Discussion Packet Contents

- Letter from Carol Couch
- Rationale for Minimizing Water Withdrawals
- Prototype Policy Framework
- Water Conservation Goals
- Packages of Water Conservation Practices
    - Sector specific tables of conservation practices
- Additional Information
    - Definitions and Acronyms
    - References Cited
    - Technical Advisory Committees
    - Map of Basin Advisory Committees
    - Members of the Basin Advisory Committees
    - Georgia Water Planning Brochure
    - Concept Paper for Georgia Water Planning

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Dear Basin Advisory Committee Member,

This packet of material is provided to help you understand concepts and approaches for which your feedback and input will be sought. The first Basin Advisory Committee (BAC) meeting will focus on water conservation and reuse as methods to achieve the management objective of minimizing water withdrawals from Georgia's streams, lakes, and aquifers. Please read over this information in preparation for the meeting.

The concepts and approaches described in this packet are works in progress. Detailed descriptions are provided to foster in-depth discussion with and informed feedback from you and other advisory committee members. Using your feedback, EPD will revise this material to develop policies for minimizing withdrawals that will be presented to the Georgia Water Council for consideration.

The material presented in this packet was developed based on information collected by researchers at the University of Georgia (UGA), input from the Water Conservation and Reuse Technical Advisory Committees (TACs), reference material submitted by interested organizations and individuals, and research and evaluation at the Georgia Environmental Protection Division (EPD). Additional information is available to you through the Statewide Water Planning website at http://www.gadnr.org/gswp/.

As you read through the water management concepts and water conservation-related information, please look for strengths and weaknesses; consider the degree to which the information fits with conditions in your area of the state or the sector you represent; and consider alternatives to the concepts and information presented. Your input, along with that from other BAC members, will be particularly important in ensuring that the policies ultimately proposed reflect the geographic, economic, and social diversity of the state.

Thank you for your time and commitment to this important process.

Sincerely,

Carol A. Couch
Director EPD and Chair Georgia Water Council

Rationale for Minimizing Water Withdrawals

Withdrawing water from rivers, streams, lakes and aquifers to meet human needs is an essential element of human existence. As the human population has grown over millenia, so have the complexities of the economic systems we employ to meet our many needs. With much larger populations and more complex economic systems, the amount of water that humankind now takes from freshwater sources has also grown. The increase in population and economic productivity was particularly dramatic during the 20th century and, in the 21st century, substantial growth in population and economic productivity is expected to continue.

Statewide, Georgia's population has grown 110% since 1960 (U.S. Census 2000) and trends in water use have followed similar paths of increase. The U.S. Geological Survey (USGS) reports that total water use statewide has increased since 1990 and that public supply water use has steadily increased since 1980 (Fanning 2003). Between 1985 and 2000, the number of individuals served by public water providers increased 44 percent. During this same time period, water used by these individuals (and some others) increased 50 percent (Turlington et al 1987 and Fanning 2003).

More recent assessments indicate that the amount of water used by individuals may be on the decline. Between 1995 and 2000, for example, per capita water usage declined by 10 gallons per day (from 195 to 185 gallons per capita per day).[1] Even if this trend continues, however, Georgia's population is projected to double over the next 25 years (Nelson 2004). Water savings from small decreases in the amount of per capita water use will be far outpaced by our state's explosive population growth. Barring concerted efforts to the contrary, there will almost certainly be proportional increases in the amount of water we remove from the fairly fixed supply of water in our freshwater systems.

YEAR	Total State Population	Population served by public supply	Water Withdrawn for public supply (MGD)
1985	5,976,100	4,664,000	835
1990	6,478,260	5,163,820	963
1995	7,201,010	5,899,530	1153
2000	8,186,450	6,732,310	1245

Data collected from USGS water use reports published in 1987, 1992, 1997, & 2003

[1] It should be noted that per capita water use was calculated by dividing the population served by public supply by the water withdrawn for public supply. This in an inexact calculation, as it does not account for the industrial, institutional and commercial customers that may be served by pubic providers.

With the exception of episodic extreme events, our natural systems have not varied much in annual availability of water. Increased demands for water for human use exert pressure on our freshwater resources. These demands can, and in some cases do, adversely affect the amount of water that flows in these freshwater systems, the timing of these flows, and the amount of water available for offstream users. As the amount of water and timing of flows are adversely affected, others that rely on these resources (humans, plants, and animals) can find the resource quality gradually diminished. Over an extended period of time, some diminution can be expected, but steady increases in water withdrawals will eventually surpass the ability of Georgia's water systems to provide the desired quantities of water without unacceptable adverse consequences being experienced by downstream users and instream uses.

Concern for the consequences of withdrawals on other water users and water uses is underscored by the system of Georgia laws that govern water withdrawals, allocations, and water use permitting. That system is founded on the principle of "reasonable use" to meet the "reasonable needs" of those seeking to use state waters. Georgia statutes provide that the state not grant a permit to meet those needs if the permit would have "...unreasonably adverse effects upon other water uses in the area" (O.C.G.A. §12-5-31(e)(9)). Georgia statutes also mandate that the state make these "reasonableness" decisions within the context of the ability of the water resource to handle more withdrawal, as well as meet present and future needs of other uses of the water.

With Georgia's abundant, yet limited, water resources, we cannot continue to use water as we have historically. We need to take steps to minimize water withdrawals and forestall adverse impacts on other water users and on the systems themselves. Without water conservation and reuse, Georgia will not be able to meet instream *and* offstream water demands of the future.

Planning for Georgia's water future

To the best of our knowledge, Georgia waterbodies in many regions of the state are generally capable of meeting current demands without causing serious harm to other downstream and instream uses (with the exception of times of extreme drought). However, to date, efforts to meet growing human needs have not given sufficient consideration to effective ways of also meeting instream needs. As a consequence, resource constraints affecting wildlife and downstream uses exist in some areas of the state.[2]

Further, there is much we do not know about the capacity of our freshwater systems. Sustainably managing water resources is a combination of broadening scientific knowledge of how our water systems support humans, plants and

[2] Given this limitation, the third management objective to be addressed in this planning process will deal with meeting instream, as well as offstream, flow needs.

animals and using that knowledge to develop and implement proactive policies to minimize the impact our demands have on the resources. Accomplishing this is complicated by incomplete information about human demands and uses of water in Georgia.

Incomplete information necessitates cautious management, including scrutiny of water use to ensure that we do not withdraw more water than the quantities reasonably necessary to produce a desired human outcome and that we return as much water as practical to the waterbody of origin. Effective management of water is about allowing as much "reasonable use" of these freshwater resources as possible, while working to not allow water withdrawals to progress to a point of creating unacceptable harm.

Our limited understanding of resource conditions, in concert with growing pressures on our water resources, underscore the importance of efforts to improve the information base for water management. Securing baseline, or starting point, information is a critical step in the water planning process. Once baseline information is established, we can then begin defining our progress toward our water management goals. As constraints on our water resources grow, it becomes increasingly more important that we understand, to greater degrees, how our uses are impacting those resources.

Improving the information base

Many states are considering development of benchmarks and/or milestones as a way to numerically measure progress toward water management goals. Examples of benchmarks can be sector-specific, such as industrial water users looking to gallons per product produced or public and private water providers looking to gallons per capita per day (gpcd). Gallons per capita per day provides a good measure of how individuals and households are using water on a daily basis and generally where potable water is being used (indoor or outdoor).

In Georgia, several efforts undertaken over the past few years have provided differing estimates of statewide gpcd. The efforts relied on different, and in some cases, unknown methods and extrapolations. Apart from local calculations and the end-use modeling conducted for the Metropolitan North Georgia Water Planning District (MNGWPD 2003b), Georgia has neither a standard methodology for calculating water use, nor a baseline for average daily water used by Georgia citizens.

Looking toward the future, the 2004 Comprehensive Statewide Water Management Planning Act defines the following vision for Georgia's water management:

> *"Georgia manages water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens." O.C.G.A. §12-5-522(a)*

The Act also establishes the following guiding principle:

> *"Water resources are to be managed in a sustainable manner so that current and future generations have access to adequate supplies of quality water that supports both human and natural systems." O.C.G.A. §12-5-522(b)(2)*

To progress toward this vision, policies and programs need to direct a higher degree of attention to the extent to which users of Georgia's waters employ practices that are intended to minimize the volume of water withdrawn to meet specific needs. This is consistent with trends nationally and internationally, as other water management agencies are investigating and adopting water conservation and reuse policies to safeguard water resources and ensure the long-term health of citizens and water systems. Water conservation is critical to the protection of Georgia's water resources. Specifically, water conservation policies and practices that contribute to individual and collective reductions in water use and water withdrawals are a fundamental component of comprehensive statewide water planning.

Five underlying principles have driven EPD's water conservation planning and research to date. These principles guided development of the proposed policy framework presented in the following pages and should be considered, as the framework, conservation goals, and proposed practices are reviewed:

- Policies, practices, measures, and tools should support the management objective of minimizing water withdrawals.
- Certain policies and management tools can apply statewide.
- Water conservation approaches should reflect local conditions and the stress/sensitivity of the water resource. For example, additional tools should be applied to areas where water resources are very limited or in areas that support habitat for sensitive species.
- All water use sectors must be addressed, but no two water use sectors are alike and no two water users are identical.
- There are many lessons to be learned from examples within and outside of the state.

