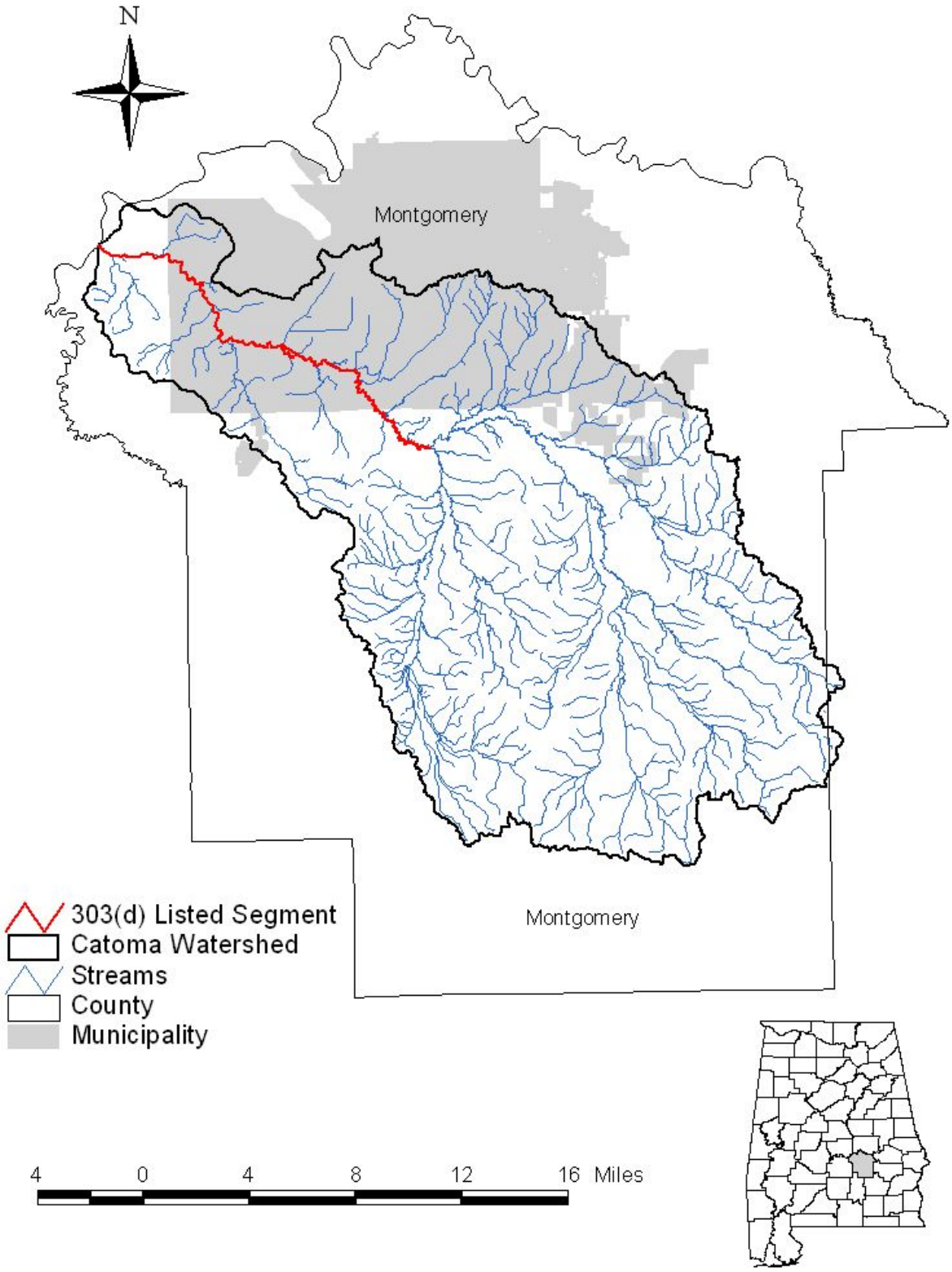
# FINAL

## Total Maximum Daily Load (TMDL)
## for
## Catoma Creek
## Assessment Unit ID # AL03150201-0309-100
## Pathogens (fecal coliform)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
September 2009

**Figure I. §303(d) Listed Portion of Catoma Creek in the Alabama River Basin**



# Table of Contents



## *List of Figures*

## *List of Tables*

# *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).

Catoma Creek is located in the Alabama River basin of central Alabama. Catoma Creek originates in southeastern Montgomery County and flows northwest through Montgomery County into Woodruff Reservoir located west of the city of Montgomery, Alabama. The pathogens listed portion of Catoma Creek is from the Alabama River upstream to Ramer Creek. This 23.2 mile segment was first placed on the State of Alabama's §303(d) use impairment list for pathogens in 2002. The source of the pathogens was listed as urban runoff/storm sewers and pasture grazing. The listed segment of Catoma Creek has the designated use classification of Fish and Wildlife. This segment of the Catoma Creek also has a approved Final Organic Enrichment/Dissolved Oxygen (OE/DO) TMDL. Only the pathogen impairment will be addressed in this TMDL.

Data collected in 2000 and 2001 by the Alabama Department of Environmental Management (ADEM) indicated that Catoma Creek was impaired due to pathogens (fecal coliform). A total of 52 samples were collected from May 2000 through January 2001. Nine out of 52 samples exceeded the 2000 colonies/100 mL single sample criterion for fecal coliform. In addition, Catoma Creek was subsequently sampled by ADEM at multiple locations in 2005 and 2006.

A mass balance approach was used to calculate the fecal coliform TMDL for Catoma Creek. The mass balance approach utilizes the conservation of mass principle. Total existing mass loads were calculated by multiplying the fecal coliform concentration times the corresponding stream flow. Mass 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 2000 col/100ml and the geometric mean criterion of 200 col/100ml. The TMDL was based on the violation that produced the highest percent reduction of fecal coliform loads necessary to achieve applicable water quality criteria, whether it be the single sample or geometric mean criterion. Table 1-1 shows the results of the fecal coliform TMDL and percent reductions for each criterion.

**Table 1-1. 2005 Fecal Coliform Loads and Required Reductions**

| Source | Existing Load (colonies/day) | Allowable Load (colonies/day) | Required Reduction (colonies/day) | Reduction % |
|---|---|---|---|---|
| NPS Load Single Sample | 3.02E+13 | 1.03E+13 | 1.99E+13 | 66% |
| NPS Load Geometric Mean | 2.13E+12 | 8.35E+11 | 1.29E+12 | 61% |

From Table 1-1, compliance with the single sample criterion of 2000 col/100ml requires the greatest reduction in fecal coliform load. Therefore the TMDL will be based on the single sample criterion. The TMDL values for the geometric mean criterion are provided in Table 1-2 below.

**Table 1-2. 2005 Coliform Loads and Required Reductions**

| Source | Existing Load (colonies/day) | Allowable Load (colonies/day) | Required Reduction (colonies/day) | Reduction % |
|---|---|---|---|---|
| Nonpoint Source | 3.02E+13 | 1.03E+13 | 1.99E+13 | 66% |
| Point Source | 6.01E+08 | 7.57E+08 | 0.00E+00 | 0% |

Allowable loading was derived by taking the streamflow which occurred at Station CATM-5 on August 17, 2005, and multiplying it times the fecal coliform single sample criterion target of 1800 colonies/100 mL (2000 colonies/100 mL – 10% Margin of Safety). Reductions needed in meeting allowable loading were then determined by subtracting allowable loading from existing loading. Table 1-2 summarizes the existing loads, allowable loads, and required reductions needed to meet applicable water quality pathogen single sample criterion for Catoma Creek. Table 1-3 lists required TMDL pathogen loadings under critical streamflow conditions for Catoma Creek.

**Table 1-3. Fecal Coliform TMDL for Catoma Creek**

| TMDL | 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) |
| 1.14E+13 | 1.14E+12 | 7.57E+08 | 66% | 0 | 1.03E+13 | 66% |

a. Both existing and future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLAs for WWTPs are expressed as a daily maximum. Future WWTPs must meet the applicable instream 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 fecal coliform loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for fecal coliform.

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 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 towards targeting the load reductions to improve water quality in the Catoma Creek 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 the 23.19 mile segment of the Catoma Creek from the Alabama River to Ramer Creek in Montgomery County as being impaired by pathogens (fecal coliform). The §303(d) listing was originally reported on Alabama's 2002 List of Impaired Waters, and subsequently included on the 2004, 2006, and 2008 lists. The source of the impairment is listed as urban runoff/storm sewers agriculture on the 2008 §303(d) list.

## *2.2 Problem Definition*

| | |
|---|---|
| Waterbody Impaired: | Catoma Creek from Alabama River to Ramer Creek. |
| Waterbody Length: | 23.19 miles |
| Waterbody Drainage Area: | 358 square miles |

| | |
|---|---|
| Water Quality Standard Violation: | Fecal Coliform (single sample)<br>Fecal Coliform (geometric mean) |
| Pollutant of Concern: | Pathogens (fecal coliform) |
| Water Use Classification: | Fish and Wildlife |

Usage Related to Classification:
The impaired segment of Catoma Creek 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.*

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

*7. Bacteria:*

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

*(ii) For incidental water contact and recreation during June through September, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean fecal coliform organism density does not exceed 200 colonies/100 mL in non-coastal waters. In*

*coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 mL nor exceed a maximum of 158 colonies/100 mL in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric bacterial coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole body water-contact sports.*

Criteria Exceeded:
Water quality data collected by the Alabama Department of Environmental Management (ADEM) in 2000 and 2001 was used for listing Catoma Creek on Alabama's 2002 §303(d) list. At the time of the listing, waters in which less than or equal to 10% of the samples collected over a five year period exceed 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 a 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 exceed 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.

