Final
Total Maximum Daily Load (TMDL)
For
Luxapallila Creek

Assessment Unit ID # AL03160105-0204-102
Assessment Unit ID # AL03160105-0101-102
Assessment Unit ID # AL03160105-0201-103

Pathogens (*E. coli*)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
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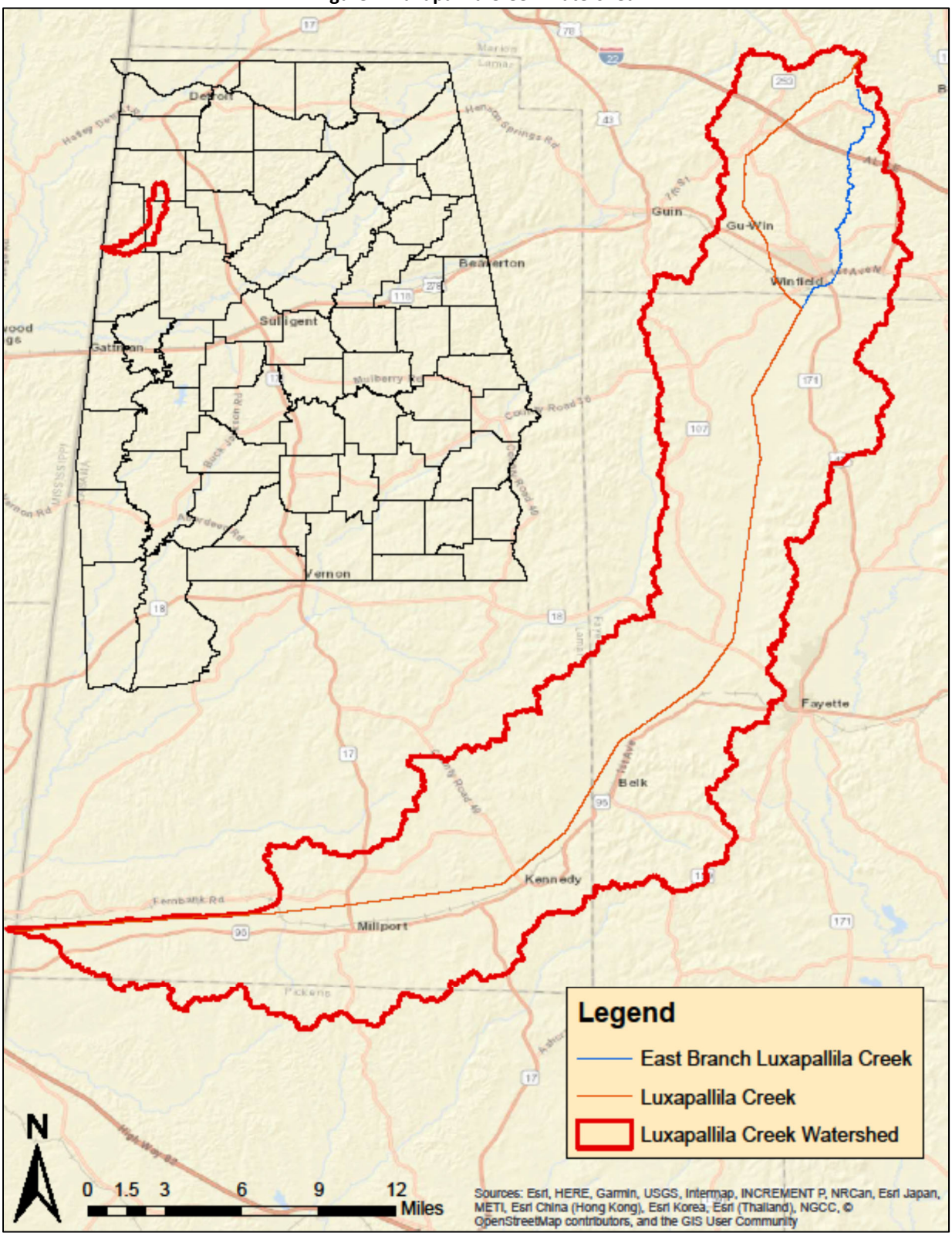
Figure 1: Luxapallila Creek Watershed



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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 uses 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 (WLAs) for point sources, load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

Luxapallila Creek is currently included on Alabama's §303(d) list as impaired for pathogens (*E. coli)*. There are three segments of Luxapallila Creek on the most recent list: Alabama/Mississippi State line to Fayette County Road 37 (AL03160105-0204-102); county road crossing approximately 6 miles upstream from Alabama Highway 18 to US Highway 78 (AL03160105-0201-103); and US Highway 78 to its source (AL03160105-0101-102). AL03160105-0101-102 has a designated use classification of Public Water Supply/Fish and Wildlife, while AL03160105-0204-102 and AL03160105-0201-103 are classified as Fish and Wildlife.

Luxapallila Creek begins north of the City of Winfield and flows southwest 53.49 miles to the Alabama/Mississippi State line, where it continues to flow towards Columbus, Mississippi and to the Tombigbee River. The total drainage area for the Luxapallila Creek watershed in Alabama is approximately 281.51 square miles.

One segment of Luxapallila Creek (AL03160105-0204-102) was first included on the §303(d) list for pathogens in 2016 based on data collected by the Alabama Department of Environmental Management (ADEM) from 2009 – 2014 at ADEM trend station LUXL-1. The additional two segments (AL03160105-0201-103 and AL03160105-0101-102) were then added in 2018 based on data collected in 2015 from ADEM stations LXC-1 and LXPM-68. This data, which can be found in Table 3, indicated that stream was impaired for pathogens (*E. coli*), which will be the basis for this TMDL.

Between 2015 and 2019, sampling studies were performed by ADEM on Luxapallila Creek to further assess the water quality of the impaired stream. From 2015-2019, ADEM collected additional *E. coli* samples from Luxapallila Creek at station LUXL-1. A review of the general water quality and intensive *E. coli* studies revealed that the listed segments of Luxapallila Creek were still not meeting the pathogen criteria applicable to their use classifications (F&W/PWS and F&W).

A mass balance approach was used for calculating the pathogen TMDL for Luxapallila Creek. The mass balance approach utilizes the conservation of mass principle. The TMDL was calculated using the single sample or geometric mean sample exceedance event that resulted in the highest percent reduction. Existing loads were calculated by multiplying the *E. coli* concentrations times the respective in-stream flows and a conversion factor. In the same manner as existing loads were calculated, allowable loads were calculated for the single sample *E. coli* target of 268.2

colonies/100 ml (298 colonies/100 ml – 10% Margin of Safety) and geometric mean *E. coli* target of 113.4 colonies/100 ml (126 colonies/100 ml – 10% Margin of Safety).

Tables 1-1, 1-2, and 1-3 are summaries of the estimated existing loads, allowable loads, and percent reductions for the single sample criterion and the geometric mean criterion. Tables 2-1, 2-2, and 2-3 list the TMDL for each segment, defined as the maximum allowable *E. coli* loading under critical conditions for Luxapallila Creek.

Table 1-1: *E. coli* Loads and Required Reductions for AL03160105-0101-102 at LXPM-68

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	4.51×10^{11}	1.40×10^{11}	3.12×10^{11}	69%

Table 1-2: *E. coli* Loads and Required Reductions for AL03160105-0201-103 at LXC-1

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	1.86×10^{12}	2.07×10^{11}	1.66×10^{12}	89%
Point Source Load (Winfield WWTP)*	2.39×10^{10}	1.13×10^{10}	1.26×10^{10}	53%

*Point source existing load is based on the reported discharge values during the month of the highest in-stream *E. coli* exceedance, and allowable load is based on permit limits during the month of the highest in-stream *E. coli* exceedance. It is noted that changes to the permit limits are not required; compliance with the existing permit limits will result in compliance with the TMDL.

