

**Organization Building of the Southeastern Water Resources
Research and Environmental Policy Consortium**

Eugene T. Holmes

2004

**Publication
Department of Civil Engineering
University of Mississippi**

Publications under Grants

This publication was developed under Assistance Agreement No. X828421010 awarded by the U.S. Environmental Protection Agency. It has not been formally reviewed by EPA. The views expressed in this document are solely those of the Principal Investigator Eugene T. Holmes and EPA does not endorse any products or commercial services mentioned in this publication.

Disclaimer

The general approach in this report is to discuss several types of water issues currently facing the southeast, comparing and contrasting each one to issues in other states which are either similar or different. These discussions represent the principal investigator's impressions of what is really going on with each of these issues, including views which may not be shared by some of the participants on one side or the other of specific issues. There is also a list at the end of excellent published references to which the reader is directed for further information on issues of particular interest. Although the views expressed here have certainly been influenced by the principal investigator's discussions with academic, governmental, and industrial leaders in several states, the principal investigator alone is responsible for any perceived factual errors or arguable policy positions.

This final report was developed under a U.S. EPA Southeastern Regional Small Drinking Water Technical Assistance Center (SE-TAC) grant to Mississippi State University (MSU 259905-01/UM #300222132A). EPA made comments and suggestions on the document intended to improve the scientific analysis and technical accuracy of the document. These comments are included in the report. However, the views expressed in this document are those of the Principal Investigator of the grant and EPA does not endorse any products or commercial services mentioned in this publication.

Eugene T. Holmes, 2004

Introduction

The research underlying this White Paper arose from a meeting at The University of Mississippi in April 2002, which included the principal investigator, Dr. Jeff Ballweber, Acting Director, Mississippi Water Resources Research Institute (MWRRI) at Mississippi State University, Dr. Jerry Anderson, Groundwater Research Institute at the University of Memphis, Dr. Alex Cheng, Department of Civil Engineering at the University of Mississippi, and Jimmy Palmer, Regional Administrator, US Environmental Protection Agency (EPA) Region IV. Drs. Larry Murdoch, Graduate Hydrogeology Program, Clemson University and Lou Motz, Director, Florida Water Resources Research Center, University of Florida, participated by telephone conference call. Following that meeting and one at MWRRI's office in Starkville among the principal investigator, Dr. Ballweber, and Dr. Darrel Schmitz, Department of Geosciences, Mississippi State University, the MWRRI agreed to fund this project through a subgrant from an EPA funded Southeastern Regional Small Public Water Systems Technical Assistance Center, which the MWRRI administered.

The subgrant to The University of Mississippi was intended to be a seed grant to help establish a collaborative effort to organize a new southeastern water and environmental research consortium to assist EPA Region IV in handling some of the short lead time multidisciplinary water issues confronting this office. As a preparatory step, the principal investigator and others from the initial group were to meet with representative players from the southeastern regional state, local, federal, and corporate water community, and to encourage freer exchanges of concerns and potential solutions.

Originally a regional meeting was intended to gather interested state, federal, and local government officials to discuss water issues. However, it was later determined that state budget constraints would not allow many water program officials to travel to a regional gathering. Therefore, the grant was modified to allow preparation of this White Paper based on the principal investigator's research, and the extensive individual meetings and interviews with the various officials listed in the appendix.

Similarities and Differences among Several Key Water Issues in the Southeast

Saltwater Intrusion at Hilton Head, South Carolina

One issue which has been a matter of concern for decades is the question of whether the heavy groundwater withdrawals from the Upper Floridan Aquifer along the coast of Georgia and adjacent areas of South Carolina and Florida can be sustained. In particular, the principal investigator was working as an environmental engineer at the Union Camp (now International Paper) pulp and paper mill in Savannah GA in the early 1970s, when consumer and environmental activist Ralph Nader came to town to promote his new book, *The Water Lords*. That book suggested that large groundwater users such as the Savannah mill were harming the aquifer by lowering its water level and inducing saltwater intrusion into its nearby outcrop areas under the Atlantic Ocean.

Generally, the slow flow of an underground aquifer proceeds from higher elevations to lower elevations by the force of gravity, eventually (in the case of the Upper Floridan Aquifer anyway) discharging its unused water into the ocean just as a river might do. The equation is made more complicated though by the fact that the discharge occurs beneath the ocean's surface, and so must occur against a head of water pressure there. Additionally, since salt water is denser than fresh water, the outward gradient of the aquifer discharge must overcome this larger force. When there are significant withdrawals of water from the aquifer near its ocean outcrop, there is the potential to move the equilibrium point (where the gravity flow pressure of the aquifer just equals the head of saltwater from the ocean surface into which it is trying to flow) upstream in the aquifer. This is because the withdrawals from the aquifer have reduced the countervailing head. When the equilibrium point is shifted too far upstream in the aquifer, water wells which would have been screened in freshwater zones in predevelopment conditions are instead now in saltwater zones, so that their product may no longer be fit for drinking water or other freshwater purposes.

This is what has allegedly been occurring near Savannah, on Hilton Head Island SC, home to some of the "political class" as the term is used on the network television news shows. This concern has also been expressed in subsequent decades by the South Carolina Department of Health and Environmental Conservation and other South Carolina government officials. In fact, according to Jim Kundell at the University of Georgia, South Carolina actually threatened litigation against the State of Georgia if it did not take steps to address this problem. At the same time, there were

increasing concerns within Georgia itself that over-reliance on the aquifer could lead to eventual saltwater intrusion on Georgia's own barrier islands such as Tybee near Savannah and other islands near Brunswick.

In Brunswick there was an additional saltwater intrusion issue, arising from the upper migration into the Upper Floridan Aquifer of saline water from a lower aquifer through a crack or gap in the intervening impervious layer. This is occurring beneath the City of Brunswick itself, and is allegedly exacerbated by the heavy withdrawals from the Upper Floridan Aquifer near this crack by water users such as Georgia-Pacific's Brunswick pulp mill among others.

