Total Maximum Daily Load

Evaluation

for

Eighteen Stream Segments

in the

Savannah 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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TMDL Action ID: GAR4_23_01_05 **EPA Approval Date**: 09/29/2023

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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 three (3) stream segments in the Savannah River Basin on the 303(d) list of impaired waters because it was assessed as "not supporting" its designated use of "Fishing" due to violation of the fecal coliform water quality criteria. The EPA approved water quality criteria in place when the 2022 Integrated 305(b)/303(d) List was developed and approved are as follows:

> 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 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. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200 counts per 100 mL (geometric mean) occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 counts per 100 mL in lakes and reservoirs and 500 counts 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 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 and not to exceed a maximum of 4,000 counts per 100 mL for any sample. 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.
>
> 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.

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.

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 waters with the "Fishing" designated use are as follows:

> 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 Savannah 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)	
GAR030601050303	Hart Creek	Headwaters to Clarks Hill Lake	Fecal coliform	2.78E+11	--	--	1.89E+11	2.10E+10	2.10E+11	24.4%
			E. coli	1.11E+13	--	--	2.92E+11	3.25E+10	3.25E+11	97.1%
GAR030601090104	Tributary to Buck Creek	Headwaters to tributary 0.16 miles downstream of SR 21	Fecal coliform	7.16E+10	--	--	5.99E+10	6.66E+09	6.66E+10	7.0%
			E. coli	(2)	--	--	1.29E+10	1.43E+09	1.43E+10	Undetermined (3)
GAR030601040608	Wahachee Creek	Tributary 0.07 miles upstream Dr. George Ward Dr to Wych Branch	Fecal coliform	2.03E+11	1.46E+08	--	3.08E+10	3.44E+09	3.44E+10	83.1%
			E. coli	(2)	9.22E+07	--	1.94E+10	2.17E+09	2.17E+10	Undetermined (3)
Revised TMDLs										
GAR030601060601	Butler Creek	Phinizy Ditch to Savannah River, Augusta	Fecal coliform	(4)	6.29E+11	3.66E+10	4.99E+10	7.95E+10	7.95E+11	Undetermined (3)
			E. coli	(4)	3.96E+11	2.31E+10	3.14E+10	5.01E+10	5.01E+11	Undetermined (3)
GAR030601020213	Chechero Creek	Headwaters to Stekoa Creek	Fecal coliform	(4)	--	--	8.65E+10	9.61E+09	9.61E+10	Undetermined (3)
			E. coli	(4)	--	--	5.45E+10	6.06E+09	6.06E+10	Undetermined (3)
GAR030601020501	Eastanollee Creek	Toccoa to Lake Hartwell	Fecal coliform	(4)	2.35E+10	--	2.33E+11	2.85E+10	2.85E+11	Undetermined (3)
			E. coli	(4)	1.48E+10	--	1.47E+11	1.80E+10	1.80E+11	Undetermined (3)
GAR030601030310	Fortson’s Creek	Elberton to Beaverdam Creek	Fecal coliform	(4)	7.03E+09	--	2.91E+10	4.01E+09	4.01E+10	Undetermined (3)
			E. coli	(4)	4.43E+09	--	1.83E+10	2.53E+09	2.53E+10	Undetermined (3)
GAR030601060103	Jones Creek	Headwaters to the Savannah River near Evans	Fecal coliform	(4)	--	1.25E+10	1.78E+10	3.37E+09	3.37E+10	Undetermined (3)
			E. coli	(4)	--	7.89E+09	1.12E+10	2.12E+09	2.12E+10	Undetermined (3)
GAR030601050202	Little River	Rocky Creek to Clarks Hill Lake	Fecal coliform	(4)	4.69E+10	--	2.37E+12	2.68E+11	2.68E+12	Undetermined (3)
			E. coli	(4)	2.96E+10	--	1.49E+12	1.69E+11	1.69E+12	Undetermined (3)
GAR030601060605	Reed Creek	Bowen Pond to Savannah River	Fecal coliform	(4)	5.39E+10	2.04E+10	1.57E+10	9.99E+09	9.99E+10	Undetermined (3)
			E. coli	(4)	3.39E+10	1.29E+10	9.87E+09	6.30E+09	6.30E+10	Undetermined (3)
GAR030601060603	Rocky Creek	SR 56 to tributary 0.5 miles downstream Doug Barnard Parkway, Augusta	Fecal coliform	(4)	--	5.81E+10	4.98E+10	1.20E+10	1.20E+11	Undetermined (3)
			E. coli	(4)	--	3.66E+10	3.14E+10	7.55E+09	7.55E+10	Undetermined (3)

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)	
GAR030601020212	Saddle Gap Creek	Headwaters to Stekoa Creek	Fecal coliform	[4]	--	--	6.44E+10	7.15E+09	7.15E+10	Undetermined [3]
			E. coli	[4]	--	--	4.06E+10	4.51E+09	4.51E+10	Undetermined [3]
GAR030601090318	Savannah Harbor	SR 25 (old US Hwy 17) to Elba Island Cut	Fecal coliform	[4]	8.05E+11	200 x Q_{WLAsw}[5]	200 x Q_{LA}[5]	20 x Q_{Total}[5]	200 x Q_{Total}[5]	Undetermined [3]
			enterococci	[4]	1.41E+11	35 x Q_{WLAsw}[5]	35 x Q_{LA}[5]	3.5 x Q_{Total}[5]	35 x Q_{Total}[5]	Undetermined [3]
GAR030601060615	Savannah River	Butler Creek to McBean Creek	Fecal coliform	[4]	6.21E+11	4.89E+11	5.79E+13	6.56E+12	6.56E+13	Undetermined [3]
			E. coli	[4]	3.91E+11	3.08E+11	3.65E+13	4.13E+12	4.13E+13	Undetermined [3]
GAR030601020211	Scott Creek	Headwaters to Stekoa Creek	Fecal coliform	[4]	--	--	1.55E+11	1.72E+10	1.72E+11	Undetermined [3]
			E. coli	[4]	--	--	9.74E+10	1.08E+10	1.08E+11	Undetermined [3]
GAR030601020215	Stekoa Creek	Cox Lake to Scott Creek	Fecal coliform	[4]	--	--	1.70E+11	1.89E+10	1.89E+11	Undetermined [3]
			E. coli	[4]	--	--	1.07E+11	1.19E+10	1.19E+11	Undetermined [3]
GAR030601020219	Stekoa Creek	Scott Creek to She Creek	Fecal coliform	[4]	1.17E+10	--	7.99E+11	9.01E+10	9.01E+11	Undetermined [3]
			E. coli	[4]	7.38E+09	--	5.03E+11	5.68E+10	5.68E+11	Undetermined [3]
GAR030601020220	Stekoa Creek	She Creek to the Chattooga River	Fecal coliform	[4]	1.17E+10	--	6.13E+11	6.94E+10	6.94E+11	Undetermined [3]
			E. coli	[4]	7.38E+09	--	3.86E+11	4.37E+10	4.37E+11	Undetermined [3]

Notes:

(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) Sample was not analyzed for *E. coli*, therefore critical load calculation not possible.
(3) Percent reduction could not be determined due to absence of current load calculation.
(4) Critical loading could not be determined due to no samples collected.
(5) The segment of the Savannah Harbor is tidal in nature. Therefore WLAsw, load allocation, MOS and the TMDL are expressed as a function of the flow Q at any given time.

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 three (3) stream segments in the Savannah River Basin included on the 2022 303(d) list for exceedances of the fecal coliform criteria. Table 3 lists the fifteen (15) stream segments in the Savannah River Basin where the previously approved TMDLs are being revised.

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

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Estuarine Status
Hart Creek	Headwaters to Clarks Hill Lake	GAR030601050303	16.6	Fishing	Non-estuarine
Tributary to Buck Creek	Headwaters to tributary 0.16 miles downstream of SR 21	GAR030601090104	2	Fishing	Non-estuarine
Wahachee Creek	Tributary 0.07 miles upstream Dr. George Ward Dr to Wych Branch	GAR030601040608	2	Fishing	Non-estuarine

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

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Estuarine Status	Original TMDL Action ID Number, Agency, and Year
Butler Creek	Phinizy Ditch to Savannah River, Augusta	GAR030601060601	3	Fishing	Non-estuarine	#202 US EPA 2000
Chechero Creek	Headwaters to Stekoa Creek	GAR030601020213	3	Fishing	Non-estuarine	#31675 US EPA 2006
Eastanollee Creek	Toccoa to Lake Hartwell	GAR030601020501	14	Fishing	Non-estuarine	#409 US EPA 2000
Fortson's Creek	Elberton to Beaverdam Creek	GAR030601030310	4	Fishing	Non-estuarine	#450 US EPA 1998
Jones Creek	Headwaters to the Savannah River near Evans	GAR030601060103	3.7	Fishing	Non-estuarine	#584 US EPA 1998
Little River	Rocky Creek to Clarks Hill Lake	GAR030601050202	4	Fishing	Non-estuarine	#707 US EPA 2000
Reed Creek	Bowen Pond to Savannah River	GAR030601060605	1.4	Fishing	Non-estuarine	#987 US EPA 2000
Rocky Creek	SR 56 to tributary 0.5 miles downstream Doug Barnard Parkway, Augusta	GAR030601060603	1.6	Fishing	Non-estuarine	#1015 US EPA 2000
Saddle Gap Creek	Headwaters to Stekoa Creek	GAR030601020212	2.1	Fishing	Non-estuarine	#31675 US EPA 2006
Savannah Harbor	SR 25 (old US Hwy 17) to Elba Island Cut	GAR030601090318	5 sq mi	Coastal Fishing	Estuarine	#1054 US EPA 2000
Savannah River	Butler Creek to McBean Creek	GAR030601060615	21	Fishing	Non-estuarine	#1055 US EPA 2000
Scott Creek	Headwaters to Stekoa Creek	GAR030601020211	4	Fishing	Non-estuarine	#31675 US EPA 2006
Stekoa Creek	Cox Lake to Scott Creek	GAR030601020215	3	Fishing	Non-estuarine	#1145 US EPA 2000
Stekoa Creek	Scott Creek to She Creek	GAR030601020219	9.3	Fishing	Non-estuarine	#1145 US EPA 2000
Stekoa Creek	She Creek to the Chattooga River	GAR030601020220	4.7	Fishing	Non-estuarine	#1145 US EPA 2000

1.2 Watershed Description

The Savannah River Basin encompasses more than 10,570 square miles and the river forms the border between the states of South Carolina and Georgia. The Savannah River begins in the Blue Ridge Mountains of north Georgia and South Carolina where the Seneca and Tugaloo rivers meet and flow into Lake Hartwell. The Savannah River then flows southeast for more than 300 miles to the Atlantic Ocean. Upstream of Augusta, the river flows through Clark Hill Reservoir and Lake Stephens. The river flows through three geographically distinct ecoregions, beginning its meandering path in the Blue Ridge, flowing through the rich soils of the Piedmont, and ending in the Coastal Plain, where it forms a braided network of tidal creeks that empty into the Atlantic Ocean.

The United States Geologic Survey (USGS) has divided the Savannah Basin into nine sub-basins, or Hydrologic Unit Codes (HUCs), of which seven are partially or completely located within Georgia. The HUCs located in Georgia are numbered 03060102 through 03060106, and 03060108 through 03060109. Figure 1 shows the location of the Savannah River Basin in the State of Georgia. Figure 2 shows the locations of the two hydrologic units within the Savannah River Basin. Figure 3 through Figure 9 indicate the location of the 303(d) listed stream segments in the Savannah River Basin.

The land use characteristics of the Savannah 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 except the segment of Savannah Harbor are located within the boundaries of the Savannah-Upper Ogeechee Regional Water Planning Council. Savannah Harbor is located in the Coastal Georgia Water Planning Region.

