Final

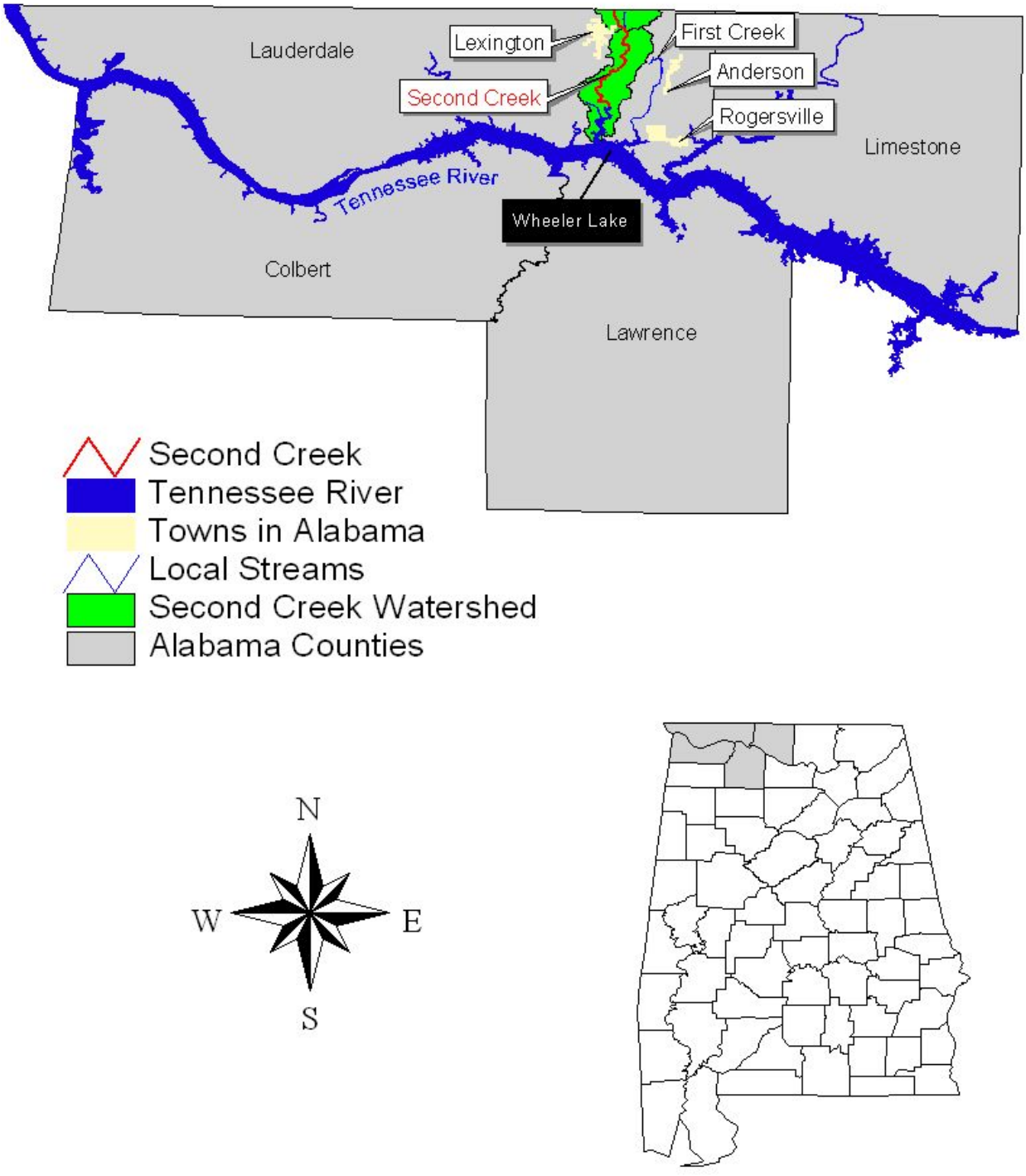
Total Maximum Daily Load for Second Creek

Waterbody ID# AL06030002-1204-103

Pathogens (fecal coliform)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
December 2006

Figure 1: 303(d) Listed Segment of Second Creek



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1.0 Executive Summary

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated use(s) and to determine the Total Maximum Daily Load (TMDL) for pollutants causing the use impairment. A TMDL is the sum of individual waste load allocations for point sources (WLAs), load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

Second Creek is on Alabama's 303(d) list for pathogens (fecal coliform) from Lauderdale County Road 76 to the Alabama/Tennessee state line. The listed portion of Second Creek has a designated use classification of Fish and Wildlife (F&W) from US Highway 72 to the Alabama/Tennessee state line. Second Creek is a part of the Upper Tennessee River Basin and begins in Tennessee and flows into Alabama near the town of Lexington and continues on to Wheeler Lake on the Tennessee River. The USGS hydrologic unit code (HUC) for Wheeler Lake is 06030002. The Second Creek watershed is comprised of the upper and lower Second Creek subwatersheds. The HUC numeric ID for the upper and lower Second Creek subwatershed is 06030002-1203 and 06030002-1204, respectively. The total drainage area of the Second Creek watershed including the portion in the state of Tennessee is approximately 59.0 square miles. Almost a third of the watershed (33.6%) lies within the state of Tennessee.

