Georgia's Statewide Management Plan: Meeting Instream and Offstream Demands

Submitted by the Georgia Water Coalition
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As Georgia's population grows, as demand increases, as two areas of the state have been under water withdrawal moratoria, our state's water resources are being stretched further and further towards their limits. Pressure is mounting for manmade solutions to water supply challenges through the construction of new reservoirs and the use of aquifer storage and recovery (ASR). Both options can bring high economic and ecological costs to our water supply sources and downstream communities. This paper will focus on why new reservoirs and ASR should be last resort solutions to Georgia's demand for new water supply sources. In addition, the paper will review instream flow principles critical to adopting a new instream flow policy for Georgia. The Georgia Water Coalition continues to emphasize that there is no one-size-fits-all policy or solution that represents the best option to meet instream and offstream needs in every river basin in Georgia. Because of this, the Coalition believes that sub-state and watershed planning is a crucial next step once broader statewide policies have been established.

Reservoirs

Introduction

Georgia has the highest density of dams in the southeast, yet Georgians still face the threat of an increasing number of dams, particularly in the north Georgia area, to meet the future projected water supply demand. The EPA's National Dam Inventory in 1998 showed 4,435 reservoirs in the state with dams six feet or higher. Other studies indicate the number could be as high as 65,000 including farm ponds and the many small impoundments on tributaries.[1] Dams destroy our free-flowing rivers and adjacent floodplains which are essential to navigation, recreation and flood control. Other parts of the country have begun removing dams, realizing that these technological solutions come at a high cost to the aquatic environment as well as to local government coffers. Reservoirs alter natural water flow, changing the timing, amount, and duration of flows, upon which native fish species and Georgia wildlife depend.[2]

Often overlooked are the social impacts on downstream communities. Reservoirs affect communties' ability to supply clean drinking water, to successfully grow while meeting municipal wastewater permit limits, to attract new industries, and for existing industries in those communities to meet wastewater discharge limits. In addition, the reduced flows from upstream reservoirs can negatively impact recreation, tourism, and commercial fishing—all of which translate into millions of dollars for Georgia's economy. While dams help make water available for some communities it often does so at the expense of the private property and quality of life of those downstream.

Although reservoirs store water, they do not create or conserve water. Instead, due to more surface water evaporation, they result in a net loss of water.[3] Reservoirs are an example of supply-driven water management that allows water users' consumption to force the State to rely on technological solutions for new sources of water, rather than managing our demand for water. Demand management is not only crucial because water supplies are fixed, but it is also the best way to extend our water supply.

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[1] See Cowie, G., Ed. "*Reservoirs in Georgia: Meeting Water Supply Needs While Minimizing Impacts*". UGA's River Basin Science and Policy Center, Athens, Georgia, 2002.
[2] Id.
[3] See Cowie, supra note 1.

Together water conservation, efficiency, and reuse will reduce excessive demand and allow us to look beyond engineered ways to increase the availability of a finite resource. In essence, conserving water is the best way to create new supplies of water.[4]

A responsible reservoir planning policy would require a rigorous review of dam-construction proposals and withdrawal permits, including an alternatives analysis and comprehensive environmental impact statement. Individual counties and municipalities should not be allowed to construct their own reservoirs without first showing that no existing water supply—such as conservation or a neighboring / nearby reservoir is available to satisfy current water demands. A thorough and well-documented needs analysis must be conducted based on verifiable future water demands. Dam construction just for the purpose of attracting additional growth and development should not be allowed. As a bottom line, additional dams in our free-flowing rivers should only be allowed as a last resort.

Legislation & Policy

Section 404 of the Clean Water Act establishes a program to regulate dredge and fill material into waters (including wetlands) of the United States. The program is jointly administered by the U.S. Army Corps of Engineers (the Corps) and the U.S. Environmental Protection Agency (EPA) and advised by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and state agencies. Section 404 of the Clean Water Act specifically requires the permitting of the least environmentally damaging practicable alternative for the types of permit issued under the Act for reservoir construction and wetland degradation. The applicant must show that steps will be taken, where practicable, to avoid wetland impacts and to minimize any unavoidable impacts to wetlands. Additionally the applicant must provide compensation for any unavoidable impacts through restoration or creation of wetlands. EPD must certify that the project permitted under Section 404 will comply with State water quality standards as mandated under Section 401 of the Clean Water Act.[5] In addition, EPD must provide letters of support to certify the need of a proposed reservoir.

