Department of Natural Resources
Environmental Protection Division
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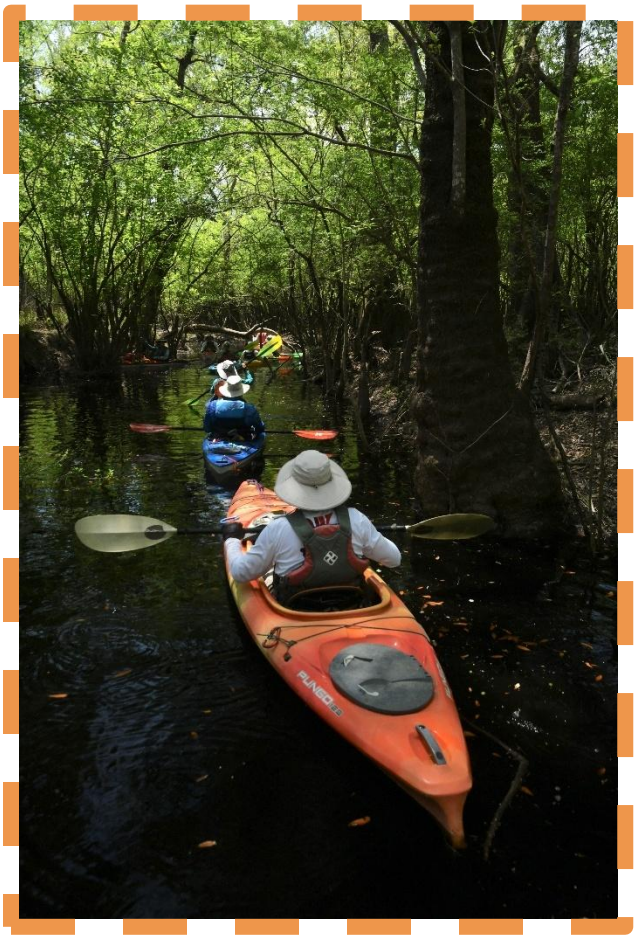
Georgia Adopt-A-Stream
Volunteer Water Quality Monitoring

INTRODUCTION TO WATER QUALITY MONITORING



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Georgia Adopt-A-Stream

Georgia Department of Natural Resources

Environmental Protection Division

2 Martin Luther King Jr. Drive SE

Suite 1462, East Tower

Atlanta, GA 30334

AdoptAStream.Georgia.gov

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Writers/Editors:

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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, 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, and estuaries. Manuals, training, and technical support are provided through Georgia EPD and more than 70 local community trainers. 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, materials, and workshops to promote nonpoint source pollution education and data collection in their areas.

Goals of Georgia Adopt-A-Stream

The goals of AAS are easy to remember by using the acronym:

Awareness: Increase public awareness of Georgia'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 (newsletter, manuals, brochures, etc.), 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 database for volunteer water quality data in the State of Georgia. This data is publicly accessible on our website and can be viewed at the city, county, and watershed level to help citizens better understand the health of their local waterways. Volunteer data is used to educate the public, identify water quality impairments, and to inform policy decisions at the local, state, and federal level.

Observations

Careful observations of our waterways can lead to success in protecting and improving its conditions. In addition to the data found on the data sheets, there may be important details to record when visiting a 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. If you need help establishing partnerships, we encourage you to contact your local 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 water quality monitoring 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 view the manuals, workshop descriptions and calendar as well as other monitoring resources, visit our website: AdoptAStream.Georgia.gov.

This manual is intended to provide an overview of water quality monitoring in the State of Georgia and to introduce basic facts and procedures of the Georgia Adopt-A-Stream program. This manual should be used in conjunction with the appropriate monitoring manual (e.g. chemical, bacterial, macroinvertebrate, etc.) for the most comprehensive understanding of the Adopt-A-Stream monitoring protocols.

Water Quality in Georgia

Georgia Water Quality Report

According to the *Georgia 305(b)/303(d) List Documents, Georgia Environmental Protection Division* states are required to assess water quality every two years in accordance with Section 305(b) of the Clean Water Act. The report is a primary assessment of the State's water quality. It should include an integrated list of waters that are both supporting and not supporting their Designated Uses. The waters not supporting their Uses that do not have a Total Maximum Daily Load (TMDL) are placed on the 303(d) List, which contains the pollutants causing impairments and the priority ranking including those waters targeted for TMDL development within the next two years.

U.S. EPA has developed *A Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program* which focuses on six elements:

1. Prioritization
2. Assessment
3. Protection
4. Alternatives
5. Engagement
6. Integration

In accordance with the EPA, GA EPD has developed a Draft Priority Framework that describes how GA EPD will prioritize its waters on the 303(d) list for development of TMDLs or TMDL alternatives. Follow this link to learn more about Georgia's List of Priority Waters prepared by the GA EPD. View the U.S. EPA's *Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program* here.