Second Creek was placed on the Alabama's §303(d) list for pathogens in 1998 based on a study conducted by TVA in 1997. The data used for the listing was gathered from TVA station 10118-1 and can be found in Appendix B.

TVA collected data monthly at Station 10118-1 in 1997 from June through October. ADEM collected data on Second Creek at Station SCDL-11 once in July 1998. More recently, ADEM has collected data on Second Creek at Stations SCDL-11, SCDL-12, and SCDL-13 five times during the month of June and five times during the month of August in 2003. In 2004, ADEM has collected data on Second Creek at Stations SCDL-11, SCDL-12, and SCDL-13 five times during the month of July and five times during the month of September. It should also be noted that TVA station 10118-1 is the same as ADEM station SCDL-11.

Based on the data from 2003 and 2004, Second Creek is not meeting the pathogen criteria applicable to its use classification of Fish and Wildlife. Therefore, this TMDL is being developed for Second Creek.

A mass balance approach was used to calculate this TMDL which utilizes the conservation of mass principle. The pathogen loading to Second Creek was calculated using a geometric mean exceedance concentration times the average flow for the 5 samples used to calculate the geometric mean. The allowable loading was calculated using the same average flow value times the fecal coliform geometric mean criterion target of 180 colonies/100 mL (200 colonies/100 mL – 10% Margin of Safety). Reductions to meet the allowable loading were then calculated by subtracting the allowable loading from the current loading. Table 1.1 is a summary of current loads, allowable loads and required load reductions necessary to meet the applicable water

quality pathogen geometric mean criterion for Second Creek. Table 1.2 lists the required TMDL pathogen loadings under critical conditions for Second Creek.

Table 1.1 Current/Allowable Loads and Required Reductions

Source	Current Load (col/day)	Allowable Load (col/day)	Required Reduction (col/day)	Reduction %	Final Load (col/day)
LA	1.83E+11	1.08E+11	7.55E+10	41%	1.08E+11
WLA	0.00E+00	0.00E+00	0.00E+00	0%	0.00E+00

Table 1.2 TMDL for Second Creek

TMDL (col/day)	WLA (col/day)	LA (col/day)	MOS (col/day)
1.20E+11	0.00E+00	1.08E+11	1.20E+10

The majority of the watershed is undeveloped and consists of agriculture and forest landuse. The most likely sources of impairment to the stream come from agricultural landuse. This watershed has an uncommonly high concentration of agricultural uses accounting for slightly over half of the landuse (54.6%).

ADEM, in cooperation with other stakeholders, will need to verify the likely sources of fecal coliform located within the watershed. The likely areas where mitigation efforts will need to occur will be pastures that contain dense sources of livestock that have direct access to Second Creek or pasture areas that lie adjacent to the streams that have little to no best management practices (BMPs) in place. Following identification of these and other landuse issues within the Alabama portion of the watershed, ADEM will need to coordinate with TDEC in order to determine the possible pathogen sources in Tennessee. Based on results of these studies, the two agencies will need to generate a plan that can produce the overall needed reduction in fecal coliform using BMPs.

2.0 Basis for §303(d) Listing

2.1 Introduction

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the total maximum daily load (TMDL) for pollutants causing use impairment. The TMDL process establishes the allowable loading of pollutants for a waterbody based on the relationship between pollution sources and instream water quality conditions, so that states can establish water-quality based controls to reduce pollution and restore and maintain the quality of their water resources (USEPA, 1991).

As previously mentioned, Second Creek was placed on the Alabama's §303(d) list for pathogens in 1998 based on a study done by TVA in 1997. In the TVA study, there were two out of the five samples collected that exceeded the maximum single sample criterion of 2000 col/100 ml. It should be noted that during the 1997 sampling did not provide enough data within the specified timeframe to calculate a geometric mean. The data collected for the study mentioned above can be found in Appendix B.

2.2 Problem Definition

Waterbody Impaired:	Second Creek from Lauderdale County Road 76 to the Alabama/Tennessee state line
Waterbody length:	13 miles
Waterbody drainage area:	59 square miles
Water Quality Criterion Violation:	Pathogens (in the form of fecal coliform) (single sample and geometric mean)
Pollutant of Concern:	Pathogens (fecal coliform)
Water Use Classification:	Fish & Wildlife (F&W)

Usage related to classification:
The impaired stream segments, Second Creek, are classified as F&W. Usage of waters in this classification are described in ADEM Admin. Code R. 335-6-10-.09(5)(a), (b), (c), (d), and (e) as follows:

(a) *Best usage of waters: fishing, propagation of fish, aquatic life, and wildlife, and any other usage except for swimming and water-contact sports or as a source of water supply for drinking or food-processing purposes.*

(b) Conditions related to best usage: the waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs

(c) Other usage of waters: it is recognized that the waters may be used for incidental water contact and recreation during June through September, except that water contact is strongly discouraged in the vicinity of discharges or other conditions beyond the control of the Department or the Alabama Department of Public Health.

