

Statewide Water Resources Planning: A Nine-State Study

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Summary

This report provides an analysis of statewide water resources planning in Tennessee and eight other states. The term “water resources” can and should encompass both water quality and water supply concerns. In this report, water supply planning – a much more recent concern in southeastern states such as Tennessee – is emphasized. But water quality and water supply are tightly coupled. Ultimately, their planning must be closely coordinated.

Tennessee has a long and strong history of water quality planning. It only recently has embarked on water supply planning. Two pilot water-planning studies are underway; one in the north central region and the other in the southern Cumberland Plateau region. Both regions were selected largely because of their drought vulnerability, and in both, the study areas have been based largely on utility districts. If the two pilot studies are an indication, it appears that Tennessee’s interpretation of water supply planning is water *system* planning – in other words, a focus on system supply, infrastructure, and interconnections – with planning regions drawn accordingly.

The eight other states discussed in this report include Florida, Georgia, North Carolina, Pennsylvania, South Carolina, Virginia, and West Virginia. These states were selected for analysis because they provide a variety of approaches to statewide water supply planning. Some, for example, focus their efforts on planning by state agencies, while others focus on planning by regional or local agencies. Virtually all, however, use watersheds (*the natural hydrological system*), not utility districts (*the water delivery system*), as the basis for their water supply planning. This enables them to link water supply planning with water quality planning into integrated water resources planning. Other common features of the other states studied include planning for both the short term and the long term, planning for both surface water and groundwater, and addressing water allocation strategies only after statewide water resources planning is underway.

Tennessee needs to tailor its own approach, but much can be learned from other states that are further along in the process of integrated water resources planning:

- First, if Tennessee is to plan for the long-term adequacy of its water resources, it should link water supply planning with water quality planning. To do so, it should reconsider its emphasis on delivery systems as the basis for water supply planning. With its 55 watershed management units for water quality planning, Tennessee is well positioned to pursue an integrated approach to water resources planning.
- Second, while Tennessee appears to have embraced long-term as well as short-term water supply planning, it may be advisable to link surface water planning with groundwater planning, especially in critical hydrological areas.

- Third, while Tennessee may decide not to embark on extensive integrated water resources planning simultaneously throughout the state, a preliminary statewide survey of water supply and demand is needed to decide which areas should be addressed first.
- Finally, while ways to allocate water efficiently can be explored, their implementation should be done within the context of a good understanding of present and future water supply and demand.

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Overview

I. Genesis and Focus of this Report

The study at hand has been conducted under contract with the Tennessee Advisory Commission on Intergovernmental Relations (TACIR). TACIR has a mandate to assess and facilitate intergovernmental coordination within Tennessee. One important issue facing the state as a whole, as well as state agencies, municipal and county governments, and public and private utilities, is the need for adequate water supply. This study examines efforts that other states and their internal water management networks are taking to develop water supply and allocation plans and processes. In the report, we often use the term “water resources planning.” Water resources planning can and should encompass both water quality and water quantity concerns. Here, however, water supply planning is emphasized.

The study focuses on case studies of water supply planning in nine states. The nine states include Tennessee and eight other states: Florida, Georgia, North Carolina, Pennsylvania, South Carolina, Texas, Virginia, and West Virginia. These eight states were selected for the following reasons:

1. We sought a range of examples along the following dimensions:
 - recent v. long-standing water supply planning
 - state v. regional v. local locus for planning
 - reliance on groundwater v. surface water
 - rural v. urban
2. Given Tennessee’s riparian tradition, we mainly considered states east of the Mississippi River. Texas was added in part because of its experience with groundwater.
3. We emphasized states in the Southeast, because this may be useful to Tennessee for future inter-state water supply planning.

In conducting the case studies, we focused on the structure of water resources planning (in particular, water supply planning) in each of the states considered. We did not, however, attempt a systematic catalogue comparing the features of various states’ water supply planning (e.g., the statutes enacted and regulations adopted, the policies expressed in statutes, the responsible agencies, and so forth). This has been done by others (e.g.,

Christy, Myszewski, and Kundell 2005; Myszewski, Christy, and Kundell 2005; Moreau and Hatch 2008). Instead, in each case we delved most deeply into the features, including innovative approaches, that may be informative for Tennessee.

II. Why Is Statewide Water Resources Planning Needed?

With the pressures of economic and population growth, water shortages can occur even in states that traditionally have had abundant water supplies. Now, with the prospect of protracted droughts, especially given global climate change, states in the Southeast and elsewhere are embarking on state-wide long-term planning for their water resources. All of the states adjacent to Tennessee except Alabama are at least nominally pursuing statewide water resources planning (Viessman and Feather 2005; Moreau and Hatch 2008).

Tennessee, like other states in the Southeast, is experiencing water shortages from the pressures of growth as well as droughts. For Tennessee, as with other states, a complicating factor is land use – in particular, rural water needs and rural sprawl. While rural sprawl occurs for many reasons, it is enabled in part by the advent of in-situ package treatment plants for wastewater, replacing the need for individual septic systems (Curtis 2008). . In-situ package treatment plants enable pockets of residential density in areas that are sparsely populated, leading to scattered development that does not necessarily have ready access to public services (schools; police and fire protection; paved, well-graded roads; etc.) or adequate water supplies. Because these areas typically have limited land use controls and planning resources, these scattered developments often are able to proceed with little oversight.

According to the *Tennessee Rural Needs Report* (Tennessee Department of Environment and Conservation 2005), approximately 6 percent of the state’s population relies on private wells and springs. Many of these people are in sparsely populated areas. Some are content with their water supplies; others have quantity or quality problems. Yet their needs may not be addressed by water utilities, even as water lines penetrate rural areas to serve new developments. As Daniel Carter has noted, “[for many] rural residents in counties supplied by a myriad of small municipal water districts, the only chance in many cases to receive a public water supply is if they happen to live on the way to a new development” (Carter 2008, p. 49).

Tennessee’s 1998 Growth Policy Act (commonly called “Public Chapter 1101”) was intended partly to promote compact, contiguous development and to address the coordination of development with the provision of public services. Nevertheless, disconnects continue to occur between coherent land use planning, local development patterns, and the extension of utility services. Apart from the phenomenon of rural

sprawl, there are other reasons to undertake water resources planning that addresses water supply as well as water quality. Three are listed below.

1. **Areas with high population growth.** According to a study conducted for the Tennessee Advisory Commission on Intergovernmental Relations (Middleton and Murray 2009), the state's population is predicted to increase from 6.2 million people in 2010 to 7.3 million in 2030. The population of the eight-county region including and surrounding metropolitan Nashville is expected to increase the most dramatically. The collective population of those eight counties (Davidson County, surrounded by Williamson, Rutherford, Wilson, Sumner, Robertson, Cheatham, and Dickson counties) is predicted to grow from an estimated 1,485,820 in 2010 to an estimated 2,074,206 in 2030 – an increase of nearly 590,000. This increase accounts for half of that expected for the state as a whole between 2010 and 2030.
2. **Areas of ecological importance that have limited water availability.** Areas in the state with limited water availability such as the Cumberland Plateau and the Duck River Basin may be severely affected by droughts, from the standpoint of the water needs of both humans and aquatic species. The Duck River, with its headwaters in Coffee County, is one of thirteen rivers that have received a State Scenic River designation from the Tennessee Department of Environment and Conservation. It contains highly diverse populations of mussels and fish and is facing both commercial and residential growth pressures. The Collins River in the southern Cumberland Plateau area also has been designated a State Scenic River; it is vulnerable to protracted drought. The Obed river system on the Cumberland Plateau is the only river in Tennessee that has been designated a National Wild and Scenic River. The plateau is a popular retirement and vacation destination, and continued growth is expected.
3. **Prospective competition among essential uses.** As of 2005, Tennessee was among the top eight states in the United States in the quantity of water withdrawn for thermoelectric power generation (Kenny et al. 2009). Approximately four-fifths of Tennessee's water withdrawals are used to generate electricity; the remainder is used mainly by industry and mining and for public water supplies. In general, Tennessee has adequate water available for these uses at present, but population growth combined with protracted drought could strain the state's ability to satisfy these needs while meeting in-stream needs and maintaining good water quality.

These are just three examples of the water supply issues that Tennessee is facing or may encounter in the coming years. Long-term comprehensive statewide planning for both water quantity and water quality will be needed to address not only these issues but also others as yet unforeseen.

III. Statewide Water Resources Planning:

Widely Shared Features

All of the states studied except Tennessee have conducted or embarked on statewide water resources planning. Statewide planning for water resources has been done in Florida and Texas for several decades. In the other states, it is a recent phenomenon.

The planning efforts were triggered by persistent drought or concerns about water shortages in light of growing populations and economies. Other shared characteristics of the states' water resources planning include the following:

1. Planning for both the short term and the long term

The planning horizons used by the states studied vary, but typically they include long-term as well as shorter-term planning – e.g., 20- or 30-year horizons as well as 5- or 10-year horizons. In Georgia, for example, each regional planning council will develop 10, 20, 30, and 40-year forecasts of water supply demands and assimilative capacity demands using estimates of future population and employment as well as land-use surface types and distribution. In several of the states studied, data for forecasts are generated by or in consultation with state agencies.

2. Planning based on hydrologic units

Although the scale of planning units used by the states varies, virtually all are based on watersheds. The most common unit for planning is the eight-digit level of the Hydrologic Unit Code established by the U.S. Geological Survey. Called HUC 8 for short, there are 2,264 of these units in the United States; they are sub-areas of the 21 two-digit regions in the United States (<http://water.usgs.gov/GIS/huc.html>).

Tennessee has all or parts of 55 HUC 8 units (<http://www.tennessee.gov/environment/watersheds/>).

3. Planning for both surface water and groundwater

Virtually all of the states studied include plans for water supply from groundwater as well as surface water. Although groundwater supplies can be much more difficult to quantify, they are recognized in the planning processes even of states such as West Virginia, which relies on surface water for virtually all of its large-quantity water withdrawals.

4. Developing water allocation strategies only after statewide water resources planning is underway

Water allocation is a feature of water resources planning in the arid and semi-arid states of the West and in some northeastern states (e.g., New Jersey, Pennsylvania, Rhode Island), but the term “water allocation” appears to be largely avoided in the Southeast. Florida is an exception: Florida’s five regional water management districts (WMDs) have the power to control water allocation through water use permits, and a 2005 state act linked growth to water supplies, requiring that communities plan their growth around WMD determinations of water availability. Most of the southeastern states studied, however, have moved very cautiously (if at all) toward water allocation strategies, and then only after extensive water resources planning.

Apart from these four commonalities, the basic features of the states’ comprehensive water resources planning have differed significantly, as briefly discussed below.

IV. Statewide Water Resources Planning:

Other Basic Features

Each state that has undertaken statewide water resources planning has had to decide – tacitly or explicitly – what roles will be played by whom, and how they will be sequenced. Below, four key features are discussed. These include the roles of

- state legislation,
- the local, regional, and state levels,
- participation, and
- data gathering.

The Role of State Legislation

In most of the states studied, state legislation mandated planning. In some cases (e.g., West Virginia), the initial impetus came from one or more state legislators; in other instances (e.g., Pennsylvania), the impetus came from the state agency responsible for water resources. In a number of states, legislation was preceded by studies, data gathering, and participation by experts and interested parties to sketch out the approach to be used.

Roles at the Local, Regional, and State Levels

The states studied vary in where the central responsibility for water resources planning is located. At one extreme, West Virginia has to date taken a strong state lead with only nominal involvement at the regional or local level. At the other extreme, North Carolina's state plan is largely a compilation of local plans. In conducting statewide planning, several of the states studied – in particular, Florida, Georgia, Pennsylvania, and Texas – emphasize the importance of regional water resources planning with significant involvement by regional councils.

The Role of Participation

In developing their statewide water resources planning efforts, many of the states studied have used state or regional committees representing various interests, together with committees of technical experts. However, two states stand out for their use of systematic, inclusive participatory methods. In Pennsylvania, the Department of Environmental Protection conducted 16 public meetings across the state to solicit public opinion on water resources management. The results convinced the legislature to take action. In Virginia, a stalemate among various competing interests was resolved by using a facilitated consensus-building process involving more than 30 representatives of different interests. The result was a recommended set of regulations for a statewide water supply planning process that was then approved and adopted by the State Water Control Board.

The Role of Data Gathering

Several of the states – e.g., North Carolina, Pennsylvania, and West Virginia – have undertaken intensive data-gathering efforts before launching their planning efforts, in part to help guide those efforts. Who has gathered the data differs. North Carolina's data gathering has been done mainly by local governments; Pennsylvania's has been done mainly by regional committees in conjunction with the state Department of Environmental Protection; West Virginia's has been done mainly by the state Department of Environmental Protection.

Other states – e.g., Georgia, South Carolina, and Virginia – have begun gathering their data as part of their planning efforts. In effect, the framework for the plan is established first; then data gathering commences.

A few of the states studied (e.g., Florida, Georgia, Pennsylvania, West Virginia) make a point of distinguishing consumptive and non-consumptive uses in gathering their data. This distinction is important: it estimates the net amount returned to the water system. In Georgia's 2008 plan (p. 10), consumptive use is defined as:

the difference between the total amount of water withdrawn from a defined hydrologic system of surface water or groundwater and the total amount of

withdrawn water that is returned to that same hydrologic system over a specified period of time.

For example, a transfer of water out of a basin is considered to be a 100 percent consumptive use, whereas a domestic or commercial use of water is thought to be about 20 percent consumptive (Draper 2002). In contrast, in stream uses such as hydroelectric power generation are considered to be non-consumptive.

V. Statewide Water Resources Planning:

Additional New Features

In addition to making decisions about the basic features of statewide water resources planning, several of the states studied have embraced one or more relatively new, forward-thinking features. As discussed below, these include

- critical areas planning,
- conjunctive management,
- tightly coupling water quantity and water quality, and
- planning for conservation and efficiency.

Critical Areas Planning

In several of the states studied, identifying critical areas has been a key component of planning – especially in recently initiated planning efforts (e.g., North Carolina, South Carolina, Virginia, Pennsylvania, and West Virginia). North Carolina and South Carolina have adopted the approach of identifying “capacity use areas” where water sources are threatened; similarly, Virginia has identified “ground water management areas.” Pennsylvania and West Virginia have included as part of their formal planning processes identifying and preparing plans for “critical planning areas.” In Pennsylvania, the areas are nominated through a regional planning process; in West Virginia, through a state-led process. In addition to identifying critical planning areas, West Virginia – after gathering extensive data statewide – has prioritized its state-led planning efforts according to which watersheds are likely to experience the fastest increases in water demand.

Conjunctive Management

Conjunctive management – i.e., the integrated management of rivers, reservoirs, and confined and unconfined aquifers – is becoming a feature of water resources planning in

some of the states studied (e.g., Georgia, North Carolina, and South Carolina), especially for areas that rely on both groundwater and surface water. Conjunctive management includes but goes beyond conjunctive use: it entails monitoring and often complex modeling. Although conjunctive management can be analytically demanding because of numerous variables, large uncertainties, nonlinearities, and multiple objectives (Abu Rumman 2005), it can be used to both recharge aquifers and substitute groundwater for surface water (Dudley and Fulton 2005).

Linking Water Quantity and Water Quality

With federal legislation in the 1970s – the 1972 Clean Water Act and the 1974 Safe Drinking Water Act – the national interest in water quality was clearly articulated, and state governments as well as the federal government assumed responsibility for setting water quality standards, monitoring, and enforcement. (At the federal level, the U.S. Environmental Protection Agency takes the lead in water quality regulation.) In contrast, water quantity issues have remained largely a matter left up to the individual states. The link between water quality and quantity has been recognized, however (e.g., through minimum flow standards), and that link is now becoming central to some states' water resources planning. Georgia's 2008 plan, for example, comments (p. 9) that “[w]ater quality and quantity and surface and groundwater are interrelated and require planning as well as reasonable and efficient use.”

Planning for Conservation and Efficiency

In states such as Texas and Florida that have considerable experience with water shortage, planning for conservation and efficiency has become an essential part of statewide water resources planning. In other states such as North Carolina and South Carolina, calls for conservation and efficiency are being incorporated into statewide planning. In Georgia, a state Water Conservation Implementation Plan was mandated by executive order.

Conservation and efficiency planning includes but goes beyond enumerating best practices for various user sectors and helping to establish leak detection programs. To meet expected future water demand in Texas, for example, regional water supply plans rely heavily on reduction in demand through planned conservation and efficiency measures with specific targets.

VI. Cousins of Statewide Water Resources Planning

Two state programs that have become increasingly popular – registering large water withdrawals and regulating inter-basin water transfers – are worthwhile in themselves;

they also can help support statewide water resources planning and water allocation strategies.

Registering (and Permitting) Large Water Withdrawals

Several of the states studied, Tennessee included, have programs for registering large water withdrawals. Tennessee's program requires reporting and registering all water withdrawals of 10,000 gallons per day (gpd) or more. Pennsylvania has a similar program. West Virginia requires registration of large quantity users, defined as those withdrawing more than 750,000 gallons per month (gpm). North Carolina requires registration of water withdrawals of 100,000 gpd or more; similarly, South Carolina requires registration of water withdrawals exceeding 3 million gpm.

A few of the states studied add permitting requirements to registration requirements for large withdrawals in specific areas. In North Carolina, all groundwater withdrawals of 100,000 gpd or more within a designated "capacity use area" require permits. Similarly, South Carolina requires permits for groundwater withdrawals over 3 million gpm in designated capacity use areas. Virginia requires permits for groundwater withdrawals of 300,000 gpm or more in designated "ground water management areas."

Regulating Inter-basin Water Transfers

Several of the states studied, Tennessee included, regulate inter-basin transfers of water. Tennessee requires permits for transfers of surface water between 10 designated basins; a permit for an inter-basin transfer of groundwater is required only if it would adversely affect the flow of a Tennessee surface water. Tennessee's inter-basin permit requirement applies to "all persons or entities (1) that have been granted powers by the state to acquire water, water rights and associated property by eminent domain or condemnation; or (2) that acquire or supply water for the use or benefit of public water supply systems..." (Tennessee Code Annotated § 69-7-204(a)).

In Florida, inter-basin transfers between the state's five water management districts require the approval of all districts involved. South Carolina's 1977 Interbasin Transfer of Water Act enabled regulating the transfer of water from one river basin to another, if the transfer involves five percent of the seven-day, ten-year low flow or 1 million gpd, whichever is less. In North Carolina, large inter-basin transfers (i.e., 2 million gpd or more) are regulated.

VII. Complicating Factors

Two factors – the federal role in managing some state waters and the refusal of water to respect state boundaries – complicate statewide water resources planning. These factors are not a reason to abjure statewide planning; they simply need to be taken into account.

The Federal Role in Managing Some State Waters

A federal presence in managing some state waters can complicate a state's water resource planning. The Tennessee Valley Authority (TVA) has dominated affairs regarding the Tennessee River and its major tributaries for more than seven decades. Although TVA's presence looms largest in Tennessee, it is felt in parts of some of Tennessee's surrounding states as well.

Apart from TVA, however, all of the states studied must take into account the actions and decisions of federal agencies, especially the U.S. Army Corps of Engineers (COE). Among other things, the COE constructs and operates dams. In the Southeast, it has 33 major projects with multiple purposes such as flood control, hydroelectric power, water supply, recreation, navigation, and wildlife enhancement. Some of these projects, such as Lake Lanier reservoir on the Chattahoochee River, have become a source of interstate controversy.

Eastern and middle Tennessee are in the COE's Great Lakes and Ohio Division; western Tennessee is in its Mississippi Valley Division. According to the COE's website (<http://outreach.lrh.usace.army.mil/States/TN/Default.htm>), Tennessee contains over 600 miles of navigable waterways in the Ohio River basin. The major waterways are the Tennessee River and the Cumberland River. The Tennessee-Tombigbee Waterway linking the Tennessee River with the Gulf of Mexico is one well-known COE project.

Interstate Water Resources Issues

Interstate water resources issues also complicate an individual state's water resources planning, yet they are virtually inevitable. Water is not always contained within state boundaries; cooperation among states becomes necessary to avoid controversies. For example, of South Carolina's four major river basins, two are shared with North Carolina and one is shared with Georgia; only the Ace basin near Charleston is located entirely within the state.

In Tennessee at present, the two largest interstate water resources issues concern the use of the Memphis Aquifer and the prospect of diverting water from the Tennessee River to help supply the metro Atlanta region. In other states studied, interstate issues include, for example, tensions between Virginia and Maryland regarding the Potomac River; Virginia

and North Carolina regarding the Roanoke River; Texas and seven other states regarding the Ogallala Aquifer; and Georgia, Alabama, and Florida regarding the Chattahoochee River and, to a lesser extent, the Etowah River.

Pennsylvania provides an example of formal, federally endorsed solutions to interstate water issues. It is a member state, with New York and Maryland, of the Susquehanna River Basin Commission and, with New York, New Jersey, and Delaware, of the Delaware River Basin Commission. In each case, the commission has responsibility for overseeing the protection and use of the basin's waters.

VIII. Water Rights Law

Water rights law is an important backdrop for water resources planning. Below are brief summaries of traditions of surface water law and groundwater law in the United States, and their interpretations in Tennessee and the other states studied.

Surface Water

In the United States, there are two distinct legal traditions regarding the allocation of surface water:

- Riparian rights, a doctrine prevalent in the humid eastern states. Grounded in English common law, this doctrine holds that landowners abutting a watercourse have use rights but not property rights to the water; instead, water is a common property.
- Appropriative rights, a doctrine prevalent in the arid western states. Grounded in nineteenth-century case law in the western states, this doctrine treats water as private property and does not make owning land abutting a watercourse a requisite.

Increasingly, the two traditions – especially the riparian rights tradition – have been modified to meet changing demands. During the last half of the twentieth century, about half of the eastern states legislatively adopted regulatory permit systems for allocating the diversion of water from some or all sources (Dellapenna 2007, 2009). Called “regulated riparianism,” this approach – which in effect shifts from treating water as common property to treating it as public property – also has been adopted more or less loosely by other eastern states. No state now adheres strictly to the traditional “natural flow” version of riparian rights; all have incorporated concepts such as “reasonable use” or “beneficial use” in their statutory or case-based law.

Groundwater

The law for allocating groundwater has evolved somewhat differently. Because of a lack of knowledge about the location or movement of groundwater, case-based law in the nineteenth century gave rise to a doctrine variously called the “absolute dominion rule,” the “absolute ownership rule,” or the “rule of capture” (Dellapenna 2003, 2009). This doctrine allows a landowner over an underground water source to withdraw an unlimited quantity of water regardless of injury to another landowner. The doctrine, or a modified version of it, has been applied to groundwater unless it can be proved to be part of an underground stream, in which case it is treated for legal purposes as surface water.

To temper the potential abuses of the absolute dominion rule, the statutory or case-based law regarding groundwater in some states has been modified to require that the groundwater use be “reasonable” – i.e., restricted to use on the overlying land and non-injurious to other landowners.

With a shift to a “reasonable use rule,” groundwater is treated less like private property and more like common property (Myszewski, Christy, and Kundell 2005).

States Studied

Texas is the only state studied that, for its surface water law, has abandoned its riparian tradition in favor of an appropriative rights approach. The remaining states studied could be called “regulated riparian” states, although the nature and extent of their regulation varies. Driven by water use disputes or concerns about water quality or water shortage, they have adopted selective or comprehensive statutory approaches to address water supply issues.

Texas, Florida, and Pennsylvania have the most elaborate statewide systems for water supply regulation. North Carolina, South Carolina, and Virginia have targeted areas of current or potential water shortage. Georgia, with the statutory creation of the 15-county Metropolitan North Georgia Water Planning District in 2001, targeted this area of water shortage. West Virginia has not forayed far into the arena of water supply regulation. Tennessee’s water rights law is very briefly summarized below.

Tennessee

Like those in most of the other states in the Southeast, Tennessee courts recognize the “reasonable use” interpretation of the riparian doctrine (Christy, Myszewski, and Kundell 2005). Tennessee has modified its common law doctrine (1) by provisions in the 1977 Water Quality Control Act stating that “...the waters of Tennessee are the property of the state and are held in public trust for the use of the people of the state...” (Tennessee Code Annotated § 69-3-102) and mandating regulations requiring an Aquatic Resource Alteration Permit (ARAP) for activities such as water withdrawals, (2) by the 2000 Inter-basin Water Transfer Act, and (3) by the 2002 Water Resources Information Act.

Regarding its groundwater law, Tennessee traditionally relied mainly on common law (Feldman and Elmendorf 2000). Nevertheless, as statutorily defined (Tennessee Code Annotated § 69-3-103(33)), the ARAP requirement applies to groundwater as well as to surface water; so do the requirements under the Inter-basin Water Transfer Act and the Water Resources Information Act.

IX. Implications for Tennessee

Tennessee is well positioned to begin statewide water resources planning. With its water withdrawal registration program, its regulation of inter-basin transfers, and its strengths in water quality monitoring and regulation (particularly its ARAP program), Tennessee has some of the essential underpinnings for integrated, statewide water resources planning. Its position in this regard is improved by the recent formation of the Water Resources Technical Advisory Committee (WRTAC) and by the recent updating of the state's Drought Management Plan.

