Mississippi v. Memphis: A Study in Transboundary Ground Water Dispute Resolution

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INTRODUCTION

The Memphis Sand Aquifer, or “Sparta” as it is known in the State of Mississippi (“Mississippi”), spans a subterranean area beneath northwest Mississippi and the western part of the State of Tennessee (“Tennessee”). Both state sovereigns separately own and control the valuable aquifer waters within their borders. Neither state has dominion over the other’s water resources. Mississippi and Tennessee were “apportioned” or allocated their discrete respective shares of the aquifer groundwater upon attaining statehood, a fundamental attribute of sovereignty acknowledged and respected by both states.

The City of Memphis, Tennessee (“Memphis”) and its wholly owned division, Memphis Light, Gas & Water (“MLGW”), operate a tremendous artesian water pumping and distribution system in the aquifer supplying over 200 million gallons of ground water daily to the City and MLGW’s other customers. MLGW’s pumping has created a geophysical feature called a cone of depression in the aquifer centered under Memphis and expanded deeply into Desoto County, Mississippi. The cone siphons millions of gallons of ground water each day from storage under Mississippi into storage under Memphis to supply MLGW’s wells. But for Memphis’ actions, the subject quantities of ground water would still be contained beneath Mississippi within its borders. Approximately 20% of Memphis’ water supply has been stolen from Mississippi over the past 40 years.

Public Reports and Memphis-MLGW’s Awareness of the Transboundary Ground Water Diversion Problem

Since at least 1965, independent federal and state ground water scientists and experts have recorded and reported huge diversions of ground water from north
Studies and reports prepared by the United States Geological Survey ("USGS") during the 1960's, 1970's, 1980's, 1990's, and in this decade, and the University of Memphis Ground Water Institute ("GWI") during the 1990's and currently, with funding from and in cooperation with MLGW and Memphis, have confirmed the existence of the cone of depression and the fact that it extends into, diverts and captures ground water from beneath Mississippi. See, e.g., Gerald K. Moore, *Geology and Hydrology of the Claiborne Group in Western Tennessee*: U.S. Geological Survey Water-Supply Paper 1809-F (1965) (Moore reported that, under conditions of heavy pumping in Memphis, 25 million gallons per day of aquifer ground water were being diverted from Mississippi into Shelby County as early as 1960); D. D. Graham & W. S. Parks, *Potential for Leakage Among Principal Aquifers in the Memphis Area, Tennessee*: U.S. Geological Survey Water-Resources Investigations Report 85-4295 (1986) (Graham studied early potentiometric surface maps from 1886, 1960, 1970 and 1975 (appearing in work by USGS scientists, Criner & Parks, 1976) for the purpose of demonstrating that the cone of depression caused by pumping in the Memphis area extended across the Tennessee-Mississippi line into Desoto County, Mississippi); John V. Brahana & R. E. Broshears, *Hydrogeology and Ground-Water Flow in the Memphis and Fort Pillow Aquifers in the Memphis Area, Tennessee*: Water Resources Investigations Report 89-4131 (2001) (Brahana, a long-time consulting expert for Memphis and MLGW, reported that, as of 1980, withdrawals were 200 million gallons a day in the Memphis area and that Memphis' pumpage had altered the pre-pumping flow of the aquifer, effectively capturing most of the water flowing through it, including ground water from northwest Mississippi, primarily Desoto County); James Kingsbury, *Altitude of the Potentiometric Surface, September 1990, and Historical Water-Level Changes in the Memphis Aquifer in the Memphis Area, Tennessee* (1990) (map depicts cone of depression as extending across the Shelby County-Desoto County border into Mississippi); W. S. Parks & J. K. Carmichael, *Altitude of Potentiometric Surface, Fall 1985, and Historic Water-Level Changes in the Memphis Aquifer in Western Tennessee*, U.S. Geological Survey Water-Resources Investigations Report 88-4180 (1990a) (Parks and Carmichael found significant declines in the water levels in the aquifer for the period 1928-1983); J. Kerry Arthur & R. E. Taylor, *Definition of the Geohydrologic Framework and Preliminary Simulation of Ground-Water Flow in the Mississippi Embayment Aquifer System, Gulf Coastal Plain, United States*: U.S. Geological Survey Water-Resources Investigation Report 86-4364 (1990) (regional ground water model demonstrated the change in the natural east to west aquifer flow path and gradient to a northern direction into the cone of depression created by pumpage in Memphis; Arthur concluded that, as of 1980, approximately 30% of MLGW’s water supply was being derived from the ground water system beneath Mississippi, see note 6 & accompanying text infra); J. Outlaw, *A Ground Water Flow Analysis of the Memphis Sand Aquifer in the Memphis, Tennessee, Area*, University of Memphis Ground-Water Institute (1994) (GWI concluded that the majority of the water withdrawn by the municipal well fields in Shelby County originates in the eastern part of Shelby County, Fayette County, Tennessee, and Desoto and Marshall Counties, Mississippi, as a result of the regional cone of depression extending into northwest Mississippi).
altered the ground water budget or inventory\textsuperscript{2} of the Memphis Sand Aquifer resulting in a permanent change in the natural flow path and rate of movement of water within the confined aquifer system. Under normal prepumping conditions, water “moved”\textsuperscript{3} 

\textsuperscript{2} The ground-water budget is an accounting of the ground-water component of the hydrologic cycle for any given area. It consists of the inflows and outflows for the specific area being studied. Inflows are comprised of recharge and ground-water inflow from upgradient adjacent areas. Outflows consist of ground-water outflow, storage depletion due to pumpage, and surface discharge. The total inflow and total outflow components for the ground-water budget should be equal to each other. If one of the outflow components in the budget changes, then either inflow or other outflow components must change to balance the budget. For example, if the pumpage component increases, storage may be depleted, which will then have to be made up from another source. Recharge may increase, ground-water outflow may decrease, surface discharge may decrease, and ground-water inflow may increase. There are a number of components comprising the water budget for the Memphis area, including recharge, storage, ground-water flow, and other factors. When a stress such as MLGW’s pumpage is introduced into the system, it creates a cone of depression that gradually reaches out further and further to obtain more water to maintain the ground-water budget to supply MLGW’s wells.

\textsuperscript{3} The subject aquifer is a subterranean reservoir occurring and "residing" over millennia in sand formations confined by clay layers. The ground water "moves" imperceptibly slowly through rock and sand against friction. Unless it is disturbed by stresses, such as MLGW’s pumpage, the aquifer stays in a static or steady state condition with a constant volume of water being always present and contained within the territorial boundaries of Mississippi. In the distinct portion of the aquifer in dispute -- that part underlying Desoto County, Mississippi -- the natural predevelopment movement of the ground water was about one inch per day, or 30.4 feet per year. By analogy, glaciers that appear to be great frozen ice sheets standing still, constantly present at the highest peaks of the Rocky Mountains move normally at a rate of about 50 feet per year. Glacial movement, governed by gravity and friction, is also totally imperceptible, but it is almost twice the rate of "movement" within the aquifer. The aquifer is not a river and, in its natural unstressed state, a constant volume comprising Mississippi’s share would always be contained within the State's borders.

However, the normal steady state condition of Mississippi’s aquifer ground water has been forever altered because of MLGW’s pumpage. Ground water confined for thousands of years under lands eventually encompassed within Mississippi’s sovereign borders has been permanently diverted from storage in Mississippi, siphoned across the State line and drawn into storage beneath Memphis to serve as supply for MLGW's well fields. MLGW's pumpage has created and expanded a cone of depression that extends from its center in Memphis into the portion of the aquifer underlying northwest Mississippi. In essence, Memphis, through MLGW's pumpage, has set in motion a force that has physically invaded the State, resulting in the diversion and capture of Mississippi's ground water resources to supply MLGW's customers' requirements. The stress of MLGW's pumpage upon the aquifer has disturbed its steady state equilibrium, and altered the State's ground water budget or inventory permanently. The aquifer water level has been drawn down at a higher rate than it is being replenished.
imperceptibly in an east to west direction. However, because of the cone of depression created by MLGW’s pumping, the flowpath of the aquifer changed to a northward direction at a significantly accelerated rate of movement into the steepest part of the cone underlying MLGW’s wellfields.\textsuperscript{4} The cause and existence of the cone of depression and its impact upon ground water normally contained within Mississippi are undisputed.

In the mid-1990's, representatives of the Mississippi Department of Environmental Quantity (“MDEQ”) contacted officials at MLGW to arrange for a joint,

\textsuperscript{4} When a well penetrating an aquifer is pumped, a cone of depression results within the aquifer. The cone will be large for a confined aquifer or small for an unconfined aquifer. A large cone of depression means that the water level in the vicinity of pumping declines to provide a gradient to drive water toward the discharge point. The gradient becomes steeper as the well is approached because the flow is converging from all directions and the area through which the flow is occurring gets smaller. Cones of depression from several pumping wells may overlap and, since their drawdown effects are additive, the water level decline throughout the area of influence is greater than from a single cone. Cones of depression represent an increase in the hydraulic gradient, which in turn controls ground water velocity and the direction of flow. Joseph W. Dellapenna, \textit{The Physical and Social Bases of Quantitative Ground Water Law}, in 3 \textit{Waters & Water Rights} §18.02 at 18-17 (Robert E. Beck, ed. 2003) (“Dellapenna I”).

As a well is pumped, the water level in the well is likely to decline, establishing the pumping level of the well. The decline to the pumping level is called the drawdown, and the pre-pumping level is the static water level, so that the specific capacity of a well is the discharge rate of the well divided by the difference between the static and the pumping levels. Pumping, therefore, usually disturbs natural laminar flow patterns and, among other effects, will draw contamination plumes from all directions toward the cone formed in the aquifer by water extraction. Ground water withdrawal, whatever the purpose, relates closely to ground water quality. \textit{Id.} at 18-18.

