2014

Pataula Creek TMDL Watershed Management Plan Year 2 Revision

Developed by:

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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.

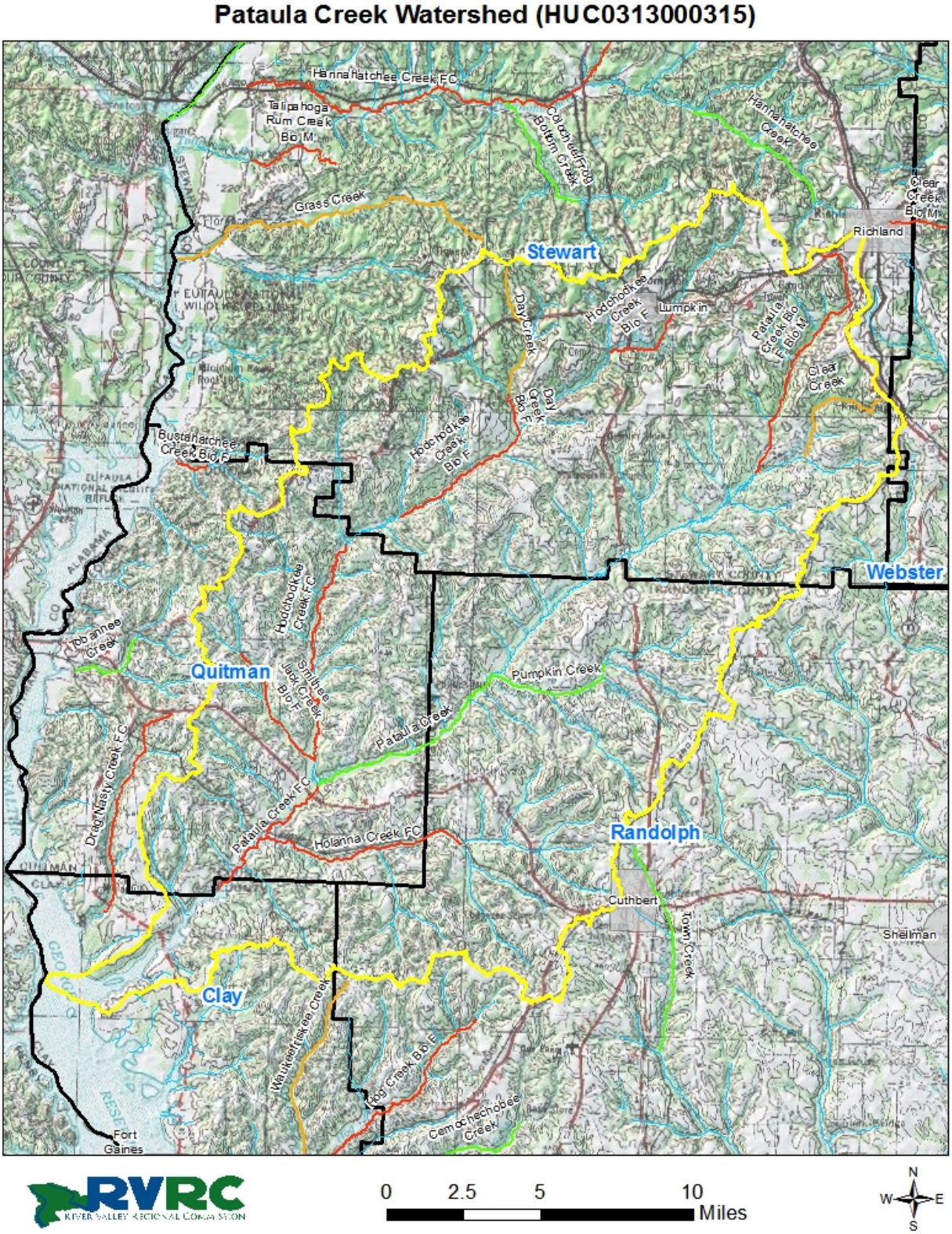
2.0 INTRODUCTION

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 determines 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 Improvement Plan for Pataula Creek is to provide a tool that demonstrates a holistic approach to water quality management. The TMDL report is reviewed by the public, revised, and then submitted to the EPA to be considered for approval.

The Pataula Creek Total Maximum Daily Load (TMDL) Watershed Management Plan defines the 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 loads in order to restore beneficial uses of the Pataula Creek Watershed (Figure 1).

FIGURE 1. PATAULA CREEK WATERSHED (HUC 0313000315).



Watershed Management Plans require the development of a process to develop and implement a plan document for the purpose of: 1) creating the local network of partners; 2) identifying and securing the resources needed to fund and install the 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 or 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 Pataula Creek watershed. The successful application of BMPs in the Pataula Creek watershed will depend on the TMDL components, the physical characteristics of the watershed, and regulatory requirements. By having a general knowledge of history and natural resources of the area, an understanding and appreciation of its existence can be established.

The Pataula Creek watershed is located in Clay, Georgetown-Quitman, Randolph, and Stewart County and covers about 388 square miles. This watershed lies between the Hannahatchee Creek watershed and the Cemochechobee Creek watershed. The Pataula Creek watershed is part of the larger 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.

Pataula Creek is located in the 10-digit hydrologic unit code (HUC) 0313000315. This Watershed Management Plan will address the Pataula Creek stream segment from Hodchodkee Creek to W.F. George Lake (approximately 6 miles), which is impaired with fecal coliform, and the stream segment from the headwaters to Clear Creek (approximately 9 miles), which is impaired with sediment. Several additional sediment impairments within the same HUC 10 watershed include Day Creek, Smithee Jack Creek, and two sections of Hodchodkee Creek. Additional fecal coliform impairments within this watershed include Hodchodkee Creek and Holanna Creek. Additional information for these segments may be found in Table 3.

Pataula Creek empties out into the Chattahoochee River near the north-western border of Clay County. The Political jurisdiction of the impaired segment of Pataula Creek for fecal coliform is in Georgetown-Quitman County, and jurisdiction of the segment with sediment impairment runs through Stewart County.

The physical landscape is fairly homogenous with no outstanding physical features. The stream flows generally south-westward. The Pataula Creek watershed encompasses 248,312.64 acres, currently composed primarily of forest/agricultural land (97.65%) with some residential (1.20%) and commercial (0.60%) use. The remaining land uses include 0.30% parks and conservation areas, 0.05% public, 0.02% industrial, and 0.20% unused. Figure 2 shows the Pataula Creek

watershed Land Use Trends of 2008 prescribed by Natural Resources Spatial Analysis Laboratory. This map demonstrates the characteristics of the land use cover within the Pataula Creek watershed. Although a majority of the watershed consists of forested land (which generally holds sediment in place), it is often coupled with steep slopes. This combination can create erosion problems. The area near the Hodchodkee Creek and Day Creek sediment impairment has steep slopes that may be suitable for erosion. The area near the Pataula Creek and Hodchodkee Creek (near Lumpkin) sediment impairment is encompassed by agriculture land. This land is particularly suitable for erosion as the farmland has no trees for sediment retention. Figure 3, *Pataula Creek Watershed Future Land Use*, illustrates the estimated future land use changes in the watershed. This data may be used to assess what changes may take place within the watershed over the next few years so that proper implementation strategies may be established. Future land use scenarios were created based on an analysis of trends from 2009 landuse and future land use zoning projected to the year 2030.

Pataula Creek's climate 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 five stream segments within the Pataula Creek watershed are currently on EPDs 303(d) list of impaired streams for sediment problems, it is important to understand the soil types that contribute to the impairment as well as the topographical characteristics. The Pataula Creek watershed is located in the Southern Coastal Plain Province. The province consists of soils occupying broad interstream areas having gentle to moderate slopes with underlying marine sands, loam, and/or clays. Soil types include: Kershaw, Lakeland, Chipley and Ellabelle; Bibb, Fresh Water Swamp; Orangeburg, Norfolk series; Cuthbert, Shubuta, Boswell; and Angie, Wahee. Table 1 describes the generalized soils identified in the watershed. Figure 4 depicts the details of the Pataula Creek watershed soils. This information will be especially useful should a plan be written to address the sediment issue within this watershed.

Characteristics of the Pataula Creek watershed's topography are broad valleys and steep rolling hills. Elevations range from 250 feet to 480 feet above sea level. Many of the steep slopes are found in the eastern section of the watershed. Parts of the watershed consist of land that slopes anywhere from 25-60 percent. Erosion and sedimentation control measures should be implemented on slopes that are suitable for development in order to minimize adverse impacts. Figure 5 shows the slope for the Pataula Creek watershed. Many of the streams impaired with sediment are encompassed by areas of 25% or greater slope. The slope and type of soil may play critical role in contributing to the sediment impairments.

FIGURE 2. PATAULA CREEK WATERSHED LAND USE TRENDS.

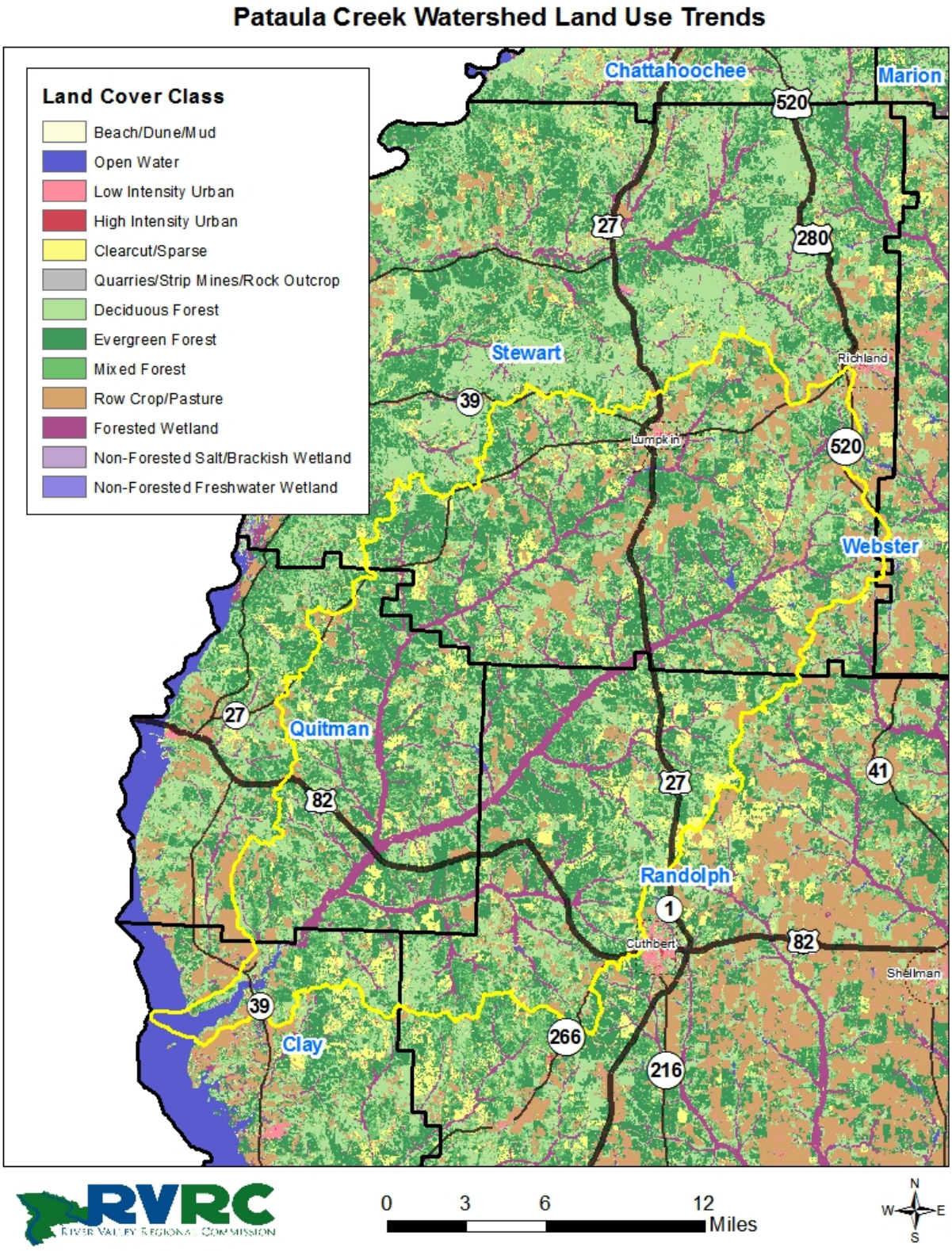


FIGURE 3. PATAULA CREEK WATERSHED FUTURE LAND USE.

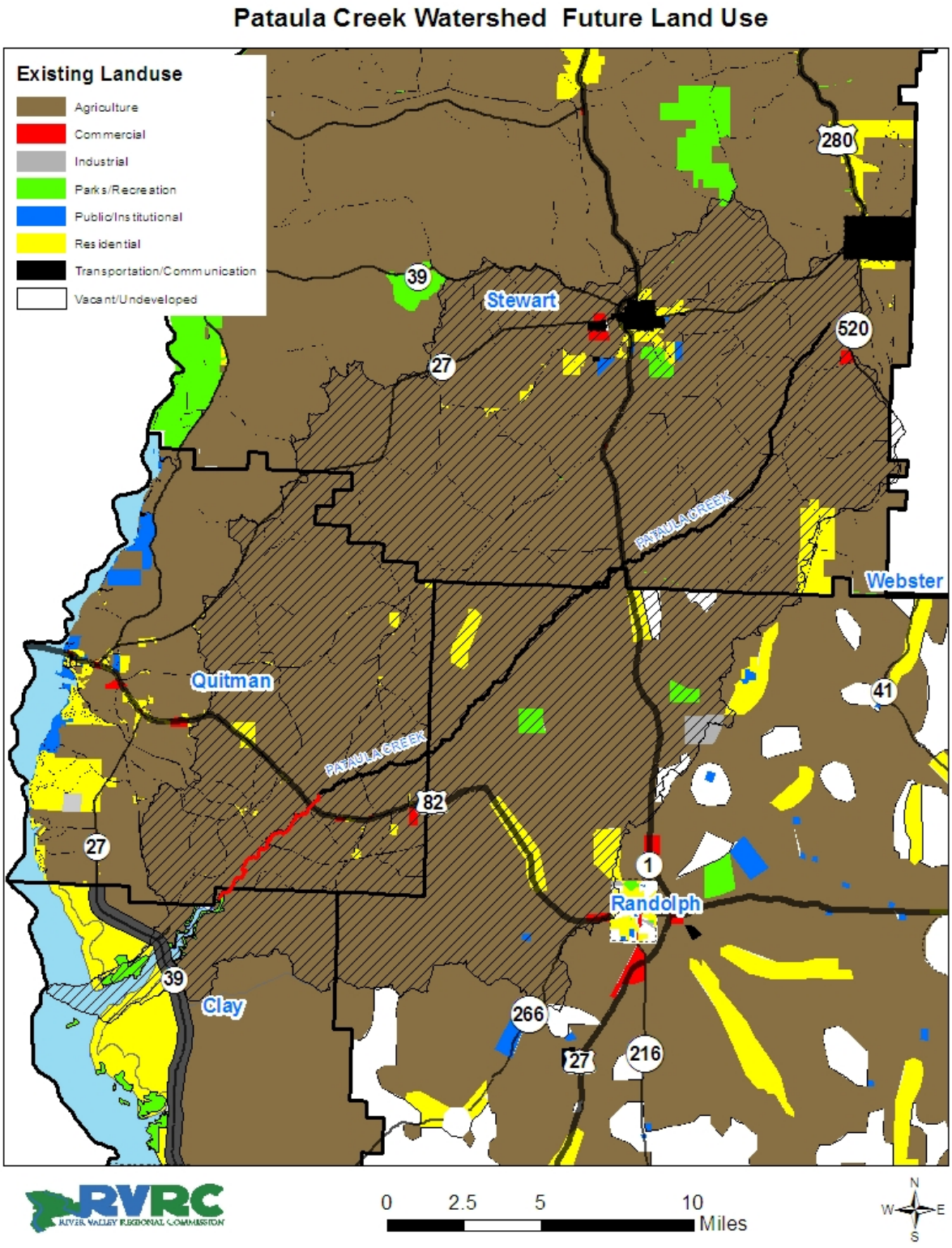


TABLE 1. GENERALIZED SOILS OF THE PATAULA CREEK WATERSHED.

