Mountain Oak Creek Healthy Watershed Initiative
Nine-Step Watershed Management Plan

Middle Chattahoochee River, Harris County, Georgia
May 18, 2018

BARGE DESIGN SOLUTION

Columbus Water Works
Serving our Community
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Contents

Purpose

The purpose of this nine-element watershed management plan (WMP) is to work with stakeholders on the maintenance of a healthy Mountain Oak Creek watershed through adoption and implementation of best management practices (BMPs), targeted water quality sampling, and community education and outreach.

Mountain Oak Creek is listed for Fecal Coliform (FC) on the 2014 Georgia's 305(b)/303(d) list of streams not supporting their designated use. The designated use of Mountain Oak Creek is fishing. The objective of this project is for the Columbus Water Works (CWW) and the Watershed Advisory Committee (WAC) to develop a nine-element WMP for the priority watershed, HUC #0313000211, which encompasses Mountain Oak Creek in the Middle Chattahoochee River. Ultimately, the goal is to de-list the creek, although it is understood that this process will not achieve that objective. This stream has approximately 5 miles of impairment and is located about 10 miles west of the City of Hamilton from Hwy 219 to Hwy 103.

Background

Watershed management plans provide an analytic framework for managing efforts to both protect overall watershed health and restore water quality in degraded areas. The nine elements presented in the Clean Water Act section 319 grant guidelines serves as building blocks to develop watershed plans. The nine elements are the components of the watershed planning process that EPA believes are the most critical to preparing effective watershed plans and are generally required for watershed projects funded under section 319. The nine elements of the watershed management plans are as follows:

1. Identify causes and sources of pollution;
2. Estimate pollutant loading into the watershed and the expected load reductions;
3. Describe management measures that will achieve load reductions and targeted critical areas;
4. Estimate amounts of technical and financial assistance and the relevant authorities needed to implement the plan;
5. Develop an information/education component;
6. Develop a project schedule;
7. Describe the interim, measurable milestones;
8. Identify indicators to measure progress;
9. Develop a monitoring component.

These nine elements are key components of the more general EPA recommended six steps in watershed planning and implementation process. Table 1 shows the relationship between the six steps of the watershed planning and the section 319 nine elements.

Table 1. Relationship between Six Steps in Watershed Planning and Section 319 nine elements

Six Steps in Watershed Planning and Implementation Process	
1. Build Partnerships • Identify key stakeholders • Identify issues of concern to be included in the watershed plan • Set preliminary goals • Conduct public outreach	
2. Characterize the Watershed • Collect existing data and create a watershed inventory • Identify causes and sources of pollution that need to be controlled • Identify data gaps and collect additional data if needed • Quantify pollutant loads	Element 1
3. Finalize Goals and Identify Solutions • Set overall goals and management objectives • Develop indicators/targets • Determine load reductions needed • Identify critical areas • Develop management measures to achieve goals	Element 2 Element 3
4. Design an Implementation Program • Develop evaluation process • Estimate amounts of technical and financial assistance and the relevant authorities needed to implement the plan • Develop an information/education component • Assign responsibility for reviewing and revising the plan • Develop a project schedule • Describe the interim, measurable milestones • Identify indicators to measure progress • Develop a monitoring component	Element 4 Element 5 Element 6 Element 7 Element 8 Element 9
5. Implement Watershed Plan • Implement management strategies • Conduct monitoring • Conduct information/education activities	
6. Measure Progress and Make Adjustments • Review, evaluate information • Prepare annual workplans • Report back to stakeholders and others • Make adjustments to program	

Characteristics of a Healthy Watershed

Healthy, well-functioning watershed provides food, clean water, and habitat for native plants and animals. Sediment is moved from the high points in the watershed to lower elevations, sorting it along the way to create diverse landscapes and habitats. Healthy watersheds cycle nutrients and convert them into forms that living organisms can use. Water is purified, stored, and released

incrementally into streams to reduce flooding and damaging erosion in the winter and to sustain flows and cool temperatures during the dry season. Healthy watersheds also affect air quality by absorbing pollutants and greenhouse gases. Well-functioning watersheds are more resilient to natural and human-induced disturbances than highly-impacted watersheds.