In the state's 2002 Water Resources Information Act, the statutory groundwork was laid for taking a regional approach to water planning. This approach was affirmed by Paul Sloan, deputy commissioner of the Tennessee Department of Environment and Conservation, in a March 13, 2008, presentation to the WRTAC entitled "Tennessee's Approach to Regional Water Resource Planning"

(http://www.tennessee.gov/environment/boards/wrtac/pdf/TN_ApproachRegionalWater%20ResourcePlanning031408.pdf). There, Commissioner Sloan noted that the elements of regional planning include delineating regions and matching current and projected sources and uses.

Delineating regions is an important first step for Tennessee. A one-page list titled "TDEC's Approach to Prioritizing the Need for Planning Regional Water Systems" (n.d.) is posted on the WRTAC's website

(<http://www.tennessee.gov/environment/boards/wrtac/pdf/PrioritizingNeedRegionalization031408.pdf> retrieved December 4, 2009) and is quoted below:

The Department would propose to assign priority for regional planning on the basis of the following criteria:

- *Do the area systems have a history of inadequate sources of supply or lack hydraulic capacity that resulted in shortages or low pressures during the drought?*
- *Has there been inadequate planning or response at the local level to address the shortage or lack of hydraulic capacity?*

- *Do existing water system withdrawals interfere with sustaining aquatic biota or assimilative capacity of the area's streams?*
- *Is there duplication of existing water supply infrastructure in the region?*
- *Will the expected population growth and water supply demand of area water systems exceed the sustainable capacity of the source?*
- *Will the energy and financial impact of piping big waters to the region exceed the customer's ability to pay for the project or result in more harm to the environment than constructing headwater impoundments for a source of water supply?*
- *Does the system(s) have a source(s) of sufficient capacity to last another 50 years?*
- *Have the water systems in the area maximized interconnections with adjacent systems to mitigate possible service interruptions due to emergencies?*
- *Has there been a history of noncooperation among nearby systems?*

The two pilot water-planning studies that are underway in Tennessee – the North Central Study and the Southern Cumberland Plateau Study – apparently were selected because of their drought vulnerability, and the study areas have been based largely on utility districts. Their selection and defined study areas thus are consonant with TDEC's criteria. If the two pilot studies are an indication, it appears that Tennessee's interpretation of water supply planning is water *system* planning with planning regions accordingly delineated.

The other states discussed in this study are taking a rather different approach. Virtually all are integrating water supply with water quality considerations in their water resources planning, and virtually all use watersheds (*the natural hydrological system*), not utility districts (*the water delivery system*), as the geographic basis for their planning.

Watersheds are used by Tennessee for its water quality planning: It has 55 watershed management areas, which are based on 8-digit Hydrologic Unit Codes of the US Geological Survey. While Tennessee's strategy of focusing water supply planning at the regional level seems appropriate for the state, if water supply planning is to be linked with water quality planning, it may be wise to use the state's watershed management areas as the primary basis for both.

Tennessee has a strong background in water quality planning on which it can and should build. Its pilot regional water-planning studies are, appropriately, using long-term (20- to 50-year) demand forecasts. Its 1977 Water Quality Control Act helped to establish the legal basis for the state's interest in not only water quality planning and regulation but

also water supply planning and regulation, with its broad declaration that "...the waters of Tennessee are the property of the state and are held in public trust for the use of the people of the state..." (Tennessee Code Annotated § 69-3-102).

The Water Quality Control Act's § 69-3-102 declaration, which falls under the "public trust" doctrine adopted by many states in various ways regarding their waters (Walston 1989), can be interpreted as establishing the state's proprietary right to and regulatory interest in its waters. However, to better understand how this declaration might serve as the underpinning for prospective state involvement in water supply issues, legal clarification likely will be needed. Similarly, clarification may be needed of the force of a 1957 statute establishing a water resources division within what has become TDEC. This statute is still part of Tennessee law (Tennessee Code Annotated § 69-7-101 et seq.), but – as discussed in the Tennessee case study – the division is long defunct. A 2002 report by the Office of Research within the state's Comptroller of the Treasury pointed out that although TDEC's Division of Water Supply carries out some of the provisions of the 1957 act, it does not, for example, define and propose water control districts or implement the basic water resource policy of the state (Cohen-Vogel and Spradley 2002). There appears to have been no case law on this point.

At this juncture in Tennessee, the future direction of statewide water resources planning is not yet fully set. Tennessee needs to tailor its own approach, mindful of its own laws, water resources, and water needs. Much can be learned, however, from other states that are further underway with integrated water resources planning.

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Tennessee

Highlights

The Tennessee Department of Environment and Conservation (TDEC) has the principal responsibility for the state's water supply, with three divisions to address water issues: the divisions of Water Pollution Control, Ground Water Protection, and Water Supply. The state's Department of Agriculture – in particular, its water resources program – also plays a significant role in land-based water quality issues, as does the Environmental Division of the Tennessee Department of Transportation, which addresses water quality issues associated with road construction.

The state does not have a formal structure for water resources management that integrates water supply planning with water quality planning. The state's 1957 Water Resources Act created a water resources division within the agency that is now TDEC, but that division is long defunct.

The 2000 Inter-basin Water Transfer Act authorized TDEC to require permits for transfers of water between 10 designated basins. Otherwise, the state currently does not have arrangements that directly address water supply allocation.

The state's 2002 Water Resources Information Act instituted a program requiring the registration of surface water and groundwater withdrawals of 10,000 gallons or more per day. Apart from the permits required under the Inter-basin Water Transfer Act, consumptive use is not tracked. (When water is transferred out of a basin, the transfer is considered a 100 percent consumptive use.)

The 2002 Water Resources Information Act also called for a Water Resources Technical Advisory Committee to be established within TDEC. The committee was established in 2007 and was given the charge of providing guidance on a Drought Management Plan to update the prior 1987 plan. Through TDEC's Division of Water Supply, the updated Drought Management Plan was released in early 2009.

Tennessee has not yet embarked on statewide water supply planning, but it has begun to lay the foundation for doing so. The 2002 Water Resources Information Act encouraged regional water supply planning, and the WRTAC was charged with providing guidance on the preparation of these plans. In the wake of the drought of 2007, the WRTAC recommended a pilot project to validate the benefits of regional water supply planning and develop a planning model. TDEC chose two pilot areas based on their vulnerability to drought and growth pressures and partnered with the U.S. Army Corps of Engineers and other member agencies of the WRTAC to develop recommendations. One of the pilot studies is for an area in the southern Cumberland Plateau; the other is for an area in

the north central region above Nashville. According to presentations by TDEC at a Southern Cumberland Plateau community meeting on October 5, 2009, and at a North Central community meeting on October 13, 2009, the objectives of the studies include “recommend[ing] source, conservation, efficiency and delivery alternatives to address water supply needs for a minimum of twenty years” and “provid[ing] information useful to capital financing source and management planning” (http://tn.gov/environment/regionalplanning/pdf/So_Cumberland_100509mtg.pdf; http://tn.gov/environment/regionalplanning/pdf/No_Centra_101309mtg.pdf).. TDEC expects to complete the studies later this year.

I. Introduction

Regarding its surface waters, Tennessee, like many other eastern states, follows the “reasonable use” interpretation of the riparian rights doctrine. In Tennessee, as in a number of other states, surface water law applies to groundwater that flows in an underground stream channel. Absent a clear indication of an underground watercourse, however, groundwater is treated as diffuse. Diffuse groundwater – either confined in an aquifer or percolating through the ground – is subject mainly to common law doctrine in Tennessee, apart from statutory requirements regarding groundwater quality.

Off-stream water use in Tennessee includes, notably, thermoelectric power (82 percent of total off-stream use), industry and mining (10 percent), and domestic and commercial uses (6 percent), with agriculture using only 1 percent. Tennessee’s available water includes 2 trillion gallons of surface water and 200 trillion gallons of groundwater. Nevertheless, of Tennessee’s 6.2 million population (2008 estimate, U.S. Census Bureau), approximately 3.9 million people receive their water supplies from surface water sources. Two major river systems, the Tennessee and the Cumberland, and their tributaries supply the majority of the surface water. About 1.5 million are served by public water systems that use groundwater, and an additional 300,000 are served by systems that use both surface and groundwater. Most west Tennesseans rely on groundwater.

According to the *Tennessee Rural Water Needs Report*, which was triggered by a 2004 act and was released by TDEC’s Division of Water Supply in January 2005, approximately 6 percent of the state’s population relies on private wells and springs. Most of these people live in sparsely populated areas. According to the report, while some are content with their water supplies, others have quality or quantity problems.

Traditionally, Tennessee has had an abundance of water, but the state is not immune to droughts. When they occur they spark an interest in water supply planning.

II. Water Management in Tennessee

The Past 50 Years: Significant State Legislation

Tennessee experienced an extreme drought in the early 1950s, triggering an interest in long-term water supply management. In 1957, the state legislature passed the Water Resources Act, which created the Water Resources Division of what is now the Tennessee Department of Environment and Conservation (TDEC). This division is described in greater detail below. A division of water supply also was created, and in 1963, all water users of 50,000 gallons per day or more were required to register with the Division of Water Supply.

The next significant piece of legislation was the 1977 Water Quality Control Act. Among other things, this act led to a rule requiring permits for activities, including water withdrawals, that may alter the properties of waters of the state. The act also created a state Water Quality Control Board. In 1985 the Division of Water Pollution Control was formed. The Water Resources Division was dissolved in the 1980s, and its remaining employees were absorbed into the Division of Water Supply (Paul Davis, personal communication, September 10, 2009).

The 2000 Inter-basin Water Transfer Act authorized TDEC to require permits for transfers between 10 designated basins (Tennessee's inter-basin permit requirement applies to people or entities who are acquiring water for public water supply systems or who have the power of eminent domain to secure water or water rights). Inter-basin transfers existing at the time of the legislation were exempt, but increasing withdrawals or locating new intakes would require permits. The act targets surface water; a permit for an inter-basin transfer of groundwater is required only when the groundwater withdrawal has "a significant potential to adversely affect the flow of a Tennessee surface water" (Tennessee Code Annotated § 69-7-204(a)(2)).

The state's 2002 Water Resources Information Act instituted a program requiring the registration of all surface water and groundwater withdrawals of 10,000 gallons or more per day. (The registration form can be found at <http://www.state.tn.us/environment/dws/forms/CN1226.pdf> .)

The Current Structure of Water Resources Management within TDEC

The programs noted above and other federally delegated programs are administered by TDEC's three water-related divisions: **Groundwater Protection, Water Supply, and Water Pollution Control**. In addition, the water resources program within the Tennessee Department of Agriculture addresses land-based water quality issues, and the Environmental Division within the Tennessee Department of Transportation addresses water quality issues associated with road construction.

The Division of Groundwater Protection (GWP). The GWP division's purpose is to protect the water quality of Tennessee's underground water systems, which – according

to GWP's website – mainly consist of regional aquifers. Among other things, the division regulates onsite wastewater disposal in areas where no municipal wastewater disposal systems are available.

The Division of Water Supply (DWS). This division is responsible for implementing four state statutes:

- **The 1963 Water Wells Act**, which provides for licensing of well drillers and pump setters.
- **The 1973 Safe Dams Act**, which provides for regulation of non-federal dam construction.
- **The 1983 Safe Drinking Water Act**, which provides for assuring drinking water quality.
- **The 2002 Water Resources Information Act**, which requires reporting and registering all water withdrawals of 10,000 gallons or more per day.

The DWS also supervises and issues permits regarding the construction and operation of public water supply facilities. The division is authorized to adopt and enforce rules and regulations governing the location, design, construction, operation, and maintenance of these facilities.

The DWS's Groundwater Management Section is responsible for developing strategies for groundwater protection under the 1977 Water Quality Control Act.

The Division of Water Pollution Control (WPC). The primary responsibility of WPC is to implement the state's 1977 Water Quality Control Act. In addition, the division regulates non-coal mining operations and illegal coal mining. WPC monitors, analyses, and reports on the quality of water in Tennessee on an annual basis, and it oversees the five-year water quality planning cycle for each of Tennessee's 55 HUC-8 watersheds. (Called HUC-8 for short, the most common watershed planning unit is the eight-digit level of the Hydrologic Unit Code established by the U.S. Geological Survey. For example, the watershed of the Caney Fork River in middle Tennessee is a HUC-8 unit. Tennessee has all or parts of 55 HUC-8 units. For a list of these units, see <http://tn.gov/environment/watersheds/index.shtml>.)

The division has the additional responsibilities of

- issuing federally delegated National Pollutant Discharge Elimination System (NPDES) permits for industrial, municipal, and other discharges of wastewater, as well as NPDES Phase I and Phase II stormwater permits for municipalities and other urban areas;
- administering the federally delegated Total Maximum Daily Load (TMDL) program for pollutant loads in surface waters;
- administering the Aquatic Resource Alteration Permit (ARAP) program for stream channel and wetland operations; and
- issuing permits under the state's Inter-basin Water Transfer Act of 2000.

The Defunct Water Resources Division

Through the 1957 Water Resources Act, a water resources division was created in the state agency that evolved into TDEC. According to the statute as amended:

The director of the water resources division is responsible to the commissioner of environment and conservation for the general direction of all matters pertaining to conservation, protection and development of the water resources of the state and the continued study of water resources looking toward the creation and development of a basic, long-range water resource policy for the state, with the exception of the functions relating to the water pollution control exercised by the Tennessee water pollution control board, and such other functions as may otherwise be provided in this part (Tennessee Code Annotated § 69-7-102).

The powers and duties of the director of water resources division under the direction of the commissioner of environment and conservation include, among other things, the powers and duties to:

- (1) Establish, maintain, and publish, as directed by the commissioner, an accurate inventory of the state's water resources;
- (2) Determine, maintain and establish estimates of existing and future water use in the state;
- (3) Define and propose, if necessary, water control districts within the state in the light of the director's findings, and make engineering plans and surveys for improving the quantity of the water supply in such proposed water control districts;
- (4) Implement the basic water resource policy of the state by creating and defining the rights of respective competing users of the water resources of the state;
- (5) Perform all duties assigned to the director relating to the determination of the waters that should be reserved for general public purposes, including navigation, sanitation, recreation, maintenance of fish and aquatic life, the maintenance of unusual scenic features and other public purposes;
- (6) Determine the feasibility of proposed dams and water diversion structures to conserve the basic water resources of the state and review and recommend plans for any such proposed dams and diversion structures in any proposed water control districts; and
- (7) Perform any other duties required by the terms of this part, or as may reasonably be required by the commissioner and the commission in relation to this part (T.C.A. 69-7-103).

According to Paul Davis, Director of Water Pollution Control for TDEC, the Water Resources Division is obsolete and its functions have been divided among the three current water divisions in TDEC (Paul Davis, personal communication, September 10, 2009). Similarly, Tom Moss, Interim Director of Water Supply for TDEC, said that the Water Resources Act of 1957 was essentially obsolete; he also remarked that since the legislation was unfunded, its efforts were handicapped from the start (Tom Moss, personal communication, October 1, 2009).

The rules of the Water Resources Division – Chapters 0400-4-1 and 0400-4-2 – were repealed in 1987 and 1993, respectively. Nevertheless, the 1957 legislation establishing the Water Resources Division has not been repealed; it remains part of Tennessee law (Tennessee Code Annotated § 69-7-101 et seq.) A 2002 report by the Office of Research within the state’s Comptroller of the Treasury noted that although TDEC’s Division of Water Supply carries out some of the provisions of the 1957 act, it does not, for example, define and propose water control districts or implement the basic water resource policy of the state (Cohen-Vogel and Spradley 2002)

State and Federal Regulations Affecting Water Supply Allocation

Because of the 1977 Water Quality Control Act, the divisions of Water Supply and Water Pollution Control have focused primarily on water quality. However, the 2000 Inter-basin Water Transfer Act directly addresses water supply allocation, and a few of the water quality regulations affect water supply allocation. In addition, the Tennessee Valley Authority (TVA) and the U.S. Army Corps of Engineers (COE) require flood control and navigation permits that can affect allocation.

TDEC. As noted above, the 2000 Inter-basin Water Transfer Act established that, with some exceptions, inter-basin transfers are subject to permitting requirements. The permits, which are issued by WPC, require that the withdrawal will not affect “the protection of public health, safety, and welfare and the environment as the water will no longer be available for use in the original stream” (Tennessee Code Annotated § 69-7-202).

WPC is responsible for determining whether a new or increased water withdrawal will alter the “physical, chemical, radiological, biological, or bacteriological properties of the source water” (Tennessee Code Annotated § 69-3-108(b)(1)). Withdrawal applicants must obtain an “Aquatic Resource Alteration Permit” from WPC. If it is found that the withdrawal will adversely affect the properties of the source water, the permit can be denied.

WPC also requires permits for pollutant discharges into streams. The division may attach conditions to the permit specifying the amount and location of water to be returned to a stream. By controlling stream flow in this manner, the division affects the amount of water available to other users. In addition, the state can regulate water withdrawals during emergencies such as extreme drought or in other situations where public health or navigation may be adversely affected.

TVA. The Tennessee Valley Authority has responsibility for power production, flood control, and navigation on the Tennessee River and all of its tributaries. Any proposed water withdrawal must obtain a “Section 26a” permit from TVA. This permit can be denied if the withdrawal will interfere with TVA operations or otherwise affect TVA’s ability to meet its responsibilities.

COE. The US Army Corps of Engineers has responsibility for navigation and flood control in navigable waters. It reviews applications for withdrawals under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act.

In Tennessee, the COE’s primary responsibility is the Cumberland River. According to the 2003 management plan for the Cumberland River, the COE manages its flow for flood control, navigation, power generation, water quality, and recreation; these uses have priority over off-stream water uses. A navigable channel is maintained throughout the length of its main stem in Tennessee. The COE leaves open the possibility of charging for water withdrawn from the Cumberland River main stem. In December 2009, the COE completed its *Ohio River Basin Comprehensive Recon Study*. In an untitled document posted on the web page of TDEC’s Water Resources Technical Advisory Committee with other material about this study, the following comment is made regarding the Cumberland River main stem;

Projects on the main stem ... have **no** storage. Water is stored only in tributary projects... . Because there is no storage on the main stem, water may be withdrawn without charge as long as authorized project purposes are not impacted. However, when water withdrawals impact authorized project purposes and stored water must be released from upstream tributary projects to mitigate those impacts, then [the federal] Water Supply Act of 1958 dictates that a reallocation of storage at tributary projects sufficient to meet those needs is required. Water withdrawal charges are required with the reallocation. (http://www.tennessee.gov/environment/boards/wrtac/pdf/uscoe_ohio_basin_cumberland_water_supply020810.pdf, retrieved March 24, 2010, emphasis in the original).

III. Water Supply Planning

Tennessee, like most states in the Southeast, has experienced periods of drought. Since Tennessee traditionally has had plentiful surface water and groundwater, however, water supply planning generally has not been a priority until recently.

The 2002 Water Resources Information Act authorized regional water supply planning and a Water Resources Technical Advisory Committee (WRTAC) to address the issue.

The commissioner and the board shall encourage and support regional water planning whenever possible. In the future, if there is a specific appropriation of state or federal funds for regional water supply planning, the board may require regional water supply planning and may provide incentives to encourage such regional planning, using the rulemaking authority under this part for so long as such specific appropriation is in effect. Among other criteria, state agencies are authorized to consider regional planning and regionalization efforts when awarding grants, making loans or funding projects (Tennessee Code Annotated § 69-7-308(a)).

The commissioner shall appoint a technical advisory committee, the number of members to be determined by the commissioner, that shall advise the commissioner on the status of the state's water resources and future planning efforts. The technical advisory committee shall be composed of representatives of federal, state, and local agencies and of appropriate private organizations, including not for profit organizations. No member of this committee is entitled to reimbursement for travel and other necessary expenses incurred in the performance of official duties (Tennessee Code Annotated §. 69-7-309).

The drought of 2007-2008 exposed some of the water supply vulnerabilities in the state, as river flows reached historic lows in parts of east and middle Tennessee and affected water supply in some areas. To ensure adequate supply, a few public water suppliers had to arrange for interconnections to other suppliers. Wells in some isolated areas dried up as groundwater levels dropped. The drought precipitated a renewed interest in water supply planning in Tennessee.

The Water Resources Technical Advisory Committee

The WRTAC was formed in 2007 to address two issues: (1) to update Tennessee's 20-year-old Drought Management Plan, and (2) to pilot a regional water supply planning process. The TDEC divisions of Water Supply and Water Pollution Control collaborated to lead this effort (Paul Davis, personal communication, September 10, 2009). Tom Moss said that since the WRTAC was mandated by legislation, it would be a standing committee with the current makeup and would meet regularly to address ongoing water resources issues (Tom Moss, personal communication, October 1, 2009).

The 2009 Drought Management Plan

The 1987 Drought Management Plan was updated by the Division of Water Supply and WRTAC during 2007-08 and was adopted by TDEC in February 2009. As stated in the plan (p.3), its purpose is as follows:

to outline TDEC's role during a drought, to facilitate planning, and to provide a framework for action and cooperation in water resources management among the many local, state, and federal agencies with drought related responsibilities.

The plan addresses the roles and responsibilities of

- TDEC;
- WRTAC;
- other state agencies, specifically the TN Emergency Management Agency, the TN Department of Agriculture, The TN Wildlife Resources Agency, the TN Department of Transportation, and the TN Advisory Commission on Intergovernmental Relations;
- federal agencies, specifically the U. S. Army Corps of Engineers, the U.S. Geological Survey, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the Rural Development program within the U.S. Department of Agriculture;
- Tennessee Valley Authority;
- community water systems;
- local governments; and
- the private sector.

The plan concludes with the following statement (p. 30):

Future plans should examine more fully a process for dealing with water use conflicts, declaring "limited" or regional water conservation emergencies and providing more detailed guidance in the development of local and user specific water shortage management plans. Future planning for drought management should allow for full participation by public water systems, industry, the agricultural community, TVA, the Corps of Engineers, and other users in a "regional" planning setting whereby standards, regulations, procedures and plans might be developed to address specific needs and issues.

Pilot Regional Water Supply Planning

TDEC's process for regional water supply planning was presented to the WRTAC in a paper, *Components of a Regional Water Resources Plan*, in June 2008. The paper was prepared by the divisions of Water Supply and Water Pollution Control. The WRTAC had an opportunity to comment on it, and their recommendations were incorporated (Paul Davis, personal communication, September 10, 2009). As the process evolved, it had 10 tasks, according to a "Regional Water Resources Project Plan" dated February 20, 2009:

1. Justification and Administration of Plan
2. Detailed Description of Planning Region
3. Current Use
4. Resource Availability

5. Projections & Competing Uses
6. Alternatives & Recommended Plan
7. Cost Structure & Economics
8. Infrastructure
9. Land-Use Planning
10. Community Planning, Facilitation & Outreach

Because of their vulnerability during droughts, the following two study areas were chosen by TDEC and the WRTAC to pilot regional planning:

- **The North Central Study:** This study focuses on several public water utilities in Sumner County and eastern Robertson County, including the Castalian Springs-Bethpage, Gallatin, Portland, Westmoreland, and White House utilities.
- **The Southern Cumberland Plateau Study:** This study focuses on parts of several counties – Franklin, Grundy, Marion, and Sequatchie – in the southern Cumberland Plateau region, and on the Big Creek, Monteagle, Tracy City, and Sewanee public water utilities serving this area.

The COE signed a cooperative agreement with TDEC to conduct the initial phases of the studies, with substantial input from others on the Water Resources Regional Planning Team (including representatives of state agencies – TDEC, TACIR, Agriculture, Economic and Community Development, and the Tennessee Wildlife Resources Agency; federal agencies – USGS, TVA, and the US Department of Agriculture’s Rural Development program; universities – the University of Tennessee, Knoxville, and Tennessee Technological University; non-profits – the Land Trust for Tennessee and The Nature Conservancy of Tennessee; and utility- or water-related organizations – the Tennessee Association of Utility Districts, the Water Authority of Dickson County, the Watauga River Regional Authority, and the Tennessee Duck River Development Agency). As of late 2009, the pilot studies were well underway but not yet complete (U.S. Army Corps of Engineers presentations, December 4, 2009, http://tn.gov/environment/regionalplanning/pdf/no_central_usace_pilot120409.pdf and http://tn.gov/environment/regionalplanning/pdf/so_cumberland_usace_pilot120409.pdf).

According to Tom Moss, future regional plans may include more focus on alternative water supplies, but water supplies should not outstrip the capability of wastewater treatment plants to handle additional supply. For this reason, the divisions of Water Supply and Water Pollution Control will work together to ensure that wastewater treatment is adequate for additional supply (Tom Moss, personal communication, October 1, 2009).

A bill was introduced in 2008 and again in 2009 that would have required utilities to prepare local water supply plans and TDEC to prepare regional water supply plans. The bill, which would have established a fund to help support water supply planning, died in committee both years. According to Tom Moss, failure to enact this legislation was primarily due to the economy and the legislature’s reluctance to fund the bill.

Sources

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Tennessee Department of Environment and Conservation. Water Resources Regional Planning web page, with links to various documents. On-line at <http://tn.gov/environment/regionalplanning/index.shtml#link>

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Appendix:

Water Resources Information Act of 2002 (T.C.A. 69-7-301 to 309)

69-7-301. Short title. —

This part shall be known and may be cited as the “Tennessee Water Resources Information Act.”