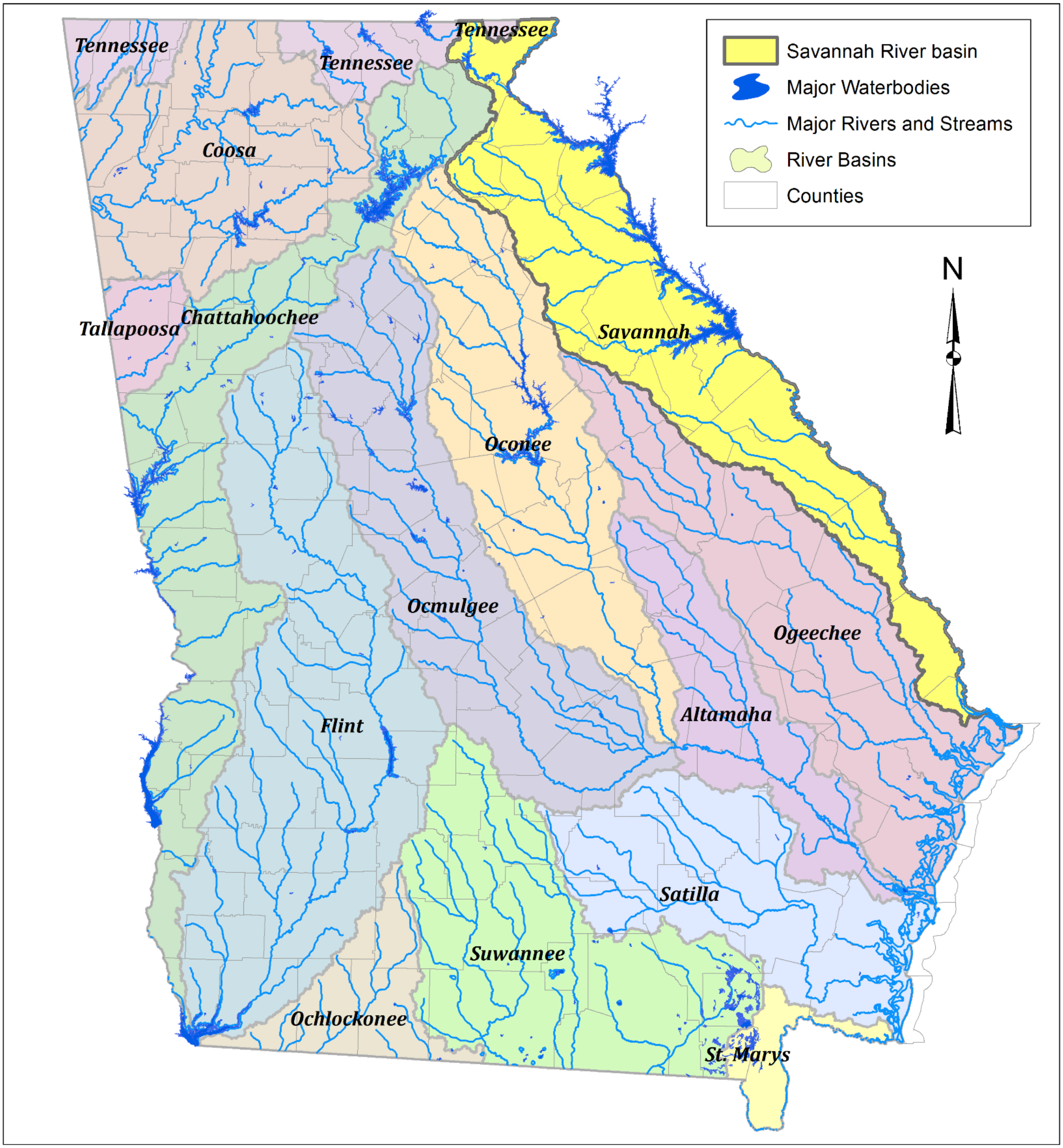

Figure 1: Location of the Savannah River Basin in Georgia

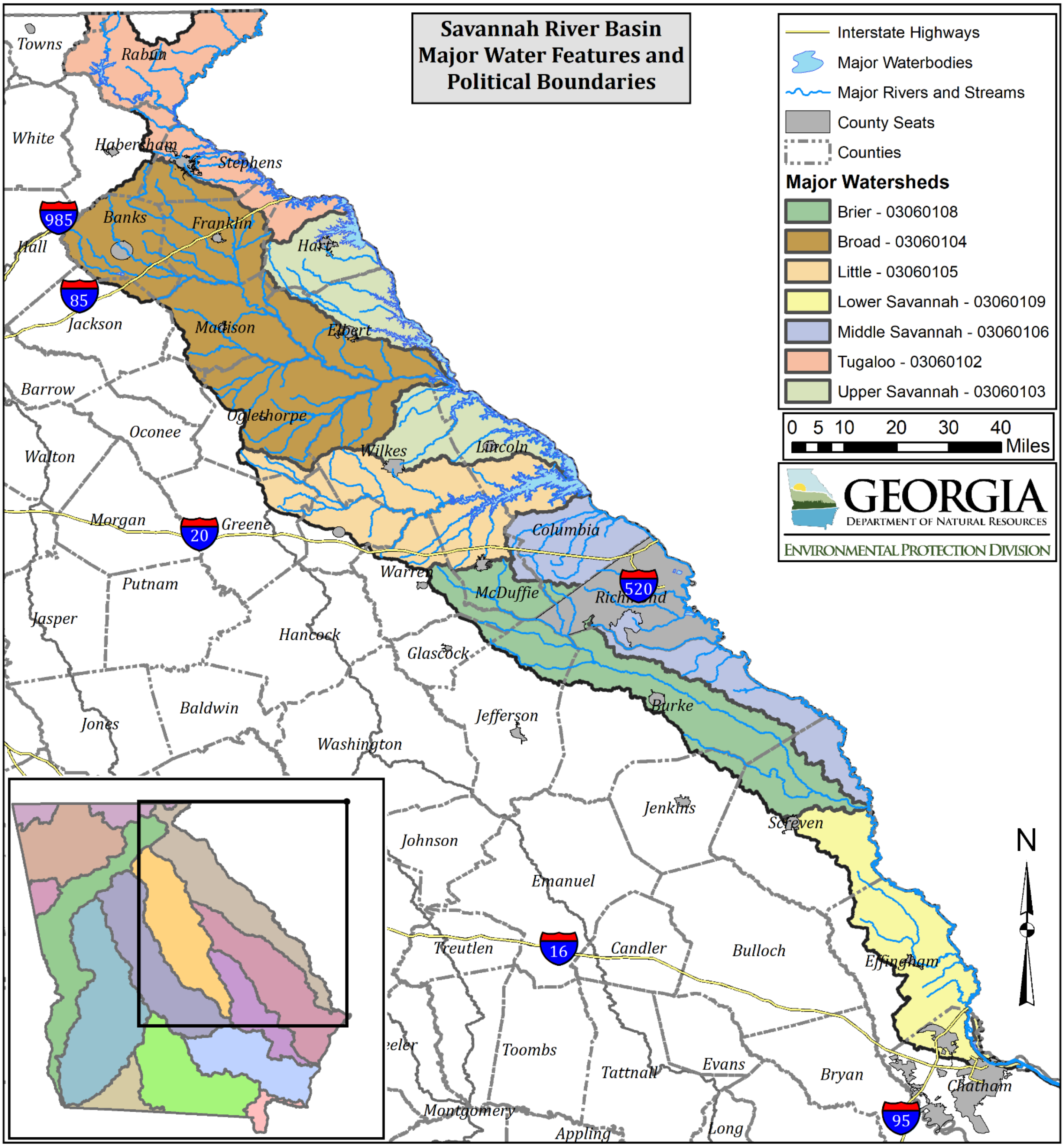

Figure 2: Major Political Boundaries, Water Features, and U.S.G.S. 12-digit HUC

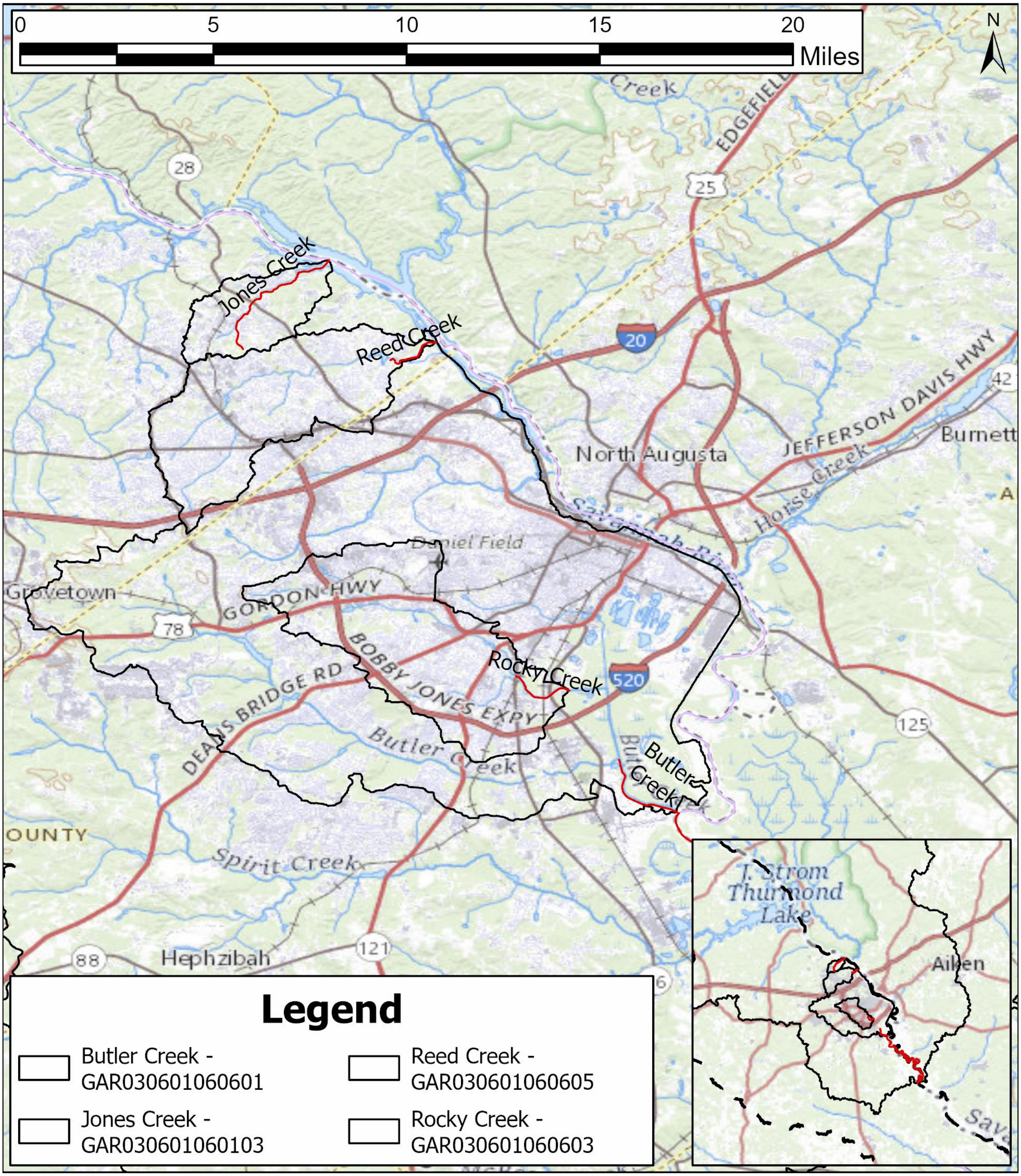

Figure 3: Impaired Stream Segments of Butler Creek, Jones Creek, Reed Creek, and Rocky Creek

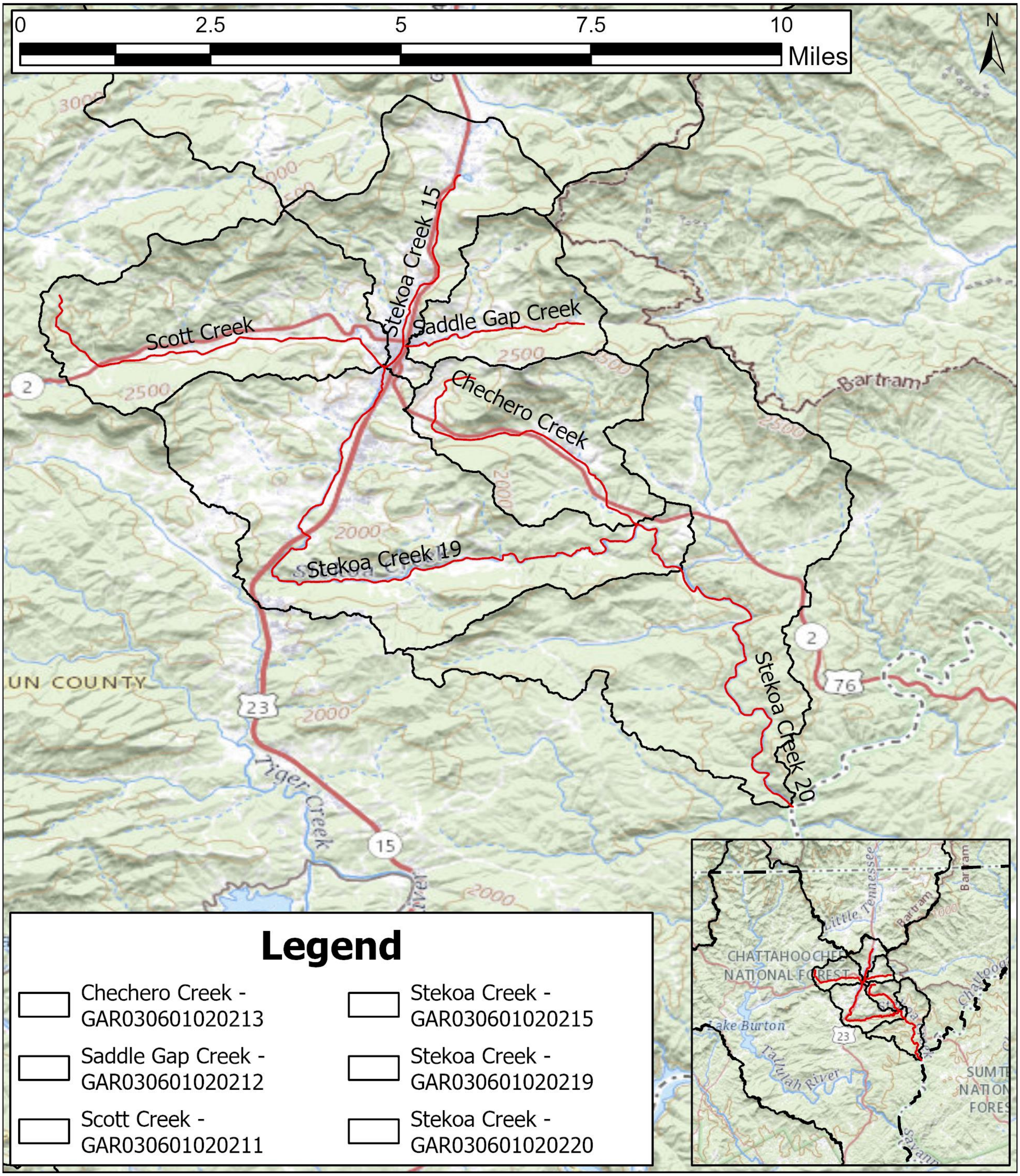

Figure 4: Impaired Stream Segments of Chechero Creek, Saddle Gap Creek, Scott Creek, and Stekoa Creek

