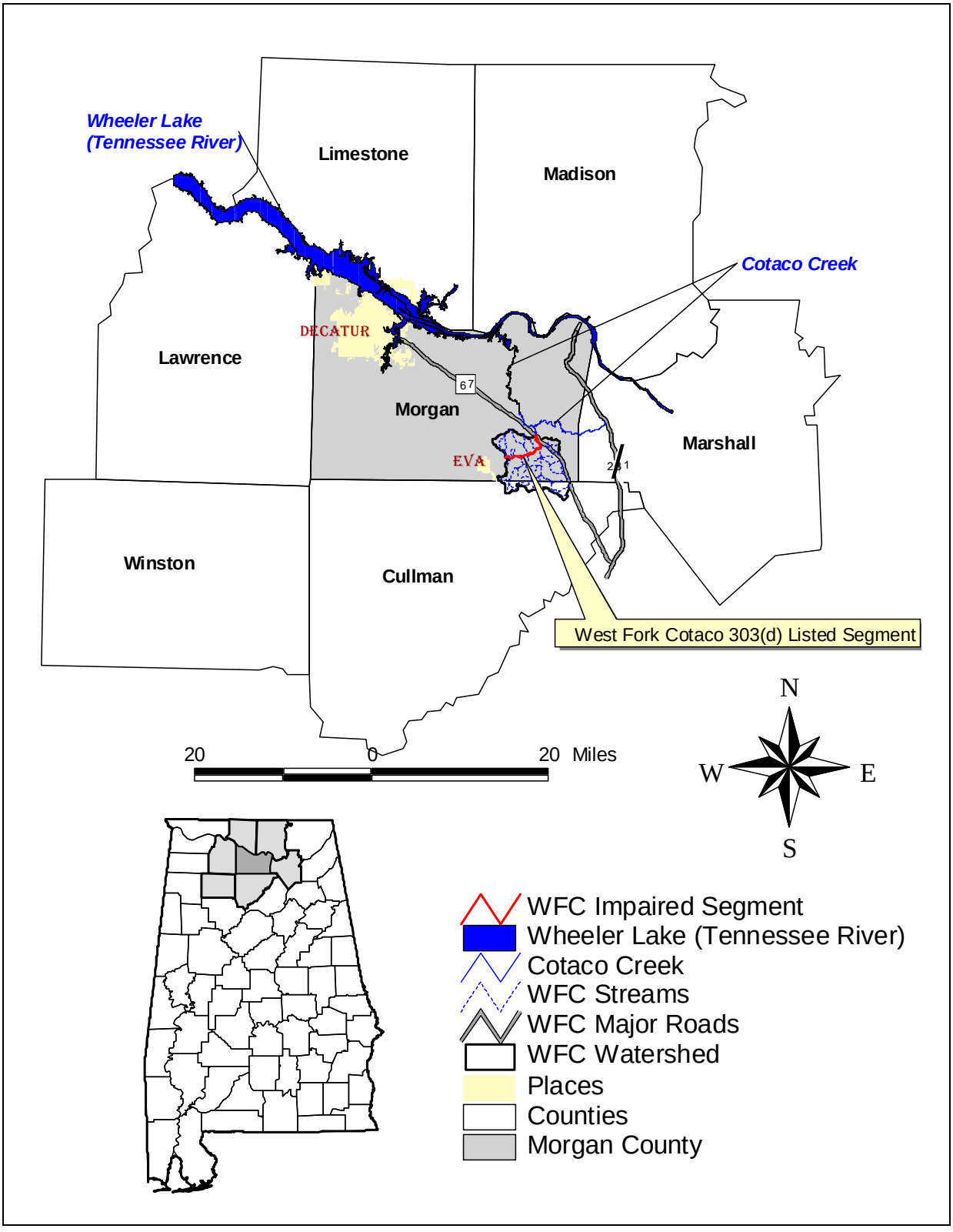
# FINAL

## Total Maximum Daily Load (TMDL)
## for
## West Fork Cotaco Creek
## Assessment Unit ID # AL06030002-0602-102
## Pathogens (fecal coliform)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
September 2008

**Figure 1. Listed Portion of West Fork Cotaco (WFC) in the Tennessee River Basin**



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

West Fork Cotaco Creek (WFC) is on the §303(d) list for pathogens (fecal coliform) and siltation from Alabama Highway 67 to Frost Creek. WFC forms in southeast Morgan county, near Eva, in the Tennessee River Basin. WFC flows into Cotaco Creek which eventually drains into Wheeler Lake on the Tennessee River. The total length of WFC is 10.9 miles, of which 8.12 miles are on the 303(d) list. The total drainage area of WFC is 53.8 square miles, of which 43.35 square miles drain to the impaired segment. WFC has a use classification of Fish & Wildlife (F&W).