[Acts 2002, ch. 800, § 2; T.C.A. § 69-8-301.]

69-7-302. Legislative intent — System of registration. —

The general assembly recognizes that in other states the withdrawal of ground water has caused the lowering of the ground water table and that there is potential for ground water or surface water withdrawals to impact water uses in Tennessee. Therefore, it is necessary and prudent to institute a system of registration so that adequate information is obtained to document current demand for water and to project growth in that demand as applicable to §§ [69-7-303](#) — 69-7-309.

[Acts 2002, ch. 800, § 3; T.C.A. § 69-8-302.]

69-7-303. Part definitions. —

As used in this part, unless the context otherwise requires:

(1) “Board” means the water quality control board established pursuant to § [69-3-104](#);

(2) “Commissioner” means the commissioner of the department of environment and conservation, the commissioner's duly authorized representative and, in the event of the commissioner's absence or a vacancy in the office of commissioner, the deputy commissioner of environment and conservation;

(3) “Person” means any individual, corporation, company, limited liability company, partnership, association, group, utility district, federal, state or local government agency, or any combination of them;

(4) “Source” means a location where surface or ground water is available, including, but not limited to, a water well, cave, spring, stream, river, lake, or impoundment; and

(5) “Withdraw” means to take water from any source on a regular or recurring basis by means of an intake structure, pipe and pump that diverts water away from a source, or by any other conveyance with or without the use of suction. This does not include nonrecurring withdrawals, including, but not limited to, the filling of a swimming pool from a residential water well or accidental withdrawals caused by failure of pipes or

equipment.

[Acts 2002, ch. 800, § 4; T.C.A. § 69-8-303.]

69-7-304. Registration of withdrawal from surface water or groundwater source — Exceptions. —

Except as provided in subdivisions (2) and (3), no person shall withdraw ten thousand (10,000) or more gallons of water per day from a surface water or a groundwater source unless the withdrawal is currently registered with the commissioner. The commissioner shall accept a recognized method of measuring the quantities of water withdrawn.

(1) Any person who causes such a withdrawal, or proposes such a withdrawal shall annually register such water withdrawal with the commissioner on forms provided for the purpose. For water wells drilled pursuant to § [69-10-101](#), the initial withdrawal may be registered by the well driller, on behalf of the person causing or proposing the withdrawal, by providing the required information, including an estimate of the withdrawal amount, with the notification of the intent to drill a well and by verifying or modifying, or both, the information when the report of well driller is delivered to the commissioner. Subsequent withdrawals from water wells shall be registered annually by the person who causes such a withdrawal, or proposes such a withdrawal.

(2) A person may withdraw water for emergencies involving human health and safety without having first registered the withdrawal, provided it is not done on a regular or recurring basis.

(3) A person may withdraw water for agricultural purposes without having registered the withdrawal. If a person withdraws water for agricultural purposes and another purpose, the water used for agriculture shall not count towards the calculation of whether the withdrawal exceeds ten thousand (10,000) gallons per day. For purposes of this part, “agricultural purposes” shall mean use in the production or harvesting of an agricultural product, including, but not limited to, irrigation of crops, nursery stock production as defined at § [43-1-112](#), and watering of poultry or livestock.

[Acts 2002, ch. 800, § 5; T.C.A. § 69-8-304.]

69-7-305. Powers of commissioner. —

The commissioner has the power to:

(1) Annually collect and compile water quantity data and other quantity information, including data and information on uses of water and well data, and to develop registration and other forms for these purposes. Additionally, if requested and if it is deemed necessary by the commissioner to protect trade secret information as defined in § [47-25-1702](#), the commissioner shall keep such trade secret information confidential;

(2) Accept forms and data provided by a municipality that has adopted home rule

pursuant to Tenn. Const., art. [XI](#), § [9](#), or any county operating under a county charter form of government, as part of the annual registration or data collection process, or both;

(3) Pursuant to § [69-7-302](#), make inspections and investigations, collect samples pursuant to a water quantity inspection or investigation, carry on research, or take such other action as may be necessary to carry out the provisions of this part, rules and regulations issued pursuant to this part, and any orders that the commissioner may issue;

(4) Enter or authorize the commissioner's agents to enter at all reasonable times upon any property other than dwelling places for the purpose of conducting investigations or studies or enforcing any of the provisions of this part;

(5) Bring suit in the name of the department for any violation of the provisions of this part, rules and regulations, and orders of the commissioner seeking any remedy provided in this part, rules and regulations and orders of the commission, and any other statutory or common law remedy provided in statutory or common law;

(6) Assess civil penalties for violation of any provision of this part or any rule, regulation, standard adopted or order issued by the commissioner pursuant to this part;

(7) Issue orders as may be necessary to secure compliance with the provisions of this part, as well as the rules and regulations adopted pursuant to this part; and

(8) Exercise general supervision over the administration and enforcement of this part and all rules and regulations promulgated under this part.
[Acts 2002, ch. 800, § 6; T.C.A. § 69-8-305.]

69-7-306. Rules — Rulings in contested cases. —

(a) The board has the authority to promulgate the rules, other than rules establishing fees, that it deems reasonable and necessary to effectuate the purposes of this part, in accordance with the Uniform Administrative Procedures Act, compiled in title [4](#), chapter 5.

(b) The board has the authority to conduct and make all rulings in contested cases under this part.

[Acts 2002, ch. 800, § 7; T.C.A. § 69-8-306.]

69-7-307. Violations — Orders — Penalties — Hearings — Injunction. —

(a) (1) Whenever the commissioner has reason to believe that a person is withdrawing water without having a valid registration, or has supplied false or materially misleading information to the department or has violated any order or rule promulgated pursuant to this part, the commissioner may cause a written administrative order to be delivered to the alleged violator. The order shall specify the provision of this part or rule or order alleged to be violated, the facts alleged to constitute a violation thereof, and may order

that corrective action be taken within a reasonable time to be prescribed in such order, and shall inform the violators of the opportunity for a hearing.

(2) Any such order shall become final and not subject to review unless the person or persons named in the order request by written petition a hearing no later than thirty (30) days after the date such order is delivered; provided, that the board may review such final order on the same grounds upon which a court of the state may review default judgments.

(b) Except as otherwise expressly provided, any order issued by or under authority of this part may be served on any person by the commissioner or any person designated by the commissioner, by certified mail, or in accordance with Tennessee statutes authorizing service of process in civil actions.

(c) Any person who violates or fails to comply with any provision of this part, any order of the commissioner or board issued pursuant to this part or any rule, regulation, or standard adopted pursuant to this part shall be subject to a civil penalty of not less than fifty dollars (\$50.00) nor more than seven thousand five hundred dollars (\$7,500) per day for each day of violation. Each day such violation continues is a separate violation.

(d) In addition to the commissioner bringing an action in any court of competent jurisdiction, a civil penalty may be assessed in the following manner:

(1) The commissioner may issue an assessment against any person responsible for the violation;

(2) Any person against whom an assessment has been issued may secure a review of such assessment by filing with the commissioner a written petition setting forth the grounds and reasons for the objections and asking for a hearing before the board in the matter involved. If a petition for review of the assessment is not filed within thirty (30) days after the date the assessment is served, the violator shall be deemed to have consented to the assessment and it shall become final;

(3) Whenever any order or assessment has become final because of a person's failure to appeal the commissioner's order or assessment, the commissioner may apply to the appropriate court for a judgment and seek execution of such judgment. The court, in such proceedings, shall treat the failure to appeal such order or assessment as a confession of judgment in the amount of the assessment; and

(4) In assessing a civil penalty, the following factors may be considered:

(A) The harm done or potential for harm to the public health or the environment;

(B) The harm done or potential for harm to the regulatory program by the violation;

(C) The economic benefit gained by the violator;

(D) The amount of effort put forth by the violator to avoid or to remedy the violation; and

(E) Any unusual or extraordinary enforcement costs incurred by the commissioner.

(e) Any hearing or rehearing brought before the board shall be conducted in accordance with the Uniform Administrative Procedures Act, compiled in title [4](#), chapter 5.

(f) The commissioner may also initiate an action in any court of competent jurisdiction seeking a judgment for any unpaid penalties.

(g) When there is reason to believe that a person has violated, or is about to violate, any of the provisions of this part or orders issued under this part, the commissioner may institute proceedings in the appropriate court for injunctive relief.

(h) Any person intentionally violating, or failing, neglecting, or refusing to comply with, any of the provisions of this part or rules or regulations commits a Class C misdemeanor. Each day upon which such violation occurs is a separate offense.

[Acts 2002, ch. 800, § 8; T.C.A. § 69-8-307.]

69-7-308. Regional water planning — Models — Report. —

(a) The commissioner and the board shall encourage and support regional water planning whenever possible. In the future, if there is a specific appropriation of state or federal funds for regional water supply planning, the board may require regional water supply planning and may provide incentives to encourage such regional planning, using the rulemaking authority under this part for so long as such specific appropriation is in effect. Among other criteria, state agencies are authorized to consider regional planning and regionalization efforts when awarding grants, making loans or funding projects.

(b) The general assembly recognizes that the Duck River development agency, compiled at title [64](#), chapter 1, part 6, and the Mississippi, Arkansas, Tennessee regional aquifer study are potential models for regional planning and modeling efforts. By January 1, 2003, the Duck River development agency and the Mississippi, Arkansas, Tennessee regional aquifer study shall report to the general assembly their findings and lessons learned. All state agencies are encouraged to cooperate with these agencies.

[Acts 2002, ch. 800, § 9; T.C.A. § 69-8-308.]

69-7-309. Technical advisory committee. —

The commissioner shall appoint a technical advisory committee, the number of members to be determined by the commissioner, that shall advise the commissioner on the status of the state's water resources and future planning efforts. The technical advisory committee shall be composed of representatives of federal, state, and local agencies and of appropriate private organizations, including not for profit organizations. No member of this committee is entitled to a salary for duties performed as a member of the committee. No member is entitled to reimbursement for travel and other necessary

expenses incurred in the performance of official duties.
[Acts 2002, ch. 800, § 10; T.C.A. § 69-8-309.]

DRAFT

Florida

Highlights

Florida's approach is unique in the Southeast; it gives broad powers to regional water management districts. Their powers and responsibilities include

- levying property taxes to raise revenue,
- regulating water supply, water quality, waste water, and storm water,
- controlling water allocation through water use permits,
- managing state funds for land acquisition in surface headwater areas and groundwater recharge areas, and
- assisting local governments with comprehensive planning efforts to ensure future water availability.

I. Introduction

The topography of northern Florida, with its hills, forests, lakes, and streams, differs greatly from the southern peninsula, which is primarily flat with vast expanses of wetlands. Underlying Florida is a system of aquifers that supply 90 percent of the state's drinking water and about 50 percent of the water used for agriculture. The coastal areas contain most of the state's population while the interior is largely agricultural.

Until 1972, Florida water regulation was based solely on the traditional common law riparian doctrine. The Florida Water Resources Act of 1972 included a provision blending the riparian doctrine with appropriative rights doctrine by stating that water rights are subject to reasonable-beneficial use. This provision was included based on recommendations stemming from a late-1960s study by University of Florida water resources experts, published as *A Model Water Code*. Reasonable-beneficial use is defined in the 1972 act as

the use of water in such quantity as is necessary for economic and efficient utilization for a purpose and in a manner which is both reasonable and consistent with the public interest (F.S. 373-019(16)).

II. Florida's Water Management Districts

The 1972 Water Resources Act created five water management districts (WMDs) divided along hydrologic (watershed) boundaries. The WMDs were given the power to manage water resources, set policy, and levy taxes to fund operations. These powers were specified in the statute's statement that

The Legislature recognizes that the water resource problems of the state vary from region to region, both in magnitude and complexity. It is therefore the intent of the Legislature to vest in the Department of Environmental Protection or its successor agency the power and responsibility to accomplish the conservation, protection, management, and control of the waters of the state and with sufficient flexibility and discretion to accomplish these ends through delegation of appropriate powers to the various water management districts. The department may exercise any power herein authorized to be exercised by a water management district; however, to the greatest extent practicable, such power should be delegated to the governing board of a water management district (F.S. 373.016(5)).

The five WMDs are

- Northwest Florida,
- Suwannee,
- St. Johns River,
- South Florida, and
- Southwest Florida.

Members of the WMDs' governing boards are appointed by the governor to four-year terms subject to confirmation by the senate. The senate has never turned down an appointee. When a vacancy occurs on a board, the replacement may be recruited by the governor or chosen from recommendations by current board members or special interest groups. Individuals also may apply; however, appointments are not a public process and are made solely at the discretion of the governor (Tom Swihart, personal communication, July 7 and 10, 2009). According to the 1972 act, board members must have experience in agriculture, the development industry, local government, government-owned or privately owned water utilities, law, civil engineering, environmental science, hydrology, accounting, or financial businesses.

Each WMD board has nine members except the Southwest Florida WMD board, which has 13. Members of the governing boards serve on a voluntary basis and may be reappointed to one additional four-year term. Terms of office of board members are staggered.

In the Northwest Florida, Suwannee, and St. Johns River WMDs, five members are appointed from groups of designated smaller basins within the WMD and must be residents of the basins they represent. Four members are appointed at large and must reside within the WMD. In the South Florida WMD, seven members are appointed to represent specific counties or groups of counties and must reside in the county they are appointed to represent. Two members are appointed at large. In the Southwest Florida WMD, all 13 members are appointed to represent specific counties or groups of counties and must reside in the counties they represent.

The Southwest Florida WMD, which includes the Tampa-St. Petersburg area, is subdivided into eight smaller basins. Seven of the eight basins have basin governing boards to provide guidance for basin-specific programs and projects. The eighth basin, the Green Swamp, is the headwaters of four major rivers and is governed by the WMD board. Each basin board has three members appointed by the governor, subject to confirmation by the Senate, to three-year terms and may be reappointed. Basin board members must reside in the basin, and no more than one member may be from the same county. Additionally, one basin board member sits on the 13- member governing board of the WMD.

The WMD governing boards are responsible for policy decisions concerning their districts. An executive director is appointed by the board, subject to senate approval during the next legislative session. The executive director is responsible for hiring staff and has oversight of the district's day-to-day operations. WMDs may have as many as 100 staff members.

The Department of Environmental Protection (DEP) has oversight responsibility for the five districts, but because of the broad powers given to the districts by the 1972 statute, the districts manage most of the state's water quantity and quality programs. The districts develop water management plans; they also administer the state's program to regulate the consumptive use of water, aquifer recharge, well construction, and storm water. In addition, each WMD must have a land acquisition program to protect critical resource areas such as surface headwater areas and groundwater recharge areas.

WMD Board Responsibilities

WMD boards have the following responsibilities:

- promote conservation of water and land related resources
- oversee the proper use of ground and surface water resources
- regulate dams, impoundments, reservoirs and other structures that alter the flow of surface water
- combat flood, erosion, and excessive drainage damage
- assist local governments in developing comprehensive water management plans
- maintain navigable rivers and harbors

- promote the health, safety, and general welfare of the people of the state (including implementing water shortage emergency plans)
- participate in flood control programs
- establish minimum flows for surface waters and minimum levels in aquifers

In addition, each WMD has responsibility for permitting wells, the management and storage of surface waters, and the consumptive use of water.

WMD Funding

Funding sources for WMDs are specified in the 1972 statute. The WMD boards have property taxation authority and annually advise counties in their districts of the rate to be applied. The boards also can charge for water delivered to public and private utilities and industries within the districts. Part of these revenues is shared with the state to develop alternative water supplies. District boards also have the authority to issue general obligation and revenue bonds. In fiscal year 2007, budgets for the five WMDs ranged from \$85 million to nearly \$1.4 billion.

The basin boards within the Southwest Florida WMD have the statutory authority to levy a maximum property tax rate of 0.5 mills (i.e., 50 cents for every \$1,000 of assessed property value). This is their primary source of revenue.

Another source of income for the WMDs has been the Florida Forever Program. This program was created by the Florida Forever Act of 1999, which established the Florida Forever Trust Fund. The legislature allocated \$300 million annually to the fund for 10 years. Thirty percent of the money went to the five WMDs, of which 50 percent had to be spent on land acquisition – in other words, \$18 million annually per district, of which \$9 million annually per district had to be spent on fee simple land acquisition. The other 50 percent was allocated to alternative water supply projects. As of June 2008, 627,500 acres of land had been preserved by the WMDs and by state agencies with funds from the Florida Forever Program at a cost of \$2.5 billion.

Water Supply Planning

Water supply planning in Florida is conducted at three levels: county, regional, and district.

County plans. Counties in Florida are required to develop long-range plans that include, among other elements, population, future land use, and residential/commercial growth projections; water supply plans; and natural resource protection plans. Plans are developed for five-year and 10-year horizons. By statute, water supply portions of the plan must include a general sanitary sewer, solid waste, drainage, potable water, and

natural groundwater aquifer recharge element correlated to principles and elements for future land use. The county plans are used in the preparation of regional and district plans.

Regional water supply authorities. In 2005, the Florida Legislature passed Senate Bill 444 allowing WMDs to establish regional water supply authorities within their districts. A regional authority is created for areas where water demand projections exceed water supply for a 20-year horizon; the authorities are established by inter-local government agreements and are designed to assure that areas with inadequate projected water supplies can meet future needs. The authority functions as a regional utility, must obtain a water use permit from the WMD, and must conform to the WMD long-range water supply plan to be eligible for WMD funding.

District plans. Water supply planning is conducted on a five-year cycle by the WMDs for a 20-year horizon. WMDs use data from local government and regional water supply authorities to develop their district plans.

By statute, the plans must include a quantification of the water supply needs for all existing and future reasonable-beneficial uses within the planning horizon. Those needs must be based on population projections and must meet a 1-in-10-year drought event. It is recommended in the statute that the WMDs use data provided by the University of Florida's Bureau of Economic and Business Research (BEBR). Local government projections also may be used, but any deviation from BEBR projections must be fully documented.

The statute requires that planning be conducted in an open public process, in coordination and cooperation with local governments, regional water supply authorities, government owned and privately owned utilities, multijurisdictional water supply entities, self suppliers, and other affected and interested parties. One public meeting is required before completion of the plan and an unspecified number of public meetings throughout the district after completion.

Growth Management

Another important section of the 2005 act based on Senate Bill 444 linked growth to water supply by providing that

prior to the approval of a building permit or its functional equivalent, the local government shall consult with the applicable water supplier to determine whether adequate water supplies to serve the new development will be available no later than the anticipated date of issuance of the local government of a certificate of occupancy or its functional equivalent.

According to Mark Howard in his article “No Water, No Growth,” Senate Bill 444 dictates that after WMDs determine how much water will be available in a region, communities must plan their growth around that supply. The law was to be incorporated into the next rounds of comprehensive plans by local governments; its effects were expected to be felt in the summer of 2008.

III. Inter-basin Transfers

Inter-basin transfers between WMDs are allowed but must be approved by the boards of all the WMDs involved. Any interested party can appeal an inter-basin transfer agreement between WMDs. If an appeal is filed, DEP has an appellate process that is based on water use permits issued within the WMDs involved. At present, the only inter-basin transfer between WMDs is in Orlando, which is located at the intersection of three WMDs. No other inter-basin transfer has been sought, and the appeal process has not been tested.

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Georgia

Highlights

Georgia, like several other southeastern states, experienced drought in the late 1990s and early 2000s. Coupled with population growth, this spurred attention to water supply needs. Georgia's response has included the following actions:

- Creating the 15-county Metropolitan North Georgia Water Planning District (WNGWMD) in 2001. Its 2003 water supply and conservation plan was the first regional water plan in the state. The WNGMDP has its own staff and funding; it is responsible for plan implementation.
- Creating 10 other water planning regions in addition to the WNGWMD. These regions roughly follow major basin boundaries; each has a regional water council and each will develop a water development and conservation plan.
- Laying the groundwork for a statewide water management plan, including creating the Georgia Water Council, which oversees the plan's development.

I. Introduction

Georgia's water law has been based on a "regulated riparian" doctrine. Serious examination of the state's water policy began about 15 years ago. In the mid-1990s, the Georgia Water Management Campaign – a partnership between the Georgia Association County Commissioners, the Environmental Protection Division (EPD) within the state's Department of Natural Resources, the Georgia Municipal Association, and the Georgia Environmental Facilities Authority – was formed to consider state water policy.

From 1998 to 2002, Georgia experienced a severe drought that increased awareness of water-related problems, particularly in the Metro Atlanta area. In 2000 the Metro Atlanta Chamber of Commerce and the Regional Business Coalition formed a task force called the Clean Water Initiative. The final report of the Clean Water Initiative recommended creating a Metro Atlanta water planning district for DeKalb County and surrounding counties. Recommendations from the final report formed the basis for legislation introduced by the governor to the general assembly in 2001.

In 2001, the general assembly passed Senate Bill 130, which authorized creating the Metropolitan North Georgia Water Planning District (MNGWPD) and mandated that the district prepare a water supply and water management conservation plan. The plan, which was adopted in 2003, was the first regional water plan in the state.

Also in 2001, the general assembly enacted State Resolution 142 creating the Joint Water Study Plan Committee. The study committee's focus was to develop a framework for a comprehensive statewide water management plan and to address water-related issues that needed clarification for the planning process to move forward. The *Final Report of the Joint Comprehensive Water Plan Study Committee* issued in August 2002 contained 33 recommendations to be included in a statewide plan.

In 2004, House Bill 237 mandated developing a comprehensive statewide water management plan. The plan, which was adopted by the legislature in January 2008, calls for 11 regional water development and conservation plans, one of which is for MNGWPD. Development of regional plans is currently underway. In addition, an executive order by Governor Perdue directed the Department of Natural Resources to develop a statewide water conservation implementation plan in consultation with other organizations, including but not limited to other state agencies; the plan was released in May 2009.

II. Metropolitan North Georgia Water Planning District

In 2001 the Georgia state senate passed Senate Bill 130 authorizing the creation of the MNGWPD using guidance from the final report of the Clean Water Initiative, a study completed in 2000 by the Atlanta Chamber of Commerce and the Regional Business Coalition. SB 130 laid out specific criteria for the creation of the district and mandated that its water supply and water conservation management plan be in place in by 2003.

The district includes 15 counties in north Georgia. The counties are located within parts of six major river basins.

Water Supply and Water Conservation Management Plan

The purpose of the plan is to present a 30-year strategy for addressing water service needs in the district. It is to be reviewed annually by the district and updated every five years. The district's population is expected to increase significantly over the next few decades. To address a growing water need, the district anticipates a future of intensive management of water resources and an increasing reliance on recycled water. The overall goal of the plan is to meet projected water demands without compromising environmental and downstream needs.

The 2003 plan was updated in May 2009. The 2009 plan contains the following elements:

Section 1:	Introduction
Section 2:	Existing Water Supply and Treatment Conditions
Section 3:	Water Demand Forecasts
Section 4:	Water Conservation Analysis
Section 5:	Water Conservation Program
Section 6:	Water Supply Sources
Section 7:	Reuse
Section 8:	Planned Water Supply Facilities
Section 9:	Local Water Planning
Section 10:	Water Resources Issues
Section 11:	State and Regional Policy Recommendations
Section 12:	Education and Public Awareness
Section 13:	Implementation Plan
Section 14:	Future Plan Evaluation

The planning process included the district governing board, a technical coordinating committee, six basin advisory councils, the EPD, planning staff from the Atlanta Regional Commission, and technical consulting firms. Key elements of updating the 2003 plan included extending the planning horizon from 2030 to 2035; reviewing and updating water conservation measures, water demand forecasts, and existing and potential water sources; and ensuring compatibility with the 2008 Statewide Water Management Plan.

As mandated by the 2001 legislation establishing the district, the Water Supply and Water Conservation Management Plan has two companions:

a **watershed management plan**, which details strategies and recommendations for effective watershed and storm water management and for water quality protection; and

a **wastewater management plan**, which sets forth strategies for comprehensive wastewater management efforts including a long-term implementation schedule for public wastewater treatment, provisions for comprehensive wastewater planning to establish future sewer service areas, and identification of the need for more intensive management of private septic systems.

Current Water Resources Issues

Section 10 of the district's 2009 Water Supply and Water Conservation Management Plan identified the following water resources issues:

- **Federal operation of Lake Lanier and Allatoona Lake**
- **Water quantity issues**, including:
 - Consumptive use
 - Reservoir storage reliability
 - Regulation of small water withdrawals
 - In-stream flow protection policy
 - Emergency and drought planning issues
 - Climate change impacts
- **Water quality issues**, including
 - Water treatment standards
 - Groundwater treatment rule
 - Chemicals of concern
 - Sedimentation of stream and river intakes

The issues surrounding the federal operation of Lake Lanier (a Chattahoochee River reservoir) and Allatoona Lake (an Etowah River reservoir) are particularly contentious. The district's 2009 Water Supply and Water Conservation Management Plan notes that:

Lake Lanier and Allatoona Lake have played a key role in assuring an adequate water supply for the Metro Water District since their construction by the U.S. Army Corps of Engineers (Corps) in the 1950. ... This Plan assumes that the federal reservoirs will continue to operate to meet water supply needs within the Metro Water District consistent with the guidance about future yield expectations provided by Georgia Environmental Protection Division (Georgia EPD). ... after reviewing alternatives to the use of the federal reservoirs, *the Metro Water District has concluded that there are no alternatives to the Chattahoochee River and the Etowah River as major water supply sources for north Georgia* (p.10-1, emphasis in the original).