Soil Association	Soil Description
Kinston-Bibb (Clay, Quitman, Randolph, Stewart, County)	Poorly drained soils that are predominantly loamy throughout; on long, narrow flood plains *Location*: Along Grass, Hodchodkee, Pataula, and Slaughter Creeks and on narrow branches to these and other creeks *Landscape*: Coastal Plain *Landform*: Flood plains *Slope*: 0 to 2 percent
Ochlockonee-Bibb-Iuka (Stewart County)	Well drained, poorly drained, and moderately well drained soils that are loamy throughout; on long, narrow flood plains *Location*: Along Hannahatchee Creek and on narrow branches to this and other creeks *Landscape*: Coastal Plain *Landform*: Flood plains *Slope*: 0 to 3 percent
Kolomoki-Wahee (Stewart County)	Well drained and somewhat poorly drained, nearly level soils that have a loamy surface layer and a clayey subsoil; on river terraces *Location*: River terraces along the Chattahoochee River *Landscape*: Coastal Plains *Landform*: River and stream terraces *Slope*: 0 to 2 percent
Orangeburg-Bonneau-Norfolk (Stewart County)	Well drained, nearly level and gently sloping soils that have a sandy or loamy surface layer and a loamy subsoil; on broad ridges *Location*: East of the Chattahoochee River *Landscape*: Coastal Plains *Landform*: Broad interstream divides *Slope*: 0 to 8 percent
Nankin-Bonneau-Blanton (Stewart County)	Well drained, nearly level to steep soils that have a sandy or loamy surface layer and a loamy or clayey subsoil; on narrow ridges, side slopes, and toeslopes *Location*: Predominantly along Hannahatchee, Grass, and Turner Creeks *Landscape*: Coastal Plains *Landform*: Interfluves and broad interstream divides *Slope*: 0 to 35 percent
Nankin-Cowarts (Clay, Stewart County)	Well drained, moderately sloping to steep soils that have a sandy surface layer and a loamy or clayey subsoil; on ridges and side slopes *Location*: Primarily in the western and northern parts of Stewart county, most areas in Quitman County *Landscape*: Coastal Plain *Landform*: Interfluves and hill slopes *Slope*: 8 to 45 percent
Nankin-Orangeburg-Cowarts (Stewart	Well drained, very gently sloping to very steep soils that have a sandy surface layer and a loamy or clayey subsoil; on narrow and broad

County)	ridges and on side slopes *Location*: Central and eastern parts of the county *Landscape*: Coastal Plain *Landform*: Interfluves and broad interstream divides *Slope*: 2 to 45 percent
Orangeburg-Greenville (Stewart County)	Well drained, nearly level to strongly sloping soils that have a sandy or loamy surface layer and a loamy or clayey subsoil; on broad ridges and on side slopes *Location*: Eastern parts of the county *Landscape*: Coastal Plain *Landform*: Broad interstream divides *Slope*: 0 to 15 percent
Troup-Nankin-Cowarts (Stewart County)	Somewhat excessively drained and well drained, very gently sloping to steep soils that have a sandy surface layer and a loamy or clayey subsoil; on broad ridges and on side slopes *Location*: Predominately in the northeastern and southeastern parts of the county *Landscape*: Coastal Plain *Landform*: Broad interstream divides and interfluves *Slope*: 2 to 35 percent
Greenville-Faceville-Red Bay (Clay, Randolph County)	Well drained, nearly level and gently sloping soils that have a sandy or loamy surface layer, have a loamy or clayey subsoil, and are on broad ridges *Location*: Predominately in the eastern part of Randolph County and the central and southern parts of Clay County *Landscape*: Coastal Plain *Landform*: Broad ridges *Slope*: 0 to 8 percent
Faceville-Carnegie-Greenville (Randolph County)	Well drained, nearly level and gently sloping soils that have a loamy surface layer, have a clayey subsoil, and are on broad ridges and side slopes *Location*: Predominately in the southern part of the county *Landscape*: Coastal Plain *Landform*: Broad ridges and steep slopes *Slope*: 0 to 8 percent
Lakeland-Lucy (Clay, Quitman, Randolph County)	Excessively drained to well drained, nearly level to strongly sloping soils that are sandy throughout or have thick, sandy surface and subsurface layers over a loamy subsoil; on broad ridges and side slopes *Location*: Most areas *Landscape*: Coastal Plain *Landform*: Ridges and side slopes *Slope*: 0 to 17 percent
Cowarts-Nankin-Ailey (Randolph	Well drained, gently sloping to strongly sloping soils that have a sandy surface layer, have a loamy or clayey subsoil, and are on ridges and

County)	side slopes *Location*: Predominately in the western part of the county *Landscape*: Coastal Plain *Landform*: Side slopes *Slope*: 8 to 35 percent
Orangeburg-Faceville-Norfolk (Randolph County)	Well drained, nearly level and gently sloping souls that have a sandy of loamy surface layer, have a loamy clayey subsoil, and are on broad ridges *Location*: Predominately in the southern part of the county *Landscape*: Coastal Plains *Landform*: Broad ridges *Slope*: 0 to 8 percent
Kolomoki-Lucy-Bonneau (Clay County)	Well drained, nearly level and gently sloping soils that have a sandy or loamy surface layer and a loamy or clayey subsoil; on broad ridges *Location*: Adjacent to the Chattahoochee River in the southern part of the county *Landscape*: Coastal Plain *Landform*: Broad ridges *Slope*: 0 to 8 percent
Faceville-Carnegie-Orangeburg (Clay County)	Well drained, nearly level and gently sloping soils that have a sandy or loamy surface layer and a loamy or clayey subsoil; on broad ridges *Location*: Predominantly in the southeastern part of the county *Landscape*: Coastal Plain *Landform*: Broad ridges *Slope*: 0 to 8 percent
Cowarts-Lakeland-Nankin (Clay County)	Well drained to excessively drained, gently sloping to strongly sloping soils that have a sandy or loamy surface layer and a loamy or clayey subsoil; on ridges and side slopes *Location*: Most areas *Landscape*: Coastal Plain *Landform*: Ridges and side slopes *Slope*: 8 to 35 percent
Nankin-Cowarts-Ailey (Clay County)	Well drained, gently to strongly sloping soils that have a sandy surface layer and a loamy or clayey subsoil; on ridges and side slopes *Location* in Clay County: Most areas *Landscape*: Coastal Plain *Landform*: Side slopes *Slope*: 8 to 35 percent
Norfolk-Marlboro-Bonneau (Clay County)	Well drained, nearly level and gently sloping soils that have a sandy or loamy surface layer and a loamy or clayey subsoil; on broad ridges *Location*: Adjacent to the Chattahoochee River in the northern parts of the county *Landscape*: Coastal Plain *Landform*: Broad ridges *Slope*: 0 to 8 percent

Faceville-Orangeburg-Nankin (Quitman County)	Well drained, nearly level and gently sloping soils that have a sandy or loamy surface layer and a loamy or clayey subsoil; on broad ridges *Location*: Most areas *Landscape*: Coastal Plain *Landform*: Broad ridges *Slope*: 0 to 8 percent
Nankin-Cowarts-Faceville (Quitman County)	Well drained, gently sloping to strongly sloping soils that have a sandy surface layer and a loamy or clayey subsoil; on ridges and side slopes *Location*: In the central and southern parts of the county *Landscape*: Coastal Plain *Landform*: Side slopes *Slope*: 8 to 45 percent
Bonneau-Norfolk (Quitman County)	Well drained, nearly level and gently sloping soils that have a sandy or loamy surface layer and a loamy or clayey subsoil; on broad ridges *Location*: Predominantly along the Chattahoochee River *Landscape*: Coastal Plain *Landform*: Broad ridges *Slope*: 0 to 8 percent

Source: NRCS/USDA. Soil Survey of Clay, Quitman, Randolph, and Stewart Counties, GA. 2006

FIGURE 4. PATAULA CREEK WATERSHED SOILS.

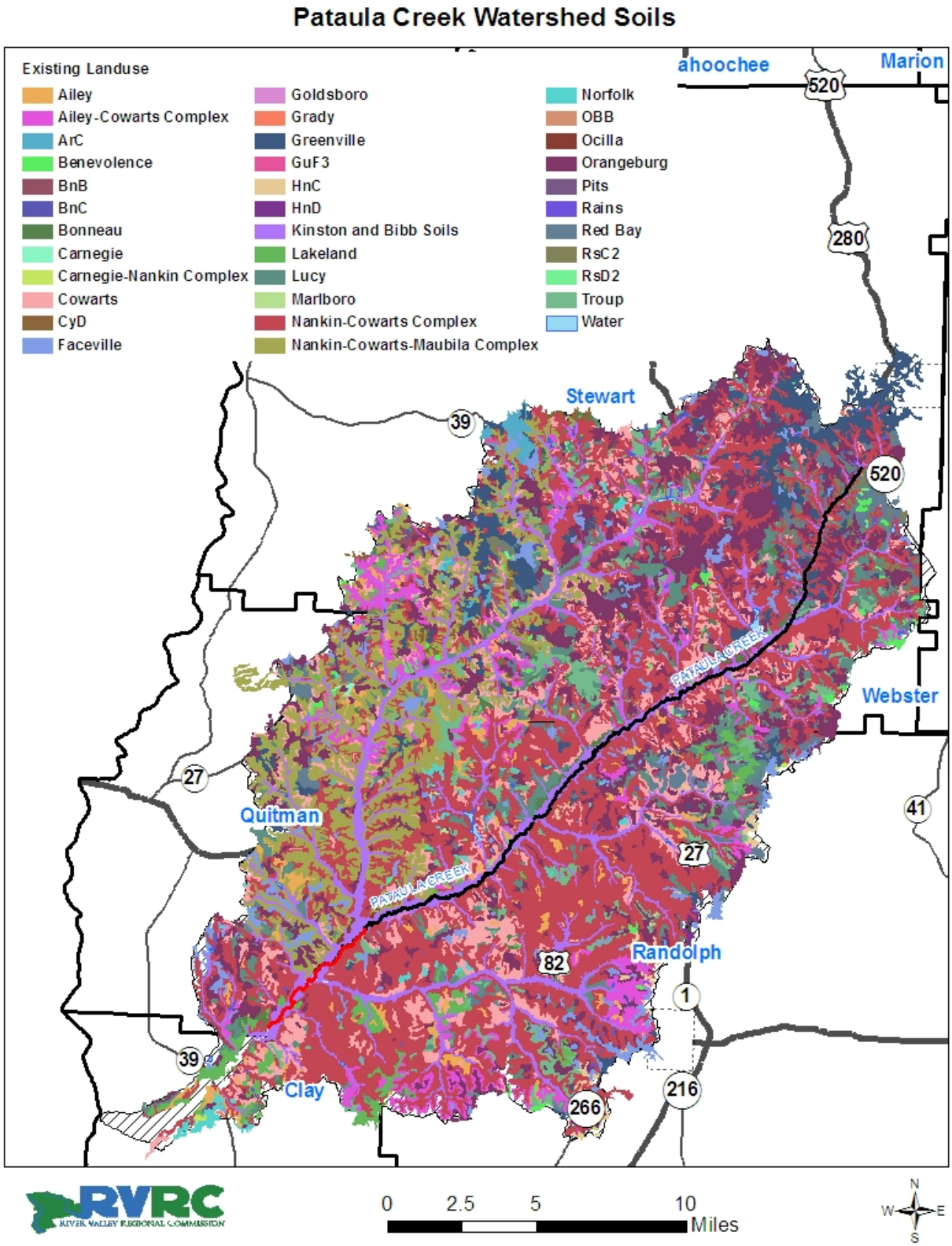
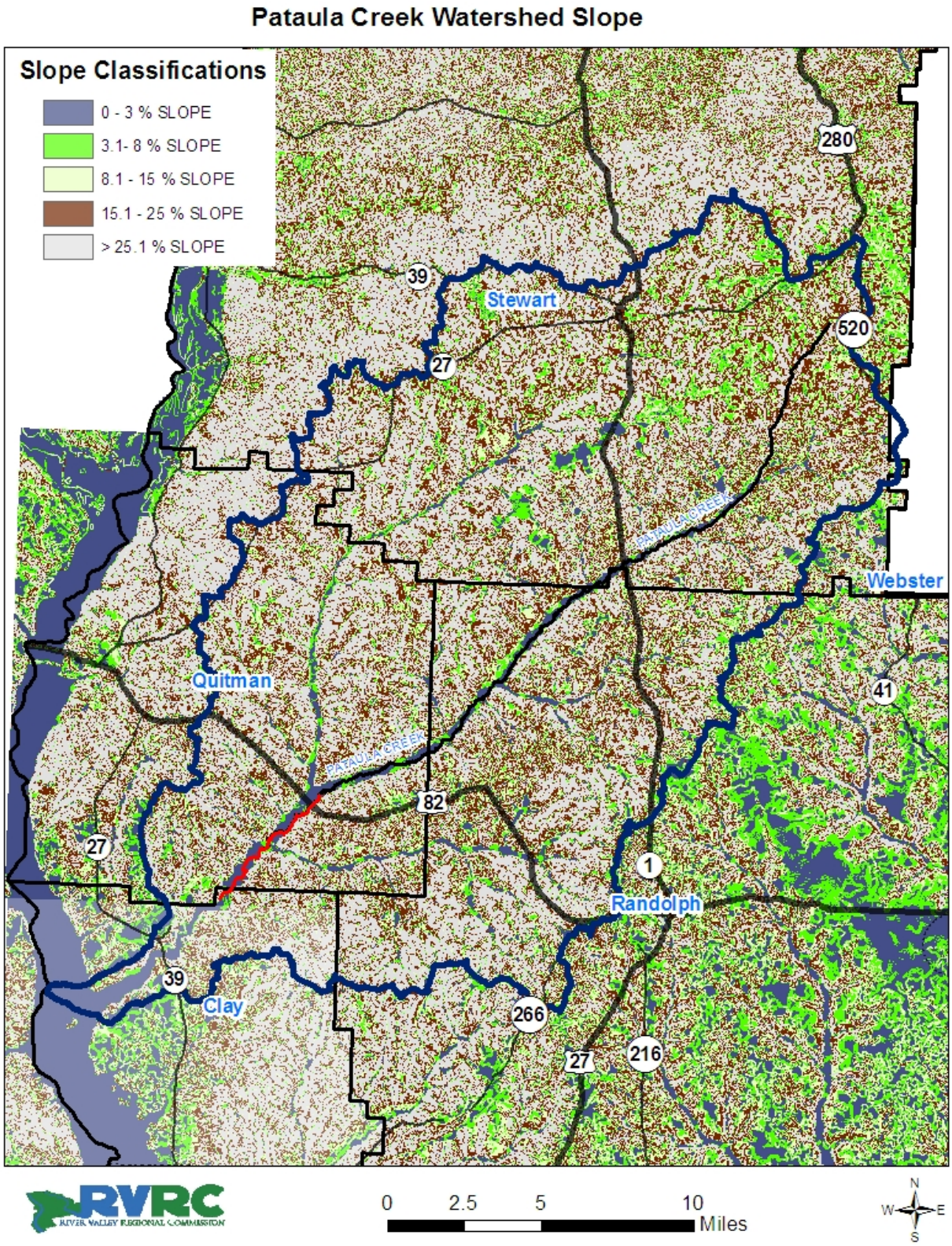


FIGURE 5. PATAULA CREEK WATERSHED SLOPE.



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 2012 305(b)/303(d) draft 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 2012 list of impaired streams located within the Pataula Creek watershed and their impairment. Table 3 depicts the 2012 list of supporting streams within the Pataula Creek watershed.

TABLE 2. PATAULA CREEK WATERSHED 2012 303(D) LIST.

Waterbody Name	Location	County(s)	Impairment	Miles Impacted	Designated Use	Category
Day Creek	Bluff Springs Branch to Hodchodkee Creek	Stewart	Bio F	1	Fishing	4a
Hodchodkee Creek	Bladen Creek to Smithee Jack Creek	Quitman	FC	8	Fishing	5
Hodchodkee Creek	SR 27 to Wimberly Mill Branch	Stewart	Bio F	3	Fishing	4a
Hodchodkee Creek	Day Creek to Foreman Mill Branch	Stewart	Bio F	5	Fishing	4a
Holanna Creek	Hog Creek to Pataula Creek	Randolph/ Quitman	FC	7	Fishing	5
Pataula Creek	Hodchodkee Creek to W. F. George Lake	Quitman/ Clay	FC	6	Fishing	4a
Pataula Creek	Headwaters to Clear Creek	Stewart	Bio F, Bio M	9	Fishing	4a, 5
Smithee Jack Creek	Headwaters to Hodchodkee Creek	Quitman	Bio F	5	Fishing	5

Source: Georgia Department of Natural Resources, Environmental Protection Division, 2012

TABLE 3. PATAULA CREEK WATERSHED 2012 305(B) LIST.

Waterbody Name	Location	County(s)	Impairment	Miles Impacted	Designated Use	Category
Pataula Creek	Pumpkin Creek to Hodchodkee Creek	Randolph/ Quitman	N/A	8	Fishing	1
Pumpkin Creek	Little Pumpkin Creek to Pataula Creek	Randolph	N/A	4	Fishing	1

Source: Georgia Department of Natural Resources, Environmental Protection Division, 2012

Pataula Creek, from Hodchodkee Creek to W. F. George Lake (6 miles), was placed on the Section 303(d) list by the GA EPD for violating the state standards for fecal coliform (FC). Based off of information provided in GA EPDs 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 5% reduction in fecal coliform for Pataula Creek. The GA EPD Sampling Station #1203150801, located at State Road 50/GA Hwy 82 (31.818333°, -84.973889°), is where GA EPD monitors this section of the creek. 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.

