

Maximizing Water Returns to River Basins

A Report to
the Georgia Environmental Protection Division



Carl Vinson *Institute of Government*

University of Georgia

Athens, Georgia

2006

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ACKNOWLEDGEMENTS

This report was prepared for the Environmental Protection Division of the Georgia Department of Natural Resources by the University of Georgia's Carl Vinson Institute of Government. Authors of the report are Margaret Myszewski, James E. Kundell, and Dana W. Seerley. The authors would like to thank Justin Welch, University of Georgia, for his research on land application of wastewater in Georgia and other states, and David Pitts, Georgia State University, for research on state sewer connection regulations. The authors would also like to extend special thanks to Bob Scott, Georgia EPD, Vince Williams, Georgia EPD and Glen Behrend, Georgia EPD, for providing information about land application and reuse practices and regulations in Georgia.

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EXECUTIVE SUMMARY

Georgia enjoys a relatively plentiful water supply, yet the availability of our water resources varies both seasonally and regionally. When our natural water complexity is considered with regard to increasing water demands, it becomes apparent that Georgia must approach water management in a thoughtful, comprehensive and coordinated manner based on the best science we have. The following factors, taken together, underscore the need for such a comprehensive approach to water management.

1. **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.
2. **Geology/Hydrology:** Georgia encompasses portions of five physiographic provinces that vary in bedrock, soil, and topography - which result in an uneven distribution of water resources. North Georgia generally has 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. 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 intrusion 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.
3. **Demographics:** Between 1990 and 2000, the population of Georgia grew by 26.4 percent. This growth is projected to continue so that in the next 25 years, the state's population is expected to approach 12 million people. Population growth is not evenly distributed across the state, exacerbating resource stress caused by greater water demands. 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 salt water intrusion in the 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 our economy has grown, trends indicate that demands for water increase to support our expanding industrial and commercial activities.
5. **Federal Laws:** Federal laws, such as the Clean Water Act and the Safe Drinking Water Act, set national requirements for water resources. In addition, several federal laws affect water resources including 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 of the Altamaha, Satilla 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. Since 1990, Georgia has been in a dispute with Florida and Alabama regarding the management of the waters of two river systems. In addition, Tennessee and South Carolina have voiced concerns over shared water resources. Georgia and neighboring states must work together to avoid continued conflicts and costly litigation relating to these shared water bodies.
7. **The Courts:** Increasingly, decisions about water resources are being taken to court. 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 management. Generally, technology helps us use water more efficiently, but in some cases, it can increase the stress 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 needed to support human functions, water provides habitat, nurseries, and refuge for aquatic and terrestrial plants and animals. It has social and 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 myriad ways. Further, 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 it will take to create one.

The legal foundation upon which water management in Georgia rests is the set of statutes enacted by Congress and the Georgia General Assembly. Collectively, this body of law has set two general water-related goals for us to meet.

- Protect public health and environmental quality; and
- Meet future needs while protecting aquifers, instream uses and downstream users.

We face significant challenges, however, in meeting these goals. First, inconsistencies and lack of coordination can hamper meeting at least some of our goals. Laws are passed by different legislative bodies at different times, with different motivations, and for different purposes. They are implemented by federal and state agencies with varying degrees of financial, technical, and managerial capacity. Specific water-related decisions reflecting policies and programs are 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 our water goals is that laws are not static. They reflect the values we attribute to water resources at a particular point in time. These laws also reflect the world as we know it—or can reasonably expect it to become—at the point in time when we conceive them. Congress and the General Assembly can amend these statutes, but they do not always change in lock step with a shift in citizens' goals, aspirations, perceptions, activities, and knowledge related to water resources.

To better address the water challenges we face, the Comprehensive State-wide Water Management Planning Act was passed by the Georgia General Assembly during the 2004 legislative session. This law directs the Environmental Protection Division of the Georgia Department of Natural Resources to develop a comprehensive state water management plan and create the Georgia Water Council, composed of legislators, legislative appointees and agency heads with water-related responsibilities to oversee the development of the plan. The plan is to be provided to the Council in July 2007, for its review and adoption and presented to the General Assembly for consideration in the 2008 legislative session.

The first iteration of the comprehensive water management plan will focus on four key policy objectives:

1. Minimizing withdrawals of water by increasing water conservation, efficiency and reuse;
2. Maximizing 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. Meeting instream and off stream water demands through storage, aquifer management and reducing water demands; and

4. Protecting water quality by reducing wastewater discharges and runoff from land to below the assimilative capacity of the streams.

These management objectives are interrelated, and policy options may relate to more than one objective. In addition, an option might be appropriate in one situation but not in another. Consequently, the plans should identify a variety of policy options that are consistent with state and federal laws and usable in different situations. The most appropriate options can then be selected to address the water challenges unique to each river basin and aquifer in the state. The result will be that approaches may vary from region to region depending on water resources and demands, but that all regions will be consistent with the overall state water policy framework.

A series of four reports examines each of the management objectives in terms of current knowledge and policies adopted in other states. As we move through the planning process, the policy options will be considered by various advisory committees, presented at public meetings, and made available on the Georgia Water Council's website (www.georgiawatercouncil.org). The intent is to distribute the information widely and to have as much feedback as possible so that the most effective water management options are identified for use in Georgia.

This report is the second of four policy documents to focus on these objectives; specifically on maximizing water return to the river basins through reducing interbasin transfers and limiting use of septic tanks and land application of treated wastewater where water quantity is limited.

Unlike the first report that focused on water conservation, efficiency and reuse—which are widely used across the country— this report concentrates on approaches that have not been widely used, except for limitations on interbasin transfers. Both land application of treated wastewater and use of septic systems have been evaluated, monitored and managed as water quality tools. In both cases, these approaches have helped address water quality challenges. This report will look at the impacts use of land application of wastewater and septic systems have on water quantity. Water quality is the focus of the fourth report in this series.

Land Application of Treated Wastewater

Reclaimed water is wastewater, generally from municipal sewerage flows, that has been treated to ensure the quality of water is appropriate for nonpotable uses, such as lawn, golf course, and agricultural irrigation; fire control; environmental restoration; and other purposes. Land application is the most common use of reclaimed water. Most land application entails the use of reclaimed water for a beneficial use, such as irrigation. However, in some locales land application is used as a wastewater disposal mechanism rather than to irrigate a desirable landscape or crop. The benefit of land application in these cases is the improved water quality that can result from reducing direct wastewater discharges to streams.

The use of reclaimed water for land application can potentially increase the quantity of water in rivers and streams. This can improve water quality as well as reducing the need for additional water storage. For example, in water bodies where low flows during dry weather periods come from ground water, land application of reclaimed water can be used to augment stream flows. In situations where the soil moisture is at higher levels due to land application of reclaimed water, a subsequent wet period will result in increases in stream flows because of the soil's reduced capacity to hold rainwater. While land application of treated wastewater can be environmentally friendly, it can also have negative impacts on both water quantity and quality. Water that is land applied may not return to the source water body or to the basin-of-origin, which may result in lower instream flows and possible water quality impacts to the river, if the river depends on a specific volume of water to meet its total maximum daily load (TMDL) requirements.

Policy questions regarding land application entail balancing uses of reclaimed water such that it meets its highest and best use; whether water quality or water quantity challenges are paramount in a given region or river basin; and whether the consumptive nature of land application is outweighed by the fact that water quality and quantity challenges may be addressed by reducing withdrawals and treatment of potable water for nonpotable uses such as irrigation.

Septic Systems

As with land application, the use of septic tanks has both water quality and water quantity implications. A typical septic system contains two major components: a septic tank that collects solids, and the absorption field or drainfield that disposes of the liquid waste. The tank and lines are buried under the ground and help disperse the wastewater into the soil. The primary purpose of the septic tank is to separate solids from the liquids and to promote partial breakdown of contaminants by microorganisms naturally present in the wastewater. The absorption field is the most critical part of the septic system for reducing contaminants and dispersing the effluent. The absorption field uses natural physical, chemical, and biological processes to clean the wastewater. The soil filters out many of the harmful bacteria, viruses, and some nutrients that are still present in the wastewater. The vegetation covering the absorption system also uses the nutrients and water to grow. Soil is the most important factor in determining whether a septic system will work properly and protect public health and the environment. Not all soils are equally effective as septic absorption fields, and only a site-specific soil analysis will determine suitability.

Much of the growth in Georgia is in suburbanizing counties which rely heavily on septic tanks in areas where sewers have not been built. In addition, it appears that many homes and buildings in more urbanized areas still use the septic systems they were built with instead of connecting to a currently available sewer system.

Although septic systems have helped to decrease water borne disease outbreaks, they are still a concern, both from a public health and an environmental perspective. Since this report addresses maximizing water returns to the system, we will discuss here the role of septic systems and public sanitary sewer systems relating to water quantity management.

From this standpoint, septic systems are a concern because they take water away from the system and do not return it to the waterways in measurable terms of quantity and time in the way a wastewater treatment system would.

Interbasin Water Transfers

Increasing population growth and urbanization are raising water demands relative to water supply in many areas of the eastern United States, including Georgia. Although droughts are still a major cause of water supply problems in the state, other factors, such as rapid population growth and extensive commercial development are beginning to cause water supply problems even during normal weather conditions. Compounding the state's water supply challenge is the fact that population growth and development do not always occur where the most abundant water supplies exist. This situation is not exclusive to Georgia, and many states have found that the demand for water in one region justifies transporting it far from the stream where it originates. Such interbasin water transfers are viewed by many states, especially in the western part of the country, as a valuable way to meet changing water needs.

Interbasin transfers involve moving water from one river basin to another. When this occurs, the benefits associated with that water are also transferred from the basin-of-origin to the receiving basin. Losses suffered by basins-of-origin tend to be economic and environmental. The economic effects of interbasin transfers include actual or potential negative impacts on incomes, jobs, and business opportunities, while negative fiscal impacts include actual or potential loss of property tax base and bonding capacity, tighter spending limitations, and reduced revenue sharing. In addition to declines in the current economy, interbasin transfers may result in the reduction of water resources available for new local development. Interbasin transfers of water can also have significant negative environmental impacts on water-dependent flora and fauna. These impacts are broad based, effecting not only instream flows, wetlands, and fish and wildlife, but also downstream water quality and recreational opportunities that are dependent on stream flows, riparian habitats, and aesthetic qualities.

Environmentally and socially there may be benefits of high quality interbasin transfers of water. In order to maintain a high quality stream it may be necessary to bring water into the basin to meet the needs of water users within the basin. There may be significant environmental benefits to protecting high biodiversity streams or social value in protecting important recreational and aesthetic opportunities in the basin.

Interbasin transfers are currently taking place in Georgia. Typically, they occur when a city or county obtains its water from one river basin, pipes it to businesses and residences in another river basin, and discharges it in that river basin.

The basic question involved in interbasin transfers is: whether the benefits of the transfer can be achieved by using means other than an interbasin transfer, or, if not, whether the benefits of the transfer to the state and/or receiving basin outweigh the costs of the transfer to the basin-of-origin.

Georgia's water resources are becoming increasingly strained by pollutant loading from point and nonpoint sources and greater withdrawal demand as the State's population and economy grow. As a result, specific policies that clearly define a strategy for maximizing return flows to water bodies have become more critical. Land application of wastewater, septic systems, and interbasin transfers are all consumptive uses of water that do not return water to the point of withdrawal, at least not in a timely and quantifiable manner. Nevertheless, all three of these water uses serve beneficial purposes that are valuable to society. It will be important for Georgia to develop water policies that will balance the water demands of its growing population against the equally important need to maximize water returns to the point of withdrawal. The basic question relating to land application, septic systems, and interbasin transfers is under what circumstances should these withdrawals be allowed and, conversely, under what circumstances should they be denied.

Chapter 1

INTRODUCTION

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 have. To meet the challenges before us, we will need to adopt new approaches or mechanisms to conserve water, return more water to the streams, help us balance off stream and instream water needs, and protect water quality. The following factors, taken together, underscore the need for such a comprehensive approach to water management.

- 1. 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.
- 2. Geology/Hydrology:** Georgia encompasses portions of five physiographic provinces that vary in bedrock, soil, and topography - which result in an uneven distribution of water resources. North Georgia generally has 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. 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 intrusion 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.
- 3. Demographics:** Between 1990 and 2000, the population of Georgia grew by 26.4 percent. This growth is projected to continue so that in the next 25 years, the state's population is expected to approach 12 million people. Population growth is not evenly distributed across the state, exacerbating resource stress caused by greater water demands. 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 salt water intrusion in the 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 our economy has grown, trends indicate that demands for water increase to support our expanding industrial and commercial activities.
- 5. Federal Laws and Policies:** Federal laws, such as the Clean Water Act and the Safe Drinking Water Act, set national requirements for water resources. In addition,

several federal laws affect water resources including 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. In addition, policies of federal agencies significantly affect Georgia's water resources. For example, the management of federal reservoirs by the U.S. Army Corps of Engineers largely determines flows in rivers including the Chattahoochee and the Savannah.

6. **Neighboring States:** All of Georgia's major rivers, except those of the Altamaha, Satilla 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. Since 1990, Georgia has been in a dispute with Florida and Alabama regarding the management of the waters of two river systems. In addition, Tennessee and South Carolina have voiced concerns over shared water resources.
7. **The Courts:** Increasingly, decisions about water resources are being taken to court. 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, however, 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 management. Generally, technology helps us use water more efficiently, but in some cases, it can increase the stress 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 needed to support human functions, water provides habitat, nurseries, and refuge for aquatic and terrestrial plants and animals. It has social and 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 myriad ways. Further, growing scarcity of water, whether real or perceived, increases its value for all of these purposes.

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 it will take to create one.

The legal foundation upon which water management in Georgia rests is the set of statutes enacted by Congress and the Georgia General Assembly. These statutes relate both directly and indirectly to our water resources. 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 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 attributes of our water resources.

The laws that express our goals vary. Some laws 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, or the responsibility 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 cannot alter the federal requirements.

Some state statutes are Georgia specific and 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, and others. In addition, states have the authority to determine how water should be allocated to various water users. Georgia has enacted legislation establishing permitting requirements for withdrawals of over 100,000 gallons per day of surface and ground water. These laws were enacted by the Georgia General Assembly and reflect goals and values of Georgians. Together, the federal and state statutes serve as the foundation for our water management programs.

Collectively, this body of law has set two general water-related goals for us to meet.

- Protect public health and environmental quality; and
- Meet future needs while protecting aquifers, instream uses and downstream users.

We face significant challenges, however, in meeting these goals. First, inconsistencies and lack of coordination can hamper meeting at least some of our goals. Laws are passed by different legislative bodies at different times, with different motivations, and for different purposes. They are implemented by federal and state agencies with varying

degrees of financial, technical, and managerial capacity. Specific water-related decisions reflecting policies and programs are made by local government officials, private sector institutions, and the general public. Assuring coordination and avoiding inconsistencies in such a situation, while desirable, rarely occurs, at least to the extent necessary to fully meet the goals of the statutes.

A second challenge in meeting our water goals is that laws are not static. They reflect the values we attribute to water resources at a particular point in time. These laws also reflect the world as we know it—or can reasonably expect it to become—at the point in time when we enact them. Congress and the General Assembly can amend these statutes, but they do not always change in lock step with a shift in 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. However, 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.

In the effort to render our waters safe and healthy, the federal government, through its executive and judicial branches, recently has increased its focus on controlling nonpoint sources as a pollution management tool. Both the USEPA and the Georgia Environmental Protection Division 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 help 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 source pollution. To improve coordination of the nonpoint source control efforts, the Georgia General Assembly enacted House Bill 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 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 federal requirements for healthy aquatic systems. 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 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 stream flow—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 withdrawal permit, EPD evaluates water withdrawal permit applications to determine if the withdrawal will have an unacceptable adverse impact on the water resource or other water users.

For surface water withdrawals, EPD formerly used annual 7Q10 (e.g., the annual average of a stream segment's 7-day low flow, with a frequency of occurrence of once in ten years) as the standard with which to determine if, after a withdrawal, a sufficient amount of water would be left in the stream for instream uses. Through the 1990s strong scientific evidence was developed that annual 7Q10 was 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 the amount of water remaining in streams—after withdrawals—for instream uses, but that change still may be insufficient. As our knowledge improves, new management actions may be necessary to meet our goals. We also may find it necessary to consider changing 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 above or approaching their limits for assimilating wastewater—not to mention limitations on their ability to meet off stream water demands for public supply, industrial uses, thermoelectric power production, and agricultural irrigation. Similarly, large withdrawals of ground water along the coast have allowed salt water to intrude into the aquifer upon which most coastal residents depend. Meeting our demands for water while ensuring sufficient water is left in the stream to meet instream needs and in the aquifer to maintain hydrologic balance is a significant challenge that will require greater coordination than we currently have.
- **Integrating Surface and Ground Water Management:** Flow in streams during drought periods comes largely from ground water. This is true throughout the state, but 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 dry period—every gallon of water withdrawn from the Floridan Aquifer decreases the amount of ground water that seeps into streams by about 0.6 gallons. This is a high irrigation region of the state, therefore, large withdrawals of ground water during dry periods 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 that reduces ground water discharge to wetlands and streams in portions of this area. To avoid surface water problems relating to inadequate flows, it is increasingly necessary to consider the potential impacts of ground water withdrawals 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, “new values” have largely grown out of lessons we have learned: 1) by programmatically implementing “old” rules and policies; and 2) from vast leaps forward in the state of our knowledge regarding the physical, chemical, and biological functions of our water systems. 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

An 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 effort, was passed in the 2004 legislative session and reflects the most recent articulation of a water vision and guiding principles for water planning in the state. The General Assembly incorporated the study committee’s overall vision for Georgia’s water resources as the state water management goal in the Comprehensive State-wide Water Management Planning Act:

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 vision encompasses the concept of sustainability that has never been articulated in earlier goals. It also recognizes the interrelationship of the economy, environmental quality, and quality of life.

Additionally, the study committee identified nine principles to guide the development of the state-wide comprehensive water management plan. These guiding principles were incorporated in the Act:

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:

1. Evaluate water trends and conditions to determine the types of challenges that we face now or will face in the future;
2. Evaluate our legal/management structure (i.e., statutes, rules, programs, policies) to address those challenges;
3. Identify gaps and other weaknesses in our water management approach; and
4. Identify options for addressing these gaps and weaknesses and the benefits and drawbacks of each option.

The plan will initially focus on four interconnected water management objectives:

1. Minimize withdrawals of water by increasing water conservation, efficiency 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 (see number 1); 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.

These policy objectives are complementary, with the overall goal to maximize the amount of water available for both humans and natural systems such that our water resources are sustained in a healthy balance within each river and aquifer. In order to achieve this goal, an overarching focus must be on preserving minimum instream flows and ground water levels. Instream flow ranges should be protective of water quality, aquatic ecosystems, and the legal responsibility to provide adequate flow for downstream users. Ground water levels should be maintained to prevent salt water intrusion and adverse impacts to surface water flows and to sustain long-term use of the aquifer.

The first objective, to minimize withdrawals through conservation, efficiency, and reuse, will help reduce the need for increased water supplies as our population and water demands grow. Making better use of the available water is usually the least costly alternative for meeting water demands. Water conservation is certainly not a new concept, but its practice should be stressed in order to better meet both instream and offstream demands for water.

The second objective, to maximize returns to the basin of origin (and thus help maintain adequate instream flow in each river basin) focuses on reducing interbasin transfers and judiciously using septic tanks and land application of treated wastewater. Each of these may be useful water management tools, but without careful management, they may threaten the balance of water resources in the basin-of-origin. Interbasin transfers may be necessary and desirable in some instances, but the benefits to the importing basin must be weighed against the instream and offstream costs to the exporting basin. Septic systems are important for protecting water quality in rural areas, however, as proliferation of septic systems has accompanied sprawling suburban growth, how much of the residential water supply is being returned to its basin-of-origin? Finally, land application of treated wastewater can be beneficial if used to irrigate land where potable water might otherwise be used, but as a wastewater discharge tool, its benefits should be examined relative to the costs of direct discharges of treated wastewater.

The third objective, meeting offstream water needs during seasonal shortages while maintaining instream values, emphasizes the need to balance human water demands with the needs of aquatic systems. Reservoirs provide valuable water storage for municipal, agricultural, industrial, and commercial needs, but they come with monetary and environmental costs that must be considered. Ground water is often connected to surface water systems and must be managed to help preserve instream flows as well as to sustain ground water quality and quantity over time. Conjunctive use of surface water and ground water, such as aquifer recharge and aquifer storage and recovery (ASR), can provide seasonal and year-to-year storage options that should be weighed with other options in terms of storage utility and environmental integrity.

The fourth management objective, protecting water quality by reducing wastewater discharges and runoff from land to below the assimilative capacity of the streams, is related to the previous management objectives in that the greater the instream flow, the greater the assimilative capacity of streams. While the other management objectives focus generally on managing water quantity, which impacts water quality, this objective focuses rather on tools that can be used to reduce direct and indirect discharges affecting water quality.

As stated above, these management objectives are interrelated and need to be considered in a comprehensive manner. To do so will require that a variety of policy options be available and that, from these available options, the most appropriate ones be selected to address the water challenges unique to each river basin and aquifer in the state. The result will be that approaches may vary from region to region depending on water resources and demands, but that all regions will be consistent with the overall state water policy framework.

A series of four reports examines each of the management objectives in terms of current knowledge and policies adopted in other states. As we move through the planning process, policy options will be considered by various advisory committees and be presented at public meetings and made available on the Georgia Water Council's website (www.georgiawatercouncil.org). The intent is to distribute the information widely and to have as much feedback as possible so that the most effective water management options are identified for use in Georgia.

Maximizing Return Flows

The volume of water that is discharged into a source after it is released from the point the water was used is called return flow. After this water is returned to the river or stream it becomes available for further uses (Solley et al. 1998). Water needed for domestic, agricultural, industrial, and recreational uses must be obtained from the finite quantity found in Georgia's surface and ground waters. While human water needs are important, so too is the need for adequate amounts of water to remain in rivers and streams. Adequate stream flow is necessary to protect a water body's ability to filter out harmful pollutants, the overall health of the river ecosystem, the extent of natural habitat surrounding the stream, and the ability of the aquatic ecosystem to sustain the existence of a diverse number of species, including endangered and threatened species (Howett and Rogers 2005).

