2006 Water Plan

East Texas Region

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Executive Summary

The regional water planning process evaluates water supplies and demands and provides strategies to meet shortages that will occur through the planning period to the year 2060. The process includes the following major tasks:

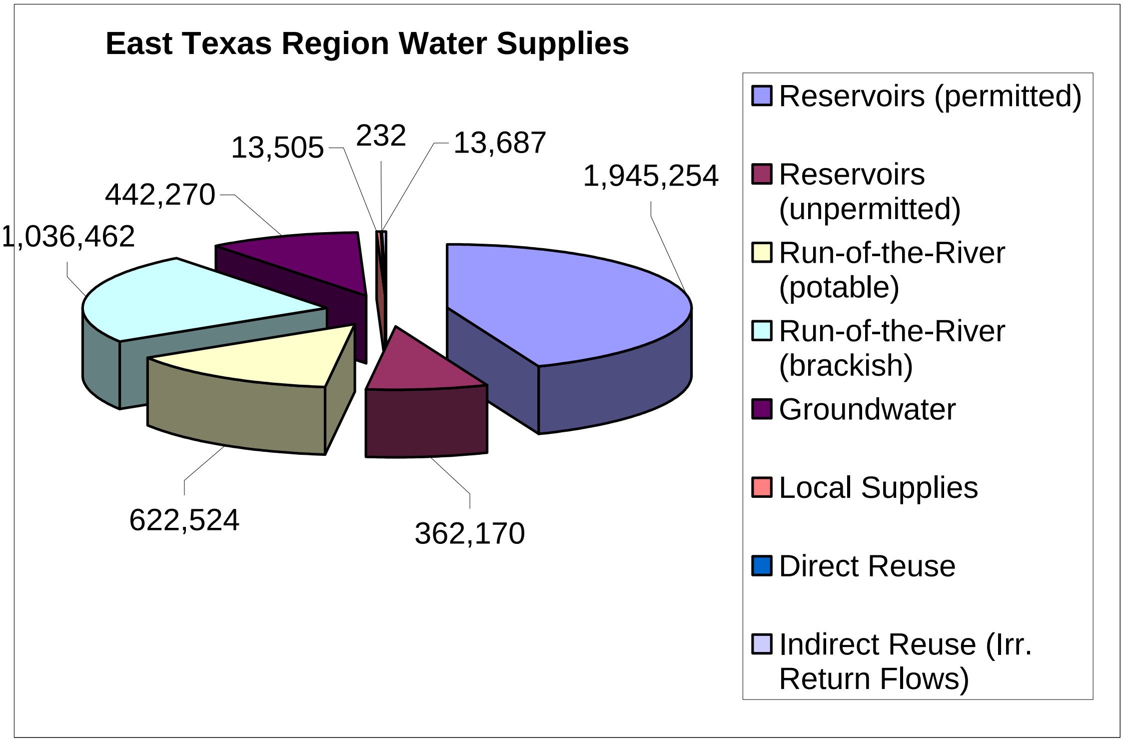
Chapter 1	Description of Region
Chapter 2	Population and Water Demand
Chapter 3	Water Supply
Chapter 4	Analysis of Water Shortages and Management Strategies
Chapter 5	Impacts of Management Strategies
Chapter 6	Model Water Conservation Plans and Drought Management
Chapter 7	Strategy Compliance with Long-Term Protection of Water and Agricultural Resources
Chapter 8	Unique Stream Segments and Reservoir Sites and Legislative Recommendations
Chapter 9	Infrastructure Financing Recommendations
Chapter 10	Public Participation

The description of the East Texas Region includes a brief summary of the planning process, expected population and water demands, agricultural and natural resources and economic activities. The task in this planning cycle was to update information in the previous planning cycle. The major changes from the previous plan included updates to population and water demands and information on groundwater conservation districts that have been formed since the previous plan.

Initial population and water demands were provided by the Texas Water Development Board (TWDB) and were reviewed by the Planning Group. The population is expected to increase from 1,011,317 in 2000 to 1,482,448 in 2060. A major portion of the growth, both in numbers and percentage, is anticipated to occur in Angelina, Nacogdoches and Smith Counties.

Water demands are expected to increase from 704,320 acre-feet per year in 2000 to 1,261,320 acre-feet/year in 2060. Demands for municipal use were based on gallon per capita demands and included a reduction in the gallon per capita in each decade to account for water conservation measures that are expected to occur without special implementation, such as natural replacement of plumbing fixtures. The percentage of the total demand is expected to increase (net gain of 8%) for power generation while decreasing for municipal and manufacturing.

An evaluation of water supplies was performed for the East Texas Region using the latest information from Water Availability Models (WAM) for surface water and Groundwater Availability Models (GAM) for groundwater sources. There are currently approximately 4.4 million acre-feet per year of available supplies for use in the East Texas Region, with approximately 3.4 million acre-feet per year being usable as potable water supplies. The following graph provides the amount of water, in acre-feet per year, supplied by the various sources in the Year 2000.



Surface water supplies comprise the largest source of water. The availability of this supply was based on the latest information using Water Availability Models. There are nineteen reservoirs, or reservoir systems, in the East Texas Region that provide 1,945,254 acre-feet/year of supply. Five of the reservoirs have a total 362,170 acre-feet per year of unpermitted supply. Run-of-the River supplies 1,658,986 acre-feet per year, however, only 622,524 acre-feet per year is considered to be a potable source.

Groundwater supplies approximately 442,270 acre-feet/year of water. Availability of supply from the Carrizo-Wilcox, Queen City, and Sparta aquifers were based on Groundwater Availability Models (GAM). The calibrated northern Gulf Coast GAM was available for supply analysis, however, the predictive portion of the GAM was not available. In addition a GAM has not been completed for the Yegua-Jackson aquifer. In addition to the use of the GAM, the Planning Group set the limits that groundwater supply would be limited to the amount of groundwater that could be withdrawn from aquifers over the next 50 years that will not cause more than 50 feet of water level decline (in areas where aquifer is confined) or 10% decrease in unsaturated thickness (in unconfined portions of the aquifer.

Other minor sources include local supplies, direct reuse and indirect reuse. Local supplies are generally surface supplies not associated with a water right, such as stock ponds or local mining supplies. Reuse, both direct and indirect, was based on existing projects with current permits or authorizations.

Analysis of demands and supplies for each water user group was performed to identify where shortages (needs) would occur in the planning period. The total shortages identified in the region is 172,704 acre-feet per year in the Year 2060. The demands within the counties located in the East Texas Region are summarized in the following table.

County	Shortage (acre-feet per year)
Anderson	22,067
Angelina	16,569
Cherokee	705
Hardin	4,256
Henderson	2,393
Houston	3,224
Jasper	226
Jefferson	25,962
Nacogdoches	23,425
Newton	667
Orange	31,743
Panola	0
Polk	1,277
Rusk	27,991
Sabine	384
San Augustine	731
Shelby	9,353
Smith	1,406
Trinity	57
Tyler	232

The water user group with the largest shortage is Steam-Electric with a total of 88,726 acre-feet per year, or 51% of the total shortages. The counties with shortages in this user group include Anderson, Jefferson, Nacogdoches and Rusk. Approximately two-thirds of the shortage in Angelina County is associated with the City of Lufkin and manufacturing. Almost all of the shortage in Orange County is associated with manufacturing.

Water management strategies considered to meet the shortages included water conservation, wastewater reuse, expansion of existing supplies and new reservoirs. Water conservation includes those actions that could be implemented to provide additional savings in water above that already considered in calculation of the water demands. Water conservation will provide approximately 1% of the supply needed to meet the shortages. Only one wastewater reuse strategy, for the City of Athens, was identified. Expansion of supplies includes increased pumpage of groundwater from aquifers, and increased use of local supplies. Continued reliance of groundwater is a major strategy that will be utilized to meet future shortages. Approximately 65% of the water user groups with shortages will utilize groundwater to provide the additional supplies. Voluntary redistribution of surface water sources will supply approximately 69% of the total shortage demand. Approximately 75% of the redistributed surface water is to meet steam-electric shortages in Anderson, Jefferson and Rusk Counties and manufacturing in Orange County. Expansion of local supplies will be used to meet less than 1% of the total shortages. Only one new reservoir, Lake Columbia is proposed to meet shortages, with most of the supply being used to meet steam-electric demands in Nacogdoches County. Water management strategies to meet potential future demands, not presently approved by the Texas Water Development Board, or those that utilize a supply source within the East Texas Region boundary to meet demands in other regions are not included in the above discussions. Details of these strategies are included under the discussion for the affected wholesale water provider.

A review was made of the impacts of selected water management strategies on water quality in the East Texas Region and on the impact to agricultural resources. A summary is included on the general affects of the various categories of water management strategies on water quality parameters. None of the selected strategies will require transfer of agricultural water supplies for use to satisfy demands on non-agricultural demands.

A review was made of the water conservation measures included in the water demands and of water conservation plans for user groups in the Region. In addition a summary of drought triggers is also included.

The East Texas Regional Water Planning Group considered both potential ecologically unique stream segments and unique reservoir sites. The Group concluded there are sufficient programs in place to protect areas of special environmental significance and there is insufficient environmental data to support valid judgment on the merits to preclude reservoir construction on stream segments. No unique stream segments or reservoir sites are being recommended for designation in this planning cycle. Lake Columbia was designated as a unique reservoir subsequent to the previous plan by Senate Bill 1362.

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Chapter 1

Description of the Region

1.1 East Texas Regional Water Planning Area

1.1.1. Location. The East Texas Regional Water Planning Area (ETRWPA), also known as Region I, consists of all or portions of 20 counties located in the Neches, Sabine, and Trinity River Basins, and the Neches-Trinity Coastal Basin. The region extends from the southeastern corner of the state for over 150 miles north and northwest as illustrated in Figure 1.1.

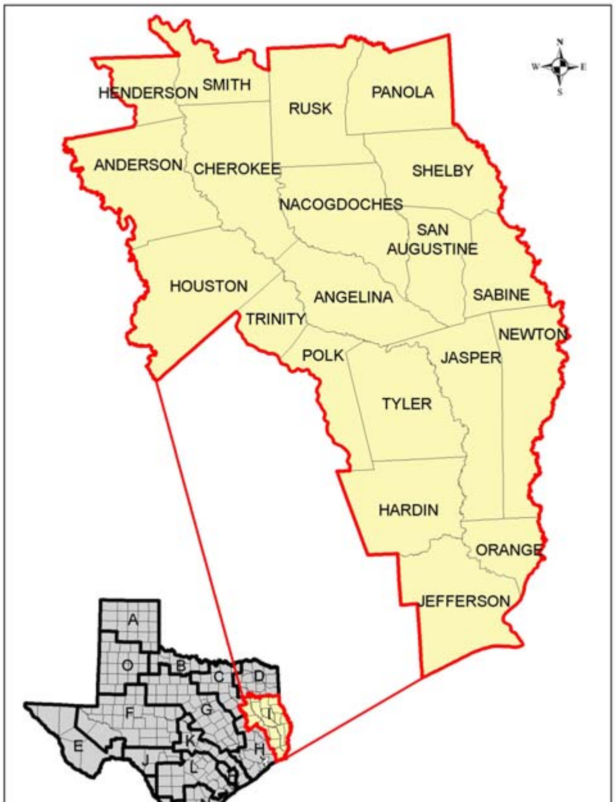


Figure 1.1
East Texas Region
East Texas Regional Water Planning Group 5/05

1.1.2. Metropolitan and Micropolitan Areas. The region contains all or part of three metropolitan areas *(with cities of 50,000 or more population)*[a]:

- Beaumont-Port Arthur area at the south end (Jefferson, Orange, and Hardin Counties).
- Part of Longview area at the north end (portion of Kilgore).
- Most of the Tyler area at the north end (region includes the portion of Smith County in Neches basin, including most of Tyler).

The combined metropolitan population (as of 2004) is 589,054, or 56.5% of the total East Texas Region population of 1,042,123.

The region also contains all or parts of five micropolitan areas *(non-metropolitan areas containing cities of 10,000 or more)* [a]:

- Lufkin and Nacogdoches areas, central to the region (Angelina and Nacogdoches Counties respectively).
- Jacksonville area near the north end (Cherokee County).
- Palestine area near the northwest corner (Anderson County).
- Part of the Athens area *(excluding most of the city)* in the northwest corner (the portion of Henderson County in Neches basin).

The combined micropolitan population (as of 2004) is 273,313, or 26.2% of the total population of the region.

1.1.3. Planning Group and Consultants. The East Texas Regional Water Planning Group (ETRWPG), which is the governing body for this region, consists of 22 representatives. These members represent the interests of the public, counties, municipalities, industry, agriculture, the environment, small business, electric generating utilities, river authorities, water districts, and water utilities. The Deep East Texas Council of Governments (DETCOG), located in Jasper, Texas, is the administrative contracting agency for the East Texas Region. The ETRWPG has retained the services of a team of engineering firms and other specialists to prepare the regional plan. Table 1.A provides a list of the ETRWPG representatives and the engineering team involved in developing the regional plan.

Table 1.1

East Texas Regional Water Planning Group

Members and Engineering Team

Executive Committee	
Chair	David Alders
Vice-Chair	Melvin Swoboda
2nd Vice-Chair	Tom Mallory
Secretary	Robert Stroder
Assistant Secretary	Jerry Clark
At-Large	George Campbell
At-Large	Dr. Leon Young

Voting Membership		
Public	Glenda Kindle William Heugel	Retired Retired
Counties	Judge Carl R. Griffith, Jr.	Jefferson County
Municipalities	David Brock Duke Lyons	City of Tyler City of San Augustine
Industries	Michael Harbordt Melvin Swoboda	Temple Inland Forest Products DuPont
Agricultural	David Alders Hermon E. Reed, Jr.	Carrizo Creek Corporation Cattlemen
Environmental	Dr. J. Leon Young	Stephen F. Austin University
Small Business	Ernest Mosby Edward McCoy, Jr.	Mosby Barber Shop McCoy Funeral Home
Electric Generating Utilities	Dale Peddy	Entergy
River Authorities	Jerry Clark Robert Stroder Tom Mallory	Sabine River Authority Lower Neches Valley Authority Upper Neches River MWA
Water Districts	Worth Whitehead	Rusk SWCD
Water Utilities	Kelly Holcomb	Angelina WSC
Others	Bill Kimbrough George P. Campbell Josh Willson David	Retired Nacogdoches County Livestock

Non-Voting Membership	
James Alford	County of Trinity
Bill Roberts	Texas Water Development Board
Connie Standridge	Region C Water Planning Group
Cynthia Duet	Louisiana Governor’s Office of Coastal Activities
Judge Sandra Hodges	Rusk County
James Porter	IMCAL
Steve Tyler	Region H Water Planning Group
Bobby Praytor	City of Dallas Water Utilities
Jerry Mambretti	Texas Department of Parks & Wildlife
Mendy Rabicoff	Region D Water Planning Group
Cliff Todd	Texas Department of Agriculture
Judge Floyd “Dock” Watson	County of Shelby

Engineering Team	
Schaumburg & Polk, Inc.	Lead Engineers
Freese & Nichols, Inc.	Subconsultant
Alan Plummer and Associates	Subconsultant
LBG Guyton & Associates	Groundwater Specialists
Bob Bowman & Associates	Public Relations

1.2 Physical Description

1.2.1. Topography and River Basins. In terms of topography, this region is generally characterized by rolling to hilly surface features except near the Gulf Coast. In terms of ground cover, the area occupied by the counties of the region is further subdivided into areas known as the Pine Belt, the Post Oak Belt, and the Coastal Prairies. The elevation in the region varies from sea level at its southern boundary on the Gulf of Mexico to 763 ft MSL at Tater Hill Mountain in Henderson County at its far northwest corner.

Most of the region falls within the Neches River Basin, which falls within the region except for small areas in Liberty and Van Zandt counties. The region also includes most of the Texas portion of the Sabine River Basin; portions of the Trinity River basin in two counties; and the portion of the Neches-Trinity Coastal Basin in Jefferson County. Approximately one square mile of the Cypress Creek Basin lies in the northeastern portion of Panola County. Streams in all the basins tend to flow from northwest to southeast.

Figure 1.2 - River Basins
East Texas Region
East Texas Regional Planning Group 5/05

The Sabine and Neches Rivers flow into Sabine Lake, a natural lake just inland from the Gulf of Mexico. Sabine Lake has been a saltwater body for many decades; it contained fresh water before ship channel excavation near the beginning of the 20th century. The Trinity River flows into Trinity Bay.

The Sabine River forms approximately half of the boundary between Texas and Louisiana. The head waters are located in the Dallas area, outside the East Texas Region. The river flows through Texas for the first half of its length, and then follows the state line to its mouth. Almost a fourth of its drainage basin is in Louisiana.

Cypress Creek itself does not fall within the region. This stream, one county north of the region, flows east and southeast to the Red River in Louisiana

1.2.2. Piney Woods. The majority of East Texas Regional Water Planning Group falls within the Pine Belt (or "Piney Woods") portion of the Texas Gulf Coastal Plains. Pine is the predominant timber of this region, although some hardwood timbers can be found interspersed amongst the pines and in the valleys of rivers and creeks. Longleaf, shortleaf, and loblolly pine are native to the region and slash pine (an introduced species) is widely known. Hardwoods include a variety of oaks, elm, hickory, magnolia, sweetgum, and blackgum. Lumber production is the principal industry of the area and practically all of Texas' commercial timber production comes from the Piney Woods region.

The soils and climate are adaptable to the production of a variety of fruit and vegetable crops. Cattle raising is widespread and is generally accompanied by the development of pastures. Economic growth in the area has also been greatly influenced by the large oil field discovered in Rusk and Smith Counties in 1931, and iron deposits are also worked in Rusk County. This area has a variety of clays, lignite coal, and other minerals that have potential for development.

1.2.3. Post Oak Belt. The extreme northwestern portion of the region (parts of Smith, Henderson, and Anderson Counties) falls within the Post Oak Belt portion of the Texas Gulf Coastal Plains. Principal trees of this area are hardwoods such as post oak, blackjack oak, and elm. The areas around streams often have growths of pecan, walnuts, and other trees with high water demands. Area upland soils are sandy and sandy loam, while the bottomlands are sandy loams and clays. The Post Oak Belt is somewhat spotty in character, with some insular areas of blackland soil and others that closely resemble those of the Pine Belt. The principal industry of the area is diversified farming and livestock raising. The Post Oak Belt also has lignite, commercial clays, and some other minerals.

1.2.4. Coastal Prairies. The southern portion of the region (large sections of Jefferson and Orange Counties) is located within the segment of the Texas Gulf Coastal Plains known as the "Coastal Prairies." In general, this area is covered with a heavy growth of grass and the line of demarcation between the prairies and the Pine Belt forests is very distinct. The soil is heavy clay. Cattle ranching is the principal agricultural industry, although significant rice production is also present. The Coastal Prairie has seen a large degree of industrial development since the end of World War II. The chief concentration of this development has been from Orange and Beaumont to Houston, and much of the development has been in petrochemicals.

1.3 Climate

Data from the National Oceanic and Atmospheric Administration state climatologist indicates that the mean temperatures for the entire region varied from a minimum January temperature of 36 degrees Fahrenheit to a maximum July temperature of 93 degrees Fahrenheit. Similarly, the average growing season for the entire East Texas Regional Water Planning Group area was 247 days.

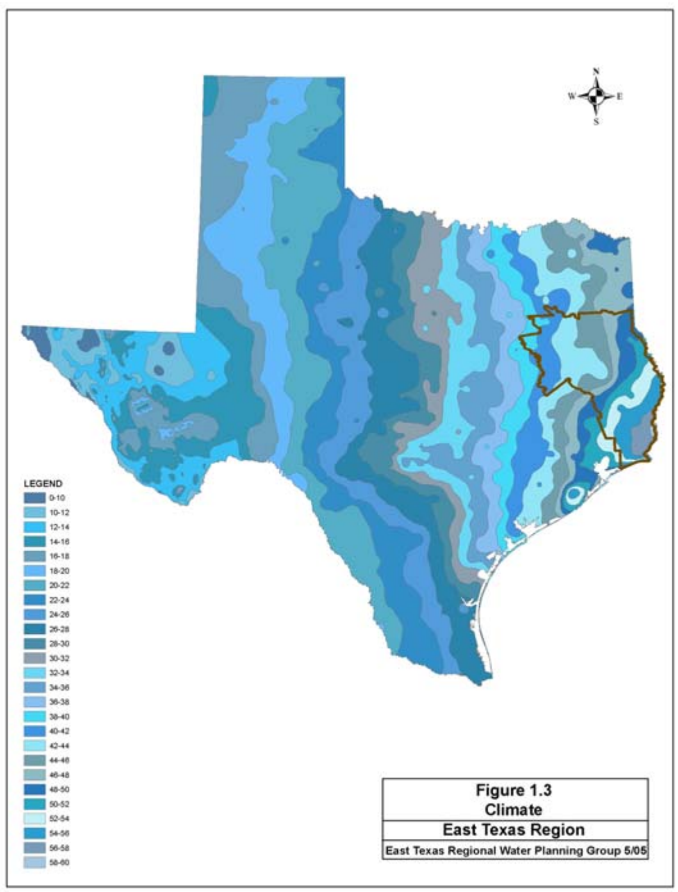


Figure 1.3
Climate
East Texas Region
East Texas Regional Water Planning Group 5/05

Precipitation and runoff generally increase from the southeast to northwest corners of the region, while evaporation increases in the opposite direction. Annual rainfall across the entire East Texas Regional Water Planning Group area averaged 48.7 inches from 1971 through 2000, with the highest annual rainfall (59.04 inches) being recorded for Orange County and the lowest annual rainfall (42.03 inches) being recorded for Henderson County.[b] Average annual runoff ranges from approximately 10 inches in the northwest to 17 inches in the southeast. Average annual gross reservoir evaporation *(the rate of evaporation from a reservoir)* ranges from approximately 41 inches in the southeast to 55 inches in the northwest.

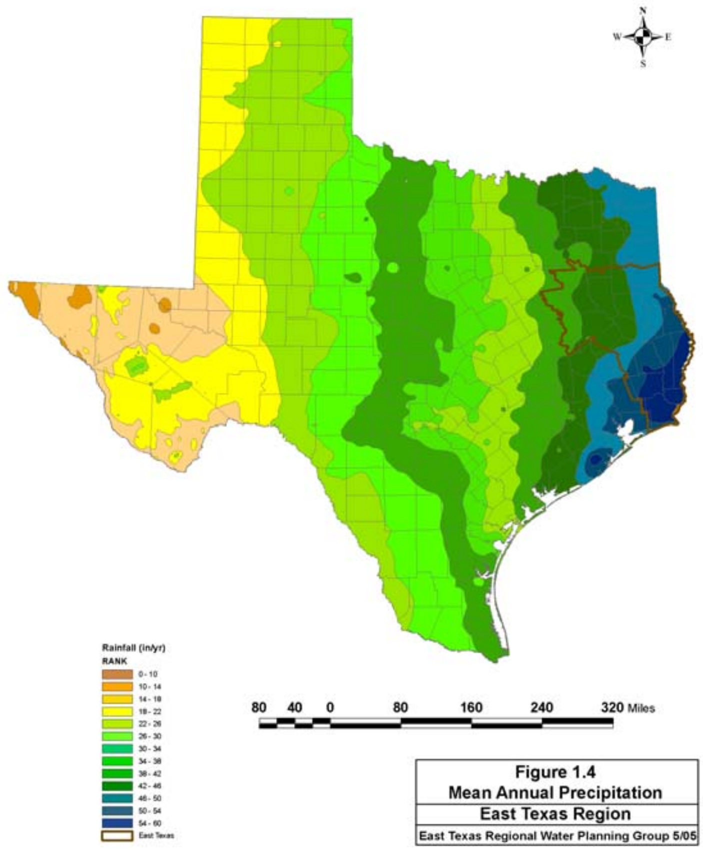


Figure 1.4
Mean Annual Precipitation
East Texas Region
East Texas Regional Water Planning Group 5/05

Figures 1.3 through 1.5 depict average annual precipitation, runoff, and evaporation respectively for the entire state, including the East Texas Region.

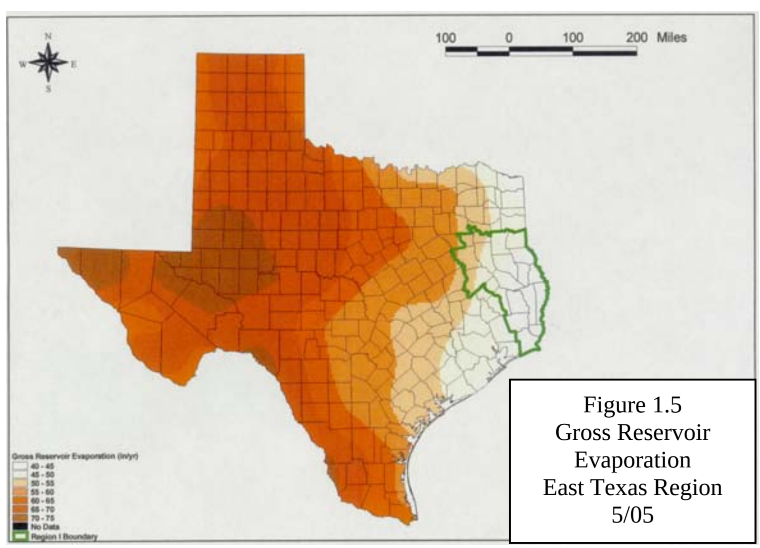


Figure 1.5
Gross Reservoir Evaporation
East Texas Region
5/05

1.4 Population

The population in the region increased approximately 14.5 percent from 1990 through 2000 to approximately 1.01 million people. Growth in the region is expected to continue with approximately 1.48 million by the year 2060. The projection in this cycle is approximately 12% below the projection in the 2001 Regional Plan. The most recent census data (2000), the estimated 2004 population, and projected year 2010 and 2060 population for the major cities located in the region are provided in Table 1.2. Major cities are defined as cities that contained at least two percent of the region's total population in 1996, or approximately 20,000.

Table 1.2

Current and Projected Population Of Major Cities

City	2000	2004[1]	2010[2]	2060[2]
Beaumont	113,866	113,866	113,866	113,866
Tyler *(Within East Texas Region)*[3]	83,650 *82,927*	86,018 *85,089*	89,571 *88,332*	119,994 *116,102*
Port Arthur	57,755	57,755	57,755	57,755
Nacogdoches	29,914	31,166	33,044	54,345
Lufkin	32,709	34,513	37,219	70,997
Region Total[2]	***317,171***	***322,389***	***330,216***	***413,065***

[1] Interpolated between 2000 census figures and 2010 projections..
[2] 2010 and 2060 projections as approved by the TWDB including several revisions approved November 3, 2003 at the request of East Texas Region.
[3] East Texas Region component disaggregrated from total Tyler population by East Texas Region subconsultants.

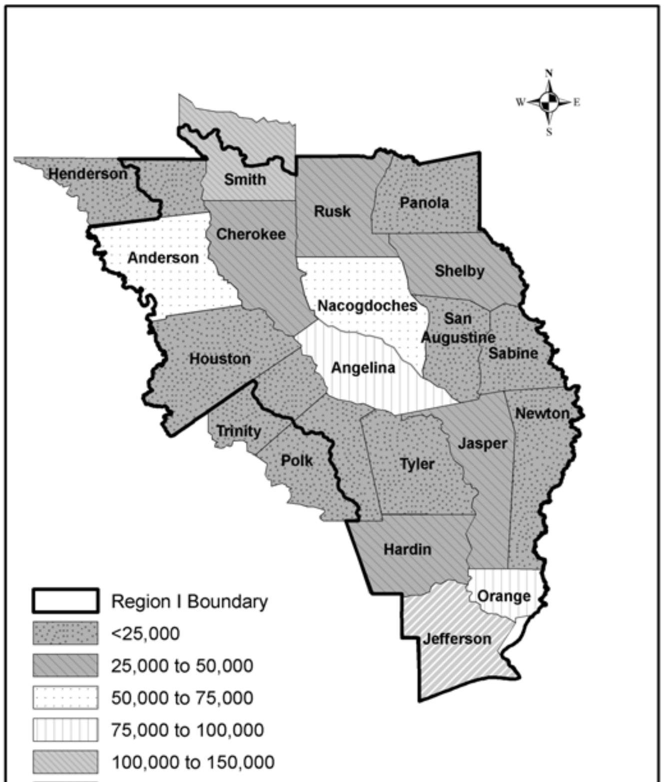


Figure 1.6 - 2000 Population East Texas Region

Figures 1.6 and 1.7 show the relative distribution, by county, of the population in the East Texas Region. Figure 1.8 shows the anticipated growth for each county from 2000 through the end of the planning period, 2060.

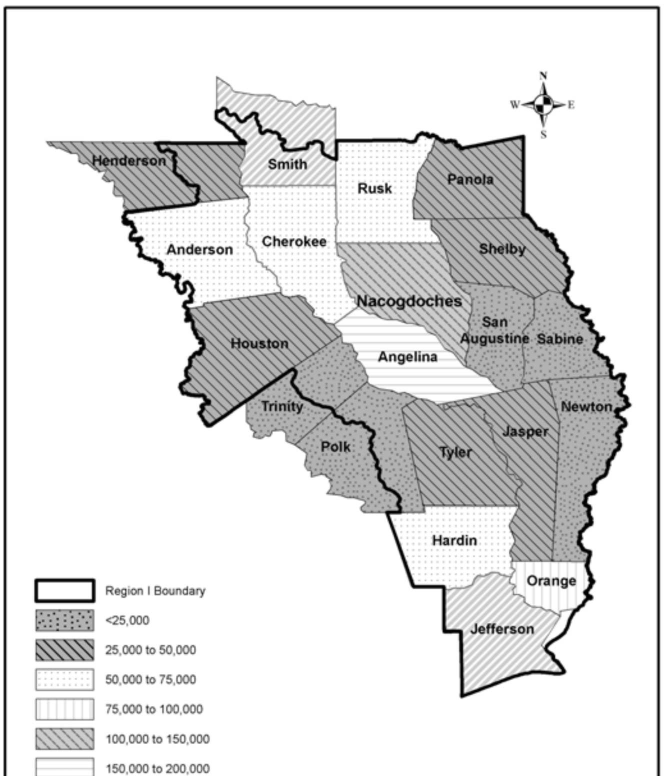
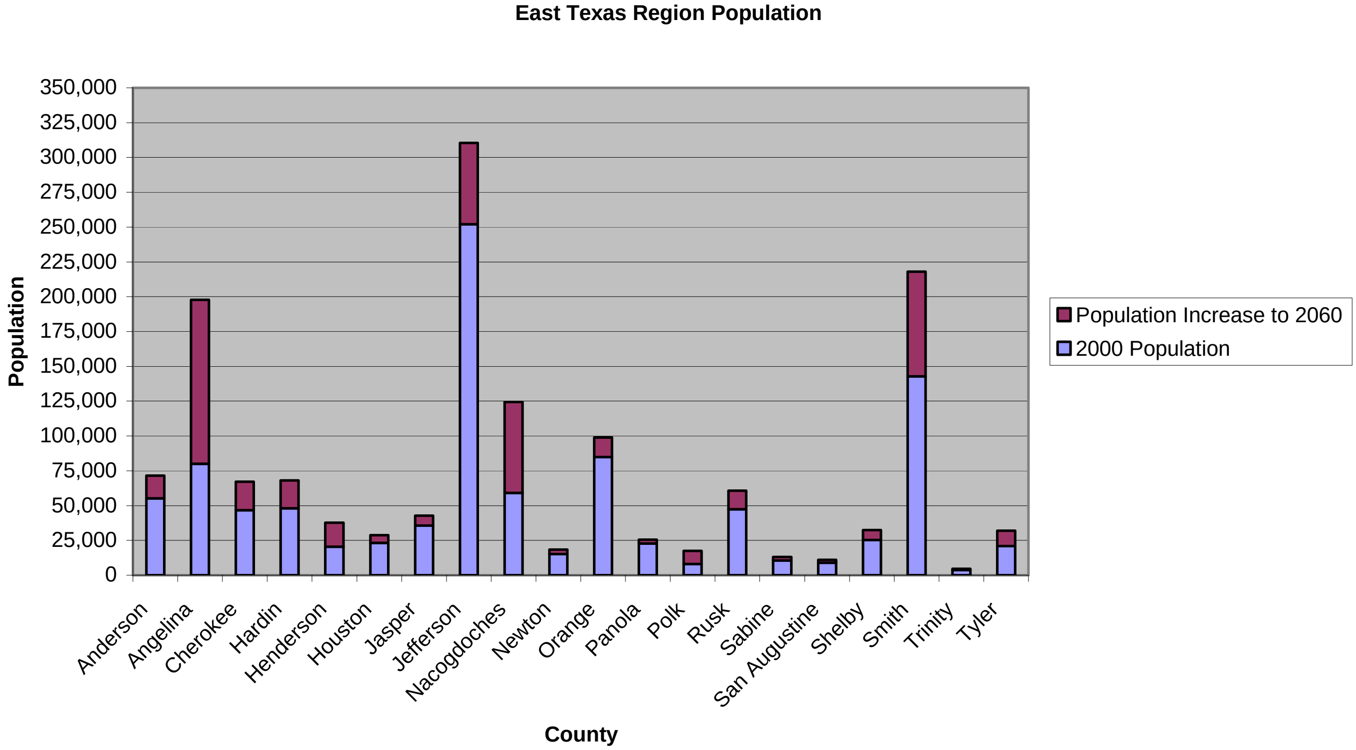


Figure 1.7 - 2060 Population East Texas Region

Figure 1.8 Population by County



1.5 Economic Activities

The overall economy of the region consists primarily of agriculture, agribusiness, mineral production, wholesale and retail trade and varied manufacturing, particularly the timber and petrochemical industries. Major water-using industries and irrigated crops are listed in Table 1.3.

Table 1.3

Major Water Uses

Industries	Crops
Petroleum Refining	Rice
Chemical and Allied Products	Soybeans
Lumber and Wood	Hay
Food and Kindred	Vegetables
Power Generation	Cotton

The Beaumont-Port Arthur metropolitan area, at the south end of the region, has an economy based primarily on petroleum refining and chemical plants including petrochemicals. Other industries include a steel mill and paper mills, correctional facilities, as well as other timber products industries in Hardin County.

Some Hardin and Orange County residents work at a paper mill in adjacent Jasper County. There are several seaports (Beaumont, Port Arthur, and Orange plus several industrial docks), along with small amounts of shipyard activity. Industrial construction, including $3 billion in Jefferson County since 1997, has provided a significant amount of local employment in recent years. Agriculture in the area includes cattle, rice, and soybeans. Oil and gas production are significant.

Four campuses of the Texas State University System are located in the area. Beaumont contains Lamar University and the adjacent Lamar Institute of Technology. Lamar State College-Port Arthur and Lamar State College-Orange are located in Port Arthur and Orange respectively.

The Longview metropolitan area is centered in Longview (population 71,746, 2000), a city outside the region. The area contains very diversified manufacturing.

Industries in Rusk County (an outlying county in this area) include brick manufacturing, power generation, steel fabrication, fiberglass specialties, timber industries, and a major barbeque smokehouse.[c, d] Rusk County also has state correctional facilities. No major East Texas Region cities are located in this area.

The Tyler metropolitan area, consisting of Smith County, lies partially within the north end of the region. Tyler, the only major city in the area, lies almost entirely within the region. Local manufacturing includes air conditioning/heating units, cast iron pipe, tires, meat packing, and oil platform. However, the area is largely a commercial, educational, and medical center. Oil production and rose farming are prevalent in the area.[e]

Lufkin and Nacogdoches, the other major cities in the region, do not presently classify as metropolitan areas but would do so by 2040 and 2060 respectively according to the current TWDB population projections. These cities, located in adjacent micropolitan counties, have many similarities including timber products industries, poultry processing, and higher education. Lufkin also has a foundry and a truck trailer manufacturer, while Nacogdoches has manufacturers of valves, transformers, sealing products, and motor homes.

The remainder of the region is largely forested and has various timber industries including paper mills in Southeast Texas. Oil production is scattered throughout the region, and beef cattle are prominent, being found in all of the counties in the region. Plant nurseries are common in the north part of the region. Poultry production and processing are prevalent in Shelby and Nacogdoches Counties and very significant in Angelina and Panola Counties. There is diverse manufacturing in addition to timber industries. Tourism is important in many areas, especially on large reservoirs; in the south end of the region near Sabine Lake and the Gulf of Mexico; in many timbered areas which offer hunting opportunities.

Information from the Texas Workforce Commission (TWC) for July 2004 shows unemployment for the region varying from 4.6% in Anderson County to 14.8% in

Newton County.[f] Wage information was presented by workforce areas on the TWC web site for the second quarter of 2003,. Of the three workforce areas overlapping the region, the average annual wages were as follows:[g]

- East Texas (northern counties): $28,322.
- Deep East Texas (middle counties): $26,802
- South East Texas (Beaumont-Port Arthur metropolitan area): $32,051.

1.6 Sources of Water.

The East Texas Region obtains its supplies from both groundwater and surface water sources.

1.6.1. Groundwater.

The Texas Water Development Board (TWDB) has identified two major aquifers and three minor aquifers in the region. The difference between the major and minor classification as used by the TWDB relates to the total quantity of water produced from an aquifer and not the total volume available.

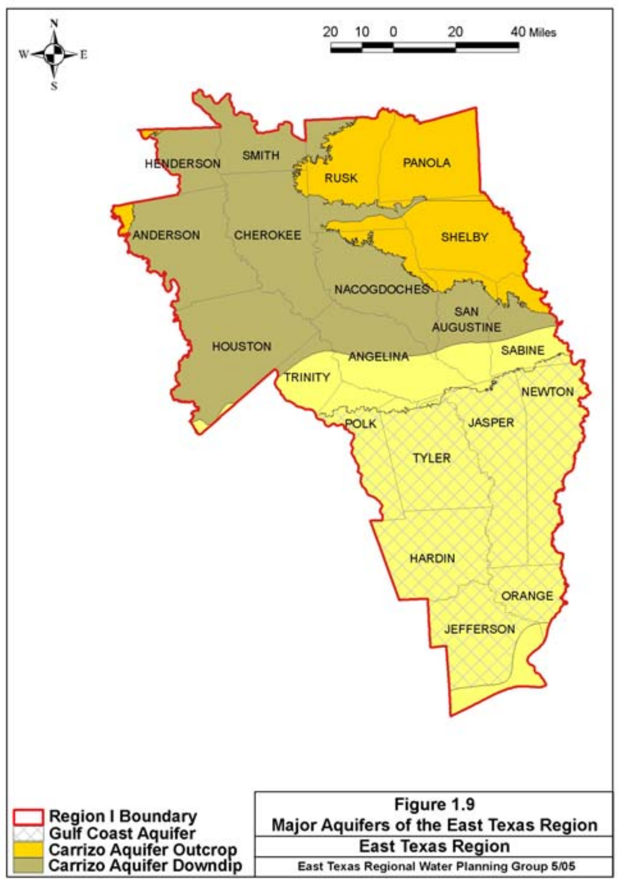


Figure 1.9
Major Aquifers of the East Texas Region

The two major aquifers that underlie the region are known as the Carrizo-Wilcox and the Gulf

Coast aquifer. The three minor aquifers, the Queen City, Sparta, and Yegua Jackson aquifers, supply lesser amounts of water to the region. Figures 1.9 and 1.10 show locations of the major and minor aquifers respectively. The figures show the entire region to be underlain with aquifers, except for narrow belts across the middle of the region and in the coastal area.

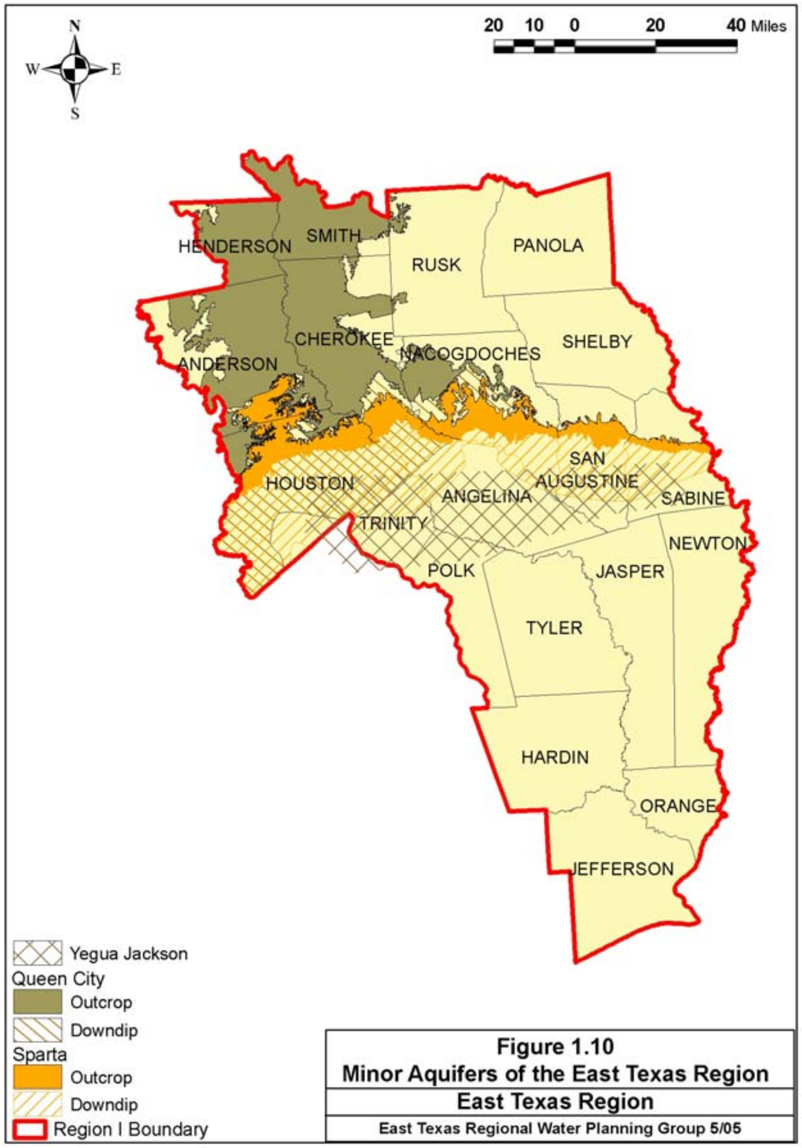


Figure 1.10
Minor Aquifers of the East Texas Region
East Texas Region
East Texas Regional Water Planning Group 5/05

The following generalized descriptions of the aquifers are based largely on the work of TWDB. A more thorough discussion of these aquifers, especially as it relates to water supply availability, is provided in the Chapter 3 report.

Gulf Coast Aquifer. The Gulf Coast aquifer forms an irregularly shaped belt along the Gulf of Mexico from Florida to Mexico. In Texas, the aquifer provides water to all or parts of 54 counties and extends from the Rio Grande northeastward to the borders with Louisiana and Arkansas. The Gulf Coast aquifer provides the sole source of groundwater in the seven southern counties of the region.

The Gulf Coast aquifer contains various interconnected layers, some of which are aquicludes *(impervious clay or rock layers)*. From bottom to top, the four main water-producing layers are the Catahoula, the Jasper, the Evangeline, and the Chicot, with the Evangeline and Chicot being the main sources of ground water in Southeast Texas.

Total pumpage from the Gulf Coast aquifer in the region averaged approximately 93,274 acre-feet per year (ac-ft/yr.) during 1995, 1996 and 1997.

Carrizo-Wilcox Aquifer. The Carrizo-Wilcox aquifer is formed by the hydrologically connected Wilcox Group and the overlying Carrizo Formation of the Claiborne Group. This aquifer extends from the Rio Grande in south Texas northeastward into Arkansas and Louisiana, providing water to all or parts of 60 counties in Texas. The Carrizo-Wilcox aquifer in the region occurs as a major trough caused by the Sabine Uplift near the Texas-Louisiana border.

Total groundwater pumpage from the Carrizo-Wilcox in the region averaged 76,607 acre-feet per year (ac-ft/yr.) during 1995, 1996 and 1997. The largest urban areas dependent on groundwater from the Carrizo-Wilcox are located in central and northeast Texas and include the East Texas Region cities of Lufkin (Angelina County), Nacogdoches (Nacogdoches County), and Tyler (Smith County). Well yields of greater than 500 gpm are not uncommon.

In some wells, declines in the artesian portion of the Carrizo-Wilcox in this area have exceeded 200 feet. However, evaluation of 46 Carrizo-Wilcox wells scattered throughout the region that have been monitored since the 1960's indicates that the average water level decline from the 1960's to the 1990's is about 51 feet and ranges from 20 feet below ground level (bgl) to 263 feet (bgl). Significant water-level declines have occurred in the region around Tyler and the Lufkin-Nacogdoches area.

Much of this pumpage has been for municipal supply, but industrial pumpage is also significant, especially for the paper mill northeast of Lufkin. However, pumpage from these industries has generally declined since the 1980's. Total pumpage from the Carrizo in Angelina and Nacogdoches counties has decreased since the 1980's and therefore, water levels have stabilized in these areas. In some wells, water levels have actually increased, although the wells are still being utilized.

Sparta Aquifer. The Sparta aquifer extends in a narrow band across the state from the Frio River in South Texas northeastward to the Louisiana border in Sabine County. The Sparta Formation is part of the Claiborne Group deposited during the Tertiary Period and consists of sand and interbedded clay with more massive sand beds in the basal section.

Yields of individual wells are generally low to moderate, although most high-capacity wells average 400 to 500 gpm. Because the Carrizo aquifer underlies the Sparta, most public water supply wells and other large production wells are completed in the Carrizo, thus limiting the total pumpage from the Sparta.

Relatively large amounts of usable quality groundwater are contained within the rocks of the Sparta aquifer. Historically, availability has been considered 5 percent of the average annual rainfall on the aquifer in the Neches and Sabine River basins.

Queen City Aquifer. Like the Sparta, the Queen City aquifer extends in a band across most of Texas from the Frio River in South Texas northeastward into Louisiana. The Queen City Formation is composed mainly of sand, loosely cemented sandstone, and interbedded clays. Although large amounts of usable quality groundwater are contained in the Queen City, yields are typically low, but a few exceed 400 gpm.

In the Neches, Sulphur, Sabine, and Cypress Creek basins, availability from the Queen City aquifer based on recharge has been estimated at 5 percent of average annual precipitation. Because of the relatively low well yields, overdrafting of the aquifer has not occurred.

Yegua-Jackson. The Yegua-Jackson aquifer extends in a narrow band from the Rio Grande to Louisiana. In the East Texas Region the aquifer is located in the southern half of Sabine and San Augustine counties, the lower tip of Nacogdoches county, most of Angelina county and in those portions of Polk and Trinity counties located in the East Texas Region. The Yegua-Jackson aquifer is a complex association of sand, silt and clay deposited during the Tertiary Period.

Springs. There are over 250 springs of various sizes documented in the region (Brune, 1981). A description of the springs is provided in Section 1.9.8. Most of the springs discharge less than 10 gpm and are inconsequential for planning purposes.

The Brune reference[1] does not indicate that any of the springs are used for water supply. The Jasper County spring was used as source water for a local TPWD fish hatchery in the 1970's.

Ground Water Quality. Ground water quality is affected by both natural and man-made contamination. The Texas Water Commission has stated, "Natural contamination probably affects the quality of more ground water in the state than all other sources of contamination combined."[h] In the Gulf Coast aquifer, salt water intrusion is an important form of natural contamination because of the proximity of the Gulf of Mexico.

Under natural conditions, in the absence of pumping, a layer of salt water underlies the lighter fresh water layer with a well-defined interface between the two layers. At any given point, especially near the coast, deeper aquifers may be filled with salt water, very shallow aquifers may contain all fresh water, and an intermediate aquifer may contain the interface.

Heavy pumpage has caused an updip migration, or saltwater intrusion, of poor quality water into the aquifer beyond its natural limits. A 1990 TWDB report indicated that salt water conditions are a problem in Orange County in the heavily pumped areas around Orange and Vidor. A 1989 Texas Water Commission report[h] also shows high chloride concentrations in most of Jefferson County. Much of the migration is lateral, but some localized vertical coning occurs in wells that draw from levels above the interface between salt and fresh water. In coning, some salt water is drawn up into the pumping well from below along with the fresh water at the intake level.

Salt water is also found farther inland, but usually at greater depths than in coastal areas. Salinity problems also occur in the vicinity of salt domes.

In some areas, natural contamination results from substances in the soil or in the aquifer media. Radioactivity is present in ground water from natural causes, particularly in a belt across East Texas Region including the area lacking major or minor aquifers. Some areas have nuisance substances in the ground water such as iron, manganese, and sulfates affecting the taste or color of the water.

Man-made aquifer pollution may result from improper waste disposal, leaking underground tanks. Wood preservation operations, pesticide use in agriculture, and improperly constructed wells.[h, i] There is no current evidence to show problems associated with man-made pollution.

The Gulf Coast aquifer generally contains good quality water except in portions of Jefferson and Orange Counties. The Carrizo-Wilcox aquifer for the most part has good water except for high dissolved solids and salinity in a band along its south boundary. Iron is a widespread problem in the aquifer, but sulfates and chlorides are found only in scattered locations other than chlorides along the south boundary.[i]

The Sparta aquifer produces water of excellent quality throughout most of its extent in the region; however, water quality deteriorates with depth in the downdip direction. Throughout most of its extent, the chemical quality of the Queen City aquifer water is excellent, however, quality deteriorates with depth in the downdip direction.

The Yegua aquifer produces good water only in a limited area. Iron is a problem, and the water from at least one location has been described as sodium bicarbonate water.

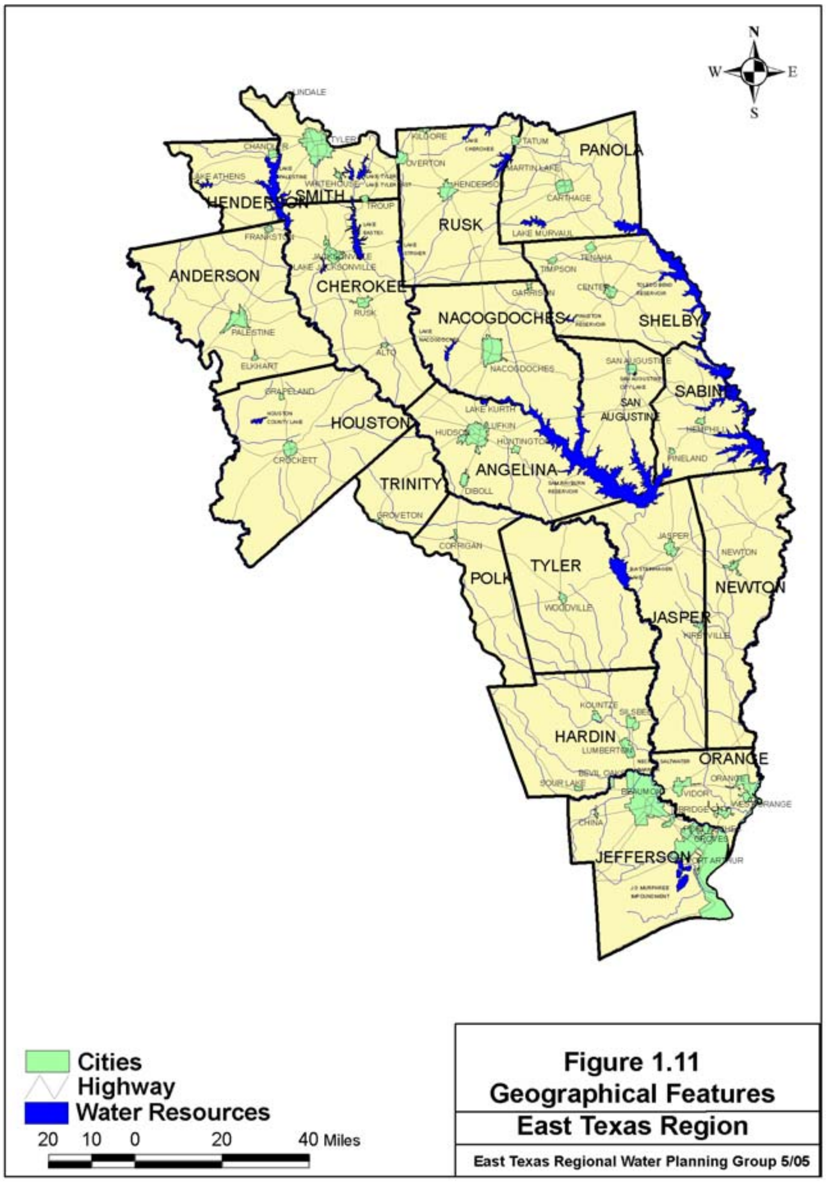


Figure 1.11
Geographical Features
East Texas Region

1.6.2. Surface Water.

Surface water for the region is currently provided by fifteen water supply reservoirs in all three river basins. Reservoir locations are shown in Figure 1.11. Table 1.4 contains pertinent data for the major water supply reservoirs in the region including eleven in the Neches River Basin, three in the Sabine River Basin and one in the Trinity River Basin.

