

Ochwalkee Creek – Oconee River Watershed Management Plan



September 2018

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Prepared by Pine Country Resource Conservation and Development Area, Inc.



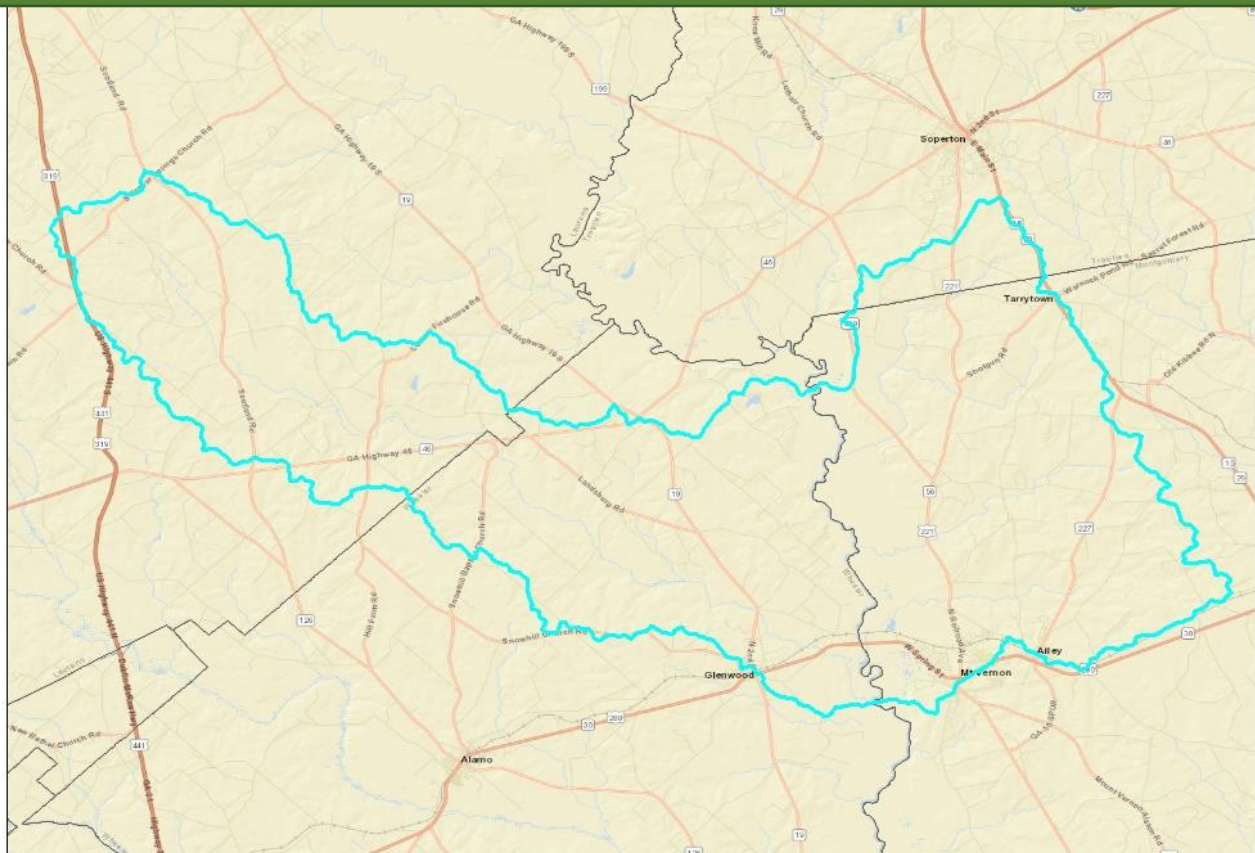
Pine Country
Resource Conservation and
Development Council, Inc.

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I. Introduction

The Watershed Management Plan for the Ochwalkee Creek – Oconee River watershed provides an outline for holistic watershed management and water quality improvement. This plan was developed through a process that engages stakeholders within the watershed to identify and recognize issues associated with water quality impairment, assess and evaluate previous efforts toward water quality improvement, and develop a plan for future efforts that includes leveraging resources, educating the public, and implementing priority Best Management Practices (BMPs). While this document is not regulatory, the ultimate goals of this plan identified by the Advisory Committee is for stakeholders and landowners within the watershed to be aware and knowledgeable of watershed issues and understand the importance of managing the landscape to minimize negative water quality impacts so as to return all impaired stream segments to meeting state water quality standards.



II. Stream Selection

The Hydraulic Unit Code (HUC)-10 0307010213 Ochwalkee Creek – Oconee River watershed is approximately 99,827 acres of primarily agricultural and forested lands and lies in parts of Laurens, Wheeler, Montgomery, and Treutlen Counties.

A Total Daily Maximum Load (TMDL) for biota impacted (fish community) due to sediment was completed in 2007 for Cypress Creek and both segments of Ochwalkee Creek. In addition, a dissolved oxygen TMDL was completed in 2002 for Ochwalkee Creek (Unnamed tributary 550 feet upstream of Little New York Road to Oconee River).

A revised TMDL Implementation Plan addressing biota impacted (fish community) due to sediment was written in 2009 for both segments on Ochwalkee Creek and Cypress Creek, and a Revised TMDL Implementation Plan for dissolved oxygen was written in 2003 for the segment of Ochwalkee Creek (Unnamed tributary 550 feet upstream of Little New York Road to Oconee River).

The GAEPD's 2016 Integrated 305(b)/303(d) List of Waters identified three stream segments in the watershed as not meeting water quality standards for biota impacted (fish community) due to sediments and one segment for dissolved oxygen. The List of Waters also identifies one stream segment as meeting water quality standards.

III. Formation of Advisory Committee

The development of the plan relied upon the participation of an Advisory Committee that represented the HUC-10 watershed and consisted of elected officials, property owners, state and federal agency representatives, and regional water council representatives. Technical specialists with the Natural Resources Conservation Service (NRCS), Georgia Forestry Commission (GFC), and UGA Cooperative Extension were included on the Advisory Committee to assist in the planning efforts and provide area specific information. The initial meeting was held on July 26, 2017, to organize the group and explain the activities to be undertaken throughout the watershed planning process.

Existing watershed data, potential sources of new data, and the critical need for local input were discussed at the initial meeting. Also, maps of the watershed were reviewed, which depicted the water quality monitoring sites, overall land use in the watershed, and the segments of the stream that were impaired according to current data. Public meetings were subsequently held to inform and engage the public in the plan development process, gather additional information, and allow input into the process and plan.

IV. Source Assessment

The major impairment in the Ochwalkee Creek – Oconee River watershed as described by previous reports and sampling has been determined to be sediment. Fish habitat has been impaired by the amounts of sediment present in the stream according to data in the *Total Maximum Daily Load Evaluation for Thirty-Two Stream Segments in the Oconee River Basin for Sediment* published January 2007.

The preliminary assumption of the January 2007 TMDL is that much of this sediment was a result of agricultural operations in prior years due to the combined average land use for row crops and pasture/hay land equating to approximately 30 percent of the Oconee River basin and contributing an estimated 39.4 percent of the average sediment load in the Oconee River basin. The report identified roads as the next largest contributor with an average percentage of the sediment load estimated at 19.7 percent. The report recognizes that legacy sediments remain in the stream and continue to negatively affect fish habitat.

Stakeholders were advised to assist in identifying any current sources of sediment loading that may exist in the watershed area. Additionally, Pine Country RC&D staff have undertaken a visual watershed assessment to determine any current or potential loading sites.

Water quality monitoring according to an approved Sampling and Quality Assurance Plan (SQAP) was anticipated to provide data that would assist in identifying the impacts of sediment loading.

V. Assessment and characterization of current conditions

Overview

The Hydraulic Unit Code (HUC)-10 0307010213 Ochwalkee Creek – Oconee River watershed is approximately 99,827 acres of primarily agricultural and forested lands and lies in parts of Laurens, Wheeler, Montgomery, and Treutlen Counties. Within the HUC-10 watershed, Cypress Creek and both segments of Ochwalkee Creek were included in GAEPD's 2014 Integrated 305(b)/303(d) List of Waters and identified as not meeting water quality standards for biota impacted (fish community) due to sediments. Also, Ochwalkee Creek (Unnamed tributary 550 feet upstream of Little New York Road to Oconee River) was identified as impaired for dissolved oxygen.

Physical and Natural Features

Hydrology

The Ochwalkee Creek – Oconee River watershed is comprised of 342 miles of streams, 641 acres of lakes, and 23,713 acres of wetlands. Major streams in the watershed include Ochwalkee Creek, Cypress Creek, Bear Creek, and Flat Creek, all tributaries of the Oconee River. All major streams have numerous tributaries throughout their respective reach, and small ponds are scattered throughout the watershed. The majority of these small ponds are located at either the headwaters of, or adjacent to, the minor tributaries.

Soils

The U.S. Department of Agriculture – Natural Resources Conservation Service has published soil surveys for each county in the Ochwalkee Creek – Oconee River watershed. All of the watershed is located in the Southern Coastal Plains Major Land Resource Area (MLRA). Dominant soils of the Southern Coastal Plains MLRA have mostly Ultisols, Entisols, and Inceptisols. They are generally very deep, somewhat excessively drained to poorly drained, and loamy. Specifically within this watershed, the dominant soil types are Troup, Pelham, Fuquay, Dothan, and Cowarts. (See Map 3)

Climate

The Ochwalkee Creek – Oconee River watershed is characterized by mild winters and hot summers. Average annual precipitation is 46.4 inches per year. Precipitation occurs chiefly as rainfall, and about 66 percent falls in the period of March through October. Thunderstorms occur approximately 55 days each year, mostly during the period of May through August. The average winter temperature is 48.2°F with an average minimum temperature of 36.8°F. Summer average temperature is 79.7°F with an average maximum temperature of 90.9°F. The growing season for the region can range from 250 to 275 days depending on temperature extremes.

Waterbody and Watershed Conditions

Visual Survey

A visual survey is used to observe problems, if present, within streams and characterize the environment in which the river flows. The survey is also useful in identifying potential sources of water quality impairments and assessing the overall condition of the streams. The visual survey was conducted by one individual on staff with the Pine Country RC&D following Georgia Adopt-A-Stream methodologies and guidelines.

Throughout the six month sampling period, the visual survey and water quality monitoring was conducted at following location:

Stream/River	Decimal Degrees Coordinates		Location
Ochwalkee Creek (Site 1)	-82.866994	32.297400	Scotland Road
Ochwalkee Creek (Site 2)	-82.811925	32.267745	Lowery Firehouse Road
Ochwalkee Creek (Site 3)	-82.768880	32.264702	GA HWY 46
Ochwalkee Creek (Site 4)	-82.646070	32.188854	US HWY 280
Oconee River	-82.631220	32.191724	US HWY 280
Cypress Creek	-82.617705	32.268730	GA HWY 199

Low rainfall coupled with long dry periods resulted in either no flow or small stagnant pools in the upper areas of the watershed during the first four months of the sampling period. During this same time period, the lower portion of the watershed was experiencing a stream flow that was below normal levels and exhibited slow movement. Throughout the entire sampling period, all locations where a flow was present exhibited clear water with the exception of sampling locations on the Oconee River where the river appeared turbid until samples were viewed in the sampling container, which revealed little to no turbidity present.

The visual survey along with the review of current aerial photography revealed that streams within the watershed appear to have adequate vegetated buffers due to the adjacent land use predominately being forestland with only portions currently undergoing harvesting operations. Agricultural lands in close proximity to streams within the watershed appear to have adequate vegetative buffers as well, with an adequate buffer being classified as a natural or vegetative buffer exceeding twenty five (25) feet measured perpendicular from the point of wretched vegetation.

