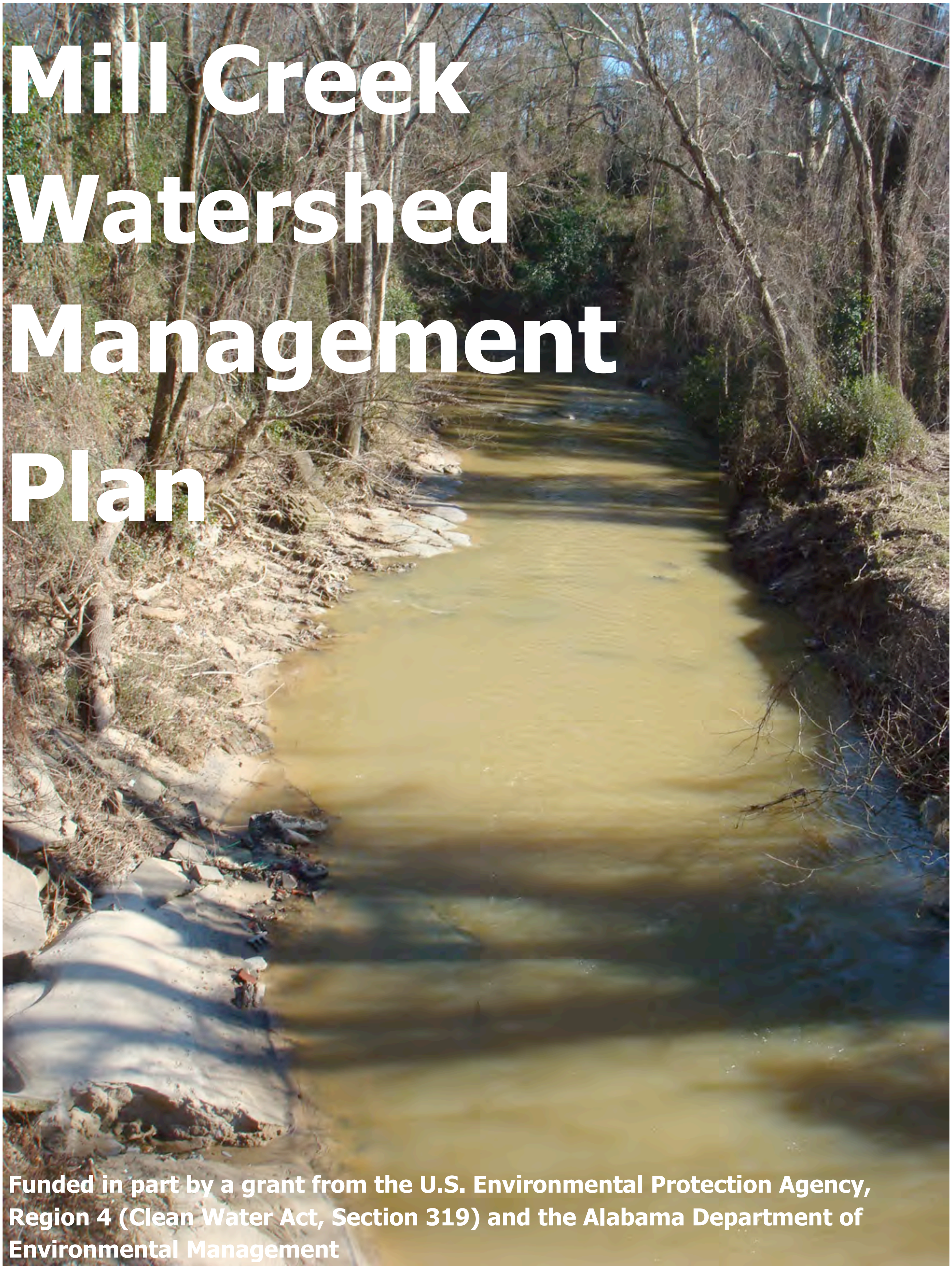


Mill Creek Watershed Management Plan

Funded in part by a grant from the U.S. Environmental Protection Agency, Region 4 (Clean Water Act, Section 319) and the Alabama Department of Environmental Management

Table of Contents

List of Acronyms

ACES – Alabama Cooperative Extension System
ADEM – Alabama Department of Environmental Management
ASWCC – Alabama Soil and Water Conservation Committee
AWW – Alabama Water Watch
BMP – Best Management Practice
BOD – Biochemical Oxygen Demand
BRAC – Base Realignment and Closure
CBOD – Carbonaceous Biochemical Oxygen Demand
CHS – Central High School
CWA – Clean Water Act
CWP – Clean Water Partnership
CSU – Columbus State University
DO – Dissolved Oxygen
EPT – Ephemeroptera, Plecoptera, and Trichoptera
HTH – Help the Hooch
HUC – Hydrologic Unit Code
JTU – Jackson Turbidity Unit
LID – Low Impact Development
MDL – Method Detectable Limit
MS4 – Municipal Separate Storm Sewer System
NBOD – Nitrogenous Biochemical Oxygen Demand
NEMO – Nonpoint Source Education for Municipal Officers
NLCD – National Land and Cover Database
NOAA – National Oceanic and Atmospheric Administration
NPDES – National Pollutant Discharge Elimination System
NPS – Nonpoint Source
NRCS – Natural Resource and Conservation Service
NTU – Nephelometric Turbidity Units
PALS – People Against a Littered State
PCB – Keep Phenix City Beautiful
PCI – Phenix City Intermediate
SOD – Sediment Oxygen Demand
SSHS – Smiths Station High School
SSO – Sanitary Sewer Overflow
SWSA – Smiths Water and Sewer Authority
TDS – Total Dissolved Solids
TMDL – Total Maximum Daily Load
TN – Total Nitrogen
TP – Total Phosphorous
TSS – Total Suspended Solids
USEPA – United States Environmental Protection Agency

List of Figures

List of Tables

1. Mill Creek Watershed Overview

1.1 Executive Summary

Introduction

Figure 1. Mill Creek Stream Crossing at Crawford Rd. in Phenix City, AL.

This watershed management plan is a comprehensive approach designed to address pollution concerns for Mill Creek. This plan aims to suggest best management practices (BMPs) that can be adopted to improve the overall health of the stream. The development of this plan is funded in part by the Alabama Department of Environmental Management (ADEM) through the Clean Water Act (CWA) Section 319(h) funds, which are granted to state and tribal agencies to develop and implement nonpoint source (NPS) watershed plans. Waters listed on the Section 303(d) are prioritized for development of watershed management plans that focus on creating an action plan to restore and protect degraded streams.

Development of this plan was initiated by the inclusion of Mill Creek on Alabama's 303(d) List of Impaired Waters. Mill Creek in its entirety (9.93 miles) is listed on the 2006, 2008, and 2010 (draft) 303(d) lists as impaired. Mill Creek is considered impaired because it is not meeting water quality criteria to support its designated use of fish and wildlife. Prior to the 2010 draft 303(d) List, Mill Creek was listed for unknown causes and sources of impairment. Following sampling completed in 2008, Mill Creek was listed for organic enrichment [Carbonaceous Biochemical Oxygen Demand (CBOD) and Nitrogenous Biochemical Oxygen Demand (NBOD)] with the source of impairment described as urban development. At the onset of the development of this watershed management plan, the Total Maximum Daily Load (TMDL) was scheduled to be written in 2010 to address the low dissolved oxygen (DO) reported during sampling conducted by ADEM in 2008. Recent communication with the ADEM reveals that the current listing for impairment is under review and may change to sedimentation to reflect current conditions of Mill Creek. TMDL development has currently been delayed based on changing conditions of Mill Creek since sampling in 2008.

Mill Creek, a major tributary to the Chattahoochee River – Bull Creek Sub-basin, is located in the Cities of Smiths Station and Phenix City within Lee County and Russell

Counties of Alabama. The Mill Creek Watershed [12-digit Hydrologic Unit Code (HUC) 03130003-0101 (See Appendix A for map)] drains an area of approximately 24.8 square miles. Mill Creek and Holland Creek are the two major streams that compose this watershed. The confluence of Mill and Holland Creek is located in north Phenix City and many members of the community refer to the creek flowing through Phenix City as Holland Creek. Because the mainstem is called both Holland and Mill Creek, it is important to note that Holland Creek above the confluence is not listed as impaired even though it is incorporated in the watershed boundary for Mill Creek.


Figure 2. Forested Buffer on Mill Creek.

The headwaters for Mill Creek are located in Smiths Station, Lee County, Alabama. The City of Smiths Station is a relatively new city, incorporated in 2001. Smiths Station has dramatically increased in population during this time with much suburban development occurring near the Lee and Russell County lines adjacent to Mill Creek and its tributaries. In the last decade, the entire watershed area has undergone a significant increase in urbanization resulting in considerable land use changes which continue to impact Mill Creek. Stream channelization and relocation, floodplain disconnection and filling, increased stormwater runoff and discharges, sediment and silt deposits, and an overall loss of riparian buffer zones have all contributed to the present degraded state of Mill Creek. Riparian buffer loss combined with increased impervious surfaces in the watershed have resulted in decreased water quality and increased stormwater quantity entering Mill Creek. Impairments associated with excessive nutrients and sedimentation in the stream are the focus of concerns for the future of Mill Creek.

Education, outreach, and community involvement for selected on-the-ground BMPs are intended to foster an environmental consciousness among watershed community members. Suggested BMPs are a collaborative effort among partners and will be implemented within Lee and Russell Counties to reduce NPS pollution. Stakeholder inputs and contributions to this plan were provided by the Alabama Cooperative Extension System (ACES), Chattahoochee and Chipola Basins Clean Water Partnership (CWP), City of Smiths Station, City of Phenix City, Lee County, Russell County, Smiths Water and Sewer Authority (SWSA) and many others. Fostering these partnerships initially can improve overall outcomes during implementation projects.

Nonpoint and Point Source Pollution

Nonpoint source (NPS) pollution results from stormwater runoff picking up and depositing pollutants in lakes, rivers, wetlands, groundwater, and coastal waters. NPS pollution impacts cannot be tied back to a single source or point.

NPS pollution occurs as water moves over impervious surfaces and throughout a landscape to carry away pollutants. NPS pollution is contributed to in a variety of ways and most people are ignorant of impacts their actions may have on stream health and the environment.

Point source pollution occurs when the source of pollution can be traced back to a single, identifiable point, such as a factory pipe or wastewater treatment plant. Point source discharges vary based on land use and surrounding business entities. A point source is generally a discharge of hazardous materials resulting from raw materials used in production or by discharge of a by-product. Point source discharges can result from agricultural, industrial, municipal, or construction practices, and are normally regulated through the State's National Pollutant Discharge Elimination System (NPDES). Table 1 summarizes NPS and point source pollution causes.

Table 1. Nonpoint and Point Source Pollution.

Nonpoint Sources	Point Sources
• Excess fertilizers applied to lawns and landscapes • Pathogens from pet or livestock waste • Oils and grease • Pesticides, herbicides, and insecticides • Sediment from stormwater runoff	• Bacteria or microorganisms from Municipal sewage treatment plants • High temperature discharges • Sediment from construction sites • Feedlots and agricultural runoff • Toxic chemicals or wastes from industrial sites

1.2 Goals and Objective

The goal of this plan is to effectively summarize stakeholder inputs and to suggest reasonable implementation practices that are scientifically supported and economically effective to improve the health and habitat of Mill Creek. The objective of this plan is to address impairments to the creek through on-the-ground BMPs and education that focus on impairments associated with sedimentation and nutrient loading (CBOD and NBOD). These impairments result from pollutants entering Mill Creek through stormwater runoff. Potential sources of these pollutants to Mill Creek include urban stormwater runoff, failing septic systems, and sediment from stream erosion or failing construction management practices. Education of underserved watershed communities to promote stream stewardship and to introduce environmental awareness as it relates to stream health is crucial to the future of Mill Creek.

1.3 Watershed Management Plan Process

Stakeholders were identified and contacted by the Mill Creek Steering Committee. Steering Committee members addressed City Councils, County Commissions, and Planning Commissions to generate interest and raise awareness in the Mill Creek Plan. Various environmental groups and other interested parties were encouraged to attend an initial stakeholder meeting to discuss background information regarding Mill Creek. Once stakeholders were identified, stakeholder meetings were conducted in both Smiths Station and Phenix City. Stakeholders were asked to work together to identify impairments to Mill Creek and their concerns for the future of Mill Creek. Stakeholders provided information, opinions, and suggestions for improvements of Mill Creek.

Stakeholder Committees

Stakeholders volunteered to form three committees to concentrate on components needed for the plan. Committees focused on specific goals and made contributions based on stakeholder expertise (Table 2).

Table 2. Stakeholder Committees and Their Contributions to the Development of the Mill Creek Watershed Management Plan.

Committee	Contributions
Technical Committee	Synthesizes and analyzes water quality data to complete data summaries, identifies target areas within the watershed based on water quality data, and suggests reasonable on-the-ground BMPs to address impairments.
Education and Outreach Committee	Collaborates on education components to target various age groups, provides suggestions for successful workshops to educate watershed community members, and organizes meetings with potential partners for BMP coordination.
Resource Committee	Provides historical information and analyzes current and past impairments to Mill Creek.

EPA Nine Key Elements

Development and components of this plan are based on guidelines set forth by the Environmental Protection Agency (EPA) Nine Key Elements. Watershed plans are considered complete when all nine elements are addressed by the watershed plan.

- ☐ 1. Identify the suspected causes and sources of impairment by analyzing existing water quality data, generating watershed maps, identifying point and NPS pollution impairments, and linking these causes and sources to the extent of impairment inflicted on the stream.

- ☐ 2. Estimate pollutant load reductions expected from management strategies (completed in 3) to meet water quality standards. To do so, pollutant load reductions needed should be estimated.

- ☐ 3. Describe BMPs that can reduce current pollutant loads or future pollutant concerns. Critical areas within the watershed should be identified as well as measures to implement watershed-based goals.

- ☐ 4. Estimate financial or technical assistance needed to implement the plan and NPS management measures or BMPs. This should include costs associated with implementation and sources that will be relied on during implementation.

- ☐ 5. Describe outreach and education components to the plan. Public knowledge and understanding should be utilized to encourage participation in activities for implementation. The public may help select, design, and implement NPS management measures.

- ☐ 6. Outline a reasonable schedule to implement NPS management measures.

- ☐ 7. Determine and describe milestones in which progress of implementation can be measured.

- ☐ 8. Determine water quality criteria to assess whether pollutant load reductions are being met by NPS management measures over time. If sufficient reductions are not being met, the plan should be revised or other steps should be taken to meet water quality goals. * When a TMDL is established, the plan should be revised to reflect pollutant load reduction guidelines.

- ☐ 9. Monitoring strategies to evaluate effectiveness of implementation practices at achieving water quality criteria (established in 8) over time should be determined.

*This plan is a living document and shall be revised to reflect current information and data as it is made available.

2. Watershed Conditions

The CWA requires states to identify and address waters not meeting water quality criteria for their designated use; ADEM is charged with listing these waters as impaired on the 303(d) List. A TMDL is established for each pollutant causing an impairment. A TMDL evaluates the amount of pollutant load the stream can handle on a daily basis in an effort to meet water quality criteria for its designated use. Pollutant load requirements include point source, NPS, and the margin of safety associated with the designated use. Mill Creek has been listed on the impaired waters list for Alabama since 2006. Water quality data for Mill Creek is limited, but it is the intent of the Mill Creek Steering Committee to present and summarize these data to effectively offer strategies to improve the health of Mill Creek.

The Mill Creek Watershed is highly urbanized and is continuously growing to accommodate population increases. Housing density is high along Mill Creek with many new subdivisions and ongoing construction activities. Severe bank erosion has been noted throughout the watershed and is likely occurring due to erosive soils, lack of riparian buffers, and altered hydrology. Without the presence of plant roots to hold soil in place, many of these streambanks are eroding. Increased urban development has resulted in stream channel modifications and increased stormwater velocities, which have led to the impairment of Mill Creek and its current unhealthy state.

2.1 Identified Impairments to Mill Creek

Impairments to Mill Creek and their causes and sources have been a frequent topic at stakeholder meetings. Based on several Committee meetings, the following summary table was created to reflect stakeholder opinions.

Table 3. Stakeholder Identified Impairments and Their Causes and/or Sources.

Identified Impairment	Potential sources and/or causes
Nutrient loadings	- Failing septic systems - Municipal stormwater runoff - Fecal matter from pets and wildlife - Sanitary Sewer Overflows (SSOs) - Fertilizer application/yard waste
Low Dissolved Oxygen	- High turbidity associated with construction sites - Sediment entering creek - Beaver ponds and dams - Low flows and high temperatures - Drought conditions - SSOs - Failing septic systems - Municipal stormwater runoff

Sediment and Turbidity	- Construction site runoff - Unstable banks (loss of riparian buffer) - Flashy flows during heavy storms - Severe bank erosion causing aggrading
Habitat Alteration	- Trash and debris in streams resulting from illegal dumping - Low flows - Unstable banks and stream incision - Loss of riparian buffers - Urbanization - Stream crossings (under or oversized culverts)

2.2 Physical Land Features

Figure 3. Kudzu on MIll Creek Streambank.

The Mill Creek Watershed is generally located in the Level IV subecoregion of the Fall Line Hills (65i). The Fall Line Hills are characterized as having dissected open hills that are gently sloping to strongly sloping with sandy to gravelly substrates and moderate gradient streams (Griffith, et al. 2001). Cretaceous age loamy and sandy sediments are prevalent in the area. Potential natural vegetation is described as oak-hickory-pine forest (Griffith, et al. 2001). Stream tours indicate the presence of highly invasive nonnative species such as Chinese privet (*Ligustrum sinense*) and kudzu (*Pueraria lobata*) (Figure 3). Native vegetation was recently noted in parts of Smiths Station and Phenix City where forested buffers exist and have not yet become developed areas (Table 4). Streams with vegetation canopy cover generally have lower water temperatures resulting in higher concentrations of DO.