The National Environmental Policy Act of 1969 (NEPA) specifically requires consideration of the direct, secondary, and cumulative impacts related to a permitting decision. In addition, NEPA requires that decision makers, as well as the public, have adequate information about environmental impacts of proposed actions and their alternatives, before making any decision which could have a major impact on the environment.

Current Status

Georgia's fast-growing population - which increased by 26% in the 1990's to 8,186,453 - makes responsible water planning crucial to satisfy the state's drinking water needs.[6] Per capita water consumption in Georgia is 10% higher than national average.[7] Municipal water consumption in Georgia is 528 million gallons per day and accounts for 19.2% of all water consumed in the state. Agricultural water consumption is 1,580 million gallons per day and accounts for 57.4% of water consumed in the state.[8] A regional water supply needs assessment of 44 North Georgia counties reveals that water

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[4] See the Georgia Water Coalition's paper entitled "*Georgia's Statewide Water Management Plan: The Need for Strategic Water Conservation and Reuse Mechanisms and Measures*", December 8, 2005.

[5] See Sutherland, E. "*The Proliferation of Reservoir Construction in Georgia: A Panel Discussion Exploring the Roles of Federal & State Agencies in the Permitting Process and an Examination of the Need for a Programmatic Environmental Impact Statement*". Paper presented at the Georgia Water Resources Conference, March 26-27, UGA Center for Continuing Education, Athens, Georgia, 2001.

[6] See US Census

[7] Georgia EPD

[8] Id.

demands from 2001 to 2003 were expected to increase by 100, 126, and 69 percent in the Coosa-Tallapoosa, Upper Chattahoochee, and Upper Ocmulgee-Upper Oconee Management areas, respectively.[9] The same study found that water savings by 2030, in these six management areas, can range anywhere from 3-11%, and that the implementation of water conservation programs can defer the need for additional water supplies.

Despite these findings, currently there are over a dozen new water-supply reservoir proposals in north Georgia alone. In an effort to take advantage of higher water quality, many of these new reservoir proposals are occurring in the most pristine remaining habitat.[10] Watershed locations of proposed reservoirs include the Coosa, Tallapoosa, Chattahoochee, Flint, Ocmulgee, and Oconee. This process is not the product of a comprehensive statewide assessment, but rather a disconnected process, driven by the self-interest of individual counties who have control. Effective and responsible water management requires the State to study and assess optimal locations for any new water-supply reservoirs (if any are needed). The State assessments would be based on examination of impacts to river basins and the needs of metropolitan regions, instead of individual counties, thereby giving counties the water they need while also protecting the river ecosystem.

Federal agencies responsible for permitting water supply reservoirs should discontinue the piecemeal permitting of such reservoirs in the continued absence of a comprehensive study outlining the water needs of the State of Georgia as well as the most sensible ways to meet those needs. Additionally, it is essential that the Corps study the potential cumulative impacts of reservoirs on a river basin scale. The Southern Environmental Law Center and the Turner Environmental Law Clinic jointly filed a citizen lawsuit against the Army Corps of Engineers challenging the permit for the planned Tussahaw Creek reservoir over precisely this issue. In response, the Corps reevaluated its Environmental Assessment (EA) of the project and agreed that it had not sufficiently addressed the cumulative impacts of the multiple reservoirs and other disturbances in the upper Ocmulgee River Basin and the entire Altamaha River basin.

The State should also exert its authority under section 401 of the Clean Water Act to condition approval or prohibit reservoirs that would degrade water quality. Frequently, water quality parameters, such as dissolved oxygen levels, are lowered downstream of a dam. Such degradations of water quality can have severe impacts to downstream wildlife and communities. Other states have used their section 401 authority to preserve their water quality, and Georgia must adopt a policy to do the same.