All this led to the Georgia General Assembly's decision to freeze new groundwater withdrawals from the Upper Floridan Aquifer in high risk areas, coupled with a multi-year and multi-million dollar study, the Coastal Georgia Sound Science Initiative, which is being financed by a combination of funds from the General Assembly itself but mostly from the large coastal groundwater users themselves, including IP's Savannah mill and GP's Brunswick mill among others. The Initiative is being carried out under a contract from the Georgia Environmental Protection Division with the United States Geological Survey Georgia District Office. The USGS in turn has subcontracted with a number of universities and other researchers to carry out specific portions of the work. Among these are new monitoring wells off the coast of Hilton Head, which are being handled by the USGS South Carolina District Office and South Carolina DHEC. According to GaEPD, these studies should provide a sound scientific basis for new, and probably tighter, groundwater withdrawal regulations in coastal Georgia. If not, there is always the background threat of litigation by South Carolina.

Why would a pulp mill in Savannah be permitted by Georgia (together with other large groundwater users) to withdraw so much water from the local aquifer that a sister state would actually threaten to take the matter to the federal courts? After all, the IP Savannah mill sits next to the Savannah River, into which its treated wastewater is discharged, and on which many of its raw materials arrive and its finished products depart for world markets. The answer is costs. Aquifer water is often much cleaner than river water, and therefore requires less treatment before being usable in a pulp mill (or for that matter a public drinking water system). IP could get its process water from the river, but it is simply cheaper to use aquifer water to the extent allowed. Since IP

and GP compete with other pulp mills in an international competitive market, anything which increases their cost of production at their coastal Georgia mills diminishes their corporate profits and potentially even the continued employment of hundreds or thousands of Georgians at those facilities. These are vital state concerns as well, and so the balancing decision is tricky.

Because of the federal Clean Water Act (CWA) and implementing regulations by the Environmental Protection Agency during the 1970s and 1980s, the amount of water used per ton of product at mills such as IP Savannah and GP Brunswick has been significantly reduced already. This is the case because EPA's technology-based effluent limitation guidelines, which were incorporated into the mills' NPDES (National Pollutant Discharge Elimination System) discharge permits, imposed discharge limitations expressed in terms of pounds of pollutants per pounds (or tons) of product, and not just concentrations in milligrams per liter or parts per million. From an engineering and economic standpoint, it then became advantageous to reduce the volume of water flowing through and out of the mills, because it is more cost effective to treat a smaller volume of more concentrated waste than to treat a larger volume of more dilute waste. As a consequence of the reduced water use for purposes of CWA compliance, then, the coastal mills (and other coastal groundwater users) also reduced the amount of water they were taking from the aquifer.

If, as a consequence of the findings of the Coastal Georgia Sound Science Initiative, GaEPD were to order IP and GP to further drastically reduce their mills' withdrawals from the aquifer, it might be met with litigation from the mills themselves if this is perceived as overkill. Historically in the eastern states of the United States, water rights including groundwater rights were viewed as part of the riparian or overlying landowners' private property rights, and a sudden order from the government to abstain from using such property rights might be viewed as a taking of private property for public use for which the Fifth Amendment to the US Constitution requires that just compensation be paid. The usual justification from the government's perspective is that it is not taking private property rights but is merely exercising its police power to regulate landowners' activities to protect the public interest in a clean environment and to balance the legitimate needs of other landowners and residents in the area.

But if GaEPD were to publish the results of the Coastal Georgia Sound Science Initiative and those results strongly indicate that additional reductions in aquifer withdrawals were needed, but

GaEPD were to shrink from ordering such reductions by established coastal employers, then Georgia would be open to litigation by South Carolina for the saltwater intrusion impact on Hilton Head and elsewhere in Beaufort County (which incidentally is South Carolina's fastest growing county and has increasing freshwater demands of its own).

While one would prefer for such a decision to be made based on the actual science, there will probably be political factors at play as well, particularly if the argument is couched in terms of jeopardizing working-class jobs in Georgia in order to placate upper-class residents and visitors at Hilton Head's famous resort communities (many of whom probably drink bottled water anyway).

Appalachicola-Chattahoochee-Flint River Water Wars

Another water issue in which Georgia is a central player is the ongoing litigation over the respective water rights of Georgia, Alabama, and Florida in the Chattahoochee and Flint Rivers, which combine near the Florida border to form the Appalachian River that empties into the Gulf of Mexico and supports a longstanding shellfish industry there. As with the much slower flowing aquifers emptying into oceans below the surface, there is also an equilibrium point where freshwater rivers flow into saltwater seas, which is also influenced by the tides. As more water is withdrawn from the tributaries of the Appalachian, less freshwater enters the Bay at its mouth where the oyster harvesters traditionally ply their trade. The resulting change in the salinity in the Bay jeopardizes this industry, at least in the view of the State of Florida. The big problem from the standpoints of both Florida and Alabama, of course, is the explosive growth of metropolitan Atlanta which is approaching a projected population of some 4 million. Unlike older cities which were sited on a navigable river, lake, or ocean bay, Atlanta was located at the intersection of two railroad tracks in the 1830s. The land beneath Atlanta is hard rock, as famously demonstrated in the Stone Mountain outcrop just east of downtown or the Peachtree Center MARTA Station which was drilled right through solid rock. This lack of sedimentary layers does not favor groundwater collection in aquifers. At the same time, Atlanta is located near the headwaters of the rivers which do supply its water needs, mainly the Chattahoochee and Flint as well as the Coosa which flows from northwest Georgia into Alabama and thence eventually to Mobile Bay and the Gulf.

Being located near headwaters and on top of hard rock means that fast-growing Atlanta has less bountiful freshwater public drinking water supplies than most other cities, and this at the same

time as its altitude-moderated climate and other locational advantages are causing its population to grow. Atlanta's growth has increasingly come (allegedly) at the expense of its downstream neighbors. The wastewater from Atlanta virtually overwhelms the fairly small rivers which receive it, and this is exacerbated by Atlanta's ongoing battles with EPA to segregate its stormwater system and adequately treat its sanitary sewage at all times including in heavy rains. Atlanta has for some time been under a federal court consent order to get this done, but it has only been in the last several months that the City Government found the political courage to raise sewer fees anywhere near the billion-dollar plus which will be required for this. Not only does Atlanta's wastewater cause downstream problems, a lot of the water which is taken from the Chattahoochee in metro Atlanta is consumed, evaporated, or otherwise does not return at all to that river system. This combination of lowered flow and lowered water quality has caused cities both in Georgia and in neighboring Alabama (for which the Chattahoochee itself forms much of the state border) to complain to state and federal authorities.