Data collected in 1997 by the Tennessee Valley Authority (TVA) indicated WFC was impaired for pathogens (fecal coliform) and siltation. This TMDL will only address the pathogen impairment. The data was collected from stations 1177001 and 1177002 and can be found in Appendix B, Table 7-1.

In 2003 and 2005, a §303(d) sampling study was performed by ADEM on WFC for additional water quality assessment. ADEM collected 10 samples from WFC in 2003 and 18 samples in 2005. According to the data collected in both 2003 and 2005, WFC was not meeting the pathogen criteria applicable to its use classification of Fish and Wildlife. Therefore, a TMDL will be developed for pathogens on the listed reach.

A mass balance approach was used for calculating the pathogen TMDL for WFC. The mass balance approach utilizes the conservation of mass principle. Loads are calculated by multiplying the fecal coliform concentrations times respective instream flows. The current (impaired) pathogen loading was calculated using a geometric mean exceedance concentration times the average flow of the five samples. The target loading, defined as the geometric mean criterion including a margin of safety, was calculated using the same average flow value times the fecal coliform geometric mean target of 180 colonies/100 mL (200 colonies/100 mL – 10% Margin of Safety). Reductions to meet the target loading were then calculated by subtracting the target loading from the current loading.

Table 1.1 is a summary of estimated current loads and allowable loads required to meet the geometric mean fecal coliform criterion for WFC. Table 1.2 lists the required TMDL (maximum allowable) pathogen loadings under critical conditions (summer months) for WFC.

**Table 1-1. Current vs Target Fecal Coliform Loads and Required Reductions**

| Source | Current Load (col/day) | Target Load (col/day) | Required Reduction (col/day) | Reduction % |
|---|---|---|---|---|
| NPS load | 1.73E+11 | 8.41E+10 | 8.93E+10 | 51% |
| Point Source | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0% |

**Table 1-2. Fecal Coliform TMDL for West Fork Cotaco Creek**

| TMDL = WLA + LA + MOS | | | |
|---|---|---|---|
| TMDL (col/day) | WLA (col/day) | LA (col/day) | MOS (col/day) |
| 9.35E+10 | 0.00E+00 | 8.41E+10 | 9.35E+09 |

# *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 water bodies 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 water body based on the relationship between pollution sources and instream water quality conditions, so that states can establish water-quality based controls to reduce pollution and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified the 8.19 miles of WFC as impaired for pathogens. The §303(d) listing was originally reported on Alabama's 1998 List of Impaired Waters based on data collected by TVA in 1997.

## *2.2 Problem Definition*

| | |
|---|---|
| Waterbody Impaired: | West Fork Cotaco Creek from Alabama Highway 67 to Frost Creek |
| Impaired Reach Length: | 8.19 miles |
| Impaired Drainage Area: | 43.35 square miles |
| Water Quality Standard Violation: | Fecal Coliform |
| Pollutant of Concern: | Pathogens (fecal coliform) |
| Water Use Classification: | Fish and Wildlife |

Usage related to classification:
The impaired stream segment, WFC, 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 Tennessee Valley Authority (TVA) in 1997 was used by ADEM for listing the stream on Alabama's 1998 §303(d) list. At the time of the listing, waters that had 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 or a geometric mean of 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) in at least five samples collected in a thirty day period are considered to comply with Alabama's water quality criteria for fecal coliform bacteria. Waters in which greater than 10% of the samples exceed the single-sample maximum of 2000 colonies/100 mL or a geometric mean of 200 colonies/100 mL (June-September) or 1000 colonies/100 mL (October-May) in at least five samples collected in a thirty day period are considered impaired and listed for pathogens (fecal coliform) on Alabama's §303(d) list.

The TVA data used for listing WFC consisted of only 12 samples, taken at two stations. Four of these samples were unable to be processed due to interference or other related issues, and two were duplicates. The basis for listing was a result of the single sample exceedance of 6,900 col/100 mL which accounts for 16% of the data set. This data can be viewed in Appendix B, Table 7-1.

ADEM collected water quality data on WFC in 2003 and 2005 as part of Alabama's §303(d) Monitoring Program at WFCM-28 at Martin Road (See Figure 3.2 and Table 3.3). Of the fecal coliform samples collected at WFCM-28 in 2003 and 2005, only one sample violated the single sample maximum criterion of 2000 colonies/100 mL. Violation: >6,000 colonies/100mL. Of the samples that qualified for a geometric mean calculation in 2003 and 2005, three months exceeded the criterion of 200 colonies/100 mL (June-Sept). Violations: 544, 210, 371 colonies/100mL. This data can be viewed in Appendix B, Table 7.2.

# *3.0 Technical Basis for TMDL Development*

## *3.1 Water Quality Target Identification*

For the purpose of this TMDL, a geometric mean fecal coliform target of 180 colonies/100 mL will be used. This target was derived by using a 10% explicit margin of safety from the geometric mean of 200 colonies/100 mL criterion. This target is considered protective of water quality standards and should not allow the geometric mean of 200 colonies/100 mL (June-Sept), the geometric mean of 1000 colonies/100 mL (Oct-May), or the single sample maximum of 2000 colonies/100 mL to be exceeded.