(d) Conditions related to other usage: the waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming places and will be considered satisfactory for swimming and other whole body water-contact sports.

(e) Specific Criteria

Fecal Coliform Criteria:
Criteria for acceptable bacteria levels for the Fish and Wildlife use classification are described in ADEM Admin. Code R. 335-6-10-.09(5)(e)7.(i) and (ii) as follows:

7. *Bacteria:*

(i) In non-coastal waters, bacteria of the fecal coliform group shall not exceed a geometric mean of 1,000 colonies/100 mL; nor exceed a maximum of 2,000 colonies/100 mL in any sample. In coastal waters, bacteria of the enterococci group shall not exceed a maximum of 275 colonies/100 mL in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours.

(ii) For incidental water contact and recreation during June through September, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean fecal coliform organism density does not exceed 200 colonies/100 mL in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 mL nor exceed a maximum of 158 colonies/100 mL in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric bacterial coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these

wastes, are not acceptable for swimming or other whole body water-contact sports.

Criteria Exceeded:

There have been no single sample violations, yet several geometric mean violations for fecal coliform for the data collected from 2003 through 2004. More specifically, Second Creek had three events where it exceeded the geometric mean criterion of 200 col/100 ml. Summary table 2.1 and 2.2 document all violations from ADEM's 2003-2004 sampling event. The single sample violations did not account for 10% or more of the samples collected, therefore, the TMDL calculations will be based on the highest geometric mean violation.

Table 2.1 Geometric Mean Fecal Coliform Violations

Station_ID	Date	Stream Flow (cfs)	Fecal Coliform (col/100ml)	Geometric Mean	Summer Geometric Mean Criterion of 200 col/100mL
SCDL-11	8/14/2003	34.5	144	257	EXCEEDANCE
	8/18/2003	41.3	132		
	8/20/2003	46.4	124		
	8/25/2003	38	780		
	8/26/2003	14.5	610		
SCDL-12	6/4/2003	--	190	268	EXCEEDANCE
	6/11/2003	21.8	220		
	6/18/2003	19.9	175		
	6/24/2003	25.9	270		
	6/26/2003	19.2	700		
	8/14/2003	27.3	212	306	EXCEEDANCE
	8/18/2003	31.9	300		
	8/20/2003		320		
	8/25/2003	21.5	750		
	8/26/2003	17.3	176		

3.0 Technical Basis for TMDL

3.1 Water Quality Target Identification

For the purpose of this TMDL a geometric mean fecal coliform target of 180 colonies/100 mL will be used. This target was derived by using a 10% explicit margin of safety from the geometric mean of 200 colonies/100 mL criterion. This target should not allow the geometric mean of 200 colonies/100 mL or the single sample maximum of 2000 colonies/100 mL to be exceeded.

3.2 Source Assessment

Point Sources in the Second Creek Watershed:
There are no point sources in the Second Creek watershed. In addition, the Alabama portion of the Second Creek watershed does not presently qualify as a municipal separate stormwater sewer system (MS4) area as defined as an urban area serving 50,000 residents or greater. Therefore, the WLA portion of the TMDL will be zero. Any new discharges to this stream must meet a geometric mean discharge limit of 200 colonies/100 mL and an instantaneous maximum limit of 2000 colonies/100 mL for fecal coliform.

Nonpoint Sources in the Second Creek Watershed:
The landuse in the Second Creek watershed is predominately forest and agriculture. On a site visit on February 18, 2004 to the watershed there were many livestock and horses observed. The following are examples of how different landuses can contribute to fecal coliform bacterial loading:

- Agricultural land is commonly a large source of fecal coliform bacteria. Pasture land runoff, animal operations, improper land application of animal waste, and animals with access to streams are all contributing factors of fecal coliform bacteria to water bodies. Agricultural land accounts for half of the landuse in the Second Creek watershed.
- Fecal coliform bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkeys, waterfowl, etc.
- Leaking septic systems can be another source of fecal coliform bacteria.

The nature and extent of fecal coliform bacterial sources in the watershed will be better identified during the implementation phase of the TMDL.

3.3 Landuse

Table 3.1 on the next page provides the various landuses (and their associated percentages) for the Second Creek watershed. Figure 3.1 is a map of landuse within the Second Creek watershed. The Tennessee portion of the watershed is 33.6% of the total area and comprises 20.6% of the total agricultural landuse of the entire Second Creek watershed. Land use for the Second Creek watershed was determined using ArcView with land use datasets from 2001. Land use information for this assessment was derived from the 2001 National Land Cover Dataset (NLCD).