Characteristics of a healthy watershed include the following:

- Water quality high enough to support native aquatic species;
- Streams and floodplains that can accommodate flood flows without destructive flooding and erosion;
- Stream flows close to historic conditions with moderate peak flows after winter storms and stable summer baseflows;
- Streams with sufficient complex habitat features (including pools, gravel bars, and large pieces of wood) to support fish and other aquatic wildlife even through short-term changes from drought, wildfires, landslides, or other events that alter habitat conditions in parts of the system;
- Native keystone plant and animal species that can sustain stable populations;
- A riparian corridor with dense, healthy native plant community that regenerates naturally; and
- Upland forests and grasslands that promote rain infiltration, provide diverse habitat for native wildlife, reduce soil erosion, and deliver clean water into streams.

Benefits of a Healthy Watershed

There are numerous benefits provided by healthy watersheds, including reduced vulnerability to invasive species, climate change, and future land use changes. Natural land cover and soil resources provide vast carbon storage capabilities, offsetting greenhouse gas emissions. Healthy watersheds provide habitat for fish, amphibians, birds, and insects. Stream corridors provide connection across the landscape for animals and birds. Vulnerability to floods, fires, and other natural disasters is minimized, thereby reducing costs to communities.

Watershed Characterization

Mountain Oak Creek is in Harris County in western Georgia. The overall creek length is approximately 22 miles, beginning near Pine Mountain, Georgia and discharging to the Chattahoochee River along the Georgia/Alabama border. Figures 1 and 2 show the location of Mountain Oak Creek. The total drainage area for Mountain Oak Creek is 88.3 square miles. As shown in Figure 3, the watershed is predominately forested, with 19.1% of the area being evergreen forest and 18.6% deciduous forest.

The impairment of Mountain Oak Creek includes approximately 5 miles, located about 10 miles west of the City of Hamilton from Hwy 219 to Hwy 103. It is listed on the state and federal Clean Water Act 305

(b)/303(d) integrated report for failing to support its designated use for recreational fishing due to fecal coliform.

Mountain Oak Creek is considered a high priority waterway due to the listed impairment, the watershed partners, and the watershed development. Maintaining the health of the watershed is important.