## *3.2 Source Assessment*

Point Sources in the WFC Watershed

There are no point sources in the WFC watershed which would cause or contribute to the fecal coliform loading. Hence, the WLA portion of the TMDL will be zero. Any new discharges to this stream must meet a monthly average discharge limit of 200 colonies/100 mL and a daily instantaneous maximum limit of 2000 colonies/100 mL for fecal coliform.

Nonpoint Sources in the WFC Watershed

Due to the absence of point sources, nonpoint sources are believed to be the primary source of fecal coliform bacteria in the WFC watershed. Land use in this watershed is rural, consisting of 41.43% agriculture (pasture/hay and row crops) and 47.09% forested. The following are examples of how different land uses can contribute to fecal coliform bacterial loading:

- Agricultural land can be a source of fecal coliform bacteria due to runoff from pastures, animal operations, improper land application of animal wastes, and animals with access to streams. These mechanisms can significantly contribute to the loading of fecal coliform bacteria.

    - During a site visit on 5/2/2007 by ADEM personnel, the WFC watershed was observed to have many active poultry and cattle operations. Poultry litter spreading and cattle access to the stream were documented.

**Picture 3.1: Cattle access to WFC on the downstream side of Martin Rd; 5/2/2007**

- Fecal coliform bacteria can originate from forested areas due to the presence of wild animals such as deer, raccoons, turkeys, beavers, waterfowl, etc. Control of these sources is usually limited and may be impractical in most cases. As a result, forested areas are not specifically targeted in this TMDL.

- Leaking or failing septic systems can be another source of fecal coliform bacteria.

## *3.3 Land Use Assessment*

Land use for the WFC watershed was determined using ArcView with land use datasets derived from the 2001 National Land Cover Dataset (NLCD). Figure 3.1 and Table 3-1 display the land use areas for the WFC watershed.

The WFC watershed is clearly dominated by two land use categories. Approximately 41% of the land use is agricultural and approximately 47% of the land use is forested. Overall, approximately 88% of the watershed is used for agricultural or silvicultural purposes with only around 11% of the land use as residential, commercial, wetlands, or other uses. If it is not managed properly, agriculture and silviculture can have significant nonpoint source impacts.

