2016

BROXTON/ROSES CREEK WATERSHED MANAGEMENT PLAN

September 1, 2017

Developed by:

Southern Georgia Regional Commission

327 West Savannah Avenue

Valdosta, GA 31601

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1.0 SUMMARY

The purpose of developing this HUC-10 watershed management plan is to expand the scale of an original Broxton Creek watershed improvement plan by including the Roses Creek impaired segment and to provide a tool that applies a holistic approach to water quality restoration and protection. This watershed management plan describes a framework for the local implementation of Total Maximum Daily Loads (TMDLs) in the Broxton/Roses Creeks HUC-10 #0307020104 watershed. This framework is intended to guide and document the evolving local policies and procedures for advancing consistency with water quality standards. Ongoing documentation will promote coordination among local, state, and federal agencies and help inform the general public and commercial interests.

For waters that do not meet water quality standards due to an excessive pollutant load, the state must conduct a scientific study to determine the maximum amount of the pollutant that can be introduced to a waterbody and still meet standards. That maximum amount of pollutant is called a Total Maximum Daily Load (TMDL). A TMDL may provide the means for recommending controls needed to meet water quality standards. These standards are set by the state and determine how much of a pollutant can be present in a waterbody. If the pollutant is over the set limit, a water quality violation has occurred. There cannot be any new additions (or "loadings") of the pollutant into the stream until a TMDL is developed. Pollutants can come from point source and non-point source pollution. Point Source Pollution – wastewater treatment plant discharges and Non-point Source Pollution – runoff from urban, agricultural, and forested area such as animal waste, litter, antifreeze, gasoline, motor oil, pesticides, metals, and sediment.

The Broxton/Roses Creek Watershed Management Plan defines the approach to planning, implementing, and evaluating the effectiveness of best management practices (BMPs) with the goal to achieve the TMDLs for fecal coliform (FC) and dissolved oxygen and restore the beneficial uses of the Broxton/Roses Creek Watershed.

The required components of a watershed management plan that address USEPA's 9-Key Elements of Watershed Planning; include the following: 1) creating the local network of partners; 2) identifying and securing the resources to implement the management practices and activities that would best achieve the pollutant load reductions needed to meet the TMDLs and restore water quality; 3) verifying major sources or causes of impairment; and 4) providing the information needed to support applications for funding (such as EQIP, Section 319(h), GEFA, or others), or identifying existing funding sources such as utility fees, SPLOST, or others.

2.0 SEGMENT AND WATERSHED DESCRIPTION

One of the first steps in understanding a watershed is through the discovery of its general and natural history. This section presents an overview and characterization of the Broxton/Roses Creek Watershed.

The Broxton/Roses Creek Watershed is located in Coffee County. It is within the Altamaha Soil & Water Conservation District, which is a five-county district established in 1945. Broxton/Roses Creek Watershed also occupies approximately 3,940 square miles of the Satilla

River Basin within Georgia. The basin lies within the Coastal Plain physiographic province, which extends throughout the southeastern United States.

Broxton and Roses Creek are located in the 10 – digit hydrologic unit code (HUC) 0307020104. Within the Broxton Creek watershed, the State of Georgia has determined sections of both Broxton Creek and Roses Creek to be impaired water bodies. Six miles of Broxton Creek from Seven Creek to the Seventeen Mile River near Broxton is classified as *not supporting* its designation as fishing water. Nine miles of Roses Creek from upstream of Georgia Highway 206 to the Seventeen Mile River south of Broxton is classified as *not supporting* its designation as fishing water. Political jurisdictions of the Broxton/Roses Creek watershed are Coffee County and the city of Douglas, the city of Broxton, and the city of Ambrose compose the HUC-10 watershed.

The physical landscape is mostly flat with no slopes greater that 15% and with no outstanding physical features the streams flow generally southward. Broxton/Roses Creek watershed encompasses 77,639.85 acres currently composed primarily of agricultural land (82.47%) with some residential/urban (14.65%). The remaining land uses are 2% forestry, and <1% parks and recreation.

Coffee County's climate is classified as humid subtropical (Cfa) according to the Köppen climate classification system. Winters are cool and short with periodic cold spells moderating in 1-2 days. Summers are hot and humid. Annual precipitation typically ranges from 45 to 50 inches and is spread evenly throughout the year (2-5 inches each month). Measurable snowfalls are very rare with a less than 5% probability each year. When they occur, snowfall amounts are most always less than one inch and melt quickly. In winter, the average minimum daily temperature is 39 degrees. In summer, the average maximum daily temperature is 90 degrees. Coffee County's growing season ranges from 8-9 months with an average of 250 days that have daily minimum temperatures greater than 32 degrees. The first winter freeze typically occurs in early November and the last freeze typically occurs in mid-March.

Soils are considered to be a region's most basic and fragile natural resource, combined with such variable resources as air and water. In 1988, the United States Department of Agriculture Soil Conservation Service published the Soil Survey of Atkinson, Bacon and Coffee Counties, Georgia in cooperation with the University of Georgia, College of Agriculture – Agricultural Experiment Stations, and Coffee County. Table 1 depicts the *Broxton/Roses Watershed Generalized Soil Associations* provides a general description of the 7 soil associations found in the Broxton/Roses Watershed.

TABLE 1 SOIL ASSOCIATIONS

Soil Association	Soil Description
Tifton – Leefield– Fuquay (76.9%)	Very deep, well drained, moderately slowly permeable soils that formed in loamy marine sediments. These soils are on nearly level to gently sloping uplands.
Leefield – Pelhelm – Irvington (7.5%)	Very deep, somewhat poorly drained, moderately slowly to slowly permeable soils on the uplands of the Coastal Plain. They formed in deposits of sandy and loamy sediments.
Mascotte – Pelham - Surrency (6.9%)	Very deep, poorly and very poorly drained, moderately slowly permeable soils on areas of flats, depressions, and on low stream terraces of the lower Coastal Plain.
Fuquay – Leefield - Lakeland (4.6%)	Deep, well drained, moderately permeable soils formed on ridgetops or hillsides. Loamy subsoil.
Cowarts– Pelham – Fuquay (2.1%)	Very deep, well drained and moderately well drained soils on ridge tops and side slopes on uplands of the Coastal Plain. They formed in loamy marine sediments.
Osier – Ousley – Ellabelle (0.8%)	Very deep, poorly drained, rapidly permeable soils on flood plains or low stream terraces. They formed in sandy alluvium.
Kershaw – Chipley – Cape Fear (0.7%)	Excessively Drained and moderately well drained soils found on ridge tops. Sandy surface and subsurface with a loamy subsoil.
Troup – Fuquay – Pelham (0.5%)	Deep, somewhat excessively drained, moderately permeable soils with thick sandy surface and subsurface layers and loamy subsoils. They formed in unconsolidated sandy and loamy marine sediments on Coastal Plain uplands.

3.0 WATER QUALITY IMPAIRMENTS AND TOTAL MAXIMUM DAILY LOADS (TMDLS)

The Georgia 2014 305(b)/303(d) list of waters was prepared as a part of the Georgia assessment of water quality in accordance with Sections 305(b) and 303(d) of the Federal Clean Water Act and guidance from the U.S. Environmental Protection Agency. Assessed water bodies are classified according to a comparison of water quality monitoring results to water quality standards and other pertinent information. Table 2 depicts the 2014 list of impaired streams located within the Broxton/Roses Watershed.

TABLE 2 Broxton/Roses **WATERSHED 2014 305(B)/303(D) LIST**

Waterbody Name	Location	County(s)	Impairment	Miles Impacted	Percent Load Reduction
Broxton Creek	Seven Creek to Seventeen Mile River near Broxton	Coffee	FC, DO	6	0% FC 37% TN, TP, TOC for DO
Roses Creek	Upstream Ga. Hwy. 206 to Seventeen Mile River near Broxton	Coffee	FC	9	66%FC

Source: Georgia Department of Natural Resources, Environmental Protection Division, 2001 and 2006
TN: (Total Nitrogen) TP: (Total Phosphorus) TOC: (Total Organic Carbon)

Broxton Creek from Seven Creek to Seventeen Mile River (6 miles) was placed on the Section 303(d) list by the GA EPD in 2014 for violating the state standards for fecal coliform (FC) and dissolved oxygen (DO). Also within the watershed, Roses Creek (9 miles) located upstream of Ga. Hwy. 206 to Seventeen Mile River near Broxton was listed as impaired for FC. Georgia's standard specifies that fecal coliform concentration in the stream water shall not exceed the 30 – day geometric mean of 200 cfu/100 ml for the months of May through October, and 1,000 cfu/100 ml with no single sample greater than 4,000 for the months of November through April. The state standard for dissolved oxygen levels requires an average of 5 mg/L from multiple samples, with each single sample at no less than 4 mg/L.

A TMDL results from an equation that describes both the allocation of allowable loading and the allocation of responsibility for reducing loading to the extent necessary to achieve the endpoint. TMDLs were evaluated in 2001 for DO (http://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/FinalSatillaDOTMDLs.pdf) and for FC in 2000 with an update in 2006 (http://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/EPD_Final_Satilla_Fecal_TMDL.pdf) on both Broxton and Roses Creeks.

The associated modeling suggests a load reduction of approximately 36.45% TP, TN and TOC in Broxton Creek to restore DO levels to meet water quality standards. At that time, load reductions of TP (27%), TN (11%) and TOC (16%) were also established for Roses Creek. In addition, modeling indicated that fecal coliform load reductions of approximately 0% in Broxton Creek and 66% in Roses Creek would result in attainment of the standard for that impairment. The 0% required FC load reduction for the Broxton Creek segment is due to GAEPD monitoring data from 2003 that shows geometric means meeting seasonal water quality standards. Also, the DO impairment for Roses Creek was removed from the 303(d) List in 2006 because data collected in 2003 met the water quality standard.

A TMDL Implementation Plan for DO in the Broxton/Roses Creeks Watershed was developed in 2002 that recommends a load reduction of 39% for TP, TN, TOC in Roses Creek and of 37% in

Broxton Creek.
(http://epd.georgia.gov/sites/epd.georgia.gov/files/tmdl/TMDL_Implementation_Plans/Satilla/0307020104/TMDLIP_Broxton_RosesCreek_0307020104_Y2002.pdf).

