

FINAL
TOTAL MAXIMUM DAILY LOAD (TMDL)

For
Fecal Coliform

In
Scott Creek
Chechero Creek
Saddle Gap Branch Creek

Rabun County, Georgia
Savannah River Basin

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TMDL SUMMARY / SIGNATURE SHEET

FECAL COLIFORM / Scott Creek, Chechero Creek, Saddle Gap Branch Creek Rabun County, Georgia HUC 03060102

In 1998, EPA Region 4 placed Scott Creek, Chechero Creek and Saddle Gap Branch Creek in the Savannah River Basin on the State of Georgia's Section 303(d) list as impaired due to fecal coliform. These waters were originally placed on the 303(d) list in response to requirements of the settlement agreement of the Georgia "TMDL" lawsuit (Sierra Club v. EPA & Hankinson; No. 194-CV-2501-MHS, N.D.GA). The settlement agreement required a stream to be listed unless data expressly demonstrated the stream supported water quality standards.

Available fecal coliform data indicate elevated levels of fecal coliform bacteria. EPA placed these streams on Georgia's 303(d) list based on violations of 305(b) listing guidance criteria as insufficient data were collected during the summer months to evaluate the Georgia 200 per 100 ml fecal coliform unit geometric mean criteria. These fecal coliform TMDLs are expressed in terms of concentration. The TMDL requires ambient fecal coliform units not to exceed 200 per 100 ml based on the geometric mean of four or more samples collected in a 30-day period during the summer months and a 1000 per 100 ml during the winter months.

The TMDLs assign wasteload allocations (WLA) to dischargers with NPDES permits. NPDES activities include municipal and industrial facilities, and stormwater discharge from MS4 and construction activities. There are no MS4 municipalities or NPDES facilities discharging fecal coliform in the listed watersheds.

<i>TMDL Fact Sheet</i>

Basin Name/Sub basin: Savannah River Basin / Tugaloo Sub basin
Waterbodies of Concern: Saddle Gap Branch Creek
 Chechero Creek
 Scott Creek

Pollutant: Fecal Coliform
Designated Use: Primary and Secondary Contact Recreation
Size of Listed Segment: Scott Creek 2937 acres
 Saddle Gap Branch Creek 1889 acres
 Chechero Creek 7660 acres

TMDL Target: 200 colonies/100 ml
 4000 colonies/100 ml maximum

Waterbody	Wasteload Allocation	Load Allocation Concentration	TMDL Concentration	Percent Reduction
May – October (Geometric Mean 200 colonies/100 ml)				
Scott Creek	0	200	200	97%
Chechero Creek	0	200	200	97%
Saddle Gap Branch Creek	0	200	200	93%

Waterbody	Wasteload Allocation	Load Allocation Concentration	TMDL Concentration	Percent Reduction
November – April (Geometric Mean 1000 colonies/100 ml or 4000 colonies/100 ml max.)				
Scott Creek	0	4000	4000	0%
Chechero Creek	0	4000	4000	7%
Saddle Gap Branch Creek	0	4000	4000	0%

Table of Contents

TMDL SUMMARY / SIGNATURE SHEET	iii
1. Introduction.....	1
2. Watershed Characterization.....	1
<i>Chechero Creek Watershed</i>	3
<i>Saddle Gap Creek Watershed</i>	5
3. Target Identification	8
<i>Numerical Target for Fecal Coliform</i>	8
<i>Target Selection</i>	8
4. Water Quality Assessment.....	8
<i>Fecal Coliform Data</i>	8
5. Source Assessment	12
Point Sources	13
Nonpoint Sources.....	13
6. Total Maximum Daily Load (TMDL)	13
Wasteload Allocation (WLA).....	14
Load Allocation (LA)	15
Margin of Safety	15
7. REFERENCES	16

List of Tables

Table 1. Scott Creek Landuse Characteristics (acres)	2
Table 2. Chechero Creek Landuse Characteristics (acres)	4
Table 3. Saddle Gap Branch Creek Landuse Characteristics (acres)	6
Table 4. Fecal Coliform Concentration in Scott Creek (Maas, 1995)	9
Table 5. Fecal Coliform Concentration in Chechero Creek (Maas, 1995).....	11
Table 6. Fecal Coliform Concentration in Saddle Gap Branch Creek	12
Table 7. TMDL Components (Summer Season)	14
Table 8. TMDL Components (Winter Season).....	14

