

City Drainage



Developed by:

Southern
Georgia

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1.0 Introduction

The purpose of the plan is to devise a course of action aimed at restoring water quality to the impaired segment City Drainage Canal located in City of Waycross, Ware County.

The Federal Clean Water Act (33 U.S.C. §§ 1251-1387) allows the U.S. Environmental Protection Agency (EPA) to delegate authority to states to implement a technical and administrative framework for managing water quality. Those assigned responsibilities include setting water quality standards, assessing water quality, identifying waters that do not meet standards, establishing limits on impairing substances, and issuing permits to ensure consistency with those pollutant limits.

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 water body and still meet standards. That maximum amount of pollutant is called a Total Maximum Daily Load (TMDL). A TMDL is a means for recommending controls needed to meet water quality standards, which are set by the state and determines how much of a pollutant can be present in a water body. If the pollutant is over the set limit, a water quality violation has occurred. If a stream is polluted to the extent that there is a water quality standard violation, 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. Examples of “pollutants” include, but are not limited to: 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 TMDL report is reviewed by the public, revised, and then submitted to the EPA to be considered for approval

An Extended Revision is a more focused TMDL Implementation Plan which brings together many different element of watershed planning to produce a document that should lead to improvement projects aimed at restoring water quality.

Extended Revisions require the development of a process to develop and implement a Plan document for the purpose of : 1) creating the local network of partners; 2) identifying and securing the resources needed to fund and install the management practices and activities that would best achieve the pollutant load reductions needed to meet the TMDL and restore water quality; 3) verifying major sources or impairment; 4) developing a TMDL Implementation Plan that would address USEPA’s 9-key Elements of Watershed Planning; and 5) 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

The City Drainage Canal is located in the Tributary to Satilla in Waycross Georgia and encompasses 3 miles of impaired stream segment that is listed as violating FC criteria and has an evaluation of non-supporting. The City Drainage Canal is part of the Satilla River Basin.

The Satilla River basin lies in southeastern Georgia, draining nearly 4,000 square miles of upper and lower coastal plain habitat. It is a "blackwater" system, heavily laden with tannins and other natural leachates, lending a clear, "iced tea" color to the waters, contrasting beautifully and markedly to the numerous "sugar-sand" bars along its reaches. Numerous plants, fishes, amphibians, reptiles, birds, and mammals, many common, but among them rare, threatened, and endangered species, inhabit its waters, floodplain, tributary systems, and isolated upland wetlands. Historically, the river was part of a huge transportation and subsistence network for the expansive Creek Indian Nation, and its mosaic of habitats remains an important ecological link between the systems whose headwaters are the Okefenokee Swamp, to the south and west, the mighty Altamaha system to the north, and the estuaries of Georgia's Golden Isles to the east. In addition, in the past, important industries centered on timber, naval stores, and commercial fisheries flourished in the Satilla basin. Today, (primarily pulp) timber, extensive row-crop agriculture, and light manufacturing are important economic engines. The landscape and river itself are enjoyed year-round for fishing, hunting, canoeing/kayaking, and other forms of nature-based recreation. The river produces exciting largemouth bass fishing, an excellent redbreast sunfish fishery, and, in its estuary, phenomenal speckled sea trout, red drum, tarpon, shark, and flounder fishing. The Satilla/St. Andrews Sound estuary is furthermore an important pillar of penaeid shrimp (brown and white) and blue crab production, harvested commercially and recreationally.¹

Mild winters and hot summers characterize the Satilla River basin. Mean annual precipitation ranges from 46 to 54 inches per year. Rainfall is fairly evenly distributed throughout the year, but a distinct dry season occurs from mid-summer to late fall. Rainfall is usually greatest in March and least in October. The mean annual temperature is about 68 degrees Fahrenheit.

The Satilla River watershed lies entirely within the Coastal Plain. The topography of the watershed is relatively flat and is characterized by sandy, porous soils. Particularly along the coast and adjacent to the river there are extensive wetlands in the Satilla watershed. Over the past 100 years much of the land has been converted from agriculture to forest, with much of the forest cultivated pine. Modern mechanized silviculture and agricultural practices have disturbed natural

¹ **The River: [The Satilla River Where she's been; Where we want to take her](http://www.satillariverkeeper.org/river.html)**
<http://www.satillariverkeeper.org/river.html>

hydrologic regimes and soil drainage through plowing and extensive ditching, used to convert seasonally flooded wetlands.

City of Waycross and Ware County are the political jurisdictions for this impaired segment of the City Drainage Canal which is three miles in length. Land use for both is as follows:

Table 1 City of Waycross Land Use

Classification	Acreage	Percent
Total Residential	2,285.5	30.9%
Duplex	4.4	0.1%
Multi-Family	95.8	1.3%
Mobile Home	45.1	0.6%
Single Family	2,140.1	28.9%
Total Public Institutional	791.5	10.7%
Cemetery	80.1	1.1%
Church	108.7	1.5%
Public Institutional	547.2	7.4%
State of Georgia	13.8	0.2%
Medical/Health	41.6	0.6%
Ag/For	13.6	0.2%
Commercial	755.3	10.2%
Industrial	70.1	0.9%
Park/Rec/Conservation	85.4	1.2%
Trans/Comm./Utilities	905.6	12.2%
Undeveloped	471.9	6.4%
Vacant	11.1	0.1%
Unclassified	120.7	1.6%
ROW	1,893.9	25.6%
Total	7,404.5	100.0%

About one third of the land in Waycross is used for residential purposes. There are over 2,000 acres of Single family homes in Waycross. These account for the vast majority residential uses. Most residents in the City are on public sewer with a few rare instances of those still using private septic tanks.

10 % of Waycross is in commercial use. Most of the commercial uses are along major highways and in the downtown area. The largest commercial properties are located in the southern reaches of the city on US Hwy 1.

Waycross has about 70 acres in industrial use, accounting for about 1% of total land uses. Many of the industries are manufacturing such as Simmons mattress and Carolina Skiff. Other large industries include retailer, Wal-Mart, and health care Satilla Regional Cardiology Associates and Baptist Village Inc.

Accounting for about 85 acres, 1% of the land in Waycross is dedicated to Parks/Recreation/Conservation.

Very little land in Waycross is devoted to agriculture or forestry

Transportation, Communication and Utilities equal 12.2% of Waycross. The largest of which is the Rice Yard.

About 10% of Waycross is Public/Institutional. The largest of these include Okefenokee Technical College and Waycross College in the northwestern areas of the City.

There are 483 acres of undeveloped/vacant land in Waycross.