In 2002 a TMDL Implementation Plan was developed for FC that addresses the original 2000 TMDL and suggests a load reduction of 81% for Roses Creek
(http://epd.georgia.gov/sites/epd.georgia.gov/files/tmdl/TMDL_Implementation_Plans/Satilla/0307020104/TMDLIP_RosesCreek_FC_0307020104_Y2002.pdf)
and 85% for Broxton Creek.
http://epd.georgia.gov/sites/epd.georgia.gov/files/tmdl/TMDL_Implementation_Plans/Satilla/0307020104/TMDLIP_BroxtonCreek_FC_0307020104_Y2002.pdf
There has been no implementation plan to address the 2006 updated TMDL for FC.

The Broxton/Roses Creek Watershed Management Plan takes into account all sources of fecal coliform and causes of oxygen demanding pollutants. Implementation of the Watershed Management Plan for Broxton/Roses Creeks will be guided by the objective of bringing the impaired segments in compliance with the fecal coliform and dissolved oxygen water quality standards.

4.0 VISUAL SURVEYS AND TARGETED MONITORING

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

Where watershed-wide monitoring has not been conducted, a targeted monitoring plan was developed to geographically isolate the major sources of impairment(s). In order to offer a "better" picture of water quality conditions, target monitoring for dissolved oxygen and E. *coli* was scheduled once every month from November 2016 – April 2017. The USEPA recommends E. *coli* bacteria as good indicator organisms of fecal coliform contamination by warm-blooded animal wastes because of E. *coli*'s long life, large numbers, and ease to culture in a laboratory.

The sampling schedule was for one (1) sample, per stream throughout the specified period. Results from water quality monitoring can direct funding and other resources in areas of the watershed that show the greatest need for attention. This can help open the door for projects that target areas of the watershed to receive funding to implement best management practices (BMPs) that are recommended to address water quality violations.

TABLE 3 BROXTON/ROSES CREEK WATER QUALITY RESULTS (E. COLI* CFU/100ML)

Site Location (Road names)	November	December	January	February	March	April
Fitzgerald Hwy	1667	N/A (stagnant)	133	300	633	666
Ambrose Rd	N/A (stagnant)	N/A (stagnant)	533	300	100	400
Moseley Rd	67	N/A (stagnant)	400	566	333	733
Lotts Crossing	67	N/A (stagnant)	333	200	200	500
Apache Trail	1033	N/A (stagnant)	433	333	566	666
Broxton Hwy	N/A (stagnant)	N/A (stagnant)	633	633	566	333
USEPA Recommendations for Swimming	<235 <298 <410 <576	<235 <298 <410 <576	<235 <298 <410 <576	<235 <298 <410 <576	<235 <298 <410 <576	<235 <298 <410 <576

*USEPA recommendations for E. coli concentrations in recreational waters used for swimming correspond to an acceptable risk level of 8 out of 1,000 people getting sick: Designated Swimming <235; Moderate Swimming <298; Light Swimming <410; Infrequent Swimming <576.

TABLE 4 BROXTON/ROSES CREEK WATER QUALITY RESULTS (DISSOLVED OXYGEN* MG/L)

Site Location (Road names)	November	December	January	February	March	April
Fitzgerald Hwy	N/A (stagnant)	5.4	5.5	5.2	5.4	3.9
Ambrose Rd	N/A (stagnant)	4.35	6.05	5.1	4.35	4.35
Moseley Rd	N/A (stagnant)	3.75	5.35	5.3	4	4.5
Lotts Crossing	N/A (stagnant)	5.1	5.5	5.3	5.6	4.15
Apache Trail	N/A (stagnant)	5.85	5.2	5.4	5.85	4.3
Broxton Hwy	N/A (stagnant)	5.8	5.1	5.35	5.7	3.95
State Standard (Nov-April)	5	5	5	5	5	5

***** Dissolved oxygen levels must average 5 mg/L, with each single sample at no less than 4 mg/L, to meet Georgia state standards.

5.0 IDENTIFICATION AND RANKING OF SIGNIFICANT SOURCES OF IMPLEMENTATION

The nonpoint sources of fecal coliform are mainly agricultural, such as, land-applied animal waste and manure deposited on pastures by cattle. A significant fecal coliform load comes from cattle directly depositing in streams. Wildlife also contributes to fecal coliform loadings on pasture, forest, and in-stream. Other nonpoint sources of fecal coliform loadings include failing septic systems, storm water runoff, and pet waste.

The nonpoint sources of oxygen-demanding substances that contribute to the DO impairment are mainly agriculture (uncovered manure piles, access to the waterway by livestock, broadcast spreading of inorganic and organic materials, hay fields, row crop production, and feedlots) and silviculture operations that washes leaves, branches, and chipping materials into the waterway. Other sources include urban development (land disturbing activities), and residential (fertilizer,

chemicals, laundry care products, spill/discharges of raw sewage, and improper collection and disposal of trash and petroleum products).

TABLE 5: SOURCES OF FECAL COLIFORM LOADINGS

Source	Percent Coverage in Watershed	Permitted (Y/N)	Estimated Contribution (Rank 1 – 5)	Stakeholder Opinion (1 – 5)	Comments
Agricultural Runoff, Pasture livestock, AFO, CAFO, Poultry houses Row Crops	86.68% Of the watershed	N	**5**	**5**	Agricultural animals can be an important source of fecal coliform loading to streams, through both runoff from Pasture, livestock, AFO/CAFO & poultry houses, and crops
Wildlife (Deer)	26/sq. mile	N	**1**	**1**	Wildlife deposit fecal coliform bacteria with their feces onto land surfaces where it can be transported during storm events to nearby streams. The bacteria load from wildlife could be a contribution due to Forested areas, woody wetlands, herbaceous wetlands in this watershed.
Failing Septic Systems	11.13% Residential watershed	Y	**2**	**3**	Failing septic systems are not always easy to identify especially if the failure involves untreated sewage entering a stream via groundwater. Water quality sampling should be collected in the Broxton/Roses watershed. Education outreach should be implemented with the help of local Health Departments.

Stormwater Runoff	3.52%	N	**2**	**3**	Stormwater runoff primarily sources fecal coliform bacteria from Dumpsters and impervious surfaces (paved roads, parking lots, fleet maintenance lots)
Domestic Animals	UNK	N	**1**	**1**	Recent research has shown that much of the fecal coliform bacteria contamination from urban areas may come from domestic pets. The presence of excessive bacteria also may indicate other problems, such as low DO.
Landfill	Inactive	Y	**2**	**2**	Leachate from landfills may contain fecal coliform bacteria that may at some point discharge into surface waters. Sanitary (or municipal) landfills are the most likely to serve as a source of fecal coliform bacteria.
Wastewater Pollution Control Plant (Land Application System)	0.16(mgd)	Y	**2**	**5**	Runoff from municipal and industrial wastewater treatment facilities' (LAS) may contribute fecal coliform to receiving waters..

Description of Commonly Considered Water Quality Constituents:
https://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/devwtrplan_b.pdf

TABLE 6: SOURCES OF BOD (OXYGEN-DEMANDING SUBSTANCES) THAT DEPLETE DISSOLVED OXYGEN

Source	Percent Coverage in Watershed	Permitted (Y/N)	Estimated Contribution (Rank 1 – 5)	Stakeholder Opinion (1 – 5)	Comments
Agricultural Runoff, Pasture livestock, AFO, CAFO, Poultry houses Row Crops	86.68%	N	**5**	**5**	Manure from agricultural animals contains nitrogen and phosphorous and these are the main nutrients responsible for eutrophication of BOD (oxygen-demanding substances) that deplete dissolved oxygen. This decrease in dissolved oxygen can result in the death of organisms through runoff from pasture, livestock, AFO/CAFO, poultry houses, and row crops
Wildlife	26/sq. mile	N	**1**	**2**	Wildlife deposit feces onto land surfaces where it can be transported during storm events to nearby streams. The bacteria loads from wildlife could be a contributor to BOD (oxygen-demanding substances) that depletes dissolved oxygen due to the rural acreage in this watershed.

Failing Septic Systems	11.13%	Y	**2**	**3**	Failing septic systems typical sources of excess nutrients in surface waters. This means that excessive amounts of phosphorous in a system can lead to an abundant supply of vegetation and cause low DO. Education outreach should be implemented with the help of local Health Departments.
Stormwater Runoff	3.52%	N	**2**	**3**	Stormwater runoff primarily sources fecal coliform bacteria from dumpsters and impervious surfaces (paved roads, parking lots, fleet maintenance lots). The presence of this excessive bacteria also may indicate other problems, such as low DO.
Domestic Animals	NA	N	**1**	**1**	Recent research has shown that much of the fecal coliform bacteria contamination from urban areas may come from domestic pets. The presence of this excessive bacteria also may indicate other problems, such as low dissolved oxygen.

Landfill	N/A	Y	**2**	**2**	Possible adverse impacts on DO from retired county landfill (GAD981024938) and known leaking underground storage tanks at Broxton-Mary Hayes School (0-340119) and Pridgen Corner Grocery (0-340110).
Wastewater Pollution Control Plant	N/A	Y	**2**	**5**	Wastewater treatment plants are designed to function as bacteria farms, where bacteria are fed oxygen and organic waste. Bacteria will decompose these organic materials using dissolved oxygen, thus reducing the DO present for fish. This will increase the BOD in the effluent discharged to nearby streams

Description Of Commonly Considered Water Quality Constituents:
https://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/devwtrplan_b.pdf

6.0 IDENTIFICATION OF APPLICABLE EXISTING MANAGEMENT MEASURES

Management measures are "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint and stormwater sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint and stormwater source pollution control practices, technologies, processes, citing criteria, operating methods, or other alternatives" (USEPA, 1993).

Descriptions of existing management measures for the Broxton/Roses Creek watershed are summarized below in Table 7. These measures are effective, practical, structural or nonstructural methods which prevent or reduce the movement of sediment, nutrients, pesticides and other pollutants from the land to surface or ground water, or which otherwise protect water quality from potential adverse effects. These practices are developed to achieve water quality protection within natural and economic limitations.