Table 1-3: *E. coli* Loads and Required Reductions for AL03160105-0204-102 at LUXL-1

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	2.38×10^{13}	4.11×10^{12}	1.97×10^{13}	83%
Geometric Mean Load	6.11×10^{11}	2.51×10^{11}	3.60×10^{11}	59%
Point Source Load (Millport Lagoon)*	1.02×10^{7}	2.37×10^{9}	0	0%

*Point source existing load is based on the reported discharge values during the month of the highest in-stream *E. coli* exceedance, and allowable load is based on permit limits during the month of the highest in-stream *E. coli* exceedance.

Table 2-1: *E. coli* TMDL for AL03160105-0101-102 at LXPM-68

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
1.55×10^{11}	1.55×10^{10}	NA	NA	0	1.40×10^{11}	69%

Note: NA = not applicable
a. Existing and future AFOs/CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLA for WWTPs is expressed as a daily maximum. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
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 maximum criterion of 298 colonies/100 ml.

Table 2-2: *E. coli* TMDL for AL03160105-0201-103 at LXC-1

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
2.30×10^{11}	2.30×10^{10}	1.13×10^{10}	NA	0	1.96×10^{11}	89%

Note: NA = not applicable
a. Existing and future AFOs/CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLA for WWTPs is expressed as a daily maximum. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
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 maximum criterion of 298 colonies/100 ml.

Table 2-3: *E. coli* TMDL for AL03160105-0204-102 at LUXL-1

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
4.56×10^{12}	4.56×10^{11}	2.37×10^{9}	NA	0	4.10×10^{12}	83%

Note: NA = not applicable
a. Existing and future AFOs/CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLA for WWTPs is expressed as a daily maximum. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
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 maximum criterion of 298 colonies/100 ml.

Compliance with the terms and conditions of existing and future NPDES 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 may be eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria, and we are committed to targeting the load reductions to improve water quality in the Luxapallila Creek watershed. As additional data and/or information become 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 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 in-stream 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).

The State of Alabama has identified 45.3 miles of Luxapallila Creek as impaired for pathogens. The §303(d) listing for segment AL03160105-0204-102 was originally reported on Alabama's 2016 List of Impaired Waters based on data collected from 2009-14 and was included on all subsequent lists. The additional two segments were then added to the 2018 List of Impaired Waters based on data collected in 2015 from ADEM stations LXC-1 and LXPM-68.

2.2 Problem Definition

Waterbody Impaired:	Luxapallila Creek – from AL-MS state line to Fayette County Road 37; county road crossing approximately 6 miles upstream from AL Highway 18 to US Highway 78; and US Highway 78 to its source
Impaired Reach Length:	25.25 miles; 10.52 miles; 9.53 miles
Impaired Drainage Area:	281.51 sq. miles
Water Quality Standard Violation:	Pathogens (Single Sample Maximum, Geometric Mean)

Pollutant of Concern: Pathogens (*E. coli*)

Water Use Classification: Fish and Wildlife & Public Water Supply

Usage Related to Classification:
The two lower impaired segments are classified as Fish and Wildlife while the upper segment from US Highway 78 to its source is classified as Public Water Supply and Fish and Wildlife.

Usage of waters in the Fish and Wildlife 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.

(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 year-round and whole body water-contact recreation during the months of May through October, 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 areas and will be considered satisfactory for swimming and other whole body water-contact sports.

Usage of waters in the Public Water Supply classification is described in ADEM Admin. Code r. 335-6-10-.09(2)(a), (b), (c), and (d).

(a) Best usage of waters: source of water supply for drinking or food-processing purposes.

(b) Conditions related to best usage: the waters, if subjected to treatment approved by the Department equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to remove naturally present impurities, and which meet the requirements of the Department, will be considered safe for drinking or food-processing purposes.

(c) Other usage of waters: it is recognized that the waters may be used for incidental water contact year-round and for whole body water-contact recreation during the months of May through October, 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 areas 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 whole body water-contact recreation during the months of May through October, 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 298 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 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 for acceptable bacteria levels for the Public Water Supply use classification are described in ADEM Admin. Code R. 335-6-10-.09(2)(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. 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. In coastal waters, bacteria of the enterococci group shall not exceed a maximum of 275 colonies/100 ml in any sample.

(ii) For incidental water contact and whole body water-contact recreation during the months of May through October, 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 298 colonies/100 ml in any single 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 period at intervals not less than 24 hours. When the geometric mean bacterial 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:

One segment of Luxapallila Creek was placed on the §303(d) list for pathogens in 2016 based on data collected during 2009-2014 at station LUXL-1. Two additional segments were added to the §303(d) list in 2018 based on data collected at stations LXC-1 and LXPM-68 in 2015. At the time of the original 2016 listing, the geometric mean criterion was 126 col/100 ml and the single sample criterion was 487 col/100 ml during the months of June – September. During the months of October – May, the geometric mean criterion was 548 col/100 ml, and the single sample criterion was 2507 col/100 ml. The current criteria were in effect at the time of the 2018 listings.

E. coli sampling at ADEM monitoring stations LUXL-1, LXC-1 and LXPM-68 showed that the applicable single sample criterion was exceeded in 4 out of 17 samples, 3 out of 8 samples, and 3 out of 7 samples, respectively. At the time of listings, the source of pathogens was linked to animal feeding operations, pasture grazing, collection system failure and municipal sources. The listing data is summarized below in Table 3.

Table 3: Data for §303(d) Listing- Ambient Monitoring

Station ID	Visit Date	E. coli (col/100ml)	E. coli Detect Criteria*	Single Sample Criteria
LUXL-1	10/15/2009	920.8		2507
LUXL-1	5/13/2010	167		2507
LUXL-1	7/8/2010	98.8		487
LUXL-1	9/9/2010	2419.6	G	487
LUXL-1	3/22/2011	172.2		2507
LUXL-1	5/10/2011	193.5		2507
LUXL-1	7/12/2011	81.6	H	487
LUXL-1	9/15/2011	193.5		487
LUXL-1	5/9/2012	2419.6	G	2507
LUXL-1	7/18/2012	167	H	487
LUXL-1	9/12/2012	238.2	H	487
LUXL-1	5/1/2013	310.6	H	2507
LUXL-1	7/23/2013	551	H	487
LUXL-1	9/4/2013	142.1	H	487
LUXL-1	5/15/2014	4839.2	G	2507
LUXL-1	7/24/2014	1540.2		487
LUXL-1	9/18/2014	139.6		487
LXC-1	3/19/2015	260.3		2507
LXC-1	4/6/2015	613.1	H	2507
LXC-1	5/4/2015	91.1	H	298
LXC-1	6/2/2015	344.8	H	298
LXC-1	7/6/2015	2419.6	GH	298
LXC-1	8/4/2015	69.7	H	298
LXC-1	8/26/2015	152.9	H	298
LXC-1	10/13/2015	2419.6	GH	298
LXPM-68	4/6/2015	365.4	H	2507
LXPM-68	5/4/2015	285.1	H	298
LXPM-68	6/2/2015	866.4	H	298
LXPM-68	7/6/2015	360.9	H	298
LXPM-68	8/4/2015	129.6	H	298
LXPM-68	8/26/2015	204.6	H	298
LXPM-68	10/13/2015	387.3	H	298

*G - The actual number was probably greater than the number reported; H - The analytical holding times for analysis are exceeded.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

For purposes of this TMDL, a single sample maximum *E. coli* target of 268.2 colonies/100 ml will be used. This target was derived by using a 10% explicit margin of safety from the single sample maximum criterion of 298 colonies/100 ml. This target is considered protective of water quality standards and should not allow the single sample maximum criterion to be exceeded. In addition,

a geometric mean target of 113.4 colonies/100 ml will be used for a series of five samples taken at least 24 hours apart over the course of 30 days. This target was also derived by using a 10% explicit margin of safety from the geometric mean criterion of 126 colonies/100 ml. This target is considered protective of water quality standards and should not allow the geometric mean criterion to be exceeded.