Table 4. Native Vegetation in Smiths Station and Phenix City.

Scientific Name	Common Name
Acer negundo	Boxelder
Acer rubrum	Red Maple
Aesculus pavia	Buckeye
Alnus serrulata	Hazel Alder
Betula nigra	River Birch
Bignonia capreolata	Cross Vine
Campsis radicans	Trumpetcreeper
Carex sp.	Sedge
Carya ovata	Shagbark Hickory
Cercis canadensis	Red Bud
Cornus florida	Dogwood
Gelsemium sempervirens	Carolina Jessamine
Hexastylis arifolia	Wild Ginger
Hydrangea quercifola	Oakleaf Hydrangea
Ilex opaca	American Holly
Itea virginica	Sweetspire
Juncus spp.	Rush
Liquidambar styraciflua	Sweet Gum
Liriodendron tulipifera	Tulip Poplar
Packera glabella	Butterweed
Parthenocissus quinquefolia	Virginia Creeper
Peltandra virginica	Arrow Arum
Pinus taeda	Loblolly Pine
Populus deltoides	Cottonwood
Prunus serotina	Black Cherry
Quercus alba	White Oak
Quercus laurifolia	Laurel Oak
Quercus lyrata	Overcup Oak
Quercus nigra	Water Oak
Sabal minor	Dwarf Palmetto
Salix nigra	Black Willow
Saururus cernuus	Lizard’s Tail
Toxicodendron radicans	Poison Ivy
Tradescantia virginiana	Virginia Spiderwort
Ulmus rubra	Slippery Elm
Viola seroria	Common Violet
Vitis rotundifolia	Muscadine

2.3 Endangered or Threatened Species

Communication with the Alabama Natural Heritage Program confirmed that endangered or threatened taxa have not been reported specifically in the Mill Creek Watershed (Barbour 2010). However, endangered or threatened species have been reported in other Chattahoochee drainage areas in the vicinity of the Mill Creek Watershed in Lee and Russell Counties (See Appendix C for complete listing).

2.4 Soils Information

Soil types associated with the Mill Creek Watershed vary greatly. In general, the soils in this watershed are characterized as Coastal Plains soils and are well drained, loamy, moderately permeable, and generally have slow runoff. This area is mainly comprised of Uchee loamy sand (36%) and Marvyn loamy sand (20%) (NRCS 1997). However, soils surrounding ADEM sampling station CHA-1 (See Appendix B for map) are classified as a Kinston silt loam, which is a flood plain soil that is poorly drained and frequently flooded (NRCS 2006, 2008). This soil type is considered fairly suitable for wetlands (See Appendix B). Soils in Russell County are, for the most part, comprised of Troup-Springhill-Luverne complex (29%) and Orangeburg-Urban land complex (27%); these soils are also generally well drained, loamy, moderately permeable, and have slow to medium rates of runoff (NRCS 1997, 2000). Increased urbanization that has occurred in the Mill Creek Watershed has likely disturbed upper horizons of these soils or replaced them with fill material better suited for construction purposes in urban areas. Of the land present in both counties, 45.7% is considered potentially highly erodible (NLCD 2000). Severe bank erosion and scouring along Mill Creek and its tributaries has been observed during watershed surveys and stream assessments. BMPs should address and prevent future erosion and sedimentation where possible.

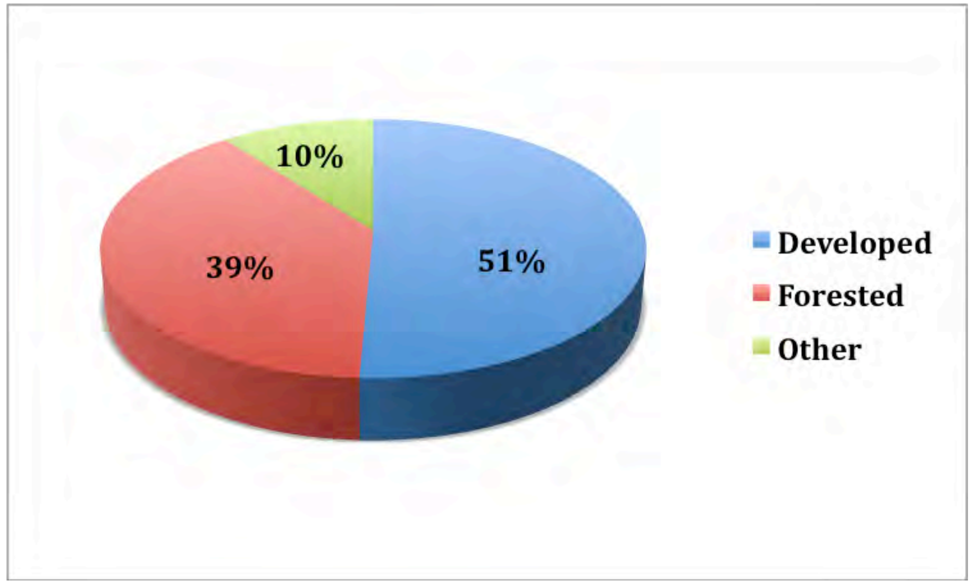
2.5 Land Use

Dominant land uses listed by the National Land and Cover Database [(NLCD) (2000)] for the Mill Creek Watershed include developed land (50.7%) and forested land (38.9%) (Figure 4). It is likely that values for forested land have decreased with increasing development in the watershed following this survey's completion in 2000. The land use map shows that forested area surrounding Mill Creek occurs mostly in the headwaters near Smiths Station. Current construction in the Smiths Station area, including a new sewer line and high school, has disturbed forested areas resulting in decreased forested buffer width adjacent to Mill Creek. Additionally, development has increased stormwater runoff and sediment entering the creek. As development occurs, impervious surfaces increase while green space or open space decreases causing a change in the natural flow of stormwater throughout the landscape. A reduction in green space decreases the chance for infiltration and potential treatment of stormwater before it enters our streams.

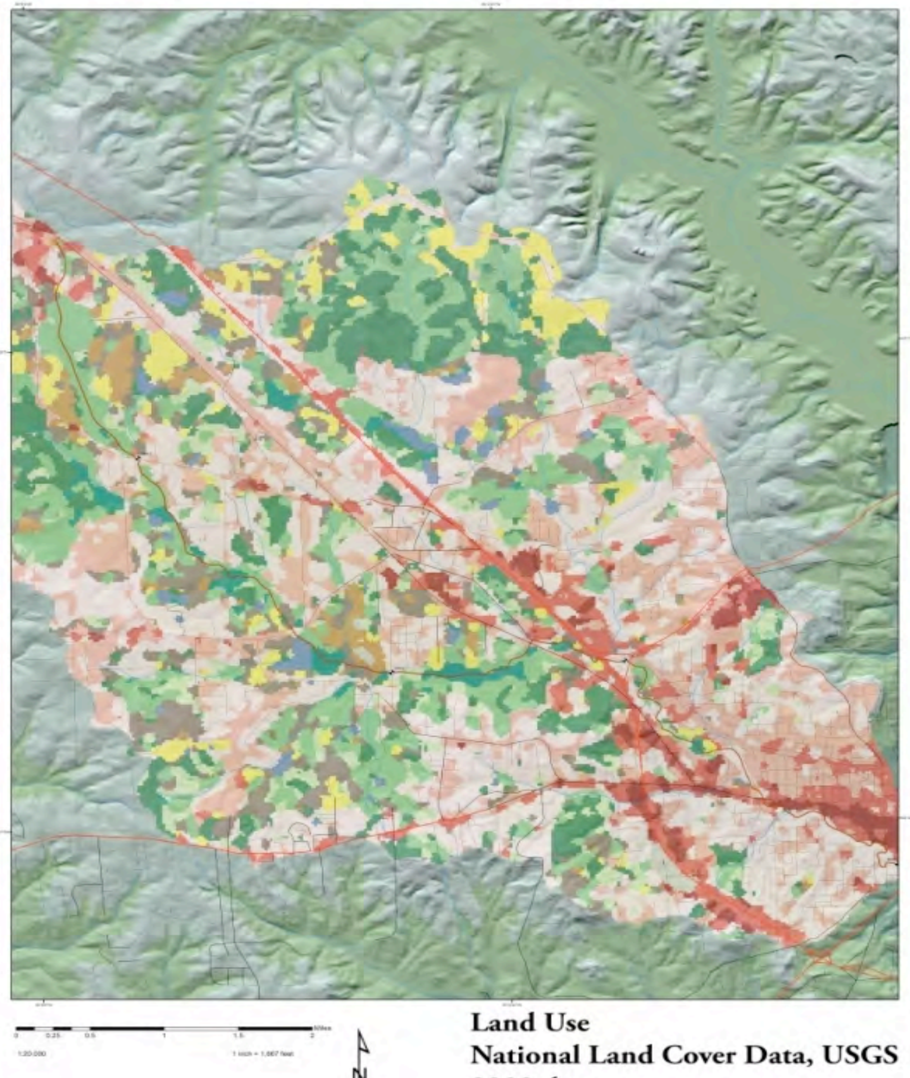
The NLCD (2000) estimates 1,557 acres of this watershed are at least greater than or equal to 50% imperviousness. Of these 1,557 impervious acres in the watershed, 1,224 acres are located in Russell County with 333 located in Lee County. Similarly, approximately 1,472 acres of this watershed are classified as medium to high intensity developed land (Figure 4). It is likely that on-the-ground stormwater BMPs and demonstration projects would have a greater impact in the Phenix City area since the majority of impervious surfaces occur there. However, improving water quality upstream in the headwaters is equally important due to the increasing urbanization of the Smiths Station area. Erosion and sediment control practices are critical and should be implemented throughout the watershed to address and prevent future sediment pollution concerns for Mill Creek.

Figure 4. Land Use Classifications Based on NLCD Data (2000).

Land Use Class	Percent	Acres
Developed Land		
Open Space	24%	3786.3
Low Intensity	17.50%	2775.5
Medium Intensity	6.70%	1070.4
High Intensity	2.50%	401.4
Totals	50.70%	8033.6
Forested Land		
Deciduous	12.60%	1994.4
Evergreen	10%	1586.1
Mixed	6.70%	1067.5
Scrub/Shrub	8.90%	1409.8
Grass/Herb	< 1%	68.5
Totals	38.90%	6126.3
Other Uses		
Pasture Land	5.10%	816.4
Crop Land	2.40%	380.3
Woody Wetland	1.80%	278.7
Open Water	1.10%	177.5
Totals	10.40%	1652.9
Overall Totals	**100%**	**15,860.30**



Mill Creek Watershed



Land Use
National Land Cover Data, USGS 2000 data.

LEGEND

Class_Names	Area
Open Water	177.471
Developed, Open Space	3786.27
Developed, Low Intensity	2775.49
Developed, Medium Intensity	1070.39
Developed, High Intensity	401.423
Barren Land (Rock/Sand/Clay)	47.5925
Deciduous Forest	1994.44
Evergreen Forest	1586.12
Mixed Forest	1067.5
Shrub/Scrub	1409.76
Grassland/Herbaceous	68.4977
Pasture/Hay	816.412
Cultivated Crops	380.295
Woody Wetlands	278.661

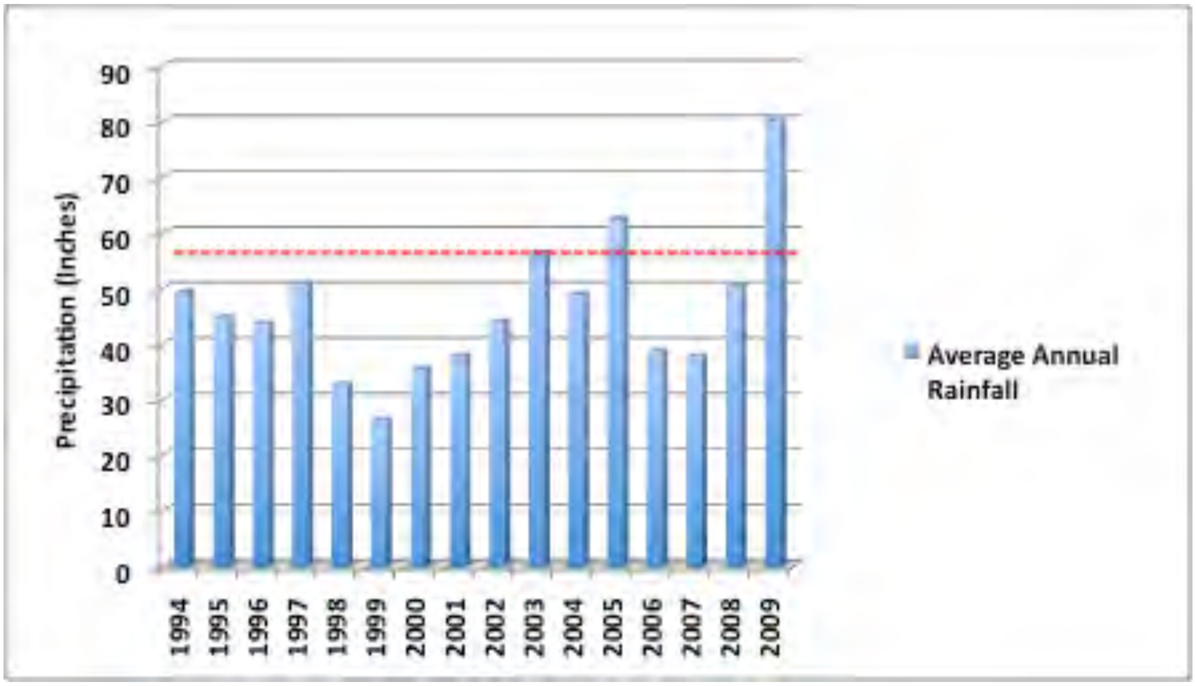
2.6 Climate, Precipitation, and Drought Conditions

Current climate and precipitation data for Smiths Station or Phenix City are not available. Therefore, climate and precipitation data for Columbus, Muscogee County, Georgia was used in development of this plan. Annually, Alabama receives an average of approximately 55 inches of precipitation. Figure 5 shows annual rainfall data for Columbus from 1994 to 2009. The most extensive sampling was conducted in 2008, and during this time Columbus received 50.76 inches of rain. However, due to latent drought effects resulting from decreased rainfall over the previous two years, 2008 was still considered a drought year.

Drought conditions can impact stream flow, plant physiology, and populations of insects and animals. When water is limited, plants cease growing and in order to conserve water, plants begin to wilt. Desiccated plants tend to drop their leaves, which can impact streams since canopy cover is decreased causing water temperatures to rise. Not only this, but excess organic matter from dropped leaves instream will cause a decrease in oxygen concentrations as decomposition occurs. Water temperature continues to rise when flows are low since a reduced volume of water heats rapidly. Decreased flow, dissolved oxygen, and increased temperature depletes habitat and without adequate habitat, ecosystems begin to decline. This can result in eventual local extinctions and an overall decline of species richness (Boulton and Lake 2008).

Data for 2008 from the National Oceanic and Atmospheric Administration [(NOAA) (2010)] suggest that on average, January is the coldest month of the year with a minimum temperature of 19º Fahrenheit. July is on average the hottest month of the year with a maximum temperature of 99º Fahrenheit. Figure 5 shows annual rainfall for years prior to and years following sampling of Mill Creek. Archives of Drought Monitor (NDMC, et al. 2010) indicate that by December 1999, the watershed was in the first stages of a drought, which corresponds to below average precipitation during and prior to 1999 (Figure 5). Other drought years include 2000 (severe to exceptional drought) and 2007 (exceptional drought) (NDMC, et al. 2010). On average, March and July are the wettest months of the year and the driest months of the year are October and November for Alabama (NOAA 2010). However, 2008 was a departure from normal trends and August was the wettest month with 8.26 inches of rainfall.

Figure 5. Average Annual Rainfall from 1994 to 2009 for Columbus, GA (NOAA 2010). The Dashed Line Represents Alabama's Average Annual Rainfall at 55 inches to Reflect Departures from Normal Trends.



2.7 Demographics

Phenix City and Smiths Station populations continue to increase. These areas are attractive to commuters due to their proximity to the Columbus, GA area. Phenix City and Smiths Station share a decreased cost of living compared to Columbus. Additionally, adjacent major roads such as US Hwy 280 and US Hwy 80 make travel to larger cities more desirable. According to US Census quick facts for 2006, the City of Phenix City was estimated to have a total of 30,067 inhabitants, a 5.8% increase from the 28,265 inhabitants reported in 2000. There are an average of 1,149 persons/mi^2 with 52.9% White, 45% Black or African American, 0.2% Native American or Native Alaskan, and 0.5% Asian. The City of Smiths Station, reported having a population of 3,456 in 1990. Ten years later in 2000, the US Census Bureau reported 21,756 inhabitants in Smiths Station (630% increase). In 2000, US Census Bureau reported that in Smiths Station there were 84.8% White, 12.7% Black, and 0.4% American Indian or Native Alaskan. This dramatic increase in population size over a 10-year period indicates rapid colonization taking place in the Smiths Station area.