ADEM collected data on Catoma Creek for the period May 2000 through January 2001. According to the 2002 §303(d) list fact sheet, Catoma Creek was listed as impaired based on 9 out of 52 samples collected by ADEM in 2000-2001, exceeding the 2000 colonies/100 mL single sample criterion for fecal coliform bacteria.

# *3.0 Technical Basis for TMDL Development*

## *3.1 Water Quality Target Identification*

For the purpose of this TMDL a single sample fecal coliform target of 1800 colonies/100 mL will be used. This target was derived by using a 10% explicit margin of safety from the single sample of 2000 colonies/100 mL criterion. This target should not allow the geometric mean of 200 colonies/100 mL or the single sample maximum of 2000 colonies/100 mL to be exceeded.

## *3.2 Source Assessment*

### 3.2.1 Point Sources in the Catoma Creek Watershed

*Continuous Point Sources*

As of April 01, 2009, the Pike Road Plantation wastewater treatment facility represents the only NPDES permitted point source within the Catoma Creek watershed as presented in Table 3-1 below. Figure 3-1 shows the location of the Pike Road Plantation facility as well as the Catoma Creek WWTP and Green Lantern Restaurant Lagoon which were previously permitted to discharge within the Catoma Creek watershed. Catoma Creek WWTP did discharge directly into the pathogen listed segment of Catoma Creek before being relocated to the Alabama River. The Green Lantern Restaurant and Lagoon which previously discharged to a tributary in the upper unlisted portion of the watershed no longer exist. The one remaining facility, Pike Road Plantation, discharges to a tributary which does flow into the upper watershed located upstream of the pathogen listed segment of Catoma Creek. The facility's NPDES permit stipulates a 200 colonies/100 mL monthly average and 2000 colonies/100 mL daily maximum fecal coliform limit for June through September along with a 1000 colonies/100 mL monthly average and 2000 colonies/100 mL daily maximum fecal coliform permit limit for October through May.

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.

**Table 3-1 Continuous discharges located in the Catoma Creek Watershed**

| Type | NPDES # | Facility Name | Stream | Flow (MGD) |
|---|---|---|---|---|
| Municipal | AL0059561 | Pike Road Plantation | Little Catoma Creek UT | 0.10 |

*Non-Continuous Point Sources*

A significant portion of the Catoma Creek watershed is classified as a Municipal Separate Stormwater Sewer System (MS4) area and therefore must be addressed in the TMDL as part of the Wasteload Allocation (WLA). Portions of the Catoma Creek watershed are within the boundary of the Montgomery Area Phase I MS4 (ALS000004) in addition to the Montgomery Area Phase II MS4 (ALR040015) area. Figure 3-2 identifies the coverage areas of both Phase I and Phase II MS4 areas in the Catoma Creek watershed. The greater part of the Montgomery Area Phase I MS4 can be seen as overlapping the Area Phase II MS4. Contributions from the both MS4 Phase I and Phase II that drain to the pathogen impaired segment of Catoma Creek watershed will be considered as point sources and allocated as MS4 WLAs in the TMDL.

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 review of ADEM files it was determined that numerous SSOs have occurred in the Catoma Creek watershed and therefore would be considered a source of pathogens to Catoma Creek.

As of April 01, 2009, Montgomery Stockyard Inc. and Brown Poultry Farm are the only permitted Concentrated Animal Feeding Operations (CAFOs) within the Catoma Creek

watershed as presented in Table 3-2 below. Future CAFOs will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

**Table 3-2 CAFOs located in the Catoma Creek Watershed**

| Type | Permit # | Facility Name |
|---|---|---|
| CAFO | A000327 | Montgomery Stockyard Inc. |
| CAFO | A000460 | Brown Poultry Farm |

**Figure 3-1. NPDES Permitted Point Sources in the Catoma Creek Watershed**

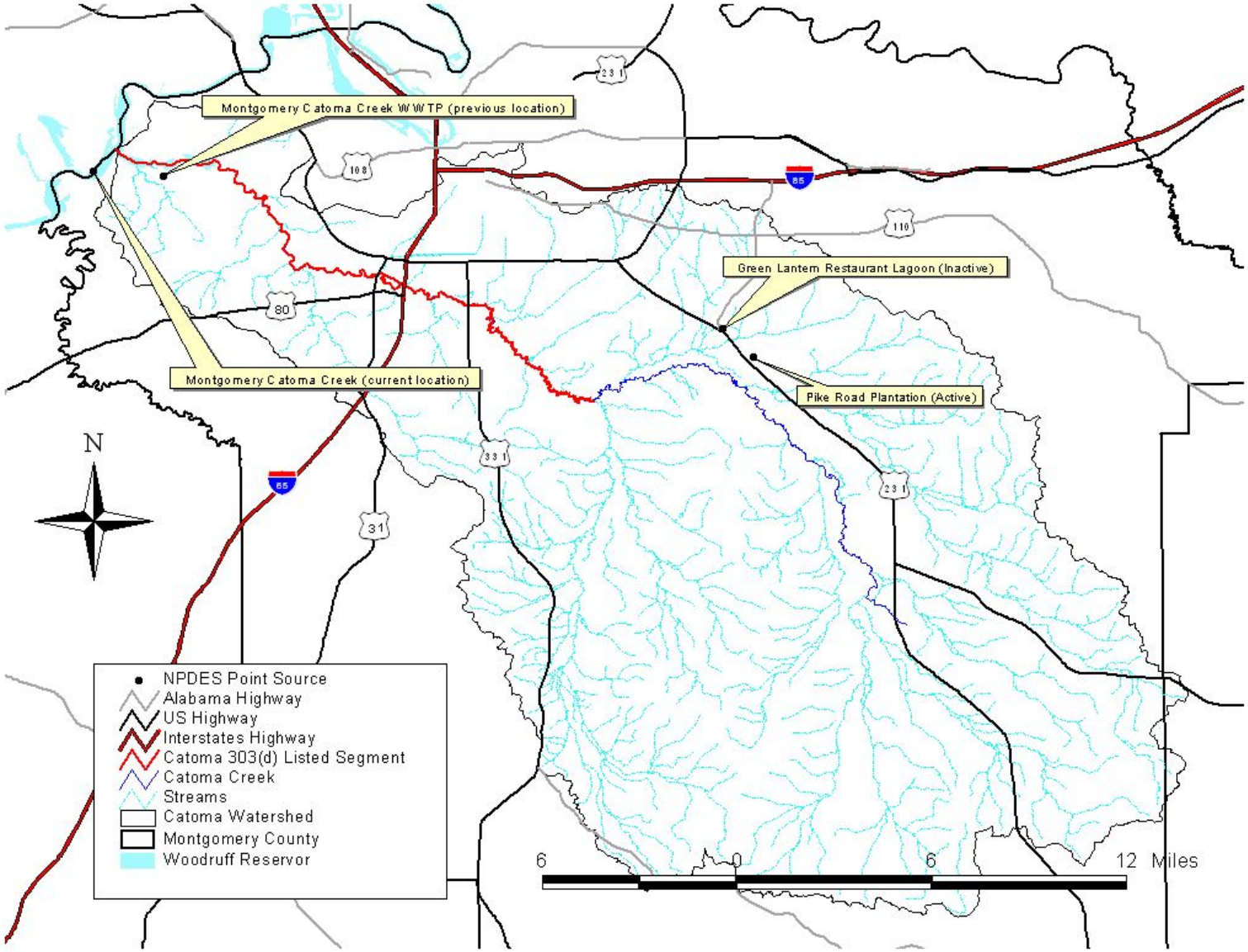
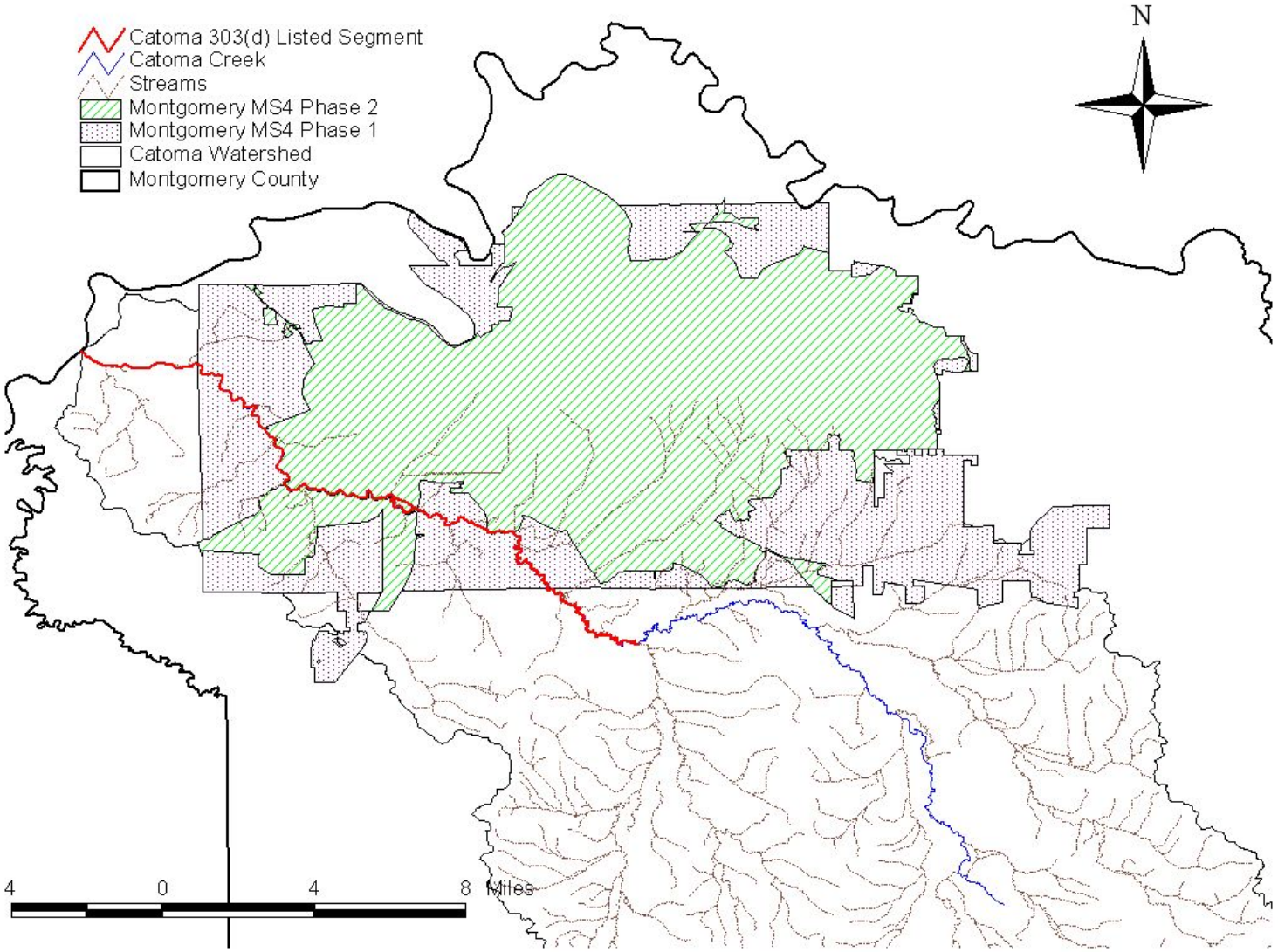