3.2 Source Assessment

A point source can be defined as a discernible, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source contributions can typically be attributed to municipal wastewater facilities, illicit discharges, and leaking sewer systems in urban areas. Municipal wastewater treatment facilities are permitted through the National Pollutant Discharge Elimination System (NPDES) process administered by ADEM. In urban settings, sewer lines typically run parallel to streams in the floodplain. If a leaking sewer line is present, high concentrations of bacteria can flow into the stream or leach into the groundwater. Illicit discharges are found at facilities that are discharging bacteria when not permitted, or when the pathogens criterion established in the issued NPDES permit is not being upheld.

3.2.1 Continuous Point Sources in the Luxapallila Creek watershed

Currently, there are three NPDES-regulated continuous point source discharges located within the Luxapallila Creek watershed. The Millport Lagoon (AL0049115) discharges directly to Luxapalilla Creek. Winfield Lagoon (AL0023400), which is also included in the East Branch Luxapallila Creek TMDL, discharges to East Branch Luxapallila Creek. The Guin Commercial/Industrial WWTP has pathogens limitations in its permit; however, it discharges through a land application system and is not permitted to discharge to a surface water of the State. As a result, this facility will not receive an allocation in this TMDL. The current NPDES permits for Millport Lagoon and Winfield Lagoon include *E. coli* limitations equivalent to the water quality criteria, as follows:

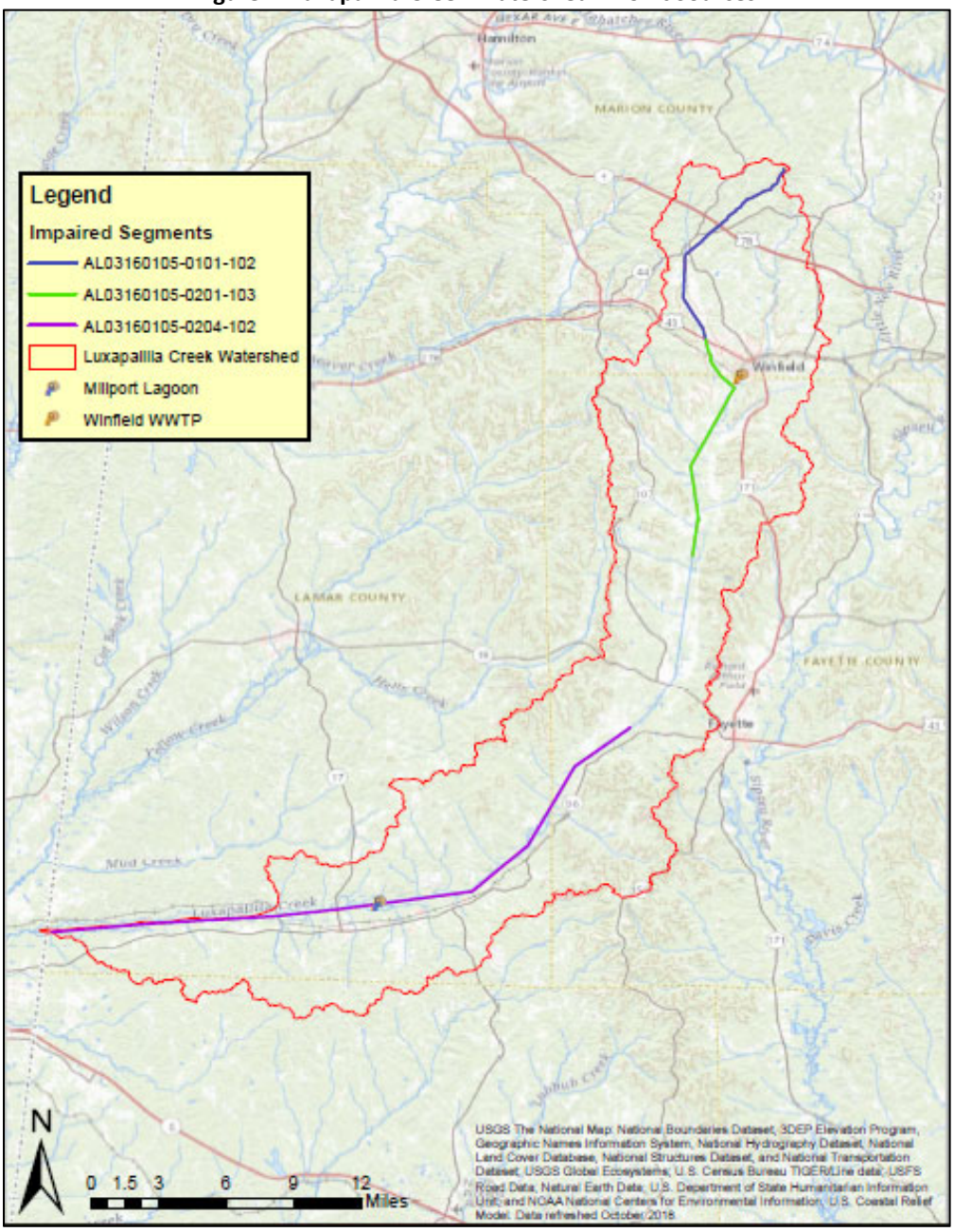
May – October (monthly average): 126 colonies/100mL
May – October (daily maximum): 298 colonies/100mL
November – April (monthly average): 548 colonies/100mL
November – April (daily maximum): 2507 colonies/100mL

Table 4 lists these facilities in the Luxapallila Creek watershed, and Figure 2 shows the locations of the sources included in the TMDL.

Table 4: Continuous NPDES Permits in the Luxapallila Creek Watershed

Facility Name	Permit Number	Program Description	Receiving Water
City of Guin - Guin Commercial/Industrial Site WWTP	AL0081337	Municipal - Land Application	N/A
Town of Millport - Millport Lagoon	AL0049115	Municipal	Luxapalilla Creek
Winfield Water Works & Sewer Board - Winfield WWTP	AL0023400	Municipal	East Branch Luxapallila Creek

Figure 2: Luxapallila Creek Watershed – Point Sources



Any future NPDES-regulated continuous discharges that are considered by the Department to be a pathogen source will be required to meet the in-stream water quality criteria for pathogens at the point of discharge.

3.2.2 Non-Continuous Point Sources in the Luxapallila Creek watershed

There are currently three individual industrial NPDES discharge permits and twenty general NPDES discharge permits within the Luxapallila Creek watershed. See Table 5 below for a list of

the non-continuous facilities located within the Luxapallila Creek watershed. None of these facilities are considered to be a source of pathogens due to the lack of process discharges and the nature of their operations. As such, no *E. coli* loading to Luxapallila Creek will be attributed to these facilities, nor will they receive an allocation in this TMDL.