There is not recent population data available for Smiths Station, but increasing development occurring in the area would point to a continuation of the rising population trend from 1990 to 2000. Upon completion of the 2010 US Census, current information will be added to this plan. The Army's Base Realignment and Closure (BRAC) program at Fort Benning is expected to bring approximately 10,000 new jobs to the area resulting in a population increase of approximately 30,000 people to the Columbus, Phenix City, and Smiths Station areas. Construction of a new high school in Smiths Station is underway to accommodate the influx of new families to the area. Plans have been approved for construction of a new elementary school, but due to recent economical restraints, strategies to move forward with the new elementary school have been stalled. Increasing housing and scholastic demands in the watershed have led to increased impervious surfaces and stormwater runoff adding to the impairment of Mill Creek.

2.8 Stormwater Discharges for MS4s and NPDES Permits

Stormwater discharges occur when rainwater does not percolate through the soil but instead flows over land or impervious surfaces such as paved streets, parking lots, building rooftops, and eventually into storm drains which then empty into streams. These discharges often contain pollutants in quantities that have the potential to adversely affect water quality. Most stormwater discharges are considered point sources and require coverage by a NPDES permit (EPA 2010). USEPA Envirofacts for Water Discharge Permits lists five NPDES Permits for stormwater outfalls located in the Mill Creek Watershed (See Appendix D). Four of the five permits are located in Russell County.

2.9 Illegal Dumping and SSOs


Figure 6. Illegal Dumping Near Mill Creek.

Mill Creek stakeholders identified illegal dumping and SSOs as sources of concern for pollution of Mill Creek. Illegal dumping in riparian buffers is common along streams. Many items such as tires, rugs, gas/oil cans, cots, paint cans, scrap metal, and others have been observed on Mill Creek streambanks during watershed assessments (Figure 6). These items negatively impact animal habitats and can potentially contaminate waters decreasing water quality. In addition to dumping along Mill Creek, stakeholders felt that SSOs in the watershed were a major source of impairment near the mouth of the stream. SSOs resulting from old infrastructure have long been a concern for the Phenix City area. In 2008, SSOs occurred and although they were repaired, correction of these problems took longer than expected. During the development of this plan, at least one SSO occurred on Mill Creek. The SSO was reported by Mill Creek stakeholders and corrected.

3. Water Quality Assessment Parameters

Water quality is assessed through biological, chemical, and bacteriological data collection.

Table 5. Water Quality Monitoring Assessments.

Water Quality Monitoring Type	Parameter Assessed
Biological	• Aquatic invertebrates (benthic and fish) • Habitat
Chemical	• Temperature (air and water) • Alkalinity • pH • Hardness • Turbidity • Total dissolved solids (TDS) and total suspended solids (TSS) • CBOD • Conductivity
Bacteriological	• Fecal coliform • *E. coli*

3.1 Biological Sampling

Sampling aquatic invertebrates can be helpful in analyzing water quality. Presence of certain organisms living in the stream can reflect health conditions of the stream. A healthy stream is inhabited by a diverse array of organisms featuring increased taxa richness and pollution intolerant organisms. Ephemeroptera, Plecoptera, and Trichoptera (EPT) are insect orders that are generally considered intolerant of pollution. Taxa richness is scored based on the presence of organisms from these insect orders. EPTs are sampled for during benthic macrovertebrate sampling, which is the most common biological sampling conducted. Fish are mobile creatures and many will leave polluted streams when conditions are poor. Benthic macroinvertebrates (benthos) are usually better indicators than fish because they are less mobile, are easily collected, and live instream during stages of their lifecycles. Benthos vary in pollution tolerance, so in an unhealthy stream, pollution tolerant benthos can be found to indicate pollution stress of the creek while pollution sensitive species will be missing. Habitat assessments are completed based on instream conditions, channel morphology, streambank structure, and riparian vegetation.

3.2 Chemical Sampling

Chemical sampling of our water resources measures a wide variety of parameters to assess water quality. Chemical makeup of water can affect the way water looks, smells, or tastes. Parameters assessed by ADEM Field Operations and Alabama Water Watch (AWW) include: temperature, pH, hardness, alkalinity, turbidity, and dissolved oxygen. ADEM also samples for total suspended solids (TSS), total dissolved solids (TDS), conductivity, metals, and nutrients. Nutrients monitored include total phosphorous (TP) and total nitrogen (TN).

Temperature is measured for the atmosphere as well as for the water during monitoring. High water temperatures can indicate thermal pollution caused by lack of streamside vegetation, industrial discharges, or stormwater runoff rushing off hot surfaces. High temperatures instream are harmful to aquatic life and may lower DO concentrations decreasing water quality. DO is a function of temperature and as temperature increases, DO decreases. Cooler months usually have higher concentrations of DO since oxygen is more soluble in water at colder temperatures (AWW 2006). DO should be 5 mg/L or higher for Fish and Wildlife use.

Surrounding substrates or soils of streams can affect **pH** levels of streams. pH is measured to determine the acidity (pH of 1 – 6), neutrality (pH of 7), or alkalinity (ph of 8 – 14) of water. Severe changes in pH can indicate the introduction of illicit discharges, sediment, wastewater, or raw sewage into streams. EPA states that a pH range of 6.5 – 8 will support the most diverse instream ecosystem (AWW 2006). When pH is above or below this range, reproduction and other physiological processes may be reduced or negatively impacted. Decreased pH can cause toxicity due to elements such as aluminum becoming more available for uptake by plants and animals.

Hardness is a measurement used to determine the amount of calcium and magnesium present in the stream. **Alkalinity** determines whether the stream can adequately buffer changes in pH. Streams with low alkalinity are unable to buffer changes in pH and thus, pH changes drastically. Hardness should be equal to or slightly higher than alkalinity. Alkalinity values much higher than hardness are a good indication of chloride or sulfate presence and may indicate pollution.

Turbidity, TSS, and TDS are measured to indicate spikes in natural conditions that may indicate excessive stormwater runoff or the occurrence of erosion. When particles are suspended in water, turbidity increases. **Turbidity** decreases water clarity and blocks sunlight from entering water. Suspended particles absorb heat and increase water temperatures. The amount of solid particles in water can affect cell density of organisms. Water always moves from higher concentration to lower concentration through the process of osmosis. When water has low levels of **TDS**, organisms will have higher levels of solid compounds and water will enter cells of organisms causing them to swell. High levels of TDS in water will cause organisms to shrink as water moves out of their cells and into surrounding water to reach equilibrium.

4. Water Quality Data for Mill Creek

The Mill Creek Technical Committee has reviewed and analyzed water quality data collected for Mill Creek. Data are limited; see Table 6 for summary of sampling conducted for Mill Creek.

Table 6. Summary Table for Sampling Conducted in Mill Creek.

Sampling Parameter	Responsible Party	Year
Water chemistry and physical	ADEM – Clean Water Strategy Project	1996
Macroinvertebrate and physical	ADEM – Middle Chattahoochee Water Quality Study	1999
Water chemistry, physical, bacteriological, and macroinvertebrate	ADEM – Five Year Rotational River Basin Assessment	2008

4.1 Past Data

Clean Water Strategy Project

Mill Creek was sampled in 1996 by ADEM for the Clean Water Strategy Project. This project served to evaluate surface waters and to identify problem areas in order to guide future monitoring efforts. Sampling locations for this study were chosen based on areas of concern and where data were lacking. There were three monitoring stations on Mill Creek: CHA-1, CHA-2, and CHA-3 (CHA-3 is synonymous with MICR-1; see Appendix A for map). This study evaluated water quality based on chemical and physical properties. Table 7 shows that DO did not exceed water quality standards for Fish and Wildlife use; during sampling, DO ranged between 5.5 and 8.5 for all sampling stations. Precipitation data for the two years prior [1994 (49.29 in) and 1995 (44.82 in)] and the year of sampling [1996 (43.72 in)] was below the annual average and it is possible that Mill Creek was experiencing minor drought conditions. However, these conditions were not reflected by low DO concentrations and it can be concluded that the Mill Creek Watershed was in a healthier state and capable of maintaining DO concentrations under decreased precipitation conditions. Results from this study indicated elevated turbidity for two out of five samples at CHA-3 (54 and 81 NTU). All other sampling parameter standards were met and Mill Creek was not listed as impaired at this time.

Middle Chattahoochee Water Quality Study

Mill Creek was sampled in 1999 by the Aquatic Assessment Unit of the Field Operations Division at ADEM as part of the Middle Chattahoochee Water Quality Study. During this study, there was only one monitoring station (MICR -1) and it was located on Mill Creek at the Broad St. Bridge in Phenix City (See Appendix A for map). Following sampling conducted in 1996, this sampling location was chosen due to high turbidity noted at MICR-1. MICR-1 is described as a riffle-run stream composed of sand, gravel, and cobble substrates (ADEM 2002). Data collected were fish, benthic macroinvertebrate, and habitat assessments. Results from this study indicated that habitat was rated as excellent for this stream and region. However, only three EPT families were collected, which reflected poor benthic macroinvertebrate populations present. NPS impairment potential for sediment was estimated as moderate (9.1 tons/acre/year) and impairment due to urban runoff and development was estimated as high (ADEM 2002). In summary, biological conditions were rated poor and chief NPS concerns were urban runoff and development. Although Mill Creek was not listed as impaired or recommended for NPS priority at this time, these data were used to list Mill Creek on the 2006 303(d) List.

Below average annual precipitation for years prior to sampling and the sampling year [1997 (50.9 in), 1998 (32.8 in), and 1999 (26.4 in)] would result in reduced EPT populations as a product of decreased flow rate combined with elevated water temperatures due to a decreased volume of water in stream channels. Additional sampling was needed to identify the sources and causes of impairment.

4.2 Summary of Current Data

Alabama Soil and Water Conservation Committee

In 2007, Alabama Soil and Water Conservation Committee (ASWCC) reported the following NPS impact ratings for the Chattahoochee River - Bull Creek Sub-basin (HUC 0313000301) within Russell County, Alabama. Mill Creek and Holland Creek were listed as high for sediment and urban runoff, moderate for domestic waste, and low for animal waste and pesticides, which is consistent with previous results from ADEM. Additional watershed assessment data from ASWCC states that in both Lee and Russell Counties resource concerns for erosion and soil conditions are excessive sediments from roads or road banks and excessive sediments resulting from urban development (ASWCC 2007). Erosion and soil conditions of concern for Lee and Russell County are gully erosion on agricultural land, road and road bank erosion, and poor soil condition (ASWCC 2007). Water quality and quantity resource concerns for Russell County, Alabama are flooding in watershed, nutrients, bacteria, pesticides, and low DO in surface waters (ASWCC 2007). Wildlife population is also less than its potential in Russell County. Other resource concerns for Russell County are that recycling is not aggressively conducted and there is unauthorized dumping into streams and turnouts (ASWCC 2007).

ADEM Field Operations Assessment

Prior to sampling in 2008, Mill Creek had not been sampled since 1999, and many land use changes occurred in the watershed during this nine-year gap. Population increases due to BRAC in both Phenix City and Smiths Station (See 2.7 Demographics) resulted in land use changes which have negatively impacted Mill Creek. Land use modifications can result in lost riparian buffers, stream channelization, and a loss of floodplain connection, all of which can be harmful to insect and fish populations inhabiting the stream. As urban development increases, stream ecosystems are disrupted with an influx of stormwater runoff carrying sediment and nutrients from developed surfaces into streams.

Following the listing of Mill Creek's impairment in 2006, Mill Creek was monitored in 2008. Water chemistry, biological, and bacteriological monitoring were conducted by ADEM in 2008 as part of the Five Year Rotational River Basin Assessment. Sampling was conducted at four sampling stations located on Mill Creek in both Lee and Russell Counties. Sampling stations were MICR-2, CHA-1, CHA-2, and MICR-1 (See Appendix A for map). Monitoring was conducted monthly at these locations from April to November 2008.

ADEM's instream water quality standards state that DO concentrations of less than 5.0 mg/L for Fish and Wildlife classification do not meet water quality standards. DO may fluctuate between 4.0 and 5.0 mg/L due to natural occurrences, but should otherwise be at least 5.0 mg/L (McIndoe 1991). In general, low DO was found at MICR-2 (2 of 8 samples exceeded criteria) and CHA-1 (5 of 8 samples exceeded criteria) (Table 7). Dissolved oxygen impairment at both sites corresponds to low flows and increased temperatures for summer sampling dates. DO concentrations ranging between 2.0 and 5.0 mg/L can be detrimental to most aquatic organisms and few can survive under these conditions. When DO concentrations are less than 2.0 mg/L, aquatic life cannot be supported (AWW 2006).

Technical Committee members speculate that low DO values for CHA-1 may be due to a combination of drought (Figure 5), surrounding soil type, and beaver dams. CHA-1 is located on a floodplain soil that is poorly drained and frequently flooded (NRCS 2006). Floodplain soils generally have lower oxygen concentrations due to soil pores being filled with water rather than air. Particle size, wetland suitability (See Appendix B), and wetland vegetation present strongly indicate past and present wetland conditions in this area.

ADEM's instream water quality standards for Fish and Wildlife state that fecal coliform should not exceed a geometric mean of 1,000 colonies/100 mL or a maximum of 2,000 colonies/100 mL in any sample (McIndoe 1991). However, during the months of June through September incidental water contact and recreation may take place and fecal coliform should not exceed a geometric mean of 200 colonies/ 100 mL. Fecal coliform samples for all sites on Mill Creek exceeded holding times. Counts for fecal coliform were high for MICR-1 and communication with Phenix City Utilities indicated that during this time a sewer main was in the process of being repaired and is currently secure.

Habitat assessment and biometrics assessment were completed for all sampling locations except CHA-1. Habitat assessments for MICR-2, CHA-2, and MICR-1 were marginal, marginal, and sub-optimal, respectively. Prior habitat assessment completed in 1999 at MICR-1 compared to the 2008 assessment indicates a decrease in habitat quality over those nine years. Macroinvertebrate assessments in 2008 for MICR-2, CHA-2, and MICR-1 indicated that populations ranked as very poor, poor, and poor, respectively. Communication among stakeholders identified a concern regarding a rapid increase in peak flow following a heavy rain. Diminished insect and fish populations are to be expected in areas with severe water table fluctuation caused by rapid influxes of stormwater during heavy rains.

Dissolved Oxygen Over Time

Dissolved oxygen data for 2008 (ADEM) and 2010 (AWW) indicate that CHA-1 DO concentrations during late summer months have been too low to support life instream. Precipitation was low during 2008 (50.8 in) and for the two years prior [2007 (37.8 in) and 2006 (38.8 in)], which would seem to indicate the likelihood of low flows and high summer temperatures resulting in low DO. By the same logic, DO in 2010 for CHA-1 should have increased following an exceptionally wet year in 2009 (80 in).

Table 7. Dissolved Oxygen Sampled from June 1996 to October 2010.

Sampling Month and Year	MICR-2	CHA-1	CHA-2	MICR-1
Jun-96	-	6.9	7.1	7
Jul-96	-	6	7.1	7.1
Aug-96	-	5.9	7.6	6.6
Sep-96	-	5.85	7.95	8.5
Oct-96	-	6.55	8.1	8.25
Apr-08	8.29	6.98	9.22	9.48
May-08	7.95	6.28	9	9.1
Jun-08	5.64	2.6	7.12	8.04
Jul-08	4.56	1.45	7.07	7.82
Aug-08	3.54	0.22	5.8	6.99
Sep-08	6.21	3.81	7.85	8.09
Oct-08	5.55	3.13	6.35	7.42
Nov-08	7.86	6.64	9.74	10.49
May-10	6.3	7	-	-
Jun-10	5.3	2.9	-	-
Jul-10	5.2	4.4	-	-
Aug-10	3.8	1.8	-	-
Sep-10	3.2	1.1	-	-
Oct-10	4.9	2.7	-	-

4.3 Sediment, Nutrients, and Dissolved Oxygen

Sediment and nutrients are the primary NPS pollution threats to Mill Creek. Sediment and nutrients typically pollute as a group since some nutrients such as phosphorous are bound to sediments. Sedimentation is a major concern for Mill Creek due to land disturbances that have occurred with increased urbanization and construction practices. In these situations, BMPs to prevent erosion have either not been installed entirely, have been installed incorrectly (Figure 7), or have been installed and have not been maintained.

Turbidity is the measurement of water clarity. When solids or sediments are suspended, the water becomes cloudy.

Severe bank erosion and lack of erosion and sediment control practices in the headwaters of Mill Creek have resulted in sediment plumes downstream at many stream crossings in the Phenix City area (Figure 10). As sediment enters a stream, it builds up until the velocity of the stream flow is such that the sediment can be pushed downstream. While the sediment may be out of sight, it has only moved downstream to become someone else's problem.

Figure 7. Incorrectly Installed Silt Fence Near Mill Creek.

The high clay turbidity found in Mill Creek is a good indicator of soil erosion and potential sedimentation problems. High turbidity associated with sedimentation can hinder sunlight penetration into water disrupting photosynthesis of aquatic plants. Fluctuations in turbidity can be detrimental to aquatic life as instream DO is limited and ecosystems are disturbed (AWW 2006). When sediment is suspended, visibility is limited and organisms cannot see their food. Sediment can also damage habitats by filling in natural pools and other areas aquatic organisms may use for spawning.

Organic Enrichment

Mill Creek is currently on the 303(d) List for organic enrichment impairment. The source of the organic enrichment for Mill Creek is urban development. Organic enrichment occurs as excessive nutrients enter streams by way of sediment and stormwater runoff. Nutrient introduction to streams results in an overstimulation of algal growth and an increase in oxygen demand. Even though the process of photosynthesis produces oxygen, as the algae decompose, oxygen is depleted. DO levels can also fluctuate between day and night since plants undergo respiration during the night and use oxygen during this process. All of these processes rapidly consume DO, which cannot be replenished at the rate it is used up in order for the stream to support itself and this creates a DO deficit. Low DO is stressful and lethal for fish and aquatic insects, which in turn provides decomposers with additional material for decomposition. When DO is low for extended periods of time, the biodiversity of fish and insect populations decrease leaving only those organisms that can withstand low concentrations of DO.

