GEORGIA

*A*dopt-A-Stream

Department of Natural Resources

Environmental Protection Division

Winter 2014

Visual Stream Survey

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

Georgia Department of Natural Resources, Environmental Protection Division, Watershed Protection Branch: *Macroinvertebrate Biological Assessment of Wadeable Streams in Georgia, Standard Operating Procedures*. March 2007. Version 1.0

GEM Center for Science and Environmental Outreach at Michigan Tech University, *Stream Habitat Survey*. http://wupcenter.mtu.edu/education/stream/streamhabitatsurvey.htm

Stream Corridor Restoration: Principles, Processes and Practice. 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.

United States Department of Agriculture, National Resources Conservation Service, *Stream Visual Assessment Protocol*. National Water and Climate Center Technical Note 99-1

United States Environmental Protection Agency: *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers* (Second Edition, July 1999). Document #: EPA 841-B-99-002

Virginia Save Our Streams, *Habitat Assessment*: http://www.vctu.org/wp-content/uploads/2012/05/VASOS_Habitat_Field_Guide.pdf

Getting Started with Georgia Adopt-A-Stream

Georgia Adopt-A-Stream (AAS) is a statewide volunteer water quality monitoring program. AAS is housed in the NonPoint Source Program in the Watershed Protection Branch of the Georgia Environmental Protection Division (EPD) and is funded by a United States Environmental Protection Agency (U.S. EPA) Section 319(h) Grant. 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 and more than 60 established Community Adopt-A-Stream organizers. Adopt-A-Stream Community Programs organize monitoring groups in their watershed, county or city. These local 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 goals of Georgia Adopt-A-Stream are easy to remember by thinking about the word "**ADOPT**".

Awareness: Increase public awareness of the State's nonpoint source pollution and water quality issues

Data: Collect baseline water quality data

Observations: Encourage volunteers to take observations of their adopted site and surrounding environment

Partnerships: Encourage partnerships between citizens and their local government

Tools and Training: Provide citizens with the tools and training to evaluate and protect their local waterways

Awareness

Georgia Adopt-A-Stream has been tasked with the goal of increasing public awareness of the State's nonpoint source pollution and water quality issues. We accomplish this through workshops, outreach materials such as newsletters, manuals and brochures, as well as our annual volunteer conference and by presenting at community events. We encourage our volunteers to also foster this goal, by building awareness within their own communities.

Data

Georgia Adopt-A-Stream houses an online clearinghouse for volunteer water quality data for the State of Georgia. This water quality data is publicly accessible on our website at www.GeorgiaAdoptAStream.org and can be viewed at the city, county and watershed level to help citizens better understand the health of their local waterways. Volunteer monitoring data is used to educate the public and help local, state and federal agencies make informed decisions and to identify water quality impairments.

Observations
Careful observations of our waterways can lead to success in protecting and improving its conditions. In addition to the data found on the datasheets, you may notice other details that are important to record when visiting your adopted site. Stay aware of baseline conditions so if anything changes in future visits, you will be able to tell and can act accordingly.

Partnerships
Adopt-A-Stream encourages new groups to inform their local government about their activities and to create partnerships with local schools, businesses, watershed organizations and government agencies. These partnerships can enhance your program by providing support for your group through data interpretation, advice on restoration techniques, remediation, sponsorships and volunteer recruitment. We cannot emphasize enough the importance of beneficial partnerships to any volunteer monitoring group. If you need help establishing partnerships, we encourage you to contact your local coordinator/trainer or the AAS state office.

Tools and Training
The Adopt-A-Stream program offers many levels of involvement including training, certification and monitoring. Some of our monitoring programs require the volunteer to obtain Quality Assurance/Quality Control certification (QA/QC), which is accomplished by attending a workshop and passing the QA/QC test. This certification allows the volunteer to enter data into the database. Our non-QA/QC programs offer a training workshop and manuals, but certification is not required. Manuals and support materials are provided for each monitoring type to guide volunteers through the monitoring process. To find out more about different levels of involvement, visit our website: http://georgiaadoptastream.org/db/aas_levels.asp

Adopt-A-Stream Certifications and Monitoring Programs
For Freshwater and Coastal Waterways

Watershed Assessments (Y)	Visual Monitoring (Q)
Macroinvertebrate Monitoring (Q)*	Amphibian Monitoring (bi-monthly)
Chemical Monitoring (M)*	Bacterial Monitoring (M)*
Freshwater Wetland Monitoring (Q)	Coastal Monitoring (M)*
Lake Monitoring (M)	Rivers Alive (annually)
Trainer Certification*	Adopt-A-Stream in the Classroom

*=QA/QC programs M=Monthly Sampling Q=Quarterly Sampling Y=Yearly Sampling

Currently, Adopt-A-Stream has over 3,400 active volunteers who monitor 470 sites and our quarterly newsletter has over 8,000 subscribers. We invite you to join us to help protect Georgia’s water resources.

Water Quality Monitoring

Many water quality parameters can be monitored to help assess the condition of a river, lake or beach area. These can include physical, chemical and biological monitoring. Each of these tells us part of the story about the health of a waterway. Physical monitoring evaluates aspects of the stream including the stability of the streambed and channel as well as the adjacent riparian zone. Chemical monitoring provides a snapshot of the chemical properties at a given time while macroinvertebrate monitoring shows more long term information about the health of the stream. Bacterial monitoring can help citizens determine if the water is 'safe' to swim in. This manual will guide you through visual stream monitoring and why it so important in determining water quality of your adopted site.

Water quality data collected by volunteers for a particular waterway has many uses and benefits along with determining if a particular waterway is safe for recreational purposes. These benefits include:

- **Establishing Baseline Data** – Georgia has more than 70,000 miles of rivers, 400,000 acres of lakes, and 100 miles of coastline - of which, about 20% is monitored on a regular basis. Long-term data collection enables volunteers to take a more active role in protecting their waterways.

- **Assessing Watersheds** – Data generated by volunteers may be used to describe current water quality conditions within a watershed and provide valuable information to water utilities and local decision makers.

- **Educating Citizens** – Volunteers can educate themselves about water quality problems within their watershed. Often this education leads to a sense of "connectedness" to their stream, river, lake or coast and a willingness to promote good stewardship.

- **Targeted Sampling** – Water quality monitoring can help identify sources (hot spots) of pollution caused by stormwater runoff, ruptured or overflowing sewer lines, leaking septic tanks, certain land use operations, industries and other sources of pollution.

- **Total Maximum Daily Load (TMDL) Development and Implementation** – Volunteers can provide data to state agencies developing TMDLs and Watershed Management Plans (also known as TMDL Implementation Plans and Watershed Improvement Plans). The information gathered by volunteers can help with TMDL modeling and help identify effective best management practices (structural and non-structural activities that improve water quality) for improving waterway conditions.

Setting Goals and Designing a Sampling Program

Before starting, first determine your goals. These will guide the level of your participation and help to develop your monitoring program. Where, when, and how often you sample will depend on these goals.

Georgia Adopt-A-Stream offers many opportunities to engage and protect waterways. Follow the below steps to get started, it's simple!

1. **Determine your level of participation and goals.** There are many levels to adopting a waterway. Take your time and think about why you want to monitor, what type of data you want to collect and who may be interested in using your data. Call us anytime if you need advice or guidance, and we can help you through this process:
   A. Basic level: Conduct one outreach event (i.e. river cleanup) and walk your watershed.
   B. Monitoring: In addition to 'A,' select a monitoring program(s) that interests your group (visual survey, macroinvertebrate, bacterial, chemical, amphibian monitoring).
2. **Attend a workshop.** Depending on your interest in participating in collecting baseline data, you and your group should attend our monitoring workshops. These workshops are fun and informative!

   To learn more about these workshops and to view our workshop calendar, visit www.GeorgiaAdoptAStream.org. If there is not a workshop scheduled for your area, please contact your local coordinator or the State Office and we'll organize one in your area.

3. **Select a site to adopt.** Look around and find a stream, wetland or lake that is important to you. Georgia Adopt-A-Stream does not assign monitoring sites, but can provide guidance and support in your decision. We suggest you find a waterbody that is easy, safe and legal to access.
4. **Create a group.** You will need help when adopting a site to monitor, restore and protect. It's always better to have two sets of eyes collecting data, to help with equipment and costs, and then also for safety reasons.
5. **Register your group and site(s).** Registration forms are on our website under 'Forms & Reports.' Register your group first, then your site(s). To register your site you will need the latitude/longitude location (this can also be generated from our site's Google maps application; you can also call us or your local coordinator for help with obtaining this information).
6. **Get informed, read your manuals!** Get a copy of the manual 'Getting to Know Your Watershed.' To obtain a copy, contact the Georgia Adopt-A-Stream office or download a copy at www.GeorgiaAdoptAStream.org. **Chapter 1** of this manual will give you some basic background on watersheds, land use issues and effects of development. **Chapter 2** provides background on nonpoint source pollution and some of the laws that are used to protect water quality. In **Chapter 3**, follow the directions on how to register your stream, wetland or lake.

7. **Take it slow, be safe and have fun!** Start slowly, ask a lot of questions, tell your neighbors what you are learning, make sure you are being safe when you sample, and most importantly, enjoy yourself!

Safety and Health Checklist

Your safety and health are of number-one importance to Georgia Adopt-A-Stream. There are several important things to remember when you are monitoring your adopted stream, river, lake or wetland. If you follow these "rules of monitoring" you will have a fun, enjoyable and accident-free experience.

Before visiting your site:

- Develop a site emergency plan: (i.e. Site location, nearest medical center, nearest phone, medical conditions of team members and their emergency contact, etc).
- Check weather reports. Stop monitoring if a storm occurs while you are monitoring.
- Determine if you have safe, legal access to your site.

Rules to monitor by:

- Your adopted site should be wadeable or accessible by a bridge. Do not monitor waters that are deeper than your knees.
- If at any time you feel uncomfortable about the condition of the waterbody or your surroundings, stop monitoring and leave the site.
- Do not monitor if the waterbody is at flood stage, or even one day after a heavy rain. Fast moving water is very dangerous. Never wade in swift or high water.
- Never cross private property without the permission of the landowner.
- Always bring your "Who to Call" list on page 89 of this manual.
- Look out for broken glass, poison ivy, and biting/stinging insects.
- Never drink the water and wash hands after monitoring.
- Do not monitor if the water body is posted as unsafe for body contact.
- Carry a first aid kit with you.
- Adopt-A-Stream recommends that you monitor with another person.

Resources Available from Georgia Adopt-A-Stream

- Organization and technical support
- Website at www.GeorgiaAdoptAStream.org
- Online water quality data clearing house
- *Getting To Know Your Watershed* manual & workshop✳
- *Visual Stream Survey* manual & workshop ✳
- *Macroinvertebrate and Chemical Stream Monitoring* manual & workshop ✳
- *Bacterial Monitoring* manual & workshop
- *Amphibian Monitoring* manual & workshop
- *Adopt-A-Wetland* manual & workshop for freshwater wetlands
- *Coastal Georgia Adopt-A-Wetland* manual & workshop
- *Adopt-A-Lake* manual & workshop
- *Adopt-A-Stream Educator's Guide* & workshop
- *Rivers Alive 'Guide to Organizing and Conducting a Cleanup'*
- *'Life at The Water's Edge'* brochure on protecting, preserving and restoring local waterways
- *Georgia Adopt-A-Stream: It All Begins With You* DVD
- Train – The – Trainer workshops
- 'You Are The Solution To Water Pollution' posters and brochures
- Six (6) bi-monthly newsletters (available also in e-newsletter format)
- Confluence, our annual volunteer conference and award ceremony

✳ **Available in Spanish**

Water Quality in Georgia

As outlined in Water Quality in Georgia, 2010-2011, Chapter 1, Executive Summary (Georgia Environmental Protection Division, Department of Natural Resources)

Georgia is one of the fastest growing states in the nation. Between 2000 and 2010, Georgia gained 1.5 million new residents, ranking 4th nationally. The increasing population places considerable demands on Georgia's ground and surface water resources in terms of water supply, water quality, and in the assimilative capacity of rivers to receive wastewaters from industrial and municipal discharges. To address these demands, the General Assembly and Governor Perdue in February 2008 approved the implementation of the Comprehensive State-wide Water Management Plan in Georgia. The regional water plans are not themselves an end. The plans present solutions identified by a cross-section of regional leaders, drawing on regional knowledge and priorities. The plans are based on consistent, statewide forecasts of needs and reflect the best available information on the capacities of Georgia's waters. More about these plans can be found at:
http://gaepd.com/Files_PDF/305b/Y2012_303d/Y2012_Coverpage-Chapter_2_305b.pdf

The pollution impact on Georgia streams has radically shifted over the last several 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, detergents and a variety of other pollutants being washed into rivers and lakes by stormwater. Even stormwater runoff itself, if rate and volume is unmitigated, can be extremely detrimental to aquatic habitat and hydrologic systems. Nonpoint source pollution, although somewhat less dramatic than raw sewage, must be reduced and controlled to fully protect Georgia's streams. Structural and nonstructural techniques such as green infrastructure, pollution prevention and best management practices must be significantly expanded to minimize nonpoint source pollution. These include both watershed protection through planning, zoning, buffer zones, and appropriate building densities as well as increased use of stormwater structural practices, low impact development, street cleaning and perhaps eventual limitations on pesticide and fertilizer usage.

Another issue of importance is the reduction of toxic substances in rivers, lakes, sediment and fish tissue. This 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.

Nutrients also serve a very important role in our environment. They provide the essential building blocks necessary for growth and development of healthy aquatic ecosystems. However, if not properly managed, nutrients in excessive amounts can have detrimental effects on human health and the environment, creating such water quality problems as excessive growth of macrophytes and phytoplankton, harmful algal blooms, dissolved oxygen depletion, and an imbalance of flora and fauna. In Georgia, site specific nutrient criteria have been adopted for several major lakes and their tributaries. Some of these lakes are currently listed for chlorophyll a, which is the primary biological indicator in lakes for nutrient over-enrichment. TMDLs, based on watershed modeling, have been completed or are in development to address the nutrient issues for these lakes. Currently, the Georgia EPD is in the process of collecting the necessary data and information for use in developing nutrient standards for rivers, streams and other waterbodies in Georgia. Determining the relationship of nutrient levels and biological response is necessary in order to develop appropriate nutrient criteria.

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 what we do on the land has a direct impact on water quality. Adding more pavement and other impervious surfaces, littering, driving cars which drip oils and antifreeze, applying fertilizers and other activities and behaviors all contribute 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 Georgia EPD 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.

Water Resources Atlas

State Population (2012 estimate)	9,383,941
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

Water Quality in Georgia, 2010-2011, Chapter 3, Water Quality Monitoring and Assessment (Georgia Environmental Protection Division, Department of Natural Resources)

Chapter 1

INTRODUCTION TO STREAMS AND RIVERS

- The Living Stream Environment
- The River System
- What Is Stream Flow and Why Is It Important?
- The River Continuum Concept

The Living Stream Environment

A healthy stream is a busy place. Wildlife and birds find shelter and food near and in its waters. Vegetation grows along its banks, shading the stream, slowing its flow in rainstorms, filtering pollutants before they enter the stream and sheltering animals. Within the stream itself are fish and a myriad of insects and other tiny creatures with very particular needs. For example, stream dwellers need dissolved oxygen to breathe, rocks, overhanging tree limbs, logs, and roots for shelter, vegetation and other tiny animals to eat and special places to breed and hatch their young. For many of these activities they might also need water of specific velocity, depth, and temperature.

Human activities shape and alter many of these stream characteristics. We dam up, straighten, divert, dredge and discharge into streams. We build roads, parking lots, homes, offices, golf courses and factories in the watershed. We farm, mine, cut down trees, and graze our livestock in and along stream edges. We also swim, fish and canoe in streams. Volunteers should be aware that the surrounding land affects stream habitat.

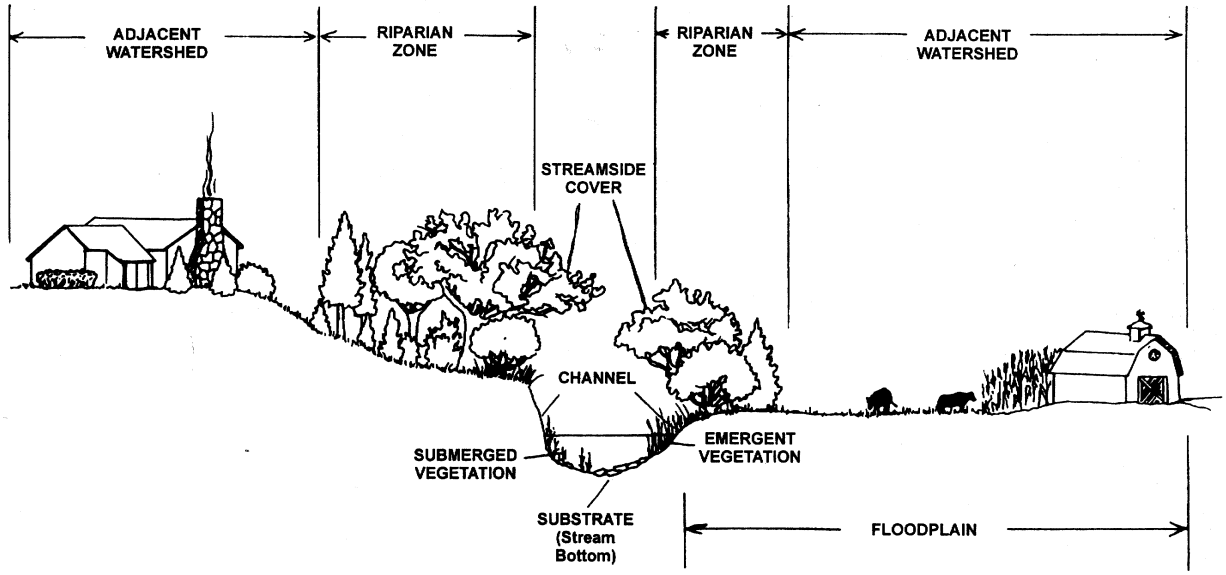


Figure 1.1 Components of a stream and the surrounding land

These activities can dramatically affect the many components of the living stream environment (Figure 1.1). These components include:

The **adjacent watershed** includes the higher ground that captures runoff and drains to the stream.

The **floodplain** is the low area of land that surrounds a stream and holds the overflow of water during a flood (Figure 1.2).

The **riparian zone (buffer)** is the area of natural vegetation extending outward from the edge of the streambank. The riparian zone acts as a buffer to pollutants entering a stream from runoff, controls erosion and provides stream habitat and nutrient input into the stream. A healthy stream system generally has a healthy riparian zone. Reductions and impairment of riparian zones occur when roads, parking lots, fields, lawns and other artificially cultivated areas, bare soil, rocks or buildings are near the streambank.

The **streamside cover** includes any overhanging vegetation that offers protection and shading for the stream and its aquatic inhabitants.

The **bankfull** line is defined as the line on the stream bank marking the normal maximum water flow level before excess water spills into the riparian zone or floodplain. The bankfull discharge is expected to occur every 1.5 to 3 years on average (Figure 1.2).

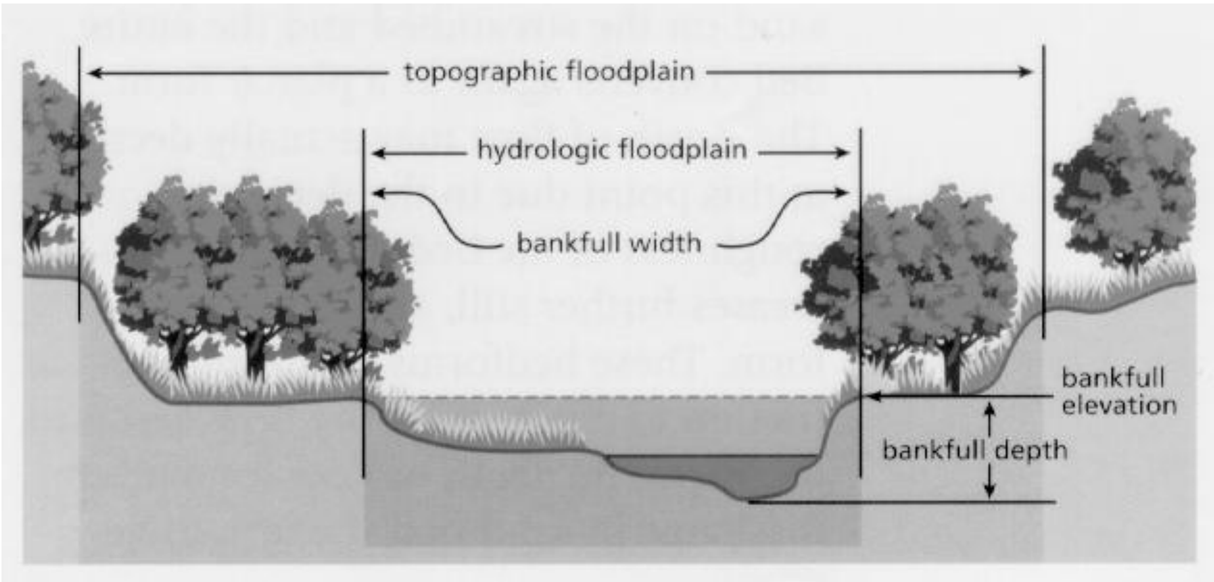


Figure 1.2 Components of the floodplain and bankfull

The **stream bank** includes both an upper bank and a lower bank. The lower bank normally begins at the normal water line and runs to the bottom of the stream. The upper bank extends from the break in the normal slope of the surrounding land to the normal high water line.