Table 5: Non-Continuous Point Sources in the Luxapallila Creek Watershed

Facility Name	Permit Number	Latitude	Longitude
Brown Wood Preserving Co Inc	AL0066184	33.578611	-88.005833
Georgia-Pacific Wood Products LLC - Fayette Sawmill	AL0083798	33.647247	-87.933761
Weyerhaeuser Company NR - Millport Landfill	AL0069221	33.529167	-88.025
3M Guin - Landfill	ALG160037	34.016667	-87.825
BFI Transfer Systems of Alabama, LLC - Little Creek Transfer Station	ALG160173	33.997622	-87.843786
BNSF Railway Company - Winfield	ALG141083	33.924042	-87.820446
Cavalier Homes, Inc. dba Mario Mounding	ALG060463	33.930594	-87.839197
Dal-Tile Fayette Mfg Plant	ALG230020	33.699133	-87.875169
Georgia Pacific Wood Products LLC	ALG060268	33.672156	-87.97015
King Kutter Inc	ALG120110	33.920028	-87.818
Komatsu Mining Corporation - Winfield	ALG120425	33.920	-87.820833
Lumber Remanufacturing, Inc.	ALG060484	33.643167	-87.934861
Lumber Remanufacturing, Inc.	ALG060272	33.649757	-87.932028
Millport Lumber & Manufacturing, LLC	ALG060364	33.56546	-88.08235
MMC Materials, Inc. - Millport Plant	ALG110495	33.567	-88.0516
Moore Petroleum Company, Inc.	ALG340047	33.926539	-87.819344
Newman Specialized Carriers, Inc	ALG140617	33.650184	-87.931202
Pepsi Cola, Dr. Pepper Bottling Company	ALG140683	33.932139	-87.78775
R&T Price Oil Co., Inc.	ALG340006	33.931389	-87.810278
Ready Mix USA, LLC - Winfield	ALG110329	33.948475	-87.788991
Robertson Ready Mix	ALG110087	33.927556	-87.815222
Steel Dust Recycling LLC	ALG120690	33.566389	-88.058611
Weyerhaeuser Company NR	ALG060519	33.581361	-88.035333

The Luxapallila Creek watershed currently contains one voluntary Animal Feeding Operation (AFO) and zero Concentrated Animal Feeding Operations (CAFOs). AFOs/CAFOs are required to implement and maintain effective best management practices (BMPs) that meet or exceed Natural Resources Conservation Service (NRCS) technical standards and guidelines, and the ADEM AFO/CAFO rules currently prohibit discharges of pollutants from these facilities and their associated land application activities. As a result, current and future AFOs/CAFOs will receive a waste load allocation of zero.

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. The recent reported SSOs in the watershed can be found in Table 6 below.

Table 6: SSOs in the Luxapallila Creek watershed

Facility Name	Permit No.	Date SSO Began	Date SSO Stopped	Estimated Volume
Winfield WWTP	AL0023400	12/18/2017 8:45	12/18/2017 9:00	500
Millport Lagoon	AL0049115	1/16/2017 4:00	1/20/2017 0:00	<1000
Millport Lagoon	AL0049115	9/13/2016 5:00	9/13/2016 8:00	150
Millport Lagoon	AL0049115	3/10/2016 16:00	3/11/2016 0:00	3000

Urban areas designated as part of the Municipal Separate Storm Sewer System (MS4) program are regulated by NPDES, and as such, are considered to be point sources by EPA and receive waste load allocations (WLAs) in TMDLs. The EPA defines an MS4 as *"a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):*

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law);
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a combined sewer; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

During rain events in an urbanized watershed, stormwater runoff has the potential to collect pollutants which are transported through MS4 systems before discharging into state waters. Therefore, in 1990 the EPA developed the NPDES stormwater program, which promulgated rules, in two different phases, in order to address the potential negative water quality effects associated with stormwater runoff. In 1990, the EPA issued Phase I regulations under the NPDES stormwater program, which required both medium and large cities and also counties with populations of 100,000 or more to obtain NPDES permit coverage specifically for their stormwater discharges. In 1999, the second phase of the NPDES stormwater program amended existing regulations in addition to requiring NPDES permits for stormwater discharges from certain small MS4 systems.

There are currently no MS4 areas within the Luxapallila Creek watershed. Any future MS4 stormwater discharges will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

3.2.3 Nonpoint Sources in the Luxapallila Creek Watershed

Nonpoint sources of bacteria do not have a defined discharge point, but rather occur over the entire length of a stream or waterbody. On the land surface, bacteria can accumulate over time and be washed into streams or waterbodies during rain events. Therefore, there is some net loading of bacteria into streams as dictated by the watershed hydrology.

Agricultural land is commonly a source of *E. coli* bacteria. Runoff from pastures, animal feeding areas, improper land application of animal wastes, and animals with direct access to streams are all mechanisms that can contribute 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, turkey, waterfowl, etc. Wildlife will 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 developed areas is potentially attributable to multiple sources including storm water runoff, unpermitted discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, sewer overflows, and domestic animals. On-site 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 due to system failures and malfunctions.

3.3 Land Use Assessment

Land use percentages for the Luxapallila Creek watershed were determined from the 2016 National Land Cover Dataset (NLCD). The total drainage area of the Luxapallila Creek watershed in Alabama is approximately 281.51 square miles. Table 7 lists the various land uses and their associated percentages for the Luxapallila Creek watershed. A pie chart illustrating the major cumulative land use types for the Luxapallila Creek watershed is shown in Figure 3.

Table 7: Luxapallila Creek Watershed Landuse (2016 NLCD)

2011 NLCD Land Cover	NLCD Legend	Area (miles ^{2})	Percentage (%)
Open Water	11	0.76587	0.27%
Developed, Open Space	21	13.64184	4.85%
Developed, Low Intensity	22	2.90191	1.03%
Developed, Medium Intensity	23	0.99417	0.35%
Developed, High Intensity	24	0.30614	0.11%
Barren Land	31	0.38328	0.14%
Deciduous Forest	41	57.38725	20.40%
Evergreen Forest	42	36.36121	12.92%
Mixed Forest	43	61.18534	21.75%
Shrub/Scrub	52	22.35346	7.95%
Herbaceous	71	17.49066	6.22%
Hay/Pasture	81	29.94408	10.64%
Cultivated Crops	82	2.62773	0.93%
Woody Wetlands	90	32.18922	11.44%
Emergent Herbaceous Wetlands	95	2.81573	1.00%
Cumulative Land Cover	**NLCD Legend**	**Area (miles ^{2})**	**Percentage (%)**
Open Water	11	0.77	0.27%
Developed	21,22,23,24	17.84	6.34%
Barren Land	31	0.38	0.14%
Forested	41,42,43	154.93	55.07%
Grassland/Shrub	52,71	39.84	14.16%
Agriculture	81,82	32.57	11.58%
Wetlands	90,95	35.00	12.44%