The Cumulative Environmental Impacts of Reservoirs

Large artificial impoundments have many far-reaching environmental impacts. Many of these impacts of existing and future water supply reservoirs are captured in the comprehensive study prepared by University of Georgia scientists.[11] The most obvious are the direct loss of riverine habitat, wetlands, and free-flowing streams. Unfortunately, many others occur, including fragmentation of river systems, upstream and downstream flow changes, and altered patterns of erosion and sedimentation. It is critical to our understanding of how reservoirs impact our environment to assess exactly what the cumulative impacts are and at what spatial (sub-basin, basin, physiographic, etc.) and temporal (seasonal, annual, etc.) scales, they occur. Included here are eight critical components to a cumulative impact assessment of reservoirs on a regional scale: water quantity, water quality, wetlands, free-flowing streams, aquatic biota, fisheries, and riparian plant and animal communities.

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[9] See CH2Mhill "North Georgia Regional Supply Needs Assessment" prepared for the Georgia DNR, 2003.
[10] Id.
[11] See Cowie, supra note 1.

Water Quantity

Although reservoirs provide water storage for times of need, we 'lose' a significant volume of water to the environment by evaporation. Reservoirs impact natural water flow cycles that support downstream flora and fauna. These losses inevitably result in an overall net decrease in downstream flow, further impacting water quantity and quality, and degrading downstream aquatic and riparian habitat. The impacts of reduced flow are magnified with the presence of multiple reservoirs in a particular basin. The state's historic standard for acceptable minimum flow is the "7Q10 standard," which mandates only a drought-like flow intended to protect water quality for purposes of pollutant assimilation.

Water Quality

Reservoirs dramatically impact natural flows, altering temperature, volume, levels, chemistry (dissolved oxygen, nutrients loads, metals, etc.) and seasonal variations. These characteristics cannot be replicated by "minimum in-stream flow" requirements alone. Dams trap sediment, often deepening river channels immediately downstream, while increasing sedimentation further downstream. Sedimentation reduces the natural ability of streams to assimilate nutrients and other waste material from point- and non-point sources. Reservoirs change riparian zones, which are important for filtering stormwater and providing wildlife habitat – particularly forested areas and wetlands. Residential and agricultural development is often encouraged around reservoirs and areas downstream from dams, which not only decreases the forest and wetland areas which filter pollution, but also increases the pollution load in the watershed. Further, reservoirs disrupt the natural annual cycles of flooding and sediment transport. Flow rates greatly affect sediment transport, which in turn, affects the level of nutrients available downstream to feed aquatic life and to replenish floodplain habitat.

Wetlands

Wetlands receive protection under federal law because of their many important functions, such as floodwater retention, critical species habitat, and water purification. Apart from the loss of natural streams, reservoirs destroy adjoining floodplains and wetlands. For example, the Tussahaw Reservoir independently resulted in the loss of 252 acres of valuable functioning wetlands. This figure actually increases to 730 acres if a cumulative assessment of all four reservoir projects in Henry County in the last ten years is considered. In fact, the Corps estimated the total wetlands loss from all impoundments in the Upper Ocmulgee to be about 14,000 acres. Under the current Section 404 program, 2,313 of the destroyed acres have been "mitigated," but this typically takes the form of preservation or restoration of existing wetlands at other locations and does not replace on-site functions and values.[12]

Free-Flowing Streams

Reservoirs fragment river systems, altering the natural hydrologic regime of streams. Fragmentation changes the timing, amounts, as well as the duration of water flows and the patterns of soil erosion, deposition, and sedimentation both upstream and downstream of the dam. Dams block migration up and down a river system and its associated floodplains, restricting movement of fish, and confining populations to ever-smaller areas of suitable stream habitat or areas where they are often exposed to intolerably high water temperatures. As a result of these changes, upstream and downstream aquatic

[12] Recognizing the inadequacies of mitigation, the Corps' primary mandate is avoidance of wetlands loss, instead of relying on mitigation. See 33 C.F.R. § 320.4(r); 40 C.F.R. § 230.10. For example, the Tussahaw Reservoir mitigation sites are existing intact and partially degraded wetlands, all but one of which is on a different stream or river. For this and other reasons, EPA objected to the adequacy of the proposed mitigation.

communities are increasingly vulnerable to natural events such as floods and drought. In addition, there is an increased likelihood of local extinction of species because fragmentation blocks the natural recolonization of stream segments following natural or human disturbances. Mitigation, at best, only partially offsets the extensive stream loss and fragmentation associated with reservoir construction.[13]

Aquatic Biota

Georgia ranks third in the nation (behind Tennessee and Alabama) for aquatic diversity, with at least 269 different kinds of freshwater fish native to the state.[14] Reservoirs drastically impair native aquatic habitat. For example, American shad no longer ascend the Savannah River past Augusta, and Gulf sturgeon are blocked from the Chattahoochee and Flint rivers due to the Woodruff Dam. Georgia lists 34 native fish and 16 mussel species as threatened or endangered due in part to changes in river ecosystems from impoundments.[15] Reservoirs also facilitate the introduction of non-native aquatic species and can impact the viability of native aquatic species. Adding more reservoirs to the existing reservoir density in Georgia will only impact the remaining miles of unimpaired connected habitat for federal and state listed species.

