Louisiana Ground Water Resources Commission

Managing Louisiana's Groundwater Resources

with supplemental information on surface water resources

An Interim report to the Louisiana Legislature

March 15, 2012

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Louisiana Ground Water Resources Commission

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To the Distinguished Members of the Louisiana Legislature and the People of the Great State of Louisiana

March 15, 2012

From its beginning in 1682 when La Salle claimed all of the territory drained by the Mississippi River in the name of King Louis XIV of France and called it "Louisiana," water has been at the center of many significant milestones in Louisiana's history. Communities and economies have developed and thrived along our rivers and coastal regions, while residents have faced the challenges of historic river floods and devastating tropical storm events that tested our state's strength and stability. As a result, much of the focus over the past 200 years since Louisiana's statehood has prudently been on reducing the risk of rising water and encroaching saltwater. Consequently, our leaders have wisely invested in critical infrastructure designed to manage floodwaters and fight coastal erosion, protecting people and property. State laws and rules have also been adopted to protect water quality and regulate discharges into surface water bodies like streams, rivers, lakes, and bayous.

Water is a conundrum, being the only natural substance that can be found in all three physical states (solid, liquid and gas) at normally occurring temperatures. It is equally enigmatic as it pertains to regulatory classification in that water is simultaneously a precious life-giving necessity, a commodity with universal utility in industry, and a nuisance to be disposed of, diverted, and controlled. As such, a hodgepodge of laws, rules, regulations, and regulatory authorities have evolved to address the complicated management of this resource. Currently in Louisiana, there are at least four federal agencies, eight state agencies, two ground water conservation districts and more than 700 local entities such as watershed districts, surface water conservation districts, reservoir districts, drainage basins, waterway commissions, lake commissions, water and sewerage districts, waterworks and recreation districts with management or regulatory authority over the resource.

In addition to the complexity with regard to the agencies that manage our water resources, our laws governing water are also complex. Historically, our state has applied various and sometimes conflicting legal concepts such as absolute ownership, rule of capture, and riparian rights. This has resulted in a situation where the running surface waters of the state are recognized as public resources, owned by the state, and generally subject to a charge for consumption, excepting riparian landowners and where used for agriculture, aquaculture, and municipal purposes. Conversely, groundwater, when reduced to possession, is treated as privately owned and free of charge. This paradox results in the state charging for surface water resources that are normally in abundance, while allowing uncompensated withdrawal of groundwater resources that are often in limited supply. While we embrace the right of capture for landowners, in order to address this quandry, legal scholars should research, debate, and explore the potential non-compensated consumption of surface water when used as an alternative to groundwater and as an aid to economic development, job creation, and job retention.

It wasn't until 2001 that Louisiana took major steps to manage a vital, yet often overlooked, asset —the groundwater provided by this state's eleven principal aquifer systems. In response to an extreme drought period in 1999-2000, the Louisiana Legislature approved Act 446, which established the Louisiana Ground Water Resources Commission, the Ground Water Management Advisory Task Force, and the Ground Water Resources Program. Ensuring the sustainability of this critical resource is the ongoing goal of these entities, placed within the Louisiana Department of Natural Resources (LDNR), Office of Conservation, by the legislature in 2003.

Since then, important steps have been made in regulating and managing groundwater use and promoting conservation, with nearly 190,000 entries in the Office of Conservation database and a list of 154 certified water well drilling contractors. From 2001 to 2007, the agency processed 980 new water well installation notices submitted as required by 2001 and 2003 legislation. Following administrative changes initiated in the fall of 2007, passage of enforcement legislation in 2008, aggressive compliance auditing and enforcement activity implemented in January 2008, and ongoing education and outreach efforts, agency staff received and processed over 5,000 new well installation notices from 2008 through February 2012, an increase of 500 percent. The primary causative force driving this improvement is the diligence in implementing compliance auditing procedures and enforcement actions. Since January 2009 to present, nearly 3,000 enforcement actions have been issued to owners of water wells that were installed without providing the agency proper notification for groundwater withdrawal sustainability evaluation. Clearly, this effort has resulted in necessary improvements, bringing into play a more comprehensive implementation of the legislature's intent for the agency to fulfill a proactive, well-specific role in the state's management of aquifer sustainability and groundwater use.

The Office of Conservation has responded to aquifer-specific groundwater supply issues by designating three Areas of Ground Water Concern in the Sparta aquifer system in 2005. More recently, due to persistent exceptional drought conditions, increased dependence on groundwater resources in two population centers in southern Caddo Parish caused some domestic well owners to experience well pumping problems, many losing the ability to withdraw groundwater from their wells. To manage groundwater availability and aquifer sustainability, the agency issued an order in August 2011 declaring portions of the Carrizo-Wilcox and Upland Terrace aquifers a groundwater emergency, thus invoking its statutory authority to curtail groundwater production and require conservation measures. Although, at the time of this interim report, aquifer conditions for these situations continue to require extraordinary management and oversight, monitoring results show that prudent application of these management techniques have had a positive impact on recovery toward sustainability.

According to the U.S. Geological Survey (USGS), total withdrawals from Louisiana groundwater and surface water sources in 2010 were approximately 8,500 million gallons per day, a decrease of about 17 percent since 2005. However, while surface water withdrawals decreased by approxinately 20 percent during this period, groundwater withdrawals increased by two percent (diagram page 51).

Today, population and economic growth are placing added pressure on strained aquifers, while severe drought conditions reveal the fragility of our aquifer systems and the interdependence of our groundwater and surface water resources. Water as a natural resource of Louisiana has been thought of as a limitless commodity. One,

that, from time to time, has been more conspicuous in its overabundance (floods) than in its absence (drought). This impression has been changed in recent times. Louisiana's water is now recognized as tremendously valuable. Evidence of this can be seen by the market's interest in the 2011 effort of the Sabine River Authority of Louisiana (SRA-LA) to sell raw water from the Toledo Bend Reservoir (Appendix A). For a variety of reasons, the SRA-LA recently elected to suspend this effort, but it is clear that we have come to a time in Louisiana's history when the State of Texas is interested in our water resources. The consequences of such a consideration, whether intended or unintended, long or short term, should be well researched by experts and fully debated through a transparent public process.

Current challenges require a renewed effort by both government and citizens to manage all of our water resources in ways that meet current and future water use demands. Clearly, the authors of our State Constitution understood the value of water resources, as expressed in Article IX, Section 1, which states, "The natural resources of the state, including air and water, and the healthful, scenic, historic, and esthetic quality of the environment shall be protected, conserved, and replenished insofar as possible and consistent with the health, safety, and welfare of the people."

It is well accepted that the ability to manage resources is only as good as the capacity to monitor the resources. Groundwater and surface water data collection has been ongoing in Louisiana by agencies, such as the USGS and the U.S. Army Corps of Engineers, for over 90 years. The USGS has had a cooperative monitoring program with the State since the early 1950's. Peak monitoring occurred in the early 1980's, at which point the cooperative network included a groundwater network of 739 wells and a surface water network of 184 gaging stations. Due to budget reductions in the mid-1980's, these networks have been reduced to the present 164 wells and 59 gaging stations, a 78 percent and 68 percent reduction respectively. Recognizing it is paramount that the State's groundwater monitoring networks be robust enough to timely identify areas of concern and enable scientifically based management decisions, the Fiscal Year 2012-2013 Executive Budget includes an appropriation, from a decade-old fund comprised of federal fines, to expand and enhance the groundwater monitoring network, reporting frequency, and aquifer evaluations, all as per a USGS recommendation. For this specific reason, this document is an interim report to be updated annually as this robust monitoring program is implemented. We are hopeful that additional funding to expand and enhance surface water monitoring can be secured in the near future.

Furthermore, we recognize that no two aquifers are the same, and a one-size-fits-all management approach is inappropriate. This interim report recommends a management strategy implemented through a centralized state governance model complemented by the establishment of regional advisory panels composed of local governments, user groups, and interested stakeholders, all as previously authorized by Act 49 of 2003. In the cases where the legislature has already established regional commissions, specifically, the Capital Area Ground Water Conservation Commission and the Sparta Aquifer Ground Water Conservation Commission, these entities should concurrently serve as their regional advisory panel. Additionally, we recognize investing in conservation education and outreach is the best value proposition to promote the long-term sustainability of the resource. We have been advised that LDNR is in the process of reallocating personnel to provide this service, in conjunction with other resource agencies, and we are very encouraged by this progress.

This interim report is a culmination of discussions with public and private water users and stakeholders, other state and federal agencies, and elected officials over the past two years, and follows a recent study of our groundwater resources and water policy. In addition to an overview of water resources and governance of these resources, we have compiled information requested by House Concurrent Resolution 1 of 2010, including recommendations for enhancing water management. This interim report also demonstrates that the management of groundwater and surface water are inextricable, and that a comprehensive approach to water sustainability in Louisiana should be considered. As a result, this interim report recommends that the appropriate public policy is for the legislature to consider adding surface water fact-gathering responsibilities, without management or regulatory authority, to the mission of the Ground Water Resources Commission, expanding its membership, and amending its name to the Water Resources Commission.

As members of the current Ground Water Resources Commission, we take our responsibilities seriously. While records indicate that the previous Ground Water Commission did not meet their statuatory requirement to convene twice annually, this Commission exceeded that requirement by meeting a total of 13 times in 41 months beginning in October 2008. Prior to 2008, all Commission meetings were held in Baton Rouge; however, since that time, to foster greater public participation, meetings have also been held in Minden, Ruston, Eunice, Mandeville, Alexandria, Crowley, and Shreveport.

There are so many people throughout Louisiana who play important roles in water management, protection, and distribution. We particularly recognize the licensed water well drillers throughout Louisiana who help bring our valuable groundwater resource to the surface and enable it to be used by residents and businesses throughout our state. Additionally, we are thankful to the thousands of stakeholders, contractors, and employees, both public and private, throughout the state who are dedicated to the safe withdrawal, treatment, and distribution of this life-sustaining resource.

The members of the Louisiana Ground Water Resources Commission are appreciative of the opportunity to work with all of you to protect, conserve, and sustain our vital water resources. When reviewing this interim report, we encourage you to refer to the appendices, which provide supporting and additional information for the water sustainability issues discussed. Please be advised, as previously communicated to the Louisiana Legislature on February 23, 2012, this interim report was delayed for two weeks to allow us to include comments from a March 8 public meeting in Baton Rouge on the matter of saltwater encroachment in the 1,500-foot and 2,000-foot sands of the Southern Hills aquifer system. Finally, this report is not an ending, but rather, a continuation of the state's efforts to manage its water resources.

Respectfully submitted,

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Why This Report Is Important

Sustainability is Non-Optional

- Louisiana's water budget – our total withdrawal and recharge capacities for groundwater and surface water – is not infinite. Just as families, businesses, and governments must act and plan responsibly to ensure that withdrawals do not exceed deposits, so must our state proactively address the sustainability of our aquifers and all water sources. Water is not an option for life. As such, we have no choice but to sustain our critical water supply.

Our Constitution Mandates It

- Article IX of the Louisiana Constitution is considered by many to be the ultimate directive with regard to the public trust empowered to the government in the management of our natural resources and environment. According to Article IX, Section 1 (Natural Resources and Environment; Public Policy) of the Louisiana Constitution, "The natural resources of the state, including air and water, and the healthful, scenic, historic, and esthetic quality of the environment shall be protected, conserved, and replenished insofar as possible and consistent with the health, safety and welfare of the people." This constitutional mandate drives every law, rule, and regulation implemented to manage or preserve water quality and quantity. Article IX also impacts the way the state manages activities and assets that rely on water, such as agriculture, wildlife, fisheries, coastal restoration and protection, exploration and mining, and industrial development.

Louisiana Constitution Article IX. Natural Resources

§1. Natural Resources and Environment: Public Policy

Section 1. The natural resources of the state, including air and water, and the healthful, scenic, historic, and esthetic quality of the environment shall be protected, conserved, and replenished insofar as possible and consistent with the health, safety, and welfare of the people.

The legislature shall enact laws to implement this policy.

Consistency With and Implementation of Coastal Master Plan

- Recognizing the need to "coordinate and focus the functions of all state agencies as they relate to coastal protection, including hurricane protection and wetlands conservation and restoration," Governor Bobby Jindal issued an Executive Order on January 28, 2008 (Appendix B). The order requires all state agencies to administer regulatory practices, programs, contracts, grants, and all other functions vested in them in a manner consistent with Louisiana's Master Plan for Coastal Restoration and Protection. Complying with Governor Jindal's Executive Order and maintaining consistency with the Coastal Master Plan are critical in the management of the state's water resources. The 2012 Draft Coastal Master Plan relies heavily upon the availability of fresh water to achieve its anticipated outcomes over the 50-year vision of the plan. The Plan relies on fresh water to enhance freshwater fisheries and habitat, combat high salinities that infiltrate our basins, and uses freshwater and sediment diversions as a restoration tool. A reliable supply of fresh water is critically important to the long-term success of the Plan. The 2012 Draft Plan has undergone public review and comment, and the Final Plan will be submitted to the Louisiana Legislature in early April 2012.

Preserving "Sportsman's Paradise" - Groundwater resources are intrinsically connected to surface water resources. Groundwater discharges to stream, bayous, marshes, coastal wetlands, and rivers, as well as many other ecologically important wildlife habitats. Louisiana is known to be the "The Sportsman's Paradise," and in many cases, this heaven for fishermen, fowl hunters, bird watchers, canoeists, boaters and general outdoorspersons heavily depends on a reliable and clean groundwater influx. During the drier months of the year, as well as during droughts, the sole source of life-giving water for many of those sensitive environments comes from the ground, as water that has travelled through aquifers discharges and becomes surface water, sustaining swamps like the Atchafalaya, our coastal marshes, and Louisiana's overall tourism and recreation industry.

Economic Development - According to the World Bank's *2006 Water for Growth and Development* report, water is a key driver of sustainable growth and poverty alleviation. Many key industry sectors in Louisiana, including traditional and emerging industries, are especially sensitive to water supply, such as agriculture, oil and gas, chemical manufacturing, power generation, food and beverage production, and construction. As indicated by GrowingBlue.com, an online resource for water issues, "many companies already consider water resources when making decisions about where to invest or locate facilities... These businesses understand what policymakers are now coming to realize: When water resources are unhealthy or unreliable, businesses cannot grow and cannot hire or sustain a workforce. Local commerce suffers, incomes decline, tax revenues fall. The effects are very real and they are felt immediately and acutely."

Power Generation, Industry, and Mineral Extraction - A dependable supply of fresh water is critical to Louisiana's industrial sector, including power generation, petrochemical, pulp and paper, mineral extraction, and other industries that are extremely important to Louisiana's economy. Many of these industries have located in this state due to the abundance and quality of this resource and have thrived because of its availability. Louisiana ranks first amongst all of the states in uses of water for industrial purposes, using about 2,680 million gallons per day, or about 17 percent of the U.S. total, according to USGS. Louisiana's oil refineries represent over 18 percent of America's refining capacity and almost four percent of the world's refining capacity. Sixteen percent of the 2011-2012 Louisiana State General Fund is derived directly from mineral income. Louisiana is also home to numerous chemical manufacturing and pulp and paper industries that are key components of this state's and nation's economy. Both industry and our residents rely upon a dependable source of power from our power generation industry, which accounts for 63 percent of surface water withdrawals and five percent of groundwater withdrawals.

Agriculture & Aquaculture - Crops, pastures, forests, livestock, and aquaculture ponds all require water to remain productive. Agriculture accounts for 54 percent of the groundwater and 5.4 percent of the surface water used in Louisiana (USGS, 2011). Agricultural production represented approximately two percent and agri-businesses 20 percent of the state's gross domestic product in 2009, and farmland is approximately 29 percent of the land area of Louisiana, according to the LSU AgCenter. Of the farmland, 60 percent is cropland and 12 percent is irrigated. Agriculture, including aquaculture, is extremely important to Louisiana's culture and employment. Agriculture employs nearly ten percent of Louisiana's workforce and represents a significant portion of the economies of 55 percent of Louisiana parishes. A large segment of Louisiana's agriculture, including rice farming, and crawfish and catfish aquaculture, would not be possible without the availability of reliable and sustainable sources of groundwater and surface water.

Tourism - Water covers almost one fifth of Louisiana's land area, contributing greatly to this state's unique geography. From the many attractive water sports in numerous state parks to world class fishing and hunting in our rivers, streams, and marshes, Louisiana's water resources have been instrumental in making this beautiful state one of America's top leisure destinations. According to the LA Department of Culture, Recreation, and Tourism, in 2010, 24.6 million domestic and international travelers spent $9.3 billion in Louisiana, an average of $24.7 million per day. The travel and tourism industry is the seventh highest employer in the State of Louisiana, with one out of ten jobs directly dependent on the industry.

Navigation - Louisiana must maintain adequate surface water flows to support navigation and waterborne commerce. Our ports are number one among the 50 states, according to the U.S. Army Corps of Engineers (USACE), which maintains 2,800 miles of Louisiana's 5,000 miles of navigable rivers, bayous, creeks, and canals. The Congressional Research Service (CRS) found in its October 14, 2005 Report to Congress that "the ports of South Louisiana, New Orleans and Baton Rouge rank third, fourth and fifteenth, respectively in total trade by port to all world ports." The CRS also pointed out that 55 to 70 percent of all corn, soy, and wheat being exported from the U.S. passes through these three ports, with the Port of New Orleans handling about 6,000 vessels annually. Among the states, Louisiana has five of the top fifteen ports, with Lake Charles and Plaquemines joining South Louisiana, New Orleans, and Baton Rouge on the list. With Louisiana's ports serving as a gateway between the inland states and the rest of the world, they play a substantial role in the state's economy, supporting about 92,566 primary and secondary jobs generating $1.95 billion in income and earnings for Louisiana's residents, according to *The Economic Impacts of the Ports of Louisiana and the Maritime Industry* by Timothy P. Ryan (University of New Orleans, 2001). Additionally, Louisiana's abundant navigable waterways provide opportunities for numerous recreational activities such as fishing, boating, hunting, canoeing, bird watching, and other water sports. For the Atchafalaya River Basin alone, the value of recreational related resources has been estimated at about $97 million annually, based on a survey by the Louisiana Department of Wildlife and Fisheries and the USACE.

Report Development

The report you hold in your hands today has its beginnings in 2001 with the creation of the Louisiana Ground Water Resources Commission (LGWRC) and Louisiana Ground Water Advisory Task Force (LGWATF). One of the duties of the LGWRC and LGWATF was to develop and implement a management plan. In 2002, *Assistance in Developing the Statewide Ground Water Management Plan* was published. It was designed to serve as a "road map for developing and implementing water regulations for Louisiana" and to "lay the foundation for water management planning in Louisiana." (C.H. Fenstermaker and Associates, Inc., 2002) The findings of that report provided support for Act 49 of 2003 and helped to launch the present groundwater authority and activities of the LDNR.

This legislation authorized the Office of Conservation to develop a groundwater emergency contingency plan and implement regulations to govern the sustainability of the state's groundwater resources. The agency subsequently developed a groundwater emergency contingency plan focused on addressing drought conditions and groundwater use, created a well-owner notification database management and tracking system, and promulgated regulations for the proper application and procedures for establishing Areas of Ground Water Concern and Critical Areas of Ground Water Concern. Regulations also included proper procedures for water well owners to comply with pre- and post-installation water well notification requirements, and provisions for agency actions to prevent well installation and groundwater withdrawal from posing adverse impacts to the aquifer or nearby water well owners. Agency staff participated and continues to participate in groundwater conservation public education and outreach efforts statewide. Adding to this responsibility in 2008 and 2009 were robust enforcement authorities and regulatory oversight of all water well driller and well construction requirements formerly under LDOTD authority. All of this collectively, along with the continued advisory roles of the Ground Water Resources Commission and Ground Water Management Advisory Task Force, served and continues to function as the management plan for groundwater resource sustainability.

Over the years, lessons have been learned and opportunities for improvement recognized. In May 2009, the LGWRC identified the need for enhanced management of our state's groundwater to address aquifer-specific concerns such as those experienced in the Sparta, Carrizo-Wilcox, Southern Hills (Baton Rouge area), and Chicot aquifer systems. The LGWRC adopted a resolution requesting LDNR to seek funding to support the development of the next generation of groundwater management in Louisiana. An interagency agreement with the Louisiana Department of Health and Hospitals was approved, setting in motion a planning process that began in March 2010. LGWRC members were interviewed in March and May 2010 to compile their ideas for addressing groundwater concerns and suggestions for future resource management. Two public workshops were conducted in September 2010 to allow all stakeholders and interested parties an opportunity to contribute their ideas and concerns, and public comments were also received electronically.

A draft report titled *Recommendations for a Statewide Ground Water Management Plan* was completed in October 2011. Five public meetings on the draft report were held in November 2011 in Ruston, Alexandria, Crowley, Shreveport, and Baton Rouge, and oral and written comments were received. The final *Recommendations for a Statewide Ground Water Management Plan* incorporated relevant comments and was released by the LDNR Office of Conservation on December 7, 2011. It includes recommendations for nine key components of groundwater management. The LGWRC hosted a two-day public meeting January 19-20, 2012 to further discuss and seek input on these recommendations. Following robust discussion and interaction, one additional component was added to the list of recommendations.

The work described above has contributed to the March 15, 2012 publication of this LGWRC interim report, *Managing Louisiana's Groundwater Resources,* the first modern publication of its kind produced by a Louisiana government agency on groundwater resource sustainability. In addition to a complete list and description of groundwater management recommendations, this document also provides readers with a description of our water resources, users and uses, agencies with authority over these resources, state law and regulatory framework for water management, current water management activities and accomplishments, and other key facts that help us understand the tremendous value of sustaining our groundwater and surface water resources in Louisiana. Additionally, specific information requested by the Louisiana Legislature in House Concurrent Resolution 1 from the 2010 Regular Legislative Session is included in this report.

According to "A Defining Resource: Louisiana's Place in the Emerging Water Economy" by Mark Davis and James Wilkins (Loyola Law Review, 2011), "The state is facing a future in which water, even in Louisiana, will be a scarce resource that will demand a well-thought-out and integrated approach to stewardship...The need to purposefully balance navigation, flood control, environmental, agricultural, industrial, and drinking water supplies is already pressing and becoming more so." (273)

History of Ground Water

1682 LaSalle claims Louisiana for France.

1812 Louisiana becomes a state.

Gov. William Claiborne

160 Years of Statehood without Groundwater Management

1972 Act 535 of the LA Legislature places the Dept. of Transportation and Development (LDOTD) in charge of water well drillers licensing, construction, and registration requirements. *(1972)*

1974 Act 678 of the LA Legislature creates the Capital Area Ground Water Conservation District with permitting and funding authority over five parishes centered on East Baton Rouge. *(1974)*

1975 LDOTD implements rules for certain wells in accordance with Act 535 of 1972. (LAC Title 56) *(1975)*

1985 LDOTD implements rules for all water wells. *(1985)*

1999 LA Legislature establishes Sparta Ground Water Conservation District. *(1999)*

1999-2000 Louisiana experiences severe drought conditions, impacting groundwater and surface water supplies. *(1999-2000)*

2001 Act 446 of the LA Legislature establishes the Ground Water Resources Commission (LGWRC), Ground Water Management Advisory Task Force (LGWMATF), and current legal structure for groundwater management.*(2001)*

2003 Act 49 of the LA Legislature places the LGWRC and LGWMATF under the Office of Conservation. *(2003)*

Management in Louisiana

2005

Commissioner of Conservation designates three areas in the Sparta aquifer system as Areas of Ground Water Concern. *(2005)*

2007

Act 471 of the LA Legislature provides sales tax exemptions for water conservation equipment used in the Sparta Ground Water Conservation District. *(2007)*

2008

Act 581 of the LA Legislature provides for the imposition of civil penalties for violations of groundwater regulations. *(2008)*

2009

Act 437 of the LA Legislature transfers duties relative to groundwater resources, water wells, and drillers from LDOTD to Office of Conservation. *(2009)*

2010

House Concurrent Resolution 1 instructs LGWRC to report on LA groundwater and surface water resources. *(2010)*

Act 955 establishes policy for withdrawals of "running waters of the state" by nonriparian landowners. *(2010)*

Act 301changes quorum requirements for LGWMATF. *(2011)*

2011

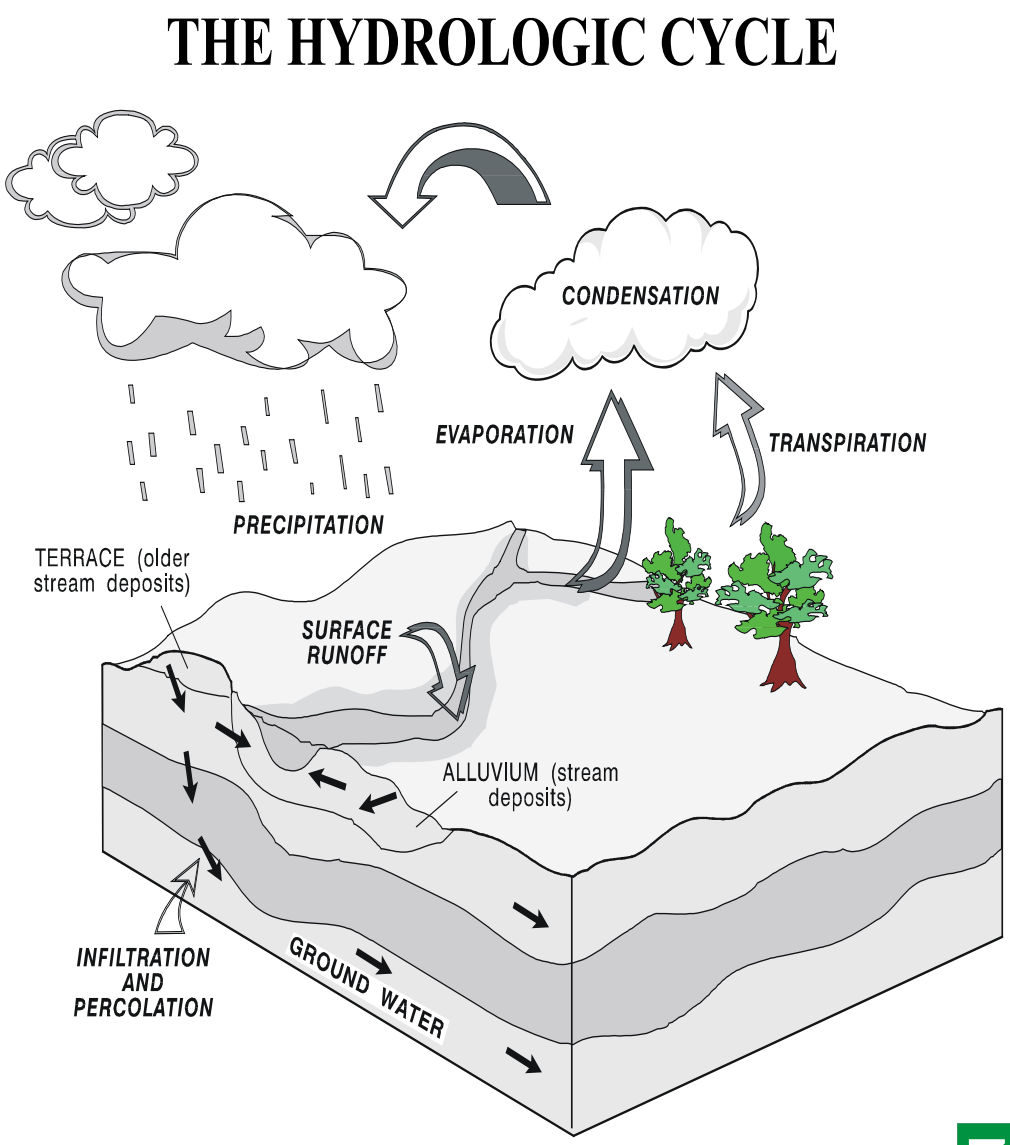
Due to drought conditions, Commissioner of Conservation declares a temporary Ground Water Emergency for two areas south of Shreveport in Caddo Parish. The prolonged drought also allowed saltwater to encroach on rice farms in coastal southwest Louisiana and greatly reduced flow in the Ouachita River, impacting nearby industries. *(2011)*

Office of Conservation holds a public meeting on saltwater encroachment in the Southern Hills Aquifer (Baton Rouge). *(2012)*

2012

LGWRC submits report, *Managing Louisiana's Groundwater Resources,* to the Louisiana Legislature with recommendations for ensuring water sustainability. *(2012)*

Groundwater Withdrawal and Recharge Cycle



Source: Stuart, C.G., Knochenmus, D., and McGee, B.D., 1994, Guide to Louisiana's ground-water resources: U.S. Geological Survey Water-Resources Investiations Report 94-4085, 55 p.

Our Water Cycle

All of the water that we use in our homes comes from either a groundwater source, such as a well, or from a surface water source, such a river, lake, or reservoir. When more than half of Lousiana's 4.5 million residents turn on their faucets, groundwater flows from their tap. Public water supplies, rural wells, agriculture irrigation systems, livestock watering, industry processes, and power generation all rely on groundwater from our states's eleven principal aquifer systems.

Groundwater is one of the Earth's most valuable resources, providing drinking water to more than 50 percent of the population of the United States. (USGS, 2011). It often begins as precipitation that infiltrates into the ground where it moves and becomes stored in geological strata. Some of this water recharges saturated strata of permeable sediment and rock called aquifers. Within these aquifers, groundwater moves away from areas of recharge toward areas of discharge, such as springs, streams, lakes, oceans, and water supply wells. The groundwater flow rate in porous aquifers is slow, in the order of tens of feet per day to a few feet per year. The movement follows a tortuous path created by pores, voids, crevices, and other apertures present in the aquifers. Aquifers can be quite extensive, possibly stretching for hundreds of miles, providing for thousands of groundwater supply wells, as well as naturally feeding springs, bayous, streams, rivers, lakes, wetlands, and coastal marshes.

Water removed from the ground has the potential to be constantly replenished or "recharged" by precipitation. However, the rate of recharge is not the same for all aquifers. Adequate time is often needed for this replenishment process since the deeper the aquifer, the longer it takes for rainfall to get there. This makes conservation of our water resources important every day of the year.

Stress placed on aquifers by extreme drought conditions and significantly increased water withdrawals can greatly impact the sustainability of our aquifers and our groundwater supply. To recover from a drought, an extended period of rain is needed to make up for water deficits, fill our surface water reservoirs, and recharge our aquifers. During hot summers, recharge is additionally diminished when rainwater evaporates before having the opportunity to replenish our water supplies. Pumping too much water too fast also draws down the water in the aquifer and might eventually cause a well to yield less water or run dry. Pumping a well too fast or too often might also cause a neighbor's well to run dry if both are pumping from the same aquifer.

Background

> *"Whiskey is for drinking. Water is for fighting."*
>
> - ATTRIBUTED TO MARK TWAIN

Rarely have Louisianans had to worry about not having enough water. With rivers and bayous criss-crossing our state, freshwater swamps and brackish marshes spanning our coastal region, and the Gulf of Mexico at our front doorstep, our biggest concerns have usually focused on keeping our communities dry as we enjoy all of the benefits that our surface water resources offer. Therefore, beginning with statehood in 1812 and continuing for the next 190 years, state law and programs related to water resources management exclusively concentrated on implementing flood protection, providing navigation, and preventing contamination of our water supply. Absent from these early initiatives was the sustainable management of a critical resource in the state's water portfolio that is literally hidden beneath our feet.

Louisiana has been blessed with an abundance of high quality groundwater in eleven principal aquifer systems that provide drinking water to nearly 50 percent of our state's residents through public water supplies and domestic water wells. Surface water from rivers, lakes, and bayous is the drinking water source for the remaining 50 percent (USGS,2011). Together, groundwater withdrawn from aquifers by public and private water wells, and surface water withdrawn from our state's water bodies make up our state's total available water resources for household, agricultural, commercial, and industrial use.

Like rivers and bayous, no two aquifers are the same and a one-size-fits-all management approach is not effective. What works in one aquifer may not be appropriate in another. Sustainability of groundwater resources is best achieved by an aquifer-by-aquifer management strategy implemented through a centralized state governance model complemented by aquifer-specific advisory panels composed of local governments, user groups, and interested stakeholders.

In 1974, the Louisiana Legislature passed Act 446, which enacted Louisiana Revised Statute 38:3071 et seq., establishing the Capital Area Ground Water Conservation District. The purpose of the district is to provide for the efficient administration, conservation, and orderly development and supplementation of groundwater resources for the parishes of East Baton Rouge, East Feliciana, Pointe Coupee, West Baton Rouge, and West Feliciana. By limiting the district to five specific parishes, the legislature recognized the need for management of ground water resources on a regional basis prior to the establishment of any statewide management authority.