TABLE 7: EXISTING MANAGEMENT MEASURES TO MITIGATE FECAL LOADINGS AND BOD (OXYGEN DEMANDING SUBSTANCES) THAT DEPLETE DISSOLVED OXYGEN

Regulation/Ordinance or Management Measure	Responsible Government, Organization or Entity	Description
Local Wetlands Policy Ordinance	Coffee County City of Douglas	Water Resource District Ordinance applies to the Georgia Planning Act Part V: Environmental Criteria. Wetlands Protection Overlay District (Coffee Co. Comp Plans)
Protected River Corridor Plan Ordinance	Coffee County City of Douglas	Water Resource District Ordinance applies to the Georgia Planning Act Part V: Environmental Criteria. **(Not yet adopted)**
Satilla River Basin Management Plan	Georgia DNR	Comprehensive Statewide Water Management Plan to replace the Satilla River Basin Management Plan.
Farm Service Agency	USDA - FSA	Requires producers to comply with conservation plans for the farm, wetland provisions, planting flexibility provisions, as well as to keep the land in agricultural use.
Conservation Reserve Program (CRP)	USDA - FSA	Ongoing financial and technical assistance to encourage farmers to convert erodible cropland to vegetative cover.
Environmental Quality Incentives Program (EQIP)	USDA - FSA	Ongoing financial and technical assistance to install /implement structural and management practices on eligible agricultural land and/or for commodity operations.
Soil Testing	USDA Soil Conservation Service/ UGA College of Agriculture	Applies to soil sampling taken on a regular basis to minimize impacts of fertilizers, pesticides, and herbicides in waterways.
Erosion & Sedimentation Ordinance	Coffee County	Adopted and enforced.
Illicit Discharge Ordinance	Coffee County	Adopted and enforced. **(Comp Plan pg 39)**
Section 319 FY 2015 Grant	SGRC	Partners with various organizations to coordinate activities within the Suwannee Basin that promote education/outreach opportunities and implementation of BMPs for non-point source pollution from municipalities and the agriculture.

Cover Crop, Critical Area Planting, Fence, Heavy Use Area Protection, Irrigation System - Sprinkler, Pasture and Hay Planting,	USDA - NRCS and landowner in Coffee County	Between 2013 – 2014, USDA – NRCS entered into 77 separate landowner contracts totaling $471,067.80 in Coffee County for BMP installation.
Groundwater Recharge Development Ordinance	Coffee County City of Douglas	Water Resource District Ordinance applies to the Georgia Planning Act Part V: Environmental Criteria. **(Not Adopted)**
Storm water detention/retention standards	Coffee County City of Douglas	Adopt and enforced
Manure Management Plan	Landowner with assistance from NRCS, UGA - Cooperative Extension, and/or licensed contractor	Applies to keeping records of manure applications and continuous soil sampling.
Section 319(h) Grant – Well and Septic Tank and Online Referencing Mapping (WelSTROM) System	SGRC	Approved by GA EPD and began work in 2007. This provides a tool for local governments and regional agencies to guide future decisions, such as development, infrastructure expansions, TMDL development and implementation, and education outreach on all new septic systems.

7.0 RECOMMENDATIONS FOR ADDITIONAL MANAGEMENT MEASURES

Development of effective management measures depends on accurate source assessment. Each potential source will respond to one or more management strategies designed to eliminate or reduce coliform bacteria or oxygen-demanding substances contributed by that specific source. Each management strategy has one or more entities that can take lead responsibility to effect the strategy.

Because the Broxton/Roses Creek watershed contains a combination of rural, suburban, and urban land uses, implementation actions consist of a variety of management practices to address human impacts arising from these various land uses. Proposed actions to reduce fecal coliform include agricultural BMPs, stream channel BMPs, stormwater management BMPs, sanitary sewer system improvements, and urban/residential education components. Specific practices to improve dissolved oxygen include disposal and management of domesticated animal/ commercial livestock excrement, of herbicide and pesticide poison, and of power equipment, commercial, industrial, home and personal-care products, stream-zone and forestry best management practices, agricultural nutrient management program.

TABLE 8: ADDITIONAL MANAGEMENT MEASURES

BMP	Cost (Per unit)	Est. Total Cost	Impair-ment Addressed	Load Reduction (%)	Stake-holder Support (1 – 5)	Benefits
Ag Riparian Buffer	$250 (bare root hand planted)	NA	FC	50 – 75%	**3**	Act to intercept sediment, nutrients, pesticides, and other materials in surface runoff and reduce nutrients and other pollutants in shallow subsurface water flow. They also serve to provide habitat and wildlife corridors and can help reduce erosion by providing stream bank stabilization.
Livestock Exclusion Fencing	$1.80 LF or $2.50 LF	$550,000	FC	75%	**5**	Reduce sediment and possibly nutrient yield from streams draining pastures.
Cover Crops	$20 AC to $65 AC	$400,000	FC	40 – 60%	**4**	Prevents erosion.
Heavy Use Area Paddocks	$2.00 SF to $8 SF	$120,000	FC	80%	**5**	Reduces erosion while improving water quality.
Increase E&S Efficiency	NA	NA	FC	75%	**4**	Helps mitigate increased sediment loads to streams.
Promote a naturalized landscape	NA	NA	FC	NA	**3**	Improves water quality, and reduces erosion.
Filter Strip	$450 AC	$50,000	FC	50 – 80%	**4**	Protects water quality by trapping soil particles, nutrients, and pesticides, they can also improve water infiltration and enhance wildlife habitat

Grass Waterway	$5 LF	NA	FC	60 – 80%	**2**	Provides pretreatment, partial infiltration of runoff in suitable soil conditions, generally less expensive than extruded curb, good for small drainage areas, and relatively low maintenance requirements.
Limited Access Crossing	$5.45AC	N/A	FC	NA	**4**	Less erosions and sedimentation in the water.
Streambank Restoration	$158.97 LF	$400,000 - $600,000	FC	NA	**3**	Helps to improve habitat for the aquatic and semi-aquatic life supported by the stream, serve as a pollutant buffer, and act as a physical buffer against cattle and other animals that may trample or erode the streambank.
Bio-retention Areas	$12 SF	$240,000	FC	71 – 90%	**3**	Removes pollutants through a variety of physical, biological, and chemical treatment processes.
Stormwater Wetlands	$10 CY	$250,000	FC	70%	**2**	Improves water quality, flood control. Enhances wildlife, and removes pollutants through sedimentation and filtration.
Street Sweeping	$180,000	$180,000	FC	NA	**4**	Removing both the large and microscopic pollutants, such as metal particles from vehicles.
Septic System Repairs	$500 to $5,000	$75,000	FC	50 – 75%	**3**	Reduces fecal coliform from nearby streams.
Pet Receptacles	$350	$5,000	FC	NA	**1**	Helps remove bacteria, pathogens, and nutrients via stormwater runoff.

Rain Barrels	$200	$10,000	FC	NA	**1**	Reduces stormwater runoff and acts as an alternative water source.
Education Outreach	NA	NA	FC	NA	**5**	Helps to increase awareness on the importance of water quality.

As with all programs, funding is an integral component in making a program not only happen, but a success. There are numerous funding opportunities for local governments, non-profits, and individuals from federal, state, and local sources. Opportunities may include, but not limited to:
U.S. Environmental Protection Agency, GA Environmental Protection Division
http://epd.georgia.gov/section-319h-georgias-nonpoint-source-implementation-grant
U.S. Department of Agriculture
https://nifa.usda.gov/funding-opportunity/integrated-research-education-and-extension-competitive-grants-program-national
Natural Resource Conservation Service
https://www.nrcs.usda.gov/wps/portal/nrcs/ main/national/programs/financial/eqip/
U.S. Fish and Wildlife Programs
https://www.fws.gov/birds/grants/north-american-wetland-conservation-act.php
GA Environmental Facilities Authority
https://gefa.georgia.gov/water-conservation-financing
These are only a few of the many funding sources available. It is important to note that funding sources and opportunities change on a yearly basis, so always check for the most up-to-date information.

8.0 Partner Organizations and Advisory Groups

Recruitment from a number of working advisory groups was prioritized to serve on the Watershed Partnership that provided input for this WMP. Representatives include agriculture, industrial or municipal point source discharge permittees, farm products suppliers, members of local government, and landowners. The final advisory group of major stakeholders and community participants includes:

Table 9: Watershed Partnership

Name	Agency/Organization	Email
Charles R. Nimmo	SGRC	cnimmo@sgrc.us
Zach Raley	USDA – NRCS	@ga.usda.gov
Dustin Rushing	Altamaha SWCD	drushing@gaswcc.org

Eugene Dyal	Seven Rivers RC&D	eugene.dyal@bellsouth.net
Darquitta Riley	City of Broxton; Mayor	broxtoncityclerk@windstream.net
Terrell Jacobs	City of Douglas	tjacobs@cityofdouglas.com
Paul Phillips	GASWCC	pphillips@gaswcc.org
Lee Meeks	Southeast Health District Health Department	John.meeks@dph.ga.gov
District Conservationist	USDA/NRCS	
Douglas Service Center Soil Conservationist	USDA/NRCS	
Anthony Kirkland	City of Douglas Public Works	akirkland@cityofdouglas.com
Wesley Vickers	County Administrator	wvickers@coffeecountygov.com
Jimmy Kitchens	Commissioner, Coffee County	
Margaret Hampton	City Clerk, City of Broxton	broxtoncityclerk@windstream.net
Jeremy Ray Taylor	UGA County Extension Agent	jeremyt@uga.edu
Charles Ricketson	Ricketson Farms	
Henry Milhollin	Mayor of Ambrose/Milhollin Farms	ambroseclerk@windstream.net
James Strickland	Coffee County Gin Company	

The Watershed Partnership represents a collection of individuals who bring unique knowledge and skills which complement the knowledge and skills of the public in order to more effectively develop and implement this WMP. The purpose of the Watershed Partnership is to provide a forum for the public, partners, etc. to discuss potential concerns and solutions that will impact Broxton/ Roses Creeks, and to make recommendations relative to TMDLs.

The Watershed Partnership's key responsibilities were to:

- **Advise** on matters of concern to the community;
- **Contribute to the education** of the residents of the watershed on water quality issues;
- **Help identify** contributing pollution sources;
- **Assist** in arriving at equitable pollution reduction allocations among contributors;
- **Recommend specific actions** needed to effectively control sources of pollution; and
- **Help develop** and set in motion an extended plan.

9.0 IMPLEMENTATION/EDUCATION STRATEGIES AND PUBLIC INVOLVEMENT

Education is key to a successful watershed management program. The overall goal of the Implementation/Education Strategies component of the watershed improvement plan is to provide educational information to local officials, residents, contractors and developers, school children and the general public, enabling them to make decisions that will enhance the protection of the Broxton/Roses Creek watershed. Informed citizens can greatly affect the outcome of a watershed protection program. Table 6 lists the information and education strategies that will be directed towards a specific a target audience.

