50538	2020
Sheep Rock Hollow	Headwaters to the Flint River	GAR031300050714	RV_11_16371	Sheep Rock Hollow at Cove Rd near Woodbury, GA	32.92279, -84.53521	2016
Shoal Creek	Unnamed Tributary 1 mile upstream Andrew Bailey Road to Rock Branch	GAR031300050215	RV_11_17790	Shoal Creek at Lower Fayetteville Rd near Peachtree City, GA	33.39425, -84.63013	2021
Tobler Creek	Headwaters to Swift Creek	GAR031300051006	RV_11_17311	Tobler Creek at Waymanville Rd near Thomaston, GA	32.84167, -84.23178	2018

Stream Segment	Location	Assessment Unit ID	GA EPD Monitoring Station No.	Monitoring Station Description	GPS Coordinates	Sample Date Range
Town Branch	Zebulon WPCP to Elkins Creek	GAR031300050610	RV_11_3691	Town Branch at SR 18	33.101824, -84.355752	2017
Tributary to Bay Branch	Pond 0.3 miles downstream Bay Street to Bay Branch	GAR031300090505	RV_11_5101	Branch Creek at Hartford St near Edison, GA	31.562284, -84.718245	2016
Tributary to Mill Creek	Headwaters to tributary 0.5 miles downstream Fowler Road	GAR031300060904	RV_11_17572	Trib to Mill Creek at Jewel Crowe Rd near Leesburg, GA	31.623937, -83.879562	2019
Tributary to the Red River	Lake Julia to the Red River	GAR031300050922	RV_11_3592	Tributary to Potato Creek at Rocky Botton Rd nr Thomaston, GA	32.93523, -84.28026	2016
Turkey Creek	Little Creek to Jalappa Branch	GAR031300060409	RV_11_17656	Turkey Creek at Parker Store Rd near Unadilla, Ga	32.22832, -83.86525	2020
Womble Creek	Headwaters to Jerry Reeves Creek	GAR031300050918	RV_11_17308	Womble Creek at Old Alabama Rd near Thomaston, GA	32.88639, -84.43287	2018

3.0 SOURCE ASSESSMENT

An important part of the TMDL development process is the identification of potential sources of pollutants causing the waterbody to be listed on the 303(d) list. A source assessment identifies the known and suspected sources and discharges of bacteria in the watershed. Sources are broadly classified as either point or nonpoint sources. The CWA defines a point source as any "discernable, confined, and discrete conveyance including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture." Nonpoint sources are diffuse, and generally, but not always, involve accumulation of bacteria on land surfaces that wash off due to storm events.

3.1 Point Source Assessment

Title IV of the CWA establishes the National Pollutant Discharge Elimination System (NPDES) permit program. Basically, there are two categories of NPDES permits: 1) wastewater treatment facilities, and 2) regulated stormwater discharges.

3.1.1 Wastewater Treatment Facilities

In general, NPDES point source discharge permits are issued to Publicly Owned Treatment Works (POTWs) and Non-Publicly Owned Treatment Works (Non-POTWs) authorizing the discharge of treated wastewater to surface waters. POTWs are commonly associated with city and county owned wastewater treatment facilities; whereas Non-POTWs are associated with industrial, private, and federal facilities. The permits include permit conditions, requirements, and numeric effluent limits developed using federal and state effluent guidelines (secondary treatment standards for POTWs and technology-based limits (TBELs) for Non-POTWs) or on water quality standards (water quality-based effluent limits, WQBELs).

The United States Environmental Protection Agency (USEPA) has developed technology-based standards and guidelines, which establish a minimum standard of pollution control for POTW and Non-POTW discharges without regard for the quality of the receiving waters. For POTWs, EPA has established Secondary Treatment Standards. For Non-POTW, the TBELs are based on Best Practical Control Technology Currently Available (BPT), Best Conventional Control Technology (BCT), Best Available Technology Economically Achievable (BAT), and New Source Performance Standards. The level of control required by each facility is dependent on the source of wastewater generated and the pollutants found in the discharge.

The USEPA and the States have also developed numeric and narrative water quality criteria to protect a stream's designated uses. Typically, these criteria are based on the results of aquatic toxicity tests and/or human health criteria and include a margin of safety. Wastewater NPDES permits also include WQBELs to protect these narrative and numeric water quality criteria and their designated uses. WQBELs ensure water quality standards are met in the receiving water and downstream uses are protected.

For purposes of this TMDL, permitted wastewater treatment facilities are considered point sources, and include POTWs and Non-POTWs. Pollutants discharged from wastewater treatment plants can contribute bacteria to receiving waters. As of 2023, there are twenty-six (2) NPDES

permitted discharges identified in the watershed of the listed segments in the Flint River Basin that could potentially impact streams on the 2022 303(d) list for fecal coliform bacteria. Typically, the contributing watershed for a 303(d) listed segment is defined as the area upstream of the segment.

Table 6 provides the monthly average discharge flow and fecal coliform concentrations for these facilities that currently have bacteria permit limits. These data were obtained from calendar years 2016 through 2021 Discharge Monitoring Reports (DMR). The current permitted flow and fecal coliform concentrations are also included in this table. Table 7 also provides a list of existing Non-POTW discharges without bacteria permit limits. It is possible these facilities could contribute bacteria to receiving water because of the type of treatment processes they employ.

Another potential point source contribution may be a combined sewer system (CSS) that conveys a mixture of raw sewage and stormwater in the same conveyance structure to the wastewater treatment plant and may also have direct discharges (as authorized under a NPDES permit) to waters of the state. These are generally a component of POTWs. When the combined sewage exceeds the capacity of the wastewater treatment plant, the excess is diverted to a combined sewage overflow (CSO) discharge point. The City of Albany has a CSO in Flint River Basin; however, there are no permitted CSO outfalls in the watersheds of the stream segments covered by this TMDL.

3.1.2 Regulated Stormwater Discharges

Discharges of stormwater authorized under a NPDES permit are considered a point source. Unlike other wastewater NPDES permits that establish end-of-pipe effluent limits, stormwater NPDES permits establish best management practices (BMPs) and controls that are intended to reduce the quantity of pollutants that stormwater picks up and carries into storm sewer systems during rainfall events “to the maximum extent practicable.” Currently, regulated stormwater discharges that may contain bacteria, consist of those associated with industrial activities and large, medium, and small municipal separate storm sewer systems (MS4s) that serve populations of 10,000 or more.

3.1.2.1 Industrial General Stormwater NPDES Permit

Stormwater discharges associated with industrial activities are currently covered under the 2022 NPDES General Permit for Stormwater Discharges Associated with Industrial Activity (GAR050000) also called the Industrial General Permit (IGP). This permit requires visual monitoring of stormwater discharges, site inspections, implementation of BMPs, preparation of a Storm Water Pollution Prevention Plan (SWPPP), and annual reporting. The IGP requires that stormwater discharging into an impaired stream segment or within one linear mile upstream of, and within the same watershed as, any portion of an impaired stream segment identified as “not supporting” its designated use(s), must satisfy the requirements of Appendix C of the 2022 IGP, if the pollutant(s) of concern for which the impaired stream segment has been listed may be exposed to stormwater as a result of industrial activity at the site. If a facility is covered under Appendix C of the IGP, then benchmark monitoring for the pollutant(s) of concern is required. Delineations of both supporting and not supporting waterbodies are provided on the GA EPD website, and are available in ESRI ArcGIS shapefile format or in KMZ format for use in Google Earth. Interested parties may evaluate their proximity to not supporting waterbodies by utilizing these geospatial files.

Table 6: NPDES Facilities Discharging Fecal Coliform in the Flint River Basin

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)	Actual Discharge (2016–2021)		NPDES Permit Limits		Number of Spills[c]
				Avg. Monthly Flow (MGD)[a]	Avg. Monthly fecal coliform (#/100mL)[b]	Avg. Monthly Flow (MGD)	Avg. Monthly fecal coliform (#/100mL)	
Americus, City of (Mill Creek WPCP)	GA0047767	Muckalee Creek	Muckalee Creek GAR031300071001	2.40	11.64	4.40	200	2
Blakely, City of (Blakely WPCP)	GA0025585	Baptist Branch	Dry Creek GAR031300100205	1.35	19.90	2.00	200	4
Cuthbert, City of (Cuthbert WPCP)	GA0037249	Town Branch	Ichawaynochaway Creek GAR031300090602	0.31	33.77	0.60	200	2
Edison, City of (Edison WPCP)	GA0037427	Unnamed tributary to Bay Branch	Ichawaynochaway Creek GAR031300090602 Tributary to Bay Branch GAR031300090505	0.13	73.04	0.25	200	0
Ellaville, City of (Ellaville WPCP)	GA0050105	Unnamed Tributary to Little Muckalee Creek	Muckalee Creek GAR031300071001	0.14	14.42	0.40	200	0
Greenville, City of (Kennel Creek WPCP)	GA0047813	Kennel Creek	Kennel Creek GAR031300050511	0.17	50.46	0.25	200	4
Leary, City of (Leary WPCP)	GA0026212	Keel Creek	Keel Creek GAR031300090902	0.07	371.42	0.10	200	2
Reynolds, City of (Reynolds WPCP)	GA0020729	Patsiliga Creek	Flint River GAR031300051604	0.15	29.29	0.16	200	0
Roberta, City of (Roberta WPCP)	GA0020834	Unnamed tributary to Culpepper Creek	Flint River GAR031300051604	0.14	4.17	0.44	200	0
Smithville, City of (Smithville WPCP)	GA0047422	Muckaloochee Creek	Muckalee Creek GAR031300071001	0.06	9.77	0.12	200	1
Taylor County Board of Commissioners (Plant Laurel WPCP)	GA0000302	Horse Creek	Horse Creek GAR031300051602	ND	ND	0.12	200	0

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)	Actual Discharge (2016–2021)		NPDES Permit Limits		Number of Spills[c]
				Avg. Monthly Flow (MGD)[a]	Avg. Monthly fecal coliform (#/100mL)[b]	Avg. Monthly Flow (MGD)	Avg. Monthly fecal coliform (#/100mL)	
Tri-City Housing Authority (Tri City Housing Authority WPCP)	GAG550074	Russell Branch	Russell Branch GAR031300050805	0.003	203.3	0.01	200	0
Zebulon, City of (Zebulon WPCP)	GA0049476	Town Branch to Elkins Creek	Town Branch GAR031300050610	ND	ND	.286	200	1
Revised TMDLs								
Americas Best Value Inn WPCP	GA0022632	Unnamed Tributary to White Oak Creek	White Oak Creek GAR031300050307 White Oak Creek GAR031300050308	0.01	66.16	0.03	200	0
Buena Vista, City of (Buena Vista WPCP)	GA0023710	Unnamed Tributary of Oochee Creek	Buck Creek GAR031300060201	0.21	39.18	0.40	200	1
Byromville, Town of (Byromville WPCP)	GA0025623	Turkey Creek	Turkey Creek GAR031300060405	0.01	46.51	0.10	200	0
Coweta County Water & Sewerage Authority (Shenandoah WPCP)	GA0038822	White Oak Creek	White Oak Creek GAR031300050307 White Oak Creek GAR031300050308	1.02	11.99	6.0	200	11
Coweta Hills Community (Coweta Hills WPCP)	GAG550010	Unnamed Tributary to Turkey Creek	White Oak Creek GAR031300050307 White Oak Creek GAR031300050308	0.02	323.9	0.04	200	
Dawson, City of (Dawson WPCP)	GA0021326	Brantley Creek	Chickasawhatchee Creek GAR031300090804	1.38	58.90	2.50	200	29
Donalsonville, City of (H. M. Shingler WPCP)	GA0026123	Fish Pond Drain	Fishpond Drain GAR031300100704	0.50	137.08	1.00	200	3

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)	Actual Discharge (2016–2021)		NPDES Permit Limits		Number of Spills[c]
				Avg. Monthly Flow (MGD)[a]	Avg. Monthly fecal coliform (#/100mL)[b]	Avg. Monthly Flow (MGD)	Avg. Monthly fecal coliform (#/100mL)	
Ellaville, City of (Ellaville WPCP)	GA0050105	Unnamed Tributary to Little Muckalee Creek	Muckalee Creek GAR031300070801	0.14	14.42	0.40	200	0
Georgia Baptist Children's Home and Family Ministries, Inc. (Meansville Campus WPCP)	GA0022314	Unnamed Tributary to Three Mile Creek	Potato Creek GAR031300050923 Potato Creek GAR031300050924	ND	ND	.008	200	0
Lee County Utilities Authority (Kinchafoonee Creek WPCP)	GA0026603	Kinchafoonee Creek	Kinchafoonee Creek GAR031300070604	0.57	5.15	0.70	100	1
Leesburg, City of (Leesburg WPCP)	GA0026638	Kinchafoonee Creek	Kinchafoonee Creek GAR031300070604	0.65	7.85	1.20	200	0
Plains, City of (Plains WPCP)	GA0020931	Pessell Creek	Kinchafoonee Creek GAR031300070604	0.05	17.09	0.12	200	4
Richland, City of (Richland WPCP)	GA0021539	Bear Creek	Kinchafoonee Creek GAR031300070604	0.20	1445.79	0.30	-	0
Talbotton, City of (Talbotton WPCP)	GA0047805	Edward Creek	Lazer Creek GAR031300050801	0.08	55.63	0.10	200	2
Thomaston, City of (Bell Creek WPCP)	GA0020079	Potato Creek	Potato Creek GAR031300050924	0.97	7.54	2.00	200	14
Thomaston, City of (Town Branch WPCP)	GA0030121	Potato Creek	Potato Creek GAR031300050924	0.88	2.25	2	200	13
Tri-City Housing Authority (Tri City Housing Authority WPCP)	GAG550074	Russell Branch	Lazer Creek GAR031300050801	0.003	203.3	0.01	200	0

Source: GA EPD – Discharge Monitoring Report (DMR data from ICIS-NPDES)

Notes: [a] - Values shown are the average of the monthly average flows reported in DMRs.

[b] - Values shown are the annual average of the monthly geometric means.

[c] - From GAPDES self-reported spill monitoring system.

ND – Facility was not discharging during this period.

Table 7: NPDES Non-POTW Facilities without Bacteria Permit Limits that Discharge to 303(d) Listed Stream Segments in the Flint River Basin

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)
Berry Global Films, LLC	GA0050307	Wasp Creek	Potato Creek GAR031300050923
			Potato Creek GAR031300050924

3.1.2.2 MS4 NPDES Permits

The collection, conveyance, and discharge of diffuse stormwater to local waterbodies by a public entity are regulated in Georgia by the NPDES MS4 permits. These MS4 permits have been issued under two phases. Phase I MS4 permits cover medium and large cities, and counties with populations over 100,000. Each individual Phase I MS4 permit requires the prohibition of non-stormwater 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. A program to monitor and control pollutants in stormwater discharges from industrial facilities, construction sites, and highly visible pollutant sources that exist within the MS4 area must be implemented under the permit. Additionally, monitoring of not supporting streams, public education and involvement, post-construction stormwater controls, low impact development, and annual reporting requirements must all be addressed by the permittee on an ongoing basis. As of 2022, fifty-seven (57) counties and municipalities are covered by Phase I MS4 permits in Georgia.

Small MS4s serving urbanized areas are required to obtain a stormwater permit under the Phase II stormwater regulations. An urbanized area is defined as an area with a residential population of at least 10,000 people and an overall population density of at least 1,000 people per square mile. As of 2022, Seventy-three (73) municipalities, thirty-five (35) counties, five (5) Department of Defense facilities, and the Georgia Department of Transportation (GDOT) are permitted under the Phase II stormwater regulations in Georgia. All municipal Phase II permittees are authorized to discharge under General NPDES Stormwater Permit GAG610000. Department of Defense facilities are authorized to discharge under General NPDES Stormwater Permit GAG480000. GDOT owned or operated facilities are authorized to discharge under General NPDES Stormwater Permit GAR041000.

Under these general permits, each permittee must design and implement a SWMP that incorporates BMPs that focus on public education and involvement, illicit discharge detection and elimination, construction site runoff control, post-construction stormwater management, and pollution prevention in municipal operations. Table 8 provides the Phase I or Phase II counties, communities, and other entities covered by MS4s Permits in the Flint River Basin. There are thirteen (13) permitted MS4s that discharge into or upstream of a stream segment not supporting its designated use for bacteria.

Table 8: Permitted MS4s in the Flint River Basin

Permit No.	MS4 Permittee	MS4 Phase	Impaired Stream Watershed
GAG610000	Coweta County	Phase 2 > 10,000	Shoal Creek GAR031300050215 White Oak Creek GAR031300050308
GAG610000	Dougherty County	Phase 2 > 10,000	Chickasawhatchee Creek GAR031300090804 Kiokee Creek GAR031300090707
GAG610000	Fayette County	Phase 2 > 10,000	Tributary to Nash Creek GAR031300050116
GAG610000	Fayetteville, City of	Phase 2 > 10,000	Tributary to Nash Creek GAR031300050116
GAG480000	Fort Benning	Phase 2 DOD	Kinchafoonee Creek GAR031300070205
GAG610000	Griffin, City of	Phase 2 < 10,000	Potato Creek GAR031300050923 Potato Creek GAR031300050924
GAG610000	Houston County	Phase 2 > 10,000	Turkey Creek GAR031300060405 Turkey Creek GAR031300060409
GAG610000	Lee County	Phase 2 > 10,000	Kiokee Creek GAR031300090707 Muckalee Creek GAR031300071001 Chickasawhatchee Creek GAR031300090804 Kinchafoonee Creek GAR031300070604
GAG610000	Leesburg, City of	Phase 2 < 10,000	Kinchafoonee Creek GAR031300070604 Muckalee Creek GAR031300071001
GAG610000	Newnan, City of	Phase 2 > 10,000	White Oak Creek GAR031300050308 White Oak Creek GAR031300050308
GAG610000	Peach County	Phase 2 > 10,000	Flint River GAR031300051604
GAG610000	Spalding County	Phase 2 > 10,000	Potato Creek GAR031300050923 Potato Creek GAR031300050924
GAG410000	Georgia Department of Transportation	Phase 2	All segments related to other Phase 2 permittees in this table

Source: Nonpoint Source Program, GA DNR, 2022

For those listed segments whose contributing watersheds intersect with the jurisdiction of MS4 permit holders in the Flint River Basin, Table 9 provides the listed segment, total contributing watershed area and percentage of the watershed area that consists of urban land use types. Urbanized areas include land uses identified as residential, commercial, industrial, and transportation, as well as lawns, parks, and greenspace. These areas are quantified using the land use categories of low, medium, and high intensity developed, and other grasses as presented in Table 4.

Table 9: Urban Land Use Percentage for Listed Segments with MS4 Permit Contributions

Stream Segment	Location	Reach AUID	Total Watershed Area (acres)	Urban Land Use Percentage
Muckalee Creek	Sumter Co. Line to tributary at Pirates Cove Nature Park, Leesburg	GAR031300071001	275326.3838	0.19%
Shoal Creek	Unnamed Tributary 1 mile upstream Andrew Bailey Road to Rock Branch	GAR031300050215	10933.91074	30.43%
Revised TMDLs				
Kinchafoonee Creek	Ga. Hwy. 45 (Webster Co. Line) to Lake Chehaw/Worth	GAR031300070604	419706.0368	0.72%
Potato Creek	Hoyle Branch to the Flint River, near Thomaston	GAR031300050924	152181.619	0.56%
Potato Creek	Drake Branch to Hoyle Branch	GAR031300050923	124418.967	1.35%
Tributary to Nash Creek	Fayetteville	GAR031300050116	661.4519243	79.99%
White Oak Creek	Little White Oak Creek to Flint River near Alvaton	GAR031300050307	114609.2706	56.74%
White Oak Creek	Newnan - I-85 to Chandlers Creek	GAR031300050308	16845.15349	6.41%

3.1.3 Concentrated Animal Feeding Operations

Animal feeding operations (AFOs) are agricultural operations where animals are kept and raised in confined situations. AFOs that meet the regulatory definition of a concentrated animal feeding operation (CAFO) are regulated under the NPDES permitting program. The NPDES program regulates the discharge of pollutants from point sources to waters of the state. From 1999 through 2001, Georgia adopted rules for permitting swine and non-swine liquid manure animal feeding operations (AFOs). Georgia rules required medium size AFOs with more than 300 animal units (AU), but less than 1,000 AU, to apply for a non-discharge state land application system (LAS) waste disposal permit. Large operations with more than 1000 AU were required to apply for an NPDES permit (also non-discharge) as a CAFO. The USEPA CAFO regulations were successfully appealed in 2005. They were revised to comply with the court's decision that NPDES permits only be required for actual discharges. Georgia's rules were amended on August 7, 2012, to reflect the USEPA revisions. The revised state rules authorize LAS permitting of medium and large size liquid manure AFOs unless they elect to obtain an NPDES permit. There are no known liquid manure CAFO located in the watersheds of the listed segments in the Flint River Basin that have NPDES or land application permits. There is one known liquid manure CAFO located in the watersheds

of the listed segments that was previously permitted under Georgia rules that no longer meets the size that is required for permit coverage.

In 2002, the USEPA promulgated expanded NPDES permit regulations for CAFOs that added dry manure poultry operations larger than 125,000 broilers or 82,000 layers. In accordance with the Georgia rule amendment discussed above, the general permit covering these facilities has been terminated and they are no longer covered under any permit. Georgia is consistently among the top three states in the U.S. in terms of poultry operations. Most poultry farms are dry manure operations where the manure is stored for a time and then land applied. Freshly stored litter can be a nonpoint source of bacteria. However, land-applied litter previously stored for an extended length of time typically exhibits very low bacteria levels. Table 10 presents the current swine and non-swine (primarily dairies) CAFOs located in the Flint River Basin and indicates those that may impact the listed streams**.**

Table 10: Permitted CAFOs in the Flint River Basin

Name	Permit No.	County	Animal Type	Total No. of Animals Units	Impaired Stream Watershed
Leatherbrook Holsteins	GAG940016	Sumter	Dairy	> 1000	Muckalee Creek GAR031300071001
Revised TMDLs					
Oak Hill Dairy	GAG930068	Lee	Dairy	4,860	Kinchafoonee Creek GAR031300070604
Windy Hill Dairy Inc. (Bud Butcher Dairy)	GAG920058	Coweta	Dairy	301-1000	White Oak Creek GAR031300050307

Source: Georgia Pollutant Discharge Elimination System, GA EPD, 2023

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 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 stormwater 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 previously described in Section 3.1.2.

3.2.1 Wildlife

The significance of wildlife as a source of bacteria in streams varies considerably depending on the animal species present in the watershed. Based on information provided by the Wildlife Resources Division (WRD) of GA DNR, the greatest wildlife sources of bacteria are the animals that spend a large portion of their time in or around aquatic habitats. Of these, waterfowl, especially ducks and geese, are the most significant source, because when present, they are typically found in large numbers on the water surface. Other 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 substantial presence in the floodplain areas of the major rivers in Georgia.

White-tailed deer populations are also abundant throughout the Flint River Basin. Bacteria contributions to waterbodies from deer are generally considered to be 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, 2007). However, feces deposited on the land surface can result in the introduction of bacteria to streams during runoff events. Between storm events, considerable decomposition of the fecal matter might occur, resulting in a decrease in the associated bacteria numbers.

3.2.2 Agricultural Livestock

Agricultural livestock are a potential source of bacteria to streams in the Flint River Basin. The animals grazing on pastureland deposit their feces onto land surfaces, where it can then be transported during storm events to nearby streams. Animal access to pastureland varies monthly, resulting in varying bacteria loading rates throughout the year. Beef cattle spend all 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).

Commercial chickens are raised indoors, and their litter is periodically disposed of. The litter can be aged or composted. This results in the decomposition of the litter into a soil amendment that can be used as a fertilizer. The stockpiled manure should be kept in a sheltered area. Proper composting should generate temperatures of 140^{o}F to 160^{o}F, which destroys bacteria. Aging the manure and litter reduces populations of microbes by providing unfavorable growing conditions causing the bacteria to gradually die off due to changes in moisture content and temperature. Table 11 provides the estimated number of beef cattle, dairy cattle, goats, horses, swine, sheep, and chickens reported by county.

Table 11: Estimated Agricultural Livestock Populations in Counties Containing the 303(d) Listed Segment Watershed in the Flint River Basin

County	Livestock								
	Beef Cattle	Dairy Cattle	Swine	Sheep	Horses	Goats	Chickens		
							Broilers	Layers	Pullets
Baker	22,364	-	1,004	50	330	2,000	3,013,482	150,830	-
Calhoun	7,127	-	30	-	50	75	7,640,705	-	-
Chattahoochee	-	-	-	-	-	-	970,527	-	-
Clay	5,857	-	-	-	-	120	-	-	-
Clayton	802	-	-	80	257	1,650	-	-	-
Colquitt	13,772	-	5,022	50	450	650	54,915,247	220,952	196,470
Coweta	4,185	389	-	50	1,000	300	-	-	-
Crawford	2,697	-	-	-	50	-	12,707,067	-	-
Crisp	1,744	1,600	-	-	344	1,201	2,377,790	-	-
Decatur	21,412	1,200	50	50	200	400	5,795,493	23,815	-
Dooly	3,056	-	-	-	30	210	5,880,657	33,077	-
Dougherty	2,197	-	3	50	1,900	150	502,247	-	-
Early	20,619	-	55	1,000	-	3,502	-	23,815	-
Fayette	922	22	9	72	384	50	-	-	-
Fulton	1,489	-	20	250	2,286	450	-	-	-
Grady	19,665	515	176	30	290	250	15,682,116	31,092	83,916
Henry	2,028	40	-	-	1,500	400	-	-	-
Houston	5,231	434	-	78	350	405	2,183,682	82,692	-
Lamar	5,604	204	-	150	400	600	6,921,727	-	-
Lee	3,923	3,000	15	10	275	200	-	-	-
Macon	2,310	15,500	150	80	300	1,776	23,643,156	243,775	193,873
Marion	3,800	-	-	1,000	70	500	9,416,519	16,538	33,300
Meriwether	8,958	425	100	500	450	200	-	-	-
Miller	-	-	-	-	-	-	2,511,235	-	-
Mitchell	27,149	4,250	-	150	850	600	22,354,357	126,353	22,644
Monroe	6,789	167	50	1,350	500	450	8,225,932	-	-
Peach	433	-	-	50	250	100	-	-	-
Pike	3,832	189	-	75	485	400	1,574,435	-	-
Randolph	6,864	-	100	105	20	115	-	-	-
Schley	2,500	-	-	90	30	200	5,155,920	-	-
Seminole	11,151	91	401	-	345	-	-	-	-

County	Livestock								
	Beef Cattle	Dairy Cattle	Swine	Sheep	Horses	Goats	Chickens		
							Broilers	Layers	Pullets
Spalding	3,000	100	-	100	185	200	436,736	-	-
Stewart	325	-	30	0	75	85	0	0	0
Sumter	4562	6400	0	150	138	600	5064931	33077	0
Talbot	732	-	50	0	300	400	0	0	0
Taylor	2377	-	40	80	100	150	5056437	0	0
Terrell	3500	-	0	50	400	600	0	0	0
Turner	8674	-	0	65	0	250	2765514	0	0
Upson	6277	72	0	350	350	2001	6491542	0	21046
Webster	4652	-	0	0	30	0	0	0	0
Worth	21098	-	0	75	340	2502	3907334	27784	0
Total	221,478	28,126	7,186	5,420	13,581	17,157	191,909,030	952,939	530,203

Source: Center for Agribusiness and Economic Development, UGA 2022

3.2.3 Urban Development

Bacteria 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 bacteria from domestic animals and urban wildlife. Bacteria enter streams by direct wash-off from the land surface, or the runoff may be diverted to a stormwater collection system and discharged through a discrete outlet structure. For large, medium, and small urban areas (populations greater than 10,000), the stormwater outlets are regulated under MS4 permits (see Section 3.1.2). For smaller urban areas, the stormwater discharge outlets currently remain unregulated.

In addition to urban animal sources of bacteria, 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, but this may not occur in unpermitted storm sewer systems. Bacteria may also enter streams from leaky sewer pipes, or during storm events when inflow and infiltration can cause sewer overflows.

3.2.3.1 Leaking Septic Systems

A portion of the bacteria contributions in the Flint River Basin may be attributed to failure of septic systems and illicit discharges of raw sewage. Table 12 below presents the number of septic systems existing at the end of 2015 and the number existing at the end of 2020 in counties in the Flint River Basin. These data are based on data provided by the Georgia Department of Public Health and information obtained from the U.S. Census. In addition, an estimate of the number of septic systems installed and repaired during the period from 2015 through 2020 is given. These data show an increase in the number of septic systems in all counties. Often, this reflects population increases outpacing the expansion of sewage collection systems.

