

Gwinnett County Watershed Protection Plan

■ Gwinnett County Watershed Protection Plan

Gwinnett County Watershed Protection Plan



prepared for

Gwinnett County, Georgia

prepared by



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in association with

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Executive Summary

Purpose

The purpose of this document is to present the strategy for protecting and enhancing watersheds and streams in Gwinnett County. The document fulfills the requirements of the Georgia Environmental Protection Division (EPD) for Watershed Protection Plans that support permitting of water withdrawals and National Pollutant Discharge Elimination System (NPDES) discharges (Reference: *Guidelines for Watershed Assessments for Domestic Water Systems*, Georgia EPD, Water Protection Branch, February 16, 1999).

In addition, this document meets the State's requirements for protection of small water supply watersheds such as Big Haynes Creek and the Alcovy River. Successful implementation of this plan will not only protect and improve the quality and appearance of Gwinnett County's streams, it will consequently enhance the quality of life for the residents of Gwinnett County.

The Watershed Protection Plan (the Plan) described in this document outlines the approach embraced by Gwinnett County for improving and protecting its streams. Implementation of the Plan may be a condition of future permits.

Results of Watershed Assessment

The results of the two-year Watershed Assessment and Modeling Project (the Project) indicated that the primary stressors on the streams in Gwinnett County are:

- Non-point source stormwater runoff from both stabilized developed lands and historic agricultural lands, along with accompanying changes in:
 - stream hydrology;
 - sediment transport and deposition; and
 - water quality.
- Clearing of riparian zone and stream bank vegetation, which:
 - reduces natural retention and filtration of surface flows and associated chemical constituents;
 - contributes to stream bank erosion, sediment deposition, and flashy stream conditions; and
 - reduces stream shading, thereby increasing water temperature.

The Project showed that if development continued in the historical mode (i.e., without changes in the approach to stormwater control), and in accordance with the County's *Comprehensive Land Use Plan*, the quality of streams in Gwinnett County would degrade

further. Also, as evidenced by the severe sedimentation observed in streams draining historic agricultural lands, many of which are now reforested, both the watershed and stream habitat must be rehabilitated to some degree in order to realize the desired improvements.

Approach

The Plan is therefore designed to address these stressors and protect the streams. In doing so the Plan must accomplish the following:

- **Changes in Hydrology:** Mitigate the changes in runoff volume and timing caused by developed areas;
- **Riparian Corridors:** Protect stream riparian areas and buffers to improve aquatic habitat and reduce stream temperatures; and
- **Water Quality:** Reduce the amount of pollutants released to streams via stormwater runoff.

In order to accomplish these objectives, the Plan includes three key components as illustrated in Figure ES-1 and as described below:

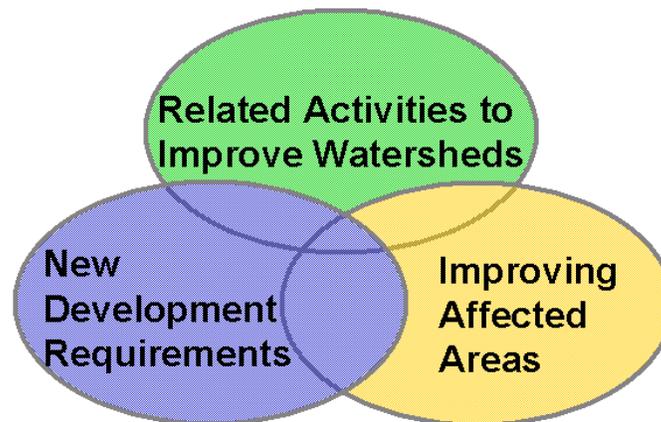


FIGURE ES-1
The Three Key Components of the Watershed Protection Plan

- **New Development Requirements** - The goal is to preserve and protect the current aquatic integrity of streams. Another way to express this goal is to state that through new requirements, new development must avoid further degradation of streams to the extent practicable.

The focus is on controlling the quantity, timing, and quality of urban runoff. This involves developing the county in ways that minimize effective imperviousness (sidewalks, pavement, and rooftops that drain directly to streams), as well as constructing structural best management practices (BMPs) to slow down the flow from

small and medium-sized storms (which cause the most negative impact on streams) and remove pollutants. These requirements also include protection of stream buffers and stream habitat. There are two key tools for meeting these objectives:

- First, a **Storm Water Quality Performance Review Form** and supporting computer tool guides the developer through the design process. The approach is performance-based, requiring a specific criterion for pollutant loading off of the site to be met, with built-in incentives to minimize impervious surfaces. The computer tool (an automated spreadsheet) automatically computes the site's loading, and provides options for implementing BMPs and comparing the revised loading rate to the criterion. An electronic version of the automated spreadsheet tool is available online at www.gcwshed.org, or on the County's website: www.co.gwinnett.ga.us/low/publicutilities.
- Second, the **Storm Water Design Manual** will efficiently coordinate with the stormwater quality requirements. In particular, the Manual focuses on hydrologic control and buffer protection, and provides the specific design criteria needed to ensure the assumed pollutant removal efficiencies.
- **Improving Affected Areas** - The goal is to enhance the aquatic integrity of streams. This means 'improve conditions' where practicable by retrofitting BMPs or redeveloping in a low-impact manner in the existing urbanized watersheds. The focus is on identifying opportunities in the heavily impacted, priority watersheds to:
 - retrofit or improve existing BMPs,
 - install new BMPs,
 - disconnect impervious areas, and
 - improve stream stability and habitat.

The approach presented herein is to prioritize key impacted watersheds, perform reconnaissance studies to identify and evaluate opportunities for improvement, and implement the recommendations.

- **Related Activities to Improve Watersheds** - The goal is to align roles and responsibilities within Gwinnett County (and related municipalities) to develop policies, programs and projects that result in less impact to streams while creating sustainable communities.

The focus is on bringing about change in the way we design our communities. This requires effective communication to promote watershed stewardship. This will only happen if there are changes in the way we regulate development and the supporting infrastructure. It will also take a broad understanding among the local governments, the development community, and the public in general, about best management practices - what they are, why they are needed, and how they can be practically accomplished.

These activities were identified in brainstorming sessions with the Citizens' Advisory Group, and were presented to the other responsible County departments for consideration and mutual coordination.

Small Water Supply Watersheds

Both Big Haynes Creek and the Alcovy River in Gwinnett County are classified as small water supply watersheds. There are specific requirements related to maximum percent imperviousness, buffer widths, and other activities in these watersheds. The state regulations allow development of alternative plans that are as protective or more protective of the watershed than the standard requirements. An alternative plan was previously adopted and implemented in the Big Haynes Creek watershed.

Gwinnett County is currently tasked with developing its protection plan for the Alcovy River Basin. The Plan outlined in this document is more stringent than the requirements for protection of small water supply watersheds. In order to enhance consistency and effectiveness of implementation, the requirements for the Alcovy Basin will therefore be the same as those for the remainder of the county. The County is currently evaluating whether to implement the same requirements in Big Haynes Creek watershed to form a consistent county-wide plan.

Long-Term Monitoring Plan

Monitoring is a critical part of implementing the Plan. The objectives of this monitoring are to:

- Detect long-term trends in the health of the county's streams and watersheds
- Document stream improvement
- Identify potential problems in a proactive manner
- Provide information for future model calibration refinement
- Provide the basis for improvements in the Watershed Protection Plan

The monitoring will be performed at 12 stations, and coordinated with monitoring for the NPDES MS4 program. Certain water quality parameters will be monitored continuously, while others will be monitored quarterly. Habitat and biotic integrity will be monitored every five years.

Implementation and Funding

The Plan includes approaches for mitigating the effects of new development on watersheds, provides a strategy for improving existing affected watersheds, and identifies additional activities that are consistent with and supportive of watershed protection. In order to implement these strategies, the following new or revised items will be required:

- County ordinances enacted by the Board of Commissioners
- Policies and procedures of County departments
- Outreach activities and cooperative agreements

Additional field studies, retrofit designs, and construction will also be performed. One critical aspect of the implementation is the proper coordination of changes in the *Storm Water Design Manual* with the approaches and tools included in the Watershed Protection Plan.

The Plan was developed with efficient yet effective implementation in mind. However, the efficient tools and integrated approaches proposed can reduce, but not eliminate, the need for additional funding. In particular, funding will be needed for improving affected areas, and for ensuring proper implementation of the requirements for new development and long-term monitoring.

It is important to also consider and quantify the ongoing operation, maintenance, inspection, staffing, and replacement costs associated with stormwater management in general, and watershed protection specifically. These costs should be considered in developing the long-term funding needs.

A number of funding options are summarized in Section 7, and Gwinnett's funding approach will consist of a combination of options. Some of the most promising options for equitably meeting the stormwater and watershed funding needs are the stormwater enterprise fund (stormwater utility), sales tax revenue, general obligation bonds, grants, and cost sharing with private entities or other governments.

Summary of Key CAG Divergent Opinions

The Citizens' Advisory Group (CAG) represented many of the diverse interests affected by watershed management in the county. Representatives of the following stakeholder groups participated on the CAG:

- Agricultural interests
- Businesses
- Developers
- Environmental interests
- Homeowners
- Industries
- Local governments

The purpose of the CAG was to:

- participate in learning about the Project and informing their respective stakeholder groups,
- provide feedback to the Project Team on strategies and technical approaches, and
- provide guidance to the Project Team to make the Watershed Protection Plan more effective and efficient.

The CAG was *not* tasked with reaching a consensus on issues, and all input was considered in the performance of the project and the development of the plan. Section 8 of this document presents some of the divergent opinions expressed by the CAG on key issues. The CAG's environmental representative has submitted a memorandum summarizing relevant issues, which is attached in the Appendix.

Introduction

Purpose

The purpose of this document is to present the strategy for protecting and enhancing watersheds and streams in Gwinnett County. The document fulfills the requirements of the Georgia Environmental Protection Division (EPD) for Watershed Protection Plans that support permitting of water withdrawals and National Pollutant Discharge Elimination System (NPDES) discharges (Reference: *Guidelines for Watershed Assessments for Domestic Water Systems*, Georgia EPD, Water Protection Branch, February 16, 1999).

In addition, this document meets the State's requirements for protection of small water supply watersheds such as Big Haynes Creek and the Alcovy River. Successful implementation of this plan will not only protect and improve the quality and appearance of Gwinnett County's streams, it will consequently enhance the quality of life for the residents of Gwinnett County.

Background

The Gwinnett County Watershed Assessment and Modeling Project (the Project) was initiated in early 1998 and completed in early 2000. The project was funded by three County departments: the Department of Public Utilities (DPU), the Department of Planning and Development, and the Department of Transportation. It included a number of tasks designed specifically to determine the health of streams in Gwinnett, and to facilitate the development of strategies for protecting and improving the streams. These tasks included:

- **Public Involvement.** A Citizens' Advisory Group (CAG) was formed to inform key stakeholders (environmental interests, developers, builders, homeowners, local governments, business/industries, and agricultural interests were represented) of the project and to obtain critical input consistently throughout the project.

In addition, informational presentations were developed and presented to interested civic and community groups in the region. Project web sites (www.gcwshed.org and www.co.gwinnett.ga.us/low/publicutilities/dep_plan.htm) were developed to provide an overview of the project and present summaries of the study results.

- **Watershed Characterization.** Watershed characterization is the determination of the health of the watershed. Watershed health is defined from three perspectives to provide a complete picture:
 - habitat,
 - biology, and
 - water quality.