The Chattahoochee River water quantity issue was joined in the early 1990s, after Atlanta had requested a contract with the US Army Corps of Engineers to increase its withdrawals from Lake Lanier on the Chattahoochee upstream of Atlanta. The Corps had built Buford Dam and operates Lake Lanier for multiple purposes originally including primarily navigation, flood control, and hydroelectric power. In recent decades the lake has come to be metro Atlanta's primary water supply as well as recreation outlet.

Lake Lanier was named for Georgia's poet laureate, Sidney Lanier, who not only penned a famous poem celebrating the Chattahoochee itself ("Song of the Chattahoochee"), but also wrote another one about the ecologically valuable wetlands on Georgia's coast ("The Marshes of Glynn") long before the public and the government perceived those wetlands' true value.

Barnett Reservoir's Nonuse for Flood Control

At least the Corps is able to raise and lower the level of Georgia's Lake Lanier to fulfill its flood control and navigation mission, unlike for example the situation at the Barnett Reservoir on the Pearl River north of the growing Jackson, Mississippi, metropolitan area which was built in the 1960s by the State of Mississippi without the Corps' help, at a time when all things federal were being eschewed by the state's white majority due to its feeling that the federal government was

overstepping its constitutional powers with respect to race relations. The Barnett Reservoir serves primarily public drinking water supply and recreational interests, with the result that the Pearl River continues to flood Mississippi's capital city regularly whenever heavy rainfalls come. There are currently efforts underway to add smaller dams downstream of Barnett which are touted as at least partial solutions to Jackson's flooding problems, but this solution may be too little too late. Barnett should have been larger, and should have required navigational servitudes for shoreline buildings that allowed for changing water levels to support a flood control mission. Now that Barnett's shores have been and continue to be heavily developed with some of the priciest real estate in Mississippi, it will be difficult to get such concessions.

ACF Water Wars, Continued

But back to the Chattahoochee River litigation. When Atlanta asked the Corps for more water from Lake Lanier, Alabama filed suit against the Corps in the federal district court in Birmingham, seeking an injunction prohibiting the Corps from granting Atlanta's request. Among other theories, the suit alleged that the Corps had not followed applicable federal statutes including the National Environmental Policy Act. Eventually Florida joined the action based on its concerns for the amount of freshwater reaching Appalachicola Bay. Eventually the matter became known as the "water wars" and led to extended efforts for a negotiated solution led at one point by then-Speaker Newt Gingrich, who helped persuade the three states to enter into an interstate compact that basically committed them only to agree to discuss a solution without actually requiring it.

Despite everyone's best efforts, and several extensions of the negotiating deadlines, it now appears that the states have failed to reach a negotiated solution and are headed for further litigation by way of an original jurisdiction action in the US Supreme Court. Note that Alabama cleverly avoided the Supreme Court's exclusive original jurisdiction over disputes between states in its 1990 federal district court filing in Birmingham, by suing the Corps instead of suing Georgia. The Corps, of course, is caught in the middle of this battle, and as it likes to say, it only does the will of Congress anyway. Ironically, in an attempt to placate the political demands to keep the water availability in the Chattahoochee as high as possible after several years of unprecedented drought in the southeast, the Corps last year found itself having failed in its original flood control mission when heavy rains forced it to release waters from already-full reservoirs along the river, resulting in

flooding in Columbus GA and other cities along the Chattahoochee on both the Alabama and Georgia sides of the border. (This is the same problem as with the Barnett Reservoir in Mississippi: if you keep the reservoir full to maximize water supply and recreational benefits, there is nowhere to store seasonally higher rainfall to be released during drier periods; hence the reservoir does nothing to ameliorate flooding problems. This is in marked contrast to the Corps' own primarily flood-control reservoirs such as Sardis near the University of Mississippi campus, which is full in summer but can be nearly walked across on foot in the winter, at Hurricane Landing near its upper end, all the way to the original thread of the Tallahatchie River itself in the center.)

Also somewhat ironically, one of the contributing problems with the flow of the Flint and Chattahoochee Rivers near their junction in southwest Georgia is increasing groundwater withdrawals from the Upper Floridan Aquifer for agricultural irrigation. It turns out apparently that perhaps half of the water withdrawn from the aquifer in that area would have contributed to the base flow of the Flint had it been left underground. Instead, much of it is lost in evaporation or transpiration by the growing cotton, soybeans, peanuts, or whatever. So the "water wars" between big-bad Atlanta and neighboring states also implicate South Georgia farmers, who probably have the same mixed feelings about Atlanta as their cultural cousins in south Alabama or the Florida Panhandle.

According to the recently created Metropolitan North Georgia Water Planning District, which includes Atlanta and its extended suburbs or exurbs, the water needs for metro Atlanta will be fully utilizing all water sources available to it by the year 2030 if not sooner. Growth cannot continue without ample water supplies, and many businesses and careers in the Atlanta area are based directly on servicing such continued growth. No matter how bad the traffic jams get, no matter how many smog alert days occur, metro Atlantans will find a way to keep growing. It's in their nature. And some of Atlanta's biggest growth boosters are people who moved from their own relative backwater home towns to Atlanta in order to participate in that growth. But how to do it if the Chattahoochee isn't getting any bigger and the downstream states won't let the Corps increase Atlanta's withdrawals from Lake Lanier?

Stormwater Runoff Issues

To make matters worse, one side effect of such urban sprawl is the paving over of areas which once allowed rainfall to infiltrate the soil and flow more evenly into the streams, resulting instead in flash floods every time the clouds open up as stormwater runs off in sheets. To manage the stormwater runoff, EPA has started the National Pollutant Discharge Elimination System (NPDES) stormwater program since 1990, known as Stormwater Phase I. The Phase I rule covers medium and large municipal separate storm sewer systems (MS4s)—cities or jurisdictional entities serving populations over 100,000. In addition, operators of construction activities disturbing more than 5 acres and 11 categories of industrial activities were required to obtain permit coverage under Phase I. Since March 2003 the EPA Stormwater Phase II becomes effective. Phase II extends NPDES stormwater permit requirements to small MS4s and construction activities disturbing more than 1 acre. A municipality's individual permit application or notice of intent for coverage under a general permit must include descriptions of the BMPs—as well as their respective measurable goals—that will be used to meet the following six minimum measures:

1. public education and outreach,
2. public participation and involvement,
3. elicit discharge detection and elimination,
4. construction-site runoff control,
5. postconstruction runoff controls, and
6. pollution prevention and good housekeeping.