Stream vegetation includes emergent, submergent and floating plants. Emergent plants include plants with true stems, roots and leaves with most of their vegetative parts above the water. Submergent plants also include some of the same types of plants, but they are completely immersed in water. Floating plants (e.g., duckweed, algae mats) are detached from any substrate and are therefore drifting in the water.

The **channel** of the stream is the width of the stream at bankfull discharge.

Pools are distinct habitats within the stream where the velocity of the water is reduced and the depth of the water is greater than that of most other stream areas (Fig. 1.3). A pool usually has soft bottom sediments.

Riffles are shallow, turbulent, swiftly flowing stretches of water that flow over partially or totally submerged rocks. This is where you can hear the sound of the water moving.

Runs or **glides** are sections of the stream with a relatively low velocity that flow gently and smoothly with little or no turbulence at the surface of the water.

The **substrate** is the material that makes up the streambed, such as clay, cobbles or boulders.

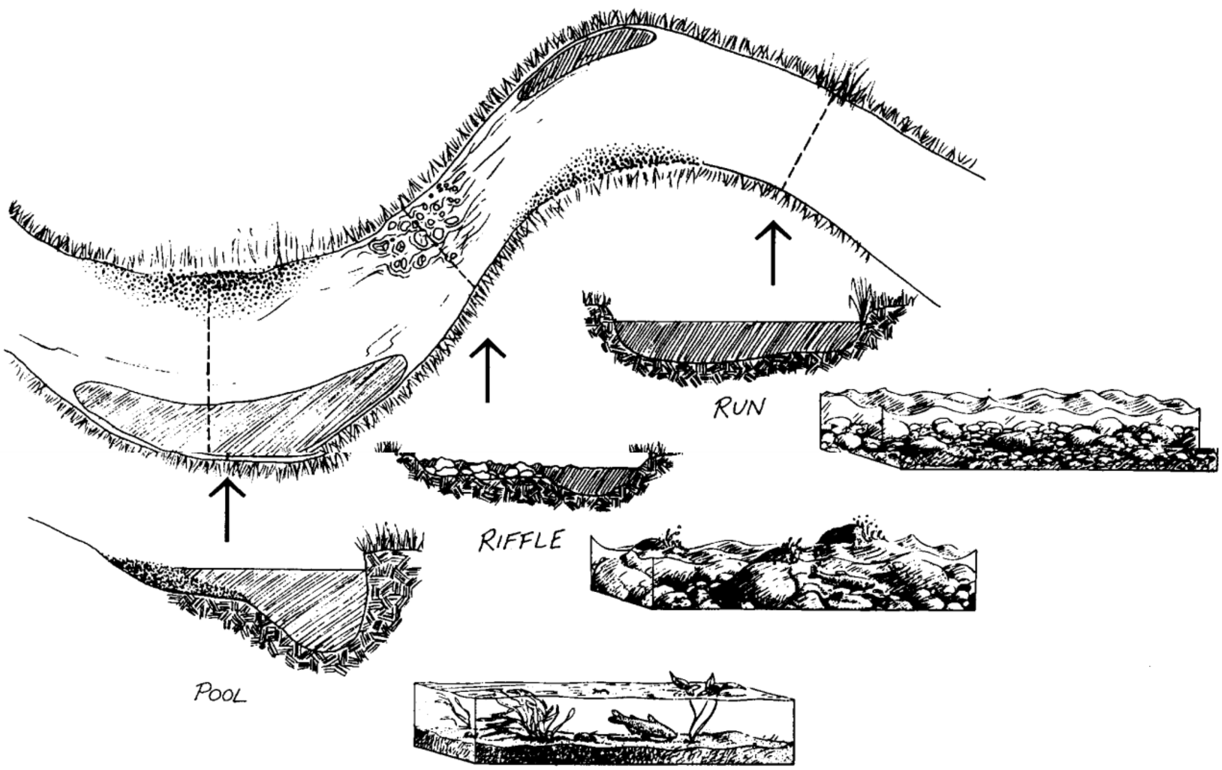


Figure 1.3. Components of the River System

Whether streams are active, fast moving, shady, cold and clear, or deep, slow moving, muddy and warm—or something in between—they are shaped by the land they flow through and by what we do to that land. For example, vegetation in the stream's riparian zone protects and serves as a buffer for the stream's streamside cover, which in turn shades and enriches (by dropping leaves and other organic material) the water in the stream channel.

Furthermore, the riparian zone helps maintain the stability of the streambank by binding soils through root systems. This helps control erosion and prevents excessive siltation of the stream's substrate. If human activities begin to degrade the stream's riparian zone, each of these stream components—and the aquatic insects, fish and plants that inhabit them—also begins to degrade. The Macroinvertebrate Monitoring Manual includes methods that volunteers can use to assess the stream's living environment—specifically, the insects that live in the stream and the physical components of the stream (the habitats) that support them.

The River System

Stream scientists categorize streams based on the balance and timing of the storm water runoff and baseflow components. There are three main categories:

Ephemeral streams flow only during or immediately after periods of precipitation. They generally flow less than 30 days out of the year and persist as dry riverbeds throughout most of the year.

Intermittent streams flow only during certain times of year. Seasonal flow in an intermittent stream usually last longer than 30 days per year.

Perennial streams flow continuously during both wet and dry times. Base flow is generally generated from the movement of ground water into the channel.

As streams flow downhill and meet other streams in the watershed, a branching network is formed (Figure 1.4). When observed from above, this network resembles a tree. The trunk of the tree is represented by the largest river that flows into the ocean or Gulf of Mexico. The “tipmost” branches are the **headwater streams**. This network of flowing water from the headwater streams to the mouth of the largest river is called the **river system**. Water resource professionals have developed a simple method of categorizing the streams in the river system. Streams that have no tributaries flowing into them are called **first-order streams**. Streams that receive only first-order streams are called **second-order streams**. When two second-order streams meet, the combined flow becomes a **third-order stream**, and so on.

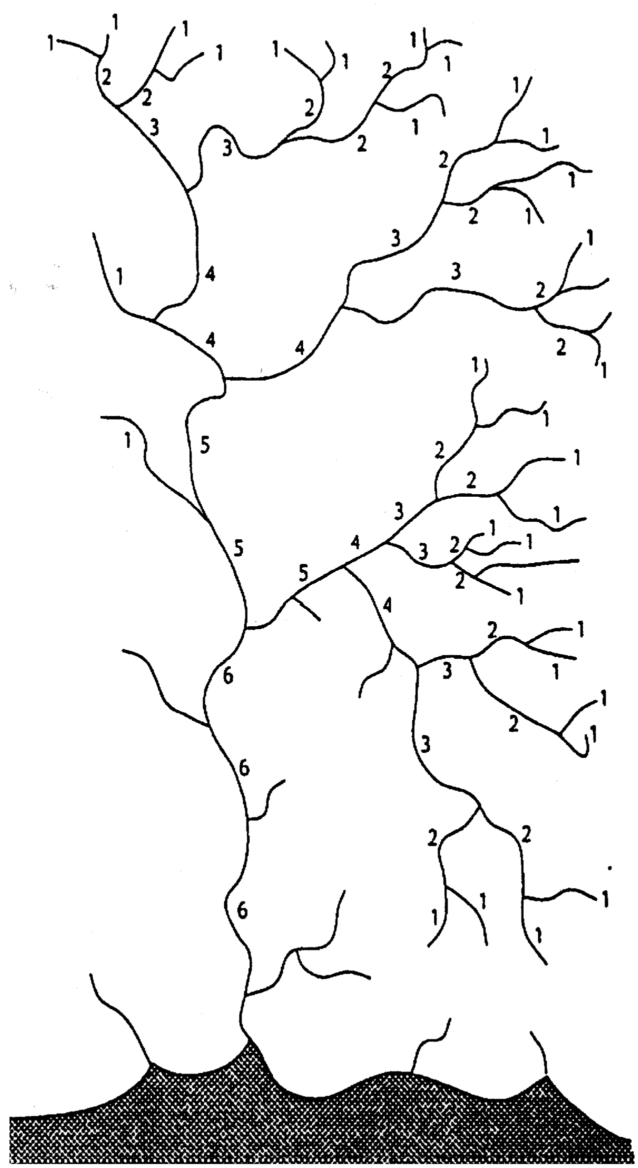


Figure 1.4 River system orders

What Is Stream Flow and Why Is It Important?

Stream flow, or discharge, is the volume of water that moves over a designated point over a fixed period of time. It is often expressed as cubic feet per second (cfs).

The flow of a stream is directly related to the amount of water moving off the watershed into the stream channel. It is affected by weather, increasing during rainstorms and decreasing during dry periods. It also changes during different seasons of the year. Stream flow decreases during the summer months when evaporation rates are high and shoreline vegetation is actively growing and removing water from the ground. August and September are usually the months of lowest flow for the majority of streams and rivers in most of the country.

Water withdrawals for irrigation purposes can seriously deplete water flow, as can industrial water withdrawals. Dams used for electric power generation, particularly facilities designed to produce power during periods of peak need, often block the flow of a stream and later release it in a surge.

Flow is a function of water volume and velocity. It is important because of its impact on water quality and on the living organisms and habitats in the stream. Large, swiftly flowing rivers can receive pollution discharges and be little affected, whereas small flowing streams have less capacity to dilute and degrade wastes.

Stream velocity, which increases as the volume of the water in the stream increases, determines the kinds of organisms that can live in the stream (some need fast-flowing areas, others need quiet pools). It also affects the amount of silt and sediment carried by the stream. Sediment introduced to quiet, slow-flowing streams will settle quickly to the stream bottom. Fast moving streams will keep sediment suspended longer in the water column. Last, fast-moving streams generally have higher levels of dissolved oxygen than slow streams because they are better aerated.

The River Continuum Concept

Imagine a small stream in the north Georgia mountains. Ideally this headwater stream (first or second order) would be characterized by many small riffles interspersed with pools of cool water with extensive shade and cover provided by tree canopy. Generally these streams are so small they possess few or no fish. Throughout the year, and especially in the fall, leaves and other organic debris are swept overland into the stream. Aquatic microbes and macroinvertebrates consume this organic matter in much the same way worms break down yard waste in a backyard compost pile. Shredders and collectors—names given to organisms that possess adaptations for shredding intact organic matter and collecting detritus—are the primary aquatic macroinvertebrates that inhabit these headwater streams (Figure 1.5).

As we progress downstream, the river becomes broader and canopy cover is reduced. The water temperature also increases. These third, fourth and fifth order streams are progressively influenced less and less by the surrounding land. The aquatic populations of fish and macroinvertebrates likewise change. Collectors slowly predominate while cold-water fish like trout and smallmouth bass give way to perch and ultimately catfish. This progressive change in the physical characteristics and biological communities in a river is called the River Continuum Concept.

The River Continuum Concept is an attempt to generalize changes in a stream as it progresses in size from a first order to second, fifth and larger order streams (Figure 1.5). This conceptual model not only helps to identify connections between the watershed, floodplain, and stream systems, but also describes the way in which biological communities develop and change from the headwaters to the mouth. The River Continuum Concept can place a site or reach in context within a larger watershed or landscape and thus help individuals define and focus monitoring and restoration goals.

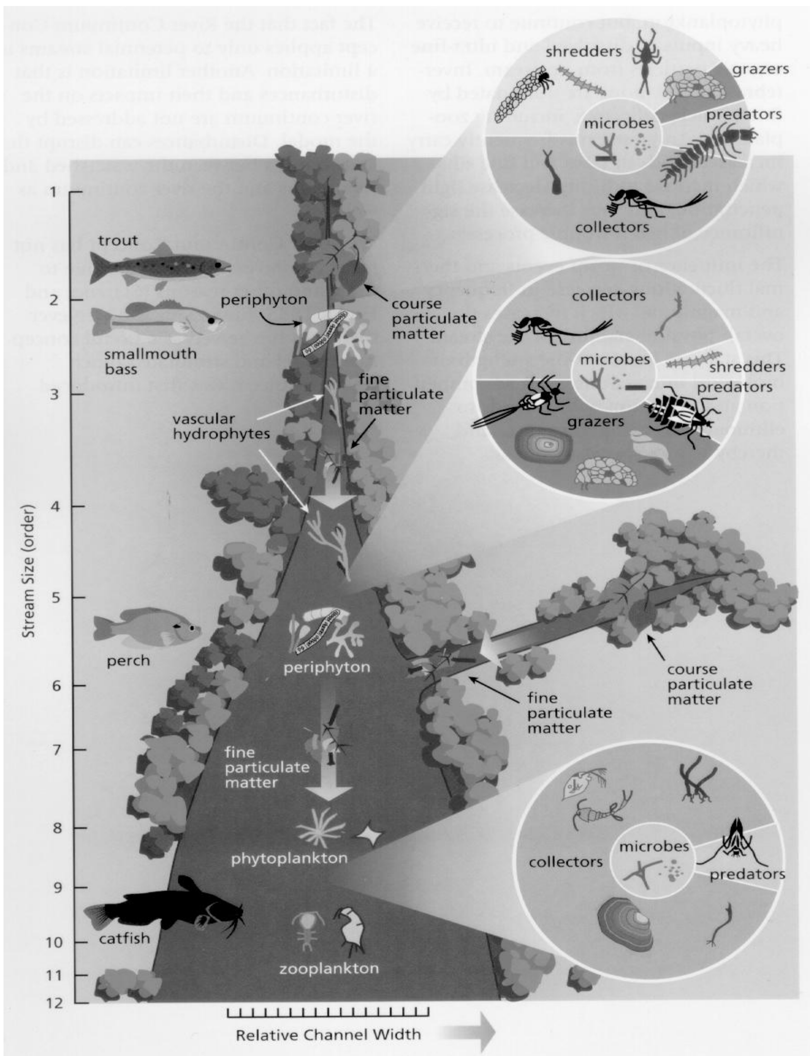


Figure 1.5 Model of the River Continuum Concept

Chapter 2

VISUAL FORMS

- Basic Visual Form
- Stream Habitat Survey
- Stream Flow
- Channel Cross-Section: Part 1
- Channel Cross-Section: Part 2
- Wentworth Pebble Count
- Site Sketch
- Visual Biological Survey

GEORGIA ADOPT-A-STREAM: Basic Visual Form

To be used with: Photo Points, Wentworth Pebble Count, Cross Section, Bio Survey, Stream Habitat Survey, Stream Flow and Site Sketch

SITE INFORMATION

Group Name:________________________ Event Date: ___________________ (MMDDYYYY)

Group ID: G-________ Site ID: S-________ Time Sample Collected:___________ (HHMM am/pm)

Stream Name:________________________ Time Spent Sampling: ____________ (Min)

Monitor(s):________________________ Total Time Spent Traveling *(optional)*: ________ (Min)

Number of Participants:___________ Furthest Distance Traveled *(optional)*: ________(Miles)

WEATHER

Present conditions (check all that apply)

☐ Heavy Rain ☐ Steady Rain ☐ Intermittent Rain

☐ Overcast ☐ Partly Cloudy ☐ Clear/Sunny

Amount of rain, if known?

Amount in Inches:________

In Last Hours/Days:________

*Refer to *wunderground.com* for rainfall data

OBSERVATIONS

Flow/Water Level: *(check all that apply)* ☐ Dry ☐ Stagnant/Still ☐ Low ☐ Normal ☐ High ☐ Flood (over banks)

Water Clarity: ☐ Clear/Transparent ☐ Cloudy/Somewhat Turbid ☐ Opaque/Turbid ☐ Other:__________

Water Color: ☐ No Color ☐ Brown/Muddy ☐ Green ☐ Milky/White ☐ Tannic ☐ Other:__________

Water Surface: ☐ Clear ☐ Oily sheen: Does it break when disturbed? Yes/No (circle one) ☐ Algae

☐ Foam ◯ Greater than 3" high ◯ It is pure white ☐ Other:____________________

Water Odor: ☐ Natural/None ☐ Gasoline ☐ Sewage ☐ Rotten Egg

☐ Fishy ☐ Chlorine ☐ Other:______________

Trash: ☐ None ☐ Yes, I did a cleanup ☐ This site needs an organized cleanup

PHOTO POINTS

Photos: Please take images to document your observations and changes in water quality conditions.

Photo point directions can be found in the manuals. Images can be submitted online with your other data.

Reference Location (RL): Latitude (+)__________ (DD.DDDD°) Longitude (-)__________ (DD.DDDD°)

Compass bearing to permanent Photo Point Location (PPL): Degrees (°)________

Distance to permanent Photo Point Location (PPL) from Reference Location (RL): Distance _________(ft/in)

Camera height at permanent Photo Point location (PPL): Height _________(ft/in)

COMMENTS

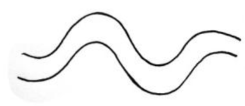
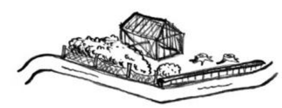
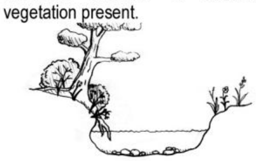
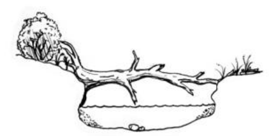
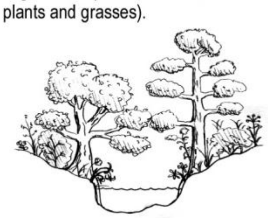
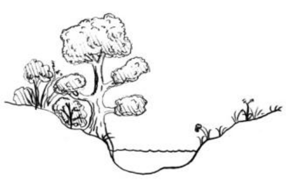
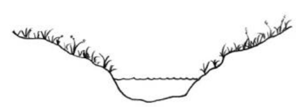
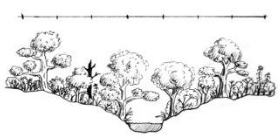
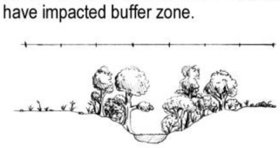
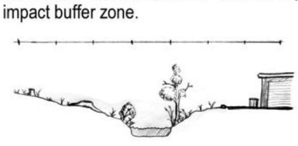
Any changes since you last sampled at this site? If yes, please describe.