Of the two reservoirs, Lake Lanier is by far the most important to Georgia's water supply, and it is also the most controversial. For the past 20 years Georgia, Alabama, and Florida have been in a legal dispute over the use of waters in Lake Lanier. Alabama and Florida have contended that Lake Lanier was not built for the purpose of water supply: Alabama wants increased releases for power plant cooling; Florida wants to insure adequate supply at the mouth of the Appalachian River to sustain aquatic life. In July 2009 a federal judge ruled in favor of Alabama and Florida. A July 17, 2009 article in *The New York Times* reported that "a federal judge ruled against Georgia in the state's water dispute with Alabama and Florida, deciding that Atlanta must stop withdrawing water from a massive federal reservoir within three years unless it can get approval from Congress. The judge, Paul A. Magnuson of Federal District Court, said that Lake Lanier had not been built for water supply and that the state's withdrawals were illegal." In October 2009, Judge Magnuson refused to hear an appeal of his decision.

According to Doug Baughman, a Senior Scientist with CH2M HILL who is involved in the regional water planning efforts in Georgia, the primary remedy being discussed by EPD is to accelerate the construction of new reservoirs to replace withdrawals from Lake Lanier (Doug Baughman, personal communication, July 28, 2009).

III. Georgia Comprehensive Statewide Water Management Plan, 2008

Overview

The 2004 Comprehensive Statewide Water Management Planning Act mandated that EPD develop a statewide water plan. The legislation also created the Georgia Water Council, which had oversight in developing the plan:

The EPD used the final report of the 2001 Joint Water Study Committee to develop four major strategies for guiding the planning process. The four strategies were as follows:

- Minimize withdrawals of water by increasing conservation, reuse, and efficiency.
- Maximize returns to river basins through managing inter-basin transfers and managing on-site sewage disposal systems (e.g. septic systems).
- Address in-stream/off-stream needs through surface storage, aquifer management, and reducing water demands.
- Protect water quality by reducing discharges of pollutants and runoff from land.

In preparing the plan, EPD in conjunction with the Georgia Water Council formed basin advisory committees, a statewide advisory committee, and technical advisory committees to discuss potential water policies and management practices and to consider regional concerns. The committees decided that developing the statewide plan hinged on developing regional plans. Georgia was divided into 11 regional basins that roughly correspond to the natural basin boundaries. Each is to have a regional water development and conservation plan.

Regional Water Development and Conservation Plans

Regional plans are to be developed with guidance from EPD in consultation with local governments and major water users in the region. The plans are to include planning for areas on the periphery as well as at the heart of the region.

To guide the regional planning processes, water resource assessments are being conducted by EPD and their consultants. Each assessment is to include the following:

1. **A consumptive use assessment.** This assessment will identify the total amount of readily available water that can be withdrawn from a system in a dry year and still meet its in-aquifer needs or flow regime requirements.
2. **An assimilative capacity assessment.** This assessment will identify the amount of a contaminant load that can be discharged to a specific waterbody without exceeding water quality standards or criteria.

To identify future water challenges, each regional planning council will develop 10-year, 20-year, 30-year, and 40-year forecasts of water supply demands and assimilative capacity demands, using regional population and employment estimates as well as information on land surface types and distribution. The regional planning council, in consultation with EPD, will then prepare a water development and conservation plan that will identify regional water management practices to meet forecasted needs. The plan is to include recommendations regarding appropriate practices for storm water management, wastewater treatment, water supply management, water conservation, and water quality protection; benchmarks for assessing plan effectiveness and for identifying required revisions; and proposals for addressing data and other information needs.

The regional plans are to be completed by 2011. EPD will review each one for consistency with requirements and guidance set forth in the state plan. Every five years, the regional water planning council will review its plan and, if necessary, revise it. The review will include the following:

- An assessment of progress
- An assessment of needs for further scientific assessment
- Updates, where necessary, of water supply and wastewater forecasts
- Recommended changes to the plan

Once adopted, the plans will be implemented by the region's permitted water users, including local governments and others with the capacity to develop water infrastructure. Unlike the other regional water planning councils, the MNGWPD has direct responsibility for implementation of its plan. The WNGWPD operates on a budget of approximately \$1 million per year funded (approximately 80/20) by a yearly 15 cent per capita fee and by state appropriation.

The development of the 2003 WNGWPD was funded by an 80 cent per capita fee. Otherwise, funding for the state and regional plans – about \$36 million – is through the Georgia Environmental Facilities Administration using State Revolving Fund monies. Consultants were hired in 2008 to begin the water resource assessments and in early 2009 to develop the regional plans. Approximately \$20 million will be spent on consultants (Rick Brownlow, personal communication, February 20, 2009).

Integrated Water Policy

Historically, Georgia's water *quality* policies have been driven by federal mandates while its water *quantity* policies have been driven by state legislation. The state plan notes, however, that water quality and quantity are interrelated, as are surface water and groundwater; they thus require integrated planning. The 2008 state plan establishes an integrated water policy based on the premise that water resources have certain capacities to provide water for off-stream users and to assimilate pollution, and that water withdrawals can and do affect other water users.

Water quantity policy. The state's water quantity policy is to manage current and predicted consumptive use on the basis of defined hydrologic systems of surface water and groundwater, so that sufficient amounts remain within a system to allow all users and uses reasonable opportunities to benefit. The policy recognizes that water resource assessments will require defining hydrologic units and geographic boundaries of watersheds and sub-basins and then determining the water system's consumptive uses and sustainable yields. Although state statutes allow inter-basin transfers to meet needs in areas facing scarce water resources if the transfer does not unreasonably foreclose opportunities for water use in the donor basin, inter-basin transfers will not be allowed until consumptive use assessments are complete.

The water quantity policy recognizes that a comprehensive accounting of aquifer yields may be unduly time-consuming and costly. Therefore, variables to be considered for an aquifer include its functional characteristics, evidence of adverse effects due to withdrawals, and the likelihood of significant increases in withdrawals. If a consumptive use assessment cannot be done in a reasonable amount of time, EPD will establish the range of additional withdrawals that will be allowed over each subsequent decade until the assessment can be completed. EPD also may develop a protocol for aquifer storage and recovery (ASR) – a process in which water is recharged through a well into an aquifer and later withdrawn.

According to the water quantity policy, water conservation and reuse will be high-priority water management practices across the state.

Water quality policy. Pollution of water resources comes from both point and non-point sources. According to the water quality policy, to improve pollution management EPD will consider

- improving compliance,
- managing non-point source pollution,
- coordinating the environmental planning activities of state and local governments,
- regulating on-site sewage management systems, and
- developing and applying innovative tools such as watershed permitting and water quality trading.

According to the water quality policy, waste-load allocations will be updated to (1) assess current and future needs for assimilative capacity on a watershed basis, and (2) identify gaps between future assimilative capacity needs and the assimilative capacity available to meet those needs. EPD will manage assimilative capacity on a watershed basis by placing conditions on discharge permits. These conditions also will help guide the water development and conservation plan for the region in which the watershed lies. Gaps between available and needed assimilative capacity will be addressed by appropriate management practices in the regional plans. Water quality management practices will be implemented at the local level.

The Board of Natural Resources establishes surface water quality standards. EPD will explore improving the standards for dissolved oxygen and bacteria and revising the designated use categories, for example, by including a new classification of Significant Natural Resource Waters with actions to protect these waters.

To help manage storm water effectively and increase infiltration, EPD will look at enhancing and expanding existing programs in post-construction storm water control, quality growth and low-impact development, green infrastructure planning, and land conservation and open space protection.

IV. The Water Conservation Implementation Plan (WCIP), December 2008 draft

The WCIP was mandated as an implementation action in the 2008 state plan and by executive orders in October 2007 and October 2008 by Governor Perdue. EPD was directed to prepare the WCIP with help from multiple stakeholders and guidance from the Department of Natural Resources. It is to be reviewed and revised every five years.

According to the WCIP (p. 14), water conservation is defined as “the beneficial reduction of water use, water waste, and water loss.” The goals of the WCIP are to educate and empower Georgia’s water users; to create incentives for water use efficiency; to measure water efficiency, including improving data collection, monitoring, research, and evaluation; and to plan for the future.

The WCIP provides guidance to help Georgia’s seven major water user sectors effectively implement water conservation practices statewide. The sectors are: agricultural irrigation, electricity generation, golf courses, industrial and commercial uses, landscape irrigation, domestic and non-industrial public uses, and state agencies. In addition to informing the water user sectors about individually attainable conservation goals and recommending actions that can be taken by sector-affiliated associations and organizations, the WCIP will help the regional water councils in their preparation of

regional plans and will serve as a resource for water withdrawal permit applicants. Major elements of the WCIP include

- water conservation goals – sector--specific, long-term aspirations for water use and efficiency;
- benchmarks -- quantifiable metrics of efficiency;
- best practices – a menu of options water users can use to reach benchmarks; and
- implementation actions – for example, providing financial assistance or developing technical guidance that can be taken to agencies, associations, organizations, or other groups to support the implementation of practices.

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Appendix:

Legislation, 2001-2004

Senate Bill 130, 2001

Passed in 2001 by the general assembly, Senate Bill 130 is known as the Metropolitan North Georgia Water Planning District Act. This act established the MNGWPD and gave specific instructions regarding its mission and development of its water supply and water conservation management plan. As codified in the Official Code of Georgia Annotated (O.G.C.A.), Title 12, Chapter 5, major components of the bill included the following:

O.G.C.A. 12-5-572(b) “The general purpose of the district shall be to establish policy, create plans, and promote intergovernmental coordination for all water issues in the district; to facilitate multijurisdictional water related projects, and to enhance access to funding for water related projects among local governments in the district area.”

O.G.C.A. 12-5-572(c) “It is the primary purpose of the district to develop regional and watershed specific plans for storm-water management, waste-water treatment, water supply, water conservation, and the general protection of water quality, which plans will be implemented by local governments in the district.”

O.G.C.A. 12-5-577(b) “Funding for district operations shall be derived from the following sources:

- (1) Dues paid by cities and counties within the district such that the aggregate total of all such dues from all such cities and counties shall be no less than \$1 million annually [amended to ‘no less than \$500,000 annually’].”
- (2) Appropriated or contracted state funds.

SB 130 gives EPD the right to include compliance with the plan as a condition for all permits it issues regarding water withdrawal, wastewater treatment, and NPDES Phase I and NPDES Phase II.

Senate Resolution 142, 2001

In 2001 the Georgia state senate enacted Resolution 142 creating the Joint Comprehensive Water Plan Study Committee. The committee was composed of 30 members of the House, Senate, agencies, city government, environmental organizations, and others. They were charged with undertaking a study of

“water resource issues, including water quality and quantity, facing Georgia. The committee shall consider the existing policy, laws, rules, and programs to manage water resources. The committee shall recommend a process and schedule to prepare the details

of a comprehensive water plan, develop the principles for a comprehensive water plan, and recommend any other action or legislation the study committee deems appropriate” (SR 142, p.3).

The study committee, by resolution, started meeting on June 15, 2001 and disbanded on September 1, 2002. A report of its findings and recommendations, including suggestions for proposed legislation, was due by December 1, 2001.

SR 142 also created a Water Plan Advisory Committee composed of members of the scientific, business, agricultural, commercial fisheries, environmental, outdoor recreation, and academic communities as well as watershed groups from each major basin. SR 142 instructed that the advisory committee should assist the study committee, as requested, in gathering information, preparing briefing documents and recommendations, and evaluating proposed recommendations.

The study was funded by a general assembly appropriation.

House Bill 237, 2004

The purpose of House Bill 237 was to enact the Comprehensive Statewide Water Management Planning Act. Policy statements contained in HB 237 include the following:

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

O.C.G.A. 12-5-522(5) “Water quality and quantity and surface and groundwater are interrelated and require integrated planning as well as reasonable and efficient use.”

EPD is required by the act to solicit extensive stakeholder involvement in the development of the plan including other state agencies, advocacy organizations, business organizations, local governments, and regional development centers.

The act creates a state Water Council to guide development of the plan:

O.C.G.A. 12-5-524(a) “There shall be a coordinating committee called the 'Water Council' composed of one member appointed by the Speaker of the House of Representatives who shall not be a member of the General assembly and who shall serve for a term of four years and until a successor is appointed and qualified; one member appointed by the President Pro Tempore of the Senate who shall not be a member of the General assembly and who shall serve for a term of four years and until a successor is appointed and qualified; and the following state officials who shall serve ex officio as members of the committee: the director of the division, the commissioner of natural resources, the executive director of the

State Soil and Water Conservation Commission, the commissioner of community affairs, the commissioner of human resources, the Commissioner of Agriculture, the director of the Georgia Forestry Commission, and the executive director of the Georgia Environmental Facilities Authority. In addition, the chairperson of the Senate Natural Resources and the Environment Committee, ex officio, and one additional member of that committee to be selected by its chairperson and the chairperson of the House Committee on Natural Resources and Environment, ex officio, and one additional member of that committee to be selected by its chairperson shall each serve in an advisory capacity. Any vacancy among the two appointed members of the Water Council who are not members of the General assembly other than for expiration of term shall be filled in the same manner as the original appointment for the unexpired term. The director shall serve as chairperson of the Water Council.”

The Water Council is charged with reviewing, modifying, and approving the plan and recommending it to the general assembly no later than the first day of the general assembly’s 2008 regular session. After approval by the general assembly, the plan must be reviewed and, if necessary, revised no later than July 1, 2010, and every three years thereafter.

North Carolina

Highlights

For 40 years (1967-2007), the general assembly reacted to water supply problems triggered by drought, population growth, and industrial expansion by enacting various policies as problems arose. It became apparent that this reactive, piecemeal approach was insufficient. In 2007, the general assembly authorized a comprehensive study of current policies and asked for legislative recommendations to fill gaps and integrate water policy, in order to provide an effective tool to address present and projected water needs in North Carolina. As of early 2009, a bill called the Water Resource Policy Act was before the general assembly.

At present, North Carolina's statewide water supply planning efforts revolve around local water supply plans that are updated every five years. This bottom-up approach to planning can help to provide the data to prepare a statewide water supply plan that can be adapted to changing socioeconomic and water resource conditions.

I. Introduction

North Carolina water law is based on the "riparian rights" concept but includes selective regulation of water withdrawals in areas of potential water shortage.

North Carolina has an average annual precipitation of 48 inches, and much of the state is undeveloped. Forests, cropland, and water bodies account for 83 percent of North Carolina's acreage. The state has three distinct regions:

- The Coastal Plain, which is characterized by flat terrain, swampland, estuaries, and sandy beaches. Its subsurface has layers of sediments that form a series of aquifers – the primary water source for the area. Apart from tourism, crops and livestock dominate the Coastal Plain's economy.
- The Piedmont, which lies between the Coastal Plain and the Mountain Region. The Piedmont is the state's manufacturing region and home to much of the state's population. The region is characterized by rolling hills; most of its water supply comes from reservoirs.

- The Mountain Region, which is rugged and heavily forested. Forest products are a major part of the region's economy. Water for the region is supplied by reservoirs and wells. The region includes the Eastern Continental Divide; surface waters on the divide's western side are regulated by the Tennessee Valley Authority.

During the past 40 years North Carolina's economic base has shifted from agriculture to manufacturing and services. As of 2000, the state's population was just over 8 million, up more than 50 percent from 1970. Currently, more than 110 water systems rely on inter-basin transfers, which are regulated by state statutes.

North Carolina began regulating water supply when the general assembly passed the Water Use Act of 1967. This act allows the NC Environmental Management Commission to selectively regulate water withdrawals by declaring a "capacity use area" where water supply is in danger of being depleted.

However, most water withdrawals in North Carolina are not regulated; they simply must be registered or supported by plans. Non-agricultural users who withdraw more than 100,000 gpd and agricultural users who withdraw more than 1 million gpd must register every five years with the DENR's Division of Water Resources. Local water supply plans must be compiled every five years by governments that supply more than 3,000 people or have more than 1,000 connections; private utilities are encouraged but not required to submit local water supply plans.

In North Carolina, groundwater and surface water have been managed as two separate sources; their interrelationship has not been addressed in the state's statutes and policies. This traditional lack of integration, coupled with little regulation of riparian rights and of large water withdrawals, has prompted North Carolina to reconsider its approach to water supply regulation. In 2008 a water allocation study team from the University of North Carolina, Duke University, and the Duke Nicholas Institute submitted a draft report to the NC Environmental Review Commission that resulted in legislation proposed to the state's general assembly. The bill, titled The Water Resource Policy Act of 2009, addresses issues of water resource regulation, integration, and allocation.

II. Local and State Water Supply Plans

In 1989, the general assembly passed House Bill 157, which provides for developing local water supply plans (LWSPs) and a state water supply plan.

The LWSPs

The 1989 act required local governments to submit LWSPs for approval by the Division of Water Resources. The statute stipulates that each LWSP must provide information on

present and projected population, present and projected water use in the service area, present and future water supplies, an estimate of technical assistance needed at the local level to address projected water needs, and other related information. The LWSPs are to be revised every five years.

In recent years, the LWSP information has included

- population served and water use projections (1997, 2000, 2010, 2020),
- breakdown of water use by type (residential, non-residential, sales, unaccounted-for water),
- average daily water use by month,
- surface water source data (name and location of water source, average daily withdrawal, safe yield, on-stream storage),
- ground water source data (well, casing, and screen depths, location, average daily withdrawals, 12-hour supply),
- interconnections with other systems (supplier and receiver names, average daily purchase or sale, contract amount),
- future source data (source name, type of source, location, proposed average daily withdrawal, proposed operational date),
- wastewater discharge information (discharge amounts, capacity, and location)
- water conservation program information, and
- technical assistance needs.

Financial assistance is the greatest need indicated in recent LWSPs. According to the 2001 State Water Supply Plan, the needs have been partially met by provisions for a state revolving fund included in the 1996 amendments to the federal Safe Drinking Water Act, and by the Clean Water and Natural Gas Critical Needs Bond Act passed by the general assembly in 1998.

The State Water Supply Plan

The 1989 act also required the development of a state water supply plan. The 2001 state plan is a compilation of over 500 LWSPs submitted by local governments to address their water supply needs over the next 20 years. The 2001 plan also incorporates water withdrawal registration data for the year 2000 from large agricultural and non-agricultural users. An appendix to the state plan contains descriptions and water use statistics for the river basins delineated by the Division of Water Resources. (The river basins are discussed below.)

According to the 2001 state plan, the Division of Water Resources encourages water systems to maintain demand-to-supply ratios of 8:10; in other words, average daily demand should not exceed 80 percent of available water supply. The state plan recognizes that meeting water supply needs includes both “off-stream” and “in-stream” considerations. According to the plan, meeting future needs encompasses three major areas:

- **Monitoring.** North Carolina needs good monitoring data and will rely on a statewide network of stream gauges to monitor surface flow and a network of groundwater observation wells.
- **Planning.** The basis for water supply planning will be the LWSPs updated every five years. As stated in the 2001 plan, “regional planning is necessary to fit the pieces together into a cost-effective and reliable water supply solution.”
- **Regulation.** The three primary regulatory tools in place are the Dam Safety Act for downstream flows; the Regulation of Surface Water Transfers Act for large inter-basin transfers; and the Capacity Use Act, which allows the Environmental Management Commission to regulate water use in areas where usage is depleting resources.

III. River Basins

As statutorily enabled, the Division of Water Resources has identified 17 major river basins. These basins were delineated to help implement the registration of water withdrawals, the regulation of surface water transfers, and regional water supply planning.

River basin summaries provide an overview of water supply and water availability for all of the LWSP systems located in each major basin. The summaries contain

- a basic geographic description of the basin, including major tributaries, impoundments, and other significant features;
- water availability;
- total water use in the basin from U.S. Geological Survey data, excluding water used for power generation and mining;
- factors affecting water demand, including, e.g., population growth, the economy, and seasonal demand fluctuations;
- self-supply use (i.e., water taken from wells for personal use);
- registered water withdrawals;
- inter-basin transfers of surface water; and
- a summary of the water supply and use information contained in the LWSPs. (A LWSP is included even if its service area is in another basin.)

According to the website of the Division of Water Resources, the division has

adopted a new planning strategy to ensure that North Carolina has sustainable water sources to meet future needs. DWR is developing river basin water supply plans for each major basin in the state. These plans will represent the merging of the data submitted by water withdrawers in each river basin with a computer-

based hydrologic model. This approach provides the ability to analyze the cumulative effects of long range projections of water withdrawals and returns on the surface waters of the basin being evaluated.

The state water supply plan will be updated as these studies are completed. The Catawba, Yadkin-Pee Dee, Cape Fear, and Roanoke river basins currently are being modeled.

IV. Current Water Supply Issues

Groundwater Supplies in the Central Coastal Plain

Approximately half of North Carolina's population relies on groundwater as its water supply source. The Water Use Act of 1967 gives the state authority to regulate water supply if the long-term use of the supply is threatened. Capacity Use Area #1 (CUA #1) in the state's Central Coastal Plain was designated in 1976 under this act.

CUA#1 was designated as a result of a phosphate mining company pumping tens of millions of gallons per day to dewater a mine. This resulted in dramatic drops in the water level in the local aquifer. Under the Water Use Act, the state has the authority to limit water supply withdrawals in a CUA. Within a designated CUA, all groundwater withdrawals of more than 100,000 gpd must obtain a permit from the Division of Water Resources.

In August 2002, CUA#1 was eliminated by the state's Environmental Management Commission and replaced with the Central Coastal Plain Capacity Use Area (CCPCUA). The CCPCUA, which covers Beaufort County and 14 surrounding counties, has a groundwater permitting process. The goal is to reduce the area's reliance on water drawn from aquifers.

In addition to limiting withdrawals, groundwater supply strategies include increased efficiencies, conservation, conservation pricing, and Aquifer Storage and Recovery (ASR).

The Piedmont: Lake Jordan

Lake Jordan in the Piedmont is an important source of supply for the Research Triangle area. Its estimated safe yield is 100 million gpd. The state controls the allocation of water from Lake Jordan and can assign water supply storage to any local government that qualifies. The two main criteria for allocation are documented future water needs and the availability of alternative sources.

Statewide Drought Response

Like most southeastern states, North Carolina has experienced a series of droughts over the past 50 years. North Carolina's approach to drought response is to have it handled at the local level. All communities that prepare a LWSP must include a drought response plan and pass a local drought ordinance.

According to the 2001 State Water Supply Plan, state agencies have adopted a state drought response plan as a means of systematically assessing and responding to the impact of drought on water supply and on agriculture. North Carolina also has a Drought Management Advisory Council (created in 1992 as the Drought Monitoring Council), which is composed of representatives from state and local agencies with expertise in climatology, water resources, agriculture, public health, and emergency management. The DMAC is chaired by a DENR employee.

Population Growth in Headwaters

The Piedmont Urban Crescent, which is experiencing much of North Carolina's growth, sits at the headwaters of two major river basins, the Cape Fear and the Neuse. Two new reservoirs under construction and one in the approval stage are crucial to the long-term water supply needs of the area. In addition, headwater demands in some mountain areas (e.g., Blowing Rock) are currently placing stress on water supplies. Efficient use of new water supplies is considered to be important in headwater areas, as is water reuse for industrial and irrigation applications.

V. State Strategies for Meeting Future Water Supply Needs

Strategies to meet North Carolina's future water needs include constructing new reservoirs, reallocating supply in existing reservoirs, regionalizing water supply systems, and desalination. Additionally the state will focus on water conservation, reuse for irrigation and industrial purposes, and efficiencies in existing supply infrastructure. Some key strategies and their options are described below.

Enhancing Existing Supplies

Three primary strategies for enhancing existing supplies are suggested in the 2001 state plan:

- Reevaluate available water from existing sources to see if additional withdrawals are feasible.

- Increase withdrawal from run-of-river sources if downstream flow and quality can be maintained.
- Raise dam spillways or install flashboards in reservoirs to increase supply.

According to the 2001 plan, another important way to improve existing water supplies is to protect water quality: Since treating poor-quality water is costly and inefficient, maintaining the high quality of raw water is vital.

Developing New Sources

Any proposed new surface water project must meet in-stream flow requirements and have sufficient supply, even during periods of drought. According to the 2001 plan, options include the following:

- **Purchasing Water.** Arrangements for purchases between supply systems are, according to the plan, often the most expeditious. A contract between systems specifies the maximum purchase amount, the term of the agreement, the price structure, and other details.
- **On-Stream Reservoir.** According to the plan, the safe yield from a reservoir should be based on the specific risk of a water shortage. For systems serving fewer than 50,000 people, a 20-year safe yield is recommended. This means that only one year in twenty will have a water shortage. Systems serving 50,000 or more customers need a safe yield of 50 years.
- **Run-of-River Intakes.** Intakes may be limited during low-flow events to preserve downstream flow.
- **Aquifer Storage and Recovery (ASR).** ASR is the injection and storage of potable water in the ground for later retrieval. According to the plan, ASR may have potential in the Coastal Plain. The city of Greenville is pilot-testing an ASR project.

Regional Water Supply Systems

Regional water supply systems serve multiple counties and/or communities. Currently, North Carolina has 60 regional systems. Regional systems can link systems with inadequate supplies to systems with surplus supplies.