In 1975, the LA Department of Transportation and Development (LDOTD) began to implement regulations related to water well driller registration, well construction, inspection, and plugging and abandonment of water wells (LAC Title 56, 1975). The scope of these regulations was and remains predominantly focused on groundwater and environmental protection, including the prevention of adverse impacts to groundwater from surface contaminant migration from abandoned or improperly constructed boreholes. Simply put, the goal of these regulations is groundwater quality protection rather than maintaining groundwater quantity.

A severe drought in 1999-2000, along with a growing population and economy that increased water demand, brought needed attention to the fragility of Louisiana's aquifer systems and available groundwater supply. As a result, the Louisiana Legislature took the first step to comprehensively manage the use and sustainability of this water resource in 2001. Act 446 of 2001 called for the regulation of groundwater withdrawals and implementation of aquifer sustainability policies, and established the Louisiana Ground Water Resources Commission (LGWRC) and the Louisiana Ground Water Management Advisory Task Force (LGWMATF). Act 49 of 2003 placed the LGWRC and the LGWMATF under the authority of the Louisiana Department of Natural Resources, Office of Conservation, and the current Louisiana Ground Water Resources Program was born.

For the first time, prospective owners of water wells statewide that were to be used for industrial, irrigation, and public supply purposes were required to provide notification for review and evaluation prior to construction. Through enabling laws and regulations, the Office of Conservation is responsible for the protection, conservation, preservation, and overall sustainability of Louisiana's aquifer systems, including the management of groundwater withdrawals, monitoring and designation of Areas of Ground Water Concern, and groundwater education and conservation initiatives. The authorities granted exclusively to the Commissioner of Conservation within these Acts, combined with the previous restrictions of Louisiana Revised Statute 36:806 (which prevents the LDNR Secretary, Deputy Secretary, and Undersecretary from exercising, reviewing, administering, or implementing the quasi-judicial, licensing, permitting, regulatory, rulemaking, or enforcement powers or decisions of the Commissioner) clearly establish the Commissioner as the state's chief groundwater sustainabiilty manager.

As depicted on page 45, stakeholders in Louisiana's water mangement efforts are numerous and varied. The Office of Conservation is the lead agency in the management of groundwater sustainability assessment and production in Louisiana. Working in cooperation with the Departments of Natural Resources, Environmental Quality, Health and Hospitals, Agriculture and Forestry, Transportation and Development, and Wildlife and Fisheries, and the Office of Coastal Restoration and Protection, the Office of Conservation is responsible for managing the evaluation, construction and installation of water wells; well registration; and a database of nearly 190,000 entries. Of these entries, approximately 130,000 water wells are registered for groundwater withdrawal; more than 106,000 are listed as active or available for groundwater withdrawal; and approximately 80,000 registered wells are domestic and public supply wells providing drinking water to households. In addition, the Office of Conservation now manages driller licensing in Louisiana. There are presently 249 active drilling contractors licensed in Louisiana, of which 154 hold water well drilling contractor certification.

Management authority granted to the Office of Conservation over ten years ago was an effective first step toward achieving ground water sustainability. However, severe drought periods in the last decade, along with continued increases in demand for ground and surface water, have stressed our aquifer systems in recent years, prompting a renewed interest in this resource.

Pursuant to authority granted by the Louisiana Legislature in 2003 and responding to continual groundwater level decline in historic pumping centers, the Commissioner of Conservation designated Areas of Ground Water Concern in the Sparta aquifer system in August 2005. In August 2011, the Office of Conservation declared a temporary groundwater emergency for two areas of southern Caddo Parish due to a 15-month drought that resulted in higher than normal withdrawal of groundwater without sufficient aquifer recharge. The declaration calls for conservation and groundwater use restrictions and remains in effect as of the publication date of this interim report.

The prolonged 2011 drought also had significant impacts on Ouachita River levels in northeast Louisiana and rice farms in the southwest, particularly in Vermilion Parish. Ouachita River flows fell below those used in the establishment of authorized wastewater discharge limits, which are protective of water quality. In order for certain facilities to remain compliant with their permits and for water quality to remain protected, operations at these facilities had to slow or cease to reduce wastewater contributions. Had this condition endured for longer periods, impacts to local economies may have resulted. Rice farmers along the coastal southwest Louisiana were faced with limited irrigation water sources as the drought allowed salt water to move into traditional surface water sources.

In 2011, it was estimated that 40,000 to 80,000 acres of irrigated rice field in Vermilion Parish may be at risk if the intrusion of saltwater within canals could not be stopped. Saltwater intrusion in coastal Louisiana is a constant battle that has now been exacerbated by drought, and damaged levees, spoil banks and water-control structures. Diversion of 138 billion gallons of Atchafalaya River water by the Teche-Vermilion Freshwater District eased the saltwater problem for some in east Vermilion Parish, but the lack of freshwater influx and/or the presence of saltwater remained an issue for many Vermilion rice farmers. A breach in levees and spoil banks, damaged locks and the lack of freshwater inflow were identified as the main culprit. Although some of the issues are being remediated by the U.S. Army Corps of Engineers, which controls and maintains the locks, this is a repeat of a situation first observed in 1999-2000, in 2003, in 2005 in the aftermath of Hurricane Rita, and in 2007.

More recently, the issue of movement of a naturally occurring saltwater wedge across a well-documented fault line, and its potential impacts to groundwater resources in the Greater Baton Rouge Area, has received renewed attention. The Office of Conservation hosted a public meeting on this concern on March 8, 2012, and the comments from this meeting are summarized on page 78. Additionally, a public hearing on this issue has been scheduled for April 12, 2012.

The condition of our water resources and water delivery infrastructure, among other issues, has recently been evaluated by the American Society of Civil Engineers (2012). In *2012 Report Card for Louisiana's Infrastructure*, the organization notes, "The aging and deteriorating water supply and treatment and distribution systems are not capable of providing potable water for future, and in some cases, current demands. Better planning and more funding are key elements to providing Louisiana with a safe supply of drinking water in the future." (41)

While the State initiated its management of groundwater only within the last decade and has made advancements in that time, these findings provide further evidence of the need for the state's current water management efforts to evolve into a more robust, comprehensive plan. This interim report includes recommendations for achieving that goal, beginning on page 101. However, prior to that discussion, the following sections provide more details on the condition of our groundwater resources today and current management efforts.

Key Terms

Groundwater - water percolating below the earth's surface.

Aquifer - a fresh groundwater-bearing stratum of permeable rock, sand, or gravel.

Surface Water - an open body of water such as a lake, river, stream, etc.

"Water is the driving force of nature."
- Leonardo da Vinci

Sustainability - the development and use of a resource in a manner that can be maintained for the present and future time without causing unacceptable environmental, economic, social, or health consequences.

Sustainability of Groundwater Resources - a situation in which water demand generally does not exceed supply. It is the State's intent to implement strategies that will help make impacted aquifers sustainable.

Conservation - the careful utilization of a natural resource in order to prevent depletion. (dictionary.reference.com, 2012)

Water Use - water withdrawn or diverted from a groundwater or surface water source and used for public supply, industry, power generation, rural domestic, livestock, irrigation, or aquaculture purposes. (USGS, 2011)

Area of Ground Water Concern - an area in which, under current usage and normal environmental conditions, sustainability of an aquifer is not being maintained due to either movement of a salt water front, water level decline, or subsidence, resulting in unacceptable environmental, economic, social, or health impacts, or causing a serious adverse impact to an aquifer, considering the areal and temporal extent of all such impacts.

Critical Area of Ground Water Concern - an Area of Ground Water Concern, in which the Commissioner of Conservation finds that the sustainability of the aquifer cannot be maintained without withdrawal restrictions.

Ground Water Emergency - an unanticipated occurrence as a result of a natural force or a man-made act which causes a groundwater source to become immediately unavailable for beneficial use for the foreseeable future or drought conditions determined by the commissioner to warrant the temporary use of drought relief wells to assure the sustained production of agricultural products in the state.

The definitions of the terms listed above are provided for the purposes of this report only.

State Agencies with Primary Regulatory Authority for Water Management*

Office of Conservation – Administers and gathers groundwater data; registers wells and groundwater users; establishes construction standards for water wells; oversees groundwater conservation and sustainability; protects groundwater from contamination through the underground injection control program; regulates oil and gas well casing and cementing; requires proper well plugging and abandonment; regulates pit construction and closure; manages offsite exploration and production waste; administers the oilfield site restoration program; and regulates storage of hydrocarbons in salt dome caverns.

Department of Natural Resources — Administers surface water cooperative endeavor agreements pursuant to Act 955 of 2010.

Department of Environmental Quality — Enforces the Clean Water Act and protects groundwater and surface water resources from contamination.

Department of Health & Hospitals — Enforces the Safe Drinking Water Act and protects groundwater and surface drinking water supplies.

Department of Transportation & Development — Administers construction requirements for surface water impoundments including reservoirs and dams. Manages state-owned water control structures.

Department of Wildlife & Fisheries — Enforces the Endangered Species Act, which prohibits the use of surface water to the extent that the habitat of threatened or endangered species is adversely modified, as well as administers Natural and Scenic River Systems.

Department of Agriculture & Forestry — Regulates the use and application of pesticides through the Office of Agriculture and Environmental Sciences. Advises and assists state soil and water conservation districts with implementing water and soil conservation activities and projects through the Office of Soil and Water Conservation.

Office of Coastal Protection & Restoration - Responsible for integrating hurricane protection, storm damage reduction, flood control, coastal protection and restoration efforts, and associated infrastructure construction and maintenance.

* There are at least 735 other entities with local, municipal, regional, or state authority for specific water resource oversight, including 51 conservation districts, seven recreation districts, seven reservoir districts, eight watershed districts, two waterway districts, two freshwater districts, 651 municipal/local water districts & systems, and seven others (Appendix C).

Our Current Governance System

Regulatory authority over our water resources is as varied as the water sources themselves.

Our laws governing water are also complex. Historically, we have used various and sometimes conflicting legal concepts such as Absolute Ownership, Rule of Capture, and Riparian Rights. Louisiana water law originated in the traditional thinking that usable water would be available forever in unlimited quantities. However, we have recognized in recent times that we must take a different approach to governance of water resources and have made significant changes to our laws.

Our Constitution Mandates It

Louisiana's responsible and effective management of the state's water resources is rooted in our State Constitution. This exemplifies the high priority that our leaders have placed on the protection and conservation of both groundwater and surface water. This priority is evidenced by the fact that the word "water" appears a total of 24 times in the 1974 Louisiana Constitution. It is used in 12 of the Constitution's 332 articles. The most notable is:

> *Article IX, Section 1, (Natural Resources and Environment; Public Policy)*
> The natural resources of the state, including air and water, and the healthful, scenic, historic, and esthetic quality of the environment shall be protected, conserved, and replenished insofar as possible and consistent with the health, safety, and welfare of the people. The legislature shall enact laws to implement this policy.

To put this into perspective, the Constitution references other natural resources such as oil (18 times), gas (32 times), fish (17 times), wildlife (13 times), sulfur (13 times), timber (12 times), lignite (8 times), and soil (once). Our state's constitution then unequivocally articulates that water has a value to the public that goes beyond its value to the individuals that have access to it by virtue of their land ownership. In addition, the people have clearly charged the legislature to enact laws which fulfill this policy.

A Look at Our Key Legal Traditions, Civil and Mineral Codes

Traditional Groundwater Law - Absolute Ownership and the Rule of Capture

Civil Code Article 490. Accession above and below the surface.

> *Unless otherwise provided by law, the ownership of a tract of land carries with it the ownership of everything that is directly above or under it. The owner may make works on, above, or below the land as he pleases, and draw all the advantages that accrue from them, unless he is restrained by law or by rights of others. Acts 1979, No. 180, §1.*

This ancient civil code article states the traditional absolute ownership concept of property, simply stated, "whoever owns the soil, it is theirs all the way up to Heaven and down to Hell." This has been part of Louisiana's written laws since 1808.

Louisiana's Supreme Court concluded in the 1963 case of Adams v. Grigsby that the absolute ownership theory was not wholly sufficient to govern subterranean liquid mineral substances like oil, gas, and groundwater. The court applied what is known as the "Rule of Capture" to groundwater ownership.

Louisiana's "Rule of Capture" is a legal theory that helps determine ownership of natural resources such as water, wildlife, and petroleum. The general rule is that the landowner captures or obtains possession of the resource in order to own that resource. This approach was originally based on the belief that these resources may move from one parcel of property to another.

This theory is written into Section 8 of our Mineral Code:

Mineral Code, §8. Landowner's right of enjoyment for mineral extraction

> *A landowner may use and enjoy his property in the most unlimited manner for the purpose of discovering and producing minerals, provided it is not prohibited by law. He may reduce to possession and ownership all of the minerals occurring naturally in a liquid or gaseous state that can be obtained by operations on or beneath his land even though his operations may cause their migration from beneath the land of another. Acts 1974, No. 50, §1, eff. Jan. 1, 1975.*

Traditional Surface Water Law in Louisiana – Riparian Rights

Traditional surface water law in Louisiana can be found in three Civil Code Articles: 657, 658 and 667.

Civil Code Article 657. Estate bordering on running water.

> *The owner of an estate bordering on running water may use it as it runs for the purpose of watering his estate or for other purposes. Acts 1977, No. 514, §1.*

Civil Code Article 658. Estate through which water runs.

> *The owner of an estate through which water runs, whether it originates there or passes from lands above, may make use of it while it runs over his lands. He cannot stop it or give it another direction and is bound to return it to its ordinary channel where it leaves his estate. Acts 1977, No. 514, §1.*

In addition to the above two articles, Article 667 limits the owner's uses to those that that do not "deprive his neighbor of the liberty of enjoying his own, or which may be the cause of any damage to him."

The rights of the owner are referred to as "Riparian Rights." These rights are limited and can only be exercised by an owner whose property is next to the water.

In contrast to the traditional Absolute Ownership and Rule of Capture theories that allowed virtually unlimited access by landowners to groundwater, traditional Louisiana law has not treated running surface water as privately owned, even when captured. A riparian owner (the owner of land next to a stream, river, or lake) has a traditional right to use the adjacent water for his own domestic purposes, but he never has legal title to the water.

Key State Groundwater Laws and Acts 994 and 955 of 2010

To fulfill the objectives of Article IX, Section 1 of the Louisiana Constitution, the legislature has, through the years, adopted a variety of laws, regulations, and rules intended to protect our groundwater and surface water, and to maintain sustainability of these resources.

In spite of the traditions of Absolute Ownership and the Rule of Capture, the legislature recognized some management and regulation of these resources were necessary to protect sustainability. It gave specific authority to the Commissioner of Conservation to evaluate notifications to drill, require water well registration, construction, plugging and abandonment standards; establish Areas of Ground Water Concern, and Critical Areas of Ground Water Concern. Additionally, the authority of the Commissioner of Conservation to limit withdrawals to respond to sustainability challenges was also granted.

Notably, through Revised Statutes 38:3091, et seq., for the first time in Louisiana's history, all well owners, with the exception of domestic, replacement, drilling rig supply (not fracking supply), and drought relief wells, are required to provide a notice of intent to drill at least 60 days prior to drilling. Upon review of this notice and where applicable, the Commissioner may 1) issue an order placing restrictions on the well, 2) request further reasonable information, or 3) take no action, allowing the drilling to proceed as noticed. The process of evaluating the proposed well to determine any potential adverse impact on the aquifer or surrounding water wells is the key determining factor for the Commissioner's decision. For proposed large volume wells (greater than 1,500 gallons per minute or greater than eight inches in diameter) not otherwise exempted, the Commissioner may restrict production or impose spacing requirements as deemed necessary.

When an Area of Ground Water Concern is established, the Commissioner may require metering, monitoring, and reporting for new and existing wells. For new wells in an Area of Ground Water Concern, the Commissioner may also impose spacing requirements. However, the Commissioner's authority to impose withdrawal restrictions is limited to 1) areas within a *Critical* Area of Ground Water Concern, an area by definition of which sustainability is challenged and 2) proposed large volume wells (greater than 1,500 gallons per minute or greater than eight inches in diameter) not otherwise exempted, regardless of location, as determined necessary.

While this authority treads on traditional ownership theories, the legislature has made it clear that this authority is necessary to achieve sustainability and to comply with Article IX, Section 1 of the Louisiana Constitution.

Mindful of Louisiana's Riparian Rights for surface water, and various Attorney General opinions (see page 30) related to the state's ownership of running water and the fair market sale of running water, the Louisiana Legislature adopted Act 955 in 2010 (found in Title 30 of Louisiana's Revised Statutes, Chapter 9-B, sections 961, 962 and 963). The law directs the Department of Natural Resources to serve in a stewardship role in the management, preservation, conservation, and protection of the state's surface water resources. It authorizes the Secretary of LDNR to develop an application for and to enter into Cooperative Endeavor Agreements (CEA's) for the withdrawal of running surface water. The statute applies to a person or entity that seeks to withdraw water from the running surface waters of the state.

As of this publication, LDNR has entered into approximately 40 CEA's with primarily industrial companies who have requested the use of surface water for production processes. (A complete list of current CEA's subject to Act 955 is included as Appendix D.) Act 955 sunsets on December 31, 2012, and legislation is being requested to extend its authorization through 2014.

Following the adoption of Act 955, the Louisiana Legislature approved Act 994 of the 2010 legislative session, (Louisiana Revised Statute 9:1103). Act 994 expanded riparian rights for agricultural and aquaculture uses. The legislature recognized the beneficial use of surface water for agricultural and aquacultural purposes by riparian owners. The legislature decided that "waters used in agricultural or aquacultural pursuits are not consumed, rather they are merely used" and that no prohibited donation was created by their use free of charge.

What is Act 955 of 2010?

"The Louisiana Legislature recently enacted Act 955 during the 2010 Regular Session to address the precise issue of the proper mechanism for the sale of running surface waters. This law implements a procedure to allow the Department of Natural Resources to enter into cooperative endeavor agreements for the withdrawal of running surface water from bodies of water in Louisiana."
AG Opinion 10-0173 (November 23, 2010)

While Act 955 successfully established a procedure for the sale of running surface waters, an unintended consequence has been a greater reliance by commercial users on groundwater, for which withdrawals do not incur any usage fees. Surface waters are recognized as public resources, owned by the state and subject to a charge for use, whereas groundwater is being treated as wholly private and free of charge. This legal disparity is noted in Louisiana Attorney General opinions (see page 30) in recent years. It is recommended that legal scholars be engaged to research and explore the potential non-compensated consumption of surface water when used as an alternative to groundwater and as an aid to economic development, job creation, and job retention.

Legislative Authority Divided Among State Agencies

To enact the policies of Article IX, our legislature set up various agencies with differing, but complementary, regulatory authority for water management.

The Office of Conservation administers and gathers groundwater data; registers wells and groundwater users; establishes construction standards for water wells; oversees groundwater conservation and sustainability; protects groundwater from contamination through the underground injection control program; regulates oil and gas well casing and cementing; requires proper well plugging and abandonment; regulates pit construction and closure; manages offsite exploration and production waste; administers the oilfield site restoration program; and regulates storage of hydrocarbons in salt dome caverns.

The Department of Natural Resources administers surface water cooperative endeavor agreements pursuant to Act 955 of 2010. The Department of Environmental Quality enforces the Clean Water Act and protects groundwater and surface water resources from contamination. The Department of Health and Hospitals enforces the Safe Drinking Water Act and protects groundwater and surface drinking water supplies. The Department of Transportation and Development administers construction requirements for surface water impoundments, including reservoirs and dams, and manages state-owned water control structures. The Department of Wildlife and Fisheries enforces the Endangered Species Act, prohibiting the use of surface water to the extent that the habitat of threatened or endangered species is adversely modified, and administers the Natural and Scenic River Systems. The Department of Agriculture and Forestry regulates the use and application of pesticides through the Office of Agriculture and Environmental Sciences, and assists state soil and water conservation districts with implementing water and soil conservation activities and projects through the Office of Soil and Water Conservation. The Office of Coastal Protection and Restoration is responsible for integrating hurricane protection, storm damage reduction, flood control, coastal protection and restoration efforts, and associated infrastructure construction and maintenance.

Louisiana Attorney General Opinions

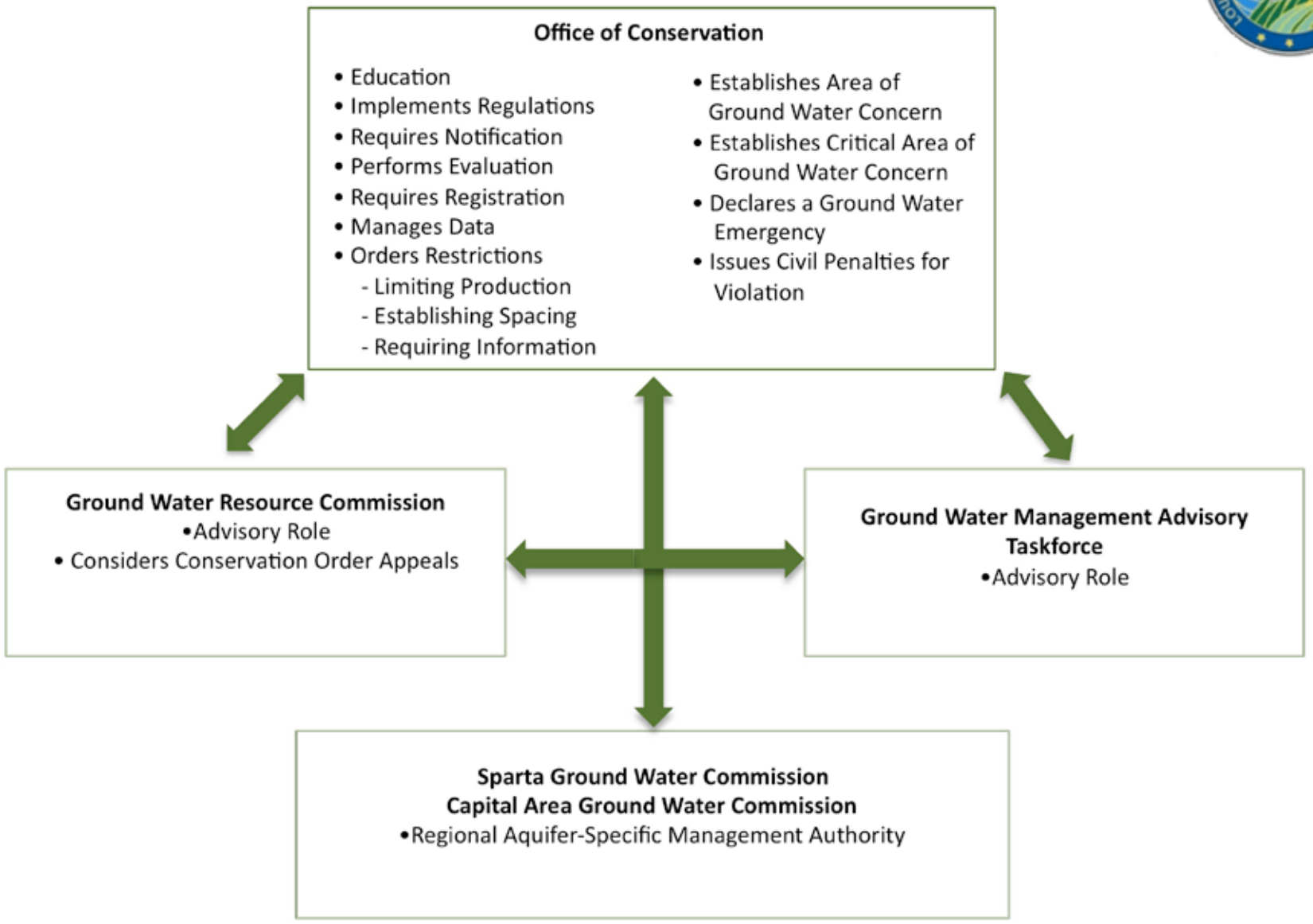
Since 2008, the Office of the Louisiana Attorney General has issued seven key opinions interpreting Louisiana water law.

These opinions include:

Year	Opinion	Summary
2008	(08-0176)	There is no right to private ownership of running waters in Louisiana.
2009	(09-0028)	If a lake's water is considered "running water," it is owned by the State.
2009	(09-0066)	Any sales of water must be for fair market value.
2009	(09-0291)	Political subdivisions of the State may only sell running waters with specific legislative authority.
2010	(10-0173)	A riparian owner may access and "use" running water for his estate, but the water remains a public thing owned by the State.
2010	(10-0289)	Statutory language that authorizes a political subdivision to "regulate the use of water" establishes regulatory control over the waters, but does not grant any rights with regard to selling the waters at issue.
2010	(10-0297)	The Sabine River Authority has a special statutory exemption from the limitations set in Opinion 10-0173.

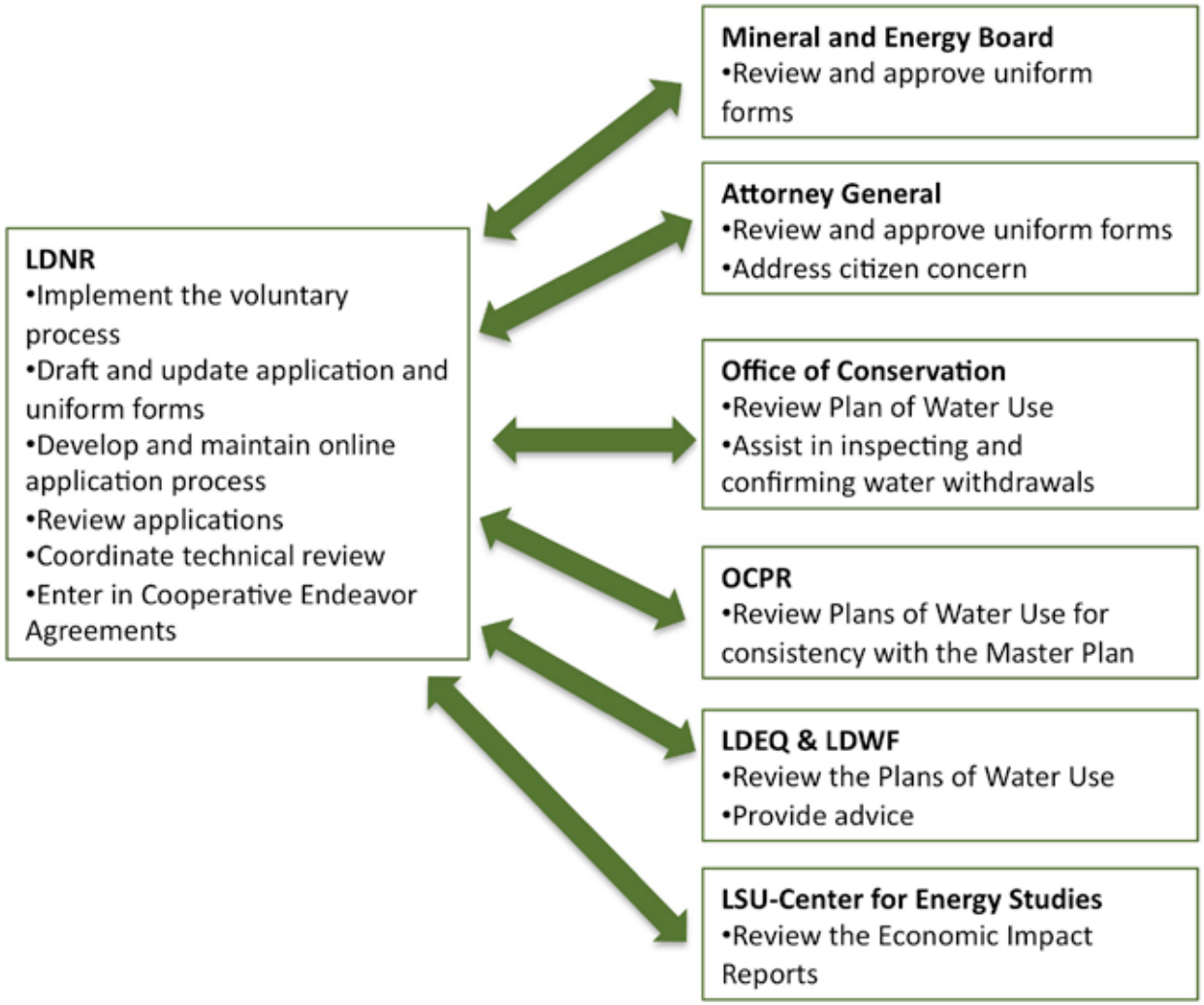
The following pages (31-42) illustrate the governance of the various state agencies involved in water resource management.