Table 1.4
Major Water Supply Reservoirs

Reservoir Name	Owner	Conservation Pool Elevation (ft. msl)	Area (ac)	Capacity (ac-ft)	Firm Yield (ac-ft/yr)(1)
Neches River Basin:					
Lake Athens	Athens MWA		1,520	32,690	6,145
Lake Columbia[2]	ANRA	315	10,000	187,839	75,700
Lake Jacksonville	City of Jacksonville	422	1,320	30,500	6,200
Lake Nacogdoches[6]	City of Nacogdoches	279	2,219	41,140	22,000
Lake Naconiche[2]	Nacogdoches County	348	692	8708	7665[3]
Lake Palestine	Upper Neches River MWA	345	25,560	411,300	222,200
Lake Pinkston[6]	City of Center	298	523	7,380	3,800
Lake Tyler/Tyler East	City of Tyler	375.4	4,880	73,700	35,490
Sam Rayburn	Corps of Engineers	164.4	114,500	2,898,300	820,000
B. A. Steinhagen	Corps of Engineers	83	13,700	94,200	131,800
Striker Creek Reservoir	Angelina-Nacogdoches WCID No. 1	292	2,400	26,960	20,600
Sabine River Basin:					
Lake Cherokee[4]	Cherokee Water Company	280	3,987	46,700	22,500
Lake Murvaul	Panola Co. FWSD No. 1	265	3,800	45,815	22,380
Toledo Bend Reservoir[5]	SRA	172	181,600	4,472,900	750,000
Trinity River Basin:					
Houston County	Houston Co. WCID No. 1	260	1,282	19,500	3,500

[1] Firm yield less of 2000 firm yield or permitted diversified unless otherwise noted.
[2] Lake Columbia (formerly known as Eastex Reservoir) and Lake Naconiche are permitted by state but not yet constructed. Lake Columbia is in the process of Corps permitting.
[3] Firm yield for Lake Naconiche estimated.
[4] Lake Cherokee lies partially in Gregg County outside the region.
[5] Capacity and yield information obtained from SRA.
[6] Permitted diversion used in lieu of lower firm yield.

Surface Water Quality. Surface water quality in the region varies greatly between water bodies. Stream and lake segments with water quality problems identified by the TCEQ as impaired are discussed in Section 1.12. None of the segments in the region where drinking water use was assessed showed any problems with that use, although aquatic life and recreation uses were often not supported by the water bodies. *(Some segments such as tidal segments are not assessed for drinking water use because that use would be obviously unattainable.)*

Fish consumption was the subject of TDH advisories in a number of segments, mostly in reservoirs as a result of mercury found in certain species of fish.[j]The mercury concentration in the water was negligible and did not present any problems for recreation or water supply.[lk]

Even though the water in the reservoirs and streams is usable as a drinking water source, surface water generally requires more extensive treatment than ground water. This additional treatment includes sedimentation, filtration, and in some instances more extensive disinfection.

Salt water intrusion is a major concern in the tidal reaches of streams, especially since ship channels were dredged around the beginning of the twentieth century. The salt water, being heavier than fresh water, tends to settle on the bottom of the channel similar to the way it underlies fresh water in aquifers. The horizontal and vertical extent of the salt water layer varies according to several factors including fresh water inflow and tidal influence. The salt water barrier in the Neches River keeps the salt water from reaching Lower Neches Valley Authority and City of Beaumont Raw Water Supply Intakes.

Pollution from industrial discharges has also been a major concern, although industries have been required to improve the quality of their effluent over what it was several decades ago. Salt water intrusion which was exacerbated by channel dredging, has disqualified the lower segments of the Sabine and Neches Rivers from use as drinking water supplies.

1.7 Wholesale Water Providers

1.7.1. Wholesale Water Providers – General. The definition of a wholesale water provider is included in Chapter 357.2(8) and is as follows: "Wholesale water provider –Any person or entity, including river authorities and irrigation districts, that has contracts to sell more than 1,000 acre-feet per year of water wholesale in any one year during the five years immediately preceeding the adoption of the last regional water plan. The regional water planning groups shall include as wholesale water providers others persons and entities that enter or that the regional water planning group expects or recommends to enter contracts to sell more than 1,000 acre-feet per year of water wholesale during the period covered by the plan." Major water suppliers, as defined by the ETRWPG, are listed in Table 1.5, with addresses and contact information in Table 1.6. These suppliers, including river authorities, are the primary source of water for many of the end suppliers.

Angelina and Neches River Authority (ANRA). ANRA, headquartered in Lufkin, has jurisdiction over the middle portion of the Neches basin including the Angelina basin, as well as the portions of Jasper and Orange Counties in the Neches basin. ANRA holds the permit for the proposed Lake Columbia *(formerly known as Eastex Reservoir)*, with rights to approximately 85,500 ac-ft/yr. for distribution. ANRA serves as the lead agency in the Neches River Basin for the Clean Rivers Program within its own jurisdiction as well as that of the Upper Neches River Municipal Water Authority. ANRA also owns and operates a water and sewer system in a subdivision near Jasper, as well as a regional wastewater facility in northwestern Angelina County.[l]

Angelina-Nacogdoches WCID No. 1. The A-N WCID #1`owns and operates Lake Striker in Rusk and Cherokee Counties. Currently the only demand on A-N WCID#1 is for steam electric power in Cherokee County. Supplies have previously been provided to a paper mill that is presently closed.

Athens Municipal Water Authority. Athens MWA provides water to the city of Athens, which is located in both Region C and East Texas Region, and the Texas Freshwater Fisheries Center at Lake Athens. Athens MWA has 8,500 acre-feet per year of water rights in Lake Athens. The firm yield of the lake was estimated at 6,145 acre-feet per year. However, the intake structure for the fish hatchery does not allow the water level to drop below 431 feet msl and maintain inflow to hatchery. Using this operational constraint, the yield of Lake Athens is 2,900 acre-feet per year. The Athens MWA also has a wastewater reuse permit for 2,677 acre-feet per year, but the infrastructure is not in place to utilize this source.

City of Beaumont. The City draws water from two sources in roughly equal amounts. The three wells are located in the Loeb community in southern Hardin County a short distance north of the City. The City also draws surface water from the Neches River at either of two points upstream from its water treatment plant. A portion of the raw water is transmitted to a refinery south of the City. The rest of the water is treated and fed into the City water system.

Water in the system, whether from the wells or from the river, is used for in-City municipal customers; for various industries inside and outside the City; for wholesale customers including two nearby water districts; and for state, federal, and county correctional facilities south of the City. Two other water districts have standby service from the City.

The City holds rights to 49,897 acre-feet per year from the Neches River.

City of Carthage. The City of Carthage provides wholesale water to County-Other customers in Panola County and manufacturing customers. The City currently obtains its water from groundwater from the Carrizo-Wilcox aquifer and surface water from Panola County Fresh Water Supply District (FWSD) (Lake Murvaul).

City of Center. The City of Center currently obtains water from Lake Center and Lake Pinkston for use within the City and for distribution to its municipal and industrial customers. Several water supply corporations have emergency interconnections with the City, one of which receives part of its normal supply from the City. Local industries include two poultry plants, a hardwood flooring plant, and manufacturers of store fixtures, shelters, and portable cooling equipment. [m] The City owns and operates Lake Center, with annual rights to 1,460 acre-feet of municipal water. Water from Lake Pinkston is pumped from the Neches River Basin to the City, located in the Sabine River Basin. The City holds rights to 3,800 acre-feet per year of water in Lake Pinkston.

City of Jacksonville. The City draws water partially from wells and partially from Lake Jacksonville, from which it holds water rights of 5,000 acre-feet per year. *(The City also holds a total of 1200 acre-feet per year of water rights in Lake Acker.)* The City supplies several wholesale customers including the Afton Grove, Craft-Turney, Gum Creek, and North Cherokee Water Supply Corporations.

The City also supplies water to local industries including feed mills, candy manufacturing, meat packing, timber products, furniture manufacturing, medical equipment, heat exchanger cores, plastic products, printing equipment, electric signs, copper products, wooden baskets, venting, and metal fabrication.[n]

City of Lufkin. The City currently draws its water from wells. In addition to its own municipal customers, the City supplies water to a number of industries as well as a wholesale entity, the Angelina Fresh Water District. The City has also taken the Burke WSC system into its own operations.

City of Nacogdoches. The City draws part of its supply from wells located in and near the City, with the remainder coming from Lake Nacogdoches ten miles west of the City *(water rights of 20,162 acre-feet per year).* An increasing percentage of the water comes from the lake as water demand increases and the wells approach the end of their useful life. The City supplies water to its own municipal customers, including Stephen F. Austin State University (SFA) and several hundred retail customers outside the City. The City also supplies various industries in and near the City.

Outside wholesale customers supplied by the City on a full time basis include one water district and one water supply corporation. One other water district and at least two other water supply corporations are interconnected for emergency use. The City has bought out one neighboring water supply corporation and taken over its system.

City of Port Arthur. The City draws all of its water supply from the LNVA canal system that extends to the City. After treating the water in its plant constructed in the late 1990's, it supplies water to a wholesale customer (a state park) and to various nearby industries, some of which use City water only for domestic use. The City has taken over the water system for one plant just outside the City.

City of Tyler. The City draws water partially from wells but primarily from surface water sources. One source consists of nearby Lake Tyler and Lake Tyler East, which are interconnected by a channel so as to function as one lake. The City also completed a new surface water plant on Lake Palestine in 2003.

The City supplies a number of local industries including steel fabrication, building fasteners, oil platforms, machine shops, plastics industries, timber industries, paper products, air conditioners, food industries, sportswear, industrial gases, signs, trailers, concrete products, tires, rubber extrusions, fishing lures, oil and gas refining, asphalt, iron pipe, refractory materials, automotive equipment, and silk flowers.[o] The City also provides part of the water supply for the City of Whitehouse and for a nearby water supply corporation.

An older and smaller City lake, Lake Bellwood, provides raw water for two golf courses and for a tire manufacturer.

The City's water rights include 40,000 acre-feet per year from Lake Tyler/Tyler East and 2000 acre-feet per year from Lake Bellwood. The City is also entitled by contract to 67,213 acre-feet per year (60 million gallons per day) from Lake Palestine.

Houston County WCID No. 1. This WCID owns and operates Houston County Lake northwest of Crockett. The District has no retail customers other than one industry, but supplies water to several wholesale customers in the county. These customers consist of three cities (Crockett, Grapeland, and Lovelady) and Consolidated Water Supply Corporation (WSC). Consolidated WSC has a multi-county service area that includes over half of Houston County. The WSC has several thousand connections in Houston County as well as connections in neighboring counties.

The cities of Crockett, Grapeland, and Lovelady have one well each to supplement the wholesale water supply, while the WSC has seven wells within the county. The first two cities resell water to the WSC to supply some of its isolated systems.

The WCID has a 3 mgd surface water plant with water rights to 3,500 acre-feet/year.

Huntsman Chemical. Huntsman purchased several chemical plants in southern Jefferson County from Texaco Chemical several years ago. Most of the Huntsman plants draw water directly from the LNVA canal system, although one plant is supplied through the adjacent Motiva refinery. One of the plants, known as Plant C4 *(one of the old Neches Butane plants)*, located near Port Neches, resells a portion of the water to the ISP plant near Port Neches.

Lower Neches Valley Authority (LNVA). Formed in 1933, LNVA has water rights to a total of 1,201,876 acre-feet per year from Sam Rayburn Reservoir/Lake B. A. Steinhagen System *(both owned and operated by the Corps of Engineers)* and the Neches River. LNVA draws water from the Neches River far downstream from the two lakes as well as from Pine Island Bayou. LNVA distributes through its canal system approximately 1.2 million ac-ft annually to cities, industries, and farmers in the Southeast Texas area. In particular, LNVA provides raw water for most of the cities and water districts in Jefferson County.

The LNVA has constructed a permanent salt water barrier on the Neches River, protecting its canal intakes and those of the City of Beaumont from salt water intrusion. This barrier helps conserve surface water in the reservoirs, since it is no longer necessary to release water during dry periods to keep the salt water pushed away from the intakes.

The LNVA completed, in October 2004, a regional water plant in Chambers County (just outside the region) to treat its own canal water for the Bolivar Peninsula (also outside the region).

In addition to most of the lower portion of the Neches River Basin, the LNVA has jurisdiction over the Neches-Trinity Coastal Basin. LNVA also serves as the lead agency for implementation of the Clean Rivers Program within its jurisdiction.

Motiva Enterprises. Motiva operates a refinery near Port Arthur *(originally Texaco, then Star Enterprise before creation of Motiva).* The refinery draws water from a reservoir supplied by the LNVA canal system. After treating the water for industrial use, it sells a portion of the water to the adjacent Huntsman Chemical Plant *(formerly Texaco Chemical).*

Panola County Fresh-Water Supply District No. 1 (Panola County FWSD 1). The Panola County FWSD 1 owns and operates Lake Murvaul in the ETRWPA. Created in 1953, the district provides water exclusively to the City of Carthage from its rights to 21,280 acre-feet of municipal water and 1,120 acre-feet of industrial water in Lake Murvaul. The City in turn provides wholesale service to five water supply corporations and a privately owned system, in some cases as the sole supply. The City also has an emergency interconnect with a water supply corporation.

Sabine River Authority (SRA). SRA, created in 1949 by the Texas Legislature, was originally formed as a conservation and reclamation district. SRA is responsible for controlling, storing, preserving and distributing the waters of the Sabine River and its tributaries throughout the Texas portion of the Sabine River Basin for beneficial use.

SRA also serves as the lead agency for implementation of the Clean Rivers Program in the basin.

Within the region, the SRA owns and operates Toledo Bend Reservoir jointly with the Sabine River Authority of Louisiana. SRA supplies raw water via contracts with municipalities, water-supply corporations and industrial users in Texas. SRA holds rights to approximately 750,000 ac-ft/yr. in the reservoir.

The SRA also holds run-of-the-river rights, which are associated with SRA's Canal System. Those rights include 100,400 acre-feet/year for municipal and industrial use, and 46,700 acre-feet/year for irrigation use.

Upper Neches River Municipal Water Authority (UNRMWA). UNRMWA, headquartered at Lake Palestine, was created in 1953. The agency is the part owner, authorized agent, and operator of Lake Palestine on the Neches River. UNRMWA holds rights to some 238,000 ac-ft/yr. in Lake Palestine, from which it distributes raw water to municipalities and other contract buyers in the region.

Several entities participated in the construction of Lake Palestine and hold contract rights for water from the lake. These entities include the cities of Palestine and Tyler within the East Texas Region. Additionally, the City of Dallas, located in the Trinity River Basin and Region C, was a participant and has a contract to import 114,337 acre-feet from Lake Palestine. The City anticipates constructing the necessary importation facilities by 2015.

Table 1.5
East Texas Region
Major Water Providers[1, 2]

Entity Name	1997 Municipal Water		1997 Industrial Water		Number of Wholesale Customers	
	Amount Used (af/y)	Amount Sold (af/y)	Amount Used (af/y)	Amount Sold (af/y)	Municipal	Industrial
ANRA[3]	NA	NA	NA	NA	NA	NA
City of Beaumont	25,667	86	0	501	3	20
City of Center	3,018	181	0	1,456	2	5
City of Jacksonville	4,868	1,050	0	523	5	19
City of Lufkin	8,161	338	0	2,602	2	11
City of Nacogdoches	6,179	305	0	1,141	5	12
City of Port Arthur[4]	13,986	4	0	4,249	1	13
City of Tyler	21,155	638	0	2,352	3	18
Houston County WCID No.1	0	1,734	0	121	4	1
Huntsman Chemical[4]	0	0	3,651	259	0	1
LNVA	0	22,361	0	130,820	7	18
Motiva Enterprises[4]	0	0	18,054	418	0	2
Panola County FWSD	0	2,246	0	0	1	0
SRA	0	1,528	0	56,568	6	9
Upper Neches River MWA	0	3,637	0	0	2	0

[1] Major water providers are defined as entities who supply over 1,000 acre-feet per year to users other than their own retail customers.
[2] Data are from the 1997 TWDB historical use records.[3] The ANRA is the permit holder for Lake Columbia *(previously known as Lake Eastex)*; the reservoir has not yet been constructed. The project is in the planning and permitting stage, and completion is expected in 2007.[4] The City of Port Arthur, Motiva, and Huntsman obtain all of their water from the LNVA through its canal system and resell some of the water.

Table 1.6
East Texas Region
Contact Information for Major Water Providers

Entity Name	Address	Telephone*	Contact Person
Angelina and Neches River Authority	210 East Lufkin Avenue Lufkin, Texas 75901-0310	936/632-7795	Kenneth Reneau, General Manager
City of Beaumont	P. O. Box 3827 Beaumont, Texas 77704-3827	409/880-3716	Hani Tohme, Water Utilities Director; Mark Goad, Assistant
City of Center	P. O. Box 1744 Center, Texas 75935-1744	936/598-2941	Chad Nehring, City Manager
City of Jacksonville	P. O. Box 1390 Jacksonville, Texas 75766-1390	903/586-3510	Mayor Kenneth Durrett; Kerry Cummings
City of Lufkin	P. O. Drawer 190 Lufkin, Texas 75902-0190	936/634-8881	Paul Parker, City Manager
City of Nacogdoches	P. O. Box 635030 Nacogdoches, Texas 75965-5030	936/559-2502	Jim Jeffers, City Manager
City of Port Arthur	P. O. Box 1089 Port Arthur, Texas 77641-1089	409/983-8115	Steve Fitzgibbons, City Manager
City of Tyler	P. O. Box 2039 Tyler, Texas 75710-2039	903/531-1161	Bob Turner, City Manager
Houston County WCID No.1	P. O Box 1246 Crockett, Texas 75835-1246	936/544-3985	John Schenette, Manager
Huntsman Petrochemical Corporation	P. O. Box 847 Port Neches, Texas 77651-0847	409/724-4700	Ron Franklin, Plant Manager
Lower Neches Valley Authority	P. O. Box 5117 Beaumont, Texas 77726-5117	409/892-4011	Robert Stroder, Manager
Motiva Enterprises	P. O. Box 712 Port Arthur, Texas 77641-0712	409/989-7001	Mike Killian
Panola County FWSD	Rt. 4, Box 331 Carthage, Texas 75633-0331	903/693-9133	Harry Smith, General Manager
Sabine River Authority*	P. O. Box 579 Orange, Texas 77631-0579	409/746-2192	Jerry Clark, General Manager
Upper Neches River Municipal Water Authority	P. O. Box 1965 Palestine, Texas 75802-1965	903/876-2237	Tom Mallory, General Manager

* SRA operates Toledo Bend Reservoir jointly with Sabine River Authority of Louisiana, 15901 Texas Highway, Many, La 71449-5718, phone 318/256-4112 or toll free 800/259-LAKE (259-5253). Each authority sells water only to entities in its own state

1.8 Current and Projected Water Demands

1.8.1 General. The demand for water in the East Texas Region is expected to grow from a demand of 704,320 acre-feet per year in the year 2000 to a total of 1,261,320 acre-feet per year in 2060. The water demands, in the regional water planning process, is categorized into six major user groups; municipal, manufacturing, irrigation, steam electric, livestock and mining. A more detailed description for each user group is found in Chapter 2. The demand for the year 2000 and 2060 for each of the major groups is shown in Figures 1.12 and 1.13. The total demand in this planning cycle is approximately 2%

Figure 1.12
2000 Distribution of Water Demand

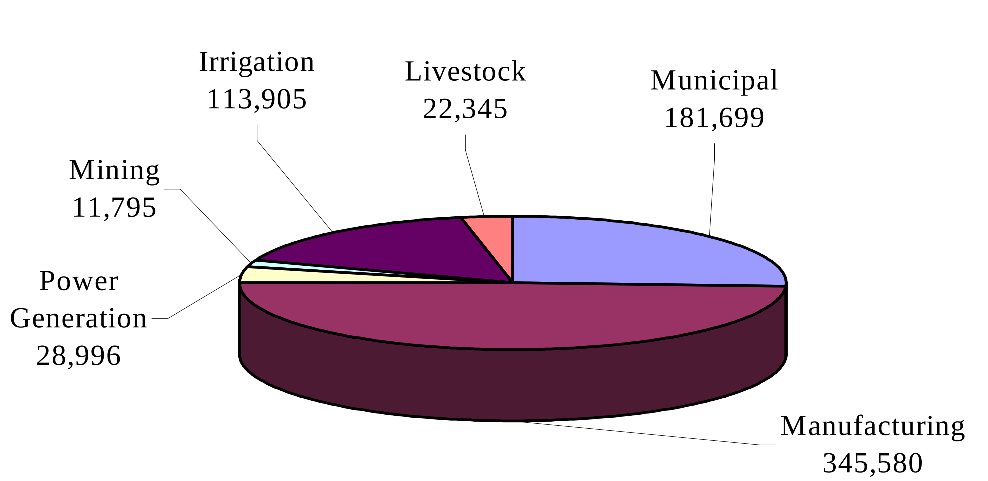
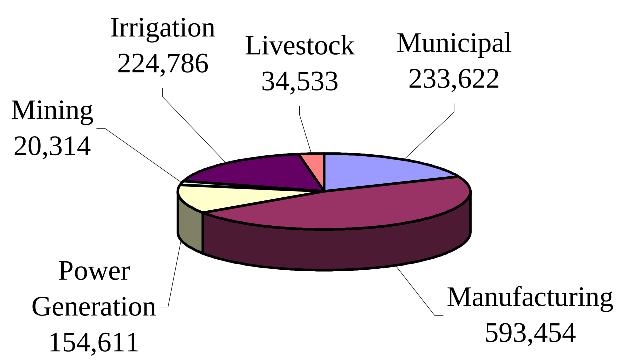


Figure 1.13
2060 - Distribution of Water Demand



higher than the 2001 planning cycle. The projected demand on supplies does not include future demands for potential LNG Facilities or demands on supplies that are located in the East Texas Region and identified as strategies for other regions.

1.8.2 Major Demand Centers. Most major demand in the region centers around larger cities or metropolitan areas. In particular, over half of the current and projected water demand lies in Jefferson and Orange Counties in Southeast Texas. In that area the two dominant water usages are manufacturing and irrigation, the latter occurring mainly in Jefferson County.

However, large volumes of water use can occur away from large cities as in the case of outlying industries and steam power generating plants.

For purposes of this report, major demand centers have been selected according to varying criteria. A county was selected if its total water usage *(without depending on a single industry)* exceeded 40,000 acre-feet per year. In counties that were not selected as a whole, a single industry was selected if it had 20,000 acre-feet per year or more and represented the majority of usage in the county. Anticipated future power plants or increased usage by power plants was assumed to represent a single facility.

There are currently five major demand centers. An additional three major demand centers are expected to become prominent by 2060, are summarized in Table 1.8. Jefferson and Orange Counties are listed together as one demand center because of the unified nature of the metropolitan area. Other counties listed as demand centers are Angelina and Nacogdoches Counties in the middle of the region and Smith County at the north end. Outside the listed counties, two existing and two anticipated industries – a paper mill and three steam electric generating plants – are listed as demand centers in themselves. These facilities account for the vast majority of water usage in their counties, which otherwise would not constitute major demand centers.

Table 1.7 Major Demand Centers

Description of Area or User		2004 Water Use		2060 Water Use	
Current (2004)	**2060**	**Dominant Use**	**Ac-Ft/Yr**	**Dominant Use**	**Ac-Ft/Yr**
Angelina County	Angelina County	Manufacturing	25,238	Manufacturing	48,356
Paper Mill in Jasper County	Paper Mill in Jasper County	Manufacturing	58,916	Manufacturing	74,069
Jefferson and Orange Counties	Jefferson and Orange Counties	Irrigation and Manufacturing	356,717	Irrigation, Manufacturing, and Steam Power Generation	699,370
	Nacogdoches County			City of Nacogdoches and Steam Power Generation	25,898
Power Plant in Rusk County	Power Plant in Rusk County	Steam Power Generation	18,805	Steam Power Generation	53,074
Smith County	Smith County	City of Tyler	24,244	City of Tyler	32,253
	Anderson County			Steam Power Generation	21,853
	Newton County			Steam Power Generation	27,317

1.9 Agricultural and Natural Resources

1.9.1 General. The primary natural resource in the region is timber. An abundance of pine and hardwood forests is evidenced by the numerous national and state parks and forests including the Angelina National Forest, Big Thicket National Preserve, Davy Crockett National Forest and Sabine National Forest.

Groundwater should be considered another primary resource for the region. Other natural resources include oil, natural gas, sand and gravel, lignite, salt and clay.

1.9.2 Wetlands. Wetlands are areas characterized by a degree of flooding or soil saturation, hydric soils, and plants adapted to growing in water or hydric soils.[2] Wetlands are beneficial in several ways; they provide flood attenuation, bank stabilization, water-quality maintenance, fish and wildlife habitat, and opportunities for hunting, fishing, and other recreational activities.[2] There are significant wetland resources in the region, especially near rivers, lakes, and reservoirs. Figure 1.14 shows large wetland areas near Sabine Lake; along the Trinity, Neches, Angelina, and Sabine Rivers; along Village Creek and its tributaries; around Lake Palestine; and along tributaries to the Sabine River.

Figure 1.14

Wetlands in East Texas Region
5/05

Figure 1.14, taken from a U.S. Fish and Wildlife Service (USFWS) study,[3] shows the density of wetlands in the coastal part of the region. The USFWS study area, shown in Figure 1.14 covers Jefferson and Orange Counties, most of Hardin County, the southern third of Jasper County, and the southern two-thirds of Newton County.

Texas wetlands types and characteristics are summarized in Table 1.8. Most Texas wetlands are palustrine bottomland hardwood forests and swamps, and most of the state's palustrine wetlands are located in the flood plains of East Texas rivers.[2] Table 1.9 shows the bottomland hardwood acreage associated with the four major rivers in the region.

Table 1.8 Texas Wetland Types and Characteristics

Wetland Classifications	Definition	Vegetation/Habitat Types
Palustrine	Palustrine wetlands are freshwater wetlands in which vegetation is predominantly trees; shrubs; emergent, rooted herbaceous plants; or submersed/floating plants. [2] Palustrine wetlands can also refer to intermittently to permanently flooded open-water bodies of less than 20 acres in which water is less than 6.6 feet dep. [3]	Predominantly trees; shrubs; emergent, rooted herbaceous plants; or submersed/floating plants. [2]
Estuarine	Estuarine wetlands are tidal wetlands in low-wave-energy environments where the salinity of the water is greater than 0.5 parts per thousand (ppt) and is variable due to evaporation and mixing of freshwater and seawater. [2]	Emergent plants; intertidal unvegetated mud or sand flats and bars; estuarine shrubs; subtitdal open water bays (deep water habitat). [3]
Lacustrine	A lacustrine system includes wetlands and deepwater habitats with all of the following characteristics[4]: (1) situated in a topographical depression or in a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage; (3) total area exceeds 20 acres.	One or more of the following: nonpersistent emergent plants, submersed plants, and floating plants. [3].
Riverine	Riverine wetlands are freshwater wetlands within a channel, with two exceptions [138]: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with salinity greater than 0.5 ppt.	One or more of the following: nonpersistent emergent plants, submersed plants, and floating plants. [3]
Marine	Marine wetlands are tidal wetlands that are exposed to waves and currents of the Gulf of Mexico and to water having salinity greater than 30 ppt. [3]	Intertidal beaches, subtidal open water (deep water habitat). [3]

Table 1.9
1980 Geographical Distribution of Bottomland Hardwood Associated with Selected Rivers*

River	Area (acres)	Amount Located in East Texas Region
Trinity River	305,000	Small portion
Neches River	257,000	Almost all
Sabine River	255,000	Approximately half of the Texas portion of the Sabine River Basin is located in East Texas Region.
Angelina River	88,000	All

* Information obtained from [5]

The TPWD, in a study of natural resources in Smith, Cherokee, Rusk, Nacogdoches, and Angelina Counties,[6] found the most extensive wetlands in the study area were water oak-willow oak-blackgum forests along the Neches, Angelina, and Sabine Rivers. In the same study, TPWD noted the presence of a significant bald cypress-water tupelo swamp along the Neches River in Angelina County.[6] TPWD identified specific stream segments in the region that they classify as being priority bottomland hardwood habitat;[7] these segments will be discussed in later sections.

In the coastal part of the region, palustrine wetlands such as swamps and fresh marshes occupy flood plains and line the shores of tidal freshwater reaches of sluggish coastal rivers.[2] Much of the palustrine wetlands area in Jefferson County is farmed wetlands used for rice growing. Figure 1.15 (b) shows the density of palustrine wetlands in the coastal part of the region.[3] In the USFWS study area, palustrine emergent wetlands were most prevalent in Jefferson County, palustrine forested wetlands were most prevalent in Newton, Jasper, Orange, and Hardin Counties, and palustrine scrub-shrub was most prevalent in Newton, Jasper, Orange, and Hardin Counties.[3] Some concentrations of palustrine shrub wetlands were also found in Jefferson County.[3]

Estuarine wetlands such as salt marshes and tidal flats are the next most prevalent type of wetland areas. Estuarine wetlands are very common in the area around Sabine Lake,[3] particularly the emergent kind. Figure 1.15 (c) shows estuarine wetlands in the coastal part of the region.

Three other kinds of wetlands cover a smaller area in the region but are ecologically significant:[3] lacustrine, riverine, and marine wetlands. See Table 1.8 above for a description of these types of wetlands.

Section 404 of the Clean Water Act mandates that, when impacts to wetlands are unavoidable, the impacts to wetlands must be mitigated by replacing the impacted wetland with a similar type of wetland. Mitigation may include restoration and rehabilitation of native wetlands or construction of new wetlands.

One wetland mitigation project, the Blue Elbow Swamp Mitigation Project, was identified near the mouth of the Sabine River[9]. This mitigation project was established by the Texas Department of Transportation to compensate for future impacts to wetlands[9].

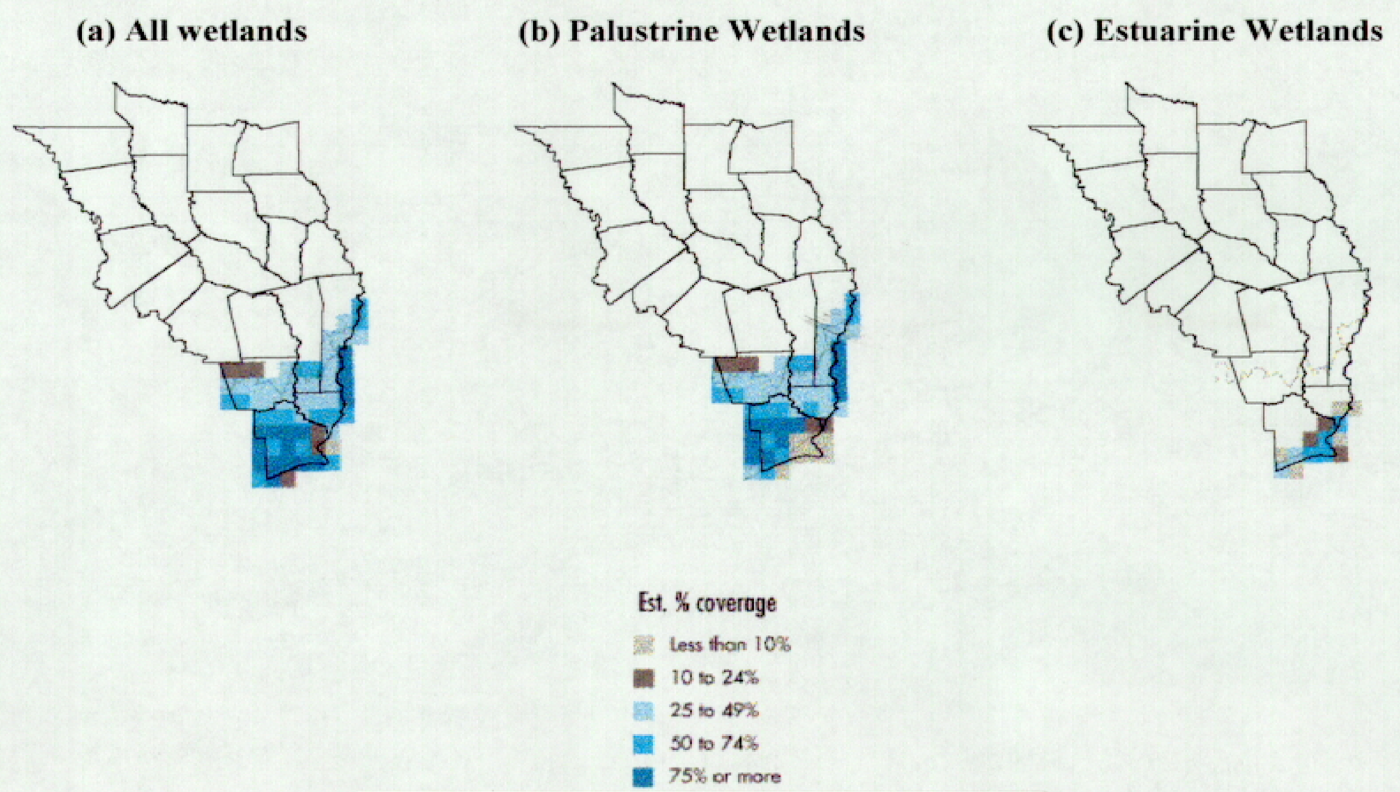


Figure 1.15

East Texas Region 5/05

Region I Coastal Wetlands as of 1992[2]

[NOTE: Each square represents one 7.5 minute USGS quadrangle map]

1.9.3 Estuaries. The Sabine-Neches Estuary includes Sabine Lake, the Sabine-Neches and Port Arthur Canals, and Sabine Pass.[10] The Sabine-Neches Estuary covers about 100 square miles. The Neches and Sabine River Basins and part of the Neches-Trinity Coastal Basin contribute flow to the estuary.[10]

In the estuary, freshwater from the Sabine and the Neches Rivers meets saltwater from the Gulf of Mexico. Although the estuary is influenced by the tide, it is protected from the full force of Gulf waves and storms due to its inland location. The Sabine-Neches Estuary is important for fish, shellfish, and wildlife habitat and for sport and commercial fishing.

1.9.4 Endangered or Threatened Species. The Texas Parks and Wildlife Department (TPWD) has identified species of special concern in the region (See Appendix A). These species are either listed as threatened or endangered at the state level or have limited range within the state. The TPWD maintains a list of species of special concern in the Texas Biological and Conservation Data System (TXBCD).

1.9.5 Stream Segments with Significant Natural Resources. In each river basin in Texas, the TPWD has identified stream segments that it classifies as having significant natural resources.[7] Stream segments have been placed on this list because they have been identified by TPWD as having high water quality, exceptional aquatic life, high aesthetic value, fisheries, spawning areas, unique state holdings, endangered or threatened species, priority bottomland hardwood habitat, wetlands, springs, and pristine areas.

Stream segments in the Trinity River Basin that have been classified as having significant natural resources include the following:[7]

- Unique state holdings

  1) Gus Engeling Wildlife Management Area on Catfish Creek in Anderson County.

2) Big Lake Bottom Wildlife Management Area on the Trinity River in Anderson County.

Stream segments in the Neches River Basin that have been classified as having significant natural resources include the following:[7]

- Priority bottomland habitat:

  1) Mud Creek from the SH 204 crossing to the confluence with the Angelina River (Cherokee County). This area has been designated as a Priority 1 bottomland hardwood area by the USFWS.[7]

  2) Angelina River between FM 1911 and US 59 (Nacogdoches, Angelina, and Cherokee Counties).

  3) Neches River between FM 1013 and the Tyler-Hardin County line (Jasper and Tyler Counties).

  4) Neches River from US 84 to the Trinity-Polk County line (Anderson, Houston, Cherokee, Trinity and Angelina Counties).

- Extensive freshwater wetland habitat:

  Neches River from the confluence with Pine Island Bayou to Sabine Lake (Orange and Jefferson Counties).

- Protected species:

  1) Neches River from SH 7 to Steinhagen Lake (Houston, Angelina, Trinity, Polk, Tyler, and Jasper Counties). Protected species are rose-mallow, slender gayfeather, bog coneflower, Drummond's yellow-eyed grass, and rough-leaf yellow-eyed grass.

2) Village Creek from the source to confluence with the Neches River (Polk, Tyler, and Hardin Counties). Protected species are Texas trailing phlox and white firewheel.

3) Neches River from Lake Palestine to Steinhagen Lake (Anderson, Cherokee, Houston, Angelina, Trinity, Polk, Tyler, and Jasper Counties). Protected species are paddlefish, creek chubsucker, and blue sucker.

- <u>Recreation</u>:

1) Neches River from Lake Palestine Dam to Steinhagen Lake (Anderson, Cherokee, Houston, Angelina, Trinity, Polk, Tyler, and Jasper Counties).

2) Angelina River from the East Fork of the Angelina River to Sam Rayburn Reservoir (Nacogdoches, Cherokee, and Angelina Counties).

3) Big Sandy Creek and Village Creek from the source to the confluence with the Neches River (Polk, Tyler, and Hardin Counties).

4) Neches River from Steinhagen Lake Dam to the confluence with Pine Island Bayou (Tyler, Jasper, Hardin, Orange, and Jefferson Counties).

5) Pine Island Bayou from FM 770 to the confluence with the Neches River (Hardin and Jefferson Counties).

6) Angelina River from Sam Rayburn Dam to Steinhagen Lake (Jasper County).

- <u>Unique state holdings</u>:

1) Mission Tejas State Park on San Pedro Creek in Houston County.

2) Angelina-Neches Scientific Area and Dam B Unit Wildlife Management Area on the Neches and Angelina Rivers in Jasper and Tyler Counties.

3) Village Creek State Park on Village Creek in Hardin County.

4) Caddoan Mounds State Historic Park on Bowles Creek in Cherokee County.

5) Lower Neches Wildlife Management Area on the Neches River in Orange County.

6) Upstream side of US 59 on the Neches River in Nacogdoches and Angelina Counties. This is a planned acquisition by the TPWD.

- Unique federal holdings:

1) Neches River Corridor Unit of the Big Thicket National Preserve on the Neches River in Jasper and Hardin Counties.

2) Little Pine Island Bayou Unit of the Big Thicket National Preserve on Little Pine Island Bayou in Hardin County.

Stream segments in the Sabine River Basin that have been classified as having significant natural resources include the following:[7]

- Priority bottomland habitat: Sabine River from the Rusk-Panola County line to the Louisiana state line (Panola County).
- Extensive freshwater habitat: Sabine River from IH 10 to Sabine Lake (Orange County).
- Protected species:

1) Sabine River from Gladewater to Toledo Bend Reservoir (Rusk, Panola, and Shelby Counties). Protected species are suckermouth minnow, chestnut lamprey, iron-colored shiner, and longnose shiner.

2) Sabine River from Toledo Bend Reservoir to Sabine Lake (Shelby, Sabine, Newton, and range Counties). Protected species are paddlefish, creek chubsucker, and blue sucker.

- TPWD wetland acquisition development project: North Toledo Bend Wildlife Management Area on the Sabine River and Toledo Bend Reservoir in Shelby County.

Stream segments in the Neches-Trinity Coastal River Basin that have been classified as having significant natural resources include the following:[7]

- Unique state holdings:

1) J. D. Murphree Wildlife Management Area on Big Hill Bayou in Jefferson County.

2) Sea Rim State Park on the Gulf Coast in Jefferson County.

- Unique federal holdings:

1) Texas Point National Wildlife Refuge on the Gulf Coast in Jefferson County.

2) McFaddin National Wildlife Refuge on the Gulf Coast in Jefferson County.

1.9.6. State Holdings

- State Parks: The TPWD operates several State Parks in the region:

1. Martin Creek Lake State Park in Rusk County

2. Rusk/Palestine State Park in Cherokee and Anderson Counties

3. Texas State Railroad State Historical Park in Cherokee and Anderson Counties
4. Jim Hogg State Historical Park in Cherokee County
5. Caddoan Mounds State Historical Park in Cherokee County
6. Mission Tejas State Historical Park in Houston County
7. Martin Dies Jr. State Park in Jasper and Tyler Counties
8. Village Creek State Park in Hardin County
9. Sea Rim State Park in Jefferson County
10. Sabine Pass Battleground State Historical Park in Jefferson County

The TPWD operates several wildlife management areas in the region:

1. Gus Engeling Wildlife Management Area in Anderson County
2. North Toledo Bend Wildlife Management Area in Shelby County
3. Bannister Wildlife Management Area in San Augustine County
4. Moore Plantation Wildlife Management Area in Sabine and Jasper Counties
5. Angelina-Neches/Dam B Wildlife Management Area in Jasper and Tyler Counties
6. Alabama Creek Wildlife Management Area in Trinity County
7. Lower Neches Wildlife Management Area in Orange County
8. J. D. Murphree Wildlife Management Area in Jefferson County

The Texas Forest Service operates several state forests in the region:

1. E. O. Siecke State Forest in Newton County

2. Masterson State Forest in Jasper County

3. John Henry Kirby Memorial State Forest in Tyler County

4. I. D. Fairchild State Forest in Cherokee County

1.9.7. Federal Holdings. The Army Corps of Engineers operates parks and other land around lakes in the region:

1. Sam Rayburn Reservoir

2. Town Bluff Dam, B. A. Steinhagen Lake

The U.S. Fish and Wildlife Service operates two national wildlife refuges in the region:

1. Texas Point National Wildlife Refuge on the Gulf Coast in Jefferson County.

2. McFaddin National Wildlife Refuge on the Gulf Coast in Jefferson County.

The National Forest Service operates three national forests in the region:

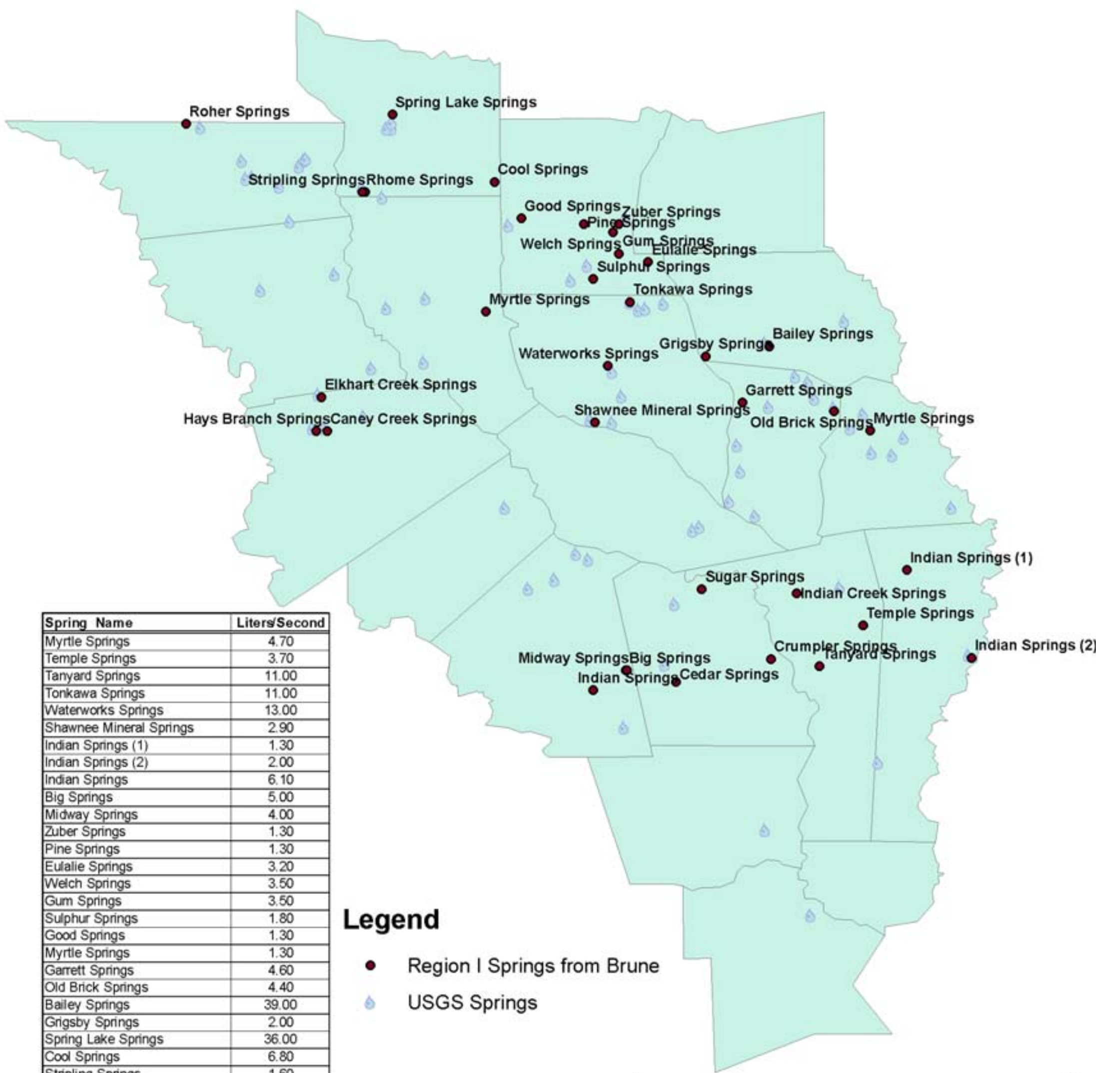
1. Angelina National Forest in San Augustine, Angelina, Jasper, and Nacogdoches Counties.

2. Davy Crockett National Forest in Houston and Trinity Counties.

3. Sabine National Forest in Sabine, Shelby, San Augustine, Newton, and Jasper Counties.

The National Park Service operates Big Thicket National Preserve in Polk, Tyler, Jasper, Hardin, Jefferson, and Orange Counties.

1.9.8. Springs. There are over 250 springs of various sizes documented in the region(1) (Brune, 1975; Brune, 1981; and Texas Water Development Board Records, 2005). Most of the springs discharge less than 10 gpm and are inconsequential for planning purposes. Based on discharge measurements collected mainly in the 1970s, 28 springs in the region discharge between 20 and 200 gpm and there are seven springs that discharge between 200 and 2,000 gpm. It should be noted that the Brune reports did not cover Anderson, Angelina, Henderson, Houston or Trinity Counties. In addition, Brune did not document any springs with flow greater than 20 gpm in Jefferson, Orange or Panola County. USGS information was reviewed and only two springs with flows greater



Spring Name	Liters/Second
Myrtle Springs	4.70
Temple Springs	3.70
Tanyard Springs	11.00
Tonkawa Springs	11.00
Waterworks Springs	13.00
Shawnee Mineral Springs	2.90
Indian Springs (1)	1.30
Indian Springs (2)	2.00
Indian Springs	6.10
Big Springs	5.00
Midway Springs	4.00
Zuber Springs	1.30
Pine Springs	1.30
Eulalie Springs	3.20
Welch Springs	3.50
Gum Springs	3.50
Sulphur Springs	1.80
Good Springs	1.30
Myrtle Springs	1.30
Garrett Springs	4.60
Old Brick Springs	4.40
Bailey Springs	39.00
Grigsby Springs	2.00
Spring Lake Springs	36.00
Cool Springs	6.80
Stripling Springs	1.60
Rhome Springs	1.30
Sugar Springs	1.60
Crumpler Springs	3.30
Cedar Springs	5.50
Roher Springs	11.67
Elkhart Creek Springs	96.28
Hays Branch Springs	50.97
Caney Creek Springs	48.14
Indian Creek Springs	360.00

Figure 1.16
Springs
East Texas Region
East Texas Regional Water Planning Group 5/05

than 20 gpm,

Black Ankle Springs in San Augustine and King's Spring in Polk County, were identified. The springs identified by Brune and USGS are shown in the attached Figure 1.16.

Brune (1981) reported a flow of 12.7 cfs (8.2 MGD) in the spring-fed Indian Creek in Jasper County, about 5 miles northwest of Jasper. This water was used at a TPWD fish hatchery.

Other notable springs are Spring Lake Springs in Smith County (570 gpm in 1979), Bailey Springs in Shelby County (620 gpm in 1976), Caney Creek Springs in Houston County (760 gpm in 1965), Hays Branch Springs in Houston County (810 gpm in 1965), and Elkhart Creek Springs in Houston County (1,500 gpm in 1965).

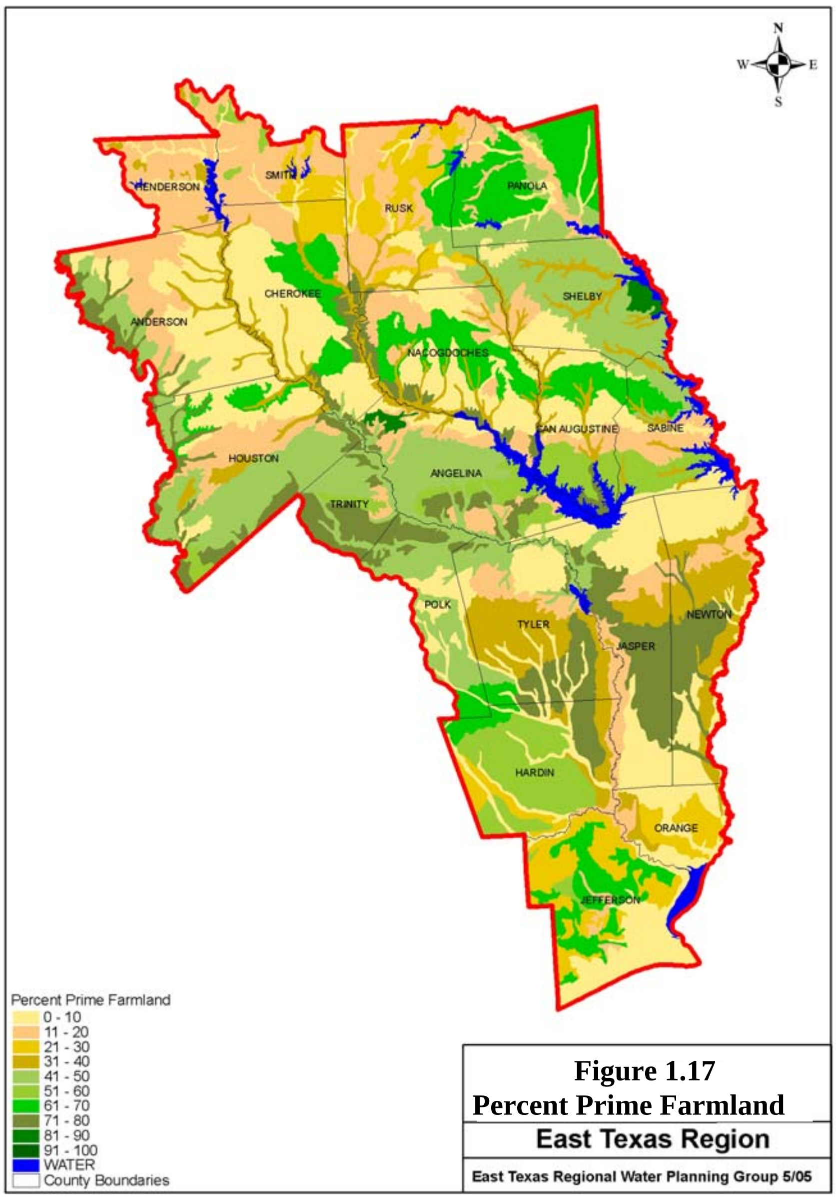


Figure 1.17
Percent Prime Farmland
East Texas Region

1.9.9. Agriculture/Prime Farmland.

Prime farmland and general agriculture are linked in this discussion because anything that threatens water supply for irrigation and agricultural household water use may also threaten to prevent the best use of prime farmland (where prime farmland is present).