Water Conservation

Federal water use standards for plumbing fixtures have increased efficiency in new homes; retrofitting the plumbing of older homes can increase their water use efficiency as

well. To be mandated, however, the latter requires legislation. For now, water conservation in North Carolina will depend largely on local efforts, including the following local programs suggested by the Division of Water Resources:

- **Water Shortage Response.** The most important element of this program is a local ordinance that declares a water shortage and spells out mandatory and voluntary water use reduction tactics.
- **Water Loss Reduction and Leak Detection.** To help with this program, the Division of Water Resources provides technical assistance and loans leak detection equipment for local water loss audits.
- **Water Use Efficiency.** This local program should include specific measures that help reduce daily water usage; for example, low-flow fixtures, variable rate structures, and restrictions on outdoor water use.
- **Public Education and Outreach.** Local outreach and education requires a comprehensive approach – e.g., in-school education, water treatment plant tours, water bill inserts, and other outreach efforts.

Water Reuse

According to the 2001 state plan, water reuse (also called water reclamation) is “the use of highly treated wastewater to satisfy non-potable demands for water.” In North Carolina, water reuse is allowed for irrigation of non-food-chain crops, fire-fighting, street- and vehicle-washing, and dust control as well as for industrial cooling and processing. The town of Cary is undertaking a water reuse project.

V. Related Programs

Water Supply Watershed Protection Program

In 1986, North Carolina initiated a voluntary water supply watershed protection program. This program was administered by counties and municipalities with the goal of protecting watersheds that supply water for public use. Included were limits on the number and type of wastewater discharges to be allowed in a watershed. The Division of Water Quality would enforce these locally imposed limits, and the local governments would adopt land use control ordinances to address polluted runoff.

It became apparent that more stringent controls were needed. In 1989 the general assembly passed the Water Supply Watershed Protection Act mandating the

Environmental Management Commission to develop minimum statewide measures for water supply protection. By 1992 the Division of Water Quality had developed water supply protection rules for watersheds. These rules required all local governments with land use jurisdiction to develop, adopt, and implement ordinances, maps, and management plans protecting the watersheds of water supplies.

Clean Water Management Trust Fund (CWMTF)

The CWMTF was created by the general assembly in 1996. The 21-member CWMTF receives appropriations from the general assembly to provide grants to state agencies, local governments, and private non-profits to help finance water pollution control projects. Through 2008, the CWMTF had awarded grants totaling nearly \$1 billion to

- protect nearly 500,000 acres of land and 5,000 miles of stream buffers through the purchase of conservation easements or tracts of land, and
- conduct 267 wastewater treatment improvement projects, 159 stream and wetland restoration projects, and 80 storm water management projects.

This was accomplished by leveraging \$1.4 billion in private and other public funds.

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Appendix A:

Draft 2008 Report of the Water Allocation Study Team

In March 2007, the Nicholas Institute for Environmental Policy Solutions at Duke University convened a one-day conference to discuss the future of water in North Carolina. The conference was sponsored by the NC Division of Water Resources, the NC Clean Water Management Trust Fund, the NC League of Municipalities, and others. Findings and recommendations from the conference included the following:

- Registration, measurement, and regular reporting of water use are essential to sustainable management of water resources.
- Land use decisions affect the quality and quantity of our water resources.
- Green infrastructure – our forests, farms, wetlands, floodplains, natural areas, and riparian buffers – is a vital economic and ecological component of our state’s long-term prosperity.
- Market-based approaches that put a dollar value on the services provided by natural resources and ecosystems (ecosystem services) have potential to improve and protect water.
- Greater efficiency in water use and reuse can sustain water resources, reduce conflicts, and reduce risks during drought.
- Climate change is an added challenge to sustainable water resources management.

Conference Report, p. 2

Partly as a result of this conference, the general assembly passed House Bill 820 in 2007 authorizing the Environmental Review Commission (ERC) to undertake a water allocation study. The ERC contracted with the Nicholas Institute to conduct the study. The Water Allocation Study Team was composed of water resources and policy experts from Duke University and the University of North Carolina-Chapel Hill. After studying North Carolina’s current approach to water allocation, the water supply/demand balance in the state, and current regulatory processes, the team made the following recommendations to the ERC in its draft report, *The Future of Water in North Carolina: Strategies for Obtaining Abundant and Clean Water* (p.1):

- Clearly state policy goals to guide administrative and judicial decisions.
- Establish a permit for large water withdrawals.
- Conform existing laws to each other and to policy goals.
- Establish proactive, adaptive, river basin water supply planning.
- Simplify and integrate water and water-funding information.
- Address critical research and study needs.
- Ensure that water infrastructure is maintained.
- Reward and spread best practices and leadership efforts in water efficiency.
- Create more storage.

As a starting point for legislative discussion and debate about water allocation in North Carolina, the team recommended a set of goals (p. 33 ff.):

- The state should require a permit for large withdrawals of groundwater and surface water.
- The NC League of Municipalities, the NC Association of County Commissioners, private water systems, and DENR should
 - inventory state and US water-reporting requirements,
 - identify and phase-in electronic reporting to DENR and provision of information to the public using websites and other means, and
 - develop and implement a plan to consolidate as much water data as possible into one comprehensive Water System Report to the state and the public.
- The general assembly should direct the Local Government Commission (LGC) to take a more active role in the financial side of local government's operation and maintenance of water infrastructure, and DENR, in conjunction with the LGC, should monitor and regulate the ongoing financial and managerial capacities of water systems rather than just review system capacity when there are requests for expansion of new systems.
- The general assembly should create an expedited regulatory permitting path for new reservoirs that meet certain upfront conditions.

Recommendations from the Water Allocation Study Team have been incorporated into Senate Bill 907, the proposed Water Resource Policy Act of 2009. As of this writing, the bill is in committee in the general assembly. A brief review of salient points in this bill can be found in Appendix B.

Appendix B:

Key Legislation, 1967 – 2009

Water Use Act of 1967

The Water Use Act of 1967 was enacted to give regulatory control to DENR in cases where water supplies are in danger of being depleted by allowing the EMC to declare certain threatened portions of the state as “capacity use areas”:

143-215.13(a): “The Environmental Management Commission may declare and delineate from time to time, and may modify, capacity use areas of the State where it finds that the use of groundwater or surface water, or both, require coordination and limited regulation for protection of the interests and rights of residents or property owners of such areas or of the public interest.”

143-215.13(b): “Within the meaning of this Part a ‘capacity use area’ is one where the Commission finds that the aggregate uses of groundwater and surface water, or both, in or affecting said area (i) have developed or threatened to develop to a degree which requires coordination and regulation, or (ii) exceed or threaten to exceed, or otherwise threaten or impair, the renewal or replenishment of such waters or any part of them.”

The act establishes the basis for rules governing capacity use areas, such as

- reporting requirements,
- requirements concerning salt water intrusion,
- permitting (all withdrawals above 100,000 gallons per day),
- well pumping rates,
- enforcement procedures, and
- the right of DENR to limit water withdrawals.

Regional Water Supply Planning Act of 1971

In 1969 the Legislative Research Commission was directed by Senate Resolution 875 to study the need for legislation concerning water supply planning on a local and regional basis. The result was passage of the Regional Water Supply Planning Act of 1971. The preamble to the act states that there were 1,782 public water systems in the state as of 1970 and that 80 percent served fewer than 1,000 people.

162A-21(3): Preamble

“If the future public water supply needs of the state are to be met, a change in the existing pattern of public water supply development and management must be undertaken. Regional planning and development is an immediate need.”

162A-22: Definition of regional water supply system

“For the purposes of this Article, “a regional water supply system” is defined as a public water supply system of a municipality, county, sanitary district, or other political subdivision of the State, or combination thereof, which provides, is intended to provide, or is capable of providing an adequate and safe supply of water to a substantial portion of the population within a county, or to a substantial water service area in a region composed of all or parts of two or more counties, or to a metropolitan area in two or more counties.”

The act also establishes a regional water supply planning revolving fund using monies appropriated from time to time by the general assembly. The act further sets forth an application process and conditions that must be met in order to qualify for funding. The responsibility for the act was given to DENR.

The 2008 Water Allocation Study found that the policies stated in the Regional Water Planning Act of 1971 have not been met due to a lack of external (federal) funding, leading local suppliers to look at the least expensive solutions, and also due to political preferences for preserving local control over growth and pricing.

House Bill 157, 1989, An Act to Provide for the Development of a State Water Supply Plan

This act authorized DENR to require utilities to prepare local water supply plans and required DENR to use this information to prepare a state water supply plan.

House Bill 820, 2007 Study Provision

“An Act to direct the Environmental Review Commission to study issues related to the transfer of water from one river basin to another river basin and the allocation of surface water resources”

This act authorized the Environmental Review Commission and DENR to commission a study to look at all water issues in the state and report the findings with recommendations for legislation to the ERC “to ensure that all State laws regulating water resources are consistent with and fully integrated into the comprehensive system for regulating surface water withdrawals and the statewide plan for water resources projects” (S.L. 2007-518 Section 1.(a)(v)). The results of the study provision are summarized in Appendix A.

Senate Bill 907, Water Resource Policy Act of 2009

This bill proposed the following:

143-350.1. Declaration of Policy

- (1) Water is a public trust resource
- (2) Water should be used efficiently and productively
- (3) Legal Security and procedural fairness for water rights – this Article establishes a system of permits that makes a water right a matter of legal record entitled to legal protection
- (4) Protection of in-stream flows and groundwater levels
- (5) Integration with water quality and adaptation of plans and hydrologic models to establish water budgets
- (6) Pricing water to cover costs fully
- (7) Efficient and equitable allocations during shortfalls
- (8) Reasonable use requirement – No person using the waters of the State shall cause unreasonable injury to other water uses made pursuant to valid water rights, regardless of whether the injury relates to the quality or quantity impacts of the activity causing the injury
- (9) No prohibition of use based on location of use
- (10) Regulating interstate and interbasin water transfers to achieve these goals on a regional basis

As proposed under this bill, all water withdrawals of 100,000 gpd or more, including withdrawals for agricultural use and irrigation, must obtain a permit from DENR.

As proposed, the act would allow the general assembly to establish river basin planning organizations to manage water resource supply and demand within those basins.

In river basins where hydrologic models have indicated that water supplies have been over-allocated or will be over-allocated in the future, the proposed act gives DENR the authority to decide how to permit allocations and also the authority to mandate that the river basin planning organization prepare a plan to prevent or eliminate over-allocation in the basin.

The proposed act sets standards of approval for water withdrawal permits along with duration, terms, conditions, renewals, modifications, and revocations.

As proposed, the act also provides for

- an identification and consolidation of water reporting requirements of the state and US Environmental Protection Agency and provision of means for public access to this data,
- a continued study of water allocation issues, as proposed in the 2008 Water Allocation Study,
- a financial review of public water supply and wastewater systems in the state to ensure adequate rate structures for local suppliers to cover costs associated with maintaining their systems, and
- a water efficiency report to be completed by April 2010.

Pennsylvania

Highlights

Pennsylvania's approach to water supply planning is notable for the following attributes:

- a well-established framework for surface water allocation based on state permits
- use of public meetings by the Pennsylvania Department of Environmental Protection (DEP) to garner public support for water supply planning legislation
- clear roles of and relationships among (1) regional water resources committees, which identify regional priorities; (2) a statewide water resources committee, which identifies statewide priorities and recommends legislative actions; and (3) DEP
- a close relationship between river basin commissions and the advisory committee/DEP structure to avoid duplicating efforts
- a focus by DEP on integrated water resource management
- the identification of "critical water planning areas" (CWPAs) and the preparation of critical area resource plans for watersheds within CWPAs

I. Introduction

Water rights in Pennsylvania are governed by riparian common law modified by a reasonable and beneficial use statutory provision. "Reasonable and beneficial use" is statutorily defined as "the use of water for a useful and productive purpose, which is reasonable considering the rights of other users and consistent with the public interest, in a quantity and manner which as is necessary for efficient utilization. The term includes withdrawal and nonwithdrawal uses" (Pa.C.S. Title 27, Chapter 31.3102).

Pennsylvania's current estimated population is 12.5 million. Of this total, nearly 80 percent live in urban areas. Drinking water accounts for 15 percent of daily water use, of which 59 percent is from surface water and 41 percent from groundwater. About three-fifths of this groundwater is drawn from private groundwater sources – i.e., from more than 1 million private wells. The single largest water consumer in Pennsylvania is the thermoelectric industry, using 70 percent of daily water withdrawals.

II. The Planning Process

A drought condition in the late 1990s provided the impetus for updating the Pennsylvania's water plan. The 2008 State Water Plan replaces the original 1983 plan.

According to Lori Mohr, Special Projects Director in the Water Supply Planning Office of the Pennsylvania Department of Environmental Protection (DEP), support in the legislature for updating the 1983 plan initially was limited (Lori Mohr, personal communication, July 28, 2009). The DEP conducted 16 public meetings across the state in 2001 to solicit public opinion on water resources management. The results of these meetings, combined with a grassroots effort, convinced the legislature to act. The best ideas from the 16 meetings were consolidated into *The Water Resources Planning Act* (commonly called Act 220) passed by the legislature in 2002.

Act 220 divided the state into six regional water supply regions by major river basin hydrologic boundaries. The six regions are called the Great Lakes, Ohio, Delaware, Lower Susquehanna, Upper/Middle Susquehanna, and the Potomac. Each region has a 23-member regional committee appointed by the governor to three-year terms. Of the 23 members, 17 are at-large members selected based on recommendations from statewide and regional organizations representing a variety of interests, four are selected for their knowledge of water resources planning, and two are county commissioners. In addition, the DEP has one non-voting member on each committee. If interstate river basin commissions are located within a region (see further below regarding the Susquehanna and Delaware river basin commissions), the commission may appoint a representative to the committee.

Act 220 also provided for a statewide water resources committee consisting of 18 members appointed by the governor to four-year terms. Each regional committee appoints one of its members to the state committee. Six members of the state committee are appointed from a cross-section of water user interests, and the remaining six members represent local governments. In addition, each water-related state agency appoints one person as an ex-officio representative to the state committee.

The primary responsibilities of the regional committees are (1) to establish priorities for their region to be incorporated into the state plan, (2) to recommend critical water planning areas, (3) to advise DEP on engaging consultants and experts to help prepare the regional components of the state plan, and (4) to use an open public process.

Responsibilities of the Statewide Water Resources Committee are (1) to help develop the public process for the State Water Plan, (2) to recommend planning policies and guidelines to the DEP Secretary, (3) to review and comment on regulations and guidelines proposed by DEP, and (4) to recommend to the DEP Secretary whether the final state plan should be approved.

Act 220 also mandated that registration of water withdrawals and identification of Critical Water Planning Areas (CWPAs) be included in the State Water Plan.

III. Pennsylvania State Water Plan

Primary Guiding Priorities

For the 2008 plan, the regional committees sent their recommendations to the statewide committee for review. The statewide committee consolidated the regional recommendations and sent them to DEP for consideration in the state plan. Three primary guiding priorities for the state plan came from these recommendations (Lori Mohr, personal communication, July 28, 2009):

- The efforts initiated in the plan to collect, interpret, and disseminate water resources information should continue into the future.
- An integrated approach to managing water resources should be encouraged and sustained.
- The state should adopt policies that encourage technological advances designed to conserve and enhance water resources.

Regional Priorities

Each of the six regions categorized individual regional priorities to reflect the characteristics of their basins. These priorities were used as the basis for preparing the state plan:

- **Great Lakes**
 - Support legislation to protect water quantity and quality in Lake Erie.
 - Address land use change and their effects on point and non-point source pollution.
- **Ohio**
 - Reclaim water resources affected by abandoned mines.
 - Identify water resources necessary to promote economic development.
- **Delaware**
 - Link land use decisions to water resources.
 - Improve water resources management to address flood and drought conditions.

- **Lower Susquehanna**
 - Evaluate supply and demand.
 - Protect “at-risk” water resources with a focus on impaired streams.

- **Upper/Middle Susquehanna**
 - Protect important headwater habitats and recharge areas.
 - Address the effects of acidic drainages on receiving streams.

- **Potomac**
 - Address land use planning and growth.
 - Develop land use programs that protect water quality and quantity.

The regional priorities were submitted to the Statewide Water Resources Committee. The committee used these regional priorities to recommend a number of legislative actions to implement the state plan. Among these were suggestions to

- enact or amend legislation to encourage integrated water resources planning, so that all state and local agencies with an interest in water resources work together;
- enact new or amended legislation to link local land use decisions with water resources planning and management;
- by regulation, give stormwater management agencies the ability to raise funds by, for example, establishing stormwater utilities; and
- make Pennsylvania’s water rights laws more holistic by adopting a regulated-riparian system that addresses both surface water and groundwater as well as water withdrawal rights.

Registration of Water Withdrawals

Registration and reporting of water withdrawal is required for all public water supply agencies, electric facilities, and all others using in excess of 10,000 gallons per day (gpd) average over a 30-day period. Homeowners’ wells are exempt, as are agricultural operations. Homeowner usage is calculated by using an average of 60 gpd per person per household.

Agricultural operations are encouraged to voluntarily report their water usage. Since 2004, DEP has been attending agricultural functions around the state, educating farm owners about the importance of information on total water usage in the state and encouraging them to voluntarily report their water usage. This effort has achieved an 80 percent rate of voluntary reporting by farmers (Lori Mohr, personal communication, July 28, 2009).

Critical Water Planning Areas

As noted above, Act 220 mandated identifying CWPAs, which were statutorily defined as “significant hydrologic unit[s] where existing or future demands exceed or threaten to exceed safe yield of available water resources” (Pa.C.S. Title 27, Chapter 31.3112). In 2006, DEP and the Statewide Water Resources Committee adopted a five-step “criteria and process” for identifying CWPAs. The regional committees are to identify CWPAs using the following process:

- 1. Nomination.** CWPAs may be preliminarily nominated through the regional planning process.
- 2. Screening.** In 2006, the U.S. Geological Survey developed and tested its Water Analysis Screening Tool (WAST). A GIS-based model, this tool helps DEP screen for possible CWPAs. WAST was run on the entire state by hydrologic units and screened out 90 percent of the state.
- 3. Data verification, development, and review.** Through the screening, 32 watersheds were identified for more detailed data verification and analysis by DEP and its consultants.
- 4. Recommendations by regional committees.** After data verification, the regional committee conducts a public process to solicit comments on the proposed CWPA(s) and then sends final CWPA recommendations to the Statewide Water Resources Committee.
- 5. Designation by the statewide committee and DEP.** Upon receipt of the regional committee recommendations, the statewide committee reviews, approves, and forwards the CWPA designation recommendations to the Secretary of DEP for final designation decisions.

The DEP expects that between 15 and 30 CWPAs will receive final designation (Lori Mohr, personal communication, July, 28, 2009). After a CWPA is designated, Act 220 stipulates that DEP prepare a critical area resource plan (CARP) for any watershed(s) within the CWPA, suggesting solutions to the key problem(s) identified during the CWPA designation process. To guide DEP in developing a CARP, the regional committee establishes a critical area advisory committee. Once a CARP is adopted, it becomes a component of the State Water Plan and may be voluntarily implemented.

Other Topics

The State Water Plan also addresses water conservation and efficiency, water quality, navigation, floodplain and storm water management, water supply alternatives, and drinking water and wastewater.

IV. Water Allocation

Pennsylvania's Surface Water Allocation Program

Pennsylvania's surface water allocation program was established by the Water Rights Act of 1939, as modified by subsequent amendments. As amended, the act revoked the power of eminent domain previously held by municipal water suppliers and instead gave allocation authority to DEP. All public water supply agencies must receive a water allocation permit. Water allocation permits allow a supplier to withdraw a certain amount of water to meet a specified public need and to preserve streams for other uses. As spelled out in the Water Rights Act, water allocation permits are required for the following:

- developing a new surface water source
- increasing a water allocation
- acquiring an additional quantity of water from another public water supply agency
- changing the location of a surface water withdrawal
- acquiring water rights previously allocated to another supplier
- expiration of a permit (A supplier must apply for a new permit, not simply a renewal.)

Applications are filed with DEP and must contain information on source yields, interconnections with other suppliers, current and projected water use, and storage capacity. DEP reviews permit applications and looks for conflicts with other permitted suppliers. It also determines if the permit is reasonable given current and future needs and whether it will interfere with navigation or cause harm to the stream ecology.

Permits may be issued for terms up to 25 years. They contain requirements for

- in-stream flow protection,
- reduction of leakage or loss in excess of 20 percent, and
- development of additional sources to meet requirements for a 50-year drought event.

Two interstate river basin commissions within Pennsylvania also have allocation authority.

Susquehanna River Basin Commission (SRBC)

The Susquehanna River Basin Compact was drafted by the U.S. Congress and the legislatures of New York, Pennsylvania, and Maryland in the late 1960s and signed into law in 1970. The compact created the SRBC to coordinate efforts in the three states to address water resource needs in the 25,000-square-mile Susquehanna Basin.

The SRBC is responsible for managing water supply, water quality, flooding, and the Chesapeake Bay, with coordination and cooperation with each state's water resource agencies, and with dissemination of public information.

Regarding water supply, responsibilities of the SRBC include

- ensuring the sustainability of water resources in the basin, including supporting and encouraging their sustainable use;
- maintaining an equitable system of water allocation for all uses;
- mitigating drought impacts;
- managing diversions; and
- managing consumptive use.

The SRBC has restricted water withdrawals in several areas in Pennsylvania where water demand exceeds capacity.

In Pennsylvania, the SRBC has representatives on regional committees whose areas are within the Susquehanna basin and a representative on the Statewide Water Resources Committee. The DEP contracted with the SRBC to help the regional committees identify CWPAs and to quantify water resources (Lori Mohr, personal communication, July 28, 2009).

Delaware River Basin Commission (DRBC)

The DRBC was formed in 1961 by compact legislation signed by New York, New Jersey, Delaware, Pennsylvania, and the U.S. President to oversee the protection and use of the Delaware River Basin waters. Commission programs include watershed planning, water quality protection, water conservation initiatives, drought management, flood control, recreation, and water supply allocation and permitting. The DRBC has water registration requirements for public water suppliers and others who exceed a 100,000 gallon per month threshold for withdrawals.

The southeastern portion of Pennsylvania has been designated a groundwater protection area. The 1,200-square-mile Southeastern Pennsylvania Groundwater Protected Area includes 76 watersheds in Montgomery County and parts of four other counties. The protected area was established by the DRBC at the request of Pennsylvania when development pressure started adversely affecting groundwater levels.

A two-tier system of allocation rules apply to the protected area. The first tier addresses what are referred to as "potentially stressed" basins. Applicants for increased allocation limits must mitigate the impacts of additional groundwater withdrawals by implementing one or more programs, such as

- conjunctive use of groundwater and surface water,
- expanded water conservation,

- control of groundwater infiltration, and
- artificial recharge and spray irrigation.

The second tier applies to areas that have been determined to be “stressed.” Stressed areas have a withdrawal rate that exceeds the groundwater recharge rate and are subject to a mandatory withdrawal limit. Withdrawals cannot exceed 10,000 gallons per month.

Sources

Contacts

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Appendix:

Statutes

Pennsylvania Consolidated Statutes, Title 27, Chapter 31.3113(a,b,c)

Composition of Regional Committees, Powers and Duties

§ 3113. Regional committees.

(a) **Creation.**--There is created within the department a regional committee for each of the following regions in this Commonwealth:

- (1) The watershed drainage area of the Delaware River and its tributaries.
- (2) The watershed drainage area of the West Branch Susquehanna River subbasin and the upper Susquehanna, middle Susquehanna and Chemung subbasins and their tributaries.
- (3) The watershed drainage area of the Juniata River and lower Susquehanna River and its tributaries below Sunbury, and Gunpowder, Northeast and Elk Creek Watersheds draining to the Chesapeake Bay.
- (4) The watershed drainage area of the Ohio River and its tributaries.
- (5) The watershed drainage area of Lake Erie and the Genesee River.
- (6) The watershed drainage area of the Potomac River and its tributaries.

Each regional committee shall be subject to the provisions applicable generally to boards and commissions identified in section 203 of the act of April 9, 1929 (P.L.177, No.175), known as The Administrative Code of 1929.

(b) **Membership.**--

- (1) Each regional committee shall be composed of:
 - (i) Four members with a knowledge, background or understanding of water resources planning and management who are county conservation district or planning commission directors or, where a county conservation district does not cover a portion of a region, who are representatives of the governing body of the county or city of the first class, as appropriate, and shall represent a geographic cross section of the region. At least two county conservation district directors shall be appointed to each regional committee. Such members shall be appointed by the Governor from recommendations made

separately by the governing bodies of each county or city of the first class which is in whole or in part within the region.

(ii) Seventeen members appointed by the Governor from recommendations made separately by Statewide and regional organizations representing such interests whose residence or place of business is within the region and who meet the following criteria:

(A) Two members shall be representative of agriculture, one from production agriculture and one from horticulture.

(B) One member shall be an officer or employee of a public water supply agency providing residential service within the region.

(C) One member shall be an officer or employee of a public wastewater agency providing service within the region.

(D) Three members shall represent significant industrial and commercial enterprises, energy development and production interests.

(E) Three members shall represent environmental and conservation interests.

(F) Four members with education and experience in professions relating to water resources management, including engineering, hydrology, geology, planning, law and economics, one of whom shall be a registered professional geologist.