Areas that drew attention during visual assessments as potential points of sediment loading included eroded areas directly adjacent to box culvert headwalls and bridge features on paved roadways in need of stabilization as well as the volume of unpaved public and private roads and associated drainage features that directly intersected streams within the watershed. Potential



contributors of low dissolved oxygen observed during the visual assessment were very low stream flows and large amounts of decaying organic matter in the form of leaves, tree limbs, and other tree and plant material within the streams. Also, while this watershed is currently not listed as impaired due to fecal coliform, the visual survey did identify sources of fecal contamination in the form of animal carcasses, mainly white-tailed deer, being disposed of within or directly adjacent to the streams. If improper disposal

of animal carcasses continues, water quality will likely become impaired due to *E. coli*.

Water Quality Standards

The Ochwalkee Creek – Oconee River watershed has stream segments identified as not meeting water quality standards for their designated use due to stream sedimentation and one segment has been identified for low dissolved oxygen. The Biota Impacted designation indicates that studies have shown a degradation of the biological populations in the stream, in this case, in the fish community. The general water quality criteria not being met as stated in *Georgia's Rules and Regulations for Water Quality Control*, Chapter 391-3-6-.03(5)(c) currently states:

All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

However, the narrative criteria in *Georgia's Rules and Regulations for Water Quality Control* are in the process of being reviewed and updated at this time. Any subsequent citing of these rules and regulations should reference the most current version available.

Regarding dissolved oxygen, the State has determined that for a water to support its use of fishing, it must have a daily average dissolved oxygen concentration of at least 5.0 mg/L and a minimum of 4.0 mg/L, but it should be noted that in the 2016 Integrated 305(b)/303(d) list for streams, GA EPD notes that they need to determine the “natural DO” for the area before it can be determined whether the dissolved oxygen criteria are being met.

Water Quality Data

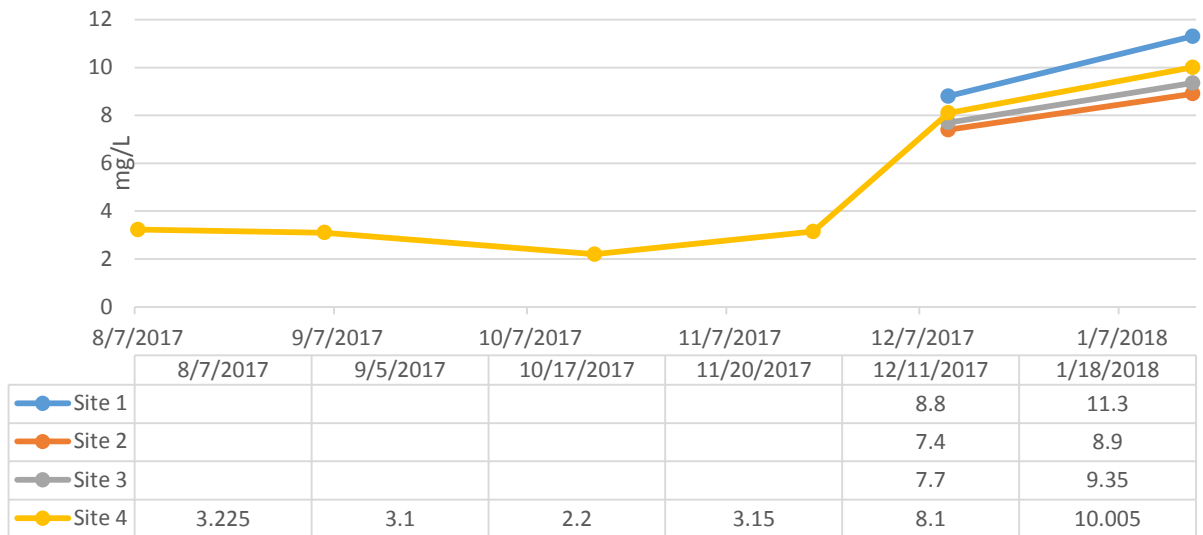
Water quality monitoring was performed by one individual on staff with the Pine Country RC&D possessing the appropriate Georgia Adopt-A-Stream certifications and following a watershed specific Sampling and Quality Assurance Plan (SQAP). The SQAP was developed to strategically sample throughout the watershed to better identify potential sources of pollution and areas having higher impacts on water quality. (See Map 9 for Sampling Locations)

During sampling events, general observations including water flow levels, water clarity, color, and odors were documented. Ambient temperature and water temperature were recorded along with Nephelometric Turbidity Units (NTU) levels, pH, dissolved oxygen (DO), and conductivity. Additional samples were taken to be tested for settleable solids and *E. Coli* in a lab setting. All samples were collected as “Grab” samples and analyzed with a calibrated turbidimeter and conductivity meter as well as a LaMotte Shallow Water Testing Kit to determine pH, DO, and temperature. Settleable solids were determined through a procedure utilizing an Imhoff Cone and *E. coli* determined through plating and incubation procedures approved by the Georgia Adopt-A-Stream program. Sampling sites with no water present or no flow were not sampled resulting in no data being shown for those sampling dates in the

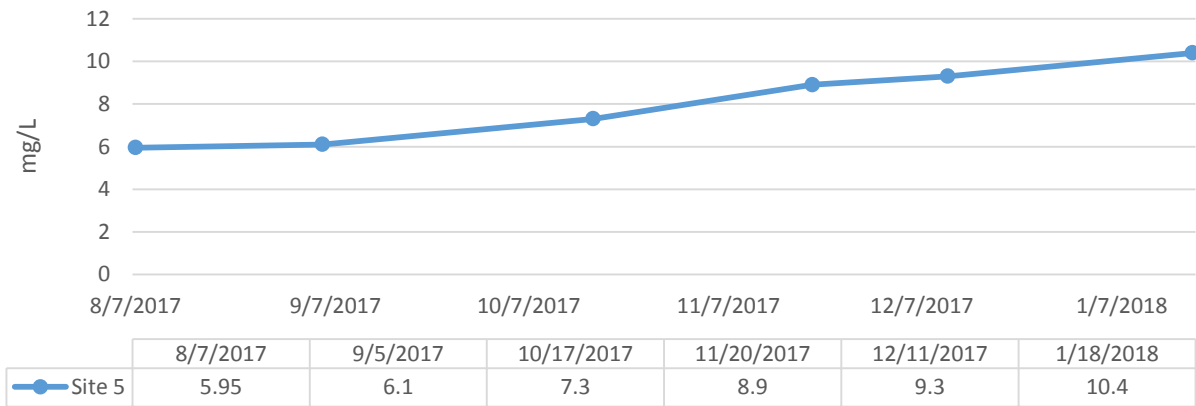
following charts. Additionally, the Oconee River is listed as a healthy water and was sampled for comparative purposes.

Overall, water quality monitoring data reflected no current problems with sediment loading. At no time during the six month sampling period was settleable solids present above a trace amount ($\geq 0.5\text{ml}/1000\text{ml}$) in any sample taken, and the highest NTU levels were recorded in the Oconee River which is identified as a health water. The dissolved oxygen concentration levels recorded for Ochwalkee Creek did fall below the current State standard a majority of the time; however, the low concentration of dissolved oxygen could be attributed to the streams low flows at the time of sampling and large amounts of decaying organic matter within the stream channels leaving few options to provide remediation.