Consumptive Uses of Water

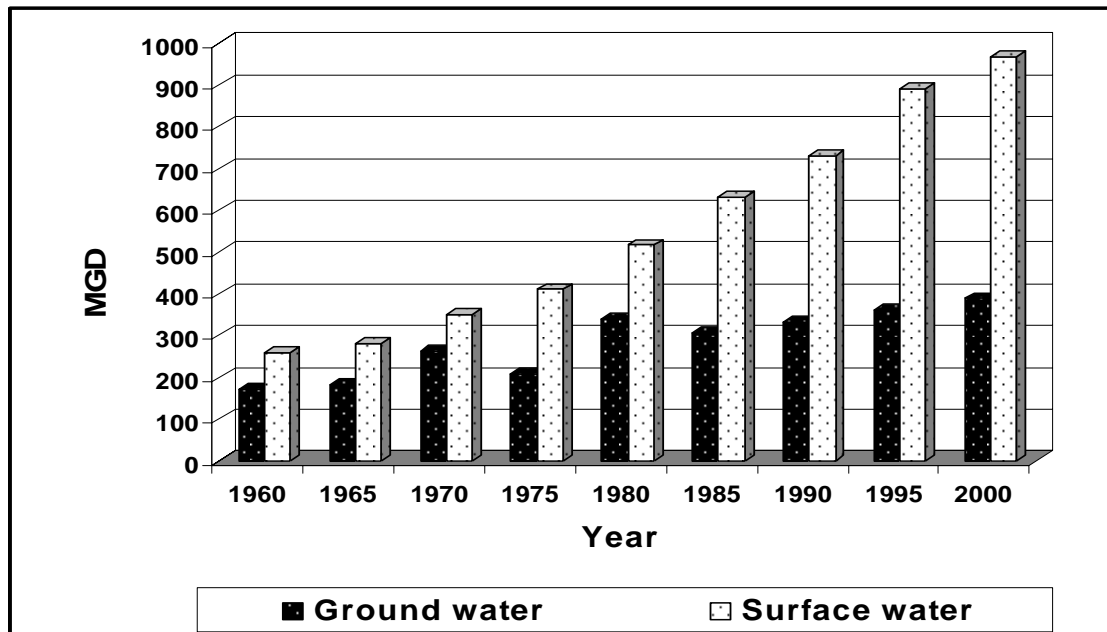
The amount of water flow required to sustain healthy river systems, including the surrounding natural habitat, is called instream flow. Instream water use takes place without the water being diverted or withdrawn from surface or ground water sources. Examples of instream uses include hydroelectric power generation, navigation, freshwater dilution of saline estuaries, maintenance of minimum stream flows to support fish and wildlife habitat, and wastewater assimilation (Solley et al. 1998).

Offstream water use refers to water that is diverted or withdrawn from a surface or ground water source and conveyed to the place of use. Offstream water use is also referred to as consumptive use when the water is not returned to the river or stream from which it was withdrawn. A consumptive use is that part of a water withdrawal that is ultimately used and removed from the water source whether by evaporation, transpiration, or incorporation into products or crops or some other form of consumption. In some instances, consumptive use is the difference between the volume of water delivered and the volume released (Solley et al. 1998). Consumptive water uses have the potential to diminish the quantity and/or quality of water in a water source. Because the focus of this report is on maximizing return flows to water sources, nonconsumptive uses will not be discussed to any great extent.

There are several types of consumptive water uses, including public supply, domestic, commercial, industrial, and agricultural.

- **Public supply:** Water withdrawn by public water suppliers that furnish water to at least 25 people or have a minimum of 15 connections is referred to as public or municipal water supply. In addition to such public uses as street cleaning, fire fighting, municipal parks, and public swimming pools, public-supply water may be delivered to users for domestic, commercial, or industrial purposes. Some public-supply water may be delivered to other public suppliers or used in the processes of water and wastewater treatment. As shown in Figure 1-1, public water supply withdrawals in Georgia more than doubled since 1960 (Fanning). In 2000, this state withdrew 968 million gallons per day (mgd) of surface water (but less than half that much from ground water) for public supply uses (Hutson et al. 2004). This reflects the concentration of people in north Georgia where ground water is less plentiful.

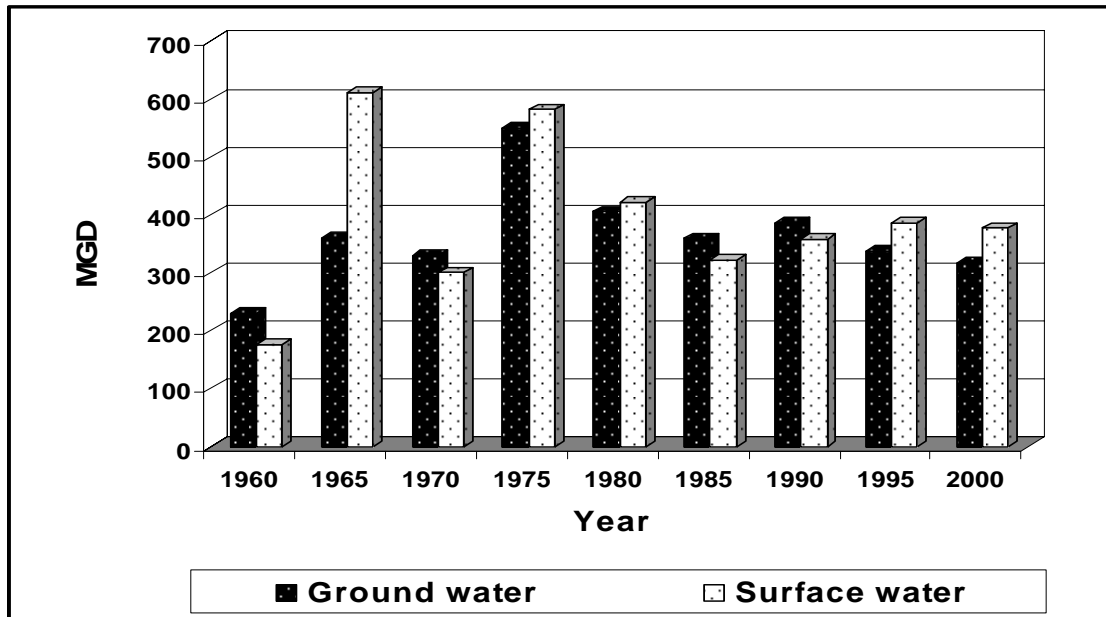
Figure 1-1. Public Water Withdrawals in Georgia: 1960-2000



Domestic water uses include everyday uses that take place in residential homes, while commercial water uses are those which take place in office buildings, hotels, restaurants, civilian and military institutions, and other nonindustrial commercial facilities. Common indoor domestic and commercial uses include drinking, preparing food, bathing, washing clothes and dishes, and flushing toilets. The watering of lawns and gardens is an example of outdoor domestic and commercial water use (Hutson et al. 2004). The amount of water used to satisfy domestic and commercial needs is included in the public water supply figure listed above, except for those that depend on individual wells or other water sources for supply.

- **Industrial water use:** Industrial water use includes water used for such purposes as fabricating, processing, washing, diluting, cooling, or transporting a product; incorporating water into a product; or for sanitation needs within the manufacturing facility. Industries that use large amounts of water include food, paper, chemicals, refined petroleum, or primary metals producers. Water for industrial use may be delivered from a public supplier or be self-supplied. As shown in Figure 1-2, surface water withdrawals for industrial purposes in Georgia actually decreased since 1965 (Fanning 2003). In 2000, 363 mgd of surface water was withdrawn for industrial use (Hutson et al. 2004). Industrial water uses are also distributed across the state with about half of the industrial water withdrawn from surface water sources and half from ground water sources.

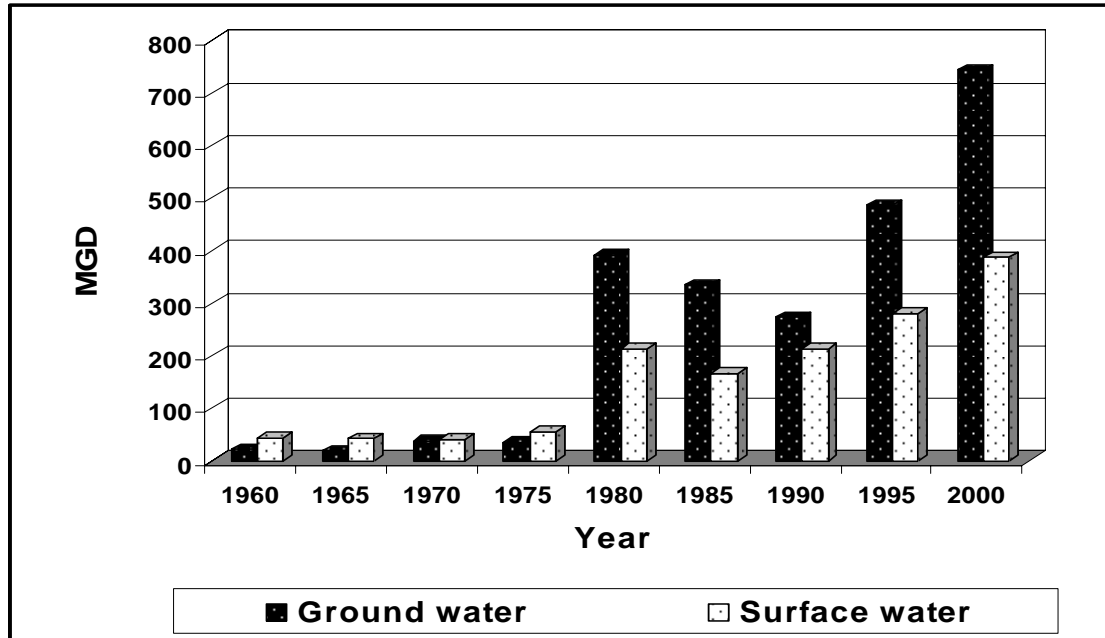
Figure 1-2. Industrial Water Withdrawals in Georgia: 1960-2000



- **Agricultural water use:** As Figure 1-3 demonstrates, ground water is a more significant source of agricultural water than is surface water in Georgia (Fanning 2003). This is due to the high concentration of agricultural irrigation in south Georgia where large quantities of ground water are generally more readily available.

However, a considerable amount of surface water is used for agricultural purposes. In Georgia, approximately 409.7 mgd of surface water was withdrawn in 2000 for irrigation and other agricultural uses (Hutson et al. 2004).

Figure 1-3. Agricultural Water Withdrawals in Georgia: 1960-2000

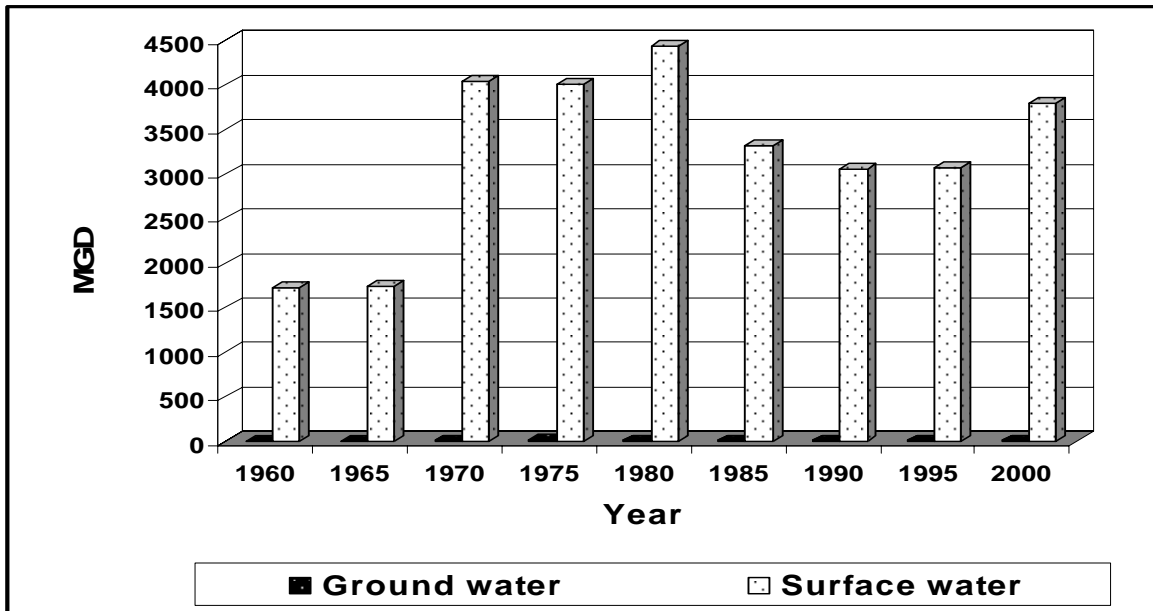


Agricultural water use can be divided into irrigation and livestock use.

- **Irrigation:** Water used in irrigation includes water that is applied to sustain plant growth in all agricultural and horticultural practices as well as for pre-irrigation, frost protection, application of chemicals, weed control, field preparation, crop cooling, harvesting, dust suppression, and for other purposes. Irrigation of golf courses, parks, nurseries, turf farms, cemeteries, and other self-supplied landscape-watering uses also are included. In 2000, Georgia withdrew 392 mgd of surface water for irrigation purposes, with an application rate of 0.83 acre-foot/acre (270,456 gallons/acre) (Hutson et al. 2004).
 - **Livestock:** Livestock use is water associated with livestock watering, feedlots, dairy operations, and other on-farm needs. Livestock includes dairy cows and heifers, beef cattle and calves, sheep and lambs, goats, hogs and pigs, horses, and poultry. Other livestock water uses include cooling of facilities for the animals and products, dairy sanitation and wash down of facilities, animal waste-disposal systems, and incidental water losses. In Georgia, 17.7 mgd of surface water were withdrawn in 2000 for livestock use (Hutson et al. 2004).
- **Thermoelectric power:** This type of water use includes water used for the production of electricity by fossil fuel, and nuclear power plants. Most water withdrawn for thermoelectric power production is used for condenser and reactor cooling. In a typical thermoelectric power plant, heat is removed from the cycle with a condenser.

In order to remove the heat, cooling water is used (Torcellini et al. 2003). This cooling water may then be returned to the water source, essentially undiminished in quantity, but at a warmer temperature. This increased temperature can affect water quality and aquatic habitat. Alternatively, the heated water can be sent to a cooling tower where the heat is transferred to the atmosphere rather than to a water body. Water is lost to evaporation through this process but it is a small percentage of the water withdrawn in a once-through system. Nationally, more than 99 percent of the water used for thermoelectric power production comes from self-supplied surface water, with less than 0.2 percent coming from public supplies (USEPA 2003). If water is used once from a nearby river then returned to the source, the evaporation at the discharge site is low, but the added heat to the stream increases the evaporation rate of the river, thus increasing the overall evaporation rate (Long and Judkoff 2003). It not known, however, how much more water evaporates once the heated water is returned to a water body. Water withdrawn for thermoelectric uses fluctuated considerably between 1960 and 2000 in Georgia, as Figure 1-4 shows (Fanning 2003). In 2000, 3,240 mgd of surface water was withdrawn in Georgia for thermoelectric power use (Hutson et al. 2004).

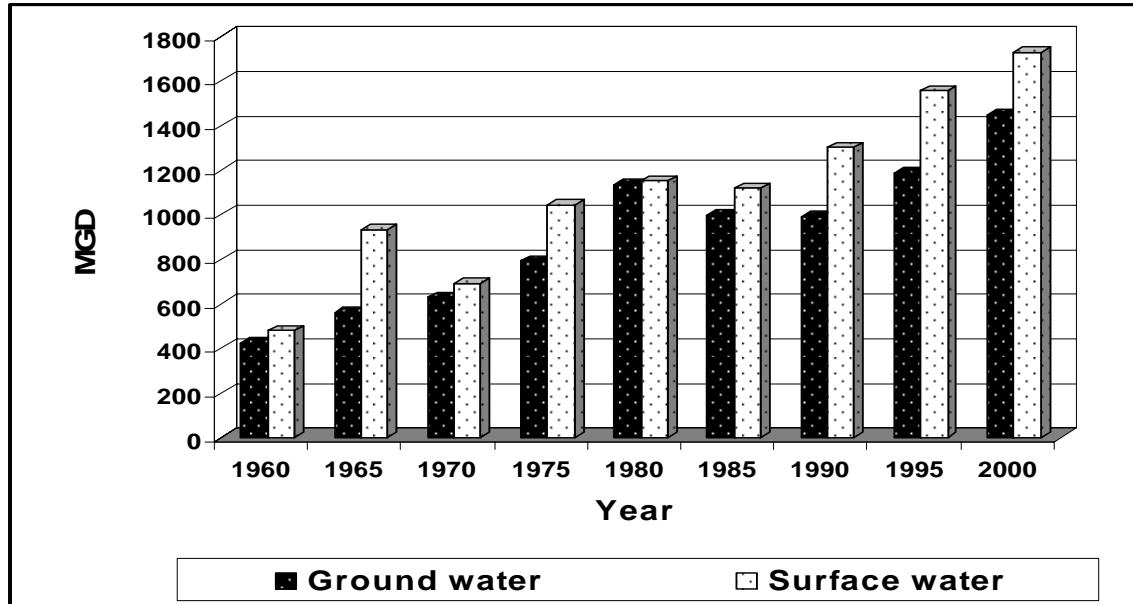
Figure 1-4: Thermoelectric Water Withdrawals in Georgia: 1960-2000



While U.S. population growth increased almost 90 percent between 1950 and 2000, total water withdrawals increased 127 percent during the same period (Hutson et al. 2004). As shown in Figure 1-5, water withdrawals have steadily increased in Georgia over the past half century. Specifically, water withdrawals in Georgia for offstream uses increased about 21 percent between 1950 and 2000 (Fanning 2003). With demand for consumptive uses increasing, it seems likely that water withdrawals, especially for public supply and domestic uses, will continue to increase as well. Consequently, instream uses, such as river-based recreation, waste assimilation, and fish and wildlife habitat, will have

increasing difficulty competing for available water supplies in the future if steps are not taken to protect return flows.

Figure 1-5: Total Water Withdrawals in Georgia (Excepting Thermoelectric): 1960-2000



Value of Maximizing Water Returns to Source Streams

In addition, to preserving and protecting the quality and quantity of wildlife habitat associated with streams, maximizing return flows can also serve many other purposes, such as:

- Water-based recreation such as swimming, rafting, kayaking, boating;
- Aesthetics;
- Aquifer recharge;
- Dilution water for effluent discharges from municipal and industrial wastewater sources;
- Maintaining water delivery to downstream uses; and
- Channel maintenance and sediment flushing flows (USEPA 1995).

The values of maximizing water returns to source streams can be summarized as follows:

- Maximizing return flows provides water quality benefits: Instream flow levels affect many water quality parameters, such as assimilative capacity. Healthy streams and their surrounding habitats, act as natural water filters. Where that function is lost, the

water that flows into a river from local streams can be contaminated with toxins that wash off roadways, such as cadmium and zinc from brake linings, as well as lawn fertilizer and other pollutants (Battiatia 2005). Depleted instream flows also lessen a stream's waste assimilation capacity which can lower the cost of water treatment that would otherwise be incurred by dischargers and by downstream water users. For example, municipal sewage treatment plants and industrial dischargers may incur additional expenses to ensure compliance with national and state water quality standards where instream flows are low. The assimilative capacity of a river or stream is affected by: the prior pollutant load of the water in a particular source; the volume of the water in that source; and the rate and amount of discharge of pollutants into the water source. The greater the volume of the water relative to prior pollutant load or to polluted effluents being discharged into the water, the greater the waste assimilative capacity of the water source (USEPA 1995).

- Maximizing return flows benefits recreationists: Outdoor recreation oftentimes concentrates around rivers, lakes, and streams. A 2004 study found that 33.1 million Americans engage in rafting, 26.9 million in canoeing, and 15 million in kayaking. Even more people take part in land-based activities that require – or are partially dependent on – healthy, intact river ecosystems: 151.2 million people view or photograph natural scenery; 124.6 million view or photograph wildlife; 116.1 million like to swim in lakes and streams; and 71.9 million visit wilderness or primitive areas (Cordell et al. 2004). Adequate instream flows are necessary to sustain these types of recreation. Much of the value of healthy river systems comes from the fact that the dollars spent on boating, fishing, hunting, camping, and equipment support local governments and recreation-related businesses as well as stimulate local economies. The U.S. Fish and Wildlife Service recently estimated that, nationally, 34 million anglers, 13 million hunters, and 66 million wildlife-watchers spent \$108 billion on their activities, while the one-third of Americans that are hikers spent \$18 billion annually (McCool 2005). It has been estimated that trout fishing in 25 North Georgia counties generates approximately \$172 million annually (DeMeo et al. 2005). Many small towns in Georgia rely on water-dependent seasonal tourism as a significant source of livelihood for local residents. Studies indicate significant economic payoffs can be achieved by augmenting stream flows in low-flow years for recreational purposes, even when such augmentation reduces water availability for other uses (NSA 1992).
- Maximizing return flows preserves natural habitat: Adequate stream flow is an important factor in maintaining a healthy river ecosystem. Lower water quality caused by reduced return flows can result in habitat degradation which, in turn, results in a loss of biodiversity. This state has been blessed with one of the most diverse selection of plant and animal species in the country.

Table 1-1: Biodiversity in Georgia

	Number of Species	Percentage at risk
Plants	2,994	11.1%
Mammals	92	14.1%
Birds	328	3.0%
Reptiles	83	14.5%
Amphibians	77	19.5%
Freshwater Fish	250	16.8%
Total Species	4,436	12.9%

(Stein 2002)

As shown in Table 1-1, Georgia ranks sixth in the nation for the number of species (4,436) that are found in the state, with 250 species of freshwater fish alone found within its borders. Georgia ranks second in the nation for number of different species of amphibians, third for fishes and fifth for mammals. Unfortunately, Georgia also ranks eighth in the nation for the total percentage of species at risk (12.9 percent) (Stein 2002). Every county in Georgia, except one, is known to be home to at least one animal or plant species that is protected under state and/or federal regulations. Two hundred and eight animal and plant species have a state status of rare, endangered, threatened or unusual or a federal status of endangered or threatened. In addition, another 848 species of animals and plants are of ‘special concern’ to the state and are being monitored for potential inclusion under a regulatory status (DNR 2005). The decline in species diversity in Georgia is directly associated with loss and degradation of waterway habitats and the deterioration of water quality in many areas of the state.