**Figure 3-1. Land Use Map for the West Fork Cotaco Creek Watershed**

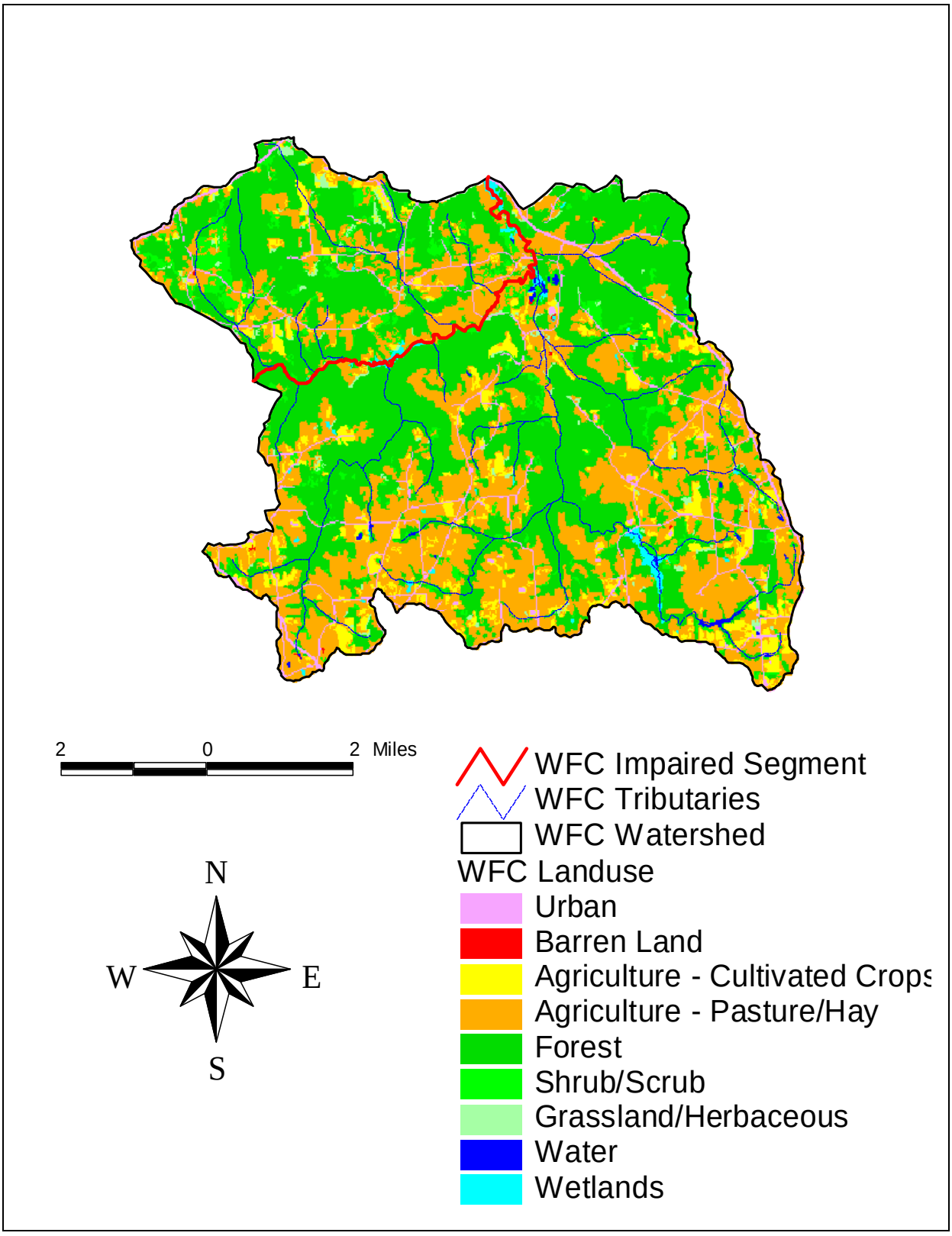

**Table 3-1. Land Use Areas for the West Fork Cotaco Creek Watershed**

| Land Use | Acres | Sq. Miles | Percentages |
|---|---|---|---|
| Open Water | 769 | 0.1 | 0.28 |
| Developed, Open Space | 10,088 | 1.6 | 3.62 |
| Developed, Low Intensity | 1,448 | 0.2 | 0.52 |
| Developed, Medium Intensity | 761 | 0.1 | 0.27 |
| Developed, High Intensity | 87 | 0.0 | 0.03 |
| Barren Land (Rock/Sand/Clay) | 156 | 0.0 | 0.06 |
| Deciduous Forest | 109,727 | 17.1 | 39.39 |
| Evergreen Forest | 6,894 | 1.1 | 2.47 |
| Mixed Forest | 12,194 | 1.9 | 4.38 |
| Shrub/Scrub | 15,312 | 2.4 | 5.50 |
| Grassland/Herbaceous | 3,360 | 0.5 | 1.21 |
| Pasture/Hay | 99,553 | 15.6 | 35.74 |
| Cultivated Crops | 15,870 | 2.5 | 5.70 |
| Woody Wetlands | 2,366 | 0.4 | 0.85 |
| **Total** | **278,584** | **43.5** | **100.00** |

| Grouped Landuses | Acres | Sq. Miles | Percentages |
|---|---|---|---|
| Agriculture | 115,423 | 18.0 | 41.43 |
| Forest | 131,181 | 20.5 | 47.09 |
| Developed | 12,383 | 1.9 | 4.44 |
| Other | 19,597 | 3.1 | 7.03 |
| **Total** | **278,584** | **43.5** | **100.00** |

## *3.4 Linkage Between Numeric Targets and Sources*

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 WFC are from the agricultural land uses 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 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*

TVA collected monthly water quality data for WFC at Alabama Highway 67 (Station 1177001) and Martin Road (Station 1177002) from June through October in 1997. Of the 12 fecal coliform samples collected, four were inconclusive and two were duplicates. Of the 6 samples that provided a colony count, the October measurement of 6,900 colonies/100 mL was the sample that resulted in WFC being placed on the 1998 §303(d) list.

ADEM collected water quality data on WFC in 2003 and 2005 as part of Alabama's §303(d) Monitoring Program at WFCM-28 at Martin Road (See Figure 3.2 and Table 3.3). Of the fecal coliform samples collected at WFCM-28 in 2003 and 2005, only one sample violated the single sample maximum criterion of 2000 colonies/100 mL. Of the samples that qualified for a geometric mean calculation in 2003 and 2005, three months exceeded the criterion of 200 colonies/100 mL (June-Sept). The necessary flow data to calculate the TMDL could not be gathered in 2003 due to beaver dams and large pools. From 2003 to 2005 the beaver dams were removed, allowing for flow measurements. Due to the significant change in flow characteristics, this TMDL will calculate loadings based on 2005 data and not 2003 data. The flow in 2005 was believed to be more representative of current conditions. In 2005, flow data was collected, but had to be supplemented to fill data gaps. This was done by using a ratio calculation of known drainage areas and flows (gathered by real-time USGS gauge) with Big Nance Creek, see Appendix B, Table 7.3 and Figure 7.1. Big Nance Creek was utilized due to its watershed location, characteristics, and landuse being similar WFC. This appears to be a good assumption when the measured flows collected in 2005 on WFC were compared with the real time USGS flows of the same days on Big Nance Creek. This comparison is shown in Appendix B, Figure 7-2 and illustrates nearly identical trends in flow. Due to limited data, the ratio calculation was essential for the development of this TMDL, specifically on 9/22/2005 and 9/26/2005. Linear interpolation was used on USGS data on Big Nance Creek on 9/22/2005 and 9/26/2005 due to no data being reported. This assumption was validated with the graph of September flow in 2005 on Big Nance Creek, as shown in Appendix B, Figure 7-1.

