Mulberry River Watershed Management Plan

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Acronyms and Abbreviations

AUDUBON/TOYOTA	Audubon/Toyota Together Green Grants
BMP	Best Management Practice
CDBG	US Housing and Urban Development, Community Development Block Grant
CWSRF	US EPA Clean Water State Revolving Fund
EMI	Engineering Management, Inc.
EPA EE	US EPA Environmental Education Grant
EQIP	Environmental Quality Incentives Program
FFA	Future Farmers of America
GA AAS	Georgia Adopt-a-Stream
GA EPD	Georgia Environmental Protection Division
GA WRD	Georgia Department of Natural Resources, Wildlife Resources Division
GAC	US EPA Office of Sustainable Communities Greening America's Communities Program
GACD	Georgia Association of Conservation Districts
GSWCC	Georgia Soil and Water Conservation Commission
HUC	Hydrologic Unit Code
JCWSA	Jackson County Water and Sewer Authority
LAS	Land Application System
NPDES	National Pollutant Discharge Elimination System
NRCS	USDA, Natural Resource Conservation Service, Watershed Protection and Flood Prevention Program
QA/QC	Quality Assurance/Quality Control
RMS	Resource Management Strategies
SWCD	Soil and Water Conservation District
TE	Georgia Department of Transportation, Transportation Enhancement Grant
TMDL	Total Maximum Daily Load
UOBWA	Upper Oconee Basin Water Authority

UOWN	Upper Oconee Watershed Network
US EPA	United States Environmental Protection Agency
USFWS	US Fish and Wildlife Service, Five Star Restoration Program
UWSG	US EPA Urban Water Small Grants Program
WAC	Watershed Advisory Committee

I. Introduction

The purpose of the Mulberry River Watershed Management Plan, HUC-10 #0307010102, is to provide a tool that demonstrates a holistic approach to water quality management by actively engaging stakeholders within the watershed in the selection of management strategies that will be implemented to solve identified problems.

This Plan builds on the Oconee River Basin Management Plan 1998 by supporting the following basin-wide goals, specifically:

- To facilitate local, state, and federal activities to monitor and protect water quality.
- Provide for education of the general public on matters involving the environment and ecological concerns specific to each river basin.
- To identify existing and future water quality issues, emphasizing nonpoint sources of pollution.
- To propose water quality improvement practices encouraging local involvement to reduce pollution, and monitor and protect water quality.
- To involve all interested citizens and appropriate organizations in plan development and implementation.

This Plan also builds on the Upper Oconee Regional Water Plan, June 2017, by supporting the following basin-wide goals, specifically:

- Promote alternatives and technologies that conserve, reuse, return, and recycle water within the Upper Oconee region.
- Educate stakeholders in the region on the importance of water quality and managing water as a resource including practices such as water conservation and increased water efficiency.
- Encourage the development of and accessibility to data and information to guide management decisions.
- Identify programs, projects, and educational messages to reduce non point source pollution to protect water quality in lakes and streams.

This Plan supports implementation of milestone activities in the 2014 Georgia Non-point Source Management Plan regarding green infrastructure, education, reduction of agricultural and urban non-point source pollution through implementation of best management practices, education and outreach, partnership development, and targeted water quality monitoring.

This document is not regulatory. Its preparation process engages stakeholders to recognize issues and provide feedback on how to deal with concerns, as well as to develop momentum and contribute to the restoration effort.

Achieving the goals and objectives of this Plan is the responsibility of State and federal agencies, local government, non-profit organizations, industry, and local citizens.

PLAN GOAL: Develop a nine-element watershed management plan (WMP) for the Mulberry River Watershed that:

- addresses water quality impairments in stream segments identified as not supporting their designated uses based on the 2016 Georgia Integrated 305(b)/303(d) List of Waters; and,

- identifies implementation policies and activities that will reduce impairments and improve water quality to meet targeted Total Maximum Daily Loads (TMDL) established by the Georgia Environmental Protection Division (EPD).

II. Stream Selection

The Mulberry River Watershed HUC-10 is comprised of five, HUC-12 subwatersheds:

- Upper Mulberry River (HUC-12 090701010201);
- Duncan Creek-Mulberry River (HUC-12 030701010202);
- Little Mulberry River (HUC-12 030701010203);
- Cedar Creek-Mulberry River (HUC-12 090701010204); and,
- Lower Mulberry River (HUC-12 030701010205).

Due to grant funding limitations and the absence of an impaired stream segment, the Little Mulberry River HUC-12 was not included in this Watershed Management Plan.

The Georgia Environmental Protection Division (GA EPD) has developed the following Total Maximum Daily Load (TMDL) Implementation Plans and TMDL Evaluation for impaired stream segments in the Mulberry River Watershed HUC-10 to address fecal coliform as well as a TMDL for sediment contamination.

- *Total Maximum Daily Load for Sediment in the Oconee River Basin*, February 2002.
- *Revised TMDL Implementation Plan for Sediment, Oconee River Basin*, 2003.
- *Revised TMDL Implementation Plan, HUC 0307010102, Mulberry River and Cedar Creek*, April 2003.
- *Total Maximum Daily Load Evaluation for Seventy-two Stream Segments in the Oconee River Basin for Fecal Coliform*, January 2007.

The TMDL establishes the allowable pollutant loadings or other quantifiable parameters for a water body based on the relationship between pollutant sources and instream water quality conditions. Water quality standards for fecal coliform and sediment limit the amount of pollution allowed to load into a river or stream. If a stream does not meet water quality standards, a TMDL is established for that pollutant. Implementation tools, such as watershed-based plans, are then developed

to reduce the pollutants loading into the stream from various (point and nonpoint) sources and restore the water body so that it meets water quality standards.

The GAEPD's 2016 Integrated 305(b)/303(d) List of Waters identifies two stream segments in the study area as not meeting water quality standards for fecal coliform and sediment biota (macroinvertebrates) and one segment not meeting standards for fecal coliform.

- Cedar Creek (Headwaters to Winder Reservoir), 4 miles in Barrow County, fecal coliform impairment;
- Mulberry River (Mulberry Creek to Little Mulberry River), 9 miles in Hall, Jackson & Barrow Counties, fecal coliform and biota macroinvertebrates (sediment) impairment; and,
- Mulberry River (Little Mulberry River to Middle Oconee River), 18 miles in Barrow & Jackson Counties, fecal coliform and biota macroinvertebrates (sediment) impairments.

According to GA EPD, the above-identified streams have a designated use of fishing. The 2007 TMDL Evaluation for the Oconee River Basin, which includes the Mulberry River Watershed HUC-10, determined that the following load reductions were required to meet State water quality standards for fecal coliform:

- Cedar Creek (Headwaters to Winder Reservoir), 95 percent;
- Mulberry River (Mulberry Creek to Little Mulberry River), 75 percent; and
- Mulberry River (Little Mulberry River to Middle Oconee River), 73 percent.

Wildlife, agricultural livestock, and urban development were identified as typical sources of non-point source fecal coliform contamination in the Oconee River basin, although no specific sources were identified for the Mulberry River watershed.

The 2003 Revised TMDL Implementation Plan for Sediment for the Mulberry River and Cedar Creek noted that a previous TMDL for sediment prepared by the US Environmental Protection Agency (US EPA) concluded that most of the sediment-

induced impairment to habitat was due to legacy sediments from prior agricultural activities. However, the report noted that the Middle Mulberry River required a 12 percent reduction in sediment load. Though not mapped in the Revised TMDL Implementation Plan, it is presumed that the Middle Mulberry River is the entire segment of the Mulberry River from Mulberry Creek to its confluence with the Middle Oconee River.

Four stream segments in the study area meet water quality standards. Those segments are:

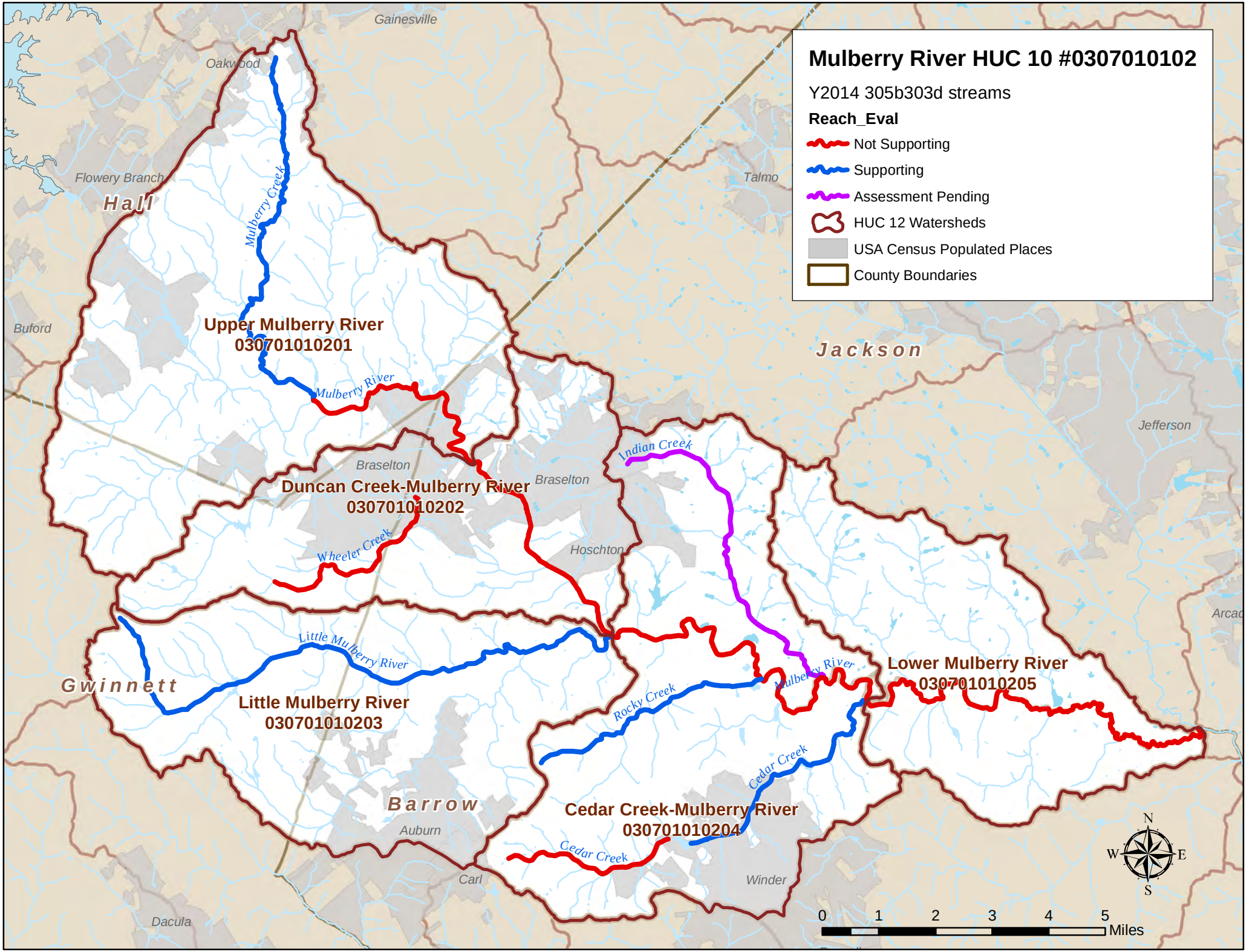
- Cedar Creek below the Winder Reservoir;
- Indian Creek (Headwaters to Mulberry River);
- Rocky Creek; and,
- Upper Mulberry River (Headwaters to Mulberry River).

Based on a review of existing Evaluations and TMDL Implementation Plans, the Watershed Advisory Committee (WAC) defined the following objectives that could lead to successful goal attainment of this Plan.

OBJECTIVES:

- Develop long-term monitoring to provide current data to support decision-making.
- Identify potential contaminant sources.
- Implementation of stabilization and management practices to reduce fecal coliform and sediment contamination from identified sources.
- Promotion of public awareness, understanding, and stewardship through public education and training opportunities for the general population, courts, and government agencies, and providing readily available technical and information-based resources.
- Establish a framework for long-term implementation of the Watershed Management Plan.

As the Watershed Management Plan was developed, specific actions were identified and designed to meet the specific objectives thus insuring that the proposed actions could objectively achieve the goals of the Mulberry River Watershed Management Plan.


Mulberry River HUC 10 #0307010102
Y2014 305b303d streams
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Not Supporting
Supporting
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HUC 12 Watersheds
USA Census Populated Places
County Boundaries
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Duncan Creek-Mulberry River
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Little Mulberry River
030701010203
Cedar Creek-Mulberry River
030701010204
Lower Mulberry River
030701010205
Mulberry Creek
Mulberry River
Wheeler Creek
Little Mulberry River
Indian Creek
Rocky Creek
Cedar Creek
Gainesville
Oakwood
Flowery Branch
Hall
Buford
Talmo
Jackson
Jefferson
Braselton
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III. Formation of a Watershed Advisory Committee

This Plan's development relied upon the participation of a Watershed Advisory Committee (WAC) which represented the Mulberry River watershed and consisted of major property owners, elected officials and staff from watershed cities and counties, homebuilders, farmers, and state and federal agencies that would assist with plan implementation. Four meetings (July 31, 2017, October 30, 2017, January 29, 2018, and April 30, 2018) were held with the WAC to engage the public in the process of designing an implementation plan. Meetings focused on gathering input concerning potential problems and solutions, developing priorities, evaluating what BMPs may be met with the best public reception, and obtaining insight on the watershed management plan. Finally, approval was sought for the document to serve as the plan on which implementation efforts will follow to restore and maintain the watershed.

IV. Source Assessment

Based on the TMDL Evaluations, TMDL Implementation Plans, current water quality monitoring, visual survey, land use, tax assessor data, and WAC input, the potential causes of water quality impairment were determined as follows:

- Fecal Coliform
  - Agricultural livestock, particularly with access to streams
  - Urban/Stormwater runoff
  - Leaking septic systems/Illicit connections

- Sediment
  - Legacy sediment
  - Urban development/Stormwater runoff
  - Streambank erosion
  - Destruction of vegetative stream buffers
  - Inadequate compliance and enforcement of Erosion and Sedimentation Ordinance

V. Assessment and Characterization of Current Conditions

Overview

The four HUC-12 subwatersheds included in this study contain a total of 80,832 acres of primarily agricultural, forested, and urbanized land in portions of Barrow, Gwinnett, Hall, and Jackson counties and portions of the cities of Braselton, Hoschton, Auburn, Winder, and Flowery Branch. See HUC-12 Base Map.

Acreage for each of the HUC-12 subwatersheds is as follows:

- Upper Mulberry (27,116 acres);
- Duncan Creek - Mulberry River (15,654 acres);
- Cedar Creek - Mulberry River (23,315 acres); and,
- Lower Mulberry River (14,745 acres).

The Mulberry River's headwaters are located in Hall County. From there, it meanders south-southeast through urbanized and urbanizing areas in the upper half of the watershed to rural areas in the lower portion of the watershed. The river is fed by numerous 1st and 2nd order tributaries. Major tributaries include Wheeler Creek, Little Mulberry River, Rocky Creek, Cedar Creek, and Indian Creek.

Within the study area, there are four stream segments identified in Georgia's 305(b)/303(d) list as not supporting their designated use of fishing due to non-point source fecal coliform and sediment (biota) contamination. The designation of these segments as "not supporting" due to fecal coliform contamination is based on sampling data from 2004 at Georgia Department of Natural Resources, Environmental Protection Division's (GA EPD) sampling stations located at the following sites:

- Cedar Creek headwaters to Winder Reservoir;
- Little Mulberry River at Boss Hardy Road;
- Mulberry River at Highway 11; and,
- Mulberry River at Old Covered Bridge Road.

The sediment (biota) contamination designation resulted from GA EPD-collected data in 1998-2001. Georgia does not have a numeric water quality standard for the protection of aquatic organisms (biota) due to sediment. Therefore, utilizing the collected data, the US Environmental Protection Agency (EPA) derived a numeric interpretation of the State's narrative water quality standard for sediment necessary to protect aquatic organisms.

Climate

The Mulberry River watershed is located along the transition zone between the Mountain and Inter-mountain Plateau and the Piedmont Plateau. The area is a temperate climate with warm summers and moderately cold winters. Average annual precipitation is 50 - 55 inches per year. Precipitation occurs chiefly as rainfall, and to a lesser extent, as snowfall. Rainfall is fairly evenly distributed throughout the year, but a distinct dry season occurs from midsummer to late fall. Rainfall is usually greatest in March and October.[1]

Habitat

This watershed's ecosystem provides habitat for diverse species of aquatic and terrestrial wildlife including white-tailed deer, opossum, raccoon, a variety of songbirds, fox, horned owl, timber rattlesnake, turtle, frog, salamanders, and a variety of fish.

Wildlife

According to the Georgia Department of Natural Resources, Wildlife Resources Division (GA WRD), the impact of wildlife on fecal coliform contamination varies widely. The animals that spend a large portion of their time in or around aquatic habitats are the most important wildlife sources of fecal coliform. Waterfowl, most notably ducks and geese, are considered to potentially be the greatest contributors of fecal coliform. This is because they are typically found on the water surface, often in large numbers, and deposit their feces directly into the water. Other potentially important animals regularly found around aquatic environments include racoons, beavers, muskrats, and to a lesser extent, river otters, and mink. Population estimates of these animal species in Georgia are not available.

[1]Soil Survey of Barrow, Hall, and Jackson Counties Georgia, USDA Soil Conservation Service, 1977.

White-tailed deer have a significant presence in the watershed with an estimated 2004 population of 50 deer per square mile in Jackson County and 35 per square mile in Barrow, Hall, and Gwinnett counties. According to GA WRD, fecal coliform bacteria contributions to water bodies from deer are generally considered less significant than that of waterfowl, racoon, and beaver due to a greater portion of their time being spent in terrestrial habitats. This is also true for other terrestrial mammals such as squirrels and rabbits, and terrestrial birds. While feces deposited on the land surface can result in the introduction of fecal coliform to streams during runoff from storm events, in the warm, humid environments typical of the southeast, there may be considerable decomposition of the fecal matter thus resulting in a decrease in the associated fecal coliform numbers introduced to streams during runoff from storm events by terrestrial mammals.

Physical and Natural Features

Topography

The watershed is within the upper fringes of the Piedmont Plateau. The Plateau is a series of prominent hills near the base of the mountains and larger streams that changes to flat topped, undulating hills toward its southern reach. Elevations in the watershed are gently sloping and range from 672 feet to 1328 feet.

Drainage patterns are dendritic; streams form in higher elevations in V-shaped valleys and generally flow southward.

Streambanks

Throughout the study area, streambanks are generally steep and streambank erosion is extensive, particularly in the developed areas. Streambank erosion occurs where streams begin cutting deeper and wider channels as a consequence of increased peak flows or the removal of local protective vegetation. Some streambank segments in the agricultural areas are

impacted and can be attributed to livestock access to water and stream buffer destruction due to agricultural practices. However, the greater proportion of eroded streambanks are in the developed areas and are primarily the result of stormwater runoff and to a lesser extent, streambank destruction. The impact of sediment pollution is substantial and includes:

- Increased flooding;
- Reduced reproduction of aquatic organisms;
- Habitat destruction impacting fish, plants, and other organisms; and,
- Increased drinking water treatment costs.

Braselton is experiencing accelerated erosion along its portion of the Mulberry River north of Liberty Church Road in Barrow County. Stream bank erosion is threatening the Town's Riverwalk and existing utilities, including a sewer outfall line, pump station, three drinking water supply wells with well houses, raw waterlines, underground power and fiberoptic cable, and its centralized water treatment system.

In response, Braselton has initiated a project to evaluate the baseline geomorphic conditions of approximately 5,300 LF of the Mulberry River to identify and prioritize areas of accelerated erosion that may be threatening the long-term structural integrity of the adjacent utilities, and prevent further land loss and damages to the Town's existing infrastructure. A stream restoration plan using natural channel design techniques will target stabilization and will utilize rock cross vanes, j-hooks, and bioengineering to help redirect stream flows away from eroding banks and thus reduce near bank sheer stress. The proposed design will include the construction of bankfull benches on both sides of the Mulberry River, providing a new flood prone area at a lower elevation. Design plans will also include a recommended planting plan. The project was initiated in February 2017 with an estimated completion date of May 2019.[2] The estimated project cost is $1,500,000 or $250 per linear foot.

Stream Buffers

Buffers provide food and cover for wildlife and aquatic organisms, aid in flood protection, and protect channel banks from scour and erosion. To help protect water quality, the State of Georgia mandates wooded stream buffers of at least 25' on each side of the stream bank. Local jurisdictions may require additional buffers. Activities, not otherwise exempt from buffer

[2]Town of Braselton, Mulberry River Stream Restoration Project, EMI, October 30, 2017.

requirements under State law, must comply with minimum stream buffers unless a variance is granted by GA EPD. The WAC expressed frustration with GA EPD granting stream buffer variances without any consultation with the local jurisdiction. Typically, development applicants obtain the variance from GA EPD before the development application is submitted to the local jurisdiction putting substantial pressure on the local jurisdiction to grant a variance to local buffer requirements. Despite the pressure, some local variance requests are denied.

Wooded buffers are adequate throughout much of the Mulberry River watershed, along the main channel as well as its tributaries. However, some non vegetative stream buffers are found in the Lower Mulberry River HUC-12. See Stream Buffer Map.

Soils

The Mulberry River HUC-10 watershed is located in the Southern Piedmont Major Land Resource Area and is underlain primarily by granite and gneiss. Dominant soils in the area have a fine sandy loam surface layer and a deep, red clayey subsoil and consist of the following soils:

- Cecil, generally found in the uplands on broad plateaus, on ridgetops, and on hillsides.
- Pacolet, generally found on moderately long or short hillsides that are mainly adjacent to drainageways.
- Appling, generally found on medium to narrow ridgetops and moderately long hillsides.
- Gwinnett, generally found on moderately broad ridgetops and sloping side slopes along drainageways.

Throughout the watershed, most soils are well-drained. Those that are not are typically found along drainageways and streams.

The following table depicts the Mulberry River HUC-10 River watershed generalized soils and provides a general description of the soil associations found in the watershed. See Soils Map.

Mulberry River HUC-10 Watershed Soils			
Soil Series	Acres	Percent	Characteristics
Cecil	22378.37	22.30	well drained
Pacolet	21074.72	21.00	well drained
Appling	16568.74	16.51	well drained
Gwinnett	10958.36	10.92	well drained
Madison	5655.77	5.64	well drained
Louisburg	5638.28	5.62	well drained to excessively drained
Chewacla	4323.94	4.31	somewhat poorly drained
Musella	3552.23	3.54	well drained
Wedowee	3060.00	3.05	poorly drained
Toccoa	2500.35	2.49	well drained
Cartecay	1278.08	1.27	moderately well drained to somewhat poorly drained
Wet	1118.25	1.11	NA
Hiwassee	650.41	0.65	well drained
Wickham	381.00	0.38	well drained
Augusta	361.30	0.36	somewhat poorly drained
Altavista	257.38	0.26	moderately well drained
Chestatee	214.64	0.21	well drained
Wilkes	178.78	0.18	well drained to somewhat excessively drained
Worsham	101.77	0.10	poorly drained
Other-Altered	86.44	0.09	NA
Wehadkee	9.36	0.01	poorly drained
Helena	1.67	0.00	somewhat poorly drained to moderately well drained

Source: Soil Survey of Gwinnett County, USDA NRCS, July 1967; Soil Survey of Barrow, Hall, and Jackson counties, 1977.

Flooding

Extensive flood zones are located throughout most of the impaired segments of the Mulberry River. Flood zones on the River's tributaries (Indian Creek, Rocky Creek, Cedar Creek) are far less extensive and generally narrower. See Flood Map.

Water Resources

Hydrology

The study area includes the following resources:

- Upper Mulberry HUC-12: 115.35 stream miles; 113.61 acres lake; 5442.85 acres wetlands.
- Duncan Creek HUC-12: 71.25 stream miles; 90.05 acres lake; 563.69 acres wetlands.
- Cedar Creek HUC-12: 81.48 stream miles; 152.62 acres lake; 1000.72 acres wetlands.
- Lower Mulberry HUC-12: 58.17 stream miles; 76.23 acres lake; 1030.32 acres wetlands

Groundwater Recharge Areas and Pollution Susceptibility

Groundwater is among the Nation's most important natural resources. It provides drinking water to urban and rural communities, supports irrigation and industry, sustains the flow of streams and rivers, and maintains riparian and wetland ecosystems. In many areas of the Nation, the future sustainability of groundwater resources is at risk from over use and contamination. Because groundwater systems typically respond slowly to human actions, a long-term perspective is needed to manage this valuable resource. It is therefore essential to the health, safety, and welfare of the public that the quality of subsurface public drinking water is maintained.

Groundwater resources exist in underground reservoirs known as aquifers. These aquifers are zones of rock beneath the earth's surface that are capable of providing water for a well. They occupy vast regions of the subsurface and are replenished by infiltration of surface water runoff in zones at the surface, known as groundwater recharge areas. Groundwater is susceptible to contamination when development occurs within groundwater recharge areas. Certain land use activities, such as septic tanks, underground tanks, and chemical spills, pose a significant threat to the quality of groundwater supplies. Therefore, it is necessary to manage land uses within groundwater recharge areas in order to ensure that pollution threats and development impacts are minimized.

The Georgia Department of Natural Resources mapped areas of high, average (or medium), and low susceptibility of groundwater to pollution in Georgia. This map is commonly known as Hydrologic Atlas 20 or the Groundwater Pollution

Susceptibility Map of Georgia. The Mulberry River watershed is located in a "low" groundwater pollution susceptibility area. However, within a pollution susceptibility area are also significant groundwater recharge areas. These areas are mapped on the Hydrologic Atlas 18 or the Groundwater Recharge Area Map of Georgia. (See Groundwater Recharge Area map.) Four groundwater recharge areas are located in the Mulberry River HUC-10 watershed, one of which intersects an impaired segment, Cedar Creek upstream of the Winder reservoir.

The significant groundwater recharge areas in the watershed are subject to pollution from spills, discharges, leaks, impoundments, applications of chemicals, injections and other human activities in the watershed. Once in the aquifer, pollutants can spread uncontrollably to other parts of the aquifer thereby degrading water quality for an entire region. Once polluted, it is almost impossible for a groundwater source to be cleaned up.

Wetlands

Extensive wetlands are primarily found in the Cedar Creek-Mulberry River and Lower Mulberry River HUC-12s adjacent to the Mulberry River, and, to a lesser extent, along its tributaries. See Wetlands Map.

Land Use and Demographics

Land Use

The predominant existing land use in the HUC-10 watershed is residential, 37.6%, and agriculture/forestry, 37.5%. Urbanized land accounts for 47.6 percent and is concentrated in the cities and the upper half of the watershed. Urbanized land includes commercial, industrial, public/institutional, residential, and transportation/communication/utilities.

Existing Land Use, Mulberry River Watershed HUC-10, 2015		
LAND USE	Acres	Percent
Agriculture/Forestry	37,658.97	37.5%
Commercial	3,192.15	3.2%
Industrial	2,886.26	2.9%
Parks/Recreation/Conservation	4,218.44	4.2%
Public/Institutional	3,437.01	3.4%
Residential	37,724.93	37.6%
Transportation/Communication/Utilities	489.35	0.5%
Undeveloped	4,821.77	4.8%
sum of land use	94,428.87	94.1%
public right of way	5,920.60	5.9%
Total Acreage of Watershed	100,349.47	

Source: Parcel data obtained from Barrow, Gwinnett, Hall and Jackson Counties.
Land uses determined using parcel attribute table data visually checked against 2015 NAIP aerial imagery.

Future Land Use (Character Area)

There are a total of 23 character areas in the HUC-10 watershed based on Comprehensive Plans for each of the four counties in the watershed. For purposes of this Watershed Plan, the 23 character areas were simplified into four general classifications:

- Urban/Urbanizing
- Residential/Suburban
- Rural
- Conservation

The Urban/Urbanizing class includes areas identified as Commercial Corridor, Downtown/Town Center, Traditional Neighborhood, and also incorporated areas. These areas currently include or are planned to include higher intensity commercial/industrial uses, mixed use, as well as small lot subdivisions and multi-family residential. Urban/Urbanizing areas are served or planned to be served by sanitary sewerage infrastructure.

The Residential/Suburban class includes areas designated as existing or emerging suburban. These areas include large lot subdivisions and estate sized parcels, generally not served by sanitary sewer infrastructure. There are numerous exceptions, especially in Gwinnett County, where small lot subdivisions have been allowed by using lift stations and lengthy sewer force mains to connect to treatment facilities.

The Rural class includes the Rural Estate designation in Gwinnett County, the Rural Reserve designation in Barrow County, and the Rural and Agriculture/Vacant designations in Jackson County. The Hall County map has no designated rural areas. The rural class is not served by sanitary sewer and is characterized by larger land holdings with some agriculture/forestry.

The Conservation class includes areas designated Preserve or Conservation and are further defined by being in public ownership as a park or open space. A significant exclusion from the Conservation class is the 1,900 acre tract south of Hoschton which was reclassified from conservation to rural for purposes of this Plan since it is not under any form of public ownership, and is currently being considered for annexation into Hoschton with the anticipation of a mixed use development.

Each of the comprehensive plans used to develop the future land map for this Plan has a different planning horizon, therefore, it is impossible to offer more than a generalized statement concerning the impact of future development on the watershed. However, conservative estimates show that for the period 2025-2030, 78% of the watershed will be urban/urbanizing areas primarily comprising residential, commercial, and industrial land uses with a majority of the land conversion in the upper half of the watershed. The lower half will retain some agricultural/forestry uses (rural) in addition to urban/urbanizing areas.[3] See Future Land Use maps.

[3] Future Development Map - 2007-2017, Barrow County Comprehensive Plan Update; Future Development Map - 2030 Gwinnett County Unified Plan; Future Development Map - 2017-2037 Hall County Comprehensive Plan; 2025 Character Area Map - 2015 Jackson County Comprehensive Plan.

Future Land Use (Character Areas)

Mulberry River HUC-10,				
Character Areas	Acres	Character Class - Summary	Total Acres	Percent
COMMERCIAL CORRIDOR	263.23	URBAN/URBANIZING*		
DOWNTOWN/TOWN CENTER	87.33			
EMPLOYMENT & INDUSTRIAL	1,183.26			
INCORPORATED	7,414.56			
MIXED USE	171.79			
PUBLIC	223.63			
QUARRY	618.48			
TRADITIONAL NEIGHBORHOOD	394.97			
TRANSITION CORRIDOR	157.85			
URBAN	4,312.78			
UTILITIES	355.04			
WEST WINDER BYPASS IMPACT CORRIDOR	275.93			
	15,458.85		15,367.10	15%
EMERGING SUBURBAN	16,969.46	RESIDENTIAL/SUBURBAN*		
EXISTING/EMERGING SUBURBAN	11,781.58			
RESIDENTIAL	18,296.97			
SUBURBAN	6,238.24			
SUBURBAN NEIGHBORHOOD	10,077.47			
	63,363.72		63,455.46	63%
AGRICULTURE/VACANT	7,863.79	RURAL**		
RURAL	2,740.04			
RURAL ESTATE AREAS	4,007.42			
RURAL RESERVE	3,917.47			
	18,528.72		20,457.33	20%
CONSERVATION	2,762.89	CONSERVATION**		
PRESERVE	235.65			
	2,998.54		1,069.93	1%
* City of Auburn areas designated 'Incorporated' in Gwinnett County switched from Urban to Residential/Suburban				
** 1,900 acre tract south of Hoschton switched from conservation to rural class				

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Upper Mulberry River HUC-12 #030701010201			
Character Area		Acres	Percent
	CONSERVATION	833.69	3%
	RESIDENTIAL/SUBURBAN	22,390.16	83%
	RURAL	111.31	0%
	URBAN/URBANIZING	3,782.48	14%
		27,117.64	
Duncan Creek - Mulberry River HUC-12 #030701010202			
Character Area		Acres	Percent
	CONSERVATION	12.74	0%
	RESIDENTIAL/SUBURBAN	8,816.46	56%
	RURAL	1,262.99	8%
	URBAN/URBANIZING	5,563.14	36%
		15,655.33	
Cedar Creek - Mulberry River HUC-12 #030701010204			
Character Area		Acres	Percent
	CONSERVATION	202.02	1%
	RESIDENTIAL/SUBURBAN	10,776.61	46%
	RURAL	8,680.26	37%
	URBAN/URBANIZING	3,658.62	16%
		23,317.51	
Lower Mulberry River HUC-12 #030701010205			
Character Area		Acres	Percent
	CONSERVATION	0	0%
	RESIDENTIAL/SUBURBAN	7,281.73	49%
	RURAL	6,140.66	42%
	URBAN/URBANIZING	1,323.60	9%
		14,745.99	

Demographics

From 2015 - 2030, each of the four counties in the HUC-10 watershed will continue to see substantial growth with the greatest population growth in Barrow County. No population data exists solely for the Mulberry River HUC-10 watershed.

Total Population and Percent Change, 2015 - 2035							
	2015	State Rank	2020	2025	2030	State Rank	Percent Change (2020-2035)
Barrow	75370	31	87355.2	100036.2	114080.8	19	51.35%
Gwinnett	895823	2	985396.2	1079546.2	1176845.4	2	31.37%
Hall	193535	12	210467.6	227477.8	244958.4	10	26.57%
Jackson	63360	37	69769.8	76413.6	83313.2	30	31.49%

Source: Georgia Data, 2017. https://georgiadata.org/data/data-tables.

Agriculture

Agricultural land in the watershed covers 37,658.97 acres, or 37.5 percent of the watershed. The average farm size is 98 acres in Barrow County, 58 acres in Gwinnett County, 84 in Hall County, and 100 acres Jackson County. The majority of farms in three counties are between 10 and 179 acres, though in Gwinnett, farms are much smaller at 10-49 acres. Top products are poultry and cattle. See Active Agriculture Map.

Silviculture

The majority of soil erosion from forested land occurs during timber harvesting and the period immediately following, and during reforestation. Once the forest is reestablished, very little soil erosion occurs. Timber harvesting includes the layout of access roads, log decks, and skid trails, the construction and stabilization of these areas, and the cutting of trees.

According to the 2015 Georgia Forestry Commission Survey, statewide, correct implementation of forestry best management practices (BMPs) was 91.13 percent, a 1.20 percent improvement in BMP implementation from 2013. By ownership, the percentage of BMP implementation was 93.62 percent on corporate lands, 96.21 percent on public lands and 89.74 percent

on private lands. Of particular interest is the fact that the number of Water Quality Risks observed decreased from 100 to 63 for an improvement of 37% over 2013.[4]

LAS/NPDES Permits

Point sources are defined as discharges of treated wastewater to the river and its tributaries, regulated under the National Pollutant Discharge Elimination System (NPDES). These are divided into two main types—permitted wastewater discharges, which tend to be discharged at relatively stable rates, and permitted storm water discharges, which tend to be discharged at highly irregular, intermittent rates, depending on precipitation.

GA EPD implements a permit for land application systems (LAS); a nondischarging waste disposal system which is not intended to discharge treated effluent to surface waters. LAS are means of disposing liquid wastewater sludge that has gone through treatment process onto the land.

LAS permits regulate the disposal of wet manure and processed wastewater from new and existing animal feeding operations (AFOs) on a land treatment system within the State of Georgia for owners of existing, new, and expanding AFOs.

There are currently no operations in the study area that hold LAS permits.

Municipal wastewater treatment plants are among the most significant point sources regulated under the NPDES program in the Oconee River basin, which includes the Mulberry River HUC-10, as they account for the majority of the total point source effluent flow (exclusive of cooling water). These plants collect, treat, and discharge large volumes of treated wastewater into nearby surface waters (receiving streams). Pollutants associated with treated wastewater include pathogens, nutrients, oxygen-demanding waste, metals, and chlorine residuals.

[4]Results of Georgia's 2015 Silvicultural Best Management Practices Implementation and Compliance Survey, Georgia Forestry Commission, December 10, 2015.