Sedimentation can also lead to organic enrichment and low DO problems in Mill Creek. Phosphorous carried by urban stormwater runoff and from leaking septic systems binds to sediments, which are transported downstream. Also, the sediment oxygen demand (SOD) may be increased as high volumes of sediment enter the water column. As this sediment settles on the creek bottom, sediment and other organic matter oxidizes, thereby using up oxygen present in water. Additionally, air is trapped beneath the cloud of suspended sediment and cannot be transferred to and from the atmosphere.

There are no instream water quality standards for organic enrichment. CBOD and NBOD comprise the total Biochemical Oxygen Demand (BOD) for a stream. BOD is the demand that biological processes have on oxygen in the stream. Stormwater runoff entering the stream carries nutrients and will ultimately increase the BOD of the stream as aquatic plant growth and decomposition are encouraged. Stormwater runoff can carry nutrients, sediment, pesticides, and other harmful material into the stream, which increases NBOD and CBOD. CBOD is the oxygen demand resulting from the decomposition of organic matter. CBOD was highest in April for all sites monitored by ADEM. Increased organic matter from fallen leaves of deciduous trees into the stream would allow for less light penetration and result in limited plant growth. Decreased sunlight limits photosynthetic activity of plants resulting in less oxygen production. Increased organic matter provides decomposers living in the stream with additional material for decomposition, which consumes more oxygen.

4.4 Beaver Dams on Mill Creek

Mill Creek stakeholders identified beaver dams as potentially contributing to the impairment of the creek. Watershed visits to ADEM's sampling locations at MICR-2 and CHA-1 indicates the presence of beavers due to dams, ponds, and adjacent stripped trees. Beaver dams have sequestered portions of Mill Creek creating stagnant pools with very limited flow. Waters with restricted movement often have high BOD with low dissolved oxygen levels. Beaver dams are present near both sampling locations, but the dams only appear to impact flow patterns and DO at CHA-1.

Figure 8. Beaver Dam on Mill Creek.

Oxygen is introduced into water physically through turbulence or water movement and biologically through photosynthesis of aquatic plants. Turbulent waters or water flowing over instream structures such as a weir or rock vane can introduce atmospheric oxygen to increase DO concentrations. Beaver dams and ponds create stagnant water with low flows that do not allow water to be re-aerated. Low flows during drought periods can also increase water temperatures due to a decrease in water volume. Increased water temperature speeds up processes such as decomposition.

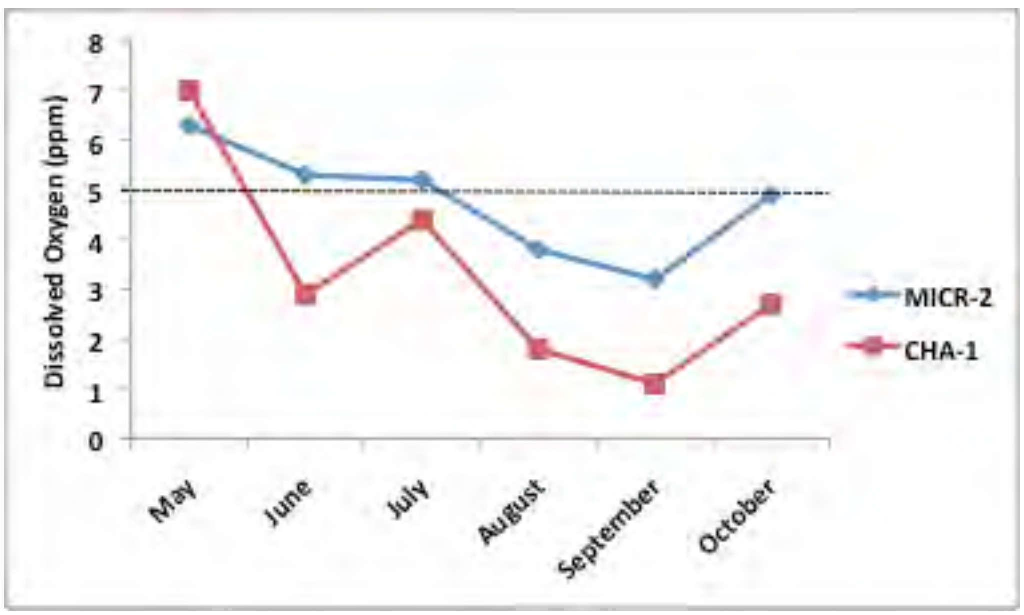
4.5 Volunteer Monitoring

Alabama Water Watch is a group of volunteer citizen monitors from various backgrounds who are dedicated to studying and protecting lakes and streams of Alabama and surrounding states (AWW 1994). AWW monitoring provides baseline water quality data to help evaluate surface waters for water chemistry and bacteria.

Baseline trend data can help to target future water quality conditions by providing consistent monthly monitoring. AWW water chemistry monitors measure up to nine parameters. These parameters are water and air temperature, pH, DO, total alkalinity, total hardness, turbidity, and salinity. Other information such as current or previous weather information, water color or smells, and water level may also be recorded. Monitors submit data collected to AWW and these data are available to the public through the AWW website. This trend data is also important to ADEM as it flags problem areas that require additional assessments.

Volunteer water chemistry monitoring of MICR-2 and CHA-1 indicates consistently higher DO levels and decreased turbidity for MICR-2 compared to CHA-1 (Figure 9). During monitoring, turbidity levels for CHA-1 were usually greater than 100 Jackson Turbidity Units (JTUs) using a Hatch Ratio turbidimeter. This method has a sensitivity of 0.01 JTUs (AWW 1994) and can detect up to 200 JTUs depending on sample column size of 25 or 50 mL. Appendix F shows the complete dataset for AWW monitoring conducted during 2010.

Figure 9. Dissolved Oxygen Measured from May to October 2010 by AWW.



5. Recommendations to Improve Mill Creek

The Mill Creek Steering Committee recommends implementing a combination of education and on-the-ground BMPs to improve overall water quality of Mill Creek and its tributaries. Practices will target the minimization of organic enrichment and sedimentation, while focusing on increasing DO concentrations.

5.1 Education and Outreach

The Education and Outreach Committee proposes education components to this plan that aim to reach public audiences on topics regarding NPS pollution and the importance of protecting and improving water quality in the watershed. Watershed stakeholder education is imperative for the success of this plan. Suggestions for education and outreach target varied audiences allowing for a broad spectrum of community member exposure (Table 8).

Table 8. Education and Outreach Plan Components

Education Component	Target Audience
Trash Clean Ups, Storm Drain Stenciling, Mill Creek Signage, Mill Creek Brochures	All
NEMO, Erosion and Sediment Control, and LID Workshops	Municipal workers, engineers, construction entities
Septic Tank Awareness Workshops	Homeowners
Volunteer Monitoring	Teachers and Students, Interested Citizens
Mill Creek Website/Newspaper articles	All

Educating students on the value of our water resources and how they can help is paramount in invoking a sense of environmental stewardship in teenagers and children. Environmental awareness is not meant to be short-lived, but rather a belief system that when instilled at a young age, can persist throughout a lifetime. Children are the future of Alabama and their knowledge of environmental impacts is key in the preservation of our valuable natural resources.

5.2 Watershed Trash Clean Ups

While touring the watershed, it was noted that some areas along Mill Creek in Phenix City and Smiths Station were used as areas for dumping of grass clippings, asphalt, concrete, and other miscellaneous solid wastes. Not only is litter in streams unsightly, but trash and other debris in streams negatively impacts aquatic organisms. Larger solid wastes can alter habitats while smaller items can be ingested or cause entanglement resulting in detrimental health effects to aquatic life. Other items may leach or leak toxic substances into streams especially when pressure treated lumber, oil cans, or batteries are introduced into streams. The Mill Creek Watershed Management Plan will promote watershed clean up days through existing organizations such as Help the Hooch (HTH) and Keep Phenix City Beautiful (PCB). Clean up days educate watershed communities and encourage understanding of consequences associated with illegal dumping.

Help the Hooch has been the largest Watershed Clean-Up Event in the Southeast since 1995. The mission of HTH is to promote environmental stewardship through public education and outreach while improving aquatic habitat and the quality of water resources in the Middle Chattahoochee Watershed. Help the Hooch is coordinated and funded by a Public/Private partnership of governmental agencies, utility companies, environmental consultants, corporations, and local businesses. In 2009, HTH collected a total of 155,340 lbs of trash covering an estimated total of 150 mi. Promoting community involvement among Phenix City and Smiths Station residents and stakeholders benefits the Chattahoochee River, while making a positive impact on the health of Mill Creek. Participating in watershed clean-up days helps to foster feelings of responsibility and ownership among community members.

Keep Phenix City Beautiful is a local organization that partners with People Against a Littered State (PALS), Auntie Litter's Take Pride Statewide Campaign, Tri-Rivers, and Riverway South. Its mission is "to enhance beautification, protect the environment, and eliminate litter and blight by changing the attitudes of our citizens through community involvement and educational programs" (PCB 2010). The organization, led by Georgia Laningham, currently holds local cleanup days in Phenix City, promotes recycling and recycling events, and is vital to getting educational information concerning litter to local school systems.

Alabama PALS is a non-profit organization dedicated to working with Alabama communities to promote a cleaner and healthier Alabama. Alabama PALS programs are designed to assist Alabama cities, counties, schools, and communities by providing programs that address litter prevention, cleanup, and litter control. Alabama PALS Clean Campus Program is designed to involve all Alabama schools in litter control and beautification projects, which will develop and sustain stewardship while focusing on environmental awareness. The program is available at no cost to all Alabama public and private schools and PALS provides all supporting materials such as large Clean Campus Litter Bags, brochures, School Window Decals, and the PALS Teachers Activity Guide, which can be used in many classroom curriculums.

5.3 Municipal, Contractor, Homebuilder, and Maintenance Worker Education

The Mill Creek Steering Committee recommends a combination of workshops focusing on constructions BMPs, maintenance, erosion and sediment control, and low impact development practices. Nonpoint Education for Municipal Officials (NEMO) presentations in the Phenix City and Smiths Station areas will provide information, education, and assistance to local land use boards and commissions on how to accommodate growth in their communities while protecting their natural resources. NEMO presentations will target local government and county decision makers and officials. NEMO's core belief is that the future of our communities and environment are dependent on the relationship between land use and water quality, and that addressing this at the local level can have the most effective and positive impacts.

Erosion and Sediment Control workshops should concentrate on the importance of installing and maintaining construction BMPs such as silt fencing, temporary seeding, and storm drain inlet protection. Lack of regulatory enforcement of constructions BMPs focusing on erosion and sediment control in the Mill Creek Watershed has led to an abundance of sediment entering the creek. Most importantly, once installed, construction BMPs must be maintained to continue functioning properly. Frequently, silt fences begin to fail and are not replaced in a timely manner. Education of construction entities is key. Sediment from construction sites freely enters streams when precautions are not taken.

Education of maintenance workers at both the City and County level is also suggested. General maintenance tasks to reduce sediment and to prevent future pollution will be the focus of these workshops. These workshops will help maintenance workers to identify maintenance concerns and suggest solutions to minimize stream and stormwater impacts. Most importantly, Maintenance workshops will concentrate on the importance of BMP maintenance and how it relates to protection of water resources and the environment as a whole.

Mill Creek stakeholders have identified a need for education targeting homebuilders and developers to raise environmental awareness on water quality and natural resource impacts. Increased building and development combined with a need for local enforcement of construction BMPs are some concerns for stakeholders. Education of builders in these communities aims to promote and encourage the use of the Erosion and Sediment Control Handbook to keep sediment and other materials from entering streams.

Workshops to highlight the use of Low Impact Development (LID) practices are suggested to educate local engineers, design professionals, and community planners. LID practices focus on mimicking natural hydrologic functions to reduce stormwater runoff, promote infiltration and groundwater recharge, and to increase green space. By encouraging green space and infiltration, LID can reduce the need for impervious surfaces thereby reducing the overall volume of stormwater runoff rushing into storm drains and eventually into our streams. By reducing runoff volumes, we can create natural flow patterns in the landscape that attempt to replicate how water would naturally move throughout a watershed absent of impervious surfaces. LID workshops will discuss how LID practices function, design and vegetation components, and how installation can reduce the environmental impacts of urbanization on Mill Creek and other streams.

Depending on interested parties within the watershed, workshops may be offered as separate workshops or a combination of NEMO, LID, and Maintenance. Continuing Education Units from Auburn University will be offered to target municipal officials, contractors, homebuilders, maintenance workers, and county officials.

5.4 Mill Creek Signage and Storm Drain Stenciling or Markers

The Education and Outreach Committee suggests watershed signage for Mill Creek at stream crossings in both Phenix City and Smiths Station areas. Signage aims to increase awareness of the presence of Mill Creek to the general public. Informational signs are recommended for installation at selected stream crossings in Phenix City and Smiths Station. Although signage cannot remediate any past impacts that the general public has had on Mill Creek, signs can help to inform the public about the restoration efforts and raise awareness about watersheds.

Storm drain stenciling or markers in addition to watershed signs is anticipated to help reduce illegal dumping in the Mill Creek Watershed. Volunteer days to complete storm drain stenciling or markers are excellent opportunities for people to get involved and educated on the importance of keeping the creek clean. Stenciling activities target both parents and children and field days are suggested to install them.

5.5 Septic Tank Workshops

Communication with stakeholders indicates a concern for failing septic tank systems in both Lee and Russell Counties. With increasing urbanization in Smiths Station, rural areas have been subdivided into small tracts of land resulting in land segments that are too small for septic systems to adequately treat sewage. For this reason, failing or non-functioning septic systems have long been a concern for the Smiths Station area. In 2006, an article in the Columbus Ledger-Enquirer discussed issues that Smiths Station faced and continues to face as a newly incorporated community (Rutledge 2006). The article discussed failing septic tanks and the potential construction of a sewer line along Mill Creek. Following a Stakeholder Meeting in Smiths Station, a septic tank awareness article was published in a local newspaper to generate public interest and the need for education of watershed community members (See Appendix E for article).

When septic systems fail, they can no longer process effluent leaving the system and in most cases, this effluent ends up contaminating our surface and ground water through leaching. To prevent system failures, septic tanks should be pumped out to remove built up solid wastes every three to four years. Septic tank pumping can help to maintain efficiency of the system. Most importantly, pump outs can prevent premature failure of these systems, which can save on the expense of replacing the system (Booth 2005).

Smiths Water and Sewer Authority (SWSA) is currently installing a sewer trunk line that runs along Mill Creek. The trunk line has been dubbed the Mill Creek Sewer Trunk Line, which follows the length of Mill Creek to connect to the Phenix City sewer line. SWSA assures the public as well as stakeholders along Mill Creek, that efforts are continually being made to meet all regulatory guidelines during installation of the Mill Creek Sewer Trunk Line. Smiths Station residents along Mill Creek who were willing to grant utility easements were provided a tap and had their impact fee waived by SWSA allowing them to gain sewer services. The new Smiths Station High School will be the largest customer to tie in to the trunk line. The new trunk line will allow an estimated 568 lots on currently undeveloped land to have sewer access. SWSA estimates completion of the sewer trunk line installation by May 2011. Due to costs associated with running lateral lines off the main trunk line, many residents of Smiths Station will still use septic systems to dispose of sewage. Construction of the trunk line has been expensive for SWSA, so any lateral line installation costs would need to be shouldered by each subdivision. In the wake of the current economy, stakeholders noted that it is unlikely that very many subdivisions will be interested in installing lateral lines to tie into the trunk line.

Both Lee and Russell County Alabama Health Departments noted high percentages of failing septic tanks. Similarly to Smiths Station, many homes in the Phenix City area do not have sewer access and rely on septic systems. The Russell County Health Department estimated 1,540 total septic tanks in the Mill Creek Watershed with a failure rate of approximately 40% (Burrell 2010). The Lee County Health Department reports an estimated 4,870 total septic tanks in the Mill Creek Watershed with approximately 30% failing (Hakel 2010). This suggests that there may be up to 32% of the septic systems failing in the entire Mill Creek Watershed (Table 9), which are likely contributing to organic enrichment and overall dissolved oxygen demand instream. EPA's STEPL model was used to calculate pollutant loadings for Mill Creek using current land use data. When this percentage of failing septic systems was incorporated into the STEPL model, it estimated that over half of the pollutant loadings for TP in the watershed could be coming from the failing systems (See Appendix G for pie charts).

Table 9. Number of Septic Systems for the Mill Creek Watershed.

County	**Number of Septic Tanks**	**Number of Failing**	**Percent Failing**
Russell	1,540	616	40%
Lee	4,870	1,440	30%
Total	6,410	2,056	32%

The Mill Creek Education and Outreach Committee recognizes the need for Septic Tank Awareness Workshops to target areas in Smiths Station and Phenix City that do not currently have sewer access. Septic Tank Workshops can provide information to the general public regarding septic tanks and the maintenance they require to continue functioning properly. Discounted septic tank pumpout vouchers will be given to attendees of these workshops. Advertisement for these workshops will be sought from local radio and newspapers as well as SWSA. The local Health Departments will assist in getting the information out to homeowners.