Table 12: Estimated Number of Septic Systems in Counties within the Flint River Basin

County	Existing Septic Systems (2015)	Existing Septic Systems (2020)	Number of Septic Systems Installed (2015 to 2020)	Number of Septic Systems Repaired (2015 to 2020)
Baker	1,996	2,053	57	50
Calhoun	1,266	1,306	40	27
Chattahoochee	1,221	1,247	26	17
Clay	1,319	1,373	54	43
Clayton	14,239	14,311	72	303
Colquitt	13,224	13,566	342	339
Coweta	32,727	35,195	2,468	1,389
Crawford	4,573	4,730	157	119
Crisp	5,626	5,771	145	123
Decatur	10,010	10,278	268	306
Dooly	2,616	2,671	55	35
Dougherty	9,286	9,409	123	584
Early	4,284	4,384	100	111
Fayette	21,556	22,623	1,067	1,301
Fulton	28,168	28,992	824	628
Grady	8,467	8,811	344	252
Henry	38,997	40,226	1,229	699
Houston	19,112	19,926	814	628
Lamar	5,889	6,279	390	142
Lee	9,794	10,199	405	795
Macon	2,651	2,743	92	47
Marion	2,496	2,637	141	41
Meriwether	9,146	9,518	372	186
Miller	2,682	2,750	68	73
Mitchell	7,537	7,709	172	244
Monroe	10,007	10,738	731	261
Peach	6,721	6,931	210	132
Pike	7,620	8,190	570	205
Randolph	1,826	1,885	59	36
Schley	1,514	1,605	91	19
Seminole	4,721	4,823	102	124

County	Existing Septic Systems (2015)	Existing Septic Systems (2020)	Number of Septic Systems Installed (2015 to 2020)	Number of Septic Systems Repaired (2015 to 2020)
Spalding	16,513	16,897	384	548
Stewart	1,118	1,170	52	16
Sumter	6,946	7,052	106	136
Talbot	2,962	3,069	107	42
Taylor	2,946	3,051	105	11
Terrell	2,883	2,950	67	90
Turner	2,148	2,212	64	61
Upson	8,496	8,659	163	230
Webster	1,320	1,373	53	10
Worth	7,773	7,957	184	304
Total	344,394	357,267	12,873	10,707

Source: The Georgia Dept. of Public Health, Environmental Health Section, 2022

3.2.3.2 Land Application Systems

Some communities and industries use land treatment systems for wastewater disposal. These facilities are required through land application system (LAS) permits to dispose of their treated wastewater by land application, and to operate as non-discharging systems that do not contribute wastewater effluent runoff to surface waters. However, sometimes the soil's percolation rate is exceeded when applying the wastewater, or encountering excess precipitation, resulting in runoff. This runoff could contribute bacteria to nearby surface waters. Runoff of stormwater might also carry surface residual containing bacteria. Listed in Table 13 below are the LASs in the Flint River Basin that could potentially impact the stream segments in this TMDL are identified.

Table 13: Permitted Land Application Systems in the Flint River Basin

LAS Name	Permit No.	County	Type	Flow (MGD)	Impaired Stream Watershed
American Proteins, Inc. (Cuthbert Division)	GAJ010509	Randolph	Industrial	Report* permit ended 2018-10-31. Renewal in progress	Ichawaynochaway Creek GAR031300090602 Pachitla Creek GAR031300090403
Butler, City of (Butler WPCP)	GAJ020074	Taylor	Municipal	0.63	Beaver Creek GAR031300051313 Flint River GAR031300051604
Manchester, City of (Pigeon Creek WPCP)	GAJ020081	Meriwether	Municipal	0.812	Pigeon Creek GAR031300050706
Morgan, City of (Morgan WPCP)	GAJ020076	Calhoun	Municipal	0.32	Ichawaynochaway Creek GAR031300090602

LAS Name	Permit No.	County	Type	Flow (MGD)	Impaired Stream Watershed
Tyson Farms, Inc. (Oglethorpe Hatchery)	GAJ010457	Macon	Industrial	0.0245	Mill Creek GAR031300060203
Revised TMDLs					
Georgia Department of Corrections (Lee State Prison WPCP)	GAJ020284	Lee	Municipal	0.134	Kinchafoonee Creek GAR031300070604
Vienna, City of (North WPCP)	GAJ020167	Dooly	Municipal	1.6	Turkey Creek GAR031300060405
Vienna, City of (South WPCP)	GAJ020244	Dooly	Municipal	0.75	Turkey Creek GAR031300060405

Source: Georgia Pollutant Discharge Elimination System, GA EPD, Atlanta, Georgia, 2022

3.2.3.3 Landfills

Leachate from landfills may contain bacteria that could at some point reach surface waters. Sanitary (or municipal landfills) are the most likely to serve as a source of 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. Table 14 provides the landfills located in the Flint River Basin.

Table 14: Permitted Landfills in the Flint River Basin

Facility Name	Permit Number	County	Interest Type	Operating Status
Andersonville - Freeman St (L)	129-010D(L)	Sumter	SW- Construction & Demolition Landfill	Closed/PCC
Baconton, City of (L)	101-005D(L)	Mitchell	SW- Construction & Demolition Landfill	Archived
Bainbridge - Ave C (L)	043-004D(L)	Decatur	SW- Construction & Demolition Landfill	Closed/PCC
Barnesville - Goggins Rd (L)	085-005D(L)	Lamar	SW- Construction & Demolition Landfill	Archived
BASF Corporation- Attapulgus (LI)	-	Decatur	SW- Private Industrial Landfill	-
BASF Corporation-Attapulgus Filter Cake-Phase 3	-	Decatur	SW- Private Industrial Landfill	-
BASF Corporation-Attapulgus-General Refuse (LI)	-	Decatur	SW- Private Industrial Landfill	-
BFI Landfill	056-012D(SL)	Fayette	SW- Municipal Solid Waste Landfill	Closed/PCC
Cairo Municipal Solid Waste Landfill	065-002D(SL)	Grady	SW- Municipal Solid Waste Landfill	Operating
Calhoun Co - SR 45 Morgan (SL)	019-004D(SL)	Calhoun	SW- Municipal Solid Waste Landfill	Closed/PCC
Cannon-Melton Landfill Holdings, LLC	047-018D(L)	Dougherty	SW- Construction & Demolition Landfill	Closed/PCC

Facility Name	Permit Number	County	Interest Type	Operating Status
Cemex Clinchfield Landfill	-	Houston	SW- Private Industrial Landfill	-
Clayton Co-SR 3 Lovejoy Site # 3	031-037D(SL)	Clayton	SW- Municipal Solid Waste Landfill	Operating
Clayton County Landfill dba Clayton County Transportation and Development Dept.	031-027D(SL)	Clayton	SW- Municipal Solid Waste Landfill	Closed/PCC
Colquitt Co - CR 15 Sunset Ph 1 (SL)	035-002D(SL)	Colquitt	SW- Municipal Solid Waste Landfill	Closed/PCC
Cordele - US 41 S Ph 2 (SL)	040-004D(SL)	Crisp	SW- Municipal Solid Waste Landfill	Closed/PCC
Crawford Co - CR 49 Roberta (SL)	039-005D(SL)	Crawford	SW- Municipal Solid Waste Landfill	Closed/PCC
Crawford Co - SR 341/Hopeville Rd (SL)	039-006D(SL)	Crawford	SW- Municipal Solid Waste Landfill	Closed/PCC
Crisp County Landfill	040-006P(RM)	Crisp	SW- Material Recovery Facility	Closed/PCC
Decatur Co-SR 309 Bainbridge Ph 2 (SL)	043-006D(SL)	Decatur	SW- Municipal Solid Waste Landfill	Closed/PCC
Decatur County Solid Waste Facility	043-011D(MSWL)	Decatur	SW- Municipal Solid Waste Landfill	Operating
Donaldsonville - SR 39 N (L)	100-005D(L)	Miller	SW- Construction & Demolition Landfill	Closed/PCC
Dooly Co - CR 101 (SL)	046-006D(SL)	Dooly	SW- Construction & Demolition Landfill	Closed/PCC
Dooly Co - US 41 (SL)	046-001D(SL)	Dooly	SW- Municipal Solid Waste Landfill	Archived
Dougherty County Landfill	047-014D(SL)	Dougherty	SW- Municipal Solid Waste Landfill	Operating
Erth Products, LLC	152-007P(CO)	Webster	SW- Composting	Operating
Esary - Dundee Mills (COI)	114-008P(COI)	Spalding	SW- Composting	Closed/PCC
Fauconniere/Buckeye Cellouse - Stge Cch Rd (LI)	-	Sumter	SW- Private Industrial Landfill	-
Fayette Co - 1st Manassas Mile Rd N Side (L)	056-015D(L)	Fayette	SW- Construction & Demolition Landfill	Closed/PCC
Fayette Co - Grady Ave Ph 2 (SL)	056-006D(SL)	Fayette	SW- Municipal Solid Waste Landfill	Closed/PCC
Fayette County Transfer Station	056-014D(SL)	Fayette	SW- Municipal Solid Waste Landfill	Closed/PCC
Forest Park - Jones Rd Ext (L)	031-023D(L)	Clayton	SW- Construction & Demolition Landfill	Archived
Forest Park - Jones Rd Ph 3 (L)	031-031D(L)	Clayton	SW- Construction & Demolition Landfill	Closed/PCC
Forsyth, Old Brent Rd, Ph 1 & 2	102-002D(SL)	Monroe	SW- Municipal Solid Waste Landfill	Closed/PCC
GA Power - Plant Scherer PH 3 (LI)	-	Monroe	SW- Private Industrial Landfill	-
Georgia Power - Plant Scherer	-	Monroe	SW- Private Industrial Landfill	-
Georgia Power Company	PBR-060-012IL	Fulton	SW- Inert Landfill	Closed

Facility Name	Permit Number	County	Interest Type	Operating Status
Green Gro - CR 61 (P-CO)	152-004P(CO)	Webster	SW- Composting	Closed/PCC
Greenco Environmental, LLC	085-008P(CO)	Lamar	SW- Composting	Released
Griffin - Shoal Creek Rd (SL)	126-003D(SL)	Spalding	SW- Municipal Solid Waste Landfill	Closed/PCC
Henry Co - W Asbury Rd Ph 1 (SL)	075-015D(SL)	Henry	SW- Municipal Solid Waste Landfill	Closed/PCC
Henry Co - W Asbury Rd Ph 2 (SL)	075-021D(SL)	Henry	SW- Municipal Solid Waste Landfill	Closed/PCC
Henry Co - Windy Hill Road Landfill	075-011D(SL)	Henry	SW- Municipal Solid Waste Landfill	Closed/PCC
Houston Co - Old Perry Rd Ph 1 (SL)	076-005D(SL)	Houston	SW- Municipal Solid Waste Landfill	Closed/PCC
Houston Co - SR247 Klondike C/D Landfill	076-024D(C&D)	Houston	SW- Construction & Demolition Landfill	Operating
International Paper - Flint River Mill	-	Macon	SW- Private Industrial Landfill	-
Kersey - Firetower Rd/Jeff David Rd (L)	145-007D(L)	Upson	SW- Other-Processor/ Disposal	Abandoned
Lamar Co - Grove St Ext (Old Milner Rd) (SL)	085-004D(SL)	Lamar	SW- Municipal Solid Waste Landfill	Closed/PCC
Lamar County Regional Solid Waste Authority	085-007D(MSWL)	Lamar	SW- Municipal Solid Waste Landfill	Operating
Lee County Landfill	088-006D(SL)	Lee	SW- Municipal Solid Waste Landfill	Closed/PCC
Macon Co - SR 49 N #3 (SL)	094-005D(SL)	Macon	SW- Municipal Solid Waste Landfill	Closed/PCC
Macon Co. - Middle Ga SWMA Regional MSWL	094-009D(MSWL)	Macon	SW- Construction & Demolition Landfill	Operating
Maple Hill Landfill	047-023D(C&D)	Dougherty	SW- Construction & Demolition Landfill	Operating
Marine Corps Logistics Base (L)	047-012D(L)	Dougherty	SW- Construction & Demolition Landfill	Archived
Miller Co - CR 37/Sheffield (SL)	100-004D(SL)	Miller	SW- Municipal Solid Waste Landfill	Closed/PCC
Mitchell Co - SR 3A (SL)	101-004D(SL)	Mitchell	SW- Municipal Solid Waste Landfill	Closed/PCC
Monroe Co - Strickland Loop Rd	102-008D(SL)	Monroe	SW- Municipal Solid Waste Landfill	Operating
Peach Co - Housers Mill Rd (SL)	111-004D(SL)	Peach	SW- Municipal Solid Waste Landfill	Closed/PCC
Perry - Chapel Rd/Ford Creek (L)	076-022D(L)	Houston	SW- Construction & Demolition Landfill	Closed/PCC
Perry - Elko Rd (SL)	076-009D(SL)	Houston	SW- Municipal Solid Waste Landfill	Closed/PCC
Pike Co - County Farm Rd (SL)	114-009D(L)	Pike	SW- Construction & Demolition Landfill	Closed/PCC
Schley Co - CR 65/Hicks (SL)	123-004D(SL)	Schley	SW- Municipal Solid Waste Landfill	Closed/PCC
Schley Co - SR 26 E Ph 1 (SL)	123-002D(SL)	Schley	SW- Municipal Solid Waste Landfill	Archived

Facility Name	Permit Number	County	Interest Type	Operating Status
Spalding Co - Griffin/Shoal Creek Rd Ph 2	126-009D(C&D)	Spalding	SW- Construction & Demolition Landfill	Closed/PCC
Spalding Co - Yamacraw Rd Ph 1 Tct A (SL)	126-001D(SL)	Spalding	SW- Municipal Solid Waste Landfill	Closed/PCC
Spalding Co -Griffin Shoal Creek Rd Ph 3 Construction/Demolition Landfill	126-010D(C&D)	Spalding	SW- Construction & Demolition Landfill	Operating
Stephens MDS, LP Processing Facility	031-039D(C&D)	Clayton	SW- Construction & Demolition Landfill	Operating
Sumner's Farm (LI)	-	Lee	SW- Private Industrial Landfill	-
Sumter Co - CR 195 Ph 2 (SL)	129-011D(SL)	Sumter	SW- Municipal Solid Waste Landfill	Closed/PCC
Sumter Co - CR 195 S Ph 1 (SL)	129-007D(SL)	Sumter	SW- Municipal Solid Waste Landfill	Closed/PCC
Syncorp Inc. (Monarch Wine Co.) (LI)	-	Crawford	SW- Private Industrial Landfill	-
Terrell Co - US 82 Dawson (SL)	135-005D(SL)	Terrell	SW- Municipal Solid Waste Landfill	Closed/PCC
Thomaston - Zorn St Ph 2 &3 (SL)	145-005D(SL)	Upson	SW- Municipal Solid Waste Landfill	Closed/PCC
Turner Co - SR 112 Ashburn Ph 1 & 2 (SL)	142-001D(SL)	Turner	SW- Municipal Solid Waste Landfill	Archived
Turner Co - SR 112 Ashburn Ph 3 (SL)	142-004D(SL)	Turner	SW- Municipal Solid Waste Landfill	Closed/PCC
Webster Co - SR 41 S Preston (SL)	152-001D(SL)	Webster	SW- Municipal Solid Waste Landfill	Closed/PCC
Whiting - SR 18 (SI)	-	Monroe	SW- Private Industrial Landfill	-
WMI - Rolling Hills (SL)	031-017D(SL)	Clayton	SW- Municipal Solid Waste Landfill	Closed/PCC
Worth County Landfill	159-004D(SL)	Worth	SW- Municipal Solid Waste Landfill	Closed/PCC

Source: Land Protection Branch, GA EPD, 2022

4.0 ANALYTICAL APPROACH

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

- The current critical bacteria 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 bacteria load necessary to achieve the TMDL.

The calculation of the bacteria load at any point in a stream requires the bacteria concentration and stream flow. The Loading Curve Approach was used to determine the current bacteria 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 segments with TMDLs being revised, listings of some segments were based on spill data that is no longer available. Therefore, a current critical load and percent reduction cannot be determined. However, the annual average flow determined using USGS StreamStats, (USGS, 2017) was used to calculate the TMDL. The StreamStats annual average flow for each stream with a revised TMDL are given in Table A-1 in Appendix A.

For those segments in which sufficient water quality data were collected to calculate at least one 30-day geometric mean above the water quality criteria, the loading curve approach was used to calculate the current critical load.

The TMDLs for this document were calculated using data from nearby USGS gages and the applicable water quality criterion. These nearby stream gages have relatively similar watershed characteristics, including land use, slope, and drainage area. The stream flows were estimated by multiplying the measured stream flow by the ratio of the listed stream drainage area to the gaged stream drainage area. Table 15 provides the USGS stream gages used to estimate the flow for the listed stream segments. The current critical load was compared to summer and winter seasonal TMDL curves to determine the required percent reduction.

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 bacteria criteria 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 bacteria 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 bacteria load
$C_{geomean}$ = bacteria concentration as a 30-day geometric mean
Q_{mean} = stream flow as an arithmetic mean

Table 15: USGS Flow Gages Used to Estimate Stream Flow in the 303(d) Listed Segments in the Flint River Basin

Waterbody Name	Location	Assessment Unit ID	Waterbody Drainage Area (sq miles)	USGS Station No.	USGS Station Name	Flow Gage Drainage Area (sq miles)
Basin Creek	Headwaters to Hightower Lake	GAR031300050903	7.90	02346180	Flint River At Sr 36 Near Thomaston, Ga	1220
Beaver Creek	Headwaters to Patsiliga Creek, Butler	GAR031300051313	17.63	02347500	Flint River At Us 19, Near Carsonville, Ga	1850
Big Turkey Creek	Hurricane Creek to the Flint River	GAR031300050711	8.51	02338840	Yellowjacket Creek-Hammett Rd, Blw Hogansville, Ga	91
Choctahatchee Creek	Rabbit Branch to Kinchafoonee Creek	GAR031300070306	36.20	02350600	Kinchafoonee Creek At Sr 41 At Preston, Ga	197
Dry Creek	Breastworks Branch to tributary 1 mile downstream GA Hwy 200	GAR031300100205	50.32	02343940	Sawhatchee Creek At Sr 273 At Cedar Springs, Ga	64.2
Flint River	Patsiliga Creek to Horse Creek	GAR031300051604	2311.80	02349605	Flint River At Ga 26, Near Montezuma, Ga	2920
Harrel Mill Creek	Headwaters to Kinchafoonee Creek	GAR031300070204	7.60	02350600	Kinchafoonee Creek At Sr 41 At Preston, Ga	197
Horse Creek	Taylor Mill Lake to Flint River	GAR031300051602	39.95	02349605	Flint River At Ga 26, Near Montezuma, Ga	2920
Ichawaynochaway Creek	Calhoun County Line to Chickasawhatchee Creek	GAR031300090602	663.98	02353500	Ichawaynochaway Creek At Sr 216 At Milford, Ga	620
Keel Creek	Headwaters to Spring Creek	GAR031300090902	19.21	02354350	Chickasawhatchee Creek At Sr 234 Near Albany, Ga	119
Kennel Creek	Headwaters to Walnut Creek	GAR031300050511	3.96	02338840	Yellowjacket Creek-Hammett Rd, Blw Hogansville, Ga	91
Kinchafoonee Creek	Marion County Line to Lanahassee Creek	GAR031300070205	208.91	02350600	Kinchafoonee Creek At Sr 41 At Preston, Ga	197
Kinchafoonee Creek	Lanahassee Creek to Terrell County Line	GAR031300070305	324.13	02350600	Kinchafoonee Creek At Sr 41 At Preston, Ga	197
Kiokee Creek	Unnamed tributary 0.25 miles upstream of Old Dawson Road to Tallahassee Creek	GAR031300090707	24.53	02354350	Chickasawhatchee Creek At Sr 234 Near Albany, Ga	119
Lanahassee Creek	Headwaters to West Fork Lanahassee Creek	GAR031300070202	20.05	02350600	Kinchafoonee Creek At Sr 41 At Preston, Ga	197
Lazer Creek (formerly Lazar Creek)	Mossy Branch to Rush Creek	GAR031300050803	20.88	02338840	Yellowjacket Creek-Hammett Rd, Blw Hogansville, Ga	91

Waterbody Name	Location	Assessment Unit ID	Waterbody Drainage Area (sq miles)	USGS Station No.	USGS Station Name	Flow Gage Drainage Area (sq miles)
Mill Creek	Unnamed tributary 200 ft upstream Clifton Bradley Drive to tributary to Flint River 0.4 miles downstream of Chatham Street	GAR031300060203	13.45	02349900	Turkey Creek At Sr 90 At Byromville, Ga	47.5
Mossy Creek	Tributary 0.5 miles upstream of John Martin Road to Kinchafoonee Creek	GAR031300070502	18.51	02350900	Kinchafoonee Creek At Pinewood Road, Nr Dawson, Ga	527
Muckalee Creek	Sumter Co. Line to tributary at Pirates Cove Nature Park, Leesburg	GAR031300071001	430.20	02351890	Muckalee Creek At Ga 195, Near Leesburg, Ga	362
Pachitla Creek	Goffs Mill Creek to Carter Creek	GAR031300090403	68.49	02353400	Pachitla Creek At Sr 37 Near Edison, Ga	181
Patsiliga Creek	Headwaters to McCants Mill Pond	GAR031300051314	47.81	02347500	Flint River At Us 19, Near Carsonville, Ga	1850
Pigeon Creek	Tributary to the Flint River	GAR031300050706	32.28	02338840	Yellowjacket Creek-Hammett Rd, Blw Hogansville, Ga	91
Po Joe Branch	Tributary 0.6 miles upstream Lamar Road to Lime Creek	GAR031300060516	3.47	02349900	Turkey Creek At Sr 90 At Byromville, Ga	47.5
Russell Branch	Headwaters to Lazer Creek	GAR031300050805	5.88	02338840	Yellowjacket Creek-Hammett Rd, Blw Hogansville, Ga	91
Sheep Rock Hollow	Headwaters to the Flint River	GAR031300050714	3.95	02338840	Yellowjacket Creek-Hammett Rd, Blw Hogansville, Ga	91
Shoal Creek	Unnamed Tributary 1 mile upstream Andrew Bailey Road to Rock Branch	GAR031300050215	17.08	02344620	Shoal Creek At Ga54, Near Sharpsburg, Ga	24.1
Tobler Creek	Headwaters to Swift Creek	GAR031300051006	63.44	02347500	Flint River At Us 19, Near Carsonville, Ga	1850
Town Branch	Zebulon WPCP to Elkins Creek	GAR031300050610	2.54	02346310	Potato Creek At County Line Rd, Nr Orchard Hill,Ga	9.51
Tributary to Bay Branch	Pond 0.3 miles downstream Bay Street to Bay Branch	GAR031300090505	1.53	02353400	Pachitla Creek At Sr 37 Near Edison, Ga	181
Tributary to Mill Creek	Headwaters to tributary 0.5 miles downstream Fowler Road	GAR031300060904	11.16	02351890	Muckalee Creek At Ga 195, Near Leesburg, Ga	362

Waterbody Name	Location	Assessment Unit ID	Waterbody Drainage Area (sq miles)	USGS Station No.	USGS Station Name	Flow Gage Drainage Area (sq miles)
Tributary to the Red River	Lake Julia to the Red River	GAR031300050922	1.52	02346310	Potato Creek At County Line Rd, Nr Orchard Hill,Ga	9.51
Turkey Creek	Little Creek to Jalappa Branch	GAR031300060409	31.92	02349900	Turkey Creek At Sr 90 At Byromville, Ga	47.5
Womble Creek	Headwaters to Jerry Reeves Creek	GAR031300050918	5.33	02346180	Flint River At Sr 36 Near Thomaston, Ga	1220

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 during the sampling period.

The maximum bacteria load at which the instream bacteria criteria will be met can be determined using a variation of the equation above. By setting C equal to the seasonal, instream bacteria criteria, 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 criteria is 200 counts/100 mL. The second curve represents the winter TMDL for the period November through April when the 30-day geometric mean criteria is 1,000 counts/100 mL. The equations for these two TMDL curves are:

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

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

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

A 30-day geometric mean load that plots above the respective seasonal TMDL curve represents an exceedance of the instream bacteria criteria. 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 bacteria criteria. There is also a single sample maximum criterion of 4,000 counts per 100 mL for fecal coliform. 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.

For future *E. coli* or enterococci TMDLs, one curve will represent the summer TMDL for the period May through October when the 30-day geometric mean criterion is 126 counts/100 mL and 35 counts/100 mL, respectively. The second curve will represent the winter TMDL for the period November through April when the 30-day geometric mean criterion is 265 counts/100 mL or 74 counts/100 mL, respectively. The equations for these two TMDL curves are:

Non-Estuarine waters:

$TMDL_{summer}$ = 126 counts *E. coli* /100 mL (as a 30-day geometric mean) x Q

$TMDL_{winter}$ = 265 counts *E. coli* /100 mL (as a 30-day geometric mean) x Q

Estuarine waters:

$TMDL_{summer}$ = 35 counts enterococci /100 mL (as a 30-day geometric mean) x Q
$TMDL_{winter}$ = 74 counts enterococci /100 mL (as a 30-day geometric mean) x Q

The TMDL for a given stream segment is the load for the mean flow corresponding to the current critical fecal coliform load. This is the point where the current fecal coliform load exceeds the fecal coliform 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 bacteria TMDL load
$C_{standard}$ = seasonal bacteria criteria (as a 30-day geometric mean)
Non-Estuarine waters:
summer – 126 counts/100 mL as *E. coli*
winter – 265 counts/ 100 mL as *E. coli*
Estuarine waters:
summer – 35 counts/100 mL as enterococci
winter – 74 counts/ 100 mL as enterococci
Q_{mean} = stream flow as an arithmetic mean

Under the updated criteria adopted and approved in 2022 there is also a seasonally-based statistical threshold value (STV) maximum criterion established for both non-estuarine and estuarine waters. For the months of May through October the STV criterion for non-estuarine waters is 410 counts per 100 mL for *E.* coli. For the same period, the STV criterion for estuarine waters is 130 counts per 100 mL for enterococci. For the months of November through April the STV criterion for non-estuarine waters is 861 counts per 100 mL for *E.* coli. For the same period, the STV criterion for estuarine waters is 273 counts per 100 mL for enterococci. If a single sample exceeds the STV 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.

For a TMDL, the percent load reduction can be expressed as follows:

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

The current critical loads and the TMDLs are expressed as equations that show the loads as a function of the total flow at any given time. The general equations for the critical load and the TMDL are:

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

Where:

$L_{critical}$ = current critical bacteria load
$C_{geomean}$ = bacteria concentration as a 30-day geometric mean
Q_{total} = stream flow

$$TMDL = C_{criterion} \times Q_{total}$$

Where:

- TMDL = total maximum daily load
- $C_{criterion}$ = criterion
- Q_{total} = estimated instantaneous flow

5.0 TOTAL MAXIMUM DAILY LOAD

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 criteria. In this case, it is the seasonal bacteria criteria. A TMDL is the sum of the individual wasteload 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 waterbody. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measures. For 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 a margin 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, and to understand the fate and transport of the pollutant(s) 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.

Watershed-based plans may be developed to address and assess both point and nonpoint sources. These plans establish a schedule or timetable for the installation and evaluation of source control measures, data collection, and assessment of water quality standard attainment. Future monitoring of the listed segments water quality may be used to evaluate this phase of the TMDL, and if necessary, to reallocate the loads.

The existing fecal coliform loads calculated for each listed stream segment are based on sampling data and measured or estimated flows and represent the sum of the total loads from all point and nonpoint sources for the 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. The following sections describe the various bacteria TMDL components.

5.1 Wasteload Allocations

5.1.1 Wastewater Treatment Facilities

The wasteload allocation (WLA) 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 POTW and Non-POTW wastewater treatment systems with NPDES end-of-pipe effluent limits established to meet the applicable water quality standard. In addition, the permits include routine monitoring and reporting requirements.

For facilities that currently have a bacteria effluent limit, the permit information, receiving stream, impaired stream and WLAs are provided in Table 16. This information is provided for facilities that discharge into or within 25 miles upstream of the listed segment. In most cases, the WLAs are calculated based on permitted or design flow and permitted bacteria concentration. However, for those facilities whose wastewater is reused, the bacteria limit to discharge into surface waters may be overly restrictive and for these facilities the WLA is calculated using the permitted flow and permitted bacteria concentration. This was expressed as an accumulated load over a 30-day period and presented in units of counts per 30 days. If there is a new facility or a facility expands its capacity and the permitted flow increases, the wasteload allocation for the facility will be the permitted flow times the appropriate water quality criteria, either 200 counts/100 mL for fecal coliform, 126 counts/100 mL for E. coli in non-estuarine waters, or 35 counts/100mL for enterococci in estuarine waters as a 30-day geometric mean.

