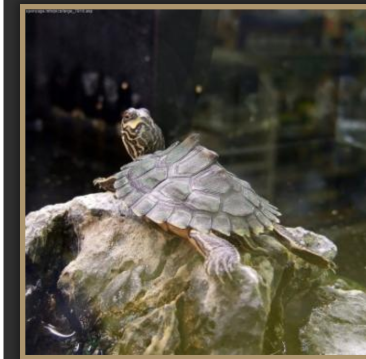
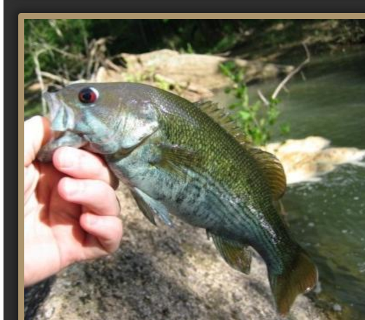
UPPER OOSTANAULA WATERSHED MANAGEMENT PLAN

INCLUDING CAMP CREEK, SNAKE CREEK, AND OTHER TRIBUTARIES





A Local Stakeholder and Georgia EPD Approved Plan that Outlines the Framework for Improving Water Quality in the Upper Oostanaula River Watershed and its Tributaries

October, 2014

Acknowledgements

Limestone Valley Resource Conservation and Development Council, Inc., would like to express its appreciation to the many organizations and individuals that assisted with the research and compilation of information presented in this plan. First and foremost, Limestone Valley wishes to thank the Environmental Protection Agency and the Georgia Environmental Protection Division for funding the preparation of this document. Additionally, the council would like to thank the individuals associated with New Echota Rivers Alliance, the Natural Resources Conservation Service and Calhoun Utilities that contributed many hours by providing resource information and guidance. Other organizations that contributed to this plan and the associated grant to develop it include the City of Calhoun, the City of Resaca, the Georgia Soil and Water Conservation Commission, the Gordon County Commission, and the Gordon County Environmental Health Department. It is the hope of Limestone Valley RC&D Council that the information presented here, as well as the cooperative partnerships formed during this process, will work to improve the water quality in the Upper Oostanaula Watershed in Georgia.

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Executive Summary

Within the Upper Oostanaula Watershed, several stream segments fail to meet criteria set by the State of Georgia for pathogens and biotic integrity, which respectively are impairments that stem from excessive fecal contamination and sediment loading. Due to these impairments, load reductions of these nonpoint source pollutants are necessary in many areas within the watershed. The need for a further effort to identify consistent sources of these pollutants and work towards addressing the load reductions led to the creation of this Watershed Management Plan. The plan outlines a process for implementing the load reductions necessary for watershed restoration, and includes the Nine Elements as recommended by the Environmental Protection Agency. In addition, the plan seeks to include methods to reduce nutrients as mandated within the Upper Coosa Basin. The plan development process also featured a stakeholder-driven course of action to build momentum and partnerships with the local community that will assist in its implementation. Limestone Valley Resource Conservation and Development Council has written the plan as a deliverable associated with a Environmental Protection Agency Clean Water Act (§319) grant administered by the State of Georgia. Limestone Valley, assuming 319 funding is available, intends on leading the collaborative restoration effort to help achieve the load reductions necessary to improve the watershed.

A multi-faceted Upper Oostanaula Watershed Restoration Program has been proposed by Limestone Valley in order to target load reductions of fecal coliform bacteria and sediment as well as assist in reduction of nutrients from agricultural, residential, and potentially more urban sources. The program was conceptualized in an effort to play on the strengths of the various project partners, and will complement existing conservation programs (e.g., Environmental Quality Incentives Program, Calhoun Utilities Stormwater Program, North Georgia Water Resources Partnership). Agricultural lands, as part of this program, have been identified for targeting load reductions through cost-shares with landowners and/or potentially the Coosa Basin Nutrient Trading Program for the installation of Best Management Practices. The agricultural practices implemented will vary according to the interests of the farmers, but will likely include stream access control, alternative watering systems, heavy use area protection, and stream crossings for livestock producers, as well as streambank stabilization and stream buffer enhancement. Incentives for proper nutrient management will also be considered. Natural Resource Conservation Service will be a significant contributor to the success of these program components. Residential lands will also be targeted to reduce the contributions of fecal coliform bacteria from human sources by addressing septic system issues. This will include cost-shares on septic system repairs focused near streams and intermittent conveyances, and elsewhere in the watershed to build further momentum.

For this program component, it is anticipated that North Georgia Health District will play a key role. Additional "on-the-ground" conservation will potentially be achieved through the implementation of stormwater practices such as streambank stabilization in the more urbanized areas like Calhoun and Resaca. Depending on location, these practices may be implemented in collaboration with Calhoun Utilities.

This document, in addition to actual “on-the-ground” projects, outlines outreach activities for volunteers that were identified by the stakeholder group as having the potential to contribute toward the reduction of pollutant loads and/or further educate the community about watersheds and the importance of water quality, as well as soil and water conservation. The success of outreach and education efforts will be maximized through effective partnerships with several groups. Collectively, these educational and "on-the-ground” management measures will be implemented across several grants, with each grant also involving monitoring to reevaluate watershed conditions.

As part of the development process for this watershed management plan, estimates were figured to consider the time and funding from 319 sources likely needed to accomplish restoration goals. Other sources of funding (mainly anticipated in the form of in-kind donations from stakeholders, agencies, and non-governmental organizations) were not estimated, but were assumed to contribute significantly to the program. In an effort to come up with a financial estimate, the extent of work within the watershed needed for complete watershed treatment was first conceptualized using Geographic Information Systems analysis and inspection of aerial photography. Then, the extent of the total watershed treatment that would likely be necessary to result in the de-listing of the majority of impaired stream segments was estimated. Finally, the projects that these funds would finance were arranged in an implementation schedule that spans several years (including grant proposal submission periods). The implementation schedule (as proposed) includes all grant activities including water quality monitoring, education and outreach activities, and project activities (e.g., agricultural Best Management Practices, septic system repairs, streambank stabilization, etc). Each of these activities will continue through each grant implementation period. Currently, it is anticipated that multiple grant implementation periods may allow for significant improvements within the watershed. After these periods, it is expected that some impaired stream reaches will have been de-listed and others, assuming projects have been completed upstream, will at least be improved and approaching compliance with state criteria. Success in this endeavor will depend on a number of variables, and priorities will be evaluated and altered throughout the multiple year periods to maximize results.

1. Plan Preparation and Implementation

The following section is meant to provide a brief overview of the purpose of the Watershed Management Plan, the objectives it aims to accomplish, some of the details of the plan development and stakeholder process, and ultimately, how the plan will be implemented.

The Upper Oostanaula Watershed (HUC 0315010301) was chosen for Watershed Management Plan (WMP) development because it contains several stream reaches that fail to meet water quality criteria for the State of Georgia. The purpose of this WMP development process is to outline a feasible method and timeline to restore the Upper Oostanaula Watershed to the level that impaired stream segments meet all water quality criteria in the future, and are eventually de-listed from the Georgia Integrated 305(b)/303(d) List. Although not regulatory in nature, this WMP is meant to serve as guidance for long-term restoration and plan implementation efforts. In developing the plan, we also sought to involve a variety of stakeholders from the local community and watershed to provide information and seek input, build momentum, and encourage future stakeholder participation in the watershed restoration process. For the groups that demonstrated a willingness to participate in and contribute in various ways during the restoration, we attempted to define their likely roles within the WMP document.

Figure 1.1.a. The Oostanuala River of the Coosa River Basin near Calhoun in Gordon County, Georgia.

In summary, the WMP for the Upper Oostanauala Watershed is simply a plan defining a feasible method for watershed restoration. However, the ultimate goals of the planning and restoration process to follow are for impaired segments to eventually be and remain de-listed and for the integrity of other segments to be maintained so that they continue to meet the criteria for each designated use. The plan also seeks to complement nutrient management reduction efforts in the Upper Coosa Basin. Ultimately, a broader goal is to make stakeholders and landowners in the watershed more knowledgeable concerning watershed issues and how to go about managing the landscape to minimize water and soil resource concerns.

As part of a U.S. Environmental Protection Agency (EPA) Clean Water Act (§319) grant awarded by Georgia Environmental Protection Division (EPD), Limestone Valley Resource Conservation and Development (RC&D) Council has developed this WMP. This plan seeks to update historical Total Maximum Daily Load (TMDL) Implementation Plans for the Upper Oostanaula Watershed to include the nine elements of watershed planning (described in detail below), which are now recommended by the EPA for all watershed planning documents. The inclusion of the nine elements is recommended to help ensure stakeholder involvement and approval lead to an explicit prescription to eventually meet watershed restoration objectives. Specifically, the nine elements are as follows:

1. An identification of the sources or groups of similar sources contributing to nonpoint source (NPS) pollution to be controlled to implement load allocations or achieve water quality standards.

2. An estimate of the load reductions needed to de-list impaired stream segments;

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

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

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

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

7. A description of interim, measurable milestones (e.g., amount of load reductions, improvement in biological or habitat parameters) for determining whether management measures or other control actions are being implemented;

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

9. A monitoring component to evaluate the effectiveness of the implementation efforts, measured against the criteria established under item (8) above.

Aside from the addition of the nine elements, this WMP is meant to be more thorough than the TMDL implementation plans constructed in the past. The plan is intended to focus more effort on specific watershed details, as well as provide a more comprehensive Geographic Information Systems (GIS) analysis that investigates several factors that exert an influence on non-point source (NPS) pollutant loads. More focus on these details should lead to a greater understanding of the local physical and social environment and help ensure greater success. Compiling more extensive data should help us better define priorities in the watershed for targeting Best Management Practice (BMP) Installations, allow for better long-term land use and riparian comparisons, and assist in the development of more discreet objectives and milestones.

Extensive research on the watershed, including water quality monitoring and GIS analysis, was necessary in order to synthesize this document. Data regarding water quality, fish assemblages, geology, soils, and land use were considered, however, only data sets and summaries of the parameters most relevant to the purpose of the WMP were included. The GIS component focused on analyzing riparian buffers, land use percentages, and housing densities. GIS and water quality monitoring were also used as tools to identify broad areas of likely NPS pollution sources and priority areas for installation of BMPs.

Table 1.1.a. Stakeholder committee members that participated in the WMP development process for the Upper Oostanaula Watershed.

WATERSHED ADVISORY COMMITTEE MEMBERS	
Main Affiliation	**Name**
Calhoun Times	Aaron Mann
Calhoun Utilities	Jerry Crawford
City of Calhoun	Larry Vickery
City of Resaca	Mitch Reed
Georgia Forestry Commission	Ritchie Mullen
Georgia House of Representatives	John Meadows
Georgia Soil and Water Conservation Commission	John Loughridge
Georgia Soil and Water Conservation Commission	Jessica Bee
Georgia Soil and Water Conservation Commission	Brady Hart
Gordon County	Don Holley
Gordon County Citizen and Farmer	John Holbert
Gordon County Citizen and Farmer	Steve Bruno
Gordon County Citizen and Farmer	Bill Dillard
Gordon County Citizen and Farmer	Adam Williams
Gordon County Citizen and Farmer	Gene Williams
Gordon County Citizen	Preston Kilgore
Gordon County Citizen, Limestone Valley RC&D Council	Ricky Smith
Gordon County Environmental Health Department	Matthew Williams
Limestone Valley RC&D Council	Dan Huser
Limestone Valley RC&D Council	Joshua Smith
Natural Resources Conservation Service	Doug Cabe
Natural Resources Conservation Service	Joanne Borders
Natural Resources Conservation Service	Paula Alford

Members of local, state, and Federal government, local utilities and universities, nonprofit groups, and the private sector, formed a watershed stakeholder group (Table 1.1.a.) and contributed to the development of the plan. Some members were invited to take part in the process due to their professional expertise and interest in relevant disciplines and restoration efforts. Others were invited due to their interests in farming, as agricultural BMPs will likely be integral to success. Local governments were also made aware of the stakeholder process and engaged in the opportunity to participate in the stakeholder group.

Overall, we sought a diverse group to provide different perspectives in the process and hopefully contribute in some aspect of the watershed restoration process.

Public meetings (conducted in 2014) were held with the stakeholder group to formally engage them as members of the public in the WMP development process and seek their input for the plan. All members were informed of our expectations of them as stakeholders during the stakeholder process. In addition, the stakeholders were asked if they had resources that they could contribute to the WMP development and/or restoration process. A few stakeholders were consulted more regularly due to their expertise and willingness to provide additional support in the process of developing the plan. It was also anticipated that some stakeholders may become project partners and contribute significantly in the restoration process. Meetings focused on informing the stakeholders of some of the issues in the Upper Oostanaula Watershed, as well as gathering input about potential problems and solutions, discussing sampling data, developing priorities, evaluating what BMPs may be received locally with the best public reception, and obtaining insight on the WMP document itself. Finally, approval was sought for the document to serve as the plan on which implementation efforts follow to restore and maintain the watershed.

Plan implementation and restoration activities intended to follow the planning process will likely depend on funding from Clean Water Act (§319) grants (in addition to various assistance from other stakeholder groups) with the focus to improve the watershed through several specific project components. These components include educating the public about NPS pollution and watershed processes and reducing NPS pollution from agricultural lands, failing septic systems, and potentially urban sources in the watershed. Stakeholder assistance in some aspects of the restoration effort will be a key factor in success. Plan implementation will occur with respect to private property rights and rely on voluntary conservation, which involves participation from landowners in cost-shares to put in BMP practices that reduce NPS pollution on/from their properties. Most practices are mutually beneficial to the landowner and water quality, which helps incentivize participation. A potential incentive program for farmers that conduct proper nutrient management will also be considered. There is also the potential that the Coosa Basin Nutrient Trading Program can assist in providing a portion of the cost-shares for agricultural projects that reduce nutrients. If this proves to be the case, the combined sources of funding would take more of the burden off of landowners and perhaps create more substantial interest in agricultural projects. Although management of individual parcels is key to watershed restoration, a discussion regarding individual parcels has been avoided so as not to discourage participation, which could occur if directed criticisms over the management of specific private lands were included. Instead, the general NPS issues associated with specific land uses which predominate within the watershed are discussed, and the proposed project components are meant to address a number of NPS pollutant sources that occur on the landscape.

Utilizing the voluntary conservation approach to accomplish the objectives of the plan will be a difficult endeavor. However, by building momentum through a phased approach, and developing relationships/partnerships in the community, the process should cumulatively achieve significant NPS pollution reduction. To our knowledge, Clean Water Act (§319) grants have not yet been implemented in the Upper Oostanaula Watershed. Developing this WMP on the front end of a potential effort will ensure restoration is designed in the most constructive way possible for the area. In addition, following an explicit document from the beginning and tracking the strengths and weakness of the process will allow the plan to evolve and make changes in strategies that are weaknesses in the process. To increase the chance of successful watershed restoration, a reassessment of the plan is scheduled every five years. This iterative process will allow for adaptive management where citizens and stakeholders can analyze project successes and failures, and provide opportunities for changes in restoration priorities.

2. Upper Oostanaula Watershed Description

The section that follows will focus on providing extensive watershed background as it relates to the development of a WMP for the Upper Oostanaula Watershed in Northwest Georgia. The section is organized into three parts. The first part describes landscape features and includes the local watershed geography and geology. The second part focuses on forests, wildlife, and fishes. The last describes anthropogenic features (e.g., resource uses, political boundaries, etc.). Much of the following information regarding the Upper Oostanaula Watershed was written with the assistance of the historical TMDL Implementation Plans and the soil surveys of Gordon and adjacent counties. Additional sources are referenced within the text.

2.1 Landscape Features

Watershed Geography

In Northwest Georgia, the Upper Oostanaula Watershed of the Coosa River Basin is classified by drainage area as a "HUC 10" watershed (specifically Hydrologic Unit Code #0315010301; Figure 2.1.a.). Most of the watershed lies within Gordon County, Georgia, although some upper watershed areas extend into Walker and Whitfield Counties and drain southward. Very small portions of Floyd County are also located within the watershed.

The Upper Oostanaula Watershed, HUC 0315010301, begins where the Oostanuala River forms at the confluence of the Conasauga and Coosawattee Rivers east of Resaca. The lowest point of the watershed (approximately 600 feet in elevation) is on the Oostanaula River west of Plainsville at the confluence with Johns Creek at the Floyd County Line. The Oostanaula River is quite sinuous in this segment. Direct tributaries draining into this reach of the Oostanaula River include from upstream to downstream: Town Creek, Camp Creek, Oothkalooga Creek, Graham Creek, Snake Creek, Bow Creek, Blue Spring Branch, and Robbins Creek. Several unnamed tributaries also drain into this part of the Oostanaula River. Each of the tributaries and their subwatersheds (depicted in Figure 2.1.b.) with the exception of Oothkalooga Creek lies within HUC 0315010301.

Camp Creek and Snake Creek have the largest subwatersheds in the HUC 10 watershed at nearly 10,000 acres. Camp Creek originates in southwest Whitfield County and flows southeast and eventually south draining the area of Resaca near its confluence with the Oostanaula River. Tributaries to Camp Creek include Dry Creek and the more significant Blue Springs Creek. The Camp Creek Subwatershed was dominated by private land ownership and the recently opened Resaca Battlefield State Historic Site. Snake Creek originates in southeast Walker County where it flows south and in Gordon County runs southeast prior to joining the Oostanaula River northwest of Calhoun. Snake Creek has no named tributaries, and much of its subwatershed occurs within the national forest.

Other direct tributaries mentioned above are discussed below. Town Creek has no significant tributaries and enters the Oostanaula River from the south just after the Conasauga and Coosawattee Rivers come together. Graham Creek is located between the Camp Creek and Snake Creek subwatersheds and has a significant tributary in Lick Creek. Bow Creek drains the subwatershed southwest of Snake Creek and enters the Oostanaula just downstream of Snake Creek. Like Snake Creek, Bow Creek drains a significant area with the national forest. Blue Spring Branch drains the area south of Bow Creek, most of which is national forest. Robbins Creek drains the area southwest of Calhoun, and enters the Oostanaula River from the southeast. The most important unnamed tributary of the Oostanaula River within this segment, due to its inclusion on the 303(d) list, comes out of the Plainsville area and is the larger tributary draining to Kings Lake.