**Figure 3-2. MS4 Areas in the Catoma Creek Watershed**



### 3.2.2 Nonpoint Sources in the Catoma Creek Watershed

Nonpoint sources of fecal coliform bacteria do not have a defined discharge point, but rather, occur over the entire length of a stream or waterbody. On the land surface, fecal coliform 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 fecal coliform bacteria are collected and carried to the stream or waterbody. Therefore, there is some net loading of fecal coliform bacteria into the stream is dictated by the watershed hydrology.

Agricultural land can be a source of fecal coliform 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 fecal coliform bacteria to waterbodies. To account for the potential influence from animals with direct access to stream reaches in the watershed, fecal coliform loads can be calculated as a direct source into the stream.

Fecal coliform bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkeys, waterfowl, etc. 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.

Fecal coliform 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, 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 fecal coliform bacteria to surface waters due to system failure and malfunction.

## *3.3 Land Use Assessment*

The Catoma Creek watershed is comprised of nine different 12-digit hydrologic unit codes (HUCs) (Table 3-3) within the 8-digit Upper Alabama catalogue unit 03150201. Total drainage area for the Catoma Creek watershed is approximately 360 square miles. Land use activity percentages for the Catoma Creek watershed were derived from using ArcView GIS 3.3 with land use information provided from the 2001 National Land Cover Dataset (NLCD). Table 3-4 summarizes the percentages of various land use activities and Figure 3-3 provides a color-coded map of land use activity locations within the Catoma Creek watershed.

Nearly 30% of land use consists of agricultural activities with crop cultivation at approximately 9% and pastureland at roughly 21%, along with forests representing about 57%, and residential, commercial, or other uses comprising the remaining 12%.

Based on these statistics, the Catoma Creek watershed can be viewed as having a mix of both urban and rural activities, with nearly 87% of land use consisting of silviculture and agriculture with the potential for significant nonpoint source impacts if it is not managed properly.

**Table 3-3. 12-Digit HUCs in the Catoma Creek Watershed**

| 12 Digit HUC | 12 Digit HUC Name | Group |
|---|---|---|
| 031502010301 | Baskins Mill Creek | Baskins Mill Creek |
| 031502010302 | Catoma Creek – Sandy Creek | Middle Catoma Creek |
| 031502010303 | Little Catoma Creek | |
| 031502010304 | Catoma Creek – Miller Pond | |
| 031502010305 | Waller Creek | Ramer – Waller Creek |
| 031502010306 | Ramer Creek | |
| 031502010307 | Baldwin Slough | Lower Catoma Creek |
| 031502010308 | Caney Branch | |
| 031502010309 | Catoma Creek – Antioch Branch | |