5.6 Mill Creek Brochures

The Education and Outreach Committee recommends the production of informational brochures on the Mill Creek Watershed Plan. The Mill Creek Plan will partner with Lee County, Russell County, City of Phenix City, and City of Smiths Station to distribute these brochures to community members. An introductory brochure will contain facts about Mill Creek and its importance to the Smiths Station and Phenix City areas. Other brochures will highlight sediment and organic loadings from stormwater runoff and failing septic systems, and will suggest simple steps that homeowners can take to help reduce impacts to the creek.

5.7 Volunteer Monitoring Campaign

The Steering Committee also suggests the promotion of community volunteers joining AWW in the quest to monitor and keep our Alabama waters safe. AWW is a non-profit organization, committed to expand the knowledge about water issues and to improve both water quality and policy through volunteer citizen monitoring and action leading to a better understanding, protection, and restoration of Alabama's streams, rivers, lakes, wetlands, and coasts (AWW 1994).

Certification workshops should be conducted in both the Phenix City and Smiths Station areas. Communication with AWW reveals that there is a need for volunteer monitoring throughout the Chattahoochee Basin. Volunteer monitoring should be utilized in evaluating BMP efficiency within the watershed. Monitoring at AWW stations should be conducted once a month for chemical properties of water. Community involvement and awareness of monitoring efforts is crucial. Communication with Central High School, Phenix City Intermediate, and Smiths Station High School indicates an interest in AWW monitoring for science labs and environmental clubs. Other organizations to partner with include Boy Scouts of America, Girl Scouts of America, and other environmental groups. There are currently three inactive AWW monitoring sites in the Phenix City area. There is only one active AWW monitoring site in the Phenix City and Smiths Station areas and these began as part of the Mill Creek Watershed Plan.

5.8 Promotion of Alabama Envirothon

The Mill Creek Education and Outreach Committee suggests the promotion of Alabama Envirothon for Smiths Station High School and working with the existing Envirothon team at Central High School. Envirothon is an annual competition that invites high school student teams to compete and use their knowledge of environmental science and natural resources. Students use problem solving skills as well as public speaking skills to compete against other participating Alabama schools. Smiths Station High School does not currently participate in Alabama Envirothon, but communication with Principal Jason Yohn indicates their interest in joining the competition. Smiths Station High School has a strong science program including an Environmental Science class. The current Envirothon team at Central High School, sponsored by Susan Lawhon, is interested in learning more about local environmental issues and how they are addressed by helping in project implementation.

5.9 Additional Monitoring of Mill Creek

Figure 10. Mid-Channel and Lateral Bars Downstream of Construction Sites on Mill Creek.

The Mill Creek Technical Committee suggests that additional macroinvertebrate sampling and water quality monitoring be conducted for Mill Creek to accurately reflect current conditions of the creek. Data gaps over previous years for water chemistry and biological sampling have made the assessment of Mill Creek difficult. Incomplete datasets cannot accurately depict past or current conditions of Mill Creek. Data were collected during a drought (2008) with low flows and high temperatures. Not only this, but Mill Creek has experienced land use changes due to development and construction activities, which have impacted water quality of the creek.

The current listing of Mill Creek on the 2010 Draft 303(d) List indicates the source of impairment as organic enrichment and the cause as urban development. While this may be true, in the past year, Mill Creek has experienced additional construction impacts leading to massive erosion of streambanks that were, at the very least, stable during the sampling of 2008. Construction in the headwaters did not maintain erosion and sediment control BMPs and sediment entered Mill Creek aggrading the creek and creating lateral and mid-channel bars downstream (Figure 10).

Columbus State University (CSU) will aid the Mill Creek Watershed Management Plan goals by conducting additional benthic macroinvertebrate sampling on Mill Creek. The Aquatic Entomology lab curriculum will begin sampling in February 2011. The lab will include trips to the four ADEM sampling locations on Mill Creek for students to collect and analyze samples. The Mill Creek Technical Committee proposes a partnership with CSU to collect a minimum of one year of biotic data at all four sampling locations. If the Aquatic Entomology class is not offered in Fall 2011, the Mill Creek Steering Committee will solicit funding from partners to support a student worker to collect and analyze samples during the winter months. These data compared with previous data collected should provide a big picture aspect in terms of historical aquatic life supported by Mill Creek.

Future Monitoring Strategies

The Mill Creek Technical Committee suggests additional chemical and physical monitoring of Mill Creek. Monitoring should be conducted for a minimum of one year concurrently with benthic macroinvertebrate sampling. Committee members prefer data be collected by a professional entity, but in the case that funds are limited, AWW volunteer monitoring data may be used. Following implementation, monitoring will be conducted by ADEM and other entities to assess on-the-ground BMP effectiveness in the Mill Creek Watershed. This plan aims to have as many on-the-ground BMPs as possible installed before ADEM Field Operations samples Mill Creek as part of the Five-Year Rotational River Basin Assessment in 2013.

6. Pollutant Load for Mill Creek

The EPA's STEPL model was used to estimate pollutant loadings for Mill Creek. STEPL is a modeling software that uses simple algorithms to calculate nutrient and sediment loads. STEPL inputs include land uses, precipitation, livestock, and septic system data. Additionally, STEPL calculates pollutant load reductions that would result from the implementation of various agricultural BMPs and stormwater BMPS/LID for urban areas. Using current land uses, rainfall amounts, livestock, and septic system data for the Mill Creek Watershed [as reported by (NLCD 2000), (Hakel 2010), (Burrell 2010), and (NOAA 2010)], the STEPL model was used to approximate pollutant loadings (Table 10) in terms of watershed surface runoff, nutrient loads including nitrogen and phosphorous, BOD, and sediment delivery. Communication with ADEM suggests the Mill Creek TMDL will target nutrients, BOD, and SOD.

Table 10. STEPL Estimated Pollutant Loadings.

Load Type	Amount per year
Nitrogen	169,527 lbs
Phosphorous	41,848 lbs
BOD	654,808 lbs
Sediment	2,631 tons

Based on STEPL generated graphs (See Appendix G), BMPs should focus on urban land use areas for the highest pollutant load reductions for TN, BOD, and sediment. Due to the high estimate of septic system failure input into the model, the highest contributor of P was correlated with septic tank failure. In this light, the Mill Creek Steering Committee recognizes that management practices that address septic tank failures will make a measurable impact on P loadings for Mill Creek. In addition, BMPs to address sediment would likely reduce P loadings as well, as discussed previously.

Table 11 shows on-the-ground BMPs suggested for the Mill Creek Watershed. All BMPs will help to reduce pollutants entering Mill Creek and will thus improve water quality. However, due to the amount of pollutant loads entering Mill Creek annually (Table 10), pollutant load reductions associated with the suggested BMPs do not make a very large impact (Table 12). Currently, a TMDL does not exist for Mill Creek. Table 13 shows pollutant load reductions and acreages necessary to reduce pollutant loadings by 20-30% based on the STEPL model. Note that acreages are based on drainage areas rather than BMP size. Pollutant load reductions set forth by the TMDL will be added to this plan as they are made available. In order to make a measurable impact on Mill Creek, partnerships among watershed community members must be formed to restore Mill Creek to a healthy state.

Table 11. Proposed BMPs for the Mill Creek Watershed and Associated Pollutant Load Reductions.

Land Use Type (STEPL)	Location	BMP	Number of Acres	N Reduction (lbs/year)	P Reduction (lbs/year)	BOD Reduction (lbs/year)	TSS Reduction (lbs/year)
Multi-Family	Downtown Phenix City and Smiths Station	Buffer and streambank stabilization	0.1	0.35	0.06	2.14	32.04
Transportation	Phenix City Utility Lots	Bioretention	3.6	49.4	15.5	-	-
Industrial	Trash Compactor Site (Lee Rd 246)	Bioretention	0.5	3.1	1	-	-
Institutional	CHS	Bioretention	16.5	78.2	24.6	-	-
Institutional	CHS	Storm drain retrofits	5	11	0.83	31.1	759
Institutional	SSHS	Constructed Stormwater Wetland	20	121	25	688	7058
Institutional	SSHS	Bioretention	2	9.5	3	-	-
Institutional	PCI	Bioretention	0.75	3.6	1.1	-	-

Table 12. Total Pollutant Load Reductions for On-the-Ground BMPs Suggested in this Plan

N Reduction (lbs/yr)	P Reduction (lbs/yr)	BOD Reduction (lbs/yr)	Sediment Reduction (lbs/yr)
276	71.1	721.2	7849

Table 13. BMPs for Potential Targeted Pollutant Load Reductions

Pollutant	BMP	Acres	Percent Reduction
Total N	Bioretention (~8.1 lbs/year)	1995	30%
Total P	Septic Tank Pumpouts	-	-
Total P	Bioretention (1.5 lbs/year)	8675	30%
BOD	Vegetated Filter Strips	3050	10%
BOD	Constructed Stormwater Wetland	2135	10%
Sediment	Constructed Stormwater Wetland	3315	30%

7. Recommended Best Management Practices

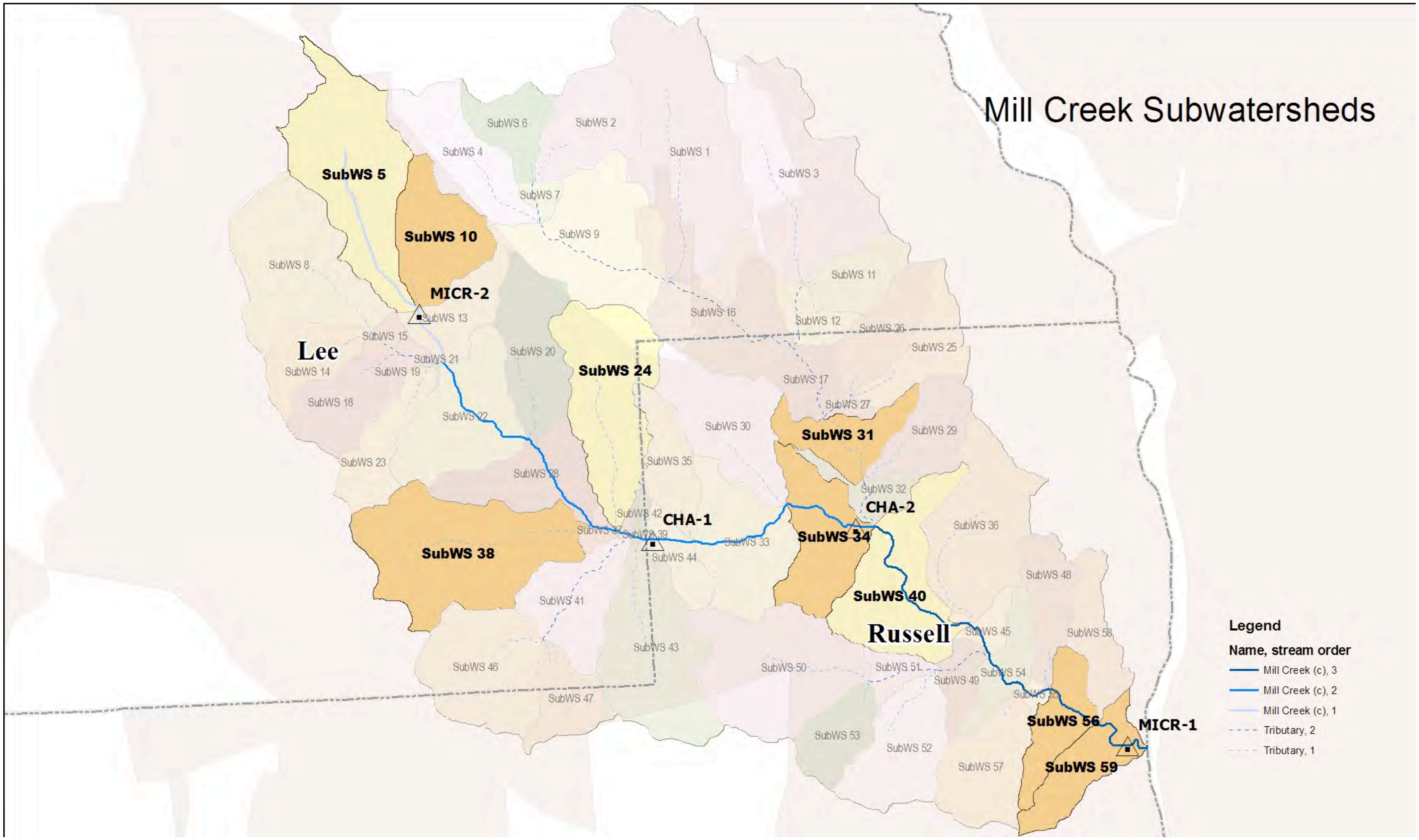
The Mill Creek Watershed Management Plan Technical Committee proposes economically practical and environmentally sound BMPs to reduce pollutant loads to meet water quality standards. This plan aspires to suggest on-the-ground projects that can improve the overall health and habitat of Mill Creek. BMPs suggested in this plan are based on current land use and cover and are subject to stakeholder input and collaboration.

Suggested On-the-Ground BMPs

The Mill Creek Steering Committee suggests on-the-ground projects that will serve to educate community members in the watershed while providing the maximum benefit for the improvement of Mill Creek. Where possible, BMPs have been suggested for industrial and transportation lands due to the high estimated pollutant load reductions.

There are a total of 59 subwatersheds within the Mill Creek Watershed. The Mill Creek Steering Committee suggests targeting eight subwatersheds in both Lee and Russell Counties. These subwatersheds were chosen based on a combination of their location along Mill Creek, whether City owned properties were present, and whether BMPs in these locations would potentially reduce pollutant loadings. The Mill Creek Steering Committee sought local school involvement and in such cases, these subwatersheds were targeted. Figure 11 shows the subwatersheds to be prioritized for on-the-ground BMPs. Subwatersheds highlighted in orange show targeted areas for BMPs at educational institutions and where BMPs have been suggested for City owned properties. Subwatersheds highlighted in yellow are privately owned lands where impairments have been identified and implementation of BMPs would likely result in pollutant load reductions.

Figure 11. On-The-Ground BMPs are Suggested for Highlighted Subwatersheds.



7.1 Streambank Stabilization in Smiths Station

Figure 12. Forested Buffer Lost on Mill Creek During Sewer Trunk Line Installation.

With the addition of the Mill Creek sewer trunk line in Smiths Station, much of the forested buffer has been lost (Figure 12). With such a large area of land cleared, there is the potential for increased erosion resulting in sedimentation in the creek. Streambank stabilization is suggested for subwatershed 5 (Figure 11). Stabilization using native grasses, shrubs, and other shallow rooted species is recommended to recoup streamside forest lost to the sewer line. Planting days and demonstrations are excellent education opportunities for both children and adults in the watershed. Land bordering Mill Creek behind Philadelphia Baptist Church is a prime location for streambank stabilization in the headwaters.

7.2 Live Staking

To stabilize streambanks, the Mill Creek Technical Committee suggests using live stakes. Live staking uses dormant hardwood cuttings of plants to stabilize and reduce erosion and subsequent sedimentation. Hardwood cuttings are harvested from mature plants and driven into the streambank during the winter months using a rubber hammer. In the spring, vegetative buds break to form new leaves and the cuttings take root. Once actively growing, roots of live stakes grow aggressively to hold banks in place. Live stakes are suggested to stabilize streambanks in areas where the sewer trunk line is not present. Live stakes would not be conducive to sewer trunk line areas because tree or shrub roots may grow too deeply and could potentially damage sewer line infrastructure. Trees or shrubs that would naturally occur on a streambank or under wet conditions are preferred for live staking since they are already adapted to these conditions. Live stakes can be harvested from nearby streambanks vegetation making them an inexpensive stabilization method.

7.3 Streambank Stabilization in Phenix City

Most areas in downtown Phenix City are highly urbanized and because of this, replacing and repairing lost riparian buffers and floodplain is difficult. Many homes and businesses are located close to streambanks and in some cases, are in danger of eventually losing their land due to eroding streambanks. To compensate for this land and streambank loss, objects such as concrete blocks have been dumped in an attempt to hold the streambank in place (Figure 13). The Mill Creek Technical Committee recognizes the need for erosion control, specifically at the Holland Creek stream crossings on Crawford Rd. and Broad St. in downtown Phenix City.

Figure 13. Concrete and Other Materials are Tossed on to Mill Creek Streambanks to Stabilize.

Addressing bank erosion in downtown Phenix City is difficult since there is not a lot of space to work in due to buildings and parking lots directly adjacent to streams. Additionally, the stream has incised to a point where it no longer has connection to its floodplain and thus, any addition of vegetation to control erosion would be difficult. Streamside vegetation relies on intermittent flooding and contact with the water table to improve survival rates. The Mill Creek Technical Committee suggests incorporating natural channel design and instream structures such as rock vanes and root wads to decrease future streambank erosion concerns and create floodplain. Following the installation of instream structures, live stakes and bank-stabilizing plants may be used to increase stabilization and reduce future erosion impacts.

Severe erosion has occurred near the mouth of the Chattahoochee River at the Broad St. Bridge in Phenix City. Sewer infrastructure has become exposed due to heavily eroding streambanks on Holland Creek. Flashy flows during and immediately following heavy rains threaten boxes that hold sewer manholes and if erosion continues, infrastructure leaks and eventually destruction threaten to dump large quantities of raw sewage into Holland Creek and the Chattahoochee River. Moving these sewer boxes further back on the streambanks combined with instream structures to dissipate energy and slow velocities during heavy rains could reduce the chance for further erosion while creating floodplain habitat and favorable conditions for streamside vegetation to hold streambanks in place.

7.4 Central High School On-the-Ground BMPs

Figure 14. Sediment Deposits from High Velocity Runoff Volumes on CHS Campus.