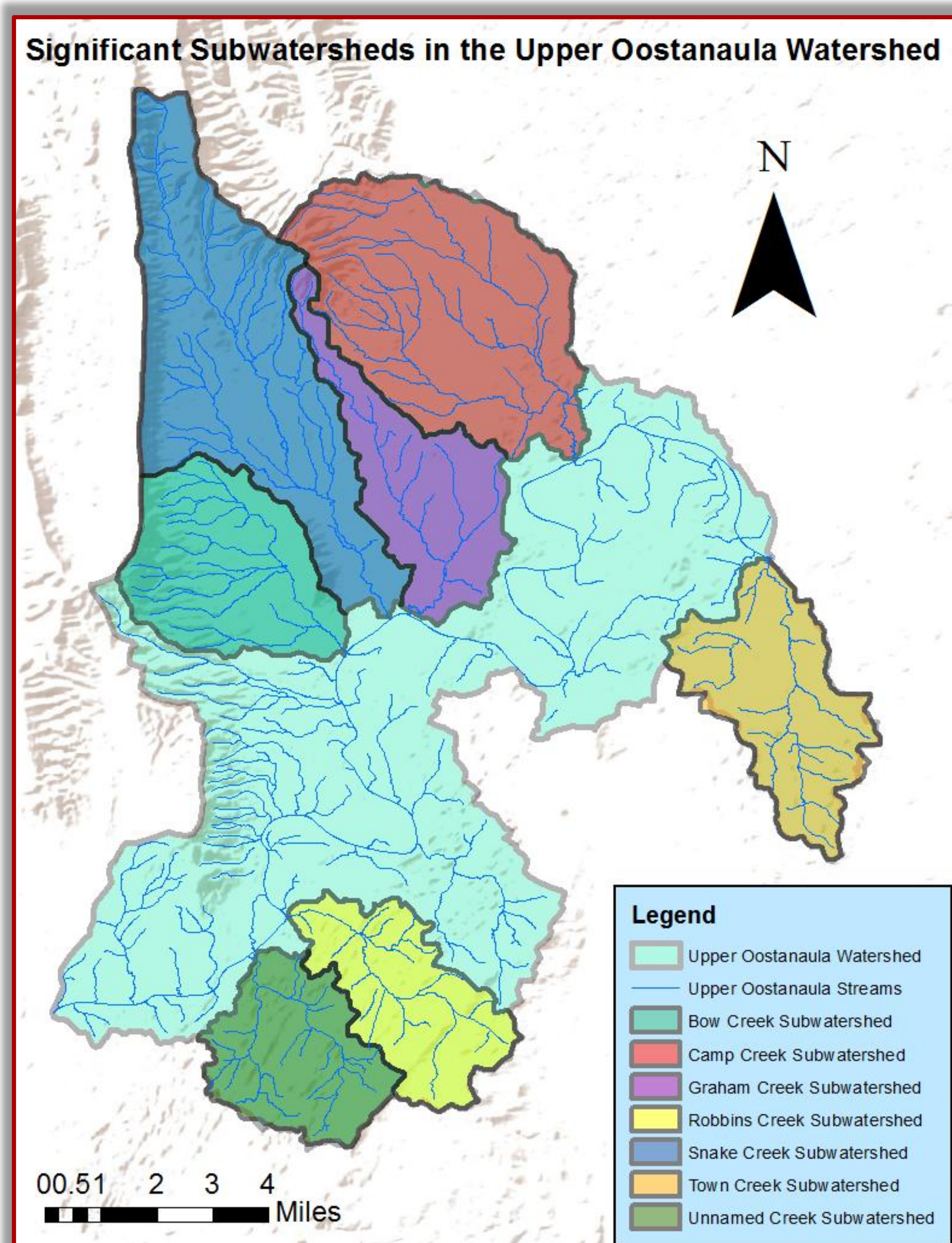

Figure 2.1.a. The Upper Oostanaula Watershed, HUC 0315010301, of the Coosa River Basin with significant subwatersheds identified.

Watershed Geology and Soils

The Upper Oostanaula Watershed is located with the Ridge and Valley physiographic region, a relatively low-lying area between the Southwestern Appalachians to the west and the Blue Ridge Mountains to the east. Rocks in this physiographic region range from early Cambrian to Mississippian age. Northward-trending valleys with pasture and cropland separated by low, rounded ridges and high, steep-sided, forested ridges dominate the landscape. The ridges tend to be composed of chert and capped sandstone, while the valleys are most often limestone or shale. The most common underlying rocks are shale, slate, dolomite, limestone, and sandstone. The faulting and cracking of dolomite and limestone (karst) topography in the mountain building process has led to sinkholes and springs in the region. The diverse habitats within the Ridge and Valley contain many unique species of terrestrial and aquatic flora and fauna.

Figure 2.1.c. A view of the landscape near Resaca in the Upper Oostanaula Watershed.

In the Upper Oostanaula Watershed, significant landforms include Horn Mountain, Baugh Mountain, Sugar Valley, and the Oostanaula River Valley itself. Horn Mountain (1,600 feet in elevation) is the narrow ridge that runs northward and serves as the western boundary for much of the watershed. The other Upper Oostanaula Watershed boundaries, however, are more bumps than dramatic ridges. Baugh Mountain (1,188 feet in elevation) is a knob that separates Bow and Snake Creeks. Sugar Valley is the valley through which Snake Creek descends toward the Oostanaula River. The low-lying Oostanaula River Valley begins at the confluence of the Coosawattee and Conasauga Rivers to the east and is more than a mile and a half at its widest point. The river valley continues on through Rome, Georgia, where the Oostanaula and Etowah Rivers form the Coosa River, although the Upper Oostanaula Watershed (HUC 0315010301) reaches its terminus at 600 feet in elevation where Johns Creek enters the Oostanaula at the county line near Plainville, Georgia.

Important geologic formations in the watershed are the Conasauga, Rome, Knox, Fort Payne, Floyd, and Red Mountain Formations. The Conasauga and Rome Formations are composed of shale and limestone. The Knox and Fort Payne Formations are comprised of dolomite and limestone, and limestone or cherty limestone, respectively. Floyd is a shale formation, whereas the Red Mountain Formation describes shale in addition to limestone.

Soils within the Upper Oostanaula Watershed are described in detail in the Soil Survey of Gordon County, Georgia. The most widespread associations are the Montevallo-Klinesville-Rarden association and the Christian-Clarksville-Fullerton association, which respectively occupy 33% and 20% of Gordon County. The Montevallo-Klinesville-Rarden association describes the shallow, well-drained soils of the mostly wooded, rolling and hilly shale ridges that occur in eastern Gordon County. The Christian-Clarksville-Fullerton association represents the well-drained soils of the uplands underlain by cherty limestone or limestone. Much of the land in this soil association has historically been used for pasture. The Whitwell-Stendal-Philo-Monongahela association, comprising approximately 12% of Gordon

County, describes the moderately well-drained to somewhat poorly drained soils of the flood plains and low stream terraces. The vast majority of acreage in this association is highly productive, and often pastured or used for row crops.

2.2 Important Flora and Fauna

Forest Ecosystems

According to the land use analysis conducted for this plan, approximately 51.8% of the Upper Oostanuala Watershed is forested. The majority of this forest is deciduous (dominated by oak and hickory), accounting for 28.9% percent of the total land. Evergreen forest (mostly loblolly-shortleaf pine) and mixed forest (mixed oak-hickory-pine) are less dominant, with each of these forest types making up around 11.5% of the overall land use. Much of the forest is contiguous along the slopes of Horn Mountain in the upper subwatersheds of Snake Creek and Bow Creek and managed as part of Chattahoochee National Forest and John's Mountain Wildlife Management Area. Outside of this area, forest is mainly dispersed along the floodplain, on Baugh Mountain, and somewhat randomly throughout the watershed.

Wildlife and Habitat

Local wildlife populations exert effects on water quality within the Upper Oostanaula Watershed. Much of the watershed is a rural environment with an abundance of pasture and forest that provide fairly good habitat for wildlife. The wildlife of the Northwest Georgia area and their habitats are described in great detail in The Soil Survey of Catoosa County, Georgia. Wildlife in woodland habitats can include wild turkey (*Meleagris gallopavo*), American woodcock (*Scolopax minor*), thrushes *(Turdidae* family*)*, woodpecker (*Picidae* family), and American black bear (*Ursus americanus)*. Pine and hardwood forests surrounding pasture make good habitat for white-tailed deer (*Odocoileus virginianus*), mourning dove (*Zenaida macroura*), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), opossum (*Didelphis virginiana*), and fox (*Vulpes sp*.). Cropland, pasture, meadows, and other open areas with suitable food and cover are inhabited by Eastern cottontail rabbit (*Sylvilagus floridanus*), bobwhite quail (*Colinus virginianus*), meadowlark (*Sturnella magna*), field sparrow (*Spizella pusilla*), and red fox (*Vulpes vulpes*). Deer, rabbit, fox, quail, and other wildlife gain food and cover in the abundant native woody and herbaceous plants that occur in unmanaged pasture, old fields, young pine plantations, and thin woodland tracts. Waterfowl, otter (*Lontra canadensis*), beaver (*Castor canadensis*), bobcat (*Lynx rufus*), and raccoon inhabit forested wetlands, which occur mostly along streams. More open wetlands attract ducks and geese (*Anatidae* family), herons (*Ardeidae* family), shorebirds, and beaver.

Listed and Sensitive Species

According to Georgia Department of Natural Resources (DNR), the Upper Ostanaula Watershed also is home to two federally listed species and several state listed species, some of which may be influenced by changes in the watershed. Known occurrences of federally listed species in the watershed include the following: a mussel, the Southern clubshell (*Pleurobema decisum*); and a snail, cylindrical lioplax (*Lioplax cyclostomataformis*). Both of these obligate aquatic species are also protected by the State of Georgia.

Other non-federally listed aquatic species protected by the State of Georgia known to occur in the Upper Oostanaula Watershed include the coldwater darter (*Ethiostoma ditrema*), river redhorse sucker (*Moxostoma carinatum)*, Alabama map turtle (*Graptemys pulchra*), and a dragonfly, the Cherokee clubtail *(Gomphus consanguis*).

Figure 2.2.a. The Alabama map turtle (Graptemys pulchra), a state-protected species in Georgia.

Other rare aquatic species in Georgia known to occur in the watershed include the mountain shiner (*Lythrurus lirus*), silver chub (*Macrhybopsis storeriana*) and the following mollusks: the Coosa fiveridge (*Amblema elliottii*), ridged mapleleaf (*Quadrula rumphiana*), and upland hornsnail (*Pleurocera showalteri*). Improvements within the watershed would undoubtedly be positive for the outlook of these collective species.

Fisheries

According to Georgia DNR, the Snake Creek Subwatershed (of the Upper Oostanaula Watershed) is designated as year-round trout fishing waters, which are stocked several times per year and open to trout fishing all year. Trout species stocked designated streams can include brown (*Salmo trutta*), rainbow (*Oncorhynchus mykiss*), and/or brook trout (*Salvelinus fontinalis*). Such designations result in more strict regulations intended to minimize sedimentation and maintain forest buffers for temperature control. Current state regulations require the maintenance of a 50 foot vegetated buffer on either side of a trout stream with permits required for modifications within the buffer areas. People can also be regularly seen fishing regularly in the Oostanaula River. According to Georgia DNR, blue catfish (*Ictalurus furcatus)*, channel catfish (*Ictalurus punctatus)*, white bass (*Morone chrysops*), striped bass (*Morone saxatilis*), spotted bass (*Micropterus punctulatus*), largemouth bass (*Micropterus salmoides*), sunfish (*Lepomis* spp.) and crappie (*Pomoxis* spp.) are all commonly caught. Lake sturgeon (*Acipenser fulvescens*), which have been reintroduced by Georgia DNR, are also caught on occasion and released.

Figure 2.2.b. Lake sturgeon (Acipenser fulvescens) have been reintroduced in the Coosa River Basin. Anglers are asked to release them unharmed and call the DNR to report their size and location.

2.3 Anthropogenic Features

<u>Political Boundaries</u>

The political boundaries of the Upper Oostanaula Watershed are shown in Figure 2.3.a. below. As the map shows, small portions of the watershed occur within Floyd, Walker, and Whitfield Counties, although the vast majority is contained within western Gordon County. The small town of Plainville (population 257) occurs entirely within the watershed, and incorporated communities that extend into the watershed include Calhoun and Resaca, which have populations of 15,650 and 815, respectively. Whereas the vast majority of Resaca is located within the Upper Oostanaula Watershed, only a small portion of Calhoun is located inside the watershed. Calhoun Utilities has a sewer system and a storm sewer system serving the general Calhoun area that operates under the general stormwater permit for small municipal separate storm sewer systems. With the exception of the Calhoun area, the remainder of Gordon County lacks a sewer system, and residents rely on septic systems for waste management. With that being said, Resaca is currently in the process of seeking funding to install a sewer system.

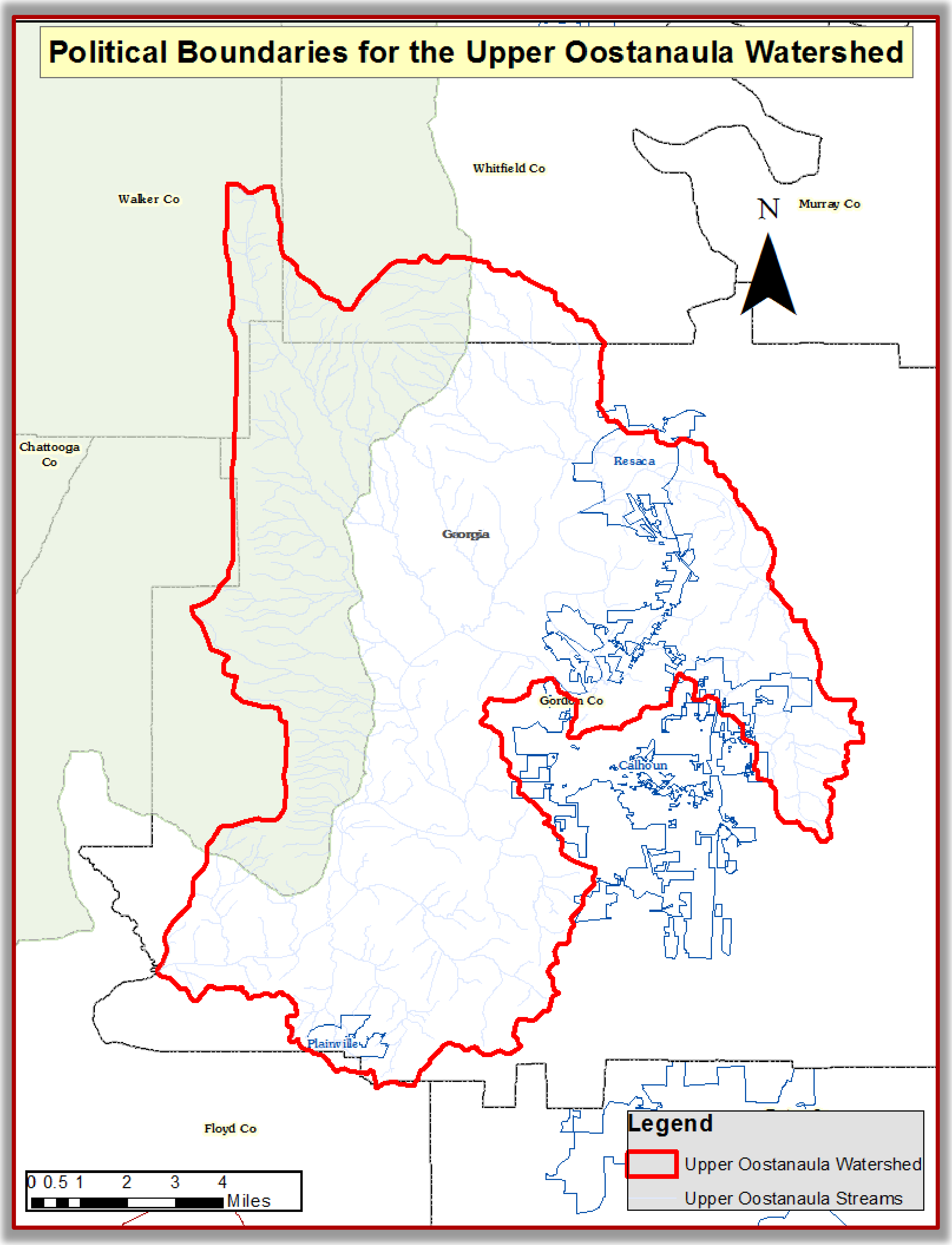

Figure 2.3.a. A map displaying the political boundaries in and within the vicinity of the Upper Oostanaula Watershed.

Active Groups Within the Watershed

Several groups with a local presence are relevant to the conservation of the Upper Oostanaula Watershed and/or the larger Coosa River Basin. Federal entities relevant to the WMP development process and/or conservation efforts in the area include the EPA, the Farm Services Agency (FSA), the Natural Resource Conservation Service (NRCS), and the United States Forest Service (USFS). State entities relevant to the conservation efforts in the area include the Georgia Association of Regional Commissions, Georgia Department of Natural Resources (DNR), Georgia Department of Public Health, the Georgia Environmental Protection Division (EPD), and the Georgia Soil and Water Conservation Commission (GSWCC). In addition, non-governmental organizations that contribute to local watershed conservation include Calhoun Utilities, Coosa River Basin Initiative (CRBI), Limestone Valley RC&D Council, The Nature Conservancy (TNC), the North Georgia Water Resources Partnership, and New Echota Rivers Alliance (NERA). Most of these groups have already conducted actions relevant to conservation within the Upper Oostanuala River Watershed, and others have improved local education regarding watershed science and water pollution. Groups conducting long-term programs, conducting monitoring, installing "on-the-ground" projects, implementing nonstructural practices, or those predicted to play a significant role in the implementation of this WMP are discussed further within the document.

3. Watershed Conditions

The section that follows will focus on introducing the state water quality standards and their importance, as well as impairments in the Upper Oostanaula Watershed, and sampling data from past and current monitoring endeavors. Assessments representative of current watershed conditions are also included.

3.1 Water Quality and Impairments within the Upper Oostanaula Watershed

Georgia Water Quality Criteria

Georgia's water quality standards are made up of two different groups of criteria. The general criteria apply to all waters, and certain specific criteria exist for each of six designated uses. The general criteria are more qualitative in nature, and include:

- Waters shall be free of materials, oils, and scum associated with municipal or domestic sewage, industrial waste or any other waste which will settle to form sludge deposits, produce turbidity, color, or odor, or that may otherwise interfere with legitimate water uses.

- Waters shall be free from toxic, corrosive, acidic, and caustic substances in amounts which are harmful to humans, animals, or aquatic life.