Table 16: WLAs for the Facilities that Currently have Bacteria Limits in the Flint River Basin

Facility Name	NPDES Permit No.	Receiving Stream	Listed Stream Segment	Bacterial Indictor	WLA (counts/ 30 days)	30 Day Geometric Mean Concentration (counts/100mL)
Americus, City of (Mill Creek WPCP)	GA0047767	Muckalee Creek	Muckalee Creek GAR031300071001	Fecal coliform	5.15E+09	200
				E. coli	3.25E+09	126
Blakely, City of (Blakely WPCP)	GA0025585	Baptist Branch	Dry Creek GAR031300100205	Fecal coliform	2.34E+09	200
				E. coli	1.48E+09	126
Cuthbert, City of (Cuthbert WPCP)	GA0037249	Town Branch	Ichawaynochaway Creek GAR031300090602	Fecal coliform	7.03E+08	200
				E. coli	4.43E+08	126
Edison, City of (Edison WPCP)	GA0037427	Unnamed tributary to Bay Branch	Ichawaynochaway Creek GAR031300090602 Tributary to Bay Branch GAR031300090505	Fecal coliform	2.93E+08	200
				E. coli	1.84E+08	126
Ellaville, City of (Ellaville WPCP)	GA0050105	Unnamed Tributary to Little Muckalee Creek	Muckalee Creek GAR031300071001	Fecal coliform	4.68E+08	200
				E. coli	2.95E+08	126
Greenville, City of (Kennel Creek WPCP)	GA0047813	Kennel Creek	Kennel Creek GAR031300050511	Fecal coliform	2.93E+08	200
				E. coli	1.84E+08	126
Leary, City of (Leary WPCP)	GA0026212	Keel Creek	Keel Creek GAR031300090902	Fecal coliform	1.17E+08	200
				E. coli	7.38E+07	126
Reynolds, City of (Reynolds WPCP)	GA0020729	Patsiliga Creek	Flint River GAR03130005160	Fecal coliform	1.87E+08	200
				E. coli	1.18E+08	126

Facility Name	NPDES Permit No.	Receiving Stream	Listed Stream Segment	Bacterial Indictor	WLA (counts/ 30 days)	30 Day Geometric Mean Concentration (counts/100mL)
Roberta, City of (Roberta WPCP)	GA0020834	Unnamed tributary to Culpepper Creek	Flint River GAR031300051604	Fecal coliform	5.15E+08	200
				E. coli	3.25E+08	126
Smithville, City of (Smithville WPCP)	GA0047422	Muckaloochee Creek	Muckalee Creek GAR031300071001	Fecal coliform	1.41E+08	200
				E. coli	8.85E+07	126
Taylor County Board of Commissionners (Plant Laurel WPCP)	GA0000302	Horse Creek	Horse Creek GAR031300051602	Fecal coliform	1.41E+08	200
				E. coli	8.85E+07	126
Tri-City Housing Authority (Tri City Housing Authority WPCP)	GAG550074	Russell Branch	Russell Branch GAR031300050805	Fecal coliform	1.17E+07	200
				E. coli	7.38E+06	126
Zebulon, City of (Zebulon WPCP)	GA0049476	Town Branch to Elkins Creek	Town Branch GAR031300050610	Fecal coliform	3.35E+08	200
				E. coli	2.11E+08	126
Revised TMDLs						
Americas Best Value Inn WPCP	GA0022632	Unnamed Tributary to White Oak Creek	White Oak Creek GAR031300050307	Fecal coliform	3.51E+07	200
				E. coli	2.21E+07	126
Buena Vista, City of (Buena Vista WPCP)	GA0023710	Unnamed Tributary of Oochee Creek	Buck Creek GAR031300060201	Fecal coliform	4.68E+08	200
				E. coli	2.95E+08	126
Byromville, Town of (Byromville WPCP)	GA0025623	Turkey Creek	Turkey Creek GAR031300060405	Fecal coliform	1.22E+08	200
				E. coli	7.67E+07	126
Coweta County Water & Sewerage Authority (Shenandoah WPCP)	GA0038822	White Oak Creek	White Oak Creek GAR031300050307 White Oak Creek GAR031300050308	Fecal coliform	7.03E+09	200
				E. coli	4.43E+09	126
Coweta Hills Community (Coweta Hills WPCP)	GAG550010	Unnamed Tributary to Turkey Creek	White Oak Creek GAR031300050307 White Oak Creek GAR031300050308	Fecal coliform	4.68E+07	200
				E. coli	2.95E+07	126
Dawson, City of (Dawson WPCP)	GA0021326	Brantley Creek	Chickasawhatchee Creek GAR031300090804	Fecal coliform	2.93E+09	200
				E. coli	1.84E+09	126
Donalsonville, City of (H. M. Shingler WPCP)	GA0026123	Fish Pond Drain	Fishpond Drain GAR031300100704	Fecal coliform	1.17E+09	200
				E. coli	7.38E+08	126
Ellaville, City of (Ellaville WPCP)	GA0050105	Unnamed Tributary to Little Muckalee Creek	Muckalee Creek GAR031300070801	Fecal coliform	4.68E+08	200
				E. coli	2.95E+08	126

Facility Name	NPDES Permit No.	Receiving Stream	Listed Stream Segment	Bacterial Indictor	WLA (counts/ 30 days)	30 Day Geometric Mean Concentration (counts/100mL)
Georgia Baptist Children's Home and Family Ministries, Inc. (Meansville Campus WPCP)	GA0022314	Unnamed Tributary to Three Mile Creek	Potato Creek GAR031300050923 Potato Creek GAR031300050924	Fecal coliform	9.37E+06	200
				E. coli	5.90E+06	126
Lee County Utilities Authority (Kinchafoonee Creek WPCP)	GA0026603	Kinchafoonee Creek	Kinchafoonee Creek GAR031300070604	Fecal coliform	4.10E+08	100
				E. coli	5.17E+08	126
Leesburg, City of (Leesburg WPCP)	GA0026638	Kinchafoonee Creek	Kinchafoonee Creek GAR031300070604	Fecal coliform	1.41E+09	200
				E. coli	8.85E+08	126
Plains, City of	GA0020931	Pessell Creek	Kinchafoonee Creek GAR031300070604	Fecal coliform	1.41E+08	200
				E. coli	8.85E+07	126
Richland, City of (Richland WPCP)	GA0021539	Bear Creek	Kinchafoonee Creek GAR031300070604	Fecal coliform	3.51E+08	200
				E. coli	2.21E+08	126
Talbotton, City of (Talbotton WPCP)	GA0047805	Edward Creek	Lazer Creek GAR031300050801	Fecal coliform	1.17E+08	200
				E. coli	7.38E+07	126
Thomaston, City of (Bell Creek WPCP)	GA0020079	Potato Creek	Potato Creek GAR031300050924	Fecal coliform	2.34E+09	200
				E. coli	1.48E+09	126
Thomaston, City of (Town Branch WPCP)	GA0030121	Potato Creek	Potato Creek GAR031300050924	Fecal coliform	2.34E+09	200
				E. coli	1.48E+09	126
Tri-City Housing Authority (Tri City Housing Authority WPCP)	GAG550074	Russell Branch	Lazer Creek GAR031300050801	Fecal coliform	1.17E+07	200
				E. coli	7.38E+06	126

Non-POTW facilities that discharge sanitary wastewater directly or sanitary waste streams commingled with other waste streams will be given a bacteria effluent limit in their permit. Potential WLAs for existing Non-POTW permittees without bacteria permit limits would be the facility design flow multiplied by the appropriate bacteria criterion, either 200 counts/100 mL for fecal coliform, 126 counts/100 mL for E. coli in non-estuarine waters, or 35 counts/100mL for enterococci in estuarine waters as a 30-day geometric mean. For these facilities, it is not known if their discharge contains any bacteria at levels that would exceed the instream water quality criteria because of the type of treatment processes employed. Therefore, existing Non-POTW facilities may be required to submit bacteria data with their NPDES permit renewal application. Non-POTW permittees must collect, analyze, and submit appropriate bacteria data from at least 4 samples collected 24 hours apart within a 30-day period. GA EPD will evaluate these data and determine if a permit limit for bacteria is needed. There is currently one (1) known existing Non-POTW discharges without bacteria permit limits in the contributing watersheds, as noted in Table 7.

5.1.2 Regulated Stormwater Discharges

State and Federal Rules define stormwater discharges covered by NPDES permits as point sources. However, stormwater discharges are from diffuse sources and there are multiple stormwater outfalls. Stormwater 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 stormwater NPDES permits is not to treat the water after collection, but to reduce the exposure of stormwater to pollutants by implementing various controls. It would be infeasible and prohibitively expensive to control pollutant discharges from each stormwater outfall. Therefore, stormwater NPDES permits require the establishment of controls or BMPs to reduce the pollutants entering the environment.

The wasteload allocations from stormwater discharges (WLAsw) associated with MS4s are estimated based on the percentage of urban area in each watershed covered by the MS4 stormwater permit. At this time, the portion of each watershed that goes directly to a permitted storm sewer or is non-permitted sheet flow or diffuse runoff has not been clearly defined. Thus, it is assumed that approximately 70 percent of stormwater runoff from the regulated urban area is collected by the MS4s. This can be represented by the following equation:

$$WLA_{SW} = Q_{WLAsw} \times C_{standard}$$

where: WLA_{SW} = Wasteload Allocation for permitted stormwater runoff from all MS4 urban areas

Q_{WLAsw} = Runoff from all MS4 urban areas conveyed through permitted storm water structures

$Q_{WLAsw} = \Sigma Q_{urban} \times 0.7$

ΣQ_{urban} = Sum of all stormwater runoff from MS4 urban

$C_{standard}$ = seasonal criteria as appropriate (as a 30-day geometric mean)

summer – 200 counts/100 mL as fecal coliform
winter – 1000 counts/ 100 mL as fecal coliform
summer – 126 counts/100 mL as *E. coli*
winter – 265 counts/ 100 mL as *E. coli*
summer – 35 counts/100 mL as enterococci
winter – 74 counts/ 100 mL as enterococci

For stormwater permits, compliance with the terms and conditions of the permit is effective implementation of the WLA to the Maximum Extent Practicable (MEP) and demonstrates consistency with the assumptions and requirements of the TMDL. GA EPD acknowledges that progress with the assumptions and requirements of the TMDL by stormwater permittees may take one or more permit iterations. Achieving the TMDL reductions may constitute compliance with a SWMP or a SWPPP, provided the MEP definition is met, even where the numeric percent reduction may not be achieved so long as reasonable progress is made toward attainment of water quality standards using an iterative BMP process.

5.1.3 Concentrated Animal Feeding Operations

Wet manure facilities are either included under a State-issued LAS General Permit or an NPDES General Permit. A small number of wet manure operations have an individual NPDES permit. Dry manure facilities are not required to obtain permits. None of the wet manure or dry manure facilities have discharges. Presently, there are three (3) wet or dry manure CAFOs located in the watersheds of the listed segments in the Flint River Basin, and therefore they were not provided a WLA.

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 stormwater (non-permitted).

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

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

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, leaking sewer system collection lines, and background loads; and loads associated with bacteria accumulation on land surfaces that is washed off during storm events, including runoff from saturated LAS fields. Currently, it is not possible to partition the various sources of load allocations. 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 bacteria criteria for waterbodies with the designated use of drinking water, fishing , and coastal fishing 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. The TMDL and percent reduction for each listed segment is 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.

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.

5.5 Total Bacteria Load

The bacteria TMDL for the listed stream segment is dependent on the time of year, the stream flow, and the applicable state water quality criteria. In January 2022, the Georgia DNR Board adopted new bacteria criteria for "Fishing" and "Drinking Water" designated uses using the bacterial indicators *E. coli* and enterococci. These bacteria are better indicators for human health illnesses. The adopted criteria have the same estimated illness rate (8 per 1000 swimmers) as the previously established fecal coliform criteria. Since this TMDL is based on fecal coliform data, but the current bacteria criterion is *E. coli* or enterococci, this TMDL will use both fecal coliform and the appropriate indicator identified above based on estuarine/non-estuarine status.

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

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

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

TMDL = 4000 counts/100 mL (instantaneous) x Q

The total maximum daily seasonal *E. coli* loads for non-estuarine waters in Georgia are given below:

$TMDL_{summer\ GEO}$ = 126 counts/100 mL (as a 30-day geometric mean) x Q

$TMDL_{summer\ STV}$ = 410 counts/100 mL (instantaneous) x Q

$TMDL_{winter\ GEO}$ = 265 counts/100 mL (as a 30-day geometric mean) x Q

$TMDL_{winter\ STV}$ = 861 counts/100 mL (instantaneous) x Q

The total maximum daily seasonal enterococci loads for estuarine waters in Georgia are given below:

$TMDL_{summer\ GEO}$ = 35 counts/100 mL (as a 30-day geometric mean) x Q

$TMDL_{summer\ STV}$ = 130 counts/100 mL (instantaneous) x Q

$TMDL_{winter\ GEO}$ = 74 counts/100 mL (as a 30-day geometric mean) x Q

$TMDL_{winter\ STV}$ = 273 counts/100 mL (instantaneous) 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 bacteria criteria and the mean flow used to calculate the current fecal coliform critical load. It represents the sum of the allocated loads from point (WLA and WLA_{sw}) and nonpoint (LA) sources located within the immediate drainage area of the listed segment, and a margin of safety (MOS). For these calculations, the bacteria contributed by a permitted facility to the WLA was the product of the bacteria permit limit concentration and the monthly average permitted flow. The

current critical loads and corresponding TMDLs, WLAs (WLA and WLA_{sw}), LAs, MOSs, and percent load reductions for the Flint River Basin listed stream segments are presented in Table 17.

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. Because of the localized nature of the load evaluations, the calculated bacterial load reductions pertain to point and nonpoint sources occurring within the immediate drainage area of the listed segment. The 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 bacteria criteria 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 bacterial loads and the potential sources occurring within the sub-watershed of each segment was examined on a qualitative basis.

Table 17: Bacteria Loads and Required Load Reductions

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)[1]	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031300050903	Basin Creek	Headwaters to Hightower Lake	Fecal coliform	8.99E+10			2.99E+10	3.32E+09	3.32E+10	63.10%
			E. coli	[3]			1.88E+10	2.09E+09	2.09E+10	Undetermined [2]
GAR031300051313	Beaver Creek	Headwaters to Patsiliga Creek, Butler	Fecal coliform	9.99E+10			7.41E+10	8.23E+09	8.23E+10	17.60%
			E. coli	[3]			4.67E+10	5.19E+09	5.19E+10	Undetermined [2]
GAR031300050711	Big Turkey Creek	Hurricane Creek to the Flint River	Fecal coliform	6.88E+10			2.24E+10	2.49E+09	2.49E+10	63.80%
			E. coli	[3]			1.41E+10	1.57E+09	1.57E+10	Undetermined [2]
GAR031300070306	Choctahatchee Creek	Rabbit Branch to Kinchafoonee Creek	Fecal coliform	5.91E+11			1.23E+11	1.37E+10	1.37E+11	76.87%
			E. coli	[3]			7.76E+10	8.62E+09	8.62E+10	Undetermined [2]
GAR031300100205	Dry Creek	Breastworks Branch to tributary 1 mile downstream GA Hwy 200	Fecal coliform	9.85E+10	2.34E+09		5.24E+10	6.08E+09	6.08E+10	38.27%
			E. coli	[3]	1.48E+09		3.30E+10	3.83E+09	3.83E+10	Undetermined [2]
GAR031300051604	Flint River	Patsiliga Creek to Horse Creek	Fecal coliform	2.97E+13	7.03E+08		2.04E+13	2.27E+12	2.27E+13	23.58%
			E. coli	[3]	4.43E+08		1.29E+13	1.43E+12	1.43E+13	Undetermined [2]
GAR031300070204	Harrel Mill Creek	Headwaters to Kinchafoonee Creek	Fecal coliform	8.51E+13			1.91E+12	2.13E+11	2.13E+12	97.50%
			E. coli	[3]			1.96E+11	2.18E+10	2.18E+11	Undetermined [2]
GAR031300051602	Horse Creek	Taylor Mill Lake to Flint River	Fecal coliform	2.81E+11	1.41E+08		2.32E+11	2.58E+10	2.58E+11	8.11%
			E. coli	[3]	8.85E+07		1.46E+11	1.62E+10	1.62E+11	Undetermined [2]
GAR031300090602	Ichawaynochaway Creek	Calhoun County Line to Chickasawhatchee Creek	Fecal coliform	1.16E+13	9.96E+08		9.47E+12	1.05E+12	1.05E+13	9.58%
			E. coli	[3]	6.27E+08		5.97E+12	6.63E+11	6.63E+12	Undetermined [2]
GAR031300090902	Keel Creek	Headwaters to Spring Creek	Fecal coliform	1.72E+13	1.17E+08		1.24E+13	1.37E+12	1.37E+13	20.00%
			E. coli	[3]	7.38E+07		1.27E+12	1.41E+11	1.41E+12	Undetermined [2]
GAR031300050511	Kennel Creek	Headwaters to Walnut Creek	Fecal coliform	4.38E+10	2.93E+08		1.09E+09	1.53E+08	1.53E+09	96.50%

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
			E. coli	(3)	1.84E+08		6.85E+08	9.66E+07	9.66E+08	Undetermined (2)
GAR031300070205	Kinchafoonee Creek	Marion County Line to Lanahassee Creek	Fecal coliform	1.47E+12			7.10E+11	7.89E+10	7.89E+11	46.18%
			E. coli	(3)			4.48E+11	4.97E+10	4.97E+11	Undetermined (2)
GAR031300070305	Kinchafoonee Creek	Lanahassee Creek to Terrell County Line	Fecal coliform	8.26E+12			1.10E+12	1.22E+11	1.22E+12	85.17%
			E. coli	(3)			6.94E+11	7.72E+10	7.72E+11	Undetermined (2)
GAR031300090707	Kiokee Creek	Unnamed tributary 0.25 miles upstream of Old Dawson Road to Tallahassee Creek	Fecal coliform	5.64E+10			3.57E+10	3.97E+09	3.97E+10	29.58%
			E. coli	(3)			2.25E+10	2.50E+09	2.50E+10	Undetermined (2)
GAR031300070202	Lanahassee Creek	Headwaters to West Fork Lanahassee Creek	Fecal coliform	2.12E+11			4.41E+10	4.90E+09	4.90E+10	76.86%
			E. coli	(3)			2.78E+10	3.09E+09	3.09E+10	Undetermined (2)
GAR031300050803	Lazer Creek (formerly Lazar Creek)	Mossy Branch to Rush Creek	Fecal coliform	3.87E+10			1.99E+10	2.21E+09	2.21E+10	42.99%
			E. coli	(3)			1.25E+10	1.39E+09	1.39E+10	Undetermined (2)
GAR031300060203	Mill Creek	Unnamed tributary 200 ft upstream Clifton Bradley Drive to tributary to Flint River 0.4 miles downstream of Chatham Street	Fecal coliform	6.42E+10			9.90E+09	1.10E+09	1.10E+10	82.87%
			E. coli	(3)			6.24E+09	6.93E+08	6.93E+09	Undetermined (2)
GAR031300070502	Mossy Creek	Tributary 0.5 miles upstream of John Martin Road to Kinchafoonee Creek	Fecal coliform	1.25E+11			3.65E+10	4.06E+09	4.06E+10	67.62%
			E. coli	(3)			2.30E+10	2.56E+09	2.56E+10	Undetermined (2)
GAR031300071001	Muckalee Creek	Sumter Co. Line to tributary at Pirates Cove Nature Park, Leesburg	Fecal coliform	2.03E+12	5.76E+09	1.72E+09	1.16E+12	1.29E+11	1.29E+12	36.35%
			E. coli	(3)	3.63E+09	1.08E+09	7.28E+11	8.14E+10	8.14E+11	Undetermined (2)
GAR031300090403	Pachitla Creek	Goffs Mill Creek to Carter Creek	Fecal coliform	7.82E+11			3.77E+11	4.19E+10	4.19E+11	46.49%
			E. coli	(3)			2.37E+11	2.64E+10	2.64E+11	Undetermined (2)
GAR031300051314	Patsiliga Creek	Headwaters to McCants Mill Pond	Fecal coliform	4.04E+11			2.01E+11	2.23E+10	2.23E+11	44.81%
			E. coli	(3)			1.27E+11	1.41E+10	1.41E+11	Undetermined (2)

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031300050706	Pigeon Creek	Tributary to the Flint River	Fecal coliform	3.35E+10			2.12E+10	2.36E+09	2.36E+10	29.51%
			E. coli	(3)			1.34E+10	1.49E+09	1.49E+10	Undetermined (2)
GAR031300060516	Po Joe Branch	Tributary 0.6 miles upstream Lamar Road to Lime Creek	Fecal coliform	1.00E+10			7.99E+09	8.88E+08	8.88E+09	11.21%
			E. coli	(3)			5.04E+09	5.60E+08	5.60E+09	Undetermined (2)
GAR031300050805	Russell Branch	Headwaters to Lazer Creek	Fecal coliform	5.92E+10			1.39E+10	1.55E+09	1.55E+10	73.81%
			E. coli	(3)			8.79E+09	9.76E+08	9.76E+09	Undetermined (2)
GAR031300050714	Sheep Rock Hollow	Headwaters to the Flint River	Fecal coliform	8.33E+09			2.60E+09	2.89E+08	2.89E+09	65.27%
			E. coli	(3)			1.64E+09	1.82E+08	1.82E+09	Undetermined (2)
GAR031300050215	Shoal Creek	Unnamed Tributary 1 mile upstream Andrew Bailey Road to Rock Branch	Fecal coliform	2.74E+11		1.40E+10	4.53E+10	6.60E+09	6.60E+10	75.95%
			E. coli	(3)		8.85E+09	2.85E+10	4.16E+09	4.16E+10	Undetermined (2)
GAR031300051006	Tobler Creek	Headwaters to Swift Creek	Fecal coliform	3.80E+11			2.67E+11	2.96E+10	2.96E+11	22.11%
			E. coli	(3)			1.68E+11	1.87E+10	1.87E+11	Undetermined (2)
GAR031300050610	Town Branch	Zebulon WPCP to Elkins Creek	Fecal coliform	1.65E+10	3.35E+08		4.71E+09	5.61E+08	5.61E+09	66.06%
			E. coli	(3)	2.11E+08		2.97E+09	3.53E+08	3.53E+09	Undetermined (2)
GAR031300090505	Tributary to Bay Branch	Pond 0.3 miles downstream Bay Street to Bay Branch	Fecal coliform	1.06E+11	2.93E+08		1.01E+10	1.13E+09	1.13E+10	89.36%
			E. coli	(3)	1.84E+08		6.10E+09	7.10E+08	7.10E+09	Undetermined (2)
GAR031300060904	Tributary to Mill Creek	Headwaters to tributary 0.5 miles downstream Fowler Road	Fecal coliform	2.32E+11			2.35E+10	2.63E+09	2.63E+10	88.65%
			E. coli	(3)			1.49E+10	1.66E+09	1.66E+10	Undetermined (2)
GAR031300050922	Tributary to the Red River	Lake Julia to the Red River	Fecal coliform	8.46E+09			8.27E+08	9.19E+07	9.19E+08	89.13%
			E. coli	(3)			5.21E+08	5.79E+07	5.79E+08	Undetermined (2)
GAR031300060409	Turkey Creek	Little Creek to Jalappa Branch	Fecal coliform	3.09E+12			5.17E+11	5.74E+10	5.74E+11	81.42%
			E. coli	(3)			3.26E+11	3.62E+10	3.62E+11	Undetermined (2)

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031300050918	Womble Creek	Headwaters to Jerry Reeves Creek	Fecal coliform	2.11E+10			1.89E+10	2.10E+09	2.10E+10	0.59%
			E. coli	(3)			1.19E+10	1.32E+09	1.32E+10	Undetermined (2)
Revised TMDLs (4)										
GAR031300100402	Aycocks Creek	Kaney Head Creek to Spring Creek	Fecal coliform	1.45E+12			1.01E+12	1.12E+11	1.12E+12	23.08%
			E. coli	(3)			6.34E+11	7.04E+10	7.04E+11	Undetermined (2)
GAR031300060101	Beaver Creek	Headwaters to Spring Hill Creek, SW Marshallville	Fecal coliform	5.49E+10			4.85E+10	5.39E+09	5.39E+10	2.00%
			E. coli	(3)			3.05E+10	3.39E+09	3.39E+10	Undetermined (2)
GAR031300060201	Buck Creek	Fox Branch to Flint River near Oglethorpe	Fecal coliform	1.86E+12	4.68E+08		1.68E+12	1.86E+11	1.86E+12	Undetermined (2)
			E. coli	(3)	2.95E+08		1.06E+12	1.17E+11	1.17E+12	Undetermined (2)
GAR031300090804	Chickasawhatchee Creek	Dougherty County (Terrell County Line to Baker County Line)	Fecal coliform	3.82E+12	2.93E+09		1.20E+12	1.34E+11	1.34E+12	65.03%
			E. coli	(3)	1.84E+09		7.55E+11	8.41E+10	8.41E+11	Undetermined (2)
GAR031300100704	Fishpond Drain	U.S. Hwy. 84, Donalsonville to Wash Pond	Fecal coliform	5.99E+12	1.17E+09		5.58E+11	6.21E+10	6.21E+11	89.63%
			E. coli	(3)	7.38E+08		3.51E+11	3.92E+10	3.92E+11	Undetermined (2)
GAR031300070604	Kinchafoonee Creek	Ga. Hwy. 45 (Webster Co. Line) to Lake Chehaw/Worth	Fecal coliform	8.58E+12	2.31E+09	2.68E+10	4.75E+12	5.31E+11	5.31E+12	38.08%
			E. coli	(3)	1.71E+09	1.69E+10	2.99E+12	3.35E+11	3.35E+12	Undetermined (2)
GAR031300050801	Lazer Creek	Marshall Creek to Flint River near Talbotton	Fecal coliform	3.13E+12	1.29E+08		1.17E+12	1.30E+11	1.30E+12	58.33%
			E. coli	(3)	8.12E+07		7.38E+11	8.20E+10	8.20E+11	Undetermined (2)
GAR031300070801	Muckalee Creek	Little Muckalee Creek to Americus	Fecal coliform	4.14E+11	4.68E+08		3.51E+11	3.90E+10	3.90E+11	5.66%
			E. coli	(3)	2.95E+08		2.21E+11	2.46E+10	2.46E+11	Undetermined (2)
GAR031300050923	Potato Creek	Drake Branch to Hoyle Branch	Fecal coliform	2.10E+12	9.37E+06	5.61E+09	1.28E+12	1.43E+11	1.43E+12	31.74%
			E. coli	(3)	5.90E+06	3.53E+09	8.08E+11	9.01E+10	9.01E+11	Undetermined (2)

AUID	Stream Segment	Description	Bacterial Indicator	Current Load (counts/ 30 days)	TMDL Components					Reduction Required
					WLA (counts/ 30 days)(1)	WLAsw (counts/ 30 days)	LA (counts/ 30 days)	MOS (counts/ 30 days)	TMDL (counts/ 30 days)	
GAR031300050924	Potato Creek	Hoyle Branch to the Flint River, near Thomaston	Fecal coliform	2.60E+12	2.35E+09	1.67E+10	1.57E+12	1.77E+11	1.77E+12	31.74%
			E. coli	(3)	1.48E+09	1.05E+10	9.91E+11	1.12E+11	1.12E+12	Undetermined (2)
GAR031300050116	Tributary to Nash Creek	Fayetteville Pennahatchee Creek, NW	Fecal coliform	6.75E+09		4.66E+09	2.83E+09	8.33E+08	8.33E+09	0.00%
			E. coli	(3)		2.94E+09	1.78E+09	5.25E+08	5.25E+09	Undetermined (2)
GAR031300060405	Turkey Creek	Cordele to Flint River	Fecal coliform	7.73E+11	1.22E+08		1.11E+12	1.24E+11	1.24E+12	0.00%
			E. coli	(3)	7.67E+07		7.01E+11	7.79E+10	7.79E+11	Undetermined (2)
GAR031300050307	White Oak Creek	Little White Oak Creek to Flint River near Alvaton	Fecal coliform	7.95E+12	7.11E+09	5.74E+11	7.20E+11	1.45E+11	1.45E+12	81.82%
			E. coli	(3)	4.48E+09	3.62E+11	4.54E+11	9.11E+10	9.11E+11	Undetermined (2)
GAR031300050308	White Oak Creek	Newnan - I-85 to Chandlers Creek	Fecal coliform	1.99E+11	7.07E+09	1.01E+10	1.85E+11	2.25E+10	2.25E+11	0.00%
			E. coli	(3)	4.46E+09	6.36E+09	1.17E+11	1.42E+10	1.42E+11	Undetermined (2)

(5) The assigned bacterial load from the NPDES permitted facility for WLA was determined as the product of the permitted flow and bacteria permit limit.
(6) Percent reduction could not be determined due to absence of current load calculation.
(7) Critical loading could not be determined due to no samples collected.
(1) The original EPA TMDL model was run for a critical time period using the "calibrated" fecal and flow parameters. The model run resulted in a summer fecal coliform 30 day geometric mean concentration. The existing load was calculated using this concentration times the annual flow.

6.0 RECOMMENDATIONS

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

This TMDL represents part of a long-term process to reduce bacteria loading to meet water quality standards in the Flint River Basin. Implementation strategies will be reviewed and the TMDL 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, the TMDL 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 several locations across the State each year. Sampling is conducted statewide by GA EPD personnel in Atlanta, Augusta, Brunswick, Cartersville, and Tifton. Additional monitoring sites are added as necessary.

In the case where a watershed-based plan has been developed for a listed stream segment, an appropriate water quality monitoring program will be outlined. The monitoring program will be developed to help identify the various bacteria sources. The monitoring program may be used to verify the 303(d) stream segment listings. This will be especially valuable for those segments where limited data resulted in the listing.

6.2 Bacteria Management Practices

Based on the findings of the source assessment, NPDES point source bacteria loads from wastewater treatment facilities usually 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. Sources of bacteria 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 bacteria 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 and mammals living close to or in water environments, can be a significant source of bacteria.

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

- Compliance with NPDES (wastewater, construction, industrial stormwater, and/or MS4) permit limits and requirements;

- Ensure storm water management plans are in place and being implemented by the local governments located in the watershed;
- Implementation of Georgia's *Statewide Nonpoint Source Management Plan* (GA EPD, 2019)
- Implementation of recommended Water Quality management practices in the *Metro District Water Resource Management Plan* (MNGWPD, 2022);
- Implementation of recommended Water Quality management practices in the *Coosa-North Georgia, Middle Chattahoochee, Upper Flint, and Lower Flint-Ochlockonee Regional Water Plans* (GA EPD, 2023);
- Implementation of *Georgia's Best Management Practices for Forestry* (GFC, 2019);
- Implementation of *Best Management Practices for Georgia Agriculture* (GSWCC, 2013) and Adoption of National Resource Conservation Service (NRCS) Conservation Practices for agriculture;
- Adoption and implementation of the *Georgia Stormwater Management Manual* (ARC, 2016) and the *Coastal Stormwater Supplement to the Georgia Stormwater Management Manual* (CWP, 2009) to facilitate water quality treatment of stormwater runoff, including bacteria removal, through structural stormwater BMP installation.

6.2.1 Point Source Approaches

The NPDES permit program provides a basis for municipal, industrial, and stormwater permits, monitoring and compliance with permit limitations, and appropriate enforcement actions for violations. In accordance with GA EPD rules and regulations, all discharges from point source facilities are required to follow the conditions of their NPDES permit at all times. Wastewater treatment plants with the potential for bacteria in their discharge are given end-of-pipe limits to meet the applicable water quality standard. In addition, the permits include routine monitoring and reporting requirements.

Achieving the TMDL reductions may constitute compliance with a SWMP or SWPPP, provided the MEP definition is met, even where the numeric percent reduction may not be achieved so long as reasonable progress is made toward attainment of water quality standards using an iterative BMP process.