The Mill Creek Technical Committee suggests on-the-ground BMPs to manage stormwater runoff on the campus of Central High School (CHS) in Phenix City. Partnering with CHS allows for education and involvement of students as well as class participation. Campus visits reflect the need for stormwater management due to obvious erosion and sediment problems (Figure 14, 16).

The high school was constructed several years ago overtop a tributary of Mill Creek and is located in subwatershed 34 (Figure 11). Campus topography is bowl-shaped and school buildings sit in the center where all stormwater flows. The campus suffers from frequent flooding as well as high velocity runoff volumes from excess impervious surfaces from parking lots. Steep slopes and minimal groundwater infiltration have created concern for erosion and sedimentation associated with peak flows during heavy rainfall events.

Figure 15. Storm Drain Needs Inlet Protection on CHS Campus.

Forested buffer areas surround Mill Creek tributaries on campus and are providing some treatment before stormwater enters the creek. However, most stormwater on campus is directed to storm drains and directly into streams via large stormwater outlets. To remediate flooding problems and high velocity flows from blowing out the stream, the committee suggests vegetated areas with curb cuts, bioretention cells, and rain gardens to maximize interception of stormwater and allow for infiltration before stormwater enters the storm drains on campus. Bioretention cells reduce erosion from high velocity stormwater runoff while allowing sediment to drop out before entering storm drains. Some storm drains on campus have large grates that cannot capture sediment before it enters the storm drain system (Figure 15). Storm drain retrofits to filter runoff containing large amounts of sediment and other debris from parking lots are also suggested.

The Mill Creek Steering Committee plans to work in conjunction with CHS environmental science students and the Envirothon team to come up with solutions for flooding and erosion problems on campus. All on-the-ground BMPs constructed on campus will also serve as educational demonstration sites and students will help to design and install practices. Any on-the-ground projects on the CHS campus will be an interactive process involving teachers, committee members, and students. Many students are hands-on learners and this training can help students and parents learn about installing practices such as rain gardens in their own backyards. General maintenance of vegetation of BMPs installed during implementation will be the responsibility of CHS students and maintenance crews on campus. Maintenance may include removing debris from storm drain filters or overflow devices, minimal plant pruning, and replacing mulch as needed.

Figure 16. Severe Erosion and Subsequent Sedimentation at CHS Campus.

7.5 Phenix City Intermediate

Phenix City Intermediate (PCI) is a middle school located in Phenix City near the confluence of Mill and Holland creeks in subwatershed 31 (Figure 11). The Mill Creek Steering Committee met with a science teacher at PCI and provided information regarding grant opportunities for restoring an outdoor classroom adjacent to the creek. The outdoor classroom was used in the past, but over the years has become unusable due to trails filling in with vegetation. After a campus tour, the Steering Committee suggested a rain garden to treat parking lot runoff in a flood prone area. The rain garden will also provide an educational tool for science teachers to discuss the importance of water quality and how these BMPs can aid in reducing runoff quantity while improving quality. The proposed location for the rain garden is adjacent to the outdoor classroom site, which is close to the creek on campus. This proximity makes the rain garden an excellent building block for teachers to educate students on watersheds and how they can make an impact.

7.6 Smiths Station High School

The Mill Creek Steering Committee suggests the implementation of LID practices to manage stormwater on campus of the new Smiths Station High School (SSHS). According to the Lee County Board of Education, Smiths Station is the largest attendance zone in Lee County with 57% of the total student population in Lee County attending Smiths Station schools. The Smiths Station area is home to many commuter families whose parents work in Columbus and LaGrange, GA. The new SSHS was proposed to accommodate student population increases related to BRAC in Fort Benning, the new KIA plant in LaGrange, and other supplier companies associated with the KIA manufacturing plant. Plans were also approved for the construction of a new elementary school in Smiths Station, but due to financial constraints and the current state of the economy, further plans will be put on hold at this time.

Construction of the new SSHS campus began in September 2009 and is currently over 60% complete. The campus sits on 120 acres off Lee Road 430 and construction is scheduled to be complete in June 2011. The SSHS is located in subwatershed 10 (Figure 11), which encompasses an intermittent tributary of Mill Creek immediately south of the new high school. Wetlands and the intermittent tributary to Mill Creek are located on campus and should be protected.

Figure 17. Retention Pond on SSHS Campus Near Mill Creek Tributarv.

The large new campus currently has six retention ponds designed to capture runoff from construction and stormwater. Campus stormwater is routed to storm drains where it ends up in one of six retention ponds. While these retention ponds are currently functioning properly, the pond discharging closest to the Mill Creek tributary on the Southside of the new campus would function well as a constructed stormwater wetland (Figure 17).

Constructed stormwater wetlands are designed to capture sediment and filter nutrients. This LID practice uses deep pools, shallow water, and shallow land areas to create natural flow patterns throughout the wetland to treat stormwater. Cleaner water discharges from the system through an outlet structure.

Constructed stormwater wetlands use native vegetation to attract birds, native insects, and other wildlife to create a healthy ecosystem. Student parking lots at the new SSHS will incorporate tree islands. Construction has not yet begun on these parking lots, and the Mill Creek Steering Committee suggests curb cuts or curb-less parking lot islands. Curb cuts can decrease stormwater peak flow runoff quantity by promoting infiltration in vegetated islands. Infiltration of stormwater can reduce the total runoff volume entering storm drains.

7.7 Trash Compactor Site at Lee Road 240

Solid waste sites with trash compactors frequently leach substances from household trash into the area surrounding these sites. Harmful leachates can percolate into groundwater and eventually end up in our waterways. Compactor sites in Lee County accept any items with the exception of dead animals, large tree limbs (thicker than 2" or longer than 5'), large objects (longer than 54"), hazardous wastes, or material that is burning or flammable. Many objects such as fluorescent light bulbs, batteries, oils, and electronics with the potential to leach harmful substances are received at these sites. During compaction, liquid leachate is squeezed from trash and this leachate can contain all or some of the chemicals that are in the objects being compacted. These discharges are not filtered or diluted before entering groundwater.

Figure 18. Effluent Leaving Compactor Site on Lee Road 240.

The Mill Creek Technical committee suggests a bioretention cell with pre-treatment to provide onsite treatment of leachates (Figure 18) resulting from trash compaction for the compactor site on Lee Road 240 in Smiths Station. The compactor site is located north of a tributary of Mill Creek in subwatershed 38 (Figure 11). Onsite discharge enters bioretention cells in a highly concentrated form, but is filtered by plant uptake, microbial processes, and retention to produce a less harmful effluent that will eventually enter groundwater. Soils surrounding the compactor site are classified as a Blanton Loamy Sand and are moderately well drained and highly permeable, thus a grassed filter strip or pretreatment area may be necessary to intercept runoff and to convey effluent into the cell.

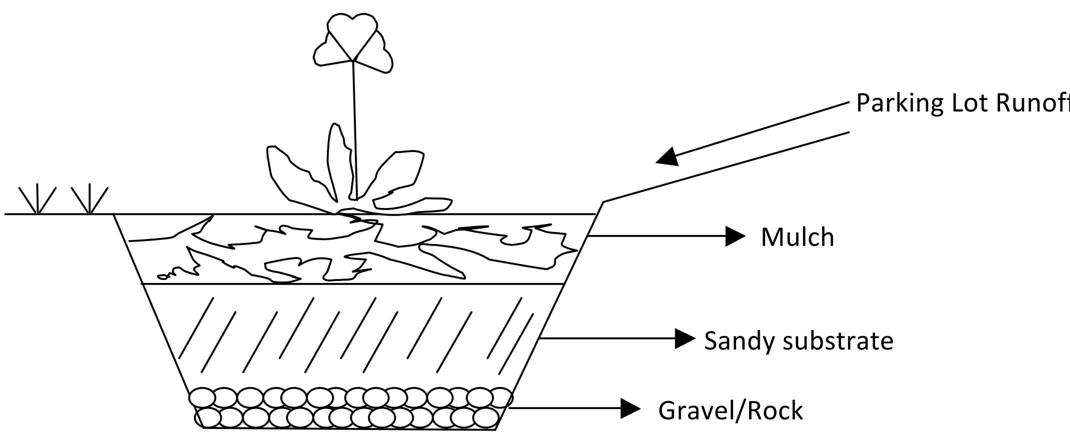
7.8 Phenix City Utility Parking Lot

The Mill Creek Technical Committee suggests stormwater treatment at the Phenix City Utility lots in downtown Phenix City. These parking lots are located directly on Holland Creek approximately half a mile from the mouth of the Chattahoochee River. Land behind these parking lots is characterized by steep slopes and is primarily supported by bamboo roots and kudzu. Although bamboo is not a native species and is invasive, their extensive root systems are serving to stabilize the streambank. Unfortunately root density appears to be so high that the surface has become impervious and unable to allow water to infiltrate before entering the stream.

Land behind the parking lots has also become a dumping site for unwanted materials and objects (Figure 19). The Mill Creek Plan suggests initial clean up of debris and trash from behind parking lots as well as an on-the-ground project to slow stormwater runoff from parking lots entering the creek. Due to steep slopes beyond parking lots, there is limited land availability for stormwater management. The Technical Committee proposes parking lot island bioretention cells. Bioretention cells catch stormwater runoff, allow it to percolate, and allow sediment to drop out, before rushing down slope into Holland Creek.

Figure 19. Tires and Other Trash Behind Phenix City Utility Parking Lot.

Figure 20. Parking Lot Bioretention Cell Cross-Section



7.9 Maintenance Agreements and BMP Signage

Operation and maintenance agreements will be made prior to construction of suggested BMPs in this plan. The Mill Creek Steering Committee intends to address maintenance tasks and parties responsible for post-construction maintenance of BMPs during BMP design and planning phases. It is not the intent of this plan to install BMPs without determining maintenance procedures necessary to sustain functionality and efficiency. A primary reason BMPs fail is due to a lack of maintenance or improper maintenance. All BMPs will require maintenance tasks on at least an annual basis and some may require quarterly maintenance. Maintenance schedules and task lists are to be reviewed by the Steering Committee as well as maintenance professionals and BMP designers.

BMP signage is to be incorporated at each BMP installation site. This plan aims to use all BMPs implemented as demonstration sites within communities. BMP signage should provide information on each BMP and an explanation of its function to the general public.

8. Implementation Timeline and Measurable Milestones

8.1 BMP Partnerships

This plan is intended to propose a combination of educational components and structural BMPs to minimize NPS impairments to Mill Creek through watershed community partnerships. Table 14 shows project descriptions and potential partners for each BMP. The Mill Creek Steering Committee recognizes the importance of diversity among partnerships for this plan. It is understood that partners and BMPs are subject to change as new information regarding the status of Mill Creek becomes available. Partners listed are suggestions and are no way bound to participate in these projects.

Table 14. BMPs for Implementation and Potential Partners for Suggested Projects.

Pollutant Target	Project Description	Potential Partners
Overall Organic Enrichment and Sediment from Stormwater Runoff	NEMO Workshops	ACES, ADEM, Chattahoochee – Chipola CWP, City of Smiths Station, City of Phenix City
Total Phosphorous from Failing Septic Systems	Septic Tank Workshops with Pumpout Vouchers	ACES, Chattahoochee – Chipola CWP, City of Phenix City, City of Smiths Station, Smiths Water and Sewer Authority, Alabama Health Departments
Sedimentation and	Signage and Storm Drain	ACES, Lee County, Russell County,

Trash	Markers at Mill Creek Stream Crossings	City of Phenix City, City of Smiths Station, Keep Phenix City Beautiful
Stormwater Runoff Volumes and Organic Enrichment	LID workshops	ACES, City of Phenix City, City of Smiths Station, Lee County, Russell County, Auburn University
Sedimentation	Erosion and Sediment Control Workshops	ACES, ADEM, ASWCC, City of Phenix City, City of Smiths Station, Lee County, Russell County
Stormwater Runoff and Sedimentation	Maintenance Worker Workshops	ACES, ADEM, City of Phenix City, City of Smiths Station, Lee County, Russell County
Stormwater Runoff	Bioretention Central High School in Phenix City	ACES, CHS, ADEM, Phenix City Board of Education, Phenix City Beautiful, Phenix City Garden Club, Russell County Board of Education
Stormwater Runoff	Bioretention at SSHS	ACES, SS HS, SS HS Science Clubs, City of Smiths Station, Le County Board Of Education
Stormwater Runoff	Bioretention at PCI	ACES, CHS, ADEM, Phenix City Board of Education, PCB, Phenix City Garden Club, Russell County Board Of Education
Stormwater Runoff	Bioretention at Phenix City Utility Lot	ACES, City of Phenix City, Russell County
Illegal Dumping and Trash	Promotion of Help the Hooch and PALS Clean-Up Days	ACES, Chatt-Chip CWP, Keep Phenix City Beautiful, PCI, CHS, SSHS
Sediment and Organic Enrichment	Compactor Site on Lee Road 240	ACES, Lee County, City of Smiths Station
Sediment and nutrients	Streambank Stabilization In Phenix City and Smiths Station	ACES, City of Smiths Station, City of Phenix City, Russell County, Lee County, Chattahoochee – Chipola CWP
Sediment and organic enrichment	SSHS Constructed Stormwater Wetland	ACES, SSHS, SSHS Science Clubs, City of Smiths Station

Partnerships with the City of Phenix City and the City of Smiths Station are prioritized based on these cities' Phase II Municipal Separate Storm Sewer System (MS4) status. Phase II Permits are issued to cities in urbanized areas with populations less than 100,000 as defined by the US Census Bureau. USEPA states that Phase II MS4s are required to address post-construction stormwater runoff. Phase II MS4s should adopt strategies that implement both structural and non-structural BMPs. Plans to maintain BMPs to ensure BMP operation and efficiency should also be considered a priority.

The Mill Creek Steering Committee acknowledges the advantages associated with a partnership between this plan and Phase II MS4 communities. Through implementation, these partnerships can help these communities meet their six control measures associated with their Phase II Stormwater Permit, specifically control measures related to public education, public involvement, and pollution prevention or good housekeeping.

USEPA Six Control Measures:

1. Public Education - BMPs for MS4s to inform individuals and households about ways to reduce stormwater pollution.
2. Public Involvement - BMPs for MS4s to involve the public in the development, implementation, and review of an MS4's stormwater management program.
3. Illicit Discharge Detection & Elimination - BMPs for identifying and eliminating illicit discharges and spills to storm drain systems.
4. Construction - BMPs for MS4s and construction site operators to address stormwater runoff from active construction sites.
5. Post-construction - BMPs for MS4s, developers, and property owners to address stormwater runoff after construction activities have completed.
6. Pollution Prevention/Good Housekeeping - BMPs for MS4s to address stormwater runoff from their own facilities and activities.

8.2 Implementation Timeline and Milestones

As with any successful plan, it is important to have milestones and check points to measure progress over time. The Mill Creek Steering Committee has compiled a draft schedule to outline expected completion dates for activities during the suggested two years for implementation of this Plan (Table 15).

Table 15. Implementation Schedule and Milestones.

Activity Type	Milestones to Measure Progress	Expected Completion
Identify and Involve Watershed Community Partners	• Hold stakeholder meetings to plan implementation projects • Identify partners • Address City Councils and Commissions to introduce implementation plan • Meet with local schools to discuss action plans	**Year 1, Quarter 1 and Ongoing**
Volunteer Monitoring for AWW	• Identify volunteers to monitor Mill Creek • Coordinate AWW certification workshops if necessary • Identify any additional sampling locations on Mill Creek and Holland Creek	**Year 1, Quarter 1 and Ongoing**
Coordinate with Engineer or Design Professional	• Make contact with design professionals needed for on-the-ground BMPs • Begin design process for on-the-ground BMPs (Bioretention, constructed stormwater wetland,	**Year 1, Quarter 1**

	storm drain retrofits)	
Website Development	• Design Mill Creek Implementation website • Provide advertisements and links to workshop registration	**Year 1, Quarter 2 and Ongoing**
BMP Implementation Phase I	• Identify BMPs and feasibility of projects suggested • Identify partners for BMPs	**Year 1, Quarter 2**
Septic Workshop Coordination	• Identify funding source(s) for pumpout vouchers • Hold meeting or other correspondence with local septic tank maintenance companies	**Year 1, Quarter 2**
Present BMP Designs and Coordinate Installation	• BMP designs should be presented to City, County, and Board of Education • Schedule BMP installation	**Year 1, Quarter 2**
Workshop Coordination Phase I	• Identify local partners to help with workshops and to help provide in-kind services for workshops • Identify any speakers needed for workshop • Determine publicity needed for attendance • Locate and reserve facilities for workshops • Workshop scheduling • Identify field locations for outdoor workshops • Identify supplies needed or other logistical information such as A/V, transportation, coffee, etc.	**Year 1, Quarter 2**
Coordinate Supplies	• Request quotes and order materials such as storm drain markers and watershed signs • If necessary, pre-order any plant material needed for BMPs	**Year 1, Quarter 2 and Ongoing**
On-the-Ground BMP Implementation	• Install and construct on-the-ground BMPs	**Year 1, Quarter 2 and Ongoing**
Workshop Coordination Phase II	• Develop workshop agendas and set up online registration • Coordination with AU for information and paperwork regarding registration fees, continuing education credits, supplies, etc. • Develop presentations to be presented at workshops • Conduct Workshops for NEMO, LID, Maintenance Workers, and Erosion and Sediment Control	**Year 1, Quarter 3**
Semi-Annual Report	• Prepare and send semi-annual report to ADEM	**Year 1, Quarter 3**
Semi-Annual	• Prepare and send semi-annual report to ADEM	**Year 2,**

Report		**Quarter 1**
Identify Monitoring Strategies	• Search for monitoring locations to assess BMP effectiveness • Identify volunteer monitors or other monitoring strategies to provide up to 2 years of monitoring	**Year 2, Quarter 2**
Design Mill Creek Brochure	• Produce informative brochure highlighting Mill Creek and implementation strategies	**Year 2, Quarter 2**
Semi-Annual Report	• Prepare and send semi-annual report to ADEM	**Year 2, Quarter 3**
Final Report	• Prepare and send final report to ADEM	**Year 2, Quarter 4**

8.3 Budget

This watershed plan seeks to implement financially effective practices in targeted subwatersheds to reduce pollutant loads for Mill Creek. The Steering Committee understands that funding is limited and that all suggested BMPs might not be funded. In this case, Steering and Technical Committees will determine projects to implement based on cost and associated pollutant removal efficiencies of each BMP. Table 16 shows estimated costs for construction and for technical assistance needed to implement BMPs in the watershed.