Please submit data to our online database at www.GeorgiaAdoptAStream.org

GEORGIA ADOPT-A-STREAM: Stream Habitat Survey

(Also fill out the Basic Visual Form when completing this survey)

Type of Stream:
☐ Rocky bottom
☐ Muddy bottom

Habitat Parameter	Excellent -Poor			
6. Channel Alteration **Is the stream channel altered by humans?**	**No evidence** of channelization (straightening) or alterations such as dredging, agriculture, concrete banks or construction activities. 	**Some evidence** of channelization (straightening) and/or alterations such as dredging, agriculture, concrete banks or construction activities. 	**Most of stream reach** channelized and/or many alterations present such as dredging, agriculture, concrete banks or construction activities. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score**
7. Channel Sinuosity * For MUDDY BOTTOM streams only **Does the channel have lots of curves and bends?**	Yes, bends in the channel are **frequent.** 	There are **more bends than straight** sections. 	There are **more straight sections** than sections with bends or channel is entirely straight. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score**
8. Bank Stability **How stable are the streambanks?** Determine right/left bank by facing downstream	**Bank stable**; erosion, scouring, undercutting or bank failure absent or minimal. Vegetation overhanging the stream is abundant. 	**Bank moderately stable**; evidence of small areas of erosion, undercutting and scouring, or bank failure present. Moderate amounts of overhanging vegetation present. 	**Bank unstable**; many eroded and scoured areas with undercutting; bank failure present; steep banks. Little over hanging vegetation present. 	What did you see?
Left bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	**Score** (Add both banks)
Right bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	
9. Vegetative Protection **Are streambanks covered & shaded by a variety of vegetation?** Determine right/left bank by facing downstream	Most streambank surfaces covered and shaded by a **large variety** of vegetation (trees, shrubs, flowering plants and grasses). 	Some streambank surfaces covered and shaded by **some variety** of vegetation (trees, shrubs, flowering plants and grasses). 	Few streambank surfaces covered and shaded by vegetation. L**ittle variety** of vegetation. Streambank dominated by one type of vegetation (trees, shrubs, flowering plants and grasses). 	What did you see? Did you see any nonnative vegetation? Check here if YES ☐
Left bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	**Score** (Add both banks)
Right bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	
10. Riparian Vegetative Zone Width **What is the amount of buffer available?** Determine right/left bank by facing downstream	Buffer present; a large variety of vegetation extends at least **three channel widths** on each side. 	Some buffer present; some variety of vegetation extends **two to one channel width** on each side. Human activities have impacted buffer zone. 	Little or no buffer present; vegetation extends **less than one channel width** on each side. Human activities substantially impact buffer zone. 	What did you see? Did you see any nonnative vegetation? Check here if YES ☐
Left bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	**Score** (Add both banks)
Right bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	

Stream Habitat Score: **Excellent (69-90)** **Good (46-68)** **Fair (23-45)** **Poor (0-22)**

Total second side _____

Total first side _____

Total _____

Please submit data at: www.GeorgiaAdoptAStream.org
Or send to: 4220 International Parkway, Suite 101, Atlanta, Georgia 30354
Fax: 404-675-6245 Phone: 404-675-6240

GEORGIA ADOPT-A-STREAM: Stream Flow

(Also fill out the Basic Visual Form when completing this survey)

CALCULATE AREA

Area = depth x width

It is advisable to take multiple depth and width measurements

Always start at the water's edge with a first measurement of zero

All data should be recorded in feet, with inches replaced by decimals

Depth Measurements	1.	2.	3.	4.	5.	6.	7.	8.	sum
	0 ft								

Average Depth [ ] ft = sum of depth measurements / number of measurements

Width Measurements	1.	2.	sum
	ft		

Average Width [ ] ft = sum of width measurements / number of measurements

Area [ ] ft^2 = width [ ] X depth [ ]

CALCULATE SPEED- Measure the time it takes a float to travel a desired distance

It is advisable to take at least 2 measurements of current speed

Take measurements from the stream <u>run</u>

length = [ ] feet (20 feet is recommended)

time in seconds	1.	2.	3.	4.	sum
	s				

average time [ ] s = sum of time measurements / number of measurements

Speed [ ] ft/s = length in feet / average time in seconds

CALCULATE STREAM FLOW

Flow [ ] cfs = **Area** [ ] **X** **Speed** [ ] **X** **Coefficient** [ ]

<u>Flow in cubic feet per second</u>

0.9 coefficient for muddy bottom stream

0.8 coefficient for rocky bottom stream

GEORGIA ADOPT-A-STREAM: Channel Cross-Section: Part 1

(Also fill out the Basic Visual Form when completing this survey)

Measurements are always taken from the left stream bank, looking downstream. Depth measurements are taken every two feet and in sections where there is a notable change. Be sure to note left and right bankfull, water edge, and sand bars.

CROSS-SECTION			
Distance from LEFT Pin		Measurement Depth	Comments
Point	Ft.	Ft.	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

CROSS-SECTION			
Distance from LEFT Pin		Measurement Depth	Comments
Point	Ft.	Ft.	
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			

GEORGIA ADOPT-A-STREAM: Channel Cross-Section: Part 2

(Also fill out the Basic Visual Form when completing this survey)

Graph Paper for Stream Channel Cross-section Measurements

Right

WIDTH

Left (looking downstream)

DEPTH

GEORGIA ADOPT-A-STREAM: Wentworth Pebble Count

(Also fill out the Basic Visual Form when completing this survey)

Count#/Size Class	Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
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32						
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35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						

Count#/Size Class	Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						
67						
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74						
75						
76						
77						
78						
79						
80						
81						
82						
83						
84						
85						
86						
87						
88						
89						
90						
91						
92						
93						
94						
95						
96						
97						
98						
99						
100						
Total in each column (%)						

GEORGIA ADOPT-A-STREAM: Site Sketch

(Also fill out the Basic Visual Form when completing this survey)

GEORGIA ADOPT-A-STREAM: Visual Biological Survey

(Also fill out the Basic Visual Form when completing this survey)

1. Wildlife in or around the stream:

☐ amphibians ☐ waterfowl ☐ reptiles ☐ mammals ☐ mussels/clams/oysters
☐ crustaceans ☐ birds

2. Fish in the stream: *(Check all that apply)*

☐ no	☐ yes, but rare	☐yes abundant
☐ small (1-2")	☐ medium (3-6")	☐ large (7" and above)

Are there barriers to fish movement?

☐ none	☐ beaver dams	☐ waterfalls > 1ft
☐ dams	☐ road barriers	☐ other: _______

3. Aquatic plants in the stream: *(Check all that apply)*

☐ none

☐ attached plants	occasional	plentiful
stream margin/edge	☐	☐
pools	☐	☐
near riffle	☐	☐

☐ free-floating plants	occasional	plentiful
stream margin/edge	☐	☐
pools	☐	☐
near riffle	☐	☐

4. Extent of algae in the stream:

a) Are the submerged stones, twigs, or other material in the stream coated with a layer of algae? *(Check all that apply)*

☐ none

☐ brownish:	occasional	plentiful
light coating	☐	☐
heavy coating	☐	☐

☐ greenish:	occasional	plentiful
light coating	☐	☐
heavy coating	☐	☐

☐ other: ________	occasional	plentiful
light coating	☐	☐
heavy coating	☐	

b) Are there any filamentous (string-like) algae?

	none	occasional	plentiful
brownish	☐	☐	☐
greenish	☐	☐	☐
other: ________	☐	☐	☐

c) Are any detached “clumps” or “mats” of algae floating on the water’s surface?

	none	occasional	plentiful
brownish	☐	☐	☐
greenish	☐	☐	☐
other ________:	☐	☐	☐

5. Presence of naturally occurring organic material in stream: *(Good habitat for aquatic organisms)*

Logs or large woody debris:	☐ none	☐ occasional	☐ plentiful
Leaves, twigs, root mats, etc.:	☐ none	☐ occasional	☐ plentiful

6. Stream shade cover: How well is the water surface shaded by vegetation?

Looking down stream:

Total shading No shading

100% 90% ____
80% 70% 60% 50% 40% 30% 20% 10% 0

Chapter 3

DIRECTIONS FOR COMPLETING FORMS

- General Monitoring Information
- Basic Visual Form
- Photo Points
- Stream Habitat Survey
- Stream Flow
- Channel Cross-Section
- Wentworth Pebble Count
- Sketch of Monitoring Site
- Visual Biological Survey
- Example Forms

General Monitoring Information

This chapter directs the volunteer step by step through the process of completing the Georgia Adopt-A-Stream Visual Stream Survey forms. Before you get started, pull your visual survey forms out and photocopy them, or download them from our website so that you have extra blank forms to work with in the future. Example completed forms are shown at the end of this chapter.

When you complete any of the surveys in this manual, please fill out the Basic Visual Form, the first form in the previous chapter. The following is a description of how to complete all the visual forms and surveys.

Basic Visual Form

SITE INFORMATION

Group Name: Choosing a group name is covered in the Georgia Adopt-A-Stream's introductory manual, Getting to Know Your Watershed, and registration of this group should be completed online in the database. Each of your monitoring sites will be registered to your group name.

Group ID: This is the ID number provided to you by the Georgia Adopt-A-Stream online database after you register your group. It will be in the format AAS-G- ###.

Site ID: When you register each of your monitoring sites, the online database will send you your site number, in the format AAS-S- ####. This site number allows you and the State to identify the exact location of your monitoring site.

Stream Name: List the stream name that you registered with the online database.

Monitors: List all QA/QC volunteers who assisted with monitoring.

Number of Participants: List the number of people who joined you as you monitored (both certified and non-certified volunteers).

Event Date (MMDDYYYY): The time of year you conduct your survey is very important. List the date of your sampling event in the MMDDYYYY format.

Time Sample Collected (HHMM): Document the time of day you began sampling. Try to be consistent and go out at about the same time each time you monitor.

Time Spent Sampling (in minutes): Report the time spent monitoring. Include preparation time for sampling and processing of samples. This is required information. *Example:* 1 individual went sampling from noon-1pm, this would be 60 minutes of sampling time. Or if 4 individuals sampled from noon-1pm, this would still be 60 minutes of sampling time.

Total Time Spent Traveling (in minutes; optional): Report the time spent traveling to/from sampling site. *Example*: 1 individual traveled 10 minutes to and 10 minutes from the site, this would be 20 minutes of travel time reported. Or, if there is more than one individual traveling to and from the site, report the sum of each monitor's to/from travel time. So if Mary traveled 20 minutes, Larry 10 minutes, and Dan 30 minutes, the total time to report would be 60 minutes.

Furthest Distance Traveled (in miles; optional): Your mileage to and from your site. This can be reported a few different ways. *Example*: 1 individual traveled 10 miles to and 10 miles from the site; this would be 20 miles reported. Or, if there is more than one individual traveling to and from the site, report the longest distance traveled. So if Mary traveled 20 miles, Larry 10 miles, and Dan 30 miles, you would report Dan's mileage, since it was the furthest.

WEATHER

Present Conditions: Please select all that apply: Heavy Rain, Steady Rain, Intermittent Rain, Overcast (no blue sky between any of the clouds), Partly Cloudy (clouds present but also some blue sky), or Clear/Sunny (no clouds).

Amount of Rain, if Known: Please check your local weather station or go to wunderground.com to find out the most recent rain levels in the past 24-48 hours in inches. If you have a rain gauge at your site, you may also use this for your measurement.

OBSERVATIONS

Note: You will need a clear cup or bottle and a white background to determine water color, water clarity and water odor. To evaluate these three parameters, take a water sample from your monitoring site.

Flow/Water Level
Even if your waterway is flooded or completely dry, that is valuable information and data. Please still fill out the datasheet as completely as possible (weather, air temperature, flow, comments section) and submit your information to the Adopt-A-Stream database.

Select one of the following:

- **Dry:** The stream or lake is dry with no visible pools.
- **Stagnant/Still (streams only):** This occurs when the water body is not flowing downstream. You should also check this box if there are pools of water in the stream or river bed that are not connected by flowing water (the bed is dry in between pools).
- **Low:** This is when the water level is lower than normal. There are a few indicators that the level is low: some parts of the creek or lake bed are dry between the water surface and the shoreline plants, or aquatic plants/algae are now exposed and lying out of the water.
- **Normal:** Based off of your observations and opinion, this is what your water body's level normally looks like.
- **High:** This is when the water body is higher than normal. Look for partially submerged shoreline vegetation, which is usually out of the water.
- **Flood (over banks):** Please do not sample when it is flooding, but a record of this level is important to note.

***NOTE:** With major changes in weather patterns, our waterways may exhibit periods of time not conducive to base flow water quality testing, including periods of extreme drought or flooding. Georgia Adopt-A-Stream encourages citizens to remember safe monitoring practices when major storms appear and waterways rise to unsafe levels.

Water Clarity
Select one of the following that describes the relative cloudiness of the water:

- **Clear/Transparent:** Water can transmit light rays and one can see through the water.
- **Cloudy/Somewhat Turbid:** Water can transmit some light rays, but one cannot see through the water.
- **Opaque/Turbid:** Neither clear nor cloudy; water cannot allow light to pass through most likely due to stirred up sediment.
- **Other**

Water Color
Select one of the following that describes the relative color of the water:

- **No Color**
- **Brown/Muddy**

- **Green**
- **Milky/White**
- **Tannic**
- **Other**

Water Surface

Select any of the following that describes the appearance of the water surface which can be a physical indicator of water pollution:

- **Clear:** No appearance of anything on the water surface.
- **Oily Sheen:** This is a multicolored reflection that may indicate oil floating in the stream. Some sheens are natural (a byproduct of iron bacteria), and may break into geometric patterns when touched (you can use a stick). Test if the oily sheen breaks when disturbed and select “yes” or “no.”
- **Algae:** Note if any types of algae are present in your stream. Algae are simple plants which do not grow true roots, stems, or leaves and which live mainly in water. They can be brown, green, reddish and can grow on rocks, the streambed or float on the surface.
- **Foam:** The presence of foam can be natural or due to pollution (e.g. detergents or nutrients). Foam that is several inches high and does not brush apart easily is generally due to some sort of pollution.
    - **If Foam is Present:**
      Select if it is more than 3 inches tall and/or if it is pure white in color.
- **Other:** Explain what you see on the water surface.

Water Odor

Select one of the following:

- **Natural/None**
- **Gasoline**
- **Sewage**
- **Rotten Egg**
- **Fishy**
- **Chlorine**
- **Other**

***NOTE:** DO NOT SMELL if there is a strong chemical odor or there is an appearance of chemical spill.

Trash

Trash is a form of pollution and is not only unsightly, but can affect the health of our waterways including aquatic life. Removing trash from streams is a simple way to protect and improve your waterways and can be done individually or with a larger group such as Rivers Alive (RiversAlive.org) and Georgia Adopt-A-Stream. The information you collect will support the efforts of these programs to identify sites across the state needing a cleanup.

Select any of the following:

- **None:** What a luxury, you monitor at a trash free site!
- **Yes, I did a cleanup:** Great, you successfully cleaned your site!
- **This site needs an organized cleanup:** Help! There is more trash present than our group can handle, and a larger effort needs to be conducted.

COMMENTS
This section is open to your personal observations of your site. Please write down information not captured by the datasheets including alterations to your site that are new since you last monitored ("*ATV tracks were seen up and down the stream channel*" or "*site access has changed to the west side of the bank*") or biological observations ("*algal growth was tremendous"* or "*fishes were seen*") as well as any other significant changes.

Photo Points

Photo point monitoring is a standardized method for taking photographs of resources so they can be compared over time. The goal of photo point monitoring is to have images to compare over time at your site. Images of your site can be submitted online.

Streams are dynamic systems that naturally change over time. However, in some cases, these changes can be caused by unnatural influences (i.e. land disturbances, instream dredging). Photo points provide a reference of conditions from the time you start monitoring, into the future. These images are intended to be repeated over time and are both a qualitative and quantitative tool that can assist in detecting natural and unnatural influences on streams. If changes are noticed, corrective actions may be taken before they become severe or irreversible.

You can also take opportunistic images, or images that are not intended on being repeated that support your observations (i.e. color of water is white, ATV tracks in your stream, destabilized stream banks, trash, etc.). These images can be posted on your site page for educational purposes or simply for documentation of observed activities at your site (i.e. erosion activities, foam, surface oil, etc.).

Below you will find the materials and directions on how to go about taking photo points at your site, including how to submit the images to the online database.

<u>Materials</u>

- Basic Visual Data Form
- Camera (try to use the same model of camera each time, at the widest depth of field)
- Tripod (optional)
- Tape measure
- Pencil/pen for taking notes
- GPS unit

- Compass

Procedure
First, we recommend selecting an area of your stream that is representative of your stream reach (12 times the bankfull width of the stream). Plan to take photo points at your site 2-4 times/year.

1. **Determine your permanent photo point location (see figure 3.0)**
   a. Pick Your Reference Point (RP): Your *reference point* is an arbitrary point in the riparian zone that will help you find the *permanent photo point location (PPL)* within the stream channel to which you will return each time for taking images. The *reference point (RP)* is a permanent structure/object located in the riparian zone such as a tree, boulder or metal rod. Make sure the reference point will be an easily located structure/object and is not in an erosion-prone area. We suggest taking a GPS location of this point and recording this in your notes.

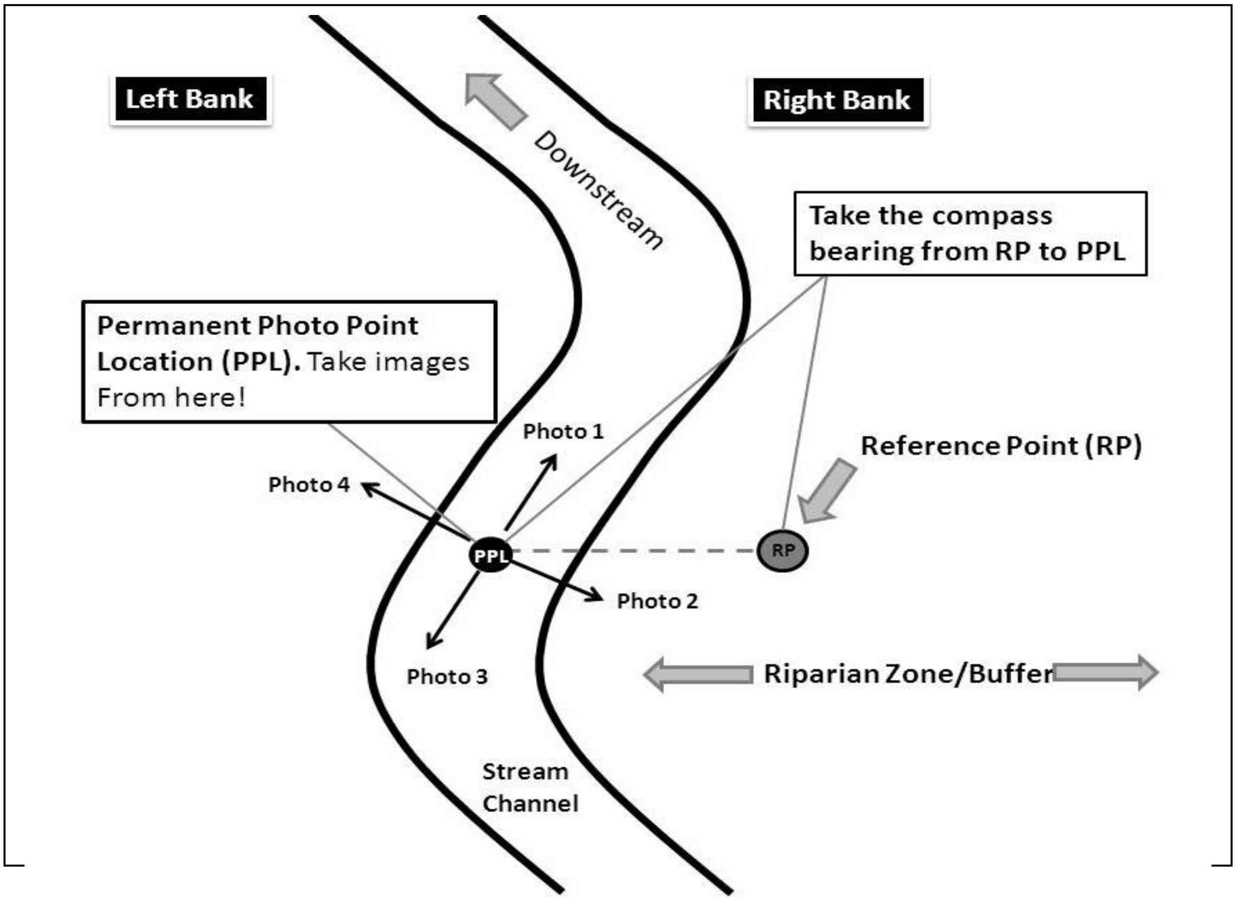
   b. Find the Permanent Photo Point Location (PPL): This is the location to which you will return each time to take your set of photo points. Because it is within the stream channel, you will use the *reference point (RP)* to locate it each time. To do this the first time, get out a tape measure (in feet) and from your *reference point (RP)*, run this out to the center of the stream channel (bankfull to bankfull). The point in the center of your stream channel will be your *permanent photo point location (PPL)*. Record this distance. Note, you will want to have a compass to find your bearing for running the tape measure consistently on your future photo point monitoring visits. See below for instructions on how to take a bearing.
2. **Determining height for taking images:** Using a tripod, set the height to take your images (record this height) or simply make sure you take the images from the same estimated height each time (i.e. same volunteer each time taking from their eye level).
3. **Taking the images:** You will take 4 images as follows, setting your camera for the widest depth of field.
   Photo Point 1: Looking downstream
   Photo Point 2: Will be 90 degrees clockwise and should capture the right bank, looking into the riparian zone
   Photo Point 3: will be 180 degrees clockwise from photo point #1, and should be looking upstream
   Photo Point 4: will be 270 degrees clockwise from photo point #1, and should capture the left bank

   NOTE: It is best to take photos early in the morning, late in the afternoon, or on slightly overcast days when the sun is less intense.
4. **Submit your images!** You can upload these images to the online dataset at: www.GeorgiaAdoptAStream.org

TAKING A BEARING WITH A COMPASS (see figure 3.1)

1. From the Reference Point (RP) in the riparian area, look to your Permanent Photo Point Location (PPL), and face it (see Figure 3.0)

2. Hold your compass at waist level and allow the north needle to position itself (using magnetic north). If you're using a map style compass with a rotating face, turn it so that the north marker lines up with the needle and the direction of travel arrow on the baseplate is pointing toward the PPL.
3. Find the degree marker that lines up with your compass baseplate arrow.
4. The marking that lines up with your landmark is your compass bearing. Record this reading on your basic visual data form.