6.2.2 Nonpoint Source Approaches

GA EPD is the lead agency for implementing the State's Nonpoint Source Management Program, as described in Georgia's *Statewide Nonpoint Source Management Plan* (GA EPD, 2019). GA EPD will continue to work with local governments, agricultural, and forestry agencies such as the Natural Resources Conservation Service (NRCS), the Georgia Soil and Water Conservation Commission (GSWCC), and the Georgia Forestry Commission (GFC) to foster the implementation of BMPs that address nonpoint source pollution. The following sections describe programs in place and recommendations which should result in reducing nonpoint source loads of bacteria in Georgia's surface waters.

6.2.2.1 Agricultural Sources

GA EPD should coordinate with other agencies that are responsible for agricultural activities in the state to address issues concerning bacteria loading from agricultural lands. It is recommended

that information such as livestock populations by sub-watershed, animal access to streams, manure storage and application practices 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 number of 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. 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 bacteria can be significant in the Flint River Basin urban areas. Urban sources of bacteria can best be addressed using a strategy that involves stormwater management, 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. The following activities and programs conducted by cities, counties, and state agencies are recommended:

- Implement stormwater BMPs that incorporate water quality treatment and/or pollutant removal

- Uphold requirements that all new and replacement sanitary sewerage 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;

- 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

GA EPD is responsible for administering and enforcing laws to protect the waters of the State. Reasonable assurance ensures that a TMDL's wasteload and load allocations are properly distributed to meet the applicable water quality standards. Without such distribution, a TMDL's ability to serve as an effective guidepost for water quality improvement is significantly diminished. Federal regulations implementing the CWA require that effluent limits in permits be consistent with "the assumptions and requirements of any available [WLA]" in an approved TMDL [40 CFR 122.44(d)(1)(vii)(B)]. NPDES point source permits will be given effluent limits in the permit consistent with the individual WLAs specified in the TMDL.

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 criteria 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 NRCS the GSWCC, and the GFC, to foster the implementation of BMPs to address nonpoint sources. In addition, public education efforts will be targeted to individual stakeholders to provide information regarding the use of BMPs to protect water quality.

6.4 Public Participation

A forty-five-day public notice is being provided for this TMDL. During that time, the TMDL will be available on the GA EPD website, a copy of the TMDL will be provided on request, and the public will be invited to provide comments on the TMDL.

7.0 INITIAL TMDL IMPLEMENTATION PLAN

This plan identifies applicable State-wide programs and activities that may be employed to manage point and nonpoint sources of bacteria loads for the segment in the Flint River Basin. Local watershed planning and management initiatives will be fostered, supported, or developed through a variety of mechanisms. Implementation may be addressed by Watershed-Based Plans or other assessments funded by Section 319(h) grants, the local development of watershed protection plans, or "Targeted Outreach" initiated by GA EPD. These initiatives will supplement or possibly replace this initial implementation plan. Implementation actions should also be guided by the recommended management practices and actions contained within each applicable Regional Water Plan developed as part of *Georgia's Comprehensive State-wide Water Management Plan* implementation (Georgia Water Council, 2008).

7.1 Impaired Segments

This initial plan is applicable to the following waterbody that was added to Georgia's 2022 Integrated 305(b)/303(d) List of not supporting waters in *Water Quality in Georgia 2020-2021* (GA EPD, 2022) available on the GA EPD website. The following tables summarize the descriptive information provided in the 303(d) list.

Table 18: Stream Segments Listed on the 2022 303(d) List for Bacteria in the Flint River Basin

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use
Basin Creek	Headwaters to Hightower Lake	GAR031300050903	6	Fishing
Beaver Creek	Headwaters to Patsiliga Creek, Butler	GAR031300051313	6	Fishing
Big Turkey Creek	Hurricane Creek to the Flint River	GAR031300050711	3	Fishing
Choctahatchee Creek	Rabbit Branch to Kinchafoonee Creek	GAR031300070306	4	Fishing
Dry Creek	Breastworks Branch to tributary 1 mile downstream GA Hwy 200	GAR031300100205	1	Fishing
Flint River	Patsiliga Creek to Horse Creek	GAR031300051604	20	Fishing
Harrel Mill Creek	Headwaters to Kinchafoonee Creek	GAR031300070204	3	Fishing
Horse Creek	Taylor Mill Lake to Flint River	GAR031300051602	10	Fishing
Ichawaynochaway Creek	Calhoun County Line to Chickasawhatchee Creek	GAR031300090602	13	Fishing
Keel Creek	Headwaters to Spring Creek	GAR031300090902	9	Fishing
Kennel Creek	Headwaters to Walnut Creek	GAR031300050511	4	Fishing
Kinchafoonee Creek	Marion County Line to Lanahassee Creek	GAR031300070205	18	Fishing
Kinchafoonee Creek	Lanahassee Creek to Terrell County Line	GAR031300070305	8	Fishing

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use
Kiokee Creek	Unnamed tributary 0.25 miles upstream of Old Dawson Road to Tallahassee Creek	GAR031300090707	5	Fishing
Lanahassee Creek	Headwaters to West Fork Lanahassee Creek	GAR031300070202	8	Fishing
Lazer Creek (formerly Lazar Creek)	Mossy Branch to Rush Creek	GAR031300050803	4	Drinking Water, Fishing
Mill Creek	Unnamed tributary 200 ft upstream Clifton Bradley Drive to tributary to Flint River 0.4 miles downstream of Chatham Street	GAR031300060203	1	Fishing
Mossy Creek	Tributary 0.5 miles upstream of John Martin Road to Kinchafoonee Creek	GAR031300070502	5	Fishing
Muckalee Creek	Sumter Co. Line to tributary at Pirates Cove Nature Park, Leesburg	GAR031300071001	28.9	Fishing
Pachitla Creek	Goffs Mill Creek to Carter Creek	GAR031300090403	8	Fishing
Patsiliga Creek	Headwaters to McCants Mill Pond	GAR031300051314	15.4	Fishing
Pigeon Creek	Tributary to the Flint River	GAR031300050706	8	Fishing
Po Joe Branch	Tributary 0.6 miles upstream Lamar Road to Lime Creek	GAR031300060516	2	Fishing
Russell Branch	Headwaters to Lazer Creek	GAR031300050805	7	Fishing
Sheep Rock Hollow	Headwaters to the Flint River	GAR031300050714	3	Fishing
Shoal Creek	Unnamed Tributary 1 mile upstream Andrew Bailey Road to Rock Branch	GAR031300050215	4	Fishing
Tobler Creek	Headwaters to Swift Creek	GAR031300051006	23	Fishing
Town Branch	Zebulon WPCP to Elkins Creek	GAR031300050610	1	Fishing
Tributary to Bay Branch	Pond 0.3 miles downstream Bay Street to Bay Branch	GAR031300090505	2	Fishing
Tributary to Mill Creek	Headwaters to tributary 0.5 miles downstream Fowler Road	GAR031300060904	9	Fishing
Tributary to the Red River	Lake Julia to the Red River	GAR031300050922	1	Fishing
Turkey Creek	Little Creek to Jalappa Branch	GAR031300060409	2.6	Fishing
Womble Creek	Headwaters to Jerry Reeves Creek	GAR031300050918	6	Fishing

Table 19: Stream Segments with Revised TMDLs for Bacteria in the Flint River Basin

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Original TMDL Action ID Number, Agency, and Year
Aycocks Creek	Kaney Head Creek to Spring Creek	GAR031300100402	15	Fishing	40 US EPA 1998
Beaver Creek	Headwaters to Spring Hill Creek, SW Marshallville	GAR031300060101	4.9	Fishing	90 US EPA 1998
Buck Creek	Fox Branch to Flint River near Oglethorpe	GAR031300060201	16	Fishing	1445 US EPA 1998
Chickasawhatchee Creek	Dougherty County (Terrell County Line to Baker County Line)	GAR031300090804	17.6	Fishing	264 US EPA 1998
Fishpond Drain	U.S. Hwy. 84, Donalsonville to Wash Pond	GAR031300100704	9.6	Fishing	437 US EPA 1998
Kinchafoonee Creek	Ga. Hwy. 45 (Webster Co. Line) to Lake Chehaw/Worth	GAR031300070604	40	Fishing	605 US EPA 1998
Lazer Creek	Marshall Creek to Flint River near Talbotton	GAR031300050801	17	Fishing	666 US EPA 1998
Muckalee Creek	Little Muckalee Creek to Americus	GAR031300070801	5	Fishing	829 US EPA 1998
Potato Creek	Drake Branch to Hoyle Branch	GAR031300050923	5.2	Fishing, Drinking Water	944 US EPA 1998
Potato Creek	Hoyle Branch to the Flint River, near Thomaston	GAR031300050924	10.8	Fishing	944 US EPA 1998
Tributary to Nash Creek	Fayetteville	GAR031300050116	1	Fishing	1218 US EPA 1998
Turkey Creek	Pennahatchee Creek, NW Cordele to Flint River	GAR031300060405	4	Fishing	1233 US EPA 1998
White Oak Creek	Little White Oak Creek to Flint River near Alvaton	GAR031300050307	9	Fishing	1323 US EPA 1998
White Oak Creek	Newnan - I-85 to Chandlers Creek	GAR031300050308	6	Drinking Water, Fishing	1323 US EPA 1998

The water use classification for the listed stream segments in the Flint River Basin are "Drinking Water" and "Fishing." The criterion violated is listed as fecal coliform. The potential causes listed include urban runoff and nonpoint sources. The "bacteria water quality criteria as applicable at the time of listing was as follows:

(a) Drinking Water Supplies: Those waters approved as a source for public drinking water systems permitted or to be permitted by the Environmental Protection Division. Waters classified for drinking water supplies will also support the fishing use and any other use requiring water of a lower quality.

(i) 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.

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

(i) 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 shellfish growing areas by the Georgia DNR Coastal Resources Division, 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 National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

In January 2022, the Georgia DNR Board adopted new bacteria criteria for "Fishing" and "Drinking Water" designated uses using the bacterial indicators *E. coli* and enterococci. These bacteria are better indicators for human health illnesses. The adopted criteria have the same estimated illness rate (8 per 1000 swimmers) as the previously established criteria. EPA approved the proposed standards August 31, 2022. Since this TMDL was written after EPA approved the new bacteria criteria, the TMDL will use both fecal coliform and the appropriate indicator identified above based on estuarine/non-estuarine status. The current bacteria water quality criteria for "Fishing" designated uses, 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, 2022), are:

(a) Drinking Water Supplies: Those waters approved as a source for public drinking water systems permitted or to be permitted by the Environmental Protection Division. Waters classified for drinking water supplies will also support the fishing use and any other use requiring water of a lower quality.

(i) Bacteria:

1. For the months of May through October, when primary water contact recreation activities are expected to occur, culturable E. coli not to exceed a geometric mean of 126 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 410 counts per 100 mL in the same 30-day interval.

2. For the months of November through April, culturable E. coli not to exceed a geometric mean of 265 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 861 counts per 100 mL in the same 30-day interval.

3. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

c) Fishing: Propagation of Fish, Shellfish, Game and Other Aquatic Life; primary contact recreation in and on the water for the months of May – October, secondary contact recreation in and on the water for the months of November – April; or for any other use requiring water of a lower quality.

(i) Bacteria:

1. Estuarine waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable enterococci not to exceed a geometric mean of 35 counts 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. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 130 counts per 100 mL the same 30-day interval.

   For the months of November through April, culturable enterococci not to exceed a geometric mean of 74 counts 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. There shall be no greater than a ten percent excursion frequency of an enterococci statistical threshold value (STV) of 273 counts per 100 mL in the same 30-day interval.

2. All other fishing waters: For the months of May through October, when primary water contact recreation activities are expected to occur, culturable E. coli not to exceed a geometric mean of 126 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 410 counts per 100 mL in the same 30-day interval.

   For the months of November through April, culturable E. coli not to exceed a geometric mean of 265 counts 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. There shall be no greater than a ten percent excursion frequency of an E. coli statistical threshold value (STV) of 861 counts per 100 mL in the same 30-day interval.

3. The State does not encourage swimming in these surface waters since a number of factors which are beyond the control of any State regulatory agency contribute to elevated levels of bacteria.

4. For waters designated as shellfish growing areas by the Georgia DNR Coastal Resources Division, 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 National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish, 2007 Revision (or most recent version), Interstate Shellfish Sanitation Conference, U.S. Food and Drug Administration.

7.2 Potential Sources

An important part of the TMDL analysis is the identification of potential source categories. A source assessment characterizes the known and suspected bacteria sources in the watershed. 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. Point sources of bacteria include NPDES permittees discharging treated wastewater and stormwater. Nonpoint sources of bacteria are diffuse sources that cannot be identified as entering the waterbody at a single location. These sources generally involve land use activities that contribute bacteria to streams during a rainfall runoff event.

NPDES point source bacteria loads from wastewater treatment facilities usually do not contribute to impairments. This is because these facilities are required to treat to levels corresponding to instream water quality criteria. However, point sources can and do fail, which may contribute to bacteria loads through leaks and overflows from sanitary sewer systems, CAFOs, or leachate from operational landfills.

Nonpoint sources of bacteria in urban areas include wastes that are attributable to domestic animals, illicit discharges of sanitary waste, leaking septic systems, runoff from improper disposal of waste materials, and leachate from closed landfills. In non-urban areas, potential sources of bacteria may include animals grazing in pastures, dry manure storage facilities and lagoons, chicken litter storage areas, and direct access of livestock to streams. Wildlife, especially waterfowl and mammals living close to or in water environments, can be a significant source of bacteria.

7.3 Management Practices and Activities

GA EPD is responsible for administering and enforcing laws to protect the waters of the State and is the lead agency for implementing the State's Nonpoint Source Management Program. Georgia is working with local governments, agricultural and forestry agencies such as the Georgia Department of Agriculture, NRCS, GSWCC, and GFC to foster implementation of BMPs that address nonpoint source pollution. The following management practices are recommended to reduce bacteria loads to stream segments:

- Sustain compliance with NPDES treated wastewater permit requirements;
- Sustain compliance with NPDES MS4 permit requirements, where applicable;
- Compliance with future NPDES Industrial General Permit requirements, including where applicable, achieving benchmark levels for monitored constituents;
- Ensure storm water management plans are in place and being implemented by the local governments, and by the industrial facilities located in the watershed;
- Implementation of Georgia's *Statewide Nonpoint Source Management Plan* (GA EPD, 2019);
- Adoption and implementation of the *Georgia Stormwater Management Manual* (ARC, 2016) to facilitate water quality treatment of stormwater runoff, including bacteria removal, through structural stormwater BMP installation;
- Further develop and streamline mechanisms for reporting and correcting illicit discharges, breaks, surcharges, and general sanitary sewer system problems;
- Uphold requirements that all new and replacement sanitary sewage systems be designed to minimize discharges into storm sewer systems;

- Adoption of local ordinances (i.e., septic tanks, stormwater, etc.) that address local water quality;
- Continue efforts to increase public awareness and education regarding the impact of human activities on water quality, ranging from industrial and municipal discharges to individual's activities in residential neighborhoods;
- Continue working with Federal, State, and local agencies and owners of sites where cleanup measures are necessary, and in developing control measures to prevent future releases of constituents of concern;
- Implementation of recommended Water Quality management practices in the *Metro District Water Resource Management Plan* (MNGWPD, 2022);
- Implementation of recommended Water Quality management practices in the *Upper Flint, Lower Flint-Ochlockonee, Middle Chattahoochee, and Middle Ocmulgee Regional Water Plans* (GA EPD, 2023);
- Adoption of NRCS Conservation Practices for primarily agricultural lands;
- Application of BMPs appropriate to both urban and rural land uses, where applicable; and
- Ongoing public education efforts on the sources of bacteria and common-sense approaches to lessen the impact of this contaminant on surface waters.

7.4 Monitoring

GA EPD encourages local governments and municipalities to develop and continue water quality monitoring programs. These programs can help pinpoint various bacteria sources, as well as verify the 303(d) stream segment listings. This will be particularly valuable for those segments where listing was based on limited data. In addition, regularly scheduled sampling will determine if there has been some improvement in the water quality of the listed stream segments. GA EPD would like to particularly commend and encourage downgradient sampling on the LAS system and supports expanding monitoring to quarterly or monthly sampling schedules. GA EPD is available to assist in providing technical guidance regarding the preparation of monitoring plans and Sampling Quality Assurance Plans (SQAP).

7.5 Future Action

This Initial TMDL Implementation Plan includes a general approach to pollutant source identification, as well as management practices to address pollutants. In the future, GA EPD will continue to determine and assess the appropriate point and non-point source management measures needed to achieve the TMDLs and to protect and restore water quality in impaired waterbodies.

For point sources, 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 stormwater will be implemented in the form of BMPs in the NPDES permits. Contributions of bacteria from regulated communities may also be managed using permit requirements such as watershed assessments, watershed protection plans, and long-term monitoring. These measures will be directed through current point source management programs.

GA EPD will work to support watershed restoration, improvement and protection projects that address nonpoint source pollution. This is a process whereby GA EPD and/or Regional Commissions or other agencies or local governments, under a contract with GA EPD, will develop a Watershed Management Plan intended to address water quality at the small watershed level

(HUC 10 or smaller). These plans will be developed as resources and willing partners become available. The development of these plans may be funded via several grant sources, including, but not limited to: CWA Section 319(h), Section 604(b), and/or Section 106 grant funds. These plans are intended for implementation upon completion.

Any Watershed Management Plan that specifically addresses a waterbody contained within this TMDL will supersede this Initial TMDL Implementation Plan for that waterbody once GA EPD accepts and/or approves the plan. Watershed Management Plans intended to address this TMDL and other water quality concerns, prepared for GA EPD, and for which GA EPD and/or the GA EPD Contractor are responsible, will contain at a minimum the US EPA's 9 Elements of Watershed Planning:

1) An identification of the sources or groups of similar sources contributing to nonpoint source pollution to be controlled to implement load allocations or achieve water quality standards. Sources should be identified at the subcategory level with estimates of the extent to which they are present in the watershed (e.g., X numbers of cattle feedlots needing upgrading, Y acres of row crops needing improved bacteria control, or Z linear miles of eroded streambank needing remediation);

2) An estimate of the load reductions expected for the management measures;

3) A description of the NPS management measures that will need to be implemented to achieve the load reductions established in the TMDL or to achieve water quality standards;

4) An estimate of the sources of funding needed, and/or authorities that will be relied upon, to implement the plan;

5) An information/education component that will be used to enhance public understanding of and participation in implementing the plan;

6) A schedule for implementing the management measures that is reasonably expeditious;

7) A description of interim, measurable milestones (e.g., amount of load reductions), improvement in biological or habitat parameters) for determining whether management measures or other control actions are being implemented;

8) A set of criteria that can be used to determine whether substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether the plan needs to be revised; and;

9) A monitoring component to evaluate the effectiveness of the implementation efforts, measured against the criteria established under item 8.

The public will be provided an opportunity to participate in the development of Watershed Management Plans that address impaired waters and to comment on them before they are finalized.

GA EPD will continue to offer technical and financial assistance (when and where available) to complete Watershed Management Plans that address the impaired waterbodies listed in this and other TMDL documents. Assistance may include but will not be limited to:

- Assessments of pollutant sources within watersheds;
- Determinations of appropriate management practices to address impairments;
- Identification of potential stakeholders and other partners;
- Developing a plan for outreach to the public and other groups;
- Assessing the resources needed to implement the plan upon completion; and
- Other needs determined by the lead organization responsible for plan development.

GA EPD will also make this same assistance available, if needed, to proactively address water quality concerns. This assistance may be in the way of financial, technical, or other aid and may be requested and provided outside of the TMDL process or schedule.

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Appendix A

Drainage Areas and Annual Average flow values for segments with revised TMDLs

Table A-1: Drainage Areas and Annual Average flow values for segments with revised TMDLs

Revised 303(d) Listed Stream Segment	Segment Location	Assessment Unit ID	Mean Annual Stream Flow (ft^3/s)	Watershed Area (sq miles)
Aycocks Creek	Kaney Head Creek to Spring Creek	GAR031300100402	89.18	106.3
Beaver Creek	Headwaters to Spring Hill Creek, SW Marshallville	GAR031300060101	42.24	8
Buck Creek	Fox Branch to Flint River near Oglethorpe	GAR031300060201	148.34	232.4
Chickasawhatchee Creek	Dougherty County (Terrell County Line to Baker County Line)	GAR031300090804	85.23	244.2
Fishpond Drain	U.S. Hwy. 84, Donalsonville to Wash Pond	GAR031300100704	89.18	59.1
Kinchafoonee Creek	Ga. Hwy. 45 (Webster Co. Line) to Lake Chehaw/Worth	GAR031300070604	510.46	655.8
Lazer Creek	Marshall Creek to Flint River near Talbotton	GAR031300050801	172.00	170
Muckalee Creek	Little Muckalee Creek to Americus	GAR031300070801	148.34	170.9
Potato Creek	Drake Branch to Hoyle Branch	GAR031300050923	189.00	192
Potato Creek	Hoyle Branch to the Flint River, near Thomaston	GAR031300050924	234.00	238
Tributary to Nash Creek	Fayetteville	GAR031300050116	1.10	1.03
Turkey Creek	Pennahatchee Creek, NW Cordele to Flint River	GAR031300060405	42.25	183.6
White Oak Creek	Little White Oak Creek to Flint River near Alvaton	GAR031300050307	191.00	179
White Oak Creek	Newnan - I-85 to Chandlers Creek	GAR031300050308	29.70	26.3

Appendix B

30-day Geometric Mean Fecal and Winter Single Sample Max Coliform Monitoring Data

Table A-1. Basin Creek at Old Alabama Rd near Thomaston, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
2/12/2020	230	39.86	140.2	46.63	2.47E+11	1.77E+12	0.0%
2/26/2020	80	44.07					
3/5/2020	300	81.54					
3/11/2020	70	21.03					
7/27/2020	170	5.24	541.8	4.38	8.99E+10	3.32E+10	63.1%
7/30/2020	1300	5.22					
8/11/2020	1300.00	3.74					
8/13/2020	300	3.33					
9/10/2020	1200	2.26	308.9	4.09	4.78E+10	3.10E+10	35.3%
10/1/2020	300	6.86					
10/5/2020	110	3.93					
10/8/2020	230	3.31					
11/3/2020	500	5.54					

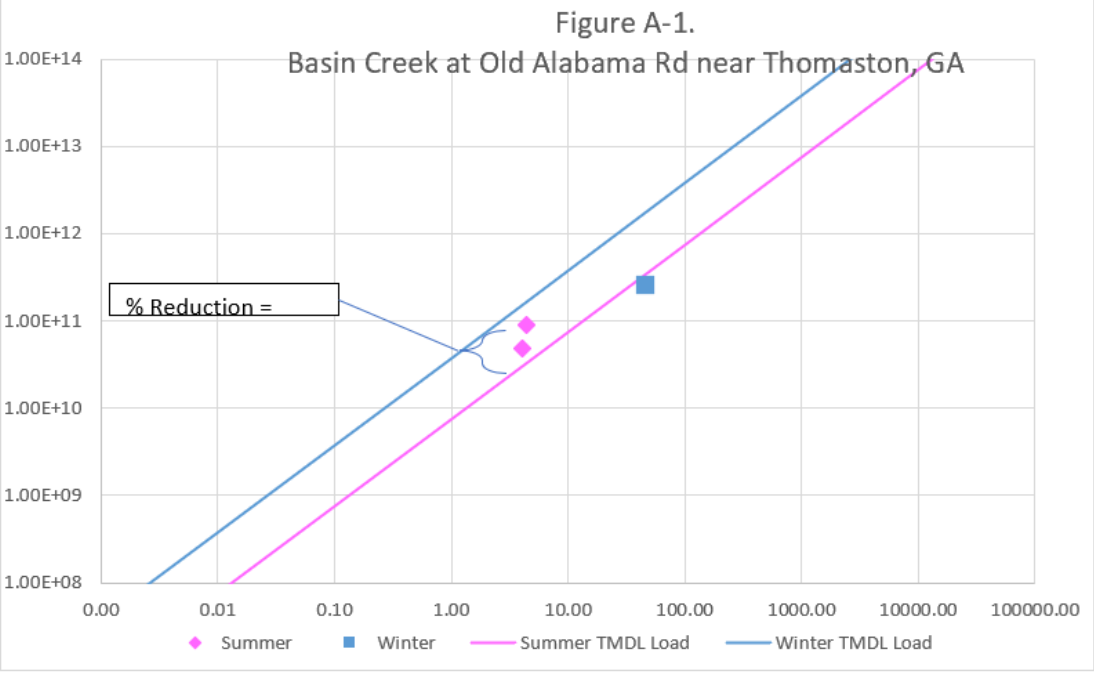

Table A-2. Beaver Creek at Hwy 137 near Butler, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
2/20/2018	20	15.06	99.0	16.35	6.13E+10	6.19E+11	
2/26/2018	3000	13.82					
3/1/2018	80	17.92					
3/7/2018	20	18.59					
6/21/2018	80	7.48	174.7	9.30	6.15E+10	7.04E+10	
6/28/2018	230	8.33					
7/5/2018	220	8.53					
7/9/2018	230	12.87					
10/2/2018	40	3.95	242.7	10.87	9.99E+10	8.23E+10	17.6%
10/15/2018	1700	25.26					
10/24/2018	300	6.82					
10/30/2018	170	7.47					
12/4/2018	70	63.29	37.4	50.49	7.15E+10	1.91E+12	
12/13/2018	20	68.34					
12/18/2018	20	43.18					
12/27/2018	70	27.17					

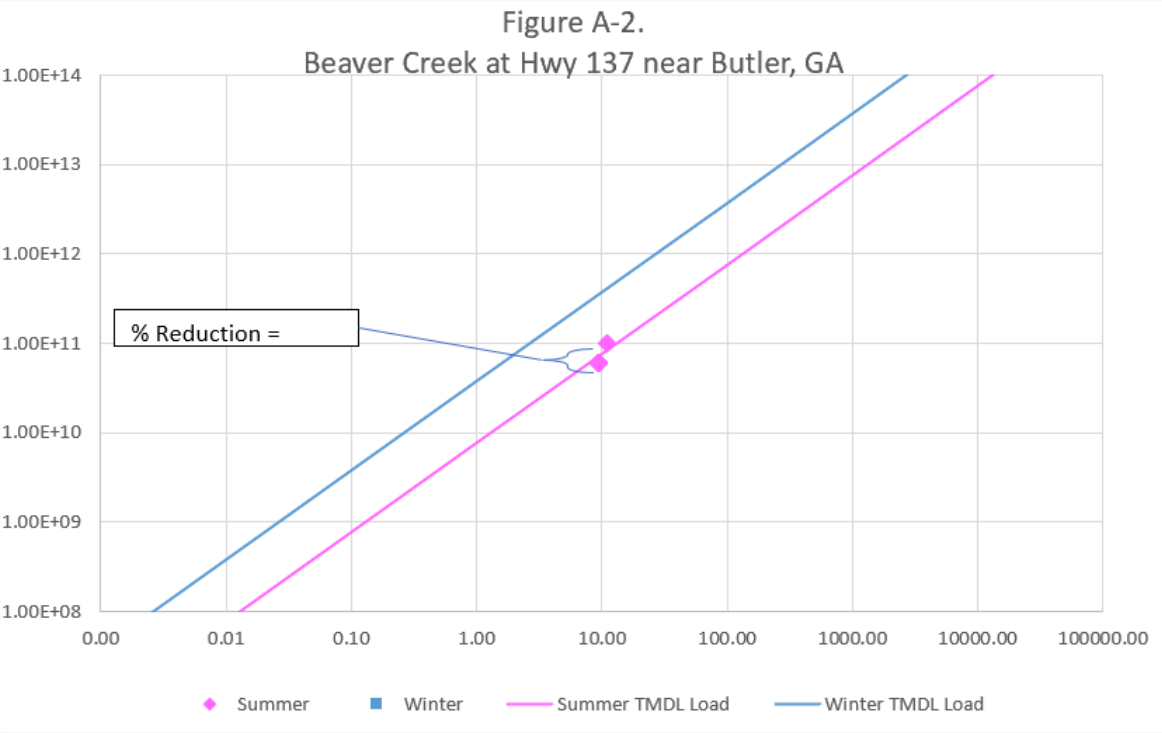

Table A-3. (Big Turkey Creek) Hurricane Creek to the Flint River

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
03/23/2016	80	9.35	187	12	8.54E+10	4.56E+11	0
03/29/2016	140	11.87					
04/06/2016	500	15.99					
04/11/2016	220	10.94					
05/16/2016	70	4.13	552	3	6.88E+10	2.49E+10	63.8%
06/01/2016	1100	2.81					
06/06/2016	1100	4.14					
06/13/2016	1100	2.07					
08/23/2016	230	1.90	399	1	1.24E+10	6.22E+09	49.9%
08/31/2016	1300	0.53					
09/07/2016	170	0.43					
09/15/2016	500	0.43					
12/12/2016	130	1.10	116	2	6.62E+09	5.72E+10	0
12/15/2016	20	2.36					
12/19/2016	300	1.50					
12/29/2016	230	1.09					