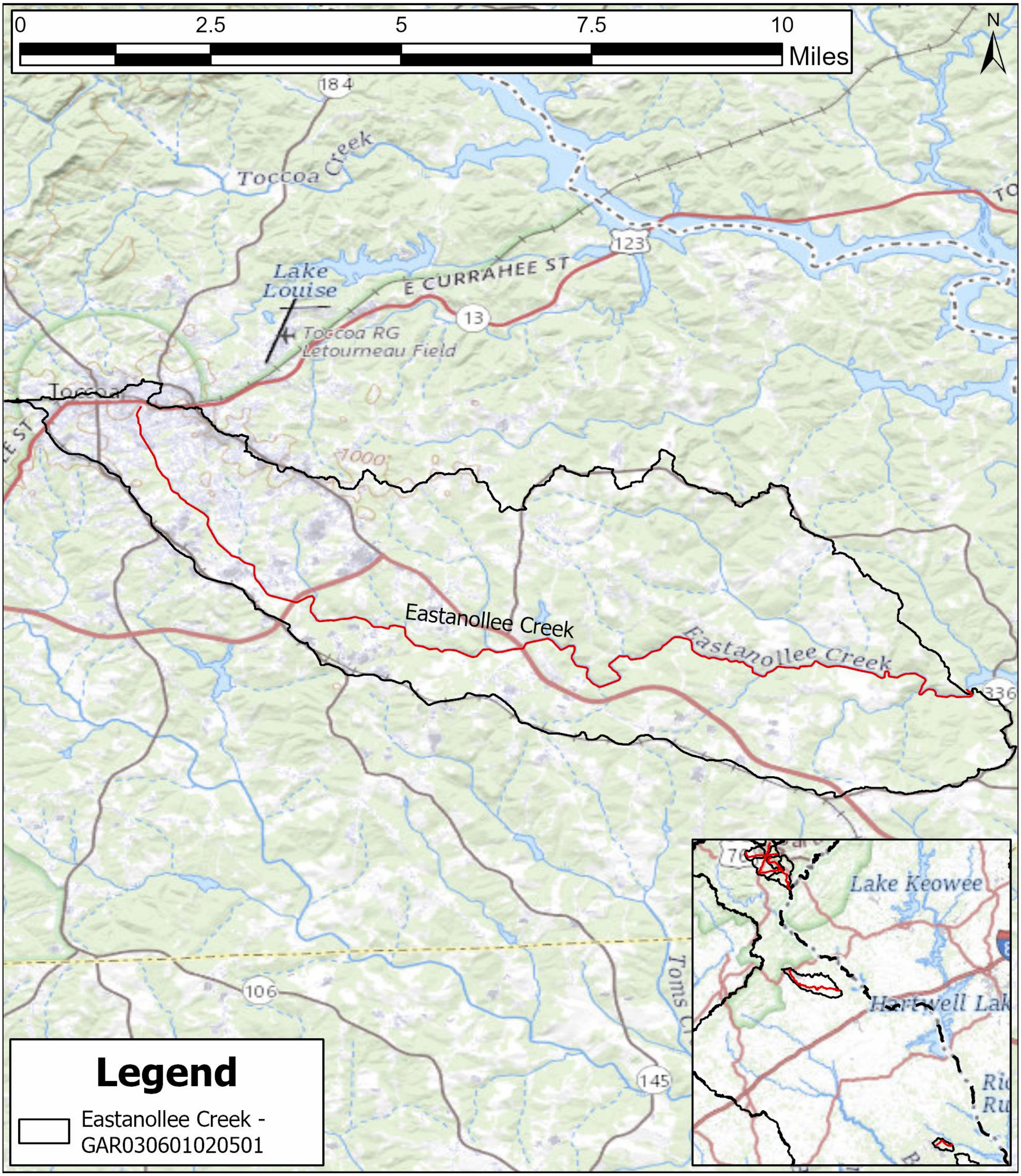

Figure 5: Impaired Stream Segment of Eastanollee Creek

Figure 6: Impaired Stream Segments of Fortson's Creek and Wahachee Creek

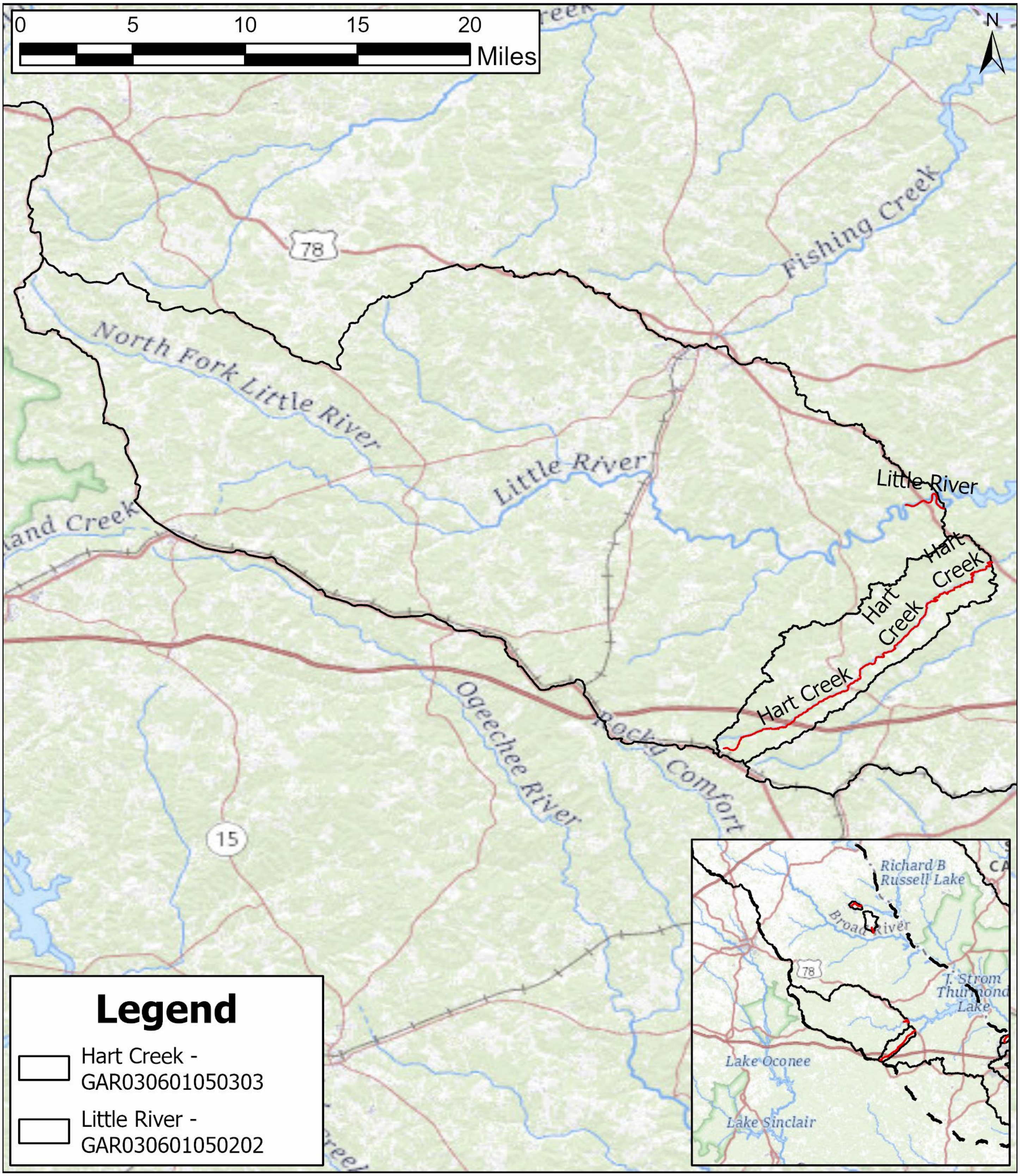

Figure 7: Impaired Stream Segments of Hart Creek and Little River

Figure 8: Impaired Stream Segment of Savannah River

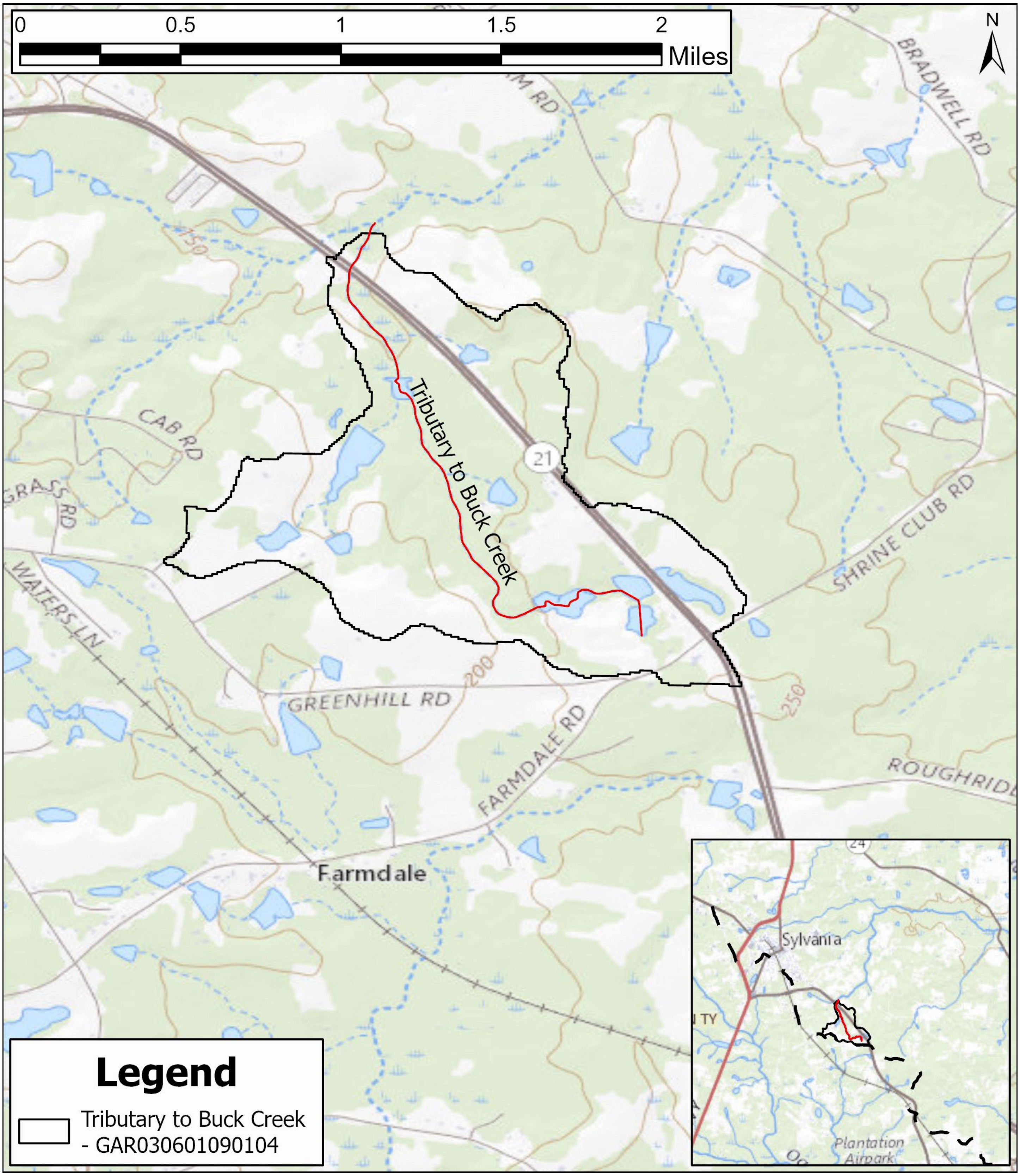

Figure 9: Impaired Stream Segment of Tributary to Buck Creek

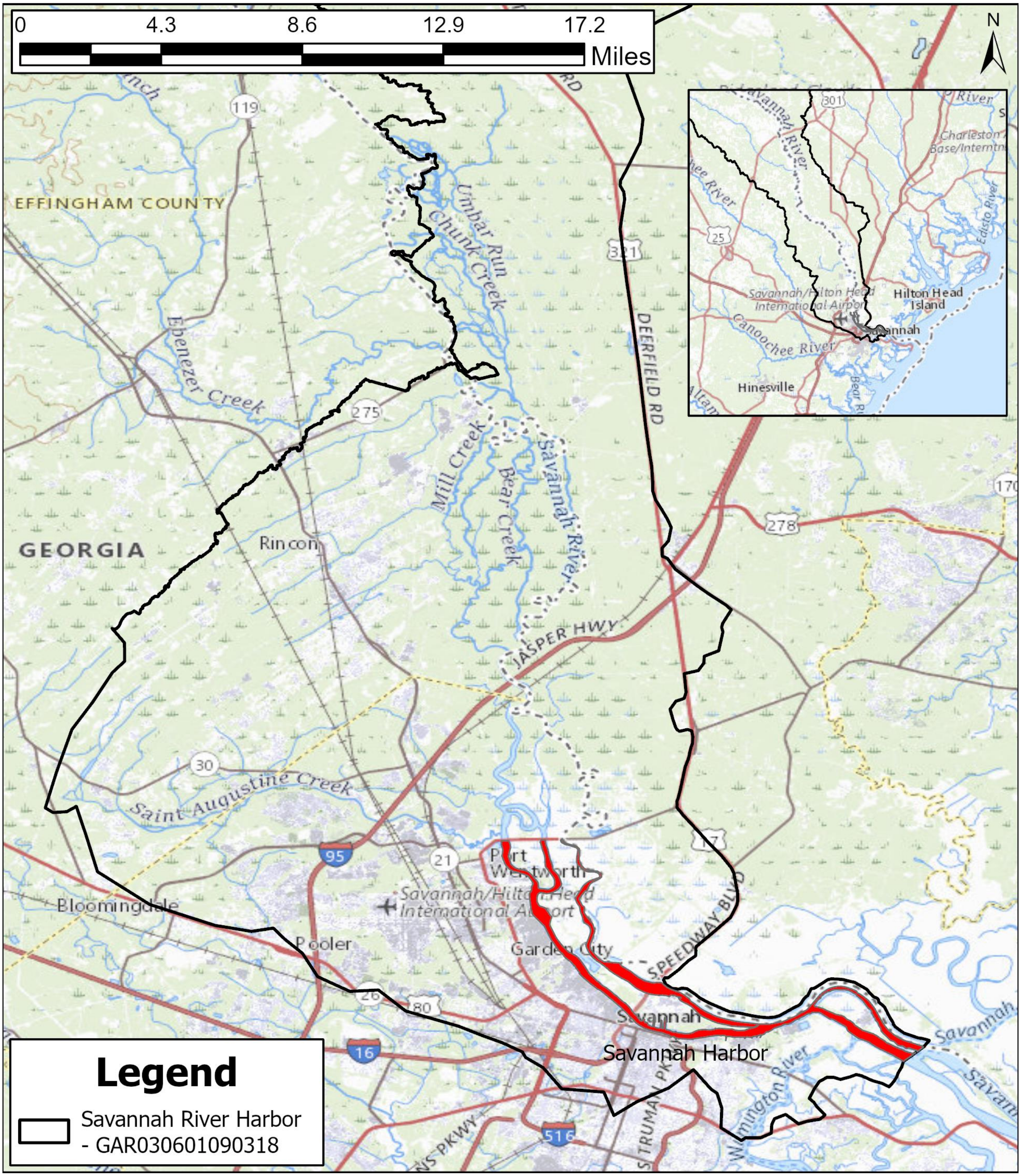

Figure 10: Harbor Segment of Savannah Harbor

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 Savannah-Ogeechee RWPC and Coastal Georgia RWPC updated their Regional Water Plans in June 2017, which were adopted by GA EPD in July 2017. The next set of updated Regional Water Plans were adopted by GA EPD in June 2023. These Regional Water Plans are available here.