TABLE 10 IMPLEMENTATION/EDUCATION STRATEGIES

Information/Education Strategy			
Source	**Target Audience**	**Message**	**Delivery Mechanism**
Streambank erosion, land clearing/construction practices	Riparian landowners, builders, contractors	Encourage landowners to leave a conservation buffer, provide attractive landscaping for natural vegetation.	Information material disseminated and implement BMPs.
Cattle/livestock access	Agriculture managers, landowners	Control livestock access, establish fencing, create proper stream crossings, provide alternate funding sources	With NRCS and Conservation Districts, and other partners provide information at fairs, field days, and events, implement BMPs.
Failing septic systems	Homeowners	Properly maintain your septic system to prevent water quality degradation.	Information material, repair failing systems. disseminated to local Health Departments and landowners.
Agriculture practices	Agriculture managers, landowners	By reducing livestock access to surface water you are protecting a resource that is very valuable to everyone.	Implement BMPs and hold field days/workshops.
Cropland	Agriculture managers, landowners	By reducing erosion access to surface water you are protecting a resource that is very valuable to everyone.	Implement BMPs and hold field days/workshops.

Stormwater runoff	Local officials, residents	Protect the waterways by reducing the amount of pollutants entering the river, make public aware of where stormwater goes.	Drain markers, informative seminars for local officials, brochures for the public, tours of model stormwater site, implement appropriate BMPs.

Stakeholders are individuals who live or have land management responsibilities in the watershed, including government agencies, businesses, private individuals and special interest groups. Stakeholder participation and support is essential for achieving the goals of this watershed management plan. Table 11 will be updated periodically as Stakeholders meet and develop strategies and logistics to implement the plan.

TABLE 11 PUBLIC INVOLVEMENT

Name	Phone Number	Email

Involving Stakeholders was and will continue to be a key component in order to declare input from the public perspective in evaluating and implementing the watershed management plan. Participation provides an opportunity for Stakeholders to understand how the peer review process contributes to managing water resources. As a result of their participation, Stakeholders will become more knowledgeable advocates for decreasing nonpoint source pollution impacts.

Stakeholders' key responsibilities:

- **Provide** technical support and assistance;
- **Distribute** and share information;
- **Identify** opportunities and common concerns; and
- **Develop** public support

SGRC staff encouraged public participation in the development of this watershed management plan by inviting Stakeholders to participate in several meetings throughout the development stages. The objective of these meetings was to obtain feedback from stakeholders about the

concerns and composition of watershed activities. Staff has given presentations and information regarding the Broxton Creek WIP at public forums including the Suwannee-Satilla Water Council Meeting on February 23rd 2011. A visual stream walk was conducted by SGRC staff, Zack Railey of NRCS and Jonathan Hall of Georgia Soil and Water Conservation Commission on June 14, 2011. SGRC staff worked with Zack Railey to identify potential areas of non-point pollution and to develop locations and protocols for targeted monitoring. A meeting was held on May 19th 2017 to present the project, help identify causes and sources of pollutants, and make recommendations for the WMP. Additional meetings will be held on to provide updates and review draft sections of the WMP. Individual meetings were held before the May 19th meeting with advisory stakeholders on various dates to assess current conditions and to advise remediation techniques of pollutant sources.

Examples of Stakeholder recommendations from 2011 meetings included:

- Assemble and publicize information on those locations where water quality is good;
- Assess existing protections that these quality waters have, and understand how and why they support high quality waters;
- Identify areas where existing protection programs are not likely to be effective;
- Identify voluntary mechanisms and incentives that can improve protection where needed;
- Obtain resources to implement voluntary approaches (BMPs);
- Provide technical assistance;
- Encourage stakeholders to participate in watershed surveys;
- Publicize successful efforts and recognize successful individuals and organizations;
- Monitor to assess success; and
- Apply adaptive management to make improvements where needed.

10.0 IMPLEMENTATION/INTERIM MILESTONES

The ultimate goal of this implementation plan is to bring impaired segments in the Broxton/Roses Creek watershed into compliance with water quality standards, which will result in a listing status of supporting designated use on the 303(d) list of impaired waters. This goal will be measured by the concentration of fecal coliform and E. coli in samples, and the level of dissolved oxygen. Milestones along the way will include both water quality measurements, the implementation of BMPs, and load reductions from each BMP. Construction of BMPs will depend on opportunities presented, while milestones may be tailored to the resources available.

Although the sources are known, there is very limited data available on the effectiveness of existing and/or potential management measures available to address the pollutant sources. Furthermore, there are also limited financial resources available to stakeholders and local governments to address nonpoint sources. A list of management measures and other general actions to be implemented during the first 3 years of the plan around the Broxton/Roses Creek watershed is shown in Section 12.0 Plan Implementation, Table 10.

In order to bring Broxton/Roses Creek watershed into compliance with fecal coliform and dissolved oxygen water quality standards, milestones towards implementing BMPs are listed below. These address the watershed issues outlined in Tables 6 and 8 of this report:

BMP Strategy #1: Implement cost-share agricultural BMPs to achieve targeted water quality improvement.

Milestone #1: Educate targeted landowners in available funding and procedures for implementing BMPs on their properties.

Milestone #2: Contract with agricultural producers to install BMPs.

Milestone #3: Install appropriate BMPs such as, but not limited to, riparian buffers, exclusion fencing, stream crossings on pastures, cover crops, heavy use area protection, and filter strips.

BMP Strategy #2: Reduce polluted stormwater runoff in urban and residential areas.

Milestone #1: Educate local governments and private property-owners on the importance of reducing stormwater pollution.

Milestone #2: Propose & adopt Development & Post-Development ordinances proscribing erosion & sedimentation controls, green infrastructure (GI) and low impact development (LID) growth areas for redevelopment and new construction.

Milestone #3: Secure funding, designs, permits for GI, LID, and other regional as well as individual urban stormwater BMPs.

Milestone #4: Offer educational programs and literature through homeowners' associations and other neighborhood or civic organizations.

Milestone #5: Include water quality and stewardship activities (stormdrain markers, tours of wastewater & stormwater facilities) in local school curricula.

Milestone #6: Expand the state Adopt-a-Stream program in the watershed.

BMP Strategy #3: Implement stormwater BMPs to reduce inputs from failing septic systems (OSDS).

Milestone #1: Educate home-owners on proper maintenance, repair and/or replacement of septic systems.

Milestone #2: Local governments partner with Health Department agents to develop GIS-based inventory of septic system locations at the jurisdictional level.

Milestone #3: Provide funding resources to property-owners and/or tenants for septic system management.

BMP Strategy #4: Implement stormwater BMPs to reduce inputs from Public Works.

Milestone #1: Improve enforcement of Erosion & Sediment Control regulations.

Milestone #2: Improve efficiency of street sweeping practices.

Milestone #3: Seek opportunities for increased stormwater infiltration with more naturalized landscaping of parks and public easements.

Milestone #4: Institute pet waste receptacles on public grounds (sports complexes, parks, easements, government facilities).

Milestone #5: Reduce sanitary sewer overflows.

Milestone #6: Prevent infiltration/exfiltration from sanitary sewers.

BMP Strategy #5: Through planning and zoning activities, identify and prioritize opportunities for stream protection and restoration, and ensure that codes and design standards are "water quality friendly."

Milestone #1: Revise as necessary, plans and action lists for watershed.

Milestone #2: Review and adopt codes and design standards as needed.
Milestone #3: Encourage future development using GI & LID development guidelines.
Milestone #4: Encourage stream restoration and other suitable infiltration practices in areas of redevelopment.

BMP Strategy #6: Reduce urban and residential inputs by performing inspections, monitoring and maintenance activities to eliminate illicit discharges, ensure proper stormwater system performance and prevent pollution.

Milestone #1: Inspect all stormwater outfalls.
Milestone #2: Detect and address non – storm water/illicit discharges.
Milestone #3: Maintain and repair stormwater structures.
Milestone #4: Provide guidelines to downtown businesses regarding acceptable wastewater disposal procedures.

The objective of watershed management implementation is to restore impaired water quality to meet water quality standards. From a broader perspective, Georgia's water quality management strategy addresses three things:

1. Protection: Prevent the degradation of healthy waters.
2. Restoration: Develop and execute plans to eliminate impairments.
3. Maintaining Restored Waters: Institutionalize technical and administrative procedures to prevent or offset new pollutants.

A schedule of BMP implementation during the first 5 years is shown in Table 10.

TABLE 12 IMPLEMENTATION SCHEDULE

2016	
Measurable Milestone	**Party Responsible**
Execute Section 319(h) Grant Contract with GAEPD	SGRC, GAEPD
Convene Partnership Meeting(s) #1 with members of Watershed Partnership	SGRC & Watershed Partnership
Conduct Public Survey #1 & Update Web Site	SGRC & Stakeholders
Finalize QA/QC Water Quality Monitoring Plan	SGRC
Conduct Adopt-A-Stream Monitoring Training	SGRC
Initiate Pre-BMP QA/QC Monitoring to Detect Pollutant Sources	SGRC
2017	
Measurable Milestone	**Party Responsible**
Finalize Pre-BMP QA/QC Monitoring to Detect Pollutant Sources	SGRC
Complete Broxton/Roses Creeks Watershed Management Plan	SGRC
Convene meeting(s) #2 with members of Watershed Partnership and public Stakeholders to present and discuss funding options and BMP implementation	SGRC, Watershed Partnership & Stakeholders
Conduct Public Survey #2 & Update Web Site	SGRC & Stakeholders
Coordinate WMP implementation with home/property-owners or tenants, local governments and agricultural producers	SGRC, Watershed partnership & Stakeholders

Contract with home/property-owners or tenants, local governments and agricultural producers to develop & install agricultural, urban & septic BMPs	SGRC, Contractors
Model sediment & nutrient load reductions from BMPs.	SGRC
Conduct Field Day #1 on agricultural, septic or urban BMP	SGRC, Watershed Partnership & Stakeholders
2018	
Measurable Milestone	**Party Responsible**
Convene meeting(s) #3 with members of Watershed Partnership and public Stakeholders to present and discuss funding options and BMP implementation Present a community educational workshop.	SGRC, Watershed Partnership & Stakeholders
Coordinate WMP implementation with home/property-owners or tenants, local governments and agricultural producers	SGRC, Watershed Partnership & Stakeholders
Model sediment & nutrient load reductions from BMPs	SGRC
Conduct Field Day #1 on agricultural, septic or urban BMP	SGRC, Watershed Partnership & Stakeholders
Submit Quarterly & Final Close-Out Reports and Invoices	SGRC
2019-2021	
Measurable Milestone	**Party Responsible**
Secure funding to implement WMP	SGRC, Watershed Partnership & Stakeholders
Coordinate with Watershed Partnership & Stakeholders to promote WMP & BMP strategies	SGRC, Watershed Partnership & Stakeholders
Hold Adopt - A - Stream workshop for pre- and post-BMP water quality monitoring.	SGRC, Watershed Partnership & Stakeholders
Conduct pre-BMP monitoring	SGRC, Watershed Partnership & Stakeholders
Implement BMPs	SGRC, Landowners
Present a rural/urban educational workshop/field day & update website.	SGRC
Every Five Years (2021, 2026, 2031)	
Update Broxton/Roses Creek WMP	
Ongoing Annually	
Measurable Milestone	**Party Responsible**
Education Outreach (website, media, workshops/field days, etc).	SGRC
Encourage and install appropriate BMPs.	SGRC, Coffee County, Watershed Partnership & Stakeholders
Expand the Adopt - A - Stream Program.	SGRC, GAEPD
Improve enforcement of Erosion and Sediment Control regulations.	SGRC, Coffee County
Submit Quarterly Reports and Load Reductions.	SGRC

A reassessment of implementation priorities on Broxton/Roses Creek will be made every five years to readjust and fine-tune the targeting approach in concert with the staged implementation approach. If reasonable progress toward implementing the management practices is not demonstrated, the watershed stakeholders will consider revising implementation actions.