List of Figures

Figure 1 - Scott Creek Watershed.....	3
Figure 2. Chechero Creek Location Map	5
Figure 3. Saddle Gap Branch Creek Location Map.....	7
Figure 4. Fecal Coliform Measurements in Scott Creek	10
Figure 5 - Fecal Coliform Measurements in Chechero Creek.....	11
Figure 6 - Fecal Coliform Measurements in Saddle Gap Branch Creek	12

1. Introduction

TMDLs are required for impaired waters on a State's Section 303(d) list as required by the Federal Clean Water Act Section 303(d) and implementing regulation 40 CFR 130. A TMDL establishes the maximum amount of a pollutant a waterbody can assimilate without exceeding the applicable water quality standard. The TMDL then allocates the total allowable load to individual sources or categories of sources through wasteload allocations (WLAs) for point sources, and through load allocations (LAs) for non-point sources. In the TMDL, the WLAs and LAs provide a basis for states to reduce pollution from both point and non-point source activities that will lead to the attainment of water quality standards and protection of the designated use.

EPA placed Scott Creek, Chechero Creek and Saddle Gap Branch Creek on the Georgia's 303(d) list as impaired due to fecal coliform. Scott Creek, Chechero Creek and Saddle Gap Branch Creek, identified on Georgia's 1998 303(d) list, are located in Rabun County, Georgia. Drainage from Scott Creek, Chechero Creek and Saddle Gap Branch Creek flows to Stekoa Creek, which discharges to the Chattooga River and eventually the Savannah River. The TMDLs for Scott Creek, Chechero Creek and Saddle Gap Branch Creek satisfy the consent decree obligation established in *Sierra Club v. EPA*, Civil Action No: 94-CV-2501-MHS (N.D.GA).

A multi-agency team, representing EPA, the U.S. Forest Service, GAEPD, and the GA Forestry Commission, evaluated water quality in the Chattooga River Basin. Results of this study were the basis for including Scott Creek, Chechero Creek and Saddle Gap Branch Creek on the 303(d) list.

2. Watershed Characterization

Scott Creek Watershed

Scott Creek is located in the Chattahoochee National Forest in Rabun County as shown in Figure 1. The Scott Creek watershed is within the Blue Ridge Mountain ecoregion (66d) characterized by forested slopes, high gradient, cool, clear streams and rugged terrain on a mix of igneous, metamorphic, and sedimentary rocks. Scott Creek starts near the town of Germany. Scott Creek flows east along US Route 76 to the City of Clayton before discharging into Stekoa Creek.

Land cover in the Scott Creek watershed is predominately forest. Landuse characteristics for the Scott Creek watershed, based on Multi-Resolution Landuse Classification Data (NLCD) of 1990, are presented in Table 1.

Table 1. Scott Creek Landuse Characteristics (acres)

Land Cover	Acres	Percent
Forest	1861	63.30
High Intensity Commercial/Industrial/Transportation	10	0.4
High Intensity Residential	1	0
Low Intensity Residential	7	0.2
Mixed Forest	792	26.9
Open Water	1	0
Other Grasses (Urban/recreational; e.g. parks law	49	1.7
Pasture/Hay	191	6.5
Row Crops	25	0.8
Woody Wetlands	0	0
Total	2937	99.8