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 placed three (3) stream segments in the Savannah River Basin on the 2022 303(d) list of impaired waters because they were assessed as "not supporting" its designated use of "Fishing" due to violations of the fecal coliform criteria presented as presented in Table 2. The potential causes listed include urban runoff and nonpoint sources. The bacteria water quality criteria for the "Fishing" designated use, as approved by US EPA Region 4 on January 20, 2021, and applicable at the time of listing was as follows:

(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. 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 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. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200 counts per 100 mL (geometric mean occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 counts per 100 mL in lakes and reservoirs and 500 counts 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 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 and not to exceed a maximum of 4,000 counts per 100 mL for any sample. 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.

2. 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 addition to establishing TMDLs for the three (3) segments discussed above, this document establishes revised TMDLs for fifteen (15) stream segments in the Savannah River Basin as presented in Table 3. Fourteen of these segments have the designated use of "Fishing", and one has the designated use of "Coastal Fishing". The bacteria water quality criteria for the "Coastal Fishing" designated use reference the criteria established for "Fishing" designated water.

(f) Coastal Fishing: For waters designated in 391-3-6-.03(14) as "Coastal Fishing," site specific criteria for dissolved oxygen will be assigned. All other criteria and uses for the fishing designated use will apply for coastal fishing.

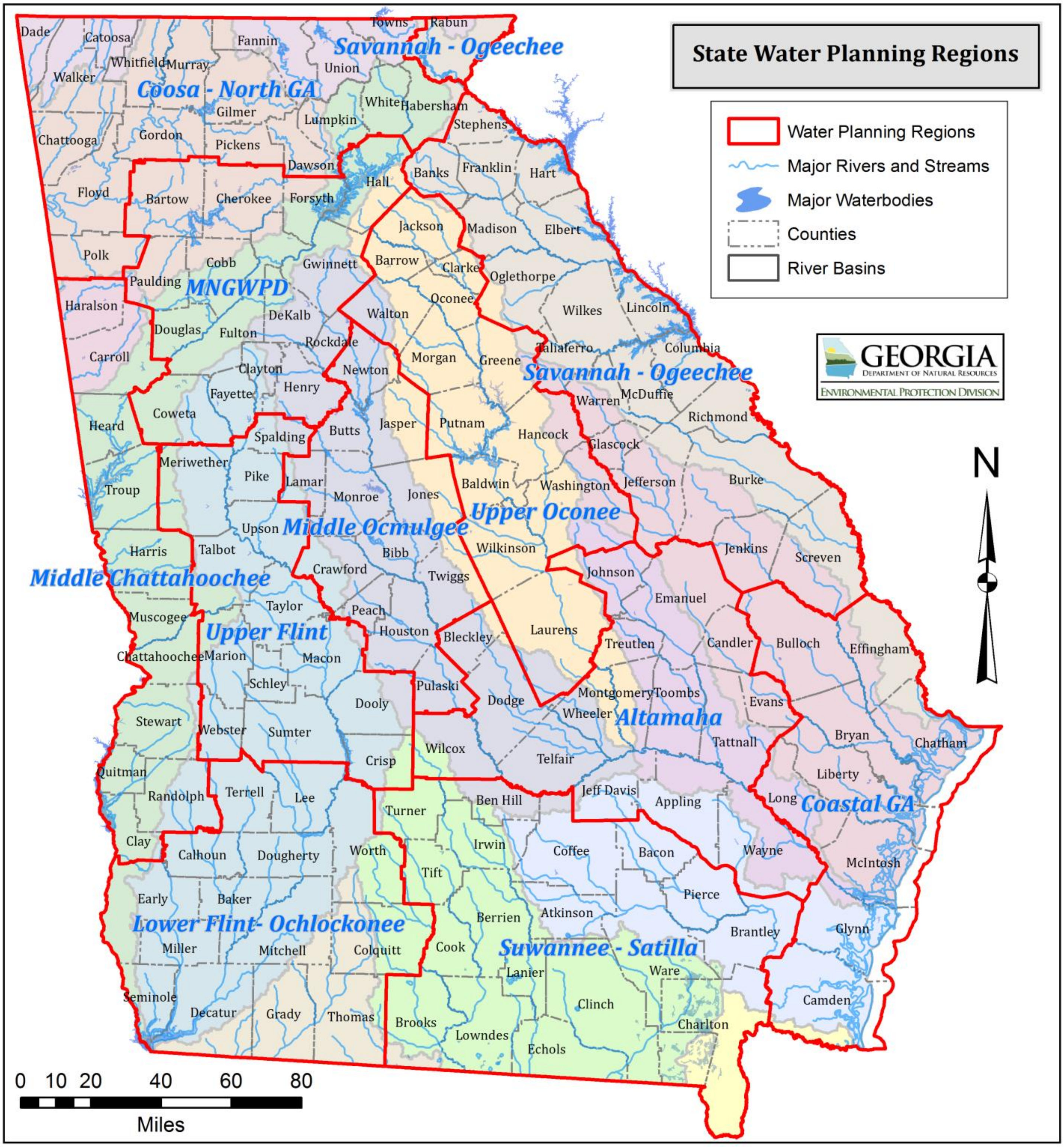

Figure 11: Boundaries of the Regional Water Planning Councils and the Metropolitan North Georgia Water Planning District

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" 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:

(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: Savannah River Basin Land Coverage

Stream/Segment	Land Use Categories - Acres (Percent)													
	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
Butler Creek	114.8	1329.9	17427.8	11217.6	10183.5	1541.9	13292.1	1144.4	3041.7	10494.6	6213.0	4.2	902.3	77719.0
GAR030601060601	0.1%	1.7%	22.4%	14.4%	13.1%	2.0%	17.1%	1.5%	3.9%	13.5%	8.0%	0.0%	1.2%	100%
Chechero Creek	0.0	1.6	61.6	8.2	0.2	6.9	2262.9	2.7	78.3	354.9	3.3	0.0	0.0	2780.6
GAR030601020213	0.0%	0.1%	2.2%	0.3%	0.0%	0.2%	81.4%	0.1%	2.8%	12.8%	0.1%	0.0%	0.0%	100%
Eastanollee Creek	16.2	2.9	1684.4	585.8	450.6	693.9	7170.2	7.8	4161.5	1789.8	177.0	0.0	1.3	16741.5
GAR030601020501	0.1%	0.0%	10.1%	3.5%	2.7%	4.1%	42.8%	0.0%	24.9%	10.7%	1.1%	0.0%	0.0%	100%
Fortson's Creek	1.6	52.3	142.1	37.1	0.0	1804.7	17171.3	47.1	1419.5	1399.1	1088.0	0.0	1.3	23164.2
GAR030601030310	0.0%	0.2%	0.6%	0.2%	0.0%	7.8%	74.1%	0.2%	6.1%	6.0%	4.7%	0.0%	0.0%	100%
Hart Creek	1.6	52.3	142.1	37.1	0.0	1804.7	17171.3	47.1	1419.5	1399.1	1088.0	0.0	1.3	23164.2
GAR030601050303	0.0%	0.2%	0.6%	0.2%	0.0%	7.8%	74.1%	0.2%	6.1%	6.0%	4.7%	0.0%	0.0%	100%
Jones Creek	3.3	61.4	825.3	415.7	107.4	129.9	863.1	39.1	70.7	623.4	91.6	0.0	1.3	3256.5
GAR030601060103	0.1%	1.9%	25.3%	12.8%	3.3%	4.0%	26.5%	1.2%	2.2%	19.1%	2.8%	0.0%	0.0%	100%
Little River	30.9	494.6	2080.5	518.6	238.4	15436.4	181447.4	1679.1	28002.0	15474.2	13555.4	0.0	54.9	259071.5
GAR030601050202	0.0%	0.2%	0.8%	0.2%	0.1%	6.0%	70.0%	0.6%	10.8%	6.0%	5.2%	0.0%	0.0%	100%
Reed Creek	0.9	5.8	3106.9	2120.8	2205.0	216.2	1273.7	99.9	514.4	1590.8	535.3	0.0	6.2	11726.9
GAR030601060605	0.0%	0.0%	26.5%	18.1%	18.8%	1.8%	10.9%	0.9%	4.4%	13.6%	4.6%	0.0%	0.1%	100%
Rocky Creek	0.9	5.8	3106.9	2120.8	2205.0	216.2	1273.7	99.9	514.4	1590.8	535.3	0.0	6.2	11726.9
GAR030601060603	0.0%	0.0%	26.5%	18.1%	18.8%	1.8%	10.9%	0.9%	4.4%	13.6%	4.6%	0.0%	0.1%	100%

Stream/Segment	Land Use Categories - Acres (Percent)													
	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
Saddle Gap Creek	0.2	2.0	40.7	16.0	8.9	9.8	1371.7	0.2	44.5	293.3	0.2	0.0	0.0	1787.6
GAR030601020212	0.0%	0.1%	2.3%	0.9%	0.5%	0.5%	76.7%	0.0%	2.5%	16.4%	0.0%	0.0%	0.0%	100%
Savannah Harbor	5475.8	208329.0	199532.8	70473.6	48038.2	371613.4	3649050.7	210395.9	850052.2	449516.1	633082.3	7958.4	13602.6	6724209.8
GAR030601090318	0.1%	3.1%	3.0%	1.0%	0.7%	5.5%	54.3%	3.1%	12.6%	6.7%	9.4%	0.1%	0.2%	100%
Savannah River	4649.4	189269.0	171722.3	55995.3	32642.9	236951.4	2985108.2	53863.8	714810.7	381825.7	157625.1	226.4	3593.0	4993101.8
GAR030601060615	0.1%	3.8%	3.4%	1.1%	0.7%	4.7%	59.8%	1.1%	14.3%	7.6%	3.2%	0.0%	0.1%	100%
Scott Creek	0.2	6.0	216.4	123.4	52.9	42.9	3265.4	0.4	90.3	780.2	4.2	0.0	0.0	4582.4
GAR030601020211	0.0%	0.1%	4.7%	2.7%	1.2%	0.9%	71.3%	0.0%	2.0%	17.0%	0.1%	0.0%	0.0%	100%
Stekoa Creek	0.2	6.0	216.4	123.4	52.9	42.9	3265.4	0.4	90.3	780.2	4.2	0.0	0.0	4582.4
GAR030601020215	0.0%	0.1%	4.7%	2.7%	1.2%	0.9%	71.3%	0.0%	2.0%	17.0%	0.1%	0.0%	0.0%	100%
Stekoa Creek	0.2	8.5	549.1	301.8	113.6	141.9	13662.4	22.9	1019.2	2657.0	16.0	0.0	0.0	18492.6
GAR030601020220	0.0%	0.0%	3.0%	1.6%	0.6%	0.8%	73.9%	0.1%	5.5%	14.4%	0.1%	0.0%	0.0%	100%
Stekoa Creek	0.9	11.8	585.8	305.6	113.6	153.7	20806.8	25.6	1207.6	2945.0	27.8	0.0	0.9	26185.0
GAR030601020219	0.0%	0.0%	2.2%	1.2%	0.4%	0.6%	79.5%	0.1%	4.6%	11.2%	0.1%	0.0%	0.0%	100%
Tributary to Buck Creek	20.7	20.9	277.1	22.9	1.3	417.2	4076.7	465.7	3884.1	598.0	117.4	0.0	0.9	9903.0
GAR030601090104	0.2%	0.2%	2.8%	0.2%	0.0%	4.2%	41.2%	4.7%	39.2%	6.0%	1.2%	0.0%	0.0%	100%
Wahachee Creek	20.7	20.9	277.1	22.9	1.3	417.2	4076.7	465.7	3884.1	598.0	117.4	0.0	0.9	9903.0
GAR030601040608	0.2%	0.2%	2.8%	0.2%	0.0%	4.2%	41.2%	4.7%	39.2%	6.0%	1.2%	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 2020 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. All the streams in which the TMDLs are being revised are currently meeting their water quality standards, and thus the streams are not included in the table below. 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 – Savannah River Basin

Stream Segment	Location	GA EPD Monitoring Station No.	GPS Coordinates	Monitoring Station Description	Sample Date Range
Hart Creek	Headwaters to Clarks Hill Lake	RV_01_17781	33.48651, -82.70873	Hart Creek at Cadley Rd near Norwood, GA	2021-2022
Tributary to Buck Creek	Headwaters to tributary 0.16 miles downstream of SR 21	RV_01_16766	32.725738, -81.608682	Trib to Buck Creek at SR 21 nr Sylvania	2021
Wahachee Creek	Tributary 0.07 miles upstream Dr. George Ward Dr to Wych Branch	RV_01_17293	34.02276, -82.75967	Wahachee Creek at Dr. George Ward Rd near Elberton, GA	2020

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 2022, there are twenty-one (21) NPDES permitted discharges identified in the watershed of the listed segments in the Savannah 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. There are no permitted CSO outfalls in the Savannah River Basin.

