Final

Total Maximum Daily Load (TMDL)
for
Pepperell Branch

Assessment Unit ID # AL03150110-0102-700

Pathogens (E. coli)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
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Figure I. Site Map of the Pepperell Branch Watershed

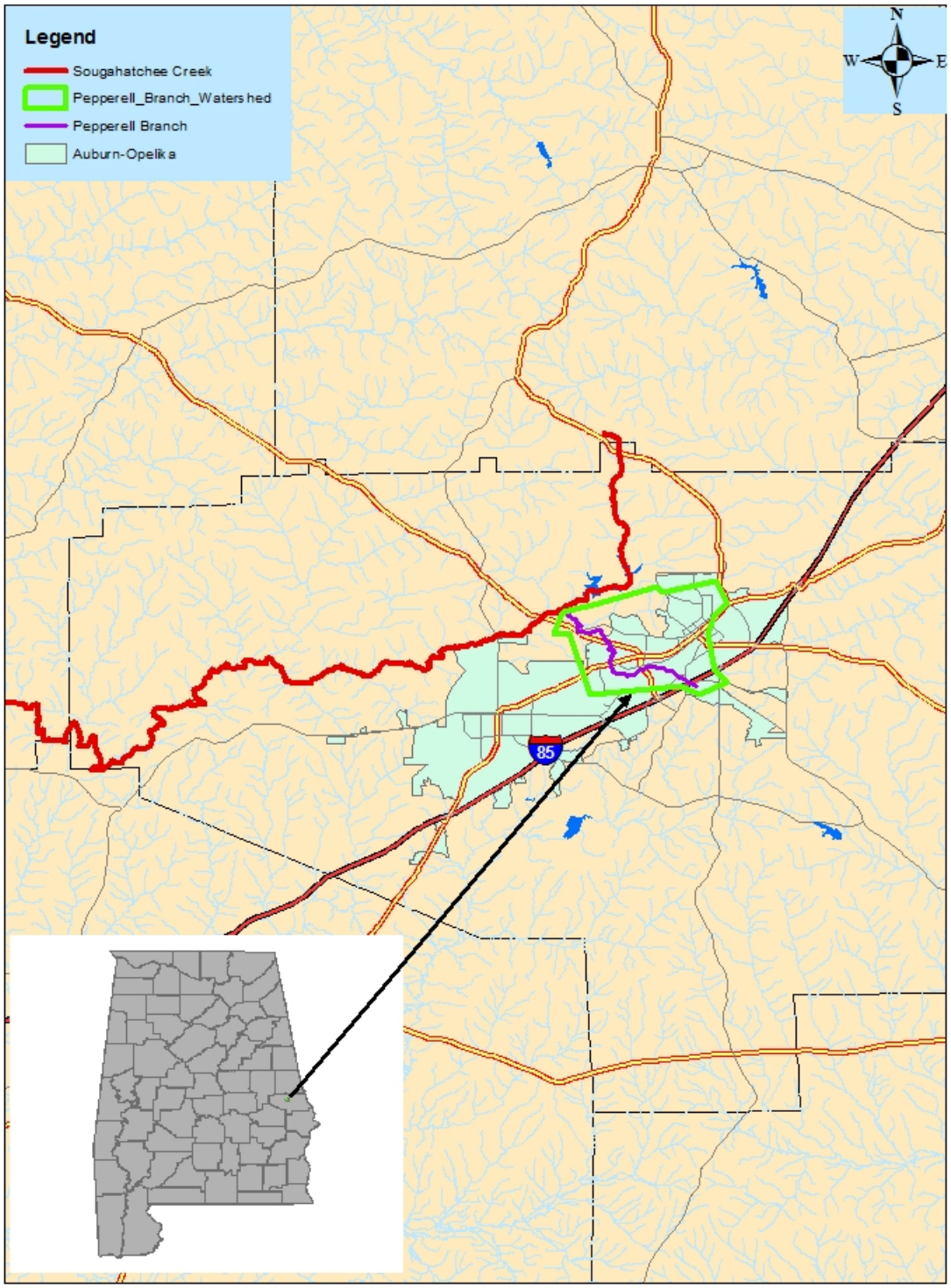


Table of Contents

List of Figures iii

List of Tables iv

1.0 Executive Summary 1

2.0 Basis for §303(d) Listing 3

2.1 Introduction 3
2.2 Problem Definition 3

3.0 Technical Basis for TMDL Development 5

3.1 Water Quality Target Identification 5
3.2 Source Assessment 5
3.3 Land Use Assessment 8
3.4 Linkage Between Numeric Targets and Sources 13
3.5 Data Availability and Analysis 13
3.6 Critical Conditions 15
3.7 Margin of Safety 15

4.0 TMDL Development 16

4.1 Definition of a TMDL 16
4.2 Load Calculations 16
4.3 TMDL Summary 17

5.0 Follow Up Monitoring 18

6.0 Public Participation 18

7.0 Appendices

7.1 References 19
7.2 Water Quality Data 20
7.3 Watershed Photographs 24

List of Figures

Figure I Site Map of the Pepperell Branch Watershed ii
Figure 3-1 City of Auburn MS4 Coverage 7
Figure 3-2 Landuse Map of the Pepperell Branch Watershed 10
Figure 3-3 2000 Population Density Map of the Pepperell Branch Watershed 11
Figure 3-4 Aerial Map of the Pepperell Branch Watershed 12

Figure 3-5 Map of Pepperell Branch Sampling Station Locations 14
Figure 7-1 Station PPLL-2 Upstream 25
Figure 7-2 Station PPLL-2 Downstream 26
Figure 7-3 Station PPLL-5 Upstream 27
Figure 7-4 Station PPLL-5 Downstream 28

List of Tables

Table 1-1 2010 E. coli Loads and Required Reduction 2
Table 1-2 E. coli TMDL for Pepperell Branch 2
Table 3-1 Landuse in the Pepperell Branch Watershed 9
Table 3-2 ADEM Sampling Stations in the Pepperell Branch Watershed 13
Table 4-1 2010 E. coli Loads and Required Reduction 17
Table 4-2 E. coli TMDL for Pepperell Branch 17
Table 5-1 §303(d) Follow Up Monitoring Schedule 18
Table 7-1 Pathogen Data Collected by ADEM from 2004 through 2009 21
Table 7-2 Pathogen Data Collected by ADEM at Station PPLL-2 in 2010 22
Table 7-3 Pathogen Data Collected by ADEM at Station PPLL-5 in 2010 23

1.0 Executive Summary

Section (§)303(d) of the Clean Water Act (CWA) and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop total maximum daily loads (TMDLs) for waterbodies that are not meeting designated uses under technology-based pollution controls. A TMDL is the maximum amount of pollutant a waterbody can assimilate while meeting water quality standards for the pollutant of concern. All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES) regulated discharges, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS).