Figure 1. Southeast US Location Map

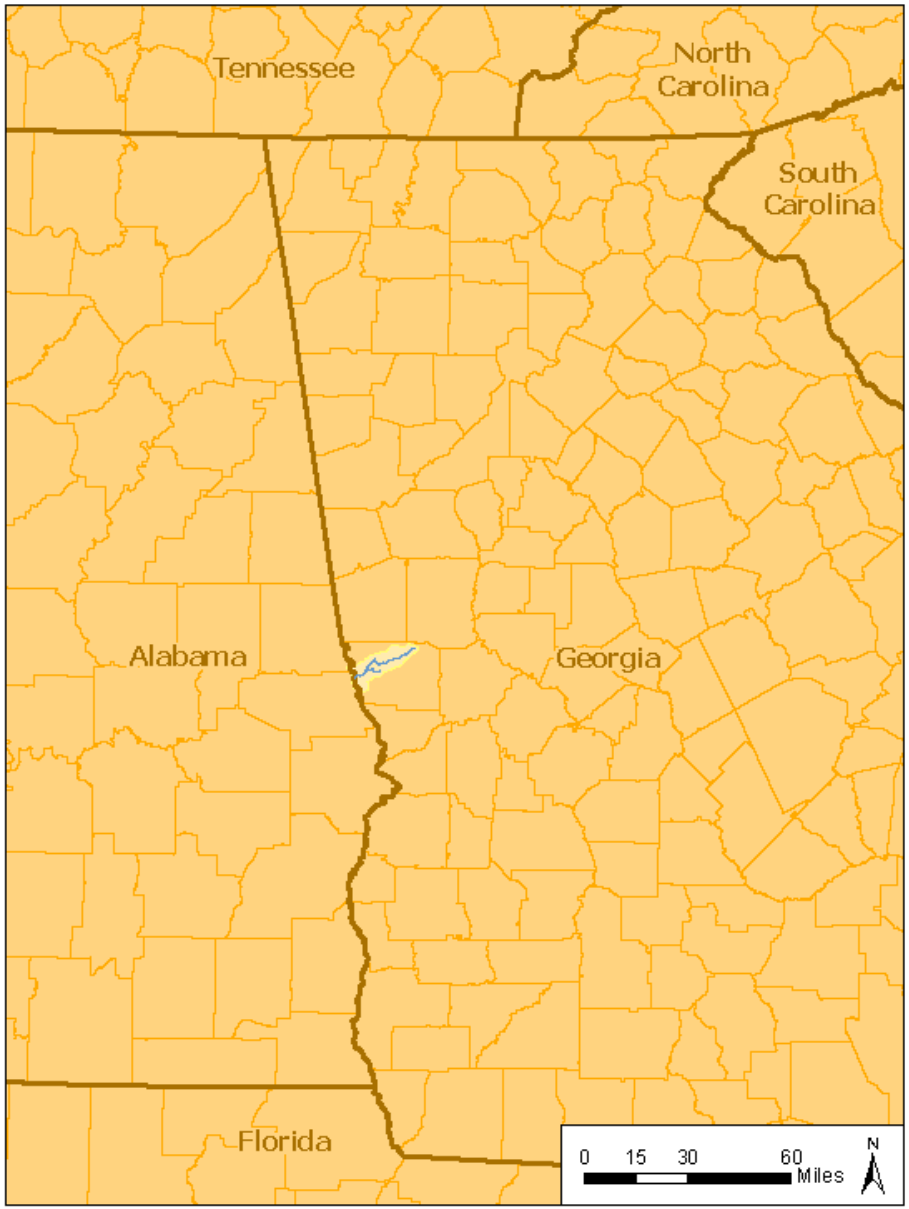


Figure 2. Harris County