Table 2 Ware County Existing Land Use

Classification	Acreage	% of Total Unincorporated County	% of Unincorporated County Excluding Okefenokee Swamp
Ag/For	210,827	36.7%	54.3%
Commercial	1,018	0.2%	0.3%
Total Residential	24,645	4.3%	6.3%
Single Family	21,760	3.8%	5.6%
Multi-Family	24	0.0%	0.0%
Manufactured Home*	2,677	0.5%	0.7%
Estate Residential	167	0.0%	0.0%
Duplex	17	0.0%	0.0%
Industrial	873	0.2%	0.2%
Public Institutional	1,009	0.2%	0.3%
Total Park/Rec/Conservation	325,586	56.7%	36.0%
Okefenokee Swamp	185,781	32.4%	n/a
Laura S. Walker State Park	626	0.1%	0.2%
Dixon Memorial Forest	31,500	5.5%	8.1%
All Other	107,679	18.8%	27.7%
Trans/Comm./Utilities	634	0.1%	0.2%
Unclassified	0	0.0%	0.0%
Undeveloped/Vacant	3,803	0.7%	1.0%
ROW	5,421	0.9%	1.4%
Total Unincorporated Acreage	573,991	100.0%	--
Unincorporated County minus Okefenokee Swamp	388,210	67.6%	100.0%

The southern third of Ware County is comprised almost entirely of the Okefenokee National Wildlife Refuge. The Okefenokee Swamp is located in Ware, Charlton, and Clinch Counties, Georgia and Baker County, Florida. Established in 1936, the Okefenokee Swamp covers 438,000 acres and The Okefenokee National Wildlife Refuge is over 402,000 acres. The wilderness area consists of 353,981 acres and was created by the Okefenokee Wilderness Act of

1974 which is part of the Wilderness Preservation System. The Okefenokee National Wildlife Refuge is the largest National Wildlife Refuge in the eastern United States.

Of the County's 325,586 acres of Parks/Recreation/Conservation, more than half are in the Wildlife Refuge. When the wildlife refuge is excluded from the calculation, 36% of the remainder of the County is made up of Parks/Recreation/Conservation Lands, including Laura Walker State Park and Dixon Memorial Forest. Laura Walker State Park is a 626 acre State Park with nature trails, a swimming pool, campgrounds, and picnic shelters. Visitors can fish, water ski, and boat on the Park's 120 acre lake. The Dixon Memorial Forest is a very bio-diverse forest including approximately 15,000 acres of the Okefenokee Swamp and 16,500 acres of pine timberland. The stewardship management plan has the forest divided into 41 compartments containing 7 stands averaging 390 acres each within each compartment. The forest is managed as a Wildlife Management Area (WMA) by the Georgia Department of Natural Resources Wildlife Resources Division (DNR-WRD) and is the 4th largest WMA in the state.

Ware County's vast size (902 square miles) and soil conditions have been suitable for and used by large timber companies to farm timber in thousands of acre tracts covering most of the County. More than half of the land in the northern two-thirds of Ware County is currently used for agriculture or forestry. This category excludes areas that are floodplains and wetlands, therefore much of this land may be made available for other uses in the future.

Currently, about 6.3% of the land in the northern two-thirds of unincorporated Ware County is used for residential purposes, the vast majority of which are single-family detached homes. Very little land is devoted to multi-family. Manufactured Housing accounts for 0.7% of the Residential uses.

Industrial uses account for about 0.2% of the land use in northern Ware County. The majority of industry is located in the Waycross-Ware County Industrial Park northwest of Waycross next to the Waycross- Ware County Airport.

About 0.3% of unincorporated Ware County's northern acreage is in commercial use.

Other land uses include Public/Institutional, Transportation/Communication/Utilities, Undeveloped/Vacant, and Right of Way. Combined, these account for about 3% of the total land in northern unincorporated County and about 2% of the County as a whole. The largest of these uses is Right of Way.

Possible nonpoint sources for FC are wildlife, agricultural livestock, leaking sanitary sewer lines, and septic systems, and landfills

Because critical natural resources such as wetlands, streams, and floodplains are evident throughout the City of Waycross future residential, commercial, and industrial development should be discouraged and/or limited.

Significant growth on the US 1 corridor south of downtown Waycross is likely to continue in the future as the region’s economy grows.

3.0 Water Quality Impairments and Total Maximum Daily Loads (TMDL)

Water quality standards address the federal requirement “to restore and maintain the chemical, physical and biological integrity of the Nations waters” (Clean Water Act § 101). The broad term “water quality standards” encompasses the adoption of “designated uses” and specific “criteria” that indicate whether or not the uses are being achieved.

City Drainage Canal was placed on the Section 303(d) list for violating the state standards for fecal coliform (FC). Georgia’s instantaneous 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 and October and 1,000 cfu/100 ml for the months of November through April.

Table 3 2008 EPD Data

Collection Date/Time	DO mg/L	pH	Temp F	Fecal mpn/100ml
2/19/08 1:30:00 PM				330
2/26/08 1:40:00 PM	6.21	5.0	60	
3/4/08 2:00:00 PM				1100
3/6/08 2:00:00 PM	6.61	6.6	63	
3/11/08 12:55:00 PM	7.87	6.4	60	330
3/19/08 12:30:00 PM	6.96	7.2	66	265
4/23/08 12:15:00 PM	8.05	6.6	69	
5/27/08 1:10:00 PM	8.1	7.5	77	
6/17/08 12:00:00 PM	7	6.9	81	1700
6/24/08 11:30:00 AM	7.45	6.7	79	8000
7/1/08 11:20:00 AM	7.39	7.1	77	800
7/8/08 10:45:00 AM	6.62	6.9	79	1300
8/20/08 11:30:00 AM	6.52	6.6	79	3000
8/27/08 11:45:00 AM	5.46	6.5	79	2300
9/9/08 11:15:00 AM	7.34	6.2	79	800
11/4/08 1:00:00 PM				1300
11/17/08 12:45:00 PM				800
11/24/08 12:30:00 PM				500
12/2/08 12:15:00 PM				800

This TMDL has an implicit margin of safety embodied in the endpoint identification. By defining the endpoint in the same units as the impairment, concentration in mg/L at a geographic

point within the drinking water source, the TMDL assures that successfully meeting the endpoint will also eliminate the impairment. Units of percent can be used to quantify the standard TMDL equation: $LA+WLA=TMDL$. This equation describes both the allocation of allowable loading and the allocation of responsibility for reducing loading to the extent necessary to achieve the endpoint. There is minimal utility in attempting to define a precise target for loading when concentration is the important and controlling factor. However, using the data set resulting in the violation, suggests that a load reduction of approximately 46 percent would result in attainment of the standard.

4.0 Visual Surveys and Targeted Monitoring

The purpose of a visual survey is to determine if there are observable problems on the canal system and to characterize the environment the canal flows through.

Visuals were done of the canal system located within the City of Waycross at all assessable areas. Sampling was done for fecal coliform in 2005 and 2008 by Georgia DNR with the following results.