The cone centered in Memphis and extending into Mississippi is capturing Mississippi’s ground water, diverting it to the ground-water budget for Memphis to maintain MLGW’s well pumpage. Billions of gallons of Mississippi’s ground water have been permanently diverted from the ground-water system “residing” beneath Mississippi into Memphis. The ground water has now become part of the hydrologic ground-water budget for Memphis. Once Mississippi’s ground water is encompassed within Memphis’ hydrologic ground-water budget, there is a continuous, ongoing process in which water that reaches MLGW’s wells or well fields is constantly being replaced by water being diverted from Mississippi.
In June of 1995, MDEQ office chief, Charles T. Branch, began working with MLGW and the Memphis subdistrict office of the USGS to fund and actively pursue a hydrogeologic assessment of the tertiary aquifers in northwestern Mississippi and adjacent Tennessee. Jamie Crawford, Chief of MDEQ's ground water planning branch, wrote to MLGW officials to solicit their cooperation in the proposed investigation in a letter stating:

Complicating the water management situation in north Mississippi is the heavy pumpage of ground water by the City of Memphis. Presently approximately 200 million gallons a day are pumped from two aquifers underlying the Memphis area, the Memphis Aquifer and the Fort Pillow Aquifer.

In November 1998, the Memphis newspaper, The Commercial Appeal, reported that Memphis “is the largest user of Mississippi’s ground water,” and reconfirmed the findings of federal ground-water scientists:

In west Tennessee and north Mississippi, the natural flow of water in the aquifer is to the west and southwest, said Kerry Arthur, a hydrologist and civil engineer with the USGS in Pearl, Mississippi. But the heavy pumping of municipal wells in Memphis, he said, has diverted that flow, creating “cones of depression” that pull water from the south.

Three of the well fields serving [M]LG&W’s 10 water-pumping stations extend to within 2 1/2 miles of the Mississippi line.

Arthur said preliminary analyses suggest that as much as 20 percent to 30 percent of the water pumped by [M]LG&W could be coming from

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Potentiometric maps of the Memphis Aquifer indicate that much of the recharge for the Aquifer originates in northern Mississippi. In fact, calculations performed by the Mississippi Department of Environmental Quality, MDEQ, estimate that the City of Memphis is the largest ground water user in the State of Mississippi.

See J. Crawford (MDEQ) letter to C. Pickel (Memphis-MLGW) dated June 6, 1995; see also C. Branch (MDEQ) letter to J. Hanes (TDEC) dated June 26, 1995.
Mississippi.  

At about the same time the Memphis newspaper article appeared, the Tennessee Department of Environment and Conservation ("TDEC") commissioned a legal and water management and policy study of MLGW’s pumpage and the effect of the tremendous cone on north Mississippi. In a report published in 2000, the potential


[Though its wells lie entirely in Tennessee, the Bluff City is the largest user of Mississippi's ground water, according to that State's regulators. Memphis each day sucks 20 million to 40 million gallons from under the feet of its neighbors in Desoto County.]

The article quoted Charles T. Branch of Mississippi's Office of Land & Water Resources:

“[T]here is a lot of concern about the cumulative use in the Memphis area . . . . [T]hey (the City) are the largest user of ground water from the State of Mississippi. Significant volumes are flowing from Desoto County northward into their pumping centers.”

Id.

7 At the time of the Charlier article, there was ongoing study of the potential liability of Memphis-MLGW to Mississippi for diversion and misappropriation of aquifer ground water. In mid-2000 -- five years before Mississippi’s lawsuit was filed -- Memphis-MLGW officials were publicly exposed for their potentially serious liability to Mississippi for MLGW’s diversion and withdrawal of billions of gallons of Mississippi's ground water from the aquifer.

In June 2000, David Lewis Feldman, Ph.D. (Principal Investigator and Research Scientist) and Julia O. Elmendorf, J.D. (College of Law & Energy), University of Tennessee-Knoxville, prepared and disseminated widely a study that essentially brought to light and confirmed for Memphis-MLGW and the public at large the basic facts supporting all the allegations of Mississippi's lawsuit. See Final Report - Water Supply Challenges Facing Tennessee: Case Study Analyses and the Need for Long-Term Planning (June 2000), http://eerc.ra.utk.edu/divisions/wrcc/water_supply/default.htm (the “Feldman-Elmendorf Report”).

The Feldman-Elmendorf Report -- a focused political, scientific and legal analysis -- addressed specifically the ground water conversion and trespass claims brought by Mississippi in its lawsuit. Feldman and Elmendorf were charged with the responsibility of evaluating the aquifer problems caused by Memphis-MLGW's pumpage and assessing their liability. The report stated unqualifiedly that MLGW may be held liable for damages and that Memphis may be subject to a suit for damages or an injunction brought by Mississippi. Dr. Feldman reported that Memphis was
then, and had been for some time, taking unlawfully billions of gallons of Mississippi’s aquifer ground water, exposing the City and its division, MLGW, to serious liability. The Feldman-Elmendorf Report, openly attesting to MLGW’s conduct and its liability to Mississippi, stated:

MLGW may be vulnerable to suit by the State of Mississippi, acting in the interests of its citizens, to prevent continued pumping of the aquifer in excess of a reasonable amount . . . Again, the outcome may be unfavorable to MLGW and Memphis water users because there is another source, the Mississippi River, and MLGW’s current use of the aquifer is not legal or equitable under the laws of either state, nor, probably under the federal common law . . .

8 Ward Archer, Jr., “Liquid Assets,” Memphis (March 2005). The article confirmed a variety of aquifer problems that prompted Mississippi to bring suit, including the cause and existence of the cone of depression. The article also focuses on contamination issues caused by MLGW’s pumping, including the pumping-induced intrusion of pollutants and “young water” from the surficial aquifer into the Memphis Sand or Sparta Aquifer.

Initiation of Mississippi’s Lawsuit and Its Current Procedural Status

In February 2005, Mississippi filed an action against Memphis and MLGW in the United States District Court for the Northern District of Mississippi, claiming that, over a forty-year period, MLGW diverted and unlawfully took over 363 billion gallons of ground water owned by Mississippi to provide between 15% and 22% of Memphis’ water supply and sales requirements. Memphis and MLGW denied Mississippi’s allegations, despite the fact that, contemporaneously with the initiation of the action, another article appeared in Memphis magazine entitled “Liquid Assets,” in which the bases for the claims of Mississippi in its lawsuit were, once again, confirmed.8 Mississippi claimed that MLGW’s massive wellfield pumping in Shelby County, Tennessee, created a geophysical condition known as a cone of depression in the
Essentially, there are two approaches that have been used to value Mississippi's ground water stolen by Memphis and MLGW. First is the market value of wholesale contracts, i.e., the price that a willing buyer and a willing seller will negotiate. The second method concerns the resource value of the water, i.e., the difference between MLGW's customers' maximum willingness to pay for water and MLGW's actual retail rates.

Mississippi's action is premised, in part, on the State's assertion of ownership of all water resources within its borders, including the subject ground water, as one of the fundamental, self-evident attributes of statehood. State water policy, statutory enactments and judicial declarations have consistently reaffirmed, beyond peradventure, the State's duty, police power and authority to protect the State's water resources and to control the reasonable and beneficial use of state-owned water resources by Mississippi citizens.

MLGW's pumping has caused a physical trespass into Mississippi resulting in conversion of vast quantities of the State's ground water. Mississippi has permanently lost the volumes of water taken by Memphis. Memphis and MLGW have been unjustly enriched to Mississippi's detriment. Mississippi seeks damages equal to the value of the misappropriated ground water, plus interest (through 2007) in amounts ranging from $980 million to $1.2 billion based upon standard, accepted water resource and fair market valuation methods.  

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The market value approach assumes that MLGW should have negotiated a wholesale purchase contract to buy water from Mississippi. Factors governing this valuation method include market demand, quality and location of the water, alternative sources of supply, cost of production, value to consumers, and comparable water sales. Using this method, Mississippi’s experts have determined total damages (including the interest) for the period 1965-2006 to be in a range of $713 to $973 million. On a prospective basis, from 2006 to 2016, MLGW is projected under this approach to owe Mississippi another $134 million to $159 million.

The standard resource economics method values Mississippi’s losses based on MLGW-public information about sales, pumpage, revenues, and unmetered and lost water together with Mississippi’s experts’ determination of MLGW residential and commercial demand curves over the amounts of water taken from Mississippi. Demand curves reflect the fact that people will demand less of a good (water) as its price increases and more as price declines. How much is measured by the price elasticity of demand. Price elasticity measures how much more or less people (here, MLGW’s customers) will consume in relation to a price change. Demand curves are sometimes referred to as “willingness to pay” curves because that is what they measure. The difference between the willingness to pay observed from a demand curve and the good’s market price is called consumer surplus. This is used to value water in resource economics methods. The objective is to value water taken by MLGW in situ from the aquifer underlying Mississippi. Using this approach, Mississippi’s experts have valued water taken from the State in a range of $518.8 million to $1.232 billion for the period 1965-2006. For prospective periods through 2017, Mississippi’s experts anticipate additional future damages of $40.4 million to $104.9 million (undiscounted).

The trial judge unilaterally revisited the issues of Tennessee’s joinder and subject matter jurisdiction after previously ruling three times in Mississippi’s favor. Memphis-MLGW filed motions to dismiss, for summary judgment and for judgment on the pleadings in their attempts to join Tennessee. Each time, the Court rejected their arguments -- only to reverse those decisions just as the trial commenced.

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belongs to Tennessee. The Court opined that the federal common law doctrine of equitable apportionment must be applied to “apportion” or allocate the aquifer ground water between the states. Accordingly, Judge Davidson determined that the action must fall within the purview of the United States Supreme Court’s original and exclusive jurisdiction under 28 U.S.C. §1251(a). The trial court, thus, dismissed Mississippi’s case without prejudice, stating: “This court’s decision today in no way ends this dispute or renders the State of Mississippi without its day in court.”