If it is demonstrated that reasonable and feasible management practices have been implemented for a sufficient period of time and water quality targets are still not being met, additional actions may be needed. If the watershed stakeholders determine that load reductions are being achieved, then the recommended course of action would be to continue management measure implementation and compliance oversight. If it is determined that all proposed control measures have been implemented, yet the TMDL is not achieved, further investigations will be made to determine whether: 1) the control measures are not effective; 2) loadings from fecal coliform and oxygen-demanding substances are due to sources not previously addressed; or 3) the TMDL is unattainable.

11.0 IMPLEMENTATION/CRITERIA FOR MEASURING SUCCESS

Long-term monitoring will help to close-up the data gap for the Broxton/Roses watershed. As this watershed plan is implemented, various criteria will be monitored to evaluate the impact of BMPs on water quality. This information will help verify which BMPs are most successful and determine how to proceed with or revise the management plan. Water quality monitoring to assess BMP implementation progress may also be based on a volunteer monitoring program such as Adopt-A-Stream. GAEPD will provide assistance, upon request, with setting up, designing, and implementing monitoring programs.

In order to determine the overall effectiveness of the implemented management strategies, an evaluation process is essential.

The various criteria to be considered for evaluation:

- Physical water quality monitoring;
- Chemical water quality monitoring;
- Photographic or visual evidence before and after BMP installation;
- Documentation of site BMPs installed;
- Pollutant load reduction measurements and modelling;
- Stakeholder surveys to evaluate knowledge or change in behavior; and
- Focus groups on identifying ecological, social, economic, and political indicators that measure the success and effectiveness of project activities.

12.0 REFERENCES

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https://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/devwtrplan_b.pdf