Figure A-3.
Hurricane Creek to the Flint River

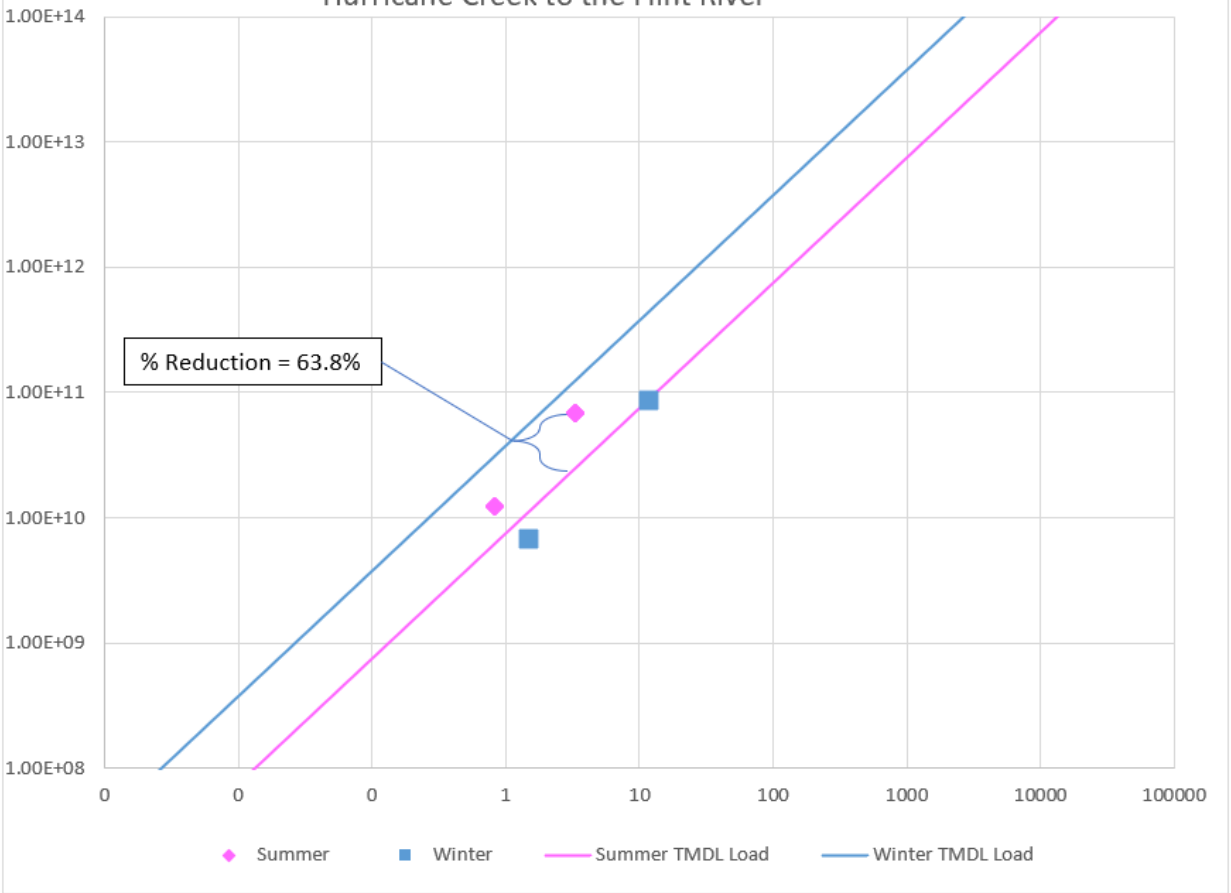

Table A-4. Choctahatchee Creek at US Hwy 280 near Plains, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
1/8/2019	130	96.84	124.7	72.40	3.42E+11	2.74E+12	0
1/14/2019	110	71.48					
1/16/2019	130	54.39					
1/23/2019	130	66.89					
4/2/2019	170	28.30	254.0	36.29	3.49E+11	1.37E+12	0
4/9/2019	500	51.08					
4/16/2019	70	47.22					
4/25/2019	700	18.56					
7/1/2019	1100	9.21	864.7	18.07	5.91E+11	1.37E+11	77%
7/15/2019	1300	9.61					
7/24/2019	1700	45.75					
7/29/2019	230	7.70					
10/7/2019	320	5.49	646.5	18.53	4.53E+11	1.40E+11	69%
10/15/2019	1400	10.86					
10/24/2019	300	10.35					
10/31/2019	1300	47.41					

Figure A-4.
Choctahatchee Creek at US Hwy 280 near Plains, GA

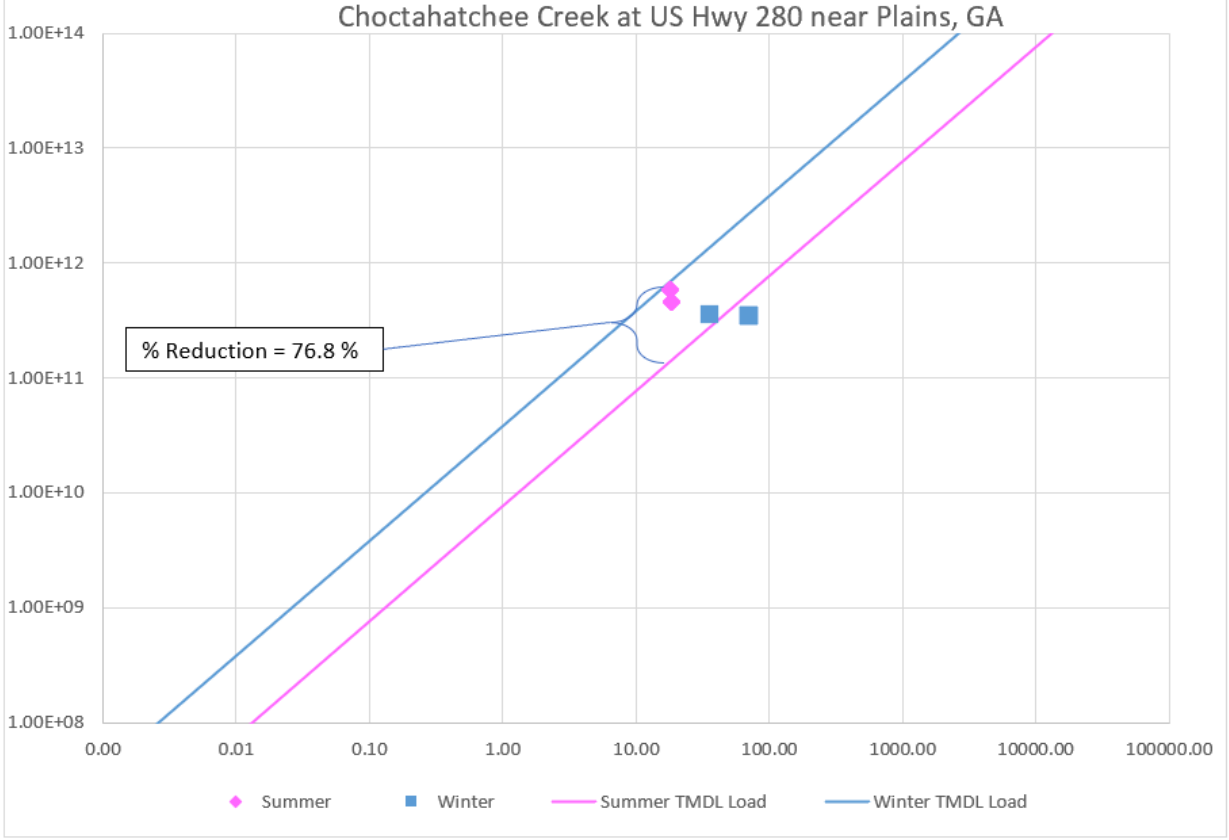

Table A-5. Dry Creek at Georgia Highway 200

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
1/11/2016	20	202.24	51.4	175.85	3.42E+11	6.66E+12	0
1/13/2016	170	151.29					
1/20/2016	40	174.02					
4/4/2016	300	505.59	182.8	242.9967	1.68E+12	9.20E+12	0
4/7/2016	220	235.94					
4/13/2016	130	143.45					
4/28/2016	130	87.01					
7/14/2016	500	22.73	292.9	18.89104	2.09E+11	1.43E+11	31.7%
7/18/2016	800	20.77					
7/25/2016	80	16.07					
7/26/2016	230	15.99					
10/11/2016	170	7.92	324.0	8.034569	9.85E+10	6.08E+10	38.3%
10/13/2016	270	8.00					
10/17/2016	300	8.15					
10/31/2016	800	8.07					

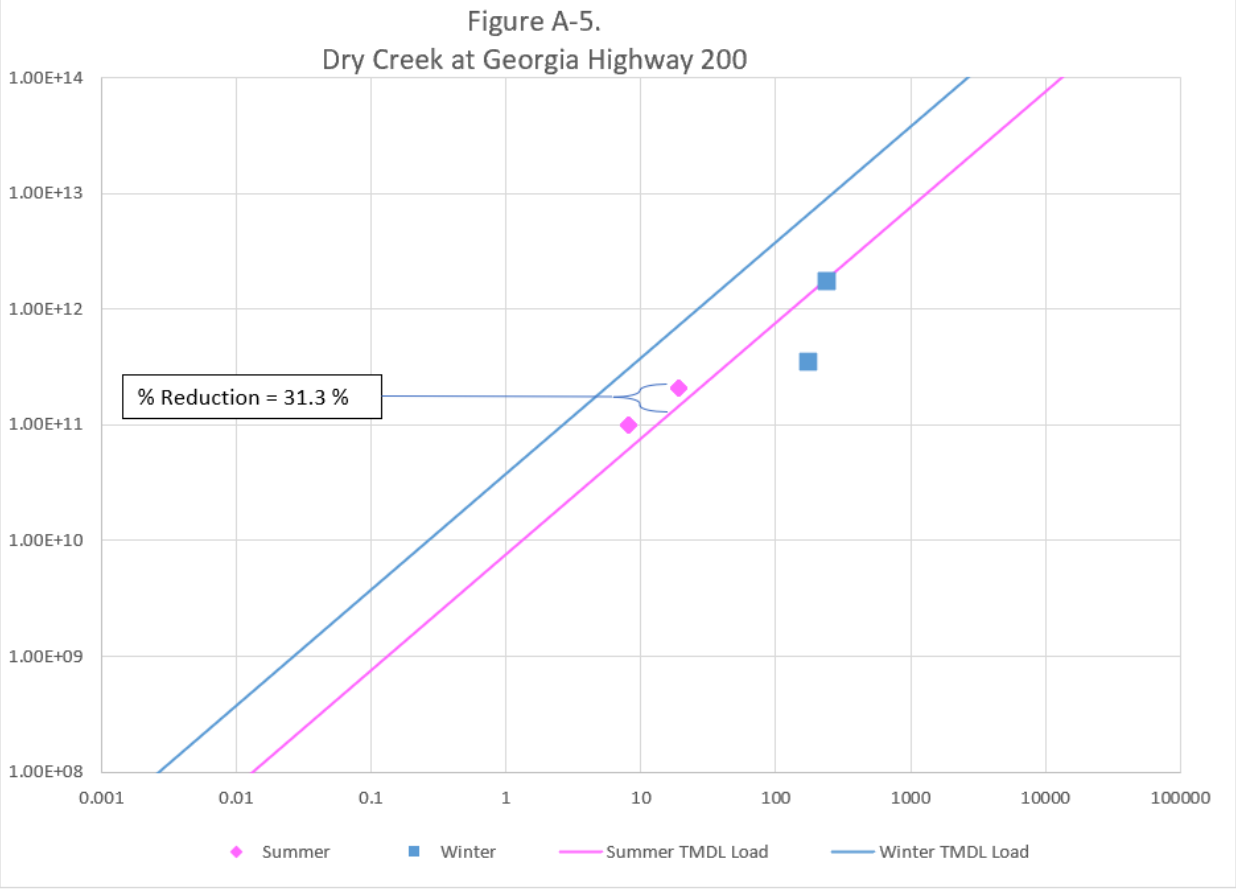

Table A-6. Flint River at SR 96 near Reynolds, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
3/7/2019	1100	6412.86	198.1	3922.93	2.94E+13	1.48E+14	0
3/12/2019	500	3515.20					
3/14/2019	70	3499.36					
3/27/2019	40	2264.29					
6/13/2019	230	6262.43	261.7	3000.58	2.97E+13	2.27E+13	23.6%
6/17/2019	300	2739.32					
6/24/2019	1700	1646.76					
6/27/2019	40	1353.83					
9/5/2019	40	746.58	89.7	627.23	2.13E+12	4.75E+12	0
9/9/2019	210	641.29					
9/17/2019	70	583.49					
9/23/2019	110	537.57					
12/5/2019	20	1155.90	103.8	2480.69	9.75E+12	9.39E+13	0
12/9/2019	20	1076.73					
12/16/2019	2800	5209.46					

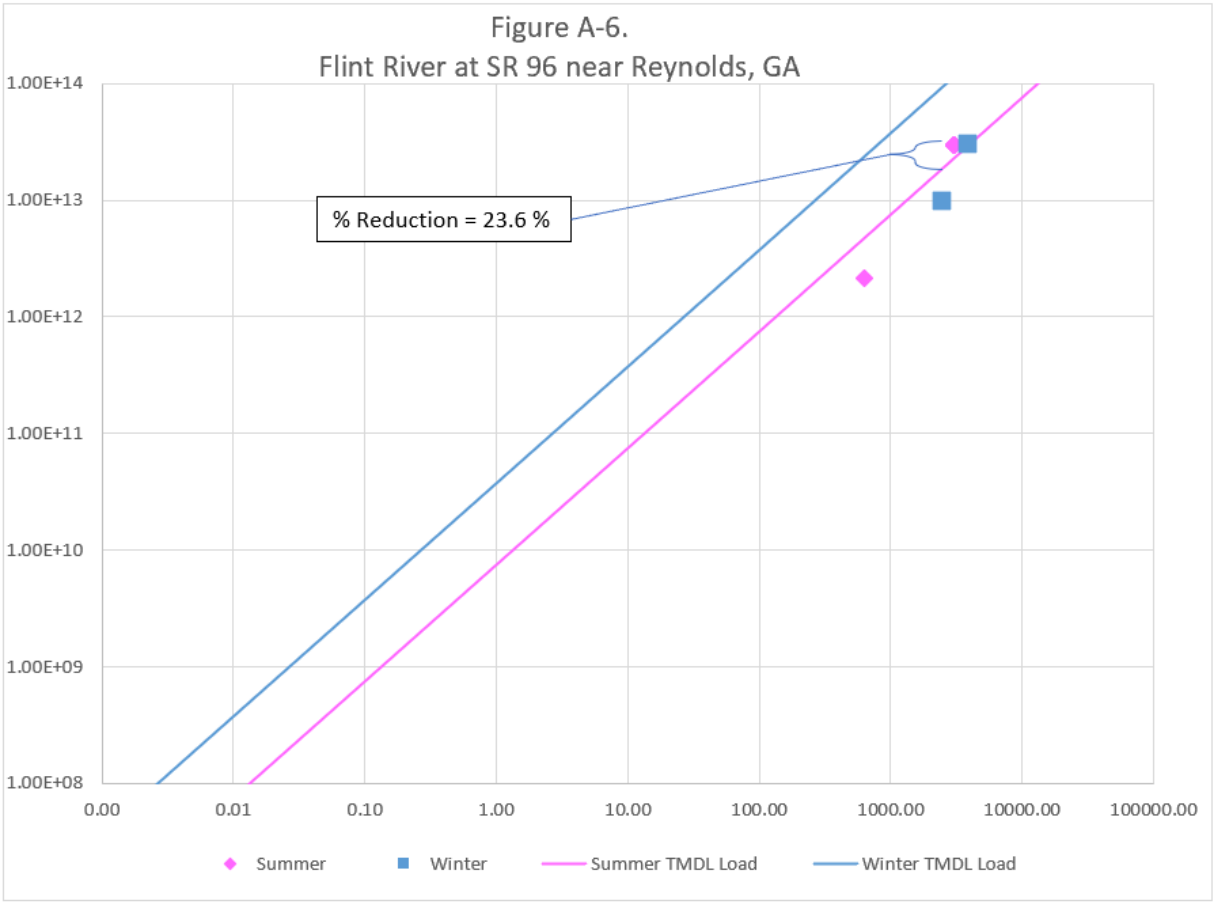

Table A-7. Harrel Mill Creek at Macedonia Church Rd near Preston, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Sampled Single Sample Coliform Loading (counts/30 days)	Sampled Single Sample TMDL Bacterial Loading (counts/30 days)	% Reduction
1/8/2019	40	20.34	1449.6	15.20915			
1/14/2019	2300	15.02					
1/16/2019	300	11.43					
1/23/2019	160000	14.05			8.51E+13	2.13E+12	97.5%
4/2/2019	1700	5.94	4729.8	7.623875			
4/9/2019	160000	10.73			6.50E+13	1.62E+12	97.5%
4/16/2019	2300	9.92					
4/25/2019	800	3.90					
7/1/2019	230	1.93	2385.5	3.795532			
7/15/2019	800	2.02					
7/24/2019	160000	9.61					
7/29/2019	1100	1.62					
10/7/2019	800	1.15	2801.5	3.892037			
10/15/2019	22000	2.28					
10/24/2019	500	2.17					
10/31/2019	7000	9.96					

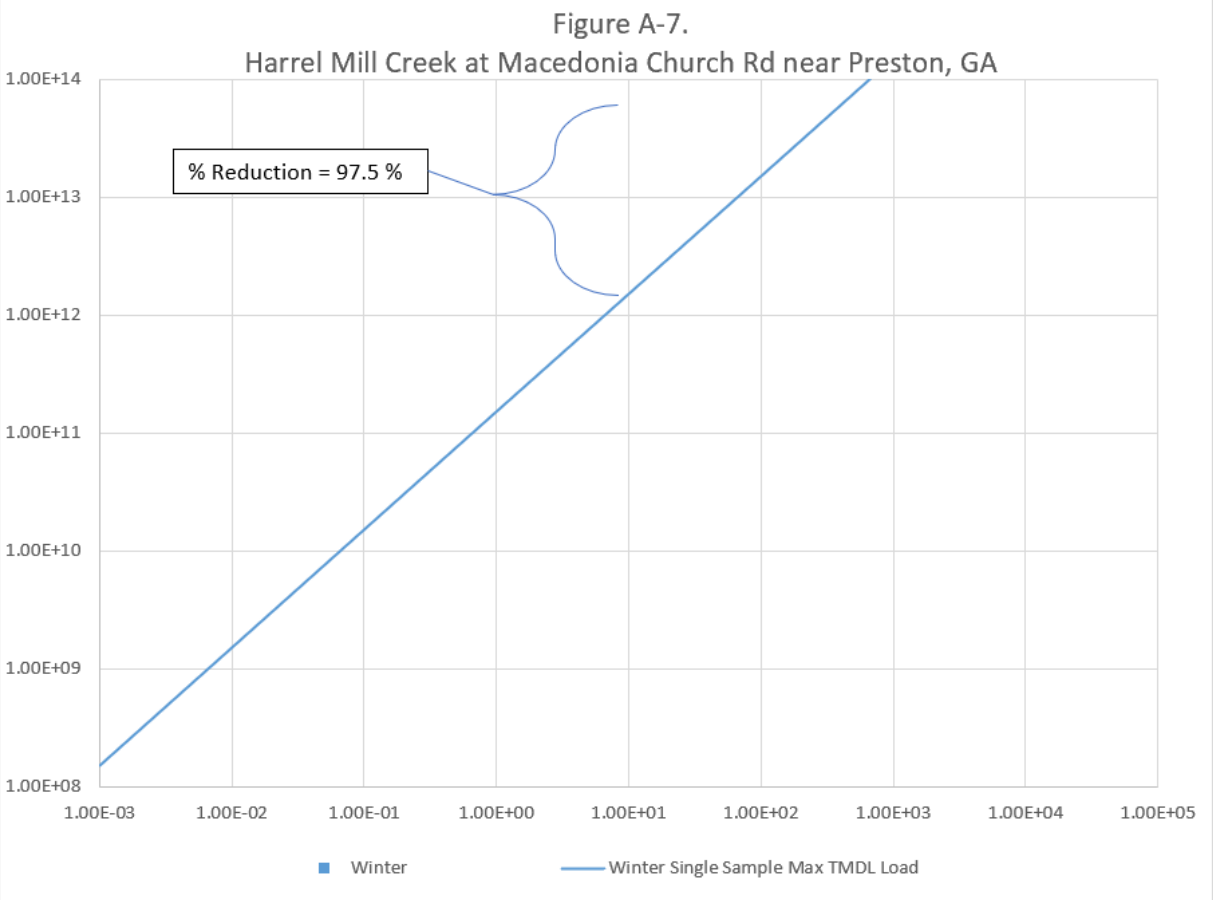

Table A-8. Horse Creek at Butler Mill Rd near Marshallville, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
2/20/2018	20	42.41	31.9	38.30425	4.63E+10	1.45E+12	0
2/26/2018	130	33.79					
3/1/2018	20	42.68					
3/7/2018	20	34.34					
6/21/2018	40	30.92	120.1	29.99359	1.36E+11	2.27E+11	0
6/28/2018	130	31.74					
7/5/2018	500	31.60					
7/9/2018	80	25.72					
10/2/2018	240	16.14	217.6	34.06342	2.81E+11	2.58E+11	8.1%
10/15/2018	500	78.11					
10/24/2018	110	20.66					
10/30/2018	170	21.34					
12/4/2018	45	73.33	34.6	118.538	1.55E+11	4.49E+12	0
12/13/2018	20	133.65					
12/18/2018	20	133.38					
12/27/2018	80	133.79					

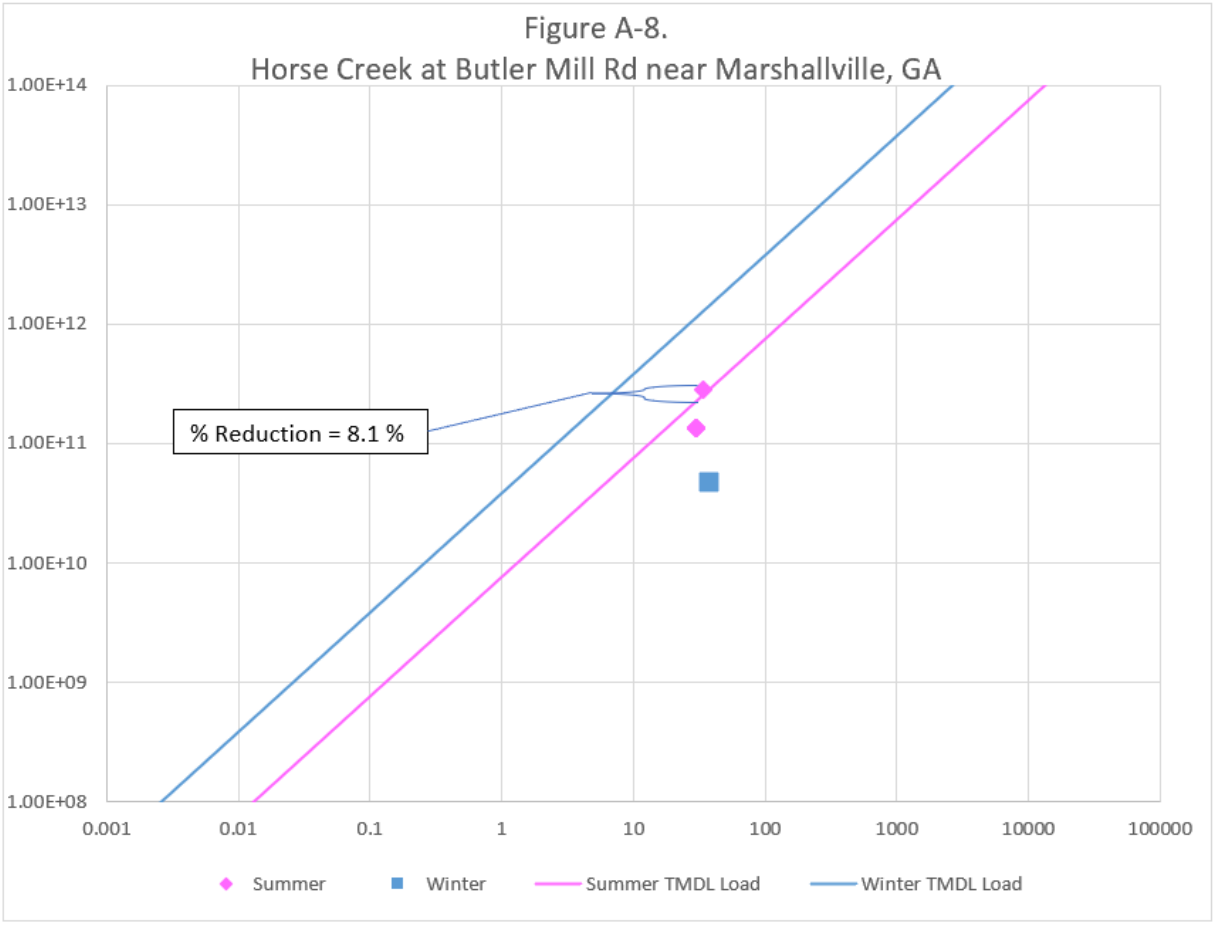

Table A-9. Ichawaynochaway Creek at Rentz Bridge Rd/ CR69

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
01/10/2018	20	364.12					
04/05/2018	110	524.76	463	960	1.68E+13	3.64E+13	0
04/17/2018	3000	1124.48					
04/19/2018	300	1231.58					
07/09/2018	70	329.85	75	1284	3.64E+12	9.72E+12	0
07/24/2018	300	1842.01					
07/26/2018	20	1681.37					
10/09/2018	340	242.03	221	1390	1.16E+13	1.05E+13	9.6%
10/15/2018	800	4230.20					
10/24/2018	110	544.04					
10/29/2018	80	542.97					

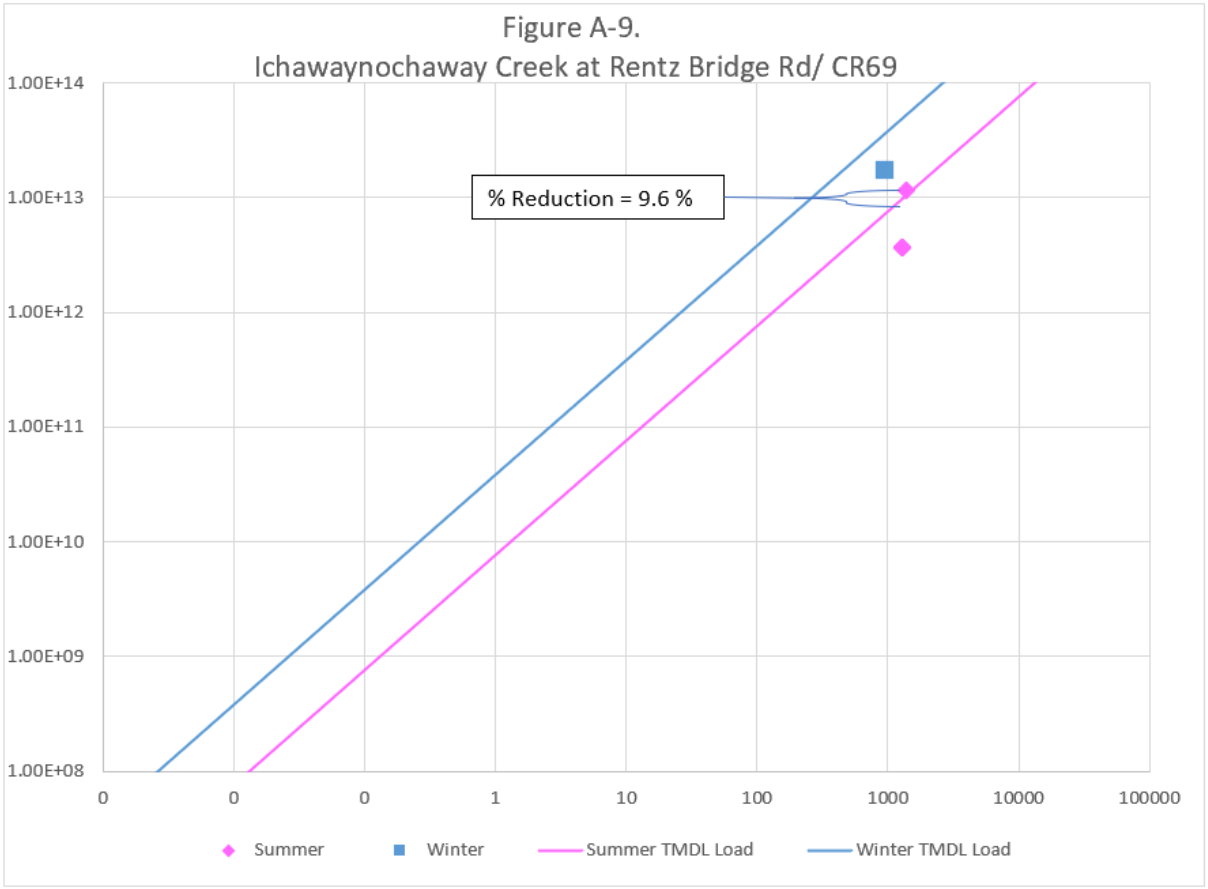

Table A-10. Keel Creek at S. Depot St. (SR 37) near Leary, Ga.