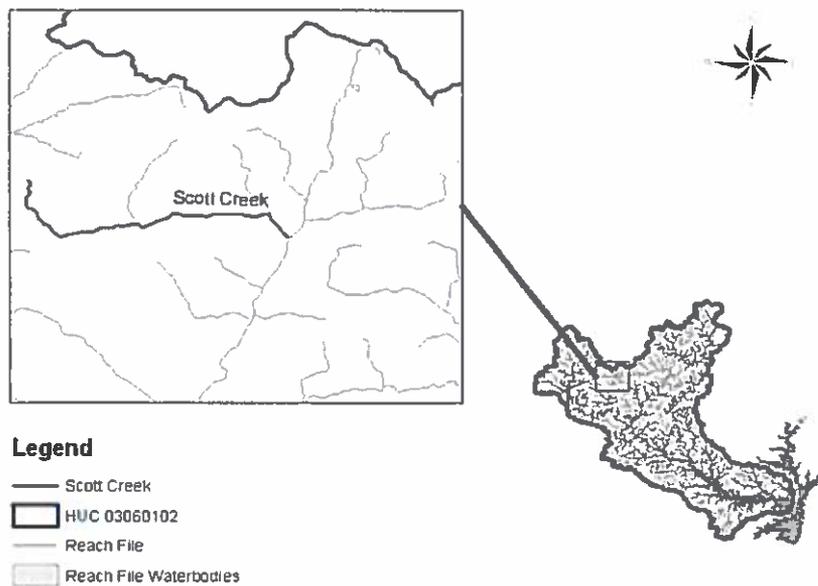


Figure 1 - Scott Creek Watershed

Chechero Creek Watershed

Chechero Creek is located in the Chattahoochee National Forest in Rabun County as shown in Figure 2. The Chechero Creek watershed is within the Blue Ridge Mountain ecoregion (66d) characterized by forested slopes, high gradient, cool, clear streams and rugged terrain on a mix of igneous, metamorphic, and sedimentary rocks. Chechero Creek originates in the extreme southeast portion of Clayton near Old Chechero Road. Chechero Creek flows southeast along US Route 76, before discharging into Stekoa Creek.

Land cover in the Chechero Creek watershed is predominately forest. Landuse characteristics for the Chechero Creek watershed, based on Multi-Resolution Landuse Classification Data (NLCD) of 1990, are presented in Table 2.

Table 2. Chechero Creek Landuse Characteristics (acres)

Land Cover	Acres	Percent
Deciduous Forest	4029	52.5
Evergreen Forest	875	11.4
High Intensity Commercial/Industrial/Transportation	34	0.4
High Intensity Residential	3	0.0
Low Intensity Residential	42	0.5
Mixed Forest	2177	28.4
Open Water	2	0.0
Other Grasses (Urban/recreational; e.g. parks law	160	2.1
Pasture/Hay	289	3.8
Row Crops	49	0.6
Woody Wetlands	1	0.0
Total	7660	99.9

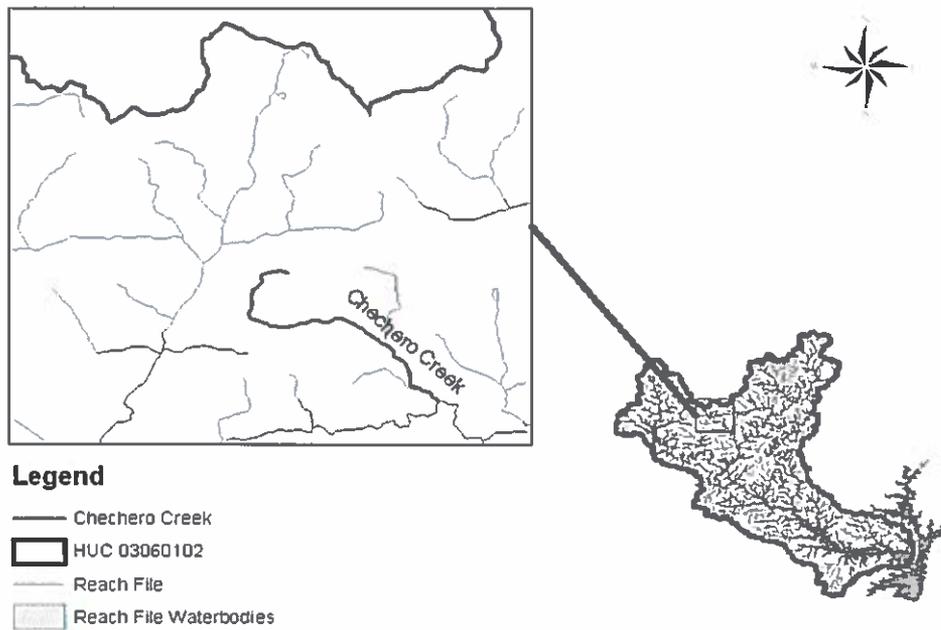


Figure 2. Chechero Creek Location Map

Saddle Gap Creek Watershed

Saddle Gap Creek is located in the Chattahoochee National Forest in Rabun County as shown in Figure 3. The Saddle Gap Creek watershed is within the Blue Ridge Mountain ecoregion (66d) characterized by forested slopes, high gradient, cool, clear streams and rugged terrain on a mix of igneous, metamorphic, and sedimentary rocks. The

headwaters of Saddle Gap Creek start approximately 2 northeast portion of Clayton near Warwoman Road. Saddle Gap Creek flows southwest along Warwoman Road, before discharging into Stekoa Creek in Clayton, Georgia.