NPDES permits in the watershed include:

- The Town of Braselton WPCP, municipal NPDES permit #GA0038857.
- The City of Hoschton WPCP, municipal NPDES permit #GA0035980.
- City of Winder, Cedar Creek WPCP, municipal NPDES permit #GA0038776.

Water Supply and Sewerage System

Within the watershed, public water supply systems include the Braselton, Hoschton, Winder, and Jackson County. See Water System map.

Treatment and Distribution System

Jackson County[5]. The Jackson County Water and Sewer Authority (JCWSA) is the public water provider in unincorporated Jackson County. The majority of the water supplied by the JCWSA is purchased from the Upper Oconee Basin Water Authority (UOBWA) from its Bear Creek Water Treatment Plant located immediately adjacent to its Bear Creek Reservoir located on Georgia Route 330 in southwest Jackson County. Raw water is pumped from the reservoir directly into the water treatment plant, where it is conditioned and filtered. The water is then chlorinated and pumped into JCWSA's water distribution system.

Braselton[6]. Braselton obtains water from a series of wells and purchases water on a wholesale basis from Barrow, Gwinnett, and Jackson counties.

Hoschton. Hoschton operates a municipal water system which is supplied by groundwater as well as the purchase of water from the City of Winder.

[5]Jackson County Comprehensive Plan, Community Facilities and Services, A Chapter of the Technical Appendix Community Assessment Revised, November 16, 2009.

[6]Town of Braselton, 2030 Comprehensive Plan.

Winder[7]. Winder holds surface water withdrawal permit #007-0303-01 which allows withdrawal of 6.7 mgd from the Mulberry River.

Sanitary Sewerage System

Public sewerage systems serve portions of Barrow, Gwinnett, Jackson, and Hall counties, the Town of Braselton, and the cities of Hoschton, Winder, and Flowery Branch.

Private Septic Systems

Private septic systems serve all development outside the public sanitary sewerage system service areas. County Boards of Health and the Geogia Department of Human Resources regulate the siting and installation of septic systems up to 10,000 gallon tank capacity. Larger systems are permitted by GA EPD. However, property owners are responsible for properly operating and maintaining the septic system to increase life expectancy and prevent failures.

No geographic areas with the study area are reported to have septic issues though periodic individual problems occur.

Impervious Surface

A significant portion of rainfall in forested watersheds is absorbed into soils (infiltration), is stored as ground water, and is slowly discharged to streams through seeps and springs. Flooding is less significant in these conditions because some of the runoff during a storm is absorbed into the ground, thus lessening the amount of runoff into a stream during the storm.

In natural landscapes such as forests and meadows, spongy soil and plant roots enable water to infiltrate the soil. Physical and chemical processes accomplished by microorganisms and plant roots help to filter and purify this water. Large volumes of water are stored in the soil and in wetlands. Sudden rainstorms in natural areas thus cause only a gradual change in the water level of streams. Evaporation of stored water also helps to cool the air in natural areas.

[7] List of Georgia EPD Non-Farm Surface Water Withdrawal Permits (Revised April 2018).

As watersheds are urbanized, much of the vegetation is replaced by impervious surfaces. Impervious surfaces are land surfaces that repel rainwater thereby reducing the area where infiltration to ground water can occur. Thus, more stormwater runoff occurs - runoff that must be collected by extensive drainage systems that combine curbs, storm sewers, and ditches to carry stormwater runoff directly to streams. More simply, in a developed watershed, much more water arrives into a stream much more quickly, resulting in an increased likelihood of more frequent and more severe flooding. Some natural surfaces can be relatively impervious, for example, compacted clay. However, for the most part this term refers to surfaces found in urban and suburban landscapes such as roads, parking lots, driveways, sidewalks, and roofs. Adding these surfaces to the landscape can alter the flow of rain water and streams.

Stream bank “blow out” from stormwater. Eroded bank is about 10' high.

Replenishment of groundwater through infiltration is important for maintaining a baseflow in streams throughout the summer. Impervious surfaces prevent much of the rainfall from replenishing the groundwater and this can cause the water table (the level of groundwater) to drop. During dry to normal conditions, a low water table may cause streams to dry up so they can no longer support fish and other aquatic species.

During storm events, the high velocity and high volume of runoff from impervious surfaces can overcome the capacity of streams. This can cause stream banks to "blow out" and erode the sides and bottom of the channel. Aquatic habitat is lost

and the resulting erosion carries sediment (sand, silt, mud) downstream. Excessive sediment from erosion can disrupt and destroy fish habitat and bury the habitat of bottom-dwelling plants and animals. Numerous examples of "blow out" exist throughout the watershed.

Toxic chemicals are often present on impervious surfaces, and are carried directly into streams, wetlands and the ocean. For example, oils and gasoline are leaked from vehicles; heavy metals are deposited from the atmosphere in industrial areas; pesticides and fertilizers are washed out onto streets and sidewalks.

The effect of imperious surfaces are substantial and include:

- Preventing the natural replenishment of groundwater, an important drinking water source in many areas;
- Greater and more frequent flooding due to the high velocity and high volume of water flowing off impervious surfaces;
- Destruction of stream channel characteristics (streamside vegetation, pools and meanders) that in a healthy system help to reduce the energy of the water;
- Property loss and damage due to erosion associated with increased stream flows;
- Habitat destruction;
- Increased cost to install and upgrade water infrastructure in order to accommodate the increased and large volumes of water that flow off impervious surfaces; and,
- Increased water treatment costs.

The greatest concentration of impervious surfaces are in the cities and the upper half of the HUC-10 watershed. (See Impervious Surface Map.) As development expands in the watershed, the amount of concentrated impervious surface will increase. Impervious surface includes not only paved or hard surfaces, but also graded surfaces as these soils are compacted during development. Although some erosion does occur naturally along every waterway, erosion problems have been exacerbated due to the short, dramatic bursts of increased flow volume and velocity associated with rain events in the urbanized areas.

Roads

Roads are a major source of stormwater runoff but have a varied impact on sedimentation, depending on their surface. Primitive, unimproved or soil surface roads have the greatest impact, with gravel or stone roads, the next greatest impact. Erosion from unpaved roadways can be a significant sediment source to creeks. Road erosion occurs when soil particles are loosened and carried from the roadway, ditch or road bank by water, wind, or traffic. There are limited unpaved roads in the study area; therefore, their impact on water quality is negligible.

Stormwater

Stormwater runs off solid surfaces, collecting pollutants such as oil, pesticides, sediments, bacteria, and other chemicals from those surfaces, and then deposits the pollutants into our waterways thus degrading water quality. Flooding increases as impervious surfaces replace natural vegetation, because water is unable to slowly filter into the landscape.

Stormwater deposits sediment thus decreasing the depth of waterways and further increasing the potential for flooding. During storms these pollutants are washed off and drain to storm drains and then directly into streams, rivers and lakes. Pollutant levels are typically much higher in the initial surface runoff of rainfall, commonly referred to as the "first flush." Some studies have found that approximately 90% of the pollutant loading is contained in the "first flush" of a one-inch rainfall. Therefore, effective water quality protection requires the treatment of the "first flush" through the use of various preventive and control measures. The Center for Watershed Protection's research has demonstrated that as little as 8 percent impervious coverage of a watershed can result in degradation of the water quality. At 25% impervious coverage, the waterways have lost most of their biological diversity and have significant impairments. A two-acre single home lot has about 12% impervious cover and a shopping center has over 90% impervious cover. Although low-density development reduces impervious surfaces in the development area, it leads to increased impervious surfaces elsewhere, because of more roads and parking that sprawling development required. Roads and parking lots can account for more than 60% of a low-density development's impervious area. Although large lawns might seem capable of absorbing runoff from adjacent surfaces, they are typically compacted by construction equipment and can generate up to 90% as much runoff as pavement.

Within the study area, stormwater runoff pollution is the result of not only the concentrated coverage of impervious surfaces but the failure to strictly enforce erosion and sedimentation ordinances. The town, cities, and counties in the study area

utilize conventional stormwater management infrastructure, infrastructure engineered to move the largest volume of water from a site as quickly as possible, collecting surface runoff in subsurface structures (e.g., storm drains, pipes, ditches). For the purpose of protecting the public from the effects of flooding. The streams that receive runoff from these newly developed areas respond through increases in channel width and depth in order to compensate for the increases in impervious areas, causing erosion and property loss. This is because more water is carried directly to the streams as less water is absorbed into the ground from the impervious surface increase. A stream channel will naturally adjust to the volume, intensity and duration of water it receives.

Historically, stormwater swales and basins are the most common approach used for managing peak runoff rates from developed areas. Swales simply convey stormwater runoff to offsite locations and are only adequate for small drainage areas. Detention basins do an effective job of addressing flood protection requirements by detaining larger volumes of runoff from high levels of impervious surfaces. Unfortunately, sole reliance upon basins to manage stormwater has proven to be ineffective to protect water resources.

Reliance on stormwater basins and swales to manage runoff problems has led to water quality and altered urban hydrology. Common stormwater basin designs were typically targeted for a single large storm such as a 10- 25- 50- or 100-yr event. The majority of smaller, more frequent storm events aren't handled as effectively because they were not considered as part of the flood control design and are typically passed through the treatment structure. These more frequent and smaller storms have tremendous stream channel forming capacities and the ability to alter channel dimensions and also affect the availability and condition of aquatic habitat. The focus on runoff rate control rather than volume based hydrology results in increases in the width and depth of stream channels, and ultimately changes and decreases biological habitat indices dramatically. The focus on runoff rate control rather than volume-based hydrology results in increases in the width and depth of stream channels, and ultimately changes and decreases in biological habitat indices, bank erosion, property loss, and damage to infrastructure.

Conventional stormwater basins often fail to protect water resources because of poor design, inadequate construction and installation, or a lack of maintenance. Outlet structures can be under- or oversized resulting in minimal treatment for the majority of flows or increased incidences of high flow by-pass. Many conventional stormwater treatment systems fail at least two-thirds of the time for some water quality constituents (Ballestero et al 2006). Failure can be simply defined as runoff leaving the stormwater system that is dirtier than when it entered. The use of stormwater basins to manage runoff rates has

Bank erosion due to stormwater runoff. Eroded bank is 15' - 20' high.

resulted in longer durations and higher frequencies of channel forming flows leading to heavy erosion and deterioration of receiving streams.[8]

Most, if not all, streams in the study area are shallow (6" - 12") with steep banks. Based on visual surveys, most cannot handle the volume of stormwater runoff discharge thus leading to substantial erosion, streambank failure, water quality concerns, etc.

The Federal Phase II Stormwater regulations, 40 CFR Part 122.33, require an operator of a small municipal separate storm sewer system (MS4) to apply for an NPDES permit to discharge from its storm sewer system. MS4 permits require structural and nonstructural controls to manage untreated stormwater discharged into local water bodies.

The regulations require MS4 communities to develop, implement and enforce a Storm Water Management Program (SWMP) designed to reduce the discharge of pollutants from its MS4 to the "Maximum Extent Practicable" to protect water quality by implementing best management practices (BMPs) which reduce pollutants prior to their discharge into the storm sewer system.

[8]Benefits of Low Impact Development, University of New Hampshire.

Communities in the study area that are designated MS4 Phase II stormwater permittees include: Auburn, Braselton, Hoschton, Barrow County, Gwinnett County, Jackson County (portions of the Mulberry HUC-10 watershed), and Hall County. Winder is not a designated MS4 Phase II stormwater permittee but has implemented some stormwater regulations.

Under the Phase II Municipal Stormwater NPDES permit, December 7, 2017, communities with a population exceeding 10,000 are required to develop a Green Infrastructure/Low Impact Development Program (GI/LID) to be implemented in the community or watershed. Green Infrastructure, as it applies to water quality, refers to approaches that divert stormwater (i.e., rain/snowmelt) into natural areas, rather than directly into storm sewers. In doing so, you reduce the volume and velocity of stormwater flow as well as improve the removal of pollutants through natural processes/filtering. Green infrastructure in this context includes utilizing rain gardens/bioretention, rain barrels/cisterns, green roofs, permeable pavements, bioswales, land conservation, urban trees and more. Low Impact Development refers to designing and implementing practices that can be employed at the construction site-level to control stormwater and strive to restore or maintain the predevelopment hydrology of the site.

Braselton Rain Garden Demonstration Project, 2018.

Presently, no community in the watershed with a stormwater program mandates GI/LID practices. At best, such practices are encouraged. However, under the new stormwater permit, MS4 communities must implement GI/LID practices by 2020.

Green infrastructure is a cost-effective, resilient approach to managing wet weather impacts that provide many community benefits. While single-purpose gray stormwater infrastructure—conventional piped drainage and water treatment systems—is designed to move urban stormwater away from the built environment, green infrastructure was developed to mimic the natural water cycle of rain events by infiltration into the ground, evapotranspiration into the air and root uptake by plants. Green

infrastructure practices include structural or nonstructural management aimed to decrease the impacts of urbanization and sediments on water quality. Structural controls or solutions include retrofitting existing infrastructure and reducing runoff volumes and peak flows: bioretention, green roofs, rainwater harvesting, and permeable pavements.

Failure to adequately comply with and enforce erosion and sediment ordinances is primarily associated with large-scale, new residential and commercial development. Based on windshield surveys, in new residential development, the erosion problems are greatest where there is large-area grading, rather than grading for infill construction. Property is leveled or terraced to accommodate construction and inadequate barriers or systems are installed or maintained to contain sediment runoff. Where appropriate stormwater structures are installed, particularly in large-scale commercial development, because of the large-scale grading and alteration of the terrain, the stormwater structures are overwhelmed during rain events thus allowing sediment to flow to nearby streams and ultimately to the Mulberry River.

Inadequate compliance with Erosion and Sedimentation ordinance.

Inadequate compliance with Erosion and Sedimentation ordinance.

Three photos show a series of ponds below a newly constructed big box facility overwhelmed with the sediment running off the cleared site. Last photo shows the sediment flowing out of the series of ponds to the tributary that flowed directly to the Mulberry River.

Visual Survey

A visual survey of the study area was conducted in September 2017.

The purpose of a visual survey is to determine if there are observable problems in the stream and to characterize the environment through which the river flows. The visual survey helps pinpoint areas that may be the source of water quality impairments and determine the overall condition of the stream.

The Mulberry River is a shallow river (6"-12") of narrow (5') to medium (15') width with a good flow. Throughout the study area, many of the stream channels are shady with occasional open areas generally adjacent to bridge or road crossings. However, in the lower portion of the watershed, there are channel segments with no tree canopy, generally in agricultural areas, and livestock have access to the creek, particularly in Cedar Creek above the Winder Reservoir. Vegetative buffers adjacent to the stream generally meet state standards, 25', and in most cases, are much wider. Sediment deposition was observed throughout the Mulberry River and many of its tributaries. Results of the visual survey indicate water quality impairment regarding sediment is largely caused by urban development/stormwater runoff, inadequate compliance with and enforcement of Erosion and Sedimentation ordinances, and loss of stream buffer vegetation through agricultural practices or human intervention, and streambank erosion.

Water Quality Monitoring Data

Extensive water quality monitoring has been conducted in the watershed for the period 2015-2017 by GA EPD, Resource Management Strategies (RMS) under contract with Jackson County, and EMI. (See Appendix, Water Quality Monitoring Data.) A wide selection of parameters were measured during the monitoring period; however, only fecal coliform and turbidity were evaluated for this plan. Sites monitored were as follows:

- Indian Creek at Tapp Wood Road (GA EPD)
- Cedar Creek at Ga 211 (GA EPD)
- Cedar Creek at Ga 211 (RMS)
- Mulberry River at Union Circle Road (EMI)
- Mulberry River at Wastewater Treatment Plant Boundary (EMI)
- Mulberry River at Thompson Mill (RMS)
- Mulberry River at Peachtree Rd (RMS)
- Mulberry River at Hwy 11 (RMS)
- Mulberry River at Ethridge Road (RMS)

Following, is information on each parameter monitored and its general impact on water quality.

- Fecal coliform – Georgia's water quality standards set a maximum number of colony forming units (cfu) at 200 per 100 milliliters water from May through October, or 1000 per 100 milliliters from November through April. Values in excess are in violation of the State bacteria water quality standard, as well as, a single sample in excess of 4000 cfu per 100 milliliters from November through April or a single sample in excess of 400 cfu per 100 milliliters from May through October

- Turbidity - Turbidity measures the amount of light scattered by particles of dirt or organic matter floating in a sample (more suspended particles cause greater scattering). High readings can be used as "indicators" of concentrations of particulate matter resulting from increased sedimentation and siltation in a stream, which in turn can ruin important habitat areas for fish and other aquatic life as well as impact recreational values (fishing, boating, swimming) in a waterbody.

- Georgia has no numerical standard for turbidity but instead requires "All watersheds 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.[9] In general, a turbidity reading below 5 NTU appears clear, while a reading of 55 NTU will start to look cloudy and a reading over 500 NTU will appear completely opaque.[10]

There is extensive historical monitoring data for fecal coliform and turbidity dating from 1999 to 2017. A review of results from 2015 - 2017 consistently show that:

! Turbidity is significantly elevated following rain event.
! Fecal coliform
  " Counts on Cedar Creek above Winder reservoir consistently exceed State standard.
  " Individual samples in the remainder of the watershed generally meet State standard except following rain events where individual samples are significantly higher and fail to meet the State standard for a single sample. When calculating the geometric mean for a site (a type of average of a minimum of four samples in a 30-day period), the elevated single sample causes the geometric mean to exceed the State standard.

Likely contamination sources for turbidity are urban development and the associated increased stormwater runoff, streambank erosion, destruction of vegetative buffers, and inadequate compliance with and enforcement of Erosion and Sedimentation ordinance. For fecal coliform, likely contamination sources are urban development/stormwater unrunoff, agriculture, particularly on Cedar Creek above the Winder Reservoir, and individual septic system failure. Based on aerial photography, there are areas of eroded stream banks associated with agricultural uses (pasture and livestock) in the Cedar Creek-Mulberry River and Lower Mulberry River subwatersheds.

[9] Water Use Classification and Water Quality Standards, §391–3-6-.03.

[10] Turbidity, Total Suspended Solids and Water Clarity." Fundamentals of Environmental Measurements. Fondriest Environmental, 13 Jun. 2014. http://www.fondriest.com/environmental-measurements/parameters/water-quality/turbidity-total-suspended-solids-water-clarity/#Turbid5

Healthy Watersheds

With the study area, GA EPD identifies Rocky Creek, Cedar Creek below the Winder Reservoir, and Indian Creek as Category 1 streams indicating that they are meeting water quality standards in "support" of their designated beneficial uses, and therefore are healthy watersheds. As such, steps should be taken locally to insure that water quality in the healthy watershed is not degraded by human activity.

US EPA defines a healthy watershed as a watershed where structure and function are in place to support healthy aquatic ecosystems. Key components of a healthy watershed include:

- intact and functioning headwater streams, floodplains, riparian corridors, instream habitat, and biotic communities;
- natural vegetation in the landscape; and
- hydrology, sediment transport, fluvial geomorphology, and disturbance regimes expected for its location.

The systems approach to healthy watersheds assessment and protection is based on an integrated evaluation of:

- Landscape Condition
- Habitat
- Hydrology
- Geomorphology
- Water Quality
- Biological Condition.

Ecological processes and natural disturbance regimes are addressed in the context of these six components.

Landscape Condition – Landscape condition assessments examine the condition and configuration of natural land cover in the landscape. Natural vegetative cover stabilizes soil, regulates watershed hydrology and provides habitat to terrestrial and riparian species. The type, quantity, and structure of the natural vegetation within a watershed have important influences on aquatic habitats. Natural land cover provides connectivity among riparian habitats and between terrestrial and aquatic ecosystems.

Many aquatic organisms depend on being able to move through connected systems to habitats in response to variable environmental conditions. Forested riparian zones are often some of the best remaining corridors for connecting habitat patches on the landscape. Vegetated landscapes cycle nutrients, retain sediments, and regulate surface and ground water hydrology. Natural disturbances on the landscape, such as fire, help to regulate nutrient and organic matter input to aquatic ecosystems.

Habitat – Freshwater habitats are comprised of flowing (i.e., streams and rivers) and standing (i.e., lakes, ponds, and wetlands) waters. Habitat extent and quality are directly related to landscape condition and hydrologic and geomorphic processes. Habitat quality is also affected by the physical and chemical characteristics of the water (e.g., water temperature). The number and distribution of different habitat types and their connectivity influence species population health.

Geomorphology – Watershed inputs (water, sediment and organic matter) and valley characteristics (valley slope and width, bedrock and surficial geology, soils and vegetation) determine a river channel's form (pattern, profile and dimension). Although watershed inputs and channel form vary over time, they are balanced in natural systems. This natural balance is termed "dynamic equilibrium" and refers to sediment size and volume being in balance with stream slope and discharge.

Any time one of these variables changes, the other variables will respond to bring the stream back to a dynamic equilibrium. Disturbances such as floods or forest fires are natural, episodic events that cause a stream to become unbalanced. After such disturbances, the stream will "seek" equilibrium conditions through adjustment of the other components until the stream is once again in a form that allows it to efficiently perform its functions of water and sediment discharge.

These periodic disturbances, of natural intensity and frequency, can increase aquatic biodiversity by creating opportunities for some species and scaling back the prevalence of others. When disturbances are of extreme intensity or frequency, as many human disturbances are, a stream channel will undergo adjustment to a new form. This can result in habitat degradation and threats to public safety and infrastructure.

Hydrology – Watershed hydrology is driven by climatic processes; surface and subsurface characteristics such as topography, vegetation, and geology and human activities such as water and land use. Aquatic ecosystems are dependent on surface and/or ground water hydrology. For example, groundwater-dependent ecosystems rely on water that infiltrates to the subsurface discharging to nearby streams or recharging to an aquifer and then discharging to springs, seeps, wetlands, streams, and lakes.

Hydrologic regimes (flows in rivers and water levels in lakes and wetlands) create habitat and are important to aquatic species life histories (e.g., providing cues for spawning and migration during discrete times of the year). Natural flow regimes are composed of seasonally varying environmental flow components, including high flows, base flows, pulses and floods that can be characterized in terms of their magnitude, frequency, duration, timing and rate of change. Natural lake levels will vary depending on precipitation, evaporation and/or ground and surface water hydrology.

Water Quality – Aquatic ecosystems are substantially affected by the quality of their water, but also by the chemical and physical characteristics of the air, surrounding watershed soils and sediment transported through the aquatic system. EPA and states have established water quality criteria for freshwater ecosystems that address important ecological constituents. Chemical and physical constituents include:

- concentrations of organic and inorganic constituents, such as nutrients, trace metals and dissolved organic matter;
- additional chemical parameters indicative of habitat suitability, such as pH and dissolved oxygen; and
- physical parameters, including water temperature and turbidity.

Many of these parameters are dynamic and related to natural watershed processes. For example, dissolved oxygen fluctuations in streams are related to nutrient cycling, biotic activity, stream flow and temperature.

Biological Condition – Freshwater aquatic biodiversity refers to the richness of native species (e.g., fish, invertebrates and plants), genetic variety, and multiple habitats and ecosystems types (e.g., lakes, ponds, and reservoirs, rivers and streams, groundwater and wetlands). The biological condition of an aquatic ecosystem is often thought of as the ultimate indicator of watershed health, as aquatic organisms and communities reflect the cumulative conditions of all other watershed components.

Biological condition is measured in a variety of ways. For example, multimetric indices measure the presence, numbers and condition of aquatic organisms and communities in an aquatic ecosystem. They are intended to represent the biological condition of an aquatic ecosystem relative to some regionally-defined reference condition. RIVPACS (River Invertebrate Prediction and Classification System) models quantify biological condition by comparing the observed (O) taxa at a site to expected (E) taxa in the absence of human-caused stress. The O/E ratio is the index of biological integrity and measures loss of native taxa or biodiversity. Biodiversity is also measured by presence of rare, threatened and endangered (RTE) species. State natural heritage programs have inventories of aquatic RTE.

Rocky Creek

The Rocky Creek sub-watershed (headwaters to its confluence with the Mulberry River), located in the Cedar Creek HUC-12 watershed, is a little-developed watershed. This sub-watershed was identified by GA EPD as "supporting" in 2006. There is limited development in the upper third of the watershed, primarily residential, on 3/4 acre lots. The remaining sub-watershed is primarily large-tract forestry with some agriculture. Vegetative buffers are heavily wooded and extensive, generally exceeding 300' on each side of the creek banks. Extensive interconnected wetlands are situated adjacent to the creek in the lower third of the sub-watershed. A comparison of aerial photographs from 2007 and 2015 show that there has been little change in the watershed.

In 1998 and 1999, the Department of Natural Resources Wildlife Resources Division (WRD) conducted studies of fish populations at a number of monitoring sites in the Oconee River Basin which includes the Rocky Creek subwatershed. Biological monitoring is a method used to evaluate the health of a biological system in order to assess degradation from various sources. It is based on direct observations of aquatic communities.

The work performed by the WRD looked at patterns of fish communities within the various ecoregions, a region of relative homogeneity in ecological systems or in relationships between organisms and their environment. Two indices of fish community health were used to assess the biotic integrity of the aquatic systems: the modified Index of Well-Being (IWB) and the Index of Biotic Integrity (IBI). The IWB and IBI scores were classified as Excellent, Good, Fair, Poor, or Very Poor. Segments with fish populations rated as Excellent to Good (occasionally Fair) were listed as "supporting".

The modified IWB measures the health of the aquatic community based on the density and diversity or structural attributes of the fish community. The IWB is calculated based on four parameters: the relative density of fish, the relative biomass of fish, the Shannon-Wiener Index of Diversity based on number, and the Shannon-Wiener Index of Diversity based on biomass.

The IBI assesses the biotic integrity of aquatic communities based on the functional and compositional attributes of the fish community. The IBI consists of twelve measurements or metrics, which assess three facets of the fish population: species richness and composition, trophic composition and dynamics, and fish abundance and condition. Each metric is scored by comparing its value to the value of the regional reference site. Factors that affect the structure and function of a fish community include stream location and size. Thus, the metrics were developed for regional drainage basins, e.g., the Atlantic Slope Drainage Basin, which includes the Ocmulgee, Oconee, Ogeechee, and Savannah River Basins. To account for the fact that streams with larger drainage basins normally have greater species richness, Maximum Species Richness plots were developed for the species richness metric (WRD, 2000).

To supplement the findings of the fish community data, habitat assessments were performed at each sampling site. Habitat scores evaluate the physical surroundings of a stream as they affect and influence the quality of the water resource and its resident aquatic community. The habitat assessment evaluates the stream's physical parameters and is broken into three levels. Level one describes in-stream characteristics that directly affect biological communities (in-stream cover, epifaunal substrate, embeddedness, and riffle frequency). Level two describes the channel morphology (channel alteration, sediment deposition, and channel flow status). Level three describes the riparian zone surrounding the stream, which indirectly affects the type of habitat and food resources available in the stream (bank vegetation, bank stability, and riparian zone width). The total habitat scores obtained for each sampling station are compared to a site-specific control or regional reference site. The ratio between the station of interest and the reference site provides a percent comparability that can be used to classify the stream.

In the June 2003 evaluation of Rocky Creek, the IBI score was 44, IBI rank, good, IWB score 8.6, and IWB Rank, excellent. The report noted the following habitat comments: no deep pools, riffle frequency excellent, habitat scores above average but banks are poor.

Overall, this is a relatively undisturbed watershed and with no obvious new development during the period 2007 to 2015. (See Rocky Creek maps 2007 and 2015.) While there are no assessments since 2003, due to the lack of new development, it is

likely that the stream has maintained its excellent habitat rating. Lack of disturbance coupled with an absence of upstream confluences or convergences from degraded or impaired streams largely accounts for its health.

Based on Future Land Use (Character Area) projections, the lower third of this subwatershed will transition from forestry to suburban, mostly residential, land uses. While Barrow County ordinances require undisturbed vegetative buffers and wetlands protection, water quality could be threatened due to urban runoff and loss of tree canopy. A weakness of Barrow County's tree ordinance is that tree replacement requirements do not apply to residential development.

Cedar Creek

Cedar Creek, below the Winder Reservoir, to its confluence with the Mulberry River, located in the Cedar Creek HUC-12 watershed was identified by GA EPD as "supporting" in 2006. This sub-watershed is the most developed of the three healthy watersheds evaluated in this study. The creek flows adjacent to residential areas in the City of Winder, the Winder Sewage Treatment Plant, and extensive agricultural areas with modest to no natural vegetated buffer and some extensive forested areas.

In June 2003, the IBI score was 50, IBI rank, good, IWB score 9.0, and IWB Rank, excellent. The report noted the following habitat comments: deep pools, abundant riffles, habitat scores well above average; however, potential problems with sediment deposition were noted by all assessors. Based on the 2017 visual survey, sediment is likely due to urban runoff.

A comparison of aerial photographs from 2007 and 2017 show that there have been a few areas in the upper-most part of the watershed where there is tree canopy loss, as well as development at its headwaters. (See Cedar Creek maps 2007 and 2015.) Otherwise, there is little change in much of the watershed.

Based on Future Land Use (Character Area) projections, the lower third of this subwatershed will transition from forestry to suburban, mostly residential, land uses. While Barrow County ordinances require undisturbed vegetative buffers and wetlands protection, water quality could be threatened due to urban runoff and loss of tree canopy. A weakness of Barrow County's tree ordinance is that tree replacement requirements do not apply to residential development.

Indian Creek

Indian Creek, (headwaters to confluence with Mulberry River) located in the Cedar Creek HUC-12 watershed was moved from Category 3 (Assessment Pending) to Category 1 - water quality standards met - and identified by GA EPD as "supporting" in 2016, based on monitoring data on Indian Creek at Tapp Road from 2014 and 2015. Current data indicate that the water is supporting its use. This site has a narrative rank of fair for macroinvertebrates. When GA EPD completes the reevaluation of the metrics used to assess macroinvertebrate data it will be determined if the macroinvertebrate criteria are being met.

Construction activity at Indian Creek headwaters.

The creek's headwaters are near the center of Braselton, south of Davis Street. This sub-watershed is the least developed of the three healthy watersheds evaluated in this study. However, in 2017, Braselton began construction of a parking deck and civic center just below the stream's headwaters at the intersection of Davis Highway and GA Highway 53. The project involved piping 295 feet of Indian Creek's headwater segment.

Based on Future Land Use (Character Area) projections, the headwaters segment of Indian Creek will transition from forestry to dense commercial/urban land use. (See Indian Creek maps 2001, 2007, and 2015.) Braselton requires a minimum 50 foot natural vegetative buffer along the stream with an additional 25 feet for impervious surfaces; however, there is precedent for granting stream buffer variances and piping this segment of the creek.

Stream burial is a common practice as urban centers develop. There are limited studies on the impact of buried streams; however, studies have documented effects of stream burial to include reduced drainage density, increased E.coli concentration, higher concentrations of pesticides in buried stream sections, decrease in taxa richness. Burying one section of a single headwater stream will have only a local effect on stream taxa; however, of greater potential impact is the cumulative effect of many individual sections of pipe.[11]

The health of Indian Creek is at risk unless natural vegetative buffers are maintained, tree canopy is maintained, erosion and sedimentation is appropriately managed, and green infrastructure is required to manage stormwater.

[11] Buried Alive: Potential Consequence of Burying Headwater Streams in Drainage Pipes, Judy L. Meyer, Geoffrey C. Poole, Krista L. Jones, Proceedings of the 2005 Georgia Water Resources Conference, University of Georgia, 2005.

Land Management Ordinances and Activities

A suite of land management ordinances are used by jurisdictions in the watershed, though ordinances are only as effective as their enforcement. Barrow, Gwinnett, and Jackson counties provide the greatest protection to the streams in the watershed through required natural vegetated buffers, erosion and sedimentation control, wetlands protection, and tree protection and/or replacement. Protections offered by the cities vary widely with Hoschton providing the least protection for water resources. See Appendix, Land Management Ordinances.

A weakness in ordinances in all jurisdictions is a failure to adequately address tree canopy destruction and replacement to maximize their benefit to water quality or habitat. Where tree conservation is required, there is no provision in ordinances that require protection of suitable trees to maximize their benefits. Too often, conserved trees are relegated to buffers on the edge of the larger development and the occasional large or specimen tree. For residential development, typically, the tract of land is cleared and one or two small caliper trees are planted per dwelling unit, and fewer in the very small lot developments. Barrow County exempts residential development from tree replacement. Loss of tree canopy coupled with soil compaction associated with development and the installation of impervious surfaces typically overwhelms the traditional stormwater system and ultimately impacts stream water quality, habitat, and structure.

The Mulberry HUC-10 watershed is a large watershed containing many municipal and county governments. Because development in one jurisdiction can either positively or negatively affect the watershed's streams, it is important that each jurisdiction, at a minimum, provide for similar tree protection/replanting requirements, stream buffer widths, and use of green infrastructure, as these practices can have the most direct impact on water quality.

Recommendations:

- All jurisdictions adopt consistent stream buffer requirements.
- Require green infrastructure throughout the watershed including areas not under MS4 jurisdiction (Winder and portions of Jackson County).
- All jurisdictions undertake retrofitting existing development with green infrastructure.
- All jurisdictions require tree conservation/replacement in all types of development with greater emphasis on tree conservation throughout the development.
- Where ordinances allow for conservation subdivisions or planned development, define areas set aside from development so that such areas are undisturbed and provide the greatest protection to environmental concerns, particularly water quality and habitat.

VI. Recommended Management Practices

Previous Mulberry River watershed studies identified fecal coliform and sediment as parameters of concern in the non supporting stream segments. Based on historical and current sampling data, both fecal coliform and sediment continue to be contaminants of concern in the non supporting segments generally following rain events. Primary sources of likely fecal coliform pollution and sediment were identified as urban runoff, inadequate compliance with and enforcement of Erosion and Sedimentation ordinances, agricultural practices/runoff, stream bank erosion, destruction of stream buffer vegetation, and leaking/failing septic systems.

Implementation priorities best management practices are:

- Require proactive green infrastructure in new development and retrofit older development;
- Repair and replace leaking/failing septic systems;
- Implement Agricultural BMPs to address agricultural runoff particularly in the Cedar Creek subwatershed above the Winder Reservoir and in the Cedar Creek – Mulberry River HUC-12 and Lower Mulberry HUC-12 ;
- Ordinance updates;
- Streambank restoration/stabilization;
- Code enforcement, particularly soil erosion and sedimentation;
- Education of the court system concerning enforcement and penalties associated with land development ordinances; and,
- Establish watershed coordinator position to manage plan implementation.

The following screening criteria will be used to evaluate the suitability of a potential management practice: (Criteria are listed in descending order of importance).

- Priority Area – Will the management practice be implemented effectively within the identified priority areas in the watershed?
- Load Reduction – Will the management practice provide a significant load reduction?
- Ease of Implementation – Will the implementation of the management practice be easy to undertake (potential legal issues, permits, etc.)
- Maintenance – What level of maintenance is required for the management practice to function optimally?
- Cost Effectiveness – Is the management practice cost-effective when compared to its impact on contamination?
- Unintended Impacts/Added benefits – Are the any unintended impacts or added benefits that result from installation of the management practice?
- Social Acceptance - Will the practice have public support?

Recommended Management Practice Effectiveness

Agriculture

The implementation of systems of BMPs reduces nonpoint source pollution. BMPs are defined as structural, vegetative, or managerial conservation practices which reduce or prevent detachment, transport and delivery of nonpoint source pollutants to surface or ground waters. The BMPs result in fewer nutrients and waste being delivered to the water bodies.

The BMPs in a water quality project must be targeted to priority agriculture properties within the watershed (i.e., those that contribute runoff to adjacent hydrologic systems such as lakes, streams, ditches, wetlands and flood plains). Additional priority areas are feedlots, water storage systems, and waste management systems. Reporting of specific pollutant load reductions will be calculated for all properties where new BMPs are installed; however, a general estimated load reduction, by installed practice, is provided below to assist with the suitability evaluation of a management practice.