Prototype Policy Framework

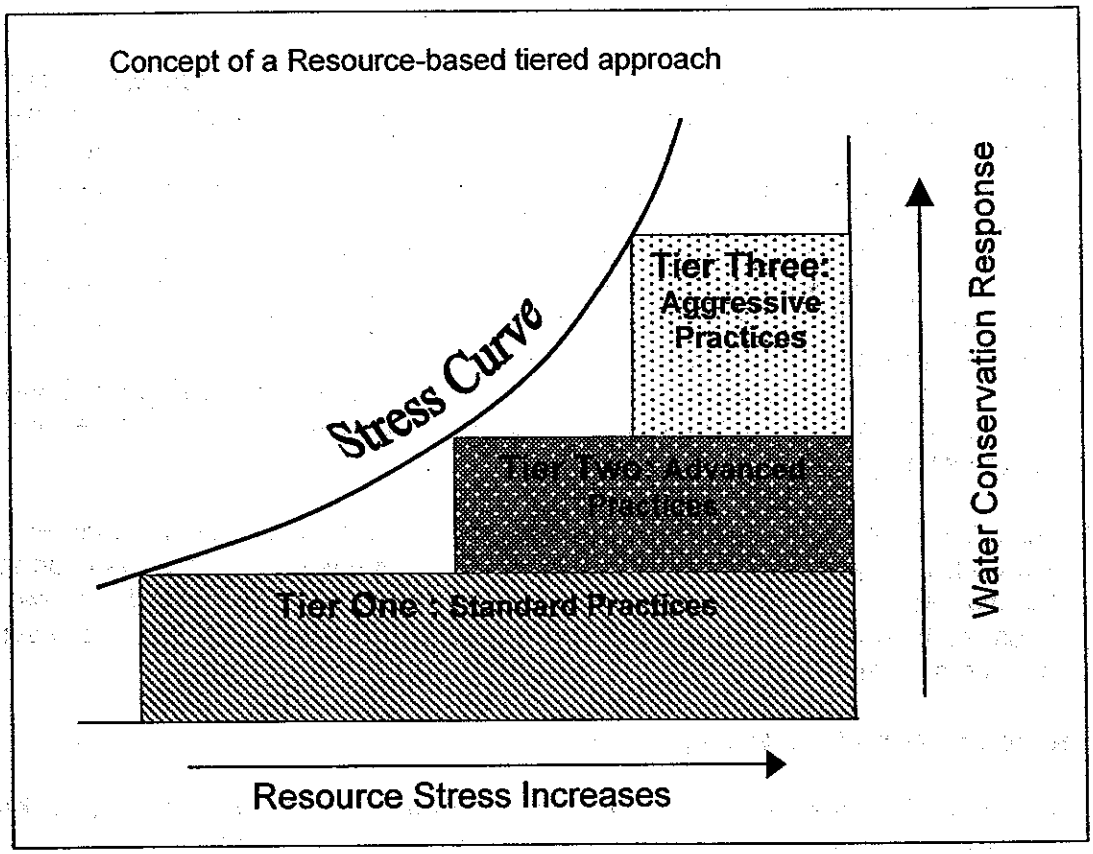
To meet the requirements of the 2004 Comprehensive Statewide Water Management Planning Act and the water management goals set forth in other statutes, state policies should be structured to minimize water withdrawals by increasing water conservation and reuse statewide, and do so in a way that recognizes local and regional variation. Material collected by researchers at UGA (CVIOG 2006), information presented by TAC members, and reference material submitted by interested parties and individuals, introduce a variety of approaches that can help Georgia embrace water conservation and minimize water withdrawals. Throughout the country, many different statewide approaches have successfully minimized water use, waste, and loss – from statutes that elaborate sector-specific actions, to voluntary programs where users have the discretion as to if and when practices are implemented.

The policy framework discussed herein is one Georgia-specific approach likely to help us meet regulatory mandates and aid in the development of a roadmap for meeting our water management goals. The resource-based tiered approach described below is a starting point for discussion by the water planning advisory committee members.

Resource-based Tiered Approach

A resource-based tiered approach uses some measure of water resource stress or scarcity to determine the appropriate level of water conservation response. Conceptually, a sliding scale can demonstrate the relationship between the characteristics of a water resource and the measure of response from those using the resource. The water resource stress or scarcity (X-axis) could be used to determine the level of conservation response expected in a particular area. The higher the measure of stress or scarcity of the resource, the more aggressive the expected conservation response.

The primary goal of a resource-based tiered approach is to determine appropriate water conservation practices based on limitations of the available water resources and conditions of water use. For this prototype approach to become a reality, we must carefully consider how to characterize resource stress or sensitivity, as well as conservation responses. At this time, we have insufficient data and information to quantify resource stress and the appropriate water conservation responses. Although not currently quantifiable, this framework still provides conceptual guidance for how to consider water conservation practices in the face of varying water resource conditions. The resource stress to be quantified could be a function of resource conditions such as water quality and habitat needs, as well as use conditions such as current population and growth rates. Water conservation responses could be quantified as reduced gallons per capita per day (gpcd), percent reduction in water withdrawals, or reductions in the volume of water used to produce a crop or a product.



Data development and quantification required to fully implement this prototype approach will not be available in this first iteration of the comprehensive statewide water planning effort. We present it here as a conceptual framework. Depending on advisory committee feedback, we anticipate moving toward quantifying it for implementation as a tool to direct water conservation responses.

Within this conceptual framework, we can establish tiers of water conservation practices (or levels of conservation practices) as our response to the resource conditions. For each tier, some package of water conservation practices can be implemented to accomplish water savings. Tier one could include practices that all water users and water withdrawal permit holders can accomplish, or standard practices. In advanced tiers, characterized by greater resource stress, more aggressive water conservation responses would be expected.

Within each tier, the entities expected to implement the practices can choose from a variety of practices designed to meet water conservation goals. The conservation packages for each tier can be designed to generate certain conservation savings that will help ensure water is used reasonably and that conditions causing stress to the resource are not made worse. Sector-specific

packages of conservation measures would need to be developed. Again, within each progressive tier, water conservation practices will become more aggressive.

Until we have the information needed to fully execute a resource-based tiered approach, we can establish a system of conservation expectations based on some other criteria. For example, an interim approach to minimizing water withdrawals by increasing water conservation and reuse could be based on the current level of development of a community or water user. Those more established or more developed water users, providers, or communities (i.e. a water provider serving 10,000 customers or more) could be expected to implement a higher degree of water conservation activities than less developed water users, providers, or communities. The less developed water users could be expected to make measurable progress toward more efficient water use over a certain period of time.

The goal of this interim approach is, over a period of time (until we have enough information to execute the resource based approach), have those water users placing the most stress on our water resources implementing more water conserving practices. Progress toward greater conservation and reuse statewide could be phased over a selected period of time. Tiers of conservation practices could be associated for each phase of development, rather than resource stress. Sector-specific water conservation packages would need to be developed for each tier of this interim approach, also.

Water Conservation Goals

The comprehensive statewide water management plan is intended to move toward two over-arching goals:

- To protect public health and environmental quality; and
- To meet future water needs while protecting aquifers, instream uses, and downstream users.

To help achieve these two aggressive goals, the water plan will initially focus on four interconnected water management objectives:

1. Minimize withdrawals of water by increasing water conservation and reuse;
2. Maximize returns to the basin of origin by managing interbasin transfers, the use of on-site sewage disposal systems, and land application of treated wastewater where water quantity is limited;
3. Meet instream and off stream demands for water through efficient surface storage, aquifer management and reducing water demands; and
4. Protect water quality by reducing pollutant loadings from discharges and runoff from the land to ensure the assimilative capacity of the streams is not exceeded and aquatic life is not impaired.

For each management objective, then, we can define additional goals. Water conservation goals are general objective-specific sub-goals that all water users, to some degree, can achieve. The U.S. Environmental Protection Agency (U.S. EPA) recommends that statewide water conservation efforts focus on tangible goals and address all major water use sectors (U.S. EPA 1998). Similarly, research conducted here in Georgia (Keyes et al. 2004) and information provided by the water conservation and reuse technical advisory groups (TACs) point toward statewide water conservation goals, with nine specific water conservation goals emerging as technically feasible and potentially useful in Georgia.

The nine water conservation goals can be broken into two major categories: information goals, those that will enhance our understanding about water use and conservation efforts, and conservation goals, those that can achieve reductions in water waste, water loss, or water use:

Information Goals:

- Meter water uses and improve water user reporting.
- Conduct reuse feasibility studies.
- Conduct water audits.
- Build understanding of conservation through education and outreach programs.

Conservation Goals:

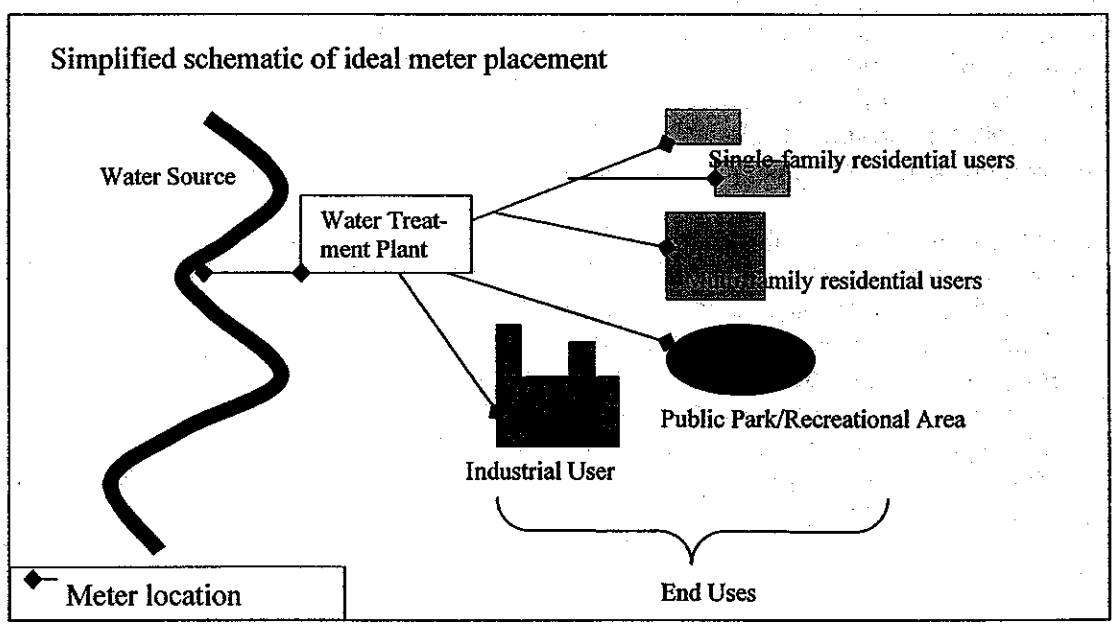
- Reduce water loss.
- Minimize outdoor water use and waste.

- Maximize in-house efficiency.
- Adopt conservation-oriented rate structures (for public and private water providers).
- Adjust management practices to minimize water use.

Collectively, these goals have the potential to significantly increase our understanding about our demand on water resources and to minimize water withdrawals statewide. Each goal is described in more detail below.

Meter Water Uses and Improve Water Use Reporting.