- Maximizing return flow ensures water availability for downstream users: Under the riparian doctrine, which Georgia follows, property owners with land next to a water body have the right to use that water. This use is subject to several conditions, however, including that the use be reasonable and not interfere with another downstream property owner’s reasonable use of water. When deciding whether a water use is reasonable or not, a court will first look at the effects of the use on such downstream property owners. The court will then consider the benefits to the user, the volume of water consumed, and the purpose for which the water is to be used (Brooks et al. 1999). Because Georgia requires a person who wishes to withdraw more than 100,000 gallons per day of ground or surface water to obtain a permit, Georgia’s water law can be described as regulated riparian. Withdrawals of 100,000 gallons per day or less, except in the case of public water supply withdrawals, remain subject to the riparian rights doctrine (Christy 2002). In determining if a permit should be issued, EPD evaluates the impacts the proposed withdrawal will have on other water users as well as on the water resource itself (O.C.G.A. §12-5-31(g); O.C.G.A. §12-5-96(d)). Maximizing return flow to source streams results in more water being available to downstream users who are also entitled to the reasonable use of water adjacent to their property.

Consumptive uses discussed in report

This report focuses on the following three types of consumptive water uses: land application of treated wastewater, septic systems, and interbasin transfers. Land application and septic systems have not generally been examined from a quantity point of view. Interbasin transfer policy has been debated in the state. In this report, interbasin transfer policy is considered in the context of maximizing return flow to water bodies.

Chapter 2

LAND APPLICATION POLICY IN GEORGIA

Many of the basic wastewater treatment processes in use today were developed between 1840 and 1890. During the period from 1890 to 1905, wastewater treatment by land application was considered to be the most effective wastewater treatment alternative in the United States and was used by most communities that treated sewage. While falling out of favor in the first half of the twentieth century, interest in land treatment picked up in the late 1950s as a result of a growing concern over availability of water resources. Various forms of land application have long been used by industries, such as food processors, to treat and dispose of industrial wastes. Such projects are often more interested in maximizing the amount of waste applied per unit land area than in optimizing waste use as a source for irrigation and/or nutrients (Bastian 2005). Today, decreasing ground water levels, salt water intrusion and growth limited by the availability of high quality water are increasingly common problems across the country and make land application of reclaimed water an attractive alternative to simply discharging wastewater into water bodies (Jewell and Seabrook 1979). The use of treated wastewater for irrigation, in lieu of potable water, makes land application additionally attractive as a tool for sustaining potable water supplies.

Land Application of Treated Wastewater

Land application projects can effectively treat and recycle wastewater. Virtually all land application entails the use of reclaimed wastewater, most commonly for irrigation, and comes under the purview of reuse regulations. These systems are usually designed to use the soil as an integral part of the treatment system (Bastian 2005). Land application may use treated wastewater for beneficial purposes such as agricultural and landscape irrigation, and replenishing ground water. A common type of water used in land application is water that has been reclaimed from municipal wastewater, or sewage. Land application can satisfy many water demands, as long as it is adequately treated to ensure the quality of the water is appropriate for the use. In uses where there is a greater chance of human exposure to the water, more treatment is required. Land application of treated wastewater is most commonly used for nonpotable purposes, such as landscape, public parks, golf courses, and some types of agricultural irrigation where nutrients such as nitrogen and phosphorous can act as a valuable fertilizer. However, some projects use reclaimed water indirectly for potable purposes. These projects include recharging ground water aquifers and augmenting surface water reservoirs. In ground water recharge projects, recycled water can be spread or injected into ground water aquifers to augment ground water supplies, and to prevent salt water intrusion in coastal areas. Reclaimed water can also be used to create or enhance wetlands and riparian habitats (USEPA 2004).

Water reuse is a term generally applied to the use of reclaimed water for beneficial purposes, including the following:

- Irrigation of public parks and recreation centers, athletic fields, school yards and playing fields, highway medians and shoulders, and landscaped areas surrounding public buildings and facilities, single-family and multi-family residences, commercial, office, and industrial developments, general wash down, golf courses, and other maintenance activities;
- Irrigation of nonconsumable agricultural crops (e.g., cotton);
- Wetlands restoration;
- Ground water recharge;
- Commercial uses such as vehicle washing facilities, laundry facilities, window washing, and mixing water for pesticides, herbicides, and liquid fertilizers;
- Industrial uses such as cooling, washing and processing;
- Ornamental landscape uses and decorative water features, such as fountains, reflecting pools, and waterfalls;
- Dust control and concrete production for construction projects;
- Fire protection through reclaimed water fire hydrants;
- Toilet and urinal flushing in commercial and industrial buildings; and
- Other nonpotable uses.

The most common uses of reclaimed wastewater are for land application (irrigation of lawns, gardens, and agricultural crops) and are therefore considered consumptive, though beneficial, uses. In some locales, reclaimed wastewater is applied to land specifically as a method of waste disposal rather than to irrigate a desirable landscape or crop, and the benefit of land application is the improved water quality that can result from reducing direct wastewater discharges to streams. More often, however, wastewater that is not used for irrigation and other nonpotable uses (particularly in winter months when irrigation demands are reduced) is discharged to streams after treatment. Fortunately, streams are usually able to assimilate greater quantities of treated wastewater during winter months than they are during times of low flow and warm water temperatures.

Impact of Land Application on Maximizing Return Flows

While generally environmentally friendly, land application of reclaimed water can have negative impacts on both water quality and quantity. Water that is land applied may not return to the source water body or basin-of-origin, resulting in lower instream flows and possible water quality impacts if the river depends on a specific volume of water to meet

its total maximum daily loads (TMDL) requirement. For example, the Trinity River in Texas, near the City of Dallas, maintains a continuous flow of several hundred cubic feet per second during dry periods. This flow is almost entirely composed of treated effluent from discharges further upstream. If extensive land application programs were to be implemented at the upstream facilities, dry weather flows in the river would be jeopardized and plans for urban development downstream could be severely impacted due to lack of available water (USEPA 2004). Land application can also contribute to nonpoint source pollution. Polluted runoff can result from excess water applied for irrigation and landscape maintenance that contains sediments, nutrients, salts, and other pollutants (USEPA 1995).

In addition to water quality impacts, land application can also potentially increase the quantity of water in rivers and streams. For example, in water bodies where low flows during dry weather periods come from ground water, land application of reclaimed water can be used to augment instream flows. Also, in situations where the soil moisture is at higher levels due to land application of reclaimed water, a subsequent wet period will result in increases in stream flows because of the soil's reduced capacity to hold rainwater.

Land application of treated wastewater can thus be viewed as contributing to or detracting from maintaining adequate, high-quality water supplies, depending on where it is applied and for what purpose. If used as a waste disposal mechanism, land application can be viewed as an alternative to stream discharges and can help improve water quality. Land application is generally more consumptive than stream discharges, however, due to evaporation and transpiration, and less control can be exercised over where the wastewater (if any) returns to the natural system. Although it contributes to less wastewater being discharged directly into streams, land application can lead to water quality impairments if it reduces the amount of water that ultimately returns to source water streams (and therefore reduces their assimilative capacity). If used for irrigation, reclaimed wastewater is also consumed through transpiration and evaporation, but efficiency is gained if this use replaces the use of potable water, thereby protecting supplies of potable water otherwise withdrawn. If used for environmental restoration purposes, the use of reclaimed water for land application provides important ecosystem functions and can similarly reduce the need for potable water withdrawals.

Current Status of Land Application in Georgia

Federal law

The Clean Water Act promotes the use of land application of reclaimed water by restricting the discharge of wastewater into receiving streams. Water bodies listed as impaired under Section 303(d) of the Act are protected by limits on the discharge of the specific pollutants of concern that could further degrade their water quality. In addition to limits on the concentration of specific contaminants, discharge regulations may also include limits on the total mass of a pollutant released to the receiving stream, known as total maximum daily load (TMDL) limits, as well as standards applied to the quality of

the water in the receiving stream itself. Because the Clean Water Act can impose limits on both the quality and quantity of treated effluent a facility is allowed to discharge, a community with limited water supply or wastewater treatment capabilities has a real incentive to build a reclaimed water project that augments existing sources and reduces discharge (USEPA 2004).

State law

The Environmental Protection Division (Division) of the Georgia Department of Natural Resources (DNR) has the authority to regulate the land application of reclaimed water in the state. The Division does this through the issuance of land disposal and land application permits to any person discharging domestic, municipal, commercial, or industrial wastewaters into a land disposal or land treatment system. A land disposal system is any method of disposing of treated wastewater in which such water is applied to or beneath the land surface and which results in the pollutants percolating, infiltrating, or being absorbed into the soil and then into the waters of the State (DNR Rule 391-3-6-.11(3)). Land disposal systems include ponds, basins, or lagoons used for disposal of wastewaters, which use evaporation and/or percolation of the wastewaters to prevent the discharge of pollutants into the waters of the State (DNR Rule 391-3-6-.11(2)(b)). A land treatment system is any land disposal system in which vegetation on the site is used to partially remove any pollutants and/or nutrients in the applied water (DNR Rule 391-3-6-.11(2)(c)). Pretreatment requirements apply to publicly owned treatment works which employ land disposal. The amount of treated wastewater that can be applied per unit of land (hydraulic load), for any land disposal or land treatment system is determined based on an analysis of soils and vegetation in the system area, climatic data, characteristics of the wastes to be disposed or treated, and previous experience with similar systems (DNR Rule 391-3-6-.11(3)(c)). Under certain conditions, the Division will grant a general land application system (LAS) permit to facilities that wish to discharge any pollutant to a LAS and then into the waters of the State. Land application systems are defined in the same way as land disposal systems (DNR Rule 391-3-6-.19(1)(2)(a)). The general LAS permit may be issued if the LAS facilities all:

- Involve the same or substantially similar types of operations;
- Land-apply the same types of wastewaters under the same conditions;
- Require the same treatment requirements or operating conditions;
- Require the same or similar monitoring; and
- In the opinion of the Division's director, are more appropriately controlled under a general LAS permit than under individual permits (DNR Rule 391-3-6-.19(3)(a)(2)).

In the case of dual permits which allow a portion of the wastewater to be disposed of through land application and a portion discharged (which is common where the water is used for irrigation purposes but is not needed or usable during winter months), the

Division requires the permit holder to land apply as much of the reclaimed water as possible and to minimize wastewater discharge (Scott 2005). For example, the Division recently determined that Gum Swamp Creek, in Dodge County, was oxygen depleted and that the outflow from an old wastewater treatment plant contributed to this condition. The Division told the City of Eastman to either formulate a land application plan or give a reason why it could not. For various reasons, the Eastman City Council opted to expand a second, newer municipal sewage treatment plant instead of disposing of treated wastewater through land application (Crenshaw 2005).

Georgia requires anyone wishing to withdraw more than 100,000 gallons of surface or ground water a day to obtain a permit from the Division (O.C.G.A. §12-5-31(a)(1) (2004); O.C.G.A. §12-5-96(a)(1)). In order to protect instream flows, water withdrawal permit applicants must provide information on projected consumptive uses, which are then used to estimate potential return flows (O.C.G.A. §12-5-31(d); O.C.G.A. §12-5-9(d)). Specific policies that require return flows of wastewater do not exist. Thus, adequate water quantity is primarily ensured in the permitting process through 7Q10 minimum flow requirements (the lowest seven-day average instream flow expected to occur with a frequency of once in ten years) and demonstrated downstream need assessments. Land application is considered a consumptive use; since there is no measurable “return flow” to surface waters (Williams 2005).

Georgia protects water quality through the state Water Quality Standards which are meant to prevent pollution; protect the public health and welfare in accordance with the public interest for drinking water supplies; conserve habitat for fish, wildlife and other beneficial aquatic life, and agricultural, industrial, recreational, and other reasonable and necessary water uses; and maintain and improve the biological integrity of the waters of the State (DNR Rule 391-3-6-.03(a)). The state also protects water quality through its anti-degradation policy which declares that those waters in the state whose existing quality is better than the minimum levels established in the water quality standards will be maintained at this high quality. The level of treatment required for these waters is the highest and best practicable under existing technology to protect existing beneficial water uses. Existing instream water uses and the level of water quality necessary to protect the existing uses will also be maintained and protected (DNR Rule 391-3-6-.03(b)). This anti-degradation policy favors land application unless it is financially infeasible or unless a downstream need for water supply is demonstrated. Under the anti-degradation policy, an applicant for a water withdrawal permit must show that land application and reuse are not feasible (Scott 2005).

The Division encourages the use of reclaimed water as a substitute for potable water for certain purposes. The Division, through its permitting program, allows owners of reclaimed water treatment systems to provide this water to designated users. A designated user means any site or facility where reclaimed water is beneficially used under a contract with the treatment system owner. A designated user may also be the customer to be supplied with reclaimed water who has a written user agreement with the treatment system owner, or a purveyor that provides reclaimed water to other customers. The designated user must enter into a written user agreement with the reclaimed water

treatment system owner. Additionally, before providing reclaimed water to a designated user, written notice must be provided to the Division and public notice must be provided to the community (Georgia EPD 2002).

Analysis and Discussion of Land Application Policy Options for Maximizing Return Flows

Land application of treated wastewater can be viewed as either contributing to or detracting from the maintenance of adequate quality and quantity of water supplies, depending on where it is applied and for what purpose. In certain cases, water quality can be improved by increasing land application of treated wastewater. For example, by increasing the use of reclaimed water, the volume of surface water discharges can be reduced which in turn lowers the adverse water quality impacts to the receiving water. However, it should be kept in mind that land application is a consumptive use of water which may result in lowering instream flows and thus, under certain conditions, lower water quality. Given these considerations, an important question for the state to address is: under what circumstances should the Division encourage or discourage the use of land application as a wastewater management tool?

Manage land application based on water quality considerations

Water quality is inextricably linked with water quantity issues. In situations where water quality is poor, the assimilative capacity of a river or stream can be improved by increasing land application of treated wastewater and decreasing the volume of surface water discharges. Increasing the amount of water used in land application may also result in less demand for potable water withdrawals and treatment and preserves water quality by maintaining the volume of water remaining in the water body. Finally, land application of treated wastewater can save local governments money by reducing the need for higher levels of wastewater treatment (e.g., nutrient removal). However, in some circumstances, water quality may be improved by decreasing land application. This is due to the fact that land application is a consumptive use of water which may result in lowering instream flows and thus, under certain circumstances, may lower water quality. In addition, direct discharge of treated wastewater keeps the water in the source water body, preserving instream flows and, depending on the level of treatment, the quality of the water. Finally, in some cases, land application options are not available or are very expensive (e.g., where usable land is unavailable or cost of land is high).

Examples from Other States

California

State regulators in California require the San Jose/Santa Clara Water Pollution Control Plant to reuse treated effluent as an alternative to limiting discharge into San Francisco Bay during the summer dry-weather period. The limitation is due to the fact that the wastewater was discharged into a saltwater marsh which was made brackish by the discharge of relatively freshly treated effluent (USEPA 2004).

The California State Water Board considers the effect of the use of recycled water in lieu of potable water on the quality of wastewater discharges (Cal. Water Code §13550(a)(1) (2004)). Before allowing the sale of recycled water, the state board must determine that the use of recycled water from the proposed source will not degrade water quality and is not injurious to plant life, fish, and wildlife (Cal. Water Code §13550(a)(4)).

Florida

In Florida, water management programs, rules, and plans, where economically and environmentally feasible, in regard to water supply must seek to:

- Advocate and direct the reuse of reclaimed water as an integral part of water and wastewater management programs, rules, and plans consistent with protection of the public health and surface and ground water quality;
- Improve the efficiency and effectiveness of reuse of reclaimed water by encouraging those uses that increase potable quality water offsets or recharge fractions, where consistent with water quality protection;
- Encourage the use of water of the lowest acceptable quality for the purpose intended; and
- Encourage the use of water from sources nearest the area of use or application whenever practical (F.A.C. §62-40.310(1)(e)(f)(g)(i)) (2004).

In addition, water management programs, rules, and plans must comply with the following requirements related to the protection and management of natural systems:

- Establish minimum flows and levels to protect water resources and the environmental values associated with marine, estuarine, freshwater, and wetlands ecology;
- Mitigate adverse impacts resulting from prior alteration of natural hydrologic patterns and fluctuations in surface and ground water levels;
- Use, preserve, restore, and enhance natural water management systems and discourage the channelization or other alteration of natural rivers, streams and lakes;
- Protect the water storage and water quality enhancement functions of wetlands, floodplains, and aquifer recharge areas through acquisition, enforcement of laws, and the application of land and water management practices that provide for compatible uses; and
- Emphasize the prevention of pollution and other water resource problems (F.A.C. §62-40.310(4)(5)).

Permits for consumptive use of water will not be granted unless the applicant can establish that the proposed use is reasonable and beneficial. In determining whether a water use is a reasonable-beneficial use, the following factors are considered:

- The quantity of water requested for the use;
- The long-term yield available from the source of water;
- The extent of water quality degradation caused;
- Whether the proposed use would cause or contribute to flood damage;
- Whether the proposed use would significantly induce or increase saltwater intrusion;
- The amount of water which can be withdrawn without causing harm to the resource;
- Whether the proposed use would adversely affect public health; and
- Whether the proposed use would significantly affect natural systems (F.A.C. §62-40.410(1)(2)).

Tennessee

In Tennessee, new or additional degradation of water will only be allowed if reasonable alternatives to degradation are not feasible. Reasonable alternatives for discharges include land application. For small domestic discharges, connection to an existing system or land application is considered preferable (TDEC Rule 1200-4-3(1) (2004)).

Manage land application based on water quantity considerations

Water shortages often provide a powerful incentive to implement water reuse projects to augment supplies, especially where reductions are frequent and other less costly methods (e.g., water conservation) have already been implemented. Increased land application in areas with water quantity challenges may reduce the amount of potable water withdrawn for irrigation and other nonpotable purposes, as well as lower the infrastructure costs incurred by the use of potable water for nonpotable purposes. However, as a consumptive use, land application may result in lowering instream flows and thus, under certain conditions, may lower water quality, and also lower the amount of water returned to rivers and streams at a time when the need is most critical (i.e., summer and fall). Reducing land application could increase the amount of wastewater discharged into water sources, thereby increasing the amount of water available for downstream users and instream flow needs. Conversely, by reducing the amount of water needed for withdrawals in times of drought, land application can help to preserve water quality and instream flows as well as reducing the need for additional water storage.

Examples from Other States

California

The California Clean Water and Water Recycling Account establishes a fund for water recycling projects that meet applicable reclamation criteria requirements (Cal. Water Code §79106). Criteria include whether the degree to which the recycled water improves water supply reliability, water quality, ecosystem restoration, and other environmental benefits; and the degree to which the recycled water would reduce water supply demands on the bay-delta system, the Colorado River, or other water systems critical to regional or statewide water supply (Cal. Water Code §79141).

Florida

Florida has a mandatory reuse program that requires water management programs to advocate and direct the use of reclaimed water as an integral part of water and wastewater management programs. The water management districts accomplish this by designating water resource caution areas for areas with critical water supply problems (existing or anticipated during the next 20 years), and requiring the reuse of reclaimed water from domestic wastewater treatment facilities within these water resource caution areas, unless such reuse is not economically, environmentally, or technically feasible (F.A.C. §62-40.310)(d). In addition, Florida recognizes that land application projects can and do recharge ground water and can be used to augment ground water used for potable purposes (F.A.C. §62-610-556).

Maryland

It is the policy of the state of Maryland to promote and encourage the use of reclaimed water in order to facilitate the indirect recharge of ground water, and develop an alternative to discharging wastewater effluent to surface waters (M.C.A. §9-302b)(5)) (2005). The State encourages the use of reclaimed water as an alternative to discharging wastewater effluent into the surface waters of the State. Reclaimed water may be used for the irrigation of farmland, golf courses, athletic fields, turf, landscaping, and any other appropriate use (M.C.A. §9-303.1(a)(b)).

Texas

Texas criteria for the use of reclaimed water are intended to allow the safe use of such water for conservation of surface and ground water; to ensure the protection of public health; to protect ground and surface waters; and to help ensure an adequate supply of water resources for present and future needs (Texas Water Code Ann. §210.2(a) (2005)).

Washington

In the State of Washington, reuse water can be discharged to a stream as stream flow augmentation. Under this provision, reclaimed water can be discharged to surface water

for purposeful uses such as: maintaining adequate flows for aquatic life; and for downstream use (USEPA 2004).

Summary and Conclusions

Reusing water through land application and other methods lowers the amount of water that needs to be withdrawn from water bodies to provide the services rendered by the reclaimed wastewater. As a consumptive use, however, land application of treated wastewater reduces the amount of water that returns to the basin-of-origin. Applying treated wastewater to land also reduces the pollution load of the stream, thus affecting water quality. Consequently, careful and site-specific consideration should be given to the use of land application, depending on the water quality and quantity needs of the basin. Whether land application is appropriate or not in any given watershed depends on the local situation and the water management objectives for that stream.

Chapter 3

SEPTIC SYSTEM POLICY IN GEORGIA

A typical septic system contains two major components: a septic tank that collects solids and the absorption field or drainfield that disposes of the liquid waste. The tank and lines are buried under the ground and help disperse the wastewater into the soil. While typically designed to hold a minimum of 1,000 gallons of sewage, the size of the tank may vary depending on the number of people living in the house (generally reflected in the number of bedrooms in the house), and use of a garbage disposal. The primary purpose of the septic tank is to separate solids from the liquids and to promote partial breakdown of contaminants by microorganisms naturally present in the wastewater. The solids collect at the tank's bottom, so a tank should be pumped out every three to five years to avoid leakage and other problems (Gwinnett County 2005). The absorption field is the most critical part of the septic system for reducing contaminants and dispersing the effluent. The absorption field uses natural physical, chemical, and biological processes to clean the wastewater. The soil filters out many of the harmful bacteria, viruses, and excessive nutrients that are still present in the wastewater. The vegetation covering the absorption system also uses the nutrients and water to grow (USEPA 2000). Soil is the most important factor in determining whether a septic system will work properly and protect public health and the environment. Not all soils are equally effective as septic absorption fields, and only a site-specific soil analysis will determine suitability.

