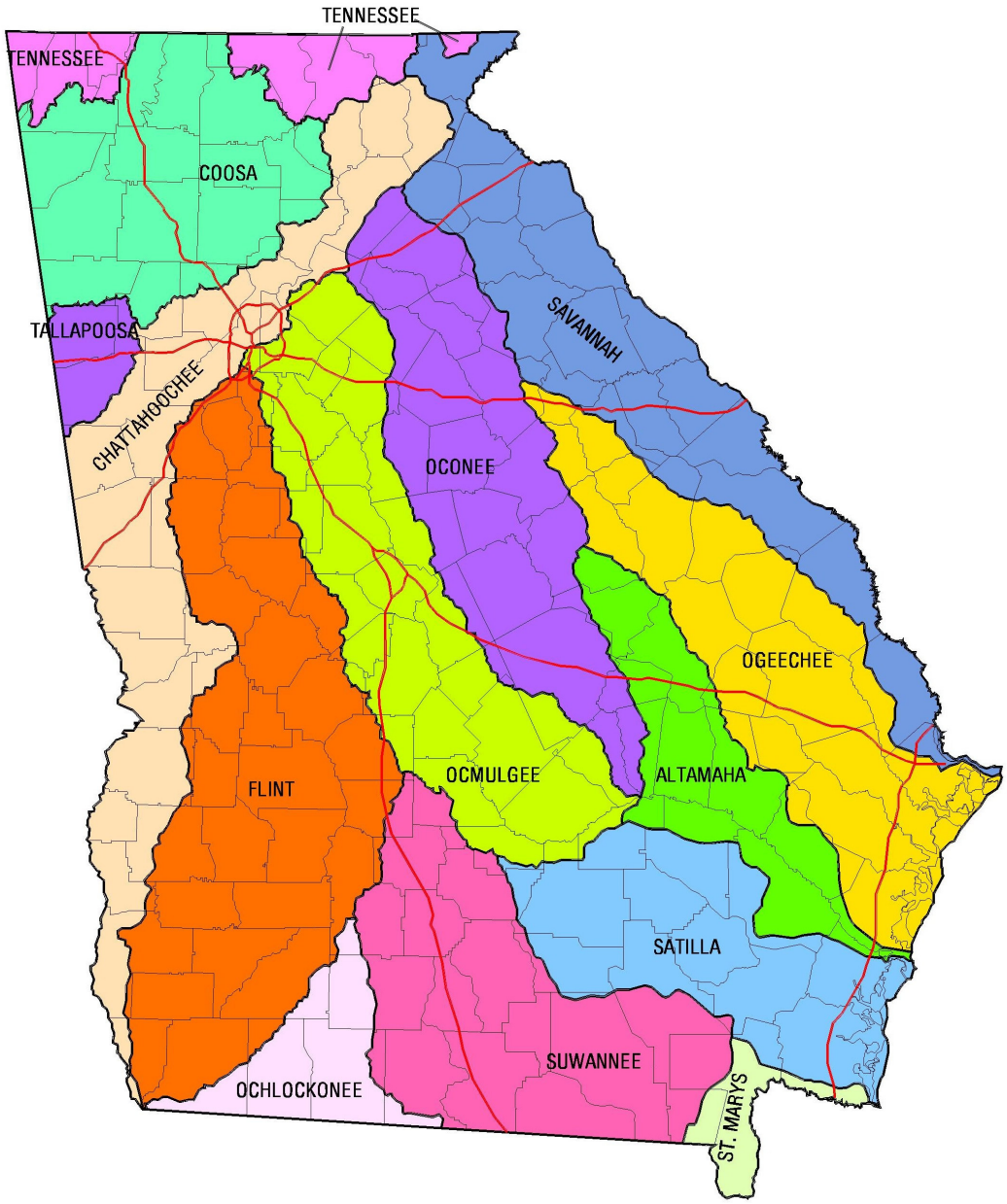
GEORGIA

Adopt-A-Stream

Department of Natural Resources
Environmental Protection Division
Spring 2008

Getting to Know Your Watershed



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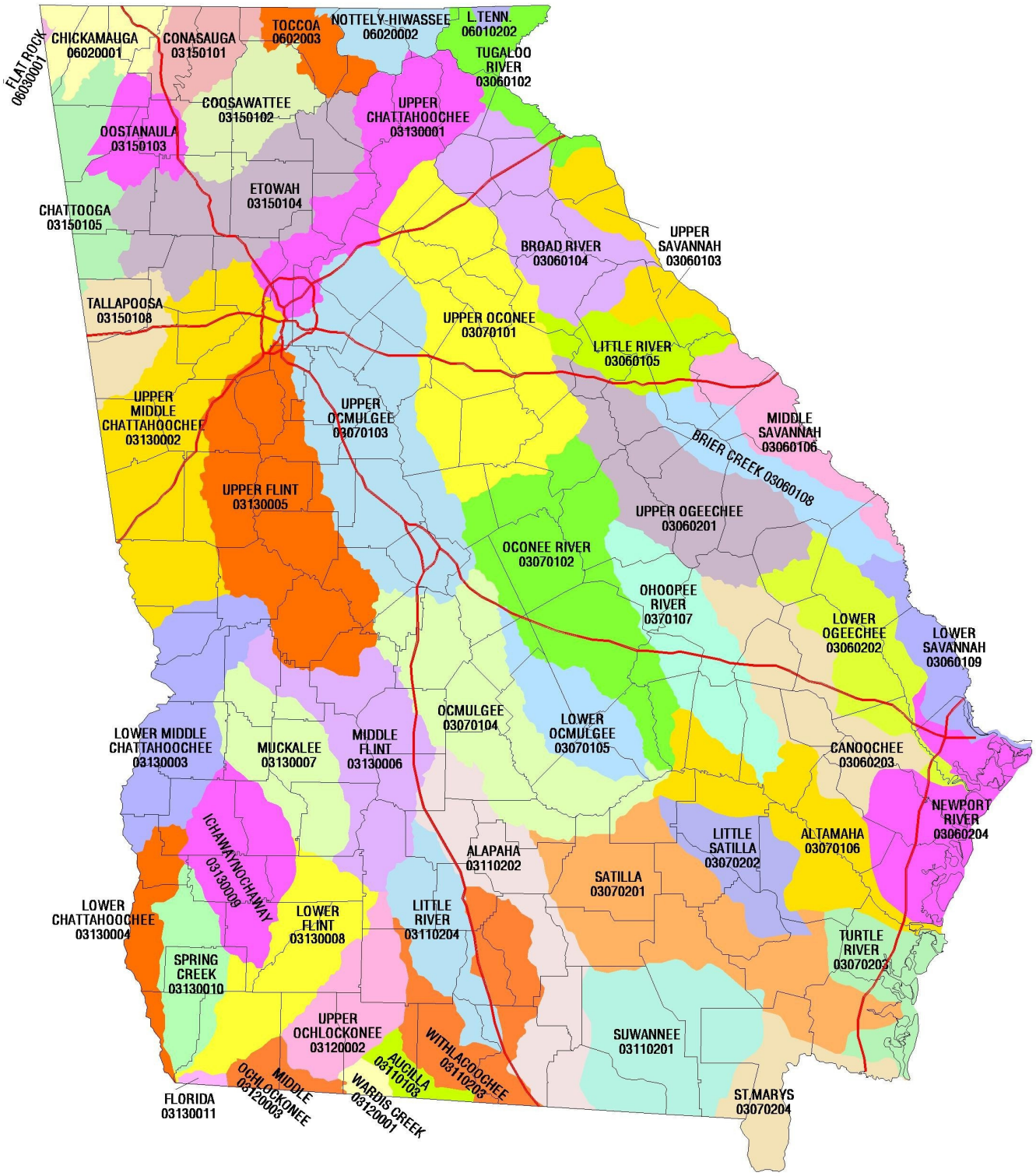
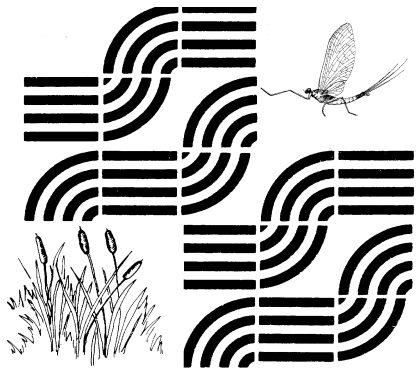
Georgia's 52 Major Watersheds



Map by the Geologic Survey Branch, Environmental Protection Division
Provided to the Georgia Water Management Campaign
Watershed boundaries from United States Geological Survey 8 digit Hydrologic Cataloging Units
Watershed names from Water Protection Branch, Environmental Protection Division
Cover: Georgia's 14 major river basins



Georgia Adopt-A-Stream
Georgia Department of Natural Resources
Environmental Protection Division
2 Martin Luther King Jr. Drive
Suite 1462, East Tower
Atlanta, Georgia 30334
www.AdoptAStream.Georgia.gov
404-463-1464

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Some of the material in this manual was taken from the following documents:

Stream Corridor Restoration: Principles, Processes and Practices
The Federal Interagency Stream Restoration Working Group, October 1998
http://www.usda.gov/stream_restoration/

Volunteer Stream Monitoring: A Methods Manual
EPA 841-B-97-003

Protecting Community Streams: A Guidebook For Local Governments In Georgia
Prepared by the Atlanta Regional Commission for Georgia Environmental Protection Division, Spring 1993.

Land Development Provisions To Protect Georgia Water Quality
Georgia DNR, EPD. Prepared by The School of Environmental Design, UGA, October 1997.

The Natural Environments of Georgia
DNR Georgia Geological Survey Bulletin 114. By Charles H. Wharton. Third printing 1998.

Adopt-A-Stream: A Northwest Handbook. University of Washington Press 1988.

Water Quality In Georgia 2000 – 2001. Prepared by Georgia DNR, EPD.

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Water Quality in Georgia

The key issues and challenges to be addressed now and in the future years include (1) the control of toxic substances, (2) the reduction of nonpoint source pollution, (3) the need to increase public involvement in water quality improvement projects, and (4) a sustainable supply of potable water. The implementation of the River Basin Management Planning program in Georgia provides a framework for addressing each of the key issues.

The reduction of toxic substances in rivers, lakes, sediment and fish tissue is extremely important in protecting both human health and aquatic life. The sources are widespread. The most effective method to reduce releases of toxic substances into rivers is pollution prevention, which consists primarily of eliminating or reducing the use of toxic materials or at least reducing the exposure of toxic materials to drinking water, wastewater and stormwater. It is very expensive and difficult to reduce low concentrations of toxic substances in wastewaters by treatment technologies. It is virtually impossible to treat large quantities of stormwater and reduce toxic substances. Therefore, toxic substances must be controlled at the source.

The pollution impact on Georgia streams has radically shifted over the last two decades. Streams are no longer dominated by untreated or partially treated sewage discharges which resulted in little or no oxygen and little or no aquatic life. The sewage is now treated, oxygen levels have returned and fish have followed. However, another source of pollution is now affecting Georgia streams. That source is referred to as nonpoint and consists of mud, litter, bacteria, pesticides, fertilizers, metals, oils, suds and a variety of other pollutants being washed into rivers and lakes by stormwater. This form of pollution, although somewhat less dramatic than raw sewage, must be reduced and controlled to fully protect Georgia's streams. As with toxic substance control, nonstructural techniques such as pollution prevention and best management practices must be significantly expanded. These include both watershed protection through planning, zoning, buffer zones, and appropriate building densities as well as increased use of stormwater retention ponds, street cleaning and perhaps eventual limitations on pesticide and fertilizer usage.

It is clear that local governments and industries, even with well-funded efforts, cannot fully address the challenges of toxic substances and nonpoint source pollution control.

Citizens must individually and collectively be part of the solution to these challenges. The main focus is to achieve full public acceptance of the fact that some of everything put on the ground or street ends up in a stream. Individuals are littering, driving cars which drip oils and antifreeze, applying fertilizers and pesticides and participating in a variety of other activities contributing to toxic and nonpoint source pollution. If streams and lakes are to be pollutant free, then some of the everyday human practices must be modified. The GAEPD will be emphasizing public involvement; not only in decision-making but also in direct programs of stream improvement. The first steps are education and adopt-a-stream programs.

Georgia is one of the fastest growing states in the nation. The burgeoning population is making considerable demands on Georgia's ground and surface water resources. The problems and issues are further complicated by the fact that surface water resources are limited in South Georgia and groundwater resources are limited in North Georgia. In some locations, the freshwater resources are approaching their sustainable limits.

Water management planning based on the Georgia 2004 Comprehensive State-wide Water Planning Act will provide an opportunity to explore opportunities to develop a plan that will provide for management of water resources in a sustainable manner to support the states economy, to protect public health and natural systems, and to enhance the quality of life for all citizens.

* Taken From *Water Quality In Georgia, 2002-2003, Chapter 1, Executive Summary*

Water Resources Atlas

State Population	8,383,915
State Surface Area	58,910 square miles
Number of Major River Basins	14
Number of Perennial River Miles	44,056 miles
Number of Intermittent River Miles	23,906 miles
Number of Ditches and Canals	603 miles
Total River Miles	70,150 miles
Number of Lakes Over 500 Acres	48
Acres of Lakes Over 500 Acres	265,365 acres
Number of Lakes Under 500 Acres	11,765
Acres of Lakes Under 500 Acres	160,017 acres
Total Number of Lakes & Reservoirs, Ponds	11,813
Total Acreage of Lakes, Reservoirs, Ponds	425,382 acres
Square Miles of Estuaries	854 square miles
Miles of Coastline	100
Acres of Freshwater Wetlands	4,500,000 acres
Acres of Tidal Wetlands	384,000 acres

Georgia Adopt-A-Stream

Georgia Adopt-A-Stream (AAS) is housed in the NonPoint Source Program in the Water Protection Branch of the Georgia Environmental Protection Division. The program is funded by a Section 319(h) Grant. The goals of Georgia Adopt-A-Stream are to (1) increase public awareness of the State's nonpoint source pollution and water quality issues, (2) provide citizens with the tools and training to evaluate and protect their local waterways, (3) encourage partnerships between citizens and their local government, and (4) collect quality baseline water quality data.

To accomplish these goals, Georgia Adopt-A-Stream encourages individuals and communities to monitor and/or improve sections of streams, wetlands, lakes or estuaries. Manuals, training, and technical support are provided through Georgia EPD, Adopt-A-Stream Regional Training Centers and more than 50 established Community/Watershed Adopt-A-Stream organizers. The Adopt-A-Stream and Wetland Regional Training Centers are located at State Universities in Columbus, Milledgeville, Americus, and Savannah. These centers play a key role in providing training, technical support and organizational support to citizens throughout Georgia.

There are more than 50 Community/Watershed Programs that organize Adopt-A-Stream groups in their watershed, county or city. These local Adopt-A-Stream programs are funded by counties, cities and nonprofit organizations and use the Georgia Adopt-A-Stream model, manuals and workshops to promote nonpoint source pollution education and data collection in their area. The State office works closely with these programs to ensure volunteers receive appropriate support and training.

The Adopt-A-Stream program offers different levels of involvement. At the most basic level, a new group informs their local government about their activities and creates partnerships with local schools, businesses and government agencies. A watershed survey and 4 visual surveys are conducted within a year's time. Volunteers create a "Who To Call List" so if something unusual is sighted, the appropriate agencies can be notified. *Getting To Know Your Watershed* and *Visual Stream Survey* manuals provide guidance in these activities.

If volunteers wish to learn more about their adopted body of water, they are encouraged to conduct biological or chemical monitoring. The *Biological and Chemical Stream Monitoring* manual guides volunteers through the monitoring process. Free workshops are provided at regular intervals in the across the State. These workshops are listed in our bimonthly newsletter and our website. Volunteers can monitor their waterways without attending a workshop, but those who attend and pass a QA/QC test will then be

considered quality data collectors under the Georgia Adopt-A-Stream Quality Assurance Plan. QA/QC data is posted on the Adopt-A-Stream database.

The title "Adopt-A-Stream" is a little misleading since the program also provides manuals and training for lake and wetland monitoring. The *Freshwater Wetland Monitoring* manual and workshops highlight wetland values and functions, which guides volunteers through the monitoring of soils, vegetation and hydrology. A separate *Coastal Wetland Monitoring* manual created by UGA Marine Extension Service provides guidance for volunteers interested in monitoring coastal habitats and the biological and chemical parameters specific to marine conditions. The Adopt-A-Lake program is a collaborative effort between Georgia Adopt-A-Stream and Georgia Lake Society. The Georgia Lake Society provides training workshops and technical advice throughout the state. An *Educator Guide* is also offered. This guide helps teachers put Adopt-A-Stream activities into a lesson plan format.

Georgia Adopt-A-Stream has partner with government and non-government groups to provide access to technical information and assistance to citizens interested in preserving and restoring the banks and vegetation along their waterways. This network will assist local governments to educate citizens on the importance of protecting riparian corridors and provide landowners with the information they need to restore the riparian zone on their property to reduce erosion, improve water quality, and provide wildlife habitat with native plantings.

*As of June 2005, Georgia Adopt-A-Stream has trained more than 14,000 volunteers and currently has 106 active groups monitoring in Georgia.

Resources Available from Georgia Adopt-A-Stream

- Website at www.georgiaadoptastream.org
- *Getting To Know Your Watershed* Manual
- *Visual Stream Survey* Manual
- *Biological and Chemical Stream Monitoring* Manual
- *Adopt-A-Wetland* Manual and workshop
- *Coastal Georgia Adopt-A-Wetland* Manual
- *Adopt-A-Lake* Manual
- *Adopt-A-Stream Educator's Guide*
- *Rivers Alive Guide to Organizing and Conducting a Cleanup*
- *Georgia Adopt-A-Stream: It All Begins With You* video
- Getting Started: Watershed Survey and Map Assessment workshops
- Biological Monitoring workshops
- Chemical Monitoring workshops
- Train – The – Trainer workshops
- You Are The Solution To Water Pollution Posters and Brochures
- Database
- Newsletter
- Technical and logistical support for volunteers and communities

Introduction

GETTING TO KNOW YOUR WATERSHED

Getting To Know Your Watershed is the first in a series of manuals produced by Georgia Adopt-A-Stream. Whether you wish to monitor a stream, wetland, lake or estuary, this manual will guide you through the important first steps. Included in this manual is all the information and activities you will need to adopt a stream, wetland or lake!

We hope you will find this manual a useful tool for beginning to understand your watershed. We are always open for suggestions on how to improve and modify future additions, so please don't hesitate to forward us your suggestions.

***Getting To Know Your Watershed* is an important first step towards gaining an in-depth understanding of the processes influencing water quality. Many of the potential land use activities that will impact your stream, wetland, lake or estuary can be pinpointed by carefully analyzing human activity within your watershed.**

By assessing the health of a waterbody, we are in fact making an assessment of the health of the land on which we live. The streams wind their way through our landscape and the wetlands nestled in our neighborhoods serve as indicators of the health of our natural environment.

Volunteers Assess Their Watershed

Chapter 1

GEORGIA'S WATERSHED ECOLOGY

- Watersheds
- The Water Cycle
- Soil, Water and Vegetation
- Ground Water and Surface Water
- Hydrology and the Effects of Development

Watersheds

(Technical definition)
A **watershed** is a system. It is the land area from which water, sediment, and dissolved materials drain to a common point along a stream, wetland, lake or river. For each watershed, there is a drainage system that conveys rainfall to its outlet. Its boundaries are marked by the highest points of land around the waterbody.

(Broader definition)
A **watershed** is more than the physical landscape that is defined by ridges with one outlet for water to flow. Watersheds support a variety of resources, uses, activities and values where everything is linked in such a way that eventually all things are affected by everything else. Most importantly, it contains the history of all that went before us and the spirit of all to come.
- George Wingate, Bureau of Land Management

Ms. Bonnet and her class collected chemical data from their stream site for three years. On the fourth year, Ms. Bonnet's class noticed that the stream was no longer flowing as it had in the past. The flow was minimal with some pooling. Ms. Bonnet called a stream ecologist and asked why this was happening. He asked; "What type of activity is happening in your watershed?" Without knowing what is happening within the watershed, it is difficult to determine what is affecting your stream, wetland or lake.

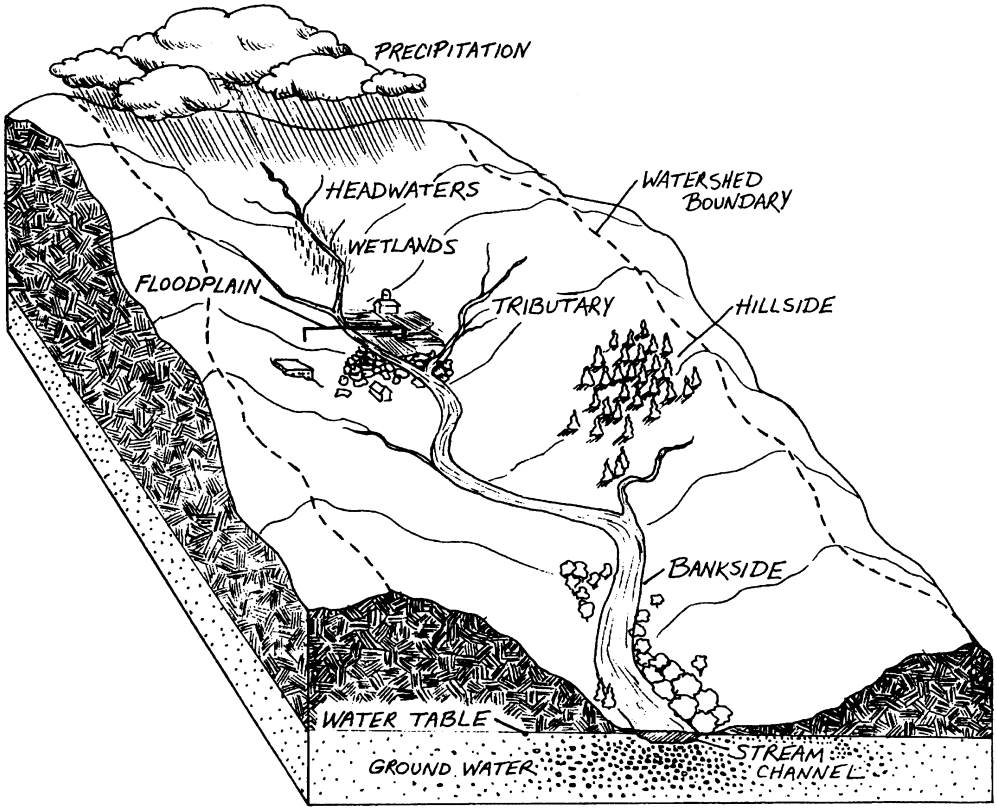


Figure 1.1 Cross section of a watershed

A watershed may be as small as the land area that drains into a small neighborhood wetland or as large as a third of the state of Georgia which drains into the Altamaha River (refer to front cover to see where the Oconee and Ocmulgee Rivers come together to form the Altamaha).