Pepperell Branch is a small waterbody that feeds into Sougahatchee Creek in central Lee County. Sougahatchee Creek is a part of the Tallapoosa River Basin. Pepperell Branch has a length of 6.67 miles and a drainage area of 14.58 square miles. It has a use classification of Fish & Wildlife (F&W). The watershed is a part of the City of Opelika's Phase II municipal separate stormwater sewer system (MS4) area.

Pepperell Branch was first placed on the State's §303(d) list for pathogens in 2010 as a result of fecal coliform data collected by ADEM from 2004 through 2009.

Pathogen loadings are calculated as the product of concentration times flow times an appropriate conversion factor. The highest load reduction to the watershed is employed for the TMDL, the rationale being that if the watershed can meet pathogen criteria under the highest load conditions, it should be able to meet the criteria under any other conditions. The highest E. coli value measured from field data was the single sample value of 4839 cols/100 mL at station PPLL-2 on June 21, 2010. Measured flow (i.e., the critical flow) on the same day was 2.88 cfs. The allowable concentration is equal to the water quality criterion minus a 10% MOS. The E. coli single sample summer water quality criterion is 487 colonies/100 mL for waterbodies classified as F&W. Incorporating a 10% MOS results in an allowable pathogen concentration of 438 colonies/100 mL. Shown in Table 1-1 below are the existing conditions and required load reduction for E. coli within the Pepperell Branch watershed.

For comparison purposes, the highest load reduction employing the geometric mean criterion was also calculated. That value was 78% as measured at station PPLL-2 for the time frame from June 14 through June 28, 2010 (see Table 7-2 in Appendix 7.2).

Table 1-1 on the following page is a summary of the estimated existing load, allowable load, and percent reduction for the single sample criterion vs. the geometric mean criterion. Table 1-2 on the following page lists the TMDL defined as the maximum allowable E. coli loading under critical conditions (June-September) for Pepperell Branch. Using critical conditions for the TMDL development will ensure that water quality is maintained throughout the year.

Table 1-1. 2010 E. coli Loads and Required Reduction

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Nonpoint Source Load Single Sample	3.41×10^{11}	3.09×10^{10}	3.10×10^{11}	91%
Nonpoint Source Load Geometric Mean	3.76×10^{10}	8.41×10^{9}	2.92×10^{10}	78%
Point Source Load[a]	NA	NA	NA	0%

a. This does not include loads associated with the MS4 Phase II Area.

Table 1-2. E. coli TMDL for Pepperell Branch

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation(LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(cols/day)	(cols/day)	(cols/day)	(% reduction)	(cols/day)	(cols/day)	(% reduction)
3.43×10^{10}	3.45×10^{9}	NA	91	0	3.09×10^{10}	91%

Note: NA = Not applicable. Cols=colonies.

a. There are no CAFOs in the Pepperell Branch watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLAs for WWTPs expressed as E. coli loads (colonies/day). Future WWTPs must meet instream water quality criteria at the point of discharge as specified in their NPDES permits.
c. Applies to all regulated MS4s located in the Pepperell Branch watershed, both current and future.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in E. coli loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for E. coli.
e. TMDL was established using the single sample criterion of 487 colonies/100ml.

Compliance with the terms and conditions of existing and future NPDES sanitary and stormwater permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and are eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria with a commitment to targeting the necessary load reductions to improve water quality in the Pepperell Branch watershed. As additional data and/or information becomes available, it may become necessary to revise and/or modify the TMDL accordingly.

2.0 Basis for §303(d) Listing

2.1 Introduction

Section 303(d) of the Clean Water Act (CWA) as amended by the Water Quality Act of 1987 and EPA's Water Quality Planning and Management Regulations [(Title 40 of the Code of Federal Regulations (CFR), Part 130)] require states to identify waterbodies which are not meeting water quality standards applicable to their designated use classifications. The identified waters are prioritized based on severity of pollution with respect to designated use classifications. Total maximum daily loads (TMDLs) for all pollutants causing violation of applicable water quality standards are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality standards with seasonal variations and margins of safety. The TMDL process establishes the allowable loading of pollutants, or other quantifiable parameters for a waterbody, based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water-quality based controls to reduce pollution from both point and non-point sources and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified Pepperell Branch as being impaired by pathogens (E. coli). The §303(d) listing was originally reported on Alabama's 2010 List of Impaired Waters. The sources of the impairment are listed as urban runoff and storm sewers.

2.2 Problem Definition

Waterbody Impaired:	Pepperell from Sougahatchee Creek to its source
Waterbody Length:	6.67 miles
Waterbody Drainage Area:	14.58 square miles
Water Quality Standard Violation:	E. coli (single sample) E. coli (geometric mean)
Pollutant of Concern:	Pathogens (E. coli)
Water Use Classification:	Fish and Wildlife

Usage Related to Classification:
The impaired segment of Pepperell Branch is classified as Fish and Wildlife. Usage of waters in this classification is described in ADEM Admin. Code R. 335-6-10-.09(5)(a), (b), (c), and (d):

(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. coli 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 E. coli group shall not exceed a geometric mean of 548 colonies/100 ml; nor exceed a maximum of 2,507 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 E. coli organism density does not exceed 126 colonies/100 ml nor exceed a maximum of 487 colonies/100 ml in any sample 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 periodat 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:

Water quality data collected by ADEM from 2004 through 2009 was used for listing Pepperell Branch on Alabama's 2010 §303(d) list. At the time of the listing, fecal coliform was the accepted pathogen indicator. Waters in which less than or equal to 10% of the samples collected over a five year period exceeded the single-sample maximum of 2000 colonies/100 mL were

considered to comply with Alabama's water quality standard for fecal coliform bacteria. Geometric mean samples comprised of at least 5 samples collected over a thirty day period that were reported less than or equal to 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) were considered to comply with Alabama's water quality standard for fecal coliform bacteria. Waters in which greater than 10% of the samples exceeded the single-sample maximum criterion of 2000 colonies/100 mL or any geometric mean sample that exceeded the geometric mean criterion of 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) were considered impaired and subsequently listed for pathogens (fecal coliform) on Alabama's §303(d) list. It should be noted that ADEM adopted E. coli as the new water quality criterion for freshwater in Alabama recently. The transition from fecal coliform to E. coli became effective on September 19, 2010. This is the date the revised regulation was certified by the Attorney General's office of the State of Alabama.