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Sampled Single Sample Coliform Loading (counts/30 days)	Sampled Single Sample TMDL Bacterial Loading (counts/30 days)	% Reduction
03/29/2018	20	15.36					
06/06/2018	130	14.04					
09/05/2018	1100	12.30					
12/13/2018	5000	90.70			1.72E+13	1.37E+13	20.0%
03/29/2018	20	15.36					
06/06/2018	40	14.04					
09/05/2018	300	12.30					
12/13/2018	3000	90.70					

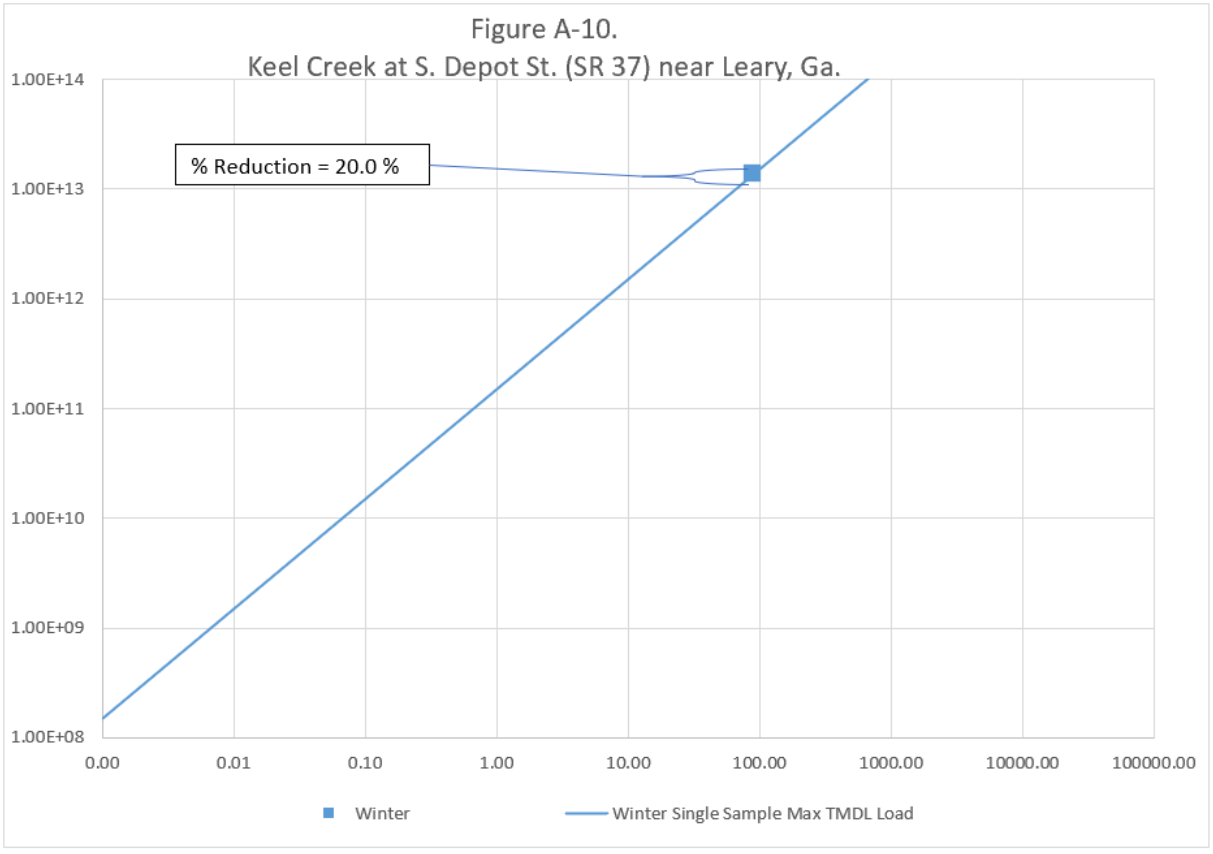

Table A-11. Kennel Creek at SR 18 near Greenville, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
03/27/2019	950	5.44	406	9	1.31E+11	3.23E+11	0
04/08/2019	1300	9.76					
04/11/2019	170	5.97					
04/23/2019	130	12.98					
07/17/2019	500	1.52	569	1	2.77E+10	9.75E+09	65%
07/25/2019	230	1.83					
07/30/2019	700	0.95					
08/01/2019	1300	0.85					
09/16/2019	1700	0.23	5707.007	0.202542	4.38E+10	1.53E+09	96.5%
09/18/2019	160000	0.19					
10/01/2019	3000	0.21					
10/9/2019	1300	0.18599024					
11/21/2019	40	1.83812372	124.4666	3.472616	16361478746	1.31453E+11	0
12/10/2019	500	1.36334769					
12/12/2019	40	1.28058857					
12/17/2019	300	9.40840578					

Figure A-11.
Kennel Creek at SR 18 near Greenville, GA

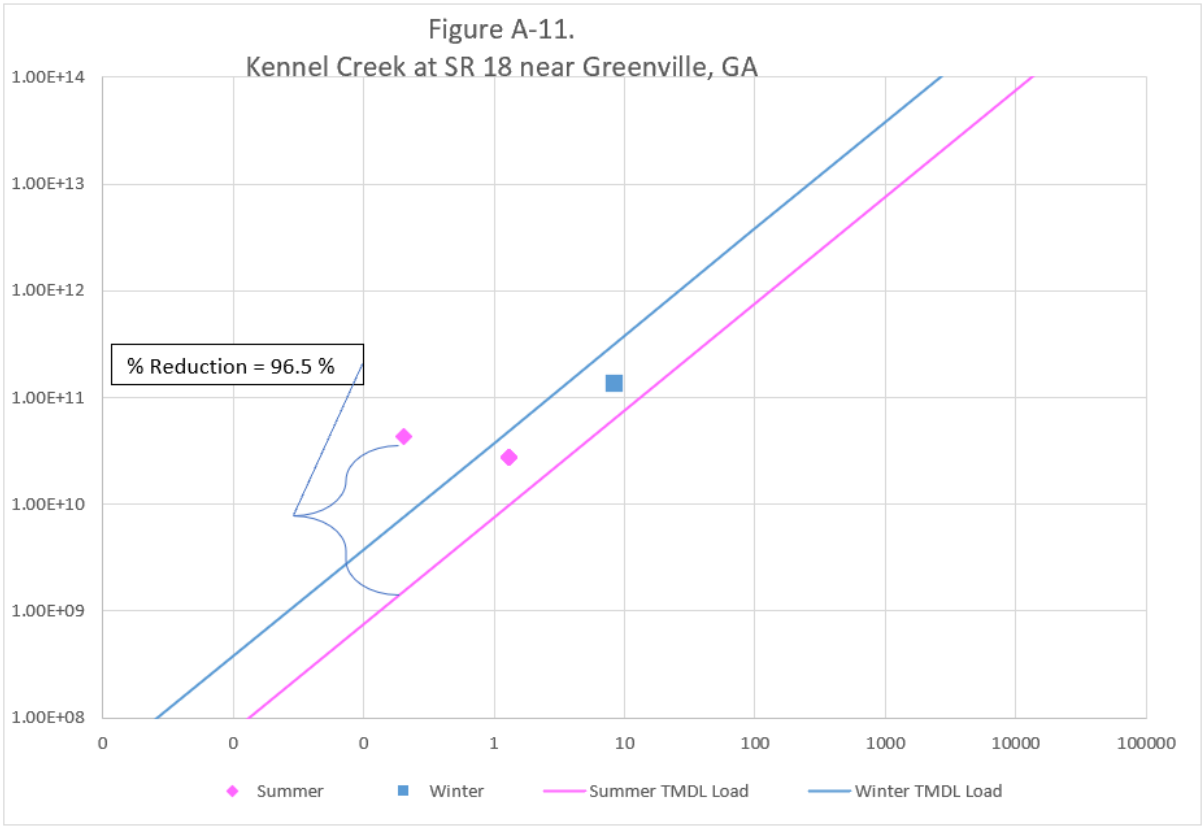

Table A-12. Kinchafoonee Creek at State Road 41 near Preston, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
08/21/2018	500	120.89					
09/20/2018	80	39.66	226	62	5.28E+11	4.67E+11	12%
09/26/2018	80	39.77					
10/01/2018	1700	77.09					
10/30/2018	240	90.14					
11/06/2018	300	102.76	198.7381	200.6631	1.51E+12	7.60E+12	0
11/28/2018	80	162.25					
12/05/2018	130	209.97					
12/12/2018	500	327.68					
01/08/2019	3000	558.86	285.3503	417.8162	4.51E+12	1.58E+13	0
01/14/2019	170	412.51					
1/16/2019	130	313.892362					
1/23/2019	100	386.002769					
4/2/2019	70	163.308864	138.126	209.4383	1.09508E+12	7.9281E+12	0
4/9/2019	500	294.804313					
4/16/2019	130	272.534922					
4/25/2019	80	107.105164					
7/1/2019	220	53.1284032	371.6297	104.2685	1.46682E+12	7.89398E+11	46.2%
7/15/2019	170	55.4613869					
7/24/2019	3000	264.051345					
7/29/2019	170	44.4327364					
10/7/2019	330	31.7073704	302.8751	106.9196	1.22584E+12	8.09469E+11	34.0%
10/15/2019	300	62.6724277					
10/24/2019	170	59.7031756					
10/31/2019	500	273.59537					

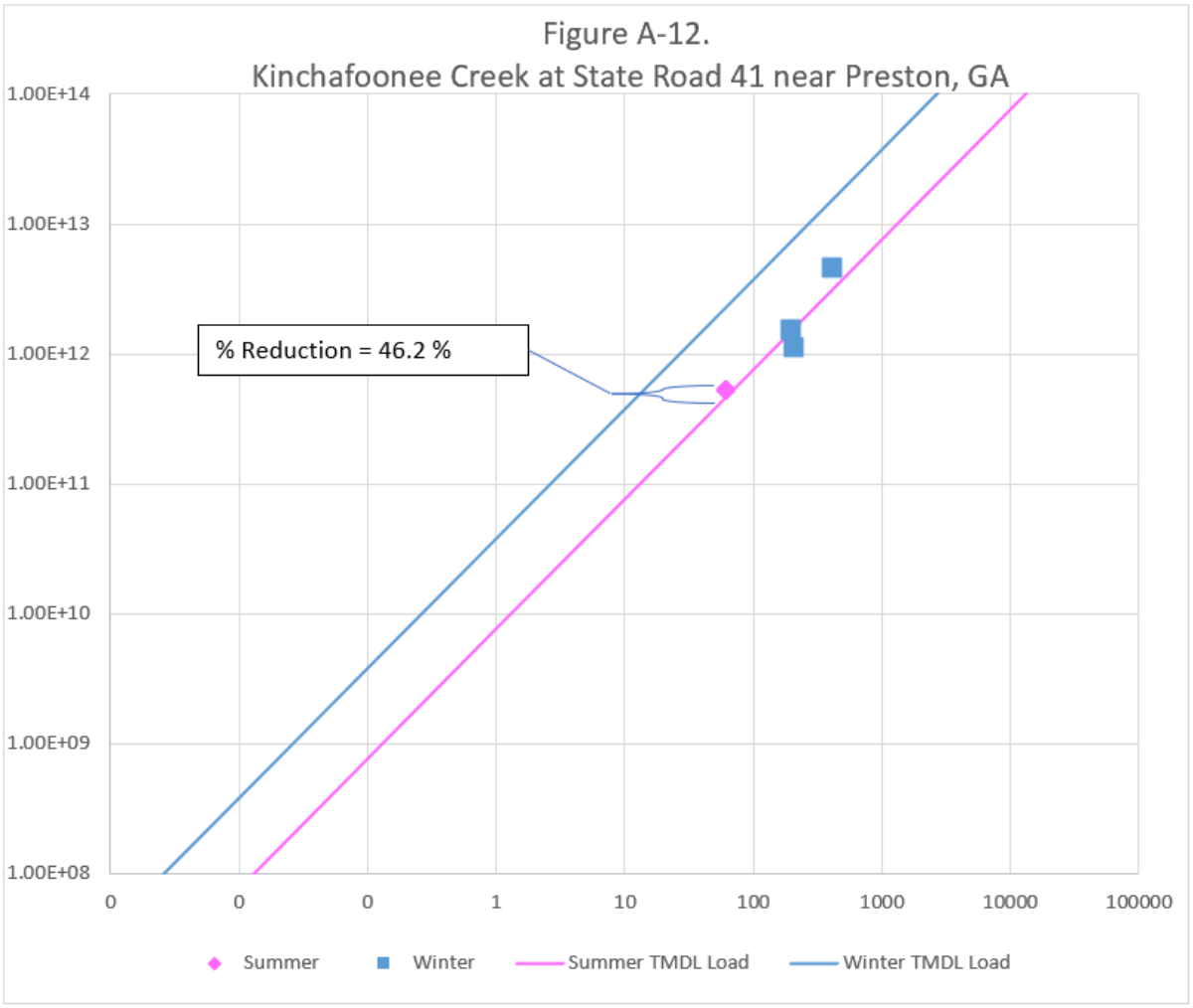
Figure A-12.
Kinchafoonee Creek at State Road 41 near Preston, GA
1.00E+14
1.00E+13
1.00E+12
1.00E+11
1.00E+10
1.00E+09
1.00E+08
% Reduction = 46.2 %
0
0
0
1
10
100
1000
10000
100000
Summer
Winter
Summer TMDL Load
Winter TMDL Load

Table A-13. Kinchafoonee Creek at Ga Hwy. 45

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
08/21/2018	1300	187.57					
09/20/2018	160	61.54	203	96	7.34E+11	7.24E+11	1%
09/26/2018	40	61.70					
10/01/2018	1300	119.62					
10/30/2018	130	139.85					
11/06/2018	70	159.43	86.04252449	311.3	1.01E+12	1.18E+13	0
11/28/2018	70	251.74					
12/05/2018	130	325.78					
12/12/2018	300	508.41					
01/08/2019	170	867.10	217.1936591	648.3	5.33E+12	2.45E+13	0
01/14/2019	170	640.04					
1/16/2019	70	487.0218465					
1/23/2019	1100	598.9052436					
4/2/2019	80	253.3829877	138.5038848	325	1.70372E+12	1.23009E+13	0
4/9/2019	500	457.4056531					
4/16/2019	230	422.8534275					
4/25/2019	40	166.1797517					
7/1/2019	300	82.4317382	1349.033026	161.8	8.26145E+12	1.2248E+12	85.17%
7/15/2019	230	86.05149517					
7/24/2019	160000	409.6906749					
7/29/2019	300	68.93991678					
10/7/2019	140	49.19578787	493.8888725	165.9	3.10147E+12	1.25594E+12	59.51%
10/15/2019	500	97.23983488					
10/24/2019	170	92.63287147					
10/31/2019	5000	424.4987716					

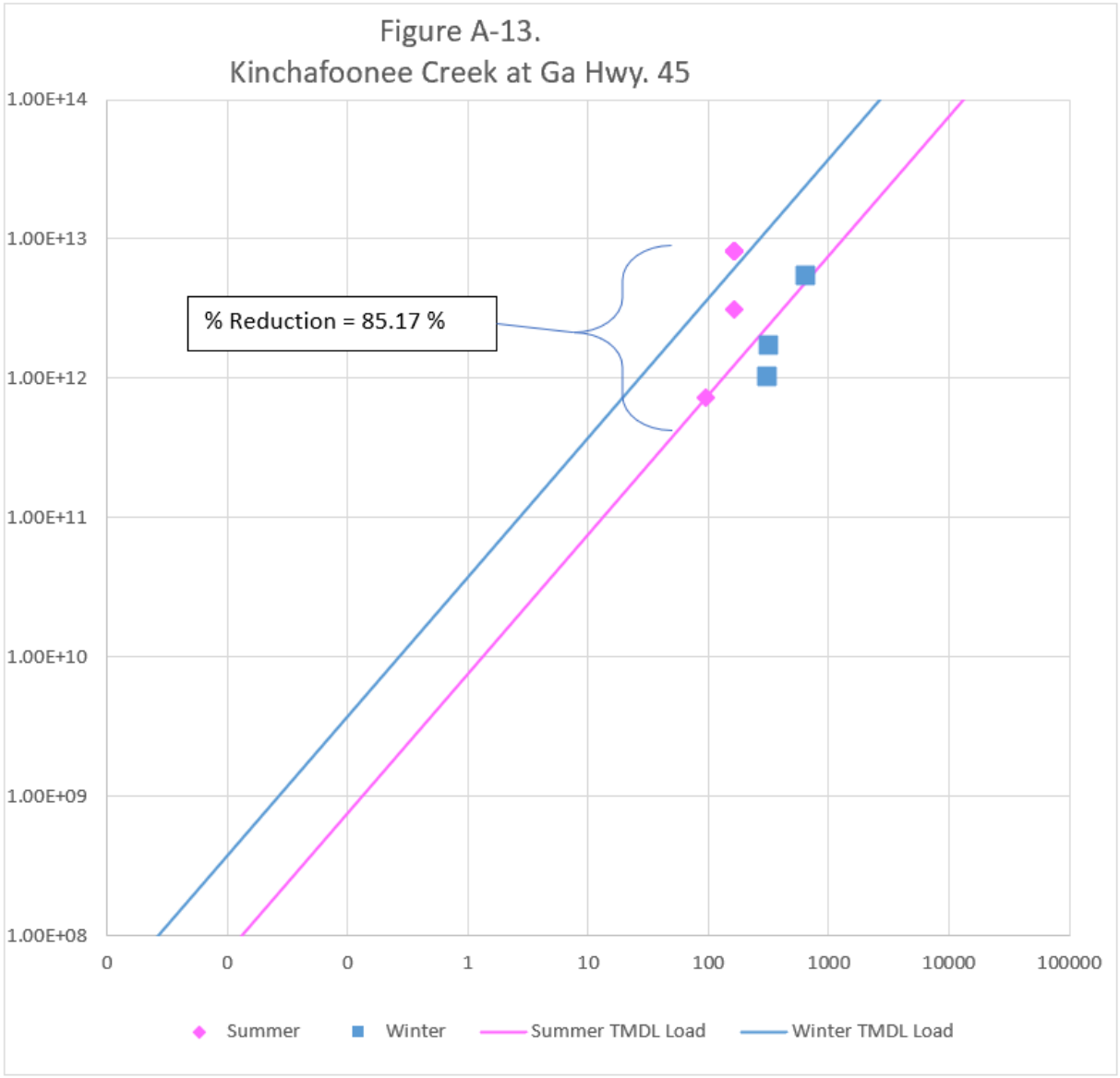
Figure A-13.
Kinchafoonee Creek at Ga Hwy. 45
1.00E+14
1.00E+13
1.00E+12
1.00E+11
1.00E+10
1.00E+09
1.00E+08
% Reduction = 85.17 %
0
0
0
1
10
100
1000
10000
100000
Summer
Winter
Summer TMDL Load
Winter TMDL Load

Table A-14. Kiokee Creek at Old Dawson Road near Albany, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
01/05/2015	700	44.32	366	51	7.04E+11	1.93E+12	0
01/07/2015	170	41.23					
01/21/2015	500	24.74					
01/26/2015	300	93.18					
04/06/2015	500	14.14	1278	38	1.82E+12	1.42E+12	22%
04/09/2015	2300	10.99					
04/23/2015	800	74.22					
04/28/2015	2900	50.92					
10/05/2015	5000	8.72	284.014422	5.241589	5.64E+10	3.97E+10	29.6%
10/15/2015	140	5.13					
10/26/2015	110	2.76					
10/28/2015	300	4.34995175					
10/29/2015	80	5.85491136					

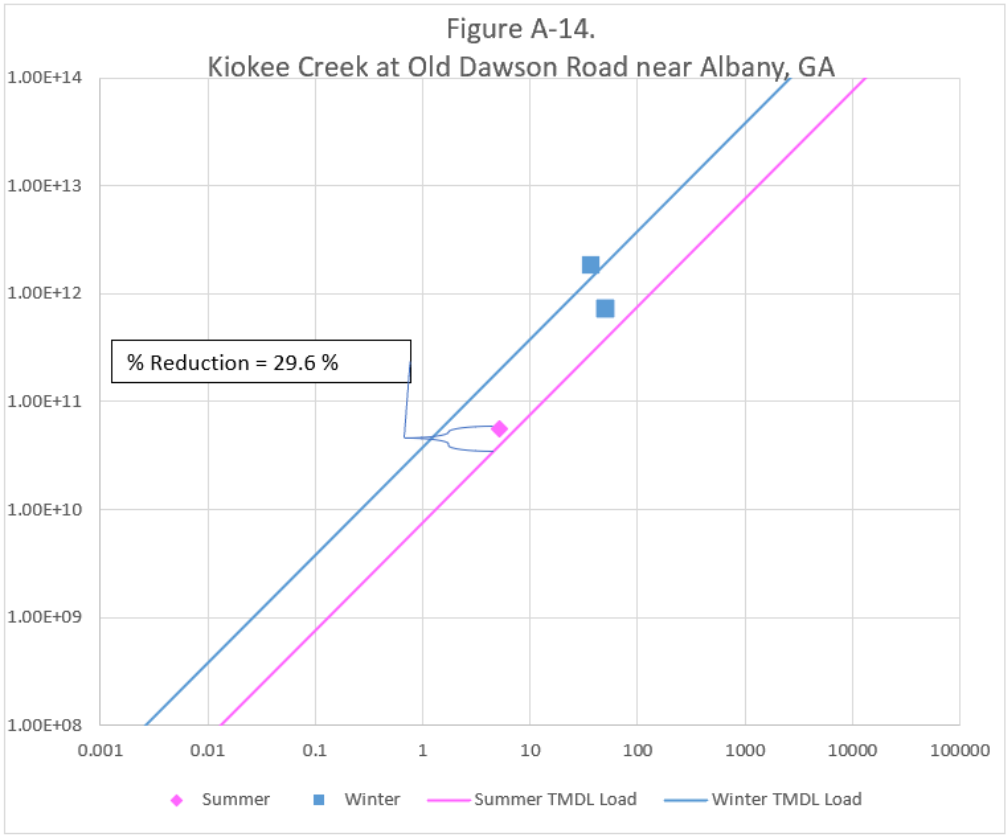

Table A-15. Lanahassee Creek nr SR153 Wasington St nr Preston, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
02/03/2016	9000	64.64	157	41	2.46E+11	1.56E+12	0
02/09/2016	170	34.92					
02/15/2016	20	26.16					
02/18/2016	20	39.50					
05/04/2016	90	11.81	525	10	1.94E+11	7.38E+10	62%
05/12/2016	230	8.16					
05/19/2016	16000	11.40					
05/25/2016	230	7.62					
08/08/2016	1300	9.39	864.171941	6.476781	2.12E+11	4.90E+10	76.9%
08/10/2016	300	7.57					
08/18/2016	1300	5.00					
8/24/2016	1100	3.94969112					
11/1/2016	170	3.33891414	197.610647	3.629033	27146522794	1.37374E+11	0
11/7/2016	230	3.37963261					
11/14/2016	300	3.75627841					

Figure A-15

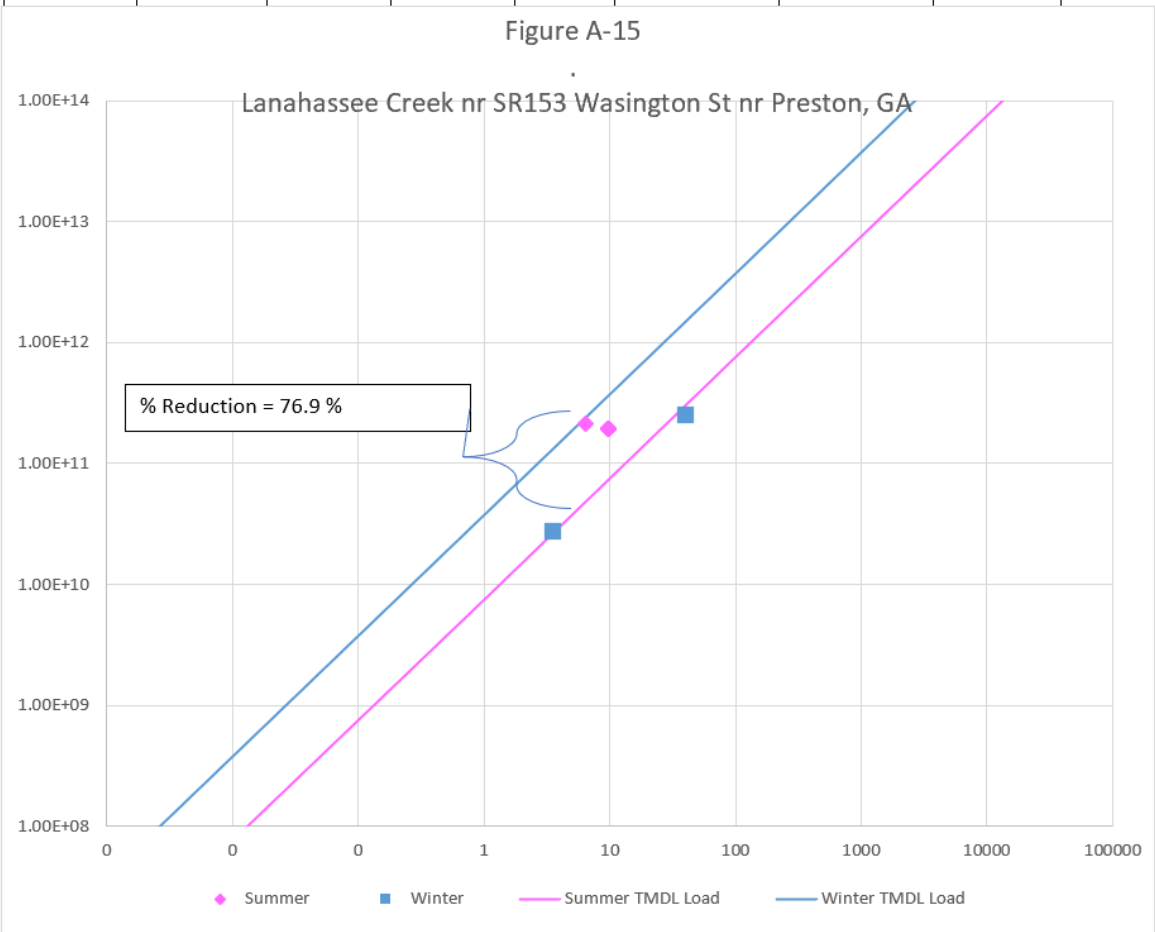

Table A-16. Lazar Creek at SR116 nr Shiloh, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
03/18/2014	240	89.01	243	48	4.40E+11	1.81E+12	0
03/20/2014	170	38.77					
04/01/2014	500	24.78					
04/10/2014	170	39.00					
06/17/2014	170	11.63					
07/21/2014	500	23.63	339.1165	7.804758	1.00E+11	5.91E+10	41.0%
07/31/2014	230	2.96					
08/04/2014	500	2.64					
08/06/2014	230	1.99					
09/16/2014	1100	3.69	350.81783	2.917393	3.87E+10	2.21E+10	43.0%
09/29/2014	170	2.48					
10/6/2014	300	3.34923857					
10/9/2014	270	2.14947708					
11/19/2014	130	6.35437729	155.59005	9.348046	55057385108	3.53862E+11	0
11/25/2014	140	17.9161323					
12/3/2014	230	6.40025727					
12/10/2014	140	6.72141713					

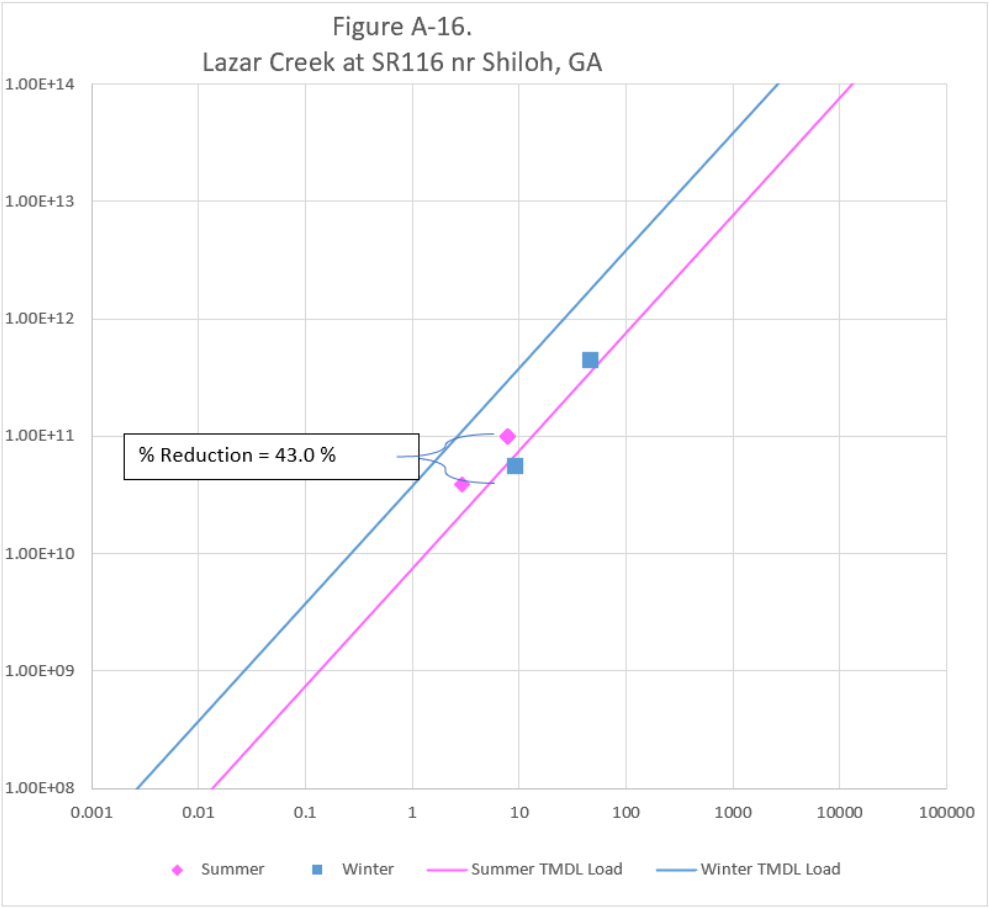

Table A-17. Mill Creek at GA Hwy 49 near Oglethorpe, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
05/18/2015	130	2.97					
05/20/2015	130	2.89					
08/04/2015	13000	1.83	1167.669261	1.453095	6.42E+10	1.10E+10	82.9%
08/06/2015	1300	1.45					
08/17/2015	500	1.20					
08/19/2015	220	1.33					
11/02/2015	16000	1.74	3370.292744	6.327904	8.07E+11	2.40E+11	70.3%
11/05/2015	1400	1.51					
11/09/2015	2400	19.97					
11/17/2015	2400	2.08					