According to the 2015 *Georgia Environmental Protection Division TMDL and 303d Approach Including Georgia's Draft Priority Framework Document* "The Watershed Protection Branch of the GAEPD, in cooperation with many local, state, and federal agencies, coordinates programs to address most aspects of water resource management and water pollution control. These programs including: Continuing Planning Process; comprehensive statewide water planning; water quality standard development, water quality monitoring and assessment; modeling to develop wasteload allocations and Total Maximum Daily Loads (TMDLs); TMDL implementation; local watershed assessment

and watershed protection plans; nonpoint source management; stormwater management; erosion and sedimentation control; Clean Water State Revolving and Georgia Fund Loan programs; NPDES permit and enforcement programs for municipal and industrial point sources; industrial pretreatment; land application of treated wastewater; regulation of concentrated animal feedlot operations (CAFOs); surface water and ground water withdrawals; drinking water permits; water conservation; source water protection; wetlands; floodplains; and public outreach including Georgia Project Wet and Adopt-A-Stream programs."

Introduction

As outlined in chapter 1 of the *Water Quality in Georgia 2020-2021 (2022 Integrated 305b/303d Report* from the Georgia Department of Natural Resources and Environmental Protection Division:

This report, often referred to as the Georgia 305(b) Report, describes water quality conditions of navigable waters across the State and provides an assessment of the water quality conditions of surface and groundwater in Georgia.

The report includes a description of the nature, extent, and causes of documented water quality problems and serves as the basis for the integrated 305(b)/303(d) list.

The report also includes a review and summary of ongoing statewide water planning efforts; wetland, estuary, and coastal public health/aquatic life issues; and water protection, groundwater, and drinking water program summaries.

The major objective of this report is to provide Georgians a broad summary of water quality information and the programs implemented by EPD and its partners to protect water resources across the State.

Watershed Protection in Georgia

EPD is the state agency charged with protecting Georgia's air, land, and water resources. EPD is responsible for environmental protection, management, regulation, permitting, and enforcement in Georgia. EPD administers programs for planning, water pollution control, water supply and groundwater management, hazardous waste management, air quality control, solid waste management, strip mining, erosion control, radiation control, underground storage tanks, and safe dams. EPD issues and enforces all state permits in these areas and has full delegation for federal environmental programs, except Section 404 (wetland) permits and Section 405, 40 CFR Part 503 *Standards for the Use or Disposal of Sewage Sludge*.

The Watershed Protection Branch of EPD, addresses most aspects of drinking water supply and water pollution control including: comprehensive statewide water planning; water quality standards; monitoring; water quality modeling to develop wasteload allocations and Total Maximum Daily Loads (TMDLs); TMDL implementation; the continuing planning process; local watershed assessment and watershed protection plans; nonpoint source management; erosion and sedimentation control; stormwater

management; the National Pollutant Discharge Elimination System (NPDES) permit and enforcement program for wastewater and stormwater point sources; water withdrawal and drinking water permits; water conservation; source water protection; industrial pretreatment; land application of treated wastewater; regulation of concentrated animal feedlot operations (CAFOs); and public outreach including Georgia Project Wet and Adopt-A-Stream programs.

EPD has designated GSWCC as the lead agency for addressing water quality problems caused by agriculture and the GFC as the lead agency to address water quality problems due to commercial forestry operations.

Surface Water Quality Assessment

Water quality data are assessed to determine if standards are met and if the water body supports its designated use using Georgia's 2022 305(b)/303(d) Listing Assessment Methodology. If monitoring data show that standards are not met, the water body is said to be "not supporting" the designated use. If the monitoring data show that standards are being met, then the water body is "supporting" its designated use. Occasionally, additional data is needed to make an assessment, and the water body is assessed as "assessment pending". The following 2022 305(b)/303(d) List of Waters can be found in Appendix A:

- 2022 River/Streams
- 2022 Lakes/Reservoirs
- 2022 Coastal Streams
- 2022 Sounds/Harbors
- 2022 Coastal Beaches
- 2022 Freshwater Beaches

Watershed Protection Programs

The state of Georgia and EPD have and/or partner on several Watershed Protection Programs to improve Georgia's water quality that are described in Chapter 7. These include:

- Watershed Planning and Monitoring Program
  - Water Quality Standards and Numeric Nutrient Criteria
  - Water Quality Monitoring and Assessment
  - Water Quality Modeling, Wasteload Allocation Development, and TMDL Development
- Wastewater Regulatory Program
  - NPDES Permitting
  - Concentrated Animal Feeding Operations (CAFOs)
  - Combined Sewer Systems (CSS)
- Nonpoint Source Program
  - Stormwater Permitting
  - Nonpoint Source Management Program
    - Agriculture
    - Silviculture

        - Urban Runoff
    - Erosion and Sedimentation Control
    - 319(h) Grants
    - Outreach
        - Water Education for Teachers
        - Georgia Adopt-A-Stream Program
        - Rivers Alive
- Compliance and Enforcement Program
    - Metropolitan North Georgia Water Planning District (Metro District)
    - Zero Tolerance
- Land Protection Programs
    - Georgia Outdoor Stewardship Program
    - Clean Water State Revolving Fund Loans
    - Agricultural Conservation Easement Program
    - Environmental Quality Incentives Program
    - Healthy Forests Reserve Program
- Georgia Emergency Response Network
- Environmental Radiation