The Southern Georgia Regional Commission Environmental Planning Department took samples for E. coli during July and August at different locations those numbers are as follows:

Table 4 Sampling Data

Waycross Canal	
July 1, 2009 E. Coli Samples	
Sample Location	E. Coli Count
City Boulevard 1	166
City Boulevard 2	399
Central Avenue	99
Morningside Drive 1	233

Waycross Canal	
July 29, 2009 E. Coli Samples	
Sample Location	E. Coli Count
Morningside Drive 2	0
Screven Avenue	168

Waycross Canal	
July 29, 2009 E. Coli Samples	
Sample Location	E. Coli Count
Morningside Drive 2	266.664
Screven Avenue	399.996

5.0 Identification and Ranking of Significant Sources of Implementation

The nonpoint sources of fecal coliform are thought mainly to come from stormwater runoff. Through visual surveys a distinct source could not be identified. The fact that stream banks are showing signs of erosion, along with several veterinarian offices located in the area were discussed at meetings and felt to be among the more possible leading causes along with possible failing septic tanks. The area around the wastewater plant is also a little suspect but no spills or leakages have been detected. All sources of implementation are focused in the Waycross/Ware County area due to the location of the impaired stream in the City Drainage Canal.

Table 5 Sources of Impairment

Source	Extent (Miles, acres, etc.)	Estimated Contribution (Rank 1-5)	Stakeholder Opinion (1-5)	Comments
Storm water Runoff	3,200	5	5	Stormwater runoff is perhaps the largest source of fecal coliform in the watershed. The primary sources of fecal coliform bacteria include pet waste, wildlife, septic systems, illicit discharges,
Failing Septic Tanks	1,000	4	4	Older septic tanks often malfunction.
Wildlife	NA	3	3	Wildlife likely to be abundant and some in close proximity to stream
Domestic Animals	NA	2	2	Recent research has shown that much of the fecal coliform bacteria contamination from urban areas may come from domestic pets.
Wastewater Pollution Control Plant	NA	1	1	

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)

Existing Management Measures are summarized below:

Table 6 Existing Measures

Regulation/Ordinance	Responsible Government, Organization, or Entity	Description
Storm Drainage Evaluation	Ware County/City of Waycross	Monitors integrity of storm drainage system
Soil Erosion & Sedimentation Plan	Ware County/City of Waycross	State model ordinance adopted by County-BMP
Stream Buffers/Agricultural Buffers	Ware County/City of Waycross	Provides a 25foot minimum protective buffer along the City Drainage Canal
Septic Tank Ordinance	Ware County/City of Waycross	Requires permit for new septic tanks
Land Use Plan	Ware County/City of Waycross	Estimated 20 year future land use
Protected River Corridor	Ware County/City of Waycross	Regulates development of areas and disturbance of land designated as protected river corridors
Wetland Ordinance	Ware County/City of Waycross	Regulates development of areas designated as wetlands as defined by the Army Corps of Engineers
Groundwater Recharge Area Ordinance	Ware County/City of Waycross	Regulates development of area designated as high pollution susceptibility due to their location

7.0 Recommendations for Additional Management Measures

Development of effective management measures depends on accurate source assessment. Coliform bacteria are contributed to the environment from a number of categories of sources including human, domestic or captive animals, agricultural practices and wildlife. Coliform bacteria from these sources can reach waterbodies directly through overland runoff, or through sewage or stormwater conveyance facilities. Each potential source will respond to one or more management strategies designed to eliminate or reduce that source of coliform bacteria. Each management strategy has one or more entities that can take lead responsibility to effect the strategy.

Education is the key to a successful watershed management program. The overall goal of the Information and Education Strategy component of the watershed improvement plan is to provide educational information to local officials, shoreline residents, contractors and developers, school children and the general public, enabling them to make decisions that will enhance the protection of the City Drainage Canal. Informed citizens can greatly affect the outcome of a watershed protection program.

Table 7 lists the information and education strategies that will be directed towards a specific a target audience.

TABLE 7 Implementation/Education Strategy

Information/Education Strategy			
Source	Target Audience	Message	Delivery Mechanism
Stream bank 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.
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.
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.

Table 8 Additional Management Measures

BMP	Cost (Per unit)	Est. Total Cost	Impairment Addressed	Load Reduction (%)	Stakeholder Support (1-5)	Benefits
Enact septic tank cleanout program ordinances	\$200	\$200	FC	10-25%	3	Will achieve reductions in pathogens and nutrient loads
Amend local land development codes to address stormwater quality control for new and redevelopment	\$500	\$500	FC	>75%	5	Application of stormwater quality controls adequate to meet Georgia Stormwater Management manual standards.
River Kids Program	\$100 per school		FC	10%	1	For use in schools for education and public service
Septic tank failure detection and correction programs/ordinances	\$2,500		FC	>50-75%	4	Failure detection and correction programs should achieve reduction in pathogen and nutrient loads
Stormwater Management Plan		\$15,000	FC	50-75%	4	
Stream Bank Restoration	NA	NA	FC	25-50%	4	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 stream bank.
DRI Implementation		\$1000	FC	15%	2	Reduces erosion and runoff.
Enact Phase 1 and 11 NPDES Stormwater Permit requirements for illicit discharge detection and	\$1,500		FC	25-50%	1	Application of required illicit discharge detection and elimination activities should achieve reduction in all major contaminant loads from spills,

elimination in permitted developed areas. Voluntarily enact in unpermitted developed areas.						illicit discharges, and wastewater leaks in areas where applied
Pet Receptacles	\$350	\$5,000	FC	5%	2	Helps remove bacteria, pathogens, and nutrients via stormwater runoff.
Rain Barrels	\$200	\$10,000	FC	5%	1	Reduces stormwater runoff and acts as an alternative water source.

8.0 Partner Organizations and Advisory Groups

An Advisory Group recruitment from a number of working group partners were prioritized to also serve to provide input for this extended revision. Representatives include agriculture, industrial or municipal point source discharge permittees, forest products firms, members of local government, and landowners. One organization that would be an asset for the future and needs to be included is the school/ BOE which includes, science clubs, and outdoor classrooms that would be an asset by bringing in new ideas for implementation, and take these ideas back to the classrooms and into their homes reaching an even larger audience.