Metering water uses and reporting usage regularly are two important steps if we are to know and understand how water is being used in Georgia. Most water withdrawals are currently metered at the point where water leaves its source. Meters at the source can be categorized by use sector, but tell us very little about how the water is actually being used. For example, a municipal water treatment plant can pull water from a source for "municipal purposes," but those purposes may include any mix of single-family residential, multi-family residential, business, industrial or commercial users. Without knowing the end use to which the water goes, it is difficult to suggest ways to improve efficiency. Metering all service connections and public uses is important. Lack of metering can undermine efforts to control leaks, price water services appropriately, maintain revenues, and increase conservation efforts.



Water use reporting is critical to progress toward our water management goals. Currently, EPD receives data from a variety of sources including the following:

- The water withdrawal permitting process and associated water conservation plans (GARules&Regs 391-3-2 and 391-3-6-.07)
- The progress reports required every five years (Georgia Rules&Regs 391-3-6-.07(4)(b)(8))
- Regional planning efforts, including the Metropolitan North Georgia Water Planning District (O.C.G.A. §12-5-57), Flint River Water Development and Conservation planning (O.C.G.A. §12-5-541), and saltwater intrusion management planning in the 24-county coastal region (EPD 2005).

While these sources of data are valuable, as demands on our water resources increase, more information about water usage is needed to make accurate assessments of reasonable use, to estimate future water needs, to estimate conservation results more precisely, and to ensure instream and downstream uses are not diminished.

Conduct Reuse Feasibility Studies.

A reuse feasibility study is an assessment of the feasibility of using reclaimed water as a substitute for another, generally higher quality, water source in order to help minimize water withdrawals. In general, using reuse water can provide a variety of services. Using reuse water can conserve source water for other uses including drinking, agricultural, and environmental services. It can minimize peak demands on other water sources. Reuse for irrigation can, in some areas, provide for groundwater recharge. In addition to providing an alternative source of water where other sources maybe limited, the use of reclaimed water can also limit pollutant loads to streams that would otherwise have to assimilate the remaining pollutants in the discharged water.

Feasibility studies should follow guidelines to be developed by EPD to ensure human health and environmental quality are protected and that the use of reuse is beneficial. Generally, a feasibility study should include an assessment of reclaimed water for purposes including, but not limited to, in-process operations, cross-process operations, agriculture and landscape irrigation. Feasibility studies for surface water sources should include calculation of return flows as a way to avoid expenditures for additional water treatment capability. Further, feasibility studies should consider storage concerns; storage of reuse water can allow additional peak demands to be met.

Conduct Water Audits.

Water audits come in many forms and sizes. U.S. EPA (1998) defines a system audit as a systematic accounting of water throughout the production, transmission, and distribution facilities within the system. An end-use audit is a systematic accounting of water uses by end users (residential, commercial, or industrial), often used to identify potential areas for water reduction, conservation, and efficiency improvements (U.S. EPA 1998).

System audits include quantifying all produced and sold water and may include testing of meters, verifying records and maps, and field checking distribution controls and operating procedures (AWWA 1990). Audits conducted regularly

can inform water providers and users of systematic ways to improve or eliminate water lost to leaks and aging appliances, equipment, and infrastructure.

Water audits can be performed for end users by a water utility, by a certified engineer at a production company, or by a third-party contractor or consultant. For industrial users and power companies, water audits are good for business because they can significantly save in energy and water costs.

An added benefit of conducting a water audit is the energy savings that can also be discovered. Couple water and energy savings that can result from more efficient practices, and a homeowner or business can save money, as well as natural resources. An ideal audit goes two steps further to 1) identify specific improvements in water efficiency and ways to reuse water in-house, and 2) recommends an implementation process and timeframe. EPD with the assistance from technical advisors will develop guidance on the most effective way of conducting water conservation audits for the diverse water use sectors in the state.

Build Understanding of Conservation through Education and Outreach Programs.

Education and outreach are central to encourage the conservation, reuse, and efficient use of Georgia's water resources. High quality technical training for relevant staff and educational opportunities for the general public are very important aspects of sustaining our water resources for current and future generations. While policies and programs lead to institutional changes, educational programs encourage shifts in personal and professional behaviors regarding water use, waste, and loss.

In addition to formal education curriculum, public outreach programs and public involvement have been closely tied to the success of water conservation programs nationwide (Keyes et al 2004). Though it is difficult to quantify water savings related to educational efforts alone, education and outreach emerged as the most fundamental tool discussed by the TAC members.

Education and outreach programs can benefit all water use sectors, but the message about the importance of conservation needs to be targeted to each water use sector as in the following examples:

- Education and outreach programs targeted to agricultural water users can help users recognize that efficient use of water is necessary for the viability of Georgia's agricultural industry, and the implementation of practices that minimize water withdrawals can contribute to financial savings and the long-term protection of a community's resources.

- For industrial water users, education and outreach programs can be targeted at the economic opportunities and social recognition of retrofitting older facilities for water-conserving practices. Further, site managers can receive instruction on practical, inexpensive, and state-of-the-art technologies for improving conservation, reuse and efficiency.

- For power production, education programs can focus on assessment and maintenance of efficient operations that minimize water loss and waste and maximize the reuse of water in the production of electricity. Outreach programs can help build an understanding of the interrelationship, and consequent savings potential, between energy consumption and water use.

- For public and private municipal water providers, education and outreach programs can target both end-use customers and plant managers. For end-users, informational brochures, water rates and bill structures, and workshops can help build an understanding that individual actions can contribute to conservation results (indoors and outdoors). For managers, educational programs and training exercises can help in the assessment and maintenance of facilities to minimize the loss and waste of water within the distribution and treatment systems, as well as education about new water saving technologies.

Reduce Water Loss.

Controlling and reducing water loss is important to the management of our limited water resources. Water loss prevention can include pipe and fixture inspection, lining, cleaning, and other basic maintenance efforts to improve a distribution system and prevent leaks and ruptures from occurring (U.S. EPA 1998). The cost of water loss can be measured in terms of lost operating costs associated with water supply development, pumping, treatment, and/or delivery. Water loss produces no revenue for water providers, can cause over-watering problems for outdoor or agricultural irrigation, and can cause serious infrastructure problems for a city or county (i.e. washed our roads or sink holes due to leaks).

Several methods for detecting and reducing water loss from municipal water delivery systems have been developed over the past few years (AWWA 2003 and Thornton 2002).

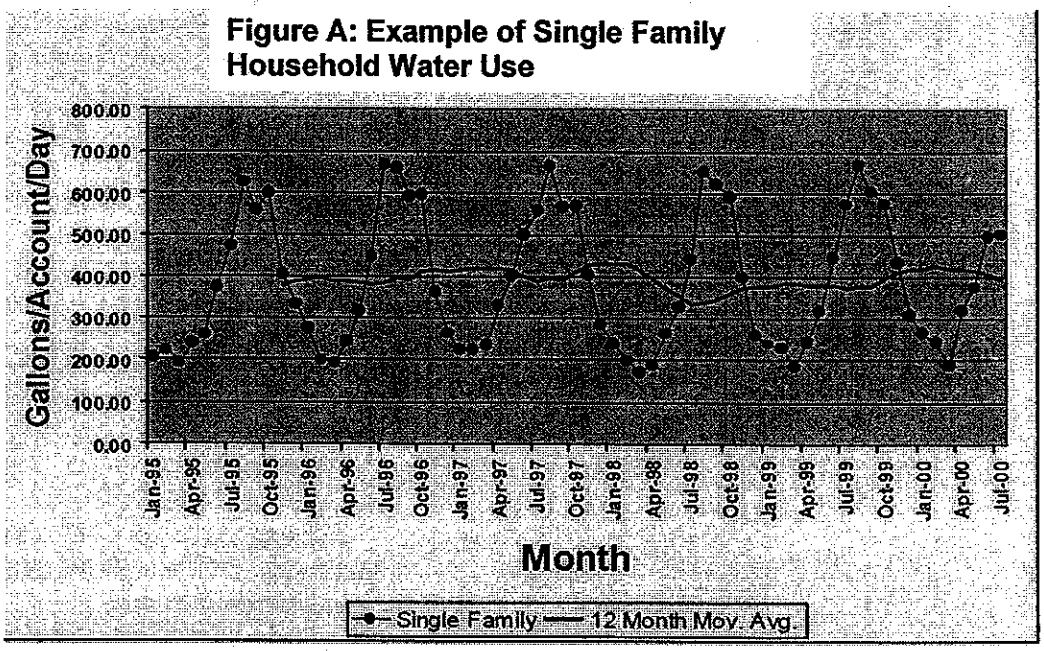
CASE STUDY: Georgia's Clayton County Water Authority invested in a water-conserving leak detection and repair program. Over a five-year period, they recovered approximately 2 billion gallons of water that was being lost to leaks. Plus, they have recovered about $9.00 in production savings for every $1.00 expended for the leak detection and repair program (Jones 2004).

Also, many programs exist to help agricultural irrigators and industrial water users minimize water loss. Agricultural irrigation is the second largest water use sector in the state (Fanning 2003). A study conducted through the Flint River Basin program, in partnership with the Nature Conservancy, Natural Resource Conservation Service, and the Georgia Soil and Water Conservation Commission, cites eliminating leaks as one of the top ranking strategies for conserving water in the Flint River Basin (FRBP 2005).

Minimize Outdoor Water Use and Waste.

Outdoor water use for landscape irrigation (and other purposes) is estimated to be 31.7 gallons per capita per day nationally (Vickers 2001). In Georgia, average outdoor water use varies across the state. All estimates, however, whether on the coast or in the mountains, point to significant increases in water use during summer months. This additional demand for water places great stress on water delivery systems and causes providers to invest large amounts of money to meet peak water demands. As figure A demonstrates, calculations and estimates of average annual water demands can greatly underestimate the peak demand placed on our water delivery systems.

Figure A: Example of Single Family Household Water Use



Source: MNGWPD 2002.

Maximize In-house Efficiency.

In-house efficiency refers to improving the way water is used in homes, factories, businesses and other end uses for non-discretionary purposes. Research has found that since the early 1990's, residendial indoor water use has declined due to advances in water efficient appliances and fixtures, such as toilets, showerheads and faucets. Due to state and federal laws passed in the early 1990s, today in Georgia only low-flow fixtures can be purchased for new construction or for renovations.