Figure 3: Luxapallila Creek Watershed Cumulative Land Use

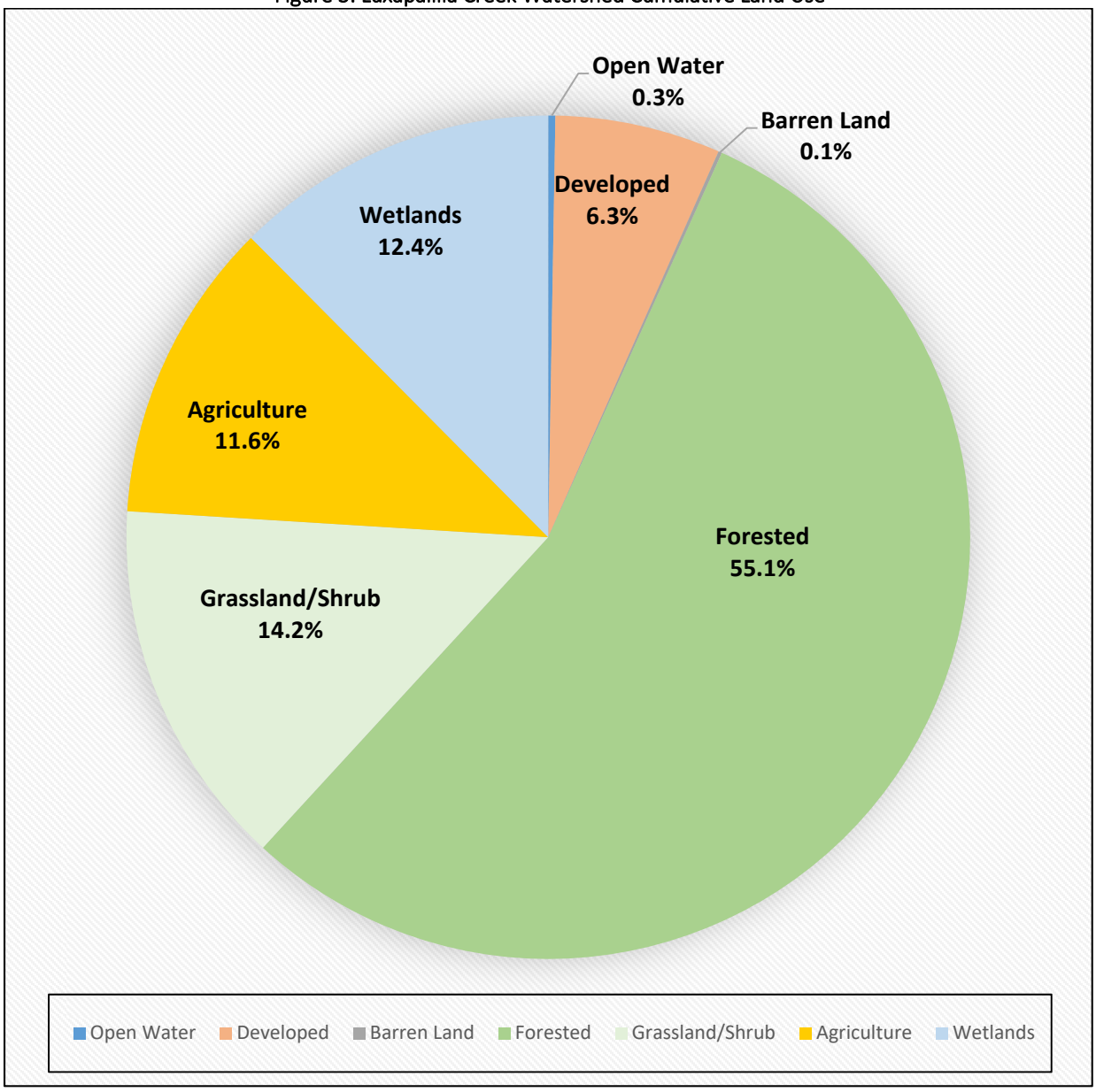
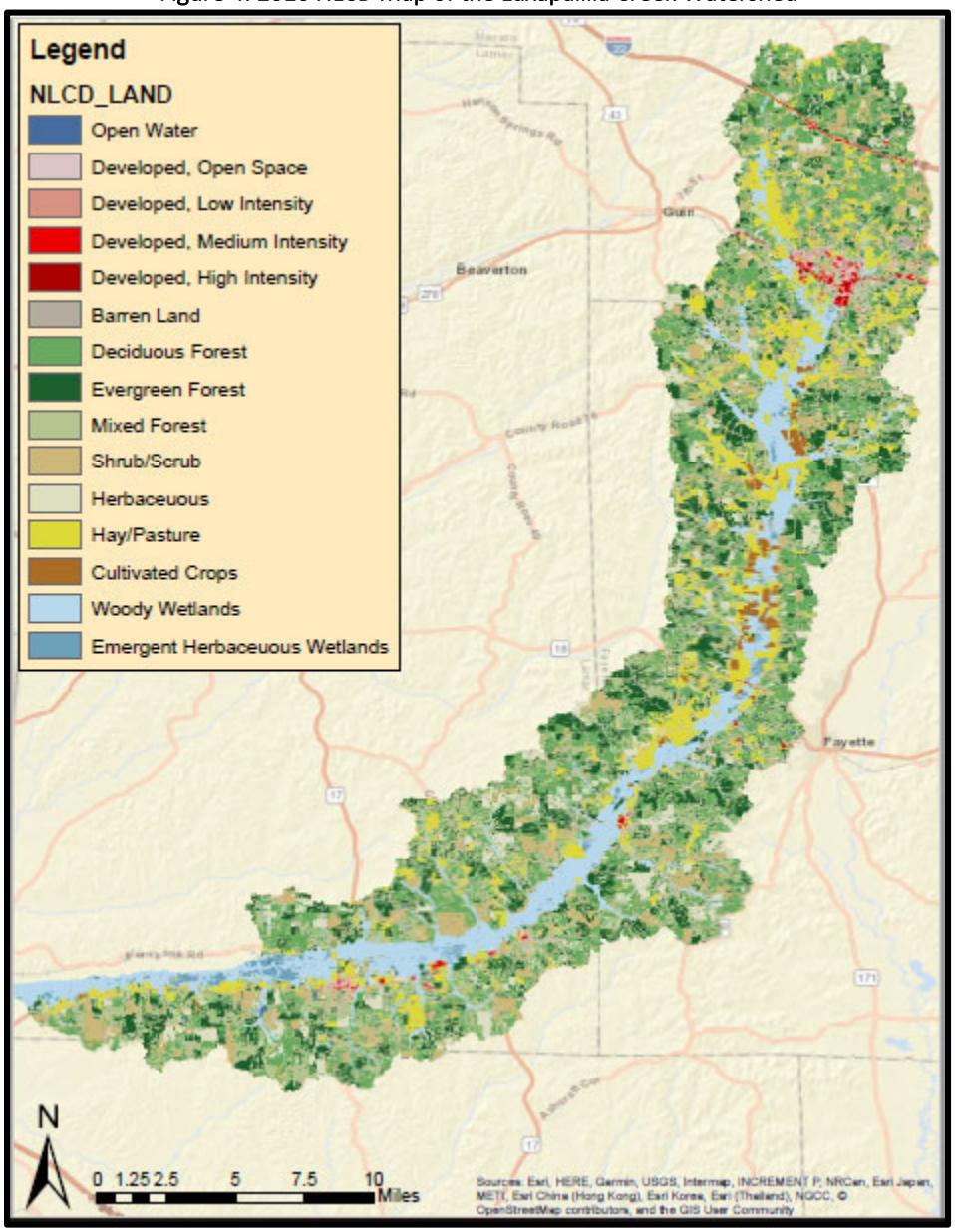


Figure 4: 2016 NLCD Map of the Luxapallila Creek Watershed



As can be seen from an inspection of the table and map above, forested land is the predominant land use in the watershed at 55 percent. Grassland/shrub covers approximately 14 percent, wetlands cover approximately 12 percent, and agriculture covers approximately 11 percent of the watershed. Developed land, which covers approximately 6 percent of the watershed, represents both commercial and residential urbanized land uses, and includes the following individual land use categories: Developed – Open Space, Developed – Low Intensity, Developed – Medium Intensity, and Developed – High Intensity.

3.4 Linkage between Numeric Targets and Sources

The dominant land use coverage in the Luxapallila Creek watershed is forested/natural, followed by agriculture. Pollutant loadings from forested areas tend to be low due to their filtering capabilities and will be considered as background conditions. The most likely sources of pathogen loadings in Luxapallila Creek are from agriculture, illicit discharges, unpermitted discharges of wastewater, and failing septic systems. It is not considered a logical approach to calculate individual components for nonpoint source loadings. Hence, there will not be individual loads or reductions calculated for the various nonpoint sources. The loadings and reductions will only be calculated as a single total nonpoint source load and reduction.