Land cover in the Saddle Gap Creek watershed is predominately forest. Landuse characteristics for the Saddle Gap Creek watershed, based on Multi-Resolution Landuse Classification Data (NLCD) of 1990, are presented in Table 3.

Table 3. Saddle Gap Branch Creek Landuse Characteristics (acres)

Land Cover	Acres	Percent
Deciduous Forest	1032	54.7
Evergreen Forest	204	10.8
High Intensity Commercial/Industrial/Transportation	20	1.1
High Intensity Residential	1	0.1
Low Intensity Residential	21	1.1
Mixed Forest	516	27.4
Open Water	1	0.0
Other Grasses (Urban/recreational; e.g. parks law	66	3.5
Pasture/Hay	19	1.0
Row Crops	9	0.5
Total	1889	100

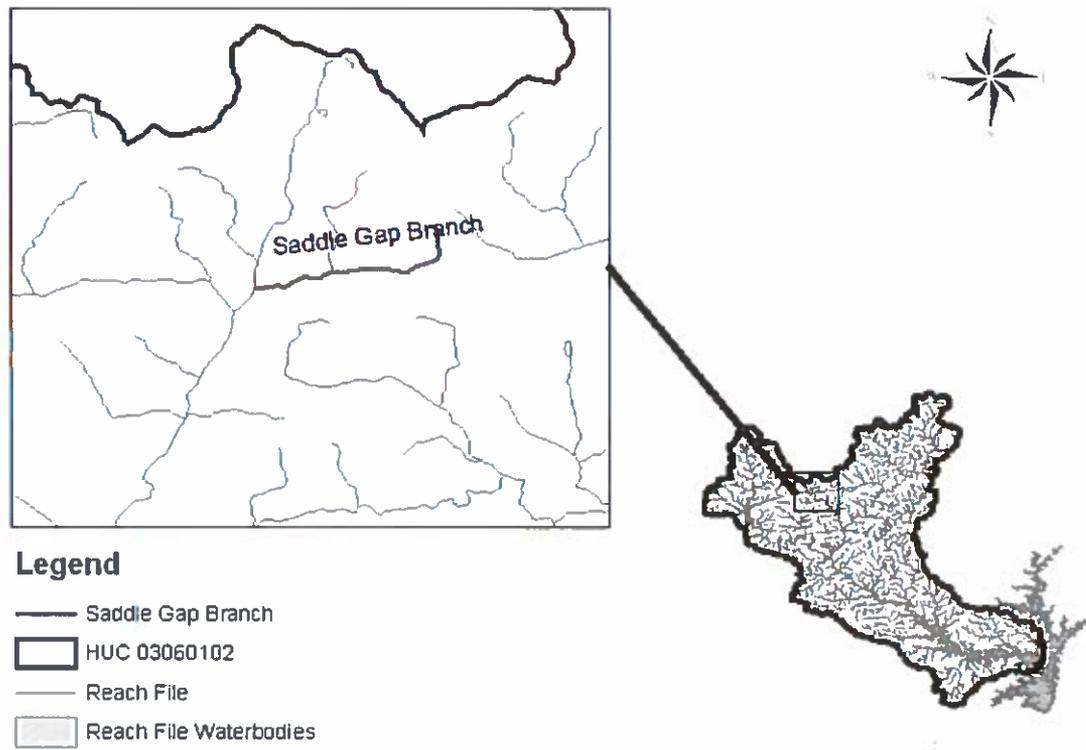


Figure 3. Saddle Gap Branch Creek Location Map

3. Target Identification

The water use classification for the impaired waterbodies is fishing and recreation. The fishing classification, as stated in *Georgia's Rules and Regulations for Water Quality Control Chapter 391-3-6-.03(4)(c)* (GAEPD, 2004) applies to: Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life.

Numerical Target for Fecal Coliform

An excerpt of the water quality standard for fecal coliform bacteria, as stated in the *State of Georgia's Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03(iii)* (GAEPD, 2004) is:

For the months of May through October, when water contact recreation activities are expected to occur, fecal coliform not to exceed a geometric mean of 200 per 100ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. For the months of November through April, fecal coliform not to exceed a geometric mean of 1000 per 100ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours and not to exceed a maximum of 4,000 per 100ml for any sample.

The above standard does not allow evaluation of data during the summer months (i.e., May through October) when less than four samples are collected in a 30-day period. EPA 305(b) listing guidance considers a stream impaired for fecal coliform bacteria if 10 percent of the samples exceed 400 per 100ml. EPA used this guidance to add Scott Creek, Chechero Creek, and Saddle Gap Branch Creek to the Georgia 303(d) list.