Major Issues and Challenges

Georgia is one of the fastest growing states in the nation. The increasing population places considerable demands on Georgia's water resources. The major issues and challenges regarding water quality are described in Chapter 9 and include:

- Comprehensive Water Plan
- Indirect Potable Reuse
- Nonpoint Source Pollution
- Nutrients
- Harmful Algal Blooms (HABs)
- PFAS
- The Golden Ray

Water Resources Atlas

As outlined in chapter 3 of the *Water Quality in Georgia 2020-2021 (2022 Integrated 305b/303d Report* from the Georgia Department of Natural Resources and Environmental Protection Division:

Water Resources Atlas

The State of Georgia has approximately 44,056 miles of perennial streams, 23,906 miles of intermittent streams, and 603 miles of ditches and canals for a total of 70,150 geological stream miles. based on the U.S. Geological Survey (USGS) 1:100,000 Digital Line Graph (DLG). The estimate for the number of lakes in Georgia is 11,813 with a total acreage of 425,382. This information is summarized in the table below

Georgia has 14 major river basins that include the Altamaha, Chattahoochee, Coosa, Flint,

Ochlockonee, Ocmulgee, Oconee, Ogeechee, St. Marys, Satilla, Savannah, Suwannee, Tallapoosa, and the Tennessee. The rivers in Georgia provide the water needed by aquatic life, animals, and humans to sustain life. Water also provides recreational opportunities, is used for industrial purposes, drives turbines to provide electricity, and assimilates waste.

Georgia Water Resources Atlas	
State Population (2016 estimate)	10,097,340
State Surface Area	57,906 sq. mi.
Number of Major River Basins	14
Perennial River Mileage	44,065
Intermittent River Mileage	23,906
Ditches and Canals Mileage	603
Total River Mileage	70,150
Number of Lakes Over 500 Acres	48
Acreage of Lakes Over 500 Acres	265,365
Number of Lakes Under 500 Acres	11,765
Acreage of Lakes Under 500 Acres	160,017
Total Number of Lakes, Reservoirs, and Ponds	11,813

Total Acreage of Lakes, Reservoirs, and Ponds	425,382
Square Mileage of Estuaries	854
Miles of Coastline	100
Freshwater Wetland Acreage	4,500,000
Tidal Wetland Coverage	384,000

Water Quality Monitoring

Many water quality parameters can be monitored to help assess the condition of a river, lake, or coastal 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 specific time and macroinvertebrate monitoring shows long-term information about the health of the stream. Bacterial monitoring can help citizens determine if the water is 'safe' for human contact.

This manual provides basic background information on water quality monitoring at the volunteer level, designing a sampling program, setting goals, and getting started with Georgia Adopt-A-Stream. Please refer to the *Chemical, Bacterial, Macroinvertebrate*, and *Visual manuals* for more information on each of these respective monitoring programs. These manuals will guide you through each monitoring type, methods, and why they are 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% are 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 "connection" to their waterway and a willingness to promote good stewardship.
- **Targeted Sampling:** Water quality monitoring can help identify sources 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 Development and Implementation:** Volunteers can provide data to state agencies developing Total Maximum Daily Load (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.

Levels of Involvement

Georgia Adopt-A-Stream offers a variety of monitoring programs which allow volunteers and groups the ability to design a monitoring plan that best fits their interests, time, and resources. Opportunities include conducting a watershed survey, a visual survey, or cleanup and outreach activities. Volunteers may also participate in quality assurance workshops that cover macroinvertebrate, chemical, and bacterial monitoring. Additional activities include wetland monitoring, waterway cleanups, and habitat enhancement projects. The time commitments for each program are listed below:

- Habitat Enhancement: One time project
- Watershed Survey: Once per year
- Wetland Monitoring: Once per year
- Visual Monitoring: Four times per year (quarterly)
- Macroinvertebrate Monitoring: Four times per year (quarterly)
- Chemical Monitoring: 12 times per year (monthly)
- Bacterial Monitoring: 12 times per year (monthly)
- Rivers Alive Cleanup: Available all year

Waterway Certifications and Monitoring

- Watershed Assessments: Yearly sampling
- Visual Monitoring: Quarterly sampling
- Macroinvertebrate Monitoring: Quarterly sampling (QA/QC)
- Chemical Monitoring: Monthly sampling (QA/QC)

- Bacterial Monitoring: Monthly sampling (QA/QC)
- Freshwater Wetland Monitoring: Quarterly sampling
- Rivers Alive Cleanup: Available all year
- Trainer Certification: (QA/QC)

Quality Assurance / Quality Controlled (QA/QC) protocols ensure training standards for inputting data. Chemical, bacterial, and macroinvertebrate monitoring require QA/QC training. Training workshops are available on the AAS website and are conducted by AAS trainers or local programs. Training includes an overview of the program, monitoring techniques, and quality assurance tests. Please refer to the appropriate monitoring manual (available on the AAS website) to learn more about specific techniques and QA/QC protocol.

For more information about map assessments and using the watershed survey as an evaluation tool, refer to the *Getting to Know Your Watershed* manual.

Additionally, the *Visual Stream Monitoring* manual introduces a diversity of low-cost, hands-on methods for analyzing the physical health of streams.