A 9 mile stretch of Pataula Creek, from its headwaters to Clear Creek, was placed on the 303(d) list by the GA EPD for violating the state standards for Biota (Sediment). Based off of information provided in GA EPDs 2003 *Total Maximum Daily Load Evaluation for Thirty-One Stream Segments in the Chattahoochee River Basin For Sediment (Biota Impacted)*, a TMDL called for an 8% reduction in sediment for Pataula Creek. 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 set resulting in the violations of fecal coliform and sediment levels suggests that a load reduction of approximately 5

percent would result in attainment of the standard for the fecal coliform impairment; a load reduction of approximately 8 percent would result in attainment of the standard for the sediment impairment.

As a result of the water quality impairment, Pataula Creek was 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, a TMDL has been developed, taking into account all sources of contamination. Upon implementation, the TMDL for Pataula Creek 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 Pataula 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 December 14, 2010 for fecal coliform and on April 4, 2013 for sediment. See Appendix D for field notes and pictures.

6.0 RANKING AND PRIORITIZING OF SIGNIFICANT SOURCES OF IMPAIRMENTS

The Advisors/Stakeholders have provided input on potential sources listed in the last Implementation Plan at the Advisory/Stakeholder meetings held on June 27, 2013 and June 20, 2014. Tables 4 and 5 address the sources of impairment and their estimated contribution (1 being little or no contribution and 5 being great contribution).

A chicken farm has been identified by advisors and is located at 32.034021°, -84.802284°, approximately 1.2 miles south of the heart of Lumpkin; operational status of this facility is unknown. Any runoff/discharge from this farm would empty into Hodchodkee Creek where the northern-most biota impairment is located. The waste from this farm travels approximately 11 miles before reaching the Hodchodkee Creek fecal coliform impairment. In addition, stakeholders have provided information about the application of poultry litter to agricultural fields. Operations in the area using poultry litter to fertilize fields could benefit from more appropriate runoff mitigation measures.

Lumpkin's waste water treatment plant is located at 32.026132°, -84.815759°, approximately 2 mile south, south west of the heart of Lumpkin. Discharge also enters Hodchodkee Creek and travels approximately 11 miles before reaching the Hodchodkee Creek fecal coliform impairment.

Illegal carcass dumping has been extensively documented within the watershed. Multiple garbage bags containing deer remains were found directly in the stream bed. In addition, numerous "dump sites" have also been identified in the area. Over twenty carcasses were noted

in just one day of visual surveying during December 2013. Additionally, the rural setting of the watershed often results in large numbers of road kill. These carcasses typically remain on or near roadways until full decomposition. Their presence attracts large groups of scavenging birds. The waste from these large groups of birds often surrounds the rotting carcasses. Eventually washing into the waterways, this further contributes to fecal coliform contamination. See Appendix D for picture documentation.

Characteristics of the Pataula Creek watershed's topography are broad valleys and steep rolling hills. Elevations range from 250 feet to 480 feet above sea level. Many of the steep slopes are found in the eastern section of the watershed, where the sediment impairment has been located. Coupled with agricultural and silvicultural operations, soil composition becomes a main concern and priority of stakeholders.

Along with soil composition and surrounding land uses, storm water drainage coming from the numerous dirt roads in the area could be contributing significantly to the issue of sediment impairments. Sediment from these dirt roads is loose and relatively unstable, leaving a high possibility of large sediment loads directly entering the surface waters of Pataula Creek and nearby tributaries, especially following very heavy precipitation events.

TABLE 4. SEDIMENT SOURCES OF CONTAMINATION FOR PATAULA CREEK.

Source	Extent (Miles, acres, etc.)	Permitted (Y/N)	Estimated Contribution (Rank 1 – 5)	Stakeholder Opinion (1 – 5)	Comments
Agricultural Uses	100+ acres	Unsure	4	4	Possible introduction of sediment from normal practices when BMPs are not followed
Silviculture	100+ acres	NA	4	3	Possible introduction of sediment from normal practices and stream crossings when BMPs are not followed
Storm water drainage from dirt roads	50+ miles	NA	4	4	Possible introduction of sediment from dirt in need of repair and maintenance
Highly erodible soils of the area/steep slopes	NA	NA	5	4	Soils near agricultural land with steep slopes may lead to erosion problems

TABLE 5. FECAL COLIFORM SOURCES OF CONTAMINATION FOR PATAULA CREEK.

Source	Extent (Miles, acres, etc.)	Permitted (Y/N)	Estimated Contribution (Rank 1 – 5)	Stakeholder Opinion (1 – 5)	Comments
Agricultural Uses, including the application of poultry litter to fields	100+ acres	unsure	3	4	Chicken houses near Lumpkin and Springvale ponds may be contaminating the watershed. In addition, application of chicken litter on agricultural fields can be contributing.
Urban runoff	0	NA	1	1	Most of this watershed is rural; there is very little urban activity to contribute.
Illegal dumping	25+ miles	NA	5	5	Hunters often illegally dump unwanted remains of carcasses over bridges and/or directly within the stream. Carcasses left in wooded areas eventually get washed into the stream as well.
Scavenging Birds	25+	NA	3	3	Dumped carcasses attract large groups of these birds that feed and defecate along the roadways.
Septic Systems	0	Y	1	1	The homeowners within this watershed have not reported any septic repairs.
Lumpkin Wastewater Treatment Plant and waste lines	10+ acres	Y	2	2	Waste lines cross several creeks within the watershed. Leakage may occur even though the plant operates under a NPDES permit.
Wildlife	200,000+ acres	NA	3	3	As in many areas of Georgia, feral hogs are invasive and contribute to contamination; Other animal wastes should be considered natural background sources.

7.0 IDENTIFICATION OF APPLICABLE EXISTING MANAGEMENT MEASURES

Several Best Management Practices exist for the Pataula Creek watershed. Clay, Georgetown-Quitman, Randolph and Stewart County strive to keep its waterways clean and have implemented several ordinances to reduce the pollution levels within its watersheds. Table 6 describes these ordinances and their responsible entity.

TABLE 6. EXISTING MANAGEMENT MEASURES FOR PATAULA CREEK.

Regulation/Ordinance or Management Measure	Responsible Government, Organization or Entity	Description
Use of storm water BMPs for all new development	Clay County, Georgetown-Quitman County, Randolph County, Stewart County	All new development will require storm water best Management Practices to be installed.
Implementation of land use measures that will protect the natural resources within the community	Clay County, Randolph County	Measures will include steep slope regulations, floodplain or marsh protection, etc.
Adoption of planning and zoning ordinances to ensure proper control of water and septic systems	Clay County	1) assure building permits 2) require health department check for soil suitability for septic tank use prior to allowing occupancy of new structures 3) provide population density control by enactment of enforcement of a county-wide zoning ordinance
Groundwater Recharge Ordinance	Georgetown-Quitman County, Randolph County	Establishes requirements to manage land use within significant groundwater recharge areas.
Wetland Protection Ordinance	Georgetown-Quitman County	Establishes boundaries around wetlands within the town and limits types and density of development to protect water quality and habitats in these areas.
Part V Environmental Planning Criteria Ordinance	Georgetown-Quitman County	New wetlands, groundwater, and river corridor protection standards.
Enforcement of soil erosion, storm water BMPs	Georgetown-Quitman County, Randolph County	Protects water quality through sedimentation and erosion control by establishing BMPs and regulating land-disturbing activities.

Storm water is the result of rain that collects in an area that can drain into a nearby body of water, such as a lake or river. The water can collect on roof tops, parking lots, saturated ground, roads, etc. The problem is large amounts of the pollutants of our modern living – such as oil, grease, pesticides, sediment, salt, and animal waste – are washed away within the storm water and enter the storm drain system or flow directly into any adjacent bodies of water. Even following a moderate rainfall, the storm water pollution can be significant enough to cause the water quality in the adjacent public water areas to violate federal and state standards for swimming and boating as defined by the Environmental Protection Agency and state health departments.

Storm water best management practices are methods designed to control storm water runoff incorporating sediment control and soil stabilization. They also define management practices that can prevent or reduce non-point source pollution. The Environmental Protection Agency defines storm water BMPs as a "technique, measure or structural control that is used for a given set of conditions to manage the quantity and improve the quality of storm water runoff in the most cost-effective manner."

Two major groundwater recharge areas lay on both sides of Pataula Creek; Cretaceous-Tertiary to the north and Clayton to the south. Protection of this area is vital in the prevention of contamination for Pataula Creek. The groundwater recharge ordinance is currently in place and functioning to prevent contamination within this watershed.

The Wetland Protection Ordinance prevents the formation of densely populated areas. Throughout this watershed, and immediately around Pataula Creek, there are no heavily populated areas.

One of the goals of the Georgia Planning Act of 1989 is the protection of our state's natural resources, environment, and vital areas. Included in the Act are minimum standards and procedures generally known as the "Environmental Planning Criteria" or "Part 5 Criteria" (from Part 5 of House Bill 215, which became the Planning Act). To maintain eligibility for certain state grants, loans, and permits, local governments must implement regulations consistent with these criteria.

The Rules for Environmental Planning Criteria (Chapter 391-3-16) were developed by the Georgia Department of Natural Resources (DNR) and are part of the local government planning standards. The rules direct local governments to establish local protection efforts to conserve critical environmental resources. They are divided into the following five sections:

- Water Supply Watersheds
- Groundwater
- Wetlands
- Protected Rivers
- Protected Mountains

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

8.0 RECOMMENDATIONS FOR ADDITIONAL MANAGEMENT MEASURES

Stakeholders have expressed various concerns about a number of activities within the watershed that may contribute to fecal coliform and sediment pollution. To address these fully, RVRC staff proposes a continuation of targeted monitoring before BMP installation. This monitoring will enable RVRC staff to have a better understanding of where contaminants may be coming from as well as provide information to assist in determining the most effective Best Management Practice type and location. The analysis of chemical testing results will give insight on whether agricultural or silvicultural operations are contributing more at a particular site. RVRC suggests that the addition of sampling sites will give a more in-depth representation of the impairment. Holanna Creek is also impaired with fecal coliform. Best Management Practices that will be applied to Pataula Creek should also be applied to other impaired streams of the area to provide assistance in maintaining a healthy watershed.

Because the application of poultry litter to agricultural operations has been listed as a potential contaminant, targeted monitoring, including the use of DNA/microbial source tracking, will assist in determining the best type and location for BMPs. This will help to determine more confidently if the source is coming from unnatural carcass dumping, related scavenging birds, runoff from agricultural fields using poultry litter, feral hogs, or cattle operations in the area. For example, DNA/microbial source tracking could suggest that an area originally believed to be impacted by a chicken farm, might actually be experiencing an unnoted feral hog problem. With DNA/Microbial source tracking, this would be discovered before financial commitments were put towards something more suited to address poultry litter rather than the real issue of feral hogs. Assessing these possibilities in depth before implementation of BMPs ensures that efforts are not wasted.

Vegetation buffers and fencing on farmland perimeters will help lessen the amount of runoff that might contain levels of fecal coliform pollution from poultry litter. This practice would also address the addition of sediment to the waterway. In addition to fecal coliform testing and DNA/microbial source tracking, the utilization of thorough chemical monitoring will help with identification locations of agricultural runoff and, thus, the most appropriate and effective BMP installation locations.

To address the impairment of fecal coliform, composting facilities should be utilized. The issue of illegal carcass dumping is well known and documented throughout the watershed. See Appendix D for picture documentation. Also, the rural setting of the area results in a large amount of road kill. A composting facility would lessen the amounts of natural and illegal pollution. Compost sites should be operational year round to account for road kill, but the operation of such facilities should be especially accessible during hunting seasons, a time when more carcasses are found along roadsides and in streams. While higher numbers of fecal coliform can be somewhat expected during winter months, the higher counts in the Pataula Creek dataset, as shown in Appendix H, also correspond to deer hunting season. The biggest increases

are seen at the very beginning of the season and again at the near end of the season. Initial work to develop operational composting facilities has been completed. Finalization of site locations should take place in order to address this pollution source. Additionally, informational signage to educate local residents about the illegality of carcass dumping should be installed.

Feral hog populations are also a noted problem for residents throughout the area and a contributing source, like other wildlife, to fecal coliform levels. Educational workshops to promote effective hog management techniques should be offered to area residents. Educational presentations about legal and illegal carcass disposal and composting operations and techniques should also be offered. Signage informing citizens on how to report illegal dumping should be installed in order to discourage this poor practice and minimize health risks.

To address the sediment impairment of Pataula Creek, the application of techniques found in the Georgia Better Back Roads Field Manual should be implemented on dirt roads in the area. Vegetation buffers, silt fences, filter strips, and sediment basins should be installed to reduce the amount of sediment in runoff from both agricultural and silvicultural activities. Terracing of agricultural land will also help to minimize the amount of sediment entering the waterway from farming operations. In addition to these practices, initial targeting monitoring, including chemical and nutrient tests, will help identify the most significant areas of contribution from agricultural. In addition to these and other erosion control measures, drainage practices such as turnouts, ditches, culverts, and cross dams should be used as deemed necessary.

TABLE 7. SUGGESTED ACTIONS AND MEASURES TO ADDRESS IMPAIRMENTS

Action/Best Management Practice	Category	Water Quality Criteria to be Addressed	BMP Estimated Effectiveness
DNA/Microbial Source Tracking	Source Determination – BMP Placement	Fecal Coliform	n/a
Chemical Testing	Source Determination – BMP Placement	Bio F (Sediment)	n/a
Installation of Informative Signage	Carcass Dumping BMP	Fecal Coliform	n/a
Composting Facilities	Carcass Dumping BMP	Fecal Coliform	30-70%
Hog Manual Distribution	Educational	Fecal Coliform	10%
Vegetative Buffers	Agricultural/ Silvicultural BMP	Bio F (Sediment) and/or Fecal Coliform	59%
Filter Strips	Agricultural BMP	Bio F (Sediment)	60%
Sediment Control Basins	Silvicultural BMP	Bio F (Sediment)	75-95%
Fencing	Agricultural/ ilvicultural BMP	Bio F (Sediment) and/or Fecal Coliform	75% (sediment), 99% (FC)
Alternate Watering Sources	Agricultural BMP	Fecal Coliform	15%

Terracing	Agricultural BMP	Bio F (Sediment)	85-95%
Silt Fencing	Agricultural/ Silvicultural BMP	Bio F (Sediment) and/or Fecal Coliform	68-98%
Stream Crossings	Agricultural BMP	Sediment	30-50%
Dirt road maintenance measures (turnouts, ditches, culverts, cross dams)	Dirt Road BMPs	Bio F (Sediment)	40-80%

9.0 PARTNERSHIP ADVISORY COUNCIL AND PARTNER ORGANIZATIONS

An Advisory Group recruitment from a number of working group partners were prioritized to also serve to provide input for this Watershed Management Plan. Representatives include agriculture and forestry professionals, members of local governments, and landowners, as well as health, safety, and environmental professionals. Table 7 shows the final Advisory Group of major Stakeholders and community participants.

TABLE 8. ADVISORY GROUP FOR PATAULA CREEK.

Name	Address	City	State	ZIP	Organization
John Pollard	1766 Valley Rd.	Lumpkin	GA	31815	Georgia Forestry Commission
Chuck Norvell	2910 Newton Road	Albany	GA	31701	Georgia Forestry Commission
Brad Carter	207 W. Webster St.	Preston	GA	31824	Regional Health Department
Cassie Myers Renfrow	1428 2nd Ave.	Columbus	GA	31901	River Valley Regional Commission
Lance Renfrow	1428 2nd Ave.	Columbus	GA	31901	River Valley Regional Commission
Jason Weeks	PO Box 277	Georgetown	GA	39854	Georgetown-Quitman County
Ernie Brown	PO Box 157	Lumpkin	GA	31815	Stewart County Board of Commissioners
Luke Crosson	4344 Albany Highway	Dawson	GA	39842	Georgia Soil and Water Conservation Commission
Mike Goare	PO Box 129	Preston	GA	31824	United States Department of Agriculture
Carl Childree	57 Kaigler Rd., Suite 1	Georgetown	GA	39854	University of Georgia Extension Office
Karen Reese	111 North Webster St.	Cuthbert	GA	39840	National Resources Conservation Service
Julie Shutters	822 Jesse Johnson Street	Blakely	GA	39823	Golden Triangle RC&D
Richard Morris	25 Old School Road	Georgetown	GA	36854	Georgetown-Quitman County Board of Commissioners

Spencer Mueller	25 Old School Road	Georgetown	GA	36854	Georgetown-Quitman County
Wanda Wilson	390 Broad Street	Richland	GA	31825	City of Richland
Jimmy Lee	PO Box 157	Lumpkin	GA	31815	Stewart County Board of Commissioners
Roger Martin	1212 3rd Avenue	Columbus	GA	31901	Chattahoochee RiverWarden
Joe Lee Williams	PO Box 157	Lumpkin	GA	31815	Stewart County Board of Commissioners

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 Pataula 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.