Target Selection

The target for the fecal coliform TMDLs in the months from May through October is the ambient concentration of fecal coliform units 200 per 100 ml as stated in the Georgia Rules and Regulations. For the months November through April the ambient sample maximum of 4000 fecal coliform units per 100 ml is used to comply with the State water quality standards.

4. Water Quality Assessment

Fecal Coliform Data

Scott Creek, Chechero Creek and Saddle Gap Branch Creek were placed on the Georgia 303(d) list as not supporting the fishing designated use classification based on data collected during an assessment of pollutant sources in the Stekoa Creek watershed (Maas, 1993). Fecal coliform data collected during this study is shown in Tables 4-6. Because stream flow was not available for these watersheds, rainfall measurements were used as a

surrogate to instream flow. Rainfall measurement collected at the NOAA station in Clayton, Georgia was used to identify trends between elevated coliform levels and rainfall. The Pearson correlation coefficient was used to assess whether a statistical association existed between fecal coliform and rainfall. Pearson correlation coefficient measures the strength and direction of a *linear* relationship between X and Y variables. Like other numerical measures, the population correlation coefficient is ρ (the Greek letter "rho") and the sample correlation coefficient is denoted by r .

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}}$$

Scott Creek

The available data for Scott Creek (Table 4 and Figure 4), shows a strong positive association between fecal coliform and rainfall events ($r = 0.66$). This potentially shows that sources of bacteria are delivered to Scott Creek mostly during rainfall events. The dotted line on this plot is the one-day maximum water quality criteria, which is valid during the months November through April. In other months, the State of Georgia does not have a one-day maximum criterion for fecal coliform.

Insufficient fecal coliform data were collected on Scott Creek to evaluate the geometric mean criteria. Also, the limited data collected during the months of November through April, indicated there were no violations of the one-day maximum criteria. EPA added Scott Creek to the Georgia 303(d) list based on 305(b) listing guidance for streams with limited data, which considers a stream impaired for fecal coliform if 10 percent of the individual samples exceed 200 cfu per 100 ml. Based on available data, all four samples exceeded 200 cfu/100ml in the summer months. It appears that there is significant wet and dry weather sources of fecal coliform bacteria since all samples were well above the geometric mean regardless of the rainfall amount.

Table 4 Fecal Coliform Concentration in Scott Creek (Maas, 1995)

Date	Fecal Coliform (cfu/100ml)	Rainfall (in.)
8/6/93	6,900	0.69
8/25/93	3,500	0.05
9/23/93	27,000	0.58
10/6/94	6,545	0
11/9/94	802	0
1/5/95	946	0