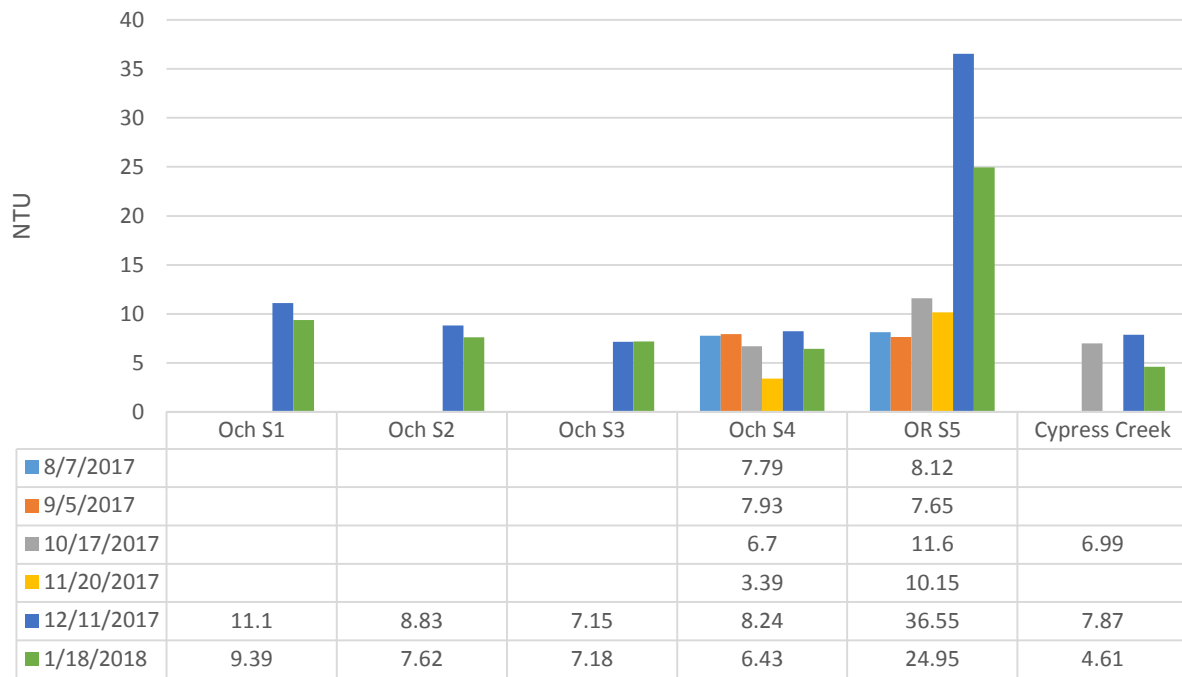
Ochwalkee Creek DO



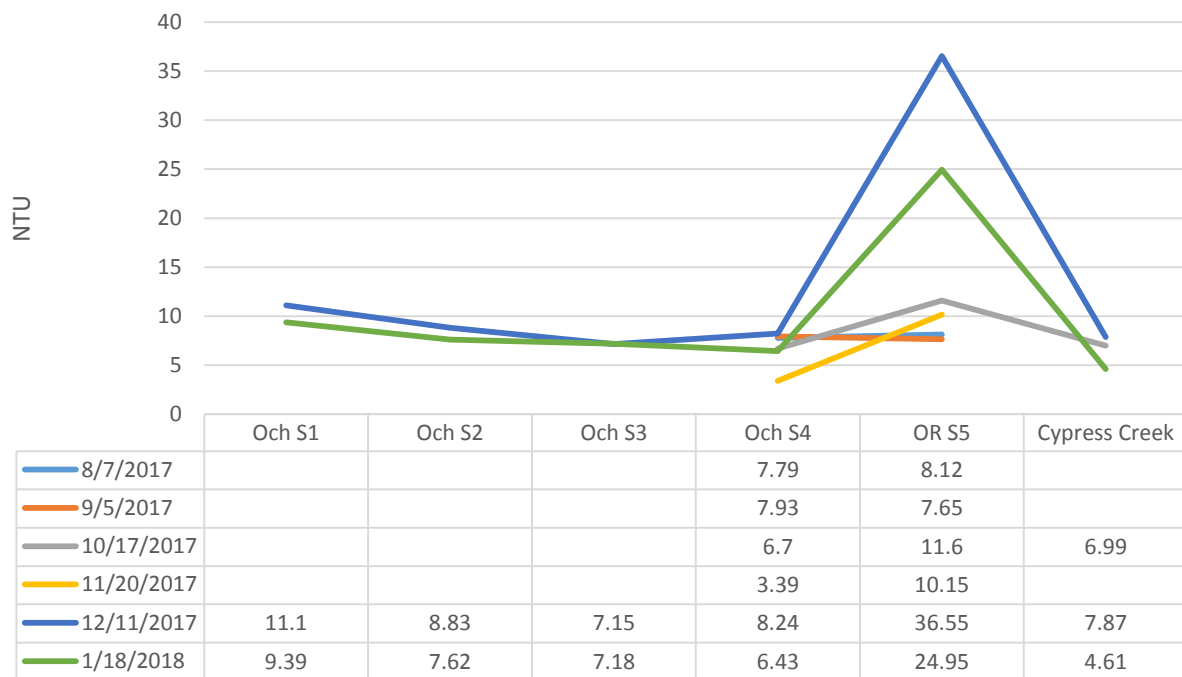
Oconee River DO



Turbidity



Turbidity



Ochwalkee Creek - Oconee River Sampling Report

Ochwalkee Creek - Oconee River Sampling Report											
SITE INFORMATION	Site ID:	OC #1									
	Stream Name:	Ochwalkee Creek									
	Location Description:	Ochwalkee Creek at Scotland Road									
	Coordinates:	32.297400		-82.866994							
	Monitor(s):	Rahn Milligan									
	Event Date:	8/7/2017		9/5/2017		10/17/2017		11/20/2017		12/11/2017	
	Time Sample Collected:									11:10 a.m.	
VISUAL OBSERVATIONS	Weather:	No Sample taken No Water Present or stagnant pool		No Sample taken No Water Present or stagnant pool		No Sample taken No Water Present or stagnant pool		No Sample taken No Water Present or stagnant pool		Clear/Sunny	
	24 Hr Rainfall:									0.0"	
	Flow Level:									Normal	
	Water Clarity:									Clear/Transparent	
	Water Color:									No Color	
	Water Surface:									Clear	
	Water Odor:									Natural/None	
CHEMICAL	Air Temp:							19.0°C		(2.7°C)	
	Water Temp:							7.4°C		1.0°C	
	pH (±0.25):							5.5		6.0	
	Dissolved Oxygen (±0.6): mg/L							8.80		11.20	
	Conductivity: μS/cm							50		40	
	Turbidity: NTU							11.10		9.30	
	Settleable Solids: mL/L							∅		∅	
BACTERIAL	<i>E. coli:</i>										
	Plate	Colonies		Colonies		Colonies		Colonies		Colonies	
	Blank-									∅	
	1-									19	
	2-									9	
	3-									11	
	Total # Colonies									39	
cfu/100mL:									1300		

Ochwalkee Creek - Oconee River Sampling Report

Ochwalkee Creek - Oconee River Sampling Report									
SITE INFORMATION	Site ID:	OC #2							
	Stream Name:	Ochwalkee Creek							
	Location Description:	Ochwalkee Creek at Lowery Firehouse Road							
	Coordinates:	32.267745	-82.811925						
	Monitor(s):	Rahn Milligan							
	Event Date:	8/7/2017	9/5/2017	10/17/2017	11/20/2017	12/11/2017	1/18/2018		
Time Sample Collected:					12:08 p.m.	11:25 a.m.			
VISUAL OBSERVATIONS	Weather:	No Sample taken No Water Present or stagnant pool				Clear/Sunny		Clear/Sunny	
	24 Hr Rainfall:					0.0"		0.0"	
	Flow Level:					Normal		Normal	
	Water Clarity:					Clear/Transparent		Clear/Transpartnet	
	Water Color:					No Color		No Color	
	WaterSurface:					Clear		Clear - Ice	
	Water Odor:					Natural/None		Natural/None	
CHEMICAL	Air Temp:			22.9°C		2.2°C			
	Water Temp:			6.9°C		3.3°C			
	pH (±0.25):			5.0		5.0		6.0	
	Dissolved Oxygen (±0.6): mg/L			7.40		7.40		9.00	
	Conductivity: μS/cm			60				40	
	Turbidity: NTU			8.85		8.80		7.60	
	Settleable Solids: mL/L			∅				∅	
BACTERIAL	<i>E. coli:</i>								
	Plate	Colonies	Colonies	Colonies	Colonies	Colonies	Colonies	Colonies	Colonies
	Blank-							∅	∅
	1-							15	∅
	2-							10	1
	3-							13	∅
	Total # Colonies							32	1
cfu/100mL:							1267	33	

Ochwalkee Creek - Oconee River Sampling Report

Ochwalkee Creek - Oconee River Sampling Report									
SITE INFORMATION	Site ID:	OC #3							
	Stream Name:	Ochwalkee Creek							
	Location Description:	Ochwalkee Creek at GA HWY 46							
	Coordinates:	32.264702	-82.768880						
	Monitor(s):	Rahn Milligan							
	Event Date:	8/7/2017	9/5/2017	10/17/2017	11/20/2017	12/11/2017	1/18/2018		
	Time Sample Collected:					12:48 p.m.	11:55 a.m.		
VISUAL OBSERVATIONS	Weather:	No Sample taken No Water Present or Stagnant pool				Clear/Sunny		Clear/Sunny	
	24 Hr Rainfall:					0.0"		0.0"	
	Flow Level:					Normal		Normal	
	Water Clarity:					Clear/Transparent		Clear/Transpartnet	
	Water Color:					No Color		No Color	
	WaterSurface:					Clear		Clear - Some Ice	
	Water Odor:					Natural/None		Natural/None	
CHEMICAL	Air Temp:	No Sample taken No Water Present or Stagnant pool				17.9°C		2.2°C	
	Water Temp:					8.4°C		4.3°C	
	pH (±0.25):					5.5	5.5	6.0	6.0
	Dissolved Oxygen (±0.6): mg/L					7.60	7.80	9.30	9.40
	Conductivity: μS/cm					50		40	
	Turbidity: NTU					7.11	7.18	7.28	7.08
	Settleable Solids: mL/L					∅		∅	
BACTERIAL	<i>E. coli:</i>								
	Plate	Colonies	Colonies	Colonies	Colonies	Colonies	Colonies	Colonies	
	Blank-					∅		∅	
	1-					21		1	
	2-					19		1	
	3-					25		1	
	Total # Colonies					65		3	
cfu/100mL:					2167		100		

Ochwalkee Creek - Oconee River Sampling Report

Ochwalkee Creek - Oconee River Sampling Report													
SITE INFORMATION	Site ID:	OC #4											
	Stream Name:	Ochwalkee Creek											
	Location Description:	Ochwalkee Creek at US HWY 280											
	Coordinates:	32.188854 -82.646070											
	Monitor(s):	Rahn Milligan											
	Event Date:	8/7/2017	9/5/2017	10/17/2017	11/20/2017	12/11/2017	1/18/2018						
	Time Sample Collected:	10:10 a.m.	12:50 p.m.	4:00 p.m.	12:01 p.m.	1:50 p.m.	1:35 p.m.						
VISUAL OBSERVATIONS	Weather:	Clear/Sunny		Partly Cloudy		Clear/Sunny		Partly Cloudy		Clear/Sunny		Clear/Sunny	
	24 Hr Rainfall:	0.0"		0.0"		0.0"		0.0"		0.0"		0.0"	
	Flow Level:	Low		Low		Low		Low		Normal		Normal	
	Water Clarity:	Clear/Transparent		Clear/Transparent		Clear/Transparent		Clear/Transparent		Clear/Transparent		Clear/Transparent	
	Water Color:	Tannic		Tannic		No Color		No Color		No Color		No Color	
	Water Surface:	Clear		Clear		Clear		Clear		Clear		Clear	
	Water Odor:	Natural/None		Natural/None		Natural/None		Natural/None		Natural/None		Natural/None	
CHEMICAL	Air Temp:	27.7°C		27.2°C		22.2°C		16.1°C		18.6°C		6.1°C	
	Water Temp:	26.5°C		24.9°C		21.2°C		11.6°C		7.9°C		4.2°C	
	pH (±0.25):	6.0	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	Dissolved Oxygen (±0.6): mg/L	3.20	3.25	3.20	3.00	2.20	2.20	3.20	3.10	8.20	8.00	10.10	10.00
	Conductivity: μS/cm	50		60		80		50		50		50	
	Turbidity: NTU	7.67	7.91	7.67	8.19	6.58	6.82	3.41	3.36	8.25	8.23	6.51	6.34
	Settleable Solids: mL/L	∅		∅		∅		∅		∅		∅	
BACTERIAL	<i>E. coli:</i>												
	Plate	Colonies		Colonies		Colonies		Colonies		Colonies		Colonies	
	Blank-	∅		∅		∅		∅		∅		∅	
	1-	∅		1		∅		1		7		∅	
	2-	1		2		∅		∅		10		1	
	3-	1		1		3		1		11		∅	
	Total # Colonies	2		4		3		2		28		1	
cfu/100mL:	66		133		100		66		933		33		

Ochwalkee Creek - Oconee River Sampling Report

Ochwalkee Creek - Oconee River Sampling Report													
SITE INFORMATION	Site ID:	OR #5											
	Stream Name:	Oconee River											
	Location Description:	Oconee River at US HWY 280											
	Coordinates:	32.191724 -82.631220											
	Monitor(s):	Rahn Milligan											
	Event Date:	8/7/2017	9/5/2017	10/17/2017	11/20/2017	12/11/2017	1/18/2018						
	Time Sample Collected:	11:10 a.m.	1:33 p.m.	3:20 p.m.	11:25 a.m.	2:20 p.m.	1:05 p.m.						
VISUAL OBSERVATIONS	Weather:	Clear/Sunny		Partly Cloudy		Clear/Sunny		Partly Cloudy		Clear/Sunny		Clear/Sunny	
	24 Hr Rainfall:	0.0"		0.0"		0.0"		0.0"		0.0"		0.0"	
	Flow Level:	Normal		Normal		Low		Low		High		Normal	
	Water Clarity:	Clear/Transparent		Clear/Transparent		Clear/Transparent		Clear/Transparent		Cloudy/Somewhat Turbid		Cloudy/Somewhat Turbid	
	Water Color:	No Color		No Color		No Color		No Color		No Color		No Color	
	Water Surface:	Clear		Clear		Clear		Clear		Clear		Clear	
	Water Odor:	Natural/None		Natural/None		Natural/None		Natural/None		Natural/None		Natural/None	
CHEMICAL	Air Temp:	31.1°C		27.2°C		22.7°C		16.1°C		17.9°C		6.1°C	
	Water Temp:	29.3°C		28.5°C		23.1°C		13.8°C		10.8°C		6.4°C	
	pH (±0.25):	7.0	7.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
	Dissolved Oxygen (±0.6): mg/L	6.00	5.90	6.60	6.40	7.20	7.40	8.80	9.00	9.40	9.20	10.40	10.40
	Conductivity: μS/cm	140		150		130		120		90		90	
	Turbidity: NTU	8.18	8.06	7.62	7.68	12.10	11.10	10.30	10.00	37.00	36.10	25.10	24.80
	Settleable Solids: mL/L	∅		∅		∅		∅		<0.3		<0.3	
BACTERIAL	<i>E. coli:</i>												
	Plate	Colonies		Colonies		Colonies		Colonies		Colonies		Colonies	
	Blank-	∅		∅		∅		∅		∅		∅	
	1-	∅		∅		∅		∅		7		1	
	2-	∅		∅		∅		∅		2		∅	
	3-	∅		∅		∅		∅		1		1	
	Total # Colonies	∅		∅		∅		∅		10		2	
cfu/100mL:	∅		∅		∅		∅		333		66		