(G) Three members representing local governments other than counties.

The members appointed under this subparagraph shall represent a cross section of the region, considering the distribution of population within each region.

(iii) One member, appointed by the secretary, who is a department employee. This member shall advise the regional committee without voting on any matter before the regional committee.

(iv) Where a Compact Basin Commission exists with jurisdiction over all or a portion of the region, a representative of such Compact Basin Commission shall be invited to serve as an ex officio voting member of the regional committee.

(2) Members shall be appointed no later than 180 days after the effective date of this chapter.

(3) A member shall be appointed for a term of three years. Of the members first appointed by the Governor under paragraph (1)(i) and (ii), five members shall serve for terms

of one year, five members shall serve for terms of two years and five members shall serve for terms of three years.

(4) Vacancies shall be filled for the remainder of an unexpired term in the same manner as original appointments. A member, upon expiration of the term, shall continue to hold office until a successor is appointed.

(5) A majority of the membership of a regional committee shall constitute a quorum for the transaction of regional committee business. Action may be taken on a matter before the regional committee by a majority vote of the full membership of the regional committee.

(6) Members of a regional committee shall serve without compensation but may be reimbursed from funds appropriated for such purposes for necessary and reasonable travel and other expenses incurred during the performance of their duties.

(7) A chairperson shall be elected annually by a majority vote of the full membership of the regional committee.

(c) Powers and duties.--A regional committee has the following powers and duties:

(1) Guide the development of and recommend to the Statewide committee the regional plan component for review and incorporation into the State water plan.

(2) Consult with, advise and make recommendations to the department and the Statewide committee prior to and throughout the process of preparing the regional plan component of the State water plan and amendments to the regional plan component of the State water plan.

(3) Advise the Statewide committee and the department regarding the engagement and selection of consultants or experts to assist in the preparation of the regional component of the State water plan.

(4) Recommend to the Statewide committee and the department the identification of critical water planning areas.

(5) Utilize an open process, including public notice and at least one combined public meeting and hearing, to solicit comments from interested persons on water resources planning issues related to the preparation of the regional component of the State water plan.

(6) Meet as necessary to accomplish the purposes of this chapter.

(7) Adopt bylaws and procedures for conducting business.

Pennsylvania Consolidated Statutes, Title 27, Chapter 31.3114(a,b,c)

Composition of the Statewide Water Resources Committee, Powers and Duties

§ 3114. Statewide Water Resources Committee.

(a) **Establishment.**--There is established within the department the Statewide Water Resources Committee. The purpose of the committee is to coordinate the development of the State water plan, recommend policies and guidelines for and oversee the development of the State water plan and, in continuing consultation and collaboration with the regional committees and the department and with the full opportunity for public review and comment, approve and recommend to the secretary approval and adoption of the State water plan. The Statewide committee shall be subject to the provisions applicable generally to boards and commissions identified in section 203 of the act of April 9, 1929 (P.L.177, No.175), known as The Administrative Code of 1929.

(b) **Membership.**--

(1) The Statewide committee shall be composed of members selected as set forth in this subsection.

(2) Eighteen members shall be appointed as follows:

(i) Six members shall be representatives of the regional committees, appointed as provided in this paragraph. The Majority Leader of the Senate and Majority Leader of the House of Representatives shall each appoint two members from among the members of the regional committees. The Minority Leader of the Senate and the Minority Leader of the House of Representatives shall each appoint one member from among the members of the regional committees. Each regional committee shall nominate from among their members individuals to be considered for appointment under this paragraph, and no more than one member from each regional committee shall be appointed under this paragraph.

(ii) The Governor shall appoint six members representing a cross section of water user interests, including agriculture, conservation districts, industrial and commercial enterprises, mining, energy development and production and public water supply. The Governor shall seek suggestions and recommendations for Statewide committee membership from representative organizations.

(iii) The Governor shall appoint six members representing local government, environmental and conservation interests and professions relating to water resources management. The Governor shall seek suggestions

and recommendations for Statewide committee membership from representative organizations.

(3) The Secretary of Environmental Protection, Secretary of Agriculture, Secretary of Conservation and Natural Resources, Executive Director of the Pennsylvania Fish and Boat Commission, Chairman of the Pennsylvania Public Utility Commission and Executive Director of the Pennsylvania Emergency Management Agency or their designees shall be ex officio voting members of the Statewide committee. The Secretary of Community and Economic Development and the Executive Director of the Governor's Center for Local Government Services or their designees and a representative of each Compact Basin Commission shall be invited to serve as ex officio nonvoting members of the Statewide committee.

(4) Members shall be appointed no later than 180 days after the effective date of this chapter.

(5) A member shall be appointed for a term of four years. Of the initial members appointed by the Governor:

(i) Six members shall serve initial terms of two years.

(ii) Six members shall serve initial terms of four years.

(iii) After such initial terms, individuals appointed by the Governor shall serve for a term of four years.

(6) Members must, as a result of educational background, training or experience, have an understanding of water resources planning and management issues.

(7) The chairperson of the Statewide committee shall be elected by a majority vote of the full membership of the committee.

(8) Vacancies shall be filled for the remainder of an unexpired term in the same manner as original appointments. A member, upon expiration of the term, shall continue to hold office until a successor is appointed.

(9) A majority of the membership of the Statewide committee shall constitute a quorum for the transaction of business. Action may be taken on a matter before the committee by a majority vote of the full membership of the committee.

(10) Members of the Statewide committee shall serve without compensation but may be reimbursed from funds appropriated for such purposes for necessary and reasonable travel and other expenses incurred during the performance of their duties.

(c) Powers and duties.--The Statewide committee shall:

(1) Recommend to the secretary the approval and adoption of the State water plan, including regional plan components, following consultation with the regional committees, the department, Compact Basin Commission and other appropriate agencies and after the public comment and hearing process specified in section 3115(b) (relating to development, adoption, amendment and periodic review of State water plan).

(2) Assist the department, in cooperation with regional committees, with the development of a public participation process to encourage the input from persons interested in water resources issues throughout the process of developing and formulating regional plan components and the State water plan.

(3) Recommend approval by the secretary of policies and guidelines for the preparation and development of regional plans and the State water plan in order to assure consistency in the methods used to carry out the assessments and inventories required under section 3112 (relating to plan contents).

(4) Review and comment upon regulations and policies proposed by the department under this chapter. In furtherance of this responsibility, the Statewide committee shall be given a reasonable opportunity to review and comment on regulations promulgated under this chapter affecting water resources prior to the submission to the Environmental Quality Board for both initial and final consideration. The written report of the Statewide committee shall be presented to the Environmental Quality Board with any regulatory proposal under this chapter. The chairperson of the Statewide committee shall be invited to participate in the presentation of all regulations promulgated under this chapter affecting water resources before the Environmental Quality Board.

(5) Carry out the duties and responsibilities assigned to the Statewide committee under this chapter or other applicable statutes.

South Carolina

Highlights

In South Carolina, surface water resources have been subject mainly to the traditional riparian rights doctrine. Under a 1982 statute, large withdrawals must be registered with the state, but the landowner holding riparian rights can withdraw an unlimited amount of water, constrained only by “reasonable use” restrictions that are undefined and are only actionable under civil law.

Groundwater is a significant if largely untapped source of water in South Carolina. According to a 1976 statute, large withdrawals must be registered and – in “capacity use areas” where water supply is threatened – permits for large withdrawals are required. Over the past few years, an effort has been launched to change the state’s riparian rights doctrine to more fully regulated riparian law and to otherwise revise the state’s approach to managing its water resources. In 2004, the South Carolina Department of Natural Resources released its South Carolina Water Plan, Second Edition. This plan included recommendations on the state’s water law and on other aspects of water resources planning and management. The plan has been the basis for subsequent legislative proposals, including two bills that as of 2009 were before the state legislature.

I. Introduction

Almost all of South Carolina’s water resources are groundwater, mainly in coastal plain aquifers. Only 1 percent of the state’s water resources are surface waters; nevertheless, 70 percent of the state’s population relies on surface water for its water supply because of its convenience and availability. The majority of surface water is contained in reservoirs on South Carolina’s major rivers. Surface water rights in South Carolina are governed by the riparian rights doctrine; there is no comparable doctrine governing groundwater.

South Carolina has three physiographic regions: coastal plain, piedmont, and mountain. Of these, the coastal plain is the largest, covering almost two-thirds of the state. The three regions include four major river basins, which are divided into 15 smaller basins. Two of the major basins are shared with North Carolina; one, the Savannah, is shared with Georgia. Only one – the Ace basin near Charleston – is located entirely within the state. Most of South Carolina’s large rivers are controlled by impoundments, several of which are in North Carolina. The Ace basin is the only one in which the major rivers still flow naturally.

The state's Water Resources Planning and Coordination Act of 1967 created the South Carolina Water Resources Commission, giving it the responsibility to develop a comprehensive water resources policy for the state and to coordinate policies between departments and agencies of the state. The 1967 act was amended in 1993, and the commission's responsibilities were split between the Department of Natural Resources (DNR) and the Department of Health and Environmental Control (DHEC).

DNR's duties include, among others

- formulating a comprehensive water resources policy,
- formulating policies and strategies to resolve specific water-related problems, and
- recommending specific legislation.

DHEC administers a number of water-related programs: e.g., programs regarding water allocation; drinking water quality; the quality of streams, lakes, and aquifers; stormwater and sediment control; and dam safety. DHEC also negotiates groundwater agreements with other states and the federal government.

II. Water Withdrawal Registration and Permitting

Three statutes govern water allocation in South Carolina:

- the 1976 Groundwater Use and Reporting Act (GURA)
- the 1977 Interbasin Transfer of Water Act (ITWA)
- the 1982 Surface Water Withdrawal and Reporting Act (SWWRA)

Current state law does not require a permit for surface water withdrawal, nor does it specify allowable uses or priorities among uses. Surface water withdrawals of more than 3 million gallons per month must be registered annually with DHEC. For groundwater withdrawals, a DHEC permit is required if the withdrawal exceeds 3 million gallons per month and is in a designated capacity use area.

A permit is required for an inter-basin transfer if the withdrawal exceeds either 1 million gallons per day or five percent of the seven-day, ten-year low flow (7Q10) in the source basin. Permits for inter-basin transfers are issued for between 20 and 40 years.

III. South Carolina Water Plan, Second Edition

Although South Carolina law does not require a state water plan, the first statewide water plan was released in 1998. The 1998 plan did not address the effects of drought, however. From June 1998 to August 2002, the state experienced one of its worst droughts on record. This sparked a new study and a revision of the state plan: The South Carolina Water Plan (SCWP), Second Edition, was published in 2004. Prepared by DNR's Land, Water, and Conservation Division for the SC Natural Resources Board, the plan's purpose was to comprehensively examine the state's water resources. The SCWP describes state water resources and gives guidance on water resources management and recommendations on state policy.

Water Resources Assessment

The 2004 plan has two parts, which were done in two phases. The first part is a water resources assessment published as the South Carolina State Water Assessment (SCSWA). It describes South Carolina's water systems and the location and availability of water in the state. It also gives population growth and water use projections through 2020. As of 2009, the SCSWA was being updated.

In the SCSWA, water use is separated into two categories: in-stream uses (e.g., for fishing, recreation, navigation, wastewater assimilation, and hydroelectric power generation), which do not require diverting or withdrawing water; and off-stream uses (e.g., for public water supply, crop and landscape irrigation, mining, and thermoelectric power generation), which do require diverting or withdrawing water. The former are considered non-consumptive uses; the latter, consumptive. By 2045, water demands in the state are expected to increase almost 50 percent due to growth in population, industry, and thermoelectric power generation.

The SCWP

The second part of the 2004 state planning effort is the plan itself: The SCWP outlines guidelines and procedures for managing the state's water resources. The SCWP addresses both water quantity and water quality for the state's surface water and groundwater resources. As the SCWP notes (p. 21)

Whether dealing with surface water or groundwater, there are two major issues facing water resource managers: *water quantity* – making sure there is enough water in the right place at the right time; and *water quality* – making sure the available water is suitable for use.

Key points and recommendations in the SCWP are synopsized below.

Water resources management. A number of recommendations are set forth in the SCWP regarding water resources management in general. The major recommendations are synopsized in the following list.

- Cooperation is needed between local, state, and federal agencies as well as public and private entities.
- Management requires the increased use of regulatory science as well as comprehensive and accurate monitoring of water use.
- Management strategies need to be flexible, to adapt to changing conditions; they also need to maximize water availability.
- Water conservation and efficiency need to be the first option for extending water availability.
- All water systems should develop interconnections with neighboring systems.
- Municipal wastewater should be recycled for irrigation use on grasslands.
- Water should be withdrawn in the following order of preference: (1) streams, (2) lakes, (3) aquifers.
- Source water assessments should be done by water providers, to help protect sources from contamination.
- Legislation is needed to establish a statewide wetlands protection program and a “no-net-loss” policy.

Surface water quantity and quality. South Carolina has over 11,000 miles of permanently flowing streams. According to the SCWP, a good monitoring network and management of the reservoirs that control the major rivers are essential for effective surface water management.

Of South Carolina’s 1,600 lakes with 10 acres or more, the 12 largest contain 95 percent of the water. These major reservoirs were constructed primarily for hydroelectric power. The lakes and the rivers that feed them are interconnected: What happens in a river affects the downstream lake, and what happens in a lake affects the river downstream. According to the SCWP, the most significant effect a reservoir has on a river is to change the downstream flow regime; therefore, minimum flow standards are needed.

According to the SCWP, surface water use should be regulated to ensure that all users have an adequate supply. In cases where only a portion of the water withdrawn from a source is returned, both total withdrawal and net withdrawal should be considered. Enough water should be returned to maintain the water system’s health. Withdrawal and return points should be as close together as possible.

According to the SCWP, water quantity should be monitored in all large streams and lakes in the state: Continuous flow monitoring should be used, in order to understand flow regimes and the relationship between precipitation, soil moisture conditions, and stream flows.

The 1972 Pollution Control Act established the state’s role in maintaining water quality. DHEC – South Carolina’s lead agency for water quality planning and management – is

responsible for administering water quality programs mandated by the federal Clean Water Act. Because water pollution in a watershed is partly a function of its land-use activities, DHEC began implementing a watershed-based approach to water quality management in 1991.

DHEC also is responsible for monitoring water quality to determine water quality trends and identify emerging problems. South Carolina has 314 permanent monitoring sites, 28 fixed special-purpose sites, and five summer-only sites. Most of these sites are maintained by the U.S. Geological Survey.

According to the SCWP, intergovernmental and interagency cooperation on water quality management is essential, to avoid duplicating efforts and to ensure consistency among state and federal programs.

Groundwater quantity and quality. About 30 percent of the state’s population – mostly in rural areas – relies on groundwater, and about 60 percent of the water in South Carolina’s streams comes from groundwater. According to the SCWP, groundwater is an important water source for manufacturing and also is vital for maintaining healthy aquatic ecosystems by recharging streams and wetlands.

The types of groundwater aquifers in the state vary. The coastal plain region has two types: confined aquifers – sometimes called “artesian wells” because the water rises above the top of the aquifer, and unconfined aquifers – sometimes called “water-table” aquifers. The piedmont and mountain regions mainly have bedrock aquifers – aquifers created through the slow downward passage of water through fractures in the rock layer. According to the SCWP, accurate data on these aquifers – including their location, thickness, hydraulic properties, and interrelationships – are needed for groundwater management plans.

In addition, according to the SCWP, groundwater withdrawal should adhere to the following management principles:

- Withdrawals should be managed to protect other users of the aquifer. Well spacing should be regulated.
- Withdrawals during drought should be managed to protect drinking supplies.
- Withdrawals should be managed to prevent subsidence and sinkholes.
- Water table aquifer withdrawals should be managed to protect wetlands, surface water, and confined aquifers.
- Withdrawals should be managed so as to not cause degradation of water quality.
- An effective groundwater management plan should be adaptive to conditions.

Furthermore, the SCWP recommends

- developing a groundwater model for the coastal plain, in order to predict the effect of future pumping and determine the spacing of wells; and

- monitoring groundwater quantity throughout the state, in order to determine the effects of drought and withdrawals on water resources.

The SCWP notes that groundwater remediation is costly and time-consuming and often fails to restore water to its original condition. Consequently, the SCWP advocates prevention of contamination as the first line of defense. As of 2009, South Carolina was developing a comprehensive groundwater protection program.

Other State Water Resources Issues in the SCWP

Drought management and mitigation. The state's 1985 Drought Response Act established a drought response committee, which can declare a drought based on climatic conditions and recommend that the governor impose mandatory water use restrictions.

Recommendations in the SCWP regarding drought mitigation include the following:

- The state should have a drought management and mitigation plan to enhance current drought-related legislation.
- Federal and state agencies need to improve drought research to increase the accuracy of drought predictions.
- Allocation mechanisms are needed for surface and ground water to ensure water availability.
- Minimum flows and water levels should be established and enforced to protect water quality and designated uses.
- All water suppliers and industries should prepare drought contingency plans with specific triggers and actions.
- Farmers should invest in efficient irrigation systems.
- A program should be established to provide financial assistance for low-income households to deepen wells.

Flood plain management and mitigation. Traditional flood control measures have centered on building reservoirs and levees. According to the SCWP, however, natural floodplains and wetlands serve important ecological and hydrologic functions; they should be preserved by limiting new development in delineated floodplain and relocating vulnerable structures and populations in flood hazard areas. Moreover, according to the SCWP, floodplain management is most effective at the local level: State and federal governments should encourage local floodplain management programs, and the state should oversee floodplain and floodway delineations.

Basin-wide management and interstate cooperation. According to the SCWP, the state should establish advisory committees for each of its four basins with representatives from federal, state, and local agencies along with other stakeholders to develop comprehensive basin management plans. The SCWP adds that because three of the state's four basins are shared with other states, formal mechanisms such as interstate compacts or

memorandums of understanding are needed to ensure a fair apportionment of available waters.

Maximizing water availability. The SCWP anticipates that population growth, development pressure, and changing climatic conditions will continue to stress the state's water supplies in the future. The SCWP recommends that the state should investigate and encourage the following practices:

- Water conservation and efficiency, achieved through more efficient operation of storage and delivery mechanisms and more efficient practices by users.
- A state role in reservoir management, with a drought contingency plan for each reservoir, as well as consideration of off-stream reservoirs to increase water supply with fewer river system impacts than in-stream reservoirs.
- Technical and financial assistance to farmers, to manage the moisture content of agricultural soils through, e.g. subsurface drainage and subsurface irrigation.
- Aquifer storage and recovery practices, to store water during wet periods for use during dry periods.
- Inter-basin transfers from water surplus areas to water deficit areas, to maximize water availability while recognizing that special conditions on inter-basin transfer permits may be needed to take droughts into account.
- Reuse of treated effluent, to increase the available water supply.

IV. Recent Developments

In 2007, Senate Bill 452 – the Water Withdrawal Permitting, Use, and Reporting Act – and House Bill 3132 – the Comprehensive Statewide Water Management Act – were introduced in the legislature to address the recommendations made in the 2004 SCWP. The bills would have significantly changed the way water is regulated in South Carolina. The SC Municipal League, representing utilities, and other industry lobbyists had concerns about proposed minimum in-stream flow requirements, permitting of water withdrawals from impoundments, and changes to the Interbasin Transfer of Water Act. They succeeded in having the bills deferred in 2007 and 2008. The bills were re-introduced in 2009. By this time, however, the recent drought had abated and reservoirs were filling. Many of the drought-driven concerns of the water utilities were less urgent. In addition, lawsuits concerning the Catawba River (South Carolina v. North Carolina) and the Savannah River (Georgia v. South Carolina) reached the federal courts in 2009. The legislature decided to defer the bills for another year to allow time for the lawsuits to be resolved (Linsey Bounds, personal communication, October 22, 2009).

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Appendix A:

Water Policy Legislation, 1967-1982

Water policy laws in South Carolina are contained in the South Carolina Code of Law Annotated (S.C.L.A.) in Title 49, Water, Water Resources, and Drainage.

Water Resources Planning and Coordination Act of 1967, as Amended

The 1967 Water Resources Planning and Coordination Act established the Water Resources Commission to govern water resources in South Carolina; in 1993, the act was amended to abolish the commission and assign its functions to the Department of Natural Resources and the Department of Health and Environmental Control.

Section 49-3-30. The former Water Resources Commission without its regulatory functions is hereby transferred to the Water Resources Division in the Department of Natural Resources and is directly accountable to and subject to the board of the Department of Natural Resources.....The regulatory functions of the former Water Resources Commission are transferred to the Department of Health and Environmental Control.

Powers and duties of the Department of Natural Resources include advising and assisting the governor and the general assembly in

- formulating water resources policy;
- reviewing projects, plans, and programs of federal aid concerning water and making recommendations when necessary;
- developing policies and recommendations to assure that the long-range interests of all stakeholders are met in the state's representation on interstate water agencies;
- recommending changes in law necessary to implement policy;
- making recommendations relating to use and control of water in the state; and
- receiving and expending grants.

Groundwater Use and Reporting Act (GURA) of 1976

The GURA was enacted when it became apparent that groundwater resources in the state's coastal plain were becoming threatened and that some regulation was necessary to provide all stakeholders access to water in the future and during times of drought. GURA is administered by the Department of Health and Environmental Control.

Section 49-5-20. The General Assembly declares that the general welfare and public interest require that the groundwater resources of the State be put to beneficial use to the fullest extent to which they are capable, subject to reasonable regulation, in order to conserve and protect these resources, prevent waste, and to provide and maintain conditions which are conducive to the development and use of water resources.

Section 49-5-40 gives DHEC the authority to establish a groundwater management program requiring groundwater withdrawers above the 3 million gallons per month threshold to register withdrawals and report use.

Section 49-5-60 creates the capacity use designation and gives DHEC the authority to create capacity use areas “where excessive groundwater withdrawal presents potential adverse effects to the natural resources or poses a threat to public health, safety, or economic welfare.”

Interbasin Transfer of Water Act (ITWA) of 1977

Under Chapter 21 of Title 49, the ITWA gives DHEC the authority to permit, under certain conditions, the transfer of water from one basin to another. The law originally was applied to 15 basins in South Carolina delineated in Section 49-21-60. Permits are issued for between 20 and 40 years.

Section 49-21-20. Following the effective date of this chapter, no person shall withdraw, divert, pump, or cause directly the transfer of five per cent of the seven-day, ten-year low flow, or one million gallons or more of water a day on any day, whichever is less, from one river basin and use or discharge all or any part of the water in a different basin unless the person shall first obtain a permit from the department.

Section 49-21-30 specifies application procedures and criteria. Criteria include providing information on

- protection of existing uses and wastewater assimilative capacity in the source basin,
- future needs of withdrawers in the source basin,
- beneficial effects,
- how the transfer will affect storage and conservation,
- feasible alternatives and their costs,
- effects on other state and federal agencies with interest in affected streams, and
- effects on other uses in both the source basin and receiving basin, including interstate impacts.

Surface Water Withdrawal and Reporting Act (SWWRA) of 1982

The SWWRA allows DHEC to require that all surface water withdrawers, with the exception of listed exemptions, report all withdrawals in excess of 3 million gallons per month. This law was enacted in an attempt to help quantify water use in South Carolina.

The following exemptions are listed in Section 49-4-30:

- Dewatering operations
- Emergency withdrawals
- Ponds fed by diffuse surface water on private property
- Permitted interbasin transfers
- Wildlife habitat management

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Appendix B:

Water Policy Bills before the General Assembly in 2009

Two water-related bills incorporating SCWP recommendations were introduced in 2009: HB 3132 and SB 452.

HB 3132, Comprehensive Statewide Management Act, 2009

This bill, if enacted, would fundamentally alter the way water resources are managed in South Carolina. The purpose of the bill is stated as follows:

“TO AMEND CHAPTER 3, TITLE 49, CODE OF LAWS OF SOUTH CAROLINA, 1976, RELATING TO WATER RESOURCES PLANNING AND COORDINATION BY ADDING ARTICLE 3, SO AS TO ENACT THE "SOUTH CAROLINA COMPREHENSIVE STATEWIDE WATER MANAGEMENT ACT OF 2009", INCLUDING PROVISIONS TO REQUIRE THE DEVELOPMENT OF A STATEWIDE COMPREHENSIVE WATER MANAGEMENT PROGRAM; TO PROVIDE FOR PRINCIPLES ON WHICH SUCH PROGRAM MUST BE BASED; TO REQUIRE ALL WATER WITHDRAWAL PERMIT DECISIONS TO BE MADE IN ACCORDANCE WITH THE PROGRAM; TO PROVIDE FOR EFFECT OF NONCOMPLIANCE WITH THE PROGRAM; TO PROVIDE FOR A SOUTH CAROLINA WATER PLANNING COMMITTEE AND FOR ITS COMPOSITION AND DUTIES; TO PROVIDE PROCEDURES FOR PROGRAM DEVELOPMENT, ADOPTION, AND REVISION; TO DESIGNATE SECTION [49-3-10](#) THROUGH SECTION [49-3-50](#) OF THE 1976 CODE AS ARTICLE 1, CHAPTER 3 OF TITLE 49; AND TO REPEAL CHAPTER 21 OF TITLE 49 RELATING TO THE INTERBASIN TRANSFER OF WATER UPON APPROVAL OF THE GENERAL ASSEMBLY BY JOINT RESOLUTION OF THE STATEWIDE COMPREHENSIVE WATER MANAGEMENT PROGRAM PROVIDED ABOVE.” (p. 3)

The bill states that the SCWP would be the foundation for developing a statewide comprehensive water management program in South Carolina. Program development would be done under the guidance of an 11-member state water planning committee. The proposed Section 49-3-320 states that “the committee shall develop and propose a Comprehensive Statewide Water Management Program consistent with this article in order to manage water resources of this State in a sustainable manner to protect public health and natural systems, support the State’s economy, and enhance the quality of life for all citizens of the State of South Carolina.”