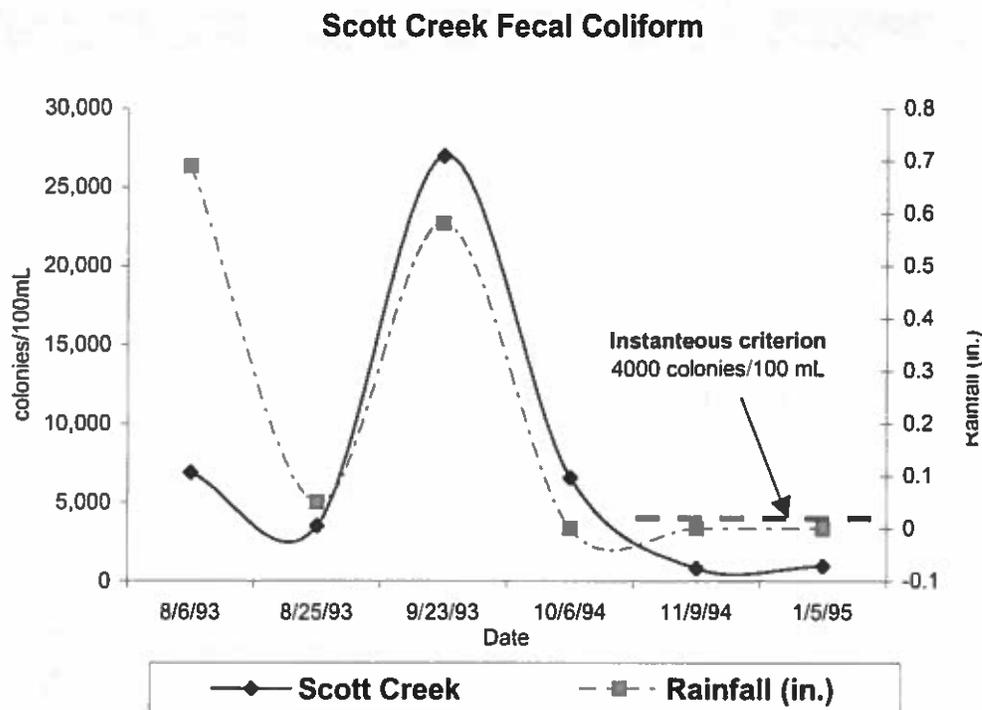


Figure 4. Fecal Coliform Measurements in Scott Creek

Chechero Creek

The available data for Chechero Creek (Table 5 and Figure 5), show a negative association between fecal coliform and rainfall events ($r = -0.33$). Data in Table 5 and Figure 5 shows that elevated fecal coliform levels tend to occur during non-rainfall events. This potentially shows that sources of bacteria are delivered to Chechero Creek during non-rainfall events. This criterion is valid during the months November through April. In other months, the State of Georgia does not have a one-day maximum criterion for fecal coliform.

Insufficient fecal coliform data were collected on Chechero Creek to evaluate the geometric mean criteria. With the limited data collected during the months of November through April, there were no violations of the one-day maximum criteria. EPA added Chechero Creek to the Georgia 303(d) list based on 305(b) listing guidance for streams with limited data, which considers a stream impaired for fecal coliform if 10 percent of the geometric mean samples exceed 200 cfu per 100 ml. Based on available data, three of the four summer samples were well above the 200 cfu/100ml summer criteria.

Table 5. Fecal Coliform Concentration in Chechero Creek (Maas, 1995)

Date	Fecal Coliform (cfu/100ml)	Rainfall (in.)
8/6/93	3,400	0.69
8/25/93	>30,900	0.05
9/23/93	180	0.58
10/6/94	7,091	0
11/9/94	676	0
1/5/95	4,300	0

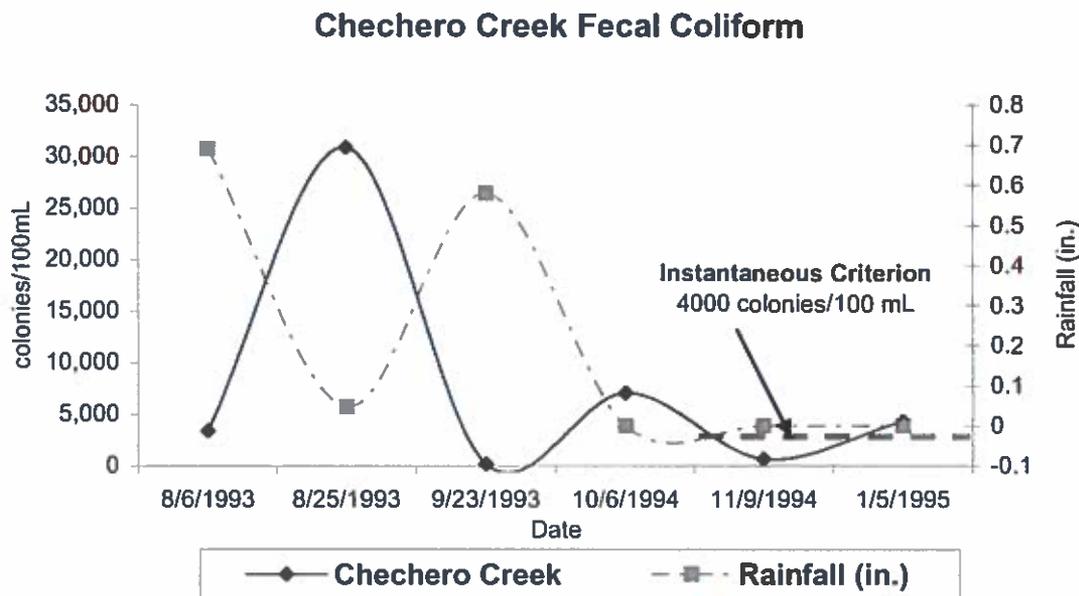


Figure 5 - Fecal Coliform Measurements in Chechero Creek

Saddle Gap Branch Creek

The available data for Saddle Gap Branch Creek (Table 6 and Figure 6), shows an association between fecal coliform and rainfall events ($r = .42$). Data in Table 6 and Figure 6 shows that elevated fecal coli form levels do not correlate with only rainfall events. This criterion is valid during the months November through April. In other months, the State of Georgia does not have a one-day maximum criterion for fecal coliform.