Fisheries

Coastal fisheries are already being affected by the potential for higher salinity in coastal estuaries. Decreased river flows have already moved the delta's "mixing zone" of brackish water several miles inland, degrading habitat for shrimp, crabs, and commercially valuable fish.

Riparian Plant and Animal Communities

Stream impoundments have many impacts on habitat both up and downstream of the dam. Riverine habitat within the large inundations upstream of the dam is converted to a relatively sterile lake environment, which has much less species diversity. This results in a shift in the biological communities within the impounded area to species that use lake-like habitats. Upstream areas that are not inundated are not affected as much, but there may be more sediment deposition in the portion of the stream near the impoundment due to slower flows. The areas downstream of the dams can be impacted due to lower quality water being released from the dam, increased erosion in the tailrace area, and a reduction in sediment transport downstream. This can result in interference with wildlife corridors and migration paths. All of these impacts affect habitat and may result in changes in the biological community.

Reservoir Summary

We believe that options with profound downstream impacts, such as the construction of new reservoirs, should be a last resort. We know that water-supply reservoirs, such as those currently proposed in north Georgia, alter natural systems and can threaten the natural quality and quantity of water flowing through river basins to the coast. We must continue to emphasize a more regional approach to reservoir planning, so that reservoirs are not built in a haphazard fashion. The General Assembly should oppose state funding for any new water supply reservoir projects until the comprehensive statewide water

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[13] For example, in the case of the Tussahaw Reservoir, the loss of 17.138 miles of streams is "mitigated" by the "restoration and preservation" of existing stream segments elsewhere. This in no sense replaces the loss of stream habitat, or compensates for fragmentation or changes in water and sediment flow patterns from the dam. In fact, over 90% of the stream mitigation for the Tussahaw Reservoir involves mere preservation, with only about 10% including enhancement of existing stream banks.

[14] See Cowie, supra note 1.

[15] Id.

management plan in place, or until the U.S. Army Corps of Engineers or the U.S. Environmental Protection Agency have completed a programmatic environmental impact statement to evaluate the cumulative impacts of reservoir construction in Georgia.

Instream Flow Policy for Georgia

How we use our rivers

In Georgia, we are blessed with abundant water resources and a myriad of native aquatic species. But increasing population growth and rising pressures to develop land are threatening our precious water resources. Rivers in Georgia are under growing pressure to provide many different services to Georgians, such as drinking water supply, navigation, wastewater treatment, agricultural irrigation, recreation, hydropower and industrial uses. In order to accommodate all of these competing uses and continue to maintain an ecosystem, which is not degraded to the point of collapse, we must adopt a balanced approach to insure that enough water remains in our rivers and streams.

When addressing the problem of strained water resources, people usually consider water quality first. Water quality is often addressed through the Clean Water Act and issues such as wastewater assimilation. Water quantity, on the other hand, is often overlooked. Water quantity is often defined in terms of instream flow, or simply the amount of water flowing in a river or stream at a given time. Instream flow is a key to the health and viability of rivers and streams throughout the state. Without enough clean water in an aquatic system, a river can no longer provide habitat for species or a reliable supply of water for human consumption. Instream flows are reduced by dams and municipal and industrial withdrawals.

The impacts of reduced flow

Reduced stream flows can result in many negative impacts, including loss of fish and wildlife, increased erosion and sedimentation, and increased concentration of pollution, as well as the loss of river recreation. Reduced flow also magnifies the problem of stormwater runoff – caused by poorly planned development and increased impervious surfaces – by reducing a river's capacity to dilute the pollution contained in the runoff. In addition, reduced flow can also diminish the availability of clean drinking water and destroys aquatic habitat.

How Is Flow Determined?