The ADEM fecal data was collected on Pepperell Branch near US Highway 29. Of 35 samples collected, six exceeded the single sample maximum fecal criterion of 2,000 colonies/100 mL.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

For the purpose of this TMDL, a single sample E. coli target of 438 colonies/100 mL will be used. This target was derived by using a 10% explicit margin of safety for the single sample summer criterion of 487 colonies/100 mL.

3.2 Source Assessment

3.2.1 Point Sources in the Pepperell Branch Watershed

Continuous Point Sources
There are no continuous NPDES discharges located in the Pepperell Branch watershed. However, any future NPDES regulated discharges that are considered by the Department to be a pathogen source will be required to meet the instream water quality criteria for pathogens at the point of discharge.

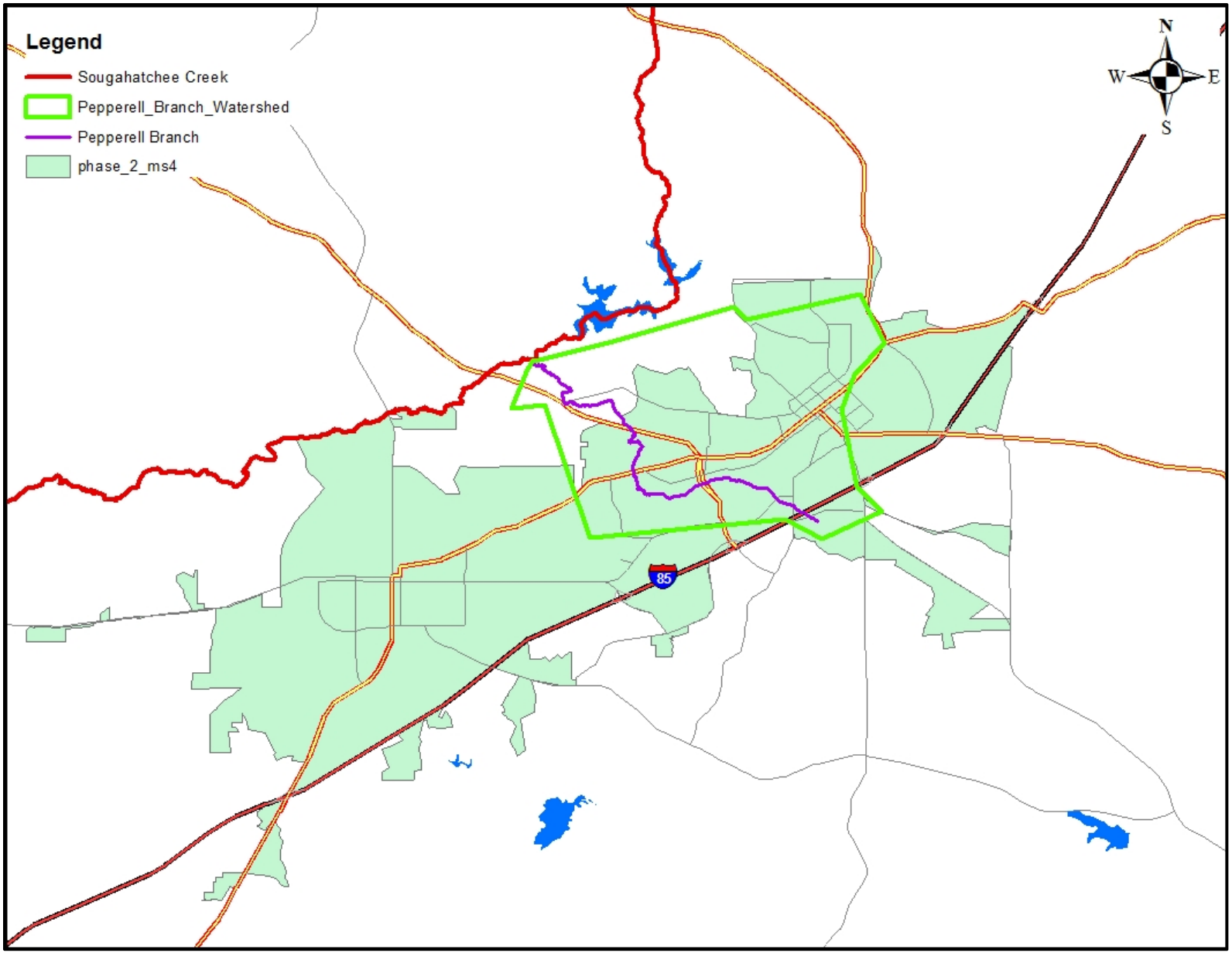
Non-Continuous Point Sources
The Pepperell Branch watershed lies within the boundary of the City of Opelika's Phase II MS4 area (NPDES Permit #ALR040018) and therefore must be addressed in the TMDL as a part of the WLA component. Figure 3-1 shows the coverage of the City of Auburn and City of Opelika's MS4 area and Pepperell Branch's location within the coverage.

Sanitary sewer overflows (SSOs) have the potential to severely impact water quality and can often result in the violation of water quality standards. It is the responsibility of the NPDES wastewater discharger, or collection system operator for non-permitted "collection only" systems, to ensure that releases do not occur. Unfortunately releases to surface waters from SSOs are not always preventable or reported. From a review of ADEM's NPDES enforcement database, it was shown that six SSO reports were made by the Opelika Westside WWTP in 2010.

This facility covers the Pepperell Branch watershed. Four of these events occurred in the area of Pepperell Branch. An event occurred on June 21, 2010 which corresponds with the highest E. Coli single sample recorded for Pepperell Branch, which was 4839 cols/100 mL. This sample was taken on June 21, 2010. The remaining events did not occur at the same time that samples were being taken.

Future NPDES regulated stormwater discharges will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

Figure 3-1. City of Auburn and City of Opelika MS4 Coverage



3.2.2 Nonpoint Sources in the Pepperell Branch Watershed

Nonpoint sources of E. coli bacteria do not have a defined discharge point, but rather, occur over the entire length of a stream or waterbody. On the land surface, E. coli bacteria can accumulate over time in the soil and then are washed off during rain events. As the runoff transports the sediment over the land surface, more E. coli bacteria are collected and carried to the stream or waterbody. Therefore, there is some net loading of E. coli bacteria into the stream dictated by the watershed hydrology.

Agricultural land can be a source of E. coli bacteria. Runoff from pastures, confined animal feeding operations (CAFOs), improper land application of animal wastes, and animals with direct access to streams are all mechanisms that can contribute E. coli bacteria to waterbodies. To account for the potential influence from animals with direct access to stream reaches in the watershed, E. coli loads can be calculated as a direct source into the stream.