Location Map

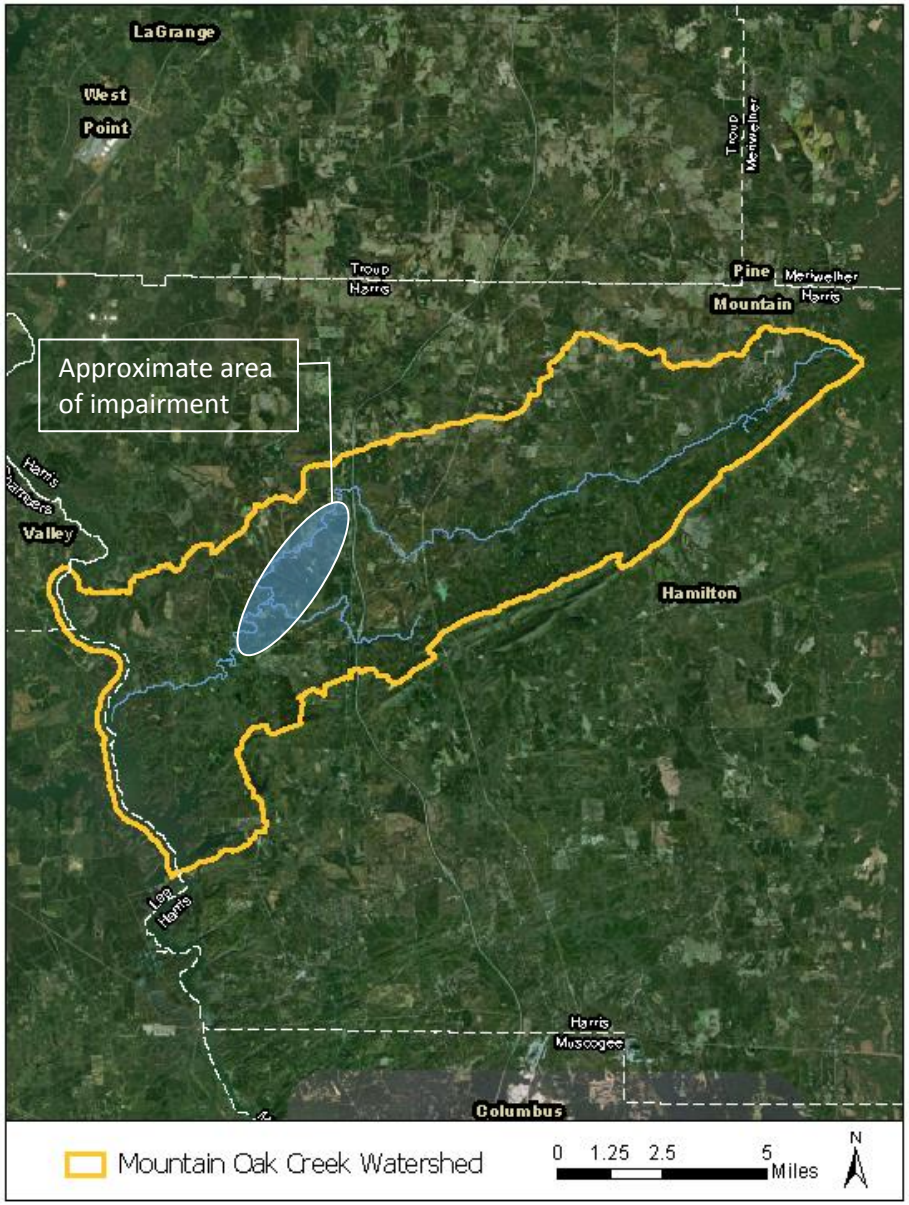
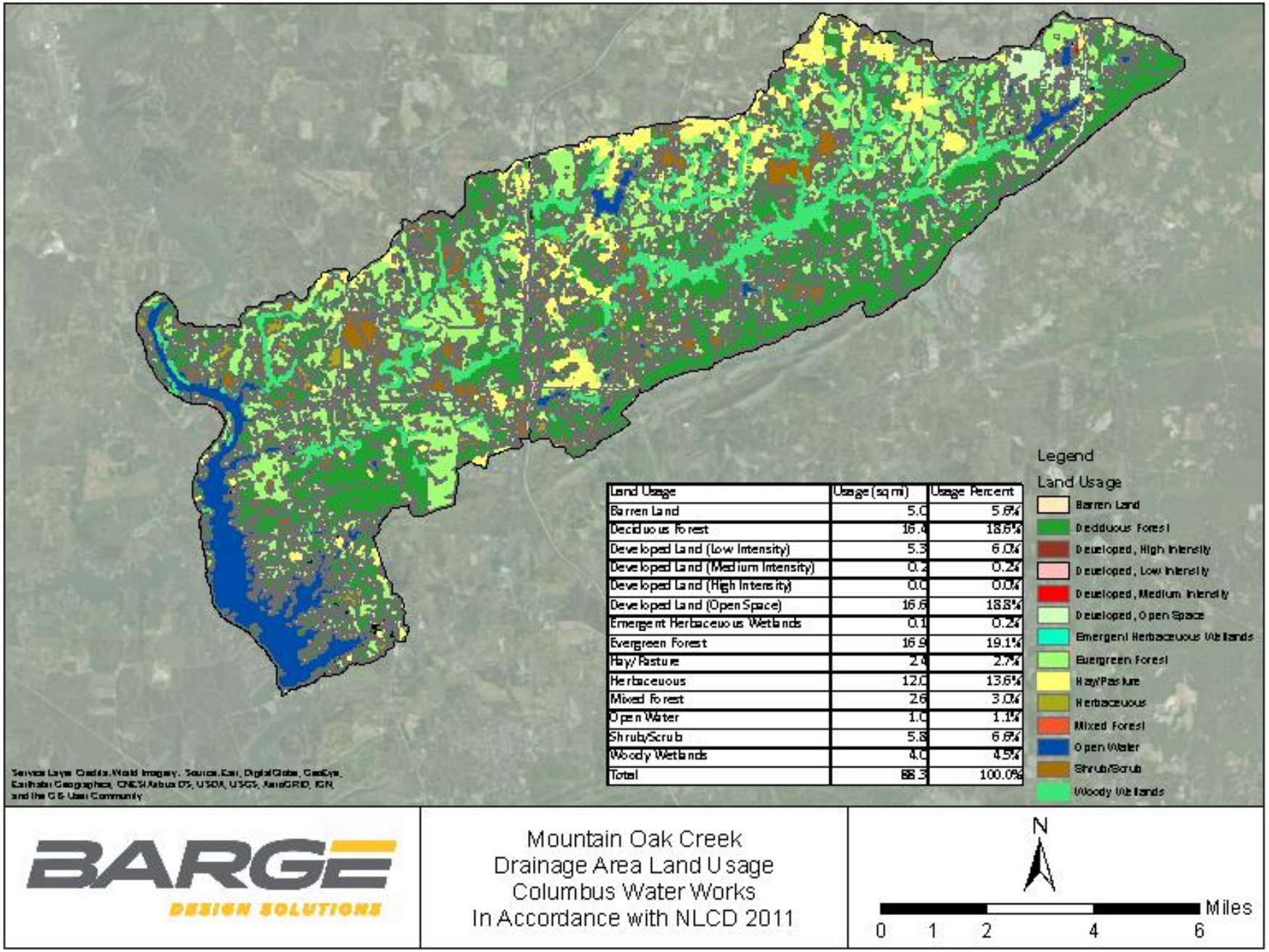