It is crucial for volunteers to understand that each monitoring program only represents a small part of a larger picture for a stream and watershed. For example, chemical monitoring alone will not provide a full picture of stream conditions. This protocol may highlight issues with a waterbody like low pH, low dissolved oxygen, etc., but cannot provide the reason these tests are out of the ordinary.

Designing a Sampling Program

Before monitoring, volunteers should determine their goals. This will help guide intended levels of participation and can help to develop a monitoring program. Where, when, and how often a waterbody is sampled depends on these goals.

Follow the steps below to engage with Georgia Adopt-A-Stream and protect waterways:

1. **Determine level of participation and goals for monitoring:** There are many levels to adopting a waterway. Think of the reason for monitoring, the type of data needed, and who may be interested in using this data. Contact the AAS state office for advice and guidance through this process:
    a. Basic Level: Conduct one outreach event (e.g. river cleanup) and walk the watershed
    b. Monitoring: In addition, select a monitoring program(s) of interest (visual survey, macroinvertebrate, bacterial, and/or chemical)
2. **Attend a workshop:** Depending on interest, attend a monitoring workshop and participate in collecting baseline data for the waterway.
    a. To learn more about workshops and view the workshop calendar, visit the AAS website.
    b. If there are no local workshops, please contact the local trainer or AAS state office, and we can organize one.
3. **Select a site to adopt:** Determine a stream, wetland, or coastal area of interest.

Georgia Adopt-A-Stream does not assign monitoring sites but can provide guidance and support for this decision. Choose a waterbody that is easy, safe, and legal to access.

4. **Create a group:** It's always better to have two set of eyes collecting data, to help with equipment and costs, and for practicing safety. We recommend having help when adopting a site to monitor, restore, and protect.
5. **Register the group and site(s):** On the AAS website, register the group and the site(s) adopted. Latitude/longitude location is required to register a site (this can be generated on the database. Please contact a local trainer or AAS state office for help).
6. **Get informed, read the manuals:** Download a copy of the *Getting to Know Your Watershed* manual from the AAS website.
7. **Take it slow, be safe, and have fun:** Start slowly, ask a lot of questions, discuss the new information with peers, and always prioritize safety when sampling.

Setting Monitoring Goals

Generally, a *goal* is a broad statement that encompasses the purpose of being involved with AAS. An *objective* is a specific, measurable, action-oriented activity that can help to achieve goals. Understanding the definition of goals or objectives is less important than having a clear picture of *why* one is adopting a waterbody and what one can achieve from these efforts. Once this is understood, decide what activities should be conducted.

Schools, county water departments, golf course managers, watershed organizations, communities, landowners, and businesses all utilize the AAS program. The goals and objectives of each group are very different. Refer to the examples of goals and objectives one might consider for a program below:

Goals:

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

Objectives:

- Conduct the watershed survey and map assessment.
- Speak at the neighborhood association or local church about one's efforts with AAS.
- Conduct Visual Surveys four times a year.
- Collect data on pH, dissolved oxygen, temperature, and nitrate-nitrogen once a month for three years.
- Organize two waterway cleanups a year.

- Ask someone at the local water authority to act as a technical advisor.
- Contact a local official with one's intentions with AAS.
- Write an article for the local newspaper with information on who to call if someone encounters a water quality problem.
- Collect data that will be useful to at least three entities (watershed organization, county water authority, local college).

Determining Data Collection Method

Before collecting data, determine the reason for collecting it and the way in which the data may be used. Refer to the examples below of how various people or organizations may use the data collected.

Watershed Survey data provides a clear picture of a waterbody and the land activities nearby that may be affecting its water quality. If a watershed has not been impacted by much development, this is an excellent time to begin collecting watershed data. The watershed map and data forms collected using this survey may be the only data available at that watershed. Conducting a watershed survey yearly provides documentation of changes that may be occurring. This information can be useful in helping local officials pass ordinances to protect the watershed's tributaries and to control development of the area.

Visual Survey data is collected quarterly (four times per year). Many critical water pollutants and habitat damage can be detected through completing a visual survey. The *Visual Stream Survey* manual available on the AAS website provides detailed instructions for completing this monitoring protocol. Sedimentation, erosion, excess nutrients, and sewage leaks are all recognized and recorded during a visual survey. Photo documentation is highly encouraged as it can show the erosion process of a streambank or the increased sedimentation in a wetland.

Chemical Monitoring data is collected once a month. The parameters we recommend testing for are pH, dissolved oxygen, temperature, settleable solids, alkalinity, phosphates, ammonia, nitrate-nitrogen, and conductivity. The chemical kits used in the field, when maintained and used properly, are accurate but are not approved under the standard methods required by the EPA and GA EPD for compliance purposes in regulatory matters. However, data of this type serves an important purpose. County, city, and state water quality technicians and environmental consulting groups often use the data for screening purposes. If significant readings are found, a local water authority or EPD agent can be called in to take additional samples. Trend monitoring is also important. Several years of data can show changes in chemical parameters which may correlate to data collected in visual or watershed surveys. This information is useful in watershed planning and management.