The Water Cycle

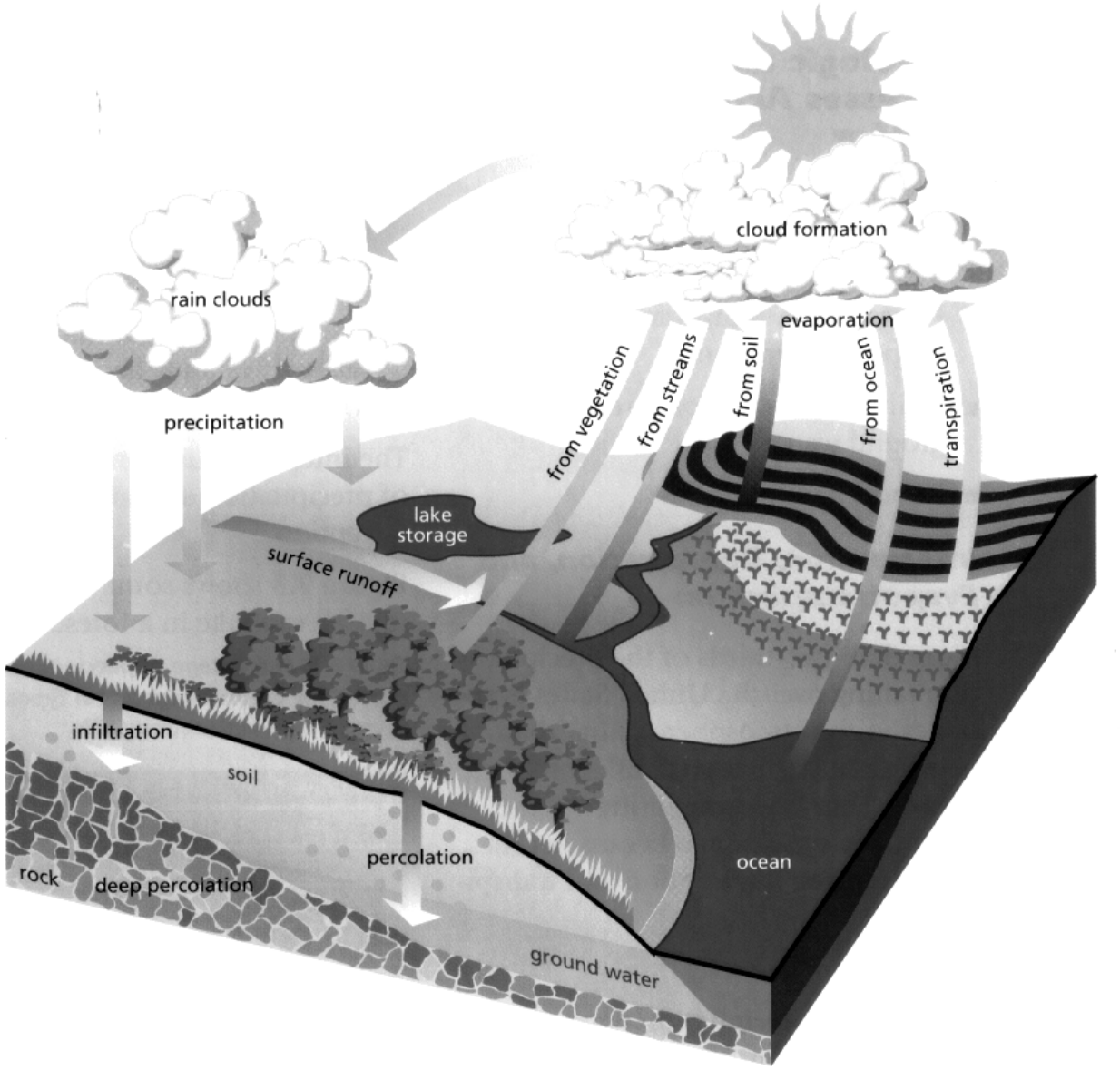


Figure 1.2. The water cycle

The **water cycle** (also called the **hydrologic cycle**) is the continuous movement of water through the air, ground, vegetation and surface water (Figure. 1.2). It is through this movement that water is replenished in the river systems and ground water of Georgia.

Most **precipitation** in Georgia occurs as rain. The rain is either intercepted by vegetation or falls directly on the ground. The rain that falls to the ground either travels over the ground as **surface runoff** or is absorbed into the ground in a process called **infiltration**. Some water is converted to water vapor by plants and returns to the atmosphere. This process is called **transpiration**. Some water from the ground and lakes, rivers and oceans is converted to water vapor by heat from the sun and returns to the atmosphere through **evaporation**.

Soil, Water and Vegetation

In undisturbed Georgia forests, soils evolve in a natural process, to absorb the state's rain and make it part of the ecosystem. Roots of grasses and trees reach into the soil and the root hairs separate mineral particles of worn rock. Ants and beetles excavate the soil and create pores. Leaves fall from the trees each autumn to form mulch over the soil and earthworms pull the leaves into their burrows, where they ingest them and add their organic matter to the soil structure. These processes make mineral soil (figure 1.3).

By accepting and absorbing rainfall, Georgia's native environment maintains its equilibrium and its health. Organic matter and soil pores suspend the water in the soil, making it available to the roots of native plants. Roots filter out passing solid particles and build them into the soil matrix. Microorganisms decompose pollutants and turn them into nutrients for the living system.

In natural areas, water that infiltrates the soil replenishes the ground water where we take our drinking water. Infiltration of water into the soil reduces flooding. The gradual movement of water through the soil and vegetation provides a consistent flow of water to streams and wetlands.

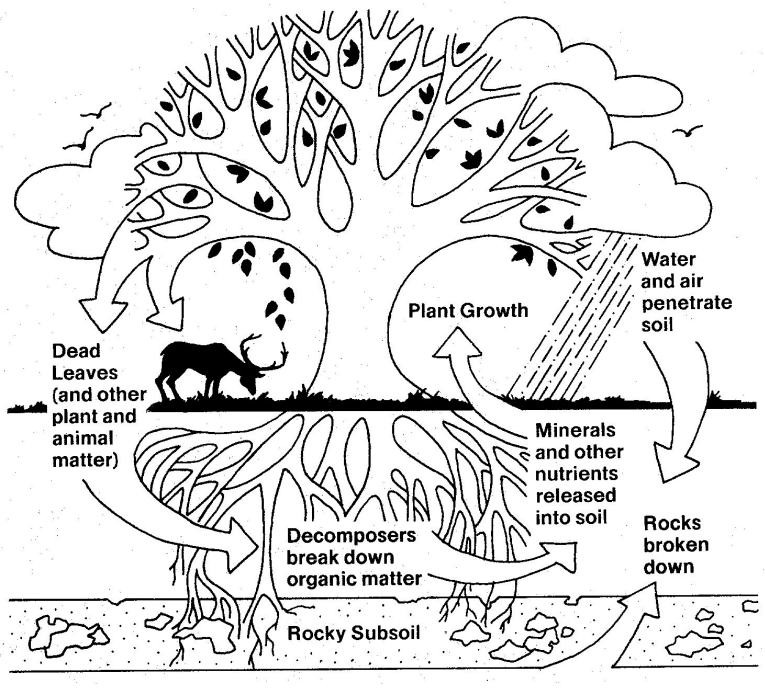


Figure 1.3 Soil, water and vegetation.
Source: USDA Soil Conservation Service

Ground Water in Georgia

Ground water is extremely important to the life, health, and economy of Georgia. For example, in 1995, ground water made up 23 percent of the public water supply, 91 percent of rural drinking water sources, 66 percent of the irrigation use and 45 percent of the industrial and mining use. Total ground water withdrawal in 1995 was approximately 1.2 billion gallons per day. For practical purposes, outside the larger cities of the Piedmont, ground water is the dominant source of drinking water (figure 1.4). Literally billions of dollars could be lost from the economy of Georgia and the health of millions of people could be compromised if Georgia's vast treasure trove of pure ground water was to be significantly polluted.

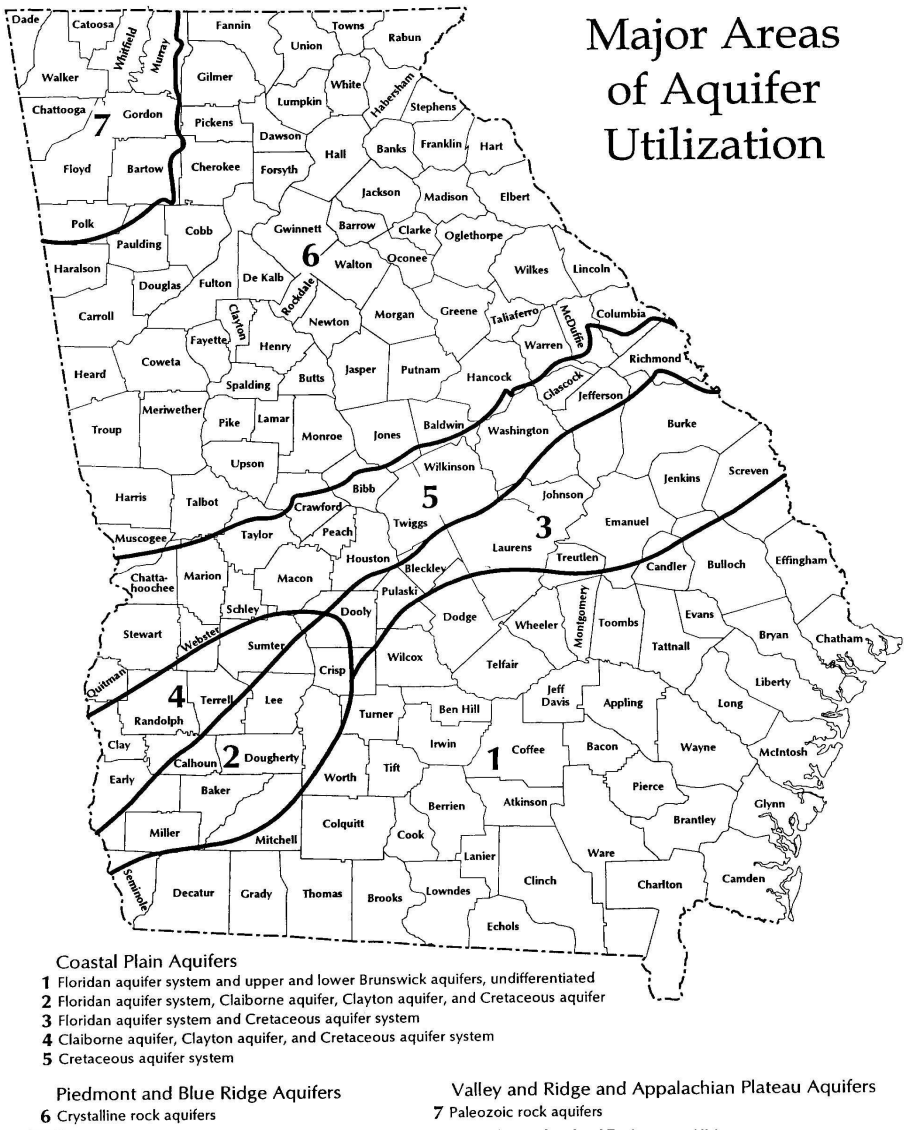


Figure 1.4 Areas in Georgia where ground water is used

The Ground Water and Surface Water Relationship

Ground water is recharged by infiltration of rain into the ground and from streams and wetlands that receive surface runoff (figure 1.5). In turn, ground water can flow into streams as a spring. The combination of ground water flow (**subsurface flow**) and surface runoff to a stream is defined as the stream's **baseflow**. At times when there is no surface runoff from precipitation, the entire flow of a stream might actually be baseflow from ground water (Figure. 1.6).

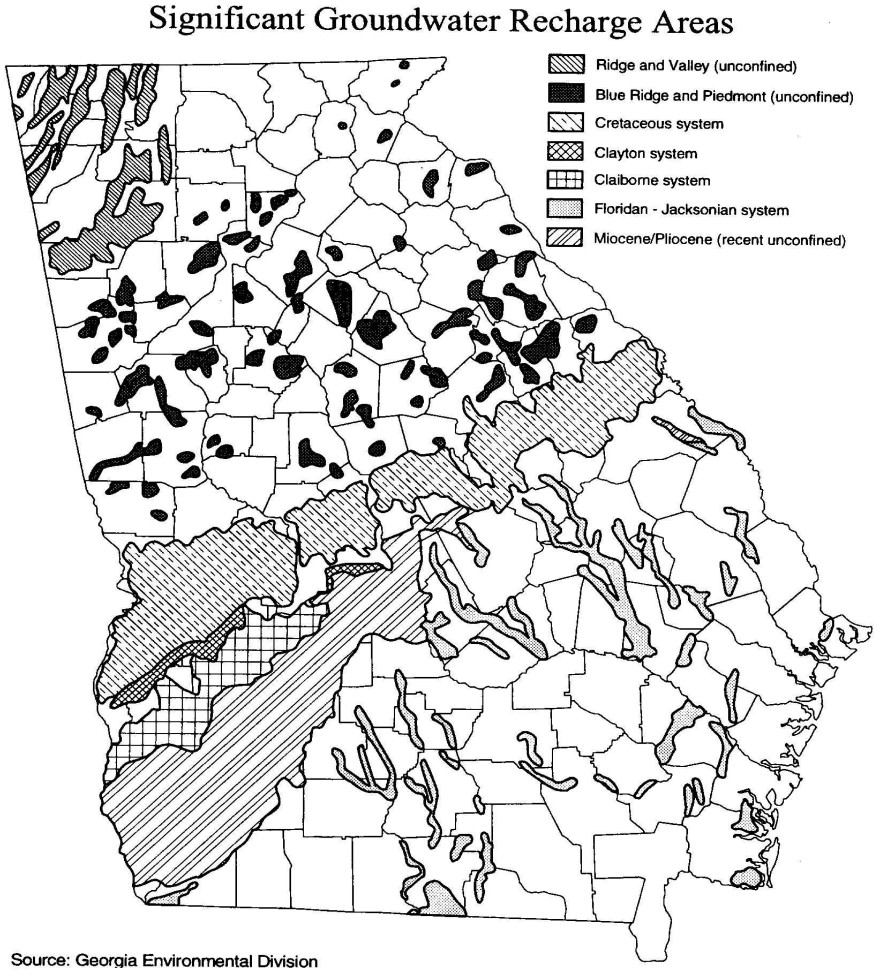


Figure 1.5 Surface water recharges ground water in these areas of Georgia

A **losing stream** is recharging ground water (Fig. 1.6). Stream water percolates down through the soil until it reaches the zone of saturation. **Gaining streams** alternate between losing and gaining water as the water table moves up and down according to the seasonal conditions or pumpage by area wells.

The same principle can be applied to wetlands and lakes.

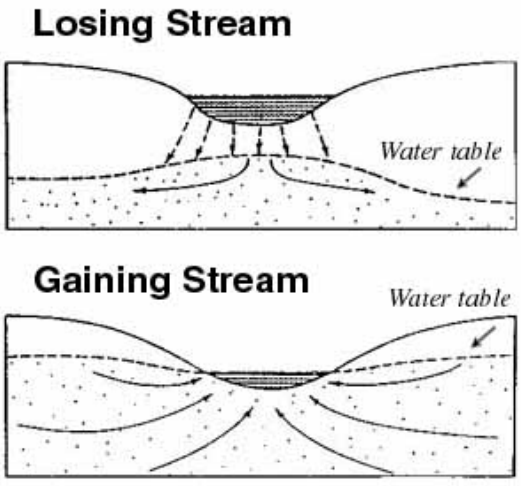


Figure 1.6 Surface and ground water recharge each other.

Hydrology and the Effects of Development

The natural water cycle and the interaction between surface water and ground water changes as naturally forested and vegetated areas are replaced by rooftops, roadways, parking lots, sidewalks, and driveways. Surfaces that do not allow water to infiltrate the ground are called **impervious** surfaces. One of the consequences of impervious surface is that the amount of ground water infiltration is reduced and surface runoff is increased (figure 1.7). As a result, water is quickly delivered to urban streams as surface runoff during storm events and is not given time to infiltrate the soil and recharge ground water; thus, little water is available to replenish streams during the dry season.

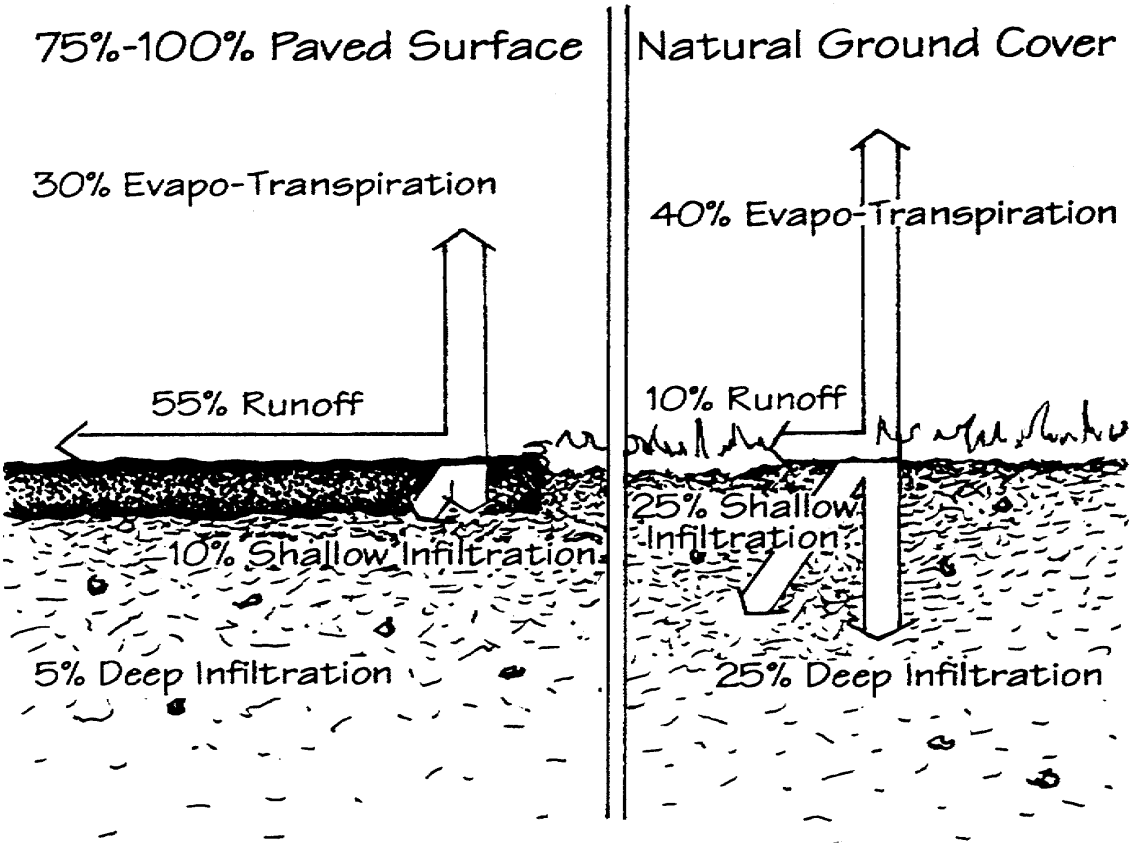


Figure 1.7 Depending on the amount of impervious surface in a watershed, the annual volume of storm water runoff can increase by up to 16 times that of natural areas*

*Schueler, Thomas, 1995 *Site Planning for Urban Stream Protection*, Washington: Metropolitan Washington Council of Governments.

In cities and other urban areas, rain falling on hard surfaces is transported via storm drains or drainage ditches into Georgia waterways. This results in very large increases of flow and volume within streams and rivers. All this water can impact our streams, causing sandbars to shift, covering stream habitat, gouging out steep banks, and causing accelerated erosion (Fig. 1.8). Storm water can also increase flooding within and downstream of developed areas (Fig. 1.9).

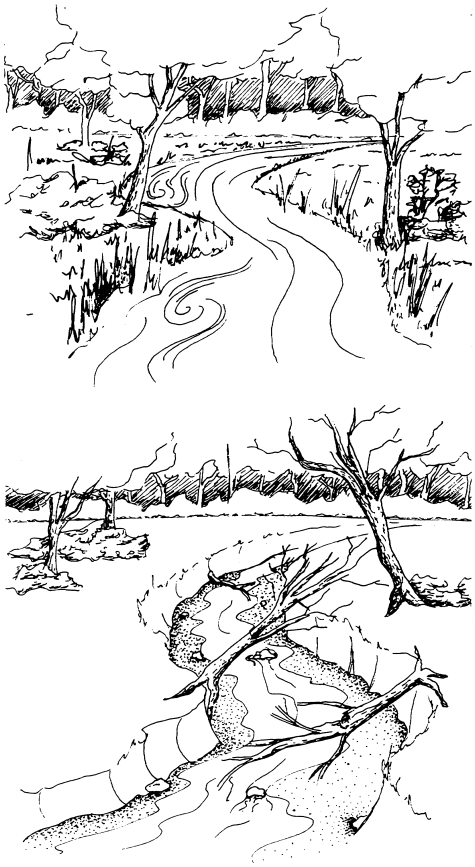


Figure 1.8 Effects of increased runoff on stream sizes and shapes

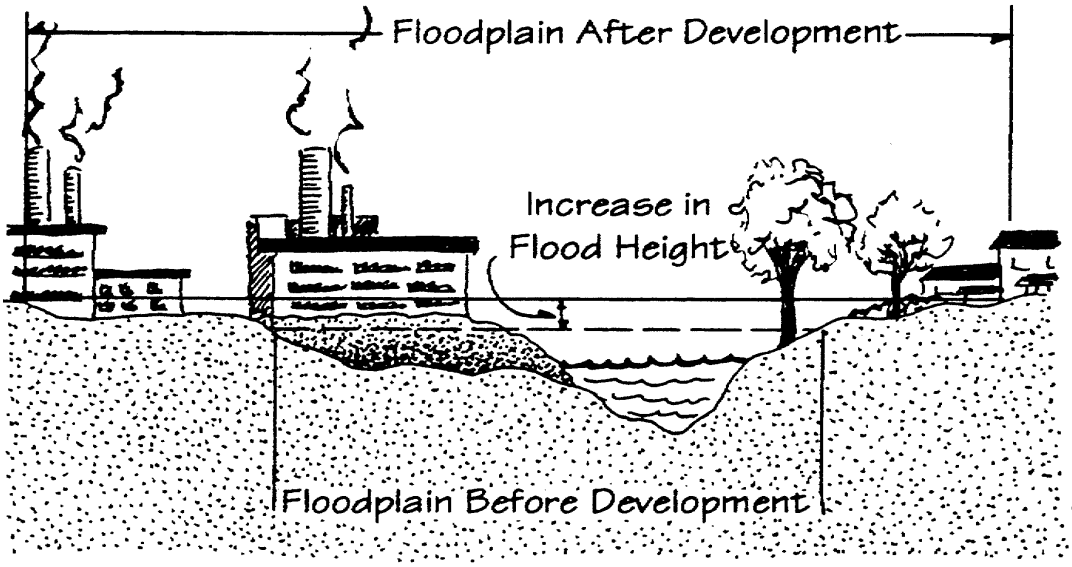


Figure 1.9. Flooding increases with development

Chapter 2

LANDUSE AND WATER QUALITY IN GEORIGA

- Nonpoint Source Pollution
- Georgia Urban Development Trends
- What Are Erosion and Sedimentation
- An Overview of Georgia's Regions and Waters
- Georgia's Wetlands

Nonpoint Source Pollution: The Nation's Largest Water Quality Problem

The United States has made tremendous advances in the past 30 years to clean up the aquatic environment by controlling **point source** pollution coming from industries and sewage treatment plants.