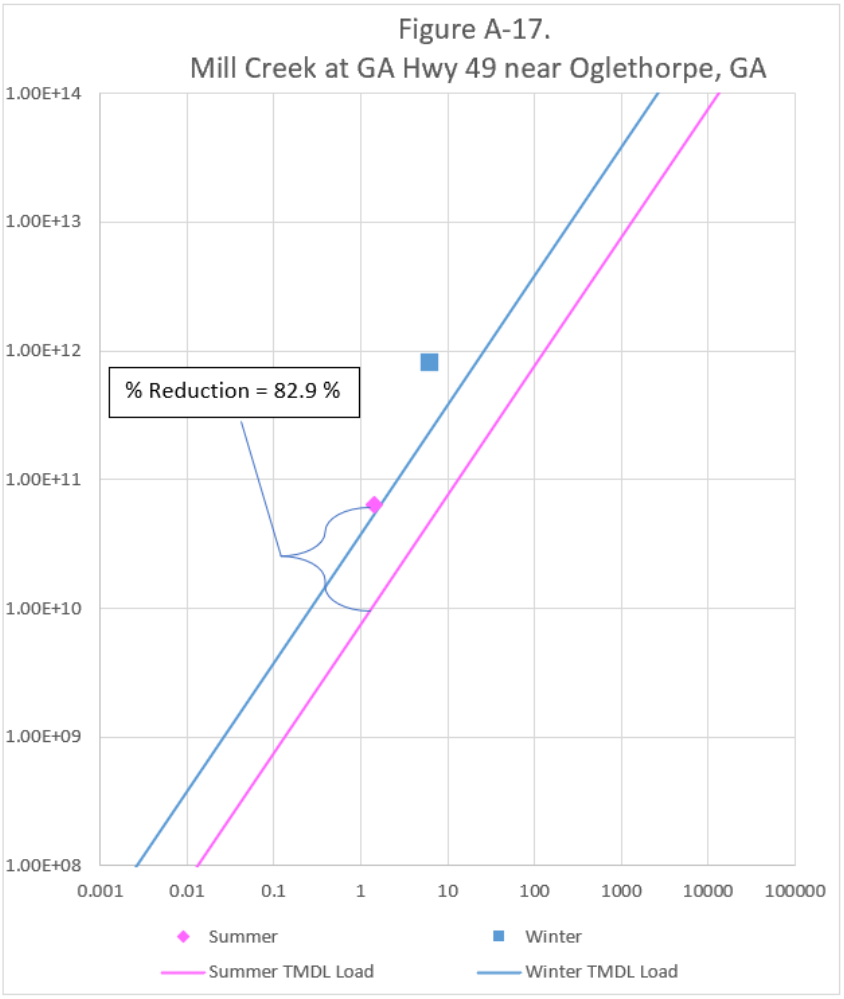

Table A-18. Mossy Creek at Pleasant Hill Road near Bronwood, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
02/03/2016	9000	35.82	1120	40	1.69E+12	1.51E+12	10.7%
02/09/2016	500	50.56					
02/15/2016	70	30.48					
02/24/2016	5000	42.84					
05/04/2016	40	13.80	609	11	2.50E+11	8.19E+10	67.2%
05/12/2016	230	9.16					
05/19/2016	50000	8.11					
05/25/2016	300	12.22					
08/08/2016	800	5.83	617.7181239	5.363741	1.25E+11	4.06E+10	67.6%
08/10/2016	700	7.37					
08/18/2016	520	3.86					
8/24/2016	500	4.38931379					
11/1/2016	7000	2.92855016	1521.212442	3.222634	1.85573E+11	1.2199E+11	34.3%
11/7/2016	1800	3.05145095					
11/14/2016	850	3.40961895					
11/16/2016	500	3.50091668					

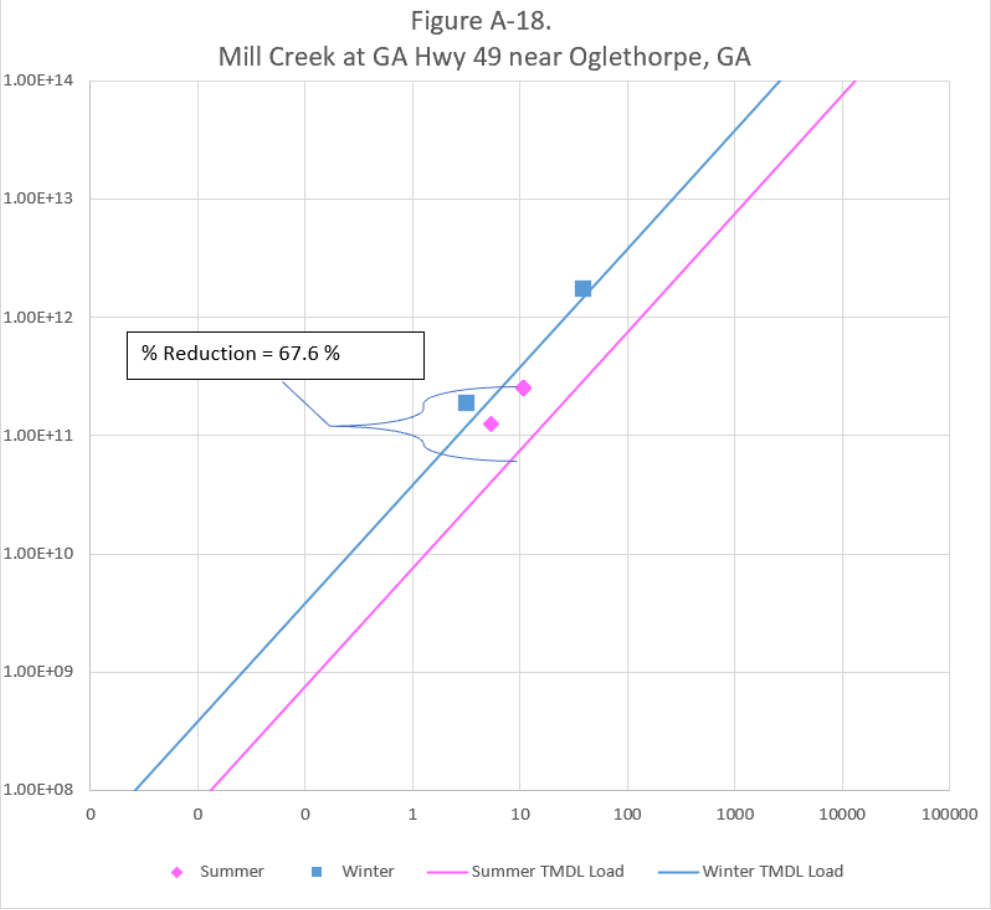

Table A-19. Muckalee Creek at State Road 195 near Leesburg, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
01/13/2014	950	944.77	398	728	1.10E+13	2.76E+13	0
01/15/2014	230	1046.97					
01/23/2014	500	408.81					
02/03/2014	230	512.20					
02/17/2014	500	1366.65					
04/01/2014	40	1106.39	180.4714	1631.9577	1.11E+13	6.18E+13	0
04/14/2014	120	798.60					
04/21/2014	1700	3351.26					
04/24/2014	130	1271.58					
07/01/2014	500	124.78	314.23254	170.62321	2.03E+12	1.29E+12	36.4%
07/02/2014	130	101.37					
7/21/2014	500	212.721956					
7/28/2014	300	243.620117					
10/1/2014	170	144.983679	279.69703	238.86655	2.52904E+12	1.80842E+12	28.5%
10/6/2014	40	161.621151					
10/16/2014	3000	490.805406					
10/23/2014	300	158.055978					

Figure A-19.
Muckalee Creek at State Road 195 near Leesburg, GA

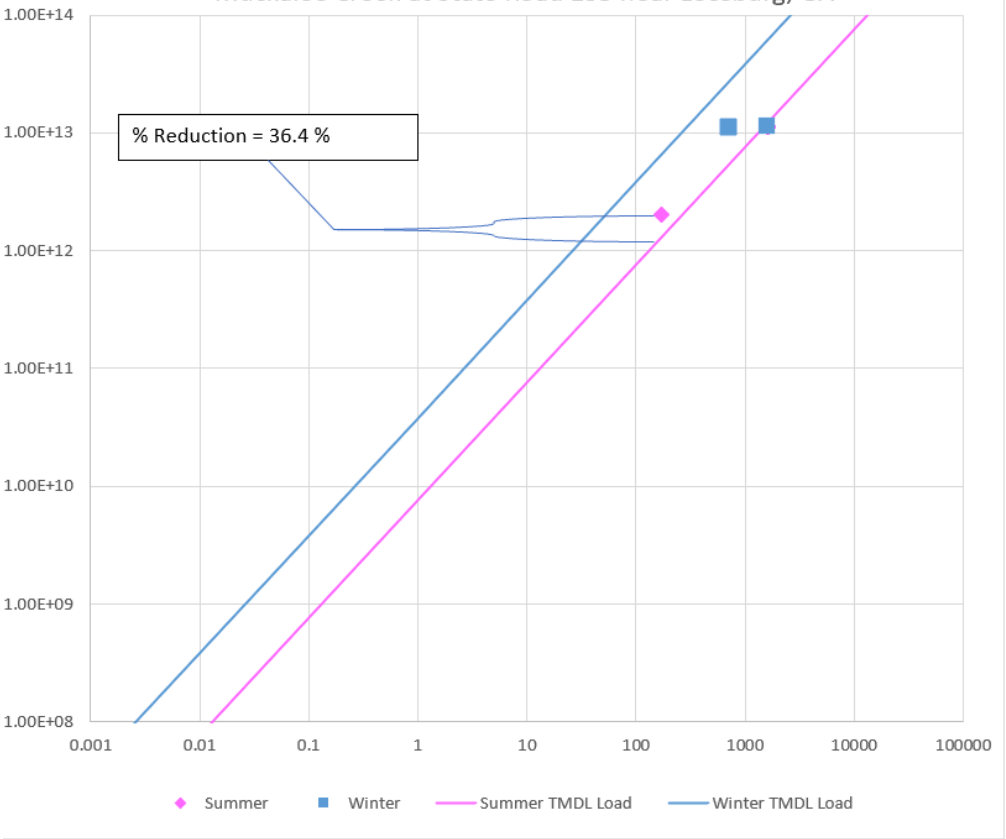

Table A-20. Pachitla Creek at Robin Factory Rd. near Cuthbert, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
02/03/2016	800	214.19	194	162	1.19E+12	6.14E+12	0
02/09/2016	230	153.26					
02/15/2016	70	117.31					
02/18/2016	110	163.86					
05/04/2016	230	72.66	272	83	8.54E+11	6.27E+11	26.6%
05/12/2016	230	47.68					
05/19/2016	800	170.29					
05/25/2016	130	40.87					
08/08/2016	650	78.33	373.781	55.29709	7.82E+11	4.19E+11	46.5%
08/10/2016	1100	81.74					
08/18/2016	130	39.73					
8/24/2016	210	21.38091					
11/1/2016	300	19.79153	606.1547	21.68365	4.97541E+11	8.20815E+11	0
11/7/2016	3000	19.71585					
11/14/2016	300	22.74324					
11/16/2016	500	24.48398					

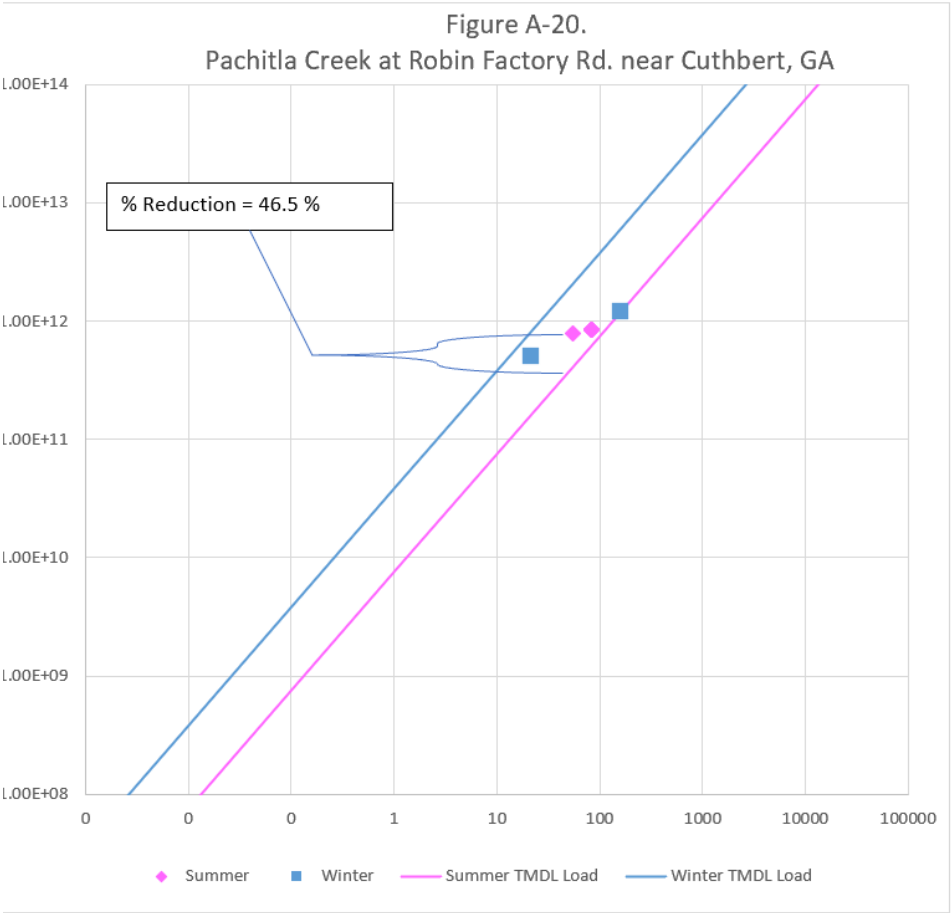

Table A-21. Patsiliga Creek at N Culverhouse Rd near Butler, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
02/20/2018	80	40.83	490	44	8.22E+11	1.68E+12	0
02/26/2018	3000	37.48					
03/01/2018	300	48.59					
03/07/2018	800	50.40					
06/21/2018	230	20.29	263	25	2.51E+11	1.91E+11	23.9%
06/28/2018	300	22.59					
07/05/2018	230	23.13					
07/09/2018	300	34.89					
10/02/2018	500	10.70	362.40758	29.482589	4.04E+11	2.23E+11	44.8%
10/15/2018	300	68.49					
10/24/2018	230	18.48					
10/30/2018	500	20.262415					
12/4/2018	130	171.61025	31.934369	136.91345	1.65507E+11	5.18274E+12	0
12/13/2018	20	185.30806					
12/18/2018	20	117.07748					
12/27/2018	20	73.658014					

Figure A-21.
Patsiliga Creek at N Culverhouse Rd near Butler, GA

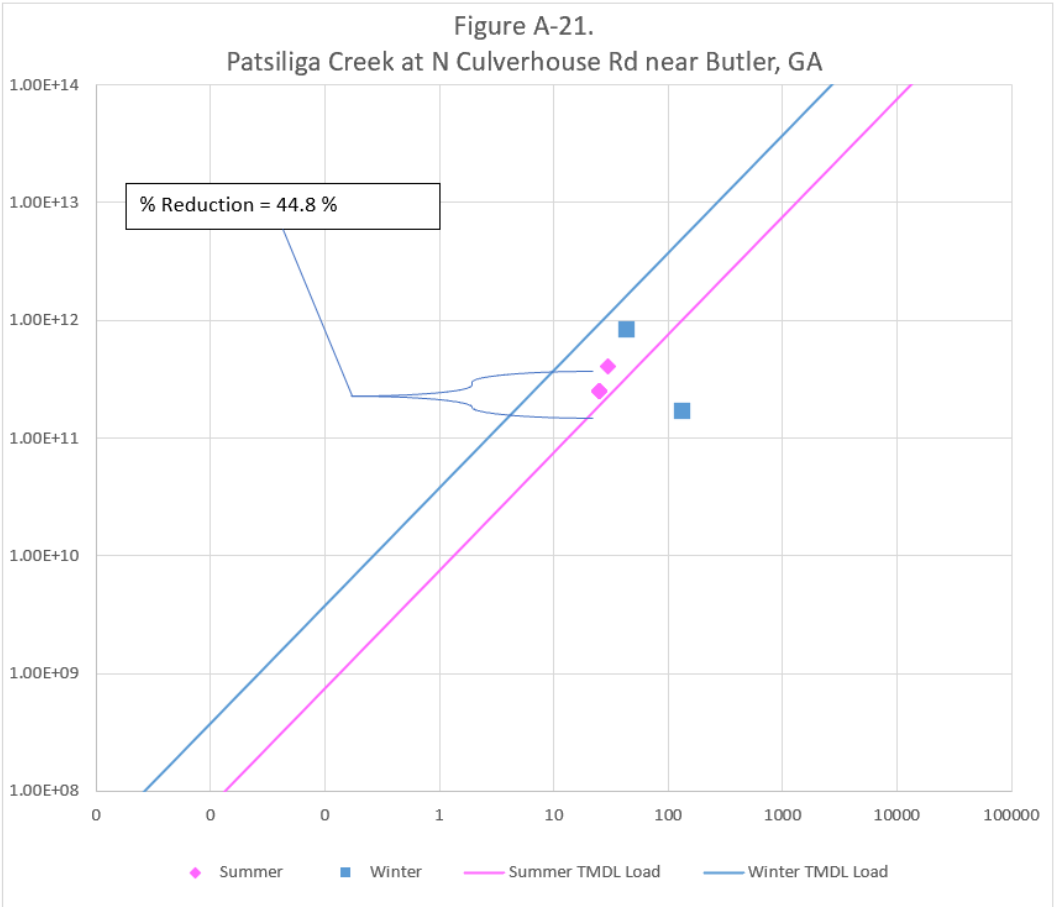

Table A-22. Pigeon Creek at Shirley Rd near Manchester, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
06/13/2016	140	7.84					
08/23/2016	90	7.20	284	3	3.35E+10	2.36E+10	29.5%
08/31/2016	300	1.99					
09/07/2016	300	1.63					
09/15/2016	800	1.65					
12/12/2016	300	4.19	530.746	5.736918	1.15E+11	2.17E+11	0
12/15/2016	230	8.94					
12/19/2016	500	5.67					
12/29/2016	2300	4.15					

Figure A-22.
Pigeon Creek at Shirley Rd near Manchester, GA

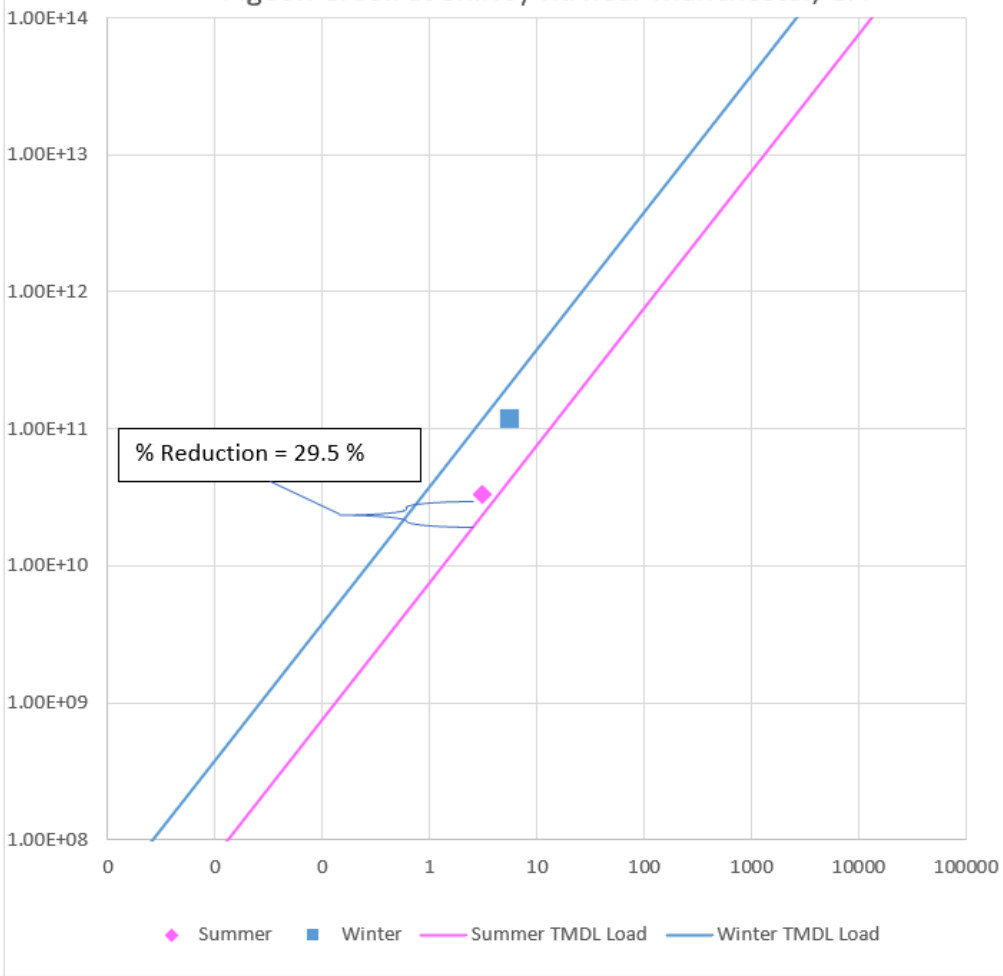

Table A-23. Po Joe Branch at Lamar Rd near Americus, Ga

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
03/03/2020	80	5.43	99	6	2.19E+10	2.20E+11	0
03/10/2020	180	7.60					
03/12/2020	40	6.48					
03/25/2020	170	3.75					
06/10/2020	300	1.86	225	1	1.00E+10	8.88E+09	11.2%
06/15/2020	300	0.96					
06/18/2020	130	1.04					
06/23/2020	220	0.84					
09/17/2020	17000	29.46					
09/21/2020	390	2.66					
12/03/2020	800	1.57	684.8661	1.390746	3.61E+10	5.26E+10	0
12/7/2020	1100	1.38160837					
12/10/2020	500	1.28657711					
12/14/2020	500	1.3231276					

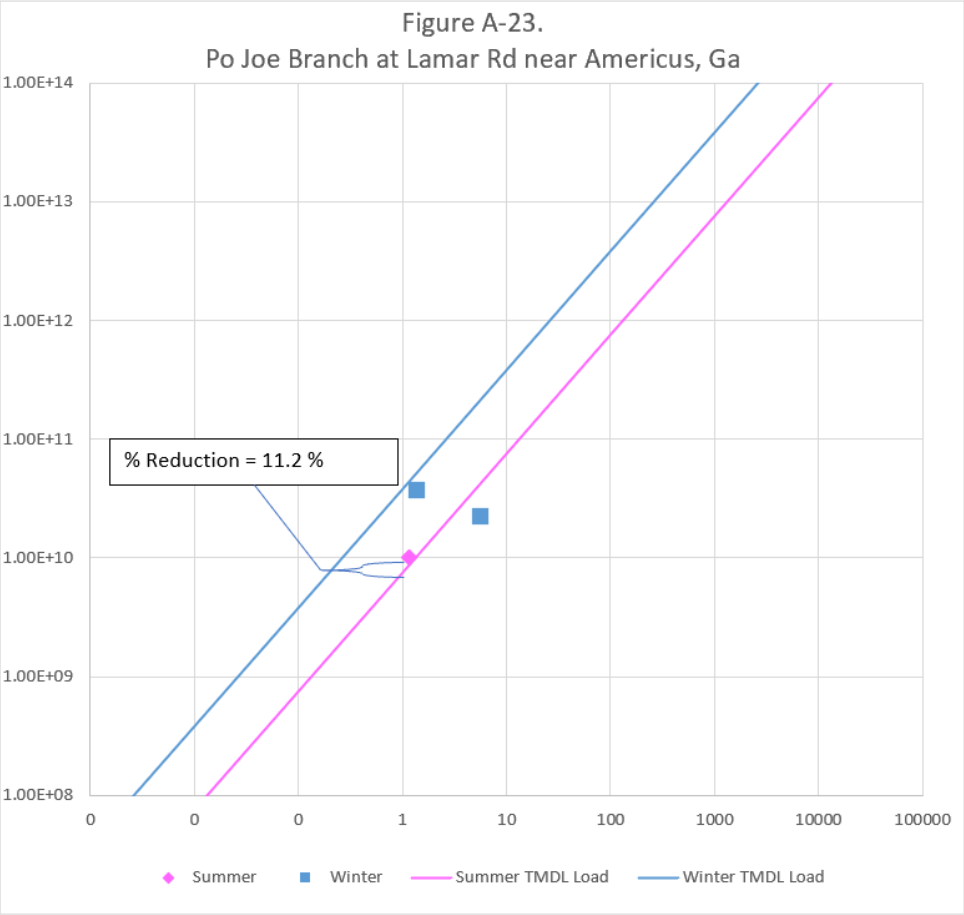

Table A-24. Russell Branch at Jeff Hendricks Rd. near Woodland, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
02/12/2020	230	71.03	261	56	5.49E+11	2.10E+12	0
02/26/2020	80	35.45					
03/05/2020	1100	100.09					
03/11/2020	230	15.43					
07/27/2020	500	1.88	764	2	5.92E+10	1.55E+10	73.8%
07/30/2020	8000	2.00					
08/11/2020	500	2.32					
08/13/2020	170	1.99					
09/10/2020	110	1.65	347.5234	2.57657	3.39E+10	1.95E+10	42.4%
10/01/2020	300	3.73					
10/05/2020	1700	2.55					
10/8/2020	260	2.376381789					
11/3/2020	140	4.274904197					

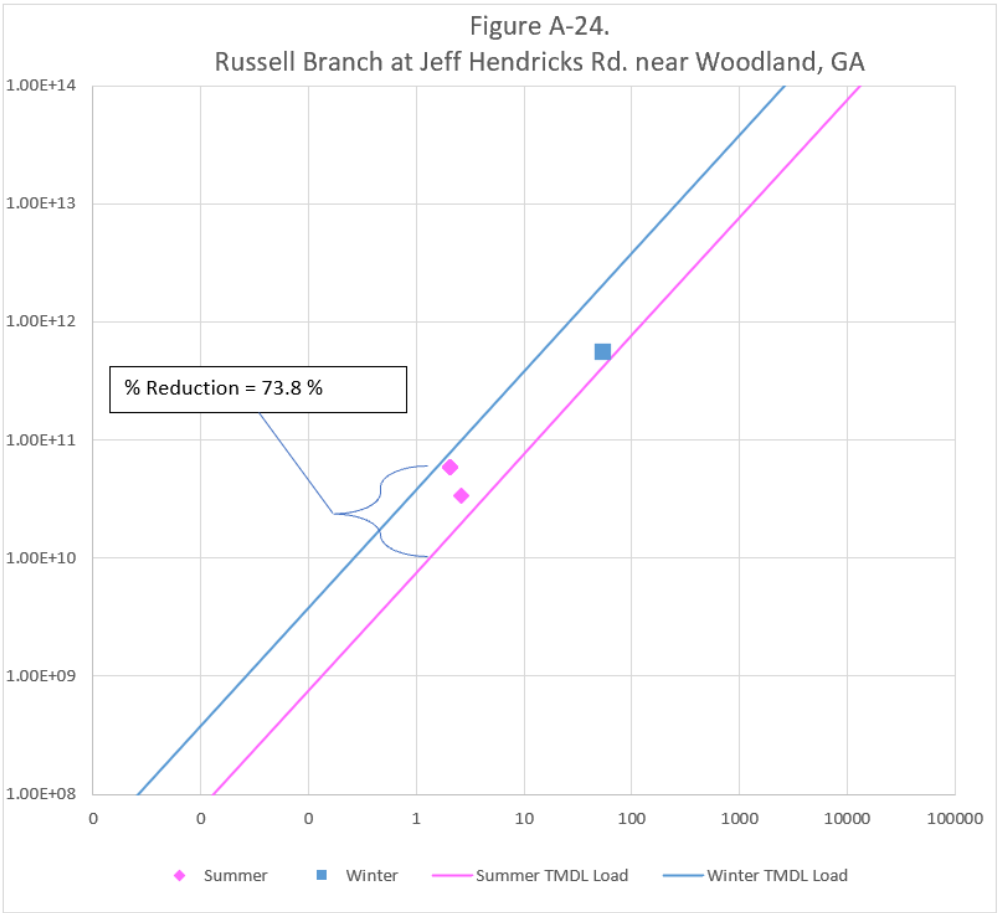

Table A-25. Sheep Rock Hollow at Cove Rd near Woodbury, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
03/23/2016	80	4.35	78	6	1.66E+10	2.12E+11	0
03/29/2016	40	5.52					
04/06/2016	90	7.43					
04/11/2016	130	5.08					
05/16/2016	110	1.92	301	2	1.74E+10	1.16E+10	33.6%
06/01/2016	500	1.31					
06/06/2016	500	1.93					
06/13/2016	300	0.96					
08/23/2016	550	0.88	575.901449	0.381988	8.33E+09	2.89E+09	65.3%
08/31/2016	800	0.24					
09/07/2016	500	0.20					
9/15/2016	500	0.20207547					
12/12/2016	40	0.51279366	96.8216573	0.702918	2576264010	26608344484	0
12/15/2016	130	1.09511866					
12/19/2016	130	0.69531344					
12/29/2016	130	0.50844795					