These new rules affect many communities in the southeastern states. But Atlanta with its sprawling population may be its most spectacular example in the southeast.

For another example, in driving back and forth between Oxford MS and Clarksdale MS, one goes through Batesville MS near the Tallahatchie River and then Marks MS on the Coldwater River. The Tallahatchie and the Coldwater together form the Yazoo River, which in turn flows into to the mighty Mississippi River at Vicksburg. The Corps has a flood control dam on the Coldwater (Arkabutla) just as it does on the Tallahatchie (Sardis), but the Coldwater seems to jump its banks at Marks far more often than does the Tallahatchie near Batesville. Why?

The answer becomes apparent if one travels north to the headwaters of the two rivers. While the Tallahatchie still rises in relatively undeveloped land northeast of Oxford, the Coldwater begins

in the southeastern suburbs of the interstate Memphis metropolitan area including DeSoto County MS, which is Mississippi's fastest growing county and one of the nation's fastest growing counties. One need only watch the runoff from shopping center parking lots on a rainy day to realize that the Corps' old flood control dam at Arkabutla was not sized to handle the sudden surges which now regularly occur, with the result that downstream towns like Marks see flooding perhaps as often now as they did before that project was ever built. This flash runoff from rainstorms not only causes downstream flooding, but also overwhelms wastewater treatment plants which happen to capture some of it (as in older combined-sewer systems such as the one which Atlanta must now spend \$1 billion or more to separate). The result is the need to spend more or bigger wastewater treatment plants as well. Another side effect of urban sprawl is that aquifer recharge areas may be paved over as well, reducing the water input to aquifers at the same time that growing cities are increasing their withdrawals from those aquifers.

Atlanta's Water Supply Solution: The Tennessee River?

But back to how metro Atlanta is going to find the water its expected incremental millions of new residents will need for the decades after 2030 or maybe 2020? Although a bill was introduced in the Georgia General Assembly to study such expensive and exotic solutions as a desalinization plant on the Georgia coast and a pipeline to Atlanta, the obvious geographical solution to Atlanta's water needs is the Tennessee River. When the Atlanta Regional Commission approached Chattanooga's private water supplier, the Tennessee-American Water Company, about purchasing water through it from the Nickajack Reservoir on the Tennessee River, a controversy erupted. Tennessee's General Assembly unanimously passed the Inter-Basin Water Transfer Act of 2000 for the widely acknowledged purpose of foiling Atlanta's efforts to get water from the Tennessee River. The legislature relied on information from what became the University of Tennessee's 2000 Final Report on Water Supply Challenges Facing Tennessee, by Dr. David Feldman and Dr. Julia Elmendorf. That study found that a direct attempt to block exports of water from the state would probably violate the commerce clause per *Sporhase v. Nebraska*, 458 U.S. 941 (1982). Hence, new rules requiring permits for inter-basin water transfers which were facially also applicable within the state might make it easier for Tennessee to deny Atlanta's proposed diversion from the Tennessee River basin into the Chattahoochee River basin. The Feldman study also asserted that use of

Tennessee River water in Georgia would be unreasonable per se under existing riparian rights doctrine, since Georgia (according to Feldman) was not a riparian state to the Tennessee River. Interestingly in that regard, TVA confirms that TVA's "marginal strip" lands around Nickajack Reservoir, which are owned in fee with the right to flood, extend all the way to the Georgia border for about 1000 feet in the extreme northwest corner of Georgia. TVA's standard definition of such marginal strip lands includes the provision that the owner of the adjacent upland (which would be in Georgia) has the right, with TVA's design approval, to construct facilities on the marginal land to be able to make use of the water. Under this factual scenario and legal definition, it might be argued that the State of Georgia is indeed a riparian to the Nickajack Reservoir.

So how much water does Tennessee fear that metro Atlanta would divert from Nickajack? Reported figures suggest that the diversion to Atlanta would be on the order of 100 MGD, which amounts to about 1.2 % of the 8.4 BGD minimum daily release at Nickajack, or about 0.3% of the Tennessee River's average 33 BGD daily flow. And how much impact would such a diversion have on downstream riparians in Tennessee? As it turns out, about ten miles downstream from Nickajack Dam, the Tennessee River enters Alabama and does not reenter Tennessee until it has flowed all the way across northern Alabama and a portion of the northeast corner of Mississippi as well. Along this stretch of the Tennessee River, the largest water users by far are TVA's own nuclear and coal-fired power plants, which evaporate large quantities of river water to provide cooling for condensing steam exiting power generation turbines. Indeed, TVA confirms that its own thermal power plants' cooling water needs are the largest constraint on multiple uses of the river, and TVA must not be very concerned about the limitations because it is currently spending over a billion dollars to restart all the units at its Browns Ferry Nuclear Plant in Alabama. In addition, just before the Tennessee River reenters Tennessee, there is a diversion from it into the Tennessee-Tombigbee Waterway which eventually flows into the Gulf of Mexico at Mobile.

Diversions into Tenn-Tom Waterway

The Tenn-Tom was developed pursuant to an interstate compact including Tennessee, with Congressional approval and funding for its construction and operation by the US Army Corps of Engineers. Although its design diversion rate is 800 MGD, it currently uses only about 200 MGD and is projected by TVA itself to require no more than 400 MGD even by 2030. One reason for this

difference is that there were widespread expectations, while the Tenn-Tom was being planned and funded during the Energy Crisis of the late 1970s, that there would be large export shipments of coal by barge from Appalachian coalfields which could be more competitive on world markets by using the shortcut route to Mobile instead of going back up the Tennessee to the Ohio and then down the Mississippi to New Orleans. The amount of water diverted into the Tenn-Tom is directly related to the number of boats going through its locks each day, since a fixed amount of water is required for every lock opening and closing. As with so many other expectations from the Energy Crisis era, this one has never materialized, with the result that the Tenn-Tom has substantial design and authorized capacity beyond what it currently uses or is likely to use in the next several decades. Nonetheless, TVA confirms that it operates the Tennessee River on the basis of an assumption that the Tenn-Tom might need its full 800 MGD design flow at any time. So the difference between TVA's operating assumption for the Tennessee River before it reenters Tennessee at Pickwick, and the actual water diversions realistically expected to go into the Tenn-Tom Waterway anytime in the next 25 years, is alone several times the amount that Atlanta reportedly would like to divert from the river at Nickajack.