The Advisory Group meetings were held on June 27, 2013 at 10:00 am at the Stewart County Courthouse in Lumpkin and on June 20, 2014 at 11:00 am at the Georgetown-Quitman County Board of Commissioners Office in Georgetown to discuss potential ways to assess the watershed of Pataula Creek. See Appendix F for meeting minutes.

Future implementation of recommended measures will be possible through partnership with GA EPD, local governments, GA Forestry Commission, GA Department of Agriculture, Natural Resources Conservation Service, GA Adopt-A-Stream, and the local health department. Independent contractors will need to be secured to ensure proper installation of recommended measures.

10.0 SCHEDULE OF SEQUENTIAL MILESTONES

The main goal of this Watershed Management Plan is to bring Pataula Creek into compliance with water quality standards, which will result in its removal from the 303(d) list of impaired waters. This goal will be measured by the concentration of fecal coliform samples taken after installation of BMPs to address the bacterial issue and by the successful installation of agriculture, silviculture, and dirt road BMPs to address the sediment issue. In order to establish BMPs to mitigate the pollution levels, it was important to determine the sources of pollution. RVRC staff has executed a targeted monitoring plan whereby *E. coli* samples were taken at six

(6) locations and turbidity samples were taken at four (4) locations throughout the watershed over a 12-month period in order to establish sources of contamination during Year 2 of the plan.

The targeted monitoring for *E. coli* and sediment was conducted during the months of July 2013 – June 2014. Testing was avoided up to 48 hours after rain events totaling 1-2 inches of precipitation. This data is stored at the River Valley Regional Commission, located at 1428 2nd Avenue, Columbus, Georgia 31901, and was updated regularly on the Adopt-A-Stream website. After results were obtained, RVRC staff and local governments determined what Best Management Practices were needed to mitigate the pollution levels.

Money to fund the management practices outlined in Section 8 of this report will be sought through Section 319(h) of the Federal Clean Water Act. The 319(h) grant application will be submitted to EPD by the October 31, 2014 deadline. Notification of approved applicants will be in the spring of 2015, and funding and project activities will begin in the fall of 2015.

Should the grant application be funded, evaluation of BMP locations will begin immediately. Installation of all BMPs, including carcass composting sites, will take approximately a year complete. During this time, targeted monitoring will continue in order to fully assess the success of plan implementation. Furthermore, during the time of BMP installation, the educational outreach component will take place and continue on through the second year. All of the outputs of the 319(h) application will take approximately two years to complete.

11.0 PUBLIC INVOLVEMENT

Stakeholders are individuals who live 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 8 shows a list of interested Stakeholders within the Pataula Creek watershed.

TABLE 9. STAKEHOLDER GROUP FOR PATAULA CREEK.

Name	City	State	ZIP
Shawn Montieth	Georgetown	GA	N/A
A. J. Bagett	Morris	GA	N/A
Phillip B. Willis	Ft. Gaines	GA	N/A
Bernice Harris	N/A	GA	N/A
Teresa Mitchell	N/A	GA	N/A
Lawerence Bussey	N/A	GA	N/A
Jerry Goforth	Leesburg	GA	31763
Bill Minick	Richland	GA	31825
Chip Jones	Richland	GA	31825
Sallie Peek Long	N/A	GA	N/A
Robin Fant	Lumpkin	GA	31815

Greg Stewart	N/A	GA	N/A
James Boling	N/A	GA	N/A
Ed Schevey	N/A	GA	N/A
David Sherrick	N/A	GA	N/A

Building partnerships was a key component in order to gather input from the Stakeholder perspective in evaluation of the Watershed Management Plan. Additionally, partnerships help 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.

RVRC staff encouraged public participation in the development of this TMDL Plan by inviting Stakeholders to participate in a meeting throughout the development stages. The objective of this meeting was to obtain feedback from Stakeholders about the concerns and composition of watershed activities. The Stakeholder Group meetings were held on June 27, 2013 at 10:00 am at the Stewart County Courthouse and on June 20, 2014 at 11:00 am at the Georgetown-Quitman County Board of Commissioners Office in Georgetown. See Appendix F for meeting minutes.

Examples of Stakeholder recommendations include:

- Additional monitoring to verify effectiveness of measures implemented;
- Review of all existing development codes, ordinances, and policies to identify where revisions could be made to reduce non-point source water pollution;
- Design and implement a citizen education program to make citizens aware of the non-point source water pollution problem and their role in improving the water quality;
- Encourage the continuing formation of volunteer groups to conduct community based stream protection efforts such as restoring vegetative cover within riparian areas, stream clean-up, and reporting of problems;
- Conduct screening level analyses of structural and non-structural BMPs;
- Investigate grant and funding opportunities to fund these efforts;
- Propose best management practices (BMPs) or other ways to correct problems at each location; and
- Evaluate technical assistance needed and how to administer assistance.

Additional educational workshops, presentations, and meetings should be held throughout the implementation process of recommended measures.

12.0 RECOMMENDATIONS FOR MONITORING AND CRITERIA FOR MEASURING SUCCESS

Targeted monitoring for Pataula Creek was conducted from July 2013 – June 2014. The results of this monitoring can be found in Appendix H. An updated monitoring plan to include sediment was submitted to EPD in June 2013. The portion of this plan documenting sampling protocols and techniques can be found in Appendix I.

Sampling locations were identified while considering Stakeholder opinion to best assess sources of pollution within the watershed. Specific sampling locations and GPS coordinates for each site are listed below in Table 9. A map of the sampling locations may be found in Figure 6. Samples were collected on the upstream side of the bridge at the road crossings.

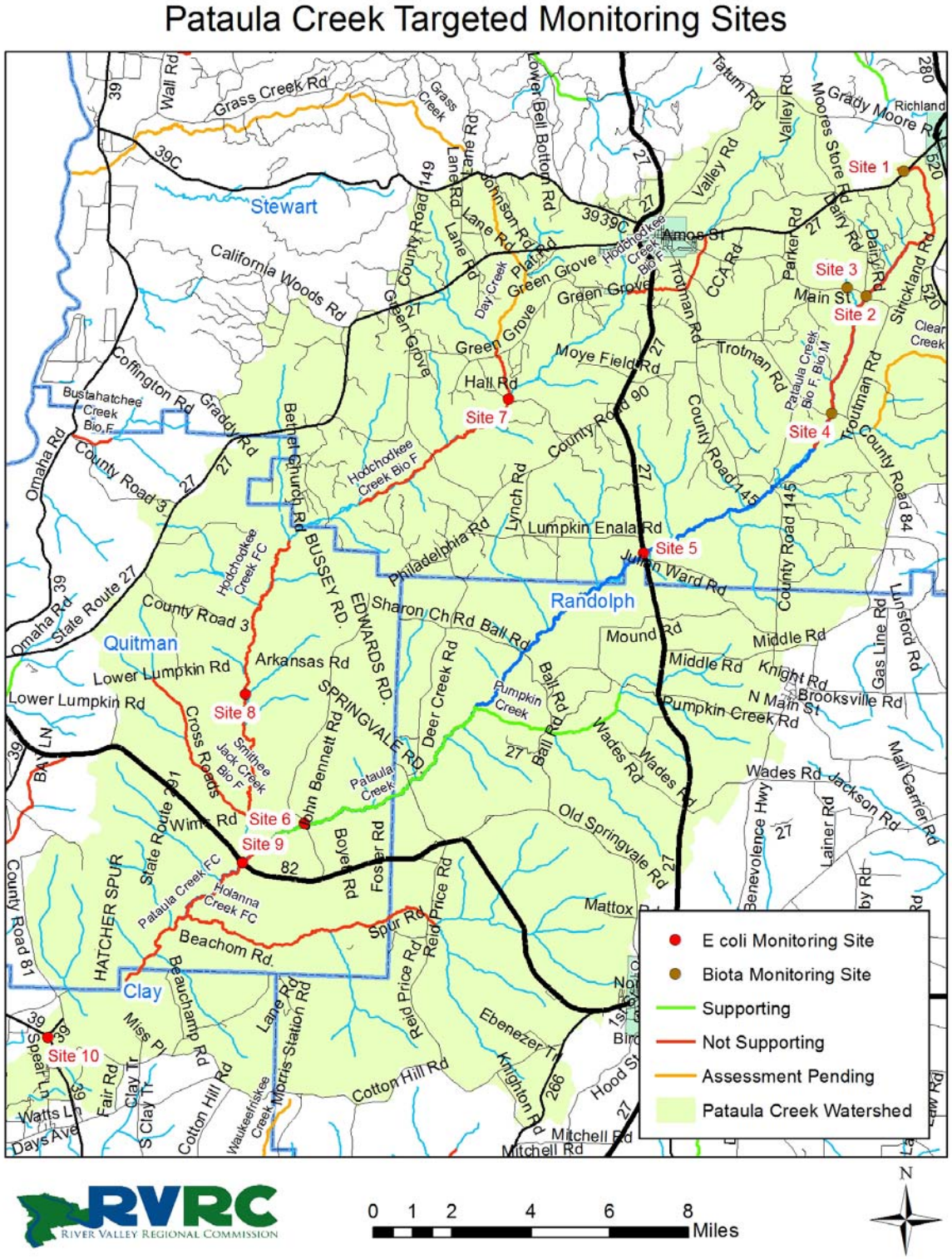
Future monitoring efforts should include DNA/microbial source tracking to determine specific sources of fecal coliform pollution. Detection should be focused on determining the location of fecal coliform contribution from cattle and poultry from agricultural operations and deer, swine, and bird from deer carcass dumping, road kill instances, and feral hog population. Having a better understanding of the source of contamination will ensure that the appropriate BMPs outlined in Table 7 are placed in an area where they will be most effective. Similarly, chemical analysis will help address the specific issues related to sedimentation problems. By using chemical testing, sediment loads can be traced to runoff from agricultural, silvicultural, or dirt roads. To measure success, fecal coliform testing will be conduction following the installation of BMP measures.

TABLE 10. SAMPLING STATIONS FOR TARGETED MONITORING.

Station Number	General Location	Sampling Site Coordinates		Sample Parameters
		Latitude	Longitude	
1	Pataula Creek and State Route 27	32.07595	-84.68980	Biota Turbidity
2	Pataula Creek and James Holder Road	32.02954	-84.70666	Biota Turbidity
3	Tributary of Pataula Creek and Main Street	32.02959	-84.70678	Biota Turbidity
4	Pataula Creek and County Road 84	31.98681	-84.72147	Biota Turbidity
5	Pataula Creek and US Highway 27	31.934119	-84.801443	*E. coli*
6	Pataula Creek and County Road 84	31.831861	-84.946851	*E. coli*
7	Hodchodkee Creek and County Road 13	31.990062	-84.861245	*E. coli*
8	Hodchodkee Creek and Lower Lumpkin Road	31.886631	-84.973590	*E. coli*

9	Pataula Creek and GA Highway 82	31.818236	-84.974000	*E. coli*
10	Pataula Creek and Highway 39	31.747500	-85.054501	*E. coli*

FIGURE 6. PATAULA CREEK WATERSHED TARGETED MONITORING SAMPLING SITES.



13.0 PLAN IMPLEMENTATION

During each semi – annual evaluation of implementation on Pataula Creek, a reassessment of implementation priorities will be made by the Advisory Group to readjust and fine–tune the targeting approach in concert with the staged implementation approach. If reasonable progress toward implementing the management practices is not demonstrated, the Advisory Group will consider additional implementation actions.

The objective of TMDL Implementation 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 general actions to be implemented during future stages is shown in Table 10.

TABLE 11. SCHEDULE FOR FUTURE IMPLEMENTATION.

Management Measure	Responsible Organization	Time Frame
Pre-BMP Targeted Monitoring	River Valley Regional Commission	1 year, Fall 2015 – Fall 2016
DNA/Microbial Source Tracking	River Valley Regional Commission, Independent Contractor	1 year, Fall 2015 – Fall 2016
Determination of Most Effective BMP Locations/ Finalization of Compost Locations	River Valley Regional Commission, Local governments, GA Department of Agriculture	1 year, Fall 2015 – Fall 2016
Installation of Composting Facilities	River Valley Regional Commission, Natural Resources Conservation Service, GA Department of Agriculture, Local governments, Independent Contractor	6 – 9 months, Fall 2016 – Spring 2017
Post Bacterial BMP Monitoring	River Valley Regional Commission	6 months, Spring 2017 – Fall 2017

Installation of Agricultural BMPs	River Valley Regional Commission, Natural Resources Conservation Service, Local landowners	1½ years, Spring 2016 – Fall 2017
Installation of Dirt Road BMPs	River Valley Regional Commission, Natural Resources Conservation Service, Local governments	1½ years, Spring 2016 – Fall 2017

During each semi – annual evaluation of implementation on Pataula Creek, a reassessment of implementation priorities will be made by the Advisory Group to readjust and fine-tune the targeting approach in concert with the staged implementation approach. 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. PATAULA CREEK WATERSHED MAP (HUC 0313000315)**
- **C. LAND USE MAPS: TRENDS AND FUTURE**
- **D. FIELD NOTES AND PICTURES**
- **E. COPIES OF PUBLIC NOTICES AND OTHER LITERATURE**
- **F. MEETING MINUTES**
- **G. FORMS**
- **H. DATA COLLECTED**
- **I. SAMPLING PROTOCOLS**
- **J. RECOMMENDED FUTURE SAMPLING PROTOCOLS**

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.

(See Section 6.0, pages 17 – 19)
The sources of fecal coliform pollution that were suggested by the Advisors and Stakeholders were agricultural uses, urban runoff, illegal dumping of carcasses, scavenging birds, septic systems, possible leakage through waste lines from the Lumpkin Wastewater Treatment Plant, and natural background levels from other native wildlife.

Most of the land in this area is rural, so there are too few urban areas to have a significant impact. The houses in the area have not reported enough septic repairs to contribute significantly to fecal coliform contamination. Waste lines from the Wastewater Treatment Plant in Lumpkin cross several creeks within the watershed. Leakage may occur even though the plant operates under a NPDES permit. The targeted monitoring approach should help determine if these areas are affecting water quality. Lumpkin's waste water treatment plant is located at 32.026132°, -84.815759°, approximately 2 mile south, south west of the heart of Lumpkin. Discharge also enters Hodchodkee Creek and travels approximately 11 miles before reaching the Hodchodkee Creek fecal coliform impairment.

A chicken farm has been identified by advisors and is located at 32.034021°, -84.802284°, approximately 1.2 miles south of the heart of Lumpkin; operational status of this facility is unknown. Any runoff/discharge from this farm would empty into Hodchodkee Creek where the northern-most biota impairment is located. The waste from this farm travels approximately 11 miles before reaching the Hodchodkee Creek fecal coliform impairment. In addition, stakeholders have provided information about the application of poultry litter to agricultural fields. Operations in the area using poultry litter to fertilize fields could benefit from more appropriate runoff mitigation measures such as vegetative buffers.

Illegal carcass dumping has been extensively documented within the watershed. Multiple garbage bags containing deer remains were found directly in the stream bed. In addition, numerous "dump sites" have also been identified in the area. Over twenty carcasses were noted in just one day of visual surveying during December 2013. Additionally, the rural setting of the watershed often results in large numbers of road kill. These carcasses typically remain on or near roadways until full decomposition. During this time, their presence attracts large groups of scavenging birds that feed and defecate in the roadway. This, too, contributes to the issue of fecal coliform contamination. See Appendix D for picture documentation. As in many areas within the state of Georgia, feral hogs are considered invasive and contribute to contamination as well.

Characteristics of the Pataula Creek watershed's topography are broad valleys and steep rolling hills. Elevations range from 250 feet to 480 feet above sea level. Many of the steep slopes are found in the eastern section of the watershed, where the sediment impairment has been located. Coupled with agricultural and silvicultural operations, soil composition becomes a main concern and priority of stakeholders.

Along with soil composition and surrounding land uses, storm water drainage coming from the numerous dirt roads in the area could be contributing significantly to the issue of sediment impairments. Sediment from these dirt roads is loose and relatively unstable, leaving a high possibility of large sediment loads directly entering the surface waters of Pataula Creek and nearby tributaries, especially following very heavy precipitation events.

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

(See Table 7, pages 23-24)
Based off of information provided in GA EPDs 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 5% reduction in fecal coliform for the listed segment of Pataula Creek. Based off of information provided in GA EPDs 2003 Total Maximum Daily Load Evaluation for Thirty-One Stream Segments in the Chattahoochee River Basin For Sediment (Biota Impacted), a TMDL called for an 8% reduction in sediment for the listed segment of Pataula Creek.

Several Best Management Practices need to be implemented throughout this watershed in order to obtain these goals. These may include, but are not limited to composting facilities, informational signage regarding carcass dumping, vegetation buffers, filter strips, sediment control ponds/settling pools, silt fencing, stream crossings, alternate watering sources, and terracing of agricultural land, as well as management practices to mitigate sediment runoff from dirt roads by the installation of Better Back Roads practices including, but not limited to, turn outs, culverts, drainage ditches, and cross dams. Installation of these BMPs will greatly reduce fecal coliform levels and sediment loads in Pataula Creek.