Ochwalkee Creek - Oconee River Sampling Report

Ochwalkee Creek - Oconee River Sampling Report											
SITE INFORMATION	Site ID:	CC #6									
	Stream Name:	Cypress Creek									
	Location Description:	Cypress Creek at GA HWY 199									
	Coordinates:	32.268730	-82.617705								
	Monitor(s):	Rahn Milligan									
	Event Date:	8/7/2017	9/5/2017	10/17/2017		11/20/2017		12/11/2017		1/18/2018	
Time Sample Collected:			4:36 p.m.				2:55 p.m.		2:08 p.m.		
VISUAL OBSERVATIONS	Weather:			Clear/Sunny				Clear/Sunny			
	24 Hr Rainfall:			0.0"				0.0"			
	Flow Level:			Low				Normal			
	Water Clarity:			Clear/Transparent				Clear/Transparent			
	Water Color:			No Color				No Color			
	Water Surface:			Clear				Clear			
	Water Odor:			Natural/None				Natural/None			
CHEMICAL	Air Temp:			21.1°C				19.9°C		6.6°C	
	Water Temp:			23.0°C				8.1°C		5.2°C	
	pH (±0.25):			5.5	5.5			5.5	5.5	6.0	6.0
	Dissolved Oxygen (±0.6): mg/L			4.00	4.00			9.40	9.40	10.60	10.80
	Conductivity: μS/cm			50				60		50	
	Turbidity: NTU			6.92	7.05			7.91	7.82	4.57	4.64
	Settleable Solids: mL/L			∅				∅		∅	
BACTERIAL	<i>E. coli:</i>										
	Plate	Colonies	Colonies	Colonies	Colonies	Colonies	Colonies	Colonies	Colonies	Colonies	
	Blank-			∅				∅		∅	
	1-			7				11		1	
	2-			7				14		1	
	3-			7				8		∅	
	Total # Colonies			21				33		2	
cfu/100mL:			700				1100		66		

Pollutant Sources

Agricultural Land

Cropland represents approximately five (5) percent of the watershed area. This land use is a potential source of sediment pollution because it is traditionally disturbed annually and is subject to impacts by high intensity summer rainfall events occurring during the growing season and cultivation activities. Agricultural operations that utilize traditional cropping techniques leave the majority of cultivated land without a cover due to chemical and mechanical control of herbaceous pests to enhance yield potential. The lack of cover results in soil movement due to wind and water erosion that can reach levels of up to 5 tons of soil per acre per year depending on soil type, terrain, and rainfall intensity.

Field borders, especially along county unpaved roads, could provide extensive benefits. However, there are very few examples of where this practice is in place at the present time. When asked, agricultural producers cited some barriers to implementation that included commodity prices, land rental rates, practice establishment requirements, or the lack of desire to implement.

Borders along woodland areas are already effective as evidenced by sediment buildup at the edge of agricultural fields. Sediment is being trapped before it can get to the streams. Likewise, many nutrients and other potential contaminants are also being trapped at these edges and are being sequestered by the vegetation.

Hay and pasture land represent approximately four (4) percent of the watershed area, but this land use will have little impact on sediment loading. However, potential sources of sediment pollution could come from streambank degradation by livestock having direct access to streams and waterways. According to NRCS personnel, many of the watershed's livestock producers have fenced livestock out of streams along with the installation of watering facilities for the livestock. NRCS cost-share programs as well as the U.S. Fish and Wildlife, Partners for Fish and Wildlife program have been effective and useful in this effort. However, there still remain a number of producers that have not adopted these practices within the watershed. They represent a group that may be in need of educational outreach on the importance of these practices, guidance on the usage and implementation of these practices, and/or potentially need financial assistance provided for their installation within the producers' respective operations.

Forestland

Forestland is the largest land use in the watershed by area representing approximately forty (40) percent of the watershed. It is predominantly owned by private individuals, but there are some corporate and state-owned lands as well. The forestlands management is generally driven by economic motives, and management activities include site preparation, planting,

thinning, and clearcutting. Occasionally, forestland owners also incorporate pine needle (straw) harvesting within their operations. Aside from harvesting pine straw, these management activities usually occur on a 20 to 40 year rotation, depending on landowner objectives and economic drivers, and activity on any given acre is generally very intermittent, possibly once every five to ten years.

Site preparation for tree planting is generally regarded to be the most soil disturbing activity on forestland. However, recent changes to site preparation techniques have resulted in less soil disturbance. Chemical site preparation and/or mechanical site preparation that doesn't disturb the soil surface is now very common. Also, soil disturbance is minimized during the planting process through the use of V-blade equipped dozers coupled to planting machines which is not uncommon.

Stream crossings on forestland is the activity with the most potential to contribute to increased sediment loading, especially during road construction and timber harvesting if adequate crossing management practices have not been utilized. Additionally, off tracking of soil and mud from unpaved roadways onto paved road surfaces during harvesting operations create opportunities for increased sediment movement into waterbodies and streams during wet periods. While temporary practices such as matting or temporary timber bridges are being used throughout the watershed, more effective alternatives such as permanent stream crossings, where applicable, utilizing culverts, bridges or stabilized ford crossings have yet to be adopted on a wide scale. Timber companies have been early adopters of these practices in the watershed, but private landowners have been less eager to install the practices due to cost and the lack of available cost-share funding. However, the utilization of stream crossings is extremely important as part of an overall road maintenance program that will enhance access for timber management activities as well as recreation activities.

Residential/Urban

There is little residential and/or urban expansion in this watershed. Single family residences are most common. The only potential sources of sediment pollution would be failure to utilize or improper usage of minimal erosion control measures during construction or development activities.

Unpaved roads

Due to the volume of unpaved roads, their numerous intersections with tributaries and waterways throughout the watershed, and their direct impacts of sedimentation observed during the visual survey, it is the Advisory Committee's opinion that they represent the largest contributor of sediments in the watershed. They also represent the most challenging contributor to address with specific solutions. Many of the situations reviewed can be improved through technical solutions such as re-sizing culverts to avoid culvert blow-outs, installation and stabilization of plunge pools, and utilization of check dams. Other conditions require governmental/political efforts such as funding paving of problematic areas and securing

proper right-of-ways for road shoulders and drainage discharges. Additional coordination may need to be undertaken with Georgia Department of Transportation (GDOT) and others for specific financial and/or technical assistance.

The *Total Maximum Daily Load Evaluation for Thirty-Two Stream Segments in the Oconee River Basin for Sediment* published January 2007 stated that the Ochwalkee Creek's and Cypress Creek's current annual sediment load is allowable and makes no recommendation for a reduction load. It is believed that if sediment loads are maintained at acceptable levels, the impaired streams will repair themselves over time.

VI. Recommended Management Measures

Best Management Practices are defined as structural, vegetative, or managerial practices which reduce or prevent soil particle detachment and/or transport and in some cases controls deposition. The implementation of a system of BMPs that are properly designed, installed and maintained are proven to be highly effective in preventing erosion and managing the resultant sedimentation. These practices can effectively reduce current sediment loading within the watershed and expedite the natural repair of the impaired segments. While some BMPs may be used across sectors or land uses, a unique set of practices has been identified for each contributing land use. The identified practices focus primarily on sediment pollution, but ancillary benefits of some practices, such as a reduction in nutrient loading, could have a direct positive affect on dissolved oxygen levels. Also, preventing turbidity levels high enough to block sunlight from reaching aquatic plant life may reduce plant mortality and the resultant decay, which will prevent oxygen depletion. Depending on the land uses and BMPs utilized, estimated sediment load reductions could be range from one (1) percent to upwards of forty (40) percent.

Agricultural Land

In traditional cultivated cropland the soil is disturbed annually as well as throughout the growing season and is subject to impacts from high intensity summer rainfall events. Due to erosion being a three step process including soil particle detachment, particle transport, and particle deposition, any measure that prevents one of these steps will be useful in minimizing or controlling sedimentation. Potential sediment pollution from agricultural cropland may be eliminated or reduced from the utilization of an individual BMP or a site specific suite of BMPs identified in the *Best Management Practices for Georgia Agriculture, Conservation Practices to Protect Surface Water Quality* published by the Georgia Soil and Water Conservation Commission. Practices specific to sediment control include the following:

- Conservation Cover
- Contour Farming
- Critical Area Planting
- Crop Rotation
- Contour Buffer Strip
- Sediment Basins
- Conservation Tillage
- Cover Crop
- Diversions

- Field Border
- Grade Stabilization Structure
- Row Arrangement
- Filter Strips
- Grassed Waterways
- Terrace
- Forage and Biomass Planting
- Riparian Buffers
- Tree/Shrub Establishment

Forestland

As mentioned earlier, forestland is the largest land use within the watershed by area, and soil disturbing activities on forestland generally occurs on an extended interval. However, when forest management activities that result in soil disturbance take place, the potential for sediment pollution is high, but can be minimized or eliminated through sound silvicultural BMP utilization. Management practices applicable to forestry operations that assist in the control of sediment include the following:

- Brush Management
- Forest Management Plans
- Grade Stabilization Structure
- Prescribed Burning
- Stream Habitat Improvement and Management
- Early Seasonal Habitat Development and Management
- Forest Stand Improvement
- Herbaceous Weed Treatment
- Riparian Forest Buffers
- Stream Crossing
- Firebreaks
- Forest Trails and Landings
- Lined Waterway and Outlet
- Silvopasture Establishment
- Tree/Shrub Establishment

The Georgia Forestry Commission (GFC) is the lead State agency responsible for monitoring non- point source pollution on forestland and responding to public complaints relating to forestry activities. The GFC Water Quality Program produced *Georgia's Best Management Practices for Forestry*, a manual that describes practices to minimize negative water quality impacts, illustrates BMP installation and usage, and references applicable Federal and State mandates. In addition to the manual, the GFC offers Master Timber Harvester training courses on the importance and necessity of utilizing BMPs to minimize non-point source pollution and thermal pollution. To ensure minimum BMP usage compliance, the GFC also conducts a "Silvicultural BMP Implementation and Compliance Survey" every two years. In the 2017 survey report, stream crossings, firebreaks/burning, and forest roads had the lowest statewide implementation rates of 88%, 90%, and 91% respectively. When looking specifically at the Lower Coastal Plains area, the implementation rates were 83%, 88%, and 89% respectively.

Currently, the Natural Resources Conservation Service (NRCS) offers technical assistance as well as financial assistance in the form of cost-share/incentive programs to eligible landowners to implement agricultural and silvicultural practices throughout their operations. In FY2017, the Swainsboro NRCS Field Office, which covers the largest portion of the watershed, entered into 155 landowner contracts and obligated approximately \$2.88 million of federal funds to implement, enhance, or expand BMP utilization as well as to secure perpetual easement on wetlands throughout their five county area. Unfortunately, this level of funding only covers less than 40% of the applications the field office receives annually.

Residential/Urban

There is little residential and/or urban expansion within the watershed. Other than insuring that all subsequent development follows the most current *Manual for Erosion and Sediment Control in Georgia* as published by the Georgia Soil and Water Conservation Commission, there are no specific measures recommended for this land use. This can only be accomplished through local governments adopting an Erosion and Sedimentation Control Ordinance or through GA EPD regulatory oversight of the areas within their jurisdiction.

Unpaved roads

Many of the pollution contribution components of an unpaved road can be improved upon with the usage of technical solutions such as properly sized and installed culverts, utilization of headwall, splash aprons, and plunge pools in conjunction with culverts, and properly graded road surfaces and ditches. Other conditions will require efforts on a more political level such as securing necessary right-of-ways for proper drainage/discharge feature installation or for paving repetitive problem areas. Additionally, public and political figures will need to generate public support for the usage and implementation of unpaved road BMPs that are traditionally not used to prevent unwanted opposition when public funds are allocated for that purpose. Also, coordination between Georgia Department of Transportation (GDOT), local road departments, and any other applicable entity should be undertaken to ensure efficient use of resources and maximize financial and technical assistance.