The six designated uses in Georgia, which can vary in strictness of standards, are:

- Drinking Water Supply
- Fishing
- Wild River
- Recreation
- Coastal Fishing
- Scenic River

The waters of the Upper Oostanaula Watershed are designated for Drinking Water Supply and Fishing. The Oostanaula River has both designations, whereas the remainder of the watershed is designated solely for the use of fishing. Despite differences in designations within the watershed, the numeric criteria associated with these designated uses are the same and are found in Table 3.1.a. The water quality parameters associated with the numeric criteria are important for several reasons including minimization of human health risk and protection of aquatic fauna. When streams fail to meet water quality criteria for a given designated use, they are listed as impaired on the Georgia Integrated 303(d)/305(b) List.

Table 3.1.a. A description of the quantitative water quality criteria for waters designated for the uses of drinking water supply and fishing.

Fecal Coliform Bacteria	Dissolved Oxygen	pH	Temperature
May – Oct < 200 colonies/100 ml as geometric mean Nov – April < 1000 colonies/100 ml as geometric mean< 4,000 inst. max	< 5 mg/l daily average Not < 4 mg/l at all times	Between 6.0 and 8.5	< 90° F

Impairments from Nonpoint Source Pollutants in the Upper Oostanaula Watershed

Sampling of water quality and biota, specifically fecal coliform counts and fish assemblages (in this case), in the Upper Oostanaula Watershed has resulted in the placement of several stream segments on the Georgia Integrated 303(d)/305(b) List for failure to meet state criteria. These impairments account for approximately 34 miles of streams in the watershed, and are shown in detail in Figure 3.1.a. and Table 3.1.b.

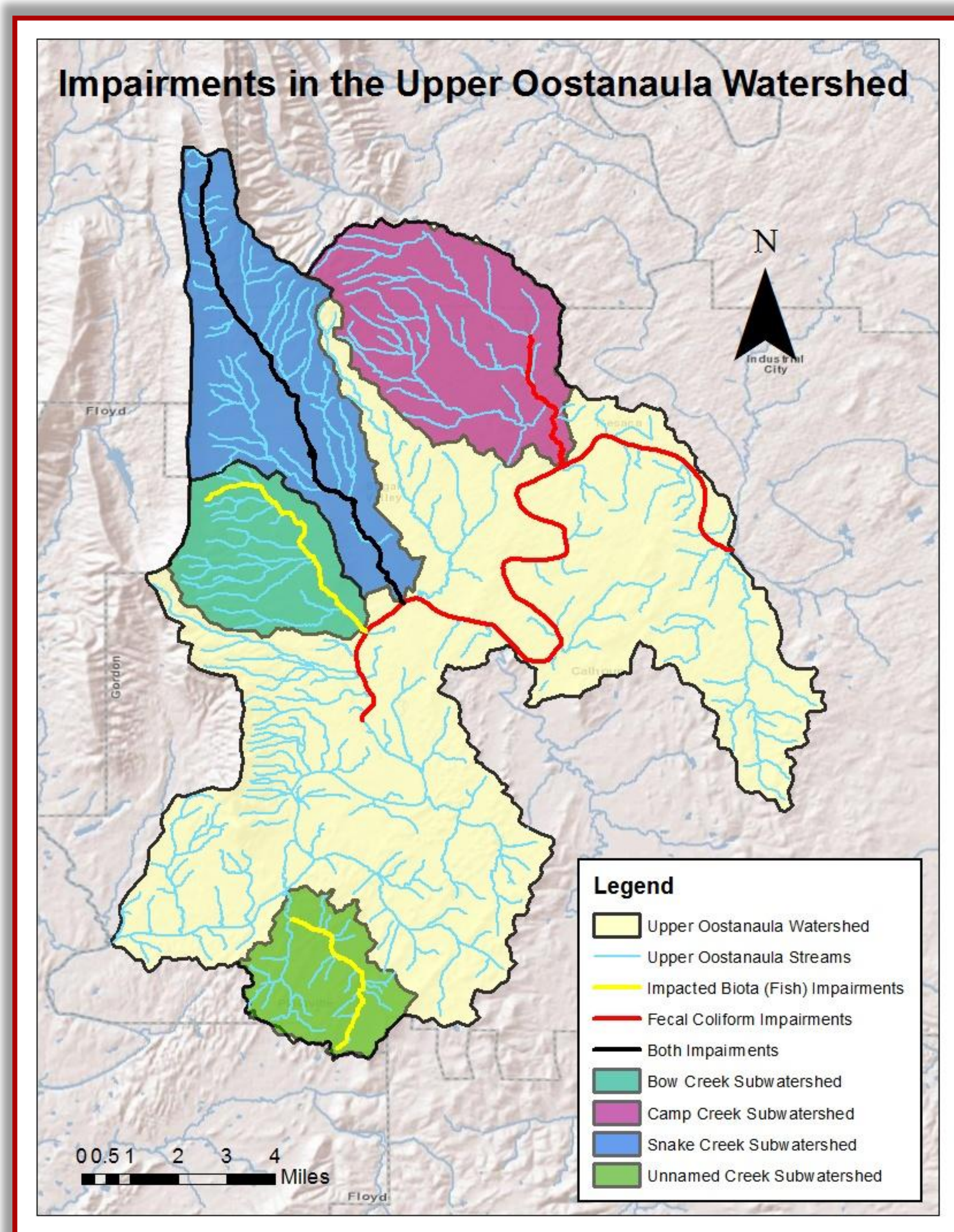

Figure 3.1.a. A map displaying the segments impaired for fecal coliform and impacted biota within the Upper Oostanaula Watershed.

Table 3.1.b. A table displaying the location and criterion violated for each segment containing nonpoint source-related impairments within the Upper Oostanaula Watershed.

UPPER OOSTANAULA WATERSHED IMPAIRED SEGMENTS		
Waterbody (Impaired Miles)	**County**	**Criterion Violated***
Bow Creek (5 miles)	Gordon	Bio (F)*
Camp Creek (3 miles)	Gordon	Fecal Coliform
Oostanaula River (11 miles)	Gordon	Fecal Coliform
Unnamed Oostanaula River Tributary (4 miles)	Gordon	Bio (F)*
Snake Creek (11 miles)	Gordon	Fecal Coliform, Bio (F)*

Bio (F) = Impacted biota characterization resulting from fish sampling (discussed further below).

<u>Fecal Coliform Impairments</u>

Three segments in the Upper Oostanaula Watershed, totaling 25 miles in length, have failed to meet state criteria for too frequently having high concentrations of fecal coliform bacteria. These segments occur along lower Camp Creek and all of Snake Creek, as well as eleven miles of the Oostanaula River. Downstream of the watershed the same issues persist, as the lower Oostanaula River and eventually the Coosa River are also impaired for high fecal coliform counts. Although generally present in the environment and not alarming at low levels, high fecal coliform bacteria (and *Escherichia coli*) concentrations in streams are used as an indicator for significant fecal contamination and more importantly the human health risks and pathogens that often coincide with fecal contamination. For this reason, impairments are often described as pathogen impairments even though they result from high fecal coliform bacteria counts.

Figure 3.1.b. Cattle with direct access to streams can contribute to a high fecal coliform load.

Although high fecal coliform bacteria concentrations can indicate a human health hazard, they are unlikely to exert negative effects on aquatic species. However, the nutrient enrichment that coincides with fecal contamination may result in indirect effects leading toward eutrophication of water bodies. Nutrient enrichment can result in heavy algal growth that can alter aquatic habitats and cause harmful dissolved oxygen fluctuations.

Sources of fecal coliform bacteria in streams include fecal contamination from humans, pets, livestock, and wildlife. More specifically, common causes of elevated fecal coliform counts in impaired watersheds include failing septic systems, livestock with direct stream access, applied manure, and natural areas with abundant wildlife. Relative proportions of contributors are watershed specific and difficult (as well as expensive) to determine.

Impacted Biota Impairments

Within the Upper Oostanaula Watershed, three tributaries totaling twenty miles of impairments, are designated as impaired due to impacted biota. These segments are located on Snake Creek and Bow Creek, each from the headwaters to the Oostanaula River, and along an unnamed tributary of the Oostanaula River, from the headwaters to Kings Lake. A stream is considered impaired for impacted biota when sampling of fish or macroinvertebrates reveals negatively impacted assemblages as indicated by "Poor" or "Very Poor" Index of Biotic Integrity scores or modified Index of Well Being scores.

In general, low biotic integrity scores are caused by a lack of quality fish habitat that results from stream sedimentation. According to Georgia EPD, it is generally assumed that if the sediment loads are reduced to and maintained at acceptable levels, the streams will repair themselves over time. Other parameters (e.g., heavy metals, high temperatures, low dissolved oxygen levels) can adversely affect the aquatic communities, but the TMDL for these impairments has identified the probable impairing pollutant as sediment. Although there are qualitative descriptions in Georgia’s water quality criteria that address restrictions on turbidity (a measurement of water clarity), there is no numeric criterion to identify discrete thresholds beyond which violations can be determined for sediment loading. Instead, indices of biotic integrity are used to represent stream health or various levels of degradation (generally stemming from sedimentation).

Sediment pollution can originate from many sources including, but not limited to: eroding streambanks, construction sites, agricultural heavy use areas, and cropland. In urban areas, the prevalence of impervious surfaces can lead to increased stormwater runoff, which often results in increased erosion of streambanks, channel incision (down-cutting), and eventually habitat homogeneity. Negative implications for aquatic fauna that often result from these types of erosion can include the deposition of fine sediment, which contributes to a loss of habitat diversity, as well as other issues. The deposition of fine sediment on the stream-bottom can result in a change in interstitial spaces (areas between substrate particles), which can have a negative effect on aquatic insect communities and the fish species which feed upon them. Fine sediments also tend to reduce habitat complexity and cover up gravels which are critical areas for fish to spawn. Altogether, significant increases in sediment loads adversely impact the biotic community.

Additional Impairments

In addition to the impairments discussed above for the Upper Oostanaula Watershed , the Upper Coosa Basin has been mandated to reduce phosphorous due to eutrophication issues in Lake Weiss as detailed in its TMDL. This endeavor will undoubtedly go along with fecal coliform reduction projects due to the close link between animal waste and nutrient runoff. Segments along the Oostanaula River (including within the Upper Oostanaula Watershed) are also impaired as a result of fish tissue sampling efforts that revealed PCB contamination (Polychlorinated Biphenyl compounds) above a certain threshold. Since PCBs in fish tissues are the result of historical point source pollution, it is not discussed further in this plan.

3.2 Available Monitoring/Resource Data from Recent Years

A significant effort was undertaken during the formation of this WMP to acquire any recent data collected in the watershed. In the past, Georgia EPD and Georgia Department of Natural Resources (DNR) Wildlife Resources Division (WRD) have conducted relevant monitoring within the Upper Oostanuala Watershed. A portion of monitoring data from these groups was made available for the purposes of this document, and a relevant subset is presented in this section.

Georgia Environmental Protection Division Monitoring Efforts

Georgia EPD periodically monitors water quality to determine whether statewide criteria are being met. Prior to the listing of any impairments in the watershed, data collected by Georgia EPD at various locations along the Oostanaula River had suggested the likelihood of impairment for fecal coliform bacteria violations. Sampling the Oostanaula River at Highway 156 in 2001, using the present listing/de-listing protocol, led to the first official impairment in the watershed. The segment officially deemed impaired stretched from the confluence of the Oostanaula River and Oothkalooga Creek to Highway 156, which lies southwest of Calhoun. The geometric means for each 30 day sampling period from this sampling effort are shown in Table 3.2.a.

Table 3.2.a. A display fecal coliform counts (in colony forming units/100 mL) collected and analyzed by Georgia EPD in 2001 from the Oostanaula River at Highway 156 (OR-3).

FECAL COLIFORM GEOMETRIC MEANS				
	Feb./March	**April**	**July/August.**	**Oct.**
Oostanaula River @ Highway 156 (OR-3) from 2001	488*	622	299**	430**

**** This time period had a sample that violated the instantaneous max criteria.***
***** These time periods had geometric means that exceeded criteria for 30 day periods.***

Additional sampling occurred in 2002 and 2003 at an Oostanaula River site (OR1) near Resaca. Data from these sampling efforts revealed that geometric means exceeded state criteria during multiple 30 day periods. In 2005, sampling farther downstream on the Oostanaula River near Calhoun (OR2) again revealed multiple violations for exceeding the geometric mean criteria for a 30 day period. For these reasons, from the confluence of the Conasauga and Coosawattee Rivers to the confluence of the Oostanaula River and Oothkalooga Creek, an additional Oostanuala River segment was listed.

Table 3.2.b. The geometric means of fecal coliform counts (in colony forming units/100 mL) found by Georgia EPD in 2005 leading to impairments in Camp and Snake Creeks.

FECAL COLIFORM GEOMETRIC MEANS		
	July/August	**September/October**
Camp Creek @ Highway 136 (near CC-1) from 2005	148	228*
Snake Creek @ Pocket Road (near SC-1) from 2005	253*	110

**** These time periods had geometric means that exceeded criteria for 30 day periods.***

Data collected by Georgia EPD in 2005 also resulted in the listing of Camp Creek and Snake Creek on the 303(d)/305(b) list of impaired waters for fecal coliform violations. The data that resulted in these impairments are displayed on the previous page in Table 3.2.b. In both cases, sampling between May and October confirmed the impairments.

More recent sampling efforts looked at the Oostanaula River at Resaca and Snake Creek in 2011 and 2013, respectively, although these efforts failed to de-list these impairments. Sampling will continue at these sites according to the sampling schedule of Georgia EPD, but until improvements in the watershed are made, de-listing appears unlikely.

Georgia Wildlife Resources Division Monitoring Efforts

In addition to Georgia EPD's water quality monitoring efforts, Georgia WRD periodically monitors fish populations and lotic habitats (along with a few water quality parameters) to determine whether statewide criteria are being met. Data collected by WRD in 2001 and 2002 in Bow Creek, Snake Creek, and an unnamed tributary of the Oostanaula River led to the impairments for impacted biota that are considered the likely result of sedimentation. The fish sampling indices and habitat scores from these sampling efforts are provided in Table 3.2.d.

Table 3.2.d A display of IBI and IWB scores from 2001 WRD fish assemblage assessments.

WRD Fish Sampling and Habitat Scores						
Location	**Sampling Date**	**IBI Score**	**IBI Category**	**IWB Score**	**IWB Category**	**Habitat Score**
Bow Creek	4/24/02	24*	Very Poor*	6.5	Fair	103.9
Snake Creek	6/26/01	26*	Poor*	6.2*	Poor	120.2
Unnamed Oostanaula River Tributary	4/24/02	22*	Very Poor*	7	Fair	100.3

**** These index scores and their classification of poor and very poor led to the impacted biota impairments for these streams.***

IBIs, according to Georgia EPD, assess the biotic integrity of aquatic communities based on the functional and compositional attributes of fish communities. They consist of twelve metrics, which assess species richness and composition, trophic composition and dynamics, and fish abundance and condition. Each metric is scored by comparing its value to that particular scoring criterion of the regional reference site. Collectively, the metric scores are combined to reach an IBI score that can be classified as Excellent, Good, Fair, Poor, or Very Poor.

Comparatively, the modified IWB measures the health of the aquatic community based on the abundance and diversity of the fish community. The IWB is calculated based on 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. Similar to the IBI, these collective scores allow for a classification of Excellent, Good, Fair, Poor, or Very Poor. As of April 2013, the IWB is no longer a part of the Georgia DNR Biomonitoring Program.

Habitat assessments were also conducted at each sampling site to supplement and help clarify the results of the biotic indices. The habitat assessment utilized by WRD is broken into three levels that describe: in-stream characteristics, channel morphology, and the riparian zone surrounding the stream. The total habitat scores indicate optimal conditions from 166 to 200, suboptimal conditions from 113 to 153, marginal conditions from 60 to 100, and poor conditions from 0 to 44. Snake Creek therefore had suboptimal conditions, whereas Bow Creek and the unnamed tributary to the Oostanaula River lied in the range between suboptimal and marginal.

3.3 Monitoring/Resource Data Collected for the WMP

Additional efforts were made to collect more contemporary water quality data to determine watershed conditions during the development of this plan. The sampling regimen developed was incorporated into a *Targeted Water Quality Monitoring Plan*, which was to implemented to provide stakeholders with current water quality data and assist with the decision-making process (e.g., determining priority areas). This sampling focused on collection of fecal coliform count and total suspended solids (TSS) data. Fecal coliform counts were analyzed to colony forming units per 100 mL (cfu/100 mL). Fecal coliform counts were determined to represent amounts of fecal contamination upstream of each site, and TSS was used to represent potential erosional/sediment issues upstream of each site. Samples were taken from nine sample sites (Figure 3.3.b.) focused on Snake Creek, Camp Creek, and the Oostanaula River, where reductions are required. Samples were collected from these sites during both wet and dry periods of the summer and winter. This was orchestrated because wet weather samples better represent the NPS pollution flushed from the landscape during runoff events (and potentially when floodplains are inundated); whereas samples collected during dry events better reveal instream sources of NPS pollutants. Summer and winter samples were collected because state criteria change seasonally.

Fecal Coliform Sampling

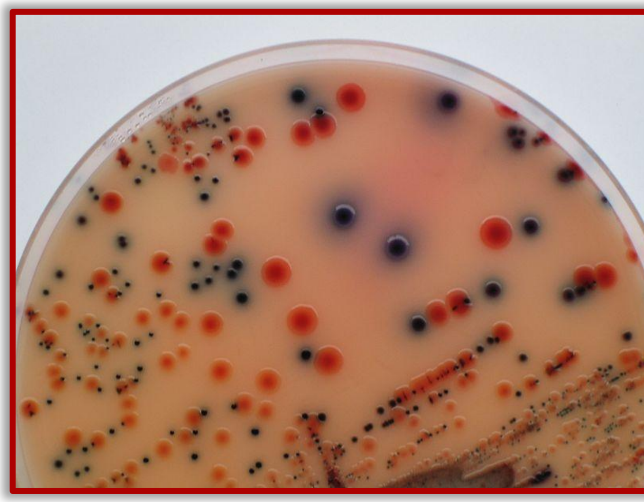

Figure 3.3.a. Bacterial growth on a petri dish.