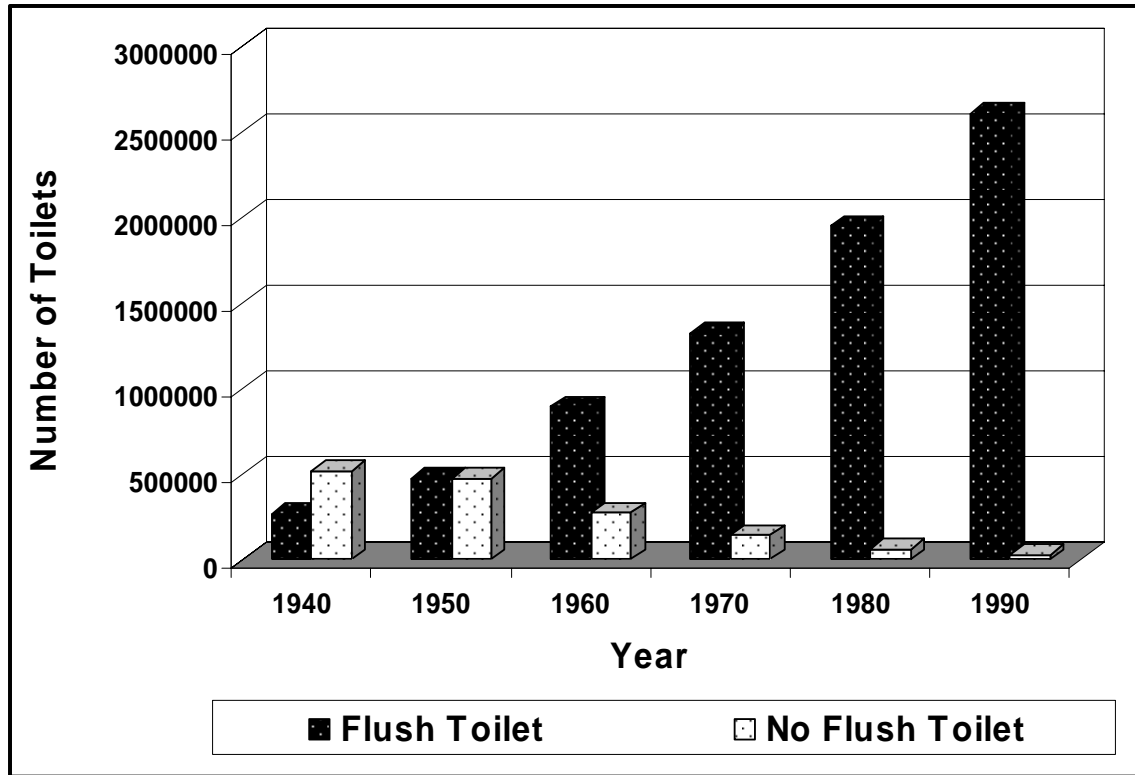
The use of septic systems as a means of disposing of human waste first appeared in the United States in the 1880s (Rome 2001). Their use was a significant improvement over the privies and cesspools that were the most common methods used at the time. One consequence of the lack of sanitary methods for dealing with human waste was that outbreaks of diseases such as hepatitis A, typhoid fever, dysentery, and gastrointestinal illness were common. As knowledge of water borne diseases increased and methods for treating wastewater evolved, more and more housing units employed flush toilets which hooked into either public wastewater systems or septic tanks. After World War II, the number of housing units with flush toilets increased dramatically in the U.S. as well as Georgia (see Figure 3-1), with a corresponding reduction in the number of homes using privies.

With the increasing use of septic tanks across the country, problems began to appear. There was little understanding of soil suitability, proper installation, and maintenance needs. Regulatory requirements relating to septic systems were nonexistent and the failure rate of septic systems was high.

After World War II, the spread of track housing development to meet the housing shortage resulted in septic tanks being used in suburban as well as rural areas. In the late-1940s, the Federal Housing Administration found that as many as one third of the septic systems in suburban subdivisions failed within the first three years (Rome 2001). Even

with this high failure rate, regulation of septic systems remained spotty throughout the 1950s and 1960s. As noted by Rome, “[b]ecause the supervision of sanitation remained largely the province of local boards of health, the response varied greatly from community to community” (2001).

Figure 3-1: Housing Units in Georgia With and Without Flush Toilets



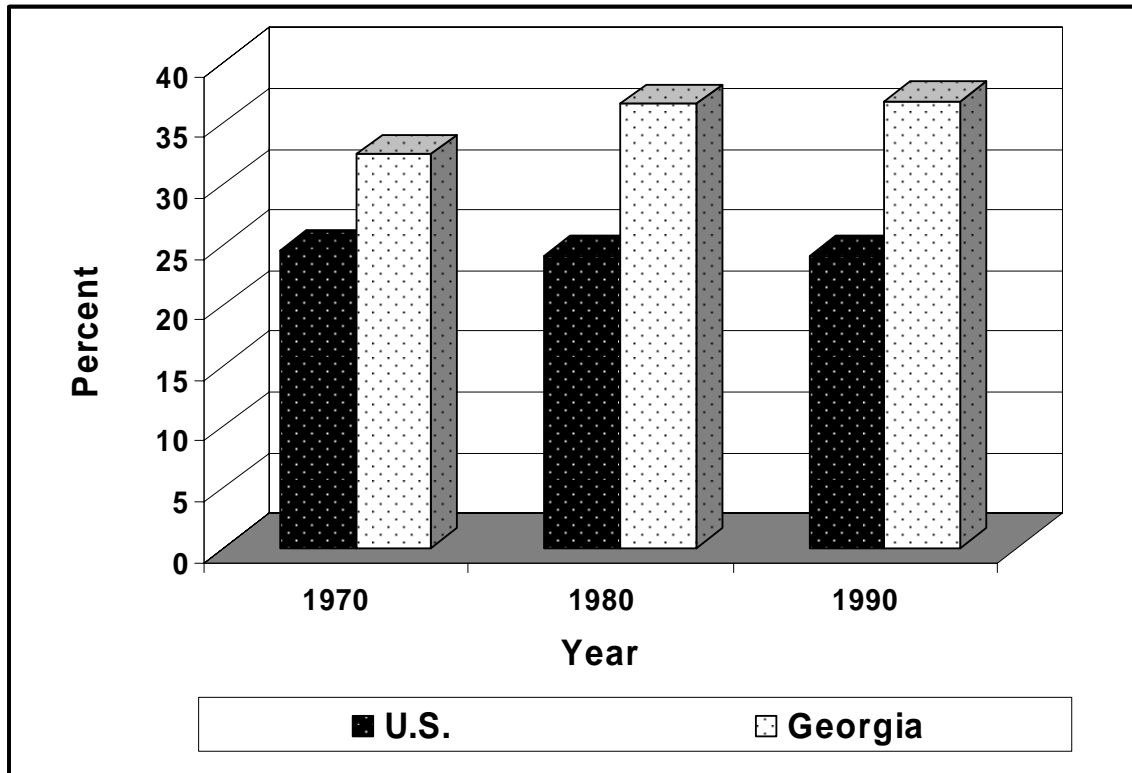
In the 1960s, national attention focused on septic systems as a significant source of ground water contamination. Rome (2001) argues that concern about septic systems was a major impetus for the passage of the federal Clean Water Act and Safe Drinking Water Act in the early 1970s. The Clean Water Act included the construction grants program to financially assist local governments to construct wastewater collection and treatment capacity in order to replace faulty septic systems.

The U.S. Census Bureau tracked the use of septic systems from 1970 to 1990. Figure 3-2 shows the percentage of housing units using septic systems in the U.S. and Georgia during this period (U.S. Census Bureau 2004).

Nationally, just fewer than 25 percent of the housing units today are on septic systems. This percentage decreased slightly during the two decades for which data exist. In Georgia, the percentage of housing units with septic systems increased from about 32 percent in 1970 to nearly 37 percent in 1990. The number of housing units increased dramatically during this period of time, resulting in a corresponding increase in the total number of septic systems. There were about one million homes on septic systems in Georgia in 1990. Since the Census Bureau did not ask about septic systems in the 2000

census, we do not know how many of these systems are currently being used. As the state’s population increased by 26.4 percent during the 1990s, and has continued to increase since 2000, we can expect that the number of septic tanks currently in use in Georgia is well over one million (U.S. Census Bureau 2004). This conclusion is supported by figures from the Metropolitan North Georgia Water Planning District.

Figure 3-2: Percentage of U.S. and Georgia Households on Septic Systems



In the Metropolitan North Georgia Water Planning District (District), septic tanks ingest as much as a quarter of the region’s water supply. (Shelton 2005). This region is more urbanized than most of the state and, as a result, has more homes on public wastewater systems. About 21 percent of the wastewater generated in the 16-county District is directed into septic systems serving nearly one million people (Green 2005). In Paulding County, however, about 70 percent of the nearly 2,600 single-family homes issued building permits in 2002 came with septic tanks, and in Henry County, roughly 43 percent of the more than 4,000 single-family houses issued building permits were on septic systems. In both counties, septic systems are mostly located in unincorporated areas. However, heavily developed DeKalb County issued residential permits for 110 new tanks in 2002, while Gwinnett County, with more than 92,000 septic tanks, has more septic systems than any other county in Georgia (Frankston 2003). Nearly 30 million gallons of wastewater is estimated to enter the soil daily from septic systems in Gwinnett County alone (Gwinnett County 2005). While the District’s Long-Term Wastewater Management Plan assumes that septic use will decline in the District from the current 21 percent to seven percent by 2030, there is no current plan for how to achieve this

reduction, and few counties have long-term maps or capital investment plans showing where future sewer extensions will occur (Green 2005).

Although septic systems have helped to decrease water borne disease outbreaks, they are still a concern, both from a public health and an environmental perspective. Since this report addresses maximizing water returns to the system, we will discuss here the role of septic systems and public wastewater systems relating to water quantity management. From this standpoint, septic systems are a concern because they take water away from the system and do not return it to the waterways in measurable terms of quantity and time in the way a wastewater treatment system would.

Impact of Septic Systems on Maximizing Return Flows

Unlike land application of wastewater, the use of septic systems does not result in the loss of water through evaporation since the wastewater is released below ground. Transpiration from plants will, however, consume water from the soil. Water not transpired by plants will flow through the leach field and soil and eventually recharge the ground and/or surface water. As with land application of treated wastewater, the amount of water returned to water sources from septic systems is not known. It will vary depending on local conditions such as soil, topography, vegetation and temperature. As a result, septic systems are considered a consumptive use of water that under certain circumstances may reduce the amount of return flow to a river or stream.

Current Status of Septic Tank Policy in Georgia

State law

Laws and regulations regarding septic systems exist on the state and local levels. State law governs the location, design, permitting, construction, inspection, maintenance, and operation of septic systems in Georgia (Jordan Jones & Goulding 2003).

The Environmental Health Section of the Division of Public Health in the Georgia Department of Human Resources (DHR) is responsible for adopting and administering statewide regulations for septic tank systems. Permitting and inspection of these systems is handled through each county board of health, which serves as the local representative of the Division of Public Health (DeMeo and Kundell 2002).

The Georgia Department of Human Resources is responsible for adopting statewide regulations governing septic systems. Where public or community sewage treatment systems are not available, the owner of every building, residence or property, designed, used or intended to be used for human occupancy or congregation, must provide an approved septic system sufficient for the number of persons normally expected to use or frequent the building for two or more hours (DPH Rule 290-5-26-.03(1)). No person may begin the development of a lot or structure where a septic system will be used, nor install a septic system without having obtained a construction permit from the County Health Department (DPH Rule 290-5-26-.03(2)). Permits will be issued only after a site

inspection by the County Board of Health shows favorable findings relative to absorption rates, soil characteristics, ground water, rock, and any other factors which would affect the acceptability of the lot. Lots are sited according to the regulations of the County Board of Health which may deny or revoke a septic system permit upon finding the lot unsuitable (DPH Rule 290-5-26-.03(3)). It is the property owner's responsibility to maintain and operate the septic system in a safe and sanitary manner so as not to constitute a public health hazard or nuisance (DPH Rule 290-5-59-.03(1)).

The Department of Public Health regulations require that connection to a public or community sewer system be made when such a system is available within two hundred feet of the property line, or available in a public right-of-way abutting the property. If an existing septic system fails, connection to a public or community sewer system, where available, must be made immediately (DPH Rule 290-5-26-.03(1)).

Case law

Federal and state case law upholds the authority of local governments to compel owners with septic systems to connect with available public sewer systems.

In *Hutchinson v. Valdosta* (227 U.S. 303 (1913)), a Valdosta City ordinance that required property owners whose home abutted a street with sewers to connect their homes with the main sewer pipe was found by the U.S. Supreme Court to be a valid exercise of the city's police power. The Court stated that when the city charter gives the municipality power to enact rules and regulations for its welfare and government, and the highest court of the State has upheld the ordinance as falling within this delegation of power, the ordinance will not be found to be a violation of the due process or equal protection provisions of the Fourteenth Amendment, where the record does not show that the city was induced by anything other than the public good or that such was not its effect. The Court further observed that one of the most common exercises of the police power of the State or municipality is to provide for a system of sewers and to compel property owners to connect to them.

Hutchinson was cited in the later case of *City of Midway v. Midway Nursing Convalescent Center* (230 Ga. 77(1973)), where the City argued it was acting under its police powers to enact a series of ordinances requiring the use of city-supplied water where available. The Court recognized that while a municipal corporation can compel connection to a public drain or sewer using its police powers, the city could not compel its citizens to use city supplied water" (*Id* at 80).

Finally, in *Humming v. City of Woodbine* (253 Ga. 255(1984)), the Court considered whether Georgia law allows cities to charge a monthly fee for sewer service to residents who do not use the city's sewer service system. The Court held that O.C.G.A. §36-34-5 is a "user" statute and "that under it a city is authorized to prescribe and collect rates, fees and charges only for public and private consumers who use the city's sewer system (*Id* at 257).

Local ordinances

Local ordinances cover the installation of and connection to public sanitary sewer systems. A county may regulate septic systems by following the Department of Public Health regulations, or it may adopt the State law as part of the county Code of Ordinances. In addition, local jurisdictions may have a sewer ordinance governing the planning, design, construction, and permitting of wastewater collection systems and connections to publicly owned wastewater treatment plants. These ordinances may include requirements or restrictions regarding when and how connections can be made to the wastewater collection system. Some ordinances include mandatory connection under some circumstances, while others require sewer system connection only in the event of a failed septic system (Jordan Jones & Goulding 2003).

Analysis and Discussion of Septic System Policy Options for Maximizing Return Flows

Most states do not take water quantity issues into consideration when regulating septic systems. Most states do, however, provide local governments with practices that enable them to limit or otherwise control the number of septic systems within their jurisdiction. Many of these measures can be used to regulate the effects septic systems have on water quantity concerns in a region, which will vary depending on what other discharges are taking place within a water basin.

Dry sewers in transitional areas

Local governments in Georgia have the current legal authority to require dry sewers to be installed for all development in locations where sewers are not currently available but are expected to be built in the near future. Dry sewers are sewer pipes that are installed at the time of housing development so that when sewers are constructed in the area, the houses are ready to connect with them. Requiring installation of dry sewer lines in new developments is generally based on the projected availability of sewer lines within a reasonable time period. Dry sewers enable sewers to be connected to the dry pipes at central locations when they become available without digging up streets and yards to install sewer pipes to each home or business. While dry sewers also make it less expensive for home owners to connect their houses to sewer systems, there are additional upfront costs to the developer associated with dry sewer installation.

Dry sewer requirements in other local jurisdictions

California

Any subdivision of property which will require water and, ultimately, sewer service from the Trabuco Canyon Water District in California is required to demonstrate that approval of the subdivision is conditioned, in part, by the construction of dry sewers pursuant to the District's standards and specifications (Trabuco Canyon, Cal., Code §7.3.3).

Cobb County, Georgia

The 1995 Cobb County Sanitary Sewer Extension Policy states that where planned sewers in an area have not been completed and use of septic systems are permitted until the planned sewer is constructed; the developer is required to construct dry sewers for all portions of the development which are not immediately connected to an active sewer (<http://cobbcounty.org>).

Nevada

In Nevada, the Truckee Meadows Services Area Regional Plan requires dry sewer construction until such time as a community sewer may be built (www.co.washoe.nv.us/clerks/County_Code/index.php).

Latecomer fees

Latecomer agreements, also referred to as recovery contracts or reimbursement agreements, allow a property owner who has installed street or utility improvements to recover a portion of the costs of those improvements from other property owners who later develop property in the vicinity and use the improvements. This option gives developers incentives to provide sewer connections by allowing the developer to recoup his investment through fees as new housing developments connect to the system. While some local governments in the metro-Atlanta area achieve the same result by negotiating cost-sharing agreements on a project-by-project basis, a more formalized process by local ordinance could provide more structure for those jurisdictions that currently negotiate these agreements, give more certainty to developers as to how and under what circumstances these agreements can work, and could also serve as a template for those jurisdictions that currently do not negotiate cost-sharing agreements. However, latecomer fees could also have the effect of raising the cost of new homes in an area.

Latecomer fees in other jurisdictions

Langley, Washington

In 2003, the City of Langley, Washington, implemented the Sewer Connection Incentive Program to provide incentives for conversion of septic systems serving existing single family residences to public sewers (Langley Municipal Code 13.60 (2005)). The City appropriated \$200,000 to assist low and moderate income homeowners connect to a sewer system when a sewer system becomes available (Langley Municipal Code 13.60.010). Money awarded under this program can be used by owners of existing single family residential property to pay for the cost of connecting the property to a city sewer main, abandonment of the septic system, financing the system connection charges, latecomer fees, and sewer reimbursement contracts (Langley Municipal Code 13.60.030).

Middleton, Idaho

In 2004, the Middleton School District #134 in Middleton, Idaho, decided to build a new high school. The District planned to pay to expand current sewer infrastructure because it would be less expensive than having to design a septic system to meet state requirements for a school as large as the one they were planning. The District could afford the expense because it was entitled to latecomer fees on the services of the expanded sewer system (www.sd134.k12.id.us).

Washington State

In Washington, the governing body of any city, town, county, or water-sewer district, may contract with property owners for construction of sewer facilities both inside and, except for counties, within ten miles of the corporate boundaries. These latecomer agreements provide for a period of not more than 15 years for reimbursement of a fair pro rata share of the cost of sewer facility construction to property owners by other property owners who did not contribute to the original cost of the facilities and who subsequently tap into or use them. No person may connect to sewer facilities under a latecomer agreement during the life of the agreement without first paying to the city or county the amount required by the agreement. Moneys received under a latecomer agreement are to be paid out under the terms of the agreement within 60 days (R.C.W. §35.91 (2005)).

Sewer tie-in ordinances

Local jurisdictions in Georgia can require sewer tie-ins for new development. For example, in areas within a certain distance of an existing sewer, where the wastewater plan calls for future sewers, developers can be required to extend sewer lines rather than install septic systems. Developers can then be required to install connections to sewer systems instead of relying on septic tanks. Local jurisdictions can require property owners to connect to these sewer systems without having to wait for a septic system failure. Local governments can recoup the cost of constructing or extending a sewer system by requiring all available property owners to connect to it. Fewer septic systems could result in less consumptive use of water in the community. However, it can be difficult for low or moderate income families to afford to connect to sewer systems.

Sewer tie-in ordinances in other jurisdictions

City of Columbus, Georgia

When, in the written opinion of the Columbus, Georgia Health Department and the Columbus Water Works, public sewers are within reasonable access of a new subdivision, the developer must tie into this system and provide sewer services to each lot within the bounds of the subdivision (Columbus, Georgia code §18A-41 (2005)).

Fulton County, Georgia

The Fulton County Board of Commissioners currently has the authority to construct sewers outside the corporate limits of any cities, towns, or municipalities with the county. They are further authorized to assess the cost of constructing and maintaining these sewers on any property owner whose land abuts the streets or roads through which the sewers are placed (Fulton, Georgia Code §62-66 (2005)).

Gwinnett County, Georgia

Gwinnett County presently requires that if sewers are available within 2000 feet of a new development, the developer must connect to the existing sewer system. This distance can be increased or decreased based on actual field conditions and the size of the project involved. Individual properties, when not part of a larger project, are required to connect to sewers when sewer service is within 200 feet of the property (Green 2005).

Prohibition of development on septic systems in certain areas

Septic moratoria

Local governments and the Division can declare either a temporary or permanent moratorium on new development using septic systems in certain areas. By prohibiting the construction of buildings using septic systems, local governments are able to limit consumptive use of water when local conditions require water conservation, preservation of water quality, or maintenance of instream flows. This option may not be cost effective for some communities, however, because septic systems can boost property tax rolls without the expense of sewer construction. Local government could also be subject to takings challenges by property owners claiming their property values dropped due to lower development expectations.

Septic moratoria in other jurisdictions

City of Olympia, Washington

The City of Olympia, Washington, enacted a six-month moratorium on the construction of new subdivisions using septic tank effluent pumping systems in order to give the city council an opportunity to examine the cost, risks, and levels of service provided by such systems as opposed to conventional sewer systems (www.ci.olympia.wa.us).

City of San Diego, California

In 1980, the county of San Diego, California, placed a moratorium on septic systems in the Central Valley area that was not lifted until June 1999 (www.co.san-diego.ca.us).

City of Snellville, Georgia

The municipal code of the City of Snellville makes it unlawful for any person to construct septic systems (Snellville, Georgia Code 62-109 (2005)). The owner of all houses, buildings, or properties used for human occupancy, employment, or recreation within the city, and located within 250 feet of an existing sewer line is required at the owner's expense to install suitable toilet facilities and connect such facilities directly with the public sewer line (Snellville, Georgia Code 62-111(a)). In addition, when a public sewer line becomes available to a property served by a septic tank, a direct connection will be made and any septic tanks will be abandoned (Snellville, Georgia Code 62-112(c)).