Agricultural Best Management Practices to Address Non-Point Source Pollution				
Practice Number	Practice Name	Fecal Coliform	Estimated Load Reduction	Cost*
313	Waste Storage Facility	M	96%	medium - high
316	Animal Mortality Facility	M	Products from composting facilities can be incorporated into the soil and improve agronomic conditions and can also be used a part of a nutrient management plan.	moderate – high
317	Composting Facility	M	70-80%	medium - high
329, 345, 346	Conservation Tillage	M	up to 70%	varies by scope of project
330	Contour Farming	M	25-50%	low
332	Contour Buffer Strip	M	20-75%	low
340	Cover Crop		40-60%	low
342	Critical Area Planting	M	75%	high
359	Waste Treatment Lagoon	M	80%	moderate - high
360	Waste Facility Closure	M	reduces likelihood of residual nutrients entering water.	high – depends on scope of project
365	Anerobic Digester - Ambient Temperature	M	90-99%	high. Requires maintenance.
366	Anaerobic Digester - Controlled Temperature	M	90-99%	high. Requires maintenance.
367	Waste Facility Cover	M	protect integrity and capacity of storage facility and reduce overflow.	high

Agricultural Best Management Practices to Address Non-Point Source Pollution				
Practice Number	Practice Name	Fecal Coliform	Estimated Load Reduction	Cost*
382	Fence	M	50 - 90% in higher order streams, 99% in second order streams	low
390	Riparian Herbaceous Cover	M	50-75%	low - moderate
391	Riparian Forest Buffer	M	50-75%	moderate
393	Filter Strip	M	50-80%	moderate, maintenance required
472	Access Control	M	50 - 90% in higher order streams, 99% in second order streams	low - moderate
516	Pipeline - Livestock	M	As part of an alternative water supply or a waste management system, pipelines indirectly reduce negative water quality impacts.	moderate
528	Prescribed Grazing		75%	low
578	Stream Crossing	M	Stream crossings reduce animal access, provide stable traffic paths and reduce the amount of nutrients and sediment entering water.	medium - high. Best to redirect around stream.
586	Field Stripcropping	M	75%	low
590	Nutrient Management	M	35% Phosphorus, 15% Nitrogen	low - moderate
606	Tree & Shrub Establishment	M	50%	low - moderate
634	Waste Transfer	M	promote nutrient reduction in soil	moderate
635	Vegetated Treatment Area	M	80 - 90% in feedlots	low

Agricultural Best Management Practices to Address Non-Point Source Pollution				
Practice Number	Practice Name	Fecal Coliform	Estimated Load Reduction	Cost*
642	Water Well	M	No available information	varies by scope of project

Source: Best Management Practices for Georgia Agriculture, Georgia Soil and Water Conservation Comm., Sept 2013.

*For additional information on Practice Number costs, see Appendix, *Georgia FY 2017 EQIP Policy*.

Individual Septic System

Coordinate with county Code Enforcement and county health departments to identify and assist users of septic systems with maintenance issues though septic repair, replacement, pump-out, and/or education.

Stormwater System

Amend development ordinances to include proactive green infrastructure in all new development. Install green infrastructure in new development and retrofit old development.

There are a variety of practices that can be implemented in the watershed to mitigate the impact of stormwater on water quality in the urbanized and urbanizing areas . These practices would be beneficial in new development and as a retrofit in older development.

Typical practices include:[12]

- Permeable pavements systems, permeable concrete, porous asphalt

These practices percolate rainwater through the substrate paving and into the ground, reduce stormwater flow volumes and minimize the pollutants introduced into storm water runoff from impervious surfaces. They are appropriate for pedestrian areas and for very low-volume, low-speed areas such as overflow parking, residential driveways, bike paths, patios, plazas, sidewalks, alleys, and parking stalls. Depending on design, paving material, soil type, and rainfall, permeable paving can infiltrate as much as 70% to 80% of annual rainfall[13] and remove 60% of Phosphorus and Nitrogen, and 80% of fecal coliform and total suspended solids.[14]

Permeable Pavement System (sidewalk)

Permeable pavements attenuate peak flows, improve water quality by reducing fine-grained sediment, organic matter and trace metals, and, reduce heat island effect (the phenomenon of urban areas retaining heat due to the prevalence of pavement). Such pavements are limited to slopes less than 5 percent and function poorly on sites with compacted soils.

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[12] 8 Shades of Green Infrastructure, Kurt Pelzer and Laura Tam, August 8, 2013.

[13] Low Impact Development Toolkit, Metropolitan Area Planning Council, http://www.mapc.org/sites/default/files/LID_Fact_Sheet_-_Permeable_Paving.pdf

[14] Georgia Stormwater Management Manual, volume 2, Technical Handbook, 2016 ed., p.139.

- Rainwater harvesting

  By retaining stormwater runoff for on-site use, harvesting systems reduce flow volumes and pollutant loads entering the stormwater collection system, helping to restore predevelopment hydrology and mitigate impacts on downstream water quality impacts. The impact of rainwater harvesting on pollutant load reduction varies widely.[15] Passive rainwater harvesting systems can be fairly easy to implement but they present limited opportunity for significant reduction in stormwater runoff due to their relatively small volume, and an inability to ensure that stormwater retention volume is available at the onset of precipitation events. Outreach campaigns are recommended on optimal use of these systems. Additionally, to achieve significant stormwater flow reduction benefit, widespread implementation is needed.

  Rainwater harvesting works best where above-ground storage can be sited in a stable, flat area that cannot block paths of travel for fire safety access; and, overflow locations are designed to direct flows away from building foundations and adjacent properties.

  Advantages of this system are reduced volume and peak flows of stormwater entering the sewer; low maintenance for above ground cisterns; good for sites where infiltration is not an option; and recycles water for nonpotable reuse.

  Disadvantages are that the system may require pumps or valves to access stored water; roof surfaces may contain copper or materials treated with fungicides and herbicides that would contaminate water for irrigation; the stored water is prone to algal growth if it is in a warm and sunny location; and, the harvesting does not remove pollutants.

[15] Rainwater Harvesting - Conservation, Credit, Codes, and Cost Literature Review and Case Studies, U.S. Environmental Protection Agency, Office of Water, Office of Wetlands, Oceans, and Watersheds, January 2013. https://www.epa.gov/sites/production/files/2015-11/documents/rainharvesting.pdf

- Rain gardens

  A rain garden is a garden which takes advantage of rainfall and stormwater runoff in its design and plant selection. Usually, it is a small garden which is designed to withstand the extremes of moisture and concentrations of nutrients, particularly Nitrogen and Phosphorus, that are found in stormwater runoff. Rain gardens are ideally sited close to the source of the runoff and serve to slow and treat the stormwater as it travels downhill. The stormwater has more time to infiltrate, which contributes to removal of contaminants, and less opportunity to gain momentum and erosive power.

Rain Garden

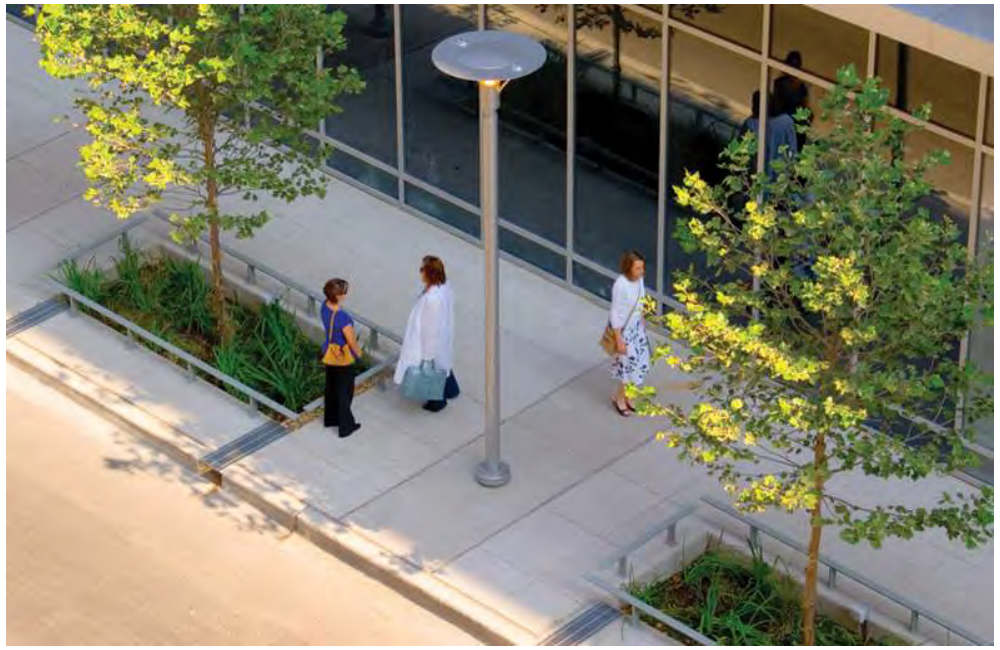
  Rain gardens work well in residential yards, office and commercial storefronts, parks, rights-of-way, and parking lots. They are easy and inexpensive to install, provide a wide range of scales and site applicability, improve water and air quality, are aesthetically pleasing, and reduce runoff volume. A gentle slope is best so that excess accumulation can exit downhill.

- Flow-through planter

  These planters allow stormwater to flow and filter through vegetation, growing medium and gravel. They temporarily store stormwater runoff on top of the soil and remove sediment and pollutants as water infiltrates down through the planter. Planters do not infiltrate runoff into the ground, rather they rely on evapotranspiration and short-term storage to manage stormwater. Stormwater planters are presumed to remove 80% of the total suspended solids (TSS) load in typical urban post-development runoff when sized, designed, constructed, and maintained in accordance with the recommended specifications.

Stormwater planters also remove 60% of Phosphorus and Nitrogen, and 80% of fecal coliform and total suspended solids.[16]

These planters work on poorly drained sites, sites with contaminated soils, and adjacent to streets where runoff from impervious surfaces may be directed for treatment. Additionally, flow-through planters work well to accept drainage from rooftop gutters. Planted vegetation helps lessen stormwater flows, traps sediment, reduces stormwater volume, removes pollutants, and provides water detention in significant rainfall events. During the dry season, irrigation may be required to maintain plants.



Flow-through planter

The initial cost of a stormwater planter averages around $8 per square foot; however, the overall cost will vary depending on the type and size of vegetation and planters used. Maintenance costs average around $400-$500 per year for a 500-square-foot planter. These also vary depending on size and plant choice.

[16] Georgia Stormwater Management Manual, volume 2, Technical Handbook, 2016 ed., p.139.

- Bioswales

Bioswales are designed to manage a specified amount of runoff from a large impervious area such as a parking lot or roadway. They consist of a swaled drainage course with gently sloped sides (less than 6 percent) and filled with vegetation, compost and/or riprap. The water's flow path, along with the wide and shallow ditch, is designed to maximize the time water spends in the swale, which aids the trapping of pollutants and silt. Bioswales can reduce Phosphorus and Nitrogen pollutant loads by 50 percent and heavy metals, 40 percent. [17]

Bioswale

The effectiveness of bioswales increases with increased contact time between soil and stormwater, and increased vegetative cover. This is all best achieved by using soils that can adequately slow down, infiltrate, and retain water, as well as support plant life.

[17] Ibid, p. 211.

- Urban tree canopy

  Urban tree canopy is a network of green spaces in a community where trees and other woody plants are maintained to improve air quality, stormwater management, and wildlife habitat. Mature trees provide significant stormwater quantity and rate control benefits through soil storage, interception, and evapotranspiration. A tree with a 25-foot diameter canopy and associated soil can manage the 1-inch rainfall from 2,400 square feet of impervious surface. Interception and evapotranspiration also decrease runoff volume with larger trees providing exponentially more benefit than smaller trees.[18]

- Vegetated roof

  A vegetated roof, or green roof system, is composed of multiple layers including a waterproof membrane, subsurface drainage pipes, engineered planting soils and specially selected plants. Green roofs can be installed on many types of roofs, from small slanting roofs to large, flat commercial roofs. There are two basic types of green roofs: extensive and intensive. An extensive green roof system is a thin, lighter-weight system (usually less than 6 inches deep) planted predominantly with drought-tolerant succulent plants and grasses. An intensive green roof is deeper, often 18 inches, and can support plants that require great root depth.

Vegetated roof

[18] Stormwater Trees, Technical Memorandum, US EPA, September 2016.

Vegetated roofs can reduce TSS by 80 percent, and phosphorus and nitrogen by 50 percent.[19]

Vegetated roofs perform best on commercial, multifamily, and industrial structures, as well as single-family homes, garages and sheds and can be used for new construction or to reroof an existing building if there is sufficient structural support. Roof slopes less than 5 degrees or greater than 20 degrees are not suitable for vegetated roofs.

Advantages of vegetated roofs are a reduction in the volume and velocity of stormwater runoff from roofs by temporarily storing stormwater; added insulation and noise reduction compared to conventional roofs; reduced urban heat island effect and lower temperature of stormwater runoff; increased biodiversity and habitat; and aesthetic amenities for building occupants or owners.

Disadvantages are that vegetated roofs are limited to roof slopes less than 20 degrees; additional structural or seismic support may be needed to bear added weight; irrigation required to establish plants and maintain them during dry periods; and, high upfront cost compared to other green infrastructure.

Extensive green roofs can range from roughly $5-$20 per square foot. Intensive green roofs can range from roughly $20-$80 per square foot. Although the cost per square foot of a green roof is notably higher than a regular roof, green roofs have been reported to save costs associated with energy consumption and increasing the life span of the roof.[20]

[19] Georgia Stormwater Manual, volume 2, Technical Handbook, 2016, p. 139.

[20] Georgia Stormwater Manual, volume 2, Technical Handbook, 2016 ed., p. 241.

Streambanks

Evaluate streambank segments and prioritize for stabilization/restoration based on extent, severity, and location of the erosion. Implement appropriate stabilization/restoration based on evaluation.

General guidance for establishing severity of erosion is as follows:[21]

Degree of Erosion	Characteristics
Stable to Mild	Little or no evidence of erosion; if eroding banks are present, they are small in extent (linear extent less than average bank height) and rates are modest (less than ½ foot per year); greater erosion may be tolerated at bends if it causes no associated problems.
Moderate	Extent of problem or rate of erosion exceeds criteria for stable class, but is less than severe.
Severe	Erosion covers large area of blank (linear extent greater than three times average bank height) and is occurring at a rate in excess of one foot per year or a rate that is unacceptable for safety, environmental, or economic reasons.

[21] Guidelines for Streambank Restoration, March 2000, Georgia Soil and Water Conservation Commission.

There are a variety of erosion protection measurers available and costs vary depending on the scope of the project. The below-chart provides information on relative costs and complexity based on selected protection measure.[22]

Measure	Relative Cost	Relatively Complexity
Live stake	Low	Simple
Joint planting	Low*	Simple*
Live fascine	Moderate	Moderate
Brushmattress	Moderate	Moderate to Complex
Live cribwall	High	Complex
Branchpacking	Moderate	Moderate to Complex
Conventional vegetation	Low to Moderate	Simple to Moderate
Conventional bank armoring (riprap)	Moderate to High	Moderate to Complex

*Assumes rock is in place.

[22] Guidelines for Streambank Restoration, March 2000, Georgia Soil and Water Conservation Commission.

Ordinance Updates

Riparian buffers

Riparian buffer widths vary throughout the watershed. This plan recommends uniform buffer widths. Necessary widths vary depending on purpose, site conditions, such as soil type, slope, and adjacent land use and other factors.

The following identifies buffer widths needed to effectively serve particular functions:[23]

Purpose	Buffer Width
Erosion/sediment control	30 feet to 98 feet
Water quality:	
Nutrients	49 feet to 164 feet
Pesticides	49 feet to 328 feet
Biocontaminants	30 feet or more (e.g. fecal matter)
Aquatic habitat:	
Wildlife	33 feet to 164 feet
Litter/debris	50 feet to 100 feet
Temperature	30 feet to 230 feet
Terrestrial habitat	30 to 1,640 feet (habitat needs for terrestrial wildlife vary widely; review information about specific animals in the targeted area as well as land conservation work at adjacent and nearby lands).

Tree Canopy

See Stormwater System, Urban Tree Canopy, page 57.

[23] The Science Behind The Need For Riparian Buffer Protection, Pennsylvania Land Trust Association, https://conservationtools.org/guides/131-the-science-behind-the-need-for-riparian-buffer-protection.

Erosion and Sedimentation Control

Studies have shown that the degree of water quality degradation in streams is significantly impacted by Erosion and Sediment enforcement activities with stronger enforcement producing less environmental impact on the streams.[24]

Enforcement of Erosion and Sedimentation ordinances varies. Uniform and stringent enforcement is needed by the local jurisdictions and courts in the watershed to protect stream degradation.

Watershed Coordinator

Due to the number and complexity of jurisdictions in the watershed, a watershed coordinator position needs to be staffed to implement this watershed plan. See page 69 for position responsibilities.

[24] Effectiveness of Regulatory Incentives for Sediment Pollution Prevention: Evaluation Through Policy Analysis and Biomonitoring, University of North Carolina at Chapel Hill, 1996-2000. https://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.highlight/abstract/753/report/F

VII. Working With The Public

Public support is a key element in the implementation process. Education is extremely important for increasing public awareness of the water quality problems and offering feasible solutions for remediation and prevention of water quality degradation.

Outreach Goals

The overarching goal of the outreach campaign is to engage agricultural producers, adult and school-aged residents, and government agencies in reducing fecal coliform non-point source pollution and sediment levels in the watershed. This will be accomplished by developing and promoting initiatives on water quality issues in the watershed, actions that may be taken to improve water quality, and programs available to assist with water quality improvement projects.

Objectives for education include:

- Educating agricultural producers on nonstructural and structural agricultural best management practices that could be implemented.
- Educating property owners on septic tank maintenance.
- Educating developers, citizens, elected officials, and planning commissions on the benefits of green infrastructure.
- Increasing watershed residents and government agencies and planning commissions knowledge on the importance of water quality and controlling non-point source pollution in the Mulberry River watershed.
- Educating the local court system concerning development code enforcement and associated penalties.

Goal 1: To educate the general public about the watershed plan and its implementation.

- Post permanent signs along major roads notifying travelers that they are entering the Mulberry River watershed.

- Coordinate with the local citizens and organizations to hold periodic cleanup events to remove smaller debris from watershed streams.

Goal 2: Educate elected officials, planning commissions, and government departments about the watershed plan and its implementation.

- Convene meetings with appropriate governing or recommending entities in order to provide information on the watershed management plan and its implementation.

Goal 3: Educate agricultural producers and users of individual septic systems in the watershed about watershed issues and solutions.

- Provide information on appropriate agricultural best management practices, their cost and effectiveness in reducing water quality impairment, and available funding assistance programs. Target agricultural producers and local 4H programs.

- Provide homeowners utilizing individual septic systems information regarding proper care and maintenance of their system.

Goal 4: Educate development community, elected officials, and planning commissions regarding benefit of green infrastructure.

- Hold informational meetings to provide information on the types and benefits of green infrastructure.

Goal 5: Educate local court system concerning enforcement and penalties for violation of development ordinances.

- Meet with local judges and clerks of court to outline enforcement concerns and review appropriate penalties.

VIII. Long-Term Monitoring Plan

Instream monitoring is important to gage the recovery of streams after remediation projects are installed, and is also crucial to support partners as they engage in periodic strategic planning of remediation priorities.

Long-term monitoring associated with this watershed management plan will have the following objective:

- To verify long-term, whether water quality meets State standards for fecal coliform and sediment following implementation of the measures outlined in this plan.

The most intractable sources of variation are likely to be changes over time. Since the primary sources of non-point source contamination in the watershed are agricultural runoff, urban development, stormwater runoff, individual sewerage systems, streambank erosion, and destruction of vegetative stream buffers, the concentration of fecal coliform and sediment will vary seasonally and with variations in precipitation. The most important quality assurance measure will be to sample many times throughout a range of hydrologic conditions.

A long-term monitoring plan for, at a minimum, fecal coliform and sediment should:

- measure the long-term effectiveness of management practices;
- analyze trends; and
- redefine water quality problems, if any.

Monthly monitoring will, at a minimum, to provide current data and to evaluate water quality improvements in the Mulberry River HUC-10 watershed.

Monitoring should be accomplished by Adopt-a-Stream certified personnel under a GAEPD–approved QA/QC Monitoring Plan that follows Adopt-A-Stream methodologies, and focus, at a minimum, at the following sites down stream of impaired segments: Cedar Creek above the Winder Reservoir, Mulberry River at Thompson Mill, Mulberry River at Peachtree Road, and Mulberry River at Highway 11. Data from this monitoring approach will maintain a broad picture of water quality

conditions in the watershed, a rough assessment of potential pollutant sources, and a general assessment of management measure implementation and effectiveness.

IX. Implementation, Evaluation, and Revision

Management Strategies

The basic strategy for implementation of this watershed management plan is to create and manage a program that features both structural and nonstructural controls within the watershed to address the fecal coliform and sediment concerns. The goal of this program is to restore the watershed to the extent that the impaired segment as well as all streams in the watershed meet State water quality standards. Practices that will be utilized to accomplish the goals include increasing installation of agricultural BMPs, repair and replacement of septic systems, if needed, streambank stabilization/restoration, implementing practices to mitigate the impact of stormwater on water quality (green infrastructure), provide educational opportunities to encourage the public, courts, and governmental participation in the watershed improvement process, aggressive enforcement of erosion and sediment control ordinances, and establishing a watershed coordinator position to coordinate plan implementation.

Priority Areas for Management Actions

While landowners from the entire watershed will be eligible for any cost-share or grant funded projects, the following projects are of the greatest priority due to likeliness of the greatest impact on fecal coliform and sediment load reduction:

- Agricultural producers in Cedar Creek - Mulberry River and Lower Mulberry River subwatersheds;
- Properties served by individual septic systems throughout the watershed;
- Inclusion of green infrastructure in new development;
- Retrofit existing development with green infrastructure;
- Strict enforcement of Erosion and Sedimentation ordinance throughout watershed; and,
- Streambank restoration/stabilization based on priority segment(s) established through streambank evaluation.

Watershed Coordinator

Due to the size of the watershed and number of jurisdictions, for plan implementation to succeed, it is critical that a staff position is established to coordinate and oversee plan implementation.

Anticipated duties and responsibilities of this position are:

- Plan and implement projects that support applicable TMDLs and watershed plans targeting impaired segments;
- Prepare grant applications and work plans to support TMDL implementation projects;
- Assemble technical expertise and coordinate resources to prepare work plans and projects;
- Develop sampling and analysis plans and perform monitoring to assess effectiveness of watershed projects and water quality improvements;
- Work with local landowners, stakeholders, and partners to promote and solicit implementation of watershed improvement projects;
- Develop or assist in developing funding proposals to implement BMPs and goals identified in TMDLs;
- Develop and organize public outreach and educational water quality programs throughout the watershed;
- Make presentations at local meetings, elected official retreats, schools, conferences;
- Develop educational materials to support public outreach; and,
- Initiate Plan review and update, as needed, every three years.

Implementation Plan and Interim Milestones

This Watershed Management Plan anticipates an implementation period of ten years. However, specific projects may be implemented over shorter periods. This section outlines objectives that apply across the entire implementation process and measurable milestones that should reveal significant progress.

#	ACTIVITY	TIMEFRAME	RESPONSIBLE PARTY	COST ESTIMATE	FUND SOURCE	EVALUATION MEASURE
Plan Implementation Framework						
1	Convene meeting of WAC every six months to review status of plan implementation.	2018-2019	Jackson County Public Development	0	NA	Number of meetings held and attendees.
2	Establish Watershed Coordinator position to coordinate and implement Mulberry Watershed Management Plan.	2020	Jackson County Public Development	30,000 - 35,000 annually	general fund	Individual hired for position.
Monitoring Program						
1	Update GA EPD-approved Water Monitoring Plan to provide for post-BMP monitoring for fecal coliform or e.coli, and sediment	2018-2020	Watershed Coordinator	$250	319(h) grant	EPD-approved plan, number and frequency of sites monitored.
2	Conduct post-BMP water quality monitoring by AAS-certified personnel under GA EPD-approved Water Quality Monitoring Plan.	2020-2025	Watershed Coordinator	$400/yr assuming 5 sites per month	319(h) grant	Monthly water quality data downstream of installed BMPs on impaired segments and including; amount of load reduction.
3	Hold periodic AAS training for purpose of certifying volunteers to assist with post-BMP and long-term watershed monitoring.	2020-2028	Watershed Coordinator; Georgia AAS	NA	NA	Number of individuals certified.

#	ACTIVITY	TIMEFRAME	RESPONSIBLE PARTY	COST ESTIMATE	FUND SOURCE	EVALUATION MEASURE
4	Undertake long-term water quality monitoring by AAS-certified personnel under GA EPD-approved monitoring plan. *Note: If post–BMP monitoring demonstrates improved water quality, long-term monitoring should be for fecal coliform rather than E.coli and include geometric means in to order to potentially delist stream as non-supporting.*	2025-2028	Watershed Coordinator; certified volunteers	E.coli – $400/yr. Fecal coliform – $640/yr	County and/or City partner	Monthly water quality data.
5	Coordinate with UOWN* to participate in the River Rendezvous, periodic monitoring, and education initiatives.	2020-2028	Watershed Coordinator	$1,000/yr.	local sponsors	number of event attendees and number of site monitored in the watershed.,
Management Practices						
1	Review nutrient management plans with agricultural producers to insure appropriate implementation.	2018-2020	NRCS, GSWCC, SWCD	0	NA	Number of plans reviewed.
2	Contact agricultural producers for participation in cost-share programs. Priority is producers in the Cedar Creek - Mulberry River and Lower Mulberry River subwatersheds.	2020-2025	NRCS, GSWCC, SWCD, Watershed Coordinator	0	NA	Number of producers contacted.
3	Install appropriate agricultural BMPs.	2020-2025	NRCS, GSWCC, Watershed Coordinator	$300,000 – $500,000	319(h), EQIP, FSA	Number of installed BMPs, estimated contaminant load reduction.

#	ACTIVITY	TIMEFRAME	RESPONSIBLE PARTY	COST ESTIMATE	FUND SOURCE	EVALUATION MEASURE
4	Coordinate with Health Department to identify failing/leaking septic systems and contact property owners for participation in cost-share program.	2020-2025	Watershed Coordinator, County Health Department.	$50,000	319(h)	Number of projects installed, estimated contaminant load reduction.
5	Update development ordinance to required green infrastructure in new development.	2020-2025	Watershed Coordinator, City and County elected officials.	0	NA	Ordinance adopted.
6	Install green infrastructure project(s) in new development and retrofit old development throughout watershed.	2020-2028	Watershed Coordinator	varies by project scope and scale	319(h), TE Grant, CWSRF, GAC, CWSRF, UWSG, CDBG, USFWS, NRCS, Audubon/Toyota, developer, Cities, Counties.	Number of projects installed.
7	Evaluate and prioritize streambank segments for restoration/stabilization and initiate projects.	2022 – 2028	Watershed Coordinator	varies by scope of project	319(h), USFWS, NRCS, Audubon/Toyota, local	Length of stream bank stabilized/restored..
8	Enforce Erosion and Sedimentation ordinances throughout watershed.	2018-2028	Local jurisdiction Planning Department and Code Enforcement	$25,000 – $40,000/yr.	General Fund	Number of development plans reviewed; number of periodic inspections; number of enforcement actions.

#	ACTIVITY	TIMEFRAME	RESPONSIBLE PARTY	COST ESTIMATE	FUND SOURCE	EVALUATION MEASURE
Education, Involvement, and Stewardship						
1	Hold workshop for elected officials and government agencies to inform of content of Watershed Management Plan and its implementation.	2018-2020	Jackson County Public Development	0	NA	Number of participants and local governments.
2	Develop and expand partnerships with K-12 schools in the watershed to establish drinking water source and water conservation education, and stewardship programs for youth, including classroom and field experiences.	2020-2028	Watershed Coordinator	Varies by scope of program.	USEPA EE grant, Capt. Planet Foundation, Gerald C. Corcoran Education Grant, Wal-Mart Foundation State Giving Program (outdoor classroom funding)	Number of participants.
3	Utilize brochures, videos, and web-based products to educate public about septic system maintenance.	2020-2028	Watershed Coordinator	0	NA	Number of brochures distributed, number of participants at events, number of web site visits.
4	Hold annual river cleanup event.	2020-2028	Watershed Coordinator	$1,000	local sponsors, River's Alive, Georgia Power, cities, counties	Number of participants, amount and type of trash collected.

#	ACTIVITY	TIMEFRAME	RESPONSIBLE PARTY	COST ESTIMATE	FUND SOURCE	EVALUATION MEASURE
5	Provide for web-based watershed information and education.	2020-2028	Watershed Coordinator	0 (if housed on existing county website)	NA	Number of visits to website.
6	Install watershed signage at watershed boundaries major roads entering the watershed.	2020-2022	Watershed Coordinator, cities, counties	$60/sign (purchased from Bureau of Prisons)	local	Number and location of signs installed.
7	Build partnerships with universities and other research entities to conduct, support, and share research on urban ecology, green infrastructure, and community engagement.	2020-2028	Watershed Coordinator	0	NA	Number of partnerships.
8	Conduct educational presentations on watershed issues and activities to local civic groups, elected officials, and at festivals and events.	2020-2028	Watershed Coordinator	$2500/yr.	Georgia Power Foundation, Robert W. Woodruff Foundation	Number of presentations and participants.

Indicators to Measure Progress

Targeted water quality monitoring is necessary to measure long-term progress of installed practices.

For more finite objectives, the Evaluation Measure associated with each task in the Implementation Plan will reveal progress that the implementation program is gaining momentum. Following up with the Evaluation Measures should provide an indication of specific tasks needing more focus. Eligible producer and property owner participation rates will be another useful tool in determining the success of Plan implementation. Education and outreach participation rates will also be analyzed to help measure progress.

Indicators identified by the WAC to measure the status of the watershed management process and educational outreach outlined in this Plan are:

Indicator Type	Specific Indicator
Environmental	E.coli/fecal coliform bacteria and sediment - Direct water quality measurement at monitored sites.
Programmatic	Number of urban and agricultural best management practices implemented.
Programmatic	Number of educational initiatives accomplished and number of participants.
Programmatic	Number of river cleanup events.
Social	Participation rate in outreach programs.

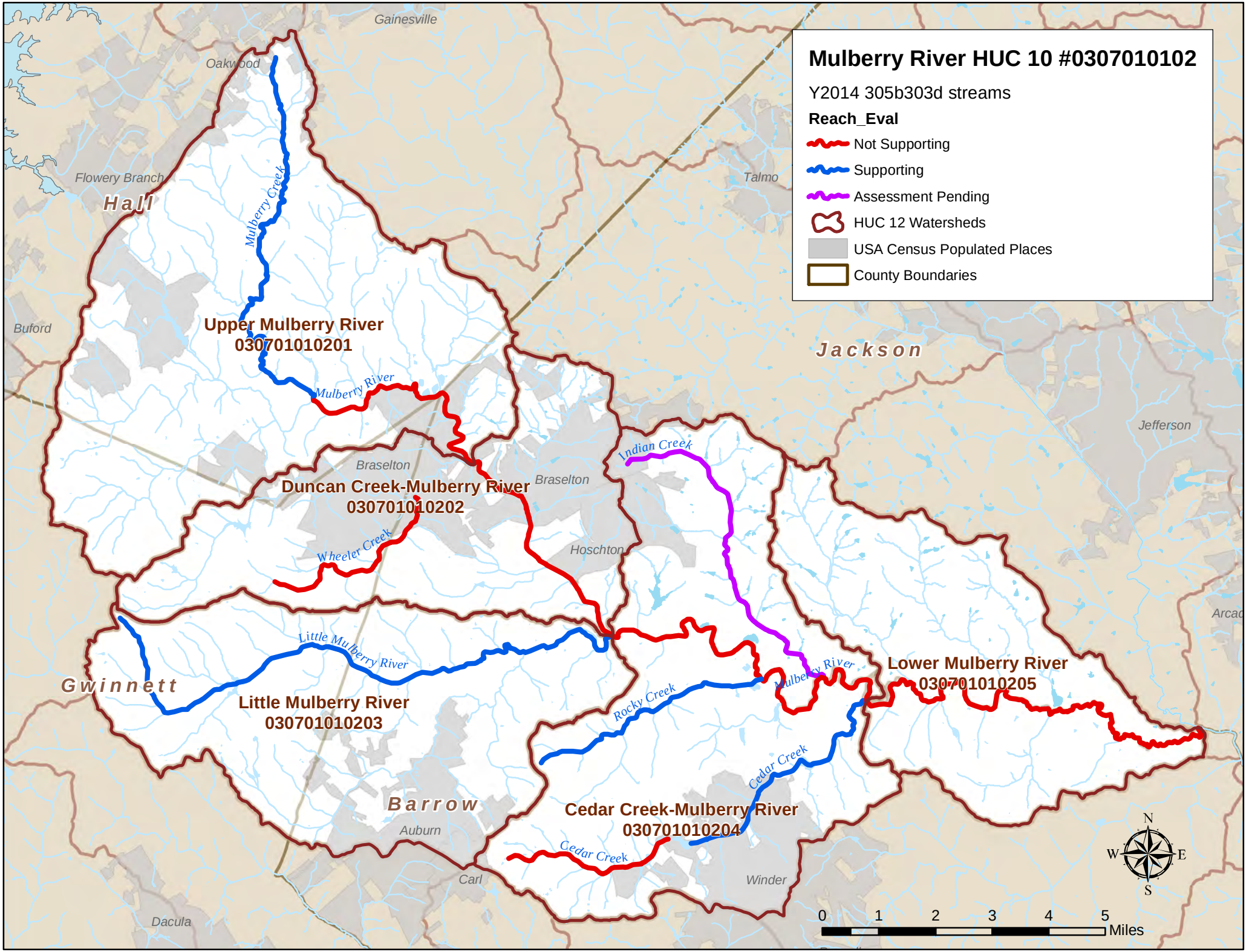
Of greatest importance, is the measure of how the various implementation projects have translated towards accomplishing the goal of attaining State water quality standards. Tracking the watershed management plan and its water quality improvements will best indicate progress toward reducing fecal contamination and sediment loads.

At a minimum of every three years, assessment of the implementation schedule and review of accomplishments are necessary to determine whether task milestones are being met.

Long-term Plan Implementation

Initially, Jackson County Planning and Development serving as the lead organization, will meet twice annually to discuss and evaluate plan implementation. NRCS, GSWCC, and UGA Ag. Extension will continue to assist agricultural producers with BMP installation through their respective agency programs. However, funding for other plan implementation activities must be secured through grants, loans, or governmental agencies. Continued plan implementation will be dependent on available funding.

