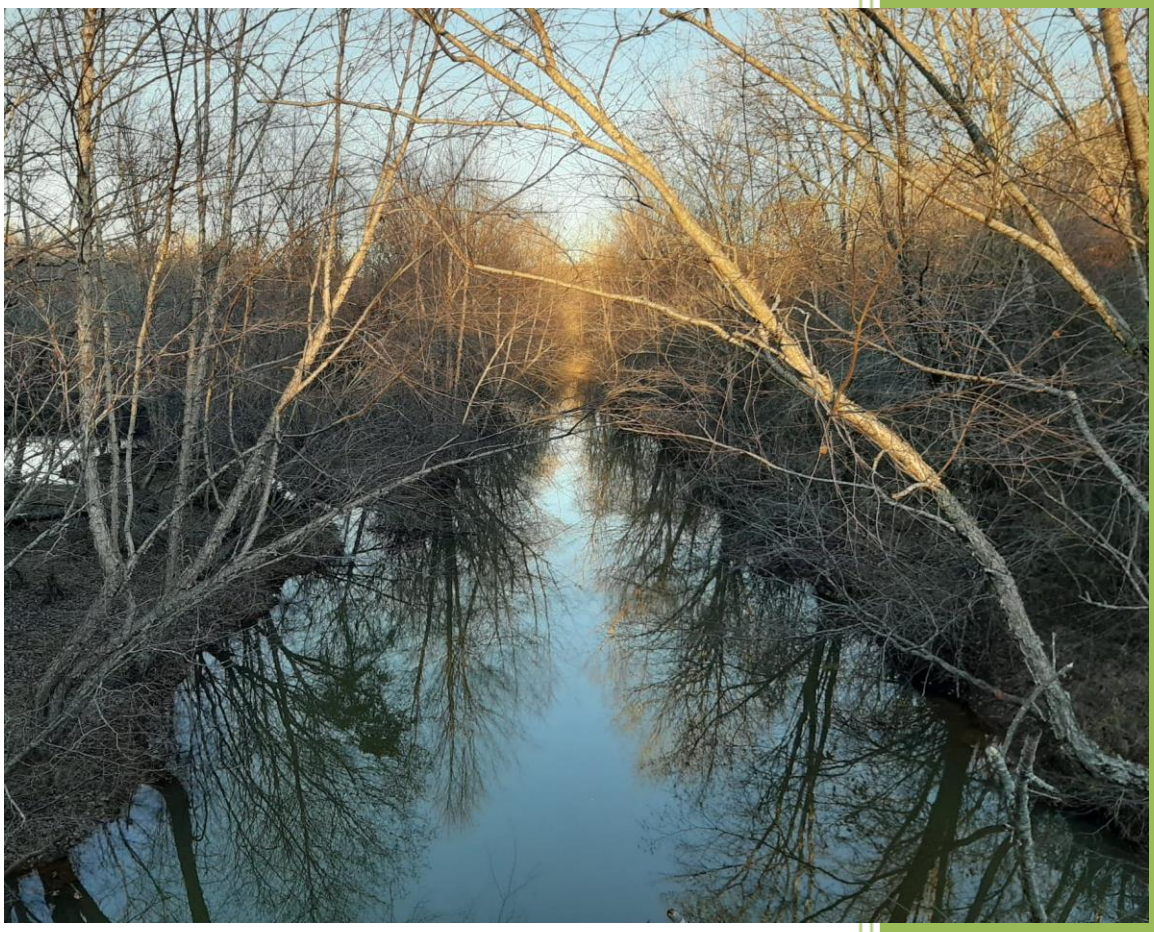
2020

Long Cane Creek Watershed Management Plan



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1.0 SUMMARY

This document describes an interim framework for the implementation of Total Maximum Daily Loads (TMDLs). This interim framework is intended to guide and document the evolving local policies and procedures for advancing consistency with water quality standards. This documentation will promote internal coordination among local, state, and federal agencies and help inform the general public and commercial interests.

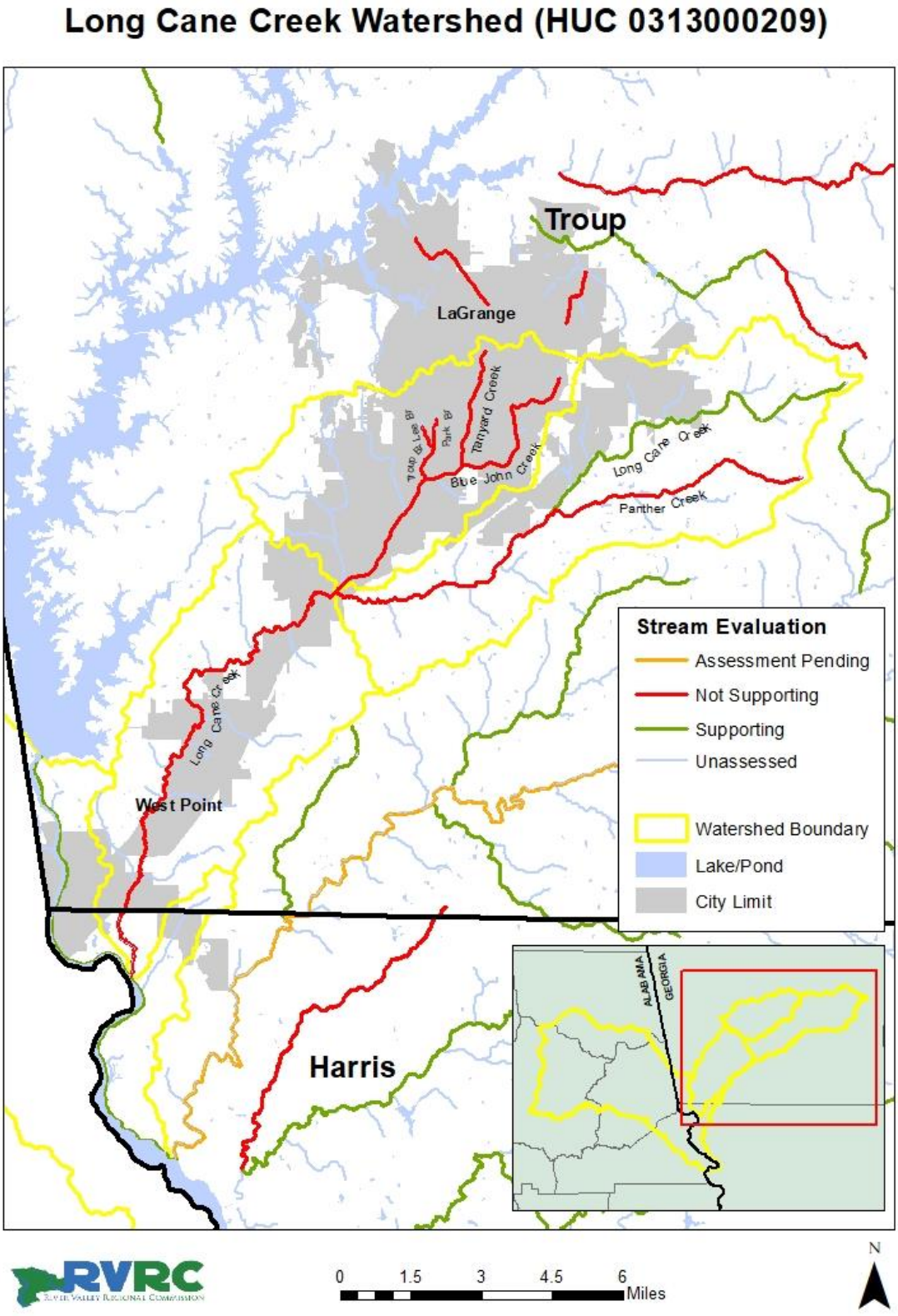
2.0 INTRODUCTION

The Federal Clean Water Act (33 U.S.C. §§ 1251-1387) allows the U.S. Environmental Protection Agency (EPA) to delegate authority to states to implement a technical and administrative framework for managing water quality. Those assigned responsibilities include setting water quality standards, assessing water quality, identifying waters that do not meet standards, establishing limits on impairing substances, and issuing permits to ensure consistency with those pollutant limits.

For waters that do not meet water quality standards due to an excessive pollutant load, the State must conduct a scientific study to determine the maximum amount of the pollutant that can be introduced to a waterbody and still meet standards. That maximum amount of pollutant is called a Total Maximum Daily Load (TMDL). A TMDL is a means for recommending controls needed to meet water quality standards, which are set by the state and determine how much of a pollutant can be present in a waterbody. If the pollutant is over the set limit, a water quality violation has occurred. If a stream is polluted to the extent that there is a water quality standard violation, there cannot be any new additions (or "loadings") of the pollutant into the stream until a TMDL is developed. Pollutants can come from point source and non-point source pollution. Examples of "pollutants" include, but are not limited to: Point Source Pollution – wastewater treatment plant discharges and Non-point Source Pollution – runoff from urban, agricultural, and forested areas – such as animal waste, litter, antifreeze, gasoline, motor oil, pesticides, metals, and sediment. The purpose of developing a Watershed Management Plan for Long Cane Creek is to provide a tool that demonstrates a holistic approach to water quality management.

The Long Cane Creek Watershed Management Plan defines an approach to planning, implementing, and evaluating the effectiveness of best management practices (BMPs) with the goal to achieve the wasteload allocations (WLAs) for fecal coliform (FC) and sediment in order to restore beneficial uses of the Long Cane Creek Watershed (Figure 1).

FIGURE 1. LONG CANE CREEK WATERSHED (HUC 0313000209).



Watershed Management Plans require the development of a process to develop and implement a planning document for the purpose of: 1) creating a local network of partners; 2) identifying and securing resources needed to fund and install management practices and activities that would best achieve the pollutant load reductions needed to meet the TMDL and restore water quality; 3) verifying major sources of impairment; 4) developing a TMDL Implementation Plan that would address USEPA's 9-Key Elements of Watershed Planning; and 5) providing the information needed to support applications for funding (such as EQIP, Section 319(h), GEFA, or others), or identifying existing funding sources such as utility fees, SPLOST, or others.

3.0 SEGMENT AND WATERSHED DESCRIPTION

One of the first steps in understanding a watershed is through the discovery of its general and natural history. This section presents an overview and characterization of the Long Cane Creek watershed. The successful application of BMPs in the Long Cane Creek watershed will depend on the TMDL components, the physical characteristics of the watershed, and regulatory requirements. By having a general knowledge of the history and natural resources of the area, an understanding and appreciation of its existence can be established.

The Long Cane Creek watershed is located in Harris and Troup Counties and covers approximately 84 square miles. This watershed is adjacent to the Chattahoochee River – West Point Lake and Yellowjacket Creek watersheds to the north and the Flat Shoal Creek watershed to the south. The Long Cane Creek watershed is part of the larger Upper Middle Chattahoochee watershed. The Chattahoochee River Basin extends from north-east Georgia and merges with the Flint River Basin at Georgia's south-west corner, where the two waterways converge to form the Apalachicola River before it empties into the Gulf of Mexico.

Long Cane Creek is located in the 10-digit hydrologic unit code (HUC) 0313000209. This Watershed Management Plan will address eight impaired stream segments located within the Long Cane Creek watershed. These include a five-mile segment of Blue John Creek, from its headwaters to Troup Branch, Lee Branch, a tributary to Troup Branch (1 mile), Park Branch, a tributary to Troup Branch (2 miles), a two-mile segment of Tanyard Creek, from its headwaters to Blue John Creek, and Troup Branch, a tributary to Blue John Creek (1 mile), all of which are impaired with fecal coliform, a six-mile segment of Panther Creek, from its headwaters to Long Cane Creek, which is impaired with sediment, and two stream segments which are impaired with both fecal coliform and sediment – a 3-mile segment of Blue John Creek, from Troup Branch to Long Cane Creek and an eighteen-mile segment of Long Cane Creek, from Panther Creek to the Chattahoochee River. Additional information for these segments may be found in Table 3.

Long Cane Creek empties out into the Chattahoochee River in northwest Harris County near the City of West Point. The political jurisdiction of seven of the eight impaired segments within Long Cane Creek watershed is Troup County. The eighteen-mile segment of Long Cane Creek, listed for fecal coliform and sediment impairments is located in both Troup and Harris Counties. The five-mile segment of Blue John Creek, from its headwaters to Troup Branch, the 3-mile segment of Blue John Creek, from Troup Branch to Long Cane Creek, Lee Branch, Park Branch, the two-mile segment of Tanyard Creek, from its headwaters to Blue John Creek, and Troup Branch are located entirely within the city limits of LaGrange. The eighteen-mile segment of

Long Cane Creek, from Panther Creek to the Chattahoochee River, is located partially within the city limits of LaGrange and West Point, respectively.

The physical landscape consists of ridgetops and hillsides that are dissected by numerous drainageways. The streams flow generally south-westward. Figure 2 shows the Long Cane Creek watershed Land Use Trends of 2015 from the University of Georgia Natural Resources Spatial Analysis Laboratory. This map demonstrates the characteristics of the land use cover within the Long Cane Creek watershed. A large majority of the watershed (47%) consists of forested land, while roughly a quarter (27%) consists of urban land, 12% consists of crop/pasture, and 5% consists of land classified as clearcut/sparse. The remaining 9% is comprised of wetlands and open water. Figure 3, *Long Cane Creek Watershed Existing Land Use*, illustrates the existing land uses in the watershed. The Long Cane Creek watershed encompasses approximately 53,651 acres, comprised primarily of conservation land (29.63%), residential use (18.38%), and agricultural use (16.41%). The remaining land uses include 13.98% exempt (religious/non-profit), 7.46% transportation, 7.45% commercial, 6.38% industrial, 0.29% unused, and 0.02% utility.

The climate of the Long Cane Creek watershed is classified as humid - subtropical (Cfa) according to the Köppen climate classification system. Winters are cool and short with periodic cold spells moderating in 1-2 days. Summers are hot and humid. Annual precipitation averages to 51.2 inches and is spread evenly throughout the year (2-5 inches each month). Measurable snowfalls are very rare with a less than 5% probability each year. When they occur, snowfall amounts are most always less than one inch and melt quickly. In winter, the average minimum daily temperature is 39.2° F. In summer, the average maximum daily temperature is 91.8° F. The first winter freeze typically occurs in early November, and the last freeze typically occurs in mid-March. The frost-free season ranges from 230 to 260 days.

Since three stream segments within the Long Cane Creek watershed are currently on EPD's 303(d) list for sediment impairments, it is important to understand the soil types that contribute to the impairment as well as the topographical characteristics. The Long Cane Creek watershed is located in the Greenville Slope District of the Piedmont Physiographic Province. This province is comprised of a transitional area between the Appalachian Mountains and the coastal plain and is characterized by soils which are fine textured and in many areas, highly erodible. Therefore, soil type may play a critical role in contributing to the sediment impairments within the watershed. Soil types include: Altavista, Appling, Cecil, Chewacla, Davidson, Gwinnett, Helena, Hiwassee, Lloyd, Louisa, Madison, Musella, Pacolet, Riverview, Roanoake, Vance, Wedowee, Wickham, and Wilkes. Table 1 provides a detailed description of the soils identified in the watershed. Figure 4 depicts the details of the Long Cane Creek watershed soils.

Elevations range from roughly 500 feet to 1,300 feet above sea level. Figure 5 shows the slope classifications for the Long Cane Creek watershed. An overwhelming portion of the watershed (roughly 99%) is comprised of slopes ranging from 0-10%, while the remainder is comprised of slopes ranging from 11-26%. It appears that the streams impaired with sediment are encompassed largely by areas with relatively low slope values (<10%). Therefore, it is not likely that soil slope plays a critical role in contributing to the sediment impairments within the watershed.

FIGURE 2. LONG CANE CREEK WATERSHED LAND USE TRENDS.

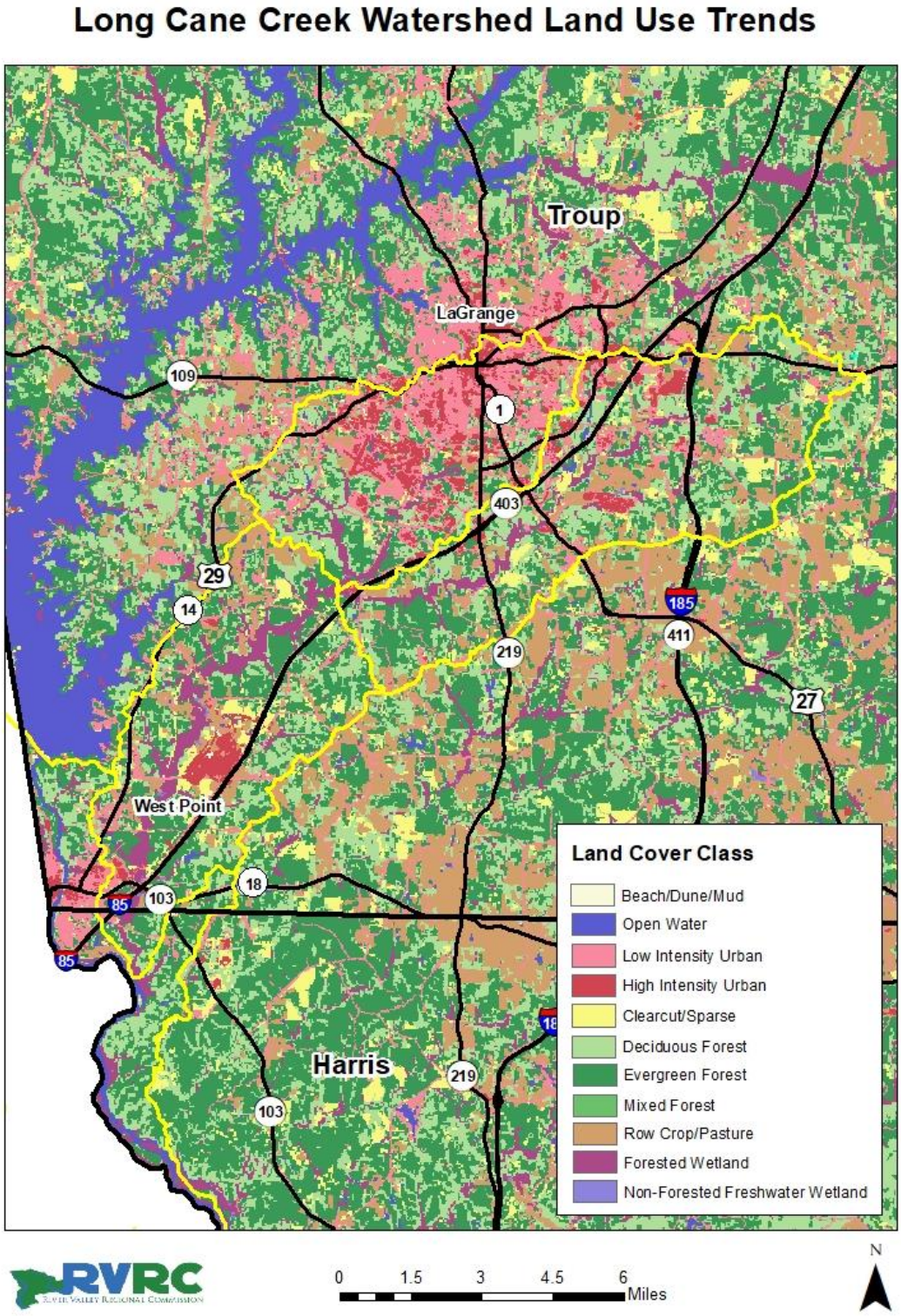


FIGURE 3. LONG CANE CREEK WATERSHED EXISTING LAND USE.

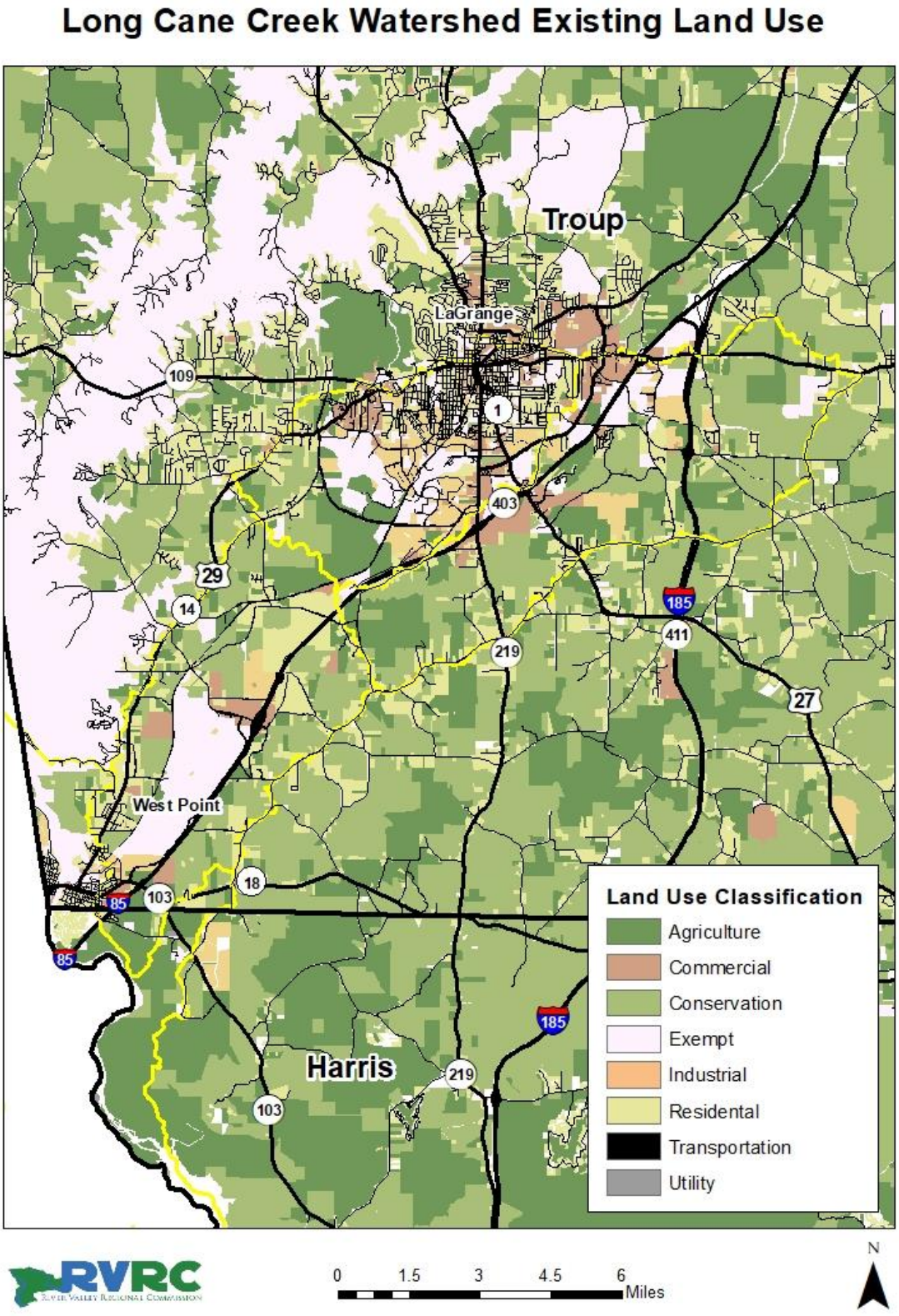


TABLE 1. DETAILED SOILS OF THE LONG CANE CREEK WATERSHED.