E. coli bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkeys, beaver, and waterfowl. Wildlife deposit feces onto land surfaces where it can be transported during rainfall events to nearby streams. Control of these sources is usually limited to land management BMPs and may be impracticable in most cases. As a result, forested areas are not specifically targeted in this TMDL.

E. coli loading from urban areas is potentially attributable to multiple sources including storm water runoff, illicit discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, sewer overflows due to I&I (infiltration and inflow) and domestic animals. Septic systems are common in unincorporated portions of the watershed and may be direct or indirect sources of bacterial pollution via ground and surface waters. Onsite septic systems have the potential to deliver E. coli bacteria to surface waters due to system failure and malfunction.

3.3 Landuse Assessment

Pepperell Branch is a part of the Upper Sougahatchee Creek watershed. The 12-digit hydrologic unit code (HUC) for the Upper Sougahatchee Creek watershed is 031501100102. Table 3-1 provides landuse in the Pepperell Branch watershed and its respective percentages. Landuse for the Pepperell Branch watershed was determined using ArcView GIS with landuse information derived from the 2006 National Land Cover Dataset (NLCD). Figure 3-2 is a map of landuse within the watershed.

As can be seen from the landuse table, most of the land in the watershed consists of forest and developed land. Developed land includes both commercial and residential tracts. The NLCD is based upon 2006 data. The population of Lee County was 115,094 in 2000 according to the US Census Bureau. The US Census Bureau estimates that the population of Lee County grew to 135,883 in 2009. The Opelika Chamber of Commerce website states that “Auburn-Opelika Metropolitan Statistical Area (MSA) is the 6th fastest growing Small MSA in the nation, and only third behind Mobile and Huntsville in Alabama. The MSA’s 2009 population is estimated to be 155,474.” A population density map of the watershed, based upon 2000 U.S. Census data, is shown in Figure 3-3. A link to the Opelika Chamber of Commerce is provided in Appendix 7-1.

An aerial map of the watershed is shown in Figure 3-4. The aerial map reflects imagery data from ESRI's ArcGIS web site. Data from this site was last modified May 21, 2010. A link to ESRI's web site is also provided in Appendix 7-1. ESRI is an acronym for Environmental Systems Research Institute.

Table 3-1. Landuse in the Pepperell Branch Watershed

Class Description	Count (30m)	mi^2	Acres	Percent
Barren Land	57	0.02	12.68	0.14%
Open Water	408	0.14	90.74	0.97%
Woody Wetlands	183	0.06	40.70	0.44%
Herbaceuous	1428	0.50	317.58	3.40%
Hay/Pasture	1464	0.51	325.59	3.49%
Developed, High Intensity	1331	0.46	296.01	3.17%
Evergreen Forest	5973	2.08	1328.36	14.24%
Shrub/Scrub	355	0.12	78.95	0.85%
Cultivated Crops	1892	0.66	420.77	4.51%
Mixed Forest	895	0.31	199.04	2.13%
Deciduous Forest	8644	3.00	1922.38	20.61%
Developed, Medium Intensity	2624	0.91	583.56	6.26%
Developed, Low Intensity	9908	3.44	2203.49	23.62%
Developed, Open Space	6788	2.36	1509.62	16.18%
TOTALS →	**41950**	**14.58**	**9329.46**	**100.00%**