Specifically within this watershed, sediment pollution from unpaved roads may be reduced through the utilization of BMPs that are found in the *Georgia Better Back Roads Field Manual* published by the Georgia Resource Conservation and Development Council, Inc. which includes structural, vegetative, and operational management practices that may be utilized individually or in combination with others to manage and/or control the movement of sediments. Examples of these practices include:

- Culverts
- Grass Seeding
- Plunge Basins (pools)
- Sediment Basins
- Dust Control
- Headwalls
- Rock Check Dams
- Splash Aprons
- Gabions
- Matting And Blankets
- Rock Filter Dams
- Turnouts

VII. Working With The Public

To further enhance the overall effectiveness of a watershed management plan, public engagement and educational opportunities to increase public awareness of water quality problems within the watershed are critically important. Being informed and knowledgeable of

the problems and the associated implications will improve overall public support for remediation and prevention of water quality degradation within the watershed. The overall objective of the educational outreach component is to provide information on current watershed conditions and how any current impairments will negatively affect overall watershed health. Additionally, the promotion of good stewardship of the resource and the usage of best management practices will be emphasized throughout these educational settings. Sector specific educational programs will also be offered to further strengthen the importance of preventing pollutant loading through the usage of best management practices that are appropriate for the situation and effective in preventing potential pollutant loading.

Specifically, Forest landowners will be encouraged to participate in landowner workshops/field days that provide current information on environmental regulations relating to water quality, silvicultural best management practice design, installation, and maintenance, and current trends and innovations in site preparation, planting, and harvesting. Agricultural producers will be encouraged to participate in producer workshops and landowner field days that will provide current information on the benefits of agricultural BMPs with specific emphasis on conservation tillage practices and irrigation water management. Livestock producers will be offered opportunities to learn about grazing land management and the usage of livestock BMPs with emphasis on water quality and streambank protection. Local governments will be encouraged to participate in the Georgia Better Back Roads Training Workshops as well as Erosion and Sedimentation Control Certification workshops developed by the Georgia Soil and Water Conservation Commission.

The overall success of this watershed management plan will require participation and cooperation from active land users, governmental agencies and entities, and the general public. Providing opportunities for everyone to better understand water quality issues within the watershed, how those issues impact overall watershed health, ways to improve water quality and watershed health, and what programs are available to assist with water quality improvement projects will greatly increase awareness, participation, and cooperation.

VIII. Long-Term Monitoring Plan

The overall objective of long-term monitoring within the watershed is to determine if water quality standards are achieved following the implementation of the measures outlined in this plan. It is important to perform instream monitoring to gauge water quality improvement as well as determine effectiveness of remediation activities. The data collected is crucial in supporting periodic strategic planning, identifying priority areas for remediation, and evaluating the effectiveness of BMPs. It also allows for trends to be identified and analyzed as well as identify any additional water quality problems should they develop.

Metrics to be monitored long-term shall include ambient temperature and water temperature, Nephelometric Turbid Units (NTU) levels, water pH, dissolved oxygen concentration, conductivity, and settleable solids. It is also encourage that samples be evaluated for *E. coli* levels to proactively monitor the watershed. This will give participating partners valuable information that may be used to direct available financial resources to address problems early on. All data collected shall be performed by a Georgia Adopt-A-Stream (GA AAS) certified person following current methodologies, utilizing GA AAS approved equipment, sampling kits, and/or supplies, and following an approved Sampling and Quality Assurance Plan (SQAP). Samples should be taken at a minimum of once monthly, and data evaluated to determine if additional samples are needed due to abnormal or critical levels of any particular metric being monitored. It may also prove beneficial to monitor specific BMP installation sites in areas that were noticed to be directly contributing to the impairment (*i.e.* unpaved road drainage features directly discharging sediment laden waters into streams.) to monitor overall effectiveness of the BMPs and make necessary changes if needed.

IX. Implementation, Evaluation, and Revision

Management Strategies

The overall effectiveness of this management plan relies on the aforementioned holistic approach of watershed management. The approach requires that all potential pollution sources be addressed through education/outreach to increase public and landowner awareness of the problems; encourage the implementation and utilization of BMPs through providing planning, technical, and financial assistance; monitor the effectiveness of the management plan and implemented practices through long-term monitoring; and make necessary revisions to the plan as needed.

Management Plan

In addition to technical assistance being provided by federal and state agencies, financial assistance in the form of a cost-share/incentive program for the implementation of agricultural and silvicultural BMPs coupled with cost-sharing with local governments on the implementation of unpaved road BMPs is necessary to achieve sediment load reductions within the watershed. The amount of funding needed to obtain current water quality standards through BMP implementation across all sectors is not known at this time, but in addition to current federal funding resources available, the application of funds through a Section 319(h) Federal Water Pollution Control Act grant or series of grants targeting specific activities of the plan will be necessary for timely implementation and water quality improvement.

While landowners and local governments throughout the entire watershed will be eligible to participate in any cost-share/incentive program, priority will be given to subwatersheds based

on monitoring data and impairment listings due to the fact that efforts in these areas will have the greatest impact on water quality improvement. Currently, the priority subwatersheds are the Upper Ochwalkee Creek, Lower Ochwalkee Creek, and Cypress Creek subwatersheds due to their current impaired listing statuses.

Implementation Plan and Interim Milestones

It is anticipated that the implementation of this watershed management plan will exceed five years, but smaller, more focused projects may be implemented in shorter time periods. To monitor progress of plan implementation, a series of measurable milestones have been developed, but a periodic review of accomplishments as compared to the implementation schedule will be needed to determine whether task milestones are being met. These reviews will also determine if revisions or amendments are necessary to address both progress and setbacks.

Implementation Partners	
Entity/Organization	Contribution
Central Georgia Soil and Water Conservation District	Technical Assistance, Financial Assistance, and In-Kind Contributions
City of Ailey	Cash and In-Kind Contributions
City of Glenwood	Cash and In-Kind Contributions
City of Mount Vernon	Cash and In-Kind Contributions
City of Tarrytown	Cash and In-Kind Contributions
Georgia Forestry Commission (GFC)	Technical Assistance, Financial Assistance, and In-Kind Contributions
Georgia Soil and Water Conservation Commission (GSWCC)	Technical Assistance, Financial Assistance, and In-Kind Contributions
Laurens County Commission	Cash and In-Kind Contributions
Montgomery County Commission	Cash and In-Kind Contributions
Natural Resources Conservation Service (NRCS)	Technical Assistance and Financial Assistance
Ochoopee River Soil and Water Conservation District	Technical Assistance, Financial Assistance, and In-Kind Contributions
Pine Country Resource Conservation and Development Council	Technical Assistance, Cash and In-Kind Contributions
Treutlen County Commission	Cash and In-Kind Contributions
University of Georgia Cooperative Extension Service	Technical Assistance and In-Kind Contributions
Wheeler County Commission	Cash and In-Kind Contributions

Implementation Plan

Goal: Implement Best Management Practices to reduce Sediment Loads in order to meet water quality standards

Task	Agency Responsible	Funding Source	Measure	Milestone		
				Short	Mid	Long
				(<2 yrs)	(2-5 yrs)	(>5 yrs)
Objective 1: Reduce Sediment loads from unpaved roads within the watershed						
Task 1: Identify critical areas of unpaved roads where unpaved roads have a direct impact on streams and waterways	Local governments, Road Departments	Local funds, Section 319(h) grant, in-kind match	Percentage of locations where unpaved roads directly impact streams and waterways identified	All	All new road construction	All new road construction
Task 2: Develop remediation plans for critical impact areas and prioritize implementation of plans	Local governments, Road Departments	Local funds, Section 319(h) grant, in-kind match	Percentage of remediation plans developed	50%	50%	All new impact areas
Task 3: Install BMPs	Local governments, Road Departments	Local funds, Section 319(h) grant, in-kind match	Percentage of remediation plans implemented	50% - contingent upon funding	50% - contingent upon funding	All new impact areas
Objective 2: Reduce Sediment loads from agricultural lands within the watershed						
Task 1: Identify agricultural producers in watershed	RC&D, GSWCC, NRCS, SWCD	In-kind	Percentage of producers	All	All new producers	All new producers
Task 2: Identify agricultural producers with no current Conservation Plan and assist with development of Plan	RC&D, GSWCC, NRCS, SWCD	In-kind	Number of producers identified	All	All new producers	All new producers
			Number of Conservation Plans developed	All	All new producers	All new producers
Task 3: Contact producers for participation in cost-share programs – target producers in priority subwatersheds	RC&D, GSWCC, NRCS, SWCD	In-kind	Number of producers identified within priority subwatersheds	All	All new producers	All new producers
			Number of applications submitted for cost-share program in priority subwatersheds	10	5	5
Task 4: Install BMPs	RC&D,	Producer,	Percentage of land area of	50	25	25

	GSWCC, NRCS, SWCD, Producer	Section 319(h) grant, EQIP	priority subwatersheds affected by BMP program			
			Number of participants	10	5	5
			Load reduction estimate	TBD	TBD	TBD
Objective 3: Reduce Sediment loads from silvicultural lands within the watershed						
Task 1: Identify forestry producers in watershed	RC&D, GFC, NRCS	In-kind	Percentage of producers	All	All new producers	All new producers
Task 2: Identify forestry producers with no current Forest Stewardship Plan and assist with development of Plan	RC&D, GFC, NRCS	In-kind	Number of producers identified	All	All new producers	All new producers
			Number of Forest Stewardship Plans developed	All	All new producers	All new producers
Task 3: Contact producers for participation in cost-share programs – target producers in priority subwatersheds	RC&D, GFC, NRCS	In-kind	Number of producers identified within priority subwatersheds	All	All new producers	All new producers
			Number of applications submitted for cost-share program in priority subwatersheds	10	5	5
Task 4: Install BMPs	RC&D, GFC, NRCS, Producer	Producer, Section 319(h) grant, EQIP	Percentage of land area of priority subwatersheds affected by BMP program	50	25	25
			Number of participants	10	5	5
			Load reduction estimate	TBD	TBD	TBD
Objective 4: Monitor water quality of load reduction achievement						
Task 1: Update EPD – approved SQAP for post-BMP monitoring	RC&D, Contractor	Section 319(h) grant, In-kind, cash match	EPD - approved SQAP and updates as needed to reflect new pre- and post-BMP monitoring	100%	N/A	
Task 2: Conduct post-BMP water quality monitoring by AAS-qualified personnel utilizing approved SQAP	RC&D, Contractor	Section 319(h) grant, In-kind, cash match	Number of samples collected	12/site/year	N/A	N/A
			Load reduction	Meet water quality standards for designated use	Meet water quality standards for designated use	Meet water quality standards for designated use

Task 3: Implement long-term water quality monitoring by AAS-qualified personnel under EPD – approved SQAP	RC&D, Contractor	TBD	Number of samples collected	N/A	TBD	TBD
			Load reduction	N/A	Meet water quality standards for designated use	Meet water quality standards for designated use
Objective 5: Conduct Education Outreach						
Task 1: Develop, coordinate, and host Field Day	RC&D, GSWCC, SWCD, UGA Cooperative Extension, NRCS	Section 319(h) grant, In-kind, cash match	Number of attendees	15	N/A	N/A
Task 2: Present sector specific information relating to pollution prevention, BMP utilization, and water quality improvement, and/or available assistance programs at producer meetings in each of the counties in the watershed	RC&D, GSWCC, SWCD, UGA Cooperative Extension, NRCS	Section 319(h) grant, In-kind, cash match	Number of Presentations	4	N/A	N/A
			Number of attendees per presentation	10	N/A	N/A
Task 3: Develop newspaper articles on Ochwalkee Creek water quality, pollution control efforts, and available assistance programs	RC&D, GSWCC, SWCD, UGA Cooperative Extension, NRCS	Section 319(h) grant, In-kind, cash match	Number of articles published	4	4	N/A
			Number of readers reached	2,000	2,000	N/A