According to the 2007 *Best Management Practices for Georgia Agriculture* by the Georgia Soil and Water Conservation Commission, vegetation buffers prevent erosion and help absorb up to 59% of nutrients, and filter strips can potentially remove up to 60% of pathogens. Sediment control ponds or settling pools protect water bodies from runoff flows and improve water quality downstream, reducing suspended solids in runoff by 75-95%. Level terraces have been found to reduce sediment by 85-95%, total nitrogen by 20%, and total phosphorus by 70%. According to USDA General Technical Report RMRS-GTR-94, silt fencing can reduce sediment 68-98%.

A load reduction estimate for composting facilities cannot be established. Effectiveness of this practice will be dependent upon the number of carcasses brought to the facility; this will vary based on season. Based on the large number of carcasses seen in the watershed during the months of July 2013 – June 2014, removal of bodies through the implementation of composting facilities will drastically reduce levels of fecal coliform attributed to this source. RVRC estimates that should composts be used as intended, up to 30-70% of the fecal coliform from carcasses could be eliminated from the waterway.

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.

(See Table 7, pages 23-24)
Stakeholders have expressed various concerns about a number of activities within the watershed that may contribute to fecal coliform and sediment pollution. To address these fully, RVRC staff proposes a continuation of targeted monitoring during and after BMP installation. This monitoring will enable RVRC staff to have a better understanding of where contaminants may be coming from as well as provide information to assist in determining the most effective Best Management Practice type and location. RVRC suggests that the addition of sampling sites will give a more in-depth representation of the impairment. Holanna Creek is also impaired with fecal coliform. Best Management Practices that will be applied to Pataula Creek should also be applied to other impaired streams of the area to provide assistance in maintaining a healthy watershed.

Because the application of poultry litter to agricultural operations has been listed as a potential contaminant, targeted monitoring, including the use of DNA/microbial source tracking, will assist in determining the best location for BMPs. Vegetation buffers on farmland perimeters will help lessen the amount of runoff that might contain levels of fecal coliform pollution. This practice would also address the addition of sediment to the waterway. In addition to fecal coliform testing and DNA/microbial source tracking, the utilization of thorough chemical monitoring will help with identification locations of agricultural runoff and, thus, appropriate BMP installation locations.

To address the impairment of fecal coliform, composting facilities should be utilized. The issue of illegal carcass dumping is well known and documented throughout the watershed. See Appendix D for picture documentation. Also, the rural setting of the area results in a large amount of road kill. A composting facility would lessen the amounts of natural and illegal pollution. Compost sites should be open year round to account for road kill, but the operation of such facilities should be especially accessible during hunting seasons, a time when more carcasses are found along roadsides and in streams. While higher numbers of fecal coliform can be somewhat expected during winter months, the higher counts in the Pataula Creek dataset, as shown in Appendix H, also correspond to deer hunting season. The biggest increases are seen at the very beginning of the season and again at the near end of the season. Feral hog populations are also a noted problem for residents throughout the area and a contributing source, like other wildlife, to fecal coliform levels. Signage informing citizens of the illegal nature of carcass dumping, as well as information on how to report illegal dumping, will serve to remind residents of the severity of this issue. Local governments should also work to inform citizens of the consequences of illegally dumping carcasses.

To address the sediment impairment of Pataula Creek, the application of techniques found in the *Georgia Better Back Roads Field Manual* should be implemented on dirt roads in the area. Initial targeting monitoring, including chemical and nutrient tests, will help identify the most significant areas of contribution from agricultural operations. From this information, best management practices such as vegetation buffers, filter strips, sediment control basins, terracing, and silt fencing will be applied in the most appropriate locations. In addition to these and other erosion

control measures, drainage practices such as turnouts, ditches, culverts, and cross dams will be used as deemed necessary.

Vegetation buffers, silt fences, and sediment basins should be installed to reduce the amount of sediment in runoff from both agricultural and silvicultural activities. Terracing of agricultural land will also help to minimize the amount of sediment entering the waterway from farming operations. In addition to these practices, initial targeting monitoring, including chemical and nutrient tests, will help identify the most significant areas of contribution from agricultural operations.

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

(See Section 9.0, pages 24-25)
Funding for watershed monitoring and BMP implementation can be obtained from a 319(h) Non-point Source Implementation Grant from GA 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 allowed contractual timeline. Match funds would be obtained through in-kind services provided by the four counties through which the majority of the watershed lies. Additional support will be given through local governments and assistance from one or more Resource Conservation and Development Councils, Georgia Department of Agriculture, Natural Resources Conservation Service, and Two Rivers Resource Conservation & Development Council. An independent contractor will be consulted to assist with DNA/microbial source tracking and compost facility installation.

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

(See Section 11.0, Pages 26-27)
This Watershed Management Plan for Pataula Creek document will be available for all persons who wish to obtain it. The RVRC will hold additional Stakeholder/Advisory meetings to update interested persons on the status of the implementation of the Watershed Management Plan. All announcements for any additional Stakeholder meetings and public hearings will be announced in the *Eufaula Tribune* and *Southern Tribune*. Advisors and Stakeholders will also be contacted by mailed letters. The targeted monitoring results will be posted on the Adopt-A-Stream website to be available for all interested parties.

Educational workshops to promote effective hog management techniques should be offered to area residents. Educational presentations about legal and illegal carcass disposal and composting operations and techniques should also be offered to local residents and any other interested patrons. Many hunters in the area come from out of state and are not year-round residents; installation of signage throughout the watershed will serve to inform these citizens who might not be aware of current local issues, including carcass dumping. Adopt-A-Stream workshops were held during the development of this Watershed Management Plan; recertification

workshops will be held to keep participants up-to-date with Quality Assurance and Quality Control protocols, and four additional certification classes will be offered in order to raise awareness and allow for proper long term monitoring efforts in the area.

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

(See Section 13.0, Table 11)
The 319(h) grant application will be submitted to EPD by the October 31, 2014 deadline. Notification of approved applicants will be in spring of 2015, and funding and project activities will begin in fall of 2015. Should the application be funded, targeted monitoring, including DNA/microbial source tracking, would begin immediately. This monitoring and investigation period will allow for the identification of appropriate locations for all BMP installation locations. During this time, partnerships with local governments, NRCS, and one or more RC&D Councils will be utilized. This process should take approximately six months. During this time, public outreach efforts to educate local citizens about water quality, appropriate carcass disposal techniques, and the general composting process will be held. Once proper locations have been identified, BMP installation should begin. These include composting facilities, practices for agricultural and silvicultural operations, and management of dirt roads in the area. This process will take approximately twelve to eighteen months. During and after installation, monitoring will continue to identify effectiveness and other areas of concern. All of the outputs of the 319(h) application will 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.

(See Section 11.0)
River Valley Regional Commission staff will take monthly visits to the watershed for water quality testing. Additionally, staff will take monthly visits to the watershed in order to monitor the progress of the BMP installations. Success of the composting BMPs will be easily assessed by traveling through the area and noting the lower number of carcasses along the roads. Additionally, once compost facilities are operating, data about the citizens using them may be collected. This could help identify any areas of concern that might need to be addressed during the grant period. Should more outreach be necessary, more workshops will be held. Following BMP installation, monthly monitoring will continue to measure success.

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.

(See Sections 10.0 and 12.0)

Monitoring before and after BMP installation will be conducted. These data sets will be compared to assess whether the BMPs are working. To conclude success, sample counts taken after BMP installation should be lower than those in previous years.

During each semi – annual evaluation of implementation on Pataula Creek, a reassessment of implementation priorities will be made by the Advisory Group to readjust and fine-tune the targeting approach in concert with the staged implementation approach. 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.

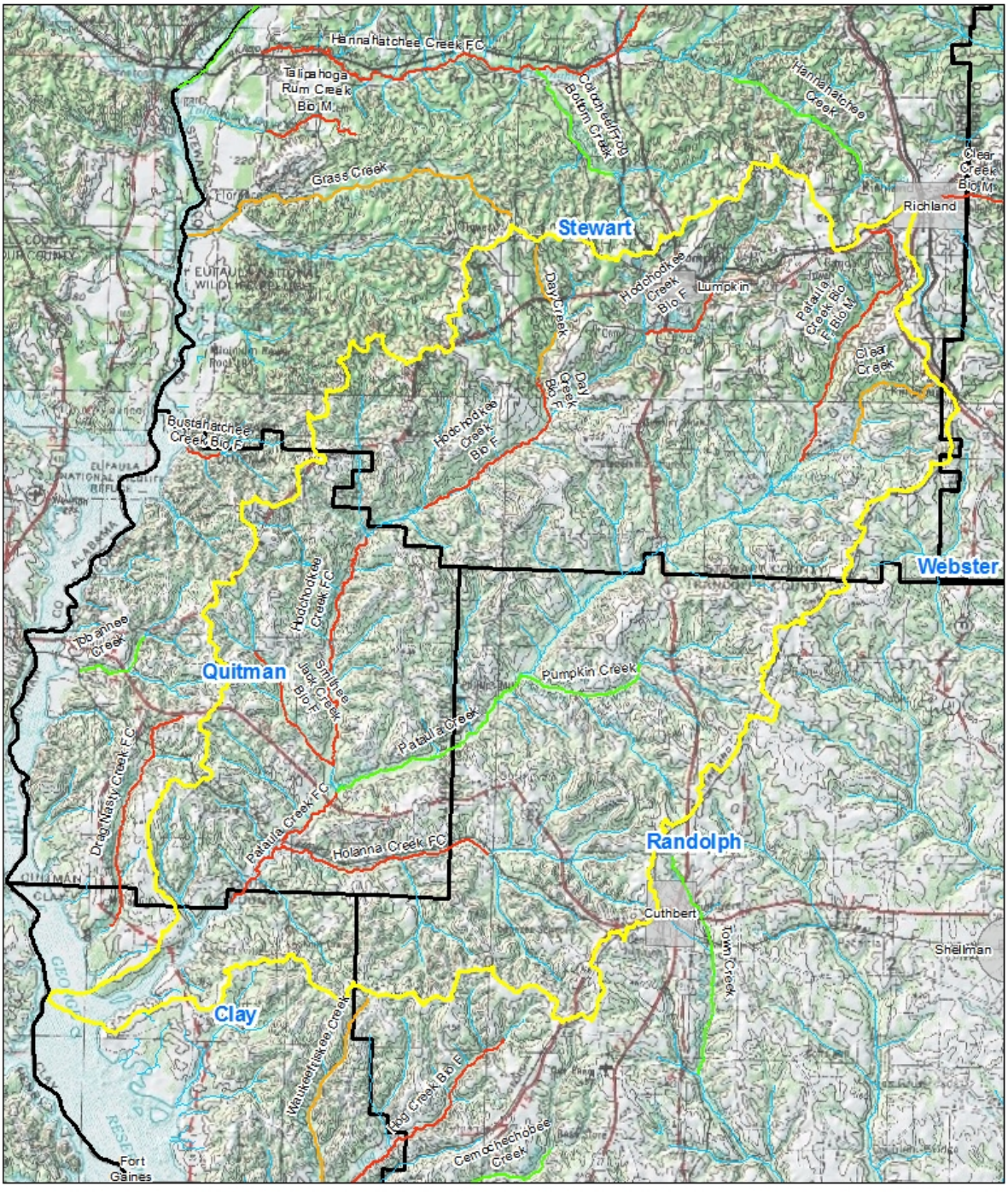
(See Sections 10.0 and 12.0)
Should the 319(h) application be funded, DNA/microbial source tracking will be conducted to locate areas of agricultural concern. Following identification of agricultural operations that would benefit from BMP installation, implementation would begin. Any concerns of citizens will be addressed during the grant period. Surveys could be used to determine alternate locations of carcass dumping.

Vegetation buffers, silt fences, and sediment basins should be installed to reduce the amount of sediment in runoff from both agricultural and silvicultural activities. Terracing of agricultural land will also help to minimize the amount of sediment entering the waterway from farming operations. In addition to these practices, initial targeting monitoring, including chemical and nutrient tests, will help identify the most significant areas of contribution from agricultural operations.

After BMP installation, follow up monitoring should be conducted to determine load reductions of both fecal coliform and sediment. Should Best Management Practices be installed correctly and used as intended, reductions in both parameters should be found.

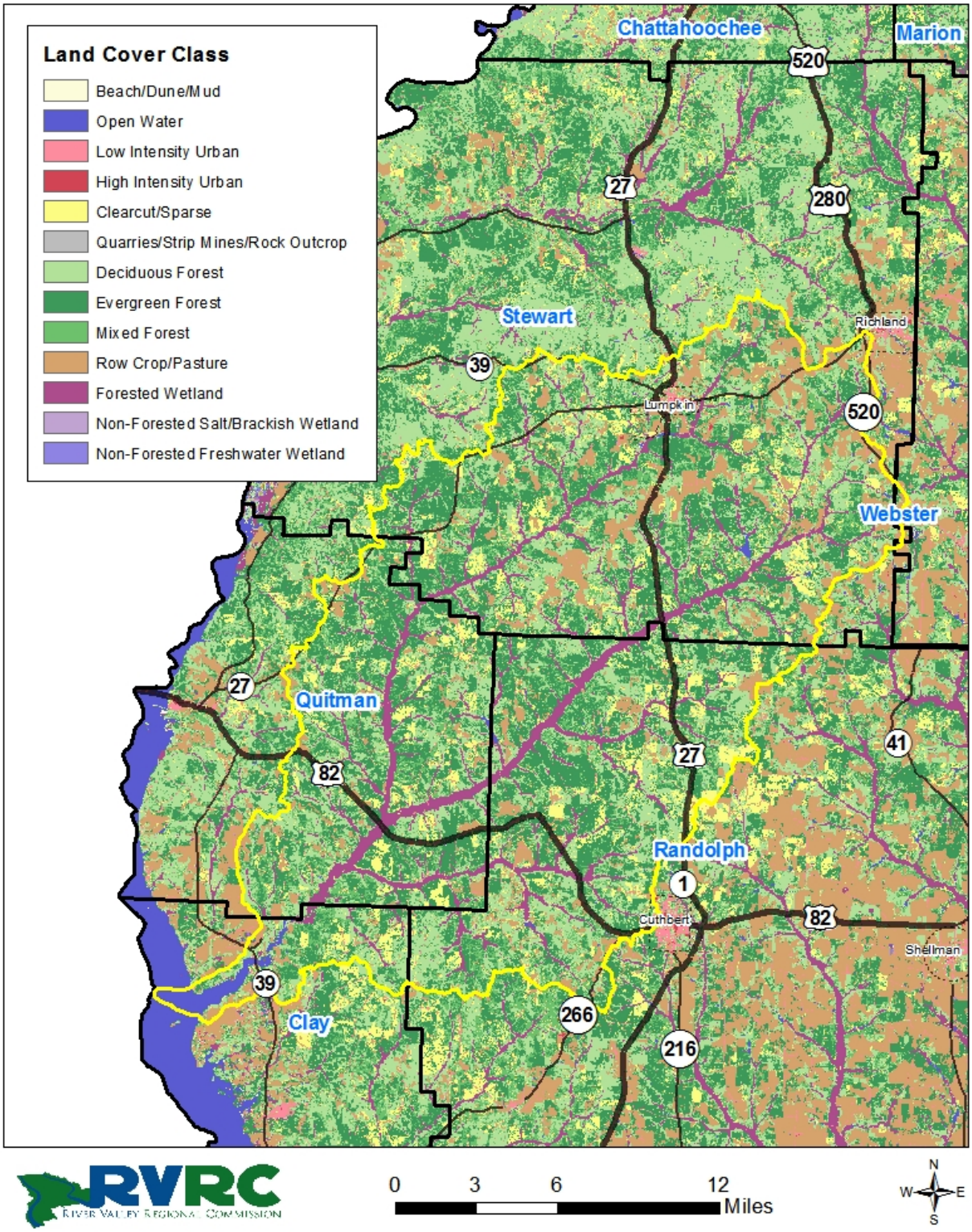
APPENDIX B. PATAULA CREEK WATERSHED MAP (HUC 0313000315)

Pataula Creek Watershed (HUC0313000315)