Figure 3. Mountain Oak Creek Land Usage



Land Usage	Usage (sq mi)	Usage Percent
Barren Land	5.0	5.6%
Deciduous Forest	16.4	18.6%
Developed Land (Low Intensity)	5.3	6.0%
Developed Land (Medium Intensity)	0.2	0.2%
Developed Land (High Intensity)	0.0	0.0%
Developed Land (Open Space)	16.6	18.8%
Emergent Herbaceuous Wetlands	0.1	0.2%
Evergreen Forest	16.9	19.1%
Hay/Pasture	2.4	2.7%
Herbaceuous	12.0	13.6%
Mixed Forest	2.6	3.0%
Open Water	1.0	1.1%
Shrub/Scrub	5.8	6.6%
Woody Wetlands	4.0	4.5%
Total	88.3	100.0%

Stakeholders and Community Involvement

This Watershed Management Plan (WMP) was drafted with input from the Watershed Advisory Committee. The committee is composed of a wide-range of stakeholders including Columbus Water Works (CWW), Georgia Power, Harris County, Chattahoochee RiverWarden, Callaway Gardens, Opelika Water, Smith Station Water, Harris County Water, and Georgia Forestry Commission. Contact information for the WAC is included in Appendix F.

Two public meetings were held during the drafting of the WMP. Public participation primarily included property owners bordering Mountain Oak Creek. The public participants did not express any concerns regarding the water quality. They did note that they had noticed an abundance of wildlife in the area.

With the understanding that the River Valley Regional Commission (RVRC) was awarded a FY18 Nonpoint Source Implementation grant, contingent upon the Environmental Protection Division (EPD) receiving funds from the Environmental Protection Agency (EPA), CWW and the WAC recommend that RVRC implement the WMP. RVRC has agreed to be the main authority to monitor and implement best management practices within the watershed. They will also be responsible for conducting public education in the watershed area. CWW and the WAC are invested partners and will continue in a role as advisors in matters concerning the watershed and concerns of the community.

Monitoring the creek and taking samples on a quarterly basis should continue to occur. Monitoring is needed to determine if further effort will be required due to deteriorated water quality. Should development occur in the area, monitoring can verify the continued protection of the creek.

Public meetings should occur on a scheduled basis. The intent of the public meetings is to inform the public of activity involving the watershed area. Should BMPs be installed in the area, the public should be aware and have input into the activity.