3.5 Data Availability and Analysis

LUXL-1 is a trend station on Luxapallila Creek that has been sampled by ADEM each year for the past several years. For purposes of this TMDL, the 2015-2019 data at station LUXL-1 will be used to assess the water quality of Luxapallila Creek for segment AL03160105-0204-102, while 2015 data from stations LXC-1 and LXPM-68 will be used for segments AL03160105-0201-103 and AL03160105-0101-102, because it is the most recent data and provides the best picture of the current water quality conditions of the stream. The 2020 edition of *Alabama's Water Quality Assessment and Listing Methodology*, prepared by ADEM, provides the rationale for the Department to use the most recent data to prepare a TMDL for an impaired waterbody.

In 2019, ADEM conducted two intensive bacteria studies for the Luxapallila Creek watershed at station LUXL-1. Each intensive bacteria study consisted of collecting at least five *E. coli* bacteria samples over a thirty day time window, with a minimum of 24 hours between each sample collection. A geometric mean was calculated from each intensive bacteria study. The individual samples from 2015-2019 and geometric means from 2019 were evaluated against the applicable *E. coli* bacteria criteria for Luxapallila Creek.

A total of 30 *E. coli* samples were collected at station LUXL-1 during 2015-2019. Of the 30 *E. coli* samples, nine samples exceeded the single sample maximum criterion of 298 colonies/100 ml. Intensive bacteria studies were performed during the months of June/July and September/October at station LUXL-1. Both of the *E. coli* geometric means violated the criterion of 126 colonies/100 ml. In addition, in 2015, three of eight samples at LXC-1 and three of seven samples at LXPM-68 exceeded the singe sample maximum criterion of 298 colonies/100 ml. A summary of the *E. coli* results is provided below in Table 9. All *E. coli* criteria exceedances are highlighted in red.

Table 8: TMDL Station Descriptions

Station	Agency	Latitude	Longitude	Description
LUXL-1	ADEM	33.575	-88.0834	Luxapallila Creek at AL Highway 17 in Millport
LXC-1	ADEM	33.8896	-87.8401	Luxapallila Creek at unnamed Fayette Co. Rd (Bobo Rd.)
LXPM-68	ADEM	33.927262	-87.843418	Marion Co. Rd. 69 at Winfield (SE 1/4)