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 Savannah River Basin

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)	Actual Discharge (2015–2021)		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)	
A.H. Stephens State Park WPCP (Dept of Natural Resources)	GAG550017	Federal Lake	Little River GAR030601050202	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.006	200	0
Clayton WPCP (City of Clayton)	GA0020923	Stekoa Creek	Stekoa Creek GAR030601020219 Stekoa Creek GAR030601020220	0.458 (0.0-0.9)	4.0 (0.0-19.0)	1.0	200	0
Crossroads WPCP (City of Savannah)	GA0038326	Unnamed Tributary to St. Augustine Creek	Savannah Harbor GAR030601090318	2.760 (2.1- 3.4)	15.36 (2-340)	3.0	200	11
Eastanollee Creek WPCP (City of Toccoa)	GA0021814	Eastanollee Creek	Eastanollee Creek GAR030601020501	0.961 (0.0-1.8)	58.5 (0.0-433.0)	2.0	200	20
Fortson Creek WPCP (City of Elberton)	GA0025631	Fortson's Creek	Fortson's Creek GAR030601030310	0.327 (0.2-0.8)	24.1 (4.0-154.0)	0.6	200	0
Garden City WPCP (Garden City)	GA0031038	Savannah River / Harbor	Savannah Harbor GAR030601090318	1.056 (0.8-1.5)	6.58 (1.0-38)	2.0	200	3
Grovetown WPCP (City of Grovetown)	GA0050246	Butler Creek	Butler Creek GAR030601060601 Savannah River GAR030601060615	0.486 (0.3-0.6)	22.9 (2.0-85.0)	3.0	200	3
Hephzibah WPCP (City of Hephzibah)	GA0049433	Tributary of Little Spirit Creek	Savannah River GAR030601060615	0.031 (0.0-0.04)	32.9 (0.0-2419.6)	0.085	200	0
International Paper Port Wentworth	GA0002798	Savannah River / Harbor	Savannah Harbor GAR030601090318	11.721 (5.2-15.6)[d]	3430.2 (18-27,404)[e]	Report	Report	0

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)	Actual Discharge (2015–2021)		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)	
J.B. Messerly WPCP (City of Augusta)	GA0037621	Butler Creek	Butler Creek GAR030601060601 Savannah River GAR030601060615	36.95 (28.5-55.1)	10.3 (1.0-94.0)	46.1	200	199
Nancy Hart Nursing Center WPCP	GAG550148	Unnamed Tributary to Wahachee Creek	Wahachee Creek GAR030601040608	0.0003 (0.0-0.01)	194.7 (0.0-4200.0)	0.0125	200	0
Old Middle School Site WPCP (Stephens County Schools)	GAG550078	Eastanollee Creek	Eastanollee Creek GAR030601020501	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.009	200	0
Port Wentworth WPCP (City of Port Wentworth)	GA0038814	Savannah River / Harbor	Savannah Harbor GAR030601090318	0.797 (0.58-1.12)	2.7 (1-20)	2.0	23	8
President Street WPCP (City of Savannah)	GA0025348	Savannah River / Harbor	Savannah Harbor GAR030601090318	16.256 (12.7-27.7)	7.1 (1.8-24.9)	27	200	31
Reed Creek WPCP (Columbia County Water Utility)	GA0031992	Reed Creek	Reed Creek GAR030601060605 Savannah River GAR030601060615	2.63 (0.0-5.46)	2.2 (0.0-18.0)	4.6	200	29
Rincon WPCP (City of Rincon)	GA0046442	Unnamed Tributary of Sweigoffer Creek	Savannah Harbor GAR030601090318	0.605 (0.3-0.8)	6.6 (1-20)	1.0	23	1
Rocky Creek WPCP (City of Washington)	GA0031101	Rocky Creek	Little River GAR030601050202	0.622 (0.3-1.2)	7.4 (0.0-44.0)	4.0	200	2
Savannah Industrial & Domestic WTP (City of Savannah)	GAG640057	Unnamed Tributary to St. Augustine Creek	Savannah Harbor GAR030601090318	3.045 (0.6-2) [f]	783.75 (44.3-5546)[g]	Report	Report	0
Spirit Creek WPCP (City of Augusta)	GA0047147	Spirit Creek	Savannah River GAR030601060615	0.509 (0.0-2.08)	67.2 (0.0-283.0)	2.24	200	2

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)	Actual Discharge (2015–2021)		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)	
Travis Field WPCP (City of Savannah)	GA0020427	Pipe Makers Canal	Savannah Harbor GAR030601090318	N/A[h]	N/A	8	200	N/A
United States Army Hunter Army Airfield WWTP	GA0027588	Savannah River / Harbor	Savannah Harbor GAR030601090318	0.34 (0.24-0.46)	33.41 (1.32-960)	1.25	200	
Wilshire WPCP (City of Savannah)	GA0020443	Savannah River / Harbor	Savannah Harbor GAR030601090318	2.76 (2.01-3.41)	2.33 (1.8-7)	4.5	200	10

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, followed by the monthly average ranges during the period.

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

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

[d] – Average is based on the October 2016 – December 2021 monitoring periods and reported as a daily average.

[e] – Fecal coliform was collected from May – December 2021 and reported as a daily geometric mean. The modified permit, effective April 2023 requires enterococci sampling.

[f] – Facility did not submit DMR's for the Jan – June 2016 monitoring periods.

[g] – Coliform limits were added in latest permit. Average is based on the Feb – December 2021 monitoring periods.

[h] –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 Savannah River Basin

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)
Augusta Quarry (Martin Marietta Materials)	GAG300082	Augusta Canal / Reed Creek Diversion	Butler Creek GAR030601060601 Savannah River GAR030601060615
Augusta Ready-Mix Plant (Georgia Carolina Concrete)	GAG300100	Oates Creek	Butler Creek GAR030601060601 Savannah River GAR030601060615
BASF Corporation	GA0048330	Savannah River / Harbor	Savannah Harbor GAR030601090318
Blanchard WTP (Columbia County Water Utility)	GAG640130	Savannah River	Savannah River GAR030601060615
Colonial Terminals, Inc	GA0037923	Savannah River / Harbor	Savannah Harbor GAR030601090318
Chemtrade Solutions	GA0002925	Swamp to Casons Dead River	Butler Creek GAR030601060601 Savannah River GAR030601060615
Hephzibah Facility (Covia Clay)	GA0002470	Grindstone Branch	Savannah River GAR030601060615
Dixon Airlines Recycling & Disposal	GAG100033	Butler Creek	Butler Creek GAR030601060601 Savannah River GAR030601060615
EMD Performance Materials	GA0034355	Savannah River / Harbor	Savannah Harbor GAR030601090318
Ergon Asphalt and Emulsions, Inc.	GA0038687	An unnamed Tributary to the Dundee Canal in the Savannah River Basin	Savannah Harbor GAR030601090318
Elba Liquefaction Company, L.L.C.	GA0050254	South Fork Savannah River	Savannah Harbor GAR030601090318
Fuji Vegetable Oil, Inc.	GA0038521	Unnamed Tributary to Savannah Harbor	Savannah Harbor GAR030601090318
GAF Materials	GA0003841	Savannah River / Harbor	Savannah Harbor GAR030601090318
Georgia-Pacific Savannah River	GA0046973	Savannah River / Harbor	Savannah Harbor GAR030601090318
Georgia Atlantic Port, LLC	GA0047783	Savannah River / Harbor	Savannah Harbor GAR030601090318
Georgia Ports Authority[a]	GA0002356	Savannah River / Harbor	Savannah Harbor GAR030601090318
Gulfstream Aerospace Corporation	GA0003255	Unnamed tributaries to Pipe Makers Canal	Savannah Harbor GAR030601090318
Highland Avenue WTP (City of Augusta)	GAG640063	Oates Creek	Butler Creek GAR030601060601 Savannah River GAR030601060615
Imperial Savannah, LP	GA0003611	Savannah River / Harbor	Savannah Harbor GAR030601090318

Facility Name	NPDES Permit No.	Receiving Stream	303(d) Listed Segment(s)
International Paper Augusta Mill	GA0002801	Savannah River	Savannah River GAR030601060615
International Paper Savannah Mill	GA0001988	Savannah River / Harbor	Savannah Harbor GAR030601090318
Morgan Advanced Materials Thermal Ceramics	GA0002488	Tributary to Rocky Creek	Butler Creek GAR030601060601 Savannah River GAR030601060615
Olin Corporation	GA0003719	Savannah River	Savannah River GAR030601060615
PCS Nitrogen Fertilizer – Augusta	GA0002071	Savannah River	Savannah River GAR030601060615
Plant McIntosh (Georgia Power Co.)	GA0003883	Savannah River / Harbor	Savannah Harbor GAR030601090318
Prayon	GA0002178	Butler Creek	Butler Creek GAR030601060601 Savannah River GAR030601060615
Savannah Yacht Center	GA0003671	Savannah River / Harbor	Savannah Harbor GAR030601090318
SeaGate Terminals Savannah, LLC	GA0002437	Savannah River / Harbor	Savannah Harbor GAR030601090318
Skull Shoals WTP (City of Washington)	GAG640111	Little Beaverdam Creek	Little River GAR030601050202
Solenis	GA0026867	Dundee Canal	Savannah Harbor GAR030601090318
Stevens Creek Hydroelectric Station (Dominion Energy South Carolina)	GA0003786	Savannah River	Savannah River GAR030601060615
Sulfco	GA0003646	Savannah River / Harbor	Savannah Harbor GAR030601090318
Union Point WTP (City of Union Point)	GAG640035	Tributary to Sherrill Creek	Little River GAR030601050202

Notes: [a] – Permit no longer in effect.

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 Savannah River Basin. There are fourteen (14) permitted MS4s that discharge into or upstream of a stream segment not supporting its designated use for bacteria.

Table 8: Permitted MS4s in the Savannah River Basin

Permit No.	MS4 Permittee	MS4 Phase	Impaired Stream Watershed
GAS000200	Augusta-Richmond County	Phase 1	Butler Creek GAR030601060601 Reed Creek GAR030601060605 Rocky Creek GAR030601060603 Savannah River GAR030601060615
GAS000207	City of Bloomingdale	Phase 1	Savannah Harbor GAR030601090318
GAS000208	City of Garden City	Phase 1	Savannah Harbor GAR030601090318
GAS000209	City of Pooler	Phase 1	Savannah Harbor GAR030601090318
GAS000210	City of Port Wentworth	Phase 1	Savannah Harbor GAR030601090318
GAS000205	City of Savannah	Phase 1	Savannah Harbor GAR030601090318
GAS000211	City of Thunderbolt	Phase 1	Savannah Harbor GAR030601090318
GAG610000	City of Grovetown	Phase 2 >10,000	Butler Creek GAR030601060601 Savannah River GAR030601060615
GAG610000	City of Hephzibah	Phase 2 <10,000	Savannah River GAR030601060615

Permit No.	MS4 Permittee	MS4 Phase	Impaired Stream Watershed
GAS000206	Chatham County	Phase 1	Savannah Harbor GAR030601090318
GAG610000	Columbia County	Phase 2 > 10,000	Butler Creek GAR030601060601 Jones Creek GAR030601060103 Reed Creek GAR030601060605 Savannah River GAR030601060615
GAG610000	Effingham County	Phase 2 > 10,000	Savannah Harbor GAR030601090318
GAG480002	Fort Gordon	Phase 2	Savannah River GAR030601060615
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 Savannah 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
Butler Creek	Phinizy Ditch to Savannah River, Augusta	GAR030601060601	64056.2	60%
Jones Creek	Headwaters to the Savannah River near Evans	GAR030601060103	2960.7	58%
Reed Creek	Bowen Pond to Savannah River	GAR030601060605	9656.6	81%
Rocky Creek	SR 56 to tributary 0.5 miles downstream Doug Barnard Parkway, Augusta	GAR030601060603	11658.8	77%
Savannah Harbor	SR 25 (old US Hwy 17) to Elba Island Cut	GAR030601090318	6724209.8	0.29%

Stream Segment	Location	Reach AUID	Total Watershed Area (acres)	Urban Land Use Percentage
Savannah River	Butler Creek to McBean Creek	GAR030601060615	86139.6	1%

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 Savannah 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 Savannah River Basin and indicates those that may impact the listed streams.