Many homes, businesses and factilities built before these conservation-oriented laws were passed continue to rely on inefficient, high-volume fixtures. Vickers (2001) estimates that retrofitting an older inefficient home with water-conserving fixtures and appliances can result in as much as 35% reducton in indoor water use.

Adopt Conservation-oriented Water Rate Structures.

Conservation-oriented water rate structures can help communities reduce water demands, as well as help providers meet revenue requirements. Basically, conservation-oriented rates structures can discourage over use by charging the consumer based on the volume of water used. Ideally, a conservation-oriented billing system splits into two sections: the first billing section is a base rate to cover basic operation and maintenance for the delivery and treatment system. The second billing section is based on the volume of water used per customer, with excess use costing more per unit of water used. Any additional revenue generated by those choosing to use excessive water can be reinvested in the system for improving efficiency in delivery or be invested in programs to help users reduce water use. Conservation-oriented rates help providers avoid raising rates across the board to pay debts, which unequally burdens those who try to conserve. This water conservation goal will require detailed guidance from EPD and others to ensure implementation is equitable and to reduce the risk of lost revenue by the water provider.

Nationally, one of the most effective conservation-oriented rate structures is the inclining block rate structure. Inclining block rates increase as consumption increases. Generally, the more units of water you use, the more you pay per unit. Challenges exist with appropriate development of block cutoffs and unit rates, but inclining block rates can help increase conservation and protect revenue

In 2005, the Georgia Municipal Association (GMA) conducted a Water and Wastewater Survey of Georgia cities. Of the 92 cities who responded to the survey, 26% are practicing inclining block rate structures, 6% have uniform rates with excess use charges, and 3% have uniform rates with seasonal sur-charges (GMA 2005).

stability. Another version of inclining block rates are individualized rates that charge per volume of water used based on the customer's own practices and use patterns. Other potential conservation-oriented rates include seasonal surcharges, or excess use charge. These are created by adding an additional charge to the basic base rate. Surcharges are designed to discourage peak usage and are usually applied during summer months.

Adjust Management Practices to Minimize Water Withdrawals.

Adjustments to management schedules and water sources can result in significant water savings, but do not always involve costly technical advancements or efficiency devices. For example, development of or regular updating of water conservation plans and programs can result in short- and long-term water savings with minimal costs. Another example is choosing to install dual distribution lines to deliver reclaimed water or reuse water as a substitute for a new source of water. Such a decision may have increased installation costs, but in an area where resources are limited, this initial investment can result in the extension of limited water supplies and potential financial savings as well.

CASE STUDY: Unilever Home & Personal Care a manufacturer of powdered laundry detergent in Cartersville, Georgia , decided to invest in non-contact cooling water and collected rainwater in manufacturing processes. This investment resulted in significant resource and financial savings:

- 77% reduction in effluent volume,
- $20,000/year in potable water savings,
- $85,000/year in savings for testing, maintenance, and labor fees, and
- Received the P3 Partner, 2000 P2AD Governor's Award Winner, and 2000 & 2001 GW&PCA Award Winner

(Iott and Adler web information)

Georgia-Specific Water Conservation Practices

The nine water conservation goals discussed earlier provide a way to organize the multitude of water conservation practices that can be implemented to help achieve our water management goals and objectives. Water conservation practices are sector specific actions or activities (behavior- based or technology-based) that can result in more efficient use of water or source management decisions that can result in reduced water withdrawals.

The practices presented herein can be considered tools for the implementation of any policies designed to minimize water withdrawals through water conservation and reuse. Members of the water conservation TAC screened over 130 conservation practices collected from around the country, and provided Georgia-specific information regarding potential water savings and relative cost of implementation. The TAC review was not quantitative, and TAC members did not evaluate all possible conservation practices. The purpose of the TAC evaluation was to eliminate those practices that, for a variety of reasons, are not technically or scientifically feasible here in Georgia.

Currently, many water conservation practices are being implemented by entities around the state. Several of the practices presented in the following charts are already in place in areas of the state and are, to some degree, addressed in state or local policies or in the water conservation plan requirements specified in Georgia Rules and Regulations (GARules&Regs 391-3-2 and 391-3-6-.07). In order to meet our growing water needs and protect instream and downstream needs, most of the practices presented have steps and/or requisites that will help move our state beyond our current level of conservation.

In keeping with the conceptual policy framework introduced earlier, the conservation practices are categorized by potential tiers of implementation. The tiers can be designed so that practices within each can achieve some level of water savings. Tier one could include standard practices that all water users and water withdrawal permit holders within a particular sector can accomplish. In advanced tiers, more aggressive water conservation practices would be expected.

Within each tier, the entities expected to implement the activities can choose from several practices designed to meet each of the nine water conservation goals. Two tiers of practices are presented for discussion by BAC members:

- Tier One – contains standard practices, those water conservation practices that water users and/or those with water withdrawal or drinking water permits can implement regularly.

- Tiers Two and Three – contains examples of what could be considered advanced or aggressive practices, those water conservation activities that go

above and beyond standard practices, and can achieve a higher degree of water savings. Practices in tiers 2 and 3 can be considered more aggressive than standard practices and can be implemented in areas where water resources are stressed. Some of the more advanced practices have a higher cost of implementation than the standard practices.

The practices listed in the following charts are organized by major water use sector. Practices are further broken down by the water conservation goal to which they most directly contribute. Based on input received from TAC members, some practices are listed as mandatory; others are listed as voluntary. If mandatory practices are considered the most effective approach to achieve the conservation goal, it may require some state action, such as adoption of state policy, passage or amendment to statute, rule or regulation.

As EPD gathers information and feedback from advisory committees members and the public, we hope to gain insight as to the applicability and practicality of these practices, individually and collectively. We also hope to identify consistent themes across the state as well as regional variations. Based on feedback EPD receives, the package of practices will be reconfigured and critical statewide elements will be considered for the comprehensive water plan. EPD staff and TAC members will then work to develop the guidance documents, technical assistance, and other material necessary to implement the practices considered as critical tools for meeting our statewide goals and objectives.

Agricultural Irrigation
Tier One - Standard Water Conservation Practices

Voluntary	Mandatory
Conducting Water Audits	
Water withdrawal permit holders to perform regular water audits of irrigation systems.	
Build Understanding of Conservation through Education and Outreach	
Applicants for new, adjusted or renewed water withdrawal permits to attend workshops or training on water conservation and efficient use of water.	
Metering Water Uses and Improving Use Reporting	
Permit holders to install meters and report annual water usage.	New or altered agricultural water withdrawal water use permit holders to submit annual water use reports.
Reduce Water Loss	
New permit holders to irrigate only at night.	Permit holders to ensure appropriate operating pressure on irrigation systems.
Minimize Outdoor Water Use	
Permit holders to replace older agricultural sprinkler packages on center pivot systems with more efficient/uniform package.	New agricultural water use permits to use most efficient irrigation practices.
Permit holders to convert set irrigation to drip irrigation systems.	Permit holders to install rain or moisture sensor shutoff devices on irrigation systems.
Permit holders to practice irrigation scheduling method.	
Permit holders to replace older in-efficient nozzles with high efficiency ones.	

Remove unproductive agricultural land from irrigation.	Applicants for new permits to submit a water conservation plan with application.

Agricultural Irrigation
Tiers Two and Three
Examples of Advanced or Aggressive Conservation Practices

Mandatory - All water withdrawal permit holders to perform regular water audits of irrigation systems.

Mandatory - Applicants for new, adjusted or renewed water withdrawal permits to attend workshops or training on water conservation and efficient use of water.

Mandatory - Permit holders to practice irrigation scheduling method.

Mandatory - Permit holders to replace older in-efficient fixtures with high efficiency ones.

Mandatory - Existing agricultural water users to use most efficient irrigation practices.

Mandatory - Remove unproductive agricultural land from irrigation.

Voluntary or mandatory - limit agricultural water irrigation use or increases in overall volume of water being withdrawn.

Voluntary or mandatory - agricultural water users to self-report monthly water usage.

Golf Course Water Users
Tier One - Standard Water Conservation Practices

Voluntary	Mandatory
Conduct Water Audits	
Golf course water users to perform regular water audits of irrigation systems.	
Build Understanding of Conservation through Education and Outreach	
Applicants for new, adjusted or renewed water withdrawal permits to attend workshops or training on water conservation and efficient use of water.	
Meter Water Uses and Improving Use Reporting	
	New or altered water golf course permit holders to submit annual water use reports. Existing golf course water users to meter water uses not currently metered.
Reduce Water Loss	
New permit holders to irrigate only at night.	Permit holders to ensure appropriate operating pressure on irrigation systems.
Minimize Outdoor Water Use	
Permit holders to replace older irrigation sprinkler packages with more efficient/uniform package. Golf Course water users to convert set irrigation to drip irrigation systems.	New agricultural water use permits to use most efficient irrigation practices. Golf course users to install rain or moisture sensor shutoff devices on irrigation systems.

Maximize Water Conservation through Management Planning	
	Applicants for new permits to submit a water conservation plan with application.

Conduct Reuse Feasibility Studies	
Use reuse water for irrigation where available.	Applicants for new, altered or renewed water withdrawal permits are to conduct reuse feasibility studies.

Golf Course Water Users
Tiers Two and Three
Examples of Advanced or Aggressive Conservation Practices

Mandatory - Golf course water users to perform regular water audits of irrigation systems.

Mandatory - applicants for new, adjusted or renewed water withdrawal permits to attend workshops or training on water conservation and efficient use of water.

Mandatory - existing permit holders to replace older irrigation sprinkler packages with more efficient/uniform package.

Mandatory - use reuse water for industrial operations where available.

Industrial Water Users and Power Providers
Tier One - Standard Water Conservation Practices

Voluntary	Mandatory
Conduct Water Audits	
	Conduct regular facility specific water audits to include: - In-process reuse capability (I.e. condensate recovery) - Cross-process reuse capability (I.e. using process water in other processes) - Reusing treated wastewater in house (end-of-pipe reuse) - Taking treated wastewater from another source
Build Understanding of Conservation through Education and Outreach	
Send management team and senior staff to workshops or training on water conservation and efficiency.	Distribute literature regarding water conservation to staff members.
Meter Water Uses and Improving Use Reporting	
Reuse water users to report reuse use and effectiveness regularly.	Industrial water users to meter all outdoor water use not currently metered. Permit holders to meter all uses of reuse water and report use
Reduce Water Loss	
Ensure appropriate operating pressure regulation on irrigation systems.	Adopt maintenance and repair program for pipelines, intakes and discharge structures.
Minimize Outdoor Water Use	
Install rain or moisture sensor shut off device on existing irrigation systems	Install rain or moisture sensor shut-off on new irrigation systems. Irrigate landscape only between 10:00pm and 10:00am

Maximize Water Conservation through Management Planning	
Practice dry clean up.	Regularly update water conservation plans to reflect new and changing circumstances/trends in water management.