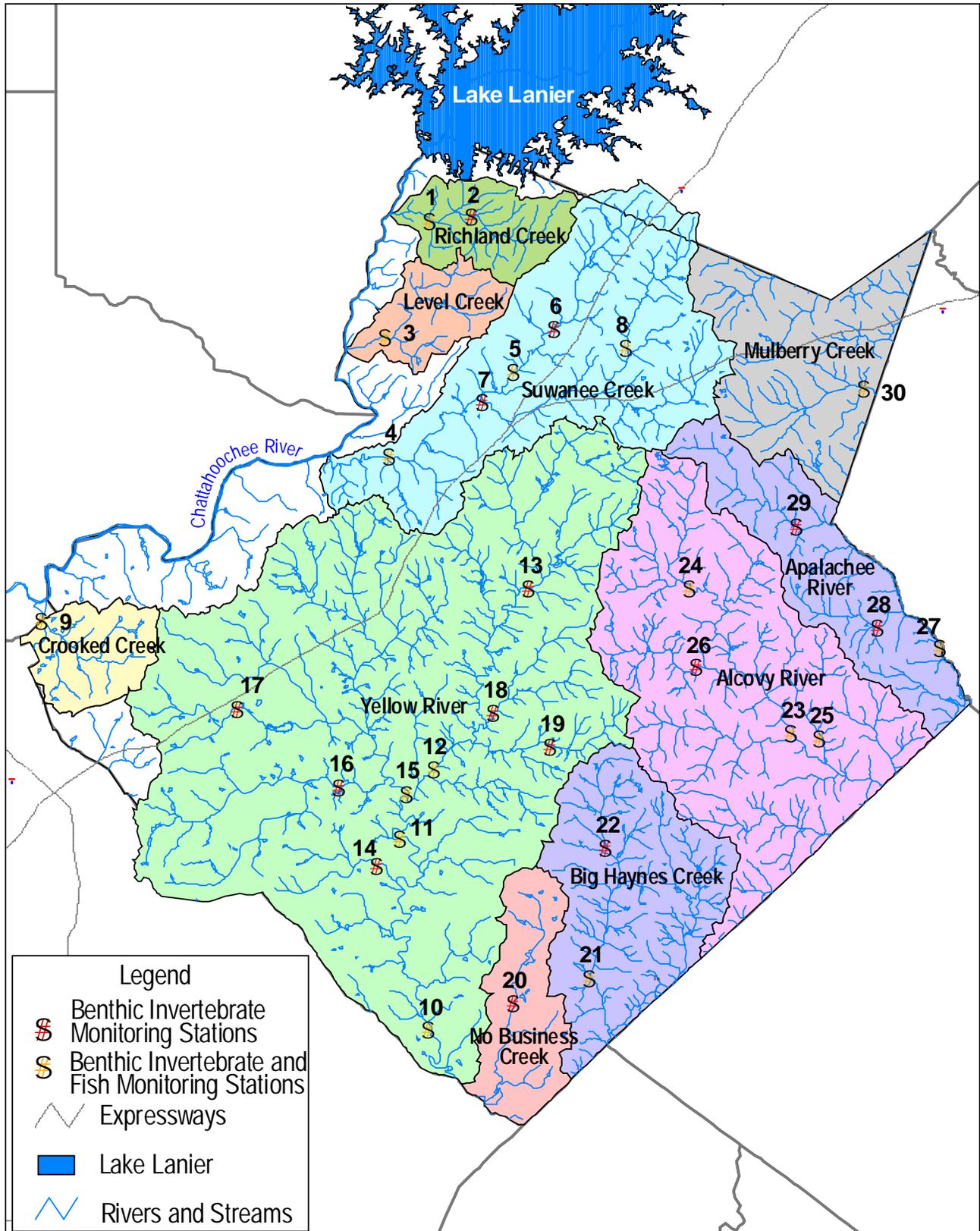
Existing data were collected and analyzed. Water quality samples were taken in both dry and wet weather conditions at 30 locations in the county. Habitat assessments were performed using standard protocols to determine the suitability of the stream for serving as a living space for aquatic organisms. Benthic macroinvertebrate (aquatic insect) sampling was performed using standard protocols and indices to measure biotic integrity. Fish sampling was also performed at a subset of the stations as a further measure of biotic integrity. Monitoring locations are shown on Figure 1-1. This information was formally analyzed to identify the key impairing issues in the watersheds, and to provide a framework for developing the strategy to protect the county's streams.

The analysis also provided valuable information on the relationship between hydrologic effects, water quality, habitat, and biology. For more information on the Watershed Characterization Task, refer to the *Chattahoochee Basin Impacts Assessment*, CH2M HILL, January 2000; and the *Oconee/Ocmulgee Basin Impacts Assessment*, CH2M HILL, January 2000.

- **Watershed Modeling.** Watershed modeling provides tools, in the form of computer models, to simulate the quantity and quality of water running off of the watershed and into the streams. The runoff can be modeled to show effects during different weather and rainfall conditions, for different land uses, and with different watershed protection and best management practices (BMPs).

The BASINS modeling framework developed by the U.S. Environmental Protection Agency (EPA) was used to model the watersheds across the entire county for both existing land use conditions and future (2020) land use conditions. For more information on the Modeling Task, refer to the *Watershed Model Calibration Technical Memorandum*, Tetra Tech, August 1999.

- **Watershed Protection.** Watershed protection is the implementation strategy for the Project. Using the results and recommendations of the Characterization and Modeling Tasks, the Watershed Protection Plan (as outlined in this document) provides the approach for improving and protecting the county's streams. Implementation of the Plan might be a condition of future permits.



CH2MHILL

Figure 1-1
Project Monitoring Stations

SECTION 2

Watershed Protection Approach

This section provides a road map for presentation of the study recommendations. To this end, it fulfills two purposes. First, it establishes a linkage to the recommendations arising from the previous impacts assessment studies. Secondly, it introduces the three components of an integrated framework for watershed protection.

Results of the Characterization Study

The results of the Characterization Study indicate that the primary stressors on Gwinnett County streams are:

- Non-point source stormwater runoff from both stabilized developed lands and historic agricultural lands, and the accompanying changes in stream hydrology, sediment transport and deposition, and water quality
- Clearing of riparian zone and stream bank vegetation, which reduces natural retention and filtration of surface flows and associated chemical constituents; contributes to stream bank erosion, sediment deposition, and flashy stream conditions; and reduces stream shading, thereby increasing water temperature.

The Project also showed that if development continued in the historical mode, and in accordance with the county's Comprehensive Land Use Plan, the quality of Gwinnett County's streams would degrade further. Also as evidenced by the severe sedimentation observed in streams through historical agricultural lands, many of which are now reforested, both the watershed and stream habitat must be rehabilitated in order to realize the desired improvements.

Recommendations Based on Results

The study results clearly show that the Watershed Protection Plan must:

- Mitigate the changes in runoff volume and timing caused by developed areas,
- Protect stream riparian areas and buffers to improve aquatic habitat and reduce stream temperatures, and
- Reduce the amount of pollutants released to streams via stormwater runoff from developed areas.

Key Components of the Watershed Protection Plan

The objective of this Watershed Protection Plan is to present a framework that will control runoff, reduce pollution, and protect streams. Achieving this vision requires integration of

the following three components, which are described in detail in the remaining sections of this Plan:

- **New Development Requirements** - The goal is to preserve and protect (and in some cases improve) the current aquatic integrity of streams. Another way to express this goal is to state that through new requirements, new development must avoid further degradation of streams to the extent practicable.

The focus is on controlling the quantity, timing, and quality of urban runoff. This involves developing the county in ways that minimize effective imperviousness (sidewalks, pavement, and rooftops that drain directly to streams), as well as construction of structural BMPs to slow down the flow from small and medium-sized storms (which cause the most negative impact on streams) and remove pollutants. The net effect is to disconnect runoff from impervious surfaces to the streams, so that it has time to infiltrate or at least slow down. These requirements also include protection of stream buffers and stream habitat.

- **Improving Affected Areas** - The goal is to enhance the aquatic integrity of streams. This means 'improve conditions' where practicable by retrofitting BMPs or redeveloping in a low impact manner in the existing urbanized watersheds.

The focus is on identifying opportunities in the heavily impacted, priority watersheds, and where practical to retrofit or improve existing BMPs, install new BMPs, disconnect impervious areas, and improve stream stability and habitat.

- **Related Activities to Improve Watersheds** – This is basically a cultural shift. We must realign roles and responsibilities within Gwinnett County (and related municipalities) to develop policies, programs and projects that result in less impact to streams while creating sustainable communities.

The focus is on bringing about change in the way we design our communities. This requires effective communication to promote watershed stewardship. This will only happen if there are changes in the way we regulate development and the supporting infrastructure. It will also take a broad understanding among the local governments, the development community, and the public in general, about best management practices - what they are, why they are needed, and how they can be practically accomplished.

Each of these components is the subject of a stand-alone section in this plan. The unifying theme is that the solutions to urban problems begin and end at individual development sites. Whereas cumulative negative effects can greatly harm a watershed, cumulative positive steps can protect it by minimizing water quality degradation. Hence, there is a need to gain political commitment to change the way that infrastructure is planned, regulated, and engineered. Through a science-based approach to setting watershed management objectives, the *Watershed Protection Plan* provides a context for such a paradigm-shift.

SECTION 3

New Development Requirements

There are currently many requirements placed on new development to protect the health, welfare, and quality of life of the residents of Gwinnett County. However, there are very few requirements focused on the protection of the quality of the county's streams from impacts associated with area development. These impacts are due primarily to altered hydrology, destroyed habitat, and increased pollutant loads.

The Gwinnett County DPU worked closely with a CAG to identify, develop, and evaluate options for mitigating the effects of new development on streams. What follows is a summary of these deliberations and DPU's resulting recommendations.

Basic Strategy

There are three basic strategies available in watershed protection: voluntary, proscriptive, and performance-based. Because performance-based strategies provide needed protection as well as maximum flexibility for the development community, the focus of this strategy is performance-based.

One benchmark for the Gwinnett County watersheds is the attainment of water quality standards. Water quality standards are defined as the combination of a designated use (e.g., fishing) and a criterion to protect that use (e.g., 5 mg/L dissolved oxygen). In most cases, the study indicated that the streams are meeting the criteria associated with the water quality standards. However, the aquatic life of a stream or waterbody is affected by all of the contributing stressors, including those during storm events that occur sporadically, are difficult to measure chemically, are not addressed by water quality criteria, and often produce significant degradation. This is common to many streams across the nation, and is a traditionally difficult problem to address.

Therefore, one approach is to focus on protection of the designated use. The benthic macroinvertebrate (aquatic insects), fish, and habitat results of the study provide a comprehensive assessment of 30 watersheds in the county. As an example, if the results indicate "good" biotic integrity for benthic macroinvertebrates (the scale ranges from very good to very poor), then the use is being protected.

The results of the characterization study indicated that the biological life and habitat in streams, as measured by fish, benthic macroinvertebrate, and habitat indices, is correlated with the total annual load of certain pollutants contributed to the stream. This pollutant load (or total number of pounds), when divided by the contributing drainage area, provides a measure of both the volume of stormwater runoff generated annually as well as the amount of pollution that it carries.

Key Pollutants and Development of Guidelines and Criteria

The CAG and DPU concurred that the goal for the county’s watersheds should be the “Good” range for the benthic macroinvertebrate index such that the designated use for the stream is being met. There was considerable discussion about whether the goal should be the upper or lower portion of the “Good” range. However, there was agreement and recognition that the benthic score for a watershed should remain a goal, and that in some heavily developed existing watersheds this goal might not be attainable. On the other hand, watersheds whose benthic score is higher than the goal would often be protected in order to remain well within the goal and thereby ensure protection of water quality.

Total suspended solids (TSS) is a key pollutant associated with sediment. It also serves as a “carrier” of other pollutants such as organics and metals, and is often used as a key parameter for sizing BMPs for protecting water quality. Therefore control of TSS was used as a surrogate for the most important pollutants which need to be controlled in order to meet the designated use and water quality standards in the stream.