14.0 PLAN APPENDICES

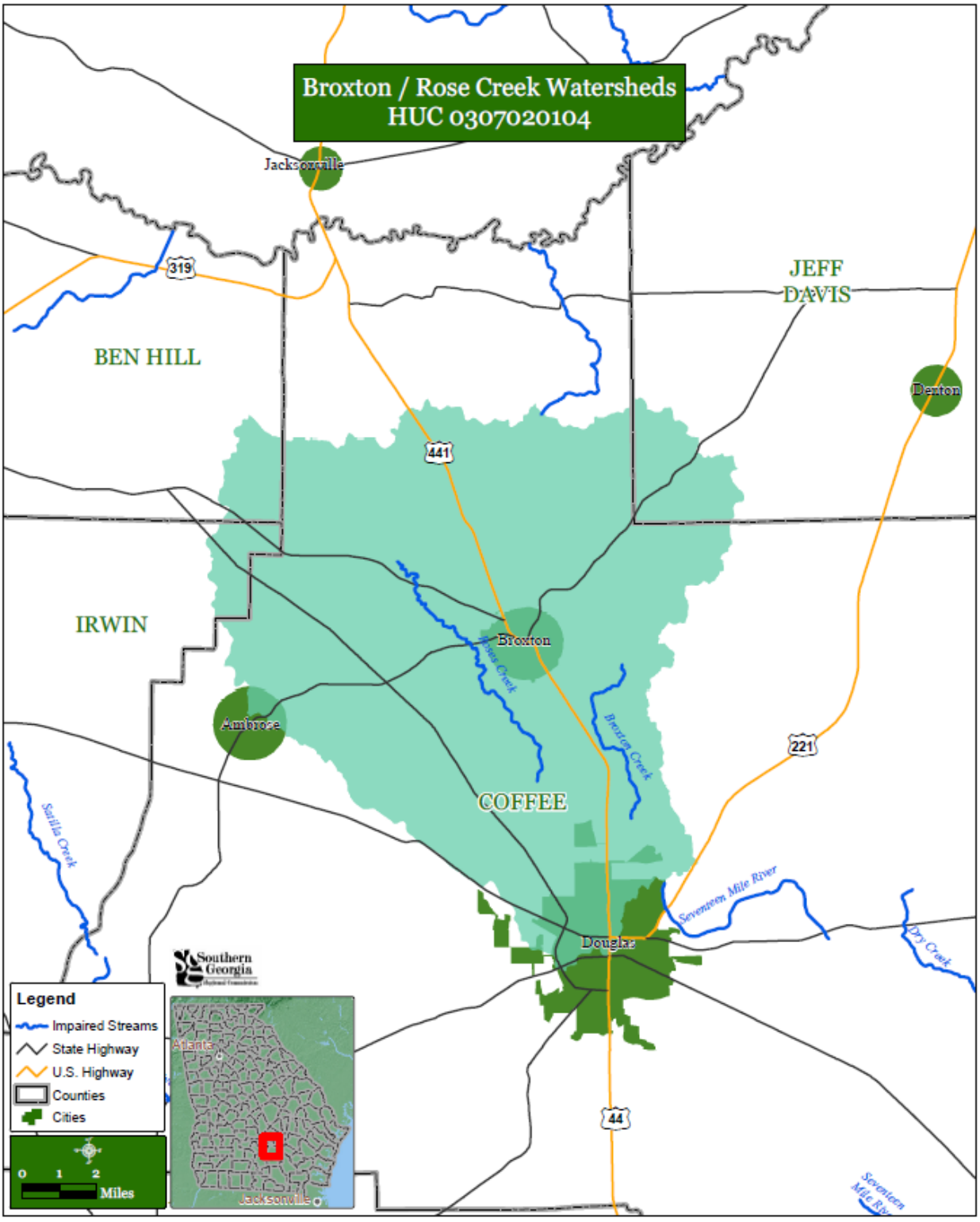
A. WATERSHED MAPS (HUC) #0307020104

B. LAND USE MAP: CURRENT

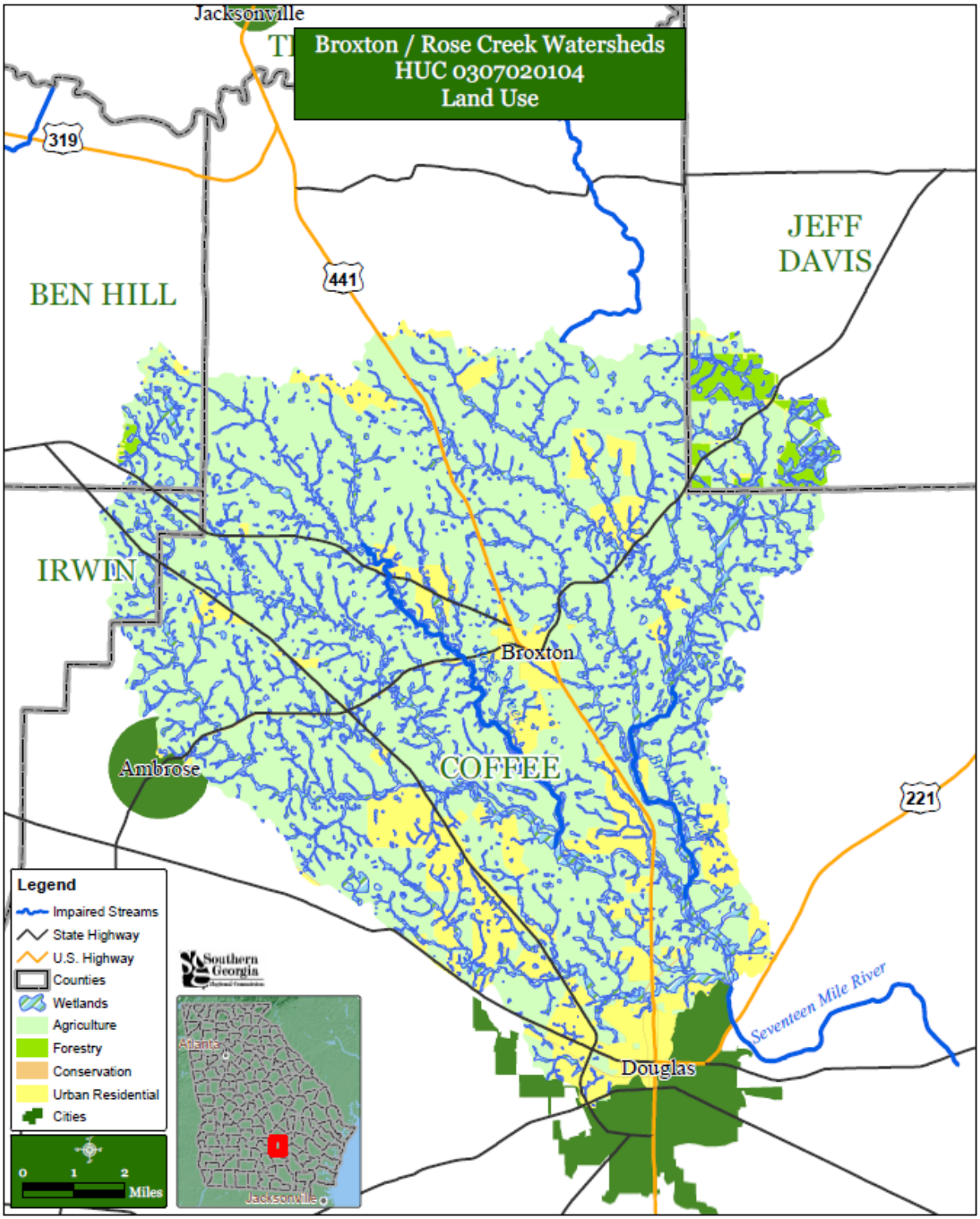
C. MONITORING DATA

D. EDUCATIONAL MATERIALS

APPENDIX A: LOCATION MAP

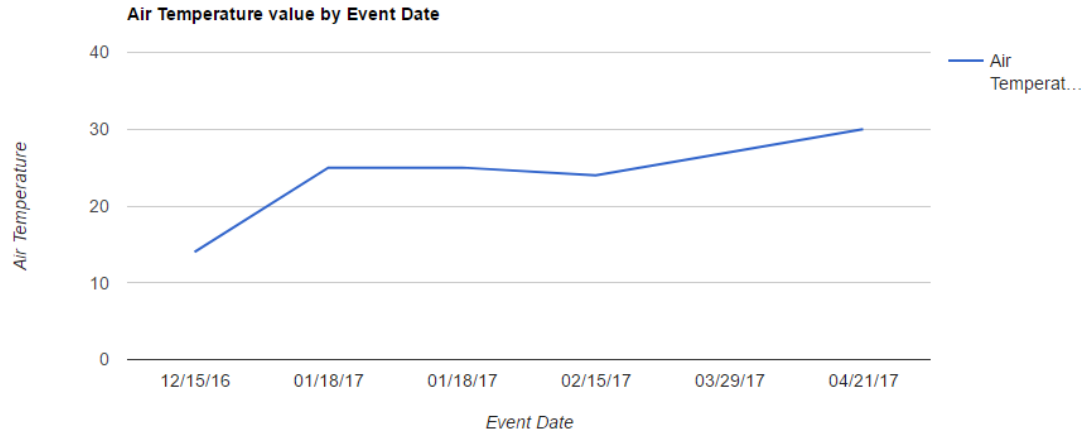


APPENDIX B: LAND USE MAP

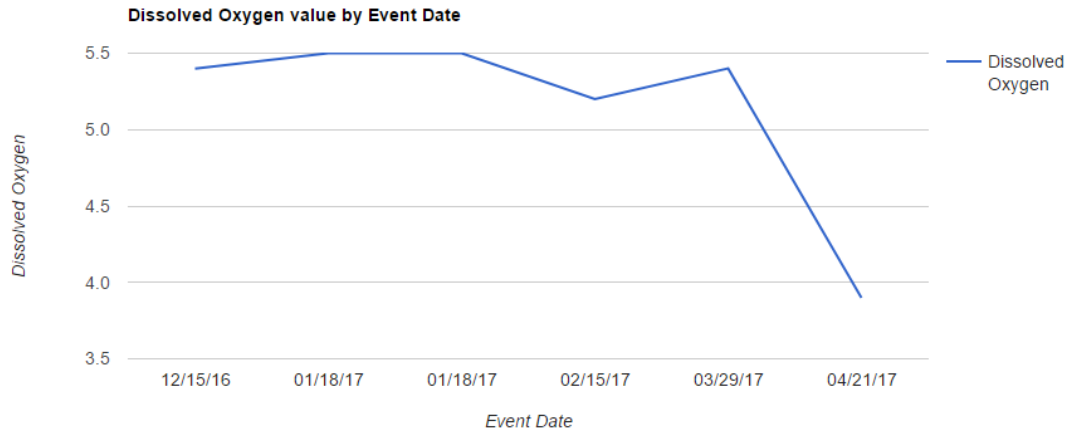


APPENDIX C: DATA
FITZGERALD HWY

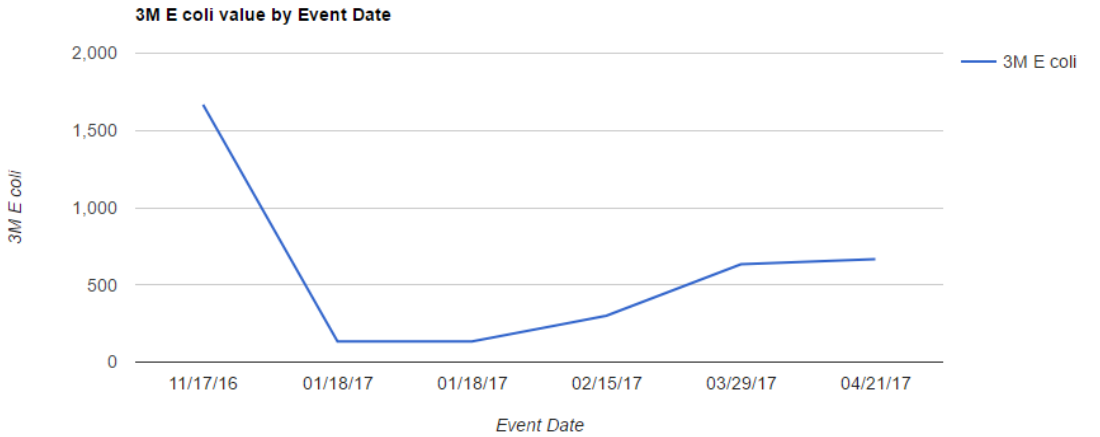
Air Temperature, °C (range 14 - 30, average 24.17)



Dissolved Oxygen, mg/L (range 3.9 - 5.5, average 5.15)

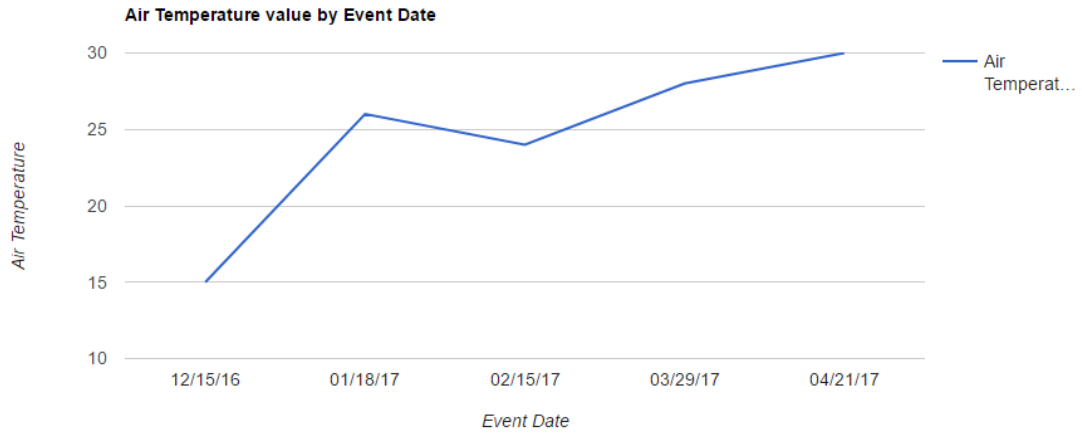


3M E coli, cfu/100 mL (range 133 - 1667, average 588.67)

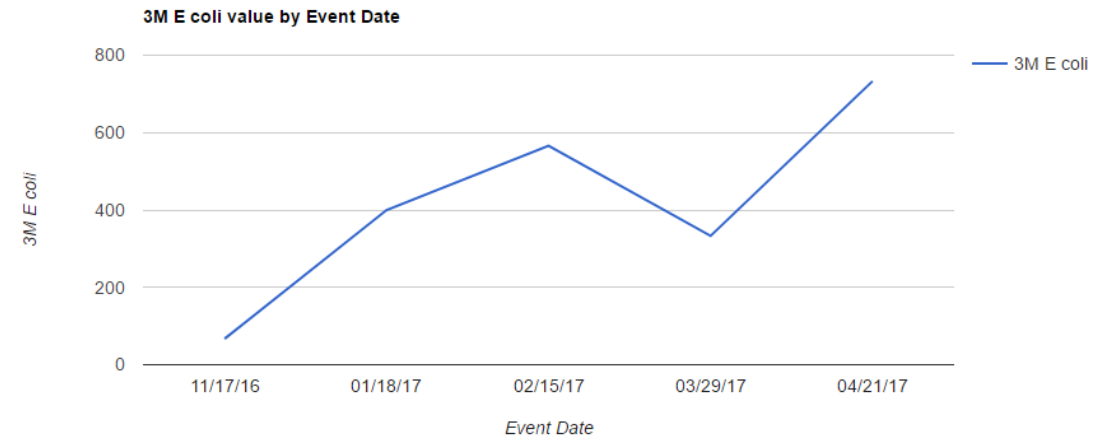


MOSLEY ROAD

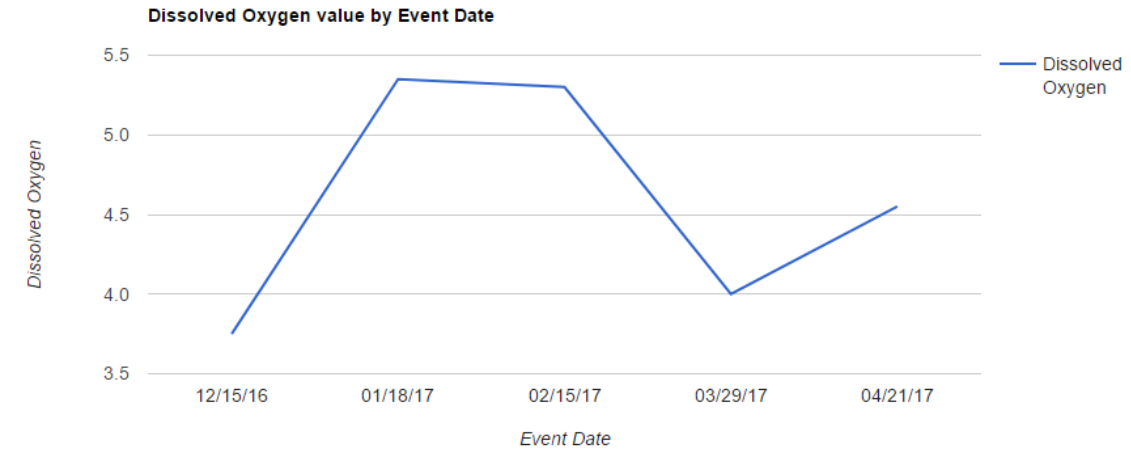
Air Temperature, °C (range 15 - 30, average 24.6)



3M E coli, cfu/100 mL (range 67 - 733, average 419.8)