Table 16. Mill Creek Implementation Budget

Category	Amount	Potential Funding Sources
Coordinator		
Salary (2.0 FTE)	**86,600**	**Section 319(h), Auburn University, ACES**
Fringe @ 35%	**30,310**	
Signage and Promotional materials		
Watershed Signs (10 @ $100)	**1,000**	**Section 319(h), Lee County, Russell County, ACES, CWP, USDA**
Storm drain markers (400 @ $3.75)	**1,500**	
Promotional Materials (Printing)	**2,000**	
BMP Signage	**15,000**	
Workshop Materials, Venue, etc.	**5,000**	**Section 319(h), ACES, CWP, City of Smiths Station, City of Phenix City, ASWCC, SWSA, ADPH, USDA**
Best Management Practices		
CHS (Bioretention and storm drain retrofits)	**20,000**	**Section 319(h), EPA, CHS, City of Phenix City, Phenix City Board of Education,**

		Russell County
SSHS (LID practices)	**25,000**	**Section 319(h), EPA, ACES, USDA, SSHS, City of Smiths Station, Lee County Board of Education, Lee County**
PCI (Rain garden and cistern)	**10,000**	**Section 319(h), EPA, CHS, City of Phenix City, Phenix City Board of Education, Russell County**
Phenix City Utility Lot (Bioretention)	**15,000**	**Section 319(h), EPA, ACES, City of Phenix City, Russell County**
Streambank Stabilization/Instream Structures	**35,000**	**Section 319(h), EPA, USDA, ACES, City of Phenix City, SWCD**
Trash Compactor Site (Bioretention)	**15,000**	**Section 319(h), EPA, ACES, City of Smiths Station, Lee County**
Additional Supplies	**5,000**	**Section 319(h), ACES**
Additional Monitoring		
Chemistry (2.5 yrs)	**16,200**	**ACES, CWP, CSU, AWW**
Macroinvertebrate (3 yrs)	**30,000**	
Travel	**5,000**	**Section 319(h), ACES**
Total	**317,610**	

8.4. Grant Match

In-kind services as well as cash donations are sought by the Mill Creek Steering Committee to provide match for federal funding. Section 319(h) funding can cover up to 60% of eligible project costs, but the remaining 40% is the responsibility of the applicant to acquire through non-federal match. Match can be provided through monies, volunteering, equipment, supplies, or any other no cost services or goods that can help to implement this plan. Some examples of in-kind services might include donation of a front-end loader, mulch or boulders supplied at no cost, and volunteer days to install storm drain markers. Mill Creek Plan Partners are encouraged to aid this plan financially through donation of equipment, labor for implementation of on-the-ground BMPs, and through community outreach projects. In-kind services can greatly reduce the total amount of funding necessary to implement BMPs while maximizing grant funds. It is the intent of this plan to seek additional federal funding outside of the Section 319(h) Program at ADEM to aid in providing federal funding sources for this Plan through grants from other agencies such as EPA and USDA.

8.5 Post BMP Implementation Additional Monitoring

Mill Creek Committees understand that the stream did not become impaired overnight and thus, restoring it to its healthy state may take years following implementation of this plan. Raising environmental awareness through education and BMP installation is a lengthy process. Not only this, but fostering an environmental consciousness, generating interest, involvement, and buy-in from community members takes time.

Monitoring through AWW and ADEM Field Operations will be conducted prior to and following BMP installation to assess pollutant removal efficiencies of structural BMPs. ADEM Field Operations will return to the Mill Creek Watershed as part of their Five Year Rotational River Basin Assessment in 2013. This Plan aspires to have the majority of structural BMPs suggested by this plan installed by this time so that monitoring completed by ADEM may assess BMP effectiveness. Prioritized BMPs may change following additional monitoring or the development of a TMDL.

Monitoring through CSU will aid in providing background data for macroinvertebrate population density in Mill Creek prior to BMP installation. This plan suggests post BMP water chemistry and physical monitoring as well as additional macroinvertebrate sampling for a minimum of two years following implementation.

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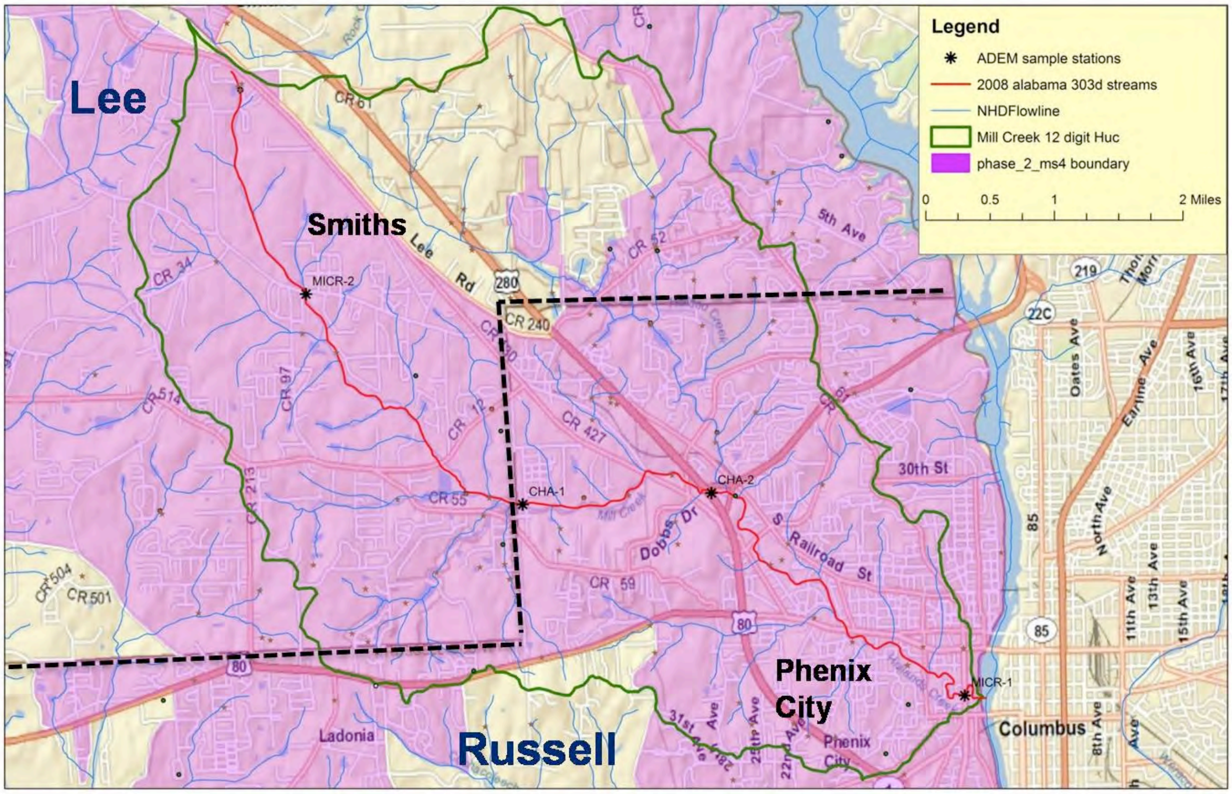
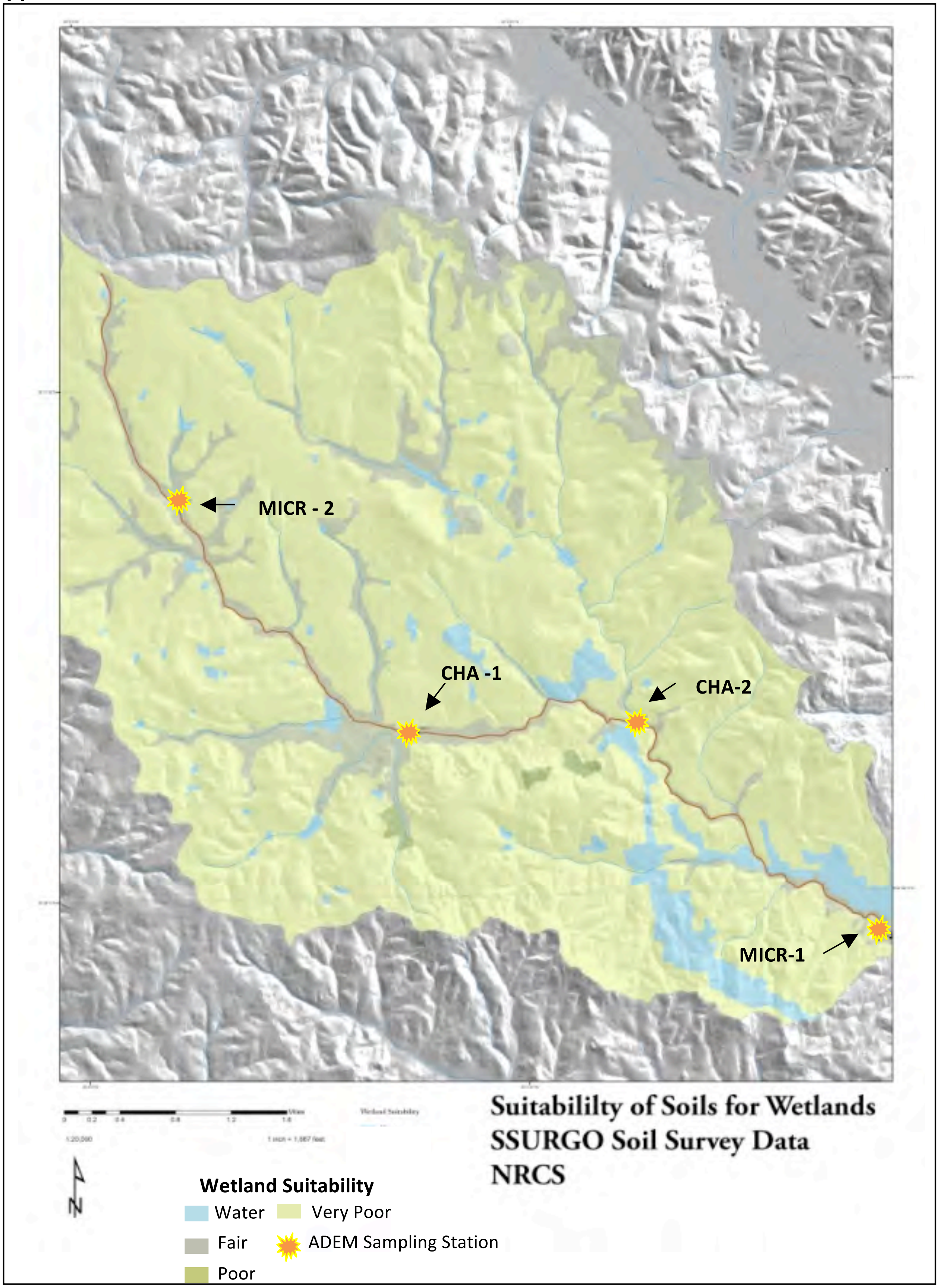
Appendix A

Mill Creek Watershed Boundary Map

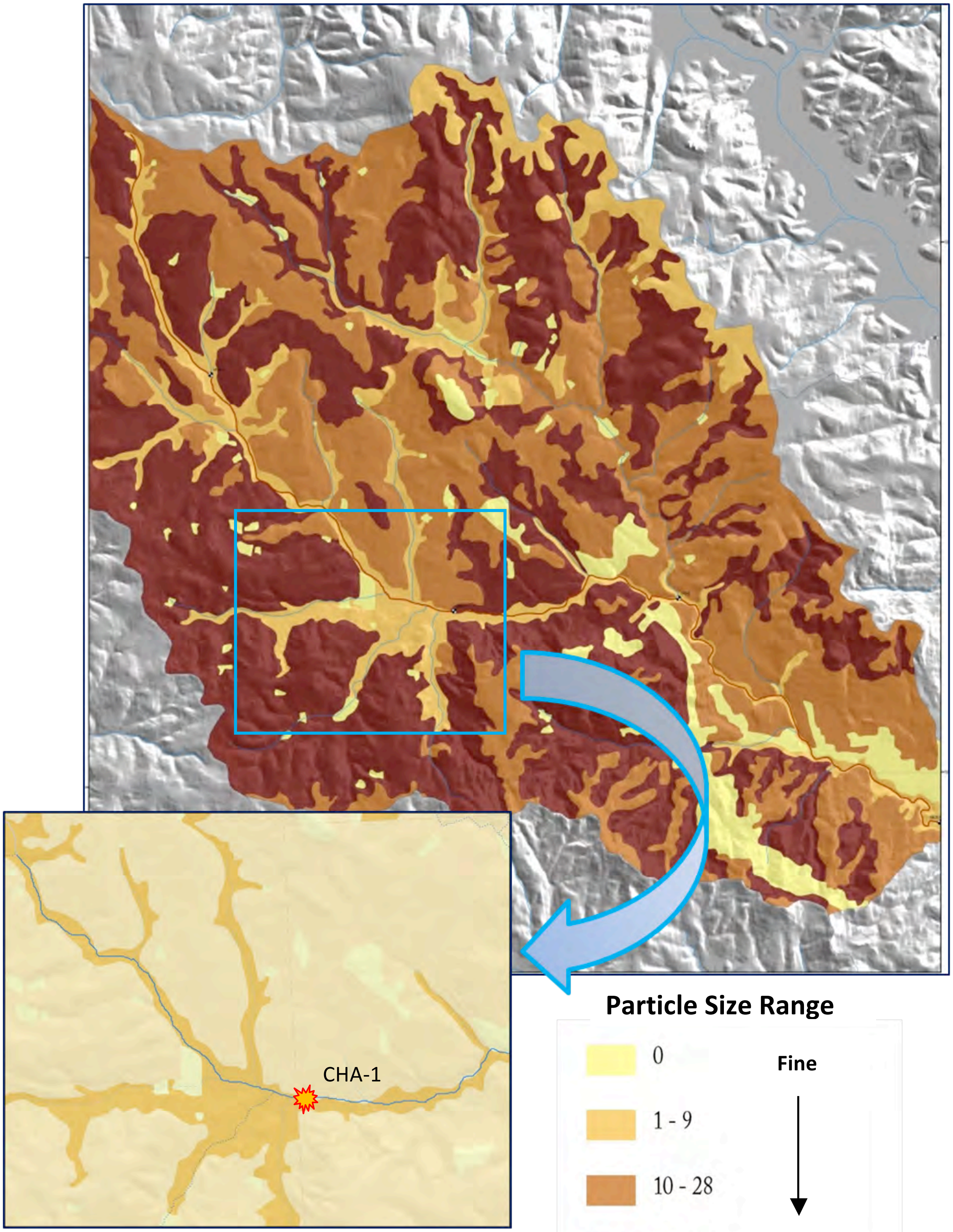


Station ID	Description	Latitude	Longitude
MICR -2	Near intersection of CR 246 and CR 301	32°30'44.02"N	85° 5'15.07"W
CHA -1	At Poyner Dr. near intersection of Poyner Ct.	32°29'17.02"N	85° 3'33.01"W
CHA -2	Near intersection of Hwy 280 and Phenix City N Bypass	32°29'20.29"N	85° 2'2.40"W
MICR -1 (1999, 2008) CHA-3 (1996)	At Broad St. bridge in Phenix City	32°27'56.15"N	85° 0'2.80"W

Appendix B


MICR - 2
CHA -1
CHA-2
MICR-1
Suitabililty of Soils for Wetlands
SSURGO Soil Survey Data
NRCS
Wetland Suitability
Water
Very Poor
Fair
ADEM Sampling Station
Poor

Soil Particle Size in Mill Creek Watershed



Appendix C List of Endangered or Threatened Species from the Alabama Natural Heritage Program.