**Table 3-2. Ratio Calculation for West Fork Cotaco Creek**

| Water bodies | Drainage Areas ($mi^2$) | Flow 9/22/2005 (cfs) | Flow 9/26/2005 (cfs) |
|---|---|---|---|
| Big Nance Creek | 166 | 11.4 | 497 |
| West Fork Cotaco Creek | 22.28 | **1.53** | **66.7** |
| Ratio Calculation for 9/22/2005: ( 11.4 cfs/ 166 $mi^2$ ) x 22.28 $mi^2$ = **1.53 cfs** | | | |

**Figure 3-2. Map of ADEM and TVA Sampling Stations on West Fork Cotaco Creek**

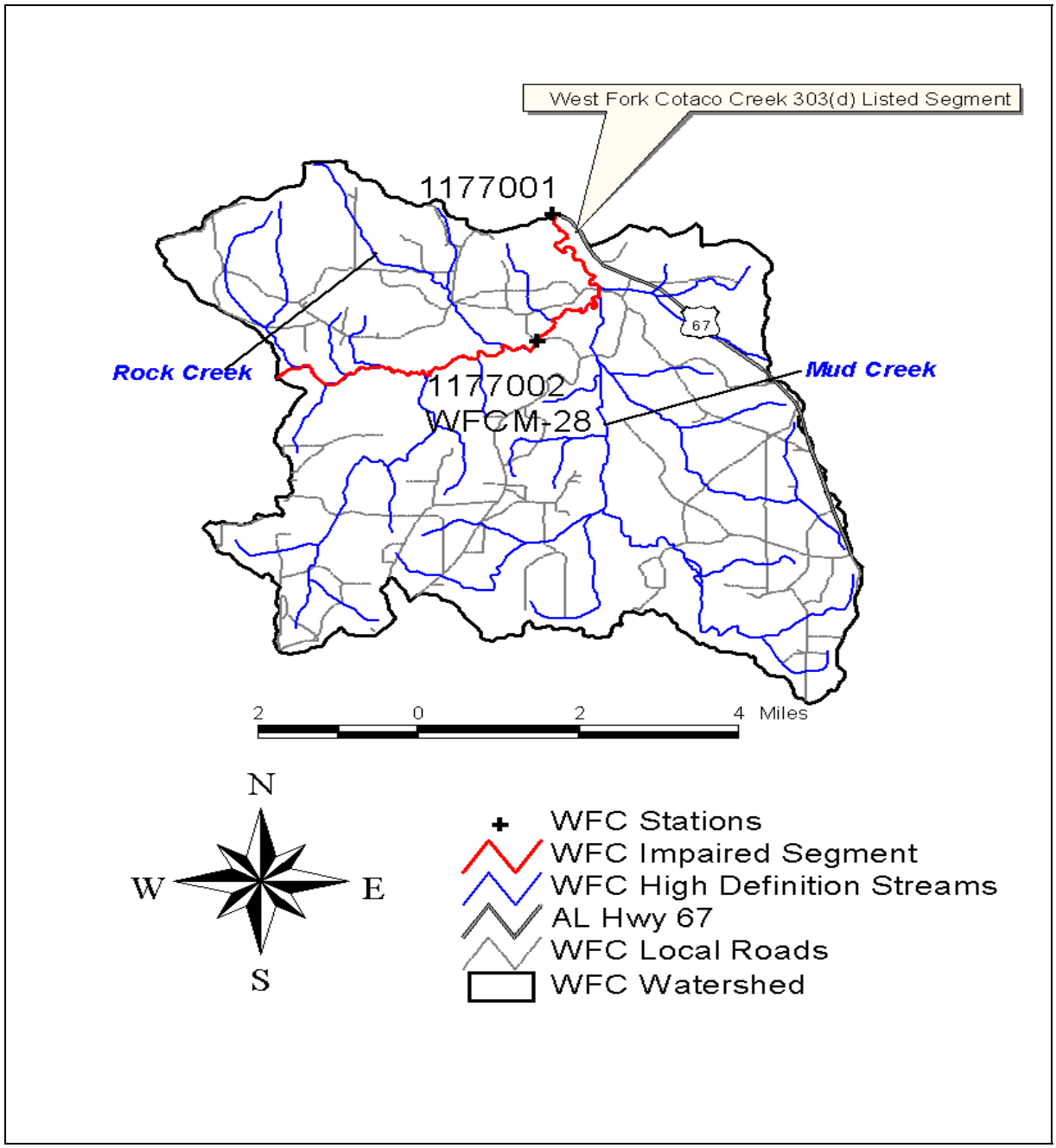


**Table 3-3. West Fork Cotaco Creek Sampling Station Descriptions**

| Years | Station ID | Data Source | Station Location | Latitude | Longitude |
|---|---|---|---|---|---|
| 1997 | 1177001 | TVA | Downstream of Hwy 67 Bridge | 34.38480 | -86.66333 |
| 1997, 2003, 2005 | 1177002, WFCM-28 | TVA , ADEM | Ryan Bridge on Martin Rd | 34.35533 | -86.67611 |

### *3.6 Critical Conditions*

Summer months are generally considered critical conditions. 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 fecal coliform bacteria into streams, resulting in spikes of fecal coliform bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up of fecal coliform bacteria on the land surface, resulting in a more uniform loading rate. Also, the summer fecal coliform criterion is more stringent than the winter criterion.

The data collected by ADEM in 2003 and 2005 in the WFC watershed follows this trend. The one single sample exceedance value, of >6000 col/100ml, appears to be the result of an extreme rain event. The other fecal coliform concentrations have a uniform loading.

### *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 geometric mean criteria was reduced by ten percent to achieve the target concentration of 180 colonies/100 mL.

## *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 water body. 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 water body 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 used to calculate the pathogen TMDL for WFC. The mass balance approach utilizes the conservation of mass principle. Total mass loads can be calculated by multiplying the fecal coliform concentration times the stream flow.

Three loads were calculated in this analysis to determine the current conditions, target conditions, and the TMDL. The first calculation represents the current load to the watershed. This was calculated by multiplying the geometric mean sample exceedance concentration of 371 colonies/100 mL times the average flow for all five of the fecal coliform measurements of 19.1 cfs times the conversion factor. This exceedance value was chosen because it yielded the greatest reduction and is therefore the most protective of the stream's use classification. The product of these three values gives the current loading to WFC.