**Figure 3-3. Land Use Map for the Catoma Creek Watershed**

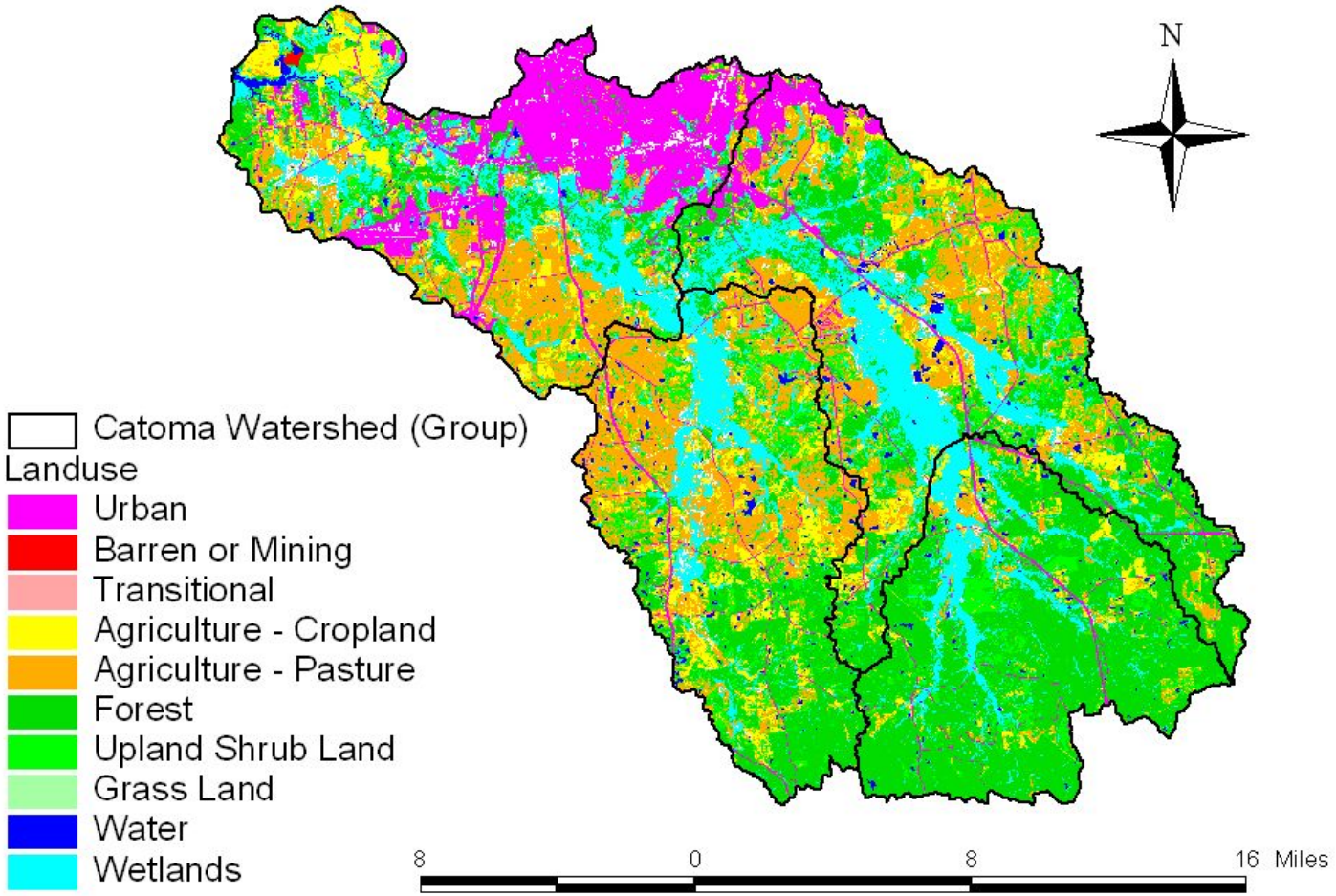


**Table 3-4. Land Use Areas for the Catoma Creek Watershed**

| | Catoma Creek Watershed | | | | | | | | Combined Watershed Totals | |
|---|---|---|---|---|---|---|---|---|---|---|
| Landuse | Lower Catoma Creek | | Middle Catoma Creek | | Ramer - Waller Creek | | Baskins Mill Creek | | | |
| (Square Miles / Percent) | Sq. Miles | Percent | Sq. Miles | Percent | Sq. Miles | Percent | Sq. Miles | Percent | Sq. Miles | Percent |
| Open Water | 1.40 | 1.5% | 1.88 | 1.7% | 1.34 | 1.6% | 0.65 | 0.9% | 5.27 | 1.5% |
| Urban | 29.73 | 31.4% | 7.75 | 7.2% | 2.33 | 2.8% | 1.71 | 2.3% | 41.52 | 11.6% |
| Barren or Mining | 0.18 | 0.2% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.18 | 0.1% |
| Transitional | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% |
| Agriculture - Cropland | 10.08 | 10.6% | 9.45 | 8.7% | 9.72 | 11.8% | 3.25 | 4.5% | 32.49 | 9.1% |
| Agriculture - Pasture | 19.49 | 20.6% | 25.31 | 23.4% | 25.99 | 31.7% | 3.06 | 4.2% | 73.85 | 20.6% |
| Forest | 9.96 | 10.5% | 26.98 | 24.9% | 19.55 | 23.8% | 46.79 | 64.1% | 103.28 | 28.8% |
| Upland Shrub Land | 6.14 | 6.5% | 13.45 | 12.4% | 11.69 | 14.2% | 7.43 | 10.2% | 38.72 | 10.8% |
| Grass Land | 0.14 | 0.1% | 0.14 | 0.1% | 0.05 | 0.1% | 0.03 | 0.0% | 0.35 | 0.1% |
| Wetlands | 17.70 | 18.7% | 23.33 | 21.5% | 11.46 | 14.0% | 10.08 | 13.8% | 62.57 | 17.5% |
| **Total** | **94.83** | **100.0%** | **108.28** | **100.0%** | **82.00** | **100.0%** | **72.99** | **100.0%** | **358.23** | **100.0%** |
| | | | | | | | | | | |
| Agriculture | 29.57 | 31.2% | 34.76 | 23.1% | 35.71 | 43.5% | 6.31 | 8.6% | 106.35 | 29.7% |
| Forest | 33.94 | 35.8% | 63.90 | 59.0% | 42.75 | 52.1% | 64.32 | 88.1% | 204.91 | 57.2% |
| Developed | 29.92 | 31.5% | 7.75 | 7.2% | 2.33 | 2.8% | 1.71 | 2.3% | 41.71 | 11.6% |
| Other | 1.40 | 1.5% | 1.88 | 1.7% | 1.34 | 1.6% | 0.65 | 0.9% | 5.27 | 1.5% |
| **Total** | **94.83** | **100.0%** | **108.28** | **100.0%** | **82.00** | **100.0%** | **72.99** | **100.0%** | **358.23** | **100.0%** |

## *3.4 Linkage Between Numeric Targets and Sources*

The Catoma Creek watershed is highly disturbed with approximately 12% of the drainage area classified as urban, 30% classified as agricultural and the remaining land use/cover being forest, shrub and woody wetlands. Fecal coliform 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. Based on the watershed characteristics, it is believed that the most likely sources of pathogen loadings in the Catoma Creek watershed are from activities in the MS4/urban areas and from agricultural activities. Such activities include leaking sewer pipes, illicit sewer connections, failing septic systems and urban runoff and runoff from pastures and animal feeding operations. From review of ADEM files it was determined that numerous sanitary sewer overflows (SSO) have occurred in the Catoma Creek watershed, which would be considered a likely source of pathogens.

It is not considered practicable to calculate individual components for nonpoint source loadings. Hence, there will not be individual loads or reductions calculated for different nonpoint sources such as forest, agriculture, and septic systems. The loadings and reductions will only be calculated as a single total nonpoint source load and reduction.

## *3.5 Data Availability and Analysis*

The pathogen impaired segment of Catoma Creek was initially listed as a result of water quality data collected by ADEM from May 2, 2000 through January 16, 2001. Of 77 fecal coliform samples collected from 6 different sampling stations throughout the watershed, nine were found to have exceeded the single sample water quality criterion of 2000 colonies/100 mL. Of the six 30-day fecal coliform geometric means that were calculated (one for each station location), none exceeded the 30-day geometric mean water quality criterion of 1000 colonies/100 mL which is applicable for the period October through May. No geometric means were calculated from the samples taken during the June though September time period.

Follow-up sampling was later conducted on the pathogen listed segment of Catoma Creek at Stations CATM-1, CATM-3A and CATM-5 as part of Alabama's §303(d) Monitoring Program during 2005 and 2006. Station IDs, location descriptions and coordinates for all stations sampled during these periods are provided in Table 3-5 and with Figure 3-6 showing their locations in relation to the overall watershed.

**Table 3-5. ADEM Sampling Stations on the Catoma Creek**

| Years | Station ID | Station Location | Latitude | Longitude |
|---|---|---|---|---|
| 2000, 2001, 2005 | CATM-1 | Trotman Road – Co. Rd. 22 | 32.2564 | -86.1742 |
| 2000, 2001, 2005 | CATM -2 | Woodley Road – Co. Rd. 39 | 32.2786 | -86.2192 |
| 2000, 2001 | CATM -3 | US Highway 331 | 32.3073 | -86.3074 |
| 2005, 2006 | CATM -3A | Norman Bridge Road | 32.3074 | -86.2994 |
| 2000, 2001, 2005 | CATM -4 | US Highway 80 | 32.3208 | -86.3485 |
| 2000, 2001, 2005 | CATM -5 | Hayneville Road | 32.3274 | -86.3849 |
| 2000, 2001, 2005 | CATM -6 | Old Selma Highway – Co. Rd. 54 | 32.3435 | -86.3920 |

Of fecal coliform samples collected by ADEM in 2005 and 2006, only one exceeded the single sample maximum criterion of 2000 colonies/100 mL, which occurred at Station CATM-1 on August 17, 2005 with a fecal coliform concentration of 5300 colonies/100 mL and an associated streamflow of 232.9 cfs. None of the remaining 32 samples collected in 2005 and 2006 exceeded the single sample criterion of 2000 colonies/100 mL.

Samples were also collected at minimal 24-hour time intervals over a 30-day period in order to determine geometric mean values which were then compared to the 30-day geometric mean criterion of 200 colonies/100 mL. Geometric mean concentrations were obtained for Stations CATM-1 and CATM-5 in July and September 2005. The resulting July 2005 geometric mean concentration obtained at Station CATM-5 was 458 colonies/100 mL. No other geometric mean concentration was found to be greater than 200 colonies/100 mL. Spreadsheets of all related water quality data are provided in Appendix 7.2.

The 2005 and 2006 data will only be used for this assessment because it is less than 6 years old. Section 4.8.2 of ***Alabama's Water Quality Assessment and Listing Methodology*** provides the Department's rationale to use the most recent data to prepare a TMDL for an impaired waterbody when that data indicates a change in water quality has occurred.

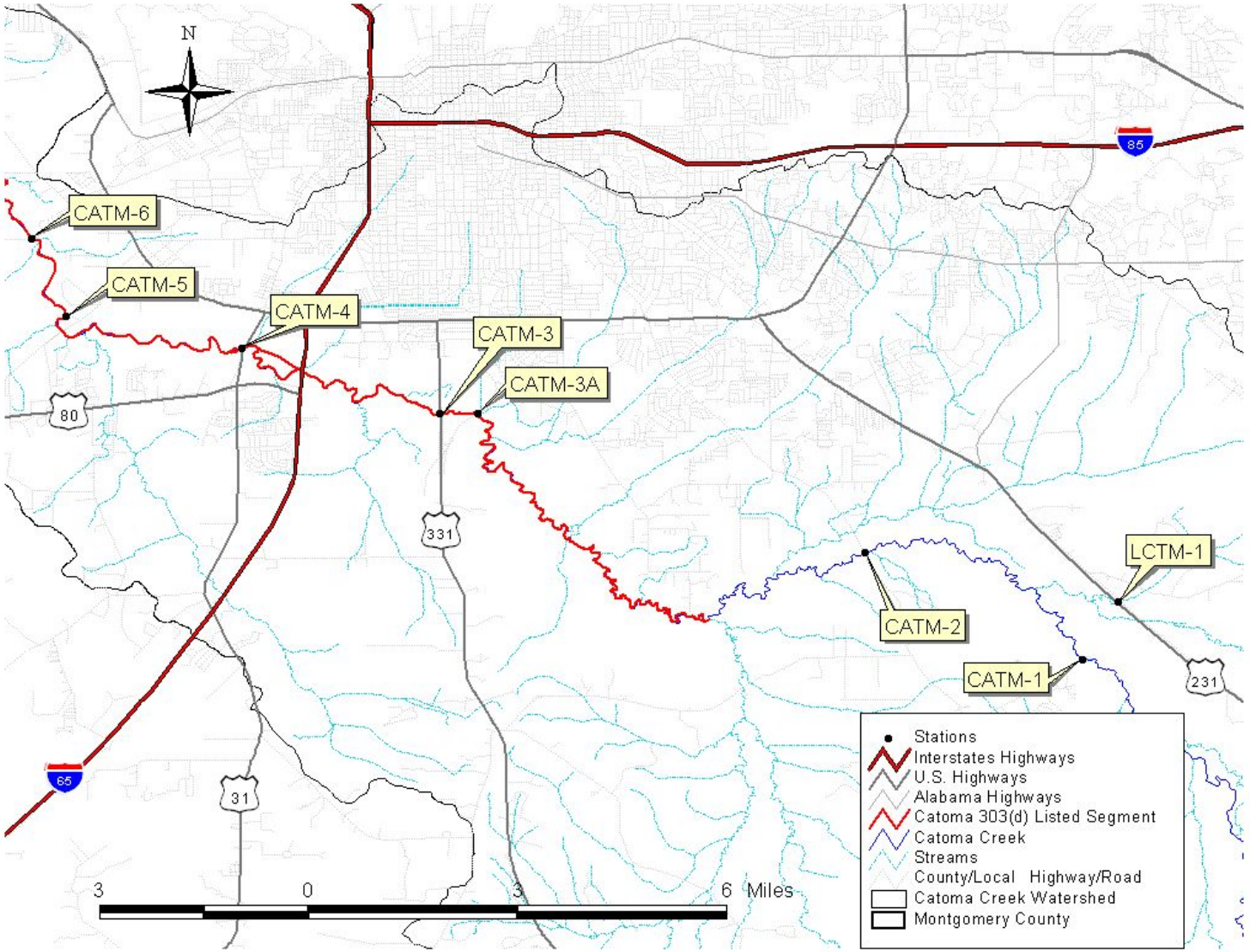
Direct stream flow measurements or representative drainage area ratioed equivalent streamflows from USGS gauging stations are necessary when relating fecal coliform samples to total mass loading of fecal coliform. Actual streamflow measurements are not always feasible at the time of fecal coliform sampling due to unsafe or non-wadeable conditions. Direct streamflows could not be measured for more than half of the fecal coliform samples collected at CATM-1, CATM-2, CATM-3, CATM-3A, CATM-4, CATM-5 and CATM-6 in 2000, 2001, 2003, and 2004 due to dangerous or non-wadeable conditions. United States Geological Survey (USGS) Gauge #02421000 is a continuously recording gauge which provides real-time streamflow and stage measurements on Catoma Creek at U.S. Highway 331. Missing streamflows were determined by ratioing the recorded USGS gauge flow to the drainage area of the fecal coliform sampling station when actual flow measurements were not possible.