The TSS loading rate was evaluated and considered as a key defining characteristic for the study watersheds. By plotting the benthic macroinvertebrate scores for each study station in the county on the y-axis against the corresponding TSS loading rate (in pounds per acre per year) on the x-axis, a relationship was developed to help guide the protection of watersheds (refer to Figure 3-1). Detailed information on the analysis of numerous pollutant parameters, biological data, and habitat data is found in the Impacts Assessment documents (*Chattahoochee Basin Impacts Assessment*, CH2M HILL, January 2000; and the *Oconee/Ocmulgee Basin Impacts Assessment*, CH2M HILL, January 2000).

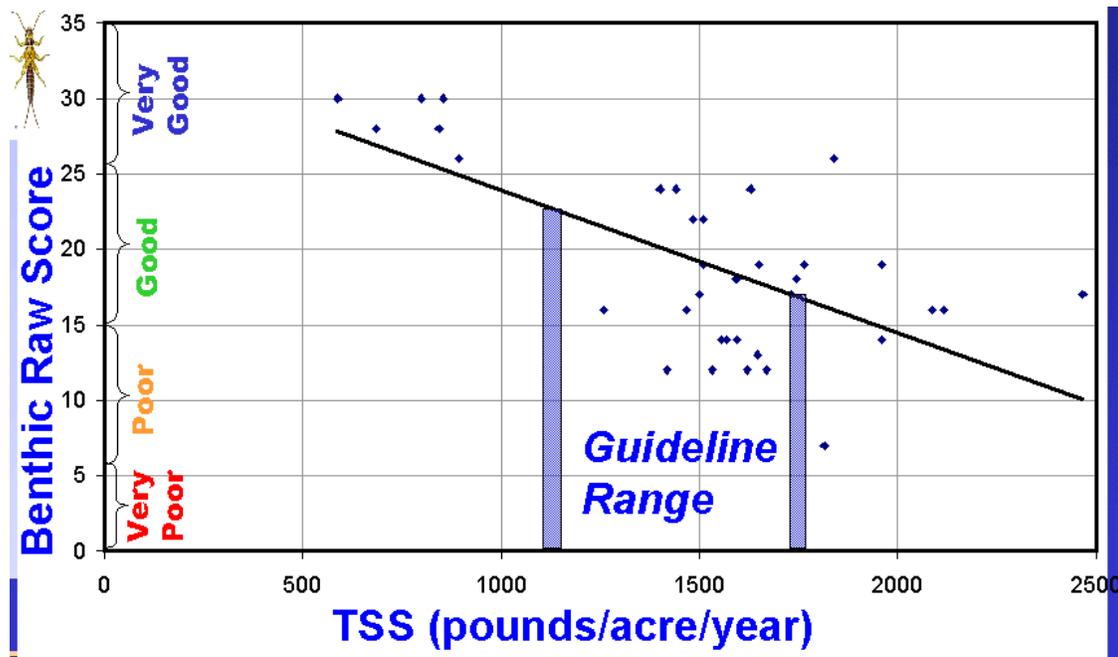


FIGURE 3-1
Development of TSS Guidelines

On an aggregate watershed basis, a range of TSS loading rates were discussed by the CAG and County staff as appropriate guidelines (supporting the “Good” biotic integrity goal) for the county’s watersheds. The guidelines discussed ranged from 1,100 lb/ac/yr to 1,600+ lb/ac/yr (Figure 3-1). The DPU staff recommendation is a guideline of 1,600 lb/ac/yr for county watersheds. Note that this guideline includes not only direct washoff of TSS from developed sites, but also the TSS load from the bed of streams resulting from increased flow due to changed hydrology (additional impervious surface) in the watershed.

This guideline is an aggregate value, and includes undeveloped areas, developing areas, and developed areas. The developed areas are not affected by new development requirements, except for the relatively small portion that is redeveloped in any year. Also, undeveloped areas that are projected to be developed under the 20-year comprehensive plan include state roads, bridges, and many other facilities and developments that would likely not be covered under the new development requirements. In order for new development to fulfill the objective of “minimize impacts” and protect and preserve water quality, the performance criterion for new development must be set well below the aggregate guideline for watersheds in the county, and closer to the estimated load from an undeveloped or sparsely developed site. Examples of the future (2020) total load from selected watersheds assuming a range of performance requirements for new development are shown in Table 3-1.

TABLE 3-1
Projected 2020 Watershed TSS Loads Under Various New Development Criteria

New Development Criteria (lb/ac/yr)	Total 2020 Watershed TSS Load (lb/ac/yr) (Assuming That New Development Meets Criteria at Left)			
	Suwanee Creek	Richland Creek	Alcovy River	Crooked Creek
600	1,443	1,699	1,449	2,423
850	1,524	1,777	1,530	2,466
1,000	1,572	1,823	1,579	2,492
1,200	1,637	1,886	1,644	2,526

Development Review Protocol and Tools

The project team developed a spreadsheet tool to facilitate evaluation of developments in accordance with TSS performance criteria (Figure 3-2). The tool was developed with the strategy of providing disincentives for installation of impervious surfaces, and incentives for leaving areas undisturbed.

The review protocol identifies four distinct types of land area on each site:

- **Impervious Area** – e.g., driveways, rooftops, parking lots, roads, sidewalks, etc.
- **Disturbed Pervious Area** – e.g., lawns, gardens, landscaped areas, porous pavement, any area that was cleared, grubbed and graded

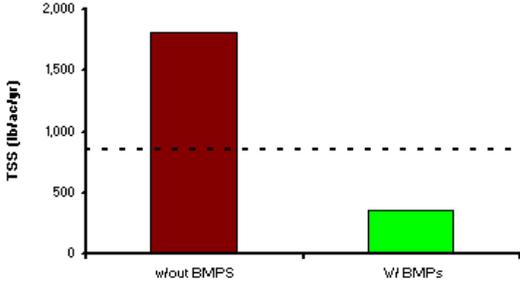
 DRAFT Gwinnett County Department of Public Utilities Stormwater Quality Performance Review Form			
Name of Developer:	John Johnson	Name of Engineer:	Joe Black, PE
Development Name:	Spring Trails	Tracking #:	12345
Development Type:	Single Family Residential	Date Submitted:	12/12/2000
Area of Development (ac):	40.00	<input type="button" value="BMP Distribution"/> <input type="button" value="BMP Efficiencies"/>	
Land Use Distribution & Pollutant Loads:			
Land Use Category	Area (acres)	TSS Rate (lb/ac/yr)	Avg Annual TSS Load (lbs)
Impervious Area (driveways, rooftops, parkinglots, etc)	10.00	4,000	40,000
Disturbed Pervious Area (lawns, gardens, porous pavement, etc)	25.00	1,200	30,000
Undisturbed Upland Area (woods, preserves, etc)	5.00	500	2,500
Undisturbed Stream Buffers	0.00	125	0
Totals	40.00		72,500
TSS Loading Rate w/out BMPs (lb/ac/yr):			1,813
TSS Loading Rate w/ BMPs (lb/ac/yr) :			352
TSS Criterion for New Development (lb/ac/yr):			850
Reviewed By:	Phil Wright, PE		
Date Approved:	02/12/2001		
Conditions of Approval:			
LEGEND FOR GRAPH:			
<input checked="" type="checkbox"/> TSS Load w/out BMPs <input checked="" type="checkbox"/> TSS Load w/BMPs <input type="checkbox"/> TSS Criterion for New Development			
			
BMPs Chosen:			
<input checked="" type="checkbox"/> Extended Detention Pond (Wet/Dry) <input type="checkbox"/> Vegetated Filter Strips <input type="checkbox"/> Dry Detention Pond <input type="checkbox"/> Infiltration Trenches <input checked="" type="checkbox"/> Constructed Wetland <input checked="" type="checkbox"/> Grassed Swales (2% slope, dam) <input type="checkbox"/> Sand Filters <input type="checkbox"/> Oil/Grit Separator			

FIGURE 3-2
Stormwater Quality Performance Review Form

- **Undisturbed Upland Area** – e.g., upland woods, meadows, and other areas not cleared, grubbed and graded
- **Undisturbed Stream Buffers** – e.g., riparian buffers contiguous to streams, lakes and wetlands in flood plain

A TSS loading rate was assigned to each area commensurate with its potential contribution to loading to the watershed (see Figure 3-3).

The sum of the products of the areas and their corresponding TSS loading rates represent the total uncontrolled load from the site. The approach is simple to use and encourages site design that takes advantage of the natural site amenities and minimizes impervious surfaces. The computerized spreadsheet form automatically calculates and graphs this value, and provides options for implementing BMPs on the site and designating the tributary drainage area to each BMP. The form compares the uncontrolled and controlled loading rates to the TSS criterion. This tool can be used iteratively in the site design process. It can be downloaded from the following Gwinnett County websites: www.gcwshed.org or www.co.gwinnett.ga.us/low/publicutilities.

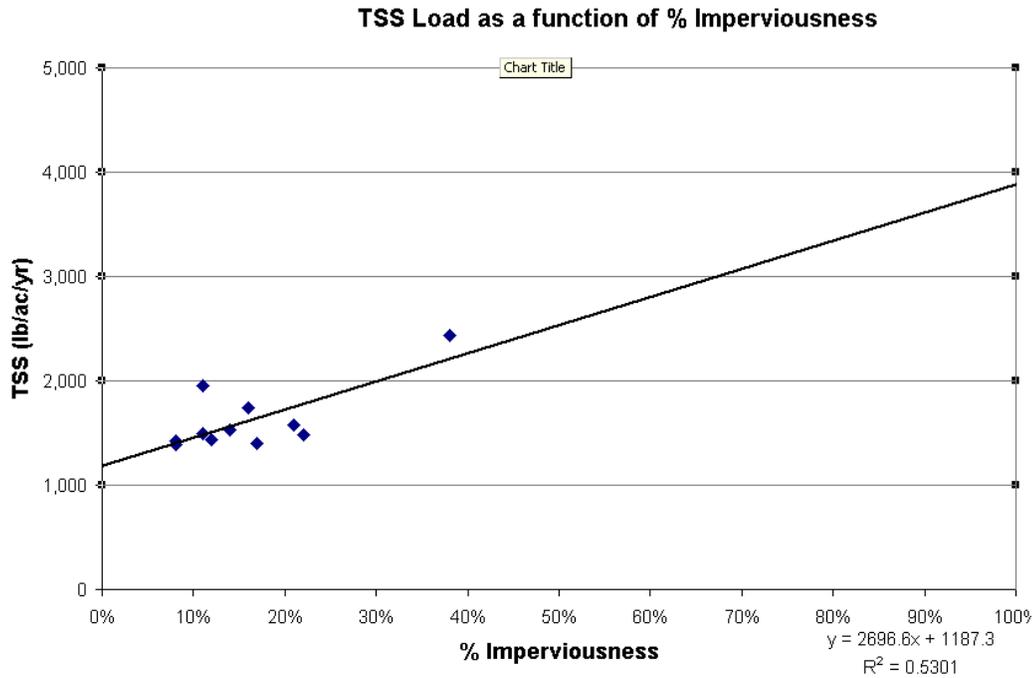


FIGURE 3-3
TSS Load as a Function of Percent Imperviousness

New Development Criterion

The project team evaluated, and reviewed with the CAG, actual sites that had been submitted for development review. Initially, six residential sites and four commercial sites were evaluated using the development review form. A comparison with the cost of existing (Stormwater Design Manual) requirements resulted in the following:

- Residential – depending on the specific characteristics of the site and design, ranging from \$0/ac to \$1,000/ac, or 0 percent to 20 percent of current water quality BMP cost.
- Commercial – depending on the specific characteristics of the site and design, ranging from \$0/ac to \$6,000/ac, or 0 percent to 30 percent of the current water quality BMP cost.

The CAG discussed a range for the New Development Performance Criterion from 600 lb/ac/yr to 1,200 lb/ac/yr based on the potential to prevent further significant degradation in the watersheds due to new development, and considering the potential costs for implementing the criterion. The resulting DPU staff recommendation was 850 lb/ac/yr as a balance among performance needed to protect streams, achievable performance as evaluated on real sites, and incremental cost of implementation.