Soil Association	Soil Description
Altavista – AkB (Troup County)	Moderately well drained, very gently sloping soils that are sandy and loamy throughout *Location*: Stream terraces near larger creeks and rivers *Landscape*: Southern Piedmont *Landform*: Stream terraces *Slope*: 2 to 6 percent
Appling – AmB (Troup County)	Well drained, very gently sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Low, broad divides between streams in the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 2 to 6 percent
Appling – AmC (Troup County)	Well drained, gently sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Hillsides of low divides between streams in the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Appling – AmD (Troup County)	Well drained, sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Narrow areas on the sides of low divides between streams in the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 15 percent
Appling – AnC2 (Troup County)	Well drained, gently sloping soils that have a sandy clay loam surface layer and subsoil *Location*: Hillsides and ridgetops of low divides between streams in the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Cecil – CeB (Troup County)	Well drained, very gently sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Broad smooth ridgetops of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 2 to 6 percent
Cecil – CeC (Troup County)	Well drained, gently sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Long, narrow ridgetops and moderately long hillsides of the

	Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Cecil – CeD (Troup County)	Well drained, sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 15 percent
Cecil – CfC2 (Troup County)	Well drained, gently sloping soils that have a sandy clay loam surface layer and subsoil *Location*: Narrow ridgetops and moderately long hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Cecil – CfD2 (Troup County)	Well drained, sloping soils that have a sandy clay loam surface layer and a clay loam subsoil *Location*: Short hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 15 percent
Cecil-Urban Land – CuC (Troup County)	Well drained, very gently sloping to gently sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Ridgetops and hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 2 to 10 percent
Cecil-Urban Land – CuE (Troup County)	Well drained, sloping to moderately steep soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 25 percent
Davidson – DgB (Troup County)	Well drained, very gently sloping soils that have a loamy surface layer and a clay loam subsoil *Location*: Broad ridgetops of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills, ridges *Slope*: 2 to 6 percent
Gwinnett – GwC2 (Troup County)	Well drained, gently sloping soils that have a sandy clay loam surface layer and subsoil *Location*: Ridgetops and hillsides of the Piedmont Upland *Landscape*: Southern Piedmont

	Landform: Hills *Slope*: 6 to 10 percent
Gwinnett – GwD2 (Troup County)	Well drained, sloping soils that have a sandy clay loam surface layer and subsoil *Location*: Hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 15 percent
Helena – HyB (Troup County)	Moderately well drained, very gently sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Low side slopes of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 2 to 6 percent
Helena – HyC (Troup County)	Moderately well drained, gently sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Low side slopes of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Louisa – LoF (Troup County)	Somewhat excessively drained, moderately steep to steep soils that have a gravelly fine sandy loam surface layer and a gravelly loam or bedrock subsoil *Location*: Hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 15 to 40 percent
Madison – MdB (Troup County)	Well drained, very gently sloping soils that have a gravelly sandy loam surface layer and a clay loam or sandy loam subsoil *Location*: Broad ridgetops of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 2 to 6 percent
Madison – MdC (Troup County)	Well drained, gently sloping soils that have a gravelly sandy loam surface layer and a clay loam or sandy loam subsoil *Location*: Ridgetops and hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills, ridges *Slope*: 6 to 10 percent
Madison – MdE (Troup County)	Well drained, moderately steep soils that have a gravelly sandy loam surface layer and a clay loam or sandy loam subsoil *Location*: Hillsides adjacent to drainageways of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 15 to 25 percent

Madison – MfC2 (Troup County)	Well drained, gently sloping soils that have a gravelly fine sandy loam surface layer and clay loam or sandy loam subsoil *Location*: Ridgetops and hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Madison – MfD2 (Troup County)	Well drained, sloping soils that have a gravelly fine sandy loam surface layer and a clay loam or sandy loam subsoil *Location*: Hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 15 percent
Musella – MvC2 (Troup County)	Well drained, gently sloping soils that have a clay loam surface layer and a gravelly clay loam or weathered bedrock subsoil *Location*: Narrow ridgetops of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Musella – MwE (Troup County)	Well drained, sloping to moderately steep soils that have a stony clay loam surface layer and a gravelly clay loam or weathered bedrock subsoil *Location*: Narrow ridgetops and hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 25 percent
Pacolet – PgC2 (Troup County)	Well drained, gently sloping soils that have a sandy clay loam surface layer and subsoil *Location*: Narrow ridgetops and short hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Pacolet – PgD2 (Troup County)	Well drained, sloping soils that have a sandy clay loam surface layer and subsoil *Location*: Short hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 15 percent
Pacolet – PgE2 (Troup County)	Well drained, moderately steep soils that have a sandy clay loam surface layer and subsoil *Location*: Hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 15 to 25 percent
Pacolet-Udorthents –	Well drained, moderately steep soils that have a clay loam surface

PhE3 (Troup County)	layer and sandy clay loam subsoil *Location*: Hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 15 to 25 percent
Pacolet – PUF (Troup County)	Well drained, moderately steep to steep soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Narrow ridgetops and hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 15 to 40 percent
Riverview – Rh (Troup County)	Well drained, nearly level soils that have a loamy surface layer and a sandy loam subsoil *Location*: Floodplains near creeks and rivers and depressions on uplands *Landscape*: Southern Piedmont *Landform*: Floodplains *Slope*: 0 to 2 percent
Riverview-Chewacla – RK (Troup County)	Well drained, nearly level soils that have a loamy surface layer and a sandy loam subsoil *Location*: Natural levees adjacent to stream channels and lower areas adjacent to uplands *Landscape*: Southern Piedmont *Landform*: Floodplains *Slope*: 0 to 2 percent
Roanoke – Ro (Troup County)	Poorly drained, nearly level soils that have a silty clay loam surface layer and a clayey subsoil *Location*: Low stream terraces along larger streams of floodplains in the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Stream terraces *Slope*: 0 to 2 percent
Rock outcrop, granite – Rx (Troup County)	Bare and hard granite bedrock with small areas of black loamy soil *Location*: Very gently sloping ridgetops and steep hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: - *Slope*: -
Urban Land – Ud (Troup County)	Soils modified by cutting, filling, shaping, and smoothing *Location*: Ridgetops and hillsides near drainageways and floodplains in and near the cities of LaGrange and Newnan *Landscape*: Southern Piedmont *Landform*: - *Slope*: -
Vance – VaB	Well drained, very gently sloping soils that have a sandy loam surface

(Troup County)	layer and a clayey or loamy subsoil *Location*: Ridgetops of divides between streams in the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 2 to 6 percent
Vance – VaC (Troup County)	Well drained, gently sloping soils that have a sandy loam surface layer and a clayey or loamy subsoil *Location*: Sides of divides between streams in the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Wedowee – WeC (Troup County)	Well drained, gently sloping soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Narrow ridgetops of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Wedowee – WEE (Troup County)	Well drained, sloping to moderately steep soils that have a sandy loam surface layer and a sandy clay loam subsoil *Location*: Narrow ridgetops and hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 25 percent
Wickham – WhB (Troup County)	Well drained, very gently sloping soils that have a fine sandy loam surface layer and a sandy clay loam or loamy subsoil *Location*: Upper part of stream terraces in the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Stream terraces *Slope*: 2 to 6 percent
Wickham – WhC (Troup County)	Well drained, gently sloping soils that have a fine sandy loam surface layer and a sandy clay loam or loamy subsoil *Location*: Sides of stream terraces in the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Stream terraces *Slope*: 6 to 10 percent
Wilkes – WvC (Troup County)	Well drained, very gently sloping to gently sloping soils that have a gravelly sandy loam surface layer and a clay loam or weathered bedrock subsoil *Location*: Narrow ridgetops of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 4 to 10 percent
Wilkes – WvF (Troup County)	Well drained, sloping to steep soils that have a gravelly sandy loam surface layer and a clay loam or weathered bedrock subsoil

	Location: Hillsides of the Piedmont Upland *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 35 percent
Cecil – CeC2 (Harris County)	Well drained, gently sloping soils that have a sandy loam surface layer and a clay loam or sandy loam subsoil *Location*: Hills, piedmonts *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Chewacla – ChA (Harris County)	Somewhat poorly drained, nearly level soils that have a loamy surface layer and a clay loam or sandy clay loam subsoil *Location*: Floodplains, piedmonts *Landscape*: Southern Piedmont *Landform*: Floodplains *Slope*: 0 to 2 percent
Hiwassee – HsB (Harris County)	Well drained, very gently sloping soils that have a sandy loam surface layer and a clay loam subsoil *Location*: High terraces on piedmonts *Landscape*: Southern Piedmont *Landform*: Terraces *Slope*: 2 to 6 percent
Hiwassee – HsC (Harris County)	Well drained, gently sloping soils that have a sandy loam surface layer and a clay loam subsoil *Location*: High terraces on piedmonts *Landscape*: Southern Piedmont *Landform*: Terraces *Slope*: 6 to 10 percent
Hiwassee-Urban Land Complex – HwC (Harris County)	Well drained, very gently to gently sloping soils that have a sandy loam surface layer and a clay loam subsoil *Location*: High terraces on piedmonts *Landscape*: Southern Piedmont *Landform*: Terraces *Slope*: 2 to 10 percent
Lloyd – LdB2 (Harris County)	Well drained, very gently sloping soils that have a loamy surface layer and clay loam subsoil *Location*: Hills, piedmonts *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 2 to 6 percent
Lloyd – LdC2 (Harris County)	Well drained, gently sloping soils that have a loamy surface layer and a clay loam subsoil *Location*: Hills, piedmonts *Landscape*: Southern Piedmont *Landform*: Hills

	Slope: 6 to 10 percent
Pacolet – PaC2 (Harris County)	Well drained, gently sloping soils that have a sandy loam surface layer and a clay loam or sandy loam subsoil *Location*: Hills, piedmonts *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 6 to 10 percent
Pacolet – PaD2 (Harris County)	Well drained, sloping soils that have a sandy loam surface layer and a clay loam or sandy loam subsoil *Location*: Hills, piedmonts *Landscape*: Southern Piedmont *Landform*: Hills *Slope*: 10 to 15 percent

Source: NRCS/USDA Soil Survey of Coweta, Heard, and Troup Counties, GA. 1976; NRCS/USDA Web Soil Survey; NRCS/USDA NASIS Soil Descriptions

FIGURE 4. LONG CANE CREEK WATERSHED SOILS.

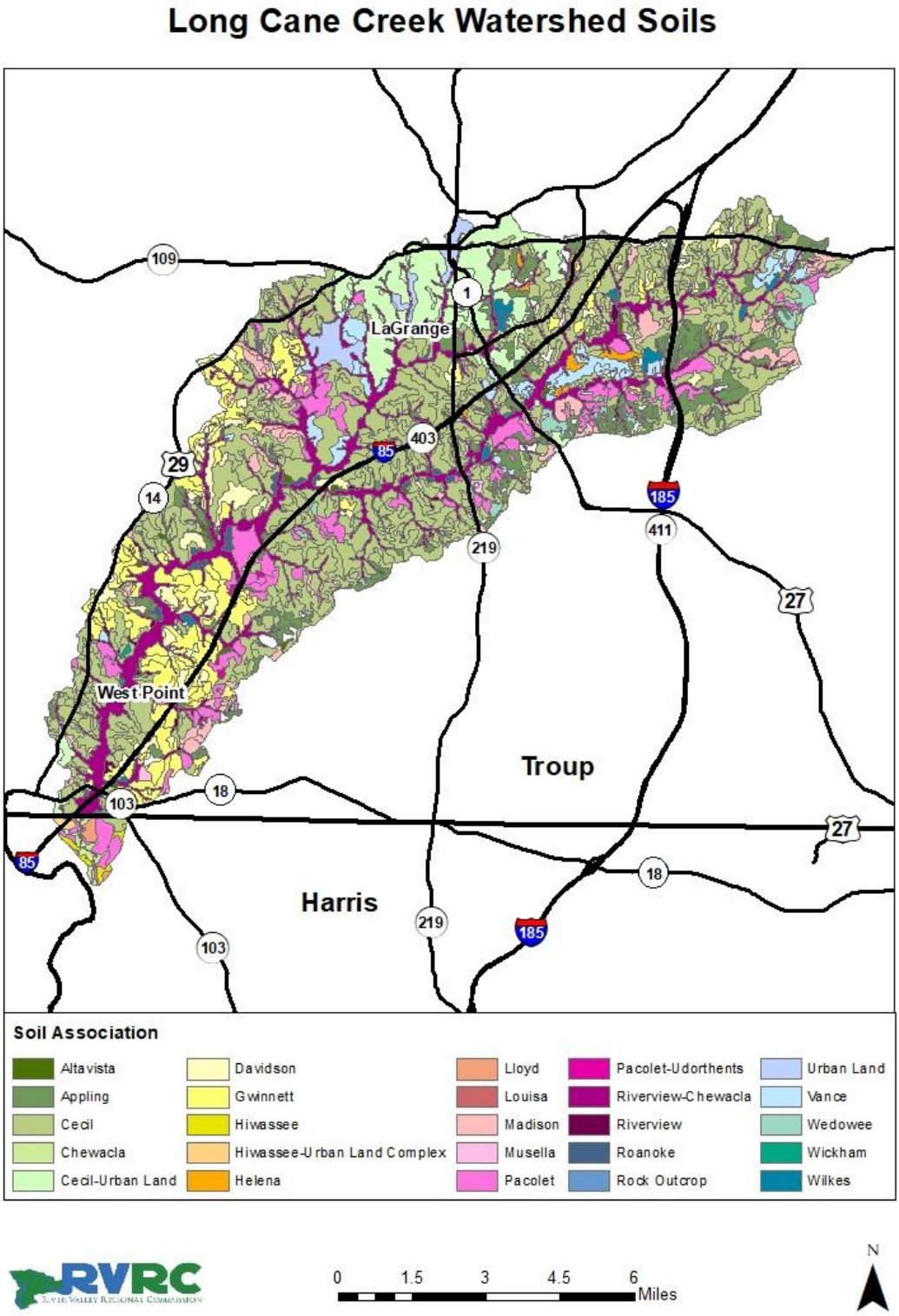
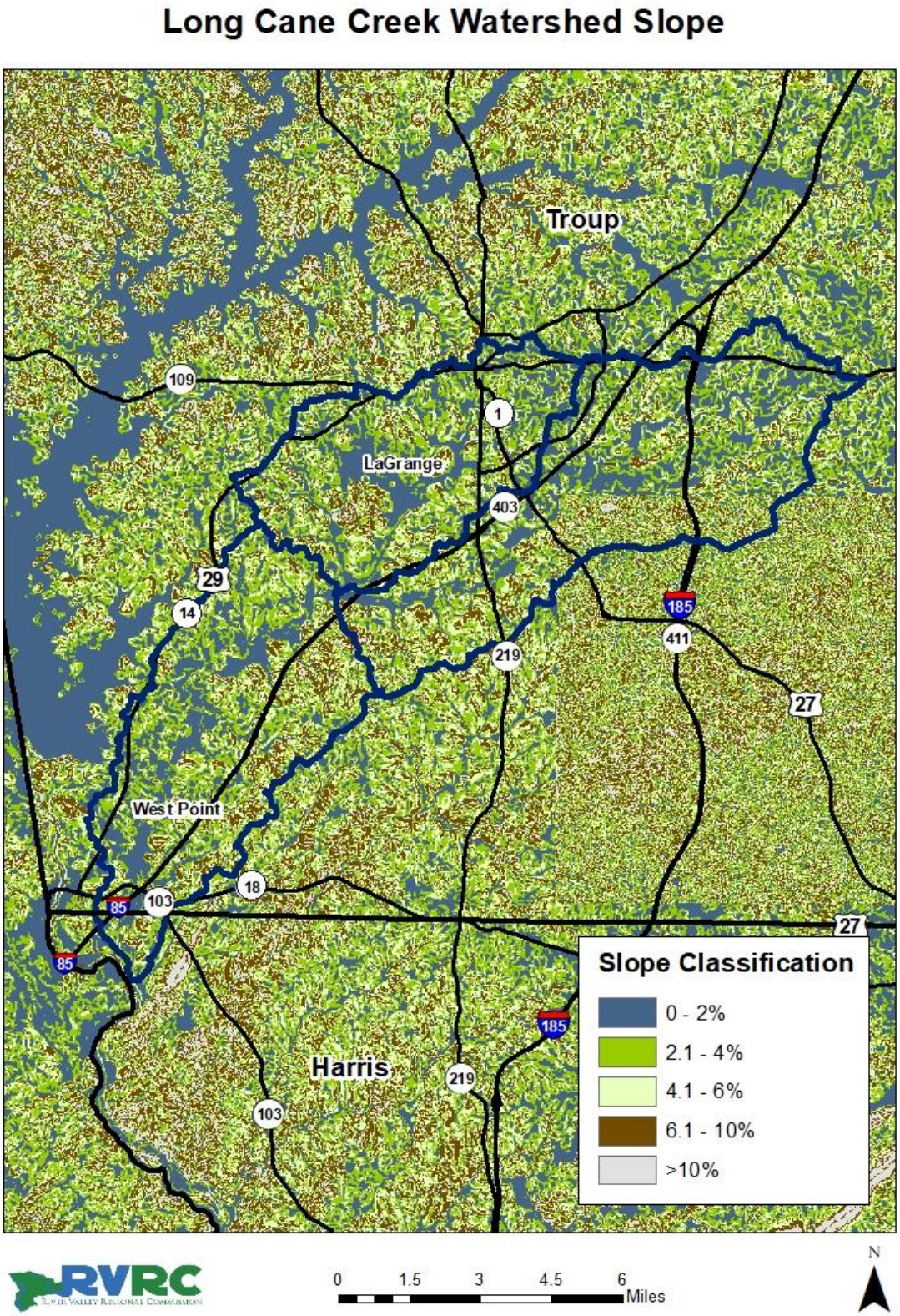


FIGURE 5. LONG CANE CREEK WATERSHED SLOPE.



4.0 WATER QUALITY IMPAIRMENTS AND TOTAL MAXIMUM DAILY LOADS (TMDLS)

Water quality standards address the federal requirement "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Clean Water Act §101). The broad term "water quality standards" encompasses the adoption of "designated uses" and specific "criteria" that indicate whether or not the uses are being achieved.

The Georgia 2014 305(b)/303(d) list of waters was prepared as a part of the Georgia assessment of water quality prepared in accordance with Sections 305(b) and 303(d) of the Federal Clean Water Act and guidance from the U.S. Environmental Protection Agency. Assessed water bodies are classified according to a comparison of water quality monitoring results to water quality standards and other pertinent information. Table 2 depicts the 2014 list of supporting streams within the Long Cane Creek watershed. Table 3 depicts the 2014 list of impaired streams within the Long Cane Creek watershed and their impairment.

TABLE 2. LONG CANE CREEK WATERSHED 2014 305(B) LIST.

Water Body Segment Name (Segment Length (Miles) or Embayment Acreage)	County Location(s)	Criterion Violated or Water Quality Concern	Listing Status Category 4a, 5 or 1	Plan Exists to Implement TMDL or Address Water Quality Concern YES / NO
Long Cane Creek – Headwaters to Panther Creek (9 miles)	Troup	Healthy Water	1	No

Source: Georgia Department of Natural Resources, Environmental Protection Division, 2014

TABLE 3. LONG CANE CREEK WATERSHED 2014 303(D) LIST.

Water Body Segment Name (Segment Length (Miles) or Embayment Acreage)	County Location(s)	Criterion Violated or Water Quality Concern	Listing Status Category 4a, 5 or 1	Plan Exists to Implement TMDL or Address Water Quality Concern YES / NO
Blue John Creek – Headwaters to Troup Branch (5 miles)	Troup	FC	4a	No
Lee Branch – Tributary to Troup Branch (1 mile)	Troup	FC	4a	No
Park Branch – Tributary to Troup Branch (2 miles)	Troup	FC, Cu	4a	No
Tanyard Creek – Headwaters to Blue John Creek (2 miles)	Troup	FC	4a	No

Troup Branch – Tributary to Blue John Creek (1 mile)	Troup	FC	4a	No
Panther Creek – Headwaters to Long Cane Creek (6 miles)	Troup	Bio F	4a	No
Long Cane Creek – Panther Creek to Chattahoochee River (18 miles)	Troup	Bio F, FC	4a	No
Blue John Creek – Troup Branch to Long Cane Creek (3 miles)	Troup	Bio F, FC	4a, 5	No

Source: Georgia Department of Natural Resources, Environmental Protection Division, 2014

A five-mile segment of Blue John Creek, from its headwaters to Troup Branch, was placed on the 303(d) list by the GA EPD for violating the state standards for fecal coliform (FC). Based off of information provided in GA EPD's 2008 *Revised Total Maximum Daily Load Evaluation for Seventy-Nine Stream Segments in the Chattahoochee River Basin for Fecal Coliform*, a TMDL called for a 46% reduction in fecal coliform for Blue John Creek. According to the Georgia Environmental Monitoring and Assessment System (GOMAS), GA EPD monitors this section of the stream at Monitoring Location ID #RV_12_16088, located at SR 219/Whitesville Road (33.007661°, -85.029176°).

Lee Branch, a tributary to Troup Branch (1 mile), was placed on the 303(d) list by the GA EPD for violating the state standards for fecal coliform (FC). Based off of information provided in GA EPD's 1998 Fecal Coliform TMDL Development document for Lee Branch, located in the Chattahoochee River Basin, a TMDL called for a 70% reduction in fecal coliform for Lee Branch. According to the Georgia Environmental Monitoring and Assessment System (GOMAS), GA EPD monitors this section of the stream at Monitoring Location ID #RV_12_16092, located at Lukken Industrial Drive (33.014354°, -85.045926°).

Park Branch, a tributary to Troup Branch (2 miles), was placed on the 303(d) list by the GA EPD for violating the state standards for fecal coliform (FC) and copper (Cu). Based off of information provided in GA EPD's 1998 Fecal Coliform TMDL Development document for Park Branch, located in the Chattahoochee River Basin, a TMDL called for a 30% reduction in fecal coliform for Park Branch. According to the Georgia Environmental Monitoring and Assessment System (GOMAS), GA EPD monitors this section of the stream at Monitoring Location ID #RV_12_16087, located at Lukken Industrial Drive (33.014333°, -85.045596°).

A two-mile segment of Tanyard Creek, from its headwaters to Blue John Creek, was placed on the 303(d) list by GA EPD for violating the state standards for fecal coliform (FC). Based off of information provided in GA EPD's 2008 *Revised Total Maximum Daily Load Evaluation for Seventy-Nine Stream Segments in the Chattahoochee River Basin for Fecal Coliform*, a TMDL called for an 82% reduction in fecal coliform for Tanyard Creek. According to the Georgia Environmental Monitoring and Assessment System (GOMAS), GA EPD monitors this section of the stream at Monitoring Location ID #RV_12_4061, located at Industrial Drive in LaGrange,

GA (33.014167°, -85.035000°) and at Monitoring Location ID #RV_12_16089, located at Fort Drive (33.010699°, -85.035197°).