Macroinvertebrate Monitoring data is collected quarterly (four times per year/once per season). Collecting and identifying macroinvertebrates is one way to assess water quality and habitat health. Macroinvertebrate surveys are indicators for the health of a waterbody. If dissolved oxygen is low, a toxic substance was spilled, or habitats have been

destroyed, this will be reflected in the type and number of macroinvertebrates collected. The overall health of the stream will be better reflected in biological data than in chemical data. Collecting chemical, biological, and visual data provides a more complete picture of a waterbody and its present or potential impacts.

Bacterial Monitoring data is collected once a month and involves sampling water for the presence of *E. coli* bacteria. Bacteria are single-celled, living, microscopic organisms. Most bacteria are beneficial and responsible for important environmental processes such as decomposition, nutrient cycling, and the breakdown of environmental toxins. Some bacteria, however, are pathogenic (disease causing) and result in human health problems. The presence of *E. coli* bacteria in waterways is an indicator of potential health hazards associated with polluted water.

Quality Assurance Quality Controlled (QA/QC) data refers to the Quality Assurance Project Plan (QAPP) and the quality controls in place to ensure the data is accurate and precise. Georgia AAS has a QAPP approved by the EPA that states the methods that trainers and volunteers use to assure high quality data. Part of the QA/QC process requires volunteers to participate in a monitoring workshop once per year for QA/QC monitoring protocols (chemical, macroinvertebrate, and bacterial). During the workshops, volunteers are given a written and field test to ensure they understand data collection procedures. **Macroinvertebrate, bacterial, and chemical data collection is not required to be involved in Georgia Adopt-A-Stream.** However, to collect this data a QA/QC workshop must be attended for certification.

Finally, determine who may use this data. One might call organizations beforehand to see if they would be interested in receiving data. Various organizations and agencies have different data needs and different quality assurance requirements for the data they use. Goals and objectives might need to be adjusted for certain organizations with different criteria to use this collected data.

Always submit data collected on the Georgia Adopt-A-Stream online database. All data is reviewed, secure, and available for anyone to download. The database also allows for other groups' QA/QC data to be downloaded and provides charts and graphs that analyze all water quality data housed within the database.

Conducting Research and Interpreting Data

Data is collected by federal, state, and local agencies through research conducted by universities and consulting firms. Most of this data is not compiled in one location and, if it were, may not be comparable due to different methods of monitoring. This is why research is required to determine data collected on a waterway. The best place to start is the EPA's How's My Waterway tool.

Historical land use and the history of a waterway may be more difficult to uncover. Local historical societies, libraries, or newspaper archives may provide useful information. Look for historical photos of the area, stories about fishing contests, fish kills, spills, floods, or other major events affecting the waterbody and its watershed. County or town planning offices may provide information on residential developments and stream

diversions. Similarly, state and local transportation agencies might have records on highway and bridge construction. State environmental regulatory agencies have records of past or current applications to modify stream hydrology through dredging, channeling, and stream bank stabilization.

Long-time residents are another invaluable source of information on the history of a stream. Locals who frequented a waterbody in their youth may have witnessed how it has changed over time. They may recall industries or land use activities of the past such as mines or farms. They may recite fish once caught or floods that led to channeling and dams. Assembling such oral histories is a particularly good activity for school aged volunteers.

Determining Equipment and Resources Needed

Begin thinking about the equipment and resources needed to accomplish the goal. Refer to the table below for equipment necessities for each monitoring protocol.

Equipment and Resource Requirements	
Monitoring Protocol	**Equipment Needs**
Watershed Survey & Map Assessment	*Getting to Know Your Watershed* manual and data forms, Topographic map, Transparency paper, Land use map, Camera, Tape measure, First aid kit, Boots, Gloves
Visual Stream Survey	*Visual Stream Survey* manual and data forms, Camera, Tape measure (in feet), 8-10 ft. measuring stick, An orange or floating object, Calculator, Twine, Line level, Rebar, Pencil, Waterproof paper, Clear jar, Rubber hammer
Chemical Monitoring (Purchasing details found on the AAS website under Monitoring Resources)	Eye protectors, Boots, Gloves, First aid kit, Test kit for pH and dissolved oxygen, Thermometer, Conductivity meter, Waste container, *Chemical Data Form,* Equipment use directions
Macroinvertebrate Monitoring (Purchasing details found on the AAS website	D-frame or kick seine net, Buckets, Forceps, Spoons, Pipettes, Sorting trays, Macroinvertebrate key, Collecting jar with alcohol (optional),

under Monitoring Resources)	*Macroinvertebrate Data Form*
Bacterial Monitoring (Purchasing details found on the AAS website under Monitoring Resources)	*Bacterial Monitoring* manual and data forms, Whirl-pak® bags, Latex or vinyl gloves, Permanent marker, Cooler with ice, 3M™ Petrifilm™ plates, Fixed-volume pipettor with sterile tips, Incubator, Thermometer, Bleach or disinfectant, Watertight bag for sample disposal
Weland Monitoring	Focal plant ID book, Wetland survey forms, *Wetland Monitoring* manual and forms, Tape measure, Shovel, Soil color chart
Lake Monitoring	*Lake Monitoring* manual and forms, Secchi Disk, All equipment listed under Chemical Monitoring

Finding Local Partners

Local partners can help with the success of the project. They can offer technical advice, donate equipment, or facilitate access to the waterbody. Including partners will amplify the effects of a project throughout the community.