Prime farmland is defined by the National Resources Conservation Service (NRCS) as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses."[12] As part of the National Resources Inventory, the NRCS has identified prime farmland throughout the country.

Figure 1.17 shows the distribution of prime farmland in the region. Each color in Figure 1.17 represents the percentage of prime farmland of any type. There are four categories of prime farmland in the NRCS STATSGO database for Texas: prime farmland, prime farmland if drained, prime farmland if protected from flooding or not frequently flooded during the growing season, and prime farmland where irrigated. Most counties in the region have significant prime farmland areas.

Table 1.11 shows 1997 agriculture statistics for the counties in the region[13] (portions of Henderson, Smith, Polk, and Trinity Counties are located in other Regions). The following general statements can be made regarding the region:[14]

- Approximately 40% of farmland is cropland.
- Approximately 30% of cropland is harvested.
- Excluding Jefferson County, approximately 0.7% of cropland is irrigated. In Jefferson County, approximately 17.6% of cropland is irrigated.

Table 1.11 1997 U.S. Department of Agriculture

Category		Anderson	Angelina	Cherokee	Hardin	Henderson	Houston	Jasper	Jefferson	Nacogdoches	Newton
Farms		1,542	790	1,429	354	1,630	1,369	639	562	1,200	294
Total Farm Land (acres)		353,969	117,920	283,241	65,442	367,096	440,228	87,079	433,597	372,451	62,108
Crop Land (acres)		138,317	47,705	140,367	17,617	155,335	168,450	26,116	180,719	101,669	10,376
Harvested Crop Land (acres)		47,101	12,080	51,190	5,326	58,000	53,714	9,186	46,709	26,482	3,936
Irrigated Crop Land (acres)		1,365	92	542	625	846	2,052	287	31,895	463	63
Market Value Crops ($1,000)		$3,410	$672	$60,086	$958	$10,105	$3,971	$991	$18,373	$1,251	$374
Market Value Livestock ($1,000)		$20,849	$15,242	$42,938	$1,915	$19,390	$23,417	$2,489	$7,584	$165,641	$1,072
Total Market Value ($1,000)		$24,259	$15,914	$103,024	$2,873	$29,495	$27,388	$3,480	$25,957	$166,892	$1,446
Livestock and Poultry:											
	Cattle and Calves Inventory	88,623	26,176	82,595	7,593	90,115	105,335	14,570	44,996	59,460	6,416
	Hogs and Pigs Inventory	(D)	243	123	363	816	(D)	319	131	480	88
	Sheep and Lambs Inventory	119	208	34	(D)	354	122	(D)	30	117	(D)
	Layers and Pullets Inventory	(D)	420	(D)	(D)	997	(D)	875	792	839,651	577
	Broilers and Meat-Type Chickens Sold	(D)	5,056,373	2,578,104	0	(D)	(D)	(D)	340	69,164,986	(D)
Crops Harvested (acres):											
	Corn for Grain or Seed	(D)	5	92	10	45	(D)	61	0	29	31
	Sorghum for Grain or Seed	(D)	(D)	0	0	0	(D)	0	(D)	0	0
	Wheat for Grain	(D)	92	(D)	0	(D)	(D)	0	(D)	0	0
	Rice	0	0	0	(D)	0	0	0	29,623	0	0
	Cotton	1,345	0	(D)	0	0	3,303	0	310	0	(D)
	Soybeans for beans	0	0	114	0	0	0	0	3,445	0	0
	Hay	43,188	11,895	49,242	4,491	53,861	43,001	8,715	12,517	26,210	3,804

Table 1.11 (continued) 1997 U.S. Department of Agriculture

Category	Orange	Panola	Polk	Rusk	Sabine	San Augustine	Shelby	Smith	Trinity	Tyler
Farms	334	866	551	1,296	194	291	1,017	1,844	518	463
Total Farm Land (acres)	87,871	202,258	135,988	267,448	25,103	65,250	187,728	250,855	98,748	53,225
Crop Land (acres)	25,669	84,141	42,208	131,072	12,568	25,628	86,490	127,336	49,188	24,995
Harvested Crop Land (acres)	6,207	21,616	11,675	30,662	3,788	7,149	22,463	44,129	14,082	6,942
Irrigated Crop Land (acres)	1,511	1,577	377	93	(D)	17	324	1,069	52	350
Market Value Crops ($1,000)	$1,420	$823	$444	$8,412	$226	$1,009	$2,182	$19,925	$411	$649
Market Value Livestock ($1,000)	$1,897	$45,075	$4,017	$20,639	$10,715	$24,118	$179,060	$18,427	$5,672	$2,466
Total Market Value ($1,000)	$3,317	$45,898	$4,461	$29,051	$10,941	$25,127	$181,242	$38,352	$6,083	$3,115
Livestock and Poultry:										
Cattle and Calves Inventory	10,020	45,041	22,056	57,513	6,915	11,135	46,895	59,968	26,016	13,769
Hogs and Pigs Inventory	118	785	963	537	78	39	60	241	152	172
Sheep and Lambs Inventory	18	(D)	22	262	0	12	(D)	63	(D)	(D)
Layers and Pullets Inventory	764	94,683	1,824	(D)	(D)	82,745	2,030,083	999	(D)	540
Broilers and Meat-Type Chickens Sold	0	19,404,090	(D)	3,774,113	5,566,080	11,792,703	72,928,627	0	0	(D)
Crops Harvested (acres):										
Corn for Grain or Seed	(D)	(D)	(D)	94	40	(D)	(D)	31	0	(D)
Sorghum for Grain or Seed	(D)	0	0	0	0	(D)	(D)	(D)	0	0
Wheat for Grain	0	220	0	0	0	0	0	(D)	(D)	0
Rice	1,446	0	0	0	0	0	0	0	0	0
Cotton	0	0	0	(D)	0	(D)	0	0	0	0
Soybeans for beans	(D)	0	0	0	(D)	0	(D)	0	0	0
Hay	4,645	21,281	11,538	29,337	3,562	6,083	20,637	41,511	13,796	6,643
TOTALS FOR ALL COUNTIES:				**SPECIAL FOR JEFFERSON COUNTY:**						
Total Farm Land (acres)	3,957,605			Irrigated/ Total Farm Land (%)			17.65%			
Crop Land (acres)	1,595,966									
Crop Land/Total Farm Land (%)	40.33%			**COUNTIES OTHER THAN JEFFERSON:**						
Harvested Crop Land (acres)	482,437			Irrigated Crop Land (acres)			11,705			
Harvested/Total Crop Land (%)	30.23%			Irrigated/ Total Farm Land (%)			0.73%			
Irrigated Crop Land (acres)	43,600									
Irrigated/ Total Farm Land (%)	2.73%									

- Poultry production generates the largest agricultural product sales in Angelina, Nacogdoches, Panola, Shelby, Sabine, and San Augustine Counties. In 1997, Shelby and Nacogdoches Counties ranked second and third in Texas in sales of poultry and poultry products.

- Cattle and calf production generates the largest agricultural product sales in Anderson, Houston, Henderson, Rusk, Trinity, Polk, Jasper, Tyler, Orange, Hardin, and Newton Counties.

- Nursery and greenhouse crops generate the largest agricultural product sales in Cherokee and Smith Counties. In 1997, Cherokee and Smith Counties ranked first and seventh in Texas in sales of nursery and greenhouse crops.

- Rice crops generate the largest agricultural product sales in Jefferson County. In 1997, Jefferson County ranked fourth in the state in sales of "rye, drybeans, and other grains."

1.10 Archeological Sites.

The most prominent archeological site in the region is Caddoan Mounds State Historical Park, a 93.8-acre park in Cherokee County west of Nacogdoches. This area was the home of Mound Builders of Caddoan origin who lived in the region for 500 years beginning about A. D. 800. The park offers exhibits and interpretive trails through its reconstructed sites of Caddo dwellings and ceremonial areas, including two temple mounds, a burial mound, and a village area[15].

The Texas Historical Commission (THC) keeps the Texas Historic Sites Atlas, a database containing historic county courthouses, National Register properties, historical markers, museums, sawmills, and neighborhood surveys[16]. This database contains a very large amount of data. The THC does not release information on archeological sites to the general public. When specific water management strategies are being evaluated, the

RWPG should request that the THC characterize archeological sites that may be affected and a search of the Texas Historic Sites Atlas should be performed for particular areas.

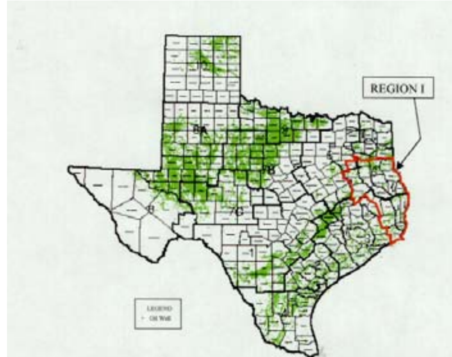


Figure 1.18
East Texas Region 5/05

Texas Producing Oil Wells
July 1998
[SOURCE: Texas Railroad Commission]

1.11 Mineral Resources.

Oil and Gas Fields. Oil and natural gas fields are significant natural resources in portions of the region. There are low densities of producing oil wells in each county in the region (see Figure 1.18). The East Texas Oil Field, a portion of which is located in Rusk County, ranked third in Texas in oil production in 1997 (see Figure 1.19). There are high densities of producing natural gas wells in Rusk, Panola, Nacogdoches, Jasper, and Newton Counties, with lesser densities in the other counties in the region (Figure 1.20). Four of the 1997 top 20 producing natural gas fields in the state are located in the region[17] (Figure 1.19):

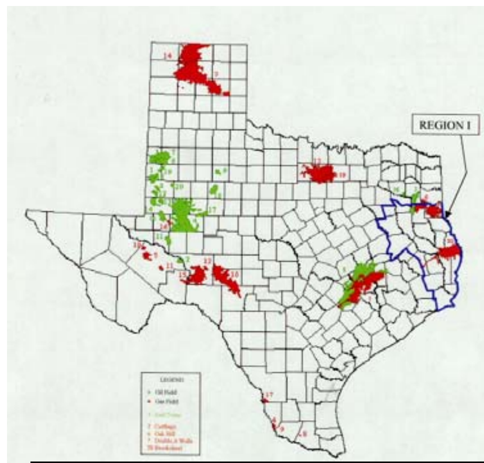


Figure 1.19 East Texas Region 5/05

1997 Top Producing Oil and Gas Fields

- Carthage Gas Field in Panola County
- Oak Hill Gas Field in Rusk County
- Double A Wells Gas Field in Polk and Tyler Counties
- Brookeland Gas Field in Jasper and Newton Counties

Lignite Coal Fields. Figure 1.21 shows lignite coal resources located in the region.[18] The Wilcox Group of potential deep basin lignite (200-2,000 feet in depth) underlies significant portions of Henderson, Smith, Cherokee, Rusk, and Nacogdoches Counties. The Jackson-

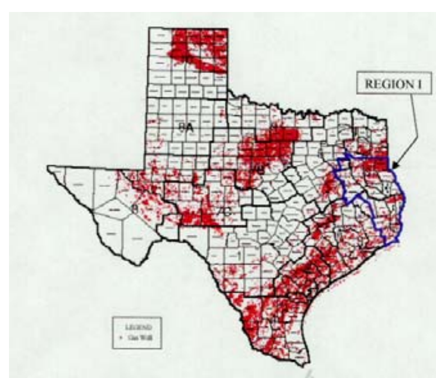


Figure 1.20
East Texas Region 5/05

Texas Producing Gas Wells
July 1998
[SOURCE: Texas Railroad Commission]

Yegua Group of potential deep basin lignite underlies significant portions of Houston, Trinity, Polk, Angelina, Nacogdoches, San Augustine, and Sabine Counties. Finally, bituminous coal underlies a small portion of Polk County in the region.

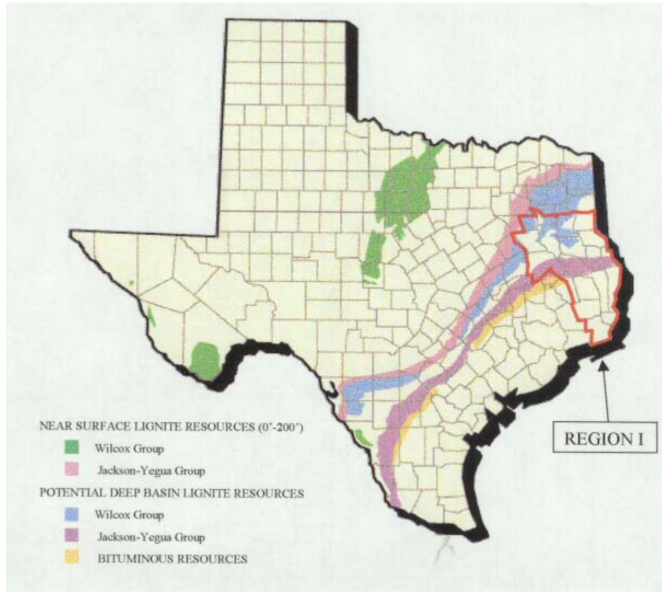


Figure 1.21 East Texas Region 5/05

Texas Lignite Coal Resources

[SOURCE: Texas Environmental Almanac]

1.12 Threats to Agricultural and Natural Resources in the Region Due to Water Quality or Quantity Problems

1.12.1 Water Quality. The TCEQ has documented concerns over water quality impacts to aquatic life, contact recreation, or fish consumption.[j] Appendix B contains a list of the reaches with concerns.

1.12.2 Drawdown of Aquifers. Overpumping of aquifers poses a threat to household water use and livestock watering in rural areas. As water levels decline, the cost of pumping water grows and water quality generally suffers. Wells that go dry must be redrilled to deeper portions of the aquifer. Significant water level declines have been reported in localized areas in both the Carrizo-Wilcox and Gulf Coast aquifers,[19] the major aquifers in the region.

Overpumping of aquifers also poses a threat to estuarine wetlands. Between 1955 and 1992, approximately 19,900 acres of estuarine intertidal emergent wetlands were lost in Texas as a result of submergence (drowning) and erosion, probably due to faulting and land subsidence resulting from the withdrawal of underground water and oil and gas.[3] These losses occurred primarily between Freeport and Port Arthur. There has been a conversion from groundwater to surface water use in many of the problem areas,[19] although none have been documented in the East Texas Region.

Finally, overpumping of aquifers in coastal regions can lead to saltwater intrusion, where saltwater is drawn updip into the aquifer. This degrades the aquifer water quality. Saltwater intrusion into the Gulf Coast aquifer has occurred previously in central and southern Orange County[19] and Jefferson County.

1.12.3 Insufficient Flows. Certain flow quantities and frequencies are necessary to maintain the fish and wildlife habitat in the region. Insufficient flow quantities and patterns could pose a threat to fish and wildlife habitat. Additionally, certain flow quantities or a physical barrier are required to control upstream encroachment of saltwater. At times of low flow in the rivers, the 0.5 ppt isohaline (the dividing line between “freshwater” and “saltwater”) moves upstream; conversely, at times of high flow in the rivers, the 0.5 ppt isohaline moves downstream. Upstream saltwater encroachment can adversely affect freshwater habitat and the suitability of water quality for water supply purposes.

In line with the recommendations of the 1997 state water plan, the Neches River Salt Water Barrier has been constructed at a location north of Beaumont below the confluence of the Neches River and Pine Island Bayou. The project, completed in 2003, prevents saltwater from reaching the freshwater intakes of lower Neches River cities, industries, and farms during periods of low flow. The project is a gated structure, allowing adjustment to prevent saltwater intrusion while maintaining flows. It is also equipped with a gated navigation channel to enable the passage of watercraft around the barrier.

1.12.4 Inundation Due to Reservoir Development. The 1984 state water plan [8] recommended development of the following reservoirs:

- Eastex Reservoir *(now designated as Lake Columbia)* on Mud Creek in Cherokee County.*
- Rockland Reservoir on the Neches River in Angelina, Trinity, Polk, Tyler, and Jasper Counties.
- Weches Reservoir on the Neches River in Anderson, Cherokee, and Houston Counties.
- Bon Wier Reservoir on the Sabine River in Newton County, Texas and Beauregard Parish, Louisiana.
- Tennessee Colony Reservoir on the main stem of the Trinity River in Freestone, Navarro, Henderson, and Anderson Counties *(partially in Region C)*.

*Redesignated as Lake Columbia in memory of the crew of the Columbia space shuttle.

In addition, the 1997 state water plan mentions the following alternative reservoir development sites in the region:[20]

- Newton, Big Cow Creek, and Little Cow Creek in Newton County
- Dam A in Jasper County
- Rockland in Tyler County
- Cochino in Trinity County
- Big Elkhart, Hurricane Bayou, Gail, and Mustang in Houston County
- Fastrill and Catfish Creek in Anderson County
- Ponta in Nacogdoches, Cherokee, and Rusk Counties
- Attoyac in Nacogdoches County *(would overlap Shelby and/or San Augustine Counties)*
- Tenaha in Shelby County
- Stateline in Panola County
- Socagee Reservoir in Panola County
- Carthage Reservoir in Panola, Rusk, Harrison, and Gregg Counties
- Cherokee II in Rusk County
- Rabbit in Smith and Rusk Counties
- Kilgore in Smith, Rusk, and Gregg Counties

Other reservoir sites[9] are:

- State Highway 322 Stages I and II in Rusk County
- Fredonia Lake in Rusk and Harrison Counties

The Angelina and Neches River Authority has a state permit to construct Lake Columbia (Eastex Reservoir) but does not yet have the necessary federal permits[20a]. The 1997 state water plan does not recommend any reservoir development projects in the region. The effects on natural resources of new reservoir construction at the five sites recommended in the 1984 state water plan[8] will be discussed below, because these reservoirs appear to be the most likely to be constructed.

Table 1.12 shows the impacts of new reservoir development at the five potential reservoir sites on the surrounding land and on protected species.

TPWD divided the inundated acreage into Resource Categories, depending on the quality of the habitat.[5] Resource Category (1) habitat is categorized as high value habitat, unique habitat, or irreplaceable habitat for which mitigation is not possible. Resource Category (2) habitat is categorized as high value habitat, scarce habitat or becoming scarce, for which mitigation is possible with an established goal of no net loss of in-kind habitat value. From a practical standpoint, Category (2) habitat for the proposed reservoir sites depicts types of habitats such as wetlands and riparian bottomland forest areas that reflect high natural resource values and high sensitivity regarding destruction.

Category (3) habitat includes abundant and medium to high value habitat (for the evaluation species) with a mitigation goal of no net loss of habitat value while minimizing loss of in-kind habitat value. Category (4) habitat includes remaining medium to low value habitat for which minimization of habitat value deterioration would be anticipated.

The proposed Lake Columbia (Eastex Reservoir) site is categorized as excellent habitat for turkey and gray squirrel and modest habitat for deer.[7] In the proposed reservoir location, Mud Creek is a “pristine area that provides excellent stream habitat.”[7] TPWD has identified Mud Creek as a significant stream segment due to its high bottomland hardwood resource value.[7]

The proposed Rockland Reservoir would impact the bottomland hardwood site known as the “Middle Neches River,” which USFWS has identified as a Priority 1 preservation area.[5] In addition, three USFWS Priority 2 bottomland hardwood preservation areas would be impacted: “Neches River South,” “Piney Creek,” and “Russell Creek.”[5] The USFWS defines Priority 1 as “excellent quality bottomlands of high value to waterfowl" and Priority 2 as "good quality bottomlands with moderate waterfowl benefits."[5]

The proposed Weches Reservoir would impact the "Middle Neches River" and the "Neches River North" bottomland hardwood sites, which USFWS has identified as Priority 1 preservation areas.[5]

The Corps of Engineers designed the Tennessee Colony Reservoir in 1979, but the project encountered numerous concerns about conflicts with development of lignite in the area and with existing communities and water supply lakes. The project has been deferred pending removal of the lignite.[21]

The USFWS has identified two preservation areas that would be affected by construction of the Tennessee Colony Reservoir. The first is an area known as "Boone Fields," located adjacent to the Trinity River between Saline Branch Creek and Catfish Creek, which contains upland forest and some bottomlands. The USFWS has classified this site as a Priority 5 preservation site.[5] The reservoir would also affect a hardwood bottom in Region C known as "Tehuacana Creek." The USFWS has also classified this site as a Priority 5 preservation site.[5] The USFWS defines Priority 5 as "sites proposed for elimination from further study because of low and/or no waterfowl benefits."[5]

Construction of the Tennessee Colony Reservoir would inundate approximately 13,796 acres of bottomland, which comprise the Richland Creek Wildlife Management Area in Region C. The TPWD acquired this area as mitigation for wildlife losses associated with the construction of Richland-Chambers Dam and Reservoir in Region C.[5] The WMA is located in Freestone County on the west side of the Trinity River within the boundaries of the proposed Tennesee Colony Reservoir.

The Tennessee Colony Reservoir is an alternative to two Region C water supply projects recommended in the 1997 state water plan. If the Tennessee Colony Reservoir were built, neither the Tehuacana Reservoir nor the diversion of water from the Trinity River would be necessary.[22]

Table 1.12 Potential Impacts of Development on Land Reservoir Area and Protected Species

Potential Impacts		Potential Reservoir Site				
		Columbia	**Rockland**	**Weches**	**Bon Weir**	**Tennessee Colony**
Inundated Land** (acres)	Mixed bottomland hardwood forest (2)	3,500	27,300	18,000	14,600	34,800
	Swamp/Flooded Hardwood Forest (2)	NA	NA	NA	2,300	NA
	Pine-hardwood forest (3)	3,000	50,800	21,000	10,400	NA
	Post Oak-Water Oak-Elm Forest (3)	NA	NA	NA	NA	19,200
	Grassland (4)	2,700	NA	4,800	NA	9,600
	Other	900	21,400	3,900	7,800	21,500
	TOTAL	***10,100***	***99,500***	***47,700***	***35,100***	***85,100***
Endangered Species Potentially Impacted	Arctic peregrine falcon	X	X	X	X	X
	Black-capped vireo					X
	Eskimo Curlew					X
	Interior least tern		X	X		
	Red-cockaded woodpecker	X	X	X	X	X
	Whooping crane			X		X
Threatened Species Potentially Impacted	Alligator snapping turtle	X	X	X	X	X
	American swallow-tailed kite	X	X	X	X	X
	Bachman's sparrow	X	X	X	X	X
	Bald Eagle	X	X	X	X	X
	Black bear	X	X	X	X	X
	Blue sucker		X		X	
	Creek chubsucker	X	X	X	X	
	Louisiana pine snake	X	X	X	X	X
	Northern scarlet snake	X	X	X	X	X
	Paddlefish	X	X	X	X	X
	Potential Impacts	**Potential Reservoir Site**				
		Columbia	**Rockland**	**Weches**	**Bon Weir**	**Tennessee Colony**
	Reddish egret		X		X	
	Texas horned lizard	X	X	X	X	X
	Timber rattlesnake	X	X	X	X	X
	White-faced ibis	X	X	X	X	X
	Wood stork	X	X	X	X	X

1.13 Threats and Constraints on Water Supply

1.13.1 Interstate Allocation. The allocation of water in the Sabine River Basin between Texas and Louisiana is a vital factor in any water study involving the Texas portion of the basin. As noted earlier, the river forms the state line for the downstream half of its length after heading in Texas far from the state line. Almost all of the basin upstream from the state line is in Texas. However, Texas does not have completely unrestricted access to the water in that area.

The Sabine River Compact, executed in 1953, provides for allotment of the water between Texas and Louisiana.[23] This agreement was not only ratified by the two state legislatures but also approved by Congress.

Texas has unrestricted access to the water in the upper reach of the river except for the requirement of a minimum flow of 36 cubic feet per second at the junction between the river and the state line. Texas may construct reservoirs in the upper reach and use their water either there or in the downstream reach without loss of ownership.

Any reservoir constructed on the downstream reach must be approved by both states. The ownership, operating cost, and water yield are proportional to the portions of the construction cost paid by the two states. To date, Toledo Bend is the only reservoir constructed in the lower reach. In the case of Toledo Bend, the states split the cost equally and have equal ownership of the lake and the water rights.

Any free water in the lower reach (not contained in or released from a reservoir) is divided equally between the two states. Since Toledo Bend extends to a point upstream from the junction of the river and the state line, the only water in that category is the water entering the river downstream from the dam.

The water in any reservoir on a tributary to the downstream reach can be used in the state where it is located, but that usage comes out of the state's share of the water in the river.

1.13.2 Diversion to Other Regions. The City of Dallas (Region C) has contractual rights to 114,337 acre-feet of water from Lake Palestine in the Neches basin. The City does not presently have the facilities to transport and treat the water, but anticipates the required construction by the year 2015.

1.13.3 Interception in Other Regions. It should be noted that large portions of the Sabine and Trinity basins are upstream from the region, as well as a small portion of the Neches basin. The upper Trinity basin includes the Dallas-Fort Worth area. The upper Sabine basin contains numerous medium sized cities as well as smaller communities. Large amounts of surface water are already being used by the upstream communities, and this usage can be expected to increase dramatically in the future along with population growth. Finally, the Sabine River Authority has contracts to provide over 300,000 ac-ft/yr. to the Dallas area from reservoirs in the upper Sabine basin.

1.14 Drought Preparations

1.14.1. Overview. Many larger communities and other suppliers supply water to neighboring systems on a wholesale basis, either full time or as a standby source. Most of these water suppliers are required to have water conservation plans. Included in each water conservation plan is a drought contingency plan for acute shortages. Many entities have been required in recent years to develop drought contingency plans as a separate requirement, or to upgrade such plans which were already contained in their water conservation plans.

Required elements of drought contingency plans include trigger conditions for specific actions such as requests for voluntary water reduction, surcharges, or rationing.

The TWDB began requiring water conservation plans during the middle 1980's as a condition for TWDB funding for water or sewer facilities in excess of $500,000. The

TCEQ has also required such plans for several years for surface water users, pursuant to state legislation.

Legislation in 2003 tightened the requirements for water conservation and drought contingency plans and required the water suppliers to review the plans every five years. One requirement is that specific five- and ten- year targets for water use reduction be included in the plans. Additionally, drought contingency plans must include specific targets for water reduction during various stages of emergency. Most requirements in the new law became effective May 1, 2005.

Wholesale water suppliers must pass on water conservation and drought contingency requirements to their wholesale customers. The wholesale customer may be required to develop its own plan or alternatively to follow the requirements in the supplier's plan. These requirements must be included in any new, renewed, or amended water supply contracts. Contracts must include provisions to pass on the requirements to any lower tier water suppliers to which the wholesale customer resells water, so that they will apply to any systems being supplied either directly or indirectly from the initial wholesale supplier.

Water conservation and drought contingency plans must now be coordinated with the Regional Water Planning Group. Drought contingency plans must be updated, if necessary, to remain consistent with regional water plans.

1.14.2. Groundwater Conservation Districts. Groundwater districts were created by the legislature for the purpose expressed in Chapter 36 of the Texas Water Code as follows:

> Sec. 36.0015. PURPOSE. In order to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their

> subdivisions, consistent with the objectives of Section 59, Article XVI, Texas Constitution, groundwater conservation districts may be created as provided by this chapter. Groundwater conservation districts created as provided by this chapter are the state's preferred method of groundwater management through rules developed, adopted, and promulgated by a district in accordance with the provisions of this chapter.

More specifically, these districts are granted authority to regulate the spacing and/or production rate from water wells. In some cases, districts may regulate or prohibit exportation of ground water from the district, provided the exportation did not begin before June 1, 1997. Districts may impose a fee for water exported from the district.

Districts are required to develop ten-year groundwater management plans[27] and to provide the plan (and any amendments) to applicable regional planning groups. Districts must establish permitting systems for new or modified wells and must keep on file copies of drilling logs.

<u>Anderson, Henderson and Cherokee Counties</u>. The Neches and Trinity Valleys Groundwater Conservation District, created in 2001 and headquartered at Jacksonville, covers Cherokee County and almost all of Anderson County, both in the East Texas Region, as well as Henderson County *(which overlaps Regions C and East Texas Region)*. The remainder of Anderson County, in the Palestine-Montalba area, is covered by the Anderson County Underground Water Conservation District, created in 1987 and headquartered at Montalba.

<u>Angelina and Nacogdoches Counties</u>. Angelina and Nacogdoches Counties are covered by the Pineywoods Groundwater Conservation District, created in 2001 and headquarted in Lufkin. The GCD has regulations including a permitting system for water wells within its territory.

Jasper and Newton Counties. Jasper and Newton Counties are included in the Southeast Texas Groundwater District created by the legislature in 2003 and headquartered in Kirbyville. Tyler and Hardin Counties have been added since creation.

Polk County. Polk County is covered by the Lower Trinity Groundwater Conservation District that was created by the 79th Legislature.

Rusk County. Rusk County is covered by the Rusk County Groundwater Conservation District, headquartered northeast of Henderson near Lake Cherokee. The District was created by the legislature in 2003.

Counties not Covered by Groundwater Conservation Districts. The other counties -- Houston, Jefferson, Orange, Panola, Sabine, San Augustine, Shelby, Smith, and Trinity, – are not covered by any confirmed or pending groundwater conservation district.

1.14.3. Groundwater Management Areas (GMA). The Texas Water Development Board has divided the state into sixteen groundwater management areas as required by the legislature. These areas were established on the basis of political and aquifer boundaries for the purpose of future planning and possible regulation. (A GMA is only a designated geographic area, not an entity with board members, staff, or governing power.) Groundwater conservation districts within each area are required to share planning information.

East Texas Regional Water Planning Group overlaps areas 11 and 14. Area 11 lies north of the north lines of Polk, Tyler, Jasper, and Newton Counties, with Area 14 south of that boundary.[27a] The boundary approximates the boundary between the Carrizo-Wilcox and Gulf Coast aquifers.

1.15 Existing Programs

1.15.1 Texas Clean Rivers Program (TCRP). TCRP was established with the promulgation of the Clean Rivers Act of 1991. TCRP provides for biennial assessments of water quality to identify and prioritize water quality problems within each watershed and subwatershed. In addition, TCRP seeks to develop solutions to water quality problems identified during the biennial assessments. The TCEQ administers the program.

The TCEQ contracts with fifteen regional agencies to conduct the required stream assessments in the various river basins. Except for the International Boundary and Water Commission and one water district, these agencies are river authorities. Each agency posts recent assessment reports for its territory on its web site.

Agencies conducting the stream assessments within East Texas Region are:

- Angelina and Neches River Authority (Lufkin) (*upper portion of Neches River Basin).*
- Lower Neches Valley Authority (Beaumont) *(lower portion of Neches River Basin plus Neches-Trinity Coastal Basin).*
- Northeast Texas Municipal Water District (Hughes Springs) *(Cypress Creek Basin).*
- Sabine River Authority of Texas (Orange) *(Sabine River Basin).*
- Trinity River Authority of Texas (Arlington) *(Trinity River Basin).*

The stream assessments result in segments being added to or removed from the TDML (Total Maximum Daily Load) Program.

1.15.2 Safe Drinking Water Act (SDWA). The SDWA, passed in 1974 and amended in 1986 and 1996, allows the U.S. Environmental Protection Agency to set drinking water standards. These standards are divided into two categories: National Primary Drinking Water Regulations (primary standards that must be met by all public water suppliers) and National Secondary Water Regulations (secondary standards that are not enforceable, but are recommended). Primary standards protect water quality by limiting contaminant levels that are known to adversely affect public health and are anticipated to occur in water. Secondary standards have been set for contaminants that may pose a cosmetic or aesthetic risk to water quality (e.g., taste, odor or color).

Standards cover various categories of parameters which have been determined to be harmful if present in more than specified concentrations. These include certain organic, inorganic, and radioactive substances; and pathogens as indicated by coliform bacteria. Surface water treatment must achieve a specified removal or inactivation of certain other pathogens (*Cryptosporidium* oocysts, *Giardia* cysts, and viruses).

Minimum and maximum disinfectant residuals must be maintained. Disinfection byproducts, which increase as the water travels through the distribution system, have limits. Turbidity and total organic carbon are limited for surface water. Lead and copper must not leach out from home plumbing in more than trace amounts. Other standards cover qualitative parameters including color, corrosivity, odor, and pH.

Additionally, certain unregulated substances must be monitored in an effort to determine whether they should become regulated. The lists of regulated and monitored parameters are revised from time to time as more is learned about them. A candidate list of additional parameters for regulation must be published every five years. The draft 2004 list includes ten microbial and 42 chemical parameters.[28]

The TCEQ requires public water systems to meet secondary standards when practical, as well as primary standards. A water system must meet a number of requirements, including all primary standards to gain recognition as an Approved Public Water System. To be recognized as a Superior Public Water System, the system must also meet all secondary standards.

Certain violations of drinking water standards must be reported to the public as well as to the TCEQ.

1.15.3 Water for Texas. Developed by the TWDB, this comprehensive State water plan identifies current and prospective water uses, water supplies, and water users. The plan also identifies needed water-related management measures, facility needs, and costs, and offers recommendations to better manage the State's water resources through the year 2050. This plan was adopted by the TWDB in August 1997.

The first cycle of regional water planning, which was completed in 2001, resulted in an updated state water plan, Water for Texas 2002, which addressed the same issues but was developed on a regional basis. SB1 had established sixteen planning regions within the state. In each region, local representatives worked with consultants to develop a regional water plan to submit to the TWDB by 2001. The TWDB, after review and approval of each regional plan, consolidated the plans into a state plan which was finalized in 2002.

Each regional plan includes a section in which water supply strategies are recommended for each water user group *(such as a city or industrial sector within a county)* which has a forecast water shortage. Strategies may be as simple as renewing a contract for purchased water, or as involved as constructing a new water supply reservoir.

The plan is being updated every five years by the regions on an ongoing basis. The second five-year cycle, which includes this report, will result in regional plans in 2006 and a state plan in 2007.

1.15.4 Sabine River Basin. Comprehensive Sabine Watershed Management Plan, December 1999, prepared for Sabine River Authority of Texas in Conjunction with the Texas Water Development Board, Contract # 97-483-214; Freese and Nichols, Inc., Brown and Root, Inc., and LBG-Guyton Associates. This plan was developed over a period from 1996 through 1999 as an update to a 1985 master plan for the basin. The plan points out the two distinct geographic regions of the basin, upstream and downstream from the upstream end of Toledo Bend Reservoir in Panola County.

TWDB Consensus Planning population and water use projections showed water use in the Upper Basin to increase from 197,000 to 457,000 acre-feet per year from 1990 to 2050. Lower Basin use was shown to increase from 79,000 to 164,000 acre-feet per year from 1990 to 2050. No new water supplies for the Lower Basin were recommended. A total of 93,000 acre-feet per year of new supplies were recommended for the Upper Basin, including a proposed Prairie Creek Reservoir.

1.15.5 Neches River Basin. Water Availability Modeling for the Neches River Basin**,** Draft Report, April 1999; prepared for TNRCC by Brown and Root Services, Freese And Nichols, Espey – Padden, and Crespo Consultants. The study determined naturalized stream flows *(the flows which would occur without the effects of human activity such as consumption and return flows)* and developed a model to determine water available to meet water rights.

Naturalized stream flows averaged 6.3 million acre-feet/year, with a minimum of 1.4 million acre-feet/year in 1967. Water rights total 4 million acre-feet/year. Cancellation of selected water rights would have little effect on reliability for the remaining rights.

1.15.6 Trinity River Basin. Trinity River Basin Master Plan, 1958, updated various times, most recently 2001. Water use projections show water use in the Upper Basin (*all counties north of Freestone and Anderson*) to increase from 904,000 acre-feet/year to 2,165,000 acre-feet/year from 1990 to 2040. Middle and Lower Basin use is shown to increase from 141,100 acre-feet/year to 302,400 acre-feet/year from 1990 to 2040. The groundwater component of the Middle and Lower Basin usage is shown to increase from 40 mgd to 63 mgd during the same period.

The firm yield of existing and under-construction major reservoirs within the Trinity Basin was 2,325,100 acre-feet/year. Several new reservoirs were recommended, including Tennessee Colony. The Tennessee Colony reservoir *(partially within the East Texas Regional Water Planning area)* is not shown as an immediate need. The plan recommended construction of the reservoir when needed for flood control and/or water supply. Coordination with lignite mining was also pointed out, so that all feasible lignite mining within the reservoir area could be performed before construction.

The Wallisville salt water barrier (near the mouth of the Trinity River, completed 1999) was cited as having dual benefits. In addition to the water which it would impound, it would serve as a saltwater barrier and avoid the need to release water from Lake Livingston to keep saltwater out of the lower reaches of the river.

A number of other recommended reservoirs are included in the plan, including several smaller reservoirs within East Texas Region in Anderson and Houston Counties.

The major and minor aquifers within the basin *(which includes portions of several East Texas Region counties)* were noted to be able to provide 212 mgd of water supply on a long-term basis.

The plan noted the presence of numerous effluent-dominated streams, including the Trinity River from the Dallas-Fort Worth area to Lake Livingston. (Portions of that reach border the East Texas Regional Water Planning area.)

Reuse of highly treated wastewater was forecast to increase, although it appears that the plan envisioned most of such use to occur in the Dallas-Fort Worth area outside the East Texas Regional Water Planning area. Water conservation was also discussed.

Flood control along the river was a concern noted in the plan. Coordinated releases from reservoirs were recommended for that purpose.

The plan recommended balancing the needs of the basin against those of Trinity Bay and its estuaries.

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Appendix A
Species of Special Concern*

	Species	Federal Status	State Status	Riparian-Wetland-, or Estuary-Dependent	County																			
					Anderson	Angelina	Cherokee	Hardin	Henderson	Houston	Jasper	Jefferson	Nacogdoches	Newton	Orange	Panola	Polk	Rusk	Sabine	San Augustine	Shelby	Smith	Trinity	Tyler
Bir0ds	American peregrine falcon	LE	E	X			X	X			X	X			X	X		X	X			X		X
	Arctic peregrine falcon	E/SA	T	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
	Bachman's sparrow		T		X	X				X	X		X		X		X	X		X	X	X	X	
	Bald eagle	LT	T	X	X	X	X		X	X	X		X	X		X	X	X	X	X	X	X	X	
	Brown pelican	LE	E	X								X			X									
	Henslow's sparrow				X	X		X	X	X			X				X	X		X	X	X	X	
	Interior least tern	LE	E	X					X			X			X									
	Migrant loggerhead shrike								X															
	Piping plover	LT	T	X								X			X									
	Red-cockaded woodpecker	LE	E			X	X	X		X	X		X	X	X		X	X	X	X	X		X	X
	Reddish egret		T									X												
	Swallow-tailed kite		T	X		X				X			X				X			X	X		X	X
	White-faced ibis		T	X								X			X									
	Whooping crane	LE	E	X					X															
	Wood stork		T	X	X	X		X	X	X	X	X	X	X	X		X	X		X	X	X	X	
Insects	A purse casemaker caddisfly			X	X																			
	Big thicket emerald dragonfly			X						X									X	X	X		X	
	Holzenthal's philopotamid caddisfly			X	X																			
	Morse's net-spinning caddisfly			X	X																			
	Phylocentropus harrisi			X	X																			

Species of Special Concern* (cont.)

	Species	Federal Status	State Status	Riparian-Wetland-, or Estuary-Dependent	County																			
					Ande	Ange	Cher	Hardi	Hend	Houst	Jaspe	Jeffer	Naco	Newt	Oran	Panol	Polk	Rusk	Sabin	San	Shelb	Smith	Trinit	Tyler
Fish	Blue sucker		T	X							X			X					X					X
	Creek chubsucker		T	X		X	X	X		X			X	X			X	X		X	X	X	X	X
	Paddlefish		T	X		X				X			X				X	X		X	X	X	X	
	Western sand darter			X				X			X			X					X			X		X
	Suckermouth minnow			X												X		X			X			
	Chestnut lamprey			X												X		X			X			
	Iron-colored shiner			X												X		X			X			
	Longnose shiner			X												X		X			X			
Mammals	Black bear	T/SA	T		X	X		X		X	X		X	X	X	X	X	X	X	X	X		X	X
	Louisiana black bear	LT	T		X	X		X			X		X	X	X	X		X	X				X	X
	Plains spotted skunk				X	X			X	X			X				X	X		X	X	X	X	
	Rafinesque's big-eared bat		T			X		X		X	X	X	X	X			X	X	X	X	X		X	
	Red wolf	LE	E					X				X		X	X									
	Southeastern myotis			X		X		X		X	X		X	X	X	X	X	X	X	X	X	X	X	X
Reptiles and Amphibians	Alligator snapping turtle		T	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	
	Atlantic hawksbill sea turtle	LE	E									X												
	Green sea turtle	LT	T									X												
	Gulf saltmarsh snake			X								X			X									
	Kemp's ridley sea turtle	LE	E									X												
	Leatherback sea turtle	LE	E									X												
	Loggerhead sea turtle	LT	T									X												
	Louisiana pine snake		T		X	X	X	X		X	X		X	X			X	X		X	X	X	X	X
	Pig frog			X				X				X		X										
	Scarlet snake		T					X	X		X	X		X					X			X		

Species of Special Concern* (cont.)

	Species	Federal Status	State Status	Riparian-Wetland-, or Estuary-Dependent	County																			
					Anders	Angeli	Cherok	Hardin	Hender	Housto	Jasper	Jeffers	Nacogd	Newto	Orange	Panola	Polk	Rusk	Sabine	San	Shelby	Smith	Trinity	Tyler
	Texas diamondback terrapin			X								X			X									
	Texas garter snake				X				X													X		
	Texas horned lizard		T		X	X	X		X	X		X	X		X	X	X	X	X	X	X	X	X	
	Timber/canebrake rattlesnake		T	X	X	X		X	X	X	X	X	X	X			X	X		X	X	X	X	
Vascular Plants	Bog coneflower			X		X					X			X					X		X			
Vascular Plants	Boynton's Oak			X		X																		
Vascular Plants	Corkwood			X								X												
Vascular Plants	Drummond's yellow-eyed grass			X		X					X			X										
Vascular Plants	Incised groovebur				X	X					X			X					X					
Vascular Plants	Long-sepaled false dragon-head							X			X			X	X									X
Vascular Plants	Navasota ladies' – tresses	LE	E	X							X													
Vascular Plants	Neches River rose-mallow	C1		X			X			X													X	
Vascular Plants	Rough-leaf yellow-eyed grass			X		X					X			X					X					
Vascular Plants	Rough-stem aster			X	X		X		X													X		
Vascular Plants	Sandhill woolywhite				X																			
Vascular Plants	Scarlet catchfly							X			X	X		X			X		X		X			X
Vascular Plants	Slender gay-feather					X		X			X			X	X				X	X				X
Vascular Plants	Small-headed pipewort			X	X																			X
Vascular Plants	Southern lady's slipper												X	X					X	X				
Vascular Plants	Texas golden glade cress	C1																	X	X				
Vascular Plants	Texas screwstem					X		X			X		X	X			X			X				X
Vascular Plants	Texas trailing phlox	LE	E					X									X							X

Species	Federal Status	State Status	Riparian-Wetland-, or Estuary-Dependent	County																			
				Anderson	Angelina	Cherokee	Hardin	Henderson	Houston	Jasper	Jefferson	Nacogdoches	Newton	Orange	Panola	Polk	Rusk	Sabine	San Augustine	Shelby	Smith	Trinity	Tyler
Texas trillium			X						X			X			X		X				X		
Threeleaf cowbane			X				X																X
Tiny bog buttons			X							X			X										
White bladderpod	LE	E																	X				
White firewheel							X																

Information taken from [11]

LE = Federally listed endangered
LT = Federally listed threatened
E/SA, T/SA = Federally endangered/threatened by similarity of appearance status

E = State endangered
T = State threatened
"blank" = Rare, but with no regulatory listing

C1 = Federal candidate, category 1; information supports proposing to list as endangered/threatened.

Appendix A
Habitat Information for Species of Special Concern*

	Common Name	Scientific Name	Habitat Description
Birds	American peregrine falcon	*Falco peregruinus anatum*	Potential migrant; nests in west Texas
	Arctic peregrine falcon	*Falco peregruinus tundrius*	Potential migrant
	Bachman's sparrow	*Aimophila aestivalis*	Open pine woods with scattered bushes or understory, brushy or overgrown hillsides, overgrown fields with thickets and brambles, grassy orchards; nests on ground against grass tuft or under low shrub
	Bald eagle	*Haliaeetus leucocephalus*	Found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds
	Brown pelican	*Pelecanus occidentalis*	Nests on small, isolated coastal islands
	Henslow's sparrow	*Ammodramus henslowii*	Wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking
	Interior least tern	*Sterna antillarum athalassos*	Nests along sand and gravel bars within braided streams and rivers; also known to nest on man-made structures
	Migrant loggerhead shrike	*Lanius ludovicianus migrans*	Open and semi-open grassy areas with scattered trees and brush; breeding March-late August
	Piping plover	*Charadrius melodus*	Spends the winter along the Atlantic coast and Gulf coast from Florida to Mexico. Wintering Piping plovers in Texas feed on tidal mudflats or sandflats
	Red-cockaded woodpecker	*Picoides borealis*	Cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, & loblolly
	Reddish egret	*Egretta rufescens*	Resident of the Texas Gulf Coast; brackish marshes and shallow salt pons and tidal flats; nests on ground or in trees or bushes, on coastal islands in brushy thickets of yucca and prickly pear.
	Swallow-tailed kite	*Elanoides forficatus*	Lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees
	White-faced ibis	*Plegadis chihi*	Prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats
	Whooping crane	*Grus americana*	Potential migrant
	Wood stork	*Mycteria americana*	Forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

*Information taken from [11]

Habitat Information for Species of Special Concern* (Continued)

	Common Name	Scientific Name	Habitat Description
Insects	A purse casemaker caddisfly	*Hydroptila ouachita*	Lotic systems, but specifics unknown
Insects	Big thicket emerald dragonfly	*Somatochlora margarita*	East Texas pineywoods; springfed creeks and bogs
Insects	Holzenthal's philopotamid caddisfly	*Chimarra holzenthali*	Trinity River basin in Anderson County
Insects	Morse's net-spinning caddisfly	*Cheumatopsyche morsei*	Lotic systems, but specifics unknown
Insects	No common name	*Phylocentropus harrisi*	Lotic systems, but specifics unknown
Fish	Blackside darter	*Percina maculata*	Usually found in streams in quiet reaches and pools with clear or slightly turbid waters, with gravelly substrates.
Fish	Blue sucker	*Cycleptus elongatus*	Prefer large, deep rivers and deeper zones of reservoirs, moderate to swift currents of narrow channels with gravel or rubble bottom.
Fish	Creek chubsucker	*Erimyzon oblongus*	Small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks
Fish	Paddlefish	*Polyodon spathula*	Prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir
Fish	Western sand darter	*Etheostoma clarum*	Texas range is Neches and Sabine drainages; spawns July-August
Fish	Suckermouth minnow	*Phenacobius mirabilis*	Inhabits mainly sand, gravel, and rubble-bottomed riffles in small to moderate-sized streams. Although generally associated with clear waters, in some areas this minnow appears to be tolerant of high levels of turbidity.
Fish	Chestnut lamprey	*Ichthyomyzon castaneus*	The chestnut lamprey can be found in large rivers and lakes. During spawning, it can be found in small rivers and creeks.
Fish	Iron-colored shiner	*Notropis chalybaeus*	Inhabits small, slow, acidic blackwater streams draining swamps and other types of vegetated wetlands.
Fish	Longnose shiner	*Notropis longirostris*	Most often found over shifting sand substrates of shallow shoals and quiet waters below riffle runs in coastal streams.
Mammals	Black bear	*Ursus americanus*	Bottomland hardwoods and large tracts of inaccessible forested areas; due to field characteristics similar to Louisiana Black Bear (LT, T), treat all east Texas black bears as federal and state listed Threatened
Mammals	Louisiana black bear	*Ursus americanus luteolus*	Possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas
Mammals	Plains spotted skunk	*Spilogale putorius interrupta*	Catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie
Mammals	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	Roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures
Mammals	Red wolf	*Canis rufus*	Formerly known throughout eastern half of Texas in brushy and forested areas, as well as the coastal prairies (extirpated)
Mammals	Southeastern myotis bat	*Myotis austroriparius*	Roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

* Information taken from [11]

*Habitat Information for Species of Special Concern**

	Common Name	Scientific Name	Habitat Description
Reptiles and Amphibians	Alligator snapping turtle	*Macroclemys temminckii*	Deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October
	Atlantic hawksbill sea turtle	*Eretmochelys imbricata*	Gulf and bay system
	Green sea turtle	*Chelonia mydas*	Gulf and bay system
	Gulf saltmarsh snake	*Nerodia clarkii*	Saline flats, coastal bays, and brackish river mouths
	Kemp's ridley sea turtle	*Lepidochelys kempii*	Gulf and bay system
	Leatherback sea turtle	*Dermochelys coriacea*	Gulf and bay system
	Loggerhead sea turtle	*Caretta caretta*	Gulf and bay system
	Louisiana pine snake	*Pituophis melanoleucus ruthveni*	Mixed deciduous-longleaf pine woodlands; breeds April-September
	Pig frog	*Rana grylio*	Found in large bodies of water such as lakes and marshes, amid floating vegetation
	Scarlet snake	*Cemophora coccinea*	Mixed hardwood scrub on sandy soils; feeds on reptile eggs; semi-fossorial; active April-September
	Southern redback salamander	*Plethodon serratus*	Found under rocks, rotten logs, and mosses in forested areas; in dry summer months occurs in and near damp areas; most active in spring and fall
	Texas diamondback terrapin	*Malaclemys terrapin littoralis*	Coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide.
	Texas garter snake	*Thamnophis sirtalis annectens*	Wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August
	Texas horned lizard	*Phrynosoma cornutum*	Open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September
	Timber/canebrake rattlesnake	*Crotalus horridus*	Swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

*Information taken from [11]

Habitat Information for Species of Special Concern (Continued)*

	Common Name	Scientific Name	Habitat Description
Vascular Plants	Bog coneflower	*Rudbeckia scabrifolia*	Hillside seepage bogs and associated broadleaf semi-evergreen acid seep forests; usually on Catahoula Formation or near the Catahoula-Willis contact; flowering late summer-fall
	Boynton's Oak	*Quercus boyntonii*	Shrub layer of loblolly-pine forests on deep sandy soils in creek bottoms; possibly also in shallower soils of upland prairies
	Corkwood	*Leitneria floridana*	Found in narrow zone between brackish marsh and contiguous coastal pine-hardwood; brackish or freshwater swamps or thickets; flowers in spring.
	Drummond's yellow-eyed grass	*Xyris drummondii*	Wet sand or peaty sand on hillside seepage bogs on the Catahoula Formation
	Incised groovebur	*Agrimonia incisa*	Mixed deciduous-longleaf pine woodlands; breeds April-September
	Long-sepaled false dragon-head	*Physostegia longisepala*	Originally found in moist acid loams in the firemaintained transition zone between pine flatwoods and coastal prairies; now found primarily in secondary habitats such as wet borrow ditches along roadsides and moist areas in manmade clearings in pine woodlands.
	Navasota ladies' –tresses	*Spiranthes parksii*	Endemic; margins of and openings within post oak woodlands in sandy loams along intermittent tributaries of rivers; flowering late October-early November
	Neches River rose-mallow	*Hibiscus dasycalyx*	Endemic; wet alluvial soils in swamps or open riparian woodlands; flowering June-August
	Rough-leaf yellow-eyed grass	*Xyris scabrifolia*	Wet sand or peaty sand on hillside seepage bogs on the Catahoula Formation
	Rough-stem aster	*Aster puniceus ssp. Elliottii var. scabricaulis*	Endemic; wet unshaded habitats ranging from sphagnum bogs to roadside ditches; flowering in fall
	Sandhill woolywhite	*Hymenopappus carrizoanus*	Endemic; open areas in deep sands derived from Carrizo and similar Eocene formations, including disturbed areas; flowering late spring-fall
	Scarlet catchfly	*Silene subciliata*	Deep sandy soils at margins of dry upland longleaf pine savannas; also on sandbars and in moister sandy soils in various habitats, including roadbanks; flowering August-October
	Slender gay-feather	*Liatris tenuis*	Mostly in fire-maintained dry upland longleaf pine savannas on the Catahoula Formation; flowering June-August
	Small-headed pipewort	*Eriocaulon koernickianum*	Wet acid sands of upland seeps and bogs, often on sphagnum mats with little other vegetative cover; flowering/fruiting late May-late June
	Southern lady's slipper	*Cypripedium kentuckiense*	The only Cypripedium in east Texas; dry to mesic forests in various topographic positions; flowering April-June
	Texas golden glade cress	*Leavenworthia texana*	Early successional or unique edaphically influenced herbaceous communities in shallow calcareous soils in vernally wet glades on Weches Formation ironstone outcrops
	Texas screwstem	*Bartonia texana*	Sandy soils in dry mesic pine or mixed pine-oak forests and forest borders; usually in fire-maintained longleaf pine savannas, but also in more mesic habitats; flowering (June-?)