Figure 5: ADEM TMDL Sampling Stations on Luxapallila Creek

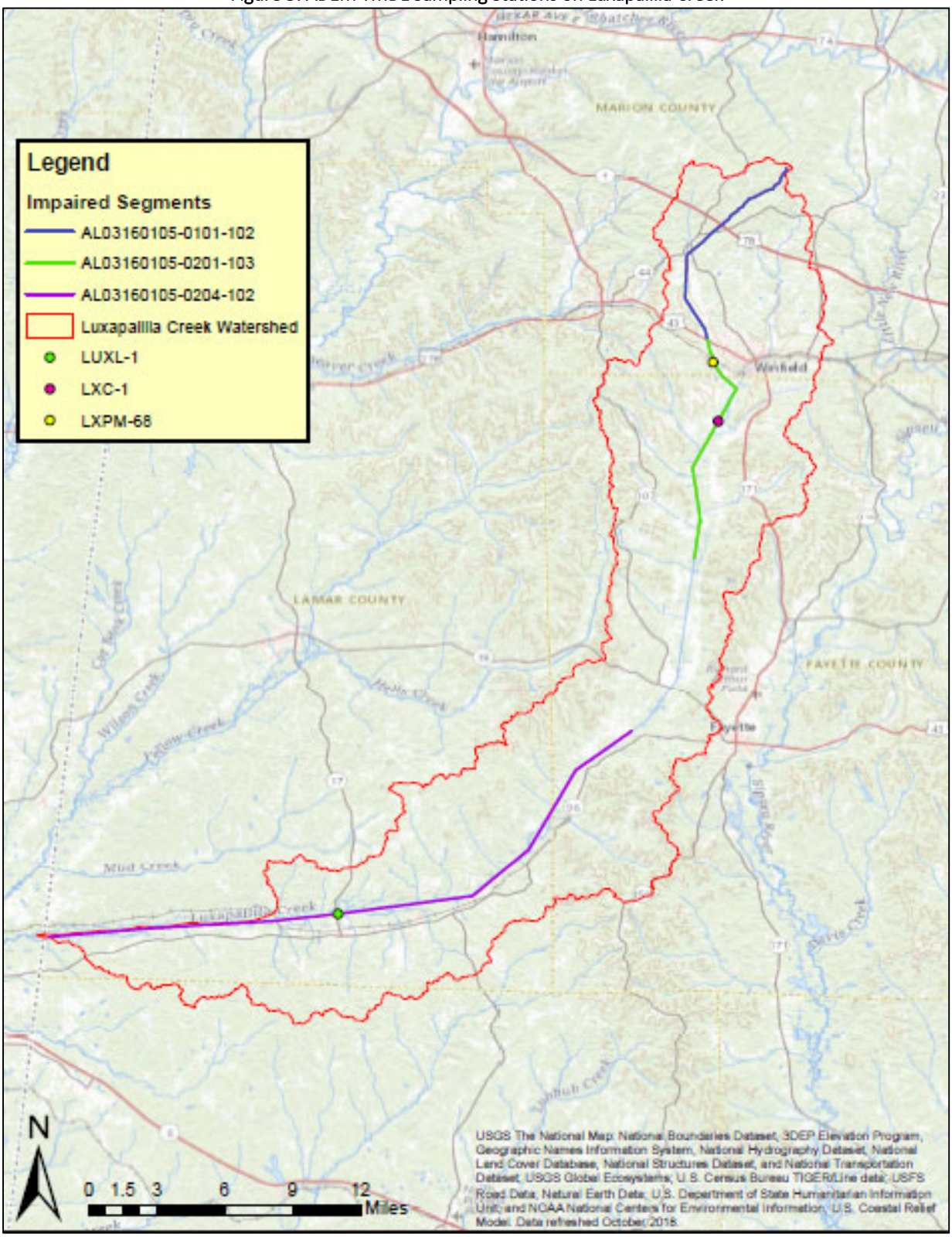


Table 9: 2015 - 2019 *E. coli* Data for Luxapallila Creek

Station ID	Visit Date	E. coli (col/100ml)	E. coli Detect Criteria+	Single Sample Criteria	Flow (cfs)	Flow Measured	Geometric Mean Calculation
LUXL-1	3/19/2015	214.3		2507	807.4	No*	
LUXL-1	4/6/2015	261.3	H	2507	620.3	No*	
LUXL-1	5/4/2015	78.8	H	298	469.5	No*	
LUXL-1	6/2/2015	325.5	H	298	426.7	No*	
LUXL-1	7/6/2015	1553.1	H	298	625.6	No*	
LUXL-1	8/4/2015	68.3	H	298	69.4	Yes - ADEM	
LUXL-1	8/26/2015	201.4	H	298	598.9	No*	
LUXL-1	10/13/2015	162.4	H	298	86.1	Yes - ADEM	
LUXL-1	5/9/2016	186	H	298	276.5	No*	
LUXL-1	7/11/2016	261.3	H	298	56.1	No*	
LUXL-1	9/5/2016	143.9	H	298	68.6	Yes - ADEM	
LUXL-1	5/2/2017	1034.4		298	232.6	No*	
LUXL-1	8/1/2017	133.3		298	76.6	Yes - ADEM	
LUXL-1	10/17/2017	461.1		298	113.8	Yes - ADEM	
LUXL-1	5/2/2018	261.3		298	388.8	No*	
LUXL-1	7/11/2018	410.6		298	180.2	No*	
LUXL-1	10/23/2018	167	H	298	63.4	Yes - ADEM	
LUXL-1	5/14/2019	770.1	H	298	3133.5	No*	
LUXL-1	6/13/2019	166.4		298	127.3	Yes - ADEM	226.45
LUXL-1	6/24/2019	131.4		298	129.6	Yes - ADEM	
LUXL-1	7/1/2019	172.5		298	105.9	Yes - ADEM	
LUXL-1	7/9/2019	727		298	86.1	Yes - ADEM	
LUXL-1	7/10/2019	172.5	H	298	78.1	No*	
LUXL-1	7/11/2019	285.1		298	150.8	Yes - ADEM	
LUXL-1	9/3/2019	488.4	H	298	163.6	No*	276.43
LUXL-1	9/5/2019	410.6		298	96.5	Yes - ADEM	
LUXL-1	9/17/2019	272.3		298	67.7	Yes - ADEM	
LUXL-1	9/23/2019	206.4		298	71.9	Yes - ADEM	
LUXL-1	9/26/2019	151.5		298	74.6	Yes - ADEM	
LUXL-1	10/1/2019	261.3		298	68	Yes - ADEM	
LXC-1	3/19/2015	260.3		2507	87.2	Yes - ADEM	
LXC-1	4/6/2015	613.1	H	2507	101.5	Yes - ADEM	
LXC-1	5/4/2015	91.1	H	298	51.6	Yes - ADEM	
LXC-1	6/2/2015	344.8	H	298		No	
LXC-1	7/6/2015	2419.6	GH	298	31.5	Yes - ADEM	
LXC-1	8/4/2015	69.7	H	298	13.1	Yes - ADEM	

LXC-1	8/26/2015	152.9	H	298	38.4	Yes - ADEM	
LXC-1	10/13/2015	2419.6	GH	298	18.4	Yes - ADEM	
LXPM-68	4/6/2015	365.4	H	2507	67.7	Yes - ADEM	
LXPM-68	5/4/2015	285.1	H	298	24	Yes - ADEM	
LXPM-68	6/2/2015	866.4	H	298	21.3	Yes - ADEM	
LXPM-68	6/9/2015				15.3	Yes - ADEM	
LXPM-68	7/6/2015	360.9	H	298	27.9	Yes - ADEM	
LXPM-68	8/4/2015	129.6	H	298	8.2	Yes - ADEM	
LXPM-68	8/26/2015	204.6	H	298	21.3	Yes - ADEM	
LXPM-68	10/13/2015	387.3	H	298	11.8	Yes - ADEM	

* Flows were estimated using a ratio from USGS 0243500 (Luxapallila Creek near Columbus MS) and a correlation value calculated from the measured values versus the ratioed values.

+ G - The actual number was probably greater than the number reported; H - The analytical holding times for analysis are exceeded.

3.6 Critical Conditions/Seasonal Variation

Critical conditions typically occur during the summer months (May-October). This can be explained by the nature of storm events in the summer versus the winter. In summer, periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off of bacteria into streams, resulting in spikes of 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.

The impaired portion of Luxapallila Creek generally follows the trends described above for the summer months of May through October. The critical condition for this pathogen TMDL was taken to be the one with the highest *E. coli* single sample exceedance value. The use of the highest exceedance to calculate the TMDL is expected to be protective of water quality in Luxapallila Creek year-round.

3.7 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the TMDL analysis: 1) by implicitly incorporating 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.

The MOS accounts for the uncertainty associated with the limited availability of data used in this analysis. An explicit MOS was applied to this TMDL by reducing the appropriate target criterion concentration by ten percent and calculating a mass loading target with measured flow data. The single sample *E. coli* maximum value of 298 colonies/100 ml was reduced by 10% to 268.2 colonies/100 ml, while the geometric mean criterion was reduced in the same fashion to 113.4 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 (WLAs) for point sources, 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:

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

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

A mass balance approach was used to calculate the pathogen TMDL for Luxapallila Creek. The mass balance approach utilizes the conservation of mass principle. Total mass loads can be calculated by multiplying the *E. coli* concentration times the in-stream flow times a conversion factor. Existing loads were calculated for the highest geometric mean sample exceedance and the highest single sample exceedance. In the same manner, allowable loads were calculated for both the single sample criterion of 298 col/100 ml and the geometric mean criterion of 126 col/100 ml. The TMDL was based on the violation that produced the highest percent reduction of *E. coli* loads necessary to achieve applicable water quality criteria, whether it be the single sample or geometric mean.

Existing Conditions

The **single sample** mass loading was calculated by multiplying the highest *E. coli* single sample exceedance concentration by the measured flow on the day of the exceedance. For example, the calculation for the existing condition for segment AL03160105-0201-103 was based on the measurements at LXC-1 on July 6, 2015. The product of the concentration, measured flow, and a conversion factor gives the total mass loading (colonies per day) of *E. coli* to Luxapallila Creek under the single sample exceedance condition.

$$\frac{31.5\ \text{ft}^3}{\text{s}} \times \frac{2419.6\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.86 \times 10^{12}\text{colonies}}{\text{day}}$$

The **geometric mean** mass loading was calculated by multiplying the highest geometric mean exceedance concentration by the average of the six measured stream flows. As an example, a

geometric mean for segment AL03160105-0204-102 was calculated based on measurements at LUXL-1 between September 3, 2019 and October 1, 2019. The average stream flow was determined to be 90.38 cfs. The product of these two values times the conversion factor gives the total mass loading (colonies per day) of *E. coli* to Luxapallila Creek under the geometric mean exceedance condition.

$$\frac{90.38\ \text{ft}^3}{\text{s}} \times \frac{276.43\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{6.11 \times 10^{11}\text{colonies}}{\text{day}}$$

The **point source** mass loading was calculated by multiplying the average discharge flow for the month of July 2015 (since this was when the highest exceedances occurred at both LXC-1 and LUXL-1) by the maximum reported *E. coli* concentration for the same month and the conversion factor. A loading was calculated for each point source included in the TMDL. The flows and *E. coli* concentrations were found on the July 2015 discharge monitoring reports (DMRs) submitted by the facilities.

Winfield WWTP (AL0023400):

$$0.2611\ \text{MGD} \times \frac{1.55\ \text{ft}^3}{\text{s} \times \text{MGD}} \times \frac{2420\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.39 \times 10^{10}\text{colonies}}{\text{day}}$$

Millport Lagoon (AL0049115):

$$0.09\ \text{MGD} \times \frac{1.55\ \text{ft}^3}{\text{s} \times \text{MGD}} \times \frac{3\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.02 \times 10^{7}\text{colonies}}{\text{day}}$$

Allowable Conditions

The **allowable load** to the watershed was calculated under the same physical conditions as discussed above for the single sample and geometric mean criteria. This was done by taking the product of the measured flow for the violation event, the allowable concentration, and the conversion factor.