Figure 3.1 Landuse Map of the Second Creek Watershed

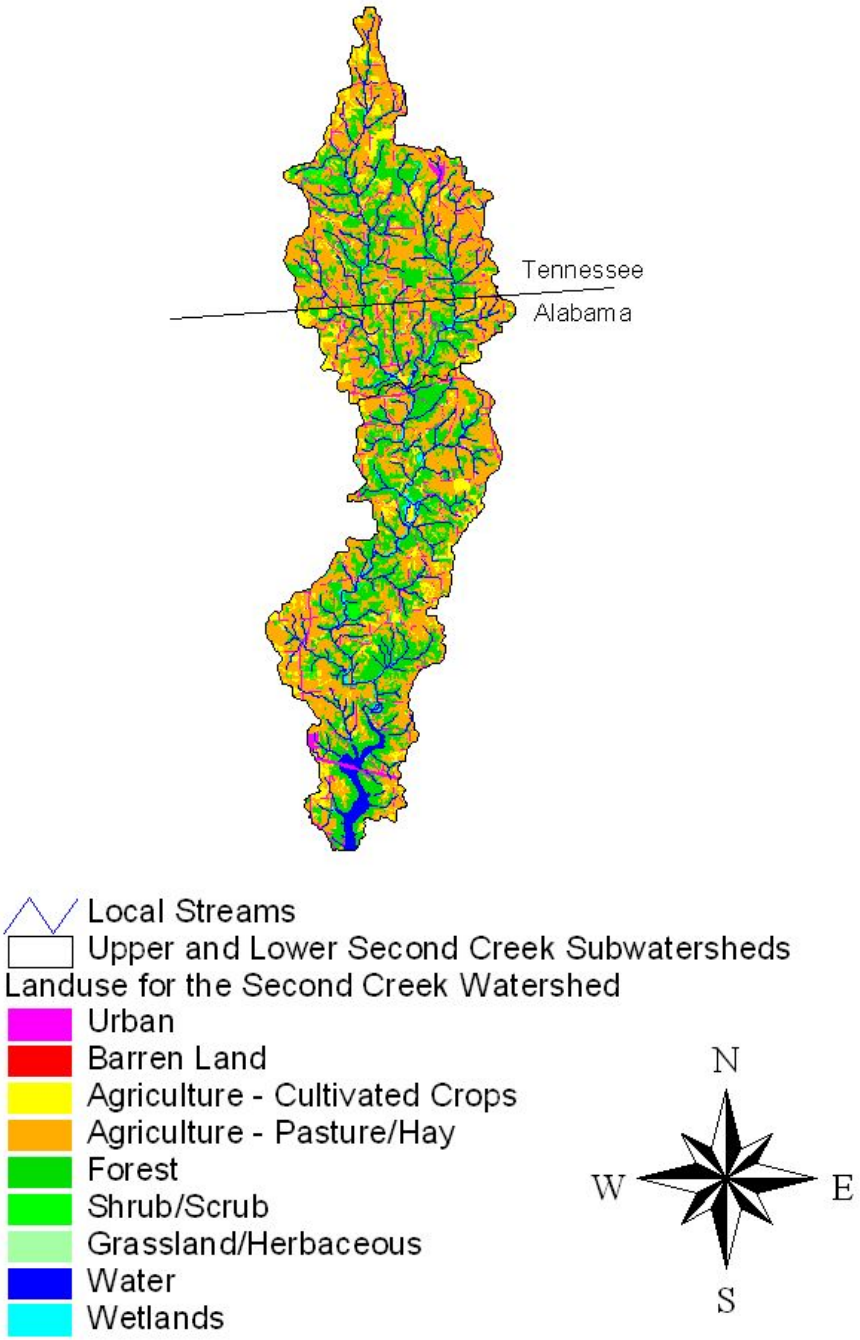


Table 3.1 Landuse in the Second Creek Watershed

Second Creek Watershed									
	Alabama			Tennessee			Combined Watersheds		
Land Cover	**acres**	**mi^2**	**%**	**acres**	**mi^2**	**%**	**acres**	**mi^2**	**%**
Open Water	621.1	1.0	2.5	2.0	0.0	0.0	623.1	1.0	1.6
Developed, Open Space	1257.0	2.0	5.0	715.4	1.1	5.6	1972.4	3.1	5.2
Developed, Low Intensity	96.5	0.2	0.4	27.8	0.0	0.2	124.3	0.2	0.3
Developed, Medium Intensity	8.0	0.0	0.0	1.3	0.0	0.0	9.3	0.0	0.0
Barren Land (Rock/Sand/Clay	0.0	0.0	0.0	2.7	0.0	0.0	2.7	0.0	0.0
Deciduous Forest	6565.5	10.3	26.2	2487.0	3.9	19.6	9052.5	14.1	24.0
Evergreen Forest	603.4	0.9	2.4	362.9	0.6	2.9	966.3	1.5	2.6
Mixed Forest	1261.6	2.0	5.0	498.8	0.8	3.9	1760.5	2.8	4.7
Shrub/Scrub	1044.4	1.6	4.2	672.7	1.1	5.3	1717.1	2.7	4.5
Grassland/Herbaceous	195.3	0.3	0.8	62.7	0.1	0.5	258.0	0.4	0.7
Pasture/Hay	11033.0	17.2	44.0	6908.7	10.8	54.3	17941.6	28.0	47.5
Cultivated Crops	1816.1	2.8	7.2	874.9	1.4	6.9	2691.0	4.2	7.1
Woody Wetlands	569.8	0.9	2.3	95.2	0.1	0.7	665.0	1.0	1.8
Total	**25071.6**	**39.2**	**100.0**	**12712.3**	**19.9**	**100.0**	**37783.8**	**59.0**	**100.0**
Agriculture	12849.0	20.1	51.2	7783.6	12.2	61.2	20632.6	32.2	54.6
Forest	9000.3	14.1	35.9	3444.0	5.4	27.1	12444.3	19.4	32.9
Developed	1361.5	2.1	5.4	744.6	1.2	5.9	2106.1	3.3	5.6
Other	1860.8	2.9	7.4	740.1	1.2	5.8	2600.9	4.1	6.9
Total	**25071.6**	**39.2**	**100.0**	**12712.3**	**19.9**	**100.0**	**37783.8**	**59.0**	**100.0**