The second calculation represents the target loading to the watershed. This was calculated by taking the same flow of 19.1 cfs times the target geometric mean fecal concentration of 180 colonies/100 mL times the conversion factor. The difference between the current load and the target load, converted to a percent reduction, represents the loading reduction necessary to achieve the fecal coliform water quality target under those specific flow conditions. Calculations for these two loads can be found in Table 4.1.

The third calculation is the TMDL under critical conditions. The TMDL is the total amount of pollutant that can be assimilated by the receiving water body per day while achieving water quality standards under critical conditions. Critical conditions will be represented by the average flow on the five days of the geometric mean exceedance value. This load was calculated by multiplying the critical condition flow of 19.1 cfs times the maximum allowable fecal concentration of 200 colonies/100 mL times the conversion factor. This value represents the maximum fecal load that can be discharged to the watershed without causing a violation of geometric mean F&W criterion of 200 colonies/100 mL. Calculations for the TMDL load are also in Table 4.1.

**Table 4-1. Current, Target, and TMDL Loadings for West Fork Cotaco Creek**

## Load Reduction and TMDL Calculations for West Fork Cotaco Creek

| | | | |
|---|---|---|---|
| Average Flow measured at WFCM-28 for Geometric Mean Samples: | 19.1 | cfs | |
| Geometric Mean Fecal coliform concentration measured: | 371 | col/100 mL | |
| Target fecal coliform geomean concentration: | 180 | col/100mL | = 200 - 10% |
| Margin of safety for the geomean criteria | 20 | col/100mL | = 10% of criteria |

### Load Calculations:

Load = Fecal Coliform Conc * Measured Flow * Conversion Factor
Load = colonies of Fecal Coliform/day — Measured Flow = cfs
Fecal Coliform Conc = colonies/100 mL — Conversion Factor = 24465755 (ml-s/ft3-day)

### Current Load:

| | | | |
|---|---|---|---|
| Nonpoint source load (LA) | 1.73E+11 | colonies/day | |
| Point source load (WLA) | 0.00E+00 | colonies/day | There are no point sources in this watershed |
| Current load = | 1.73E+11 | colonies/day | |

### Target Load:

| | | | |
|---|---|---|---|
| Nonpoint source load (LA) | 8.41E+10 | colonies/day | |
| Point source load (WLA) | 0.00E+00 | colonies/day | There are no point sources in this watershed |
| Target load = | 8.41E+10 | colonies/day | |

### Margin of Safety:

| | | |
|---|---|---|
| MOS load = | 9.35E+09 | colonies/day |

| Source | Current Load (col/day) | Target Load (col/day) | Required Reduction (col/day) | Reduction % | Final Load (col/day) |
|---|---|---|---|---|---|
| **LA** | 1.73E+11 | 8.41E+10 | 8.93E+10 | 51% | 8.41E+10 |
| **WLA** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0% | 0.00E+00 |
| **Total** | 1.73E+11 | 8.41E+10 | 8.93E+10 | 51% | 8.41E+10 |