Pollutant Source Identification

Agriculture

According the most recent land use data (2011 NLCD), approximately 2.7% of the Mountain Oak Creek watershed is hay or pasture land. No large farms were identified from either the land use data or the creek walks conducted by CWW. Additionally, there were no cattle observed on the banks or in the creek nor were there cattle crossings identified. There were two properties with horses observed on Highway 219 adjacent to the creek. There was no evidence of the use of manure as fertilizer, nor were there any feedlots or poultry production operations observed in the basin.

Animal Waste

Creek walks by CWW provided adequate evidence of a variety of wildlife, including the presence of deer, coyotes, raccoons, opossums, and squirrels on Mountain Oak Creek. One beaver dam was observed on Little Creek, a tributary to Mountain Oak Creek. The abundance of deer and small mammals indicate that

there is a “background” of fecal coliform due to wildlife. Images 1 and 2 show numerous animal tracks in a sandbar along Mountain Oak Creek.

Images 1 and 2. Animal Tracks in Sandbar at Tributary

Water samples were taken at five sites within the watershed. See Figure 4 for the location of the five sites. These water samples were analyzed for fecal coliform, e. coli, dissolved oxygen, conductivity, pH, water temperature, air temperature, and speciation. Speciation testing provides identification for specific genetic markers to identify the potential fecal solution source. The fecal indicator bacteria for these tests are from the Bacteroides genus. Bacteroides is one of the prominent bacterial groups inhabiting the intestinal tracts of warm-blooded animals and is present in fecal contamination. As shown in Table 2, speciation of the samples at the sites indicate that there are detectable amounts of ruminant and dog Bacteroidetes, the full dataset is included in Appendix C. This indicates populations of wildlife in the area.