Insufficient fecal coliform data were collected on Saddle Gap Creek to evaluate the geometric mean criteria. With the limited data collected during the months of November through April, there were no violations of the one-day maximum criteria. EPA added Saddle Gap Branch Creek to the Georgia 303(d) list based on 305(b) listing guidance for streams with limited data, which considers a stream impaired for fecal coliform if 10

percent of the geometric mean samples exceed 200 cfu per 100 ml. Based on available data, all four summer samples exceeded 200 cfu/100ml.

Table 6. Fecal Coliform Concentration in Saddle Gap Branch Creek (Maas, 1995)

Date	Fecal Coliform (cfu/100ml)	Rainfall (in.)
8/6/93	3,500	0.69
8/25/93	2,900	0.05
9/23/93	620	0.58
10/6/94	320	0
11/9/94	1,364	0
1/5/95	320	0

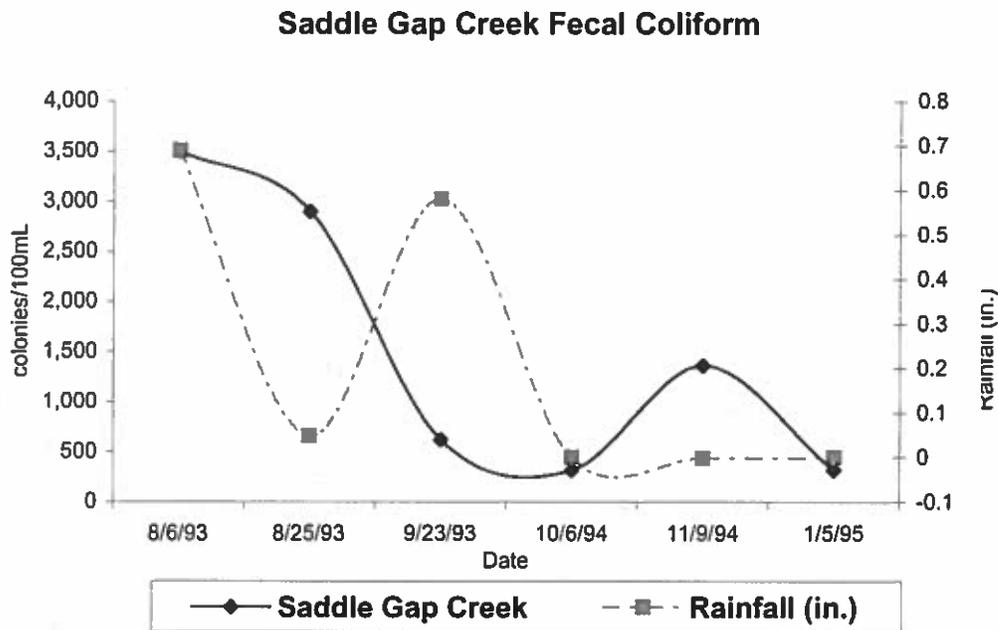


Figure 6 - Fecal Coliform Measurements in Saddle Gap Branch Creek

5. Source Assessment

A TMDL evaluation examines the known potential sources of the pollutant in the watershed, including point sources, no point sources, and background levels. For the purpose of these TMDLs, facilities under the National Pollutant Discharge Elimination System (NPDES) Program are considered point sources.

Point Sources

Discharge from municipal and industrial facilities may contribute fecal coliform to receiving waters. Empire Manufactures in Mountain City, Georgia, is the only discharger in the watershed. This facility discharges to Black Creek which is a tributary to Chechero Creek. There are no NPDES discharges in Scott Creek, Chechero Creek and Saddle Gap Branch Creek watersheds.

Nonpoint Sources

Wildlife, septic systems, agricultural, and human activities associated with hiking and camping are identified as possible no point sources contributing to the coliform levels in the Stekoa Creek watershed (Maas, 1993 and Hansen et al, 1995). Based on the land use distribution, agricultural activities are not prevalent in the watershed and not likely a major contributor to elevated coliforms in the stream.