SECTION 4

Improving Affected Areas

The previous section presented a criterion for new development, a tool for reviewing and evaluating developments, and an analytical framework for mitigating the impacts of new development on receiving water quality. Next, we build on the results of that analysis to address impacts originating from existing development. The focus is on identifying 'affected watersheds' and developing efficient and effective strategies for improving these streams.

Defining Affected Watersheds

An 'affected watershed' is loosely defined as a watershed where the biotic integrity (i.e., health of the aquatic communities) has already been compromised. Indicators of this include the indices evaluated as part of the study, and/or the estimated TSS loading rate in the watershed exceeding the proposed watershed guideline of 1,600 lb/ac/yr.

Approach for Improving Affected Areas

Within each of the watersheds in Gwinnett County, the focus in this section is on identifying urbanized areas that fall into one of two categories:

1. Could be re-developed in either the near or longer term future; or
2. Would require BMP retrofitting to reduce the overall TSS loading to meet the target guideline of 1,600 lb/ac/yr for the entire watershed.

A fundamental premise pertaining to the first category is that the "850 criterion" for new development will apply equally to both substantially improved re-development and new development. The objective in applying this criterion is to improve receiving water quality and protect aquatic habitat. Given this frame of reference, the remainder of this section focuses on addressing the second category, which may be summarized best as follows:

- Identify and prioritize affected watersheds
- Present an approach for watershed reconnaissance studies
- Suggest a timeframe for phased implementation of the reconnaissance studies

Each topic is the subject of a brief sub-section that provides a roadmap for implementation of this portion of the Watershed Protection Plan.

Guideline for Prioritization of Watersheds

Based on Pollutant Loading

Table 4-1 provides a starting point for prioritizing affected watersheds. The objective in this first level of screening is to identify those watersheds that would require retrofitting of water quality BMPs or other actions in the watershed to reduce the TSS loading rate below

the 1,600 lb/ac/yr watershed guideline. This step has involved application of the *WISE Model* to establish what percentage of the existing developed area within each watershed would need to be retrofitted. It must be emphasized that the 1,600 watershed guideline is but one indicator of potential watershed health.

TABLE 4-1
Watersheds Exceeding 1,600 lb/ac/yr Watershed Guideline

River Basin	Tributary Watersheds	Existing TSS Loading Rate (lb/ac/yr)	Projected TSS Loading Rate ¹ (lb/ac/yr)	Estimated Percentage of Existing Development Needing Retrofit
Chattahoochee	Richland Creek	1,738	1,777	20%
	Level Creek	1,959	2,016	35%
	Suwanee Creek	1,396	1,524	0%
	Crooked Creek	2,438	2,466	55%
	Other Direct Areas	1,582	1,626	0%
Ocmulgee	Alcovy River	1,430	1,530	0%
	Big Haynes Creek	1,492	1,562	0%
	No Business Creek	1,530	1,611	0%
	Yellow River	1,483	1,562	0%
Oconee	Apalachee River	1,388	1,475	0%
	Mulberry River	1,425	1,502	0%

Note:

¹ Using the new development criterion of 850 lb/ac/yr

Table 4-1 indicates that watersheds in the Chattahoochee Basin have been more affected by existing land development than those in the Oconee and Ocmulgee Basins. However, the TSS indicator only provides a partial picture of existing stream conditions. For watersheds that are not identified by the TSS criteria, biotic integrity indicators provide a more complete picture of stream health.

Considering the Chattahoochee Basin, and based on using the net land area requiring BMP retrofits as a ranking measure, the three affected watersheds are listed in a possible order-of-priority for remedial action as shown in Table 4-2.

TABLE 4-2
Chattahoochee Basin Estimated Net Land Area Needing Retrofit

Name of Tributary Watershed	Total Drainage Area (acres)	Estimated Net Area Needing BMP Retrofit (in acres and % of total area)
Crooked Creek	5,960	3,300 (55%)
Level Creek	5,670	2,000 (35%)
Richland Creek	6,810	1,400 (20%)

This first level of screening accounts for three of the eleven watersheds. One objective in considering TSS loading is to provide consistency with the water quality requirements for new development. For the other eight watersheds that were not projected to exceed the 1,600 guideline nor need BMP retrofitting, the next level of screening is keyed to the biotic integrity of stream systems.

Based on Biotic Integrity

Biotic integrity refers to the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms comparable to that of the natural habitat of the region. To evaluate biotic integrity in Gwinnett County streams, a biological monitoring program has been completed. This encompassed habitat assessments and biological community assessments of benthic macroinvertebrates and fish. These assessments involved application of a numbers-based rating system. Based on data analysis, the eleven stream systems are characterized as follows:

- **Chattahoochee Basin:** Habitat degraded by heavy deposition of sand and silt; lack of vegetative cover on stream banks; unstable, eroding stream banks; and pool substrates dominated by sand and mud.
- **Ocmulgee Basin:** Widespread habitat degradation related to sediment deposition, lack of bank vegetative protection, lack of riparian buffer zone vegetation, and lack of pool variability.
- **Oconee Basin:** The Mulberry River has been impacted minimally by recent human activities, whereas the Apalachee River has suffered severe habitat degradation (surmised to be attributable to historic intensive agricultural activity).

Altered landscapes, increased flow, and engineered channels have brought about changes in the structure and function of waterways. As shown in Table 4-3, these changes have typically occurred at comparatively low percentages of impervious area.

TABLE 4-3
Impacted Watersheds with Relatively Low Percent Imperviousness

Chattahoochee Basin Watersheds	Total Impervious Area		Other Watersheds	Total Impervious Area	
	Existing	Future		Existing	Future
Richland Creek	16%	22%	Alcovy River	12%	23%
Level Creek	11%	21%	Big Haynes Creek	11%	18%
Suwanee Creek	17%	32%	No Business Creek	11%	18%
Crooked Creek	38%	46%	Yellow River	23%	30%
Other Areas	21%	30%	Apalachee River	8%	17%
			Mulberry River	8%	21%

As evidenced by the severe sedimentation observed in streams through historical agricultural lands, many of which are now reforested, both the watershed and stream habitat must be rehabilitated in order to realize the desired improvements.

This observation is consistent with experience in other bioregions. Impervious area is typically a good indicator of stream health. Once the uncontrolled impervious percentage reaches 8% to 12%, for example, fisheries biodiversity and abundance may be initially and significantly impacted. The four primary factors affecting stream health are, in order of importance:

- **Changes in hydrology** - due to an increasing percentage of impervious ground cover
- **Disturbance of the riparian corridor** - due to removal of trees and natural vegetation
- **Degradation of aquatic habitat** - due mainly to erosion and sedimentation processes, including historical intensive agricultural practices
- **Deterioration of water quality** - due to pollutant loading from non-point sources

The paramount factor in stream degradation is *changed hydrology* associated with small, frequently occurring rainfall events. The consequences of those changes manifest themselves in the other three factors. Conversely, partially restoring the natural hydrology would limit TSS loading, stabilize the rate of watercourse erosion, and reduce sedimentation. In turn, this would result in protection of both aquatic habitat and beneficial uses of receiving waters.

Based on an Integrated Approach

Because TSS is a primary driver for most pollutants of concern, as well as a fundamental parameter for watershed and BMP modeling, it was been decided to base watershed improvement guidelines on the TSS-benthic relationship. Effective impervious area can be used as a complementary parameter for prioritizing watershed-based strategies.

Developing effective solutions to water quality concerns, flooding problems, and fish habitat degradation means that an integrated plan for watershed protection must address the root cause of problems, namely: **changes in hydrology due to changes in land use**. Underpinning an integrated approach is the distinction between 'total' and 'effective' impervious area. These terms are defined as follows:

- **Total Impervious Area (TIA)** - The fraction of a watershed covered by constructed, non-infiltrating surfaces (such as concrete, asphalt and buildings).
- **Effective Impervious Area (EIA)** - The non-infiltrating surfaces that have direct hydraulic connection to the downstream drainage (or stream) system. Excludes some paved surfaces that may contribute nothing to the rainfall-runoff response of the downstream system.

The proposed new and substantially improved re-development requirements outlined previously not only control TSS contributions in the watershed, but they also effectively reduce the EIA to protect the stream. Similarly, any retrofit effort should address both these factors and, where practical, reduce the EIA by providing “hydraulic disconnects” to partially restore natural stream hydrology.

Building on the foregoing, the suggested order-of-priority for a long-term plan to improve conditions in the eleven watersheds is presented below. For the purposes of establishing a starting point for analysis, it is assumed that the existing TIAs equal the Baseline EIAs. Based on experience, this is a reasonable expectation for TIAs in the range 8% to 12% (see Table 4-4).

TABLE 4-4
Basins Ranked by Effective Impervious Area

Rank	Watershed	Baseline EIA	Rank	Watershed	Baseline EIA
1	Crooked Creek	38%	7	Alcovy River	12%
2	Level Creek	11%	8	Big Haynes Creek	11%
3	Richland Creek	16%	9	No Business Creek	11%
4	Yellow River	23%	10	Apalachee River	8%
5	Other Chattahoochee Areas	21%	11	Mulberry River	8%
6	Suwannee Creek	17%			

Crooked, Level and Richland Creeks rank 1-2-3 because of the identified need to address the TSS issue as part of a consistent approach to setting watershed objectives.

Approach to Watershed Reconnaissance Studies

The over-arching goal in having a county-wide *Watershed Protection Plan* is to provide a sound basis for making informed watershed protection decisions and balancing economic growth with the long-term health of the county's streams. Given this framework, the next step in the process is to undertake a more detailed reconnaissance of each of the eleven watersheds. This will require a phased program to develop a set of individual Watershed Protection Plans. The objective will be to determine *how* to best achieve the over-arching goal.

Over the past two decades, the county has undergone many changes. New challenges have emerged. These challenges are driving the need for an integrated approach to watershed management and stream corridor protection. The component plans and synergies are illustrated in Figure 4-1.

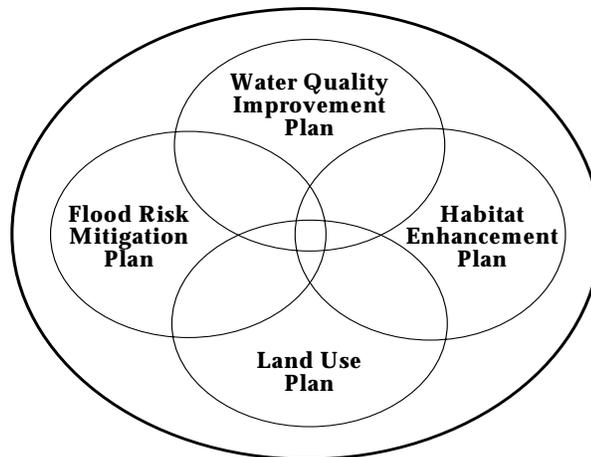


FIGURE 4-1
Integrated Watershed Protection Framework

The product resulting from integration of these four component plans is a *Watershed Protection Plan*. Through an integrated plan, the goal is to protect life and property, support profitable land use, and preserve and enhance the natural environment for the citizens of Gwinnett County to enjoy now and in the future. The primary objectives for an integrated plan are synthesized as follows:

- **Flood risk management** - Protect life and property by ensuring that the infrequent 'design flood' can be contained by the floodplain and the creek channels and passed by culverts and bridges.
- **Environmental risk management** - Prevent receiving water quality and stream corridor ecosystems from being degraded by the insidious consequences of frequently occurring small storms.

Gwinnett County has previously addressed flood risk management. Thus, the primary focus of the proposed watershed reconnaissance studies is to identify *achievable and affordable elements* of a comprehensive retrofit strategy. The strategy should mitigate *changes in hydrology* and improve *water quality* in existing developed areas. The strategy elements would comprise both water quantity and water quality BMPs. Again, it must be emphasized that mitigating changes in hydrology would reduce pollutant loading, and thereby have a corresponding beneficial impact on water quality.