New Mexico

New Mexico communities may impose septic moratoria when there is an increase of ground water contamination by too many septic tanks, a shortage of water to serve new development, or the existing sewer system is inadequate to serve new residents (www.nmheritage.org/resources).

Adequate public facilities ordinances

An adequate public facilities ordinance is a growth management approach that conditions development approval on the availability and adequacy of infrastructure, which can include sewer lines. To receive a permit, the developer must demonstrate that the required levels of public facilities are, or will be, available to the proposed project. Adequate public facilities ordinances can manage the growth of septic systems by providing that: (1) new subdivisions over a certain size or number of units are on public sewers; or (2) there would be no new development on septic systems in certain areas, unless the development meets specific criteria. The potential benefits of these ordinances include the fact that communities would be required to link their comprehensive land use plans with their capital improvement programs, a principal of good planning that is often ignored. Adequate public facilities ordinances can also encourage contiguous or infill development because of its proximity to existing urban infrastructure and services. However, these ordinances can also be perceived as a means to slow or prevent economic development in an area.

Adequate public facilities ordinances in other local jurisdictions

Alachua County, Florida

In the County of Alachua, Florida, no final development order may be approved, unless it is determined that the necessary public facilities will be available concurrent with the impacts of the proposed development. The burden of meeting this concurrency requirement is on the applicant requesting a final development order. The criteria for determining whether the public facilities affected by the development will be available based on the level of service standards adopted for each public facility are as follows:

For sanitary sewer facilities:

- The necessary facilities and services are in place at the time a development permit is issued; or
- The necessary facilities will be in place when the impacts of development occur; or
- The necessary facilities are under construction at the time a development permit is issued and will be in place when the impacts of development occur; or
- The necessary facilities and services are guaranteed in an enforceable development agreement that includes the previously stated provisions. Any such agreement must guarantee that the necessary facilities and services will be in place when the impacts of development occur (Alachua, Florida Code §365.06(1) (2005)).

Brevard County, Florida

The concurrency evaluation system used by Brevard County, Florida, measures the potential impact of any development permit proposal on the established minimum acceptable level of service for sanitary sewer service. Any person seeking approval of a site plan, subdivision plat or building permit must submit a concurrency evaluation along with the application. The following criteria are used to determine whether levels of sewer service are adequate to support the specific impacts of the proposed development:

- If the system is county operated, the county utilities services department must determine capacity for sanitary sewer facilities by using the existing capacity, which is determined by subtracting the committed capacity and present flow from the design capacity of the facilities; and
- The impact on the treatment plant must be determined using the county's level of service standards.

Where septic tanks are to be used, a certificate from the county consumer health division that certifies that the site is or can be made suitable for the use of an onsite sewage disposal system is required. (Brevard, Florida Code §62-602(a)(d)(2) (2005)).

Montgomery County, Maryland

Montgomery County, Maryland passed an Adequate Public Facilities Ordinance in 1973. The ordinance states that a preliminary subdivision plan can not be approved unless the Planning Board determines that public facilities will be adequate to support and service the area of the proposed subdivision. Public facilities and services to be examined include roads and public transportation facilities, sewerage and water service, schools, police stations, firehouses, and health clinics (Subdivision of Land of the Montgomery County Code – Chapter 50-35(k)).

City of Rockville, Maryland

The City of Rockville, Maryland, adopted adequate public facilities standards under which a use permit or preliminary subdivision plan will not be approved until the appropriate city agency determines that public facilities will be adequate to support and service the area of the proposed development. Public facilities and services to be examined for adequacy include sewer service (Rockville, Maryland Code 25-801(a) (2002)).

Requirement that existing development on septic systems tie into sewer systems as they become available

Currently, local governments in Georgia have the authority to require landowners to hook up to a public sewer system as a function of their public health, safety, and welfare powers in the event the septic system fails or if a public sewer system is located within 200 feet of the landowner's property. Many states, however, allow local governments to require residents with septic tanks to connect to public sewer systems regardless of public health concerns or distance to sewer lines. In such jurisdictions, local governments may be allowed to recoup their investment in sewer infrastructure. Local governments may also be able to capture the wastewater from sewer systems for reuse, thus reducing their consumptive use of water by limiting the number of septic systems used in their communities. Drawbacks to septic system tie-in requirements include placing an unfair burden on low and moderate income families that can not afford to connect to a sewer system.

Requirement that existing septic systems tie into sewer systems as they become available from other local jurisdictions

Colorado

In Colorado, no individual sewage disposal system permit will be issued to any person when the subject property is located within a municipality or special district which provides public sewer service, except where such sewer service to the property is not feasible (5 C.C.R. §1003-6(IV)(A)(9)).

City of Columbus, Ohio

The City of Columbus, Ohio, has a Sewer Tie-In Program that assists in the abandonment of septic systems and connections to sewer systems. Assistance is offered to low and moderate income persons in the form of a zero percent interest deferred loan or a three percent low interest loan. Eligible households include families earning 80 percent or less of the area median income as determined by HUD regulations (www.td.ci.columbus.oh.us/Housing/sewer.htm).

Florida

In Florida, the owner of a properly functioning septic system must connect the system to an available sewer system within one year after the sewer system is available for connection (F.S. §381.00655(1)(a) (2004)).

Kentucky Infrastructure Authority

The Kentucky Infrastructure Authority may, upon the occurrence of any event of default by a government agency, require the owner of each and every lot or parcel of land which abuts a street containing a sewer or where a sewer is reasonably available for service and upon which lot an improvement exists for residential, commercial, or industrial use, to connect to the sanitary sewer and to cease to use any other means for the disposal of sewage (K.R.S. §224A.180(2) (2004)).

Louisiana

In Louisiana, municipalities and sewer districts having a public sewer system may compel the connection by owners of premises within three hundred feet of the public sewer (L.R.S.A. §4041 (2005)).

Maine

In Maine, if required by municipal ordinance, the owner of each lot or parcel of land upon which a building has been constructed which abuts a street or public way containing a sewer must connect that building with the sewer and must cease using any other method for the disposal of wastewater (M.R.S.A. §3405 (2004)).

Summary and Conclusions

Although septic systems have facilitated the state's significant economic and population growth by allowing housing development to take place quickly, this speed also has some drawbacks. In many communities, growth has far outpaced local land use and capital investment planning resulting in large amounts of low density and sprawl development. In areas where growth has occurred around housing built on septic systems, water lost to consumptive use by these systems might be put to more beneficial uses such as improving or maintaining water quality and instream flows. Where an interbasin transfer of water occurs, water in a wastewater system could be returned to the basin-of-origin, whereas the direction of water flow released from septic systems can not be controlled and would result in an interbasin transfer. The ultimate question relating to septic systems is whether and under what conditions should these systems be encouraged or discouraged.

Chapter 4

INTERBASIN TRANSFER POLICY IN GEORGIA

Increasing population growth and urbanization are raising water demands relative to water supply in many areas of the eastern United States, including Georgia. Although droughts are still a major cause of water supply problems in the state, other factors, such as rapid population growth, extensive commercial development, and contamination of available water supplies are beginning to cause water supply problems even during normal weather conditions. Compounding the state's water supply challenge is the fact that population growth and development do not always occur where the most abundant water supplies exist. This situation is not exclusive to Georgia, and many states have found that the demand for water in one region justifies transporting it far from the stream where it originates. Such interbasin water transfers are viewed by many states, especially in the western part of the country, as a valuable way of meeting changing water needs (NSA 1992). Sometimes the source of exported water is considered available because it is relatively plentiful and there is little demand for its use downstream in the basin-of-origin. Other times, water is removed from current uses in order to satisfy higher uses in another basin (Getches 2005).

What are Interbasin Transfers?

An interbasin transfer of water is defined as a withdrawal or diversion of water to a different river basin from which it is withdrawn where it is used and discharged. The river basin is the area of natural surface water drainage associated with any river and stream, or combination of the two (MNGWPD 2003).

Most of the interbasin transfers in Georgia currently occur in the Metropolitan North Georgia Water Planning District (District), encompassing the metro-Atlanta area. Generally speaking, in the District, water is moved from areas where it is available to areas where it is needed; likewise, wastewater is moved from water use points to available wastewater treatment facilities. Transfers among basins are particularly common within counties that straddle the ridges between two or more basins. This situation applies to 13 of the District's 16 counties, including the most populous counties of Cobb, DeKalb, Fulton, and Gwinnett. Currently, interbasin transfers play a critical role in supplying water throughout the District; there are water supply and wastewater transfers into and out of every river basin in the District. The majority of interbasin transfers are out of the Chattahoochee River Basin. Residents in the Ocmulgee River Basin rely heavily on the Chattahoochee River Basin for water supply. Water withdrawn from the Chattahoochee River Basin is treated by DeKalb and Gwinnett Counties which then distribute the treated water to areas inside and outside the Chattahoochee Basin. Smaller quantities are also exported from the Chattahoochee River Basin to the Flint, Etowah, and Oconee River Basins. Water is also transferred from Lake Allatoona (Etowah River Basin) to the Chattahoochee River Basin within Cobb County (MNGWPD 2003).

Although interbasin transfers most commonly occur in the Atlanta region, others take place across primarily the northern portion of the state. This is because many cities and counties in Georgia were built on high ground which is often a ridgeline that separates two river basins. Such communities typically obtain their water from one river basin, and transport it to their citizens who live and work in either of the river basins. There are currently numerous existing and proposed transfers of water of this type involving six of the state's fourteen river basins (MNGWPD 2003). In 2000, Habersham County raised concerns when it proposed an interbasin transfer from the Savannah River Basin to the Chattahoochee River Basin in order to serve its citizens and businesses in the latter basin. Although Habersham County withdrew its request following heated objections from its neighbors, the concern persists throughout the state that communities may be vulnerable to large-scale interbasin transfers of water that will have negative environmental and economic consequences on the basin-of-origin (Pavey 2002).

Impacts of Interbasin Transfers on Maximizing Return Flows

Interbasin transfers are consumptive uses of water because the water that is diverted by such a transfer is completely removed from the basin-of-origin, preventing its use by anyone downstream from the withdrawal point. Interbasin transfers of water can result in reduced instream flows which affect the health of wetlands, fish and wildlife habitat, and downstream water quality and quantity, as well as recreational opportunities that are dependent on instream flows, riparian habitats, and aesthetic qualities (NSA 1992). Changes in the timing and magnitude of instream flows may interfere with migratory cues or reduce spawning in many fish species. Studies have found that migration and spawning of blueback herring were reduced in the Santee River after diversion of water to the Cooper River in South Carolina resulted in changes to instream flow and water temperature (Brooks et al. 1999). In rural areas that are dependent on tourism-based activities such as fishing, hunting, boating, and appreciation of nature, interbasin transfers can result in fewer water resources available for new local development in the basin-of-origin since these areas may become less attractive to tourists as well as new businesses who are seeking a location with a pleasant environment, if an interbasin transfer causes a reduction in free-flowing streams. Interbasin transfers can act to reduce the amount of freshwater flowing out of the mouth of a river resulting in saltwater intrusion; a situation where saltwater is able to further migrate up the river. Saltwater intrusion changes the salinity of the water rendering portions of the river uninhabitable for organisms with narrow salinity tolerances. Saltwater intrusion as a result of interbasin transfers has been observed, for example, in the Santee River in South Carolina and several other rivers in northern California (Getches 2005).

Environmentally and socially there may be beneficial or high quality interbasin transfers of water. In order to maintain a high quality stream it may be necessary to bring water into the basin to meet the needs of water users within the basin. There may also be significant environmental benefit to protecting high biodiversity streams or social value in protecting important recreational and aesthetic opportunities in the basin. Importing

water from another basin may be an equitable way of protecting high quality streams from deterioration while allowing for economic growth in the basin.

Current Status of Interbasin Policy in Georgia

Federal policy

Georgia, like every state in the union, is required by the Commerce Clause in the U.S. Constitution to not unduly burden interstate commerce. Because water is considered to be an article of commerce, states have found ways to regulate interbasin transfers without discriminating against out-of-state users. Interbasin transfers that would result in water diversions across state lines could invite review under the dormant Commerce Clause. The dormant Commerce Clause allows a state to justify discriminatory regulation where it is strictly necessary due to a compelling governmental interest. The test for assessing the constitutionality of a state regulation under the dormant Commerce Clause is known as the *Pike* test (*Pike v. Bruce Church, Inc.*, 397 U.S. 137 (1970)). Under this test, a statute which does not discriminate against, but only incidentally burdens interstate commerce, will be held constitutionally valid, unless the burden imposed on interstate commerce clearly outweighs the presumed local benefits. The underlying water shortage conditions that satisfy such a high standard are seldom faced by most eastern states when they pass laws that attempt to prevent water exports. However, evenhanded regulation is permitted; thus a state that imposes stringent conservation requirements, such as preservation of instream flows, on its own water users as a condition of permitting an interbasin transfer can impose the same conditions on exporters (Abrams 2002).

Interbasin transfer law in Georgia

The Environmental Protection Division (Division) has the authority to manage interbasin transfers in the State (O.C.G.A. §12-5-23). Interbasin transfers are defined as withdrawals or diversions in which the surface water used is returned to a different basin than that from which it was withdrawn (DNR Rule 391-3-6-.07). Under provisions of the Georgia Water Quality Control Act, the director of the Division may not authorize any new water pollution control discharge permits which would allow water drawn from one river basin to be discharged into another river basin as sewerage, industrial waste, treated wastewater, or other wastes unless for both the basin-of-origin and receiving river basin the director has:

- Identified waters where applicable effluent limitations are not stringent enough for the waters to meet applicable water quality standards;
- Established total limitations for the pollutants which cause such waters to fail to achieve water quality standards; and
- Established water quality standards for the nearest downstream lake (O.C.G.A. §12-5-29(d)(1)).

In addition, when considering applications for water withdrawal permits that would result in interbasin transfers, the director of the Division must: consider competing existing uses and applications for permits which would not involve interbasin transfers; try to allocate a reasonable supply of surface waters to such users and applicants; and provide a press release regarding the proposed issuance of an interbasin transfer permit to newspapers in all areas which would be affected by the transfer. If there is sufficient public interest to justify a public hearing, the director must call such a hearing to be held somewhere in the affected area (O.C.G.A. §12-5-31(n)). These interbasin transfer requirements apply only to transfers of surface water, not ground water. Interbasin transfers into the North Georgia Metropolitan Water Planning District are not allowed (O.C.G.A. §12-5-584(f)).

Analysis and Discussion of Interbasin Transfer Policy Options for Maximizing Return Flows

Under certain conditions, interbasin transfers may be an appropriate water management tool for Georgia. Communities located along ridgelines between river basins are already using interbasin transfers as a way of providing water to their citizens. Interbasin transfers can ensure areas with high water demand that they will be able to obtain water to satisfy their future demands. Interbasin transfers could also provide Georgia with a significant amount of flexibility in determining how water should be allocated around the state based on water requirements of divergent regions. The most equitable way to protect high value water bodies (i.e., biodiversity, recreation), could be through interbasin transfers. However, interbasin transfers could also expose basins-of-origin to potentially negative environmental and economic impacts, as well as give economically and politically powerful communities an advantage over smaller communities in satisfying their water supply needs.

Interbasin transfers under certain conditions based on specific criteria

Many states have developed specific policies to guide their interbasin transfer permit approval process that give consideration to the community and any environmental impacts of such transfers because of the serious long-term consequences that may result.

Interbasin transfers by volume of water transferred

Allowing only small volumes of water to be transferred could mitigate the negative environmental and economic impacts that can result from interbasin transfers. This policy could also have the indirect effect of making long distance interbasin transfers less economically attractive due to the cost involved in creating the infrastructure for such transfers. Allowing interbasin transfers based on volume, however, could result in limited economic growth in areas where water supplies have been fully appropriated.

Examples from Other States

Great Lakes Basin Annex Implementing Agreements

The Great Lakes Basin Annex Implementing Agreements, when finalized, will only allow interbasin transfers if the proposed withdrawal is less than 100,000 gallons per day averaged over a 90-day period, or is more than 100,000 gallons per day with a consumptive use of less than 5 million gallons per day averaged over a 90-day period. If a consumptive use is more than 5 million gallons per day the interbasin transfer will be subject to several other requirements (www.cglg.org; Chapter 2, Article 201(2)).

Kansas

The Kansas Water Transfer Act defines transfers as a diversion of 2,000 acre-feet (652 million gallons) or more of water per year (K.S.A. §82a-1501) (2004)).

Maryland

In Maryland, permits issued or amended by the Department for nonresidential surface water appropriation in the Potomac River Basin must condition the withdrawal of water on the provision of low flow augmentation for consumptive water use, if the maximum consumptive water use can exceed one million gallons per day at any time. Low flow augmentation is required whether the one million gallons per day level is obtained under one permit or reached incrementally under successive new or amended permits for the same project. As an alternative to the provision of low flow augmentation, permittees may cease consumptive water use during certain periods specified by the Department or may reduce consumptive water use to levels of one mgd or less (COMAR 26.17.07.02(A)(B)).

Massachusetts

Increases over one million gallons per day in currently approved interbasin transfers must be approved by the Water Resources Commission (313 C.M.R. 4.02) (2005)).

Minnesota

In Minnesota, a water use permit involving a diversion of more than two million gallons of water per day averaged over a 30-day period from the basin-of-origin, must be approved by the commissioner (M.S. §103G.265(subd.2) (2004)).

Montana

In Montana, no more than 50,000 acre-feet (163 billion gallons) of water per year may be leased (M.C.A. §85-2-141(4) (2005)).

New Jersey

In New Jersey, water diversions over 100,000 gallons per day must be permitted. Diversions are defined as the taking of water from a water body, including instances where the water is consumed, made to flow into another stream or basin, or discharged elsewhere (N.J.S. §58:1A-5(a); N.J.S. §58:1A-3)(d) (2005)).

Ohio

In Ohio, no person may withdrawal more than 100,000 gallons per day of water from either the Lake Erie or Ohio River basin and transfer the water to another basin without a permit (O.R.C. §1501.32(A) (2005)); §O.R.C. §1501.30(A)(2)).

Oregon

Oregon requires the General Assembly to consent to any interbasin transfers over 50 cubic feet per second (O.R.S. §537.810 (2003)).

Texas

In Texas, interbasin transfers of less than 3,000 acre-feet (978 million gallons per year) do not require a permit (Texas Water Code Ann. §11.085(v)).

Wisconsin

In Wisconsin, if a person proposes to begin a new withdrawal that will result in a water loss averaging more than two million gallons per day in any 30-day period, an application must file with the appropriate agency. In addition, if a person proposes to increase an existing withdrawal that will result in a water loss averaging more than two million gallons per day in any 30-day period above the person's authorized base level of water loss, an application must be submitted to the appropriate state agency (W.S. §281.35(4)(b) (2004)).

Interbasin transfers based on criteria that minimize damage to the donor basin and require a show of good stewardship by the receiving basin

Before approving an interbasin transfer, many states require the receiving basin to provide evidence of such criteria as: demonstrable need, water conservation methods, and that the proposed transfer is the most economical way to obtain water before an interbasin transfer permit is granted. Limiting interbasin transfers based on specific criteria could afford the state greater flexibility in addressing the issues and concerns associated with interbasin transfers that are important to Georgia. However, this policy could also result in higher administrative costs of managing water withdrawals permits because of the increased time and analysis that would be needed to review interbasin transfer permits.

Examples from Other States

Connecticut

In Connecticut, applicants for an interbasin transfer permit must submit the following information:

- The need for the diversion;
- The reasons for the diversion and the use of the diverted water;
- The locations of withdrawals and discharges of water the applicant proposes to divert;
- The effect of the proposed diversion on public water supplies, water quality, wastewater treatment needs, flood management, water-based recreation, wetland habitats, waste assimilation, agriculture, fish and wildlife and low flow requirements;
- The alternatives, if any, to the proposed diversion including a study of cost factors, feasibility and environmental effects of such alternatives;
- Contingency measures for limiting water use during seasonal or drought shortages; and
- Conservation measures instituted by the applicant prior to the application and the applicant's long-range water conservation plan to be implemented or continued after issuance of a permit. The plan must provide for:
 - The identification of the cost effectiveness of distribution system rehabilitation to correct sources of lost water;
 - Measures which encourage proper maintenance and water conservation;
 - A public information program to promote water conservation, including industrial and commercial recycling and reuse (C.G.S. §22a-369 (2005)).

The Great Lakes Basin Annex Implementing Agreements

The Great Lakes Basin Annex Implementing Agreements, when finalized, will require that an applicant for a long distance interbasin transfer show that there is no reasonable water supply alternative within the basin in which the community is located, including conservation of existing water supplies, and that the transfer will not endanger the integrity of the Great Lakes Basin Ecosystem (www.cglg.org; Chapter 2, Article 201(3)(d)(e)).

Idaho

An Idaho statute provides that a permit may not be approved if an interbasin transfer would cause a change in water use away from agricultural use which would significantly affect the agricultural base of the local area (I.C. §42-222 (2005)).

Kansas

In Kansas, a permit for an interbasin transfer will not be allowed if the benefits to the state of approving the transfer do not outweigh the benefits to the state of not approving the transfer. In making this determination, the Department of Health and Environment must consider: alternative sources of water available to the applicant and present or future users for any beneficial use; whether the applicant has taken all appropriate measures to preserve the quality and remediate any contamination of water currently available for use by the applicant; the effectiveness of conservation plans and practices adopted and implemented by the applicant; and the conservation plans and practices adopted and implemented by any persons potentially affected by the proposed transfer (K.S.A. §82a-1502(a)(c)).

Massachusetts

Under the Massachusetts Interbasin Transfer Act, criteria upon which the commission bases its approval or disapproval of any proposed interbasin transfer include:

- The identification of distribution system sources of lost water, and where cost effective, the implementation of a program of leak detection and repair;
- Metering of all water users in the receiving area and a program of meter maintenance;
- Implementation of rate structures which reflect the costs of operation, proper maintenance and water conservation;
- Public information programs to promote water conservation, including industrial and commercial recycling and reuse; and
- Contingency plans for limiting use of water during seasonal or drought shortages (C.M.R. §21-8D).