Flow is generally measured in cubic feet per second (cfs) to gauge the amount of water at a point in the river at a given time. However, while cfs is an easily measured figure, it does not always address the issue of ecosystem health. Scientists have determined that healthy rivers cannot be maintained by meeting a minimum cfs in a stream or river reach; rather, it is the natural ebb and flow of the river, in addition to water volume, that is required in order to maintain a diversity of species habitat. In other words, the flow regime needs variability. It must change from season to season, and there should be a mix of wet, dry and normal years. Proper ecosystem function does not rely solely on the aggregate amount of water in the river; the variation in flow, which supports different species at different times, is equally, if not more, important.

Since dams interrupt the flow of rivers and often release water based on hydropower generation peak hours rather than ecological requirements, adequate minimum flow standards are crucial just below dams. However, a single minimum flow value can lead to flatlining, which means removing flow variability from the river and reducing it to a constant low-flow condition. The removal of flow variability is one of the greatest problems affecting our endemic species in Georgia. By removing the variability in stream flow, aquatic habitat is destroyed and water quality is degraded. Mimicking the natural flows of rivers and streams (including seasonal and inter-annual variability) is key to preserving river health and clean water.

The History of Instream Flows in Georgia

Legal Framework

In Georgia, we have a "regulated riparian" legal system in which water use is governed by both common law and a permitting system. We enjoy water as a public resource for reasonable use by all Georgians. However, to keep systems functioning to provide clean water for everyone, our rivers and streams are regulated so that anyone withdrawing more than 100,000 gallons per day from any surface water must get a permit from Georgia's Environmental Protection Division (EPD).

These permits are supposed to be issued only if they do not have "unreasonable adverse effects" on the other water uses in the area, which includes public use and future uses as well as present uses. To prevent adverse effects, adequate low flow protection must include seasonally variable instream flows that are maintained at a point below any water intake location or below a dam, from the headwaters of a river system to the estuaries. These flow standards, discussed below, are included in water withdrawal permits issued by EPD.

Interim Instream Flow Policy Adopted in 2001

In 1995, DNR's Wildlife Resources Division published an important report entitled "A Recommended Method to Protect Instream Flows in Georgia". It concluded that the flow standard being used at the time by the EPD in its issuance of water permits was not adequate to protect aquatic species, which need seasonally variable volumes of water to live, grow, and reproduce. This report began a discussion of the need for an effective streamflow standard in the state.

In 2001, the Georgia Department of Natural Resources Board adopted an Interim Instream Flow Policy which serves as the statewide policy until a final one is adopted. The Interim Policy offers three options to permit applicants (e.g. municipalities, industries, etc.) to maintain adequate flow in streams.

- Monthly 7Q10 Minimum Flow Option: The monthly 7Q10 is the lowest seven-day running average of a stream's flow for each calendar month with a recurrence frequency of once in ten years. In the case of a water supply reservoir, the applicant must release the lesser of the monthly 7Q10 or the inflow to the reservoir. For an instream withdrawal, the applicant is at all times required to pass the lesser of the monthly 7Q10 or the inflow at the withdrawal point.

- Site-Specific Instream Flow Study Option: The applicant may perform a site-specific instream flow study to determine what minimum flow conditions must be maintained for protection of aquatic habitat. For this option, approval of the study design by DNR is needed, at which point the EPD Director recommends the minimum flow.

- Mean Annual Flow Options: 30% Mean Annual Average Flow: For direct water withdrawals, the applicant must allow the lesser of 30% of the mean annual flow of the stream or the inflow to pass the instream withdrawal point. 30/60/40% Mean Annual Flow: For reservoirs, the applicant is at all times required to release from the reservoir, the lesser of 30% of the mean annual flow or inflow during the months of July through November; 60% of the mean annual flow or inflow during the months of January through April; and 40% of the mean annual flow or inflow during the months of May, June, and December.

The future of flows in Georgia

Georgia must develop and approve a final instream flow policy, as part of the ongoing statewide water planning process. Such a policy must balance the needs of wildlife, recreation, communities, industry and agriculture. The Georgia Water Coalition will be actively involved in this issue as EPD moves towards the adoption of a final policy. Currently, most water permit applicants have chosen (and EPD has approved) the Monthly 7Q10 option, which is the low-cost, least protective choice. The monthly 7Q10 permits a constant monthly low flow average which creates a permanent drought condition. While the 30/60/40 method may be the best option for heavily regulated rivers, other rivers may have other variabilities that can only be assessed through regional or site-specific studies.