X. Appendix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Supporting
Assessment Pending
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030701010201
Duncan Creek-Mulberry River
030701010202
Little Mulberry River
030701010203
Cedar Creek-Mulberry River
030701010204
Lower Mulberry River
030701010205
Mulberry Creek
Mulberry River
Wheeler Creek
Little Mulberry River
Indian Creek
Rocky Creek
Cedar Creek
Gainesville
Oakwood
Flowery Branch
Hall
Buford
Talmo
Jackson
Jefferson
Braselton
Hoschton
Gwinnett
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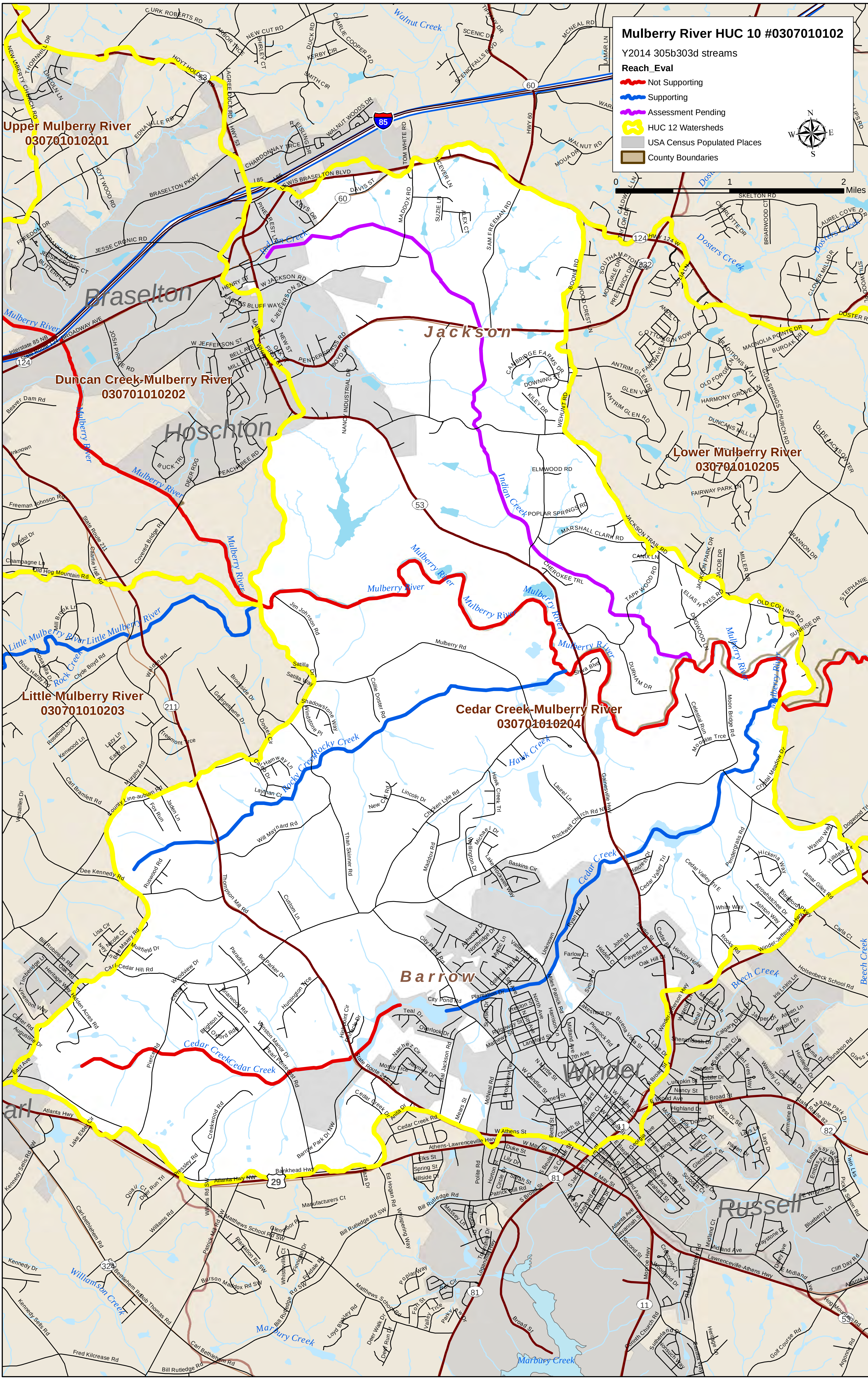

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Y2014 305b303d streams
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Not Supporting
Supporting
Assessment Pending
HUC 12 Watersheds
USA Census Populated Places
County Boundaries
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Upper Mulberry River
030701010201
Duncan Creek-Mulberry River
030701010202
Little Mulberry River
030701010203
Cedar Creek-Mulberry River
030701010204
Lower Mulberry River
030701010205
Braselton
Hoschton
Jackson
Barrow
Winder
Russell
Mulberry River
Little Mulberry River
Indian Creek
Rocky Creek
Rock Creek
Hawk Creek
Cedar Creek
Beech Creek
Dosters Creek
Walnut Creek
Williamson Creek
Marbury Creek
85
60
124
53
211
29
81
11
82
324

Mulberry River HUC 10 #0307010102

Y2014 305b303d streams

Reach_Eval

- Not Supporting
- Supporting
- Assessment Pending
- HUC 12 Watersheds
- USA Census Populated Places
- County Boundaries

N W E S

0 1 2 Miles

Duncan Creek-Mulberry River
030701010202

Little Mulberry River
030701010203

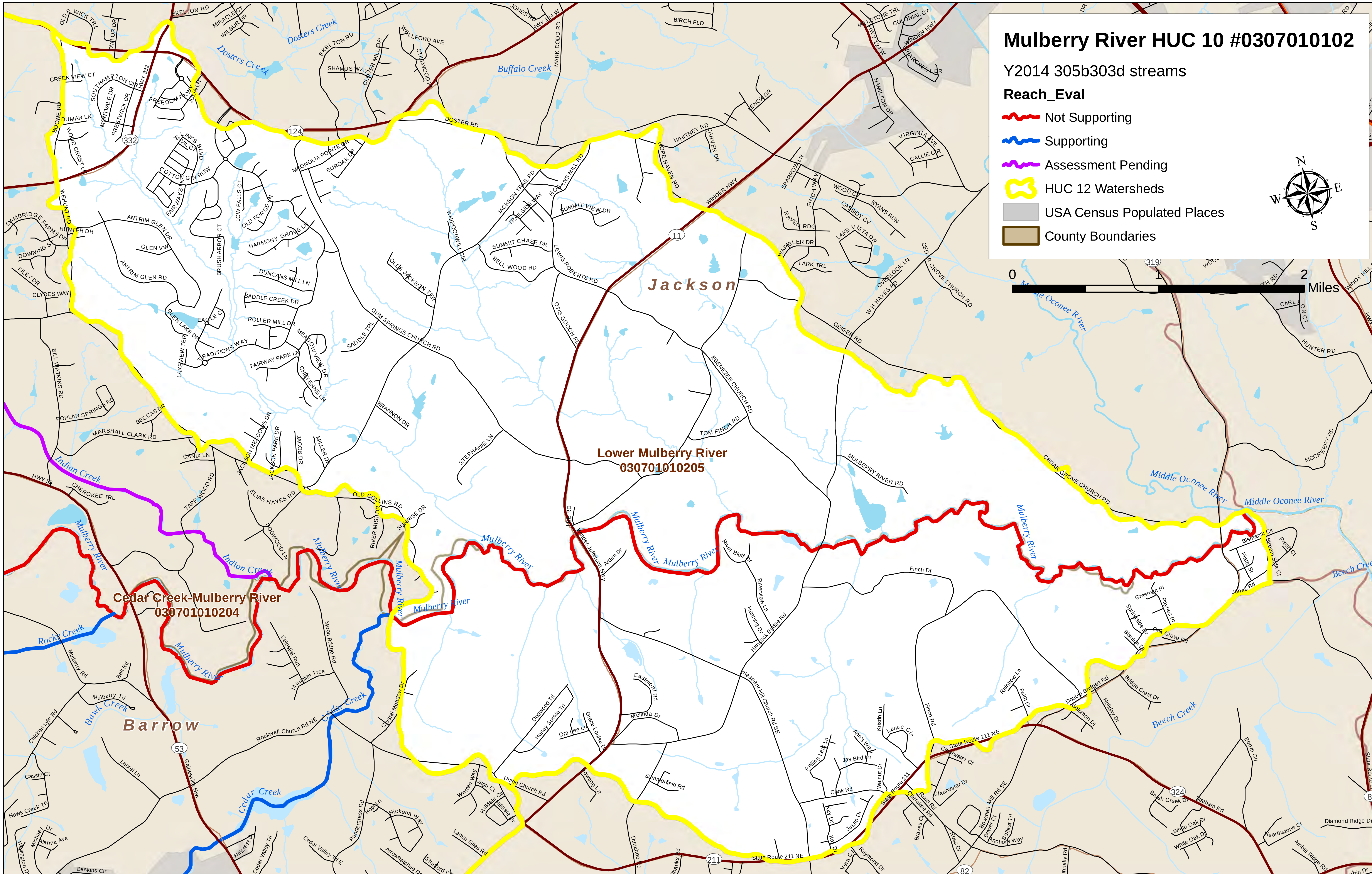
Braselton

Jackson

Gwinnett

Barrow

Hoschton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Supporting
Assessment Pending
HUC 12 Watersheds
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Miles
Lower Mulberry River
030701010205
Cedar Creek-Mulberry River
030701010204
Jackson
Barrow
Mulberry River
Middle Oconee River
Indian Creek
Cedar Creek
Rocky Creek
Hawk Creek
Beech Creek
Buffalo Creek
Dosters Creek

Mulberry River HUC 10 #0307010102

Y2014 305b303d streams

Reach_Eval

- Not Supporting
- Supporting
- Assessment Pending
- HUC 12 Watersheds
- USA Census Populated Places
- County Boundaries