Figure A-25.
Sheep Rock Hollow at Cove Rd near Woodbury, GA

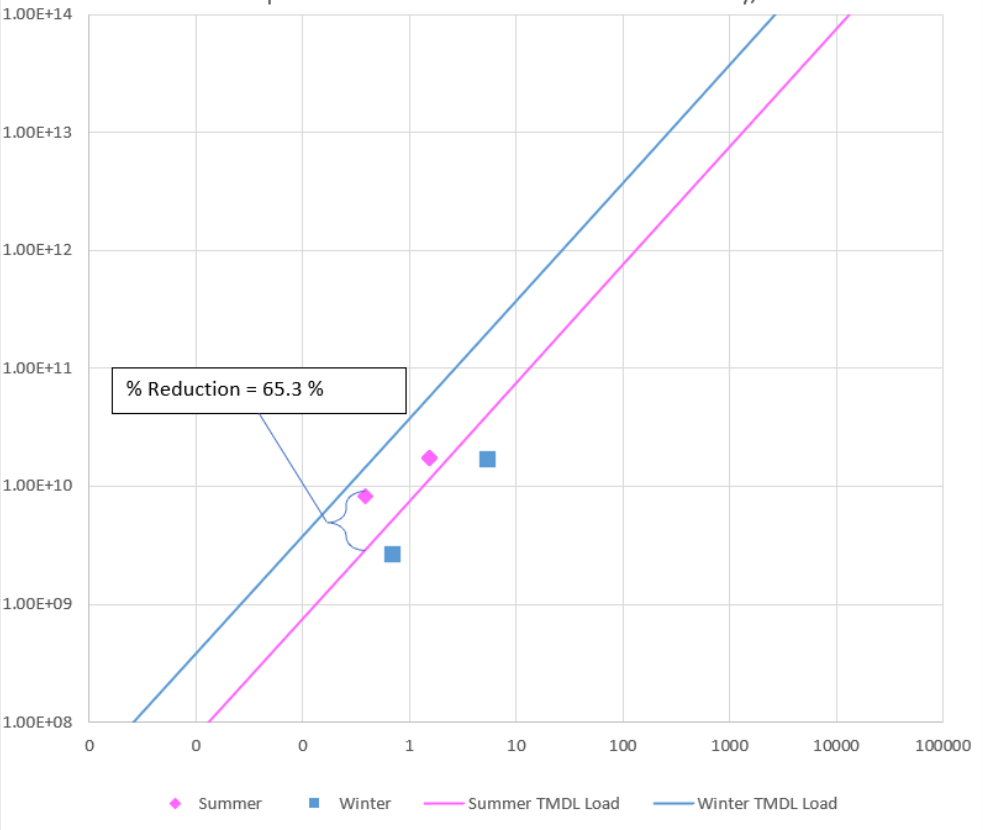

Table A-26. Shoal Creek at Lower Fayetteville Rd near Peachtree City, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
01/12/2021	300	19.42	232	27	2.41E+11	1.04E+12	0
01/26/2021	1100	37.93					
02/02/2021	110	20.13					
02/09/2021	80	32.04					
05/18/2021	110	12.97	245	10	9.40E+10	7.66E+10	18.5%
05/25/2021	300	7.73					
06/08/2021	500	11.77					
06/15/2021	220	8.01					
07/22/2021	460	15.88	831.663789	8.71225	2.74E+11	6.60E+10	76.0%
07/28/2021	2600	9.14					
08/03/2021	800	5.44					
8/10/2021	500	4.38093675					

Figure A-26.
Shoal Creek at Lower Fayetteville Rd near Peachtree City, GA

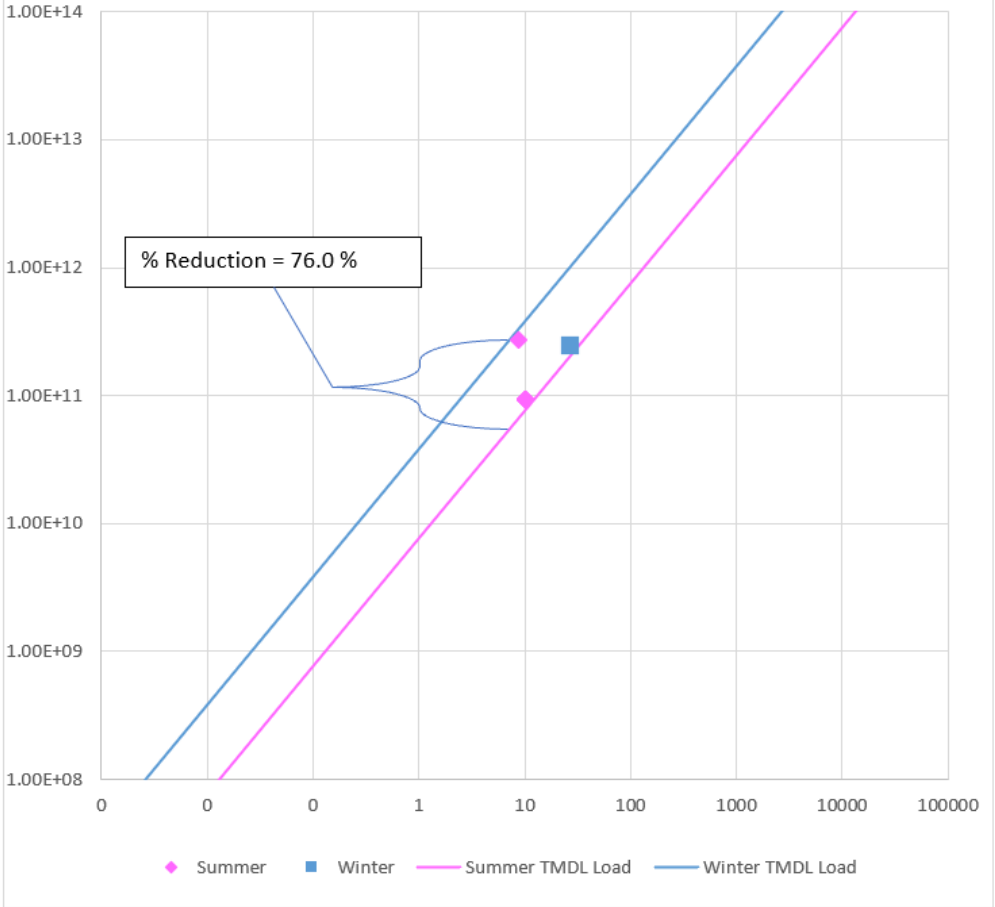

Table A-27. Tobler Creek at Waymanville Rd near Thomaston, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
02/20/2018	160	54.18	161	59	3.59E+11	2.23E+12	0
02/26/2018	230	49.72					
03/01/2018	80	64.47					
03/07/2018	230	66.87					
06/21/2018	40	26.92	57	33	7.17E+10	2.53E+11	0
06/28/2018	80	29.97					
07/05/2018	80	30.69					
07/09/2018	40	46.30					
10/02/2018	300	14.20	256.77185	39.11948	3.80E+11	2.96E+11	22.1%
10/15/2018	210	90.88					
10/24/2018	300	24.52					
10/30/2018	230	26.885533					
12/4/2018	40	227.70401	87.9524408	181.666	6.04831E+11	6.8768E+12	0
12/13/2018	110	245.87918					
12/18/2018	170	155.34626					
12/27/2018	80	97.7344					

Figure A-27.
Tobler Creek at Waymanville Rd near Thomaston, GA

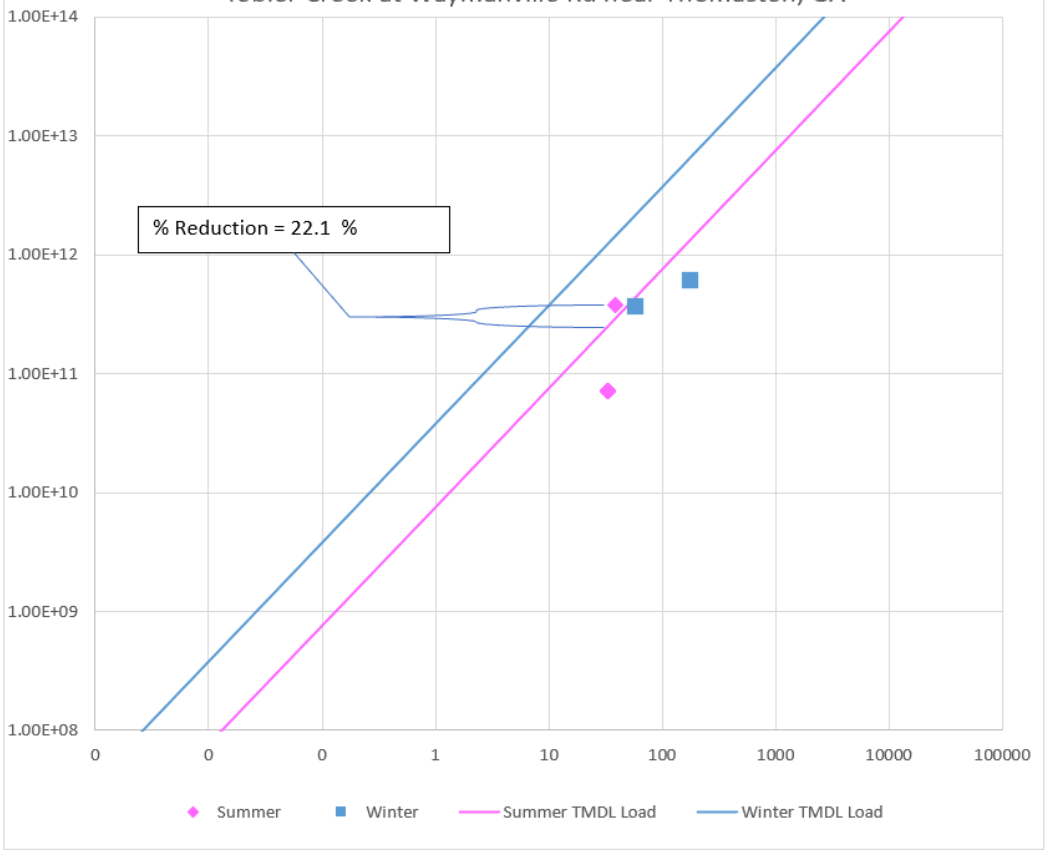

Table A-28. Town Branch at SR 18

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
05/25/2017	700	0.97	589	1	1.65E+10	5.61E+09	66.1%
05/30/2017	500	0.96					
06/08/2017	265	0.62					
06/12/2017	1300	0.41					
08/15/2017	80	0.97	231	1	8.17E+09	7.08E+09	13.4%
08/28/2017	220	0.54					
09/05/2017	700	1.29					
11/02/2017	170	0.68	126	1	3.39E+09	2.68E+10	0
11/08/2017	170	0.73					
11/16/2017	110	0.71					
11/21/2017	80	0.71					

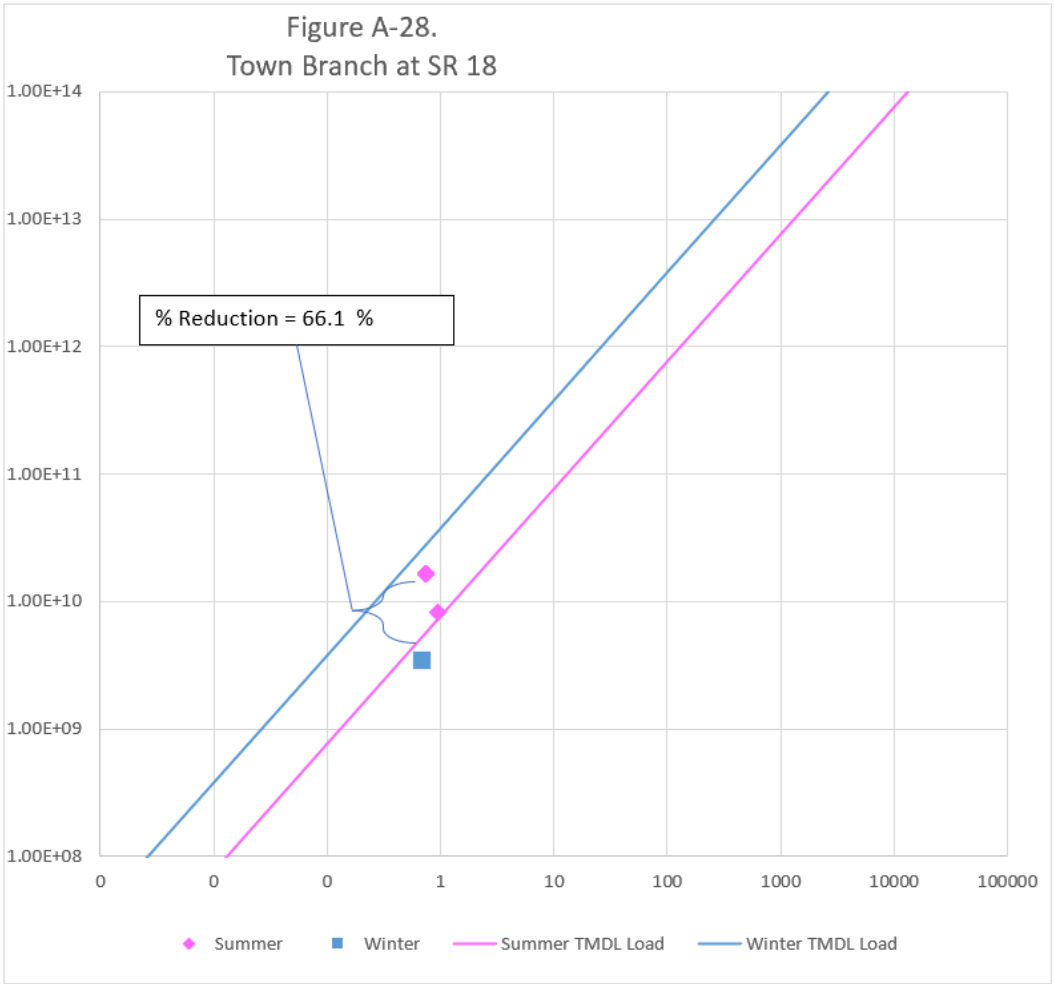

Table A-29. Branch Creek at Hartford St near Edison, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
02/03/2016	230	4.79	177	4	2.43E+10	1.37E+11	0
02/09/2016	110	3.43					
02/15/2016	170	2.62					
02/18/2016	230	3.66					
05/04/2016	90	1.62	390	2	2.74E+10	1.40E+10	48.7%
05/12/2016	230	1.07					
05/19/2016	800	3.81					
05/25/2016	1400	0.91					
08/08/2016	2300	1.75	1880.2195	1.4887	1.06E+11	1.13E+10	89.4%
08/10/2016	1700	1.83					
08/18/2016	1700	0.89					

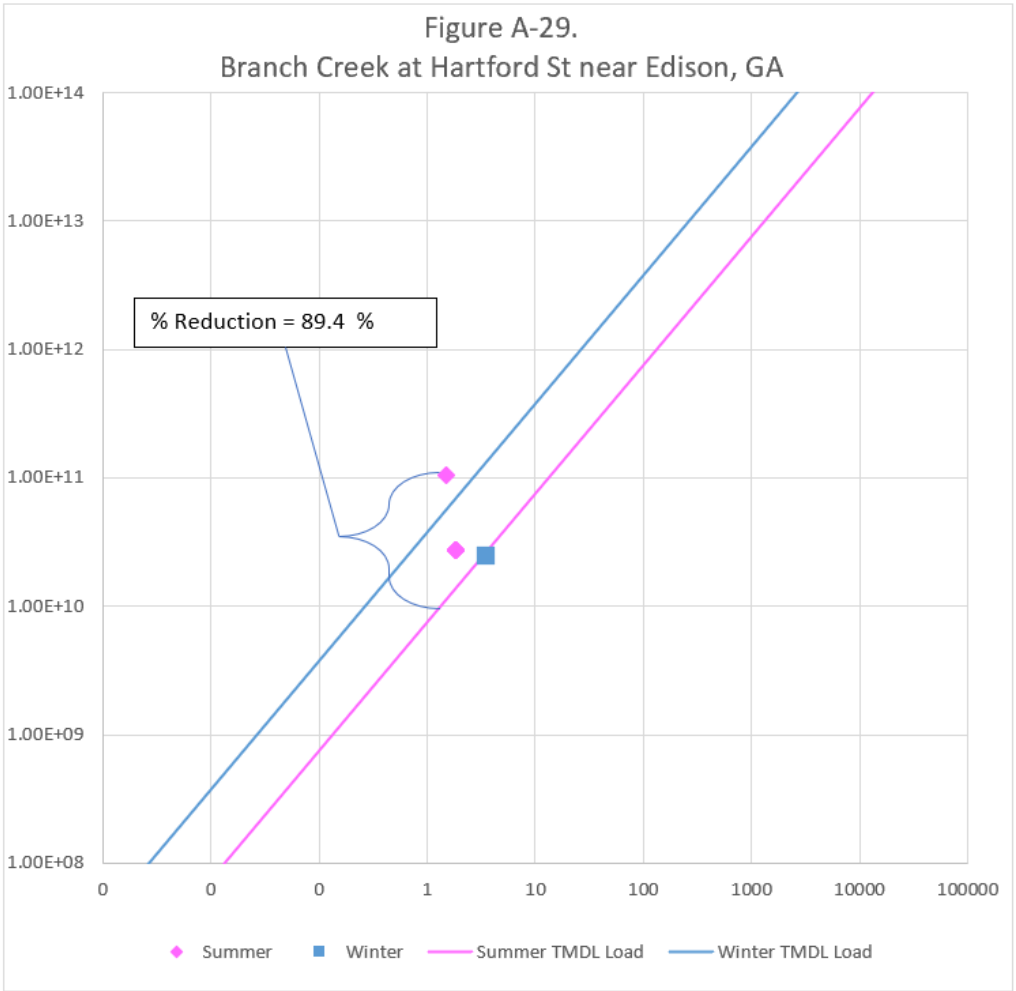

Table A-30. Trib to Mill Creek at Jewel Crowe Rd near Leesburg, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
03/07/2019	300	28.64	921	18	6.34E+11	6.89E+11	0
03/14/2019	200	26.51					
03/27/2019	13000	13.22					
06/24/2019	1700	4.44	1762.388	3.480292	2.32E+11	2.63E+10	88.7%
06/25/2019	2300	3.58					
06/27/2019	1400	2.43					
09/23/2019	900	1.96					
12/16/2019	2200	32.68					

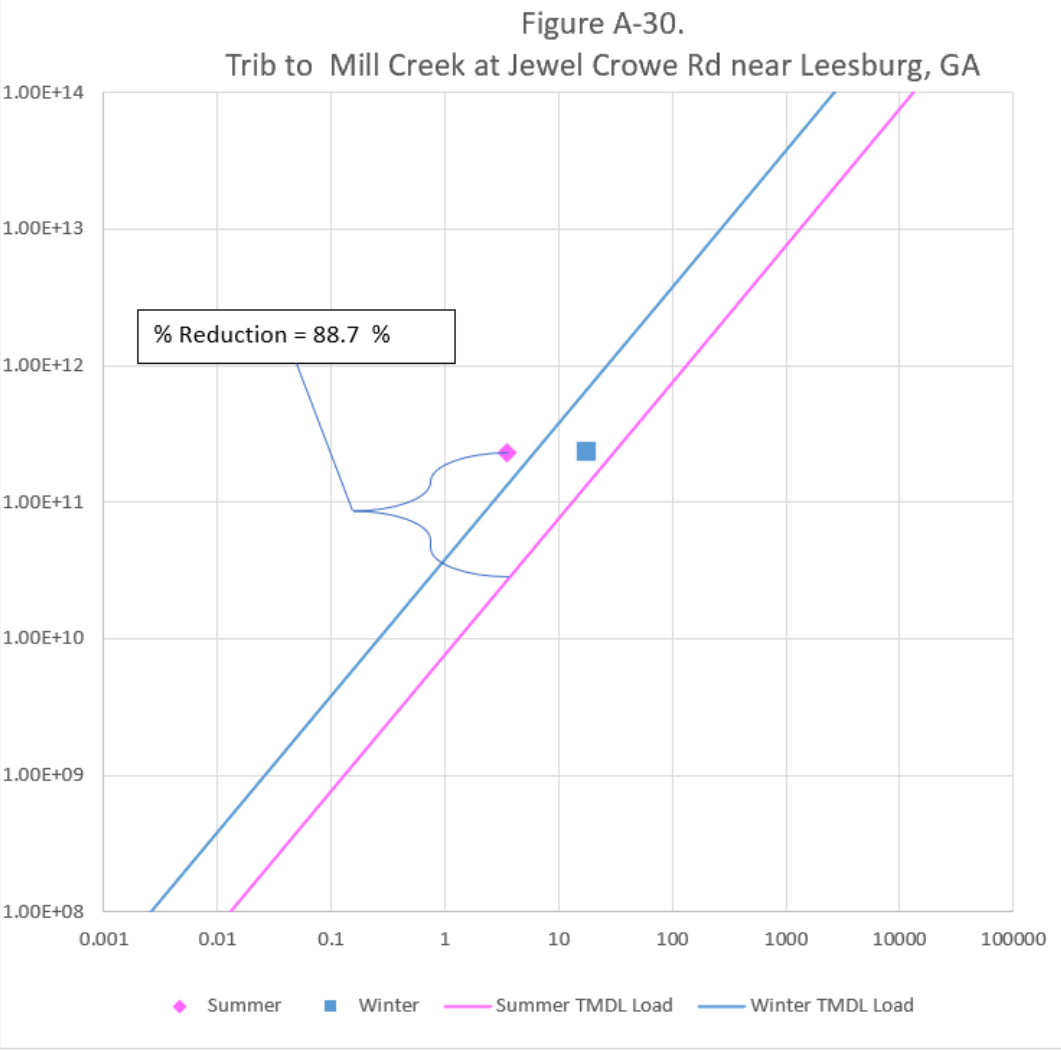

Table A-31. Lake Julia to the Red Rive

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
03/23/2016	300	1.29	275	2	2.07E+10	7.50E+10	0
03/29/2016	800	1.40					
04/06/2016	300	3.36					
04/11/2016	80	1.87					
05/16/2016	170	0.47	815	1	4.47E+10	1.10E+10	75.5%
06/01/2016	400	2.40					
06/06/2016	5000	2.56					
06/13/2016	1300	0.37					
08/23/2016	800	0.14	1840.71043	0.121347	8.46E+09	9.19E+08	89.1%
08/31/2016	2050	0.15					
09/07/2016	1400	0.06					
9/15/2016	5000	0.13296092					
12/12/2016	80	0.30597031	419.225264	0.569089	9031094277	21542342620	0
12/15/2016	270	0.43732929					
12/19/2016	1300	0.59271735					
12/29/2016	1100	0.94033807					

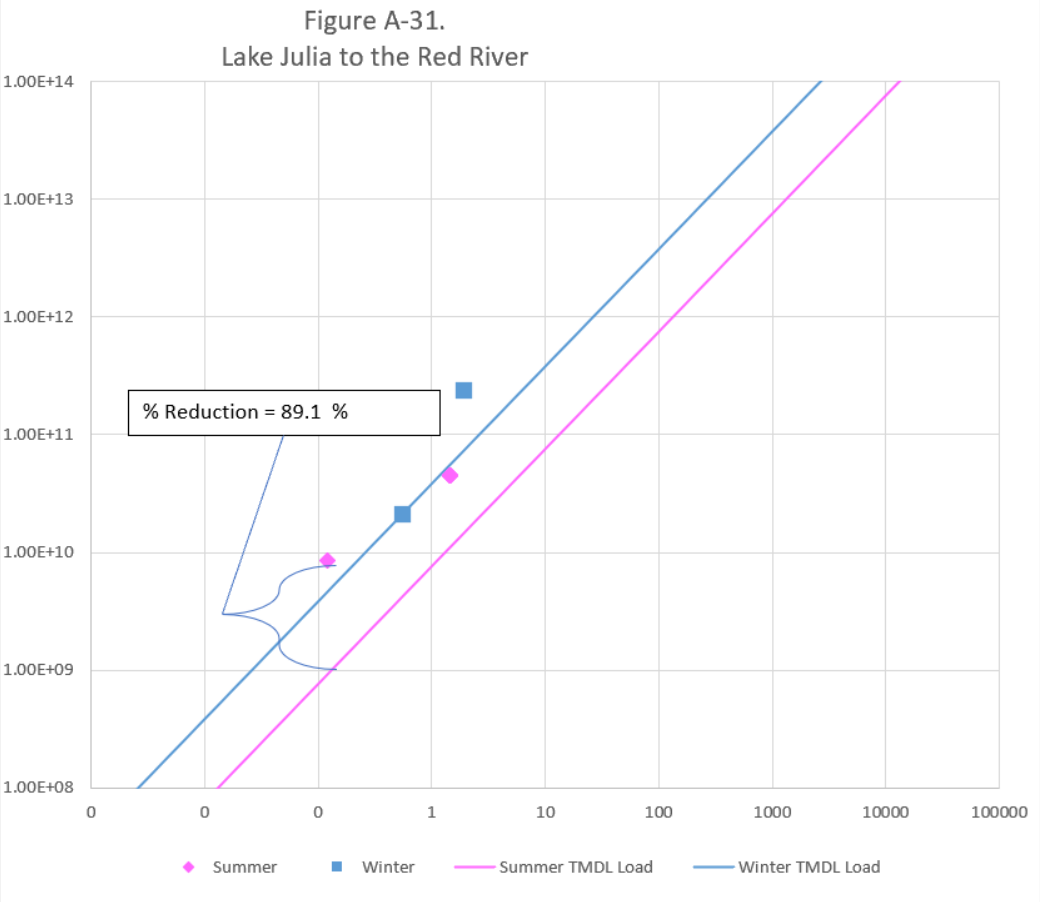

Table A-32. Turkey Creek at Parker Store Rd near Unadilla, Ga

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
03/03/2020	700	49.93	326	53	6.59E+11	2.02E+12	0
03/10/2020	140	69.88					
03/12/2020	230	59.54					
03/25/2020	500	34.47					
06/10/2020	110	17.07	287	11	1.17E+11	8.17E+10	30.3%
06/15/2020	700	8.80					
06/18/2020	800	9.54					
06/23/2020	110	7.73					
09/08/2020	70	3.92	1076.7127	75.85688	3.09E+12	5.74E+11	81.4%
09/14/2020	240	4.25					
09/17/2020	160000	270.80					
9/21/2020	500	24.459664					
12/3/2020	800	14.447329	903.24035	12.78421	4.37109E+11	4.83935E+11	0
12/7/2020	800	12.7002102					
12/10/2020	1300	11.8266507					
12/14/2020	800	12.1626351					

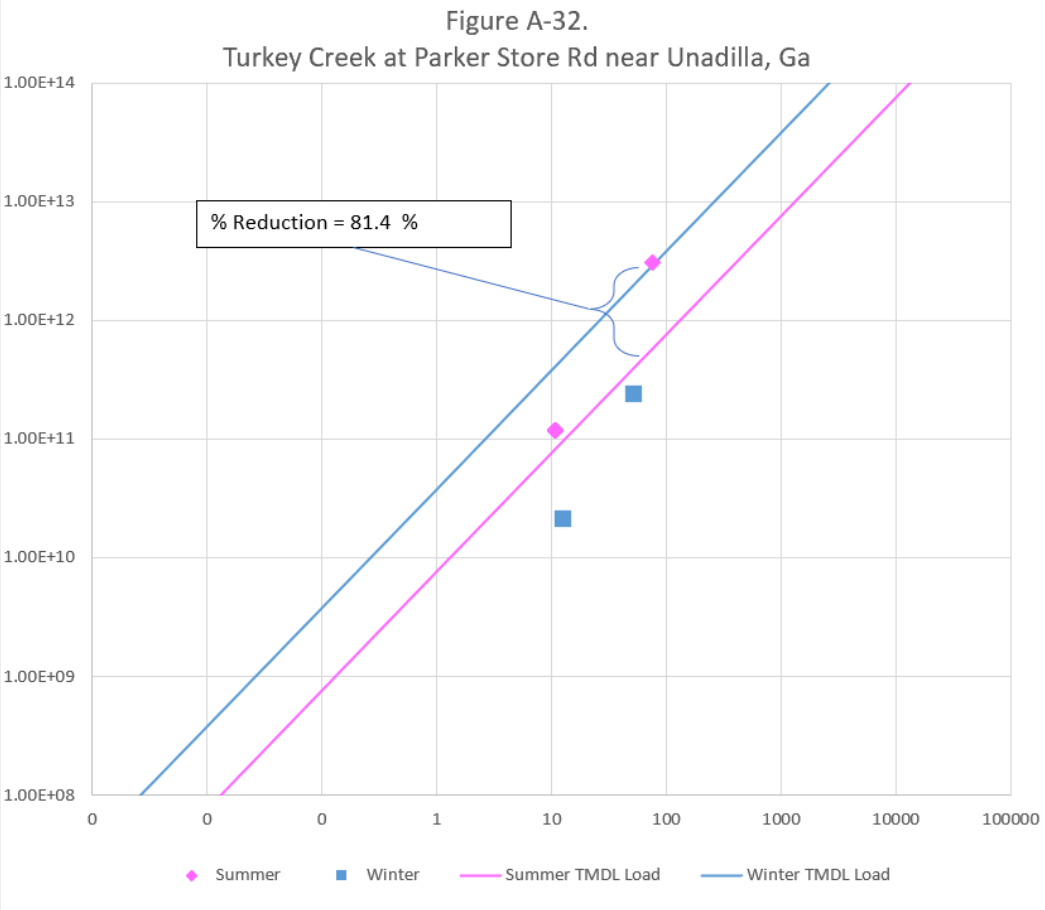

Table A-33. Womble Creek at Old Alabama Rd near Thomaston, GA

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Current Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)	% Reduction
02/20/2018	110	4.67	122	5	2.54E+10	2.08E+11	0
02/26/2018	300	4.67					
03/01/2018	170	5.90					
03/07/2018	40	6.68					
06/21/2018	130	1.63	140	3	1.38E+10	1.96E+10	0
06/28/2018	220	2.69					
07/05/2018	170	2.04					
07/09/2018	80	3.99					
10/02/2018	300	1.07	201.177068	2.771689	2.11E+10	2.10E+10	0.6%
10/15/2018	300	6.55					
10/24/2018	140	1.61					
10/30/2018	130	1.8565294					
12/4/2018	40	25.510897	43.7987741	17.33125	28734570158	6.56059E+11	0
12/13/2018	230	23.457794					
12/18/2018	20	13.017547					
12/27/2018	20	7.3387513