Figure 3-2. Landuse Map of the Pepperell Branch Watershed

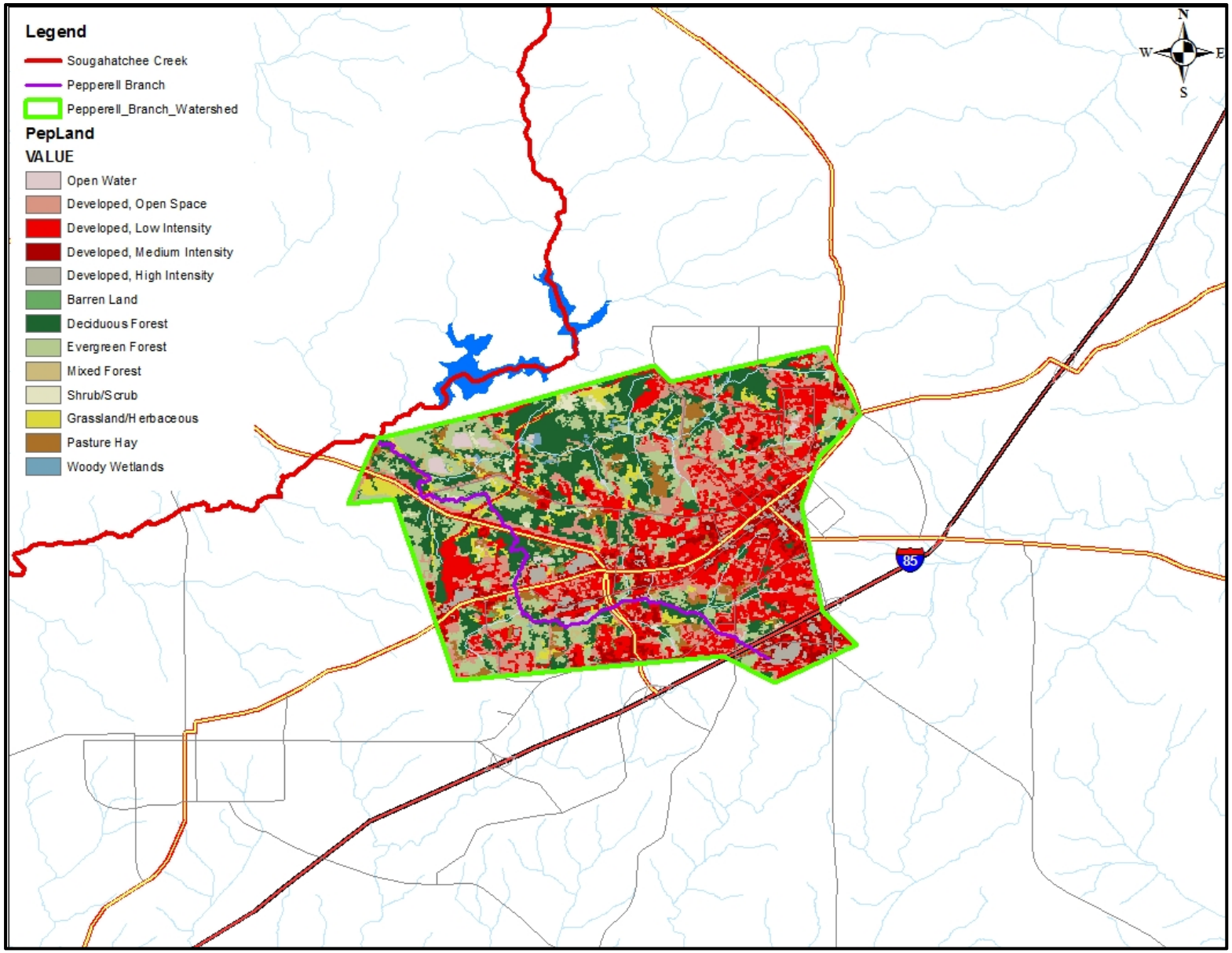


Figure 3-3. 2000 Population Density Map of the Pepperell Branch Watershed

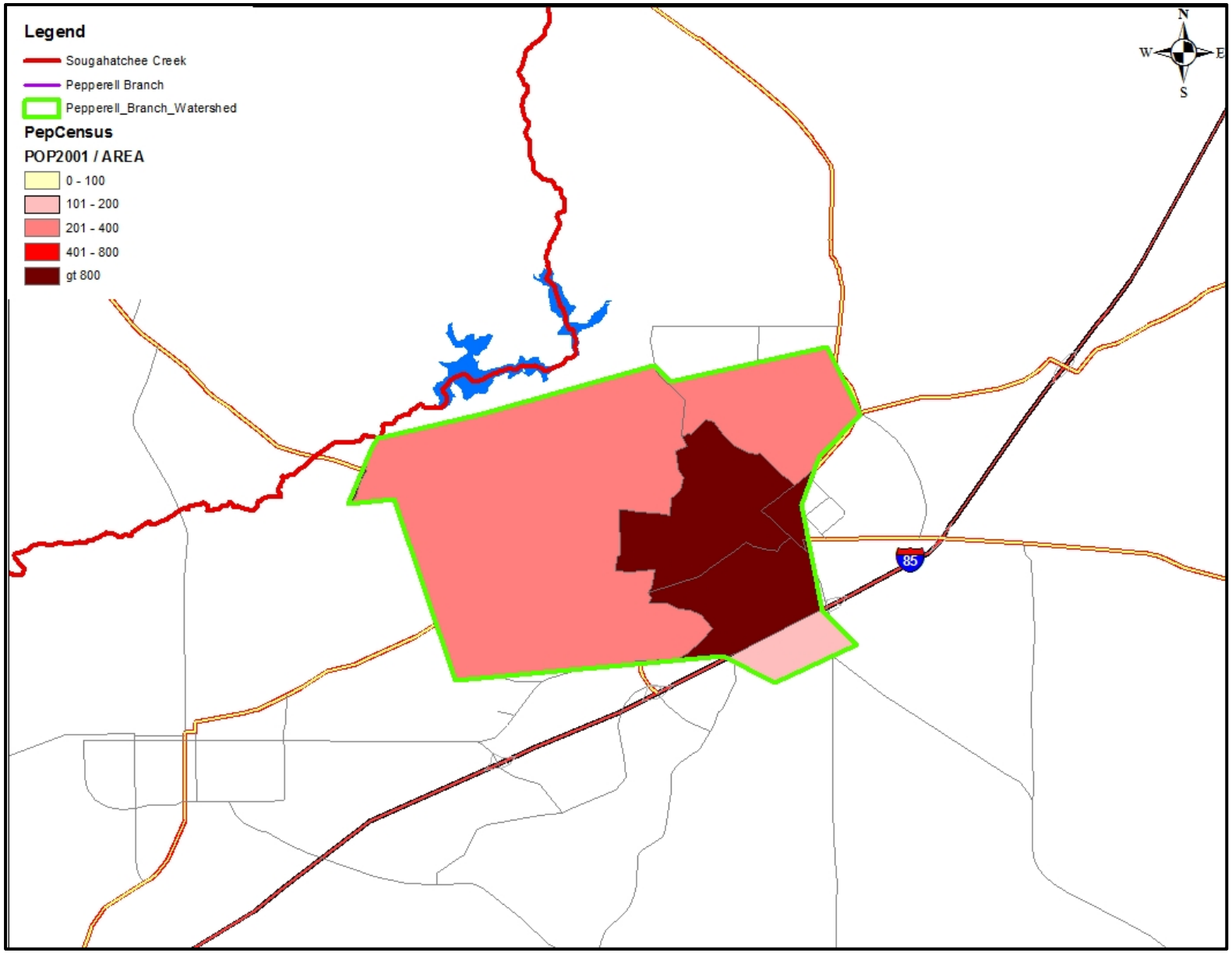
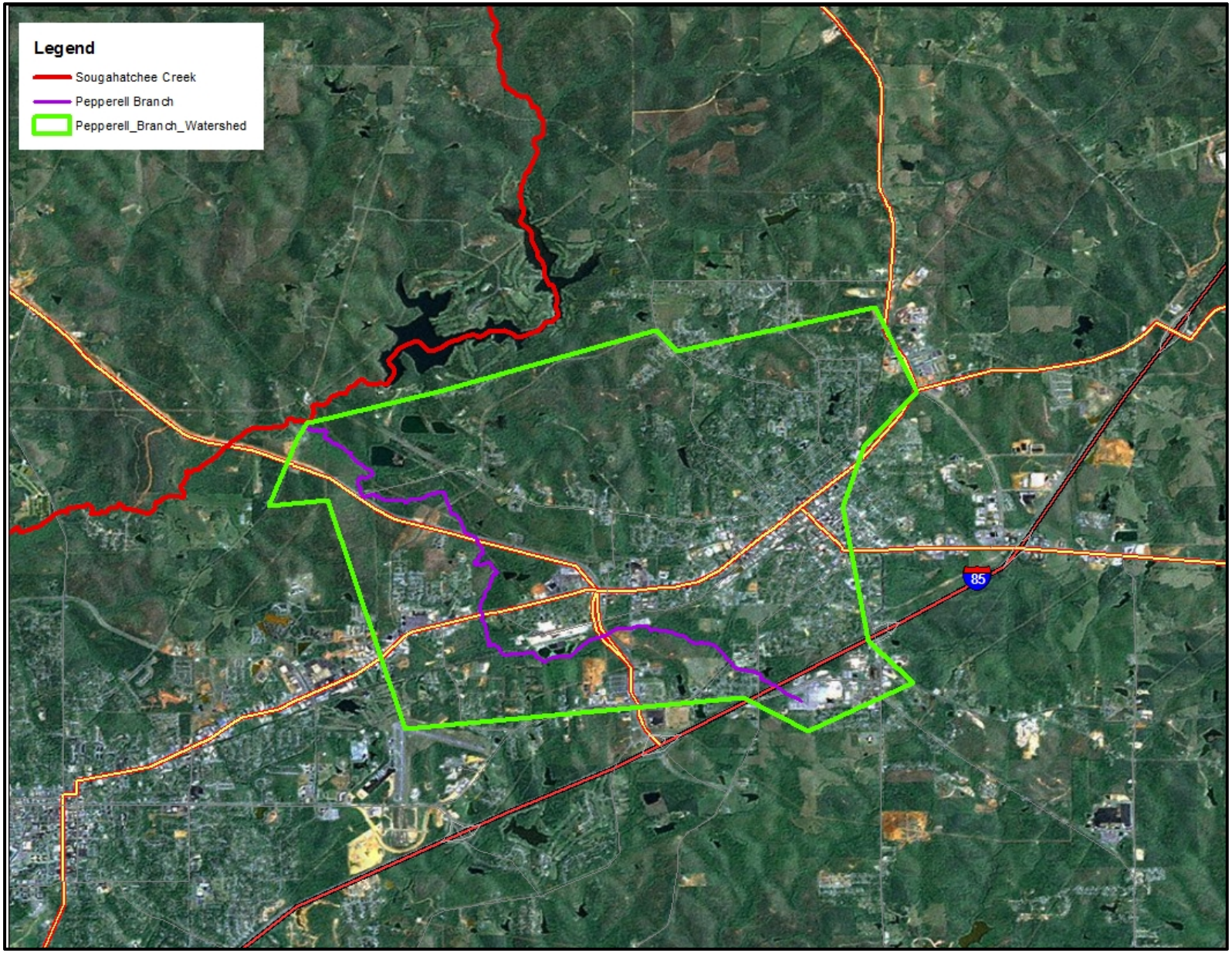