Figure 4. Location of Five Sites for Water Samples

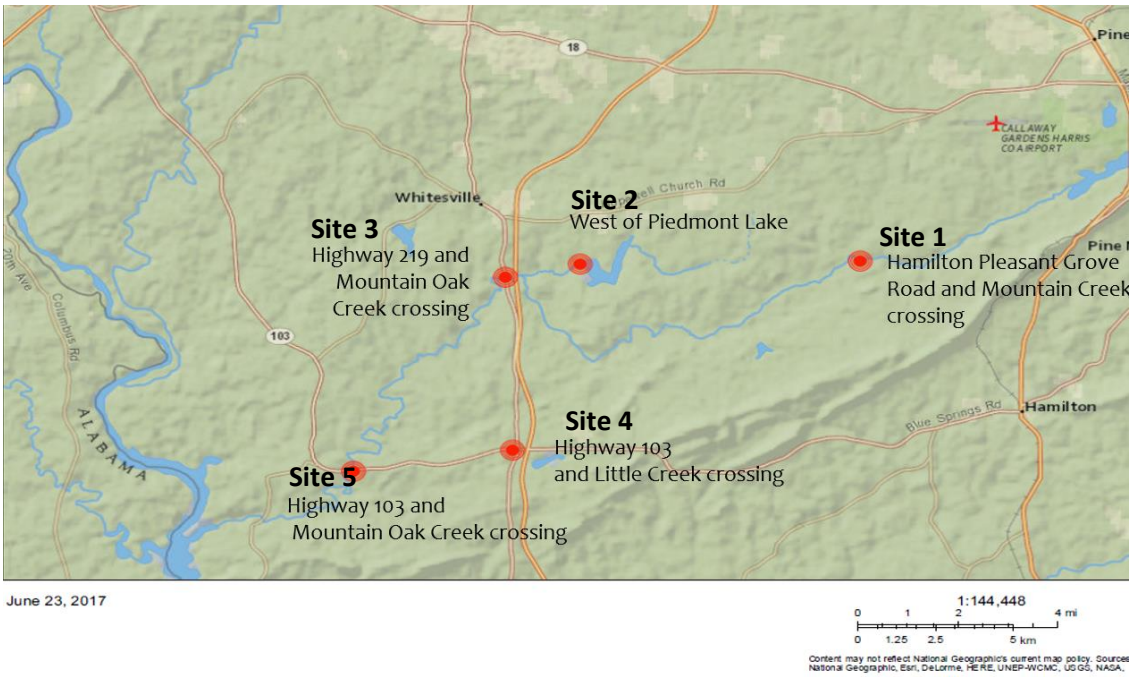


Table 2. Example Speciation of Water Samples

Date	Site 1	Site 2	Site 3	Site 4	Site 5
Aug – 17	BacR DBACT	<	Rum2Bac BacR DBACT	<	BacR DBACT
Sep – 17	<	NS	Rum2Bac BacR DBACT	NS	Rum2Bac
Nov – 17	<	NS	<	NS	<
Dec – 17	<	NS	DBACT	NS	DBACT
Feb – 18	<	NS	Rum2Bac	NS	Rum2Bac BacR DBACT
Mar – 18	DBACT	<	<	<	BacR

All speciation samples have been below the PQL for Human Associated Bacteroidetes HF 183
PQL – Practical Quantitative Limit
LQL – Lower Quantitative Limit
< - Results not detected
NS – Not Sampled
Note: Speciation was not done on geese in December

Phylogenetic Group

Canada Goose Bacteroidetes	CGBACT-1	
Canada Goose Bacteroidetes	CGBACT-2	
Ruminant associated Bacteroidetes	Rum2Bac	Cows and sheep
Ruminant associated Bacteroidetes	BacR	Cows, sheep, deer, and goats
Dog Bacteroidetes	DBACT	Dogs and coyotes
Human Associated Bacteroidetes	HF183	

Table 3 shows the geomeans for the water quality monitoring for the five sample sites. Recommendations for continued monitoring at four of the five sites are discussed in the best management practices section of this report.

Table 3. Geomeans for each Sample Site by Quarter

Sample Site	1st Quarter (April/May/June) 2017		2nd Quarter (July/August/September) 2017		3rd Quarter (October/November /December) 2017		4th Quarter (January/February/March) 2018	
	Fecal	e. Coli	Fecal	e. Coli	Fecal	e. Coli	Fecal	e. Coli
1	119	52	**224**	131	173	102	208	62
2	10	10	14	12	10	10	11	10
3	140	70	**310**	189	239	137	131	36
4	72	50	93	53	33	17	11	10
5	145	61	**232**	143	201	113	151	58
Other test: Dissolved Oxygen/Conductivity/PH/Water Temp/Air Temp								

Failing Septic Tanks

The landscape of the Mountain Oak Creek watershed is characterized by a very small concentration of rural residential homes on septic systems and no development supported by municipal sanitary sewer. There are approximately 20 septic systems located in the watershed. There were no obvious septic tank failures observed and, as shown in Table 2, speciation of fecal coliform samples did not indicate human associated bacteroidetes as a source of fecal contamination.

Recommendations for Maintaining a Healthy Watershed

To maintain the healthy Mountain Oak Creek watershed, best management practices (BMPs) can be implemented. These elements can be combined for maximum effectiveness.

Bacteria Source Tracking

Knowing the source of bacteria is valuable information to prevent future issues. By continuing to conduct water quality sampling and speciation testing, this will allow the RVRC to effectively target appropriate BMPs to control sources of pollution. It is recommended that all the sites, except for Site 2 continue to be monitored. Site 2, Piedmont Lake, had very low fecal coliform and e. Coli measurements for the entire monitoring period. Although measurements at sites 1 and 4 were not high, it is recommended that monitoring continue as they are at Callaway Gardens and Little Creek, respectively, both of which are large tributaries to Mountain Oak Creek. Continued monitoring is also recommended at sites 3 and 5 as they are in the impaired portion of Mountain Oak Creek. Given the prevalence of hogs in South Georgia,

it is recommended that monitoring occurs for the presence of hogs and that speciation be expanded to include horses and hogs.