Judge Davidson’s ruling is currently on appeal to the Fifth Circuit Court of Appeals. Oral arguments were presented on December 3, 2008, and the parties are still awaiting a decision. Mississippi argues that Tennessee’s interests are not implicated in the case; rather, only Memphis and MLGW are responsible for the wrongful diversions and misappropriation of ground water owned by the State and taken from within its territorial boundaries. Under Illinois v. Milwaukee, 406 U.S. 91 (1972), Mississippi’s claims involving transboundary or interstate ground water confer federal question jurisdiction on the District Court. Because the action does not involve two states, however, the action is not within the original and exclusive jurisdiction of the United States Supreme Court and as recognized in Illinois v. Milwaukee, the proper forum for trial is the District Court.11

Moreover, Mississippi maintains that, as public trustee, the State owns all the water resources contained or “residing” within its borders. The action does not involve a common pool or shared resource as only diversion of Mississippi’s ground

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11 Illinois v. Milwaukee, 406 U.S. at 97, 103-08; see also Alabama v. United States Army Corps of Engineers, 424 F.3d 1117, 1130 (11th Cir. 2005); South Dakota v. Ubbelohde, 330 F.3d 1014, 1025-26 (8th Cir. 2003), cert. den., 541 U.S. 987 (2004); Georgia v. United States Army Corps of Engineers, 302 F.3d 1242, 1254-55 (11th Cir. 2002); Alabama v. United States Army Corps of Engineers, 382 F.2d 1301, 1309-12 (N.D. Ala. 2005).
water is at issue. No “apportionment” is necessary. Mississippi’s portion of the aquifer was established at the time of statehood and the ownership and management of state resources are the responsibility of the State in its sovereign capacity exercising its inherent police powers. Thus, neither the Supreme Court nor any lower federal court has any authority to “reapportion” resources, the ownership of which was established when the borders of the states were set and the control and management of which are inherent state prerogatives.

The underlying facts of the case are, for the most part, undisputed. The current procedural entanglement will determine when and where the case will be tried, not whether it will be tried. If the trial court’s decision is upheld, the case may be pursued in the United States Supreme Court before a Special Master. If the trial court is reversed, however, the matter will be returned to United States District Court in the Northern District of Mississippi for trial.

**Why Mississippi v. Memphis is Important to the Evolution of Ground Water Law**

*Mississippi v. Memphis* is a unique case with potentially important precedential ramifications due to, *inter alia*, two key, interrelated factual and legal points: (1) the novel geographic and geophysical context of the ground water dispute; and (2) the overarching significance of the issue of Mississippi’s ownership and control of state-water resources for the use and benefit of Mississippi’s citizens. This “confluence” of scientific and legal factors will invariably clarify, shape and, in some respects, redefine ground water law and policy to (a) provide viable techniques for resolution of ever more frequent water quantity and quality disputes and to (b) address more precisely and appropriately “real world” twenty-first century concerns over water demand, consumption and supply problems. The outcome of the litigation could
have lasting impact in several crucial ground water management, conservation and policy concerns in, at least, five areas.

(1) The Unique Context of Mississippi’s Case Distinguishes It from Traditionally Recognized Approaches to Resolution of Transboundary or Interstate Water Disputes.

The Importance of State-Owned Ground Water Resources to Public Health, Safety and Welfare

Ground water is enormously important to human survival. Only one percent of the world’s water is fresh and liquid. The remaining is oceanic, frozen or briny ground water. Dellapenna I, supra, at §18.01, 18-1. Of that important one percent, only three to four percent is surface water (located in reservoirs, lakes and streams), while all of the rest is ground water. Id. See also Allan Kanner, The Public Trust Doctrine, Parens Patriae, and the Attorney General as the Guardian of the State’s Natural Resources, 16 DUKE ENVT. L. & POL’Y F., 57, 84-85 (2005).

The increased utilization and relative importance of ground water resources represents a fairly recent development in history. As late as the eighteenth century, ground water constituted only a small fraction of water used. The state of our scientific understanding of ground water precluded the development of any coherent body of law to govern its allocation. Today, ground water constitutes a critical component of our water resources. Approximately 94 to 97 percent of the world’s total available fresh water is ground water. As technology and scientific understanding of hydrology and geology have improved, reliance upon ground water to satisfy demand for fresh water has increased dramatically. John L. Fortuna, Water Rights, Public Resources, and Private Commodities: Examining the Current and Future Law Governing the Allocation of Georgia Water, 38 GA. L. REV. 1009,
Nearly 60 percent of all ground water used in the United States is pumped in eight states -- in order of volume pumped within the state, California, Texas, Nebraska, Arkansas, Florida, Kansas, Arizona and Idaho. Dellapenna I, supra, at §18.01, 18-2. See also James H. Davenport, Less is More: A Limited Approach to Multi-State Management of Interstate Ground Water Basins, at 162 & n. 61, 26th Annual Water Law Conference, San Diego, California (February 21-22, 2008). As noted by Joseph Dellapenna, with ground water now providing drinking water for about 50% of the population of the United States, indifference to the ways in which ground water is used is ruled out. Dellapenna I, supra, §18.01, 18-1; see also Fortuna, supra, at 1026-27; Erik Swenson, Public Trust Doctrine and Ground Water Rights, 53 U. MIAMI L. REV. 363, 372 (1999).

Two hundred years ago, people used rather little ground water and knew even less about how to find it or how it behaved. The notion of a legal regime governing management of ground water was literally unthinkable. Hydrogeology and hydraulics were not developed enough during the nineteenth century to offer certainty, and the common law regarding use and allocation of ground water developed with little guidance from science. See generally Dellapenna I, supra, at §18.01, 18-3; Fortuna, supra, at 1027. As a result, courts and legislatures looked not to the poorly understood properties of ground water and its imperceptible movement through invisible aquifers, but rather to property lines which could be clearly established. Id. Accordingly, the rule of “absolute ownership” of ground water emerged as the guiding principle for ground water allocation and use.

Our rapidly growing (albeit relatively recent) understanding of ground water hydrology and geology has led courts and legislatures to fashion alternative rules to
that of absolute ownership. Fortuna, supra, at 1028-29. Today, many courts and legislatures use a basic knowledge of hydrogeology to support court decisions and statutory enactments relating to ground water. Dellapenna I, supra, at 18-3. The growth of the science of ground water has led to development of technologies that provide for greater exploitation of ground water. This has resulted in an explosive growth in human extractions of ground water as well as increasing contamination of ground water sources creating, in some areas, crises where ground water demand has outstripped ground water supply. Dellapenna I, supra, at 18-4. Such problems have led to stresses on the relevant law. Id. At the opening of the twenty-first century, hydrogeology and law are still not wholly integrated. However, lawyers and jurists have increasingly developed knowledge of hydrogeology and are drawing on that knowledge in litigation, in the administrative processes and in drafting of statutory enactments. Undoubtedly, the intertwined relationship between law and hydrogeology, that has had a long-established history, will become even more intimate in the future. Id. at 18-6.

Litigation as a Means to Effective Water and Natural Resources Dispute Resolution

Historically, there have been at least five traditionally recognized methods for transboundary or interstate dispute resolution: (1) private suits between water users in different states; (2) equitable apportionment suits between states; (3) interstate water apportionment compacts; (4) apportionment by Congress; and (5) state regulation of interstate water export. See Douglas Grant, Interstate Water Allocation, in 8 WATERS AND WATER RIGHTS §§44.01-44.05, 45.01-45.07, 46.01-46.08, 47.01-47.02 & 48.01-48.03. See also Christopher H. Meyer, Interstate Water Allocation: A Primer Based on Idaho Issues, 26th Annual Water Law Conference, San Diego,
California, at 131 (February 21-22, 2008); Joseph W. Dellapenna, Transboundary Water Allocation in the Twenty-First Century: Colloquium Article: Interstate Struggles Over Rivers: Southeastern States and the Struggle Over the ‘Hooch, 12 N.Y.U. ENVTL. L. J. 828, 881-898 (2005) (“Dellapenna II”). Other more flexible and creative approaches must be added to this catalog of viable dispute resolution methods. These techniques should include (6) informal private agreements between transboundary disputants that do not constitute interstate compacts; (7) joint study and data exchange between transboundary disputants; (8) coordinated state-to-state regulatory actions (regardless of whether the dispute is “between states”); (9) arbitration or other alternative dispute resolution mechanisms; and (10) agreements intended to facilitate transboundary or interstate water marketing. Such modern, more progressive and informal approaches have yet to be adopted or approved by courts and commentators in fashioning the law of interstate water allocation. Because of the unique geographic and geophysical context of Mississippi’s dispute with Memphis and MLGW, litigation -- perhaps combined with these other more flexible, case-specific techniques -- provides the optimum mechanism for resolution of this transboundary ground water diversion issue.

Mississippi’s action involves claims stemming from “ownership” of ground water resources as distinguished from disputes involving “use” of ground water; i.e., disputes invoking usufructory rights of private citizens. It is a tort case for recovery of damages initiated by a state against a neighboring municipality as a separate political subdivision of another state, and its wholly-owned utility division. As such, the action is not a dispute “between states.” Thus, most of the traditional transboundary dispute resolution mechanisms do not come into play because they presuppose that the action is a dispute between two (or more) states competing for
As discussed infra, the aquifer is not a “shared resource” as between Mississippi and Memphis, or for that matter, Tennessee. Mississippi’s portion of the aquifer was allocated at the time of statehood when the border between Mississippi and Tennessee was established. As the dispute is not “between states,” the federal common law doctrine of equitable apportionment and interstate compacts have no relevance with regard to dispute resolution. Apportionment by Congress is extremely rare and has only occurred once throughout the entire history of the evolution of the United States’ water law. Intrastate regulatory agencies lack jurisdiction to handle transboundary disputes and, even if a state acting as sovereign to protect the health and welfare of its citizens could restrict water exports, its actions must bear constitutional scrutiny under the dormant Commerce Clause of the United States Constitution. Simply put, the usual state versus state context is absent. The identity of the parties -- i.e., a state and a non-state entity -- defines the context of the litigation and eliminates most of the usual transboundary dispute resolution methods as viable alternatives.