Nonpoint source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.

These pollutants include:

- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas;
- Oil, grease, and toxic chemicals from urban runoff and energy production;
- Sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks;
- Salt from irrigation practices and acid drainage from abandoned mines;
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems.

Atmospheric deposition and modifications to natural vegetation, stream shape and flow are also sources of nonpoint source pollution.

Georgia Urban Development Trends

**From Land Development Provisions To Protect Georgia Water Quality*

Early urban development

A hundred years ago, trains and streetcars supported downtown business districts by bringing shoppers and workers from all over the urban regions. Development in the suburbs was kept within walking distance of streetcar lines. Land use combinations evolved within the constraints of daily walking distances. City streets were paved with cobblestones, which were permeable to small amounts of rainfall and runoff. Minor residential streets had no curbs; instead they were usually flanked by swales or ditches that kept streets passable during moderate rainfalls.

Auto-oriented development

Since the automobile was developed in the early years of this century, its use has been subsidized with public investment and land use regulation. Local governments spent million of dollars to widen the cobbled streets and repave them with asphalt. The Federal government began subsidizing auto use in 1916 and 1921 with Federal Road Acts to construct and improve auto roads, support the formation and operation of state highway departments, and link state highways into national networks. To enable Georgia to participate in the new program, the General Assembly created a State Highway Board in August 1916. In 1925, federal highway spending topped $1 billion per year. In 1956, the federal government began the Interstate system, which added 41,000 miles of connecting and beltway expressways and subsidized the widening of local roads to collect auto traffic onto them. By the early 1970s paving was referred to as “the nation’s biggest endowed business” (Sorvig, 1993). Each year, in the United States, we are paving or repaving half a million acres (Ferguson, 1996).

The new highways opened up rural areas to suburban development. Georgia’s citizens moved from farms to urban areas, and from the central sections of cities to the fringes. Sewer and water lines were extended into low-density suburbs. City development was refitted to accommodate the car. Zoning codes, originally devised to protect residential neighborhoods from incompatible industries, grew to segregate every detailed category of land use. They imposed exclusive reliance on cars for daily transportation by requiring homogeneous, low-density residential development across large areas. Street pavement widths increased by more than 50 percent to favor rapid, unobstructed automobile traffic. Parking lots became essential adjuncts to suburban stores and offices that had once fronted on city sidewalks. As land uses spread farther apart with only auto roads as connectors, more cars were needed to link them back together, and more asphalt and concrete were needed to maintain the connectors.

Effects of impervious surfaces

- Development requirements increase the dimensions of streets, driveways and parking lots causing an increase in impervious pavement, which generate runoff. Curbs make structural channels accelerate it.

- Almost any contemporary land use produces impervious coverage over 10 percent. Even residences dispersed on 2-acre lots produce impervious cover of 12 percent.

- Industrial and office uses and shopping centers can produce nearly 100 percent impervious coverage.

- Of all the impervious areas, the pavements of the roads and parking lots make up the major portion.

- Impervious surfaces seal over the soil pores, depriving the root zone of water and air. They deflect rainwater into surface channels, where it concentrates into downstream floods.

- Storm water runoff carries oils from cars, parking lots, maintenance yards, and storage areas, metals from construction materials, and herbicides, pesticides, and nutrients from over-maintained landscapes.

- Streets and parking lots are the impervious surfaces with the greatest area and highest pollutant loads. Automobiles drop hydrocarbons from oil, and metals from the wearing of brake pads and tires; all are washed off of pavements and into streams by runoff.

- In the days or weeks between rainstorms, oils and sediments accumulate on pavements. When the first rain falls on pavements, it flushes the accumulated pollutants into streams. As the rain continues, growing volumes of runoff erode stream banks, destroying habitats and producing further sediment pollution.

- Stream and wetland health decline with overall impervious coverage. Significant impacts begin at 10 percent coverage. At impervious coverage over 30 percent, impacts on streams and wetlands become severe and degradation is almost unavoidable (Arnold and Gibbons, 1996).

Impervious coverage	Stream health
<10%	“Protected”
10 to <30%	“Impacted” if not mitigated
>30%	“Degraded” if not mitigated

Effects of development on peak discharges and runoff volumes

A storm hydrograph is a tool used to show how storm water discharge changes with time. The portion of the hydrograph that lies to the left of the peak is called the rising limb, which shows how long it takes the stream to peak following a rain event. The portion of the curve to the right of the peak is called the recession limb.

Storm runoff moves more rapidly over smooth, hard pavement than over natural vegetation (figure 2.1). As a result, the rising limbs hydrographs become steeper and higher in urbanized areas. Recession limbs also decline more steeply in urban streams.

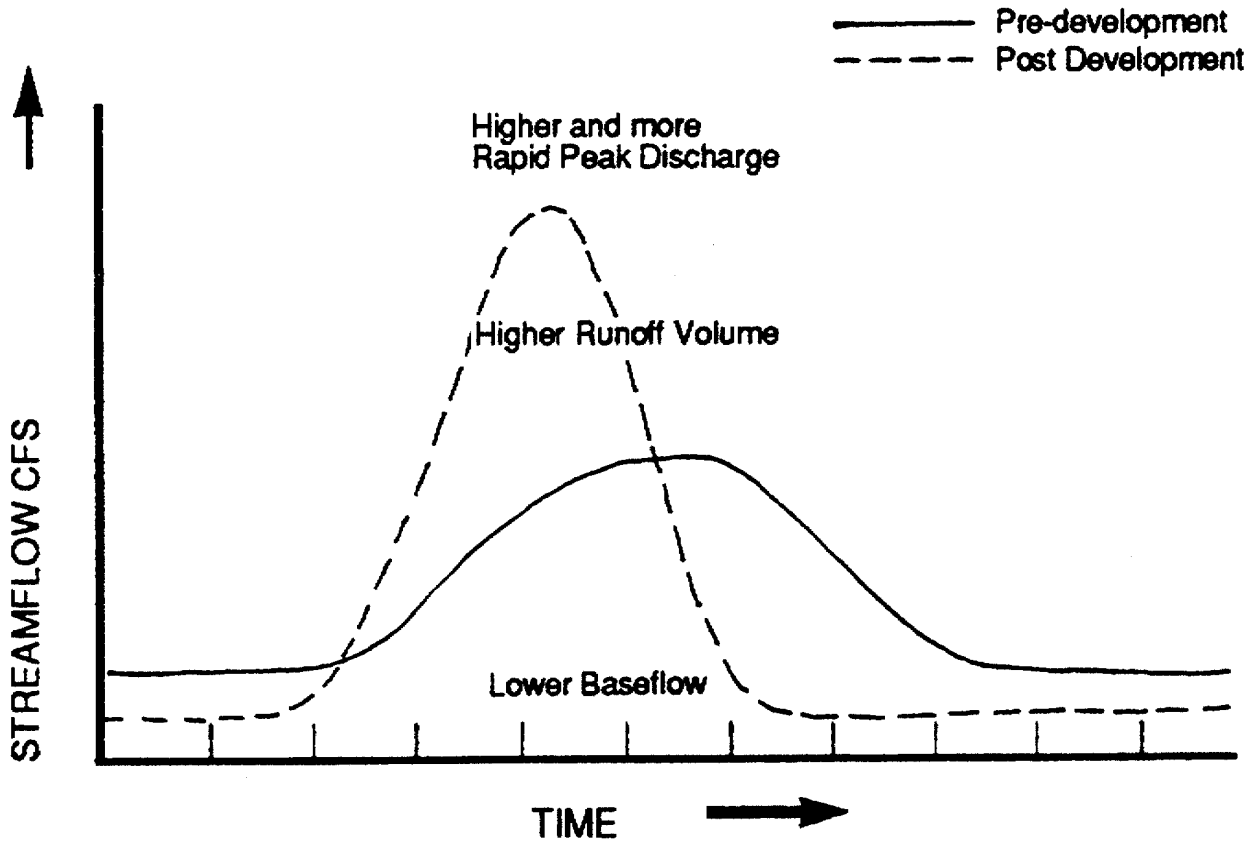


Figure 2.1 Effects of development on stream flow

What Are Erosion and Sedimentation?

Erosion is the breaking away and movement of soil or rock fragments by water, wind, ice, or gravity. Once the soil or rock is detached, it becomes known as sediment. The sediment can move by wind or, most commonly, water onto adjoining land or into our streams and rivers. This movement into rivers and streams is Georgia's number one source of water pollution. If erosion is controlled, sediment does not travel. Therefore, by controlling erosion we can greatly improve the quality of our water.

Erosion is a natural process and its natural occurrence creates mountains, flatlands, and coastal regions. Natural erosion occurs slowly and in a uniform manner. However, human activity can result in "accelerated erosion." Accelerated erosion causes too much sediment to enter our rivers and streams.

Humans, through land-disturbing activities, accelerate erosion. A land-disturbing activity is "any activity which may result in soil erosion from water or wind and the movement of sediments into State water or onto lands within the State." Examples include clearing, grading, dredging, filling, transporting and excavating.

When excessive eroded soil enters a stream, the stream becomes sedimented. This means that the stream is overloaded with silt and clay, giving the water a murky, cloudy look. Georgia's infamous red clay contributes the orange-red coloration that characterizes many of Georgia's rivers.

The suspended sediment may contain a mixture varying from fine silt to larger gravel. As the stream flows downhill, it usually widens and slows. As the stream's pace decreases, the sediment settles out to the stream bed. Heavier sediment like pebbles will settle out first. Fine sediment such as silt and clay particles take much longer to settle out. Unfortunately, the rate at which eroded soil enters the stream along its banks may exceed the rate at which fine sediment settles out. The result is permanently muddy water.

An Overview of Georgia's Regions and Waters

This information was taken from a series of sources, including *The Natural Environments of Georgia* by Charles H. Wharton, DNR Bulletin 114. Combining the available chemical, physical, biological and watershed data, a description of the major watersheds in Georgia has been developed.

North Georgia Mountains
Four mountain rivers, Chatooga, Chattahoochee, Etowah and Hiawassee, possess similar water chemistry. Their acidity is moderate (6.4 – 6.9) and their phosphorus and nitrogen levels low. Blue Ridge mountain streams are low in calcium, manganese and iron and are not especially rich in other minerals. Cold, well-oxygenated water coursing over a rocky substrate is the picture of a typical mountain stream. The headwater streams tend to be highly oxygenated, but lack organic nutrients. Most nutrients come from leaves and other organic debris that fall into the water. Algae on rocks is the dominant primary producer in North Georgia mountain streams. Macroinvertebrates adapted to living among the rocks of these streams include stoneflies, mayflies, caddisflies, black fly larvae, water pennies and dobsonflies.

The Piedmont
The Upper Piedmont region is drained by the Chattahoochee River and its tributaries and by small portions of the Coosa and Savannah. The Lower Piedmont region contains the Chattahoochee, Flint, Altamaha, Savannah and small portions of the Ogeechee River. Piedmont streams are more basic (pH 6.9 – 7.2), contain slightly more organic matter, and are more turbid (44 NTU) than mountain streams. As these waters move downstream, they gradually gain more organic matter and more species (as the temperature also climbs). A familiar characteristic of this region is the red clay subsoil, which is exposed when most of the topsoil has been eroded away during heavy development and agricultural practices. The rock and gravel substrate in the Piedmont streams is typically embedded in sand and silt.

Coastal Plains
The Coastal Plain streams can be divided into three groups on the basis of water chemistry. The large rivers originating in the Piedmont are weakly acid (average pH 6.8) and have moderate amounts of organic matter, turbidity (15 NTU), and hardness (average 17), with fairly high phosphorus (.07) and nitrogen (.24) levels. Two examples are the Oconee and Ocmulgee Rivers. They carry heavy runoff, coming from the steeper slopes of the Piedmont, and form extensive floodplains – four miles wide – as they drop below the Fall Line. These rivers carry significant loads of silt, clay and sand all the way to the sea.

Rocky Creek (Laurens Co.) and Ichawaynochaway (Baker Co.) exemplify the second group of Coastal Plain streams. These streams have a basic pH (7.25), are low in organics, moderately turbid (15.5 NTU), very hard (28), and have moderate loads of nutrients. The hardness and pH of these streams are probably due to passing through the basic limestone in the aquifer recharge zone. Many of the streams running through this area of Georgia (called the Dougherty Plain) are intermittent.

The third group consists of the lower Coastal Plain streams and is exemplified by the Little, Alapaha, Satilla, St. Marys, and Suwannee. These are referred to as blackwater river systems. Except for the large rivers that drain the Piedmont, almost all Coastal Plain rivers fall into this category. The water appears black when deep and tea-colored when shallow. The color comes from the organic acids leached from plant matter by the slow-moving waters of the swamps through which the tributaries flow.

These rivers and streams have a high content of organic matter and low levels of inorganic matter, such as sand, silt and clay. The high percentage of organic material plays a big role in the chemistry of these waters. These streams are relatively acidic (pH 4.59). Both the Little and the Alapaha are slightly less acidic, probably due to their contact with the basic limestone in the vicinity of Valdosta. The ultimate acidity is shown by the Suwannee (pH 4.3), deriving its acid from the Okefenokee peat and the cypress-tupelo floodplain along its upper portion. Hardness is low, approaching that of mountain streams, and phosphorus and nitrogen are quite low. Oxygen levels are lower than those of the North Georgia and Piedmont area due to the warmer, slower-moving waters. The common macroinvertebrates found in these blackwater systems are stoneflies, mayflies, dragonflies, beetles, dobsonflies, caddisflies, midges, and black flies.

The Coastal Marsh

Some of our volunteers located on the coast monitor tidal creeks, rivers or canals. These are defined as the network of channels that drain the salt marshes. The salt marsh “boundaries” lie between the coastal barrier islands and the high tide line and extend up tidal creeks and rivers, where its upper boundary is generally marked by the black rush (Juncus roemerianus). Salinity levels range from 1 to 28 parts per thousand (ppt). Temperature and dissolved oxygen levels can also have great fluctuations. These factors will depend on the tidal influence and the source and amount of freshwater entering the creeks. Coastal Georgia Adopt-A-Stream provides biological protocols and indices for these systems.

Georgia’s Wetlands

Various assessments of Georgia's wetlands have identified from 4.9 to 7.7 million acres, including more than 600,000 acres of open water habitat found in estuarine, riverine, palustrine, and lacustrine environments. Estimates of wetland losses since colonial settlement beginning in 1733 and expanding over the next two and one-half centuries are between 20-25% of the original wetland acreage.

Georgia has approximately 100 miles of shoreline along the Atlantic, with extensive tidal marshes separating the barrier islands from the mainland. Georgia's coastline and tidal marshes are well preserved compared to other South Atlantic states.

Georgia's interior ranges in elevation from sea level to 4,788 feet in the Blue Ridge Mountain Province. At the higher elevations, significant pristine cool water streams originate and flow down steep to moderate gradients until they encounter lower elevations of the Piedmont Province. Many of the major tributaries originating in the mountains and Piedmont have been impounded for hydropower and water supply

reservoirs. These man-made lakes constitute significant recreational resources and valuable fishery habitat. Palustrine wetlands in floodplains and beaver ponds are found in Piedmont river corridors. At the fall line, streams flowing southeasterly to the Atlantic Ocean or south-southwesterly to the Gulf of Mexico have formed large floodplains as each encounters the soft sediments of the upper Coastal Plain (Figure 4-1).

Other significant wetlands found in the state are associated with blackwater streams originating in the Coastal Plain, lime sinkholes, spring heads, Carolina bays, and the Okefenokee Swamp, a bog-swamp measuring approximately one-half million acres in south Georgia.

In the flatwoods of the lower Coastal Plain, seven tidal rivers originate in the ancient shoreline terraces and sediments of Pleistocene age. Scattered throughout the flatwoods are isolated depressional wetlands and drainages dominated by needle-leaved and broad-leaved tree species adapted to long hydroperiods.

Due to considerable variation in the landscape in topography, hydrology, geology, soils, and climatic regime, the state has one of the highest levels of biodiversity in the eastern United States. The state provides a diversity of habitats for nearly 4,000 vascular plant species and slightly less than 1,000 vertebrate species. Numerous plant and animal species are endemic to the state. Many of the rarer species are dependent upon wetlands for survival.

Chapter 3

MONITORING FORMS

- Registration Form
- Watershed Survey and Map Assessment Form

Return form to:

Georgia Adopt-A-Stream
4220 International Parkway
Suite 101
Atlanta, GA 30354

GEORGIA ADOPT-A-STREAM
Stream / Wetland / Lake Registration Form

Complete the following form for each stream segment, wetland or lake you monitor. We must have a completed form on file at the state office in order to include your efforts on our web site and database.

This form is to register the monitoring of a: (Circle one)

Stream Freshwater Wetland Saltwater Wetland Lake

Name of stream / wetland / lake you are monitoring (official name) _____

Lead Coordinator / Contact _____

Complete Mailing Address _____

_____

_____

Phone Number(s) _____

_____

E-mail Address _____

Topographic Map Quadrangle (**include copy of map**) on which your waterbody can be located _____

_____

Watershed (from 8 digit HUC map) _____

Latitude _____ Longitude _____

County _____ Today's Date _____

Do not send in your registration form without a map. The map must be a copy of a topographic map (see how to obtain maps on page 43) with an X marking your monitoring site. To easily obtain a map and the lat/long for your site from the web go to www.topozone.com (see detailed directions on page 46).

1. Describe the location of your monitoring site (i.e. 25 yards downstream of North Decatur Road crossing in Emory Village).

2. What is the name of your monitoring group? (i.e. Scout Troop 101, Friends of Hayworth Park, Dukes Creek Ducklings)?

3. If associated with a larger group (i.e. Big Creek Watershed Association) please list them here.

4. Who are your partners (partners may contribute equipment, provide skills or services, provide technical support or grant you access across their land)?

5. What are the goals you hope to accomplish with the Adopt-A-Stream (Wetland or Lake) program?

6. What equipment or supplies do you need to achieve your goals?

7. Where will you send the data you collect?

8. Name of the local official or agency that you have informed about your program.

9. Name the QA/QC data collectors in your group.

Return form to:

Georgia Adopt-A-Stream
4220 International Parkway
Suite 101
Atlanta, GA 30354

GEORGIA ADOPT-A-STREAM
Watershed Survey and Map Assessment
To be conducted at least once a year

AAS group name: _____ Investigator(s): _____

_____

Type of waterbody: stream / wetland / lake _____

Water body name: _____ County(ies): _____

Approximate size of drainage/study area: _____ acres

Date: _____ Time: _____ Picture/photo documentation? Yes/No

I. CREATE A MAP OF YOUR WATERSHED

A copy of this map should be included in your Registration Form to be filed with the State Georgia Adopt-A-Stream office.

II. LAND USES/ACTIVITIES AND IMPERVIOUS COVER

1. Identify land uses and activities in the watershed, which have the highest potential to impact water bodies:

Check all boxes that apply, describe the location of the activity(ies) under Notes on Location & Frequency of Activities and also mark the locations on your map. If too frequently occurring to record locations, so note. If you don't know some of the information below, write DK under Notes.