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

| TMDL | WLA | LA | MOS |
|---|---|---|---|
| **9.35E+10** | 0.00E+00 | 8.41E+10 | 9.35E+09 |

**Percent Reduction to Achieve the Fecal Coliform Standard:**
Total reduction: 51% = (current load – target load) / current load

**The following assumptions are made for calculating the allowable load.**
The water quality criteria for fecal coliform for summer geometric means is 200 col/100 ml.
To account for an explicit Margin of Safety (MOS) a target concentration of 180 col/100 ml was used to calculate the target load compared to the geometric criteria which is 200 col/ 100 ml.

### *4.3 TMDL Summary*

Pathogen impairment in WFC was documented as indicated from the 1997 TVA study and the §303(d) follow up monitoring performed in 2003 and 2005 by ADEM. This TMDL has estimated the current loading to WFC as twice the acceptable load for complying with the pathogen criteria for the use classification of Fish and Wildlife. Therefore, the TMDL is specifying a 51% reduction to non-point sources, targeted primarily to the agricultural uses in the watershed.

## *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, ADEM's 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 |
|---|---|
| Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia | 2008 |
| Tennessee | 2009 |
| Alabama / Coosa / Tallapoosa | 2010 |
| Escatawpa / Mobile / Lower Tombigbee / Upper Tombigbee | 2011 |
| Black Warrior / Cahaba | 2012 |

## *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 A
# References

ADEM Administrative Code, 2005. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2004. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's 303(d) Monitoring Program. 2003 and 2005. ADEM.

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, December 2005.

Alabama Department of Environmental Management, 1998 - 2006 §303(d) List. ADEM.

Tennessee River Basin Non-Point Source Project. 1997. Tennessee Valley Authority (TVA)

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

Water Quality Report to Congress, For Calendar Years 1990-1991. Alabama Department of Environmental Management, Montgomery, Alabama, June 1996. ADEM, 1992.

# Appendix B
# Water Quality Data

## Table 7-1. TVA Pathogen Data Collected on West Fork Cotaco Creek

| Station ID | Date | Time (24 hr) | Flow (cfs) | Fecal Coliform (col/100ml) |
|---|---|---|---|---|
| 1177001 | 6/25/1997 | 10:00 | 162.0 | INT |
| 1177001 | 7/16/1997 | 11:25 | 6.1 | 590 |
| 1177001 | 8/20/1997 | 11:00 | 3.0 | 1080 |
| 1177001 | 9/17/1997 | 8:00 | 0.0 | 60 |
| 1177001 | 10/22/1997 | 10:40 | 46.3 | 6900 |
| 1177001 | 10/22/1997 | 10:41* | - | 5800 |
| | | | | |
| 1177002 | 6/25/1997 | 10:30 | 101.0 | INT |
| 1177002 | 7/16/1997 | 12:00 | 4.8 | 430 |
| 1177002 | 7/16/1997 | 12:01* | - | 480 |
| 1177002 | 8/20/1997 | 8:00 | 1.9 | INT |
| 1177002 | 9/17/1997 | 8:00 | 0.0 | 220 |
| 1177002 | 10/22/1997 | 8:00 | 19.6 | - |

* Duplicate

## Table 7-2. ADEM Pathogen Data Collected on West Fork Cotaco Creek

| Station ID | Date | Time (24 hr) | Flow (cfs) | Fecal Coliform (col/100ml) |
|---|---|---|---|---|
| WFCM-28 | 06/03/03 | 12:28 PM | none taken | 200 |
| WFCM-28 | 06/09/03 | 10:50 AM | none taken | >620 |
| WFCM-28 | 06/16/03 | 10:45 AM | none taken | 610 |
| WFCM-28 | 06/19/03 | 9:50 AM | none taken | 1020 |
| WFCM-28 | 06/25/03 | 10:45 AM | none taken | >620 |
| | | **Geomean:** | | **544** |
| WFCM-28 | 08/14/03 | 10:12 AM | none taken | 62 |
| WFCM-28 | 08/18/03 | 11:00 AM | none taken | 136 |
| WFCM-28 | 08/20/03 | 10:23 AM | none taken | 620 |
| WFCM-28 | 08/25/03 | 9:48 AM | none taken | 290 |
| WFCM-28 | 08/26/03 | 10:40 AM | none taken | 270 |
| | | **Geomean:** | | **210** |