Given all these significant intervening factors on the Tennessee River between where it leaves Tennessee just below Nickajack Dam and where it reenters Tennessee at Pickwick, it is difficult to see how a diversion of just 0.3% of its average flow from Nickajack Reservoir would have any measurable impact at all on downstream riparians in Tennessee itself.

Tennessee's Inconsistent Attitudes Toward the Tennessee River and Memphis Aquifer

The same 2000 report by Drs. Feldman and Elmendorf also discusses the situation that Tennessee faces with respect to the Memphis Sand Aquifer which underlies portions of western Tennessee as well as northwest Mississippi. In particular, the study discusses Memphis Light Gas & Water's potential liability to overlying landowners in Mississippi for pumping aquifer water from below DeSoto County MS for up to one third of MLGW's total withdrawals, with the effect of lowering the aquifer level and pressure under DeSoto County. A subsequent 2002 report to the Tennessee General Assembly by the Tennessee Comptroller's Office of Research concluded that MLGW would probably need to reduce its reliance on the aquifer as part of any solution.

Interestingly, while Tennessee's Inter-Basin Water Transfer Act of 2000 included a provision

requiring permits from TDEC for new or increased groundwater withdrawals which could affect the flow of surface streams in Tennessee (apparently an effort to close any indirect attempt by Atlanta to get Tennessee River water by shallow wells in its adjacent alluvial aquifer), there was no general rule requiring permits from TDEC for all new or existing groundwater withdrawals in Tennessee. Similarly, in Tennessee's recent legislation aimed at the spate of proposed new merchant power plants in 1998-2001, there was a provision requiring a TDEC permit for such plants' proposed withdrawals of surface water or groundwater from a source which is already being used for public water supply. In both cases, it would presumably have been simpler to draft a generally applicable groundwater withdrawal permitting requirement for all wells over a certain minimum size throughout the state, as Mississippi (for example) did in its 1985 Water Resources Act. The fact that Tennessee's legislature chose not to do so despite having the benefit of Dr. Feldman's (and others') input on the potential Memphis Sand Aquifer situation, can be interpreted as confirming that the State of Tennessee did not wish to involve itself in MLGW's withdrawals. Indeed, MLGW withdraws more groundwater than all the other municipalities in Tennessee combined, and the State of Tennessee's attitude toward regulating groundwater withdrawals was described by one participant at a January 2003 meeting of the Mississippi-Arkansas-Tennessee Regional Aquifer Study (MATRAS) as "bordering on apathy." Tennessee has acknowledged that its initial funding for MATRAS was justified as a means of delaying a "water war" with Mississippi over MLGW's withdrawal. However, Tennessee has not subsequently fully funded MATRAS.

It is instructive to compare Tennessee's unanimously passed legislative reaction to block Atlanta's attempt to divert a tiny percentage of the Tennessee River's flow as it enters Alabama, with its repeated legislative choice not to regulate MLGW's withdrawals from the Memphis Sand Aquifer despite advice from the University of Tennessee and the Tennessee Comptroller that MLGW may be violating Mississippi's water rights and will probably need to reduce its reliance on the aquifer as part of any solution of that problem.

Rice Farming in Arkansas

Stuttgart, Arkansas is known as the duck hunting capital of the world. The Grand Prairie region, situated in eastern Arkansas between the Arkansas River and the White River, is also home to much of the nation's rice production as well as catfish farms and other water-intensive agricultural

activities. Much of this agriculture has been irrigated by water withdrawn from the Mississippi River Valley Alluvial Aquifer, whose water levels have fallen so far that some farmers have turned to the deeper Sparta Aquifer for irrigation water. This in turn threatens a primary drinking water source for the cities in the region. Like Tennessee, the State of Arkansas is participating in the MATRAS program, but has steadfastly refused to enact direct legislative limits on the amount of groundwater that farmers may withdraw for irrigation. Thus the Grand Prairie region is playing out a classic example of what Garrett Hardin called “The Tragedy of the Commons.” As Hardin explained, a resource which is freely open to a number of potential users encourages each user to take as much of it as he can, since others will presumably use his “share” anyway even if he chooses to forgo it. Several years ago, the US Army Corps of Engineers partnered with other organizations to develop a plan to try to save the alluvial and Sparta aquifers in the Grand Prairie region, by diverting some of the flow from the nearby White River to meet the farmers’ irrigation needs. Unfortunately, environmental and other opponents have now sued to block this project, with the possible result that the area’s aquifers will continue to be threatened by overpumping for irrigation. One of the ironies of the Grand Prairie situation is that much of the water-intensive rice production would probably not occur without the federal government’s pervasive crop price support system. There is nothing wrong with exports, of course, but should they be encouraged by policies which threaten to ruin the long-term groundwater resources of a productive farming region whose natural climate and hydrological balance might be better suited to drier crops than rice?

Complying with EPA TMDL Regulations

Another issue of concern throughout the southeast is the implementation of EPA’s consent decrees with environmental groups to require TMDLs (total maximum daily loads) on rivers and streams which are not consistently meeting state water quality standards despite the previous adoption of best conventional treatment and best available treatment by all of the point sources on those streams. The problem is with nonpoint source pollution, mainly stormwater runoff in urban areas and agricultural runoff in rural areas. While most industrial and municipal point sources of water pollutants have long since met the Clean Water Act’s requirements for best available technology and best conventional technology (*i.e.*, secondary treatment), the Clean Water Act has proven more difficult to apply in the case of nonpoint sources. Such nonpoint sources in many

places use up the streams' assimilative capacity for diluting or biodegrading their pollutant loads to the extent that the point sources themselves may need to make even greater investments for more complete treatment of their waste loads beyond what would normally be required under the Clean Water Act. One of the alternatives available to state water quality planners is low flow augmentation, which would not be considered acceptable in lieu of Clean Water Act requirements for secondary treatment of point source loads, but which may be used as a supplement to achieve water quality standards for streams impaired by nonpoint source loads such as urban stormwater runoff or rural agricultural runoff.