The proposed Section 49-3-330 sets out the following guiding principles, among others:

- Water resources are to be managed in a sustainable manner.

- Water resource management efforts shall have a sound scientific base.
- Water quality and quantity and surface water and groundwater are interrelated and require integrated management as well as reasonable and efficient use.
- A comprehensive database must be created to provide a sound scientific and economic base.
- Water resources management should encourage local and regional innovation.
- Water management during periods of drought must include continuous basin monitoring and the ability to adjust and adapt policies as necessary.
- Periodic revisions of the statewide plan may be necessary as scientific and economic conditions change.

According to the proposed Section 49-3-340, the Comprehensive Statewide Water Management Program will include

- water policies to guide river basin and aquifer management plans, regional and river basin planning efforts, and local water plans, and
- regional water basin management councils, which will prepare water planning and conservation plans for each basin.

SB 452, Water Withdrawal, Permitting, and Reporting Act, 2009

This bill was introduced to enable DHEC to require permits, with certain exceptions, for water withdrawals in excess of 3 million gallons a month and to require the permit holder to report on an annual basis the quantity of water used. It also defined minimum flow requirements.

With certain exemptions, Section 49-4-25 makes surface water withdrawals in excess of 3 million gallons per month illegal unless permitted. Exemptions include

- dredging,
- emergency withdrawals,
- agricultural uses from farm ponds owned by the person making the withdrawal, and
- wildlife habitat management.

Section 49-4-35 allows withdrawers on regulated rivers currently registered with the state to continue to withdraw surface water up to their registered amount without obtaining a permit. An existing registered withdrawer may make application and receive permission to increase withdrawals without obtaining a permit.

The bill as amended gives DHEC the right to determine the safe yield from a water body. The proposed act also delineates eight river basins to be used in determining the affected area of a withdrawal application.

Section 49-4-150 defines minimum in-stream flow requirements. Minimum flow is defined as 20 percent of the mean average daily flow for any stream segment not influenced by an impoundment. Minimum downstream flows from impoundments are specified in the license issued by the appropriate government agency. When flow falls below the defined minimum, water withdrawers must discontinue withdrawals unless authorized by DHEC. Water withdrawers are required to submit contingency plans to be implemented when minimum flows fall below the standard.

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Texas

Highlights

Texas relies on both surface water and groundwater for its water supplies. Surface water and groundwater are subject to different legal principles in Texas. The state's surface water law has moved away from the common law doctrine of riparian rights and now statutorily holds that surface water rights belong to the state and are held in trust for the people. Groundwater law in Texas continues to adhere to the principle that groundwater is the property of the landowner who can pump it out.

Texas has more than 50 years of experience with state water planning. Once top-down, the state's approach now stresses its 16 regions. Plans for surface water and groundwater supplies are adopted by the regional planning groups and are sent to the Texas Water Development Board for approval. Once approved, the plans are used to develop the statewide plan.

Texas also has moved away from a water supply approach that relied mainly on reservoirs to one that includes an emphasis on efficiency and conservation as well as water reuse.

I. Introduction

In Texas, water is divided into three categories: natural surface water, diffused surface water, and groundwater. Different legal principles govern each.

Natural surface water. Natural surface water is defined as water in a watercourse, as delineated by its bed and banks. Until five decades ago, surface water rights in Texas were governed primarily by the doctrine of riparian rights. With its 1967 Water Rights Adjudication Act, the Texas legislature shifted away from court-created riparian rights toward legislatively created appropriative rights. Landowners had until 1969 to claim a riparian right with the Texas Water Commission. All subsequent water rights were to be held by the state in trust for the people. Surface water owned by the state can only be used with a permit from the Texas Commission on Environmental Quality.

Diffused surface water. Diffused surface water, defined as storm water or runoff, is the property of the landowner until it passes into a natural watercourse. It then becomes the property of the state. Diffused surface water can be captured and used by the owner of the

land over which it runs. Three legal principles govern diffused surface water that is captured or diverted:

Common Enemy Rule: Drainage water is considered to be a common enemy. The rule allows landowner to take any measure to protect his property, regardless of the consequences to neighbors.

Natural Flow or Civil Law Rule: Each landowner has the right to rely on continuation of the natural flow. Any landowner diverting or increasing flow that causes flooding on another landowner's property is liable for damages.

Reasonable Flow Rule: A landowner may change or divert a flow, even to the extent that it damages adjoining property, as long as the actions are "reasonable" considering all circumstances.

Groundwater. Groundwater, defined as water beneath the land surface, is the property of the landowner. Of all the water used in Texas, groundwater provides approximately 60 percent, about four-fifths of which is used for irrigation. Groundwater in Texas is governed by the "rule of capture." Under this rule, landowners have the right to capture and use or sell the water under their land. If sold, water may be transported off the land or exported outside a county or region. This rule is often called the "law of the biggest pump": Texas courts consistently have held that a landowner has the right to pump out all of the water under his land regardless of the consequences to his neighbor.

The Texas legislature has the ultimate authority to regulate groundwater but has delegated this authority to local groundwater conservation districts. The districts have extensive legal authority under Chapter 36 of the Texas Water Code. They can enforce pumping limits to preserve aquifer storage and recovery, but most choose to permit new wells and simply require they have certain spacing from other wells.

II. Water Supply Planning in Texas

Fifty Years of Water Planning in Texas

From 1950 to 1957, Texas had the longest drought in the state's history. Partially as a result of this drought, the legislature created the Texas Water Development Board (TWDB) in 1957 to begin statewide water planning. The Texas constitution subsequently was amended to enable the TWDB to administer a \$200 million water development fund to help communities develop water supplies.

The TWDB prepared its first statewide water plan in 1961. This plan and its 1968 successor were early attempts to quantify how much water the state has and how much it will need. As of 2009, the TWDB had prepared eight plans.

The first two plans advocated reservoirs as a preferred supply strategy and recommended the construction of 107 new reservoirs of greater than 5,000 acre/feet of storage. As of 2009, Texas had 197 reservoirs – all but 28 built prior to 1980. In the 1970s and 1980s, as suitable sites for reservoirs became scarce, the TWDB’s strategies began to concentrate on conservation, reusing treated wastewater, desalinating salt water and brackish water, and other less conventional, more innovative approaches than reservoirs.

The 1996 drought in Texas led to the 1997 passage of Senate Bill 1 to establish a new water planning process relying on plans from 16 regional planning districts. With this new planning process, there was a shift from a “top down” model to a “bottom up,” consensus-driven model. The first state water plan adopted after the enactment of Senate Bill 1 was *Water for Texas-2002*. The most recent is *Water for Texas-2007*.

Basis for the 2007 State Water Plan

According to the act creating the TWDB as amended

the state water plan shall provide for the orderly development, management, and conservation of water resources and preparation for and response to drought conditions, in order that sufficient water will be available at a reasonable cost to ensure public health, safety, and welfare; further economic development; and protect the agricultural and natural resources of the entire state (Texas Water Code Chapter 16.051).

Water for Texas-2007 was developed with the input of 16 regional water planning groups. Each had about 20 members representing interests such as agriculture, industry, environment, business, municipal and county governments, water districts, river authorities, water utilities, and power generation. The planning groups evaluated population and water demand projections through 2060 and existing water supplies within the context of a “drought of record.” The planning groups then identified who would not have enough water and recommended strategies and projects to remedy the situation, with estimates of their costs and environmental impacts. Plans were adopted by the regional planning groups and sent to the TWDB for approval. Once approved, the plans were used to develop the statewide plan. The regional planning groups’ recommendations for the 2007 statewide plan addressed

- regulatory, administrative, or legislative changes;
- unique reservoir sites;
- stream segments of unique ecological value;
- conservation strategies and reuse; and
- evaluating impacts to the state’s water, agricultural, and natural resources.

Organization of *Water for Texas-2007*, Volume II

The 2007 plan is organized as follows:

- Chapter 1:** Highlights of the 2007 State Water Plan
- Chapter 2:** Regional Summaries
- Chapter 3:** Fifty Years of Water Planning in Texas
- Chapter 4:** Population and Water Demand Projections
- Chapter 5:** Climate of Texas
- Chapter 6:** Surface Water Resources
- Chapter 7:** Groundwater Resources
- Chapter 8:** Water Reuse
- Chapter 10:** Water Management Strategies
- Chapter 11:** Plan Implementation Funding
- Chapter 12:** Challenges and Uncertainties in Water Supply Planning
- Chapter 13:** Planning Group Policy Recommendations

Conclusions Drawn from the Regional Water Plans

Chapter 1 of the 2007 plan notes the following:

- The state's population is expected to more than double from 21 million to 46 million by 2060.
- Demand for water is expected to increase 27 percent by 2060.
- Existing water supplies are expected to decrease about 18 percent by 2060 due to accumulated sediment in reservoirs and depletion of aquifers.
- Texas will need an additional 8.8 million acre/feet per year of water to meet expected demand in 2060.
- Planning groups identified 4,500 water management strategies and projects to generate an additional 9 million acre/feet per year of water supply at a cost of \$30.7 billion by 2060.
- If the plan is not implemented, costs to businesses and workers will be about \$9.1 billion in 2010, escalating to \$98.4 billion per year by 2060. Furthermore, 85 percent of the state's projected population will have inadequate water supplies during drought conditions in 2060; approximately 60 percent will have inadequate water supplies in 2020.

TWDB Policy Recommendations to the Legislature

As part of the 2007 plan, the TWDB made recommendations to the state legislature on a number of issues, including the following seven topics.

Financing water management strategies. Approximately 90 percent of the funds to finance the estimated \$30.7 billion needed to implement the 4,500 projects identified in the regional plans will be generated locally. However, those plans also identified specific funding needs that could be filled by the state. The TWDB recommended that the legislature consider appropriating \$77.5 million for 2008-2009 for debt service on general obligation bonds to supply grants and loans to construct \$930 million in projects. Cumulative appropriations between 2008 and 2028 are expected to fund \$1.7 billion in projects.

More than \$2 billion in state financial assistance are expected to be needed by 2060. With the balance borne by local jurisdictions through traditional financing mechanisms, this will result in \$30.7 billion needed for capital costs.

The TWDB recommended that the legislature maintain existing state programs for water and wastewater infrastructure in order to provide adequate financing for these projects and ensure continued access to federal funds for water-related infrastructure.

Reservoir site designation and acquisition. The TWDB holds the view that major reservoir projects must remain a strong and viable tool if the state is to meet its future water supply needs. Planning groups have recommended 14 new major reservoir projects as a management strategy. The TWDB recommended that the legislature designate all remaining viable reservoir sites for protection under the Texas Water Code.

Regional planning groups have identified 19 unique reservoir sites needing protection for future projects, along with 15 ecologically unique stream segments. Some of the unique stream segments may be in direct competition with the designated reservoir sites. The TWDB recommended that the legislature designate all river or stream segments of unique ecological value recommended by the state water plan for protection under the Texas Water Code.

The TWDB also recommended that the legislature provide a mechanism for acquiring viable reservoir sites; e.g.,

- legislative creation of a State Reservoir Site Development Easement System to provide limited eminent domain, in order to restrict certain land uses that would conflict with reservoir development, or
- legislative creation of a Reservoir Site Acquisition Fund to be administered by TWDB for the purpose of preserving future reservoir sites, with legislative appropriation of \$100 million each biennium for such acquisition.

Inter-basin transfers of surface water. Another TWDB recommendation was for the legislature to enact statutory provisions to eliminate unreasonable restrictions on the voluntary transfer of surface water from one basin to another.

Environmental water needs. Debate continues in Texas about the amount of in-stream flow and freshwater inflow for bays and estuaries needed to protect the environment. In 2003, the legislature created the Study Commission for Environmental Flows; in 2004, the commission recommended standards for flow regimes, but these standards were not legislatively enacted. The TWDB recommended that the legislature enact statutory provisions to balance human water needs, the need for greater certainty in water rights permitting, and the need for adequate in-stream flows.

Water conservation. In 2003, the legislature created the Water Conservation Implementation Task Force, which developed a best management practices guide. The regional planning groups' municipal water conservation strategies relied heavily on this guide; they included, for example,

- aggressive plumbing replacement programs,
- water-efficient landscaping codes,
- water loss and leak detection programs,
- education and public awareness programs,
- rainwater harvesting,
- changes in water rate structures,
- irrigation management systems,
- land management systems,
- on-farm delivery systems,
- water district delivery systems, and
- other systems such as water recovery and reuse.

The TWDB asked the legislature to review the recommendations of the Water Conservation Implementation Task Force and implement those that will result in water use efficiency and conservation.

Expedited amendments to regional water plans. Another TWDB recommendation was for the legislature to enable expedited amendments to regional water plans if the TWDB's executive administrator determines the amendment will not result in over-allocation of a source, is not related to a new reservoir, and does not have a significant effect on instream flows or fresh water inflows to bays and estuaries.

Direct and indirect reuse. There are two types of water reuse: direct reuse, where effluent is piped directly to the place where it is used; and indirect reuse, where the water – usually effluent – is placed back into a river or stream. In Texas, the holder of a water right may directly reuse and consume effluent, but Texas law does not address the potential impacts of direct reuse on the environment because of downstream flow reductions.

The Reuse Committee of the Texas Water Conservation Association has raised the following questions:

- Is effluent discharged into a waterbody the property of the state, or is it subject to a different regulatory scheme?
- Does current law allow effluent derived from different sources of water to be treated differently for purposes of reuse?
- Who can obtain reuse rights?
- To what extent should environmental protection be considered in reuse permitting decisions?

The TWDB recommended that the legislature develop policies that respond to these questions.

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Appendix A:

Summary of Two Regional Plans

The following two regional plans are summarized here because of their focus on groundwater.

South Central Texas (Region L)

The South Central Texas regional planning area is composed of 21 counties ranging from San Antonio to the Gulf of Mexico. There are five major and two minor aquifers supplying water to this region. Approximately half of the region's water supply is projected to come from the Edwards Aquifer with another third provided by the Carrizo-Wilcox Aquifer. The primary surface water sources are the Guadalupe, San Antonio, and Nueces rivers. Available water supply is expected to decrease slightly by 2060 due to the depletion of aquifers.

Approximately 10 percent of the population of Texas currently resides in the South Central region, and the region's population is expected to increase 75 percent by 2060. Its largest economic sectors are tourism, the military, medical and other services, manufacturing, and retail trade.

Total water demands for the region are expected to increase by 29 percent by 2060, with municipal needs experiencing the bulk of the increase. Irrigation needs are expected to decline.

To meet the future water supply needs of the South Central region, its planning group recommended the following strategies:

- Through inter-basin transfer from the Lower Colorado River, import 150,000 acre-feet per year at a project cost of \$2.1 billion to construct the needed pipelines and pumps.
- Increase withdrawal of the Carrizo-Wilcox Aquifer by 117,809 acre-feet per year.
- Increase withdrawal from the Edwards Aquifer by 93,112 acre-feet per year.
- Implement conservation strategies, saving up to 109,927 acre-feet per year.
- Expend \$5.2 billion for 11 projects to be constructed by 2060.

The South Central Texas regional planning group also made these policy recommendations:

- Reconcile groundwater and surface water law in order to achieve an appropriate balance between the uses of these resources and to promote conjunctive-use projects.

- Fund and complete state environmental flow studies.
- Fund desalination demonstration projects.
- Adequately fund groundwater conservation districts.

Llano Estacado (Region O)

The Llano Estacado region is composed of 21 counties in the southern high plains of the Texas Panhandle. The region's largest city is Lubbock. Approximately 97 percent of the region's water supply comes from the Ogallala Aquifer, which underlies the Panhandle and parts of seven other states.

A huge aquifer with water from the Ice Age, the Ogallala receives very little recharge and is being depleted. The aquifer was the subject of a six-state regional study authorized by federal law in 1976 and conducted by the federal Economic Development Administration over the next four years, under the direction of a High Plains Study Council formed to oversee the study with representatives from each of the states. The aquifer was also the subject of a recent (1999-2005) High Plains Regional Ground-Water Study conducted by the U.S. Geological Service as part of its National Water Quality Assessment Program.

The Llano Estacado region currently has about 2 percent of the state's population. The region's population is expected to increase 12 percent by 2060. Its primary economic sectors are livestock operations and agriculture; the region produces about 60 percent of the state's cotton. Irrigation currently consumes 95 percent of the region's water supply.

By 2060, total water supply for the region is expected to decrease by 55 percent, due to depletion of the Ogallala Aquifer, while total water demand is expected to decrease by 15 percent. Although municipal water demand is expected to increase 7 percent, irrigation demand is expected to decrease by 17 percent, due in part to improved irrigation efficiencies.

To meet the future water supply needs of the Llano Estacado region, its planning group recommended the following strategies:

- Implement stringent irrigation conservation strategies; they can account for 77 percent of the estimated additional 441,511 acre-feet per year of water supply needed by 2060.
- Reduce consumption by 1 percent per year until water use is reduced to a goal of 172 gallons per capita per day.
- Fund four recommended water supply projects for a total capital cost of \$819 million.

The Llano Estacado regional planning group also made these policy recommendations:

- Seek legislative support for conservation measures.
- Manage groundwater through groundwater conservation districts.

- To improve equitable distribution of water supplies, support modifications to the Rule of Capture as recommended by existing conservation districts.
- Support planting vegetation as a water conservation practice.

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Appendix B:

Legislation

Texas Water Code

Section 1.003. PUBLIC POLICY. It is the public policy of the state to provide for the conservation and development of the state's natural resources, including:

- (1) the control, storage, preservation, and distribution of the state's storm and floodwaters and the waters of its rivers and streams for irrigation, power, and other useful purposes;
- (2) the reclamation and irrigation of the states arid, semiarid, and other land needing irrigation;
- (3) the reclamation and drainage of the state's overflowed land and other land needing drainage;
- (4) the conservation and development of its forest, water, and hydroelectric power;
- (5) the navigation of the state's inland and coastal waters;
- (6) the maintenance of a proper ecological environment of the bays and estuaries of Texas and the health of related living marine resources; and
- (7) the voluntary stewardship of public and private lands to benefit the waters of the state.

Senate Bill 1, 1997

With the enactment of Senate Bill 1, the Texas Water Code was amended to include state drought planning. The bill as enacted also mandated forming regional planning groups and developing regional plans. It changed the process for formulating the state's five-year plans by requiring that the state plan be a compilation of the regional plans.

Highlights of Senate Bill 1 include the following:

Section 16.060. STATE DROUGHT PLANNING

- (a) The executive administrator [of the TWDB] shall prepare, coordinate, and oversee the development and implementation of a comprehensive state drought plan.

- (b) The state plan shall provide for the initial development and updating of effective regional and local drought response plans.
- (c) The board [of the TWDB] may provide cost-sharing financial assistance from the research and planning fund to assist local governments in the development of regional and local drought response plans.

Section 15.407. REGIONAL WATER MANAGEMENT PLANNING

- (a) The board [of the TWDB] may enter into contracts with political subdivisions to pay from the research and planning fund all or part of the cost of developing or revising comprehensive regional water management plans as defines in Section 16.059 of this code.

Sec. 16.059. REGIONAL WATER MANAGEMENT PLANS.

- (a) The executive administrator [of the TWDB] shall encourage the development and periodic revision, as necessary, of regional water management plans and may provide technical assistance with the development or revision of such plans.
- (b) Regional water management plans shall be prepared by political subdivisions under this section to assure an adequate, reliable, and affordable long-term water supply for all of the communities and public water supply systems within a designated regional water management planning area. Regional water management plans shall be developed and revised with the substantive participation of all communities, public water systems, and water suppliers within a designated regional planning area and shall include but are not limited to:
 - (1) consideration and inclusion, as appropriate, of all potentially feasible water management strategies including, but not limited to, improved management of existing water supplies, improved water use efficiency, water reuse and recycling, water supply and water demand management during water shortage, conjunctive use of surface water and groundwater supplies, acquisition of available existing water supplies, and development of new water supplies;
 - (2) consideration and inclusion, as appropriate, of water management strategy provisions contained in regional or local drought response plans;
 - (3) consideration of opportunities for and the benefits of developing regional water supply facilities or providing regional management of water supply facilities; and
 - (4) consideration of and appropriate provision for environmental water needs, including adequate water to maintain instream uses and freshwater inflows to the state's bays and estuaries.
- (c) The board shall, in coordination with the Parks and Wildlife Department and the commission, develop guidance consistent with the state water plan for the development and revision of regional water management plans.
- (d) The executive administrator shall designate the areas for which regional water management plans shall be developed, taking into consideration such factors

as river basin and aquifer delineations, water utility development patterns, socioeconomic characteristics, and other factors the executive administrator deems relevant. The executive administrator may also designate a political subdivision or group of political subdivisions within each designated regional water management planning area to serve as the coordinating body for planning. The board shall adopt rules to provide for the procedures for approval of regional water management plans and to govern the procedures to be followed by the executive administrator in carrying out the responsibilities of this subsection.

- (e) In preparing, developing, and formulating the state water plan, the executive administrator shall give consideration to and incorporate, as appropriate, regional water management plans approved by the board.

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Virginia

Highlights

Virginia's approach to water supply planning is notable for the following:

- The state used an extensive stakeholder process to draft its water supply planning regulations.
- Its regional and state planning efforts are based on detailed data supplied by local governments.
- Virginia has attempted to resolve interstate water rights disputes by negotiating with states having shared basins. Negotiations have not been successful, and most of the disputes have ended up in court. However, a bi-state commission recently has been created with North Carolina. Its success remains to be seen.

I. Introduction

Virginia's surface waters are subject to a regulated riparian legal system. Most of the state's population relies on surface water supplies; approximately 30 percent, or 2.2 million residents, are supplied by groundwater. Details regarding Virginia's legislative framework for water resources management are given in the appendix. The focus of this case study is on Virginia's recent process for developing water supply planning regulations.

Water supply planning was triggered in Virginia by the drought of 1999 through 2002. Extreme drought conditions in 2001 and 2002 caused local water supply shortages, and voluntary water use restrictions were encouraged. Some metropolitan areas were 60 to 90 days from experiencing immediate water emergencies. It became apparent that Virginia needed a comprehensive water supply plan to address increasing demands for water with a limited supply.

Water policy issues in Virginia had been contentious for a number of years, with various disputing factions (environmental groups, local governments, industry, and agriculture) negating coordinated efforts to address long-term water resources. In December 2002, the governor issued an executive order directing state agencies and local governments to work together to address water supply needs. The governor also directed the Department of Environmental Quality (DEQ) to convene a technical advisory committee (TAC) of

stakeholders to make recommendations for water planning legislation. The TAC met for three years. The first year was spent drafting the legislation. In its second and third years, the TAC concentrated on the regulations spelling out the process to implement the legislation.

Based on recommendations of the TAC, the general assembly passed a bill in 2003 authorizing the State Water Control Board to develop a process for water supply planning at the local, regional, and state levels. In 2003, DEQ established a new Water Resources Division. Water supply planning regulations based on TAC recommendations were adopted in 2005.

II. Technical Advisory Committee Process

The TAC participants were invited by the DEQ director on behalf of the Secretary of Natural Resources and the State Water Commission. To identify possible participants, DEQ consulted organizations such as the Virginia Municipal League, the Virginia Association of Counties, and major environmental groups. The composition of the TAC changed over its three-year lifetime, as some participants dropped out and others were added; in addition, beginning in its second year the committee's size doubled. At its maximum, the TAC had over 30 representatives from government agencies, academic institutions, business, industry, and environmental groups.

After the TAC was formed, it became obvious that little agreement would be reached through conventional means. To address this situation in the second and third years of the TAC, DEQ hired the McCammon Group, which specializes in alternative dispute resolution, at a cost of \$214,600.

The facilitation process used by the McCammon group was called "collaborative problem solving." At the outset, two hurdles had to be overcome. Many of the TAC members were used to dealing with the legislature, where agreements are reached through adversarial negotiation. It was difficult for these members to switch to a collaborative process. The second hurdle concerned conflicting values and world views. According to an article by a University of Virginia researcher, Mark Rubin, about the TAC process, the breakthrough came when TAC members realized that they sought a balance between beneficial in-stream uses and beneficial off-stream uses. At that point, problem solving began.

Stakeholder Interests and Concerns

According to Rubin, the interests and concerns of stakeholders on the TAC can be grouped as follows:

Department of Environmental Quality. The agency focused on the importance of gathering information on water resources and demands, in order to prepare a “big picture” state water resources plan. The big picture would allow the state to identify potential conflicts and stresses on water resources. Local governments could provide the information necessary to prepare the plan.

Environmental groups. The environmental groups saw the potential for well-documented local plans that included beneficial in-stream uses; this would enable local communities to recognize possible problems and stresses on water resources when planning for future water supplies. At the same time, environmental groups were concerned that state and local plans might dilute the permitting process for new water withdrawal projects.