Table 10: Permitted CAFOs in the Savannah River Basin

Name	Permit No.	County	Animal Type	Total No. of Animals Units	Impaired Stream Watershed
Rimes Family Farm of Taliaferro	GAG940009	Taliaferro	Swine	>1000	Little River GAR030601050202

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

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 Savannah 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 Savannah 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 140ºF to 160ºF, 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 Savannah River Basin

County	Livestock								
	Beef Cattle	Dairy Cattle	Swine	Sheep	Horses	Goats	Chickens		
							Broilers	Layers	Pullets
Banks	13,185	80	60	225	1,020	575	29,470,979	1,872,021	1,252,280
Burke	10,592	13,000	60	300	550	600	-	-	-
Chatham	214	-	-	-	-	-	-	-	-
Clarke	403	-	-	25	184	50	54,592	-	-
Columbia	2,696	-	-	-	209	350	-	-	-
Effingham	4,190	-	150	80	625	1,001	-	-	-
Elbert	12,517	-	150	-	480	150	33,894,573	697,503	35,298
Franklin	27,724	-	-	450	800	1,800	92,543,917	1,746,252	692,973
Glascock	5,931	-	80	350	390	1,500	-	-	-
Greene	9,429	500	-	300	325	400	8,629,913	75,415	-
Habersham	2,725	-	3,674	300	1,000	4,503	14,692,362	275,957	528,859
Hart	16,421	875	-	200	245	901	87,232,928	2,268,549	670,262
Jackson	30,930	-	100	400	700	1,601	31,968,019	1,130,309	471,461
Jefferson	9,437	2,100	45	120	20	600	-	-	-
Jenkins	4,130	110	300	125	55	850	-	-	-
Lincoln	5,558	-	30	75	300	300	-	-	-
Madison	23,495	200	200	850	420	3,502	74,812,961	777,005	325,741
McDuffie	6,316	385	-	300	1,460	650	-	-	-
Oglethorpe	20,838	1,200	140,675	500	1,000	1,001	56,845,076	187,545	268,931
Rabun	2,517	-	75	200	300	250	1,564,608	-	-
Richmond	1,883	-	-	25	115	275	-	-	-
Screven	10,369	-	-	100	200	1,001	-	-	-
Stephens	14,648	-	120	175	367	600	12,826,951	71,205	-
Taliaferro	-	-	-	-	-	-	6,266,077	50,277	-
Warren	6,931	-	438	320	780	1,500	-	-	-
Wilkes	20,354	1,500	100	50	250	500	28,013,371	25,138	-

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 Savannah 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 Savannah 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 Savannah 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)
Banks	7,358	7,799	441	133
Burke	8,347	8,924	577	203
Chatham	14,945	15,242	297	392
Clarke	10,695	10,885	190	372
Columbia	11,287	11,885	598	343
Effingham	17,830	18,895	1,065	378
Elbert	6,802	7,058	256	239
Franklin	9,794	10,188	394	198
Glascock	1,427	1,483	56	13
Greene	5,401	5,786	385	32
Habersham	15,437	16,038	601	420
Hart	11,850	12,343	493	299
Jackson	22,070	23,546	1,476	415
Jefferson	5,271	5,446	175	105
Jenkins	2,751	2,773	22	0
Lincoln	4,314	4,429	115	53
Madison	13,737	14,442	705	205

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)
McDuffie	6,367	6,554	187	132
Oglethorpe	7,141	7,616	475	44
Rabun	11,280	11,695	415	193
Richmond	15,618	15,903	285	420
Screven	6,095	6,298	203	28
Stephens	9,120	9,260	140	167
Taliaferro	898	920	22	3
Warren	2,043	2,095	52	27
Wilkes	3,670	3,761	91	24

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 Savannah River Basin that could potentially impact the stream segments in this TMDL are identified.

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

LAS Name	Permit No.	County	Type	Flow (MGD)	Impaired Stream Watershed
Crawfordville Feed Mill (Harrison Poultry)	GAJ040038	Taliaferro	Industrial	0.04	Little River GAR030601050202
Effingham Energy Facility	GAJ010564	Effingham	Industrial	0	Savannah Harbor GAR030601090318
South WRF (Effingham County)	GAJ020016	Effingham	Municipal	0.5	Savannah Harbor GAR030601090318
Westwood Height & Mill Creek WPCP (Coastal Water & Sewerage Company)	GAJ020234	Effingham	Municipal	0.24	Savannah Harbor GAR030601090318

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 Savannah River Basin.

Table 14: Permitted Landfills in the Savannah River Basin

Facility Name	Permit Number	County	Interest Type	Operating Status
Augusta - Goodrich St (L)	121-012D(L)	Richmond	SW- Construction & Demolition Landfill	Archived
Augusta Renewable Power, LLC Anaerobic Digester	121-020P(AD)	Richmond	SW- Composting	Construction
AUGUSTA-RICHMOND COUNTY SOLID WASTE	121-018D(MSWL)	Richmond	SW- Municipal Solid Waste Landfill	Operating
CITY OF WASHINGTON	PBR-157-06YTL	Wilkes	SW- Yard Trimming Landfill	Operating
Columbia Co - Baker Place Rd (SL), Ph 1	036-010D(SL)(1)	Columbia	SW- Municipal Solid Waste Landfill	Closed/PCC
Columbia Co - Baker Place Rd (SL), Ph 2	036-010D(SL)	Columbia	SW- Municipal Solid Waste Landfill	Closed/PCC
Elbert Co - Hull Chapel Rd Ph 1 (SL)	052-008D(SL)	Elbert	SW- Municipal Solid Waste Landfill	Closed/PCC
Elberton - Old Middleton Rd Ph 1 (SL)	052-002D(SL)	Elbert	SW- Municipal Solid Waste Landfill	Archived
Elberton - Old Middleton Rd Ph 2 (SL)	052-006D(SL)	Elbert	SW- Municipal Solid Waste Landfill	Archived
Franklin County - SR 51 Construction/Demolition Landfill	059-012D(C&D)	Franklin	SW- Construction & Demolition Landfill	Operating
Franklin County Sanitary Landfill	059-010P(RM)	Franklin	SW- Material Recovery Facility	Closed/PCC
FT GORDON	121-014D(SL)	Richmond	SW- Construction & Demolition Landfill	Operating
Graphic Packaging International, LLC - Augusta Mill	0	Richmond	SW- Private Industrial Landfill	0
Grovetown - Newmantown Rd (L)	036-006D(L)	Columbia	SW- Construction & Demolition Landfill	Construction
Harlem - Lamkin Rd (L)	036-007D(L)	Columbia	SW- Construction & Demolition Landfill	Closed/PCC
Hart Co - SR 172 S Ph 1&2 (SL)	073-002D(SL)	Hart	SW- Municipal Solid Waste Landfill	Archived
Hart Co - SR 172 S Ph 3 (SL)	073-005D(SL)	Hart	SW- Municipal Solid Waste Landfill	Closed/PCC
James - SR 17 S (L)	097-009D(L)	McDuffie	SW- Construction & Demolition Landfill	Closed/PCC
Lavonia - Bear Creek Rd Ph 1 (SL)	059-006D(SL)	Franklin	SW- Municipal Solid Waste Landfill	Archived
Lavonia - Bear Creek Rd Ph 2 (SL)	059-009D(SL)	Franklin	SW- Municipal Solid Waste Landfill	Closed/PCC
Lincoln Co - CR 121/Prater (SL)	090-004D(SL)	Lincoln	SW- Municipal Solid Waste Landfill	Closed/PCC
McDuffie Co - Mesena Rd Ph 1 (SL)	097-007D(SL)	McDuffie	SW- Municipal Solid Waste Landfill	Closed/PCC
Reeves - Frontage/Buff Rds (L)	036-012D(L)	Columbia	SW- Construction & Demolition Landfill	Archived
Richmond Co - Deans Bridge Rd Ph 2A (SL)	121-015D(SL)	Richmond	SW- Municipal Solid Waste Landfill	Closed/PCC

Facility Name	Permit Number	County	Interest Type	Operating Status
Richmond Co - Deans Bridge Rd Ph 2B (SL)	121-016D(SL)-(2B)	Richmond	SW- Municipal Solid Waste Landfill	Closed/PCC
Richmond Co - Deans Bridge Rd Ph 2C (SL)	121-016D(SL)	Richmond	SW- Municipal Solid Waste Landfill	Operating
Richmond Co - RCCI,Arkard St	121-011D(SL)	Richmond	SW- Municipal Solid Waste Landfill	Closed/PCC
Sample and Son, Inc	036-017D(C&D)	Columbia	SW- Construction & Demolition Landfill	Operating
Stephens Co - SR 145 Ph 2&3 (SL)	127-003D(SL)	Stephens	SW- Construction & Demolition Landfill	Closed/PCC
US Army - Ft Gordon 17th St (SL)	121-010D(SL)	Richmond	SW- Municipal Solid Waste Landfill	Closed/PCC
Wilbros, LLC	127-004P(CO)	Stephens	SW- Composting	Closed/PCC
WILKES COUNTY MSWLF S.R. 40	157-003D(SL)	Wilkes	SW- Municipal Solid Waste Landfill	Closed/PCC
Williams - Mesena Rd (L)	097-010D(L)	McDuffie	SW- Construction & Demolition Landfill	Permit Revoked

Source: Land Protection Branch, GA EPD, 2022

4.0 ANALYTICAL APPROACH

The process of developing bacteria TMDLs for the Savannah 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. For each listed segment, the drainage areas and USGS gages used to estimate stream flow are given in Table A-2 in Appendix A. The current critical load was compared to summer and winter seasonal TMDL curves to determine the required percent reduction.

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

Waterbody Name	Location	USGS Station No.	USGS Station Name	Flow Gage Drainage Area (sq miles)
Hart Creek	Headwaters to Clarks Hill Lake	02193340	Kettle Creek near Washington, GA	33.9
Wahachee Creek	Tributary 0.07 miles upstream Dr. George Ward Dr to Wych Branch			

Waterbody Name	Location	USGS Station No.	USGS Station Name	Flow Gage Drainage Area (sq miles)
Tributary to Buck Creek	Headwaters to tributary 0.16 miles downstream of SR 21	02198100	Beaverdam Creek near Sardis, GA	30.8

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

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:

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

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 Savannah 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)
A.H. Stephens State Park WPCP (Dept of Natural Resources)	GAG550017	Federal Lake	Little River GAR030601050202	Fecal coliform	7.03E+07	200
				E. coli	4.43E+07	126
Clayton WPCP (City of Clayton)	GA0020923	Stekoa Creek	Stekoa Creek GAR030601020219 Stekoa Creek GAR030601020220	Fecal coliform	1.17E+10	200
				E. coli	7.38E+09	126
Crossroads WPCP (City of Savannah)	GA0038326	Unnamed Tributary to St. Augustine Creek	Savannah Harbor GAR030601090318	Fecal coliform	3.51E+10	200
				E. coli	2.21E+10	126
Eastanollee Creek WPCP (City of Toccoa)	GA0021814	Eastanollee Creek	Eastanollee Creek GAR030601020501	Fecal coliform	2.34E+10	200
				E. coli	1.48E+10	126
Fortson Creek WPCP (City of Elberton)	GA0025631	Fortson's Creek	Fortson's Creek GAR030601030310	Fecal coliform	7.03E+09	200
				E. coli	4.43E+09	126
Garden City WPCP (Garden City)	GA0031038	Savannah River / Harbor	Savannah Harbor GAR030601090318	Fecal coliform	2.34E+10	200
				enterococci	4.10E+09	35
Grovetown WPCP (City of Grovetown)	GA0050246	Butler Creek	Butler Creek GAR030601060601 Savannah River GAR030601060615	Fecal coliform	3.51E+10	200
				E. coli	2.21E+10	126
Hephzibah WPCP (City of Hephzibah)	GA0049433	Tributary of Little Spirit Creek	Savannah River GAR030601060615	Fecal coliform	9.96E+08	200
				E. coli	6.27E+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)
International Paper Port Wentworth	GA0002798	Savannah River / Harbor	Savannah Harbor GAR030601090318	Fecal coliform	2.81E+11	200
				enterococci	4.92E+10	35
J.B. Messerly WPCP (City of Augusta)	GA0037621	Butler Creek	Butler Creek GAR030601060601 Savannah River GAR030601060615	Fecal coliform	5.40E+11	200
				E. coli	3.40E+11	126
Nancy Hart Nursing Center WPCP	GAG550148	Unnamed Tributary to Wahachee Creek	Wahachee Creek GAR030601040608	Fecal coliform	1.46E+08	200
				E. coli	9.22E+07	126
Old Middle School Site WPCP (Stephens County Schools)	GAG550078	Eastanollee Creek	Eastanollee Creek GAR030601020501	Fecal coliform	1.05E+08	200
				E. coli	6.64E+07	126
Port Wentworth WPCP (City of Port Wentworth)	GA0038814	Savannah River / Harbor	Savannah Harbor GAR030601090318	Fecal coliform	2.34E+10	200
				enterococci	4.10E+09	35
President Street WPCP (City of Savannah)	GA0025348	Savannah River / Harbor	Savannah Harbor GAR030601090318	Fecal coliform	3.16E+11	200
				enterococci	5.53E+10	35
Reed Creek WPCP (Columbia County Water Utility)	GA0031992	Reed Creek	Reed Creek GAR030601060605 Savannah River GAR030601060615	Fecal coliform	5.39E+10	200
				E. coli	3.39E+10	126
Rincon WPCP (City of Rincon)	GA0046442	Unnamed Tributary of Sweigoffer Creek	Savannah Harbor GAR030601090318	Fecal coliform	1.17E+10	200
				E. coli	7.38E+09	126
Rocky Creek WPCP (City of Washington)	GA0031101	Rocky Creek	Little River GAR030601050202	Fecal coliform	4.68E+10	200
				E. coli	2.95E+10	126
Savannah Industrial & Domestic WTP (City of Savannah)	GAG640057	Unnamed Tributary to St. Augustine Creek	Savannah Harbor GAR030601090318	Fecal coliform	8.78E+08	200
				E. coli	5.53E+08	126
Spirit Creek WPCP (City of Augusta)	GA0047147	Spirit Creek	Savannah River GAR030601060615	Fecal coliform	2.62E+10	200
				E. coli	1.65E+10	126
Travis Field WPCP (City of Savannah)	GA0020427	Pipe Makers Canal	Savannah Harbor GAR030601090318	Fecal coliform	9.37E+10	200
				enterococci	1.64E+10	35