Phased Implementation of Watershed Studies

A framework for a multi-year program is outlined as follows:

- **Year 1** - Complete the first plan as a pilot study to provide a template for the ones that will follow.
- **Years 2 through 10** – Undertake one or two plans per year, build on experience, and fine-tune the template.
- **Years 2 through 30** – Implement and construct the plans.

For the County's purposes in establishing a preliminary estimate of a program budget, it is suggested that the average cost per reconnaissance study would likely be on the order of \$200,000. The basic framework for performing the study is as follows:

- **Initial Reconnaissance**
 - Collect and evaluate existing data, maps, etc.
 - Plan field reconnaissance effort and strategy for specific subbasin.
 - Perform field reconnaissance and data collection.
 - Identify and summarize potential opportunities (BMPs needing retrofit, vacant or underutilized land, etc.).

- **Evaluation of Opportunities**
 - Evaluate opportunities based on predetermined criteria (e.g., capital cost, annual cost, effectiveness, public acceptance, ease of implementation, etc.).
 - Select opportunities for inclusion in the conceptual plan.
- **Development of Conceptual Plan**
 - Document conceptual plan for retrofit of subject watershed (include current and future levels of improvement desired if phased approach).
 - Develop planning level cost estimates for implementation of subwatershed plan.
- **Implementation of Conceptual Plan**
 - If necessary, generate detailed design documents.
 - Construct/implement retrofit plans.

Given that the retrofit strategy for each watershed must be achievable and affordable, the objective of the master planning process is to develop solutions that are realistically implementable.

SECTION 5

Related Activities to Improve Watershed Protection

The third category of watershed protection activities is not necessarily related to BMPs for new development, nor to restoration. It is comprised of more generic programs and ideas that could improve watershed protection and are under the control of more than one County department.

These related activities can be quite diverse, and often have only one thing in common: they provide a benefit to watersheds. In many cases, these activities are not in the domain of the Department of Public Utilities. The County did not make any commitment to implement these ideas. However, these ideas are valuable to consider in all future decision-making. A multi-departmental approach to understanding these activities will help improve interdepartmental coordination and eliminate duplicate efforts.

Input from CAG

Table 5-1 presents the results of an interactive brainstorming process involving the CAG and the Consultant Team. The CAG, which had diverse representation encompassing environmental interests, developers, builders, homeowners, local governments, business/industries, and agricultural interests, identified a host of 'watershed protection activities.' These were categorized in terms of eight issues listed below:

- **Issue #1** - Public Education/Awareness
- **Issue #2** - Land Use/Zoning
- **Issue #3** - Buffers/Habitat Improvement
- **Issue #4** - Residential Design Standards
- **Issue #5** - Erosion and Sedimentation Control
- **Issue #6** - Implementation and Enforcement
- **Issue #7** - Inter-governmental Coordination
- **Issue #8** - Funding

In general, the ideas encourage coordination of stormwater development review requirements, stormwater design manual requirements, and development regulations. Implementation of activities that increase public awareness about watersheds, encourage designs that minimize impervious surfaces, and generally protect stream riparian areas and reduce pollution is recommended.

TABLE 5-1
 Suggested Watershed Protection Ideas
 From Brainstorming Sessions of the Citizens' Advisory Group

Suggested Responsible Group	Type of Action	Ideas to be Considered	Coordination Indicated
Department of Public Utilities	Public Education Awareness	<ul style="list-style-type: none"> ● Establish an education program for streams and storm drains in existing developed areas, including an education program targeting businesses and home owners' associations and establishing volunteer educational programs; educate residents on proper use of fertilizers, pesticides and herbicides ● Encourage composting and bagging of leaves and clippings ● Appoint a citizen's advisory group with well-balanced representation to consider complaints concerning violation of ordinances, regulations, and other requirements protecting water quality and state waters, with the authority to make recommendations to the Board of Commissioners and to keep a public record of complaints and resolution, but with no authority to waive or enforce compliance or impose penalties 	
	Land Use/Zoning	<ul style="list-style-type: none"> ● Establish a county-wide program for preserving greenways throughout the county with minimal impervious surface and maximum natural vegetation, primarily along state waters, including streams, springs and wetlands, with incentives (in the TSS calculations and otherwise) that reward developers for widening and protecting stream buffers 	
	Buffers/Habitat Improvement	<ul style="list-style-type: none"> ● Evaluate, prioritize, and/or retrofit streambank restoration, wetland restoration, and wetland improvements for highly degraded subbasins ● Establish water quality goal improvement for existing development ● Develop specific criteria to justify reducing buffer size and/or obtaining a stream buffer variance ● Keep utility services from buffers except to the extent necessary and to be consistent with the basic goal of greenway and stream protection 	
	Pollution Prevention	<ul style="list-style-type: none"> ● Protect steel pipes from rusting 	DOT
	Implementation and Enforcement	<ul style="list-style-type: none"> ● Enforce mandatory septic tank inspections, paid for by property owners ● Revise stormwater regulations to match watershed recommendations ● Coordinate regulations for stormwater, water quality and stormwater discharge, placing under one county-level department 	Health Dept.
	Other	<ul style="list-style-type: none"> ● Develop load guideline trading within basins 	

TABLE 5-1 (CONTINUED)
 Suggested Watershed Protection Ideas
From Brainstorming Sessions of the Citizens' Advisory Group

Suggested Responsible Group	Type of Action	Ideas to be Considered	Coordination Indicated
Planning and Development	Land Use Zoning	<ul style="list-style-type: none"> ● Allow for conservation developments by zoning and development regulation flexibility, eliminating public hearing process as an incentive ● Create a new zoning category – Conservation Zone – with stricter protection measures but with incentives such as waiver of proposed stormwater utility fee or lower property tax rate ● Increase mixed use zoning which includes as a key requirement the reduction of impervious surface by allowing shared use of parking and preservation of open space ● Review zoning and development regulations: <ul style="list-style-type: none"> – to reduce the required number of parking spaces for specific uses to the extent the current regulations require excessive parking for uses such as churches or shopping centers while recognizing that other specific uses, such as restaurants and theaters require more parking – to require that a percentage of required parking (for predictable overflow parking) be pervious material 	
	Buffers/Habitat Improvement	<ul style="list-style-type: none"> ● Require disclosure by all rezoning applicants of location of state waters on tract in question and description of plans to protect stream buffers 	
	BMPs	<ul style="list-style-type: none"> ● Limit or reduce curb and gutter in subdivisions ● Encourage the use of pervious surfaces where possible 	DOT
	Erosion/Sedimentation	<ul style="list-style-type: none"> ● Monitor and enforce current E&S regulations to gauge effectiveness and ensure uniformity/consistency across departments ● Prohibit clearcutting for marketing land only ● Enhance incentives for effective E&S control measures in order to achieve compliance and watershed protection ● Require a plan for erosion and sedimentation control on each building site ● Enforce E&S regulations on builders 	

TABLE 5-1 (CONTINUED)
 Suggested Watershed Protection Ideas
 From Brainstorming Sessions of the Citizens' Advisory Group

Suggested Responsible Group	Type of Action	Ideas to be Considered	Coordination Indicated
Planning and Development (Continued)	Implementation and Enforcement	<ul style="list-style-type: none"> ● Encourage sidewalks and study ways to make them pervious ● Revise county ordinances and regulations to allow a stop work order or denial of a Certificate of Occupancy for any documented failure to comply with erosion and sediment control, stormwater and land disturbance permitting requirements. A bond should be required for any developer or land owner that has been cited twice in the last two years for noncompliance with such requirements ● Require a habitat restoration plan or development plan when land is clearcut 	DPU
	Other	<ul style="list-style-type: none"> ● Use the same development regulations throughout the county 	
Department of Transportation	Implementation and Enforcement	<ul style="list-style-type: none"> ● Establish a policy for state and county designed and constructed roads to use culverts to attenuate storm events by functioning as stormwater (detention) basins. Acquire adequate easement to contain the flood zone created by the construction ● No sizing of culverts to handle more than 25 year storms 	DPU
Senior Management	Implementation and Enforcement	<ul style="list-style-type: none"> ● Uniformly require compliance by all county departments (the Gwinnett Co. School Board, Dept. of Transportation, Parks & Rec. Dept., DPU), contractors, subcontractors, builders and developers who perform work on county and school board projects, to county ordinances, development regulations and other requirements (including the stormwater design manual, erosion and sediment control and stream buffer variance procedures) that affect water quality and stream protection 	
	Funding	<ul style="list-style-type: none"> ● Establish some type of funding beyond taxing new development ● Evaluate the effectiveness of stormwater utility fees ● Establish a Stormwater Authority 	
	Intergovernmental Coordination	<ul style="list-style-type: none"> ● Get cities to participate in and agree upon the Watershed Protection Plan recommendations ● Withhold services from cities that do not participate in the Water Protection Plan 	

Alignment of Roles and Responsibilities

An underlying theme is the need for alignment of roles and responsibilities within the County government to achieve shared goals for watershed protection. In addition, the related activities to improve a watershed can be categorized in terms of three cascading levels of decision-making:

1. Regional
2. Community
3. Site

Solutions to urban drainage issues begin and end at individual development sites. But changing the way that infrastructure is planned, regulated and engineered starts with a change in thinking at the regional level. Hence, the implicit purpose of a Watershed Protection Plan is to establish objectives that can be translated into achievable actions at the site level.

Watershed Stewardship

Many of the decisions about choice of BMPs require judgment—about public values and priorities, about the pace of change, and even 'judgment' about environmental conditions based on the currently available scientific information. Choices, especially, involve **balance** among competing objectives. The CAG represents a range of values; different stakeholders might give these values different emphasis. Table 5-1 is the product resulting from the CAG process. Once BMPs and watershed protection activities have been selected, it is natural to assume that the 'job is done'. Although the watershed plan may be largely complete, the watershed restoration job has just begun.

Related activities to improve watersheds will only happen if there is a broad understanding among the development community in particular, and the public in general, about BMPs—what they are, why are they needed, and how they can be practically accomplished. To create this understanding requires reaching a large number of people.

Public awareness will not be changed in a single event. There is a need for a 'stewardship communication initiative' that is designed to reach the spectrum of audiences in the watershed. This awareness program needs to allow for repetition and reinforcement over time. Effective communication—using a variety of media and series of events with increasing levels of detail—is fundamental to implementing watershed stewardship.

SECTION 6

Long-Term Trend Monitoring Plan

Overview

Over a two-year period from April 1998 to March 2000, Gwinnett County assessed its watersheds in detail. As part of this effort, 30 stations throughout the county were sampled for various water quality and biological parameters. The objective was to characterize the environmental health of the county's streams under current conditions.

Watershed models (BASINS/HSPF) were then used to simulate water quality under current conditions, and to project water quality under future land use conditions. Based on these results, the strategies for watershed protection outlined in the previous sections of this document were developed.

The purpose of this section of the Watershed Protection Plan is to outline Gwinnett County's approach to long-term trend monitoring in the watersheds. The objectives of this monitoring are to:

- Detect long-term trends in the health of the county's streams and watersheds
- Document stream improvement
- Identify potential problems in a proactive manner
- Provide information for future model calibration refinement
- Provide the basis for improvements in the Watershed Protection Plan

The plan is designed to meet the Georgia EPD's requirements for watershed monitoring following a watershed assessment, and may be referenced as a condition of the County's permits.

Monitoring Strategy

Monitoring is a critical component of any overall strategy for watershed management. It is also expensive and resource intensive. The monitoring strategy should meet the County's objectives, meet regulatory requirements, and provide a picture of whether county streams are improving or degrading over time. This can only be accomplished through efficient coordination of the various monitoring programs.

The basic strategy involves:

- Monitoring water quality continuously at several stations for basic parameters
- Monitoring water quality seasonally at the same stations for additional key parameters
- Monitoring habitat, benthic macroinvertebrates, and fish at those and additional stations approximately every five years

- Analyzing the data collected to look for statistically correlated relationships between continuously monitored parameters, additional key parameters, and biological data

Based on the monitoring data collected, experience gained in implementing the Watershed Protection Plan, and other factors, refinements will be made in the future to the Watershed Protection Plan.