Local governments. Local governments were primarily concerned about unfunded mandates; they also expressed the view that water planning should be a local government function and that state planning would lead to water allocation. At the same time, they saw the potential for good local plans streamlining the permitting process for new water withdrawal projects.

Industry and utilities. These groups primarily obtain water through grandfathered water withdrawal projects. Their concern was that the state plan would change the regulatory structure and lead to allocation. However, creating a “big picture” plan was seen as an asset for economic and business planning.

Agriculture. Agricultural interests were very satisfied with the status quo. Their fear was increased regulation. Agricultural producers felt that less regulation was best for them.

Home builders and developers. This group depends on growth and needs adequate water supplies. Their concern was that water resources planning would curtail growth.

The Consensus Product

Despite differences in interests and concerns, the TAC was able to reach consensus on a number of issues in making recommendations for regulations. As discussed by Rubin, these issues include the following:

Legal context. The TAC agreed that all decisions would be made within the context of existing water law; no effort would be made to change these laws.

Local plans. It was agreed that local government plans, rather than being comprehensive, would mainly be inventories. Local governments would

- provide information on current utilization of water, its source, and the environmental conditions of the source;
- prepare a 30-year projection;
- look at alternative sources to meet future demands;
- complete plans within a six-year window; and
- understand that local plans would become a part of the state plan.

Allocation. The TAC recognized that local water resource plans could identify potential conflicts over the use of the same resource, and the earlier these conflicts were identified the more likely a regional solution could be found. With such conflicts, the DEQ defined its role as a facilitator rather than an arbiter.

Permitting. The TAC recognized that the permitting of new water withdrawal systems was a contentious issue, but one separate from planning. Therefore, the issue of permitting would not be addressed in the planning regulations.

The TAC had over 30 meetings to draft regulations establishing a water supply planning process. During its third year, the TAC reached consensus on the recommended set of regulations. The recommended regulations were approved by the State Water Control Board, seven public hearings on them were held across the state, and they were adopted in 2005.

Comments from the Office of Water Supply Planning

Scott Kudlas, Director of the Office of Surface and Ground Water Supply Planning within DEQ's Water Resources Division, said that Virginia's water supply planning process – in its fourth year as of 2009 – is going well (Scott Kudlas, personal communication, May 20, 2009). His office is receiving water withdrawal and use data from local governments – data that are essential to developing regional supply plans and the State Water Resources Plan. He attributed this success in part to the regulations recommended by the TAC.

Regarding the TAC consensus-seeking process, Kudlas noted that the greatest opposition came from environmental groups and from the Virginia chapter of the American Waterworks Association. He also commented that in the TAC process, several conditions were necessary to its success:

- Someone with credibility in the legislature to run interference, in order to assure that TAC members would not undermine the process by involving their legislators.
- Weekly updates to the legislature.
- Flexible deadlines, because otherwise interest groups might try to kill the process by stalling until a set deadline had passed.
- A clear and workable definition of “consensus” – in this case, “what you can live with.”

- Involvement of the rulemaking agency in the stakeholder process. The Water Resources Division helped with the facilitation process, and the deputy director of Natural Resources as well as the director of DEQ attended all meetings.

Regarding local water disputes, Kudlas said that the TAC came to realize that local disputes could be addressed by looking at supply on a regional level. There is water interdependence between communities; they have to look at non-traditional alliances and manage expectations.

The local plan, by regulation, is designated as a local program, in order to ensure that local governments implement their plans once they are approved. To be approved by the state, a local program must be accompanied with a resolution that includes

- an ordinance change to govern water allocation and to address efficiency, conservation, and reuse;
- an implementation strategy for the ordinance; and
- an enforceable drought contingency plan.

Water quality and quantity interrelationships are addressed at the state level in the State Water Resources Plan. The local plans are incorporated into regional plans, which are used to prepare the state plan. The state models the supply information from the compiled data to determine nutrient and low-flow impacts on a basin scale.

Kudlas also mentioned the following:

- Minimum in-stream flow is defined in Virginia as 10 percent of instantaneous flow. Part of the state plan will be to do a cumulative impact/accounting analysis of flow.
- Inter-basin transfers within Virginia require permits and are considered a 100 percent consumptive use.
- The coastal plain area of Virginia is served by groundwater, and its aquifers are running dry. The coastal plain area will have to look for alternative supply such as desalination.

III. Interstate Disputes

According to Scott Kudlas, Virginia shares permit applications with the neighboring state if the water basin crosses state boundaries. However, for many years Virginia has had water allocation disputes over shared basins. Two interstate disputes stand out, one with Maryland and one with North Carolina.

Virginia and Maryland: The Potomac River

The dispute between Maryland and Virginia over Potomac River water rights goes back over 400 years. The first agreement was signed in 1785 and allowed both jurisdictions use of the water. Nevertheless, a boundary dispute continued until 1877, when arbiters appointed by the federal government determined that the boundary of Maryland would extend to the low water mark of the Potomac on the Virginia side. Water withdrawal permit applications from Virginia thereafter had to be approved by Maryland. Permits were granted without exception until 1996, when the Fairfax County Water Authority submitted a permit to extend its intake 725 feet into the middle of the river in order to extract cleaner water to keep treatment costs down. Maryland denied the permit, and Virginia subsequently sued. The suit eventually made its way to the U.S. Supreme Court. Virginia argued that Maryland did not have the right to restrict Virginia from the use of water in the Potomac. In 2003 the Supreme Court issued its opinion in favor of Virginia.

Virginia and North Carolina: The Roanoke River

Interstate water rights disputes between Virginia and North Carolina mainly concern the Roanoke River, which flows from the Blue Ridge Mountains of southern Virginia southeast through North Carolina to the Albemarle Sound.

The first dispute concerned the inter-basin transfer of water from North Carolina's Lake Gaston, one of a series of impoundments on the Roanoke River. This inter-basin transfer would supply up to 60 million gallons per day (mgd) to Virginia Beach using a 76-mile pipeline. North Carolina objected on the basis of potential future drought and allocation restrictions. The dispute was resolved after 14 years through federal intervention, and the withdrawal project was approved by an amendment to the Federal Energy Regulatory Commission's license to Virginia Power, the owner of Lake Gaston. The pipeline became operational in 1998.

The latest dispute concerns the inter-basin transfer of water from Lake Kerr in Virginia (one of the Roanoke River impoundments) to the Neuse and Tar river basins in North Carolina. The Kerr Lake Regional Water System, which serves only North Carolina, is seeking a withdrawal permit to increase its current allocation of 10 mgd to 24 mgd due to growth. In addition, utilities in the Research Triangle area, including those supplying Raleigh and Durham, want to withdraw an additional 50 mgd from the Neuse River basin to meet their future growth needs. The US Army Corps of Engineers has approved a 24-mgd increase in supply, but allocation of this increase has not yet been determined. Virginia is concerned that, if the entire 24-mgd increase is given to the Neuse and Tar basins in North Carolina, future growth in Virginia, particularly of water-dependent industry, will be affected.

In 2002 the North Carolina and Virginia legislatures each passed legislation creating a Roanoke River Bi-State Commission and Advisory Committees to equitably allocate water rights on the Roanoke River. Each state would have nine members on the

commission. Virginia established its Basin Advisory Committee in 2002 and began meeting on a quarterly basis; North Carolina did not establish its Advisory Committee until 2008. The first bi-state commission meeting was held in March 2009. At the time of this writing, results of that meeting are not available.

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Appendix:

Current Legislative Framework for Water Allocation

Water resources management is governed by Title 62.1 of the Code of Virginia.

State Water Control Act of 1950 (Title 62.1, Chapter 3)

This act established that the administration of water management in Virginia is vested in the State Water Control Board (SWCB). The SWCB is a seven-member citizen board whose members are appointed by the governor to four-year terms. The members must have water resources expertise.

The SWCB is authorized to require water withdrawers to register and report withdrawal and water use information. Thresholds for registering and reporting are one million gallons per month for irrigation and 10,000 gallons per day average for all other users.

Surface Water Management Act of 1989 (Title 62.1, Chapter 24)

There are two important regulations under this act. The first allows the SWCB to authorize surface water management areas (SWMAs) where surface water resources are threatened. Permits are required for major users, but permits would only be in effect for low-flow periods. Major users are defined as those withdrawing at least 300,000 gallons per day. No SMWA has been designated to date.

The other important regulation is the Virginia Water Protection (VWP) permit. This regulation states that no person in Virginia can withdraw surface water without a VWP permit. Permits are issued for a maximum of 15 years. This permit, which is similar to Tennessee's Aquatic Resources Alteration Permit, is used for water quality protection.

Ground Water Management Act of 1992 (Title 62.1, Chapter 25)

Groundwater permitting is limited to groundwater management areas, which are designated through authority granted by this act. Two such areas have been designated: the Eastern Shore Management Area and the Eastern Virginia Management Area. These areas are supplied by coastal aquifers. Permits for withdrawals of 300,000 gallons per day or more in these areas are required and must meet certain criteria. A conservation plan – including the use of water-saving plumbing, a water loss reduction program, water use education, potential water reuse options, and mandatory use reduction during water shortage emergencies – must be included with the permit application.

West Virginia

Highlights

West Virginia's approach to water supply planning has several unusual features:

- The process was triggered by legislators, and they remained intensively involved in the early years following water supply legislation in 2004.
- The process began with a water use survey of consumptive and non-consumptive uses; this survey preceded planning.
- For the foreseeable future, water supply planning will be done at the state level, with little input from local governments or other stakeholders.
- State planning will be done on a Hydrologic Unit Code (HUC) 8 watershed basis; the state plan will consist of these watershed plans.
- The HUC 8 watersheds have been prioritized: state planning efforts are focusing first on areas where water demand is expected to increase the fastest.

I. Introduction

West Virginia water rights have been governed by riparian common law. In 2004, the state legislature enacted the Water Resources Protection Act (WRPA). Among other things, the WRPA added a beneficial use clause to the riparian doctrine:

Beneficial use means uses that include, but are not limited to, public or private water supplies, agriculture, tourism, commercial, industrial, coal, oil and gas and other mineral extraction, preservation of fish and wildlife habitat, maintenance of waste assimilation, recreation, navigation and preservation of cultural values.

(WVC 22-26-2 (b))

The 2004 WRPA also initiated water supply planning in West Virginia. According to Mike Stratton, Chief of the Water Supply Section in the WV Department of Environmental Protection (DEP), the legislature decided in 2003 to draft legislation requiring (1) the quantification of surface and groundwater resources in the state, and (2) the registration of large quantity users. These tasks were assigned to DEP, which – according to Stratton – had not been involved in developing the legislation. He speculates that the 2001-03 drought in eastern West Virginia, together with strained water supplies

due to development pressures, were the drivers behind the legislation (Michael Stratton, personal communication, August 5, 2009).

In 2008, the state legislature amended the WRPA with the Water Resources Protection and Management Act. The 2008 act adopted recommendations by DEP to develop a statewide water resources plan. The plan is due by the end of 2013.

II. The 2004 Water Resources Protection Act

The WRPA established the state's right to regulate water:

The waters of the state of West Virginia are hereby claimed as valuable public resources held by the state for the use and benefit of its citizens. The state shall manage the quantity of its waters effectively for the use and enjoyment and for the protection of the environment (WVC, 1931, 22-25-3(a)).

The WRPA also addressed the water use survey, as described below.

III. Water Use Survey

The survey was to be conducted by DEP and submitted to the legislature by the end of 2006. According to the WRPA, the survey was to include nine elements:

1. to the extent the information is available, the location and quantity of all surface water and groundwater in this state;
2. a discussion of the consumptive and non-consumptive withdrawals of surface water and groundwater in this state;
3. a listing of each person whose consumptive or non-consumptive withdrawal during any single month during the calendar year exceeds seven hundred fifty thousand gallons, including the amount of water used, location of the water resource, the nature of the use, location of each intake and discharge point by longitude and latitude where available and, if the use includes more than one watershed or basin, the watershed or basins involved and the amount transferred;
4. a discussion of any area of concern regarding historical or current conditions that indicate a low flow condition or where a drought or flood has occurred or is likely to occur that threatens the beneficial use of the surface water or groundwater in the area;

5. current or potential in-stream or off-stream uses that contribute to or are likely to exacerbate natural low flow conditions to the detriment of the water resource;
6. discussion of a potential groundwater well network that provides indicators where the groundwater levels in an area are declining or are expected to decline excessively;
7. potential growth areas where competition for water resources may be expected;
8. any occurrence of two or more withdrawals that are interfering or may reasonable be expected to interfere with one another; and
9. discussion of practices or methods persons have implemented to reduce water withdrawals.

An internal DEP team was formed to develop the process for conducting the water use survey. The DEP used Marshall University's Center for Environmental, Geotechnical, and Applied Science and West Virginia University's Water Research Institute as consultants for research and preparation of major portions of the survey. Component #3 of the survey was potentially contentious: The coal and gas industries were vocal about having input to the registration process for large quantity withdrawals. DEP had four meetings with these industries to hear their concerns (Stratton, personal communication, August 5, 2009).

The results of the survey were documented in a December 2006 report, *The Water Resources Protection Act, Water Use Survey*. As related in that report, the survey addressed the nine components set forth in the WRPA by carrying out five major tasks:

1. Location and quantity of surface and groundwater resources

According to the National Hydrology Dataset, West Virginia has 52,500 streams totaling approximately 55,400 miles. According to DEP's Office of Dam Safety, the state contains 115 public lakes totaling 17,573 acres and 396 private lakes totaling 10,252 acres.

Another important source of surface water in West Virginia comes from springs. The DEP catalogued springs producing an average flow of more than 750,000 gallons per month. These large-flow springs are concentrated in watersheds on the boundary with Virginia.

Large-quantity surface water withdrawals in West Virginia are calculated to be 3.4 trillion gallons of water annually. The Kanawha River Valley accounts for about 73 percent of all surface water withdrawals. This watershed includes Charleston, the state's largest city, and Elkem Metals, which accounts for just under 54 percent of all surface water withdrawals in the state. Public water supply only accounts for 1.5 percent of all surface water withdrawals.

Large-quantity groundwater withdrawals are calculated to be approximately 33 billion gallons per year. Public water supply accounts for 41 percent of this total. Groundwater withdrawals are primarily located in three areas: along the Ohio River, in the southern coalfields, and in the northeastern panhandle. According to DEP, aquifers in West Virginia have not been delineated, and the 11 U.S. Geological Survey test wells measure only well levels and do not provide enough data to determine quantity. DEP recommends further study.

2. Consumptive and non-consumptive withdrawals

For this comparison, only large-quantity withdrawals (i.e., more than 750,000 gallons per month) were considered. Purchased water was considered a non-consumptive use. Because irrigation is rarely used for agriculture in West Virginia, water for agriculture (mainly for livestock and poultry) was considered a consumptive use.

DEP acknowledges that the data are flawed. Many facilities lack metering to determine their exact discharge amounts. This makes it impossible to determine the quantity of storm water included, and as a result, some facilities appeared to discharge more water than they withdrew.

3. Survey results

The DEP contracted with the U.S. Geological Service (USGS) and West Virginia University to help develop the registration and survey form for large-quantity users. Through estimates done by USGS and information supplied by the WV Department of Health, it was determined that there were approximately 1,600 large-quantity water users in the state. Few facilities meter water intake; therefore, the survey results reflect the facility owner's judgment.

By extracting survey data, DEP was able to map surface and groundwater withdrawal by county. These maps give a visual representation of large-quantity water withdrawal on a county-by-county basis.

4. Drought, flood, and low-flow conditions

Flood research was conducted to identify and map flood-prone areas by county. Another analysis used National Flood Insurance Program payments as a surrogate for the economic impact of flooding. The results showed that flooding increased over the past 20 years. Flooding has affected all 32 major watersheds and 55 counties.

A drought analysis also was conducted. Only two major droughts have affected the state in the past 40 years. In both cases, including the drought of 1998-2001, only the eastern portion of the state has been affected.

Low-flow conditions were examined for their economic impact. It was found that low flows would affect (1) non-consumptive uses such as ecological services,

recreation/tourism, and hydro-energy production; and (2) consumptive uses such as industry, public water supply, agriculture, and mining.

Uses that can lead to increased water withdrawals and contribute to low-flow conditions include, for example, rapid growth and resource extraction. These uses also can contribute to water pollution and riverbed sedimentation.

5. Competition for water resources in potential growth areas

The purpose of this task area was to identify potential industrial and residential growth areas, in order to predict future increases in water demand. Economic forecasts were conducted by the West Virginia University's Bureau of Business and Economic Research on 20 different industries. The industries with the highest growth potential are service industries, health care, and recreation. Population growth studies were conducted to provide an estimate of increased residential water needs. From this information, maps were created showing the counties most likely to have increases in industrial and/or residential water demand.

Information gathered in tasks 1-5 led DEP to make a number of policy recommendations to the Joint Legislative Commission on Water Resources. These recommendations were formalized in the Water Resources Protection and Management Act of 2008, which substantially amended the 2004 WRPA.

IV. 2008 Water Resources Protection and Management Act

Correcting Data Deficiencies

The 2006 Water Use Survey identified a number of deficiencies in data collection. Following DEP's recommendations, the 2008 act addressed these deficiencies as follows:

- Annual reporting by large-quantity users
“The secretary [of DEP] shall conduct an ongoing water resources survey of consumptive and non-consumptive surface water and groundwater withdrawals by large quantity users in this state...” (WVC 22-26-3(b)).
- Estimation of withdrawals by small-quantity users
“...Water withdrawals for self-supplied farm use and private households will be estimated...” (WVC 22-26-3(c)).

- Improved means for accurately measuring large-quantity withdrawals

“In addition to any requirements for completion of the survey established by the secretary, the survey must accurately reflect both actual and maximum potential water withdrawal. Actual withdrawal shall be established through metering, measuring or alternative accepted scientific methods to obtain a reasonable estimate or indirect calculation of actual use” (WVC 22-26-3(j)).

- Means to monitor groundwater withdrawal

“The secretary has the authority to gather data, including driller and geologic logs, run electric and other remote-sensing logs and devices and perform physical characteristic tests on nonresidential and multifamily water wells” (WVC 22-26-7(2)).

Developing a State Water Resources Management Plan

DEP recommended an approach for a state water resources management plan. The state was divided into four growth regions. DEP recommended starting with the region expected to experience the largest growth and that developing the plans on a USGS Hydrologic Unit Code (HUC) 8 watershed basis. (The section of the 2008 act regarding the State Water Resources Management Plan is appended.)

Identifying Critical Planning Areas

The 2008 act provided for “regional or critical planning areas ... in particular, areas where competition for water was likely to cause water supply shortages.” Most potential water deficiencies were expected to be in the eastern part of the state, due to its karst geology (Stratton, personal communication, August 5, 2009). Criteria for identifying the critical planning areas are not yet available; they were to be developed by DEP within 12 months following the act’s passage.

Not Addressed: Natural Gas Fracturing

Effects on underground water supplies of natural gas fracturing is a “sleeper” issue that was not addressed in the 2008 act. The economic downturn has delayed the practice of natural gas fracturing; if implemented, the two primary concerns will be water supply and the treatment of wastewater from the process (Stratton, personal communication, August 5, 2009).

V. Developing the State Water Resources Management Plan

In 2009 DEP expanded the Water Supply Section of its Division of Water and Waste Management to four people and began the water resources planning process. As noted above, planning is to be done on a HUC 8 watershed basis, starting with the watersheds most likely to experience near-term increases in water demand. The HUC 8 watersheds will be divided into smaller HUC 10 and HUC 12 sub-basins, and critical areas will be identified. HUC 8 plans will then be linked by planning region. The final State Water Resources Management Plan is due Nov. 30, 2013, and will consist of 32 HUC 8 watershed plans.

The first HUC 8 plan is in its initial stage of development. DEP has sent letters to large-quantity users, economic development councils, mayors, county commissioners, and watershed groups in the watershed inviting them to a stakeholder meeting. At this meeting, DEP will ask the groups represented to appoint members to serve as an unofficial advisory committee for the planning process (Stratton, personal communication, August 5, 2009).

Sources

Contacts

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Other Resources

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Appendix:

Legislation Mandating a State Water Resources Management Plan

§22-26-8. State Water Resources Management Plan; powers and duty of secretary.

(a) The Secretary of the Department of Environmental Protection shall oversee the development of a State Water Resources Management Plan to be completed no later than the thirtieth day of November, two thousand thirteen. The plan shall be reviewed and revised as needed after its initial adoption. The plan shall be developed with the cooperation and involvement of local and state agencies with regulatory, research or other functions relating to water resources including, but not limited to, those agencies and institutions of higher education set forth in section three of this article and a representative of large quantity users. The State Water Resources Management Plan shall be developed utilizing the information obtained pursuant to said section and any other relevant information available to the secretary.

(b) The secretary shall develop definitions for use in the State Water Resources Management Plan for terms that are defined differently by various state and federal governmental entities as well as other terms necessary for implementation of this article.

(c) The secretary shall continue to develop and obtain the following:

(1) An inventory of the surface water resources of each region of this state, including an identification of the boundaries of significant watersheds and an estimate of the safe yield of such sources for consumptive and nonconsumptive uses during periods of normal conditions and drought.

(2) A listing of each consumptive or nonconsumptive withdrawal by a large quantity user, including the amount of water used, location of the water resources, the nature of the use, location of each intake and discharge point by longitude and latitude where available and, if the use involves more than one watershed or basin, the watersheds or basins involved and the amount transferred.

(3) A plan for the development of the infrastructure necessary to identify the groundwater resources of each region of this state, including an identification of aquifers and groundwater basins and an assessment of their safe yield, prime recharge areas, recharge capacity, consumptive limits and relationship to stream base flows.

(4) After consulting with the appropriate state and federal agencies, assess and project the existing and future nonconsumptive use needs of the water resources required to serve areas with important or unique natural, scenic, environmental or recreational values of national, regional, local or statewide significance, including national and state parks; designated wild, scenic and recreational rivers; national and state wildlife refuges; and the habitats of federal and state endangered or threatened species.

(5) Assessment and projection of existing and future consumptive use demands.

(6) Identification of potential problems with water availability or conflicts among water uses and users including, but not limited to, the following:

(A) A discussion of any area of concern regarding historical or current conditions that indicate a low-flow condition or where a drought or flood has occurred or is likely to occur that threatens the beneficial use of the surface water or groundwater in the area; and

- (B) Current or potential in-stream or off-stream uses that contribute to or are likely to exacerbate natural low-flow conditions to the detriment of the water resources.
- (7) Establish criteria for designation of critical water planning areas comprising any significant hydrologic unit where existing or future demands exceed or threaten to exceed the safe yield of available water resources.
- (8) An assessment of the current and future capabilities of public water supply agencies and private water supply companies to provide an adequate quantity and quality of water to their service areas.
- (9) An assessment of flood plain and stormwater management problems.
- (10) Efforts to improve data collection, reporting and water monitoring where prior reports have found deficiencies.
- (11) A process for identifying projects and practices that are being, or have been, implemented by water users that reduce the amount of consumptive use, improve efficiency in water use, provide for reuse and recycling of water, increase the supply or storage of water or preserve or increase groundwater recharge and a recommended process for providing appropriate positive recognition of such projects or practices in actions, programs, policies, projects or management activities.
- (12) An assessment of both structural and nonstructural alternatives to address identified water availability problems, adverse impacts on water uses or conflicts between water users, including potential actions to develop additional or alternative supplies, conservation measures and management techniques.
- (13) A review and evaluation of statutes, rules, policies and institutional arrangements for the development, conservation, distribution and emergency management of water resources.
- (14) A review and evaluation of water resources management alternatives and recommended programs, policies, institutional arrangements, projects and other provisions to meet the water resources needs of each region and of this state.
- (15) Proposed methods of implementing various recommended actions, programs, policies, projects or management activities.
- (d) The State Water Resources Management Plan shall consider:
- (1) The interconnections and relationships between groundwater and surface water as components of a single hydrologic resource.
- (2) Regional or watershed water resources needs, objectives and priorities.
- (3) Federal, state and interstate water resource policies, plans, objectives and priorities, including those identified in statutes, rules, regulations, compacts, interstate agreements or comprehensive plans adopted by federal and state agencies and compact basin commissions.
- (4) The needs and priorities reflected in comprehensive plans and zoning ordinances adopted by a county or municipal government.
- (5) The water quantity and quality necessary to support reasonable and beneficial uses.
- (6) A balancing and encouragement of multiple uses of water resources, recognizing that all water resources of this state are capable of serving multiple uses and human needs, including multiple uses of water resources for reasonable and beneficial uses.
- (7) The distinctions between short-term and long-term conditions, impacts, needs and solutions to ensure appropriate and cost-effective responses to water resources issues.

(8) Application of the principle of equal and uniform treatment of all water users that are similarly situated without regard to established political boundaries.

(e) In November of each year, the secretary shall report to the Joint Legislative Oversight Commission on State Water Resources on the State water Resources Management Plan. The report on the water resources plan shall include benchmarks for achieving the plan's goals and time frames for meeting them.

(f) Upon adoption of the State Water Resources Management Plan by the Legislature, the report requirements of this article shall be superseded by the plan and subsequent reports shall be on the survey results and the water resources plan. If the plan is not adopted a detailed report discussing the provisions of this section as well as progress reports on the development of the plan shall be submitted every three years.

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