Table 9 Advisory Committee:

Name	Address	City	State	ZIP	Email
Chris Faulkner	4220 International Parkway, Ste. 101	Atlanta	GA	30354	Chris, Faulkner@dnr.state.ga.us
Janice McKinnon	1725 South GA Parkway, W	Waycross	GA	31503	jrmckinnon@sgrc.us
Chris Mock	1725 South GA Parkway, W	Waycross	GA	31503	rcmock@sgrc.us
Frank Baugh	P.O. Drawer 99	Waycross	GA	31503	
Scott Murphy	P.O. Drawer 99	Waycross	GA	31503	smurphy@esginc.net
Wayne Kilmark	P.O. Box 1069	Waycross	GA	31502	wkilmark@warecounty.com
Wilton Deloach	P.O. Drawer 99	Waycross	GA	31503	wdeloach@waycrossga.com

The TMDL Advisory Group is a collection of individuals who bring unique knowledge and skills which complement the knowledge and skills of the public in order to more effectively accomplish this revision. The purpose of the TMDL Advisory Group is to provide a forum for

the public, partners, etc. to discuss potential concerns and solutions that will impact City Drainage Canal and to make recommendations relative to TMDLs.

The Advisory Group’s key responsibilities are 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.

The initial meeting was held March 13, 2008, and a second meeting was held October 1, 2008. Three Stakeholder meetings were held May 28, 2009, July 30, 2009, and September 24, 2009.

9.0 Public Involvement

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 TMDL effort.

Table 10 Stakeholders

Name	City	State	Zip	Email
Ricky Sweat,	Baxley	GA	31513-0127	Ricky.sweat@ga.usda.gov
Joey Futch	Baxley	GA	31513-0058	Joey.futch@ga.usda.gov
Terry A Dillard				terry@wayxcable.com

Building partnerships was a key component in order to declare input from the Stakeholder perspective in evaluating the extended revision; and to provide an opportunity for Stakeholders to understand how the peer review process contributes to the development of TMDL plans and results. As a result of their participation Stakeholders became knowledgeable advocates for the role to help manage or decrease nonpoint source pollution impacts.

Stakeholder’s key responsibilities were to:

- **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 TMDL Plan by creating displays and placing them in prominent areas of the Ware County Courthouse and City of

Waycross City Hall foyer. The displays included a large map of the complete drainage canal with violated segment highlighted for easier viewing along with a listing of Stakeholder meeting dates, times and place. An Adopt-A-Stream Workshop was held on May 12, with invitations being mailed to potential stakeholders. Seven (7) participants attended workshop.

Three Stakeholder meetings were held on the following dates; May 28, 2009, July 30, 2009, and September 24, 2009. All meetings were advertised as PSAs on local radio stations and as PSAs on local television stations.

10.0 Interim Milestones

The ultimate goal of this implementation plan is to bring the City Drainage Canal into compliance with water quality standards, which will result in its removal from the 303(d) list of impaired waters. This goal will be measured by the concentration of fecal coliform and E. coli in samples, but milestones along the way will include both water quality measurements and the implementation of BMPs. Implementation goals must keep in mind the TMDL allocation goals. At the same time, practicality must be considered. For example, retrofitting, urban land can be difficult and costly, as urban areas have few sites suitable for the construction of large-scale BMPs. The construction of BMPs in the urban area will be to some extent dependent on opportunities presented.

GOAL#1: Reduce inputs in urban, rural and residential areas through education.

Objective: Educate homeowners in funding available for forested buffers.

Objective: Include education about water quality and stewardships in local school curricula.

Objective: Offer educational programs and literature through homeowner's associations and other neighborhood or civic organizations.

Objective: Implement the River Kids Program in local schools for educational and public service.

GOAL #2: Implement stormwater management practices to reduce inputs from public works.

Objective: Conduct regular testing along canal at intervals from wastewater Treatment Plan.

Objective: Possible retention ponds to be used to separate pollutants from stormwater runoff before entering canal.

Objective: Reduce sanitary sewer overflows.

GOAL #3: Identify and prioritize opportunities for stream protection and restoration.

Objective: Reexamine and possibly improve existing buffer regulations.

Objective: Educate and encourage local governments to apply for grants for stream bank restoration.

11.0 Recommendations for Monitoring and Criteria for Measuring Success

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

The various methods should be considered for evaluation:

- Physical water quality monitoring;
- Chemical water quality monitoring;
- Biological life measurements;
- Photographic or visual evidence, before and after photos;
- Documentation of site BMPs installed;
- Pollutant loading measurements;
- Stakeholder surveys, evaluate knowledge or change in behavior; and
- Focus groups, to determine effectiveness of project activities.

The City of Waycross should conduct sampling each year as BMPs are being implemented. This information will help verify which BMP projects are most beneficial. This information will be used not only in determining how to proceed or revised the management plan, but also in other nearby watersheds.

According to EPA standards, monitoring is recommended at rotation sites throughout the watershed as well as biological and habitat assessments every two years. The monitoring program to assess 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.

Additional monitoring will be included in grants requested for specific urban/rural BMPs, and additional field measurements for estimating reductions in FC loading due to restoration activities.

12.0 Plan Implementation

The objective of TMDL 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.

Table 11 Implementation Schedule

2009	
Measurable Milestone	Party Responsible
Complete final TMDL Extended Revision	SGRC
2010	
Coordination and liaison with Citizens, Stakeholders and Advisory Groups	SGRC
Present a community educational workshop	SGRC
Educate City of Waycross on importance of stream bank restoration and possible 319 funding from GA EPD	SGRC EPD
2011	
Coordination and liaison with Citizens, Stakeholders and Advisory Groups	SGRC
Assist City of Waycross with 319 application for stream bank restoration funding	SGRC
Hold Adopt-A-Stream workshop	SGRC, EPD
Detect and eliminate illicit discharges	City of Waycross
2012	
Coordination and liaison with Citizens, Stakeholders and Advisory Groups	SGRC
Hold Adopt-A-Stream workshop	SGRC
Detect and eliminate illicit discharges	City of Waycross
Present a community educational workshop	SGRC
2013	
Coordination and liaison with Citizens, Stakeholders and Advisory Groups	SGRC
Organize and implement education and outreach programs	SGRC
Detect and eliminate illicit discharges	City of Waycross

After a three year period 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) fecal coliform loads are due to sources not previously addressed; or 3) the TMDL is unattainable.

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, U.S. Department of Agriculture – Natural Resource Conservation Service, U.S. Fish and Wildlife Programs, and GA Environmental Facilities Authority. 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.

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14.0 Plan Appendices

- A. Nine-Key Element Summary**
- B. Watershed Maps**
- C. Land Use Maps: Current and Future**
- D. Pictures and Field notes**
- E. Copies of public notices etc.**

Appendix A: Nine (9) – Key Element Summary

Beginning with FY03 grants, the United States Environmental Protection Agency (EPA) requires all implementation, demonstration, and outreach – education projects funded under Section 319 of the federal Clean Water Act to be supported by a Watershed Plan which includes the following nine listed elements. To be eligible for Section 319 funding watershed plans must address all nine elements. The nine EPA required elements, and the location of the plan component addressing these elements are listed below.