Minnesota

In Minnesota, an interbasin transfer will not be approved until a determination is made that the water remaining in the basin-of-origin will be adequate to meet the basin's water resource needs during the specified life of the diversion project (M.S. §103G.265(subd.2) (2005)).

Nebraska

When evaluating an application which involves an interbasin transfer of water in Nebraska, the following factors must be taken into consideration when making a determination of whether denial of such application is demanded by the public interest:

- The economic, environmental, and other benefits of the proposed interbasin transfer and use;
- Any adverse impacts of the proposed interbasin transfer and use;
- Any current beneficial uses being made of the unappropriated water in the basin-of-origin;
- Any reasonably foreseeable future beneficial uses of the water in the basin-of-origin;
- The economic, environmental, and other benefits of leaving the water in the basin-of-origin for current or future beneficial uses;
- Alternative sources of water supply available to the applicant; and
- Alternative sources of water available to the basin-of-origin for future beneficial uses (N.S. §46-289 (2004)).

Ohio

In Ohio, no interbasin transfers will be permitted if the applicant has not demonstrated that:

- During the life of the project for which the water is to be diverted, some or all of the water to be diverted will be needed for use within the basin;
- The proposed diversion would endanger the public health, safety, or welfare;
- The applicant has not demonstrated that the proposed diversion is a reasonable and beneficial use and is necessary to serve the applicant's present and future needs; and
- Reasonable efforts have been made to develop and conserve water resources in the importing basin and that further development of those resources would engender overriding, adverse economic, social, or environmental impacts (O.R.S. §1501.32(B)).

Pennsylvania

Pennsylvania requires applicants for an interbasin transfer to adopt land and water

resource plans and adequate development controls before approving the use transfer (P.C.S. §9153(b) (2003)).

Texas

In Texas, review criteria for an interbasin transfer include:

- Alternative supplies in the receiving basin;
- Amount and purpose of use of the water;
- Conservation and drought contingency efforts in the receiving basin;
- Efforts of the receiving basin to put the water to beneficial use;
- Economic impact in each basin; and

Impacts of the transfer on existing water rights, instream uses, water quality, aquatic and riparian habitat, and bays and estuaries (Texas Water Code Ann. §11.085(k)(2)).

Wisconsin

An application for an interbasin transfer in Wisconsin must contain a statement of the anticipated effects, if any, that the transfer will have on existing uses of water resources and related land uses both within and outside of the basin-of-origin (W.S. §281.35(5)(a)). If a proposed withdrawal will result in an interbasin transfer, Wisconsin also requires all of the following information to be submitted with the application:

- That each state or province to which the water will be diverted has developed and is implementing a plan to manage and conserve its own water quantity resources, and that further development of its water resources is impracticable or would have a substantial adverse economic, social, or environmental impact;
- That granting the application will not impair the ability of the Great Lakes basin or upper Mississippi River basin to meet its own water needs;
- That the interbasin diversion alone, or in combination with other water losses, will not have a significant adverse impact on lake levels, water use, the environment or the ecosystem of the Great Lakes basin or upper Mississippi River basin; and
- That the proposed withdrawal is consistent with all applicable federal, regional and interstate water resources plans (W.S. §281.35(5)(d)(7)).

Interbasin transfers from specific basins only

Allowing interbasin transfers to only take place in specified basins could give the state flexibility in addressing water management challenges while affording protection to the states' most endangered or high quality water bodies. However, this policy could also be politically unpopular if the residents of the basins-of-origin in water bodies where interbasin transfers are allowed feel they have been unfairly targeted.

Examples from Other States

California

In California, water users in protected areas have the right to purchase water from a water supplier exporting water for use outside the protected area (Cal. Water Code §1215.5(a)). "Protected areas" are all land which normally drains to the ocean, to a hydraulic sink, or to another state within any of a set of named river systems (Cal. Water Code §1217(a)).

Minnesota

Minnesota defines "basin-of-origin" as being the drainage basin of the Great Lakes, the Red River of the North, the Mississippi, or the Missouri River (M.S. §103G.005 (Subd. 6)).

Nebraska

In Nebraska, interbasin transfers are defined as diversions of water in one river basin and the transportation of such water to another river basin for storage or utilization for a beneficial use, while river basin means any of the following river basins of the state:

- The White River and Hat Creek basin;
- The Niobrara River basin;
- The Platte River basin, including the North Platte and South Platte River basins;
- The Loup River basin;
- The Elkhorn River basin;
- The Republican river basin;
- The Little Blue River basin;
- The Big Blue River basin;
- The Nemaha River basin; and

- The Missouri tributaries basin (N.S. §46-288(3)(4)).

New Hampshire

In New Hampshire, no interbasin transfers of water from a designated natural river (N.H.R.S. §483.9(II) (2004)), rural river (N.H.R.S. §483:9-a(III)), rural-community river or community river are permitted (N.H.R.S. §483:9aa(III); N.H.R.S. §483.9-b(III)).

Ohio

No person in Ohio may divert more than 100,000 gallons per day of any waters of the state out of the Lake Erie or Ohio river drainage basins to another basin without having a permit to do so (O.R.S. §1501.32(A)).

Wisconsin

Interbasin transfers in Wisconsin are defined as transfers of the waters of the state from either the Great Lakes basin or the upper Mississippi River basin to any other basin (W.S. §281.35(1)(g)).

Interbasin transfers after a public interest review

The potentially negative economic, social and environmental impacts of interbasin transfers include such public interest concerns as instream flows, fish and wildlife habitat, recreation, water quality, and the economic viability of an area. Many states have provisions that allow interbasin transfers to take place only after the impacts on all these concerns have been taken into consideration. A public interest review could protect basins-of-origin from bearing the brunt of negative impacts resulting from an interbasin transfer. Public interest reviews could also help ensure that any interbasin transfer that does take place is in the best interest of the state. However, public interest reviews could also result in higher administrative costs due to the increased time needed to review interbasin transfer permits.

Examples from Other States

Connecticut

In Connecticut, the diversion of the waters of the state is permitted only when the diversion is found to be necessary; is compatible with long-range water resource planning, proper management, and use of the water resources of Connecticut; and is consistent with the state's policy of protecting its citizens against harmful interstate diversions and with the state's conservation and development plans and that therefore it is in the public interest (C.G.S. §22a-366).

Florida

In Florida, to obtain a consumptive use permit, the applicant must establish that the proposed use of water is consistent with the public interest (F.S. §373.223(1)). When evaluating whether a potential transport and use of ground or surface water across county boundaries is consistent with the public interest, the governing board or department must consider:

- The proximity of the proposed water source to the area of use or application;
- All impoundments, streams, ground water sources, or watercourses that are geographically closer to the area of use or application than the proposed source, and that are technically and economically feasible for the proposed transport and use;
- All economically and technically feasible alternatives to the proposed source, including, but not limited to, desalination, conservation, reuse of nonpotable reclaimed water and stormwater, and aquifer storage and recovery;
- The potential environmental impacts that may result from the transport and use of water from the proposed source, and the potential environmental impacts that may result from use of water courses that are geographically closer to the area of use and all economically and technically feasible alternatives to the proposed source;
- Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for existing legal uses and reasonably anticipated future needs of the water supply planning region in which the proposed water source is located;
- Consultations with local governments affected by the proposed transport and use; and
- The value of the existing capital investment in water-related infrastructure made by the applicant (F.S. §373.223(3)).

Kentucky

In Kentucky, a permit may be issued for the transfer or diversion of public water from one stream or watershed area to another, where the transfer is consistent with the wise use of the public water and is in the best interests of the public (K.R.S.A. §151.200(2) (2005)).

Nebraska

Under the Nebraska interbasin appropriation statute, an application to appropriate water from one basin and divert it to another basin is deemed in the public interest if the overall benefits to the state and the applicant's basin are greater than or equal to the adverse impacts to the state and the basin-of-origin (N.R.S. §46-289).

Texas

A Texas law provides that no person may take or divert water of the state into any other natural stream or watershed to the prejudice of any person or property situated within the watershed from which the water is to be taken or diverted (Texas Water Code Ann. §11.085). The Texas Supreme Court ruled that “prejudice” is determined by weighing the detriments to the basin-of-origin against the benefits of the diversion (*City of San Antonio v. Texas Water Comm’n*, 407 S.W.2d 752 (1966)).

Interbasin transfers where instream flow protection is provided

Laws to protect instream flows can mitigate the negative impacts of interbasin transfers by keeping water flowing in streams regardless of what volume of water is transferred. Such laws may also prevent interbasin transfers that would deplete a stream below the allowed minimum flow level. Instream flow protection could include not allowing interbasin transfers when water flows are below a certain level. Instream flow preservation could help provide minimal protection for fish and wildlife habitat, as well as protect the water quality and recreational interests of the basins-of-origin. Flow levels could also be seasonally adjusted to mimic the natural fluctuations in water levels that are critical to the plants and animals within the basin. Protecting instream flows may affect the amount and timing of water that can be transferred, however, and make such a transfer uneconomical.

Examples from Other States

Arkansas

Arkansas allows the interbasin transfer of excess surface water defined as 25 percent of that amount of water available on an average annual basis from any watershed above that amount required to maintain instream flows for fish and wildlife, water quality, aquifer recharge requirements, and navigation (A.C.A. §15-22-304(b) (2005)).

Maryland

In Maryland, except for permits issued for the appropriation and use of water for agricultural purposes, surface water appropriation or use permits may be conditioned on the permittee’s provision of low flow augmentation to offset consumptive use during low flow periods to protect other users of the water and to protect the resource (COMAR 26.17.06.05(C)). “Consumptive water use” means that part of water withdrawn from a source which, due to interbasin diversions, is not returned to the source to be available for subsequent use (COMAR 26.17.06.01(B)(7)). “Low flow augmentation” means provision of water through development of new water storage facilities or the purchase of storage space in existing water storage facilities equal to the amount of consumptive use from a water source (COMAR 26.17.06.01(B)(14)).

Massachusetts

Under the Massachusetts Interbasin Transfer Act, when deciding whether to approve a proposal to increase over the present rate of an interbasin transfer, the Water Resource Commission must determine that reasonable instream flow in the river from which the water is transferred is maintained. The Commission must take into consideration in determining reasonable instream flow the impact of the proposed interbasin transfer on the stream flow dependent ecosystems and water uses including:

- Length of the stream below the point of withdrawal;
- Effects on flood flows, intermediate flows and low flows;
- Effect on ground water and surface water elevations;
- Significance of indigenous and anadromous fisheries and fauna and effects thereon;
- Significance of wetlands and dependent flora and fauna and effects thereon;
- Effect on water quality, recreational uses, aesthetic values, areas of critical environmental concern and protected areas;
- Effect on established riparian uses and uses dependent on recharge from stream flow;
- Effect on hydropower production;
- Effect on other water withdrawals and undeveloped rights within the donor basin; and
- Effect on other instream uses (313 C.M.R. 4.05(5)).

New Jersey

In the Susquehanna River Basin, in Maryland, a determination concerning a transfer of water into or out of a river basin which may have the effect of reducing below a proper minimum the flow of water in that portion of the basin, will be subject to judicial review (M.C.A. §5-301.3.10(6)). Interbasin transfers of more than 100,000 gallons per day in New Jersey must allow for the maintenance of the minimum water levels and flow necessary to provide adequate water quantity and quality (N.J.S. §58:1A-5(e)).

Ohio

In Ohio, no interbasin transfers will be permitted if the proposed diversion, alone or with other diversions, will have a significant adverse impact on in-stream uses or on economic or ecological aspects of water levels (O.R.C.A. §1501.32(B)).

SUMMARY AND CONCLUSIONS

Although interbasin water transfers can represent a drastic solution to water supply needs, sometimes the demand for water might justify transporting it away from the water body from which it originated. It is important to remember that while an interbasin water transfer can appear to be negative from a basin-of-origin perspective, it may result in positive net benefits when viewed from a regional or statewide perspective. For example, there may be circumstances in which an interbasin transfer could improve the quality and instream flow of a high value water body. In order to provide basin-of-origin protection, interbasin water transfer processes could formally recognize the environmental, economic and social interests within the basins-of-origin, and weigh these interests when interbasin transfers are being considered. The basic question relating to interbasin transfers is under what circumstances should such transfers be allowed and, conversely, under what circumstances should they be denied.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Georgia enjoys a relatively plentiful water supply, yet the availability of our water resources varies both seasonally and regionally. When our natural water complexity is considered with regard to increasing water demands, it becomes apparent that Georgia must approach water management in a thoughtful, comprehensive and coordinated manner based on the best science we have.

The legal foundation upon which water management in Georgia rests is the set of statutes enacted by Congress and the Georgia General Assembly. Collectively, this body of law has set two general water-related goals for us to meet:

- Protect public health and environmental quality; and
- Meet future needs while protecting aquifers, instream uses and downstream users.

We face significant challenges, however, in meeting these goals. First, inconsistencies and lack of coordination can hamper meeting at least some of our goals. Laws are passed by different legislative bodies at different times, with different motivations, and for different purposes. They are implemented by federal and state agencies with varying degrees of financial, technical, and managerial capacity. Specific water-related decisions reflecting policies and programs are 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 our water goals is that laws are not static. They reflect the values we attribute to water resources at a particular point in time. These laws also reflect the world as we know it – or can reasonably expect it to become – at the point in time when we conceive them. Congress and the General Assembly can amend these statutes, but they do not always change in lock step with a shift in citizens' goals, aspirations, perceptions, activities, and knowledge related to water resources.

To better address the water challenges we face, the Comprehensive State-side Water Management Planning Act was passed by the Georgia General Assembly during the 2004 legislative session. This law directs the Environmental Protection Division of the Georgia Department of Natural Resources to develop a comprehensive state water management plan and create the Georgia Water Council composed of legislators, legislative appointees and agency heads with water-related responsibilities to oversee the development of the plan. The plan is to be provided to the Council in July 2007 for its review and adoption and presented to the General Assembly for consideration in the 2008 legislative session.

The first iteration of the comprehensive water management plan will focus on four key policy objectives:

1. Minimizing withdrawals of water by increasing water conservation, efficiency and reuse;
2. Maximizing 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. Meeting instream and off stream water demands through storage, aquifer management and reducing water demands; and
4. Protecting water quality by reducing wastewater discharges and runoff from land to below the assimilative capacity of the streams.

This report is the second of four policy documents to focus on these objectives; specifically on maximizing water return to the river basins through reducing interbasin transfers and limiting use of septic tanks and land application of treated wastewater where water quantity is limited.

Georgia's water resources are becoming increasingly strained by greater pollutant loading and greater withdrawal demand as the State's population and economy grow. As a result, specific policies that clearly define a strategy for maximizing return flows to water bodies have become more critical. Land application and reuse of wastewater, septic systems, and interbasin transfers are all consumptive uses of water that do not return water to the point of withdrawal. Nevertheless, all three of these water uses also serve beneficial purposes that are valuable to society. It will be important for Georgia to develop water policies that will balance the water demands of its growing population against the equally important need to maximize water returns to the point of withdrawal. The basic question relating to land application, septic systems, and interbasin transfers is under what circumstances should these withdrawals be allowed and, conversely, under what circumstances should they be denied.

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Appendix A

LAND APPLICATION AND REUSE STATUTES OF SELECTED STATES

As water supplies become more strained while demand is increasing, land application and other forms of reuse of treated wastewater are becoming increasingly popular in many states. The following provides an overview of the ways selected states are regulating land application and reuse of reclaimed water.

CALIFORNIA

The California Legislature declared that the use of potable domestic water for nonpotable uses, including, but not limited to, cemeteries, golf courses, parks, highway landscaped areas, and industrial and irrigation uses, is a waste or an unreasonable use of the water if recycled water is available (Cal. Water Code §13550(a)). The source of recycled water must be of adequate quality for these uses. In determining adequate quality, the state board must consider all relevant factors, including, but not limited to, food and employee safety, and level and types of specific constituents in the recycled water affecting these uses, on a user-by-user bases. In addition, the state board must consider the effect of the use of recycled water in lieu of potable water on the generation of hazardous waste and on the quality of wastewater discharges subject to regional, state, or federal permits (Cal. Water Code §13550(a)(1)). The recycled water may be furnished for these uses at a reasonable cost to the user. In determining reasonable cost all relevant factors will be considered by the state board including the present and projected costs of supplying, delivering, and treating potable domestic water for these uses and that the cost of supplying the treated recycled water is comparable to, or less than, the cost of supplying potable domestic water; the use of recycled water from the proposed source will not be detrimental to public health; the use of recycled water for these uses will not adversely affect downstream water rights, will not degrade water quality and is determined not to be injurious to plant life, fish, and wildlife (Cal. Water Code §13550(a)(2)(3)(4)). When making the determination pursuant to subdivisions the state board must consider the impact of the cost and quality of the nonpotable water on each individual user (Cal. Water Code §13550(b)).

FLORIDA

The encouragement and promotion of water conservation and reuse of reclaimed water are state objectives and considered to be in the public interest. The Florida Legislature finds that the use of reclaimed water provided by domestic wastewater treatment plants permitted and operated under a reuse program approved by the department is environmentally acceptable and not a threat to public health and safety (F.S. §373.250(1)). A water management district may require the use of reclaimed water in lieu of surface water or ground water when the use of uncommitted reclaimed water is

environmentally, economically, and technically feasible and of such quality and reliability as is necessary to the user (F.S. §373.250(2)(c)).

The governing board of each water management district must implement a program for the issuance of permits authorizing the consumptive use of particular quantities of water covering those areas deemed appropriate by the governing board (F.S. §373.216).

The governing board of a water management district is authorized to adopt rules that identify preferred water supply sources for consumptive uses. A consumptive use permit issued for the use of a preferred water supply source must be granted for at least a 20-year period (F.S. §373.2234).

Permits for consumptive use of water will not be granted unless the applicant can establish that the proposed use is reasonable and beneficial. In determining whether a water use is a reasonable-beneficial use, the following factors are considered:

- The quantity of water requested for the use;
- The demonstrated need for the use;
- The suitability of the use to the source of water;
- The purpose and value of the use;
- The extent and amount of harm caused;
- The practicality of mitigating any harm by adjusting the quantity or method of use;
- Whether the impact of the withdrawal extends to land not owned or legally controlled by the user;
- The method and efficiency of use;
- Water conservation measures taken and available to be taken;
- The feasibility of alternative sources such as reclaimed water, stormwater, aquifer storage and recovery, brackish water and salt water;
- The present and projected demand for the source of water;
- The long-term yield available from the source of water;
- The extent of water quality degradation caused;
- Whether the proposed use would cause or contribute to flood damage;

- Whether the proposed use would significantly induce or increase saltwater intrusion;
- The amount of water which can be withdrawn without causing harm to the resource;
- Whether the proposed use would adversely affect public health; and
- Whether the proposed use would significantly affect natural systems (FAC 62-40.410(1)(2)).

In addition, water may be reserved from permit use in such locations and quantities, and for such seasons of the year, as is required for the protection of fish and wildlife or the public health or safety (FAC 62-40.410(3)). If water withdrawals are causing, or are projected to cause within 20 years, a water body to fall below its minimum flow or level established, a recovery or prevention strategy must be expeditiously implemented to achieve or maintain the established minimum flow or level as consistent with Florida statutes. For water bodies that are below their established minimum flow or level, renewals of existing consumptive use permits; increased allocations, or new withdrawals must be allowed only if they meet applicable District rules, including those implementing the recovery or prevention strategy (FAC 62-40.410(4)).

In establishing minimum water flows and levels, consideration must be given natural seasonal fluctuations in water flows or levels, nonconsumptive uses, and environmental values associated with coastal, estuarine, riverine, spring, aquatic, and wetlands ecology, including:

- Recreation in and on the water;
- Fish and wildlife habitats and the passage of fish;
- Estuarine resources;
- Transfer of detrital material;
- Maintenance of freshwater storage and supply;
- Aesthetic and scenic attributes;
- Filtration and absorption of nutrients and other pollutants;
- Sediment loads;
- Water quality; and
- Navigation (FAC 62-40.473(1)).

MARYLAND

It is the policy of the State of Maryland to promote and encourage the used of reclaimed water in order to conserve water supplies, facilitate the indirect recharge of ground water, and develop an alternative to discharging wastewater effluent to surface waters (M.C.A. §9-302(b)(5)).

The use of reclaimed water as an alternative to discharging wastewater effluent into the surface waters of the State is to be encouraged. Reclaimed water may be used for irrigation of:

- Farmland;
- Golf courses;
- Athletic fields;
- Turf;
- Landscaping; and
- Any other appropriate use (M.C.A. §9-303.1(a)(b)).

TENNESSEE

A State Operation Permit from the Tennessee Division of Water Pollution Control is required for anyone with a wastewater stream who does not discharge it but may instead spray, irrigate or hold it. The discharge of treated municipal and industrial wastewater to land and the operation of a pump and haul system and requires a permit. In addition, the operation of a municipal sewage collection system which discharges into a system owned by another entity may require a permit. Applicants must provide the following information:

- Name and distance to the nearest stream;
- Previous state and federal water quality permits;
- Information regarding the industry's products and/or processes;
- A description of the processes from which wastewater is discharged; and
- Detailed information regarding the waste stream entering the treatment system, sludge disposal and other general information as required (www.state.tn.us/environment/permits/wqoperm.php).

Tennessee's anti-degradation policy states that for substances or conditions not currently at or in violation of water quality standards, new or additional degradation will only be allowed if the applicant has demonstrated that reasonable alternatives to degradation are not feasible. Reasonable alternatives for discharges include, but are not limited to, connection to an existing collection system, land application, water reuse, or water recycling. For small domestic discharges, connection to an existing system or land application will be considered preferable. The alternatives analysis must be part of the application process and must include a discussion of the feasibility, social and economic considerations, and environmental consequences of each potential alternative (TDEC Rule 1200-4-3(1)).

TEXAS

Texas allows the safe use of reclaimed water for conservation of surface and ground water; to ensure the protection of public health; to protect ground and surface waters; and to help ensure an adequate supply of water resources for present and future needs (Texas Water Code Ann §210.2(a)).