Monitoring Locations

The intensive Watershed Assessment and Modeling Project monitored at 30 locations for water quality, habitat, benthic macroinvertebrates, and fish. The County currently monitors regularly at 6 locations as part of its NPDES MS4 program. The proposed monitoring plan adds 6 additional water quality monitoring locations (for a total of 12). Biological monitoring is planned for all 30 locations studied as part of the Watershed Assessment and Modeling Project. Figure 6-1 illustrates the monitoring locations. The locations represent a mixture of basins, basin sizes, land uses, and other factors.

Water Quality Monitoring

The approach to water quality monitoring is continuous (hourly) monitoring of certain parameters amenable to this frequency of monitoring (e.g., with the use of probes as opposed to sample collection and laboratory analysis). This monitoring is complemented by seasonal monitoring of key parameters requiring laboratory analysis.

Parameters

The parameters were chosen on the basis of the Watershed Assessment and Modeling Study results as either parameters of key impact on the watershed or parameters anticipated to provide important information related to the effects of changes in the watershed. For example, during the Watershed Assessment and Modeling Study metals levels were shown to be far below instream standards during both dry and wet weather conditions. Therefore these parameters were not included in the long-term monitoring plan.

By tracking trends and applying relationships developed between continuous parameters and seasonal parameters (to be investigated by the U.S. Geological Survey [USGS] as part of a 319 grant), these data can provide valuable information on the increasing or decreasing health of watersheds. Table 6-1 summarizes the parameters to be monitored and the method of monitoring.

Frequency

Annually, during each of the summer and winter seasons, a minimum of three samples will be collected during representative wet weather events, and one sample will be collected under dry weather conditions (for a total of eight samples per year), from each sampling location.

If the event is not captured (e.g., because of overly wet or dry conditions) in the assigned season, the sample should be collected as soon as practicable in the following season.

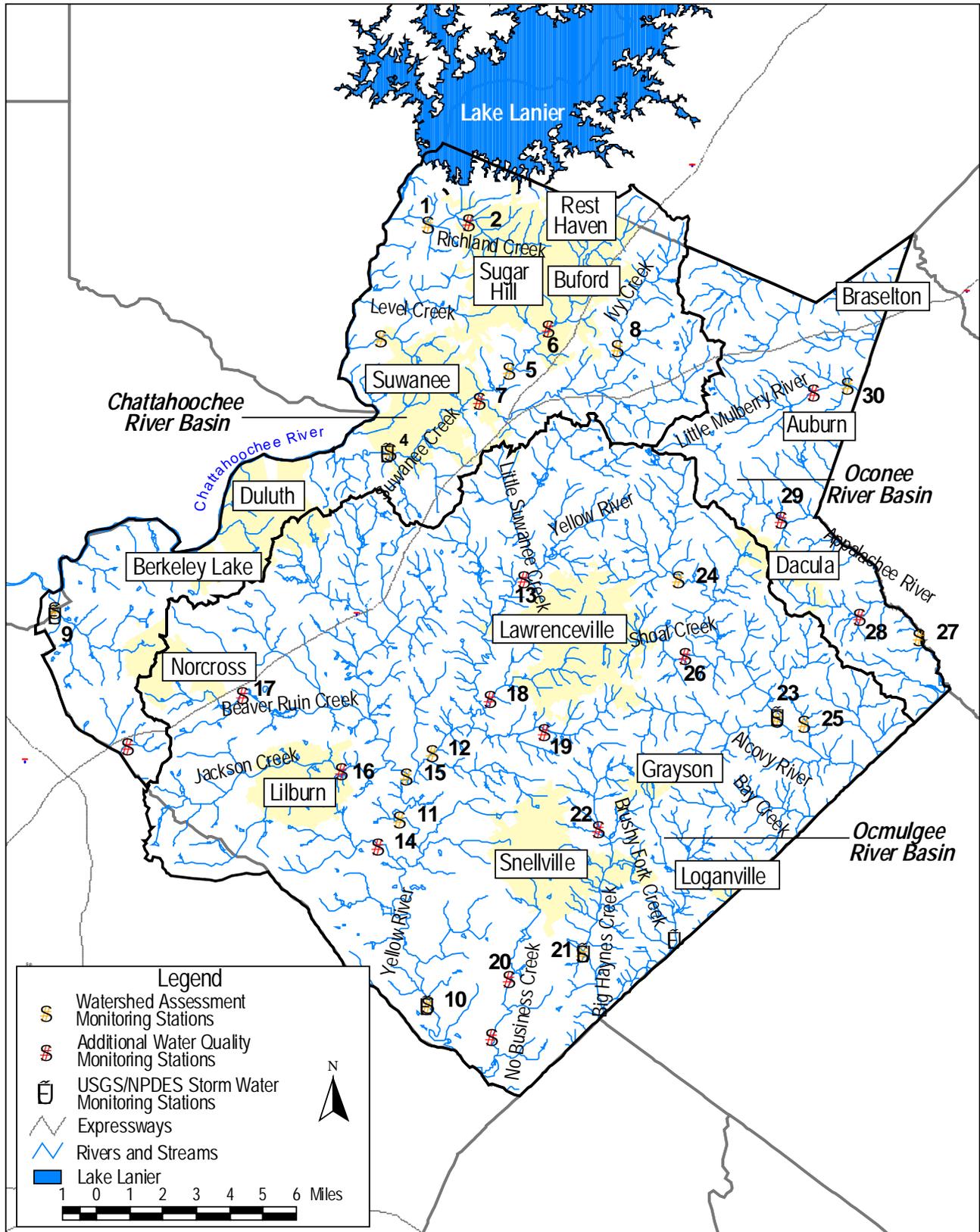


Figure 6-1
Proposed Monitoring Stations

TABLE 6-1
Water Quality Parameters—Frequency of Monitoring

Parameter	Continuous	Seasonal
Flow	✓	
Temperature	✓	
Conductivity	✓	
Turbidity	✓	
Rainfall	✓	
pH		✓
Dissolved Oxygen		✓
Total Organic Carbon		✓
Total Suspended Solids		✓
Total Phosphorus		✓
Total Nitrogen		✓
Fecal Coliform		✓

Protocol

Wet weather sampling events will be defined as samples collected after rainfall events with intensity of greater than 0.3 inch per hour. Dry weather sampling events will be defined as samples collected at a time preceded by at least 72 hours without rainfall of an intensity in excess of 0.1 inch per hour. Samples will be collected as either composite or grab, depending on the location and watershed characteristics and hydrograph response. Wet weather samples will be collected when the stream is obviously experiencing the effects of the runoff event. The QA/QC procedures used in the Watershed Assessment and Modeling Project regarding sample collection, sample blanks, sample handling, chain-of-custody, sample analysis, etc. will be followed at a minimum.

Biological Monitoring

The approach to biological monitoring is to sample and evaluate using industry standard metrics to identify trends in the health of the watershed. The Watershed Assessment and Modeling Project provided a comprehensive view of the biological health of Gwinnett County's streams, covering 30 stations throughout the county.

Parameters

The parameters were chosen to be consistent with the Watershed Assessment and Modeling Study. These parameters also provide a comprehensive picture of the biotic integrity of the watershed.

Under the long-term monitoring plan, the 30 selected monitoring locations would be monitored for the following to detect trends in biotic integrity and assess the streams' status relative to the "fishing" use designation:

- Habitat
- Benthic macroinvertebrates
- Fish

Frequency

Biological communities integrate the cumulative effects of changes in not only water quality but also all other activities in the watershed. Biological monitoring will be conducted once every five years at each station for habitat, macroinvertebrate communities and fish communities.

Protocols

Biological monitoring and analysis will follow Georgia Department of Natural Resources Standard Operating Procedures as specified in the Georgia Rapid Bioassessment Protocol (GARBP).

Other Supporting Monitoring Strategies

Adopt-a-Stream Program

Performed annually, Adopt-a-Stream programs are often very useful for developing citizens' understanding of water quality issues while providing periodic clean-ups of specific streams or stream segments. Other communities in Georgia have implemented Adopt-a-Stream programs that have immediate and continuing benefits to water quality and stream health.

The County has an award-winning Adopt-a-Stream program administered by staff. Local groups and individuals provide the volunteers needed to conduct the periodic clean-up efforts. These clean-up efforts, often conducted semi-annually, provide another surveillance mechanism to identify potential problems (illicit discharges or habitat degradation) before they become a major concern.

Reporting and Adaptive Management

Brief summary reports presenting the results of the monitoring will be prepared as required and submitted to the Georgia EPD as part of the NPDES MS4 report.

Once every five years, as part of the MS4 annual report, a summary report will be prepared and submitted to Georgia EPD documenting the successes of, and recommended improvements to, the Watershed Protection Program. Based on the results of this report, the County will re-evaluate the Watershed Protection Program and make recommendations for adjustments to the program to help attain the watershed improvement goals.

Monitoring the effectiveness of watershed protection strategies, and making adjustments as understanding grows, is the essence of an 'adaptive approach' to watershed stewardship. The operational foundation of an adaptive approach is periodic environmental assessment, using modeling to predict outcomes, and monitoring to test the predictions.

Watershed Hydrology

The focus of the current monitoring strategy is on water quality and biological parameters. However, the program also includes a rainfall and flow monitoring program. This information not only supports calibration of watershed simulation models, it also provides valuable information for interpreting the water quality and biological data. This information is also an integral part of the ongoing update and improvement of the *Storm Water Design Manual* to integrate stormwater quality requirements with hydrologic criteria.

Implementation and Funding

Overview

The strategies for protection of Gwinnett County's watersheds, developed as part of the Watershed Assessment and Monitoring Project, must be efficiently implemented.

The purpose of this section of the Watershed Protection Plan is to outline how Gwinnett County proposes to implement and fund these activities. The objectives in advancing an 'implementation plan' include:

- Detect long-term trends in the health of the county's streams and watersheds
- Document stream improvement
- Identify potential problems in a proactive manner
- Provide information for future model calibration and refinement
- Provide the basis for improvements in the Watershed Protection Plan

The Plan is designed to meet the Georgia EPD's requirements for watershed protection, and for inclusion by reference in the County's water withdrawal and/or NPDES discharge permits. In doing so it includes approaches for mitigating the effects of new development on watersheds, provides a strategy for improving existing affected watersheds, and identifies additional activities that are consistent with and supportive of watershed protection.

In order to implement these strategies, the following new or revised items will be required:

- County ordinances enacted by the Board of Commissioners
- Policies and procedures of County departments
- Outreach activities and cooperative agreements

In addition, supplementary field studies, retrofit designs, and construction will be performed. One critical aspect of the implementation is the proper coordination of changes in the *Storm Water Design Manual* (Ogden/Gwinnett County, 1999) with the approaches and tools included in the Watershed Protection Plan.

County Ordinances

The items in Table 7-1 may require action by the Gwinnett County Board of Commissioners. They are listed in descending order of priority, with a projected schedule shown in parentheses. Note that this schedule projection is an estimate and is subject to change.

TABLE 7-1
Items That May Require Action by the Board of Commissioners

Priority	Description of Required Action	Schedule
1	Acceptance of this county-wide Watershed Protection Plan	3Q-2000
2	Acceptance of final watershed protection plan for the Alcovy River small water supply watershed and submittal to Georgia EPD and the Georgia Department of Community Affairs (DCA) for approval	4Q-2000
3	Approval of development regulation changes (if needed) related to implementation of the Plan including those related to the following interrelated criteria: a) extreme flood, b) overbank flood protection, c) channel protection, and d) water quality	1Q-2001
4	Approval of budget, including necessary funding for implementation of Plan	1Q-2001 & ongoing

Policies and Procedures of County Departments

The items in Table 7-2 may require revisions to the policies and procedures followed by various departments of Gwinnett County government. They are listed in descending order of priority, with a projected schedule shown in parentheses. Note that this schedule projection is an estimate and is subject to change.