Examples of local partners:

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

Quality Assurance Certification

Georgia Adopt-A-Stream monitoring programs are aligned with the protocols outlined in our Quality Assurance Project Plan (QAPP) that was submitted and approved by the U.S. EPA. This plan is the core of our monitoring program, and it is essential that volunteers follow these protocols to ensure the collection of credible data. Volunteers who wish to ensure high quality data can become QA/QC certified. QA/QC certification is part of every

chemical, bacterial, and macroinvertebrate training workshop. Data collect under a QA/QC plan can be entered into the AAS database and is often used by local and state agencies to assess water quality conditions. Refer to the steps below to become a QA/QC volunteer for each monitoring protocol.

QA/QC Chemical Certification

1. Attend a QA/QC chemical monitoring workshop.
2. Demonstrate testing methods that achieve results within duplicate precision of those obtained by a certified Adopt-A-Stream trainer.
3. Pass the written test with a score of at least 80%.
4. Replace test kit reagents as they expire or become contaminated.
5. Re-certify annually to submit QA/QC data to the AAS database.

QA/QC Macroinvertebrate Certification

1. Attend a QA/QC macroinvertebrate monitoring workshop.
2. Demonstrate the ability to collect a macroinvertebrate sample.
3. Identify, with 90% accuracy, no less than 20 macroinvertebrates and calculate the water quality index.
4. Pass the written test with a score of at least 80%.
5. Re-certify annually to submit QA/QC data to the AAS database.

QA/QC Bacterial Certification

1. Attend a QA/QC bacterial workshop.
2. Demonstrate the ability to collect a bacterial sample.
3. Identify, with 90% accuracy, the *E. coli* counts and correctly calculate the *E. coli* levels of sample plates on the written test.
4. Pass the written test with a score of at least 80%.
5. Re-certify annually to submit QA/QC data to the AAS database.

QA/QC Trainer Certification

Georgia AAS has a trainer program for the chemical, macroinvertebrate, and bacterial monitoring programs.

Criteria for new trainers includes:

- At least one year of AAS QA/QC certifications and monitoring experience in the Train-the-Trainer workshop of interest or obtain approval from the AAS state staff.
- Attend a macroinvertebrate (6-hours), chemical (5-hours), or bacterial (4-hours) Train-the-Trainer (TTT) workshop and pass the field and written tests.
  - To attend a TTT, one must have already attended a QA/QC workshop and have working knowledge of biology, chemistry, microbiology, or a related field; and commit to conducting two workshops within a year.
  - TTT workshops cover what it means to be a trainer, how to conduct a workshop, and how to work with volunteers.

- After attending the TTT workshop, a new trainer must complete two co-trainings with another trainer who has been approved by the AAS state office.
    - These co-training courses count towards the two workshops that a trainer commits to do within a year.

A trainer must attend a TTT refresher course once per year for the macroinvertebrate, chemical, or bacterial programs (if they will be conducting workshops for any of the three). These courses review the field portion and require a written test.

Registering a Waterbody

It is important to register the chosen waterbody as soon as possible to the AAS database. The group and its leader will receive a notification email once it is registered. The AAS database is used by local and state agencies or by citizens wishing to learn more about their watershed.

Refer to the questions posed in the *Watershed Survey and Map Assessment* to form a clear picture of the chosen waterbody and determine the goals of the monitoring effort. These forms can be found on the AAS website under Data Forms.

Selecting a Site

There are four major types of water bodies commonly monitored: streams, wetlands, lakes, and coastal waters. Refer to the guidelines below when selecting monitoring sites from each:

General Guidelines

- Select a waterway meaningful to the monitoring group.
- Select a location with easy, safe, and legal access.
- Select a project that meets the monitoring goals.

Streams

Choose a stream that is meaningful to the monitoring group. Is there a particular stream of interest? Many communities study an entire watershed and monitor several sites. Comparing the effect of land uses on water quality can be interesting (sample upstream and downstream of a farm, urban area, construction site, etc.). If the community has a local AAS program, they may have mapped stream segments that need to be monitored.

Please ensure that the chosen site is safe and legally accessible. During a watershed survey, a monitoring point is chosen to represent the stream segment. From this location, visual surveys, chemical, macroinvertebrate, or bacterial monitoring will be conducted. Along with attending a workshop, program manuals are available on the AAS website.

Wetlands

Wetlands are less common than streams and creeks, so it may be useful to partner with landowners where wetlands are located or by contacting a government agency for permission to work on publicly owned land. One way to determine if a wetland is present is to purchase a WSGS topographic quadrangle of the area of interest. Another estimation of wetland location can be found on a National Wetland Inventory (NWI) map. These quadrangles correlate with the USGS topographic maps and are specifically made to identify and classify wetlands. Both the USGS and NWI maps can be purchased the State Geological Survey office in Atlanta. Learn more about wetlands on the AAS website or through the *Wetland Monitoring* manual.