Image 3. Typical Example of Mountain Oak Creek with deteriorated flow path

Livestock Practices

Though very little livestock was identified in the watershed, those citizens with livestock should be educated on best practices and encouraged to implement where appropriate to maintain the health of the creek. These include but are not limited to practicing critical area planting, prescribed grazing, alternative water sources, composting facilities and installation of filter strips, where appropriate. These BMPs will decrease the velocity of runoff and remove potential contaminants before they reach the creek.

Citizen Education

Education for the community in the surrounding area is beneficial for a healthy watershed. Presentations to promote wide-spread and distributed adoption of BMPs throughout the watershed should occur on a regular basis. Some topics that the public can do on their own include removing pet waste, proper disposal of hunted carcasses, clearing downed trees, removing invasive or non-native vegetation, and maintenance of septic systems.

Low Impact Development

As a continuation of citizen education, encouraging the use of low impact development for any future development in the area will help keep the creek in good condition. Water quality degrades as population increases, so ensuring planned developments disturb the minimum area necessary will preserve natural drainages, vegetation and buffer zones.

Project Schedule

Columbus Water Works collected and analyzed 120 samples for fecal coliform, e. coli, dissolved oxygen, conductivity, pH, water temperature, and air temperature at the five samples sites from April 2017 to March 2018. CWW also collected twenty-two samples for 126 speciation analyses from August 2017 to March 2018. Ongoing Watershed Advisory Committee meetings occurred during that time, as well as Public Meetings. Moving forward, continuing monitoring and presentations to the WAC and the public should occur.

Milestones

CWW and the WAC are committed to being regional partners moving forward. As part of implementation of the WMP, it is recommended that RVRC continue to conduct public meetings and update the WAC with measurable results from the implementation of the plan. Continued monitoring and analysis should occur.

Indicators to Measure Progress

Water quality can be monitored in a measurable way. The combination of physical, chemical, and water quality information provides insight as to the ability of the stream to support a healthy community, and to the presence of stressors to the ecosystem. The physical and chemical monitoring that occurred throughout 2017 and 2018 were the following elements:

1. **Water Temperature (°C)**
   Biologic processes increase when temperature increases.
2. **Air Temperature (°C)**
   Air temperature varies greatly with season.
3. **Dissolved Oxygen (mg/L)**
   While each organism generally has its own DO tolerance range, DO levels below 3 mg/L are of concern and waters with levels below 1 mg/L are considered devoid of life.
4. **pH**
   Most living organisms, especially aquatic life, function at the optimal pH range of 6.5 to 8.5.
5. **Conductivity (mS/cm**)
   Conductivity increases as salinity and temperature increases.
6. **Fecal Coliform (geometric mean)**
   Bacterial counts of fecal coliform during the warm months (May – October) should be less than 200 CFU/100mL. During the cool months (November – April), bacterial counts should be less than 1000 CFU/100mL.
7. **E. Coli (geometric mean)**
   Bacterial counts of E. Coli should be less than 126 CFU/100mL.

Develop a monitoring component

The above elements should be measured 20 times within a 12-month period for an average of 1 to 2 measurements per month, annually, for a duration of 2 years.

Schedule for Implementation of Plan

Table 4. Plan Implementation Activities

Activity	Years	Responsible Party	Cost Estimate	Funding Source
Public Meetings to educate the public about the healthy watershed initiative at Mountain Oak Creek	2018 – 2020	RVRC	Staff Time	EPA Nonpoint Source Implementation Grant
Continued monitoring and analysis as described in the Plan.	2018 – 2020	RVRC	$3,500 Staff Time	EPA Nonpoint Source Implementation Grant
Implementation of best management practices	2018 - 2020	RVRC	Variable	EPA Nonpoint Source Implementation Grant

Appendices

Appendix A – Watershed Advisory Committee Meeting Agendas and Sign-in Sheets

Appendix B – Public Meeting Agendas and Sign-in Sheets

Appendix C – Speciation Reports

Appendix D – Columbus Water Works Water Quality Analysis Reports

Appendix E – Water Quality Targeted Monitoring Plan

Appendix F – Watershed Advisory Committee Members