Groundwater Sustainability Governance

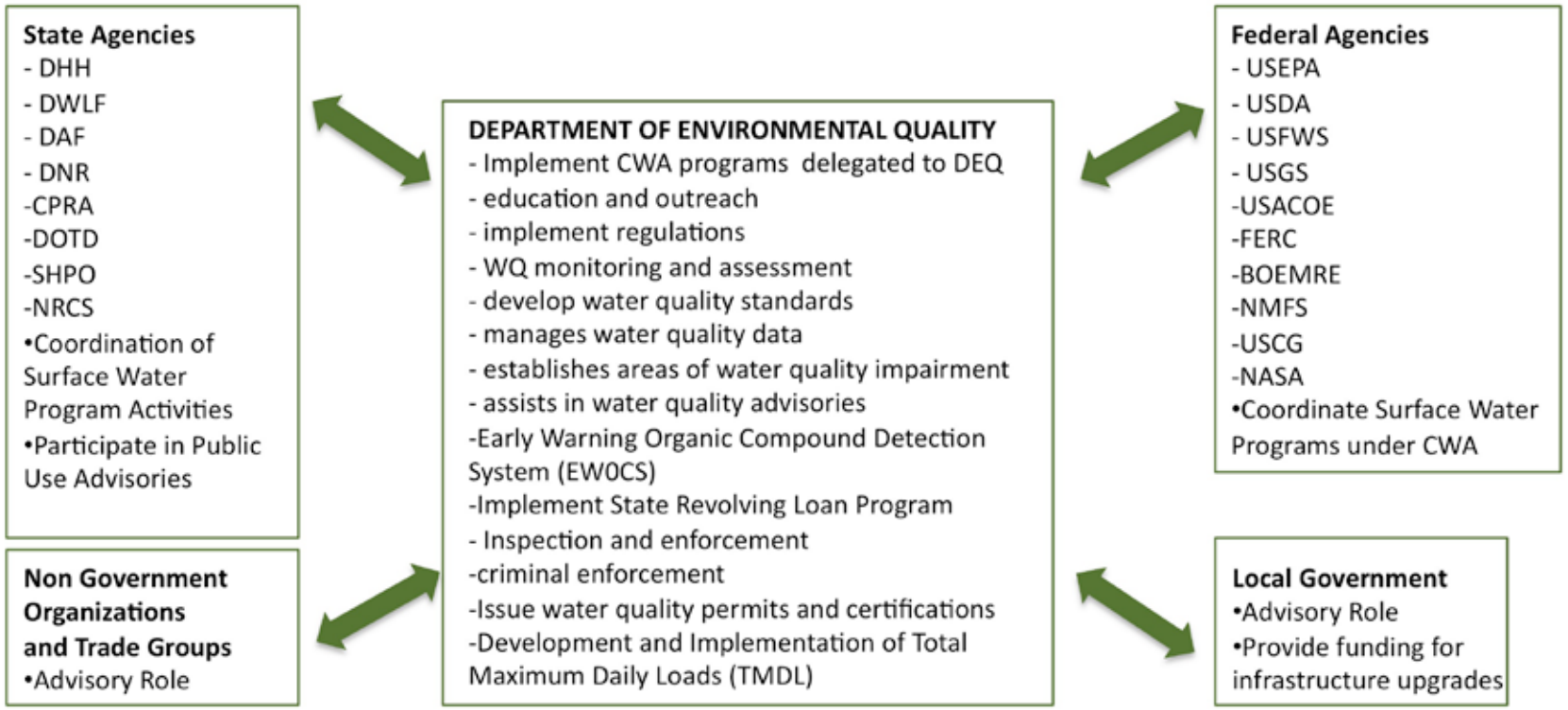


Surface Water Withdrawal Process

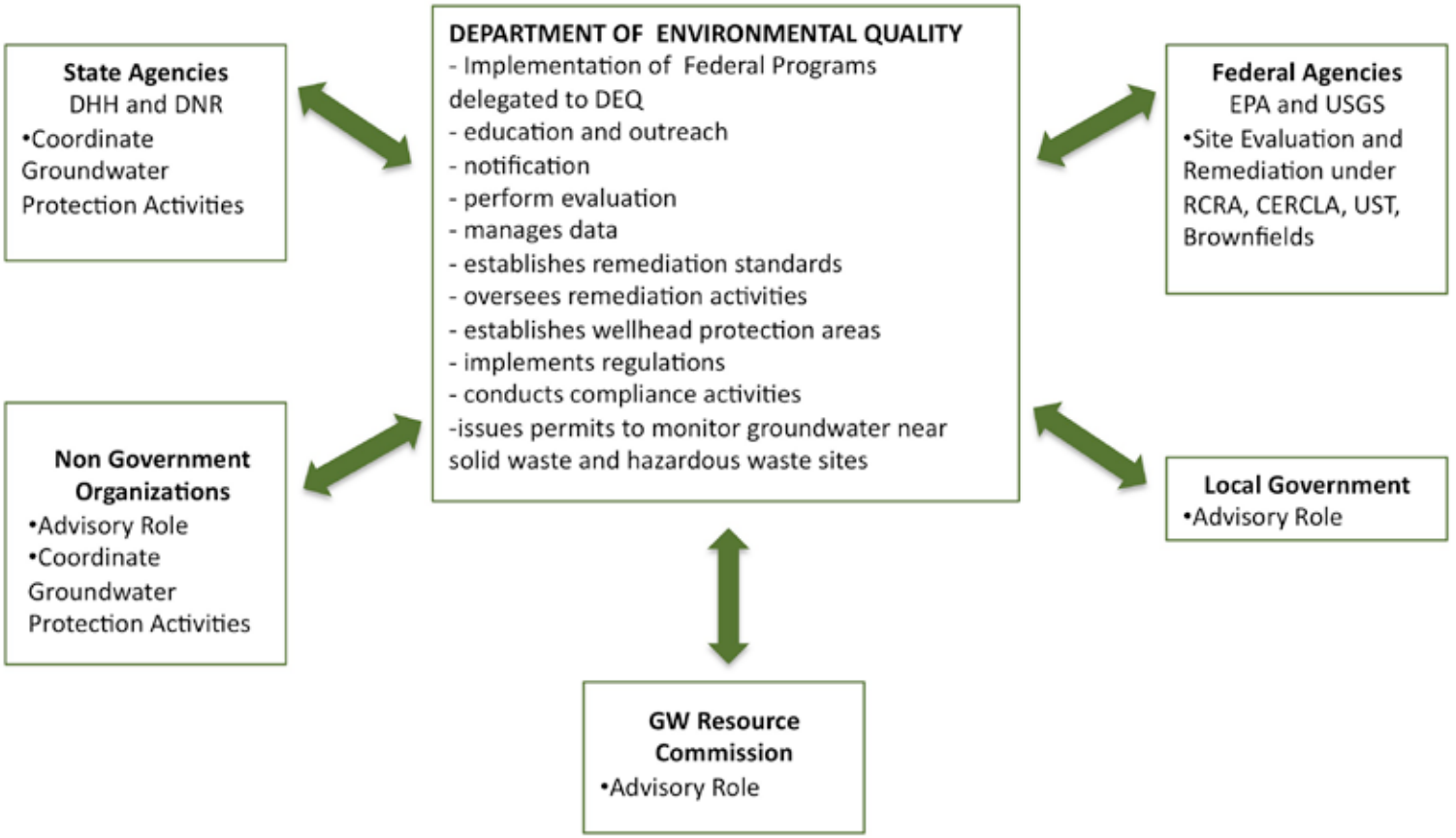
Act 955 of 2010



Surface Water Quality Governance At DEQ

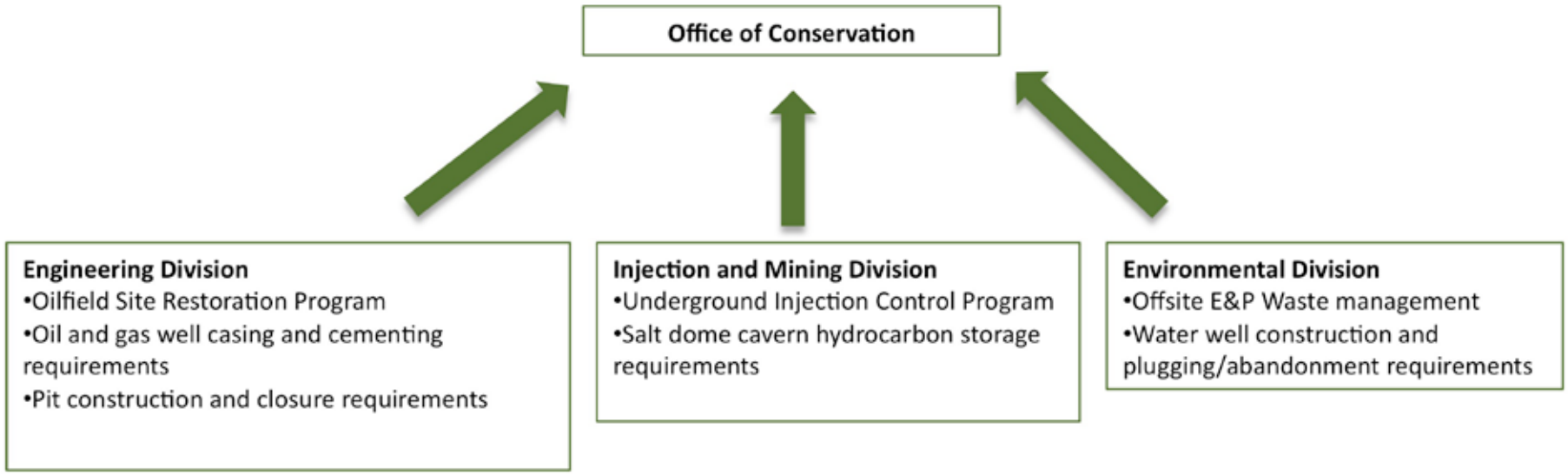


Groundwater Quality Governance At DEQ



Office of Conservation

Groundwater Protection Measures



CPRA Implementation Office

Coastal Protection and Restoration Authority of Louisiana

Directs development and implementation of efforts to achieve comprehensive "integrated coastal protection" through the state's comprehensive Master Plan for a Sustainable Coast.

(Currently OCPR)

Plans, projects, policies, and programs intended to provide hurricane protection or coastal conservation or restoration, and shall include but not be limited to coastal restoration; coastal protection; infrastructure; storm damage reduction; flood control; water resources development; erosion control measures; marsh management; diversions; saltwater intrusion prevention; wetlands and central wetlands conservation, enhancement, and restoration; barrier island and shoreline stabilization and preservation; coastal passes stabilization and restoration; mitigation; storm surge reduction; or beneficial use projects.

Office of Public Health

Center for Environmental Health

Engineering Services

- Implements and enforces the Safe Drinking Water Act
- Conducts regular inspections of public water supplies
- Reviews plans and issues permits for public water supplies
- Reviews plans and issues permits for community sewage collection and treatment facilities
- Conducts sewage inspections in response to sewage complaints
- Collects raw and finished water chemical samples such as radiological, nitrites, arsenic, and lead for public water supplies
- Evaluates chemical, bacteriological, and radiological test results for compliance with the Safe Drinking Water Act
- Provides technical assistance to water and sewer systems
- Issues compliance orders and civil penalties for Sanitary Code violations
- Monitors boil advisories and requests boil orders
- Regulates activities in or near Drinking Water designated reservoirs
- Reviews projects in coastal zone for impacts to surface water quality affecting public water supplies
- Conducts training and outreach for water and wastewater (sewer) system operators
- Certifies public water and wastewater (sewer) system operators
- Maintains/conducts Lower Mississippi Waterworks Warning Network in emergency events
- Lead agency for statewide water and wastewater emergency response in ESF-12 (Infrastructure Branch)

State Health Officer (DHH)

- Exclusive jurisdiction, control and authority of state's Sanitary Code
- Issues health advisories
- Issues boil orders
- Issues compliance orders

Dept. of Environmental Quality

Source Water Assessment Program, Well Head Protection Program, Drinking Water Protection Program, & Early Warning Organic Compound Detection System

Commissions/Committees/Councils

Operator Certification Committee, Ground Water Resource Commission, Advisory Committee for Regulation and Control of Water Well Drillers, & Louisiana Aquatic Invasive Species Council

Office of Public Health

Center for Environmental Health

Sanitarian Services

- Reviews plans and issues permits for onsite sewage treatment systems
- Conducts sewage inspections in response to sewage complaints
- Conducts inspections of existing onsite wastewater systems
- Reviews plans and issues permits for domestic wells
- Conducts inspections and sampling of existing domestic wells
- Collects Bacteriological samples for public water supplies
- Provides technical assistance to water and sewer systems
- Issues compliance orders and civil penalties for Sanitary Code violations
- Beach water monitoring – water sampling between April 1 – October 31
- Provide and monitor public awareness signage as dictated by beach water sample results
- Reviews plans and issue permits for bottled water manufacturing and distribution facilities
- Hydrogeological review of springs and artesian wells used for bottled water production
- Monitors the source and finish water for contaminants for bottled water manufacturing facilities
- Conducts inspections of bottled water manufacturing and distribution sites
- Reviews plans and issues permits for water and ice vending units
- Monitors the source and finish water for bacteriological contaminants used in water and ice vending units

Office of Public Health

Center for Preventive and Community Health

OPH Laboratory

- Analyzes chemical, bacteriological, and radiological samples in accordance with the Safe Drinking Water Act
- Analyze Oyster growing waters for harmful bacteria.
- Inspect and Certify both in state and out of state Laboratories to perform chemical analysis of drinking water in Louisiana as a National Environmental Laboratory. Accreditation Authority certified by NELAC.
- Limited certification of Drinking water laboratories that perform microbiological testing of drinking water.
- Analyzed bacteriological water samples for the Beach Program

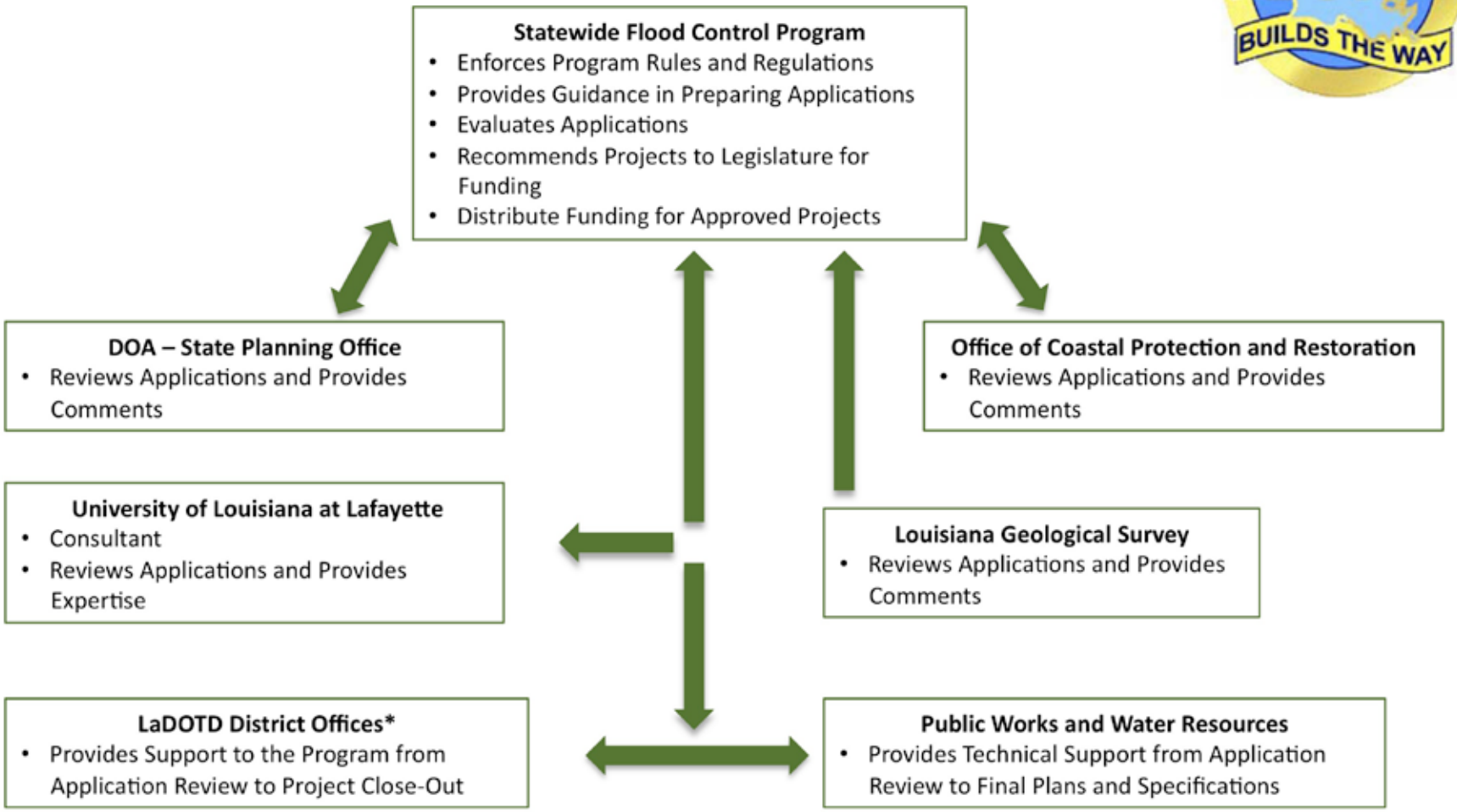
Environmental Epidemiology and Toxicology

- Assesses water quality to determine impact on human health
- Issues environmental health advisories related to water and seafood quality
- Distributes information on contaminants effecting water quality
- Develops and tracks environmental public health indicators related to water quality

Infectious Epidemiology

- Evaluate outbreaks and unusual infections related to water.

Flood Control Governance



*See Appendix E for additional details.

Wildlife & Fisheries Surface and Ground Water Authority

LDWF & LWF Commission

Office of Fisheries

- Administer functions of the state relating to freshwater fisheries
- Manage resources within game and fish preserves

Office of Wildlife

- Administer Scenic Rivers Act
- Maintain, operate Wildlife Management Areas & Refuges
- Manage resources within game and fish preserves
- Fish & Wildlife Coordination Act consultation
- Member of Ground Water Resources Commission

Louisiana Department of Agriculture and Forestry

Office of Agricultural & Environmental Sciences
(R.S. 3:3201 et seq.)

Pesticide Enforcement
- Licensing and training pesticide applicators
- Implements Regulations
  - Pesticide Registration
  - Conduct Inspections
  - Surface water and groundwater sampling
  - Manages Data
  - State lead agency for federal pesticide enforcement

Advisory Commission on Pesticides

Office of Soil & Water Conservation
(R.S. 3:1201 et seq.)
- Education
- Agricultural Nonpoint Source Pollution Abatement
- Irrigation Water Management
- Flood Control and Prevention
- Watershed Management
- Agricultural Solid Waste Management
- Private Lands Conservation Planning
- Water Conservation
- Water Quality Protection
- Member of Groundwater Resources Commission

State Soil & Water Conservation Commission

Soil & Water Conservation Districts

Memorandum of Understanding Between State Agencies

A Guidance Memorandum issued by the Office of the Louisiana Attorney General and the Secretary of the Louisiana Department of Natural Resources on February 5, 2010, addressed the removal for private use of running water and water in naturally navigable water bodies owned by the state. In some cases, the removal of surface water was a result of negotiated agreements between private entities and the public entities statutorily charged with the management of a water body. In other cases, however, the removal of state surface water was occurring without the knowledge or consent of the appropriate public entity (Appendix F).

As the memorandum states, "Under Louisiana Law persons, with the possible exception of riparian landowners, are not authorized to remove State owned surface water without obtaining the prior written approval of the State and without paying fair value." The memorandum continues with instructions to state agencies and state political subdivisions for responding to requests for the transfer or sale of state-owned surface waters.

Following this memorandum, the Office of the Attorney General issued opinions 10-0173, 10-0289, 10-0297 to further clarify restrictions on surface water use. In addition, the Secretaries of the Louisiana Department of Natural Resources, Louisiana Department of Environmental Quality, and Louisiana Department of Wildlife and Fisheries signed a Memorandum of Understanding on April 22, 2010 (Appendix G), confirming that LDNR shall act as the coordinating agency for requests for withdrawal of surface waters. LDNR shall, in turn, distribute requests and coordinate comments and responses from other agencies. According to the MOU, "The parties recognize the value of working together to protect and preserve Louisiana's valuable natural resources."

Many Other Stakeholders

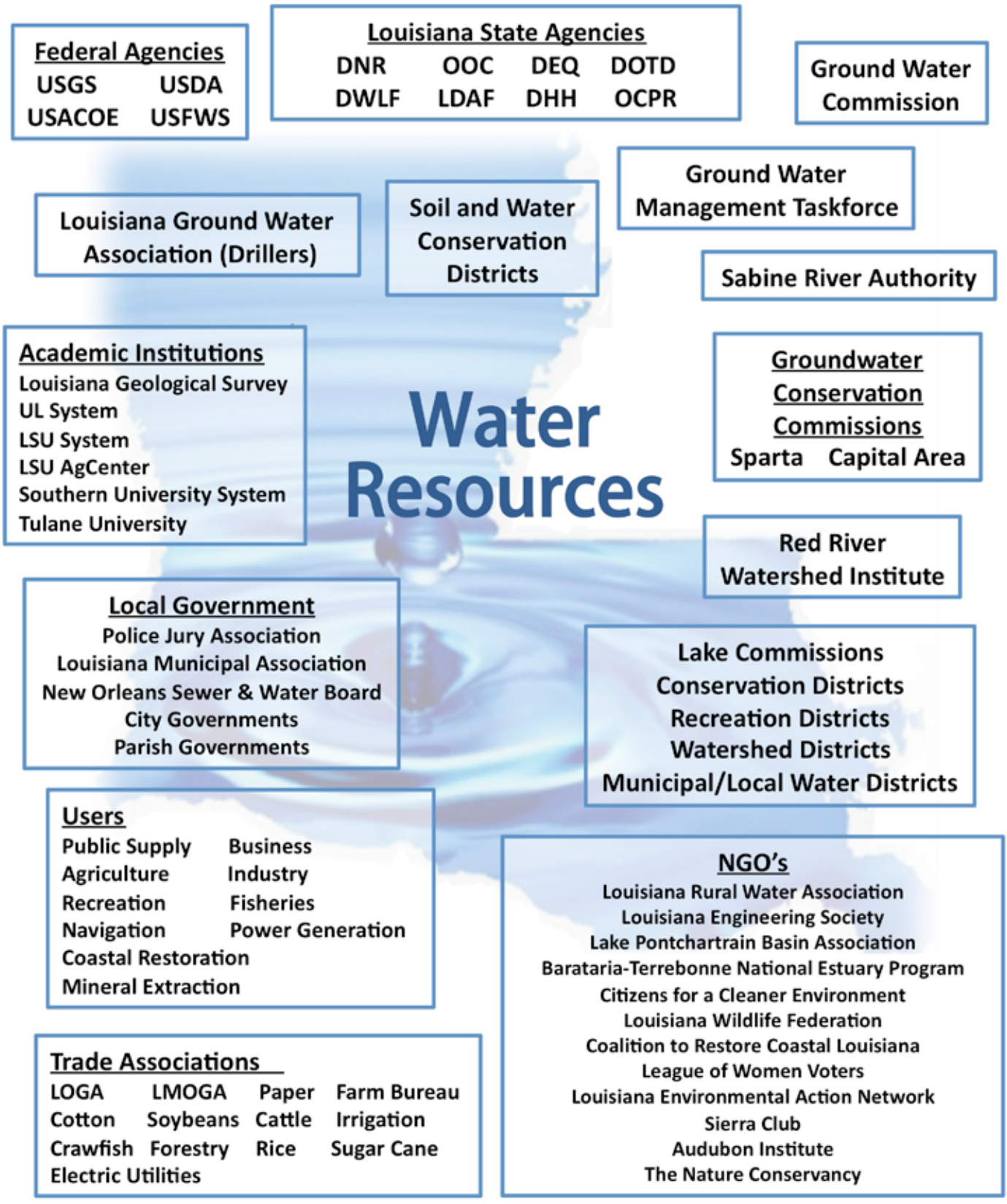
The issues discussed in this report are critically important to our state. They touch each and every citizen in a daily, almost invisible, way that if not addressed with a balance of care and vigor, could result in much loss. Fortunately, the people of Louisiana realize this and have formed many diverse and talented groups and organizations to address water-related issues.

The following organizations carry out the management and distribution of this crucial resource as it exists today:

- state agencies
- federal agencies
- soil and water conservation districts
- local governments
- academic institutions
- trade associations
- user groups,
- non-profits
- recreation districts
- reservoir districts
- watershed and waterway districts
- river and lake authorities
- municipal water districts and systems in addition to numerous other private and corporate water systems. The Environmental Protection Agency (EPA) lists over 1,000 community water systems in Louisiana that report to them under the Safe Drinking Water Act. In addition, there are systems not on the EPA list since they serve less than 25 people.

The vast number of stakeholders that are involved is a testament to how important this resource is to our state.

STAKEHOLDERS



Water Research

Colleges and universities in Louisiana have partnered with federal and state agencies and local water districts over the years to provide unique and valuable studies about water quality and availability. Important research currently being conducted on campuses around the state will greatly contribute to our understanding of water resources and prudent water management.

A sample of this research conducted by universities such as UNO, LSU, LSU-S, UL-L, LA Tech, McNeese State University, Tulane University, Loyola University, and Southern University are listed below:

Groundwater

- Groundwater flow modeling studies (Sparta, Chicot, Carrizo-Wilcox and Southern Hills aquifer systems)
- Groundwater contaminant transport modeling studies (Southern Hills, Chicot and Mississippi River Alluvial aquifer systems)
- Saltwater intrusion studies and evaluation of remediation techniques for groundwater systems (Chicot, Mississippi River Alluvial and Southern Hills aquifer systems)
- Baseline groundwater quality (organic, inorganic and toxicologic) and natural gas (methane) occurrence studies of regional groundwater systems (Carrizo-Wilcox and Sparta aquifer systems)
- Geospatial analyses of aquifer recharge areas (Chicot Aquifer System) and orphan water wells locations
- Induced land subsidence
- Groundwater use conservation education

Surface Water

- Hydrodynamics, transport and circulation in estuaries, lakes, rivers, tidal inlets, and the Gulf
- Geospatial analysis of watersheds
- Surface water quality and implication for bioaccumulation in aquatic life
- Coastal and marsh hydrology and restoration
- Saltwater intrusion impact on riverine and marsh systems
- Wetland and aquatic ecology and Invasive aquatic species and vegetation
- Impact of climatic change on coastal hydrology and ecology

Louisiana Water by the Numbers

Groundwater

- Louisiana has 11 principal freshwater aquifers. If you live in a home that uses its own water well, you are likely using groundwater from one of these aquifers.
- Louisiana uses a total of 1.6 billion gallons of groundwater every day. About 421 million gallons a day of that total is derived from home water wells and public water supply. (USGS, 2011)
- Approximately 3.9 million out of LA's 4.5 million residents use water from public suppliers. Of this number, approximately half of these residents (1.95 million) rely on groundwater-fed public supplies and the other half rely on surface water-fed public supplies.The remaining 587,507 of state residents, or 13 percent of the Louisiana population, use groundwater-fed privately owned domestic wells. (USGS, 2011)
- Estimated groundwater used for drinking water in 2010: approximately 420 million gallons per day (USGS, 2011).
- Estimated number of active public water supply wells: approximately 2,700 wells (LDHH).
- Estimated number of domestic water supply wells in 2010: approximately 75,000 wells (USGS,2011)
- Aquifer with the greatest number of water supply wells: Chicot aquifer system.
- Total number of active drilling contractors in Louisiana as of March 1, 2012: 249
  Of that total, 154 are licensed water well drillers (121) and licensed water well and environmental drillers (33) (Office of Conservation).
- Nearly 190,000 entries are in the Office of Conservation water well database.

Surface Water

- Water from 41 percent of continental United States land areas flows through Louisiana.
- Water covers 17.5 percent of Louisiana's territorial area, or 9,174 square miles out of a state total of 43,204 square miles. (U.S. Census, 2010)
- Eleven percent of that water is coastal in nature, including the Gulf of Mexico and bays. Four percent includes lakes and two percent includes rivers (Louisiana GIS CD, 1999).
- The state's largest metropolitan area relies primarily on surface water resources rather than groundwater.
- The state's largest freshwater lake is Toledo Bend Reservoir.


Toledo Bend Reservoir

Water Works for Us

According to preliminary results compiled by the U.S. Geological Survey (USGS, 2011) for *Water Use in Louisiana, 2010,* total withdrawals from groundwater and surface water sources in Louisiana in 2010 were approximately 8,500 million gallons per day. Of this total, about 1,600 million gallons per day (19 percent) was from groundwater and about 6,900 million gallons per day (81 percent) was from surface water.

Following are descriptions of water use categories identified by the LDOTD and USGS:

- ***Aquaculture -*** Water is used in the fishing and crawfishing industries, and in alligator farming.
- ***Industry -*** Water is used in/for process and production, boiler feed, air conditioning, cooling, sanitation, washing, and steam generation.
- ***Irrigation -*** Water is applied to the land to promote vegetation growth, including field crops, fruit crops, nurseries, and nonagricultural applications such as golf courses and sporting fields.
- ***Livestock -*** Water is used in the production of cattle, horses, sheep, swine, poultry, and other animals.
- ***Power Generation -*** Water is used in thermo-electric power generation such as for cooling, sanitation, washing, and steam generation.
- ***Public supply -*** Water is delivered to a group of users by public or private suppliers.
- ***Rural Domestic -*** Water is used by individuals or families for personal home use in rural areas where public supplies are unavailable.

The information described herein is for illustrative purposes only and shall not be considered in the context of compliance with the Clean Water Act, EPA, or LDEQ jurisdiction.

How We Use Our Water

Louisiana Total Water Withdrawals by Use Category, 2010

(USGS, 2011)

Power Generation (4,429 Mgal/d)	52 %
Industry (2,076 Mgal/d)	24 %
Irrigation (928 Mgal/d)	11 %
Public Supply (746Mgal/d)	9 %
Aquaculture (303 Mgal/d)	4 %
Rural Domestic and Livestock (49 Mgal/d)	1 %

Louisiana Surface Water Withdrawals by Use Category, 2010

(USGS, 2011)

Power Generation (4,352 Mgal/d)	63 %
Industry (1,831 Mgal/d)	26 %
Public Supply (368 Mgal/d)	5 %
Irrigation (258 Mgal/d)	4 %
Livestock & Aquaculture (116 Mgal/d)	2 %

Louisiana Groundwater Withdrawals by Use Category, 2010

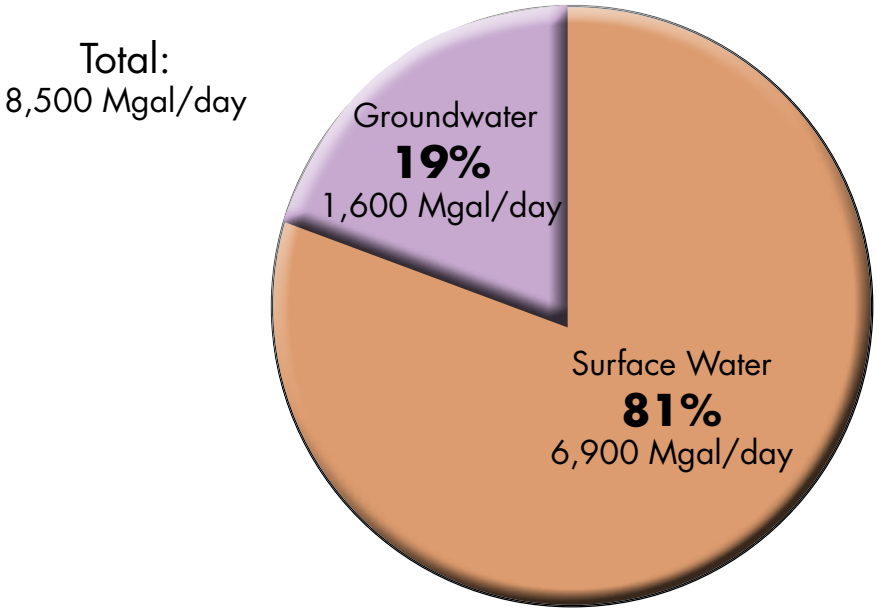
(USGS, 2011)

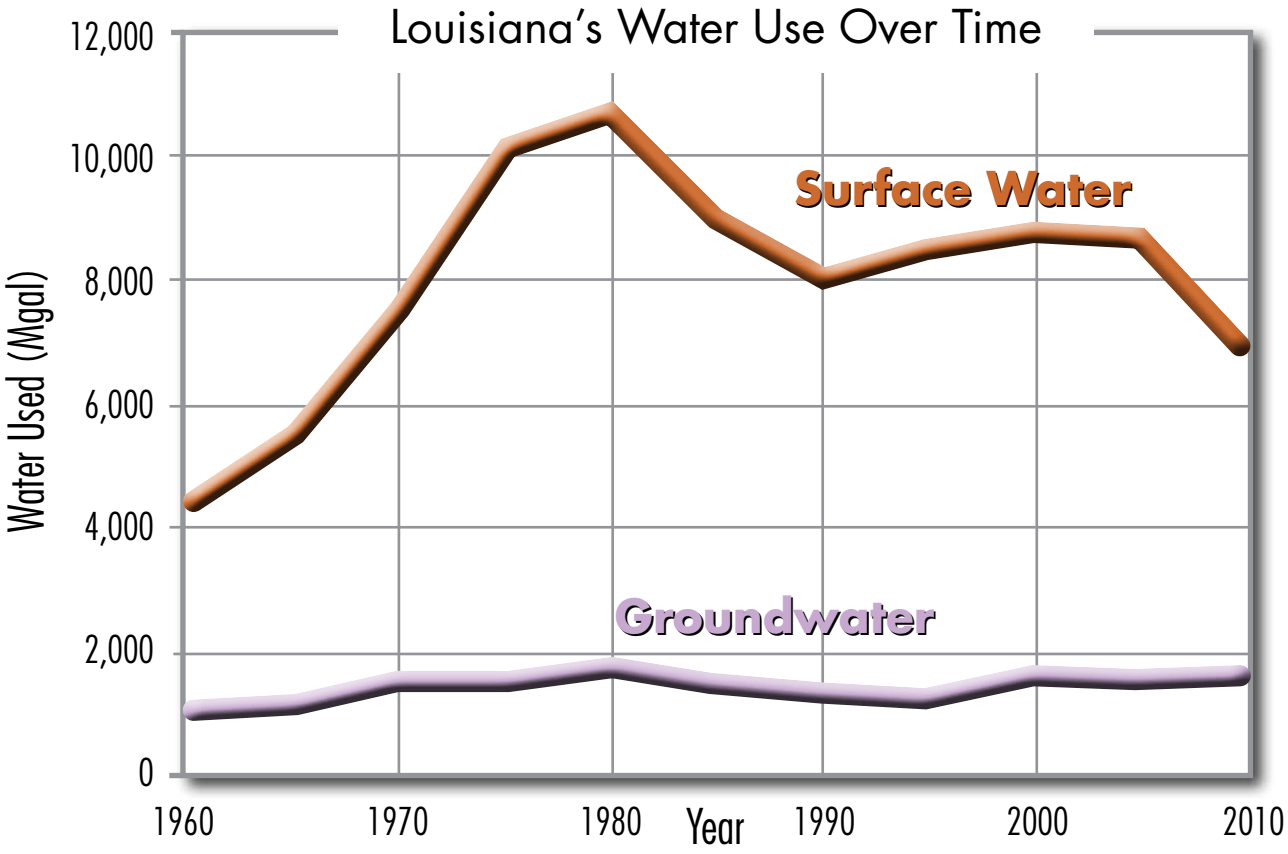
Irrigation (670 Mgal/d)	42 %
Public Supply (378 Mgal/d)	24 %
Industry (243 Mgal/d)	15 %
Aquaculture (191 Mgal/d)	12 %
Power Generation (76 Mgal/d)	5 %
Rural Domestic & Livestock (45 Mgal/d)	3 %

Mgal/d = Million gallons per day

Water Use in Louisiana - 2010

(Millions of gallons per day)



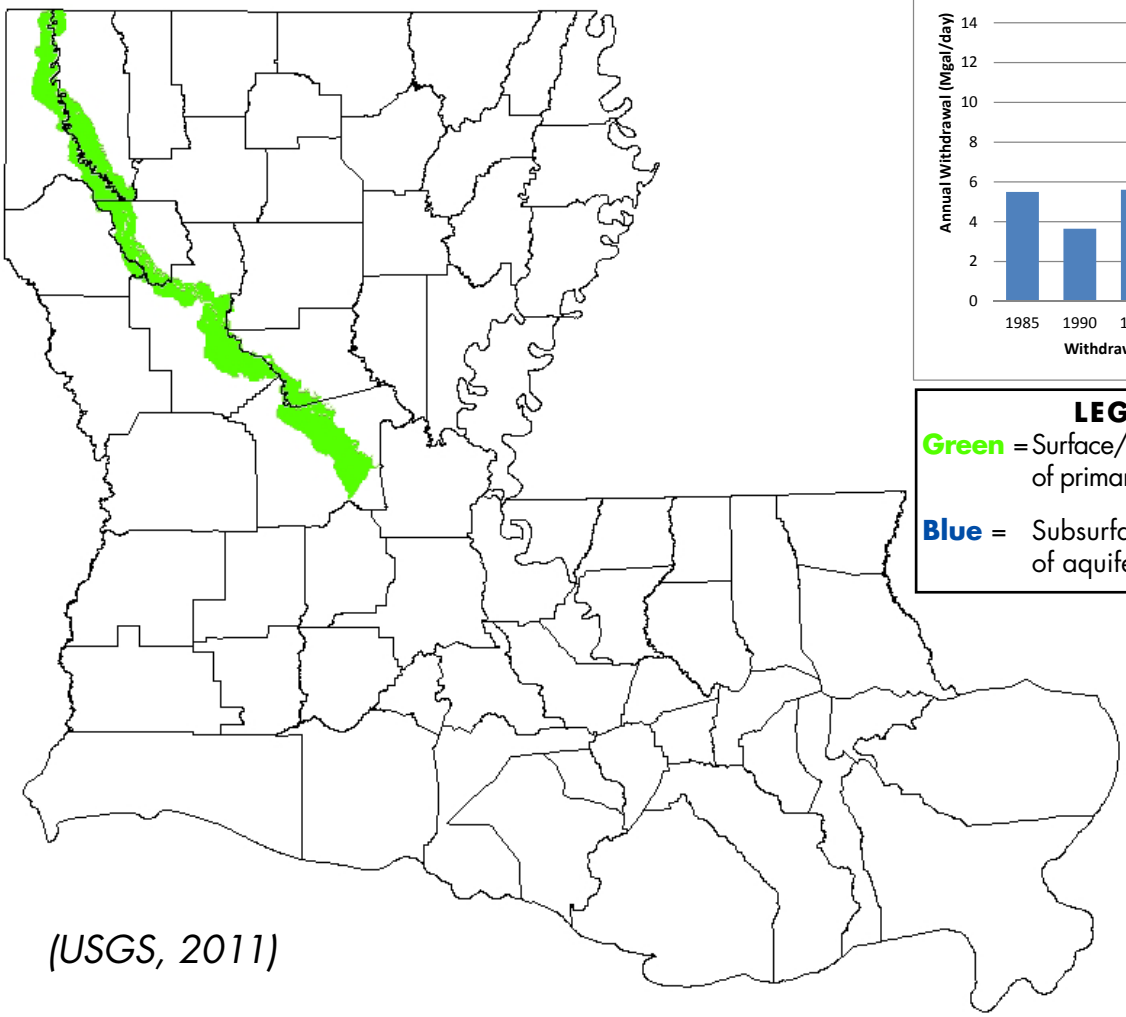


According to *Water Use in Louisiana, 2005* and *Water Use in Louisiana, 2010* by the LDOTD and USGS, total withdrawals from groundwater and surface water sources in 2010 were approximately 8,500 million gallons per day, a decrease of about 17 percent since 2005. Surface water withdrawals decreased by approxinately 20 percent during this period (8661.96 Mgal /d in 2005 versus 6926.19 Mgal/d in 2010), while groundwater withdrawals increased by two percent (571.91 Mgal/d versus 1603.51 Mgal/d in 2010).