Figure 3-4. Aerial Map of the Pepperell Branch Watershed



3.4 Linkage Between Numeric Targets and Sources

The Pepperell Branch watershed is highly developed. Most of the remaining landuse is forest. E. coli loads from forests and wetlands tend to be low due to their filtering capabilities and are considered as natural or background conditions with respect to pollutant sources. It is believed that the most likely sources of pathogens in Pepperell Branch are from sanitary sewer overflows, domestic animals and other wildlife within the watershed.

It is not considered practical to calculate individual components for nonpoint source loadings. Hence, there will not be individual loads or reductions calculated for different nonpoint sources such as commercial and residential land uses. The loadings and reductions will only be calculated as a single total nonpoint source load and reduction.

3.5 Data Availability and Analysis

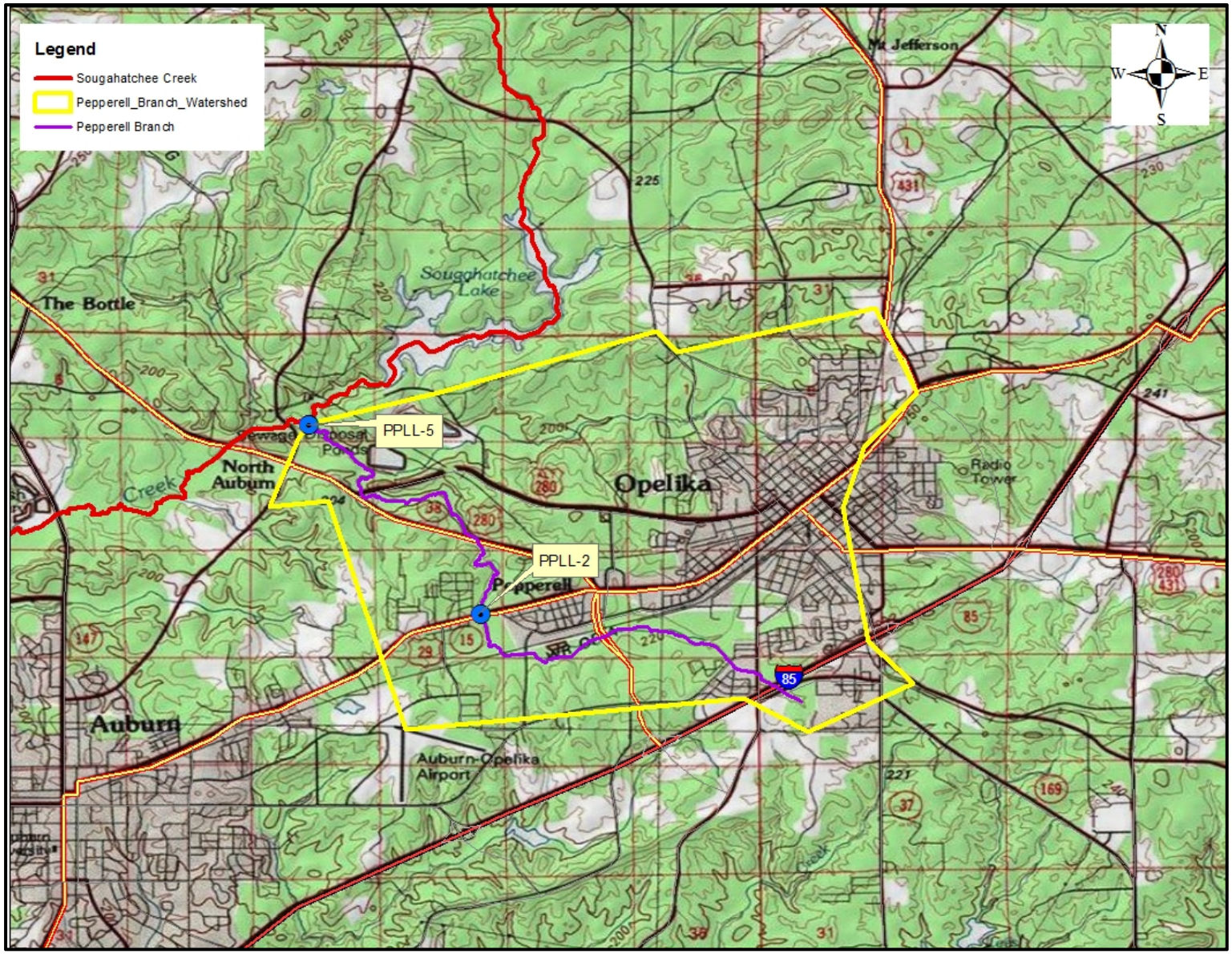
Water quality data collected by the ADEM from 2004 through 2009 was used for listing Pepperell Branch on Alabama's 2010 §303(d) list of impaired waters. The ADEM fecal data was collected on Pepperell Branch near US Highway 29. Of 35 samples collected, six exceeded the single sample maximum fecal criterion of 2,000 colonies/100 mL. The ADEM pathogen data used for the original listing can be found in Appendix 7.2.