The end uses of industrial wastewater that are subject to the requirements of a Texas Land Application permit include landscape irrigation, dust suppression, soil compaction, impoundment maintenance, or industrial wastewater that is otherwise land applied for a beneficial purpose (Texas Water Code Ann §210.51(c)). Land application is defined as the discharge of waste adjacent to water in the state (Texas Water Code Ann §210.52(10)), while industrial reclaimed water means any industrial wastewater which has been treated to a quality suitable for land application for beneficial use (Texas Water Code Ann §210.51(8)).

Appendix B

SEWER CONNECTION REQUIREMENTS OF SELECTED STATES

All states give local governments the authority, under their charge to protect the public health, safety, and welfare, to compel connection to sanitary sewers. Usually, conditions are placed on when such a hook-up will be required. These conditions most commonly include a public health criteria and a set minimum distance from the nearest sewer connection. The following states provide an overview of conditions under which various local governments are allowed to require sewer connections.

COLORADO

No individual sewage disposal system permit will be issued to any person when the subject property is located within a municipality or special district which provides public sewer service, except where such sewer service to the property is not feasible (5 C.C.R. §1003-6(IV)(A)(9)).

FLORIDA

The owner of a properly functioning septic system must connect to an available publicly owned sewerage system within one year after written notification that the system is available for connection (F.S. §381.00655(1)(a)). The owner of a septic system that needs repair or modification to function in a sanitary manner must connect to an available publicly owned sewerage system within 90 days after written notification (F.S. §381.00655(1)(b)).

It is the intent of the Florida Legislature that where a publicly owned sewerage system is not available, the department will issue permits for the construction, installation, modification, abandonment, or repair of septic systems. It is further the intent of the Legislature that the installation and use of septic systems not adversely affect the public health or significantly degrade the ground water or surface water (F.S. §381.0065(1)).

“Available” means that the publicly owned sewerage system is capable of being connected to the plumbing of an establishment or residence, is not under a Department of Environmental Protection moratorium, and has adequate permitted capacity to accept the sewage to be generated by the establishment or residence (F.S. §381.00655(2)(a)).

The district board is authorized and empowered to regulate the use of sewers and to prohibit the use and maintenance of outhouses, privies, septic tanks or other unsanitary structures or appliances and to require and enforce the use of its facilities whenever and wherever they are accessible (F.S. §153.62(5)(13)). “District” means any unincorporated contiguous area comprising part but not all of the area of any county created into and existing as a water and sewer district pursuant and subject to this law (F.S. §153.52(1)).

“Sewer system” means and includes any facility useful or necessary or having the present capacity for future use in connection with the collection, treatment, purification or disposal of sewage of any nature or originating from any source (F.S. §153.52(4)).

Any municipality may extend and execute all of its corporate powers applicable for the accomplishment of the purposes of this chapter outside of its corporate limits, as may be desirable or necessary for the promotion of the public health, safety and welfare (F.S. §180.02(2)). In the event any municipality desires to avail itself of the provisions or benefits of this chapter, it is lawful for such municipality to create a zone or area by ordinance and to prescribe reasonable regulations requiring all persons or corporations living or doing business within said area to connect, when available, with any sewerage system. In the creation of said zone the municipality may not include any area within the limits of any other incorporated city or village, nor may such area or zone extend for more than five miles from the corporate limits of said municipality (F.S. §180.02(3)).

Under the Small Community Sewer Construction Assistance Act, the department will use funds specifically appropriated to award grants to assist financially disadvantaged small communities with their needs for adequate sewer facilities. “Financially disadvantaged small community” means a municipality with a population of 7,500 or less and a per capita annual income less than the state per capita annual income (F.S. §403.1838(2)). The department may provide grants, from funds specifically appropriated for this purpose, to financially disadvantaged small communities for up to 100 percent of the costs of planning, designing, constructing, upgrading, or replacing wastewater collection, transmission, treatment, disposal, and reuse facilities, including necessary legal and administrative expenses (F.S. §403.1838(3)(a)). The reuse facilities must be cost-effective, environmental sound, permittable, and implementable (F.S. §403.1838(3)(b)(1)).

OHIO

The legislative authority of a municipal corporation may require the installation of sewer connections and assess the cost of the connections. Whenever the legislative authority of a municipal corporation deems it necessary, in view of contemplated street paving or as a sanitary regulation, that sewer connections be installed, the legislative authority will provide written notice to the owner of each lot (O.R.C.A. §729.06).

If the board of health of the health district within which a new public sewer construction project is proposed or located passes a resolution stating that the reason for the project is to reduce or eliminate an existing health problem or a hazard of water pollution, the board of county commissioners of the county, may order the owner of any premises located in a sewer district in the county, to connect the premises to the sewer, and to cease discharging waste into a septic tank. This section does not apply to any of the following:

- Any discharge authorized by a permit;
- Wastes resulting from the keeping of animals;

- Any premises that are not served by a common sewage collection system when the foundation wall of the structure from which sewage or other waste originates is more than two hundred feet from the nearest boundary of the right of way within which the sewer is located; or
- Any premises that are served by a common sewage collection system when both the foundation wall of the structure from which the sewage or other waste originates and the common sewage collection system are more than two hundred feet from the nearest boundary of the right-of-way within which the public sewer is located (O.R.C.A. §6117.51(A)(B)(C)(D)).

Regional water and sewer districts may require the owner of any premises located within the district to connect the premises to a water resource project determined to be accessible to such premises and found to require such connection so as to prevent or abate pollution or protect the health and property of persons in the district. Such connection must be made in accordance with procedures established by the board of trustees of such district and pursuant to such orders as the board may find necessary to ensure and enforce compliance with such procedures (O.R.C.A. §6119.06(Z)).

VIRGINIA

Upon the acquisition or construction of any sewer system under the provisions of this chapter, the owner of each lot or parcel of land (i) which abuts a street which contains a sanitary sewer and (ii) upon which a building has been constructed for residential, commercial or industrial use, will, if so required by the rules and regulations or a resolution of the authority, connect the building with the sanitary sewer, and will cease to use any other source of water supply for domestic use or any other method for the disposal of sewage, sewage waste or other pollution matter (V.C.A. §15.2-5137(A)).

Notwithstanding any other provision of this chapter, those persons having a private septic system or domestic sewage system meeting applicable standards established by the Virginia Department of Health will not be required to discontinue the use of such system. However, such persons may be required to pay a connection fee, a front footage fee, and a monthly nonuser service charge imposed by the Water and Wastewater Authority, as debt service bears to the total operating and debt service costs (V.C.A. §15.2-5137(C)).

Appendix C

INTERBASIN TRANSFERS IN THE REGULATED RIPARIAN MODEL WATER CODE

The Regulated Riparian Model Water Code, a project of the American Society of Civil Engineers, was begun in 1990 for the purpose of developing proposed legislation for adoption by state governments for allocating water rights among competing interests and for resolving other quantitative conflicts over water. The Model Code addresses several issues involving direct use of water, including interbasin transfers. The following excerpts state the Model Code's interbasin transfer policy.

An interbasin transfer is defined as any transfer of water, for any purpose and regardless of the quantity involved, from one water basin to another (§2R-2-10).

The State must protect the reasonable needs of water basins-of-origin through the regulation of interbasin transfers (§1R-1-14). Implicit in this policy is a recognition that interbasin transfers are not to be permitted if it would prevent the basin-of-origin from meeting any of the environmental or other social and economic objectives set forth in related laws and regulations pertaining to water quality.

Interbasin transfers will only be allowed upon successful application of a permit. The State Agency will approve an application and issue a permit only upon determining that:

- The proposed use is reasonable;
- The proposed withdrawal, in combination with other relevant withdrawals, will not exceed the safe yield of the water source;
- The proposed withdrawal and use are consistent with any applicable comprehensive water allocation plan and drought management strategies;
- Both the applicant's existing water withdrawals and use, if any, and the proposed withdrawal and use incorporate a reasonable plan for conservation; and
- The proposed withdrawal and use will be consistent with the provisions of the Model Code and any order, permit term or condition, and regulation made pursuant to this Code or any other statute pertaining to the use of water (§6R-3-01(1)).

In determining whether a use is reasonable, the State Agency must consider:

- The number of persons using a water source and the object, extent, and necessity of the proposed withdrawal and use and of other existing or planned withdrawals and uses of water;

- The supply potential of the water source in question, considering quantity, quality, and reliability, including the safe yields of all hydrologically interconnected water sources;
- The economic and social importance of the proposed water use and other existing or planned water uses sharing the water source;
- The probable severity and duration of any injury caused or expected to be caused to other lawful consumptive and non-consumptive uses of water by the proposed withdrawal and use under foreseeable conditions;
- The probable effects of the proposed withdrawal and use on the public interest in the waters of the State, including, but not limited to:
 - General environmental, ecological, and aesthetic effects;
 - Sustainable development;
 - Domestic and municipal uses;
 - Recharge areas for underground water;
 - Waste assimilation capacity;
 - Other aspects of water quality; and
 - Wetlands and flood plains;
 - Whether the proposed use is planned in a fashion that will avoid or minimize the waste of water;
 - Any impacts on interstate or interbasin water uses;
 - The scheduled date the proposed withdrawal and use of water is to begin and whether the projected time between the issuing of the permit and the expected initiation of the withdrawal will unreasonably preclude other possible uses of the water; and
 - Any other relevant factors (§6R-3-02).

The Model Code includes special standards for interbasin transfer permits. In determining whether to issue a permit for an interbasin transfer of water, the State Agency will give a particular weight to any foreseeable adverse impacts that would impair the sustainable development of the water basin-of-origin. In addition to the factors in other portions of

the Code, in determining whether an interbasin transfer is reasonable the State Agency will consider:

- The supply of water available to users in the basin-of-origin and available to the applicant within the basin in which the water is proposed to be used;
- The overall water demand in this basin-of-origin and in the basin in which the water is proposed to be used; and
- The probable impact of the proposed transportation and use of water out of the basin-of-origin on existing or foreseeable shortages in the basin-of-origin and in the basin in which the water is proposed to be used.

Appendix D

INTERBASIN TRANSFER STATUTES OF SELECTED STATES

Many states have implemented a number of polices that place controls and conditions on interbasin transfers. Generally, such polices act to limit or mitigate the environmental and economic effects of interbasin transfers. The following provides a representation of the various methods used by states across the county to regulate interbasin transfers.

CALIFORNIA

Water users in a protected area have the right to purchase water made available by the construction of any works by a water supplier exporting water for use outside the protected area (Cal. Water Code §1215.5(a)). “Protected areas” are all land which normally drains to the ocean, to a hydraulic sink, or to another state within any of a set of named river systems (Cal. Water Code §1217(a)). Upon the request of an applicant for a permit to appropriate water for use outside a protected area, a county-of-origin will cooperate with the applicant in estimating the amount of water that may be bought within the county and that may be developed or used within the county impacting the proposed project (Cal. Water Code §1218).

No water priority may be released that will deprive the county in which the water originates of any such water necessary for the development of the county (Cal. Water Code §10505). Every application for a diversion permit made and held by the State Water Resources Control Board must be amended to provide that the application, permit, or license may not authorize the use of any water outside of the county-of-origin which is necessary for the development of the county (Cal. Water Code §10505.5).

In the construction and operation by the Department of Water Resources of any project, a watershed or area where water originates, or an area immediately adjacent to such an area which can conveniently be supplied with water from it, may not be deprived by the Department of Water Resources directly or indirectly of the prior right to all of the water reasonably required to adequately supply the beneficial needs of the watershed, area, or any of the inhabitants or property owners therein (Cal. Water Code §11460).

CONNECTICUT

The diversion of the waters of the state is permitted only when such diversion is found to be necessary, is compatible with long-range water resource planning, proper management and use of the water resources of Connecticut, and is consistent with Connecticut’s policy of protecting its citizens against harmful interstate diversions and with the state plan of conservation and development (C.G.S. §22a-366). “Diversion” means any activity which causes, allows or results in the withdrawal from or the alteration, modification or diminution of the instantaneous flow of the waters of the state (C.G.S. §22a-367(2)).

“Interbasin transfer” is defined as any transfer of waters for use from one subregional drainage basin to another (C.G.S. §22a-367(5)).

Applicants for a permit to divert water must submit an application with such information as the commissioner, including but not limited to:

- The need for the diversion;
- The reasons for the diversion and the use of the diverted water;
- A description of the existing water system where the diversion is proposed;
- The locations of withdrawals and discharges of water the applicant proposes to divert;
- The quantity, frequency and rate of water the applicant proposes to divert;
- The length of time for which the diversion permit is sought;
- The effect of the proposed diversion on public water supplies, water quality, wastewater treatment needs, flood management, water-based recreation, wetland habitats, waste assimilation, agriculture, fish and wildlife and low flow requirements;
- The alternatives, if any, to the proposed diversion including a study of cost factors, feasibility and environmental effects of such alternatives;
- Conservation measures instituted by the applicant prior to the application and the applicant’s long-range water conservation plan to be implemented or continued after issuance of a permit. The plan must provide for:
 - The identification of the cost effectiveness of distribution system rehabilitation to correct sources of lost water;
 - Measures which encourage proper maintenance and water conservation;
 - A public information program to promote water conservation, including industrial and commercial recycling and reuse; and
 - Contingency measures for limiting water use during seasonal or drought shortages;
- In the case of a proposed interbasin transfer, the commissioner may request the applicant to file an environmental impact report on the transfer which:
 - Considers the effect of the transfer on present and future water uses in the proposed donor basin;

- Includes a plan for meeting water supply needs and demands in the donor basin for a minimum of twenty-five years; and
- Analyzes the alternative solutions to the water supply or wastewater problem including comparative cost analysis of the proposed transfer relative to alternative measures (C.G.S. §22a-369).

In making his decision, the commissioner must consider all relevant facts and circumstances including but not limited to:

- The effect of the proposed diversion on related needs for public water supply including existing and projected uses, safe yield of reservoir systems and reservoir and ground water development;
- The effect of the proposed diversion on existing and planned water uses in the area affected such as public water supplies, relative density of private wells, hydropower, flood management, water-based recreation, wetland habitats, waste assimilation and agriculture;
- Compatibility of the proposed diversion with the policies and programs of the state of Connecticut dealing with long-range planning, management, allocation and use of the water resources of the state;
- The relationship of the proposed diversion to economic development and the creation of jobs;
- The effect of the proposed diversion on the existing water conditions, with due regard to watershed characterization, ground water availability potential, evapotranspiration conditions and water quality;
- The effect, including thermal effect, on fish and wildlife as a result of flow reduction, alteration or augmentation caused by the proposed diversion;
- The effect of the proposed diversion on navigation;
- Whether the water to be diverted is necessary and to the extent that it is, whether such water can be derived from other alternatives including but not limited to conservation;
- Consistency of the proposed diversion with action taken by the Attorney General; and
- The interests of all municipalities which would be affected by the proposed diversion (C.G.S. §22a-373(b)).

MASSACHUSETTS

The Massachusetts Water Resources Commission issues approvals of interbasin transfers which are defined as any transfer of surface water, including wastewater, outside a river basin. Interbasin transfers do not include situations where a city or town which is partially situated within a river basin takes waters from that basin and sends it to a portion of the same city or town outside the basin (313 C.M.R. 4.02).

Any person in Massachusetts who proposes an increase over the present withdrawal rate of interbasin transfers must apply to the Commission. (313 C.M.R. 4.01). Rate increases that are considered to be insignificant are exempt from this requirement. Insignificant increases are those which the Commission determines will have a minor impact on the donor basin. However, no increase over one million gallons per day will be deemed insignificant. The Commission may, upon request, consider an increase to be insignificant when the transfer is to be temporary, of short duration and conducted to facilitate the construction, maintenance or repair of a public utility, for flood control purposes, for public safety purposes or other similar purposes not related to water supply (313 C.M.R. 4.02).

When determining whether the proposed increase may take place, the Commission must consider the following criteria:

- That all reasonable efforts have been made to identify and develop all viable sources in the receiving area of the proposed interbasin transfer;
- That all practical measures to conserve water have been taken in the receiving area, including but not limited to:
 - The identification of distribution system sources of lost water, and where cost effective, the implementation of a program of leak detection and repair;
 - Metering of all water users in the receiving area and a program of meter maintenance;
 - Implementation of rate structures which reflect the costs of operation, proper maintenance, proposed capital improvements, and water conservation and which encourage the same;
 - Public information programs to promote water conservation, the use of water conserving devices, and industrial and commercial recycling and reuse;
 - Contingency plans for limiting the use of water during seasonal or drought shortages; and
 - Implementation of land use controls to protect existing water supply sources of the receiving area.

- That a comprehensive forestry management program which balances water yields, wildlife habitat and natural beauty on watershed lands presently serving the receiving area and under control of the proponent has been implemented;
- That reasonable instream flow in the river from which the water is transferred is maintained. The Commission must take into consideration in determining reasonable instream flow the impact of the proposed interbasin transfer on the stream flow dependent ecosystems and water uses to include:
 - Length of the stream below the point of withdrawal;
 - Effects on flood flows, intermediate flows and low flows;
 - Effect on ground water and surface water elevations;
 - Significance of indigenous and anadromous fisheries and fauna and effects thereon;
 - Significance of wetlands and dependent flora and fauna and effects thereon;
 - Effect on water quality, recreational uses, aesthetic values, areas of critical environmental concern and protected areas;
 - Effect on established riparian uses and uses dependent on recharge from stream flow;
 - Effect on hydropower production;
 - Effect on other water withdrawals and undeveloped rights within the donor basin;
 - Effect on other instream uses;
- That the communities and districts in the receiving area have adopted or are actively engaged in developing a local water resources management plan; and
- The Commission must consider the impacts of all past, authorized or proposed transfers on stream flows in the donor basin (313 CMR 4.05).

KANSAS

In 1983, Kansas enacted a Water Transfer Act, which was substantially amended in 1993. The act now defines, “transfers” as a diversion of 2,000 acre-feet or more of water per year, a distance of 35 miles from the point of diversion but not including “a release of water from a reservoir to the water’s natural watercourse for use within the natural watercourse or watershed made under the authority of the state water plan storage act or

the water assurance program act.” The Act provides that such diversion is not permitted if it would reduce the amount of water required to meet present or reasonably foreseeable future uses of water by present or future users in the “area from which the water is to be taken for transfer [unless] the benefits to the state for approving the transfer outweigh the benefits to the state for not approving the transfer, [or unless] . . . an emergency exists which affects the public health, safety, or welfare.” In determining whether the benefits to the state for approving the transfer outweigh the benefits to the state for disapproving the transfer, the hearing officer of the Department of Health and Environment must consider the following:

- Any current beneficial use made of the water proposed to be diverted, including minimum desirable stream flow requirements;
- Any reasonably foreseeable future beneficial use of the water;
- The economic, environmental, and public health, welfare and other impacts of approving or denying the transfer;
- Alternative sources of water available to the applicant and present or future users for any beneficial use;
- Whether the applicant has taken all appropriate measures to preserve the quality and remediate any contamination of water currently available for use by the applicant;
- The proposed plan of design, construction, and operation of any works or facilities to be used in conjunction with carrying the water from the point of diversion, which plan to be in sufficient detail to enable the parties to understand the impacts of the proposed transfer;
- The effectiveness of conservation plans and practices adopted and implemented by the applicant;
- Conservation plans and practices adopted and implemented by any persons protecting or potentially affected by the proposed transfer, which plans and practices must be consistent with the guidelines for conservation plans and practices developed and maintained by the Kansas Water Office pursuant to the statute as amended; and
- Any applicable management program, standards, policies and rules and regulations of a ground water management district.

A proposed reallocation may not be approved unless the applicant has adopted and implemented conservation plans and practices and if the reallocation would impair any water rights or prior applications for permits (K.S.R. §82a-1501).

MARYLAND

The Department of the Environment issues water appropriation or use permits using the following criteria:

- The amount of water to be appropriated is reasonable in relation to the anticipated level of use during the permit period; and
- The requested appropriation or use does not have an unreasonable impact on:
 - The waters of the State of Maryland, and
 - Other users of the waters of the State (COMAR 26.17.06.05(A)).

Except for water use for agricultural purposes, the Department, when determining the reasonableness of a proposed appropriation, may consider the following factors:

- The protection of existing water uses, land values, investments, and enterprises; and
- The financial hardship of requiring a new user to bear the loss of potential harm (COMAR 26.17.06.05(B)(1)).

When determining the reasonableness of a proposed appropriation or use, the Department must consider the following factors:

- The purpose of the use;
- The suitability of the use to the watercourse, lake, or aquifer;
- The extent and the amount of the harm it may cause;
- The practicality of avoiding the harm by adjusting the proposed use or method of use of the applicant or another permittee;
- The practicality of adjusting the quantity of water used by each permittee;
- Aggregate changes and cumulative impact that this and future appropriations in an area may have on the waters of the State;
- The contribution that the proposed appropriation may make to future degradation of the waters of the State; and
- Whether the proposed appropriation or use is located within a water management strategy area (COMAR 26.17.06.05(B)(2)).

Except for permits issued for the appropriation and use of water for agricultural purposes, the Department may condition approval of a surface water appropriation or use permit on the permittee's provision of low flow augmentation to offset consumptive use during low flow periods to protect other users of the water and to protect the resource (COMAR 26.17.06.05(C)). "Consumptive water use" means that part of water withdrawn from a source which, due to evaporation, interbasin diversions, or other causes, is not returned to the source to be available for subsequent use (COMAR 26.17.06.01(B)(7)). "Low flow augmentation" means provision of water through development of new water storage facilities or the purchase of storage space in existing water storage facilities equal to the amount of consumptive use from a water source (COMAR 26.17.06.01(B)(14)).

Permits issued or amended by the Department for nonresidential surface water appropriation in the Potomac River Basin must condition the withdrawal of water on the provision, by the permittee, of low flow augmentation for consumptive water use, if the maximum consumptive water use can exceed one million gallons per day (mgd) at any time. Low flow augmentation will be required whether the one mgd level is obtained under one permit or reached incrementally under successive new or amended permits for the same project. As an alternative to the provision of low flow augmentation, permittees may cease consumptive water use during certain periods specified by the Department or may reduce consumptive water use to levels of one mgd or less (COMAR 26.17.07.02(A)(B)). The amount of required low flow augmentation will be calculated for the location at which the withdrawal occurs or, if the consumptive use occurs on a tributary and augmentation is provided on the Potomac River, at the confluence of the tributary and the Potomac River. The Department will direct the permittee as to when and for what duration consumptive water use must cease or a release from a water storage facility must be made for low flow augmentation for consumptive water use. Total nonexempt consumptive use on a daily basis by a permittee may not exceed the value used in calculating water augmentation requirements during low flow restriction periods (COMAR 26.17.06.03(B)(D)(E)).