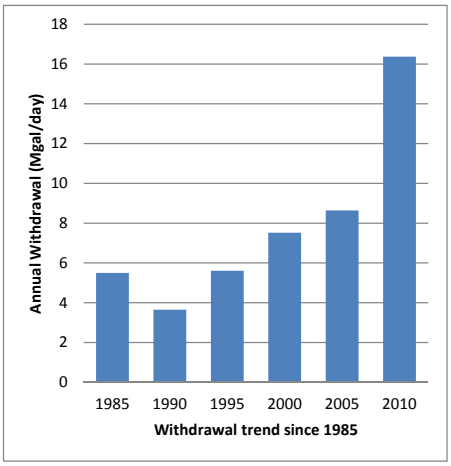
Our Aquifer Systems

Louisiana has eleven principal freshwater aquifers systems that are used for public, domestic, industrial and agricultural water supplies. They also feed into streams, rivers, lakes, and other surface water reservoirs.

Red River Alluvial Aquifer



(USGS, 2011)



LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

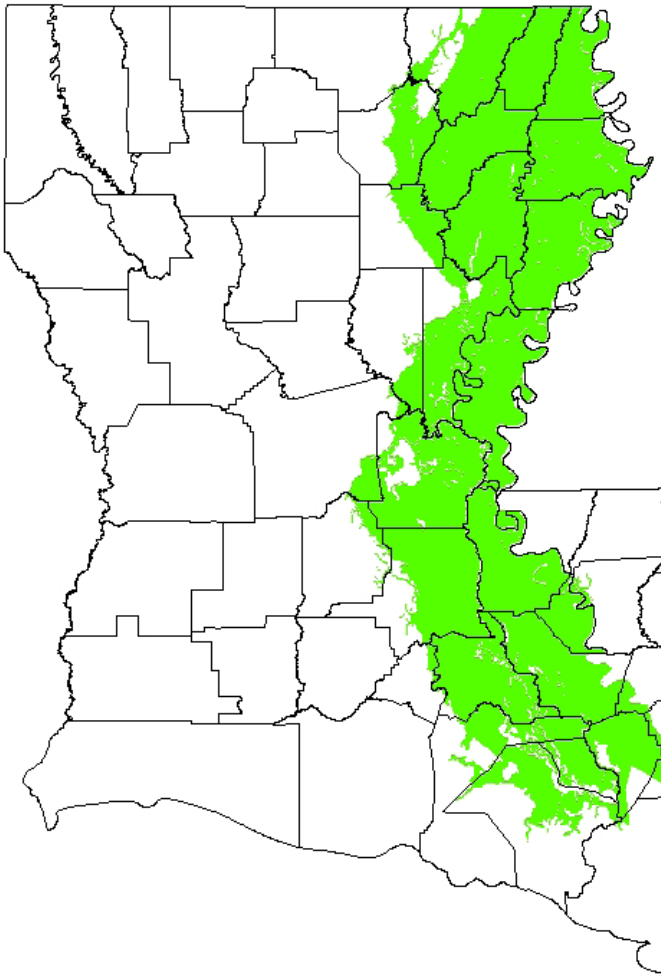
Blue = Subsurface/confined areas of aquifer

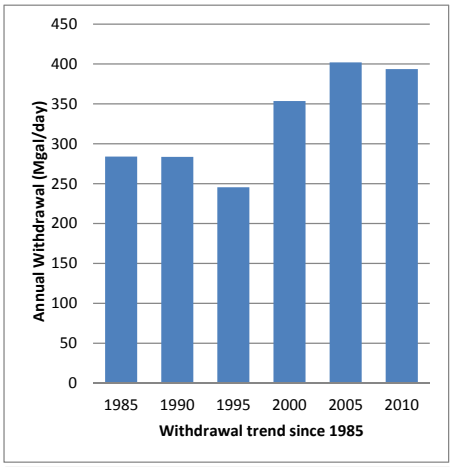
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	0.12
Industry	0.27
Power generation	0.00
Rural domestic	0.15
Livestock	0.29
Rice Irrigation	3.43
General irrigation	5.31
Aquaculture	6.80
Total	**16.37**

Withdrawals by Parish

Parish	**Mgal/d**
Avoyelles	6.47
Bossier	0.24
Caddo	3.09
Catahoula	0.21
DeSoto	0.15
Grant	0.02
Natchitoches	2.99
Rapides	1.92
Red River	1.26

Mississippi River Alluvial Aquifer





LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer

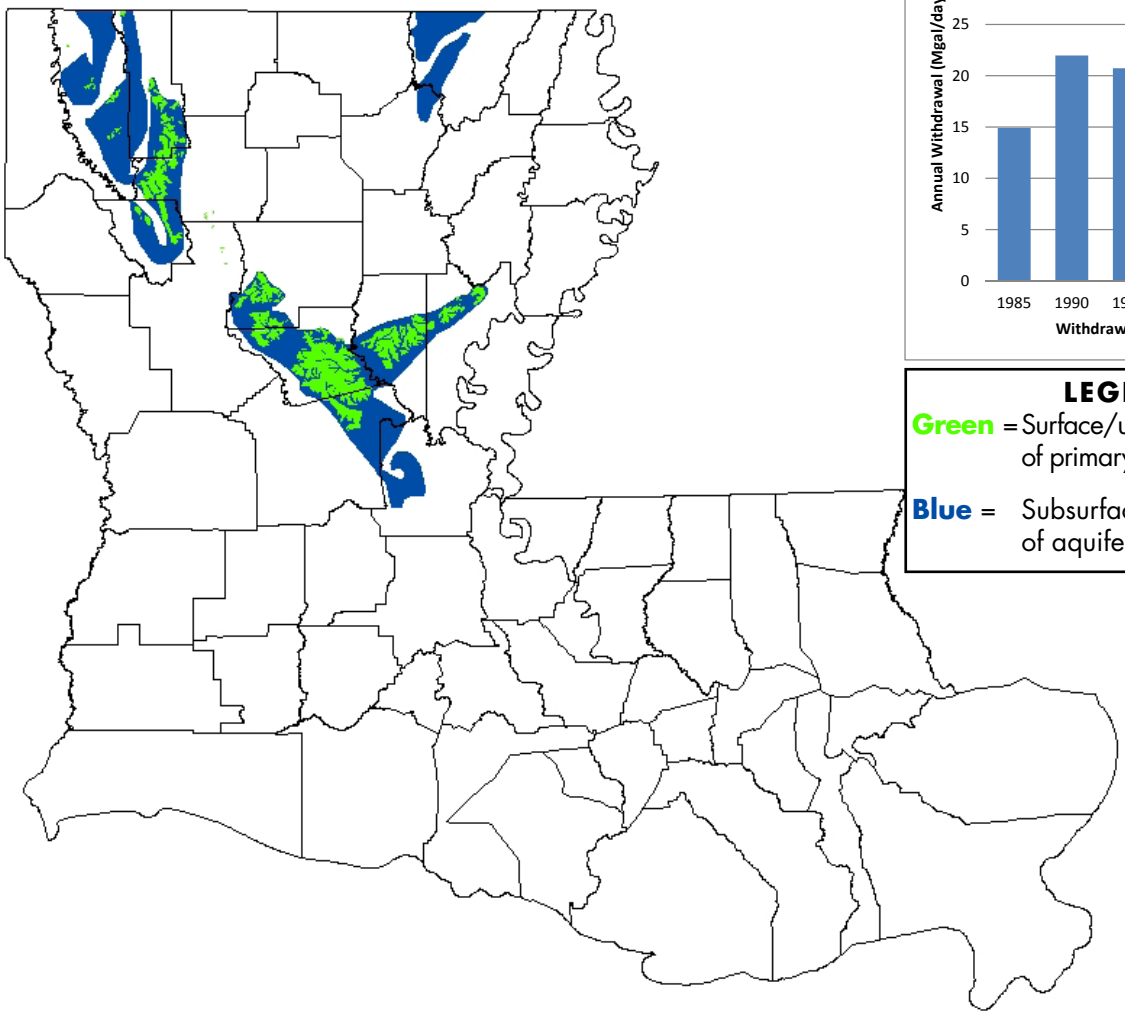
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	10.04
Industry	28.49
Power generation	0.82
Rural domestic	3.41
Livestock	1.12
Rice Irrigation	132.3
General irrigation	155.13
Aquaculture	62.26
Total	**393.57**

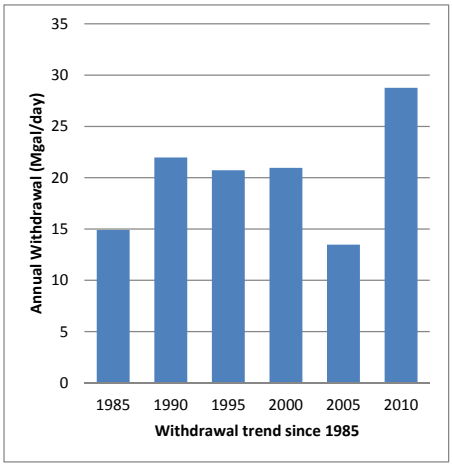
Withdrawals by Parish

Parish	Mgal/d
Ascension	0.15
Assumption	6.81
Avoyelles	24.96
Caldwell	0.61
Catahoula	20.49
Concordia	26.16
East Baton Rouge	0.09
East Carroll	19.91
Franklin	35.18
Iberia	0.17
Iberville	20.41
Lafayette	0.29
Lafourche	4.09
Madison	38.83
Morehouse	67.5
Ouachita	0.88
Pointe Coupee	17.64
Richland	20.37
St. James	0.01
St. Landry	19.77
St. Martin	25.08
St. Mary	0.03
Tensas	28.62
Terrebonne	0.61
West Baton Rouge	2.88
West Carroll	11.98
West Feliciana	0.04

(USGS, 2011)

Upland Terrace Aquifer





LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer

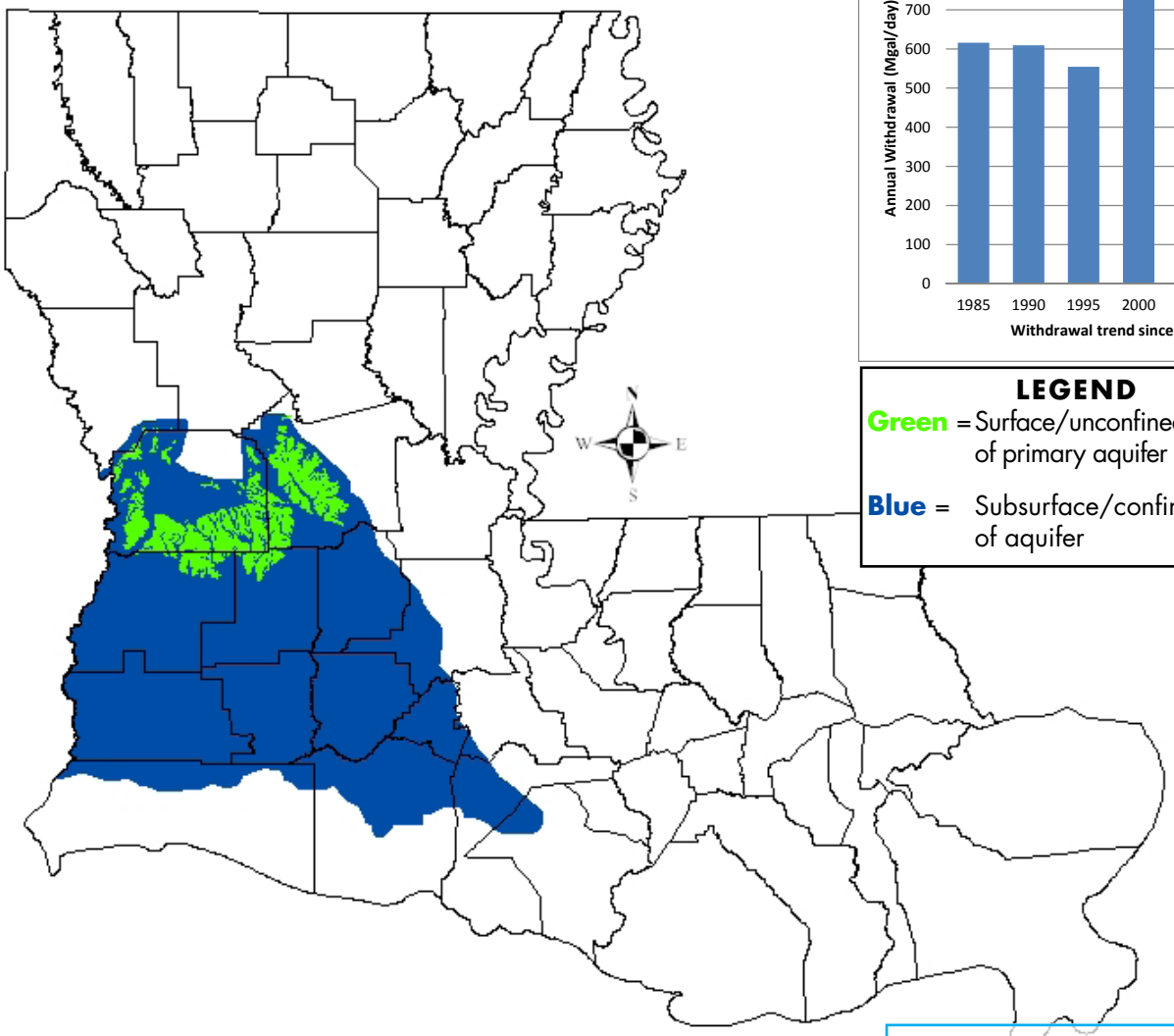
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	13.24
Industry	0.62
Power generation	0.00
Rural domestic	0.99
Livestock	0.09
Rice Irrigation	4.64
General irrigation	4.47
Aquaculture	4.71
Total	**28.76**

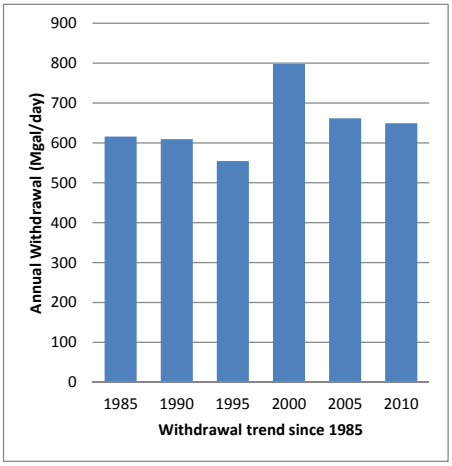
(USGS, 2011)

Withdrawals by Parish

Parish	**Mgal/d**
Avoyelles	5.35
Bienville	0.03
Bossier	1.40
Caddo	0.58
DeSoto	0.49
Grant	0.98
LaSalle	1.28
Morehouse	7.08
Natchitoches	0.20
Ouachita	0.07
Rapides	10.45
Red River	0.25
Sabine	0.03
Union	0.01
Vernon	0.06
Webster	0.43
Winn	0.05

Chicot Aquifer System





LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer

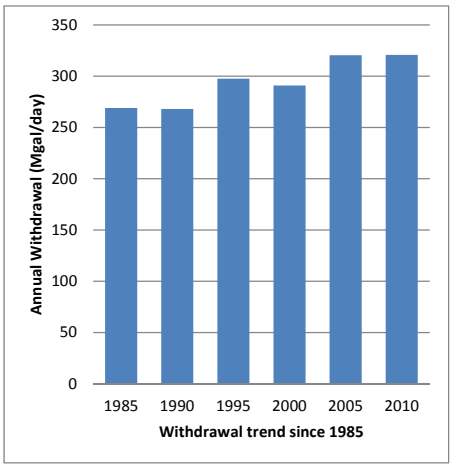
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	97.35
Industry	57.86
Power generation	14.74
Rural domestic	11.84
Livestock	1.20
Rice Irrigation	341.9
General irrigation	10.55
Aquaculture	113.89
Total	**649.33**

Withdrawals by Parish

Parish	**Mgal/d**
Acadia	183.25
Allen	17.77
Beauregard	11.74
Calcasieu	85.86
Cameron	7.74
Evangeline	65.69
Iberia	16.29
Jefferson Davis	140.46
Lafayette	38.24
Rapides	1.15
St. Landry	36.49
St. Martin	4.11
St. Mary	8.28
Vermilion	31.75
Vernon	0.53

(USGS, 2011)

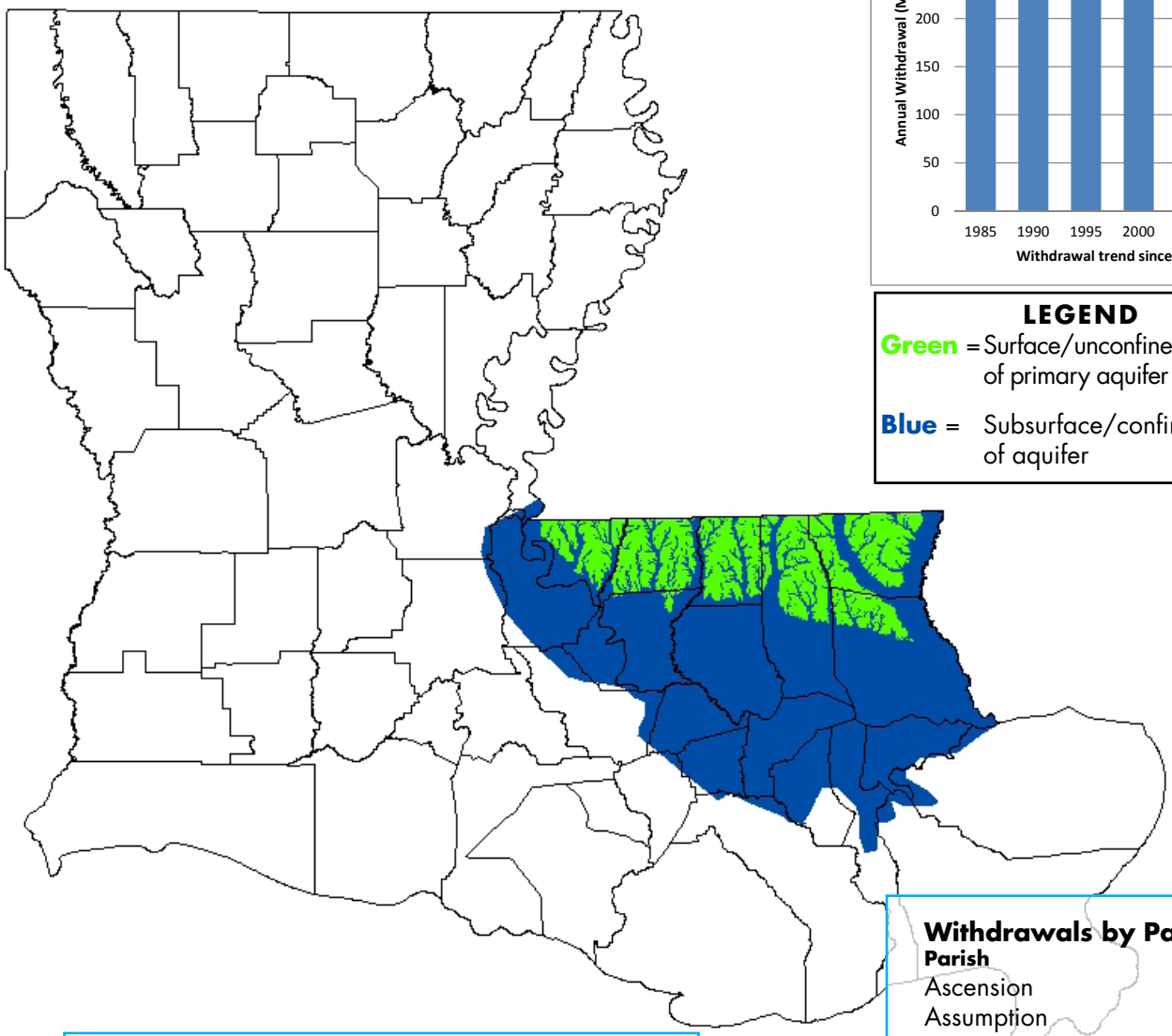
Southern Hills Aquifer System



LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer



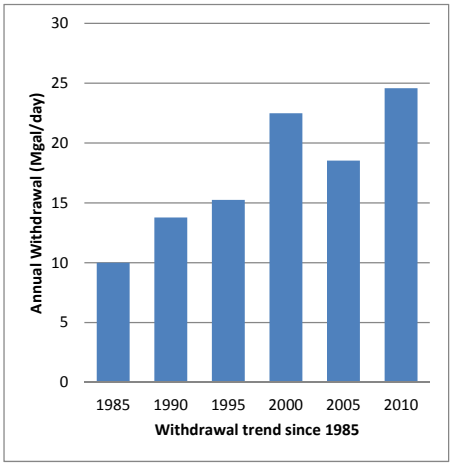
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	162.79
Industry	112.64
Power generation	25.35
Rural domestic	16.66
Livestock	0.89
Rice Irrigation	0.24
General irrigation	1.83
Aquaculture	0.36
Total	**320.76**

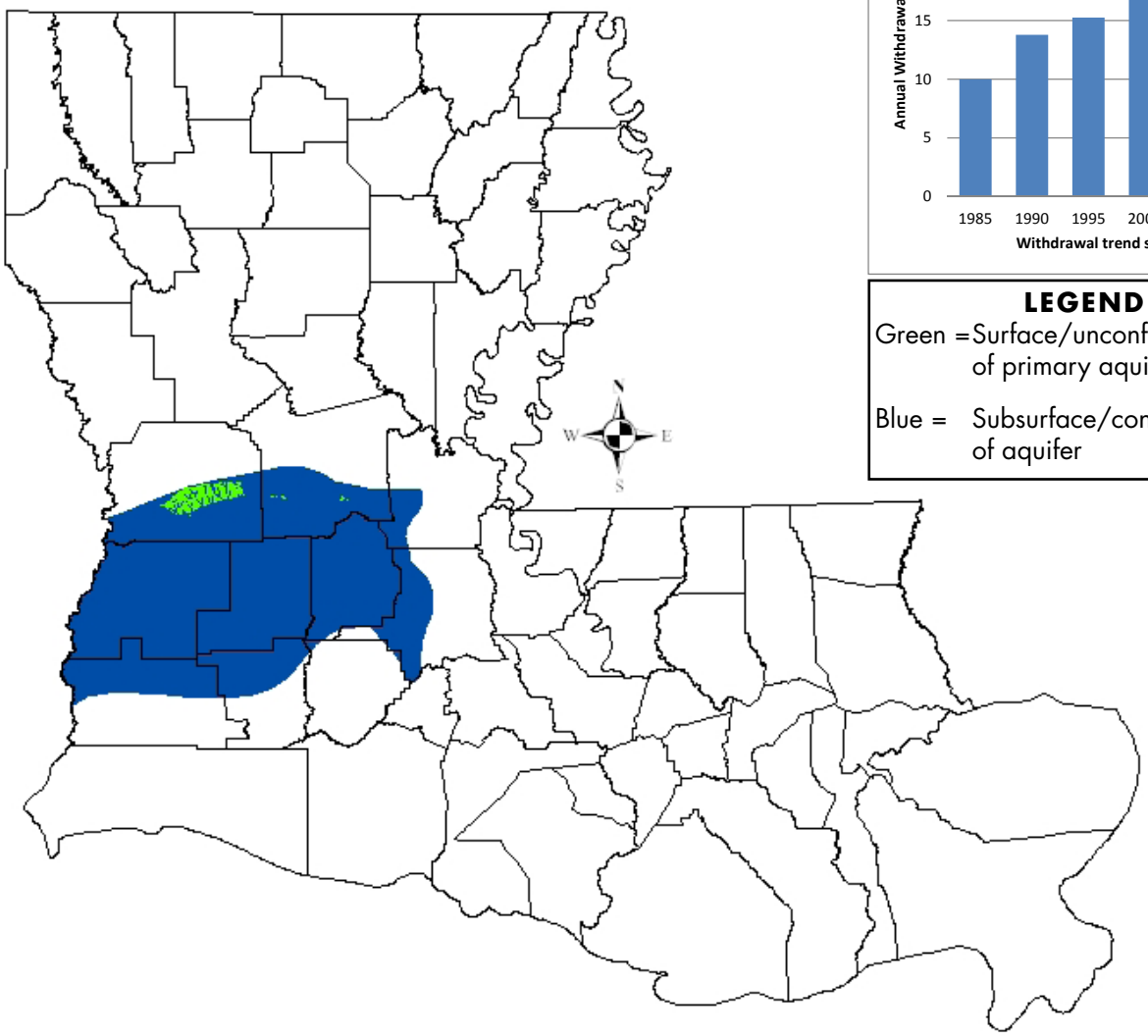
Withdrawals by Parish

Parish	Mgal/d
Ascension	11.80
Assumption	2.22
East Baton Rouge	149.81
East Feliciana	3.45
Iberville	0.47
Jefferson	7.16
Livingston	13.55
Orleans	12.94
Plaquemines	0.04
Pointe Coupee	9.87
St. Bernard	0.02
St. Charles	4.23
St. Helena	1.05
St. James	2.85
St. John the Baptist	13.51
St. Tammany	27.84
Tangipahoa	19.90
Washington	28.11
West Baton Rouge	7.33
West Feliciana	4.64

(USGS, 2011)

Evangeline Aquifer





LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer

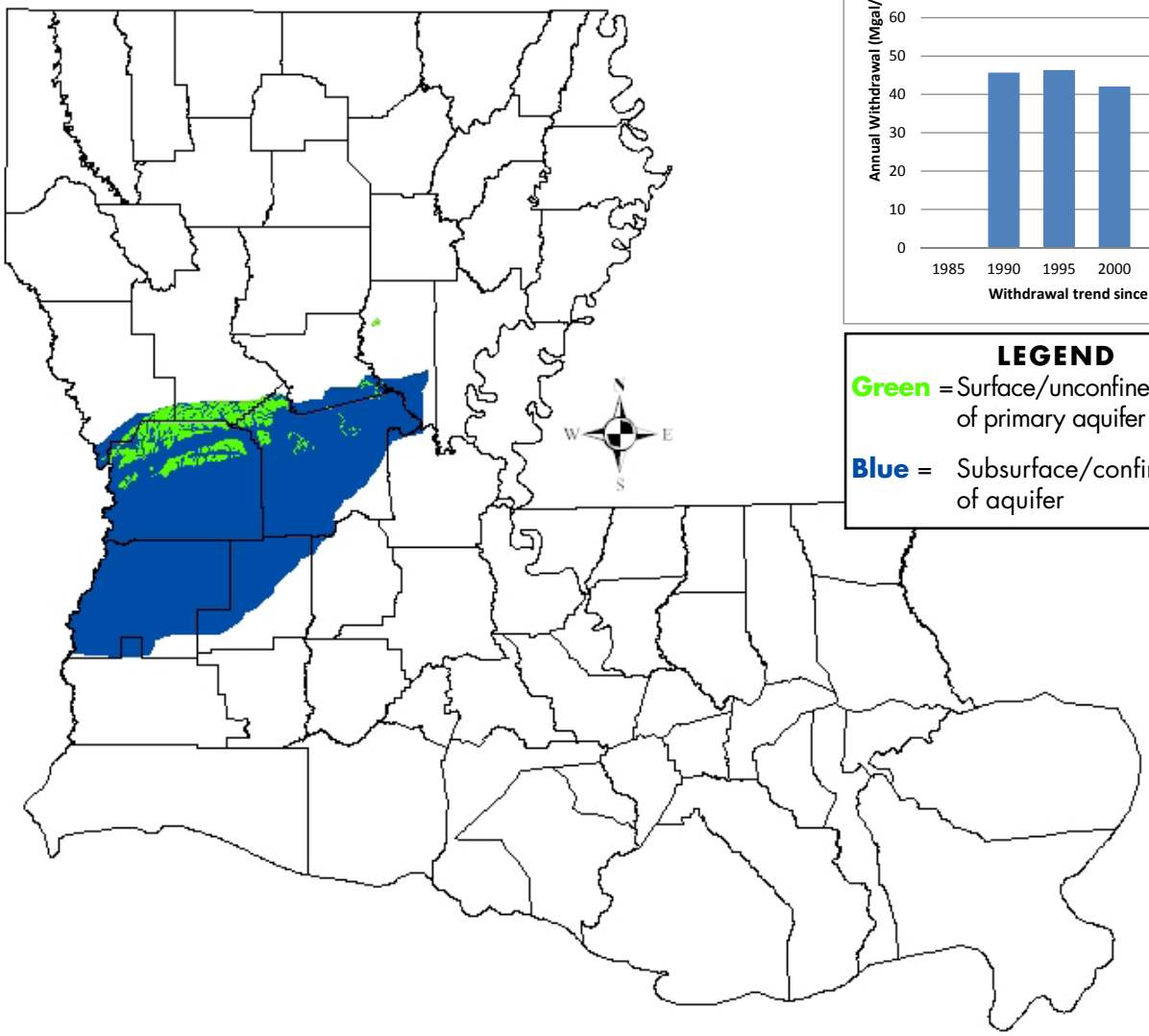
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	17.66
Industry	2.71
Power generation	0.00
Rural domestic	0.30
Livestock	0.07
Rice Irrigation	2.89
General irrigation	0.68
Aquaculture	0.27
Total	**24.58**

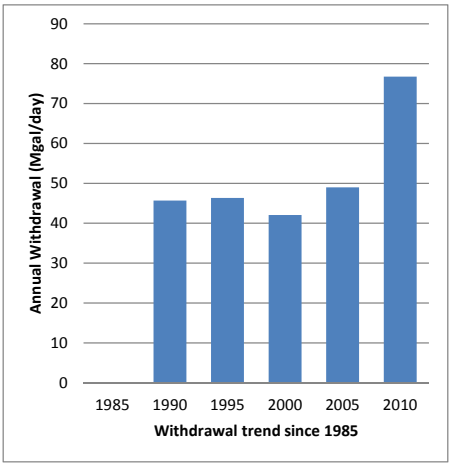
Withdrawals by Parish

Parish	**Mgal/d**
Allen	4.25
Avoyelles	3.36
Beauregard	3.22
Calcasieu	0.79
Evangeline	6.99
Rapides	3.40
St. Landry	2.42
Vernon	0.15