**Table 3-6. Drainage Areas of ADEM Sampling Stations on Catoma Creek**

| Station ID | Drainage Area* |
|---|---|
| CATM-1 | 102 $mi^2$ |
| CATM-2 | 159 $mi^2$ |
| CATM-3 | 290 $mi^2$ |
| CATM-3A | 290 $mi^2$ |
| CATM-4 | 311 $mi^2$ |
| CATM-5 | 332 $mi^2$ |
| CATM-6 | 340 $mi^2$ |

*Drainage areas estimated using ArcView

**Figure 3-4. Map of ADEM Sampling Stations**



Fecal coliform sampling was also performed on Little Catoma Creek upstream of the pathogens listed segment of Catoma Creek at Station LCTM-1 at U.S. Highway 231 (Table 3-7). Little Catoma Creek represents a major tributary to Catoma Creek. The maximum measured fecal coliform concentration at Station LCTM-1 was 200 colonies/100 mL on both May 2, 2000 and May 22, 2000, and the geometric mean determined for May, 2000 was 124 colonies/100 mL.

**Table 3-7. ADEM Sampling Stations on Tributaries to the Catoma Creek Pathogens Listed Segment**

| Years | Station ID | Station Location | Latitude | Longitude |
|---|---|---|---|---|
| 2000 | LCTM-1 | US Highway 231 | 32.2682 | -86.1668 |

## *3.6 Critical Conditions*

Critical conditions typically occur during the summer months. This can be explained by the nature and occurrence of summer storm events versus winter. Periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off of fecal coliform bacteria into adjacent streams, resulting in abrupt increases of fecal coliform bacteria concentration. By comparison winter rain events, while more frequent, are typically less intense with a more gradual build-up and uniform loading of fecal coliform bacteria on the land surface.

The Catoma Creek watershed generally conforms to these trends with respect to the summer months of June through September. Figure 3-5 illustrates how the majority of high fecal coliform concentrations occur during higher streamflow conditions. The same relationship holds true for geometric mean concentrations as shown in Figure 3-6. The maximum 2005 single sample concentration of 5300 colonies/100 mL with a flow of 232.9 cfs at Station CATM-1 was selected to estimate TMDL pathogen loadings to Catoma Creek under critical conditions.

## *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.

An explicit MOS was incorporated in this TMDL. The explicit MOS includes the uncertainty of the fecal coliform data used in this analysis and the uncertainty of selecting an appropriate critical condition from the existing fecal coliform loads. A margin of safety was applied to the TMDL by reducing the criterion concentration by ten percent and calculating a mass loading target with measured flow data. The summer single sample criteria was reduced by ten percent to achieve the target concentrations 1800 colonies/100 mL.

**Figure 3-5. Catoma Creek Single Sample Fecal Coliform Data (2005)**

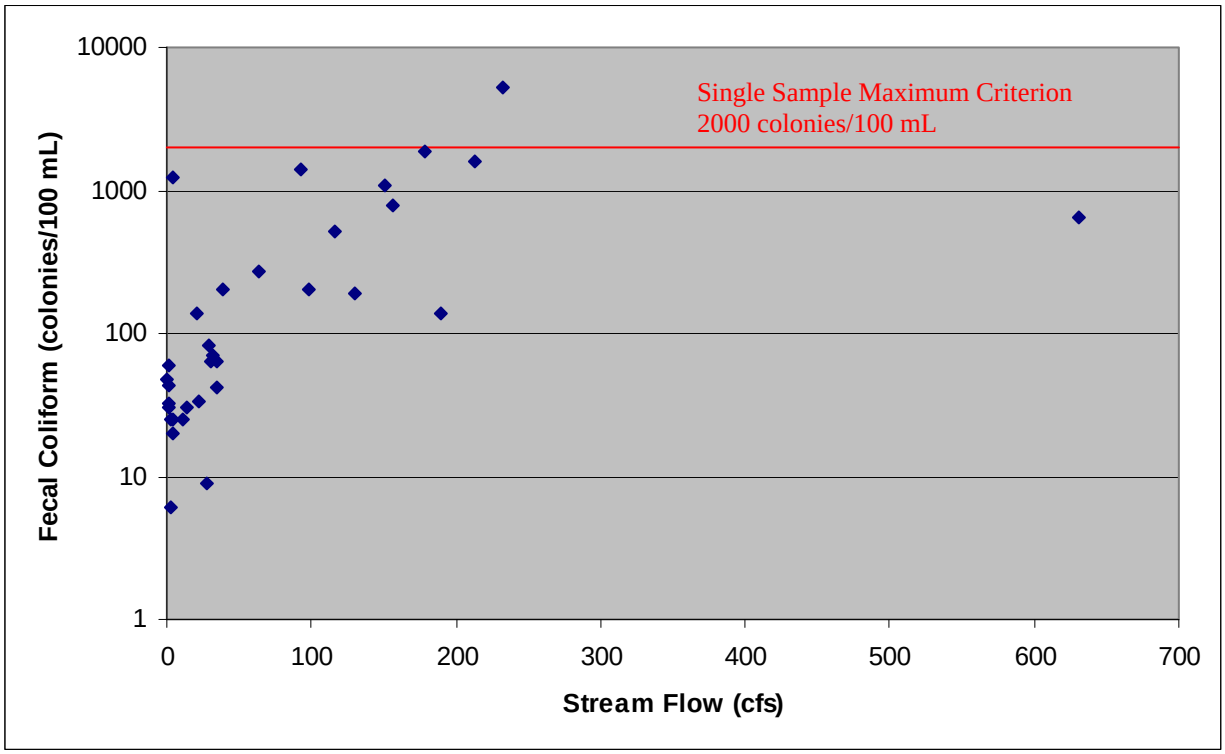
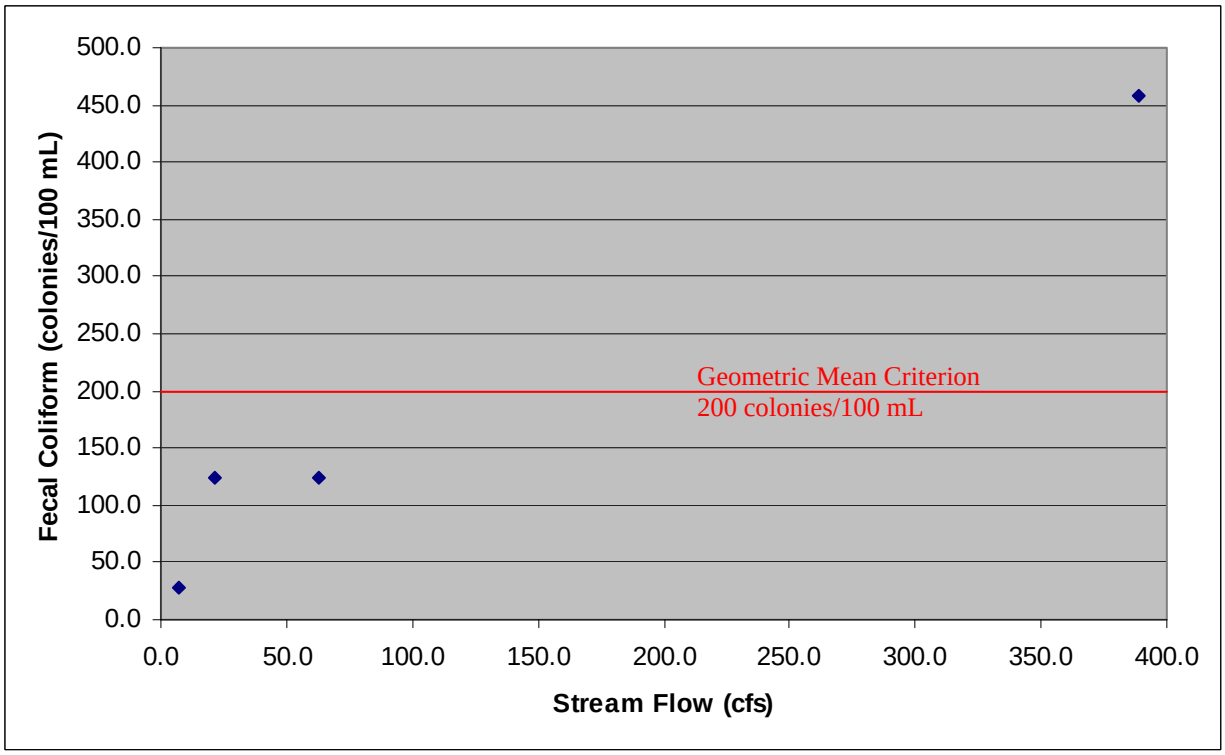



**Figure 3-6. Catoma Creek Geometric Mean Fecal Coliform Data (2005)**



# 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

A mass balance approach was utilized to determine the total pathogen loading or TMDL for Catoma Creek. The mass balance approach employs the conservation of mass principle by multiplying fecal coliform concentration times streamflow in order to determine total mass loading.