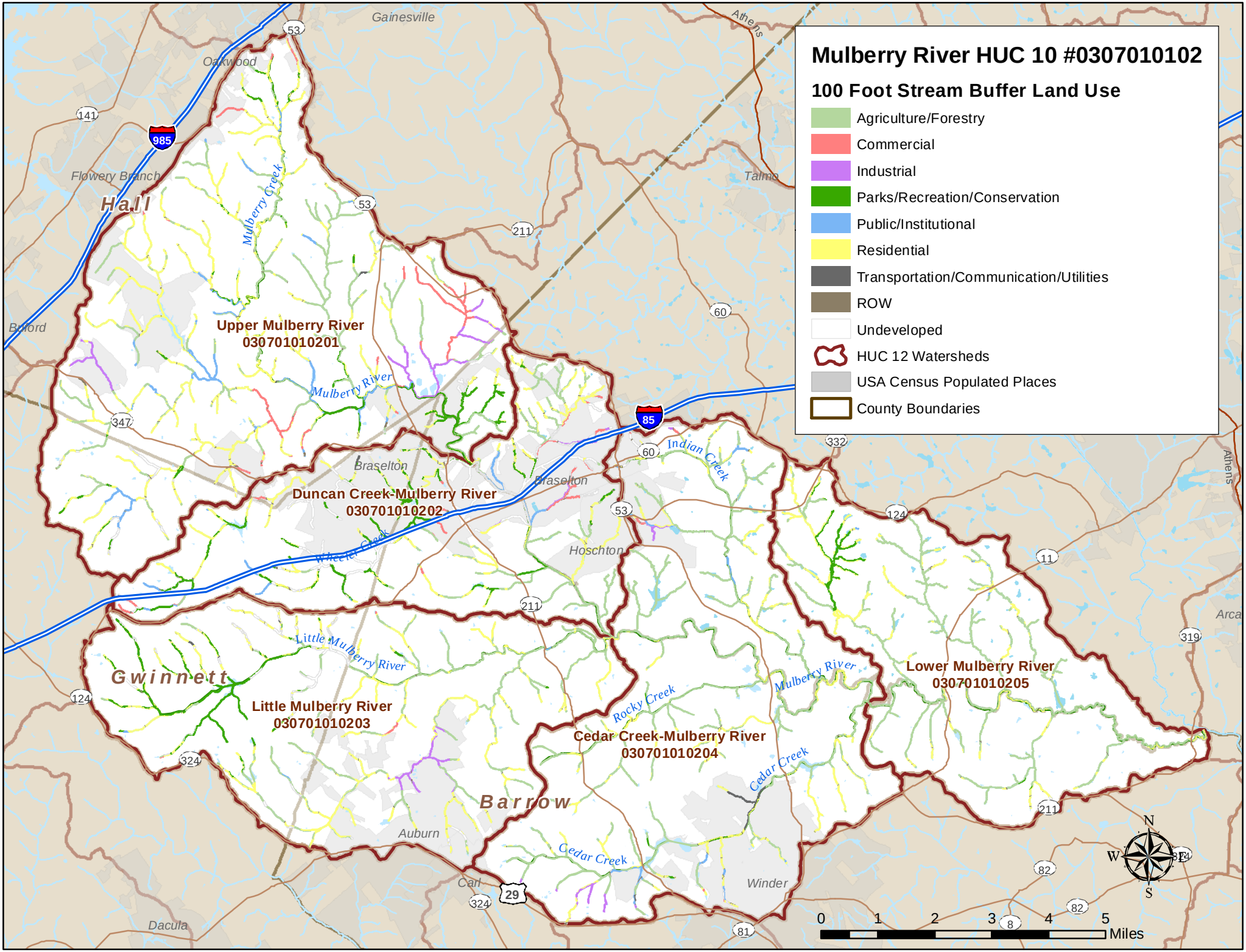
N W E S

0 1 2 3 Miles

Upper Mulberry River
030701010201

Duncan Creek-Mulberry River
030701010202

Oakwood
Flowery Branch
Buford
Hall
Gwinnett
Braselton
Barrow
Jackson
Mud Creek
Mulberry Creek
Big Creek
Suwanee Creek
Ivy Creek
Little Mulberry Creek
Mitchell Creek
Lollis Creek
Sherwood Creek
Duncan Creek
Cooper Creek
Deaton Creek
Lott Creek
Walnut Creek
Interstate 985 SB
Interstate 985 NB
I 85
I 85 S
I 85 N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100 Foot Stream Buffer Land Use
Agriculture/Forestry
Commercial
Industrial
Parks/Recreation/Conservation
Public/Institutional
Residential
Transportation/Communication/Utilities
ROW
Undeveloped
HUC 12 Watersheds
USA Census Populated Places
County Boundaries
Upper Mulberry River
030701010201
Duncan Creek-Mulberry River
030701010202
Little Mulberry River
030701010203
Cedar Creek-Mulberry River
030701010204
Lower Mulberry River
030701010205
Hall
Gwinnett
Barrow
Gainesville
Oakwood
Flowery Branch
Buford
Braselton
Hoschton
Auburn
Carl
Winder
Dacula
Talmo
Athens
Arca
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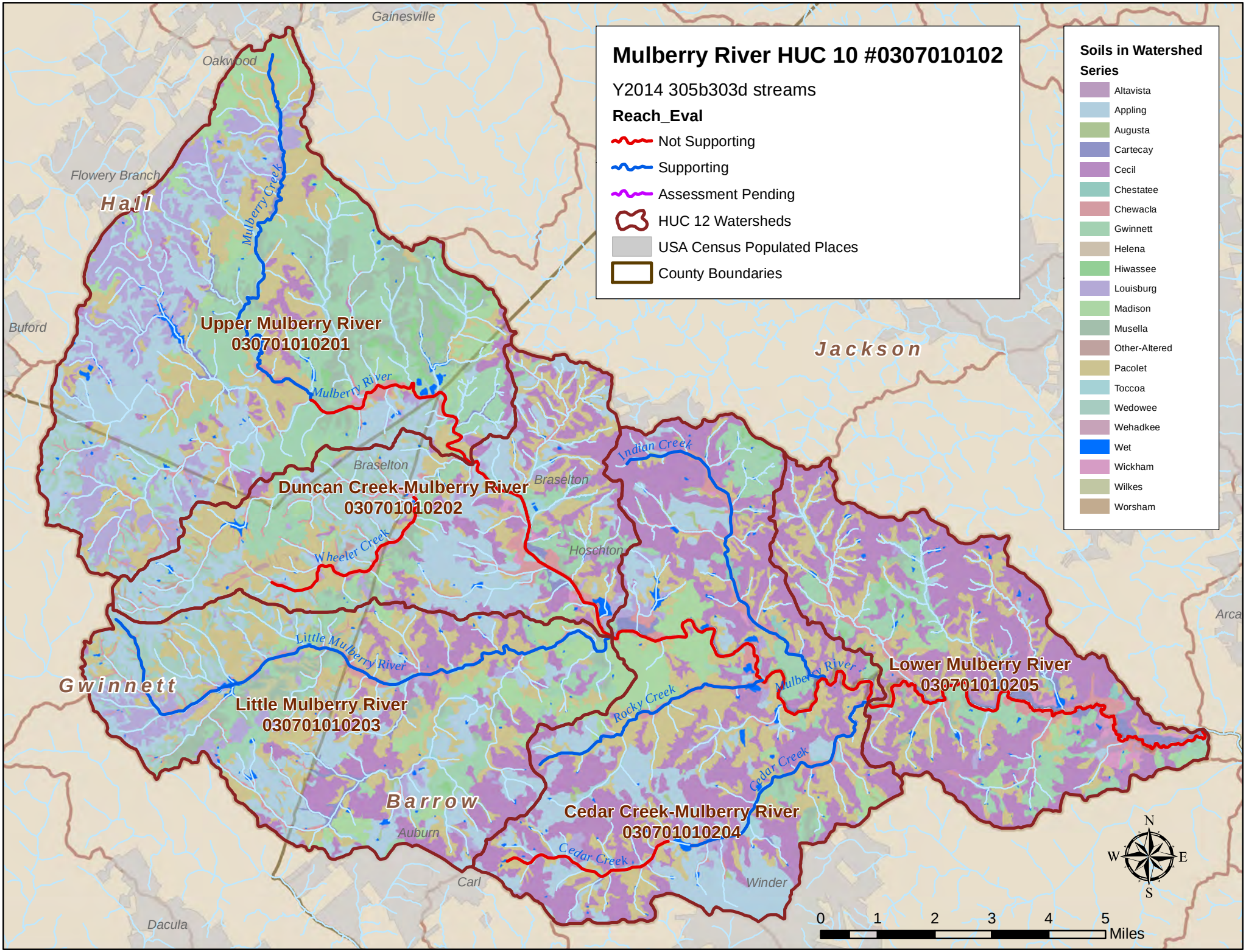
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Y2014 305b303d streams
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Supporting
Assessment Pending
HUC 12 Watersheds
USA Census Populated Places
County Boundaries
Soils in Watershed Series
Altavista
Appling
Augusta
Cartecay
Cecil
Chestatee
Chewacla
Gwinnett
Helena
Hiwassee
Louisburg
Madison
Musella
Other-Altered
Pacolet
Toccoa
Wedowee
Wehadkee
Wet
Wickham
Wilkes
Worsham
Upper Mulberry River
030701010201
Duncan Creek-Mulberry River
030701010202
Little Mulberry River
030701010203
Cedar Creek-Mulberry River
030701010204
Lower Mulberry River
030701010205
Gainesville
Oakwood
Flowery Branch
Hall
Buford
Jackson
Braselton
Hoschton
Arca
Gwinnett
Barrow
Auburn
Carl
Winder
Dacula
Mulberry Creek
Mulberry River
Indian Creek
Wheeler Creek
Little Mulberry River
Rocky Creek
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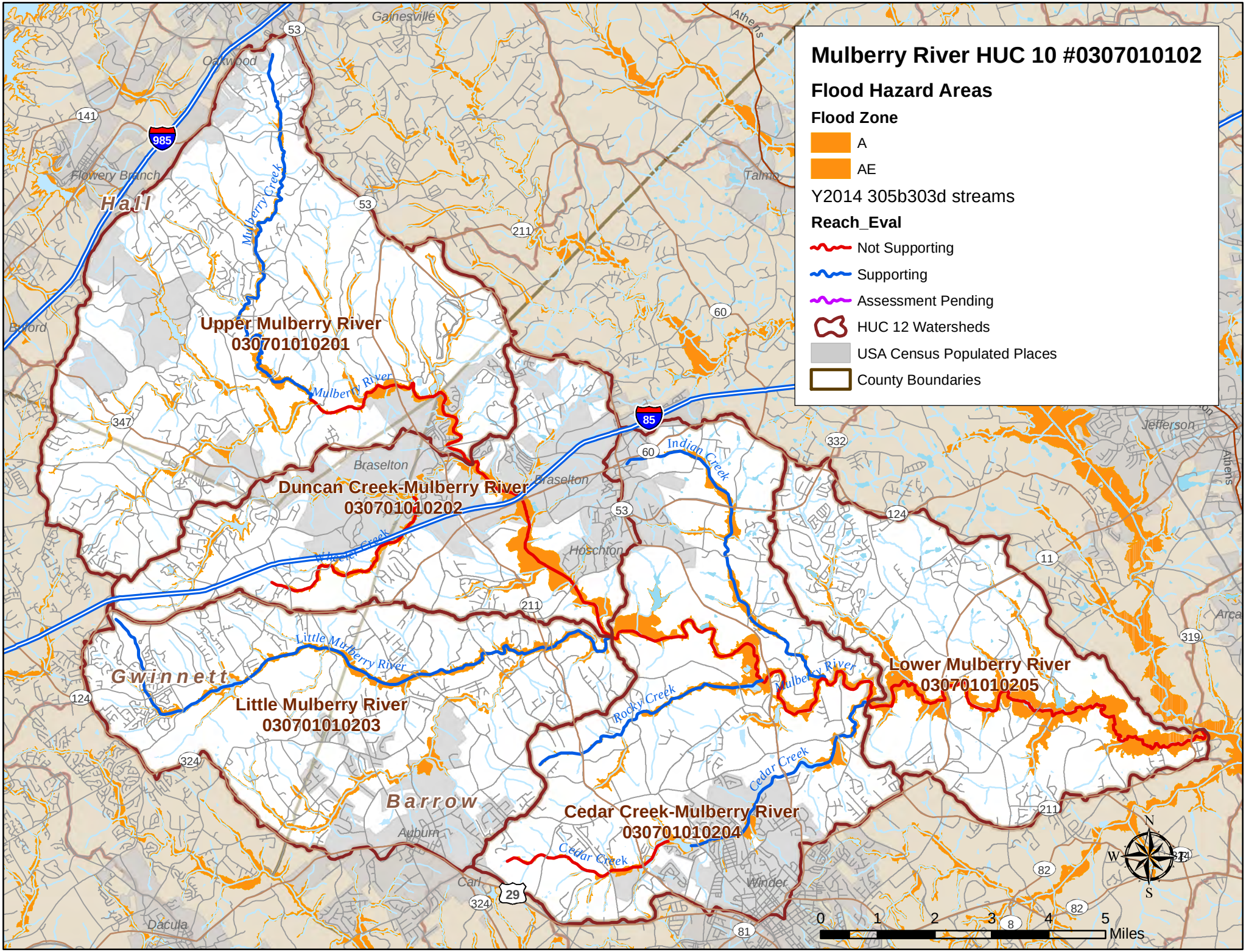
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Flood Hazard Areas
Flood Zone
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Y2014 305b303d streams
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Supporting
Assessment Pending
HUC 12 Watersheds
USA Census Populated Places
County Boundaries
Upper Mulberry River
030701010201
Duncan Creek-Mulberry River
030701010202
Little Mulberry River
030701010203
Cedar Creek-Mulberry River
030701010204
Lower Mulberry River
030701010205
Hall
Gwinnett
Barrow
Gainesville
Oakwood
Flowery Branch
Talmo
Braselton
Hoschton
Auburn
Winder
Carl
Dacula
Jefferson
Arca
Mulberry Creek
Mulberry River
Indian Creek
Little Mulberry River
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Cedar Creek
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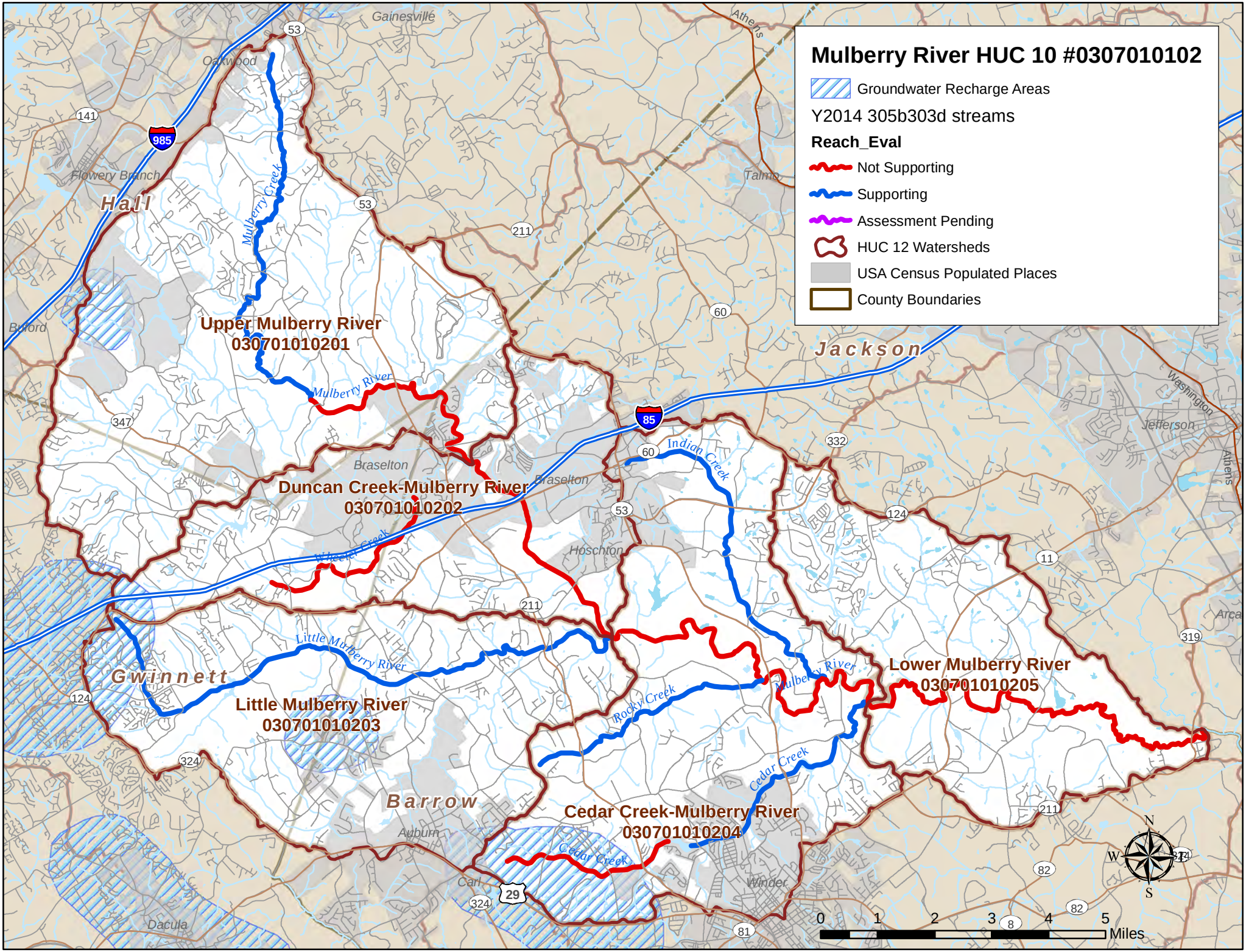
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Groundwater Recharge Areas
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HUC 12 Watersheds
USA Census Populated Places
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Duncan Creek-Mulberry River
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Little Mulberry River
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030701010204
Lower Mulberry River
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Barrow
Gainesville
Oakwood
Flowery Branch
Talmo
Braselton
Hoschton
Auburn
Winder
Carl
Dacula
Jefferson
Arcade
Athens
Buford
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Wheeler Creek
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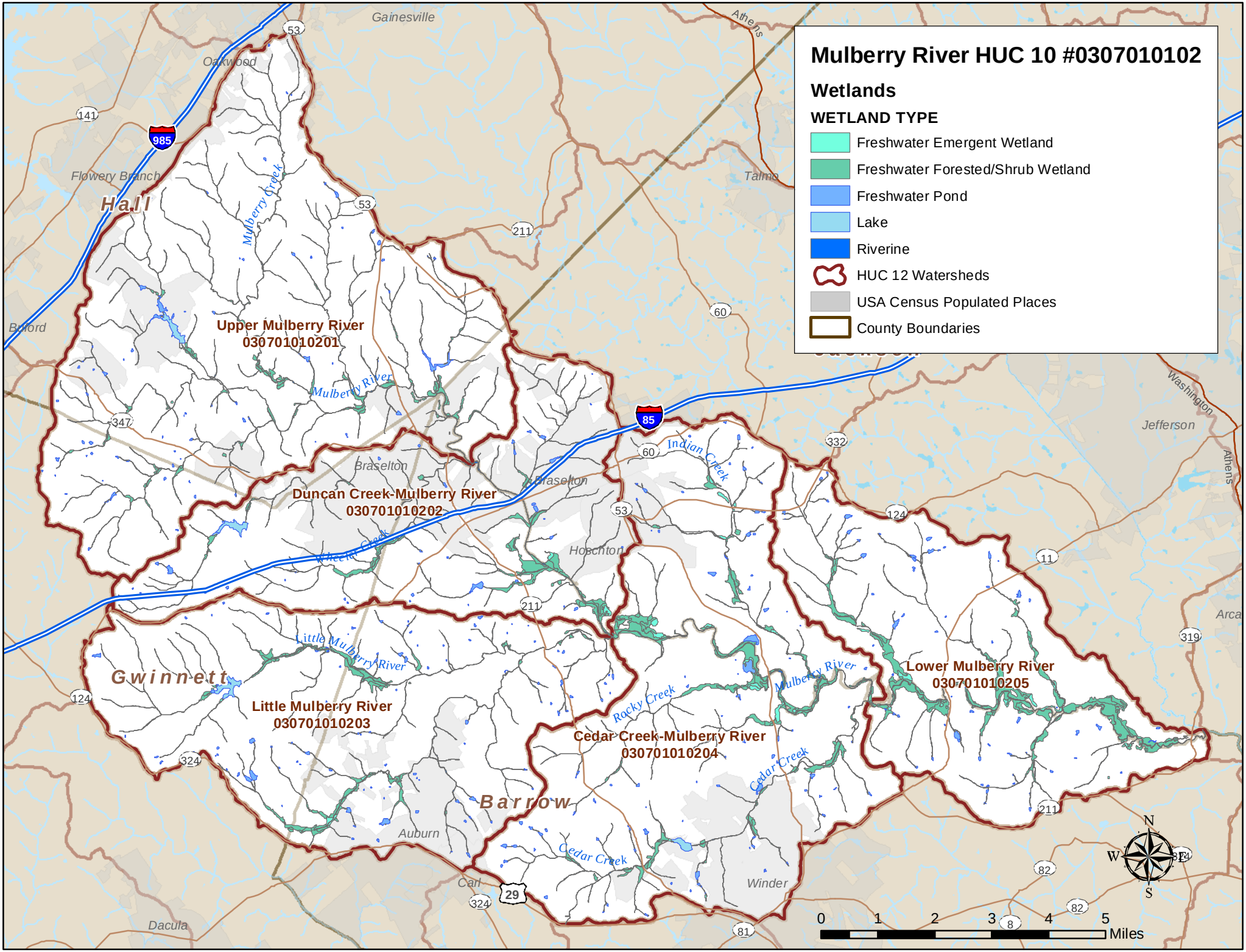
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Wetlands
WETLAND TYPE
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine
HUC 12 Watersheds
USA Census Populated Places
County Boundaries
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030701010201
Duncan Creek-Mulberry River
030701010202
Little Mulberry River
030701010203
Cedar Creek-Mulberry River
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Lower Mulberry River
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Oakwood
Flowery Branch
Talmo
Buford
Braselton
Hoschton
Auburn
Carl
Winder
Dacula
Jefferson
Arca
Mulberry Creek
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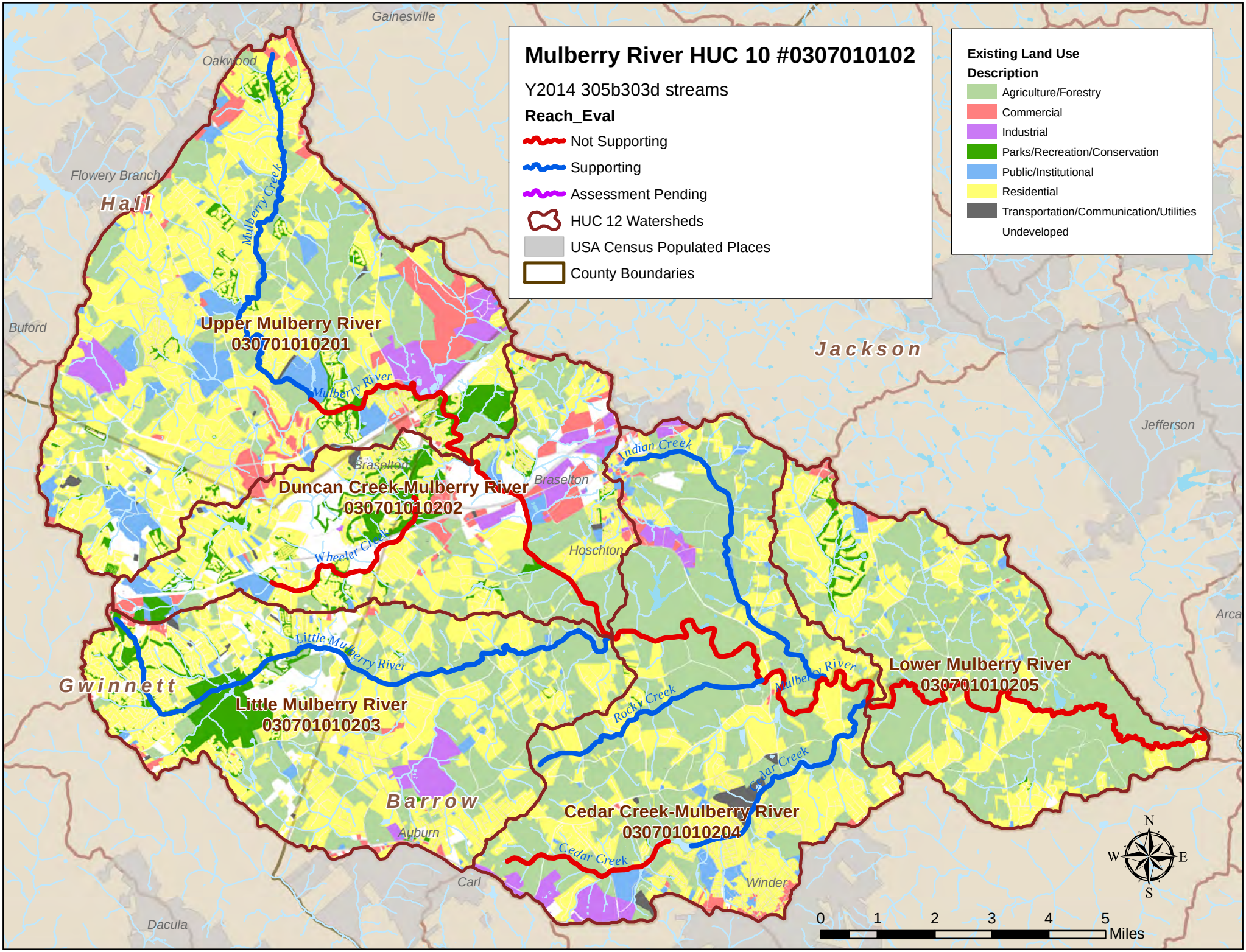
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Not Supporting
Supporting
Assessment Pending
HUC 12 Watersheds
USA Census Populated Places
County Boundaries
Existing Land Use
Description
Agriculture/Forestry
Commercial
Industrial
Parks/Recreation/Conservation
Public/Institutional
Residential
Transportation/Communication/Utilities
Undeveloped
Upper Mulberry River
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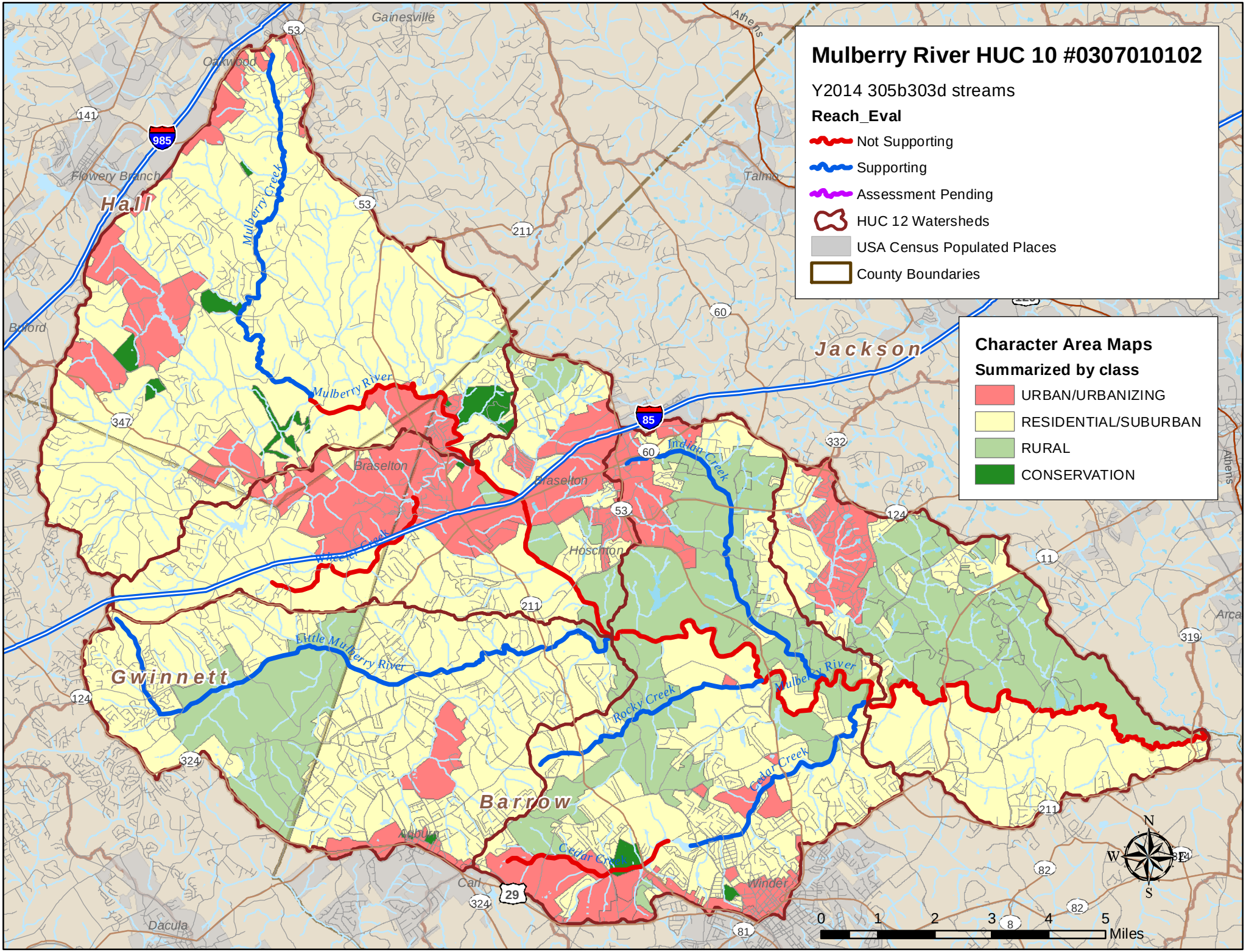
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Supporting
Assessment Pending
HUC 12 Watersheds
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URBAN/URBANIZING
RESIDENTIAL/SUBURBAN
RURAL
CONSERVATION
Hall
Jackson
Gwinnett
Barrow
Gainesville
Oakwood
Flowery Branch
Buford
Braselton
Hoschton
Talmo
Athens
Arca
Dacula
Carl
Winder
Auburn
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Little Mulberry River
Wheeler Creek
Indian Creek
Rocky Creek
Cedar Creek
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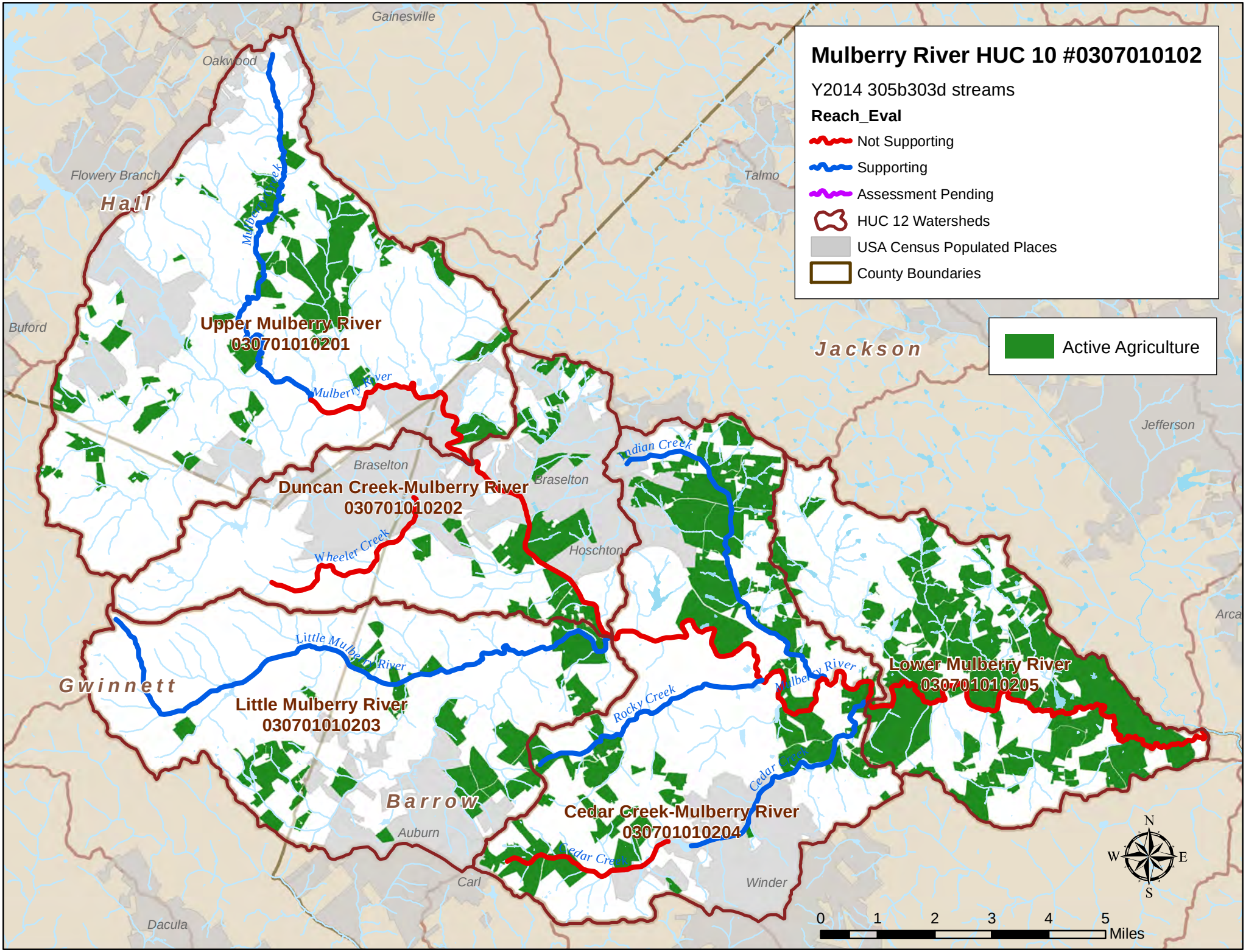
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Supporting
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Active Agriculture
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Duncan Creek-Mulberry River
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Little Mulberry River
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Cedar Creek-Mulberry River
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Hall
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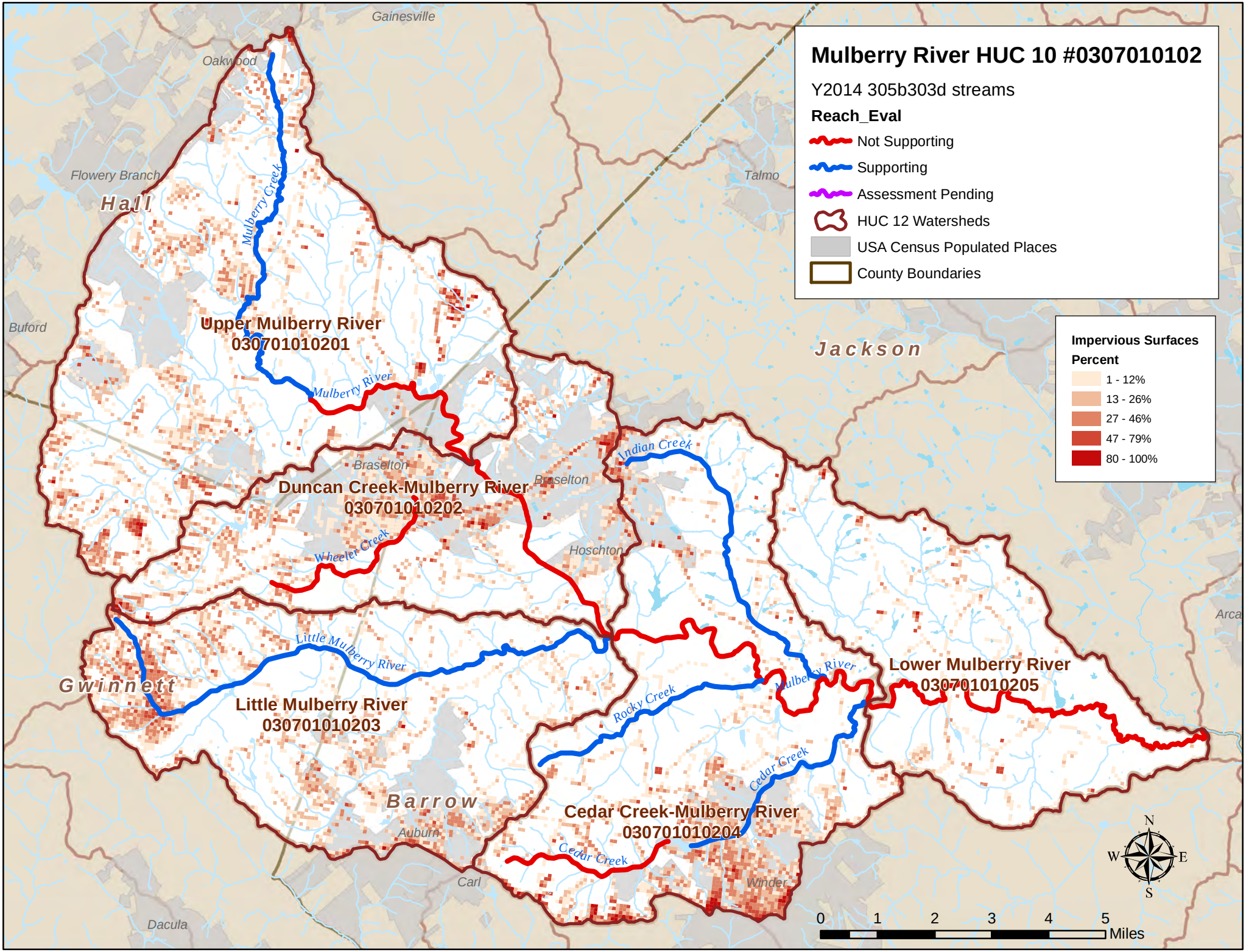
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Y2014 305b303d streams
Reach_Eval
Not Supporting
Supporting
Assessment Pending
HUC 12 Watersheds
USA Census Populated Places
County Boundaries
Impervious Surfaces
Percent
1 - 12%
13 - 26%
27 - 46%
47 - 79%
80 - 100%
Upper Mulberry River
030701010201
Duncan Creek-Mulberry River
030701010202
Little Mulberry River
030701010203
Cedar Creek-Mulberry River
030701010204
Lower Mulberry River
030701010205
Gainesville
Oakwood
Flowery Branch
Hall
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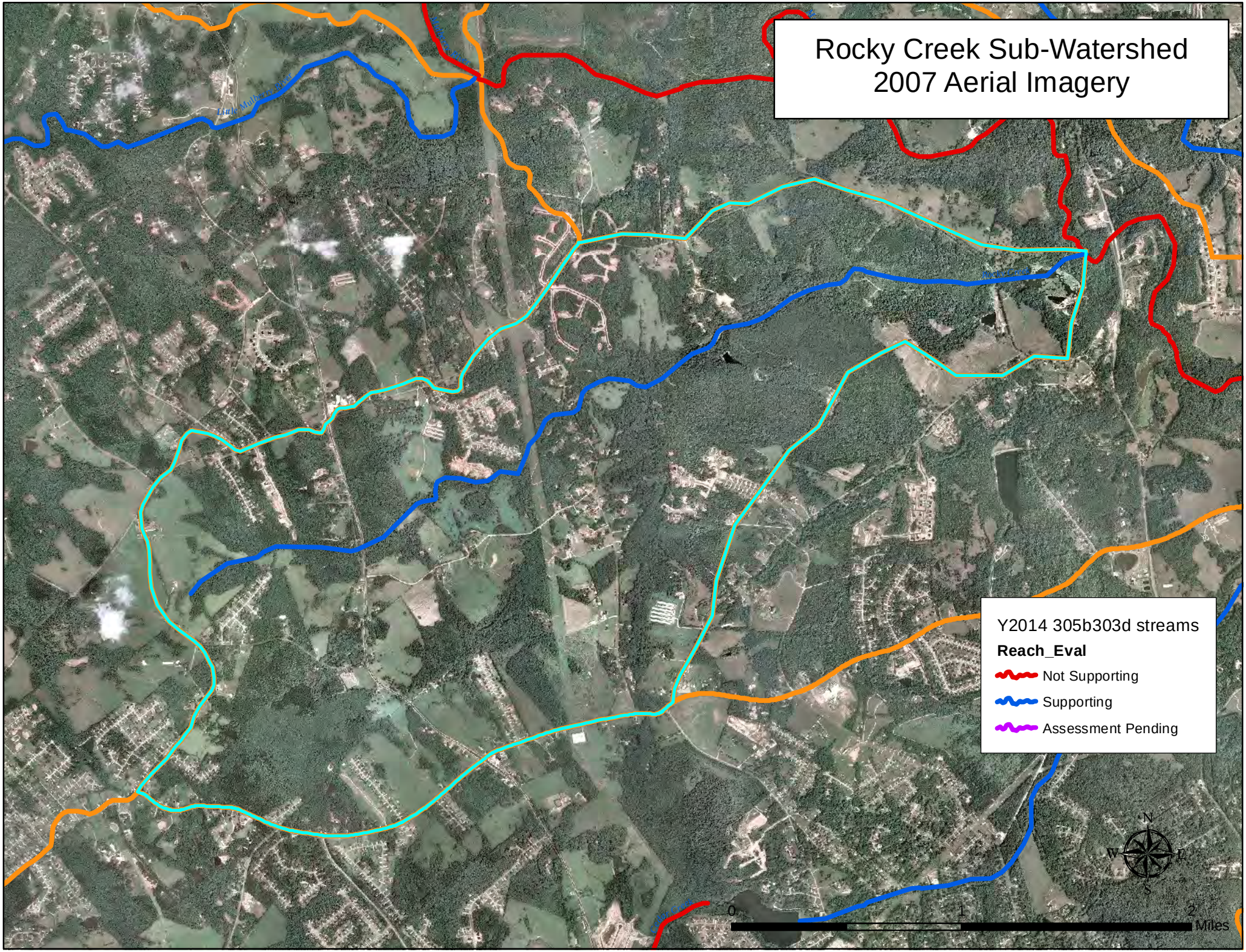
Rocky Creek Sub-Watershed
2007 Aerial Imagery
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Reach_Eval
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Supporting
Assessment Pending
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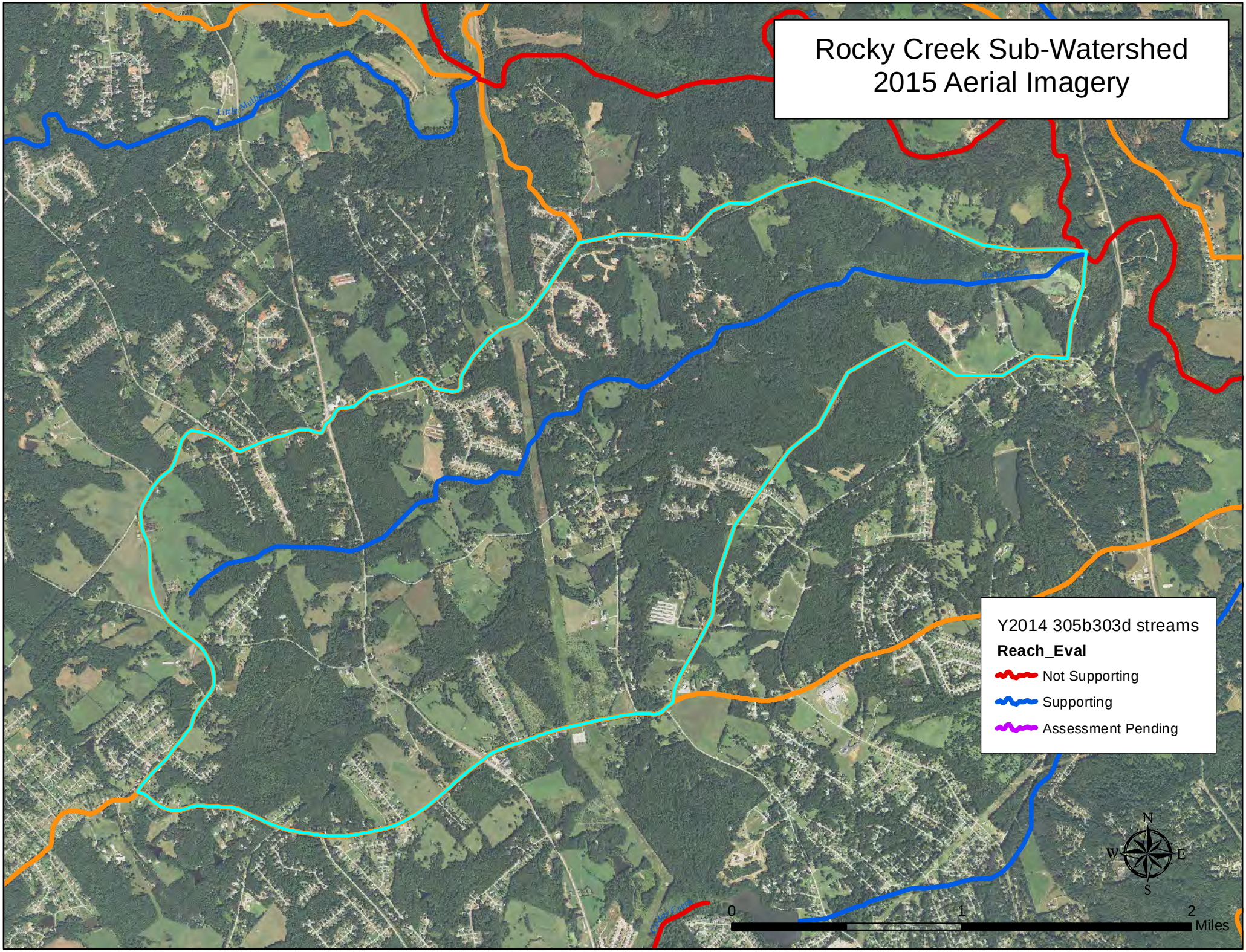
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2015 Aerial Imagery
Y2014 305b303d streams
Reach_Eval
Not Supporting
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Assessment Pending
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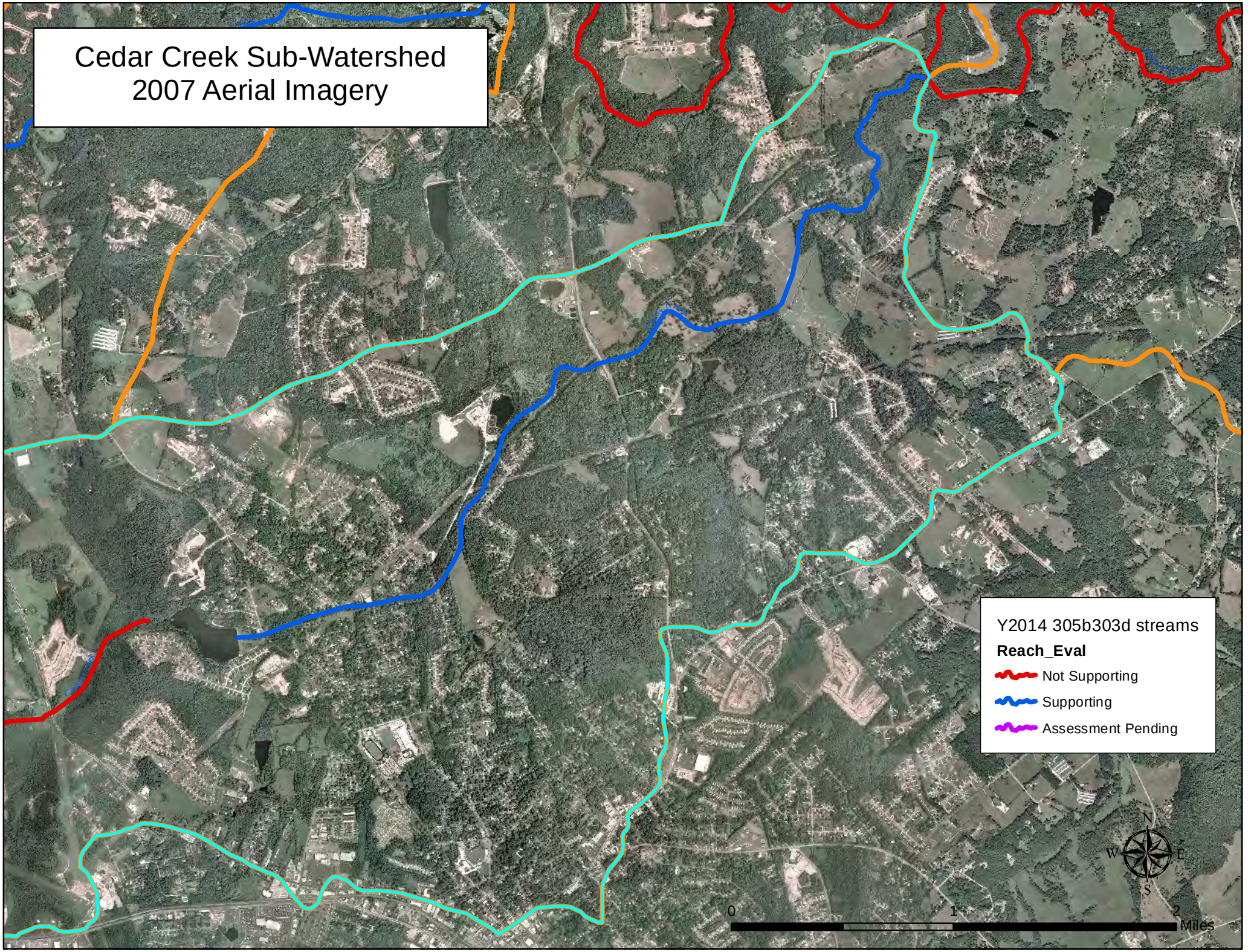
Cedar Creek Sub-Watershed
2007 Aerial Imagery
Y2014 305b303d streams
Reach_Eval
Not Supporting
Supporting
Assessment Pending
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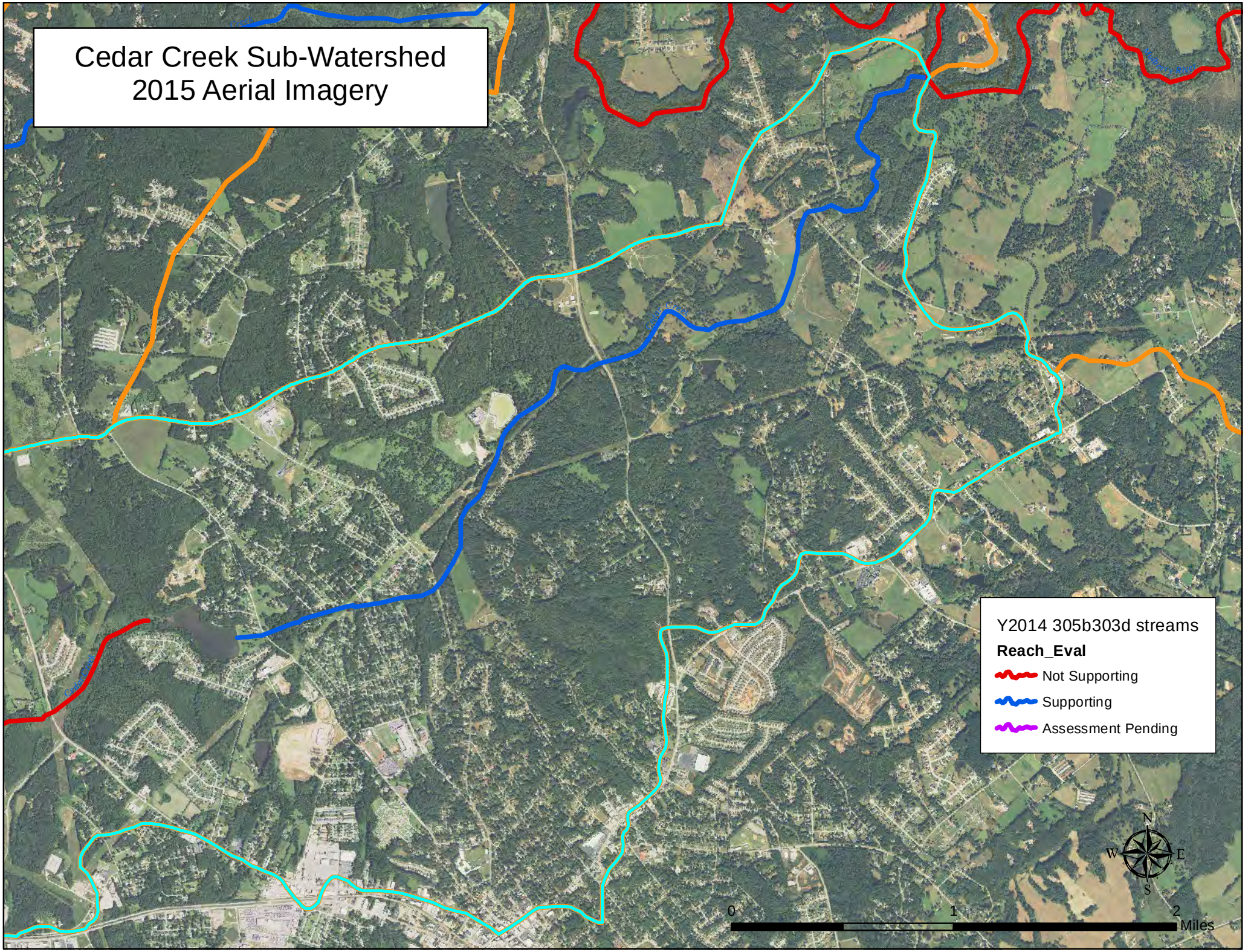
Miles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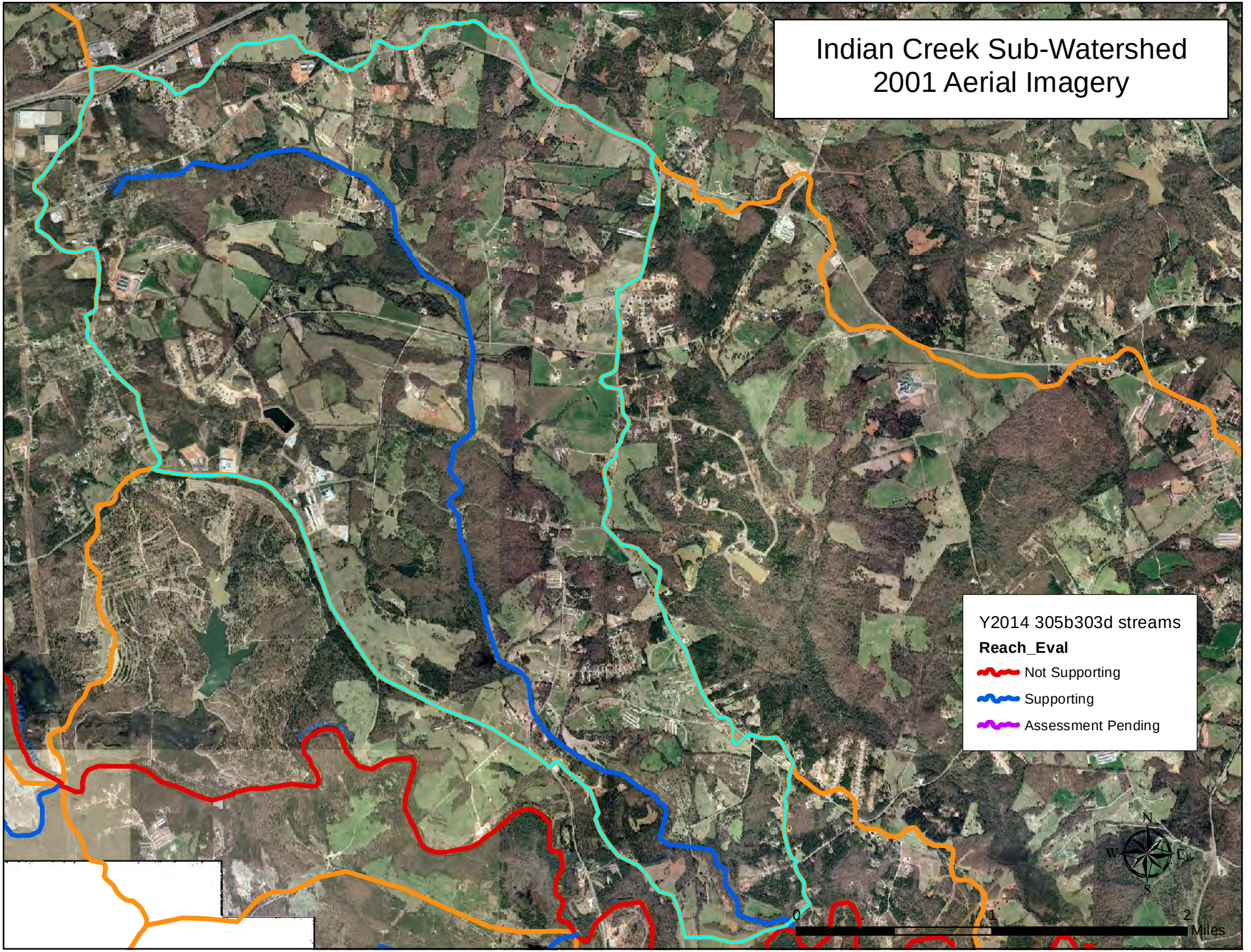
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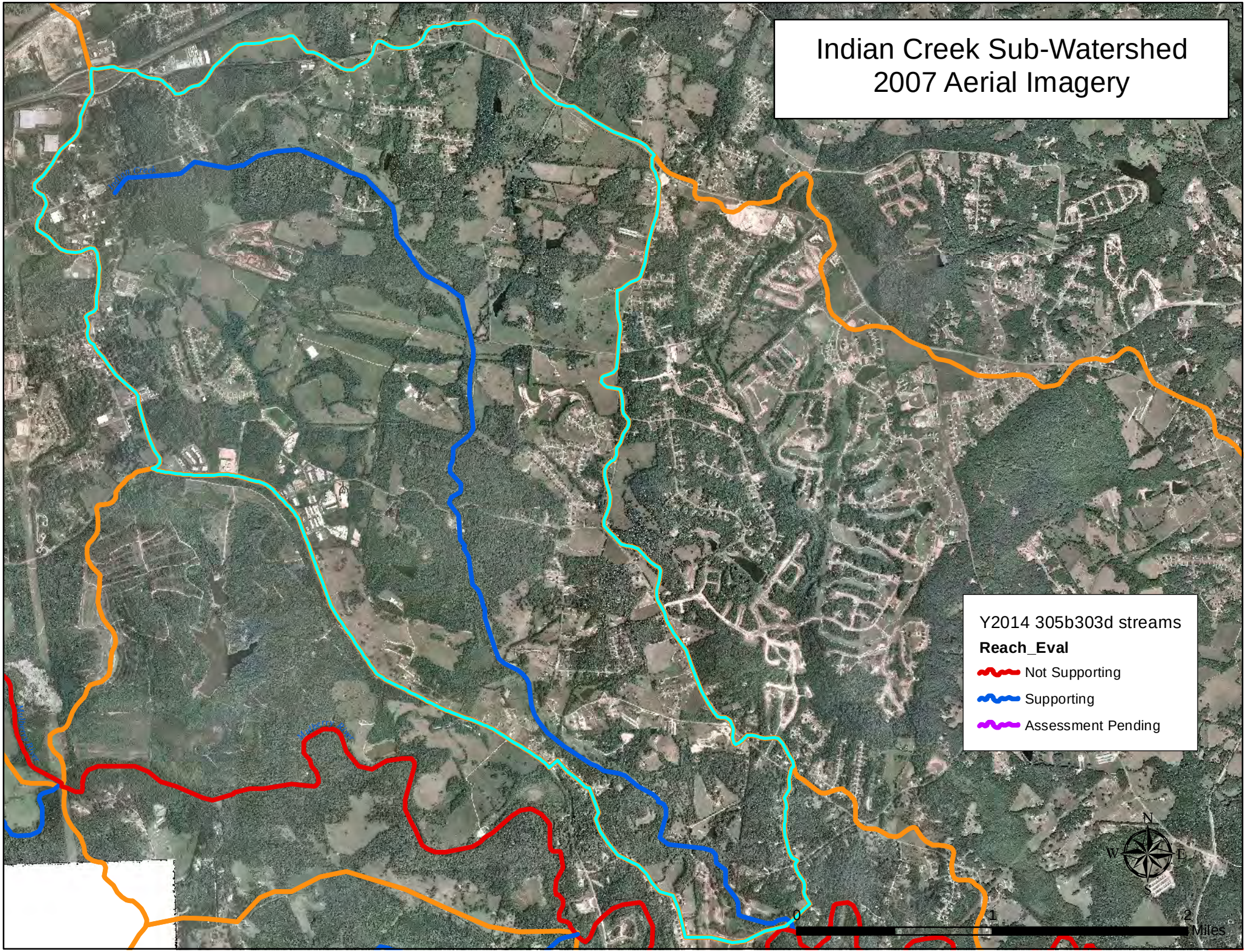
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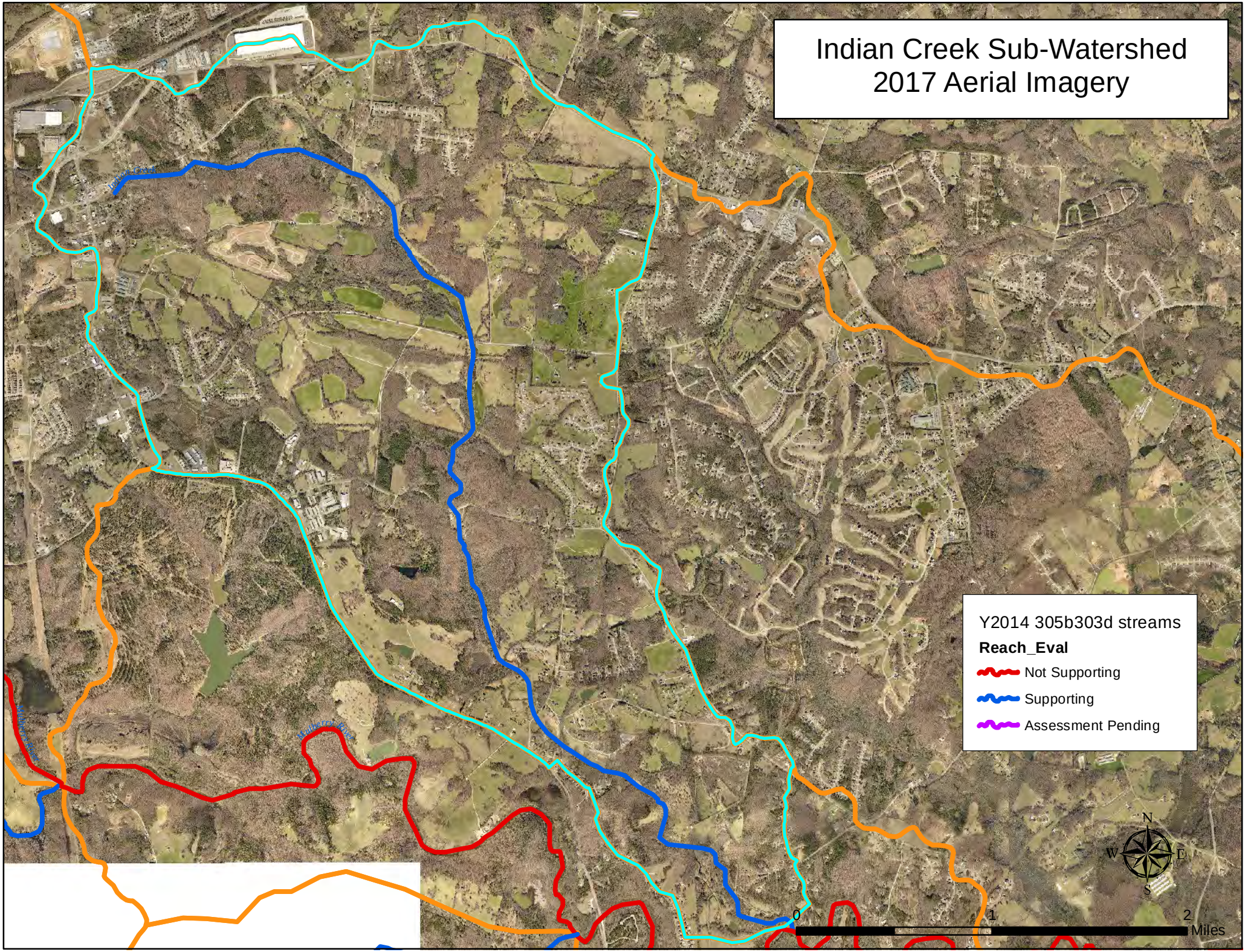
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Mulberry River Watershed Land Management Ordinances (2017)

BARROW COUNTY

Regulation/Ordinance	Description
Conservation and Natural Resource Area Easements	All required protected areas including stream buffers wetlands, and all other primary and secondary conservation are required to be placed in either a conservation or natural resource easement andpermanently protected from further subdivision, development, and unauthorized use. Addresses water quality.
Groundwater Recharge	Regulates development in groundwater recharge areas, as mapped on Georgia Hydrologic Atlas #18, for the purpose of protection public drinking water. Specifically places restrictions on septic tanks, drain fields; and spray fields; provides minimum sizes for lots requiring septic systems; and controls on landfills, above-ground chemical or petroleum tanks, agricultural waste lagoons, and certain other hazardous waste land uses. Addresses water quality.
Natural Resources Conservation Areas	Purpose, in part, is to conserve open land, including those areas containing unique and sensitive natural features such as stream buffers, floodplains, and wetlands, by setting them aside from development; to reduce erosion and sedimentation by the retention of existing vegetation and to encourage minimization of development on steep slopes;to enhance water quality of streams and waterways, and to protect valuable groundwater resources. Designates primary and secondary conservation areas; apecifies areas that must remain undisturbed and restricts types of development certain conservation areas. Addresses water quality.
River and Stream Corridor Protection	Establishes mininum of 100' buffer for protected rivers, which includes the Mulberry River, as well as Cedar Creek. All other streams require a minimum 25' buffer. Addresses water quality.
Tree Conservation	Provides standards for the protection or replacement of trees as part of the land development and building construction process for purpose of aesthetics, stormwater control, soil erosion, etc. For replacement, existing and new trees are assigned a "tree unit" value based on tree caliper or DBH and a specified number of tree units is required by development type based on distrubed site, excluding stream buffer.Encourages preservation of specimen trees and provides density bonus for preservation of such trees. The intent of the tree conservation provisions is to insure that a minimum density of trees is maintained on all developed sites. Where this intent cannot be met because a project site will not bear the required density of trees, the developer may be allowed to plant trees at his own expense on an alternate property in lieu of over-planting the development site. Priority for such tree planting is given to public sites. NOTE: Does not apply to residential subdivisions or agricultural activities. Has limited impact on stormwater due to exemption of residential development and limited number of trees required where tree replacement is mandated.
Water Supply Watershed	Requires vegetated buffer of 100' and setback of 150' in large and small water supply watersheds in water quality critcal area and 25' in limited development area. Additionally, in small water supply watershed, approval of BOC is reuqired where impervious surface will exceed 25% of property. Addresses water quality.