(USGS, 2011)

Jasper Aquifer System





LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer

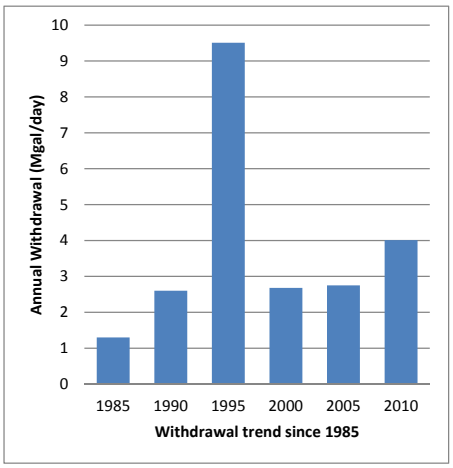
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	25.01
Industry	12.80
Power generation	34.72
Rural domestic	1.06
Livestock	0.04
Rice Irrigation	0.96
General irrigation	0.65
Aquaculture	1.52
Total	**76.76**

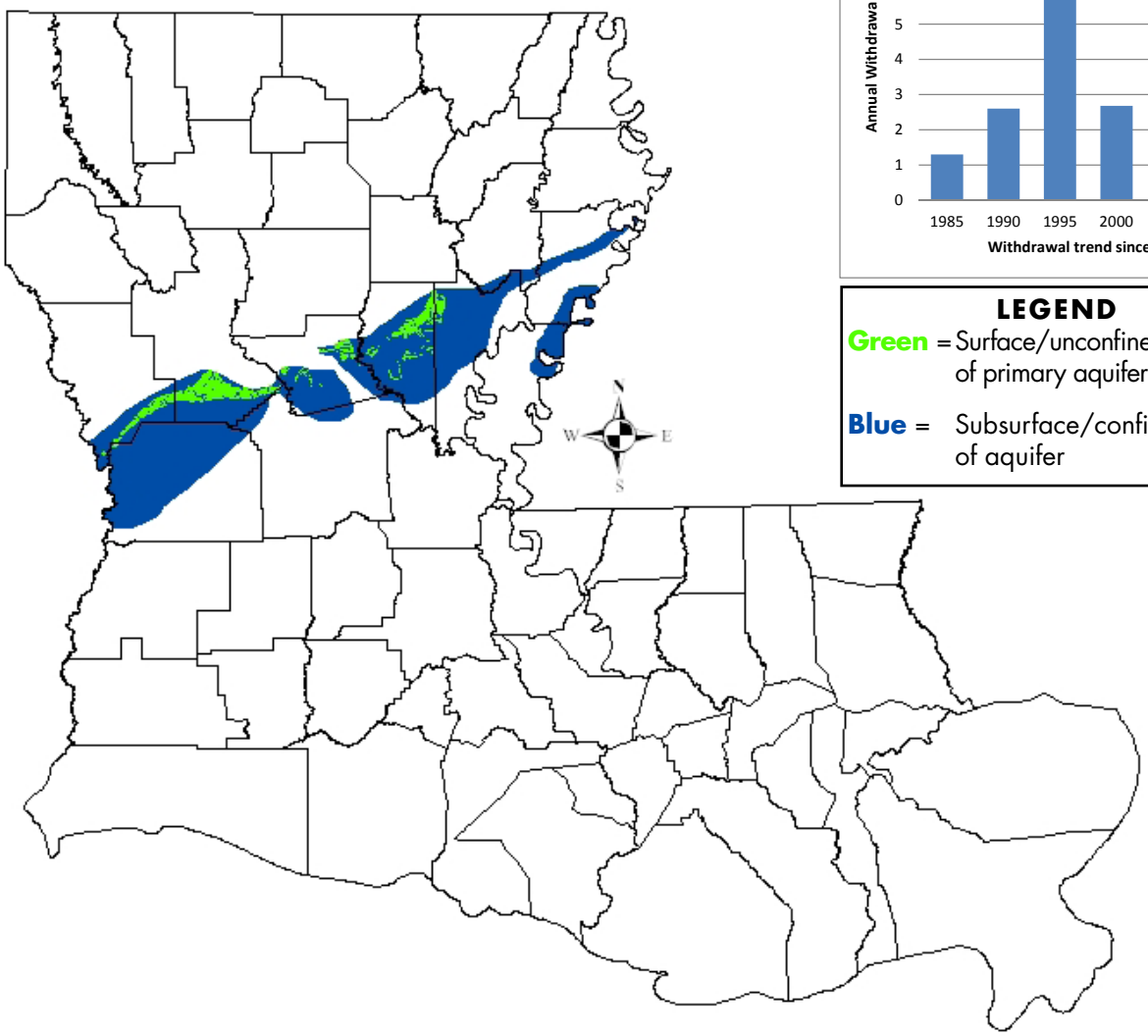
Withdrawals by Parish

Parish	**Mgal/d**
Avoyelles	0.01
Beauregard	12.40
Concordia	2.17
Grant	0.50
Rapides	54.52
Vernon	7.17

(USGS, 2011)

Catahoula Aquifer





LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer

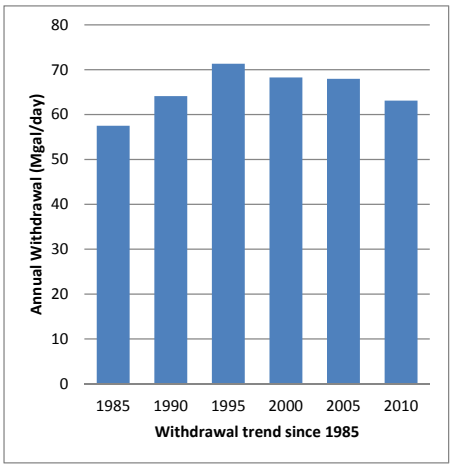
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	3.51
Industry	0.06
Power generation	0.00
Rural domestic	0.20
Livestock	0.03
Rice Irrigation	0.00
General irrigation	0.15
Aquaculture	0.06
Total	**4.01**

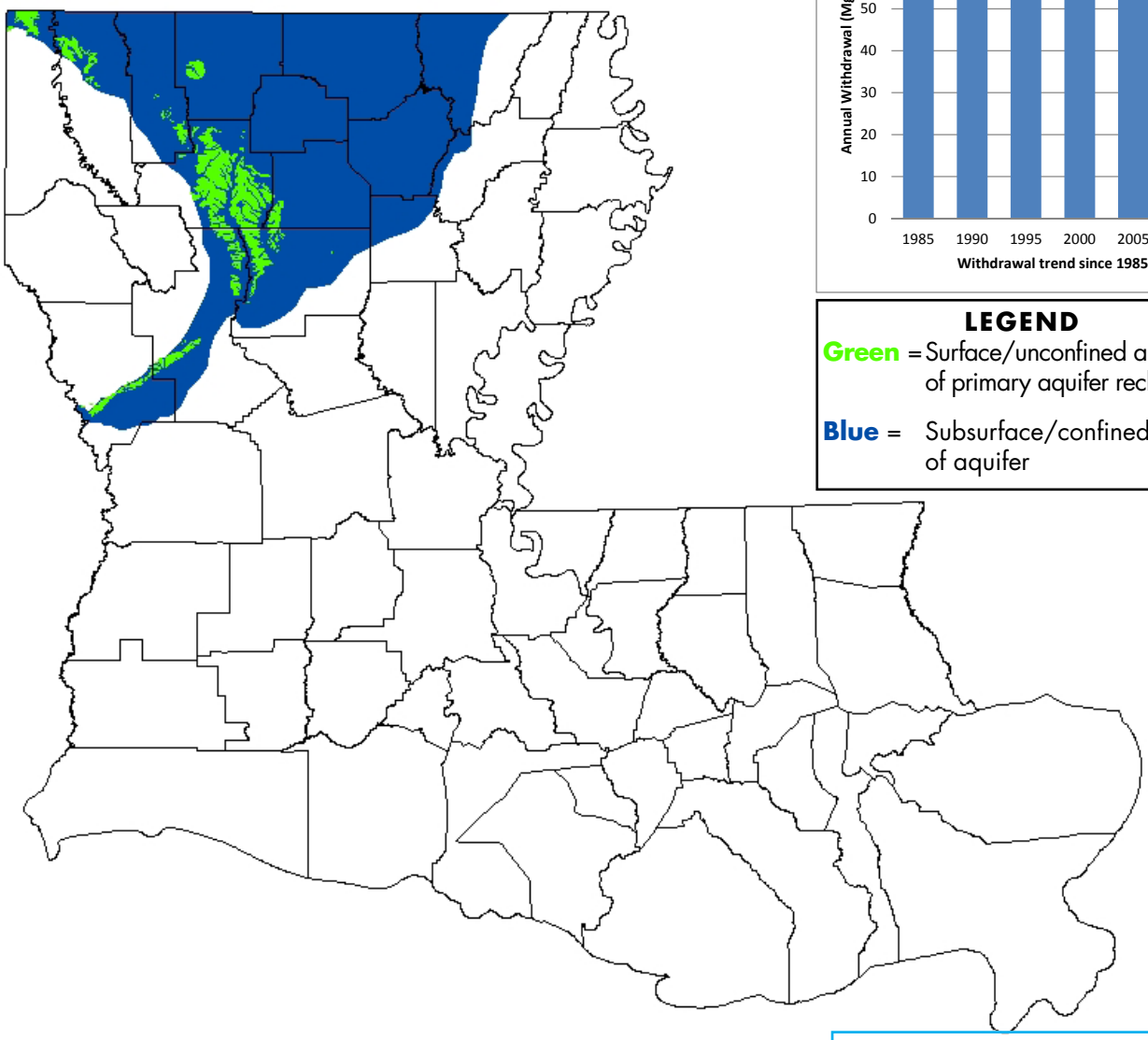
Withdrawals by Parish

Parish	**Mgal/d**
Catahoula	1.93
Concordia	0.41
East Feliciana	0.06
Grant	0.61
LaSalle	0.16
Natchitoches	0.03
Rapides	0.59
Sabine	0.05
Vernon	0.18

(USGS, 2011)

Sparta Aquifer System





LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer

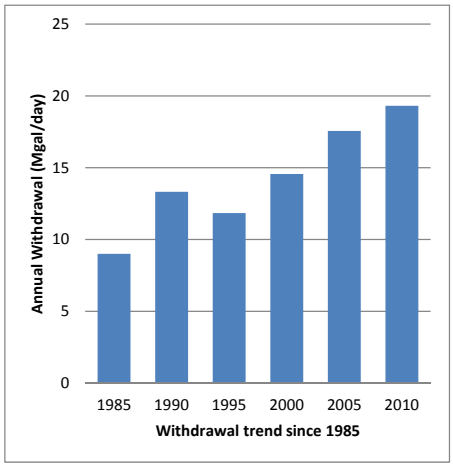
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	34.61
Industry	25.60
Power generation	0.00
Rural domestic	1.50
Livestock	0.14
Rice Irrigation	0.22
General irrigation	0.98
Aquaculture	0.06
Total	**63.11**

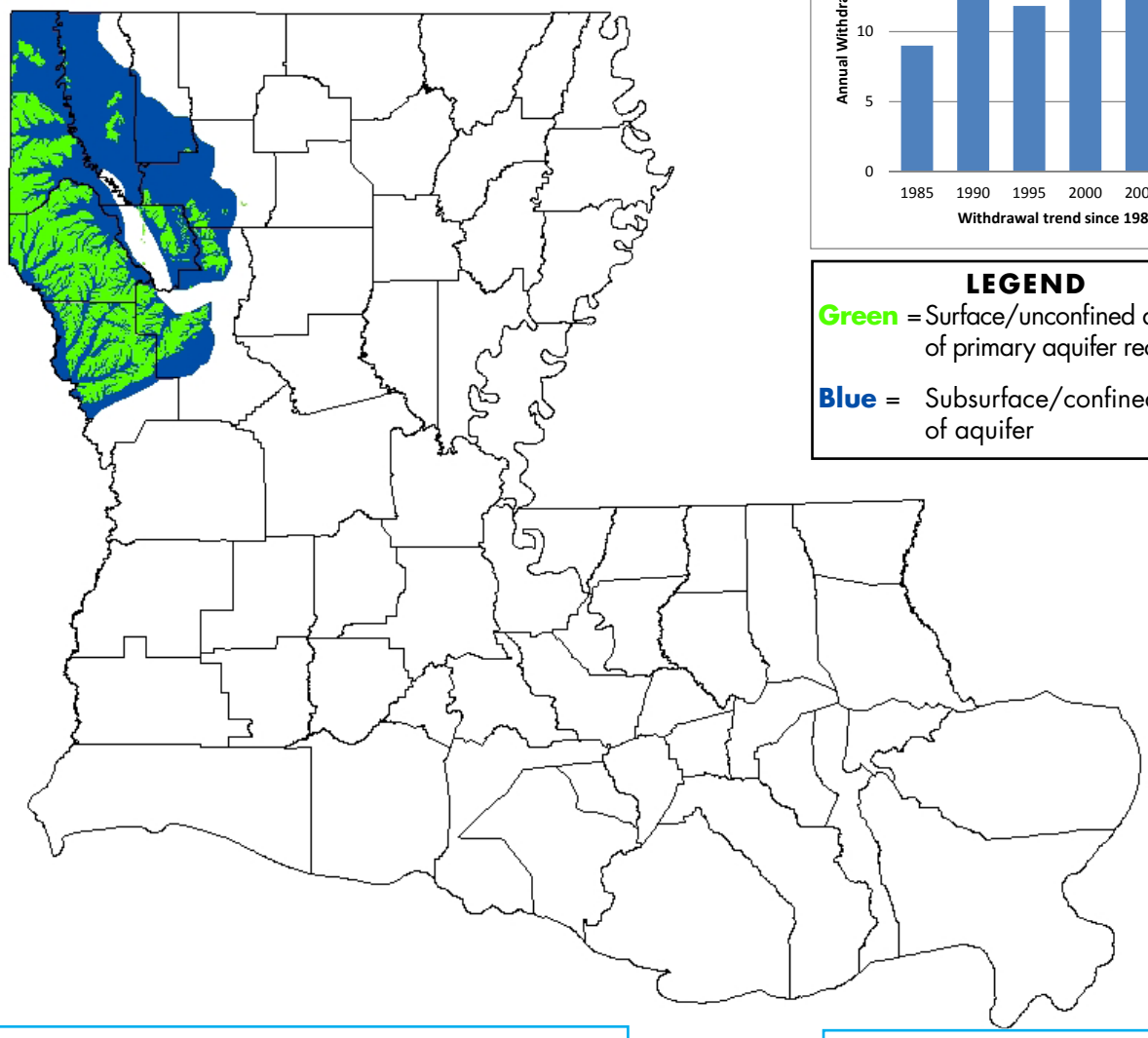
Withdrawals by Parish

Parish	**Mgal/d**
Bienville	12.00
Bossier	0.19
Caddo	0.13
Caldwell	0.02
Claiborne	2.41
Jackson	3.88
Lincoln	8.71
Morehouse	0.38
Natchitoches	1.21
Ouachita	22.27
Sabine	0.13
Union	3.84
Webster	5.89
Winn	2.05

(USGS, 2011)

Carrizo-Wilcox Aquifer





LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer

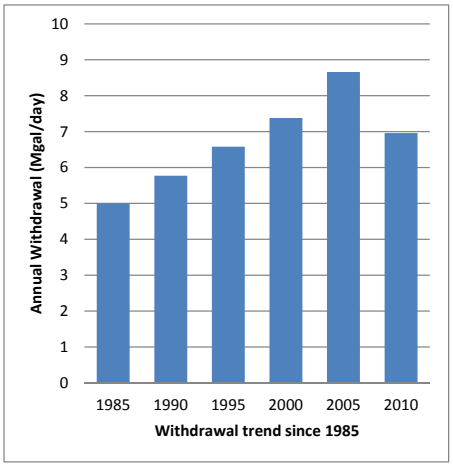
Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	7.55
Industry	3.03
Power generation	0.00
Rural domestic	4.46
Livestock	0.28
Rice Irrigation	0.15
General irrigation	3.05
Aquaculture	0.79
Total	**19.31**

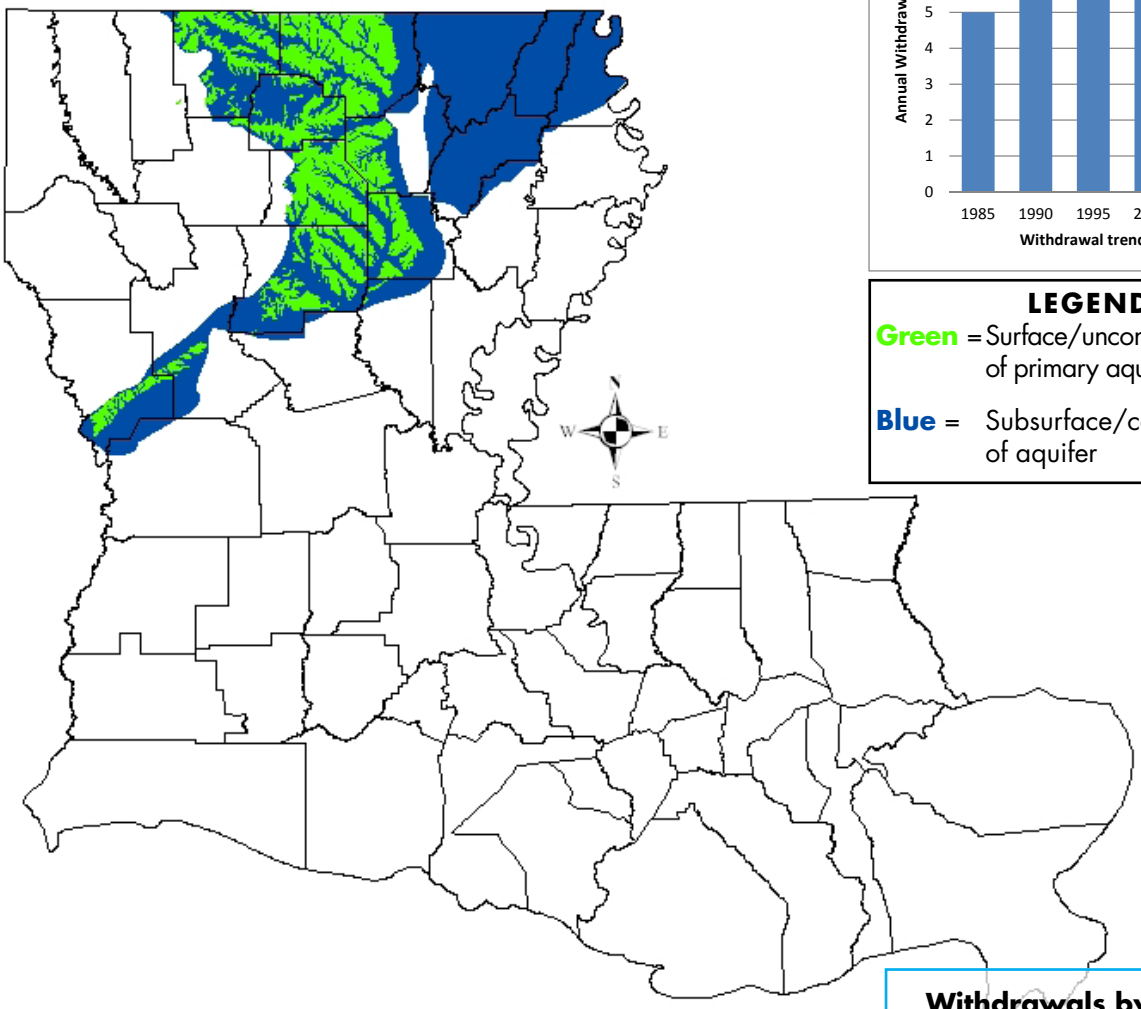
Withdrawals by Parish

Parish	**Mgal/d**
Bienville	0.99
Bossier	2.39
Caddo	6.78
DeSoto	4.11
Natchitoches	1.03
Red River	1.19
Sabine	1.81
Webster	1.03

(USGS, 2011)

Cockfield Aquifer





LEGEND

Green = Surface/unconfined areas of primary aquifer recharge

Blue = Subsurface/confined areas of aquifer

Withdrawals, in millions gallons per day (Mgal/d)	
Public supply	6.40
Industry	0.00
Power generation	0.00
Rural domestic	0.44
Livestock	0.01
Rice Irrigation	0.11
General irrigation	0.00
Aquaculture	0.00
Total	**6.96**

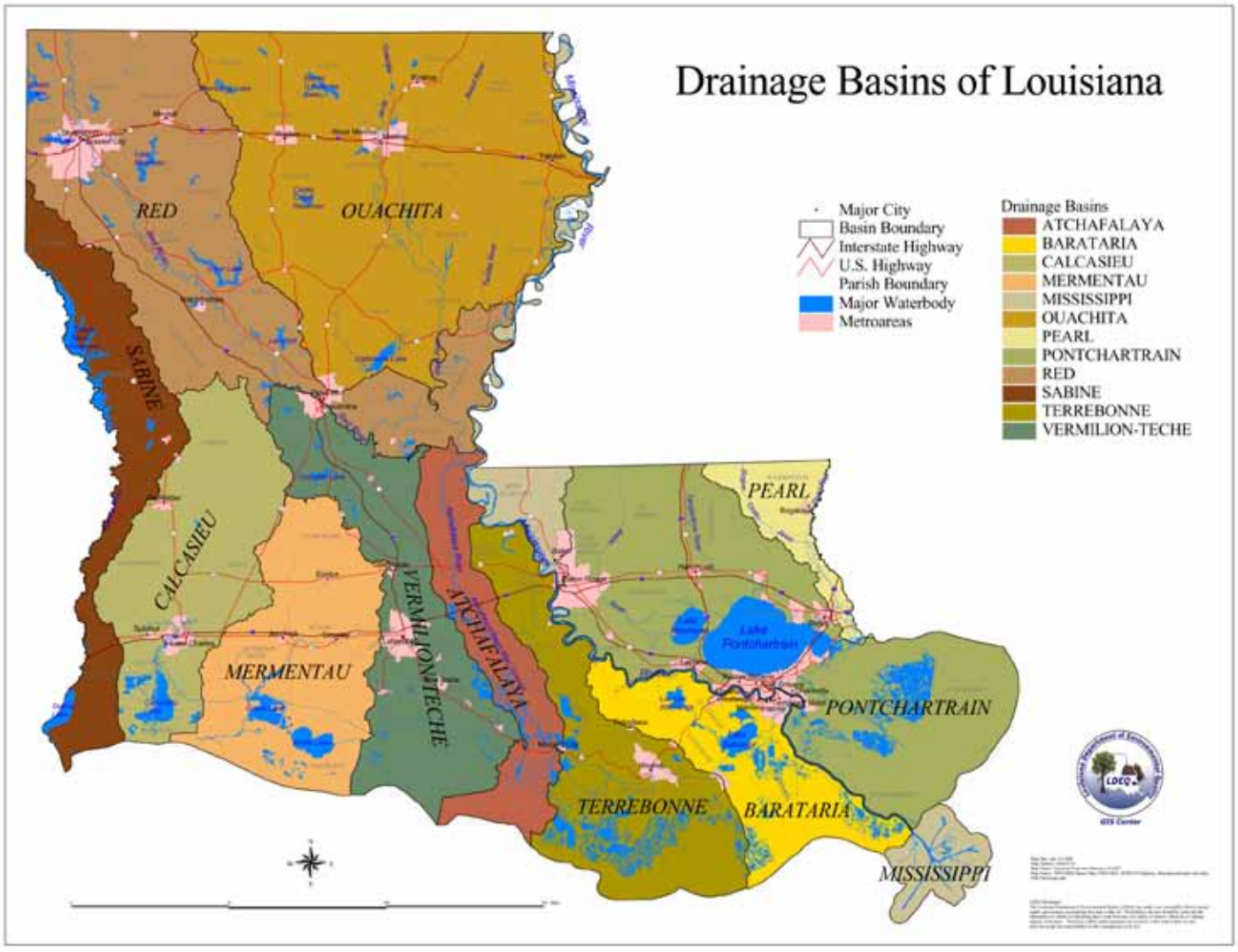
(USGS, 2011)

Withdrawals by Parish

Parish	Mgal/d
Caldwell	1.09
Claiborne	0.01
East Carroll	1.29
Grant	0.20
Jackson	0.06
LaSalle	0.86
Lincoln	0.01
Morehouse	0.34
Natchitoches	0.07
Ouachita	0.11
Richland	1.46
Sabine	0.07
Union	0.06
Vernon	0.06
West Carroll	1.08
Winn	0.19

Principal Drainage Basins in Louisiana

Comprehensive water management integrates both groundwater and surface water resources to achieve resource sustainability. In addition to eleven aquifers, Louisiana has ten recognized surface watersheds, depicted in the map below.



Map produced by LA Department of Environmental Quality.

Current Major Issues

Discussed in this section are major issues having either a direct or indirect impact on groundwater sustainability management, in no particular order. These include inadequate monitoring network, coastal restoration and saltwater intrusion, Sparta aquifer system Areas of Ground Water Concern, saltwater encroachment in Capital Area aquifers, high water use in southwest Louisiana, southern Caddo Parish temporary groundwater emergency, Toledo Bend Reservoir, surface water withdrawal management, energy exploration/emerging technologies, surface water quality management, safe drinking water supply, and conservation education/public outreach. An aquifer-by-aquifer summary of all known or potential adverse impacts affecting groundwater quality or availability are identified on page 82.

Inadequate Monitoring Network

This recommendation is derived from the December 7, 2011 report by Ecology and Environment, Inc. (E&E) for LDNR titled *Recommendations for a Statewide Ground Water Management Plan* and extensively discussed by members of the Ground Water Resources Commission at a public meeting on January 19-20, 2012.

The E&E Executive Summary notes, "In conclusion, the single most significant and fundamental groundwater resource management issue that Louisiana should focus its immediate attention and efforts for improvement is the timely and periodic acquisition and dissemination of comprehensive aquifer-wide groundwater level measurements, water well production and ground-water quality data. Although the state has implemented various methods of obtaining such information, it is clear that these current methods fall short of producing a sufficient volume of data in a coordinated manner available in a time frame necessary for implementing a more efficient and effective means of managing the state's groundwater resources to ensure both short and long term aquifer sustainability. Establishing improvements in data acquisition and dissemination must be adequately addressed in order for the state to develop and implement any successful groundwater management strategy and therefore should be addressed as a matter of priority."

Groundwater and surface water data collection has been ongoing in Louisiana by agencies such as the USGS and the U.S. Army Corps of Engineers for over 90 years. The USGS has had a cooperative monitoring program with the state since the early 1950's. Peak monitoring occurred in the early 1980's, at which point the cooperative network included a groundwater network of 739 wells and a surface water network of 184 gaging stations. Due to budget reductions in the mid-1980's, these networks have been reduced to the present 164 wells and 59 gaging stations, a 78 percent and 68 percent reduction respectively.

Recognizing it is paramount that the state's groundwater monitoring networks be robust enough to timely identify areas of concern and enable scientifically based management decisions, the Fiscal Year 2012-2013 Executive Budget includes an appropriation, from a decade-old fund comprised of federal fines, to expand and enhance the groundwater monitoring network, reporting frequency, and aquifer evaluations, all as per a USGS recommendation. See Appendix H for details of the enhanced monitoring well network proposal.

The data gathered from any increased monitoring project may be used to determine if more frequent or extensive water withdrawal reporting may need to be required for certain users and/or in certain areas. Considering that all aquifers are not the same, the monitoring program should not be "one size fits all." For example, the challenges of the lenticuler nature of the Carrizo-Wilcox aquifer, the deficit issues of the Sparta aquifer, the high use of the Chicot aquifer, and the Baton Rouge area Southern Hills aquifer saltwater encroachment issue all require aggressive, yet different, monitoring strategies.

For the above reason, this document is called an interim report. It will be updated annually as this robust monitoring program is implemented. In addition, we are hopeful that additional funding to expand and enhance surface water monitoring can be secured in the near future.

Coastal Restoration and Saltwater Intrusion

Louisiana's coastal ecosystem and wetland habitats are in peril due to the continued loss of coastal wetlands. Currently, Louisiana has 30 percent of the total coastal marsh and accounts for 90 percent of the coastal marsh loss in the lower 48 states. In the last 80 years 1,883 square miles have been lost and it is projected that 1,756 square miles of additional land are at risk of being lost in the next 50 years. In 2004, the United States Geological Survey (USGS) projected that, between 1956 and 2050, Louisiana will have lost more than 2,000 square miles of coastal wetlands. Naturally occurring deltaic processes, exacerbated by human activities, have been identified as key contributors to this coastal land loss crisis. It has been well documented that a reduction of sediments and the lack of fresh water that is being input into the coastal ecosystem are two of the major reasons for continued coastal wetland decline. Due to the importance to the state and to nation of the assets that are located in this fragile area – our ports, energy infrastructure, seafood, wetlands, natural resources, etc. – this land loss crisis is nothing short of a national emergency.

The State of Louisiana is making significant efforts to reverse this land loss trend, having restored more land and invested more dollars since the release of the 2007 State Master Plan for a Sustainable Coast than any time in the state's history. Since 2007 the Coastal Protection and Restoration Authority (CPRA) has built or improved 159 miles of levees, benefited 19,405 acres of coastal habitat, secured approximately $17 billion in state and federal coastal funding, constructed 32 miles of barrier islands and berms, moved 150 projects into design and construction, and constructed projects in 20 parishes.Therefore, as the state moves forward to implement its aggressive coastal restoration and protection effort, in accordance with the 2012 draft State of Louisiana's Comprehensive Master Plan for a Sustainable Coast (Plan), water must play a key role in reversing the trend of coastal land loss.

Yearly changes in the availability of fresh water and sediment, as well as other long-term trends that may be associated with climate change, reinforce the need to explore aggressive ecosystem restoration measures to include management of freshwater resources. Salt water is destroying fragile marsh and impinging on freshwater lakes and marshes. Fresh water needed for agriculture is also increasingly compromised by this saltwater intrusion, a trend that endangers the region's tradition of rice, cattle, and crawfish farming. These conditions have been further exacerbated by recent drought conditions. It is critical that the state maintains the integrity of freshwater reservoirs in both the Chenier and Deltaic Plains of the coastal area. Inland lakes and freshwater marshes are at continued risk from encroaching saltwater. Without an adequate supply of fresh water, these coastal wetland habitats will not receive the wetland-sustaining fresh water that is required to sustain these critical habitats.

Current Major Issues (cont.)

The 2012 draft Plan relies heavily upon the availability of fresh water to achieve its anticipated outcomes over the 50-year vision of the plan. The Plan also relies on fresh water to enhance freshwater fisheries and habitat, combat higher salinities which infiltrate our basins and uses freshwater and sediment diversions as a restoration tool. A reliable supply of fresh water is critically important to the long-term success of the Plan. In order to maintain the supply envisioned by the plan as well as sustain surface water resources for drinking water, agriculture, municipal, and industrial needs, and recreation and aquatic habitat ecosystem demands throughout the state, a management plan that addresses water allotment should be developed to ensure the sustainable use of this valuable resource for coastal restoration and other purposes. In order to reduce the impacts of periodic saltwater intrusion, the Plan suggests managing fresh water supplies to allow better maintenance of water resources throughout the year. Such management will also permit the delivery of fresh water to areas that may be exposed to saltwater stress.

Images of Freshwater-Starved Marsh in Coastal Louisiana

Area of Ground Water Concern: Sparta Aquifer System

After due process, including public notice and public hearing, and based on good management practices and scientifically sound data, the Commissioner of Conservation can establish an Area of Ground Water Concern. Louisiana Revised Statute 38:3097.2.(1) states that an area of ground water concern shall mean an area in which, under current usage and normal environmental conditions, sustainability of an aquifer is not being maintained due to either movement of a saltwater front, water level decline, or subsidence, resulting in unacceptable environmental, economic, social, or health impact, or causing serious adverse impact to an aquifer, considering the areal and temporal extent of all such impacts.

In 2003, the Sparta Ground Water Conservation Commission submitted an application to LDNR to have areas of the Sparta aquifer system evaluated based on aquifer studies that showed long term declining water level trends in the aquifer. The Office of Conservation reviewed, evaluated, and documented water usage and water levels. After careful consideration of the facts available before, during and after public hearings, three Areas of Ground Water Concern were established in 2005 under Office of Conservation Order No. AGC-1-05 (Order) in areas experiencing continual ground water level decline in historic pumping centers.