3.4 Linkage between Numeric Targets and Sources

It is envisioned that sources will be better defined during actual implementation. As can be seen from viewing the above table, Second Creek has two major landuses – forest and agriculture. Pollutant loadings from forested areas tend to be low due to their filtering capabilities. Observation of the landuses within the Second Creek watershed indicates agricultural areas as being the likely sources of fecal coliform bacteria. However, since the impaired segment consists of such a large drainage area, (59.0 square miles) with diverse land cover/uses, it was not considered practicable to determine individual components of nonpoint source (NPS) loading. As such, individual loads or reductions for various sources such as forest, agriculture, and septic systems will not be specified. Loadings and reductions will only be viewed as a total NPS load.

3.5 Data Availability and Analysis

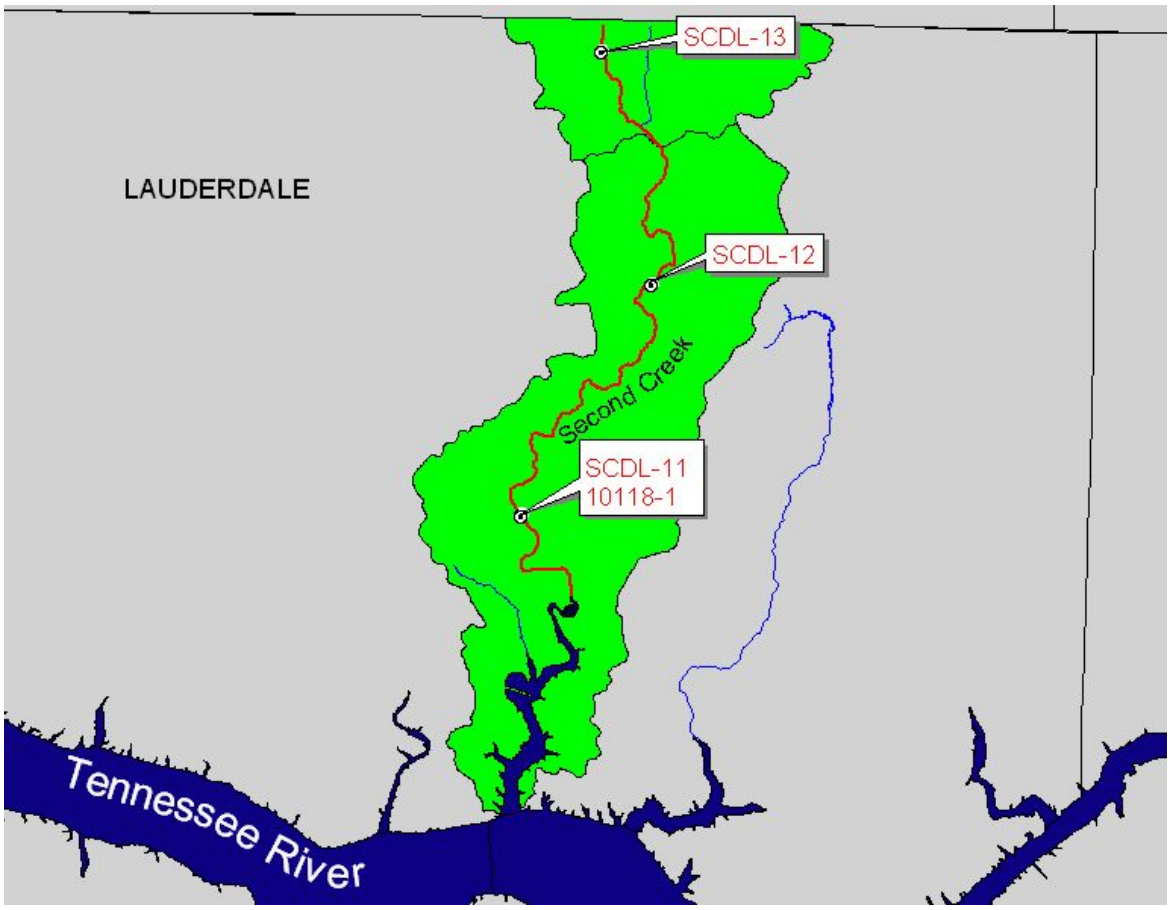
There have been three main studies in this watershed for relevant chemical data. The first study was performed by TVA in 1997. Of the five stations in this study, station 10118-1 recorded two samples that exceeded the single sample criterion and placed Second Creek on the §303(d) list in 1998 for fecal coliform. The second study was performed by ADEM in which only one sample was collected on Second Creek at Station SCDL-11 in July 1998 which was below the single sample criterion of 2000 col/100 ml.