Lakes

In Georgia, lakes range in size from small farm ponds to large reservoirs. There are many choices in Georgia for choosing a site to monitor. Most larger lakes have lake associations and/or citizen monitoring programs. Contact the Georgia Lake Society to determine if the chosen site has one of these programs. The Georgia Lake Society also provides workshops and technical assistance.

Coastal Waters

Georgia has approximately 90 miles of sandy beaches and 384,000 acres of estuarine wetlands along its 100 miles of south Atlantic shoreline. These sensitive ecosystems need volunteer assistance to assess their health. The Marine Extension Service has a *Coastal Adopt-A-Wetland* program geared towards helping volunteers assess water quality, monitor biological conditions, and assist with marsh diebacks or invasive species issues.

Determining a Name for the Waterbody

Many waterbodies are not named on any maps. If this is the case, contact the county or city water or utilities department and ask if they have named the waterbody. Some groups make up a name, but if this does not correspond to the name used by the municipality or State, it will be hard to associate this data with the appropriate waterbody.

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

Registering a Group and Monitoring Site(s)

The process of registering a group and a site is simple and can be done through the AAS database. First, register the group. A group can have as many sites as desired associated with it. For each site, locate the monitoring point on a map. Finding the site and its associate coordinates can be accomplished easily through the AAS database. Once registered, list all the participants in the group. Only the group leader can edit the group information. Maintaining updated group information helps keep track of group activities

and participant certification status.

Safety and Health

Safety and health of volunteers are of number one importance to Georgia AAS. There are several important things to remember when monitoring. Refer to the lists below to ensure a fun, enjoyable, and accident-free experience.

Before Visiting a Site:

- Develop an emergency plan
  - Include the site location, nearest medical center, medical conditions of team members, emergency contacts, who to call list, etc.
- Have an emergency plan prepared when taking a group
  - Who will go for help? Does anyone know CPR? Are there any allergies?
- Check weather reports
  - Stop monitoring if a storm blows in.
- Ensure there is safe and legal access to the site

Rules to Monitor by:

- Sites should be easy to wade through or accessible by a bridge
  - Do not monitor waters that are too deep to wade through
- If safety and comfort are in question, stop monitoring immediately and leave the site
- Monitor during base flow conditions
  - Do not monitor if the waterbody is at flood stage, fast moving water is very dangerous.
  - Never wade in swift or high waters and avoid steep banks as access points
- Do not go near the water if there is a strong chemical smell, a fish kill, or other dangerous conditions.
  - Leave immediately and report the condition to appropriate authorities.
- Never cross private property without written permission from the landowner
- Always bring the *Who to Call* list found on the AAS website under Monitoring Resources
- When sampling from a bridge:
  - Be vigilant about passing traffic. Vehicles may not see pedestrians getting in and out of a car – bridges are narrow.
  - Never lean over bridge rails without proper anchorage to the ground or a bridge with good hand/foot holds.
  - If walking under a bridge, watch for objects knocked off the road from overhead.
- Look for broken glass, poison ivy, ticks, bees, fire ants, or any other hazards
- Watch for snakes, alligators, and snapping turtles
  - Hit the ground and trees with a stick during the walk to the site to scare any creatures away.
  - Leave them alone, and they will leave you alone.

- Never drink the water
- Always wash and sanitize hands after monitoring
- Do not monitor if the water body is posted as unsafe for body contact
- Avoid touching face, mouth, and eyes when sampling and always wash hands before eating
- Wear plastic gloves and rubber boots if the waterbody is polluted or if its water quality is unknown
- Always monitor with at least one other person so someone can go for help in case of an emergency
- Always carry a first aid kit
- **If any of the following is observed at the site, STOP and refer to the *Who to Call List* (found on the AAS website under Monitoring Resources) for the best course of action:**
  - STOP! If there are closed or leaking drums near or in the water.
  - STOP! If there is a large quantity of dead fish or other organisms.
  - STOP! If there is a pipe discharging odd looking/smelling substances into the water.

Monitoring Areas with High Fecal Coliform Levels:

The following conditions warrant concern for high fecal coliform levels: heavy rain occurrence in the last 24 hours, muddy water, a leaking sewer line, and/or the presence of many animals in the water. If monitoring during these conditions, please take the following precautions:

- Avoid open or incompletely healed wounds encountering the water.
- Avoid swimming or other high contact activities for at least 24 hours after heavy rain or if water is obviously muddy.
- Do not disturb or stir up sediment.
  - There are higher survival rates of bacteria and other pathogens in sediment.
- Avoid high contact activities like swimming in areas where fecal droppings from wildlife are obvious, large numbers of wildlife are present (ducks, geese), or domestic/companion animals are in the waterway or on shore (cows, dogs, horses, etc.)
- Those with compromised immune systems should avoid primary contact activities in waters with elevated levels of fecal bacteria.
- Avoid contact with water for at least a week if recovering from gastrointestinal illness, especially children.