An interesting example of the use of such low flow augmentation is on the Sunflower River in Mississippi, which flows from just above Clarksdale down to its confluence with the Yazoo River just above Vicksburg. According to MDEQ, municipal sources along the Sunflower such as the City of Indianola may need to enlarge their existing wastewater treatment plants, which currently meet EPA best conventional treatment requirements for secondary treatment, just to achieve water quality standards in the Sunflower during low flow periods. The Yazoo Mississippi Delta Joint Water Management District is currently working with the US Army Corps of Engineers in Vicksburg and the Tunica County Soil Conservation District, to study a range of problems and solutions in the Coldwater River basin, which they also define to include the Sunflower River for purposes of the study. Funding for this study comes mostly from the concentration of new casinos on the Mississippi River in Tunica County. One of the proposals being studied by this group is the completion of new wells in the Mississippi River Valley Alluvial Aquifer at the Mississippi River Levee just south of Moon Lake in Coahoma County, to provide water for augmenting the flow of the Sunflower River during low-flow periods. At an environmental impact statement scoping hearing in Tunica in September 2003, the Executive Director of the YMDJWMD explained that the location of these wells was chosen because of the high transmissivity of the alluvial aquifer near the Mississippi River, so that in effect water would be pumped from the Mississippi River under the Levee and into the headwaters of the Sunflower River when needed to maintain minimum flows to meet water quality standards for EPA's TMDL purposes. The irony of this solution is that the Sunflower River's minimum flow rate has been falling for years due to its lack of base flow recharge from that same alluvial aquifer, as farmers have withdrawn ever increasing quantities of alluvial aquifer water for irrigation purposes. As a matter of fact, the YMDJWMD has for the past decade been requesting

Clarksdale Public Utilities to run its existing alluvial aquifer wells at its Wilkins power plant, even when the power plant itself is not running and does not need any cooling water, just so the discharge from the wells can augment the flow of the Sunflower River south of Clarksdale. Since CPU has always been happy to comply with these requests, one question which arises is why this solution cannot just be continued instead of constructing new wells so near the base of the Levee itself. Presumably the involvement of the Corps of Engineers in this project will ensure that nothing is done in the name of the Sunflower River's water quality which might jeopardize the Levee's function of protecting the Delta from Mississippi River floods.

Policy Conflicts of Siting Casinos in Coastal Wetlands or on the Wrong Side of the Levee

And one cannot leave the subject of the Levee along the Mississippi River without commenting on the policy inconsistencies by which the State of Mississippi's legalization of casino gambling has required that these high-value real estate developments be sited on the unprotected side of the Levee or in ecologically sensitive coastal wetlands and beach areas. When Mississippi legalized casino gambling in 1990, the Legislature felt that it was necessary to limit it to the Gulf Coast and the Mississippi River in order to overcome the longstanding opposition of the state's considerable religious communities. It was felt that these areas were traditionally somewhat more open than other parts of the state, and the image could also be conjured up of riverboat gambling out on the Mississippi and beyond any state's jurisdiction. In fact, what has happened is that most of the casino "boats" which are "docked" along the Mississippi are specially built barges floating in specially dug ponds surrounded by dikes and connected to the river itself only by a pipe. Adjacent to the floating gaming areas are many millions of dollars of new upscale commercial, hotel, entertainment, and even residential developments, which sit on dry land but are unnecessarily exposed to the ravages of the Mississippi River's famous floods because they are on the "wrong" side of the Levee. One can only marvel at the conflicting policy objectives which led to such risk taking behavior. (But isn't that what gambling is anyway?)

As a sidelight of the casino siting issue, it turns out that some (but not all) of the casinos in Tunica County MS went ahead with their construction in the 1990s without waiting to receive the required dredge and fill permits from the US Army Corps of Engineers under Section 404 of the Clean Water Act. The matter was eventually resolved by USEPA Region 4 as a violation of that

statute, by use of consent orders including fines for the offending casinos. These fines were small compared to the casinos' daily gaming takes once they started operating, so the business decisions to go ahead with construction without waiting several months for the required permits can be readily understood.

Watershed and Sourcewater Protection Efforts

One of the big improvements in assuring water quality and supply in recent years has been the emergence of collaborative watershed and sourcewater protection efforts throughout the region. USEPA has encouraged such activities under amendments to the Safe Drinking Water Act among other statutory policies and missions. The Southeast Watershed Forum has emerged as a leader in this activity and has served as a model for forums in other regions and even nationally. Traditionally there has been a division of authority and responsibility among federal, state, and local government agencies with respect to water. Thus, the Corps of Engineers has done marvels in flood control and navigation and more recently in protection of wetlands, but its statutory mission does not place as high a priority on planning for water supply or water quality. USEPA has done great things in the field of protecting water quality and ensuring drinking water safety, but its mission was deliberately restricted by Congress in the area of water quantity allocations. And the US Geological Survey does great scientific work with its myriad ongoing studies of surface and ground water resources, but its mission is limited to objective and neutral scientific analyses and does not allow it to make policy or take sides in water disputes. At the state level, while all states have certain water quality programs in place pursuant to the Clean Water Act's carrot-and-stick approach for delegating permitting authority and channeling federal funding for water quality protection facilities and programs, there are sharp differences among state programs in other areas which are not directly mandated by federal statutes. Thus, some states such as Florida, Georgia, and Mississippi have statewide permitting requirements for withdrawing water from either surface or ground water sources, but other southeastern states do not. And given the tendency of water to flow across state borders (or in many cases serve as the state border itself), it is inevitable that there will be differences between neighboring states as to how best to use or protect a particular water source.

With this background, the emergence of multilateral stakeholder-driven watershed and sourcewater protection activities is definitely a step in the right direction. It deals with the

interrelated causes of water problems, such as deforestation and development along headwaters, nonpoint source runoff from rural agriculture and urban stormwater, and the like. Many people are surprised to learn that one of the stated purposes for the federal government's national forests program more than 100 years ago was to ensure water quality and quantity by preventing erosion and sudden runoff that cause streams to flood or choke with sediment. The concept of using trees to protect watersheds is not a new one, but it was not applied as systematically in the past as it has been in more recent years. Similarly, a better grip on stormwater runoff from paved urban areas simplifies both the operation of that city's own wastewater treatment plant but also the downstream needs for flood control and minimum streamflow for water quality assurance despite nonpoint source agricultural runoff etc. As another example, it is usually cheaper to remove toxic pollutants from wastewater before discharging it into a stream, than it is to remove them from that same stream when it becomes the next town's water supply source. But without adequate alignment of the resulting economic and environmental costs and rewards, one city's minimum required discharge treatment becomes the next city's added water supply treatment cost. Here is where stakeholders covering entire watersheds can help bring to the attention of their state environmental agencies as well as EPA innovative win-win solutions which minimize the overall economic and environmental costs for everyone in the watershed.