These areas include Ruston (Lincoln Parish), Jonesboro-Hodge (Jackson and Bienville Parishes), and Monroe-West Monroe (Ouachita Parish). Management actions such as water conservation education, monthly groundwater production reporting, and Sparta user pursuit of alternative water resources were implemented.

Since 2005, water level data collected from USGS observation wells located in the Sparta aquifer system in north Louisiana generally show improving water level conditions (see maps on pages 70-71). However, while water level conditions and trends have clearly improved in some areas of the Sparta aquifer system, water level decline, in the three established Areas of Ground Water Concern warrants continued close observation and management actions.

Letter from Union County (Arkansas) Water Conservation Board to LDNR - June 24, 2010

"On behalf of the Union County Water Conservation Board, our public and private partners, and particularly the citizens of Union County, thank you (to) the Louisiana Office of Conservation for your support of the Board's Sparta Aquifer Recovery Initiative in South Arkansas and North Louisiana."

- UCWCB President Robert Reynolds

Funding for Outside Groups Associated with Groundwater Monitoring of the Sparta

- On October 1, 2007, LDNR entered into a contract with United States Geological Survey in the amount of $47,950 to determine water level data from the Sparta aquifer system in northern Louisiana.

- On October 1, 2008, LDNR entered into a contract with United States Geological Survey in the amount of $23,250 to determine water level data from the Sparta aquifer system in northern Louisiana.

- On July 1, 2008, LDNR entered into a contract with United States Geological Survey in the amount of $32,000 to determine water quality data from the Sparta aquifer system in northern Louisiana.

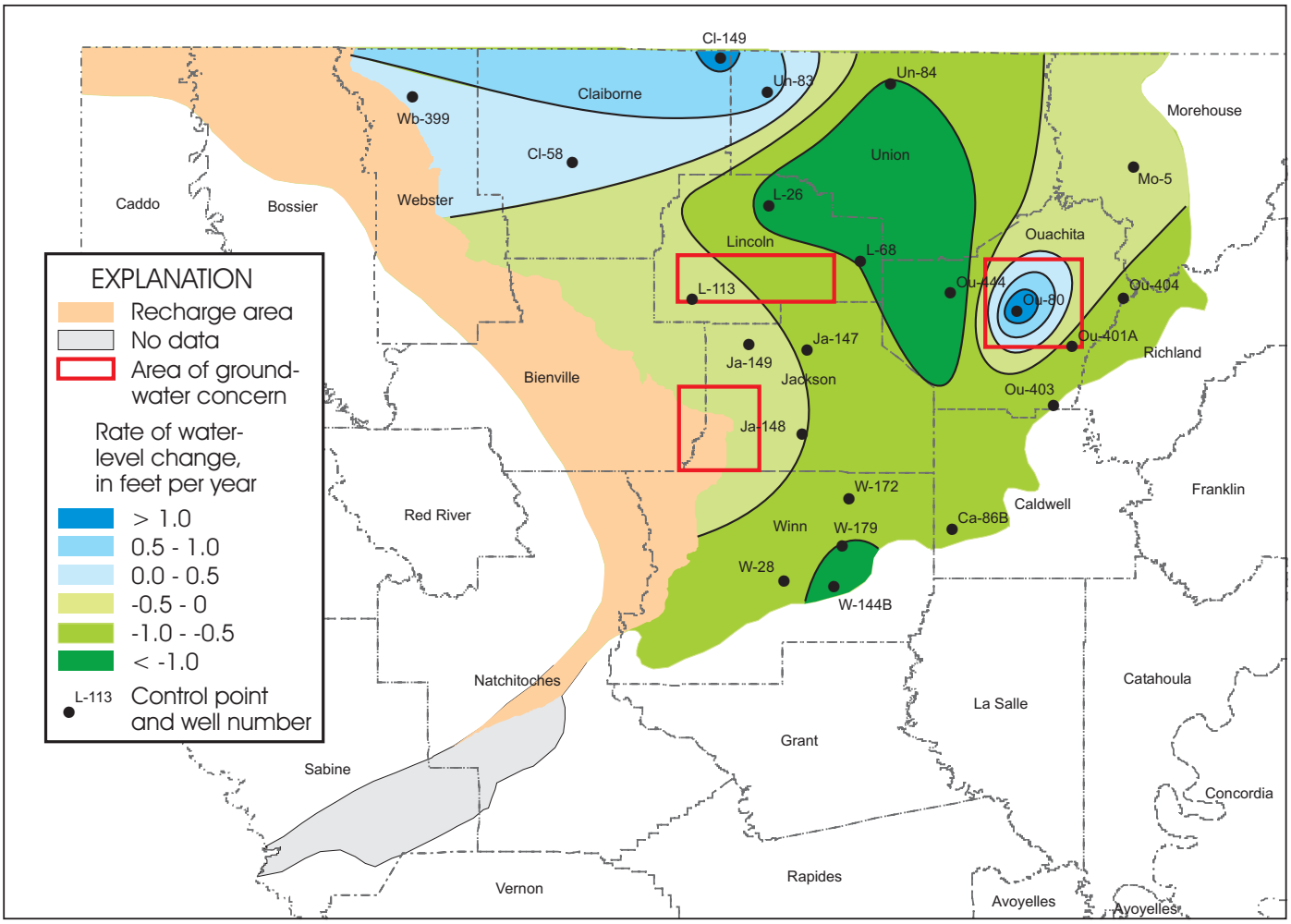
- On January 1, 2008, LDNR entered into a contract with United States Geological Survey in the amount of $16,000 to determine water quality data from the Sparta aquifer system in northern Louisiana.

- On July 1, 2009, LDNR entered into a contract with United States Geological Survey in the amount of $31,000 to determine water quality data from the Sparta aquifer system in northern Louisiana.

- On July 1, 2009, LDNR entered into a contract with Union County Arkansas in the amount of $32,746 to monitor the North Louisiana Sparta Aquifer Recovery.

- On July 1, 2011, LDNR entered into a contract with Union County Arkansas in the amount of $35,375 to collect and analyze water samples from seven Sparta Aquifer Recovery MW'S located in Northern Louisiana.

Water-level changes in the Sparta aquifer, 2000-05

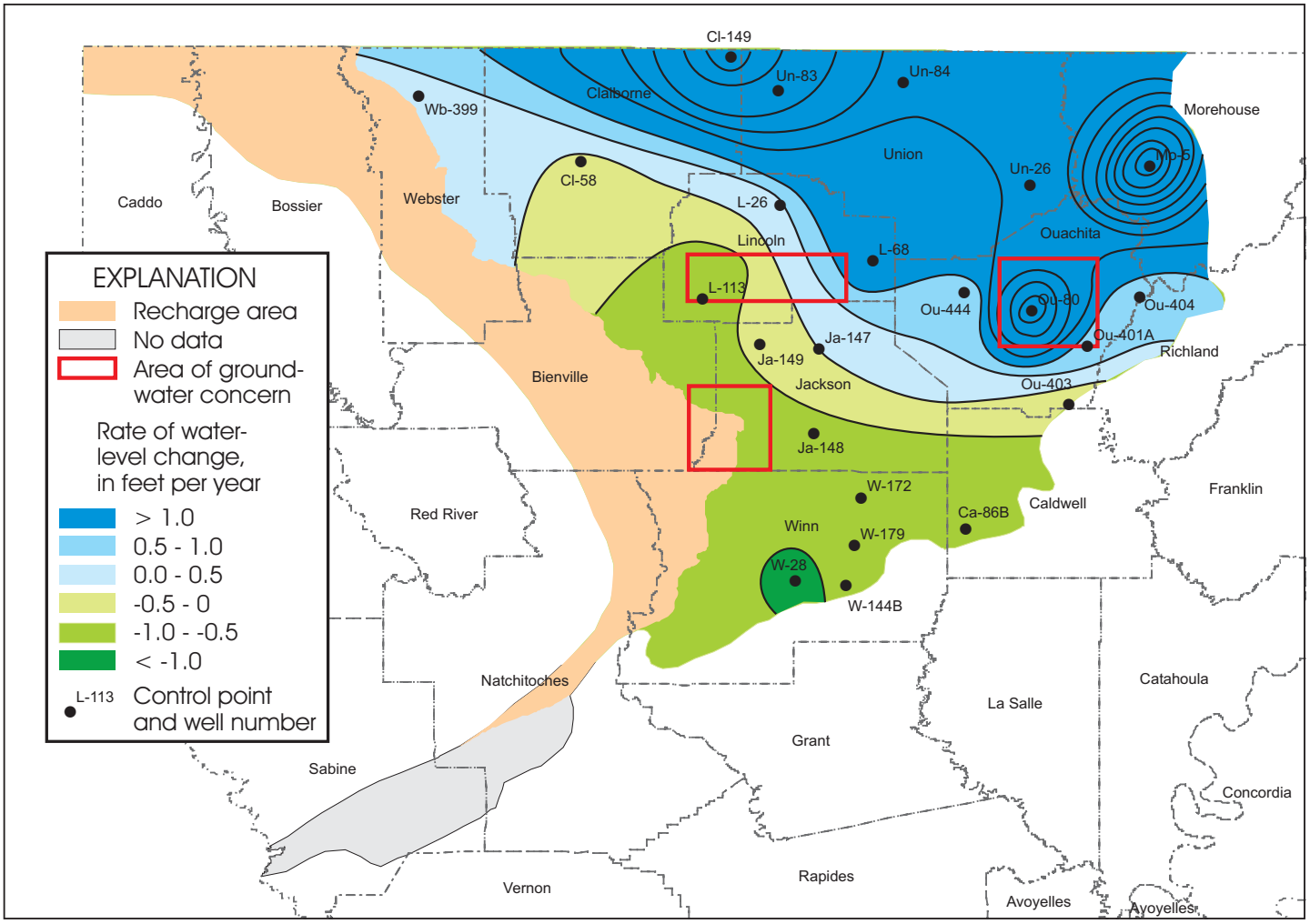


USGS science for a changing world

Unpublished data, subject to revision

This 2000-2005 map from the USGS shows most of the Sparta aquifer system is still in long-term decline during this period, although water levels are starting to rise in northern Claiborne Parish and northwestern Union Parish due to changes in pumping at El Dorado, Arkansas. Water levels have also started to rise at West Monroe, presumably due to decreased pumping there. Much of the area between northwestern Union Parish and West Monroe are not yet affected by these changes and still reflect the long-term decline. Also notable is the continued decline in central Winn Parish.

Water-level changes in the Sparta aquifer, 2006-11



USGS science for a changing world

Unpublished data, subject to revision

The 2006-2011 map produced by the USGS shows water levels rising across much of the northern extent of the Sparta aquifer system in this period due to decreased pumping at El Dorado, West Monroe, and Bastrop. Water levels continue to decline in Winn Parish.

Saltwater Encroachment in Capital Area Aquifers

At the request of the Capital Region Legislative Delegation and East Baton Rouge Parish Metro Council, a public meeting was held on March 8, 2012 on the issue of saltwater encroachment in the aquifer system underlying the Baton Rouge area. The purpose of the meeting was two-fold: 1) to provide information on the issue of saltwater encroachment in the 1,500-foot and 2,000- foot sands of the Southern Hills aquifer system in the Baton Rouge area, and 2) to provide an opportunity for all stakeholders, interested parties and the general public to deliver information on this issue for the Office of Conservation and other governing authorities to consider as they proceed with evaluating, determining, and implementing the next steps to take toward managing aquifer sustainability in Baton Rouge and surrounding areas affected by saltwater encroachment. Comments from this public meeting are summarized on page 78.

A subsequent public hearing has been scheduled for April 12, 2012 to create a record, including the information obtained during and after the March 8, 2012 public meeting, all for consideration by the Commissioner of Conservation in determining what action should be undertaken to manage the sustainability of the Southern Hills aquifer system, particularly as it concerns saltwater encroachment in the 1,500-foot and 2,000-foot sands in the Baton Rouge area. At that hearing, the Commissioner will take testimony, receive evidence, and hear public comments in order to determine if the water levels in the aquifers under East Baton Rouge Parish are being lowered because of excessive pumping of groundwater, and whether the lowering of the water levels in these aquifers is causing the acceleration of the intrusion of saltwater in the 1,500-foot and 2,000-foot sands of the Southern Hills aquifer system from the saltwater aquifers south of the Baton Rouge Fault into the fresh water north of the Baton Rouge Fault.

The Issue Defined:

According to scientific publications from the United States Geological Survey (USGS), two major groundwater supply aquifers of the Baton Rouge area,namely the 1,500-foot and 2,000-foot sands of the Southern Hills aquifer system, have undergone historic high water use dating back to the 1940's and continue to be relied upon to provide large volumes of water supply. Historical observation well data indicate that water levels have declined as much as 175 feet for the 1,500-foot sand – approximately 150 feet from 1945 to 1975, and an additional 25 feet from 1975 to the present. More recent well data indicates that water levels continue to decline, and a large cone of depression in the 1,500-foot sand is centered over the Lula Street, central Baton Rouge public supply pumping station consisting of six 1,500-foot sand wells. Historic observation well data show that water levels of the 2,000-foot sand declined as much as 275 feet from 1945 to 1970, then rose 25 to 50 feet after 1975. However, more recent well data show that water levels of the 2000-foot sand have been mostly stable since 1985. A large cone of depression in the 2,000-foot sand is centered over the Baton Rouge industrial area.

The USGS published information during 1970's reporting that large withdrawals of groundwater from the 1,500-foot sand and 2,000-foot sand aquifers in the Baton Rouge area have caused groundwater flow patterns to change from their former north-to-south orientation toward the pumping centers such that saltwater now flows north across the Baton Rouge Fault System and encroaches into these formerly freshwater areas. Samples collected semi-annually from 13 public supply wells screened in the 1,500-foot sand in 2004 and following years indicate that saltwater encroachment is presently continuing and increasing in this aquifer beneath the Baton Rouge area. Similarly, samples collected semi-annually from 22 wells screened in the 2,000-foot sand in 2004 and following years indicate that saltwater encroachment is presently continuing and increasing in the 2,000-foot sand aquifer beneath the Baton Rouge area.

Legal Framework Established:

Recognizing the issues described above, the state passed legislation in 1974 creating the Capital Area Ground Water Conservation District (District), comprised of the parishes of East Baton Rouge, East Feliciana, Pointe Coupee, West Baton Rouge, and West Feliciana. The legislature also created a board of commissioners to administer the affairs of the district. The Capital Area Ground Water Conservation Commission consists of 15 members including representation from state government, district parishes, and groundwater users and stakeholders. The law provided the Commission with broad authority to manage groundwater resource sustainability in the District which includes, among other things, specific provisions to address saltwater intrusion.

In 2003, the Capital Area Ground Water Conservation Commission (Capital Area Commission) law was amended to recognize the newly established statewide governing authority granted to the Office of Conservation for groundwater resources management. Thus, since 2003, the Capital Area Commission continues to hold all previous authority to manage groundwater sustainability issues within their District with the added measure that they broadly "shall work with" the Office of Conservation as it exercises its groundwater management authority within the district, and more specifically shall have the authority to manage groundwater resources within their District "in conjunction with" the Commissioner of Conservation.

Resource Management Actions:

From its inception in 1974 to present, the Capitol Area Ground Water Conservation Commission has developed and implemented strategies to address groundwater issues within its District including the issues of water level decline and saltwater encroachment in the 1,500-foot and 2000-foot foot sands in the Baton Rouge area. Details of those actions are found in Appendix I. The latest effort will be delivery of a regional groundwater flow and solute-transport model to simulate past, current and a variety of possible future conditions in the 2000-foot sand in the Baton Rouge area, with similar evaluation capabilities for the 1,500-foot sand. The model and simulation results are expected to be delivered and available to the public within nine months, with a target delivery date of October 2012.

Next Steps:

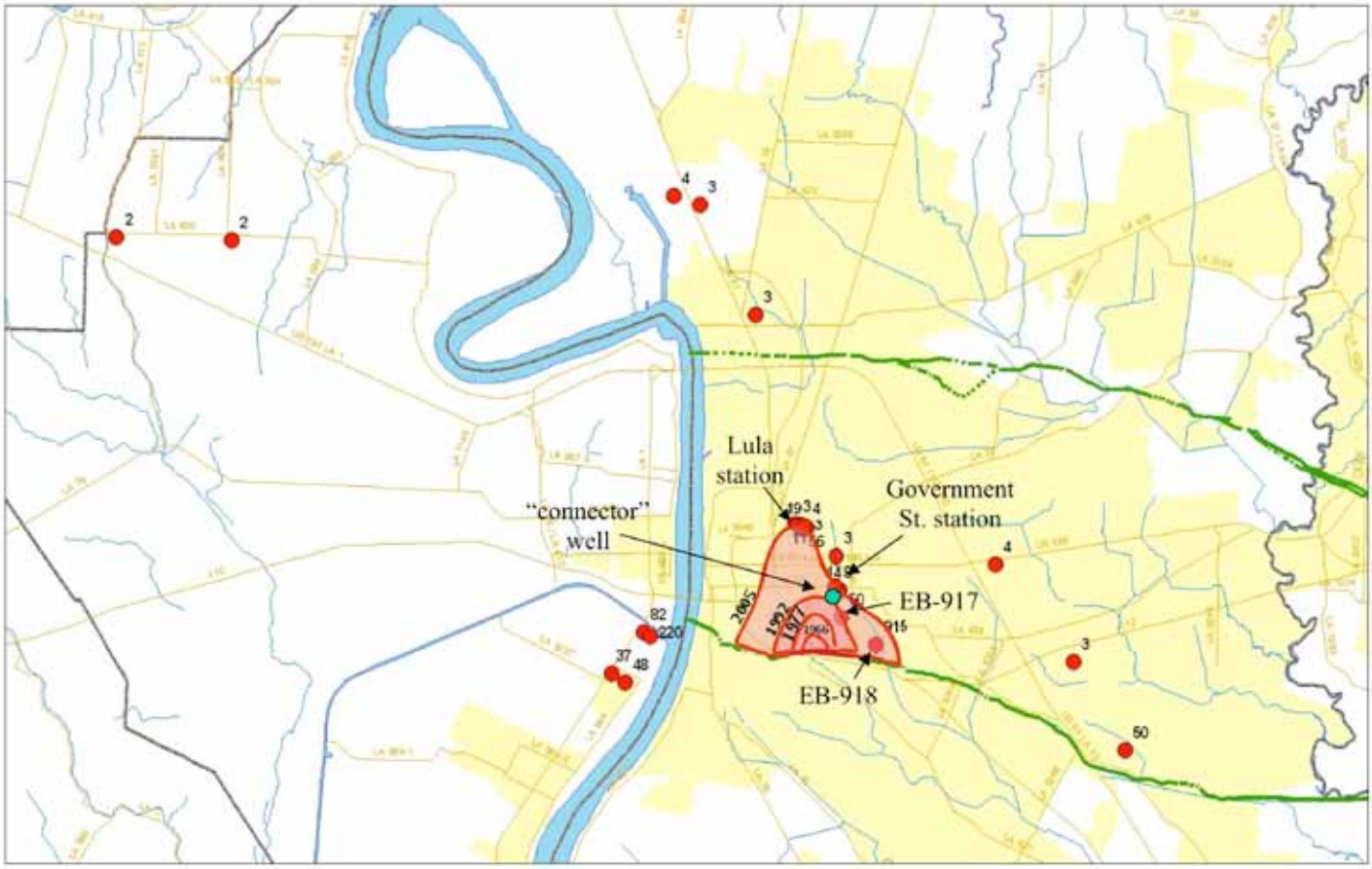
The Office of Conservation will continue to work with the Capital Area Ground Water Conservation Commission, providing the necessary guidance, governance and action, as needed, within our statutory authority to manage the sustainability of the aquifers in the Baton Rouge area. The knowledge gained from the USGS model, in addition to relevant findings of the hearing record, will be considered by the Commissioner in determining what future actions may be necessary to address saltwater encroachment and sustainability of the 1500-foot and 2000-foot sands of the Southern Hills aquifer system.

"We do not know the value of water until we go dry."

- Irish proverb

Saltwater Encroachment in the Capital Area

Images provided by USGS

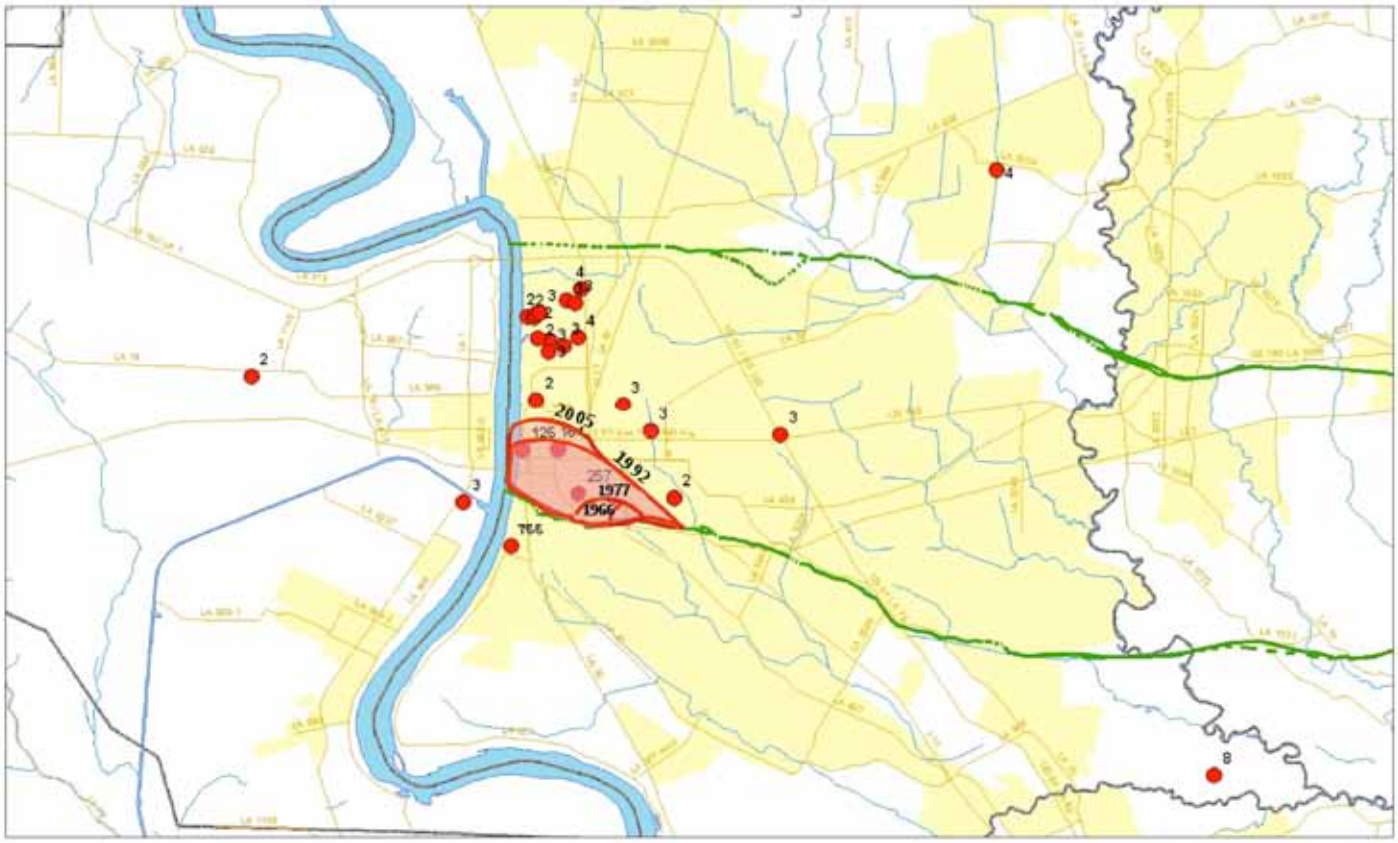


Location of saltwater and chloride concentrations at sampled wells and in the "1,500-foot" sand. (Note: The location of the saltwater interface in 2005 is unpublished and subject to revision.)

USGS science for a changing world

Saltwater Encroachment in the Capital Area

Images provided by USGS



Location of saltwater and chloride concentrations at sampled wells and in the "2,000-foot" sand. (Note: The location of the saltwater interface in 2005 is unpublished and subject to revision.)

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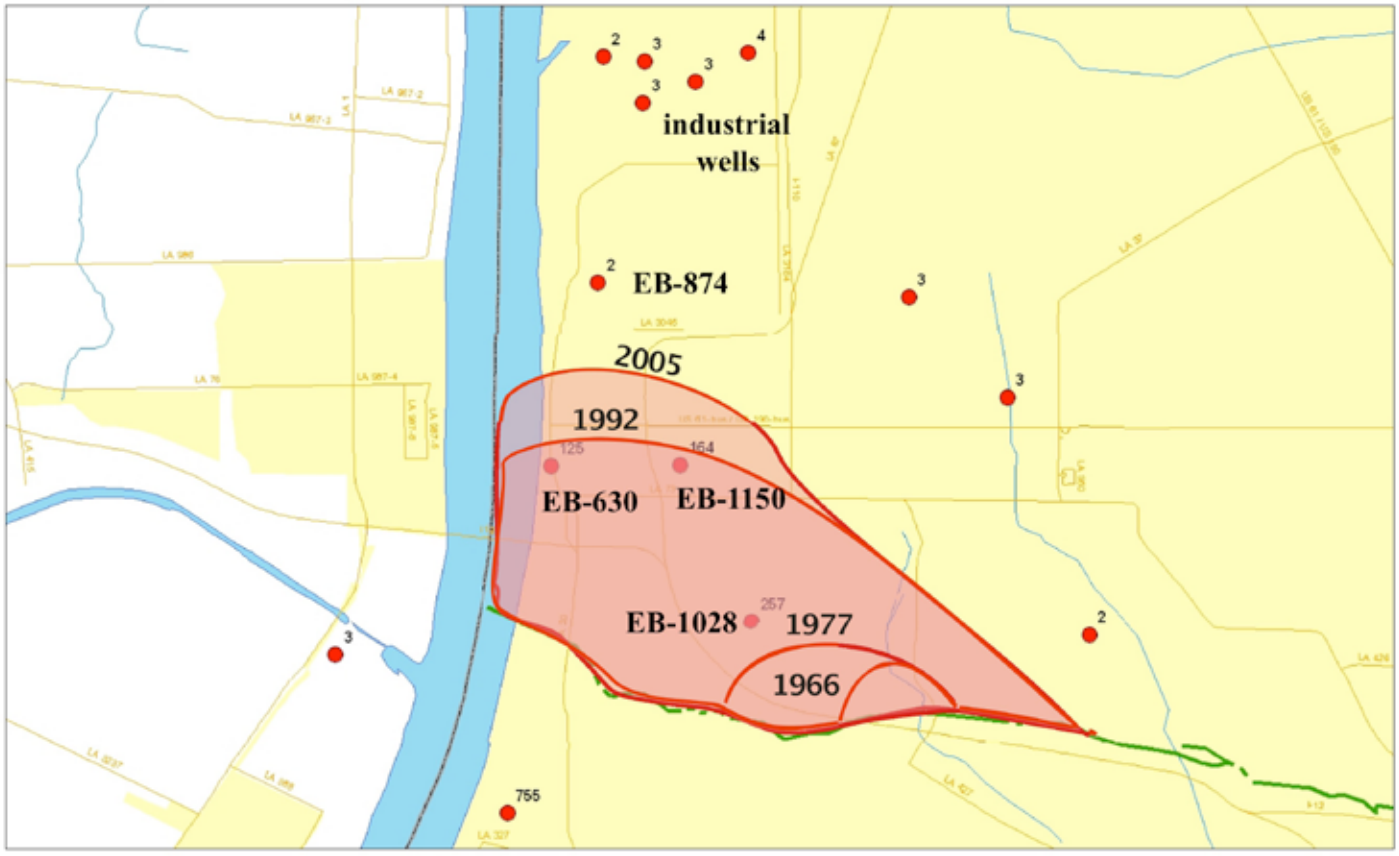
Saltwater Encroachment in the Capital Area

Images provided by USGS



Location of saltwater and chloride concentrations at sampled wells and in the "2,000-foot" sand. (Note: The location of the saltwater interface in 2005 is unpublished and subject to revision.)

USGS
science for a changing world

Comments from March 8, 2012 Capital Area Public Meeting

A public meeting was held on March 8, 2012 on the issue of saltwater encroachment in the aquifer system underlying the Baton Rouge area. Approximately 70 people attended the meeting including local and state officials, state agency and legislative staff, industry and public water supply representatives, media representatives, other interested parties, stakeholders, and members of the general public.

The meeting opened with assurances from the Commissioner of Conservation that the issue of saltwater encroachment and aquifer sustainability in the Baton Rouge area is taken very seriously and will be addressed as necessary within the Office's legal jurisdiction based on sound, objective science. Office of Conservation, Capital Area Ground Water Conservation Commission, and United States Geological Survey (USGS) staff then proceeded with providing information on: 1) the history of saltwater encroachment in the Baton Rouge area dating back to the 1940's, 2) legislative action taken in the 1970's establishing a groundwater resource management governing body, i.e., the Capital Area Ground Water Conservation Commission (Capital Area), 3) legislative action taken in 2003 for statewide groundwater management under the Office of Conservation, 4) actions implemented by the Capital Area from 1974 to present including development of an aquifer sand-specific groundwater flow and saltwater transport model by the USGS, and 5) specific use of the model as a management tool to aid in the management of saltwater encroachment in the Baton Rouge area.

Eight persons in attendance elected to speak during the public meeting, which was being transcribed by a court reporter. Although no specific aquifer remediation plans were discussed in detail, timely action was urged by a majority of speakers. The hearing officer announced that the transcript of the March 8 public meeting would be placed into the official record, and that the information contained in this transcript would assist Conservation staff in preparing for its public hearing on April 12, 2012.

High Water Use in Southwest Louisiana

Southwest Louisiana is a vital part of Louisiana's agricultural and industrial base. According to census data, this area is home to 20 percent of the population of the state. It produces 65 percent of the rice grown in the state, generates 42 percent of the aquaculture and fisheries output, and grows 34 percent of the state's sugar cane crop (LSU AgCenter).

The Chicot aquifer aystem of southwest Louisiana is referred to by the U.S. Environmental Protection Agency as a "sole-source aquifer." In this part of Louisiana, an alternative reliable source of freshwater to groundwater is not readily available. Surface water diversions from both the Toledo Bend Reservoir to the Sabine River and onward to the Sabine River Diversion Canal provide some supply to industries to the west around the Lake Charles area, and from the Atchafalaya River to Bayou Teche to farmers to the east. SRA-LA is currently under contract with 12 industries and two public utilities from the Lake Charles area to divert over 79 million gallons of Toledo Bend Reservoir water down the Sabine River Diversion Canal. But the water levels of the Chicot aquifer system, the primary source of water for southwest Louisiana and the largest provider of groundwater of the state (40 percent) (USGS, 2011), have declined as much as 50 feet or more in Calcasieu, Jefferson Davis, and Acadia Parishes since major industrial pumping began. The rate of decline in these areas is due primarily to industrial use in the Lake Charles area and rice irrigation. The observed decline has been as much as one to two feet per year (USGS, 2011). However, water level declines in the rice-growing areas are seasonal, and the water levels fluctuate as much as 20 feet each year, recovering to their pre-pumping levels. Saltwater migration/intrusion from deeper sands has occurred in wells in the high water use Lake Charles area. Others areas with saltwater concerns are the vicinities of Iowa and Opelousas, as well as areas along the eastern edge of the Chicot Aquifer System, which are affected by the presence of salt domes and/or relic saltwater.

In 2011, it was estimated that 40,000 to 80,000 acres of irrigated rice field in southwest Louisiana, primarily in Vermilion Parish, might be at risk if intrusion of saltwater from the Gulf of Mexico within canals used for irrigation could not be stopped. Saltwater intrusion in coastal Louisiana is a constant battle that has now been exacerbated by drought causing decreased freshwater influx, damaged levees and old spoil banks, and damaged water control structures. Diversion of 138 billion gallons of Atchafalaya River water by the Teche-Vermilion Freshwater District eased the saltwater problem for some in eastern Vermilion Parish, but the current lack of freshwater influx and/or the presence of saltwater has remained an issue for many rice farmers. Some of the issues are being remediated by the U.S. Army Corps of Engineers, which controls and maintains the locks. This is a repeat of the situation first observed in Southwest Louisiana in 1999-2000, in 2003, in 2005 in the aftermath of Hurricane Rita, and in 2007.

Temporary Ground Water Emergency: Southern Caddo Parish

Extreme drought conditions in north Louisiana triggered a termporary groundwater emergency declaration by the Office of Conservation on August 19, 2011 for two areas of southern Caddo Parish. Higher than normal withdrawals of groundwater without sufficient offsetting aquifer recharge caused water levels in the Carrizo-Wilcox and Upland Terrace aquifers to drop, resulting in several water wells in the area going dry in July 2011.