TABLE 7-2
Items That May Require Revisions to County Policies/Procedures

Priority	Description of Policy & Procedure Revision	Schedule
1	Final version of Storm Water Quality Performance Review Form and supporting computer spreadsheet tool with integrated instructions	3Q-2000
2	Final version of Storm Water Design Manual incorporating changes for seamless implementation with the Watershed Protection Plan	4Q-2000
3	Revisions to development and planning procedures and review requirements supporting revisions to development regulations	4Q-2000

Outreach Activities and Cooperative Agreements

The implementation of the Plan will be enhanced by educating targeted stakeholder groups, as well as the general public, on the reasons for and importance of watershed protection. The activities listed in Table 7-3 are planned to facilitate successful implementation of the Plan. They are listed in descending order of priority, with a projected schedule shown in parentheses. Note that this schedule projection is an estimate and subject to change.

TABLE 7-3
Schedule for Outreach and Cooperation Activities

Priority	Description of Outreach Activity	Schedule
1	Presentation of Plan to Watershed Assessment and Modeling Project Citizens Advisory Group	1Q-2000
2	Presentation of Plan and proposed associated development regulations changes (summarized in Issues Paper) to Council for Quality Growth	1Q-2000
3	Presentation of Plan to Gwinnett County Development Advisory Committee	1Q-2000
4	Presentations and training workshops for engineers and developers on practical application of the new requirements and use of the supporting tools	3Q-2000
5	Presentation of Plan and associated development regulation changes to Gwinnett County Development Advisory Committee	1Q-2000
6	Multiple presentations to Gwinnett County municipalities' planning staffs and elected officials	3Q-2000
7	Watershed Assessment and Modeling Project web site	1Q-2000

Improving Affected Watersheds

The strategy for improving affected watersheds is described in Section 4 of this Plan. The schedule for implementation is summarized below. More detailed schedules and associated budgets will be developed concurrently with the reconnaissance studies and the development of the Capital Improvements Plan (CIP) as part of the Department of Public Utilities' annual budgeting process.

- **Year 1** - Complete the first plan for a pilot watershed to provide a template for the ones that will follow.
- **Years 2 through 10** - Undertake one or two plans/watersheds per year, build on experience, and fine-tune the template.
- **Years 2 through 30** - Implement and construct the plans.

For the County's purposes in establishing a preliminary estimate of a program budget, it is suggested that the average cost per reconnaissance study would likely be on the order of \$200,000.

Given that the retrofit strategy for each watershed must be achievable and affordable, the objective of the master planning process is to develop solutions that are realistically implementable.

Funding Options

The Plan was developed with efficient yet effective implementation in mind. However, the efficient tools and integrated approaches proposed can reduce, but not eliminate, the need for additional funding. In particular, funding will be needed for improving affected

areas, ensuring proper implementation of the requirements for new development, and long-term monitoring.

It is important to also consider and quantify the ongoing operation, maintenance, inspection, staffing, and replacement costs associated with stormwater management in general and watershed protection specifically. These costs should be considered in developing the long-term funding needs.

Sources of Capital

It is often useful to characterize sources of capital in two broad categories: internal funding and external funding. Although a number of different categories could be used and some alternatives could be discussed in more than one category, this two-category framework is practical for evaluating the available financing alternatives.

Internal Funding

There are four sources of internal funding, namely:

- Stormwater Management (User Fee) Enterprise Fund (Stormwater Utility)
- Revenue Bonds
- User Fees
- Net Utility Revenues

Stormwater Management (User Fee) Enterprise Fund (Stormwater Utility)

A stormwater management enterprise fund can be one of the most equitable sources of funding to meet the needs of the Watershed Protection Plan. Activities that could be funded by the enterprise fund include the control of stormwater runoff, restoration of streams, maintenance and repair of drainage systems, construction of projects to minimize flood hazards and non-point source pollution, water quality monitoring, and many other activities that are outlined in the watershed management plan. Property owners would pay a fee based on the stormwater services required of the County due to runoff from their properties. This requirement is commonly measured by the amount of impervious area they own.

Billing is typically divided into two categories: residential properties and nonresidential properties. Residential units are charged a fee depending on the classification of the dwelling; for example, single family homes pay more than a townhouse or condominium. Nonresidential property owners pay a fee based on the ratio of their impervious area to that of the typical single family residential property. Impervious area is directly measured using GIS or some other tool. Fee adjustments and credits are sometimes available for water management controls that are implemented onsite by the property owner or by participating in programs related to public education, pollution prevention, or Adopt-a-Stream/Pond.

The first step in the development of a stormwater management enterprise fund is to conduct a feasibility study. The study should include the following:

- The funding requirements of the proposed stormwater management program including capital improvement projects, maintenance activities, engineering activities, and funds needed for the preparation of the NPDES stormwater permit applications.

- The customer base and rate structure should be well defined. A pilot study may be necessary to determine the size of the base unit, which is the total impervious area of a typical single family residential property in the county. It may also be necessary to evaluate a range of potential revenues provided based on different rates for the base unit.
- Alternative billing system options should be analyzed. The most typical systems involve sending bills accompanying water/sewer bills, and accompanying annual property tax bills.
- Organizational or ordinance requirements required for the implementation of the stormwater management enterprise fund.

Revenue Bonds

Revenue bonding is the most common form of financing significant capital improvements for water and wastewater utilities in Georgia. Revenue bonds for water and wastewater system projects rely on the revenues from water sales and wastewater services to repay the bondholders. Municipal governments are able to raise funds at advantageous rates due to tax-exempt status of interest earnings from municipal bonds. Revenue bonding is the most common approach to financing projects that will reliably produce significant revenues.

External Funding

General Obligation Bonds

General obligation bonds are backed by the general resources of the community, including revenues from taxes, fines, fees, and other sources not previously obligated. General obligation bonds normally receive a better credit rating than revenue bonds, resulting in even lower interest costs to the community. This is because of the higher level of confidence among bond purchasers that they will be paid an interest return on their investment, that the principal of the investment will be safe, and that the principal will ultimately be repaid. This confidence results from the fact that general obligation bonds are backed by the general assets of the community rather than just utility revenues. A disadvantage of general obligation bonds is that a municipal government's bonding capacity is limited by state statute. General obligation bonds would have applicability to capital improvements projects in the watershed protection plan.

Sales Tax Revenues

Georgia law permits a special sales tax to be imposed by local referendum and to be collected in a defined area for defined uses. Some of this revenue may be available for infrastructure improvements as part of a Watershed Management Plan if it is specified in the enabling referendum. However, the legal requirements for using sales tax revenues include approval by voters through a referendum.

Cost Sharing

A government's cost of capital improvements may be shared with businesses or other governmental entities that stand to gain substantial benefits from the improvement. It is not uncommon for manufacturing enterprises to provide partial capital funding for improvements designed to provide services to their facilities. The County should be alert

to the potential for opportunities to share costs with local governments, manufacturing facilities, and developments.

Direct Loans

Low-interest loans are available through the Georgia Environmental Facilities Authority (GEFA) and Georgia's State Revolving Fund (SRF). Low-interest loans could reduce the overall cost of utility projects and also make funding capacity available for other projects.

Other direct loans may be acquired through the banking industry. Some banks lend money at favorable rates to local governments for projects that will improve the community and its economy. In many cases, such loans are secured by pledges of revenues—the same method used for revenue bonds. An advantage of acquiring direct loans is that the financing cost can sometimes be lower.

Grants

Grant programs can provide funding for small projects, often as demonstration projects, economic development projects, or projects that benefit disadvantaged neighborhoods. Various federal agencies have grants for monitoring environmental conditions, enhancing habitat, encouraging community programs, and other specific programs. The State of Georgia has special grants, such as the Governor's Emergency Grant Program, which could provide capital improvements monies under some conditions. Such special grants may be identified through contacts with state and federal agencies. For example, Gwinnett County was recently awarded a 319 grant by the State to perform specific watershed monitoring activities.

Ad Valorem Taxes

Ad valorem taxes have provided funding for public works projects in the past. One advantage of ad valorem taxes for citizens is that such taxes are deductible on federal and state income taxes, whereas utility services charges are not. Use of ad valorem taxes could result in lower total expenditures for property owners.

Assessments

Georgia law permits governments to place assessments on selected parcels of property to collect funds for a particular capital project that will benefit the identified parcels. Georgia law specifies the procedures for instituting assessments on properties for public works projects, and legal guidance is needed to establish an assessment program. Care must be taken in the crafting of an assessment program to assure that the benefit of the capital improvement is linked to those who will pay the assessment.

SECTION 8

Summary of Key CAG Divergent Opinions

Overview

The purpose of this section of the Plan is to capture some of the divergent opinions expressed by the CAG on key issues. The CAG was *not* tasked with reaching a consensus on issues, and all input was considered in the performance of the project and the development of the Plan. Therefore, the recommendations contained in the Plan are those developed by the County staff with the benefit of the CAG's input. In many cases the staff's recommendations were largely mirrored by the opinions expressed by the CAG. In other cases, the CAG expressed divergent views among the many groups represented.

The CAG

The CAG represented many of the diverse interests affected by watershed management in the county. Representatives of the following stakeholder groups participated on the CAG:

- Agricultural interests
- Businesses
- Developers
- Environmental interests
- Homeowners
- Industries
- Local governments

The purpose of the CAG was to:

- Participate in learning about the Project and informing their respective stakeholder groups,
- Provide feedback to the Project Team on strategies and technical approaches, and
- Provide guidance to the Project Team to make the Watershed Protection Plan more effective and efficient.

Summary of Several Key Issues

The following key issues were discussed by the CAG, with divergent opinions expressed by the CAG members.

Stream Buffer Requirements

Stream buffer requirements were discussed in both the CAG meetings and in a separate subcommittee meeting. The proposed new development requirements (refer to Section 3

of the Plan) include significant incentives to minimize imperviousness and leave areas undisturbed, particularly areas near streams. Some members of the CAG expressed the opinion that expanding stream buffer requirements beyond those currently in place would be a double burden, and that the new development requirements' incentives would be more than sufficient to increase stream buffers in a flexible manner. They were also interested in seeing additional flexibility in the stream buffer requirements, primarily related to viewing the buffer as a total width (to deal with real world topography) rather than as a strict limitation from each individual stream bank.

Other members of the CAG disagreed with some of these opinions. They argued for several reasons that stream buffers were so important to stream integrity and water quality that an additional "safety net" was needed to ensure that adequate stream buffers were protected. Stream buffers provide a natural and aesthetic means of protecting stream habitat and improving water quality, with lower maintenance than traditional BMPs. Concerns were expressed that TSS loading rates assigned to stream buffers (125 lb/ac/yr) are not sufficiently precise, and may overestimate the actual load reduction to the stream. Therefore the benefits of the stream buffer related to pollutant loadings may be overstated because the actual increase in pollutant loading may be greater than that (125 lb/ac/yr) allocated to the stream buffers.

Also of concern was the issue that these procedures for new development have not yet been implemented and therefore there is uncertainty about how effective the built-in incentives for preservation of stream buffers actually will be in practice. In summary, a call was made by these CAG members for minimum stream buffer widths greater than 25 feet, and for additional evaluation of stream buffers TSS load and removal rates using monitoring data as opposed to computer simulations.

After consideration of the information discussed, the staff recommended generally as follows:

- Maintain the minimum stream buffer width of 25 feet for most county streams.
- Implement the proposed new development requirements with significant incentives to preserve additional stream buffers beyond the minimum requirements.
- Maintain the larger minimum stream buffer widths (up to 100 feet depending on drainage area) for the small water supply watersheds (Big Haynes Creek and Alcovy River) per state requirements.