Since the original listing, ADEM has collected E. coli data at two stations in the watershed in 2010. Each station had exceedances of both the geometric mean and the single sample criteria for E. coli. Geometric mean criteria for F&W waterbodies is as follows: 126 cols/100 mL and 548 cols/100 mL, respectively, for summer and winter. Single sample criteria for F&W waterbodies are 487 and 2507 cols/100 mL, respectively, for summer and winter. Summer is defined as the time frame from June through September; winter, October through May. The ADEM data for 2010 can be found in Appendix 7.2. Table 3-2 shows location descriptions for ADEM's 2010 sampling stations. Figure 3-5 is a map of the station locations.

Table 3-2. ADEM Sampling Stations in the Pepperell Branch Watershed

Station	Location Description	Latitude	Longitude
PPLL-2	Pepperell Branch @ US Highway 29	32.6347	-85.4254
PPLL-5	Pepperell Branch @ Sougahatchee Creek	32.6603	-85.4487

Figure 3-5. Map of Pepperell Branch Sampling Station Locations



3.6 Critical Conditions

Critical conditions typically occur during the summer months. This can be explained by the nature of storm events in the summer versus the winter. Periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off of E. coli bacteria into streams, resulting in spikes in bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up of bacteria on the land surface, resulting in a more uniform loading rate. Also, the summer E. coli criterion is more stringent than the winter criterion.

The highest load reduction to the watershed is employed for the TMDL, as this can be considered the critical condition. The highest E. coli value measured from field data was 4839 cols/100 mL at station PPLL-2 on June 21, 2010. The allowable concentration is equal to the water quality criterion minus a 10% MOS. The E. coli single sample summer water quality criterion is 487 colonies/100 mL for F&W waterbodies. Incorporating a 10% MOS results in an allowable pathogen concentration of 438 colonies/100 mL. Calculated load reduction for this event is equal to 91%.

3.7 Margin of Safety

There are two methods for incorporating a Margin of Safety (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 and using the remainder for allocations.

Both an explicit and implicit MOS was incorporated into this TMDL. The MOS accounts for the uncertainty associated with the limited availability of E. coli data used in this analysis. An explicit MOS was applied to the TMDL by reducing the E. coli target geometric mean criterion concentration by ten percent and calculating a mass loading target with measured flow data. The single sample maximum value of 487 colonies/100 mL was reduced by 10% to 438.3 colonies/100 mL. An implicit MOS was also incorporated in the TMDL by basing the existing condition on the highest measured E. coli concentration that was collected during critical conditions.

4.0 TMDL Development

4.1 Definition of a TMDL

A total maximum daily load (TMDL) is the sum of individual wasteload 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 (colonies/day), in accordance with 40 CFR 130.2(i).

4.2 Load Calculations

Existing and Allowable Conditions

As discussed previously, the highest concentration measured from the 2010 field data was 4839 colonies/100 mL at station PPLL-2 on June 21, 2010. This can be referred to as the existing conditions concentration. The allowable conditions concentration would be the criterion minus the 10% MOS, or 438 colonies/100 mL. Measured flow from the exceedance event was 2.88 cfs. Based upon comments from the field crew, this was an average flow. Concentration multiplied by the flow gives a loading (i.e., colonies/unit time) for E. coli. Employment of the appropriate conversion factor gives the loading in colonies/day. When the concentration is given in colonies/100 mL and the flow in cubic feet per second (cfs), the appropriate conversion factor is 24465755. Units of the conversion factor are equal to [(100mL)(s)]/[(cubic feet)(day)]. Hence, the existing conditions loading is calculated as:

$$\frac{2.88\,\text{ft}^3}{\text{s}} \times \frac{4839\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755 * 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.41 \times 10^{11}\ \text{colonies}}{\text{day}}$$

The allowable conditions loading is given as:

$$\frac{2.88\,\text{ft}^3}{\text{s}} \times \frac{438\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755 * 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.09 \times 10^{10}\ \text{colonies}}{\text{day}}$$

The difference between the two loadings results in the reduction required to bring the waterbody into compliance with F&W criteria for pathogens. The difference divided by the existing conditions loading times 100 gives the load reduction as a percentage.

Table 4-1 is a summary of the estimated existing load, allowable load, and percent reduction for the single sample criterion vs. the geometric mean criterion. Table 4-2 lists the TMDL defined as the maximum allowable E. coli loading under critical conditions (June-September) for

Pepperell Branch. Using critical conditions for the TMDL development will ensure that water quality is maintained throughout the year.

Table 4-1. 2010 E. Coli Loads and Required Reduction

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Nonpoint Source Load Single Sample	3.41×10^{11}	3.09×10^{10}	3.10×10^{11}	91%
Nonpoint Source Load Geometric Mean	3.75×10^{10}	8.41×10^{9}	2.92×10^{10}	78%
Point Source Load[a]	NA	NA	NA	0

a. This does not include loads associated with the MS4 Phase II Area.

Table 4-2. E. coli TMDL for Pepperell Branch

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation(LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(cols/day)	(cols/day)	(cols/day)	(% reduction)	(cols/day)	(cols/day)	(% reduction)
3.43×10^{10}	3.45×10^{9}	NA	91	0	3.09×10^{10}	91%

Note: NA = Not applicable. Cols=colonies.

a. There are no CAFOs in the Pepperell Branch watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLAs for WWTPs expressed as E. coli loads (colonies/day). Future WWTPs must meet instream water quality criteria at the point of discharge as specified in their NPDES permits.
c. Applies to all regulated MS4s located in the Pepperell Branch watershed, both current and future.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in E. coli loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for E. coli.
e. TMDL was established using the single sample criterion of 487 colonies/100ml.

4.3 TMDL Summary

Pepperell Branch was placed on Alabama's §303(d) list in 2010 based on data collected by ADEM from 2004 through 2009. In 2010, ADEM collected additional water quality data which confirmed the pathogen impairment and provided the basis for TMDL development. Based upon the TMDL analysis, it was determined that a 91% reduction in E. coli loading was necessary to achieve compliance with applicable water quality standards.

Compliance with the terms and conditions of existing and future NPDES sanitary and stormwater permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and are eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria with a commitment to targeting the necessary load reductions to improve water quality in the Pepperell Branch watershed. As additional data and/or information becomes available, it may be necessary to revise and/or modify the TMDL accordingly.

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 monitor §303(d) listed waters. 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 the schedule shown in Table 5-1 below.

Table 5-1. §303(d) Follow Up Monitoring Schedule

River Basin Group	Year to be Monitored
Escatawpa / Mobile / Lower Tombigbee / Upper Tombigbee	2011
Black Warrior / Cahaba	2012
Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia	2013
Tennessee	2014
Alabama / Coosa / Tallapoosa	2015

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 cljohnson@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.