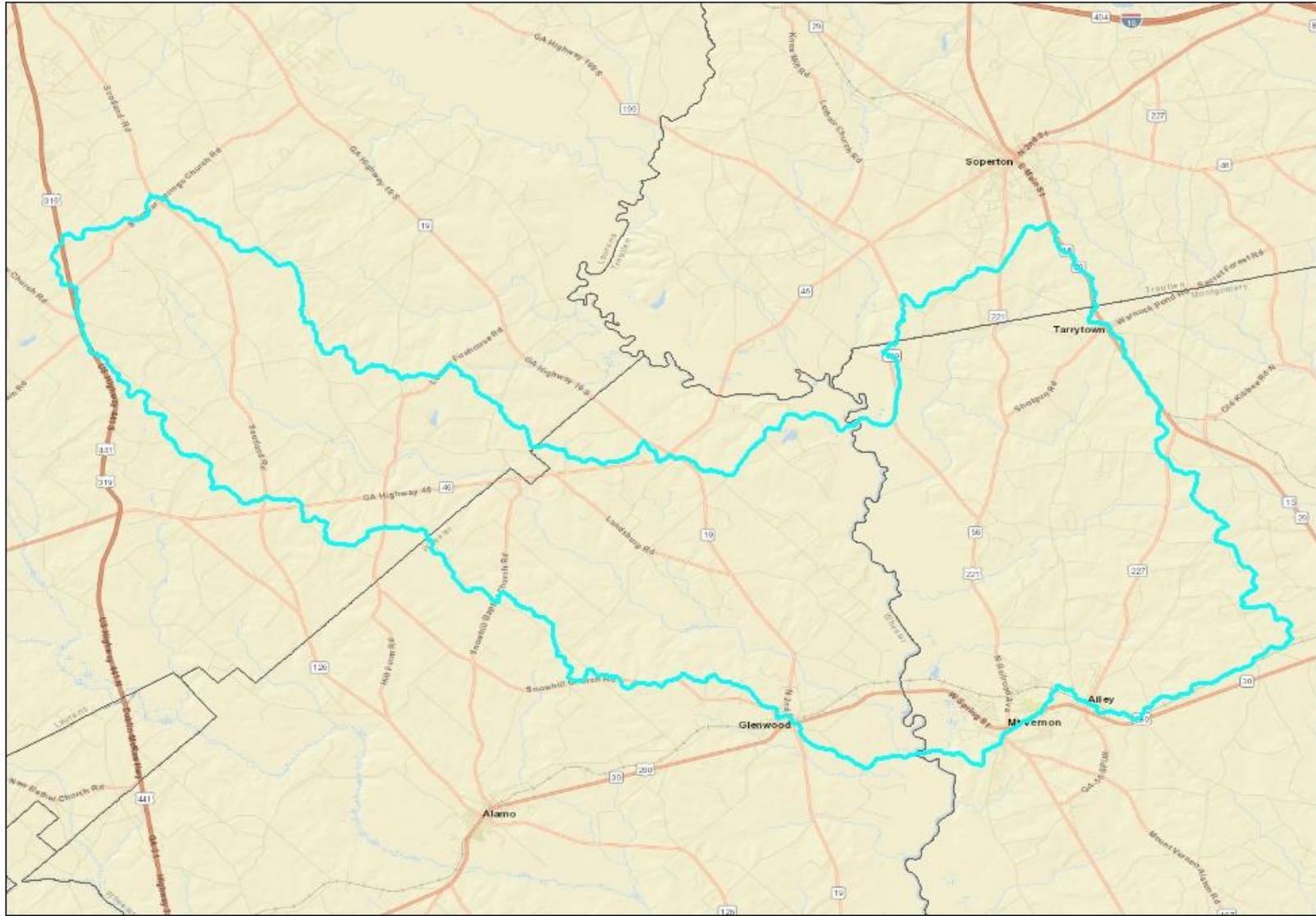
Note: RC&D – Pine Country Resource Conservation and Development Area Inc.
 NRCS – Natural Resources Conservation Service
 GFC – Georgia Forestry Commission

GSWCC – Georgia Soil and Water Conservation Commission
 SWCD – Local Soil and Water Conservation District
 UGA – University of Georgia Cooperative Extension

X. Appendix

Map 1:

Ochwalkee Creek Watershed

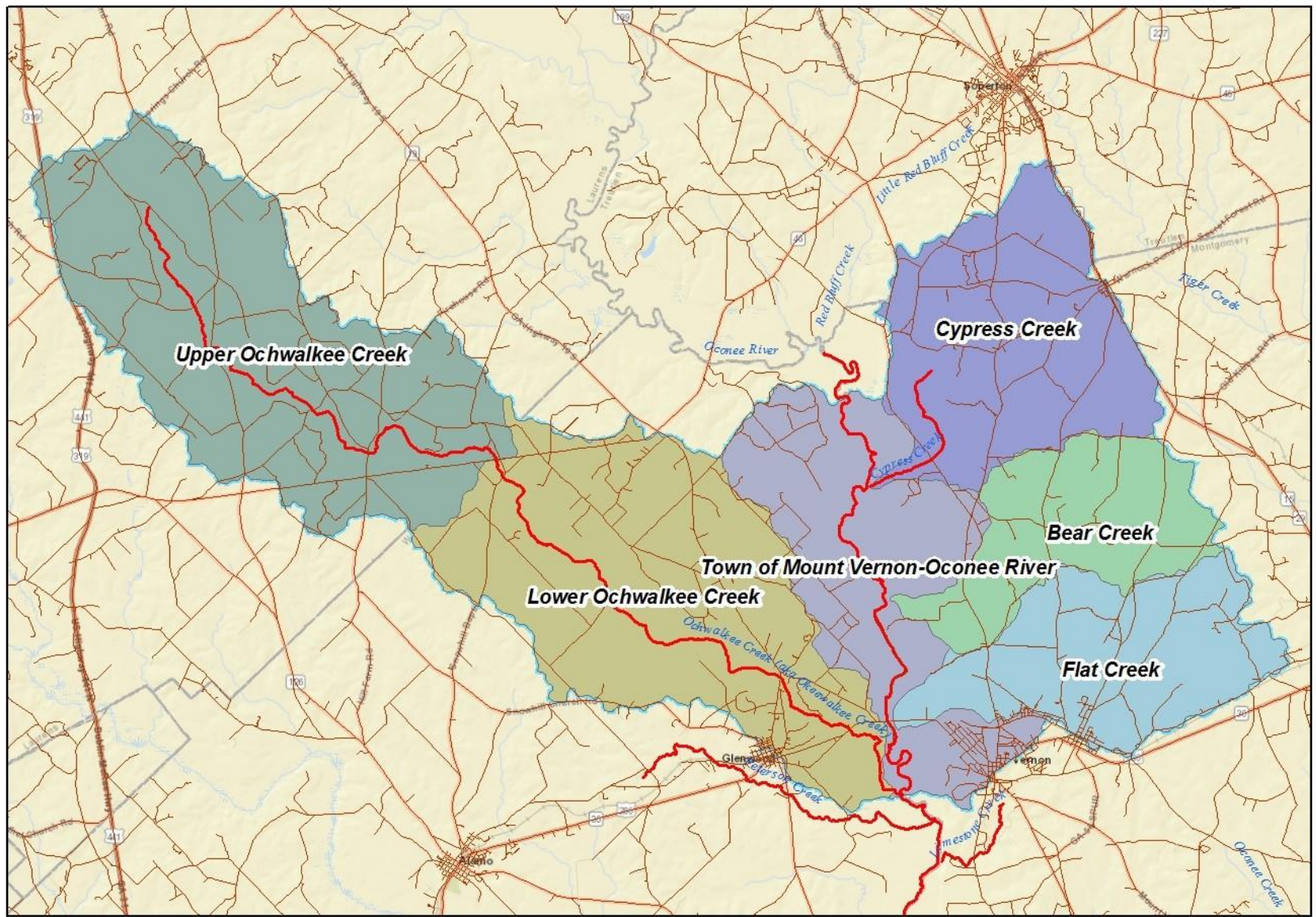


0 1.25 2.5 5 7.5 10 Miles



Map 2:

Ochwalkee Creek Subwatersheds (HUC12)