* Information taken from [11]

Habitat Information for Species of Special Concern* (Continued)

Vascular Plants (cont.)	Texas trailing phlox	*Phlox nivalis ssp. Texensis*	Endemic; deep sandy soils in fire-maintained openings in upland longleaf pine savannas or bluejack oak woodlands; flowering March-early April
	Texas trillium	*Trillium pusillum var. texanum*	Acid hardwood bottoms and lower slopes, often in or downslope from acid sphagneous hillside seeps; flowering March-mid April
	Threeleaf cowbane	*Oxypolis ternata*	Wetland pine savannas and flatwoods
	Tiny bog buttons	*Lachnocaulon digynum*	Wet acid exposed sands or sphagnum mats of hillside seepage bogs, primarily on the Catahoula formation, usually among other low-growing graminoids; occasionally in wetland pine savannahs.
	White bladderpod	*Lesquerella pallida*	Seasonally wet, comparatively high pH sandy soils in natural openings or glades within pine/oak forests over Weches Formation ironside/glauconite; flowering April-May
	White firewheel	*Gaillardia aestivalis var. winkleri*	Deep loose well drained sands in openings in pine-oak woodlands and along unshaded margins; flowers in late spring and sporadically through early fall.

*Information taken from [11]

Appendix B
TCEQ Draft 2004 303(d) List of Impaired and Threatened Water Bodies Within East Texas Region*

Segment Number	Name	Concern is for				Description of Problems	TDML Status
		Aquatic Life	Recreation	Fish Consumption	General Use		
0501B	Little Cypress Bayou (unclassified water body)	X				Aquatic life use is partially supported in the middle reach and not supported in other reaches, because of chronic toxicity.	D
0502A	Nichols Creek (unclassified water body)	X	X			Uses not supported in lower 25 miles because of bacteria, chronic toxicity, and low dissolved oxygen.	D
504☝	Toledo Bend Reservoir	X		X		The fish consumption use is partially supported, based on a restricted-consumption advisory issued by the Texas Department of Health in November of 1995 due to mercury in fish tissue (M/PS). Aquatic life is only partially supported in one arm of the reservoir because of low dissolved oxygen..	D
0504C	Palo Gaucho Bayou (unclassified water body)	X				Aquatic life use is partially supported because of chronic toxicity.	D
505👆	Sabine River above Toledo Bend Reservoir		X			The 2004 draft list shows recreation not supported on a 22 mile reach along the East Texas Region boundary along side Panola and Rusk Counties, because of bacteria. The fish consumption use was previously not supported in Martin Creek Reservoir (Rusk County) and in Brandy Branch Reservoir (Harrison County), based on advisories issued by the Texas Department of Health in May 1992 due to elevated levels of selenium in fish tissue (M/NS). These two water bodies, which have subsequently been assessed separately as unclassified segments, are not listed in the draft 2004 list as impaired. In the lower 25 miles of the segment, concentrations of dissolved lead have sometimes exceeded the criterion established to protect aquatic life (M/NS). However, the draft 2004 list shows aquatic life fully supported in the lower reach.	D
0505D👆	Rabbit Creek (unclassified water body					The lower 5.7 mile reach (outside East Texas Region) has been cited for bacteria problems prior to the assessment for the draft 2004 list. That reach has not been cleared from the list.	D

(cont.)

Segment Number	Name	Concern is for				Description of Problems	TDML Status
		Aquatic Life	Recreation	Fish Consumption	General Use		
508	Adams Bayou Tidal	X	X			Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum conditions for aquatic life (L/NS). Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS).	M
0508A	Adams Bayou Above Tidal (unclassified water body)	X	X			Aquatic life partially supported, recreation not supported because of bacteria and low dissolved oxygen.	D, S
0508B	Gum Gully (unclassified water body)					Bacteria and low dissolved oxygen previously identified.	D
0508C	Hudson Gully (unclassified water body)	X	X			Uses not supported because of bacteria and low dissolved oxygen.	H, D
0511	Cow Bayou Tidal	X	X		X	Recreation use not supported in lowermost and uppermost reaches because of bacteria; aquatic use not supported or partially supported in upper three reaches because of low dissolved oxygen. General use not supported in upper reach because of low pH.	D, S
0511A	Cow Bayou Above Tidal (unclassified water body)	X				Use partially supported in upper reach because of low dissolved oxygen.	D
0511B	Coon Bayou (unclassified water body)	X	X			Aquatic life partially supported, recreation not supported because of bacteria and low dissolved oxygen.	D
0511C	Cole Creek (unclassified water body)	X	X			Use not supported because of bacteria; previous problem with low dissolved oxygen.	D
0511E	Terry Gully (unclassified water body)		X			Use not supported because of bacteria.	D
0601A	Star Lake Canal (unclassified water body)					Previous problem with low dissolved oxygen.	D
0602A	Booger Branch (unclassified water body)	X				Use not supported because of low dissolved oxygen.	S

(cont.)

Segment Number	Name	Concern is for				Description of Problems	TDML Status
		Aquatic Life	Recreation	Fish Consumption	General Use		
603	B. A. Steinhagen Lake			X		The fish consumption use is partially supported, based on a restricted-consumption advisory issued by the Texas Department of Health in November 1995 due to mercury in fish tissue (M/PS). Problem still appears in 2004 assessment.	D
0603A	Sandy Creek (unclassified water body)		X			Use not supported in lower reach because of bacteria.	D
0604	Neches River Below Lake Palestine	X				Use not supported between Hwy. 21 and U. S. 84 because of chronic lead problem.	D
0604A	Cedar Creek (unclassified water body)		X			Use not supported because of bacteria.	D
0604B	Hurricane Creek (unclassified water body)		X			Use not supported because of bacteria.	D
0604C	Jack Creek (unclassified water body)		X			Use not supported because of bacteria.	D
0604D	Piney Creek (unclassified water body)	X				Use not supported because of low dissolved oxygen and (previously identified) bacteria.	D
0604M	Biloxi Creek (unclassified water body)		X			Use not supported because of bacteria.	D
0604T	Lake Ratcliff (unclassified water body)			X		The fish consumption use (largemouth bass only) is partially supported, based on a restricted-consumption advisory issued by the Texas Department of Health in May 2002 due to mercury in fish tissue. Problem still appears in 2004 assessment.	D
0605A	Kickapoo Creek (unclassified water body)		X			Use not supported downstream from FM 1803 because of bacteria.	D
0606	Neches River Above Lake Palestine	X			X	Use not supported from Prairie Creek to River Mile 7 *(reach may be partially outside East Texas Region)* because of low dissolved oxygen and acute zinc problem. Farther upstream, outside East Texas Region, a low pH problem results in partial support of general use.	D

(cont.)

Segment Number	Name	Concern is for				Description of Problems	TDML Status
		Aquatic Life	Recreation	Fish Consumption	General Use		
0606A	Prairie Creek (unclassified water body)		X			Use not supported in lower four miles because of bacteria. Upstream reach has previously had chronic zinc problem, which was not assessed for 2004 assessment.	D
0607	Pine Island Bayou	X				Use not supported between river miles 5.7 and 12.1, partially supported between river miles 21.5 and 46.5 because of low dissolved oxygen. Previously identified problems include low dissolved oxygen in the other reaches, as well as chronic cadmium problems in the reaches between miles 12.1 and 46.5..	S
0607A	Boggy Creek (unclassified water body)					Previously identified low dissolved oxygen problem.	D
0607B	Little Pine Island Bayou (unclassified water body)	X				Use partially supported in lower 25 miles because of low dissolved oxygen.	D
0607C☝	Willow Creek (unclassified water body)					Previously identified problems with low dissolved oxygen and chronic cadmium.	S
0608	Village Creek				X	Low pH problems upstream from FM 418.	S
0608A	Beech Creek (unclassified water body)					Previously identified problems with low dissolved oxygen.	D
0608B	Big Sandy Creek (unclassified water body)		X			Use not supported because of bacteria.	D
0608C	Cypress Creek (unclassified water body)	X				Use partially supported because of acute aluminum problem; also, previously identified low dissolved oxygen and acute cadmium.	D
0608F	Turkey Creek (unclassified water body)		X			Use not supported because of bacteria in lower 25 miles.	D
0608G	Lake Kimball (unclassified water body)			X		The fish consumption use is partially supported, based on a restricted-consumption advisory issued by the Texas Department of Health in April 1999 due to mercury in fish tissue. Problem still appears in 2004 assessment.	D

(cont.)

Segment Number	Name	Concern is for				Description of Problems	TDML Status
		Aquatic Life	Recreation	Fish Consumption	General Use		
610	Sam Rayburn Reservoir	X		X		The fish consumption use is partially supported, based on a restricted-consumption advisory issued by the Texas Department of Health in November 1995 due to mercury in fish tissue (M/PS). In the upper portion of the reservoir, dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum conditions for aquatic life (M/NS). Problem still appears in 2004 assessment.	D
0610A	Ayish Bayou (unclassified water body)		X			Use not supported downstream from U. S. 96 because of bacteria.; bacteria previously found in other reaches.	D
0611	Angelina River Above Sam Rayburn Reservoir		X			Use not supported upstream from FM 343 because of bacteria. Also, lead and low pH problems have been previously identified in this portion of the stream.	D
0611A	East Fork Angelina River (unclassified water body)		X			Use not supported near mouth because of bacteria. Also, the entire stream has had lead problems identified previously for its entire length..	D
0611B	La Nana Bayou (unclassified water body)		X			Use not supported downstream from Hwy. 7 because of bacteria.	D
0611C	Mud Creek (unclassified water body)		X			Use not supported in downstream portion because of bacteria.	D
0612	Attoyac Bayou		X			Use not supported in upper and lower reaches because of bacteria.	D
0612B	Waffelow Creek (unclassified water body)					Previously identified bacteria, problems not reassessed for 2004, considered still existing.	D
0615	Angelina River/Sam Rayburn Reservoir	X		X		The fish consumption use is partially supported because of mercury in fish tissue (M/PS). Aquatic life not supported downstream from Papermill Creek. Also noted are low dissolved oxygen and (for the portion downstream of Papermill Creek), an impaired fish community.	D
701	Taylor Bayou above Tidal	X				In the lower 15 miles of the segment, dissolved oxygen concentrations have previously been measured lower than the standard established to assure optimum conditions for aquatic life (L/PS). This condition was still found in the middle reach of the stream in the 2004 assessment.	D

(cont.)

Segment Number	Name	Concern is for				Description of Problems	TDML Status
		Aquatic Life			General Use		
0701D	Shallow Prong Lake (unclassified water body)	X				Use not supported because of low dissolved oxygen.	D
702A	Alligator Bayou (unclassified water body)	X				Ambient toxicity in water occasionally exceeds the criterion established to assure optimum conditions for aquatic life (L/PS). Toxicity in sediment sometimes exceeds the criterion established to assure optimum conditions for aquatic life (L/NS). Use is not supported in lower reach, partially supported in remainder. The 2004 assessment also noted an impaired fish community in the lower reach.	D
704	Hillebrandt Bayou	X				Dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum conditions for aquatic life (L/PS). Use is only partially supported above Bayou Din.	D
0803☝	Lake Livingston				X	Low dissolved oxygen problems have previously been identified in some portions. High pH was identified in one portion in 2004 assessment, resulting in partial support of general use..	D
2501👆	Gulf of Mexico *(areas in or next to East Texas Region)*			X		Use not supported because of mercury found in king mackerel over 43 inches, as reflected in a 1997 Texas Department of Health advisory..	D

* Information taken from [19]. 👆Partially outside East Texas Region. ☝Along border of East Texas Region.

TMDL Rank#: Water bodies in Category 5 have been prioritized by TCEQ. For Category 5a, a rank of High (H), Medium (M), or Low (L) is given for the urgency to initiate a TMDL. Rankings are based on the current understanding of the causes of the non-support of the water quality standards and the sources of pollution, the importance of the resource, the severity of the impact, and the likelihood of TMDL success.

For water bodies in Category 5b, a ranking of "S" has been assigned to indicate that a standards review will be conducted before a TMDL is scheduled. For water bodies in Category 5c, a ranking of "D" has been assigned to indicate that additional data and information will be collected before a TMDL is scheduled.

#As of January 15, 2004.

NOTE; Many water bodies were also assessed for public water supply and oyster water uses. None of the impaired waters in East Texas Region failed the water supply use assessment in cases where it was conducted. None of the listed water bodies in the region were assessed for oyster water use.

Chapter 2

Current and Projected Population and Water Demand

2.1 Introduction

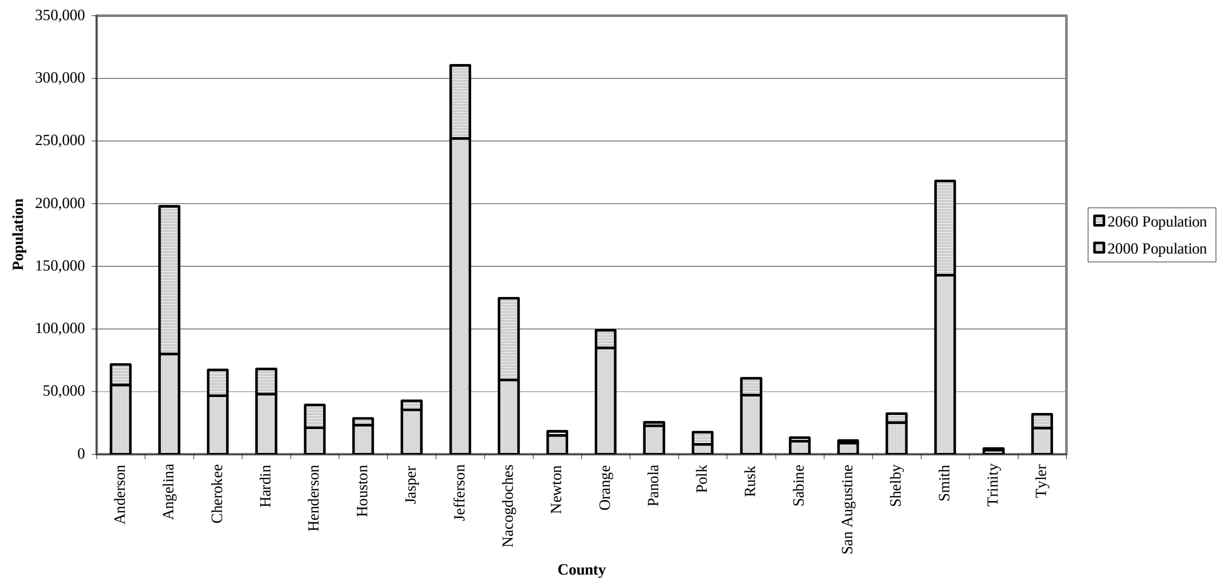
The TWDB provided population projections for the East Texas Region. The ETRWPG forwarded the projections to entities within the Region for review. Based on the comments received revised, population numbers were forwarded to the TWDB.

Municipal water demands were calculated based on current gallon per capita per day usages and allowing for reduction in demands associated with water conservation achieved through eventual compliance with plumbing codes. Demands for other user groups; manufacturing, irrigation, steam-electric, livestock and mining; were generated with input from representatives of these areas.

2.2 Population Growth

The population in the East Texas Region is projected to increase from 1,011,317 to 1,482,448 from 2000 to 2060. The major centers of population are Jefferson, Smith and Angelina Counties that comprise nearly 50% of the population through the entire planning period. The projection of population growth from 2000 to 2060 by County is presented in Figure 2.1. The change in population on a County basis, based on an average annual growth during the planning period, is presented in Figure 2.2. The largest change in percentage growth is expected in the Nacogdoches, Angelina and Polk county areas. The distribution of population by individual entity is provided in Table 2.1.

Figure 2.1
Population Projection by County



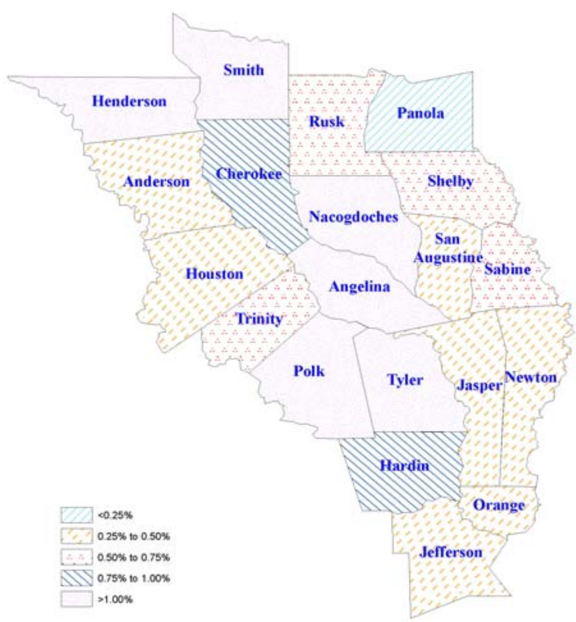


Figure 2.2
Population % Annual Change
East Texas Region
East Texas Regional Planning Group 5/05

Table 2.1
Distribution of Population by County/Entity

County/Entity	Historical	Projections					
	Figures taken from TWDB Board Revisions dated Feb. 5, 2005						
	2000	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County							
Brushy Creek WSC	2,928	3,155	3,332	3,466	3,604	3,712	3,805
Consolidated WSC	1,447	1,560	1,647	1,713	1,781	1,834	1,881
County-Other	24,445	26,344	27,821	28,934	30,091	30,994	31,768
Elkhart	1,215	1,309	1,383	1,438	1,496	1,541	1,579
Four Pine WSC	2,727	2,939	3,104	3,228	3,357	3,458	3,544
Frankston	1,209	1,303	1,376	1,431	1,488	1,533	1,571
Palestine	17,598	18,965	20,028	20,830	21,663	22,313	22,870
Walston Springs WSC	3,540	3,815	4,029	4,190	4,358	4,488	4,601
Anderson County Total	***55,109***	***59,390***	***62,720***	***65,230***	***67,838***	***69,873***	***71,619***
Angelina County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Central WCID of Angelina County	6,302	6,564	6,886	7,283	7,783	8,470	9,380
County-Other	19,962	21,111	22,526	24,269	26,466	29,479	33,473
Diboll	5,470	6,449	7,654	9,137	11,007	13,574	16,976
Four Way WSC	2,972	4,503	6,388	8,708	11,634	15,649	20,970
Hudson	3,792	5,021	6,535	8,398	10,747	13,971	18,243
Hudson WSC	6,208	7,579	9,268	11,346	13,967	17,564	22,331
Huntington	2,068	2,306	2,598	2,958	3,412	4,035	4,861
Lufkin	32,709	37,219	42,351	48,190	54,834	62,394	70,997
Zavalla	647	647	647	647	647	647	647
Angelina County Total	***80,130***	***91,399***	***104,853***	***120,936***	***140,497***	***165,783***	***197,878***
Cberokee County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Alto	1,190	1,290	1,404	1,502	1,592	1,681	1,786
Alto Rural WSC	4,500	4,806	5,156	5,456	5,732	6,006	6,329
Bullard	53	54	55	56	57	58	59
County-Other	6,836	6,288	5,555	4,406	2,811	2,110	1,690
Craft-Turney WSC	4,575	5,672	7,032	8,719	10,810	12,000	13,000
Jacksonville	13,868	14,543	15,316	15,978	16,587	17,191	17,904
New Summerfield	998	1,290	1,624	1,910	2,173	2,434	2,742
North Cherokee WSC	3,489	4,116	4,834	5,449	6,015	6,576	7,238
Rusk	5,085	5,525	6,029	6,461	6,858	7,252	7,717
Rusk Rural WSC	2,970	3,166	3,391	3,584	3,761	3,937	4,145
Southern Utilities Company	2,286	2,525	2,799	3,034	3,250	3,464	3,717
Troup	40	44	49	53	57	61	66
Wells	769	774	780	785	789	793	798
Cherokee County Total	***46,659***	***50,093***	***54,024***	***57,393***	***60,492***	***63,563***	***67,191***

County/Entity	Historical	Projections					
Hardin County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	11,311	12,824	13,909	14,402	14,913	15,441	15,989
Kountze	2,115	2,398	2,601	2,693	2,788	2,887	2,990
Lake Livingston Water Supply and Sewer Service Company	88	100	108	112	116	120	124
Lumberton	8,731	9,899	10,736	11,117	11,511	11,919	12,342
Lumberton MUD	7,269	8,241	8,939	9,256	9,584	9,923	10,275
North Hardin WSC	6,500	7,370	7,993	8,276	8,570	8,874	9,188
Silsbee	6,393	7,248	7,861	8,140	8,429	8,728	9,037
Sour Lake	1,667	1,890	2,050	2,123	2,198	2,276	2,356
West Hardin WSC	3,999	4,534	4,918	5,092	5,272	5,459	5,653
Hardin County Total	***48,073***	***54,504***	***59,115***	***61,211***	***63,381***	***65,627***	***67,954***
Henderson County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Athens	236	380	536	690	848	1,040	1,283
Berryville	891	977	1,071	1,164	1,259	1,375	1,521
Bethel-Ash WSC	2,391	3,096	3,860	4,614	5,387	6,330	7,521
Brownsboro	796	949	1,115	1,279	1,447	1,652	1,910
Brushy Creek WSC	732	837	951	1,063	1,178	1,318	1,495
Chandler	2,099	2,385	2,695	3,001	3,314	3,696	4,179
County-Other	13,113	14,004	14,971	15,923	16,904	18,097	19,604
Murchison	592	642	696	749	804	871	955
RPM WSC	443	495	552	608	665	735	823
Henderson County Total	***21,293***	***23,765***	***26,447***	***29,091***	***31,806***	***35,114***	***39,291***
Houston County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Consolidated WSC	12,965	13,391	13,732	14,281	14,852	15,446	16,064
County-Other	1,020	1,053	1,080	1,123	1,169	1,216	1,264
Crockett	7,141	7,376	7,563	7,866	8,180	8,507	8,848
Grapeland	1,451	1,499	1,536	1,599	1,662	1,729	1,798
Lovelady	608	628	644	670	696	724	753
Houston County Total	***23,185***	***23,947***	***24,555***	***25,539***	***26,559***	***27,622***	***28,727***
Jasper County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	20,643	22,244	23,624	24,439	24,647	24,647	24,647
Jasper	7,657	8,315	8,883	9,218	9,303	9,303	9,303
Jasper County WCID No. 1	4,000	4,319	4,595	4,757	4,799	4,799	4,799
Kirbyville	2,085	2,251	2,395	2,480	2,501	2,501	2,501
Mauriceville WSC	1,219	1,316	1,400	1,450	1,462	1,462	1,462
Jasper County Total	***35,604***	***38,445***	***40,897***	***42,344***	***42,712***	***42,712***	***42,712***

County/Entity	Historical	Projections					
Jefferson County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Beaumont	113,866	113,866	113,866	113,866	113,866	113,866	113,866
Bevil Oaks	1,346	1,346	1,346	1,346	1,346	1,346	1,346
China	1,112	1,096	1,072	1,051	1,035	1,018	987
County-Other	16,364	21,249	28,265	34,588	39,464	44,381	53,675
Groves	15,733	15,733	15,733	15,733	15,733	15,733	15,733
Jefferson County WCID No. 10	4,497	4,923	5,534	6,085	6,509	6,937	7,747
Meeker MUD	2,835	3,322	4,022	4,653	5,139	5,629	6,556
Nederland	17,422	18,052	18,958	19,775	20,404	21,039	22,238
Nome	515	549	598	643	677	712	777
Port Arthur	57,755	57,755	57,755	57,755	57,755	57,755	57,755
Port Neches	13,601	13,956	14,466	14,926	15,281	15,638	16,314
West Jefferson County MWD	7,005	7,853	9,071	10,169	11,016	11,870	13,484
Jefferson County Total	***252,051***	***259,700***	***270,686***	***280,590***	***288,225***	***295,924***	***310,478***
Nacogdoches County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Appleby WSC	3,218	4,341	5,481	6,560	7,749	9,985	12,345
County-Other	19,290	21,463	23,669	25,755	28,054	32,380	36,944
Cushing	637	683	730	774	823	915	1,012
Garrison	844	844	844	844	844	844	844
Lily Grove SUD	2,300	3,229	4,172	5,064	6,047	7,896	9,847
Nacogdoches	29,914	33,044	36,501	39,946	43,074	49,198	54,345
Swift WSC	3,000	3,753	4,517	5,240	6,037	7,535	9,116
Nacogdoches County Total	***59,203***	***67,357***	***75,914***	***84,183***	***92,628***	***108,753***	***124,453***
Newton County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	9,384	9,967	10,417	10,476	10,790	11,114	11,447
Mauriceville WSC	457	485	507	510	525	541	557
Newton	2,459	2,612	2,730	2,745	2,827	2,912	3,000
South Newton WSC	2,772	2,944	3,077	3,094	3,187	3,282	3,381
Newton County Total	***15,072***	***16,008***	***16,731***	***16,825***	***17,329***	***17,849***	***18,385***
Orange County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Bridge City	8,651	9,264	9,681	9,851	9,924	10,075	10,184
County-Other	31,924	32,563	32,998	33,177	33,252	33,411	33,527
Mauriceville WSC	5,944	9,467	11,866	12,848	13,265	14,137	14,769
Orange	18,643	18,643	18,643	18,643	18,643	18,643	18,643
Pine Forest	632	632	632	632	632	632	632
Pinehurst	2,274	2,274	2,274	2,274	2,274	2,274	2,274
Rose City	519	519	519	519	519	519	519
South Newton WSC	828	1,108	1,299	1,377	1,410	1,479	1,529
Vidor	11,440	11,922	12,251	12,386	12,443	12,562	12,648
West Orange	4,111	4,111	4,111	4,111	4,111	4,111	4,111
Orange County Total	***84,966***	***90,503***	***94,274***	***95,818***	***96,473***	***97,843***	***98,836***

County/Entity	Historical	Projections					
Panola County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Beckville	752	790	806	820	831	840	846
Carthage	6,664	7,000	7,146	7,263	7,362	7,444	7,497
County-Other	14,432	15,159	15,476	15,728	15,944	16,121	16,235
Gill WSC	693	728	743	755	766	774	780
Tatum	215	226	231	234	238	240	242
Panola County Total	***22,756***	***23,903***	***24,402***	***24,800***	***25,141***	***25,419***	***25,600***
Polk County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Corrigan	1,721	2,232	2,720	3,132	3,409	3,580	3,759
County-Other	6,314	8,190	9,981	11,490	12,508	13,132	13,789
Polk County Total	8,*035*	***10,422***	***12,701***	***14,622***	***15,917***	***16,712***	***17,548***
Rusk County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	26,005	27,930	29,754	30,789	31,307	32,741	36,271
Easton	37	61	83	96	102	120	163
Elderville WSC	2,282	2,518	2,741	2,868	2,931	3,107	3,539
Henderson	11,273	11,358	11,438	11,484	11,506	11,570	11,726
Kilgore	2,580	2,580	2,580	2,580	2,580	2,580	2,580
Mount Enterprise	525	540	554	562	566	577	605
New London	987	1,026	1,063	1,084	1,094	1,123	1,194
Overton	2,215	2,363	2,503	2,582	2,621	2,732	3,003
Southern Utilities Company	399	426	451	465	472	492	541
Tatum	960	960	960	960	960	960	960
West Gregg WSC	109	112	114	115	116	118	123
Rusk County Total	***47,372***	***49,874***	***52,241***	***53,585***	***54,255***	***56,120***	***60,705***
Sabine County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	1,740	1,875	1,952	2,010	2,070	2,133	2,197
G-M WSC	6,643	7,157	7,451	7,675	7,905	8,142	8,386
Hemphill	1,106	1,192	1,241	1,278	1,316	1,356	1,396
Pineland	980	1,056	1,099	1,132	1,166	1,201	1,237
Sabine County Total	***10,469***	***11,280***	***11,743***	***12,095***	***12,457***	***12,832***	***13,216***
San Augustine County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	5,712	6,203	6,328	6,490	6,685	6,886	7,023
G-M WSC	759	824	841	862	888	915	933
San Augustine	2,475	2,688	2,742	2,812	2,897	2,984	3,043
San Augustine County Total	***8,946***	***9,715***	***9,911***	***10,164***	***10,470***	***10,785***	***10,999***

County/Entity	Historical	Projections					
Shelby County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Center	5,678	5,974	6,363	6,668	6,896	7,092	7,306
County-Other	16,481	17,417	18,647	19,614	20,333	20,953	21,632
Joaquin	925	974	1,038	1,088	1,126	1,158	1,193
Tenaha	1,046	1,046	1,046	1,046	1,046	1,046	1,046
Timpson	1,094	1,120	1,154	1,181	1,201	1,218	1,237
Shelby County Total	***25,224***	***26,531***	***28,248***	***29,597***	***30,602***	***31,467***	***32,414***
Smith County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Arp	901	965	1,013	1,061	1,109	1,189	1,295
Bullard	1,097	1,284	1,424	1,563	1,702	1,936	2,245
Community Water Company	1,050	1,340	1,557	1,773	1,989	2,352	2,832
County-Other	4,750	4,253	3,807	3,409	3,052	2,732	2,446
Crystal Systems, Inc.	276	321	355	389	423	480	555
Dean WSC	4,310	5,111	5,710	6,307	6,903	7,904	9,229
Jackson WSC	2,449	3,832	4,650	5,535	6,420	7,000	7,550
Lindale	673	673	673	673	673	673	673
Lindale Rural WSC	2,246	2,714	3,064	3,413	3,761	4,346	5,119
New Chapel Hill	553	635	697	758	819	922	1,058
Noonday	515	550	576	602	628	672	730
Overton	57	61	64	67	70	75	81
RPM WSC	201	228	249	269	289	323	368
Southern Utilities Company	33,640	36,295	38,496	40,620	42,736	47,202	53,328
Troup	1,909	2,113	2,266	2,418	2,570	2,825	3,163
Tyler	82,927	88,332	92,372	96,399	100,415	107,168	116,102
Whitehouse	5,346	6,305	7,022	7,736	8,449	9,647	11,232
Smith County Total	***142,900***	***155,012***	***163,995***	***172,992***	***182,008***	***197,446***	***218,006***
Trinity County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	2,857	3,186	3,435	3,518	3,660	3,817	3,960
Groveton	542	604	652	668	660	633	610
Trinity County Total	***3,399***	***3,790***	***4,087***	***4,186***	***4,320***	***4,450***	***4,570***
Tyler County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Colmesneil	638	756	872	946	974	974	974
County-Other	11,271	13,363	15,398	16,707	17,209	17,209	17,209
Lake Livingston Water Supply & Sewer Service Company	88	104	120	130	134	134	134
Tyler County WSC	6,459	7,658	8,824	9,574	9,862	9,862	9,862
Woodville	2,415	2,863	3,299	3,580	3,687	3,687	3,687
Tyler County Total	***20,871***	***24,744***	***28,513***	***30,937***	***31,866***	***31,866***	***31,866***

2.3 Water Demands

Water demands have been compiled for each water user group; Municipal, Manufacturing, Irrigation, Steam-Electric, Livestock and Mining. Municipal use comprises residential and commercial. Commercial water use includes business establishments, public offices, and institutions but does not include industrial uses. Manufacturing includes industries that manufacture goods. The five major manufacturing groups in the State include chemical products, petroleum refining, pulp and paper, food and kindred products, and primary metals. Irrigation comprises the production of crops ranging from food and feed grains to fruits and vegetables to cotton. Steam-Electric use is related to generation of power. Livestock includes the use of water used in raising of cattle, poultry, sheep and lambs, and hogs and pigs. Mining is related to the use of water in mining minerals including oil production, coal, native asphalt, sulfur, clay, gypsum, lime, salt, stone and aggregate.

The total increase in water demand is expected to increase from 704,320 acre-feet to 1,261,320 acre-feet from 2000 to 2060. The percentage of total water used for each of the six water user groups for 2000 and 2060 are shown in Figures 2.3 and 2.4. . Table 2.2 shows a summary of the water usage by water user groups for each decade of the planning period.

Table 2.2

Summary of Water Usage by Decades

Water User Group	2000	2010	2020	2030	2040	2050	2060
Municipal	181,699	189,559	196,828	202,761	208,193	218,705	233,622
Manufacturing	345,580	401,790	446,939	465,692	524,491	558,594	543,454
Livestock	22,345	23,613	25,114	26,899	29,020	31,546	34,533
Irrigation	113,905	222,846	223,163	223,517	223,899	224,321	224,786
Steam-Electric	28,996	43,985	79,989	93,515	110,006	130,108	154,611
Mining	11,795	14,662	16,297	17,331	18,385	19,432	20,314
Total for Region	**704,320**	**896,455**	**988,330**	**1,049,715**	**1,113,994**	**1,182,706**	**1,261,320**

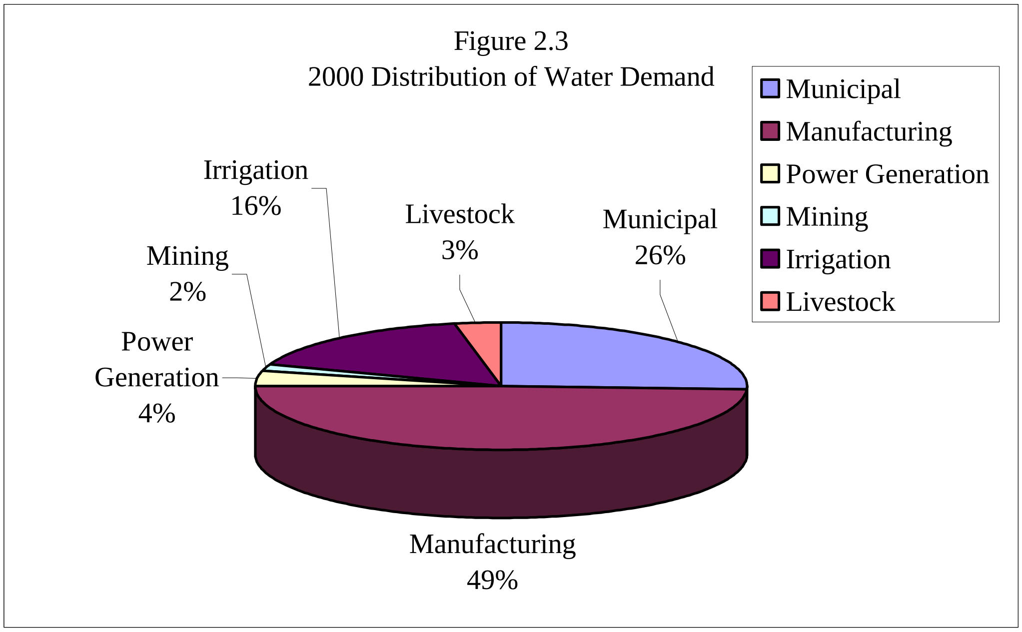


Figure 2.3
2000 Distribution of Water Demand
Municipal
Manufacturing
Power Generation
Mining
Irrigation
Livestock
Irrigation 16%
Livestock 3%
Municipal 26%
Mining 2%
Power Generation 4%
Manufacturing 49%

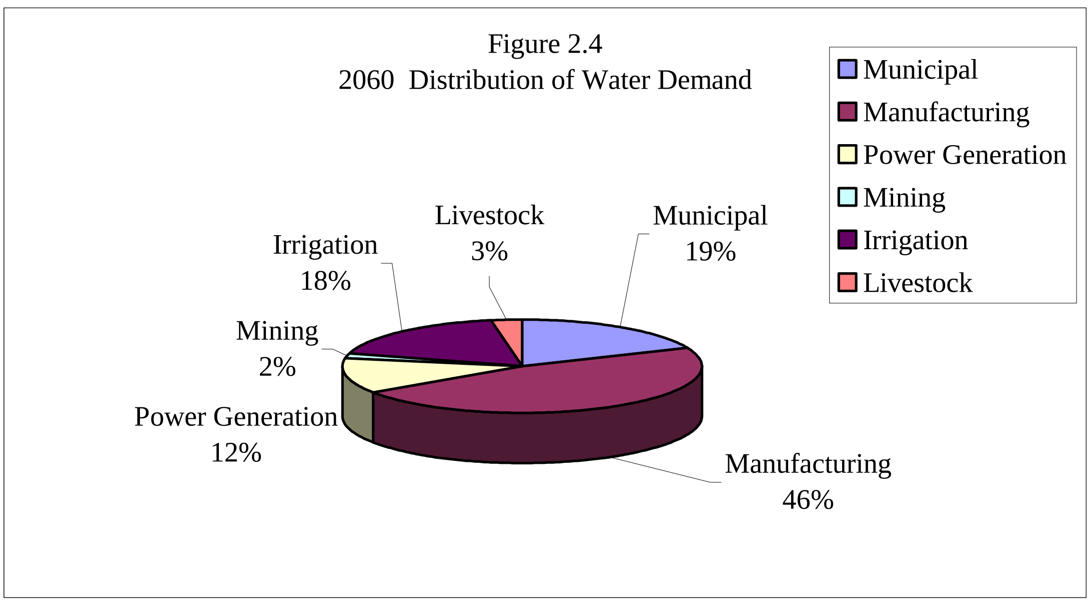


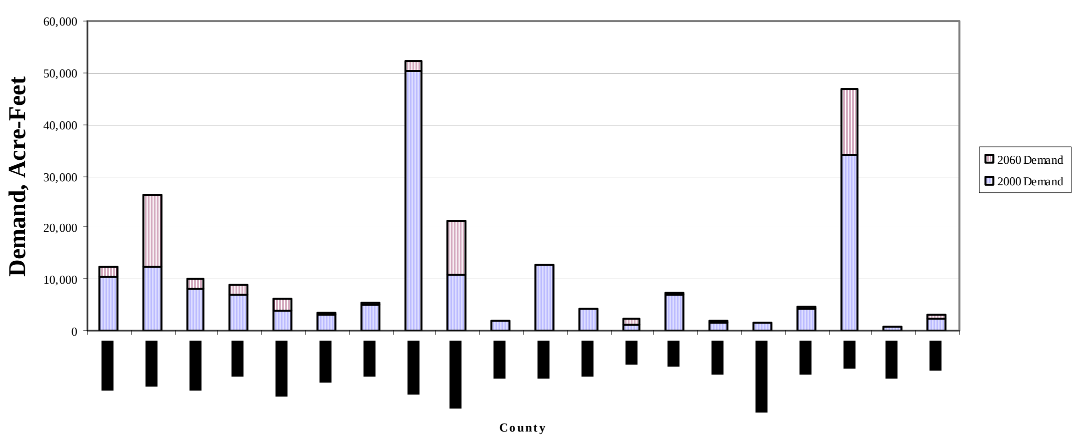
Figure 2.4
2060 Distribution of Water Demand
Municipal
Manufacturing
Power Generation
Mining
Irrigation
Livestock
Livestock 3%
Municipal 19%
Irrigation 18%
Mining 2%
Power Generation 12%
Manufacturing 46%

2.3.1 Municipal Demands

Municipal water use includes both residential and commercial. Residential use includes single and multi family housing uses. Commercial demand is composed of water used by small businesses, institutions and public offices. It does not include water used by industry. Municipal water demands projections are computed by multiplying the projected population of an entity by the entity's projected per capita water use. The per capita water uses were adjusted with time to account for current plumbing, appliance and other conservation technologies. The estimated water savings, in the year 2060, afforded by the savings projected into the per capita consumption is 20,600 acre-feet/year. Table 2.3 provides a summary of the calculated municipal use by the entities in the East Texas Region.

Municipal water use is expected to grow from 181,699 acre-feet to 233,622 acre-feet during the planning period. The projected increase for each county is illustrated in Figure 2.5. Most of the increased demand will occur in Angelina, Nacogdoches and Smith Counties. The average annual percent increase for municipal demand over the planning period is represented on Figure 2.6.

Figure 2.5
Municipal Demand by County



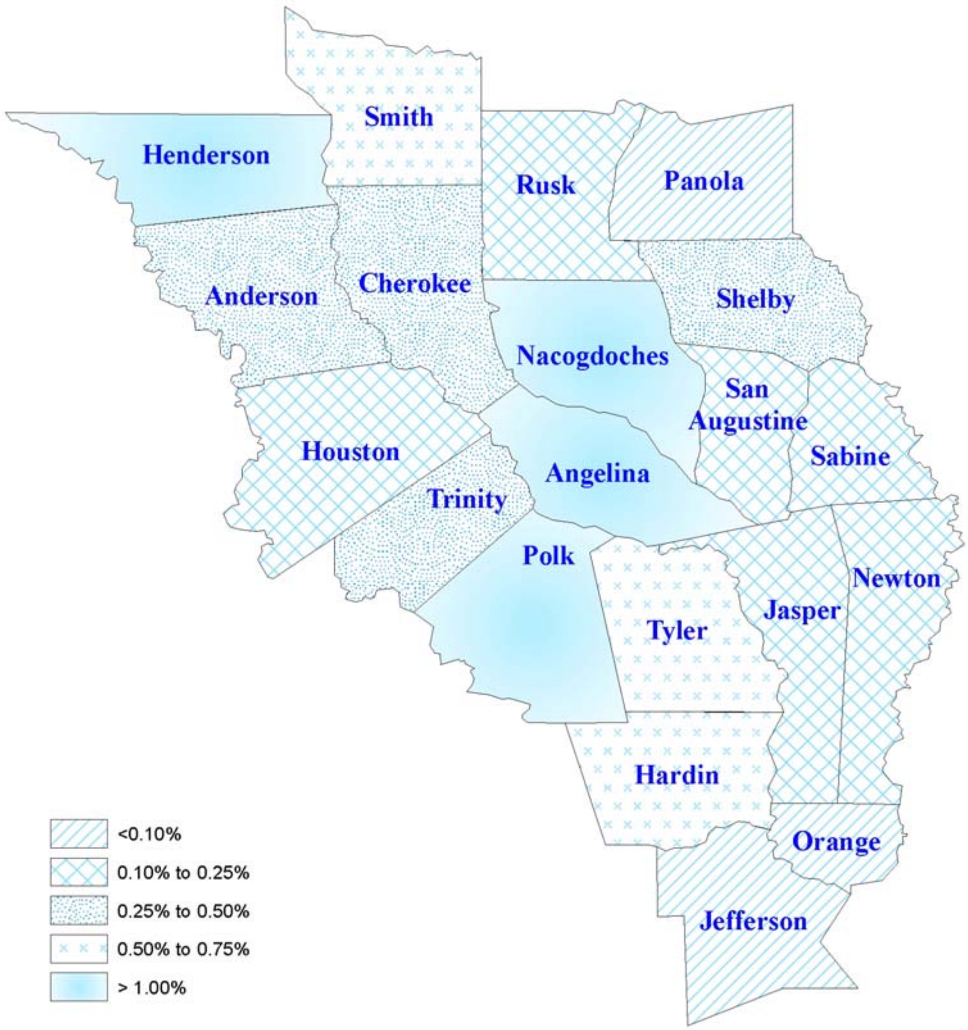


Figure 2.6
Municipal Demand % Annual Change
East Texas Region
East Texas Regional Planning Group 5/05

Table 2.3 Municipal Water Demand by County							
	Figures taken from TWDB Board Revisions dated Feb. 5, 2005						
	Historical	**Projected**					
City/County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County							
Brushy Creek WSC	266	272	276	280	278	282	289
Consolidated WSC	122	127	129	129	127	130	133
County-Other	5,147	5,459	5,672	5,801	5,932	6,075	6,227
Elkhart	170	177	183	185	188	192	196
Four Pine WSC	272	283	292	296	301	306	314
Frankston	492	524	547	564	582	598	612
Palestine	3,529	3,717	3,837	3,920	4,004	4,099	4,202
Walston Springs WSC	408	427	438	441	444	452	464
Anderson County Total	***10,406***	***10,986***	***11,374***	***11,616***	***11,856***	***12,134***	***12,437***
Angelina County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Central WCID of Angelina County	678	676	686	702	724	778	862
County-Other	2,460	2,530	2,624	2,746	2,905	3,203	3,637
Diboll	858	968	1,123	1,310	1,554	1,901	2,377
Four Way WSC	256	368	501	673	886	1,192	1,597
Hudson	459	579	732	931	1,168	1,518	1,982
Hudson WSC	563	654	768	902	1,095	1,358	1,726
Huntington	227	243	262	288	325	380	457
Lufkin	6,778	7,546	8,444	9,446	10,565	11,951	13,599
Zavalla	89	86	84	82	80	78	78
Angelina County Total	***12,368***	***13,650***	***15,224***	***17,080***	***19,302***	***22,359***	***26,315***
Cherokee County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Alto	220	233	248	261	273	286	304
Alto Rural WSC	383	393	404	409	411	424	447
Bullard	13	13	13	13	13	13	14
County-Other	995	902	790	617	378	272	218
Craft-Turney WSC	436	515	614	742	908	995	1,078
Jacksonville	3,402	3,502	3,637	3,741	3,827	3,948	4,111
New Summerfield	165	208	258	302	338	379	427
North Cherokee WSC	344	387	439	482	519	560	616
Rusk	1,122	1,194	1,283	1,353	1,421	1,495	1,591
Rusk Rural WSC	349	358	372	381	388	401	423
Southern Utilities Company	392	421	458	486	513	543	583
Troup	6	6	6	7	7	8	8
Wells	124	122	121	119	117	115	116
Cherokee County Total	***7,951***	***8,254***	***8,643***	***8,913***	***9,113***	***9,439***	***9,936***

Hardin County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	1,685	1,853	1,963	1,984	2,005	2,058	2,131
Kountze	282	306	323	326	328	336	348
Lake Livingston Water Supply and Sewer Service Company	6	6	7	7	7	7	7
Lumberton	1,301	1,430	1,515	1,544	1,573	1,615	1,673
Lumberton MUD	1,734	1,929	2,073	2,125	2,179	2,245	2,325
North Hardin WSC	626	685	716	714	720	736	762
Silsbee	974	1,072	1,136	1,149	1,161	1,193	1,235
Sour Lake	162	176	184	183	182	186	193
West Hardin WSC	291	315	325	325	325	330	342
Hardin County Total	***7,061***	***7,772***	***8,242***	***8,357***	***8,480***	***8,706***	***9,016***
Henderson County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Athens	44	77	107	136	163	199	246
Berryville	119	126	134	142	149	162	179
Bethel-Ash WSC	206	250	303	351	404	468	556
Brownsboro	136	158	182	206	232	263	304
Brushy Creek WSC	66	72	79	86	91	100	114
Chandler	369	409	453	494	538	596	674
County-Other	2,644	2,761	2,901	3,032	3,162	3,365	3,645
Murchison	131	139	148	157	166	179	196
RPM WSC	64	69	75	80	86	95	106
Henderson County Total	***3,779***	***4,061***	***4,382***	***4,684***	***4,991***	***5,427***	***6,020***
Houston County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Consolidated WSC	1,089	1,095	1,077	1,072	1,064	1,090	1,134
County-Other	176	178	179	182	186	192	199
Crockett	1,416	1,438	1,449	1,480	1,512	1,553	1,615
Grapeland	260	264	265	270	275	283	294
Lovelady	75	75	75	76	76	78	81
Houston County Total	***3,016***	***3,050***	***3,045***	***3,080***	***3,113***	***3,196***	***3,323***
Jasper County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	2,706	2,815	2,911	2,929	2,871	2,844	2,844
Jasper	1,510	1,602	1,682	1,714	1,699	1,688	1,688
Jasper County WCID No. 1	318	324	329	325	312	306	306
Kirbyville	446	474	494	506	501	499	499
Mauriceville WSC	98	100	104	104	103	103	103
Jasper County Total	***5,078***	***5,315***	***5,520***	***5,578***	***5,486***	***5,440***	***5,440***

Jefferson County	2000	2010	2020	2030	2040	2050	2060
Beaumont	27,550	27,040	26,657	26,275	25,892	25,636	25,636
Bevil Oaks	143	137	133	128	124	121	121
China	171	165	157	151	145	140	136
County-Other	1,503	1,880	2,438	2,906	3,272	3,679	4,449
Groves	3,260	3,190	3,137	3,085	3,031	2,996	2,996
Jefferson County WCID No. 10	605	640	700	750	787	832	929
Meeker MUD	289	324	379	423	461	498	580
Nederland	4,059	4,125	4,268	4,387	4,456	4,573	4,834
Nome	121	127	136	144	150	157	172
Port Arthur	9,898	9,704	9,510	9,315	9,122	8,993	8,993
Port Neches	1,782	1,782	1,782	1,789	1,780	1,804	1,882
West Jefferson County MWD	949	1,029	1,148	1,264	1,345	1,436	1,631
Jefferson County Total	***50,330***	***50,143***	***50,445***	***50,617***	***50,565***	***50,865***	***52,359***
Nacogdoches County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Appleby WSC	580	763	945	1,117	1,311	1,678	2,074
County-Other	2,269	2,452	2,625	2,770	2,954	3,373	3,849
Cushing	123	129	135	140	147	162	179
Garrison	153	149	147	144	141	139	139
Lily Grove SUD	314	423	533	641	752	982	1,224
Nacogdoches	6,903	7,625	8,423	9,218	9,939	11,352	12,540
Swift WSC	403	483	567	640	730	903	1,093
Nacogdoches County Total	***10,745***	***12,024***	***13,375***	***14,670***	***15,974***	***18,589***	***21,098***
Newton County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	1,104	1,128	1,132	1,103	1,100	1,120	1,154
Mauriceville WSC	37	37	37	37	37	38	39
Newton	463	480	495	489	497	509	524
South Newton WSC	255	257	259	253	253	257	265
Newton County Total	***1,859***	***1,902***	***1,923***	***1,882***	***1,887***	***1,924***	***1,982***
Orange County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Bridge City	940	965	977	960	934	936	947
County-Other	4,577	4,559	4,473	4,385	4,284	4,267	4,282
Mauriceville WSC	479	721	877	921	936	998	1,042
Orange	3,863	3,801	3,738	3,675	3,613	3,571	3,571
Pine Forest	75	73	71	69	67	65	65
Pinehurst	344	336	329	321	313	308	308
Rose City	86	84	83	81	79	78	78
South Newton WSC	76	97	109	113	112	116	120
Vidor	1,601	1,629	1,619	1,595	1,561	1,562	1,572
West Orange	548	530	516	502	488	479	479
Orange County Total	***12,589***	***12,795***	***12,792***	***12,622***	***12,387***	***12,380***	***12,464***

Panola County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Beckville	129	133	133	132	131	131	132
Carthage	2,187	2,274	2,297	2,311	2,317	2,326	2,343
County-Other	1,665	1,698	1,681	1,656	1,625	1,607	1,619
Gill WSC	89	94	96	97	99	100	100
Tatum	28	29	28	28	28	27	28
Panola County Total	***4,098***	***4,228***	***4,235***	***4,224***	***4,200***	***4,191***	***4,222***
Polk County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Corrigan	216	270	320	358	378	389	408
County-Other	884	1,110	1,319	1,480	1,583	1,647	1,730
Polk County Total	***1,100***	***1,380***	***1,639***	***1,838***	***1,961***	***2,036***	***2,138***
Rusk County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	2,622	2,660	2,733	2,759	2,700	2,787	3,088
Easton	5	8	11	12	13	15	21
Elderville WSC	294	324	353	369	378	400	456
Henderson	2,450	2,417	2,396	2,367	2,333	2,320	2,351
Kilgore	543	532	520	512	503	500	500
Mount Enterprise	71	71	71	70	68	69	73
New London	220	225	228	230	228	232	248
Overton	394	413	429	434	432	447	491
Southern Utilities Company	68	71	74	74	75	77	85
Tatum	125	122	118	115	112	110	110
West Gregg WSC	15	15	15	15	15	15	16
Rusk County Total	***6,807***	***6,858***	***6,948***	***6,957***	***6,857***	***6,972***	***7,439***
Sabine County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	424	449	461	468	476	485	500
G-M WSC	640	665	668	662	655	666	686
Hemphill	349	371	382	389	397	406	418
Pineland	209	221	227	230	232	237	244
Sabine County Total	***1,622***	***1,706***	***1,738***	***1,749***	***1,760***	***1,794***	***1,848***
San Augustine County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	601	625	623	618	614	624	637
G-M WSC	73	77	75	74	74	75	76
San Augustine	851	915	925	939	957	979	999
San Augustine County Total	***1,525***	***1,617***	***1,623***	***1,631***	***1,645***	***1,678***	***1,712***
Shelby County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Center	1,577	1,633	1,718	1,785	1,823	1,867	1,923
County-Other	2,049	2,087	2,172	2,241	2,255	2,300	2,375
Joaquin	145	148	155	158	160	163	168
Tenaha	194	191	187	184	180	178	178
Timpson	180	179	181	181	180	181	184
Shelby County Total	***4,145***	***4,238***	***4,413***	***4,549***	***4,598***	***4,689***	***4,828***

Smith County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Arp	166	173	178	183	188	200	218
Bullard	269	309	338	366	395	447	518
Community Water Company	89	137	188	211	232	271	327
County-Other	1,059	929	823	726	643	572	512
Crystal Systems, Inc.	58	65	71	77	82	93	108
Dean WSC	473	538	582	629	673	761	889
Jackson WSC	234	288	333	384	431	463	499
Lindale	154	150	148	146	145	144	144
Lindale Rural WSC	375	438	484	531	577	662	780
New Chapel Hill	105	118	127	137	146	163	187
Noonday	98	102	105	107	110	117	127
Overton	10	11	11	11	12	12	13
RPM WSC	29	32	34	36	38	42	47
Southern Utilities Company	5,680	6,058	6,296	6,507	6,750	7,402	8,363
Troup	267	286	297	311	322	351	393
Tyler	24,244	25,528	26,385	27,211	28,007	29,771	32,253
Whitehouse	862	982	1,070	1,153	1,240	1,405	1,636
Smith County Total	***34,172***	***36,144***	***37,470***	***38,726***	***39,991***	***42,876***	***47,014***
Trinity County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	538	585	619	623	640	663	688
Groveton	105	114	121	122	118	113	109
Trinity County Total	***643***	***699***	***740***	***745***	***758***	***776***	***797***
Tyler County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Colmesneil	64	72	80	84	84	83	83
County-Other	1250	1,422	1,587	1,684	1,696	1,677	1,677
Lake Livingston Water Supply & Sewer Service Company	6	7	7	8	8	8	8
Tyler County WSC	514	575	633	665	663	652	652
Woodville	571	661	750	802	818	814	814
Tyler County Total	***2,405***	***2,737***	***3,057***	***3,243***	***3,269***	***3,234***	***3,234***

2.3.2 Manufacturing Demands.

Manufacturing demand in the Region is largely located in Jefferson and Orange Counties that comprise approximately 75% of the manufacturing use. The use is mainly in the petrochemical industry. Angelina and Jasper County comprise an additional 22% of the use, largely in the paper industry. Manufacturing demands are expected to increase from 345,580 acre-feet to 593,454 acre-feet during the planning period. Table 2.4 shows a summary of the usage on a county basis. Figures 2.7 and 2.8 show usage by the counties with major usages and the other counties. The average annual percentage increases for manufacturing use is shown in Figure 2.9.