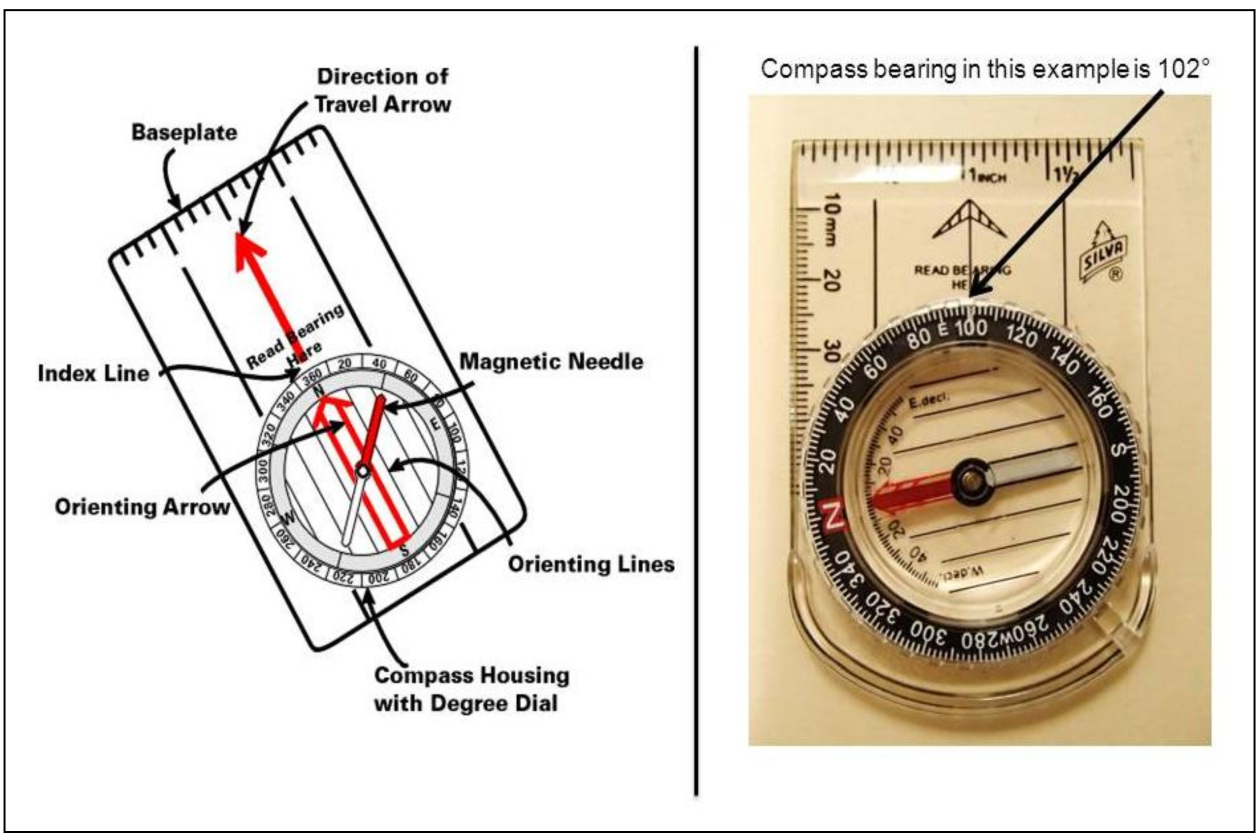


Figure 3.1 How to Take a Compass Bearing

Stream Habitat Survey

INTRODUCTION

Stream habitat includes the physical and chemical conditions of this ecosystem and plays a large role in the aquatic life you will find. By conducting this survey, you will be able to qualitatively document the condition of instream habitat and the riparian zone. By conducting this on a quarterly basis, changes over time and a good snapshot of the stream's health will be achieved. Stream habitats will be evaluated looking upstream and downstream and into the riparian zone on both sides of the channel. The survey rates parameters including channel bottom materials, sinuosity, bank stability, streamside vegetation and many more. It is intended for wadeable streams only, and it is recommended that you read this guide first before completing the survey. Training workshops are also available, and can be found on our website's calendar at www.GeorgiaAdoptAStream.org or call/email us to schedule one in your area.

USING THE SURVEY

Before you begin conducting the survey, there are some important concepts and ideas to keep in mind:

- **Stream Reach:** At your adopted site, determine a section of stream you will walk and survey. The reach is defined as twelve (12) times the average width of the stream. Figure out the most upstream and downstream points, and perhaps place a permanent marker so you remember this area for future surveys. Be sure to walk the entire reach, getting in the stream and riparian zone when completing the survey to achieve a better idea of the overall condition.
- **Reference Stream:** This survey works best if you have identified a local reference stream for comparison. This is a stream that has had minimal disturbance from human interactions, or is as healthy a stream you can find in your area and can serve as a benchmark for the survey and other streams your evaluate.
- **Total Score***:* After you have evaluated and scored each parameter, sum up the total points to determine your final score and rating for your stream.
- **Rocky Bottom vs. Muddy Bottom Streams:** Determine which type of stream you have (one with riffles/rocks vs. one with a more sandy/muddy bottom). Evaluate only those parameters that are appropriate for that type (i.e. #2 refers to only rocky bottom streams, #7 refers to only muddy bottom streams).
- **The assessment should be completed at least four (4) times a year**: Intended as a compliment to the AAS Macroinvertebrate Monitoring Program, this survey will help you better understand and interpret the water quality index score. Both should be completed four times a year or seasonally.
- **Photo Points:** Take four (4) images of your site, 1 upstream, 1 downstream, 1 looking at the left bank/riparian zone, and 1 looking at the right bank/riparian zone. Take a set of these each time you conduct the habitat survey. To setup your photo points, see the Photo Points section in this document.

SCORING THE PARAMETERS

Each habitat parameter is rated with a value of 0 to 10, and in some cases (Numbers 8, 9 and 10) you will be asked to evaluate each bank separately, scoring each from 0 to 5. Using the Adopt-A-Stream Stream Habitat Survey data form, record the score that best fits the observations you have made based on the narratives, drawing, images and description provided in the following page of this guide. See the example form at the end of this document to assist you in completing the survey.

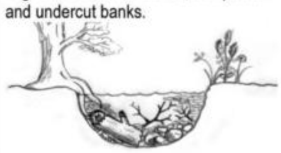
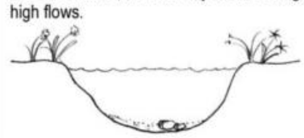
HOW DO I INTERPRET MY TOTAL SCORE?

Based on your total score, your stream will range from 'poor' to 'excellent' condition. This can change through the seasons and in varying weather and climatic patterns. It is good to have baseline data through the seasons and over time compare the total. It is also good to look at each parameter individually over time and perhaps see if there are any 'weak' parameters that may warrant further investigation or intervention such as restoration initiatives. Additionally, if the survey is completed in conjunction with the macroinvertebrate survey, this should give insight into the results of the water quality index score in regards to overall habitat condition and availability at your site.

STREAM HABITAT SURVEY GUIDE

In the following pages you will find a more in-depth guide to scoring each parameter, including what to look for, why is it important, how to score the parameter and a definition of terms.

#1 EPIFAUNAL SUBSTRATE: What types of submerged materials are on the channel bottom?

Habitat Parameter	Excellent --- -Poor			
1. Epifaunal Substrate **What types of submerged materials are on the channel bottom?**	**Abundant stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Adequate stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Little or no stable** habitat cover available for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks; habitat may move during high flows. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	Score

What to Look for: This parameter looks at the amount of habitat or cover available for critters such as macroinvertebrates and fish living in the water. It looks at the quantity and variety of natural materials in the channel including submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks.

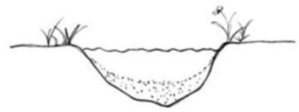
Why is it Important? These types of available cover provide refuges as well as breeding and feeding grounds for aquatic life. An abundance and variety of habitat can support a diversity of organisms and also provide for more stability following a disturbance such as flooding.

How to Score this Parameter: Rated on a scale from 0-10, choose a value that reflects the variety and abundance of habitat materials present ranging from 'little to abundant' such as submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks.

Definition of Terms

- *EPIFAUNAL SUBSTRATE*: The organic and inorganic material that is available within the stream for organisms to live in or on. Otherwise known as 'available cover.'

#2 EMBEDDEDNESS: Are fine sediments being deposited in the riffle/run area? (Score for ROCKY BOTTOM streams only)

Habitat Parameter	Excellent -Poor			
2. Embeddedness * For ROCKY BOTTOM streams only **Are fine sediments being deposited in riffle/run area?**	Gravel and cobble are **slightly** embedded in riffle area. 	Gravel and cobble are **partially** embedded in riffle area. 	Gravel and cobble are **completely** embedded in riffle area. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score**

What to Look for: This is a measure of how much the bottom substrate materials (cobbles, boulders and other rock) are surrounded and covered by fine sediment (silt and sand). The more the bottom is covered in silt and sand, the more embedded it is. This parameter is only to be scored if evaluating rocky bottom streams and in an area where riffles are a natural feature.

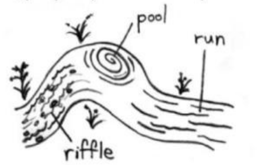
Why is it Important? Embeddedness tells us if there is enough suitable habitat available for aquatic life including macroinverterbates, fish and amphibians. Generally, as cobbles and gravel become embedded, the surface area available to these critters for shelter, spawning and egg incubation decreases.

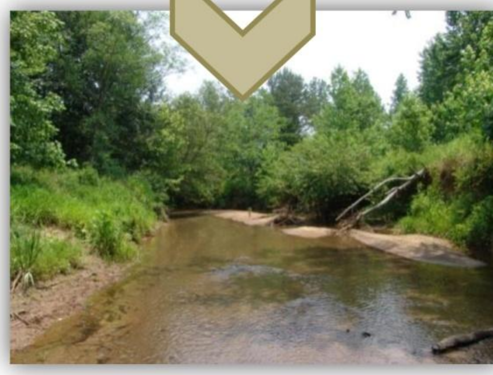
How to Score this Parameter: Rated on a scale from 0-10, choose a value that reflects the degree to which cobble and gravel are embedded ranging from 'slightly to completely.' Evaluate this parameter by picking up gravel or cobble out of the streambed with your fingertips, and estimating what percentage of the particle was buried. Observations should be taken in the upstream and central portions of riffles.

Definition of Terms

- *EMBEDDEDNESS*: The amount of silt and sand that surrounds and covers the gravel and cobbles found in a stream.
- *RIFFLE:* A shallow section in a stream where water is breaking over rocks, cobble, wood or other substrate in the streambed causing surface agitation.

#3 RIFFLE/RUN/POOL: Is a diversity of instream habitats available: riffle, runs and pools?

Habitat Parameter	Excellent -Poor			
3. Riffle/Run/Pool Is a diversity of instream habitats available: riffle, runs and pools?	Yes, all **three (3)** habitat types (riffle, run, pool) are present and frequent. 	**Two (2)** habitat types are present. 	Only **one (1)** habitat type present and dominant. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	Score



What to Look for: In this parameter we are looking at the diversity and frequency of different instream habitat types including riffles, runs and pools.

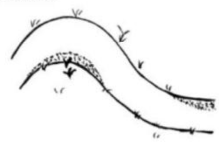
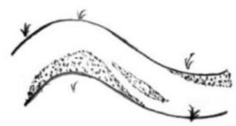
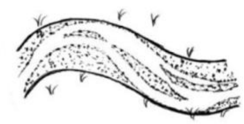
Why is it Important? The presence of these different flow regimes and habitat types relates to a stream's ability to provide and maintain a stable aquatic environment through the distribution of nutrients and oxygen, movement of materials and dispersion of energy.

How to Score this Parameter: Rated on a scale from 0-10, choose a value that reflects the amount of habitat types available ranging from one type as dominant, to all three types present and frequent.

Definition of Terms

- *RIFFLE:* Shallow areas of a stream or river with a fast-moving current bubbling over rocks.
- *RUN:* These areas differ from riffles in that depth of flow is typically greater and slope of the bed is less than that of riffles. Runs will often have a well defined thalweg.
- *POOL*: A deeper area of a stream with slow moving water.
- *Thalweg:* The line defining the lowest points along the length of a river bed or valley; the deepest part of the channel.

#4 SEDIMENT DEPOSITION: Are point bars and islands present?

Habitat Parameter	Excellent -- Poor			
4. Sediment Deposition **Are point bars and islands present?**	**Point bars and islands stable** and of small size and frequency with some vegetation. Composed mostly of gravel and cobble. 	**Point bars and islands less stable** and of moderate size and frequency with some sparse vegetation. Composed mostly of some gravel ad finer sediment. 	**Point bars and islands unstable** and of a large size with little or no vegetation. Composed almost entirely of fine sediment. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score**

What to Look for: This parameter relates to the amount of sediment that has gathered in the channel and the changes that have occurred because of sediment deposits. Deposition can cause the formation of islands, point bars, shoals or result in the filling of pools. Sediment typically comes from bank erosion within the stream and watershed as a result of land disturbance.

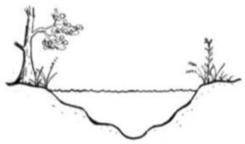
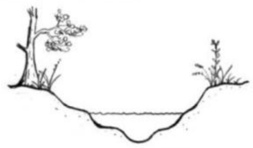
Why is it Important? Deposition of sediments naturally occurs in slow-low flow sections. High levels of sediment deposition create a dynamic and unstable system, making habitat unsuitable for aquatic life by smothering available cover and lowering oxygen levels. This parameter is a reflection of the stability of the point bars and islands.

How to Score this Parameter: Rated on a scale from 0-10, choose a value that reflects the size and composition, as well as frequency of vegetated islands and point bars in the channel.

Definition of Terms

- *POINT BARS:* Deposits of sediment on the inside of a meander or bend of stream.
- *VEGETATED ISLANDS:* A small islet or sandbar within a river having a grouping or thicket of trees.

#5 CHANNEL FLOW STATUS: How much water is in the stream channel?

Habitat Parameter	Excellent -Poor			
5. Channel Flow Status **How much water is in the stream channel?**	Water reaches base **of both** lower banks; little substrate exposed. 	**Some substrate is exposed** and water partially fills channel. 	**Most substrate is exposed** and very little water in channel. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	Score

What to Look for: This is the degree to which the channel is filled with water during base or average annual flow, and how much, if any, of the stream substrate is exposed.

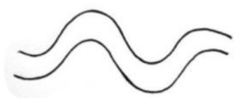
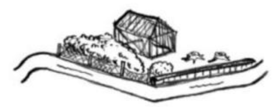
Why is it Important? The more water covering available habitat within the substrate, the better for aquatic organisms.

How to Score this Parameter: Use the vegetation line on the lower bank as your reference point to estimate channel flow status. Rated on a scale from 0-10, choose a value that reflects the amount of water reaching the base of both banks from 'very little water' to 'reaches both banks,' and look at how much the stream substrate is exposed from 'most to little.'

Definition of Terms

- *SUBSTRATE:* The mineral or organic material that forms the bed (bottom) of a stream.

#6 CHANNEL ALTERATION: Is the stream channel altered by humans?

Habitat Parameter	Excellent -Poor			
6. Channel Alteration **Is the stream channel altered by humans?**	**No evidence** of channelization (straightening) or alterations such as dredging, agriculture, concrete banks or construction activities. 	**Some evidence** of channelization (straightening) and/or alterations such as dredging, agriculture, concrete banks or construction activities. 	**Most of stream reach** channelized and/or many alterations present such as dredging, agriculture, concrete banks or construction activities. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	Score

What to Look for: This parameter examines changes in sinuosity and if the shape of the channel and/or the instream habitat have been impacted by alterations. Examples of alterations include: riprap, artificial embankments or stabilization structures, impoundments, diversions, straightening or the presence of dams and bridges.

Why is it Important? Streams tend to follow a normal and natural meandering pattern. Streams that have been altered typically have fewer natural habitats for aquatic organisms and have an unnatural shape that leads to major differences in energy distribution, structures, and flow regimes.

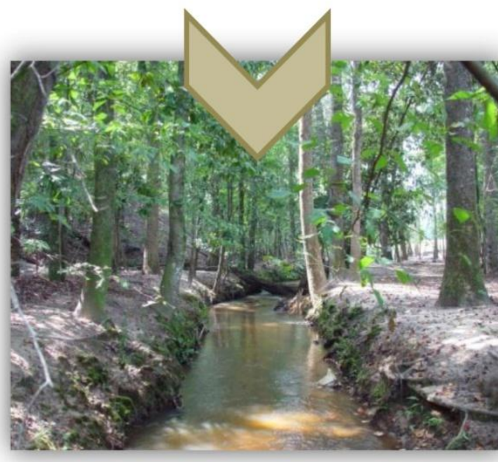
How to Score this Parameter: Rated on a scale from 0-10, choose a value that reflects the occurrence of bends (sinuosity) in the channel ranging from 'most of the stream reach is channelized to no evidence of channelization.' Look for evidence of alterations to score this parameter including: dredging, agriculture, concrete banks or construction activities.

Definition of Terms

- *CHANNELIZATION:* Straightening of a stream channel.

#7 CHANNEL SINUOSITY: Does the channel have lots of curves and bends? (Score for MUDDY BOTTOM streams only)

Habitat Parameter	Excellent -Poor			
7. Channel Sinuosity * For MUDDY BOTTOM streams only **Does the channel have lots of curves and bends?**	Yes, bends in the channel are **frequent.** 	There are **more bends than straight** sections. 	There are **more straight sections** than sections with bends or channel is entirely straight. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	Score



What to Look for: This parameter is a measure of how much the stream meanders, or its sinuosity. These meanders or bends can be measured using aerial views and maps of the stream channel. This parameter is only to be scored if evaluating muddy bottom streams.

Why is it Important? More meanders in a stream provide for a higher diversity of habitat and aquatic critters. The bends absorb energy from higher and faster flows, protecting the stream from excessive flooding and erosion.

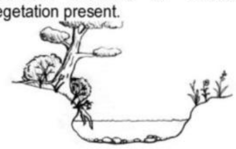
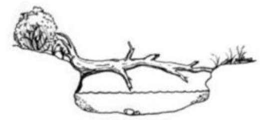
How to Score this Parameter: Rated on a scale from 0-10, choose a value that reflects the occurrence of bends in the channel ranging from 'straight sections to frequent bends.'

Definition of Terms

- *CHANNEL SINUOSITY:* The frequency of bends that occur in a stream.

#8 BANK STABILITY: How stable are the streambanks?

(Look at both left and right banks)

Habitat Parameter	Excellent -Poor			
8. Bank Stability **How stable are the streambanks?** Determine right/left bank by facing downstream	**Bank stable**; erosion, scouring, undercutting or bank failure absent or minimal. Vegetation overhanging the stream is abundant. 	**Bank moderately stable**; evidence of small areas of erosion, undercutting and scouring, or bank failure present. Moderate amounts of overhanging vegetation present. 	**Bank unstable**; many eroded and scoured areas with undercutting; bank failure present; steep banks. Little over hanging vegetation present. 	What did you see?
Left bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	**Score** (Add both banks)
Right bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	

What to Look for: This parameter is a measure of the potential for soil to detach from the upper and lower streambanks and move into the stream.

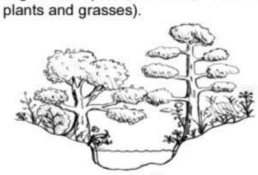
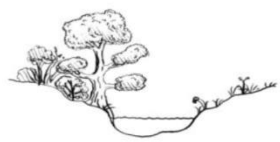
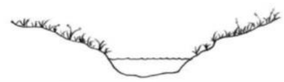
Why is it Important? Steep banks, considered more unstable, are more likely to collapse from erosion and cause channel widening than gently sloping banks. Eroded banks indicate scarcity of cover and organic inputs to the stream as well as problems with sediment movement and deposition.

How to Score this Parameter (score each bank separately): Rate both the left and right banks separately (facing downstream). Rated on a scale from 0-5, choose a value that reflects the stability of each bank from ‘unstable to stable.’ Are there any of the following signs of erosion: bare exposed soil, crumbling banks, exposed tree roots and undercutting? Combine these scores when finished for a cumulative score ranging from 0-10.

Definition of Terms

- *UNDERCUTTING:* A type of erosion which occurs when soils are swept away by the action of the stream, especially on the outer banks of curves. The result is an unstable, overhanging bank.

#9 VEGETATIVE PROTECTION: Are streambanks covered & shaded by a variety of vegetation? (Look at both left and right banks)

Habitat Parameter	Excellent -Poor			
9. Vegetative Protection **Are streambanks covered & shaded by a variety of vegetation?** Determine right/left bank by facing downstream	Most streambank surfaces covered and shaded by a **large variety** of vegetation (trees, shrubs, flowering plants and grasses). 	Some streambank surfaces covered and shaded by **some variety** of vegetation (trees, shrubs, flowering plants and grasses). 	Few streambank surfaces covered and shaded by vegetation. **Little variety** of vegetation. Streambank dominated by one type of vegetation (trees, shrubs, flowering plants and grasses). 	What did you see? Did you see any nonnative vegetation? Check here if YES ☐
Left bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	**Score** (Add both banks)
Right bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	

What to Look for: This is a measure of the amount of vegetation covering the streambanks and the near-stream portion of the riparian zone. It provides information on the ability of the banks to resist erosion.