A recurrent theme of regional and national watershed forum roundtables in recent years in Atlanta, St. Petersburg, Arlington, and Biloxi, has been the need for better coordination of actions among the local, state and federal agencies involved in water planning and protection activities. Another recurring theme has been the need for more reliable funding for watershed activities, so many of which rely on volunteer and public involvement without the hammer of regulatory jurisdiction to enforce their preferences on uncooperative entities. To some extent, the availability of citizen suits for violations of the Clean Water Act has given environmentalists and citizen groups (also known as NGOs or non-governmental organizations) a better seat at the table as water allocation and protection decisions are made.

Conclusion

As population growth and urban sprawl continue throughout the southeastern states, there will be increasing conflicts over water use and protection among competing interests in different

states as well as between different users within particular states. This paper has presented a selective survey of some of the water issues facing the southeast at this time, including water quantity, water quality, flood control, navigation, aquifer use, wetlands protection, siting issues, and watershed protection.

Recommendations

The following recommendations are made to EPA Region IV as the most effective and economical way to address the challenging water supply and pollution issues facing the US southeast today:

1. To convene EPA Region 4 Water Supply and Source Water Protection Workshops to identify and develop viable alternatives to address priority regional water supply and source water protection issues.
2. To organize a multi-state, multi-university “Southeast Water Resources Technology and Environmental Policy Consortium” to assist EPA Region 4 to identify water resources and environmental issues and to coordinate university researchers and research institutes to conduct research that consolidates and supports EPA’s regulatory and remediation needs.
3. For each interstate water issue identified in the Workshop, the relevant and active state and/or federal agencies (i.e., state Source Water Protection primacy agencies; USDA’s state Rural Development offices) will be invited to a Strategic Planning Meeting. The meeting’s goal will be to reach a consensus and publish a White Paper/Action Agenda on priority interstate issues and areas (i.e., interstate aquifers), with immediate or near-term water supply and/or source water protection issues (i.e., depleted aquifers, competing drinking water/industrial water use, salt water intrusion, etc.) in Region IV.
4. Based on the Action Agenda, the university researchers participating in the Water Consortium will develop projects that involve Region IV and state/federal agencies in priority areas to better quantify and qualify the issue through data collection, and modeling. The goal is to use a cooperative federal/state approach to prioritize issues and areas in Region IV and then identify opportunities to address/resolve those issues before they reach a crisis point.

References

- Brahana, J.V., and R.E. Broshears, 2001, *Hydrogeology and Groundwater Flow in the Memphis and Fort Pillow Aquifers in the Memphis Area, Tennessee*, USGS WRI Report No. 89-4131.
- Charlier, Tom. 2003. “Tide of Growth Further Fouls/ Coldwater Basin.” *Memphis Commercial Appeal*, June 23.
- Childs, Nathan, and Amy Burdett. 2000. “The U.S. Rice Export Market,” USDA Economic Research Service, *Rice Situation and Outlook/RCS-2000/* November p. 48.
- Crosby, Dana, 1996. *Water, Water Everywhere, but Not Enough to Drink? A Look at Water Supply and Florida’s Growth Management Plan*, 12 LAND USE & ENVT. L. 153 (Fall 1996).
- Dellapenna, Joseph, 2002, *The Law of Water Allocation in the Southeastern States at the Opening of the Twenty-First Century*, 25 U. ARK. LITTLE ROCK L.REV. 9-88.
- Feldman, David, and Elizabeth Albertson, 2003, *Final Report: Research Needs for Protecting Tennessee’s Water Supply*, University of Tennessee.
- Feldman, David, and Julia Elmendorf, 2000, *Final Report: Water Supply Challenges Facing Tennessee*, University of Tennessee.
- Feldman, David, 2001, “Treading Political Water”, *Forum for Applied Research and Public Policy*, 16(1) Spring: 78-81.
- Florida Water Plan*, 2001. State of Florida Homepage. www8.myflorida.com
- Gelder, Austin. 2004. “Lawsuits Seek to Halt Tapping of White River: Conservationists, Sportsmen See Harm in Irrigation Project.” *Arkansas Democrat-Gazette* (Little Rock). Feb. 18.
- Hardin, Garrett. 1968. "The Tragedy of the Commons," *Science*, 162:1243-1248.
- Kundell, James, and D. Tetens, 1998, *Whose Water Is It? Major Water Allocation Issues Facing Georgia*, University of Georgia.
- Lawson, J.M., 2000. *Transboundary Groundwater Pollution: The Impact of Evolving Groundwater Use Laws on Salt Water Intrusion of the Floridan Aquifer Along the South Carolina -Georgia Border*, 1 S.C. ENVTL. L.J. 85 (2000).
- “Louisiana Bill Advances to Change Groundwater Lawsuits,” 2003. *U.S. Water News Online*, June.
- Morgan, John, Dan Cohen-Vogel and Greg Spradley. 2002. *Toward a Long-Term Water Policy for Tennessee*, Comptroller of Tennessee, Office of Research, March.
- Muzzi, Doreen, 2001. “Collaboration a Must to Solve Delta Water Issues,” *Delta Farm Press*, May 25.

National Watershed Forum, Final Report. 2001. Arlington VA. Meridian Institute.

--*Northwest Florida Water Management District*, 2001. "Protecting our Water Resources through Regulatory Activities," Tallahassee FL.

--Proceedings, 2003 Mississippi Water Resources Conference, Raymond MS April 2003, Mississippi Water Resources Research Institute.

--Proceedings, Southeast Watershed Forum, Georgia Watershed Roundtable 2002-03, Mississippi Watershed Roundtable 2002-03, Tennessee Watershed Roundtable 2002-03.

--Seabrook, Charles. 1998. "Special Report: Chattahoochee–River in Peril, Water War Splits the South," *Atlanta Journal and Constitution*, October 5.

--Shelton, Stacy, 2003. "State Leaders Want Water Use Curbed," *Atlanta Journal and Constitution*, November 10.

--Shelton, Stacy, 2003. "Water War Now Headed to Federal Courts," *Atlanta Journal and Constitution*. September 2.

--*South Carolina Water Plan*, 1998, Columbia SC, Department of Natural Resources

--*Southeast Watershed Forum Roundtable*, 2003. Biloxi MS. *Southeast Watershed Forum*. In conjunction with 2003 *Southern States Environmental Conference and Exhibition*, MDEQ, EPA Region 4, and Mississippi State University.