Conduct Reuse Feasibility Studies	
Use reuse water for industrial operations where available.	Applicants for new, altered or renewed water withdrawal permits are to conduct reuse feasibility studies.

Maximize In-House Efficiency
Decrease down-time and minimize start-up (i.e. the time a plant is not operating).
Replace older in-door plumbing fixtures (toilets, faucets, showerheads) with more efficient ones.
Implement water-conservation practices identified in a system audit.
Limit or prohibit single-pass cooling systems in all facilities.

Industrial Water Users and Power Providers
Tiers Two and Three
Examples of Advanced or Aggressive Conservation Practices

Mandatory - install rain sensor shutoff devices on existing irrigation systems.

- Mandatory - limit high quality water use for industrial operations; use reuse water.

Mandatory - Implement water-conservation practices identified in a system audit.

- Mandatory - Limit or prohibit single-pass cooling systems in all facilities.

Mandatory - Replace older in-door plumbing fixtures (toilets, faucets, showerheads) with more efficient ones.

Voluntary or Mandatory - Sub-meter and report all in-house water uses

Public and Private Water Providers
Tier One - Standard Water Conservation Practices

Voluntary	Mandatory
Conduct Water Audits	
Offer residential water audits (indoor and outdoor) residential customers.	Conduct regular water system audit (from withdrawal to meter)
Offer commercial, industrial and institutional customers water audits.	Require customers installing new irrigation systems to include a water budget with new system audit.
	Require commercial customers with irrigation systems to conduct regular irrigation system audits.
Build Understanding of Conservation through Education and Outreach	
Provide workshops/educational sessions to customers on designing, installing, and maintaining irrigation systems and ways to minimize outdoor watering.	Adopt water bills that reflect consumer usage (compared annually) and clearly stating which "conservation rate" in which they fall.
	Create a local or regional water conservation staff position to facilitate conservation activities.
	Implement water conservation education program in schools.
Meter Water Uses and Improving Use Reporting	
Meter existing multi-family residential buildings with individual meters.	Meter all water uses (current and future).
	Meter new multi-family residential buildings with individual meters.
	Meter all outdoor water uses not currently metered.
	Permit holders to meter all uses of reuse water and report use regularly.

Reduce Water Loss	
Ensure appropriate operating pressure regulation on irrigation systems.	Providers to adopt the new AWWA-indorsed International Water Association water loss program.
	Providers to calibrate meters regularly.
	Providers to adopt a meter replacement program.

Minimize Outdoor Water Use	
Providers to offer a rebate program for advanced irrigation controllers that have weather or soil moisture adjusted systems.	Providers to require rain or moisture sensor shut-off devices installed on all new landscape irrigation systems.
Providers to promote Georgia-friendly and water efficient landscaping.	Providers to meter all outdoor water uses that are not currently metered (including public uses.)
Providers to charge those who hold irrigation only accounts the highest tier amount per volume of water.	Providers to require golf course customers to comply with outdoor watering requirements around clubhouses.
Providers to work with city or county governments to adopt ordinances that prohibit wasteful use of outdoor water (such as watering impervious surfaces, runoff from landscaped property, etc)	

Maximize Water Conservation through Management Planning	
Providers to install dual-distribution (purple pipe) lines for irrigation purposes in new service areas.	Regularly update water conservation plans to reflect new and changing circumstances/trends in water management.
Providers to encourage grey water or rainwater harvesting as a substitute for potable irrigation water uses.	

Conduct Reuse Feasibility Studies	
Use reuse water as a substitute for potable irrigation purposes, where possible.	Applicants for new, altered or renewed water withdrawal permits are to conduct reuse feasibility studies.

Maximize In-House Efficiency
Providers to implement conservation-oriented practices identified in system audit.
Offer low flow fixture retrofit kits to residential users.
Offer rebates for the purchase of high water efficient clothes washing machines.
Offer rebates/vouchers for retrofitting older homes with the water-savings products (such as toilets and showerheads).
Offer fixture replacement program with direct installation of ultra-low flow toilets.
Require fixtures in older homes to meet codes for new buildings prior to new water service.
Offer food service operations with low-flow pre-rinse spray valves and installation.
Offer toilet retrofit program for industrial, commercial, and institutional customers.

Adopt Conservation-Oriented Rate Structures	
Implement seasonal surcharges to reduce peak demands.	Implement a tiered water conservation rate structure for residential customers.
Implement individualized tiered rate structure for all water use customers.	Adopt a rate structure for any reuse water used by customers.

Public and Private Water Providers
Tiers Two and Three
Examples of Advanced or Aggressive Conservation Practices

Mandatory - offer residential water audits (indoor and outdoor) residential customers.

Mandatory - offer commercial, industrial and institutional customers water audits.

Voluntary or Mandatory - calibrate meters annually.

Mandatory - Providers to require rain or moisture sensor shut-off devices installed on existing landscape irrigation systems.

Mandatory - providers to install dual-distribution (purple pipe) lines for irrigation purposes in new service areas.

Mandatory - providers to implement conservation-oriented practices identified in system audit.

Mandatory - implement 2-3 practices identified below:

- Offer low flow fixture retrofit kits to residential users.
- Offer rebates for the purchase of high water efficient clothes washing
- Offer rebates/vouchers for retrofitting older homes with the water-savings products (such as toilets and showerheads).
- Offer fixture replacement program with direct installation of ultra-low flow toilets.
- Offer toilet retrofit program for industrial, commercial, and institutional customers.

Mandatory - Require that fixtures in older homes to meet codes for new buildings prior to new water service.

Mandatory - offer food service operations with low-flow pre-rinse spray valves and installation.

Mandatory - install sub-meters on all multi-family residential units.

Key Definitions and Acronyms

To provide a common base for discussion, the following key definitions are presented to clarify the, often confusing, language to be used in the planning process.

- Water conservation is the beneficial reduction in water use, waste and loss (Vickers 2001). This broad definition allows us to use water conservation as an umbrella term to cover issues related to water efficiency and source management.

- Water conservation practices are sector specific actions or activities (behavior- based or technology-based) that can result in more efficient use of water or source management decisions that can result in reduced water withdrawals.

- Water efficiency is generally addresses how efficiently water is used or the act of achieving a water use function with the minimal amount of water possible.

- Water conservation goals, are general objective-specific sub-goals that all water users, to some degree, can achieve.
    - Information goals are those that will enhance our understanding about water use and conservation efforts, and
    - Conservation goals, those that can achieve reductions in water waste, water loss, or water use

- Water reuse is currently defined in Georgia guidelines as "the use of reclaimed water as a substitute for other water sources for the beneficial irrigation of areas that may be accessible to the public. This includes areas such as golf courses, residential and commercial landscaping, parks, athletic fields, roadway medians, and landscape impoundments". (For this particular management objective, water reuse can be defined as the use of wastewater as a substitute for another generally higher quality water source. Reuse in this sense could include municipal wastewater, industrial wastewater, and stormwater.)

- Water withdrawal is water diverted or withdrawn from a surface or groundwater source.

- Water use refers to water that is actually used for a particular purpose (end use) or by a specific customer group (such as residential, industrial, commercial)

- Source management refers to how much water we take from a waterbody and for which use.

- Reclaimed water is defined as "wastewater that has received treatment to urban water reuse standards, meets the treatment criteria specified in these guidelines, and is utilized at a reuse area or is sent to a designated user for reuse".

Acronyms

BAC – Basin Advisory Committee

EPD – Georgia Environmental Protection Division

gpcd – gallons per captia per day

MGD – million gallons a day

O.C.G.A. – Official Code of Georgia – Annotated

SAC – Statewide Advisory Committee

TAC – Technical Advisory Committee

U.S. EPA – U.S. Environmental Protection Agency

USGS – U.S. Geological Survey

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Technical Advisory Committees

Two technical advisory committees (TACs) were convened to assist in answering technical and scientific questions regarding the management objective of minimizing water withdrawals by increasing water conservation and reuse. The information provided by the TAC, as well as reference material submitted by citizens and groups in October, 2005, were used to inform the development of the material to be discussed by the advisory committees.

Members of the Technical Advisory Committees include:

Water Conservation Technical Advisory Committee

- Judy Adler – Pollution Prevention & Assistance Division
- Cindy Daniel – Metropolitan North Georgia Water Planning District/Atlanta Regional Commission
- Deatre Denion – City of Savannah
- David Eigenberg – Georgia Soil and Water Conservation Commission
- Bill Evans – Georgia Power
- Jim Gleason – City of Woodstock
- David Gustashaw – Interface, Inc.
- Kerry Harrison – University of Georgia / NESPAL
- Jim Hook – University of Georgia / NESPAL
- Mark Johnson – Weyerhaeuser
- Kathy Nguyen – Cobb County Water System
- Rose Mary Seymour – Georgia WaterWise Council
- Tom Shannon – Ewing Irrigation
- Robert Sumner – Plumbing and Mechanical Association of Georgia
- Shana Udvardy – Georgia Conservancy