Please indicate if you: □ surveyed only adjacent to the waterbody
□ surveyed the whole watershed
Provide notes as necessary

Land Disturbing Activities & Other Sources of Sediment	Adjacent to Water	In Watershed	Notes on location & frequency of activity
Extensive areas disturbed by land development or construction of utilities, roads & bridges	☐	☐	_____
Large or extensive gullies	☐	☐	_____
Unpaved roads near or crossing streams	☐	☐	_____
Croplands	☐	☐	_____
Pastures with cattle access to water bodies	☐	☐	_____
Commercial forestry activities including harvesting and site-preparation	☐	☐	_____
Extensive areas of streambank failure or channel enlargement	☐	☐	_____
Other Agricultural Activities			
Confined animal (cattle or swine) feeding operations and concentrations of animals	☐	☐	_____
Animal waste stabilization ponds	☐	☐	_____
Poultry houses	☐	☐	_____
Highways and Parking Areas			
Shopping centers & commercial areas	☐	☐	_____
Interstate and controlled access highways and interchanges	☐	☐	_____
Major highways and arterial streets	☐	☐	_____
Other extensive vehicle parking areas	☐	☐	_____
Mining			
Quarries with sediment basins in live flowing streams	☐	☐	_____

Transportation and Motor Vehicle Services	Adjacent to Water	In Watershed	Notes on location & frequency of activity
Truck cleaning services	☐	☐	_____
Public and private automobile repair facilities	☐	☐	_____
Car washes and large auto dealers	☐	☐	_____
Rail or container transfer yards	☐	☐	_____
Airports with fuel handling/aircraft repair	☐	☐	_____
Business & Industry, General			
Activities with exterior storage or exchange of materials.	☐	☐	_____
Activities with poor housekeeping practices indicated by stains leading to streams or storm drains or on-site disposal of waste materials	☐	☐	_____
Heavy industries such as textiles & carpet, pulp & paper, metal, and vehicle production or fabrication	☐	☐	_____
Dry cleaners/outside chemical storage	☐	☐	_____
Food & Kindred Products			
Fertilizer production plants	☐	☐	_____
Feed preparation plants	☐	☐	_____
Meat and poultry slaughtering or processing plants	☐	☐	_____
Construction Materials			
Wood treatment plants	☐	☐	_____
Concrete and asphalt batch plants	☐	☐	_____

Waste Recycling, Movement & Disposal	Adjacent to Water	In Watershed	Notes on location & frequency of activity
Junk and auto salvage yards	☐	☐	_____
Solid waste transfer stations	☐	☐	_____
Landfills and dumps (old & active)	☐	☐	_____
Recycling centers	☐	☐	_____
Drum cleaning sites	☐	☐	_____
Illicit Waste Discharges*			
Sanitary sewer leaks or failure	☐	☐	_____
Overflowing sanitary sewer manholes due to clogging or hydraulic overloading	☐	☐	_____
Bypasses at treatment plants or relief valves in hydraulically overloaded sanitary sewer lines	☐	☐	_____
Domestic or industrial discharges	☐	☐	_____
Extensive areas with aged/malfunctioning septic tanks	☐	☐	_____
Dry-weather flows from pipes (with detectable indications of pollution)	☐	☐	_____
Streamside areas of illegal dumping	☐	☐	_____

* If found (most likely during stream surveys), these activities should be immediately reported to the local government or the EPD regional office. These phone numbers are listed in the Who to Call List on page 55.

Optional

2. Percent impervious surface: *acre overlay, example map and acreage calculating grid in Appendix A. Example form in Chapter 5.*

Coverage category for LANDUSE MAP method	**impervious quotient**	**times**	**percent of...**	**percent of impervious cover**
Forest/open land/undeveloped land/vacant/land owned by institutions	.005	x		%
Agriculture/pasture/cropland	.005	x		%
Single family residential (1.1 - 5 acre lot or no more than 1 dwelling per acre)	.12	x		%
Single family residential (.5 - 1 acre lot or 0 – 2 dwellings per acre)	.19	x		%
Low density residential / single family residential (.25 - .5 acre lot or 0 – 4 dwelling units per acre)	.26	x		%
Low/medium density residential (.25 acre lot or smaller or 0 –8 dwelling units per acre)	.48	x		%
Medium density residential (0 –12 dwelling units per acre)	.56	x		%
High density residential (18 – 30 dwelling units per acre)	.65	x		%
Townhouse/apartment	.48	x		%
Office/light industrial (assembly, finishing, packaging products)	.70	x		%
Heavy industrial (timber, chemical, cement, brick plants, lumber mills)	.80	x		%
Commercial (business districts, commercial strip development, shopping centers, warehouses, parking lots, office buildings	.85	x		%
Major roads	.90	x		%
	Total percent of watershed covered by impervious surfaces			%

Land use categories and quotient provided by the Atlanta Regional Commission

III. GENERAL WATERBODY AND WATERSHED CHARACTERISTICS

This information will be gathered from your wetland, lake or stream segment.

1. Note the number of hydrologic modifications on your waterbody: *structures that alter water flow*

None	_____	Beaver dams	_____
Dams	_____	Dredge spoils	_____
Bridges	_____	Pipes	_____
Waterfalls	_____	Other	_____

2. Note the approximate length of the stream that is affected by the following: *if assessing a wetland, lake or pond, some of the following may also affect your waterbody*

Stream culvert	_____	feet or	_____	mile or	_____	% of stream length
Stream straightening	_____	feet or	_____	mile or	_____	%
Concrete streambank/bottom	_____	feet or	_____	mile or	_____	%
Dredging/channelization	_____	feet or	_____	mile or	_____	%
Riprap/gabion	_____	feet or	_____	mile or	_____	%
Cattle crossing	_____ #					
Stream crossing *(for vehicles)*	_____ #					

3. Note extent of vegetative buffer along the banks: *at a minimum of 5 sites, at regular intervals (every 500 ft. in a ½ mile. section) note the following*

#	**Width in feet**	**Location** (Left bank, Right bank or N, S, E, W side of wetland or lake)	**Characteristics and comments**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

4. Check the categories that best describe the general appearance of the waterbody:

Litter:

- ☐ No litter visible
- ☐ Small litter occasionally (i.e., cans, paper)
- ☐ Small litter common
- ☐ Large litter occasionally (i.e., tires, pallets, shopping carts)
- ☐ Large litter common

Special Problems:

- ☐ Spills of chemicals, oil, etc.
- ☐ Fish kills
- ☐ Wildlife, waterfowl kills

Erosion:

- ☐ No bank erosion or areas of erosion very rare; no artificial stabilization
- ☐ Occasional areas of bank erosion
- ☐ Areas of bank erosion common
- ☐ Artificial bank stabilization (i.e., riprap) present

5. Comments on general waterbody and watershed characteristics: (e.g. date and size of fish kill, increased rate of erosion evident, litter most evident after storms)
* Fish kills should be immediately reported to DNR Wildlife Resources Division at 770-918-6400

6. Summarize notable changes that have taken place since last year (if this is not your first year conducting the Watershed Survey).

IV. PIPE AND DRAINAGE DITCH INVENTORY

In this section, provide information on pipes and drainage ditches found on the banks or in the waterbody. These pipes/ditches can be abandoned or active. Note the information for each pipe or drainage ditch you observe. *Make additional copies as necessary.*

Pipe #	Location	Type	Size	Flow	Waterbody condition	Comments

1. <u>Number</u> each pipe/ditch for mapping/locating purposes
2. <u>Location</u> of pipe/ditch: note whether in water, bank, near waterbody or other. Describe location.
3. Identify <u>type</u> of pipe (list all that apply): PVC, iron, concrete, galvanized; industrial outfall, sewage treatment plant outfall, storm drain, combined sewer overflow; agricultural field drainage, paddock or feedlot drainage, settlement basin/pond drainage, parking lot drainage, unknown, other
4. <u>Size</u>: measure approximate diameter of pipe: inches or centimeters
5. Describe the discharge <u>flow</u>: Rate of flow: none, intermittent, trickle, steady, heavy
Appearance: clear, foamy, turbid, oily sheen, color, other
Odor: none, rotten eggs/sewage, chemical, chlorine, other
7. Waterbody condition: describe the bank/waterbody below pipe or drainage ditch: no problem evident, eroded, sewage litter (e.g. toilet paper), litter (e.g. bottles, cans), lots of algae, other
8. Comments of pipes and drainage ditches: Use this space to explain or expand on information provided on pipes and discharges you have identified above. For example, you may want to identify particular facilities, or discuss in more detail the condition of the waterbody below the discharge. Use separate page if necessary.

Chapter 4

GETTING STARTED: REGISTERING YOUR STREAM, WETLAND OR LAKE

- Identify a Stream Segment, Wetland or Lake Area To Monitor
- Determine the Official Name of Your Waterbody
- How To Obtain Maps and Other Information
- Determine Which Watershed You Are In
- Determining Your Lat/Long
- Sample Delineated Watershed
- Name Your Group
- Why Am I Monitoring? Setting Goals
- Determine What Equipment and Resources You Need
- Find Local Partners
- Determine What Data Will Be Collected
- Make a "Who To Call" List
- Inform a Local Official
- Public Outreach
- Sample Registration Form

It is important to register your waterbody as soon as you are sure you can commit to a year of monitoring. When you register your waterbody you will be registered in the Adopt-A-Stream (AAS) database. You will also receive a certificate of adoption. This database is used by local and State agencies and by citizens who wish to form watershed networks.

Answering the questions on the **Registration Form** and the **Watershed Survey and Map Assessment** will help you create a clear picture of your waterbody and a clear set of goals for your monitoring efforts. These forms are located in Chapter 3.

Identifying a Stream Segment, Wetland or Lake to Monitor

Some general guidelines to follow for selection of a stream segment, wetland or lake:

- Select a waterbody meaningful to you or your group.
- Select a location that has **easy, safe, and legal** access.
- Select a project that meets your monitoring goals.

Stream
Choose a stream that is meaningful to you and your group. Do you want to learn more about a stream that flows near your home or school? Many communities study an entire watershed and monitor several sites. Comparing the effect of land uses on water quality can be interesting (sample upstream and downstream of a farm, an urban area, etc.). If your community has a local AAS program, they may have mapped stream segments that need to be monitored.

We suggest you choose a ½ mile segment of stream to monitor. During the watershed survey, you will locate one monitoring point representative of your stream segment. From this location, you will conduct the visual surveys, chemical and biological monitoring. Once you have registered your stream segment or have attended a workshop, you will receive the *Visual Stream Survey* Manual and the *Chemical and Biological Stream Monitoring* Manual**.**

Wetland
Wetlands are not as common and easy to find as streams and creeks. For this reason, it is advisable to work with a local partner who may own land where a wetland is located or contact a government agency for permission to work on publicly owned land. By purchasing a USGS topographical quadrangle of the area of interest, you may learn if a wetland is present. A better estimation of wetland location will be found on a NWI map (National Wetland Inventory). These quadrangles correlate to the USGS topographic maps and are specifically made to identify and classify wetlands. Both the USGS and NWI maps may be purchased at the State Geological Survey office in Atlanta (information in this chapter). You can also learn more about wetlands on our website at www.georgiaadoptastream.com

The *Wetland Monitoring* Manual will guide you through determining if you have a wetland. Call the State office at (404) 675-6240 to request the manual.

Lake
In Georgia there are many small and large lakes ranging from farm ponds to large reservoirs. Do you want to monitor a small pond, a larger lake or one or more sites on a large reservoir? In Georgia, you have many choices.

Most of the larger lakes have lake associations and/or citizen monitoring programs. Contact the Georgia Lake Society to find out if your lake has one of these. The Georgia Lake Society will also provide workshops and technical assistance. *If you have chosen a lake to monitor, contact the State office for an Adopt-A-Lake Manual***.** Call the State office at (404) 675-6240 to request the manual .The contact numbers for the Georgia Lake Society are in the manual.

Determine Official Name of Your Waterbody

Many streams, wetlands and small ponds are not named on the maps. If this is the case for your waterbody, contact your county or city water or utilities department and ask them if they have named the waterbody. Some groups make up their own names, but if this does not correspond to the name used by the municipality or State, it will be hard to associate your data to the appropriate waterbody.

If you are looking at a stream or wetland associated with a larger stream that is named, you should call the stream "a tributary to (name of bigger stream)" or "wetland adjacent to (name of waterbody)." For example, a small tributary running into Peachtree Creek would be called "unnamed tributary to Peachtree Creek." Also include the location such as, "flows under Sycamore Street in Downtown Decatur".

How To Obtain Maps And Other Information

Stream headwaters, length, tributaries, final stream destination, and watershed boundaries are best determined through maps. Of greatest value are U.S. **Geological Survey 7.5- minute topographic maps** (on a 1:24,000 scale where 1 inch = 2,000 feet). They depict landforms, major roads and political boundaries, developments, streams, tributaries, lakes, and other land features. Sporting goods stores and bookstores often carry these maps, especially for recreational areas that are likely to be hiked or camped. The maps can also be ordered through the U.S. Geological Survey (see Obtaining USGS Topographic Maps below). Small versions are available online at http://www.topozone.com.

Road, state, and county maps might also prove helpful in identifying some of these stream and watershed features. **Hydrologic unit maps**, also available from the U.S. Geological Survey but at a 1:100,000 scale of resolution (less detail than the 7 1/2-minute maps cited above) might also help you determine hydrologic watershed boundaries. **Atlases** and other reference materials at libraries can prove helpful in determining facts about population in the watershed.

Land uses in the stream's watershed might also be depicted on maps such as those discussed above. You will verify this information in the second half of the watershed survey, when you are actually in the field observing land around your waterbody. Information from maps is particularly useful in developing a broad statement about general land use in the watershed (e.g., land use in the hypothetical Volunteer Creek watershed is 60 percent residential, 20 percent parkland/recreational, and 20 percent light industrial).

Much information about your local watershed can be obtained from the internet. **EPA's Surf Your Watershed** (http://www.epa.gov/surf/) is a good place to start, however there are other sources for obtaining detailed maps, both topographical and aerial views. On the following page is a list of potential sources to begin your exploration, though there are probably more sites popping up everyday.

Obtaining USGS Topographic Maps

Start by checking with the Regulatory Support Program (RSP) of the Water Resources Branch (the old Georgia Geologic Survey). They offer 1:24,000 scale maps for the entire State of Georgia at a cost of $6 a map. They also offer a multitude of other maps including land use, agriculture, ecoregion, wetland, and different scale maps

Regulatory Support Program
19 Martin Luther King Dr. SW
Suite 400
Atlanta, GA 30334
(404) 656-3214

Order online at http://ggsstore.dnr.state.ga.us

The U.S. Geological Survey's Earth Science Information Centers can provide you with a catalog of available USGS topographic maps, a brochure on how to use topographic maps, and general information on ESIC services. Contact the main ESIC office at:

USGS Earth Science Information Center
507 National Center
12201 Sunrise Valley Drive
Reston, VA 22092
1-888-ASK-USGS

If you know the coordinates of the map you need, you can order it directly from:

USGS
Branch of Information Services
Box 25286
Denver, CO 80225
Or call 1-888-ASK-USGS, TDD (703) 648-4101.

Place your order in writing and include a check for $4.00 per map plus $3.50 for shipping and handling. The ESIC can also refer you to commercial map distributors that can get you the topographic maps sooner, for a higher fee.

For more detailed information, contact one of the Earth Science Information Centers.

USGS topographic maps might also be available from sporting goods stores in your area, i.e. REI, Sports Authority, etc.

There are also several websites that have topographic map search abilities. Two that we have found helpful are www.topozone.com and http://tiger.census.gov.

Other sources of information include:

- Plans from local planning offices, include information not only for current land uses but also for potential uses for which the area is zoned. Additionally, many planning offices have a Geographic Information Service Department to assist you with obtaining maps.
- Conservation District offices or offices of the Agricultural Extension Service or Natural Resources Conservation Service (Formerly the Soil Conservation Service). These offices might be able to provide information on agricultural land in rural areas.
- Local offices of the U.S. Geological Survey, which might provide a variety of publications, special studies, maps, and photos on land uses and landforms in the area.
- Aerial photographs, which might provide current and historical views of land uses.

Aerial Photographs

Historic and current aerial photographs can be obtained from local, state, and federal governments, as well as private firms. Try planning offices, highway departments, soil and water conservation districts, state departments of transportation, and universities. Many of these photographs are now available over the internet.

Federal sources of aerial photographs include:

USGS Earth Science
Information Center
507 National Center
12201 Sunrise Valley Drive
Reston, VA 22092
1-888-ASK-USGS (1-888-275-8747)

USDA Consolidated
Farm Service Agencies
Aerial Photography Field Office
222 West 2300 South
P.O. Box 30010
Salt Lake City, UT 84103-0010
801-975-3500 ext. 7

Cartographic and Architectural Branch
National Archives and Records Administration
8601 Adelphi Road
College Park, MD 20740-6001
(301)-837-3200

Determine Which Watershed You Are In

On the cover page of this manual is a map for the delineation of the 14 major watersheds or river basins in Georgia. On the inside of the cover page is a map that delineates the 52 watersheds in Georgia. The 52 watersheds are smaller watersheds within the larger river basins. They are labeled by common name and by an 8-digit number. The 8-digit Hydrologic Cataloging Unit (HUC) is part of a national coding system. HUC units can range from 2 to 16 digits: the larger the number, the smaller the watershed. Therefore, the 14 major river basins on the front cover will have smaller HUC numbers. For the purpose of grouping and tracking the AAS monitoring sites, please indicate which of the 52 watersheds your waterbody is in, using common name and the 8-digit HUC. For example, if you live in Cherokee County, you can see on the map that you are in the Etowah River watershed and that its HUC number is 03150104.

Additional information about watersheds (e.g., 8-digit hydrological unit codes, rivers and streams in the watershed, land characteristics, river corridor and wetlands restoration efforts, index of watershed indicators, etc.) may be accessed through the USEPA web page at:

http://www.epa.gov/surf/

The USGS 8-digit hydrological cataloging unit map for Georgia may be ordered from the USGS Earth Information Science Center (ESIC) at 1-800-USA-MAPS.

Determine Your Latitude/Longitude

So others can find the exact location of your monitoring site, you will need to know how to determine the latitude and longitude of your site. To locate the coordinates, you will need to work with a topographic map and have access to the web.

The best-quality maps we have found on the web are available at www.topozone.com. Scroll down to the bottom of the screen and type the official name of your waterbody in the area designated “Place Name.” If you are working with an unnamed tributary to a larger stream, type in the name of the larger stream. Select your state (GA) on the pull-down menu, and click “Search.” This should bring up a list of all sites with that name. Select your site by clicking on the link, which will take you to a topographic map of the area. Locate your exact data collection point as closely as possible and click on it, using the green arrows at the edges of the map to change the view if necessary. A small red mark should appear where you click, allowing you to keep track of your site. Now go to the left hand column of the map and under USGS Topo Maps click on the 1:24/25K Series option, which will zoom in on the red mark. Adjust its position if necessary. Select the Map Size you prefer and the 1:50,000 View Scale. Click on the Update Map button. Under Coordinate Format, select the one labeled “DD.DDDD” for decimal degrees. The latitude and longitude of your site and the name of the quadrangle will appear above the map. Print this map for your records, noting the

scale, coordinates, quadrangle, and date of production, which may be obtained by clicking “Quad Info” in the upper right corner of the screen. For online registration (found at http://www.georgiaadoptastream.org/register.html) copy the link and paste it into the online registration form. Always keep a hard copy for your record.

To obtain a hard copy of the topographic quadrangle map, contact the Georgia Geological Survey at 19 Martin Luther King Jr. Drive, Room 400, Atlanta, GA 30334. Phone: (404) 656-3214. The US Geological Survey may be reached at 1-800-USA-MAPS. Maps cost $4 each plus shipping and handling. To order the map, you will need the name of the quadrangle, the scale of the map and the date it was printed.

NOTE: Your waterbody may cover more than one quadrangle.

While topozone.com provides lovely maps, its coordinates may not be precise. Therefore, to determine the exact latitude and longitude of your site (important for future studies!), you should now visit http://tiger.census.gov. Scroll down and click on “The TIGER Mapping Service.” This will bring up a default map. About three quarters of the way down the page, enter the latitude and longitude you obtained from topozone.com in the designated spaces under BOTH “Place a Marker on this Map” and “Enter Precise Coordinates.” Set the map width to 0.022 and the map height to 0.009, and click “Redraw map.” Locate your data collection site, which should be fairly close to the marker. To the right of the map, under “Click on the image to:” select “Place Marker” and click on your site as precisely as you can. When the map reloads, scroll down to the original “Place a Marker on this Map,” which will now show the new, more accurate coordinates of your marked site. Record these coordinates for your final data sheets, and print this map for your records.

Send copies of both maps and all information to Georgia Adopt-A-Stream.

Name Your Group

On the Registration Form and the data forms, a few different names are requested. The first is the official name of your waterbody. The next name is the lead coordinator. That will be the main contact person for the group, and his or her address and phone number should be written on the Registration Form.

The next name is the name of your group. This can be a fun name or the official name of your organization monitoring a waterbody. Once you have chosen a name, be consistent. This name will be used to track your data forms throughout the year.

Why Am I Monitoring? Setting Goals

Generally, a *goal* is a broad statement that encompasses the purpose of your involvement in Georgia Adopt-A-Stream. An *objective* is a specific, measurable, action-oriented activity that will help you achieve your goals. Don't get weighed down with the definition of goals and objectives. What is important is you have a clear picture of why you are adopting a stream, wetland or lake and what you hope to achieve from your efforts. Then you can decide which activities you will conduct.

Schools, county water departments, golf course managers, watershed organizations, communities, landowners, and businesses use the Georgia Adopt-A-Stream Program. As you can imagine, the goals and objectives of each group may be very different. Below are examples of goals and activities you may consider for your program.

Goals:

- To learn more about my local stream and watershed.
- To educate the community about water quality, watersheds and nonpoint source pollution.
- To collect baseline water quality or stream morphology data.
- To get the community involved in a hands-on effort to protect the lake.
- To form a watershed alliance.
- To work in partnership with local governments and businesses to protect our water.
- To teach aquatic biology to students.

Objectives:

- Conduct the watershed survey and map assessment.
- Speak at the neighborhood association or local church about your Adopt-A-Stream efforts.
- Obtain $500 sponsorship from a local business to purchase monitoring equipment.
- Conduct Visual Surveys four times a year.
- Collect data on pH, dissolved oxygen, temperature and nitrate-nitrogen once a month for three years.
- Organize two cleanups this year.
- Ask someone at the local water authority to act as your technical advisor.

- Send a letter to a local official, informing him or her of your intentions.
- Write an article in your local paper with information on "Who to Call" if someone sees a water quality problem.
- Collect data that will be useful to at least three entities (watershed organization, county water authority, local college).

Determine What Equipment and Resources You Need

Think about the equipment and resources you will need to accomplish your goals. This may include topographic maps, boots, chemical test kits, nets, garbage bags or information on how to form a watershed group.

Equipment List for Watershed Survey and Map Assessment

Getting To Know Your Watershed manual and forms
Topographic map
Transparency paper
Land use map
Camera
Tape measure
First aid kit
Boots
Gloves

Equipment List for Visual Stream Survey

Visual Stream Survey manual and forms
Camera
Tape measure
8 – 10 ft. measuring stick
An orange
Calculator
Twine
Line level
Rebar
Pencil
Waterproof paper
Clear jar

Equipment List for Chemical Monitoring – Details on pricing found in the *Biological and Chemical Stream Monitoring* Manual.

Eye protectors
Boots
Gloves
First aid kit
Test kits for pH, Dissolved Oxygen, Nitrate-nitrogen, Phosphate, Alkalinity, Ammonia

Thermometer
Conductivity Meter
Imhoff cone
Waste bucket
Chemical data forms

Equipment List for Biological Monitoring– Details on pricing found in the *Biological and Chemical Stream Monitoring* Manual.