Wetlands Protection	Wetlands Protection District adopted as component of County development regulations protecting wetlands from most types of development. Addresses water quality.

GWINNETT COUNTY

Regulation/Ordinance	Description
Buffers Landscaping and Tree Protection	Provides standards for the protection or replacement of trees as part of the land development and building construction process for purpose of aesthetics, stormwater control, soil erosion, etc. For replacement, existing and new trees are assigned a "tree unit" value based on tree caliper or DBH and a specified number of tree units is required by development type based on distrubed site, excluding stream buffer.Encourages preservation of specimen trees and provides density bonus for preservation of such trees.Provides for tree bank as an alternative option to be used only in the event the site tree density or recompense tree requirement cannot be met on-site due to hardship. The Tree Bank provides two options: planing trees off-site or payment to the County monetary compentsation for trees. Funds are used to plant trees on public land. Addresses water quality.
Floodplain Management	Establishes minimum standards for new construction in flood hazard areas to reduce damage from flooding. Does not address water quality.
Phosphorus Reduction	Provides that when phosphorus reduction in wastewater is required by GA EPD, a local government must pass an ordinance mandating the retail sale of low phosphorus household laundry detergent as part of its phosphorus reduction process. Addresses water quality.
Riparian Ordinance	Applies to all land development activity on property containing a stream protection area. Requires a 50' undisturbed buffer from the stream bank and an additional setback or 25' beyond the undisturbed buffer. Prohibits impervious cover including, but not limited to, buildings, parking areas, driveways, and concrete retaining walls as well as minimizing grading, filling and earthmoving within the setback. Prohibits septic tanks or septic tank drain fields in the buffer or the setback. Addresses water quality.
Soil Erosion and Sedimentation Control Ordinance	Establishes minimum requirements effecting land-disturbing activities. Addresses water quality.
Stormwater Management	Requires that stormwater conveyance systems be provided for the protection of public right-of-way and private properties adjoining project sites and/or public rights-of-way.
Stream Buffer Mitigation Bank	Createsa Stream Buffer Mitigation Bank and a stormwater capital project for the sole purpose of financing and supporting the creation and perpetual operation of a stream buffer mitigation bank to serve the county. Funds may be used to implement projects that will replace the functional loss (for both water quality and quantity) of the forested stream buffer, including, but not limited to, design and construction of stream restoration projects, property acquisition, engineering and planning studies, and design and construction of stormwater best management practices. Addresses water quality.

HALL COUNTY	
Regulation/Ordinance	**Description**
Floodplain Management	Establishes minimum standards for new construction in flood hazard areas to reduce damage from flooding.
Soil Erosion and Sedimentation Control	Establishes minimum requirements effecting land-disturbing activities. Addresses water quality.
Tree Protection	Provides standards for the protection or replacement of trees for purpose of aesthetics, stormwater control, soil erosion, etc. For replacement, existing and new trees are assigned a "tree unit" value based on tree caliper or DBH and a specified number of tree units is required by development type based on distrubed site, excluding stream buffer.Encourages preservation of specimen trees and provides density bonus for preservation of such trees. Addresses water quality.
Water Supply Watershed, Groundwater Recharge Area, and Wetlands Protection	Groundwater Recharge Area - Regulates development in groundwater recharge areas, as mapped on Georgia Hydrologic Atlas #18, for the purpose of protection public drinking water. Specifically places restrictions on septic tanks, drain fields; and spray fields; provides minimum sizes for lots requiring septic systems; and controls on landfills, above-ground chemical or petroleum tanks, agricultural waste lagoons, and certain other hazardous waste land uses. Wetland Protection - Protects wetlands from most types of development. Water Supply Watershed - Applies to North Oconee Watershed Water Supply. Establishes required buffer depth. Addresses water quality.

JACKSON COUNTY	
Regulation/Ordinance	**Description**
Buffers, Tree Protection, and Landscaping	Tree Protection - Prohibits tree removal in stream and zoning buffers, unless otherwise permitted, encourages developers to consider development design to that protects exiting trees to the maximum extent possible. Provides standards for the protection or replacement of trees. For replacement, existing and new trees are assigned a "tree unit" value based on tree caliper or DBH and a specified number of tree units is required by development type based on disturbed site. Credits are available for preserved, existing trees. Encourages preservation of specimen trees and provides density bonus for preservation of such trees. Addresses water quality.
Floodplain Management	Establishes minimum standards for new construction in flood hazard areas to reduce damage from flooding.
Groundwater Recharge	Regulates development in groundwater recharge areas, as mapped on Georgia Hydrologic Atlas #18, for the purpose of protection public drinking water. Specifically places restrictions on septic tanks, drain fields; and spray fields; provides minimum sizes for lots requiring septic systems; and controls on landfills, above-ground chemical or petroleum tanks, agricultural waste lagoons, and certain other hazardous waste land uses. Addresses water quality.
River Corridor	Requires 100' natural vegetative buffer adjacent to Mulberry River. Addresses water quality.
Soil Erosion and Sedimentation Control	Establishes minimum requirements effecting land-disturbing activities. Addresses water quality.
Stormwater Management	Establishes minimum post-development stormwater management standards and design criteria for regulation and control of stormwater runoff quantity and quality. Encourages implementation of principles of low-impact development. NOTE: Ordinance has differing requirements for development inside versus outside the MS4. The MS4 is only a small portion of the Mulberry River watershed.
Water Supply Watershed	Within the large water supply watershed, which includes most of the Mulberry River in Jackson County, requires 100' natural vegetative buffer; 150' buffer for impervious surfaces; and limits percentage of impervious surface by development type. Addresses water quality.
Wetlands Protection	Protects wetlands from most types of development. Addresses water quality.

CITY OF AUBURN

Regulation/Ordinance	Description
Floodplain Management/Flood Damage Prevention	Establishes minimum standards for new construction in flood hazard areas to reduce damage from flooding.
Soil Erosion and Sedimentation Control	Establishes minimum requirements effecting land-disturbing activities. Addresses water quality.
Post Development Stormwater Management	Establishes minimum post-development stormwater management standards and design criteria for regulation and control of stormwater runoff quantity and quality. Encourages implementation of principles of low-impact development. Addresses water quality.
Trees and Landscaping	Provide for preservation and maintenance of trees and tree replacement based on a minimum basal area per acre. Requires tree protection during development. Addresses water quality.
Stormwater Detention	Requires stormwater detention where stormwater report indicates adverse stormwater runoff as a consequence of development.

TOWN OF BRASELTON

Regulation/Ordinance	Description
Flood Damage Prevention	Establishes minimum standards for new construction in flood hazard areas to reduce damage from flooding.
Groundwater Recharge	Regulates development in groundwater recharge areas, as mapped on Georgia Hydrologic Atlas #18, for the purpose of protection public drinking water. Specifically places restrictions on septic tanks, drain fields; and spray fields; provides minimum sizes for lots requiring septic systems; and controls on landfills, above-ground chemical or petroleum tanks, agricultural waste lagoons, and certain other hazardous waste land uses. Addresses water quality.
Soil Erosion and Sedimentation Control	Establishes minimum requirements effecting land-disturbing activities. Addresses water quality.
Stormwater Management	Establishes minimum post-development stormwater management standards and design criteria for regulation and control of stormwater runoff quantity and quality. Encourages implementation of principles of low-impact development.
Stream Buffer	Established natural vegetated buffer 150' from Mulberry River and 50; from other streams plus an addition 25' buffer for impervious surfaces. Addresses water quality.
Wellhead Protection	Protects defined radius from wellhead from development. Addresses water quality.

CITY OF FLOWERY BRANCH

Regulation/Ordinance	Description
Floodplain Management	Establishes minimum standards for new construction in flood hazard areas to reduce damage from flooding.
Soil Erosion and Sedimentation Control	Establishes minimum requirements effecting land-disturbing activities. Addresses water quality.

CITY OF HOSCHTON	
Regulation/Ordinance	**Description**
Soil Erosion and Sedimentation Control	Establishes minimum requirements effecting land-disturbing activities. City is not Local Issuing Authority. Addresses water quality.
CITY OF WINDER	
Regulation/Ordinance	**Description**
Flood Damage Prevention	Establishes minimum standards for new construction in flood hazard areas to reduce damage from flooding.
Soil Erosion and Sedimentation Control	Establishes minimum requirements effecting land-disturbing activities. Addresses water quality.
Stream Buffers	Established a natural vegetative stream buffer of 50' plus an additional 25' for impervious surfaces. Addresses water quality.
STATEWIDE	
Regulation/Ordinance	**Description**
On-Site Sewage Management Systems	Rules established by the Georgia Department of Public Health. Applies to all on-site sewage management systems except those under the jurisdiction of and regulated by GA DNR, as well as any public or community sewage treatment system.

Georgia FY 2017 EQIP Policy

This Policy is based on the Final Rule (IFR) for EQIP, published 12/12/14 in Vol. 79 No. 239 of the Federal Register, 7 CFR Part 1466.

Planned conservation practices must be maintained for the lifespan of the practice, as indicated on the NRCS-CPA-1155 or -1156. **All practices must also meet the minimum criteria in the Conservation Practice Standard (see the Georgia eFOTG)** and the criteria listed below. Extents above the minimum necessary to meet practice criteria are not eligible for payment. Note: Payment for some practices is only authorized when used in conjunction with another practice, as detailed in the Conservation Plan of Operation (CPO), with or without payment. The applicant is responsible for the installation, use, and maintenance of all components required in the conservation management system.

Management Practices - Management practice payments are only available on acres where the practice option has not been previously applied &/or utilized, and where there will be a higher level of management required for the requested practice option. Management payments are not authorized if the conservation practice option has previously been implemented on the acres in the application, with or without financial assistance. A management practice payment is only authorized once per acre within the length of the contract period for that conservation practice. Some management practices, where noted in the practice footnotes, are limited to no more than three separate management practices combined per acre.

Structural Practices - Structural practices include conservation practices that are either structural or vegetative, and have a multi-year lifespan. Structural practices involve the establishment, construction, or installation of site-specific measures. Payments are established as a one-time payment. The landowner must be a signatory to a contract which has EQIP funds used for any structural practice. Extents above the minimum necessary to meet practice criteria are not eligible for EQIP payment. Note: Payment for some practices is only authorized when used in conjunction with another practice, as detailed in the Conservation Plan of Operation (CPO), with or without payment.

Conservation Activity Plans (CAP) - Conservation Activity Plans are conservation plans developed for producers to assist in identifying conservation practices needed to address a specific natural resource need. CAPs are completed by NRCS certified Technical Service Providers (TSP). The list of NRCS certified TSPs is available on the NRCS TSP webpage: *www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/tsp*

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
472	**Access Control**						
	Bat Cave Exclusion	SqFt	$10.80		$12.96		10 Years
Excluding people from an area in order to address identified resource concerns. This is for facilitating exclusion of people to protect or enhance natural resource values. Control will be by a gate and support posts.							
Applicable to Wildlife Landuse Only. Only allowed on caves actively utilized as bat hibernacula that are in need of access control. **Must receive prior approval from the NRCS State Biologist** to implement this practice. Must be planned as a supporting practice in conjunction with 643 Restoration and Management of Rare and Declining Habitats.							
309	**Agrichemical Handling Facility**						
	Open building, locked chemical storage room, concrete slab floor 1/	SqFt	$13.14		$15.77		
	Enclosed building, locked chemical storage room, concrete slab floor 2/	SqFt	$20.79		$24.95		15 Years
1/ Includes following components of an open, post frame agrichemical handling facility: wash down station, locked chemical storage area, curbed reinforced concrete pad with collection sump area, and roof structure. Planner may add the following (if needed): critical area planting, mulch, HUA for entrance pads, and roof runoff. **Building must be designed and installation certified by registered Georgia PE or Area Engineer.**							
2/ Includes following components of an enclosed, roofed agrichemical handling facility: wash down station, locked chemical storage area, curbed reinforced concrete pad with collection sump area, a flexible membrane beneath concrete pad, and roof structure. Planner may add the following (if needed): critical area planting, mulch, HUA for entrance pads, and roof runoff. **Building must be designed and installation certified by registered Georgia PE or Area Engineer.**							
316	**Animal Mortality Facility**						
	Static pile, Wood Bin(s) 1/	SqFt	$6.76		$8.12		
	Composting - Small Animals 2/	LB/Day	$13.72		$16.47		
	Composting - Large Animals 3/	LB/Day	$73.34		$88.00		15 Years
If applicant has a functioning composter, incinerator, or rotary drum at the farm, they are eligible for a new composter, incinerator, or rotary drum only if the capacity of the existing animal mortality facility is not sufficient to handle the volume of mortality at the farm (for example: size of operation has increased since existing animal mortality facility was purchased or constructed). **NRCS approved Comprehensive Nutrient Management Plan required.**							
1/ Composters for animal mortality must use this scenario. Cost covers concrete floor , wooden walls, and any required excavation. Must add roofs and covers, concrete HUA access pad and critical area planting and mulch (if needed). Covers all types of composters (side shed, stand alone, and inside stackhouse). Area for payment is the area of concrete pad from post to post.							
2/ Rotary drums and incinerators - Poultry. Rotary cost include rotary drum, concrete pad and concrete entrance pad. Minimum width of the pad under the composter is 10 feet, and minimum length of pad will be the length of the machine plus 4 feet on each end. Incinerator must be a Type IV. Use the calculated total pounds/day from the Cost Estimator under the "Rotary Drum & Incinerators" tab. The value for pounds/day for this item is highlighted in yellow.							
3/ Rotary drums and incinerators - Swine. See note 2.							
396	**Aquatic Organism Passage**						
	Concrete Dam Removal	CuYd	$105.01		$126.01		
	Earthen Dam Removal	CuYd	$45.57		$54.69		
	Blockage Removal	CuYd	$73.31		$87.97		
	Nature-Like Fishway	Acre	$70,948.49		$85,138.19		
	CMP Culvert 1/	Each	$21,314.39		$25,577.27		
	Bottomless Culvert 1/	Each	$31,189.17		$37,427.01		
	Concrete Box Culvert 1/	Each	$37,920.58		$45,504.70		
	Concrete Ladder	Ft	$9,298.13		$11,157.76		
	Low Water Crossing	CuYd	$468.22		$561.86		5 Year
Applicable to Wildlife Landuse Only. This practice shall only be used in instances where rare and declining aquatic species passage has been identified as a resource concern (does not include low water crossing). Must receive prior approval from the State Biologist and engineer to schedule these scenarios.							
Landowner must secure required CWA and other necessary permits							

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
1/ If used on perennial streams must meet ACOE regional conditions and may need to submit a ACOE PCN.							
314	**Brush Management**						
	Mechanical, Hand tools 5/	Acre	$37.62		$45.15		
	Mechanical Bush Hog 3/	Acre	$27.82		$33.38		
	Mechanical Roller Chopper 4/	Acre	$41.42		$49.71		
	Mechanical & Chemical, Small Shrubs, Medium Infestation 2/	Acre	$105.03		$126.04		
	Chemical - Ground Applied 1/	Acre	$38.56		$46.27		
	Chemical, Aerial Applied 6/	Acre	$55.39		$66.47		10 Years
Applicable to Wildlife Landuse Only. Method selected must have the least negative effect on desirable native vegetation							
1/ Brush management on grazed forest, or pasture thru the use of broadcast application of material using chemical(s) to reduce or remove undesirable deciduous species (brush) in uplands and other areas not in or directly adjacent to streams, ponds, or wetlands.							
2/ Removal of small woody vegetation infestations by the use of mechanical cutter, chopper or other light equipment followed by an application of low cost chemicals in low volume							
3/ Removal of brush by the use of mechanical cutter.							
4/ The removal of brush by the use of chopper.							
5/ The removal of brush by the use of hand tools on sentitive areas where mechanical equipment will cause damage to the ecological site.							
6/ The removal of brush by using aerial equipment.							
5/ **Applicable to Wildlife Landuse Only**. Use of mechanical hand treatments for sensitive habitats that could be damaged by broadcast applications or large machinery.							
672	**Building Envelope Improvement**						
	Building Envelope - Sealant 1/	Ft	$1.05	$ 10,000.00	$1.26	$ 10,000.00	
	Building Envelope - Greenhouse Screens 2/	SqFt	$1.55	$ 10,000.00	$1.87	$ 10,000.00	
	Greenhouse - Insulate Unglazed Walls 5/	SqFt	$0.23	$ 10,000.00	$0.28	$ 10,000.00	
	Tunnel Doors 3/	SqFt	$8.93	$ 30,000.00	$10.72	$ 30,000.00	
	Insulated Poultry House Door	SqFt	$7.81	$ 20,000.00	$9.37	$ 20,000.00	
	Attic Insulation 4/	SqFt	$0.20	$ 20,000.00	$0.24	$ 20,000.00	
	Building Envelope - Batt Wall Insulation 5/	SqFt	$1.71	$ 30,000.00	$2.05	$ 30,000.00	10 Year
Practice must be a recommended practice in a Type 2 energy audit meeting the requirements of ANSI/ASABE S 612, Completing An On Farm Energy Audit. The energy audit must have been completed within the last 4 years. **Applicant must have certified audit completed before contract ranking to be eligible. Area Engineer will review all Farm Energy Improvement applications. Designs will be completed by third parties (Registered PE, TSP,etc) or Area Engineer; all designs must be submitted/approved by State Ag Eng or State Energy POC prior to implementation.** The licensed engineer/installer will provide certification that the work was completed in accordance with local codes. Landowner will provide material specifications which are used for these practices in order to certify that the material requirements in the energy audit are achieved. Energy Savings for each practice must be included in the energy audit and these energy savings must be entered into protracts during ranking.							
1/ Payment for linear foot of gap sealed by professional contractor							
2/ Mechanical screens for greenhouse to control heat loss and gain.							
3/ Based upon square foot of tunnel opening.							
4/ Based upon a minimum R-7 insulation in addition to existing attic/ceiling; **All materials other than blown fiberglass insulation must be approved by Area Engineer.**							
5/ Payment based on square foot of **existing** wall insulated, **can also include foundation wall or end walls**. Typically only a portion of the wall height is insulated (4 to 6'). The portion of the wall where exhaust fans are located is not insulated. Only approved method of insulation is metal exterior, 3.5" fiberglass batts (R-11), vapor barrier, & interior plywood or OSB sheathing.							
372	**Combustion System Improvement**						
	Electric Motor/Centrifugal Pump in-lieu of IC Engine, < 100 hp 1/	Each	$7,979.85		$9,575.82		
	Electric Motor in-lieu of IC Engine, less than 100 hp 2/	Each	$5,372.29		$6,446.74		
	Electric Motor in-lieu of IC Engine, greater than or equal to 100 hp 3/	HP	$70.61		$84.73		10 Years
Documentation requirements include; picture of the pumping unit being replaced that shows the pump model and capacity; total Dynamic Head calculations used by the dealer to determine the required size of the new pump and/or motor; picture of the new pumping unit showing model, serial number and capacity; new pump must be installed on concrete pad. **Must be submitted by Certified Irrigation Designer (CID), Georgia PE, or Area Engineer**. Documentation that engine has been replaced and evidence (i.e. picture) that an older engine was destroyed or salvaged. Payment will be made for the motor size required by the design or to next largest commercially available pump (ie 48 hp would be a 50 hp motor). . Must address a documented energy or an air quality resource concern; see eFOTG. All electrical work must meet local and state codes.							
1/ Surface water							
2/ Well							
3/ Well or Surface water							
317	**Composting Facility**						
	Concrete floor, outer wood wall no bins	SqFt	$5.32		$6.39		
	Composter, whole concrete floor, wood or concrete bins	SqFt	$5.85		$7.02		
	Composter, whole concrete floor, no bins, organic	SqFt	$3.75		$4.50		15 Years
Only for non animal mortality composting (manure, ag by products). Use 316 scenario for dead animal composting. Add roof (if needed), critical area planting, mulch and HUA for entrance pad. Pay based on square foot of concrete pad post to post area. NRCS approved Comprehensive Nutrient Management Plan required, if waste is generated on site.							
327	**Conservation Cover**						
	Native Species 5/	Acre	$137.29		$164.75		
	Pollinator Species 1/	Acre	$449.84		$539.81		

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
	Monarch Species Mix 4/	Acre	$668.26		$801.91		
	Introduced Species 2/	Acre	$124.65		$149.59		
	Orchard or Vineyard Alleyways 3/	Acre	$86.16		$103.40		3 Years
	1/ Pollinator permanent vegetation, including mix of native grasses, legume, forbs, established on any land needing permanent vegetative cover that provides habitat for pollinators. See Job sheet specification on planting mix. Limited to 1 year.						
	2/ This practice applies to land retiring from agricultural production and on other lands needing permanent protective cover. See Forage & Biomass Planting (512) if the purpose is to reduce erosion and sedimentation. The document is filed alphabetically in the FOTG. Limited to 1 year. Payment made upon planting.						
	3/ Pecan groves needing permanent protective cover in the alleyway to reduce ground and surface water pollution. Payment made after estimating the nitrogen contribution from the legume in the spring by using UGA's Nitrogen Avaliability Calculator, or current recommended laboratory analysis, in a nutrient budget for pecans. Also, note degree of weed control provided by the legume cover. Payment applies only to area planted to conservation cover. Limited to 1 year.						
	4/ MONARCH Species: Establish permanent vegetative cover for pollinator habitat according to state specifications. Typically used for high quality nectar and pollen species. Land covered with permanent monarch habitat including a mix of milkweed species, native grasses, legumes, and forbs. Plants sown for monarch habitat may also provide cover for beneficial insects and wildlife. Typically, used for conventional or organic land on small, intensive areas that are central to specialty crop production. Not typically used for large scale plantings.						
	5/This practice typically involves conversion from a clean tilled (conventional tilled) intensive cropping system to permanent native vegetation (scenario includes native grass).See native jobsheet for specific specification for planting.						
	Applicable to Wildlife Landuse Only. Only native plantings allowed as a supporting practice to Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Creation (658), Wetland Restoration (657), or Wetland Wildlife Habitat.						
328	**Conservation Crop Rotation**						
	Basic Rotation - Organic and Non-organic 1/	Acre	$4.20		$5.03		
	Specialty Crops -Organic and Non-organic 2/	Acre	$22.37		$26.85		1 Year
	1/ 2/ The rotation established adds higher residue crop(s) to the rotation in order to reduce erosion, improve soil quality or break pest cycles. Limited to two years. Payment after evaluating weed control through harvest when the purpose is to reduce weed pressure. Follow UGA directions if managing other pests. Payment after harvest when the pupose is to have a positive effect on soil characteristics.						
340	**Cover Crop**						
	Cover Crop - Basic and organic/non-organic	Acre	$61.37		$73.65		
	Cover Crop Multiple Species Organic and Non-Organic	Acre	$72.19		$86.63		1 Year
	Basic (1 cereal or legume) and multiple (2 or more species). Payment limited only to establishing a cover crop in a conservation tillage system. Payment made after documentation of cover crop biomass at termination. May not be harvested for seed. See standard jobsheet for specific data required for each purpose in this crop production system: control soil erosion, improve soil health, increase sol moisture, protect water quality/manage nitrogen and control weeds. Limited to two years.						
342	**Critical Area Planting**						
	Grass Hydroseeding 1/	Acre	$1,958.64		$2,350.36		
	Perennial Sod Establishment	SqFt	$0.23		$0.28		
	Vegetation-normal tillage (Organic and Non-Organic) 1/	Acre	$267.60		$321.12		
	Native and Introduced Vegetation - Moderate Grading 2/	Acre	$535.98		$643.17		10 Years
	Payment made after establishment of seeded vegetation or planting rooted vegetation. Limited to one year.						
	1/ Normal tillage includes cutipacking and light tillage						
	2/ Moderate grading includes cultipacking and bulldozing						
	Applicable to Wildlife Landuse Only. Native seeding -light tillage is the only approved payment scenario for the widlife fund pool.						
362	**Diversion**						
	Diversion	Ft	$1.68		$2.02		10 Years
	Includes grading and shaping. Need to add critical area planting and mulching (if needed)						
647	**Early Successional Habitat Development/ Management**						
	Mowing 1/ 3/	Acre	$27.89		$33.47		
	Disking 2/ 3/	Acre	$26.55		$31.86		1 Year
	1/ Provides early successional habitat by mowing in forested openings where existing vegetation needs to be maintained for early successional habitat. May also need 314 brush management, 666 forest stand improvement, 315 herbaceous weed control, 327 Conservation Cover, or 666 forest stand improvement.						
	2/ Provides early successional habitat by disking vegetation and creating bare ground. May also need 314 brush management, 666 forest stand improvement, 315 herbaceous weed control, 327 Conservation Cover, or 666 forest stand improvement.						
	3/ Applicable to Wildlife Landuse Only. Allowed when planned as a supporting practice to 643, 644,645,or 666. This practice will not disturb high quality, natural habitat.						
374	**Farmstead Energy Improvement**						
	Ventilation - Paddle Stir Fan	Each	$156.68		$188.01		
	Plate Cooler ≤ 499 gal/hr	Each	$4,165.27		$4,998.33		
	Plate Cooler 500 - 749 gal/hr	Each	$4,860.01		$5,832.01		
	Plate Cooler 750 - 999 gal/hr	Each	$5,592.60		$6,711.12		
	Plate Cooler 1,000 - 4,999 gal/hr	Each	$9,279.78		$11,135.73		
	Scroll Compressor	HP	$664.34		$797.20		

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
	Variable Speed Drive ≤ 50 HP	HP	$282.21		$338.66		
	Variable Speed Drive > 50 HP	HP	$99.47	$ 15,000.00	$119.36	$ 15,000.00	
	Automatic Controller System	Each	$1,108.55	$ 7,500.00	$1,330.26	$ 7,500.00	
	Motor Upgrade ≤ 2 HP	Each	$570.48		$684.58		
	Motor Upgrade > 2 and < 40 HP	Each	$1,063.67		$1,276.40		
	Motor Upgrade 40 and < 100 HP	Each	$4,948.73		$5,938.48		
	Motor Upgrade = or > 100 HP	Each	$6,297.52		$7,557.03		
	Vacuum Pump - Compatible w/Variable Speed	Each	$3,467.79		$4,161.34		
	Heating - Radiant Systems 1/	SqFt	$0.47	$ 40,000.00	$0.56	$ 40,000.00	
	Heating (Building) 2/	kBTU/Hr	$9.59		$11.51		
	Heating - Attic Heat Recovery vents	Each	$115.39	$ 10,000.00	$138.47	$ 10,000.00	
	Compressor Heat Recovery Unit	kBTU/Hr	$2,887.29		$3,464.75		
	Grain Dryer	BU/HR	$73.52	$ 50,000.00	$88.22	$ 50,000.00	10 Years

Practice must be a recommended practice in a Type 2 energy audit meeting the requirements of ANSI/ASABE S612, Completing An On Farm Energy Audit. The energy audit must have been completed within the last 4 years. **Applicant must have certified audit completed before contract ranking to be eligible. Area Engineer will review all Farm Energy Improvement applications. Designs will be completed by third parties (Registered PE, TSP, etc) or Area Engineer; all designs must be submitted/approved by State Ag Eng or State Energy POC prior to implementation**. **All electrical practices requiring electrical wiring will be completed by licensed electrician. The licensed installer will provide certification that the work was completed in accordance with local and state codes**. Landowner will provide material specifications which are used for these practices in order to certify that the material requirements in the energy audit are achieved. Energy Savings for each practice must be included in the energy audit and these energy savings must be entered into protracts during ranking.

1/ Replacement of pancake heaters or equivalent. Can use radiant tube heaters, radiant brooders heaters (aka round radiant heaters), or quad radiant heaters. Based upon square ft. of house.

2/ Natural gas, propane, or fuel oil unit heater or boiler; typically for swine and greenhouse production.

382	**Fence**						
	Barbed/Smooth Wire	Ft	$1.83		$2.20		
	Woven Wire	Ft	$2.44		$2.93		
	Permanent Electric	Ft	$0.97		$1.16		
	Temporary Electric-Polywire	Ft	$0.63		$0.75		20 Years

515.81E(1)
Boundary fence (property line fence) or perimeter fence is eligible—
--- On expired or expiring Conservation Reserve Program (CRP) land to establish a grazing operation; however, practices may not be implemented until the CRP contract has expired. See section 515.52C regarding eligibility for EQIP on CRP.
--- On land to protect, restore, or enhance an environmentally sensitive area, such as a riparian area or wetland.
--- On land to facilitate a change in production systems per the requirements of section **515.81D(4). (see below)**.
515.81D(4)
(4) Changes in Production System
(i) Practices that facilitate a beneficial cost-effective change in production system (e.g., change in agricultural land use) provided that all of the following criteria are met:
• The change in production system results in a higher level of conservation benefit, such as a lower intensity land use
• The producer will implement a management practice that supports the change in production system
• The practices are necessary to address a natural resource concern that is associated with the new production system
• Cost-effectiveness can be documented
(ii) Example 1.—Producer is transitioning highly erodible cropland to grazed pasture. The operation currently does not support or maintain livestock, but transitioning to grazed pasture will address erosion related resource concerns and result in a higher level of conservation benefit. Program support is allowed to implement fencing (CP 382), watering facility (CP 614), prescribed grazing (CP 528) and other facilitating practices that are necessary to establish the new production system and address the resource concern.
(iii) Example 2.—Producer is transitioning cropland to pastureland to address a resource concern resulting from overgrazing on part of the operating unit. At a minimum, the EQIP schedule of operations must include prescribed grazing (CP 528) to address resource concerns associated with livestock on the cropland being converted to grazing land. Other supporting or facilitating practices likely to be needed include forage and biomass planting (CP 512), watering facility (CP 614), fence (CP 382), or other practices identified that are necessary to address resource concerns associated with the conversion from cropland to grazing land. The conversion of cropland production system to a grazing production system reduces impact to the existing operating unit and also moderates erosion by lowering the intensity of use on the converted cropland field

Applicable to Wildlife Landuse Only. Allowed when planned as a supporting practice to Prescribed Grazing (528) in conjunction with Forest Stand Improvement (666), Restoration

386	**Field Border**						
	Field Boarder, Native Species 1/	Acre	$90.79		$108.95		
	Field Boarder, Pollinator 2/	Acre	$133.83		$160.60		
	Field boarder, Introduced Species 3/	Acre	$65.21		$78.25		10 Years

1/ Practice includes seedbed prep and planting of native species. The area of the field border is taken out of production.

2/ Practice includes seedbed prep and planting of pollinator friendly herbaceous species. The area of the field border is taken out of production. See pollinator job sheet for specific planting recommendations.

3/ Practice includes seedbed prep and planting of introduced species. The area of the field border is taken out of production.

Applicable to Wildlife Landuse Only. Allowed when planted around active cropland and the area is taken out of production . Native species must be utilized . Must request a State Biologist variance to use non-native species if no suitable native species are available.

393	**Filter Strip**						
	Filter Strip, Native species 1/	Acre	$120.98		$145.17		
	Filter Strip, Introduced species 2/	Acre	$128.33		$153.99		10 Years

Payment made after establishment. Includes seedbed preparation. Limit one year.

1/ Native herbaceous vegetation - Practice includes seedbed prep and planting.

2/ Introduced herbaceous vegetation. Practice includes seedbed prep and planting.

Applicable to Wildlife Landuse Only. Only the Filter Strip payment scenaraio approvded for use under the wildlife fund pool. This practice will not disturb high quality, natural habitat.