To prevent further water level decline and reduce stress on the aquifers in these two areas, the Office of Conservation ordered water conservation measures and ground water use restrictions.

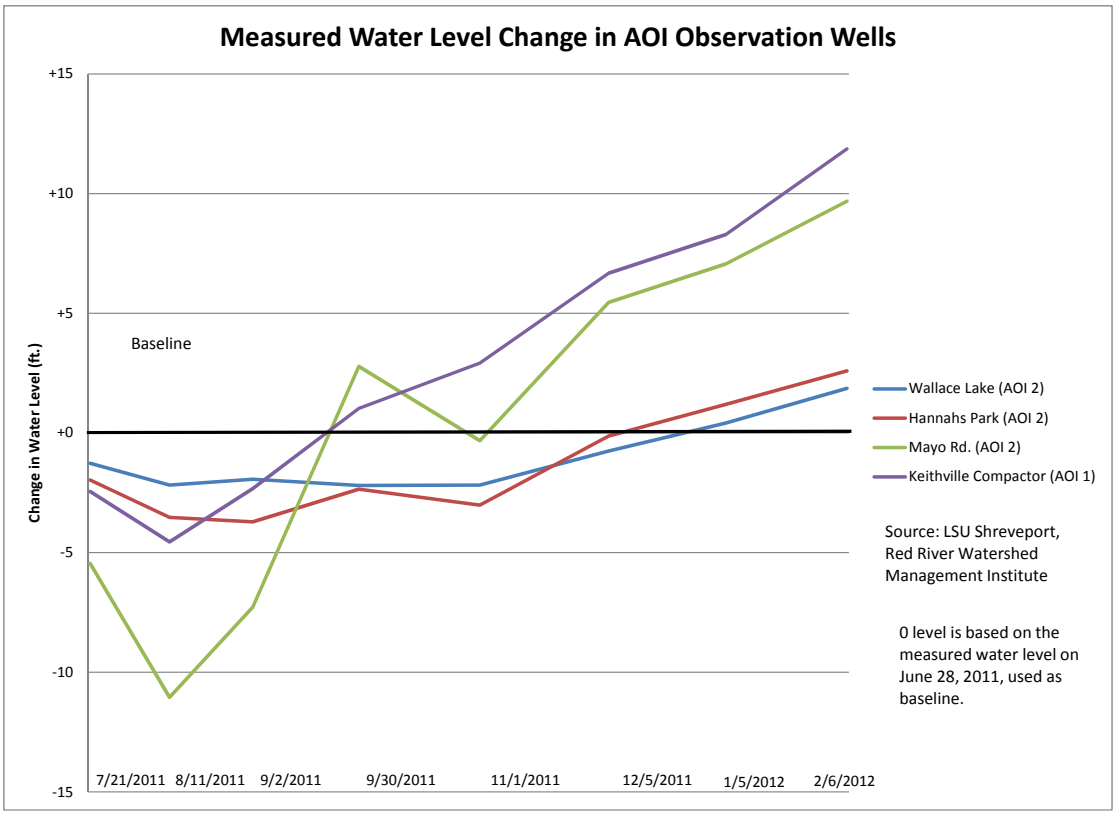
Since issuance of the emergency order, Conservation staff has continued to monitor hydrologic data in the region provided to our agency courtesy of the LSU Shreveport Red River Watershed Management Institute. Review of the groundwater level data received on February 6, 2012 collected from the LSU Shreveport monitoring wells located in the areas of interest indicate that water levels from November 2012 to present continue to show a gradual upward trend. Water level data reported during January and February 2012 indicate that water levels at all four monitored locations have risen above water levels reported on June 28, 2011 (see page 81).

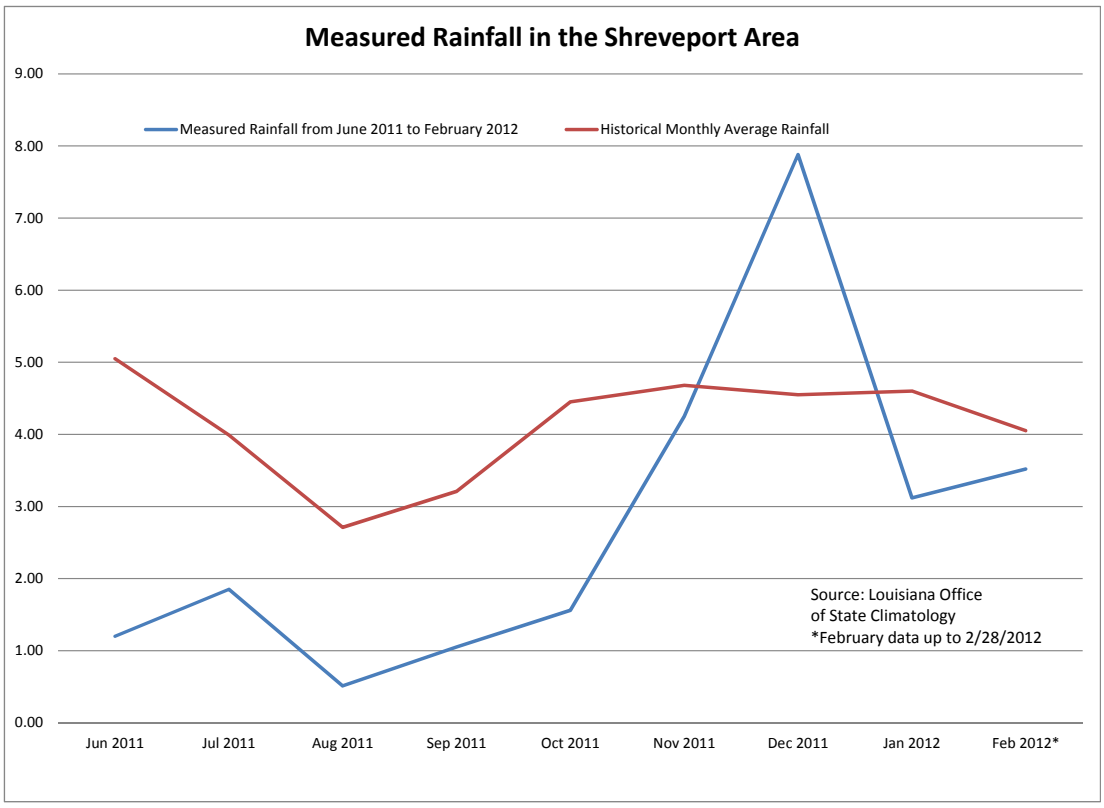
The most recent U. S. Drought Monitor Report for Louisiana dated February 22, 2012 indicates drought conditions continue to improve in the areas of interest having been upgraded from "extreme" to "severe."

The Louisiana Office of State Climatology rainfall data for the area south of Shreveport indicates monthly rainfall totals for June through October 2011 to be well below respective average monthly rainfall with the month of October 2011 reported to be 65 percent below the monthly average. The rainfall total for the month of November is reported to be within nine percent of the monthly average and continued improvement is noted for December with a 73 percent increase of rainfall above the normal average. Although rainfall in the area continues to show marked improvement from summer and fall 2011 rainfall totals, rainfall reported for January 2012 fell 32 percent below the monthly average and February totals to date are reported to be 13 percent below the monthly average (see page 81).

In summary, although aquifer water levels and measurable rainfall data continue to show signs of improvement, severe drought conditions are expected to continue to place high groundwater demands on the aquifer systems underlying the areas of interest. The Office of Conservation will continue to closely monitor hydrologic conditions in the areas of interest and periodically provide updates on the same. All restrictions and conditions set forth in the Emergency Order shall remain in full effect at this time and until further notice.

Recognizing that additional monitoring was needed to fully evaluate water levels in the two areas of interest, on November 1, 2011, LDNR entered into a contract with United States Geological Survey in the amount of $10,400 adding four more observation well locations to the existing network thus providing the agency a more comprehensive assessment of conditions in these areas to manage regional aquifer sustainability.


Measured Water Level Change in AOI Observation Wells
+15
+10
+5
+0
-5
-10
-15
Change in Water Level (ft.)
Baseline
7/21/2011
8/11/2011
9/2/2011
9/30/2011
11/1/2011
12/5/2011
1/5/2012
2/6/2012
Wallace Lake (AOI 2)
Hannahs Park (AOI 2)
Mayo Rd. (AOI 2)
Keithville Compactor (AOI 1)
Source: LSU Shreveport, Red River Watershed Management Institute
0 level is based on the measured water level on June 28, 2011, used as baseline.


Measured Rainfall in the Shreveport Area
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Measured Rainfall from June 2011 to February 2012
Historical Monthly Average Rainfall
Jun 2011
Jul 2011
Aug 2011
Sep 2011
Oct 2011
Nov 2011
Dec 2011
Jan 2012
Feb 2012*
Source: Louisiana Office of State Climatology
*February data up to 2/28/2012

Other Aquifer Issues

In its report, *Recommendations for a Statewide Ground Water Management Plan,* December 7, 2011, Ecology and Environment, Inc. provides a summary of known or potential adverse impacts to groundwater quality or availability in the major aquifer systems in Louisiana. The chart below includes an aquifer-by-aquifer reference of major aquifer issues such as those noted in the Sparta, Southern Hills (Capital Area) and Carrizo-Wilcox aquifer systems are discussed in greater detail in prior text in this chapter.

Summary of Impacts to Major Aquifer Systems in Louisiana

Aquifers	Location	Impacts
Mississippi River Alluvial Aquifer	Aquifer wide	Water quality (total dissolved solids [TDS], metals)
	Franklin Parish, SE Ouachita Parish	Naturally-occurring chlorides
	Coastal Parishes	Saltwater intrusion from Gulf of Mexico and potential upward migration of saltwater
	Sporadic throughout	Occurrence of methane in shallow sands
	Aquifer wide	Agricultural applications (pesticides/herbicides, fertilizers) Water quality (TDS, metals) Naturally-occurring chlorides
Chicot Aquifer	Iowa, LA	Shallow saltwater, possibly from Iowa Salt Dome
	Lake Charles	200 ' and 500' sand have been impacted by water level decline from industrial activity/over pumping and increased TDS impact
	Lake Charles	200 ' and 500' sands exhibit the presence of methane 700' sand is being impacted by saltwater intrusion
	Opelousas	Possible saltwater intrusion from naturally-occurring chlorides, salt domes in the area
	Coastal Zone	Saltwater intrusion from Gulf of Mexico, subsidence, and land loss
	Eastern edge of Chicot	Contact with Atchafalaya Aquifer provides potential increased TDS impact
Jasper Aquifer	Leesville	Water level decline and increased TDS impact
	Alexandria	Water level decline and increased TDS impact
Cockfield Aquifer	Southern Winn/Northern Grant Parishes	Water level decline and increased TDS impact
Sparta Aquifer	Monroe	Water level decline and increased chlorides
	Ruston	Water level decline and increased chlorides
	Minden	Water level decline and increased TDS impact
	Jonesboro Hodge	Water level decline and increased TDS impact
	Winnfield	Water level decline and increased chlorides
Carrizo- Wilcox Aquifer	Sporadic Throughout	Water level decline and increased TDS/chlorides
	South of Shreveport	Water level decline and increased TDS impact
Southern Hills Aquifer	Baton Rouge	Water level decline and saltwater intrusion
	Bogalusa	Water level decline and increased TDS impact

Toledo Bend Reservoir

In 1950, the legislature of the State of Louisiana created the Sabine River Authority, State of Louisiana, by Act 261 of 1950, amended by Act 432 of 1956, and shown as Louisiana Revised Statutes Title 38, Section 2321, et. Seq., as amended. The voters of the State of Louisiana, on November 8, 1960, passed Amendment Number 8 to the 1921 Constitution of the State of Louisiana, (Article 14, Section 45), which ratified the creation of the Sabine River Authority and gave it constitutional status. These provisions were subsequently transferred to La. R.S. 38:2321, et. Seq., after adoption of a new constitution in 1974.

The Toledo Bend Reservoir Project was funded, constructed, and managed by the Sabine River Authority of Louisiana (SRA-LA) jointly with the Sabine River Authority of Texas (SRA Texas). A feasibility report was done on the project by Forrest & Cotton, Inc. in 1958. Thereafter, the Federal Energy Regulatory Commission issued a License on October 14, 1963 for 50 years. That license is set to expire in 2013. Construction of the dam was complete and operations began in 1969.

Toledo Bend Project Joint Operations (TBPJO) are controlled by the Basic Contract between Louisiana and Texas. Administration of the operations is handled by SRA Texas whereas the engineering is done by SRA-LA. There is a TBPJO Operating Board with two Board members from each respective Authority and an Executive Director/General Manager from each Authority. The TBPJO Technical Committee includes staff from each Authority.
The Sabine River Diversion System was created by Act's 90 and 117 of the 1970 legislature as part of the program for utilization of the waters impounded in Toledo Bend Reservoir. The Sabine River Diversion Canal was constructed by the Department of Public Works and completed in 1981. Act 898 of 1985 transferred responsibility for maintenance and operations to SRA-LA. The Diversion System is a water conveyance system consisting of more than 35 miles of unlined, open channel canals, nearly four and a half miles of underground pipelines, three pumping stations, and five automatic level control gates. The system diverts surface water from the Sabine River to supply agricultural, municipal, and industrial water needs in southwest Louisiana and reduce dependence on the Chicot Aquifer. Approximately 20 billion gallons are diverted annually.

SRA-LA currently has about 43 active water sales contracts in effect (Appendix J). About eight of those are long-term contracts to municipal or utility customers. About 14 are intermediate-term to industrial customers, and the rest are short-term contracts.

Current Major Issues (cont.)

The stated mission of the SRA-LA is, "to provide for economic utilization and preservation of the waters of the Sabine River and its tributaries by promoting economic development, irrigation, navigation, improved water supply, drainage, public recreation, and hydroelectric power for the citizens of Louisiana."

One of the goals of the SRA-LA is, "to strengthen SRA's financial ability to service debt obligations, support existing programs, and implement new programs." A stated objective and strategy to achieve this goal include:

- Developing Water Supply as the primary source of revenue to support the Toledo Bend Project in lieu of Hydro electric Power Production by 2018.
- Identifying and developing markets to utilize the water of the Sabine River Basin, its tributaries and reservoirs, for municipal, industrial, and agricultural purposes.

Consistent with this goal, objective and strategy, out-of-state water sales have been considered by SRA-LA for a number of years. However, recently there was an effort of SRA-LA to sell raw water from the Toledo Bend Reservoir (Appendix A). For a variety of reasons, the SRA-LA elected to suspend this effort.

Here is a timeline of those recent actions taken by the Board of Commissioners of SRA-LA:

- January, 2011: The board's water sales committee considered a proposal received by staff from Toledo Bend Partners, LLC. A negotiating team was named, a law firm approved for hiring, and the executive director authorized to execute the necessary documents.
- August, 2011:Upon recommendation of the water sales committee, the Board approved the out-of-state water sales Contract with Toledo Bend Partners, authorized the director to execute the contract and send it to Governor for his approval.
- September, 2011: A letter was received from the governor's office with written directions that SRA-LA put together a request for proposal for the out-of-state water sales contract. The board authorized the board chairman, water sales committee chairman, executive director and SRA-LA staff to prepare an RFP for out-of-state water sales contract, to let for bids, and to report back to the board to make a recommendation to accept or reject the bids.
- November, 2011: As recommended by the governor's office, staff prepared an RFP specific to out-of-state water sales contract. The deadline to return proposals was November 9, 2011, at which time bids were opened for the RFP. Only one proposal was received, that being from Toledo Bend Partners, LP.
- December, 2011: Board discussed the drought contingency plan, length of the contract, the state's water needs, as well as spending the revenue from the sale of water. Board moved to delay accepting the proposal from Toledo Bend Partners, LP until the public had time to review and make comments.
- January, 2012: Upon recommendation of the executive director, the board suspended the consideration of an out-of-state water sales contract until the State of Louisiana develops a statewide comprehensive water plan.

Other states are likely to be interested in Louisiana's water resources. The recent effort of the SRA-LA to sell raw water from the Toledo Bend Reservoir evidences that there is valuable, marketable interest in our water. Before taking steps to act on this situation, we should consider the long-term effects on our state, let experts research the issue, and let it be fully debated through a transparent process.

Act 955 of 2010: Procedure for Authorizing Withdrawals from Running Waters of the State for Non-Riparian Owners

With Act 955 of 2010, the Louisiana Legislature has directed the LDNR to serve in a stewardship role in the management, preservation, conservation, and protection of the running surface water of the state. The statute authorized the secretary of LDNR to develop a voluntary application process and to enter into cooperative endeavor agreements (CEAs) with prospective consumptive water users for the withdrawal of surface water from state-owned water bodies

The content of the application includes a plan of water use, any supporting documents, and an economic impact report from users seeking to compensate Louisiana for the value of the water taken with credit for the values of their project in-lieu of cash payment. After the water user's plan of water use is reviewed by a hydrologist in the LDNR, comments are solicited from the Departments of Environmental Quality and Wildlife and Fisheries. When applicable, the Departments of Health and Hospitals and Transportation and Development are also asked to provide comments to ensure that the plan does not present any adverse impacts to the resource, users, or the environment. All agreements are presented to the Office of Coastal Protection and Restoration for a review of the plan of water use for consistency with Louisiana's Comprehensive Master Plan for a Sustainable Coast. Each agreement is confected on a form that was developed by the Mineral and Energy Board and approved by the Attorney General. Almost immediately after the program began, an online electronic submittal and tracking process was established to streamline the process for users and commenting agencies. To date the state has reviewed more than 40 applications and entered into more than 30 agreements (Appendix D).

For the applicants that select to submit cash payments for their use of running surface water of the state, LDNR is using the fee charged by SRA-LA ($0.15 per 1,000 gallons). In an attempt to assess the economic value of raw surface water in Louisiana, LDNR, in July, 2011, proposed to the Mineral and Energy Board that a survey of water purchasers and sellers be completed. The online survey showed that a broad range of fees were being practiced in the state (Appendix K), however, the number of positive responses was too small to statistically evaluate the results.

Act 955 sunsets on December 31, 2012. HB-532 has been submitted to the 2012 regular session of the legislature requesting to extend its authorization until December 31, 2014.

Emerging Technologies for Energy Exploration

Over the last several years, Louisiana, and indeed the U.S., has witnessed an exponential increase in the application of horizontal drilling and hydraulic fracturing stimulation technologies to access oil and natural gas deposits once thought impossible to recover, giving rise to the term "unconventional resources." In Louisiana alone, the use of these technologies at their 2010 peak in the state was nearly 30 times what it was in 2007.

This has contributed to a marked increase in domestic energy production and has, in fact, reversed a decades-long decline in our nation's oil production. The application of this technology, commonly referred to as "fracking," has allowed the Haynesville Shale in northwestern Louisiana and east Texas to become the nation's largest natural gas shale producer in only four years. Although Haynesville Shale wells made up only nine percent of Louisiana's active gas well count in 2011, they accounted for an astounding 68 percent of our state's 2011 natural gas production.

All of this has contributed to the economy in a big way. In a 2010 economic impact study, economist Loren Scott noted that Haynesville Shale activity benefited the state through $16.9 billion in business sales, $4.3 billion in new household earnings, and more than 111,000 jobs tied directly or indirectly to the activity. And in fact, expansion in the oil and natural gas industry sector alone contributed nine percent of all jobs created in the U.S. in 2011.

In addition to creating jobs, this increased production has sparked a new debate on the possibility of the U.S. gaining the long-sought-after goal of energy independence and ushering in a new world order for national security. That's a big statement, but experts agree that discovering and producing more domestic energy will help inoculate us against the spreading impacts of the many world events that lead to spiraling fuel costs, while at the same time slowing down the transfer of U.S. wealth to unstable areas of the globe.

Here in Louisiana, the use of these technologies, in only a few short years, has transformed the natural gas supply chain. In 2003, then-Federal Reserve Chairman Allen Greenspan testified to the U.S. Congress that we, as a nation, didn't have enough natural gas to fuel our economy, and that we needed to embrace construction of natural gas import facilities and the subsequent importation of foreign natural gas. Due to supply challenges, in the summer of 2008, natural gas prices spiked to $13 per thousand cubic feet. While having a positive impact on drilling investment, this unsustainable commodity pricing sent the chemical and petrochemical industry, a huge user of natural gas, reeling with cutbacks, closures, and layoffs. Yet by 2009, the wider use of horizontal drilling and hydraulic fracturing stimulation in unconventional resources led to a claim that the U.S. was now sitting on a 100-year supply of natural gas. Commodity pricing begin to fall and is now currently trading around $2.50 per

thousand cubic feet. The result is a boom in chemical and petrochemical expansion, employment, and investment.

Some of the activity directly credited to natural gas price and availability includes:

- Dow Chemical re-opening its St. Charles Parish ethylene plant
- Nucor's announced investment of up to $750 million in a new St. James Parish iron-making facility
- Williams chemical company's announced 44-percent expansion of its ethylene plant in Ascension Parish
- Sapa's announced expansion of its Richland Parish aluminum products manufacturing facility
- Union Pacific's $200-million expansion of rail capacity along the Mississippi River to support increased petrochemical activity
- Sasol's announced investment of $4.5 billion for an ethylene plant in Calcasieu Parish
- Sasol's consideration of Calcasieu Parish as the site of an up-to-$10-billion new facility to convert natural gas to liquid fuel
- Cheniere Energy's moving forward with plan to invest more than $4 billion in expanding its Sabine Pass Liquefied Natural Gas (LNG) import facility in Cameron Parish to allow for liquefaction and export of domestic natural gas as LNG
- The Port of New Orleans' announced 34-percent increase in chemical exports in 2010

Simply put, this has been good for Louisiana. But why is this being mentioned in a report on water resources? Because the unlocking of these unconventional resources requires water, and lots of it. It requires the consumption of one natural resource, water, to make available another natural resource, natural gas. The average hydraulic fracking job in Louisiana uses five millions of gallons, as reported to the Office of Conservation from 2009 to 2012. The charts on page 92 show that energy industry has been very cooperative in seeking the use of abundant surface water rather than ground water.

At present, the only area of the state that has experienced significant increased water usage associated with hydraulic fracturing for shale-gas production purposes is in the northwestern portion of the state – where Haynesville Shale development has been focused in the parishes of Bienville, Bossier, Caddo, DeSoto, Natchitoches, Red River, Sabine, and Webster.

At the onset of development in summer and early fall of 2008, operators were relying primarily on local groundwater resources to supply water for drilling (referred to as rig supply water) and hydraulic fracturing (referred to as "frack water"), withdrawing large volumes of water from the Carrizo-Wilcox, Upland Terrace, and Red River Alluvial aquifer systems. In order to protect and preserve the sustainability of the Carrizo-Wilcox, which is a low-yielding, high-quality aquifer system used predominantly for public supply and domestic purposes throughout the Haynesville Shale development area, the Commissioner of Conservation issued an October 2008 water use advisory to the oil and gas industry (Appendix L).

Current Major Issues (cont.)

Haynesville Shale operators were advised to seek frack water supply alternatives to groundwater from the Carrizo-Wilcox aquifer system, and encouraged to draw water from the more prolific, lesser-quality Red River Alluvial aquifer, or from abundant surface water sources such as the Toledo Bend Reservoir or the Red River.

Subsequent to issuance of the advisory, in October 2009, the agency began requiring oil and gas operators to report water use source and volume information for every work permit issued for hydraulic fracture stimulation operations.

Based on data obtained from this reporting requirement following issuance of the water use advisory, we know that approximately 75 percent of all water used at Haynesville Shale well locations reporting from October 2009 to present originated from surface water resources.

Other areas of the state hold promise for additional unconventional resources; specifically the Tuscaloosa Marine Shale and the Lower Smackover/Brown Dense (map page 93). The Tuscaloosa Marine Shale, estimated to contain as much as seven billion barrels of oil, is believed to underlie much of central Louisiana, with potential productive areas currently being explored from Vernon and Sabine parishes to Tangipahoa Parish. The potential "Brown Dense" productive area spans portions of northern Louisiana and southern Arkansas – including the parishes of Claiborne, Morehouse, Union and East and West Carroll – is believed to lie at the base of the Smackover, a well-known formation that has long been a source for traditionally produced oil and natural gas in northern Louisiana. Industry estimates of oil contained in the formation have ranged as high as 3 billion barrels.

As the energy industry focuses more on the opportunities represented by these unconventional resources, and consequently requires more water, it is important that Louisiana likewise remains focused on water issues to avoid injuring one resource to take advantage of another. It is critical that we ensure the appropriate balance of the Three E's-Energy, Environment, and Economy.

What is Hydraulic Fracture Stimulation?

The practice of hydraulic fracture stimulation in the oil and natural gas exploration industry involves using water pressure to create hairline fractures in dense geologic formations, creating a path for oil and natural gas to flow to wells through otherwise-impermeable rock. Hydraulic fracture stimulation is not a new technique – exploration companies began common implementation of the practice in the 1940's, and the national Interstate Oil and Gas Compact Commission (IOGCC) has noted that more than one million wells across the U.S. have been fractured since that time.

The IOGCC and U.S. Environmental Protection Agency (EPA) estimate that about 35,000 wells in the U.S. are stimulated with hydraulic fracture stimulation each year. Operators have hydraulically fractured approximately 40,000 wells in Louisiana since the practice began to take hold in the state in the 1960's.

EPA Director Lisa Jackson has spoken several times in recent months to the track record of fracture stimulation practices and regulation, including her statement in May 2011 testimony to the U.S. House of Representatives Committee on Oversight and Government Reform, that "I'm not aware of any proven case where the fracking process itself has affected water."

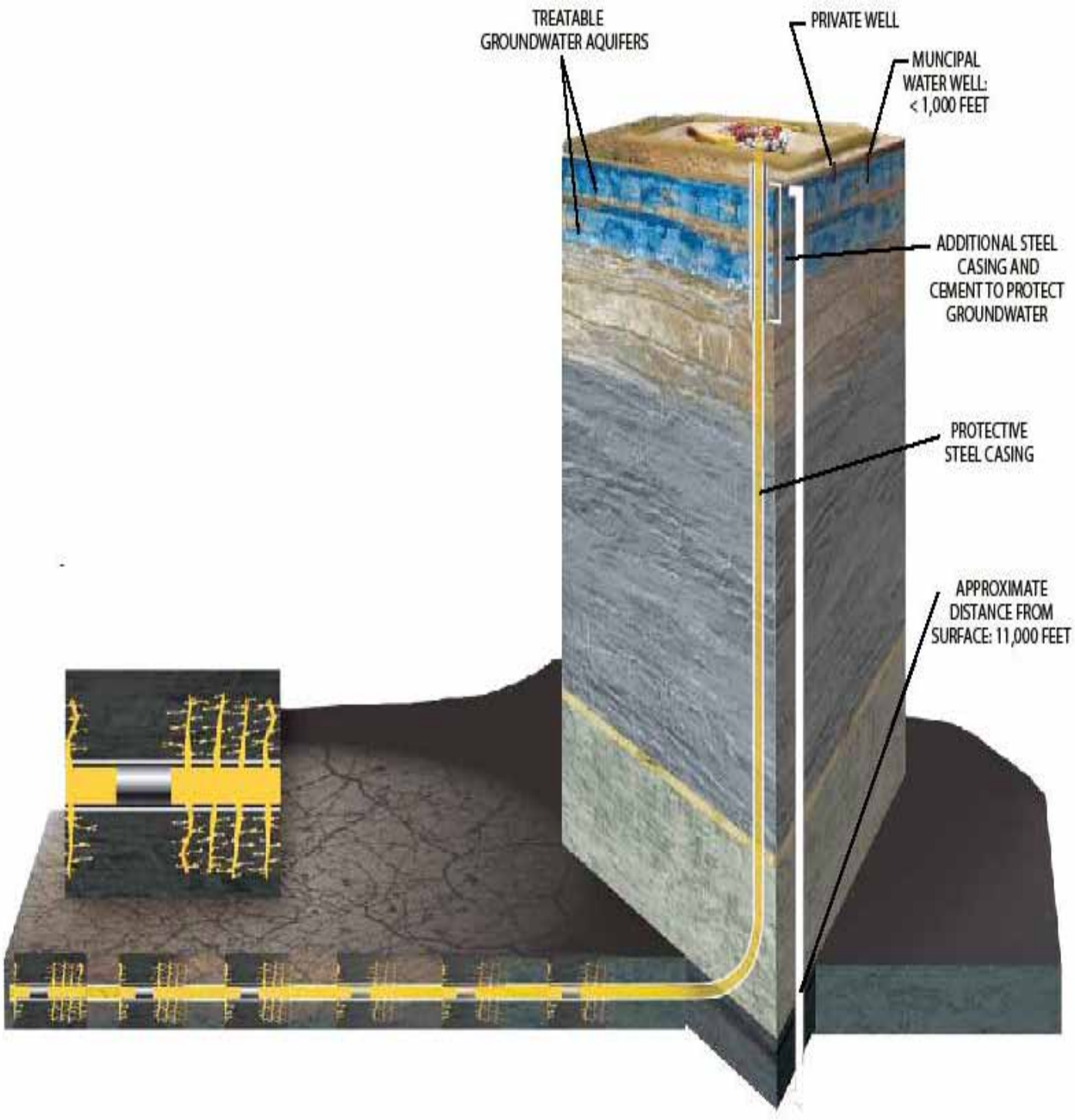
In a November media interview, Jackson noted indicated that states were doing a "good job" in regulating fracturing and that additional federal regulation of the practice may not be necessary in the future.
At a recent energy symposium in New Jersey, Jackson said, "I think that fracking as a technology is perfectly capable of being clean. I do. But it requires people who are doing it and innovators who use the technology to take some time to make sure that it's done right. And it requires smart regulation, smart rules of the road."

How is It Regulated?

The Louisiana hydraulic fracturing disclosure regulation requires operators to report all additives used in hydraulic fracturing fluids and the names and concentrations of chemicals which are subject to Occupational Safety and Health Administration (OSHA) Hazard Communication requirements (29 CFR 1910.1200) and are not deemed trade secret. Disclosure can be made by reporting directly to the Office of Conservation or via the Frac Focus website. The Louisiana regulation has no effect on rules or laws mandating disclosure of trade secret information to health care providers. The requirements are effective for wells with drilling permits issued on or after October 20, 2011.

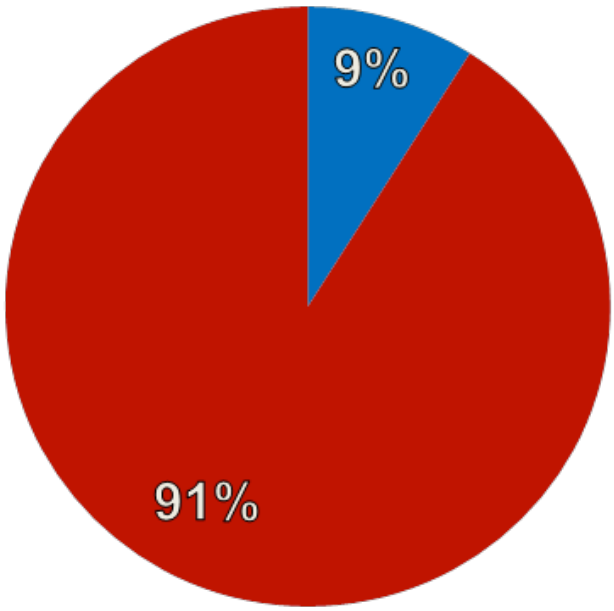
The disclosure rule was developed following a recommendation in the March 2011 report made by the non-profit, multi-stakeholder organization, STRONGER, Inc. (State Review of Oil and Natural Gas Environmental Regulations), summarizing the results of their review of Office of Conservation policies and regulations associated with the hydraulic fracturing. To draft the rule, the Office of Conservation consulted with operators and used portions of the hydraulic fracturing regulations recently promulgated in the State of Arkansas and statutes recently passed in Texas as models. A summary of other states regulations can be found as Appendix M.