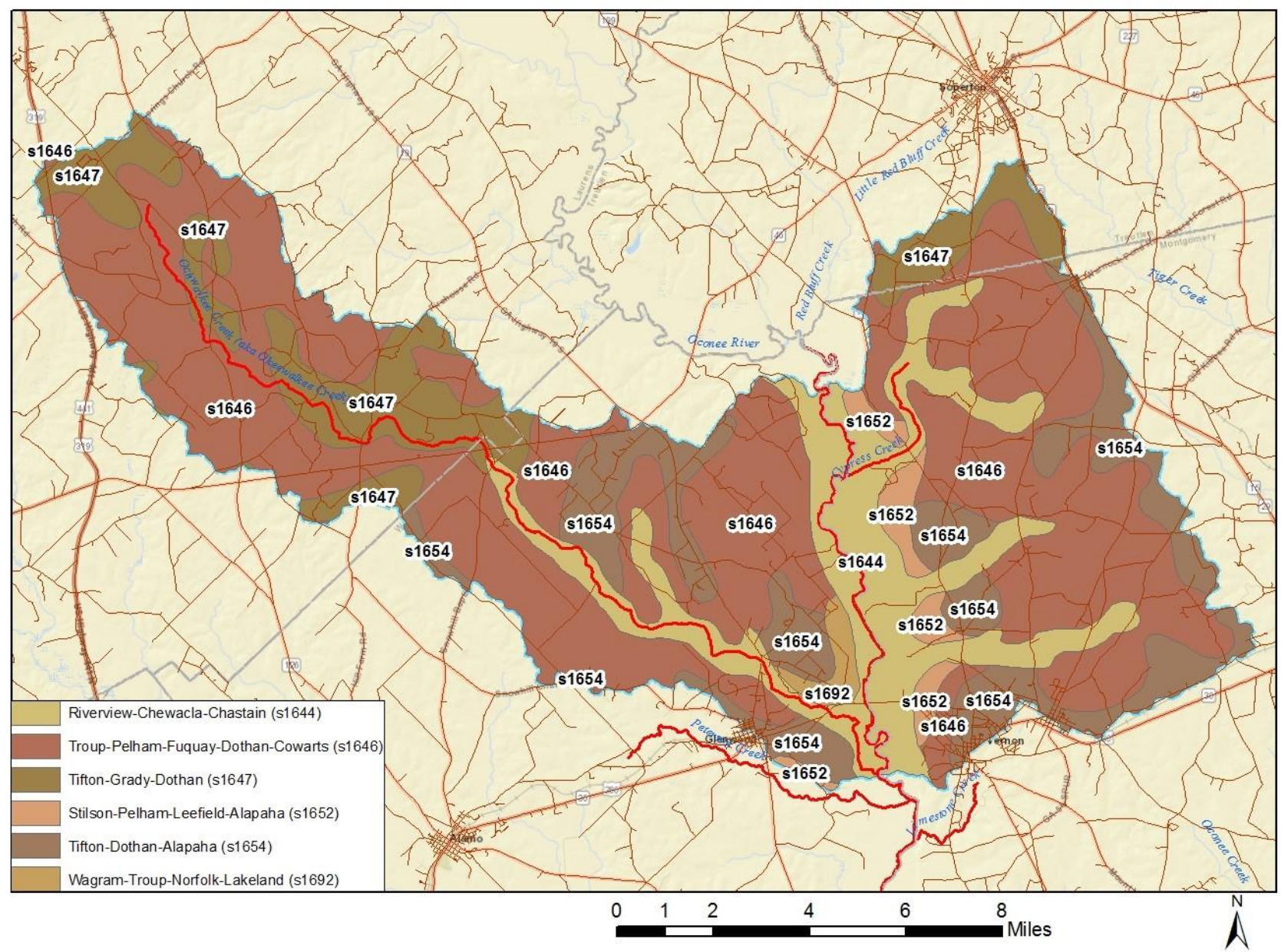


0 1 2 4 6 8 Miles



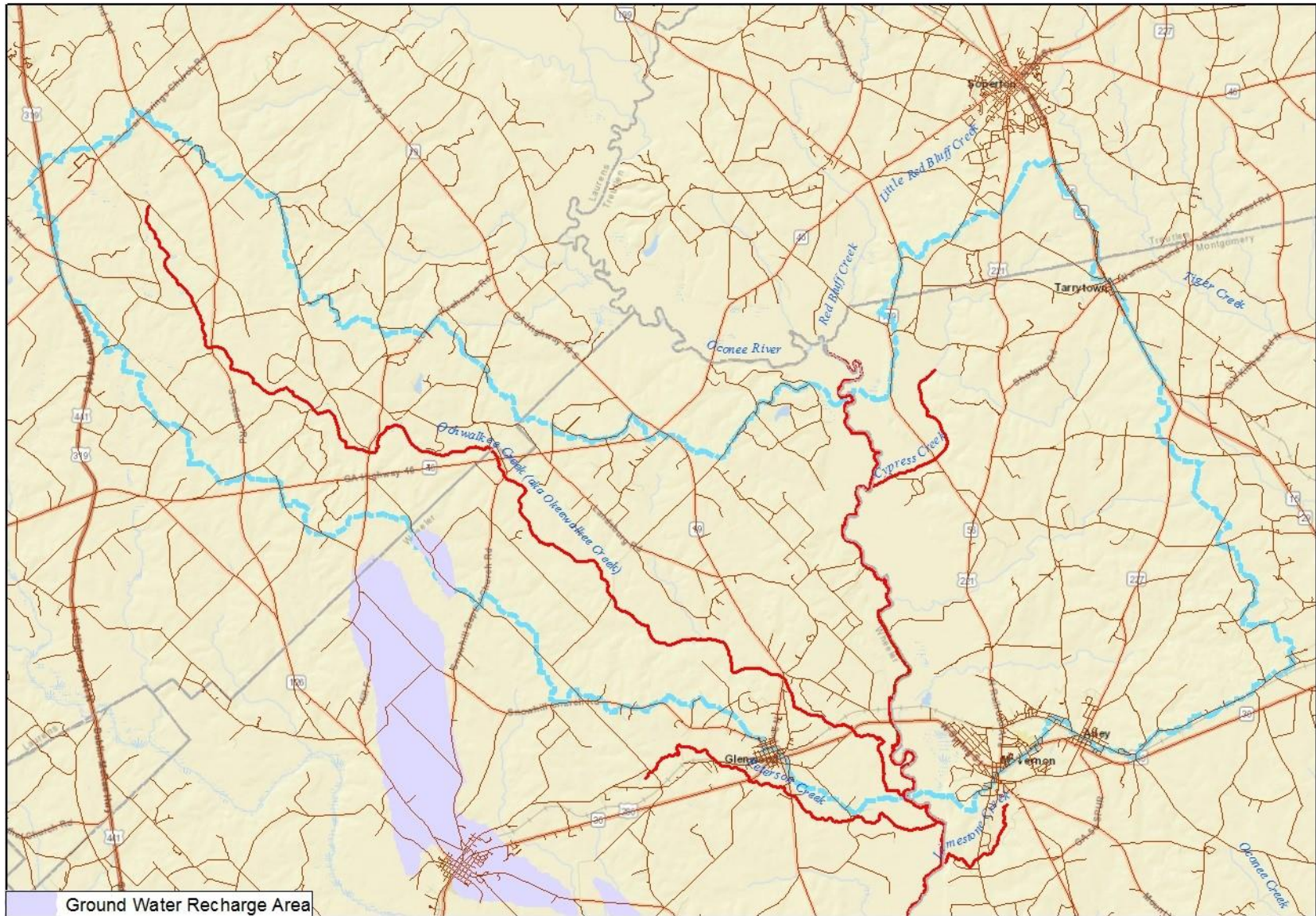
Map 3:

Ochwalkee Creek Soils



Map 4:

Ochwalkee Creek Groundwater Recharge Area

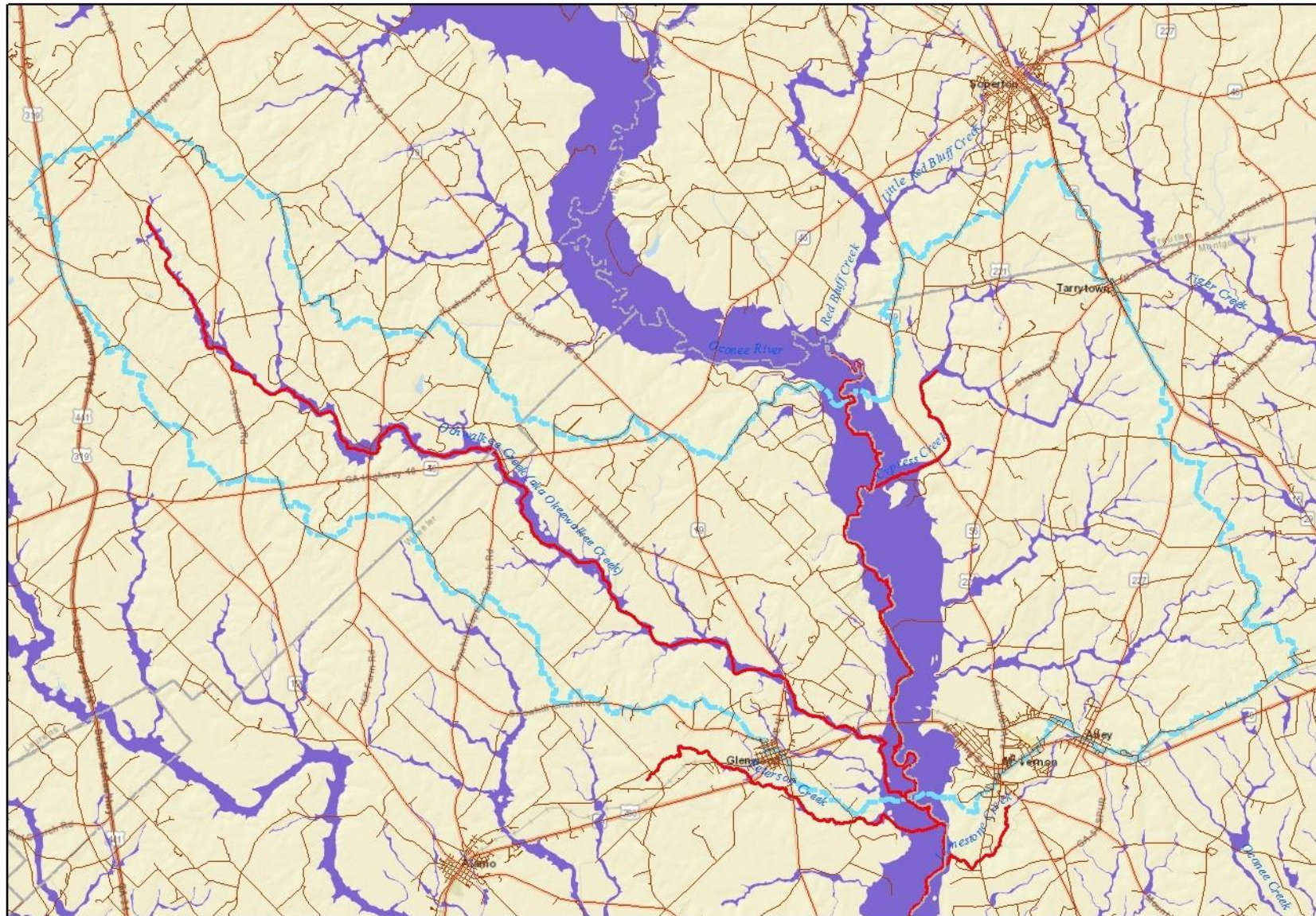


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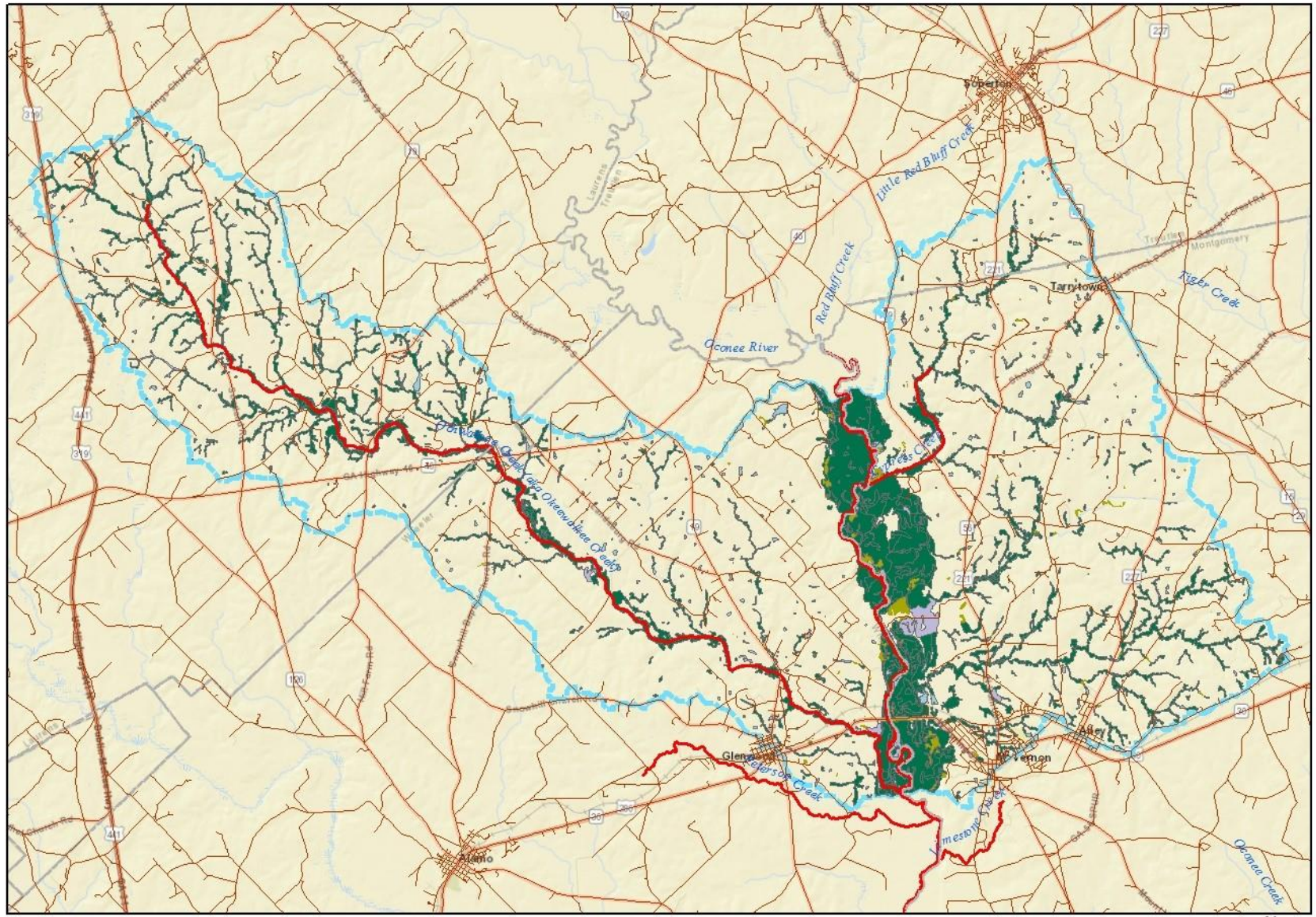
Map 5:

Ochwalkee Creek FEMA Floodplains



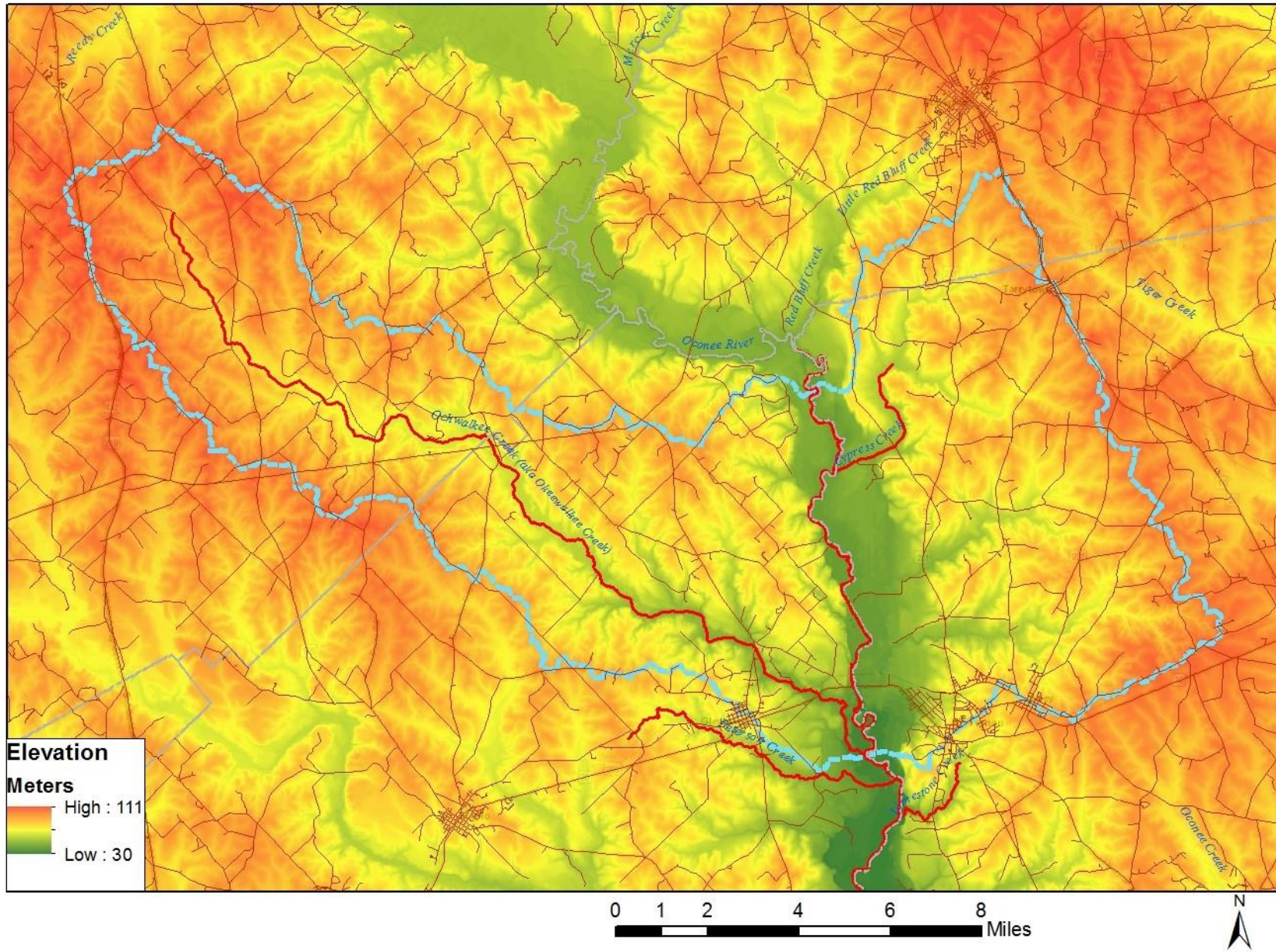
Map 6:

Ochwalkee Creek Wetlands



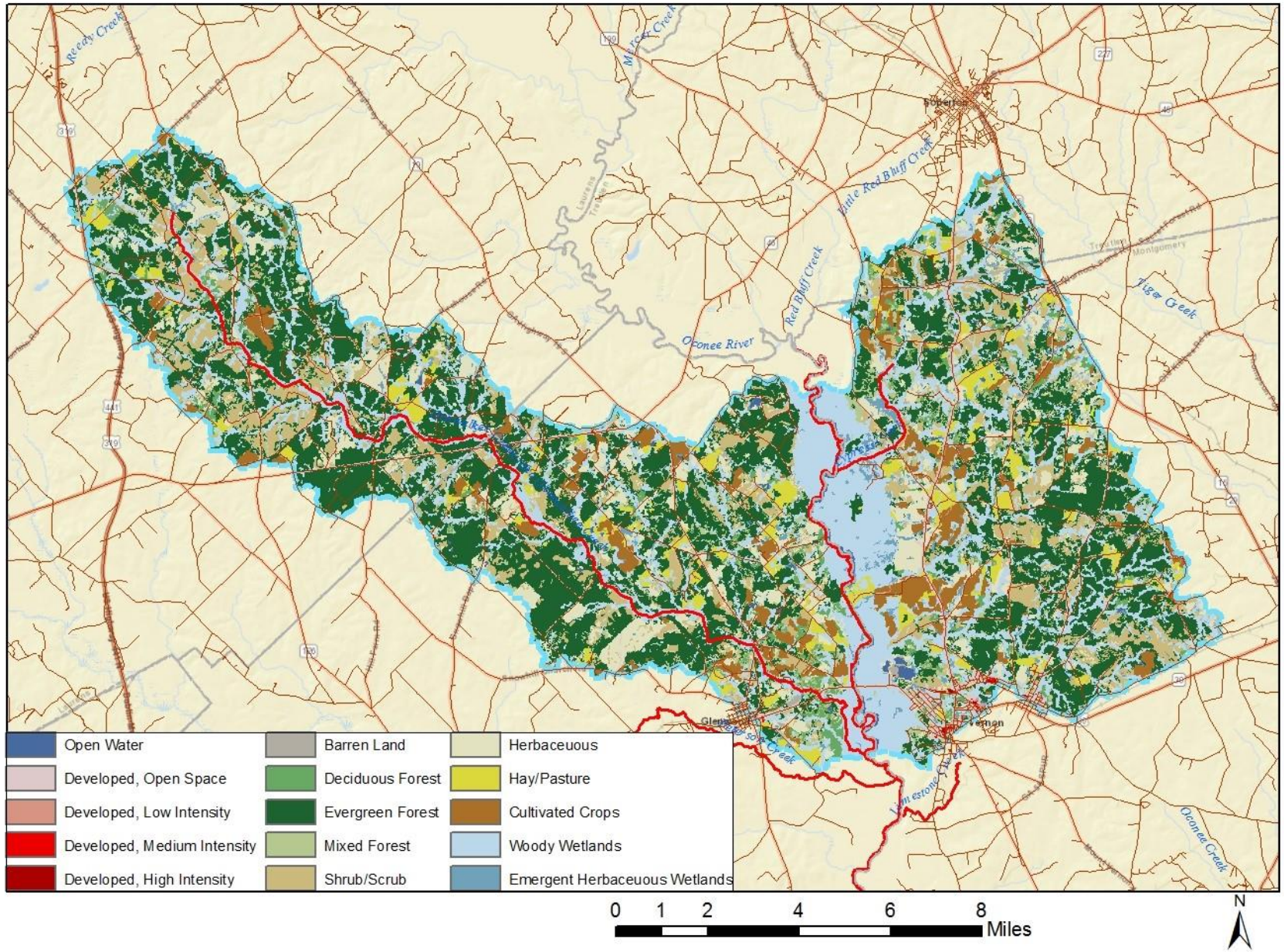
Map 7:

Ochwalkee Creek Elevation



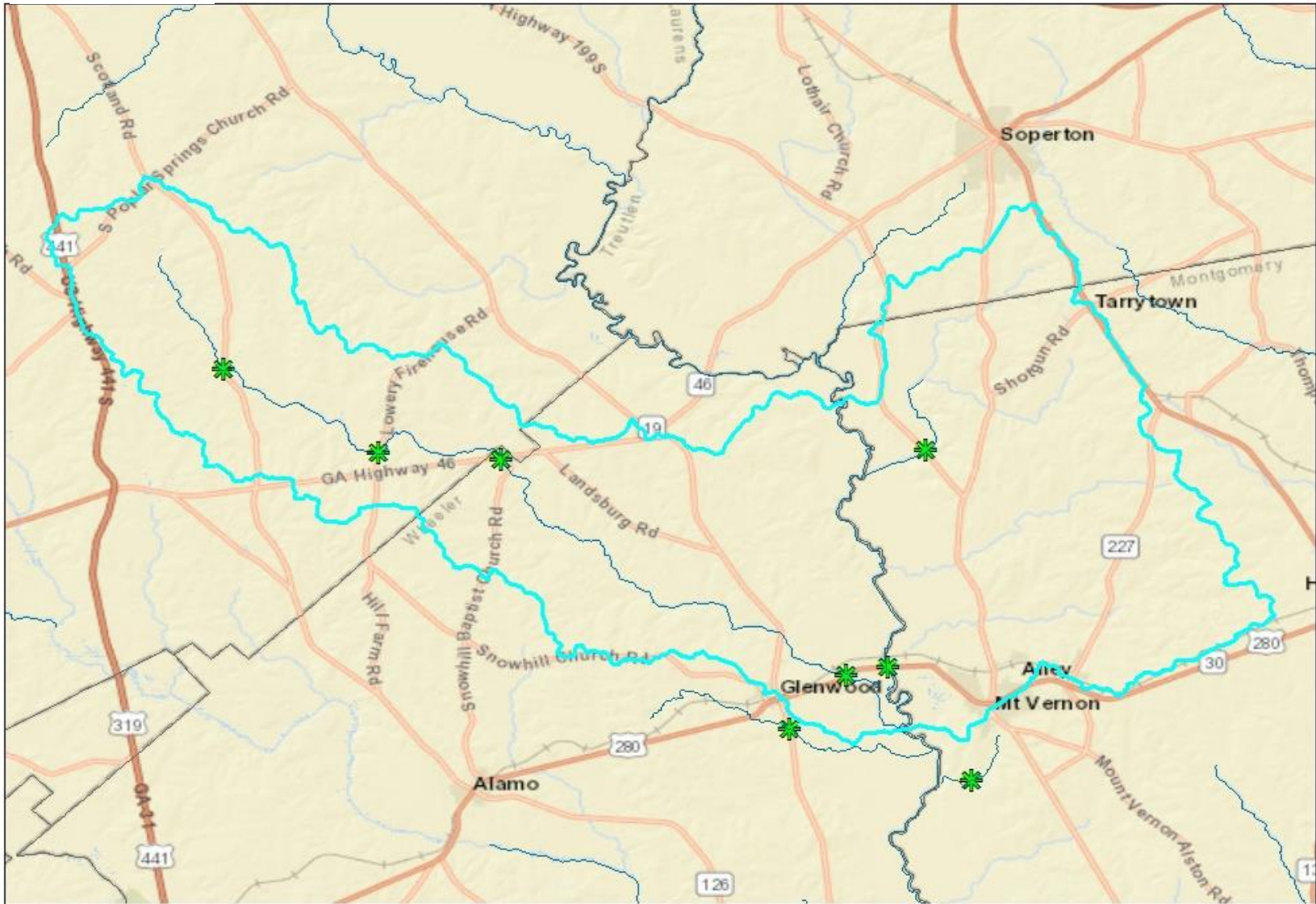
Map 8:

Ochwalkee Creek Land Cover



Map 9:

Ochwalkee Creek Monitoring Sites



 Monitoring Sites

0 0.5 1 2 3 4 Miles



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