Table 2.4
Historical and Projected Manufacturing Water Demand by County

Figures taken from TWDB Board Revisions dated Feb. 5, 2005

County	Historical 2000	Projections					
		2010	2020	2030	2040	2050	2060
Anderson	0	0	0	0	0	0	0
Angelina	25,238	30,266	34,359	37,982	41,642	44,887	48,356
Cherokee	606	718	784	839	891	934	1,007
Hardin	119	146	165	182	200	216	233
Henderson	9	12	14	16	18	20	22
Houston	139	169	190	209	227	243	263
Jasper	58,916	64,267	67,649	70,162	72,359	74,006	74,069
Jefferson	202,952	237,954	267,434	292,871	318,669	341,559	365,636
Nacogdoches	1,898	2,288	2,553	2,786	3,016	3,214	3,468
Newton	551	678	793	899	1,006	1,103	1,196
Orange	48,763	57,624	64,461	70,439	76,399	81,690	87,641
Panola	1,184	1,357	1,437	1,500	1,561	1,614	1,720
Polk	504	619	725	825	930	1,026	1,110
Rusk	69	82	90	97	103	108	116
Sabine	294	359	427	490	554	611	662
San Augustine	5	6	7	8	9	10	11
Shelby	1,145	1,360	1,508	1,637	1,766	1,880	2,019
Smith	3,156	3,846	4,297	4,697	5,081	5,407	5,854
Trinity	0	0	0	0	0	0	0
Tyler	32	39	46	53	60	66	71
Total for Region	***345,580***	***451,790***	***446,939***	***485,692***	***524,491***	***558,594***	***593,454***

Figure 2.7
Manufacturing Demand in Industrial Counties

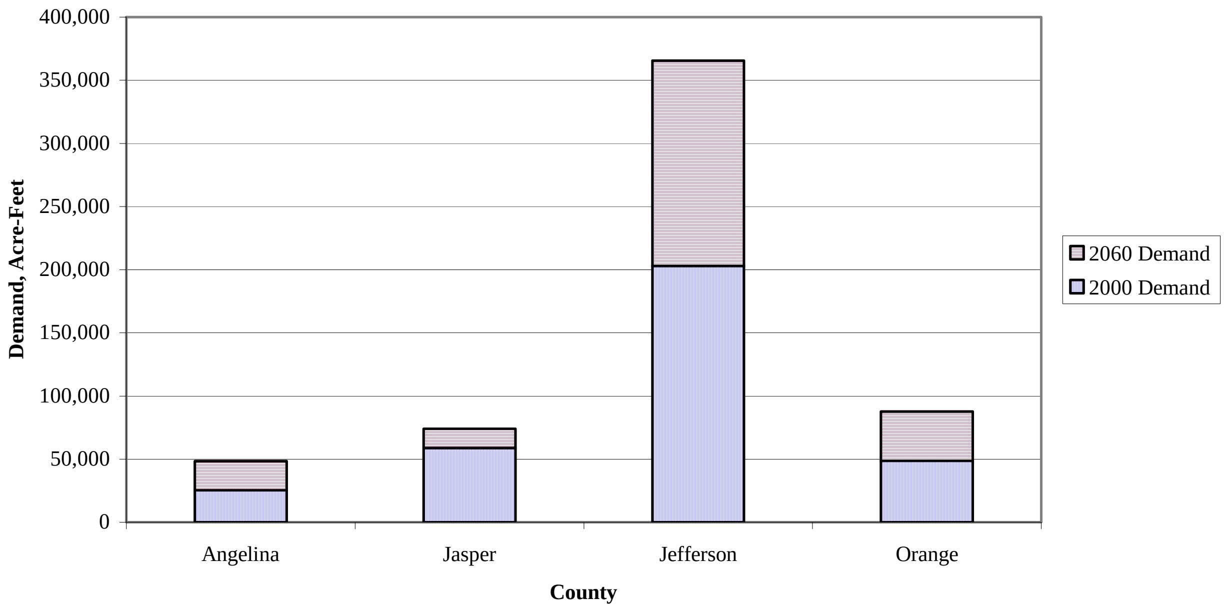
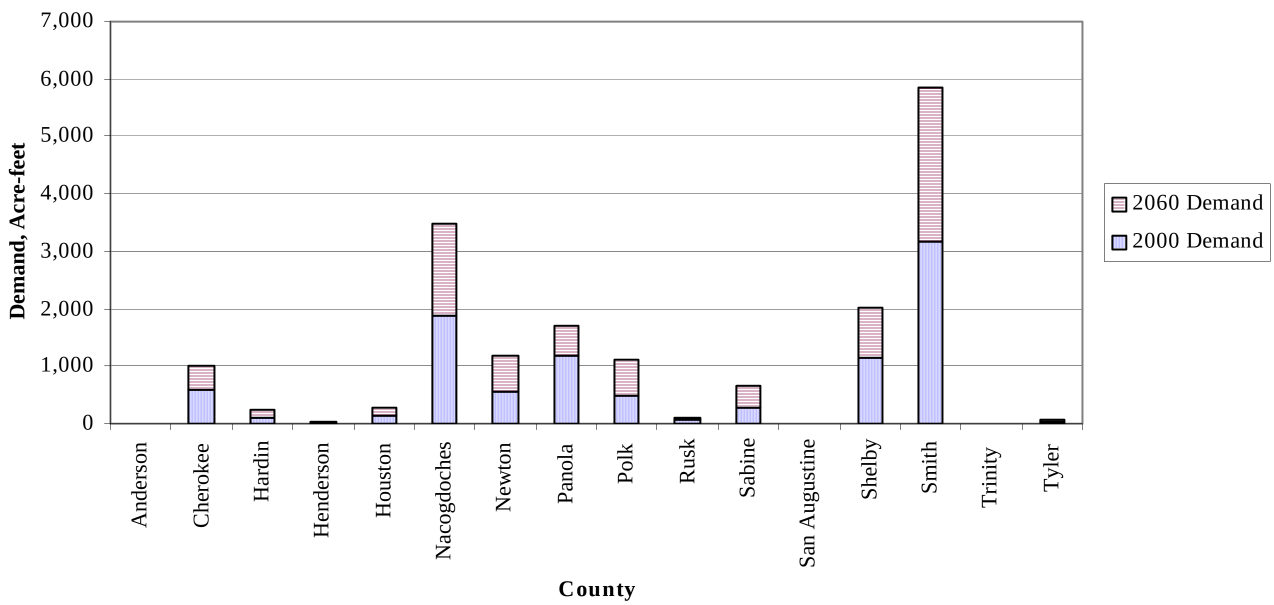


Figure 2.8
Manufacturing Demand in Non-Industrial Counties



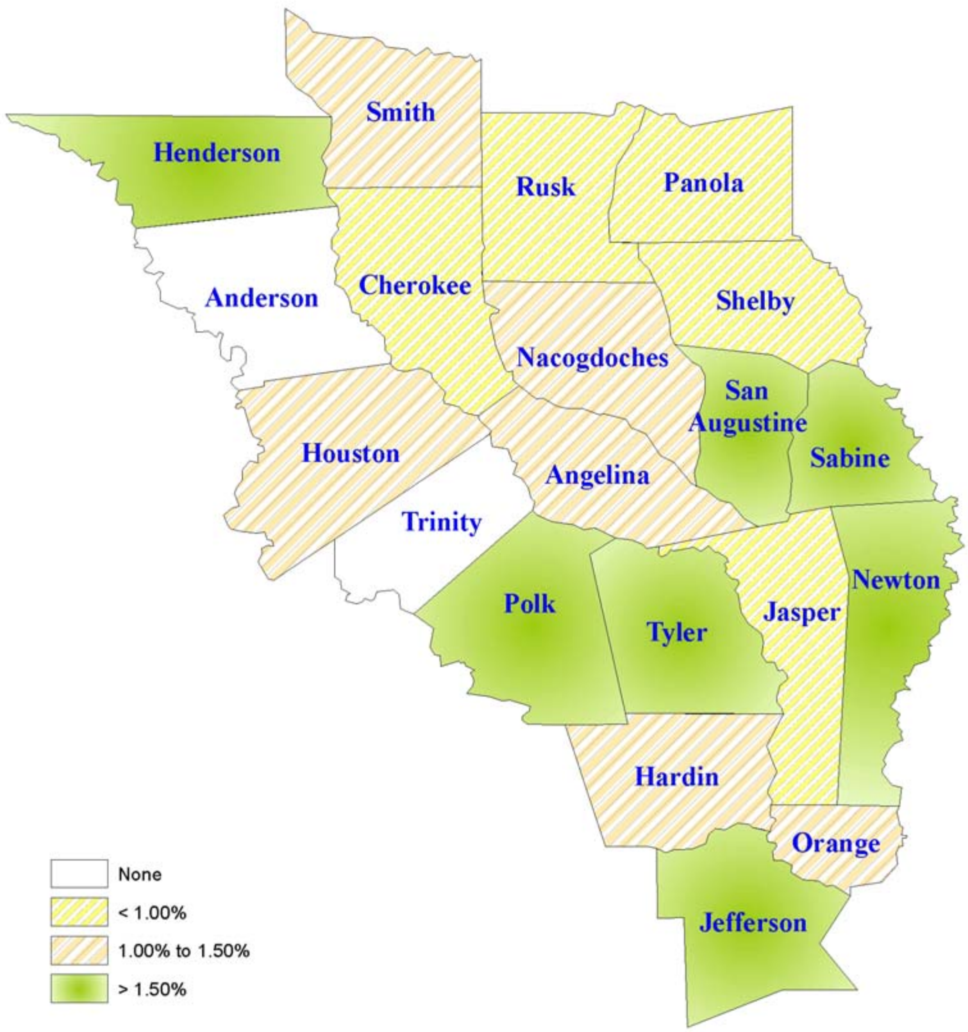


Figure 2.9
Manufacturing Demand
Percentage Annual Change
East Texas Region
East Texas Regional Planning Group 5/05

2.3.3 Irrigation Demands

Irrigation in Jefferson County accounts for approximately 93% of the water used for irrigation. Water use for irrigation is presented in Table 2.5. The other major irrigation counties in the Region, after Jefferson County, are Hardin, Houston, and Orange Counties. The projection of irrigation use for these counties is presented in Figure 2.10. The usage for the remaining counties is shown in Figure 2.11.

Table 2.5
Projected Irrigation Water Demand by County

Figures taken from TWDB Board Revisions dated Feb. 5, 2005

County	Historical 2000	Projections					
		2010	2020	2030	2040	2050	2060
Anderson	212	212	212	212	212	212	212
Angelina	30	30	30	30	30	30	30
Cherokee	321	321	321	321	321	321	321
Hardin	3,502	7,213	7,213	7,213	7,213	7,213	7,213
Henderson	10	10	10	10	10	10	10
Houston	2,479	2,739	3,024	3,343	3,691	4,077	4,503
Jasper	0	0	0	0	0	0	0
Jefferson	103,924	208,035	208,035	208,035	208,035	208,035	208,035
Nacogdoches	302	302	302	302	302	302	302
Newton	367	367	367	367	367	367	367
Orange	1,678	2,509	2,509	2,509	2,509	2,509	2,509
Panola	0	0	0	0	0	0	0
Polk	135	135	135	135	135	135	135
Rusk	126	126	126	126	126	126	126
Sabine	0	0	0	0	0	0	0
San Augustine	225	225	225	225	225	225	225
Shelby	25	27	30	34	37	41	46
Smith	540	566	595	626	657	689	723
Trinity	0	0	0	0	0	0	0
Tyler	29	29	29	29	29	29	29
Total for Region	***113,905***	***222,846***	***223,163***	***223,517***	***223,899***	***224,321***	***224,786***

Figure 2.10
Major Irrigation Demands

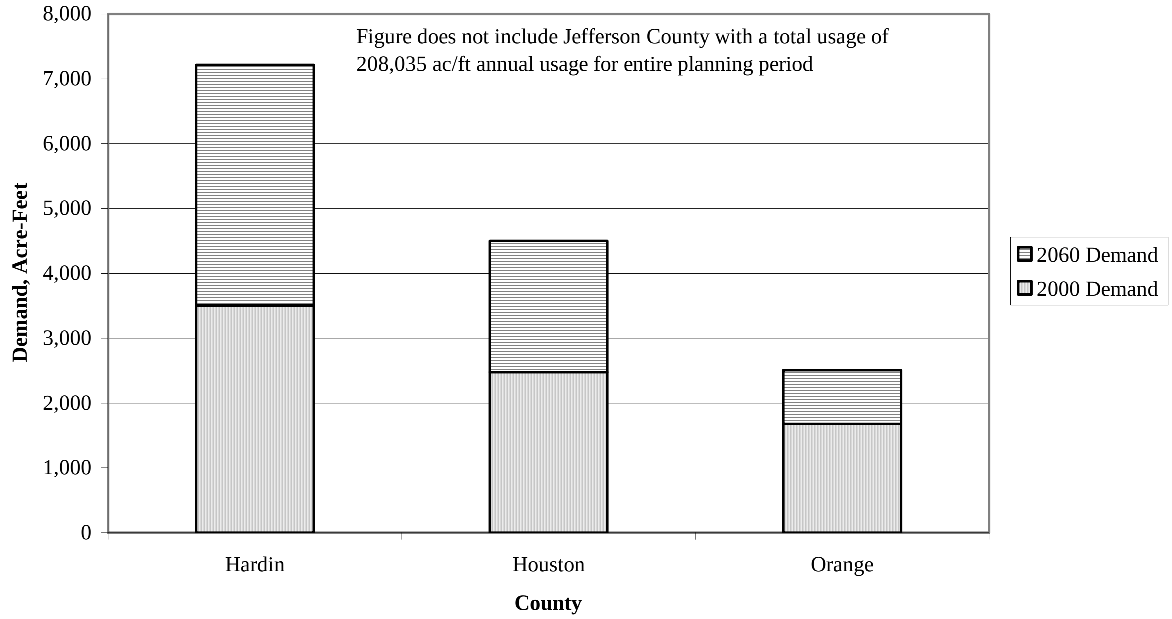
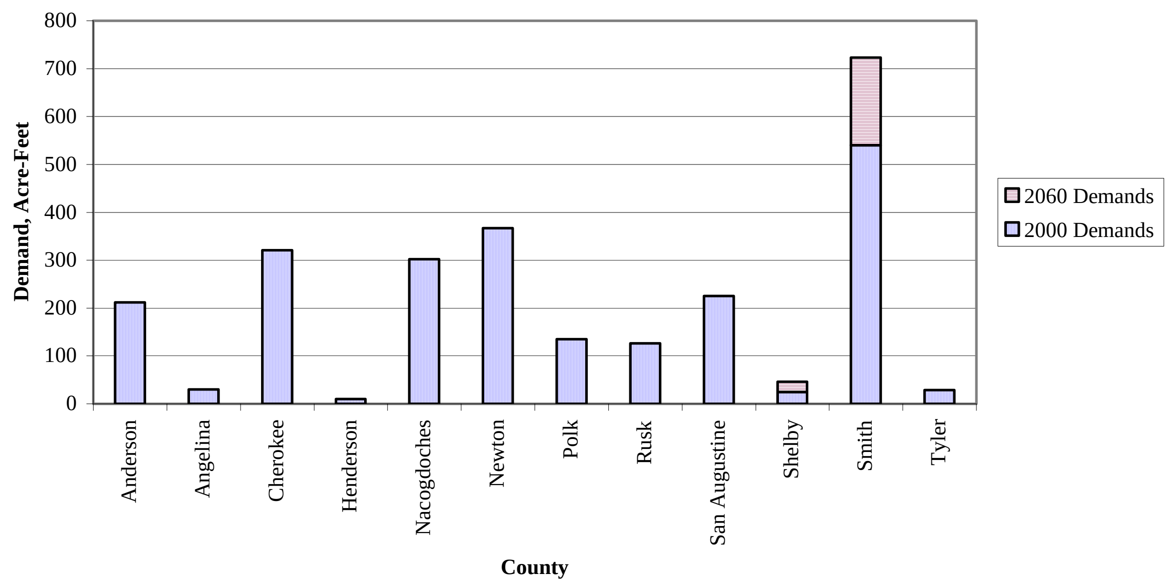


Figure 2.11
Minor Irrigation Demands



2.3.4 Steam-Electric Demands

Counties with current demands are Cherokee, Nacogdoches, Newton, Orange and Rusk Counties. The usage, in the East Texas Region is expected to increase from 28,996 acre-feet to 154,611acre-feet during the planning period. The demands for this user group were taken from a report, "Power Generation Water Use in Texas for the Years 2000 through 2060", prepared by representatives of Investor-Owned Utility Companies of Texas. Rusk County accounts for approximately 56% of the usage in the region. The report indicates the demand for Rusk County to be associated with two existing power plants. Counties adding steam-electric demands during the period include Anderson and Jefferson. The demand for steam-electric usage are projected in Table 2.6. Figure 2.12 shows the projected demand by County. Figure 2.13 shows the location of the demands for the Year 2060.

Figure 2.12
Steam-Electric Demand by County

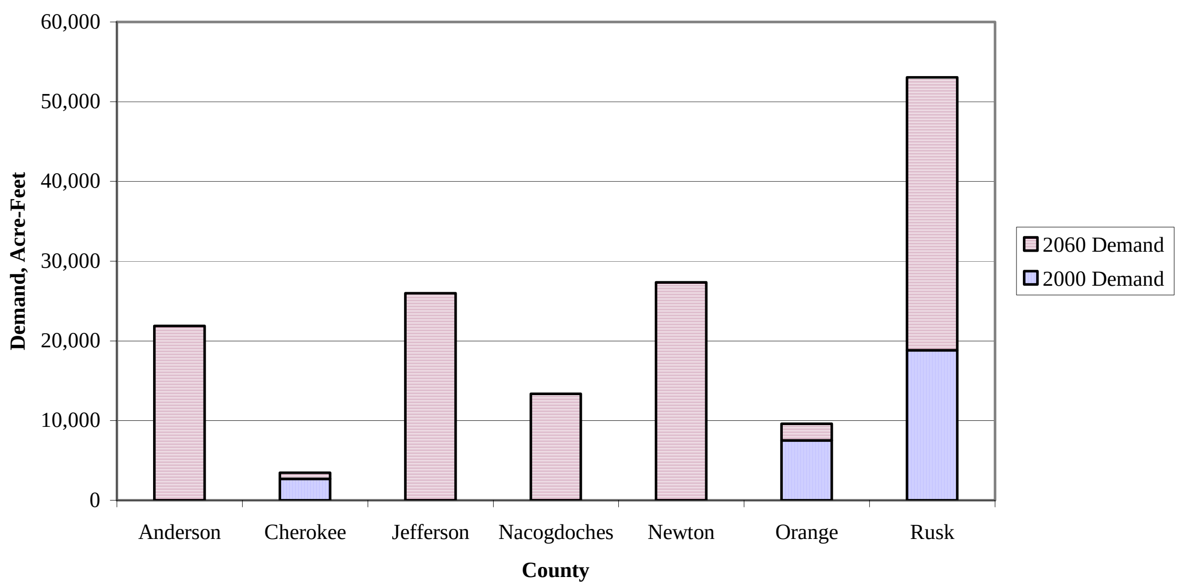


Table 2.6

Projected Steam Electric Water Demand by County

Figures taken from TWDB Board Revisions dated Feb. 5, 2005

County	Historical 2000	Projections					
		2010	2020	2030	2040	2050	2060
Anderson	0	0	11,306	13,218	15,549	18,390	21,853
Angelina	0	0	0	0	0	0	0
Cherokee	2700	2,245	1,790	2,093	2,462	2,912	3,460
Hardin	0	0	0	0	0	0	0
Henderson	0	0	0	0	0	0	0
Houston	0	0	0	0	0	0	0
Jasper	0	0	0	0	0	0	0
Jefferson	0	0	13,426	15,696	18,464	21,838	25,951
Nacogdoches	0	4,828	6,911	8,079	9,504	11,241	13,358
Newton	0	5,924	14,132	16,522	19,436	22,987	27,317
Orange	7491	6,228	4,966	5,805	6,829	8,077	9,598
Panola	0	0	0	0	0	0	0
Polk	0	0	0	0	0	0	0
Rusk	18805	24,760	27,458	32,102	37,762	44,663	53,074
Sabine	0	0	0	0	0	0	0
San Augustine	0	0	0	0	0	0	0
Shelby	0	0	0	0	0	0	0
Smith	0	0	0	0	0	0	0
Trinity	0	0	0	0	0	0	0
Tyler	0	0	0	0	0	0	0
Total for Region	***28,996***	***43,985***	***79,989***	***93,515***	***110,006***	***130,108***	***154,611***

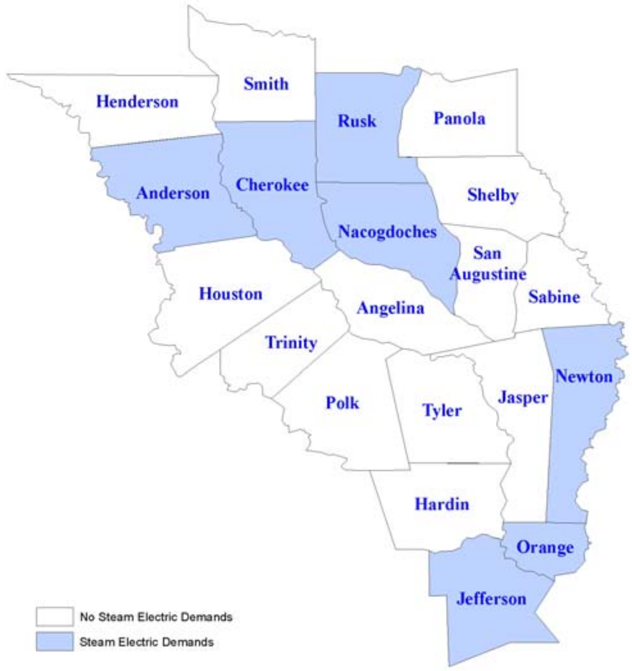


Figure 2.13
Steam Electric 2060 Demand
East Texas Region
East Texas Regional Planning Group 5/05

2.3.5 Livestock Demands

Shelby County presently accounts for 18% of the livestock usage and is expected to account for 33% of the livestock usage by the end of the planning period. Other major livestock counties include Anderson, Cherokee, Henderson, Houston, Nacogdoches, Panola, Rusk and San Augustine that use approximately average 60% of the usage during the planning period. The total usage is expected to increase from 22,345 acre-feet to 34,543 acre-feet. The projected usage by County during the planning period is presented in Table 2.7. Figures 2.14 and 2.15 show the livestock demand by major and minor counties. The largest percentage change in growth, as well as total demand, is expected to occur in Nacogdoches, San Augustine and Shelby Counties. Figure 2.16 illustrates the average annual % change, by County, in the Region during the planning period.

Table 2.7
Projected Livestock Water Demand by County
Figures taken from TWDB Board Revisions dated Feb. 5, 2005

County	Historical 2000	Projections					
		2010	2020	2030	2040	2050	2060
Anderson	1,708	1,708	1,708	1,708	1,708	1,708	1,708
Angelina	579	598	620	647	677	712	749
Cherokee	1,765	1,765	1,765	1,765	1,765	1,765	1,765
Hardin	156	156	156	156	156	156	156
Henderson	2,594	2,594	2,594	2,594	2,594	2,594	2,594
Houston	1,951	2,115	2,291	2,483	2,690	2,915	3,158
Jasper	317	317	317	317	317	317	317
Jefferson	807	807	807	807	807	807	807
Nacogdoches	1,516	1,719	1,954	2,227	2,544	2,911	3,332
Newton	110	110	110	110	110	110	110
Orange	210	210	210	210	210	210	210
Panola	3,096	3,096	3,096	3,096	3,096	3,096	3,096
Polk	202	202	202	202	202	202	202
Rusk	1,156	1,171	1,188	1,207	1,231	1,257	1,283
Sabine	631	667	710	759	816	882	954
San Augustine	936	1,004	1,082	1,173	1,278	1,400	1,534
Shelby	3,483	4,246	5,176	6,310	7,691	9,376	11,430
Smith	660	660	660	660	660	660	660
Trinity	194	194	194	194	194	194	194
Tyler	274	274	274	274	274	274	274
Total for Region	***22,345***	***23,613***	***25,114***	***26,899***	***29,020***	***31,546***	***34,533***

Figure 2.14
Major Livestock Demand

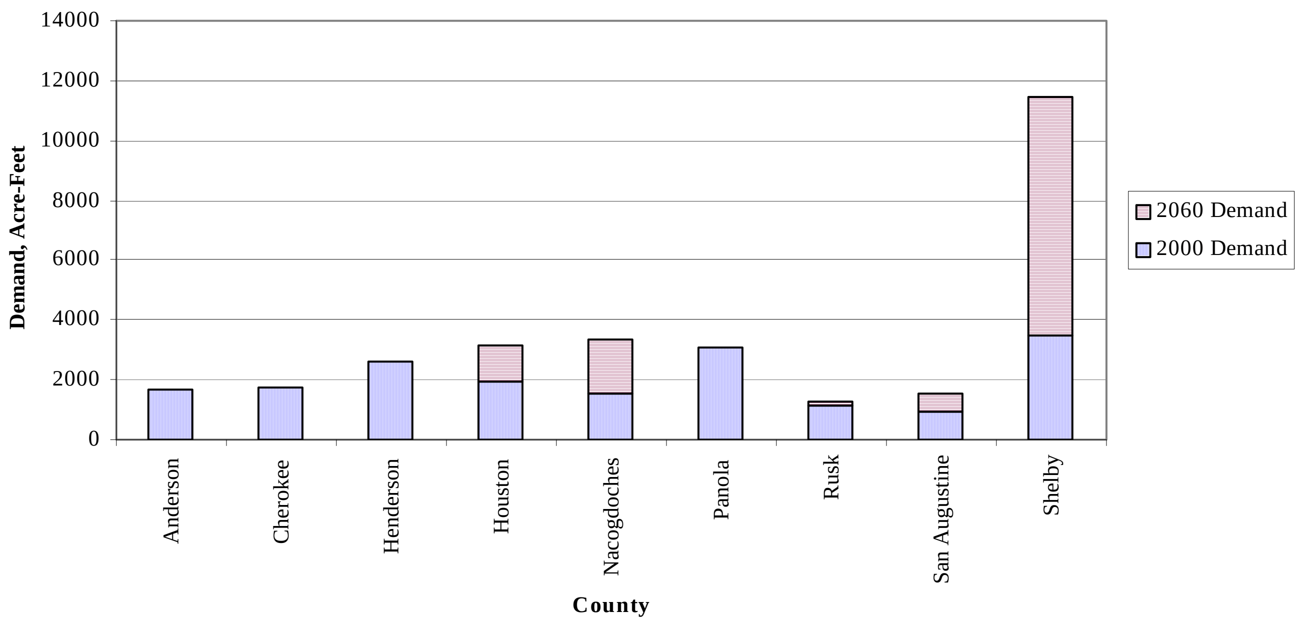
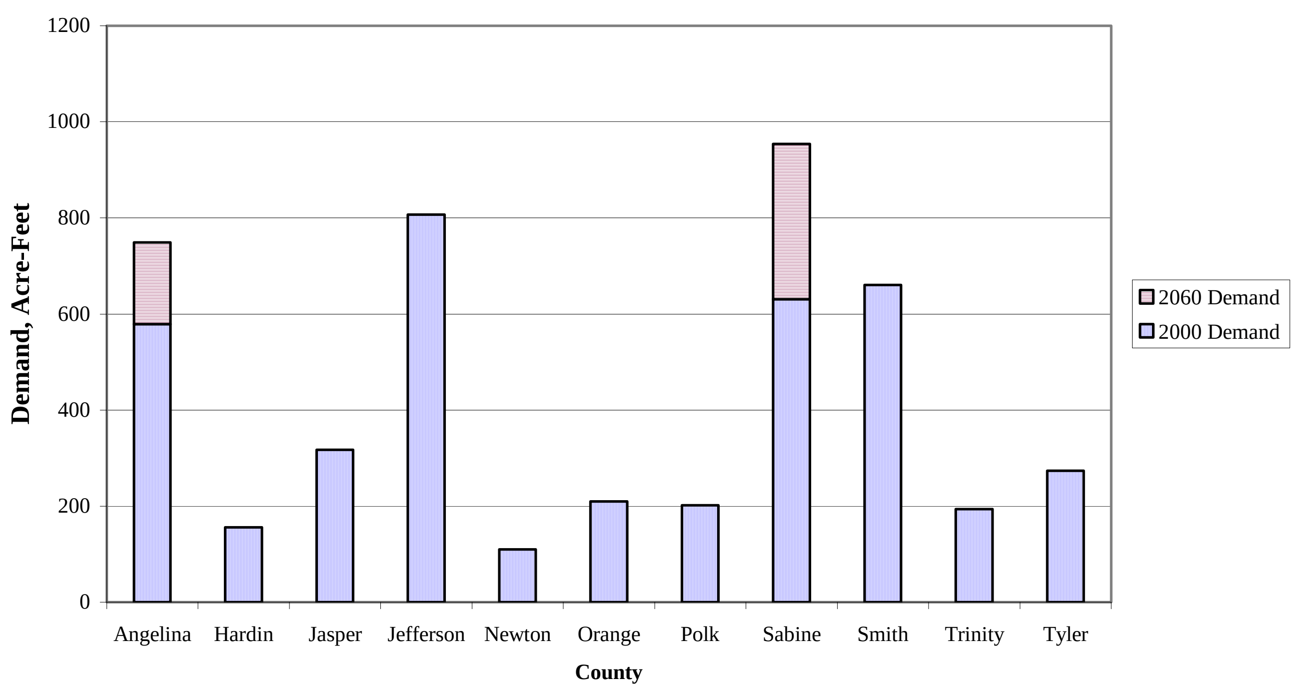


Figure 2.15
Minor Livestock Demand



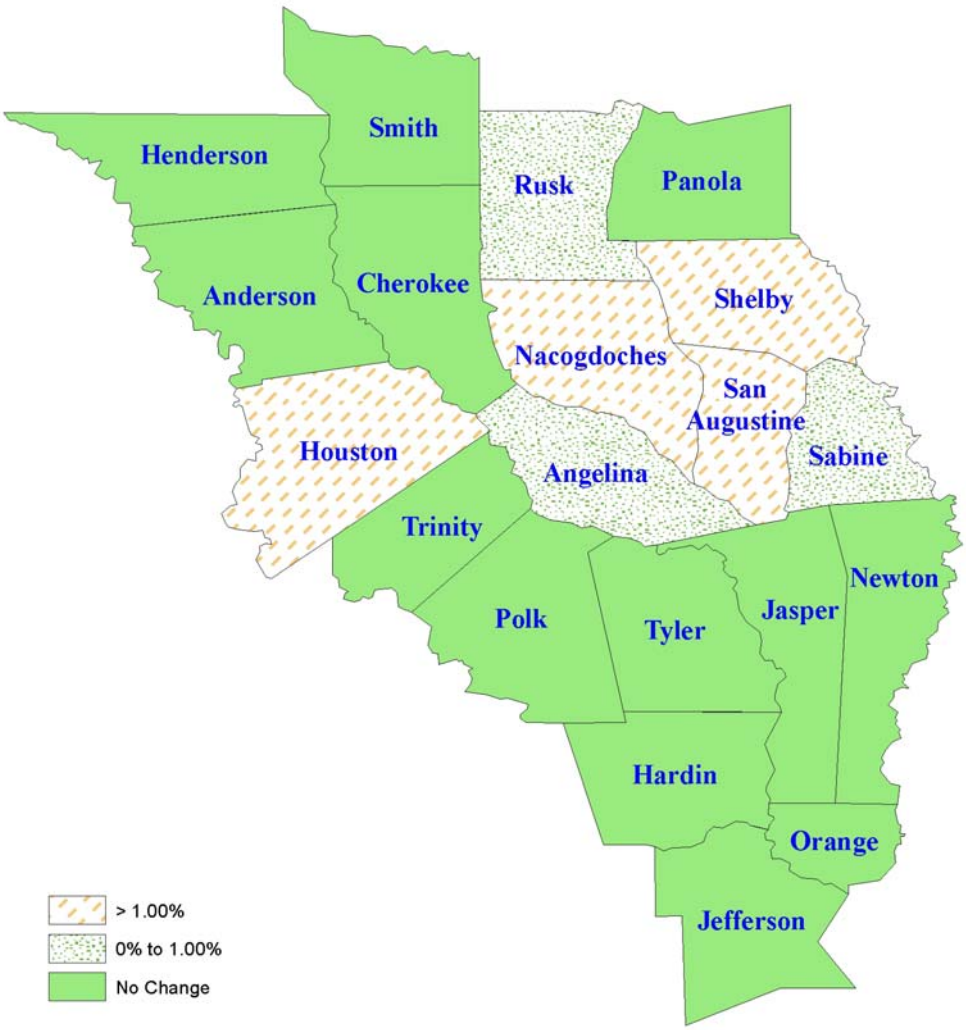


Figure 2.16
Livestock Demand % Annual Change
East Texas Region
East Texas Regional Planning Group 5/05

2.3.6 Mining Demands

90% of the demand for mining occurs in Hardin, Panola and Rusk Counties. The water demand for this use is expected to increase from 11,795 acre-feet to 20,314 acre-feet during the planning period. Table 2.8 shows the usage on a County basis. Figures 2.17 and 2.18 show the usage for the major and minor counties in which the activity occurs. Figure 2.19 illustrates the average annual % change in the Region, by County, during the planning period.

Table 2.8 Projected Mining Water Demand by County

Figures taken from TWDB Board Revisions dated Feb. 5, 2005

	Historical 2000	Projections					
		2010	2020	2030	2040	2050	2060
Anderson	423	513	557	583	608	633	657
Angelina	22	18	17	17	17	17	17
Cherokee	83	93	97	99	101	103	105
Hardin	6,228	7,800	8,648	9,219	9,788	10,361	10,798
Henderson	14	14	14	14	14	14	14
Houston	177	163	160	158	156	154	153
Jasper	4	4	4	4	4	4	4
Jefferson	294	323	334	341	348	355	360
Nacogdoches	220	215	213	212	211	210	209
Newton	34	32	32	32	32	32	32
Orange	7	8	9	9	9	9	9
Panola	2,897	3,756	4,271	4,587	4,905	5,228	5,536
Polk	0	0	0	0	0	0	0
Rusk	1,261	1,540	1,679	1,761	1,841	1,921	1,996
Sabine	0	0	0	0	0	0	0
San Augustine	0	0	0	0	0	0	0
Shelby	0	0	0	0	0	0	0
Smith	131	183	262	295	351	391	424
Trinity	0	0	0	0	0	0	0
Tyler	0	0	0	0	0	0	0
Total for Region	***11,795***	***14,662***	***16,297***	***17,331***	***18,385***	***19,432***	***20,314***

Figure 2.17
Major Mining Demand

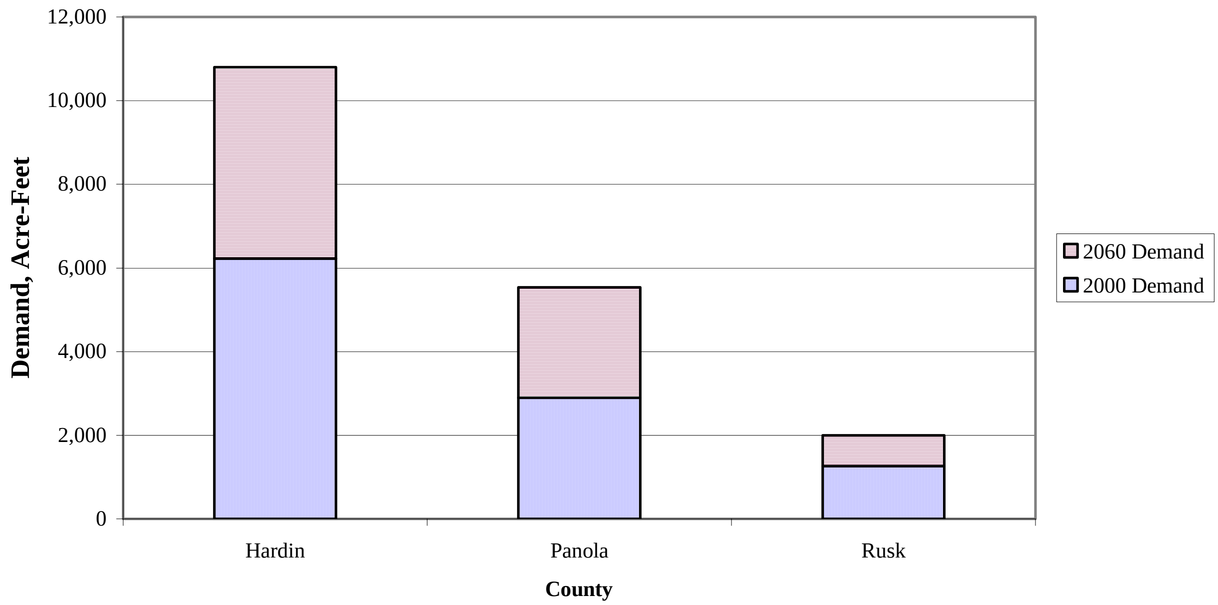
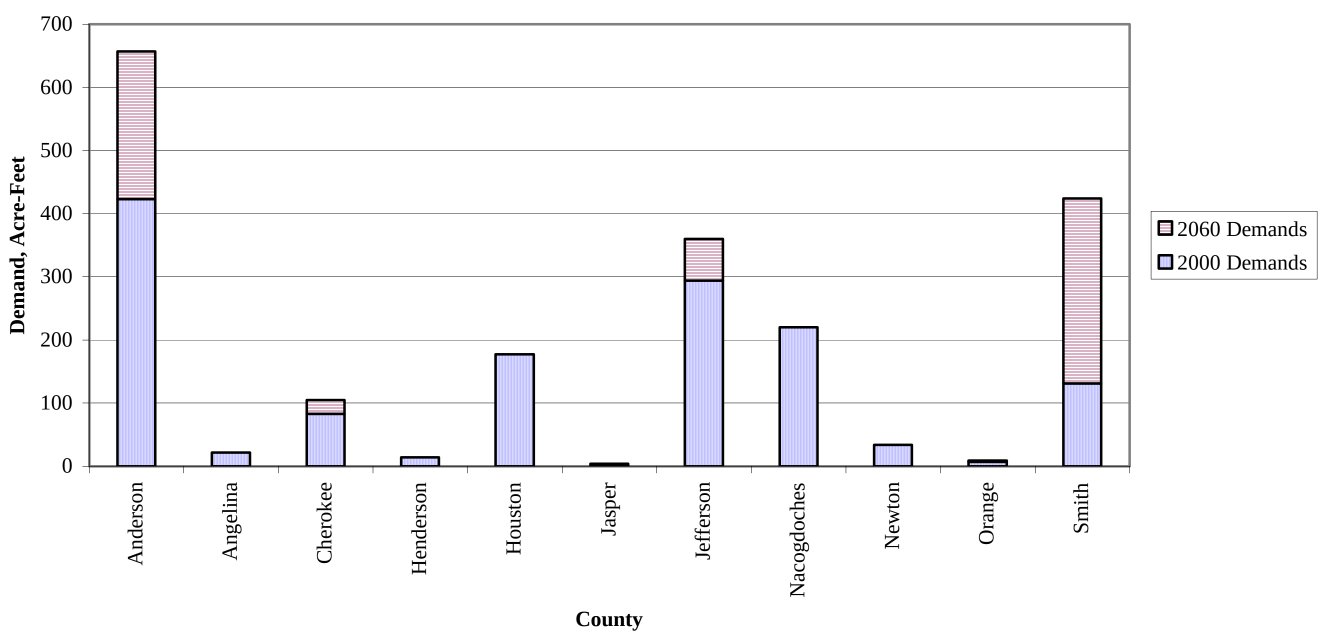


Figure 2.18
Minor Mining Demands



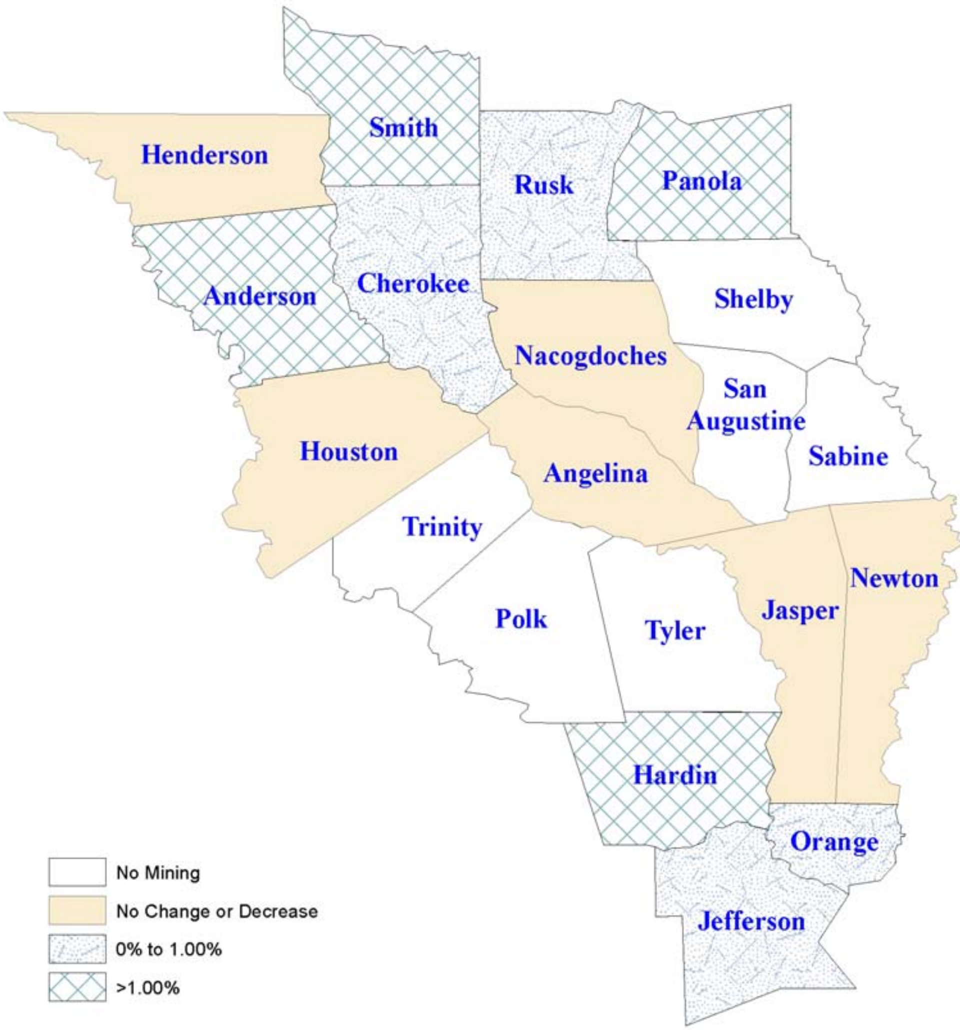


Figure 2.19
Mining Demand % Annual Change
East Texas Region
East Texas Regional Planning Group 5/05

2.4 County-Other

The East Texas Regional Water Planning Group was provided additional authorization to review the population and water demands for the County-Other user group approved by the Texas Water Development Board. A listing of entities that comprise the County-Other user group and the data required by the authorization is provided in Appendices A and B. A summary of the comparison of population and water demand data derived from information reported by the entities to the Texas Commission on Environmental Quality (TCEQ) and the data used in the East Texas Regional Water Plan is provided in the following table. The data, given reasonable adjustments for the differences in the derivation and source of information, appear to match closely for the Region as a whole, however adjustments may be warranted on a county by county comparison.

The data generated from this comparison was not used in determination of needs and therefore was not considered in selection of water management strategies. Five of the communities in the County-Other category; TDCJ units in Anderson County, Hardin County WCID No. 1, Three Community WSC, Melrose WSC and Denning WSC; may warrant evaluation for implementation of water conservation based on reported gallon per capita per day usage and percentage demand of the County-Other use. Six counties; Cherokee, Hardin, Henderson, Sabine, Smith and Trinity; may warrant further consideration of needs and water management strategies, if the TCEQ data is determined to be more accurate in distributing the population. However, the additional population is assumed to be individuals not on water systems and would have usage scattered in the counties.