The geophysical characteristics of the aquifer also have a role in determining the most appropriate dispute resolution mechanism. Disputes involving equitable apportionment and interstate compacts generally relate to apportionment of interstate streams or rivers free-flowing rapidly in torrent or turbulent conditions across state boundaries. The affected states compete for allocation of these surface waters as they pass across their lands, with downstream states vying for priority against upstream diversions by other states. Absent apportionment, an upstream appropriator could divert the entire flow, thereby depriving the downstream state of quantities of surface water resources. These distinctive characteristics of surface
water and the inherent competitive relationships of states across whose boundaries these rivers flow are wholly distinguishable from the basic factual context of Mississippi’s lawsuit.

The ground water at issue between Mississippi and Memphis has “resided” for thousands of years beneath the lands that ultimately became encompassed within the territorial boundaries of Mississippi. The aquifer is not an underground river; the ground water “moves” imperceptibly slowly through rock and sand against friction. But for MLGW’s excessive well field pumping, the subject ground water would still “reside” beneath the State of Mississippi. Under natural pre-pumping conditions, none of the ground water at issue would ever have “moved” into Tennessee or the Memphis area. In essence, the ground water has been contained within the State of Mississippi and has been, therefore, “apportioned” as a function of the establishment of state boundaries.\textsuperscript{12} Notwithstanding the ground water’s “movement,” the water “resides” within the borders of Mississippi as a state resource. See Davenport, \textit{supra}, at 155. Certainly, the aquifer has an interstate character due to the fact that it straddles the state line. However, only Mississippi’s ground water is at issue. It has been recognized that the rapidity of flow of water largely defines its “residence.” Rivers and streams moving in torrent, turbulent flow reside only briefly within a physical, geographical location. By contrast, the

\textsuperscript{12}\textit{Cf. Howard v. Ingersoll}, 54 U.S. 381 (1852). Ingersoll brought an action in the circuit court of Alabama (state court) to recover damages for wrongful obstruction by Howard of the Chattahoochee River which caused the waters of the river to flood Ingersoll’s land and obstruct the use of his mill. While the underlying dispute involved private (non-state) claimants, the determinative issue, according to the Court, was one of boundary between the States of Georgia and Alabama. The Court held that the western line of Georgia was established upon the western bank of the Chattahoochee River and that, therefore, the river “resided” within Georgia’s territorial boundaries. \textit{Ingersoll} is analogous to Mississippi’s case inasmuch as it supports the proposition that the ground water at issue “resides” within Mississippi and thus constitutes a resource owned, controlled and managed by the State.
“movement” of ground water, imperceptible to humans, may have residence times spanning millennia. The mean residence times may be determined by dividing the water volumes by their net throughput. Residence times of surface waters may be very brief, whereas residence times of ground waters may be thousands of years. \textit{Id.} at 162 \& n. 62.

Private suits between parties located in different states date back to the middle of the nineteenth century in the eastern states and from the turn of the twentieth century in western states. From the early litigation developed traditionally-recognized regimes governing water rights throughout the United States. Generally, the arid, water-challenged western states, i.e., states west of Kansas City, adopted a prior appropriation doctrine; the more humid, water-rich eastern states, i.e., east of Kansas City, adopted the riparian approach. In both eastern and western states, the judicial decisions applied different legal rules to surface water and ground water, although, as the law has begun to catch up with science, these distinctions -- as well as the doctrinal differences between legal regimes -- are beginning to fade and become reconciled. See discussion \textit{infra}. With the establishment of legal regimes regarding “use” of water and water rights (as opposed to “ownership’ of water), private litigation between transboundary disputants all but disappeared after the early twentieth century. However, due to many factors, such litigation has re-emerged as commonplace in addressing transboundary disputes. Transboundary disputes -- not involving actions between two or more states -- have begun to appear. Mississippi’s action against Memphis is just one such case.

Various water supply and water demand issues, coupled with the confusion spawned by evolving legal concepts applicable to waters and water rights, have prompted or contributed to the emerging trend in transboundary dispute resolution
by litigation. Because of divergent legal water rights doctrines and regulatory agencies’ lack of “extraterritorial” powers and authorities, states have begun to develop new, albeit untested, legal regimes. Transboundary disputes have become more prominent because of outmoded legal concepts that haven’t kept pace with scientific developments. The disputes have become more pronounced due to climate change, global warming, alterations in precipitation patterns and severe droughts and water scarcity. Other issues have evolved concerning water quality, contamination, overuse or overallocation, water infrastructure quality and aging facilities, land use and urban sprawl, population growth and water usage.

(2) Mississippi’s Case Addresses and Confirms the Distinction Between State Ownership of Public Water Resources and The Private Citizens’ Right to Use Water Owned by the State.

Water “ownership” includes two separate, yet related, realms: ownership of the water body in a territorial sense and ownership of the water in a usufructory sense. See Julia R. Wilder, The Great Lakes as a Water Resource: Questions of Ownership and Control, 59 IND.L.J. 463, 468 (Summer 1983). In this dichotomy, the state owns the water resource as a function of its sovereignty. The people of the state enjoy usufructory rights or rights to use water owned by the state. In essence, the state is the legal owner of the resource itself, while a usufructory right owner merely possesses an equitable or beneficial right to diversion and use of the water available from that resource.

Most reported cases rendered during the 19th and 20th centuries involved disputes between private holders of usufructory rights, i.e., rights of use and allocation of water resources. This even applied in the equitable apportionment cases which involved rights of use, not ownership. In those cases -- admittedly
involving transboundary disputes “between states” -- the issue involved allocation for use of water, not ownership. It was assumed that each state owned the water “residing” for whatever period within its territorial boundaries. Each state had a claim to ownership of its water resources and the dispute usually focused upon allocation of use as between the two (or more) states, each owning a portion of the water. Of course, the identity of the parties -- two or more competing states -- was (and has been) the factor determining the application of the federal common law doctrine of equitable apportionment. The doctrine has no application in *Mississippi v. Memphis* because apportionment or allocation of the subject ground water has been established as a matter of state’s rights or sovereignty and issues of ownership of the resource are governed by state law, not federal law.

Most states have enacted statutes or constitutional provisions codifying the concept of state ownership of natural resources. Likewise, most jurisdictions have judicial decisions also confirming the basic legal precepts that each state owns and controls the waters and other natural resources within its territorial boundaries and has the authority and fiduciary obligation to protect and manage such resources for the use and benefit of its citizens.

**3) Mississippi’s Case Highlights the Emerging Trend in Eastern States Toward State-Administered Regulated Riparianism.**

Ground water control and management is typically left to the states. Swenson, *supra*, at 374. Each state, through its statutes and case law, is vested with the power and authority to determine which system or modification thereof it will use to allocate water resources. It has thus been left to the states to decide how to allocate water to competing users within their borders. James E. Kundel & Diana Tetens, *Whose Water Is It? Major Water Allocation Issues Facing Georgia*, Public Policy
Generally, in order to deal with the unpredictable nature of ground water resources, state legislators have experimented with the common law riparian doctrines (absolute ownership, reasonable use, correlative rights) and the doctrine of prior appropriation. Swenson, supra, at 374. The common law has tended to emphasize the rights of individuals over the public interests. Id. Because each doctrine has presented problems which make strict adherence by the state impractical, today states are adopting permit systems that integrate the needs of private individuals with the interests of the public. Id.

With the expansion of the public trust doctrine to afford states the ability to protect vital natural resources (see discussion infra), there is a trend among eastern states to expand their water management capacities. Kundel & Tetens, supra, at 4. The doctrinal distinctions between eastern and western water law and policies are converging in significant ways. One commentator characterizes this as “conceptual confluence” as policy approaches in which this trend is apparent include programmatic scope, quantification, in-stream flows, the role of public interests in setting priorities, water conservation, and interbasin transfers. Id. at 15.

Today, a national trend for recognizing water as a public resource is occurring as eastern states experience increasing supply shortages and both eastern and western states grapple with common issues. Id. With the demise of traditional common law riparian doctrine, eastern water law has evolved to an increasing use of administrative water management. It has been referred to as “regulated riparianism.”

Water law in the eastern states is in a state of transition. There are categories as to which the various states have adopted regulated riparianism: states that have...
not significantly modified riparian rights, states that have adopted registration requirements, and states with administrative permitting programs. The states that have not significantly modified riparian rights include Louisiana, Rhode Island, Vermont and West Virginia. However, states requiring registration of major water users include Michigan, Missouri, Ohio, Tennessee and New Hampshire. States with administrative permitting programs have adopted two approaches to permitting: comprehensive permitting (Connecticut, Delaware, Florida, Georgia, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, New Jersey and Wisconsin) and selective permitting, also referred to as targeted regulatory intervention (Alabama, Arkansas, Illinois, Indiana, Maine, Mississippi, New York, North Carolina, Pennsylvania, South Carolina and Virginia). Id. at 8. As of 1995, 14 eastern states had consolidated agencies (Connecticut, Delaware, Florida, Georgia, Kentucky, Massachusetts, Michigan, New York, New Jersey, North Carolina, Tennessee, Vermont, West Virginia and Wisconsin) and 12 states had decentralized agencies (Alabama, Illinois, Indiana, Kansas, Maine, Maryland, Minnesota, Mississippi, Pennsylvania, Rhode Island, South Carolina and Virginia). Id. at 13. Iowa and Florida consider water to be a public resource belonging to the people of the state rather than to the owner of associated lands. Id. at 9. Thus, most eastern states have already moved from primary reliance on common law doctrines to establishing some degree of regulatory control over state water resources. Id. at 10. Within this framework, the trend in water policy is for management of water as a public resource, with private uses regulated by statutory and administrative guidelines. Id. at 13. See also Fortuna, supra, at 1024.

At the heart of the emergence of “regulated riparianism” lies the basic concept of state-ownership of water resources. As discussed infra, Mississippi’s legislative
enactments and decisional law comport with the state ownership theory and the modern trend toward state control, management and protection of water resources through a regulated riparian regime.

(4) Mississippi’s Case Is Premised, in Part, upon the State’s Expansion of the Public Trust Doctrine to Embrace Subterranean Resources Including Ground Water.