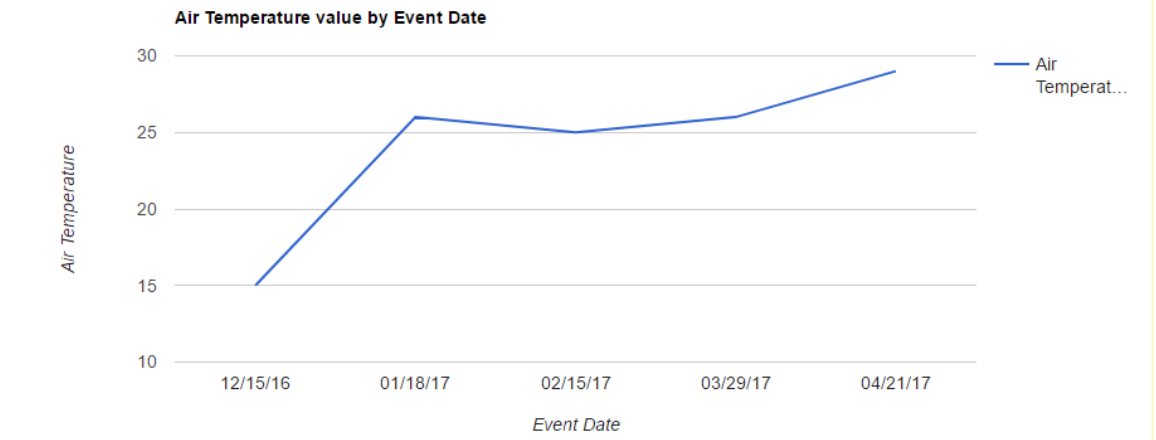


Dissolved Oxygen, mg/L (range 3.75 - 5.35, average 4.59)

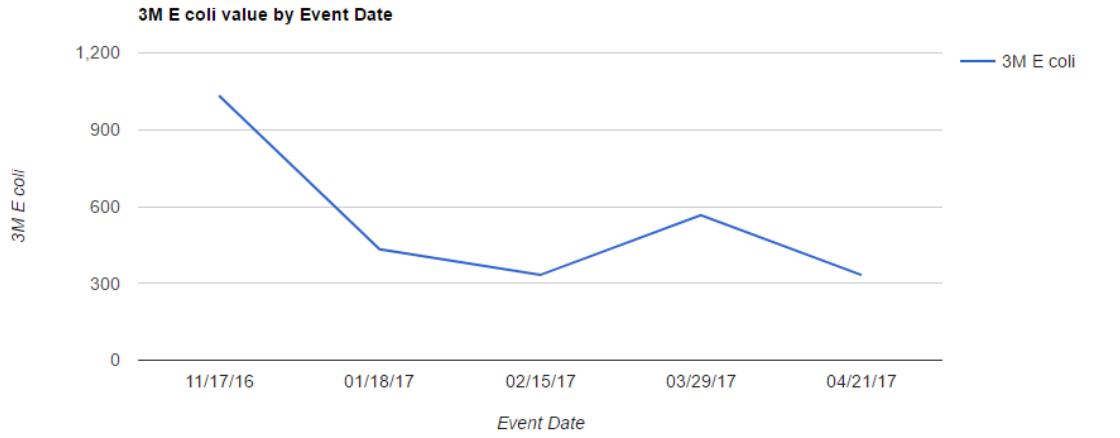


APACHE TRAIL

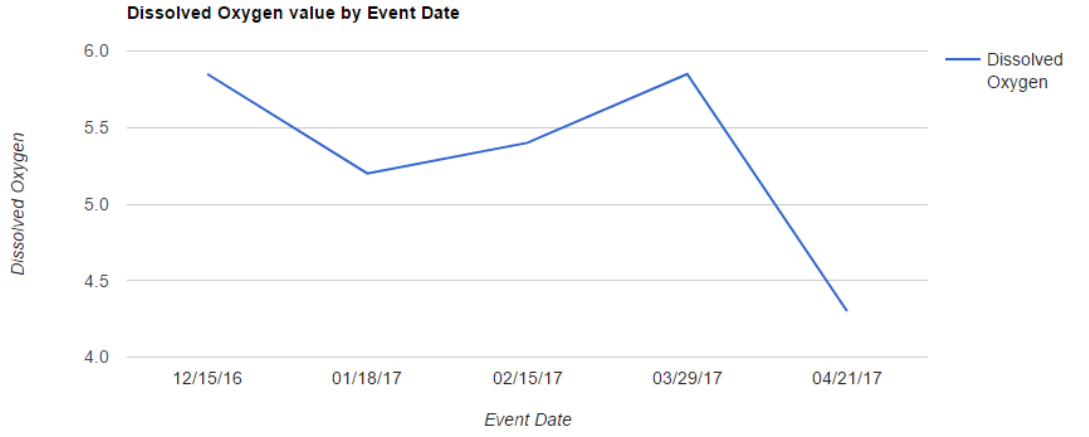
Air Temperature, °C (range 15 - 29, average 24.2)



3M E coli, cfu/100 mL (range 333 - 1033, average 539.6)

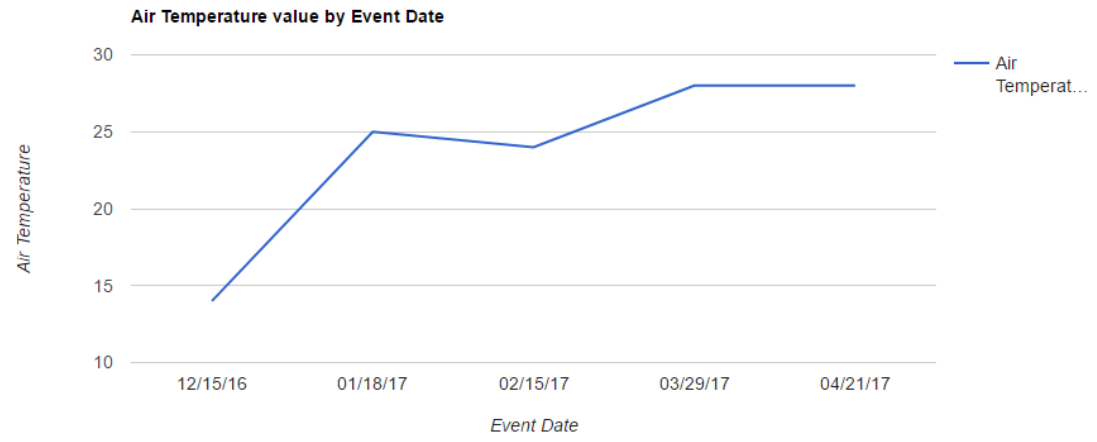


Dissolved Oxygen, mg/L (range 4.3 - 5.85, average 5.32)

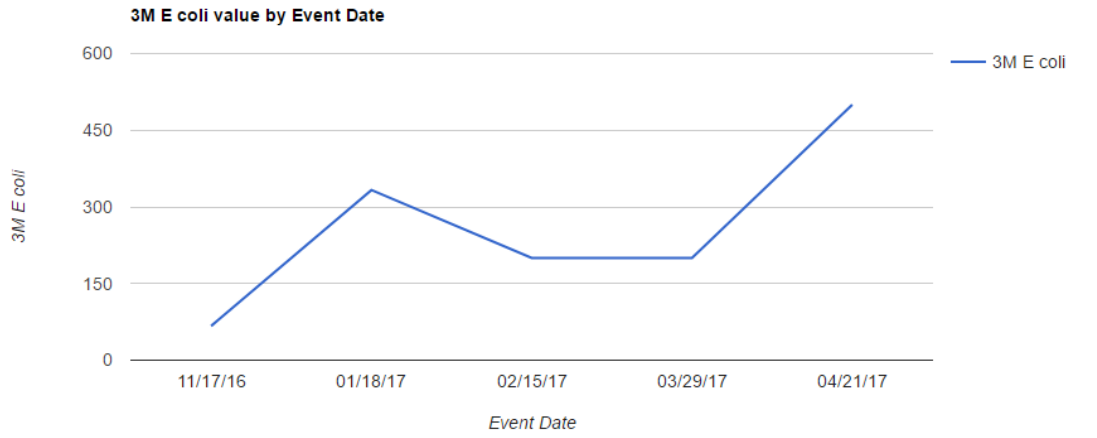


PRIVATE LANDOWNER ROAD (OFF LOTTS CROSSING)

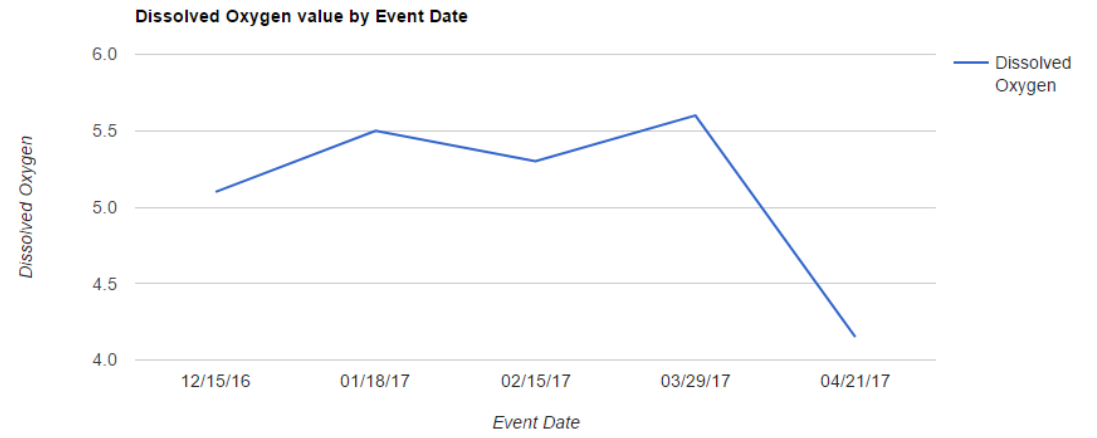
Air Temperature, °C (range 14 - 28, average 23.8)



3M E coli, cfu/100 mL (range 67 - 500, average 260)



Dissolved Oxygen, mg/L (range 4.15 - 5.6, average 5.13)