	TCEQ 2004 Data			As Reported in Regional Plan			TCEQ vs Plan	
County	Population	Water Demand (Acre-ft/yr)		2000 Population	2000 Water Demand (Acre-ft/yr)		Population	Water Demand (Acre-ft/yr)
Anderson	22798	3304		24445	5147		-7%	-56%
Angelina	13419	1118		19962	2460		-49%	-120%
Cherokee	14482	1529		6836	995		53%	35%
Hardin	4428	482		11311	1685		-155%	-250%
Henderson	17988	1605		13113	2644		27%	-65%
Houston	1376	192		1020	176		26%	8%
Jasper	12918	1136		20643	2706		-60%	-138%
Jefferson	3387	173		16364	1503		-383%	-769%
Nacogdoches	16238	1997		19290	2269		-19%	-14%
Newton	8783	663		9384	1104		-7%	-67%
Orange	13765	1169		31924	4577		-132%	-292%
Panola	12287	1147		14432	1665		-17%	-45%
Polk	3688	242		6314	884		-71%	-265%
Rusk	22087	1881		26005	2622		-18%	-39%
Sabine	6283	376		1740	424		72%	-13%
San Augustine	4723	431		5712	601		-21%	-39%
Shelby	14892	1805		16481	2049		-11%	-14%
Smith	15755	1386		4750	1059		70%	24%
Trinity	5167	444		2857	538		45%	-21%
Tyler	7229	612		11271	1250		-56%	-104%
Total	221693	21692		263854	36358		-19%	-68%

Difference in Water Demand (ac-ft/year)

Difference in population of 42,126 persons not on public system - 5,810 ac-ft/yr

Difference in gpcd rate from data on TCEQ database and TWDB projections (87 gpcd vs. 123 gpcd) - 8,.856 ac-ft/yr

Note: Average gpcd demand for all municipal users, excluding cities with larger commercial base and county-others, is 132 gpcd

Appendix A

County Other Entities

Anderson County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
ANDERSON	10044	TDCJ ID BETO UNIT	5784	433	1.71	1.155	0.36	200
ANDERSON	10049	TDCJ ID POWLEDGE	1256	127	0.893	0.334	0.57	266
ANDERSON	10028	SLOCUM WSC	2304	768	0.891	0.218	0.199	95
ANDERSON	10018	BCY WSC	2211	737	1.069	0.193	0.334	87
ANDERSON	10026	PLEASANT SPRINGS WSC	804	268	0.432	0.193	0.055	240
ANDERSON	10024	NECHES WSC	1896	632	1.289	0.136	0.236	72
ANDERSON	10029	TUCKER WSC	1422	474	0.497	0.134	0.149	94
ANDERSON	10015	BBS WSC	1188	396	0.412	0.123	0.115	104
ANDERSON	10047	NORWOOD WSC	1089	363	0.789	0.101	0.132	93
ANDERSON	10021	LONE PINE WSC	963	321	0.36	0.083	0.119	86
ANDERSON	10046	ANDERSON COUNTY CEDAR CREEK WSC	1077	359	0.374	0.077	0.216	71
ANDERSON	10023	MANTALBA WSC	528	176	0.187	0.067	0.043	127
ANDERSON	10003	LAKEVIEW METHODIST CONF. CENTER	800	1	0.23	0.031	0.067	39
ANDERSON	10054	LAKE IONI WATER SUPPLY	180	60	0.057	0.025	0.02	139
ANDERSON	10039	DOGWOOD HILLS EAST	204	68	0	0.019	0	93
ANDERSON	10019	CAYUGA WSC	240	80	0.082	0.015	0.02	63
ANDERSON	10059	DOGWOOD SPRINGS WSC PLANT 2	375	125	0.144	0.015	0.048	40
ANDERSON	10038	DOGWOOD HILLS NORTH	189	63	0	0.014	0	74
ANDERSON	10007	DOGWOOD SPRINGS WSC #1	135	45	0.041	0.008	0.012	59
ANDERSON	10037	CAMP BETTE PEROT	120	1	0.063	0.004	0.033	33
		SUBTOTAL REPORTED	22765	5497	9.52	2.945	2.728	129
		Per Capita Usage (GPCD)	129					
ANDERSON	10008	EDGEWATER SHORES WATER SUPPLY	33	11	0.058	*0.004*	0	
		SUBTOTAL PROJECTED	22798	5508	9.578	2.949	2.728	
		Water Demand (Acre-ft/yr)	3304					

County Other Entities

Angelina County

County	PWS ID	PWS Name	Population Served	Number Of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
ANGELINA	30102	ANGELINA COUNTY FWSD 1	573	191	0	0.031	0	54
ANGELINA	30028	REDLAND WSC	2394	798	1.498	0.23	0.415	96
ANGELINA	30016	ANGELINA WSC	3000	1106	1.137	0.183	0.406	61
ANGELINA	30029	WOODLAWN WSC	1824	608	0.511	0.149	0.234	82
ANGELINA	30094	POLLOK REDTWON WSC	1710	570	0.576	0.142	0.12	83
ANGELINA	30031	LUFKIN STATE SCHOOL	1300	65	0.648	0.092	0.22	71
ANGELINA	30027	PRAIRIE GROVE WSC	603	201	0.068	0.055	0.02	91
ANGELINA	30017	BEULAH WSC	618	206	0.418	0.035	0.04	57
ANGELINA	30006	WALNUT RIDGE ESTATES WATER SYSTEM	195	65	0.058	0.005	0.009	26
ANGELINA	30053	TX AIRSTREAM HARBOR INC WATER CO	216	72	0.078	0.003	0.02	14
		SUBTOTAL REPORTED	12433	3882	4.992	0.925	1.484	74
		Per Capita Usage (GPCD)	74					
ANGELINA	30007	PLEASURE POINT WSC	216	43	0.038	*0.016*	0.009	
ANGELINA	30015	FORT STANELY AREA WATER UTILITY	216	72	0.097	*0.016*	0.021	
ANGELINA	30036	KERVINS RV PARK	111	37	0.012	*0.008*	0	
ANGELINA	30042	LAKEVIEW RV PARK	150	50	0.007	*0.011*	0.005	
ANGELINA	30091	USCOE HANKS CREEK PARK	58	47	0.043	*0.004*	0	
ANGELINA	30092	CASSELS BOYKIN COUNTY PARK	25	20	0.032	*0.002*	0	
ANGELINA	30095	PINE OAKS OASIS	111	37	0.094	*0.008*	0	
ANGELINA	30099	MATTIES PLACE	36	12	0.022	*0.003*	0	
ANGELINA	30100	SUN N FUN ASSOCIATION	25	32	0	*0.002*	0	
ANGELINA	30103	USFS ZAVALLA WORK CENTER	38	1	0.019	*0.003*	0.017	
		SUBTOTAL PROJECTED	13419	4233	5.356	0.998	1.536	
		Water Demand (Acre-ft/yr)	1118					

County Other Entities

Cherokee County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
CHEROKEE	370015	ALTO RURAL WSC COLD SPRINGS PLANT	1878	626	0.724	0.21	0.187	112
CHEROKEE	370014	AFTON GROVE WSC	1158	386	0	0.129	0.156	111
CHEROKEE	370021	GUM CREEK WSC	1269	423	0	0.128	0.15	101
CHEROKEE	370031	RUSK RURAL WSC CROCKETT ST PLANT	1383	461	0.252	0.127	0.164	92
CHEROKEE	370029	BLACKJACK WSC	825	275	0.373	0.121	0.08	147
CHEROKEE	370036	WEST JACKSONVILLE WATER SUPPLY	1524	508	0.691	0.109	0.18	72
CHEROKEE	370033	STRYKER LAKE WSC	816	272	0.245	0.098	0.056	120
CHEROKEE	370037	RUSK STATE HOSPITAL	785	71	0.806	0.081	0.8	103
CHEROKEE	370017	DIALVILLE OAKLAND WSC	825	275	0.274	0.059	0.04	72
CHEROKEE	370020	GALLATIN WSC	876	292	1.141	0.052	0.093	59
CHEROKEE	370039	REKLAW WSC	576	192	0.266	0.049	0.073	85
CHEROKEE	370024	MAYDELLE WSC	711	237	0.245	0.048	0.159	68
CHEROKEE	370052	EAGLES BLUFF	171	57	0.432	0.042	0.03	246
CHEROKEE	370019	FOREST WSC	501	167	0.158	0.031	0.052	62
CHEROKEE	370022	IRON HILL WSC	375	125	0	0.024	0.064	64
CHEROKEE	370027	NEW CONCORD WSC	333	111	0.14	0.024	0.02	72
CHEROKEE	370051	CUNEY RURAL WATER SUPPLY	234	78	0.14	0.021	0.088	90
CHEROKEE	370040	MOUNTAIN VIEW CAMP	220	26	0.288	0.009	0	41
CHEROKEE	370043	BROADWAY MOBILE HOME PARK	22	17	0.079	0.003	0	136
		SUBTOTAL PROJECTED	14482	4599	6.254	1.365	2.392	
		Per Capita Usage (GPCD)	94					
		Water Demand (Acre-ft/yr)	1529					

County Other Entities

Hardin County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
HARDIN	1000016	HARDIN COUNTY WCID 1	1185	409	1.209	0.177	0.149	149
HARDIN	1000018	WILDWOOD RESORT CITY	1377	597	1.432	0.117	0.167	85
HARDIN	1000061	COUNTRYWOOD WATER SYSTEM	417	139	0.171	0.029	0.04	70
HARDIN	1000037	ENCHANTED FOREST	312	103	0.154	0.027	0.021	87
HARDIN	1000053	BIG THICKET RETREAT WATER SYSTEM	102	34	0.058	0.009	0	88
HARDIN	1000030	QUAIL VALLEY ESTATES MOBILE HOME	210	70	0.216	0.007	0	33
HARDIN	1000065	DAIRYLAND HEIGHTS WATER SYSTEM	120	41	0.116	0.006	0	50
HARDIN	1000069	BREAKAWAY TRAILS SUBDIVISION	114	38	0.136	0.006	0	53
HARDIN	1000071	LITTLE BIG HORN SERVICES	81	27	0.041	0.006	0	74
HARDIN	1000038	WHISPERING PINES SUBDIVISION	60	20	0.056	0.004	0	67
HARDIN	1000067	BULLOCKS MOBILE HOME PARK	50	33	0.115	0.003	0	60
		SUBTOTAL REPORTED	4028	1511	3.704	0.391	0.377	97
		Per Capita Usage (GPCD)	97					
HARDIN	1000056	JONES TRAILER PARK	84	28	0.204	*0.008*	0	
HARDIN	1000060	NORTHWOODS SUBDIVISION	117	39	0.08	*0.011*	0	
HARDIN	1000062	NEW FOREST ESTATES WATER SYSTEM	63	21	0.115	*0.006*	0	
HARDIN	1000070	RANCHLAND	51	17	0.835	*0.005*	0	
HARDIN	1000072	BIG THICKET NATURE TRAIL	25	5	0.02	*0.002*	0	
HARDIN	1000073	EARLY CHILDHOOD DEVELOPMENT CENTER	60	1	0.115	*0.006*	0	
		SUBTOTAL PROJECTED	4428	1622	5.073	0.430	0.377	
		Water Demand (Acre-ft/yr)	482					

County Other Entities

Henderson County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
HENDERSON	1070071	THREE COMMUNITY WSC	768	256	0.422	0.25	0.084	326
HENDERSON	1070016	CRESENT HEIGHTS WSC	1812	604	0.677	0.176	0.344	97
HENDERSON	1070025	LEAGUEVILLE WSC	2236	746	0.838	0.143	0.143	64
HENDERSON	1070198	LAKE PALESTINE WATER CO	1581	527	0.568	0.108	0.126	68
HENDERSON	1070124	HIGHSAW	1740	580	0.364	0.106	0.092	61
HENDERSON	1070055	MOORE STATION WSC	1758	586	0.229	0.081	0.222	46
HENDERSON	1070211	PHOENIX WATER WORKS	780	260	0.301	0.068	0.152	87
HENDERSON	1070032	UNION HILL WSC	456	152	0.187	0.065	0.064	143
HENDERSON	1070234	POYNOR COMMUNITY WSC	720	240	0.266	0.059	0.12	82
HENDERSON	1070074	CARRIZO WATER CORP FOREST GROVE	837	279	0.363	0.054	0.126	65
HENDERSON	1070085	WESTWOOD BEACH	1122	374	0.559	0.053	0.162	47
HENDERSON	1070162	PARTICIPATION DEVELOPMENT OF TEXAS PINNACLE CLUB	555	188	0.16	0.034	0.091	61
HENDERSON	1070228	CRS WSC	342	114	0.098	0.033	0.044	96
HENDERSON	1070174	PARKSIDE SHORES WATER SYSTEM	444	148	0.225	0.024	0.065	54
HENDERSON	1070176	CAPE TRANQUILITY SYSTEM	189	63	0.101	0.016	0.015	85
HENDERSON	1070059	LAKE UTILITY CO	318	106	0.108	0.015	0.044	47
HENDERSON	1070039	LOLLIPOP WATER WORKS INC	234	78	0.156	0.013	0.046	56
HENDERSON	1070151	POINT ROYAL WATER SYSTEM	171	57	0.072	0.012	0.023	70
HENDERSON	1070165	MICHAELS COVE WATER SUPPLY	186	63	0.075	0.011	0.015	59
HENDERSON	1070194	CHRISTIAN YOUTH FOUNDATION MAIN	250	14	0.072	0.01	0.026	40
HENDERSON	1070155	FLAT CREEK COVE PROPERTY OWNERS ASSOCIATION	129	43	0.058	0.006	0.009	47
HENDERSON	1070222	TPWD PURTIS CREEK STATE PARK	25	82	0.088	0.005	0.025	200
HENDERSON	1070197	LAKE PALESTINE CAMPGROUND	234	78	0.021	0.003	0.001	13
		SUBTOTAL REPORTED	16887	5638	6.008	1.345	2.039	80
		Per Capita Usage (GPCD)	80					
HENDERSON	1070199	LA POYNOR ISD	550	48	0.086	*0.044*	0	
HENDERSON	1070024	TWIN OAKS MHP	75	25	0.101	*0.006*	0	
HENDERSON	1070009	LAKEWOOD WATER EAST	276	92	0.23	*0.022*	0.03	
HENDERSON	1070196	CAMP LONE STAR	200	20	0.072	*0.016*	0	
		SUBTOTAL PROJECTED	17988	5823	6.497	1.433	2.069	
		Water Demand (Acre-ft/yr)	1605					

County Other Entities

Houston County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
HOUSTON	1130011	CITY OF KENARD	534	178	0.327	0.081	0.066	
HOUSTON	1130020	RATCLIFF WSC	342	114	0.17	0.028	0.044	
		SUBTOTAL REPORTED	876	292	0.497	0.109	0.11	
		Per Capita Usage (GPCD)	124					
HOUSTON	1130021	RATCLIFF RECREATION AREA USFS	250	11	0.025	*0.031*	0.005	
HOUSTON	1130022	RATCLIFF RECREATIONAL DOGWOOD LOOP	250	26	0.027	*0.031*	0.01	
		SUBTOTAL PROJECTED	1376	329	0.549	0.171	0.125	
		Water Demand (Acre-ft/yr)	192					

County Other Entities

Jasper County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
JASPER	1210014	RAYBURN COUNTY MUD	2055	685	0.95	0.27	0.483	131
JASPER	1210060	UPPER JASPER COUNTY WATER AUTHORITY 1	2358	786	0.619	0.167	0.395	71
JASPER	1210015	RURAL WSC	1320	440	0.605	0.098	0.94	74
JASPER	1210004	HOLLY HUFF WSC	744	248	0.331	0.089	0.098	120
JASPER	1210016	SOUTH KIRBYVILLE RURAL WSC	927	309	0.549	0.075	0.116	81
JASPER	1210063	SOUTH JASPER WSC	1119	373	0.266	0.064	0.146	57
JASPER	1210011	EVADALE WATER SYSTEM	705	239	0.824	0.062	0.096	88
JASPER	1210064	UPPER JASPER COUNTY WATER AUTHORITY 2	624	208	0.497	0.046	0.162	74
JASPER	1210048	CITY OF BROWNDELL	330	110	0.314	0.044	0.04	133
JASPER	1210013	HARRISBURG WSC	156	52	0.05	0.021	0.015	135
JASPER	1210007	WESTWOOD WSC	447	149	0.122	0.02	0.042	45
JASPER	1210012	FOREST HILLS WATER SUPPLY	390	130	0.152	0.017	0.021	44
JASPER	1210054	TPWD MARTIN DIES STATE PARK HEN HOUSE	381	127	0.086	0.005	0.02	13
JASPER	1210049	MULBERRY WATER SUPPLY	99	33	0.072	0.005	0.01	51
JASPER	1210055	TPWD MARTIN DIES STATE PARK WALNUT RIDGE	327	109	0.072	0.004	0.02	12
JASPER	1210040	USCOE SANDY CREEK PARK 1	80	64	0.104	0.003	0	38
JASPER	1210056	EVADALE ISD	561	2	0.19	0.002	0	4
JASPER	1210062	LEOFFLER SPRINGS	25	1	0.081	0.001	0.053	40
		SUBTOTAL REPORTED	12648	4065	5.884	0.993	2.657	79
		Per Capita Usage (GPCD)	79					
JASPER	1210019	COUGAR COUNTRY WATER SYSTEM	270	90	0.192	*0.021*	0.024	
		SUBTOTAL PROJECTED	12918	4155	6.076	1.014	2.681	
		Water Demand (Acre-ft/yr)	1136					

County Other Entities

Jefferson County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
JEFFERSON	1230086	NORTHWEST FOREST MUD	642	214	0.123	0.045	0	70
JEFFERSON	1230025	HAMSHIRE COMMUNITY WSC	207	69	0.202	0.015	0.02	72
JEFFERSON	1230020	CARDINAL MEADOWS IMPROVEMENT DISTRICT	159	56	0	0.011	0	69
JEFFERSON	1230052	TPWD SEA RIM STATE PARK	25	31	0	0.004	0.022	160
JEFFERSON	1230072	HAMSHIRE FANNETT ISD	680	14	0.207	0.003	0	4
		SUBTOTAL REPORTED	1713	384	0.532	0.078	0.042	46
		Per Capita Usage (GPCD)	46					
JEFFERSON	1230083	SUNCHASE SUBDIVISION	120	40	0.112	*0.005*	0	
JEFFERSON	1230074	MOORE WATER SYSTEM	102	34	0.05	*0.005*	0	
JEFFERSON	1230037	COUNTRY SIDE ESTATES	1452	484	0	*0.066*	0	
		SUBTOTAL PROJECTED	3387	942	0.694	0.154	0.042	
		Water Demand (Acre-ft/yr)	173					

County Other Entities

Nacogdoches County

County	PWS ID	PWS Name	Population Served	Number Of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
NACOGDOCHES	1740006	MELROSE WSC	2988	996	1.364	0.435		146
NACOGDOCHES	1740010	D & M WSC	4584	1528	1.355	0.434	0.225	95
NACOGDOCHES	1740020	WODEN WSC	2035	814	1.567	0.233	0.364	114
NACOGDOCHES	1740007	CARO WSC	2364	788	0.588	0.218	0.442	92
NACOGDOCHES	1740013	LILBERT LOONEYVILLE WSC	516	172	0.273	0.059	0.05	114
NACOGDOCHES	1740012	LIBBY WSC	525	175	0.397	0.056	0.27	107
NACOGDOCHES	1740018	SACUL WSC	516	172	0.228	0.046	0.06	89
NACOGDOCHES	1740029	NACOGDOCHES COUNTY MUD 1	123	64	0	0.018	0	146
		SUBTOTAL REPORTED	13651	4709	5.772	1.499	1.411	110
		Per Capita Usage (GPCD)	110					
NACOGDOCHES	1740011	ETOILE WSC	2562	854	1.08	*0.281*	0.843	
NACOGDOCHES	1740033	UNION SPRINGS WATER CO.	25	1	0.017	*0.003*	0	
		SUBTOTAL PROJECTED	16238	5564	6.869	1.783	2.254	
		Water Demand (Acre-ft/yr)	1997					

County Other Entities

Newton County

County	PWS ID	PWS Name	Population Served	Number Of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
NEWTON	1760022	SOUTH NEWTON WSC	3984	1328	1.339	0.27	0.347	68
NEWTON	1760008	BON WIER WSC	602	201	0.305	0.075	0.052	125
NEWTON	1760002	TOLEDO VILLAGE WSC	1500	500	0.278	0.064	0.084	43
NEWTON	1760003	BURKEVILLE WSC	942	314	0.373	0.062	0.08	66
NEWTON	1760023	JAMESTOWN WSC	558	186	0.266	0.05	0.079	90
NEWTON	1760015	TALL TIMBERS WSC	258	86	0.076	0.013	0.028	50
NEWTON	1760010	CAMP RED OAK SPRINGS	90	9	0.034	0.001	0.003	11
		SUBTOTAL REPORTED	7934	2624	2.671	0.535	0.673	67
		Per Capita Usage (GPCD)	67					
NEWTON	1760004	EAST NEWTON WSC	384	12	0.118	*0.026*	0.03	
NEWTON	1760011	EAST TEXAS BAPTIST ENCAMPMENT	125	41	0.09	*0.008*	0.022	
NEWTON	1760018	CAMP OTANYA	40	10	0.064	*0.003*	0	
NEWTON	1760024	ARTESIAN SPRINGS	300	66	0	*0.020*	0	
		SUBTOTAL PROJECTED	8783	2753	2.943	0.592	0.725	
		Water Demand (Acre-ft/yr)	663					

County Other Entities

Orange County

County	PWS ID	PWS Name	Population Served	Number Of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
ORANGE	1810186	ORANGEFIELD WSC	3897	1299	2.6	0.3	0.4	77
ORANGE	1810059	KINARD ESTATES	285	95	0.137	0.154	0.032	540
ORANGE	1810140	CYPRESS BAYOU WATER & SEWER INC	834	278	0.359	0.079	0.084	95
ORANGE	1810060	COUNTRY SQUIRE WATER & SEWER INC	714	238	0.489	0.073	0.084	102
ORANGE	1810154	CHASE HOLLOW WATER SYSTEM	687	229	0.328	0.035	0.065	51
ORANGE	1810117	EVERGREEN PARK HICKORY HILLS WATER SYSTEM	480	160	0.288	0.035	0.031	73
ORANGE	1810015	LONGFORD PLACE WATER SYSTEM	279	93	0.095	0.032	0.042	115
ORANGE	1810015	LONGFORD PLACE WATER SYSTEM	279	93	0.095	0.032	0.042	115
ORANGE	1810175	WATERWOOD ESTATES	177	59	0.252	0.024	0.05	136
ORANGE	1810057	ORANGEFIELD ISD HI	1846	17	0.282	0.021	0	11
ORANGE	1810123	CORBETT WATER SYSTEM 1	87	29	0.073	0.012	0	138
ORANGE	1810177	SUNRISE EAST APARTMENTS	132	44	0.065	0.009	0	68
ORANGE	1810007	LANXESS CORPORATION	300	1	7.2	0.006	0.005	20
ORANGE	1810150	YEAGER ESTATES ADDITION	60	20	0.079	0.006	0	100
ORANGE	1810125	RIVER BEND WATER SYSTEM	54	18	0.089	0.006	0	111
ORANGE	1810077	MOBILE ESTATES MOBILE HOME PARK	56	33	0.063	0.005	0	89
ORANGE	1810170	TIMER WATER SYSTEM	33	11	0.072	0.003	0	91
ORANGE	1810039	OAK LEAF CAMPGROUND 1	210	70	0.14	0.003	0	14
ORANGE	1810065	OAK LEAF CAMPGROUND 3	35	27	0.02	0.001	0	29
ORANGE	1810148	TXDOT COMFORT STATION IH 10 NORTH	600	1	0.087	0.001	0	2
		SUBTOTAL REPORTED	11045	2815	12.813	0.837	0.835	76
		Per Capita Usage (GPCD)	76					
ORANGE	1810008	CISD HIGH SCHOOL	1275	5	0.648	*0.097*	0	
ORANGE	1810010	ORANGEFIELD WATER WORKS 1	189	1	0.08	*0.014*	0	
ORANGE	1810103	SUGAR PINES MHP	156	52	0.118	*0.012*	0.018	
ORANGE	1810083	SUSAN CIRCLE COMMUNITY WS	51	17	0.043	*0.004*	0	
ORANGE	1810062	RANCHETTE ESTATES	75	25	0.075	*0.006*	0	
ORANGE	1810076	HI HO ACRES SUBDIVISION	258	86	0.176	*0.020*	0.022	
ORANGE	1810034	SAWMILL ADDITION	72	24	0.092	*0.005*	0	
ORANGE	1810061	IWANDA MOBILE HOME PARK	83	29	0.105	*0.006*	0	
ORANGE	1810018	CHERRY HILL SUBDIVISION	66	22	0.059	*0.005*	0	
ORANGE	1810023	HOUSEMAN PARK	78	26	0.072	*0.006*	0	
ORANGE	1810025	LAKEVIEW ESTATES	84	28	0.095	*0.006*	0	
ORANGE	1810178	CAPRI AND GALL STREETS	66	22	0.032	*0.005*	0	
ORANGE	1810179	OAK ACRES MOBILE HOME PARK	90	30	0.043	*0.007*	0	
ORANGE	1810143	CLAIRE STREET WATER SYSTEM	93	31	0.102	*0.007*	0	
ORANGE	1810127	PARKVIEW WATER SUPPLY	84	28	0.27	*0.006*	0.021	
		SUBTOTAL PROJECTED	13765	3241.000	14.823	1.043	0.896	
		Water Demand (Acre-ft/yr)	1169					

County Other Entities

Panola County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
PANOLA	1830011	PANOLA BETHANY WSC	1623	541	0.829	0.201	0.215	124
PANOLA	1830009	HOLLANDS QUARTER WSC	1164	388	0.094	0.089	0.307	76
PANOLA	1830006	DEBERRY WSC	666	222	0.369	0.089	0.168	134
PANOLA	1830014	ROCK HILL WSC	969	288	0.158	0.084	0.138	87
PANOLA	1830025	DEADWOOD WSC	915	305	0.325	0.084	0.325	92
PANOLA	1830029	CLAYTON WSC PLANT 2	816	272	0.1	0.076	0.021	93
PANOLA	1830012	REHOBETH WSC	975	325	0	0.065	0.111	67
PANOLA	1830019	RIDERVILLE WSC	744	248	0	0.06	0.04	81
PANOLA	1830008	GARY WSC	846	282	0.18	0.057	0.05	67
PANOLA	1830007	FAIRPLAY WSC	666	222	0.37	0.052	0.128	78
PANOLA	1830017	A & P WSC PUMP 1	570	190	0.081	0.035	0.065	61
PANOLA	1830027	SOUTH MURVAUL WSC	534	178	0.72	0.025	0.138	47
PANOLA	1830010	MURVAUL WSC	711	237	0.239	0.023	0.061	32
PANOLA	1830030	CLAYTON WSC PLANT3	306	102	0.144	0.02	0.032	65
PANOLA	1830005	CLAYTON WSC PLANT 1	132	44	0.034	0.01	0.031	76
		SUBTOTAL REPORTED	11637	3844	3.643	0.97	1.83	83
		Per Capita Usage (GPCD)	83					
PANOLA	1830018	DANIEL SPRINGS BAPTIST CAMP	320	36	0.086	*0.027*	0.065	
PANOLA	1830020	PIRTLE SCOUT RESERVATION WATER SYSTEM	330	33	0.072	*0.028*	0.002	
		SUBTOTAL PROJECTED	12287	3913	3.801	1.024	1.897	
		Water Demand (Acre-ft/yr)	1147					

County Other Entities

Polk County

County	PWS ID	PWS Name	Population Served	Number Of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
POLK	1870089	DAMASCUS STRYKER WATER SUPPLY	2500	471	0.963	0.142	0.17	
POLK	1870125	MOSCOW WSC 2	405	147	0.393	0.026	0.035	
POLK	1870004	WOODS CREEK WSC	282	94	0.108	0.019	0.015	
		SUBTOTAL REPORTED	3187	712	1.464	0.187	0.22	
		Per Capita Usage (GPCD)	59					
POLK	1870126	DALLARDSVILLE SEGNO WSC	501	225	0.158	*0.029*	0.04	
		SUBTOTAL PROJECTED	3688	937	1.622	0.216	0.26	
		Water Demand (Acre-ft/yr)	242					

County Other Entities

Rusk County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
RUSK	2010050	CHALK HILL SUD	2706	1057	1.19	0.201	0.433	74
RUSK	2010011	CROSS ROADS WSC	3003	1001	0.328	0.187	0.174	62
RUSK	2010015	GASTON WSC	1650	550	0.547	0.138	0.135	84
RUSK	2010005	MINDEN BRACHFIELD WSC	1773	591	0.478	0.128	0.152	72
RUSK	2010039	SOUTH RUSK COUNTY WSC	1614	538	0.634	0.123	0.136	76
RUSK	2010016	GOODSPRINGS WSC PLANTS A & B	1830	610	0.379	0.117	0.072	64
RUSK	2010025	NEW PROSPECT WSC PLANT 1	636	212	0.418	0.095	0.075	149
RUSK	2010017	JACOBS WSC PLANTS 1 & 2	816	272	0.261	0.089	0.06	109
RUSK	2010004	ARLAM CONCORD WSC	1050	350	0.318	0.079	0.084	75
RUSK	2010014	EBENEZER WSC	786	262	0.36	0.079	0.153	101
RUSK	2010012	CRYSTAL FARMS WSC	822	274	0.389	0.067	0.06	82
RUSK	2010031	PRICE WSC	735	245	0.307	0.06	0.1	82
RUSK	2010036	LEVERETTS CHAPEL WSC	510	170	0.288	0.058	0.055	114
RUSK	2010030	PLEASANT HILL WSC	675	225	0.305	0.046	0.055	68
RUSK	2010049	SOUTH RUSK COUNTY WSC COMPTON MCKNIGHT	531	177	0.194	0.046	0.035	87
RUSK	2010008	CHURCH HILL WSC	387	129	0.094	0.036	0.022	93
RUSK	2010007	PINE HILL CHAPMAN WSC	495	165	0.374	0.028	0.042	57
RUSK	2010058	CROSS ROADS WSC GREENWOOD RANCH ME	261	87	0.035	0.027	0	103
RUSK	2010042	SHAN D WATER SUPPLY	195	65	0.065	0.018	0.017	92
RUSK	2010020	LANEVILLE WSC PLANT 1	225	75	0.098	0.016	0.06	71
RUSK	2010028	OAKLAND WSC	198	66	0.088	0.015	0.02	76
RUSK	2010010	CRIMS CHAPEL WSC PLANT NO 1	114	38	0.059	0.014	0.044	123
RUSK	2010052	TPWD MARTIN CREEK STATE PARK	900	101	0.072	0.006	0.06	7
RUSK	2010055	KENNEDY ROAD WSC	100	30	0	0.005	0	50
RUSK	2010013	DIRGIN WSC	75	25	0.086	0.001	0.013	13
		SUBTOTAL PROJECTED	22087	7315	7.367	1.679	2.057	
		Per Capita Usage (GPCD)	76					
		Water Demand (Acre-ft/yr)	1881					

County Other Entities

Sabine County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
SABINE	2020070	SOUTH SABINE WSC	2637	879	1.008	0.141	0.2	53
SABINE	2020014	BEECHWOOD WSC	1131	443	0.096	0.058	0.295	51
SABINE	2020004	BROOKELAND WATER SUPPLY	744	203	0.153	0.056	0.063	75
SABINE	2020020	PENDLETON UTILITY CORP.	552	184	0.508	0.041	0.038	74
SABINE	2020028	FRONTIER PARK MARINA	360	120	0.092	0.013	0.022	36
SABINE	2020013	EL CAMINO BAY WATER SYSTEM	363	121	0.102	0.01	0.025	28
SABINE	2020050	SHAWNEE SHORES	246	106	0.099	0.007	0.021	28
SABINE	2020054	TIMBERLANE WATER SYSTEM INC	120	48	0.03	0.003	0.02	25
SABINE	2020055	TIMBERLANE ESTATES PROPERTY OWNERS ASSOCIATION	45	30	0.034	0.002	0.008	44
		SUBTOTAL REPORTED	6198	2134	2.122	0.331	0.692	53
		Per Capita Usage (GPCD)	53					
SABINE	2020018	USFS INDIAN MOUND RECREATION AREA	25	7	0.389	*0.001*	0.033	
SABINE	2020057	USFS LAKEVIEW RECREATION AREA	10	2	0.035	*0.001*	0	
SABINE	2020027	MID LAKE KAMPGROUND	50	126	0.144	*0.003*	0.025	
		SUBTOTAL PROJECTED	6283	2269	2.69	0.336	0.75	
		Water Demand (Acre-ft/yr)	376					

County Other Entities

San Augustine County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
SAN AUGUSTINE	2030007	SAN AUGUSTINE RURAL WSC	1305	435	0	0.118	0.086	90
SAN AUGUSTINE	2030004	DENNING WSC	750	253	0.266	0.106	0.075	141
SAN AUGUSTINE	2030002	BLAND LAKE RURAL WSC	507	169	0.202	0.047	0.064	93
SAN AUGUSTINE	2030003	CITY OF BROADDUS	537	179	0.295	0.047	0.08	88
SAN AUGUSTINE	2030023	POWELL POINT WATER SYSTEM	456	152	0.094	0.021	0.063	46
SAN AUGUSTINE	2030011	PARKWAY WATER SYSTEM	447	149	0.252	0.016	0.042	36
SAN AUGUSTINE	2030010	ANTHONY HARBOR SUBDIVISION	156	52	0.094	0.005	0.013	32
SAN AUGUSTINE	2030005	HICKORY HOLLOW WATER SYSTEM	132	44	0.035	0.005	0.034	38
SAN AUGUSTINE	2030032	GLEN OAKS WATER SYSTEM	138	46	0.03	0.004	0.021	29
SAN AUGUSTINE	2030014	SUTTON HILLS ESTATES	28	18	0.043	0.001	0.005	36
SAN AUGUSTINE	2030006	LAKEWOOD WATER SYSTEM	93	31	0.032	0.001	0.011	11
		SUBTOTAL REPORTED	4549	1528	1.343	0.371	0.494	82
		Per Capita Usage (GPCD)	82					
SAN AUGUSTINE	2030013	EL PINON ESTATES WATER SYSTEM	141	47	0.023	*0.011*	0	
SAN AUGUSTINE	2030015	LA PLAYA SUBDIVISION WATER SYSTEM	33	11	0.022	*0.003*	0.005	
		SUBTOTAL PROJECTED	4723	1586	1.388	0.385	0.499	
		Water Demand (Acre-ft/yr)	431					

County Other Entities

Shelby County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
SHELBY	2100019	CITY OF HUXLEY	2256	752	0.864	0.217	0.47	96
SHELBY	2100011	MCCLELLAND WSC	1365	546	0.388	0.19	0.194	139
SHELBY	2100015	TIMPSON RURAL WSC	1818	606	0.734	0.162	0.085	89
SHELBY	2100013	SAND HILLS WSC	1308	436	0.13	0.156	0.294	119
SHELBY	2100014	SHELBYVILLE WSC	927	309	0.266	0.151	0.078	163
SHELBY	2100008	FIVE WAY WSC	1371	457	0.495	0.15	0.2	109
SHELBY	2100005	CHOICE WSC	815	326	0.672	0.117	0.178	144
SHELBY	2100007	FLAT FORK WSC	879	293	0.338	0.097	0.088	110
SHELBY	2100006	EAST LAMAR WSC	715	286	0.31	0.081	0.07	113
SHELBY	2100012	PAXTON WSC	714	238	0.348	0.063	0.06	88
SHELBY	2100031	PAXTON WSC JACKSON PLANT	711	237	0.207	0.054	0.05	76
SHELBY	2100032	BUENA VISTA WSC	672	224	0.23	0.054	0.101	80
SHELBY	2100009	HUBER WSC	405	135	0.158	0.042	0.045	104
SHELBY	2100017	TENNESSEE WSC	417	139	0.305	0.03	0.06	72
SHELBY	2100034	HASLAM COMMUNITY	351	117	0	0.025	0	71
SHELBY	2100018	ON SITE WATER WORKS	75	25	0.067	0.012	0	160
		SUBTOTAL REPORTED	14799	5126	5.512	1.601	1.973	108
		Per Capita Usage (GPCD)	108					
SHELBY	2100035	ROLLING HILLS SUBDIVISION	93	31	0	*0.010*	0	
		SUBTOTAL PROJECTED	14892	5157	5.512	1.611	1.973	
		Water Demand (Acre-ft/yr)	1805					

County Other Entities

Smith County

County	PWS ID	PWS Name	Population Served	Number of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
SMITH	2120024	WALNUT GROVE WSC	6339	2113	2.14	0.54	0.77	85
SMITH	2120099	WRIGHT CITY WSC 2	1572	524	0.598	0.142	0.126	90
SMITH	2120037	BIG EDDY INC	1650	550	0.598	0.121	0.184	73
SMITH	2120027	WRIGHT CITY WSC 1	1140	380	0.379	0.078	0.084	68
SMITH	2120064	LAKEWAY HARBOR	1086	362	0.288	0.063	0.084	58
SMITH	2120008	COMMUNITY WATER CO MONTGOMERY GARDEN	783	261	0.23	0.057	0.123	73
SMITH	2120035	PINE TRAIL SHORES	810	270	0.482	0.055	0.084	68
SMITH	2120007	CARROLL WSC WELL 3	456	152	0.317	0.049	0.03	107
SMITH	2120034	MOUNT SYLVAN WATER SYSTEM	510	170	0.23	0.04	0.042	78
SMITH	2120097	EAST LAKE WOODS	243	81	0.096	0.023	0.044	95
SMITH	2120081	GARDEN VALLEY RESORT INC	90	29	0.144	0.019	0	211
SMITH	2120070	PINE COVE CONFERENCE CENTER	220	40	0.072	0.017	0.014	77
SMITH	2120090	PINE COVE RANCH CAMP	490	10	0.043	0.013	0.03	27
SMITH	2120062	SOUTHPARK MOBILE HOME ESTATES	246	82	0.05	0.011	0.02	45
SMITH	2120071	PINE COVE TOWERS CAMP	120	20	0.043	0.009	0.006	75
		SUBTOTAL PROJECTED	15755	5044	5.71	1.237	1.641	
		Per Capita Usage (GPCD)	79					
		Water Demand (Acre-ft/yr)	1386					

County Other Entities

Trinity County

County	PWS ID	PWS Name	Population Served	Number Of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
TRINITY	2280009	PENNINGTON WSC	2550	850	1.46	0.221	0.316	87
TRINITY	2280005	CENTERVILLE WSC	1200	400	0.428	0.082	0.08	68
TRINITY	2280010	WOODLAKE JOSSERAND WSC	732	244	0.298	0.053	0.093	72
TRINITY	2280006	NOGALUS CENTRALIA WSC	660	220	0.132	0.038	0.055	58
		SUBTOTAL REPORTED	5142	1714	2.318	0.394	0.544	77
		Per Capita Usage (GPCD)	77					
TRINITY	2280036	NIGTON WAKEFIELD WSC	25	10	0	*0.002*	0	
		SUBTOTAL PROJECTED	5167	1724	2.318	0.396	0.544	
		Water Demand (Acre-ft/yr)	444					

County Other Entities

Tyler County

County	PWS ID	PWS Name	Population Served	Number Of Connections	Total Production (MGD)	Avg Daily Usage (MGD)	Total Storage (MG)	GPCD
TYLER	2290002	CHESTER WSC	1323	441	0.612	0.133	0.171	101
TYLER	2290011	SENECA WSC	1083	361	0.5	0.126	0.18	116
TYLER	2290007	CYPRESS CREEK WSC	735	245	0.367	0.087	0.07	118
TYLER	2290010	IVANHOE LAND OF LAKES	2202	731	0.628	0.068	0.187	31
TYLER	2290012	WHITE TAIL RIDGE LAKE ESTATES	363	121	0.213	0.038	0.024	105
TYLER	2290004	DOUCETTE WATER SYSTEM	426	142	0.177	0.035	0.022	82
TYLER	2290015	BARLOW LAKE ESTATES	198	66	0.105	0.018	0	91
TYLER	2290014	WAYWARD WINDS OASIS LL	87	29	0.075	0.01	0	115
TYLER	2290042	LAKESIDE WATER SUPPLY 5	117	39	0.046	0.005	0	43
TYLER	2290027	MONT NECHES LAKE ESTATES	78	26	0.072	0.005	0	64
TYLER	2290021	LAKESIDE WATER SUPPLY 1	111	37	0.04	0.003	0	27
TYLER	2290039	LAKESIDE WATER SUPPLY 2	99	33	0.04	0.003	0	30
TYLER	2290041	LAKESIDE WATER SUPPLY 4	99	33	0.04	0.003	0	30
TYLER	2290043	TOWN BLUFF WATER SYSTEM	48	16	0.05	0.003	0	63
TYLER	2290040	LAKESIDE WATER SUPPLY 3	90	30	0.035	0.002	0	22
TYLER	2290032	USCOE MAGNOLIA RIDGE PARK	85	48	0.069	0.001	0	12
		SUBTOTAL REPORTED	7144	2398	3.069	0.540	0.654	76
		Per Capita Usage (GPCD)	76					
TYLER	2290024	TPWD MARTIN DIES PARK CHEROKEE UNIT	25	6	0.017	*0.002*	0	
TYLER	2290038	WINDMILL MOBILE HOME ESTATES	60	20	0.072	*0.005*	0	
		SUBTOTAL PROJECTED	7229	2424	3.158	0.546	0.654	
		Water Demand (Acre-ft/yr)	612					

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
ANDERSON	10003	LAKEVIEW METHODIST CONF. CENTER	400 PRIVATE ROAD 6036 PALESTINE, TX 75801	VON DAWSON	CARRIZO WILCOX	G
ANDERSON	10007	DOGWOOD SPRINGS WSC #1	DOGWOOD SPRINGS WSC PO BOX 608 FRANKSTON, TX 75763	JERRY SCHMUTZ	CARRIZO	G
ANDERSON	10008	EDGEWATER SHORES WATER SUPPLY	RR 2 BOX 262 FRANKSTON, TX 75763	V HUMPHREYS	CARRIZO WILCOX	G
ANDERSON	10015	BBS WSC	BBS WSC RR 1 BOX 60C MONTALBA, TX 75853	ROBERT FITZGERALD	WILCOX	G
ANDERSON	10018	BCY WSC	BCY WSC PO BOX 7 TENNESSEE COLONY, TX 75861	GRADY HENRY	BETHEL WILCOX	G
ANDERSON	10019	CAYUGA WSC	CAYUGA WSC PO BOX 338 CAYUGA, TX 75832	DAVID KELLY	WILCOX	G
ANDERSON	10021	LONE PINE WSC	LONE PINE WSC PO BOX 1616 PALESTINE, TX 75802	MARLON COOPER	WILCOX	G
ANDERSON	10023	MANTALBA WSC	10890 STATE HIGHWAY 19 MONTALBA, TX 75853	ORVILLE WILBANKS	WILCOX	G
ANDERSON	10024	NECHES WSC	PO BOX 217 NECHES, TX 75779	FRANK MORTON	TAP-LOC WILCOX	G
ANDERSON	10026	PLEASANT SPRINGS WSC	1041 AN COUNTY ROAD 2140 PALESTINE, TX 75801	BILL COPELAND	WILCOX	G
ANDERSON	10028	SLOCUM WSC	5720 E STATE HIGHWAY 294 ELKHART, TX 75839	VIRGIL SIMPSON	WILCOX	G
ANDERSON	10029	TUCKER WSC	PO BOX 593 ELKHART, TX 75839	ALFRED MAORROW	WILCOX	G
ANDERSON	10037	CAMP BETTE PEROT	PO BOX 797447 DALLAS, TX 75379	JORENE JAMESON	CARRIZO WILCOX	G
ANDERSON	10038	DOGWOOD HILLS NORTH	AQUASOURCE UTILITY INC 1421 WELLS BRANCH PRKWY STE 105 PFLUGERVILLE, TX 78660	STEVE BLACKHURST	LAKE PALESTINE	S

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
ANDERSON	10039	DOGWOOD HILLS EAST	AQUASOURCE UTILITY INC 1421 WELLS BRANK PRKWY STE 105 PFLUGERVILLE, TX 78660	STEVE BLACKHURST	NECHES RIVER	S
ANDERSON	10044	TDCJ ID BETO UNIT	TX DEPT OF CRIMINAL JUSTICE PO BOX 4011 HUNTSVILLE, TX 77342	MARTIN SMITH	WILCOX	G
ANDERSON	10046	ANDERSON COUNTY CEDAR CREEK WSC	3550 W STATE HIGHWAY 294 ELKHART, TX 75839	CHARLES MCDANIEL	WILCOX	G
ANDERSON	10047	NORWOOD WSC	PO BOX 115 PALESTINE, TX 75802	ROBERT MCCLUSKY	CARRIZO WILCOX	G
ANDERSON	10049	TDCJ ID POWLEDGE	TX DEPT CRIMINAL JUSTICE PO BOX 4011 HUNTSVILLE, TX 77342	MARTIN SMITH	CARRIZO WILCOX	G
ANDERSON	10054	LAKE IONI WATER SUPPLY	1149 AN COUNTY ROAD 186 ELKHART, TX 75839	E BISHOP	CARIZO WILCOX	G
ANDERSON	10059	DOGWOOD SPRINGS WSC PLANT 2	DOGWOOD SPRINGS WSC PO BOX 608 FRANKSTON, TX 75763	JERRY SCHMUTZ	CARRIZO	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
ANGELINA	30006	WALNUT RIDGE ESTATES WATER SYSTEM	PO BOX 427 ZAVALLA, TX 75980	LEO BIRD	YEGUA	G
ANGELINA	30007	PLEASURE POINT WSC	PLEASURE POINT HOMEOWNERS ASSO. PO BOX 163 ZAVALLA, TX 75980	MARY TIDWELL	YEGUA	G
ANGELINA	30015	FORT STANELY AREA WATER UTILITY	FOUR WAY WSC PO BOX 250 HUNTINGTIN, TX 75949	TOMMY CARSWELL	YEGUA	G
ANGELINA	30016	ANGELINA WSC	5978 FM 841 LUFKIN, TX 75901	KEITH WEATHERS	CARRIZO WILCOX	G
ANGELINA	30017	BEULAH WSC	12182 FM 58 STE 200 LUFKIN, TX 75901	OLEN BLAKE	YEGUA	G
ANGELINA	30027	PRAIRIE GROVE WSC	3436 FM 1818 DIBOLL, TX 75941	EDDIE COURTNEY	CARRZIO	G
ANGELINA	30028	REDLAND WSC	5350 US HIGHWAY 59 N LUFKIN, TX 75901	BOBBY NAPIER	CARRIZO	G
ANGELINA	30029	WOODLAWN WSC	3015 TED TROUT LUFKIN, TX 75904	CHARLES VINSON	CARRIZO WILCOX	G
ANGELINA	30031	LUFKIN STATE SCHOOL	PO BOX 1648 LUFKIN, TX 75902	FRANK BRUNSON	CARRIZO WILCOX	G
ANGELINA	30036	KERVINS RV PARK	161 ANNAS LN ZAVALLA, TX 75980	ARTHUR KERVIN	YEGUA	G
ANGELINA	30042	LAKEVIEW RV PARK	RR 2 BOX 88 ZAVALLA, TX 75980	GORDON ROGERS	YEGUA	G
ANGELINA	30053	TX AIRSTREAM HARBOR INC WATER CO	714 ANGELINA ZAVALLA, TX 75980	MONA SNYDER	YEGUA	G
ANGELINA	30091	USCOE HANKS CREEK PARK	US ARMY CORP OF ENGINEERS RR 3 BOX 486 JASPER, TX 75951	ED SHIRLEY	YEGUA	G
ANGELINA	30092	CASSELS BOYKIN COUNTY PARK	ANGELINA COUTNY PO BOX 908 LUFKIN, TX 75902	LYNN GEORGE	YEGUA	G
ANGELINA	30094	POLLOK REDTWON WSC	PO BOX 10 POLLOK, TX 75969	MARK YODER	CARRIZO	G
ANGELINA	30095	PINE OAKS OASIS	140 RED BIED ST DIBOLL, TX 75941	JOHN JONES	CARRIZO WILCOX	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
ANGELINA	30099	MATTIES PLACE	5915 STATE HIGHWAY 147 ZAVALLA, TX 75980	GREG WHEELER	CARRIZO	G
ANGELINA	30100	SUN N FUN ASSOCIATION	215 SUN DR ZAVALLA, TX 75980	CHARLES VINES	CARRIZO	G
ANGELINA	30102	ANGELINA COUNTY FWSD 1	PO BOX 387 LUFKIN, TX 75901	KELLY HOLCOMB	CARRIZO	G
ANGELINA	30103	USFS ZAVALLA WORK CENTER	US DEPT OF AGRICULTURE 701 N 1ST ST LUFKIN, TX 75901	FRED SALINAS	GULF COAST	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
CHEROKEE	370015	ALTO RURAL WSC COLD SPRINGS PLANT	ALTO RURAL WSC PO BOX 616 ALTO, TX 75925	JACK BENNETT	CARRIZO WILCOX	G
CHEROKEE	370017	DIALVILLE OAKLAND WSC	RR 4 BOX 415 RUSK, TX 75785	CHARLES PETERS	CARRIZO WILCOX	G
CHEROKEE	370020	GALLATIN WSC	PO BOX 140 GALLATIN, TX 75764	LEM DERRINGTON	CARRIZO WILCOX	G
CHEROKEE	370021	GUM CREEK WSC	PO BOX 1230 JACKSONVILLE, TX 75766	MARK TURNEY	JACKSONVILLE	S
CHEROKEE	370022	IRON HILL WSC	PO BOX 405 RUSK, TX 75785	ELMER KENNEDY	CARRIZO WILCOX	G
CHEROKEE	370024	MAYDELLE WSC	PO BOX 44 MAYDELLE, TX 75772	DENNIS EBERWEIN	CARRIZO WILCOX	G
CHEROKEE	370027	NEW CONCORD WSC	PO BOX 115 PRICE, TX 75687	JAMES GALLOWAY	CARRIZO WILCOX	G
CHEROKEE	370029	BLACKJACK WSC	RR3 PO BOX 964 TROUP, TX 75789	JOE PARSLEY	WILCOX	G
CHEROKEE	370031	RUSK RURAL WSC CROCKETT ST PLANT	RUSK RURAL WSC PO BOX 606 RUSK, TX 75785	EWELL NEWMAN	CROCKETT STREET/ CARRIZO WILCOX	G
CHEROKEE	370033	STRYKER LAKE WSC	PO BOX 156 NEW SUMMERFIELD, TX 75780	JIM ROSS	QUEEN CITY	G
CHEROKEE	370036	WEST JACKSONVILLE WATER SUPPLY	PO BOX 1245 JACKSONVILLE, TX 75766	PATRICK REAGAN	JACKSONVILLE/WILCOX CARRIZO	S/G
CHEROKEE	370037	RUSK STATE HOSPITAL	PO BOX 318 RUSK, TX 75785	KEVIN GENTRY	CARRIZO WILCOX	G
CHEROKEE	370039	REKLAW WSC	PO BOX 250 REKLAW, TX 75784	CHARLES GLENN	CARRIZO	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
CHEROKEE	370040	MOUNTAIN VIEW CAMP	THE TEXAS LATIN AMERICAN CONFERENCE OF THE INTERNATIONAL PENECOSTAL HOLINES CHURCH PO BOX 437 JACKSONVILLE, TX 75766	RONNIE SALDANA	CARRIZO WILCOX	G
CHEROKEE	370043	BROADWAY MOBILE HOME PARK	RR 1 BOX 4221 JACKSONVILLE, TX 75766	W BROADWAY	CARRIZO WILCOX	G
CHEROKEE	370051	CUNEY RURAL WATER SUPPLY	CITY OF CUNEY PO BOX 68 CUNEY, TX 75759	OSCAR BIRDOW	CARRIZO WILCOX	G
CHEROKEE	370019	FOREST WSC	PO BOX 311 WELLS, TX 75976	KATHY OLIVER	QUEEN CITY	G
CHEROKEE	370052	EAGLES BLUFF	AQUASOURCE DEVELOPMENT COMPANY 1421 WELLS BRANCH PKWY STE 105 PFLUGERVILLE, TX 78660	STEVE BLACKHURST	CARRIZO WILCOX	G
CHEROKEE	370014	AFTON GROVE WSC	PO BOX 1282 JACKSONVILLE, TX 75766	MARK BETTS	LAKE JACKSONVILLE	S

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
HARDIN	1000016	HARDIN COUNTY WCID 1	101 PINE GARDEN LN SOURLAKE, TX 77659	JACK MADDOX	GULF COAST	G
HARDIN	1000018	WILDWOOD RESORT CITY	WILDWOOD PROPERTY OWNERS ASSOCIATION PO BOX 903 VILLAGE MILLS, TX 77663	NONA SMITH	GULF COAST	G
HARDIN	1000030	QUAIL VALLEY ESTATES MOBILE HOME	QUAIL VALLEY ESTATES INC. 1930 DUBLIN VIDOR, TX 77662	STEVE JORDAN	GULF COAST	G
HARDIN	1000037	ENCHANTED FOREST	WATER NECESSITIES INC. PO BOX 62 VIDOR, TX 77670	LARRY BREWER	GULF COAST	G
HARDIN	1000038	WHISPERING PINES SUBDIVISION	WATER NECESSITIES INC. PO BOX 62 VIDOR, TX 77670	LARRY BREWER	GULF COAST	G
HARDIN	1000053	BIG THICKET RETREAT WATER SYSTEM	LAKE LIVINGSTON WATER SUPPLY & SEWER SERVICE CORPORATION PO BOX 1149 LIVINGSTON, TX 77351	JOHN GANZER	GULF COAST	G
HARDIN	1000056	JONES TRAILER PARK	BENNETT JONES TRAILER PARK PO BOX 2526 SILSBEE, TX 77656	MICHAEL JONES	GULF COAST	G
HARDIN	1000060	NORTHWOODS SUBDIVISION	T JOHNSON INDUSTRIES INC PO BOX 8009 LUMBERTON, TX 77657	TERRY JOHNSON	GULF COAST	G
HARDIN	1000061	COUNTRYWOOD WATER SYSTEM	WATER NECCESSITIES INC. PO BOX 62 VIDOR, TX 77670	LARRY BREWER	GULF COAST	G
HARDIN	1000062	NEW FOREST ESTATES WATER SYSTEM	NEW FOREST ESTATES WATER SINK G FUND PO BOX 763 MAUICEVILLE, TX 77626	RUSSELL ROBINSON	GULF COAST	G
HARDIN	1000065	DAIRYLAND HEIGHTS WATER SYSTEM	WATER NECCESSITIES INC. PO BOX 62 VIDOR, TX 77670	LARRY BREWER	GULF COAST	G
HARDIN	1000067	BULLOCKS MOBILE HOME PARK	SAME 2735 OLD SPURGER HWY SILSBEE, TX 77656	DORIS BULLOCK	GULF COAST	G