The theory of public trust is an ancient legal doctrine, evolving from Roman law into English common law and was passed on to the American colonies. Kanner, supra, at 62-63. When the colonists arrived in America, they brought the doctrine from England, although they changed its beneficiary from the monarchy to the public as a whole. After the American Revolution, the rights of the sovereign passed to the governments of the individual colonies, not the central federal government. Originally emphasizing water-related resources, the public trust doctrine was expanded to include nearly all natural resources. The public trust doctrine refers to the duty of sovereign states to hold and preserve certain resources for the benefit of its citizens. Described simply, the doctrine provides that natural resources belong to the whole public, not private citizenry. Id. at 61, 66-67; Davenport, supra, at 151-52.

Originally, the public trust doctrine related only to navigable waterways. Over time, the doctrine has been extended beyond navigable waterways by statute and by the courts. Id. at 74-75 & n. 119. Mississippi is among the progressive jurisdictions that has extended the public trust doctrine to both navigable and non-navigable waterways. In fact, as discussed infra, the Mississippi Supreme Court has declared the state’s ownership and plenary authority over its water resources, including subterranean resources. Cinque Bambini Partnership v. State of
Mississippi, 491 S.2d 508, 511-14, 516-17 & 519-20 (1986), aff’d sub nom, Phillips Petroleum Co. v. Mississippi, 484 U.S. 469, 479 (1988). Mississippi’s expansion of the public trust doctrine to include resources such as ground water is consistent with the views of respected commentators in recent articles and treatises. See Kanner, supra, at 76-77; Swenson, supra, at 380-381.

At least one commentator has noted the vital importance of expanding the public trust doctrine to protection of ground water resources. Under the public trust doctrine, state attorney generals can sue, as trustee, for damages to water resources that are held in the public trust. Kanner, supra, at 59. This is precisely the approach applied by Mississippi’s attorney general in Mississippi v. Memphis. Attorney generals have the authority to bring parens patriae suits to recover for damages to a state’s water and other natural resources. Id. This litigation strategy should arguably have broad-based appeal across political ideologies because the notion that a responsible party should pay for damages it causes is neither a liberal nor conservative idea. Further, as stated by one commentator, litigation by the state’s attorney general, when used in conjunction with a contingency fee arrangement with private litigators, requires comparatively nominal direct state oversight and staffing. This cost-shifting incentive is especially beneficial to states, many of whom are currently experiencing deep budget cuts. Id. at 59-60.

Perhaps an even more compelling reason for the extension of the doctrine of public trust to ground water rights concerns the fundamental duty of the state to exercise continuous supervisory control over water resources. The state must take the public trust into account when allocating water resources in an attempt to protect the trust uses whenever possible. This fiduciary duty includes the power to reconsider previous valid water uses that no longer coincide with trust values or
current socioeconomic, geopolitical or environmental imperatives. If ground water is part of the state’s overall water resources budget, state officials must consider the public trust in ground water allocation decisions. Swenson, supra, at 381.

Mississippi’s case against Memphis and MLGW stands at the forefront of the progressive move for inclusion of ground water as a specific state-owned resource protected under the public trust doctrine for the use and benefit of Mississippi citizens.

(5) Mississippi’s Case Heralds the Rapidly Evolving Concepts of Water As a Commodity with Significant Market And/or Resource Values.

As previously noted, Mississippi has sued Memphis and MLGW for the value of misappropriated ground water using traditionally recognized economic valuation methods. As Benjamin Franklin once said: “When the well’s dry, we know the worth of the water.” Fortuna, supra, at 1009. Commentators have noted that interstate ground water issues have come to public attention in several areas of the country. The poster child of ground water use is the Ogallala Aquifer, a gigantic aquifer that underlies large portions of Kansas and Nebraska, and smaller portions of Colorado, New Mexico, Oklahoma, South Dakota, Texas and Wyoming. John D. Leshy, Interstate Ground Water Resources: The Federal Role, at 188, 26th Annual Water Law Conference, San Diego, California, February 21-22, 2008. Other areas where interstate ground water issues have emerged include, obviously, the Sparta Aquifer underlying parts of Arkansas, Louisiana, Mississippi and Tennessee; the Sandstone Aquifer underlying the Chicago area and eastern Wisconsin; and the Spokane Valley-Rathdrum Prairie Aquifer under several hundred square miles of northern Idaho and eastern Washington, the sole source of drinking water for almost 400,000
people who live in the area. Id.

The resource and/or market value of ground water has provided impetus for major investments by speculators and would-be “water barons.” T. Boone Pickens, legendary Texas oilman and corporate raider, has recently formed a new company and invested about $100 million in acquisition of water rights and implementation of operations intended to take water from the Ogallala Aquifer and pump it to cities like El Paso, Lubbock, San Antonio and Dallas-Fort Worth -- for a significant price and profit, of course. See, e.g., M. Milstein, “Beyond Wind Plan, Pickens Eyes Pipelines in Drought-Ridden U.S.” (Popular Mechanics, July 25, 2008); T. Dwinnell, “T. Boone Pickens Invests in Water - Should You?” (Seeking Alpha, January 17, 2007); S. Bearfield, “There Will Be Water: T. Boone Pickens Thinks Water is the New Oil -- and He’s Betting $100 Million That He’s Right” (Business Week, June 12, 2008).

Water -- or what many are calling “blue gold” -- will become an increasingly scarce resource. It is estimated that by 2030, nearly half of the world’s population will inherit areas with severe water stress. Companies that use large quantities of the precious resource to run their businesses are seeking to lock up water supplies. One is Royal Dutch Shell, which is buying ground water rights in Colorado as it prepares to drill for oil in the shale deposits there. Id.

The potential for water markets is expanding and has the potential to be extremely competitive, not to mention complex, within the context of interstate water marketing. See generally J. L. Huffman, “The Institutional Constraints on Transboundary Water Marketing,” in Water Marketing -- The Next Generation, The Political Economy Forum (Terry L. Anderson & Peter J. Hill, eds.) The debate over the viability and propriety of water marketing has a long and contentious history. Compare Wilder, supra, at 842, 899-500 (author discusses national market for Great
Lakes water and exportation of surplus water inventory to non-riparian states) with Fortuna, supra, at 1018-20 (author discusses various reasons why states should refuse to establish water markets). This evolving understanding of the importance and value of ground water gives Mississippi v. Memphis not just jurisprudential significance on a local and national level, but also places the case at the center of converging economic and resource management concerns.

Mississippi has quantified the value of the ground water misappropriated by Memphis through MLGW’s pumpage at seemingly astonishing levels. Of course, Memphis has alternative water supply sources available to the City. For example, at a cost of some $600 to $800 million dollars, Memphis could design, fund and construct a river water treatment facility on the Mississippi River to replace the ground water MLGW pumps from Mississippi. Memphis could also relocate its well fields to lands in the northeast part of its service area in an attempt to cause contraction of the cone of depression such that it would no longer extend into Mississippi and cause the diversion and misappropriation of Mississippi’s ground water. This alternative, too, would cost hundreds of millions of dollars. The least cost alternative available to Memphis is to simply pay Mississippi for the water taken from the State.

Certainly, Memphis understands the vital importance of the aquifer ground water. After all, Memphis has benefitted by having numerous industries locate in the City because of its much-touted, high-quality artesian ground water. These include companies like Coors, DuPont, Cargill, Velsicol, PepsiCo (Aquafina), Arizona Tea and Viral Antigens, a biotech, cell culture company making diagnostic and injectable products. See “Memphis Water Termed ‘Sweetest in the World,’” Water World (Pennwell, November 2003). In fact, an internal Memphis document entitled
“Memphis Light Gas & Water Division Valuation Analysis” discussing aquifer control and exploitation, reported that the voluminous quantities of ground water held in reserve for MLGW’s customers could be viewed as an inventory asset and predicted the possibility of barges and tank trucks of pure Memphis ground water leaving town headed for distant cities to be sold for a profit. The MDEQ was even approached by a private concern considering the purchase and shipment of Mississippi’s ground water to arid countries such as Saudi Arabia. These plans may seem far-fetched, but, as previously noted, investors are already betting on water becoming recognized as a commodity much more valuable than oil or gold to be sold at a profit and no longer complacently presumed to be a “free good.” When Mississippi prevails in its lawsuit against Memphis and MLGW, the State will have established -- as Benjamin Franklin predicted -- *what the water is worth.*

**FACTUAL CONTEXT OF MISSISSIPPI’S CLAIMS AGAINST MEMPHIS AND MLGW**

The aquifer beneath North Mississippi is the primary source for the water supply of Desoto County, Mississippi. Memphis uses the aquifer as its sole source of municipal water supply and customer sales requirements. MLGW, a division of Memphis, is the largest three-service municipal utility in the United States, providing water, gas and electricity to Memphis and its other customers. MLGW owns and operates one of the largest artesian water systems in the world, containing over 175 wells in ten (soon to be eleven) well fields, three of which are located near the Mississippi state border. Memphis began using the aquifer for its water supply in 1886, having earlier drawn its water from the Wolf River. The aquifer soon became Memphis’ exclusive water source. Memphis today is the largest city in the world that relies solely on ground water for its water supply, pumping in excess of 200 million
gallons per day.

The benefit enjoyed by Memphis due to MLGW’s exploitation of the aquifer comes at a high price. MLGW’s ground-water pumpage in the aquifer has created a geophysical feature known as a *cone of depression* that is centered in Memphis and extends into Mississippi, resulting in Memphis’ diversion and taking of ground water that belongs exclusively to the State. Ironically, this unique hydrogeological condition has made MLGW the largest pumper of aquifer ground water from Mississippi.