Sampling the nine sites revealed additional information regarding fecal coliform bacteria and sediment sources in the watershed. The fecal coliform sampling data (Table 3.3.a.) revealed a few potential trends. In general, greater fecal coliform counts were found in the Oostanaula River at I-75 downstream of Resaca and in the Oostanuala River at Reeves Station Road than in other Oostanaula River sites, although each had a geometric mean above 200 cfu/100mL over the course of sampling. Snake Creek counts were low at upstream sites (with several No Counts) yet generally worse moving downstream with the most downstream site having an overall geometric mean of 258 cfu/100mL. The Camp Creek site counts had an overall geometric mean of 196 cfu/100mL. Altogether, despite impairments for pathogens in the Upper Oostanaula Watershed, no fecal coliform counts were recorded above 680 cfu/100mL. Wet weather events were characterized by 0.25 inches of rainfall in the last 48 hours and sampled, but the precise amount of rainfall was not recorded which would have better indicated the most significant events. In addition, the majority of sampling was conducted in a very wet year. This may suggest that constant flushing of fecal coliform occurred rather than heavy buildup of feces on the landscape during dry periods which often leads to larger fecal coliform counts when heavy precipitation events occur.

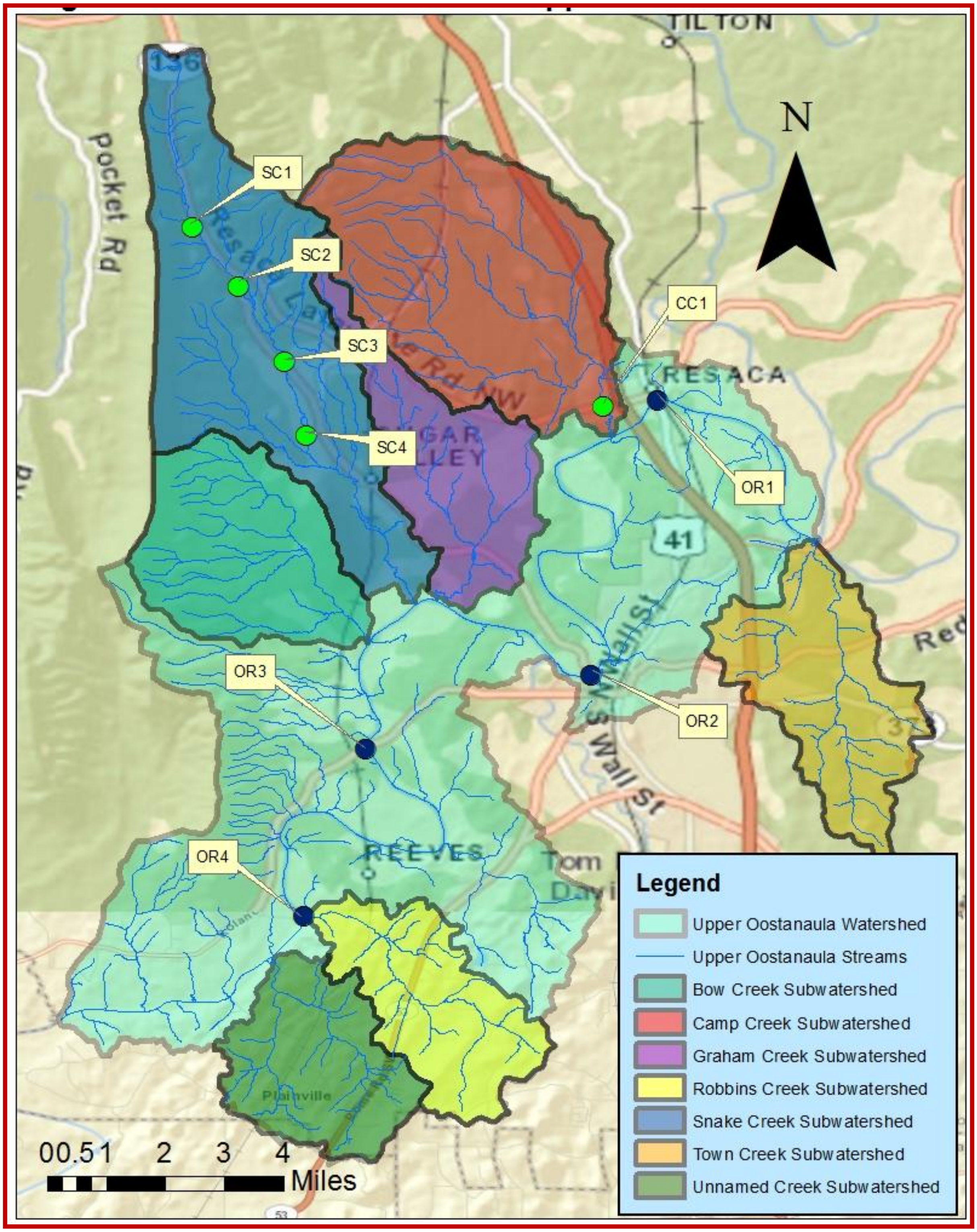

Figure 3.3.b. A display of the locations of the nine sample sites used during targeted monitoring in the Upper Oostanaula Watershed.

Table 3.3.a. A display of geometric means (n = 20) of fecal coliform counts (in cfu/100mL) calculated from samples collected in 2013 and 2014 in the Upper Oostanaula Watershed.

GEOMETRIC MEANS OF FECAL COLIFORM COUNTS (2013-2014)	
Site (code)	**Mean Fecal Coliform Counts (cfu/100mL)**
Camp Creek Site 1 (CC-1)	204
Oostanaula River Site 1 (OR-1)	285
Oostanaula River Site 2 (OR-2)	240
Oostanaula River Site 3 (OR-3)	225
Oostanaula River Site 4 (OR-4)	269
Snake Creek Site 1 (SC-1)	116*
Snake Creek Site 2 (SC-2)	106**
Snake Creek Site 3 (SC-3)	196
Snake Creek Site 4 (SC-4)	254

**SC-1 had three No Count observations that were not used in geometric mean calculations.*
***SC-2 had four No Count observations that were not used in geometric mean calculations.*

Sampling was conducted during wet weather events on seven of 20 sampling dates as sampling during wet weather tends to indicate where runoff issues lie on the landscape and often results in higher bacteria counts than when sampling during dry periods. Wet weather was characterized by more than 0.25 inches of precipitation within the last 48 hours. The geometric means from these sampling events per site are documented in Table 3.3.b. below, along with the maximum fecal coliform counts recorded during wet weather events.

Table 3.3.b. A display of geometric means (n = 7) of fecal coliform counts (cfu//100mL) calculated as well as maximum counts from samples collected during wet weather events in 2013 and 2014 in the Upper Oostanaula Watershed.

GEOMETRIC MEANS AND MAXIMUM FECAL COLIFORM COUNTS (2013-2014) FROM WET WEATHER SAMPLING EVENTS		
Site (code)	**Geometric Means (cfu/100mL)**	**Maximum Counts (cfu/100mL)**
Camp Creek Site 1 (CC-1)	192	300
Oostanaula River Site 1 (OR-1)	272	680
Oostanaula River Site 2 (OR-2)	247	640
Oostanaula River Site 3 (OR-3)	229	480
Oostanaula River Site 4 (OR-4)	298	610
Snake Creek Site 1 (SC-1)	121*	200
Snake Creek Site 2 (SC-2)	79**	160
Snake Creek Site 3 (SC-3)	193	280
Snake Creek Site 4 (SC-4)	274	310

**SC-1 had one No Count observations that were not used in geometric mean calculations.*
***SC-2 had two No Count observations that were not used in geometric mean calculations.*

On 13 of 20 sampling dates, sampling was conducted during dry weather events, which serve as better indicators of direct introduction of fecal contamination upstream. The geometric means gathered from these events show relatively low levels of fecal coliform bacteria for impaired streams, and are documented in Table 3.3.b. below, along with the maximum fecal coliform counts from dry weather sampling per site.

Table 3.3.c. A display of geometric means (n = 13) of fecal coliform counts (cfu/100mL) calculated from samples collected during dry weather events in 2013 and 2014 in the Upper Oostanaula Watershed.

GEOMETRIC MEANS AND MAXIMUM FECAL COLIFORM COUNTS (2013-2014) FROM DRY WEATHER SAMPLING EVENTS		
Site (code)	**Geometric Means (cfu/100mL)**	**Maximum Counts (cfu/100mL) From Dry Weather Sampling**
Camp Creek Site 1 (CC-1)	198	320
Oostanaula River Site 1 (OR-1)	265	420
Oostanaula River Site 2 (OR-2)	200	310
Oostanaula River Site 3 (OR-3)	197	280
Oostanaula River Site 4 (OR-4)	250	360
Snake Creek Site 1 (SC-1)	114*	200
Snake Creek Site 2 (SC-2)	121*	200
Snake Creek Site 3 (SC-3)	190	320
Snake Creek Site 4 (SC-4)	249	340

**SC-1 and SC-2 had two No Count observations that were not used in geometric mean calculations.*

Due to the unpredictable nature of fecal coliform bacteria in streams, the recent fecal coliform count data are difficult to compare with the historical Georgia EPD data due to a lack of congruency in terms of sampling schedules, as well as a lack of data on precipitation, flows, and rainfall antecedent. However, the geometric means of the May through October fecal coliform counts within the period sampled are above the standard of 200 cfu/100mL at CC-1, OR-1, OR-4, and SC-4. In addition, as recently as January and February of 2013, Georgia EPD sampled Snake Creek according to the listing/de-listing protocol, and only one 30 day period was required to confirm that the stream is still impaired. As far as Camp Creek is concerned, the fecal coliform numbers that led to listing for elevated fecal coliform counts in 2005 were relatively low in comparison to other pathogen impairments. The more contemporary data from Camp Creek similarly indicate that only a slight reduction in fecal coliform is needed to de-list the stream. The Oostanaula River has historically been sampled at a number of sites with the most recent data collected by Georgia EPD in 2011 near Resaca. The main distinction between the historical EPD Oostanaula River data and the data collected for the development of this plan is the lack of counts greater than 1000 cfu/100mL in the more contemporary data. Perhaps this is due to improvements across the landscape, although there is also the potential that sampling in a very wet year led to a more constant flush of fecal coliform from the landscape leading to a reduction of occasions with elevated counts.

Overall, the data collected in conjunction with the development of this plan indicate that fecal coliform counts, while not likely low enough to de-list streams at the present time, do not appear as severe as those associated with most pathogen impairments. This suggests that a local push to improve water quality may be all that is needed to improve the water quality to the extent that these streams are de-listed, especially in Camp Creek and Snake Creek due to the size of these catchments.

Sampling for Total Suspended Solids

The overall total suspended solids data (Table 3.3.e.) revealed TSS as generally highest in the Oostanaula River, where all sites had generally comparable TSS values. Although lower than those in the Oostanaula River, TSS values were slightly higher in Camp Creek than in Snake Creek. As anticipated, TSS counts in Snake Creek were generally lower at upstream sites and slightly higher at downstream sites with the highest average being found at Snake Creek Site 3.

Table 3.3.e. A display of geometric means (n = 20) from samples collected by Limestone Valley in 2013 and 2014 in the Upper Oostanaula Watershed and analyzed for Total Suspended Solids.

TOTAL SUSPENDED SOLIDS GEOMETRIC MEANS (2013-2014)	
Site (code)	**Total Suspended Solids (TSS)**
Camp Creek Site 1 (CC-1)	15.05
Oostanaula River Site 1 (OR-1)	11.31
Oostanaula River Site 2 (OR-2)	13.04
Oostanaula River Site 3 (OR-3)	14.85
Oostanaula River Site 4 (OR-4)	14.52
Snake Creek Site 1 (SC-1)	7.41
Snake Creek Site 2 (SC-2)	8.95
Snake Creek Site 3 (SC-3)	10.31
Snake Creek Site 4 (SC-4)	8.40

Sampling was conducted during wet weather events on six of 16 sampling dates to try to capture where sediment enters the system during runoff events. Wet weather was characterized by more than 0.25 inches of precipitation within the last 48 hours. The geometric means from these sampling events per site are documented in Table 3.3.f. below, along with the maximum TSS measurements per site recorded during wet weather events.

Table 3.3.f. A display of geometric means (n = 7) of TSS measurements calculated from samples collected during wet weather events in 2013 and 2014 in the Upper Oostanaula Watershed.

GEOMETRIC MEANS AND MAXIMUM TSS MEASUREMENTS (2013-2014) FROM WET WEATHER SAMPLING EVENTS		
Site (code)	**Geometric Means**	**Maximum TSS**
Camp Creek Site 1 (CC-1)	9.80	18
Oostanaula River Site 1 (OR-1)	15.09	20
Oostanaula River Site 2 (OR-2)	14.93	24
Oostanaula River Site 3 (OR-3)	17.92	25
Oostanaula River Site 4 (OR-4)	15.91	24
Snake Creek Site 1 (SC-1)	7.25	18
Snake Creek Site 2 (SC-2)	7.46	18
Snake Creek Site 3 (SC-3)	9.76	18
Snake Creek Site 4 (SC-4)	7.89	11

On ten of 16 sampling dates, sampling was conducted during dry weather events. The same general trends were present as overall, with the Oostanaula River sites having the highest values and Camp Creek having greater measurements than Snake Creek sites. The geometric means and maximum measurements from dry weather sampling are shown below in Table 3.3.g.

Table 3.3.f. A display of geometric means (n = 13) of TSS measurements calculated from samples collected during wet weather events in 2012 and 2013 in the Upper Oostanaula Watershed.

GEOMETRIC MEANS AND MAXIMUM TSS MEASUREMENTS (2013-2014) FROM DRY WEATHER SAMPLING EVENTS		
Site (code)	**Geometric Means**	**Maximum TSS**
Camp Creek Site 1 (CC-1)	11.20	23
Oostanaula River Site 1 (OR-1)	14.17	20
Oostanaula River Site 2 (OR-2)	10.85	26
Oostanaula River Site 3 (OR-3)	11.63	29
Oostanaula River Site 4 (OR-4)	12.06	27
Snake Creek Site 1 (SC-1)	6.86	13
Snake Creek Site 2 (SC-2)	8.14	21
Snake Creek Site 3 (SC-3)	8.95	19
Snake Creek Site 4 (SC-4)	8.52	11

<u>Microbial Source Tracking</u>

Microbial Source Tracking (MST) is a set of methods used to determine the host (different animals or Human) that contributes fecal pollution to a variety of water bodies. The results are interpreted for each animal selected in general terms along a gradient as one of the following: below detectable limits, a trace contributor, a minor contributor, an important contributor, or a major contributor. Samples were collected for this analysis at two sites on two separate occasions during significant rain events when fecal coliform bacteria were anticipated to be more abundant. One site sampled was CC-1 and the other was along lower Snake Creek farther downstream of the sites sampled for fecal coliform and TSS. The samples were mailed to Source Molecular Corporation for analysis to determine if cows and/or humans were contributing to the fecal coliform pollution found in Camp Creek and Snake Creek, and if so to what extent their respective contributions are. The data from the analysis is presented below in Table 3.3.f.

Table 3.3.f. A display of the results from microbial source tracking efforts to determine the relative contribution of human and cattle waste in Camp Creek and Snake Creek.

MICROBIAL SOURCE TRACKING RESULTS (2013)			
Site Code	**Date**	**Human**	**Cattle**
Camp Creek Site 1 (CC-1)	April, 2013	Below Det. Limits	Below Det. Limits
Camp Creek Site 1 (CC-1)	November, 2013	Minor Contributor	Important Contributor
Snake Creek Site 5 (SC-5)	April, 2013	Below Det. Limits	Below Det. Limits
Snake Creek Site 5 (SC-5)	November, 2013	Minor Contributor	Important Contributor

Results indicate that humans and cattle are both contributing to the fecal coliform issues in the watershed on one of two sampling dates. The severity of the contribution of humans on that date was less of a concern than that of cattle. However, it does appear that at times these two groups potentially account for the majority of fecal coliform load within these creeks. Other organisms may also be contributing, but were not tested as part of this first effort.

Additional testing was conducted at the previously sampled sites and two Oostanaula River sites in September 2014, to provide additional data and not only look at human and cattle influence on the fecal coliform load but also poultry. The results, shown in Table 3.3.g., revealed humans as a minor contributor at most sites, yet microbes associated with the intestinal tract of chickens or cattle were not detected. The presence/absence of poultry indicators is likely seasonal, however, funding and time precluded prohibited additional sampling.

Table 3.3.f. A display of the results from microbial source tracking efforts from September 2014.

MICROBIAL SOURCE TRACKING RESULTS (September 2014)			
Site Code	**Human**	**Cattle**	**Chicken**
Camp Creek Site 1 (CC-1)	Minor Contributor	Below Det. Limits	Below Det. Limits
Snake Creek Site 5 (SC-5)	Below Det. Limits	Below Det. Limits	Below Det. Limits
Oostanaula River Site 1 (OR-1)	Minor Contributor	Below Det. Limits	Below Det. Limits
Oostanaula River Site 4 (OR-4)	Minor Contributor	Below Det. Limits	Below Det. Limits

3.4 Land Use Analysis

Land uses within the Upper Oostanaula Watershed are variable (Figure 3.4.a.), yet primarily reflect its rural nature with the exception of the vicinity of Calhoun. As mentioned previously, approximately 51.8% of the land in the watershed is forested. Much of this land is located on the slopes of Horn Mountain, which makes up a portion of the watershed boundary to the west. Other areas with significant forested lands include the Oostanaula River Valley, which has several smaller holdings, and Baugh Mountain. The next most significant land use is pasture and hay, which accounts for 21.9% of the land in the watershed. Much of this land is in the Oostanaula River Valley and Sugar Valley. Cultivated crops, mostly located in the Oostanaula River Valley, make up about 5% of the watershed. Other land uses are present in the Calhoun area, such as developed open space (8.7%) and low intensity development (2.6%). Medium intensity development and high intensity development are also present at much lower values of 0.9% and 0.4% of the watershed, respectively. Interstate 75 also runs through the eastern part of the watershed, generally between Resaca and Calhoun. All of the land use types outlined likely exerts some contribution to the current water quality conditions in the watershed, although significant variation in NPS contributions per land use exists from parcel to parcel depending on management.

Calhoun Utilities uses water collected from sources upstream and within the Upper Oostanaula Watershed from the Oostanaula River, and the Oostanaula River downstream of the watershed is utilized as a drinking water source by the City of Rome and often Floyd County as well. People in some areas in the watershed also rely on wells as a water source, which are used for both domestic and livestock purposes. Livestock water sources also include streams and ponds, which is a topic of discussion found later in this document.