D-frame or kick seine net
Buckets
Forceps
Spoons
Pipettes
Sorting trays
Macroinvertebrate key (laminated)
Collecting jar with alcohol
Biological Monitoring Forms

Equipment List for Wetland Monitoring

Tape measure
Shovel
Soil color chart (laminated)
Local plant ID book
Wetland survey forms

Equipment List for Lake Monitoring

Secchi Disk
All equipment listed under Chemical Monitoring

Find Local Partners

Local partners can help make your project a success in many ways. They can offer technical advice, donate equipment, or facilitate access to the waterbody. The more partners you have, the more your efforts will be magnified throughout your community.

Examples of local partners:

- Large private landowners such as timber companies who may have wetlands on their property.
- Government agencies like the Department of Natural Resources Wildlife Resources Division, USDA Natural Resources Conservation Service, the Extension Service or the US Geological Survey.
- Municipalities who may have an interest in working with citizen monitoring groups.
- Environmental education centers.
- Professors at colleges or universities.
- A local business to sponsor your group.
- A corporation interested in promoting and supporting environmental stewardship.

Determine What Data Will Be Collected

Before you begin to collect visual, biological or chemical data, determine why you are collecting the data and for what purpose the data will be used. Below are examples of how various people and organizations can use the data you collect.

Watershed Survey data first provides you and your group with a clear picture of your waterbody and the activities on the land that may affect the quality of your waterbody. If your watershed has not been impacted by much development, this is an excellent time to begin collecting watershed data. Your watershed map and data forms may be the only data available on your watershed. Conducting the watershed survey every year will provide documentation of the changes in your watershed. This information may be useful in helping local officials pass ordinances to protect streams and wetlands and to control development.

Visual Survey data is collected four times per year. Many of the critical water pollutants and most habitat damage can be detected through the visual survey. In the wetland, stream, and lake manuals there are detailed descriptions on how to conduct the visual surveys. Sedimentation, erosion, excess nutrients and sewage leaks are all recognized and recorded during the visual survey. Photo documentation is highly encouraged. A picture can be worth more than a thousand data points. This data can show the erosion process of a streambank or the increased sedimentation in a wetland.

Chemical data is collected once a month. The common parameters we recommend are pH, dissolved oxygen, temperature, settleable solids, alkalinity, phosphates, ammonia, nitrate-nitrogen, and conductivity. The chemical kits used in the field are accurate (if used and maintained properly) but are not approved under the standard methods required by EPA and GA EPD for compliance purposes in regulatory matters.

However, data of this type serves an important purpose. County, city and State water quality technicians and environmental consulting groups often use the data for screening purposes. If significant readings are found, a local water authority or EPD agent can be called in to take additional samples. Trend monitoring is also important. Several years of data can show changes in chemical parameters, which may correlate to the data collected in your visual and watershed surveys. This type of information is useful in watershed planning and management.

Biological data is collected four times per year (once per season). Collecting and identifying macroinvertebrates is a good way to assess water quality and habitat quality. Biological surveys can provide a good indication of the "health" of the stream. If the dissolved oxygen is low or a toxic substance was spilled into the water or habitats have been destroyed, this will be reflected in the type and number of macroinvertebrates you collect. The overall health of the stream will be better reflected in biological data than in chemical data. Collecting chemical, biological and visual data will provide a more complete picture of your waterbody and its present or potential impacts.

QA/QC data refers to the Quality Assurance Plan and the quality controls in place to assure the data is accurate and precise. Georgia Adopt-A-Stream has a Quality Assurance Plan approved by the EPA and states the methods AAS trainers and volunteers use to assure high quality data. Part of the QA/QC process is for volunteers to participate in a chemical and/or biological workshop once a year. During the workshops, the volunteers are given a written and field test to ensure they understand the data collection procedures. **You do not have to collect biological or chemical data to be involved in Georgia Adopt-A-Stream**. If you plan to collect biological or chemical data, we suggest you attend a QA/QC workshop.

Finally, determine who will receive your data. It is a good idea to call a few organizations ahead of time to find out if they will be interested in receiving data. Various organizations and agencies have different data needs and different quality assurance requirements for the data they use. If you want a particular organization or agency to use your data, you may have to adjust your goals and objectives to meet their criteria.

Of course, always send your data to the State Georgia Adopt-A-Stream office. All data is reviewed and filed in your group file and is available to anyone upon request. If your data is QA/QC, it will be posted on the database.

Permitted Discharge Information

Industries and others that discharge to the stream might be identified at the State, city, or county environmental protection or water quality office. At these offices, you may ask to see records of industries with permits to discharge treated effluent to streams. These records are maintained through the National Pollutant Discharge Elimination System (NPDES). All industrial and municipal dischargers are required to have permits, which specify where, when, and what they are allowed to discharge to waters of the United States. The EPD Permitting and Compliance Program maintain these records at their office. This information can also be found on EPA Surf Your Watershed website at http://www.epa.gov/surf/

In older metropolitan areas, combined sewers are also potential discharges. Combined sewers are pipes in which sanitary sewer waste overflow and storm water are combined in times of heavy rain. These combined sewers are designed to discharge directly into harbors and rivers during storms when the volume of flow in the sewers exceeds the capacity of the sewer system. The discharge might include raw sanitary sewage waste. Combined sewers do not flow in dry weather. Maps of sewer systems can be obtained from your local water utility. The EPD should also be able to provide location information on other potential pollution sources such as landfills, wastewater treatment plants, and stormwater detention ponds.

Conducting Research

Historical land uses and the history of the stream might take some legwork to uncover. Local historical societies, libraries, and newspaper archives are good places to start. Look for historical photos of the area and stories about fishing contests, fish kills, spills, floods, and other major events affecting the stream and its watershed. County or town planning offices might be able to provide information on when residential developments were built and when streams were channeled or diverted. State and local transportation agencies might have records on when highways and bridges were built. State environmental regulatory agencies have records of past or current applications to modify stream hydrology through dredging, channeling, and stream bank stabilization.

Long-time residents are another invaluable source of information on the history of your stream. People who fished or swam in your stream in their youth might have witnessed how the stream has changed. They might remember industries or land use activities of the past such as mines or farms that could have affected the stream. They might have tales to tell about fish they once caught or floods that led to channeling and dams. Assembling such oral histories is a particularly good activity for school age volunteers.

Data and The Story It Tells

Data is collected by a number of Federal, State and local agencies and through research done by universities and consulting firms. Most of this data is not compiled in one location and if it were compiled, the data may not be comparable due to different monitoring methods. For this reason, it may take some research to determine if any data has been collected on your stream, lake or wetland. The best place to start is EPA Surf Your Watershed at http://www.epa.gov/surf/

Make A “Who To Call” List

It is very important to know whom to call if you find a problem on your waterbody! This list can also include technical contacts. Lists will be different for each county and city. Use the blue pages in your phone book and call these numbers to be sure you are calling the right place!

State and regional numbers are located on the next page of this manual. Other numbers you may want to include on your list are the local contacts for erosion and sedimentation violations, storm water problems, sewage leaks, septic leaks, fish kills and toxic spills.

Who to Call List (State Numbers)

EPD General Information	1-888-EPD-5947 or 404-657-5947
EPD Emergency Operations Center (for requesting assistance)	1-800-241-4113 or 404-656-4863
EPD Emergency Response (for information & follow up)	404-656-4863
EPD Hazardous Waste Program (for illegal dumping)	404-656-7802
EPD Water Protection (responds to underground storage complaints)	404-362-2687
EPD Georgia Safe Dams Program (questions about dams)	404-362-2678
EPD Water Protection (modeling and monitoring or water quality)	404-675-6240
EPD Non Point Source Program (erosion, buffers, stormwater)	404-675-6240
EPD Land Protection Scrap Tire Program	404-363-7027
Sewage Spill	404-362-2680

EPD Environmental Management Districts (for water quality questions, fish kills, erosion & sedimentation problems)

Mountain District – Atlanta	(404) 362-2671	East Central District – Augusta	(706) 792-7744
Mountain District – Cartersville	(770) 387-4900	Southwest District – Albany	(229) 430-4144
Northeast District – Athens	(706) 369-6376	Coastal District – Brunswick	(912) 264-7284
Middle GA District – Macon	(478) 751-6612	Coastal District – Savannah	(912) 353-3225

DNR Coastal Resource Division	912-264-7218
DNR Georgia Wildlife Resources Division	770-918-6400
Endangered Species	770-761-3035
Georgia Cooperative Extension Service	1-800-ASK-UGA1
Georgia Forestry Commission	1-800-GA-TREES
Georgia Soil & Water Conservation Commission	706-542-3065

US NRCS	State	404-546-2272
	Clayton	770-473-5467
	Fulton	770-393-2849
	Gwinnett	770-963-9288
	Henry	770-957-5705
	Cobb	770-528-2218

EPA	Environmental Education	404-562-8314
	Lakes/Rivers/Streams	404-562-9345
	Wetlands Information	1-800-832-7828
	Wetlands/Oceans/Watersheds	404-562-9355

USGS Water Resources Division	770-409-7700
US Fish and Wildlife Service	404-679-7319
US Army Corps of Engineers	912-652-5279– Savannah Office
US Geological Survey	404-656-3214

Complete list of EPD numbers under “About EPD” at “Contact List” at http://www.gaepd.org/Files_PDF/epd_directory.pdf

Inform Your Local Government

It is important to have everyone working together as stewards of our watersheds. Involving the local government will give your project respectability and help you establish a working relationship with the people who can help you protect your wetland, stream, lake or watershed. Write a letter to the mayor, a council member, and/or the city/county manager (sample letters in Appendix A). Let them know where your project is located, your goals, and why it is important. Invite them out for a visual survey!

Public Outreach

Public outreach is probably the most important activity you can do to help protect Georgia's waters. Outreach and education can help develop an awareness of your local stream, wetland or lake. This is your opportunity to tell people what you have learned about your local water body, what the potential threats are and what the community can do to protect the stream, wetland or lake. We ask you conduct at least one outreach activity each year.

Most of the threats to your adopted water body come from the every day activities of you and your neighbors. In order to reduce those threats, you first have to educate yourself and your neighbors. Then you have to see the link between your actions and the threatened water body. Finally, you have to decide it is important enough to change your behaviors or take action.

Taking others through the process from education to action is not easy but it can be done. Each community is different and you may have to try a few outreach techniques. Below are a few suggestions. For more information, contact Georgia Adopt-A-Stream.

- Write a letter to your neighbors explaining what your are doing. Attach a copy of the brochure "You Are The Solution To Water Pollution." (Available from AAS)
- Organize a cleanup. For in-depth information, go to www.riversalive.org.
- Arrange to speak at the neighborhood association, garden club or local school.
- Put an article in the local newspaper.

Conduct a Watershed Survey and Map Assessment and Register Your Waterbody!

Make enough copies of your Registration Form and Watershed Survey and Map Assessment to send to the State AAS office, local officials and other interested parties. Remember to keep copies for yourself.

Return form to:

SAMPLE FORMS

Georgia Adopt-A-Stream
4220 International Parkway
Suite 101
Atlanta, GA 30354

Georgia Adopt-A-Stream / Wetland / Lake Registration Form

Complete the following form for each stream segment, wetland or lake you monitor. We must have a completed form on file at the state office in order to include your efforts on our web site and database.

This form is to register the monitoring of a: (STREAM) WETLAND LAKE
(Circle one)

Name of stream / wetland / lake you are monitoring (official name): Shoal Creek

Lead Coordinator / Contact: Allison Hughes

Complete Mailing Address: 4220 International Parkway, Suite 101
Atlanta, GA 30354

Phone Number(s): 404-675-1635

E-mail Address: Allison_Hughes@dnr.state.ga.us

Topographic Map Quadrangle (**include copy of map**) on which your waterbody can be located: NE Atlanta—map attached

Watershed (from 8 digit HUC map): 03070103,

Latitude: 33.7581°N Longitude: 84.2871°W

County: DeKalb Today's Date: February 16, 2003

Do not send in your registration form without a map. The map must be a copy of a topographic map (see how to obtain maps on page 43) with an X marking your monitoring site. To easily obtain a map and the lat/long for your site from the web go to www.topozone.com (see detailed directions on page 46).

SAMPLE FORMS

1. Describe the location of your monitoring site (i.e. “25 yards downstream of North Decatur Road crossing in Emory Village).

75 feet downstream of the bridge crossing Midway Rd, just after unnamed tributary enters Shoal Creek.

2. What is the name of your monitoring group? (i.e. Scout Troop 101, Friends of Hayworth Park, Dukes Creek Ducklings)?

Friends of Shoal Creek

3. If associated with a larger group (i.e. Big Creek Watershed Association) please list them here.

South River Watershed Alliance, Shoal Creek Watershed Alliance

4. Who are your partners (Partners may contribute equipment, provide skills or services, provide technical support or grant you access across their land)?

South River Watershed Alliance, Georgia Adopt-A-Stream, Oakhurst Community Garden

5. What are the goals you hope to accomplish with the Adopt-A-Stream (Wetland or Lake) program?

To educate my neighbors about the stream and their impact on the stream
To collect baseline water quality data (visual, chemical and biological)
To learn about my watershed

6. What equipment or supplies do you need to achieve your goals?

Chemical test kit, D-frame net, boots, gloves, waterproof paper, nonpoint source pollution brochures.

7. Where will you send the data you collect?
DeKalb County, South River Watershed Alliance, GA Adopt-A-Stream, Oakhurst Garden Club

8. Name of the local official or agency that you have informed about your program.
The CEO of DeKalb County
The president of the neighborhood association

9. Name the QA/QC data collectors in your group.
Allison Hughes

Chapter 5

WATERSHED SURVEY AND MAP ASSESSMENT

- Directions for Completing the Watershed Survey and Map Assessment Forms
- Create A Map of Your Watershed
- Land Use Activities and Impervious Cover
- General Waterbody and Watershed Characteristics
- Pipe and Drainage Ditch Inventory
- Sample Watershed Survey and Map Assessment Form

One of the most rewarding and least costly monitoring activities a volunteer program can conduct is the Watershed Survey. Some programs call it a windshield survey, a visual survey, or a watershed inventory. It is, in essence, a comprehensive survey of the geography, land and water uses, potential and actual pollution sources, and history of the waterbody and its watershed.

The watershed survey requires little in the way of training or equipment. Its chief uses include:

- Screening for pollution problems
- Identifying potential sources of pollution
- Identifying sites for monitoring
- Helping interpret biological and chemical information
- Giving volunteers and local residents a sense of the value of the stream or watershed
- Educating volunteers and the local community about potential pollution sources and the stressors affecting the stream and its watershed
- Providing a blueprint for possible community restoration efforts such as cleanups, stream bank stabilization and riparian tree plantings

- Determining whether those stressors are, in fact, affecting the stream requires additional monitoring of chemical, physical, or biological conditions.

Researching the watershed is generally a one time per year activity, which should yield valuable information about the cultural and natural history of your waterbody and the uses of the land surrounding it. This information will prove helpful in orienting new volunteers to the purpose of the monitoring program, in building a sense of the importance of the stream, lake, or wetland, and identifying land use activities in the watershed with a potential to affect the quality of the waterbody. The background investigation is essentially a "detective investigation" for information.

Asking the Questions

Before beginning the Watershed Survey and Map Assessment, think about what it is you want to know about the stream, lake or wetland you are surveying. Types of information include:

- Location of the stream's headwaters, its length, where it flows, and where it empties
- Name and boundaries of the watershed it occupies, the population in the watershed, and the communities through which it flows
- Roles of various jurisdictions in managing the waterbody and watershed (city, county, state government)
- Percentage of watershed land area in each town or jurisdiction
- Land uses in the watershed
- Industries and others that discharge to the stream
- Current uses of the waterbody (such as fishing, swimming, drinking water supply, irrigation)
- Historical land uses
- History of the waterbody

The following directions lead the volunteer, step by step, through the process of filling out the Georgia Adopt-A-Stream Watershed Survey and Map Assessment forms. Before you get started, pull your watershed forms out and photocopy them so that you have extra blank forms to work with.

Directions for Completing: Georgia Adopt-A-Stream Watershed Survey and Map Assessment Forms

AAS group name: This is covered in "Getting Started" and should have been completed in your registration. Be consistent! Use the same name each time.

Investigator: Please list all individuals who assisted with this survey.

Type of waterbody: List whether you will be conducting stream, wetland, or lake monitoring.

Waterbody name: This information should be on your registration form. Be sure to provide the official name.

County(ies): List the counties and/or cities your watershed occupies. Note which one contains your monitoring site.

Approximate size of drainage/study area: Determine how many acres your watershed drains. If you are monitoring a water body on a very large watershed, determine the area you will study for your watershed survey and calculate that acreage. How to obtain this information is described in detail on the next page. Some land use maps will have this information. Check with your county or city planning office if it is not an officially defined watershed listed on county, city, or GIS maps.

Picture/photo documentation? Yes/No Photo documentation can serve as a useful and powerful tool for documenting changes and developments in your adopted watershed. Make double prints and include them in your survey. GA AAS might include your photos in our newsletter or on our web page. We will also file your photos for comparison with past and future documentation of the watershed/stream segment. Be sure to date and label the photos!

Date: The time of year you conduct your survey is very important. Vegetative cover and stream flow depth will vary with the seasons. Sometimes it's advisable to conduct the watershed survey multiple times, such as in the winter, early spring and late summer.

Time: Document the time of day.

I. CREATE A MAP OF YOUR WATERSHED

The first step in conducting a Watershed Survey is to map your watershed!

Volunteers should learn to read a topographic map to learn about the natural and cultural features of their study stream's watershed (Appendix A). Once you learn to read a map, the next step is to delineate the boundaries of your watershed.

Delineating the Boundaries of Your Watershed

Once you've obtained topographic maps of your area (ways to obtain maps are listed in Chapter 3), follow these steps to draw your watershed boundaries:

1. Locate and mark your monitoring point.

2. Locate all water features such as streams, wetlands, lakes, and reservoirs that eventually flow to this point. Start with major tributaries, and then include smaller creeks and drainage channels. Highlight these water features to make them easier to see.

3. To determine whether a stream is flowing to or from a lake or river, compare the elevation of land features to the waterbody. Use arrows to mark the direction of stream or wetland flow.

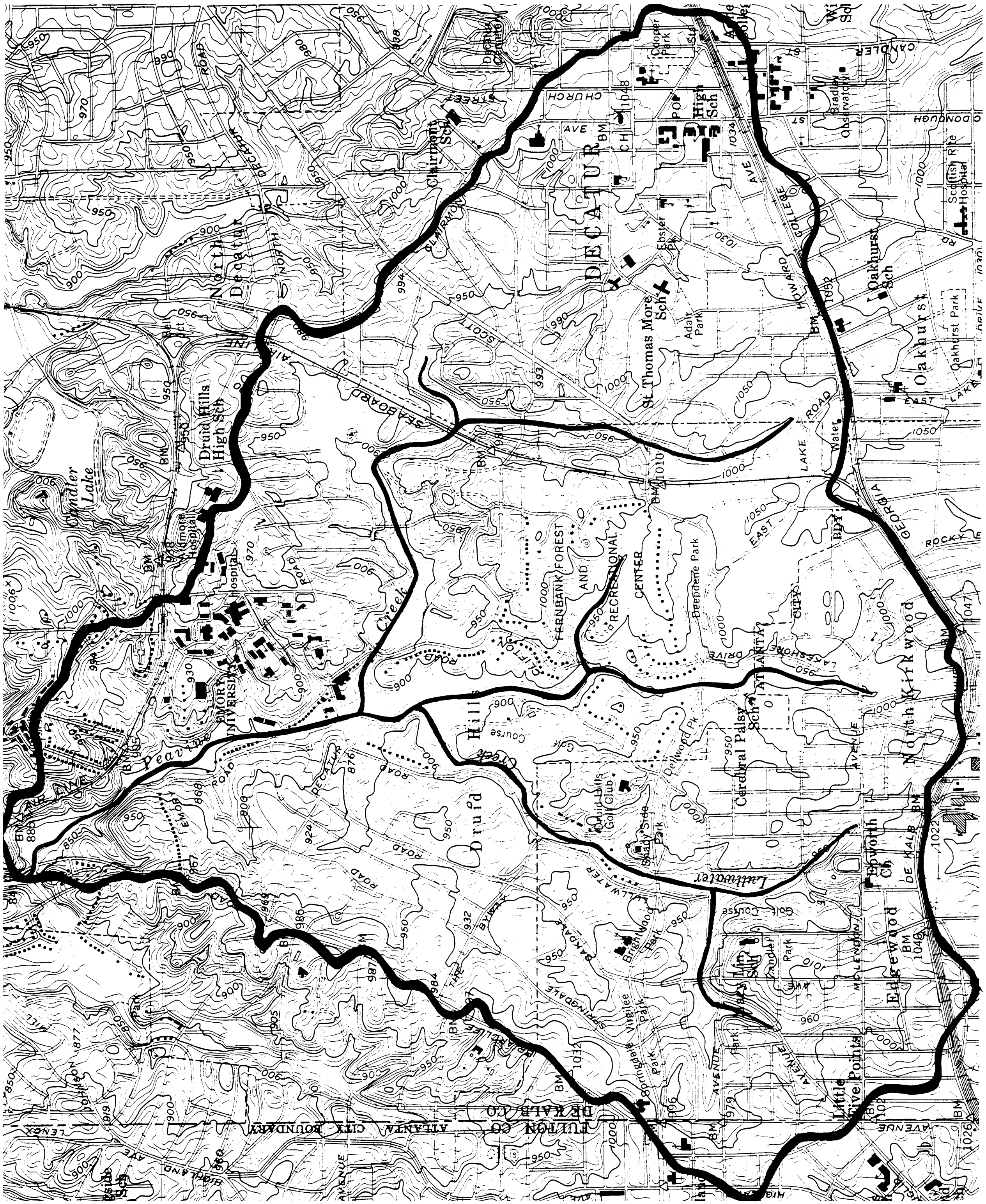
4. Find and mark the high points (hills, ridges, saddles) on the map. Then connect these points, following ridges and crossing slopes at right angles to contour lines. This line forms the watershed boundary.

If you don't need to know exact watershed boundaries, simply look at the pattern of stream flow and draw lines dividing different stream systems. This will give you an idea of the shape of your watershed and those bordering it. Also, once you've identified watershed boundaries, water features, and flow direction, you might want to transfer this information to a road map for easier use.

