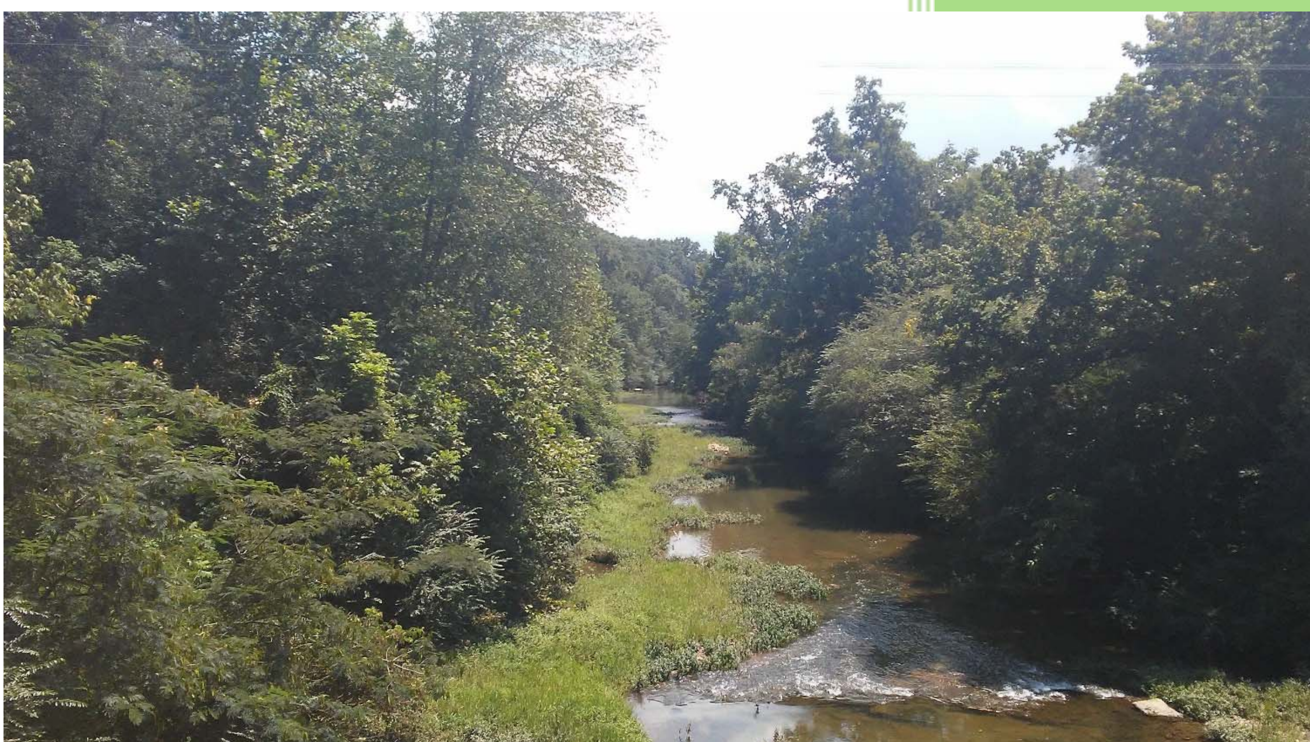
2017

Anderson Creek Watershed Plan



Northwest Alabama Council of Local Governments

Anderson Creek Watershed Management Plan

Lauderdale County, Alabama

Developed by

Northwest Alabama Council of Local Governments

Department of Planning and Transportation

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I. Introduction

The Anderson Creek Watershed includes areas in Lauderdale County and Limestone County, Alabama and Lawrence County Tennessee. The Anderson Creek Watersheds is identified by Hydrological Unit Code (HUC) AL0603004-0404-102. It is part of the Elk River Sub Basin of the Wheeler Lake Basin, which drains a portion of the Tennessee River. The Alabama Department of Environmental Management (ADEM) has classified a section of the watershed as impaired and listed it on the 303(d) list in 1998 following a series of tested samples from which found low levels of macroinvertebrates in the creek. The ADEM identified siltation/sedimentation/erosion as the cause of impairment, resulting in the low macroinvertebrates count. Direct measures of siltation are difficult since local conditions in the watershed directly influence the amount of siltation entering streams. Background conditions such as soil characteristics, average or above average rainfall, plant and animal decay, and the presence of wastewater disposal can greatly influence measurements. Typical measurements for siltation include Nephelometric Turbidity Units (NTUs) and Total Suspended Solids (TSS), which measure the cloudiness and particulate matter in samples taken from surface waters. Prolonged exposure to turbid waters can lead to changes in light and temperature in surface waters, causing environmental damage to the local ecosystem, including the death of plants and animals. Macroinvertebrates counts are a measure of these secondary effects and are a critical measure of the impact from siltation. Other dangers from siltation include changes to the depth and course of surface waters channels which bring an increased risk of flooding to adjacent properties as well as significant damage to wildlife habitat.

Samples taken from two locations in Anderson Creek in 2013 indicate low macroinvertebrate counts and a rating Poor and Fair, respectively, at monitoring sites ANDL-8 (34.8515; -87.2361) and ANDL-9 (34.90568; -87.2656). Other water samples taken between 1998 and 2013 and measuring turbidity (NTUs and TSS) did not directly indicate high levels of siltation. Drinking water standards generally call for less than 5 and preferably less than 1 NTU in samples. The ADEM standards for fish and wildlife waters in the State of Alabama, including Anderson Creek, sets a maximum of 50 NTUs above background levels of natural turbidity. None of the measures surpassed 50 NTUs, although the NTU levels and TSS measures in several samples might prove dangerous to plant and animal life under prolonged exposure. More frequent testing, particularly after heavier rainfall events, would likely produce different results given the condition of macroinvertebrates in Anderson Creek. A summary of water quality testing results is found in III. Environmental Data Summary in this document. A Total Maximum Daily Load (TMDL) guidance has not been developed for the watershed.

The impairment listing established a clear concern for this watershed. Siltation and erosion into waters is a primary non-point source pollutant. The impaired areas of the creek are between Snake River Bridge (CR 26) and the Town of Anderson in Lauderdale County with a flow line length of 9.31 miles. The impaired section is shown in Figure 1, below. The most probable causes of impairment are causes are sheet, rill and gully erosion from upland areas used as cropland, pastures, or streambank erosion upstream of the impaired area. The land use in the watershed is over 50% agricultural.

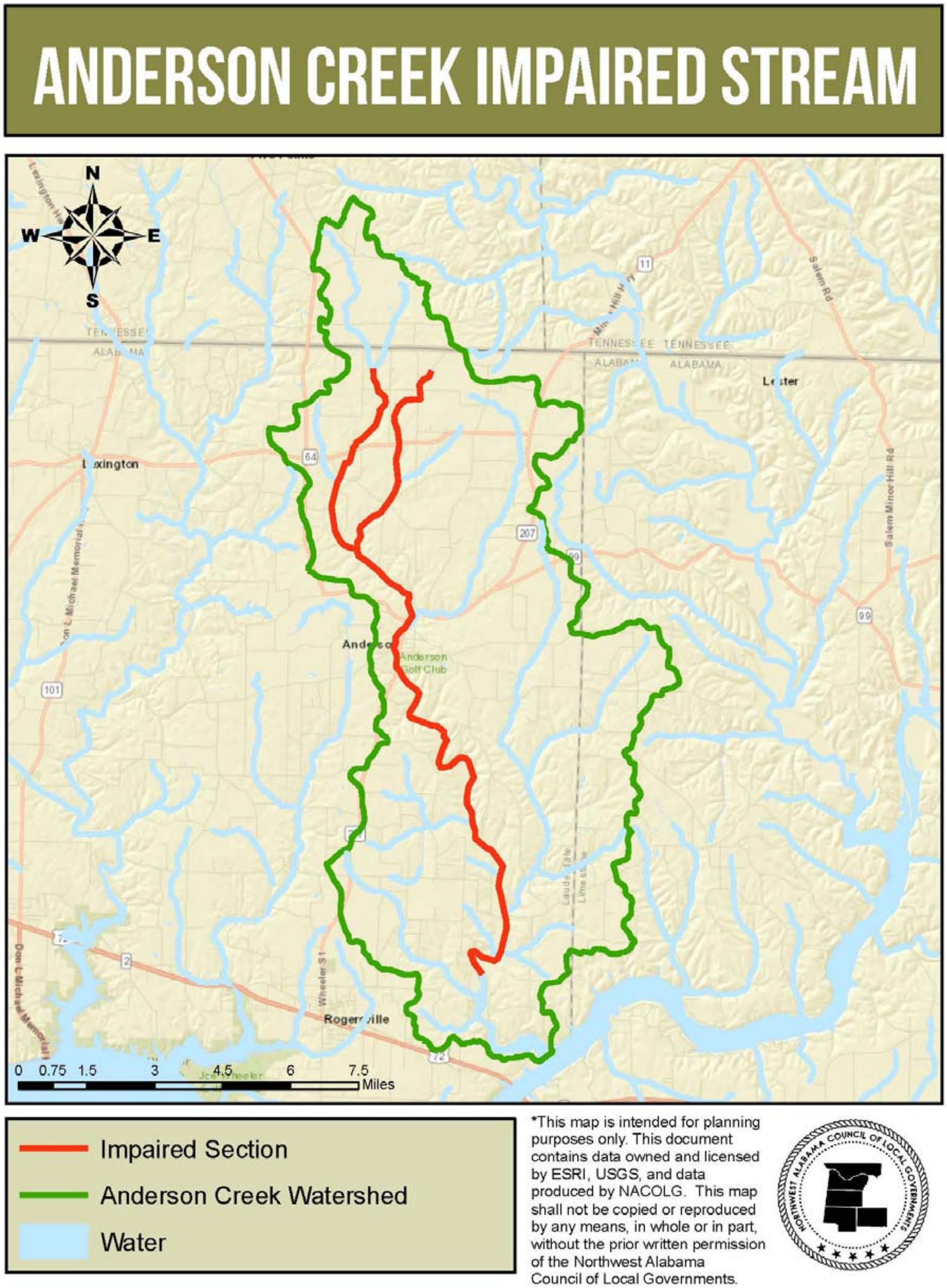

Figure 1: Anderson Creek Impaired Stream

A. Plan Guidelines

The purpose of this watershed plan is to assess watershed characteristics, potential causes of impairment, and identify BMPs to reduce pollution loading in the Anderson Creek waterbody. The plan has been conducted with funding from Section 604(b) Clean Water Act funds administered by flood reduction

ADEM and granted to the Northwest Alabama Council of Local Governments specifically for developing a strategy to assess and treat causes of impairment in the Anderson Creek watershed. Implementation will take place through future funding secured specifically for implementation of BMPs identified in this plan, including but not limited to Section 319 EPA funding. The planning process and implementation rely heavily on public outreach as a means for continued success.

B. Plan Participants

Organizations involved in planning for this project include:

- The Alabama Department of Environmental Management (ADEM)
- The Town of Anderson, AL
- Lauderdale County Commission
- U.S.D.A. Natural Resource Conservation Service
- Lauderdale County Soil and Water Conservation District
- Lawrence County Soil and Water Conservation District
- Limestone County Soil and Water Conservation District
- The Northwest Alabama Resource Conservation and Development District
- The Alabama Forestry Commission
- The Tennessee Valley Authority
- The Alabama Department of Public Health
- The Farm Services Administration
- The Fish and Wildlife Service
- The Alabama Cooperative Extension Service

Private individuals' involvement has also been crucial and will continue to be important to the project's implementation.

C. The Watershed Approach to and the Nine Key Elements of a Watershed Plan

Watershed planning is a critical activity that focuses on the preservation and restoration of water quality, a critical resource for human and other habitation. As such, watershed planning touches on aspects of the lives of all of the individuals who acquire drinking water, water for economic and industrial processes, recreation, or any other use of water resources in an area. Watershed planning touches upon a wide array of complicated issues and affect virtually every potential stakeholder group within the watershed. Because it can be a complex process, the U.S. EPA has encouraged holistic approaches to watershed planning, which adequately confront the diffuse nature of most pollution sources and the voluntary nature of most conservation activities on private lands.

EPA encourages watershed plans to be based on "The Watershed Approach", which is a coordinating framework that addresses the multi-faceted and complex nature of watershed plans by defining planning areas for watershed plans based on drainage, local geography, and hydrological areas. The watershed approach defines the planning unit for watershed activities based on natural features and drainage patterns that create the boundaries of catchments, subwatersheds, watersheds, basins, and basins. These geographic units provide identifiable boundaries that aggregate various environmental and ecological factors, pollutant sources, and stakeholders into areas that are effective units for assessing and correcting problems that contribute to the overall health of downstream areas. Within these areas, the watershed approach identifies data sources to identify contributing factors for water quality deterioration, collects and analyzes new data as needed, prioritizes challenges and actions leading to improved water quality outcomes, engages key stakeholders to produce actionable outcomes, and provides for follow-up monitoring of water quality in the planning area.

1. In addition, key funding to the project for implementation may be provided under Section 319 of the Clean Water Act. In order to be eligible for this funding the project must provide "An identification of the best management practices and measures which will be undertaken to reduce pollutant loadings" and identify "programs to achieve implementation of the best management practices."[1] To best accomplish this, the plan will follow the Section 319 EPA guidelines. These guidelines include the following key elements: Identification of causes and sources for the pollution leading to the present impairment, as well as identifying potential pollution factors that should also be addressed.
2. Estimate of load reductions expected from the proposed management measures.
3. Description of management measures.
4. Sources and amounts of technical and financial assistance available.
5. Formulation of an information/education component.
6. Schedule for implementation of management measures.
7. A description of expected milestones.
8. Criteria that can be used to determine whether load reductions are being achieved over time.
9. A future monitoring component.

These nine key elements provide a step by step framework for evaluating the effectiveness of the watershed approach to watershed planning in the Anderson Creek watershed. These nine key elements serve as building blocks for creating effective watershed approaches to watershed management. These elements allow watershed planning efforts and watershed managers to avoid common pitfalls in the process of assessing and planning actions in watershed, such as the need for clear and objective data sources on impairments, defensible standards for prioritizing decisions, and a link between actions and outcomes. Although these elements are not all-encompassing, they do provide a quantitative frameworks for evaluating the effectiveness of watershed plans in the context of an overall

[1] https://www.epa.gov/nps/watershed-approach

watershed approach. A checklist of these elements is provided in Appendix A of this plan.[2]

[2] https://cfpub.epa.gov/watertrain/pdf/modules/introduction_to_watershed_planning.pdf

II. Watershed Characterization

A. Description and Location

The Anderson Creek Watershed is part of the Wheeler Lake Reservoir in the Upper Tennessee River Basin, shown in Figure 2. The area of the watershed is 59.24 square miles. The watershed is approximately 37,926 acres in area, according to calculations derived from the National Land Cover Database (2011) data using local Geographic Information Systems (GIS). Approximately 36,196.37 of the total is in Alabama, divided between Lauderdale County (32,152.96 acres) and Limestone County (4,043.73 acres) with the remaining 1,729.70 acres in Lawrence County, Tennessee. Its farthest latitude north is at 35° 2’16.28”N and its farthest south latitude is at 34°48’47.53”N; its average longitude is 87°17’0.92”W. The flow line length for the impaired section of Anderson Creek from Snake River Bridge (CR 26) to the Town of Anderson is 9.31 miles (see Table 1). Anderson Creek is designated for fish and wildlife uses according to EPA standards.

Waterbody ID	AL06030004-0404-102
12 Digit Hydrological Code(s)	06030004-0404
HUC Name	Anderson Creek
Location	Lauderdale, Limestone (AL), Lawrence (TN)
Latitude, farthest north	35° 2’16.28”N
Latitude, farthest south	34°48’47.53”N
Longitude, avg.	87°17’0.92”W
Receiving waterbody	Tennessee River
Watershed Area	59.24 Square Miles
Lauderdale County, AL	50.23 Square Miles
Limestone County, AL	6.31 Square Miles
Lawrence County, TN	2.70 Square Miles
Flowline Length	9.31 Miles

Table 1 Anderson Creek Watershed Description and Information


Anderson Creek facing south at 34°55'19.26"N 87°16'16.61"W

ANDERSON CREEK WATERSHED LOCATION

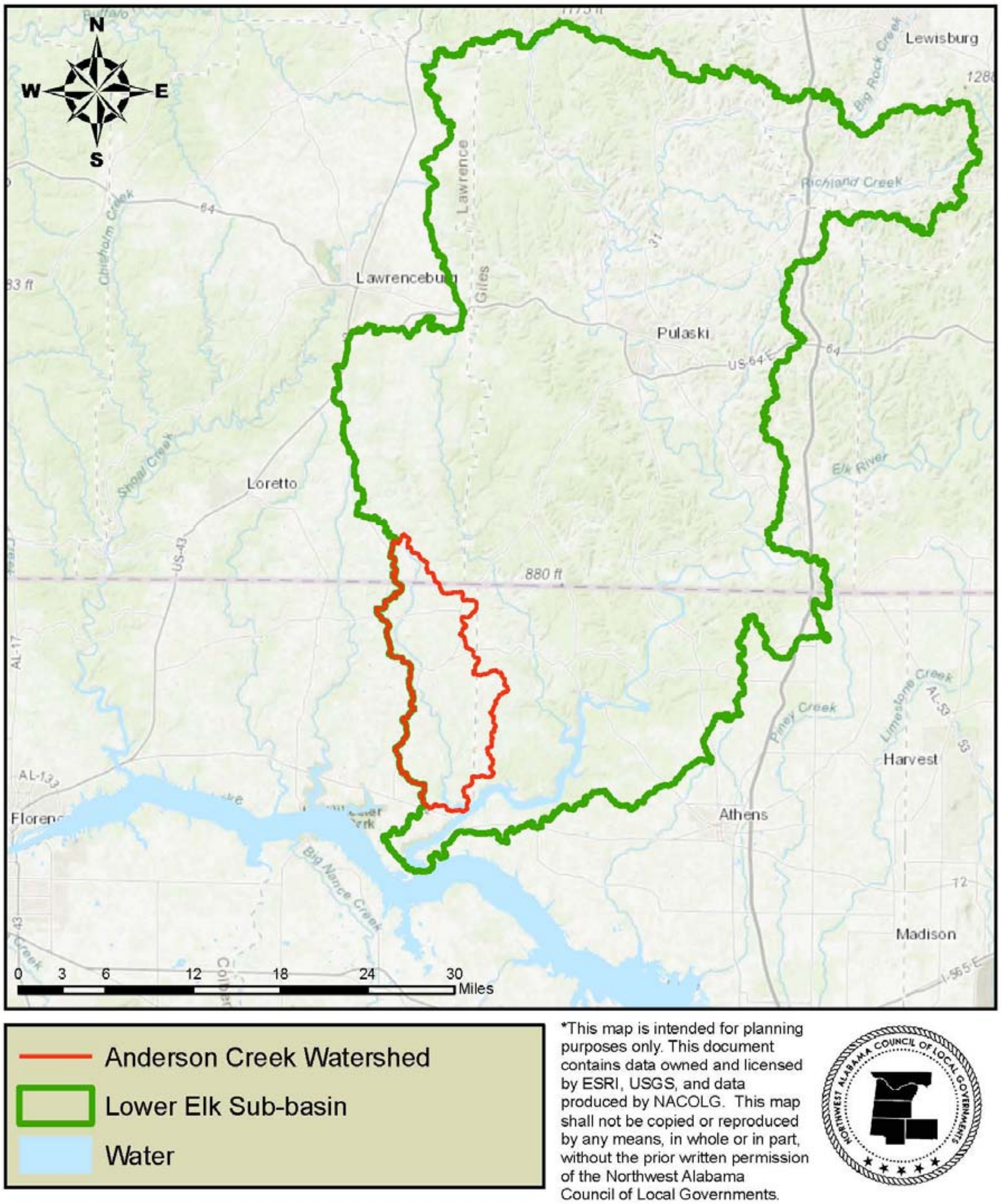

Figure 2: Anderson Creek Watershed Location

B. Environmental/Public Importance

This watershed is similar to other tributaries along the Tennessee River in that it provides a suitable ecosystem for any number of wildlife species. The human value of this ecosystem can be seen in the use of the waterbody for fishing, particularly at the wider area at the mouth. This value is also seen in the large number of pasture tracts and forested lands in the watershed, which are also suitable for hunting and wild game harvesting. The ecosystem of the creek also fills an important role as a lynchpin for fertility and suitability for farming. The description for this classification according to ADEM Administrative Code R. 335-6-10-.09(5) is as follows:

- **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.
- **Conditions related to best usage:** the waters will be suitable for fish, aquatic life and wildlife propagation.
- **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 Alabama Department of Public Health.
- **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.
- **Specific criteria for Fish and Wildlife designations as they pertain to turbidity (siltation):** Turbidity: there shall be no turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of waters or interfere with any beneficial uses which they serve. Furthermore, in no case shall turbidity exceed 50 Nephelometric units above background. Background will be interpreted as the natural condition of the receiving waters without the influence of man-made or man-induced causes. Turbidity levels caused by natural runoff will be included in establishing background levels.

C. Population

According to the 2010 Census, the Anderson Creek Watershed is home to approximately 3,820 residents in Lauderdale County and Limestone County, Alabama and Lawrence County, Tennessee. The majority of the populace, approximately 3,278, reside in Lauderdale County including residents of the Town of Anderson and Rogersville; approximately 361 reside in the Limestone portion of the watershed and 181 in the Lawrence County, Tennessee portion.

D. Environmental Justice Considerations

Environmental justice refers to disproportionate environmental burdens borne by individuals along racial, ethnic, or economic lines. The U.S. EPA defines environmental justice as “the fair treatment and equal involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies...achieved when everyone enjoys the same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn, and work."[3] The Anderson Creek Watershed plan assessed environmental justice impacts from existing sources of pollution and found no disproportionate impacts on communities on the basis of color, ethnicity, or economic status in the watershed. Nonpoint source impacts are by their nature diffused throughout the watershed and none of them were concentrated within any particular areas. The planning process was kept open to all residents and potential stakeholders in the watershed and, likewise, future implementation efforts will be made available to all interested parties so as to avoid creating any undue positive or negative impact as a result of environmental justice considerations.

E. Ecoregion

Ecoregions are areas where ecosystems share broad environmental characteristics that affect or relate to ecosystem quality and integrity. These factors include geology, landforms, soils, vegetation, climate, land use, wildlife and hydrology. Ecoregions are defined from broadest to narrowest as Level I, Level II, Level III, and Level IV based on the mapping of these features. The Anderson Creek Watershed is located in the Level IV Ecosystem known as the Western Highland Rim. The Western Highland Rim is characterized by weakly to moderately dissected rolling terrain of irregular plains and rounded hills. In Alabama, the ecoregion tends to have less relief and dissection than in Tennessee. The limestone, chert, siltstone, and shale bedrock is covered by soils that are gravelly, acidic, and low to moderate in fertility. Streams are characterized by coarse chert gravel and sand substrates with areas of exposed bedrock, low to moderate gradients, and relatively clear water. Although the steeper, more dissected side slopes tend to be forested, most of the natural vegetation has been removed from the broad, gently sloping uplands used for pasture and cropland. Cattle production is locally significant, and hay, cotton, and soybeans, with some wheat and corn, comprise much of the cropland.

F. Aquifers

Physiographically, the watershed is located in the Highland Rim, which drains generally southward toward the Tennessee River. The majority of Lauderdale County including the area of the Anderson Creek watershed overlies the Tuscumbia-Fort Payne aquifer. The Tuscumbia-Fort Payne aquifer includes the Monteagle Limestone, Tuscumbia Limestone, and Fort Payne Chert. The aquifer name emphasizes the prominence of the Tuscumbia Limestone and the Fort Payne Chert which are the most significant sources of water within it. The Monteagle Limestone is a significant source of water in only the southeastern part of the study area. The Tuscumbia-Fort Payne aquifer is the major aquifer for all of the study area north of Little Mountain and is used for public supplies throughout its outcrop area. The aquifer underlies the entire study area, but has not been developed south of Little Mountain because of the availability of water from the overlying Bangor aquifer. The aquifer is recharged throughout its outcrop by water which infiltrates and percolates through the regolith. The base of the aquifer is the contact with the underlying Chattanooga Shale. Water in the Tuscumbia-Fort Payne aquifer is partially confined because of the lower hydraulic conductivity of the overlying residual mantle.

[3] https://www.epa.gov/environmentaljustice

The Tuscumbia-Fort Payne aquifer is the most widely-used aquifer for public supply in the study area. The potentiometric contours for the Tuscumbia-Fort Payne aquifer show ground-water movement toward the Tennessee River from the north and south. Minor variations shown at this scale are generally related to topography. The trend is for ground water to move from higher to lower topographic areas. A substantial amount of information concerning the configuration of the Chattanooga Shale, the base of the Tuscumbia-Fort Payne aquifer, has been collected in Limestone and Madison Counties. These data indicate that there are depressions on the surface of the Chattanooga Shale. Areas of depressions provide a reservoir-like area that is well suited for ground-water storage.[4]

G. Endangered Species

Table 2 describes the endangered and threatened species known to occur in Lauderdale County, Alabama:[5]

Group	Common Name	Scientific Name	Status
Clams	Cumberland monkeyface (pearlymussel)	Quadrula intermedia	Endangered
Clams	Pink mucket (pearlymussel)	Lampsilis abrupta	Endangered
Clams	Dromedary pearlymussel	Dromus dromas	Endangered
Clams	Littlewing pearlymussel	Pegias fabula	Endangered
Clams	White wartyback (pearlymussel)	Plethobasus cicatricosus	Endangered
Clams	Rough pigtoe	Pleurobema plenum	Endangered
Clams	Orangefoot pimpleback (pearlymussel)	Plethobasus cooperianus	Endangered
Clams	Ring pink (mussel)	Obovaria retusa	Endangered
Clams	Spectaclecase (mussel)	Cumberlandia monodonta	Endangered
Clams	Slabside Pearlymussel	Pleuronaia dolabelloides	Endangered
Clams	Fanshell	Cyprogenia stegaria	Endangered
Clams	Snuffbox mussel	Epioblasma triquetra	Endangered
Clams	Sheepnose Mussel	Plethobasus cyphyus	Endangered
Fishes	Alabama cavefish	Speoplatyrhinus poulsoni	Endangered
Fishes	Spotfin Chub	Erimonax monachus	Threatened
Fishes	Slackwater darter	Etheostoma boschungi	Threatened
Flowering Plants	White fringeless orchid	Platanthera integrilabia	Threatened
Mammals	Indiana bat	Myotis sodalis	Endangered
Mammals	Gray bat	Myotis grisescens	Endangered
Mammals	Northern Long-Eared Bat	Myotis septentrionalis	Threatened
Snails	Slender campeloma	Campeloma decampi	Endangered

Table 2 Endangered Species in Lauderdale County

Restoration and preservation activities related to this management plan will consider the impacts of proposed actions on these populations, especially the aquatic species.

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[4] https://pubs.usgs.gov/wri/1987/4068/report.pdf

[5] https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=01077

H. Climate

Northwest Alabama and the Anderson Creek Watershed lies in a humid subtropical climate, with an average annual temperature of 58.85 (F) and an average annual precipitation level of 57.93 inches. The first frost of the year comes in late October and the last frost is usually in late March or early April; the growing season is approximately 195 days long. The coldest month is February with an average low of 30 (f) and the warmest month is August with an average high of 89 (f). The annual average high is 70.4 (f) and the annual average low is 47.3(f).

I. Soils

The majority of the bedrock for the Anderson Creek Watershed dates to the Mississippian Age, 360 million years ago. This Mississippian Age bedrock is interspersed with older rock from the Ordovician Period, dating back at least 443 million years. Slope runs generally south but naturally drains towards the creek beginning at distances of no greater than ½ mile from the creek bank. Percent slope is 40% at its greatest, and the areas with greatest slope are generally nearest the creek bank. Peak elevation for the watershed is 879 feet above sea level at the headwaters of the creek. The lowest point of elevation, at 569 feet, is the normal pool elevation of Elk River where it flows toward Wheeler Lake and the Tennessee River.