The Susquehanna River Basin Commission has the power to enter into agreements with other river basin commissions or other states with respect to in-basin and out-of-basin allocations, withdrawals, and diversions (M.C. §5-301.3.8(b)). "Diversions" means the transfer of water into or from the river basin (M.C. §5-301.1.2(4)). A determination of the commission concerning a diversion with the claimed effect of reducing below a proper minimum the flow of water in that portion of the basin within the area of a signatory party, will be subject to judicial review (M.C. §5-301.3.10(6)).

NEBRASKA

In 1982, the Nebraska legislature enacted legislation setting forth certain criteria to be considered by the director in determining whether the public interest would be met by an interbasin transfer. Among the criteria that must be considered are the current and reasonably foreseeable future needs in the area-of-origin. Under the Nebraska interbasin appropriation statute, an application to appropriate water from one basin and divert it to another basin is "deemed in the public interest if the overall benefits to the state and the

applicant's basin are greater than or equal to the adverse impacts to the state and the basin-of-origin (N.R.S. §46-289).

When evaluating an application which involves an interbasin transfer of water in order to determine whether denial of such application is demanded by the public interest, Director of Natural Resources must consider the following factors:

- The economic, environmental, and other benefits of the proposed interbasin transfer and use;
- Any adverse impacts of the proposed interbasin transfer and use;
- Any current beneficial uses being made of the unappropriated water in the basin-of-origin;
- Any reasonably foreseeable future beneficial uses of the water in the basin-of-origin;
- The economic, environmental, and other benefits of leaving the water in the basin-of-origin for current or future beneficial uses;
- Alternative sources of water supply available to the applicant; and
- Alternative sources of water available to the basin-of-origin for future beneficial uses.

The application will be deemed in the public interest if the overall benefits to the state and the applicant's basin are greater than or equal to the adverse impacts to the state and the basin-of-origin (N.R.S. §46-289).

OREGON

In 1989, Oregon enacted a statute requiring an applicant for an out-of-basin appropriation or reallocation to include with the application an analysis of several basin-of-origin concerns. These concerns include:

- The amount of water in the basin-of-origin available for future appropriation;
- Projected future needs for water in the basin-of-origin;
- Benefits presently and prospectively derived from the return flow of water used within the basin-of-origin that will be eliminated by the proposed out of basin use;
- The correlation between surface water and ground water in the basin-of-origin, and whether the proposed use will be harmful to the supply of either;

- Injury to existing water rights of other appropriators or interference with planned uses or developments within the basin-of-origin for which a permit has been issued or for which an application is pending;
- Whether the proposed use will adversely affect the quantity or quality of water available for domestic or municipal use within the basin-of-origin;
- Whether the proposed use will adversely affect public uses . . . in the basin-of-origin; and
- Alternative sources of water for the proposed use that would not rely on transfer of water out of its basin or origin (O.R.S. §537.803(1)).

This statute does not apply to exchanges of water, to transfers of less than 0.5 cubic feet per second of water, or to cities that have historically transported water between the basin-of-origin and the proposed receiving basin (O.R.S. §537.803(3)(4)(5)).

The preliminary analysis, or a reasonable summary, must be published at the applicant's expense for three consecutive weeks in a newspaper of general circulation in the basin-of-origin of the proposed appropriation, diversion, or impoundment. Following publication, the commission must conduct a public hearing at the applicant's expense, in the basin-of-origin. After considering the application, the information generated during the comprehensive review of the application, all comments received at the hearing, the commission will:

- If the application requires legislative approval, submit a report to the Assembly that addresses all the necessary factors and recommends whether to approve or deny the application for use of water outside the basin-of-origin; or
- If the application does not require legislative approval, approve or deny the application (O.R.S. §537.805(2)(3)(4)).

Before approving or recommending approval of an application, the Water Resources Commission must reserve an amount of water adequate for future needs in the basin-of-origin, including an amount sufficient to protect public uses, and subordinate the out-of-basin use to that reservation (O.R.S. §537.809).

No waters located or arising within a basin may be diverted, impounded or in any manner appropriated for diversion or use beyond the boundaries of that basin except upon the express consent of the Assembly. When granting consent to any such request, the Assembly may attach such terms, conditions, exceptions, reservations, restrictions and provisions as it may care to make in the protection of the natural resources of the basin and the health and welfare of the present and future inhabitants of the basin within which the water arises or is located. This does not apply to appropriations or diversion of less than 50 cubic feet per second out of the basin-of-origin, appropriations or diversion within the Klamath River Basin or within the Goose Lake Basin, or to diversions by cities

to facilitate regional municipal water service if the city has historically transported water between the basin-of-origin and proposed receiving basins identified in the application (O.R.S. §537.810).

WISCONSIN

Interbasin transfers in Wisconsin are defined as transfers of the waters of the state from either the Great Lakes basin or the upper Mississippi River basin to any other basin (W.S. §281.35(1)(g)). If a proposed withdrawal will result in an interbasin diversion, all of the following information must be submitted to the Department of Natural Resources:

- That each state or province to which the water will be diverted has developed and is implementing a plan to manage and conserve its own water quantity resources, and that further development of its water resources is impracticable or would have a substantial adverse economic, social or environmental impact;
- That granting the application will not impair the ability of the Great Lakes basin or upper Mississippi River basin to meet its own water needs;
- That the interbasin diversion alone, or in combination with other water losses, will not have a significant adverse impact on lake levels, water use, the environment or the ecosystem of the Great Lakes basin or upper Mississippi River basin; and
- That the proposed withdrawal is consistent with all applicable federal, regional and interstate water resources plans (W.S. §281.35(5)(d)(7)).

Appendix E

INTERBASIN TRANSFER STATUTES OF GEORGIA'S NEIGHBORING STATES

Four states bordering Georgia (Florida, North Carolina, South Carolina, and Tennessee) have adopted various measures to protect their waters against current and future water supply challenges. These measures include the enactment of interbasin transfer policies that set forth detailed criteria stating under what conditions water will be allowed to be diverted within the state. These measures also serve to protect against interbasin water transfers outside the state, as any such transfer would be subject to the same conditions as in-state interbasin transfers.

FLORIDA

To obtain a permit for an interdistrict transfer and use of ground water, an applicant must file an application with the water management district having jurisdiction over the area from which the applicant proposes to withdraw ground water, and submit a copy of the application to the water management district having jurisdiction over the area where the water is to be used (F.S. §373.3395(2)). “Interdistrict transfer and use means a consumptive water use which involves the withdrawal of ground water from a point within one water management district for use outside the boundaries of that district (F.S. §373.2295(1)). The governing board of the water management district where the ground water is proposed to be withdrawn must review the application (F.S. §373.2295(3)). In determining if an application is consistent with the public interest, the projected populations, as contained in the future land use elements of the comprehensive plans adopted by the local governments within which the withdrawal areas and the proposed use areas are located, will be considered together with other evidence presented on future needs of those areas. If the proposed interdistrict transfer of ground water meets the statutory requirements, and if the needs of the area where the use will occur and the specific area from which the ground water will be withdrawn can be satisfied, the permit for the interdistrict transfer and use will be issued (F.S. §373.2295(4)).

To obtain a consumptive use permit, the applicant must establish that the proposed use of water:

- Is a reasonable-beneficial use;
- Will not interfere with any presently existing legal use of water; and
- Is consistent with the public interest (F.S. §373.223(1)).

The governing board or the department may authorize the holder of a use permit to transport and use ground or surface water beyond overlying land, across county boundaries, or outside the watershed from which it is taken if the governing board or

department determines that such transport and use is consistent with the public interest (F.S. §373.223(2)). When evaluating whether a potential transport and use of ground or surface water across county boundaries is consistent with the public interest, the governing board or department must consider:

- The proximity of the proposed water source to the area of use or application;
- All impoundments, streams, ground water sources, or watercourses that are geographically closer to the area of use or application than the proposed source, and that are technically and economically feasible for the proposed transport and use;
- All economically and technically feasible alternatives to the proposed source, including, but not limited to, desalination, conservation, reuse of nonpotable reclaimed water and stormwater, and aquifer storage and recovery;
- The potential environmental impacts that may result from the transport and use of water from the proposed source, and the potential environmental impacts that may result from use of water courses that are geographically closer to the area of use and all economically and technically feasible alternatives to the proposed source;
- Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for existing legal uses and reasonably anticipated future needs of the water supply planning region in which the proposed water source is located;
- Consultations with local governments affected by the proposed transport and use; and
- The value of the existing capital investment in water-related infrastructure made by the applicant (F.S. §373.223(3)).

The governing board or the department may reserve from use by permit applicants, water in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety. Such reservations are subject to periodic review and revision in the light of changed conditions (F.S. §373.223(4)).

NORTH CAROLINA

North Carolina defines “transfer” to mean the withdrawal, diversion, or pumping of surface water from one river basin and the subsequent discharge of all or any part of the water in a river basin different from the origin. However, the following are not transfers under North Carolina law: (1) the discharge of water upstream from the point where it is withdrawn; and (2) the discharge of water downstream from the point where it is withdrawn (N.C.G.S. §143-215.22G(3) (2004)).

Any person who transfers 100,000 gallons per day or more of water from one river basin to another must register the transfer with the Environmental Management Commission (N.C.G.S. §143-215.22H(a)). No person, without first securing a certificate from the Commission, may:

- Initiate a transfer of two million gallons of water or more per day from one river basin to another;
- Increase the amount of an existing transfer of water from one river basin to another by twenty-five percent or more above the average daily amount transferred during the year ending July 1, 1993, if the total transfer including the increase is two million gallons or more per day; or
- Increase an existing transfer of water from one river basin to another above the amount approved by the Commission prior to July 1, 1993 (N.C.G.S. §143-215.221(a)).

When applying for a certificate, the petition must include:

- A description of the facilities to be used to transfer the water;
- A description of the proposed uses of the water to be transferred;
- The water conservation measures to be used by the applicant to assure efficient use of the water and avoidance of waste; and
- Any other information deemed necessary by the Commission for review of the proposed water transfer (N.C.G.S. §143-215.221(c)).

In determining whether a certificate may be issued for the transfer, the Commission must specifically consider each of the following items:

- The necessity, reasonableness, and beneficial effects of the amount of surface water proposed to be transferred and its proposed uses;
- The present and reasonably foreseeable future detrimental effects on the source river basin, including present and future effects on public, industrial, and agricultural water supply needs, wastewater assimilation, water quality, fish and wildlife habitat, hydroelectric power generation, navigation, and recreation;
- The cumulative effect on the source major river basin of any water transfer or consumptive water use that is authorized or is projected in any local water plan;
- The detrimental effects on the receiving river basin, including water quality, wastewater assimilation, fish and wildlife habitat, navigation, recreation, and flooding; and

- Reasonable alternatives to the proposed transfer, including their probable costs, and environmental impacts (N.C.G.S. §143-215.221(f)).

An environmental assessment must be prepared for any petition for a certificate under this section.

A certificate must be granted for a water transfer if the applicant establishes and the Commission concludes by a preponderance of the evidence based on the findings of fact that: (1) the benefits of the proposed transfer outweigh the detriments of the proposed transfer, and (2) the detriments have been or will be mitigated to a reasonable degree (N.C.G.S. §215.221(g)). The Commission may also grant a certificate with any conditions attached including mitigation measures proposed to minimize any detrimental effects of the proposed transfer and measures to protect the availability of water in the source river basin during a drought or other emergency. The certificate must indicate the maximum amount of water that may be transferred. No person may transfer an amount of water that exceeds the amount in the certificate (N.C.G.S. §143-215.221(h)).

In the case of water supply problems caused by drought, a pollution incident, temporary failure of a water plant, or any other temporary condition in which the public health requires a transfer of water, the Secretary of the Department of Environment and Natural Resources may grant approval for a temporary transfer (N.C.G.S. §143-215.221(j)).

SOUTH CAROLINA

No person is allowed to transfer either five percent of the seven-day, ten-year low flow, or one million gallons or more of water per day on any day, whichever is less, from one river basin and use or discharge all or any part of the water in a different river basin unless the person first obtains a permit from the Department of Health and Environmental Control (S.C.C.A. §49-21-20 (2004)).

The department may grant, deny, or issue with conditions as to quantity or qualities of water, a permit to any person for any interbasin transfer of water upon application for a permit. The applicant must specify the location of all collection, withdrawal, and transportation facilities and additional information as the department may require. The department must publish notice of the permit application once a week for four consecutive weeks in a newspaper of general circulation in each river basin area to be affected by the transfer. The department must provide notice to each holder of an interbasin water transfer permit within the proposed losing river basin (S.C.C.A. §49-21-30(A)(B)). “Losing river basin” means a river basin which sustains a decrease in water as the result of a diversion or transfer of water to a different river basin and there is no significant return of the water to the river basin-of-origin (S.C.C.A. §49-21-10(4)).

In making its determination whether transfer may be permitted, the department must:

- Protect present, and consider projected stream uses of the losing river basin generally and of the losing river specifically including, but not limited to, present agricultural, municipal, industrial and instream uses, and assimilative needs;
- Protect water quality of the losing river basin;
- Consider reasonably foreseeable future water needs of the losing river basin;
- Consider the reasonably foreseeable future water needs of the applicant for the water to be transferred, including methods of water use, conservation, and efficiency of use;
- Consider beneficial impact on the State and its local subdivisions of any proposed transfer, and the capability of the applicant to implement effectively its responsibilities under the requested permit;
- Consider the nature of the permittee's use of the water, to determine whether the use is reasonable and beneficial;
- Consider whether the proposed project must promote and increase the storage and conservation of water;
- Consider the feasibility of alternative sources of supply and their comparative costs;
- Consider impact on interstate water use;
- Consider requirements of other state or federal agencies with authority relating to water resources;
- Consider availability of water in the losing river basin to respond to emergencies, including drought;
- Consider whether the project will have any beneficial or detrimental impact on navigation, hydropower generation, fish and wildlife habitat, aesthetics, or recreation; and
- Consider such other facts and circumstances as are reasonably necessary to carry out the purposes of this chapter (S.C.C.A. §49-21-30(C)).

In addition to the requirements listed above, the department will not issue a transfer permit except upon certification by the department that the proposed interbasin transfer of water will neither:

- Violate the water classification standard system regulation or the stream classification regulation, nor

- Adversely affect the public health and welfare. Through its certification the department must insure the protection of the water quality and health of the losing river basin and will insure the protection of the present and permitted assimilative needs of the losing river basin (S.C.C.A. §49-21-30(D)).

In order to protect the water uses of the losing river basin, the department, in determining the amount of water to be approved, may conduct or have conducted instream sampling and stream modeling to predict the volumes of water which may be transferred.

Transferable amounts may vary to accommodate seasonal water conditions in the losing river basin. No transfer of water may be permitted at any time which will cause the remaining flow in the losing river basin to be less than the statistical low flow that occurs for seven consecutive days, once every ten years as established prior to the interbasin transfer (S.C.C.A. §49-21-30(E)).

The permit must specify the location of all collection, withdrawal, transmission, and discharge facilities to be used or constructed to effect the interbasin transfer and must specify the amount or amounts which can be withdrawn. The permit must require that the interbasin transfer will cease or decrease when the actual flow of the losing basin is less than a specified minimum required to protect against adverse effects to the basin. The permit must further require that the permittee comply with other requirements as may be advisable to promote an adequate water supply for the State and to mitigate any adverse conditions or effects which the department finds exist, but are not sufficient to require denial of the permit (S.C.C.A. §49-21-30(F)).

Any riparian landowner or person legally exercising rights to use water, suffering material injury for the loss of water rights as a consequence of an interbasin transfer will have a cause of action against the water transferor to recover all provable damages for loss of riparian rights including increases in operating costs, lost production, or other damages directly caused him by the interbasin transfer. The burden of proof is on the person alleging damages (S.C.C.A. §49-21-30(G)).

No permit may be issued for a longer period than the longest of the following, unless the applicant requests a shorter period:

- Twenty years; or
- A period found to be reasonable based upon review of all relevant facts and circumstances pertaining to the proposed water transfer but for a period no longer than forty years (S.C.C.A. §49-21-40(A)).

The department may modify, suspend, or revoke any water transfer permit, including authority to transfer water for good cause. Permits may be renewed following their expiration upon a full review of all factors considered issuing a permit for the first time. Finally, permits may not be transferred except with the approval of the department (S.C.C.A. §49-21-40(B)(C)(D)).

TENNESSEE

Under the Interbasin Transfer Act, all persons or entities which have been granted powers by the state to acquire water or which acquire or supply water for the use or benefit of public water supply systems, must, when proposing a new or increased withdrawal of surface water or ground water for the purpose of transferring and/or diverting some or all of it out of a river basin either directly or through one or more intermediaries, first apply for and obtain a permit from the Commissioner of Environment and Conservation. In the case of ground water withdrawal, this section only applies if the loss of the ground water has a significant potential to adversely affect the flow of Tennessee surface water (T.C.A. §69-8-204(a) (2003)).

The applicant must provide the commissioner with the following information:

- The volume of the proposed withdrawal and the proposed transfer stated in gallons per day that the applicant seeks to be authorized;
- Identification of all of the withdrawal, return, and transfer points;
- The volume of water that will be returned to the basin-of-origin or an downstream basin;
- The peak capacity of each major component in the proposed withdrawal and transfer facilities;
- Engineering and economic justification for the capacity of each major component of the proposed withdrawal and transfer facilities;
- An assessment of the hydraulic and environmental impacts of the withdrawal on the losing river;
- An engineering, environmental, and economic assessment of the feasibility of using alternate water sources by the water system in the receiving basin;
- A listing of conservation programs or practices occurring or proposed of the system in the receiving river basin;
- The proposed date upon which the water transfer is to commence;
- The purpose and justification for the proposed transfer; and
- Any other appropriate information deemed necessary by the commissioner for review of the proposed transfer (TDEC Rule 1200-4-13-.03(1)).

The following factors will be used by the commissioner in making a determination on a permit application:

- The quantity of the proposed withdrawal and the stream flow of the losing river (defined as a river or river basin which sustains a decrease in water as the result of a diversion or transfer of water to a different river basin and there is no significant return of the water to the river or river basin-of-origin (TDEC Rule 1200-4-13-.02)), with special concern for low flow conditions;
- Protection of the present uses, and consideration of projected stream uses of the losing river including but not limited to, present agricultural, municipal, industrial and in-stream uses, and assimilative needs, with special concern for low flow conditions;
- Protection of the water quality in the losing river at low flow conditions;
- The reasonably foreseeable future water needs of the losing river basin;
- The reasonably foreseeable future water needs of the applicant for the water to be transferred, including methods of water use, conservation, and efficiency of use;
- The beneficial impact of any proposed transfer, and the capability of the applicant to implement effectively its responsibilities under the requested permit;
- The nature of the applicant's use of the water, to determine whether the use is reasonable and beneficial;
- Whether the proposed project will promote conservation of water;
- The feasibility, the costs, and the environmental impacts of alternative sources of supply;
- The requirements of other state or federal agencies with authority relating to water resources;
- The availability of water in the losing river basin to respond to emergencies, including drought;
- Whether the project will have any beneficial or detrimental impact on navigation, hydropower or other power generation, fish and wildlife habitat, aesthetics, or recreation;
- The quantity, location, and timing of water returned to the basin-of-origin or a downstream basin;
- Climatic conditions;
- Any offsetting increases in flow in the basin-of-origin that may be arranged through permit conditions;

- The number of downstream river miles from which water will be diverted as a result of the transfer; and
- Such other factors as are reasonably necessary to carry out the purposes of the Act and this rule chapter.

The foregoing list is to be used by the Commissioner as a basis both to deny permits and to impose conditions in permits that are issued (TDEC Rule 1200-4-13-.05(2)).

No transfer of water may be permitted at any time that would impair the classified uses of a losing river. Furthermore, no transfer of water will cause the remaining flow in the losing river basin to be less than the seven day, ten year low flow as established prior to the interbasin transfer unless a condition on the permit states that the transfer of water will be required to cease when the instantaneous stream flow of the river of origin is equal to or less than a specified value (TDEC Rule 1200-4-13-.05(3)).

The commission must issue or deny any permit in accordance with the provisions of this part. Such permits must be issued for a renewal term of five years and contain necessary and appropriate conditions to accomplish the purposes of the same part. The commissioner may revoke, suspend, or modify any permit (T.C.A. §69-8-206(a)(b)(c)).

The commissioner may include conditions in the permit, including but not limited to the following:

- The amount of water approved for transfer may be varied seasonally;
- The transfer of water must be required to cease or decrease when the instantaneous stream flow of the river basin-of-origin is equal to or less than a specified value;
- Special provisions in order to promote an adequate water supply for the state or to mitigate any future adverse conditions resulting from the transfer;
- Installation, maintenance and use of stream flow monitoring equipment; and
- Establishment and reporting of transfer activities by the permittee.

Upon the issuance of a declaration of an emergency relating to water resources, the commission may:

- Waive the usual permitting requirements and issue a temporary emergency transfer permit; or
- Modify or revoke and reissue any interbasin transfer permit (TDEC Rule 1200-4-13-.06(2)(3)(4)).

The commissioner may issue a general permit for a category of transfer activities. Such permits require:

- That any person intending to make use of a general permit for authorization of any transfer must file a Notice of Intent; and
- That the department will issue a response either confirming that the general permit is applicable or stating why it is not and directing the person to file a individual permit application (TDEC Rule 1200-4-13-.07(1)).

The Water Quality Control Board has the following powers and duties:

- Defining necessary terms; and
- Setting criteria for permit issuance and denial as well as for permit conditions, taking into account all appropriate factors including, but not limited to, existing uses downstream of a proposed withdrawal, low flow conditions, classified uses of the stream under the Water Quality Control Act, climatic conditions, alternatives to the proposed withdrawal, the number of downstream river miles from which water will be diverted as a result of the transfer, quantity of a proposed withdrawal, and quantity and location of water returned (T.C.A. §69-8-207(1)(A)(B)).