**Hydrogeological Characteristics and the Effect of MLGW Pumpage on the Aquifer**

The aquifer, often called “the 500 foot sand,” is a formation occurring at depths ranging from zero to 600 feet and varying in thickness from 500 to 890 feet based on interpretations of geophysical logs. Extremely high quality ground water is stored in the aquifer and is naturally filtered by “moving” imperceptibly through the sand. The natural path of movement of ground water in the aquifer in Desoto County was, prior to MLGW's pumping, east to west through pore spaces (between sand and rock against friction) at a rate of about 1 - 2 inches per day. Ground water does not flow rapidly in a torrent or turbulent state; it is not wildly free-flowing like a stream or a river. Under natural pre-pumping conditions, it would take between 2,800 and 5,700 years for the aquifer ground water to “move” across Desoto County, a distance of about 33 miles. The subject ground water, therefore, has been confined and stored beneath Mississippi for several millennia. See note 3 & accompanying text *supra*. But for MLGW's pumping, and its creation and expansion of the cone of depression, the ground water taken by Memphis would still be contained within the territorial boundaries of Mississippi.
MLGW’s pumping operations have diverted the aquifer’s ground water movement from its natural westerly direction to a true northward accelerated flow path toward the steepest part of the cone which underlies Memphis. As a result, MLGW’s pumpage has been and is now capturing aquifer ground water beneath Mississippi. The following illustration demonstrates how MLGW’s ground water pumpage has altered the natural flow gradient and rate, causing Mississippi’s water to move northward:
The curved lines on the illustration, called “potentiometric contours,” depict the configuration and expansive geographic scope of the cone. The illustration is a “flow net,” a graphical representation of the ground-water flow system consisting of a set of equipotential lines (i.e., the contour lines of the aquifer’s potentiometric surface as defined by measured water levels) and corresponding flow lines. Flow net analysis is a standard hydrologic method used to calculate ground-water flow volumes, in this instance driven by the cone from within Mississippi northward into Memphis. Flow lines define the direction of ground-water movement resulting from the pumping stress imposed by MLGW on the aquifer beneath Mississippi. The red arrows, or “flow lines” on the flow net illustration above show how the cone causes Mississippi’s aquifer ground water to actually change direction from its normal east to west course of movement as it is drawn into a true north pathway directly into the smaller contours representing MLGW’s southernmost well fields. Due to demand and growth of MLGW’s system, the aquifer has been pumped and drawn down at a higher rate than it is being recharged or replenished, causing water levels to drop

13 The construction of flow nets is one of the most powerful analytical tools for the analysis of ground water flow. An excellent discussion of flow nets by graphical construction is contained in the seminal work of R. Allan Freeze and John A. Cherry, *Groundwater*, §5.1 at 168, *et seq.* (1979). Mississippi’s experts have demonstrated that, based on flow net analysis, ground water withdrawals of MLGW have altered the ground water flow direction, capturing ground water from beneath Mississippi, particularly Desoto County. Mississippi’s experts used flow net analysis to calculate flow volumes driven by gradient from 1965 to 2006. The flow net figures were constructed from potentiometric surface contour maps, from published material and ground water model-derived maps created by Mississippi’s experts. They also used ground water flow models to simulate the aquifer ground water flow system. All of the maps show the cone of depression extending into Mississippi. Ground water draw-down from pumping-induced stress was analyzed, demonstrating that draw-down increased over time as much as 120 feet for the 1995-2005 time frame. Using flow net analysis, ground water mapping and modeling exercises and construction of a ground water budget analysis, Mississippi’s experts’ study indicates that there was substantial diversion of vast quantities of Mississippi’s ground water on an annual basis over the last 40 years equal to 25-35% of the Memphis area supply. Refined data analysis demonstrates that 15-22% of MLGW’s ground water withdrawals have been pumped from beneath Mississippi for that same time frame.
and creating the cone of depression expanding outward from Memphis across the border into Desoto County, Mississippi.

**The Cone of Depression and Its Impact Upon Mississippi's Ground Water Resources**

Commencing in 1886, MLGW's pumpage and withdrawal of aquifer ground water disturbed its steady-state condition and created a dynamic flow condition, thus altering the aquifer ground-water system. These circumstances created the cone of depression under Memphis that expands deeply into Mississippi. A three-dimensional illustration of the cone would resemble the image shown below:

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14 In the pre-development steady-state condition of the aquifer, there was continual inflow (recharge) of water in the aquifer so that there was always a constant volume of water physically present under Mississippi, and more particularly Desoto County. The water levels of this constant volume have varied over time depending on stresses on the aquifer such as MLGW's pumping. There are a number of components that make up the aquifer water inventory or “budget” as it is defined in hydrogeological terms. These include recharge, changes in storage, ground-water in-flow and out-flow, and other factors. When a stress such as MLGW's pumpage is introduced to the system, it creates a cone of depression that gradually reaches out further and further to draw in more water to maintain the ground-water supply for MLGW's wells. The ground-water system in the Desoto County area was, prior to MLGW pumpage, in a steady-state condition. See note 2 & accompanying text *supra*. 
A cone of depression is a pattern that forms when a pumping well pumps from an aquifer, in this case a confined aquifer. When a large cone forms in a confined aquifer, the water levels decline due to pumping and there is an increase in hydraulic gradient which in turn alters and controls ground water velocity and direction of flow. The shape and extent or size of the cone depends on the rate and duration of pumping, and the hydraulic properties of the aquifer (ground water system). It begins to form a funnel-shaped vortex in the potentiometric surface of the aquifer, as shown (for illustration purposes only) in the following hydrogeologic cross-section:

Memphis and MLGW have never disputed either the existence of the huge cone caused by their pumping or its past and continuing effects on Mississippi's ground water resources. The cone results from cumulative ground water pumping from multiple wells in numerous well fields operated by MLGW for Memphis'
municipal supply and sales. Essentially, many smaller individual well cones of depression overlap forming one, expansive cone of depression with broad geographical impact. The area of this large cone, occurring from MLGW’s cumulative well field pumpage, is depicted in yellow on the following graphic representation:

Memphis and MLGW have been diverting and capturing aquifer ground water from Mississippi on a continual basis since at least 1924. For the period 1965 to 2006, the range of diversions was from 13.64 million gallons per day to 28.33 million gallons per day. This equates to 15% to 22% of MLGW's ground-water supply provided by water diverted from Mississippi. Over 363 billion gallons of Mississippi's
ground water have been permanently diverted from storage in Mississippi into storage in Memphis during the period 1965 through 2006. These diversions are ongoing; the present level of diversions of some 24 million gallons per day are expected to continue from 2007 to 2016.

Absent total cessation of MLGW's pumpage, Memphis' misappropriation of Mississippi's ground water will continue for the foreseeable future life of the aquifer. Because of the alteration of the ground-water system, even if MLGW were to completely cease pumping from its well fields, the ground water already diverted by Memphis will not return to Mississippi. MLGW's cessation of pumping will simply mitigate additional future diversions. Once Mississippi's ground water becomes captured and encompassed within Memphis' hydrologic ground-water inventory, there is a continuous, ongoing process in which water that reaches MLGW's wells or well fields is constantly being replaced by water being continually diverted from Mississippi. The quantities of Mississippi's ground water diverted and taken by Memphis have become part of the Memphis ground-water supply inventory or "budget" and permanently lost to Mississippi. Ground water originating from Mississippi -- now part of Memphis' hydrologic inventory -- has been and is now reaching MLGW's wells. This process will continue indefinitely into the future as long as MLGW's municipal well pumping maintains or expands the cone of depression and continues to displace and permanently capture Mississippi's water to supply MLGW's well fields.
THE PUBLIC TRUST DOCTRINE AND STATE “OWNERSHIP” OF GROUND WATER RESOURCES


The Mississippi Supreme Court declared the State’s ownership and plenary authority over its water resources, including subterranean resources, in Cinque Bambini Partnership v. State of Mississippi, 491 So.2d 508, 511-14, 516-17 & 519-20 (1986), affirmed by the Supreme Court in Phillips Petroleum Co. v. Mississippi, supra. Ever since the federal sovereign ceded title to Mississippi, state law has controlled ownership and allocation of the use of Mississippi’s natural resources. Oregon, 429 U.S. at 378-82; Cinque Bambini, 491 So.2d at 513, 516-19. It is, thus, the State’s prerogative to control and preserve state-owned resources. Id. at 513, 517.

Mississippi Has Owned the Ground Water Within Its Boundaries Since Statehood

The ground water at issue has been owned by Mississippi for almost 200 years, since 1817. For over 160 years, an unbroken line of Supreme Court decisions has consistently traced state ownership of water and other natural resources to the American Revolution. Each state’s right and responsibility to control the water
resources within its boundaries arises from the American colonies' inheritance of England's common law under which the sovereign or King owned all of the waters, forests, game, minerals and profits upon or under the land. See Phillips Petroleum, 484 U.S. at 479; Oregon, 429 U.S. at 378; Illinois Centr., 146 U.S. at 452; Pollard, 44 U.S. at 222-23; Waddell's Lessee, 41 U.S. at 410. When the original thirteen colonies joined in releasing English royal claims by the Declaration of Independence, each colony asserted the same governmental ownership or control over the waters and other natural resources within their boundaries as previously exercised by the sovereign. As new states entered the Union, each entered on “equal footing” with those of the original thirteen colonies; that is, each new state was presumed to be endowed with the same governmental rights and privileges, including sovereignty with respect to all natural resources within the particular territory, as the original thirteen. Pollard, 44 U.S. at 222-23.

In Mississippi, these fundamental principles have been adopted to establish conclusively that the ground waters within Mississippi's territorial boundaries are owned and controlled by the State. The Cinque Bambini Court held that, once Mississippi had been admitted to the Union and the public trust had been created and funded, the role of the equal footing policy ended and the title to and plenary authority over the lands and resources conveyed in trust became vested in the State. 491 So.2d at 512-13. Cinque Bambini confirmed Mississippi's ownership of subsurface resources such as ground water, see id. at 516-17, and the decree was upheld by the Supreme Court in Phillips Petroleum, 484 U.S. at 476 (reaffirming long standing Supreme Court precedents holding that the states, upon entry into the Union, received ownership of their lands and waters).
Mississippi’s water policies, legislative enactments and decisional law have consistently reaffirmed state ownership and control of the water resources within its borders for the beneficial use of the people of the State. See *State Game & Fish Comm’n v. Louis Fritz Co.*, 187 Miss. 539, 193 So. 9 (1940) (State is the owner of water within its borders and incident to this ownership is right and duty to police and protect it; court stresses police power connected with State’s ownership in trust for the people); *State ex rel. Rice v. Stewart*, 184 Miss. 202, 184 So. 44 (1938) (State has power, as trustee, to bring a trespass action to recover value of subterranean resources removed from river bed); MISS. CODE ANN. §§51-3-1, *et seq.* (1985 & Supp. 2007) (Mississippi’s 1985 Omnibus Water Rights Act codifies state ownership of ground water under the public trust).