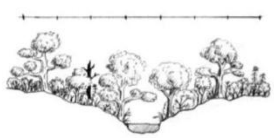
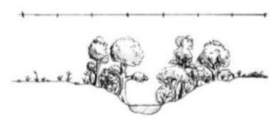
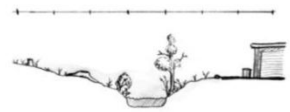
Why is it Important? Banks with full plant growth are more beneficial for aquatic life, as the root systems of plants growing in the streambanks help hold soil in place, control erosion/undercutting, provide shade and habitat, and lessen the amount of runoff coming into the waterway.

How to Score this Parameter (score each bank separately): Rate both the left and right banks separately (facing downstream). Rated on a scale from 0-5, choose a value that reflects the **amount** of streambank surfaces covered by a **variety** of healthy, living vegetation (i.e. trees, shrubs, flowering plants and grasses) from 'few to most' surfaces. Factors to consider when scoring this parameter include the balance of upper/under/lower story cover presence and during which season the assessment is being conducted. Also, please note if any nonnative vegetation is present, if known. You will combine these scores when finished for a cumulative score ranging from 0-10. To learn about nonnative species in the Southeast visit http://www.invasive.org/eastern/srs

Definition of Terms

- *NONNATIVE:* A species living outside its native distributional range, which has arrived there by human activity.
- *UNDERCUTTING:* A type of erosion which occurs when fine sediment are swept away by the action of the stream, especially around curves. The result is an unstable overhanging bank.
- *RIPARIAN VEGETATIVE ZONE:* The vegetated area along the stream channel.

#10 RIPARIAN VEGETATIVE ZONE WIDTH: What is the amount of buffer available? (Look at both left and right banks)

Habitat Parameter	Excellent - - - - - - - -	- - - - - - - - - - - - - - - -	- - - - - - - - -Poor	
10. Riparian Vegetative Zone Width **What is the amount of buffer available?** Determine right/left bank by facing downstream	Buffer present; a large variety of vegetation extends at least **three channel widths** on each side. 	Some buffer present; some variety of vegetation extends **two to one channel width** on each side. Human activities have impacted buffer zone. 	Little or no buffer present; vegetation extends **less than one channel width** on each side. Human activities substantially impact buffer zone. 	What did you see? Did you see any nonnative vegetation? Check here if YES ☐
Left bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	**Score** (Add both banks)
Right bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	

What to Look for: This parameter is a measure of the amount of the vegetation from the edge of the streambank into the riparian zone (buffer).

Why is it Important? The riparian zone performs many important functions such as removing pollutants from runoff, providing shade to cool the water, controlling erosion by reducing the velocity and volume of runoff and by providing habitat for aquatic life (i.e. organic matter inputs). Depending on the stream size and order, the width of the riparian zone may vary.

How to Score this Parameter (score each bank separately): Rate both the left and right banks separately (facing downstream). Rated on a scale from 0-5, choose a value that reflects the width of the riparian zone from 'less than one channel width to at least three channel widths.' Also, please note if any nonnative vegetation is present, if known. You will combine these scores when finished for a cumulative score ranging from 0-10. To learn about nonnative species in the Southeast visit http://www.invasive.org/eastern/srs

Definition of Terms

- *RIPARIAN VEGETATIVE ZONE:* The vegetated area along the stream channel.
- *BUFFER:* A vegetated area near a stream, usually forested, which helps shade and partially protect a stream from the impact of adjacent land uses.
- *NONNATIVE:* A species living outside its native distributional range, which has arrived there by human activity.

Stream Flow

Stream flow, or discharge, is the volume of water that moves over a designated point in a fixed period of time. It is often expressed as cubic feet per second (cfs). To determine your stream flow rate, follow the directions below. These measurements can also be taken when doing your channel cross-section survey.

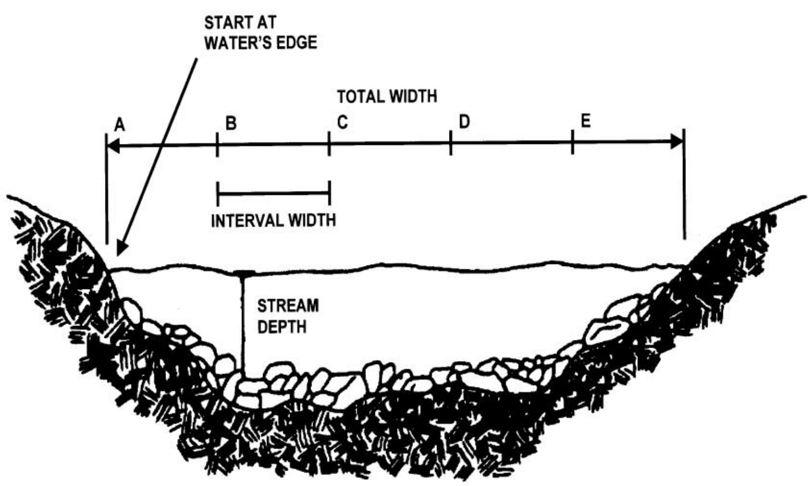
<u>Materials</u>

- Tape measure (in feet and tenths of feet)
- Waterproof yardstick or other implement to measure water depth (in feet and tenths of feet)
- An orange or other flotation device, and a fishing net to scoop the float out of the stream
- Stopwatch (or watch with a second hand)
- Calculator
- Stream Flow data form

<u>Procedure</u>

All data should be recorded in feet and tenths of feet.

1. AREA – Calculate the area of a cross section of your stream in square feet. Area = depth x width. To do this, determine the average depth of your stream (Figure 3.1). Multiple depth measurements should be taken, starting at the water's edge and in the stream substrate. Take the average of all the depth measurements. Now run the tape measure across your stream (from water's edge to water's edge). Measure the width of the flowing stream at two locations. Multiply the average width and average depth of your stream to get area in square feet.



AREA = Depth x Width

Figure 3.1 Calculating stream area

2. SPEED – Calculate the speed at which your stream is flowing in feet per second (ft/sec). Starting from the point where the stream area measurements were taken, mark off a 20-foot section downstream (Figure 3.2). Use a stopwatch to time how many seconds it takes for a flotation object, such as an orange, to float the 20-foot distance.

The volunteer who lets the flotation object go at the upstream transect should position it so that it starts a little upstream of starting point and then flows into the fastest current. This "time of travel" measurement should be conducted at least three times and the results averaged – the more trials you do, the more accurate your results will be. Discard any float trials in which the object gets hung up in the stream (by cobbles, roots, debris, etc.). After obtaining the average time, divide the distance in feet by the number of seconds it took the object to travel that distance. This is the speed in feet per second.

SPEED = 20 ft / # seconds

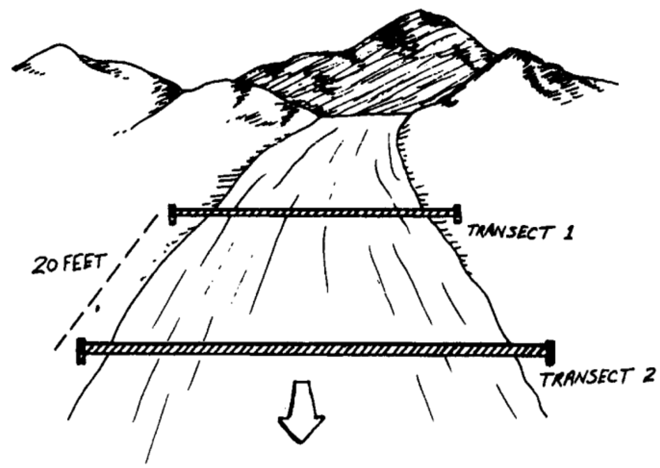


Figure 3.2 Calculating time between transects

3. COEFFICIENT – Scientists have determined a coefficient or correction factor for muddy bottom and rocky bottom streams. This allows you to correct for the fact that water at the surface travels faster than near the stream bottom due to resistance from gravel, cobble, etc. Multiplying the surface velocity by a correction coefficient decreases the value and gives a better measure of the stream's overall velocity. The coefficient or correction factor is 0.8 for rocky-bottom streams or 0.9 for muddy-bottom streams.

COEFFICIENT = 0.8 for rocky-bottom streams

COEFFICIENT = 0.9 for muddy-bottom streams

4. FLOW – To determine flow rate, multiply your stream area and your stream speed. Then multiply that answer by 0.8 or 0.9, depending on whether you have a rocky or muddy bottom stream.

FLOW = AREA X SPEED X COEFFICIENT

For those who are interested, the flow equation is:

$$FLOW = ALC / T$$

Where:
A = Average cross-sectional area of the stream in feet (average stream width multiplied by average water depth).
L = Length of the stream reach measured (usually 20 ft.)
C = A coefficient or correction factor (0.8 for rocky-bottom streams or 0.9 for muddy-bottom streams).
T = Time, in seconds, for the float to travel the length of L

Channel Cross-Section

Drawing a channel cross-section allows you to observe and track changes in your stream channel shape. Forms are found in the previous chapter. Measuring your stream channel cross-section is a simple and easy method of documenting changes in your stream channel shape, or stream profile.

This involves stretching a tape across the stream and taking measurements of the stream channel and banks. Twenty to thirty depth measurements are recommended to accurately portray most streams, with more measurements needed for broad or structurally complex sites (such as stream channels with islands in the middle). Measure all significant changes that occur across the channel, with an emphasis on elevation and structural changes.

All measurements are taken from the left bank, when facing downstream. All data should be recorded in feet and tenths of feet.

Materials

- 100-foot measuring tape (or longer, depending on your stream)
- 8- to 10-foot measuring stick in increments of feet and tenths (you can construct one from materials available at the hardware store)
- Thick twine (preferably non-stretch builders' quality)
- Line level
- 2- to 3-foot lengths of rebar, nails, and hammer (for first measurement)
- Clips or vise grips to fix tape to rebar or nails.
- Channel Cross-section: Part 1 data form
- Channel Cross-section: Part 2 graph paper
- Pencil

Procedure

A. Locate a representative section of your stream. Make sure there are no stream hazards—think safety first. Ideally, your site will have some

Figure 3.3. Preparing to measure channel cross section

permanent marker that will help you identify it in the future, e.g. a large tree, concrete structure, etc. If a permanent marker is not available, use rebar to mark the endpoints on each bank or hammer a nail in a large tree. The end points should be set back from your stream, behind the bankfull stage on either side (Figure 3.4).

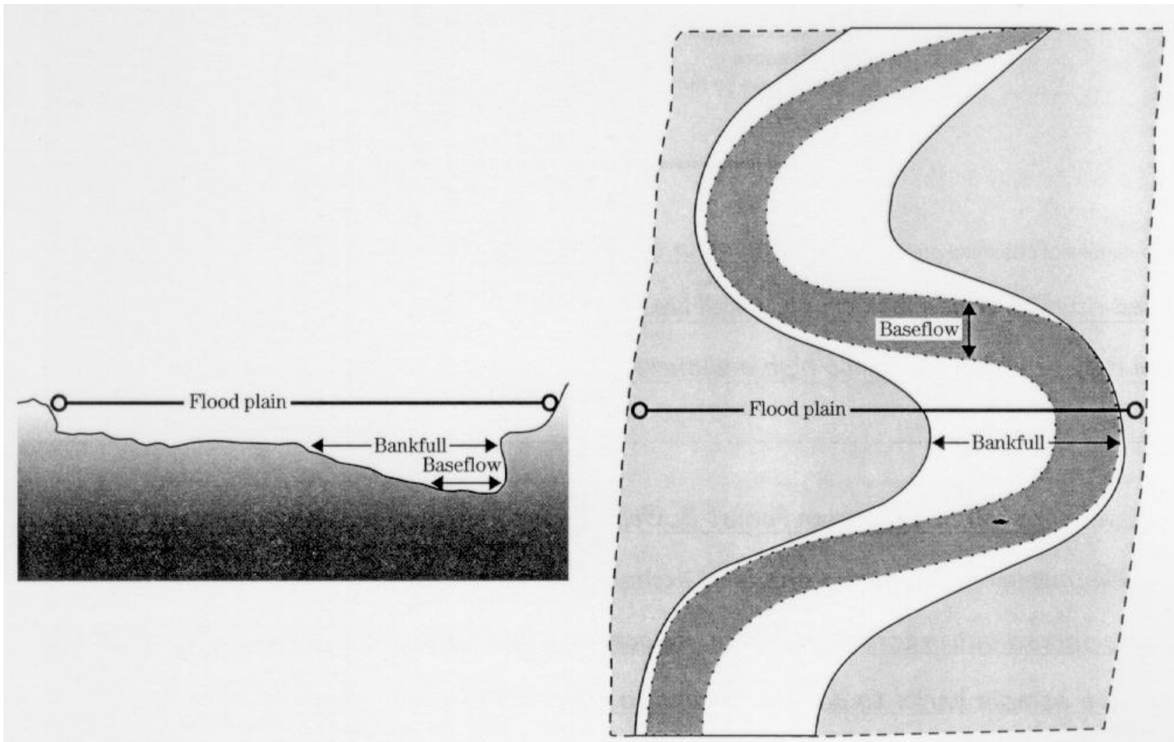


Figure 3.4 Cross-section measurements should begin in the flood plain.

B. Stretch your twine between your permanent markers. Using the line level, make sure the twine is perfectly level. If the twine is not level, your vertical measurements (elevation) will not be accurate. Stretch the measuring tape between both endpoints directly beside your twine. Attach the zero end of the tape to the left permanent marker (when looking downstream). Stretch the tape tight and level above the water. You will be taking vertical measurements from the stream substrate to the twine and horizontal measurements along the measuring tape.

Figure 3.5 Eying line level to ensure accurate measurements

C. Starting with the left endpoint at zero, measure horizontal distance along the measuring tape every 1 or 2 feet and at each change in each important feature (Figure 3.6). Always measure the bankfull stage (see Appendix A), edge of water, deepest point, sandbars, etc. At those horizontal distances, measure the vertical distance (or elevation) from bank or stream bottom to twine. Continue across the channel to the right endpoint. Under **Comments**, note when you are at the bankfull stage, edge of water, and other significant features.

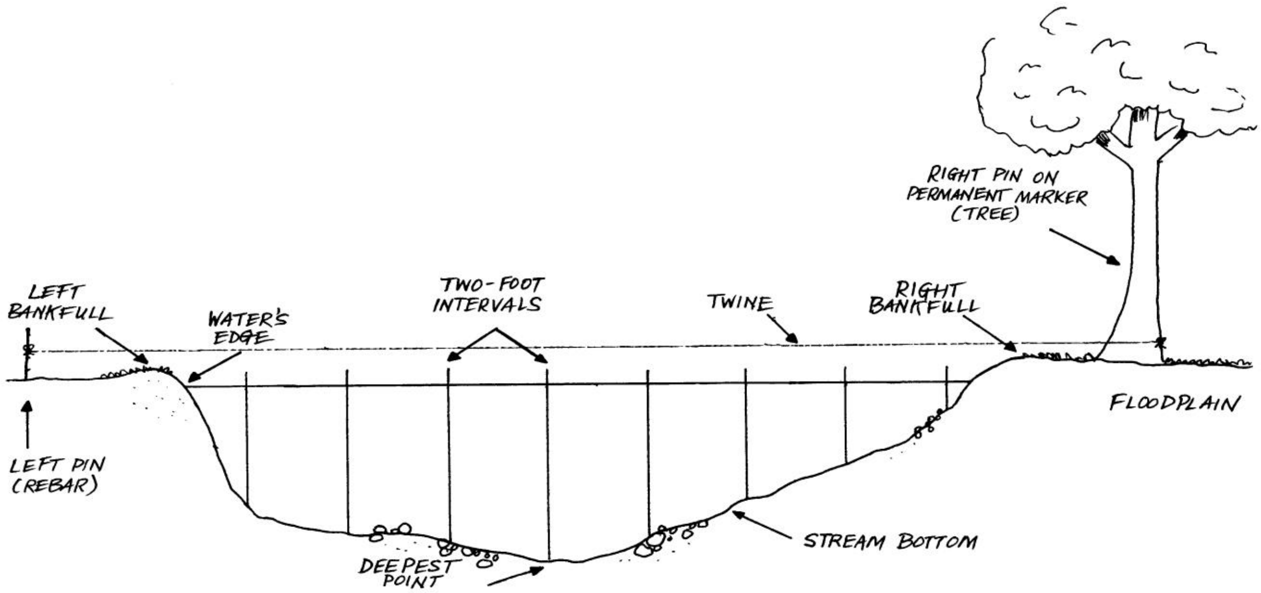


Figure 3.6 Stream profile depth measurements every 1 to 2 feet and at each important stream feature

D. Record the distance and elevation measurements to 0.1 feet (e.g. 3.7 ft.) on the Channel Cross-section: Part 1 data form found in the previous chapter.

E. On the Channel Cross-Section: Part 2 graph paper provided with your Visual Stream Survey forms, graph your stream profile to compare with future and past measurements.

Wentworth Pebble Count

The Wentworth pebble count provides a method for quantitatively characterizing the substrate particles in your streambed by determining the percentage of silt, sand, gravel, cobbles and boulders. The results can be used to evaluate the amount of sediment entering your stream. The method requires a minimum of two people, but can also be done in larger groups.

Materials

- Metric Ruler with a 2mm mark
- Size Chart (provided)
- Wentworth Pebble Count data form
- Pencil

Procedure

1. Select a member of your group to record the results on the data form. The remaining members of your group will be counters. You may wish to rotate these positions periodically throughout the pebble count. You may also wish to work in pairs of a counter and a note-taker.
2. Select a cross-section of your stream to sample. Look for an area of the stream with a representative number of pools, riffles, and/or runs. Make sure the area you choose is safe and wadeable.
3. Begin by wading through the stream. Make sure to cover all areas of the stream cross-section up to the bankfull mark, the highest point water reaches on the banks before it spills into the floodplain. If only one person is counting, walk upstream in a zigzag from bankfull to bankfull. If a whole group is counting, walk upstream in a line formed from bankfull to bankfull.
4. When the recorder says “stop,” each counter picks up the pebble closest to his/her right big toe. To avoid the natural tendency to pick up larger pebbles, you should pick a point on your toe or boot to use as a reference point. You should also use a reference point on the finger that descends into the water. The first particle touched by this point should be measured.
5. Using a ruler and the Size Chart, each counter determines if s/he has silt/clay, sand, gravel, cobble, boulder or bedrock. The pebble is measured at its middle length. This is not the longest or the shortest cross-section of the pebble, but in between.
6. Call the size out to be recorded on the data sheet.
7. Repeat the process until you have counted approximately 100 times.
8. Calculate the percentage that are silt/clay, sand, gravel, cobble, boulder or bedrock (See example).
9. Graph the number of pebbles versus pebble size.

The following table contains particle size classes. Use the descriptions if you are making visual estimation. If more accurate measurements are taken, it is possible to obtain a clearer picture of changes in substrate composition over time.

Wentworth Pebble Count Size Chart

Size Class	**Size Range (mm)**	**Description**
Silt/Clay	< 0.062	Smooth when rubbed between fingers
Sand	0.062 – 2.0	May have some clay in it but you will feel the gritty texture.
Gravel	2.0 – 64.0	This line is just over 2 mm
Cobble	64.0 – 256.0	This line is about 64 mm. This page is just over 256 mm tall.
Boulder	256.0 – 4096.0	These are big.
Bedrock		Bare/exposed rock.

Sketch of Monitoring Site

On the Site Sketch form, or on a separate page, note the physical features of the stream reach, such as: riffles, pools, runs, streambanks (bare or eroded), changes to stream shape (rip-rap, gabions, cemented banks), vegetation, stream flow obstructions (dams, pipes, culverts), outfalls, tributaries, landscape features, paths, bridges and roads.

As accurately as possible, identify the location of **channel cross-section** measurements and provide information on the **location of stream reach** (e.g. 034.6772 N, 083.6823 W, or Cricket Creek stream reach begins 57 feet north of Cormorant Bridge.)

Include comments such as observed stream physical characteristic changes or potential problems, e.g. spills, new construction, type of discharging pipes, etc.

Visual Biological Survey

1. Wildlife in or around the stream: Make note of the wildlife you see or hear.
2. Fish in the stream: Check all that apply. Note any barriers that may keep fish from moving up or downstream.
3. Aquatic plants in the stream: Attached plants are those that are rooted in the streambed.
4. Extent of algae in the stream: Note the color of algae, the thickness of the coating and the distribution of algae covering on submerged material. A stream should have a light coating of algae on the rocks and other submerged material, visible only when standing within a few feet of the rock.