--*Southeast Watershed Forum Roundtable, Final Report*, 2002, St. Petersburg FL. *Southeast Watershed Forum*.

--*Southeast Watershed Forum Roundtable, Final Report*, 2001, Atlanta, GA. *Southeast Watershed Forum*. In conjunction with *Georgia Water Leadership Summit*.

--Tennessee Valley Authority, 2004, *Reservoir Operations Study*, www.tva.gov <http://www.tva.gov>

--*Welcome to Water in Region 4*, EPA Region 4, Atlanta GA. www.epa.gov/region4/water/

--Westberry, Katy, 2003. *The Battle Between Georgia and South Carolina over Groundwater in the Floridan Aquifer*, Georgia State University, Atlanta GA. Spring. www.gsu.edu/lawlibrary

Appendix: Southeastern Water Contacts Consulted for Project

For purposes of the Appendix and throughout the report, the acronyms stand for:

- Ark. SWCC: Arkansas Soil and Water Conservation Commission
- CPUC: Clarksdale (MS) Public Utilities Commission
- CU: Clemson University
- DeSoto: DeSoto County (MS)
- Entergy: Entergy Co.
- EPA R4: US Environmental Protection Agency Region 4
- ERDC: US Army Corps of Engineers Research and Development Center
- FWRRC: Florida Water Resources Research Center at the University of Florida
- GCWW: Greater Cincinnati Water Works
- GPDNR: Georgia Department of Natural Resources.
- G-P: Georgia-Pacific
- IP: International Paper
- LSU: Louisiana State University
- MDEQ, Mississippi Department of Environmental Quality
- MIT CEEPR: Massachusetts Institute of Technology Center for Energy and Environmental Policy Research
- MPSC: Mississippi Public Service Commission
- MWRA: Mississippi Water Resources Association
- PRVWSD: Pearl River Valley Water Supply District
- SLWD: St. Louis Water Division
- SoCo: Southern Company
- TVA: Tennessee Valley Authority
- UK: University of Kentucky
- UGA: University of Georgia
- UM: University of Mississippi
- UMGWI: University of Memphis Ground Water Institute
- UNC: University of North Carolina

- USACE: US Army Corps of Engineers
- USDA: US Department of Agriculture
- USGS: US Geological Survey
- UT: University of Tennessee
- VU: Villanova University
- YMDJWMD: Yazoo Mississippi Delta Joint Water Management District

The following persons in the various federal, state, and local agencies, as well as universities and private companies were interviewed for the purpose of the project:

Federal Agencies

- EPA R4: RA Jimmy Palmer and Chief of Staff Allen Barnes.
- USGS: Director Charles Groat; SE Regional Hydrologist Tim Hale, SE Regional Ground Water Specialist Eve Kuniansky, SE Hydrologist Briane Adams; Mississippi District Chief Mickey Plunkett, Kerry Arthur, Heather Welch, and Larry Slack; Tennessee District Office Mike Bradley; Arkansas District Office David Frewell, David Freiwald, and John Czarnecki; Assistant Georgia District Chief John Clarke.
- USACE: Vicksburg: Economic and Environmental Branch Chief Norwyn Johnson, District Counsel Henry Black, Paul Eagles, Brian Chewning, Joe Smith;
ERDC: Dr. June Mirecki, Tim Ables, Sandra Knight.
- USDA: Dr. Matt Romkens, Director, National Sedimentation Lab
- US Congress: Senators Trent Lott and Thad Cochran, Rep. Roger Wicker

Regional Agency

- TVA: Chair Glenn McCullough Jr., Senior VP River Operations Janet Herrin, Manager of Water, Gene Gibson.

State and Local Agencies

Mississippi

- MPSC: Commissioner Bo Robinson.
- MDEQ: Executive Director Charles Chisolm, Office of Land & Water Resources Director Jamie Crawford, David Hardin, Steve Jennings, David Dockery

CPUC: General Manager Marvin Carraway, PE
YMDJWMD: Executive Director Dr. Dean Pennington
PRVWSD: General Manager Dr. Ken Griffin
MWRA: Deirdre McGowan, Executive Director
DeSoto: David Armstrong, County Administrator; Bill Austin, Regional Utility Authority

Arkansas

Ark. SWCC: Todd Fuggitt

Ohio

GCWW: Bill Phelps

Missouri

SLWD: Hassen Saleh

Georgia

GaDNR Bob Kerr, Dr. Bill McLemore

Universities

CU: Dr. Jim Castle, Dr. Larry Murdoch
FWRRC: Dr. Lou Motz, Director
UT: Dr. David Feldman and Dr. Randy Gentry
UGA: Dr. Jim Kundell, Director of Environmental Policy Center
UK: Dr. Richard Ausness (co-principal investigator, Model Water Code)
VU: Dr. Joe Dellapenna (Director, ASCE Model Water Code Project)
MIT CEEPR: Dr. Denny Ellerman, Executive Director
UM: Drs. Alex Cheng, Sam Wang, Gregg Davidson, Bob Holt, and Garey Fox
UNC: Dr. Greg Charackis
LSU: Dr. Vijay Singh
UMGWI: Dr. Jerry Anderson, Director; Dr. Brian Waldron, Dr. Dan Larsen (Geology Department), Dr. David Case (Environmental Law).

Private Companies

SoCo: Executive Vice Presidents Dwight Evans and David Ratcliffe
G-P: Bill Jernigan, PE, Manager of Environmental Affairs
IP: Eric Johannessen, Senior Counsel
Entergy: Alan Katz, Senior Counsel

About the Principal Investigator, Eugene T. Holmes

In 2002-03, the principal investigator was a Research Professor in the Department of Civil Engineering at the University of Mississippi. Earlier, the principal investigator had been Adjunct Professor of Law at both the University of Mississippi and Samford University, where he has taught courses in environmental, energy, and natural resources law, and water and environmental policy. Before returning to his *alma mater*, he had practiced law with major law firms in Atlanta, Chicago, and Washington DC. He has also taught environmental seminars for sponsors including the American Chemical Society, Electric Power Research Institute, and Technical Association of the Pulp and Paper Industry. Most recently he spoke on “A Comparison of Two Potential Interstate Groundwater Disputes: “The Upper Floridan in GA/SC and the Memphis Sand in TN/MS ” at the American Institute of Hydrology’s October 2003 Annual Conference in Atlanta.