***Existing Conditions***

The **single sample** mass loading was calculated by multiplying the highest single sample exceedance concentration of 5,300 colonies/100 ml times the estimated flow for that day. This concentration was calculated based on measurements at CATM-1 on August 17, 2005 and can be found in Table 7-4, Appendix 7.2. The estimated stream flow, determined by the drainage area ratio of stream flows estimated from USGS Gage 02421000, for that sampling event was 232.9 cfs. The product of these two values and a conversion factor gives the total mass loading (colonies per day) of fecal coliform to Catoma Creek under a single sample exceedance conditions.

$$\frac{232.9\,\text{ft}^3}{\text{s}} \times \frac{5300\,\text{colonies}}{100\,\text{mL}} \times \frac{24465755 \quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.02 \times 10^{13}\,\text{colonies}}{\text{day}}$$

The **geometric mean** mass loading was calculated by multiplying the highest geometric mean sample exceedance concentration of 458.4 colonies/100 ml times the average flow for all five of the fecal coliform measurements. This concentration was calculated based on measurements at CATM-5 on July 18, 19, 20, 21, and 25, 2005 and can be found in Table 7-5, Appendix 7.2. The average stream flow, determined by field measurements during the sampling of the stream. Average flow estimated from for these five sampling events was 189.7 cfs. The product of these

two values and a conversion factor gives the total mass loading of fecal coliform to Catoma Creek under geometric mean exceedance conditions.

$$\frac{189.7\,\text{ft}^3}{\text{s}} \times \frac{458.4\,\text{colonies}}{100\,\text{mL}} \times \frac{24465755 \quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.13 \times 10^{12}\ \text{colonies}}{\text{day}}$$

The second mass loading represents the allowable loading from NPDES point sources in the watershed that are defined as facilities contribute continuous wasteflow to the system. Since the exceedance condition is based on August 2005 conditions, the loading from NPDES point sources in August 2005 must be determined. A list of NPDES permitted point sources with discharge to the pathogen listed segment of Catoma Creek in August 2005 is located in Table 4-1. The only facility actively discharging in August 2005 was the Pike Road Plantation. Pike Road Plantation is an municipal wastewater treatment facility that serves a manufactured home community. Its discharge is relatively small and is not considered to be a major contributor of fecal coliform to the Catoma Creek watershed.

**Table 4-1. NPDES Point Sources Permitted during August 2005**

| Type | NPDES # | Facility Name | Stream | Flow (MGD) |
|---|---|---|---|---|
| Municipal WWTP | AL0059561 | Pike Road Plantation | Catoma Creek UT | 0.10 |

$WWTP_{WLA}$ loading during the violation period in August 2005 consisted of only one point source, Pike Road Plantation. The August 2005 discharge monitoring report (DMR) for Pike Road Plantation recorded an average wasteflow of 0.050 million gallons per day (MGD) and an average effluent fecal coliform concentration of 3.5 colonies/100 mL, with a maximum wasteflow of 0.125 MGD and a maximum effluent fecal coliform concentration of 127 colonies/100 mL. Mass loading from Pike Road Plantation during August 2005 was:

$$\frac{0.125 \times 10^6\,\text{gal}}{\text{day}} \times \frac{3785.41\,\text{mL}}{\text{gal}} \times \frac{127\ \text{colonies}}{100\,\text{mL}} = \frac{6.01 \times 10^8\ \text{colonies}}{\text{day}}$$

**Table 4-2. NPDES Point Sources included in the WLA Portion of the TMDL**

| Type | NPDES # | Facility Name | Stream | Flow (MGD) |
|---|---|---|---|---|
| Municipal | AL0059561 | Pike Road Plantation | Catoma Creek UT | 0.10 |

***Allowable Conditions***

The **allowable loads** to the watershed were calculated under the same physical conditions as discussed above for the single sample and the geometric mean criterion. This is done by taking the product of the flow used for the violation event times the conversion factor times the allowable concentration which are as follows:

For the **single sample** fecal concentration of 1800 colonies/100 mL. The allowable fecal coliform loading is:

$$\frac{232.9\ \text{ft}^3}{\text{s}} \times \frac{1800\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.03 \times 10^{13}\ \text{colonies}}{\text{day}}$$

The explicit margin of safety of 200 colonies/100 mL equals a daily loading of:

$$\frac{232.9\,\text{ft}^3}{\text{s}} \times \frac{200\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.14 \times 10^{12}\ \text{colonies}}{\text{day}}$$

For the **geometric mean** fecal concentration of 180 colonies/100 mL. The allowable fecal coliform loading is:

$$\frac{189.7\,\text{ft}^3}{\text{s}} \times \frac{180\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{8.35 \times 10^{11}\ \text{colonies}}{\text{day}}$$

The explicit margin of safety of 20 colonies/100 mL equals a daily loading of:

$$\frac{189.7\,\text{ft}^3}{\text{s}} \times \frac{20\ \text{colonies}}{100\,\text{mL}} \times \frac{24465755\quad 100\,\text{mL} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{9.28 \times 10^{10}\ \text{colonies}}{\text{day}}$$

$WWTP_{WLA}$ allowable loading consisted of only one point source, Pike Road Plantation. The permitted wasteflow of 0.100 million gallons per day (MGD) and monthly average effluent fecal coliform concentration of 200 colonies/100 mL. Mass allowable loading from Pike Road Plantation:

$$\frac{0.100 \times 10^6\,\text{gal}}{\text{day}} \times \frac{3785.41\,\text{mL}}{\text{gal}} \times \frac{200\ \text{colonies}}{100\,\text{mL}} = \frac{7.57 \times 10^8\ \text{colonies}}{\text{day}}$$

The difference in the pathogen loading between the existing conditions (violation event) and the allowable conditions converted to a percent reduction represents the total load reduction needed to achieve the fecal coliform water quality criterion. The TMDL was calculated as the total daily fecal coliform load to Catoma Creek as evaluated at Station CATM-1. Table 4-4 shows the results of the fecal coliform TMDL and percent reductions applicable to point and nonpoint sources.

**Table 4-3. 2005 Fecal Coliform Loads and Required Reductions**

| Source | Existing Load (colonies/day) | Allowable Load (colonies/day) | Required Reduction (colonies/day) | Reduction % |
|---|---|---|---|---|
| NPS Load Single Sample | 3.02E+13 | 1.03E+13 | 1.99E+13 | 66% |
| NPS Load Geomean | 2.13E+12 | 8.35E+11 | 1.29E+12 | 61% |

From Table 4-3, compliance with the single sample criterion of 2000 col/100ml requires the greatest reduction in fecal coliform load. Therefore the TMDL will be based on the single sample criterion. The TMDL, WLA, LA and MOS values necessary to achieve the applicable fecal coliform criteria are provided in Table 4-4 below.

**Table 4-4. 2005 Coliform Loads and Required Reductions**

| Source | Existing Load (colonies/day) | Allowable Load (colonies/day) | Required Reduction (colonies/day) | Reduction % |
|---|---|---|---|---|
| Nonpoint Source | 3.02E+13 | 1.03E+13 | 1.99E+13 | 66% |
| Point Source | 6.01E+08 | 7.57E+08 | 0.00E+00 | 0% |

Allowable loading was derived by taking the streamflow which occurred at Station CATM-1 on August 17, 2005, and multiplying it times the fecal coliform single sample criterion target of 1800 colonies/100 mL (2000 colonies/100 mL – 10% Margin of Safety). Reductions needed to meet allowable loading were then determined by subtracting allowable loading from existing loading. Table 4.4 summarizes the current loads, allowable loads, and required reductions needed to meet applicable water quality pathogen single sample criterion for Catoma Creek. Table 4.5 lists required TMDL pathogen loadings under critical streamflow conditions for Catoma Creek.

**Table 4-5. Fecal Coliform TMDL for Catoma Creek**

| TMDL | 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) |
| 1.14E+13 | 1.14E+12 | 7.57E+08 | 66% | 0 | 1.03E+13 | 66% |

a. Both existing and future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. WLAs for WWTPs are expressed as a daily maximum. Future WWTPs must meet the applicable instream 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 fecal coliform loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for fecal coliform.

### *4.3 TMDL Summary*

Catoma Creek was placed on Alabama's §303(d) list in 2002 based on data collected by ADEM in 2000 and 2001. In 2005, ADEM collected additional water quality data which confirmed the pathogen impairment and provided the basis for TMDL development.