5. Presence of naturally occurring organic material in stream: This assessment measures availability of physical habitat for aquatic organisms, including fish and macroinvertebrates. The potential for the maintenance of a healthy fish community and its ability to recover from disturbance is dependent on the variety and abundance of suitable habitat and cover available.

Look for logs, fallen trees, or parts of trees that provide structure and attachment for aquatic macroinvertebrates and hiding places for fish. Thick root mats from trees and shrubs at or beneath the water surface also provides ideal habitat for aquatic animals.

6. Stream shade cover: Vegetative cover of the water's surface (i.e. trees and shrubs overhanging the stream, not algae covering the surface of it) reduces the amount of direct sunlight and also provides organic matter for the stream's food chain. Review the information on the River Continuum Concept (pages 16 and 17) to learn more.

Note the occurrence of string-like algae. If it is present in your stream, you will notice it easily. Also note if there are clumps of algae floating on the water's surface. The presence of these types of algae is not typical in a healthy stream.

EXAMPLE FORM

GEORGIA ADOPT-A-STREAM: Basic Visual Form

To be used with: Photo Points, Wentworth Pebble Count, Cross Section, Bio Survey, Stream Habitat Survey, Stream Flow and Site Sketch

SITE INFORMATION

Group Name: Chattahoochee Hills Creek Keepers

Group ID: G- 1214 Site ID: S- 1507

Stream Name: Little Bear Creek

Monitor(s): Mary and Matt Mayfly

Number of Participants: 2

Event Date: 05232013 (MMDDYYYY)

Time Sample Collected: 0900 (HHMM am/pm)

Time Spent Sampling: 30 (Min)

Total Time Spent Traveling *(optional)*: 25 (Min)

Furthest Distance Traveled *(optional)*: 75 (Miles)

WEATHER

Present conditions (check all that apply)

- [ ] Heavy Rain
- [ ] Steady Rain
- [ ] Intermittent Rain
- [ ] Overcast
- [ ] Partly Cloudy
- [x] Clear/Sunny

Amount of rain, if known?

Amount in Inches: 0.5

In Last Hours/Days: 3 days

*Refer to *wunderground.com* for rainfall data

OBSERVATIONS

Flow/Water Level: *(check all that apply)* ☐ Dry ☐ Stagnant/Still ☐ Low ☑ Normal ☐ High ☐ Flood (over banks)

Water Clarity: ☐ Clear/Transparent ☑ Cloudy/Somewhat Turbid ☐ Opaque/Turbid ☐ Other:________

Water Color: ☐ No Color ☑ Brown/Muddy ☐ Green ☐ Milky/White ☐ Tannic ☐ Other:________

Water Surface: ☐ Clear ☑ Oily sheen: Does it break when disturbed? Yes/No (circle one) ☑ Algae
☐ Foam ◯ Greater than 3" high ◯ It is pure white ☐ Other:________

Water Odor: ☑ Natural/None ☐ Gasoline ☐ Sewage ☐ Rotten Egg ☐ Fishy ☐ Chlorine ☐ Other:________

Trash: ☐ None ☑ Yes, I did a cleanup ☑ This site needs an organized cleanup

PHOTO POINTS

Photos: Please take images to document your observations and changes in water quality conditions.
Photo point directions can be found in the manuals. Images can be submitted online with your other data.

Reference Location (RL): Latitude (+) 33.5590 (DD.DDDD°) Longitude (-) 84.7002 (DD.DDDD°)

Compass bearing to permanent Photo Point Location (PPL): Degrees (°) 40°E

Distance to permanent Photo Point Location (PPL) from Reference Location (RL): Distance 24 ft 5 in (ft/in)

Camera height at permanent Photo Point location (PPL): Height 5 ft 3in (ft/in)

COMMENTS

Any changes since you last sampled at this site? If yes, please describe.

Yes. Noticed that a large area of the east bank has collapsed since my last monitoring visit.
Also, there is now a beaver dam of just upstream of where we sample.

Please submit data to our online database at www.GeorgiaAdoptAStream.org

EXAMPLE FORM

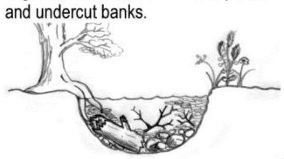
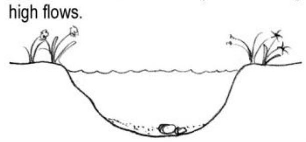
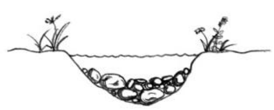
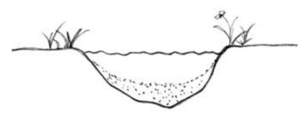
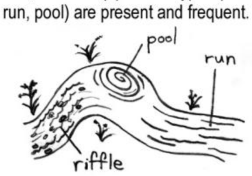
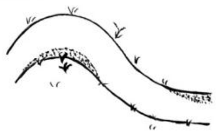
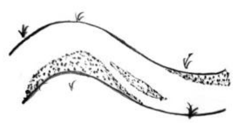
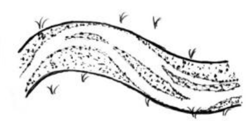
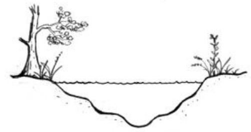
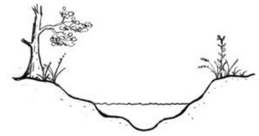
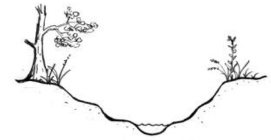
GEORGIA ADOPT-A-STREAM: Stream Habitat Survey

(Also fill out the Basic Visual Form when completing this survey)

Type of Stream:
☐ Rocky bottom
X Muddy bottom

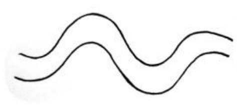
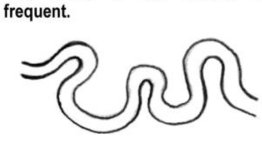
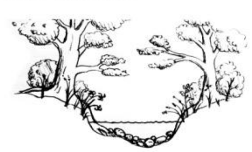
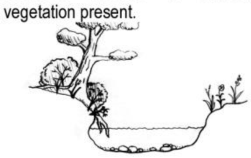
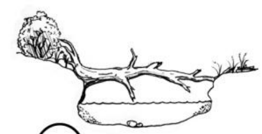
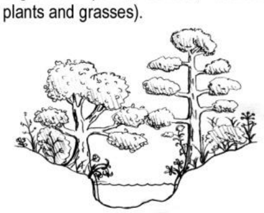
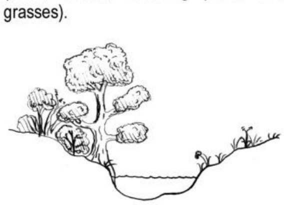
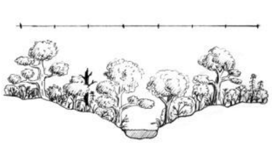
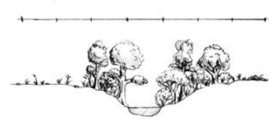
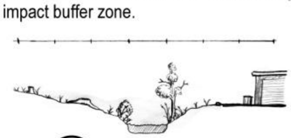
Stream habitat will be evaluated looking both upstream and downstream, and includes: channel bottom materials, streamside vegetation, slope, and other channel characteristics. You may choose a value between 0-10 for each parameter. Note #s 8-10 ask you to evaluate each bank separately.

All measurements should be taken during baseflow conditions. Stream reach is defined as 12 times stream width, bankfull to bankfull.

Habitat Parameter	Excellent -	- -	-Poor	
1. Epifaunal Substrate **What types of submerged materials are on the channel bottom?**	**Abundant stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Adequate stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Little or no stable** habitat cover available for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks; habitat may move during high flows. 	What did you see?
	10 9 8 7	6 5 4	3 2 1 0	**Score** 7
2. Embeddedness * For ROCKY BOTTOM streams only **Are fine sediments being deposited in riffle/run area?**	Gravel and cobble are **slightly** embedded in riffle area. 	Gravel and cobble are **partially** embedded in riffle area. 	Gravel and cobble are **completely** embedded in riffle area. 	What did you see?
	10 9 8 7	6 5 4	3 2 1 0	**Score** NA
3. Riffle/Run/Pool **Is a diversity of instream habitats available: riffle, runs and pools?**	Yes, all **three (3)** habitat types (riffle, run, pool) are present and frequent.  	**Two (2)** habitat types are present. 	Only **one (1)** habitat type present and dominant. 	What did you see?
	10 9 8 7	6 5 4	3 2 1 0	**Score** 4
4. Sediment Deposition **Are point bars and islands present?**	**Point bars and islands stable** and of small size and frequency with some vegetation. Composed mostly of gravel and cobble. 	**Point bars and islands less stable** and of moderate size and frequency with some sparse vegetation. Composed mostly of some gravel and finer sediment. 	**Point bars and islands unstable** and of a large size with little or no vegetation. Composed almost entirely of fine sediment. 	What did you see?
	10 9 8 7	6 5 4	3 2 1 0	**Score** 9
5. Channel Flow Status **How much water is in the stream channel?**	Water reaches base **of both lower** banks; little substrate exposed. 	**Some substrate is exposed** and water partially fills channel. 	**Most substrate is exposed** and very little water in channel. 	What did you see?
	10 9 8 7	6 5 4	3 2 1 0	**Score** 6

Total first side 26

EXAMPLE FORM

Habitat Parameter	Excellent -	- -	- - - - - - - - - - - - - - -Poor	
6. Channel Alteration **Is the stream channel altered by humans?**	**No evidence** of channelization (straightening) or alterations such as dredging, agriculture, concrete banks or construction activities. 	**Some evidence** of channelization (straightening) and/or alterations such as dredging, agriculture, concrete banks or construction activities. 	**Most of stream reach** channelized and/or many alterations present such as dredging, agriculture, concrete banks or construction activities. 	What did you see?
	10 9 8 7	6 5 4	3 2 1 0	**Score** 5
7. Channel Sinuosity * For MUDDY BOTTOM streams only **Does the channel have lots of curves and bends?**	Yes, bends in the channel are **frequent.** 	There are **more bends than straight** sections. 	There are **more straight sections** than sections with bends or channel is entirely straight. 	What did you see?
	10 9 8 7	6 5 4	3 2 1 0	**Score** 4
8. Bank Stability **How stable are the streambanks?** Determine right/left bank by facing downstream	**Bank stable**; erosion, scouring, undercutting or bank failure absent or minimal. Vegetation overhanging the stream is abundant. 	**Bank moderately stable**; evidence of small areas of erosion, undercutting and scouring, or bank failure present. Moderate amounts of overhanging vegetation present. 	**Bank unstable**; many eroded and scoured areas with undercutting; bank failure present; steep banks. Little over hanging vegetation present. 	What did you see? Bank developed on left side
Left bank	5 4.5 4 3.5	3 2.5 2	1.5 1 .5 0	**Score** (Add both banks) 5
Right bank	5 4.5 4 3.5	3 2.5 2	1.5 1 .5 0	
9. Vegetative Protection **Are streambanks covered & shaded by a variety of vegetation?** Determine right/left bank by facing downstream	Most streambank surfaces covered and shaded by a **large variety** of vegetation (trees, shrubs, flowering plants and grasses). 	Some streambank surfaces covered and shaded by **some variety** of vegetation (trees, shrubs, flowering plants and grasses). 	Few streambank surfaces covered and shaded by vegetation. **Little variety** of vegetation. Streambank dominated by one type of vegetation (trees, shrubs, flowering plants and grasses). 	What did you see? Lots of privet on left-bank Did you see any nonnative vegetation? Check here if YES ✓
Left bank	5 4.5 4 3.5	3 2.5 2	1.5 1 .5 0	**Score** (Add both banks) 5
Right bank	5 4.5 4 3.5	3 2.5 2	1.5 1 .5 0	
10. Riparian Vegetative Zone Width **What is the amount of buffer available?** Determine right/left bank by facing downstream	Buffer present; a large variety of vegetation extends at least **three channel widths** on each side. 	Some buffer present; some variety of vegetation extends **two to one channel width** on each side. Human activities have impacted buffer zone. 	Little or no buffer present; vegetation extends **less than one channel width** on each side. Human activities substantially impact buffer zone. 	What did you see? Did you see any nonnative vegetation? Check here if YES ☐
Left bank	5 4.5 4 3.5	3 2.5 2	1.5 1 .5 0	**Score** (Add both banks) 6
Right bank	5 4.5 4 3.5	3 2.5 2	1.5 1 .5 0	

Stream Habitat Score: **Excellent (69-90)** **Good (46-68)** **Fair (23-45)** **Poor (0-22)**

Total second side 25

Total first side 26

Total 51

Please submit data at: www.GeorgiaAdoptAStream.org
Or send to: 4220 International Parkway, Suite 101, Atlanta, Georgia 30354
Fax: 404-675-6245 Phone: 404-675-6240

EXAMPLE FORM

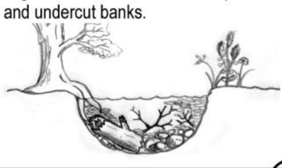
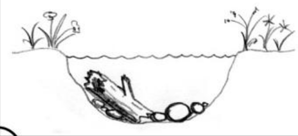
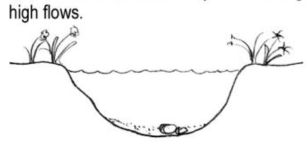
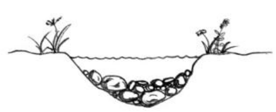
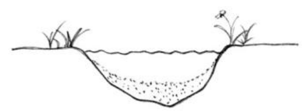
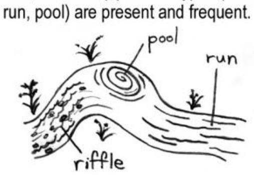
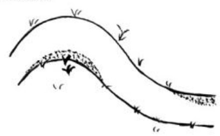
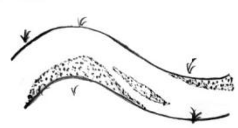
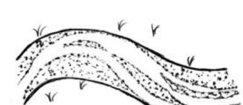
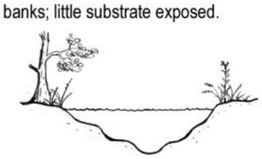
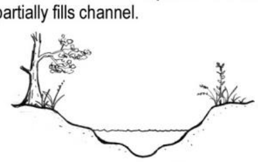
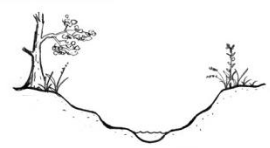
GEORGIA ADOPT-A-STREAM: Stream Habitat Survey

(Also fill out the Basic Visual Form when completing this survey)

Type of Stream:
X Rocky bottom
☐ Muddy bottom

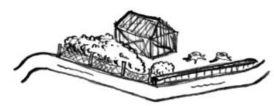
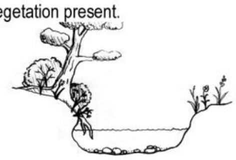
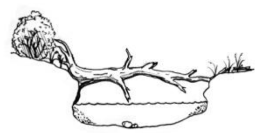
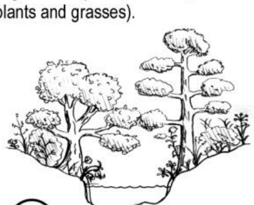
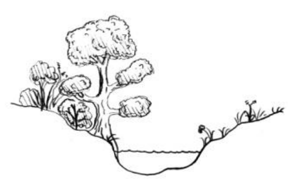
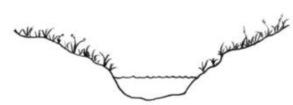
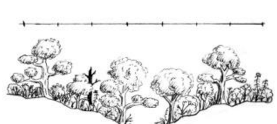
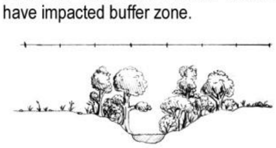
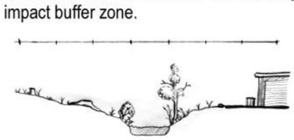
Stream habitat will be evaluated looking both upstream and downstream, and includes: channel bottom materials, streamside vegetation, slope, and other channel characteristics. You may choose a value between 0-10 for each parameter. Note #s 8-10 ask you to evaluate each bank separately.

All measurements should be taken during baseflow conditions. Stream reach is defined as 12 times stream width, bankfull to bankfull.

Habitat Parameter	Excellent - - - - - - - - - -	- - - - - - - - - - - - -	- - - - - - - - - - -Poor	
1. Epifaunal Substrate **What types of submerged materials are on the channel bottom?**	**Abundant stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Adequate stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Little or no stable** habitat cover available for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks; habitat may move during high flows. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score** 7
2. Embeddedness * For ROCKY BOTTOM streams only **Are fine sediments being deposited in riffle/run area?**	Gravel and cobble are **slightly** embedded in riffle area. 	Gravel and cobble are **partially** embedded in riffle area. 	Gravel and cobble are **completely** embedded in riffle area. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score** 6
3. Riffle/Run/Pool **Is a diversity of instream habitats available: riffle, runs and pools?**	Yes, all **three (3)** habitat types (riffle, run, pool) are present and frequent. 	**Two (2)** habitat types are present. 	Only **one (1)** habitat type present and dominant. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score** 4
4. Sediment Deposition **Are point bars and islands present?**	**Point bars and islands stable** and of small size and frequency with some vegetation. Composed mostly of gravel and cobble. 	**Point bars and islands less stable** and of moderate size and frequency with some sparse vegetation. Composed mostly of some gravel and finer sediment. 	**Point bars and islands unstable** and of a large size with little or no vegetation. Composed almost entirely of fine sediment. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score** 9
5. Channel Flow Status **How much water is in the stream channel?**	Water reaches base **of both lower** banks; little substrate exposed. 	**Some substrate is exposed** and water partially fills channel. 	**Most substrate is exposed** and very little water in channel. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score** 6

Total first side 32

EXAMPLE FORM

Habitat Parameter	Excellent --		-Poor	
6. Channel Alteration **Is the stream channel altered by humans?**	**No evidence** of channelization (straightening) or alterations such as dredging, agriculture, concrete banks or construction activities. 	**Some evidence** of channelization (straightening) and/or alterations such as dredging, agriculture, concrete banks or construction activities. 	**Most of stream reach** channelized and/or many alterations present such as dredging, agriculture, concrete banks or construction activities. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score** 9
7. Channel Sinuosity * For MUDDY BOTTOM streams only **Does the channel have lots of curves and bends?**	Yes, bends in the channel are **frequent.** 	There are **more bends than straight** sections. 	There are **more straight sections** than sections with bends or channel is entirely straight. 	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	**Score** NA
8. Bank Stability **How stable are the streambanks?** Determine right/left bank by facing downstream	**Bank stable**; erosion, scouring, undercutting or bank failure absent or minimal. Vegetation overhanging the stream is abundant. 	**Bank moderately stable**; evidence of small areas of erosion, undercutting and scouring, or bank failure present. Moderate amounts of overhanging vegetation present. 	**Bank unstable**; many eroded and scoured areas with undercutting; bank failure present; steep banks. Little over hanging vegetation present. 	What did you see?
Left bank **Right bank**	5 4.5 4 3.5 5 4.5 4 3.5	3 2.5 2 1.5 3 2.5 2 1.5	1 .5 0 1 .5 0	**Score (Add both banks)** 7
9. Vegetative Protection **Are streambanks covered & shaded by a variety of vegetation?** Determine right/left bank by facing downstream	Most streambank surfaces covered and shaded by a **large variety** of vegetation (trees, shrubs, flowering plants and grasses). 	Some streambank surfaces covered and shaded by **some variety** of vegetation (trees, shrubs, flowering plants and grasses). 	Few streambank surfaces covered and shaded by vegetation. L**ittle variety** of vegetation. Streambank dominated by one type of vegetation (trees, shrubs, flowering plants and grasses). 	What did you see? Did you see any nonnative vegetation? Check here if YES ☐
Left bank **Right bank**	5 4.5 4 3.5 5 4.5 4 3.5	3 2.5 2 1.5 3 2.5 2 1.5	1 .5 0 1 .5 0	**Score (Add both banks)** 8
10. Riparian Vegetative Zone Width **What is the amount of buffer available?** Determine right/left bank by facing downstream	Buffer present; a large variety of vegetation extends at least **three channel widths** on each side. 	Some buffer present; some variety of vegetation extends **two to one channel width** on each side. Human activities have impacted buffer zone. 	Little or no buffer present; vegetation extends **less than one channel width** on each side. Human activities substantially impact buffer zone. 	What did you see? Did you see any nonnative vegetation? Check here if YES ☐
Left bank **Right bank**	5 4.5 4 3.5 5 4.5 4 3.5	3 2.5 2 1.5 3 2.5 2 1.5	1 .5 0 1 .5 0	**Score (Add both banks)** 8

Stream Habitat Score: **Excellent (69-90)** **Good (46-68)** **Fair (23-45)** **Poor (0-22)**