Horizontal Wells and Hydraulic Fracturing

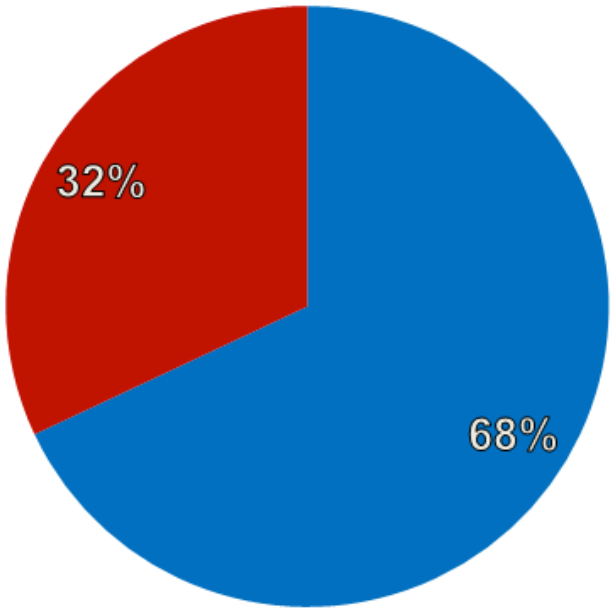


Haynesville Shale vs. All Other Louisiana Natural Gas 2011 Wells & Production

Percentage of Total Natural Gas Wells



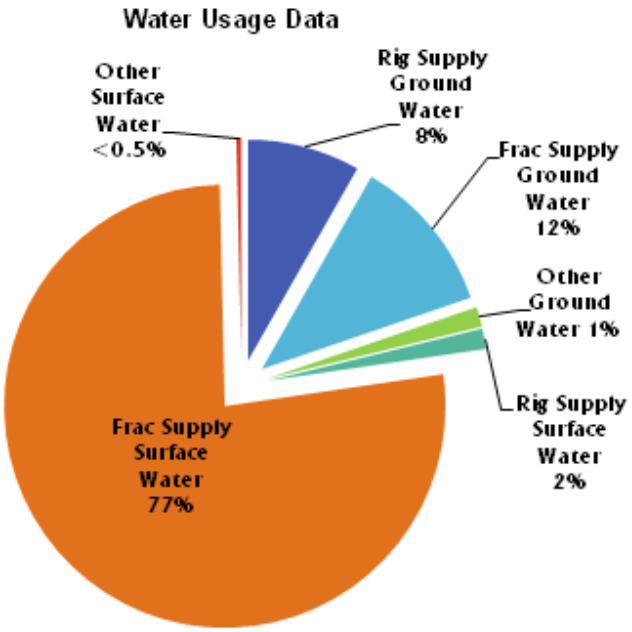
Percentage of Total Natural Gas Produced

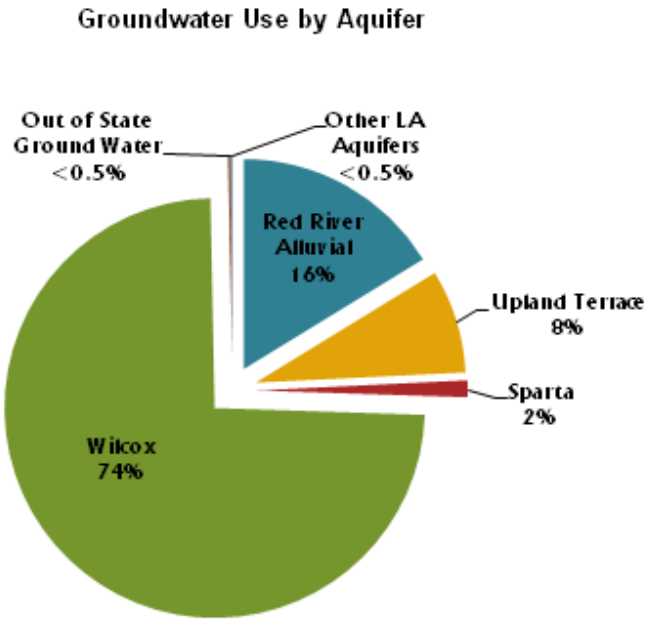


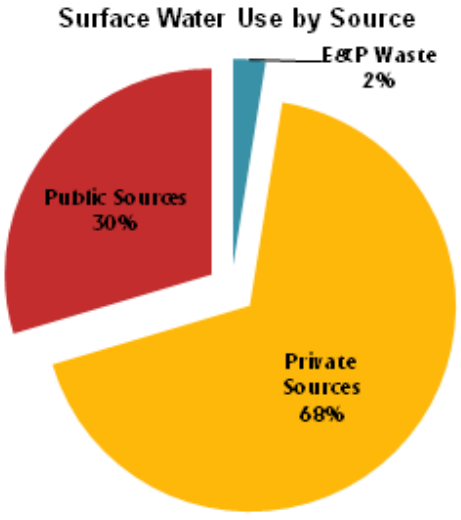
Haynesville Wells Other Wells

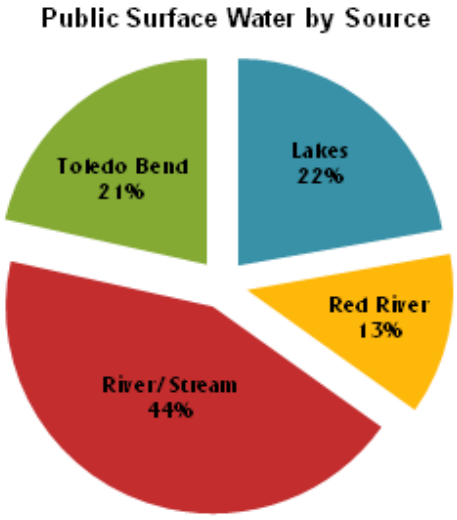
Haynesville Shale Natural Gas Well Development Drilling and Stimulation Operations

Reported Usage from 10/1/2009 to 2/23/2012 - 1959 Wells

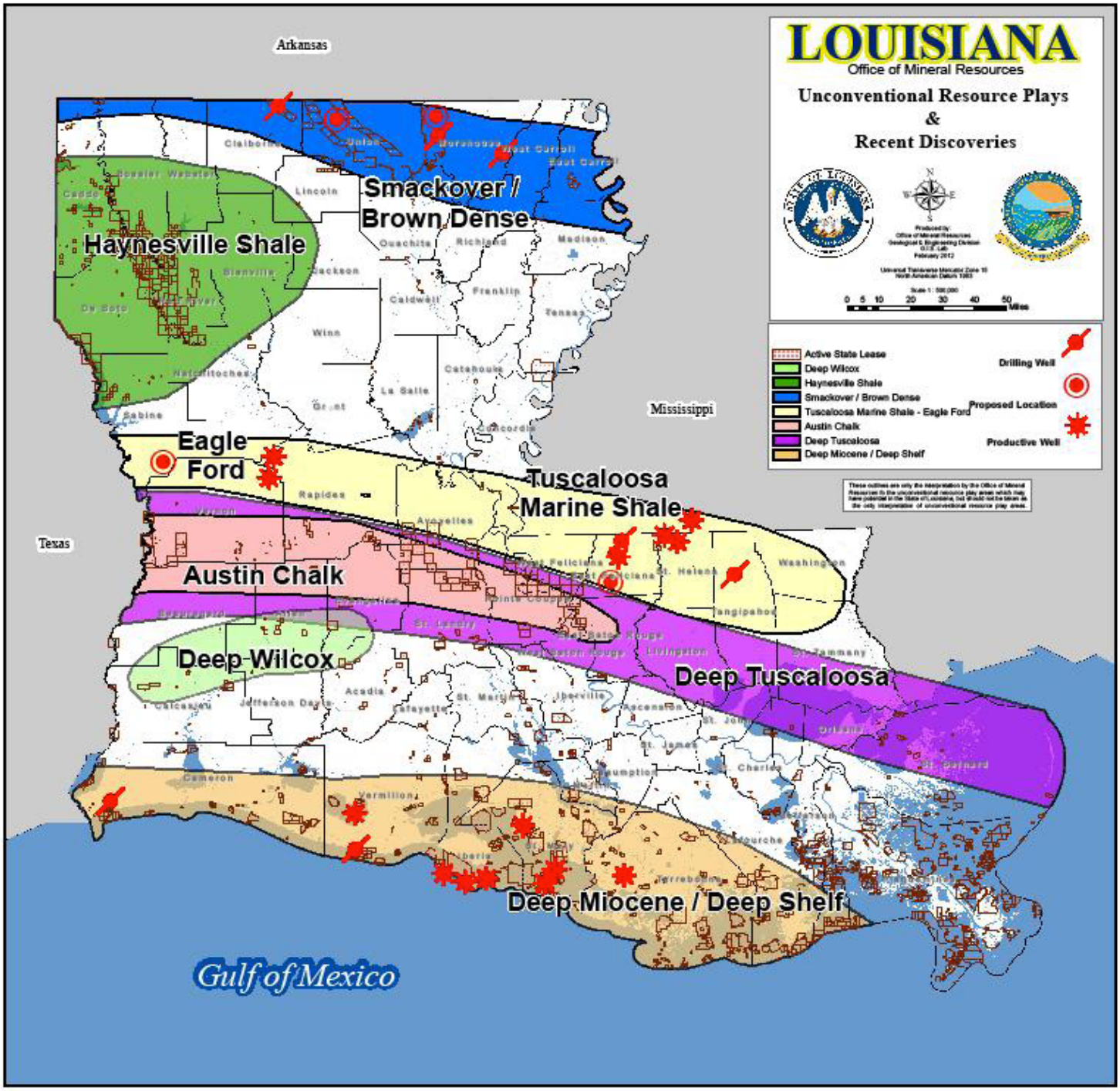








Louisiana's New Energy Map



Surface Water Quality Impairment Management

In 2011 extreme drought conditions on the Ouachita River led the U.S. Army Corps of Engineers to reduce the flow through the Felsenthal Lock and Dam. The reduction in flow reduced the assimilative capacity of the river, potentially impacting 67 permitted water discharge facilities. The Graphic Packaging paper mill in West Monroe was forced to limit its discharge to the river and impound the remaining effluent. This facility employs in excess of 1,000 people and spends approximately $100-$125 million per year on purchases from Louisiana-based industries.

The City of West Monroe's wastewater treatment plant was forced to reduce its discharge, typically about seven million gallons per day, to three million gallons per day. Additional reductions of the river's flow would have forced the plant to impound its effluent in two 50-acre ponds. These ponds would have reached capacity in about three days. Any additionally effluent would have overflowed into the river, potentially causing unsanitary conditions.

Having reliable and suitable surface water resources for use where needed as an alternative to groundwater resources is a vital sustainability management tool that is fortunately often available to resource planners and managers as an option in Louisiana. However, should our surface water features not be adequately regulated with regard to water quality, their availability as potential alternatives to groundwater may be diminished or simply rendered unsuitable.

The Louisiana Department of Environmental Quality (LDEQ) has assumed delegation of certain aspects of the Clean Water Act, including those associated with monitoring and assessing state surface water quality (Ambient Water Quality Monitoring Network, AWQMN) and with issuing water discharge permits that are protective of existing and designated water uses (Louisiana Pollutant Discharge Elimination System, LPDES). When water quality is not sufficient to meet these uses, the waters are listed as "impaired." Impaired water bodies are surveyed for Total Maximum Daily Load (TMDL) development to further restrict pollutants allowed by existing permits and potentially restrict the issuance of new waste water permits in watersheds of the impaired water bodies.

LPDES permits, as well as the calculations associated with TMDL development, are dependent upon knowing the "low flow critical condition" of the subject water body so as to be protective of that water body at all times. If natural stream "low flows" are less, such as through excessive removal for "out-of-stream" uses or through excessive drought conditions, waste loads authorized by LPDES permits may no longer be adequately protective of stream health. Also, lack of adequate flow in a stream may require existing discharges to pay for costly treatment add-ons or limit new discharges, potentially hampering economic development.

This situation can occur in streams where TMDLs have been developed or where LPDES permitted discharges are predicated on in-stream flows. However, in any flowing water, should flows be reduced to the point of creating an "effluent dominated stream," then all LPDES water discharge permits may have to be re-issued with more stringent treatment requirements, potentially contributing economic impact to both public and private assets within an affected watershed.

Louisiana's water quality is assessed and reported every two years in the "Louisiana Water Quality Integrated Report" (WQIR) and includes the status of the state's surface waters, such as impairment listings when compared to state surface water quality standards. The 2010 draft WQIR and previously published reports are found at the LDEQ website.

Safe Drinking Water Supply

Low water levels expose water intakes and can result in sanitary issues for treatment facilities. During the recent drought, the water level in Caddo Lake dropped to its lowest level since 1921, the first year data are available for the USGS gaging station located at Caddo Lake Dam near Mooringsport. Caddo Lake is the water supply source for seven Louisiana utilities, and the bayou to which it discharges is a backup source of water supply for the City of Shreveport. In 2011, of the seven utilities using this water resource, one had their water intake completely exposed and had to install a bypass line; another had its water intake partially exposed. Overall, three out of the seven utilities had to move their intakes as a result of the drought.

Similar to issues associated with low water levels, high water level events can affect public and private water supply systems. During the Mississippi River flood of 2011, 46 public water supply wells and at least 281 domestic water supply wells were located in the path of or near the rising floodwater. Systems which were submerged may be exposed to potential pathogens that require special disinfection treatments of the wells, as well as the distribution/delivery system.

Should situations such as these persist, increased reliance on groundwater resources to offset loss of surface water availability could adversely impact, or further impact, aquifer systems serving to fulfill the water budget demand.

Current Major Issues (cont.)

The Department of Health and Hospital's (LDHH's) role in statewide water quality begins with the enabling legislation found in R.S. 40:4(8)(a) that states in part, "In order to protect the public against disease from water supplied for drinking, culinary, and ablutionary purposes, the state health officer shall prepare and promulgate all rules and regulations necessary to ensure that water supplied to the public by public water supplies is obtained from safe and sanitary sources and that such sources are properly protected; is treated, stored, and conveyed in a safe and sanitary manner; and is safe and potable for human use."

Subsequently, LDHH is the primacy agency for the federal Safe Drinking Water Act in Louisiana, and as such, supervises and ensures compliance of Louisiana's approximately 1,400 public water systems with the requirements of the Safe Drinking Water Act.

In light of these responsibilities, LDHH currently has the most extensive active groundwater sampling network of any entity operating in the state. From Louisiana's 1,400 public water systems, the LDHH has nearly 2,700 active water wells that are sampled at regular three-year intervals for approximately 125 distinct chemical and physical analytical parameters.

When groundwater monitoring reveals that any drinking water source is contaminated at concentrations above the established maximum contaminant levels (MCLs), LDHH works with the affected water system to identify options including alternate water supply sources or water treatment strategies that would provide safe drinking water to the citizens connected to the affected system. In cases where contamination of the groundwater appears to have occurred due to human influence, LDHH reports such findings to LDEQ, as they have authority and jurisdiction over groundwater contamination, and LDHH works with LDEQ to identify a reasonable and safe solution for any affected public water system.

Additionally, LDHH works with LDEQ to support the Source Water Protection Program they administer that works with local governments to identify potential sources of contamination near their public water supply wells and establish local ordinances to safeguard and protect these water wells from future potential sources of contamination.

Conservation Education and Public Outreach

Each year, there has been a statewide Governor's Proclamation issued during the month of March, acknowledging Ground Water Awareness Week nationally and across our state. As part of the LA Department of Natural Resources' awareness campaigns during March, educators and students have been the primary focus, and LDNR provides materials, lesson plans, and information on the department's website that encourage the protection and importance of groundwater resources in our daily lives. Activities have included the development, creation and posting of the "Teacher's Portal to Ground Water Lesson Plans" on the LDNR website, and others listed below:

- LDNR Geaux Team, Executive staff, and Science/PIO staff visited elementary and middle school classrooms to teach and provide instruction about the environment.
- Produced and distributed an award-winning DVD, called "Our Lives…Our Water" video in 2008 with over 3,000 copies in circulation to date.
- Distributed water video to youth groups and institutions such as YMCAs, daycare programs, and at community Fairs and Festivals all across the state.
- Declared Sept. 14, 2010 as "Protect Your Ground Water Day", and prepared fliers and conservation "tips" push cards.
- Organized and traveled for "WATER Teaching Tour" in 2010 with Sparta Ground Water Educator and participated in several school presentations during the week.
- Participated in other community events such as LSU's Ocean Commotion, annual Earth Day and Earth Walk, Water Fest in Claiborne Parish, Home and Garden Shows.
- Teamed with other organization for exhibits and presentations such as the Boy Scouts, LA Resources Center for Educators, LA Environmental Education Commission, LA Dept. of Environmental Quality, LSU Center for Energy Studies, LSU AgCenter and Cooperative Extension Service, LA Farm Bureau, Sparta Ground Water Commission, and Home Builders Association.

Recognizing investing in conservation education and outreach is the best value proposition to promote the long-term sustainability of the resource, at the January 19-20, 2012 public meeting, members of the Louisiana Ground Water Resources Commission discussed the great value of groundwater conservation education in achieving the goal of resource sustainability. As a result of this discussion, the LDNR is in the process of reallocating personnel to coordinate conservation education for the state, in conjunction with other resource agencies. LDNR will work with other Louisiana agencies such as Wildlife and Fisheries, Transportation and Development, Environmental Quality, Agriculture and Forestry, and Health and Hospitals, as well as the Office of Coastal Protection and Restoration, to develop a robust education program.

An Example of What Integrated State Policy Can Do

One promising strategy for promoting sound water management in specific aquifers is the use of capital outlay investments to promote conservation and alternative, beneficial use of water sources and streams. The Sparta Reuse Demonstration Project in Ouachita Parish's City of West Monroe is a strong example of how use of state capital outlay funding can support sound water action and policy.

The Sparta Aquifer provides groundwater for 16 northern Louisiana parishes, including nearly all the freshwater needed by homes, businesses, and industry for the majority of parishes in north-central Louisiana. Parish and community leaders throughout the area recognized more than a decade ago that the rate of use of the water, or "draw," from the aquifer was far outstripping the aquifer's natural rate of replenishment, or "recharge," with the total draw on the aquifer as a whole estimated at about 18 million gallons a day greater than the rate of recharge. In seeking opportunities to relieve this stress on groundwater supplies, area leaders identified a single industrial user, Graphic Packaging, as a potential focus of an effort to take a significant step in water conservation for the Sparta aquifer system.

Graphic Packaging draws approximately ten million gallons of groundwater a day to support operations involving its core business of manufacturing cardboard for packaging. Threats to the the company's ability to access water present very real risks to the viability of its facilities in West Monroe, which in turn provide employment for more than 1,000 workers.

Recognizing that opportunity, area leaders developed the "Sparta Reuse Demonstration Project." This involved construction of treatment facilities and pipelines to process up to ten million gallons a day of West Monroe wastewater to clean it up to federal drinking water standards and direct it to Graphic Packaging, supplanting an equal amount of the company's draw on the Sparta aquifer system. If the full ten million gallons a day could be provided to the treatment facility by West Monroe's wastewater system, it would mean a reduction of more than half the estimated overdraw on the entirety of the Sparta aquifer system in Louisiana.

In 2008 and 2009, the administration of Gov. Bobby Jindal worked with legislators in providing more than half of the funding for construction of the project. Much of the balance of the cost was covered by a $4.7 million grant awarded by the LA Department of Environmental Quality, drawn from federal American Recovery and Reinvestment Act funding. The project is expected to be complete in the first half of 2012.

Beyond the direct and immediate relief of stress on the aquifer, the project is expected to demonstrate environmental benefits as well. City wastewater will be directed to manufacturing instead of to the Ouachita River,

allowing the city to consolidate older, more inefficient wastewater facilities. Another key benefit of the Sparta Reuse project is its potential to be applied in other areas where industries draw heavily on water sources shared with providers of public supply.

The Sparta Reuse Demonstration Project is an example of how water use and the availability impacts economic growth of a community, and how wise capital outlay investments tied to sound water management policy can provide benefits not only to our water supplies themselves, but to the overall environmental and economic health of a region as well.

Community Water Enrichment Fund

The Community Water Enrichment Fund was established in FY 08/09. Its purpose is to fund rehabilitation, improvement and construction projects for community water systems. Funds were to be divided equally among 63 parishes (Orleans Parish was excluded due to direct funding) with some funding held in an Emergency Set-Aside fund. The cities of Alexandria, Baton Rouge, Bossier City, Kenner, Lafayette, Lake Charles, Monroe, New Orleans and Shreveport are excluded due to being HUD entitlement cities.

The following is a summary of the Community Water Enrichment Fund to date.

	FY 08/09	FY 09/10	FY 10/11	FY 11/12 *
Programmatic Funding	$10,000,000	$0	$10,000,000	$10,000,000
Total Project Value	$9,327,758	$0	$8,745,135	$10,000,000
# of Projects	261	-	268	TBD
# of Parishes Participating	63	-	57	TBD

* FY 11/12 project awards are currently being reviewed

Commodity of the 21st Century: Where Do We Go From Here?

Throughout the 20th century, issues such as available land, workforce, infrastructure, and energy sources were driving forces of economic development in our state and nation. These issues remain critical today, but could something as basic as water become the "commodity of the 21st century?" More and more researchers and economic development professionals believe so.

In the article, "A Defining Resource: Louisiana's Place in the Emerging Water Economy," published in Loyola Law Review (2011), Mark Davis and James Wilkins write, "...it is clear that the availability of dependable supplies of fresh water is already transforming our economic and cultural landscapes. As the state's and the nation's growth, energy, and environmental priorities evolve, water is often the common denominator." (273)

Clearly, if Louisiana intends to continue to attract new business and industry to every region of our state, comprehensive water management is required to ensure that this commodity of the 21st century is sustained for all public and private water users.

Key Components of Groundwater Sustainability Management

1. Monitoring
2. Auditing
3. Public Education, Conservation & Outreach
4. Registration
5. Evaluation
6. Incentives
7. Enforcement
8. Emergencies
9. Collaboration
10. Governance

Groundwater Sustainability Management Recommendations

Based on recommendations provided in the E&E report, robust meeting discussions and input from LGWRC, LGWMATF, stakeholders, interested parties, etc. and agency staff experienced in implementing water management laws and regulations, this section details resource management changes and recommendations that, at this time, are considered necessary to improve efficiency and provide for a more comprehensive regulatory strategy. The management changes and recommendations are categorized by key groundwater resource management plan components that are currently under development as we continue our progression toward finalizing a statewide groundwater resource management plan.

1. Monitoring (Resource Metrics)

Action Required	Recommendation	Start Date
Legislative	Appropriate funding as necessary to establish an adequate statewide aquifer monitoring network, as recommeded by USGS, including monitoring of domestic wells.*	2012
Legislative	Appropriate funding as necessary to establish an adequate statewide surface water availability gaging network in areas where surface water alternatives may be necessary to obtain or maintain groundwater resource sustainability.*	2012
Administrative	Establish, where supported by objective, sound science, periodic groundwater production reporting requirements for non-domestic water well owners in areas within aquifer systems where metrics demonstrate that resource sustainability is not improving.*	7/1/13
Administrative	As supported by statewide monitoring network improvements, develop and implement an aquifer sustainability grading and prioritization ranking system.*	1/31/14

* Assumes legislative funding approved and available for monitoring network enhancement implementation in 2012.

2. Auditing (Regulatory Compliance and Program Effectiveness)

Action Required	Recommendation	Start Date
Administrative	Continue to improve aggressive implementation of statewide water well notification compliance audit procedures.	Ongoing
Administrative	Focus resources on consolidating existing and future water well registration and notification database information under one uniform database system and establish one unique well identifier for each well in the system.	7/1/12

3. Education (Resource Conservation and Regulatory Compliance)

Action Required	Recommendation	Start Date
Administrative	Through the Louisiana Department of Education, seek to establish a mandatory statewide groundwater and surface water education and water conservation curriculum at elementary and higher grade levels. Partner with the LDEQ, through its Drinking Water Protection Program, LDWF, LDHH, LDAF, OCPR, and LDOTD to leverage existing conservation and protection education activities currently presented to most grade levels.	7/1/12
Administrative	Seek to partner with other established web-based education programs, implement improvements to LDNR's and LDEQ's existing web-based education and outreach efforts, and develop social media opportunities for the same.	7/1/12
Administrative	Request local governments, where groundwater resources are in demand for public drinking water supplies, to establish groundwater and surface water education and conservation outreach measures.	7/1/12
Administrative	Pursue partnerships with each parish to establish a single point of contact to serve as the champion of the respective parish's groundwater and surface water education and conservation efforts in coordination with statewide efforts for the same.	7/1/12

4. Registration (Water Well Driller and Owner/User Responsibilities)

Action Required	Recommendation	Start Date
Administrative	In an effort to achieve 100 percent compliance with water well registration (notification) and agency evaluation requirements for proposed well installation for non-exempt well use purposes, such as irrigation, public supply, industrial, etc., the agency intends to aggressively pursue amending regulations under groundwater resources management law for water well drillers to ensure that water well pre-installation notification evaluation has been performed and an appropriate agency response has been issued to the well owner prior to engaging in well construction operations.	4/1/12
Administrative	Focus resources to implement integration of water well driller registration and well owner notification database management systems into one consolidated system, improve SONRIS and GIS output capacity, and develop and implement online document review opportunities for easier access to agency well notification, evaluation and response correspondence.	7/1/12
Administrative	Pursue innovative ideas to encourage well owner registration of any water well still in existence (not plugged and abandoned or destroyed) but previously not required to be registered with the state under Louisiana Administrative Code Title 56.	7/1/12

5. Evaluation (Assessing Resource Sustainability)

Action Required	Recommendation	Start Date
Administrative	Update the water well notification evaluation procedure to clearly document that water level drawdown assessments are performed, taking into account multiple well withdrawal effects within established areas of review, where applicable. The current evaluation procedure can be viewed at: http://dnr.louisiana.gov/assets/docs/conservation/documents/ WellEvalation Checklist.pdf and as Appendix N in this report.	5/1/12
Administrative	Investigate revising the water well notification form (Form GWR-01) to include identification of and disclosure of efforts to use surface water alternatives for certain well uses (irrigation, public supply, industrial, etc., but excluding domestic use) in certain areas of aquifers such as areas of ground water concern, etc. Form GWR-01 can be viewed at: http://dnr.louisiana.gov/assets/docs/conservation/documents/ GWR-01.pdf.	5/1/12
Administrative	Focus resources to improve and increase the use of USGS observation well and other state agency groundwater level/quality data through the DNR SONRIS and GIS systems.	7/1/12

6. Incentives (Resource Conservation)

Action Required	Recommendation	Start Date
Administrative	Continue to investigate feasible and effective ways to provide incentives such as conservation stewardship recognition plans, etc.	7/1/12
Legislative	Evaluate capital outlay policies & procedures to promote beneficial use of alternative water sources where sustainability is challenged.	2012
Legislative	Evaluate requirements for local governments and water districts' eligibility to participate in the Community Water Enrichment Fund program, including master meter installation, conservation education, public outreach, water production reporting, and unaccounted for water loss abatement.	2012
Legislative	Evaluate linking tax credit and abatement policy to conservation participation, water loss prevention, and alternative water use.	2012
Legislative	Evaluate fiscal policy to reward high volume groundwater users to switch to surface water, recognizing the public benefits.	2012

7. Enforcement (Regulatory Compliance)

Action Required	Recommendation	Start Date
Administrative	Investigate possibilities of implementing progressive enforcement techniques to aid in beneficial projects such as conservation education assistance, etc., similar to LDEQ's program.	7/1/12

8. Emergencies (Response Coordination)

Action Required	Recommendation	Start Date
Administrative	Investigate the extent to which groundwater emergencies are covered through GOHSEP, consider any additional needs to establish a multi-agency committee for emergencies, and amend or revise the agency's Ground Water Emergency Response Contingency Plan as necessary.	7/1/12

9. Collaboration (Concerted Multi-Agency Resource Management)

Action Required	Recommendation	Start Date
Administrative	Implement an annual multi-agency stakeholders conference, including legislators, state agencies, federal agencies, local governments, conservation commissions, soil and water districts, academic institutions, non-governmental organizations, trade associations, lake commissions, drillers, agriculture and aquiculture farmers, industry representatives, environmental organizations, power generators, navigation interests, coastal restoration advocates, fisheries interests, oil and gas representatives, tourism industry, economic developers, and other users, all designed to seek best management practices for the sustainability and protection of our water resources.	2012
Administrative	Require the regional conservation commissions and the soon-to-be-established regional advisory bodies to file annual reports with the Ground Water Commission on the vital statistics and concerns for the groundwater of their region.	2012
Administrative	Engage legal scholars to research and explore the potential non-compensated consumption of surface water when used as an alternative to groundwater.	2012
Administrative	Engage experts to research and explore the consequences of out-of-state sales of water resources.	2012

10. Governance

Action Required	Recommendation	Start Date
Administrative	Draft and implement regulations for the establishment of a statewide regional network of advisory panels composed of local governments, user groups, and interested stakeholders, all as previously authorized by Act 49 of 2003. In cases where the legislature has already established regional commissions, specifically the Capital Area Ground Water Conservation Commission and the Sparta Aquifer Ground Water Conservation Commission, these entities should concurrently serve as their regional advisory panel.	2012
Legislative	By legislation or resolution, affirm the authority of local governments to adopt ordinances to protect the quality of public groundwater supply wells.	2012
Administrative	Explore the possibility of drafting new regulations to improve upon recent on-site and off-site E&P waste fluids recovery, remediation, recyclying, and reuse regulatory amendments, encouraging greater use of these fluids as an alternative to groundwater and surface water resources in hydraulic fracture stimulation operations.	2012
Administrative	Engage legal scholars to research and explore the potential non-compensated consumption of surface water when used as an alternative to groundwater, and as an aid to economic development, job creation, and job retention.	2012
Administrative	Engage experts to research and explore the consequences of out-of-state sales of water resources.	2012
Legislative	Extend the sunset of Act 955 of 2010 through December 2014, continuing state agency oversight and management of surface water resource use under the cooperative endeavor agreement procedure consistent with the Attorney General's surface water use opinions.	7/1/12
Legislative	Add surface water fact-gathering responsibilities, without management or regulatory authority, to the mission of the Ground Water Resources Commission, expanding its membership, and amending its name to the Water Resources Commission.	7/1/12
Administrative	Investigate possibilities of developing new, or improving upon existing, agency aquifer recharge area protective measures.	2012

Conclusion

For the first 190 years of statehood, Louisiana's efforts to manage water predominantly focused on keeping it out of our communities, namely flood waters and the encroaching Gulf of Mexico. However, since 2001 and following extreme drought conditions, Louisiana has recognized the critical need to manage the sustainability of our ground and surface water resources. Laws and regulations through the past decade have been passed and implemented, and policies and procedures have been developed to ensure the appropriate use and continued availability of Louisiana water.

As population and industry growth continue to place increased demands on our water resources, and weather conditions continue to impact the natural replenishment of those resources, a renewed focus on comprehensive water management in Louisiana is required. The Louisiana Ground Water Resources Commission and the Louisiana Department of Natural Resources have produced this report and compiled legislative and regulatory recommendations aimed at enhancing and strengthening current management practices. Much of the recommendations concern ground water resources, but this report also acknowledges that ground water and surface water are inextricable and effective management must consider the sustainability of both.

Recognizing that each aquifer represents a unique environment with its own individual challenges, state regulators continue to assess water quality and availability and make management decisions as needed on an aquifer-by-aquifer basis when risk is determined. LDNR expects that greater monitoring capabilities now planned will increase the amount and frequency of reliable data gathered in the most stressed aquifer systems. In addition, the Ground Water Resources Commission is proposing to move forward with suggested legislative and administrative actions contained in this report (beginning on page 101) that focus on monitoring, auditing, conservation education and public outreach, well registration, evaluation, incentives, enforcement, emergencies, collaboration, and governance. These recommendations will positively benefit not only stressed aquifers, but our state's total water budget. No single law, regulation, or recommendation will be a quick-fix; rather, the wise prioritization and implementation of these recommendations, covering all components and more, will help Louisiana sustain its precious water resources for centuries to come.

This report is only a first step in what will be a continuous, vigorous effort to effectively manage what we believe is the "commodity of the 21st Century," and develop a comprehensive water resources management plan. Ultimately, the goal is to "protect, conserve, and replenish" all water resources, as entrusted to state government by the people of Louisiana in Article IX, Section 1 of the State Constitution.

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Online Resources

View the Executive Summary of *Recommendations for a Statewide Groundwater Management Plan* at:
http://dnr.louisiana.gov/assets/OC/env_div/gw_res/20111205_GWPLAN_FINALEXECSUM.pdf

View the *Recommendations for a Statewide Groundwater Management Plan* Technical Report and Appendices at:
http://dnr.louisiana.gov/assets/OC/env_div/gw_res/20111206_GWPLAN_FINALTECHAPP.pdf

Appendices

Appendix A: Sabine River Authority RFP for sale of raw water and Response to RFP

Appendix B: Executive Order Relative to Coastal Master Plan

Appendix C: Local, Municipal, or State Entities with Water Resources Authority

Appendix D: List of existing CEA's relative to Act 955

Appendix E: Flood Control

Appendix F: Guidance Memorandum, Office of the Attorney General

Appendix G: Memorandum of Understanding April 2010

Appendix H: USGS Monitoring Proposal

Appendix I: Capital Area Ground Water Conservation Commission Actions

Appendix J: Toledo Bend Current Water Sales

Appendix K: Survey of Water Purchasers and Sellers

Appendix L: Haynesville Shale Water Use Advisory

Appendix M: Hydraulic Fracturing Fluid Disclosure Requirements by State

Appendix N: Water Well Evaluation Procedure

View this interim report and all appendices online at:

http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=907

We are thankful to the many organizations that help conserve and protect our water resources. This page represents only a small portion of these groups.

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