Water Reuse Technical Advisory Committee

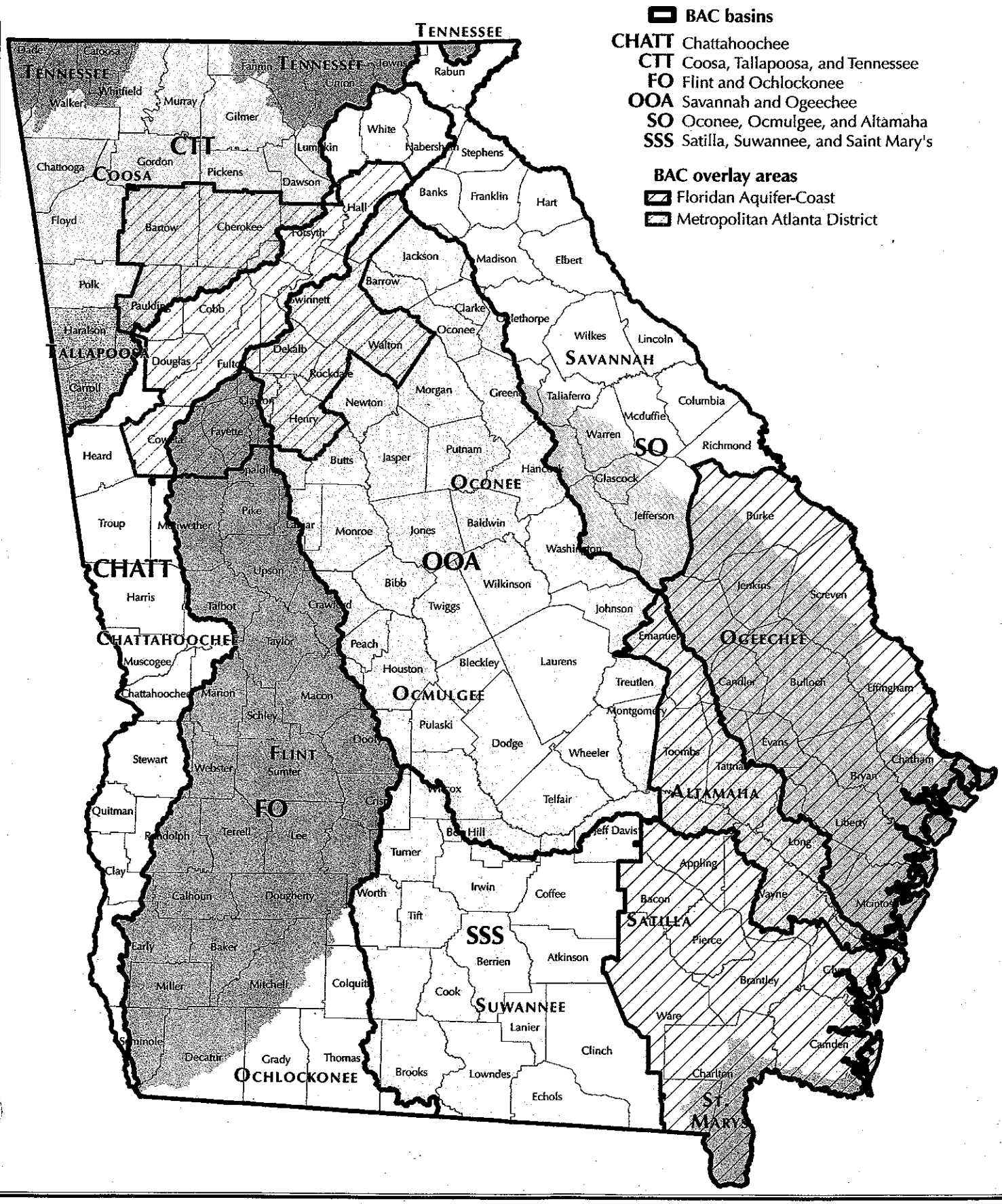
- Charlie Birkenkamper – City of Savannah
- Mark Esoda – Georgia Golf Course Superintendents Association
- Craig Ferguson – PBS&J
- Daniel Johnson – Hayes, James, & Associates, Inc.
- Michelle Lawrence – Fulton County Department of Public Works
- Paul Morgan – Rain Harvest Company
- Lawrence (Larry) Morris – University of Georgia, Warnell School of Forest Resources
- Bob Scott – Irrigation Consultants
- Frank Stephens – Gwinnett County Public Works
- Jim Vaughn – Stevenson and Palmer

The water conservation and reuse TACs convened four times from October 2005, to January 2006, to assist with conservation and reuse technical issues. On October 12 the group met in Atlanta, Georgia, in the Empire Room of the Floyd Towers West, downtown. On October 25 the groups met in Macon,

Georgia, at the Macon Water Authority. On November 30 the two TACs met in Atlanta, Georgia at Ewing Irrigation Training Center. The final meeting was held on January 4, 2006, at the Frank C. Amerson Water Treatment Plant in Macon, Georgia.

Due to the diverse needs of each water use sector, water conservation TAC members were organized into small working groups. The working groups were defined, in large part, by water use sector. The members were asked to narrow down a menu of approximately 130 water conservation practices pulled from all over the United States. The small groups were: public and private water providers, agricultural water use, industrial water users and energy providers, and landscape and recreational irrigation. The practices assessed by each group were organized by those most relevant to their particular sector and were collected by researchers at UGA (CVIOG 2006), research conducted by EPD associates, and research material provided by the public. During the day-long small group working sessions, participants were asked to screen potential water conservation practices for the applicability to the participants sector and the technical feasibility of their implementation here in Georgia. In order to identify those water-conserving practices that could be most effective in particular Georgia sectors, the water conservation practices were assessed based on their 1) potential water savings and 2) the relative cost of implementation (to the permit holder or by the state, where indicated). The small group meetings occurred on November 9, November 15, December 7, and December 9, 2005.

Basin Advisory Committees



BASIN ADVISORY COMMITTEE MEMBERS

Savannah & Ogeechee Basin Advisory Committee

Ms. Amanda Wrona--The Nature Conservancy, Savannah

Mayor Dwain Biggerstaff--GA Association of RDC's, Lincolnton

Ms. Patty McIntosh--Georgia Conservancy, Savannah

Ms. Chandra Brown--Canoochee Riverkeeper, Statesboro

Mr. Frank Carl--Savannah Riverkeeper, Augusta

Mr. Kline Petty--Georgia Power, Evans

Mr. Williams C. Clayton--Columbia County Water, Martinez

Mr. W. Phillip Jones--Bryan County, Pembroke

Ms. Jan Tankersley--Bulloch County, Statesboro

Mr. Lamar Smith--Southprop Development, Reidsville

Mr. Gary Fesperman--City of Lavonia, Lavonia

Mr. Mike Eskew--City of Washington, Washington

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Mr. Dennis Brown--GSWCC Commission Member, Commerce

Mr. Robert Sackellares--Georgia Pacific, Atlanta

Mr. Craig Lanier--Farmer & Cotton Gin, Metter

Mr. Chris McCorkle--Horticulture Production, Dearing

Mr. Joe Boddiford--Cotton & Peanut Farmer, Sylvania

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Mr. Pat Reddish--Forest Products Company, Riceboro

Mr. Larry Haley, Hartwell

Satilla, Suwanne & St. Mary's Basin Advisory Committee

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Mr. Dan Coty--Georgia Association of RDC's, Brunswick

Mr. David Kyler--Center for Sustainable Coast, St. Simons Island

Ms. Emily Perry-Davenport, Valdosta

Mr. Gordon Rogers--Satilla Riverkeeper, Waynesville

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Mr. Bill Jernigan--Georgia Pacific Corporation, Atlanta

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Mr. O.C. Prince, Lake Park

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Commissioner Richard Lee--Lowndes County, Valdosta

Mr. Gary Walker

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Mr. Frank Turner--Newton Land Trust, Covington

Mr. Melvin Davis--Oconee County Commission, Watkinsville

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Ms. Susan Varlamoff--UGA Agricultural & Environmental Sciences, Athens

Ms. Deborah Sheppard--Altamaha Riverkeeper, Darien

Ms. Carol Hassell--Georgia Wildlife Federation, Covington

Mr. Scott Hendricks--Georgia Power Land Resources, Atlanta

Mr. Robert Phillips--Georgia Bass Federation, Covington

Mr. Alan Reddish--City Manager, Athens

Mayor Ken Turner--City of Gordon, Gordon

Mr. Tony Rojas--Macon Water Authority, Macon

Mr. Larry Kaiser--Public Services and Engineering, Conyers

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Mr. Ted Griffin--A.A.A. Construction

Mr. Rick Jeffares--City Manager of Locus Grove, Locust Grove

Mr. Gerald A. Dewitt---Rayonier, Jesup

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Mr. Tom Lehman--Engelhard Corporation, Gordon

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Mr. Ronnie Stapp--Pennington Seed, Madison

Mr. Spencer Black--Triangle Chemical, Macon

Mr. Randall Morris--Row Crop Farmer, Uvalda

Mr. Jerry Davis-Cotton Gin, Hawkinsville

Mr. Wade Hall—Landowner, Eastman

Dr. L.C. Evans—Landowner, Cochran

Mr. Ted Rhinehart--Dekalb County - Pubic Works, Decatur

Mr. Mark Brock--Brock Design Group, Suwanee

Mr. Larry Eley, White Plains

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Ms. Janet Sheldon--Georgia Conservancy, Moultrie

Mr. Tommy Greggors--Georgia Wildlife Federation, Leesburg

Mr. Ronnie Walston--Georgia Power, Albany

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Mr. Terrell Hudson--Cotton, Peanut, and Watermelon Grower, Unadilla

Mr. Harvey Lemmon--Beef Industry Farmer, Woodbury

Mr. Chris Hobby--City of Bainbridge, Bainbridge

Mr. Russ Ober, Leesburg

Ms. Rebecca Martin--Development Authority Bainbridge, Bainbridge

Mr. Raines Jordan-- Land Owner, Talbutton

Mr. Dennis L. Carey--Timber Harvesting Firm, Montezuma

Mr. Rick, Eastin--City of Fayetteville, Department of Water and Sewer, Fayetteville

Mr. John (Bubba) Johnson, Camilla

Chattahoochee Basin Advisory Committee

Mr. Joe Maltese--City of LaGrange, LaGrange

Mr. Gerald Anderson--Clay County Commissioners, Ft. Gaines

Ms. Clair Muller--City of Atlanta, Atlanta

Mr. Denney Rogers--Farm Input Sales, Franklin

Mr. Joe Burns--Landscape Industry, Grayson

Ms. Dorothy McDaniel--Georgia Conservancy, Columbus

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Mr. Ralph Balkcom, Georgetown
Mr. Theron Gay--Coweta County, Newnan
Mr. George Williams--Chattahoochee Riverkeeper, Columbus
Mr. Rob Kindrick--Land Business, Pine Mountain
Mr. Roy Fowler--Cobb-Marietta Water Authority, Marietta
Mr. Cliff Chamblee--GP Cedartown, Cedar Springs
Mr. Joe Padilla, Woodstock
Mr. Sam Chapman, Talmo
Ms. Jackie Joseph--Lake Lanier Association, Gainesville