6. Total Maximum Daily Load (TMDL)

A TMDL establishes the total pollutant load a waterbody can assimilate and still achieve water quality standards. The components of a TMDL include a wasteload allocation (WLA) for point sources, a load allocation (LA) for nonpoint sources (including natural background), and a margin of safety (MOS), either implicitly or explicitly, to account for uncertainty in the analysis. Conceptually, a TMDL is defined by the equation:

$$\text{TMDL} = \Sigma \text{WLA} + \Sigma \text{LA} + \text{MOS}$$

40 CFR 130.7(i), allows TMDLs to be expressed as mass-per-unit time, toxicity or as another appropriate measure. For this TMDL, the target is expressed as the water quality criteria concentration and as a percent reduction in the existing nonpoint source load to achieve the water quality criteria. This approach was chosen for the following reasons: there is limited data but it indicates significant nonpoint sources of fecal coliform bacteria and there is no stream flow data to calculate daily or monthly pollutant loads. With the limited sampling data, less than 10 samples, the median value was compared to the geometric mean concentration to determine a percent reduction of fecal coliform bacteria to achieve the geometric mean water quality criteria. Since the State water quality summer criteria does not include a single sample maximum, comparing single sample values to the geometric mean is considered a conservative approach. The nonpoint source percent reductions are well over 90 percent to achieve the summer water quality criteria.

Table 7. TMDL Components (Summer Season)

Waterbody	Wasteload Allocation	Load Allocation Concentration	TMDL Concentration	Percent Reduction
May – October				
Scott Creek	0 cfu/day	200 cfu/100 ml	200 cfu/100 ml	97%
Chechero Creek	0 cfu/day	200 cfu/100 ml	200 cfu/100 ml	97%
Saddle Gap Branch Creek	0 cfu/day	200 cfu/100 ml	200 cfu/100 ml	93%

For the winter season, Chechero Creek was the only water to have an instantaneous violation. Based on the existing fecal coliform concentration exceedence of 4,300 cfu/100 ml in Chechero Creek, a 7% reduction in bacteria is needed to meet the applicable criterion of 4000 colonies/100 ml maximum allowable single sample value.

Table 8. TMDL Components (Winter Season)

Waterbody	Wasteload Allocation	Load Allocation Concentration	TMDL Concentration	Percent Reduction
November - April				
Scott Creek	0 cfu/day	4000 cfu/100 ml	4000 cfu/100ml	0%
Chechero Creek	0 cfu/day	4000 cfu/100 ml	4000 cfu/100 ml	7%
Saddle Gap Branch Creek	0 cfu/day	4000 cfu/100 ml	4000 cfu/100 ml	0%

Wasteload Allocation (WLA)

Wasteload allocations are provided to point source discharge from industrial and municipal facilities as well as permitted stormwater discharges. There is one industrial facility that discharges to Black Creek; a tributary to Chechero Creek. Because this facility is unlikely to have bacteria associated with its discharge, a wasteload allocation of zero cfu/day was given. No other watersheds had point source discharges.

Load Allocation (LA)

Nonpoint sources are considered to be the primary cause of sediment impairment and elevated fecal coliform concentrations in Scott Creek, Chechero Creek, and Saddle Gap Branch Creek watersheds. Wildlife, septic systems, and human activity associated with hiking and camping contribute fecal coliform these watershed. Previous studies have indicated the elevated fecal coliform problems in the Stekoa Creek watershed are avoidable and reasonable management options and practices exist to help alleviate problems (Hansen, et al 1995).

Margin of Safety

A Margin of Safety (MOS) is a required component of a TMDL that accounts for the uncertainty in the relationship between the pollutant loads and the quality of the receiving waterbody. The MOS is typically incorporated into the conservative assumptions used to develop the TMDL. A MOS is implicitly incorporated into these TMDLs by using the individual sample events to estimate the percent reduction in nonpoint source loads rather than use a geometric mean which, if data were available, would result in a less stringent load reduction.

Critical Conditions

The analysis of the limited data available for the three waterbodies indicated that violations occurred in both wet and dry weather conditions in the summer. Therefore, there is no specific flow period that is deemed critical.

Seasonal Variation

The fecal coliform criteria were assessed for both the summer and winter months. For summer the values are compared to the geometric mean concentration of 200 cfu per 100 ml. For the winter samples are compared to the single sample maximum value of 4000 cfu per 100 ml. Due to the much more stringent summer criteria to protect for contact recreation, the summer criteria produce much grater pollutant load reduction requirements.

7. REFERENCES

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