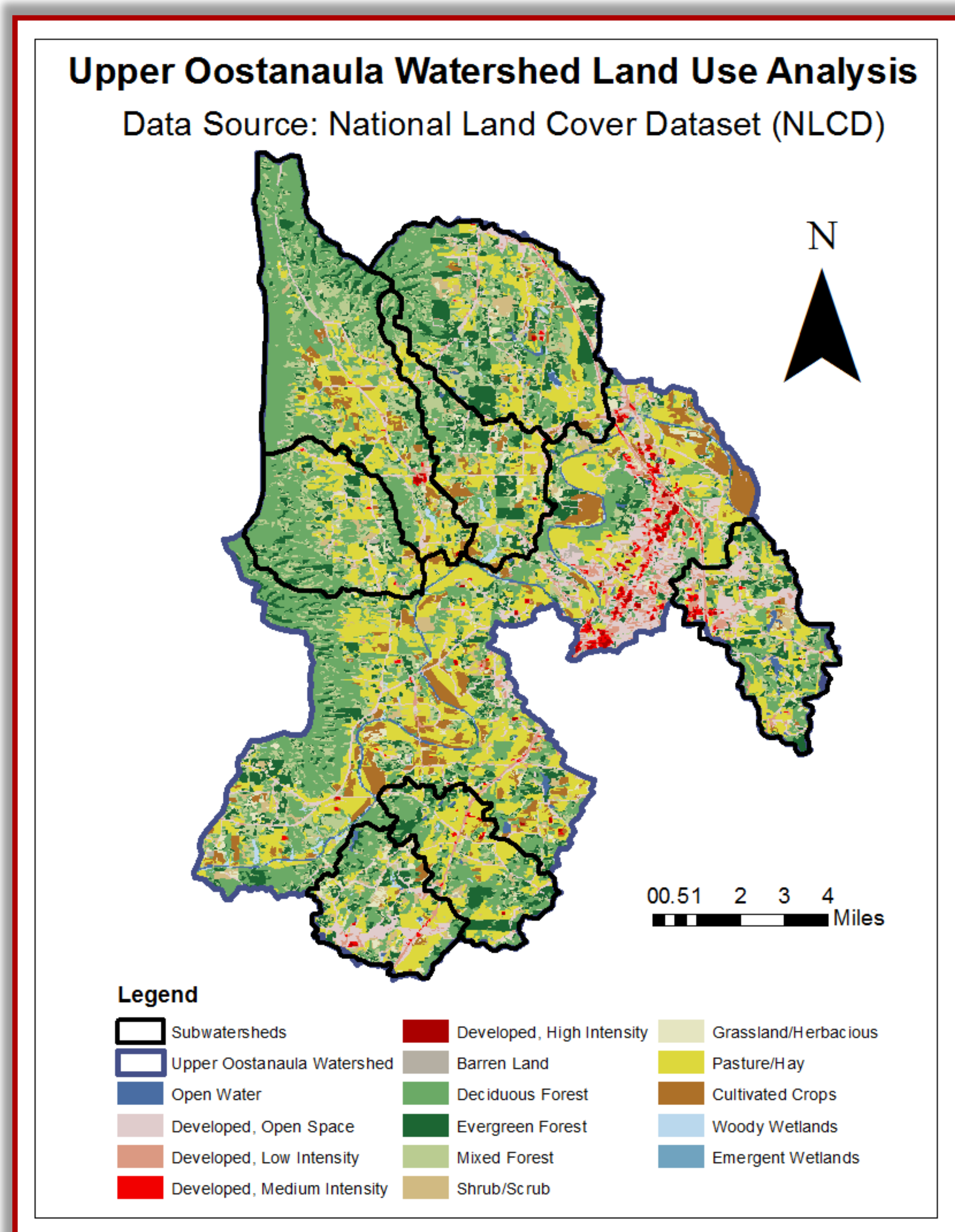

Figure 3.4.a. A map displaying the Upper Oostanaula River Watershed's more prominent land uses. More detailed definitions of land uses are listed in Appendix C.

3.5 Riparian Buffer Analysis

A stream buffer analysis was also completed for the Upper Oostanaula Watershed as part of the development of the WMP due to the importance of vegetative buffer zones (i.e., riparian zones) on stream and water quality conditions. As the name indicates, these zones literally serve as a buffer between activities that occur on the landscape and the contents of the water in the stream by physically catching pollutants (e.g., sediment, nutrients, bacteria) from runoff during rain events.

In addition, buffers serve many other functions that are important to the health of the stream. One of the functions of sufficiently intact buffers is the mitigation of stream bank erosion, which is a common contributor of sediment to streams. The roots of the vegetation help to hold the sediment in place during high flows, making the banks more stable. The vegetation also provides shade for the stream, which aids in keeping the temperatures low (and dissolved oxygen high). Dense vegetation in the riparian zone also contributes falling dead and dying vegetation into the stream channel, providing diverse habitat for aquatic life.

Conducting an analysis of buffers within an impaired watershed has become an acceptable way to assess areas in need of restoration. Insufficient riparian buffers often indicate sources of NPS pollution. These areas could simply be a place where pollutants enter the stream through runoff, or even a place where livestock enters the stream (heavy use inhibits vegetative growth) thereby allowing direct introduction of NPS pollutants.

The stream buffer analysis was conducted using GIS software and recent aerial imagery. The purpose of this analysis was to identify areas of inadequate vegetation within a 100 foot buffer of all streams. Every tributary was analyzed with the software and aerial imagery (viewed with the naked eye), to confirm insufficient buffers. The areas having insufficient riparian zones are depicted in pink in Figure 3.6.a. This information was used for estimating the technical and financial assistance needed to de-list the impaired segments (discussed later).

The buffer analysis map reveals that many of the insufficient buffers in the watershed are along headwater tributaries of the Oostanaula River, as opposed to along the mainstem of the Oostanaula River. Due to the more upper sections of these tributaries being more mountainous and the lower reaches more bottomlands, much of the inadequate buffer acreage lies in the middle portions of these tributary watersheds. Lack of riparian buffers when combined with cattle access can increase bank erosion, and thus sediment introduction, into the streams of the Upper Oostanaula Watershed. The impacted biota impairments, which are presumably the result of sedimentation and the homogeneous habitat that generally accompanies it, lie in several subwatersheds, where in each the riparian zones appear relatively lacking.

Table 3.5.a. A display of the results of insufficient riparian mapping in the Upper Oostanaula Watershed.

INSUFFICIENT RIPARIAN BUFFER (2013			
Grazing/Hay	**Crop**	**Other**	**Total Insufficient**
947 acres (13.4 %)	89 acres (1.2%)	198 acres (2.8%)	1234 acres (17.5 %)

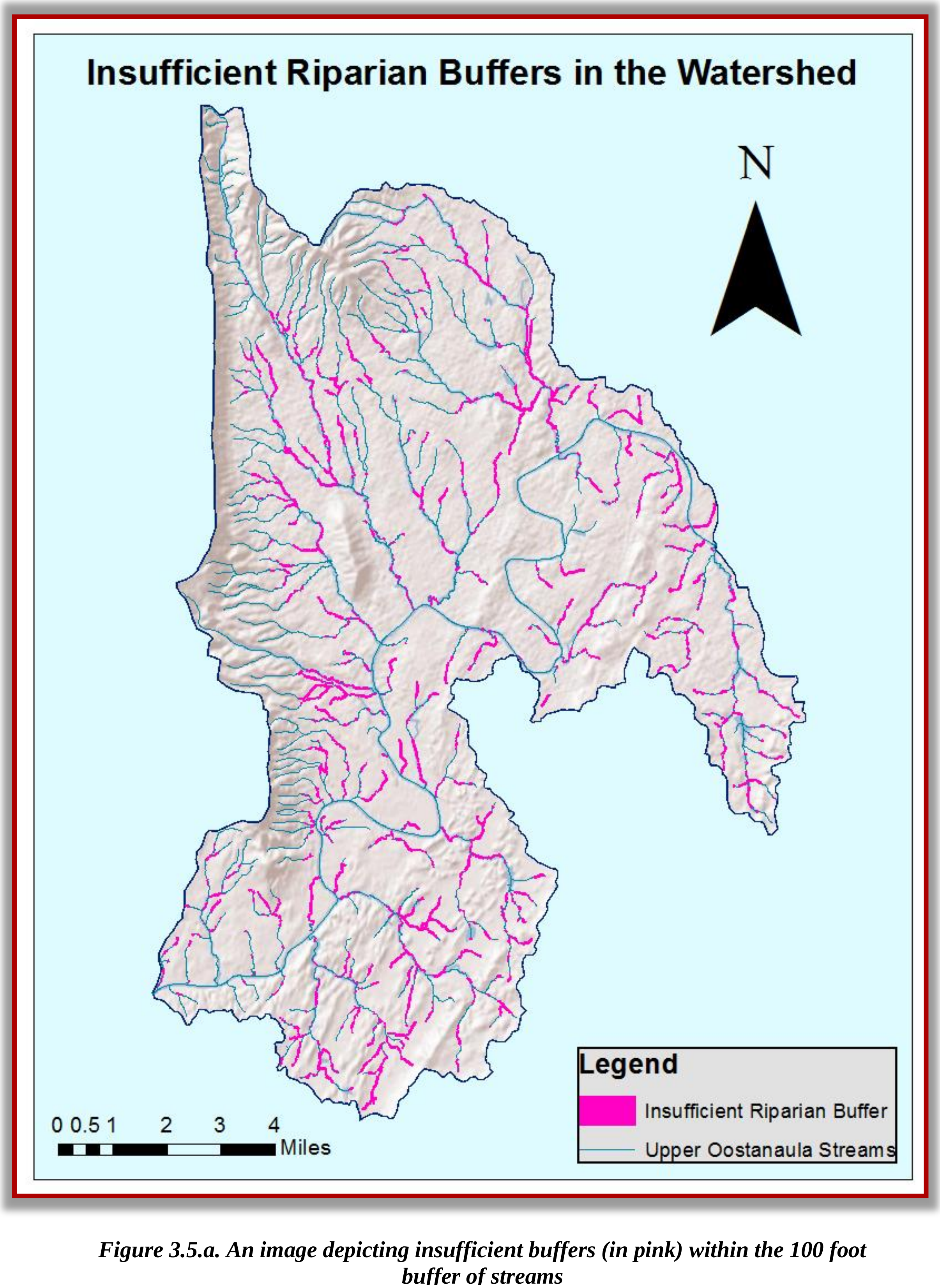

Figure 3.5.a. An image depicting insufficient buffers (in pink) within the 100 foot buffer of streams

3.6 Structure Density Analysis

Additional GIS analysis was conducted to investigate the number of structures that occur within a 500 foot buffer of streams within the watershed. This analysis generated the map in Figure 3.6.b., and the information in Table 3.6.a. Specific types of dwellings were quantified, and residences can be used to represent the likelihood of septic system presence and ultimately fecal coliform contributions from failed septic systems. The figure and the data in the associated table were utilized to evaluate where sources of fecal coliform contributions from septic systems are likely significant. These indicate that septic systems may be significant issues on the outskirts of Calhoun and Resaca.

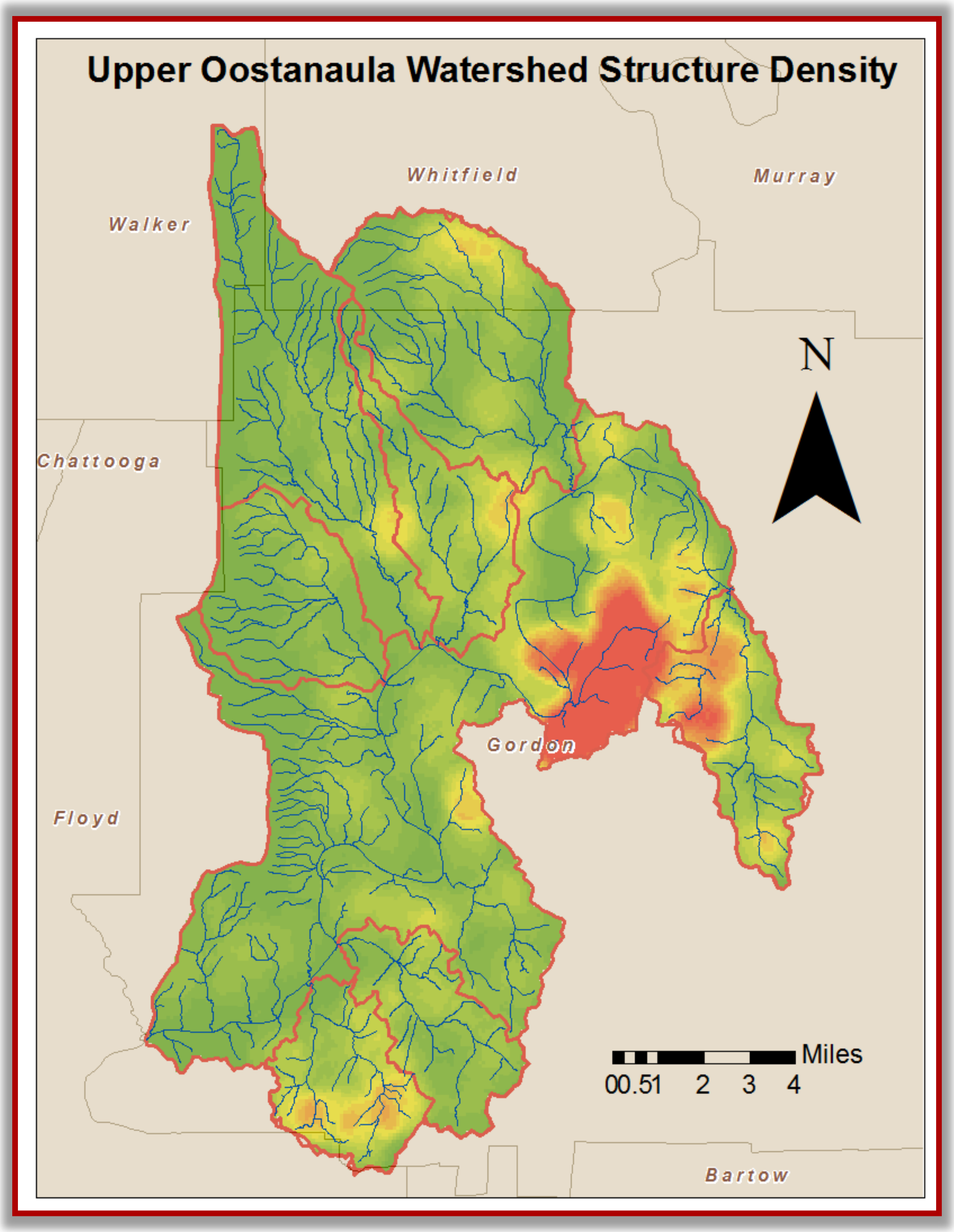

Figure 3.6.a. An image depicting the distribution of structures found in the Upper Oostanaula River Watershed. Red depicts a high density area, whereas green reflects low density areas.

Table 3.6.a. A display of the number of residential and agricultural structures found within a 500 foot buffer per subwatershed within the Upper Oostanaula Watershed.

STRUCTURES WITHIN BUFFERS			
Agricultural	**Commercial**	**Residential**	**Total**
1,620	871	7670	10,166

4. Pollutant Source Assessment

This section of the WMP outlines the most likely sources of significant impairing pollutants within the watershed. The most significant issues in the watershed stem from excessive fecal coliform loads, and presumably sediment and habitat homogeneity, which more than likely led to impaired biota. The two major categories of pollutants addressed in this section are point and nonpoint sources. The quantity and type of pollutants found in a water body are directly related to the land uses within the watershed. See Figure 2.3.a. for a map depicting the distribution of land uses throughout the watershed. The following information was gathered through both research and stakeholder input during WMP formation.

4.1 Nonpoint Sources

Nonpoint source pollution encompasses a wide range of pollutants distributed across the landscape and washed into streams during rain events, as well as those NPS pollutants deposited directly into streams from unregulated sources. These pollutant sources are difficult to identify and regulate since they are typically ubiquitous and originate from numerous land parcels with various owners. NPS pollution can also be quite variable over time due to variable land uses, management practices, grazing rotations, runoff events, and other factors. It is generally assumed that NPS pollution makes up a significant portion of the pollutant load in this watershed leading to impairments despite several point sources permitted under the NPDES program. The major NPS pollutants of concern in this watershed include fecal coliform, sediment, and nutrients.

Agriculture

Within the Upper Oostanaula Watershed, agriculture makes up 26.9% of the land use. Activities range from livestock grazing and hay production (pasture = 21.9%) to cultivation of crops (5%). Many poultry operations are also located in the watershed. Agriculture, with the exception of forest, is the most dominant land use type; hence it likely plays a role in impairment issues. Stakeholders postulated that installing agricultural best management practices would likely help reduce fecal coliform bacteria and sediment and nutrient loads within the watershed. These agricultural programs will not only lead to nonpoint source pollution reduction, but will do so in a way that is already accepted in the local community, while also assisting farmers in their management operations.

Figure 4.1.a. Cropland is a common contributor of nonpoint source pollution in the U.S.; however, it only accounts for a small percentage of land use within the watershed.

With pastures representing approximately 22% of the land use in the watershed, livestock has the potential to be a significant contributor to both fecal coliform, nutrient, and sediment loads in the form of NPS pollution. Although dairy cattle, hogs, and poultry spend a large portion of their time confined (see CAFOs in 5.2), beef cattle spend the vast majority of their time in pastureland. In the pasture, cattle tend to deposit their feces upon the land, as well as create erosion issues and destroy vegetative cover when overgrazed. When significant feces builds up and erosion becomes more prevalent on the landscape, fecal coliform bacteria, nutrients, and eroded soil become more frequently captured by rainwater runoff and delivered into nearby waterways.

In addition to nonpoint sources of pollution derived from the landscape, beef cattle often have access to streams that run through pastureland, giving them the opportunity to deposit feces directly into the waterways. This stream access also generally contributes to the sediment load through streambank erosion, which is often significant. When cattle destroy much the vegetation in the riparian zone, the streambank may collapse into the waterway, increasing the sediment load further.

Poultry operations are also fairly common throughout the watershed. Depending on the number of animals present (> 125,000 animals), these operations can be encouraged to obtain an NPDES permit but are not required to. No operations in the watershed exceed the threshold above which NPDES permits are recommended. Despite this fact, these operations are still potential NPS contributors due to their production of large quantities of animal waste that is often applied to agricultural lands, and this is often implicated as the worst source of nutrient runoff in the watershed. According to Wang et. al. (2004), fecal coliform can survive for several months after animal waste excretion. This indicates that in some cases even aged manure could be a significant contributor to the fecal coliform bacteria load when applied to the landscape.