There are eleven different soil associations in the Anderson Creek Watershed area according to 1975 Lauderdale County soil surveys. Figure 3 illustrates the soil map units from the county soil surveys conducted by NRCS. The three largest account for over 80% of the soils in the area: Dickson-Fullerton; Dewey-Decatur; and Bodine Fullerton. Dickson-Fullerton soils flank the watershed in the upland areas, with Bodine-Fullerton soils filling most of the areas near the creek bank. Dewey- Decatur can be found mainly in the northern portion of the watershed. Descriptions of these soil associations are as follows:

- **Dickson-Fullerton**- These are moderately to well drained soils of medium cherty texture found in broad areas in uplands. The composition is 59 percent Dickson, 24% Fullerton, and the remainder is of varying soil types. Typical surface layers are brown or grayish-brown silt loam with a subsoil of yellow brown or red silty clay loam that is sometimes friable; there is often a second subsoil of dense and brittle clay. These soils are cultivable, but are only fertile with intensive management; they are often used as pastureland.
- **Dewey-Decatur**- This soil is usually found in broad valley uplands and it is comprised of well drained, medium textured, non-cherty soils. This association is 53 percent Dewey soils, 26 percent Decatur soils, and finished out by 21 percent other soil types. Surface layers are reddish brown silty or clay loam and subsoils are dark red and brown silt loam or clay loam that is friable. This is very productive soil and is usually farmed intensively.
- **Bodine-Fullerton**- This soil type is on sloping to steep terrain on uplands. These soils are well drained to excessively drained, generally with a slope gradient of 15-35 percent. It is comprised of 71 percent Bodine, 12 percent Fullerton, and 17 percent other soil types and is characterized by brown silty loam surfaces and light to dark brown cherty silty clay. This soil type is generally found in wooded areas.
- **Erosion factor K** indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised

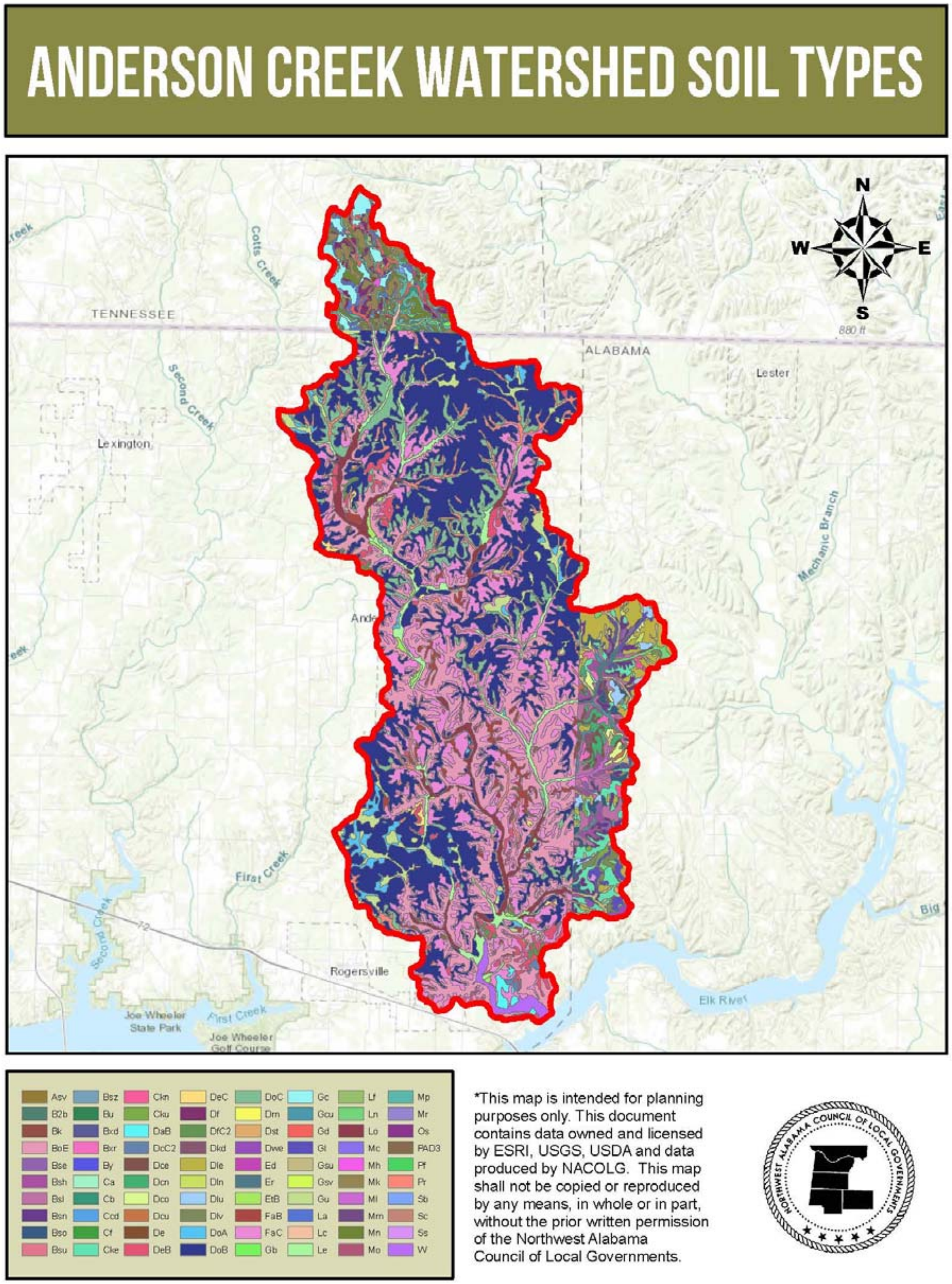

Figure 3: Anderson Creek Watershed Soil Types

Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

- **The T factor** is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

The four hydrologic soil groups (HSGs) are described as:

- **Group A**—Soils in this group have low runoff potential when thoroughly wet. Water is transmitted freely through the soil. Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravel or sand textures. Some soils having loamy sand, sandy loam, loam or silt loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments. The limits on the diagnostic physical characteristics of group A are as follows. The saturated hydraulic conductivity of all soil layers exceeds 40.0 micrometers per second (5.67 inches per hour). The depth to any water impermeable layer is greater than 50 centimeters [20 inches]. The depth to the water table is greater than 60 centimeters [24 inches]. Soils that are deeper than 100 centimeters [40 inches] to a water impermeable layer are in group A if the saturated hydraulic conductivity of all soil layers within 100 centimeters [40 inches] of the surface exceeds 10 micrometers per second (1.42 inches per hour).
- **Group B**—Soils in this group have moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded. Group B soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures. Some soils having loam, silt loam, silt, or sandy clay loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments. The limits on the diagnostic physical characteristics of group B are as follows. The saturated hydraulic conductivity in the least transmissive layer between the surface and 50 centimeters [20 inches] ranges from 10.0 micrometers per second (1.42 inches per hour) to 40.0 micrometers per second (5.67 inches per hour). The depth to any water impermeable layer is greater than 50 centimeters [20 inches]. The depth to the water table is greater than 60 centimeters [24 inches]. Soils that are deeper than 100 centimeters [40 inches] to a water impermeable layer or water table are in group B if the saturated hydraulic conductivity of all soil layers within 100 centimeters [40 inches] of the surface exceeds 4.0 micrometers per second (0.57 inches per hour) but is less than 10.0 micrometers per second (1.42 inches per hour).
- **Group C**—Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand and have loam, silt

loam, sandy clay loam, clay loam, and silty clay loam textures. Some soils having clay, silty clay, or sandy clay textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments. The limits on the diagnostic physical characteristics of group C are as follows. The saturated hydraulic conductivity in the least transmissive layer between the surface and 50 centimeters [20 inches] is between 1.0 micrometers per second (0.14 inches per hour) and 10.0 micrometers per second (1.42 inches per hour). The depth to any water impermeable layer is greater than 50 centimeters [20 inches]. The depth to the water table is greater than 60 centimeters [24 inches]. Soils that are deeper than 100 centimeters [40 inches] to a restriction or water table are in group C if the saturated hydraulic conductivity of all soil layers within 100 centimeters [40 inches] of the surface exceeds 0.40 micrometers per second (0.06 inches per hour) but is less than 4.0 micrometers per second (0.57 inches per hour).

- **Group D**—Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas, they also have high shrink-swell potential. All soils with a depth to a water impermeable layer less than 50 centimeters [20 inches] and all soils with a water table within 60 centimeters [24 inches] of the surface are in this group, although some may have a dual classification, as described in the next section, if they can be adequately drained. The limits on the physical diagnostic characteristics of group D are as follows. For soils with a water impermeable layer at a depth between 50 centimeters and 100 centimeters [20 and 40 inches], the saturated hydraulic conductivity in the least transmissive soil layer is less than or equal to 1.0 micrometers per second (0.14 inches per hour). For soils that are deeper than 100 centimeters [40 inches] to a restriction or water table, the saturated hydraulic conductivity of all soil layers within 100 centimeters [40 inches] of the surface is less than or equal to 0.40 micrometers per second (0.06 inches per hour).
- **Dual hydrologic soil groups**—Certain wet soils are placed in group D based solely on the presence of a water table within 60 centimeters [24 inches] of the surface even though the saturated hydraulic conductivity may be favorable for water transmission. If these soils can be adequately drained, then they are assigned to dual hydrologic soil groups (A/D, B/D, and C/D) based on their saturated hydraulic conductivity and the water table depth when drained. The first letter applies to the drained condition and the second to the undrained condition. For the purpose of hydrologic soil group, adequately drained means that the seasonal high water table is kept at least 60 centimeters [24 inches] below the surface in a soil where it would be higher in a natural state.

Appendix B contains detailed information regarding soils in Lauderdale County, Limestone County, and Lawrence County including conservation planning and erosion information.

J. Elevation and Slope

Elevation data from the U.S.G.S. National Elevation Dataset (2013) shows elevations in the watershed ranging from 879 feet at the northern headwaters to 569 at the mouth of Anderson Creek at Elk River. Land forms are gently rolling to steep hills with slopes of greater than 10% to nearly flat. Steeper slopes are located adjacent to tributary streams and adjoining Anderson Creek. Figure 4 describes elevations in the watershed. Figure 5 describes steep slopes greater than 10%.

K. Land Use and Land Cover

Considering the siltation impairment, land use and land cover may be the most important aspect of the watershed assessment. Awareness of how the land is used helps determine pollution causes; this will enable participants in the watershed plan to pick out the best management practices that are easiest employed and which will be most effective. The 2011 National Land Cover Database (NLCD) shows approximately 37,926 acres in the Anderson Creek Watershed. With 18,114 acres, hay fields and pasture lands makes up almost 48% of the land use in the watershed. Forest cover accounts for 29.22% of total land cover with 11,083 total acres. There are 2,237 acres of urban land in the watershed area, most of which is in or surrounding Anderson and Rogersville, AL. There are two major highways that run through the watershed; Highway 72 crosses in the southern tip near the river, and Highway 64 bisects the watershed into its upper and lower parts. There are a number of county roads that run through the watershed. Table 3 and Figure 6 illustrate land use in the watershed.

Land Use Category	Acres	
Hay/Pasture	18114.05	47.76%
Forest	11083.42	29.22%
Cultivated Crop	2803.57	7.39%
Herbaceous/Shrub/Scrub	2418.58	6.38%
Urban	2237.44	5.90%
Wetlands	977.35	2.58%
Open Water/Barren Land/Other	291.67	0.77%
Total	37926.08	

Table 3 Land Use Distributed in Anderson Creek Watershed

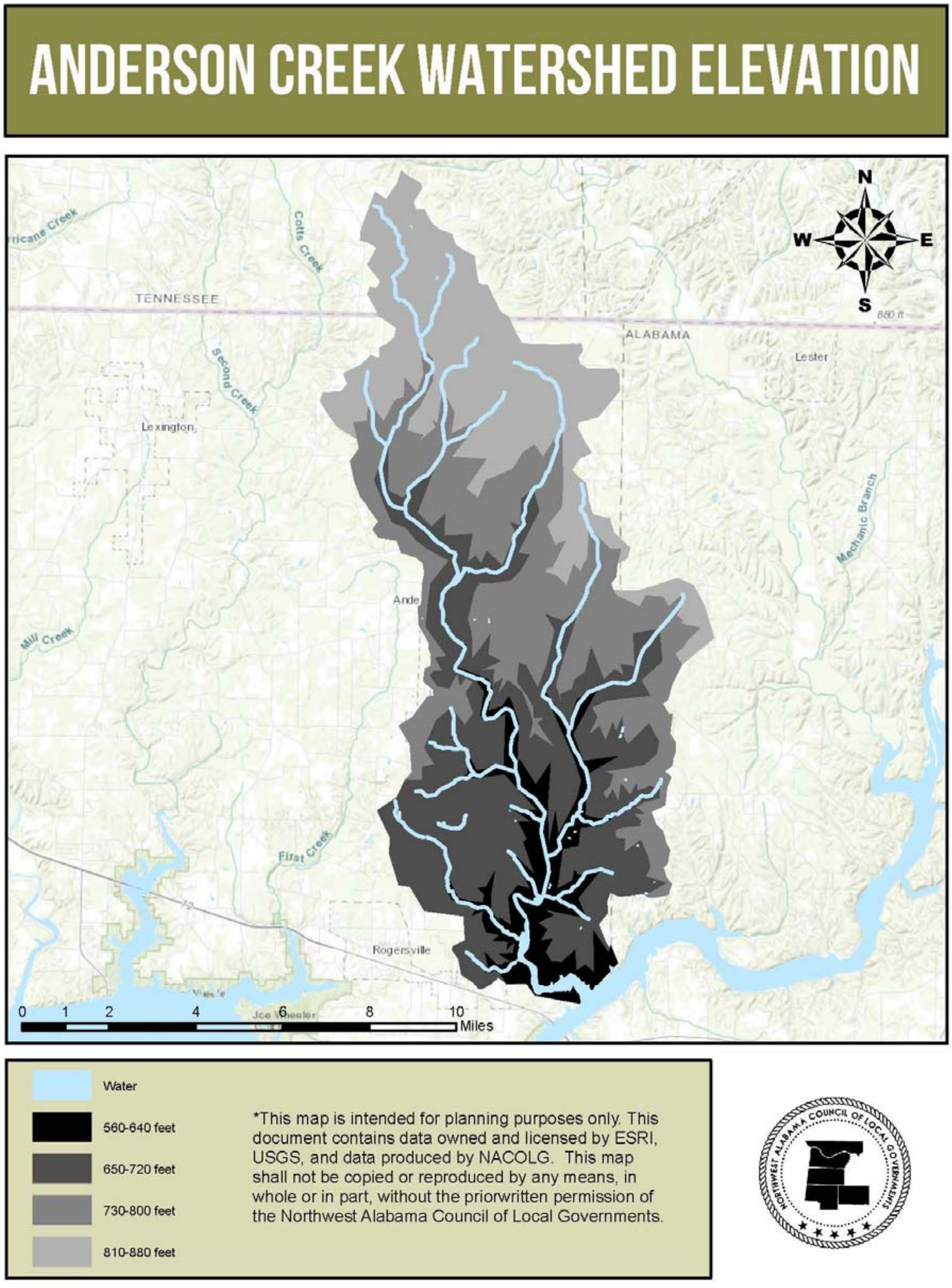

Figure 4: Anderson Creek Watershed Elevation

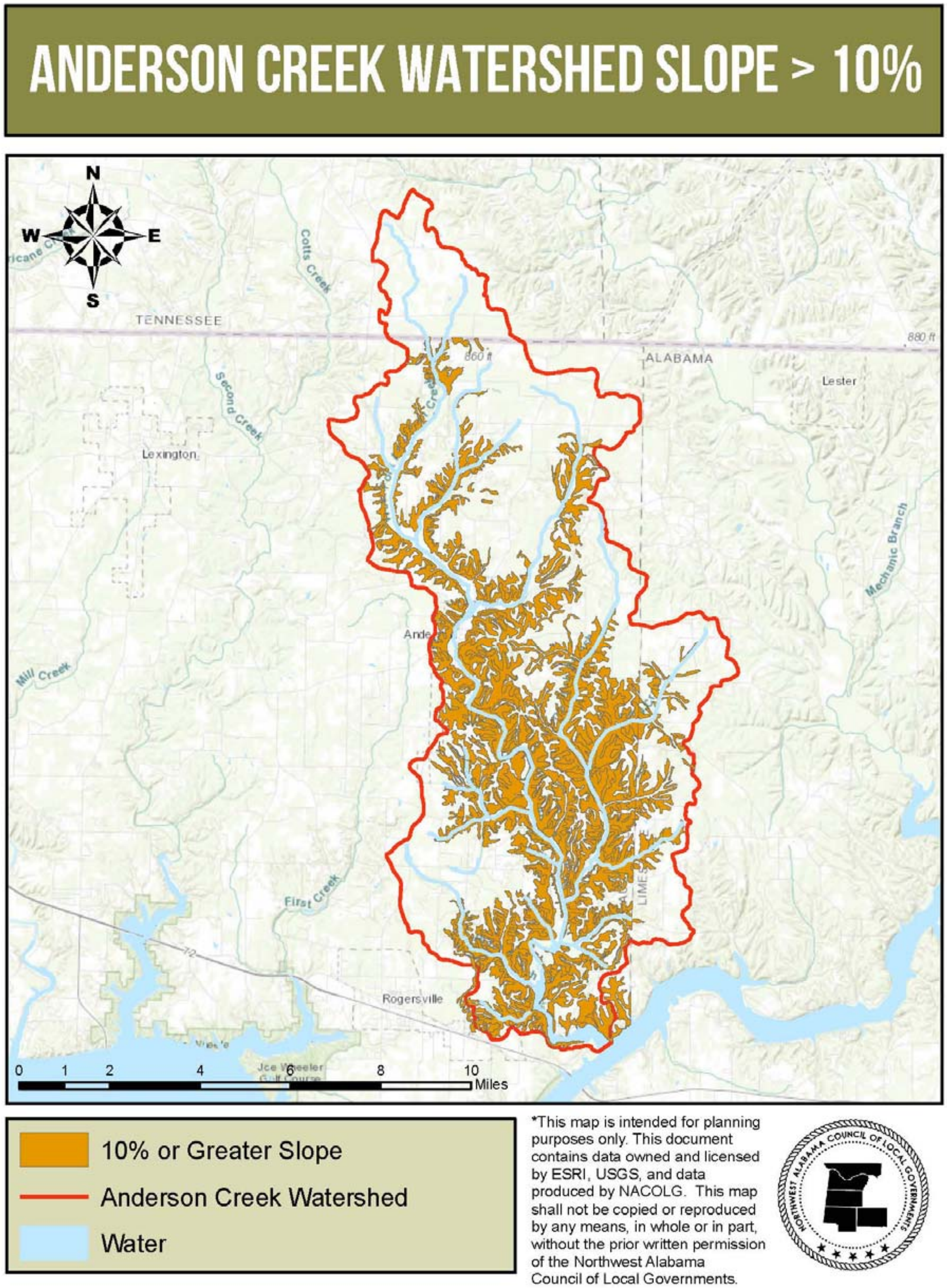

Figure 5: Anderson Creek Watershed Slope Greater than 10%

ANDERSON CREEK WATERSHED LAND USE

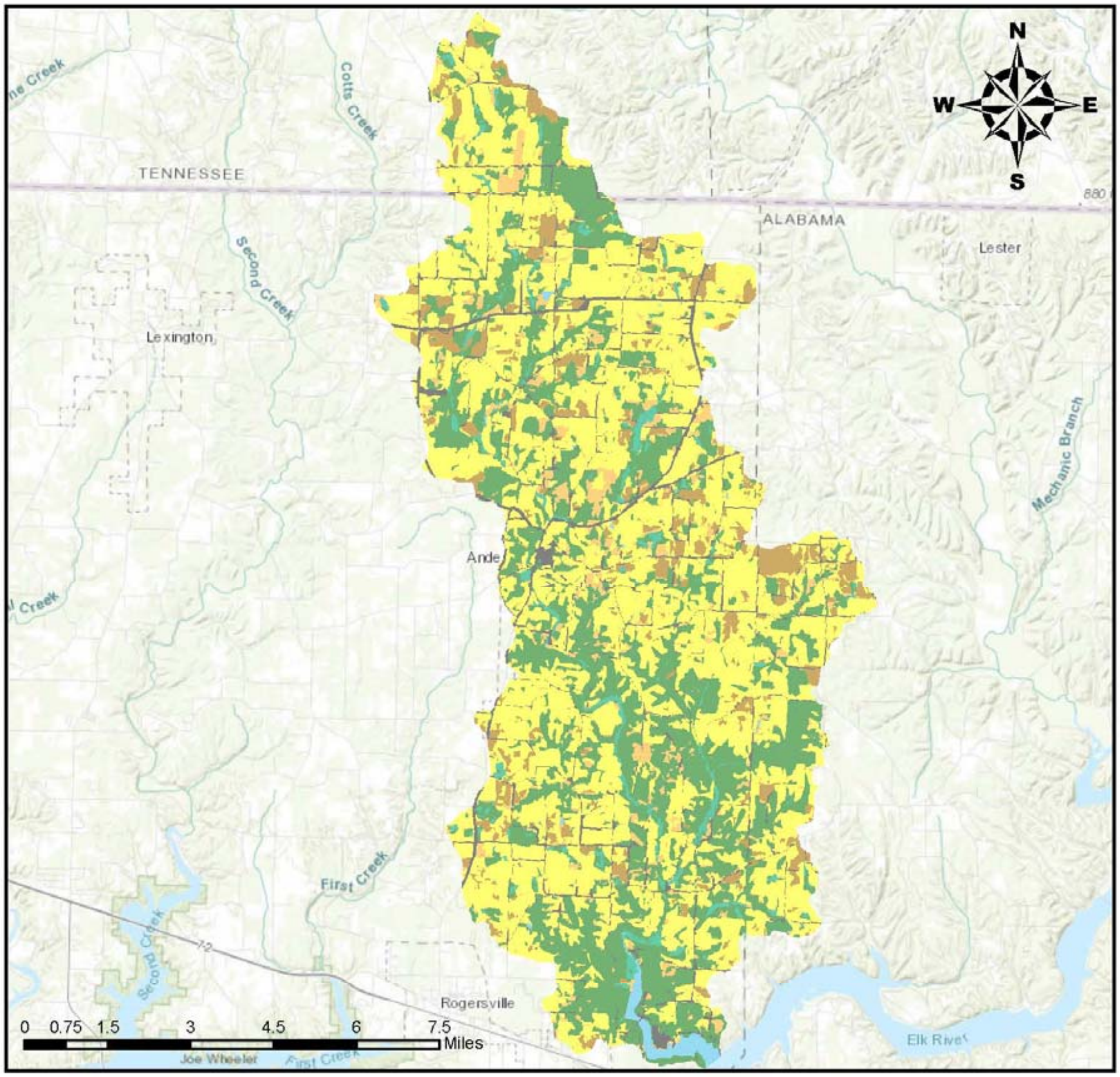

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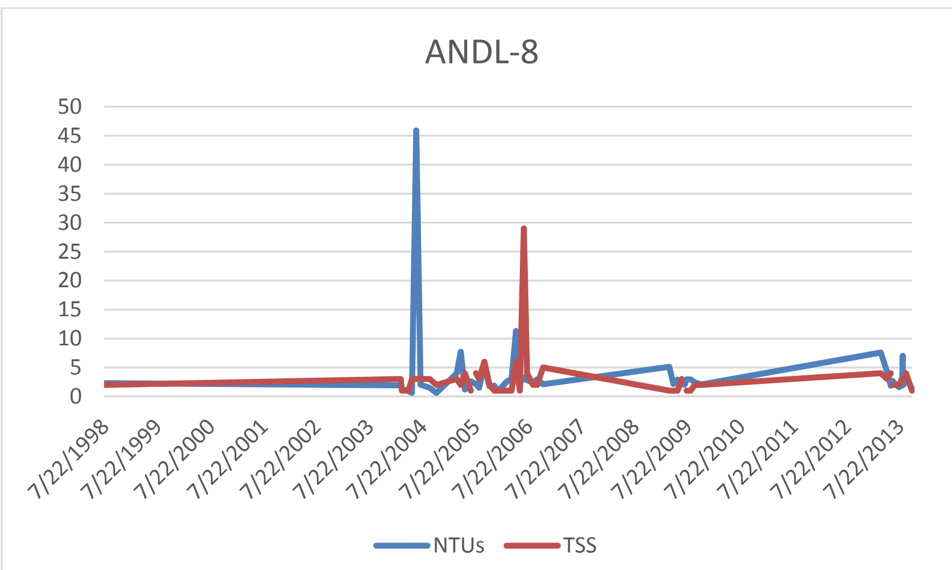
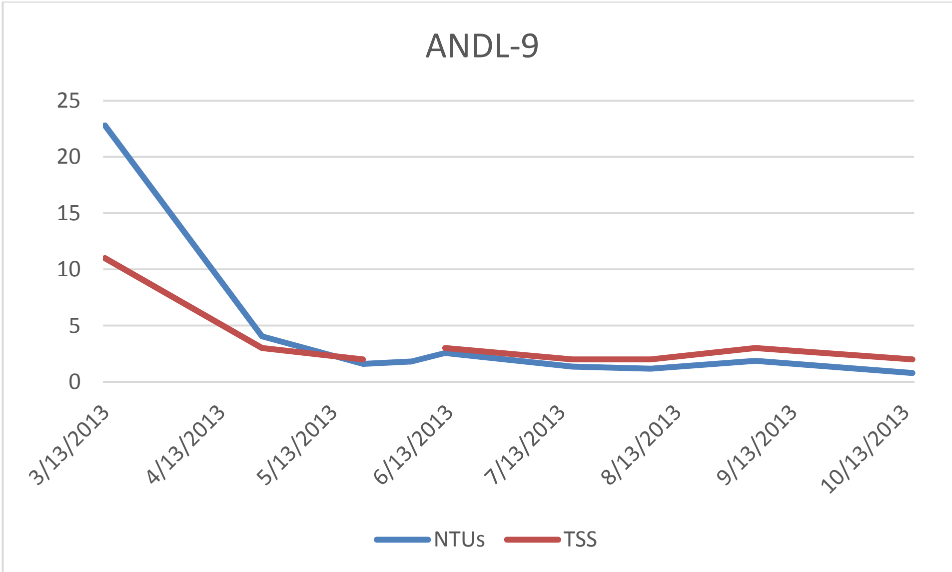
Figure 6: Anderson Creek Watershed Land Use

III. Environmental Data Summary

A. 303(d) Impairment

The 303(d) listing for siltation occurred in 1998, following the study and measurement of macroinvertebrates in Anderson Creek. Data collection supporting the 303(d) listing took place at stations ANDL-8 and ANDL-9 in 2013. These collection points were located along Anderson Creek at 34.8515N, -87.2361W and 34.90568N, -87.2656W at Anderson Creek and Lauderdale County Road 156 and Anderson Creek and Snake Road Bridge. The drainage area upstream of each site was 25.3 square miles for ANDL-9 and 48.97 square miles for ANDL-8. These collection points are shown in Figure 7. The data collected at these sites indicated Poor and Fair levels of macroinvertabrates in Anderson Creek at that time. Testing records from 1998 to 2013 at both locations and measuring turbidity (NTUs and TSS) did not directly indicate high levels of siltation. Appendix C contains full testing records for these sites. Drinking water standards generally call for less than 5 and preferably less than 1 NTU in samples. The ADEM standards for fish and wildlife waters in the State of Alabama, including Anderson Creek, sets a maximum of 50 NTUs above background levels of natural turbidity. None of the measures surpassed 50 NTUs, although the NTU levels and TSS measures in several samples might prove dangerous to plant and animal life under prolonged exposure. More frequent testing, particularly after heavier rainfall events, would likely produce different results given the condition of macroinvertebrates in Anderson Creek. The ADEM has not published a TMDL for Anderson Creek. NACOLG will develop a watershed management plan to reduce sedimentation and siltation loads in the Anderson Creek Watershed through BMPS and goals to manage the watershed in the future.





B. National Pollution Discharge Elimination System (NPDES) Permitting

There are 12 permits listed on EPA's list of environmentally permitted sites in the watershed: Rose Lumber Mill, Weather's Grocery, Kenneth Sewell Farm, Stephens Performance, Inc., BRZ-3900 (Highway Construction), Mosley Farm, Hillwood Apartments WWTP, Anderson Jr. High WWTP, Romine Chicken Barn Expansion, Cap Auto Sales and Salvage, ALDOT BR 3916 (Highway Construction), and one unpermitted facility complaint. These largely function for wastewater treatment and disposal. Additional information on these permits is available at www.epa.gov/enviro/index.html.