The third study was performed by ADEM in 2003 and 2004 in which §303(d) sampling occurred at three stations on Second Creek at stations SCDL-11, SCDL-12, and SCDL-13. The stations collectively produced 59 samples that were adequate for geometric mean calculations and single sample analysis. Station SCDL-11 had one violation and SCDL-12 had two violations exceeding the geometric mean water quality criterion of 200 col/100 ml for fecal coliform. When comparing the data to the single sample criterion of 2000 col/100 ml, there were no violations. The data for the stations mentioned above can be found in Appendix B. Sample locations are shown in Figure 3.2. Location descriptions for all stations can be found in Table 3.2. It should also be noted that TVA station 10118-1 is the same as ADEM station SCDL-11.

Table 3.2 Sampling Station Location Descriptions

Year	Station ID	Data Source	Station Location	Latitude	Longitude
1997	10118-1	TVA	Second Creek @ Lauderdale County Road 76	34.8854	-87.3734
1998	SCDL-11	ADEM - NPS			
2003 & 2004		ADEM - 303(d)			
2003 & 2004	SCDL-12	ADEM - 303(d)	Second Creek @ Lauderdale County Road 88	34.9395	-87.3368
2003 & 2004	SCDL-13	ADEM - 303(d)	Second Creek @ Lauderdale County Road 489	34.9939	-87.3509

Figure 3.2 Sampling Stations in the Second Creek Watershed



3.6 Critical Conditions

The summer months are generally considered critical conditions. In the summer, periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off of fecal coliform bacteria into streams. These summer trends result in spikes of fecal coliform bacteria counts. Winter trends show frequent low intensity rain events that do not allow for the build-up of fecal coliform bacteria on the land surface, resulting in a more uniform loading rate. The summer fecal coliform criterion is more stringent than the winter criterion.

The Second Creek watershed follows both the trends described above for the summer months and winter months. Table 2.1 and 2.2 show that the higher concentrations of fecal coliform occur at high flows and low flows. The maximum geometric mean concentration of 306 colonies/100 mL with an average flow of 24.5 cfs at SCDL-12 will be used to estimate the TMDL pathogen loadings to Second Creek under critical conditions.

3.7 Margin of Safety (MOS)

There are two methods for incorporating a MOS in the analysis: 1) implicitly incorporate the MOS using conservative model assumptions to develop allocations, or 2) by explicitly specifying a portion of the TMDL as the MOS. An explicit MOS was incorporated in this TMDL and was applied by reducing the target criterion concentration by ten percent. Thus, the geometric mean criterion was reduced by ten percent to achieve a target concentration of 180 colonies/100 ml, which yields a MOS equal to 20 colonies/100 ml.

4.0 TMDL Development

4.1 Definition of a TMDL

A total maximum daily load (TMDL) is the sum of individual waste load allocations for point sources (WLAs), load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS). The margin of safety can be included either explicitly or implicitly and accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. As discussed earlier, the MOS is explicit in this TMDL. A TMDL can be denoted by the equation:

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

The TMDL is the total amount of pollutant that can be assimilated by the receiving waterbody while achieving water quality standards under critical conditions.

For some pollutants, TMDLs are expressed on a mass loading basis (e.g. pounds per day). However, for pathogens, TMDL loads are typically expressed in terms of organism counts per day (col/day), in accordance with 40 CFR 130.2(i).

4.2 Load Calculations

A mass balance approach was used to calculate the TMDL for Second Creek which utilizes the conservation of mass principle. The pathogen loading to Second Creek was calculated using a geometric mean exceedance concentration times the average flow for the 5 samples used to calculate the geometric mean.

Two loads were calculated in this analysis. The first was to estimate current pathogen loads to the watershed during a violation event. It was done by multiplying a geometric mean exceedance concentration of 306 col/100 ml times the average measured flow. This concentration was measured at SCDL-12 in August of 2003 and can be found in Appendix B. The average measured flow for this event was 24.5 cfs. The product of these two values and a conversion factor gives the loading to the watershed under exceedance conditions. The second load represents the allowable value to the watershed under the same physical conditions as the first. This is done by taking the product of the same flow

times the conversion factor times the allowable fecal concentration of 180 col/100 mL. The difference between these two loads, converted to a percent reduction, represents the loading reduction necessary to achieve the water quality criterion for fecal coliform under critical conditions. Calculations for these two loads can be found below in Table 4.1.