Troup Branch, a tributary to Blue John Creek (1 mile), was placed on the 303(d) list by the GA EPD for violating the state standards for fecal coliform (FC). Based off of information provided in GA EPD's 1998 Fecal Coliform TMDL Development document for Troup Branch, located in the Chattahoochee River Basin, a TMDL called for a 60% load reduction in fecal coliform for Troup Branch. According to the Georgia Environmental Monitoring and Assessment System (GOMAS), GA EPD monitors this section of the stream at Monitoring Location ID #RV_12_16083, located at CSX Railroad Crossing (33.007179°, -85.050165°).

A six-mile segment of Panther Creek, from its headwaters to Long Cane Creek, was placed on the 303(d) list by the GA EPD for violating the state standards for biota (fish) (Bio F). Based off of information provided in GA EPD's 2003 *Total Maximum Daily Load Evaluation for Thirty-One Stream Segments in the Chattahoochee River Basin for Sediment (Biota Impacted)*, a TMDL called for a 16% reduction in sediment for Panther Creek. The Georgia Environmental Monitoring and Assessment System (GOMAS) does not have information on any GA EPD Monitoring Locations for this section of the stream.

An eighteen-mile segment of Long Cane Creek, from Panther Creek to the Chattahoochee River, was placed on the 303(d) list by the GA EPD for violating the state standards for biota (fish) (Bio F) and fecal coliform (FC). Based off of information provided in GA EPD's 2003 *Total Maximum Daily Load Evaluation for Thirty-One Stream Segments in the Chattahoochee River Basin for Sediment (Biota Impacted)*, a TMDL called for a 16% reduction in sediment for Long Cane Creek. Based off of information provided in GA EPD's 2008 *Total Maximum Daily Load Evaluation for Seventy-Nine Stream Segments in the Chattahoochee River Basin for Fecal Coliform*, a TMDL called for a 24% reduction in fecal coliform for Long Cane Creek. According to the Georgia Environmental Monitoring and Assessment System (GOMAS), GA EPD monitors this section of the stream at Monitoring Location ID #RV_12_3848, located at Hutchinson Mill Road near LaGrange, GA (32.966000°, -85.072000°), at Monitoring Location ID #RV_12_4062, located at Cannonville Road (32.963056°, -85.091667°), at Monitoring Location ID #RV_12_4064, located at Webb Road near West Point, GA (32.910300°, -85.145278°), at Monitoring Location ID #RV_12_4141, located at SR18/E 10th Street (32.878656°, -85.153584°), and at Monitoring Location ID #RV_12_17373, located at Power Easement Upstream of SR18/East 10th near West Point, GA (32.879617°, -85.152175°).

A three-mile segment of Blue John Creek, from Troup Branch to Long Cane Creek, was placed on the 303(d) list by the GA EPD for violating the state standards for biota (fish) (Bio F) and fecal coliform (FC). Based off of information provided in GA EPD's 2003 *Total Maximum Daily Load Evaluation for Thirty-One Stream Segments in the Chattahoochee River Basin for Sediment (Biota Impacted)*, a TMDL called for a 16% reduction in sediment for Blue John Creek. Based off of information provided in GA EPD's 2008 *Total Maximum Daily Load Evaluation for Seventy-Nine Stream Segments in the Chattahoochee River Basin for Fecal Coliform*, a TMDL called for a 46% reduction in fecal coliform for Blue John Creek. According to the Georgia Environmental Monitoring and Assessment System (GOMAS), GA EPD monitors this section of the stream at Monitoring Location ID #RV_12_4283, located at Orchard Hill Road near

LaGrange, GA (32.999722°, -85.051389°), at Monitoring Location ID #RV_12_16086, located at WPC Plant (32.973083°, -85.075432°), and at Monitoring Location ID #RV_12_17334, located upstream of Long Cane WPCP at sewer ROW (32.978830°, -85.065870°).

Georgia's instantaneous standard specifies that fecal coliform concentration in the stream water shall not exceed the 30-day geometric mean of 200 cfu/100 ml for the months of May through October, and 1,000 cfu/100 ml for the months of November through April.

Sediment is expected to fluctuate according to the amount and distribution of rainfall. Since rainfall is greatest in the spring and winter seasons, it is expected that sediment loadings would be highest during these seasons. However, these seasonal fluctuations and other short-term variability in loadings due to episodic events are usually balanced by the response of the biological community to habitat alteration, which is a long-term process. Therefore, the average annual sediment load is considered to be an adequate indicator of potential stream impairment due to sediment.

This TMDL has an implicit margin of safety embodied in the endpoint identification. By defining the endpoint in the same units as the impairment, concentration in mg/L, at a geographic point within the drinking water source, the TMDL assures that successfully meeting the endpoint will also eliminate the impairment. Units of percent can be used to quantify the standard TMDL equation: LA + WLA = TMDL. This equation describes both the allocation of allowable loading and the allocation of responsibility for reducing loading to the extent necessary to achieve the endpoint. There is minimal utility in attempting to define a precise target for loading when concentration is the important and controlling factor. Using the data sets resulting in the violations of fecal coliform and sediment levels suggests that a load reduction of approximately 16% would result in attainment of the standard for the sediment impairments for Blue John Creek, Long Cane Creek, and Panther Creek and load reductions of approximately 46%, 70%, 24%, 30%, 82%, and 60% would result in attainment of the standard for the fecal coliform impairments for Blue John Creek, Lee Branch, Long Cane Creek, Park Branch, Tanyard Creek, and Troup Branch, respectively.

As a result of these water quality impairments, segments of Blue John Creek, Lee Branch, Long Cane Creek, Panther Creek, Park Branch, Tanyard Creek, and Troup Branch were assessed as "not supporting" the Clean Water Act's fishing use support goal. In order to remedy the water quality impairment pertaining to fecal coliform and sediment, TMDLs have been developed, taking into account all sources of contamination. Upon implementation, the TMDLs for Blue John Creek, Lee Branch, Long Cane Creek, Panther Creek, Park Branch, Tanyard Creek, and Troup Branch shall ensure that the water quality standard relating to fecal coliform and sediment load levels will be in compliance with the fecal coliform geometric mean standard and the acceptable sediment levels.

5.0 VISUAL FIELD SURVEY

A visual survey of Long Cane Creek is very important. The purpose of a visual survey is to determine if there are observable problems in the stream and to characterize the environment the stream flows through. The visual survey helps pinpoint areas that may be the source of water

quality problems and helps to familiarize the overall condition of the stream. The visual field surveys were conducted on January 7, 2019 for fecal coliform and sediment. See Appendix D for visual field surveys and photo documentation.

6.0 SIGNIFICANT SOURCES OF IMPAIRMENTS

In the 2010 Watershed Implementation Plan Phase II for Long Cane Creek, several sources of impairment for fecal coliform were identified. These sources were evaluated further and additional sources were considered. Input on potential sources listed in the previous implementation plan and new sources were discussed during advisory/stakeholder meetings held on September 26, 2018 and December 28, 2020. Table 4 addresses the identified sources of fecal coliform impairment for the watershed.

TABLE 4. FECAL COLIFORM SOURCES OF CONTAMINATION FOR LONG CANE CREEK.

Source	Estimated Extent (Miles, acres, etc.)	Permitted (Y/N)	Comments
Livestock	8,000 + acres	Unsure	Cattle was detected as a source of fecal coliform contamination during DNA microbial source tracking analysis at 6 of 10 sites monitored for *E.coli*. RVRC staff observed cattle at several locations throughout the watershed. The presence of cattle in the watershed was also noted by stakeholders.
Wildlife	50,000 + acres	N/A	Beaver was detected as a source of fecal coliform contamination during DNA microbial source tracking analysis at 9 of 10 sites monitored for *E.coli*, while deer was detected at 4 of 10 sites monitored for *E.coli*. High beaver populations were noted near John Lovelace Road by several stakeholders. Waste from wildlife should be considered a natural background source.
Invasive Species	Unsure	N/A	Several stakeholders raised concerns about a large number of feral hogs on their property located on John Lovelace Road and Lower Blue Springs Road. No other stakeholders were aware of the presence of feral hogs elsewhere in the watershed.
Illicit Dumping	Unsure	N/A	Illicit dumping of deer carcasses was noted on Edgewood Avenue at Blue John Creek (Site 1) during several monitoring events conducted by RVRC staff.
Leaking Sewer Lines	16,000 + acres	Y	Human was detected as a source of fecal coliform contamination during DNA microbial source tracking analysis at 1 of 10 sites monitored for

			E.coli. Waste lines cross and are adjacent to several streams within the watershed. Leakage may occur even though the two municipal wastewater treatment plants within the watershed operate under NPDES permits. Several sewer leaks were detected during monitoring events conducted by RVRC staff.
NPDES permitted wastewater treatment facilities	2,000 + acres	Y	Two municipal wastewater treatment facilities operating under NPDES permits are located within the watershed. Records indicate that a total of 28 CWA violations occurred within the watershed in the three-year period of record available, all of which are linked to municipal wastewater treatment facilities.

Agricultural livestock, specifically cattle and horses, was noted as a potential source of fecal contamination in the 2010 Watershed Improvement Plan. To further evaluate this as a potential source, DNA/microbial source tracking analysis was conducted. Cattle was detected as a source of fecal coliform contamination during DNA microbial source tracking analysis. This source was detected at six of the ten sites that were chosen as targeted monitoring locations throughout the watershed. These results can be found in Appendix G. Cattle were observed by RVRC staff on Lower Blue Springs Road, New Hutchinson Mill Road, and Robert Taylor Road. One stakeholder noted that there are several properties with cattle near Upper Big Springs Road, and that they have seen evidence of cattle in streams in this area. Another stakeholder noted the presence of cattle near their property on John Lovelace Road. Stakeholders did not believe that horses were a likely source of fecal coliform contamination. The DNA/microbial source tracking analysis that was conducted did not test for the presence of this source.

Wildlife, specifically beaver and deer, was also noted as a potential source of fecal contamination in the 2010 Watershed Improvement Plan. To further evaluate this as a potential source, DNA/microbial source tracking analysis was conducted. Beaver was detected as a source of fecal coliform contamination during DNA microbial source tracking analysis at 9 of 10 sites monitored for *E.coli,* while deer was detected at 4 of 10 sites monitored for *E.coli*. These results can be found in Appendix G. High beaver populations were noted near John Lovelace Road by several stakeholders, and one stakeholder who owns property on this road stated that they have trapped beaver over the years to control their numbers. Waste from wildlife should be considered a natural background source.

Leaking septic systems was also noted as a potential source of fecal contamination in the 2010 Watershed Improvement Plan. Roughly 60% of the watershed is located in unincorporated areas which do not have access to sewer, and of that approximately 12% of the watershed is classified as unincorporated residential. However, detailed information on septic leaks within the watershed is not available, therefore it is unclear at this time what impact leaks may have on surrounding water quality.

Leaking sewer lines was also noted as a potential source of fecal contamination in the 2010 Watershed Improvement Plan. Within the watershed, there are two municipal wastewater

treatment plants. The Long Cane Creek Water Pollution Control Plant serves the City of LaGrange and the West Point Water Pollution and Control Plant serves the City of West Point. Human was detected as a source of fecal coliform contamination during DNA microbial source tracking analysis at 1 of 10 sites monitored for *E.coli*. These results can be found in Appendix G. This site is located on Lukken Industrial Drive at Tanyard Creek (Site 3) in LaGrange and is less than a quarter of a mile downstream from a waste line. A sewage spill was discovered on Old West Point Road at Long Cane Creek (Site 10) during a monitoring event conducted by RVRC staff. This spill was reported to Chattahoochee Riverkeeper, who subsequently notified the City of West Point of the incident. After learning of the spill, the City issued a notice to Georgia EPD and posted a notice at the site of the spill. It was determined that the spill was caused by a pump failure at the wastewater lift station adjacent to the creek and that a damaged manhole located on the opposite side of the creek allowed untreated waste to enter Long Cane Creek. The estimated volume of discharge reported was less than 1,000 gallons. The manhole was repaired to prevent future spills at the location. RVRC staff became aware of a sewage leak on Hamilton Road /U.S. Hwy 27 at Long Cane Creek (Site 5) following a monitoring event conducted by RVRC staff. Elevated levels of *E.coli* in the water sample collected from this location were reported to Chattahoochee Riverkeeper, who returned to the site the next day and observed crews digging up sewer lines adjacent to the creek.

NPDES permitted wastewater treatment facilities were also noted as a potential source of fecal contamination in the 2010 Watershed Improvement Plan. Two NPDES permitted wastewater treatment facilities were identified within the watershed. These include the City of LaGrange Long Cane Creek Water Pollution Control Plant and the City of West Point Water Pollution Control Plant, both of which have municipal discharge permits. According to records obtained from EPA's Enforcement and Compliance History Online (ECHO), a total of 27 wastewater sanitary sewer overflow discharge to water violations and 1 unauthorized discharge effluent violation occurred within the watershed in the three-year period of record available. Within this timeframe, violations occurred during 18 of the 36 months, with more than one violation occurring during eight of those months. Given the number of repeated discharge violations within this timeframe, is it likely that municipal wastewater treatment facilities operating under NPDES permits are a contributing source of fecal coliform within the watershed.

Land application systems were also noted as a potential source of fecal contamination in the 2010 Watershed Improvement Plan. No land application systems were identified within the watershed.

Landfills were also noted as a potential source of fecal contamination in the 2010 Watershed Improvement Plan. Two landfills in operation were identified within the watershed, one of which is a municipal solid waste landfill, the other of which is a construction and demolition landfill. EPD records also indicate that one sanitary landfill was closed within the watershed. No records were found indicating violations at these facilities.

One potential source of fecal coliform contamination, which was not noted in the 2010 Watershed Improvement Plan, is invasive species, specifically feral hogs. Several stakeholders raised concerns about a large number of feral hogs on their property located on John Lovelace Road and Lower Blue Springs Road. They stated that they have taken measures to control their

numbers, but they continue to pose a problem. No other stakeholders were aware of the presence of feral hogs elsewhere in the watershed.

Another potential source of fecal coliform contamination, which was not noted in the 2010 Watershed Improvement Plan, is illicit dumping. On Edgewood Avenue at Blue John Creek (Site 1), RVRC staff discovered deer remains that appeared to have been dumped over the bridge into the creek and adjacent to the creek during several monitoring events.

TABLE 5. SEDIMENT SOURCES OF CONTAMINATION FOR LONG CANE CREEK.

Source	Estimated Extent (Miles, acres, etc.)	Permitted (Y/N)	Comments
Livestock	8,000 + acres	Unsure	RVRC staff observed cattle at several locations throughout the watershed. The presence of cattle in the watershed was also noted by stakeholders. One stakeholder noted that they have seen evidence of cattle in streams in this area.
Construction Sites/ Development	Unsure	Y	Development was noted by RVRC staff throughout the watershed. Stakeholders noted presence of residential development near John Lovelace Rd.
Forestry/ Logging	Unsure	Y	Logging was noted by RVRC staff adjacent to Long Cane Creek on Gabbettville Rd and near Long Cane Creek on Upper Big Springs Road. One stakeholder also stated that they lease a portion of their property on John Lovelace Road and Lower Blue Springs Road for forestry/timber.
Invasive Species	Unsure	N/A	Several stakeholders stated concerns about a large number of feral hogs on their property located on John Lovelace Road and Lower Blue Springs Road. Stakeholders were not aware of the presence of feral hogs elsewhere in the watershed.

No potential sources of sediment contamination were noted in the 2010 Watershed Improvement Plan.

One potential source of sediment contamination is livestock (cattle). RVRC staff observed cattle at several locations throughout the watershed. The presence of cattle in the watershed was also noted by stakeholders. One stakeholder noted that they have seen evidence of cattle in streams in this area. If cattle have access to streams, they could be disturbing the stream bed, causing sediment to become suspended in the water column and transported downstream.

Another potential source of sediment contamination is development. During monitoring events conducted by RVRC staff, development was observed at several locations throughout the

watershed, in both the cities and unincorporated areas. Stakeholders noted the presence of residential development near John Lovelace Rd.

Another potential source of sediment contamination is forestry/logging. RVRC staff noted areas of cleared timber adjacent to Long Cane Creek on Gabbettville Rd and less than half a mile from Long Cane Creek on Upper Big Springs Road. One stakeholder also stated that they lease a portion of their property on John Lovelace Road and Lower Blue Springs Road for forestry/timber.

Another potential source of sediment contamination is invasive species (feral hogs). Several stakeholders stated concerns about a large number of feral hogs on their property located on John Lovelace Road and Lower Blue Springs Road. They stated that the hogs root up their pastureland. Stakeholders were not aware of the presence of feral hogs elsewhere in the watershed.

7.0 IDENTIFICATION OF APPLICABLE EXISTING MANAGEMENT MEASURES

Both Troup and Harris Counties have implemented a number of ordinances to protect water quality within their jurisdictional boundaries. Table 6 describes these ordinances and their responsible entity.

TABLE 6. EXISTING MANAGEMENT MEASURES FOR LONG CANE CREEK WATERSHED.

Regulation/Ordinance or Management Measure	Responsible Government, Organization or Entity	Description
Zoning Ordinance	Harris County and Troup County	Establishes regulations to encourage the most appropriate use of land, to prevent the overcrowding of land and undue concentrations of population, and to facilitate the planning and provision of water, sewage, etc.
Water, Sewage, and Utilities Ordinance	Harris County	1) Establishes standards for new installations, addition, and repairs of on-site sewage management systems 2) Prohibits unapproved discharges from on-site sewage systems 3) Regulates the use of public sewers and the installation and connections of building sewers 4) Establishes standards of permissible liquid wastes acceptable into the

		sanitary sewer system of Harris County 5) Regulates industrial and commercial wastes discharged into the sanitary sewage system
Rules and Regulations for Sewer Use and Protection of the Water Supply	Troup County	Establishes policies and procedures relating to operation of the sewer system
Development and Design Standards	Troup County	1) Establishes density requirements for new developments 2) Establishes septic and sewer requirements for residential and commercial developments
Water Supply Watershed Protection Regulation	Harris County	Regulates hazardous waste and materials within a distance of seven miles of the Chattahoochee River corridor
Watershed Protection District	Troup County	Establishes measures to protect the quality of the present and future water supply for Troup County
Chattahoochee River Corridor Protection District	Harris County and Troup County	Establishes measures to guide future growth and development in the areas adjacent to the Chattahoochee River
Wetlands Protection District	Harris County and Troup County	Delineates boundaries of wetlands within the county and limits activities within these boundaries to protect water quality, floodplain and erosion control, groundwater recharge, aesthetic natural areas, and wildlife habitat in these areas
Aquifer Recharge Area Protection Ordinance	Harris County	1) Protects groundwater by prohibiting land uses that generate dangerous pollutants in recharge areas 2) Protects groundwater by limiting density of development 3) Protects groundwater by ensuring that the development that occurs within the recharge

		area shall have no adverse effect on groundwater quality
Groundwater Recharge Protection District	Troup County	Establishes measures to protect Troup County's identified recharge areas from potential sources of contamination
Soil Erosion, Sedimentation and Pollution Control Ordinance	Harris County and Troup County	Protects water quality through sedimentation and erosion control by requiring BMPs and regulating land disturbing activities

Beyond the ordinances listed above, there are not any watershed planning activities related to the Long Cane Creek watershed impairments that are known by the staff at River Valley Regional Commission.

8.0 Recommendations for Additional Management Measures

DNA source tracking analysis has confirmed several sources which are contributing to the fecal coliform pollution within the watershed. These sources include livestock (cattle), wildlife (beaver and deer), and human.

To address the livestock (cattle) source, agricultural BMPs should be implemented. Examples of BMPs that could be installed to address fecal coliform from livestock include access control and alternative watering facilities, among others. All agricultural BMPs should be installed according to USDA NRCS specifications. DNA/microbial source tracking analysis should be conducted following installation to determine the effectiveness of installed BMPs.

Waste from wildlife (beaver and deer) should be considered a natural background source. However, private landowners can take measures to manage nuisance wildlife populations on their property in accordance with local and state regulations if they so choose.

Sources of human waste that were identified as a result of DNA/microbial source tracking analysis, targeted monitoring, and visual assessments have been attributed to municipal sewer system leaks and sanitary sewer system overflows. Failing sewage infrastructure should be repaired and/or replaced as necessary by local governments as funding is available to reduce the amount and frequency of leaks and overflows into streams. DNA/microbial source tracking analysis should be conducted to determine if failing infrastructure is continuing to cause leaks or overflows that are affecting streams within the watershed.

Additionally, RVRC staff and stakeholders have identified other sources which may also be contributing to the elevated levels of fecal coliform within the watershed. These sources include illicit dumping and invasive species (feral hogs).

Evidence of illicit dumping of animal remains was documented on several occasions at one location in the watershed. Since there is no evidence to indicate that this a widespread issue throughout the watershed, the installation of educational signage at this location may help to educate local residents about the illegality of carcass dumping.

Several landowners expressed concerns about a large number of feral hogs on their property, which includes a section of Panther Creek. Since this source was not mentioned in the 2010 Watershed Improvement Plan, the DNA/microbial source tracking analysis that was conducted did not test for the presence of this source. While Panther Creek is not listed for a fecal coliform impairment, the segment of Long Cane Creek from Panther Creek to the Chattahoochee River, which begins at the confluence of Long Cane and Panther Creeks, is listed for fecal coliform. Another round of DNA/microbial source tracking analysis should be conducted to determine whether this source is contributing to the fecal coliform levels within this portion of the watershed. If the analysis indicates that feral hogs are a contributing source of sediment in this portion of the watershed, additional steps should be taken. Examples of actions to address this source include educational workshops for landowners to promote effective hog management techniques in addition to professional hog harvesting. DNA/microbial source tracking analysis should be conducted following implementation to determine the effectiveness of management measures.

Potential sources of sediment within the watershed, based on visual assessments and stakeholder feedback include livestock, construction sites/development, forestry/logging, and invasive species (feral hogs).

To address the livestock (cattle) source, agricultural BMPs should be implemented. Examples of BMPs that could be installed to address sediment transport caused by livestock include prescribed grazing, heavy use area protection, and stream crossings, among others. All agricultural BMPs should be installed according to USDA NRCS specifications.

To address sediment from construction sites/development and forestry/logging activity, BMPs should be installed to prevent sediment runoff from these sites. Both Harris and Troup Counties have a Soil Erosion, Sedimentation and Pollution Control Ordinance, which protects water quality through sedimentation and erosion control by requiring BMPs and regulating land disturbing activities. The enforcement of this ordinance will help to ensure that construction sites and sites utilized for forestry/logging are complying with these regulations.

Several landowners expressed concerns about a large number of feral hogs on their property, which includes a section of Panther Creek. The rooting and wallowing behavior of feral hogs can cause extensive damage to pastureland as well as wetland and riparian areas, resulting in increased sedimentation to streams. To assess whether feral hog activity is contributing to the sediment levels in streams in this portion of the watershed, visual surveys should be conducted to document locations where evidence of rooting or wallowing behavior has occurred. Streams in close proximity to documented locations should be monitored for turbidity to determine if levels are high. If visual surveys and data indicate that feral hogs are a contributing source of sediment in this portion of the watershed, additional steps should be taken. Examples of actions to address

this source include educational workshops for landowners to promote effective hog management techniques in addition to professional hog harvesting.