C. Other Data and Information

According to officials with the Lauderdale County Department of Public Health, most houses and facilities use septic systems for waste disposal. The wastewater treatment area of the Town of Rogersville, including its collection and treatment infrastructure, is outside of the watershed boundaries. Two permitted wastewater treatment facilities serve the Anderson Junior High School (now privately owned) and Hillwood Apartments as shown in Figure 8 and Figure 9.

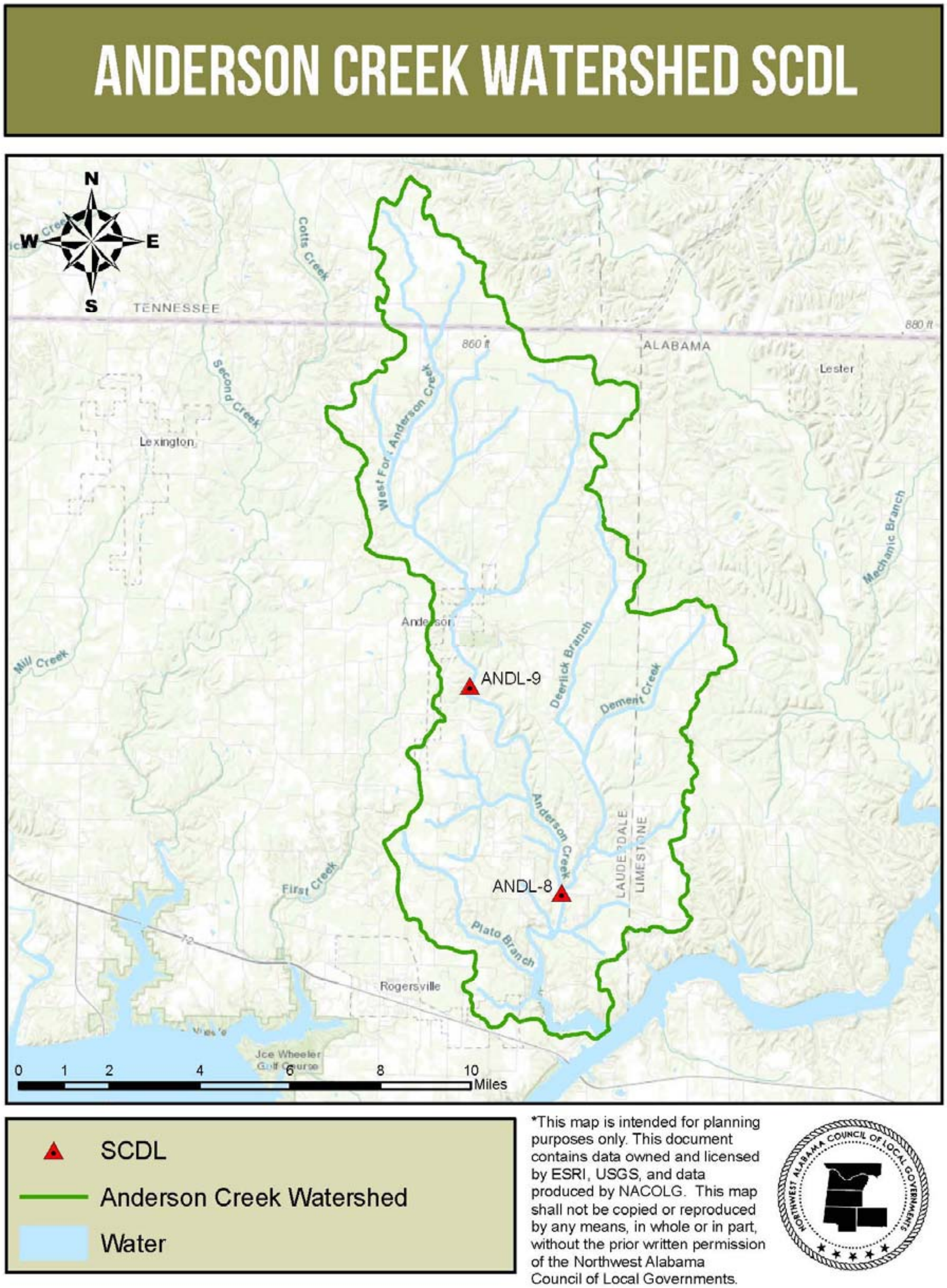


Figure 7: Anderson Creek SCDL Locations

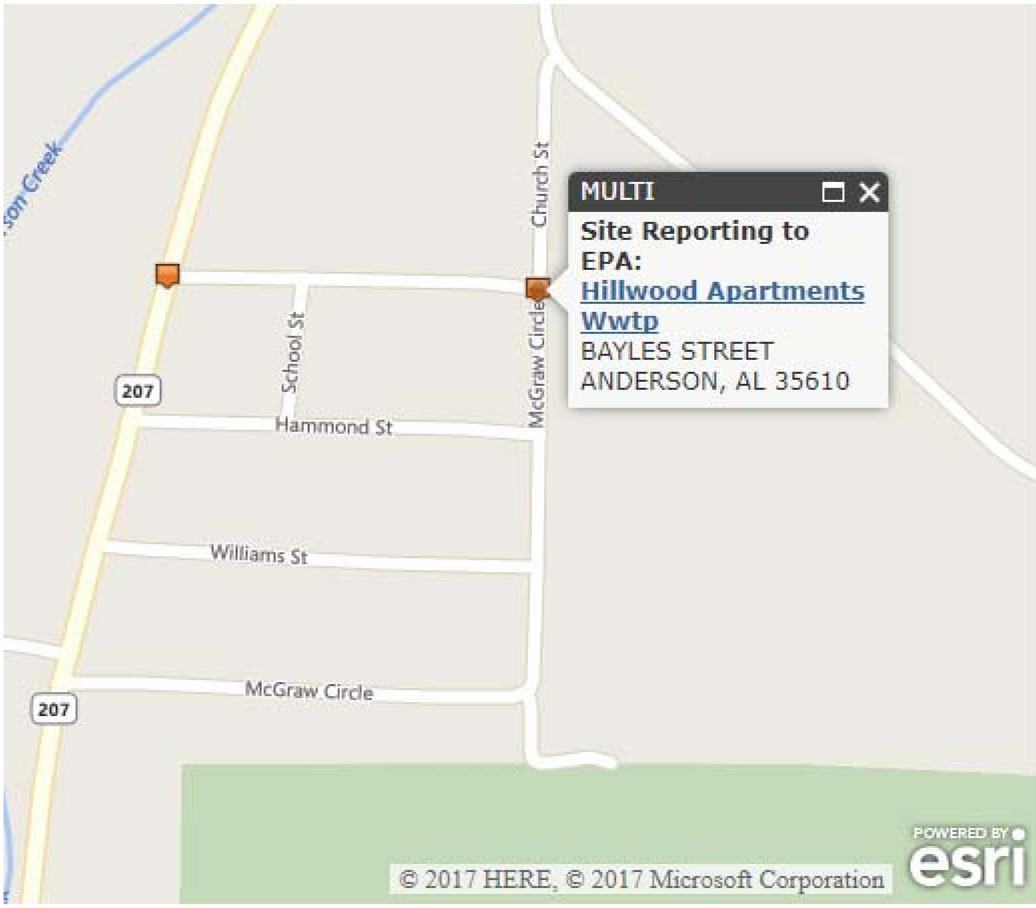


Figure 8: Hillwood Apartments (Source: EPA Enviromapper)

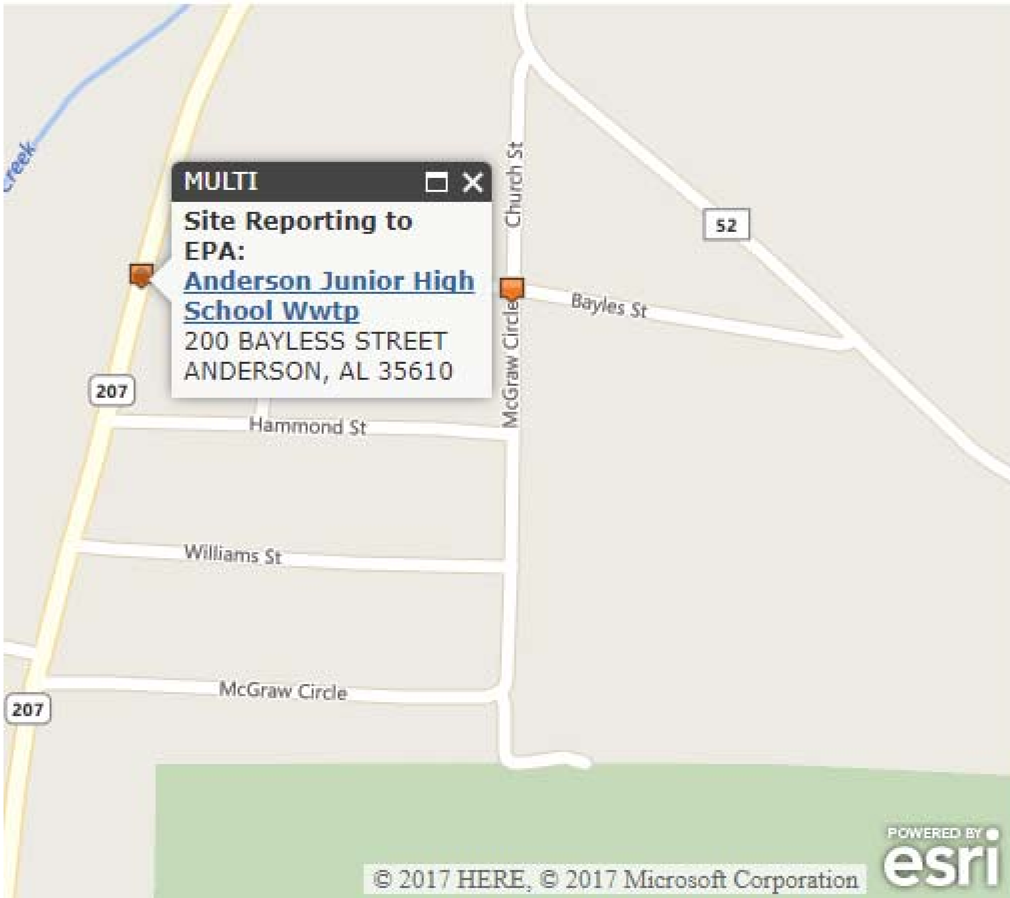


Figure 9: Anderson Junior High School (Source: EPA Enviromapper)

IV. Observations on Potential Sources of Pollution

Nonpoint source pollution generally means that there are no specific points of discharge that can be identified as causing the pollution. Siltation is a category of nonpoint pollution because it usually has a number of different potential sources any or all of which can be contributing to pollution at different levels. In this case, there most likely sources are rill, sheet, and gully erosion from upstream land uses. A field survey of existing conditions in the Anderson Creek Watershed revealed several problem areas exemplary of conditions contributing to sedimentation in the creek:

- A significant gully has formed over time across steeper slopes down to bare rock.

34°54'58.95"N, 87°16'14.86"W 08-02-17

- Land cover in several locations had been removed; sheet and rill erosion was developing into a gully.

34°59'22.43"N, 87°16'8.76"W 08-02-17

34°59'22.43"N, 87°16'8.76"W 08-02-17

34°59'22.43"N, 87°16'8.76"W 08-02-17

34°59'22.43"N, 87°16'8.76"W 08-02-17

34°56'6.12"N, 87°16'50.72"W 08-02-17

- In places, erosion was apparent adjacent to the Creek.

34°55'19.59"N, 87°16'15.81"W 08-02-17

- Unpaved roadways, especially at stream crossings, contributed erosion directly into tributary streams.

34°58'2.98"N, 87°15'52.51"W 08-02-17

34°58'2.98"N, 87°15'52.51"W 08-02-17

34°58'2.98"N, 87°15'52.51"W 08-02-17

These observed nonpoint sources of sedimentation and erosion point to land use and land cover disturbance related to rural agriculture and forestry as the primary contributors to sedimentation in Anderson Creek.

V. Reducing Pollution Loads

The 303(d) listing for Anderson Creek cites siltation as having loads that exceed standards, causing a low macroinvertebrate count. Addressing the level of siltation entering Anderson Creek is the main purpose of this watershed plan. Under the guidelines set forth by the EPA this plan should address the estimated load reductions and BMPs that can be used to reach standards that return the waterbody to its described usage. This is a more difficult task with non-point sources because there is no specific location that can be referenced for where to reduce the loading. Instead it requires an approach that estimates loading across the contributors in the watershed and allocating reductions based on the highest potential contributors. Once these contributors have been identified by percentage of loading they contribute, BMPs can be designated in general areas to best reduce the pollution level.

A. Best Management Practices

Best management practices (BMP) are practices that are put in place in the watershed area to reduce pollution loads by removing or altering what is allowed to enter the waterway. This section of the watershed plan will discuss a variety of BMP options. Realistic estimates for the implementation cost and effectiveness are most reliable on a case by case basis. Also, since the plan is dealing with a specific type of pollution load (siltation) BMP practices discussed will deal with those that will specifically impact that sort of pollution loading.

<u>Overview of Best Management Practices</u>

I. Watershed Education and Outreach for Prevention

II. Constructed/Structural Best Management Practices

A. Maintaining a healthy vegetative cover in impacted areas.

i. Create or improve vegetative cover to reduce soil erosion due to wind and water. The primary effect of this practice is to prevent sedimentary deposit, but it will also reduce runoff and increase the filtering capacity of vegetation; thus reducing level of contamination reaching the waterbody.

- **Rotate grazing to reduce compaction and amount of vegetation removed. This increases soil infiltration.**
- **Improve riparian and upland vegetation.**
- **Promote ecological and stable plant communities both upland and in bottom land sites.**
- **Use of improved grazing management systems to reduce disturbance of soil and vegetation.**

ii. Reduce stream bank erosion.

B. Exclude livestock where possible and/or controlling access by livestock to sensitive areas.

i. Manage for deposition of fecal matter away from water bodies.

ii. Installation of alternative drinking sources.

iii. Placement of alternative shade and salt at distances to protect sensitive areas.

iv. Stream crossings used to minimize impact on water quality

v. **Exclusionary practices such as fencing, hedgerows, and moats.**

III. **Monitoring. Continue testing and monitoring water quality throughout the watershed.**

Examples of potential BMPs for this watershed's land use characteristics

This section includes examples of some, but certainly not all, BMPS that may be efficient in reducing siltation loading by either lessening land disturbance or by controlling runoff. It should be noted that many of these BMPs will also be quite effective in controlling other facets of pollution loading, such as reducing pathogens, nitrate, phosphorus, and BOD loading.

- Animal Trails and Walkways

Animal trails and walkways are facilities designed to allow livestock or wildlife to move through difficult or ecologically sensitive terrain. They are intended to reduce erosion by providing or improving animals' access to forage, water, or shelter; improving grazing efficiency and distribution; and diverting travel away from ecologically sensitive or erosive sites.

- Conservation Cover

Conservation cover is the practice of establishing and maintaining perennial vegetative cover to protect soil and water resources on land that has been retired from agricultural production. It reduces soil erosion and sedimentation, improves water quality, and creates or enhances wildlife habitat.

- Contour Farming

Contour farming includes tillage, planting, and other farming operations performed with the rows on or along the contour of the field slope. It helps to reduce sheet and rill erosion and the resulting transport of sediment and other waterborne contaminants.

- Critical Area Planting

Critical area planting is the planting of grasses, legumes, or other vegetation to stabilize slopes in small, severely eroding areas. The permanent vegetation stabilizes areas such as gullies, overgrazed hillsides and terraced backslopes. Although the primary goal is erosion control, the vegetation can also reduce other pollutant loads and provide nesting cover for birds and small animal habitat.

- Filter Strip

A filter strip is a strip or area of vegetation for removing sediment, organic matter, and other pollutants from runoff and wastewater before they reach water bodies or water sources, including wells.

- Grass Swale

Grass swales are elongated depressions in the land surface that are at least seasonally wet, usually heavily vegetated, and normally without flowing water. Swales direct storm water flows into primary drainage channels and allow some of the storm water to infiltrate into the ground surface. Swales are vegetated with erosion resistant and flood tolerant grasses. Sometimes check dams are strategically placed in swales to moderate flow, and an engineered soil mixture might underlie swales.

- Infiltration Basin

An infiltration basin is a facility constructed in highly permeable soil that provides temporary storage of runoff during rain events. Over a period of several hours or days, the basin allows the water to discharge primarily by infiltration through the surrounding soil. It might have an outlet for overflow discharge to surface water.

- Reduced Tillage Systems

Reduced tillage refers to any system that is less intensive and aggressive than conventional tillage. The number of operations is decreased compared to conventional tillage, or a tillage implement that requires less energy per unit area is used to replace an implement typically used in conventional tillage system. The term is sometimes used to imply conservation tillage; however, for a system to be considered a conservation tillage system, 30 percent of the soil surface must be covered with residue after planting.

- Sand Filter

Sand filters are self-contained, compartmented treatment systems designed to catch runoff from highly impervious areas with relatively high total suspended solids, heavy metal, and hydrocarbon loadings, such as roads, driveways, drive-up lanes, parking lots, and urban areas. The compartments consist of a fore bay that removes trash, debris, and coarse sediment, and a sand bed that allows solids settling and uses filtering and adsorption processes to reduce pollutant concentrations in storm water. The sand filter compartments are usually constructed of concrete, and they may be set above or below ground.

- Streambank Protection

Streambank protection helps to prevent streambank erosion. Streambank protection methods are essentially the same as stream channel stabilization methods. They include modifying the channel capacity, channel armoring, providing channel crossings for livestock, and seeding (vegetating or planting the channel to prevent erosion).

- Streambank Fencing

Fencing is used to restrict livestock access to streambanks because animal traffic erodes streambanks, increases sediment load, and contributes animal waste in and near the stream, impairing water quality.

- Terrace

Terraces are constructed benches on slopes, which consist of level field or paddy areas held in place by embankments of soil or rock. Terraces enable water to be stored temporarily on slopes to allow sediment deposition and water infiltration; reduce slope length, erosion, and soil particle content in runoff water; improve water quality; retain runoff for moisture conservation; prevent gully development; and reduce flooding. There are three types of terraces: bench terraces, contour terraces, and parallel terraces. Bench terraces are the type that most often comes to mind when the word *terrace* is used, and they are employed most often in mountain regions around the world.

BMP Locations

Determining the best BMP locations is one of the requisites for plan approval under EPA and ADEM guidelines. At this stage in the proposed plan, BMP locations can only be estimated due to a number of factors such as funding and involvement by private land owners. Below is a series of map that illustrate a number of potential BMP installation sites that could yield the most significant results in reduction of sedimentation in Anderson Creek. BMP installation should not necessarily be confined to these areas, but these are good places to use for estimating the effects of management practices in a best case scenario with the fewest management practices implemented. Load reduction models will usually determine potential reduction based on percent of land use affected, while BMPs on these parcels may yield much greater or lesser results depending on their actual site conditions, land use characteristics, and the BMPs employed.

Since this is an estimation of Best Management Practices based on remotely sensed data, specific BMPS are not discussed in great length. Modeling included a broad spectrum of implementation percentages, but in truth the best practices to use for each individual area will depend on willingness of participation by the landowners. In many cases the available BMPS may only require planting practices such as low tillage crop planting, or, conversely, conditions may allow for more elaborate or expensive implementations.

B. Anderson Creek Load Reduction Model

A successful watershed plan requires an accurate estimate of load reduction for the pollution type identified as an impairment source as well as a demonstration that that reduction can be sustained in the future. It also requires that the actions taken will manage other types of pollution in order to prevent future 303(d) listings for these types of pollution. Accurate assessment requires modeling of reduction levels with on the ground BMP locations to illustrate how the BMP will reduce loading. The total, cumulative, direct and indirect impact of sedimentation BMPs is particularly difficult to model because sedimentation impacts are largely measured by secondary conditions (e.g. turbidity and macroinvertebrate count) rather than direct impacts (e.g. temperature changes, light penetration); however, the direct measure of sediment removed is more easily modeled using a variety of modeling techniques. In other words, the volume of sedimentation reduction achieved is more easily modelled than are the impacts of removing sedimentation from streams.

The Anderson Creek Watershed Plan used the **Spreadsheet Tool for Estimation of Pollutant Loads** (STEPL) Version 4.3 (updated 01/16/2017) developed for the Environmental Protection Agency (EPA) by Tetra Tech (available http://it.tetratech-ffx.com/steplweb/models$docs.htm, accessed 08/01/17). The STEPL provides a system for watershed modeling and load estimation that addresses the requirements for the watershed plan in a suitable fashion. STEPL employs simple algorithms to calculate nutrient and sediment loads from different land uses and the load reductions that would result from the implementation of various BMPs. The STEPL allows the user to model watershed conditions accurately by inputting values land use and current loading. These values can then be modelled in the STEPL to provide estimated baseline, pre-BMP implementation pollution levels for each sub watershed basin in the watershed area. BMP reduction modeling is then assessed based on calculations derived from measures of the area of potential impact and internal spreadsheet algorithms calculating projected effectiveness. The result is a pre-

BMP baseline model and post BMP load reduction expressed in absolute values of tons of sediment per year as well as percentage load reduction.

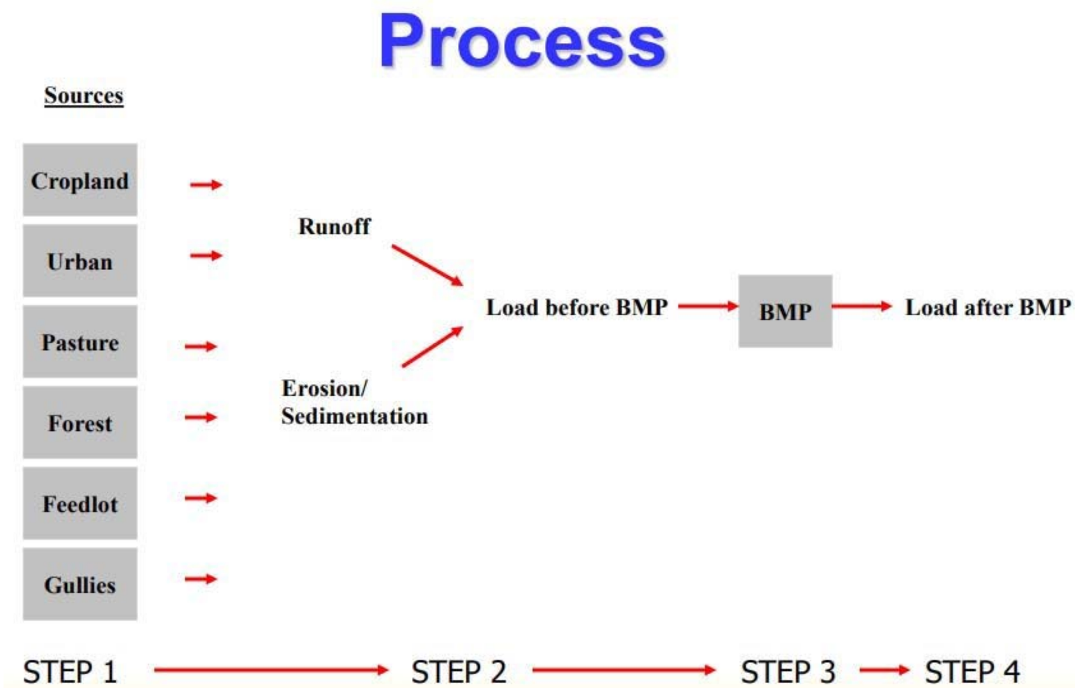
The Anderson Creek Load reduction model contained the following inputs:

- A delineation of the boundary of the Anderson Creek Watershed. This area is based on topography and captures all of the drainage into Anderson Creek.
- The STEPL load reduction model was built in a two-step process, first, by locating BMP placements in ten smaller modelling units to estimate the load reduction effectiveness in these units, and secondly, by modelling these combined units into an overall load reduction model for Anderson Creek. These ten smaller areas were defined by low-lying topographical depressions that form tributary streams that flow toward and converge at the same point along Anderson Creek. Each modeling unit represents two halves of a catchment area that is separated by a high point or ridge, with water flowing toward separate streams and then flowing to a single point of convergence downstream. All water and pollutant loads from upland areas flow toward this point. These are shown in Figure 10.
    - In the STEPL software, BMPs were modeled by placing each proposed BMP within a modelling unit to generate a combined BMP estimate of the effectiveness of all BMPs for that area.
    - Each of the combined BMP's from the ten model units was then modeled to determine the overall load reduction in the Anderson Creek watershed.
    - The modelling process is illustrated in Appendix D.
- National Land Cover Database, 2011 land cover data was used to generate a base land use for the model.
- STEPL Input Data Server by TetraTech (http://it.tetratech-ffx.com/steplweb/STEPLdataviewer.htm)) provided soil quality data, agricultural animal counts, and septic tank inputs. Agricultural animal count and septic tanks were distributed to sub-basins according to land use percentages (percent of total pastureland and urban land).
- Universal Soil Loss Equation (USLE) and Rain Correction factors were default STEPL inputs from Lauderdale County, Alabama and the Huntsville WSO weather station.
- Quality control check was conducted using STEPL Web, 2014, by Perdue University (https://engineering.purdue.edu/mapserve/ldc/STEPL/)
- Each proposed BMP was loaded into the model in appropriate BMP trains for each of the ten sub-basin catchment areas to determine load reduction efficiencies. Each combined BMP was then loaded to determine overall BMP load reduction efficiencies and load reduction projected from BMP placements. BMP locations are illustrated in Figures 11 through Figure 21.

The maps that follow illustrate the watershed delineation, user defined basins, land use in the Anderson Creek Watershed.

STEPL modelling process

Modelling parameters are placed into the STEPL modelling spreadsheet, which calculates an estimated pollutant load prior to BMP placement. BMP locations are determined outside of the STEPL model and the area of impact is calculated as a percentage of the total area in the watershed. Where multiple BMPs are utilized, combined BMP estimates are generated using the Combined BMP modeling tool found in STEPL. The STEPL model then automatically calculates post-BMP load reduction based on Universal Soil Loss Equation (USLE) estimates and internal algorithms.