**Mississippi’s Ownership of Its Ground Water Resources Is a Self-Evident Attribute of Statehood and Sovereignty**

Ownership of Mississippi’s ground water resources has vested exclusively in the State since 1817, the time when Mississippi was admitted to the Union. See *Cinque Bambini Partnership v. State of Mississippi*, 491 So.2d 508, 516 (Miss. 1986), *aff’d sub nom. Phillips Petroleum Co. v. Mississippi*, 484 U.S. 469, 476-77, 484-85 (1988). Each state, including Mississippi, owns the surface water and ground water resources within the geographical confines of its boundaries as a function of statehood. The water resources of each state properly belong to each such state by their inherent sovereignty. *Kansas v. Colorado*, 206 U.S. 46, 94 (1907). Each state has full jurisdiction over the lands within its borders, including the beds of streams and other waters. *Id.* at 93.
In Mississippi, state ownership and control of water resources for the beneficial use of the people extends to navigable and non-navigable waters, including subsurface resources. *Cinque Bambini*, 491 So. 2d at 516. Such title being in the State, the protection of ground water within its territorial boundaries is a sovereign imperative. See *id.*; *State Game & Fish Comm’n v. Louis Fritz Co.*, 187 Miss. 539, 193 So. 9 (1940) (State is the owner of water within its borders and incident to this ownership is right and duty to police and protect it; court stresses police power connected with State’s ownership in trust for the people); *State ex rel. Rice v. Stewart*, 184 Miss. 202, 184 So. 44 (1938) (State has power, as trustee, to bring an action for trespass to recover value of gravel and sand removed from riverbed).

Mississippi law places ownership, dominion and control of its surface and ground water resources in the State. These basic precepts are codified in Mississippi’s statutory modern regulated riparian regime which provides, in pertinent part:

*All water, whether occurring on the surface of the ground or underneath the surface of the ground, is hereby declared to be among the basic resources of this state and therefore belong to the people of this state*, and is subject to regulation in accordance with the provisions of this chapter. *The control and development and use of water for all beneficial purposes shall be in the state, which, in the exercise of its police powers, shall take such measures to effectively and efficiently manage, protect and utilize the water resources of Mississippi.*

Mississippi's adoption of regulated riparianism is part of a trend in the eastern states\(^\text{15}\) to abandon or modify the system of riparian rights that evolved in the 19th century on the tenuous assumption of permanent surpluses. As demand for water continues to increase and precipitation and other weather patterns have undeniably become more erratic, causing recurring water shortages to become more frequent, there is simply no longer enough water to satisfy all needs in the eastern states. See Joseph W. Dellapenna, *The Law of Water Allocation in the Southeastern States at the Opening of the Twenty-First Century*, 25 U. ARK. LITTLE ROCK L. REV. 9 (Fall 2002) ("Dellapenna III"). Mississippi's current law codifies the existing state policy

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\(^{15}\) Mississippi is not alone in its declaration of its historical ownership of the waters of the State. Since the 1950's, about half of the states east of Kansas City have deployed versions of regulated riparianism to replace traditional riparian rights. These states have developed a highly regulated system of water administration based on riparian principles that are best described as a system of public property and which affirm state-ownership of water resources. States that have active regulated riparian systems and the approximate date of that adoption are as follows: Alabama (1993); Arkansas (1957); Connecticut (1982); Delaware (1959); Florida (1972); Georgia (1977); Hawaii (1987); Iowa (1957); Kentucky (1966); Maryland (1957); Massachusetts (1985); Minnesota (1973); Mississippi (1985); New Jersey (1965); North Carolina (1973); New York (1979); Virginia (1989); and Wisconsin (1957).

The Regulated Riparian Model Water Code provides, in pertinent part:

*The waters of the State are a natural resource owned by the State* in trust for the public and subject to the State's sovereign power to plan, regulate, and control the withdrawal and use of those waters, under law, in order to protect the public health, safety, and welfare by promoting economic growth, mitigating the harmful effects of drought, resolving conflicts among competing water users, achieving balance between consumptive and non-consumptive uses of water, encouraging conservation, preventing excessive degradation of natural environments, and enhancing the productivity of water-related activities.

that Mississippi’s valuable ground water belongs to and is owned by the State.\textsuperscript{16} See also Mississippi’s 1976 Ground Water Capacity Use Act, MISS. CODE ANN. §51-4-1 (1976) (declaring ground water to be among the State’s basic resources subject to State control and development for the benefit of the people).\textsuperscript{17}

\textsuperscript{16} Like Mississippi, many eastern states have adopted a basic declaration confirming the ownership of the states’ rights and interests in the waters within their territorial boundaries. \textit{Compare} MISS. CODE ANN. §51-3-1 (1985 & Supp. 2006) with ALA. CODE §9-10B-2; CONN. GEN. STAT. ANN. §22a-366; DEL. CODE ANN. tit. 7, §6001; FLA. STAT. ANN. §373.016; GA. CODE ANN. §§12-5-21, 12-5-91; HAW. REV. STAT. §174C-2(a); IND. CODE ANN. §13-12-1-8; IOWA CODE ANN. §455B.262(3); KY. REV. STAT. ANN. §151.110; MD. CODE ANN. NAT. RES. §8-801(1); MINN. STAT. ANN. §105.38; N.J. STAT. ANN. §58:1A-2; N.Y. ENVTL. CONSERV. LAW §§15-0103, 15-0105(1); N.C. GEN. STAT. §143-215.12; VA. CODE ANN. §62.1-11; VA. CODE ANN. §62.1-44.36, 62.1-44.84; and WIS. STAT. ANN. §144.25(1).

\textsuperscript{17} Additionally, Mississippi was the only state east of the Mississippi River that adopted a prior appropriation regime relating to surface water contained within the State. This made Mississippi a \textit{dual water rights} legal system, basing its common law on riparian doctrine, while adopting a legislative enactment of providing for prior appropriation in the context of surface water.

In 1956, twenty years prior to enacting the Ground Water Capacity Use Act, the Mississippi Legislature enacted a surface water conservation regime in which it declared that all of the waters of the State could be put to beneficial use in the interest of the people and that water occurring in any water course, lake or other natural body of water of the State was among the basic resources belonging to the State. The enactment provided, in part, that “the control and development and use of water for all beneficial purposes shall be in the State, which, in the exercise of its police powers, shall take such measures as shall effectuate full utilization and protection of the water resources of Mississippi.” See MISS. CODE ANN. §5956-01 (1956). The Appropriations Act empowered the Board of Water Commissioners of the State of Mississippi to implement and enforce regulations for issuing permits for the appropriation of surface water owned by the State. See id. at §§5956-08 & 5956-13.

Apparently, the prior appropriation regime for surface water was never actually implemented and it appears that the courts in Mississippi had virtually ignored the statute’s existence during the 29 years the statute was in force. \textit{See Dellapenna III} at 78. Mississippi had originally followed the reasonable use version of riparian rights for surface water and the absolute ownership rule for ground water. \textit{Id}. The prior appropriation experiment ended, however, in 1985 with Mississippi’s repeal of its appropriations statute. Instead, Mississippi replaced its appropriative surface right system with another highly regulated system of water allocation -- the public property system of regulated riparianism. \textit{Id}. at 31. The 1985 Omnibus Water Rights Act was enacted to cover both surface and ground water resources of the State.

While the current water allocation law of Mississippi constitutes a rather standard regulated riparian regime, the statutory scheme contains a number of significant advances in design. For
These statutes reaffirm Mississippi's ownership and control of the water resources. The State, as the legal owner of its water resources, has the power, authority, and fiduciary obligation, to take all steps necessary to protect its valuable surface water and ground water resources. The State's ownership interest, as affirmed by these statutory enactments, is an inalienable right attendant to its sovereign statehood.

These principles underlie the public trust doctrine pursuant to which each state, upon attaining statehood, became vested with title and ownership of lands and waters within the state's geographical confines. See Cinque Bambini, supra, at 516 ("effective upon statehood on March 1, 1817, we understand federal law to provide that the United States granted to the State of Mississippi in trust all lands, to which the United States then held title, including their mineral and other subsurface resources") (emphasis added).

Mississippi's law and policy regarding state ownership of surface and ground water resources is consistent with the laws of other jurisdictions, \(^{18}\) regardless of what example, Mississippi's legislative enactments mandate the conjunctive management of surface and ground water. The statutes also are careful to declare a set of regulations under the State's police power. Id. at 78.