A. An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed based plan (and to achieve any other watershed goals identified in the watershed based plan), as discussed in item (b) immediately below. Sources that need to be controlled should be identified at the significant subcategory level with estimates of the extent to which they are present in the watershed (e.g., X numbers of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation).

- Causes of pollution in the watershed that will need to be controlled are found in Section 3.0 Water Quality Impairments and Total Maximum Daily Loads (TMDLs) and 5.0 Identification and Ranking of Significant Sources of Implementation of the completed watershed improvement plan. The nonpoint sources of fecal coliform are thought mainly to come from stormwater runoff. Through visual surveys a distinct source could not be identified. The fact that stream banks are showing signs of erosion, along with several veterinarian offices located in the area were discussed at meetings and felt to be among the more possible leading causes along with possible failing septic tanks. The area around the wastewater plant is also a little suspect but no spills or leakages have been detected. All sources of implementation are focused in the Waycross/Ware County area due to the location of the impaired stream in the City Drainage Canal.

B. An estimate of the load reductions expected for the management measures described under paragraph (c) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time). Estimates should be provided at the same level as in item (a) above (e.g., the total load reduction expected for dairy cattle feedlots; row crops; or eroded streambanks).

- Estimates of the load reductions expected for the management measures recommended for implementation are found in Section 7.0 Recommendations for Additional Management Measures of the completed watershed improvement plan. Most load reductions recommended in Section 7.0 reflect load reductions from 10% up to 75%.

C. A description of the NPS management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.

- A description of the measurements that are recommended for implementation to achieve the estimated load reductions can also be found in Section 7.0 Recommendations for Additional Management Measures of the completed watershed improvement plan. Enacting septic tank cleanout and failure detection ordinances will help reduce pathogen and nutrient loads, investing in River Kids program will further clean water education in the school system, amending local land development codes to address stormwater control will reduce pollutants in stream and stream bank restoration will improve habitat for the aquatic life in steam and serve as a pollutant buffer.

D. An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan. As sources of funding, States should consider the use of their Section 319 programs, State Revolving Funds, USDA's Environmental Quality Incentives Program and Conservation Reserve Program, and other relevant Federal, State, local and private funds that may be available to assist in implementing this plan.

- Section 319 Grants can be utilized for Stream bank restoration, education and outreach programs conducted through the RC for minimum cost, Adopt-A-Stream workshops through DNR at minimum to no cost.

E. An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.

- Stream bank erosion, will encourage landowners to leave a conservation buffer, information material disseminated an implement BMPs
- For local officials and residents, stormwater runoff education will protect the waterways by reducing pollutants entering the river, drain markers, informative seminars, brochures for public, and tours of model stormwater sites.
- Homeowners, failing septic systems, by properly maintaining it will prevent water quality degradation, information material, repair failing systems, disseminated to local Health Departments and landowners.

F. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

- A schedule for implementing the NPS management measures identified in this plan can be found in Section 12.0 Plan Implementation. Four year program starting 2009 through 2013 describing milestone and party responsible.

G. A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.

- A description of interim, measurable milestones for the implementation phase of the watershed plan can be found in Section 6.0 Identification of Applicable Existing Management Measures which details those measures already implemented and 10.0 Interim Milestones are the measures to implemented within the next three to four year period that uses education, BMPs and grant funding to achieve.

H. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.

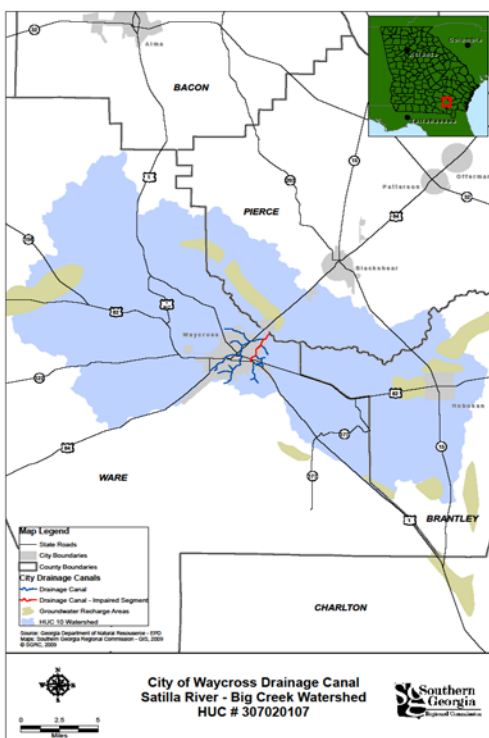
- Section 12.0 Plan Implementation contains the required set of criteria allowing for a three year period to determine if all proposed control measures have been implemented with little to no success then further investigations will need to be made to determine if new control measures are needed, or if loads of FC are due to sources not addressed, or the TMDL is unattainable.

I. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

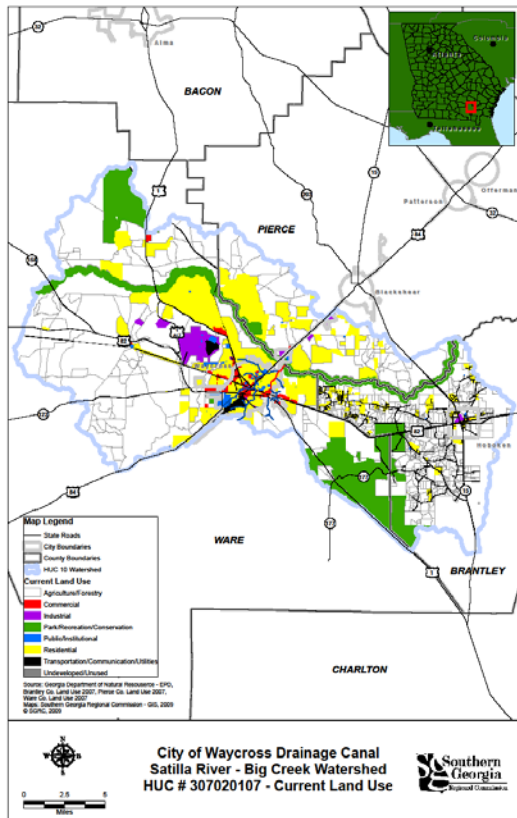
- The required monitoring component for the watershed plan can be found in Section 11, Recommendations for Monitoring and Criteria for Measuring Success.