U.S. EPA. Training for Wisconsin DNR, 08-05-14 (http://dnr.wi.gov/topic/Nonpoint/documents/STEPL/STEPLTrainingSlidesExercises2014-08-05.pdf)

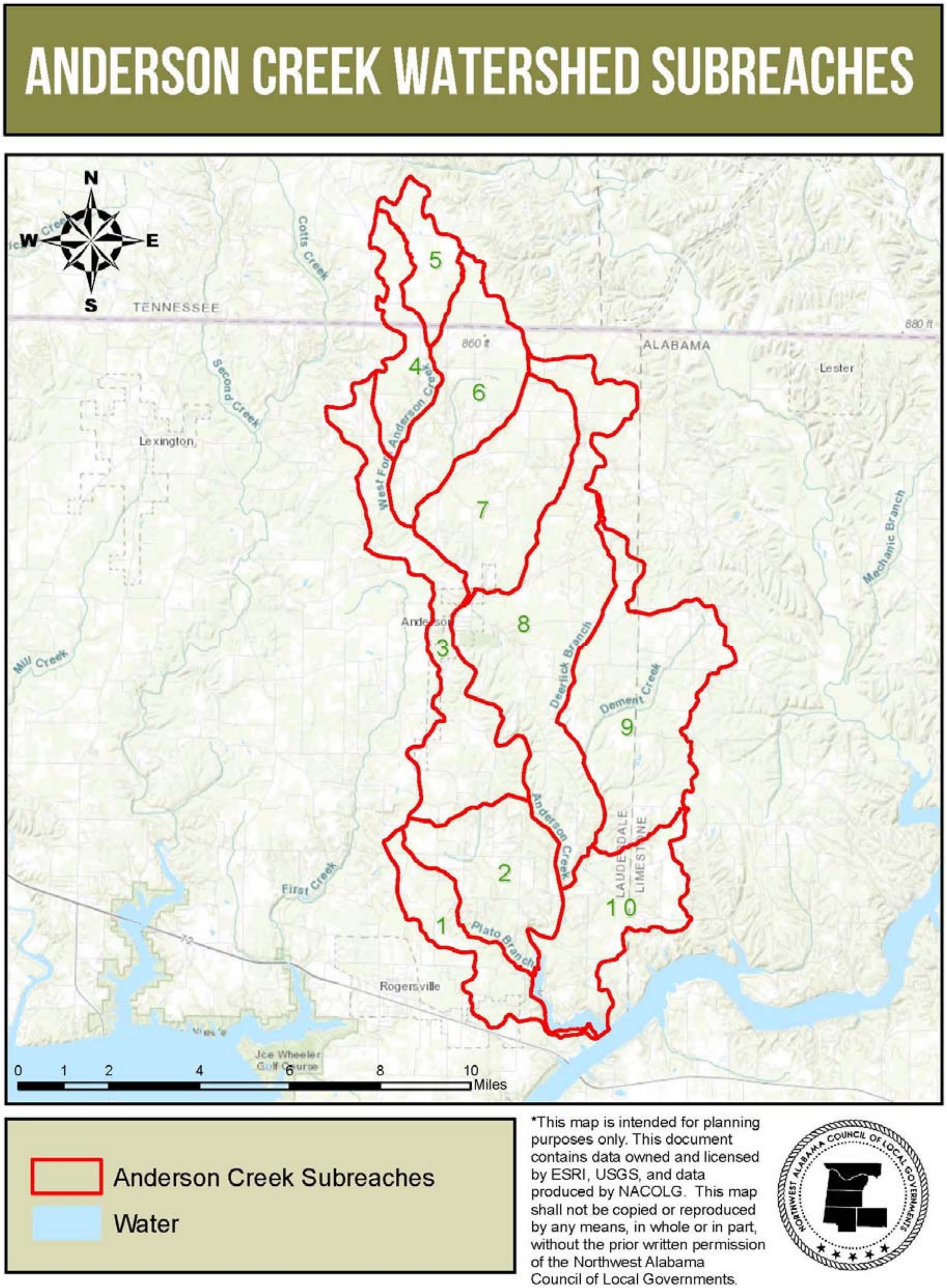
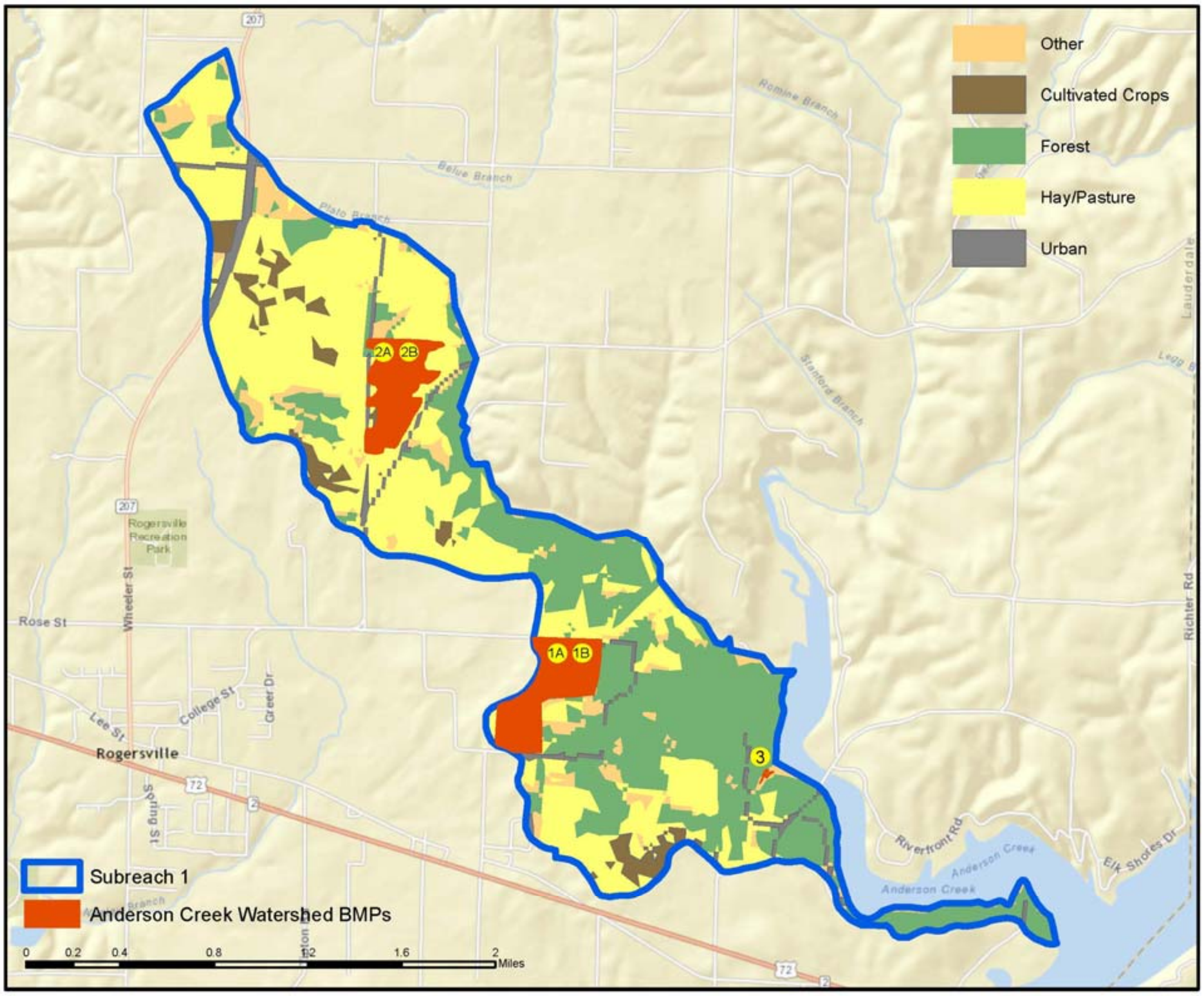


Figure 10: Anderson Creek Watershed Subreaches

ANDERSON CREEK WATERSHED SUBREACH 1



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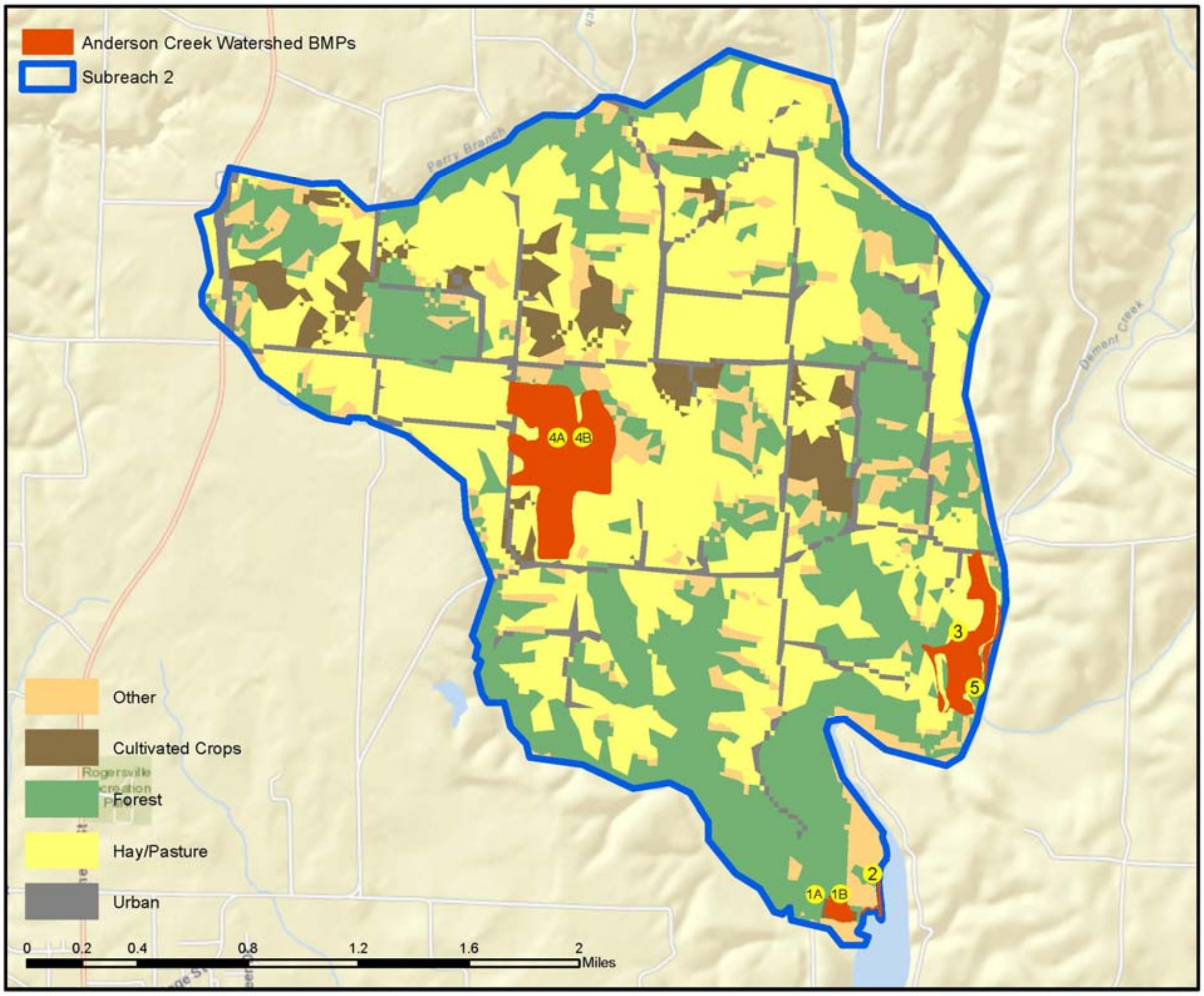
Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1A	Cropland	Cropland Erosion 1a W1	Contour Farming	83.18	1	34.83	-87.26
1B	Cropland	Cropland Erosion 1b W1	Reduced Tillage Systems	83.18	1	34.83	-87.26
2A	Cropland	Cropland Erosion 2a W1	Contour Farming	64.27	1	34.85	-87.27
2B	Cropland	Cropland Erosion 2b W1	Reduced Tillage Systems	64.27	1	34.85	-87.27
3	Cropland	Stream Bank Erosion 1 W1	Streambank stabilization and fencing	85	1	34.82	-87.25
Total Area or Load: 232.00 N Eff = 0.72 PEFF= 0.72 BOD Eff = 0.00 Sed Eff = 0.814							

Figure 12: Anderson Creek Subbasin Area 1 BMP Locations

ANDERSON CREEK WATERSHED SUBREACH 2



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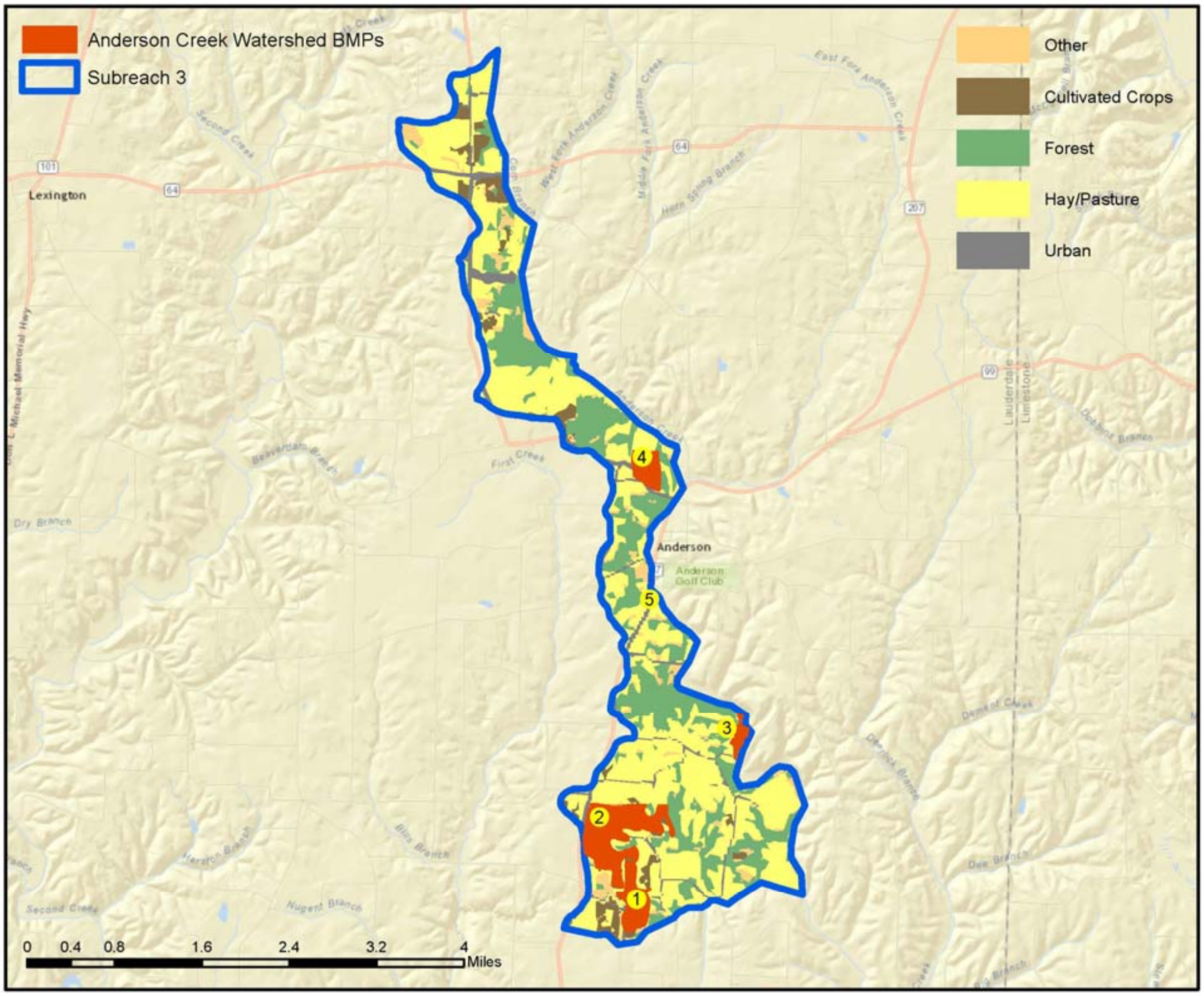
Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1A	Cropland	Cropland Erosion 1a W2	Contour Farming	4.28	2	34.83	-87.25
1B	Cropland	Cropland Erosion 1b W2	Reduced Tillage Systems	4.28	2	34.83	-87.25
2	Cropland	Cropland Erosion 2 W2	Filter Strip	45	2	34.83	-87.24
3	Cropland	Cropland Erosion 3 W2	Filter Strip	34.47	2	34.85	-87.24
4A	Cropland	Cropland Erosion 4a W2	Reduced Tillage Systems	100.08	2	34.86	-87.26
4B	Cropland	Cropland Erosion 4b W2	Filter Strip	100.08	2	34.86	-87.26
5	Streambank Erosion	Stream Bank Erosion 3 W2	Streambank stabilization and fencing	2.49	2	34.84	-87.24
Total Area or Load: 183.80 N Eff = 0.797 PEFF= 0.811 BOD Eff = 0.00 Sed Eff = 0.798							

Figure 13: Anderson Creek Subbasin Area 2 BMP Locations

ANDERSON CREEK WATERSHED SUBREACH 3



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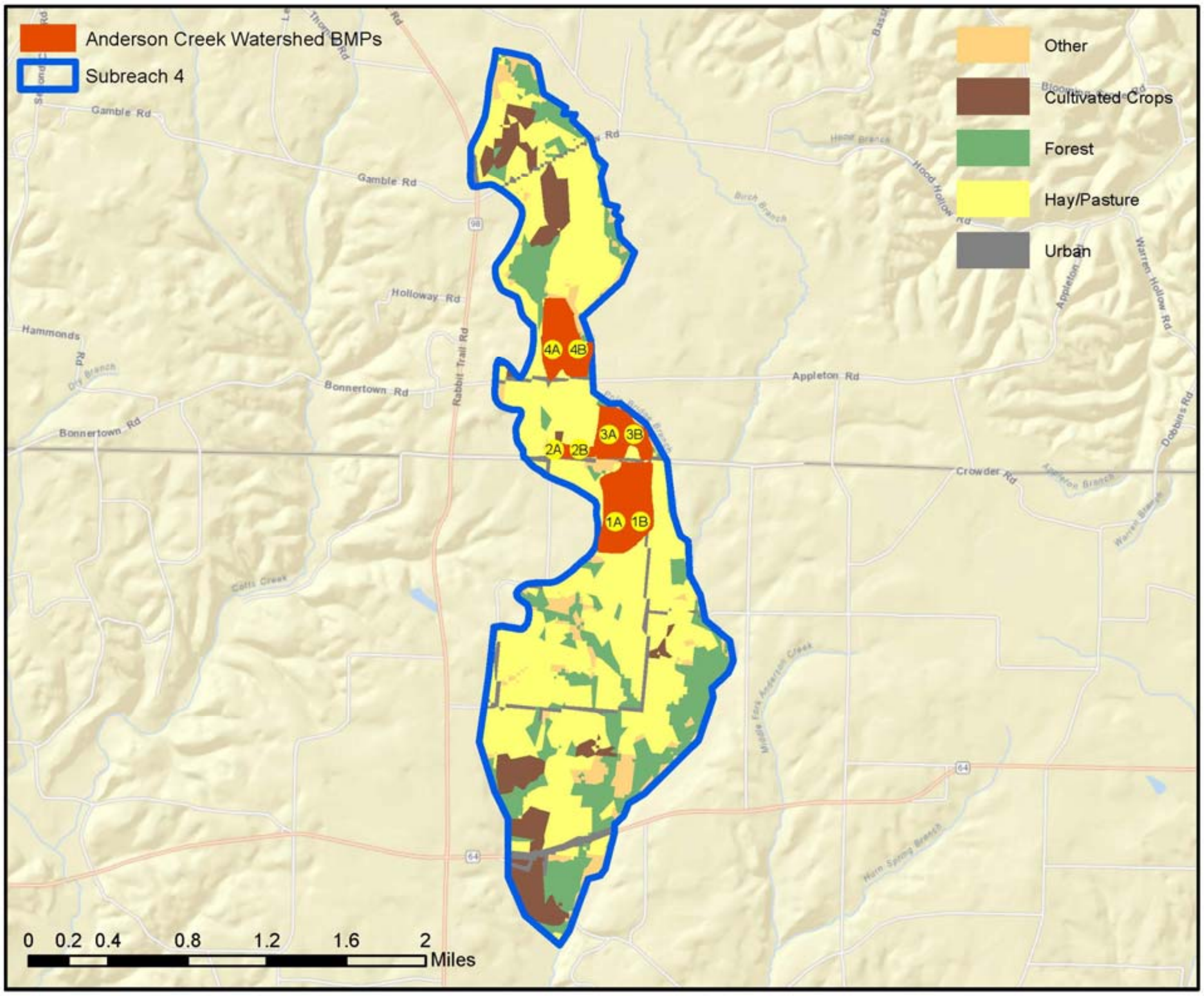
Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1	Cropland	Cropland Erosion 1 W3	Reduced Tillage Systems	74.23	3	34.88	-87.27
2	Cropland	Cropland Erosion 2 W3	Reduced Tillage Systems	199.25	3	34.89	-87.27
3	Cropland	Cropland Erosion 3 W3	Reduced Tillage Systems	24.64	3	34.9	-87.26
4	Cropland	Cropland Erosion 4 W3	Reduced Tillage Systems	51.44	3	34.93	-87.27
5	Streambank Erosion	Gully Erosion 1 W3	Streambank stabilization and fencing	0.46	3	34.92	-87.27
Total Area or Load: 349.560 N Eff = 0.550 PEFF= 0.450 BOD Eff = 0.00 Sed Eff = 0.750							

Figure 14: Anderson Creek Subbasin Area 3 BMP Locations

ANDERSON CREEK WATERSHED SUBREACH 4



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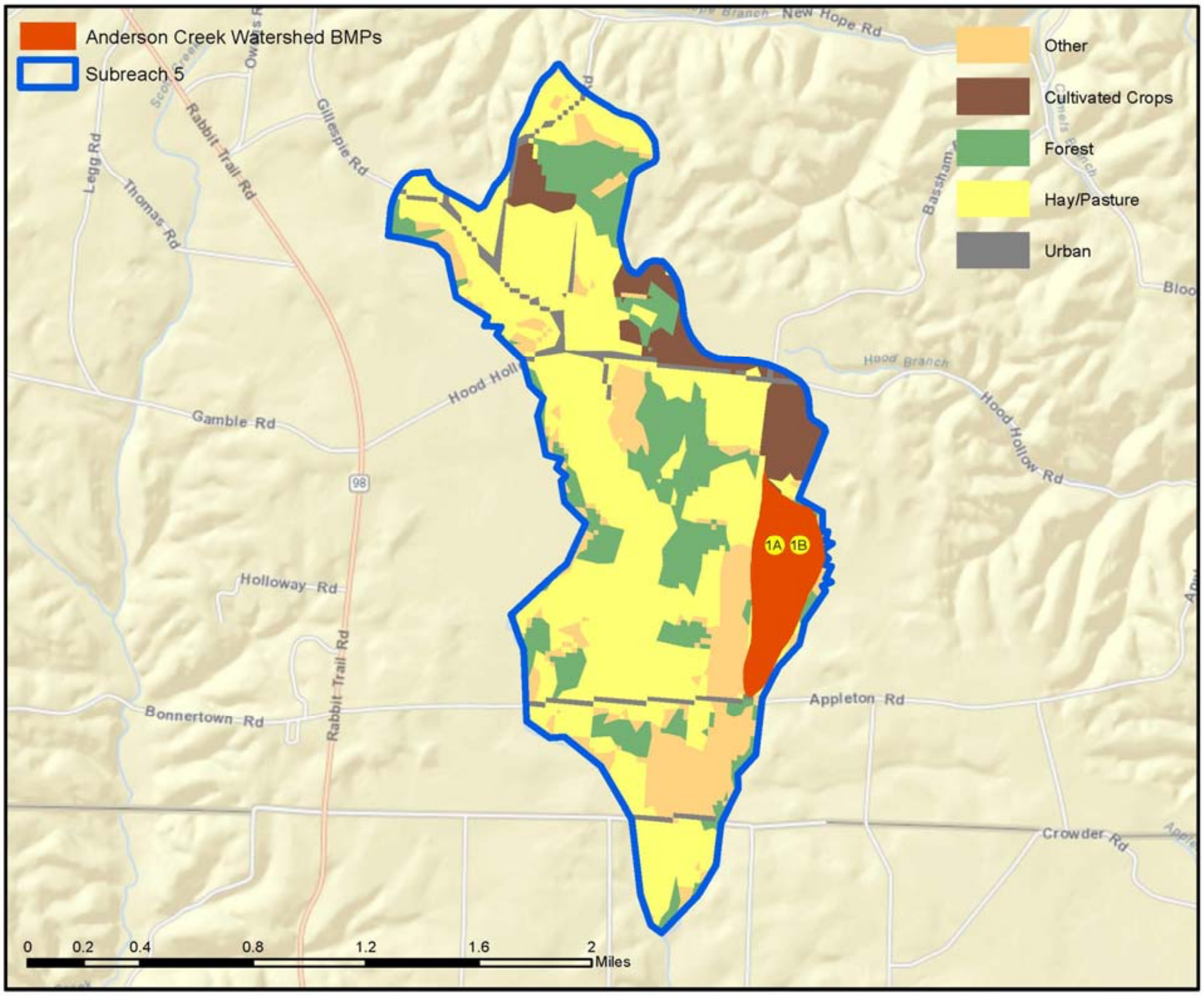
Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1A	Cropland	Cropland Erosion 1a W4	Reduced Tillage Systems	67.16	4	34.99	-87.29
1B	Cropland	Cropland Erosion 1b W4	Filter Strip	67.16	4	34.99	-87.29
2A	Cropland	Cropland Erosion 2a W4	Reduced Tillage Systems	8.93	4	35	-87.29
2B	Cropland	Cropland Erosion 2b W4	Filter Strip	8.93	4	35	-87.29
3A	Cropland	Cropland Erosion 3a W4	Filter Strip	35.24	4	35	-87.28
3B	Cropland	Cropland Erosion 3b W4	Contour Farming	35.24	4	35	-87.28
3C	Cropland	Cropland Erosion 3c W4	Reduced Tillage Systems	35.24	4	35	-87.28
4A	Cropland	Cropland Erosion 4a W4	Filter Strip	48.1	4	35.01	-87.29
4B	Cropland	Cropland Erosion 4b W4	Reduced Tillage Systems	48.1	4	35.01	-87.29
Total Area or Load: 194.670	N Eff = 0.877	PEFF= 0.876	BOD Eff = 0.00	Sed Eff = 0.919			

Figure 15: Anderson Creek Subbasin Area 4 BMP Locations

ANDERSON CREEK WATERSHED SUBREACH 5



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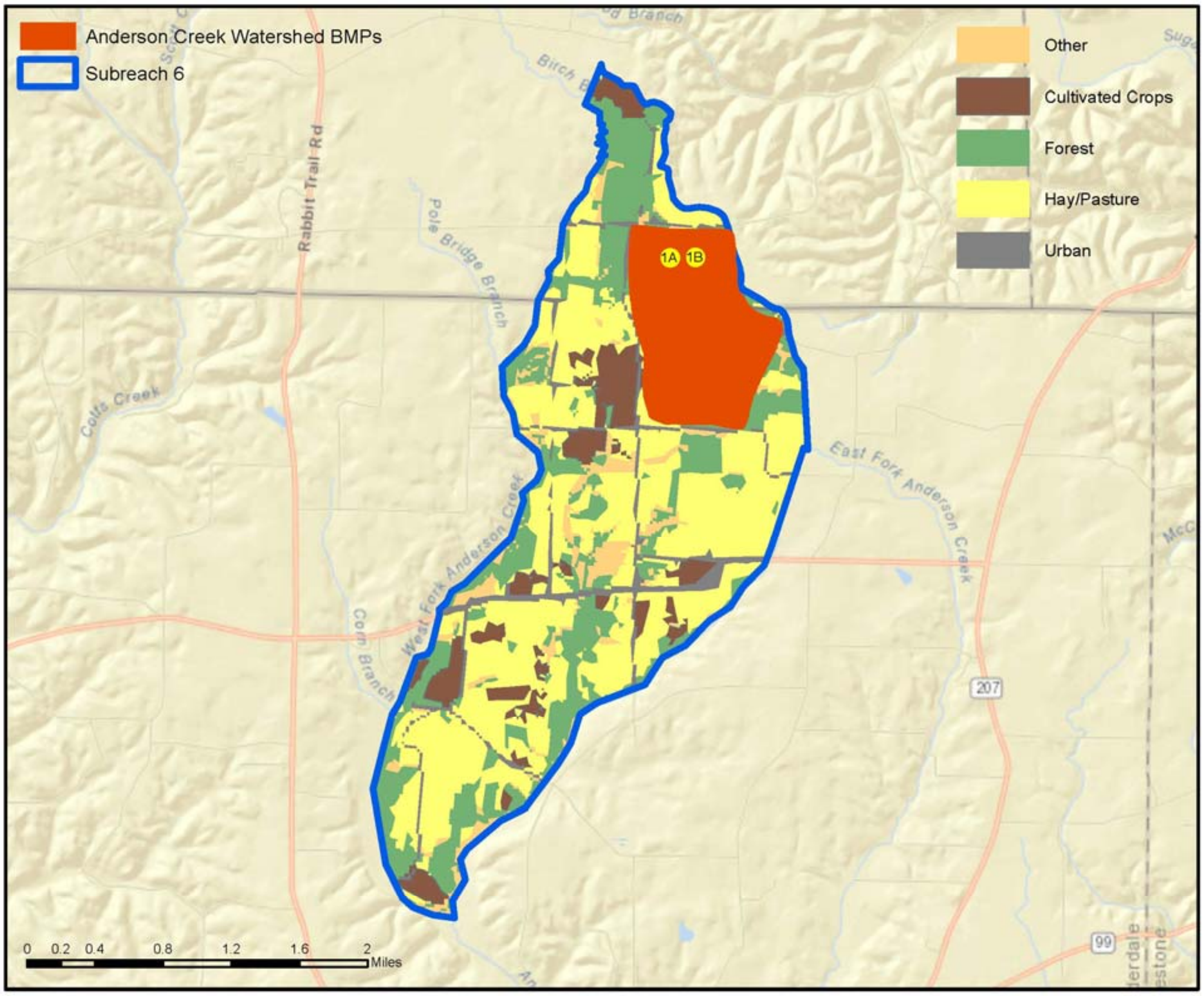
Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1A	Cropland	Cropland Erosion 1a W5	Reduced Tillage Systems	80.66	5	35.01	-87.27
1B	Cropland	Cropland Erosion 1b W5	Filter Strip	80.66	5	35.01	-87.27
Total Area or Load: 163.320 N Eff = 0.783 PEFF= 0.806 BOD Eff = 0.00 Sed Eff = 0.781							