TABLE 7. SUGGESTED ACTIONS AND MEASURES TO ADDRESS IMPAIRMENTS.

Action/Management Measure	Category	Water Quality Criteria to be Addressed	Estimated Effectiveness
Access Control	Agricultural BMP	Fecal coliform, Sediment	99% (fecal coliform), 75% (sediment)
Alternative Watering Facility	Agricultural BMP	Fecal coliform	15%
Repair and replacement of failing sewage infrastructure	Maintenance	Fecal coliform	Unknown
Educational Signage	Illicit Dumping BMP	Fecal coliform	Unknown
DNA/Microbial Source Tracking Analysis	Source Determination/ BMP Placement	Fecal coliform	N/A
Educational Workshops	Educational	Fecal coliform, Sediment	N/A
Professional Hog Harvesting	Invasive Species BMP	Fecal coliform, Sediment	Unknown
Prescribed Grazing	Agricultural BMP	Sediment	75%
Heavy Use Area Protection	Agricultural BMP	Sediment	80%
Stream Crossings	Agricultural BMP	Sediment	30-50%
Enforcement of Soil Erosion, Sedimentation and Pollution Control Ordinances	Enforcement	Sediment	Unknown
Visual Surveys	Source Determination/ BMP Placement/BMP Effectiveness	Sediment	N/A
Turbidity Monitoring	Source Determination/ BMP Placement	Sediment	N/A
Bacterial Monitoring	Source Determination/ BMP Place	Fecal coliform	N/A

9.0 PARTNERSHIP ADVISORY COUNCIL AND PARTNER ORGANIZATIONS

Advisory Group recruitment from a number of working group partners was prioritized to provide input for this Watershed Management Plan. Members include representatives from local city and county governments and non-profit organizations. Table 8 shows the list of final Advisory Group participants.

TABLE 8. ADVISORY GROUP FOR LONG CANE CREEK WATERSHED.

Name	Address	City	State	ZIP	Organization
Jim Russell	200 Ridley Ave	LaGrange	GA	30240	City of LaGrange
Hannah Bradford	35 Lafayette Pkwy	LaGrange	GA	30240	Chattahoochee Riverkeeper
Laura Schneider	710 Front Ave, Suite A	Columbus	GA	31901	River Valley Regional Commission
James Emery	100 Ridley Ave	LaGrange	GA	30240	Troup County

The TMDL Advisory Group is a collection of individuals who bring unique knowledge and skills which complement the knowledge and skills of the public in order to more effectively accomplish this plan. The purpose of the TMDL Advisory Group is to provide a forum for the public, partners, etc. to discuss potential concerns and solutions that will impact Long Cane Creek, and to make recommendations relative to TMDLs.

The Advisory Group's key responsibilities were to:

- **Advise** on matters of concern to the community;
- **Contribute to the education** of the residents of the watershed on water quality issues;
- **Help identify** contributing pollution sources;
- **Assist** in arriving at equitable pollution reduction allocations among contributors;
- **Recommend specific actions** needed to effectively control sources of pollution; and
- **Help develop** and set in motion an extended plan.

Advisory meetings were held on September 26, 2018 at 11:00 am and on December 28, 2020 at 2:00 pm at the Mike Daniel Recreation Center in LaGrange to discuss potential ways to assess the watershed of Long Cane Creek. See Appendix F for meeting minutes.

Future implementation of recommended management measures will be possible through partnership with GA EPD, NRCS, and local governments within the watershed. In some cases, independent contractors will need to be secured to ensure proper installation of management measures.

10.0 SCHEDULE OF SEQUENTIAL MILESTONES

The main goal of this Watershed Management Plan is to bring Long Cane Creek and its impaired tributaries into compliance with water quality standards, which will result in their removal from the 303(d) list of impaired waters. This goal will be measured by the levels of fecal coliform and turbidity in samples collected after the implementation of BMPs to address the fecal coliform (FC) and sediment (Bio F) impairments of stream segments within the watershed.

In order to establish BMPs to mitigate pollution levels, it was important to determine the sources of fecal coliform and sediment contamination. RVRC staff has executed a targeted monitoring plan in which *E. coli* samples were collected at ten (10) locations and turbidity samples were collected at eight (8) locations throughout the watershed over a 12-month period in order to establish current baseline conditions of impaired stream segments and identify pollution hotspots. In addition to this, RVRC staff collected samples for DNA/microbial source tracking analysis at the same ten (10) locations which were monitored for *E. coli* in order to verify sources of fecal coliform contamination which were identified in the 2010 Watershed Improvement Plan.

The targeted monitoring for *E. coli* and turbidity was conducted during the months of October 2018 – September 2019, while the monitoring for DNA/Microbial source tracking was conducted during the months of July 2018, October 2018, February 2019, and April 2019. Monitoring was avoided up to 48 hours after rain events resulting in greater than 1 inch of precipitation. This data is stored at the River Valley Regional Commission, located at 710 Front Avenue, Suite A, Columbus, Georgia 31901, and is also available on the Georgia Adopt-A-Stream website. After results were obtained, RVRC staff determined what management practices were needed to mitigate pollution levels.

Funding to implement the management practices outlined in Section 8 of this plan will be sought through Section 319(h) of the Federal Clean Water Act. Should funding be awarded, evaluation of BMP locations will begin immediately. Once BMP locations are finalized, installation of BMPs will take approximately one year to complete. The educational outreach component will also be conducted during this time. Following BMP implementation, post-BMP turbidity and bacterial monitoring will be conducted to determine the effectiveness of installed BMPs. All of these outputs will take approximately two years to complete.

11.0 PUBLIC INVOLVEMENT

Stakeholders are individuals who reside in or have land management responsibilities in the watershed, including government agencies, businesses, private individuals and special interest groups. Stakeholder participation and support is essential for achieving the goals of this TMDL effort. Table 9 shows a list of stakeholders who attended public meetings and/or contributed to the plan development process for the Long Cane Creek watershed.

TABLE 9. STAKEHOLDER GROUP FOR LONG CANE CREEK.

Name	City	State	ZIP
Elizabeth Willimon	LaGrange	GA	30240
Dana Johnson	LaGrange	GA	30241
Retha Hart	LaGrange	GA	30241
Herb Hart	LaGrange	GA	30241
Catherine Linz	LaGrange	GA	30241

Building partnerships was a key component in order to declare input from the stakeholder perspective in evaluating the Watershed Management Plan; and to provide an opportunity for stakeholders to understand how the peer review process contributes to the development of TMDL plans and results. As a result of their participation, stakeholders became knowledgeable advocates for the role to help manage or decrease non-point source pollution impacts.

Stakeholder's key responsibilities were to:

- **Provide** technical support and assistance;
- **Distribute** and share information;
- **Identify** opportunities and common concerns; and
- **Develop** public support.

Public participation in the development of this plan was encouraged by inviting stakeholders to participate in meetings throughout the various development stages. The objective of these meetings was to obtain feedback from stakeholders about the concerns and composition of watershed activities. Stakeholder group meetings were held on September 26, 2018 at 11:00 am and on December 28, 2020 at 2:00 pm at the Mike Daniel Recreation Center in LaGrange to discuss potential ways to assess the watershed of Long Cane Creek. See Appendix F for meeting minutes.

Additional stakeholder meetings should be held throughout the implementation process of recommended measures.

12.0 Recommendations for Monitoring and Criteria for Measuring Success

Targeted monitoring for *E. coli* and turbidity was conducted during the months of October 2018 – September 2019, while the monitoring for DNA/Microbial source tracking was conducted during the months of July 2018, October 2018, February 2019, and April 2019. The results of this monitoring can be found in Appendix G. Monitoring protocols and techniques can be found in Appendix H.

Monitoring locations were identified while considering aerial imagery, road maps, and site visits to best assess sources of pollution within the watershed. Specific monitoring locations and GPS coordinates for each site are listed below in Table 10. A map of the monitoring locations may be found in Figure 6. Samples were collected on the upstream side of the bridge at road crossings.

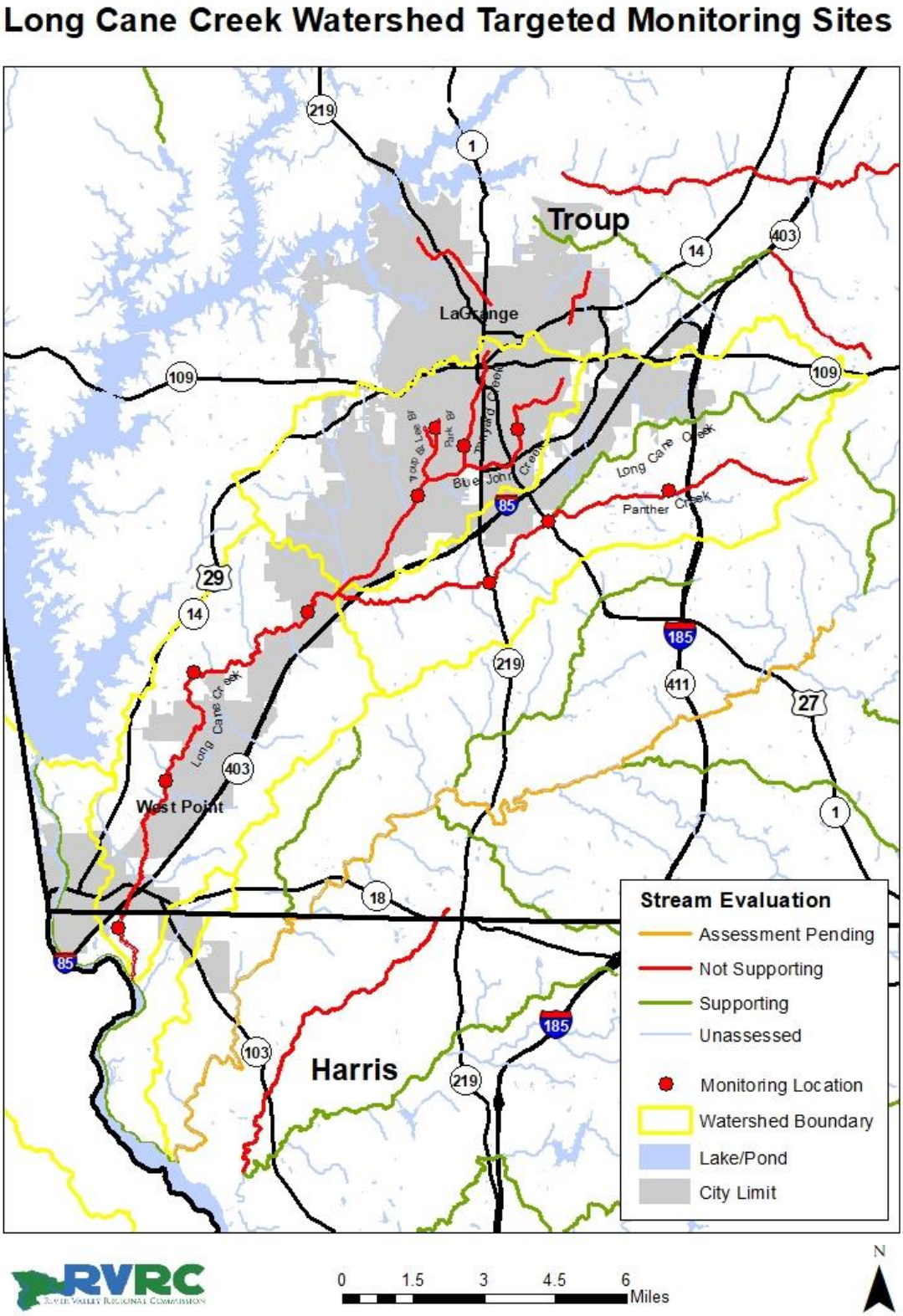
Future monitoring efforts should include additional DNA/microbial source tracking analysis to determine whether feral hog activity is contributing to the fecal coliform levels within the watershed. The results of this analysis will help to determine whether BMPs for feral hogs will need to be implemented to address associated fecal coliform levels, and if so, where implementation will be most effective. To assess whether feral hog activity is contributing to sediment levels within the watershed, visual surveys should be conducted to document locations where evidence of rooting or wallowing behavior has occurred. Streams in close proximity to documented locations should be monitored for turbidity to determine if levels are high. Additionally, bacterial and turbidity monitoring should be conducted following BMP installation to determine the effectiveness of installed BMPs.

TABLE 10. TARGETED MONITORING LOCATIONS FOR LONG CANE CREEK WATERSHED.

Site Number	General Location	Sampling Site Coordinates		Sample Parameters
		Latitude	Longitude	
1	Edgewood Avenue	33.019° W	85.016° N	DNA, Bacterial
2	Forrest Avenue	33.019° W	85.045° N	DNA, Bacterial
3	Lukken Industrial Drive	33.014° W	85.035° N	DNA, Bacterial
4	Orchard Hill Road	32.999° W	85.051° N	Turbidity, DNA, Bacterial
5	Hamilton Road/U.S. Highway 27	32.991° W	85.004° N	Turbidity, DNA, Bacterial
6	Whitesville Road/State Route 219	32.972° W	85.025° N	Turbidity, DNA, Bacterial
7	Cannonville Road	32.963° W	85.091° N	Turbidity, DNA, Bacterial
8	Gabbettville Road	32.944° W	85.132° N	Turbidity, DNA, Bacterial
9	Webb Road	32.910° W	85.142° N	Turbidity, DNA, Bacterial
10	Old West Point Road	32.865° W	85.159° N	Turbidity, DNA, Bacterial

11	John Lovelace Road	33.001° W	84.961° N	Turbidity

FIGURE 6. LONG CANE CREEK WATERSHED TARGETED MONITORING SITES.



13.0 PLAN IMPLEMENTATION

The objective of the Watershed Management Plan is to restore impaired water quality to meet water quality standards. From a broader perspective, Georgia's water quality management strategy addresses three things:

1. Protection: Prevent the degradation of healthy waters.
2. Restoration: Develop and execute plans to eliminate impairments.
3. Maintaining Restored Waters: Institutionalize technical and administrative procedures to prevent or offset new pollutants.

A list of management measures and other additional actions to be implemented during future stages is shown in Table 11.

TABLE 11. SCHEDULE FOR FUTURE IMPLEMENTATION.

Action/Management Measure	Responsible Entity	Time Frame
Implementation of agricultural BMPs	River Valley Regional Commission, NRCS	1 year
Repair and replacement of failing sewage infrastructure	Local Governments	Ongoing
Educational Signage	River Valley Regional Commission, Independent Contractor, Local Government	1 year
DNA/Microbial Source Tracking Analysis	River Valley Regional Commission, Independent Contractor	6 months- 1 year
Educational Workshops	River Valley Regional Commission	
Professional Hog Harvesting	Independent Contractor	1 year
Enforcement of Soil Erosion, Sedimentation and Pollution Control Ordinances	Local Governments	Ongoing
Visual Surveys	River Valley Regional Commission	3-6 months
Pre and Post-BMP Turbidity Monitoring	River Valley Regional Commission	9-12 months
Post-BMP Bacterial Monitoring	River Valley Regional Commission	6 months

An evaluation of implementation will be conducted on a semi-annual basis by the Advisory Group to evaluate the progress towards implementing management measures. If reasonable progress toward implementing the management practices is not demonstrated, the Advisory Group will consider additional implementation actions.

If it is demonstrated that reasonable and feasible management measures have been implemented for a sufficient period of time and TMDL targets are still not being met, the TMDL will be reevaluated and revised accordingly. If after three years the Advisory Group determines that load reductions are being achieved as management measures are implemented, then the recommended appropriate course of action would be to continue management measure implementation and compliance oversight. If it is determined that all proposed control measures have been implemented, yet the TMDL is not achieved, further investigations will be made to determine whether: 1) the control measures are not effective; 2) fecal coliform and sediment loads are due to sources not previously addressed; or 3) the TMDL is unattainable.

14.0 PLAN APPENDICES

- **A. NINE (9) – KEY ELEMENT SUMMARY**
- **B. LONG CANE CREEK WATERSHED MAP (HUC 0313000209)**
- **C. LAND USE MAPS: TRENDS AND EXISTING**
- **D. VISUAL FIELD SURVEYS AND PHOTO DOCUMENTATION**
- **E. COPIES OF PUBLIC NOTICES AND OTHER DOCUMENTATION**
- **F. MEETING MINUTES AND ADDITIONAL STAKEHOLDER COMMENTS**
- **G. TARGETED MONITORING DATA**
- **H. SAMPLING PROTOCOL**

APPENDIX A. NINE (9) – KEY ELEMENT SUMMARY

Element 1 – An identification of the sources or groups of similar sources contributing to nonpoint source pollution to be controlled to implement load allocations or achieve water quality standards. Sources should be identified at the subcategory level.

Sources of fecal coliform contamination outlined in this plan include agricultural livestock (cattle), wildlife (beaver and deer), leaking septic systems, leaking sewer lines, NPDES permitted wastewater treatment facilities, feral hogs, and illicit dumping.

Agricultural livestock (cattle) was detected as a source of fecal coliform contamination during DNA microbial source tracking analysis. This source was detected at six of the ten sites that were chosen as targeted monitoring locations throughout the watershed. Cattle were observed by RVRC staff on Lower Blue Springs Road, New Hutchinson Mill Road, and Robert Taylor Road. One stakeholder noted that there are several properties with cattle near Upper Big Springs Road, and that they have seen evidence of cattle in streams in this area. Another stakeholder noted the presence of cattle near their property on John Lovelace Road.

Beaver was detected as a source of fecal coliform contamination during DNA microbial source tracking analysis at 9 of 10 sites monitored for *E.coli*, while deer was detected at 4 of 10 sites monitored for *E.coli*. High beaver populations were noted near John Lovelace Road by several stakeholders, and one stakeholder who owns property on this road stated that they have trapped beaver over the years to control their numbers. Waste from wildlife should be considered a natural background source.

Within the watershed, there are two municipal wastewater treatment plants. The Long Cane Creek Water Pollution Control Plant serves the City of LaGrange and the West Point Water Pollution and Control Plant serves the City of West Point. Human was detected as a source of fecal coliform contamination during DNA microbial source tracking analysis on Lukken Industrial Drive at Tanyard Creek. Additionally, a sewage spill was discovered on Old West Point Road at Long Cane Creek during a monitoring event conducted by RVRC staff. It was determined that the spill was caused by a pump failure at the wastewater lift station adjacent to the creek and that a damaged manhole located on the opposite side of the creek allowed untreated waste to enter Long Cane Creek. RVRC staff also became aware of a sewage leak on Hamilton Road /U.S. Hwy 27 at Long Cane Creek following a monitoring event conducted by RVRC staff. Elevated levels of *E.coli* in the water sample collected from this location were reported to Chattahoochee Riverkeeper, who returned to the site the next day and observed crews digging up sewer lines adjacent to the creek.

Two NPDES permitted wastewater treatment facilities were identified within the watershed. These include the City of LaGrange Long Cane Creek Water Pollution Control Plant and the City of West Point Water Pollution Control Plant, both of which have municipal discharge permits. According to records obtained from EPA's Enforcement and Compliance History Online (ECHO), a total of 27 wastewater sanitary sewer overflow discharge to water violations and 1 unauthorized discharge effluent violation occurred within the watershed in the three-year period of record available. Within this timeframe, violations occurred during 18 of the 36

months, with more than one violation occurring during eight of those months. Given the number of repeated discharge violations within this timeframe, is it likely that municipal wastewater treatment facilities operating under NPDES permits are a contributing source of fecal coliform within the watershed.

Several stakeholders stated concerns about a large number of feral hogs on their property located on John Lovelace Road and Lower Blue Springs Road. They have taken measures to control their numbers, but they continue to pose a problem. No other stakeholders were aware of the presence of feral hogs elsewhere in the watershed.

On Edgewood Avenue at Blue John Creek, RVRC staff discovered deer remains that appeared to have been dumped over the bridge into the creek and adjacent to the creek during several monitoring events.

Sources of sediment contamination outlined in this plan include agricultural livestock (cattle), development, forestry/logging, and feral hogs.

RVRC staff observed cattle at several locations throughout the watershed. The presence of cattle in the watershed was also noted by stakeholders. One stakeholder noted that they have seen evidence of cattle in streams in this area. If cattle have access to streams, they could be disturbing the stream bed, causing sediment to become suspended in the water column and transported downstream.

During monitoring events conducted by RVRC staff, development was observed at several locations throughout the watershed, in both the cities and unincorporated areas. Stakeholders noted the presence of residential development near John Lovelace Rd.

RVRC staff noted areas of cleared timber adjacent to Long Cane Creek on Gabbettville Rd and less than half a mile from Long Cane Creek on Upper Big Springs Road. One stakeholder also stated that they lease a portion of their property on John Lovelace Road and Lower Blue Springs Road for forestry/timber.

Several stakeholders stated concerns about a large number of feral hogs on their property located on John Lovelace Road and Lower Blue Springs Road. The rooting and wallowing behavior of feral hogs can cause extensive damage to pastureland as well as wetland and riparian areas, resulting in increased sedimentation to streams. Stakeholders were not aware of the presence of feral hogs elsewhere in the watershed.

Element 2 – An estimate of the load reductions expected for the management measures described under Element 3.

Using the data sets resulting in the violations of fecal coliform and sediment levels suggests that a load reduction of approximately 16% would result in attainment of the standard for the sediment impairments for Blue John Creek, Long Cane Creek, and Panther Creek and load reductions of approximately 46%, 70%, 24%, 30%, 82%, and 60% would result in attainment of

the standard for the fecal coliform impairments for Blue John Creek, Lee Branch, Long Cane Creek, Park Branch, Tanyard Creek, and Troup Branch, respectively.

Several best management practices need to be implemented throughout the watershed in order to obtain these goals. These may include, but are not limited to, agricultural BMPs including access control, alternative watering facilities, heavy use area protection, prescribed grazing, and stream crossings. Should feral hog activity be deemed as a source of fecal coliform and/or sediment pollution, professional hog harvesting is recommended. Educational signage should be installed to address the illicit dumping of deer carcasses. Enforcement of soil erosion, sedimentation, and pollution control ordinances and repair and replacement of failing sewage infrastructure by local governments will also help to reduce fecal coliform and sediment levels within the watershed.

According to the Georgia Soil and Water Conservation Commission's 2013 Best Management Practices for Georgia Agriculture, access control has been found to reduce fecal coliform in second order streams by 99% and sediment by 75%, heavy use area protection has the potential to reduce erosion from protected areas up to 80%, prescribed grazing can be 75% effective in reducing soil loss. Additionally, alternative watering facilities and stream crossings can protect water sources by reducing access and/or amount of time livestock spend in water and providing stable traffic paths, thereby reducing the amount of waste and sediment entering water.

Load reduction estimates for hog harvesting have not been established. However, when implemented correctly, certain harvesting methods have been shown to effectively and efficiently remove entire sounders (reproductive groups) of feral hogs.

Established load reduction estimates for educational signage, repair and replacement of failing sewage infrastructure, and enforcement of Soil Erosion, Sedimentation and Pollution Control Ordinances do not currently exist.

Element 3 – A description of the nonpoint source management measures that will need to be implemented to achieve the load reductions established in the TMDL or to achieve water quality standards.

DNA source tracking analysis has confirmed several sources which are contributing to the fecal coliform pollution within the watershed. These sources include livestock (cattle), wildlife (beaver and deer), and human.