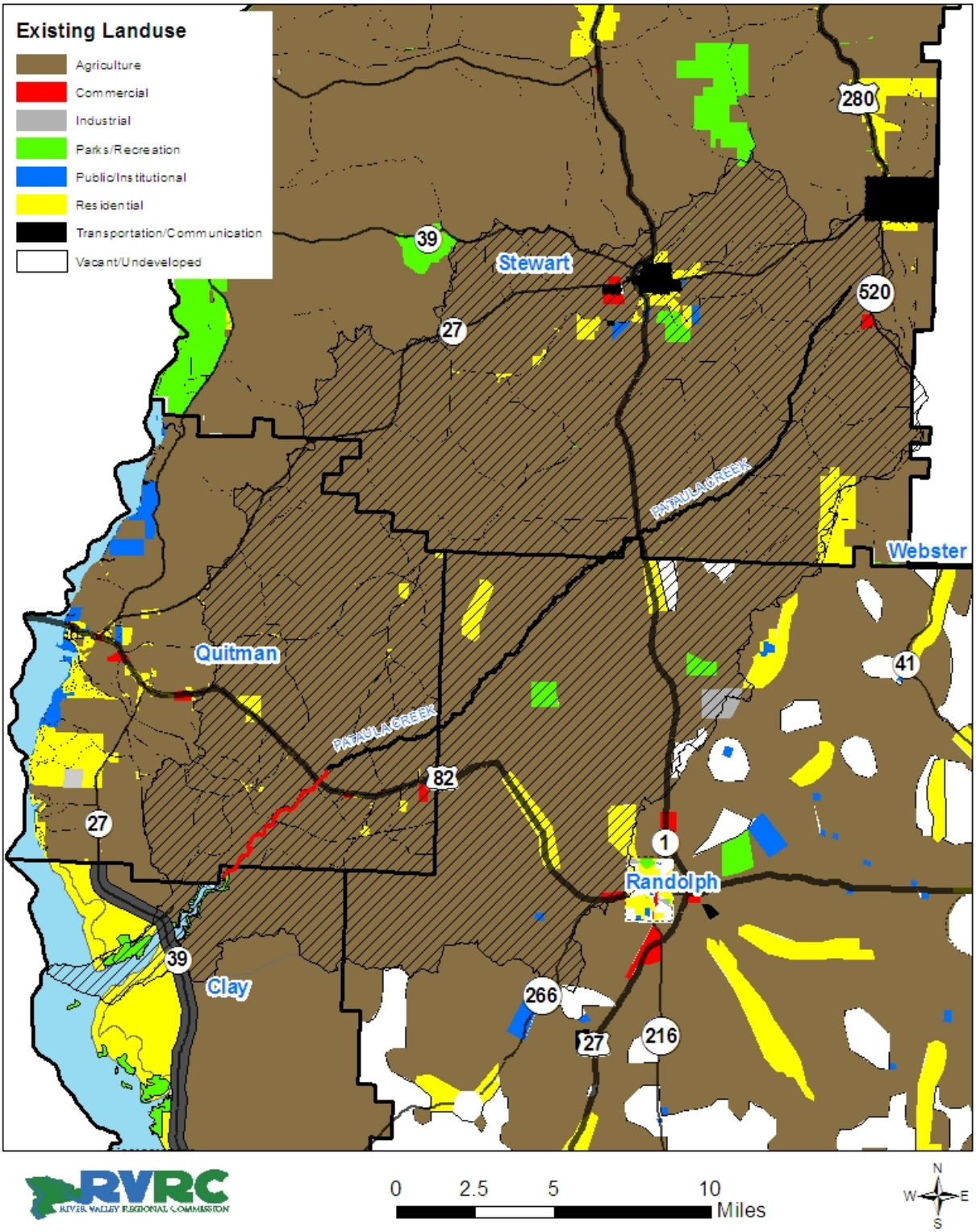


APPENDIX C. LAND USE MAPS: TRENDS AND FUTURE

Pataula Creek Watershed Land Use Trends



Pataula Creek Watershed Future Land Use



APPENDIX D. FIELD NOTES AND PICTURES

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

Pataula Creek Visual Field Survey

Date: 12/14/10 Arrival Time: 1:30pm-3:00pm

Site Location 3 sites (see notes below)

GPS Coordinates (if taken) (see notes below)

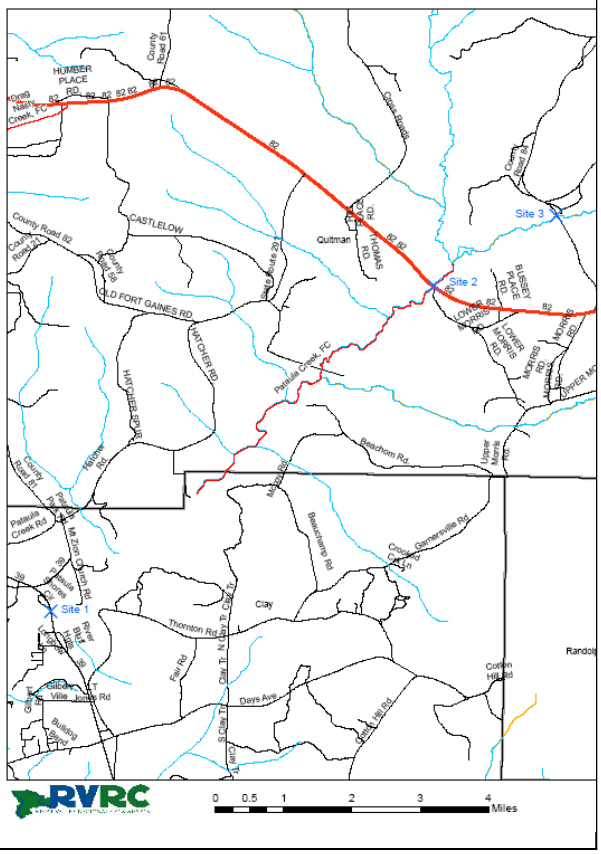
Current Weather overcast Time Since Last Rain 48 hr +

Team Members: *Lance Renfrow*

Stream or Road Segment Map

Or Drawing

Lanahassee Creek Visual Field Survey



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

Pataula Creek Fecal Coliform VFS Site 1: 12/14/10 10:45am

- N 31° 44.908' W 85° 3.310'
- Downstream from impaired site
- Entry way into Walter F. George reservoir
- Channel ≈ 425 yards wide
- Water slightly grayish-brown possibly from sediment
- Level normal
- Moderate residential population
- No visible signs of pollution other than water fowl (multiple Canada geese sightings)
- Pollution can enter into this portion of Pataula Creek from the Chattahoochee River

Pataula Creek Fecal Coliform VFS Site 2: 12/14/10 11:15am

- N 31° 49.114' W 84° 58.441'
- USGS survey station
- Channel ≈ 60 feet wide
- Water brown from sediment
- Level ≈ 1.5 feet low
- Low residential population
- No visible signs of pollution other than water fowl (1 crane sighting)

Pataula Creek Fecal Coliform VFS Site 3: 12/14/10 11:40am

- North fork
  - N 31° 49.990' W 84° 56.848'
  - Channel ≈ 30 feet wide
  - Water clear
  - Level ≈ 1.5 feet low
  - Very low or no population
  - No visible signs of pollution other than water fowl (3 crane sightings)
- South fork
  - N 31° 49.915' W 84° 56.803'
  - Channel ≈ 40 feet wide
  - Water slightly brown from sediment
  - Level ≈ 1.5 feet low
  - Very low or no population
  - No visible signs of pollution

Pataula Creek and Hwy 39.

Pataula Creek near Hwy 82.

Pataula Creek under Hwy 82 bridge.

Pataula Creek downstream of Hwy 82 bridge.

Pataula Creek downstream from Hwy 82.

Pataula Creek upstream from Hwy 82.

Pataula Creek upstream from North fork of County Road 84.

Pataula Creek upstream from South fork of County Road 84.

Pataula Creek downstream from South fork of County Road 84.

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

Pataula Creek Visual Field Survey

Date: 4/4/13 Arrival Time: 11:30am-2:00pm

Site Location 4 sites (see notes below)

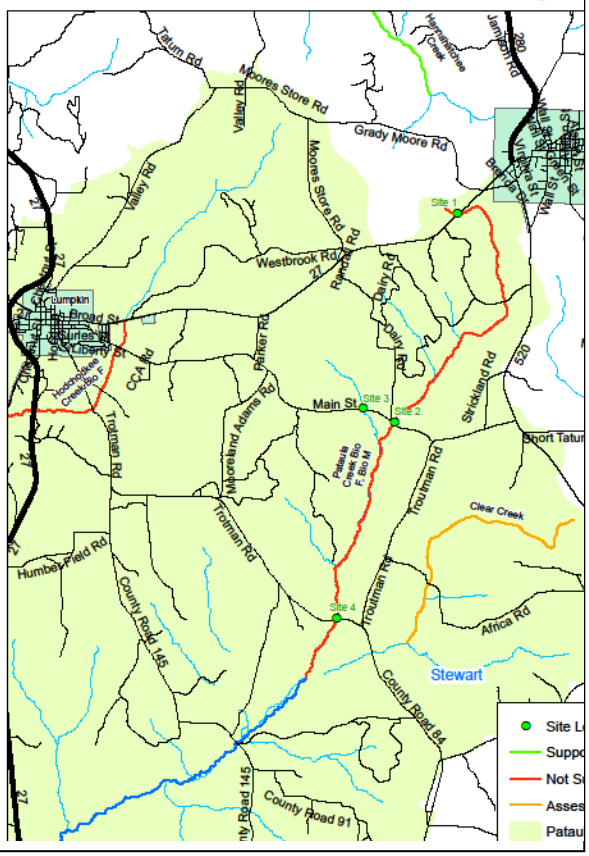
GPS Coordinates (if taken) (see notes below)

Current Weather cloudy/light rain Time Since Last Rain N/A

Team Members:*Lance Renfrow/Cassie Myers*

Stream or Road Segment Map

Or Drawing



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

Pataula Creek Sediment VFS Site 1: 4/4/13 11:30am

- N 31.07595° W 84.68980°
- On Hwy 27 near Richland City Limits
- Channel ≈ 20 feet wide, flow ≈ 1.5 feet wide
- Water clear
- Level ≈ 3 – 6 inches
- Low residential population
- Rotational subsidence

Pataula Creek Sediment VFS Site 2: 4/4/13 12:00pm

- N 32.02954° W 84.70666°
- Wetland-like conditions downstream from James Holder Rd. crossing
- Channel ≈ 30-45 feet wide, flow ≈ 15-30 feet wide
- Murky color
- Level ≈ 1 foot
- Low residential population
- Dirt road (Dairy Rd) 0.08 miles upstream of crossing

Pataula Creek Sediment VFS Site 3: 4/4/13 11:20pm

- N 32.02959° W 84.70678°
- Tributary of Pataula Creek downstream of Main St. bridge, entering just south of Site 2
- Channel ≈ 35 feet wide, flow ≈ 25 feet wide
- Murky color
- Level ≈ 6 inches above normal flow
- Low residential population
- Dirt road (Dairy Rd) runs parallel with stream about 0.5 miles east

Pataula Creek Sediment VFS Site 4: 4/4/13 1:45pm

- N 31.98681° W 84.72147°
- Troutman Rd. bridge crossing
- Channel ≈ 55 feet wide, flow ≈ 45
- Murky color
- Level ≈ 1.5 feet below normal
- Low residential population
- No visible signs of pollution

Pataula Creek Sediment VFS Site 1

Pataula Creek Sediment VFS Site 2

Pataula Creek Sediment VFS Site 3

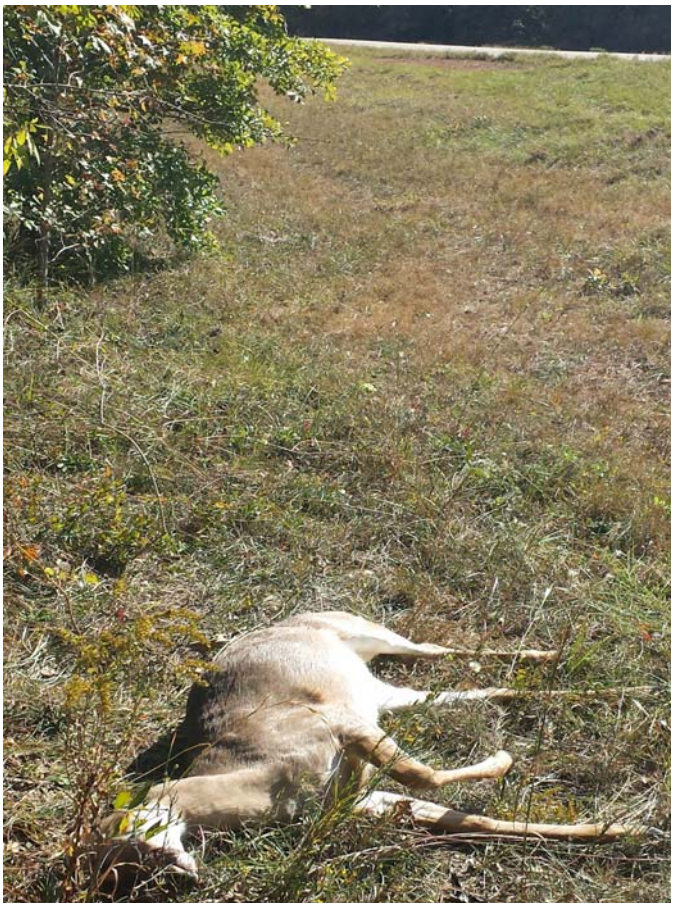
Pataula Creek Sediment VFS Site 4

Additional Photos From Sampling Events

Feral hogs are a noted problem throughout the area. Hogs are commonly seen throughout the watershed along the side of the road. This hog was found along Highway 27 south of Lumpkin in October 2013.

Deer are also common roadside fixtures. Many times, the carcasses are simply pushed off of the roadway and left there until buzzards destroy the body or until it fully decomposes. This carcass was seen near Site 7 on October 30, 2013.

Feral hog along roadside in December 2013. Note the asphalt in the upper right hand corner.



Deer carcass found near Site 6 on November 25, 2013. Lower Lumpkin Road is seen in the background.

In addition to contributing to fecal coliform counts directly, carcasses left in the area attract buzzards and other scavenging birds, typically in large groups, that also contribute. As seen in this picture, birds will gather around the carcass and leave droppings, that also eventually get washed into the waterway.

Dumping carcasses in streams is, unfortunately a common practice within the Pataula Creek watershed. This picture was taken at Site 7 during deer season in November 2013.

Along with the carcass in the previous picture, these remains were also found at Site 7 in November 2013.

Shown here is a close-up of one of the many bags found during the November 2013 sampling event. A deer ribcage is clearly visible.

In addition to dumping of carcasses directly within the stream, some people find obscure dumpsites. Sometimes, however they are just off the roadway. Shown here is evidence of two carcasses that looked to have been dumped at different times. This picture was taken in December 2013.

At the same site on the same day, more remains were found just a litter further from the road. More remains were found behind the pile of dirt seen above. This dump site was located at the Stewart-Quitman County boundary.

Shown here is a freshly severed deer head, which was thrown from the bridge at Site 6 in October 2013. The rest of the body was not seen.

This remote dump site was found near Site 7, an area that seems desolate and appears to be seldom traveled. To the side of the road in a wooded area, several ribcages and piles of deer fur were found. Shown here are just two of the thirteen found in this area of about 200 square feet in December 2013.

APPENDIX E. COPIES OF PUBLIC NOTICES AND OTHER LITERATURE

For Immediate Service Announcement:
Stewart-Webster Journal – June 20, 2013
Cuthbert Southern Tribune – June 20, 2013

Contact: Lance Renfrow
Phone: 706-256-2910
Fax: 706-256-2908
Email: lrenfrow@rivervalleyrc.org

Public Hearing on Water Quality Concerns in Pataula Creek

A community hearing will be held to discuss the monitoring and preparation of new Watershed Management Plans for the decrease in pollutant Total Maximum Daily Loads (TMDL). A TMDL is the maximum amount of a pollutant that a river can receive and still be safe and healthy.

Stakeholders will have the opportunity to assist in developing a plan to restore Pataula Creek to its designated use. Also, you will be able to help identify and discuss contributing pollution sources, assist in arriving at equitable pollution reduction allocations, 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 Pataula Creek.

Our community hearing will be held on **June 27, 2013** at **10:00 am** upstairs at the **Stewart County Courthouse**, located at 1764 Broad St. in Lumpkin. If you have any questions please call Lance Renfrow at 706.256.2910 or email at lrenfrow@rivervalleyrc.org.

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www.rivervalleyrc.org

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Fax (706) 256-2908

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

June 12, 2013

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 new Watershed Management Plans for the decrease in Total Maximum Daily Load (TMDL) of the levels of fecal coliform in the section of Pataula Creek from Hodchodkee Creek to W.F. George Lake (6 miles) and sediment from the headwaters to Clear Creek. As part of the contract, the RVRC must form a Technical Advisory Group to make recommendations and/or provide key information and materials to the RVRC staff. The purpose of the Advisory Group is to provide a forum for the public, partners, etc. to discuss potential concerns and solutions that will impact Pataula Creek, and to make recommendations relative to TMDLs.

This committee will assist in developing a plan to restore Pataula Creek to its designated use of fishing. The Advisory Group 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 Pataula Creek.

The Advisory Group'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 Group. Our first meeting will be held on **Thursday, June 27, 2013** at **10:00 am** upstairs in the Stewart County Courthouse in Lumpkin, located at 1764 Broad Street. If you have any questions please call me at 706.256.2910 or email at lrenfrow@rivervalleyrc.org. Together, we can ensure our waters will be clean and safe for everyone to enjoy!