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HARDIN	1000069	BREAKAWAY TRAILS SUBDIVISION	T JOHNSON INDUSTRIES PO BOX 8009 LUMBERTON, TX 77657	TERRY JOHNSON	GULF COAST	G
HARDIN	1000070	RANCHLAND	RANCHLAND POSA INC PO BOX 1248 KOUNTZE, TX 77625	JUDY JASTER	GULF COAST	G
HARDIN	1000071	LITTLE BIG HORN SERVICES	8029 FM 92 SILSBEE, TX 77656	DOLORES LUKE	MAIN ST	G
HARDIN	1000072	BIG THICKET NATURE TRAIL	BIG THICKET MAINTENANCE FACILITY 6044 FM 420 RD KOUNTZE, TX 77625	RAYMOND MARTINEZ	GULF COAST	G
HARDIN	1000073	EARLY CHILDHOOD DEVELOPMENT CENTER	PO BOX 576 SOURLAKE, TX 77659	KIMBERLEY PELT	EP 001	G

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HENDERSON	1070165	MICHAELS COVE WATER SUPPLY	TECON WATER COMPANY LP 9511 RANCH ROAD 620 N AUSTIN, TX 78726	DAVID YOHE	WILCOX	G
HENDERSON	1070085	WESTWOOD BEACH	TECON WATER COMPANY LP 9511 RANCH ROAD 620 N AUSTIN, TX 78726	DAVID YOHE	CARRIZO WILCOX	G
HENDERSON	1070059	LAKE UTILITY CO	AQUASOURCE UTILITY INC 1421 WELLS BRANCH PKWY STE 105 PFLUGERVILLE, TX 78660	STEVE BLACKHURST	CARRIZO WILCOX	G
HENDERSON	1070234	POYNOR COMMUNITY WSC	PO BOX 228 POYNOR, TX 75782	SQUARE WALKER	CARRIZO WILCOX	G
HENDERSON	1070151	POINT ROYAL WATER SYSTEM	POINT ROYAL PROPERTY OWNERS ASSOCIATION 2250 ROYAL DR W CHANDLER, TX 75758	TONY KEATING	WILCOX	G
HENDERSON	1070155	FLAT CREEK COVE PROPERTY OWNERS ASSOCIATION	FLAT CREEK COVE ASSOCIATION INC PO BOX 331 CHANDLER, TX 75758	HERBERT WELCH	CARRIZO WILCOX	G
HENDERSON	1070211	PHOENIX WATER WORKS	AQUASOURCE UTILITY INC 1421 WELLS BRANCH PKWY STE. 105 PFLUGERVILLE, TX 78660	STEVE BLACKHURST	CARRIZO WILCOX	G
HENDERSON	1070197	LAKE PALESTINE CAMPGROUND	PO BOX 1074 FRANKSTON, TX 75763	DONALD TOLNER	CARRIZO WILCOX	N
HENDERSON	1070198	LAKE PALESTINE WATER CO	AQUASOURCE UTILITY INC 1421 WELLS BRANCH PKWY STE 105 PFLUGERVILLE, TX 78660	STEVE BLACKHURST	WILCOX	G
HENDERSON	1070199	LA POYNOR ISD	13155 US HWY 175 E LARUE, TX 75770	EUGENE BUFORD	CARRIZO WILCOX	G
HENDERSON	1070074	CARRIZO WATER CORP FOREST GROVE	2702 AN COUNTY ROAD 489 MONTALBA, TX 75853	GARY DOUGLAS	CARRIZO WILCOX	G
HENDERSON	1070071	THREE COMMUNITY WSC	18870 WYATT RD BROWNSBORO, TX 75756	BILL YOUNG	CARRIZO WILCOX	G

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HENDERSON	1070055	MOORE STATION WSC	3429 FM 314 S BROWNSBORO, TX 75756	CHARLES ANDERSON	WILCOX	G
HENDERSON	1070039	LOLLIPOP WATER WORKS INC	TECON WATER COMPANY LP 9511 RANCH ROAD 620 N AUSTIN, TX 78726	DAVID YOHE	WILCOX	G
HENDERSON	1070032	UNION HILL WSC	11650 COUNTY ROAD 3424 BROWNSBORO, TX 75756	DENNIS PIERCE	CARRIZO WILCOX	G
HENDERSON	1070025	LEAGUEVILLE WSC	PO BOX 462 BROWNSBORO, TX 75756	CONLEY OWEN	WILCOX	G
HENDERSON	1070024	TWIN OAKS MHP	10000 STATE HWY 31 W MALAKOFF, TX 75148	MIKE PADGETT	WILCOX	G
HENDERSON	1070009	LAKEWOOD WATER EAST	COMMUNITY WATER COMPANY PO BOX 730 CORSICANA, TX 75151	STEVE STROUBE	EP 01	NA
HENDERSON	1070016	CRESENT HEIGHTS WSC	PO BOX 375 ATHENS, TX 75751	DON MEZZLES	WILCOX	G
HENDERSON	1070228	CRS WSC	PO BOX 2551 ATHENS, TX 75751	JAMES LOGAN	WILCOX	G

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HENDERSON	1070222	TPWD PURTIS CREEK STATE PARK	TEXAS PARKS & WILDLIFE 4200 SMITH ROAD AUSTIN, TX 78744	MILBURN SMART	CARRIZO WILCOX	G
HENDERSON	1070194	CHRISTIAN YOUTH FOUNDATION MAIN	3693 STATE HIGHWAY 31 E ATHENS, TX 75752	DAVID HORN	CARRIZO WILCOX	G
HENDERSON	1070196	CAMP LONE STAR	PO BOX 226289 DALLAS, TX 75222	BILL WRIGHT	CARRIZO WILCOX	G
HENDERSON	1070176	CAPE TRANQUILITY SYSTEM	TEXAS WATER SYSTEMS INC. PO BOX 131945 TYLER, TX 75713	GLEN TRIMBLE	WILCOX	G
HENDERSON	1070174	PARKSIDE SHORES WATER SYSTEM	AQUASOURCE UTILITY INC. 1421 WELLS BRANCH PKWY STE. 105 PFLUGERVILLE, TX 78660	STEVE BLACKHURST	WILCOX	G
HENDERSON	1070124	HIGHSAW	TECON WATER COMPANY LP 9511 RANCH ROAD 620 N AUSTIN, TX 78726	DAVID YOHE	WILCOX HIGHSAW	G
HENDERSON	1070162	PARTICIPATION DEVELOPMENT OF TEXAS PINNACLE CLUB	TECON WATER COMPANY LP 9511 RANCH ROAD 620 N AUSTIN, TX 78726	DAVID YOHE	PINNACLE CLUB	S

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HOUSTON	1130011	CITY OF KENARD	PO BOX 115 KENNARD, TX 75847	BILL THOMAS	SPARTA	G
HOUSTON	1130020	RATCLIFF WSC	PO BOX 1386 RATCLIFF, TX 75858	A. ALLISON	AQUIFER (A)	G
HOUSTON	1130021	RATCLIFF RECREATION AREA USFS	DAVY CROCKETT NATIONAL FOREST FS RR 1 BOX 55 KENNARD, TX 75847	FRED SALINES	SPARTA	G
HOUSTON	1130022	RATCLIFF RECREATIONAL DOGWOOD LOOP	DAVY CROCKETT NATIONAL FOREST FS RR 1 BOX 55 KENNARD, TX 75847	FRED SALINES	SPARTA	G
HOUSTON	1130025	AMPACET TEXAS LP	PO BOX 1038 LATEXO, TX 75849	JAMES EDGE	LAKE HOUSTON CO	S

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JASPER	1210004	HOLLY HUFF WSC	PO BOX 1917 JASPER, TX 75951	GARLAND POWELL	HOLLY HUFF WSC/ JASPER	G
JASPER	1210007	WESTWOOD WSC	RR 3 BOX 519-118A JASPER, TX 75951	JAMES GRAY	WESTWOOD/CHAROLA	G
JASPER	1210011	EVADALE WATER SYSTEM	PO BOX 100 EVADALE, TX 77615	CHARLINE STIMITS	CHICOT/EVANGELINE	G
JASPER	1210012	FOREST HILLS WATER SUPPLY	BROOKELAND FWSD PO BOX 5350 SAM RAYBURN, TX 75951	JERRY SHANDS	CATAHOULA/TWIN DIKES	G
JASPER	1210013	HARRISBURG WSC	RR 2 BOX 544 JASPER, TX 75951	JOHN COLE	HARRISBURG WSC/GULF COAST	G
JASPER	1210014	RAYBURN COUNTY MUD	PO BOX 5060 JASPER, TX 75951	LINDA POWELL	JASPER	G
JASPER	1210015	RURAL WSC	PO BOX 832 JASPER, TX 75951	BOBBY HADNOT	JASPER	G
JASPER	1210016	SOUTH KIRBYVILLE RURAL WSC	PO BOX 189 CALL, TX 75933	RANDY FUSSELL	EVANGELINE	G
JASPER	1210019	COUGAR COUNTRY WATER SYSTEM	PO BOX 23 BUNA, TX 77612	EDNA DERRICK	CHICOT / JASPER	G
JASPER	1210040	USCOE SANDY CREEK PARK 1	US ARMY CORP. OF ENGINEERS 890 FM 92 WOODVILLE, TX 75979	ED MURTISHAW	JASPER	G
JASPER	1210048	CITY OF BROWNDELL	PO BOX 430 BROOKELAND, TX 75931	ED BROOKS	CATAHOULA	G
JASPER	1210049	MULBERRY WATER SUPPLY	BROOKELAND FWSD PO BOX 5350 SAM RAYBURN, TX 75951	EDDIE BASS	CATAHOULA/MULBERRY	G
JASPER	1210050	WESTVACO TEXAS EVADALE MILL	MEADWESTVACO TEXAS LP PO BOX 816 SILSBEE, TX 77656	PHIL SPARKS	EVANGALINE	G
JASPER	1210054	TPWD MARTIN DIES STATE PARK HEN HOUSE	TEXAS PARKS & WILDLIFE DEPARTMENT 4200 SMITH ROAD AUSTIN, TX 78744	DAN ODOM	JASPER	G

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JASPER	1210055	TPWD MARTIN DIES STATE PARK WALNUT RIDGE	TEXAS PARKS & WILDLIFE DEPARTMENT 4200 SMITH ROAD AUSTIN, TX 78744	DAN ODOM	GULF COAST	G
JASPER	1210056	EVADALE ISD	PO BOX 497 EVADALE, TX 77615	KENNY GIBSON	GULF COAST	G
JASPER	1210060	UPPER JASPER COUNTY WATER AUTHORITY 1	RR 7 BOX 364-4 JASPER, TX 75951	JERRY SHAVER	COASTAL SANDS	G
JASPER	1210061	BUCK SPRINGS BOTTLED WATER CO.	RR 5 BOX 316B JASPER, TX 75951	BOBBY SHELLHAMMER	SPRING	G
JASPER	1210062	LEOFFLER SPRINGS	RR 5 BOX 109C KIRBYVILLE, TX 75956	ORVILLE LEOFFLER	LEOFFLER SPRING	G
JASPER	1210063	SOUTH JASPER WSC	SOUTH JASPER COUNTY WSC PO BOX 1939 BUNA, TX 77612	GAYLON CHESSER	GULF COAST	G
JASPER	1210064	UPPER JASPER COUNTY WATER AUTHORITY 2	RT 7 BOX 364-4 JASPER, TX 75951	JERRY SHAVER	COASTAL SANDS	G

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JEFFERSON	1230020	CARDINAL MEADOWS IMPROVEMENT DISTRICT	749 HILLDEBRANDT RD. BEAUMONT, TX 77705	MYRNA JONES	NECHES RIVER	S
JEFFERSON	1230025	HAMSHIRE COMMUNITY WSC	PO BOX 417 HAMSHIRE, TX 77622	J NORWOOD	GULF COAST	G
JEFFERSON	1230037	COUNTRY SIDE ESTATES	AQUASOURCE UTILITY INC. 1421 WELLS BRANCH PKWY STE 105 PFLUGERVILLE, TX 78660	STEVE BLACKHURST	LNVA CANAL	S
JEFFERSON	1230052	TPWD SEA RIM STATE PARK	TEXAS PARKS & WILDLIFE DEPARTMENT 4200 SMITH ROAD AUSTIN, TX 78744	JANELLE TAYLOR	LNVA CANAL	S
JEFFERSON	1230072	HAMSHIRE FANNETT ISD	PO BOX 223 HAMSHIRE, TX 77622	MARY ANN KONDO	GULF COAST	G
JEFFERSON	1230082	ONYX ENVIRONMENTAL SERVICES	ONYX ENVIRONMENTAL SERVICES LLC PO BOX 2563 PORT ARTHUR, TX 77643	ART MATHES	RESEVOIRS	S
JEFFERSON	1230083	SUNCHASE SUBDIVISION	STARWARD REALTY & DEV INC 13307 FORELAND CT HOUSTON, TX 77079	SHEILA GESSLER	GULF COAST	G
JEFFERSON	1230086	NORTHWEST FOREST MUD	NORTHWEST MUD 2370 EASTEX FWY BEAUMONT, TX 77703	PAUL SWEAT	NECHES RIVER / GULF	S
JEFFERSON	1230087	DOE STRATEGIC PETROLEUM BIG HILL	US DEPARTMENT OF ENERGY PO BOX 1270 WINNIE, TX 77665	TIM LEWIS	TRINITY RIVER	S
JEFFERSON	1230074	MOORE WATER SYSTEM	MOORE WATER SERVICE PO BOX 256 HAMSHIRE, TX 77622	TROY MOORE	GULF COAST	G

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NACOGDOCHES	1740006	MELROSE WSC	MELROSE WSC 12542 E STATE HIGHWAY 21 NACOGDOCHES, TX 75961	CARL DYES	WILCOX	G
NACOGDOCHES	1740007	CARO WSC	3947 STATE HIGHWAY 204 NACOGDOCHES, TX 75964	JAMES COATS	WILCOX	G
NACOGDOCHES	1740010	D & M WSC	PO BOX 9 DOUGLASS, TX 75943	ROBERT WHITEHEAD	CARRIZO/ WILCOX	G
NACOGDOCHES	1740011	ETOILE WSC	PO BOX 67 ETOILE, TX 75944	GARLAND PICOU	CARRIZO	G
NACOGDOCHES	1740012	LIBBY WSC	PO BOX 115 MARTINSVILLE, TX 75958	E WALKER	CARRIZO WILCOX	G
NACOGDOCHES	1740013	LILBERT LOONEYVILLE WSC	RR 1 BOX 45 CUSHING, TX 75760	JOHN RANEY	CARRIZO	G
NACOGDOCHES	1740018	SACUL WSC	PO BOX 11 SACUL, TX 75788	TOMMY KING	CARRIZO	G
NACOGDOCHES	1740020	WODEN WSC	441 COUNTY ROAD 520 NACOGDOCHES, TX 75961	DAN SIMMONS	CARRIZO WILCOX	G
NACOGDOCHES	1740029	NACOGDOCHES COUNTY MUD 1	205 COUNTY ROAD 5024 NACOGDOCHES, TX 75964	JACKIE JOHNSON	LK NACOGDOCHES	S
NACOGDOCHES	1740033	UNION SPRINGS WATER CO.	17051 US HWY 259 NACOGDOCHES, TX 75965	DELORES BAILEY	CARRIZO/WILCOX	G

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NEWTON	1760003	BURKEVILLE WSC	PO BOX 220 BURKEVILLE, TX 75932	E GREER	GULF COAST	G
NEWTON	1760002	TOLEDO VILLAGE WSC	BROOKELAND FWSD PO BOX 5350 SAM RAYBURN, TX 75951	SHERRY SHANDS	JASPER	G
NEWTON	1760001	CITY OF NEWTON	101 W NORTH STREET NEWTON, TX 75966	CHARLES CLOVER	GULF COAST	G
NEWTON	1760004	EAST NEWTON WSC	PO BOX 956 NEWTON, TX 75966	MIKE HORN	GULF COAST	G
NEWTON	1760010	CAMP RED OAK SPRINGS	2455 COMMERCE ST BEAUMONT, TX 77703	JOHN DAVIS	GULF COAST	G
NEWTON	1760011	EAST TEXAS BAPTIST ENCAMPMENT	RR 2 BOX 12 NEWTON, TX 75966	WAYNE DAVIS	GULF COAST	G
NEWTON	1760015	TALL TIMBERS WSC	RR 1 BOX 328 BURKEVILLE, TX 75932	CARL AVILA	GULF COAST	G
NEWTON	1760018	CAMP OTANYA	ORANGE CAMP FIRE COUNCIL INC 1204 W ELM ST ORANGE, TX 77630	CHARLOTTE ALFORD	GULF COAST	G
NEWTON	1760022	SOUTH NEWTON WSC	SOUTH NEWTON WSC PO BOX 659 DEWEYVILLE, TX 77614	RANDY PEVETO	EVANGELINE	G
NEWTON	1760023	JAMESTOWN WSC	PO BOX 886 JASPER, TX 75951	JOHN ROSS	GULF COAST	G
NEWTON	1760024	ARTESIAN SPRINGS	RR 1 BOX 670-12 NEWTON, TX 75966	LAWRENCE GORDON	GULF COAST	G
NEWTON	1760008	BON WIER WSC	PO BOX 167 BON WIER, TX 75928	CHARLES HUGHES	GULF COAST	G

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ORANGE	1810178	CAPRI AND GALL STREETS	COMMUNITY WATER SYSTEMS PO BOX 389 VIDOR, TX 77662	MELVIN BLOCK	GULF COAST	G
ORANGE	1810179	OAK ACRES MOBILE HOME PARK	1225 OSTEEN ST VIDOR, TX 77662	CHARLES WRIGHT	GULF COAST	G
ORANGE	1810143	CLAIRE STREET WATER SYSTEM	WATER NECESSITIES INC PO BOX 62 VIDOR, TX 77670	LARRY BREWER	GULF COAST	G
ORANGE	1810148	TXDOT COMFORT STATION IH 10 NORTH	TEXAS DEPARTMENT OF TRANSPORTATION 3128 HIGHWAY 62 N ORANGE, TX 77632	MARK COX	GULF COAST	G
ORANGE	1810150	YEAGER ESTATES ADDITION	WATER NECESSITIES INC PO BOX 62 VIDOR, TX 77670	LARRY BREWER	GULF COAST	G
ORANGE	1810154	CHASE HOLLOW WATER SYSTEM	NORTH ORANGE WATER & SEWER 10406 HIGHWAY 87 N ORANGE, TX 77632	BOBBY MANSHACK	GULF COAST	G
ORANGE	1810168	PRINT PACK INC	PO BOX 43687 ATLANTA, GA 30336	TODD WIEDERHOLD	GULF COAST	G
ORANGE	1810117	EVERGREEN PARK HICKORY HILLS WATER SYSTEM	1590 N MAIN ST VIDOR, TX 77662	JAMES MANCHAC	CHICOT	G
ORANGE	1810123	CORBETT WATER SYSTEM 1	PO BOX 62 VIDOR, TX 77670	LARRY BREWER	CHICOT	G
ORANGE	1810125	RIVER BEND WATER SYSTEM	WATER NECESSITIES INC PO BOX 62 VIDOR, TX 77670	LARRY BREWER	GULF COAST	G
ORANGE	1810127	PARKVIEW WATER SUPPLY	P C S DEVELOPMENT COMPANY PO BOX 1447 ORANGE, TX 77631	J TURPIN	GULF COAST	G
ORANGE	1810140	CYPRESS BAYOU WATER & SEWER INC	AQUASOURCE UTILITY INC 1421 WELLS BRANCH PKWY STE. 105 PFLUGERVILLE, TX 78660	STEVE BLACKHURST	CHICOT	G

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ORANGE	1810094	HONEYWELL	PO BOX 640 ORANGE, TX 77631	AL CULTRONE	GULF COAST	G
ORANGE	1810103	SUGAR PINES MHP	WEST CIRCLE MOBILE HOME PARK 80 S LAKE AVE STE 719 PASADENA, CA 91101	LOGAN BOGGS	CHICOT	G
ORANGE	1810083	SUSAN CIRCLE COMMUNITY WS	COMMUNITY WATER SYSTEMS PO BOX 389 VIDOR, TX 77662	MELVIN BLOCK	GULF COAST	G
ORANGE	1810062	RANCHETTE ESTATES	COMMUNITY WATER SYSTEMS PO BOX 389 VIDOR, TX 77670	DEBBIE BLOCK	GULF COAST	G
ORANGE	1810065	OAK LEAF CAMPGROUND 3	6900 OAK LEAF DR ORANGE, TX 77632	MARION PEVETO	GULF COAST	G
ORANGE	1810076	HI HO ACRES SUBDIVISION	PO BOX 1409 VIDOR, TX 77670	KELLEY BREWER	GULF COAST	G
ORANGE	1810077	MOBILE ESTATES MOBILE HOME PARK	2710 TANGLEWOOD ST ORANGE, TX 77630	ARTHUR BEEBE	GULF COAST	G
ORANGE	1810034	SAWMILL ADDITION	COMMUNITY WATER SYSTEMS PO BOX 389 VIDOR, TX 77662	MELVIN BLOCK	GULF COAST	G
ORANGE	1810039	OAK LEAF CAMPGROUND 1	6900 OAK LEAF DR ORANGE, TX 77632	MARION PEVETO	GULF COAST	G
ORANGE	1810057	ORANGEFIELD ISD HI	ORANGEFIELD ISD PO BOX 228 ORANGEFIELD, TX 77639	MIKE GENTRY	GULF COAST	G
ORANGE	1810059	KINARD ESTATES	PO BOX 1409 VIDOR, TX 77670	KELLEY BREWER	CHICOT	G
ORANGE	1810060	COUNTRY SQUIRE WATER & SEWER INC	NORTH ORANGE WATER & SEWER 10406 HIGHWAY 87 N ORANGE, TX 77632	BOBBY MANSHACK	EVANGALINE	G
ORANGE	1810061	IWANDA MOBILE HOME PARK	5645 N MAIN ST TRLR 1 VIDOR, TX 77662	MIKE DUBOSE	CHICOT	G
ORANGE	1810015	LONGFORD PLACE WATER SYSTEM	10406 HWY 87N ORANGE, TX 77632	BUFORD MOONEY	CHICOT	G

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ORANGE	1810018	CHERRY HILL SUBDIVISION	COMMUNITY WATER SYSTEMS PO BOX 389 VIDOR, TX 77662	MELVIN BLOCK	GULF COAST	G
ORANGE	1810023	HOUSEMAN PARK	COMMUNITY WATER SYSTEMS PO BOX 389 VIDOR, TX 77662	MELVIN BLOCK	GULF COAST	G
ORANGE	1810025	LAKEVIEW ESTATES	COMMUNITY WATER SYSTEMS PO BOX 389 VIDOR, TX 77662	MELVIN BLOCK	GULF COAST	G
ORANGE	1810007	LANXESS CORPORATION	PO BOX 200 ORANGE, TX 77631	GARY MYERS	CHICOT	G
ORANGE	1810008	CISD HIGH SCHOOL	LCM CISD 7565 NORTH HWY 87 ORANGE, TX 77632	LAMAR HEBERT	CHICOT	G
ORANGE	1810010	ORANGEFIELD WATER WORKS 1	ORANGEFIELD WSC PO BOX 359 ORANGEFIELD, TX 77639	RANDY PEVETO	GULF COAST	G
ORANGE	1810186	ORANGEFIELD WSC	PO BOX 398 ORANGEFIELD, TX 77639	BILLY RIGBY	GULF COAST	G
ORANGE	1810015	LONGFORD PLACE WATER SYSTEM	10406 HWY 87 N ORANGE, TX 77632	BUFORD MOONEY	GULF COAST	G
ORANGE	1810170	TIMER WATER SYSTEM	WATER NECESSITIES INC PO BOX 62 VIDOR, TX 77662	LARRY BREWER	GULF COAST	G
ORANGE	1810172	CHEVRON PHILLIPS EMPLOYEES RECREATION AREA	CHEVRON CHEMICAL CO LP PO BOX 7400 ORANGE, TX 77631	GENE STRAIT	GULF COAST	G
ORANGE	1810175	WATERWOOD ESTATES	BLACKSHER DEVELOPMENT CORP 4158 HIGHWAY 87 S ORANGE, TX 77630	DAN BLACKSHER	GULF COAST	G
ORANGE	1810176	TXDOT MAINTENANCE FACILITY	TEXAS DEPARTMENT OF TRANSPORTATION 3128 HIGHWAY 62 N ORANGE, TX 77632	MARK COX	GULF COAST	G
ORANGE	1810177	SUNRISE EAST APARTMENTS	GULF LAND PARTNERS GROUP 2512 COLONIAL DR ORANGE, TX 77630	STEVEN LEE	GULF COAST	G

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PANOLA	1830008	GARY WSC	PO BOX 160 GARY, TX 75643	WALTER CRAFT	CARRIZO WILCOX	G
PANOLA	1830009	HOLLANDS QUARTER WSC	PO BOX 146 CARTHAGE, TX 75633	MILFORD GROVES	LAKE MURVAUL	S
PANOLA	1830010	MURVAUL WSC	PO BOX 105 GARY CITY, TX 75643	REX GRAVES	CARRIZO WILCOX	G
PANOLA	1830011	PANOLA BETHANY WSC	PO BOX 279 BETHANY, TX 71007	JAMES YOUNGBLOOD	WILCOX	G
PANOLA	1830012	REHOBETH WSC	PO BOX 691 CARTHAGE, TX 75633	PATRICK WILLIAMS	LAKE MURVAUL	S
PANOLA	1830014	ROCK HILL WSC	PO BOX 673 BECKVILLE, TX 75631	JACKIE MERKET	LAKE MURVAUL	S
PANOLA	1830017	A & P WSC PUMP 1	A & P WSC PO BOX 322 CARTHAGE, TX 75633	JERRY PEACE	LAKE MURVAUL	G
PANOLA	1830018	DANIEL SPRINGS BAPTIST CAMP	1571 FM 999 GARY CITY, TX 75643	JAMES SPEER	CARRIZO WILCOX	G
PANOLA	1830019	RIDERVILLE WSC	PO BOX 227 CARTHAGE, TX 75633	JERRY PORTER	LAKE MURVAUL	S
PANOLA	1830020	PIRTLE SCOUT RESERVATION WATER SYSTEM	1331 E 5TH ST TYLER, TX 75701	BARBARA BARBEE	CARRIZO WILCOX	G
PANOLA	1830021	TX UTILITIES MINING CO BECKVILLE	TX UTILITIES MINING COMPANY PO BOX 1359 TATUM, TX 75691	PHIL GRIMES	CARRIZO WILCOX	G
PANOLA	1830031	TX UTILITIES MINING CO MARTIN LAKE	TX UTILITIES MINING COMPANY PO BOX 1359 TATUM, TX 75691	PHIL GRIMES	CARRIZO WILCOX	G
PANOLA	1830025	DEADWOOD WSC	PO BOX 412 CARTHAGE, TX 75633	MICHAEL ISBELL	WILCOX	G
PANOLA	1830027	SOUTH MURVAUL WSC	463 COUNTRY ROAD 194 GARY, TX 75643	JAMES YOUNG	LK MURVAUL	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
PANOLA	1830005	CLAYTON WSC PLANT 1	PO BOX 3 CLAYTON, TX 75637	MIKE PENNINGTON	CARRIZO WILCOX	G
PANOLA	1830029	CLAYTON WSC PLANT 2	PO BOX 3 CLAYTON, TX 75637	MIKE PENNINGTON	LK MURVAUL	S
PANOLA	1830030	CLAYTON WSC PLANT3	PO BOX 3 CLAYTON, TX 75637	MIKE PENNINGTON	CARRIZO WILCOX	G
PANOLA	1830006	DEBERRY WSC	PO BOX 278 DEBERRY, TX 75639	LAWRENCE THOMAS	CARRIZO WILCOX	G
PANOLA	1830007	FAIRPLAY WSC	PO BOX 603 BECKVILLE, TX 75631	JAMES BROWNING	CARRIZO WILCOX	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
POLK	1870125	MOSCOW WSC 2	PO BOX 250 MOSCOW, TX 75960	KENNETH PEACE	CATAHOULA	G
POLK	1870126	DALLARDSVILLE SEGNO WSC	PO BOX 133 DALLARDSVILLE, TX 77332	SISSIE HENDRIX	JASPER	G
POLK	1870004	WOODS CREEK WSC	2120 US HWY 190 W LIVINGSTON, TX 77351	WILLIAM AYERS	JASPER	G
POLK	1870089	DAMASCUS STRYKER WATER SUPPLY	PO BOX 660 CORRIGAN, TX 75939	JAMES REINHARDT	GULF COAST	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
RUSK	2010004	ARLAM CONCORD WSC	ARLAM CONCORD WSC PO BOX 324 GARRISON, TX 75946	L CHATMAN	WILCOX	G
RUSK	2010005	MINDEN BRACHFIELD WSC	MINDEN BRACHFIELD WSC PO BOX 136 MINDEN, TX 75680	JON BEST	CARRIZO WILCOX	G
RUSK	2010007	PINE HILL CHAPMAN WSC	11746 COUNTY ROAD 352 E HENDERSON, TX 75654	JOE DURAN	CARRIZO WILCOX	G
RUSK	2010008	CHURCH HILL WSC	PO BOX 482 HENDERSON, TX 75653	DAVID WHITEHEAD	CARRIZO WILCOX	G
RUSK	2010010	CRIMS CHAPEL WSC PLANT NO 1	CRIMS CHAPEL WSC PO BOX 45 HENDERSON, TX 75653	FRED GRAHAM	CARRIZO WILCOX	G
RUSK	2010011	CROSS ROADS WSC	PO BOX 1001 KILGORE, TX 75663	SCOTT MASON	CARRIZO WILCOX	G
RUSK	2010012	CRYSTAL FARMS WSC	PO BOX 1089 TATUM, TX 75691	JESSIE INMAN	CARRIZO WILCOX	G
RUSK	2010013	DIRGIN WSC	PO BOX 1266 TATUM, TX 75691	PAT MCCLUNG	CARRIZO WILCOX	G
RUSK	2010014	EBENEZER WSC	PO BOX 1925 HENDERSON, TX 75653	BENNY PAYNE	WILCOX	G
RUSK	2010015	GASTON WSC	PO BOX 98 JOINERVILLE, TX 75658	CONNIE PERRYMAN	CARRIZO WILCOX	G
RUSK	2010016	GOODSPRINGS WSC PLANTS A & B	GOODSPRINGS WSC PO BOX 2108 HENDERSON, TX 75653	LLOYD KEE	CARRIZO WILCOX	G
RUSK	2010017	JACOBS WSC PLANTS 1 & 2	JACOBS WSC PO BOX 954 HENDERSON, TX 75653	WAYNE HOLLAND	CARRIZO WILCOX	G
RUSK	2010020	LANEVILLE WSC PLANT 1	LANEVILLE WSC PO BOX 91 LANEVILLE, TX 75667	TODD SPRINGFIELD	CARRIZO WILCOX	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
RUSK	2010025	NEW PROSPECT WSC PLANT 1	NEW PROSPECT WSC 2937 STATE HIGHWAY 43 E HENDERSON, TX 75652	ANGUS MIMS	CARRIZO WILCOX	G
RUSK	2010028	OAKLAND WSC	PO BOX 895 HENDERSON, TX 75653	DWAYNE MILEY	WILCOX	G
RUSK	2010030	PLEASANT HILL WSC	PO BOX 223 NEW LONDON, TX 75682	JACK MURPHY	CARRIZO WILCOX	G
RUSK	2010031	PRICE WSC	PO BOX 126 PRICE, TX 75687	DELBERT HAMILTON	CARRIZO WILCOX	G
RUSK	2010036	LEVERETTS CHAPEL WSC	RR 2 BOX 20AA OVERTON, TX 75684	JAMES WHITE	CARRIZO WILCOX	G
RUSK	2010039	SOUTH RUSK COUNTY WSC	PO BOX 38 LANEVILLE, TX 75667	GREG LEE	CARRIZO WILCOX	G
RUSK	2010050	CHALK HILL SUD	16076 FM 1716 HENDERSON, TX 75652	ROBERT DURBIN	WILCOX	G
RUSK	2010049	SOUTH RUSK COUNTY WSC COMPTON MCKNIGHT	SOUTH RUSK COUNTY WSC PO BOX 38 LANEVILLE, TX 75667	MAX MOORE	CARRIZO WILCOX	G
RUSK	2010042	SHAN D WATER SUPPLY	465 DESIREES TRL TATUM, TX 75691	DAVID SHIVERS	CARRIZO WILCOX	G
RUSK	2010052	TPWD MARTIN CREEK STATE PARK	TEXAS PARKS & WILDLIFE DEPARTMENT 4200 SMITH ROAD AUSTIN, TX 78744	VICTOR PEREZ	CARRIZO WILCOX	G
RUSK	2010055	KENNEDY ROAD WSC	1121 COUNTY ROAD 168 W KILGORE, TX 75662	CLARA BRADFORD	WILCOX	G
RUSK	2010058	CROSS ROADS WSC GREENWOOD RANCH ME	CROSS ROADS WSC PO BOX 1001 KILGORE, TX 75663	SCOTT MASON	SABINE RIVER	S

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
SABINE	2020004	BROOKELAND WATER SUPPLY	BROOKELAND FWSD PO BOX 5350 SAM RAYBURN, TX 75951	JERRY SHANDS	CARRIZO WILCOX	G
SABINE	2020013	EL CAMINO BAY WATER SYSTEM	EL CAMINO BAY OWNERS ASSOCIATION 118 LAKEVIEW DR HEMPHILL, TX 75948	JACK CLARK	TOLEDO BEND RES	S
SABINE	2020014	BEECHWOOD WSC	HC 6 BOX 763 HEMPHILL, TX 75948	BEN POWELL	TOLEDO BEND RES	S
SABINE	2020018	USFS INDIAN MOUND RECREATION AREA	SABINE RIVER AUTHORITY RT 1 BOX 270 BURKEVILLE, TX 75932	STEVEN DOUGHARTY	CARRIZO WILCOX	G
SABINE	2020057	USFS LAKEVIEW RECREATION AREA	SABINE RIVER AUTHORITY RT 1 BOX 270 BURKEVILLE, TX 75932	STEVEN DOUGHARTY	CARRIZO WILCOX	G
SABINE	2020020	PENDLETON UTILITY CORP.	PO BOX 591 MARSHALL, TX 75671	W NEEL	TOLEDO BEND	S
SABINE	2020027	MID LAKE KAMPGROUND	RR 1 BOX 960 HEMPHILL, TX 75948	LARRY FITTS	CARRIZO WILCOX	G
SABINE	2020028	FRONTIER PARK MARINA	RR 1 BOX 1690 HEMPHILL, TX 75948	DANIEL NEAL	CARRIZO WILCOX	G
SABINE	2020050	SHAWNEE SHORES	BROOKELAND FWSD PO BOX 5350 SAM RAYBURN, TX 75951	JERRY SHANDS	CARRIZO WILCOX	G
SABINE	2020054	TIMBERLANE WATER SYSTEM INC	PO BOX 1611 NEDERLAND, TX 77627	THOMAS MINALDI	CARRIZO WILCOX	G
SABINE	2020055	TIMBERLANE ESTATES PROPERTY OWNERS ASSOCIATION	TIMBERLANE ESTATES PROPERTY OWNERS ASSOCIATION HC 53 BOX 303 HEMPHILL, TX 75948	JAMES DAVIS	CARRIZO WILCOX	G
SABINE	2020070	SOUTH SABINE WSC	HC 52 BOX 935 HEMPHILL, TX 75948	GEORGE COOPER	CARRIZO WILCOX	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
SAN AUGUSTINE	2030007	SAN AUGUSTINE RURAL WSC	DEEP EAST TEXAS ELECTRIC COOPERATIVE INC PO BOX 209 SAN AUGUSTINE, TX 75972	MIKE BEASLEY	CITY LAKE	S
SAN AUGUSTINE	2030010	ANTHONY HARBOR SUBDIVISION	SAM RAYBURN WATER INC PO BOX 154322 LUFKIN, TX 75915	DON JOHNSON JR	CARRIZO WILCOX	G
SAN AUGUSTINE	2030011	PARKWAY WATER SYSTEM	SAM RAYBURN WATER INC PO BOX 154322 LUFKIN, TX 75915	DON JOHNSON JR	YEGUA	G
SAN AUGUSTINE	2030013	EL PINON ESTATES WATER SYSTEM	RR 1 BOX 121 BROADDUS, TX 75929	CURTIS WHITE	CARRIZO WILCOX	G
SAN AUGUSTINE	2030014	SUTTON HILLS ESTATES	SUTTON HILLS ESTATES PROPERTY OWNERS ASSOCIATION PO BOX 164 BROADDUS, TX 75929	C MCCOY	CARRIZO WILCOX	G
SAN AUGUSTINE	2030015	LA PLAYA SUBDIVISION WATER SYSTEM	SAM RAYBURN WATER INC. PO BOX 154322 LUFKIN, TX 75915	DON JOHNSON JR	CARRIZO WILCOX	G
SAN AUGUSTINE	2030023	POWELL POINT WATER SYSTEM	SAM RAYBURN WATER INC. PO BOX 154322 LUFKIN, TX 75915	DON JOHNSON JR	CARRIZO WILCOX	G
SAN AUGUSTINE	2030032	GLEN OAKS WATER SYSTEM	SAM RAYBURN WATER INC PO BOX 154322 LUFKIN, TX 75915	DON JOHNSON JR	YEGUA	G
SAN AUGUSTINE	2030004	DENNING WSC	PO BOX 209 SAN AUGUSTINE, TX 75972	JACK NICHOLS	CARRIZO WILCOX	G
SAN AUGUSTINE	2030005	HICKORY HOLLOW WATER SYSTEM	SAM RAYBURN WATER INC PO BOX 154322 LUFKIN, TX 75915	DON JOHNSON JR	CARRIZO WILCOX	G
SAN AUGUSTINE	2030006	LAKEWOOD WATER SYSTEM	SAM RAYBURN WATER INC PO BOX 154322 LUFKIN, TX 75915	DON JOHNSON JR	YEGUA	G
SAN AUGUSTINE	2030003	CITY OF BROADDUS	PO BOX 149 BROADDUS, TX 75929	MARION NEILL	WILCOX CARRIZO	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
SHELBY	2100005	CHOICE WSC	POWER CONTROLS PO BOX 1409 CENTER, TX 75935	VINCE DIVERDI	EP0001	NA
SHELBY	2100006	EAST LAMAR WSC	PO BOX 16 CENTER, TX 75935	MORGAN HARRIS	WILCOX	G
SHELBY	2100007	FLAT FORK WSC	PO BOX 99 CENTER, TX 75935	HAROLD ROBERTSON	CARRIZO WILCOX	G
SHELBY	2100008	FIVE WAY WSC	POWER CONTROLS PO BOX 1409 CENTER, TX 75935	VINCE DIVERDI	CARRIZO WILCOX	G
SHELBY	2100009	HUBER WSC	PO BOX 839 TIMPSON, TX 75975	TRAVIS MORRIS	CARRIZO WILCOX	G
SHELBY	2100011	MCCLELLAND WSC	6438 STATE HIGHWAY 87 S SHELBYVILLE, TX 75973	CHARLES JONES	CARRIZO WILCOX	G
SHELBY	2100012	PAXTON WSC	PO BOX 1138 CENTER, TX 75935	VINCE DIVERDI	CARRIZO WILCOX	S
SHELBY	2100013	SAND HILLS WSC	13938 STATE HWY 7 W CENTER, TX 75935	MIKE ADAMS	AIKENS	G
SHELBY	2100014	SHELBYVILLE WSC	PO BOX 297 SHELBYVILLE, TX 75973	VINCE DIVERDI	CARRIZO WILCOX	G
SHELBY	2100015	TIMPSON RURAL WSC	PO BOX 839 TIMPSON, TX 75975	JOHN TYSON	CARRIZO WILCOX	G
SHELBY	2100017	TENNESSEE WSC	PO BOX 839 TIMPSON, TX 75975	BEN GOOLSBY	CARRIZO WILCOX	G
SHELBY	2100018	ON SITE WATER WORKS	PO BOX 7831 THE WOODLANDS, TX 77387	GEORGE OBERDORF	CARRIZO WILCOX	G
SHELBY	2100019	CITY OF HUXLEY	11798 FM 2694 SHELBYVILLE, TX 75973	LARRY VAUGHN	TOLEDO BEND	S
SHELBY	2100031	PAXTON WSC JACKSON PLANT	POWER CONTROLS PO BOX 1138 CENTER, TX 75935	VINCE DIVERDI	SABINE RIVER	S

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
SHELBY	2100032	BUENA VISTA WSC	1070 COUNTY ROAD 4778 TIMPSON, TX 75975	CADDELL STEPHENSON	CARRIZO WILCOX	G
SHELBY	2100034	HASLAM COMMUNITY	CITY OF JOAQUIN PO BOX 237 JOAQUIN, TX 75954	STEVE HUGHES	SABINE	S
SHELBY	2100035	ROLLING HILLS SUBDIVISION	QUEEN CREEK 35533 N BELL ROAD QUEEN CREEK, AZ 85242	GEORGE WHITESEL	EP 001	S

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
SMITH	2120090	PINE COVE RANCH CAMP	PINE COVE INC PO BOX 9055 TYLER, TX 75711	MARIO ZANDSTRA	CARRIZO	G
SMITH	2120097	EAST LAKE WOODS	LAKESHORE UTILITY COMPANY INC 106 E CORSICANA ST ATHENS, TX 75751	ALAN WHATLEY	CARRIZO WILCOX	G
SMITH	2120081	GARDEN VALLEY RESORT INC	TEXAS WATER SYSTEMS INC PO BOX 131945 TYLER, TX 75713	GLENN TRIMBLE	CARRIZO WILCOX	G
SMITH	2120007	CARROLL WSC WELL 3	CARROLL WSC PO BOX 428 VAN, TX 75790	KAMERON INNERARITY	CARRIZO WILCOX	G
SMITH	2120008	COMMUNITY WATER CO MONTGOMERY GARDEN	COMMUNITY WATER COMPANY PO BOX 730 CORSICANA, TX 75151	STEVE STROUBE	CARRIZO WILCOX	G
SMITH	2120024	WALNUT GROVE WSC	PO BOX 269 WHITEHOUSE, TX 75791	RONNIE NEEL	CARRIZO WILCOX	G
SMITH	2120027	WRIGHT CITY WSC 1	24065 LYLES LN TROUP, TX 75789	CHARLES SEALE	CARRIZO WILCOX	G
SMITH	2120099	WRIGHT CITY WSC 2	24065 LYLES LN TROUP, TX 75789	CHARLES SEALE	WILCOX	G
SMITH	2120034	MOUNT SYLVAN WATER SYSTEM	TEXAS WATER SYSTEMS INC PO BOX 131945 TYLER, TX 75713	GLEN TRIMBLE	WILCOX	G
SMITH	2120035	PINE TRAIL SHORES	TECON WATER COMPANY LP 9511 RANCH ROAD 620 N AUSTIN, TX 78726	DAVID YOHE	WILCOX	G
SMITH	2120037	BIG EDDY INC	SILVERLEAF RESORTS INC 17141 PINTAIL DR FLINT, TX 75762	MICKEY MCINTOSH	WILCOX	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
SMITH	2120062	SOUTHPARK MOBILE HOME ESTATES	13529 STATE HWY 110 S TRLR 127 TYLER, TX 75707	RICHARD CASWELL	WILCOX CARRIZO	G
SMITH	2120064	LAKEWAY HARBOR	TECON WATER COMPANY LP 9511 RANCH ROAD 620 N AUSTIN, TX 78726	DAVID YOHE	LAKE PALESTINE	S
SMITH	2120071	PINE COVE TOWERS CAMP	PINE COVE INC PO BOX 9055 TYLER, TX 75711	MARIO ZANDSTRA	CARRIZO WILCOX	G
SMITH	2120070	PINE COVE CONFERENCE CENTER	PINE COVE INC PO BOX 9055 TYLER, TX 75711	MARIO ZANDSTRA	CARRIZO WILCOX	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
TRINITY	2280036	NIGTON WAKEFIELD WSC	PO BOX 117 APPLE SPRINGS, TX 75926	GERALD HOLLIS	WELL	N
TRINITY	2280005	CENTERVILLE WSC	PO BOX 9 GROVETON, TX 75845	CHARLIE ASHWORTH	GULF COAST	G
TRINITY	2280006	NOGALUS CENTRALIA WSC	228 PROTHRO RD APPLESPRINGS, TX 75926	LEWIS PILLOWS	YEGUA	G
TRINITY	2280010	WOODLAKE JOSSERAND WSC	PO BOX 103 WOODLAKE, TX 75865	RON SIMMONS	GULF COAST	G
TRINITY	2280009	PENNINGTON WSC	PO BOX 15 PENNINGTON, TX 75856	BILLY AVERY	YEGUA	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
TYLER	2290002	CHESTER WSC	PO BOX 77 CHESTER, TX 75936	STEVE WATTS	GULF COAST	G
TYLER	2290004	DOUCETTE WATER SYSTEM	PO BOX 529 COLMESNEIL, TX 75938	CHARLES BRANCH	GULF COAST	G
TYLER	2290007	CYPRESS CREEK WSC	PO BOX 536 WOODVILLE, TX 75979	LLOYD FORTENBERRY	GULF COAST	G
TYLER	2290010	IVANHOE LAND OF LAKES	TECON WATER COMPANY LP 9511 RANCH ROAD 620 N AUSTIN, TX 78726	DAVID YOHE	GULF COAST	G
TYLER	2290011	SENECA WSC	PO BOX 27 WOODVILLE, TX 75979	LILLENE SMITH	GULF COAST	G
TYLER	2290012	WHITE TAIL RIDGE LAKE ESTATES	PURE UTILITIES LC 3595 FM 3277 LIVINGSTON, TX 77351	STONEWALL JACKSON	GULF COAST	G
TYLER	2290014	WAYWARD WINDS OASIS LL	LAKE LIVINGSTON WATER SUPPLY & SEWER SERVICE CORPORATION PO BOX 1149 LIVINGSTON, TX 77351	JOHN GANZER	GULF COAST	G
TYLER	2290015	BARLOW LAKE ESTATES	PURE UTILITIES LC 3595 FM 3277 LIVINGSTON, TX 77351	STONEWALL JACKSON	GULF COAST	G
TYLER	2290021	LAKESIDE WATER SUPPLY 1	PO BOX 697 DOUCETTE, TX 75942	CHARLES BRANCH	GULF COAST	G
TYLER	2290039	LAKESIDE WATER SUPPLY 2	PO BOX 697 DOUCETTE, TX 75942	CHARLES BRANCH	GULF COAST	G
TYLER	2290040	LAKESIDE WATER SUPPLY 3	PO BOX 697 DOUCETTE, TX 75942	CHARLES BRANCH	GULF COAST	G
TYLER	2290041	LAKESIDE WATER SUPPLY 4	PO BOX 697 DOUCETTE, TX 75942	CHARLES BRANCH	GULF COAST	G
TYLER	2290042	LAKESIDE WATER SUPPLY 5	PO BOX 697 DOUCETTE, TX 75942	CHARLES BRANCH	GULF COAST	G

County	PWS ID	PWS Name	Mailing Address	Contact Person	Name/Source Summation	Source Type
TYLER	2290024	TPWD MARTIN DIES PARK CHEROKEE UNIT	TEXAS PARKS & WILDLIFE DEPARTMENT 4200 SMITH SCHOOL ROAD AUSTIN, TX 78744	DAN ODOM	JASPER	G
TYLER	2290027	MONT NECHES LAKE ESTATES	PURE UTILITIES LC 3595 FM 3277 LIVINGSTON, TX 77351	STONEWALL JACKSON	GULF COAST	G
TYLER	2290032	USCOE MAGNOLIA RIDGE PARK	US ARMY CORP. OF ENGINEERS 890 FM 92 N WOODVILLE, TX 75979	ED MURTISHAW	JASPER	G
TYLER	2290038	WINDMILL MOBILE HOME ESTATES	PO BOX 295 COLMESNEIL, TX 75938	MIKE MURPHY	COASTAL SANDS	G
TYLER	2290043	TOWN BLUFF WATER SYSTEM	PURE UTILITIES WATER SYSTEM 3595 FM 3277 LIVINGSTON, TX 77351	STONEWALL JACKSON	GULF COAST	G

Chapter 3

Evaluation of Current Water Supplies in the Region

3.1. Introduction

Under SB1 planning guidelines, each region is to identify currently available water supplies to the region by 1) source and 2) user. The supplies available by source are based on the supply available during drought of record conditions. For surface water reservoirs, this is the equivalent of firm yield supply or permitted amount (whichever is lower). For run-of-the-river supplies, this is the minimum supply available in a year over the historical record. Groundwater supplies are based on region-approved acceptable levels of drawdown for each aquifer. Other supplies considered for planning purposes include reuse of treated wastewater, saline sources and local supplies. Local supplies generally consist of stock ponds that do not require water rights permits or local mining supplies. These supplies are assessed based on historical and current use.

Currently available water supplies to each user are those water supplies that have been permitted or contracted with infrastructure in place to transport and treat (if necessary) water. Some water supplies are permitted or are contracted for use but the infrastructure is not yet in place. Connecting such supplies is considered a water management strategy for future use. Limitations considered in this analysis include raw water source availability, well field production capacities, permit limits, contract amounts, water quality, transmission infrastructure, and water treatment capacities.

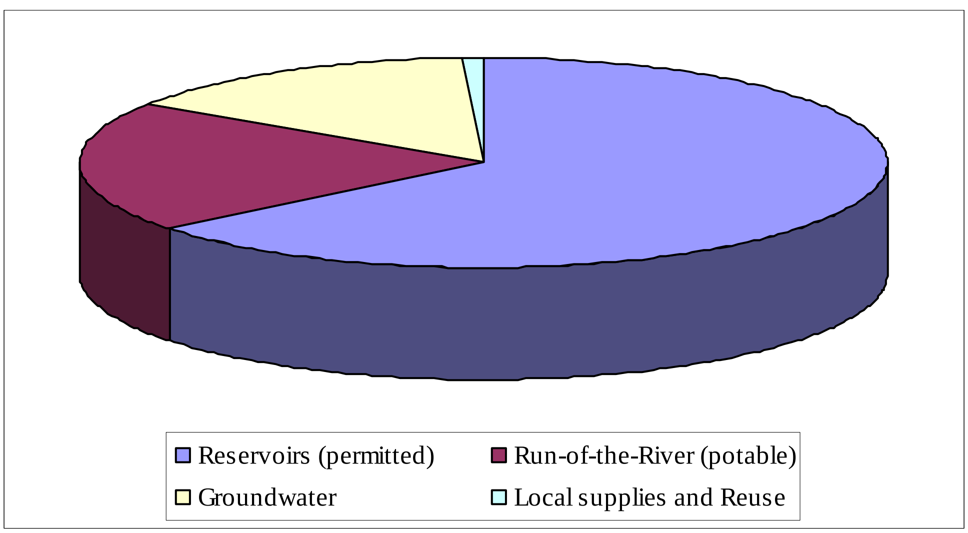
3.2 Overall Water Supply Availability

Table 3.1 and Figure 3.1 summarize the overall water supply availability in East Texas Regional Water Planning Area. There is approximately 4.4 million acre-feet per year of permitted supplies in the East Texas Region. Of this amount, about 3.4 million acre-feet per year are potable water supplies. Most of the available water in the East Texas Region is associated with surface water sources. Approximately 15% of the total supply is groundwater. However, groundwater is a very important resource in the region and is used to supply much of the municipal and rural water needs.