Health and Safety Contacts: Georgia Department of Public Health (404) 657-2700

Centers for Disease Control and Prevention 1 (800) 232-4636

Permitted Discharge Information

Industries and other discharges to the stream may be identified at the state, city, or county environmental protection of water quality office. These offices can provide records of industries with permits to discharge treated effluent to streams. These records are

maintained through the National Pollutant Discharge Elimination System (NPDES). All industrial and municipal discharges are required to have permits that specify where, when, and what they can discharge into United States waters. The EPD, Compliance and Enforcement Program maintain these records at their office. This information can also be found on the EPA Envirofacts website.

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

Make a Who to Call List

When monitoring, it is crucial to know who to contact if problems are discovered at the waterbody. Lists will differ between counties and cities; but State and regional numbers are available on the AAS website. Other numbers that may be added to this list are local contacts for erosion and sedimentation violations, storm water problems, sewage leaks, fish kills, or toxic spills. Contact the local government to complete the *Who to Call List* before monitoring. This will help find resolutions to any problems as they arise.

Inform the Local Government

All parties should work together as watershed stewards. Involving the local government can increase the projects' respectability and can establish a working relationship with those who can help protect the waterbody. Write an email to the mayor, council member, or city/county manager letting them know where the project is located, its goals, and why it is important.

Public Outreach

Public outreach is one of the most important activities for protecting Georgia waterways. Outreach and education help develop an awareness of the waterbody chosen. This provides an opportunity to educate others about the local waterbody, its potential threats, and how the community can protect it. We recommend conducting at least one outreach activity every year.

Most threats to a waterbody derive from the everyday activities of the community in which it resides. The first step towards reducing these threats is through education. From there, one must connect the links between their actions and the threatened waterbody. One then must decide that it is important enough to change behaviors and act.

Taking others through the process from education to action is not easy, but it can be done. Refer to the suggestions below for different community outreach techniques.

- Write letters to neighbors explaining efforts taken with Georgia AAS.
- Organize a Rivers Alive cleanup.
- Speak with the neighborhood association, garden club, or local school
- Add an article to the local newspaper
- Create an account or post from a personal social media account to highlight efforts

Sample Letter/Email to Inform Local Officials

February 25, 2006

J. Concerned Citizen 123 Watershed Plaza Streams, GA 30000

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

Dear Honorable Mayor Buggs,

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

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

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

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

We look forward to hearing from you.

Sincerely,

J. Concerned Citizen Ripple Rock Adoption Project

Sample Articles for Public Outreach

Adopt-A-Stream Group Surveys Beaver Creek

The West End Homeowners Association (WEHA) has completed a one year Adopt-A-Stream project on Beaver Creek. In partnership with the Johnson County Water Department and Georgia Adopt-A-Stream, the WEHA adopted a one-mile stretch of

Beaver Creek. The group completed a Watershed Walk, four visual surveys and four litter pickups. Results show the creek generally in good shape, although the group has reported two illegal dumping incidents to the county (which has sent out crews to pick up trash and is investigating the dumper).

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

WEHA learned a lot about Beaver Creek, the surrounding area, and how to help protect water quality. An example is keeping the area next to the creek natural so that this buffer area will protect the stream from pollutants that may wash into the creek during a storm. Also, watching how much fertilizer and yard chemicals are put out (especially near the stream) so that these chemicals will not wash into the water protects the stream. WEHA has sponsored a tour of the creek for other landowners and shared with them the efforts and desire for everyone to pitch in and help protect Beaver Creek. For more information about the WEHA Adopt-A-Stream project, call J. Concerned at 404- 555-1212.

Clear Creek Can Be Improved

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

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

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

Next, the Marshers are working with the City of Baldwin to plant trees and other vegetation where the streambank is eroding. The City has contacted property owners and

asked for their help to maintain the new plantings. The Marshers will check upstream and downstream of the newly stabilized streambanks to see if the plantings have decreased erosion. Finally, the students will send a letter to all the businesses in the industrial park to emphasize the importance of the creek. The letter will include some tips on how the businesses can help keep Clear Creek clean.

Sample Presentation Outline for Public Outreach

1. Introduction
    a. Describe the project – who is involved, what stream, what activities
2. Importance
    a. Why the stream is significant to volunteers and community
3. Results
    a. What was found during Watershed Walks, Visual Surveys, and Stream Litter Cleanups
4. Potential Improvement Activities
    a. What are some activities to try that can protect or improve water quality?

RESOURCES AVAILABLE ON THE ADOPT-A-STREAM WEBSITE

- Online water quality database
- Organizational and technical support
- *Getting to Know Your Watershed* manual* and workshop
- *Visual Steam Survey* manual* and workshop
- *Macroinvertebrate Monitoring* manual and workshop
- *Chemical Monitoring* manual* and workshop
- *Bacterial Monitoring* manual* and workshop
- *Adopt-A-Wetland* manual and workshop for freshwater wetlands
- *Coastal Georgia Adopt-A-Wetland* manual and workshop
- Rivers Alive *Guide to Organizing and Conducting a Cleanup*
- *Georgia Adopt-A-Stream: It All Begins With You* video
- Train-the-Trainer workshops
- Quarterly e-newsletters
- Information on Confluence, the AAS annual volunteer conference and award ceremony

*Available in Spanish