As an example, for the **single sample** *E. coli* target concentration of 268.2 colonies/100 ml, the allowable *E. coli* loading for segment AL03160105-0201-103 is:

$$\frac{31.5\ \text{ft}^3}{\text{s}} \times \frac{268.2\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.07 \times 10^{11}\text{colonies}}{\text{day}}$$

The explicit margin of safety of 29.8 colonies/100 ml equals a daily loading of:

$$\frac{31.5\ \text{ft}^3}{\text{s}} \times \frac{29.8\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.30 \times 10^{10}\text{colonies}}{\text{day}}$$

For the **geometric mean** *E. coli* target concentration of 113.4 colonies/100 ml, the allowable *E. coli* loading for segment AL03160105-0204-102 is:

$$\frac{90.38\ ft^3}{s} \times \frac{113.4\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100mL * s}{ft^3 * day} = \frac{2.51 \times 10^{11} colonies}{day}$$

The explicit margin of safety of 12.6 colonies/100 ml equals a daily loading of:

$$\frac{90.38\ ft^3}{s} \times \frac{12.6\ colonies}{100\ mL} \times \frac{24{,}465{,}755 * 100\ mL * s}{ft^3 * day} = \frac{2.79 \times 10^{10} colonies}{day}$$

The **point source** allowable loading was calculated by multiplying the design flow of each facility by their *E. coli* daily maximum permit limitation of 298 colonies/100 ml and the conversion factor.

Winfield WWTP (AL0023400):

$$1.0\ \text{MGD} \times \frac{1.55\ \text{ft}^3}{\text{s} \times \text{MGD}} \times \frac{298\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.13 \times 10^{10}\text{colonies}}{\text{day}}$$

Millport Lagoon (AL0049115):

$$0.21\ \text{MGD} \times \frac{1.55\ \text{ft}^3}{\text{s} \times \text{MGD}} \times \frac{298\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.37 \times 10^{9}\text{colonies}}{\text{day}}$$

The difference between the existing conditions (violation event) and the allowable conditions converted to a percent reduction represents the total load reduction needed to achieve the *E. coli* water quality criteria. Tables 10-1, 10-2, and 10-3 below depict the existing and allowable *E. coli* loads and required reductions for the Luxapallila Creek watershed.

Table 10-1: *E. coli* Loads and Required Reductions for AL03160105-0101-102 at LXPM-68

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	4.51×10^{11}	1.40×10^{11}	3.12×10^{11}	69%

Table 10-2: *E. coli* Loads and Required Reductions for AL03160105-0201-103 at LXC-1

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	1.86×10^{12}	2.07×10^{11}	1.66×10^{12}	89%
Point Source Load (Winfield WWTP)*	2.39×10^{10}	1.13×10^{10}	1.26×10^{10}	53%

*Point source existing load is based on the reported discharge values during the month of the highest in-stream *E. coli* exceedance, and allowable load is based on permit limits during the month of the highest in-stream *E. coli* exceedance. It is noted that changes to the permit limits are not required; compliance with the existing permit limits will result in compliance with the TMDL.

Table 10-3: *E. coli* Loads and Required Reductions for AL03160105-0204-102 at LUXL-1

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	2.38×10^{13}	4.11×10^{12}	1.97×10^{13}	83%
Geometric Mean Load	6.11×10^{11}	2.51×10^{11}	3.60×10^{11}	59%
Point Source Load (Millport Lagoon)*	1.02×10^{7}	2.37×10^{9}	0	0%

*Point source existing load is based on the reported discharge values during the month of the highest in-stream *E. coli* exceedance, and allowable load is based on permit limits during the month of the highest in-stream *E. coli* exceedance.

The TMDL, WLA, LA and MOS values necessary to achieve the applicable *E. coli* criteria for each segment are provided in Tables 11-1, 11-2, and 11-3 below.

Table 11-1: *E. coli* TMDL for AL03160105-0101-102 at LXPM-68

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
1.55×10^{11}	1.55×10^{10}	NA	NA	0	1.40×10^{11}	69%

Note: NA = not applicable
a. Existing and future AFOs/CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLA for WWTPs is expressed as a daily maximum. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
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 maximum criterion of 298 colonies/100 ml.

Table 11-2: *E. coli* TMDL for AL03160105-0201-103 at LXC-1

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
2.30×10^{11}	2.30×10^{10}	1.13×10^{10}	NA	0	1.96×10^{11}	89%

Note: NA = not applicable
a. Existing and future AFOs/CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLA for WWTPs is expressed as a daily maximum. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
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 maximum criterion of 298 colonies/100 ml.

Table 11-3: *E. coli* TMDL for AL03160105-0204-102 at LUXL-1

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
4.56×10^{12}	4.56×10^{11}	2.37×10^{9}	NA	0	4.10×10^{12}	83%

Note: NA = not applicable
a. Existing and future AFOs/CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLA for WWTPs is expressed as a daily maximum. Future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
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 maximum criterion of 298 colonies/100 ml.

4.3 TMDL Summary

One segment of Luxapallila Creek was first included on the §303(d) list for pathogens in 2016 based on data collected by ADEM from 2009 - 2014 at ADEM trend station LUXL-1. An additional two segments were then added in 2018 based on data collected in 2015 from ADEM stations LXC-1 and LXPM-68. Between 2015 and 2019, sampling studies were performed by ADEM on Luxapallila Creek to further assess the water quality of the impaired stream. This data confirmed the pathogen impairment and provided the basis for TMDL development.

A mass balance approach was used to calculate the *E. coli* TMDL for Luxapallila Creek. Based on the TMDL analysis, it was determined that *E. coli* reductions of 63%, 89%, and 83% for segments

AL03160105-0101-102, AL03160105-0201-103, and AL03160105-0204-102, respectively, were necessary to achieve compliance with applicable water quality standards.

Compliance with the terms and conditions of existing and future NPDES sanitary and storm water 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 will be implemented through voluntary measures/best management practices (BMPs). Cooperation and active participation by the general public and various other groups is critical to successful implementation of TMDLs. Local citizen-led and implemented management measures offer the most efficient and comprehensive avenue for reduction of loading rates from nonpoint sources. Therefore, TMDL implementation activities for nonpoint sources will be coordinated through interaction with local entities and may be eligible for CWA §319 grants through the Department's Nonpoint Source Unit.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria, and we are committed to targeting the load reductions to improve water quality in the Luxapallila Creek watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

5.0 Follow-up Monitoring

ADEM has adopted a statewide approach to water quality management. Each year, ADEM's water quality resources are divided among multiple priorities statewide including §303(d) listed waterbodies, waterbodies with active TMDLs, and other waterbodies as determined by the Department. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices and load reductions in the watershed.

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 requested to be on ADEM's postal and electronic mailing distributions. In addition, the public notice and subject TMDL were made available on ADEM's website: www.adem.alabama.gov. The public could also request paper or electronic copies of the TMDL by contacting Ms. Kimberly Minton at 334-271-7826 or kminton@adem.alabama.gov. 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 final completion of this TMDL and subsequent submission to EPA Region 4 for final approval.

7.0 Appendices

7.1 References

ADEM Administrative Code, 2017. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2017. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's Monitoring Program. 2009-2019. ADEM.

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, 2020.

Alabama's §303(d) List and Fact Sheet. 2016, 2018. ADEM.

Alabama Department of Environmental Management (ADEM), Laboratory Data Qualification SOP #4910 Revision 6.2, 2016.

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

United States Environmental Protection Agency, 1986. Quality Criteria for Water. Office of Water. EPA 440/4-91-001.

7.2 Luxapallila Creek Watershed Photos

Figure 6: At LUXL-1: Upstream View of Luxapallila Creek

Figure 7: At LUXL-1: Downstream View of Luxapallila Creek

Figure 8: At LXC-1: Upstream View of Luxapallila Creek (8/4/2015)

Figure 9: At LXC-1: Downstream View of Luxapallila Creek (8/4/2015)

Figure 10: At Station LXPM-68: Upstream View of Luxapallila Creek (6/9/2015)

Figure 11: At Station LXPM-68: Downstream View of Luxapallila Creek (6/9/2015)