Figure 16: Anderson Creek Subbasin Area 5 BMP Locations

ANDERSON CREEK WATERSHED SUBREACH 6



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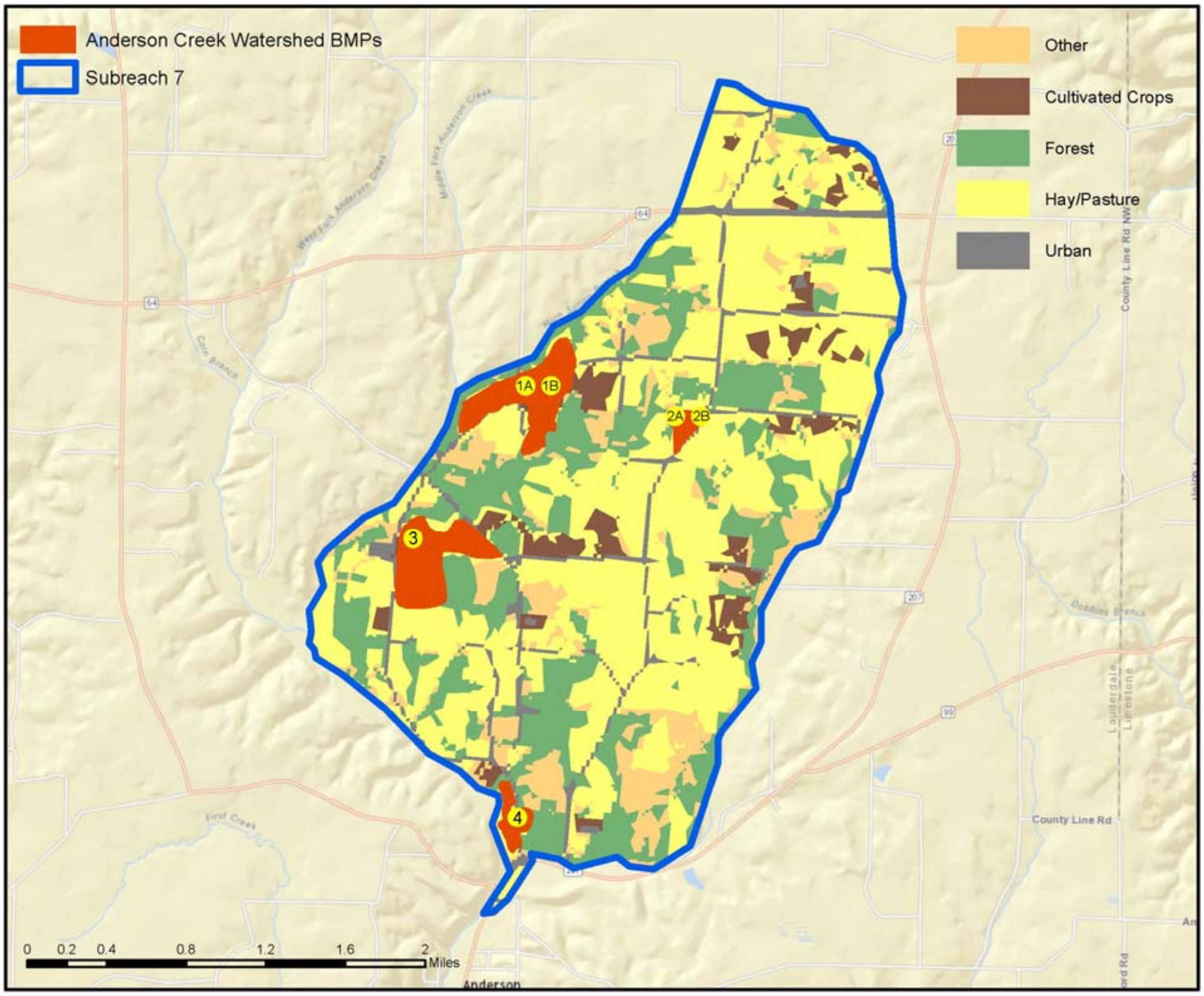
Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1A	Cropland	Cropland Erosion 1a W6	Contour Farming	511.87	6	35	-87.26
1B	Cropland	Cropland Erosion 1b W6	Reduced Tillage Systems	511.87	6	35	-87.26
Total Area or Load: 70.0 N Eff = 0.659 PEFF= 0.601 BOD Eff = 0.00 Sed Eff = 0.801							

Figure 17: Anderson Creek Subbasin Area 6 BMP Locations

ANDERSON CREEK WATERSHED SUBREACH 7



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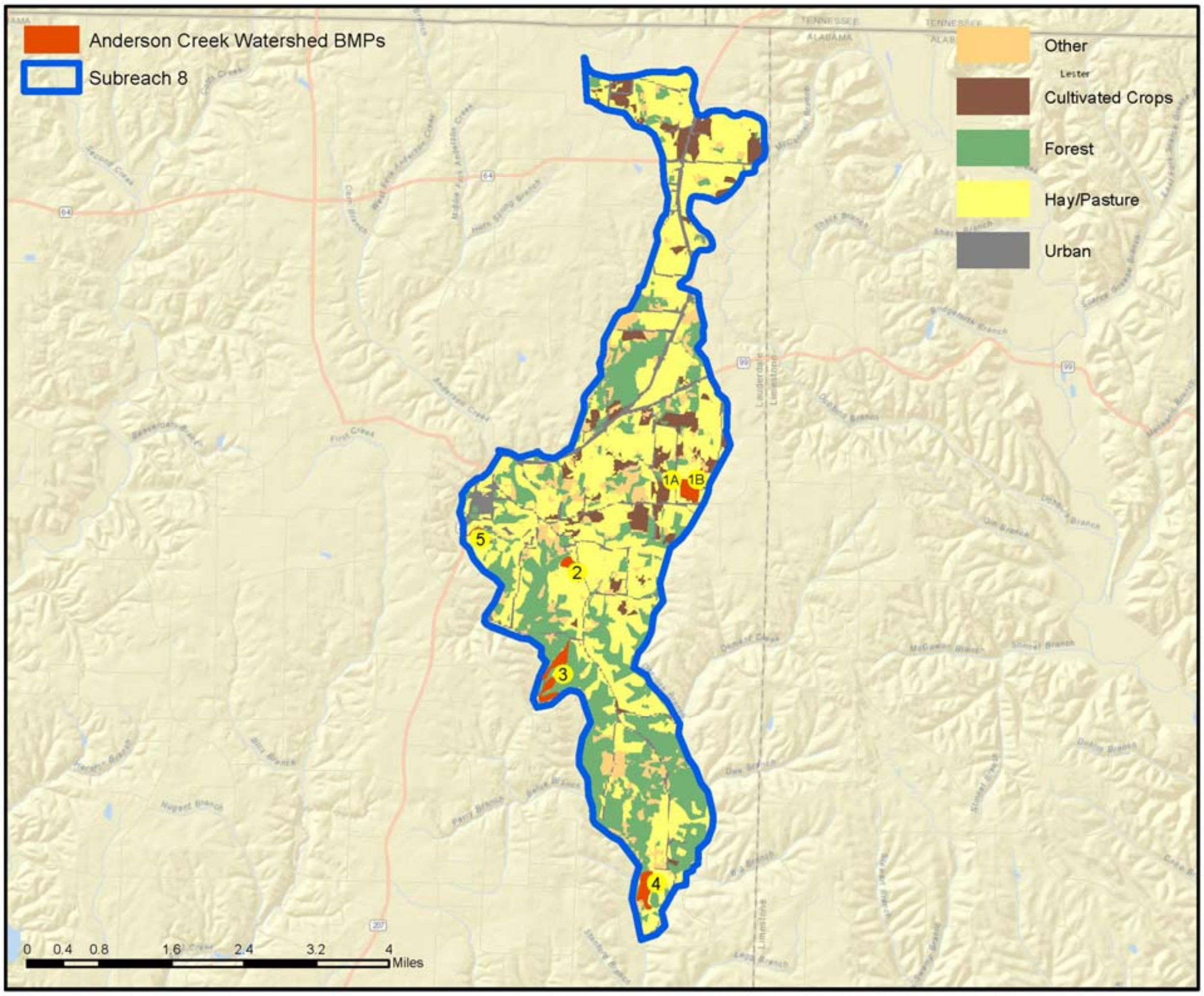
S

Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1A	Cropland	Cropland Erosion 1a W7	Reduced Tillage Systems	87.5	7	34.96	-87.27
1B	Cropland	Cropland Erosion 1b W7	Filter Strip	87.5	7	34.96	-87.27
2A	Cropland	Cropland Erosion 2a W7	Reduced Tillage Systems	13.66	7	34.96	-87.25
2B	Cropland	Cropland Erosion 2b W7	Filter Strip	13.66	7	34.96	-87.25
3	Cropland	Cropland Erosion 3 W7	Reduced Tillage Systems	86.29	7	34.95	-87.27
4	Cropland	Cropland Erosion 4 W7	Filter Strip	19.09	7	34.94	-87.27
Total Area or Load: 220.200 N Eff = 0.717 PEFF= 0.684 BOD Eff = 0.00 Sed Eff = 0.810							

Figure 18: Anderson Creek Subbasin Area 7 BMP Locations

ANDERSON CREEK WATERSHED SUBREACH 8



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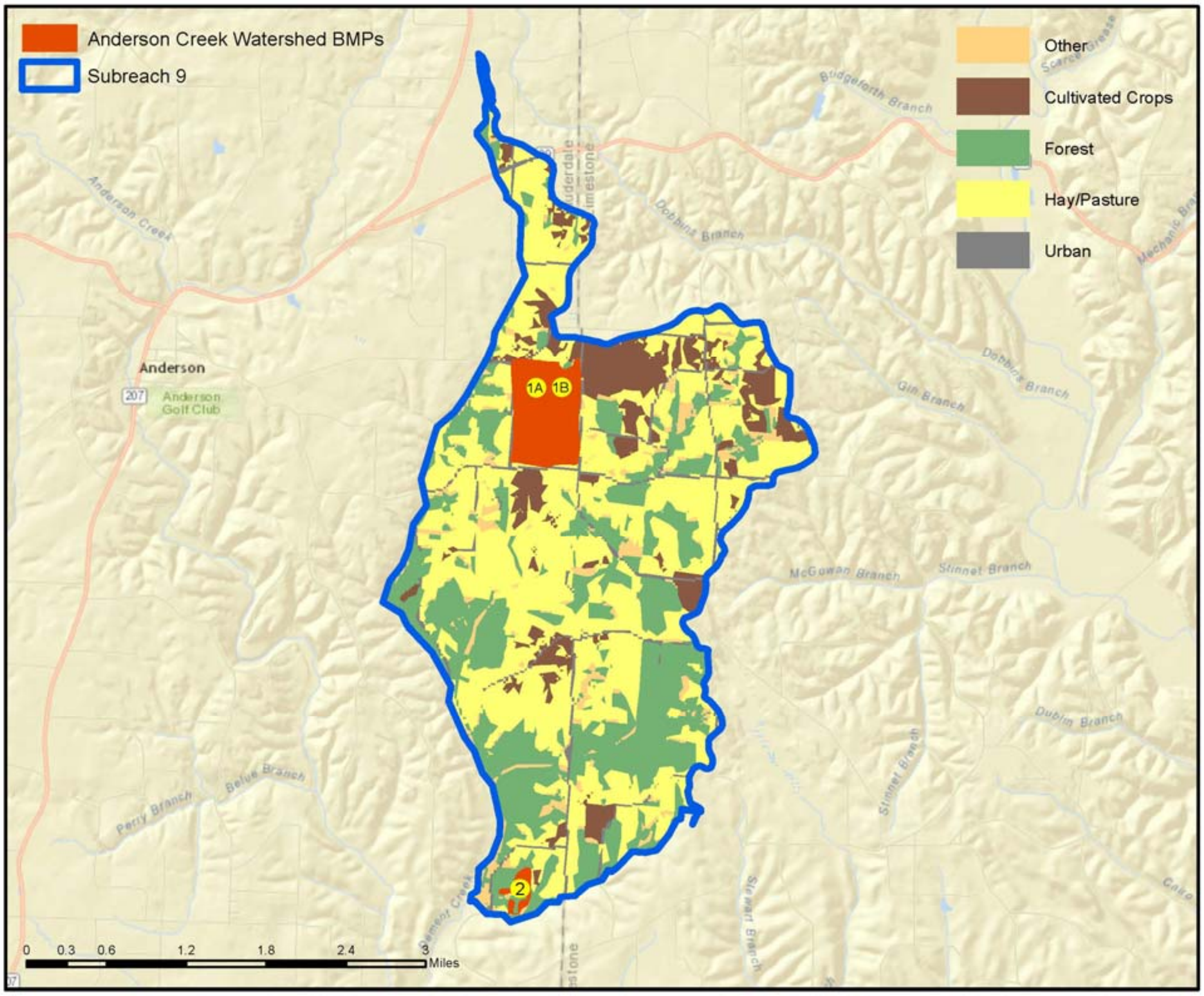
Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1A	Cropland	Cropland Erosion 1a W8	Reduced Tillage Systems	27.69	8	34.93	-87.23
1B	Cropland	Cropland Erosion 1b W8	Reduced Tillage Systems	27.69	8	34.93	-87.23
2	Cropland	Cropland Erosion 2 W8	Reduced Tillage Systems	10.28	8	34.91	-87.25
3	Cropland	Cropland Erosion 3 W8	Reduced Tillage Systems	44.14	8	34.89	-87.25
4	Cropland	Cropland Erosion 4 W8	Reduced Tillage Systems	29.38	8	34.86	-87.24
5	Gully Erosion	Gully Erosion 1 W8	Streambank stabilization and fencing	826.36	8	34.92	-87.27
Total Area or Load: 111.490 N Eff = 0.550 PEFF= 0.450 BOD Eff = 0.00 Sed Eff = 0.750							

Figure 19: Anderson Creek Subbasin Area 8 BMP Locations

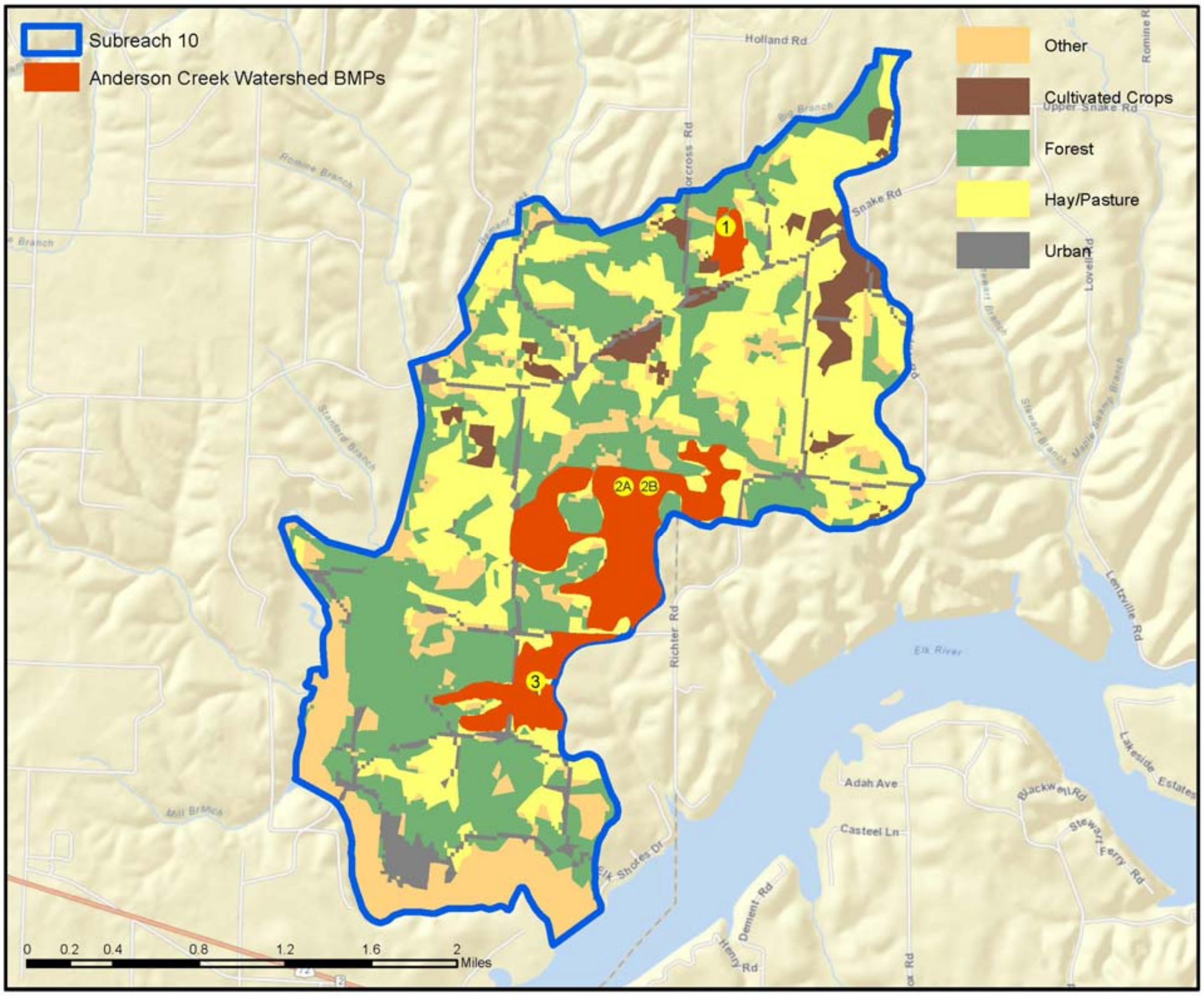
ANDERSON CREEK WATERSHED SUBREACH 9



Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1A	Cropland	Cropland Erosion 1a W9	Reduced Tillage Systems	250.74	9	34.92	-87.21
1B	Cropland	Cropland Erosion 1b W9	Filter Strip	250.74	9	34.92	-87.21
2	Cropland	Cropland Erosion 2 W9	Reduced Tillage Systems	19.62	9	34.86	-87.22
Total Area or Load: 270.360 N Eff = 0.842 PEFF= 0.833 BOD Eff = 0.00 Sed Eff = 0.901							

Figure 20: Anderson Creek Subbasin Area 9 BMP Locations

ANDERSON CREEK WATERSHED SUBREACH 10



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Map ID	Land Use	Name	BMP	Acreage	SubCatch No	Latitude	Longitude
1	Cropland	Cropland Erosion 1 W10	Reduced Tillage Systems	20.22	10	34.86	-87.21
2A	Cropland	Cropland Erosion 2a W10	Reduced Tillage Systems	242.15	10	34.84	-87.22
2B	Cropland	Cropland Erosion 2b W10	Filter Strip	242.15	10	34.84	-87.22
3	Cropland	Cropland Erosion 4 W10	Reduced Tillage Systems	86.54	10	34.83	-87.23
Total Area or Load: 348.910 N Eff = 0.769 PEFF= 0.736 BOD Eff = 0.00 Sed Eff = 0.863							

Figure 21: Anderson Creek Subbasin Area 10 BMP Locations

BMP locations and load reduction

The proposed BMP locations in Anderson Creek watershed were selected by reviewing land use conditions and prospects for load reduction where available data indicated that agricultural practices could be improved to produce load reductions. The proposed BMPs were assessed using remote sensing data, aerial photographs, and field surveys to determine the locations with the greatest load reduction potential within the watershed. Proposed BMPs are listed in Table 4 by type and location:

Land Use	Name	BMP	Acres	Reach No	Latitude	Longitude
Cropland	Cropland Erosion 1a W1	Contour Farming	83.18	1	34.83	-87.26
Cropland	Cropland Erosion 1b W1	Reduced Tillage Systems	83.18	1	34.83	-87.26
Cropland	Cropland Erosion 2a W1	Contour Farming	64.27	1	34.85	-87.27
Cropland	Cropland Erosion 2b W1	Reduced Tillage Systems	64.27	1	34.85	-87.27
Cropland	Stream Bank Erosion 1 W1	Streambank stabilization and fencing	85	1	34.82	-87.25
Cropland	Cropland Erosion 1a W2	Contour Farming	4.28	2	34.83	-87.25
Cropland	Cropland Erosion 1b W2	Reduced Tillage Systems	4.28	2	34.83	-87.25
Cropland	Cropland Erosion 2 W2	Filter Strip	45	2	34.83	-87.24
Cropland	Cropland Erosion 3 W2	Filter Strip	34.47	2	34.85	-87.24
Cropland	Cropland Erosion 4a W2	Reduced Tillage Systems	100.08	2	34.86	-87.26
Cropland	Cropland Erosion 4b W2	Filter Strip	100.08	2	34.86	-87.26
Streambank Erosion	Stream Bank Erosion 3 W2	Streambank stabilization and fencing	2.49	2	34.84	-87.24
Cropland	Cropland Erosion 1 W3	Reduced Tillage Systems	74.23	3	34.88	-87.27
Cropland	Cropland Erosion 2 W3	Reduced Tillage Systems	199.25	3	34.89	-87.27
Cropland	Cropland Erosion 3 W3	Reduced Tillage Systems	24.64	3	34.9	-87.26
Cropland	Cropland Erosion 4 W3	Reduced Tillage Systems	51.44	3	34.93	-87.27
Streambank Erosion	Gully Erosion 1 W3	Streambank stabilization and fencing	0.46	3	34.92	-87.27
Cropland	Cropland Erosion 1a W4	Reduced Tillage Systems	67.16	4	35	-87.29
Cropland	Cropland Erosion 1b W4	Filter Strip	67.16	4	35	-87.29
Cropland	Cropland Erosion 2a W4	Reduced Tillage Systems	8.93	4	35	-87.29
Cropland	Cropland Erosion 2b W4	Filter Strip	8.93	4	35	-87.29
Cropland	Cropland Erosion 3a W4	Filter Strip	35.24	4	35	-87.28
Cropland	Cropland Erosion 3b W4	Contour Farming	35.24	4	35	-87.28
Cropland	Cropland Erosion 3c W4	Reduced Tillage Systems	35.24	4	35	-87.28
Cropland	Cropland Erosion 4a W4	Filter Strip	48.1	4	35.01	-87.29
Cropland	Cropland Erosion 4b W4	Reduced Tillage Systems	48.1	4	35.01	-87.29
Cropland	Cropland Erosion 1a W5	Reduced Tillage Systems	80.66	5	35.01	-87.27
Cropland	Cropland Erosion 1b W5	Filter Strip	80.66	5	35.01	-87.27
Cropland	Cropland Erosion 1a W6	Contour Farming	511.87	6	35	-87.26
Cropland	Cropland Erosion 1b W6	Reduced Tillage Systems	511.87	6	35	-87.26
Cropland	Cropland Erosion 1a W7	Reduced Tillage Systems	87.5	7	34.96	-87.27
Cropland	Cropland Erosion 1b W7	Filter Strip	87.5	7	34.96	-87.27
Cropland	Cropland Erosion 2a W7	Reduced Tillage Systems	13.66	7	34.96	-87.25
Cropland	Cropland Erosion 2b W7	Filter Strip	13.66	7	34.96	-87.25
Cropland	Cropland Erosion 3 W7	Reduced Tillage Systems	86.29	7	34.95	-87.27
Cropland	Cropland Erosion 4 W7	Filter Strip	19.09	7	34.94	-87.27
Cropland	Cropland Erosion 1 W8	Reduced Tillage Systems	27.69	8	34.93	-87.23
Cropland	Cropland Erosion 2 W8	Reduced Tillage Systems	10.28	8	34.91	-87.25
Cropland	Cropland Erosion 3 W8	Reduced Tillage Systems	44.14	8	34.89	-87.25
Cropland	Cropland Erosion 4 W8	Reduced Tillage Systems	29.38	8	34.86	-87.24
Gully Erosion	Gully Erosion 1 W8	Streambank stabilization and fencing	0.78	8	34.92	-87.27
Cropland	Cropland Erosion 1a W9	Reduced Tillage Systems	250.74	9	34.92	-87.21
Cropland	Cropland Erosion 1b W9	Filter Strip	250.74	9	34.92	-87.21
Cropland	Cropland Erosion 2 W9	Reduced Tillage Systems	19.62	9	34.86	-87.22
Cropland	Cropland Erosion 1 W10	Reduced Tillage Systems	20.22	10	34.86	-87.21
Cropland	Cropland Erosion 2a W10	Reduced Tillage Systems	242.15	10	34.84	-87.22
Cropland	Cropland Erosion 2b W10	Filter Strip	242.15	10	34.84	-87.22
Cropland	Cropland Erosion 4 W10	Reduced Tillage Systems	86.54	10	34.83	-87.23

Table 4 Proposed BMP Type and Location

The STEPL model produces post-BMP load reduction estimates of 32.3% below pre-BMP conditions, or approximately 2,135.6 tons of sediment prevented from entering Anderson Creek each year. Input values for the model are provided in Appendix D. Table 5 describes pre-BMP pollution loads. Table 6 describes pollutant load reductions in quantities of weight per year. Table 7 describes pollutant loads remaining after BMPs are implemented. Table 8 load reductions as a percentage of total pollutant loads prior to BMP implementation. Table 9 describes land uses contributing to pollutant loads following BMP implementation.