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
394	**Firebreak**						
	Constructed - Dozer 1/	Ft	$0.23		$0.28		
	Constructed - Light Equipment 2/	Ft	$0.09		$0.10		5 Years
Install firebreak as per required burn plan and according to the GFC GA Best Management Practices for Forestry Manual.							
1/ track mounted equipment							
2/ rubber tired equipment							
512	**Forage and Biomass Planting**						
	Seedbed Prep. Seed & Seeding-Native Per. Warm Season Grass 1/	Acre	$310.84		$373.01		
	Seedbed Prep. Seed & Seeding-Intro. Perennial Grasses. 2/	Acre	$216.17		$259.40		
	Seedbed Prep. Seed & Seeding-Intro. Perennial Grasses Organic 3/	Acre	$230.83		$277.00		
	Grass Establishment-Sprigging 4/	Acre	$256.34		$307.61		
	Overseeding Legumes 5/	Acre	$182.41		$218.90		
	Overseeding Legumes - Organic□	Acre	$178.81		$214.57		
	Remediation-Seed and Seeding--Introduced Perennial Grasses 6/	Acre	$86.34		$103.61		5 Years
1/ Establish adapted perennial native warm season grasses. Used for either conventional or no-till seeding of perennial native warm season grasses for pasture, hayland, and wildlife openings. This practice may be utilized for organic or regular production. This scenario assumes fertilizer, seed, equipment and labor for seed bed prep, tillage, seeding, and spreading.							
2/ Establish adapted introduced grasses. Used for either conventional or no-till seedings. This scenario assumes fertilizer, seed, equipment and labor for seed bed prep, tillage, seeding ,and spreading.							
3/ Establish adapted introduced perennial grasses using organic approved seed. Used for either conventional or no-till seeding. This practice is for organic production. This scenario assumes fertilizer, seed, equipment and labor for seed bed prep, tillage, seeding ,and spreading.							
4/ Sprigging new grasses with sprigging application. This scenario assumes fertilizer, sprigs, equipment and labor for seed bed prep, tillage, sprigging ,and spreading.							
5/Overseeding legumes in an existing pasture. This practice may be utilized for organic or regular production. This scenario assumes fertilizer, seed, equipment and labor for no-till seeding and amendment spreading.							
6/ Utilize when desirable perennial grass stands have thinned to less than 50% cover. Assess and document baseline condition using Pasture Condition Scoring							
666	**Forest Stand Improvement**						
	Pre-commercial Thinning - Hand tools 1/	Acre	$85.33		$102.39		
	Pre-Commercial Thinning-Mechanical 1/	Acre	$44.18		$53.01		
	Thinning for Wildlife and Forest Health at 50BA 2/ 3/	Acre	$27.25		$32.70		
	Thinning for Wildlife and Forest Health at 60BA 2/ 3/	Acre	$20.92		$25.11		
	Thinning for Wildlife and Forest Health at 80BA 2/ 3/	Acre	$13.88		$16.66		
	Thinning for Wildlife Health at 70 BA 3/	Acre	$18.93		$22.72		10 Years
1/ Adjusting the stocking of a young, non-merchantable stand of trees. The operation is supervised by a registered forester. Mechancial equipment can be utilized to treat pre-commercial forest stand.							
2/ Used to open the canopy of a stand to improve the wildlife habitat and tree health by mechancial equipment.							
3/4/5/6 Used to open the canopy of a stand to improve the wildlife habitat and tree health.							
3/ **Applicable to Wildlife Landuse Only**. This practice scenario is approved for use under the Wildlife fund pool. This practice will be implemented according to habitat needs identified by the GA Habitat Suitability Index model and comparisons with site appropriate Ecological Site Descriptions or other suitable reference conditions.Allowed as a supporting practice to Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644).							
655	**Forest Trails and Landings**						
	Water Bars 1/	Each	$90.21		$108.25		
	Trail Erosion Control w/o Vegetation 2/	Foot	$3.16		$3.79		5 Years
Dual engineering/forestry practice, consult with NRCS Forestor and Engineer for design criteria; reference PS560, Access Road for design criteria.							
1/ Refer to Job Sheet							
2/ Grading, shaping and installation of water deflectors to control sediment delivery to waterways; not to be used in conjunction with waters bar scenario.							
410	**Grade Stabilization Structure**						
	Check Dams 1/	Ton	$45.08		$54.10		
	Embankment, Pipe <12" 2/	CuYd	$4.25		$5.10		
	Embankment, Pipe >=12" & < 36" 2/	CuYd	$4.56		$5.48		
	Embankment, Pipe >= 36" 2/	CuYd	$7.85		$9.42		
	Weir Drop Structures 3/	SqFt	$64.22		$77.06		
	Rock Drop Structures 3/	SqFt	$49.25		$59.10		15 Years
1/ Excavation and riprap, does not include vegetation. Must add critical area planting and mulch.							
2/ Payment per cubic yard of embankment fill which includes fill, pipe system and outlet protection. Must add critical area planting and mulch.							
3/ Payment is based on weir length in feet times drop in "feet". The drop (feet) is defined as the structure inlet crest elevation minus the control outlet elevation. Consult with State Biologist and Assistant SCE for planning and design.							
Applicable to Wildlife Landuse Only. Allowed when the planned purpose is wildlife habitat management or natural stream restoration in conjunction with Timber Stand Improvement (666), Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644). This practice will not disturb high quality, natural habitat.							

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
412	**Grassed Waterway**						
	Base Waterway 1/	Acre	$2,661.84		$3,194.20		
	With Checks 2/	Acre	$1,960.41		$2,352.49		10 Years
1/ Grading Only. Must add critical area planting and mulch.							
2/ Includes grading only and rock check dams. Must add critical area planting and mulch.							
561	**Heavy Use Area Protection**						
	Concrete with sand or gravel foundation 1/	Sq Ft	$1.62		$1.95		
	Rock/Gravel on Geotextile 2/	Sq Ft	$1.15		$1.38		10 Years
1/ 4" thick fiber reinforced concrete pad							
2/ Includes 6" GAB, Geotextile, Grading and Shaping.							
Applicable to Wildlife Landuse Only. Can be scheduled as a supporting practice in conjunction with Prescribed Grazing 528 when needed to protect wildlife or natural communities.							
422	**Hedgerow Planting**						
	Pollinator Habitat 1/	Ft	$1.00		$1.19		
	Wildlife Machine Plant 2/	Ft	$0.41		$0.49		15 Years
1/ A stand with a minimum of nine wildflower species and one native warm season grass should be established. This will include at least three flowering species from each of the three bloom periods (spring, summer, and fall). The stand should include a minimum of one legume species and one native bunchgrass for a total of ten or more species (see pollinator establishment jobsheet). Trees should be planted 12 foot apart and shrubs should be planted 6 foot apart following hedgerow jobsheet specifications.							
2/ This scenario is for machine planting of woody species. A minimum of two species of native plants- 2 Trees and/or shrubs are typically plant at eight foot intervals (this will vary with species selection and density goals) and a mix of 2 native grasses.							
Applicable to Wildlife Landuse Only. Native species must be utilized . This practice will not disturb high quality, natural habitat.							
315	**Herbaceous Weed Control**						
	Mechanical 1/	Acre	$32.19		$38.63		
	Chemical-Broad Band 2/	Acre	$26.59		$31.91		
	Chemical, Ground 3/	Acre	$33.46		$40.16		
	Invasive Chemical and Mechanical 4/	Acre	$477.30		$572.75		
	Mechanical, Hand 5/	Acre	$44.65		$53.58		5 Years
1/ Removal of herbaceous weeds by the use of mower, brush hog, disc, or light equipment in order to reduce fuel loading and improve ecological site conditions. Weed has exceeded desired level based on ecological site potential.							
2/ Eradication of vegetation by use of weed treatment using ground equipment to apply chemicals in a broad strip avoiding the planting row, in order to eliminate noxious weeds, and improve ecological condition. Spray a 4-6 foot wide band across seedlings after the first growing season in the early spring after planting. Forest application only.							
3/Eradication of vegetation by treating weeds with herbicides using ground equipment to apply chemicals in order to eliminate noxious weeds, promote forage productivity, or wildlife and improve ecological conditions.							
4/ Utilize a forestry mulcher, hydro axe, brush cutter, etc. mechancial equipment in combination with chemical/herbicides to eliminate noxious weeds, promote forage productivity, wildlife and improve ecological condition.							
5/ Hand treatment of sensitive habitats that could be damaged by broadcast treatment or heavy machinery use or where treatment areas are small.							
5/ **Applicable to Wildlife Landuse Only**. Only allowed when heavy invasion is present and cannot be adequately treated by less expensive alternatives.							
Applicable to Wildlife Landuse Only. Method selected must have the least negative effect on desirable native vegetation							
325	**High Tunnel System**						
	High Tunnel	SqFt	$2.89	$ 7,000.00	$3.47	$ 7,000.00	4 Years
Costs are based on purchase of manufactured kit and landowner installing the structure. Structure must be installed to manufaturer's specifications. **NOT FOR GENERAL EQIP, ONLY FOR ORGANICAND HIGH TUNNEL INITIATIVES.**							
430	**Irrigation Pipeline**						
	PVC (Iron Pipe Size)	LB	$1.80		$2.16		20 Years
Includes pipe, labor and equipment for placement. Add critical area planting and mulching where needed. Use spreadsheet in section IV of EFOTG to convert length of pipe to pounds							
436	**Irrigation Reservoir**						
	Embankment Dam with On-Site Borrow 1/	CuYd	$3.53	$ 50,000.00	$4.24	$ 50,000.00	
	Embankment Reservoir ≤ 30 Acre-Feet 2/	CuYd	$2.79	$ 50,000.00	$3.35	$ 50,000.00	
	Plastic Tank 3/	Gal	$1.14		$1.37		15 Years
1/ Earthern embankment built across a natural depression. Cost based upon volume of compacted earth fill. Must add critical area planting and mulch. **NOT FOR GENERAL EQIP, ONLY FOR IRRIGATION PILOT PROGRAM.**							
2/ Excavated reservoir, generally rectangular in shape. Must add critical area planting and mulch. **NOT FOR GENERAL EQIP, ONLY FOR IRRIGATION PILOT PROGRAM**.							
3/ Includes installation and a concrete pad. Pay per gallon of storage in tank. Use standard tank closest in volume to design volume.							
441	**Irrigation System, Micro**						
	Microjet 1/	Acre	$2,077.46	$ 30,000.00	$2,492.96	$ 30,000.00	
	Surface Micro with Screen Filter	Acre	$1,109.00	$ 30,000.00	$1,330.80	$ 30,000.00	
	Surface Micro with Sand Media Filter	Acre	$1,220.36	$ 30,000.00	$1,464.43	$ 30,000.00	

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
	Microirrigation High Tunnel	SqFt	$0.16	$ 30,000.00	$0.19	$ 30,000.00	
	SDI (Subsurface Drip Irrigation) 2/	Acre	$1,466.91	$ 30,000.00	$1,760.30	$ 30,000.00	15 Years
Water supply and conveyance from source to field is not addressed within this practice. **An IWM plan must be provided to the landowner when contracting 441, but the IWM, PS 449, does not have to be included for payment in the EQIP contract. (High Tunnel is excluded). Producers may request an IWM Plan through the IWM CAP118. Must have a copy of system design completed and certified by a Certified Irrigation Designer (CID), Georgia PE, or Area Engineer. CID designs must be reviewed by NRCS engineers.Certification must be provided that system was installed in accordance with the certified design.** Certification can be provided by the installer, provided the landowner is not the installer, the CID or field office staff. **Irrigation conversion to micro irrigation system. Must be replacing existing non-microirrigation system.** Does not include conveyance pipe from source to field under contract. Includes components for system including filters, control valves, flow meter (if required) and PVC pipe for laterals and sublaterals. **Water quality testing (see PS and eFOTG) is required prior to design.**							
1/ Orchards/vineyards using above ground emitters or spray jets							
2/ Must have a GPS guidance system or markers placed for annual crops.							
449	**Irrigation Water Management**						
	Basic IWM 1/	Acre	$10.42		$12.50		
	Intermediate IWM 2/	Acre	$18.89		$22.66		
	Advanced IWM 3/	Acre	$24.56		$29.47		
	Soil Moisture Sensors 4/	Each	$69.51		$83.42		
	Soil Moisture Sensors with Data Recorder 5/	Each	$311.83		$374.19		
	Variable Rate IWM	**Acre**	$30.32		$36.38		1 year
Records must be provided as outlined in the Irrigation Water Management Plan prior to payment.							
1/ Low intensity irrigation water management system. Soil moisture is determined by feel or other similar methods; payment after receipt of 1 growing season of data (This practice is for 1-year only).							
2/ Medium intensity irrigation water management system. Soil moisture is determined by soil moisture sensors with manual data download. Records are kept by manual input of data into a computer program. Irrigation amounts determined by flow meters on system. Use in conjunction with Soil Moisture Sensors; payment after receipt of 1 growing season of data (This practice is for 1-year only).							
3/ High intensity irrigation water management system. Soil moisture determined by remote monitor soil moisture sensors. Automated logging of soil moisture data into computer system using telemetry or mobile phone data system. Data is monitored daily and adjustments made accordingly. Use in conjunction with Soil Moisture Sensors with data logger; payment after receipt of 1 growing season of data (This practice is for 1-year only).							
4/ Manually read soil moisture sensors for use in the intermediate IWM scenario. Payment is for each individual sensor; therefore, if customer installs a shallow sensor and a deep sensor, contract would be for 2 sensors.							
5/ Soil Moisture Sensors with automated data logging system for use in the advanced IWM scenario. Use one set per irrigation management unit.							
460	**Land Clearing**						
	Heavy Equipment	Acre	$1,326.01		$1,591.21		10 Years
For use with Irrigation Reservoir only. **NOT FOR GENERAL EQIP, ONLY FOR IRRIGATION PILOT PROGRAM.**							
670	**Lighting System Improvement**						
	Lighting - CFL 1/	Each	$14.08	$ 10,000.00	$16.89	$ 10,000.00	
	Lighting - LED 1/	Each	$18.06	$ 10,000.00	$21.67	$ 10,000.00	
	Lighting - Linear Fluorescent	Each	$264.15	$ 10,000.00	$316.98	$ 10,000.00	
	Lighting - Pulse-Start Metal Halide	Each	$20.00	$ 10,000.00	$23.99	$ 10,000.00	
	Automatic Controller System	Each	$202.60	$ 2,000.00	$243.11	$ 2,000.00	
	Poultry House Lighting 2/	SqFT	$0.04	$ 6,000.00	$0.05	$ 6,000.00	10 year
Practice must be a recommended practice in a Type 2 energy audit meeting the requirements of ANSI/ASABE S 612, Completing An On Farm Energy Audit. The energy audit must have been completed within the last 4 years. **Area Engineer will review all Farm Energy Improvement applications. Applicant must have certified audit completed before contract ranking to be eligible. Area Engineer will review all Farm Energy Improvement applications. Designs will be completed by third parties (Registered PE, TSP, etc) or Area Engineer; all designs must be submitted/approved by State Ag Eng or State Energy POC prior to implementation. All electrical practices requiring electrical wiring will be completed by licensed electrician. The licensed installer will provide certification that the work was completed in accordance with local codes.** Landowner will provide material specifications which are used for these practices in order to certify that the material requirements in the energy audit are achieved;and, self-certification that these measures were installed in the correct quantities. Energy Savings for each practice must be included in the energy audit and these energy savings must be entered into protracts during ranking. Lifespan should be considered when selecting item to cost share.							
1/ Lighting design requires additional lighting and wiring to implement.							
2/ Square footage is based upon the size of the poultry house; based upon the scenario of a one for one exchange of bulbs in the house; no wiring required.							
468	**Lined Waterway or Outlet**						
	Turf Reinforced Matting 1/	SqFt	$0.64		$0.76		
	Rock Lined - 12"or less 2/	SqFt	$2.88		$3.45		15 Years
1/ Payment is for SF of waterway. Includes grading and shaping of waterway and installation of a permanent erosion control mat (TRM). Must add critical area planting and mulching.							
2/ Payment is for SF of waterway. Includes grading and shaping of waterway and installation of rock ripap with geotextile beneath it. Must add critical area planting and mulching.							
516	**Livestock Pipeline**						
	PVC (Iron Pipe Size) Linear	Ft	$1.29		$1.55		20 Years
This practice is used only for livestock water supply pipelines. Cost covers pipe materials and installation. Use this cost for any pipe that meets the requirements of CPS 516. Use critical area planting and mulch where needed. Use in conjunction with CPS 614, Watering Facility and CPS 561, Heavy Use Area Protection							

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
Applicable to Wildlife Landuse Only. Must be planned in conjunction with Prescribed Grazing (528) when planned in conjunction with Timber Stand Improvement (666), Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644). This practice will not disturb high quality, natural habitat.							
576	**Livestock Shelter Structure**						
	Portable Shade Structure	SqFt	$2.99	$ 2,200.00	$3.59	$ 2,200.00	
	Prefabricated Portable Shade Structure	SqFt	$3.58	$ 2,600.00	$4.29	$ 2,600.00	10 Years
Applicable to Grazing Landuse Only. Grassland Conservationist must be contacted for design requirements. This practice must be used in conjunction with exclusion of animals from sensitive areas, when applicable.							
484	**Mulching**						
	Natural Material - Full Coverage 2/	Acre	$332.41		$398.89		
	Erosion Control Blanket 1/	SqFt	$0.14		$0.17		
	Synthetic Material 3/	Acre	$675.97		$811.17		1 Year
1/ Blanket is typically made of coconut coir, wood fiber, straw and is typically covered on both sides with polypropylene netting. Used to help control erosion and establish vegetative cover.							
2/ Mulch provides full coverage using natural materials and is typically used with critical area planting. Assumes 125 bales/acre (3 bales/1000 sq ft). Payment limit $2,000 per contract.							
3/ Installation of geotextile, biodegradable plastic, polyethylene plastic, or other state approved synthetic mulch to conserve soil moisture, moderate soil temperature, suppress weed growth and provide erosion control. Payment based on actual area covered by mulching material. Payment limit $2,000 per contract.							
Applicable to Wildlife Landuse Only. Allowed when planned in conjunction with Timber Stand Improvement (666), Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644) to reduce short-term soil erosion concerns.							
590	**Nutrient Management**						
	Basic NM System 1/	Acre	$2.28		$2.74		
	Basic NM system with manure injection or incorporated 2/	Acre	$15.86		$19.04		
	Basic NM system with manure and/or Compost 3/	Acre	$4.05		$4.85		
	Small Farm NM 4/	Acre	$115.91		$139.10		1 Year
The planned nutrient management (NM) system will meet the current 590 standard. Records demonstrating implementation of the 4 R's of the NM criteria will be required. Must also plant cover crop, Code 340, for crop land, but not hay and pasture land. Use the Georgia Phosphorous Index when the planned rates of phosphorous exceeds UGA recommendations. Payment made upon implementation of the NM system. Limit 2 years.							
1/ Basic system - Conventional or organic. There is no application of manure. Follow the results of a soil test to develop a nutrient management plan to apply fertilizer according to soil test and 590 Nutrient Management Standard.							
2/ Basic system with the application of manure. All nutrient sources (except micronutrients) incorporated with tillage at least 3-4 in. deep or injected at least 4-6 in. deep. Not applicable to conservation tillage systems. Applicable to other sytems where manure is applied to the soil surface. Also, applicable where manure is incorporated with tillage, but want to adopt injection. Conventional or organic. Follow the results of a soil test to develop a nutrient management plan to apply nutrients according to the Nutrient Management 590 Standard. Laboratory analysis of organic nutrient sources required.							
3/ Basic system with manure and/or compost. Also applies to systems relying totally on manure or compost. Conventional or organic. Follow the results of a soil test to apply nutrients according to the 590 Nutrient Management Standard. Laboratory analysis required for organic fertilizer sources.							
4/ Small farm system (10 acres or less). Conventional or organic. Follow the results of a soil test and laboratory analysis of organic fertilizer, if applied. Apply nutrients according to the 590 Nutrient Management Standard.							
521C	**Pond Sealing or Lining - Bentonite Sealant**						
	Bentonite Treatment - Covered	CuYd	$62.14		$74.57		15 Years
Payment for installation of a liner treated with bentonite and a protective compacted fill cover. Payment volume is the sum of the volume of the liner and the volume of the cover. For waste storage ponds and lagoons only.							
521D	**Pond Sealing or Lining - Compacted Clay Treatment**						
	Material Onsite 1/	CuYd	$10.04		$12.05		15 Years
	Material Hauled 2/	CuYd	$16.47		$19.77		
1/ Payment for installation of a compacted clay liner and protective cover using **on site** materials. Volume is sum of liner and cover volumes. For waste storage ponds and lagoons only.							
2/ Payment for installation of a compacted clay liner and protective cover using **imported** materials. Volume is sum of liner and cover volumes. For waste storage ponds and lagoons only.							
521B	**Pond Sealing or Lining - Soil Dispersant**						
	Soil Dispersant - Covered	CuYd	$3.67		$4.41		20 Years
Payment for installation of a liner treated with soil dispersant and a protective compacted fill cover. Payment volume is the sum of the volume of the liner and the volume of the cover. For waste storage ponds and lagoons only.							
338	**Prescribed Burning**						
	Prescribed Burn 1/	Acre	$20.66		$24.79		
	Prescribed Burn - High Risk 2/	Acre	$30.04		$36.05		1 Year

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
1/ Burn according to designed burn plan and NRCS Prescribed Burning (338) standard and specifications. Site prep burns are included. Constructed firebreak cost is not included in cost of burn.							
2/ Prescribed burns conducted when herbaceous vegetation (grasses and forbs) is actively growing during summer months of June through September. Burn according to designed burn paln and NRCS Prescribed Burning (338) standard and specifications. Constructed firebreaks cost is not included in cost of burn.							
Applicable to Wildlife Landuse Only. Allowed when planned in conjunction with Timber Stand Improvement (666), Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644) and in a manner that burns will be conducted within the natural variability of the ecological system being restored/managed. Where necessary, plan in conjunction with Firebreak (394). Burn according to designed burn plan and NRCS Prescribed Burning (338) standard and specifications and according to the GFC GA Best Management Practices for Forestry Manual. Site prep burns are included.							
528	**Prescribed Grazing**						
	Standard 1/	Acre	$11.88		$14.25		
	Intensive 2/	Acre	$24.87		$29.85		1 Year
1/ Design and implementation of a grazing system using a 5 to 10 day rotation. Monitoring & record keeping required (ex: photo points, pre and post grazing heights, and once annual Pasture Condition Scoring).							
2/ Design and implementation of a grazing system using a 4 day or less rotational cycle. Monitoring and record keeping required (ex: photo points, pre and post grazing heights, and once annual Pasture Condition Scoring) .							
Applicable to Wildlife Landuse Only. Allowed when planned for habitat restoration or management purposes in conjunction with Timber Stand Improvement (666), Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644).							
533	**Pumping Plant**						
	Electric-Powered Pump ≤ 5 Hp 1/	BHP	$661.78		$794.14		
	Electric-Powered Pump ≤ 5 HP with Pressure Tank 2/	BHP	$1,404.56		$1,685.47		
	Electric-Powered Pump >5 HP<=30 hp 3/	BHP	$399.11		$478.93		
	Electric-Powered Pump <30 hp <=75 4/	BHP	$278.32		$333.98		
	Electric-Powered Pump >75 5/	BHP	$157.95		$189.54		
	Variable Frequency Drive 6/	BHP	$182.69		$219.23		
	Internal Combustion-Powered Pump ≤ 50HP 7/	BHP	$533.59		$640.31		
	Internal Combustion-Powered Pump > 50 to 70 HP 7/	BHP	$399.93		$479.92		
	Internal Combustion-Powered Pump > 70 HP 7/	BHP	$309.21		$371.05		
	Photovoltaic-Powered Pump 8/	BHP	$6,962.04		$8,354.45		15 Years
Payment will be made for the pump size required by the design for the pump rounded to next largest commercially available pump (ie 1.67 hp would be a 2.0 hp pump). In the case of well pumps the size for payment will be determined by the watering facility design spreadsheet. If the applicant wishes to use a larger pump than the design requires, the additional cost will be the applicant's responsibiity. All electrical work must meet local and state codes.							
1/ Pump for livestock water, waste transfer or irrigation.							
2/ Pump in well for livestock water or irrigation with pressure tank added.							
3/ Pump for livestock water, waste transfer or irrigation. Centrifugal Pump.							
4/ Pump for waste transfer or irrigation. Centrifugal Pump.							
5/ Pump for livestock or irrigation. Centrifugal Pump.							
6/ Cost includes VFD modifications only.							
7/ Irrigation and Ag Waste Transfer; **Use only when not economically feasible to use electric motor/pump combinations.**							
8/ Typical installation of photvoltaic cells to run solar pump (includes pump); **Option only when there is no available power source and not economical to run power to site. Economical threshold to run power must exceed $10,000 to be feasible.**							
Applicable to Wildlife Landuse Only. Can be scheduled as a supporting practice in conjunction with Prescribed Grazing 528 when needed to protect wildlife or natural communities.							
329	**Residue & Tillage Mgmt - Notill/Striptill Direct Seed**						
	No-Till/Strip-Till	Acre	$14.31		$17.17		1 Year
Limited to 2 years. Payment made when cash crop is seeded/planted with no-till drill or no-till/strip-till planter into cover crop residue.							
System is applicable in all cropland and land where crops are planted.							
643	**Restoration and Mgt. of Rare and Declining Habitats**						
	Habitat Monitoring and Mgt, Low Intensity and Complexity	Acre	$2.26		$2.71		
	Rare or Dec. Habitat Monitoring and Mgt, Medium Intensity 1/	Acre	$8.41		$10.10		
	Habitat Monitoring and Mgt, High Intensity and Complexity 1/	Acre	$15.68		$18.81		
	Dev.of Shallow Micro-Topo Features with Normal Farm Equip 2/	Acre	$28.70		$34.44		
	Dev.of Deep Micro-TopoFeatures with Heavy Equipment 2/	Acre	$78.19		$93.82		1 Year
1/ **Applicable to Wildlife Landuse Only.** Requires a monitoring plan, an approved agreement with the monitoring organization, and a signed landowner release agreeing that the data will be publicly available.							
2/ **Applicable to Wildlife Landuse Only.** Restore and manage according to habitat needs identified by the GA Habitat Suitability Index model and comparisons with site appropriate Ecological Site Descriptions or other suitable reference conditions.							
391	**Riparian Forest Buffer**						
	Bare-root, hand planted 1/	Acre	$191.22		$229.46		
	Bare-root, machine planted 2/	Acre	$207.60		$249.12		15 Years

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
1/ The buffer will be located adjacent to and up-gradient from a watercourse or water body extending a minimum of 40 feet wide. The planting will consist of hand planted bare-root hardwood trees. One third of the area will be planted to each woody plant type. Tree spacing will be 12' x 12'.							
2/ The buffer will be located adjacent to and up-gradient from a watercourse or water body extending a minimum of 40 feet wide. The planting will consist of machine planted bare-root hardwood trees. One third of the area will be planted to each woody plant type. Tree spacing will be 12' x 12'.							
558	**Roof Runoff Structure**						
	Roof Gutter, Small, 6 inches wide and smaller 1/	LnFt	$4.32		$5.19		
	Concrete Curb 2/	LnFt	$8.02		$9.63		
	Trench Drain 3/	LnFt	$7.69		$9.23		
	Roof Gutter with storage tank 4/	Gal	$1.17		$1.40		15 Years
1/ Price of length of roof gutter.							
2/ Price of length of concrete curb.							
3/Price of length of trench drain.							
4/ Pay per gallon of storage in tank. Use standard tank closest in volume to design volume. Cost includes length of roof gutter.							
367	**Roofs and Covers**						
	Post Frame Building 1/	SqFt	$6.42		$7.70		
	Steel Frame Building 2/	SqFt	$5.27	$ 50,000.00	$6.32	$ 50,000.00	10 Years
1/ Posts and roof system with concrete footers at support posts. Square footage is measured post to post.							
2/ Posts and roof system with concrete footers at support posts. Steel frame buildings must be designed and installation certified by a registered Georgia PE. Square footage is measured post to post. Must provide additional information as to why a steel frame building is needed (e.g meeting fire code) rather than the less expensive wooden post frame structure.							
381	**Silvopasture**						
	Commercial thinning and establishment of introduced grasses. 1/	Acre	$215.53		$258.63		
	Tree Establishment 2/	Acre	$80.33		$95.06		
	Commercial Thinning and Establishment of Native Grass 3/	Acre	$188.36		$226.03		20 Years
1/ Commercial thinning of an existing stand of trees followed by establishment of introduced grasses. Thinning should be to a basal area of 30 to 50. Cost includes grass establishment. For the Sandhills, Coastal Plain, and Flatwoods Regions Bahiagrass is the recommended forage species. For the Ridge and Valley and Blue Ridge Regions Orchardgrass and/or Tall Fescue are the recommended forage species. Tall Fescue can be used as the chosen forage species throughout the Piedmont, but Bahiagrass is also acceptable in the lower Piedmont.							
2/ The establishment of trees into an existing pasture where adequate native grasses or introduced forage is present. Typical alley arrangement is 40' wide forage alley with a minimum of 200 trees per acre.							
3/ Commercial thinning of an existing stand of trees followed by establishment of native grasses. Thinning should be to a basal area of 30 to 50. Cost includes native grass establishment. For the Sandhills, Coastal Plain, and Flatwoods Regions native grasses is the recommended forage species. For the Ridge and Valley and Blue Ridge Regions native grasses are the recommended forage species. See the native grass plant list for additional information for establishment of native grass forage species throughout the Piedmont.							
574	**Spring Development**						
	Spring Development 1/ 2/	Each	$2,571.88		$3,086.26		20 Years
1/ Includes collection system and spring box. Does not include livestock pipeline from spring box to watering facility.							
2/ **Applicable to Wildlife Landuse Only**. Allowed when planned in conjunction with Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644).This practice will not disturb high quality, natural habitat.							
442	**Sprinkler System**						
	Center Pivot System 1/	Ft	$56.80		$68.16		
	Solid Set System 2/	Acre	$3,611.96	$ 30,000.00	$4,334.35	$ 30,000.00	
	Traveling Gun System 1/	Each	$34,762.34		$41,714.81		
	Retrofit of Existing Sprinkler System 3/	Ft	$6.17		$7.40		
	VRI_System_Renovation 4/	Ft	$16.53		$19.84		15 Years

Water supply and conveyance from source to field is not addressed within this practice. **Efficiency of the system must be provided in the design package. The designer may use (FIRI) or other similar programs to document the gain in efficiency; consult with Area Engineer.**

Ag Wastewater Notes: For Ag Wastewater the least cost system (center pivot, solid set system, or traveling gun system) will be selected based on acres figured in the Cost Estimator "Ag Waste Calculator" tab. Actual wastewater and soil samples are required to calculate acreage needed to apply yearly wastewater prior to irrigation design or payment. Example, if acreage needed to apply yearly wastewater is 9.6 acres or less then a solid set system would be the least cost system for the practice instead of a hose reel. The producer can install a hose reel but payment will be based on the solid set system. **Ag Wastewater applications will require a NMP**.

Freshwater Notes: **An IWM plan must be provided to the landowner when contracting 442, but the IWM does not have to be included for payment in the EQIP contract. Producers can request an IWM plan through the IWM CAP 118.** If a working center pivot system is determined to be past its usable life and landowner is willing to install a new center pivot system, the calculated amount necessary to retrofit **(high to low pressure)** the old center pivot system will be provided to the landowner to offset the cost of the new center pivot system. In addition, the old center pivot system being replaced will be destroyed. Conversion from a traveler system to a pivot will be acceptable; cost-share rate will be based on the cost of retrofitting the size pivot necessary for servicing the involved field. **Must have a copy of system design completed and certified by a Certified Irrigation Designer(CID), Georgia PE, or Area Engineer**. **CID designs must be reviewed by NRCS engineers (does not include retrofits). Certification must be provided that system was installed in accordance with the certified design.** Certification can be provided by the installer (provided the landowner is not the installer), the CID or field office staff.

1/ For Ag Wastewater Only. Use for wastewater application. Waste water application acres based on Cost Estimator "Ag Waste Calculator" tab for nitrogen.