Facility Name	NPDES Permit No.	Receiving Stream	Listed Stream Segment	Bacterial Indictor	WLA (counts/ 30 days)	30 Day Geometric Mean Concentration (counts/100mL)
United States Army Hunter Army Airfield WWTP	GA0027588	Savannah River / Harbor	Savannah Harbor GAR030601090318	Fecal coliform	1.46E+10	200
				enterococci	2.56E+09	35
Wilshire WPCP (City of Savannah)	GA0020443	Savannah River / Harbor	Savannah Harbor GAR030601090318	Fecal coliform	5.27E+10	200
				enterococci	9.22E+09	35

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 are currently thirty-three (33) 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 one (1) wet or dry manure CAFOs located in the watersheds of the listed segments in the Savannah 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 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 Savannah 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)	
GAR030601050303	Hart Creek	Headwaters to Clarks Hill Lake	Fecal coliform	2.78E+11	--	--	1.89E+11	2.10E+10	2.10E+11	24.4%
			E. coli	1.11E+13	--	--	2.92E+11	3.25E+10	3.25E+11	97.1%
GAR030601090104	Tributary to Buck Creek	Headwaters to tributary 0.16 miles downstream of SR 21	Fecal coliform	7.16E+10	--	--	5.99E+10	6.66E+09	6.66E+10	7.0%
			E. coli	(2)	--	--	1.29E+10	1.43E+09	1.43E+10	Undetermined (3)
GAR030601040608	Wahachee Creek	Tributary 0.07 miles upstream Dr. George Ward Dr to Wych Branch	Fecal coliform	2.03E+11	1.46E+08	--	3.08E+10	3.44E+09	3.44E+10	83.1%
			E. coli	(2)	9.22E+07	--	1.94E+10	2.17E+09	2.17E+10	Undetermined (3)
Revised TMDLs										
GAR030601060601	Butler Creek	Phinizy Ditch to Savannah River, Augusta	Fecal coliform	(4)	6.29E+11	3.66E+10	4.99E+10	7.95E+10	7.95E+11	Undetermined (3)
			E. coli	(4)	3.96E+11	2.31E+10	3.14E+10	5.01E+10	5.01E+11	Undetermined (3)
GAR030601020213	Chechero Creek	Headwaters to Stekoa Creek	Fecal coliform	(4)	--	--	8.65E+10	9.61E+09	9.61E+10	Undetermined (3)
			E. coli	(4)	--	--	5.45E+10	6.06E+09	6.06E+10	Undetermined (3)
GAR030601020501	Eastanollee Creek	Toccoa to Lake Hartwell	Fecal coliform	(4)	2.35E+10	--	2.33E+11	2.85E+10	2.85E+11	Undetermined (3)
			E. coli	(4)	1.48E+10	--	1.47E+11	1.80E+10	1.80E+11	Undetermined (3)
GAR030601030310	Fortson's Creek	Elberton to Beaverdam Creek	Fecal coliform	(4)	7.03E+09	--	2.91E+10	4.01E+09	4.01E+10	Undetermined (3)
			E. coli	(4)	4.43E+09	--	1.83E+10	2.53E+09	2.53E+10	Undetermined (3)
GAR030601060103	Jones Creek	Headwaters to the Savannah River near Evans	Fecal coliform	(4)	--	1.25E+10	1.78E+10	3.37E+09	3.37E+10	Undetermined (3)
			E. coli	(4)	--	7.89E+09	1.12E+10	2.12E+09	2.12E+10	Undetermined (3)
GAR030601050202	Little River	Rocky Creek to Clarks Hill Lake	Fecal coliform	(4)	4.69E+10	--	2.37E+12	2.68E+11	2.68E+12	Undetermined (3)
			E. coli	(4)	2.96E+10	--	1.49E+12	1.69E+11	1.69E+12	Undetermined (3)
GAR030601060605	Reed Creek	Bowen Pond to Savannah River	Fecal coliform	(4)	5.39E+10	2.04E+10	1.57E+10	9.99E+09	9.99E+10	Undetermined (3)
			E. coli	(4)	3.39E+10	1.29E+10	9.87E+09	6.30E+09	6.30E+10	Undetermined (3)
GAR030601060603	Rocky Creek	SR 56 to tributary 0.5 miles downstream Doug Barnard Parkway, Augusta	Fecal coliform	(4)	--	5.81E+10	4.98E+10	1.20E+10	1.20E+11	Undetermined (3)
			E. coli	(4)	--	3.66E+10	3.14E+10	7.55E+09	7.55E+10	Undetermined (3)

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)	
GAR030601020212	Saddle Gap Creek	Headwaters to Stekoa Creek	Fecal coliform	[4]	--	--	6.44E+10	7.15E+09	7.15E+10	Undetermined [3]
			E. coli	[4]	--	--	4.06E+10	4.51E+09	4.51E+10	Undetermined [3]
GAR030601090318	Savannah Harbor	SR 25 (old US Hwy 17) to Elba Island Cut	Fecal coliform	[4]	8.05E+11	200 x Q_{WLAsw}[5]	200 x Q_{LA}[5]	20 x Q_{Total}[5]	200 x Q_{Total}[5]	Undetermined [3]
			Enterococci	[4]	1.41E+11	35 x Q_{WLAsw}[5]	35 x Q_{LA}[5]	3.5 x Q_{WLAsw}[5]	35 x Q_{Total}[5]	Undetermined [3]
GAR030601060615	Savannah River	Butler Creek to McBean Creek	Fecal coliform	[4]	6.21E+11	4.89E+11	5.79E+13	6.56E+12	6.56E+13	Undetermined [3]
			E. coli	[4]	3.91E+11	3.08E+11	3.65E+13	4.13E+12	4.13E+13	Undetermined [3]
GAR030601020211	Scott Creek	Headwaters to Stekoa Creek	Fecal coliform	[4]	--	--	1.55E+11	1.72E+10	1.72E+11	Undetermined [3]
			E. coli	[4]	--	--	9.74E+10	1.08E+10	1.08E+11	Undetermined [3]
GAR030601020215	Stekoa Creek	Cox Lake to Scott Creek	Fecal coliform	[4]	--	--	1.70E+11	1.89E+10	1.89E+11	Undetermined [3]
			E. coli	[4]	--	--	1.07E+11	1.19E+10	1.19E+11	Undetermined [3]
GAR030601020219	Stekoa Creek	Scott Creek to She Creek	Fecal coliform	[4]	1.17E+10	--	7.99E+11	9.01E+10	9.01E+11	Undetermined [3]
			E. coli	[4]	7.38E+09	--	5.03E+11	5.68E+10	5.68E+11	Undetermined [3]
GAR030601020220	Stekoa Creek	She Creek to the Chattooga River	Fecal coliform	[4]	1.17E+10	--	6.13E+11	6.94E+10	6.94E+11	Undetermined [3]
			E. coli	[4]	7.38E+09	--	3.86E+11	4.37E+10	4.37E+11	Undetermined [3]

Notes:

(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) Sample was not analyzed for *E. coli*, therefore critical load calculation not possible.
(3) Percent reduction could not be determined due to absence of current load calculation.
(4) Critical loading could not be determined due to no samples collected.
(5) The segment of the Savannah Harbor is tidal in nature. Therefore $WLA_{sw,}$ load allocation, MOS and the TMDL are expressed as a function of the flow Q at any given time.

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 Savannah 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 *Savannah-Ogeechee Regional Water Plan* (GA EPD, 2017)
- 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 Savannah 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 thirty-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 Savannah 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 Savannah River Basin

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Estuarine Status
Hart Creek	Headwaters to Clarks Hill Lake	GAR030601050303	16.6	Fishing	Non-estuarine
Tributary to Buck Creek	Headwaters to tributary 0.16 miles downstream of SR 21	GAR030601090104	2	Fishing	Non-estuarine
Wahachee Creek	Tributary 0.07 miles upstream Dr. George Ward Dr to Wych Branch	GAR030601040608	2	Fishing	Non-estuarine

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

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Estuarine Status	Original TMDL Action ID Number, Agency, and Year
Butler Creek	Phinizy Ditch to Savannah River, Augusta	GAR030601060601	3	Fishing	Non-estuarine	#202 US EPA 2000
Chechero Creek	Headwaters to Stekoa Creek	GAR030601020213	3	Fishing	Non-estuarine	#31675 US EPA 2006
Eastanollee Creek	Toccoa to Lake Hartwell	GAR030601020501	14	Fishing	Non-estuarine	#409 US EPA 2000

Stream Segment	Location	Assessment Unit ID	Segment Length (miles)	Designated Use	Estuarine Status	Original TMDL Action ID Number, Agency, and Year
Fortson's Creek	Elberton to Beaverdam Creek	GAR030601030310	4	Fishing	Non-estuarine	#450 US EPA 1998
Jones Creek	Headwaters to the Savannah River near Evans	GAR030601060103	3.7	Fishing	Non-estuarine	#584 US EPA 1998
Little River	Rocky Creek to Clarks Hill Lake	GAR030601050202	4	Fishing	Non-estuarine	#707 US EPA 2000
Reed Creek	Bowen Pond to Savannah River	GAR030601060605	1.4	Fishing	Non-estuarine	#987 US EPA 2000
Rocky Creek	SR 56 to tributary 0.5 miles downstream Doug Barnard Parkway, Augusta	GAR030601060603	1.6	Fishing	Non-estuarine	#1015 US EPA 2000
Saddle Gap Creek	Headwaters to Stekoa Creek	GAR030601020212	2.1	Fishing	Non-estuarine	#31675 US EPA 2006
Savannah Harbor	SR 25 (old US Hwy 17) to Elba Island Cut	GAR030601090318	5 sq mi	Coastal Fishing	Estuarine	#1054 US EPA 2000
Savannah River	Butler Creek to McBean Creek	GAR030601060615	21	Fishing	Non-estuarine	#1055 US EPA 2000
Scott Creek	Headwaters to Stekoa Creek	GAR030601020211	4	Fishing	Non-estuarine	#31675 US EPA 2006
Stekoa Creek	Cox Lake to Scott Creek	GAR030601020215	3	Fishing	Non-estuarine	#1145 US EPA 2000
Stekoa Creek	Scott Creek to She Creek	GAR030601020219	9.3	Fishing	Non-estuarine	#1145 US EPA 2000
Stekoa Creek	She Creek to the Chattooga River	GAR030601020220	4.7	Fishing	Non-estuarine	#1145 US EPA 2000

The water use classification for the listed stream segments in the Savannah River Basin is "Fishing." The criterion violated is listed as fecal coliform. The potential causes listed include urban runoff and nonpoint sources. The "Fishing" bacteria water quality criteria as approved by US EPA Region 4 on January 20, 2021, and applicable at the time of listing was as follows:

(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. 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 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. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200 counts per 100 mL (geometric mean) occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 counts per 100 mL in lakes and reservoirs and 500 counts 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 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 and not to exceed a maximum of 4,000 counts per 100 mL for any sample. 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.

2. 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:

(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 *Savannah-Ogeechee Regional Water Plan* (GA EPD, 2017);
- 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

30-day Geometric Mean Fecal Coliform Monitoring Data

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

Revised TMDL Stream Segment	Segment Location	Annual Average Stream Flow (ft^3/s)	Watershed Area (sq miles)
Butler Creek	Phinizy Ditch to Savannah River, Augusta	105	122
Chechero Creek	Headwaters to Stekoa Creek	12.7	4.34
Eastanollee Creek	Toccoa to Lake Hartwell	37.7	26.1
Fortson’s Creek	Elberton to Beaverdam Creek	5.11	5.3
Jones Creek	Headwaters to the Savannah River near Evans	4.45	5.09
Little River	Rocky Creek to Clarks Hill Lake	354	405
Reed Creek	Bowen Pond to Savannah River	13.2	15.1
Rocky Creek	SR 56 to tributary 0.5 miles downstream Doug Barnard Parkway, Augusta	15.8	18.3
Saddle Gap Creek	Headwaters to Stekoa Creek	9.45	2.79
Savannah Harbor	SR 25 (old US Hwy 17) to Elba Island Cut	Unavailable due to tidal nature of waterbody	10505
Savannah River	Butler Creek to McBean Creek	8660	7800

Revised TMDL Stream Segment	Segment Location	Annual Average Stream Flow (ft^3/s)	Watershed Area (sq miles)
Scott Creek	Headwaters to Stekoa Creek	22.7	6.36
Stekoa Creek	Cox Lake to Scott Creek	25	7.15
Stekoa Creek	Scott Creek to She Creek	91.7	28.9
Stekoa Creek	She Creek to the Chattooga River	119	40.9

Table A-2: Drainage Areas and USGS Flow Gages used to Estimate Stream Flow in 303(d) Listed Streams

303(d) Listed Stream Segment	Segment Location	Impaired Stream Drainage Area (sq miles)	USGS Station ID	USGS Description	USGS Drainage Area (sq miles)
Hart Creek	Headwaters to Clarks Hill Lake	36.2	02193340	Kettle Creek near Washington, GA	33.9
Wahachee Creek	Tributary 0.07 miles upstream Dr. George Ward Dr to Wych Branch	15.5			
Tributary to Buck Creek	Headwaters to tributary 0.16 miles downstream of SR 21	0.95	02198100	Beaverdam Creek near Sardis, GA	30.8

Table A-3: RV_01_ 17781: Hart Creek at Hadley Rd near Norwood, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
02/08/2021	130	20.17	89	53	1.79E+11	2.01E+12
02/10/2021	40	17.18				
02/15/2021	40	134.47				
02/22/2021	300	40.55				
05/03/2021	900	42.05	**265**	28	2.78E+11	2.10E+11
05/05/2021	800	44.07				
05/10/2021	170	13.45				
05/17/2021	40	11.53				