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)
	lb/year	lb/year	lb/year	t/year
W1	398492.3	45795.5	1221514.8	6606.0
Total	398492.3	45795.5	1221514.8	6606.0

Table 5 Pre-BMP Pollution Loads

N Reduction	P Reduction	BOD Reduction	Sediment Reduction
lb/year	lb/year	lb/year	t/year
26763.2	5583.9	13108.8	2135.6
26763.2	5583.9	13108.8	2135.6

Table 6 BMP Load Reduction Estimates (units of weight/year)

N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)
lb/year	lb/year	lb/year	t/year
371729.0	40211.6	1208406.0	4470.4
371729.0	40211.6	1208406.0	4470.4

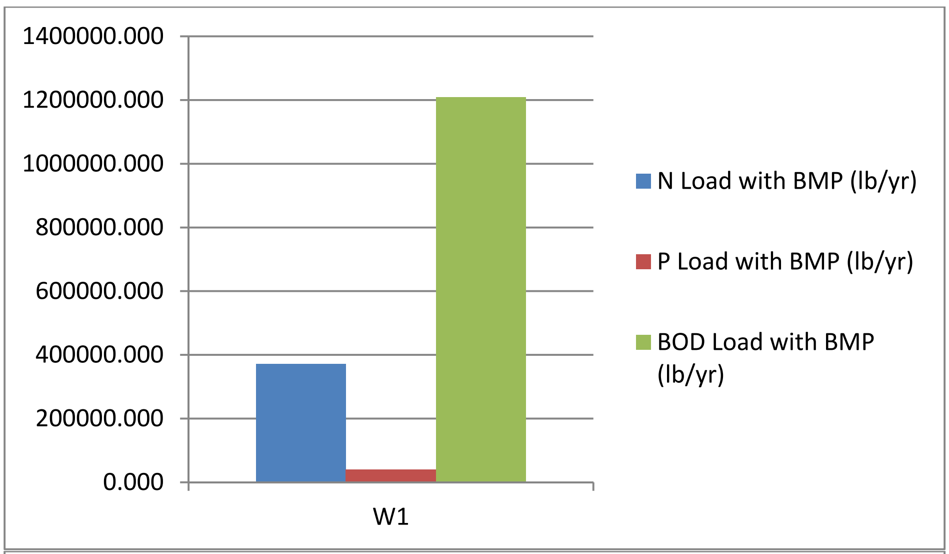
Table 7 Pollutant loads remaining after BMPs

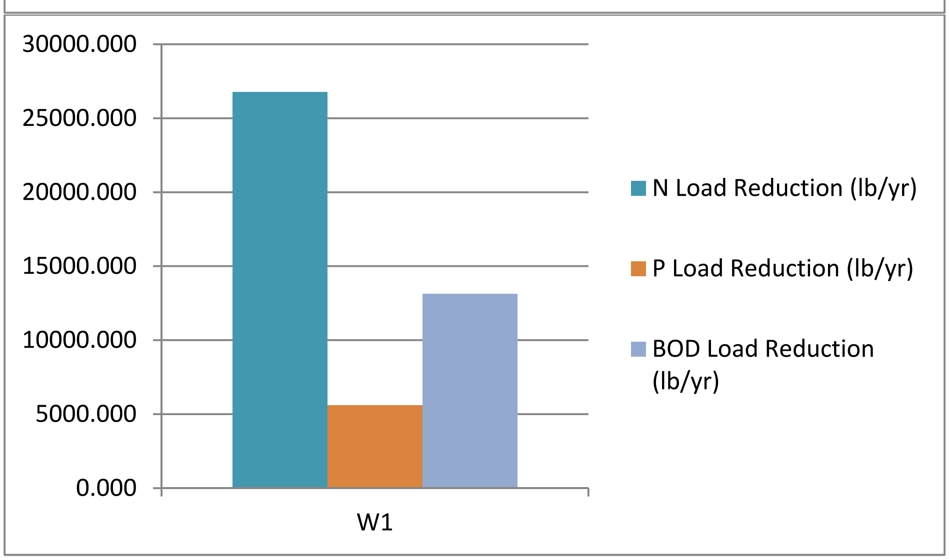
%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
%	%	%	%
6.7	12.2	1.1	32.3
6.7	12.2	1.1	32.3

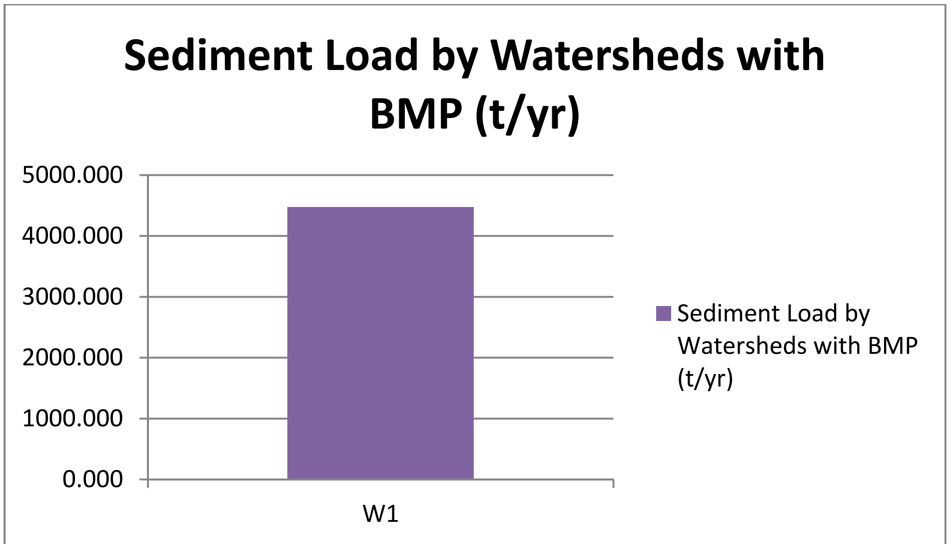
Table 8 Percentage of load reduction

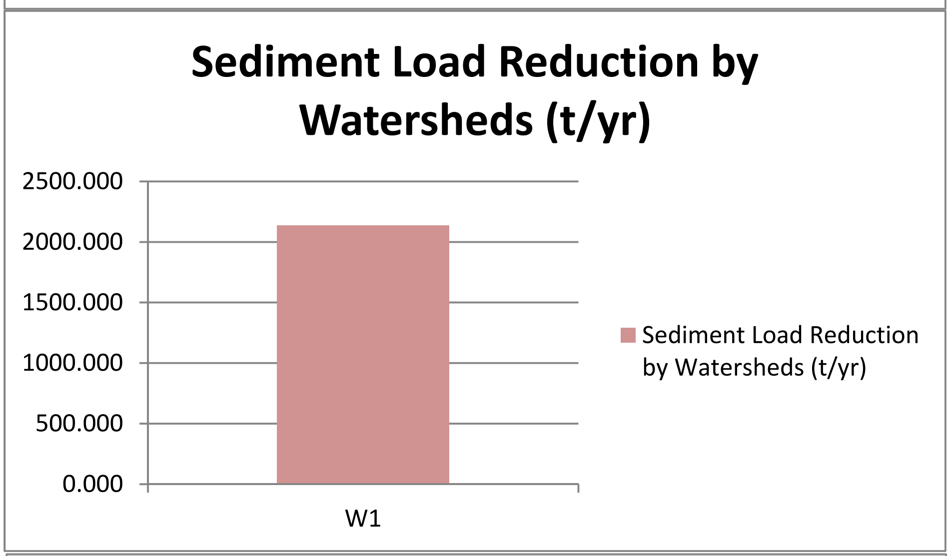
Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	31421.21	4866.14	123051.81	721.21
Cropland	8646.70	1796.16	60609.25	413.45
Pastureland	305876.05	26090.70	981395.58	3175.40
Forest	7829.71	3859.71	19334.50	149.87
Feedlots	17913.94	3582.79	23885.25	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	22.45	8.79	91.67	0.00
Gully	16.27	6.26	32.53	8.84
Streambank	2.69	1.03	5.37	1.68
Groundwater	0.00	0.00	0.00	0.00
Total	371729.01	40211.58	1208405.96	4470.45

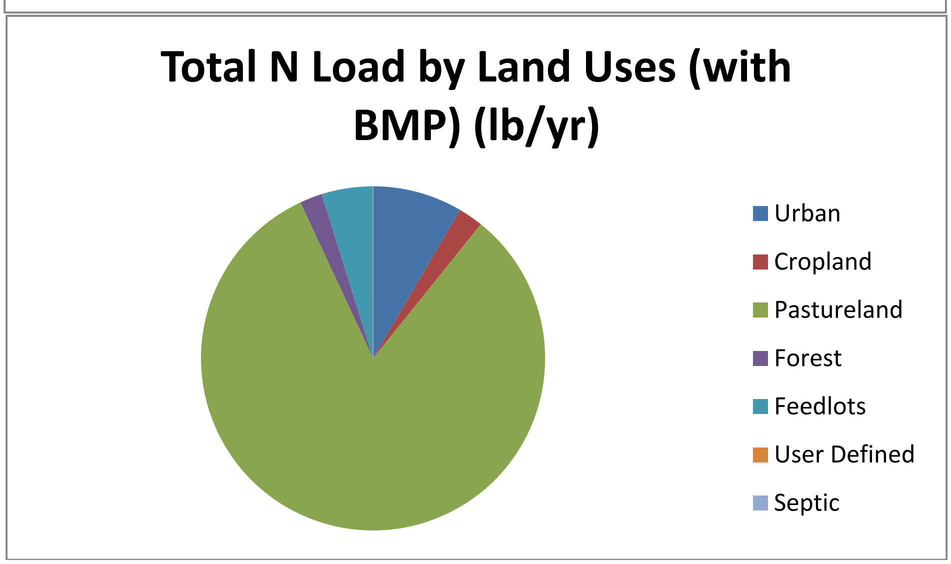
Table 9 Pollutant loading by land use type

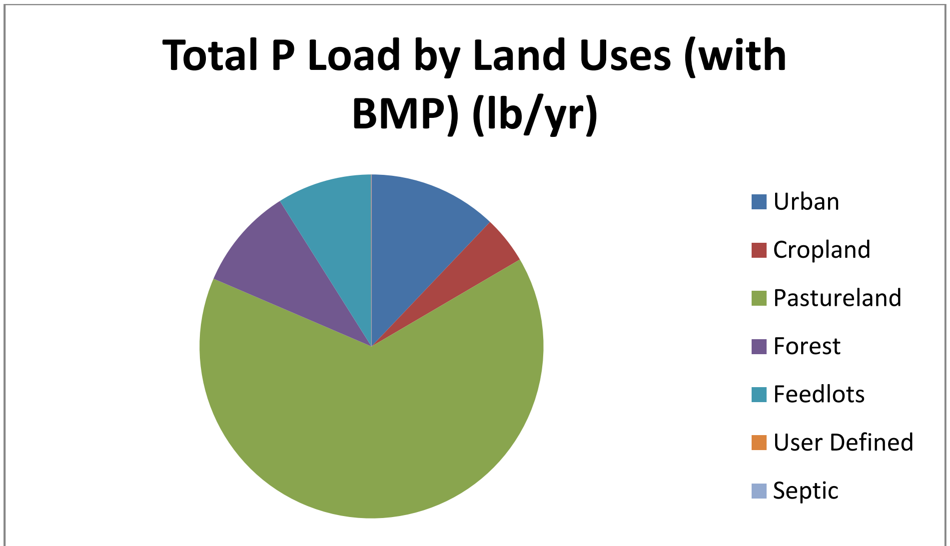


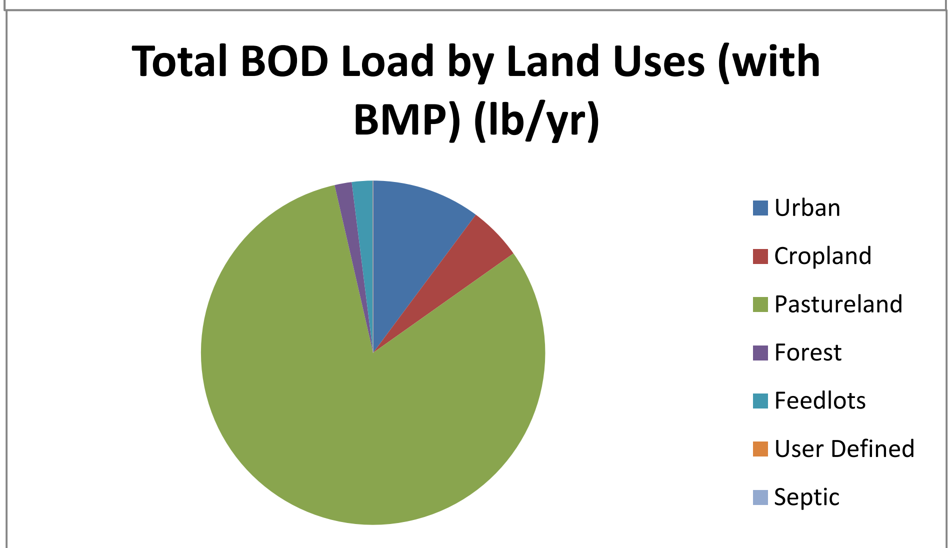


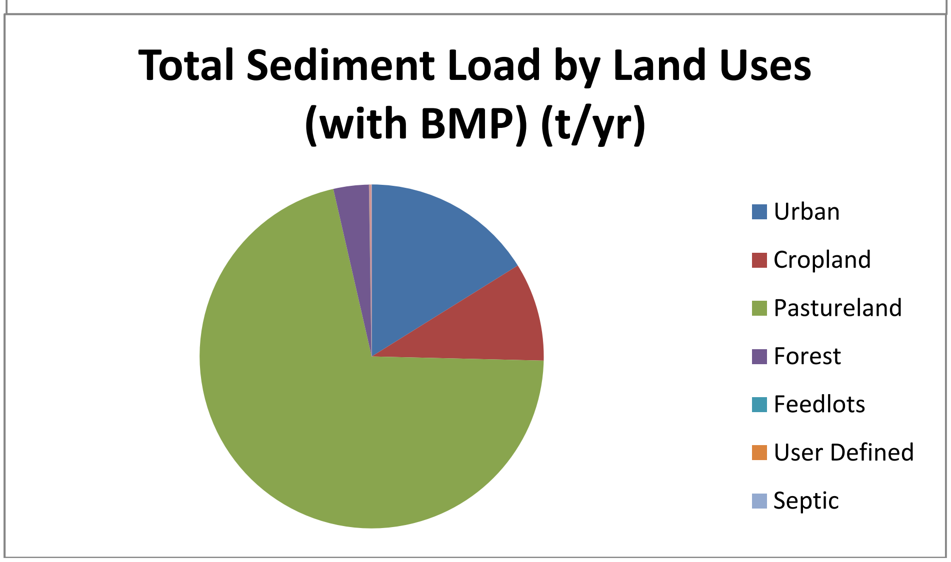

Sediment Load by Watersheds with BMP (t/yr)
5000.000
4000.000
3000.000
2000.000
1000.000
0.000
W1
Sediment Load by Watersheds with BMP (t/yr)


Sediment Load Reduction by Watersheds (t/yr)
2500.000
2000.000
1500.000
1000.000
500.000
0.000
W1
Sediment Load Reduction by Watersheds (t/yr)


Total N Load by Land Uses (with BMP) (lb/yr)
Urban
Cropland
Pastureland
Forest
Feedlots
User Defined
Septic


Total P Load by Land Uses (with BMP) (lb/yr)
Urban
Cropland
Pastureland
Forest
Feedlots
User Defined
Septic


Total BOD Load by Land Uses (with BMP) (lb/yr)
Urban
Cropland
Pastureland
Forest
Feedlots
User Defined
Septic


Total Sediment Load by Land Uses (with BMP) (t/yr)
Urban
Cropland
Pastureland
Forest
Feedlots
User Defined
Septic

BMP implementation cost estimation

Watershed planning under ADEM and EPA requires that the plan illustrate cost of implementation of proposed structural BMPs. This section illustrates costs of BMP implementation by sub-watershed basing in the Anderson Creek watershed area. BMP costs estimates make broad assumptions about the construction and maintenance costs of each BMP type, as shown in the table below. Individual BMPs were assessed for effectiveness on a cost per acre per load reduction basis to produce a prioritized list of BMPs, with lower values indicating, generally, more cost effective means of producing load reductions for a given acreage of property. The major challenge for implementation remains to be property owner participation in the practices proposed; however, the BMP model and cost estimates provide a guideline for beginning to work with local owners to produce load reduction. Streambank stabilization and eroded gullies, however, present a different challenge because despite the high cost of remediation, the volume of sedimentation produced from those localized sources is much larger than from general runoff. These locations should be a high priority. The majority of proposed BMPs had relatively low up-front construction cost and are primarily achieved through outreach, education, and low cost subsidies for implementation of conservation farming techniques, including contouring, low/no till, and filter strips in the watershed. Table 11 details cost estimates for BMPs by type of practice and Table 11 contains estimates for specific BMPs proposed in Anderson Creek.

Construction BMP Cost Estimates		
BMP Type	**Unit and cost share**	**Notes**
Stream Bank Stabilization & Fencing	$136/linear foot	Installation costs for streambank and shoreline protection according to USCOE regulations and restrictions including shaping, geotextile, and rock.
Contour Farming	$3.23/acre	Terrace system excluding land levelling or removal of old terraces.
Reduced Tillage	$19.10/acre	Mulch till, No till, or Strip Tillage Systems; acres eligible for incentive payments where tillage decreases Soil Tillage Intensity Rating (STIR) by sufficient amount.
Filter Strip	$149.10/acre	Payment includes seedbed preparation, seed, lime, and fertilizer.
Source: Draft FY 2017 EQIP Handbook, Alabama, 01/04/2017		

Table 10 BMP cost estimate by type

Land Use	BMP	Units		Cost/Unit	Cost Estimate	BMP Efficiency	$/A/Ce
Cropland	Contour Farming	Acres	83.18	$3.23	$268.67	0.405	7.975
Cropland	Reduced Tillage Systems	Acres	83.18	$19.10	$1,588.74	0.750	25.467
Cropland	Contour Farming	Acres	64.27	$3.23	$207.59	0.405	7.975
Cropland	Reduced Tillage Systems	Acres	64.27	$19.10	$1,227.56	0.750	25.467
Cropland	Streambank stabilization and fencing	Feet	756	$136.00	$102,816.00	N/A	N/A
Cropland	Contour Farming	Acres	4.28	$3.23	$13.82	0.405	7.975
Cropland	Reduced Tillage Systems	Acres	4.28	$19.10	$81.75	0.750	25.467
Cropland	Filter Strip	Acres	45	$149.10	$6,709.50	0.650	229.385
Cropland	Filter Strip	Acres	34.47	$149.10	$5,139.48	0.650	229.385
Cropland	Reduced Tillage Systems	Acres	100.08	$19.10	$1,911.53	0.750	25.467
Cropland	Filter Strip	Acres	100.08	$149.10	$14,921.93	0.650	229.385
Streamban k Erosion	Streambank stabilization and fencing	Feet	256	$136.00	$34,816.00	N/A	N/A
Cropland	Reduced Tillage Systems	Acres	74.23	$19.10	$1,417.79	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	199.25	$19.10	$3,805.68	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	24.64	$19.10	$470.62	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	51.44	$19.10	$982.50	0.750	25.467
Streamban k Erosion	Streambank stabilization and fencing	Feet	826	$136.00	$112,336.00	N/A	N/A
Cropland	Reduced Tillage Systems	Acres	67.16	$19.10	$1,282.76	0.750	25.467
Cropland	Filter Strip	Acres	67.16	$149.10	$10,013.56	0.650	229.385
Cropland	Reduced Tillage Systems	Acres	8.93	$19.10	$170.56	0.750	25.467
Cropland	Filter Strip	Acres	8.93	$149.10	$1,331.46	0.650	229.385
Cropland	Filter Strip	Acres	35.24	$149.10	$5,254.28	0.650	229.385
Cropland	Contour Farming	Acres	35.24	$3.23	$113.83	0.405	7.975
Cropland	Reduced Tillage Systems	Acres	35.24	$19.10	$673.08	0.750	25.467
Cropland	Filter Strip	Acres	48.1	$149.10	$7,171.71	0.650	229.385
Cropland	Reduced Tillage Systems	Acres	48.1	$19.10	$918.71	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	80.66	$19.10	$1,540.61	0.750	25.467
Cropland	Filter Strip	Acres	80.66	$149.10	$12,026.41	0.650	229.385
Cropland	Contour Farming	Acres	511.87	$3.23	$1,653.34	0.405	7.975
Cropland	Reduced Tillage Systems	Acres	511.87	$19.10	$9,776.72	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	87.5	$19.10	$1,671.25	0.750	25.467
Cropland	Filter Strip	Acres	87.5	$149.10	$13,046.25	0.650	229.385
Cropland	Reduced Tillage Systems	Acres	13.66	$19.10	$260.91	0.750	25.467
Cropland	Filter Strip	Acres	13.66	$149.10	$2,036.71	0.650	229.385
Cropland	Reduced Tillage Systems	Acres	86.29	$19.10	$1,648.14	0.750	25.467
Cropland	Filter Strip	Acres	19.09	$149.10	$2,846.32	0.650	229.385
Cropland	Reduced Tillage Systems	Acres	27.69	$19.10	$528.88	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	10.28	$19.10	$196.35	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	44.14	$19.10	$843.07	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	29.38	$19.10	$561.16	0.750	25.467
Gully Erosion	Streambank stabilization and fencing	Feet	200	$136.00	$27,200.00	N/A	N/A
Cropland	Reduced Tillage Systems	Acres	250.74	$19.10	$4,789.13	0.750	25.467
Cropland	Filter Strip	Acres	250.74	$149.10	$37,385.33	0.650	229.385
Cropland	Reduced Tillage Systems	Acres	19.62	$19.10	$374.74	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	20.22	$19.10	$386.20	0.750	25.467
Cropland	Reduced Tillage Systems	Acres	242.15	$19.10	$4,625.07	0.750	25.467
Cropland	Filter Strip	Acres	242.15	$149.10	$36,104.57	0.650	229.385
Cropland	Reduced Tillage Systems	Acres	86.54	$19.10	$1,652.91	0.750	25.467

Table 11 Anderson Creek BMP cost estimates

VI. Public Outreach and Education Component

The success of this plan will depend most heavily on reaching and coordinating with the public and connecting them with resources for implementing BMPS and monitoring. Developing partnerships between the landowners and agencies to assist with movement in the project is crucial. In addition continued education is necessary for the plan to extend into the future and maintain the water standards established by ADEM. Initial steps in the outreach and connection portion of the plan have been completed by NACOLG staff. During the planning process, two meetings were conducted in the Town of Anderson on April 11th and August 23rd, 2017 involving private landowners, local government, and governmental resources for the continuation of the plan. The meetings established the local NRCS, the County Farm Service Agency, the County Soil and Water Conservation District, and the Alabama Forestry Commission as potential resources for assistance in BMP implementation. The forum also provided landowners and opportunity to gain information and educational materials regarding the purpose of the plan, best management practices, load reduction techniques and the costs and technical expertise requirements of implementing BMPs.

Public outreach past the NACOLG planned meetings will be facilitated by the agencies directly involved in implementation and monitoring, NRCS, the Lauderdale Soil and Water Conservation District, and the Resource Conservation and Development Council. Ideally these activities will be administered by a watershed coordinator. Priority agencies for each phase of implementation of the plan from this point should be established so there will be a point of contact for questions that the public may have regarding the plan. NACOLG can participate in this aspect in an advisory capacity regarding data collected and cataloged for the assessment; along with technical assistance from ADEM these can be sources of information on how changes in BMPs may affect load reduction estimates. The NRCS is a good candidate for guidance of BMP implementation and funding resources along with other conservation groups.

The implementation included in section VII illustrates a 3 year plan, but in reality a good watershed plan will extend well beyond that time frame. The purpose of any good plan is to restore a watershed to its intended use and maintain or improve those standards. This requires a continuing education and monitoring component overseen by an enthusiastic watershed coordinator. Watershed monitoring practices are discussed in greater detail in section VII. An education component is broadly outlined below, with suggestions for different organizations and resources available to inform the public in how they can maintain involvement.

A. Natural Resource Conservation Service

NRCS provides farmers and ranchers with financial aid and technical assistance to voluntarily put conservation on the ground, not only helping the environment but agricultural operations, too. Farmers, ranchers and landowners can receive financial assistance from NRCS to make improvements to their land. NRCS conservationists provide technical assistance and conservation planning for farmers, ranchers, and forest landowners to improve their land and make conservation decisions.

B. Alabama Clean Water Partnership

The Alabama Clean Water Partnership offers a number of workshops on a variety of clean water topics including rain barrel workshops that focus on water reuse, dirt road workshops that show BMPS for unpaved roads, septic maintenance workshops, and water festivals. Although there is not an active AWCP watershed facilitator in the Tennessee River basin, the efforts at Anderson Creek may benefit from coordination with AWCP activities and resources in other locations, which may help to strengthen and improve local efforts as well as generate additional support for AWCP support in the Tennessee River basin.

C. Printed Materials

Printed materials that can be used independently or in conjunction with any of the programs mentioned in this section are available for several sources. Alabama Water Watch has a large library of available materials for their programs mentioned in this section as well as other materials that can be used for education and public outreach. Use of printed materials generated by local partners in the watershed can also be a valuable tool in circulating watershed plan progress as well upcoming activities.

C. Watershed Education Programs for Children

Educational programs for school age children can be arranged through a number of sources including NRCS and ACWP. These programs included stepped education components for elementary school aged children as well as individual programs that can be taught at any level in or outside of the classroom. Water festivals, which introduce children to topics related to whole watershed approaches and water quality topics, are another important educational component to be planned for the Anderson Creek watershed.

D. Alabama Water Watch

Alabama Water Watch is a citizen volunteer, water quality monitoring program covering all of the major river basins of the state. The mission of AWW is to improve both water quality and water policy through citizen monitoring and action. Established in 1992, AWW is a national model for citizen involvement in watershed stewardship, largely because of its three interrelated components: citizen monitoring groups, a university-based program, and a non-profit association. AWW uses EPA-approved monitoring plans with a community-based approach to train citizens to monitor conditions and trends of their local waterbodies. With a “data-to-action” focus, AWW helps volunteers collect, analyze, and understand their data to make positive impacts. Potential locations for volunteer monitoring activiites include the existing monitoring sites ANDL-8 at Snake Road Bridge and ANDL-9 at County Road 156 as well as potential sites at State Route 207 and accessible from Anderson Park in the Town of Anderson.

VII. Implementation and Monitoring

On ground implementation of this plan will be handled through public outreach under the direction of a volunteer, or paid- depending on funding, watershed coordinator with NACOLG functioning in the capacity of a technical advisory resource. The final watershed meeting in May before implementation begins should also concentrate on the identification of this coordinator. Below is a suggested implementation schedule for the plan as well as a banded estimate of the amount of technical and financial assistance that will be needed for each item on the list.

The implementation schedule includes a 3-year timeline; although implementation will take coordination over many more years, this is a feasible schedule of progress that may be revised and revisited based on performance. In addition, the schedule contains estimates of cost and technical assistance required for implementation, rated as either Low, Medium, or High. Low financial cost items are anticipated to require from $0 to $1,000 investment; Medium are from $1,001 to $3,000; and High are greater than $3,000. All costs approximate and in most cases variable due to differences in scope and quantities of materials, for example. Finally, the schedule describes the technical assistance required. Low technical assistance BMPs can be accomplished with minimal outside assistance, perhaps in conjunction with zero or one partnering agencies, and without advanced engineering or scientific knowledge. Medium technical assistance BMPs require more advanced partnerships among two, three or more agencies and moderately advanced knowledge, such as that required for planning and implementing a project with no adverse impacts on environment or habitat; High technical skill BMPs require advanced partnerships among three or more agencies and/or specialized knowledge, skill, or permitting requirements, such as consent of a school official or enhanced environmental review or scientific knowledge.

A. Schedule of Implementation

The following schedule of implementation follows a timeframe of one to three years. It should be used as a benchmark to the success of initial efforts to improve water quality measurements in the Anderson Creek watershed and should be revisited and updated periodically to reflect accomplishments in the watershed as well as potential work remaining. The full restoration of the watershed will likely take many years and several iterations of implementation actions that initially reduce sedimentation levels, verified through monitoring, and eventually involve restoration of macroinvertebrate populations through natural processes that may take a decade or longer. Table 12 and Table 13 describe the timeframe for implementation and the financial and technical capacity required to implement the plan.

Tasks for Implementation	Time Frame											
	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Education/Outreach	-	-	-	-	-	-	-	-	-			
Host watershed Festivals				■				■				■
School Programs	■		■		■		■		■		■	
Meetings/progress publications	■	■	■	■	■	■	■	■	■	■	■	■
Community Outreach	■	■	■	■	■	■	■	■	■	■	■	■
Technical Assistance	-	-	-	-	-	-	-	-	-			
Watershed Coordinator Position			■	■	■	■	■	■	■	■	■	■
Landowner Partnership BMPs	-	-	-	-	-	-	-	-	-			
Identify BMP needs	■	■	■	■	■	■	■	■				
Develop Funding sources		■	■	■	■	■	■	■	■	■	■	■
Install BMPS	-	-	-	-	-	-	-	-	-			
Contour Farming					■	■	■	■	■	■	■	■
Reduced Tillage Systems					■	■	■	■	■	■	■	■
Filter Strips					■	■	■	■	■	■	■	■
Streambank stabilization/fencing									■	■	■	■
Monitoring	-	-	-	-	-	-	-	-	-			
Establish Monitoring component					■	■	■	■	■	■	■	■
Recruit and Train Volunteers					■	■	■	■	■	■	■	■
Perform Monitoring					■	■	■	■	■	■	■	■

Table 12 Implementation Schedule

Task for Implementation	Financial Capacity Required			Technical Assistance Needed		
	Low	Medium	High	Low	Medium	High
Education/Outreach						
Host watershed Festivals	■	■				■
School Programs	■				■	
Meetings/progress publications	■			■		
Community Outreach	■			■		
Technical Assistance						
Watershed Coordinator Position			■			■
Landowner Partnership BMPs						
Identify BMP needs	■				■	■
Develop Funding sources	■				■	
Install BMPS						
Contour Farming	■			■		
Reduced Tillage Systems	■			■		
Filter Strips	■			■		
Streambank stabilization/fencing			■		■	■
Monitoring						
Establish Monitoring component	■					■
Recruit and Train Volunteers	■			■		
Perform Monitoring			■		■	

Table 13 Financial and Technical Capacity

B. Potential Funding

Funding is naturally a critical element of any plan's implementation. The Anderson Creek Watershed Plan anticipates funding from a wide variety of potential sources including, but certainly not limited to, the following:

- **ADEM (EPA) Section 319 funds-** Under Section 319, states, territories and tribes receive grant money that supports a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects and monitoring to assess the success of specific nonpoint source implementation projects.
- **Northwest Alabama RC&D Grants-** Alabama's RC&D Councils have limited funds tosupport locally developed conservation programs such as anticipated in the Anderson Creek Watershed Management Plan.
- **National Resource Conservation Service-** NRCS administers several grants including the Environmental Quality Incentives Program (EQIP) grants, which can be used to promote conservation practices and BMPs in the Anderson Creek Watershed. Environmental Quality and

Sustainability (EQIP)

- **Volunteers-** Volunteer resources are among the most critical for implementing the Anderson Creek Watershed Plan. Volunteers may be enlisted for water quality testing and monitoring, as well as outreach and education practices launched in local schools and communities.