Ideally, all instream flows would be determined by very focused, scientific, sub-basin studies to evaluate aquatic habitat and water demands specific to each region. A satisfactory flow regime would include planning by region and on a basin level, as opposed to a statewide policy which embodies a one-size-fits-all mold creating mandatory minimum flows, which may lead to flatlining as stated above.

Preferably, instream flow models in Georgia will fundamentally shift from determining minimum flows to leave in streams to addressing how much water can safely be removed while sustaining the streams' ecosystems. To accomplish this, the state should implement a true adaptive management program which evaluates maximum withdrawals and accounts for variable flows. When we begin to look at flow as a volume of water that changes throughout seasons and years, and not as an instantaneous rate to be measured uniformly throughout the river, we will have made significant progress towards protecting our precious water resources.

The following principles are critical when determining a final instream flow policy for Georgia:

Flatlining

Flatlining streams is one of the greatest threats to species in our rivers and streams, creating poor habitat and water quality. Flatlining is essentially removing the flow and variability of a river, and reducing it to a low, constant drought flow. All flow policies should be designed to avoid flatlining.

Variability

Natural flow variability is one of the most important components of any healthy stream and instream flow policy. It is not only the amount of water in a stream, but also the variability of that quantity throughout the seasons, months and even days that supports species habitat. In addition, the presence of high and low flow pulses are important indicators of the health of an aquatic community. Creating a flow policy that preserves or restores natural variability is crucial.

Connectivity

Dams interrupt river flows and create reservoirs that drown productive streamside vegetation and wildlife habitat. Dams should only be created as a last resort, and releases from dams should mimic natural flows as much as possible.

Water Quality

Reduced flows in rivers concentrate pollution, including stormwater, one of the largest sources of pollution in the state. The flow region of any stream or river should therefore be based in part on the need to assimilate wastewater and stormwater pollution.

Regional, sub-basin planning

Ideally, all new instream flow standards should be determined by focused, scientific, sub-basin studies designed to evaluate aquatic habitat and water demands specific to each region. Flow requirements vary throughout the state and should not be treated uniformly.

Aquifer Storage and Recovery

Introduction

ASR is a technology that has been around in the United States since the 1960's, but one that has never been established in Georgia. There are approximately 100 ASR systems nationwide (at least 26 states), and examples in the southeast can be found in South Carolina and Florida. ASR is a process of storing water in the aquifer, when surface water is plentiful, by pumping surface water into a well. That same water is then pumped out, or recovered, when needed. ASR has been used as a method to store water, to restore aquifers that have gone dry, and to restore aquifers that have become undrinkable. Many organizations, legislators, and government agencies are against ASR for environmental and water rights issues. Ecological concerns regarding the ASR technology include long-term responses of aquifer systems, subsurface chemical and biological changes of the injected water, and geochemical effects of mixing waters of different chemistries. Water rights concerns come into play if a permittee were to attempt to sell the stored water. This scenario violates Georgia's legal tradition of water as a public resource regulated and fairly allocated by the State.

Current Legal and Regulatory Status of ASR

Legislation

Beginning in 1999, Georgia placed a moratorium on ASR that continues through today. This moratorium applies statewide and prohibits the state from taking any preliminary steps toward granting a permit.

Permitting

To engage in ASR in Georgia, an interested party would need three permits: 1) a water withdrawal permit from EPD to withdraw surface water; 2) an Underground Injection Control (UIC) permit for ASR, a federal program managed by EPD[16]; and 3) an ASR permit from EPD if the moratorium on ASR permits is lifted.

[16] There are approximately 200 active UIC permits in Georgia. Two UIC permits are in Chatham County, where Georgia Power injects 2.5 million gallons of cooling water a day into the aquifer. Personal communication with Georgia EPD UIC coordinator, Bijan Rahbar, February 28, 2006.