AMBROSE ROAD

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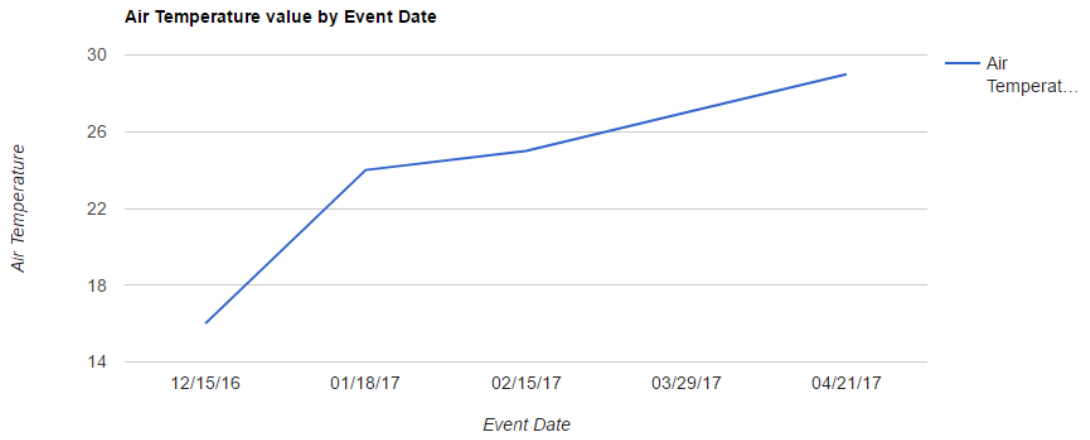
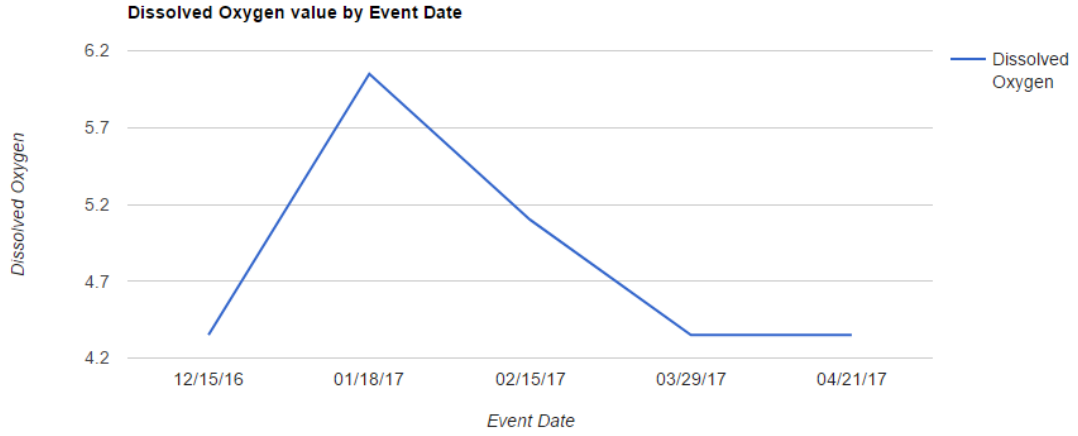
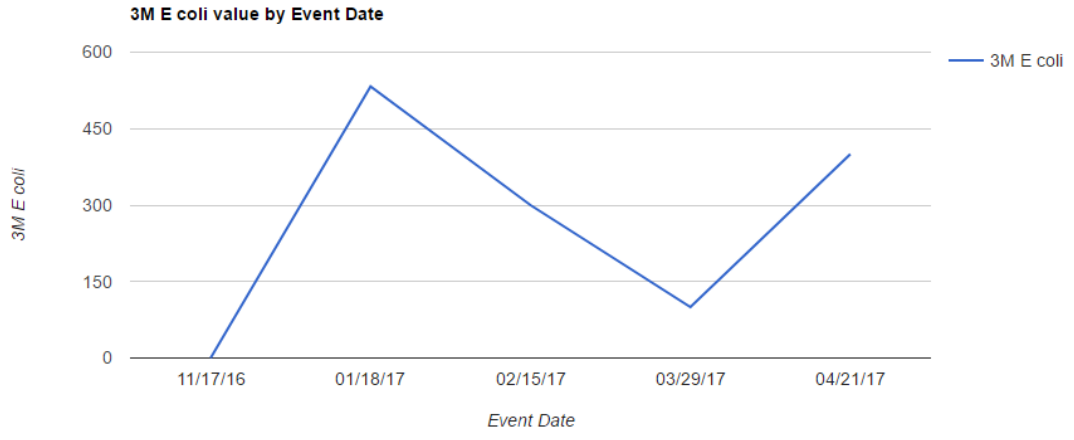


Dissolved Oxygen, mg/L (range 4.35 - 6.05, average 4.84)

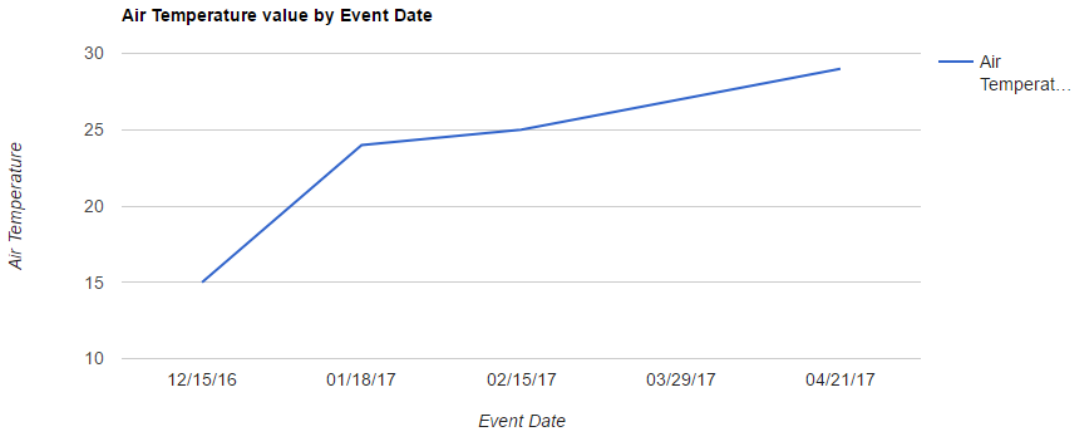


3M E coli, cfu/100 mL (range 0 - 533, average 266.6)



BROXTON WEST GREEN HWY

Air Temperature, °C (range 15 - 29, average 24)



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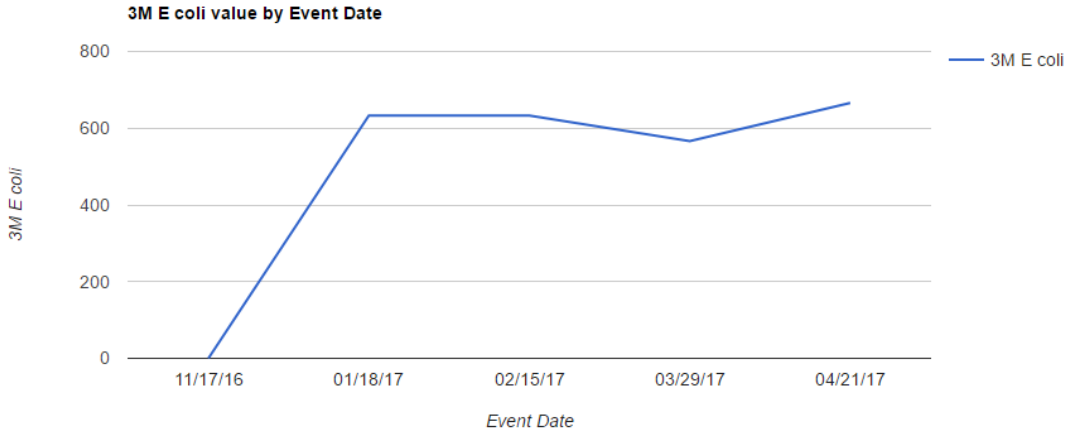
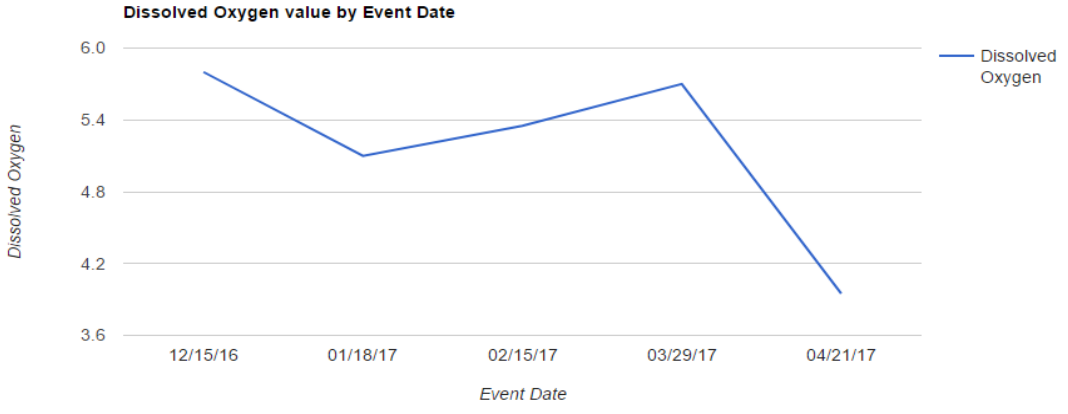


Dissolved Oxygen, mg/L (range 3.95 - 5.8, average 5.18)



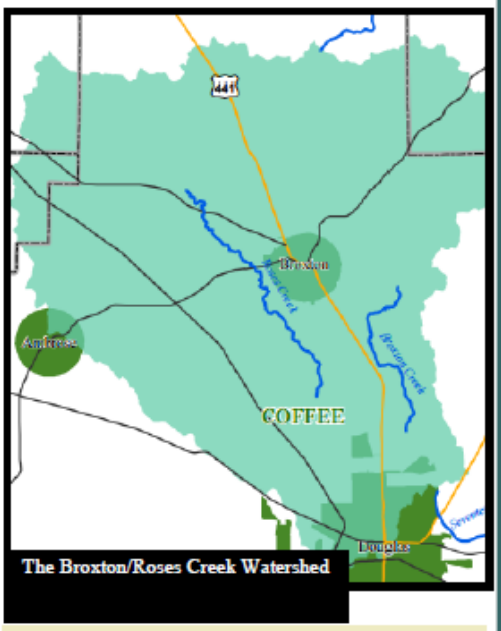
APPENDIX D: EDUCATIONAL MATERIALS

Grant Money Available for Ag Producers, Homeowners, & Businesses

Looking for assistance with projects around your farm, business, community, or even your home?

Grant money is now available to assist with projects that will improve water quality in the watershed!

Contact the Southern Georgia Regional Commission and we can work with you to determine the environmental benefit to the watershed. Grant money is only available for a limited time, so please call today!



The Broxton/Roses Creek Watershed

Eligible Projects:

- Manure Storage Facilities (stackhouses, lagoons, holding ponds)
- Grass Planting
- Cover Crops
- Exclusion Fencing
- Cross Fencing
- Septic Repair/Replace
- Heavy Use Paddocks
- Riparian Forest Buffers
- Contact us for more details!

The 319 Grant is a 50/50 cost share 100% must be paid initially, then 50% will be reimbursed by the grant.

Southern Georgia Regional Commission

Ryne Nimmo
Phone: (229) 333-5277
Email: cnimmo@sgrc.us

BROXTON/ROSES CREEK WATERSHED
319 PROJECT GRANT