1/25/06

Coosa, Tallapoosa, & Tennessee Basin Advisory Committee

Mr. Shawn Clouse--The Nature Conservancy, Atlanta Stream Bank Rest. Gail Howell Alice Keyes } EPD
Mr. Jerry Jennings--North GA RDC, Rome
Mr. Cody Laird--Mountain Conservation Trust of Georgia, Jasper
Mr. Joe Cook--Coosa River Basin Initiative, Rome
Mr. Sidney Lanier--Georgia Power, Rome
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Ms. Doris Cook--Etowah County Water & Sewer Authority, Dawsonville
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Mr. John Bennett--City of Rome, Rome
Mr. Rozier Wingate--GACDS, Ellijay (FARMER Chairman SCD)
Mr. Stan Bearden--New Riverside Ochre Company, Cartersville Tom McCoon
~~Ms. Denise Wood--Mohawk Industries, Dalton~~ Moved to Statewide Committee
Mr. Ken Morrow-- Sod Atlanta, Cartersville

Ms. Margaret Tanner--MACTEC, Kennesaw

Mr. Tom Ritch-- Landowner/Business, Rome

Mr. Frank Riley-- Landowner, Hiawassee

Ms. Carrie Hunt--Shaw Industries Group, Dalton

Mayor Boyd Austin--City of Dallas, Dallas

Mr. Brian Anderson--Whitfield County Commissioners, Dalton

Mr. Alfred Thomas, Chickamauga

Metro Overlay Basin Advisory Committee

Mr. Doug Baughman--CH2MHILL, Atlanta

Mr. Rick Blackwell--Let's Go Fishing, Union City

Mr. Rick Brownlow--Metropolitan North Georgia Water Planning District, Atlanta

Ms. Becky Champion--Oxbow Meadows Environmental Learning Center, Columbus

Mr. David Dockery--City of Gainesville, Gainesville

Ms. Kit Dunlap--Greater Hall Chamber of Commerce, Gainesville

Mr. Christopher Ernst--Georgia Mountains RDC, Gainesville

Mr. Kevin Green--Metro Atlanta Chamber of Commerce, Atlanta

Mr. James Hazelwood, Cumming

Mr. Jon Heard--City of Cumming Department of Utilities, Cumming

Mr. Jamie Higgins--U. S. Army Corps of Engineers, Atlanta

Mr. Rob Hunter--City of Atlanta Department of Watershed Management, Atlanta

Ms. Birdel Jackson--B & E Jackson & Associates, Atlanta

Mr. John Lawrence, Douglasville

Mr. Steven Lofton--Regional Business Coalition, Atlanta

Mr. George Martin--Georgia Power, Atlanta

Mr. Steve McCullers--Cobb County Water System, Marietta

Mr. Dennis McEntire--Newnan Utilities, Newnan

Mr. Roy Middlebrooks--Rockdale County Commission, Conyers

Mr. Ron Papaleoni--Lake Allatoona Preservation Authority, Acworth

Mr. Michael Paris--Council for Quality Growth, Duluth

Mr. Michael Patton--Douglas County, Douglasville

Mr. Jim Scarbrough--Gwinnett County Department of Public Utilities, Lawrenceville

Mr. Frank Sherrill--Walton County Water & Sewer Authority, Social Circle

Ms. Bettie Sleeth--Home Builders Association of Georgia, Atlanta

Mr. Jim Stafford--City of Cartersville, Cartersville

Mr. George Taylor--Oglethorpe Power Corporation, Tucker

Ms. Shana Udvardy--Georgia Conservancy, Atlanta

Mr. Marty Williams, Marietta

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Why Georgia Needs a Comprehensive Water Plan

Georgia is a complex state when it comes to water resources. Couple this natural water complexity with increasing water demands and it becomes apparent that Georgia must approach water management in a thoughtful, comprehensive and coordinated manner based on the best science we can have. The following factors, taken together, underscore the need for such a comprehensive approach to water management.

1. **Geology/Hydrology**: Georgia encompasses portions of five physiographic provinces which vary in bedrock, soil, and topography—all of which affect water resources. The geology of the state results in north Georgia generally having more limited surface and ground water resources than South Georgia, which has larger rivers and one of the most prolific aquifer systems in the world. But, even with the abundant water resources of south Georgia, pumping too much water from any one place at any one time can result in salt water intrusions or lowering of ground and surface water levels. These problems now face coastal Georgia- an area of high industrial and municipal withdrawals, and southwest Georgia- the agricultural irrigation center of Georgia.

2. **Weather/Climate**: Although Georgia is located in the humid southeastern United States and receives an average of 50 inches of annual precipitation, floods and drought are common and can significantly affect our water resources and how we use them. In fact, in the past two decades, Georgia has experienced the two worst droughts on record and a 100 and a 500-year flood.

3. **Demographics**: Between 1990 and 2000, the population of Georgia grew by 26.4 percent and this growth is projected to continue so that in the next 25 years, the state's population is expected to approach 12 million people. This growth not be evenly distributed across the state, exacerbating the stress that greater demands will place on our water resources. Most of the growth in population is expected to occur in the northern part of the state, which has more limited water resources than south Georgia. The second fastest growing region of the state is along the coast, an area faced with saltwater intrusion in the Upper Floridan Aquifer, the major water resource of the region.

4. **Economic Growth**: Although Georgia, like the rest of the nation, has been in an economic recession for the past few years, indicators suggest that economic activity is increasing. As the economy grows, the demands for water increase to support our expanding industrial and commercial activities.

5. **Federal Laws**: A number of federal laws set national requirements for water resources. These laws include the Clean Water Act and the Safe Drinking Water Act. In addition, several federal laws affect water resources such as the Resource Conservation and Recovery Act, Endangered Species Act, National Environmental Policy Act, and others. Collectively these federal laws set parameters within which Georgia must operate.

6. **Neighboring States**: All of Georgia's major rivers, except those in the Altamaha and Ogeechee basins, are shared with neighboring states. The Floridan Aquifer, the major aquifer in south Georgia, is also shared with Alabama, Florida and South Carolina. Georgia has been in a "water war" with Florida and Alabama on two river systems since 1990. In addition, Tennessee and South Carolina have voiced concerns over shared water resources. Georgia must work with our neighbors if we are to avoid continued conflicts and costly litigation relating to these water bodies.

7. **The Courts**: Increasingly, decisions about water resources are taken to court by one party or another. Georgia has been in litigation over ground water use in coastal Georgia, water quality protection, and various other issues. The U.S. Constitution provides the federal courts with a role in resolving interstate disputes, including conflicts over shared water resources. Courts at all levels are becoming increasingly involved in determining how water will be managed in Georgia.

8. **Technology**: Advances in technology have affected how we get water, transport water, treat water, use water, conserve water, and treat wastewater. In fact, technological changes are evident in every aspect of water use. Sometimes this helps us use water more efficiently, but at other times it increases the stresses we place on the water system.

9. **Knowledge**: We know a great deal more about our water resources today than we did in past eras. Research has improved our knowledge of how water resources systems work, and what is necessary to have healthy, functioning aquatic systems. Not only have we generated new water-related knowledge and insights, but our ability to communicate this new information has expanded greatly through formal and informal educational programs, media, and the internet.

10. **Value of Water**: Water is a valuable resource in many ways. It supports our economy and thus has value in the production of agricultural and industrial products. It has environmental value in that all life is dependent upon water—in addition to water to support bodily functions, water provides habitat, nurseries and refuge for aquatic and terrestrial plants and animals. It has social/cultural value in that our lives are intertwined with water in countless ways. Water provides recreational and aesthetic values. Water not only supports life but it improves the quality of life in a myriad of ways. And, growing scarcity of water, whether real or perceived, increases its value.

These factors support the need for a comprehensive approach to managing water resources. The question is whether we have such a water management program in place and, if not, what will it take to create one. To answer these questions, we have to review our current water management efforts and how they developed over the years.

The foundation upon which water management in Georgia rests is the set of statutes enacted by Congress and the Georgia General Assembly that relate directly or indirectly to our water resources. The statutes are implemented—through a series of rules, policies, and programs—by various departments of federal and state governments. One must look to the statutes themselves for either explicit or implicit expression of our collective goals for managing

water resources. These "goals" (i.e., the outcomes we seek to achieve) reflect best how we collectively, as citizens of the United States and of Georgia, value the direct and indirect attributes of our water resources.

The laws that express our goals vary. Some reflect the broader goals of Americans and were passed by Congress. The federal statutes, such as the Clean Water Act, Safe Drinking Water Act, Endangered Species Act, Coastal Zone Management Act, and others, identify overarching goals that have been embraced, to varying degrees, by Georgia statutes. By enacting state laws that are at least as stringent as the federal laws, the state is able to receive primacy to implement the federal policies and programs in Georgia. The primacy mechanism applies to environmental laws administered by the U.S. Environmental Protection Agency (USEPA), such as the Clean Water Act and the Safe Drinking Water Act. Primacy, however, does not apply to all laws. For example, the Endangered Species Act is administered exclusively by the U.S. Fish and Wildlife Service. If there is sufficient change in collective American values or goals relating to water resources management, Congress adds to or amends federal laws to reflect this change; the State of Georgia alone can not alter the federal requirements.

Some state statutes, however, are Georgia specific, and are not driven by federal directives. State statutes include the Erosion and Sedimentation Control Act, Safe Dams Act, Georgia Planning Act, the Coastal Marshlands Protection Act, laws enacted to provide for allocation of water quantities, and others. These laws were enacted by the Georgia General Assembly and reflect goals and values of Georgians. Collectively, the federal and state statutes serve as the foundation for our water management program.

We face significant challenges, however, in meeting the goals stated or implied in these statutes. First, inconsistencies and lack of coordination can hamper meeting at least some of the goals. Laws are passed by different legislative bodies, at different times with different motivations and for different purposes, and are implemented by federal and state agencies with varying degrees of financial, technical and managerial capacity. Specific water-related decisions reflecting these policies and programs are then made by local government officials, private sector institutions, and the general public. Assuring coordination and avoiding inconsistencies in such a situation may be desirable but rarely occurs, at least to the extent necessary to fully meet the goals of the statutes.