These are only a few of the many and varied resources that may be utilized to implement the Anderson Creek Watershed Plan.

C. Monitoring and Load Reduction Milestones

Full implementation of the suggested BMP's are estimated to reduce pollutant loads attributed to sedimentation by 42.8% over the course of several years. Continued monitoring by state environmental agencies is the most effective means of tracking progress toward this eventual goal. The ADEM will conduct post BMP monitoring after the project ends.to determine water quality improvements. In addition, volunteer testing should be completed monthly at the two ADEM monitoring site for the duration of the project. Volunteer monitoring should reveal incremental progress that tracks along the timeline shown in Section VII. The most direct benchmark to measure the success of the watershed planning and implementation effort will be measurements of polluted runoff filtered by BMPs, as indicated by pre- and post- BMP placement water quality testing for TSS and NTUs. In addition, measures of topsoil stability before and after BMPs are an indicator of soil health on sites affected by BMPs. Finally, in long term water quality testing, the restoration of macroinvertebrates to the watershed are a final, measurable goal of this plan.

VIII. Conclusion

The Anderson Creek Watershed is a valuable ecosystem for residents in Lauderdale County, Alabama. It plays a significant role in the overall health of the Elk River and Wheeler Watersheds and subsequent downstream areas. However, contamination from sedimentation has caused problems along the stream. Its health and restoration to full function is important for overall environmental stewardship, but equally for the continued economic functions the watershed supports.

A well-arranged watershed plan includes an assessment of the sources of contamination, discussion of the practices most likely to affect changes in the watershed, an estimate of current and future loading for contaminants, and details on the implementation of the plan, including various resource requirements. This planning effort has attempted to accomplish these major goals through primary and secondary research and analysis of conditions in the Anderson Creek Watershed and by recruiting the aid of various interested parties, organizations and individuals to attempt to leverage cooperative relationships into actions designed to improve overall conditions in the watershed. Through comprehensive, cooperative implementation of this plan, Anderson Creek may be restored to full function.

References

U.S. Environmental Protection Agency (2017) "The Watershed Approach", online: https://www.epa.gov/nps/watershed-approach, accessed 09-14-2017**.**U.S. Environmental Protection Agency (n.d.), "Introduction to Watershed Planning", Watershed Web Academy, online https://cfpub.epa.gov/watertrain/pdf/modules/introduction_to_watershed_planning.pdf, accessed 09-14-2017.

U.S. Environmental Protection Agency (2017), "Environmental Justice", online https://www.epa.gov/environmentaljustice, accessed 09-14-2017.

Alabama Department of Environmental Management (2017), "Draft FY 2017 EQIP Handbook, Alabama", 01-04-2017.

Wisconsin DNR (2014), "U.S. EPA. Training for Wisconsin DNR, 08-05-14", online http://dnr.wi.gov/topic/Nonpoint/documents/STEPL/STEPLTrainingSlidesExercises2014-08-05.pdf, accessed 09-14-2017.

Purdue University (2014), "STEPL WEB: Web-Based Spreadsheet Tool for the Estimation of Pollutant Load (ver. 2014)", online https://engineering.purdue.edu/mapserve/ldc/STEPL/, accessed 09-14-2017.

TetraTech (2014), "STEPL Online Data Access System", online http://it.tetratech-ffx.com/steplweb/STEPLdataviewer.htm, accessed 09-14-2017.

Appendices

Appendix A - Nine Elements of a Watershed Protection Plan

To ensure that Section 319 projects make progress towards restoring waters impaired by nonpoint source pollution, watershed protection plans that are developed or implemented with Section 319 funds to address Section 303(d)-listed waters must include at least the nine elements listed below. Where the watershed protection plan is designed to implement a TMDL, these elements will provide reasonable assurance that the nonpoint source load allocations identified in the NPS TMDL or anticipated in National Pollutant Discharge Elimination System (NPDES) permits for the watershed will be achieved. However, even if a NPS TMDL has not yet been completed, the nine elements are critical to assure that public funds to address impaired waters are used effectively.

1. An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed protection plan (and to achieve any other watershed goals identified in the plan), as discussed in item (2) immediately below. Sources that need to be controlled should be identified at the significant subcategory level with estimates of the extent to which they are present in the watershed (e.g., X numbers of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation).

2. An estimate of the load reductions expected for the management measures described under paragraph (3) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time). Estimates should be provided at the same level as in item (1) above (e.g., the total load reduction expected for dairy cattle feedlots; row crops; or eroded streambanks).

3. A description of the NPS management measures that will need to be implemented to achieve the load reductions estimated under paragraph (2) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.

4. An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement the plan. Sources of funding may include CWA Section 319, State Revolving Funds, USDA's Environmental Quality Incentives Program and Conservation Reserve Program, and other relevant Federal, State, local and private funds that may be available to assist in implementing the plan.

5. An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.

6. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

7. Descriptions of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.

8. A set of criteria that can be used to determine whether pollutant loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether the watershed protection plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.

9. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (8) immediately above.

Appendix B - Soils Data

Conservation Planning

This report provides those soil attributes for the conservation plan for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. It provides the soil description along with the slope, runoff, T Factor, WEI, WEG, Erosion class, Drainage class, Land Capability Classification, and the engineering Hydrologic Group and the erosion factors Kf, the representative percentage of fragments, sand, silt, and clay in the mineral surface horizon. Missing surface data may indicate the presence of an organic surface layer. Further information on these factors can be found in the National Soil Survey Handbook section 618 found at the url http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054223#00 .

Report—Conservation Planning

Soil properties and interpretations for conservation planning. The surface mineral horizon properties are displayed. Organic surface horizons are not displayed.

Conservation Planning–Lauderdale County, Alabama																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface						
												Depths in.	Kf Factor	Fragments RV	Sand RV	Silt RV	Clay RV	
BoE—Bodine gravelly silt loam, 12 to 30 percent slopes																		
Bodine	85	16.0	75	Low	5	48	6	Class 1	Somewhat excessively drained	6s	A	0 - 7	.37	26	30	52	17	
DaB—Decatur silt loam, 2 to 6 percent slopes																		
Decatur	95	4.0	249	Low	5	48	6	Class 1	Well drained	2e	B	0 - 7	.37	0	12	64	24	
DcC2—Decatur silty clay loam, 6 to 10 percent slopes, eroded																		
Decatur	90	8.0	150	Medium	5	48	6	Class 2	Well drained	4e	B	0 - 3	.28	3	7	58	35	
DeB—Dewey silt loam, 2 to 6 percent slopes																		
Dewey	85	4.0	150	Low	5	48	6	Class 2	Well drained	2e	B	0 - 5	.32	9	26	52	22	
DeC—Dewey silt loam, 6 to 10 percent slopes																		
Dewey	85	8.0	124	Medium	5	48	6	Class 2	Well drained	3e	B	0 - 5	.32	9	26	52	22	
DfC2—Dewey silty clay loam, 6 to 10 percent slopes, eroded																		
Dewey	85	8.0	124	Medium	5	38	7	Class 2	Well drained	4e	B	0 - 5	.24	9	7	54	38	

Conservation Planning–Lauderdale County, Alabama

Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface					
												Depths in.	Kf Factor	Frag-ments RV	Sand RV	Silt RV	Clay RV
DoA—Dickson silt loam, 0 to 2 percent slopes																	
Dickson	90	1.0	196	Very low	4	48	6	Class 1	Moderately well drained	2w	C/D	0 - 7	.43	—	20	59	20
DoB—Dickson silt loam, 2 to 5 percent slopes																	
Dickson	90	4.0	150	Low	4	48	6	Class 1	Moderately well drained	2e	C/D	0 - 6	.43	—	18	60	21
DoC—Dickson silt loam, 6 to 10 percent slopes																	
Dickson	85	8.0	98	Medium	4	48	6	Class 1	Moderately well drained	3e	C	0 - 7	.43	2	11	68	20
EtB—Etowah silt loam, 2 to 8 percent slopes																	
Etowah	85	5.0	124	Low	5	48	6	Class 1	Well drained	2e	B	0 - 7	.32	13	26	52	21
FaB—Fullerton cherty silt loam, 2 to 6 percent slopes																	
Fullerton	85	4.0	150	Low	5	38	7	None - deposition	Well drained	2e	B	0 - 7	.32	20	26	52	21
FaC—Fullerton gravelly silt loam, 6 to 15 percent slopes																	
Fullerton	85	11.0	98	—	5	38	7	Class 1	Well drained	4e	B	0 - 5	.37	16	21	58	21
Gu—Guthrie silt loam, 0 to 2 percent slopes, frequently flooded																	
Guthrie	90	1.0	98	Low	4	56	5	None - deposition	Poorly drained	5w	D	0 - 3	.43	0	13	68	17

Conservation Planning–Lauderdale County, Alabama																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Fact or	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydro logic Group	Surface						
												Depths in.	Kf Fact or	Frag- ments RV	Sand RV	Silt RV	Clay RV
Le—Lee cherty silt loam																	
Lee	90	1.0	98	Low	5	38	7	Class 1	Poorly drained	3w	B/D	0 - 5	.32	22	24	52	22
Lo—Lobelville cherty silt loam																	
Lobelville	85	1.0	98	Low	4	38	7	Class 1	Moderately well drained	2w	C	0 - 5	.32	21	26	52	21
PAD3—Paleudults, 6 to 15 percent slopes, severely eroded																	
Paleudults, (Decatur)	85	11.0	98	Medium	4	38	7	Class 3	Well drained	4e	B	0 - 7	.20	7	7	47	45
Pr—Pruitton silt loam																	
Pruitton	90	1.0	124	Very low	5	56	5	None - deposition	Well drained	2w	A	0 - 9	.28	13	27	54	19

Conservation Planning–Lawrence County, Tennessee																	
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Fact or	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydro logic Group	Surface					
												Depths in.	Kf Fact or	Frag- ments RV	Sand RV	Silt RV	Clay RV
B2a—Bodine gravelly silt loam, 12 to 30 percent slopes																	
Bodine	85	16.0	75	Low	5	48	6	Class 1	Somewhat excessively drained	6s	A	0 - 7	.37	26	30	52	17

Conservation Planning–Lawrence County, Tennessee																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Fact or	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydro logic Group	Surface						
												Depths in.	Kf Fact or	Frag- ments RV	Sand RV	Silt RV	Clay RV
B2b—Bodine cherty silt loam, eroded moderately steep phase																	
Bodine	100	19.0	—	—	5	38	7	Class 2	Somewhat excessively drained	6s	A	0 - 5	.37	48	27	54	18
B2d—Bodine cherty silt loam, eroded steep phase																	
Bodine	100	45.0	—	—	5	38	7	Class 2	Somewhat excessively drained	7s	A	0 - 5	.37	48	27	54	18
Bc—Baxter cherty silt loam, eroded sloping phase																	
Baxter	100	9.0	—	—	5	38	7	—	Well drained	3e	B	0 - 5	.37	27	21	54	24
Bd—Baxter cherty silt loam, moderately steep phase																	
Baxter	100	19.0	—	—	5	48	6	—	Well drained	4e	B	0 - 7	.37	27	26	53	19
Be—Baxter cherty silt loam, eroded moderately steep phase																	
Baxter	100	19.0	—	—	5	38	7	—	Well drained	4e	B	0 - 5	.37	27	21	54	24
Bg—Baxter cherty silt loam, eroded gently sloping light colored phase																	
Ironcity	100	4.0	—	—	5	38	7	—	Well drained	2e	B	0 - 5	.37	27	27	50	22

Conservation Planning–Lawrence County, Tennessee																	
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface					
												Depths in.	Kf Factor	Frag-ments RV	Sand RV	Silt RV	Clay RV
Bk—Baxter cherty silt loam, eroded sloping light colored phase																	
Ironcity	100	9.0	—	—	5	38	7	—	Well drained	3e	B	0 - 5	.37	27	27	50	22
Bu—Bewleyville silt loam, eroded gently sloping shallow phase																	
Bewleyville	100	4.0	—	—	5	48	6	—	Well drained	2e	B	0 - 5	.43	2	7	69	24
Bw—Bodine cherty silt loam, eroded gently sloping phase																	
Bodine	100	4.0	—	—	5	38	7	—	Somewhat excessively drained	4s	A	0 - 5	.43	48	30	55	14
Bx—Bodine cherty silt loam, sloping phase																	
Bodine	100	9.0	—	—	5	38	7	—	Somewhat excessively drained	4s	A	0 - 5	.43	48	30	55	14
By—Bodine cherty silt loam, eroded sloping phase																	
Bodine	100	9.0	—	—	5	38	7	—	Somewhat excessively drained	4s	A	0 - 5	.37	48	27	54	18
Ca—Captina silt loam, gently sloping phase																	
Captina	100	4.0	—	—	4	56	5	—	Moderately well drained	3e	C/D	0 - 5	.43	5	13	69	17

Conservation Planning–Lawrence County, Tennessee																	
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface					
												Depths in.	Kf Factor	Frag-ments RV	Sand RV	Silt RV	Clay RV
Cb—Captina silt loam, eroded gently sloping phase																	
Captina	100	4.0	—	—	4	56	5	—	Moderately well drained	3e	C/D	0 - 5	.43	5	11	69	19
Cf—Cookeville silt loam, eroded gently sloping phase																	
Ironcity	100	4.0	—	—	5	48	6	—	Well drained	2e	B	0 - 5	.37	10	27	50	22
De—Dickson silt loam, 2 to 5 percent slopes																	
Dickson	85	4.0	177	Low	3	56	5	Class 1	Moderately well drained	2e	C/D	0 - 9	.43	—	20	69	10
Df—Dickson silt loam, eroded gently sloping phase																	
Dickson	100	4.0	—	—	4	48	6	—	Moderately well drained	2e	C/D	0 - 5	.43	2	11	68	20
Ed—Etowah silt loam, eroded gently sloping phase																	
Etowah	100	4.0	—	—	5	48	6	—	Well drained	2e	B	0 - 5	.37	13	21	54	24
Ga—Greendale cherty silt loam																	
Greendale	100	3.0	—	—	5	38	7	—	Well drained	2e	B	0 - 7	.37	26	26	52	21
Gb—Greendale silt loam																	
Greendale	100	3.0	—	—	5	48	6	—	Well drained	2e	B	0 - 7	.37	14	26	52	21
Gc—Guthrie silt loam																	
Guthrie	100	1.0	—	—	4	56	5	—	Poorly drained	5w	C/D	0 - 3	.43	—	13	68	17

Conservation Planning–Lawrence County, Tennessee																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Fact or	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydro logic Group	Surface					
												Depths in.	Kf Fact or	Frag- ments RV	Sand RV	Silt RV	Clay RV
Gd—Guthrie silt loam, overwash phase																	
Guthrie	100	1.0	—	—	4	56	5	—	Poorly drained	4w	C/D	0 - 9	.43	—	13	68	17
La—Lawrence silt loam																	
Lawrence	100	2.0	—	—	4	56	5	—	Somewhat poorly drained	3w	C/D	0 - 9	.43	2	11	68	19
Lc—Lee silt loam																	
Lee	100	1.0	—	—	5	38	7	—	Poorly drained	3w	B/D	0 - 3	.37	22	22	55	22
Lf—Lobelville silt loam, local alluvium phase																	
Lindside	100	2.0	—	—	5	48	6	—	Moderately well drained	2w	B/D	0 - 7	.43	2	11	67	21
Mc—Minvale cherty silt loam, sloping phase																	
Minvale	100	9.0	—	—	5	38	7	—	Well drained	3e	B	0 - 5	.37	30	22	55	22
Mk—Mountview silt loam, eroded gently sloping phase																	
Mountview	100	4.0	—	—	5	48	6	—	Well drained	2e	B	0 - 9	.43	2	11	66	22
Mm—Mountview silt loam, gently sloping shallow phase																	
Sugargrove	100	4.0	—	—	4	48	6	—	Well drained	2e	B	0 - 7	.37	25	27	54	18
Mn—Mountview silt loam, eroded, gently sloping shallow phase																	
Sugargrove	100	4.0	—	—	4	48	6	—	Well drained	2e	B	0 - 5	.37	25	27	54	18

Conservation Planning–Lawrence County, Tennessee																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface					
												Depths in.	Kf Factor	Fragments RV	Sand RV	Silt RV	Clay RV
Mo—Mountview silt loam, sloping shallow phase																	
Sugargrove	100	9.0	—	—	4	48	6	—	Well drained	3e	B	0 - 5	.37	25	27	54	18
Mp—Mountview silt loam, eroded, sloping shallow phase																	
Sugargrove	100	9.0	—	—	4	48	6	—	Well drained	3e	B	0 - 5	.37	25	27	54	18
Mr—Mountview silty clay loam, severely eroded sloping shallow phase																	
Sugargrove	100	9.0	—	—	4	38	7	—	Well drained	4e	B	0 - 5	.37	25	19	52	29
Pf—Pace silt loam, eroded gently sloping phase																	
Tasso	100	4.0	—	—	5	48	6	—	Well drained	2e	C	0 - 5	.37	11	26	53	20
Sb—Sango silt loam, gently sloping phase																	
Sango	100	3.0	—	—	4	56	5	—	Moderately well drained	2e	C/D	0 - 3	.49	2	14	72	13

Conservation Planning–Limestone County, Alabama																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface					
												Depths in.	Kf Factor	Fragments RV	Sand RV	Silt RV	Clay RV
Asv—Abernathy silt loam level phase																	
Abernathy	90	1.0	124	Low	5	48	6	None - deposition	Well drained	2w	B	0 - 7	.37	6	11	64	25

Conservation Planning–Limestone County, Alabama																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface						
												Depths in.	Kf Factor	Frag-ments RV	Sand RV	Silt RV	Clay RV
Bse—Baxter cherty silt loam eroded undulating phase																	
Baxter	85	4.0	150	Low	5	38	7	None - deposition	Well drained	2e	B	0 - 14	.32	15	26	52	21
Bsh—Baxter cherty silt loam eroded hilly phase																	
Baxter	85	21.0	124	High	5	38	7	None - deposition	Well drained	6e	B	0 - 14	.32	15	26	52	21
Bsl—Baxter cherty silt loam hilly phase																	
Baxter	85	25.0	124	High	5	38	7	None - deposition	Well drained	6e	B	0 - 14	.32	15	26	52	21
Bsn—Baxter cherty silt loam eroded rolling phase																	
Baxter	85	9.0	150	Medium	5	38	7	None - deposition	Well drained	3e	B	0 - 14	.32	15	26	52	21
Bso—Baxter cherty silt loam rolling phase																	
Baxter	85	9.0	150	Medium	5	38	7	None - deposition	Well drained	3e	B	0 - 14	.32	15	26	52	21
Bsu—Baxter cherty silt loam undulating phase																	
Baxter	85	4.0	150	Low	5	38	7	None - deposition	Well drained	2e	B	0 - 14	.32	15	26	52	21
Bsz—Baxter cherty silt loam steep phase																	
Baxter	85	35.0	75	High	5	38	7	None - deposition	Well drained	7e	B	0 - 14	.32	16	26	52	21

Conservation Planning–Limestone County, Alabama																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface						
												Depths in.	Kf Factor	Frag-ments RV	Sand RV	Silt RV	Clay RV
Bxr—Baxter cherty silty clay loam severely eroded hilly phase																	
Baxter	85	21.0	124	High	5	38	7	None - deposition	Well drained	7e	B	0 - 14	.28	33	18	47	33
Cke—Cookeville silt loam eroded undulating phase																	
Cookeville	85	4.0	200	Low	5	48	6	None - deposition	Well drained	2e	B	0 - 7	.37	2	11	67	21
Ckn—Cookeville silt loam eroded rolling phase																	
Cookeville	85	9.0	150	Medium	5	48	6	None - deposition	Well drained	3e	B	0 - 7	.37	2	11	67	21
Cku—Cookeville silt loam undulating phase																	
Cookeville	90	4.0	200	Low	5	48	6	None - deposition	Well drained	2e	B	0 - 7	.37	2	11	67	21
Dce—Dickson cherty silt loam eroded undulating phase																	
Dickson	85	4.0	173	Low	4	48	6	Class 1	Moderately well drained	2e	C	0 - 7	.43	2	11	68	20
Dcn—Dickson cherty silt loam eroded rolling phase																	
Dickson	85	8.0	150	Medium	4	48	6	Class 1	Moderately well drained	3e	C	0 - 7	.43	2	11	68	20

Conservation Planning–Limestone County, Alabama																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface						
												Depths in.	Kf Factor	Fragments RV	Sand RV	Silt RV	Clay RV
Dco—Dickson cherty silt loam rolling phase																	
Dickson	85	8.0	75	Medium	4	48	6	Class 1	Moderately well drained	3e	C	0 - 7	.43	2	11	68	20
Dkd—Dickson cherty silty clay loam severely eroded rolling phase																	
Dickson	85	8.0	75	Medium	4	48	6	Class 1	Moderately well drained	3e	C	0 - 7	.37	2	11	60	28
Dle—Dickson silt loam, 2 to 5 percent slopes, eroded																	
Dickson	90	4.0	150	Low	4	48	6	Class 2	Moderately well drained	2e	C/D	0 - 7	.43	0	11	68	21
Dlu—Dickson silt loam, 2 to 5 percent slopes																	
Dickson	90	4.0	150	Low	4	48	6	Class 1	Moderately well drained	2e	C/D	0 - 6	.43	—	18	60	21
Dlv—Dickson silt loam, 0 to 2 percent slopes																	
Dickson	90	1.0	196	Very low	4	48	6	Class 1	Moderately well drained	2w	C/D	0 - 7	.43	—	20	59	20
Drd—Dewey cherty silty clay loam severely eroded rolling phase																	
Dewey	85	8.0	150	Medium	5	38	7	None - deposition	Well drained	4e	B	0 - 14	.28	33	18	47	33

Conservation Planning–Limestone County, Alabama																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface						
												Depths in.	Kf Factor	Frag-ments RV	Sand RV	Silt RV	Clay RV
Drn—Dewey cherty silty clay loam eroded rolling phase																	
Dewey	85	8.0	150	Medium	5	38	7	None - deposition	Well drained	4e	B	0 - 14	.28	33	18	47	33
Dst—Dewey silt loam slightly eroded undulating phase																	
Dewey	90	4.0	249	Low	5	48	6	Class 1	Well drained	2e	B	0 - 5	.32	9	26	52	22
Dwe—Dewey silty clay loam eroded undulating phase																	
Dewey	90	4.0	249	Low	5	38	7	Class 1	Well drained	2e	B	0 - 5	.24	9	7	54	38
Er—Ennis cherty silt loam																	
Ennis	85	1.0	124	Very low	5	48	6	None - deposition	Well drained	2w	A	0 - 9	.32	29	27	54	18
Gcu—Greendale cherty silt loam undulating phase																	
Greendale	85	1.0	124	Very low	5	48	6	None - deposition	Well drained	2w	A	0 - 9	.32	29	27	54	18
Gl—Guthrie silt loam, 0 to 2 percent slopes, occasionally flooded																	
Guthrie	90	1.0	98	Low	4	56	5	None - deposition	Poorly drained	4w	C/D	0 - 7	.43	0	14	68	18
Gsu—Greendale silt loam undulating phase																	
Greendale	85	1.0	124	Very low	5	56	5	None - deposition	Well drained	2w	A	0 - 9	.28	13	27	54	19

Conservation Planning–Limestone County, Alabama																		
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface						
												Depths in.	Kf Factor	Fragments RV	Sand RV	Silt RV	Clay RV
Ln—Lawrence silt loam																	
Lawrence	90	1.0	124	Low	4	56	5	None - deposition	Somewhat poorly drained	3w	C/D	0 - 9	.32	2	13	68	17
Ml—Melvin silt loam																	
Melvin	90	1.0	75	Low	5	48	6	None - deposition	Somewhat poorly drained	4w	B/D	0 - 16	.37	2	11	62	25
Os—Ooltewah silt loam																	
Ooltewah	90	1.0	173	Low	5	56	5	None - deposition	Somewhat poorly drained	4w	B/D	0 - 16	.43	2	12	68	19
Ss—Sango silt loam																	
Sango	90	1.0	150	Low	4	48	6	Class 1	Moderately well drained	2w	C	0 - 7	.43	2	11	68	20

Data Source Information

Soil Survey Area: Lauderdale County, Alabama
Survey Area Data: Version 9, Sep 23, 2016

Soil Survey Area: Lawrence County, Tennessee
Survey Area Data: Version 12, Sep 28, 2015

Soil Survey Area: Limestone County, Alabama
Survey Area Data: Version 8, Sep 23, 2016

Appendix C – Water Quality Data

Organization Name	Station ID	Station Name	Type	Latitude	Longitude
ADEM	21AWIC-343	ANDL-8	River/Stream	34.8515	-87.2361
ADEM	21AWIC-1921	ANDL-9	River/Stream	34.90568	-87.2656

Activity Type						DRAINAGE_ SQ_MI	ECOREGION	LOCATION_ DESC
Macroinv	2013	ANDL-9	6/3/2013	Poor	Anderson Ck	25.3	71F	Anderson Creek @ Lauderdale
Macroinv	2013	ANDL-8	6/3/2013	Fair	Anderson Ck	48.97	71F	Anderson Creek at Snake Road Bridge

Anderson Creek				
Station ID	Visit Date	Turb NTU	TSS mgl	Flow CFS
ANDL-9	10/15/2013	0.79	2	8.3804
ANDL-8	10/15/2013	1.24	1	10.3952
ANDL-9	9/3/2013	1.87	3	11.7912
ANDL-8	9/3/2013	3.33	4	21.8084
ANDL-8	8/15/2013	1.96		22.332
ANDL-8	8/14/2013	4.11		23.869
ANDL-8	8/13/2013	2.74		31.173
ANDL-8	8/12/2013	7.03		35.241
ANDL-9	8/6/2013	1.17	2	12.8327
ANDL-8	8/6/2013	1.89	3	21.421
ANDL-9	7/16/2013	1.36	2	20.9899
ANDL-8	7/16/2013	1.59	2	37.2509
ANDL-9	6/12/2013	2.56	3	43.6995
ANDL-8	6/12/2013	2.38	2	70.541
ANDL-9	6/3/2013	1.81		20.249
ANDL-8	6/3/2013	2.68		39.3993
ANDL-9	5/21/2013	1.6	2	26.7503
ANDL-8	5/21/2013	1.85	4	48.7177
ANDL-9	4/24/2013	4.04	3	55.9488
ANDL-8	4/24/2013	4.33	3	103.0959
ANDL-9	3/13/2013	22.8	11	
ANDL-8	3/13/2013	7.56	4	
ANDL-8	10/26/2009	2.07	2	53.25
ANDL-8	9/8/2009	2.44	2	19.897
ANDL-8	8/12/2009	2.94	1	30.52
ANDL-8	7/15/2009	2.97	1	36.57
ANDL-8	7/1/2009	2.01		11.989
ANDL-8	6/11/2009	2.17	3	29.2

ANDL-8	5/13/2009	2.91	1	73.6
ANDL-8	4/16/2009	2.16	1	75.4
ANDL-8	3/18/2009	5.1	1	43.3
ANDL-8	10/30/2006	2.09	5	30.79
ANDL-8	9/20/2006	2.95	2	18.57
ANDL-8	8/21/2006	2.41	2	7.1
ANDL-8	7/12/2006	2.82	4	11.53
ANDL-8	6/20/2006	3.29	29	7.43
ANDL-8	5/23/2006	2.33	1	27.93
ANDL-8	4/26/2006	11.3	6	84.63
ANDL-8	3/27/2006	3.01	1	57.4
ANDL-8	2/22/2006	2.57	1	69.06
ANDL-8	1/10/2006	1.33	1	23.5
ANDL-8	12/7/2005	1.18	1	32
ANDL-8	11/29/2005	1.86	1	32.6
ANDL-8	10/26/2005	1.73	2	14.3
ANDL-8	9/20/2005	5.23	6	15.5
ANDL-8	8/16/2005	1.5	3	7.5
ANDL-8	7/25/2005	2.14	4	16
ANDL-8	6/21/2005	2.61		27.3
ANDL-8	6/20/2005		1	
ANDL-8	5/10/2005	1.18	4	30
ANDL-8	4/11/2005	7.7	2	
ANDL-8	3/15/2005	4	3	
ANDL-8	10/25/2004	0.6	2	78.8
ANDL-8	9/9/2004	1.5	3	24.3
ANDL-8	7/8/2004	2.03	3	65.1
ANDL-8	6/9/2004	45.9	3	16.9
ANDL-8	5/10/2004	0.6	3	23.4
ANDL-8	4/15/2004	0.9	1	70.8
ANDL-8	3/1/2004	1.3	1	75.2
ANDL-8	2/23/2004	1.9	3	77.1
ANDL-8	7/22/1998	2.3	2	21.4

Appendix D – STEPL Model Input Variables

STEPL Input Sheet: Values in RED are required input. Change worksheets by clicking on tabs at the bottom. You entered 1

This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (initially hidden) contain default

Step 1: Select the state and county where your watersheds are located. Select a nearby weather station. This will automatically specify values for rainfall p

Step 2: (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of months per year that manure is ap
(c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with the selected county in Table 4.