Table 4.1 Current vs. Allowable Pathogen Loadings for Second Creek

Average Flow measured at SCDL-12 for Geometric Mean Samples: 24.5 cfs
Geometric Mean Fecal coliform concentration measured: 306 col/100 mL
Allowable fecal coliform maximum concentration minus MOS: 180 col/100mL = 200 - 10%
Margin of saftey for the maximum criteria 20 col/100mL = 10% of criteria

Load Calculations:

Load = Fecal Coliform Conc * Measured Flow * Conversion Factor
Load = colonies of Fecal Coliform/day Measured Flow = cfs
Fecal Coliform Conc = colonies/100 mL Conversion Factor = 24468984 (ml-s/ft3-day)

Current Load:

Nonpoint source load (LA)	1.83E+11	colonies/day	
Point source load (WLA)	0.00E+00	colonies/day	There are no point sources in this watershed
Current load =	1.83E+11	colonies/day	

Allowable Load:

Nonpoint source load (LA)	1.08E+11	colonies/day	
Point source load (WLA)	0.00E+00	colonies/day	There are no point sources in this watershed
Allowable load =	1.08E+11	colonies/day	

Margin of Saftey:

MOS load = 1.20E+10 colonies/day

Source	Current Load (col/day)	Allowable Load (col/day)	Required Reduction (col/day)	Reduction %	Final Load (col/day)
LA	1.83E+11	1.08E+11	7.55E+10	41%	1.08E+11
WLA	0.00E+00	0.00E+00	0.00E+00	0%	0.00E+00
Total	1.83E+11	1.08E+11	7.55E+10	41%	1.08E+11

Total Maximum Daily Load (TMDL): TMDL = WLA + LA + MOS

TMDL	WLA	LA	MOS
1.20E+11	0.00E+00	1.08E+11	1.20E+10

Percent Reduction to Achieve the Fecal Coliform Criterion:

Total reduction: 41% = (current load - allowable load) / current load

The following assumptions are made for calculating the allowable load.

The water quality criterion for fecal coliform for summer geomtric means is 200 col/100 mL.
To account for an explicit Margin of Safety (MOS) a target concentration of 180 col/100 ml was used to calculate the allowable load compared to the maximum criterion which = 200 – 10%

4.3 TMDL Summary

Regulations require states to identify waterbodies which are not meeting their designated use and to determine the Total Maximum Daily Load (TMDL) for pollutants causing the use impairment. A TMDL is the sum of individual waste load allocations for point sources (WLAs), load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

Based on ADEM's 2003 & 2004 sampling events, the violations of geometric mean criterion at two of the three stations in the watershed make it evident that Second Creek is impaired for fecal coliform. The fecal coliform violations in this watershed were relatively moderate in number and concentration with the highest geometric mean concentrations at 306 col/100 ml which is approximately one and a half times the geometric mean fecal coliform criterion of 200 col/100 ml.

A mass balance approach was used to calculate the TMDL. Table 4.1 is a summary of current loads, allowable loads and required load reductions necessary to meet the applicable water quality pathogen geometric mean criterion for Second Creek. Table 4.2 lists the required TMDL pathogen loadings under critical conditions for Second Creek.

Table 4.2 Current/Allowable Loads and Required Reductions

Source	Current Load (col/day)	Allowable Load (col/day)	Required Reduction (col/day)	Reduction %	Final Load (col/day)
LA	1.83E+11	1.08E+11	7.55E+10	41%	1.08E+11
WLA	0.00E+00	0.00E+00	0.00E+00	0%	0.00E+00

Table 4.3 TMDL for Second Creek

TMDL (col/day)	WLA (col/day)	LA (col/day)	MOS (col/day)
1.20E+11	0.00E+00	1.08E+11	1.20E+10

The most likely source of fecal coliform in this watershed is activities associated with agricultural landuse (i.e. pasture/hay). Of the 59 square miles of watershed, 32.2 square miles are designated as agricultural lands, which is just over half of the entire watershed. High agricultural use is common in the Tennessee basin. Based on USGS's 2001 NLCD, the portion of the Second Creek watershed in the state of Tennessee has an agricultural land cover equal to 61.2% and the portion of the Second Creek watershed in the state of Alabama, specifically Lauderdale County, is 51.2% agriculture. Combined, the total landuse for the Second Creek watershed is more than half (54.6%) agriculture.

ADEM, in cooperation with other stakeholders, will need to verify the likely sources of fecal coliform located within the watershed. The likely areas where mitigation efforts will need to occur will be pastures that contain dense sources of livestock that have direct access to Second Creek or pasture areas that lie adjacent to the streams that have little to

no best management practices (BMPs) in place. Following identification of these and other landuse issues within the Alabama portion of the watershed, ADEM will need to coordinate with TDEC in order to determine the possible pathogen sources in Tennessee. Based on results of these studies, the two agencies will need to generate a plan that can produce the overall needed reduction in fecal coliform using BMPs.

5.0 Follow Up Monitoring

ADEM has adopted a basin approach to water quality management; an approach that divides Alabama's fourteen major river basins into five groups. Each year, the ADEM water quality resources are concentrated in one of the five basin groups. One goal is to continue to routinely monitor §303(d) listed waters until such waters are meeting their designated uses. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices in the watershed. This monitoring will occur in each basin according to the schedule shown in Table 5-1.