Approximately 5% of the watershed is characterized as cropland. Despite this small percentage, croplands could still contribute significant amounts of pollutants (e.g., fecal coliform and nutrients after manure application) into nearby waterways. Croplands can also factor into sediment loading. According to the National Research Council (1989), sediment deposition into surface waters is significantly related to cropland erosion within basins.

Wildife

Depending on the animals present within the watershed (see 3.2), wildlife contributions of fecal coliform and sediment to streams vary considerably. Based on the TMDL written for this section of Georgia and information provided by the Wildlife Resources Division of Georgia DNR, the animals that spend the majority of their time in and around aquatic habitats are the most important wildlife sources of fecal coliform bacteria. Waterfowl are considered to be significant contributors since they spend a large portion of their time on surface waters and deposit feces directly into the waterway. Other contributors include aquatic mammals such as beaver, muskrat, and river otters. Feral pig populations (*Sus scrofa*), known to exist along the floodplains of every major river in Georgia, could contribute as they have been sighted locally. According to Kaller et. al. (2007), these animals can contribute both fecal coliform and sediment to waterways due to their numbers and behavior.

Figure 4.1.b. Wildlife can also contribute to a stream's fecal coliform load.

Despite feral pigs and other animals that may be viewed as pests, wildlife populations are mostly naturally occurring and an indicator of the relative health of the environment. For this reason, the plan will emphasize the reduction of anthropogenic sources of fecal coliform bacteria.

Urban/Suburban Runoff

Sediment pollution can originate from many sources in an urban or suburban area, such as Calhoun. Land-disturbing activities are a consistent contributor of sediment to streams nationwide. These activities include clearing, grading, excavating, or filling of land. Disturbance of land typically removes the vegetation, which exposes the surface sediment to rain events resulting in erosion and sediment delivery into streams. For example, conversion of forests to developed land (clearing) is often associated with water quality degradation.

In more urbanized areas, stormwater runoff can also contribute to erosion issues in streams. This type of runoff originates from developed land that contains higher proportions of impervious surface cover (rooftops, parking lots, roads, etc.). These surfaces concentrate large quantities of water into the stream quickly, resulting in stream bank erosion and incision. Eventually, as banks collapse, streams tend to widen and collect additional sediment, which can lead to losses in habitat variation. Additional stormwater practices and other green infrastructure may be able to reduce these issues in the Upper Oostanaula Watershed.

Figure 4.1.c. A failing septic system can introduce pathogens into nearby streams. This system has effluent surfacing in the yard, and drains into a nearby tributary.

In addition to introduction of sediment into waterways, fecal coliform (and nutrient) contributions can also occur as a result of stormwater runoff. Domestic pets and urban wildlife populations contribute fecal coliform to the landscape, which is often washed directly into streams during rain events. Similar contributions in urban environments often originate from leaks and overflows from sanitary sewer systems, illicit discharges, and leaking septic systems in areas not serviced by sewer.

Stakeholders identified failing septic systems as a significant contributor to the fecal coliform load in the watershed. When considering failing septic systems as contributors of fecal coliform bacteria in our streams, it is important to look at current systems on the ground, as well as anticipate those that come along with new development. Currently, there are over 5,000 households in the watershed that are serviced by septic systems. The rate of urban and suburban expansion in Gordon County has been high during the past decade, creating more potential sources of fecal coliform pollution. According to U.S. Census data, the population of Gordon County has increased by 25% during 2000 – 2010, which is more than twice the national growth rate (9.7%).

Due to population growth rates and the frequent use of septic systems (over 5,000 households in the watershed), stakeholders considered failing septic systems to be another significant source of fecal coliform bacteria loads. It was decided by the stakeholder group that landowners experiencing septic system failures would likely be motivated to fix the issues, especially if cost-share assistance is available.

4.2 Point Sources

Point sources of pollution are those which are delivered to a water body via "discrete conveyances". These sources are regulated through the NPDES permitting system. Point sources typically include industrial sites, municipal separate storm sewer systems, and confined animal feeding operations (CAFOs). There are several permitted point sources in the watershed, but it is assumed that the majority of impairing pollutants result from NPS pollution.

Table 4.2.a. A display of the locations of facilities that hold NPDES permits within the Upper Oostanaula Watershed.

INDUSTRIAL NPDES PERMITEES –UPPER OOSTANAULA WATERSHED	
FACILITY	**ADDRESS (CALHOUN, GA)**
DARLING INTERNATIONAL	170 FRED HURLEY DRIVE
HENKEL CORPORATION	923 MAULDIN ROAD, NW
MOHAWK IND./ALADDIN MILLS - SUGAR VALLEY	3090 SUGAR VALLEY ROAD
SHAW INDUSTRIES PLANT	200 FRED HURLEY ROAD
QUALITY FINISHINGS OF GEORGIA, INC.	355 OLD DALTON ROAD
WEST LINE STREET PLANT	311 W LINE STREET
BASIC READY MIX / CALHOUN PLANT	712 NORTH WALL STREET
WAYNE DAVIS CO - CALHOUN	927 MAULDIN ROAD
BOSTIK, INC.	129 NANCE RD NE
TANDUS CALHOUN FIBER EXTRUSION PLANT	246 OLD DALTON RD NE
Wall Street Plant	965 N WALL STREET
BEAULIEU FIBERS PLANT	103 NORTH INDUSTRIAL BLVD
DARLING INTERNATIONAL	170 FRED HURLEY DRIVE
HENKEL CORPORATION	923 MAULDIN ROAD, NW
MOHAWK IND./ALADDIN MILLS - SUGAR VALLEY	3090 SUGAR VALLEY ROAD

Industrial Sites

Many industries are required to apply for an NPDES permit when discharging industrial storm water to a nearby water body. There are 12 permits of this type located within the watershed. Since all are in compliance with their NPDES permits, it is likely that industrial stormwater's contribution to stream impairment is minimal. Table 4.2.a. lists the industrial NPDES permits found within the watershed.

According to the EPA (2011), Stormwater Phase I regulations require *medium* and *large* cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges. Phase II (1999) requires regulated small MS4s in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges. There are no areas within the Upper Oostanaula Watershed that fall under phase I or Phase II regulations, and thus any stormwater issues found within the watershed must be considered non-point source pollution.

5. Watershed Improvement Goals

This section of the WMP outlines the overall goals for the watershed improvement process in the Upper Oostanaula Watershed. In addition, the minimum NPS load reduction objectives for each segment (as written in TMDLs) are included and describe the estimated necessary load reductions for streams to meet water quality criteria.

5.1 Overall Objectives

Restoration

The primary objective of this WMP is to outline a framework that will lead to the restoration of the Upper Oostanaula Watershed to achieve and maintain compliance with state standards. Five segments have been placed on Georgia's 303 (d)/305 (b) list, totaling over 34 miles of impairments. In addition, the EPA completed a TMDL for Weiss Lake (downstream in Alabama) that has mandated a 30% reduction of phosphorous in areas upstream which includes the Upper Oostanaula Watershed. A major component of restoration efforts will include implementing cost-share programs that incentivize landowners to address these pollution sources on their privately-owned lands. Reductions in relevant pollutants will be tracked through water quality sampling. State-designated water quality collection and analysis protocols will be followed during periodic sampling events in an effort to de-list stream segments impaired for high fecal coliform bacteria counts. In addition, sampling rotations by monitoring groups (from Georgia EPD) should help indicate improvements in biotic integrity as they occur within the streams of the watershed.

Figure 5.1.a. Excluding cattle from streams can reduce the fecal coliform load in the watershed.

The restoration objectives outlined in this WMP were derived from the desires of the Watershed Advisory Committee and local stakeholders. The underlying concerns for these water quality issues within the group were variable; however, a general consensus was identified. The main concern of the stakeholder group appears to be the health hazard that fecal coliform contamination poses. In addition, the stakeholders expressed the need for nutrient management and reduction of sedimentation issues that negatively affect aquatic organisms to be reduced to preserve the biodiversity present within the watershed.

Anti-degradation

Through water quality sampling data obtained during the formation of this WMP, the stakeholder group recognized that sources of fecal coliform and sediment were widespread in the subwatersheds that were sampled, and none of the fecal coliform impairments were likely ready to be de-listed. In addition, another primary objective of restoration efforts is to ensure degradation of additional streams does not occur. For this reason, any cost-share program will be implemented on a watershed-wide basis. In addition, outreach efforts will be focused on the whole watershed to raise awareness of existing programs that make best management practices more affordable to private landowners and prevent further degradation of stream segments within the watershed. Given the current growth trends in the area (e.g., conversion of farmland to suburban uses), one of the biggest threats to anti-degradation objectives in the future may be stormwater pollution that negatively affects water quantity and water quality.

Education

The third and final objective identified in this plan is to educate local citizens on the uniqueness of their watershed and its diverse fauna, the NPS threats present in the area, and what can be done to mitigate these issues. Education and outreach efforts are paramount if watershed goals and objectives are to be reached. Involving local communities in the watershed improvement process is a key to success, and providing an opportunity for locals to gain an understanding of the importance of watershed restoration needs to be a priority program component to supplement BMP installation efforts.

Presentations at local events were suggested by the stakeholder group as a means to reach a broad audience in the community. Creation of events with the sole purpose of gaining support was also suggested. Specific examples include stream cleanups, rainbarrel workshops, and canoe cleanup floats down local waterways. Although several of the impaired streams are not large enough for canoe cleanup floats, the Oostanaula River (also impaired) is perfect for such events.

5.2 Load Reduction Targets

Three impaired segments within the watershed are the result of past fecal coliform concentrations exceeding state standards. These segments have had TMDLs created/updated in 2009. Based on these TMDLs, percent reductions of fecal coliform loadings were calculated. These load reductions attempt to calculate how much the pollutant load must be reduced from the watershed for a stream to meet state criteria for a particular pollutant. The results from these calculations are listed in Table 5.2.a.

The other two listed segments resulted from impacted biota, for which Snake Creek is also listed. These segments have had TMDLs created/updated in 2009. It is assumed that sediment load was the main contributor to the state of the biotic assemblages, and that should load reductions for sediment be reduced and maintained, biotic assemblages will recover in time. Sediment loads were assessed and established for each of the impaired segments and Total Allowable Loads were calculated. These calculations allowed percent reduction estimates needed to de-list problem segments to be obtained. Two of the three segments are deemed historical issues, and no reduction is required. Calculations are listed in Table 5.2.a.

In addition to these listed segments inside the watershed, a TMDL was completed by the US EPA downstream in Lake Weiss (Alabama) that requires a 30% reduction in phosphorous from areas upstream. The Upper Oostanaula Watershed likely contributes a significant amount of this type of pollution due to the abundance of poultry operations and their associated production and land application of poultry litter to farmlands. The stakeholder group involved in the development of this WMP were adamant that nutrient reduction projects, although not identified as an impairment in this watershed, be completed to help achieve the reductions needed downstream.

Table 5.2.a. Required load reductions for impaired segments in the Upper Oostanaula Watershed.

Impaired Stream Segment	Impairing Pollutant	Percent Reduction
Bow Creek (5 miles)	Bio (F)*	Sed. = 0%
Camp Creek (3 miles)	Fecal Coliform	FC = 12%
Oostanaula River (11 miles)	Fecal Coliform	FC = 32%
Unnamed Oostanaula River Tributary (4 miles)	Bio (F)*	Sed. = 0%
Snake Creek (11 miles)	Fecal Coliform, Bio (F)*	Sed. = 88.10% FC = 21%

It is not anticipated that these load reductions will be met in a short time frame. This plan calls for multiple 319(h) grants to be sought over more than a decade. It is anticipated that each grant cycle, which will encompass additional efforts from other organizations (e.g. NRCS agricultural BMP Program, Calhoun Utilities Nutrient Trading Program, etc.), will bring the streams closer to compliance. The stakeholders that assisted with the development of this plan have set a goal of a 10% reduction in fecal coliform and sediment loads, and a 5% reduction in phosphorous to occur during each grant cycle. Success depends on acquiring 319 grants as scheduled, the continuation of partnerships solidified during the WMP development process, as well as the continued funding of our partners programs.

6. Pollution Reduction

This section explores management programs and strategies (structural and non-structural) that currently exist within the Upper Oostanaula Watershed that impact fecal coliform and/or sediment pollution. Structural practices are those that are engineered and result in a physical structure that is designed to reduce a specific type(s) of pollution. Non-structural practices are those that typically work to change the attitude or behavior of individuals. The section also explores a proposed program needed in the Upper Oostanaula Watershed in order for the previously identified restoration goals and objectives to be accomplished.

6.1 Existing Conservation Programs

There are several existing structural conservation programs implemented within the Upper Oostanaula Watershed (See Table 6.1.a.); however, none are unique to the area. Most programs that encourage water quality improvements are ubiquitous across Georgia, if not the nation. Only those that specifically relate to sediment and/or fecal coliform pollution reduction are displayed here.

Table 6.1.a. A display of existing structural programs and practices in the Upper Oostanaula Watershed.

Structural Measure	Responsibility	Description	Impairment Source Addressed
Conservation Tillage Program	Limestone Valley RC&D, Coosa River SWCD	Makes conservation tillage equipment available for rent within the watershed, helping producers plant their crops with minimal disturbance to the soil. This reduces erosion from cropland, and increases water retention and nutrients.	Agriculture
Environmental Quality Incentives Program (EQIP)	NRCS	Works to address resource concerns on agricultural lands. EQIP is a cost-share program (75% typically) for landowners seeking to implement BMPs on their property.	Agriculture
Conservation Reserve Program	FSA, NRCS	Addresses problem areas on farmland through conversion of sensitive acreage to vegetative cover such as establishing vegetative buffers along waterways. Conversion costs are shared with FSA, and the landowner receives an annual payment for maintaining the conversion.	Agriculture
Sanitary Sewer Maintenance Program	Calhoun Utilities	Sanitary sewer system inventory and inspection; infiltration and inflow identification and reduction; sewer line and manhole rehabilitation.	Urban/Residential
Septic System Permitting and Inspection Program	Northwest Georgia Public Health District	Septic system repairs and installations are permitted and inspected by North Georgia Health District Staff. This not only ensures that systems are functioning, but also that they are installed by a licensed individual according to state regulations	Urban/Residential

Many programs also provide non-structural practices in the Upper Oostanaula Watershed (See Table 6.1.b.), and most are not unique to the area. These practices, although not physically reducing pollution, can arguably improve water quality as much or more than structural practices themselves. Changing behaviors and/or attitudes can be contagious, making a real difference in both the cultural and natural landscape over time.

Table 6.1.b. Existing non-structural programs and practices in the Upper Oostanaula Watershed.

Non-Structural Measure	Responsibility	Description	Impairment Source Addressed
Georgia Water Quality Control Act (OCGA 12-5-20)	Georgia EPD	Makes it unlawful to discharge excessive pollutants into waters of the state in amounts harmful to public health, safety, or welfare, or to animals, birds, aquatic life.	All inclusive
Georgia Erosion and Sedimentation Act	Georgia EPD	Among other things, it prevents buffers on state waters from being mechanically altered without a permit.	All inclusive
Rules and Regulations for On-site Wastewater Management	Georgia DPH	Stringent enforcement and application of the regulations through permitting and inspection of new and repaired systems.	Suburban, Residential
Georgia Rules & Regulations of Water Quality Control for CAFOs 301 to 1,000 animal units	Georgia Department of Agriculture, Georgia EPD	Outlines the swine and non-swine Feeding Operation Permit Requirements. CAFOs in this category receive a land application system permit (LAS).	Agriculture
Conservation Technical Assistance Program	NRCS	Assists landowners with creating management plans for their lands, including but not limited to Farm and Forest Conservation Plans and Comprehensive Nutrient Management Plans (CNMPs).	Agriculture
UGA Cooperative Extension Program	Whitfield Co. Extension Office	Assists with general agricultural assistance, which includes providing suggestions for soil and water conservation.	Agriculture

6.2 Proposed Conservation Program for the Upper Oostanaula Watershed

The presence of impaired stream segments in the watershed suggests that a new collaborative program (in addition to those already in existence) is needed to approach compliance with state water quality standards in a more expedient manner. The following proposed program, the *Upper Oostanaula Watershed Restoration Program* (UOWRP), would be an endeavor partially funded by Clean Water Act

(§319) grants (and assisted by in-kind donations of certain stakeholders, agencies, and non-governmental organizations) that would provide cost-shares on practices that have been deemed by the stakeholder group as a means to address the water quality issues specifically related to the local watershed. In addition, this program would attempt to raise awareness of the issues in the area, as well as educate citizens about potential solutions to these local problems.

Proposed Structural Practices of the Upper Oostanaula Watershed Restoration Program

Based on water quality analysis results and stakeholder surveys, it was evident that although certain segments are listed for fecal coliform and others for impacted biota (sediment), both pollutants of concern are present in excess at times throughout much of the watershed. These data, when combined with the anti-degradation objective as well as stakeholder survey results, indicate the need to implement BMP installations throughout the watershed instead of only those locations in close proximity to the impaired segments themselves. The stakeholders decided that at least some emphasis should be placed on each of the three major sources of pollutants which include agriculture, failing septic systems, and stormwater (streambank stabilization, etc.).

Since agricultural activity encompasses a large proportion of land use within the watershed, the UOWRP will include a cost-share program that will help local farmers afford conservation practices that reduce fecal coliform, nutrient, and/or sediment contributions to receiving waters. Many of these practices are also beneficial to landowners which will serve as additional motivation for participation in the program. Most of the agricultural lands within the watershed are used for grazing, so funds need to be available to assist farmers with an interest in voluntary conservation to restrict livestock stream access and provide alternative watering sources. These practices would reduce the fecal coliform load from direct sources and agricultural runoff in the watershed. Projects that address erosion issues will likely include streambank and heavy use area stabilization. In addition, funds are needed to establish riparian buffers where they are absent. GIS analysis indicated that approximately 17% of the watershed has inadequate riparian buffers. Projects to improve riparian buffers would help reduce both fecal coliform and sediment pollution by acting as a physical barrier to runoff during rain events.

Figure 6.2.a. Constructing heavy use area pads for cattle feeding or watering areas can reduce erosion and sediment loads in the watershed.

Altogether, many types of agricultural BMPs will be installed as a part of the UOWRP. In general, however, projects that only marginally address the resource concerns will be avoided. A suite of agricultural BMPs may be installed as part of the restoration process assuming they collectively assist in sediment and/or fecal coliform load reductions.