Total second side 32

Total first side 32

Total 64

Please submit data at: www.GeorgiaAdoptAStream.org
Or send to: 4220 International Parkway, Suite 101, Atlanta, Georgia 30354
Fax: 404-675-6245 Phone: 404-675-6240

EXAMPLE FORM

GEORGIA ADOPT-A-STREAM: Stream Flow

(Also fill out the Basic Visual Form when completing this survey)

CALCULATE AREA

Area = depth x width

it is advisable to take multiple depth and width measurements
always start at the water's edge with a first measurement of zero
all data should be recorded in feet, with inches replaced by decimals

Depth Measurements	1.	2.	3.	4.	5.	6.	7.	8.	sum
	0 ft	0.6	1.1	0.7	0.3	0.6			3.3

Average Depth 0.55 ft = 3.3 / 6 (sum of depth measurements / number of measurements)

Width Measurements	1.	2.	sum
	11.5 ft	14.6	26.1

Average Width 13 ft = 26.1 / 2 (sum of width measurements / number of measurements)

Area 7.15ft^2 = width 13 X depth 0.55

CALCULATE SPEED-measure the time it takes a float to travel a desired distance

it is advisable to take at least 2 measurements of current speed
take measurements from the stream <u>run</u>

length = 20 feet (20 feet is recommended)

time in seconds	1.	2.	3.	4.	sum
	23s	21	24		68

average time 22.7s = 68 / 3 (sum of time measurements / number of measurements)

Speed 0.88ft/s = 20 / 22.7 (length in feet / average time in seconds)

CALCULATE STREAM FLOW

			Area		**Speed**		**Coefficient**
Flow	5.03cfs	=	7.15	X	0.88	X	0.8

<u>Flow in cubic feet per second</u>

0.9 coefficient for muddy bottom stream
0.8 coefficient for rocky bottom stream

EXAMPLE FORM

GEORGIA ADOPT-A-STREAM: Channel Cross-Section: Part 1

(Also fill out the Basic Visual Form when completing this survey)

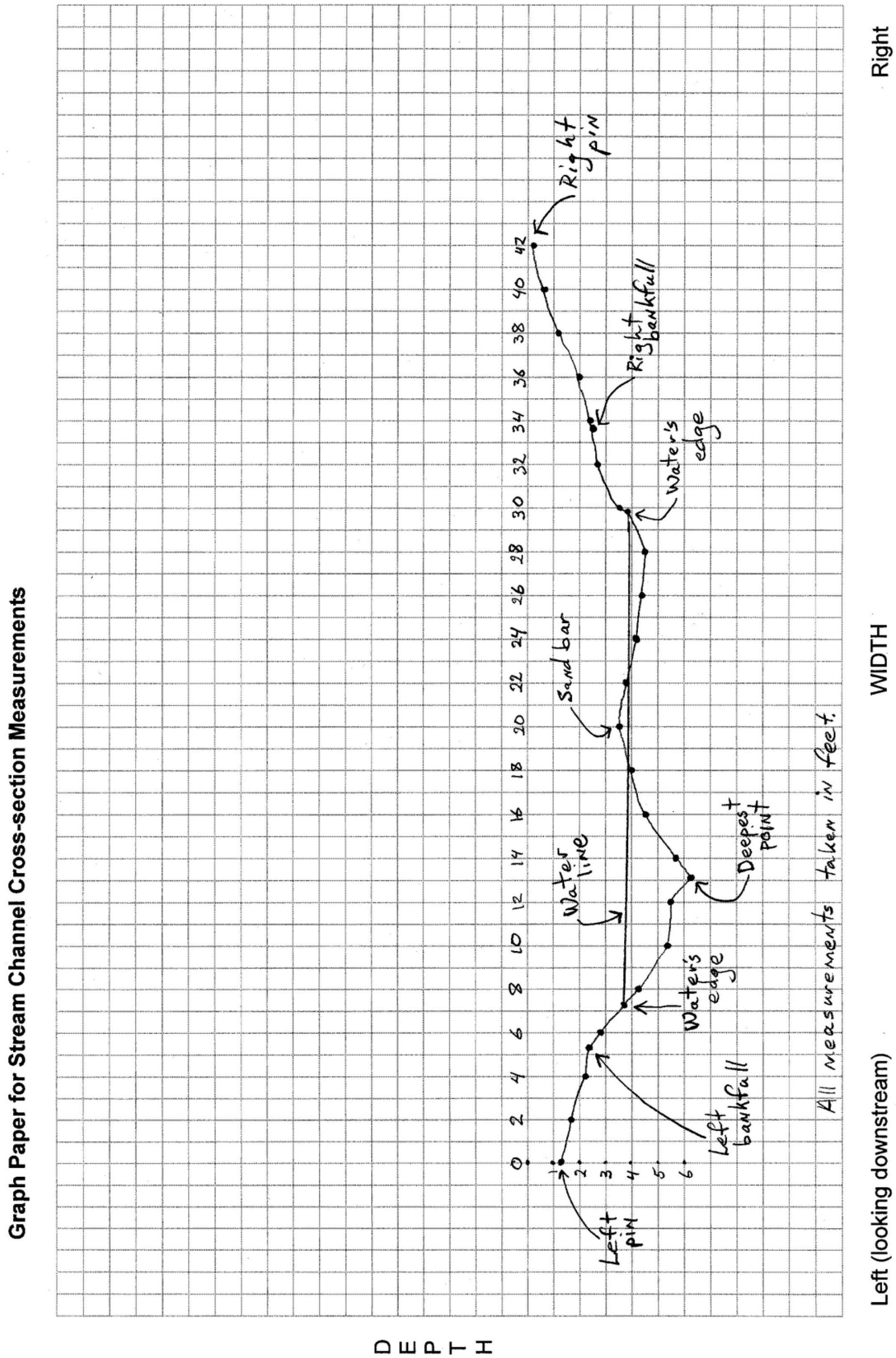
CROSS-SECTION			
Distance from LEFT Pin		Measurement Depth	Comments
Point	Ft.	Ft.	
1	0	1.2	Left pin
2	2	1.7	
3	4	2.1	
4	5.3	2.3	Left bankfull
5	6	2.9	
6	7.2	3.8	Water's edge
7	8	4.2	
8	10	5.3	
9	12	5.4	
10	13.1	6.2	Deepest point
11	14	5.7	
12	16	4.5	
13	18	4	
14	20	3.5	Sandbar
15	22	3.9	
16	24	4.1	
17	26	4.3	
18	28	4.4	
19	29.8	3.9	Water's edge
20	30	3.6	
21	32	2.7	
22	33.9	2.4	Right bankfull
23	34	2.3	
24	36	2	
25	38	1.1	

CROSS-SECTION			
Distance from LEFT Pin		Measurement Depth	Comments
Point	Ft.	Ft.	
26	40	.6	
27	42	.2	Right pin
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			

EXAMPLE FORM

GEORGIA ADOPT-A-STREAM: Channel Cross-Section: Part 2

(Also fill out the Basic Visual Form when completing this survey)



EXAMPLE FORM

GEORGIA ADOPT-A-STREAM: Wentworth Pebble Count

This was completed by 5 individuals counting plus 1 recorder (20 rounds of counting)

(Also fill out the Basic Visual Form when completing this survey)

Count#/Size Class	Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
1	1	2		2		
2	1	3	1			
3		2	2	1		
4	1	3	1			
5	2	3				
6	1	2		2		
7	2	2	1			
8		2	2	1		
9	1	2		2		
10	1	3	1			
11	2	3				
12	1	2		2		
13	1	3	1			
14	2		3			
15	2	2	1			
16	1	2		2		
17		2	2	1		
18	1	2		2		
19	1	3	1			
20	2	3				
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						

Count#/Size Class	Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						
67						
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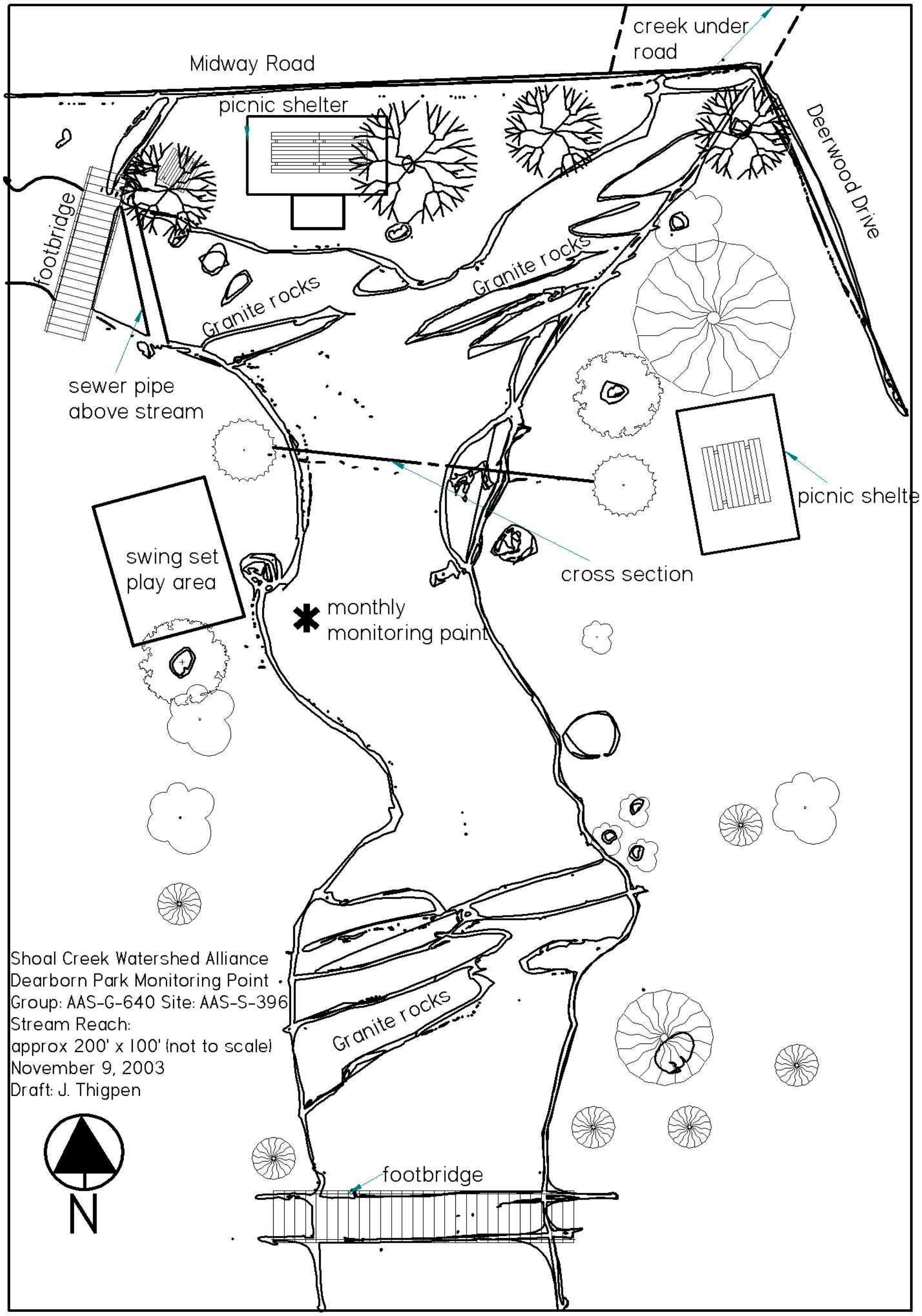
78						
79						
80						
81						
82						
83						
84						
85						
86						
87						
88						
89						
90						
91						
92						
93						
94						
95						
96						
97						
98						
99						
100						
Total in each column (%)	**23**	**46**	**16**	**15**	**0**	**0**

EXAMPLE FORM

GEORGIA ADOPT-A-STREAM: Site Sketch

(Also fill out the Basic Visual Form when completing this survey)



EXAMPLE FORM

GEORGIA ADOPT-A-STREAM: Visual Biological Survey

(Also fill out the Basic Visual Form when completing this survey)

1. Wildlife in or around the stream:

☐ amphibians ☐ waterfowl **X** reptiles ☐ mammals **X** mussels/clams/oysters
☐ crustaceans **X** birds

2. Fish in the stream: *(Check all that apply)*

☐ no ☐ yes, but rare **X** yes abundant
X small (1-2") **X** medium (3-6") ☐ large (7" and above)

Are there barriers to fish movement?

X none ☐ beaver dams ☐ waterfalls > 1ft
☐ dams ☐ road barriers ☐ other: _______

3. Aquatic plants in the stream: *(Check all that apply)*

☐ none

X attached plants	occasional	plentiful
stream margin/edge	☐	☐
pools	☐	☐
near riffle	☐	☐

☐ free-floating plants	occasional	plentiful
stream margin/edge	☐	☐
pools	☐	☐
near riffle	☐	☐

4. Extent of algae in the stream:

a) Are the submerged stones, twigs, or other material in the stream coated with a layer of algae? *(Check all that apply)*

☐ none

☐ brownish:	occasional	plentiful
light coating	☐	☐
heavy coating	☐	☐

X greenish:	occasional	plentiful
light coating	☐	☐
heavy coating	☐	**X**

☐ other: ________	occasional	plentiful
light coating	☐	☐
heavy coating	☐	☐

b) Are there any filamentous (string-like) algae?

	none	occasional	plentiful
brownish	X	☐	☐
greenish	☐	☐	X
other: ________	X	☐	☐

c) Are any detached “clumps” or “mats” of algae floating on the water’s surface?

	none	occasional	plentiful
brownish	☐	X	☐
greenish	X	☐	☐
other ________:	X	☐	☐

5. Presence of naturally occurring organic material in stream: *(Good habitat for aquatic organisms)*

Logs or large woody debris:	☐ none	**X** occasional	☐ plentiful
Leaves, twigs, root mats, etc.:	☐ none	**X** occasional	☐ plentiful

6. Stream shade cover: How well is the water surface shaded by vegetation?

Looking down stream:

Total shading No shading

100% 90% ____
80% 70% 60% 50% 40% 30% 20% 10% 0

Appendix A

- Evaluation of Stream Conditions
- Selecting Bankfull Stage
- Bank Erosion Pins
- Glossary of Stream Related Terms
- Who to Call List

Evaluation of Stream Conditions

OBSERVABLE CONDITION	LIKELY CAUSES	FOR FURTHER INFORMATION
PHYSICAL		
Sediment: the stream bottom is almost completely covered with deposition and there may be moving sand bars. Sedimentation may be associated with brown or reddish stream color during high flow conditions.	Mud, silt, or sand on the stream bottom may result from surface runoff from construction sites or exposed soils, channel alterations, or bank undercutting and slumping.	Examine upstream areas for development activities with inadequate sediment control, streambank modification, or severely undercut or slumping streambanks. Unpaved roads can also be a significant source of sediment.
Aquatic Weeds covering the water surface or stream bottom, especially in pond or slow moving areas with sunlight.	This may be a difficult problem to assess because aquatic plants can be indicators of a high quality habitat, such as a wetland or a shallow, muddy backwater. Sometimes, they are a symptom of excessive nutrients, especially when there are long strands of algae present.	Examine upstream areas for sources of nutrients such as sewage, heavily fertilized areas (e.g. golf courses or croplands), car washes, livestock areas or washwater discharges from food processing industries.
Bank Stains or Dry Weather Discharges from Pipes: stains may be observed on streambanks (which would indicate a spill, leachate or a sporadic discharge) or below pipes (which suggests an intermittent or periodic discharge). Dry weather flow may be discharged from pipes protruding from the streambank or from storm sewer pipes (normally large and composed of concrete).	Bank stains and mats of dried materials, especially below pipes, are likely to indicate sporadic discharges of oil, organic wastes or the discharges of washwaters or process wastes. Dry weather flow from storm sewer pipes would suggest washwaters from paved areas or direct connections to commercial or industrial drains. Flow from other pipes along the streambanks may be non-contact cooling water (legal with a permit) or washwaters or process wastewaters from nearby activities.	Examine the stain or discharge and its texture. Is it familiar? Stains and discharges from pipes along the streambanks are likely to result from nearby or adjacent activities. However, dry weather flows discharged from storm sewers can come from remote locations. The procedure for locating the source of such discharges is to follow the storm sewer. Continue looking or listening for flow in curbside inlets or storm sewer manholes until you find the discharge source or identify the activity causing the discharge.
Algae: floating or attached tiny plants which can color the water green, resemble seaweed when affixed to the stream bottom, form a surface scum, or have an oil-like appearance.	Algal growth indicates an upstream nutrient source.	Examine upstream areas for sources of nutrients (see above).

OBSERVABLE CONDITION	LIKELY CAUSES	FOR FURTHER INFORMATION
PHYSICAL		
Dingy White or Grey (or even brown-stained) Cotton-like Tufts: hair-like growths, which are attached to the stream bottom or objects in the stream.	This growth is probably Sphaerotilus, or iron bacterium, which thrives on organic matter. When a continuing abundance of organic wastes is available they grow in colonies, which resemble dingy cotton. This could sometimes be sulphur bacteria in south Georgia.	Look for nearby wastewater discharges or sources of nutrients and organic wastes such as food processing plants.
Foam or Bubbles floating on the water surface.	When foaming occurs in only a few scattered patches, is less than 3 inches high, and cream colored, it is probably natural. If the foaming is extensive, white in color or thicker than 3 inches, it may be due to detergents or surfactants entering the stream. White foam can also be caused by fertilizer leachate.	Examine upstream areas for industrial, municipal or residential wastewater sources or other sources of nutrients.
Leaking or Surcharging Sanitary Sewers or Manholes: white to gray musky smelling discharges from a joint or a crack in a pipe (normally-cast iron) or a sewer manhole. Sewage may be seen gushing from a manhole top. Grey mat materials draped on or deposited near a manhole may indicate past overflows.	Sanitary sewers and manholes can fail or clog over the course of time and leak or surcharge from manholes.	Report immediately to the local public works department.
Red Mats on the stream bottom which appear to be shimmering with the current and disappear when disturbed. (Not to be confused with iron bacteria).	These are colonies of aquatic, segmented worms called sludge worms. These individuals resemble small earthworms and are also an indication of heavy organic waste loads.	Examine upstream areas for sources of organic wastes.
Orange-Red Surface Film or Floc-like Deposits in slow-flowing or pond areas. The surface film breaks up when stirred.	This is normally a naturally occurring phenomenon resulting from iron bacteria growth. It is generally associated with acidic soils, or can be enhanced by iron in surface runoff or leachates.	Examine upstream areas for sources of organic wastes or wastewater.

OBSERVABLE CONDITION	LIKELY CAUSES	FOR FURTHER INFORMATION
PHYSICAL		
Sludge Deposits/Bubbles Rising to Surface: normally deposits of thick dark gray to black, "mucky" material. The top few inches of sediment and objects in the water may be stained black. Sometimes bubbles may be observed rising to the surface.	Sludge deposits are the result of solid organic matter, which has settled to the bottom in quiet areas. When the dissolved oxygen level in the water is severely depleted, anaerobic bacteria (they function without oxygen) reduce nitrogen and sulphur compounds creating gases, which bubble to the surface and create the characteristic rotten egg (hydrogen sulfide) odor.	Examine upstream areas for sources of heavy oil such as industries or fuel storage areas. Bank stains are likely to be evident. Look for a label to identify the contents of the barrel or container. If there is no label or the barrel is labeled hazardous, call the EPD Hazardous Waste Program (404/656-7802) or Emergency Response Team (1-800-241-4113 or 656-4863 in the Atlanta area). DO NOT REMAIN NEAR OR ATTEMPT TO DEAL WITH HAZARDOUS MATERIALS, AS THEY COULD BE DANGEROUS TO BREATHE OR TOUCH.
Oil Released from Sediment when sediment is stirred up.	Heavy oils may settle out and be deposited in sediment. When the sediment is stirred up the oil is re-suspended.	
Barrels or Containers in stream or on streambanks.	Empty barrels and containers may contain traces of hazardous or polluting substances.	
WATER COLOR		
Light Brown (muddy or cloudy), especially during high flows.	Mud, silt, sand on bottom or entering the stream from such sources such as surface runoff from construction activities, channel alterations, or bank undercutting and scouring is suspended in the water column.	Examine upstream areas for development activities with inadequate sediment control practices, streambank modifications, or severely undercut streambanks.
Green, especially deep green or blue-green.	If the stream is noticeably green, this could be an indication of "organic" pollution being released into the stream feeding algae (hence the term algal bloom) and other aquatic plants.	Examine upstream areas for sources of nutrients such as sewage, heavily fertilized areas like golf courses or croplands, car washes, livestock areas or wastewater discharges from food processing industries.
Dark Red, Purple, Blue or Black in comparison to normal stream color in the area.	This would normally indicate organic dye from leather tanning or clothing manufacturers.	Examine upstream areas for potential sources such as pipes or ditches from industrial plants.