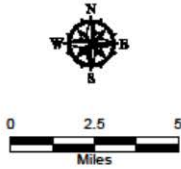
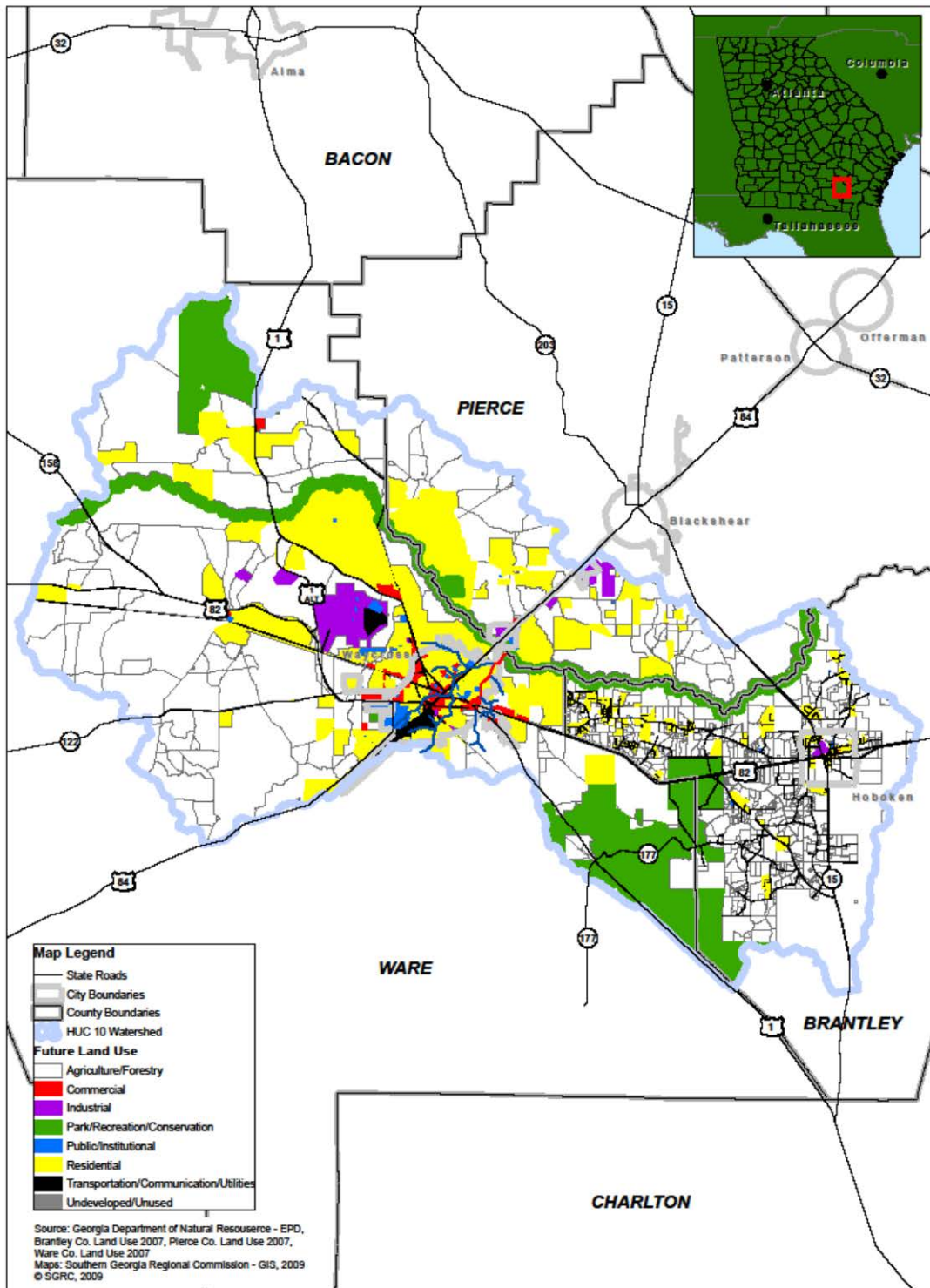
- City of Waycross recommended to sample yearly
- Additional monitoring to be included in grants as requested for specific BMPs and additional field measurements for estimating reductions in FC loading

**Appendix B Watershed Maps (HUC)
030702010704**



Appendix C Land Use Maps: Current and Future



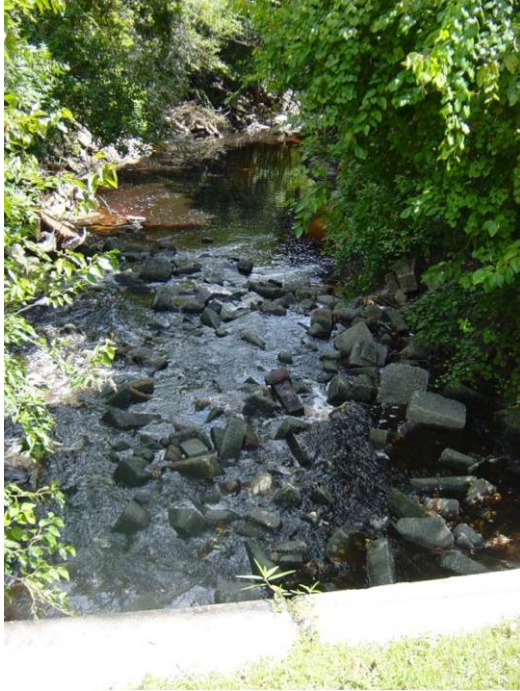


**City of Waycross Drainage Canal
 Satilla River - Big Creek Watershed
 HUC # 307020107 - Future Land Use**



Appendix D. Field Notes and Pictures






Pictures show the need for bank restoration. Fill in has been done with pieces of concrete but erosion is present in many locations.



Appendix E: Copies of Public Notices and Other Literature

DRAGON ARTS CENTER
408 Main St. Downtown, Worcester, MA



Adults: \$10.00
yeharts.com

THE WIZ
Presents
Sat. 8/1 @ 7 p.m.
Sun. 8/1 @ 9 p.m.
Adapted from "The Wizard of Oz" by L. Frank Baum. Book by William P. Brown. Directed by Charles Brannin.
Produced by special arrangement with Samuel French, Inc.

Bring This Ad And Get 20% Discount

Stakeholders needed

The purpose of stakeholders is to provide a forum for the public, partners, etc. discuss potential concerns and solutions that will improve the City Drainage Canal. City of Worcester and the Worcester Regional Drainage Canal Stakeholders will assist in developing a plan to restore the City Drainage Canal to its designated use. The Stakeholder Group provides an opportunity for groups of concerned and interested citizens to see the process through from start to finish. They will help of any concerns, pollution so they can assist in arriving at a suitable pollution reduction alternatives, and recommended specifications needed to address the control sources of pollution.

If you would like to become a stakeholder and have input into your area's TMDL, contact me with a plan for the City Drainage Canal of Worcester. We invite you to join us on the scheduled dates and times listed below.