A mass balance approach was used to calculate the fecal coliform TMDL for Catoma Creek. Based on the TMDL analysis, it was determined that a 66% reduction in fecal coliform 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 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 towards targeting the load reductions to improve water quality in the Catoma Creek watershed. As additional data and/or information becomes available, it may become 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.

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

| River Basin Group | Year to be Monitored |
|---|---|
| Tennessee | 2009 |
| Alabama / Coosa / Tallapoosa | 2010 |
| Escatawpa / Mobile / Lower Tombigbee / Upper Tombigbee | 2011 |
| Black Warrior / Cahaba | 2012 |
| Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia | 2013 |
| Tennessee | 2014 |

## *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.

# 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. 2000, 2001, 2005, and 2006. ADEM.

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, January 2008.

Alabama's §303(d) Lists. 2002, 2004, 2006, and 2008 §303(d) List. ADEM.

U.S. Census Bureau, 2007. Table 3: Estimates of Population Change for Counties of Alabama and County Rankings: July 1, 2005 to July 1, 2006 (CO-EST2006-03-01). Population Division, March 22, 2007

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, PCS website. http://www.epa.gov/enviro/html/pcs/index.html

# Appendix 7.2

# Water Quality Data

**Table 7-1. Pathogen Data Collected by ADEM at Stations CATM-1 and CATM-2 in 2000 and 2001**

| Station ID | Date | Time | Turbidity (NTU) | Stream Flow (CFS) | USGS Flow from DA ratio (CFS) | Fecal Coliform (col/100ml) | Fecal Coliform oor* | Daily Criterion | Fecal Geomean (col/100ml) | 30-Day Geometric Mean Criterion |
|---|---|---|---|---|---|---|---|---|---|---|
| CATM-1 | 5/2/2000 | | 20 | 3.5 | 4.49 | 57 | est | OK | | |
| CATM-1 | 5/16/2000 | | | | 0.48 | 26 | | OK | | |
| CATM-1 | 5/22/2000 | | | | 7.60 | 67 | | OK | 43.5 | OK |
| CATM-1 | 5/24/2000 | | | | 0.32 | 29 | | OK | | |
| CATM-1 | 5/30/2000 | | | 0.5 | 2.38 | 54 | | OK | | |
| CATM-1 | 6/21/2000 | | | 0.7 | 0.97 | 113 | | OK | | |
| CATM-1 | 7/6/2000 | | | - | 0.25 | 10 | est | OK | | |
| CATM-1 | 10/4/2000 | | | 0.1 | 0.13 | 9 | est | OK | | |
| CATM-1 | 1/16/2001 | | | | 20.04 | 26 | | OK | | |
| CATM-1 | 11/8/2000 | | | - | 21.77 | | | | | |
| CATM-1 | 11/28/2000 | | 17.9 | 16 | 17.97 | 127 | | OK | | |
| CATM-1 | 1/8/2001 | | | | 45.61 | 70 | | OK | | |
| CATM-1 | 1/10/2001 | | 11.2 | 16.7 | 25.57 | 17 | est | OK | | |
| | | | | | | | | | | |
| CATM-2 | 5/2/2000 | | 17 | - | 7.13 | 90 | | OK | | |
| CATM-2 | 5/16/2000 | | | | 0.77 | 55 | | OK | | |
| CATM-2 | 5/22/2000 | | | | 12.06 | 42 | | OK | 84.7 | OK |
| CATM-2 | 5/24/2000 | | | | 0.51 | 150 | | OK | | |
| CATM-2 | 5/30/2000 | | | - | 3.78 | 140 | | OK | | |
| CATM-2 | 6/21/2000 | | | - | 1.54 | 63 | | OK | | |
| CATM-2 | 7/6/2000 | | | - | 0.39 | 12 | est | OK | | |
| CATM-2 | 10/4/2000 | | | - | 0.20 | 51 | | OK | | |
| CATM-2 | 11/8/2000 | | 6.2 | - | 34.54 | 180 | | OK | | |
| CATM-2 | 11/28/2000 | | 17.9 | - | 28.51 | 87 | | OK | | |
| CATM-2 | 1/8/2001 | | | | 72.37 | 73 | | OK | | |
| CATM-2 | 1/10/2001 | | 10.7 | - | 40.57 | 4 | est | OK | | |
| CATM-2 | 1/16/2001 | | | | 31.80 | 26 | | OK | | |

est - Result is a estimate

**Table 7-2. Pathogen Data Collected by ADEM at Stations CATM-3 and CATM-4 in 2000 and 2001**

| Station ID | Date | Time | Turbidity (NTU) | Stream Flow (CFS) | USGS Flow from DA ratio (CFS) | Fecal Coliform (col/100ml) | Fecal Coliform oor* | Daily Criterion | Fecal Geomean (col/100ml) | 30-Day Geometric Mean Criterion |
|---|---|---|---|---|---|---|---|---|---|---|
| CATM-3 | 5/2/2000 | | | - | 13.00 | 10 | est | OK | | |
| CATM-3 | 5/16/2000 | | | | 1.40 | 30 | | OK | | |
| CATM-3 | 5/22/2000 | | | | 22.00 | 8600 | GDL | VIOLATION | 126.5 | OK |
| CATM-3 | 5/24/2000 | | | | 0.93 | 220 | | OK | | |
| CATM-3 | 5/30/2000 | | | - | 6.90 | 57 | | OK | | |
| CATM-3 | 6/21/2000 | | | - | 2.80 | 50 | | OK | | |
| CATM-3 | 7/6/2000 | | 11 | - | 0.71 | 1 | est | OK | | |
| CATM-3 | 10/4/2000 | | | - | 0.37 | 2 | est | OK | | |
| CATM-3 | 11/8/2000 | | 5.13 | - | 63.00 | 3867 | > | VIOLATION | | |
| CATM-3 | 11/28/2000 | | 16 | - | 52.00 | 210 | | OK | | |
| CATM-3 | 1/8/2001 | | | | 132.00 | 966 | | OK | | |
| CATM-3 | 1/10/2001 | | 12.8 | - | 74.00 | 67 | est | OK | | |
| CATM-3 | 1/16/2001 | | | | 58.00 | 20 | est | OK | | |
| | | | | | | | | | | |
| CATM-4 | 5/2/2000 | | 9.19 | - | 13.94 | 73 | | OK | | |
| CATM-4 | 5/16/2000 | | | | 1.50 | 97 | | OK | | |
| CATM-4 | 5/22/2000 | | | | 23.59 | 10000 | GDL | VIOLATION | 350.6 | OK |
| CATM-4 | 5/24/2000 | | | | 1.00 | 340 | | OK | | |
| CATM-4 | 5/30/2000 | | | - | 7.40 | 220 | | OK | | |
| CATM-4 | 6/21/2000 | | | - | 3.00 | 200 | | OK | | |
| CATM-4 | 7/6/2000 | | | - | 0.76 | 50 | est | OK | | |
| CATM-4 | 10/4/2000 | | | - | 0.40 | 20 | | OK | | |
| CATM-4 | 11/8/2000 | | 4.5 | - | 67.56 | 4000 | > | VIOLATION | | |
| CATM-4 | 11/28/2000 | | 13.3 | - | 55.77 | 120 | est | OK | | |
| CATM-4 | 1/8/2001 | | | | 141.56 | 766 | | OK | | |
| CATM-4 | 1/10/2001 | | 12.5 | - | 79.36 | 67 | est | OK | | |
| CATM-4 | 1/16/2001 | | | | 62.20 | 27 | est | OK | | |

est - Result is a estimate
> - The actual number was probably greater than the number reported
GDL - Greater Than Method Detection Limits

**Table 7-3. Pathogen Data Collected by ADEM at Stations CATM-5 and CATM-6 in 2000 and 2001**

| Station ID | Date | Time | Turbidity (NTU) | Stream Flow (CFS) | USGS Flow from DA ratio (CFS) | Fecal Coliform (col/100ml) | Fecal Coliform oor* | Daily Criterion | Fecal Geomean (col/100ml) | 30-Day Geometric Mean Criterion |
|---|---|---|---|---|---|---|---|---|---|---|
| CATM-5 | 5/2/2000 | | 4.78 | - | 14.93 | 20 | | OK | | |
| CATM-5 | 5/16/2000 | | | | 1.61 | 12 | est | OK | | |
| CATM-5 | 5/22/2000 | | | | 25.26 | 27000 | GDL | VIOLATION | 147.0 | OK |
| CATM-5 | 5/24/2000 | | | | 1.07 | 212 | | OK | | |
| CATM-5 | 5/30/2000 | | | - | 7.92 | 50 | | OK | | |
| CATM-5 | 6/21/2000 | | | - | 3.22 | 20 | | OK | | |
| CATM-5 | 7/6/2000 | | | - | 0.82 | 1 | est | OK | | |
| CATM-5 | 10/4/2000 | | | - | 0.42 | 13 | est | OK | | |
| CATM-5 | 11/8/2000 | | 12 | - | 72.34 | 2867 | > | VIOLATION | | |
| CATM-5 | 11/28/2000 | | 10.4 | - | 59.71 | 60 | est | OK | | |
| CATM-5 | 1/8/2001 | | | | 151.57 | 2466 | GDL | VIOLATION | | |
| CATM-5 | 1/10/2001 | | 12 | - | 84.97 | 1167 | | OK | | |
| CATM-5 | 1/16/2001 | | | | 66.60 | 2700 | | VIOLATION | | |
| | | | | | | | | | | |
| CATM-6 | 5/2/2000 | | 15 | - | 15.24 | 46 | | OK | | |
| CATM-6 | 5/16/2000 | | | | 1.64 | 12 | est | OK | | |
| CATM-6 | 5/22/2000 | | | | 25.79 | 28 | | OK | 84.0 | OK |
| CATM-6 | 5/24/2000 | | | | 1.09 | 1000 | GDL | OK | | |
| CATM-6 | 5/30/2000 | | | - | 8.09 | 270 | | OK | | |
| CATM-6 | 6/21/2000 | | | - | 3.28 | 120 | | OK | | |
| CATM-6 | 7/6/2000 | | | - | 0.83 | 3 | est | OK | | |
| CATM-6 | 10/4/2000 | | | - | 0.43 | 22 | | OK | | |
| CATM-6 | 11/8/2000 | | 36.5 | - | 73.86 | 3933 | > | VIOLATION | | |
| CATM-6 | 11/28/2000 | | 11.2 | - | 60.97 | 110 | est | OK | | |
| CATM-6 | 1/8/2001 | | | | 154.76 | 1100 | | OK | | |
| CATM-6 | 1/10/2001 | | 12.2 | - | 86.76 | 370 | | OK | | |
| CATM-6 | 1/16/2001 | | | | 68.00 | 870 | | OK | | |

est - Result is a estimate
> - The actual number was probably greater than the number reported
GDL - Greater Than Method Detection Limits