OBSERVABLE CONDITION	LIKELY CAUSES	FOR FURTHER INFORMATION
PHYSICAL		
Multi-Colored Film or Reflection over an extensive portion of the stream surface, which does not break apart when, stirred.	This is typically a hydrocarbon product such as oil or gasoline resulting from spills, discharges, or runoff from vehicle maintenance areas.	If continuously flowing, follow the sheen back to its point of origin or look for dark bank stains, dripping pipes, stains in tributaries or likely sources of oil and gas such as service stations, car dealers, storage tanks, or vehicle service areas.
Milky/White	This color of water can indicate streambed substrate disturbance or runoff from a parking lot or construction site.	Examine your watershed to see if any land disturbance is occurring.
Tannic	Tannins are natural organic matter that can result from nature's fermentation process as water passes through the ground in peaty areas or through levels of decaying vegetation. Tannins are typical found in shallow wells, in swampy or marshy areas as well as coastal areas. Water can be yellow to brown/red.	Tannins do not pose a health issue. However, if you see tannic water in areas not naturally known for this occurrence, this could indicate pollution discharges.
ODOR		
Rotten egg	This may indicate sewage pollution or sludge deposits, but this odor may also be present in swamps, marshlands, or slow moving streams where leaf litter and other organic matter has settled.	Examine upstream areas for a source of sewage, heavy organic wastes, or animal wastes.
Sewage		Examine upstream areas for raw wastewater discharges; gray discolored flows, septic tank leachate or leaking sewers or manholes.

Selecting Bankfull Stage

(Modified from Harrelson et al. 1994)

Bankfull discharge is defined as water discharged when the stream water just begins to overflow into the active floodplain; the active floodplain is defined as a flat area adjacent to the channel constructed by the river and overflowed by the river at a recurrence interval of about 2 years or less (Wolman and Leopold 1957). If you observe a stream at bankfull discharge, the water level will be obvious, but this discharge is infrequent. The average discharge, which you are more likely to encounter, fills about 1/3 of the channel, and is reached or exceeded only 25% of the time (Leopold 1994).

Floodplains are the best indicator of bankfull stage. Floodplains are most prominent along low-gradient, meandering reaches, and are often difficult or impossible to identify along steeper mountain streams. The floodplains may be intermittent on alternate sides of meander bends or may be completely absent. Recently disturbed systems may give false indicators of bankfull status.

Where floodplains are absent or poorly defined, other indicators may serve as surrogates to identify bankfull stage. Several indicators should be used to support identification of the bankfull stage; use as many as can be found. These include:

TOP OF POINTBARS

The pointbar consists of channel material deposited on the inside of meander bends. They are a prominent feature of low-gradient, meandering reaches but may be absent in other stream types. Set the top elevation of pointbars as the lowest possible bankfull stage since this is the location where the floodplain is being constructed by deposition.

CHANGE IN VEGETATION

Look for the low limit of perennial vegetation on the bank, or a sharp break in the density or type of vegetation. On surfaces lower than the floodplain, vegetation is either absent or annual. On the floodplain (above bankfull stage) vegetation may be perennial but is generally limited to typical streamside types. Willow, alder, and dogwood often form lines near bankfull stage. The lower limit of mosses or lichens on rocks or banks, or a break from mosses to other plants, may help identify bankfull stage.

CHANGE IN SLOPE

Changes in slope occur often along the cross-section (e.g., from vertical to sloping, from sloping to vertical, or from vertical or sloping to flat at the floodplain level). The change from a vertical bank to a horizontal surface is the best identifier of the floodplain and bankfull stage, especially in low-gradient meandering streams. Many banks have multiple breaks, so be careful and examine banks at several sections of the selected reach for comparison. Slope breaks also mark the extent of stream terraces. Terraces are old floodplains that have been abandoned by a down cutting stream. They will generally have perennial vegetation, definite soil structure and other features to distinguish them from the active floodplain. Avoid confusing the level of the lowest terrace with that of the active floodplain; they may be close in elevation.

CHANGE IN BANK MATERIALS

Any clear change in particle size may indicate the operation of different processes (e.g., coarse, scoured gravel moving as bedload in the active channel giving way to fine sand or silt deposited by overflow). Look for breaks from coarse, scoured, water-transported particles to a finer matrix that may exhibit some soil structure or movement. Changes in slope may also be associated with a change in particle size. Change need not necessarily be from coarse to fine material, but may be from fine to coarse.

BANK UNDERCUTS

Look for bank sections where perennial vegetation forms a dense root mat. Feel up beneath this root mat and estimate the upper extent of the undercut. This estimate is usually slightly below bankfull stage. Bank undercuts are best used as indicators in steep channels lacking floodplains. Where a floodplain exists, the surface of the floodplain is a better indicator of bankfull stage than undercut banks that may also exist.

STAIN LINES

Look for frequent inundation water lines on rocks. These lines may be marked by sediment or lichen. Stain lines are often left by lower, more frequent flows, so bankfull is at or above the highest stain line.

Deposits of pine needles, twigs, trash and other floating materials are common along streams, but are seldom good indicators of bankfull stage. A receding stream may leave several parallel deposits. Floods may also leave organic drift above the bankfull stage.

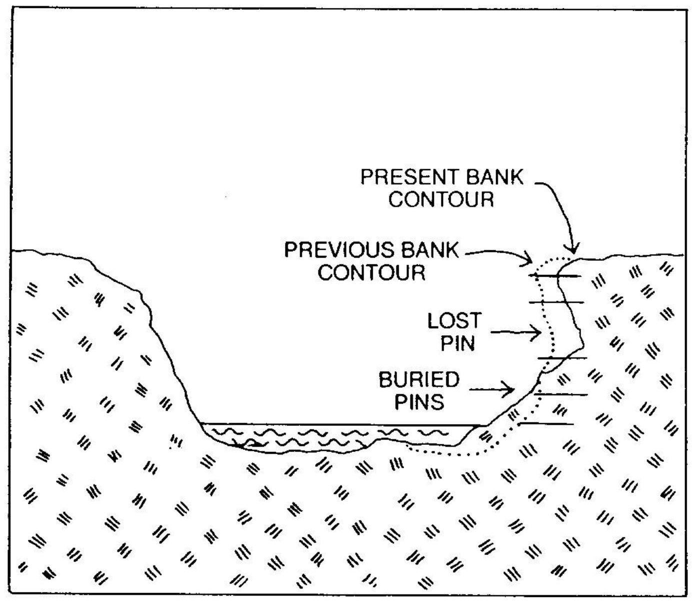
If stream gage data is available for the stream, observations of indicators at or near the gages may help to identify the indicators most useful for a particular area. Ratios of present-to-bankfull discharge can be used to estimate bankfull stage at nearby sites. Also, compare your bankfull discharge to the regional averages by drainage area. Use the graphs to validate your selected bankfull stage. If it is unreasonably different, examine your methods.

Bank Erosion Pins

Method For Measuring Erosive or Depositional Changes In Streambed And Banks (from USDA Forest Service General Technical Report RM-245)

Repeated cross-section and longitudinal profile surveys will measure erosive or depositional changes in banks, but smaller changes may be registered by using bank erosion pins. These are fine metal rods (1/16” – 1/8” x 4” – 12” long) inserted horizontally at regular intervals into a stream bank, leaving a standard length exposed. Measure the elevation of each pin with a rod and level.

On successive visits to the site, measure the exposure of each pin and record it, then drive exposed pins into the bank. If pins are entirely lost, make a note and insert another pin at the same elevation. Below is a diagram of erosion pins and placement.



Bank erosion pins and placement

Glossary of Stream Related Terms

Accuracy – a measure of how close repeated trials are to the desired target.

Acid Rain – rain with a pH of less than 5.6; results from atmospheric moisture mixing with sulfur and nitrogen oxides emitted from burning fossil fuels; can cause damage to buildings, car finishes, crops, forests, and aquatic life.

Acidity – a measure of the number of free hydrogen ions (H+) in a solution that can chemically react with other substances.

Algae – simple plants which do not grow true roots, stems, or leaves and which live mainly in water, providing a base for the food chain.

Algal Bloom – a heavy growth of algae in and on a body of water as a result of high nitrate and phosphate concentrations from farm fertilizers and detergents.

Alkalinity – a measure of the negative ions that are available to react and neutralize free hydrogen ions. Some of most common of these include hydroxide (OH), sulfate (SO4), phosphate (PO4), bicarbonate (HCO3) and carbonate (CO3)

Ambient – pertaining to the current environmental condition.

Assemblage – the set of related organisms that represent a portion of a biological community (e.g., benthic macroinvertebrates).

Bearing – direction one object is from another object.

Bankfull – the channel at the top-of-bank or point from where water begins to overflow onto a floodplain.

Benthic – pertaining to the bottom (bed) of a water body.

Best Management Practices (BMPs) – an engineered structure or management activity, or combination of these, that eliminates or reduces an adverse environmental effect of pollutants.

Biochemical Oxygen Demand (BOD) – the amount of oxygen consumed by microorganisms as they decompose organic materials in water.

Biological Criteria – numerical values or narrative descriptions that depict the biological integrity of aquatic communities in that state. May be listed in state water quality standards.

Buffer – a vegetated area near a stream, usually forested, which helps shade and partially protect a stream from the impact of adjacent land uses.

Channel – the section of the stream that contains the main flow.

Channelization – the straightening of a stream; this is often a result of human activity.

Channel Sinuosity – the frequency of bends that occur in a stream.

Chemical Constituents – chemical components that are part of a whole.

Clear Cutting – felling and removing all trees in a forest area.

Cobble Stone – 2-10 inch size stones among which aquatic insects are commonly found.

Combined Sewer Overflow (CSO) - sewer systems in which sanitary waste and stormwater are combined in heavy rains; this is especially common in older cities. The discharge from CSOs is typically untreated.

Community – the whole of the plant and animal population inhabiting a given area.

Culvert – a man-made closed passageway (such as a pipe) under roadways and embankments, which drains surface water and diverts natural flow.

Designated Uses – state-established desirable uses that waters should support, such as fishing, swimming, and aquatic life. Listed in state water quality standards.

Dissolved Oxygen (DO) – oxygen dissolved in water and available for living organisms to use for respiration.

Distilled water – water that has had most of its impurities removed.

Dredge – to remove sediments from the streambed to deepen or widen the channel.

Effluent – an out-flowing branch of a main stream or lake; liquid materials (i.e. industrial refuse, treated wastewater) discharged into the environment.

Ecoregion – geographic areas that are distinguished from others by ecological characteristics such as climate, soils, geology, and vegetation.

Embeddedness – the degree to which rocks in the streambed are surrounded by sediment.

Emergent plants – plants rooted underwater, but with their tops extending above the water.

Epifaunal Substrate – the organic and inorganic material that is available within the stream for organisms to live in or on. Otherwise known as 'available cover.'

Erosion – the wearing away of land by wind or water.

Eutrophication – the natural and artificial addition of nutrients to a waterbody, which may lead to depleted oxygen concentrations. Eutrophication is a natural process that is frequently accelerated and intensified by human activities.

Floating plants – plants that grow free-floating, rather than being attached to the stream bed.

Flocculent (floc) – a mass of particles that form into a clump as a result of a chemical reaction.

Gabion – a mesh "cage" containing earth or rocks placed into a stream to support the banks or slow the current.

Glide/run – section of a stream with a relatively high velocity and with little or no turbulence on the surface of the water.

Fish kill – the sudden death of fish due to the introduction of pollutants or the reduction of dissolved oxygen concentration in a water body.

Floodplain – a low area of land surrounding streams or rivers, which holds the overflow of water during a flood.

Flow (Stream)– the direction of movement of a stream or river. It is also is the volume of water passing a fixed point over a unit of time and is usually expressed in cubic feet per second (cfs)

Groundwater – a supply of fresh water under the earth's surface, which forms a natural reservoir.

Headwaters – the origins of a stream. They are the smaller tributaries that carry water from the upper reaches of the watershed to the main channel of the river.

Hypoxia – depletion of dissolved oxygen in an aquatic system.

Impairment – degradation.

Impoundment – a body of water contained by a barrier, such as a dam.

Land Uses – activities that take place on the land, such as construction, farming, or tree clearing.

Leaching – the process in which material in the soil (such as nutrients, pesticides, and chemicals) are washed into lower layers of soil or are dissolved and carried away by water.

Macroinvertebrates – organisms that lack a backbone and can be seen with the naked eye.

Nonnative – a species living outside its native distributional range, which has arrived there by human activity.

Nonpoint Source Pollution – pollution that cannot be traced to a specific point, and comes from many individual places (e.g., urban and agricultural runoff).

NPDES – National Pollutant Discharge Elimination System, a national program in which pollution dischargers such as factories and sewage treatment plants are given permits to discharge. These permits contain limits on the pollutants they are allowed to discharge.

Nutrients – substances which enhance the growth of plants and animals, such as phosphorous and nitrogen compounds.

Orthophosphate – inorganic phosphorus dissolved in water.

Outfall – the pipe through which industrial facilities and wastewater treatment plants discharge their effluent (treated wastewater) into a waterbody.

Permeable – porous; having openings through which liquid or gaseous substances can penetrate.

Pesticide – a chemical that kills insects and rodents. Pesticides can poison aquatic life when they reach surface waters through runoff.

pH – a numerical measure of the hydrogen ion concentration used to indicate the alkalinity or acidity of a substance. Measured on a scale of 1.0 to 14.0; 7.0 is neutral, greater than 7 is acidic, less than 7 is basic.

Phosphorus – a nutrient that is essential for plants and animals.

Photo Point Monitoring– photo point monitoring is a standardized method for taking photographs of resources so they can be compared over time.

Photosynthesis – the chemical reaction in plants that utilizes light energy from the sun to convert water and carbon dioxide into simple sugars. This reaction is facilitated by chlorophyll.

Point Bars – deposits of sediment on the inside of a meander or bend of stream.

Point Source Pollution – a type of pollution that can be tracked down to a specific source such as a factory discharge pipe.

Pollutant – something that makes land, water or air dirty and unhealthful.

Pool – deeper portion of a stream where water flows more slowly than in neighboring, shallower portions.

Precision – a measure of how close repeated trials are to each other.

Protocol – defined procedure.

Reach (Total Stream): A reach is a representative length of your stream. The length of your reach should be 12 times the active channel width, which is the width of your stream at bankfull discharge.

Reagent – a substance or chemical used to indicate the presence of a chemical or to induce a reaction to determine the chemical characteristics of a solution.

Riffle – a shallow section in a stream where water is breaking over rocks, cobble, wood or other substrate in the streambed causing surface agitation.

Riparian – of or pertaining to the banks of a body of water.

Riparian Vegetative Zone – the vegetated area along either side of the stream channel.

Riprap – rocks used on an embankment to protect against bank erosion.

Run – these areas differ from riffles in that depth of flow is typically greater and slope of the bed is less than that of riffles. Runs will often have a well-defined thalweg.

Runoff – water, including rain and melted snow, which is not absorbed into the ground but instead flows across the land and eventually runs into streams and rivers. Runoff can pick up pollutants from the air and land, carrying them into the stream.

Saturated – inundated; filled to the point of capacity or beyond.

Sediment – soil, sand, and materials washed from land into waterways. Other pollutants may attach to sediment and be carried into stream.

Sedimentation – when soil particles (sediment) settle to the bottom of a waterway.

Septic Tank – a domestic wastewater treatment system into which wastes are piped directly from the home; bacteria decompose the organic waste, sludge settles to the bottom of the tank, and the treated effluent flows out into the ground through drainage pipes.

Sheen – the glimmering effect that oil has on water as light is reflected more sharply off the surface.

Silviculture – forestry and the commercial farming of trees.

Slumping – sections of soil on a streambank that have come loose and slipped into the stream.

Stagnation – when there is little water movement and pollutants are trapped in the same area for a long period of time.

Submergent Plants – plants that live and grow fully submerged under the water.

Substrate – refers to a surface. The material comprising the streambed (mineral or organic material) that forms the bed (bottom) of a stream or the surfaces to which plants or animals may attach or upon which they live.

Surface Water – precipitation which does not soak into the ground or return to the atmosphere by evaporation or transpiration, and is stored in streams, lakes, wetlands, and reservoirs.

Taxon (plural taxa) – a level of classification within a scientific system that categorizes living organisms based on their physical characteristics.

Taxonomic key – a quick reference guide used to identify organisms. They are available in varying degrees of complexity and detail.

Thalweg – the line defining the lowest points along the length of a river bed or valley; the deepest part of the channel.

Tolerance – the ability to withstand a particular condition, e.g., pollution-tolerant indicates the ability to live in polluted waters.

Toxic Substances – poisonous matter (either man-made or natural) which causes sickness, disease and/or death to plants or animals.

Tributaries – a body of water that drains into another, typically larger, body of water.

Turbidity – murkiness or cloudiness of water, indicating the presence of some suspended sediments, dissolved solids, natural or man-made chemicals, algae, etc.

Undercutting – a type of erosion which occurs when fine soils are swept away by the action of the stream, especially around curves. The result is an unstable overhanging bank.

Vegetated Islands – a small islet or sandbar within a river having a grouping or thicket of trees.

Water Cycle – the cycle of the earth's water supply from the atmosphere to the earth and back which includes precipitation, transpiration, evaporation, runoff, infiltration, and storage in water bodies and groundwater.

Water Quality Criteria – maximum concentrations of pollutants that are acceptable, if those waters are to meet water quality standards. Listed in state water quality standards.

Water Quality Standards – written goals for state waters, established by each state and approved by EPA.

Watershed – land area from which water drains to a particular water body.

Water Table – the upper level of groundwater.

Waterway – a natural or man-made route for water to run through (such as a river, stream, creek, or channel).

Wetland – an area of land that is regularly wet or flooded, such as a marsh or swamp.

Georgia Adopt-A-Stream "Who to Call List"

Emergency Response 1-800-241-4113 or 404-656-4863

Use this number to report an emergency situation that is currently happening. Examples include fish kills, chemical, sewage or oil spills, illegal dumping in progress, poaching or anything that warrants immediate attention.

Non-Emergency Response 1-888-EPD-5947 or 404-657-5947

Use this number for non-emergency situations such as illegal dumping after the fact, buffer violations, sedimentation, or other impairments that warrant attention.

Georgia Adopt-A-Stream State Office 404-657-5947

Monday through Friday - 8:00 a.m. to 4:30 p.m.

Your phone call may be forwarded to a voicemail box, in this instance please review the notes below.

Your Local Contacts

Local Emergency Hotline	________________	Local DNR Ranger	________________
Local Health Department	________________	Local EPD Office	________________
Local Code Enforcement	________________	Local AAS Coordinator	________________

***** Remember to get after hour numbers as well.

Please call Georgia Adopt-A-Stream and your local coordinator if you have reported a situation to one of the numbers above so that we are aware of the situation and can follow-up within the Environmental Protection Division.

Please remember to take detailed notes on the following:

- Exact location: address or GPS coordinates (more specific than 'John Doe's Farm')
- Clear directions on how to get there
- Describe the nature of the issue
- Date and when the issue occurred or what time did it start
- Take a picture of the site
- If the conditions are safe, gather water quality data and a water sample in a sterile container

Important information to give to the operator:

- Your phone number first, so they can call you back if you are disconnected
- Request a call back if you wish to talk to an EPD officer, if you have not received a call within 1 hour, please call back and also report this to Adopt-A-Stream.
- Talk clearly and slowly

Other Useful Numbers

EPD Hazardous Waste Program (for illegal dumping)	404-656-7802
EPD Water Protection (responds to underground storage complaints)	404-362-2688
EPD Georgia Safe Dams Program (questions about dams)	404-362-2678
EPD Water Protection (modeling and monitoring or water quality)	404-675-6236
NonPoint Source Program (erosion, buffers, stormwater)	404-657-5947

EPD Regional Offices (for water quality questions, erosion & sedimentation problems)

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

DNR Coastal Resource Division	912-264-7218
Georgia Wildlife Resources Division	770-918-6400
Endangered Species	912-994-1438
Georgia Cooperative Extension Service	706-542-3824
Georgia Forestry Commission	912-751-3500
Georgia Soil & Water Conservation Commission	706-542-3065

US NRCS	Regional	404-347-6105
	Clayton	770-473-5467
	Fulton	770-393-2849
	Gwinnett	770-963-9288
	Henry	770-957-5705
	Cobb	770-528-2218

EPA	Environmental Education	404-562-8327
	Lakes/Rivers/Streams	404-562-9355
	Wetlands Information	1-800-426-4791
	Wetlands/Oceans/Watersheds	404-562-9355

USGS Water Resources Division	770-409-7700
US Fish and Wildlife Service	404-679-7319
Army Corps of Engineers	678-422-2720
US Geological Survey	404-656-3214

For a complete list of EPD numbers look under “Contacts” at
http://www.gaepd.org/Documents/wpb_phonelist.pdf