Direct queries to Laurie McKinnon or Cheryl Wood at 912 285-6077

City of Worcester
City Drainage Canal TMDL Stakeholder Meeting Schedule

Date	Time	Place
May 28	5:00p.m.-6:30p.m.	Southeast Georgia RDC Conference Room
July 30	5:00p.m.-6:30p.m.	Southeast Georgia RDC Conference Room
September 24	5:00p.m.-6:30p.m.	Southeast Georgia RDC Conference Room

**TMDL – Extended Revision
City of Waycross Drainage Canal
Stakeholder Meeting
Southeast Georgia RDC**

May 28, 2009

Please include e-mail and phone number

Chris Mack _____ cmack@regardc.org _____ SEGA RDC

Terry A. Dillard _____ terry@waycrosscable.com _____ 912-285-2915

William DeLoach _____ wdeLoach@waycrossga.com _____ 912-287-2955

Chris Faulkner _____ EPD _____

Julie Walden _____ EPD _____

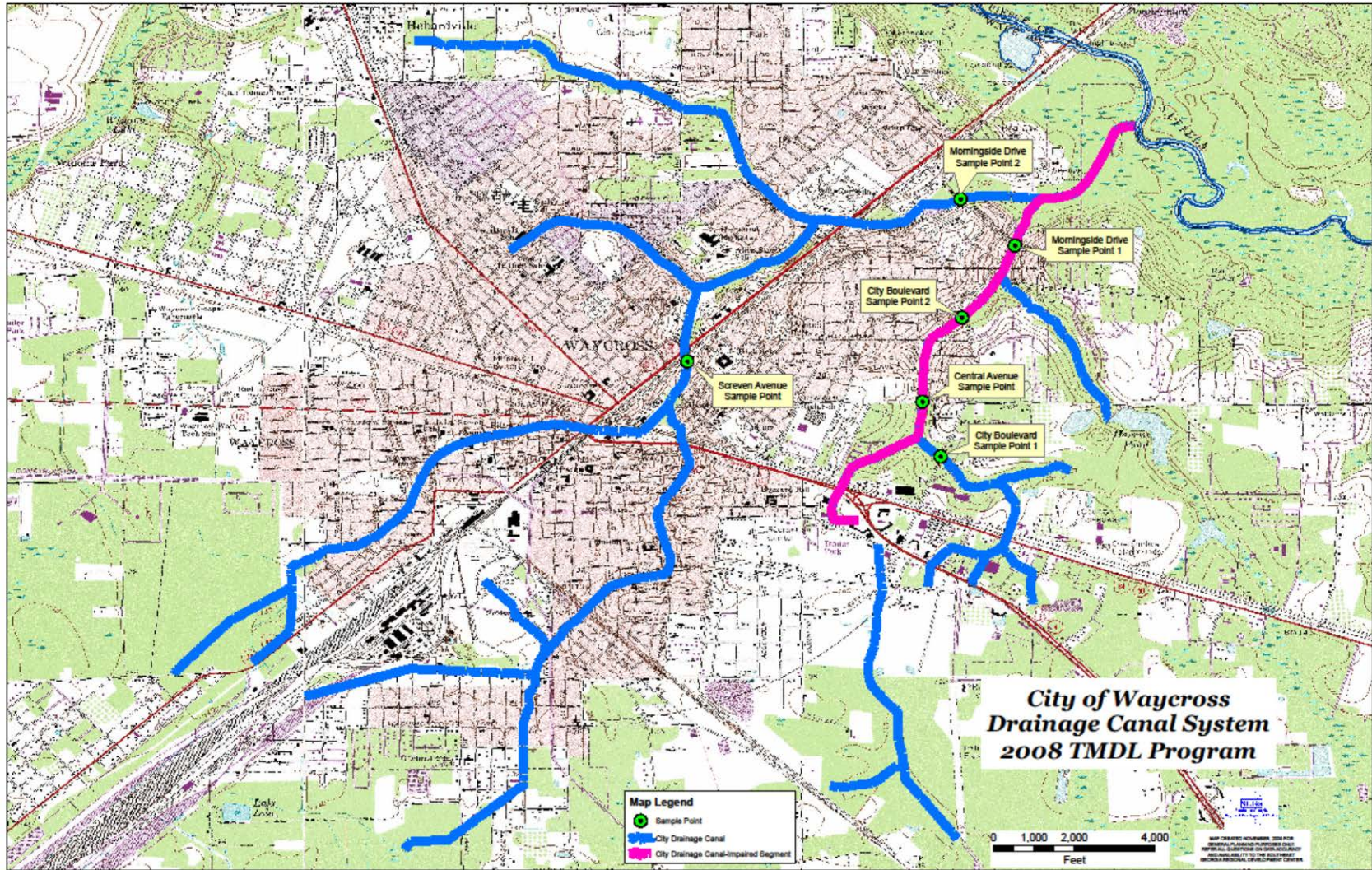
Wayne Kilmarck _____ wkilmarck@wacounty.com _____ 912/287-4379



Trash collected at clean up of the Drainage Canal
October 23, 2009







**Adopt-A-Stream
Chemical Workshop Outline
Southeast Georgia Regional Development Center
May 12, 2009**

I. Introduction 8:30 – 9:00

Goals of Program
Georgia Adopt-A-Stream, what is it?
Water Quality Impacts

II. Getting Started 9:00 – 9:45

Review “Getting To Know Your Watershed” Manual
Introduction, Local Partners, Who To Call
Registration
Map Assessment and Watershed Survey
“Stream Walk” video
Visual Survey, Litter Pick Up, Public Outreach

III. Break 9:50-10:00

IV. Classroom Discussion of Chemical Parameters 10:00 – 10:45

Basic Tests – DO, pH, Temperature, Conductivity
Advanced Tests – Alkalinity, Nitrate-nitrogen, Phosphate, etc.
Discuss Trend Monitoring, Importance of Quality Assurance
Data flow
Brief intro to bacteria and monitoring

V. Field 10:45 – 12:00

Review Watershed and Visual Stream Survey
Conduct Chemical Tests

VI. Review and take QA/QC Test 12:00 - 12:30

Power Point used at educational workshop at local middle school and for stakeholder meeting.

11/17/2009

Waycross City Drainage Canal

Definitions

A watershed is an area that drains into an estuary, lake, stream or into groundwater.

A term used to describe water that originates during precipitation events. It becomes a concern because of the potential contaminants that the water is carrying (water pollution).

A value of the total amount of pollutant that a body of water can receive while still meeting water quality standards. The Waycross City Drainage Canal is listed as over the TMDL for fecal coliform.

A term for polluted runoff that comes from so many places that it's hard to "pinpoint" a source.

- Storm water and rainfall wash off
- Agriculture
- Animal Operations

How do we in Waycross cause nonpoint source pollution?