Once you have delineated your watershed, it is time to make note of all land use activities within your watershed segment. Data for this portion of your survey should be obtained from your background research and from information you gather in the other portions of the Watershed Survey forms. It is best to finish this portion of the mapping exercise after you've completed your watershed survey.

You are welcome to create a map of your own or modify an existing 1:24,000 topographical map. Be as precise as possible--this map should serve as an invaluable resource throughout your monitoring activities. Make sure to identify the section(s) of the stream where you will be conducting your physical, chemical or biological monitoring—the stream reach.

Sample Delineated Watershed



The map should include access points, pipes and drainage ditches, sections of land that have been altered via construction, agriculture, industry, and your AAS monitoring point(s). You may want to include specific information about the land and waterbody, such as areas of severe bank erosion, channeling, commercial and industrial areas, auto repair shops, dry cleaners, cattle crossings, feed lots, feed lot lagoons, and more.

A copy of the map must be included in your registration form to be filed with the State Georgia Adopt-A-Stream office.

II. LAND USES/ACTIVITIES AND IMPERVIOUS COVER

1. Identify land uses and activities in the watershed, which have the highest potential to impact water bodies:

Check all boxes that apply, describe the location of the activity(ies) under Notes on Location & Frequency of Activities and also mark the locations on your map. If too frequently occurring to record locations, so note. If you don't know some of the information below, write DK under Notes.

Use a map, which allows you to see the streets and water bodies within your watershed. Conduct a driving/walking survey (in addition to your stream survey). Identify and describe land activities/uses and processes that have the highest potential to impact water bodies in the watershed.

If you find an activity next to your water body, check off "Adjacent to Water." If a land use activity is not adjacent to your water body, but within the watershed, check the box stating "In Watershed." Indicate frequency and location of activity under the notes section, "Note Frequency & Location of Activity." If you do not understand a term or do not know if that type of land use activity is taking place, also indicate that under the notes.

This inventory of **land uses and activities in the watershed which have the highest potential to impact water bodies** is intended only to help identify potential causes of water quality problems. "Causes and Sources of Water Resource Degradation" in Appendix A provides a handy guide to identify likely causes of major categories of degraded conditions. This list is based on field experience in Georgia, New Zealand and nationwide studies of the sources of water quality impacts.

Optional
2. Percent impervious surface:

Measurements of impervious surface cover for a particular watershed can be found by analyzing land use maps or Geographic Information System (GIS) files. These maps can be found in many city or county planning departments. Georgia has a GIS Data Clearinghouse at www.gis.state.ga.us with maps of the entire state. There are several methods for determining percent impervious surface. Below is a simple method that requires minimal expertise and no special equipment. For More information on watersheds and delineation of watersheds can be found at the Center for Watershed Protection, www.cwp.org.

Your task is to estimate the percentage of impervious surface within your selected watershed. To accomplish this you will need: (1) the delineated map of your watershed from section 1; (2) one clear overlay sheet -- a transparency; (3) different colored, erasable pens; (4) a land use map of your selected watershed, which is the same scale as your delineated watershed; (5) the list of land use terms and definitions for your county or city (they vary from city to city, county to county); and (6) tape.

Important! Make sure you are using the same scale on both your land use map and the map you used to delineate your watershed, i.e. 1:24,000 topo map and 1:24,000 land use map. You may have to change the scale of one of the maps by making an enlarged photocopy.

First, place the transparency over the delineated watershed. Then trace the outline of your watershed on the transparency. It's helpful to mark key landmarks such as bridges, rivers and major roads so that your transparency will line up with your land use map.

Next, using the land use map, determine the types of land use in your watershed. Do this by overlaying your outlined watershed onto the land use map. Determine which land uses cover what percentage of your watershed. If the maps are not to scale, you will have to estimate the percentage of land use coverage. Record the percentage of cover for each land use in your watershed on the data form.

Multiply the percentages by the corresponding impervious quotient for the land use category to obtain the impervious percentage for each category. Sum the totals for the categories to obtain the percent of the watershed covered by impervious surfaces as of the date of the land use/cover information.

Keep in mind land use coverage can change very quickly in regions of the State undergoing rapid development. Within a year or two, your impervious surface quotient may also change dramatically. Always try to find the most recent map available to ensure accurate information!

SAMPLE FORMS

Coverage category for LAND USE MAP method	**impervious quotient**	**times**	**percent of...**	**percent of impervious cover**
Forest/open land/undeveloped land/vacant/land owned by institutions	.005	x	**20**	**.1** %
Agriculture/pasture/cropland	.005	x		%
Single family residential (1.1 - 5 acre lot or no more than 1 dwelling per acre)	.12	x	**30**	**3.6** %
Single family residential (.5 - 1 acre lot or 0 – 2 dwellings per acre)	.19	x		%
Low density residential / single family residential (.25 - .5 acre lot or 0 – 4 dwelling units per acre)	.26	x		%
Low/medium density residential (.25 acre lot or smaller or 0 –8 dwelling units per acre)	.48	x	**45**	**21.6** %
Medium density residential (0 –12 dwelling units per acre)	.56	x		%
High density residential (18 – 30 dwelling units per acre)	.65	x		%
Townhouse/apartment	.48	x		%
Office/light industrial (assembly, finishing, packaging products)	.70	x	**5**	**3.5** %
Heavy industrial (timber, chemical, cement, brick plants, lumber mills)	.80	x		%
Commercial (business districts, commercial strip development, shopping centers, warehouses, parking lots, office buildings	.85	x		%
Major roads	.90	x		%
	Total percent of watershed covered by impervious surfaces			**28.8** %

III. GENERAL WATERBODY AND WATERSHED CHARACTERISTICS

This information will be gathered from your wetland, lake or stream segment.

1. Note the number of hydrologic modifications on your waterbody.

These are structures that alter water flow and are not natural to the water body.
Dams can be a large structure or a stack of rocks placed in a stream or wetland to obstruct the flow of water.
Bridges that need stabilization along the banks will affect water flow.
Waterfalls that are man made are the only ones that need to be indicated here.
Beaver dams will obstruct the flow of water, often turning a flood plain into a pond.
Dredge Spoil is material dug up from the bottom of a waterbody and then deposited somewhere else.
Pipes may be in the way of natural water flow.

2. Note the approximate length of the stream affected by the following:
If assessing a wetland, lake or pond, some of the following may also affect your water body.
Stream culverts are usually large pipes that allow water to flow under an obstruction, such as a road.
Stream straightening is done by using heavy machinery to take the meanders (natural curves) out of the stream.
Concrete stream bank /bottom are heavy engineering techniques to reduce erosion but it also speeds up water flow and destroys habitat.
Dredging/channeling is done to straighten a stream or make a stream, lake or wetland deeper.
Riprap is large rock placed on banks with the intention of stabilizing the banks.
Gabions are large rocks held together by a wrapping of heavy mesh.
A cattle crossing is an area where cattle cross a stream.
A stream crossing *(for vehicles)* can cause severe damage to banks and habitat.

3. Extent of vegetative buffer along banks: The importance of a vegetative buffer along the banks of streams, wetlands and lakes has been well documented. The width of your buffer zone will play an important role in helping to filter contaminants, nutrients, and reduce sediment introduction to your stream, wetland or lake. We suggest that you make visual surveys, at 5 equal intervals along your adopted waterbody, or every 500 feet for a ½ mile section.

The various characteristics of a riparian buffer zone include but are not limited to the type of vegetation and low-lying shrubs and grasses, which help stabilize soil and provide a canopy of shade for aquatic life. Other characteristics include disturbances to the vegetative riparian buffer such as stormwater pipes, drainage ditches, drainage from animal husbandry operations, presence of farm animals, construction runoff, gullies, and other modifications, which might alter or increase direct flow of water and associated contaminants into the waterbody. The extent of native vs. introduced

vegetation also helps determine the effectiveness of your vegetative buffer. In general, native vegetation forms a more effective riparian buffer than exotics.

4. Check the categories that best describe the general appearance of the waterbody: Look at "Causes and Sources of Water Resource Degradation," in Appendix A.

5. Comments on general waterbody and watershed characteristics (i.e., date and size of fish kill, increased rate of erosion evident, litter most evident after storms): We can't cover everything in our data forms, so this is your opportunity to provide a written account of the status of your adopted waterbody.

6. Summarize notable changes that have taken place since the last time you conducted a watershed survey.

IV. PIPE AND DRAINAGE DITCH INVENTORY

The State EPD Storm Water Permitting Program requires certain municipalities to control the amount of pollutants discharged into the storm sewer systems they own or operate. Permits are issued by the State requiring municipalities to implement and enforce local storm water management programs (MS4 Permits). These programs include characterization of the storm sewer system and pollutants discharged to waters of the State, as well as, implementation of educational programs, best management practices, inspections and sampling procedures.

AAS programs can assist EPD and the local governments in their storm water management efforts by increasing public involvement and public education about storm water and nonpoint source pollution issues. Volunteers can conduct storm drain stenciling activities and help to identify problem areas, impacted streams and elicit discharges from storm water outfalls during watershed surveys and stream walks. Volunteers can also report dumping activities, sanitary sewer leaks, overflows and other problems to the local governments. For more information about how you can get involved, please contact the State AAS Program.

SAMPLE FORMS

Return form to:

Georgia Adopt-A-Stream
4220 International Parkway
Suite 101
Atlanta, GA 30354

GEORGIA ADOPT-A-STREAM

Watershed Survey and Map Assessment

to be conducted at least once a year

AAS group name: Friends of Shoal Creek Investigator(s): Allison Hughes

Type of waterbody: (stream) / wetland / lake

Water body name: Trib to Shoal Creek County(ies): DeKalb

Approximate size of drainage/study area: 32 acres

Date: 2/12/03 Time: 10:20 a.m. Picture/photo documentation? (Yes)/No

I. CREATE A MAP OF YOUR WATERSHED

A copy of this map should be included in your registration form to be filed with the State program.

II. LAND USES/ACTIVITIES AND IMPERVIOUS COVER

1. Identify land uses and activities in the watershed, which have the highest potential to impact water bodies:

Check all boxes that apply, describe the location of the activity(ies) under Notes and mark the locations on your map. If too frequently occurring to record locations, so note. If you don't know some of the information below, write DK in the Notes.

Please indicate if you:
- ☐ surveyed only adjacent to the waterbody
- X surveyed the whole watershed
- Provide notes as necessary

Land Disturbing Activities & Other Sources of Sediment	**Adjacent to Water**	**In Watershed**	**Notes on location & frequency of activity**
Extensive areas disturbed by land development or construction of utilities, roads & bridges	X	X	_____
Large or extensive gullies	☐	☐	_____
Unpaved roads near or crossing streams	☐	☐	_____
Croplands	☐	☐	_____
Pastures with cattle access to water bodies	☐	☐	_____
Commercial forestry activities including harvesting and site-preparation	☐	☐	_____
Extensive areas of streambank failure or channel enlargement	X	☐	_____
Other Agricultural Activities			
Confined animal (cattle or swine) feeding operations and concentrations of animals	☐	☐	_____
Animal waste stabilization ponds	☐	☐	_____
Poultry houses	☐	☐	_____
Highways and Parking Areas			
Shopping centers & commercial areas	☐	☐	_____
Interstate and controlled access highways and interchanges	☐	X	_____
Major highways and arterial streets	☐	☐	_____
Other extensive vehicle parking areas	☐	X	_____
Mining			
Quarries with sediment basins in live flowing streams	☐	☐	_____

Transportation and Motor Vehicle Services	**Adjacent to Water**	**In Watershed**	**Notes on location & frequency of activity**
Truck cleaning services	☐	☐	_____
Public and private automobile repair facilities	☐	X	_____
Car washes and large auto dealers	☐	☐	_____
Rail or container transfer yards	☐	X	_____
Airports with fuel handling/aircraft repair	☐	☐	_____
Business & Industry, General			
Activities with exterior storage or exchange of materials.	☐	☐	_____
Activities with poor housekeeping practices indicated by stains leading to streams or storm drains or on-site disposal of waste materials	X	☐	_____
Heavy industries such as textiles & carpet, pulp & paper, metal, and vehicle production or fabrication	☐	☐	_____
Dry cleaners/outside chemical storage	☐	X	_____
Food & Kindred Products			
Fertilizer production plants	☐	☐	_____
Feed preparation plants	☐	☐	_____
Meat and poultry slaughtering or processing plants	☐	☐	_____
Construction Materials			
Wood treatment plants	☐	☐	_____
Concrete and asphalt batch plants	☐	☐	_____

Waste Recycling, Movement & Disposal	**Adjacent to Water**	**In Watershed**	**Notes on location & frequency of activity**
Junk and auto salvage yards	☐	☐	_____
Solid waste transfer stations	☐	☐	_____
Landfills and dumps (old & active)	☐	☐	_____
Recycling centers	☐	X	_____
Drum cleaning sites	☐	☐	_____
Illicit Waste Discharges*			
Sanitary sewer leaks or failure	☐	☐	DK
Overflowing sanitary sewer manholes due to clogging or hydraulic overloading	☐	☐	_____
Bypasses at treatment plants or relief valves in hydraulically overloaded sanitary sewer lines	☐	☐	_____
Domestic or industrial discharges	☐	☐	DK
Extensive areas with aged/malfunctioning septic tanks	☐	☐	_____
Dry-weather flows from pipes (with detectable indications of pollution)	☐	☐	_____
Streamside areas of illegal dumping	☐	☐	_____

* If found (most likely during stream surveys), these activities should be immediately reported to the local government or the EPD regional office. These phone numbers are listed in the Who to Call List on page 55.

SAMPLE FORMS

Optional

2. Percent impervious surface: acre overlay, example map and acreage calculating grid in Appendix A.

Coverage category for LAND USE MAP method	**impervious quotient**	**times**	**percent of...**	**percent of impervious cover**
Forest/open land/undeveloped land/vacant/land owned by institutions	.005	x	**20**	**.1** %
Agriculture/pasture/cropland	.005	x		%
Single family residential (1.1 - 5 acre lot or no more than 1 dwelling per acre)	.12	x	**30**	**3.6** %
Single family residential (.5 - 1 acre lot or 0 – 2 dwellings per acre)	.19	x		%
Low density residential / single family residential (.25 - .5 acre lot or 0 – 4 dwelling units per acre)	.26	x		%
Low/medium density residential (.25 acre lot or smaller or 0 –8 dwelling units per acre)	.48	x	**45**	**21.6** %
Medium density residential (0 –12 dwelling units per acre)	.56	x		%
High density residential (18 – 30 dwelling units per acre)	.65	x		%
Townhouse/apartment	.48	x		%
Office/light industrial (assembly, finishing, packaging products)	.70	x	**5**	**3.5** %
Heavy industrial (timber, chemical, cement, brick plants, lumber mills)	.80	x		%
Commercial (business districts, commercial strip development, shopping centers, warehouses, parking lots, office buildings	.85	x		%
Major roads	.90	x		%
	Total percent of watershed covered by impervious surfaces			**28.8** %

III. GENERAL WATERBODY AND WATERSHED CHARACTERISTICS

This information will be gathered from your wetland, lake or stream segment.

1. Note the number of hydrologic modifications on your waterbody: *structures that alter water flow*

None	_____	Beaver dams	_____
Dams	_____	Dredge spoils	_____
Bridges	_____	Pipes	X
Waterfalls	_____	Other	_____

2. Note the approximate length of the stream that is effected by the following:
if assessing a wetland, lake or pond, some of the following may also effect your waterbody

Stream culvert 30 feet or _____ mile or _____ % of stream length
Stream straightening _____ feet or _____ mile or _____ %
Concrete streambank/bottom 5 feet or _____ mile or _____ %
Dredging/channeling _____ feet or _____ mile or _____ %
Riprap/gabion 500 feet or _____ mile or _____ %
Cattle crossing _____ #
Stream crossing *(for vehicles)* _____ #

3. Note extent of vegetative buffer along the banks: *at a minimum of 5 sites, at regular intervals (every 500 ft. in a ½ mile. section) note the following*

#	Width in feet	Location (Left bank, Right bank or N, S, E, W side of wetland or lake)	Characteristics and comments
1	100	Left bank looking downstream	Shrubs, trees, grasses. No manmade structures. Completely vegetated
2	25	Right bank	Riprap on bank. Buffer only mowed grass. A few small trees.
3	100	Left bank, 500 ft from site 1 Behind Johnson's house	Shrubs, trees, grasses. No manmade structures. Completely vegetated
4	25	Right bank, 500 ft. from site 2. Across from site 3	Vegetation is ivy. After ivy, there is a concrete parking area.
5	50	Left bank, 500 ft. from site 3. Behind subdivision	All Vegetation is mowed grass. The banks look eroded here.
6	50	Right bank, 500 ft from site 4, Behind the restaurant	50 ft buffer left to grow wild. Variety of small tress and shrubs and trash
7	10	Left bank, 300 ft from site 5.	A deck with cement base built in buffer zone. Grass is the vegetation along the stream.
8	50	Right bank, across from site 7	Well vegetated with trees and shrubs. No ground layer.
9	40	Left bank, 500 ft from site 7	Stream side has shrubs and long grass, the rest of the buffer is mowed grass.

4. Check the categories that best describe the general appearance of the water body:

Litter:

- ☐ No litter visible
- ☐ Small litter occasionally (i.e., cans, paper)
- ☐ Small litter common
- X Large litter occasionally (i.e., tires, pallets, shopping carts)
- ☐ Large litter common

Special Problems:

- ☐ Spills of chemicals, oil, etc.
- ☐ Fish kills
- ☐ Wildlife, waterfowl kills

Erosion:

- ☐ No bank erosion or areas of erosion very rare; no artificial stabilization
- ☐ Occasional areas of bank erosion
- X Areas of bank erosion common
- X Artificial bank stabilization (e.g., riprap) present

5. Comments on general water body and watershed characteristics: (e.g. date and size of fish kill, increased rate of erosion evident, litter most evident after storms)
* Fish kills should be immediately reported to DNR Wildlife Resources Division at 770-918-6400

The neighborhood is changing some with new buildings and houses being constructed. Overall though its a stable, old neighborhood. Property owners with access to streams need to be more aware of their potential impacts, thus there is a need for more education.

6. Summarize notable changes that have taken place since last year (if this is not your first year conducting the Watershed Survey). This is our first year.

IV. PIPE AND DRAINAGE DITCH INVENTORY

In this section, provide information on pipes and drainage ditches found on the banks or in the waterbody. These pipes/ditches can be abandoned or active. Note the information for each pipe or drainage ditch you observe. *Make additional copies as necessary.*

Pipe #	Location	Type	Size	Flow	Waterbody condition	Comments
1	In right bank	Galvanized storm drain from road	24 in.	none	No problem evident	
2	Right bank behind apartment buildings	Concrete. Use unknown.	15 in	none	Erosion all along the bank.	This pipe may not be in use anymore.
3	In water	concrete	24 in	Don't know since it is under water	No problem evident	The pipe is running across the stream, not meant to flow into stream.

1. Number each pipe/ditch for mapping/location purposes
2. Location of pipe/ditch: note whether in water, bank, near waterbody or other. Describe location.
3. Identify type of pipe (list all that apply): PVC, iron, concrete, galvanized; industrial outfall, sewage treatment plant outfall, storm drain, combined sewer overflow; agricultural field drainage, paddock or feedlot drainage, settlement basin/pond drainage, parking lot drainage, unknown, other
4. Size: measure approximate diameter of pipe: inches or centimeters
5. Describe the discharge flow: Rate of flow: none, intermittent, trickle, steady, heavy
Appearance: clear, foamy, turbid, oily sheen, color, other
Odor: none, rotten eggs/sewage, chemical, chlorine, other
7. Waterbody condition: describe the bank/waterbody below pipe or drainage ditch: no problem evident, eroded, sewage litter (e.g., toilet paper), litter (e.g. bottles, cans), lots of algae, other
8. Comments of pipes and drainage ditches: Use this space to explain or expand on information provided on pipes and discharges you have identified above. For example, you may want to identify particular facilities, or discuss in more detail the condition of the water body below the discharge. Use separate page if necessary.

Appendix A

WATERSHED TOOLS

- Think Safety!
- Causes and Sources of Water Resource Degradation
- Sample Letter
- Sample Public Outreach
- Reading A Topographic Map
- Dot Grid For Calculating Acreage

Think Safety!

To ensure a fun and educational trip to your stream, wetland or lake, please keep these simple precautions in mind:

- Always visit a site with at least one other person so someone can go for help if one person is unable to.

- Never sample if a stream or river is flooding, or even one day after a heavy rain. Fast moving water is very dangerous. Also, avoid steep banks as access points. Wear a life jacket if near deep water.

- When sampling, avoid touching your mouth and eyes and be sure to wash hands before eating. If a waterbody is polluted or water quality is unknown, wear plastic gloves and rubber boots.

- Know the location of the nearest available phone or take a cell phone with you. Have an emergency plan ready if you are taking a group out – who will go for help? Does anyone know CPR? Does anyone have allergies?

- Don't go near the water if there is a strong chemical smell, a fish kill, or other dangerous conditions. Leave immediately and report the condition to appropriate authorities.

- Watch out for snakes, alligators, and snapping turtles. Hit the ground and trees with a stick as you walk to your site to scare snakes and other creatures away. Leave them alone and they will leave you alone.

- Look out for broken glass, poison ivy, ticks, bees, fire ants, and other hazards.

- Be aware of road hazards, both driving to the site and while conducting activities. Vehicles may not see you getting in and out of your car—bridges are narrow. Make sure you have enough room to safely park and walk to your site. If walking under a bridge, watch for objects knocked off the road from overhead.

- Bring a first aid kit.