Sincerely,

Lance Renfrow
Environmental Planner

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River Valley Regional Commission
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Fax (229) 931-2917

Toll Free (877) 819-6348

June 12, 2013

Dear Stakeholder/Landowner:

I am writing to inform you that the State of Georgia is conducting a study for segments Pataula Creek from the headwaters to Clear Creek and from Hodchodkee Creek to W.F. George Lake. This study, known as a TMDL (or Total Maximum Daily Load) study, will determine and address the levels of pollutants in these segments of Pataula Creek. 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 concerned 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 creek segments.

The primary impairment identified in these parts of Pataula Creek are sediment and fecal coliform. The major sources of sediment and fecal coliform are runoff of adjacent land, point contributions, and unauthorized contributions. 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 the stakeholder, landowner, and local authorities are encouraged to participate and make suggestions. 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 **Thursday, June 27, 2013** at **10:00 am**, a stakeholder meeting will be held upstairs at the Stewart County Courthouse located at 1764 Broad Street, 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 the following:

Sincerely,

Lance Renfrow
Environmental Planner

For Immediate Service Announcement:
Stewart-Webster Journal – June 12, 2014
Cuthbert Southern Tribune – June 12, 2014
Eufaula Tribune – June 18, 2014

Contact: Cassie Myers
Phone: 706-256-2910
Fax: 706-256-2908
Email: cmyers@rivervalleyrc.org

Public Hearing on Water Quality Concerns in Pataula Creek

Are you concerned about the water quality in Pataula Creek? If so, please attend the community hearing to be held in order to discuss monitoring efforts and the preparation of new Watershed Management Plans for the decrease pollutant levels.

Those attending the meeting will have the opportunity to assist in developing a plan to restore Pataula Creek to its designated use. Also, you will 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 Pataula Creek.

Our community hearing will be held on **June 20, 2014** at **11:00 am** at the **Georgetown-Quitman County Board of Commissioners' Office**, located at 25 Old School Road in Georgetown. If you have any questions please contact Cassie Myers at 706.256.2910 or email at cmyers@rivervalleyrc.org.

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Toll Free (877) 819-6348

June 3, 2014

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 in the section of Pataula Creek from Hodchodkee Creek to W.F. George Lake (6 miles) and levels of sediment from the headwaters to Clear Creek (9 miles). 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 Group is to provide a forum for the public, partners, etc. to discuss potential concerns and solutions that will impact Pataula Creek and to make recommendations relative to TMDLs.

This committee will assist in developing a plan to restore Pataula Creek to its designated use of fishing. The Advisory Group 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 Pataula Creek.

The Advisory Group'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 Group. Our next meeting will be held on **Friday, June 20, 2014** at **11:00 am** at the Quitman County Board of Commissioners' Office in Georgetown, located at 25 Old School Road. If you have any questions, please feel free to call me at 706.256.2910 or email me at cmyers@rivervalleyrc.org. I look forward to seeing you there.

Sincerely,

Cassie Myers
Environmental Planner

RVRC
River Valley Regional Commission
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Fax (229) 931-2745
Fax (229) 931-2917

Toll Free (877) 819-6348

June 3, 2014

Dear Stakeholder/Landowner:

I am writing to inform you that the State of Georgia is conducting a study for segments of Pataula Creek from the headwaters to Clear Creek and from Hodchodkee Creek to W.F. George Lake. This study, known as a TMDL (or Total Maximum Daily Load) study, will determine and address the levels of pollutants in these segments of Pataula Creek. 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 creek segments.

The primary impairments identified in these parts of Pataula Creek 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 the stakeholder, landowner, and local authorities are encouraged to participate and make suggestions. 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 **Friday, June 20, 2014** at **11:00 am**, a stakeholder meeting will be held at the Georgetown-Quitman County Board of Commissioners' Office located at 25 Old School Road, Georgetown, GA, 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 cmyers@rivervalleyrc.org.

Sincerely,

Cassie Myers

Cassie Myers
Environmental Planner

APPENDIX F. MEETING MINUTES

TMDL Partnership Advisory Council Meeting Minutes
June 27, 2013

Persons Attending

Lance Renfrow, RVRC
Cassie Myers, RVRC
John Pollard, GA Forestry Commission
Chuck Norvell, GA Forestry Commission
Bill Minick, Local Farmer
Ernie Brown, Stewart County Commissioner
Jimmy Lee, Stewart County Commissioner
Wanda Wilson, Richland City Clerk

This meeting was held at 10:00 am in the council room at Lumpkin City Hall to discuss potential sources and solutions for the fecal coliform and sediment pollution in the Pataula Creek watershed.

Lance Renfrow provided an overview of the Total Maximum Daily Load Implementation Plan that is being written for this watershed and the role that the Advisory Committee has in providing input into the plan.

The following topics were discussed as potential sources of pollution:

- Feral Hogs – especially in the northern area of the watershed; Farmer Bill Minick saw sixteen on his farm near Richland just weeks before the meeting
- Waterfowl – very few waterfowl seen in the area especially compared to a few decades ago
- No significant cattle or hog operations in the area according to the group
- Chicken houses – could have been a contributing factor in the past, but many have closed or are closing due to the newly required upgrades and associated costs
- No known Land Application Systems or sewage leaks in the area; no or few known septic systems in the stretch of Pataula Creek impaired with fecal coliform – most of this area is timberland
- Multitude of dirt roads within the county and watershed could be contributing to the sediment issues; Diary Road specifically mentioned as a problem road
- Hunting camps in the area – carcass dumping along roadsides and bridges as well as in the creek itself, hogs and deer
- Southern Pine Bark Beetle could be attributing to the loss of excess trees and more erosion in the area
- "Root Rot" also contributing to the erosion problem, creating gullies, etc.
- Soil type of the area blamed for most of the sediment issues, highly erodible soils

Suggestions for research or clean up:

- With help of GA Forestry Commission, identify areas of non-compliance that are in need of BMP installation following complaints from local citizens
- Sterilizing salt for feral hogs in order to reduce population (not yet feasible, but research at Auburn University is currently being conducted)
- Better Backroads Project for dirt roads in the area

- Strip till, no till, or cover for farmers in the area to alleviate some erosion issues
- Carcass harvesting or composting to prevent dumping into or along streams
- Any problems noted should be documented, photographed if possible, and brought to the attention of RVRC; GPS coordinates needed as well

Meeting was adjourned at 12:00 pm.

TMDL Stakeholder/Advisory Committee Meeting Minutes
June 20, 2014

Persons Attending

Cassie Myers, RVRC
Lance Renfrow, RVRC
John Pollard, GA Forestry Commission
Julie Shutters, Golden Triangle RC&D
Spencer Mueller, Georgetown-Quitman County
Richard Morris, Georgetown-Quitman County Commission

This meeting was held at 11:00 am in the council room at Georgetown-Quitman County Board of Commissioners Office to discuss potential sources and solutions for the fecal coliform and sediment pollution in the Pataula Creek watershed.

Lance Renfrow provided an overview of the Total Maximum Daily Load Watershed Management Plan that is being written for this watershed and the role that the Advisory Committee has in providing input into the plan.

Cassie Myers presented a graph of the monthly e-coli targeted monitoring. Richard Morris suggested that the high levels of e-coli correlated with hunting season (mid-September to the end of January).

Spencer Mueller mentioned that hogs may be increasing the levels of fecal coliform in the waterways and that we may need to reduce their numbers. Farmers using chicken litter on their fields may also contribute to the fecal coliform impairment. This can also cause elevated levels of Phosphorus and Nitrogen.

Cassie mentioned that a composting facility may help. Richard said that the location must be convenient. People will not want to drive more than 20 miles. Julie Shutters suggested adding to the monitoring plan an educational workshop focused on composting facilities. Spencer suggested that RVRC staff can learn about composting at White Oak Pastures. Selling composting materials may pay for the operating costs of the facility and reduce the use of chicken litter.

Signage can be used as advertisement to get the word out about composting. All counties in the area may be able to share the facility. They can even provide equipment.

Richard suggested that RVRC goes to the Council of Governments and express support for inter-county coordination.

Terracing, vegetation buffers, and plunge pools can decrease sediment transportation. Georgia Better Back Roads Field Manual can be used to help alleviate sediment problems on dirt roads.

Meeting was adjourned at 1:00 pm.

APPENDIX G. FORMS

Pataula Creek Bacterial Targeting Monitoring

Sampling Date: ________________________

Total Time Spent Monitoring: ________________

Current Conditions - Heavy Rain, Steady Rain, Intermittent Rain, Overcast, Partly Cloudy, or Clear/Sunny (circle one)

Rain in the last 24 hours - Heavy Rain, Steady Rain, Intermittent Rain, None (circle one)

Amount of rain, if known - _______ inches in the last _______ hours

				Petrifilm Counts				Total Colony		Time	Time
	Air Tmp (˚C)	Water Tmp (˚C)	Conduct. (µS/cm)	Blank	Plate 1	Plate 2	Plate 3	Count	CFU/100 mL	Started	Spent
Site 5											
Site 6											
Site 7											
Site 8											
Site 9											
Site 10											

Incubation

Date and Time In	
Start/Minimum Temp (˚C)	

Date and Time Out	
End/Maximum Temp (˚C)	

Notes:

GEORGIA ADOPT-A-STREAM: Macroinvertebrate Form (page 1)

To be conducted quarterly

SITE INFORMATION

Group Name:_____ Event Date: _____ (MMDDYYYY)

Group ID: G-_____ Site ID: S-_____ Time Sample Collected:_____ (HHMM am/pm)

Stream Name:_____ Time Spent Sampling: _____ (Min)

Monitor(s):_____ Total Time Spent Traveling *(optional)* : _____ (Min)

Number of Participants:_____ Furthest Distance Traveled *(optional)* : _____(Miles)

WEATHER

Present conditions (check all that apply)

☐ Heavy Rain ☐ Steady Rain ☐ Intermittent Rain

☐ Overcast ☐ Partly Cloudy ☐ Clear/Sunny

Amount of rain, if known?

Amount in Inches:_____

In Last Hours/Days:_____

*Refer to *wunderground.com* for rainfall data

OBSERVATIONS

Flow/Water Level: *(check all that apply)* ☐ Dry ☐ Stagnant/Still ☐ Low ☐ Normal ☐ High ☐ Flood (over banks)

Water Clarity: ☐ Clear/Transparent ☐ Cloudy/Somewhat Turbid ☐ Opaque/Turbid ☐ Other:_____

Water Color: ☐ No Color ☐ Brown/Muddy ☐ Green ☐ Milky/White ☐ Tannic ☐ Other:_____

Water Surface: ☐ Clear ☐ Oily sheen: Does it break when disturbed? Yes/No (circle one) ☐ Algae

☐ Foam ◯ Greater than 3" high ◯ It is pure white ☐ Other:_____

Water Odor: ☐ Natural/None ☐ Gasoline ☐ Sewage ☐ Rotten Egg

☐ Fishy ☐ Chlorine ☐ Other:_____

Trash: ☐ None ☐ Yes, I did a cleanup ☐ This site needs an organized cleanup

Photos: Please take images to document your observations and changes in water quality conditions.

Photo point directions can be found in the manuals. Images can be submitted online with your other data.

COMMENTS

Any changes since you last sampled at this site? If yes, please describe.

Please submit data to our online database at www.GeorgiaAdoptAStream.org

GEORGIA ADOPT-A-STREAM: Macroinvertebrate Form (page 2)

METHODS

Stream Type: ☐ Rocky Bottom Stream ☐ Muddy Bottom Stream

Method Used: ☐ Kick seine (2 x 2 ft area) ☐ D-Frame net (1 x 1 area) **Total Area Sampled:** _____ ft^2

Habitats Sampled: ☐ Leaf Packs/Woody Debris ☐ Vegetated Bank Margin ☐ Riffle ☐ Streambed with silty area (very fine particles) ☐ Streambed with Sand or small gravel

Directions: ***Consult the macroinvertebrate monitoring manual for sampling guidelines***

1. Separate the macroinvertebrates into the different taxa groupings listed in the table below.

2. Note which **taxa** are present and their **abundance code** based on the number of individuals present in your sample. Enter these codes in the boxes below for each taxa. *Abundance Codes:* **R** (rare)=1-9, **C** (common)=10-99, and **D** (dominant)=100 individuals or greater

TAXA GROUPS

SENSITIVE TAXA	SOMEWHAT SENSITIVE TAXA	TOLERANT TAXA
☐ Stonefly Nymphs	☐ Common Net Spinning Caddisflies	☐ Midge Fly Larvae
☐ Mayfly Nymphs	☐ Dobsonfly/Helgrammite & Fishfly	☐ Black Fly Larvae
☐ Water Penny Larvae	☐ Dragonfly & Damselfly Nymphs	☐ Lunged Snails
☐ Riffle Beetle Larvae/Adults	☐ Crayfish	☐ Aquatic Worms
☐ Aquatic Snipe Flies	☐ Crane Flies	☐ Leeches
☐ Caddisflies	☐ Aquatic Sow Bugs	
☐ Gilled Snails	☐ Scud	
	☐ Clams & Mussels	

WATER QUALITY INDEX/RATING

☐ # of taxa groups times 3 =____ ☐ # of taxa groups times 2 =____ ☐ # taxa groups times 1 =__

Now add together the three index values to get your **Water Quality Index Score** =_____
Use this score to find out your **Water Quality Rating** for your stream (below).
Good water quality is indicated by a variety of different kinds of taxa/organisms, with no one kind making up a majority of the sample.

Water Quality Rating

☐ *Excellent (>22)* ☐ *Good (17-22)* ☐ *Fair (11-16)* ☐ *Poor (<11)*

OTHER

Optional: Do you see any of the following in your samples? Please count number of individuals.

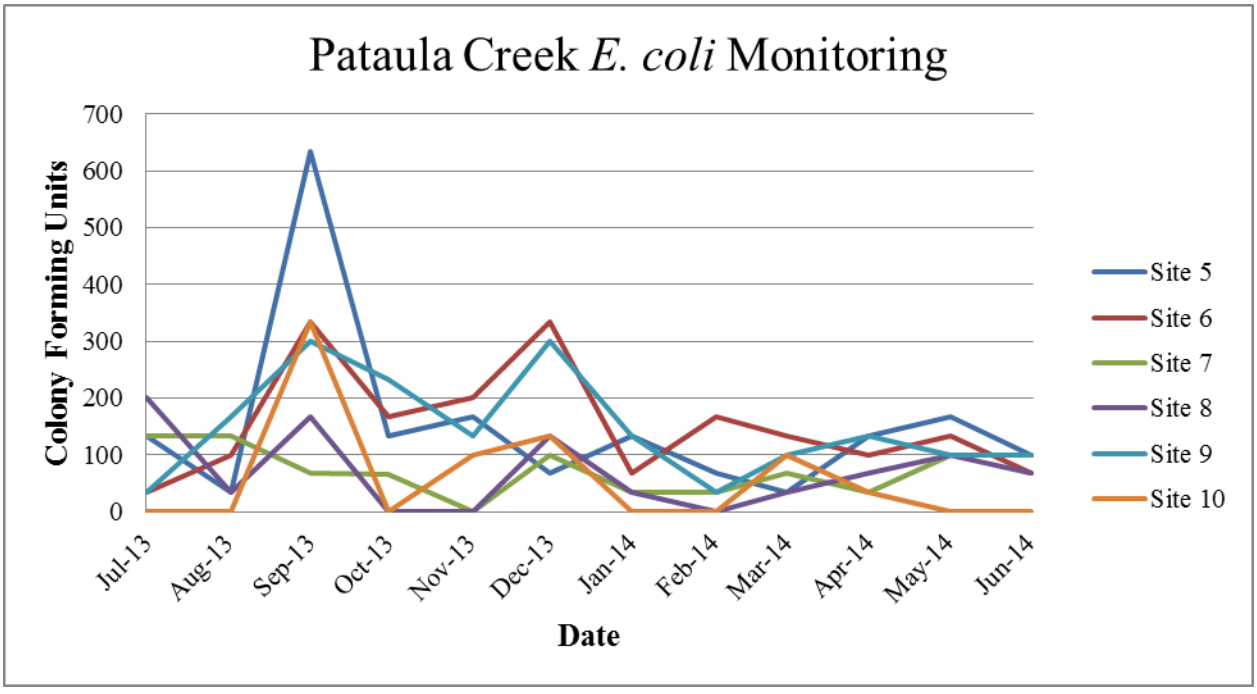
☐ Fishes # : _____ ☐ Tadpoles # : _____
☐ Asian Clams # : _____ ☐ Nonnative Crayfish Which species?
☐ Salamanders # : _____ _____