- Trash not disposed of properly
- Leaking septic tanks
- Fertilizers and animal wastes (including dogs) which contain nutrients that "feed" algae and other aquatic plants harmful to water quality
- Dumping motor oil, paint, insecticide, or other dangerous materials. Did you know that a single quart of motor oil can pollute 2 million gallons of water?

A term for polluted runoff that comes from a single localized source.

- Raw sewage
- Leaking septic tanks

Where does the stormwater go in my neighborhood?

- Whether it goes into a storm drain, or directly into a drainage ditch, it all eventually makes its way into the Waycross City Drainage Canal.
- From there it goes into the Satilla River and directly to the Atlantic Ocean after picking up pollution from your neighborhood and city.

11/17/2009

Natural Environment Versus Construction

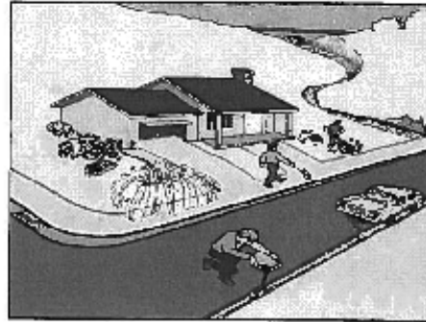
- When natural areas are replaced by impervious surfaces (such as concrete & asphalt) the rain that falls in an average rain storm is forced to behave differently.
- More rainfall becomes stormwater runoff because less infiltration (permeability) and less interception (sources of evaporation) takes place.
- In areas such as Weycross, small storms can result in large amounts of stormwater runoff because there are not many places for the rainfall to soak into the ground or evaporate.

Natural Environment Versus Construction

- The larger amount of stormwater runoff is forced to fit into the existing stream channel. For this to take place the runoff water must travel at a faster speed in the stream channel.
- The larger amount of water travelling faster in the stream channel increases the risk of flooding and increases the amount of erosion taking place in the stream channel.

Natural Environment Versus New Construction

- The larger amount of water travelling faster also picks up additional sediment (causing erosion), as well as pollutants from the streets and sidewalks.
- Because there is less vegetated surface in an urban setting such as Weycross, the pollution is less likely to be filtered out before it is carried downstream to the Sati'la River and the Atlantic Ocean.



What can I do to help?

- Put trash in a trash can
- Maintain septic tanks
- Leave grass clippings on lawn to reduce need for commercial fertilizers
- Pick up animal waste
- Dispose of motor oil, paint, insecticide and other dangerous materials properly
- Practice proper crop and animal management

Conserving Water

Test Your Water Sense

11/17/2009

The average family of four uses approximately _____ gallons of water a day?

400

It may seem hard to believe, but the average person uses 100 gallons of water each day—that's enough to fill 1,600 drinking glasses. This water use can easily be cut by as much as 30% by taking a few simple steps.

A. 50
B. 100
C. 250
D. 400

How much of the water on earth is available for people's everyday use?

Less than 1%

About 75% of the earth's surface is covered by water, but less than 1% of this is available for people to use. The rest is saltwater, locked in inaccessible locations underground, or is frozen in polar ice caps or glaciers.

A. More than 50%
B. 28%
C. Less than 1%
D. 12%

What percentage of the earth's water is fresh?

Only 3% of the earth's water is fresh!

A. 10%
B. 3%
C. 20%
D. 25%

How much water can you save per day by turning off the tap while brushing your tooth in the morning and at bedtime?

Up to 8 gallons

The average bathroom faucet flows at a rate of 2 gallons per minute. By simply turning the tap off, you can save more than 100 gallons of water per person each month.

A. Up to 4 gallons
B. Up to 8 gallons
C. Up to 6 gallons
D. Up to 2 gallons

Which of the following uses less water?

Taking a 5 minute shower

This uses 10 to 25 gallons of water, while a full tub requires about 70 gallons. If you take a bath, stopper the drain immediately and adjust the temperature as you fill the tub.

A. Taking a 5 minute shower
B. Taking a bath

In the average household, which of the following wastes the MOST water each day?

A leaky toilet

A leaky toilet can waste about 200 gallons of water a day! To tell if your toilet is leaking, place a drop of food coloring in the tank. If the color shows in the bowl without flushing, you have a leak!

A. Running the tap while washing dishes
B. Using a garbage disposal
C. A leaky toilet
D. Long showers

11/17/2009

How much water used for irrigating lawns and gardens, on average, is wasted due to overwatering and evaporation?

50%
Water-efficient irrigation systems help save water, potentially more than 11 billion gallons per year across the U.S.
[This is equal to the amount of water used by 3,200 garden hoses flowing constantly for 1 year!]

A. 50%
B. 25%
C. 15%
D. 10%

Which of the following uses less water?

Washing dishes in a fully loaded automatic dishwasher without pre-rinsing.

A. Washing dishes under a running tap
B. Washing dishes in a fully loaded automatic dishwasher without pre-rinsing

In waste the least amount of water in the kitchen, operate your automatic dishwasher only when its fully loaded.
Filling the sink or bowl instead of running water can save an average of 25 gallons.

Between 1950 and 2000, the U.S. population grew by 89%; approximately how much has our water use grown in the same period?

200%
With demand outstripping supply, 36 states anticipate some degree of water shortage by 2015.

A. 200%
B. 50%
C. 100%
D. 25%

Easily corrected household water leaks account for what percentage of the average water bill?

8%
Leaky faucets that drip at the rate of 1 drop per second can waste up to 3,000 gallons of water each year.

A. 2%
B. 4%
C. 6%
D. 8%

Fun Water Facts

- A person can live without food for more than a month, but can only live without water for approximately 1 week.
- Today we use around 100 gallons of water per person per day. In medieval times, a person only used 5 gallons per day.
- It takes about 1 gallon of water to process a quarter pound of hamburger.

Fun Water Facts

- It takes 2,072 gallons of water to make 4 new tires.
- Ancient Egyptians treated water by siphoning water out of the top of huge jars after allowing the muddy water from the Nile River to settle.
- The first U.S. water plant with filters was not built until 1872.

Appendix F: Meeting Minutes

Three Stakeholder meetings were held on; May 28, July 30, and September 24, 2009.

- At the initial meeting in May a power point explaining stormwater runoff and education on conserving water was presented along with a map of the entire canal system with the impaired segment highlighted.
- Designed map for stakeholders showing where impaired segment begins and ends in relationship to city streets and city boundaries.
- Discussed possible non-point source pollution and location of said pollution.
- Discussed debris getting into stream. Note; since meetings City of Waycross has qualified for a grant to help install bar screen to help with this problem.
- Studied E coli data gathered from EPD.
- Discussed E coli data gathered at specified collection locations on impaired stream by SGRC staff.
- Scott Murphy discussed possibility of waste water treatment plant conducting water test on the impaired segment located around plant.
- Discussed grant availability for stream bank enhancement.