Table 5.1 ADEM's Major River Basin Monitoring Schedule

River Basin Group	Year to be Monitored
Escatawpa / Mobile / Lower Tombigbee / Upper Tombigbee	2006
Black Warrior / Cahaba	2007
Tennessee	2008
Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia	2009
Alabama / Coosa / Tallapoosa	2010

6.0 Public Participation

As part of the public participation process, this TMDL was placed on public notice and made available for review and comment. The public notice was prepared and published in the four major daily newspapers in Montgomery, Huntsville, Birmingham, and Mobile, as well as submitted to persons who have requested to be on ADEM's postal and electronic mailing distributions. In addition, the public notice and subject TMDL was made available on ADEM's Website: www.adem.state.al.us. The public can also request paper or electronic copies of the TMDL by contacting Mr. Chris Johnson at 334-271-7827 or clj@adem.state.al.us. The public was given an opportunity to review the TMDL and submit comments to the Department in writing. At the end of the public review period, all written comments received during the public notice period became part of the administrative record. ADEM considered all comments received by the public prior to finalization of this TMDL and subsequent submission to EPA Region 4 for final review and approval.

Appendix A
References

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Alabama Department of Environmental Management's 303(d) Monitoring Program. 2001-2002.

ADEM Administrative Code, 2002. Water Quality Program, Chapter 335-6-10, Water Quality Criteria, and Chapter 335-6-11 Use Classifications for Interstate and Intrastate Waters.

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Appendix B
Water Quality Data

Table B.1 Pathogen & Flow Data Collected by TVA on Second Creek (1997)

Station #	Stream Name	Date (yymmdd)	Time (24 hr)	Stream Flow (cfs)	Fecal Coliform (col/100ml)
10118-1	Second Cr	970609	1100	457	3200
10118-1	Second Cr	970708	1100	63.2	55
10118-1	Second Cr	970812	1100	23.3	1820
10118-1	Second Cr	970909	1045	20.1	1940
10118-1	Second Cr	971014	1030	39.3	2860

Table B.2 Pathogen & Flow Data Collected by ADEM on Second Creek (1998)

Station #	Date (yymmdd)	Time (24 hr)	Stream Flow (cfs)	Fecal Coliform (col/100ml)
SCDL-011	980722	0955	28.5	350

Table B.3 Pathogen & Flow Data Collected by ADEM on Second Creek at Station SCDL-11 (2003 & 2004)

Station ID	Date	Stream Flow (cfs)	Fecal Coliform (col/100ml)	Geometric Mean (col/100ml)
SCDL-11	6/4/2003	77.8	67	200
	6/11/2003	20.9	212	
	6/18/2003	23.8	220	
	6/24/2003	35.8	260	
	6/26/2003	15.1	390	
	8/14/2003	34.5	144	257
	8/18/2003	41.3	132	
	8/20/2003	46.4	124	
	8/25/2003	38	780	
	8/26/2003	14.5	610	
	7/12/2004	43.4	73	81
	7/13/2004	64.1	112	
	7/14/2004	62	76	
	7/19/2004	8.8	100	
	7/20/2004	36.5	57	
	9/14/2004	27.9	200	100
	9/20/2004	42.3	60	
	9/23/2004	49.7	88	
	9/27/2004	28.7	124	
	9/29/2004	24.3	78	

Table B.4 Pathogen & Flow Data Collected by ADEM on Second Creek at Station SCDL-12 (2003 & 2004)

Station ID	Date	Stream Flow (cfs)	Fecal Coliform (col/100ml)	Geometric Mean (col/100ml)
SCDL-12	6/4/2003	--	190	268
	6/11/2003	21.8	220	
	6/18/2003	19.9	175	
	6/24/2003	25.9	270	
	6/26/2003	19.2	700	
	8/14/2003	27.3	212	306
	8/18/2003	31.9	300	
	8/20/2003	--	320	
	8/25/2003	21.5	750	
	8/26/2003	17.3	176	
	7/12/2004	--	120	151
	7/13/2004	--	232	
	7/14/2004	--	92	
	7/19/2004	26.6	132	
	7/20/2004	27.1	232	
	9/14/2004	15.8	140	165
	9/20/2004	49.4	135	
	9/23/2004	30.9	160	
	9/27/2004	18.6	148	
	9/29/2004	19.7	270	

Table B.5 Pathogen & Flow Data Collected by ADEM on Second Creek at Station SCDL-13 (2003 & 2004)

Station ID	Date	Stream Flow (cfs)	Fecal Coliform (col/100ml)	Geometric Mean (col/100ml)
SCDL-13	6/4/2003	7.6	67	111
	6/11/2003	10.7	152	
	6/18/2003	8.3	94	
	6/24/2003	8.1	116	
	6/26/2003	6.1	152	
	8/14/2003	10.7	--	n/a
	8/18/2003	15.6	180	
	8/20/2003	13.5	132	
	8/25/2003	9.3	104	
	8/26/2003	8.7	490	
	7/12/2004	17.3	120	84
	7/13/2004	15.6	220	
	7/14/2004	14	88	
	7/19/2004	36	37	
	7/20/2004	11.3	49	
	9/14/2004	4.9	116	125
	9/20/2004	17.8	105	
	9/23/2004	10.8	156	
	9/27/2004	7.6	100	
	9/29/2004	9.2	160	