\(^{18}\) See generally National Audubon Society v. The Superior Court of Alpine County, 658 P.2d 709, 724, 727-28 (Calif. 1983) (all water within state is property of people of the state; state, as sovereign, retains control of waters); Chatfield East Well Co., Ltd. v. Chatfield East Property Owners, 956 P.2d 1260 (Colo. 1998) (all surface and ground water is a public resource) citing California Oregon Power Co. v. Beaver Portland Cement Co., 295 U.S. 142, 163-64 (1935) (waters of the public domain are publici juris, subject to plenary control of the states); Monte Vista Canal Co. v. Centennial Irrigating Ditch Co., 123 P.831 (Colo. App. 1912) (ultimate title or ownership of water of state is vested in public); Bennett v. Twin Falls North Side Land and Water Co., 150 P. 336, 338-39 (Idaho 1915) (ownership of the corpus of the water is in the state); Ex parte Louis Fritz, 86 Miss. 210, 38 So. 722, 723 (1905) (ownership of ferae naturae is in the state in its sovereign capacity; state has right and duty to preserve and protect public resources from trespassers); Barry v. Merickel Holding Corp., 108 P.2d 311, 314-15 (Nev. 1940) (all water of state, whether above or beneath the surface of the ground, belongs to state; water being state property, the state has the right and power to prescribe how it may be used); Johns-Manville Sales Corp. v. New Jersey Water
usufructuary water rights law may be in effect. These decisions comport with laws enacted in various jurisdictions declaring the waters of the state to belong to the state, in its sovereign capacity, and providing for control and regulation of state-owned water resources for the beneficial use of the people.\textsuperscript{19} Many states have

Supply Auth., 211 N.J. Super. 315, 511 A.2d 1194, 1195-97 (1986) (water resources are public assets held by state; ultimate ownership of state of precious natural resource is held by state for public's use); New Mexico v. City of Las Vegas, 89 P.3d 47, 61 (N.M. 2004) (all water within state belongs to state); State v. Erickson, 308 P.2d 983 (N.M. 1957) (all water within the state, whether above or beneath the surface of the ground, belongs to the state; the state as owner has right to prescribe how water may be used); State Game Comm'n v. Red River Valley Co., 182 P.2d 421 (N.M. 1945) (water held to belong to public); United Plainsmen Ass'n v. North Dakota State Water Conserv. Comm'n, 247 N.W.2d 457, 461 (N.D. 1976) (all streams and natural water courses shall forever remain property of state; all water within limits of state held by state by virtue of its sovereignty); Parks v. Cooper, 676 N.W.2d 823, 838 (S.D. 2008) ("we align ourselves with the Idaho, Iowa, Minnesota, New Mexico, Montana, North Dakota, Oregon, Utah and Wyoming decisions that have recognized the public trust doctrine's applicability to state waters"). See also Murphy v. Kerr, 296 F.536 (D.N.M. 1923) (Court noted that Arizona, Colorado, California, Montana, Nevada, New Mexico, Oklahoma, Oregon, North Dakota, South Dakota, Texas, Utah, Wyoming and Idaho have declared that "all waters within the state are the property of the public, and belong to the state").

\textsuperscript{19} See, e.g., Alabama's "Water Resources Act," ALA. CODE ANN. §9-10B-1 (all waters of the state, above or below surface of ground, are the resources of state); Arizona's "Groundwater Management Act," ARIZONA STAT. §45-401 (groundwater of state made subject to state management and regulation); Arkansas Ground Water Protection and Management Act, ARK. CODE ANN. §§15-22-901, et seq. (mandate for reporting use of ground water to state); Delaware's "Natural Resources-Environment Control" Law, DEL. CODE ANN. Tit. 7, §6001 (the state, in the exercise of its sovereign power, controls development and use of land and water resources of state); Florida's "Water Resources Act," FLA. STAT. ANN. §373.016 (waters of state are its basic resources controlled by state for benefit and use of public); Georgia's "Ground-Water Use Act," GA. CODE ANN. §12-5-91 (the water resources of the state are to be regulated in public interest); Indiana's "Waters Rights; Ground Water" Law, INDIAN CODE ANN. §14-25-3-4 (ground water resources of state protected and regulated for citizens' beneficial use); Iowa's "Resources Enhancement and Protection" Law, IOWA CODE ANN. §455A.16 (state's natural resources subject to state protection); Kentucky's "Geology and Water Resources" Law, KY. REV. STAT. ANN. §151.120 (water occurring in any stream, lake, ground water, or subterranean water in Commonwealth is declared to be a natural resource and public water of the Commonwealth subject to control and regulation for the public); Minnesota's "Water Policy," MINN. STAT. ANN. §103A.201 (public waters are subject to control of the state); New Jersey's "Waters and Water Supply Management" statutes, N.J. STAT. ANN. §58:1A-2 (water resources of state are public assets of state held in trust for people); New York's "Water Resources Law," N.Y. ENVTL. CONSERV. LAW §15-0103 (sovereign power to regulate and control water resources of state "ever since its establishment has been and now is vested exclusively in the state"); South Carolina's "Groundwater Use and Reporting Act," S.C. CODE ANN.
codified the public trust doctrine under their state constitutions;\textsuperscript{20} thus, the public trust doctrine, after codification, is no longer just an “ancient common law doctrine.” Kanner, \textit{supra}, at 86. The public trust doctrine, expanded in Mississippi to embrace subterranean resources, including ground water, provides the basis for state ownership, control and management of valuable water resources within the State’s territorial boundaries for the use and benefit of Mississippi’s citizens.

\textsuperscript{20} See Wyoming Constitution, Article 8, Section 1 (declares that “the water of all natural streams, springs, lakes or collection of still water within the boundaries of the state are . . . the property of the state.”); Colorado Constitution, Article XVI, Section 5 (declares that “the water of every natural stream, not heretofore appropriated, within the State of Colorado, is declared to the property of the public, and the same is dedicated to the use of the people of the State, subject to appropriate as hereinafter provided.”); Montana Constitution, Article IX (declares that all water within the state, including underground water, is the property of the state, and that all its use is a “public use” notwithstanding its user or purpose.); New Mexico Constitution, Article XVI, Sections 1, 2 (declares that all the “water of every natural stream, perennial or torrential, within the state” unappropriated at the time of statehood, “belong(s) to the public.”); California Constitution, Article 10, Section 5 (provides that “the use of all water” by appropriation is a “public use” and subject to the regulation and control of the state.”); Nevada Revised Statutes, 533.125 (provides that “the water of all sources of water supply within the boundaries of the state, whether above or beneath the ground, belongs to the public”); North Dakota Century Code, §61-01-01 (declares both surface and ground water to “belong to the public”); Utah Code, §73-1-1 (declares that all waters in the state, whether above or under the ground are hereby declared to be the property of the public, subject to all existing rights to the use thereof”); Oregon Revised Statutes 537.110 (provides that all waters of the state, whether above or below the ground, are the property of the public); Nebraska Revised Statutes §46-202(1) (provides that the water of every natural stream not heretofore appropriated within the State of Nebraska, including the Missouri River, is hereby declared to be the property of the public and is dedicated to the use of the people of the state, subject to appropriation); Washington’s Legislation set forth in RCW §90.03.010 (provides that all waters within the state belong to the public); Idaho Code §42-101 (declares that all its water belong to the state); California Water Code, Section 1201 (provides that surface waters are “public waters of the state”); Texas Water Code §11.021 (declares that surface water is the “property of the state”).
CONCLUSION

The Memphis Sand/Sparta Aquifer represents an extremely unique and valuable resource vital to the economy and general health and welfare of the citizens of Mississippi. The State, in its sovereign capacity, owns this resource and controls its use by Mississippians through its inherent authority and police powers. For itself and acting *parens patriae*, Mississippi seeks hundreds of millions of dollars in monetary damages equal to the fair market value and/or resource value of the water taken, plus interest as additional damages.

*Mississippi v. Memphis* presents an excellent opportunity for achieving clarity and consistency in Mississippi’s water law and policy. The novel factual context of the case accentuates the need for creative dispute resolution in transboundary water disputes, particularly in the area of ground water where historically science has so radically outpaced advances in the law. With Mississippi’s adoption of a public water rights regime of regulated riparianism and its exertion of its police powers to exercise control and dominion over state-owned resources, the case also represents an opportunity to bring to the forefront the concepts of public ownership of water resources as distinguished from private rights of use (or usufructory rights), the latter being traditionally the primary focus of lawyers and jurists.

The Mississippi Supreme Court’s decision in *Cinque Bambini* clearly articulates an expansion of the public trust doctrine to both navigable and non-navigable waters. The Supreme Court goes further, however, to embrace subterranean resources within the public trust doctrine. This should include ground water resources as a natural and reasonable exercise of the State’s sovereign prerogatives to manage the waters and other natural resources contained within the territorial boundaries of the State. For this reason, *Mississippi v. Memphis* could
have important ramifications in not only clarifying the distinctions between “ownership” and “use” of water resources, but to confirm the power of every state of the United States to control and manage water resources within their borders to serve and protect their respective citizens’ health, safety and general welfare . . . not to mention the advancement of political, regulatory and economic imperatives, serious environmental programs, conservation and resource management goals and the orderly and effective development and application of new technologies, consistent with emerging (and converging) modern legal regimes.
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Mr. Cameron is Special Counsel with the law firm of Daniel Coker Horton & Bell, P.A., in its Oxford, Mississippi office. He is an “AV-rated” lawyer in Martindale-Hubbell and is licensed to practice law in Mississippi and Colorado. His primary practice areas include arbitration, mediation and complex litigation with particular emphasis on oil and gas, energy and natural resources, including water rights and water management policy. He is a member of the Arbitration, Natural Resources and Energy Litigation Sections of the American Bar Association. Mr. Cameron is also a member of CPR International Institute for Conflict Prevention and Resolution, CPR National Panels for Distinguished Neutrals: Energy, Oil & Gas and Mississippi Panels. He is a co-founder of the Energy & Natural Resources ADR Group, LLC a/k/a ENR Dispute Resolution. Mr. Cameron has published articles and presented addresses on a variety of oil and gas and natural resources-related issues, including a recent paper prepared for the keynote address of the Sea Grant Law and Policy Journal 2009 Symposium entitled “Mississippi v. Memphis: A Study in Transboundary Ground Water Dispute Resolution” presented March 24, 2009.

Mr. Cameron is a member of various oil and gas associations including the Rocky Mountain Mineral Law Foundation, Federal Energy Bar Association and U. S. Oil and Gas Association (Alabama/Mississippi Division). He has been admitted to practice before the United States Supreme Court, the United States Court of Appeals for the Fifth, Eleventh and Tenth Circuits, the United States District Courts for the Northern and Southern Districts of Mississippi, the United States District Court for the District of Colorado, and all Mississippi and Colorado state courts. He lives and practices law in Oxford, Mississippi.