To address the livestock (cattle) source, agricultural BMPs should be implemented. Examples of BMPs that could be installed to address fecal coliform from livestock include access control and alternative watering facilities, among others. All agricultural BMPs should be installed according to USDA NRCS specifications. DNA/microbial source tracking analysis should be conducted following installation to determine the effectiveness of installed BMPs.

Waste from wildlife (beaver and deer) should be considered a natural background source. However, private landowners can take measures to manage nuisance wildlife populations on their property in accordance with local and state regulations if they so choose.

Sources of human waste that were identified as a result of DNA/microbial source tracking analysis, targeted monitoring, and visual assessments have been attributed to municipal sewer system leaks and sanitary sewer system overflows. Failing sewage infrastructure should be repaired and/or replaced as necessary by local governments as funding is available to reduce the amount and frequency of leaks and overflows into streams. DNA/microbial source tracking analysis should be conducted to determine if failing infrastructure is continuing to cause leaks or overflows that are affecting streams within the watershed.

Additionally, RVRC staff and stakeholders have identified other sources which may also be contributing to the elevated levels of fecal coliform within the watershed. These sources include illicit dumping and invasive species (feral hogs).

Evidence of illicit dumping of animal remains was documented on several occasions at one location in the watershed. Since there is no evidence to indicate that this a widespread issue throughout the watershed, the installation of educational signage at this location may help to educate local residents about the illegality of carcass dumping.

Several landowners expressed concerns about a large number of feral hogs on their property, which includes a section of Panther Creek. Since this source was not mentioned in the 2010 Watershed Improvement Plan, the DNA/microbial source tracking analysis that was conducted did not test for the presence of this source. While Panther Creek is not listed for a fecal coliform impairment, the segment of Long Cane Creek from Panther Creek to the Chattahoochee River, which begins at the confluence of Long Cane and Panther Creeks, is listed for fecal coliform. Another round of DNA/microbial source tracking analysis should be conducted to determine whether this source is contributing to the fecal coliform levels within this portion of the watershed. If the analysis indicates that feral hogs are a contributing source of sediment in this portion of the watershed, additional steps should be taken. Examples of actions to address this source include educational workshops for landowners to promote effective hog management techniques in addition to professional hog harvesting. DNA/microbial source tracking analysis should be conducted following implementation to determine the effectiveness of management measures.

Potential sources of sediment within the watershed, based on visual assessments and stakeholder feedback include livestock, construction sites/development, forestry/logging, and invasive species (feral hogs).

To address the livestock (cattle) source, agricultural BMPs should be implemented. Examples of BMPs that could be installed to address sediment transport caused by livestock include prescribed grazing, heavy use area protection, and stream crossings, among others. All agricultural BMPs should be installed according to USDA NRCS specifications.

To address sediment from construction sites/development and forestry/logging activity, BMPs should be installed to prevent sediment runoff from these sites. Both Harris and Troup Counties have a Soil Erosion, Sedimentation and Pollution Control Ordinance, which protects water quality through sedimentation and erosion control by requiring BMPs and regulating land

disturbing activities. The enforcement of this ordinance will help to ensure that construction sites and sites utilized for forestry/logging are complying with these regulations.

Several landowners expressed concerns about a large number of feral hogs on their property, which includes a section of Panther Creek. The rooting and wallowing behavior of feral hogs can cause extensive damage to pastureland as well as wetland and riparian areas, resulting in increased sedimentation to streams. To assess whether feral hog activity is contributing to the sediment levels in streams in this portion of the watershed, visual surveys should be conducted to document locations where evidence of rooting or wallowing behavior has occurred. Streams in close proximity to documented locations should be monitored for turbidity to determine if levels are high. If visual surveys and data indicate that feral hogs are a contributing source of sediment in this portion of the watershed, additional steps should be taken. Examples of actions to address this source include educational workshops for landowners to promote effective hog management techniques in addition to professional hog harvesting.

Element 4 – An estimate of the sources of funding needed, and/or authorities that will be relied upon, to implement the plan.

Funding for future implementation will be sought through Section 319(h) of the Federal Clean Water Act in the form of a 319(h) Nonpoint Source Implementation Grant from the Georgia Environmental Protection Division Department of Natural Resources. Should funding be awarded, the staff of the River Valley Regional Commission would implement the Watershed Management Plan during the established contractual timeline. Match funds would be obtained through in-kind services provided by local governments, agricultural BMP cost-share agreements, and stakeholders. NRCS would be consulted to assist with agricultural BMP implementation, and independent contractors will be consulted to assist with DNA/microbial source tracking, hog harvesting, and educational signage.

Element 5 – An information/education component that will be used to enhance public understanding of and participation in implementing the plan.

This Watershed Management Plan will be available for all persons who wish to obtain it. Should funding be awarded for future implementation, additional stakeholder/advisory meetings will be held to update interested persons in the status of the project and to evaluate the progress towards implementing management measures. Additionally, educational workshops to promote effective hog management techniques will be offered to local landowners. All announcements for public meetings will be announced in *The Harris County Journal* and *Troup County News*. Advisors and stakeholders will also be contacted by mailed letters. Targeted monitoring data will be posted on the Georgia Adopt-A-Stream website, which can be accessed by all interested parties.

Element 6 – A schedule for implementing the management measures that is reasonably expeditious.

The 319(h) grant application will be submitted to GA EPD in 2021.Should funding be awarded for implementation, evaluation of BMP locations would begin immediately. This monitoring and investigation period will allow for the identification of appropriate locations for BMP

installations. During this time, local governments, NRCS, and independent contractors will be consulted with. This process would take place during the first 3-6 months of the grant period. Once BMP locations have been finalized, installation of BMPs would take approximately one year to complete. The educational outreach component would also be conducted during this time. Following BMP implementation, post-BMP turbidity and bacterial monitoring would be conducted to determine the effectiveness of installed BMPs. All of these outputs would take approximately two years to complete.

Element 7 – A description of interim, measurable milestones for determining whether management measures or other control actions are being implemented.

RVRC staff will conduct targeted monitoring, collect samples for DNA/Microbial Source Tracking analysis, and conduct visual surveys during the beginning of the grant period. Targeted monitoring data will be submitted to the Georgia Adopt-A-Stream website. Completion of DNA/microbial source tracking analysis will be documented with data reports from the independent contractor. Completion of agricultural BMPs will be documented with landowner cost-share agreements and photo evidence from NRCS documenting completed BMPs. Completion of educational signage installations will be verified by RVRC staff at installation location(s), and these location(s) will be monitored for the presence of illicit carcass dumping following installation. Should professional hog harvesting be conducted, contracts with landowners will be executed and photo documentation of the implementation process will be provided by the independent contractor. Repair and replacement of failing sewage infrastructure will be evident through DNA/microbial source tracking results and facility compliance information maintained by EPA. RVRC staff will also offer educational workshops for landowners to promote effective hog management techniques. Following BMP installation, monthly targeted monitoring will be conducted throughout the watershed to measure success. This data will be submitted to the Georgia Adopt-A-Stream website.

Element 8 – A set of criteria that can be used to determine whether substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether the plan needs to be revised.

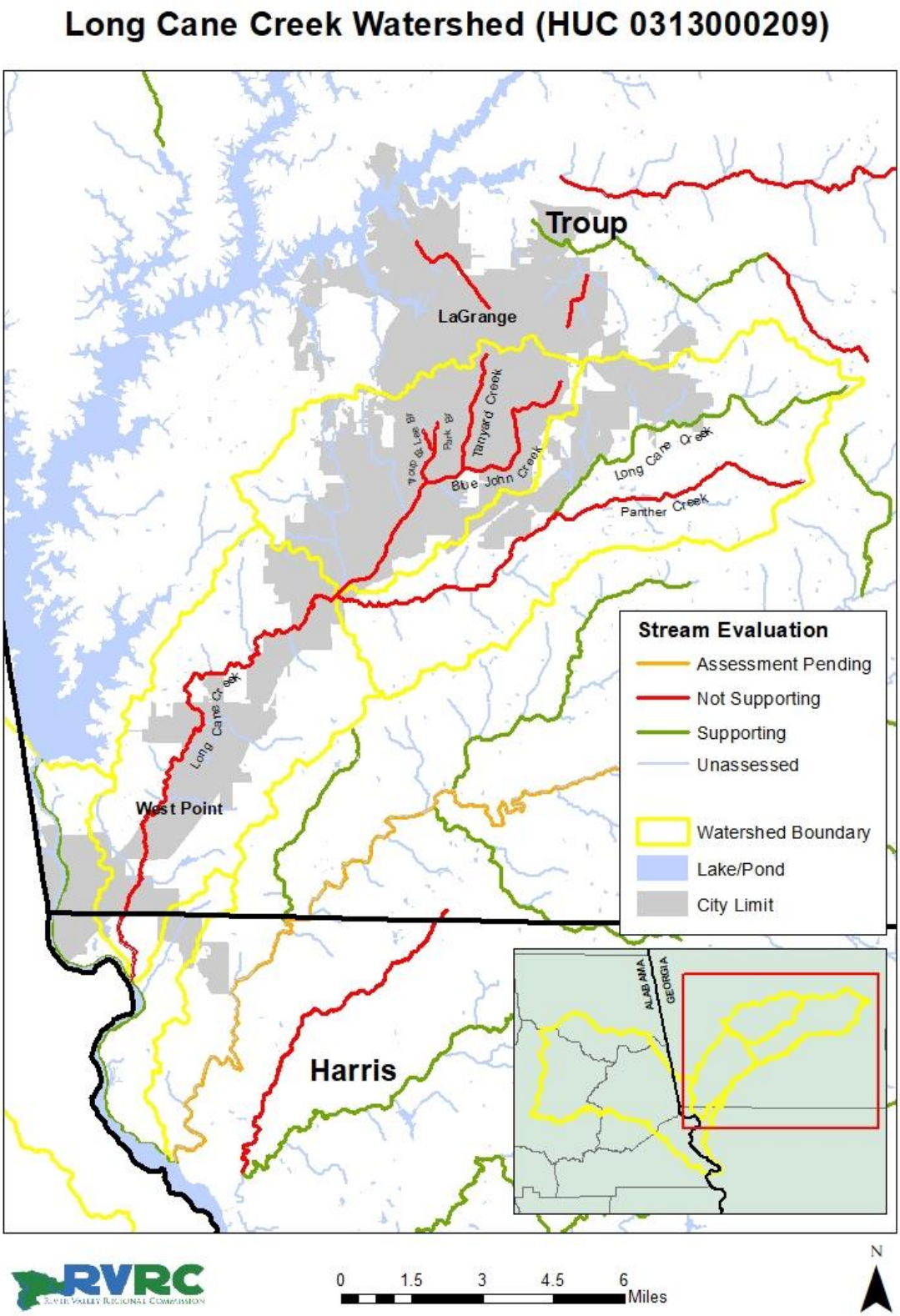
Targeted monitoring for *E. coli* and turbidity was conducted during the months of October 2018 – September 2019, while the monitoring for DNA/Microbial source tracking was conducted during the months of July 2018, October 2018, February 2019, and April 2019. Should funding be awarded for implementation, additional targeted monitoring and DNA/Microbial Source Tracking analysis will be conducted prior to and following BMP implementation. Data sets before and after BMP installation will be compared to assess the effectiveness of installed BMPs. Success will be determined by a statistically significant reduction in fecal coliform and turbidity levels following BMP implementation.

An evaluation of implementation will be conducted on a semi-annual basis by the Advisory Group to evaluate the progress towards implementing management measures. If reasonable progress toward implementing the management practices is not demonstrated, the Advisory Group will consider additional implementation actions.

Element 9 – A monitoring component to evaluate the effectiveness of the implementation efforts, measured against the criteria established under Element 8.

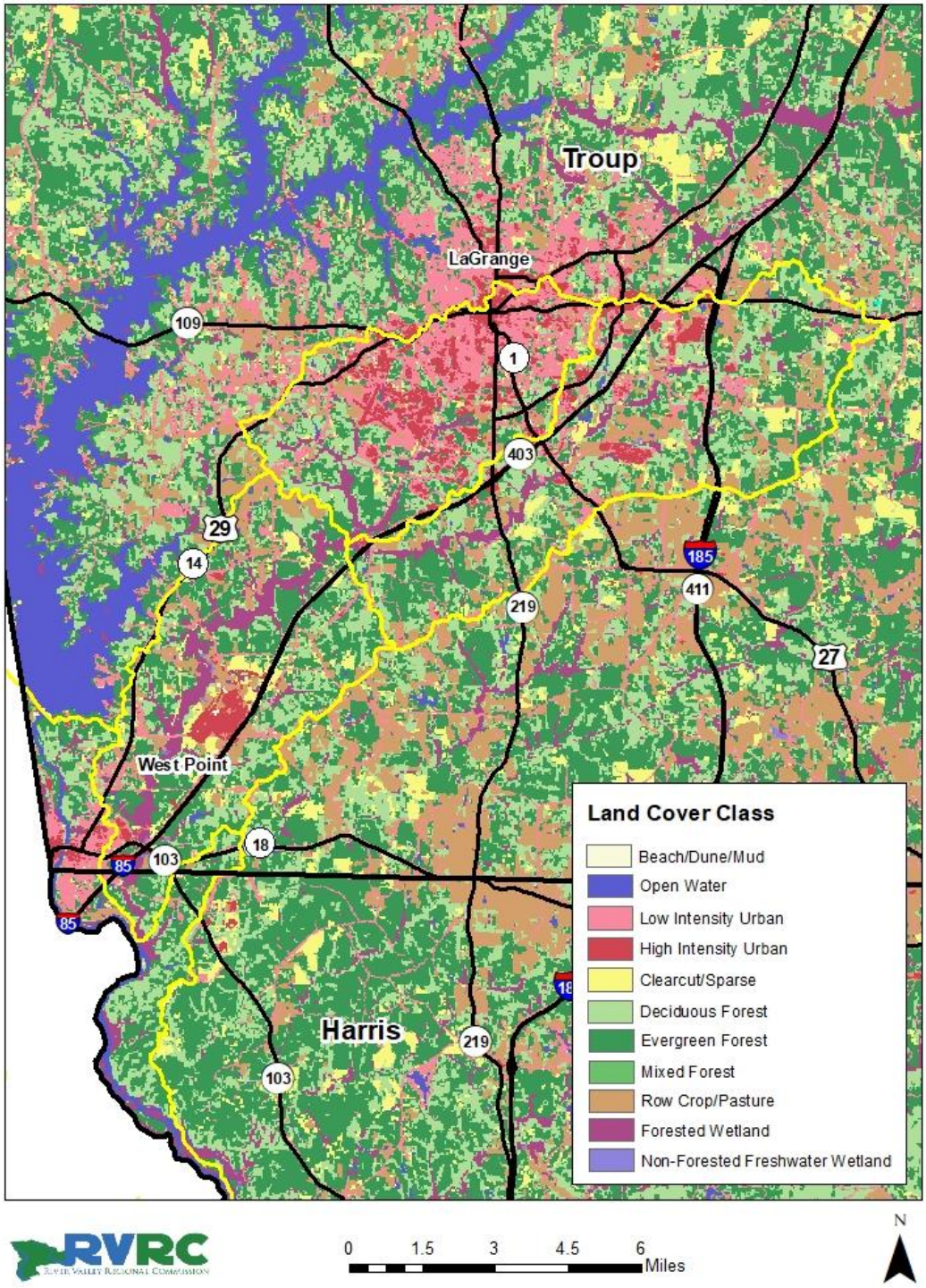
Should funding be awarded for implementation, targeted monitoring, DNA/Microbial Source Tracking analysis, and visual surveys will be conducted to determine whether feral hog activity is contributing to the fecal coliform and sediment levels within the watershed. Following this monitoring and investigation period, all BMP locations will be finalized, and BMP installations will begin. Following BMP implementation, post-BMP turbidity and bacterial monitoring will be conducted in addition to DNA/Microbial Source Tracking analysis to determine the effectiveness of installed BMPs.

APPENDIX B. LONG CANE CREEK WATERSHED MAP (HUC 0313000209)

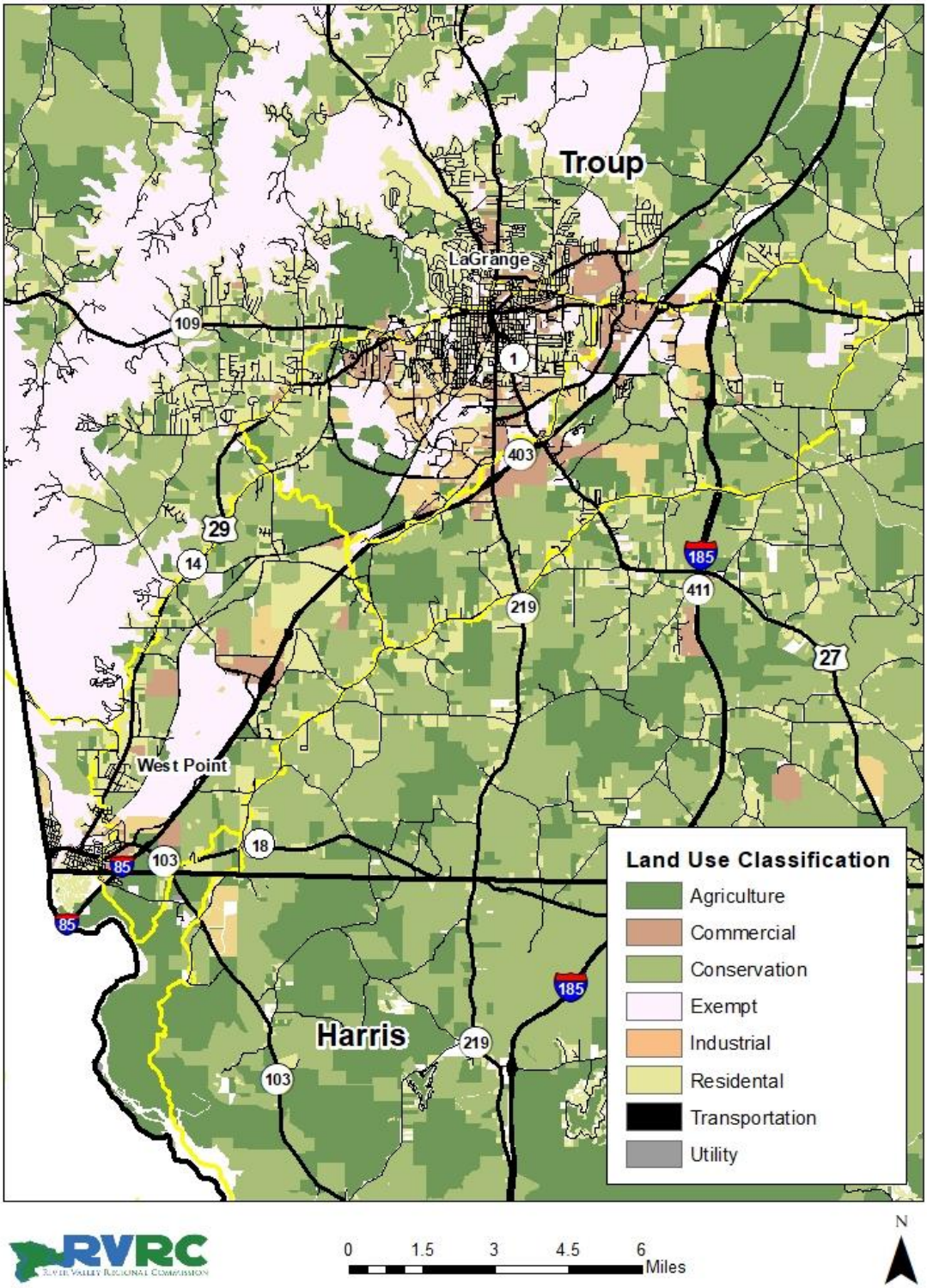


APPENDIX C. LAND USE MAPS: TRENDS AND EXISTING

Long Cane Creek Watershed Land Use Trends



Long Cane Creek Watershed Existing Land Use



APPENDIX D. VISUAL FIELD SURVEYS AND PHOTO DOCUMENTATION

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Blue John Creek at Edgewood Avenue

Blue John Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 12:08 PM

Site Location: Edgewood Avenue

GPS Coordinates (if taken): 33.019699°W 85.016098°N

Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +

Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):
See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)

Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____

Flow Stage: High☐; medium ☐; low ☒; dry☐.

Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____

Water Clarity: Clear ☐; tea-colored ☐; cloudy ☒; opaque ☐; red or brown from sediment ☐; other_____

Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____

Algal Growth—Description & Extent: N/A

Sediment: Eroded banks ☐; mid-channel bars ☐; recent sediment deposition on banks ☐; other ☒

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Park Branch at Forrest Avenue

Park Branch **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 1:39 PM
Site Location: Forrest Avenue
GPS Coordinates (if taken): 33.019901°W 85.045799°N
Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +
Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):
See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)
Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____
Flow Stage: High☐; medium ☒; low ☐; dry☐.
Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____
Water Clarity: Clear ☒; tea-colored ☐; cloudy ☐; opaque ☐; red or brown from sediment ☐; other_____
Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____
Algal Growth—Description & Extent: N/A
Sediment: Eroded banks ☐; mid-channel bars ☐; recent sediment deposition on banks ☐; other ☒

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Tanyard Creek at Lukken Industrial Drive

Tanyard Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 1:18 PM

Site Location: Lukken Industrial Drive

GPS Coordinates (if taken): 33.014400°W, 85.035301°N

Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +

Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):
See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)

Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____

Flow Stage: High☐; medium ☐; low ☒; dry☐.

Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____

Water Clarity: Clear ☒; tea-colored ☐; cloudy ☐; opaque ☐; red or brown from sediment ☐; other_____

Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____

Algal Growth—Description & Extent: N/A

Sediment: Eroded banks ☐; mid-channel bars ☒; recent sediment deposition on banks ☐; other

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Blue John Creek at Orchard Hill Road

Blue John Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 1:58 PM
Site Location: Orchard Hill Road
GPS Coordinates (if taken): 32.999777°W 85.051301°N
Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +
Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):
See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)
Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____
Flow Stage: High☐; medium ☒; low ☐; dry☐.
Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____
Water Clarity: Clear ☐; tea-colored ☐; cloudy ☒; opaque ☐; red or brown from sediment ☐; other_____
Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____
Algal Growth—Description & Extent: N/A
Sediment: Eroded banks ☒; mid-channel bars ☐; recent sediment deposition on banks ☐; other

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Long Cane Creek at Hamilton Road/US Hwy 27

Long Cane Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 11:27 AM
Site Location: Hamilton Road/U.S. Highway 27
GPS Coordinates (if taken): 32.991401°W 85.004501°N
Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +
Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):
See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)
Channel Type: Swamp ☐; pool ☒; run ☐, riffle☐; other_____
Flow Stage: High☒; medium ☐; low ☐; dry☐.
Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____
Water Clarity: Clear ☐; tea-colored ☐; cloudy ☒; opaque ☐; red or brown from sediment ☐; other_____
Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____
Algal Growth—Description & Extent: N/A
Sediment: Eroded banks ☐; mid-channel bars ☒; recent sediment deposition on banks ☐; other

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Long Cane Creek at Whitesville Road/SR 219

Long Cane Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 11:47 AM

Site Location: Whitesville Road/State Route 219

GPS Coordinates (if taken): 32.972400°W 85.025703°N

Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +

Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):

See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)

Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____

Flow Stage: High☒; medium ☐; low ☐; dry☐.

Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____

Water Clarity: Clear ☐; tea-colored ☐; cloudy ☒; opaque ☐; red or brown from sediment ☐; other_____

Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____

Algal Growth—Description & Extent: N/A _____

Sediment: Eroded banks ☐; mid-channel bars ☐; recent sediment deposition on banks ☒; other ☐

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Long Cane Creek at Cannonville Road

Long Cane Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 2:27 PM

Site Location: Cannonville Road

GPS Coordinates (if taken): 32.963199°W 85.091697°N

Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +

Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):

See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)

Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____

Flow Stage: High☐; medium ☒; low ☐; dry☐.

Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____

Water Clarity: Clear ☐; tea-colored ☐; cloudy ☒; opaque ☐; red or brown from sediment ☐; other_____

Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____

Algal Growth—Description & Extent: N/A

Sediment: Eroded banks ☐; mid-channel bars ☐; recent sediment deposition on banks ☐; other ☒

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Long Cane Creek at Gabbettville Road

Long Cane Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 2:49 PM
Site Location: Gabbettville Road
GPS Coordinates (if taken): 32.944198°W 85.132797°N
Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +
Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):
See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)
Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____
Flow Stage: High☐; medium ☒; low ☐; dry☐.
Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____
Water Clarity: Clear ☐; tea-colored ☐; cloudy ☐; opaque ☐; red or brown from sediment ☒; other_____
Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____
Algal Growth—Description & Extent: N/A
Sediment: Eroded banks ☐; mid-channel bars ☐; recent sediment deposition on banks ☐; other ☒

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Long Cane Creek at Webb Road

Long Cane Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 3:05 PM

Site Location: Webb Road

GPS Coordinates (if taken): 32.91080°W 85.14270°N

Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +

Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):

See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)

Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____

Flow Stage: High☒; medium ☐; low ☐; dry☐.

Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____

Water Clarity: Clear ☐; tea-colored ☐; cloudy ☐; opaque ☒; red or brown from sediment ☐; other_____

Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____

Algal Growth—Description & Extent: N/A

Sediment: Eroded banks ☐; mid-channel bars ☒; recent sediment deposition on banks ☐; other

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Long Cane Creek at Old West Point Road

Long Cane Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 3:28 PM

Site Location: Old West Point Road

GPS Coordinates (if taken): 32.865798°W 85.159301°N

Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +

Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):
See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)

Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____

Flow Stage: High☐; medium ☒; low ☐; dry☐.

Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____

Water Clarity: Clear ☐; tea-colored ☐; cloudy ☒; opaque ☐; red or brown from sediment ☒; other_____

Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____

Algal Growth—Description & Extent: N/A

Sediment: Eroded banks ☐; mid-channel bars ☐; recent sediment deposition on banks ☐; other ☒

Show stream or road segment & landmarks (crossing stream or road) or distances marking the upper & lower end of segment. If a stream, show the direction of flow, ponds or swampy areas, & estimate the width of the riparian corridor from each bank. Use an arrow to show the approximate direction of north. Show & describe (in the notes section) major adjoining land activities (see attached table) & show the location of specific potential sources & describe in the notes section. Show the direction and number of photographs taken.

Stream or Road Segment Map Or Drawing

Panther Creek at John Lovelace Road

Panther Creek **Visual Field Survey**

Date: 1/7/19 **Arrival Time:** 11:00 AM
Site Location: John Lovelace Road
GPS Coordinates (if taken): 33.001098°W, 84.961097°N
Current Weather: Clear/Sunny **Time Since Last Rain:** 48 hr +
Team Members: Laura Schneider, Will Griggs

Notes (point to/reference applicable activity on map):
See notes below

STREAM CONDITIONS @ ROAD CROSSINGS (Check as appropriate)
Channel Type: Swamp ☐; pool ☐; run ☒, riffle☐; other_____
Flow Stage: High☒; medium ☐; low ☐; dry☐.
Odors: None/normal ☒; sewage ☐; petroleum ☐; chemical ☐; chlorine ☐; rotten egg ☐; animal waste ☐; other_____
Water Clarity: Clear ☐; tea-colored ☐; cloudy ☒; opaque ☐; red or brown from sediment ☐; other_____
Water Surface: None ☒; slick ☐; oil sheen ☐; oil sheen—breaks into plates ☐; globs ☐; flecks ☐; foam ☐; other _____
Algal Growth—Description & Extent: N/A
Sediment: Eroded banks ☐; mid-channel bars ☐; recent sediment deposition on banks ☒; other

Blue John Creek at Edgewood Avenue (FC) Site 1: 1/7/19 12:08 PM

- 33.019699°W 85.016098°N
- Channel ≈ 15 ft wide
- Water cloudy, brown
- Level ≈ 1 ft low
- Some riprap around culvert
- No visible signs of pollution
- Low Intensity Urban
- Located within city limits of LaGrange
- Not located downstream from an impaired stream segment, located along Blue John Creek FC impaired stream segment
- Major Surrounding Land Uses: Commercial, Exempt, Industrial, Residential
- Not located downstream of any wastewater treatment facilities

Park Branch at Forrest Avenue (FC) Site 2: 1/7/19 1:39 PM

- 33.019901°W 85.045799°N
- Channel ≈ 8 ft wide
- Water cloudy, brown
- Level ≈ 1 ft low
- No riprap visible
- No visible signs of pollution
- Low Intensity Urban
- Located within city limits of LaGrange
- Not located downstream of an impaired stream segment, located along Park Branch FC impaired stream segment
- Major Surrounding Land Uses: Exempt, Industrial, Residential
- Not located downstream of any wastewater treatment facilities

Tanyard Creek at Lukken Industrial Drive (FC) Site 3: 1/7/19 1:18 PM

- 33.014400°W, 85.035301°N
- Channel ≈ 15 ft wide
- Water clear, no color
- Level ≈ <1 ft low
- No riprap visible
- No visible signs of pollution
- Low Intensity Urban

- Located within city limits of LaGrange
- Not located downstream from an impaired stream segment, located along Tanyard Creek FC impaired stream segment
- Major Surrounding Land Uses: Commercial, Exempt, Industrial, Residential
- Not located downstream of any wastewater treatment facilities

Blue John Creek at Orchard Hill Road (Bio F, FC) Site 4: 1/7/19 1:58 PM

- 32.999777°W 85.051301°N
- Channel ≈ 30 ft wide
- Water clear, no color
- Level ≈ 1 ft low
- Riprap on both side of bridge
- No visible signs of pollution
- Low Intensity Urban
- Located within city limits of LaGrange
- Located downstream of Park Branch, Troup Branch, Tanyard Creek, Lee Branch, and Blue John FC impaired stream segments and along Blue John Creek Bio F, FC impaired stream segment
- Major Surrounding Land Uses: Exempt, Industrial

Long Cane Creek at Hamilton Road/U.S. Hwy 27 (Bio F, FC) Site 5: 1/7/19 11:27 AM

- 32.991401°W 85.004501°N
- Channel ≈ 70 ft wide
- Water cloudy, brown
- Too turbid to determine level
- Little visible riprap around bridge
- No visible signs of pollution
- High Intensity Urban
- Located within unincorporated Troup County, less than .5 mile downstream of city limits of LaGrange
- Located downstream of Panther Creek Bio F impaired stream segment and along Long Cane Creek Bio F, FC impaired stream segment
- Major Surrounding Land Uses: Agriculture, Commercial, Exempt, Residential, Conservation
- Located approximately 1.5 miles downstream of Vulcan Construction Materials (LaGrange Quarry)

Long Cane Creek at Whitesville Road/SR 219 (Bio F, FC) Site 6: 1/7/19 11:47 AM

- 32.972400°W 85.025703°N

- Channel ≈ 60 ft wide
- Water cloudy, brown
- Too turbid to determine level
- Riprap around bridge
- No visible signs of pollution
- Low Intensity Urban
- Located within unincorporated Troup County, approximately 1.5 miles downstream of city limits of LaGrange
- Located downstream of Panther Creek Bio F impaired stream segment and along Long Cane Creek Bio F, FC impaired stream segment
- Major Surrounding Land Uses: Commercial, Residential, Conservation
- Located approximately 3.5 miles downstream of Vulcan Construction Materials (LaGrange Quarry)

Long Cane Creek at Cannonville Road (Bio F, FC) Site 7: 1/7/19 2:27 PM

- 32.963199°W 85.091697°N
- Channel ≈ 70 ft wide
- Water cloudy, brown
- Too turbid to determine level
- No visible riprap
- No visible signs of pollution
- Forested Wetland
- Located within city limits of LaGrange
- Located downstream of Park Branch, Lee Branch, Troup Branch, Tanyard Creek, and Blue John Creek FC impaired stream segments, Blue John Creek Bio F, FC impaired stream segment, and Panther Creek Bio F impaired stream segment, located along Long Cane Creek Bio F, FC impaired stream segment
- Major Surrounding Land Uses: Agricultural, Residential, Conservation
- Located approximately 1 mile downstream from City of LaGrange Long Cane Creek WPCP NPDES permitted wastewater treatment facility
- Located approximately 8 miles downstream of Vulcan Construction Materials (LaGrange Quarry)

Long Cane Creek at Gabbettville Road (Bio F, FC) Site 8: 1/7/19 2:49 PM

- 32.944198°W 85.132797°N
- Channel ≈ 60 ft wide
- Water cloudy, brown
- Too turbid to determine level
- Riprap on one side of bridge
- No visible signs of pollution

- Low Intensity Urban
- Located within unincorporated Troup County, 1.5 miles downstream of city limits of LaGrange
- Located downstream of Park Branch, Lee Branch, Troup Branch, Tanyard Creek, and Blue John Creek FC impaired stream segments, Blue John Creek Bio F, FC impaired stream segment, and Panther Creek Bio F impaired stream segment, located along Long Cane Creek Bio F, FC impaired stream segment
- Major Surrounding Land Uses: Exempt, Residential, Conservation
- Located approximately 5 mile downstream from City of LaGrange Long Cane Creek WPCP NPDES permitted wastewater treatment facility

Long Cane Creek at Webb Road (Bio F, FC) Site 9: 1/7/19 3:05 PM

- 32.91080°W 85.14270°N
- Channel ≈ 65 ft wide
- Water cloudy, brown
- Too turbid to determine level
- Some riprap visible
- No visible signs of pollution
- Low Intensity Urban
- Located within city limits of West Point
- Located downstream of Park Branch, Lee Branch, Troup Branch, Tanyard Creek, and Blue John Creek FC impaired stream segments, Blue John Creek Bio F, FC impaired stream segment, and Panther Creek Bio F impaired stream segment, located along Long Cane Creek Bio F, FC impaired stream segment
- Major Surrounding Land Uses: Exempt, Residential, Conservation
- Directly adjacent to Kia Motors Manufacturing
- Located approximately 8.5 miles downstream from City of LaGrange Long Cane Creek WPCP NPDES permitted wastewater treatment facility

Long Cane Creek at Old West Point Road (Bio F, FC) Site 10: 1/7/19 3:28 PM

- 32.865798°W 85.159301°N
- Channel ≈ 40 ft wide
- Water cloudy, brown
- Too turbid to determine level
- Riprap on both sides of bridge
- No visible signs of pollution
- Low Intensity Urban
- Located within unincorporated Harris County, less than 0.5 mile downstream of city limits of West Point

- Located downstream of Park Branch, Lee Branch, Troup Branch, Tanyard Creek, and Blue John Creek FC impaired stream segments, Blue John Creek Bio F, FC impaired stream segment, and Panther Creek Bio F impaired stream segment, located along Long Cane Creek Bio F, FC impaired stream segment
- Major Surrounding Land Uses: Agricultural, Commercial, Residential

Panther Creek at John Lovelace Road (Bio F) Site 11: 1/7/19 11:00 AM

- 33.001098°W, 84.961097°N
- Channel ≈ 15 ft wide
- Water cloudy, brown
- Level ≈ 1 ft low
- Some riprap around culvert
- No visible signs of pollution
- Low Intensity Urban
- Located within unincorporated Troup County
- Not located downstream of an impaired stream segment, located along Panther Creek Bio F impaired stream segment
- Major Surrounding Land Uses: Agricultural, Residential, Conservation

Blue John Creek at Edgewood Avenue (Site 1) Upstream

Blue John Creek at Edgewood Avenue (Site 1) Downstream

Park Branch at Forrest Avenue (Site 2) Upstream

Park Branch at Forrest Avenue (Site 2) Downstream

Tanyard Creek at Lukken Industrial Drive (Site 3) Upstream

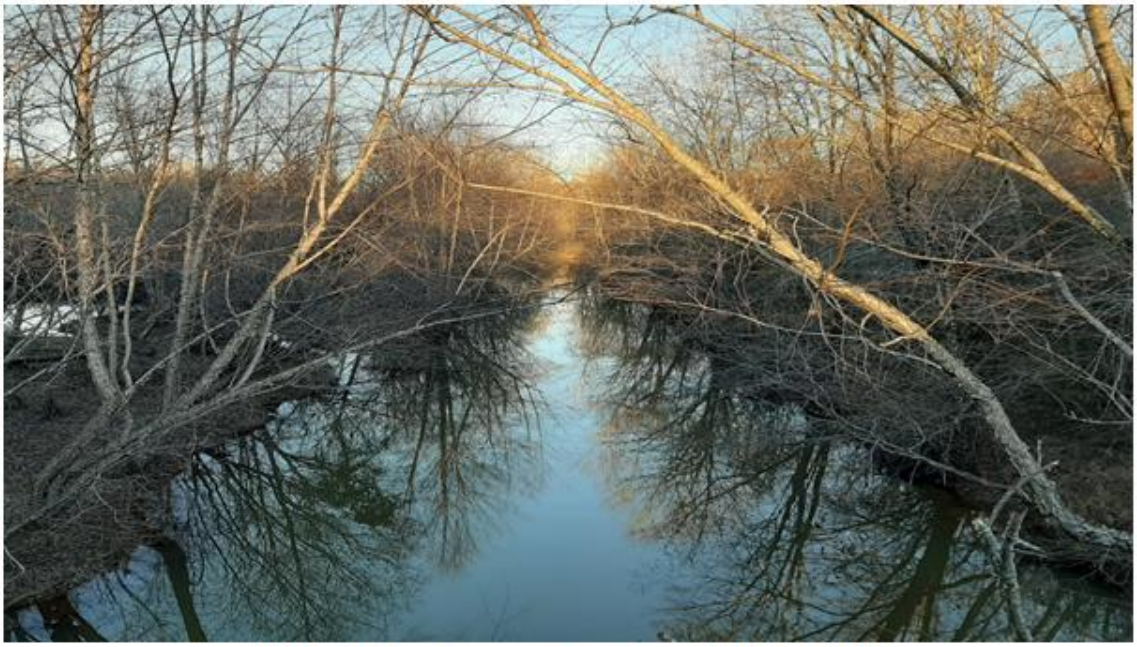
Tanyard Creek at Lukken Industrial Drive (Site 3) Downstream

Blue John Creek at Orchard Hill Road (Site 4) Upstream

Blue John Creek at Orchard Hill Road (Site 4) Downstream

Long Cane Creek at Hamilton Road/U.S. Hwy 27 (Site 5) Upstream

Long Cane Creek at Hamilton Road/U.S. Hwy 27 (Site 5) Downstream



Long Cane Creek at Whitesville Road/SR 219 (Site 6) Upstream

Long Cane Creek at Whitesville Road/SR 219 (Site 6) Downstream

Long Cane Creek at Cannonville Road (Site 7) Upstream

Long Cane Creek at Cannonville Road (Site 7) Downstream

Long Cane Creek at Gabbettville Road (Site 8) Upstream

Long Cane Creek at Gabbettville Road (Site 8) Downstream

Long Cane Creek at Webb Road (Site 9) Upstream

Long Cane Creek at Webb Road (Site 9) Downstream

Long Cane Creek at Old West Point Road (Site 10) Upstream

Long Cane Creek at Old West Point Road (Site 10) Downstream

Panther Creek at John Lovelace Road (Site 11) Upstream

Panther Creek at John Lovelace Road (Site 11) Downstream

ADDITIONAL PHOTOS FROM MONITORING EVENTS

Cattle on Lower Blue Springs Road 2/11/19

Cattle and Horses on Lower Blue Springs Road 2/11/19

Cattle on New Hutchinson Mill Road 2/27/19

Cattle on New Hutchinson Mill Road 5/28/19

Cattle on Robert Taylor Road 9/19/19

Horses on Robert Taylor Road 5/28/19

Deer carcass dumped over bridge on Edgewood Avenue into Blue John Creek (Site 1) 8/22/19

Deer remains dumped onto bridge on Edgewood Avenue into Blue John Creek (Site 1) 10-29-18

Carcass(es) dumped next to bridge on Edgewood Avenue at Blue John Creek (Site 1) 11/28/18

Sewage spill on Old West Point Road at Long Cane Creek resulting from pump failure at lift station and damaged manhole (Site 10) 2/27/19

Sewage spill on Old West Point Road at Long Cane Creek resulting from pump failure at lift station and damaged manhole (Site 10) 2/27/19

Damaged manhole at sewage spill location on Old West Point Road at Long Cane Creek (Site 10)

Notice of sewage spill posted by the City of West Point on Old West Point Road at Long Cane Creek (Site 10)

Sewage spill location following manhole repair and spill clean-up on Old West Point Road at Long Cane Creek (Site 10) 3/29/19

Before: Undeveloped land at intersection of John Lovelace Road and Lower Blue Springs Road prior to residential development (seen below)

After: Residential development at intersection of John Lovelace Road and Lower Big Springs Road 2/27/19

Construction site on E 10th Street in West Point 2/27/19

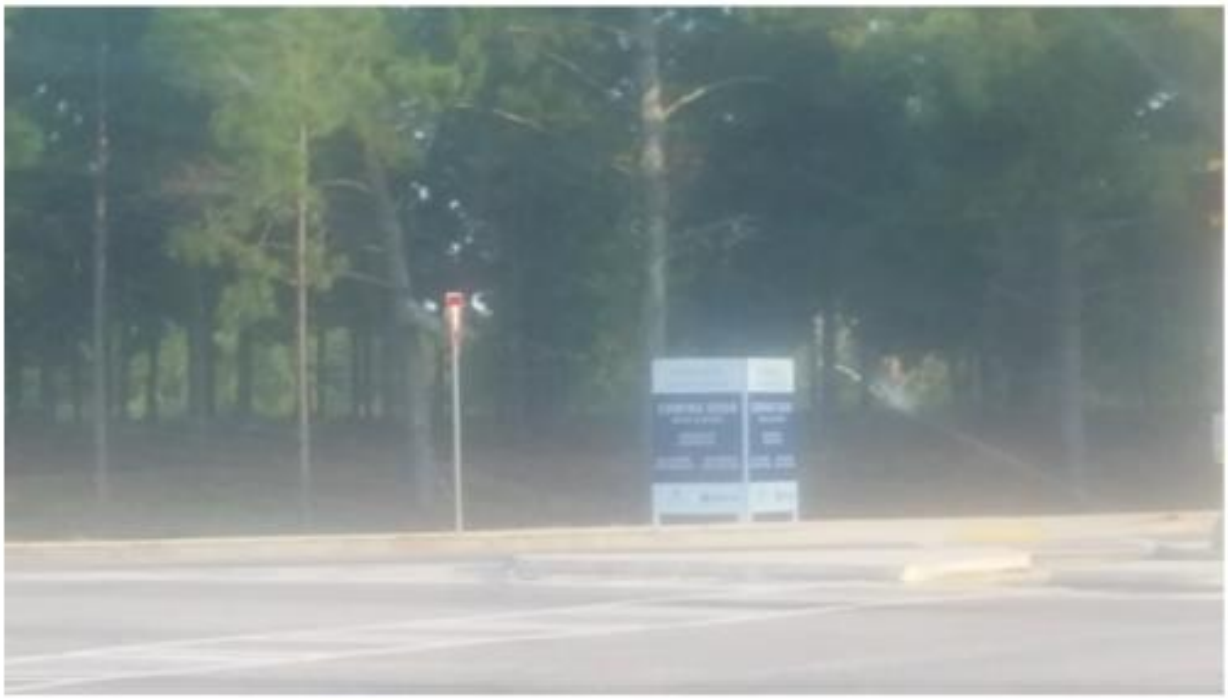
Construction site on E 10th Street in West Point 2/27/19

Best management practices implemented at construction site on E 10th Street in West Point 3/29/19

Best management practices implemented at construction site on E 10th Street in West Point 5/28/19

Sign advertising development opportunity for lot on E 10th Street in West Point 5/28/19

Sign advertising development opportunity for lot on E 10th Street in West Point 5/28/19



Sign advertising new retail and office space on Whitesville Road/SR 219 in LaGrange 9/19/19

Sign advertising new homes at intersection of John Lovelace Road and Lower Big Springs Road near Panther Creek (Site 11) 10/29/18

Residential development off Ragland Street in LaGrange one quarter of a mile from Blue John Creek
12/28/20

Residential development off Ragland Street in LaGrange one quarter of a mile from Blue John Creek
12/28/20

Logging on Gabbettville Road adjacent to Long Cane Creek (Site 8) 10/29/18

Logging on Gabbettville Road adjacent to Long Cane Creek (Site 8) 5/28/19

Logging on Upper Big Springs Road in LaGrange less than 1 mile from Long Cane Creek 12/28/20

Logging on Upper Big Springs Road in LaGrange less than 1 mile from Long Cane Creek 12/28/20

Sediment in Long Cane Creek on Hood Road 6/27/18

Sediment plume in Long Cane Creek at Webb Road (Site 9) 5/28/19

APPENDIX E. COPIES OF PUBLIC NOTICES AND OTHER DOCUMENTATION

RVRC
RIVER VALLEY REGIONAL COMMISSION
www.rivervalleyrc.org

Columbus Office
710 Front Avenue
P. O. Box 1908
Columbus, GA 31901
Phone (706) 256-2910
Fax (706) 256-2908
TDY (706)256-2944

Americus Office
228 West Lamar Street
Americus, GA 31709
Phone (706)256-2910
Fax (229) 931-2745
Fax (229) 931-2917

Toll Free (877)819-6348

August 20, 2018

Dear Community Leader:

The Georgia Department of Natural Resources – Environmental Protection Division (GA DNR – EPD) has contracted with River Valley Regional Commission (RVRC) to monitor and prepare a new Watershed Management Plan for the decrease in Total Maximum Daily Load (TMDL) of the levels of fecal coliform and sediment in the segment of Long Cane Creek from Panther Creek to the Chattahoochee River and its tributaries. The RVRC is holding a Stakeholder/Advisory meeting so that key advisors may make recommendations and/or provide key information and materials to the RVRC staff. The purpose of the Advisory Committee is to provide a forum for the public, partners, etc. to discuss potential concerns and solutions that will impact Long Cane Creek and its tributaries, and to make recommendations relative to TMDLs.

This committee will assist in developing a plan to restore Long Cane Creek and its tributaries to their designated use of fishing. The Advisory Committee will help identify contributing pollution sources, assist in arriving at equitable pollution reduction allocations, and recommend specific actions needed to effectively control sources of pollution. These groups of people are critical to the successful restoration and protection of Long Cane Creek and its tributaries.