Please submit data to our online database at www.GeorgiaAdoptAStream.org

APPENDIX H. DATA COLLECTED

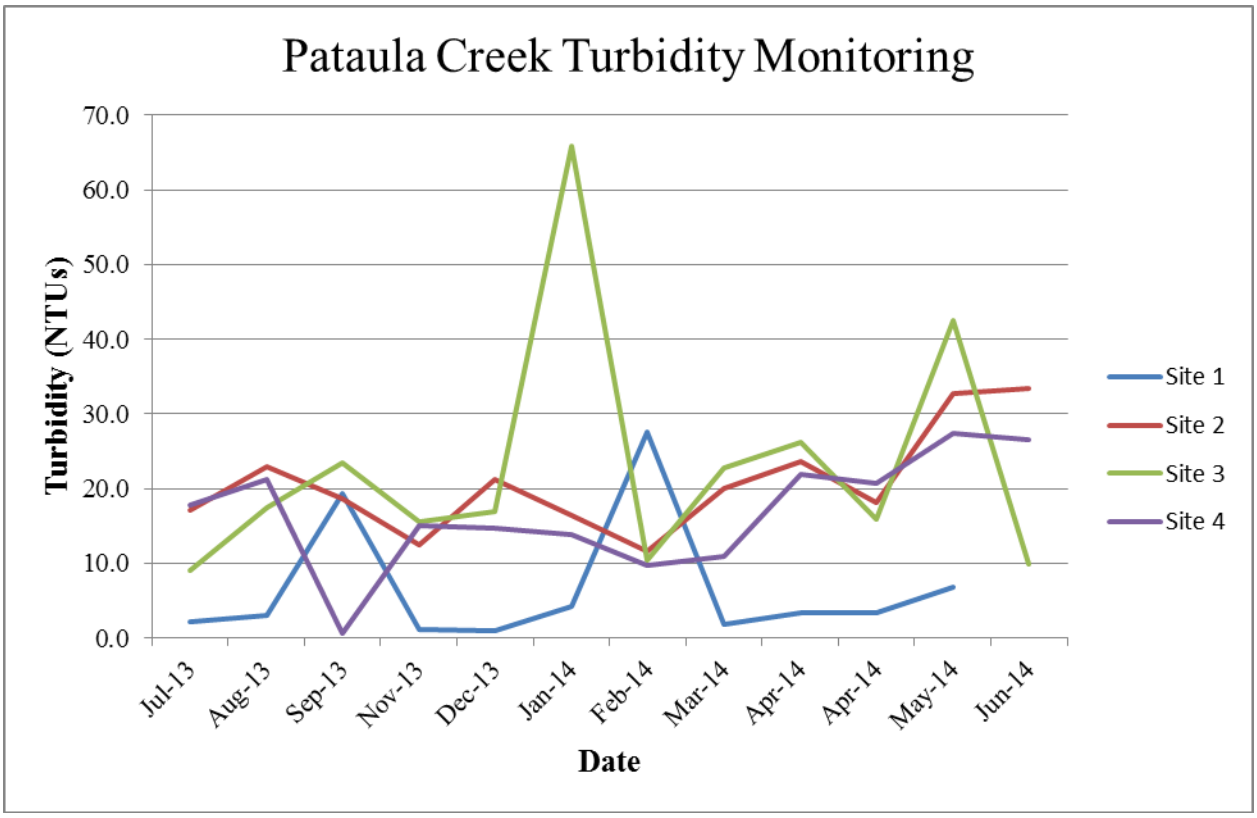
Pataula Creek Fecal Coliform Counts (in Colony Forming Units/100 mL)

		Date											
		Jul 2013	**Aug 2013**	**Sep 2013**	**Oct 2013**	**Nov 2013**	**Dec 2013**	**Jan 2014**	**Feb 2014**	**Mar 2014**	**Apr 2014**	**May 2014**	**Jun 2014**
Site Number	**5**	133	33	633	133	167	67	133	67	33	133	167	100
	6	33	100	333	167	200	333	67	167	133	100	133	67
	7	133	133	67	66	0	100	33	33	67	33	100	100
	8	200	33	167	0	0	133	33	0	33	67	100	67
	9	33	167	300	233	133	300	133	33	100	133	100	100
	10	0	0	333	0	100	133	0	0	100	33	0	0



Pataula Creek Sediment Counts (in NTUs)

		Date											
		Jul 2013	**Aug 2013**	**Sep 2013**	**Nov 2013**	**Dec 2013**	**Jan 2014**	**Feb 2014**	**Mar 2014**	**Apr 2014**	**Apr 2014**	**May 2014**	**Jun 2014**
Site Number	1	2.1	3.0	19.4	1.2	1.1	4.3	27.7	1.9	3.4	3.4	6.9	n/a
	2	17.1	22.9	18.7	12.5	21.3	16.4	11.7	20.1	23.6	18.2	32.7	33.4
	3	9.0	17.4	23.5	15.6	16.9	65.9	10.4	22.7	26.1	15.9	42.5	9.9
	4	17.8	21.2	0.7	15.0	14.8	13.8	9.8	10.9	21.9	20.7	27.3	26.6



APPENDIX I. SAMPLING PROTOCOL

The protocol below was included in the updated monitoring plan, submitted to EPD in June 2013.

The following outlines the procedures for *E. Coli* monitoring:

A. 6 sites will be monitored.
   1. Sites will be sampled in July 2013 – June 2014
   2. 1 sample will be collected per site per month over a 12-month period
   3. There will be a total of 6 samples per month and 72 samples over a 12-month period

B. Samples will be collected and analyzed by EPD-trained professionals. Staff who will collect and analyze *E. coli* samples were trained by GA EPD Adopt-A-Stream personnel on December 28, 2012 and February 20, 2013 in *E. coli* sampling and testing. Staff will renew the Adopt-A-Stream one year certification in December 2013 and February 2014, respectively.

C. Equipment used for sampling and testing is as follows:
   1. 3M™ *E. coliform* Count Plates
   2. Genesis Hova-Bator Incubator with circulation fan, calibrated to 35° C
   3. Fixed-volume pipettor 1000µL
   4. Pipette tips, 200 - 1300µLMicroLite USB Temperature Data Logger
   5. Armored Thermometer
   6. Whirl-Pak® sterile sampling bag, 2 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 biological monitoring:

A. 4 sites will be monitored.
   1. Sites will be sampled in July 2013, October 2013, January 2014, and April 2014
   2. 1 sampling event will be conducted per site per quarter over a 12-month period
   3. There will be a total of 4 samples per quarter and 16 samples over a 12-month period

B. Samples will be collected and analyzed by EPD-trained professionals. Staff who will collect macroinvertebrate biological samples will be trained by GA EPD Adopt-A-Stream personnel in biological monitoring protocol in July 2013 prior to sampling.

C. Equipment used for sampling is as follows:
   1. D-frame net and/or kick seine
   2. Sorting pans
   3. Tweezers, Forceps, or Plastic Spoons
   4. Hand lens
   5. Latex Gloves
   6. Collection Bucket
   7. Bucket with screen bottom
   8. 90% Isopropyl Alcohol
   9. Collection vials/preservation jars

D. Georgia Adopt-A-Stream Macroinvertebrate Count Form will be used to record official field notes for stream bottom sediment type, current weather, rainfall intensity over the previous 24 hours, date, and time, as well as macroinvertebrate counts.

The following outlines the procedures for turbidity monitoring:

A. 4 sites will be monitored.
   1. Sites will be sampled July 2013 – June 2014
   2. 1 sample will be collected per site monthly over a 12-month period
   3. There will be a total of 4 samples per month and 48 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

Table 1 demonstrates the tentative sampling schedule for Pataula Creek. One sample for turbidity will be collected at sites 1-4 monthly from July 2013 – June 2014. One sample for *E. coli* will be collected at sites 5 – 10 monthly from July 2013 – June 2014. One biological sampling event will be conducted at sites 1 – 4 quarterly from July 2013 – June 2014.

TABLE 1. SAMPLING SCHEDULE FOR PATAULA CREEK.

Month/Year	Sampling Sites	Parameter
July 2013	1-4 1-4 5-10	Turbidity Biota (Macroinvertebrates) *E. coli*
August 2013	1-4	Turbidity

	5-10	*E. coli*
September 2013	1-4 5-10	Turbidity *E. coli*
October 2013	1-4 1-4 5-10	Turbidity Biota (Macroinvertebrates) *E. coli*
November 2013	1-4 5-10	Turbidity *E. coli*
December 2013	1-4 5-10	Turbidity *E. coli*
January 2014	1-4 1-4 5-10	Turbidity Biota (Macroinvertebrates) *E. coli*
February 2014	1-4 5-10	Turbidity *E. coli*
March 2014	1-4 5-10	Turbidity *E. coli*
April 2014	1-4 1-4 5-10	Turbidity Biota (Macroinvertebrates) *E. coli*
May 2014	1-4 5-10	Turbidity *E. coli*
June 2014	1-4 5-10	Turbidity *E. coli*

The following outlines the Quality Assurance Plan for sampling Pataula Creek:

A. The 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.

B. Bacterial Field Quality Assurance
   a. The following sampling protocol will be used for each sample:
      i. The grab samples for quantification of *E. coli* bacteria will be collected at 6 locations on Pataula 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 (See Appendix G for Field Notes Form):
         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 white 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 white 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. Incubator temperature will be monitored over a 24-hour period with a Microlite USB Temperature Data Logger
         e. 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
         f. 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, or the grab sampling technique should be employed from the safety of the stream bank. 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. Biological Field Sampling Quality Assurance
   a. The following sampling protocol will be used for each sample:
      i. The samples for quantification of macroinvertebrates will be collected at 4 locations on Pataula Creek and its tributaries using the muddy bottom stream sampling protocol
      ii. The same stream segment at each site will be sampled each quarter to ensure consistency
      iii. Prior to sample collection:
         1. 2 preservation jars should be labeled with site number, date, and time for each of the four sampling sites
         2. Samples collected from the streambed will be kept in a separate preservation jar than those samples collected from vegetated margins and woody debris
      iv. Record the following on the Field Notes Form at each sample site
         1. Current weather conditions (overcast, partly cloudy, clear/sunny)
         2. Date and time
         3. Rainfall intensity for the previous 24 hours, total amount if known
         4. Site Description
         5. Stream Bottom Sediment Type
         6. Habitats selected for sampling
      v. Sample Collection
         1. RVRC staff will utilize the biological sampling protocol for muddy bottom streams
            a. The following three habitats will be sampled using a D-frame net: vegetated margins, woody debris with organic matter, and streambed substrate
            b. Each scoop of the D-frame net will involve a forward motion covering a sample area of one square foot
            c. 7 scoops will be taken from vegetated margins, 4 scoops will be taken from woody debris with organic matter, and 3 scoops will be taken from the streambed bottom/substrate
               i. For vegetated margin sampling, the D-frame net will be moved quickly in a bottom-to-surface motion, scooping toward the stream bank, jabbing at the bank to loosen organisms with each scoop of the net covering one square foot of submerged area

ii. For woody debris sampling, the D-frame net will be placed under the section of wood to be sampled, and one square foot of the surface should be rubbed allowing organisms to be swept into the net
iii. For streambed sampling, the coarsest area of the streambed will be sampled by moving the D-frame net upstream with a jabbing motion in order to dislodge the first few inches of sediment, which will then be gently washed in the screen bottom bucket
1. Should rocks greater than two inches in diameter be present, kicking of the substrate upstream will be conducted in order to dislodge any burrowing organisms
2. Should fine silt and mud be present, the sample will be placed in a bucket with water, stirred, and excess water should be poured off, a process that will be conducted three times to separate any organisms from the finer sediment particles
3. As with the other habitats, only one square foot of sediment will be sampled
iv. Samples will be taken starting downstream and moving upstream after each scoop
d. All macroinvertebrates will be placed in preservation jars, analyzed, and counted within 24 hours of collection

b. Sample Handling and Custody Requirements
i. Macroinvertebrate samples will be sorted and counted within 24 hours of collection to ensure no damage to the specimens occurs
1. Each sample will be placed in a sorting tray and examined closely to ensure all organisms are included in the final counts
2. The Georgia Adopt-A-Stream Macroinvertebrate Count Form will be completed following the sorting and counting of organisms to determine the water quality rating
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. Sampling will be postponed if weather conditions make sampling unsafe for field personnel.

D. 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 should be collected by lowering a sampling container from a bridge or culvert, or the grab sampling technique should be employed from the safety of the stream bank. Sampling is postponed, however, if weather conditions make sampling unsafe for field personnel.

Records will be maintained by the Planning Division of the River Valley Regional Commission located at 1428 2nd Avenue, Columbus, Georgia 31901 for a period of three years from the conclusion of the project and will be available for review. Additionally, data will be posted by the Regional Commission to the Georgia Adopt-A-Stream database.

APPENDIX J. RECOMMENDED FUTURE SAMPLING PROTOCOL

The following outlines the procedures for *E. Coli* monitoring:

E. 5 sites will be monitored.
   1. Sites will be sampled in May 2017 – October 2017
   2. 1 sample will be collected per site per month over a 6-month period
   3. There will be a total of 5 samples per month and 30 samples over a 6-month period

F. Samples will be collected and analyzed by EPD-trained professionals. Staff who will collect and analyze *E. coli* samples will be trained by GA EPD Adopt-A-Stream personnel in *E. coli* sampling and testing. .

G. Equipment used for sampling and testing is as follows:
   1. 3M™ *E. coliform* 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. Armored Thermometer
   6. Whirl-Pak® sterile sampling bag, 8 oz
   7. 90% Isopropyl Alcohol
   8. Latex Gloves
   9. Bleach
   10. Distilled Water

H. 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 chemical monitoring:

E. 9 sites will be monitored.
   4. Sites will be sampled in November 2015-October 2016
   5. 1 sampling event will be conducted per site per month over a 12-month period
   6. There will be a total of 9 samples per month and 108 samples over a 12-month period

F. Samples will be collected and analyzed by EPD-trained professionals. Staff who will collect chemical samples will be trained by GA EPD Adopt-A-Stream personnel in chemical monitoring protocol prior to sampling.

G. Equipment used for sampling is as follows:
   10. Latex Gloves
   11. 90% Isopropyl Alcohol
   12. Potassium Test Strips
   13. Nitrogen Color Disc
   14. Dissolved Oxygen Color Disk
   15. Multi-Range Conductivity Tester
   16. Phosphorus Test Kit

H. Georgia Adopt-A-Stream Chemical Monitoring Data Form will be used to record official field notes for stream bottom sediment type, current weather, rainfall intensity over the previous 24 hours, date, and time, as well as chemical counts.

Table 2 demonstrates the tentative sampling schedule for Pataula Creek. One sample for *E. coli* will be collected at sites 5 – 9 monthly from May 2017 – October 2017. One chemical sampling event will be conducted at sites 1 – 9 monthly from November 2015 – October 2016.

TABLE 2. SAMPLING SCHEDULE FOR PATAULA CREEK.

Month/Year	Sampling Sites	Parameter
November 2015	1-9	Chemical Monitoring
December 2015	1-9	Chemical Monitoring
January 2016	1-9	Chemical Monitoring
February 2016	1-9	Chemical Monitoring
March 2016	1-9	Chemical Monitoring
April 2016	1-9	Chemical Monitoring
May 2016	1-9	Chemical Monitoring
June 2016	1-9	Chemical Monitoring
July 2016	1-9	Chemical Monitoring
August 2016	1-9	Chemical Monitoring
September 2016	1-9	Chemical Monitoring
October 2016	1-9	Chemical Monitoring
May 2017	5-9	*E. coli*
June 2017	5-9	*E. coli*
July 2017	5-9	*E. coli*
August 2017	5-9	*E. coli*
September 2017	5-9	*E. coli*
October 2017	5-9	*E. coli*

The following outlines the Quality Assurance Plan for sampling Pataula Creek:

E. The 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.

F. Bacterial Field Quality Assurance
   a. The following sampling protocol will be used for each sample:
      i. The grab samples for quantification of *E. coli* bacteria will be collected at 5 locations on Pataula 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 white 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 white 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, or the grab sampling technique should be employed from the safety of the stream bank. 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.

G. Chemical Field Sampling Quality Assurance
   a. The following sampling protocol will be used for each sample:
      i. The samples for quantification of chemicals will be collected at 9 locations on Pataula Creek and its tributaries using the muddy bottom stream sampling protocol
      ii. The same stream segment at each site will be sampled each month to ensure consistency
         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. Date and time
         3. Rainfall intensity for the previous 24 hours, total amount if known
         4. Site Description
         5. Stream Bottom Sediment Type
         6. Habitats selected for sampling
      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 white 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 white 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

1. Within 24 hours of collection, RVRC staff will utilize the Adopt-A-Stream Chemical Monitoring methods and procedures to process and analyze the samples and the blank
2. 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. Sampling will be postponed if weather conditions make sampling unsafe for field personnel.

Records will be maintained by the Planning Division of the River Valley Regional Commission located at 1428 2nd Avenue, Columbus, Georgia 31901 for a period of three years from the conclusion of the project and will be available for review. Additionally, data will be posted by the Regional Commission to the Georgia Adopt-A-Stream database.