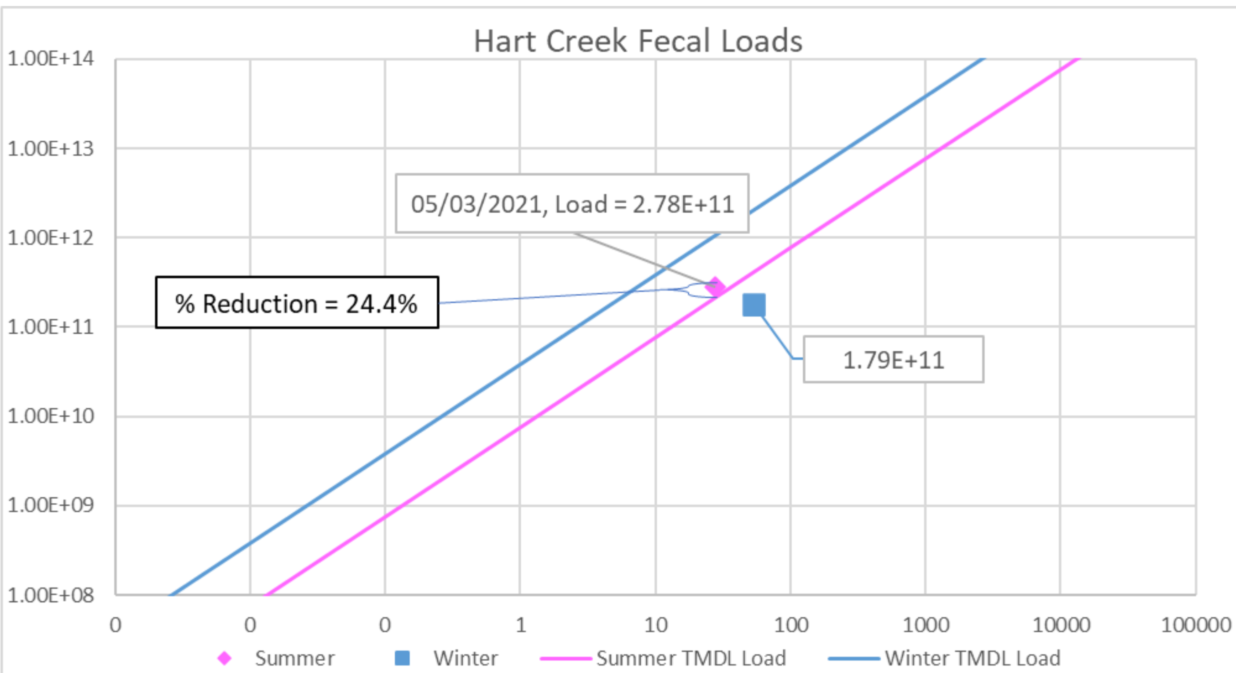

Figure A-1: Hart Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-4: RV_01_16766 – Tributary to Buck Creek at SR 21 near Sylvania Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Fecal Coliform Loading (counts/30 days)	TMDL Fecal Coliform Loading (counts/30 days)
01/12/2021	170	0.42				
02/02/2021	1700	1.08				
03/01/2021	3000	1.30				
04/06/2021	**4300**	0.44			7.16E+10	6.66E+10
05/03/2021	1300	0.34				
07/28/2021	30000	0.28				
08/05/2021	5000	0.13				
01/12/2021	170	0.42				

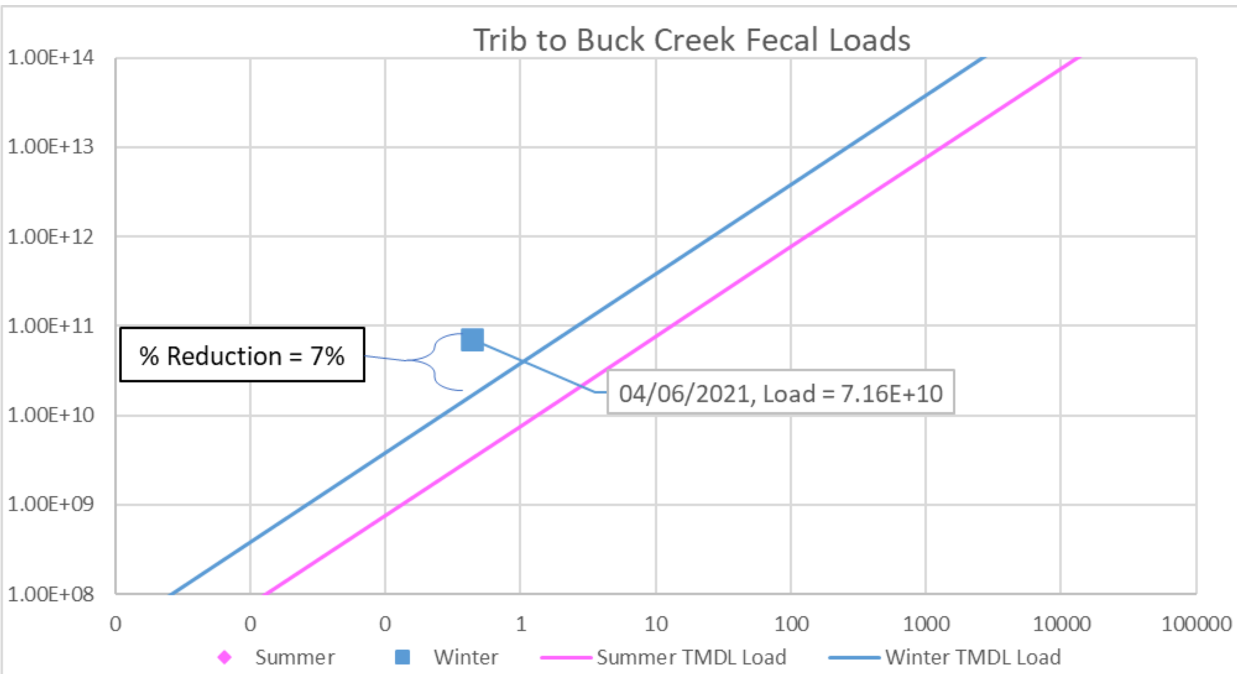

Figure A-2: Tributary to Buck Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves

Table A-5: RV_01_17293 – Wahachee Creek at Dr. George Ward Rd near Elberton, GA Water Quality Monitoring Data

Date	Observed Fecal coliform (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	Geometric Mean Fecal Coliform Loading (counts/30 days)	Geometric Mean TMDL Fecal Coliform Loading (counts/30 days)
01/09/2020	130	6.57	291	7	7.90E+10	2.72E+11
01/21/2020	800	7.35				
02/03/2020	300	7.48				
02/05/2020	230	7.30				
05/26/2020	500	5.57	**1181**	5	2.03E+11	3.44E+10
05/28/2020	2300	5.52				
06/03/2020	1300	3.39				
06/08/2020	1300	3.68				
08/18/2020	800	3.97	**507**	4	8.14E+10	3.22E+10
08/20/2020	2200	9.44				
09/01/2020	220	2.26				
09/08/2020	170	1.31				

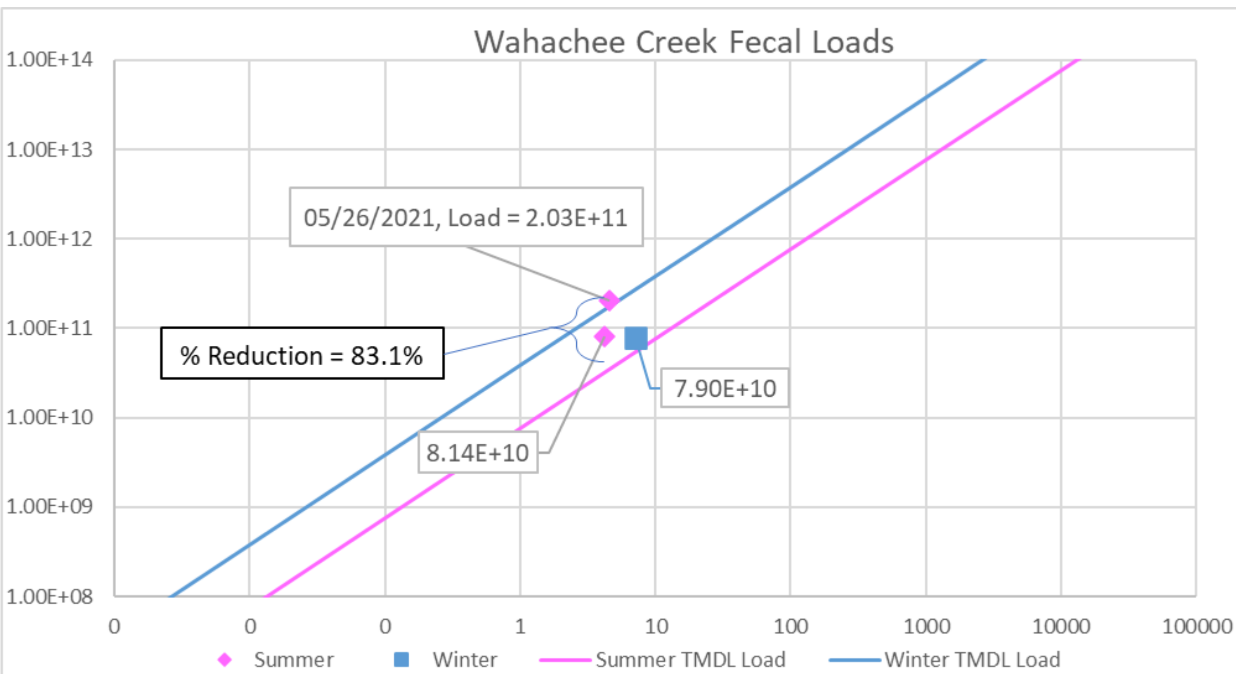

Figure A-3: Wahachee Creek Fecal Coliform Geometric Mean Loads and Summer and Winter TMDL Curves for both Sampling Stations

Appendix B

Single Sample and 30-day Geometric Mean *E. coli* Monitoring Data

Table B-1: RV_01_ 17781: Hart Creek at Hadley Rd near Norwood, GA Water Quality Monitoring Data

Date	Observed *E. coli* (Count/100 mL)	Estimated Instantaneous Flow on Sample Day (cfs)	Geometric Mean (counts/100 mL)	Mean Flow (cfs)	*E. coli* Loading (counts/30 days)	TMDL *E. coli* Loading (counts/30 days)
02/01/2022	**1100**	14.30	139	27	1.40E+11	2.67E+11
02/07/2022	210	45.68				
02/09/2022	20	30.31				
02/16/2022	80	16.11				
05/02/2022	230	13.02	**493**	14	2.70E+11	6.89E+10
05/04/2022	230	13.45				
05/09/2022	80	10.43				
05/23/2022	**14000**	20.92			1.11E+13	3.25E+11
08/01/2022	10	1.25				

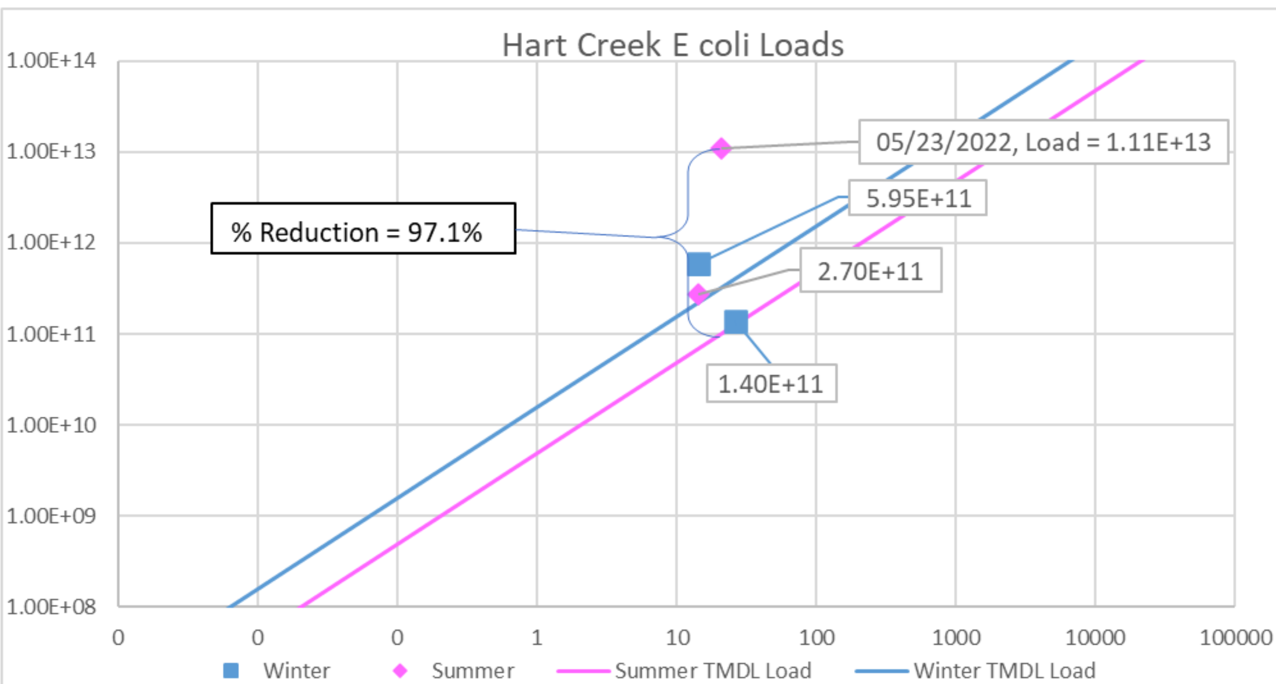

Figure B-1: Hart Creek *E. coli* Geometric Mean Loads and Summer and Winter TMDL Curves