A second challenge in meeting stated goals is that these goals are not static, but rather they reflect the values we attribute to water resources at a particular point in time. These goals also reflect the world as we know it—or can reasonably expect it to become—at the point in time when we conceive the statutes. Congress and the General Assembly can amend these statutes, but they do not always change in lock step with a shift in our citizens' goals, aspirations, perceptions, activities and knowledge related to water resources.

Problems Resulting from Uncoordinated Water Management

Some examples of the need for a more comprehensive, thoughtful and coordinated approach to water management may be instructive.

- **Protecting Water Quality:** Our efforts to meet water quality standards have focused primarily on reducing contamination through controlling discharges from industries and municipalities. We have accomplished a great deal nationally and in Georgia by reducing pollutants that enter our waterways through these industrial and municipal wastewater discharges. Streams, rivers and lakes across the country are cleaner today than they were when the Clean Water Act was passed in 1972. But as we reduced the contaminant load from these point sources and as our knowledge of the impacts of nonpoint sources (e.g., runoff from land) increased, land use changes were outpacing our efforts to address resultant nonpoint sources.

  Georgia's Erosion and Sedimentation Control Act, passed in 1975, only addresses runoff from certain construction activities. It does not deal with the direct relationship between post-construction land use and nonpoint pollution; nor does it address the broad array of nonpoint pollutant types- such as nutrients, heavy metals, and synthetic organic compounds - that enter our waterways as a result of post-construction land-use practices. The Act also assigns responsibilities to multiple state agencies and to local governments who wish to implement the requirements within their jurisdiction.

  More recently, the federal government, both through its executive and judicial branches, has increased its focus on controlling nonpoint pollution as an additional management tool in the effort to render our waters safe and healthy. Both the USEPA and the Georgia Environmental Protection Division (EPD) have worked to control stormwater discharges. Since the first flush of stormwater carries most of the nonpoint pollutants to streams, collecting and/or otherwise treating this stormwater can do much to improve water quality. Additionally, the federal court system has required USEPA and, by extension EPD, to develop total maximum daily loads (TMDLs) in order to bring those streams that do not meet water quality standards into compliance with the Clean Water Act.

  In Georgia, there are over 6,000 miles of streams that have been assessed that do not meet water quality standards; most of these impairments are due to nonpoint pollution sources. To improve coordination of the nonpoint control efforts, the Georgia General Assembly enacted HB 285 in the 2003 legislative session. This statute better aligns erosion and sedimentation control requirements under state law with stormwater control requirements under the federal Clean Water Act. This legislation will result in better coordination but to be truly effective, the efforts of federal, state and local governments, as well as those of private land owners must work in concert to protect our waterways from nonpoint pollution.

- **Maintaining Healthy Aquatic Systems:** Achieving and maintaining healthy aquatic systems was built into our statutory foundation for water management in the 1970s when the Clean Water Act made it a national goal to have "fishable" and "swimmable" waters. The term "fishable" waters implies a healthy aquatic habitat that supports fish. Additionally, the Clean Water Act declares that "[t]he objective of this Act is to restore and maintain the chemical, physical and biological integrity of the Nation's waters." To restore and maintain the biological integrity of our waterways, Congress intended that

- this federal water quality law protect healthy aquatic communities. So too, the Endangered Species Act was designed to protect both terrestrial and aquatic species.

  To obtain primacy for implementing the provisions of the Clean Water Act in Georgia, the Georgia Water Quality Control Act, first passed in the 1950s and amended in the 1960s, was again amended by the General Assembly to incorporate the federal requirements. Thus maintaining the biological integrity of Georgia's waters was incorporated as a goal for the state. Although the Georgia General Assembly enacted the Georgia Endangered Wildlife Act and the Wildflower Preservation Act in 1973, these laws are much narrower in scope than the federal Endangered Species Act that, as noted above, does not have a primacy provision. Consequently, the goal to have healthy aquatic systems has been in place at the federal level and, to a lesser extent at the state level, since the 1970s. That goal has not changed.

  What has changed over the past few decades is our understanding of what is required take to achieve that goal. In 1972, when the Clean Water Act was passed, it was anticipated that improving water quality would enable us to have healthy aquatic systems. Now, it is clear that we also must maintain sufficient streamflow – as well as flow patterns that mimic the natural flow regime - in order to maintain healthy communities of fish and other aquatic organisms.

  The Supreme Court of the United States has determined that states have retained the authority to allocate water to users within their borders. The Georgia General Assembly enacted the Georgia Ground Water Use Act in 1972 and amended the Georgia Water Quality Control Act in 1977 to provide for a water allocation system that requires major water users to obtain water withdrawal permits from EPD. Before issuing a permit, the Environmental Protection Division evaluates water withdrawal permit applications to determine if they will adversely affect the water resource or other water users.

  For surface water withdrawals, EPD has used 7Q10 (e.g., the low flow amount of water you would expect to have in a stream for seven consecutive days in a ten year period) to determine the impact of a new withdrawal on the water resource. We now know that this is not a sufficient amount of water to maintain a healthy aquatic system. In 2001, the Board of Natural Resources adopted an interim instream flow policy designed to increase minimum flows, but that change still may be insufficient. As our knowledge improves, new actions may be necessary to meet our goals, or we may have to change our goals to reflect our new knowledge.

- **Integrating Water Quality and Quantity Management:** As more water is withdrawn from streams and less is returned, the capacity of the streams to assimilate wastewater discharges decreases. There is simply less water available to dilute pollutants. Currently a number of streams and rivers in the state are approaching their limits for assimilating wastewater—not to mention limitations on their ability to meet offstream water demands for public supply, industrial uses, thermoelectric power production, and agricultural irrigation. Meeting offstream demands for water while ensuring there is sufficient water left in the stream to meet instream needs is a significant challenge that will require

- greater coordination. Similarly, large withdrawals of ground water along the coast have resulted in salt water intrusion concerns, a water quality problem.

- **Integrating Surface and Ground Water Management:** Flow in streams during drought periods comes largely from ground water. Although this is true throughout the state, it is even more significant in karst areas where dissolvable bedrock (i.e., limestone, dolomite) is at or near the surface. In Georgia, this includes both the southwest and northwest portions of the state. In the lower Flint River basin, it has been estimated that – over an extended period - every gallon of water withdrawn from the Floridan aquifer decreases the amount of groundwater that seeps into streams by 0.6 gallons. In this high irrigation region of the state, therefore, large withdrawals of ground water may have a significant impact on the amount of water in streams. Similarly, large withdrawals of ground water along the coast have resulted in decreases in artesian pressure, reducing ground water discharge to wetlands and streams in portions of this area. Consequently, to avoid surface water problems relating to inadequate flows, it is increasingly necessary to consider the potential impacts of ground water use on streams, lakes, and estuaries.

When water management values, statutes, rules or programs change in an uncoordinated fashion, there is an inevitable conflict between our goals/aspirations and the rules/policies/programs that seek to achieve them. Here in Georgia, the "new values" have largely grown out of lessons we have learned in programmatically implementing "old" rules and policies, and from vast leaps forward in the state of our knowledge regarding the physical, chemical, and biological functions of our water systems since the 1970s. Generally we have addressed these conflicts between "old" programs and "new" values in an issue-by-issue, piece-meal fashion through the legislative process, followed by "fixes" to individual rules and programs. A more comprehensive approach is rarely an option due to the cost in time and resources.

A New Opportunity

Occasionally there exists a curious mix of circumstances that presents an opportunity, if recognized and properly embraced, to comprehensively review where we are, how we got here, and where we should be going. Such an opportunity is clearly provided in developing Georgia's first comprehensive state-wide water management plan. We now have a chance to revisit, in a comprehensive manner, our water management goals and to recommend a set of statutory, regulatory, and policy fixes designed to effectively meet our water needs for the next few decades. Such an opportunity has not been available since our water management program first began to take shape 30+ years ago. An opportunity of this nature should not be squandered.

This opportunity to comprehensively address water management concerns began with the creation of the Joint Comprehensive Water Plan Study Committee and the Water Plan Advisory Committee during the 2001 legislative session of the Georgia General Assembly. Legislation, based on this 15-month effort, was passed in the 2004 legislative session and reflects the most recent articulation of a water goal or vision and guiding principles for water planning in the state. The General Assembly incorporated the overall goal/vision for Georgia's water resources, adopted by the study committee, in HB 237:

Georgia manages water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens.

This goal/vision encompasses the concept of sustainability that was not articulated in earlier goals, and recognizes the interrelationship of the economy, environmental quality, and quality of life.

In addition, the study committee identified nine principles to guide the development of the state-wide comprehensive water management plan and these guiding principles were incorporated in HB 237.

1. Effective water resources management protects public health, safety and welfare of Georgia's citizens.
2. Water resources are managed in a sustainable manner so that current and future generations have access to adequate supplies of quality water that supports both human needs and natural systems.
3. All citizens have a stewardship responsibility to conserve and protect the water resources of Georgia.
4. Water management efforts recognize that economic prosperity and environmental quality are interdependent.
5. Water quality and quantity and surface and ground water are interrelated and require integrated planning as well as reasonable and efficient use.
6. A comprehensive and accessible database is developed to provide sound scientific and economic information upon which effective water management decisions can be based.
7. Water resource management encourages local/regional innovation, implementation, adaptability and responsibility for watershed and river basin management.
8. Sound water resources management involves meaningful participation, coordination and cooperation among interested and affected stakeholders and citizens as well as all levels of governmental and other entities managing and/or utilizing water.
9. Periodic revisions of the plan are required to incorporate new scientific and policy insights, as well as changing social, economic, cultural, and environmental factors.

The General Assembly has thus created a framework for developing Georgia's first comprehensive state-wide water management plan by providing a vision/goal for water management and guiding principles for developing the plan. The planning process must evaluate water trends and conditions to determine the types of challenges that we face or will face; evaluate our legal/management structure (i.e., statutes, rules, programs, policies) to address those challenges; identify gaps and other weaknesses in our water management approach; and identify options for addressing these gaps and weaknesses and the pros and cons of each option. Throughout this process, public input is needed to ensure that the plan reflects the goals and values of Georgia citizens. It is then the role of state policy makers to select the best set of options to manage Georgia's water resources and to enact necessary legislation or make appropriate changes in rules, policies and programs to achieve our water resources goal.