The Advisory Committee's key responsibilities are to:

- **Advise** on matters of concern to the community;
- **Contribute to the education** of the residents of the watershed on water quality issues;
- **Help identify** contributing pollution sources;
- **Assist** in arriving at equitable pollution reduction allocations among contributors;
- **Recommend specific actions** needed to effectively control sources of pollution; and
- **Help develop** and set in motion an extended plan.

Since you may have a better understanding of the interests in your area, we are asking for you or someone of interest to please serve on this Advisory Committee. Our first meeting will be held on **September 26, 2018** at **11:00 am** at the **Mike Daniel Recreation Center**, located at 1220 Lafayette Parkway in LaGrange. If you have any questions please call me at 706-256-2910 or email me at lschneider@rivervalleyrc.org. Together, we can ensure our waters will be clean and safe for everyone to enjoy!

Sincerely,

Laura Schneider

Laura Schneider
Environmental Planner

Chattahoochee | Clay | Crisp | Dooly | Harris | Macon | Marion | Muscogee
Quitman | Randolph | Schley | Stewart | Sumter | Talbot | Taylor | Webster

RVRC
River Valley Regional Commission
www.rivervalleyrc.org

Columbus Office
710 Front Avenue
P. O. Box 1908
Columbus, GA 31901
Phone (706) 256-2910
Fax (706) 256-2908
TDY (706)256-2944

Americus Office
228 West Lamar Street
Americus, GA 31709
Phone (706)256-2910
Fax (229) 931-2745
Fax (229) 931-2917

Toll Free (877)819-6348

August 20, 2018

Dear Stakeholder/Landowner:

I am writing to inform you that the State of Georgia is conducting a study for the segment of Long Cane Creek from Panther Creek to the Chattahoochee River and its tributaries. This study, known as a TMDL (or Total Maximum Daily Load) study, will determine and address the levels of pollutants in this segment of Long Cane Creek and its tributaries. This study will also propose the means to reduce the amount of pollutants in the waters.

It is important that the State include input from landowners in the immediate area, local government authorities, and citizens concerning any possible actions or decisions. This input will be included in the resulting TMDL Watershed Management Plan, as well as plans for further stakeholder participation, both in the restoration and/or maintenance of these stream segments.

The primary impairments identified in this part of Long Cane Creek and its tributaries are sediment and fecal coliform. These impairments are an indicator of other possible health threats. This impact can be reversed or marginalized.

The State of Georgia's TMDL protocol process is most effective when stakeholders, landowners, and local authorities are encouraged to participate and make recommendations. The process is meant to be a coordinated effort among all parties to ensure success of the program.

As a landowner/stakeholder, your participation is needed. On **Wednesday, September 26, 2018** at **11:00 am**, a stakeholder meeting will be held at the Mike Daniel Recreation Center in LaGrange, located at 1220 Lafayette Parkway in LaGrange, where you may express and hear other people's concerns. We encourage you to attend this meeting. If you have any questions, please feel free to contact me at 706-256-2910 or lschneider@rivervalleyrc.org. I look forward to seeing you there.

Sincerely,

Laura Schneider

Laura Schneider
Environmental Planner

For Immediate Service Announcement:
September 10, 2018

Contact: Laura Schneider
Phone: 706-256-2910
Fax: 706-256-2061
Email: lschneider@rivervalleyrc.org

Public Hearing on Water Quality Concerns for the Long Cane Creek Watershed

A community hearing will be held to discuss the monitoring efforts and preparation of a new Watershed Management Plan for the decrease in pollutant levels within the Long Cane Creek watershed.

Those attending the meeting will have the opportunity to assist in developing a plan to restore the Long Cane Creek watershed to its designated use. Stakeholders will also be able to help identify and discuss contributing pollution sources, assist in determining appropriate reduction levels, and recommend specific actions needed to effectively control sources of pollution. In order to make recommendations and/or provide key information and materials from your local community, the River Valley Regional Commission is asking all interested residents to attend and provide input. This group of people will be critical to the successful restoration and protection of the Long Cane Creek watershed.

Our community hearing will be held on **September 26, 2018** at **11:00 am** at the **Mike Daniel Recreation Center,** located at 1220 Lafayette Parkway in LaGrange. If you have any questions, please contact Laura Schneider at 706-256-2910 or email at lschneider@rivervalleyrc.org.

RVRC
RIVER VALLEY REGIONAL COMMISSION
www.rivervalleyrc.org

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710 Front Avenue
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Phone (706) 256-2910
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228 West Lamar Street
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Fax (229) 931-2917

Toll Free (877)819-6348

December 14, 2020

Dear Community Leader:

The Georgia Department of Natural Resources – Environmental Protection Division (GA DNR – EPD) has contracted with River Valley Regional Commission (RVRC) to monitor and prepare a new Watershed Management Plan for the decrease in Total Maximum Daily Load (TMDL) of the levels of fecal coliform and sediment in the segment of Long Cane Creek from Panther Creek to the Chattahoochee River and its tributaries. The RVRC is holding a Stakeholder/Advisory meeting so that key advisors may make recommendations and/or provide key information and materials to the RVRC staff. The purpose of the Advisory Committee is to provide a forum for the public, partners, etc. to discuss potential concerns and solutions that will impact Long Cane Creek and its tributaries, and to make recommendations relative to TMDLs.

This committee will assist in developing a plan to restore Long Cane Creek and its tributaries to their designated use of fishing. The Advisory Committee will help identify contributing pollution sources, assist in arriving at equitable pollution reduction allocations, and recommend specific actions needed to effectively control sources of pollution. These groups of people are critical to the successful restoration and protection of Long Cane Creek and its tributaries.

The Advisory Committee's key responsibilities are to:

- **Advise** on matters of concern to the community;
- **Contribute to the education** of the residents of the watershed on water quality issues;
- **Help identify** contributing pollution sources;
- **Assist** in arriving at equitable pollution reduction allocations among contributors;
- **Recommend specific actions** needed to effectively control sources of pollution; and
- **Help develop** and set in motion an extended plan.

Since you may have a better understanding of the interests in your area, we are asking for you or someone of interest to please serve on this Advisory Committee. Our next meeting will be held on **December 28, 2020** at **2:00 pm** at the **Mike Daniel Recreation Center**, located at 1220 Lafayette Parkway in LaGrange. If you have any questions, please feel free to call me at 706-256-2910 or email me at lschneider@rivervalleyrc.org . I look forward to seeing you there.

Sincerely,

Laura Schneider

Laura Schneider
Environmental Planner

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Toll Free (877)819-6348

December 14, 2020

Dear Stakeholder/Landowner:

I am writing to inform you that the State of Georgia is conducting a study for the segment of Long Cane Creek from Panther Creek to the Chattahoochee River and its tributaries. This study, known as a TMDL (or Total Maximum Daily Load) study, will determine and address the levels of pollutants in this segment of Long Cane Creek and its tributaries. This study will also propose the means to reduce the amount of pollutants in the waters.

It is important that the State include input from landowners in the immediate area, local government authorities, and citizens concerning any possible actions or decisions. This input will be included in the resulting TMDL Watershed Management Plan, as well as plans for further stakeholder participation, both in the restoration and/or maintenance of these stream segments.

The primary impairments identified in this part of Long Cane Creek and its tributaries are sediment and fecal coliform. These impairments are an indicator of other possible health threats. This impact can be reversed or marginalized.

The State of Georgia's TMDL protocol process is most effective when stakeholders, landowners, and local authorities are encouraged to participate and make recommendations. The process is meant to be a coordinated effort among all parties to ensure success of the program.

As a landowner/stakeholder, your participation is needed. On **Monday, December 28, 2020** at **2:00 pm**, a stakeholder meeting will be held at the Mike Daniel Recreation Center, located at 1220 Lafayette Parkway in LaGrange, where you may express and hear other people's concerns. We encourage you to attend this meeting. If you have any questions, please feel free to contact me at 706-256-2910 or lschneider@rivervalleyrc.org. I look forward to seeing you there.

Sincerely,

Laura Schneider

Laura Schneider
Environmental Planner

For Immediate Service Announcement:
December 14, 2020

Contact: Laura Schneider
Phone: 706-256-2910
Fax: 706-256-2061
Email: lschneider@rivervalleyrc.org

Public Hearing on Water Quality Concerns for the Long Cane Creek Watershed

A community hearing will be held to discuss the monitoring efforts and preparation of a new Watershed Management Plan for the decrease in pollutant levels within the Long Cane Creek watershed.

Those attending the meeting will have the opportunity to assist in developing a plan to restore the Long Cane Creek watershed to its designated use. Stakeholders will also be able to help identify and discuss contributing pollution sources, assist in determining appropriate reduction levels, and recommend specific actions needed to effectively control sources of pollution. In order to make recommendations and/or provide key information and materials from your local community, the River Valley Regional Commission is asking all interested residents to attend and provide input. This group of people will be critical to the successful restoration and protection of the Long Cane Creek watershed.

Our community hearing will be held on **December 28, 2020** at **2:00 pm** at the **Mike Daniel Recreation Center,** located at 1220 Lafayette Parkway in LaGrange. If you have any questions, please contact Laura Schneider at 706-256-2910 or email at lschneider@rivervalleyrc.org.

APPENDIX F. MEETING MINUTES AND ADDITIONAL STAKEHOLDER COMMENTS

Long Cane Creek Watershed TMDL
Advisory/Stakeholder Committee Meeting Minutes
September 26, 2018

Persons Attending

Laura Schneider (Environmental Planner, River Valley Regional Commission)
Jim Russell (Water Quality Programs Manager, City of LaGrange)
Hannah Bradford (Watershed Protection, Chattahoochee Riverkeeper)
James Emery (Director of Engineering and Development, Troup County)
Dana Johnson (Landowner, Prophett Family Limited Partnership)
Elizabeth Willimon (F.L.I. Properties)

This meeting was held at 11:00 am at the Mike Daniel Recreation Center in LaGrange to discuss potential sources and solutions for the fecal coliform and sediment pollution in the Long Cane Creek watershed.

- Introductions were made by all who attended. Laura Schneider provided an overview of the Total Maximum Daily Load (TMDL) process and discussed the segments listed as impaired in the Long Cane Creek watershed.
- The state of Georgia assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the federal Clean Water Act.
- Assessed water bodies are placed into one of three categories with respect to designated uses (supporting, assessment pending, or not supporting).
- These water bodies are published every two years in Georgia's Water Quality Report, also known as the 305(b)/303(d) list.
- For water bodies that are listed as not supporting their designated uses, Section 303(d) of the Clean Water Act requires states to develop TMDL evaluations for the water quality constituents in violation of the water quality standard.
- The TMDL process establishes the allowable pollutant loadings or other quantifiable parameters for a water body based on the relationship between pollutant sources and instream water quality conditions.
- This allows water quality based controls to be developed to reduce pollution and restore and maintain water quality.
- In Georgia Environmental Protection Division's (EPD) 2014 305(b)/303(d) list of waters, eight stream segments were identified within the Long Cane Creek watershed as not supporting their designated uses.
- Those segments listed include several tributaries to Long Cane Creek, which include Blue John Creek, Lee Branch, Park Branch, Tanyard Creek, Troup Branch, and Panther Creek. An 18-mile segment of Long Cane Creek, which begins at Panther Creek and ends at the Chattahoochee River was also listed.
- The designated use for all listed stream segments is fishing. Water quality impairments in these segments include fecal coliform and sediment (biota impacted-fish community).

- According to the 2014 305(b)/303(d) list, TMDLs were completed by the state in 1998 and 2003 for these segments, with the exception of a 3-mile segment of Blue John Creek, which is listed for a fecal coliform impairment.
- Of those completed in 2003, 4 out of 5 were revised in 2008.
- Laura Schneider gave an overview of the project and informed stakeholders of the progress that has been made since the grant was awarded.
- RVRC applied for Regional Water Plan Seed Grant funding in December 2017. RVRC received notification of funding in March 2018, and RVRC's contract with GA EPD was executed in May 2018.
- The goal of this grant is to update the current watershed management plan with land use and water quality data which reflects existing watershed conditions. The updated plan will recommend best management practices (BMPs) to be installed in the watershed to address pollutants.
- Since the grant was executed, RVRC staff has established sampling locations for the watershed, developed and submitted a Quality Assurance/Quality Control (QA/QC) targeted monitoring plan to GA EPD, and conducted one round of DNA/microbial source tracking analysis.
- This analysis tested for the presence of fecal contamination from human, deer, cattle, and beaver. Results revealed that deer are contributing at sites 4-7, cattle are contributing at sites 4 & 5, and beaver are contributing at sites 1-8. No human contamination was detected.
- Since there are several TMDL reports, Laura Schneider did not go through the percentage reduction requirements for each listed segment. Stakeholders were encouraged to request individual TMDL reports if they had an interest in a particular stream segment.
- Laura Schneider discussed some of the point and non-point sources that are mentioned in the current watershed management plan as potentially contributing to the fecal coliform and sediment impairments. Potential sources that were discussed include leaking sewer lines and septic systems, wildlife (beaver, deer), invasive species (feral hogs), agriculture (cattle, horses), erosion from dirt roads, and runoff from construction sites.
- Jim Russell said that the City of LaGrange monitors sewer pipes often for leaks and clogs, checking potential problem areas frequently. They also educate citizens on how to properly dispose of fats, oils, grease, and pet waste. Elizabeth Willimon suggested that new homeowners in the watershed be provided with these educational materials.
- Dana Johnson's family owns property adjacent to site 11 near John Lovelace Rd. She said that beavers are a big issue on her property and have caused many acres to become inaccessible due to flooding. James Emery said John Lovelace Rd floods about once every 3 years due to water buildup from beaver dams.
- Dana Johnson said that feral hogs are also a problem on her property. No one else is aware of feral hogs at any other locations in the watershed.
- Jim Russell said that there are several properties with cattle near Upper Big Springs Rd, and he has seen evidence of cattle in streams in the area. Dana Johnson also confirmed that there are cattle near her property, which runs through Panther Creek and Long Cane Creek. Both stated that the DNA/microbial source tracking results for sites 5 & 6 make sense. No one thought that horses were a likely source of fecal coliform in the watershed.
- Dana Johnson said that recent construction near her property could be contributing to the sediment problem.

- Hannah Bradford said that Chattahoochee Riverkeeper monitors for turbidity and *E.coli* at many of the same sites RVRC has established in the watershed. She said that site 10 on Old West Point Rd has spikes in *E.coli* levels periodically, and that the spikes are not always correlated to rainfall. They have searched the area for signs of pollutants, but have not been able to identify any potential sources yet. Hannah Bradford also mentioned that once a year, Chattahoochee Riverkeeper has a big monitoring event in which volunteers sample between 30-40 sites throughout the watershed. The next event will take place in the spring.
- Stakeholders requested that a copy of the watershed map as well as the results from the first round of DNA/microbial source tracking be sent out to all in attendance via email.
- Several stakeholders suggested that since Chattahoochee Riverkeeper is also collecting water quality data in the watershed, that it would be beneficial for them and RVRC to share data. Hannah Bradford said that if RVRC is interested in Chattahoochee Riverkeeper's data, she can make it available.
- James Emery asked what BMPs will be recommended in the updated watershed management plan to address beavers. Laura Schneider said no specific BMPs have been decided upon at this point in the process.
- Visual stream assessments will take place between now and the end of December. Targeted water quality monitoring for fecal coliform and sediment (turbidity) will begin next month and will take place for one year. Three additional rounds of DNA/microbial source tracking will be conducted seasonally through April 2019. A second stakeholder meeting will be held next fall.
- Laura Schneider thanked the stakeholders for attending and encouraged them to contact her with any questions or concerns that may come up between now and the next meeting.
- Elizabeth Willimon stayed after the meeting to ask questions about turbidity monitoring and construction sites as potential sources of sediment in the watershed.

The meeting was adjourned at 11:45 am.

Long Cane Creek Watershed TMDL
Advisory/Stakeholder Committee Meeting Minutes
December 28, 2020

Persons Attending

Laura Schneider (Environmental Planner, River Valley Regional Commission)
Retha Hart (Landowner, Prophett Family Limited Partnership)

This meeting was held at 2:00 pm at the Mike Daniel Recreation Center in LaGrange to discuss potential sources and solutions for the fecal coliform and sediment pollution in the Long Cane Creek watershed.

- Introductions were made by all who attended. Ms. Schneider discussed the purpose of the meeting and provided a brief description of the project.
- The purpose of the meeting is to obtain input from stakeholders into the update of the watershed management plan for Long Cane Creek watershed.
- Records indicate that segments of this watershed have been listed by GA EPD as impaired since 1996.
- In 2010, a watershed based plan was developed for Long Cane Creek watershed by Three Rivers Regional Commission, however this plan lacked key elements necessary for implementation.
- The RVRC's goal is to update this plan to meet the nine elements of watershed planning as set forth by the US EPA and to update the land use and water quality data to reflect current conditions in the watershed. This updated plan will set the groundwork for future implementation efforts to take place.
- Ms. Schneider then provided an overview of the state's listing process and Total Maximum Daily Load (TMDL) development.
- The state of Georgia assesses its water bodies for compliance with water quality standards criteria as required by the federal Clean Water Act every two years.
- Assessed water bodies are placed into one of three categories with respect to designated uses (supporting, assessment pending, or not supporting).
- These water bodies are published every two years in Georgia's Water Quality Report, also known as the 305(b)/303(d) list.
- For water bodies that are listed as not supporting their designated uses, Section 303(d) of the Clean Water Act requires states to develop total maximum daily load, or TMDL, evaluations for the water quality constituents that are in violation of the water quality standard.
- The TMDL establishes the allowable pollutant loadings or other quantifiable parameters for a water body based on the relationship between pollutant sources and instream water quality conditions. This allows water quality based controls to be developed to reduce pollution and restore and maintain water quality.
- Impaired stream segments within the watershed were discussed, including reach location, impairment, and designated use.
- In 2017, the RVRC applied for Regional Water Plan Seed Grant funding to undertake this project.

- At that time, 8 stream segments within the watershed were identified by GA EPD as not meeting their designated use.
- Those segments listed include several tributaries to Long Cane Creek, which include Blue John Creek, Lee Branch, Park Branch, Tanyard Creek, Troup Branch, and Panther Creek, in addition to an 18-mile segment of Long Cane Creek, which begins at Panther Creek and ends at the Chattahoochee River, totaling 38 miles of impairment.
- Water quality impairments in these segments include fecal coliform and sediment (biota impacted-fish community), and the designated use for all listed stream segments is fishing.
- TMDLs were completed by the state in 1998 and 2003 for these segments. Of those completed in 2003, 5 out of 7 were revised in 2008.
- Since there are a number of TMDL reports for impaired stream segments within the watershed, percentage reduction requirements for each listed segment were not discussed in detail. Stakeholders were encouraged to request individual TMDL reports if they had an interest in a particular stream segment. Mrs. Hart stated that she is interested in the 6-mile segment of Panther Creek which begins at the headwaters of Panther Creek and ends at its confluence with Long Cane Creek.
- Ms. Schneider provided background information about the watershed.
- The watershed begins in east-central Troup County and flows southwest through the cities of LaGrange and West Point before it empties out into the Chattahoochee River in northwest Harris County and covers approximately 84 square miles.
- Existing land use data indicates that the primary land uses in the watershed are conservation, residential, and agricultural, together accounting for roughly 65% of the land area in the watershed. The remaining land uses include exempt (religious, non-profit), transportation, commercial, industrial, unused, and utility.
- According to information from the University of Georgia, a large majority (47%) of the watershed consists of forested land, while roughly a quarter (27%) consists of urban land, 12% consists of crop/pasture, and 5% consists of land classified as clearcut or sparse. The remaining 9% is comprised of wetlands and open water. Mrs. Hart agreed that these numbers sound reasonable for the area.
- Potential sources of impairment listed in the 2010 watershed based plan were discussed.
- This plan listed a number of potential pollutant sources, including both point and non-point sources. Point sources that were listed included leaking sewer lines, land application systems, landfills, and NPDES permitted wastewater treatment facilities. Non-point sources listed included wildlife (specifically beaver and deer), agricultural livestock, and leaking septic systems.
- As part of the RVRC's contract with GA EPD, they conducted visual stream assessments of impaired stream segments within the watershed to identify potential sources of pollutants, conducted targeted water quality monitoring to establish current baseline conditions of impaired stream segments within the watershed, and conducted DNA/microbial source tracking analysis to assess specific sources of fecal coliform impacting impaired stream segments within the watershed.
- This helped them to further evaluate the some of the potential sources that were included in the previous plan and identify additional sources that may be contributing to the fecal coliform and sediment impairments.

- Sources of fecal coliform were discussed.
- From the DNA/microbial source tracking analysis that was conducted, the RVRC was able to verify that livestock, wildlife, and leaking sewer systems are contributing sources of fecal coliform contamination within the watershed.
- Cattle was detected at 6 of 10 stream sites monitored for *E.coli*, cattle were also observed at several locations throughout the watershed. Stakeholders also confirmed that they had seen evidence of cattle in streams.
- Beaver was detected at 9 of 10 sites monitored for *E.coli*, high beaver populations were also noted by stakeholders in the northeastern portion of the watershed. Mrs. Hart stated that John Lovelace Rd floods every so often due to beaver activity. Her property is adjacent to John Lovelace Rd. She echoed her family's comments about beavers on the property.
- Deer was detected at 4 of 10 sites monitored for *E.coli*.
- Human was detected at site 3, which was monitored for *E.coli*. This site is located within the city limits of LaGrange, and is less than a quarter of a mile downstream from a city sewer line.
- High *E.coli* counts were also detected by RVRC staff at site 5 during a monitoring event. These elevated levels were attributed to a sewage spill that occurred along a city of LaGrange sewer line adjacent to the stream the day prior to the monitoring event.
- A sewage spill was also discovered by RVRC staff at site 10 during a monitoring event. This spill was attributed to a pump failure that occurred two days prior to the monitoring event. This site is located within the city limits of West Point and is adjacent to a wastewater lift station operated by the city.
- Horses were noted as a potential source of fecal coliform contamination in the 2010 watershed based plan, however stakeholders did not believe this would be a likely source of contamination. The RVRC did not test for the presence of horse in any of their samples. Mrs. Hart agreed that this was an unlikely source of contamination.
- Leaking septic systems were also noted as a potential source in the previous plan. A large portion of the watershed (roughly 60%) is located in unincorporated areas which do not have access to sewer, so this should be considered as a potential source. However there is no detailed information available on septic leaks within the watershed.
- The final source that was listed as a potential source for fecal coliform was NPDES permitted wastewater treatment facilities. These are facilities that are permitted to discharge treated wastewater from a point source into a water body. The permit contains limits on what can be discharged, monitoring and reporting requirements, and additional provisions to ensure that the discharge is not negatively impacting water quality or human health.
- The RVRC found records for two permitted wastewater treatment facilities within the watershed. These include the City of LaGrange Long Cane Creek Water Pollution Control Plant and the City of West Point Water Pollution Control Plant, both of which have municipal discharge permits.
- Compliance history for each of these facilities, will give the RVRC an idea of if and when Clean Water Act (CWA) violations have occurred.
- Potential sources that were not noted in the previous plan include illicit dumping, which RVRC staff found evidence of at site 1 on multiple occasions. At this site, deer remains were found dumped over the bridge into the creek and adjacent to the creek. This site is located within the city limits of LaGrange.