Causes and Sources of Water Resource Degradation

Causes (pollutant or stressor)	Possible Sources	Potential Adverse Impacts
Sediment and Siltation (sand, silt, clay)	Cropland Forestry activities Pasture Stream banks Construction Roads Mining operations Gullies Livestock operations Other land-disturbing activities	Sediment may destroy fish habitat by: (1) blanketing spawning and feeding areas; (2) eliminating certain food organisms; (3) causing gill abrasion and fin rot; and (4) reducing sunlight penetration, thereby impairing photosynthesis. Suspended sediment decreases recreational values, reduces fishery habitat, adds to mechanical wear of water supply pumps and distribution systems, and adds treatment costs for water supplies. Nutrients and toxic substances attached to sediment particles may enter aquatic food chains, cause fish toxicity problems, impair recreational uses or degrade the water as a drinking water source.
Nutrients (phosphorus, nitrogen)	Erosion and runoff from fertilized fields Urban runoff Wastewater treatment plants Industrial discharges Septic systems Animal production operations Cropland or pasture where manure is spread	Nutrient enrichment may cause excessive algae and aquatic plant growth, which may choke open waters and consume oxygen (primarily from decomposition of dead plants and algae). These conditions will adversely affect fish and aquatic organisms, fishing and boating, and the taste and odor of finished drinking water. Nitrogen contaminants in drinking water significantly above the drinking water standard may cause methoglobinemia (blood disease) in infants, and have forced the closure of many water supplies.
Pathogens (bacteria and viruses)	Human and animal excreta Animal operations Cropland or pasture where manure is spread Wastewater treatment plants Septic systems Urban runoff Wildlife	Waterborne diseases may be transmitted to humans through drinking or contact with pathogen-laden water. Eating shellfish taken from or uncooked crops irrigated with pathogen-laden waters may also transmit waterborne diseases. The principal concern in both surface and ground waters is the potential degradation of public water supply sources. Pathogens reaching a lake or other surface waterbody may limit primary contact recreation, such as swimming.
Pesticides	All land where pesticides are used (forest, pastures, urban/suburban areas, golf courses, waste disposal sites) Sites of historical usage (chlorinated pesticides) Urban runoff Irrigation return flows	Pesticides may enter surface waters either dissolved in runoff or attached to sediment or organic materials, and may enter ground water through soil infiltration. The principal concerns in surface water are their entry into the food chain, bioaccumulation, toxic effects on fish, wildlife and microorganisms, habitat degradation and potential degradation of public water supply sources. Ground water impacts are primarily related to water supply sources.
Organic Enrichment (depletion of dissolved oxygen)	Human and animal excreta Decaying plant/animal matter Discarded litter and food waste	Organic materials (natural or synthetic) may enter surface waters dissolved or suspended in runoff. Natural decomposition of these materials may deplete oxygen supplies in surface waters. Dissolved oxygen may be reduced to below the threshold necessary to maintain aquatic life.

Toxic Substances (heavy metals, oil and petroleum products)	Urban runoff Wastewater treatment plants Industrial discharges	Toxic substances may enter surface waters either dissolved in runoff or attached to sediment or organic materials and may enter ground waters through soil infiltration. Principal concerns in surface water include entry into the food chain, bioaccumulations, toxic effects on aquatic organisms, other wildlife and microorganisms, habitat degradation and degradation of water supplies. Ground water impacts are primarily related to degradation of water supply sources.
Thermal Stress / Sunlight	Riparian corridor destruction Bank destruction Urban runoff Hydrologic modifications Industrial dischargers	Direct exposure of sunlight to streams may elevate stream temperatures, which can exceed fish tolerance limits, reduce dissolved oxygen and promote the growth of nuisance algae. The lack of trees along a stream bank contributes to thermal stress and excessive sunlight. Thermal stress may also be the result of storm water runoff, which is heated as it flows over urban streets. Hydromodifications that create wider, shallower channels create more surface area and allow for quicker temperature changes. Modifications that create pools and increase the storage time of water may also contribute to thermal stress by increasing surface area and not allowing the warmed water to wash out of the watershed. Coldwater fish may be eliminated or only marginally supported in streams affected by thermal stress.
pH (acidic and alkaline waters)	Mine drainage Mine tailings runoff Atmospheric deposition Industrial point source discharges	Acidic or alkaline waters will adversely affect many biological processes. Low pH or acidic conditions adversely affect the reproduction and development of fish and amphibians, and can decrease microbial activity important to nutrient cycling. An extremely low pH will kill all aquatic life. Acidic conditions can also cause the release of toxic metals that were adsorbed to sediments into the water column. High pH, or alkaline conditions, can cause ammonia toxicity in aquatic organisms.
Flow Alterations (hydrologic modifications)	Channeling Dams Dredging Streambank modifications	Hydrologic modifications alter the flow of water through the stream. Structures or activities in the water body that alter stream flow may in turn be the source of stressors, such as habitat modifications, or exacerbate others, such as thermal stress. Dams may also act as a barrier to the upstream migration of aquatic organisms. Stream flow alterations may result from a stressor such as sedimentation, which may change a streambed from narrow with deep pools to broad and shallow.
Habitat Modifications	Channeling Construction Changing land uses in the watershed Stream burial Dredging Removal of riparian vegetation Streambank modifications	Habitat modifications include activities in the landscape or in the water body that alter the physical structure of the aquatic and riparian ecosystem. Some examples include: removal of stream side vegetation that stabilizes the stream bank and provides shade; excavation in the stream and removal of cobbles from the stream bed that provide nesting habitat for fish; stream burial; and development that alters the natural drainage pattern by increasing the intensity, magnitude and energy of runoff waters.
Refuse, Litter and Other Debris	Litter Illegal dumping of solid wastes	Refuse and litter in a stream can clog fish spawning areas; stress aquatic organisms; reduce water clarity; impede water treatment plant operations; and impair recreational uses of the water body, such as swimming, fishing and boating.

Sample Letter To Inform Local Official

February 25, 2006

J. Concerned Citizen
123 Watershed Plaza
Streams, GA 30000

Mayor George Buggs
Rivers City Hall
555 Wetlands Way
Streams, GA 30000

Dear Honorable Mayor Buggs,

I would like to inform you of an interesting and exciting project my neighbors and I are working on. Several of us who live near Ripple Rock Creek decided to learn more about the creek and start protecting it. We have started an Adopt-A-Stream project and registered with the Environmental Protection Division's Georgia Adopt-A-Stream program.

We started the project because we are concerned about the continuing development in our area. Ripple Rock Creek is a beautiful creek and we want to make sure it stays that way. Our Ripple Rock Adoption Project is one way to learn about and protect the creek and share our findings with others.

The Ripple Rock Adoption Project will help protect the creek because we will regularly evaluate water quality, share our results with others, pick up litter, and plant trees to stabilize an eroding streambank. We also know whom to call if a water quality problem is noticed.

We would very much like to send you, or someone you designate, our results. We would like to help in any way to protect our stream's water quality. May we count on your support?

We look forward to hearing from you.

Sincerely,

J. Concerned Citizen
Ripple Rock Adoption Project

Sample Article and Presentation For Public Outreach

Adopt-A-Stream Group Surveys Beaver Creek

The West End Homeowners Association (WEHA) has completed a one-year Adopt-A-Stream project on Beaver Creek. In partnership with the Johnson County Water Department and Georgia Adopt-A-Stream, the WEHA adopted a one mile section of Beaver Creek. We completed a Watershed Walk, four visual surveys and four litter pickups. Results show the creek generally in good shape, although the group has reported two illegal dumping incidents to the county (which has sent out crews to pick up trash and is investigating the dumper).

The WEHA was started by a group of landowners whose land borders Beaver Creek and wanted to learn more about and protect it. The land surrounding Beaver Creek (the watershed) is generally undeveloped, however, new development upstream concerns us. One upstream builder was polluting the creek with sediment and litter until the WEHA, working with county officials, convinced the builder to put up silt fences and to store construction debris away from the creek.

We've learned a lot about Beaver Creek, the surrounding area, and how we can help protect water quality. For example, we have kept the area next to the creek natural, so that this buffer area will protect the stream from pollutants that may wash into the creek during a storm. We watch how much fertilizer and yard chemicals we put out (especially near the stream) so that these chemicals will not wash into the water. Also, WEHA has sponsored a tour of the creek for other landowners and shared with them our efforts and desire for everyone to pitch in and help protect Beaver Creek.

For more information about the WEHA Adopt-A-Stream project, call J. Concerned at 404-555-1212.

Clear Creek Can Be Improved

A student group at Baldwin High School, the Marshers, took on a new project this year. The Marshers joined the Environmental Protection Division's Adopt-A-Stream Program to learn about and protect Clear Creek. Clear Creek runs behind the high school, so it seemed to be a natural project for the students.

The Marshers started out by conducting a Watershed Walk. Topographical maps of the area were used to study the watershed before the Walk. During the Walk, students recorded land uses and potential impacts to water quality along a one-mile section of the creek upstream from the school. The students found that the creek drains both residential and industrial areas. There are some areas that need to be cleaned up and two places where the streambank is eroding. Also, downstream of the residential area lots of algae was noticed in the water, an indication that excessive nutrients are present in the water. Regular visual surveys confirm that there is a noticeable difference in water appearance and presence of algae upstream and downstream of the residential area. However, occasional oily sheens were noticed downstream from the industrial area.

Clear Creek is an important resource for the students at Baldwin High School and they plan to act on the information they have obtained. First, the Marshers will conduct a creek cleanup. Working with the local Rotary Club, the Marshers will sponsor the first annual "Clean Clear Creek" day and register with Rivers Alive. The Rotary Club will provide trash bags to volunteers. The first 100 people to bring in a full trash bag will also receive a T-Shirt compliments of the Rivers Alive program.

Next, the Marshers are working with the City of Baldwin to plant trees and other vegetation where the streambank is eroding. The City has contacted property owners and asked for their help to maintain the new plantings. The Marshers will check upstream and downstream of the newly stablized streambanks to see if the plantings have decreased erosion. Finally, the students will send a letter to all the businesses in the industrial park to emphasize the importance of the creek. The letter will include some tips on how the businesses can help keep Clear Creek clean.

Sample Presentation Outline for Public Outreach

I. Introduction
   Describe project--who is involved, what stream, what activities

II. Importance
   Why the stream is important to volunteers and community

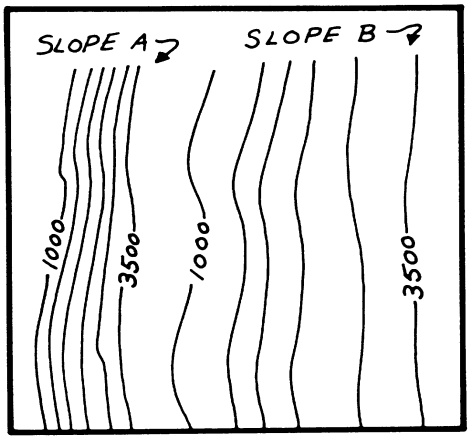
III. Results
   What was found during Watershed Walks, Visual Surveys, and Stream Litter Cleanups.

IV. Potential Improvement Activities
   What are some activities you can do, or several partners can do together, to protect or improve water quality?

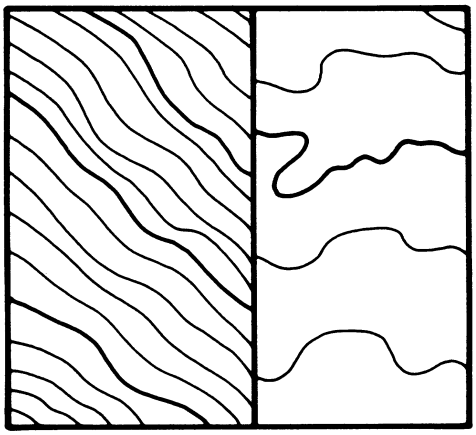
Reading A Topographic Map

Elevation is indicated on topographic maps by contour lines (Figure 1). Elevation can be measured by 10 ft, 20ft, or even 100 ft intervals. The closer the lines are, the steeper the slope (Figure 2). When marking the high points of your watershed, the hills are the easiest features to locate (Figure 3). When connecting the high points of your watershed, be sure to draw your lines crossing the contour lines at right angles, even when the contours are rough (Figure 4).

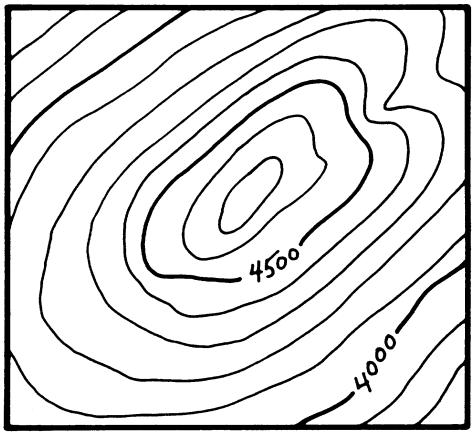
1. Contours are perpendicular to the direction of maximum slope.



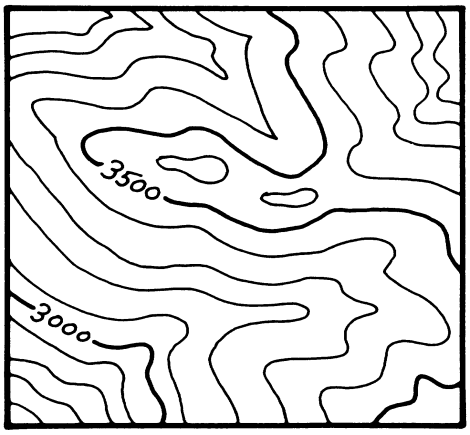
2. The distance between contours indicates the steepness of a slope; close spacing denotes steep slopes; wide spacing denotes gentle slope.



3. Concentric closed contours which increase in elevation represent hills.

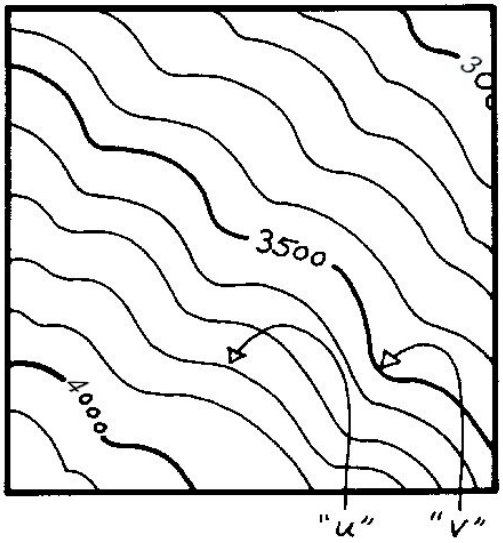


4. Irregular contours signify rough, rugged country. Smooth lines designate gradual slopes and changes.

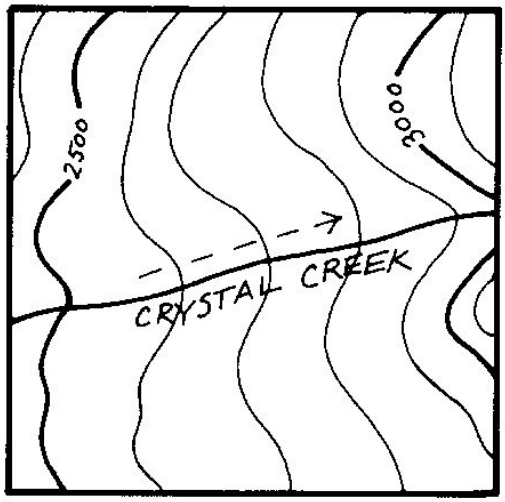


V shaped contour lines indicate a valley. The sharper the V shape, the more pronounced the valley. The point of the V lines point toward higher elevation or upstream (Figure 6). If you follow the V shaped contour lines uphill until they stop, you can assume this is the high point of your watershed. U-shaped contour lines indicate a ridge and point downstream toward lower elevation.

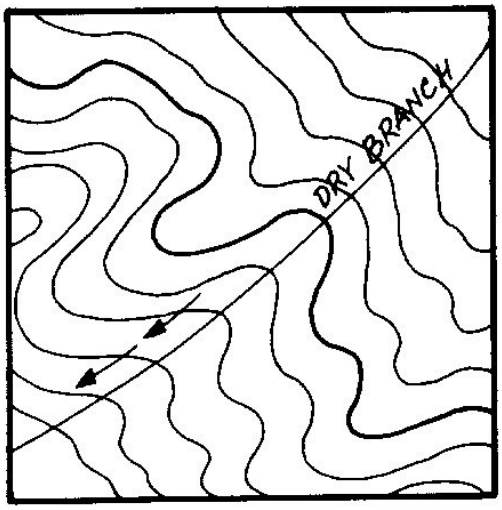
5. Valleys are usually characterized by V-shaped contours, and ridges by U-shaped contours.



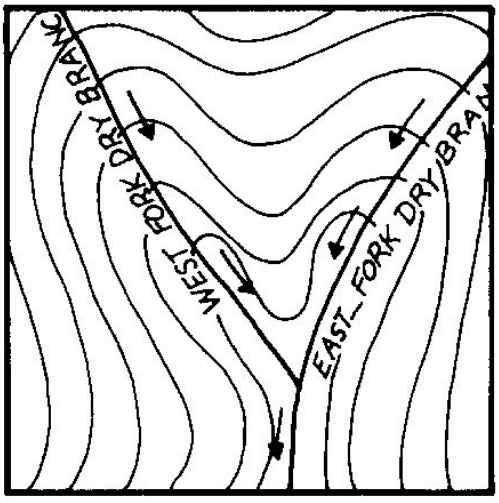
6. The V's formed by contours crossing a stream point upstream.



7. The U's made by contours crossing ridge lines point down the stream.

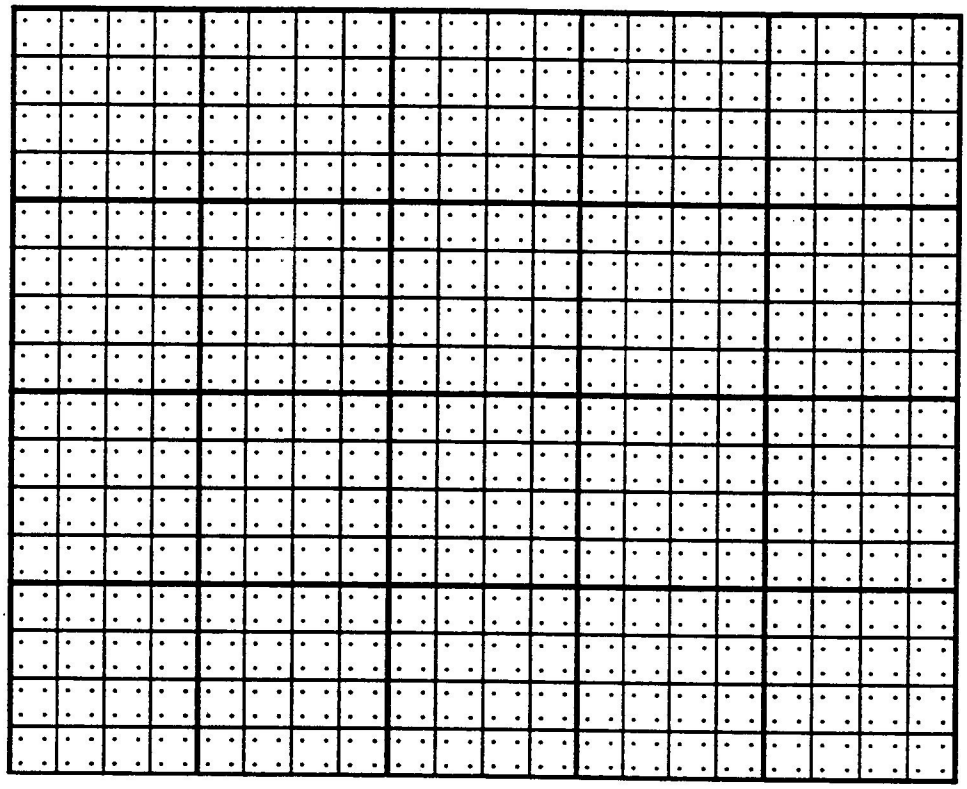


8. Contours tend to parallel streams and have an M-shape just above stream junctions.



Dot Grid for Calculating Acreage

- Photo copy this gird on transparency paper to calculate acreage within your watershed (directions below).



Map Scales and Equivalents

Fractional Scale	Acres per Square Inch	Acres per Dot
1: 24,000 (1inch = 2,000 ft)	91.8	1.43
1: 100,000 (1 inch = 8,333 ft)	1594.0	24.9

1. Delineate watershed.
2. Place dot grid over area to be calculated.
3. Count all dots fully within the area and those dots that fall on the line around the area.
4. Record total number of dots.
5. Repeat three times, randomly placing grid each time to determine accurate average.
6. Multiply by appropriate acres/dot factor noted in the table above.

Note: Areas larger than dot grid may be estimated by breaking down into smaller areas, then totaling dots. Use the same directions when totaling land use coverage.

Appendix B

OVERVIEW OF LAWS, RULES AND REGULATIONS

- National Laws and Programs Addressing Nonpoint Source Pollution
- Georgia Laws and Programs Addressing Nonpoint Source Pollution
- Agencies Working With Agriculture and Nonpoint Source Pollution
- The Clean Water Act
- Georgia Water Quality Control Act
- Georgia Water Use Classification
- 305(b) Report, 303(d) List, River Basin Management Planning and TMDL
- Georgia Erosion and Sedimentation Control Act
- The Metropolitan River Protection Act
- Definition of State Waters
- Public Access To Waterways In Georgia
- Wetland Trends In Georgia
- Wetland Protection Through Planning

National Laws and Programs: Regulatory and Voluntary Approaches To Addressing Nonpoint Source Pollution

During the recent years, our country has made significant headway in addressing nonpoint source pollution. At the federal level, recent NPS control programs include the **Nonpoint Source Management Program** established by the 1987 Clean Water Act Amendments, and the **Coastal Nonpoint Pollution Program** established by the 1990 Coastal Zone Act Reauthorization Amendments. In addition, public and private groups have developed and used pollution prevention and pollution reduction initiatives and NPS pollution controls, known as **Best Management Practices** (BMP), to clean up our water efficiently.

The U.S. Environmental Protection Agency (EPA) administers Section 319 of the Clean Water Act, also known as the **Nonpoint Source Management Program**. Under Section 319, states, territories, and tribes can apply for and receive grants from EPA to implement NPS pollution controls.

National Oceanic and Atmospheric Administration (NOAA) administers section 306 of the **Coastal Zone Management Act** that provides funds for water pollution control projects, including NPS management activities, in states with coastal zones. Together with the EPA, NOAA also helps administer section 6217 of the **Coastal Zone Act Reauthorization Amendments**. This requires the 29 states with approved Coastal Zone Management Programs to establish and implement Coastal Nonpoint Pollution Control Programs.

EPA administers other Sections of the Clean Water Act to help states, territories, and tribes to plan for and implement water pollution programs, which can include measures for NPS control. These include:

Section 104(b)(3), **Water Quality Cooperative Agreements**,
Section 104(g), **Small Community Outreach**,
Section 106, **Grants for Pollution Control Programs**,
Section 314, **Clean Lakes Program**,
Section 320, **National Estuary Program**,
Section 604(b), **Water Quality Management Planning**.