7.0 Appendices

Appendix 7.1

References

ADEM Administrative Code, 2007. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2007. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's §303(d) Monitoring Program. 2010. ADEM.

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, January 2010.

Alabama's 2010 §303(d) List. ADEM.

United States Environmental Protection Agency, 1991. Guidance for Water Quality-Based Decisions: The TMDL Process. Office of Water. EPA 440/4-91-001.

U.S. Census Bureau. 2000 Census data.

ESRI Web Site for ArcGIS maps and data: http://www.arcgis.com/home/group.html?q=tags:ArcMap931_Base&t=group&owner=esri&title=ESRI%20Maps%20and%20Data&sortField=title&sortOrder=asc&content=all.

The Opelika Chamber of Commerce: http://www.opelika.com/

Appendix 7.2

Water Quality Data

Table 7-1. Pathogen Data Collected by ADEM from 2004 to 2009

Station ID	Activity Date	Fecal Col 100ml	Fecal Col dc
PPLL-2	3/11/2004	43	J
PPLL-2	4/8/2004	2000	
PPLL-2	5/4/2004	360	
PPLL-2	6/2/2004	470	
PPLL-2	6/10/2004	43	J
PPLL-2	7/1/2004	2000	
PPLL-2	8/4/2004	320	
PPLL-2	8/5/2004	210	
PPLL-2	9/9/2004	770	
PPLL-2	10/6/2004	67	
PPLL-2	10/27/2004	220	
PPLL-2	6/15/2005	10000	G
PPLL-2	8/9/2005	2500	J
PPLL-2	10/13/2005	130	J
PPLL-2	8/16/2006	22000	
PPLL-2	10/11/2006	1700	GH
PPLL-2	1/17/2007	380	
PPLL-2	1/24/2007	510	
PPLL-2	1/31/2007	100	
PPLL-2	2/7/2007	150	
PPLL-2	2/14/2007	370	
PPLL-2	6/19/2007	2800	G
PPLL-2	8/2/2007	230	
PPLL-2	9/17/2007	550	
PPLL-2	9/24/2007	230	
PPLL-2	9/27/2007	180	
PPLL-2	10/4/2007	240	
PPLL-2	10/11/2007	240	
PPLL-2	10/18/2007	60	J
PPLL-2	6/9/2008	80	J
PPLL-2	8/14/2008	540	J
PPLL-2	10/23/2008	110	
PPLL-2	6/15/2009	2600	GH
PPLL-2	8/5/2009	100	JH
PPLL-2	10/14/2009	9400	GH

Fecal Criteria		
Parameter	Summer	Winter
Geomean	200	1000
SS	2000	2000

Summer = June - Sept

Winter = Oct - May

Note: Cells highlighted in red present exceedances of the applicable fecal criterion

Table 7-2. Pathogen Data Collected by ADEM at Station PPLL-2 in 2010

Station ID	Activity Date	Flow Stage	Flow CFS	E Coli Dc	E Coli	Geomean
PPLL-2	4/14/2010	NORMAL	4.397		325.5	N/A
PPLL-2	5/25/2010	NORMAL	3.56	H	1299.7	N/A
PPLL-2	6/14/2010	NORMAL	2.371		261.3	562.8
PPLL-2	6/17/2010	NORMAL	2.809		1986.3	
PPLL-2	6/21/2010	NORMAL	2.881		4839.2	
PPLL-2	6/23/2010	NORMAL	4.09	H	275.5	
PPLL-2	6/28/2010		1.928		81.6	
PPLL-2	7/6/2010	NORMAL	1.853		131.4	N/A
PPLL-2	7/28/2010	NORMAL	2.71	H	2419.6	
PPLL-2	8/3/2010	ABOVE NORMAL	4.528		1553.1	237.8
PPLL-2	8/5/2010	LOW	2.115		178.2	
PPLL-2	8/10/2010	LOW	0.951		547.5	
PPLL-2	8/23/2010	NORMAL	0.868		78	
PPLL-2	8/25/2010	LOW	0.711		517.2	
PPLL-2	8/26/2010	LOW	0.801		31.3	
PPLL-2	8/31/2010	NORMAL	0.846		224.7	
PPLL-2	9/22/2010	LOW	0.314		81.3	N/A
PPLL-2	10/13/2010	NORMAL	0.7077		107.6	N/A
PPLL-2	11/2/2010	NORMAL	0.115		105.4	N/A

E Coli Criteria		
Parameter	Summer	Winter
Geomean	126	548
SS	487	2507

Summer = June - Sept

Winter = Oct - May

Note: Cells highlighted in red present exceedances of the applicable E coli criterion

Table 7-3. Pathogen Data Collected by ADEM at Station PPLL-5 in 2010

Station ID	Activity Date	Flow Stage	Flow CFS	E Coli Dc	E Coli	Geomean
PPLL-5	4/14/2010	NORMAL	28.95		66.3	N/A
PPLL-5	5/25/2010	NORMAL	24.06	H	344.8	N/A
PPLL-5	6/14/2010	NORMAL	7.486		209.8	156.8
PPLL-5	6/17/2010	NORMAL	7.827		131.4	
PPLL-5	6/21/2010	NORMAL	11.1		461.1	
PPLL-5	6/23/2010	NORMAL	17.961	H	93.4	
PPLL-5	6/28/2010		8.734		79.8	
PPLL-5	7/6/2010		4.634		96	N/A
PPLL-5	7/28/2010	ABOVE NORMAL	4.81	H	1732.9	
PPLL-5	8/3/2010	ABOVE NORMAL	12.833		2419.6	206.9
PPLL-5	8/5/2010	LOW	6.083		137.4	
PPLL-5	8/10/2010	LOW	3.461		218.7	
PPLL-5	8/23/2010	NORMAL	2.496		58.3	
PPLL-5	8/25/2010	LOW	2.195		96	
PPLL-5	8/26/2010	NORMAL	2.0729		275.5	
PPLL-5	8/31/2010		2.19		145	
PPLL-5	9/22/2010	LOW	0.501		133.3	N/A
PPLL-5	10/13/2010	LOW	1.4338		214.3	N/A
PPLL-5	11/2/2010	NORMAL	0.815		77.1	N/A

E Coli Criteria		
Parameter	Summer	Winter
Geomean	126	548
SS	487	2507

Summer = June - Sept

Winter = Oct - May

Note: Cells highlighted in red present exceedances of the applicable E coli criterion

Appendix 7.3

Watershed Photographs

Figure 7-1. Station PPLL-2 Upstream

Figure 7-2. Station PPLL-2 Downstream

Figure 7-3. Station PPLL-5 Upstream

Figure 7-4. Station PPLL-5 Downstream