- Another potential source that was noted by a stakeholder was feral hogs. This stakeholder stated that hogs are present on their property near John Lovelace Road, however stakeholders were not aware of the presence of feral hogs elsewhere in the watershed. The property previously noted is the same property that Mrs. Hart owns. She confirmed that feral hogs are present on the property.
- Sources of sediment were discussed.
- One potential source of sediment is development. Residential development was noted by RVRC staff near John Lovelace Road and was confirmed by stakeholders. Development was also noted at several sites in LaGrange and West Point.
- Another potential source of sediment is logging, which was observed adjacent to Long Cane Creek on Gabbettville Road.
- Given the stakeholder accounts of the presence of feral hogs at at least once location in the watershed, this may also be a potential source of sediment, as they are known to disturb soil.
- Ms. Schneider asked for Mrs. Hart's input on the information presented as well as input on any additional sources that may have not been considered.
- Mrs. Hart did not have any additional recommendations in regards to sources of fecal coliform or sediment within the watershed.
- Mrs. Hart did state that her family also owns the property that the quarry is located on and that the quarry puts up silt fencing.
- Ms. Schneider asked Mrs. Hart about the presence of dirt roads in the watershed. Mrs. Hart said that her family has created dirt roads on their property, but she was not aware of dirt roads elsewhere in the watershed.
- Mrs. Hart inquired about a public comment period. Ms. Schneider stated that there would be a period for public comment and that this would be advertised to the public.
- Ms. Schneider thanked Mrs. Hart for attending.

The meeting was adjourned at 2:45 pm.

Additional Stakeholder Comments

Phone call with Herb Hart 9-6-18:

-Mr. Hart's family owns property just to the south of Highway 27, which backs up to the concrete plant (Walker concrete)
-Roughly 900 acres, near John Lovelace Rd and Lower Blue Springs Rd
-Part of the Prophett Family Limited Partnership
-Beaver population is very high, they have probably trapped over 200 on the property in the last 7-8 years
-They stay on top of the beaver problem, but Mr. Hart believes it will take more people trapping in the watershed to be effective
-Mr. Hart believes that is the waterways were kept clear of dams, sediment would not be as much of a problem
-Roughly 400 yards from the bridge on Highway 27 on Long Cane Creek, there is a beaver dam which pools 5-6 feet of water
-Upstream of John Lovelace Rd there are lots of beaver
-From John Lovelace Rd to Highway 27 there are no beavers at this time, and Mr. Hart currently has no beavers on his property
-Water is clear on his property until it rains (Panther Creek)
-They lease some land for forestry/timber on their property
-Mr. Hart and his wife are big environmentalists, and would love to help in any way that they can
-Send minutes from 9-26-18 stakeholder meeting
-hhart@cfl.rr.com
-321-480-0793

Phone call with Herb Hart 9-13-18:

-Feral hogs are a problem on his property as well, at any given time he estimates there are between 100-200
-Hogs get in pastures and root up land
-They trap using single iron drop gate pens, but mostly shoot
-In Florida, near where he and his wife live, there is a sheriff's department that traps hogs (Brevard County, Cape Canaveral)
-They harvest 200-400 hogs/year and 50 deer/year, meat is donated to the prison
-Maybe something similar could be done in Troup County

Phone call with Catherine Linz 12-29-20:

-Ms. Linz lives on Greenville Road/Highway 109, just north of Long Cane Creek

-Ms. Linz stated that she is very concerned about the vegetation spraying along the roadside, which is conducted by GA DOT at least twice a year during the spring and summer

-Ms. Linz has placed "do not spray" signs out, and says that the spraying is not as frequent as in years past, however it is still an issue

-Several times right after roadside has been sprayed, there has been excessive rainfall which has washed the spray into the culverts underneath the road and into the creek and ponds on her property

-Following the rain, Ms. Linz observed thousands of dead frogs in the ponds and sent water samples to the UGA lab to be analyzed

-Ms. Linz believes that the chemicals in the spray are negatively impacting the creeks adjacent to the roadway, where the spraying occurs, and that the water bodies downstream are also being impacted

-She stated that this has been an ongoing cause for concern over the past 30 years

APPENDIX G. TARGETED MONITORING DATA

E.COLI COUNTS FOR EACH BACTERIAL MONITORING SITE BY MONTH

Long Cane Creek Watershed	Date												Average
E. coli Count (CFU/100 mL)	10/29/2018	11/28/2018	1/7/2019	2/4/2019	2/27/2019	3/29/2019	4/30/2019	5/28/2019	6/25/2019	7/25/2019	8/22/2019	9/19/2019	
Site 1	300	100	100	100	66.66	66.66	233.33	66.66	133.33	133.33	33.33	166.66	125
Site 2	300	66.66	166.66	66.66	66.66	66.66	66.66	733.33	200	400	100	933.33	263.89
Site 3	300	33.33	33.33	66.66	166.66	133.33	266.66	266.66	33.33	100	66.66	200	138.89
Site 4	166.66	166.66	100	166.66	333.33	33.33	233.33	200	100	66.66	166.66	33.33	147.22
Site 5	100	100	33.33	66.66	133.33	100	800	TNTC	33.33	133.33	0	33.33	139.39
Site 6	133.33	33.33	33.33	33.33	66.66	133.33	66.66	300	100	133.33	100	233.33	113.89
Site 7	66.66	0	33.33	33.33	133.33	33.33	33.33	66.66	33.33	166.66	166.66	233.33	83.33
Site 8	66.66	100	133.33	33.33	33.33	100	33.33	66.66	100	66.66	433.33	200	113.89
Site 9	33.33	100	33.33	100	166.66	33.33	133.33	33.33	0	66.66	33.33	66.66	66.66
Site 10	133.33	0.00	33.33	33.33	33.33	166.66	133.33	33.33	100	133.33	66.66	33.33	75

GEOMETRIC MEANS FOR EACH BACTERIAL MONITORING SITE BY QUARTER

E. coli Count (CFU/100 mL)	1st Quarter (Oct, Nov, Dec) 2018	2nd Quarter (Jan, Feb, Mar) 2019	3rd Quarter (Apr, May, Jun) 2019	4th Quarter (Jul, Aug, Sep) 2019
Site 1	144.22	76.31	127.52	90.48
Site 2	149.37	66.66	213.83	334.22
Site 3	69.33	113.99	133.33	110.06
Site 4	140.57	122.79	167.11	71.81
Site 5	69.33	96.15	163.29	0
Site 6	52.91	66.66	125.99	145.98
Site 7	0	52.91	41.99	186.44
Site 8	96.14	48.07	60.57	179.43
Site 9	48.07	82.20	0	52.91
Site 10	0	56.99	76.31	66.66

TURBIDITY COUNTS FOR EACH TURBIDITY MONITORING SITE BY MONTH

Long Cane Creek Watershed	Date												Average
Turbidity Count (NTU)	10/29/2018	11/28/2018	1/7/2019	2/4/2019	2/27/2019	3/29/2019	4/30/2019	5/28/2019	6/25/2019	7/25/2019	8/22/2019	9/19/2019	
Site 4	4.53	6.66	12.42	6.86	3.92	2.85	5.67	3.88	4.30	3.04	2.91	2.62	4.97
Site 5	8.66	9.25	14.60	11.01	9.89	9.32	11.30	13.80	16.67	11.81	10.72	5.16	11.02
Site 6	11.09	9.59	15.40	10.94	9.73	9.57	11.30	10.76	17.77	12.27	11.74	6.69	11.40
Site 7	11.69	9.58	16.33	11.19	9.60	8.85	12.22	10.98	11.53	10.63	10.98	12.66	11.35
Site 8	10.60	9.74	17.30	11.11	9.24	8.91	12.33	11.26	11.20	9.70	9.46	11.50	11.03
Site 9	11.27	10.38	17.00	11.33	9.79	9.69	12.31	9.80	12.27	9.46	7.65	6.86	10.65
Site 10	11.47	9.97	18.73	11.25	9.50	9.56	11.70	11.36	12.10	9.65	7.71	12.61	11.30
Site 11	12.26	8.18	12.49	8.72	8.23	8.17	13.83	13.60	12.29	11.71	11.21	17.97	11.55

DNA/MICROBIAL SOURCE TRACKING RESULTS

Table 1. Source tracking (human, ruminants, cattle, and beaver) for Long Cane samples

Sample ID	Hf183	Rum2Bac (deer)	CowM2	Beaver
Blank	-	-	-	-
1	-	-	-	++
2	-	-	-	++
3	-	-	-	++
4	-	+	-	+
5	-	+	++	+/-
6	-	+	+	+
7	-	+	-	+
8	-	-	-	+/-
9	-	-	-	-
10	-	-	-	-

(July 2018).

Table 1. Source tracking (human, ruminants, cattle, and beaver) for Long Cane samples

Sample ID	Hf183	Rum2Bac (deer)	CowM2	Beaver
Blank	-	-	-	-
1	-	-	-	+
2	-	-	-	++
3	+	-	-	-
4	-	-	-	-
5	-	+	-	-
6	-	+	-	+
7	-	-	+	+
8	-	-	-	+/-
9	-	-	-	-
10	-	-	-	-

(Oct 2018).

Table 1. Source tracking (human, ruminants, cattle, and beaver) for Long Cane samples

Sample ID	Hf183	Rum2Bac (deer)	CowM2	Beaver
Blank	-	-	-	-
1	-	-	-	+
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	+	+	-
6	-	+	-	-
7	-	+	-	+
8	-	-	-	+/-
9	-	-	-	-
10	-	-	-	-

(Feb 2019).

Table 1. Source tracking (human, ruminants, cattle, and beaver) for Long Cane samples

Sample ID	Hf183	Rum2Bac (deer)	CowM2	Beaver
Blank	-	-	-	-
1	-	-	-	-
2	-	-	-	-
3	-	-	+	-
4	-	-	+	-
5	-	-	+	-
6	-	+	-	+
7	-	-	-	-
8	-	-	-	-
9	-	-	-	+
10	-	-	+/-	-

(Apr 2019).

H. SAMPLING PROTOCOL

The protocol below was included in the targeted monitoring plan for Long Cane Creek watershed, submitted to GA EPD in June 2018.

The following outlines the procedures for bacterial monitoring:

A. 10 sites will be monitored.
   1. Sites will be sampled in October 2018 – September 2019.
   2. 1 sample will be collected per site per month over a 12-month period.
   3. There will be a total of 10 samples per month and 120 samples over a 12-month period.

B. Samples will be collected and analyzed by RVRC staff trained by GA EPD Adopt-A-Stream personnel in bacterial sampling and testing.

C. Equipment used for sampling and testing is as follows:
   1. 3M™ *E. coli* Count Plates
   2. Genesis Hova-Bator Incubator with circulation fan, calibrated to 35° C
   3. Fixed-volume pipettor, 1000µL
   4. Pipette tips, 200 - 1300µL
   5. Thermometer
   6. Whirl-Pak® sterile sampling bag, 8 oz
   7. 90% Isopropyl Alcohol
   8. Latex Gloves
   9. Bleach
   10. Distilled Water

D. Georgia Adopt-A-Stream Bacterial Monitoring Data Form will be used to record official field notes for current weather, air and water temperature, rainfall intensity over the previous 24 hours, date, and time.

The following outlines the procedures for turbidity monitoring:

A. 8 sites will be monitored.
   1. Sites will be sampled October 2018 – September 2019.
   2. 1 sample will be collected per site monthly over a 12-month period.
   3. There will be a total of 8 samples per month and 96 samples over a 12-month period.

B. Samples will be collected and analyzed using the EPA compliant protocol in order to determine any potential sediment pollution hotspots.

C. Equipment used for sampling is as follows:
   1. LaMotte 2020we turbidimeter
   2. Associated calibration solutions and water sample tube
   3. Lint-free cloth
   4. 1 liter bottle should sites need mixing to achieve a representative sample

The following outlines the procedures for DNA microbial source tracking:

A. 10 sites will be monitored.
   1. Sites will be sampled July 2018 – April 2019.
   2. 1 sample will be collected per site quarterly over a 12-month period.
   3. There will be a total of 10 samples per month and 40 samples over a 12-month period.

B. Samples will be collected by RVRC staff trained by GA EPD Adopt-a-Stream personnel in bacterial sampling. Samples will be analyzed using the procedures discussed in the attached "Environmental and Molecular Microbiology Quality Assurance Project Plan (QAPP) for *Fecal Coliform and PCR Based Microbial Source Tracking in Georgia,"* provided by Dr. Dave Bachoon of Georgia College and State University.

C. Equipment used for sampling is as follows:
   1. Lined cooler
   2. Ice packs or regular ice
   3. 500 mL sterile sample bottles (labeled)
   4. 500 mL sterile blank bottle filled with distilled water (labeled)
   5. Gloves
   6. Thermometer (designed for air and water measurements)

D. Field sampling measurements will include, for each site: date, time, weather, and air and water temperature. These measurements will be used only to help track chronology and weather conditions.

II. Schedule

Table 3 outlines the tentative sampling schedule for the Long Cane Creek watershed. One sample for turbidity will be collected at sites 4-11 monthly from October 2018 – September 2019. One sample for bacteria will be collected at sites 1-10 monthly from October 2018 – September 2019. One sample for DNA microbial source tracking will be collected at sites 1-10 quarterly from July 2018 – April 2019.

Table 3. Sampling schedule for Long Cane Creek watershed.

Month/Year	Sampling Sites	Parameter
October 2018	4-11	Turbidity
November 2018	4-11	Turbidity
December 2018	4-11	Turbidity
January 2019	4-11	Turbidity
February 2019	4-11	Turbidity

March 2019	4-11	Turbidity
April 2019	4-11	Turbidity
May 2019	4-11	Turbidity
June 2019	4-11	Turbidity
July 2019	4-11	Turbidity
August 2019	4-11	Turbidity
September 2019	4-11	Turbidity

Month/Year	**Sampling Sites**	**Parameter**
October 2018	1-10	Bacterial (*E. coli*)
November 2018	1-10	Bacterial (*E. coli*)
December 2018	1-10	Bacterial (*E. coli*)
January 2019	1-10	Bacterial (*E. coli*)
February 2019	1-10	Bacterial (*E. coli*)
March 2019	1-10	Bacterial (*E. coli*)
April 2019	1-10	Bacterial (*E. coli*)
May 2019	1-10	Bacterial (*E. coli*)
June 2019	1-10	Bacterial (*E. coli*)
July 2019	1-10	Bacterial (*E. coli*)
August 2019	1-10	Bacterial (*E. coli*)
September 2019	1-10	Bacterial (*E. coli*)

Month/Year	Sampling Sites	Parameter
July 2018	1-10	DNA
October 2018	1-10	DNA
January 2019	1-10	DNA
April 2019	1-10	DNA

III. Quality Assurance

The following outlines the Quality Assurance Plan for sampling Long Cane Creek watershed:

A. River Valley Regional Commission is in a contract to track potential pollutant sources within the watershed. The watershed assessment and monitoring data results will influence what actions local governments can take to reduce pollutant loadings.

A. Turbidity Field Quality Assurance
   a. The following protocol will be used for each sample:
      i. Prior to collection:
         1. One liter bottles will be labeled with the following information:
            a. Site number
            b. Date
            c. Time
            d. Current weather conditions
      ii. Sample Collection
         1. For uniform sampling sites, sample will be collected in a one liter bottle and stored for sampling
         2. For sites that are not uniform, several locations at varying depths will be sampled and combined into a single, well-mixed composite sample
   b. Sample Handling and Custody Requirements
      i. RVRC staff will analyze samples using the EPA-compliant equipment and protocols, following all turbidimeter user manual instructions and calibration techniques in order to determine any areas of sedimentation issues
      ii. Samples will be analyzed within 24 hours of collection

1. Sample from each site will be mixed gently but thoroughly enough to ensure a representative sample before taking the measurement
2. The sample will not be allowed time to settle before the measurement is obtained

iii. RVRC staff will collect the samples with equipment obtained by the River Valley Regional Commission. To ensure safety, staff will choose a sample collection technique on site. If waters are safe for wading, staff will use the "grab sampling while wading technique" for representative samples. However, if the water appears to be unsafe for wading, then the turbidity samples will be collected by lowering a sampling container from a bridge or culvert. Sampling will be postponed, however, if weather conditions make sampling unsafe for field personnel.

B. Bacterial Field Quality Assurance

a. The following sampling protocol will be used for each sample:

i. Samples for quantification of *E. coli* bacteria will be collected at 10 locations on Long Cane Creek and its tributaries

ii. Prior to sample collection:

1. 1 Whirl-Pak® bag per site plus a bag for the "Blank"
2. Using a Sharpie, label each bag as follows:
    a. Stream name or for the blank, label the bag "Blank"
    b. Collection site number
    c. Date of collection
    d. Time of collection
    e. Collector

iii. Record the following on the Field Notes Form at each sample site:

1. Current weather conditions (overcast, partly cloudy, clear/sunny)
2. Air temperature
3. Water temperature
4. Date and time
5. Rainfall intensity for the previous 24 hours, total amount if known

iv. Sample Collection

1. Put on latex gloves for protection and to limit sample contamination.
2. Tear off top of bag along perforation. Avoid touching the inside of the bag.
3. Before first sample is collected from the stream, fill one Whirl-Pak® bag with distilled water. This will be the "blank." Twist the yellow ties to seal the top and place the bag in a cooler with ice or frozen ice packs.

4. Select a location in the middle of the flow channel. The flow channel may not be in the middle of the stream. Stand downstream from the flow.
5. Collect sample from mid-depth of the flow channel.
6. Open the Whirl-Pak® bag by taking hold of the yellow tabs on either side of the bag, one in each hand. Use a different bag if the inside is accidentally touched.
7. Keep the bag upright and use a scooping motion to submerge the top under the water.
8. At mid-depth, pull both yellow tabs apart to open the mouth. Allow water to pour into the mouth until the bag is ¾ full.
9. Pull the bag out of the water, take the yellow ties on either side, one in each hand, and flip of fold the top of the bag twice to wrap up the top.
10. Twist the yellow ties to seal the top, and place the bag in a cooler with ice or frozen ice packs.

b. Sample Handling and Custody Requirements

i. *E. coli* samples will be stored for no longer than 24 hours after collection in a cooler with ice or frozen packs.

1. Within 24 hours of collection, RVRC staff will utilize the Adopt-A-Stream Bacterial Monitoring methods and procedures to process and analyze the samples and the blank.
2. Petrifilm plates for each sample, including the blank, shall be labeled with a Sharpie pen as follows:
    a. Stream name, or in the case of the blank, "Blank"
    b. Site number
    c. Date of collection
    d. Collector
3. The Georgia Adopt-A-Stream *E. coli* Data Form will be completed by RVRC staff for petrifilm results.
    a. Utilizing a fixed volume pipette, a sample from each site will be placed on 3 petrifilm plates according to the instructions in the GA EPD Adopt-A-Stream Bacterial Monitoring Manual.
    b. Utilizing a fixed volume pipette, a sample from the "Blank" will be placed on 1 petrifilm plate.
    c. Plates will be stacked and placed in the Hova-Bator incubator calibrated to 35° C for 24 hours.
    d. After 24 hours, plates (3 per site plus the blank will be removed from the incubator and *E. coli* colonies will be counted. The sum of colonies found on 3 plates prepared for each site as well as the 1 plate prepared for the blank, will be multiplied by 33.33 to calculate the total colony count per 100 mL for each site.
    e. RVRC staff will contact GA EPD staff should questions arise about total colony counts.

ii. RVRC staff will collect the samples with equipment obtained by the River Valley Regional Commission. Staff will be trained by GA EPD staff prior to any collection. To ensure safety, staff will choose a sample collection technique on site. If waters are safe for wading, staff will use the "grab sampling while wading technique" for *E. coli* bacteria. However, if the water appears to be unsafe for wading, then the *E. coli* sample should be collected by lowering a sampling container from a bridge or culvert. If rainfall in the preceding 24 hours is greater than 1", then sampling should not occur until 48 hours after the rain event. Sampling is postponed, however, if weather conditions make sampling unsafe for field personnel.

C. DNA Microbial Source Tracking Field Quality Assurance

a. The following sampling protocol will be used for each sample:

i. Samples for DNA microbial source tracking analysis will be collected at 10 locations along Long Cane Creek and its tributaries.

ii. Unless otherwise suggested by the analysists, samples will be collected during dry weather, because rain events typically raise the levels of fecal coliform, thus altering the data. If there are wet weather conditions during the scheduled sampling week, collection will be rescheduled for dry weather. Weather conditions are considered "wet" when there are at least 0.2 inches of rainfall in the 24 hours preceding sampling. Samples will be collected no less than 24 hours after a rain event. Rainfall amount will be checked utilizing the Weather Channel's website, www.weather.com.

iii. Prior to sample collection:

1. 1 sterile 500 mL bottle per site plus 1 sterile 500 mL bottle for the "Blank", provided by Georgia College and State University
2. Bottles will be labeled correctly and completely (for example, Long Cane Creek – Site 1).
3. Fill "Blank" bottle with distilled water, and place in cooler with ice.

iv. Record the following field notes at each sample site:

1. Date and time
2. Current weather conditions (overcast, partly cloudy, clear/sunny)
3. Air temperature
4. Water temperature

v. Sample Collection:

1. Put on latex gloves for protection and to limit sample contamination.
2. Wade to riffle area where main current is flowing, taking precautions to not excessively disturb the

sediment. Samples will not be taken at the stream banks edge or on a curved bank, since this may cause the water to be stagnant or not well mixed with the rest of the stream water. (If access or safety prevent RVRC staff from wading into the stream, samples may be collected on the upstream side of bridge crossings).

3. Standing downstream, remove the lid of the bottle. Holding the bottle near its base, plunge the bottle neck downward 3-5 inches below the surface of the water (or at wrist level, if this depth is impossible to reach due to low water levels).
4. Hold the bottle in this position until is filled completely and cap while submerged under water. (If there is no stream current, push the sample bottle forward horizontally until it is filled completely).

b. Sample Handling and Custody Requirements:
   i. Samples and blank will be placed in a cooler with ice and shipped overnight to Georgia College and State University in Milledgeville, Georgia, for analysis.
   ii. If samples are not handled properly, if holding time is exceeded, or the amount of water in the sample is not adequate for analysis, the sites will be resampled.

D. DNA Microbial Source Tracking Lab Quality Assurance
   a. Samples will be filtered for DNA extraction within 48 hours of collection. Water samples will be stored on ice or refrigerated before analysis. Field blanks (distilled water) will be processed with each set of samples.

Fecal coliform: Fecal coliform concentration gradient along a transect will be used to trace the source origin. qPCR of samples can be used to trace a specific marker from high to low based on the principle that in qPCR reactions, Ct value can be used to compare marker concentration.

The above analysis procedures are discussed in detail in the attached "Environmental and Molecular Microbiology Quality Assurance Project Plan (QAPP) for *Fecal Coliform and PCR Based Microbial Source Tracking in Georgia*," provided by Dr. Dave Bachoon of Georgia College and State University.

IV. Records Retention

Records will be maintained by River Valley Regional Commission at 710 Front Avenue, Columbus, Georgia 31901 for a period of three years from the conclusion of the project and will be available for review.