The U.S. Department of Agriculture (USDA) administers incentive-based conservation programs through the Consolidated Farm Services Agency, the Natural Resources Conservation Service, and the U.S. Forest Service to help control NPS pollution from agriculture, forestry, and urban sources.

*Additional information on these programs can be found at http://www.epa.gov/owow/nps/facts/

Georgia Laws and Programs: Regulatory and Voluntary Approaches To Addressing Nonpoint Source Pollution

Georgia's Water Quality Protection Time Line

1957	The first major legislation to deal with water pollution control in Georgia
1964	The Act of 1957 was ineffective and was replaced by the **Water Quality Control Act.** This Act established the Georgia Water Quality Control Board, the predecessor of the Environmental Protection Division of the Georgia Department of Natural Resources.
1972	EPD was established.
1972	Congress enacted the Federal Water Pollution Control Act of 1972. Today, this law is known as the **Clean Water Act** (CWA).
1972	The CWA established the NPDES permit system for regulation of municipal and industrial water pollution control plants, a water use classifications and standards process, and a construction grants process to fund the construction of municipal water pollution control facilities. Most industries in Georgia had installed modern, effective water pollution control facilities by the end of 1972.
1975	The Georgia General Assembly passed the Erosion and Sedimentation Control Act.
1987	The National Clean Water Act required all States evaluate water quality standards and adopt numeric criteria for toxic substances to protect aquatic life and public health. The Act also required each state to evaluate nonpoint source pollution impacts and develop a management plan to deal with documented problems. This work was initiated and completed by the GAEPD in the late 1980s.
1989	The Georgia Growth Strategies Act was passed. It helps protect sensitive watersheds, wetlands, and ground water recharge areas and placed the ban on high phosphate detergents to reduce nutrient loading to rivers and lakes.
1990	Legislation was passed which requires the GAEPD to conduct comprehensive studies of major publicly owned lakes and establish specific water quality standards for each lake.
1992	The General Assembly passed the River Basin Management Planning Act, which requires the GAEPD to develop and implement plans for water protection for each major river basin in Georgia.
1996-Present	High priority was placed on NPDES permitting and enforcement, nonpoint source pollution abatement, monitoring and assessment, river basin management planning, Chattahoochee River modeling, fish consumption guidance, storm water permitting, treatment plant funding, and public participation projects.

Nonpoint Source Management Program

In 1996, the GAEPD established the Nonpoint Source Program to focus on nonpoint sources of pollution. This program combines regulatory and non-regulatory approaches.

The documents, *Nonpoint Source Assessment Report* and *Nonpoint Source Management Program* were completed in compliance with the Clean Water Act of 1987 and approved by the USEPA in January 1990. The *Nonpoint Source Management Program* will provide an overview of the State's nonpoint source management activities as well as a summary of what the State intends to accomplish in the coming years.

Agriculture

Agricultural nonpoint source pollution continues to be managed and controlled with a State wide non-regulatory approach. This approach utilizes cooperative partnerships with various agencies and a variety of programs. Agencies that form the basis of the partnerships include the following:

Georgia Soil and Water Conservation Commission (GSWCC)
Georgia Soil and Water Conservation Districts (SWCD)
Natural Resources Conservation Service (NRCS)
University of Georgia College of Agriculture and Environmental Sciences (CAES)
University of Georgia Marine Institute and Skidaway Institute of Oceanography
Farm Services Agency (FSA)
Georgia Forestry Commission (GFC)
Georgia Department of Agriculture (GDA)
Agricultural Research Service (ARS)
Resource Conservation and Development (RC&D) Councils

Agencies Working With Agriculture and Nonpoint Source Pollution

Created in 1937 by an Act of the Georgia Legislature, the **Georgia Soil and Water Conservation Commission** (GSWCC) has been designated as the administering or lead agency for agricultural nonpoint source pollution prevention in the state. The GSWCC develops NPS water quality programs and conducts educational activities to promote conservation and protection of land and water resources devoted to agricultural uses. Primary functions of the GSWCC are to provide guidance and assistance to the Soil and Water Conservation Districts and provide oversight for the **Georgia Erosion and Sedimentation Act**. There are six (6) regional offices and forty (40) local districts.

The State **Soil and Water Conservation Districts** (SWCD) include all counties and are governed by boards of supervisors comprised of local citizens. The SWCD, NRCS and GSWCC provide technical assistance to the agricultural community. In addition, SWCD sponsor educational programs and field days to encourage and demonstrate new and/or innovative conservation practices.

The **USDA - Natural Resources Conservation Service** (NRCS) cooperates with federal, state and local units of government to provide technical assistance to landowners, cooperators, producers and special interest groups. Standards and specifications regarding conservation practices, animal waste management systems, grazing activities, plant materials, and other practices are developed and revised by a varied staff.

The University of Georgia College of Agricultural and Environmental Sciences (CAES) includes the **Cooperative Extension Service** and **Experiment Stations**. Services provided include classroom instruction in agriculture related topics, basic and applied research, consultative assistance and information on nonpoint related impacts on water quality, water quality monitoring, pest control, and analyses of nutrients, pesticides, herbicides, and other constituents in forage, water and animal waste. Nutrient management plans for farms are often developed by CAES.

The **University of Georgia Marine Institute** at Sapelo Island, Georgia and the **Skidaway Institute of Oceanography** near Savannah, Georgia are involved in research and monitoring programs for agricultural nonpoint impacts in coastal or estuarine waters. The Sapelo Island National Estuarine Research Reserve is one of 22 estuarine sites nationwide devoted to protection of the resource and study of estuarine function. Coastal aquaculture will likely become more prevalent and a consideration for prevention of NPS pollution in future years.

The **U.S. Farm Services Agency** (FSA), formerly known as the Consolidated Farm Services Agency (CFSA) and the Agricultural Stabilization and Conservation Service (ASCS), administers conservation cost-sharing programs for practices, which improve water quality on farms. A variety of water quality improvement practices are cost-shared with rates generally between 50-70 percent of the total cost of the installation. A

large portion of the funds allocated is targeted for high priority watersheds with water quality problems.

The **Georgia Forestry Commission** (GFC) provides technical information and assistance regarding areas such as reforestation, forest stewardship and management, harvesting, marketing and education. Services provided by the GFC include development of management plans, timber marking, loan or rental of equipment, fire brake plowing and sales of seedlings.

The **Georgia Department of Agriculture** (GDA) administers a variety of insect and plant and animal disease control programs. The Department also enforces a myriad of Georgia laws that include inspections of agricultural products and the registration and use of pesticides. The GDA also provides guidance in location of animal waste facilities and disposal of dead animals.

As part of the United States Department of Agriculture, the **Agricultural Research Service** (ARS) is involved in a wide variety of agricultural research projects and monitoring programs. Research on grazing land systems and irrigation methods relevant to watershed scale monitoring projects and nutrient movement in surface and ground waters are examples of work performed by the ARS.

Resource Conservation and Development (RC&D) Councils are groups of local citizens that are involved in a program to encourage economic development as well as the wise conservation of natural and human resources. The RC&D Councils are locally organized within geographic regions served by the United States Department of Agriculture (USDA). The 1962 Food and Agriculture Act established the RC&D Council program with USDA employees assigned to help the RC&D Councils and termed coordinators. Currently, there are ten (10) RC&D Councils in Georgia.

The federal and state agencies work closely with the Georgia agricultural commodity commissions and organizations such as the Farm Bureau Federation, AgriBusiness Council, Cattleman’s Association, Milk Producers, Pork Producers Association, Poultry Federation, and other producer groups and agriculture support industries to control, prevent and/or abate nonpoint source pollution.

The Clean Water Act

The Clean Water Act (CWA) was passed in 1972 to help clean the nation's waters. The CWA makes state agencies and the EPA jointly responsible for identifying both point and nonpoint sources of pollution. A permit-based program governs "point source" pollution, or discharges from a discrete conveyance such as a pipe or ditch. All other sources of water pollution not associated with a discrete conveyance, or "nonpoint" sources, are approached with various management strategies.

The CWA has provided the foundation for reducing water pollution over the past 25 years, especially curbing point sources of pollution, or pollution that is discharged from a

specific source such as an outfall pipe from a municipal wastewater treatment plant or an industry. Section 402 of the Clean Water Act prohibits the discharge of any pollutants into navigable waters of the United States unless the discharger has a National Pollutant Discharge Elimination System (NPDES) permit.

The Environmental Protection Agency delegated the NPDES program to the Environmental Protection Division of the Georgia Department of Natural Resources (EPD). Facilities which discharge wastewater from a point source must meet effluent limitations set forth in their permits. The CWA also requires permittees to self-monitor which includes sending a monthly discharge monitoring report (DMR) to EPD. DMRs list the pollutants that the permittee is allowed to discharge and the amount and concentration of each pollutant actually discharged during the month monitored. DMRs are public documents and are therefore available for public review.

In 1987, Congress required EPA to extend the NPDES program to stormwater runoff. Cities with populations over 100,000 must apply for NPDES permits for their storm drain discharges (MS4 permits). The permit application must describe the management practices, control systems, and engineering methods that the city plans to use to reduce pollutant discharges, as well as the long-term monitoring that will be performed. Most cities will include public education as a significant part of their management practices.

Georgia Water Quality Control Act

Section 303 of the Clean Water Act requires states to develop and periodically revise water quality standards for every body of water in the state. The standards consist of a designated use for the water, which describe and define the maximum levels of pollutants that may exist in the water, and an "antidegradation" statement which prohibits water quality from being degraded. Generally, the standards of NPDES permits are stringent enough to ensure that the state water quality standards are not violated.

A state must specify the "designated use" of each body of water in the state under Section 303. All of Georgia's waters are currently classified as either fishing, recreation, drinking water, wild river, scenic river, or coastal fishing. Each designated use has a different set of water quality standards for parameters such as pH, dissolved oxygen and temperature. Water quality standards are criteria developed in an effort to determine the maximum concentrations of pollutants that may exist in the water body while still preserving the designated use.

GEORGIA WATER USE CLASSIFICATIONS AND INSTREAM WATER QUALITY STANDARDS FOR EACH USE

Taken from *Water Quality In Georgia*

	Bacteria (fecal coliform)		Dissolved Oxygen (other than trout streams)[1]		pH	Temperature (other than trout streams)[1]	
Use Classification	30-Day Geometric Mean[2] (no/100 ml)	Maximum (no./100ml)	Daily Average (mg/l)	Minimum (mg/l)	Std. Units	Maximum Rise (F)	Maximum (F)
Drinking Water requiring treatment	1,000 (Nov-April) 200 (May-Nov)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Recreation	200 (Freshwater) 100 Coastal)	--	5.0	4.0	6.0-8.5	5	90
Fishing Coastal Fishing[3]	1,000 (Nov-April) 200 (May-October)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Agriculture[4]	5,000	--	--	3.0	6.0-8.5	5	90
Industrial[4]	--	--	--	3.0	6.0-8.5	5	90
Navigation[4]	5,000	--	--	3.0	6.0-8.5	5	90
Urban Stream[4]	2,000	5,000	--	3.0	6.0-8.5	--	--
Wild River		No alteration of natural water quality					
Scenic River		No alteration of natural water quality					

[1] Standards for Trout Streams for dissolved oxygen are an average of 6.0 mg/l and a minimum of 5.0 mg/l. No temperature alteration is allowed in Primary Trout Streams and a temperature change of 2 F is allowed in Secondary Trout Streams.

[2] Geometric means should be “based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours.” The geometric mean of a series of N terms is the Nth root of their product. Example: the geometric mean of 2 and 18 is the square root of 36.

[3] Standards are same as fishing with the exception of dissolved oxygen, which is site specific.

[4] Improvements in water quality since the water use classifications and standards were originally adopted in 1972 provided the opportunity for Georgia to upgrade all stream classifications and eliminate these use designations in 1993.

Even though Section 303 gives the states discretion to set designated uses, the EPA has taken the position that, wherever possible, states must set water standards at a level that will protect aquatic life and allow recreation in and on the water. These are known as "fishable/swimmable" waters. In order for states to set designated uses below the "fishable/swimmable" level, the state must be able to demonstrate the use is not attainable because of either natural environmental conditions or because raising the current limits will cause widespread adverse social and economic impacts.

Based on these designated uses and water quality criteria, the state evaluates whether a stream or river 1) supports, 2) partially supports, or 3) does not support its designated use. This information is published every other year by EPD in its "Water Quality in Georgia" report.

What is the 305(b) Report, the 303(d) List, River Basin Management Planning and a TMDL?

The document, *Water Quality in Georgia,* is often referred to as the Georgia Section 305(b) Report as it is prepared to comply with this section of the Federal Clean Water Act. The report is prepared by the Georgia Environmental Protection Division (EPD) of the Department of Natural Resources (DNR). The DNR Coastal Resources (CRD) and Wildlife Resources Divisions (WRD), the Georgia Forestry Commission, and the Georgia Soil and Water Conservation Commission also contributed portions to the report. In addition, water quality data is provided by a number of governmental agencies and universities.

Section 305(b) requires that each State prepare and submit to the Administrator of the United States Environmental Protection Agency (EPA) a report, biennially, which describes water quality conditions of navigable waters across the State. The EPA provides guidance to the States to establish a framework for consistent reporting across the nation. The EPA reviews the individual State reports and uses the information to develop a national water quality inventory report, which is transmitted to the Congress of the United States.

This report provides an assessment of the water quality conditions of surface and groundwater in Georgia and includes a description of the nature, extent and causes of documented water quality problems. The lists of water quality problem areas serve as the basis for lists required by Sections 303(d), 314, and 319 of the Clean Water Act. The report also includes a review and summary of ongoing wetland, estuary, coastal, and public health/aquatic life issues; and water protection, groundwater, and drinking water supply program summaries. In addition to complying with the Federal Clean Water Act, the major objective of this report is to provide Georgians a broad summary of information on water quality and the programs being implemented by the EPD to protect water resources across the State.

The list of waters in the 305(b) Report includes all waters for which data is available (waters that are impaired and also waters that meet water quality standards and designated use). This list has become a comprehensive list of waters for Georgia, incorporating the information requested by Sections 305(b), 303(d), 314, and 319 of the Federal CWA. As noted, waters listed on the partial and not supporting lists are active 305(b) waters. The list of lakes or reservoirs listed as partial or not supporting designated uses provides the information requested in Section 314 of the CWA. Waters with nonpoint sources identified as a potential cause of a standards violation are considered to provide the information requested in the CWA Section 319 nonpoint assessment.

The 303(d) list is a subset of the 305(b) listed waters. To develop the 303(d) list, the previous 305(b) list was reviewed and coded based on the guidance provided by the EPA. First, segments were identified where enforceable State, local or Federal requirements have led to or will lead to attainment of water quality standards. Segments where improvements were completed at the time of the report were assigned a "1" code and segments with ongoing action which will lead to attainment of water quality standards were assigned a "2" code under 303(d) status. A "3" code was assigned to segments where the EPA, Region IV finalized TMDLs. The remaining segments are marked with an "X" and represent 303(d) listed waters for Georgia. In addition to these waters, the USEPA added waters to the Georgia 303(d) list.

The 303(d) list is a list of Impaired Waters
"Impaired Water" is any water body that does not meet or is not expected to meet the state's water quality standards after full implementation of existing permits.

Georgia is implementing a watershed approach to water resource management through River Basin Management Planning. **River basin planning is the foundation for implementation of water protection strategies in Georgia**. This approach provides the framework and schedule for actions to address waters on the Georgia 303(d) list. Basin planning provides an opportunity to focus monitoring, assessment, problem prioritization, TMDL development, water resource protection strategy development and implementation resources in specific basins on an orderly five year rotating basis.

TMDL stands for Total Maximum Daily Load.
That is, the maximum amounts of a pollutant that can enter a water body without exceeding water quality standards for its designated use.
The State must develop TMDLs for streams on the 303(d) list and a plan to reduce pollution in the impaired water bodies.

The Georgia River Basin Management Planning process provides the framework for the long-term schedule for developing TMDLs for 303(d) listed segments. The proposed schedule includes:

1) the Savannah and Ogeechee River Basins in 2004 (completed Jan-Mar 2005);
2) the St. Marys, Satilla, Suwannee, and Ochlockonee River Basins in 2005 (completed Jan-Mar 2006);
3) the Ocmulgee, Oconee, and Altamaha River Basins in 2006 (submitted to EPA for review Jan 2007)
4) the Chattahoochee and Flint River Basins in 2007; and
5) the Coosa, Tallapoosa, and Tennessee River Basins in 2008.

This schedule is in concert with the agreements between the USEPA.

Georgia Erosion and Sedimentation Control Act

Georgia's Erosion and Sedimentation Control Act (ESA) provides for a statewide program to protect Georgia's waters from soil erosion and sediment deposition. The ESA requires permits for non-exempt "land disturbing activities" for disturbed areas of more than 1 acre in jurisdictions of local issuing authorities. In jurisdictions where there is no local issuing authority (LIA) "land disturbing activities" for disturbed areas of more than 1 acre are regulated under the NPDES General Storm Water Permits.

For most streams in the State, no development is allowed within 25 feet of the stream. For trout streams, the buffer width required is 50 feet. If a developer wants to encroach into a buffer zone, State approval is required. Although ESA provides for the delegation of the program from the State to local governments, local governments do not have the authority to grant variances to the buffer requirements.

The Metropolitan River Protection Act

This Act establishes a 2000-foot protection corridor along the Chattahoochee River and its impoundments for 48 miles between Buford Dam and Peachtree Creek. Like ESCA, land disturbing activity is monitored in the Corridor in an effort to minimize adverse impacts of development on water quality.

Definition of State Waters

"Any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells, and other bodies of surface and subsurface water, natural or artificial, lying within or forming a part of the boundaries of the state, which are not entirely confined and retained completely upon the property of a single, individual, partnership, or corporation."

Public Access To Waterways In Georgia

Simply stated, for a river or stream to be completely "open" to public use for boating, fishing, and other uses, it must be deemed a "navigable" waterway (See Official Code of Georgia Section 44-8-5). Georgia's definition of navigable waterways remains as it historically has been: a navigable stream is one which is capable of transporting boats loaded with freight in the regular course of trade either for the whole or part of the year. This definition excludes the rafting of timber or the transporting of wood in small boats as "freight."

If a stream or river is deemed non-navigable, then the owner of the land on either side of the river or stream has exclusive fishing and navigation rights to the middle of the stream or river. If one owner owns the land on both sides of the river or stream, then such owner has exclusive fishing and possession rights, whereby he or she can exclude all others from use of the river or stream.

If a river is deemed navigable, the public may pass upon it as it would any public highway. The rights of the owner of land along a navigable river or stream extend only to the low-water mark in the bed of the stream. The public's fishing rights on such a river or stream extend to the low-water mark of the river or stream.

Local Ordinances

All local governments have ordinances and/or regulations that may help maintain the water quality of your local streams. For example, many counties have regulations that govern zoning, septic tank maintenance and activities that affect erosion and sedimentation. In some instances, local ordinances may be more stringent than State law.

Wetland Trends In Georgia

The loss of wetlands has become an issue of increasing concern to the general public because of associated adverse impacts to flood control, water quality, aquatic wildlife habitat, rare and endangered species habitat, aesthetics, and recreation. Historically, we have often treated wetlands as "wastelands" that needed "improvement." Today, "swamp reclamation" acts are no longer funded or approved by Congress, but increasing suburban sprawl now accounts for continued wetland losses annually.

Georgia's total wetland area covers an estimated 20 percent of the State's landscape. This total (7.7 million acres) includes approximately 367,000 acres of estuarine wetlands and 7.3 million acres of palustrine wetlands (forested, scrub-shrub and emergent wetlands). A net wetland loss due to conversion of approximately 78,000 acres was estimated for the seven (7) year period between 1975 and 1982, while timber harvesting altered 455,000 acres.

Dredge and fill activities in freshwater and coastal tidal wetlands are regulated in Georgia by the **U.S. Army Corps of Engineers (COE)** in coordination with the DNR through a joint permitting and public notice procedure. The State may also require additional permits for activities in salt marshes and marine water bottoms. These permit activities are coordinated through the DNR, Coastal Resources Division. Enforcement of various noncompliance activities or permit violations may be pursued by DNR, the COE, or U.S. EPA. Normal agricultural and silvicultural operations are generally exempted under the **Clean Water Act Section 404** regulations with certain conditions.

Wetland Protection through Planning

In Georgia, wetland uses are tied to both the state water quality standards through the definition of "water" or "waters of the State," and to established criteria for wetlands protection (Chap. 391-3-16-03) associated with the **Comprehensive Planning Act of 1989** (O.C.G.A. 12-2-8).

The definition of "water" or "waters of the State" (Chap. 391-3-6) means "any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells, wetlands, and all other bodies of surface or subsurface water, natural or artificial, lying within or forming a part of the boundaries of the State which are not entirely confined and retained completely upon the property of a single individual, partnership, or corporation." The **Comprehensive Planning Act** requires all local governments and Regional Development Centers to recognize or acknowledge the importance of wetlands for the public good in the land use planning process. All local governments (municipalities and county governments) were required, beginning in 1990, to meet minimum criteria for wetland use and protection. Each government is required to map wetlands using DNR or NWI maps, and describe how wetlands will be protected from future development. The wetlands protection criteria define freshwater wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands

generally include swamps, marshes, bogs, and similar areas" (33 CFR 32.93). This definition is not intended to include coastal marshlands or tidal salt marshes as defined by the state **Coastal Marshlands Protection Act**. The minimum area of wetlands to be identified in land use planning is not to exceed five acres.

Additional Wetlands Protection Activities

In addition to land use planning, Georgia is protecting its wetlands through land acquisition, public education, wetland restoration and regulatory programs. The state maintains monitoring and enforcement programs for estuarine marshes under authority of the **Coastal Marshlands Protection Act of 1970**. Monthly or bimonthly over-flights are made of the Georgia coastline to find potential violations. Restoration and penalties are provided for in the Act. No similar monitoring or enforcement programs are maintained for freshwater wetlands by the State apart from interaction with the COE in some regulatory matters. **Additional protection to wetlands is provided either directly or indirectly by the statutes listed below, described elsewhere in this report. These state laws are as follows:**

Coastal Marshlands Protection Act
Shore Protection Act
401 Water Quality Certification
Water Quality Control Act
Ground Water Use Act
Safe Drinking Water Act
Erosion and Sedimentation Control Act
Metropolitan Rivers Protection Act