**(continue Table 7-2)**

| Station ID | Date | Time (24hr) | Flow (cfs) | Fecal Coliform (col/100ml) |
|---|---|---|---|---|
| WFCM-28 | 03/29/05 | 10:00 AM | | 88 |
| WFCM-28 | 04/27/05 | 10:20 AM | 14.0 | 49 |
| WFCM-28 | 05/17/05 | 10:00 AM | 3.9 | 29 |
| | | | | |
| WFCM-28 | 6/9/2005 | 12:05 PM | 34.9 | 240 |
| WFCM-28 | 6/15/2005 | 9:45 AM | 26.1 | 380 |
| WFCM-28 | 6/20/2005 | 10:20 AM | 7.3 | 240 |
| WFCM-28 | 6/21/2005 | 10:45 AM | 33.4 | 240 |
| WFCM-28 | 6/23/2005 | 10:30 AM | 10.0 | scratched |
| | | | | |
| WFCM-28 | 07/18/05 | 9:15 AM | 8.4 | 100 |
| WFCM-28 | 07/18/05 | 9:20 AM | | 128 |
| WFCM-28 | 08/25/05 | 10:00 AM | 9.9 | 260 |
| WFCM-28 | 08/25/05 | 10:05 AM | | 270 |
| | | | | |
| WFCM-28 | 09/22/05 | 1:20 PM | *1.53 | 145 |
| WFCM-28 | 09/26/05 | 12:30 PM | *66.7 | **>6000** |
| WFCM-28 | 09/27/05 | 12:40 PM | 14.2 | 480 |
| WFCM-28 | 09/28/05 | 12:50 PM | 7.7 | 150 |
| WFCM-28 | 09/29/05 | 1:00 PM | 5.5 | 112 |
| | | **Geomean:** | | **371** |
| WFCM-28 | 10/27/05 | 9:00 AM | | 190 |

** Calculated w/ Ratio Method*

## Table 7-3. Flow Data-Big Nance Creek USGS Gauge 03586500

| BIG NANCE - CFS | |
|---|---|
| 9/1/2005 | 129 |
| 9/2/2005 | 62 |
| 9/3/2005 | 41 |
| 9/4/2005 | 31 |
| 9/5/2005 | 26 |
| 9/6/2005 | 23 |
| 9/7/2005 | 19 |
| 9/8/2005 | 18 |
| 9/9/2005 | 17 |
| 9/10/2005 | 17 |
| 9/11/2005 | 16 |
| 9/12/2005 | 15 |
| 9/13/2005 | 14 |
| 9/14/2005 | 13 |
| 9/15/2005 | 13 |

| BIG NANCE - CFS | |
|---|---|
| 9/16/2005 | 14 |
| 9/17/2005 | 19 |
| 9/18/2005 | 19 |
| 9/19/2005 | 16 |
| 9/20/2005 | 13 |
| 9/21/2005 | - |
| 9/22/2005 | - |
| 9/23/2005 | 9.7 |
| 9/24/2005 | 9 |
| 9/25/2005 | 38 |
| 9/26/2005 | 497 |
| 9/27/2005 | 245 |
| 9/28/2005 | 77 |
| 9/29/2005 | 44 |
| 9/30/2005 | 31 |

**Figure 7-1. Graph of September USGS Flow Gauge 03586500 at Big Nance Creek**

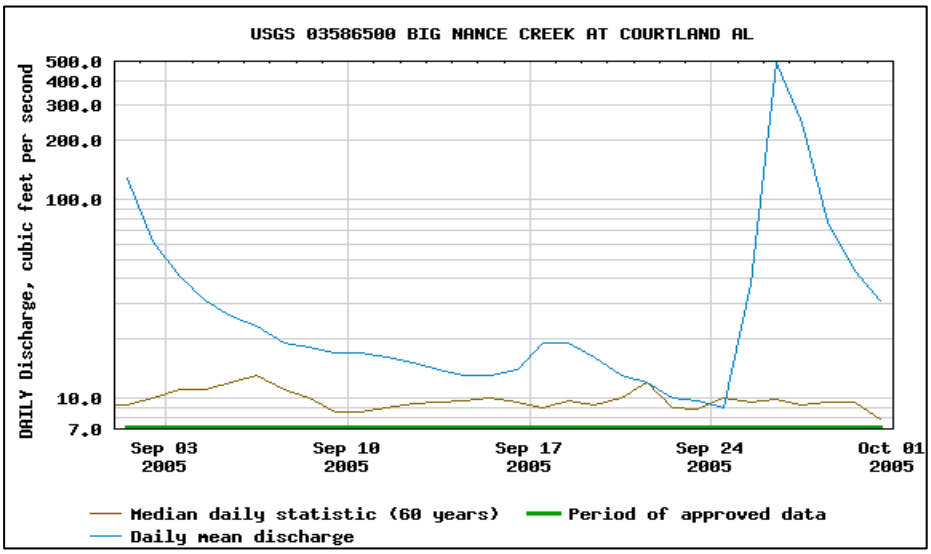


**Figure 7-2. Comparison of ADEM Flow Data on West Fork Cotaco Creek to USGS Gauge Data on Big Nance Creek**