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
2/ Includes all components of solid set system and installation costs. Use for wastewater application. Waste water application acres based on Cost Estimator "Ag Waste Calculator" tab for nitrogen. Use for freshwater for historically underserved clients.							
3/ Payment rate covers all materials and labor for completing the retrofit in accordance with the system design . Pressure regulators are required at each sprinkler. Drop nozzles can be either wobblers, orbitors or rotator sprinklers. CID may approve the retrofit design and as-builts.							
4/ Renovation of a previously retrofitted irrigation system with proper modular components and pressure regulating devices, along with all other needed components. VRI system requirements must be shown at signup.							
570	**Stormwater Runoff Control**						
	Combination, Most common Best Management Practices	Acre	$537.15		$644.58		
	Storm Water Retention	CuYd	$5.02		$6.03		20 Years
For use with Irrigation Reservoir only. **NOT FOR GENERAL EQIP, ONLY FOR IRRIGATION PILOT PROGRAM.**							
578	**Stream Crossing**						
	Rock armored low water crossing 1/	SqFt	$4.25		$5.10		
	Concrete low water crossing	SqFt	$5.67		$6.80		
	Culvert installation 2/	In-Ft	$2.58		$3.09		
	Low water crossing using prefabricated products 3/	SqFt	$5.21		$6.25		10 Years
Must add critical area planting and mulch. May be used in WRP/ACEP-WRE and livestock systems (livestock must be fenced out of creeks). If needed in a forestry system, contact State Forester and State Engineer							
1/ Includes stream crossing with any rock surface (GAB, surge stone, riprap). Price inlcudes all surfacing materials, geotextile and installation.							
2/ Paid by inches of culvert diameter multiplied by culvert length. Must add HUA; Pipe must be designed to accommodate fish passage (Must use 396, Aquatic Organism Passage). If used on perennial streams, need to submit a ACOE PCN under Nationwide Permit 40. **Must receive prior approval from Area Engineer.**							
3/ Geocell filled with gravel, articulated concrete, pavers, or concrete block.							
Applicable to Wildlife Landuse Only. Allowed when planned for a wildlife habitat purpose and as a supporting practice to Forest Stand Improvement (666), Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644) ONLY IF a stream crossing is required to carry out wildlife management activities. Use of this practice must be justified in the conservation plan. Plan in conjunction with Aquatic Organism Passage. This practice will not disturb high quality, natural habitat. Landowner must secure required permits. **Must receive prior approval from the State Biologist and engineer to schedule these scenarios for wildlife land use.**							
395	**Stream Habitat Improvement and Management**						
	Riparian Zone Improvement-Forested	Acre	$6,176.93		$7,412.31		
	Instream wood placement	Acre	$15,032.33		$18,038.79		
	Instream rock placement	Acre	$9,645.84		$11,575.01		
	Rock and wood structures	Acre	$23,905.74		$28,686.89		
	Fish Barrier	CuYd	$4,348.10		$5,217.72		5 Years
Applicable to Wildlife Landuse Only. Must receive prior approval from the State Biologist and/or engineer to schedule these scenarios. Manage according to habitat needs identified by the Stream Visual Assessment Protocol 2 and comparisons with site appropriate Ecological Site Descriptions or other suitable reference conditions.							
Applicable to Wildlife Landuse Only. Landowner must secure required CWA and other necessary permits							
580	**Streambank and Shoreline Protection**						
	Shaping 1/	LnFt	$14.35		$17.22		
	Bioengineered 2/	LnFt	$49.00		$58.80		
	Structural 3/	LnFt	$128.34		$154.01		
	Toe Protection 4/	LnFt	$78.45		$94.14		20 Years
The Savannah District of the Corp of Engineers has put a regional restriction on Nationwide Permit 13. A preconstruction notification (PCN) must be filed with the Corp of Engineers prior to the construction of streambank stablization projects unless exempted under NWP 13. Landowner shall provide NRCS with a copy of the approved ACOE permit prior to contracting. Streambank and shoreline protection contracts must also include practices that are biologically beneficial to the system; this may include riparian forest buffer, fence, stream habitat improvement and management, etc. Consult with NRCS biologist and NRCS Assistant State Engineer prior to contracting.							
1/ Includes shaping bank and erosion control fabric. Add critical area planting and mulch as needed.							
2/ Includes shaping bank, livestake, rootwads and revetments. Add critical area planting and mulch as needed.							
3/ Includes shaping bank and installing riprap. Add critical area planting and mulch as needed.							
4/ Type I or III rock rip rap used in conjunction with shaping or bioengineered streambank stabilization.							
Applicable to Wildlife Landuse Only. Allowed when planned in for a wildlife habitat purpose in conjunction with Timber Stand Improvement (666), Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644).							
649	**Structures for Wildlife**						
	Nesting Box, Small no pole 1/	Each	$30.68		$36.81		
	Nesting Box, Small, with wood pole 2/	Number	$45.80		$54.96		
	Nesting Box, Large 3/	Each	$61.76		$74.11		
	Nesting Box or Rapture Perch, Large, with Pole 4/	Each	$181.20		$217.44		
	Escape Ramp 5/	Each	$26.12		$31.35		

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
	Fence Markers, Vinyl Undersill 6/	Ft	$0.11		$0.13		
	Brush Pile - Small 7/	Each	$23.47		$28.16		
	Brush Pile - Larg 8/	Each	$95.63		$114.76		5 Years
1/ The installation of nesting and rearing boxes that support the life-cycle needs of targeted speces, such as birds, bats and pollinators. Each nesting box is 1-1/2" x 6" x 12-1/2" w/ 1-1/2" diameter opening.							
2/ The installation nesting and rearing boxes support the life-cycle needs of targeted speces, such as blue birds and waterfowl. Each Bluebird nesting box is 1-1/2" x 6" x 12-1/2" w/ 1-1/2" diameter opening. Each Wood Post, End 6" X 8', CCA Treated.							
3/ A structure is provided to support the nesting and rearing of larger targeted species such as waterfowl, bats and barn owls, and is directly mounted to a tree, building or other structure. Habitat Box, waterfowl, typically 24" x 11" x 12" with 4" wide oval entrance, single.							
4/ Constructing a nest box or rapture perch on a steel pole with a predator guard where needed. Pipe, steel, galvanized, threaded, 1 1/4", schedule 40. Habitat Box, Waterfowl Box, typically 24" x 11" x 12" with 4" wide oval entrance,single. Predator guards (i.e. stove pipes, cone, hole guard, etc.) for habitat boxes.							
5/ Retrofit an existing watering trough/tank with an appropriately designed and installed wildlife escape ramp to reduce wildlife mortality and maintain water quality within the watering facility. Pool size 15' x 30', for small mammals less than one pound.							
6/ Existing fences are retrofitted with vinyl markers that increase wire visibility and reduce mortality due to collision for wildlife species of concern. Markers are installed approximately every 3 feet along top wire using Vinyl Undersill Strips.							
7/ Small brush piles are created to provide shrubby/woody escape cover for wildlife. Small brush piles are typically 10' x 20' area for structure covered by interlocking limbs of trees less than 12 inches in diameter.							
8/ Downed tree structures are created to provide shrubby/woody escape cover for wildlife. Large brush piles are typically 30' x 50' area for structure covered by interlocking limbs of trees at least 12" in diameter.							
600	**Terrace**						
	Broadbased	Ft	$1.60		$1.92		
	Narrow Base, less than 8% slope	Ft	$1.63		$1.95		10 Years
Add critical area planting and mulching as needed							
612	**Tree/Shrub Establishment**						
	Medium Density-hand plant Conifer B.R. 7/	Acre	$93.96		$112.76		
	Medium Density-Mech Plant Conifer 8/	Acre	$94.65		$113.57		
	High Density mech conifer planting 3/	Acre	$144.55		$173.46		
	High Density-hand plant Conifer 4/	Acre	$201.59		$241.91		
	Hardwood Hand Planting-bare 1/	Acre	$156.64		$187.97		
	Hardwood Hand Planting-bare root-protected 2/	Acre	$255.78		$306.94		
	Shrub Planting 5/	Acre	$105.32		$126.38		
	Hardwoods Tree Planting and Shrubs Hand Planting 2-3 gallon plants--protected 6/	Acre	$445.79		$534.95		15 Years
1/ Hardwood seedlings will be planted at minimum of 12X12 spacing at 300 trees per acre. ALL forestry acres are eligible for payment. Sites will be hand planted. A Forest management plan is required prior to payment.							
2/ Hardwood seedlings will be planted at minimum of 12X12 spacing by hand method at 300 trees per acre with protected tree tubes. ALL forestry acres are eligible for payment. Sites will be hand planted. A Forest management plan is required prior to payment.							
3/ Longleaf pines will be planted by mechancial method. ALL forestry acres are eligible for planting. A Forest Management plan is required prior to payment. A minimum of 605 trees per acre at a 6X12 spacing.							
4/ Longleaf Pines will be hand planted at 6X12 spacing at 605 trees per acre. ALL forestry acres are eligible for planting. A Forest Management plan is required prior to payment.Sites will be hand planted. Plant containerized longleaf pines seedling only.							
5/ **Applicable to Forestry Landuse Only**. Shrubs will be planted on a 20 X 30 spacing of 1-3 gallon shrubs plants for wildlife in forest openings. Each shrub plant will be protected with tree shelter or tree tube. A Forest Management plan is required prior to payment.							
6/ **Applicable to Wildlife Landuse Only.** In one acre openings, hand plant 20 trees (hardwood, seedling or transplant, potted or B&B 2-3gal.) per acre and 20 shrubs (seedling or transplant, potted or B&B 2-3 gal.) per acre							
7 /Conifers (loblolly or slash) will be planted by hand method. ALL forestry acres are eligible for planting. A Forest Management plan is required prior to payment. A minimum of 545 trees per acre at a 8X10 spacing.							
8 /Conifers (loblolly or slash) will be planted by machine method. ALL forestry acres are eligible for planting. A Forest Management plan is required prior to payment. A minimum of 545 trees per acre at a 8X10 spacing.							
660	**Tree/Shrub Pruning**						
	Pruning-Low Height 1/ 2/	Acre	$100.50		$120.60		1 Year
Applicable to Wildlife Landuse Only. 1/ Allowed when planned for a wildlife habitat purpose in conjunction with Timber Stand Improvement (666), Restoration and Management of Rare or Declining Habitats (643), Stream Habitat Improvement (395), Upland Wildlife Habitat Management (645), Wetland Restoration (657), or Wetland Wildlife Habitat Management (644) to restore a site-suited native plant community according to a Ecological Site Description or other appropriate reference condition.							
2/ On Grazing and Forest Land, for maintenance of established silvopasture sites only. First lift should be done when trees reach 15-20 feet in height. Prune up to 9 feet (Do not remove>50% of canopy) Second lift should be done when trees reach 30-40 feet in height. Prune to 18 feet. (Maintain a live crown of no less than 40%)							
490	**Tree/Shrub Site Preparation**						
	Mechanical - Medium 2/	Acre	$177.88		$213.46		

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
	Chemical - Ground Application 1/	Acre	$52.02		$62.43		
	Chemical - Aerial Application 3/	Acre	$71.61		$85.94		
	WindBreak - Site Preparation 4/	Acre	$209.25		$251.10		
	Heavy Mechanical Plus Chemical 5/	Acre	$219.29		$263.14		
	Chemical - Hand Application 6/	Acre	$83.63		$100.36		1 Year

1/ The use of various herbicides applied in order to remove undesirable vegetation and improve site conditions for establishing trees and/or shrubs. Typical sites include abandoned fields, pastures, rangelands, agricultural fields or forestland that was recently harvested.

2/This practice involves the use of machinery to treat an area in order to improve site conditions for establishing trees and/or shrubs.

3/ Practice involves the use of herbicides applied by helicoptor in order to remove undesirable vegetation and improve site conditions for establishing trees and/or shrubs.

4/ Practice involves the use of various mechanical methods to allow for the planting of a Windbreak/Shelterbelt for shade structure for livestock.

5/ This practice involves the use of heavy machinery in combination with a chemical to treat an area in order to improve the site conditions for establishing tree and/or shrubs

6/ Hand treatment of sensitive habitats that could be damaged by broadcast treatment or heavy machinery use or where treatment areas are small.

4/ **Applicable to Forestry Landuse Only.** Apply herbicides to a forest cut over site by using aerial methods.

620	**Underground Outlet**						
	Less than or equal to 6in	Ft	$4.55		$5.46		
	Greater than 6in to 12in	Ft	$9.99		$11.98		
	Greater than 12in to 18 in	Ft	$13.49		$16.19		
	Greater than 18in to 30in	Ft	$21.98		$26.37		20 Years

Includes pipe, earthwork, and riprap outlet basin. Must add critical area planting and mulch.

645	**Upland Wildlife Habitat Management**						
	Habitat Monitoring and Mgt, Very-Low Intensity and Complexity 1/	Acre	$0.68		$0.81		
	Habitat Monitoring and Mgt, Low Intensity and Complexity 2/	Acre	$2.26		$2.71		
	Habitat Monitoring and Mgt, Medium Intensity and Complexity 3/	Acre	$8.41		$10.10		
	Habitat Monitoring and Mgt, High Intensity and Complexity 4/	Acre	$20.67		$24.80		
	Development of Shallow Micro-Topographic Features with Normal Farming Equipment. 5/	Acre	$28.70		$34.44		
	Development of Deep Micro-Topographic Features with Heavy Equipment. 6/	Acre	$78.19		$93.82		
	Establishment of seasonal forage or cover for wildlife on non-cropland. 7/	Acre	$119.22		$143.02		1 Year

1/ Implementation of annual adaptive management actions of very low intensity and complexity. Is applied to all landuse types including those with wildlife as a modifier, where any resource concern is identified for wildlife, and where very low intensity and complexity of monitoring or management will treat the identified resource concern. Only 1 2 monitoring efforts are needed and each requiring less than 2 people and 4 hours per effort. The adaptive management actions such as cutting of limbs that are impeding access of birds into nest boxs, replacing damaged fence markers, cleaning of nest structures and debris around other structures requires only hand labor and less than 16 hours of labor per year.

2/ Implementation of annual adaptive management actions of low intensity and complexity. Is applied to all landuse types including those with wildlife as a modifier, where any resource concern is identified for wildlife, and where low intensity and complexity of monitoring or management will treat the identified resource concern. Only 1 2 monitoring efforts are needed and each requiring less than 2 people and 4 hours per effort. The adaptive management actions such as cutting of limbs that are impeding access of birds into nest boxs, replacing damaged fence markers, cleaning of nest structures and debris around other structures requires only hand labor and less than 8 hours labor per year.

3/ Is applied to all landuse types including those with wildlife as a modifier, where any resource concern is identified for wildlife, and where medium intensity and complexity of monitoring or management will treat the identified resource concern. Two or three monitoring efforts are needed and each requiring less than 2 people and less than 8 hours per effort. Two or three adaptive management efforts are required (such as cutting of limbs that are impeding access of birds into nest boxes, replacing damaged fence markers, cleaning of nest structures and debris around other structures). The adaptive mgmt requires hand labor and the occasional use of light equipment. A crew of 2 is needed for the hand labor efforts and the crew will require less than 16 total hours of labor per mgmt effort.

4/ Is applied to all landuse types including those with wildlife as a modifier, where any resource concern is identified for wildlife, and where high intensity and complexity of monitoring or management will treat the identified resource concern. Two four monitoring efforts are needed and each requiring less than 2 people and less than 8 hours per effort. The adaptive management actions (2 5 efforts) such as cutting of limbs that are impeding access of birds into nest boxes, replacing damaged fence markers, cleaning of nest structures and debris around other structures requires hand labor and light equipment, requiring a 2 person crew less than 1 day per effort.

5/ Is installed on open non wetlands. The purpose is to increase plant species richness and diversity, create micro habitats for invertebrates, increase water infiltration and reduce run off. The area is plowed to loosen the soil. Then the soil is excavated with normal farming equipment (e.g. tractor and box blade) to a depth of 2 6 inches and immediately deposited. This lowering and raising of a box blade restores the original micro topographic features (6' X 6' depressions and mounds) common to most landscapes and landforms prior to clearing, tilling, and annual mowing.Restoration of shallow but frequent micro topographic features has been lost by the smoothing action of tillage, mowing and the original land clearing.This is typically found on restoration projects.

6/ Is installed on open non wetlands, where micro topographic features have been removed by past farming practices. The purpose is to increase plant species richness and diversity, create micro habitats for invertebrates, increase water infiltration and reduce run off. The area is plowed 2 weeks prior to excavation to kill existing vegetation and allow for proper dirt work. Soil is excavated with track equipment (dozer) to a depth of 6 12 inches and immediately deposited. This lowering and raising of a dozer blade restores the original deep micro topographic features (10' X10' depressions and mounds) common to many landscapes and landforms prior to the lands conversion to agricultural lands.

7/ Habitat assessment identifies the need to provide seasonal forage or cover for target wildlife species. This habitat need will be met through the establishment of annual plants by planting of seed. This activity will occur on herbaceous areas, not currently in cropland. Due to existing dense vegetation, these area will need to be mowed 2 3 weeks prior to disking (primarily disking), then followed by a light disking. Seed bed preparation will be furthered by firming the seed bed by cultipacking the site.

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
360	**Waste Facility Closure**						
	Liquid Waste Impoundment Closure with fill 1/	CuFt	$0.30		$0.36		
	Liquid Waste Impoundment Closure with no liquid/slurry 2/	CuYd	$2.96		$3.55		20 Years
Contract for one item only, not both. **Producer must provide Notice of Termination to State Agency for state permitted sites along with certification that the closure was completed to NRCS Stds. Not for freshwater conversion. A Waste Facility Closure Plan is required; may be a component of a CNMP/NMP.**							
1/ Covers the cost of pumping or hauling sludge and disposing of the wastes in accordance with a nutritent management plan and backfilling the holding pond with compacted earth fill. Need to add critical area planting and mulch (if needed).							
2/ Covers the cost of backfilling holding pond with compacted earth fill. Need to add critical area planting and mulch (if needed).							
632	**Waste Separation Facility**						
	Mechanical Separation Facility 1/	Each	$25,825.31		$30,990.37		
	Concrete Separator 2/	CuFt	$4.05		$4.86		
	Concrete Sand Settling Lane 3/	SqFt	$4.82		$5.78		15 Years
Must have an NRCS approved CNMP.							
1/ Includes equipment and concrete support pad. Must add critical area planting and mulch as needed.							
2/ Based on designed storage and includes grading and concrete placement. Must add critical area planting and mulch as needed.							
3/ Includes grading and concrete placement. Must add critical area planting and mulch as needed.							
313	**Waste Storage Facility**						
	Earthen Storage Facility 1/	CuFt	$0.23		$0.27		
	Dry Stack, concrete floor, wood wall 2/	SqFt	$4.47		$5.37		
	Conc Tank, Buried 3/	CuFt	$1.72		$2.06		
	Dry Stack, concrete floor, concrete wall 4/	SqFt	$5.59		$6.70		15 Years
NRCS Approved Comprehensive Nutrient Management Plan required.							
1/ Payment based on designed storage volume to include manure, wastewater and rainfall on contributing areas and pond surface. Pay volume does not include freeboard or sludge accumulation volume.							
2/ Must add critical area planting, mulch, roof and HUA for entrance pad. Size based on concrete pad area from post to post.							
3/ Must add critical area planting and mulch.							
4/ Must add critical area planting, mulch, roof and HUA for entrance pad. Size based on concrete pad area from post to post. Concrete walls are to be used for high moisture manures							
634	**Waste Transfer**						
	Concrete Channel 1/	SqFt	$8.75		$10.50		
	Manure Flush System of transfer through a collection basin 2/	Gal	$1.89		$2.27		
	Waste Transfer Pipeline 3/	LB	$2.43		$2.91		15 Years
NRCS Approved Comprehensive Nutrient Management Plan required.							
1/ Cost of concrete channel paid by sf of channel bottom. Must add critical area planting and mulch as needed.							
2/ Flush Tanks; Includes cost of concrete pad for flush tank. Must add critical area planting and mulch as needed.							
3/ For waste transfer from a production area to a storage or treatment facility. Must add critical area planting and mulch as needed.							
359	**Waste Treatment Lagoon**						
	Waste Treatment Lagoon	CuFt	$0.16		$0.19		15 Years
NRCS Approved Comprehensive Nutrient Management Plan required.							
Payment based on designed storage including manure, wastewater, minimum treatment volume, and rainfall on contributing drainage areas and pond surface. Pay volume does not include freeboard . Must add critical area planting and mulch as needed							
638	**Water and Sediment Control Basin**						
	WASCOB base	CuYd	$2.12		$2.55		10 Years
Add critical area planting and mulch if needed. Use in conjunction with underground outlets as needed.							
642	**Water Well**						
	Typical Well 1/	Each	$4,466.38		$5,359.66		
	Deep Well 2/	Each	$6,687.83		$8,025.40		20 Years
If existing well/water source is adequate for **the resource** need, a new well is not justified. Not to be used for providing water to confined feeding operations or in buildings. **Must be part of a prescribed grazing system or where livestock exclusion has removed a water supply. Wells may be used for irrigation only for historically underserved applicants but only when existing well/water source is inadequate to supply irrigation water needs. Does not include the cost of the pump so include CPS 533, Pumping Plant, as a companion practice. All electrical work must meet local and state codes. Documentation must be provided to justify the need for a well, refer to water well drawing on eFOTG.**							
1/ Well depth 100 to 600 feet below ground surface. Complete well installation (casing, screen, seal, filter pack, concrete pad at well head).							

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
2/ Well depth > 600 ft. below ground surface. Complete well installation (casing, screen, seal, filter pack, concrete pad at well head).							
614	**Watering Facility**						
	Less than 100 gal 1/	Each	$75.08		$90.09		
	100-200 gal 2/	Each	$196.70		$236.05		
	201-400 gal 3/	Each	$234.89		$281.87		
	401-600 gal 4/	Each	$377.70		$453.24		
	Greater Than 600 gal 5/	Each	$527.91		$633.49		
	2 Ball Freeze proof 6/	Each	$792.11		$950.53		
	4 Ball Freeze proof 6/	Each	$958.99		$1,150.79		
	Storage Tank for Solar Systems 7/	Gal	$0.79		$0.95		
	Low velocity Watering Ramp 8/	SqFt	$1.66		$1.99		
	High Velocity Watering ramp 9/	SqFt	$4.63		$5.55		10 Years
For livestock grazing systems. Not to be used in confined feeding operations or in buildings. Must use Heavy Use Area Protection, CPS 561, around watering facility. **Use of used materials is not allowed.**							
1/ Very small trough for small animals; includes installation.							
2/ Small size trough; includes installation							
3/ Medium trough; includes installation.							
4/ Large trough; includes installation.							
5/ Extra-Large trough; includes installation.							
6/ Includes concrete pad, trough and installation.							
7/ Includes tank, concrete pad, and installation.							
8/ low velocity = still water such as ponds							
9/ high velocity = moving water such as streams, creeks, etc.,.							
657	**Wetland Restoration**						
	Riverine Levee Removal and Floodplain Features	Acre	$244.35		$293.22		
	Ditch Plug	CuYd	$10.40		$12.48		
	Estuarine Fringe Levee Removal	Acre	$12.04		$14.45		
	Riverine Channel and Floodplain Restoration	Acre	$331.91		$398.29		15 Years
Applicable to Wildlife Landuse Only. Restoration will occur according to habitat needs identified by the GA Habitat Suitability Index model and comparisons with site appropriate Ecological Site Descriptions or other suitable reference conditions. Must receive State Office biologist and engineer approval prior to scheduling this practice.							
644	**Wetland Wildlife Management**						
	Habitat Monitoring and Management, Very-Low Intensity and Complexity 1/	Acre	$0.68		$0.81		
	Wetland Widlife Habitat Mongtand Mgt, Low Intensity and Complexity 2/	Acre	$2.26		$2.71		
	Habitat Monitoring and Management, Medium Intensity and Complexity 3/	Acre	$8.41		$10.10		
	Habitat Monitoring and Management, High Intensity and Complexity 4/	Acre	$20.67		$24.80		
	Dev of Shallow Micro-Topoc Features with Normal Equipment. 5/	Acre	$28.70		$34.44		
	Development of Deep Micro-Topo Features with Heavy Equipment. 6/	Acre	$78.19		$93.82		1 Year
1/ Wetland wildlife habitat is improved by implementation of annual adaptive management actions of very low intensity and complexity. The adaptive management actions such as cutting of limbs that are impeding access of birds into nest boxs, replacing damaged fence markers, cleaning of nest structures and debris around other structures requires only hand labor and less than 16 hours of labor per year.							
2/ Wetland wildlife habitat is improved by implementation of annual adaptive management acions such as cutting of limbs that are impeding access of birds into nest boxs, replacing damaged fence markers, cleaning of nest structures and debris around other structures requires only hand labor and less than 8 hours labor per year.							
3/ Two or three adaptive management efforts are required (such as cutting of limbs that are impeding access of birds into nest boxes, replacing damaged fence markers, cleaning of nest structures and debris around other structures). The adaptive mgmt requires hand labor and the occasional use of light equipment. A crew of 2 is needed for the hand labor efforts and the crew will require less than 16 total hours of labor per mgmt effort.							
4/ Two four monitoring efforts are needed and each requiring less than 2 people and less than 8 hours per effort. The adaptive management actions (2 5 efforts) such as cutting of limbs that are impeding access of birds into nest boxes, replacing damaged fence markers, cleaning of nest structures and debris around other structures requires hand labor and light equipment, requiring a 2 person crew less than 1 day per effort.							
5/ Soil is excavated with normal farming equipment (e.g. tractor and box blade) to a depth of 2 6 inches and immediately deposited. This lowering and raising of a box blade restores the original microtopographic features (6' X 6' depressions and mounds) common to most landscapes and landforms prior to clearing, tilling, and annual mowing. This scenario it typically implemented for ecosystem restoration projects.							
6/ soil is excavated with track equipment (dozer) to a depth of 6 12 inches and immediately deposited. This lowering and raising of a dozer blade restores the original deep micro topographic features (10' X10' depressions and mounds) common to many landscapes and landforms prior to the lands conversion to agricultural lands. This scenario it typically implemented for ecosystem restoration projects							
1/ **Applicable to Wildlife Landuse Only.** Requires a monitoring plan, an approved agreement with the monitoring organization, and a signed landowner release agreeing that the data will be publicly available.							

Practice Code	Conservation Practice	Payment Unit	Payment Rate	Maximum Amount	HU Payment Rate	HU Maximum Amount	Lifespan
2/ **Applicable to Wildlife Landuse Only**. Manage according to habitat needs identified by the GA Habitat Suitability Index model and comparisons with site appropriate Ecological Site Descriptions or other suitable reference conditions.							
380	**Windbreak/Shelterbelt Establishment**						
	2 Row windbreak, trees, Machine planted	Foot	$0.44		$0.52		15 Years

Two offset rows of Hardwoods/Pines/Evergreens or Shrubs planted for wind protection, shelter for livestock, wildlife habitat, air quality or to provide a visual screen. Trees should be planted at the desired spacing to meet the resource need.

FOOTNOTES

Maximum Amounts for the life of the contract are established on certain conservation practices or options, as noted in this Policy. EQIP funds provide financial assistance to eligible farmers and ranchers to help these producers enhance agricultural and forested lands in a cost-effective and environmentally beneficial manner. Establishing Maximum Amounts for the contract allows Georgia NRCS to make EQIP funding assistance available to a larger number of eligible farmers, ranchers and forest producers here in Georgia, and also as a method to make funding available to eligible producers regardless of size of operation (i.e., by not obligating large amounts of funds on operations with more acres, Georgia EQIP funds will be available to a larger number of separate operations). The specified "Maximum Amounts" for identified practices within this policy does not allow applicants to exceed the maximums through multiple offers/contracts on different acres when those acres are controlled by the same applicant(s), where 'control' means possession of the land by ownership, written lease, or other legal agreement (as generally indicated on FSA's EZ156 &/or Producer Farm Data Report forms). Historically Underserved Maximum Amounts refers to the maximum contract payment for Historically Underserved Farmers (Limited Resource Farmers, Beginning Farmers, and Socially Disadvantaged Farmers as defined in the 2014 EQIP Final Rule). NOTE: While there is no restriction on the number of applications (or contracts, if funded) that may be submitted by an applicant for EQIP, all FY17 EQIP applications (and contracted amounts) will count towards the Maximum Amount as listed in FY17 EQIP Policy for any and all FY17 EQIP applications (and FY17 EQIP contracts, if funded) where acres are controlled by the same applicant(s).

FMP = Forest Management Plan. Approved FMP's are:
(a) Forest Management Plan 106 Plan developed by a TSP OR
(b) Forest Stewardship Plan (FSP) prepared by GFC OR
(c) GFC Resource Management Plan OR
(d) Conservation Plan on Forest Land OR
(e) a site-specific plan prepared by a professional forester if this site-specific plan has been approved by either an NRCS forester or the Georgia State Forester at the time the EQIP applicant signs the CPA1200.

Conservation practices that are either structural or vegetative, and have a multi-year lifespan. Structural practices involve the establishment, construction, or installation of site-specific measures. Vegetative practices involve the establishment or planting of site-specific vegetative measures. Payments are established as a one-time only payment, not multi-year payments. Georgia policy requires the owner be a signatory to a contract which has EQIP funds used for any structural or vegetative practice, in accordance with CPM515.71(B)(2)(ii).

Technical Service Provider *(http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/tsp)*

2/1/2017

Georgia State Conservationist Date

Cedar Creek at Ga 211						
Station #03023951						
Date	**Fecal cfu/100ml**	**Geometric Mean**		**Date**	**Fecal cfu/100ml**	**Geometric Mean**
02.15.99	460	264		01.15.04	170	162
02.21.99	40			01.20.04	110	
02.28.99	110			01.28.04	230	
03.03.99	2,400			02.02.04	160	
05.27.99	330	723		04.13.04	24,192	1332
06.10.99	1,300			04.19.04	504	
06.17.99	1,300			04.21.04	480	
06.22.99	490			04.25.04	538	
07.29.99	330	446		07.20.04	3,000	4300
08.12.99	1,100			07.26.04	9,000	
08.19.99	330			07.28.04	16,000	
08.26.99	330			08.03.04	800	
11.30.99	140	316		10.18.04	340	913
12.14.99	1,800			10.20.04	1,700	
12.16.99	790			10.25.04	500	
12.21.99	50			10.27.04	2,400	
01.15.04	170	162				
01.20.04	110					
01.28.04	230					
02.02.04	160					
04.13.04	24,192	1332				
04.19.04	504					
04.21.04	480					
04.25.04	538					
07.20.04	3,000	4300				
07.26.04	9,000					
07.28.04	16,000					
08.03.04	800					
10.18.04	340	913				
10.20.04	1,700					
10.25.04	500					
10.27.04	2,400					

Source: GA EPD

Duncan Creek at GA 211							
Date	Wet/Dry	Turbidity (NTU)	Fecal mpn/100 mL	Geometric Mean	Water Color	Water Clarity	Observations
06/13/2016		9.13	92			Clear	
06/20/2016		7.45	160			Clear	
06/23/2016	Dry	5.94					
06/27/2016		5.97	104	277			
07/05/2016		7.5	220				Low water levels in streams
07/13/2016		6.8	648				Streams at low-medium flow
07/19/2016		7.53	1680			Slightly turbid	
07/20/2016	Dry	17.3				Clear	Banks of streams were wet, medium flow
07/27/2016		5.97	440			Clear	Mid to low water level in streams
08/04/2016		176	>400			Turbid	Medium flow in streams
11/29/2016	Wet					Turbid	Banks of streams were wet, medium to high flow in streams
07/12/2017		121	2927	939		Turbid	
07/17/2017		33.5	1925				high stream level
07/18/2017		14.1	425				
07/20/2017	Dry	8.52	325		Clear	Clear	
07/24/2017		342	>400	679	Muddy	Clear	low stream level
07/31/2017		6.67	100		Clear	Clear	high stream level
08/02/2017	Dry	5.54	175		Clear	Clear	normal stream level
08/07/2017	Wet	178	30400		Muddy	Clear	low stream level
08/31/2017	Wet	248					high stream level

Source: EMI

Indian Creek at Tapp Wood Road, RV 03_0794		
DATE	**Total Suspended Solids (TSS)**	**Turbidity**
01/08/2014	2.8	6.1
02/25/2014	4.4	6.2
03/03/2014	4.9	4.8
04/14/2014	6.8	8.3
05/22/2014	6.6	6.8
06/19/2014	22	8.2
11/02/2002		9.9
01/20/2015	2.9	7.5
02/04/2015	5.3	10
02/04/2015		13
03/10/2015		5.6
03/10/2015	2.7	4.1
04/06/2015	5.4	5.3
05/04/2015	8.2	6.9
06/08/2015		
06/08/2015	10	8.5
07/01/2015	9.6	21
08/25/2015	6.8	8.1
05/04/2015		
08/25/2015		
09/22/2015		7.68
10/28/2015		17.4
12/15/2015		7.33
07/01/2015		21.6
06/08/2015		13.8
04/06/2015		7.94
09/22/2015	3.0	6.9
10/28/2015	8.8	12
11/03/2015	58	70
12/15/2015		
12/15/2015	3.0	5.5
12/15/2015	3.9	5.3

DATE	**Total Suspended Solids (TSS)**	**Turbidity**
12/15/2015		7.33
11/03/2015		73.3
07/15/2014		
02/11/2015		9.76
09/04/2015		8.11

Source: Ga EPD

Mulberry River at New Liberty Church Road							
Date	Wet/Dry	Turbidity (NTU)	Fecal mpn/100 mL	Geometric Mean	Water Color	Water Clarity	Observations
6/2/2015	Wet	470	8100	792			
6/9/2015	Dry	2	480				
6/16/2015	Dry	8	232				
6/24/2015	Dry	7	312				
7/15/2015	Wet						
8/4/2015	Dry	6	200	940			
8/11/2015	Wet	14	1387				
8/18/2015	Wet	213	8800				
8/25/2015	Dry	18	320				
06/13/2016		8.53	187	189		Clear	
06/20/2016		6	153			Clear	
06/23/2016	Dry	5.01					
06/27/2016		5.01	207				Low water levels in streams
07/05/2016		9.35	220				Streams at low-medium flow
07/13/2016		9.7	570	1076			
07/19/2016		7.9	1280			Slightly turbid	Banks of streams were wet, medium flow
07/20/2016	Dry	23.4				Clear	Mid to low water level in streams
07/27/2016		6.3	247			Clear	Medium flow in streams
08/04/2016		195	7440			Turbid	Banks of streams were wet, medium to high flow in streams
11/29/2016	Wet					Turbid	
07/10/2017		11.8	250	530		Clear	
07/12/2017		135	2387			Turbid	high stream level
07/17/2017		17.5	460				
07/20/2017	Dry	8.3	288		Muddy	Slightly turbid	low stream level
07/24/2017		545	27600	1149	Muddy	Opaque	high stream level
07/31/2017		24.1	50		Clear	Clear	normal stream level
08/02/2017	Dry	11.3	140		Clear	Clear	low stream level
08/07/2017	Wet	245	9050		Clear	Slightly turbid	high stream level
08/31/2017	Wet	176					

Source: EMI

Mulberry River at Union Circle Road							
Date	Wet/Dry	Turbidity (NTU)	Fecal mpn/100 mL	Geometric Mean	Water Color	Water Clarigy	Observations
6/2/2015	Wet	403	9500	785			
6/9/2015	Dry	5	293				
6/16/2015	Dry	6	352				
6/24/2015	Dry	6	388				
7/15/2015	Wet						
8/4/2015	Dry	12	1250	2170			
8/11/2015	Wet	47	7700				
8/18/2015	Wet	90	5600				
8/25/2015	Dry	11	412				
06/13/2016		4.97	293	208		Clear	
06/20/2016		3.66	180			Clear	
06/23/2016	Dry	6.7					
06/27/2016		6.7	200				Low water levels in streams
07/05/2016		7.98	356				Streams at low-medium flow
07/13/2016		4.19	612	441			
07/19/2016		7.11	372			Slightly turbid	Banks of streams were wet, medium flow
07/20/2016	Dry	5.14				Clear	Mid to low water level in streams
07/27/2016		5.26	416			Clear	Medium flow in streams
08/04/2016		97.9	>400			Turbid	Banks of streams were wet, medium to high flow in streams
11/29/2016	Wet					Turbid	
07/10/2017		8.66	247	377		Clear	
07/12/2017		9.35	672			Turbid	low stream level
07/17/2017		11.6	573		Muddy	Turbid	high stream level
07/20/2017	Dry	28.52	213		Clear	Clear	Natural water odor, normal flow level
07/24/2017		207	>400	868	Muddy	Opaque	High water level, natural water odor
07/31/2017		9.54	250		Clear	Clear	Normal water level, natural odor
08/02/2017	Dry	5.21	233		Clear	Clear	Low stream level, natural odor
08/07/2017	Wet	133	24400		Muddy	Opaque	High stream level, natural odor
08/31/2017	Wet	98.6					

Source: EMI

Mulberry River at Wastewater Treatment Plant Boundary							
Date	Wet/Dry	Turbidity (NTU)	Fecal mpn/100 mL	Geometric Mean	Water Color	Water Clarity	Observations
6/2/2015	Wet	470	8100	792			
6/9/2015	Dry	2	480				
6/16/2015	Dry	8	232				
6/24/2015	Dry	7	312				
7/15/2015	Wet						
8/4/2015	Dry	6	200	940			
8/11/2015	Wet	14	1387				
8/18/2015	Wet	213	8800				
8/25/2015	Dry	18	320				
06/13/2016		8.53	187	189		Clear	
06/20/2016		6	153			Clear	
06/23/2016	Dry	5.01					
06/27/2016		5.01	207				Low water levels in streams
07/05/2016		9.35	220				Streams at low-medium flow
07/13/2016		9.7	570	1076			
07/19/2016		7.9	1280			Slightly turbid	Banks of streams were wet, medium flow
07/20/2016	Dry	23.4				Clear	Mid to low water level in streams
07/27/2016		6.3	247			Clear	Medium flow in streams
08/04/2016		195	7440			Turbid	Banks of streams were wet, medium to high flow in streams
11/29/2016	Wet					Turbid	
07/10/2017		11.8	250	530		Clear	
07/12/2017		135	2387			Turbid	high stream level
07/17/2017		17.5	460				
07/20/2017	Dry	8.3	288		Muddy	Slightly turbid	low stream level
07/24/2017		545	27600	1149	Muddy	Opaque	high stream level
07/31/2017		24.1	50		Clear	Clear	normal stream level
08/02/2017	Dry	11.3	140		Clear	Clear	low stream level
08/07/2017	Wet	245	9050		Clear	Slightly turbid	high stream level
08/31/2017	Wet	176					

Source: EMI

Monitoring Site No.	Monitoring Site Description	Sep-17				Oct-17			
		E.coli cfu/100 ml	Fecal Coliform cfu/100 ml	Turbidity (NTU)	Conductivity (uS)	E.coli cfu/100 ml	Fecal Coliform cfu/100 ml	Turbidity (NTU)	Conductivity (uS)
1	Mulberry River at Thompson Mill	99.99	166.65	42.40	NA	1199.88	1999.80	73.50	96.00
2	Mulberry River at Peachtree Rd	33.33	55.55	55.40	NA	1666.50	2777.50	76.70	90.00
3	Mulberry River at Hwy 11	33.33	55.55	10.40	NA	2333.10	3888.50	44.70	77.00
4	Mulberry River at Etheridge	166.65	277.75	13.40	NA	2566.41	4277.35	149.00	69.00
5	Cedar Creek at 211	99.99	166.65	9.56	NA	2699.73	4499.55	235.00	64.00
	Rainfall - previous 48 hours (inches)	0				0			
	Rainfall - previous 24 hours (inches)	0				1.03			

Monitoring Site No.	Monitoring Site Description	Nov-17				Jan-18			
		E.coli cfu/100 ml	Fecal Coliform cfu/100 ml	Turbidity (NTU)	Conductivity (uS)	E.coli cfu/100 ml	Fecal Coliform cfu/100 ml	Turbidity (NTU)	Conductivity (uS)
1	Mulberry River at Thompson Mill	233.31	388.85	10.30	109.00	0.00	0.00	29.20	119.00
2	Mulberry River at Peachtree Rd	33.33	55.55	5.42	125.00	133.32	222.20	13.10	123.00
3	Mulberry River at Hwy 11	66.66	111.10	16.20	95.00	66.66	111.10	14.20	102.00
4	Mulberry River at Etheridge	33.33	55.55	21.00	135.00	99.99	166.65	9.51	133.00
5	Cedar Creek at 211	99.99	166.65	11.30	127.00	366.63	611.05	14.00	135.00
6	Rainfall - previous 48 hours (inches)	0				0	0.00		
7	Rainfall - previous 24 hours (inches)	0	0			0.00	0.00		
	Source: RMS		exceeds seasonal fecal coliform standard (200 May - Oct))						
			exceeds seasonal fecal coliform standard (1000 Nov - Apr)						
			wet weather sampling event						