ASR in the Southeast

Georgia

In 1999, The Savannah Group (TSG), a private water company, requested permits from EPD to withdraw surface water from the Ogeechee, Altamaha, and Savannah Rivers. The chemically treated water was injected into the Floridan Aquifer as a way to store the water for future withdrawal and sale to residential and commercial customers. This proposal clearly violates the principle of water as a public resource that cannot be sold separate from the land and would have created a dangerous precedent—violating the Georgia constitution's provisions prohibiting gratuities and the delegation of public authorities to private citizens.

Florida

The Southwest Florida Water Management District has been using ASR since 1983. Florida State officials envision ASR as a way to provide water for their citizens during dry periods as well as a way to help restore the vanishing Everglades. In addition to providing water during severe droughts, advantages of ASR in south Florida are suggested to include limiting water loss due to evaporation and limiting the acreage of land removed from other productive uses. In contrast to the ASR program proposed for Georgia, the Florida ASR program uses higher quality water and adds this water to a lesser quality aquifer.

ASR is the main water storage component of the Comprehensive Everglades Restoration Plan (CERP).[17] CERP is a joint U.S. Army Corps of Engineers and the South Florida Water Management District initiative that was approved by Congress in December 2000 to restore, preserve, and protect the South Florida ecosystem. At an estimated one-fifth of the total project cost, the ASR project would use 333 wells in the Upper Floridan Aquifer to store up to 1.7 billion gallons per day (gpd) of surplus surface water during wet periods for recovery during dry periods.

Issues with ASR

Water quality

Under an ASR program, questions remain as to how injecting surface water into an aquifer will impact the quality of the stored surface water and the quality of water naturally found in the aquifer. The injection of lower quality surface water or 'recharge water' into higher quality ground water in an aquifer will compromise existing water quality in the aquifer. For example, studies have shown that recharge water is likely to have high concentrations of dissolved organic carbon compared with ground water.[18] In some areas in Florida, the oxygen-rich surface water injected into the Floridan Aquifer System have caused the release of trace metals such as arsenic (As), iron (Fe), manganese (Mn), uranium (U), and perhaps nickel (Ni) into the recharged (and eventually recovered) waters.[19] Given the potential for

[17] See Barlow, P.M. U.S. Geological Survey, Circular 1262 "*Ground Water in Freshwater-Saltwater Environments of the Atlantic Coast*" Box F. Aquifer Storage and Recovery in South Florida, 2003. http://water.usgs.gov/pubs/circ/2003/circ1262/#boxf.

[18] See National Academy of Sciences "*Aquifer Storage and Recovery in the Comprehensive Everglades Restoration Plan: A Critique of the Pilot Projects and Related Plans for ASR in the Lake Okeechobee and Western Hillsboro Areas*". 2001. See also Comprehensive Everglades Restoration Plan (CERP). Document: *Comprehensive Everglades Restoration Plan: Aquifer Storage and Recovery Program*. http://www.evergladesplan.org/docs/asr_whitepaper.pdf

[19] See FDEP. *ASR Hydrogeochemical Research*, 2005. http://www.dep.state.fl.us/geology/programs/hydrogeology/aquifer_storage.htm. Tallahassee, Florida

geochemical effects of mixing waters, recovered waters may contain levels of trace metals and may pose health concerns to water consumers. In addition, clogging of the porous aquifer structure may occur due to geochemical effects. Mercury bioaccumulation has been raised as a potential environmental problem because the recovered ASR water is likely to contain higher levels of sulfate and chloride than the pre-injected water.[20] Both chlorides and sulfates are known to play a role in the cycling of mercury in aquatic ecosystems.

Water movement

Ground water is always moving by the force of gravity from recharge areas to discharge areas. Ground water movement is generally very slow, typically only a few feet per year. However, the movement of water depends upon the permeability of the different aquifer layers. If the aquifer has fractures or channels in limestone, water may move as fast as several feet per day. We have yet to gain a full understanding of the movement and mixing of the freshwater "bubble". Generally, the quality of ground water in Georgia is good and is only compromised on very local levels. In Savannah, the declining water levels have elevated the chloride levels in some ground water wells due to salt water encroachment into the aquifer. In these areas with salt water intrusion, chemical changes may occur while the fresh surface water is stored underground in the aquifer. Given the variability of ground water movement and quality of surface water, studies should be done to understand how much of the original volume of surface water stored in aquifers can actually be recovered and whether the injected water impedes natural aquifer recharge. Few studies exist on how injected surface water may affect other subsurface water sources that may be interconnected with the primary aquifer on short and long-term scales. We also lack an understanding of the geographic range of impact for a proposed ASR application, including all existing and prospective water-using areas and all affected water sources, surface and subsurface.