Watershed Biotic Integrity Goals and TSS Load Guidelines

Many CAG meetings were devoted to discussion of these issues. The Plan describes the watershed biotic integrity goals proposed by the staff in order to meet the "fishing" designated use of the streams. Benthic macroinvertebrates were used as the representative biological indicator, with a goal for county watersheds of about 18 (in the "Good" range). Using statistical correlation of these benthic macroinvertebrate scores with TSS loading rates (in lb/ac/yr) at each sampling location (30 total), a corresponding TSS load guideline was proposed of about 1,600 lb/ac/yr to help protect or improve to this biotic integrity goal (refer to Section 3 of the Plan and the Chattahoochee Basin [CH2M HILL, January 2000] and Oconee/Ocmulgee Basin [CH2M HILL, January 2000])

Impacts Assessment documents). The guideline is an aggregate loading rate from a watershed used as a target to guide overall watershed improvement activities (refer to Sections 3 and 4 of the Plan).

A number of issues and concerns were discussed on these topics. Some CAG members expressed concerns about the robustness of the relationships developed through the statistical analysis, primarily due to the R^2 values being low (on the order of 0.42 for benthos v. TSS) because of scatter in the data. Concerning the selected value for the TSS guideline, the CAG suggestions ranged from 1,200 to 1,600+ lb/ac/yr, with a computed average of 1,427 lb/ac/yr (using 1,600 as the value for 1,600+ in the computation of the average).

In an interesting twist, some CAG members proposed a lower guideline to press for additional protection for county watersheds, while others proposed a lower guideline coupled to a request for a higher new development performance criterion (see the following subsection) effectively forcing additional retrofit of existing development to meet the lower watershed guideline. It was noted that the 1,600 lb/ac/yr guideline was higher than the total load currently computed from several watersheds (about half), although lower than others. Concerns were expressed that some watersheds would degrade further with a higher guideline, and become “Poor” in biotic integrity rather than “good”. Concerns were also expressed about how watersheds that were above the existing guidelines would be improved (see Section 4 of the Plan).

After consideration of the information discussed, the staff recommended generally as follows:

- Propose a watershed TSS guideline of 1,600 lb/ac/yr , corresponding to a benthic score in the “Good” range.
- The proposed guideline represents a goal to design the program, not a limit, and it is recognized that watersheds below this guideline will be protected to the extent practicable to remain below the guideline, and that the watersheds above the guideline will be evaluated to be improved to the extent practicable.
- The proposed guideline represents a level where approximately half of the watersheds are above the guideline and half below.
- Design the new development criterion to effectively protect less developed watersheds.
- Design the approach to improving affected watersheds to investigate cost-effective ways to improve these watersheds.

New Development TSS Load Criterion

Many CAG meetings were devoted to discussion of this issue, particularly related to the TSS watershed guideline discussed above. The staff used a spreadsheet tool to illustrate the effect of implementing various levels of control for new development in each of the county’s watersheds. This requirement would be applied to each site submitting for development review (refer to Section 3 of the Plan).

The TSS criterion numbers discussed by the CAG ranged from 600 to 1,100 lb/ac/yr, with an average of about 895 lb/ac/yr. Some members of the CAG expressed the view that the recommended value of 850 lb/ac/yr as a criterion for each site was too high. The value for forest/open space is between 500 and 600 lb/ac/yr. The spreadsheet tool used to evaluate the effect of implementing various levels of control on new development showed that criteria in the range of 200 to 250 lb/ac/yr would be necessary to result in no increase in load in the watersheds. However, the spreadsheet tool includes some assumptions (such as no anticipated controls for highways or agricultural lands, and 10 percent of developed land escapes control requirements) that affect how low these values need to be to avoid any increase in loading. Some members argued that the 850 criterion would result in a 3 to 5 percent increase in the load to many rivers and streams, and that this would perpetuate the momentum for the decline of the natural system.

Other members of the CAG expressed concerns that the 850 lb/ac/yr was too low. In particular, the use of this criterion and the approach outlined in Section 3 for new development would make commercial development very difficult and expensive (estimated increase for commercial in the range of zero to 30 percent beyond current requirements) to implement. A number of developments of all types were evaluated using the proposed approach.

After consideration of the information discussed, the staff's recommendations and conclusions were generally as follows:

- Propose a new development TSS criterion of 850 lb/ac/yr for each site.
- This provides a balance of protection for the watersheds and while allowing for "smart" development.
- Lower TSS criteria were very difficult for developers to meet, and had little incremental benefit to the total watershed.
- Staff agreed to work with interested parties in developing the specifics of implementation (proposed regulations and refinements to the Stormwater Design Manual) to provide flexibility in the approach without compromising environmental protection.

Monitoring

Some CAG members promoted development of relationships between the TSS guideline and criterion and turbidity. There was considerable discussion about the relationship between TSS and turbidity, particular the level of TSS corresponding to 25 nephelometric turbidity units (NTU). There was also considerable debate about the relationship of the two parameters in the context of the NPDES General Construction Permit for Stormwater. This was an emotional topic, primarily because of the contentious issues surrounding the legal actions and negotiations related to the NPDES General Construction Permit for Stormwater.

The staff explained the distinction between the regulatory context of this project (instream water quality standards) and the NPDES General Construction Permit for Stormwater (construction activities and permit requirements). The Project was focused on protection

of instream standards through watershed protection for existing and future development after the site was stabilized. The Project did not address directly (because of ongoing separate activities related to sediment and erosion control) construction-related sediment and erosion control.

After consideration of the information discussed, the staff recommended generally as follows:

- Retain the new development TSS criterion of 850 lb/ac/yr for each site and the 1,600 lb/ac/yr guideline for watersheds.
- Monitor turbidity and other parameters conducive to continuous monitoring continuously at long-term trend monitoring locations to indicate trends and changes over time.
- Monitor other parameters (including TSS) on a seasonal basis to detect trends over time.

Appendix

Minority Memorandum from the Environmental Representative of the CAG

**MINORITY MEMORANDUM FROM THE ENVIRONMENTAL
REPRESENTATIVE OF THE CITIZENS ADVISORY GROUP OF THE GWINNETT
COUNTY WATERSHED ASSESSMENT PROJECTS FOR THE CHATTAHOOCHEE
AND OCMULGEE/OCONEE BASINS**

It is requested that this memorandum be included with any reports referencing data or actions of the Citizens Advisory Group of the above titled watershed assessment projects, especially those reports forwarded to the Gwinnett County Commission via written or oral means.

AREAS OF AGREEMENT

1. Gwinnett County's rivers and streams are being deleteriously impacted by current growth and land use patterns and are trending toward (and have reached in certain stretches) a poor condition as determined by fish, benthic, and habitat measures.
2. The retrofitting of damaged rivers and streams with BMPs is 5 to 50 times more expensive than preventive measures. The implication is that impact prevention is the more cost effective public policy.

AREAS OF DISAGREEMENT

1. The 1600 pounds per acre per year Total Suspended Solid (TSS) limit proposed for rivers and streams is too high. The Citizens Advisory Group (CAG) recommended an average of 1427lbs./acre/yr. with a range of 1200 to 1600lbs./acre/year. Of the 14 benthic life data points measured between 1500 and 1600 lbs./acre/ yr. half were in the poor range. Yet, of the 6 data points between 1400 and 1500 lbs./acre/tr. only one was in the poor range. Just this simple analysis should compel any policy maker to opt for a standard lower than 1600lbs./acre/yr. It appears the 1500 to 1600 lbs./acre/yr. range is a critically sensitive range to benthic life. The majority of the panel realized this and recommended standards at or below 1500 lbs./acre/yr. averaging 1427lbs./acre/yr. Gwinnett County staff arbitrarily selected the 1600 number even though it was the top end of the range and represented only 3 of 11 suggested values. This data is displayed in Table 1, which is taken from the CAG meeting minutes of 10-21-99. The 1600 value represents an increase of 12% over the current loading (1430) for the Alcovy River, an 8% increase over the current Yellow River loading of 1483, and a 15% increase over the current loading of 1397 for Suwanee Creek. Given the already significant stress these waters are under, this level of degradation is liable to put more stretches of these waters in the poor category. Future improvements in them, which are presently unlikely to occur because of the expense involved, become even less likely to occur as increased damage increases restoration costs.
2. The 850 lb./acre/ year TSS maximum for any new project is too high. It is close to an average value (895) of the CAG recommendations, which ranged from 600 to 1100 lb./ac./yr. (see the aforementioned table 1). The 850 site value equates to an increase in annual TSS from 1397 to 1524 (9.2% increase) for Suwanee Creek, from 1430 to 1530 (7.0% increase) for the Alcovy River, and from 1483 to 1562 (a 5.3% increase) for the Yellow River. Though relatively small on a percentage basis these increases can have significant impacts. In these cases and all others examined except for one the critical 1500 lb./acre/ yr. loading is exceeded and therefore puts these rivers and streams at a much higher risk of falling into the poor category than if they remained at the status quo. Once the threshold for decline for

a given species has been reached small changes can have large impacts. A natural system that is in a state of decline still trends toward further decline as long as momentum for degradation is applied. The suggested 850 number continues to significantly apply the degradation momentum that already exists in every watershed tributary analyzed in the study and puts them all at a higher level of risk than their current loadings imply.

3. The allowance of 125 lb./ac./yr. for buffers (as an incentive for more buffer creation) instead of counting the 500lbs./acre/ year they represent may be too large. This represents a 4:1 reduction. A 250 lb./ac./yr. allowance may be more reasonable as it still gives an incentive at a 2: 1 ratio but does not create as likely a situation where the benefits of the buffer are more than offset by the actual increased loading. This issue needs to be evaluated with existing or new field data and not hypothetical computer simulations.

COMMENTS

The obvious position to take in the face of the measurement uncertainty that is acknowledged in the watershed reports is to do no harm. In order to preserve the status quo and do no further harm site specific numbers of 200 lb./ac./yr. for the Yellow River, 210 lb./ac./yr. for the Alcovy, and 250 lb./ac./yr. for Suwanee Creek would be required. Though no in stream NTU standard currently exists, it is recognized that less than 25 NTUs in a stream is good for stream health. These do no harm numbers would add less than 25 NTUs to the stream whereas the 850 TSS number is much more likely to exceed a 25 NTU standard. Passive forest land generates 500-600 lb./ac./yr. of TSS so how can standards in the 200-250 range be practical? The model used in the watershed analysis assumes no control of run-off from highways or agricultural land and that 10% of development bypasses regulatory control. If these assumptions are eliminated and the TSS standard is applied equally to all then a do no harm scenario would be much closer to a 500-600 lb./ac./yr. standard. A combination of buffers, BMPs, and perhaps some BMP retrofit could create a do no harm situation for our rivers and streams. This is practical and should be evaluated.

A concerted effort needs to be made to more closely examine and define the relationship between the proposed TSS loading rates and the additional NTUs they cause with their resulting impacts. New data indicates better correlations have been developed between TSS and NTUs than those briefly discussed in the reports.

More emphasis needs to be placed upon buffers as effective BMPs especially at 75 -100 foot widths. Technological systems require maintenance and will invariably have breakdowns and malfunctions. Passive, natural systems such as an undisturbed buffer offer higher reliability, lower costs, less maintenance, and more positive environmental benefits (cooler water re-entering the waterways, green space, air pollution control benefits, wildlife habitat, etc.), than detention ponds.

Thanks go to the Gwinnett County Department of Public Works staff, CH2MHill staff, and members of the CAG for an enjoyable, thought provoking, and fair-minded experience.

Respectfully submitted by Stephen Day 3-23-2000

TABLE 1
TSS Criteria Suggested by CAG Members
from CAG Meeting Minutes, 10/21/99

CAG Member/Attendee	New Development (lb/acre/yr)	Overall Watershed (lb/acre/yr)
Laura Beall	1000	1500
Dennis Billew	900	1500
Stephen Day	600	1300
Carol Hassell	600	1300
Steve Hill	1100	1600
Matt Houser	750	1400
Ellis Lamme	1100	1200
Jim Nix	1100	1600
Joyce Nuszbaum	600	1500
Mike Paris	1000+	1600+
Don Woods	1100	1200