Step 3: You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click the Yes button in row 10 to dis

Step 4: (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the curve number table by landus
(c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the urban area in Table 8.

Step 5: Select BMPs in BMPs sheet. **Step 6**: View the estimates of loads and load reductions in Total Load and Graphs sheets.

☑ **Treat all the subwatersheds as parts of a single watershed** ☐ **Groundwater load**

State	County	Weather Station
Alabama	Lauderdale	AL HUNTSVILLE WSO AP

Rain correction: 0.935

1. Input watershed land use area (ac) and precipitation (in)

Watershed	Urban	Cropland	Pastureland	Forest	User Defined	Feedlots	Feedlot Percent Paved	Total	Annual Rainfall
W1	2155.665	2745.231	18150.016	11421.486	0	2.601	0-24%	34474.999	60

2. Input agricultural animals

Watershed	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck	# of months manure applied
W1	2400	12	85	177	441	30175	5	33	0
Total	2400	12	85	177	441	30175	5	33	

3. Input septic system and illegal direct wastewater discharge data

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Wastewater Direct Discharge, # of People	Direct Discharge Reduction, %
W1	82	2	1.07	0	0

4. Modify the Universal Soil Loss Equation (USLE) parameters

Watershed	Cropland	Pastureland

	R	K	LS	C	P	R	K	LS	C
W1	300.000	0.329	0.379	0.200	0.978	300.000	0.329	0.379	0.040

Optional Data Input:

5. Select average soil hydrologic group (SHG), SHG A = highest infiltration and SHG D = lowest infiltration

Watershed	SHG A	SHG B	SHG C	SHG D	SHG Selected	Soil N conc.%	Soil P conc.%	Soil BOD conc.%
W1	○	○	⊙	○	C	0.080	0.031	0.160

6. Reference runoff curve number (may be modified)

SHG	A	B	C	D
Urban	83	89	92	93
Cropland	67	78	85	89
Pastureland	49	69	79	84
Forest	39	60	73	79
User Defined	50	70	80	85

6a. Detailed urban reference runoff curve number (may be moc

Urban\SHG	A	B	C
Commercial	89	92	94
Industrial	81	88	91
Institutional	81	88	91
Transportation	98	98	98
Multi-Family	77	85	90
Single-Family	57	72	81
Urban-Cultivat	67	78	85
Vacant-Develo	77	85	90
Open Space	49	69	79

7. Nutrient concentration in runoff (mg/l)

Land use	N	P	BOD
1. L-Cropland	**1.9**	**0.3**	**4**
1a. w/ manure	8.1	2	12.3
2. M-Croplan	**2.9**	**0.4**	**6.1**
2a. w/ manure	12.2	3	18.5
3. H-Cropland	**4.4**	**0.5**	**9.2**
3a. w/ manure	18.3	4	24.6
4. Pasturelan	**4**	**0.3**	**13**
5. Forest	**0.2**	**0.1**	**0.5**
6. User Defin	**0**	**0**	**0**

7a. Nutrient concentration in shallow groundwater (mg/l) (may

Landuse	N	P	BOD
Urban	1.5	0.063	0
Cropland	1.44	0.063	0
Pastureland	1.44	0.063	0
Forest	0.11	0.009	0
Feedlot	6	0.07	0
User-Defined	0	0	0

8. Input or modify urban land use distribution

Watershed	Urban Area (ac.)	Commercial %	Industrial %	Institutional %	Transportation %	Multi-Family %	Single-Family %	Urban-Cultivated %	Vacant (developed)
W1	2155.665	15	10	10	10	10	30	5	5

9. Input irrigation area (ac) and irrigation amount (in)

Watershed	Total Cropland (ac)	Cropland: Acres Irrigated	Water Depth (in) per Irrigation - Before BMP	Water Depth (in) per Irrigation - After BMP	Irrigation Frequency (#/Year)
W1	2745.231	0	0	0	0

Input Ends Here.

subwatershed(s).
values users may choose to change.
arameters in Table 1 and USLE parameters in Table 4
plied to croplands in Table 2;
olay optional input tables
e and SHG in Table 6;

calculation

on factors

0.541	
Rain Days	Avg. Rain/Event
103.3	1.004

	Forest	User Defined

P	R	K	LS	C	P	R	K	LS	C	P
1.000	300.000	0.329	0.379	0.003	1.000	300.000	0.329	0.379	0.162	1.000

lified)

D
95
93
93
98
92
86
89
92
84

be modified)

Open Space %	Total % Area
5	100

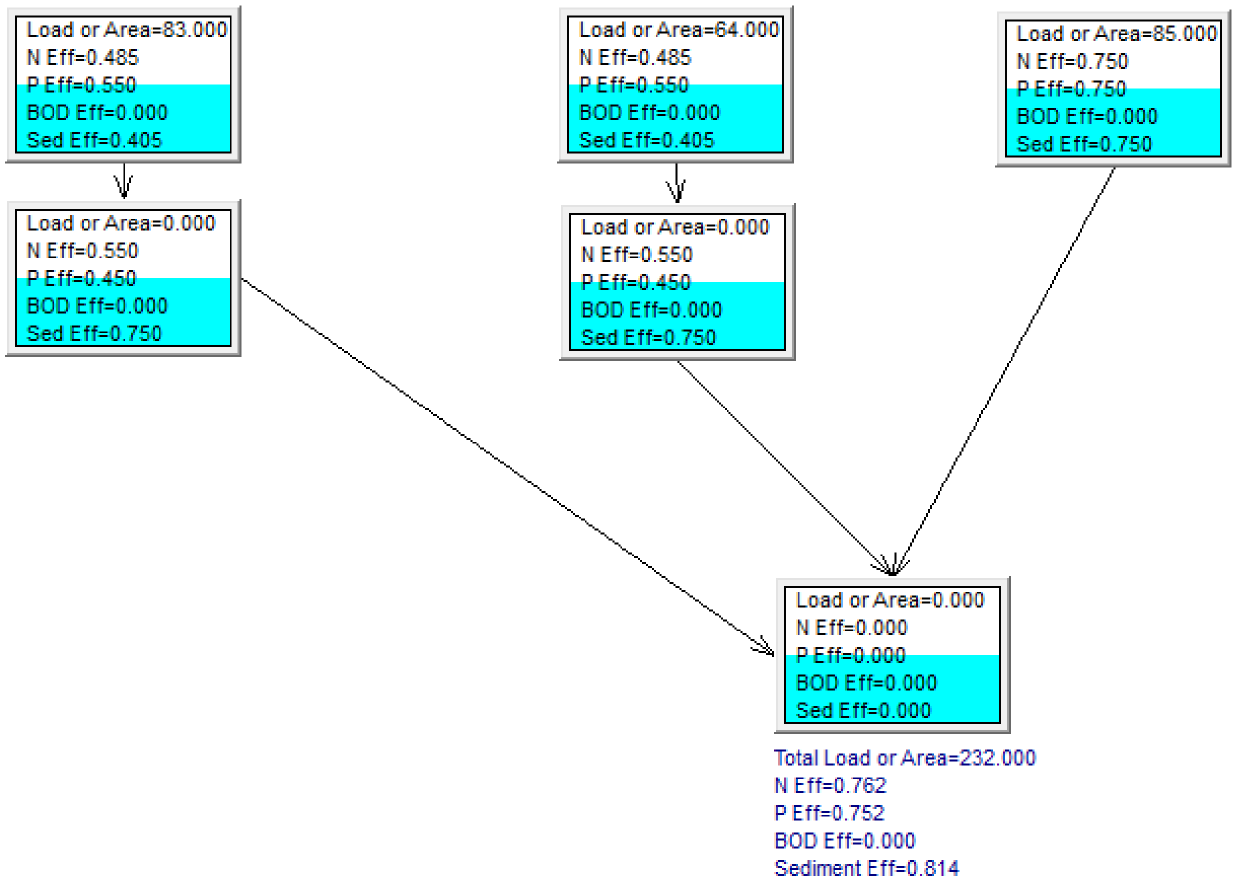


Figure 3 Combined BMP 1

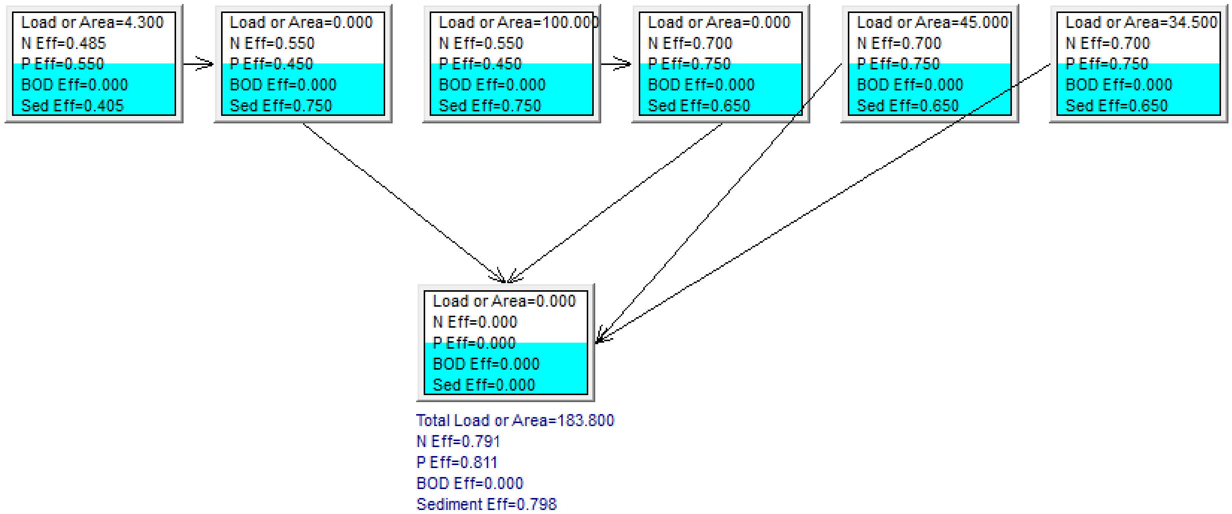


Figure 4 Combined BMP 2

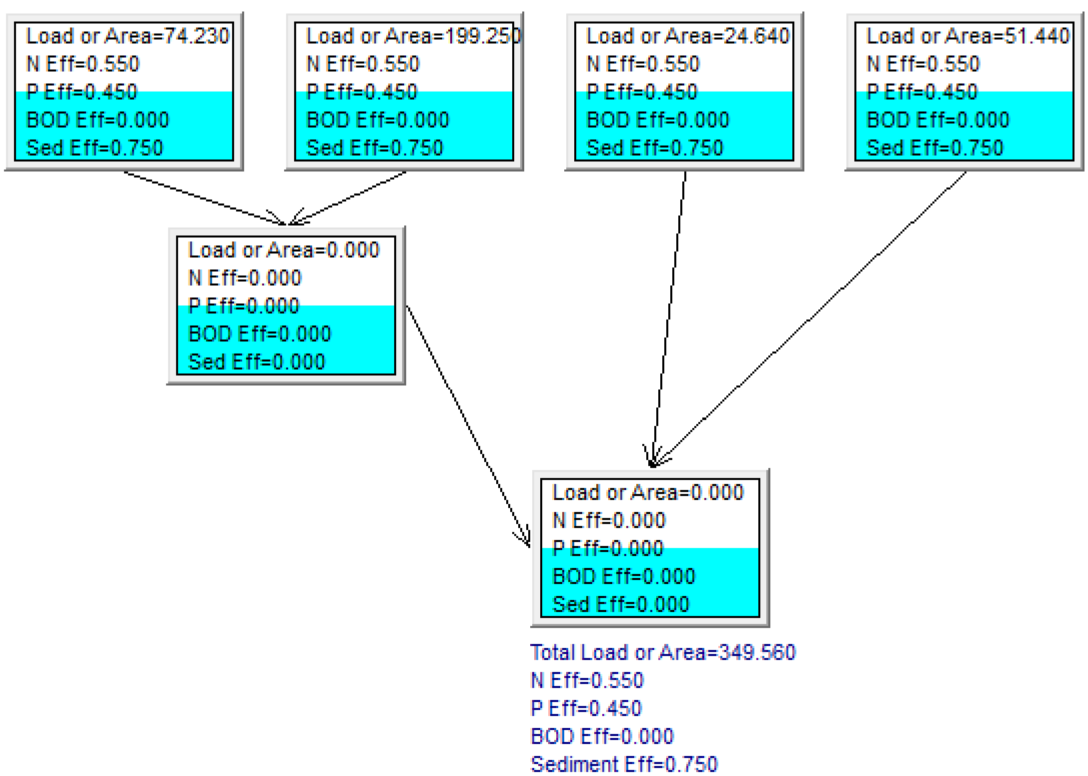


Figure 5 Combined BMP 3

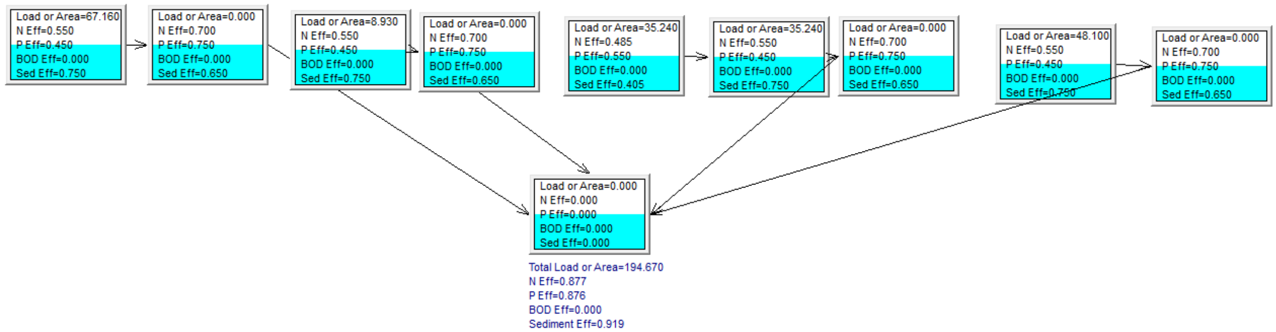


Figure 6 Combined BMP 4

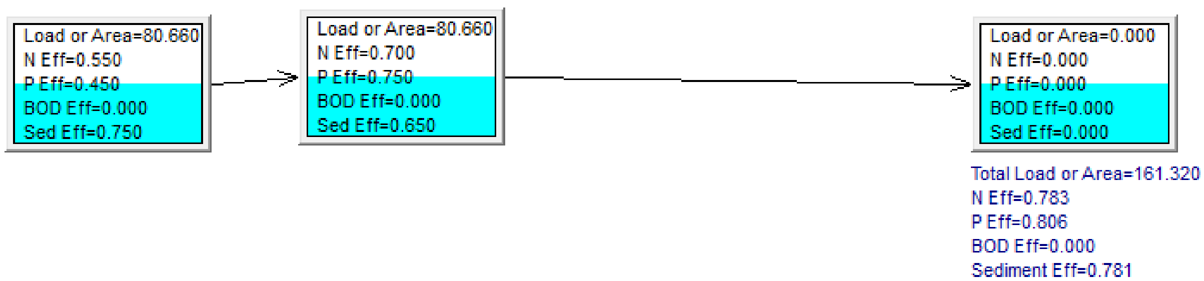


Figure 7 Combined BMP 5

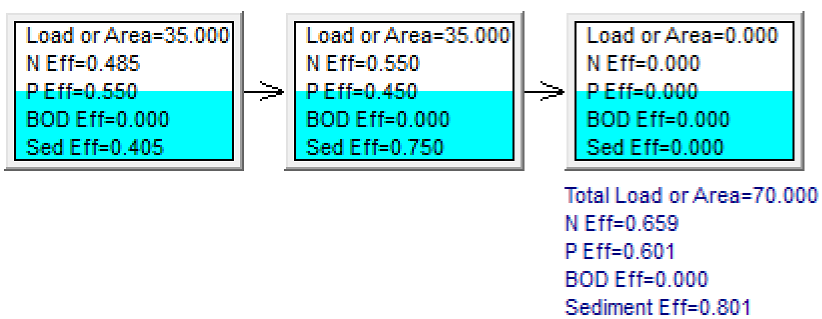


Figure 8 Combined BMP 6

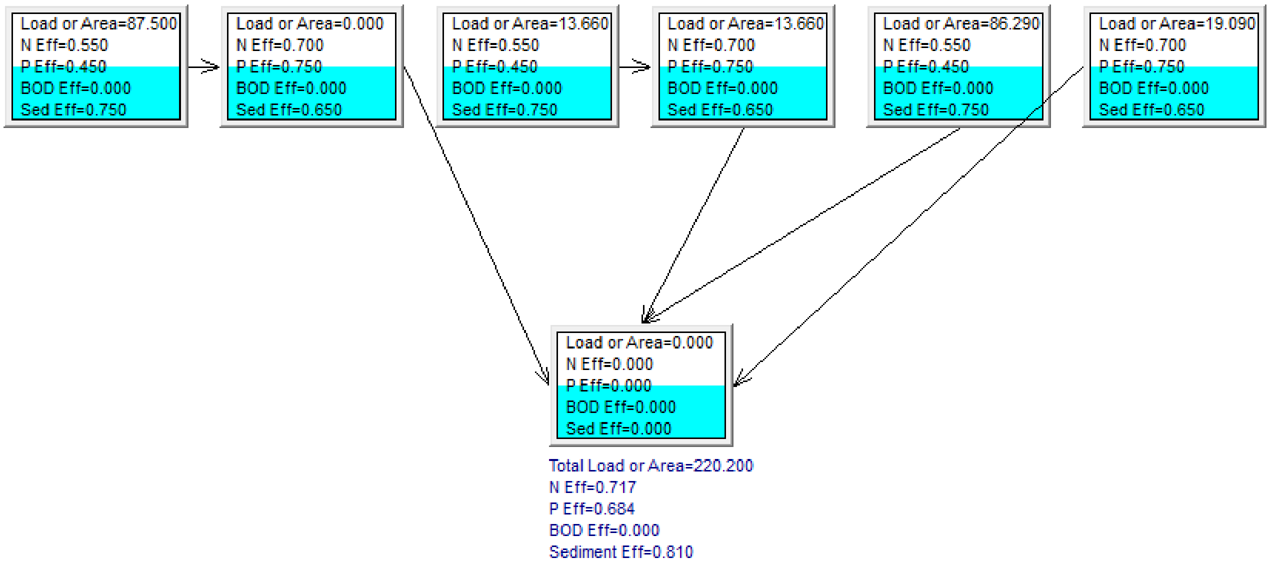


Figure 9 Combined BMP 7

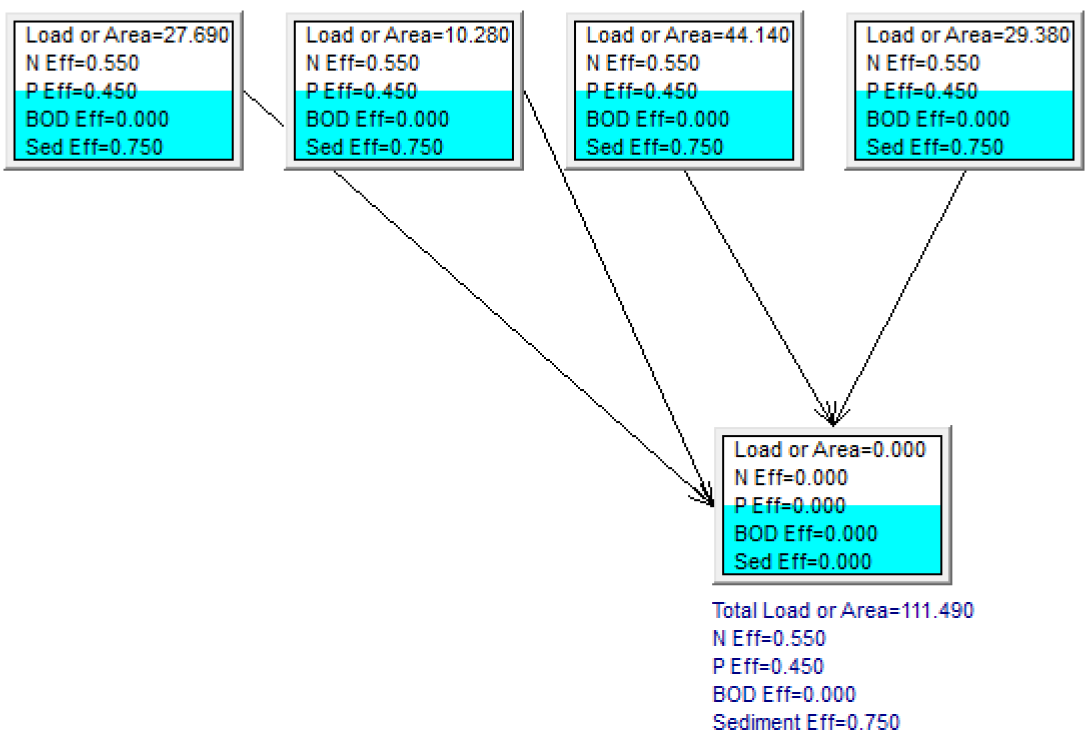


Figure 10 Combined BMP 8

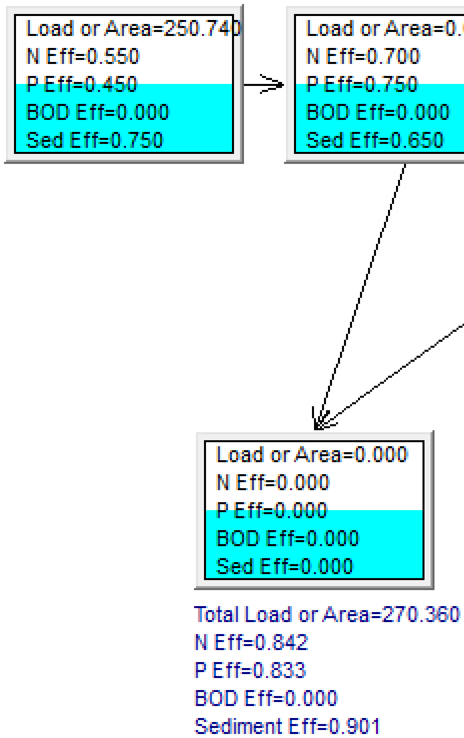


Figure 11 Combined BMP 9

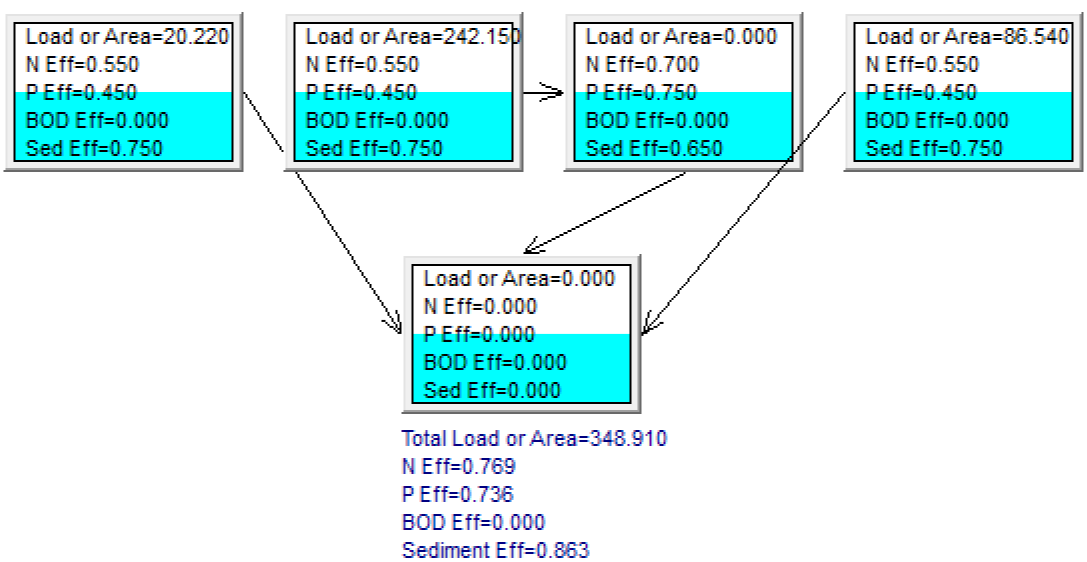


Figure 12 Combined BMP 10

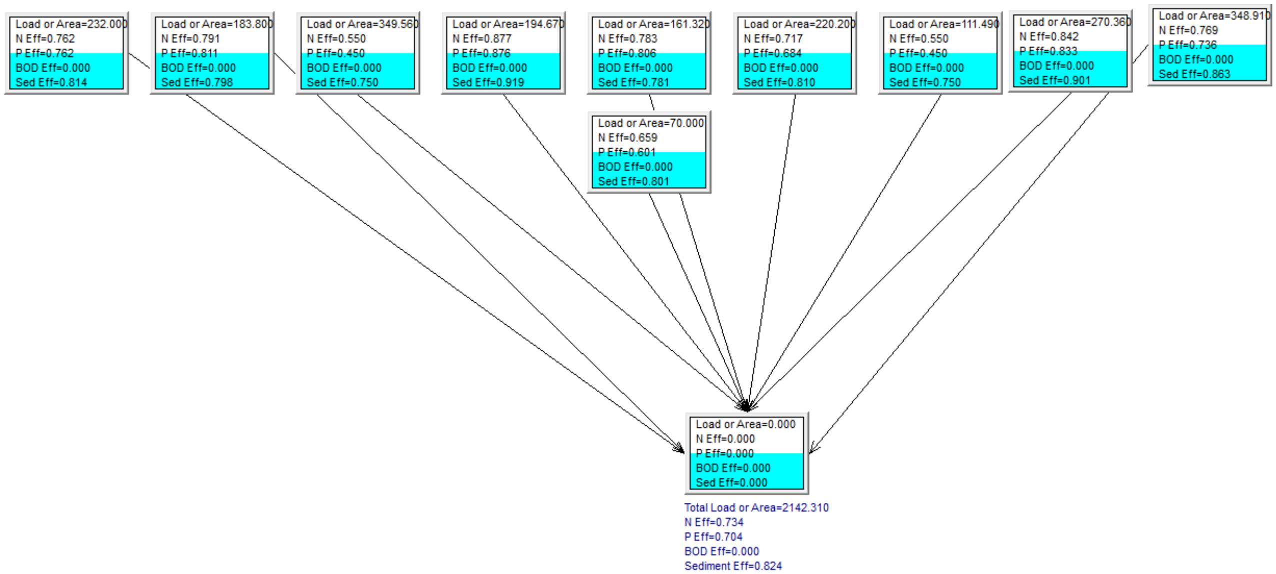


Figure 13 Anderson Creek Combined BMP model

Appendix E. – Meeting Information

Anderson Creek Watershed Plan

Anderson Town Hall
7352 AL 207
Anderson, AL
April 11, 2017
10:00 AM

Agenda-

1. Welcome and Introduction

2. Project Overview

3. Project Review

4. Overview of BMPs

5. Discussion- Managing BMPs: Placement, Load Reductions, Implementation

6. Adjourn

Anderson Creek Watershed Plan

Fish Creel Restaurant
Anderson, AL
7810 AL-207
Anderson, AL
August 2, 2017 10:00 AM

Agenda-

7. Welcome and Introduction

8. Farm to Table Event Planning- Donna Garretson, SWCD

9. Presentation of Draft Watershed Plan for Review

    a. Overview of Project

    b. Draft Review Process

10. Questions?