Instream flows and interbasin transfers

An interbasin transfer can occur under an ASR program due to movement of injected water through the aquifer, which is then released (or extracted) in a different watershed. Such transfers can have significant impacts, by permanently removing an often substantial amount of water from one basin and adding it to another basin that may not be as well-equipped to accept such a large volume of water. The environmental impacts of these transfers on both originating and receiving basins must not be overlooked.[21] Among other impacts, interbasin transfers fundamentally and irreversibly alter natural water flows in our rivers and streams, affecting both Georgia and our neighboring states.

<u>ASR Summary</u>

Legislation should be passed to continue the moratorium on ASR. Water conservation is the answer to ensure viable water supplies in Georgia - not ASR. There are still significant policy and environmental questions regarding its application as well as serious concerns about its potential for degrading ground water quality and the dangers posed by accidental injection of harmful substances.

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[20] <u>See</u> Petkewich, M.D., K.J. Conlon, J.E. Mirecki, and B.G. Campbell, "*Aquifer Storage and Recovery in the Santee Limestone/Black Mingo Aquifer, Charleston, South Carolina, 1993-2001*". In George R. Aiken and Eve L. Kuniansky, editors, 2002, U.S. Geological Survey Artificial Recharge Workshop Proceedings, Sacramento, California, April 2-4, 2002: USGS Open-File Report 02-89.

[21] <u>See</u> the Georgia Water Coalition's paper entitled "*Georgia's Statewide Water Management Plan: Recommendations to Maximize Returns to the Basin of Origin*", December 9, 2005.

The Georgia Water Coalition advocates continuing the moratorium on aquifer storage and recovery (ASR) indefinitely. Aquifer storage and recovery is not a viable means of water supply in Georgia. Furthermore, ASR can lead to unfounded assertions of property rights in the injected water that may violate Georgia's riparian system of water regulation.

Enough clean water is an essential ingredient in what makes life special here in Georgia. The Floridan Aquifer — an underground water supply found in Florida, parts of Mississippi, Alabama, Georgia and South Carolina — is one of the most productive underground water systems in the world and the primary source of drinking water for coastal Georgia. The water quality is very high and requires little or no treatment before we use it. In Georgia we are fortunate to have access to this special resource. Without protecting these areas, pollutants from runoff and other contaminants can seep into the aquifer and damage ground water supplies. Careful management of our waters is essential to strong property values, clean water for drinking, recreation, and fish and wildlife. We need to hold state policy-makers accountable for making responsible decisions and resisting powerful insiders that would sacrifice our water resources for their private gain. Putting management strategies into place to protect the water quality in the Floridan Aquifer will benefit us all.

Meeting Instream and Offstream Needs: Summary

The Georgia Water Coalition supports strict regulation of reservoirs, a new approach to instream flow policies based on sub-region planning and sound principles that protect stream ecology, and a continued moratorium on aquifer storage and recovery. The Water Council must strive to implement substate and regional planning to find the most appropriate ways to meet instream and offstream demands in each of the state's 14 river basins. The only sure approach to meet water supply and demand needs is for the Council to adopt a range of conservation mechanisms (regulatory actions, education and technical programs, and financial incentives) and measures that reduce water consumption and demand statewide. Water conservation and the efficient use of existing water supplies must always be treated as the highest priority in planning to meet the needs of Georgia's citizens and ecosystems prior to increasing water supplies. Comprehensive water conservation planning has the potential to improve water quality and instream flow levels, decrease the need for new capital investments, reduce vulnerability to drought, and provide additional benefits to people and ecosystems.

Now is the time to shift the current water supply paradigm from trying to increase a finite supply to reducing our excessive demand. The Georgia DNR and the public must be committed to protecting the integrity of Georgia's aquatic resources for the long-term benefit of humans and other species. Only by strictly regulating reservoir development and cumulative impact analysis, by continuing the ASR moratorium, and by adopting new instream flow guidelines on a sub-region scale, can Georgia honestly say that it has made this commitment. Healthy, free-flowing rivers, streams, wetlands, aquifers, and estuaries are vital to all life and to the state's economic success.