Scientific Name	Common Name	State Rank[1]	State Status[2]	County
Birds				
Haliaeetus leucocephalus	bald eagle	S3B	SP	Lee
Columbina passerine	common ground-dove	S3	SP	Lee and Russell
Picoides borealis[3]	red-cockaded woodpecker	S2	SP	Russell
Limnothlypis swainsonii	Swainson's warbler	S3B		Lee and Russell
Aimophila aestivalis	Bachman's sparrow	S3		Russell
Ammodramus savannarum	grasshopper sparrow	S3		Lee and Russell
Mammals				
Spilogale putoris	Eastern spotted skunk	S2/S3		Lee
Mustela frenata	long-tailed weasel	S3	SP	Lee
Ursus americanus	black bear	S2		
Tadarida brasiliensis	Brazilian free-tailed bat	S3		Lee
Zapus hudsonius	meadow jumping mouse	S3	SP	Lee
Reptiles				
Macrochelys temminckii	alligator snapping turtle	S3	SP	Russell
Gopherus polyphemus	gopher tortoise	S3	SP	Russell
Eumeces anthracinus	coal skink	S3		Russell
Lampropeltis calligaster rhombomaculata	mole kingsnake	S3		Lee and Russell
Nerodia taxispilota	brown water snake	S3		Lee and Russell
Amphibians				
Desmognathus apalachicolae	Apalachicola duskysalamander	S3		Russell
Plethodon serratus	Southern redback salamander	S2/S3		Lee
Plethodon websteri	Webster's salamander	S3		Lee
Fishes				
Moxostoma lachneri	greater jumprock	S3		Lee
Moxostoma sp cf. *poecilurum*	Apalachicola redhorse	S2		Lee and Russell
Campostoma pauciradii	bluefin stoneroller	S2		Lee and Russell
Cyprinella callitaenia	bluestripe shiner	S1/S2		Lee and Russell

Cyprinella gibbsi	Tallapoosa shiner	S3		Lee
Hybopsis lineapunctata	lined chub	S3		Lee
Hybopsis winchelli	clear chub	S3		Lee
Luxilus zonistius	bandfin shiner	S3		Lee and Russell
Notropis hypsilepis	highscale shiner	S2		Lee and Russell
Notropis maculatus	taillight shiner	S3		Russell
Pteronotropis euryzonus	broadstripe shiner	S2		Lee and Russell
Micropterus cataractae	shoal bass	S2		Lee and Russell
Etheostoma tallapoosae	Tallapoosa darter	S3		Lee
Etheostoma zonifer	backwater darter	S3		Russell
Perca flavescens	Yellow perch	S3		Lee and Russell
Percina palmaris	Bronze darter	S3		Lee
Percina smithvanizi	muscadine darter	S2		Lee
Percina sp. cf. *palmaris*	Halloween darter	S1		Russell
Ameiurus brunneus	snail bullhead	S3		Lee and Russell
Ameiurus catus	white catfish	S3		Lee and Russell
Ameiurus serracanthus	spotted bullhead	S2		Lee and Russell
Clams and Mussels				
Alasmidonta triangulata	Southern elktoe	S1	PS	Russell
Elliptio fumata	gulf slabshell	S3	PS	Lee and Russell
Elliptio purpurella	inflated spike	S1	PS	Russell
Elliptoideus sloatianus[3]	purple bankclimber	S1	SP	Lee
Hamiota altilis[3]	finelined pocketbook	S2	SP	Lee
Hamiota subangulata[3]	shinyrayed pocketbook	S1	SP	Lee and Russell
Lampsilis floridensis	Florida sandshell	S2	PS	Lee and Russell
Medionidus penicillatus	Gulf moccasinshell	S1	SP	Russell
Pleurobema decisum[3]	Southern clubshell	S2	SP	Lee
Pleurobema perovatum[3]	ovate clubshell	S1	SP	Lee
Pleurobema pyriforme	oval pigtoe	S1	SP	Lee and Russell

Pyganodon cataract	Eastern floater	S1	PS	Russell
Quadrula infucata	sculptured pigtoe	S1		Lee and Russell
Strophitus connasaugaensis	Alabama creekmussel	S3	PS	Lee
Toxolasma corvunculus	Southern purple lilliput	S1	PS	Lee
Toxolasma parvum	lilliput	S3	PS	Lee
Toxolasma paulus	iridescent lilliput	S2	PS	Lee and Russell
Uniomerus columbensis	Apalachicola pondhorn	S2	PS	Lee and Russell
Villosa villosa	downy rainbow	S1	PS	Lee
Crayfish and Shrimp				
Cambarus acanthura	thornytail crayfish	S3		Russell
Cambarus bartonii	Appalachian brook crayfish	S2		Lee
Cambarus halli	slackwater crayfish	S3		Lee
Cambarus howardii	Chattahoochee crayfish	S2		Lee
Procambarus lewisi	spur crayfish	S3		Russell
Procambarus paeninsulanaus	peninsula crayfish	S2		Lee
Plants				
Botrychium jenmanii	Alabama grapefern	S1		Lee
Psilotum nudum	whisk fern	S1		Lee
Isoetes virginica	Piedmont quillwort	S2		Lee
Selaginella arenicola spp *riddellii*	Riddell's spike moss	S2		Lee
Selaginella rupestris	ledge spike-moss	S2		Lee
Carex impressinervia	impressed-nerved sedge	S1		Russell
Rhynchospora globularis var. *saxicola*	Stone Mountain beakrush	S1		Lee
Panicum lithophilum	Swallen's panic-grass	S1		Lee
Juncus georgianus	Georgia rush	S1		Lee
Hymenocallis coronaria	shoals spider-lily	S2		Lee
Trillium reliquum[3]	relict trillium	S2		Lee
Trillium rugelii	Southern nodding trillium	S2		Lee
Trillium vaseyi	Vasey's trillium	S1		Lee
Croomia pauciflora	croomia	S2		Lee and Russell

Liparis loeselii	Loesel's twayblade	S1	Lee
Hexastylis shuttleworthii var *harperi*	Harper's wild ginger	S2	Russell
Brickellia cordifolia	Flyr's brickell-bush	S2	Lee and Russell
Echinacea pallida	pale-purple coneflower	S2	Lee
Helianthus porteri	confederate daisy	S2	Lee
Rudbeckia heliopsis	sun-facing coneflower	S2	Lee
Arabis georgiana[3]	Georgia rockcress	S1	Russell
Rhododendron prunifolium	plumleaf azalea	S2/S3	Lee and Russell
Baptisia megacarpa	Apalachicola wild indigo	S2	Lee
Pycnanthemum curvipes	a mountain mint	S1	Lee
Waldsteinia lobata	Piedmont barren strawberry	S1	Lee
Phacelia dubia var *georgiana*	outcrop small-flower phacelia	S2	Lee
Hypericum nudiflorum	pretty St. John's-wort	S2	Lee

[1]Alabama Heritage Program uses the ranking system developed by the Nature Conservancy to define the state-wide status of a species. State ranks range from S1 to S5 with S1 being the most critically imperiled and S5 being the most secure.

[2]State Status denotes regulatory protection received. SP is state protected and is assigned to species that are protected by the Alabama Game, Fish, and Fur Bearing Animals Regulation. PS is partially protected and is assigned to mussel species that are not protected under the Alabama Game, Fish, and Fur Bearing Animals Regulation but are partially protected under other regulations of the Alabama Invertebrate Species Regulation.

[3]Reported in 2007 by the Alabama Ecological Services Field Office as threatened or endangered.

Appendix D

NPDES Permits

Facility Name	**Permit Number**	**Address**	**Valid Until**
Diversified Iron and Metal	ALG180665	5585 Lee Road 430 Phenix City, AL 36870	Sept. 30, 2012
Mid South Auto Parts Inc.	ALG180444	3755 Opelika Road Phenix City, AL 36870	Sept. 30, 2012
Ready Mix USA	ALG110294	2804 Dobbs Drive Phenix City, AL 36870	Aug. 31,2012
Terry's Get N Go	ALG340563	9209 Lee Road 246 Smiths Station, AL 36877	Jan. 31, 2012
Vectorply Corp	ALG240066	3406 South RR Street Phenix City, AL 36867	Sept. 30, 2012

Appendix E
From: Citizen of East Alabama
By Brent Godwin
Staff Writer

Over the past decade, the city of Smiths Station has grown rapidly. Families and businesses have moved to the area consistently since the town was first incorporated in 2001.

But with progress comes problems.

"The area developed so fast-and with no guidelines," said Mayor LaFaye Delinger. As a result, residents of Smiths Station are experiencing the problems of growing pains.

For Larry Gruhn, who lives off Lee Road 991 in Smiths Station, he says his neighborhood has problems with their septic systems and drainage.

"The neighborhood is only about 15 years old. There are these new subdivisions going up that are immediately connected to the sewer system," Gruhn said. His neighborhood has widespread problems with the septic systems, and wants to be connected to the sewer lines in town. Their requests have been met with indifference, Gruhn says. "We feel like the red-headed stepchild."

"There is a high turnover rate in our neighborhood. People will move into a house, but no one wants to put 6,000-10,000 dollars in their backyard to try to fix the problem. So they move back out."

The council informed Gruhn that the new developments are connected to the sewer because the developers pay for it to be done. Any project like that would cost money that would usually be provided by federal means.

Councilmember Richard Key said federal money doesn't come in for projects like this very often. In the case of Gruhn's neighborhood, it appears to be too late to be connected.

According to the Smiths Water and Sewage Authority website, they serve a limited area with sanitary sewer service. The website also says that they intend to expand the service area when the budget will allows for it.

The City of Smiths Station doesn't have municipality over the water authority, because the authority was incorporated before the city.

Gruhn urges the water authority to implement a plan that would extend the sewer lines to his neighborhood. The lines run to Smiths Station High School; a stone's throw from Gruhn's house.

He says the problems with drainage in Smiths Station also aren't to be ignored, as they might potentially cause health issues to residents.

With 2009 and 2010 already being such wet years, people with septic systems are suffering by the ground no longer being able to contain any more moisture

Appendix F

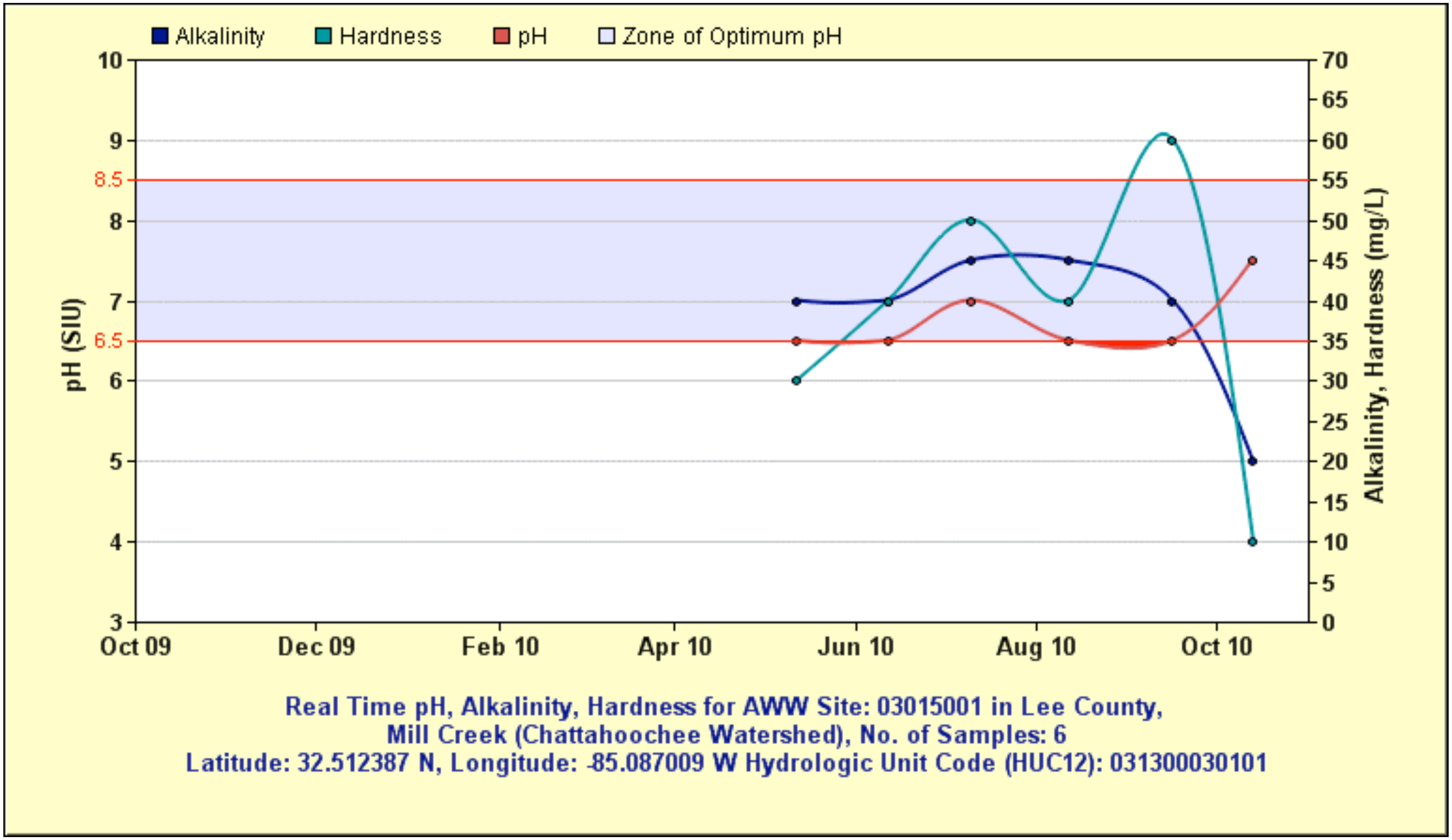
Alabama Water Watch Water Chemistry Data Collected from May to October 2010.

Sampling Locations

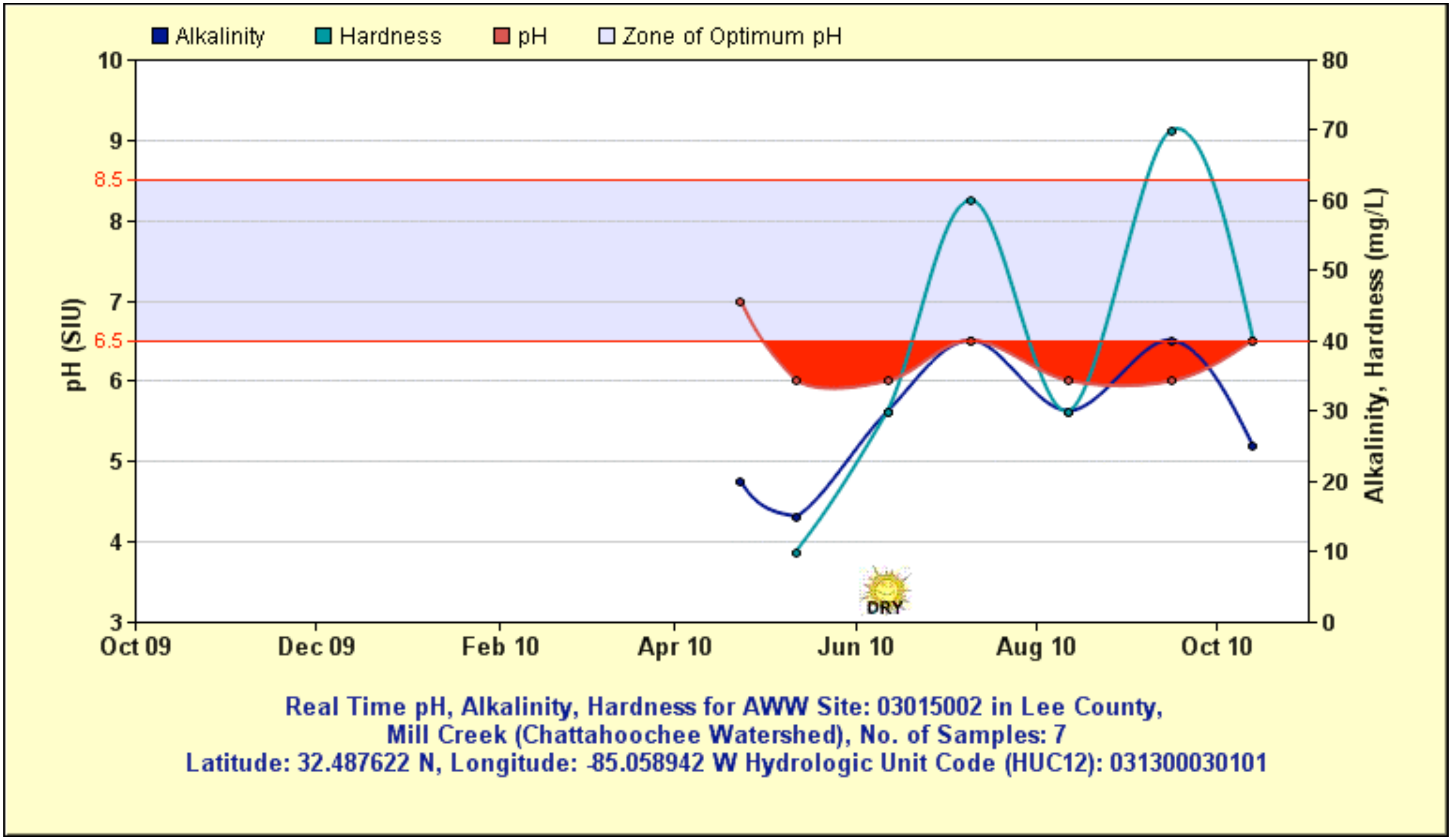
MICR-2	CHA-1

Sampling Month	Dissolved Oxygen (ppm)		Alkalinity (mg/L)		Hardness (mg/L)		Water Temp (°C)		Air Temp (°C)		pH		Turbidity (JTU)	
May	6.3	7	40	15	10	30	20	20	26	26	6.5	6	-	105
June	5.3	2.9	40	30	30	40	27	25	29	28	6.5	6	10	-
July	5.2	4.4	45	40	60	50	27	28	31	33	7	6.5	15	-
August	3.8	1.8	45	30	30	40	27	27	29	30	6.5	6	10	-
September	3.2	1.1	40	40	70	60	23	24	24	25	6.5	6	10	-
October	4.9	2.7	20	25	40	10	23	24	27	26	7.5	6.5	10	-

AWW Monitoring Results for Alkalinity, Hardness, and pH for MICR-2 from May to October 2010 (AWW, 2010).



AWW Monitoring Results for Alkalinity, Hardness, and pH for CHA-1 from May to October 2010 (AWW, 2010).



Appendix G
STEPL Generated Graphs