Since failing septic systems were determined by the stakeholder group to be a significant contributor to the fecal coliform bacteria load in the watershed, the UOWRP will include a cost-share program to address this issue. High failure rates are said to occur for several reasons, including poorly percolating soils, outdated systems, and the low-income financial condition of a portion of the local population. A cost-share program in the area would help to incentivize more of the population to get their systems repaired. Cost-share rates are likely to vary according to the likely contributions of the failed systems to pollutant loads, and in the cases of impoverished families, financial conditions. In addition, greater public demand for septic system repairs will likely result in lower cost-shares offered in order to assist more homeowners, as well as result in greater water quality benefit per dollar. Although higher rates will generally be offered on projects that more significantly reduce pollutant loads, inclusion of other property owners to be eligible for lower cost-share rates will maximize program participation while building important momentum within communities.

Figure 6.2.b. A septic system repair can reduce the fecal coliform load in streams. A cost-share program can help incentivize costly repairs.

Water quality data and the existence of impacted biota impairments led the stakeholders to desire an emphasis on stormwater BMPs, especially streambank stabilization. A cost-share program would incentivize private landowners to implement streambank stabilization techniques, as well as riparian restoration and potentially practices that mitigate stormwater quantity (e.g., retention ponds, etc.). Several homeowners in the area have already inquired with Calhoun Utilities for help with streambank stabilization, and it is expected that cost-shares will be well-received by citizens in the area.

The mandate to reduce phosphorous in the Upper Coosa Basin also creates the potential to incentivize proper nutrient management on farms in the watershed. This potential program could complement the need for this nutrient reduction by ensuring local farmers are using all the recommended methods to reduce the runoff of excessive nutrients from their properties and potentially the properties of others where nutrients might be delivered.

<u>Proposed Non-Structural Practices of the Upper Oostanaula Watershed Restoration Program</u>

Efforts to educate and inform the public will accompany the cost-share programs funded through the UOWRP. The idea is to invest in conservation practices while demonstrating their effectiveness to other landowners, with hopes that voluntary conservation and modern land management practices that address resource concerns become contagious in the community. At the least, the concepts and practices will slowly become more accepted over a period of time as they become more commonplace. Local newspaper articles derived from the press releases, farm days, and workshops are all acceptable ways to spotlight the benefits of agricultural BMPs. Other efforts will offer educational opportunities during volunteer work days (riparian plantings, stream cleanups, etc.).

As a part of the UOWRP, an outreach plan will be developed for any and every grant that is received from the 319 program. This plan will identify annual or semi-annual events that will be held that encourage public participation in the watershed improvement process. These events could include canoe floats, stream cleanups, and the establishment of viable Adopt-A-Stream groups. Although many of the streams within this watershed may be too small for floats or effective cleanups, the Oostanaula River offers ample opportunity to make significant connections between citizens and their waterways.

In addition, the new program should include promotion of the watershed improvement process to local stakeholders to further develop and maintain program momentum. Press releases should be periodically issued to local newspapers highlighting program details, and the watershed issues it attempts to resolve.

Figure 6.2.c. Volunteer events, such as stream cleanups, can keep stakeholders engaged while benefitting stream quality.

Promotions should also include local presentations to stakeholder groups. These promotions would serve to maintain community interest in the restoration effort by reminding local groups of the benefits the implementation effort is seeking to provide (e.g., reduced human health risk and water treatment costs and increased financial assistance within the community). These stakeholders should be also updated as significant progress is made toward water quality goals in order to show them that the goals of the restoration efforts are attainable.

7. Implementation Program Design

The objective of this WMP is to outline implementation efforts needed to result in the long-term goal of de-listing the five impaired stream segments, while ensuring additional segments are not listed. This section of the WMP outlines specific restoration activities, how they relate to implementation milestones, and estimated dates of completion. In addition, costs associated with the measures needed for watershed restoration are estimated.

7.1 Management Strategies

The recommended strategy for implementation of this WMP is to create and manage a program that features both structural and non-structural controls within the watershed to address the fecal coliform, sediment, as well as nutrient issues. It is the intent of the proposed restoration program (UOWRP) to restore the watershed to the extent that impaired segments are eventually de-listed, while ensuring that additional segments are not listed, and complementing the need for reductions of nutrients. This should be accomplished by increasing the available agricultural BMP cost-share opportunities, creating a septic system repair cost-share program, creating a nutrient management program, assisting in the stabilization of problematic streambanks, making available educational opportunities to encourage public participation in the watershed improvement process, and monitoring water quality to track improvements and potentially de-list impaired segments. Septic system failures will be identified and addressed with the technical assistance provided by the North Georgia Health District. The NRCS will assist with technical advisement with respect to agricultural, nutrient management, and streambank projects. Other agencies and non-governmental organizations will make key contributions to outreach efforts, as well as other facets of the program. All participation in grant programs will be voluntary in nature, and great care should be taken to respect private property rights.

In order to de-list several stream segments through implementation of a number of small projects, it is likely a long-term investment of time and significant funding will be necessary. Assuming the behaviors and land management practices improve over time, the benefits of clean water can last generations. It has been estimated that approximately 25% of the critical areas within the watershed can be treated with BMP installations to reduce NPS pollution through the implementation of four separate Clean Water Act §319 grants. The program, as outlined here, would cumulatively fund over $700,000 worth of projects and be implemented over the course of thirteen years (including grant proposal submission periods). This proposed allocation of funds is similar to other restoration efforts that have been funded in the state, yet is to be focused on a smaller geographic scale, which should lead to more pronounced improvements. It is believed that multiple stream segments could be de-listed as a result of this effort, although there is a possibility that more funding could be necessary to accomplish that goal.

7.2 Management Priorities

Project Fund Allocation

Cost-share programs are to be developed for agricultural BMP installations, septic repairs, nutrient management, and streambank stabilization projects. Stakeholders were solicited as to how to allocate the funds between these projects within the watershed. Stakeholder opinions were variable, and it was suggested that approximately 60% of the potential funds were allocated to septic system repair, and 40% to agricultural BMPs.

Cost-Share Rates

Agricultural BMPs addressing water quality concerns should generally be cost-shared upon at a rate of 60%. This rate is such that these projects adequately assist in providing matching fund contributions that count toward grant requirements, while remaining reasonably competitive with the NRCS EQIP program, which cost-shares at 75% on estimated project costs for projects that receive funding.

Streambank stabilization projects should also be cost-shared upon at a rate of 60%. This rate again allows completed projects to adequately assist in providing matching fund contributions that count toward grant requirements, and should incentivize landowners with considerable streambank concerns to act to improve their properties. When the high cost of this practice is prohibiting, perhaps a portion of the landowner cost could be offset by donated advisement, planning, and expertise.

Stormwater projects (e.g., retention ponds, swales, etc.) are possible depending on demand and whether these projects can be adequately matched. There is again potential to address the necessary project match through donated advisement, planning, expertise, as well as volunteer hours. At this point, specific stormwater concerns have not been pointed out within the stakeholder processes.

For septic system repair projects, cost-share rates should depend on the demand. If demand for repair assistance is high, cost-shares should be set at lower rates in order to accommodate as many projects as possible and achieve the greatest water quality improvement. The most ideal projects for water quality improvement will be those significantly addressing the pollutants in close proximity to streams within or just upstream of impaired reaches. However, inclusion of landowners from the entire Upper Oostanaula Watershed to be eligible for program cost-shares on projects that address water quality concerns is necessary to maximize program participation by building important momentum within the local community. In addition, since the problem areas are often in the downstream reaches, all areas of the Upper Oostanaula River Watershed likely contribute to the impaired status of local stream segments, albeit to varying degrees.

Since certain septic system repair projects may address resource concerns more than others, variable cost-share rates will generally be utilized to reflect the anticipated water quality improvement. For example, a septic system within 100 feet of an impaired stream will generally receive a higher cost-share rate than one located much farther away. This method of incentivizing participation will bring about the greatest load reductions while maximizing the overall number of participants. Similarly, impoverished members of the community may be further incentivized with higher cost-share rates in order to ensure they get failing systems repaired.

A nutrient management program is still in the process of being designed. The vision of the potential program, however, is to teach farmers the proper process for nutrient management, analysis of litter contents, calibration of spreaders, and ultimately litter application. The program will likely offer an incentive payment for farmers who prove they are following the process properly.

7.3 Interim Milestones

It has been recommended that this WMP should be implemented for multiple years over several grants, each of which may have its own updated objectives and milestones according to changes in watershed conditions and/or management strategies. This section, however, seeks to outline objectives and milestones that could be used by any group (in any combination) seeking funds for restoration efforts in the watershed.

OBJECTIVE #1: Create a septic system repair cost-share program in the watershed.

MILESTONES:

- Identify local certified septic system contractors interested in participating in the program.
- Hold meetings with NWGAHD representatives to design program.
- Establish initial cost-share criteria based on proximity of system to state waters.
- Hold a septic system installer's workshop to explain program details, and ensure standards for participation are understood.
- Maintain the septic repair program throughout the implementation process.

The repair process should involve the submission of bids from locally-owned businesses. These businesses should attend an installer's workshop to participate in grant projects. Bids should be requested from 3-4 contractors for each repair, and the specific businesses that receive the opportunity to bid should be determined by using a rotating list of approved contractors. The homeowner should be allowed to choose which bid to accept. The rate of cost-share should be on a sliding scale that will result in offering more assistance to projects that will likely result in the greatest load reductions.

OBJECTIVE #2: Create an agricultural BMP cost-share program in the watershed.

MILESTONES:

- Hold meetings with the NRCS to determine appropriate BMPs and cost-share rates.
- Advertise the available grant money through local media.
- Issue press releases for successful BMP installations.
- Maintain the agricultural BMP program throughout the implementation process.

Agricultural BMP installation should be on a strictly voluntary basis, and landowner confidence and satisfaction should be a primary focus. This will allow any program to develop a positive reputation in the area, which is hoped to eventually garner more conservation interest in the watershed.

OBJECTIVE #3: Create a nutrient management incentive program in the watershed.

MILESTONES:

- Hold meetings with the NRCS and GSWCC to determine appropriate procedures and incentive payments.
- Advertise the available grant money through local media.
- Maintain the nutrient management program throughout the implementation process.

Nutrient Management endeavors should be on a strictly voluntary basis, and landowner confidence and satisfaction should be a primary focus. This will allow any program to develop a positive reputation in the area, which is hoped to eventually garner more conservation interest in the watershed.

OBJECTIVE #4: Seek potential opportunities for stormwater and streambank stabilization projects in the Upper Oostanaula Watershed.

MILESTONES:
- Hold meetings with Calhoun Utilities, GSWCC, NRCS, and local municipalities to evaluate the demand for such projects.
- Advertise the availability of grant money for such projects through local media.
- Evaluate how potential projects would be matched.
- Plan and follow through with solid projects as available.

Stormwater and streambank stabilization endeavors should be on a strictly voluntary basis, and the confidence and satisfaction of the partners and/or private landowners should be a primary focus. This will allow any program to develop a positive reputation in the area, which is hoped to eventually garner more conservation interest in the watershed.

OBJECTIVE #5: Implement BMPs to achieve load reductions specified in the TMDL.

MILESTONES:
- Identify farmers willing to cost-share on agricultural BMP projects and/or nutrient management incentive programs.
- Identify property owners willing to address streambank issues and inadequate riparian zones.
- Identify homeowners within targeted subwatersheds with failing or without proper septic systems.
- Implement septic repairs and pump-outs in the watershed anticipated for each grant period as shown in Table 7.7.b.
- Implement agricultural BMPs in the watershed anticipated for each grant period as shown in Table 7.7.b.
- Implement potential streambank and stormwater BMPs in the watershed anticipated for each grant period as shown in Table 7.7.b.
- Estimate load reductions from projects when possible.

BMPs that specifically address fecal coliform should be emphasized on agricultural lands. These include activities that restrict cattle access to the stream while providing alternative water sources, and enhancement of riparian zones that may prevent animal waste and sediment from entering the stream during runoff events. Failing septic systems and “straight-pipes” should be identified and repaired to reduce the contribution of fecal coliform originating from residential areas. Streambank stabilization projects should be sought on agricultural land, as well as in urban areas that experience heavy flows from increased impervious surface cover. Potential stormwater practices should be sought in these urban areas as well.

OBJECTIVE #6: Reduce pollution inputs from suburban and rural areas through education and outreach.

MILESTONES:
- Provide opportunities for the public to assist with stream restoration and cleanup efforts.
- Provide opportunities for the public to participate in Georgia's Adopt-A-Stream Program.
- Conduct presentations discussing watershed restoration efforts at local events.
- Submit press releases to inform the public of the restoration process and NPS pollution issues and solutions.

A key component of the education and outreach portion of implementation should be designed to raise the awareness of citizens in the area through local media and "hands-on" events. Stream cleanups, creek walks/floats, and rainbarrel workshops should be planned to be offered to interested citizens in the area throughout any implementation effort. This ensures that the general public is provided the opportunity to not only learn about the watershed, but also participate in restoration events. These events should have the ability to not only educate and empower local citizens about water quality, but also effectively provide program outreach that can lead to agricultural BMP, stormwater, and streambank stabilization projects, as well as septic system repairs.

OBJECTIVE #7: Document changes in water quality throughout WMP implementation.

MILESTONES:
- Submit a SQAP to EPD to outline sampling protocol
- Conduct Pre- and Post-BMP monitoring for large agricultural BMP projects near significant streams.
- Sample to potentially de-list streams impaired for fecal coliform violations.
- Initiate WMP revisions.

A SQAP should be also written for each grant that is received. This will guide efforts to sample fecal coliform according the procedure necessary to "de-list" stream segments should standards be found to have been met.

When large agricultural BMP projects are implemented near significant streams, an effort should be made to sample for the pollutants of concern before and after project completion. This may allow inferences to be made about what projects are most beneficial, as well as build local confidence on finding solutions to water quality issues.

Biological monitoring should also be conducted as part of Georgia DNR/EPD sampling rotations and will provide insight on whether the local biotic integrity in the impaired segments is improving as water quality improvement activities take place in the Upper Oostanaula River Watershed. Additional biotic monitoring (e.g., fish IBIs, etc.) could be conducted in conjunction with a university, or other qualified entity, to investigate whether the biotic community has improved in the impacted biota segments should funding be approved.

OBJECTIVE #8: Provide local community leaders with the knowledge to consider the effects management decisions may have on stream health in the watershed.

MILESTONES:
- Establish connections with local community leaders.

- Conduct presentations to community leaders discussing water quality issues and the solutions that BMPs can provide.
- Share water quality data and interpret the results with local community leaders for discussion purposes.

City and county personnel should be updated regularly through presentations at local meetings to keep up involvement and/or awareness during the restoration process.

7.4 Schedule of Activities

The following schedule provides the anticipated years for various objectives and milestones to be addressed in the WMP implementation process, assuming that a comprehensive approach is pursued by the proposing organization and that funding needs are met.

Table 7.4.a. A display of milestone activities and a timeline in which they will each be addressed throughout the implementation of the WMP.

IMPLEMENTATION SCHEDULE													
MILESTONE ACTIVITY	**2014**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Submit §319 Proposal to GA EPD	X		X			X			X				
Create septic cost-share program		X											
Create an agricultural BMP cost-share program		X											
Create a nutrient management incentive program		X											
Install agricultural and streambank BMPs		X	X	X	X	X	X	X	X	X	X	X	X
Install septic system BMPs		X	X	X	X	X	X	X	X	X	X	X	X
Implement nutrient management incentive program		X	X	X	X	X	X	X	X	X	X	X	X
Establish AAS Monitoring Group			X		X		X		X		X		X
Update County Commission/press releases			X		X		X		X		X		X
Conduct education/outreach Events		X	X	X	X	X	X	X	X	X	X	X	X
Conduct WQ monitoring (de-listing)				X			X			X			X
Reevaluate milestones				X			X				X		
Initiate reassessment of WMP						X					X		

7.5 Indicators to Measure Progress

The numbers of agricultural, streambank stabilization, stormwater, and septic system projects completed as well as outreach event attendance should reveal progress that the implementation program is gaining momentum. Landowner participation rates can be another useful tool in determining the success of grant implementation. It is hoped that the rate will increase through subsequent years of watershed restoration due to education and outreach efforts, as well as the gradual acceptance of BMPs within the watershed. Education and outreach participation rates can be analyzed to help measure progress. It is anticipated that these rates will also increase through subsequent years as the events gain notoriety within the watershed.

Of more importance in the long run will be to measure how these projects have translated toward the goals of accomplishing the necessary load reductions and eventually de-listing the impaired segments within the watershed and relieve the nutrient issues in downstream water bodies as mandated by US EPA. For the stream segments impaired for high fecal coliform bacteria counts, tracking water quality improvements will best indicate progress toward reducing fecal contamination and eventually de-listing streams. Water quality improvements should be revealed through water quality sampling regimes intermittently throughout the implementation process.

For stream segments impaired for poor biotic diversity, progress may be more difficult to indicate. Targeted water quality monitoring may potentially reveal changes in TSS (total suspended solids) within the water column over time, but Georgia DNR/EPD will be relied upon to sample fish according to their scheduled rotations in order to determine whether biotic integrity has improved and to potentially de-list streams.

7.6 Technical Assistance and Roles of Contributing Organizations

This section will focus on the roles of various groups anticipated to contribute to make any restoration effort a success. Any organization seeking to aid in watershed restoration should rely on technical expertise from the NRCS with respect to agricultural BMP implementation, and the Northwest Georgia Public Health with respect to septic system BMPs. The program also relies on in-kind assistance with logistics and education/outreach activities from other groups listed below (Table 7.6.a.).

Table 7.6.a. The following groups are anticipated to contribute to implementation by taking on the roles described below. While working towards accomplishing conservation goals, many of these activities could count towards non-federal match contributions associated with any funded 319 projects.