**Table 7-4. Pathogen Data Collected by ADEM at Stations CATM-1 and CATM-3A in 2005 and 2006**

| Station ID | Date | Time | Turbidity (NTU) | Stream Flow (CFS) | USGS Flow from DA ratio (CFS) | Fecal Coliform (col/100ml) | Fecal Coliform oor* | Daily Criterion | Fecal Geomean (col/100ml) | 30-Day Geometric Mean Criterion |
|---|---|---|---|---|---|---|---|---|---|---|
| CATM-1 | 3/22/2005 | 9:45 | 23.6 | | | | | | | |
| CATM-1 | 4/12/2005 | 9:40 | 46.8 | | 150.30 | 1100 | | OK | | |
| CATM-1 | 5/10/2005 | 10:25 | 19.3 | | 14.51 | 30 | E | OK | | |
| CATM-1 | 6/8/2005 | 9:45 | 20.2 | 9.7 | 21.77 | 33 | | OK | | |
| CATM-1 | 7/18/2005 | 9:35 | 39.1 | | 189.69 | 140 | E | OK | | |
| CATM-1 | 7/19/2005 | 9:45 | 27.2 | | 63.92 | 270 | --- | OK | | |
| CATM-1 | 7/20/2005 | 10:45 | 18.4 | 21.4 | 39.04 | 200 | E | OK | 124.3 | OK |
| CATM-1 | 7/21/2005 | 10:48 | 15.9 | 17.1 | 34.90 | 42 | --- | OK | | |
| CATM-1 | 7/25/2005 | 8:10 | 14.7 | 10 | 29.71 | 83 | --- | OK | | |
| CATM-1 | 7/26/2005 | 10:13 | 13.7 | 7.3 | 20.73 | 140 | | OK | | |
| CATM-1 | 8/17/2005 | 10:20 | 22.7 | | 232.88 | 5300 | G | VIOLATION | | |
| CATM-1 | 9/19/2005 | 10:10 | 17.3 | 1.1 | 1.35 | 30 | E | OK | | |
| CATM-1 | 9/20/2005 | 9:35 | 13.7 | 0.3 | 1.07 | 32 | --- | OK | | |
| CATM-1 | 9/21/2005 | 10:20 | 6.27 | 0.2 | 0.93 | 60 | E | OK | 28.7 | OK |
| CATM-1 | 9/22/2005 | 10:25 | 6.94 | 0.5 | 0.90 | 43 | --- | OK | | |
| CATM-1 | 9/27/2005 | 10:05 | 4.77 | 0.4 | 27.99 | 9 | E | OK | | |
| CATM-1 | 10/12/2005 | 10:40 | 10.8 | 5.5 | 11.06 | 25 | | OK | | |
| | | | | | | | | | | |
| CATM-3A | 6/16/2005 | 13:10 | 13.9 | 29 | 30.00 | 64 | --- | OK | | |
| CATM-3A | 7/28/2005 | 9:45 | | | 149.00 | | | | | |
| CATM-3A | 8/11/2005 | 14:10 | 46.6 | 177 | 156.00 | 780 | G | OK | | |
| CATM-3A | 11/17/2005 | 13:20 | 16.9 | 19 | 15.00 | | --- | | | |
| CATM-3A | 8/14/2006 | 9:20 | 9.31 | 8.8 | 3.80 | 1250 | G | OK | | |
| CATM-3A | 6/13/2006 | 10:05 | 13.5 | 3.7 | 20.00 | | | | | |
| CATM-3A | 10/4/2006 | 9:00 | 3.7 | 1 | 0.69 | 47 | | OK | | |

G - The actual number was probably greater than the number reported
E - Result is a estimate

**Table 7-5. Pathogen Data Collected by ADEM at Station CATM-5 in 2005**

| Station ID | Date | Time | Turbidity (NTU) | Stream Flow (CFS) | USGS Flow from DA ratio (CFS) | Fecal Coliform (col/100ml) | Fecal Coliform oor* | Daily Criterion | Fecal Geomean (col/100ml) | 30-Day Geometric Mean Criterion |
|---|---|---|---|---|---|---|---|---|---|---|
| CATM-5 | 4/13/2005 | 12:00 | 114 | | 781.98 | | | | | |
| CATM-5 | 5/12/2005 | 12:30 | 12.6 | 37.4 | 32.15 | 70 | E | OK | | |
| CATM-5 | 6/16/2005 | 11:55 | 7.58 | 32.7 | 34.45 | 63 | | OK | | |
| CATM-5 | 7/12/2005 | 13:25 | 86.6 | 1200 | 1144.83 | | | | | |
| CATM-5 | 7/18/2005 | 11:15 | 53.7 | 537 | 630.40 | 640 | --- | OK | | |
| CATM-5 | 7/19/2005 | 11:15 | 36 | 202 | 212.43 | 1600 | --- | OK | | |
| CATM-5 | 7/20/2005 | 12:10 | 19.6 | 96.1 | 129.76 | 190 | --- | OK | 458.4 | VIOLATION |
| CATM-5 | 7/21/2005 | 12:10 | 13.9 | 64.7 | 115.98 | 520 | --- | OK | | |
| CATM-5 | 7/25/2005 | 9:20 | 12.8 | 48.9 | 98.75 | 200 | --- | OK | | |
| CATM-5 | 8/11/2005 | 13:30 | 54 | | 179.13 | 1900 | | OK | | |
| CATM-5 | 9/19/2005 | 12:00 | 3.96 | 6.7 | 4.48 | 20 | E | OK | | |
| CATM-5 | 9/20/2005 | 10:15 | 2.07 | 6.7 | 3.56 | 25 | --- | OK | | |
| CATM-5 | 9/21/2005 | 12:20 | 2.5 | 5.3 | 3.10 | 6 | E | OK | 124.3 | OK |
| CATM-5 | 9/22/2005 | 12:25 | 1.86 | 4.8 | 2.99 | 25 | --- | OK | | |
| CATM-5 | 9/27/2005 | 11:50 | 13.6 | | 93.01 | 1400 | --- | OK | | |
| CATM-5 | 11/17/2005 | 14:20 | 10.1 | 13.4 | 17.22 | | --- | | | |

E - Result is a estimate

**Table 7-6. Pathogen Data Collected by ADEM at Station LCTM-1 in 2000 and 2001**

| Station ID | Date | Time | Turbidity (NTU) | Stream Flow (CFS) | USGS Flow from DA ratio (CFS) | Fecal Coliform (col/100ml) | Fecal Coliform oor* | Daily Criterion | Fecal Geomean (col/100ml) | 30-Day Geometric Mean Criterion |
|---|---|---|---|---|---|---|---|---|---|---|
| LCTM-1 | 5/2/2000 | 9:00 | 15.2 | *** | 2.30 | 200 | | OK | 124.3 | OK |
| LCTM-1 | 5/16/2000 | 9:14 | | | 0.25 | 25 | | OK | | |
| LCTM-1 | 5/22/2000 | 9:19 | | | 3.90 | 200 | | OK | | |
| LCTM-1 | 5/24/2000 | 9:18 | | | 0.16 | 127 | | OK | | |
| LCTM-1 | 5/30/2000 | 8:40 | | *** | 1.22 | 53 | | OK | | |
| LCTM-1 | 6/21/2000 | 8:40 | | *** | 0.50 | 113 | | OK | | |
| LCTM-1 | 7/6/2000 | 8:50 | | *** | 0.13 | 66 | > | OK | | |
| LCTM-1 | 10/4/2000 | 9:20 | | *** | 0.07 | 26 | | OK | | |
| LCTM-1 | 11/8/2000 | 9:05 | 13.5 | *** | 11.17 | 107 | | OK | | |
| LCTM-1 | 11/28/2000 | 9:35 | 31.3 | *** | 9.22 | 57 | est | OK | | |
| LCTM-1 | 1/8/2001 | 9:45 | | | 23.40 | 66 | | OK | | |
| LCTM-1 | 1/10/2001 | 9:15 | 16.2 | *** | 13.12 | 4 | est | OK | | |
| LCTM-1 | 1/16/2001 | 8:30 | | | 10.28 | 35 | | OK | | |

est - Result is a estimate

> - The actual number was probably greater than the number reported