Organization Roles and Responsibilities		
Organization Name	**Organization Type**	**Description of Role in Oostanaula River WMP Implementation**
Calhoun Utilities	Local Govt. Org.	Provide donated services in order to aid the restoration efforts. Analyze water samples for fecal coliform concentrations and other parameters, which will be collected by project partners throughout implementation of this plan.
Coosa River Soil and Water Conservation District	State Agency	Assist with marketing for agricultural BMPs in the watershed. Potentially help identify willing landowners in the watershed that are interested in the program.
Environmental Protection Agency	Federal Agency	Provide EPA Clean Water Act Section 319 funds to Georgia EPD to administer through the state 319 grant program.
Georgia Department of Natural Resources	State Agency	Conduct monitoring rotations to sample sites in the watershed for fecal coliform bacteria and biota that can reveal improvements or aid de-listing efforts.
Georgia Environmental Protection Division	State Agency	Adminster Clean Water Act Section 319 Grants to provide funding for this restoration program.
Limestone Valley RC&D Council	Quasi-Governmental Organization	Lead implementation efforts including submitting grant applications, serving as grantee fulfilling reporting obligations, marketing program components, spearheading outreach efforts, managing finances, conducting monitoring, and managing projects
Natural Resources Conservation Service	Federal Agency	Provide technical expertise for agricultural BMPs. This process will include multiple farm visits, the development of a conservation plan for the landowner, project supervision and project inspection. All projects will be installed according to NRCS specifications and standards.
Northwest Georgia Public Health District	State Agency	Provide technical expertise for septic system repairs. This process will include assessing, planning, permitting, and inspection of installed or repaired septic system components. Help may also be provided through identification of potential septic system repair projects. Assistance may also be provided during workshop preparation if applicable.
Northwest Georgia Regional Commission	State Agency	Provide technical assistance for implementation efforts in the watershed. Serve as a vehicle to promote the Upper Oostanaula River Restoration Project and assist in marketing its outreach efforts.
University of Georgia Cooperative Extension	State Agency	Assist in marketing efforts for program components and outreach events.

7.7 Estimates of Funding

As discussed in Section 6, many programs are already offered within the Upper Oostanaula River Watershed that aim to reduce NPS pollution. Despite the existence of these endeavors, impairments persist in the area. The estimates in this section for implementing the recommended comprehensive restoration program (UOWRP) are reliant on the 319 program as the main source of funding (in addition to key contributions from various groups as discussed above), and assume continuous consistent effort from the other programs previously mentioned in order for water quality improvements to occur.

In order to estimate the cost associated with the de-listing of impaired segments within the watershed using a comprehensive approach, an estimate of total watershed treatment was first calculated (Table 7.7.a.). The Total Watershed Treatment Table is an estimate of the cost of a hypothetical instantaneous treatment for fecal coliform and sediment reduction at all critical sites (estimated through statistics, or identified remotely). **The high cost associated with total watershed treatment may be alarming at first glance; however, it is not anticipated that total watershed treatment is necessary in order to de-list the majority of impaired segments.** Despite this fact, it is important to estimate the maximum restoration effort in the watershed based on actual watershed conditions and the amount of money needed to accomplish such an effort, so that lower estimates can be developed that are necessary to meet state criteria.

Many of the BMPs needed to de-list the stream were chosen by the Watershed Advisory Committee based on their expertise and knowledge of the area. The quantities of BMP**s** estimated in the Total Watershed Treatment Table were calculated using a variety of techniques. The septic system BMP needs were estimated based on information obtained from Gordon County and failure statistics provided by the U.S. EPA. Agricultural BMP quantities were largely estimated through Geographic Information Systems analysis. Each tributary in the watershed was studied to determine the location of grazing lands and cropland. This information was coupled with an insufficient riparian buffer analysis to determine likely areas in need of BMPs. Many BMPs are often coupled with others, and the frequencies of these associations were calculated using conservative estimates.

Efforts to begin working towards the de-listing of impaired stream segments are recommended to begin immediately with the approval of this WMP. **A goal of approximately 25% of total watershed treatment has been set to be accomplished by 2027, which is believed to likely be sufficient to de-list segments.** In order to lay the framework to accomplish this, Table 7.7.b. was created to outline the recommended approach for fund requests, and collectively represents approximately 25% of the total watershed treatment costs excluding landowner contributions. Again, the costs associated with these tables do not include landowner contributions to the project, and are displayed at 60% of the total cost in order to better describe federal funding needs.

Table 7.7.a. An estimate of the cost associated with a hypothetical instantaneous watershed-wide treatment for fecal coliform and sediment reduction at all critical sites.

TOTAL WATERSHED TREATMENT TABLE			
Agricultural, Streambank, and Stormwater BMPs (Name - Code)	**Quantity**	**Cost/Unit**	**Cost Estimate**
Fence - 382	966,240	$1.31/lin.ft.	$1,265,774
Heavy use area (pad – geotextile/gravel 50' x 50') - 561	228,750	$1.50/sqft	$343,125
Pipeline - 516	183,000	$1.71/lin.ft.	$312,930
Riparian forest buffer -391	500	$256.82/ac	$128,410
Riparian herbaceous cover - 390	500	$228.50/ac	$114,240
Streambank stabilization and potentially stormwater projects	9,500	$67.27/lin.ft.	$639,065
Water well - 642	30	$4,569.00 each	$137,070
Watering facility - 614	366	$968.12 each	$354,332
Septic System BMPs (Name - Code)	**Quantity**	**Cost/Unit**	**Cost Estimate**
Conventional system repair (5,500 homes on septic)	425	$4000 each	$1,700,000
TOTAL WATERSHED TREATMENT COST			**$4,994,946**
TOTAL TREATMENT COST EXCLUDING LANDOWNER CONTRIBUTIONS (60%)			**$2,996,967***

60% of Total Watershed Treatment Cost.

Table 7.7.b. A display of recommended financial requests (excluding travel, supplies, etc.) each of four 319 grants sought by an organization attempting comprehensive watershed restoration. The proportions are derived by stakeholder recommendations, and the sum of all activities is approximately 25% of total watershed treatment as displayed in figure 7.7.a.

	Septic System Funds	*Agricultural Project Funds	TOTAL
Proposal 1 - 2015	$100,000	$70,000	**$170,000**
Proposal 2 - 2018	$100,000	$80,000	**$180,000**
Proposal 3 - 2021	$100,000	$100,000	**$200,000**
Proposal 4 - 2024	$100,000	$100,000	**$200,000**

**Includes Nutrient Management and Streambank Projects*

7.8 Getting Started

A goal of approximately 25% watershed treatment has been set to be accomplished by 2027 through the recommended comprehensive approach, as opposed to the piecemeal approach (assuming funding needs are met). This treatment prescription is believed to likely be enough to de-list multiple segments, although there is a possibility more funding may be necessary to de-list all impaired streams. Efforts to begin working towards the de-listing of impaired stream segments are recommended to begin immediately with the approval of this document by Georgia EPD and the US EPA.

8. Education and Outreach Strategy

According to the recommendations from local stakeholders, the outreach associated with watershed restoration efforts should seek to put volunteers to work in ways that assist with cleaning up the Oostanaula River and its tributaries, enhancing the riparian buffer, reducing non-point source pollution, and sampling water quality parameters. These events have been recommended, since they aid in raising awareness of local nonpoint source issues, and lay the groundwork for implementation through the establishment of partnerships and identification of potential BMP projects. This idea is based on stakeholder opinions and Limestone Valley's past experience with implementing 319 grant projects, which revealed that the general public is one of the most valuable sources of information with respect to identifying both general and specific sources of pollutants. With each commitment from a citizen to volunteer their time, the likelihood of successful watershed restoration increases. The following descriptions are recommended events that could be held in and adjacent to the watershed. A value could be placed on many of these events through calculating volunteer labor, supplies, or other in-kind donations. This value, with all supporting documentation, could then be reported as match to the federal funds distributed through any applicable 319 grant.

Riparian Tree Plantings

Riparian tree planting events with volunteers could be held on the banks of streams and creeks in the Upper Oostanaula River Watershed. It is anticipated that trees and the tools with which to plant them would be obtained through the use of grant funds or donations from non-federal sources. The volunteers to plant the trees could be acquired through newspaper articles and word-of-mouth. The primary purpose would be to utilize volunteer labor to plant trees in an effort to increase the riparian buffer within the watershed. Another purpose of this event is to identify potential BMP projects through personal interaction with volunteers that encourage them to assist in "spreading the word" about grant funds and opportunities. These events should include a presentation about the non-point source pollution issues that face the Oostanaula River. Other educational materials on septic system repairs and maintenance, and stormwater practices (rainbarrels, raingardens) should be made available.

Rainbarrel Workshops

During past 319(h) grant implementation projects in Northwest Georgia, rainbarrel workshops have proven to be one of the more useful tools to garner public support for watershed restoration efforts. Through these past projects, the workshops not only develop a relationship with the local Coca-Cola plant that provides the barrels, but also assess the level of interest from the public. In the past, these events have generated overwhelming interest from local communities, and have attracted the most enthusiastic volunteers. Furthermore, rainbarrels are desired by a diverse array of citizens including both farmers and homeowners, which is the exact demographic that is needed to implement BMPs that address resource concerns on residential and agricultural lands.

For the purposes of conducting outreach thorugh a 319(h) grant project, this outreach activity would have the primary objective of incentivizing rainbarrel construction and installation to reduce NPS pollution, but would also serve as the sounding board from which to advertise available BMP funds. At these events, citizens should receive specific information about cost-share funds for projects that benefit both landowners and our natural resources, information about the Oostanaula River's water quality issues (with watershed map visual aids), and the opportunity to work to construct and take home a free rainbarrel to affix to the guttering system of their home. Volunteers from these events should be encouraged to participate further in identifying potential BMP sites and assisting with other outreach events. Follow-up communications should be initiated to keep these interested citizens engaged throughout the implementation process. The barrels donated from Coca Cola, the parts used to retrofit them, and the homeowners' labor and time spent constructing rainbarrels are all values that could be calculated and compiled for matching purposes for any applicable 319 grant.

Adopt-A-Stream Workshops

These events are designed to train volunteers on how to use AAS monitoring equipment to sample water quality parameters and inform them of non-point source pollution issues. At these workshops, volunteers should be informed of the basics of water quality sampling and watershed science, as well as how to use the AAS website to enter all collected data from the stream that they choose to adopt. The hours that volunteers spend in the training workshop, along with subsequent hours of actual sampling, could be used to calculate a match value that could be reported with supporting documentation to Georgia EPD. In addition, volunteers should be given information advertising potential available cost-share funds for both agricultural projects and septic system repairs that reduce non-point source pollution. Some workshop components may be featured in events that fall under a different category (e.g., Water Quality Monitoring Canoe Float).

River’s Alive Cleanup

As part of 319 planning efforts in the watershed, a partnership has been formed with Limestone Valley RC&D and NERA to host a river cleanup. It is planned that this cleanup event will occur annually, and (since many volunteers are from the watershed) could be continuously used as sounding board for advertising available BMP project funds while providing opportunities for NPS education. Volunteer labor and donated material values from sites within and near the Oostanaula Watershed could be recorded and reported for matching purposes.

Water Quality Monitoring and Stream Cleanup Canoe Floats

These events should be designed to attract members of the local community to volunteer to clean up our local waterways from a canoe and/or sample water quality during a training session on how to use Adopt-A-Stream equipment for water quality sampling. These volunteers could paddle while picking up all accessible trash within the stream and on the banks, and/or sample water quality at several sites, while learning about the importance of various water quality parameters, agricultural and residential runoff issues and how they pertain to the Oostanaula. Maps and handouts should be distributed at stops along the way to discuss pollution sources, BMPs, and steps they can take on their own property to reduce pollution. In addition, local aquatic fauna should be a topic of discussion in order to convey what could be at stake should pollution problems continue. Volunteer labor and donated material values will be recorded and reported as matching funds for any applicable 319 grant.

Summary of Nine Elements

The following is a summary of the Nine Elements addressed in the Upper Oostanaula River Watershed as identified in the Watershed Management Plan (WMP).

1. An identification of the sources or groups of similar sources contributing to nonpoint source pollution to be controlled to implement load reductions or achieve water quality standards.

The Upper Oostanaula River Watershed has a number of streams that fail to meet the criteria within the State of Georgia for pathogens and impacted biota, which respectively result from fecal contamination and excessive sediment loads. Load reductions of these pollutants are necessary in several stream segments, so the WMP focuses on fecal coliform bacteria and sediment as the nonpoint source (NPS) pollutants of concern and identifies several consistent sources for these pollutants (discussed in detail in Section 4), each of which relates to land use. This WMP identifies agricultural lands for targeting load reductions of both fecal coliform bacteria and sediment pollution through the installation of Best Management Practices (BMPs; e.g., controlling livestock access to water sources, installing alternative watering sources, protecting heavy use areas, etc.). In addition, residences will be targeted for septic system repairs to reduce the contributions of fecal coliform bacteria from failing septic systems. Streambank stabilization and stormwater projects will be completed on agricultural and/or urban land when feasible. Nutrients will be a secondary pollutant addressed in any 319 effort, and may be conducted through a nutrient management incentive program.

2. An estimate of the load reductions expected for the management measures described under number 3 (below);

The load reductions recommended in Total Maximum Daily Load (TMDL) documents are featured in Section 5. Management measures that will be implemented to achieve load reductions include nutrient management projects, agricultural projects, streambank stabilization, and septic system repairs. Agricultural BMPs will vary according to the interests of the farmers, and it is difficult to predict the frequency that each practice will be used during implementation, as well as where projects will be located, the current onsite conditions, and the significance of the NPS pollution at each site to be ameliorated. Septic system repairs will also be conducted as part of the WMP implementation process, especially in close proximity to blueline streams. However, the type of repairs, the proximity to streams, and the contributions to instream fecal coliform counts may vary for each septic repair project. Complicating matters further, conditions within the watershed will change over time. Due to the complexity involved in predicting the load reductions from the broad management measures provided below, the WMP instead seeks to focus on the completion of multiple projects and intermittently evaluating where the watershed is within the restoration process. Eventually, the management measures implemented should result in restoration to the extent that the necessary load reductions will be met and the impaired segments will be able to remain delisted.

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

A number of management measures including both structural and non-structural practices have already accomplished and will continue to accomplish various objectives. These practices are highlighted within Section 6. WMP implementation will also aim to execute additional structural controls to include some combination of the agricultural practices, streambank stabilization and stormwater efforts, and a number of septic system repairs directed toward NPS load reductions (discussed in Chapters 6 and 7). The management measures should be implemented across several grants with each involving monitoring to gain updates on current watershed conditions and completing projects potentially according to changing priorities. In conjunction with these efforts, we recommend implementing non-structural controls geared towards promoting watershed improvements with educational involvement within the community (also described in Chapters 6 and 7).

4. An estimate of the amounts of technical and financial assistance needed, and/or the authorities that will be relied upon to implement the plan;

The groups responsible for each existing and new management measure are described within Section 7 of the WMP. Estimates of funding needs are indicated only for activities conducted exclusively for WMP implementation. In order to come up with an estimate, we first conceptualized the extent of work within the watershed potentially needed for complete watershed treatment. Next, we estimated the extent of that treatment that would likely result in the de-listing of the majority of impaired streams. We assumed completion of approximately 25% of total watershed treatment may suffice to meet this objective, and each series of projects and monitoring events may allow for a better estimate. The process used to estimate the financial resources utilized is described in greater detailed in Section 7, and was chosen due to the complexities of implementing load reductions "on the ground" through voluntary conservation practices. The anticipated sources of funding to achieve restoration goals are several Environmental Protection Agency (EPA) Section 319 grants administered by the Georgia Environmental Protection Division (EPD), in conjunction with in-kind services from Gordon County, Northwest Georgia Health District, and volunteers from across the region.

5. An informational/educational component that will be used to enhance public understanding of and participation in implementing the plan;

Public education and outreach recommendations are identified in Section 8. The more successful programs should remain standard practices for the duration of the implementation process. The recommended educational programs focus on water quality monitoring, septic system maintenance, and stream cleanups, among others. Additional programs should be designed and implemented as necessary for successful implementation.

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

The implementation schedule is found in Section 7 and initially estimates implementation activities to occur through 2027. This includes water quality monitoring and implementation activities (e.g., agricultural BMPs, and septic system repairs), in addition to education and outreach. Each of these activities will continue through each grant implementation period, although priorities may be reevaluated and subsequently altered with each grant period. Currently, we anticipate that four grant implementation periods may allow for the goals of the WMP to be accomplished.

7. A description of interim, measurable milestones (e.g., amount of load reductions, improvement in biological or habitat parameters) for determining whether management measures or other control actions are being implemented;

A number of goals and objectives are recommended as interim milestones proposed to implement the management measures of this watershed improvement plan. These are included in Section 7. The initial goals of the WMP include developing a septic system cost-share program, building momentum toward implementation of agricultural management practices, completing septic, streambank, stormwater, and agricultural projects that reduce pollutant loads, reducing impacts of nutrients on waterways, carrying out educational activities, and monitoring to observe where extra focus is necessary and maintain that load reductions are occurring as a result of implementation. Over the course of implementation, each grant will include interim milestones with more finite objectives for each of the overall goals (i.e., number of agricultural and septic projects, number of newspaper articles, number of Adopt-A-Stream (AAS) programs initiated, multiple years of water quality monitoring data, etc.).

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

Several sources of the pollutants of concern will be addressed by WMP implementation. Water quality data collection is ongoing to determine priorities and current conditions and will continue intermittently to indicate how projects on the landscape are translating into water quality changes. Yet, it may be a few years before enough projects are completed in each subwatershed to significantly affect water quality. Therefore, throughout the implementation process, project types and locations will be documented to get an idea of the extent of water quality improvements as projects become more prevalent within each subwatershed and the Oostanaula River Watershed. This will allow management measures to be adapted to effectively address concerns that may arise with improvements in the implementation strategy. In the interim, continued monitoring of water quality and determination of the success of completed projects is necessary to determine if revisions are needed. At the least, revisions should be submitted in an addendum to this document in 2019 to evaluate successes and adaptations to the initial management measures recommended in this WMP. Section 7 includes how progress will be indicated and considers documenting the details of each project, load reductions per project when applicable, increased public interest, and changes in water quality that indicate progress toward the overall goal of de-listing all or the majority of segments within the watershed.

9. A monitoring component to evaluate the effectiveness of the implementation efforts, measured against the criteria established under item (8).

In Section 7, the WMP recommends that a monitoring protocol continue to be conducted within the watershed as the new management measures (and the ongoing programs discussed in Section 6) are implemented. This monitoring is for “de-listing” purposes, and follows a strict procedure (regardless of weather) in an attempt to show that restoration has been achieved.

Glossary of Acronyms

AAS - Adopt-A-Streams

BMP - Best Management Practice

CNMP - Comprehensive Nutrient Management Plan

DNR - Department of Natural Resources

EPA - Environmental Protection Agency

EPD - Environmental Protection Division

GIS - Geographic Information Systems

IBI - Index of Biotic Integrity

IWB - Index of Well Being

UOWRP – Upper Oostanaula Watershed Restoration Program

NPS - Nonpoint Source

NRCS - Natural Resource Conservation Service

RC&D - Resource Conservation and Development Council

SQAP - Sampling and Quality Assurance Plan

TMDL - Total Maximum Daily Loads

WMP - Watershed Management Plan

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