Table 3.1
Summary of Total Available Supplies to the East Texas Regional Water Planning Area
(values in acre-feet per year)

Source of Supply	2000	2010	2020	2030	2040	2050	2060
Reservoirs (permitted)	1,945,254	1,942,444	1,939,224	1,936,006	1,932,784	1,929,565	1,926,344
Reservoirs (unpermitted)	362,170	352,966	344,172	335,378	326,583	317,789	308,995
Run-of-the-River (potable)	622,524	622,524	622,524	622,524	622,524	622,524	622,524
Run-of-the-River (brackish)	1,036,462	1,036,462	1,036,462	1,036,462	1,036,462	1,036,462	1,036,462
Groundwater	442,270	442,270	442,270	442,270	442,270	442,270	442,270
Local Supplies	13,505	13,505	13,505	13,505	13,505	13,505	13,505
Direct Reuse	232	253	268	281	294	305	319
Indirect Reuse (Irrigation Return Flows)	13,687	13,687	13,687	13,687	13,687	13,687	13,687
Total	**4,436,104**	**4,424,111**	**4,412,112**	**4,400,113**	**4,388,109**	**4,376,107**	**4,364,106**

Figure 3.1
Year 2000 Available Supplies by Source Type



3.2.1 Surface Water Availability

In accordance with the Texas Water Development Board's (TWDB) established procedures, the surface water supplies for the 2006 regional water plans were determined using the TCEQ-approved Water Availability Models (WAM). In the East Texas Region, four river basins were evaluated: Neches, Neches-Trinity, Trinity and Sabine. Figure 3-2 shows the river basins and major reservoirs in the East Texas Region.

The WAM models were developed for the purpose of reviewing and granting new surface water rights permits using a hypothetical repetition of historical hydrology. The results from the modeling for regional water planning are used for planning purposes only and do not affect the right of an existing water right holder to divert and use the full amount of water authorized by its permit. The assumptions in the WAM models are based in part on the legal interpretation of water rights, and in some cases do not accurately reflect current operations. For planning purposes, adjustments were made to the TCEQ-approved WAMs that were available in 2003 to better reflect current and future surface water conditions in the region. WAM Run 3, as modified below, was used to assess surface water supplies. The principal assumptions of Run 3 are that all water right holders divert the full permitted amount of their right by priority date order and do not return any of the diversion to the watershed unless an amount is specified in the permit. This assumption provides a conservative estimate of water supplies in the East Texas Region since there is little reuse currently identified or planned in the East Texas Region.

Generally, changes to the WAMs included:

- Re-assessment of reservoir sedimentation rates, and the calculation of area-capacity conditions for current (2000) and future (2060) conditions.
- Inclusion of subordination agreements that are currently in place
- Inclusion of system operations where appropriate
- Basin-specific modifications

The specific changes to each river basin are described below. Some of these changes have been accepted by the TCEQ and are incorporated into the 2005 TCEQ-approved WAMs. The modified Trinity WAM for Region C was used to assess the supplies in the East Texas Region from this basin. There were no changes specific to the East Texas Region sources. Also, no changes were made to the Neches-Trinity WAM.

Neches River Basin WAM

- The drainage area ratio method was used to estimate the natural flows at un-gaged control points instead of the curve number method. This was due to the inconsistencies with curve numbers and mean precipitation values. (TCEQ subsequently accepted this change in their official model.)
- Modeled the Upper Neches River MWA's water rights as a system (Lake Palestine and Rocky Point dam).
- Sam Rayburn/Steinhagen water right was modeled subordinate to flow upstream above Ponta Dam (which is now Lake Columbia) and Weches Dam (special condition (d) of Certificate of Adjudication 4411)[1]. TCEQ subsequently accepted this change in their official model.
- The original TCEQ input file did not consider hydropower use in Sam Rayburn. Hydropower was included in the model. (The current TCEQ model does include hydropower.)
- Modeled the operation of LNVA's water rights as a system by including backup of LNVA's Pine Island water rights with storage from Sam Rayburn.
- The firm yield of Sam Rayburn/Steinhagen included a minimum elevation in Sam Rayburn of 149 ft. msl., and all storage available in Sam Rayburn up to elevation 164.4 ft. msl.

1 Lake Columbia and the Weches Dam have not been constructed to date. Lake Columbia has a water right permit for 85,507 acre-feet per year.

- The backup from Sam Rayburn/Steinhagen for water right 4415 (City of Beaumont) was deleted. This water right does not receive releases from these reservoirs.

Sabine River Basin WAM

- Adjusted the sedimentation rate for Lake Fork to equal the rate determined for Lake Tawakoni. Based on soil types and watershed characteristics of the two lakes, sedimentation for Lake Fork should be less than Lake Tawakoni. This rate will be re-assessed after a new volumetric survey is completed for Lake Fork.
- The Sabine River Authority's water rights in the lower basin were modeled as a system by backing up the Authority's canal water rights with releases from Toledo Bend Reservoir.
- The remainder of the yield of Toledo Bend was evaluated assuming all diversions were taken lakeside.
- The TCEQ Sabine WAM models Toledo Bend with hydropower. For purposes of finding total available supply for Toledo Bend, hydropower was excluded. Hydropower was included in the evaluation of supplies for all other reservoirs and run-of-the-river supplies.

Reservoirs. All major reservoirs in East Texas Regional Water Planning Group were evaluated, as were some smaller reservoirs used for municipal supply. (Major reservoirs are those with over 5,000 acre-feet of conservation storage.) The available water supply is limited to currently permitted diversions or firm yield. (The firm yield is the greatest amount of water a reservoir could have supplied on an annual basis without shortage during a repeat of historical hydrologic conditions, particularly the drought of record.) Both Sam Rayburn and Toledo Bend Reservoirs were constructed for multiple purposes, and include hydropower generation. Hydropower is not considered a consumptive use of water, yet it can have an impact on water availability. Hydropower is included in the approved WAM models, and the inclusion of hydropower in the firm yield analyses was an operating decision by the reservoir owner. For this plan, hydropower is not considered in the yield determination of Toledo Bend Reservoir. Hydropower is included for the Sam Rayburn/Lake B. A. Steinhagen System, however, the actual operation of hydropower may differ from the assumptions in the WAM models.

A summary of the firm yields for reservoirs in the East Texas Region is shown in Table 3.2. The yields are generally less than the amounts reported in the 2001 Regional Water Plan. This is partly because of the assumptions in the WAMs and reduced storage due to sediment accumulation in the reservoirs.

Unpermitted Reservoir Yields. Table 3.3 includes information on "unpermitted reservoir yields". This provides an estimate of available supply that could be permitted for future use. The largest unpermitted reservoir yield in the East Texas Region is Texas' share of the yield of Toledo Bend Reservoir, which is nearly 225,000 acre-feet per year. Other unpermitted yields are in Lake Rayburn/B.A. Steinhagen System, Houston County Lake, and Lake Jacksonville.

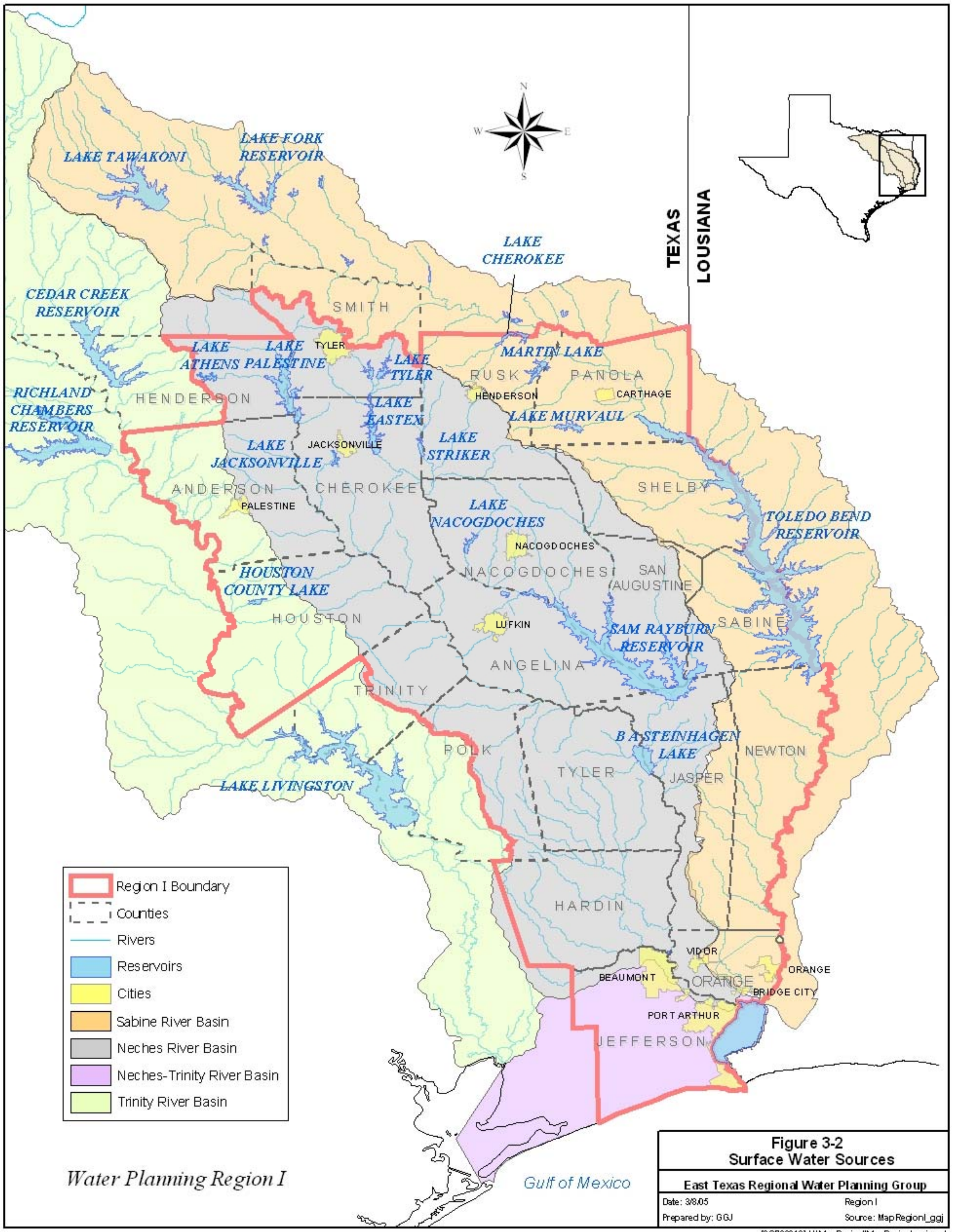


Figure 3-2
Surface Water Sources

Table 3.2
Currently Available Supplies from Permitted Reservoirs
(values in acre-feet per year)

Reservoir	Basin	County	Permitted Diversion	Currently Available Supply (acre-feet per year)						
				2000	2010	2020	2030	2040	2050	2060
Lake Athens	Neches	Henderson	8,500	6,145	6,064	5,983	5,903	5,822	5,741	5,660
Bellwood Lake	Neches	Smith	2,200	950	950	950	950	950	950	950
Lake Kurth	Neches	Angelina	19,100	18,425	18,421	18,417	18,413	18,408	18,404	18,400
Lake Columbia	Neches	Cherokee	85,507	0	0	0	0	0	0	0
Lake Jacksonville	Neches	Cherokee	6,200	6,200	6,200	6,200	6,200	6,200	6,200	6,200
Lake Nacogdoches	Neches	Nacogdoches	22,000	9,865	9,459	9,053	8,648	8,242	7,836	7,430
Lake Palestine system	Neches	Anderson	238,110	222,200	220,933	219,667	218,400	217,133	215,867	214,600
Lake Tyler/Tyler East	Neches	Smith	40,325	35,490	35,458	35,425	35,393	35,360	35,328	35,295
Pinkston Reservoir	Neches	Shelby	3,800	2,045	2,031	2,017	2,003	1,988	1,974	1,960
Rusk City Lake	Neches	Cherokee	160	65	64	63	63	62	61	60
San Augustine City Lake	Neches	San Augustine	1,285	1,285	1,285	1,285	1,285	1,285	1,285	1,285
Sam Rayburn & Steinhagen System	Neches	Jasper	820,000	820,000	820,000	820,000	820,000	820,000	820,000	820,000
Striker Lake	Neches	Rusk	20,600	20,600	20,183	19,357	18,530	17,703	16,877	16,050
Lake Timpson	Neches	Shelby	350	350	350	350	350	350	350	350
Lake Center	Sabine	Shelby	1,460	754	754	754	754	754	754	754
Lake Murvaul	Sabine	Panola	22,400	22,380	21,792	21,203	20,615	20,027	19,438	18,850
Martin Lake	Sabine	Rusk	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Toledo Bend	Sabine	Sabine	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Houston Co. Lake	Trinity	Houston	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
TOTAL - RESERVOIRS				**1,945,254**	**1,942,444**	**1,939,224**	**1,936,006**	**1,932,784**	**1,929,565**	**1,926,344**

*** calculated by modified WAM Run 3**

Table 3.3
Unpermitted Supply from Existing Reservoirs
(values in acre-feet per year)

Reservoir	Basin	County	2000	2010	2020	2030	2040	2050	2060
Houston Co. Lake	Trinity	Houston	3,500	3,350	3,200	3,050	2,900	2,750	2,600
Lake Jacksonville	Neches	Cherokee	2,260	2,249	2,238	2,228	2,217	2,206	2,195
Sam Rayburn & Steinhagen System	Neches	Jasper	131,500	127,450	123,400	119,350	115,300	111,250	107,200
Striker Lake	Neches	Rusk	410	0	0	0	0	0	0
Toledo Bend	Sabine	Sabine, Shelby	224,500	219,917	215,333	210,750	206,167	201,583	197,000
TOTAL - UNPERMITTED SUPPLY			**362,170**	**352,966**	**344,172**	**335,378**	**326,583**	**317,789**	**308,995**

Run-of-the-River Diversion. Table 3.4 presents the run-of-the-river supplies by county and basin. Some of the projected demands include industries that currently use these brackish supplies. Generally, brackish run-of-the-river water supplies are located in tidally influenced river segments and are not expected to be developed beyond current levels of use. These supplies are shown in italics on Table 3.4. It is anticipated that industries will reduce its use of brackish water over the planning period.

Table 3.4
Summary of the Available Supply from Run-of-the-River Diversions

				Available Supply (acre-feet per year)						
County	**Basin**	**Use**	**Owner**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson	Neches	Irrigation		197	197	197	197	197	197	197
Anderson	Trinity	Irrigation		1,060	1,060	1,060	1,060	1,060	1,060	1,060
Angelina	Neches	Industrial	Temple Inland	57	57	57	57	57	57	57
Angelina	Neches	Irrigation		17	17	17	17	17	17	17
Cherokee	Neches	Irrigation		182	182	182	182	182	182	182
Hardin	Neches	Irrigation		57	57	57	57	57	57	57
Henderson	Neches	Irrigation		0	0	0	0	0	0	0
Houston	Neches	Irrigation		287	287	287	287	287	287	287
Houston	Trinity	Irrigation		1,783	1,783	1,783	1,783	1,783	1,783	1,783
Jasper	Neches	Industrial	LNVA	381,876	381,876	381,876	381,876	381,876	381,876	381,876
Jasper	Neches	Industrial	TPWD (hatchery)	604	604	604	604	604	604	604
Jasper	Neches	Industrial	Louisiana Pacific	12	12	12	12	12	12	12
Jasper	Neches	Irrigation		127	127	127	127	127	127	127
Jefferson	Neches	Industrial	Huntman Corp.	*434,400*	*434,400*	*434,400*	*434,400*	*434,400*	*434,400*	*434,400*
Jefferson	Neches	Industrial	Independent Refining	*2,700*	*2,700*	*2,700*	*2,700*	*2,700*	*2,700*	*2,700*
Jefferson	Neches	Industrial	Union Oil	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*	*4,300*
Jefferson	Neches	Industrial	Mobil Oil	*17,922*	*17,922*	*17,922*	*17,922*	*17,922*	*17,922*	*17,922*
Jefferson	Neches	Industrial		*319*	*319*	*319*	*319*	*319*	*319*	*319*
Jefferson	Neches	Industrial	Beaumont	2,806	2,806	2,806	2,806	2,806	2,806	2,806
Jefferson	Neches	Industrial	Motiva	*12,900*	*12,900*	*12,900*	*12,900*	*12,900*	*12,900*	*12,900*
Jefferson	Neches	Industrial	Gulf States Utilities	*279,131*	*279,131*	*279,131*	*279,131*	*279,131*	*279,131*	*279,131*
Jefferson	Neches	Industrial	Premcor Refining	*480*	*480*	*480*	*480*	*480*	*480*	*480*
Jefferson	Neches-Trinity	Irrigation		54,746	54,746	54,746	54,746	54,746	54,746	54,746
Jefferson	Neches-Trinity	Industrial		680	680	680	680	680	680	680
Jefferson	Neches-Trinity	Mining		34	34	34	34	34	34	34
Jefferson	Neches	Municipal	Beaumont	25,160	25,160	25,160	25,160	25,160	25,160	25,160

Table 3.4 (continued)

				Available Supply (acre-feet per year)						
County	**Basin**	**Use**	**Owner**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Jefferson	Neches	Municipal	Beaumont	4,145	4,145	4,145	4,145	4,145	4,145	4,145
Nacogdoches	Neches	Industrial		2	2	2	2	2	2	2
Nacogdoches	Neches	Irrigation		136	136	136	136	136	136	136
Orange	Neches	Industrial	TE Products	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Orange	Neches	Industrial	Gulf States Utilities	*17,210*	*17,210*	*17,210*	*17,210*	*17,210*	*17,210*	*17,210*
Rusk	Neches	Irrigation		86	86	86	86	86	86	86
Rusk	Neches	Industrial		2	2	2	2	2	2	2
Sabine	Neches	Industrial	Temple Inland	182	182	182	182	182	182	182
Smith	Neches	Irrigation		50	50	50	50	50	50	50
Smith	Neches	Mining		0	0	0	0	0	0	0
Trinity	Neches	Mining	Temple Inland	62	62	62	62	62	62	62
Tyler	Neches	Irrigation		123	123	123	123	123	123	123
Newton	Sabine	Industrial	Weirgate Lumber	135	135	135	135	135	135	135
Newton	Sabine	Irrigation	SRA	46,700	46,700	46,700	46,700	46,700	46,700	46,700
Newton	Sabine	Irrigation		50	50	50	50	50	50	50
Newton	Sabine	Industrial	SRA	100,400	100,400	100,400	100,400	100,400	100,400	100,400
Orange	Sabine	Industrial	E.I. Dupont Nemours	*267,000*	*267,000*	*267,000*	*267,000*	*267,000*	*267,000*	*267,000*
Orange	Sabine	Irrigation		28	28	28	28	28	28	28
Panola	Sabine	Industrial	Hills Lake Fishing Club	114	114	114	114	114	114	114
Panola	Sabine	Industrial	TXU	129	129	129	129	129	129	129
Panola	Sabine	Irrigation		191	191	191	191	191	191	191
Panola	Sabine	Mining	TXU	167	167	167	167	167	167	167
Rusk	Sabine	Irrigation		127	127	127	127	127	127	127
Rusk	Sabine	Municipal	Henderson	10	10	10	10	10	10	10
TOTAL				**1,658,986**	**1,658,986**	**1,658,986**	**1,658,986**	**1,658,986**	**1,658,986**	**1,658,986**
Subtotal Brackish water				***1,036,462***	***1,036,462***	***1,036,462***	***1,036,462***	***1,036,462***	***1,036,462***	***1,036,462***
Subtotal Potable water				**622,524**	**622,524**	**622,524**	**622,524**	**622,524**	**622,524**	**622,524**

3.2.2 Groundwater Availability

The TWDB planning guidelines require that regional planning groups *"Calculate the largest annual amount of water that can be pumped from a given aquifer without violating the most restrictive physical or regulatory or policy conditions limiting withdrawals, under drought-of-record conditions. Regulatory conditions refer specifically to any limitations on pumping withdrawals imposed by groundwater conservation districts through their rules and permitting programs."* This guideline requires that planning groups make a policy decision as to the interpretation of the term "most restrictive" as it relates to long-term groundwater availability. In addition, TWDB guidelines further require that *"Once GAM* (Groundwater Availability Model) *information is accessible for an area within a region, the Planning Group shall incorporate this information in its next planning cycle unless better site-specific information is developed."* Groundwater supplies in the East Texas Region can be divided into the northern and southern regions. The restrictive conditions and available information for each region is different and is presented separately.

Northern Region

The Carrizo-Wilcox Aquifer provides the majority of the groundwater supply in the northern region. Minor aquifers in the northern region include the Queen City, Sparta and Yegua-Jackson. In some areas, the Queen City aquifer provides a significant quantity of water, although the well yields are typically smaller than in the underlying Carrizo-Wilcox aquifer. Because it has a relatively large surface area, the Queen City aquifer also receives a significant volume of recharge from precipitation and thus provides significant baseflow to creeks and rivers in the region. The Yegua-Jackson aquifer provides water in the area between the downdip extent of the Carrizo-Wilcox and the outcrop area of the Gulf Coast aquifer. Figure 3.4 and 3.5 provide an overview of the location of the aquifers. Four groundwater conservation districts are located in the northern region; Anderson County UWCD (part of Anderson County), Neches and Trinity Valleys GCD (Anderson, Henderson and Cherokee Counties), Pineywoods GCD (Angelina and Nacogdoches Counties), and the Rusk County GCD (Rusk County). Most of the districts are currently focused on completing administrative duties like establishing rules and management plans, and some are beginning to register new and existing wells and monitor water levels. In the absence of specific production restrictions, the ETRWPG wanted to ensure a reasonably sustainable planning goal for the groundwater during the 50-year planning window as well as for future generations beyond the 50-year window. With that goal in mind, groundwater availability for the planning period was defined as the amount of groundwater that could be withdrawn from aquifers over the next 50 years that will not cause more than 50 feet of water level decline or 10% decrease in saturated thickness (in unconfined portions of the aquifer) whichever is les in the aquifers of the Region.

The Queen City/Sparta/Carrizo Wilcox GAM was available to analyze the availability of groundwater in each county based on the above criteria. The only county not meeting the criteria was Smith County. In Smith County, the GAM indicated that current demands could not be met with available supplies based on the above criteria. Average water-level decline was over 80 feet during the 50-year period. In this case, the ground-water supply was set equal to the demand because there is currently no groundwater conservation district to limit pumping in that county. The ETRWPG acknowledges that additional water does occur in storage within the aquifers and that a portion of that water (above than the estimated supply) could be pumped if there is not a groundwater conservation district in place to prevent such withdrawals. The groundwater availability for the counties in the Northern Region are provided in Table 3.5.

Southern Region

The Gulf Coast Aquifer provides most of the groundwater supply in the southern region. One groundwater conservation district, the Southeast Texas GCD (Jasper and Newton Counties), is located in the Southern Region. There are no restrictions on groundwater by the conservation district.

Although the historical, calibrated northern Gulf Coast GAM was available when the supply analyses were being completed, the predictive portion of the northern Gulf Coast GAM (that incorporates pumping from 2000-2050) was not available. Therefore, the ground-water availability assessment for the Gulf Coast and Jasper aquifers were based on published information such as Baker (1986), available well and water level records, and the knowledge base of the consultant team.

Appendix B contains a more detailed discussion of the methodology used to determine ground-water availability.

Baker, E.T., Jr., 1986. Hydrology of the Jasper Aquifer in the Southeast Texas Coastal Plain. TWDB Report 295

Table 3.5
Available Groundwater by Aquifer
(values in acre-feet per year)

	Total Supply Available to Region I					
County	**Yegua**	**Queen city**	**Sparta**	**Carizzo**	**Gulf Coast**	**Other**
Northern Region						
Anderson		18,320	600	9,830		280
Angelina	4,860	1,060	670	28,330		1,450
Cherokee		21,850	350	10,870		
Henderson (P)		14,870		4,200		
Houston	1,380	400	870	5,220		1,380
Nacogdoches	60	4,860	400	31,140		80
Panola				10,370		
Rusk		4,250		20,290		
Sabine	1,100		290	6,710	1,100	200
San Augustine	540		200	1,690		60
Shelby				12,750		
Smith (P)		17,280		18,400		80
Trinity (P)	740		600		100	280
Southern Region						
Hardin					23,500	
Jasper					52,000	6,000
Jefferson					2,500	
Newton					29,000	1,500
Orange					20,000	
Polk (P)	360				13,500	1,450
Tyler	180				30,300	1,620
TOTAL	**9,220**	**82,890**	**3,980**	**159,800**	**172,000**	**14,380**

Note: The above values are total supply available to meet both existing and projected demands and are available for each decade of the 50 year planning cycle.

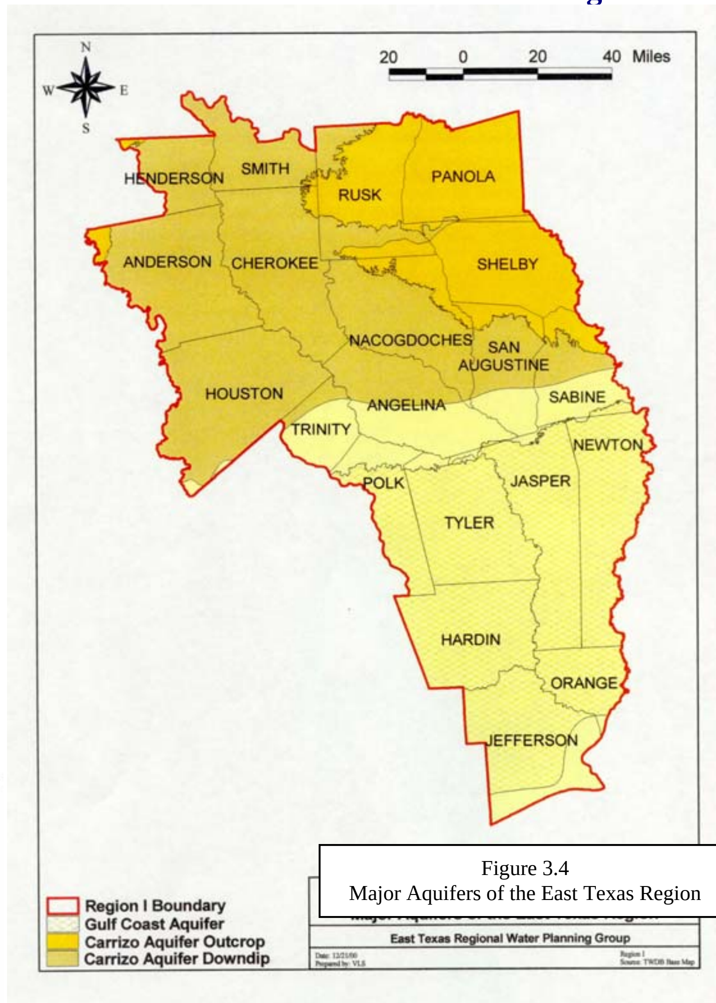


Figure 3.4
Major Aquifers of the East Texas Region

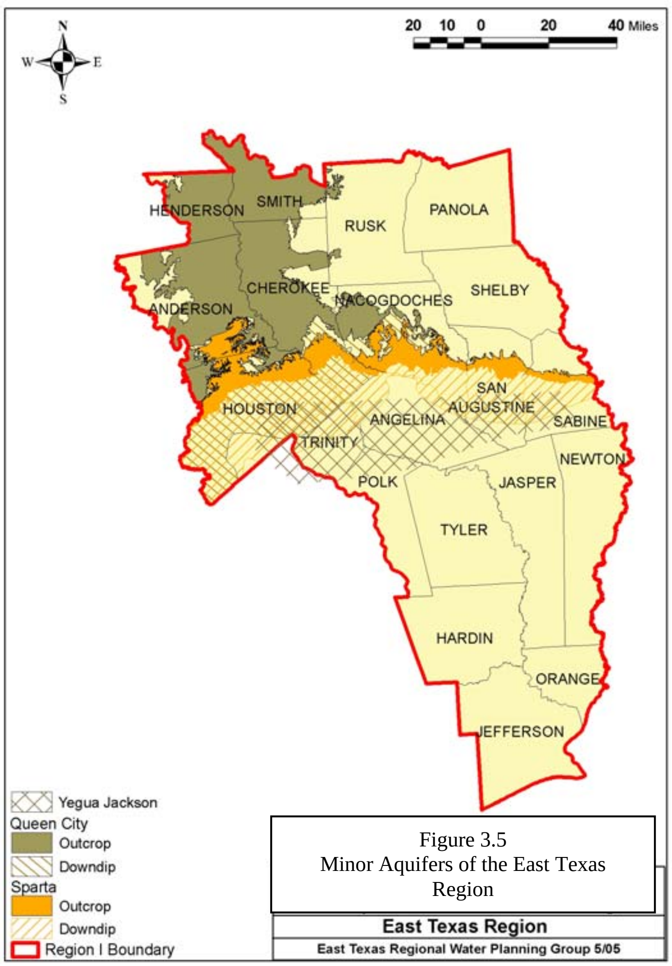


Figure 3.5
Minor Aquifers of the East Texas Region

3.2.3 Local Supply

Local supply is generally surface water supplies that are not associated with a water right. Most of the local supply is surface water used from livestock ponds. A small amount of local supply is for mining purposes. This generally represents recycled water captured from surface flow that has not entered the waters of the state. The maximum recent historical use from these sources (according to TWDB records) is assumed to be available in the future. Local supplies are listed on Table 3.6

3.2.4 Reuse

The reuse listed as available to the region is for existing projects based on current permits and authorizations. Categories of reuse include (1) currently permitted and operating indirect reuse projects for non-industrial purposes, in which water is reused after being returned to the stream; (2) existing indirect reuse for industrial purposes; and (3) authorized direct reuse projects for which facilities are already developed. The specific reuse projects are listed in Table 3.6.

3.2.5 Imports and Exports. There are several small imported supplies to the East Texas Regional Water Planning Area from adjoining regions and Louisiana. Water from Lake Fork in the Northeast Region is used by the cities of Henderson and Kilgore and their customers. The city of Longview has several contracts with customers that serve both the Northeast Region and East Texas Region. Much of this water comes from Lake Cherokee, which is partially located in the East Texas Region. Other imports include groundwater for Crystal Water System from the Northeast Region, water from Lake Livingston to Groveton and surface water for the City of Joaquin from the City of Logansport, Louisiana. The specific source for this import is the Louisiana portion of the Toledo Bend Reservoir.

Water from the East Texas Region is used to supply the city of Tyler’s customers in the Northeast Region, and several customers of the Lower Neches Valley Authority in Region H. It is also assumed that the portion of the city of Overton in the Northeast Region obtains all of its water from the East Texas Region.

Table 3.6
Summary of Available Local Supply and Reuse
(values in acre-feet per year)

County	Basin	Use	Supply
Local Supplies			
Anderson	Neches	Livestock	599
Anderson	Trinity	Livestock	684
Angelina	Neches	Livestock	347
Cherokee	Neches	Livestock	1,059
Cherokee	Neches	Mining	2
Hardin	Neches	Livestock	139
Hardin	Trinity	Livestock	1
Henderson	Neches	Livestock	248
Houston	Neches	Livestock	388
Houston	Trinity	Livestock	783
Jasper	Neches	Livestock	115
Jasper	Sabine	Livestock	75
Jefferson	Neches	Livestock	43
Jefferson	Neches-Trinity	Livestock	280
Jefferson	Neches	Mining	242
Nacogdoches	Neches	Livestock	910
Nacogdoches	Neches	Mining	220
Newton	Sabine	Livestock	66
Newton	Sabine	Mining	28
Orange	Neches	Livestock	56
Orange	Sabine	Livestock	70
Orange	Sabine	Mining	1
Panola	Cypress	Livestock	2
Panola	Sabine	Livestock	1,856
Polk	Neches	Livestock	202
Rusk	Neches	Livestock	386
Rusk	Sabine	Livestock	308
Rusk	Sabine	Mining	287
Sabine	Neches	Livestock	59
Sabine	Sabine	Livestock	320
San Augustine	Neches	Livestock	490
San Augustine	Sabine	Livestock	71
Shelby	Neches	Livestock	334
Shelby	Sabine	Livestock	1,755
Smith	Neches	Livestock	671
Trinity	Neches	Livestock	243
Tyler	Neches	Livestock	165
TOTAL LOCAL SUPPLY			**13,505**

Table 3.6 (continued)

Direct Reuse Supplies			
County	**Basin**	**Use**	**Supply**
Sabine	Neches	Manufacturing	20
Orange	Sabine	Irrigation	15
Shelby	Sabine	Irrigation	82
Shelby	Sabine	Manufacturing	115
Indirect Reuse Supplies			
Jefferson	Neches-Trinity	Irrigation	13,687
TOTAL REUSE SUPPLY			**13,919**

3.3. Water Availability by Water User Group

Summary tables in Chapter 4A, Appendix A present the current water available for each water user group by county. (Water user groups are cities, water supply corporations, county-other municipal users and countywide manufacturing, irrigation, mining, livestock, and steam electric uses.) Unlike the overall water availability values in Table 3.1, the water availability by water user group in Chapter 4A, Appendix A is limited by the ability to deliver and/or use the water. These limitations include firm yield of reservoirs, well field capacity, aquifer characteristics, water quality, water rights, permits, contracts, regulatory restrictions, raw water delivery infrastructure and water treatment capacities where appropriate.

The summary tables in Chapter 4A, Appendix A show the amount of supply available to each user group from each source by decade based on existing facilities. The total supply to water users by use type is shown on Figure 3.6. These developed supplies represent about one third of the currently available supply to the region. The supplies by county are shown in Table 3.7.

Figure 3.6
Currently Available Supply to Water User Groups

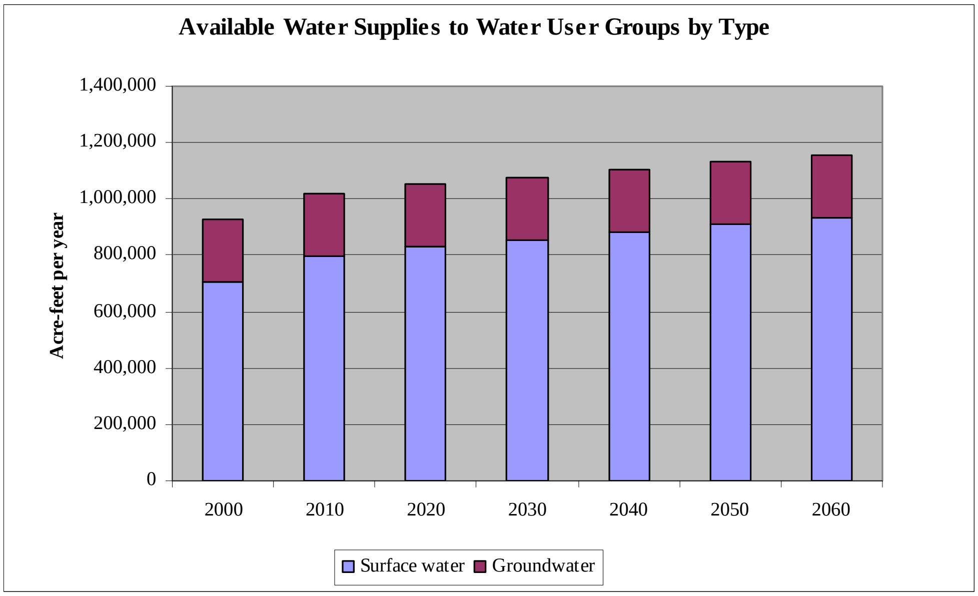


Table 3.7
Summary of Available Supply to Water Users by County
(Values in acre-feet per year)

	2000	2010	2020	2030	2040	2050	2060
Anderson	17,824	17,825	17,823	17,823	17,822	17,824	17,828
Angelina	59,305	59,209	59,184	59,194	59,215	59,271	59,334
Cherokee	18,492	18,050	17,632	17,980	18,400	18,893	19,476
Hardin	20,544	22,116	22,964	23,535	24,104	24,677	25,114
Henderson (P)	7,426	7,210	7,088	6,970	6,861	6,751	6,650
Houston	10,186	10,194	10,182	10,179	10,172	10,191	10,222
Jasper	66,457	71,808	75,190	77,703	79,900	81,547	81,610
Jefferson	437,678	509,290	538,616	563,899	589,412	612,235	636,794
Nacogdoches	22,307	21,929	21,543	21,156	20,763	20,365	19,962
Newton	23,657	37,099	37,099	37,099	37,099	37,099	37,099
Orange	96,330	96,330	96,330	96,330	96,330	96,330	96,330
Panola	17,758	18,252	18,549	18,727	18,906	19,088	19,254
Polk (P)	2,677	2,677	2,677	2,677	2,677	2,677	2,677
Rusk	41,552	41,559	41,566	41,567	41,557	41,554	41,565
Sabine	3,992	3,992	3,992	3,992	3,992	3,992	3,992
San Augustine	2,925	2,925	2,925	2,925	2,925	2,925	2,925
Shelby	9,885	9,893	9,894	9,891	9,890	9,888	9,888
Smith (P)	59,640	59,251	58,975	58,727	58,507	58,237	57,963
Trinity (P)	1,078	1,087	1,094	1,095	1,091	1,086	1,082
Tyler	5,516	5,516	5,516	5,516	5,516	5,516	5,516
TOTAL	**925,229**	**1,016,210**	**1,048,838**	**1,076,985**	**1,105,140**	**1,130,145**	**1,155,279**

3.4 Water Availability by Wholesale Water Provider

There are 17 designated wholesale water providers in the East Texas Regional Water Planning Area. A wholesale water provider is a provider that has wholesale water contracts for 1,000 acre-feet per year or is expected to contract for 1,000 acre-feet per year or more over the planning period. Similar to the available supply to water user groups, the water availability for each wholesale water provider is limited by the ability to deliver the raw water. These limitations include firm yield of reservoirs, well field capacity, aquifer characteristics, water quality, water rights, permits, contracts, regulatory restrictions and infrastructure. A summary of supplies to each wholesale water provider is included in Chapter 4A, Appendix B. A brief description of the supply sources is presented below. As previously discussed, the analyses of the available supplies by source were determined using the assumptions outlined in Sections 3.2.1 and 3.2.2. The results of these analyses are for planning purposes and do not affect the right of a water holder to divert and use the full amount of water authorized by its permit.

Angelina & Neches River Authority (ANRA): ANRA has a state permit to construct Lake Columbia on Mud Creek in the Neches River Basin and divert 85,507 acre-feet per year. ANRA estimates that development of the lake could be complete by the year 2010. No currently available supply is shown since the reservoir is not constructed. The estimated firm yield using the modified Neches WAM Run 3 is 75,700 acre-feet per year.

Angelina – Neches Water Control Improvement District #1 (A-N WCID #1) The A-N WCID #1`owns and operates Lake Striker in Rusk and Cherokee Counties. Currently the only demand on A-N WCID#1 is for steam electric power in Cherokee County. The paper mill that formerly received water from this provider has closed.

Athens Municipal Water Authority. Athens MWA provides water to the city of Athens, which is located in both Region C and Region I, and the Texas Freshwater Fisheries Center at Lake Athens. Athens MWA has 8,500 acre-feet per year of water rights in Lake Athens. The firm yield of the lake using the modified Neches WAM Run 3 was estimated at 6,145 acre-feet per year. However, the intake structure for the fish hatchery does not allow the water level to drop below 431 feet msl and maintain inflow to hatchery. Using this operational constraint, the yield of Lake Athens is 2,900 acre-feet per year. The Athens MWA also has a wastewater reuse permit for 2,677 acre-feet per year, but the infrastructure is not in place to utilize this source.

City of Beaumont: The City of Beaumont obtains water from the Neches River and groundwater wells from the Gulf Coast Aquifer in Hardin County. The supplies are based on firm yield of the city's run-of-the-river water rights and current well capacity.

The City provides treated water to most of the County-Other demands in Jefferson County, including Jefferson County Water Improvement District No. 1 and Northwest Forest MUD and the prison complexes. The City also serves several industrial customers, which is estimated at 0.5% of the total manufacturing demands in Jefferson County.

City of Carthage The city of Carthage provides wholesale water to County-Other customers in Panola County and manufacturing customers. The city currently obtains its water from groundwater from the Carrizo-Wilcox Aquifer and surface water from Panola County FWSD (Lake Murvaul). Considering its current water system capacities, the city of Carthage has sufficient supplies to meet its projected demands.

City of Center: The City of Center currently obtains water from Lake Center and Lake Pinkston for use within the City and for distribution to its municipal and industrial customers. The City owns and operates Lake Center, with a firm yield of 754 acre-feet of municipal water. Water from Lake Pinkston is pumped from the Neches River Basin to the City, located in the Sabine River Basin. The City holds rights to 3,800 acre-feet of water in Lake Pinkston. The current firm yield of the lake using the modified Neches WAM Run 3 is 2,045 acre-feet per year, which decreases to 1,960 acre-feet per year by 2060. The City's municipal customers include Sand Hills WSC and Shelbyville WSC. The primary customer for manufacturing water is Tyson Foods, Inc. The City of Center holds a water right from Lake Pinkston that is intended to be the entire yield of the lake. The WRAP computer model recognizes Lake Pinkston's priority date, as junior to Sam Rayburn's. As a result the model simulates releases of water from Lake Pinkston during the drought of record in an attempt to keep Rayburn full when calculating the yields of these reservoirs. Calculating the yield of Lake Pinkston in this fashion drastically decreases the calculated yield of Lake Pinkston, but does not significantly increase the yield of Rayburn. An agreement between the City of Center and LNVA that priority calls on Lake Pinkston will not be made would allow the yield of Lake Pinkston to be calculated, by WRAP, in a manner more consistent with realistic conditions.

Houston County WCID No. 1: Houston County WCID No. 1's water rights to Houston County Lake include a right to divert 3,500 acre-feet/year at a rate not to exceed 6,300 gpm. Supplies to Houston County WCID No. 1 are limited to its permitted diversions. Houston County WCID No. 1 presently serves Consolidated WSC, City of Crockett, City of Grapeland, City of Lovelady and AMPACET (an industrial user).

City of Jacksonville: The City of Jacksonville obtains water supplies from Lake Jacksonville and the Carrizo-Wilcox Aquifer. The city holds 6,200 acre-feet per year in water rights in Lake Jacksonville. The firm yield of the lake exceeds the permitted diversions. The ability to use this water for municipal purposes is limited by the city's water treatment capacity. The groundwater supplies are based on current well field production. The total supply available to Jacksonville is estimated at 7,391 acre-feet per year.

The City of Jacksonville currently provides water to several water supply corporations in Cherokee County as well as nearly all of the manufacturing needs in the county.

Lower Neches Valley Authority: The LNVA maintains water rights from Lake Sam Rayburn, Lake B.A. Steinhagen and Run-of-the-River diversion from the Neches River. LNVA's water rights total 1,173,876 acre-feet per year. The firm yield analyses using the modified Neches WAM Run 3 show that the full permitted amount is available, and there are also unpermitted supplies associated with the Sam Rayburn/ B.A. Steinhagen system. The LNVA currently possesses the infrastructure to divert these water rights to its municipal, manufacturing and irrigation users.

In Region I, the LNVA currently services the municipal demands for the City of Groves, City of Nederland, City of Port Arthur, City of Port Neches, Jefferson County Water Improvement Control District #10, Town of Nome and West Jefferson County MUD.

The LNVA supplies water used for manufacturing in Jefferson County. The LNVA supplies irrigation water to Jefferson County, and Chambers and Liberty Counties and potable water to Bolivar Peninsula Special Utility District in Region H.

City of Lufkin: The City of Lufkin presently receives groundwater from the Carrizo-Aquifer in Angelina County. Supplies for the City of Lufkin are based on its present well field total pumping capacity. The City presently has contracts to provide water to two water supply corporations: Angelina WSC and Burke WSC.

The City presently has a water right for 28,000 acre-feet/year of water rights from Lake Sam Rayburn. Currently there are no transmission facilities to use this water.

Motiva: Motiva receives water supply from the LNVA. The supply source for Star Enterprise is included in the “Manufacturing” category. A separate supply is not indicated since water is obtained through a contract with the LNVA.

City of Nacogdoches : The City of Nacogdoches obtains groundwater from the Carrizo-Wilcox aquifer and Lake Nacogdoches. The groundwater supply is based on the average annual current well field pumping capacity. The City currently has water rights to divert 22,000 acre-feet/year of water from Lake Nacogdoches. The modified Neches WAM Run 3 shows the current firm yield of this lake to be 9.865 acre-feet per year, and reducing to 7,430 acre-feet per year by 2060.

The WRAP computer model recognized Lake Nacogdoches priority date, 1970, as junior to Sam Rayburn’s, 1963. As a result the model simulates releases of water from Lake Nacogdoches during the drought of record in an attempt to keep Rayburn full when calculating the yields of these reservoirs. Calculating the yield of Lake Nacogdoches in this fashion drastically decreases the calculated yield of Lake Nacogdoches, but does not significantly increase the yield of Rayburn. An agreement between the City of Nacogdoches and LNVA that priority calls on Lake Nacogdoches will not be made would allow the yield of Lake Nacogdoches to be calculated, by WRAP, in a manner more consistent with realistic conditions. In conjunction with water conservation the increase in calculated yield would meet

Nacogdoches' water needs for the planning period. The regional water plan can be amended as soon as agreement is reached between the City of Nacogdoches and LNVA on this issue.

The City currently provides water to County-Other in Nacogdoches County, including Central Heights WSC, D&M Water Supply, Lilly Grove WSC, Nacogdoches County MUD No. 1, and Timber Ridge East. The city also supplies water to Appleby WSC.

Panola County Fresh-Water Supply District No. 1 (Panola County FWSD 1): The Panola County FWSD 1 owns and operates Lake Murvaul in the ETRWPA. The district provides water to the City of Carthage from its water right of 21,400 acre-feet in Lake Murvaul. Water is also provided for mining operations. The estimated firm yield of Lake Murvaul using the modified Sabine WAM Run 3 is 22,380 acre-feet per year in year 2000, decreasing to 18,850 acre-feet per year by 2060.

City of Port Arthur: The City of Port Arthur receives raw water supply from the LNVA. Treated water is supplied to industrial users in addition to its citizens. It is assumed that LNVA will provide for 100% of the city's demands.

Sabine River Authority (SRA): The SRA owns and operates Lake Tawakoni, Lake Fork, and the Toledo Bend Reservoir. In addition, the SRA maintains run-of-the-river rights from the Sabine in Newton and Orange County. The SRA provides water to municipal and industrial customers in Region C and Region D from Lake Fork and Lake Tawakoni, located outside of the East Texas Region. Water in the lower East Texas Region is provided from Toledo Bend Reservoir and diversions from the Sabine River through the SRA Canal System. SRA holds water rights of 750,000 acre-feet per year from Toledo Bend Reservoir and 147,100 acre-feet per year from the Sabine River. Municipal customers include the Cities of Hemphill, Huxley and Rose City, and Beechwood WSC, El Camino Bay Property Owner's Association and Pendleton Utility Corporation. The largest manufacturing demands are for E.I. Dupont De Nemours Company, Inc., and Inland Paperboard and Packaging.

City of Tyler: The City of Tyler receives raw water supply from Lake Tyler and Tyler East and Lake Palestine. It possesses water rights to Lake Bellwood, however, the raw water from this source is used directly by industry or for irrigation. Water is not treated by the City from this source. It also obtains water from the Carrizo-Wilcox aquifer. It presently provides treated water to the City of Whitehouse.

Upper Neches River Municipal Water Authority (UNRMWA): The UNRMWA maintains a total water right of 238,110 acre-feet/year for diversions from Lake Palestine and a downstream location at Rocky Point Dam. The UNRMWA operates these rights as a system. Available supply using the modified Neches WAM Run 3 is estimated at 222,200 acre-feet per year in year 2000, decreasing to 214,600 acre-feet per year by 2060. The Authority has existing water supply contracts with the cities of Dallas, Tyler and Palestine, and a small amount to other local water users.

Presently, the City of Dallas does not have transmission facilities to transport water from Lake Palestine. Dallas is expected to begin using water from Lake Palestine by 2015. The city of Tyler recently completed a 30 mgd treatment and transmission facility from the lake, and is now using water from this source.

3.5. Summary of Current Water Supply in East Texas Region

1. The projected overall reliable water supply to the East Texas Region from current sources will be about 3 million acre-feet per year in 2060. (This figure does not consider supply limitations due to the capacities of current raw water transmission facilities and wells nor does it include brackish water sources). Approximately 85% of the supply is associated with in-region reservoirs and run-of-the river diversions. Nearly 15% of the supply is from groundwater. Very little supply is currently obtained from reuse.

2. There are some sources of supply that will not be utilized fully during the period covered by this plan. Others are fully utilized today, including groundwater from the Carrizo-Wilcox aquifer in Smith County and several smaller reservoirs.

Appendix A

Determination Of Available Surface Water Supplies

Background

The TWDB specifies that the Water Availability Models (WAMs) developed for TCEQ will be used to determine the surface water availabilities for the regional water planning process. The WAMs are basin-specific and use the Water Rights Analysis Package (WRAP) to evaluate water availabilities under different scenarios. The scenario used by TCEQ to evaluate future water rights was selected by the TWDB to be used for SB1 analyses. This scenario, Run 3, assumes full permit diversions with no return flows. Availabilities for each water right are analyzed in priority date order, with water rights with the earliest permit date diverting first. Generally, there is no distinction in water type use, unless this distinction is specified in the permit.

There are two basic types of information needed for surface water supplies in regional water planning:

1. Total available supply within the region
    a. Firm yield of individual reservoirs
    b. Increased yield due to current system operations
    c. Run-of-the river supplies
2. Currently available supply to water user groups
    a. Limited by permits, contracts, available supply and infrastructure
    b. Identified by source

The WAMs were used to assess the total available supply within the region. Supplies to water users were determined based on production capacities, infrastructure constraints, contracts and historical use.

Approach

The general approach in determining water availabilities within a river basin is to have all reservoirs at the same area-capacity conditions in time. This is different from the TCEQ analyses under Run 3 that assumes each reservoir is at the original permitted capacity. The two time periods evaluated were year 2000 and year 2060. Supply available for the other decades was interpolated.

Reservoir Firm Yield

1. Use the January 2003 version of WRAP for analyses
2. Modify input files to have all reservoirs in model at 2000 ACE conditions
3. Check for special conditions that may not be modeled in WAM.
4. Modify WAM as appropriate to reflect special conditions.
5. Repeat process for 2060 sediment conditions.

Run-of-River Diversions

This supply is the minimum available supply in a year over the historical period of record. It is determined from the available supply for existing permits supply in the river. Run-of-the-river supplies are determined by county and water use type.

The approach to assess reliable run-of-the-river supplies is:

1. Run the WAMs under 2000 reservoir conditions.
2. Sum diversions by water use type within each county (by month and year). This will include municipal, manufacturing, mining, irrigation, and livestock water use. Water rights for irrigation greater than 10,000 ac-ft/yr and water rights for other uses greater than 1,000 ac-ft/yr are listed separately. (Table A-4 shows the water rights evaluated for the run-of-the river supplies.)

Determine the minimum yearly flow available for each use type. The sum of all minimums is the total permitted run-of-the-river flow available for the county.

Water Availability Models

The East Texas Region is located primarily within the Neches and Sabine Basins. Freese and Nichols, Inc. ran the Neches and Sabine WAMs making adjustments for contract agreements and other details not included in the TCEQ's original WAM. The East Texas Region also has water supplies originating in the Trinity, Neches-Trinity and the Cypress River Basin. Supplies in the Trinity and Neches-Trinity River Basins were evaluated using the respective WAMs. Those in the Cypress Basin are local supplies and were not evaluated with the WAM.

Generally, changes to the WAMs included:

- Re-assessment of reservoir sedimentation rates, and calculation of area-capacity conditions for current (2000) and future (2060) conditions.
- Inclusion of subordination agreements
- Inclusion of system operations where appropriate
- Other corrections

The water rights and contracting agreements were reviewed in the Neches and Sabine WAMs. The following adjustments were made to the WAMs to more accurately reflect the water rights and agreements in the river basins:

Neches River Basin WAM

- The drainage area ratio method was used to estimate the natural flows at un-gauged control points instead of the curve number method. This was due to the inconsistencies with curve numbers and mean precipitation values. (TCEQ subsequently accepted this change in their official model.)
- Modeled the Upper Neches River MWA's water rights as a system (Lake Palestine and Rocky Point dam).
- Sam Rayburn/Steinhagen water right was modeled subordinate to flow upstream above Ponta Dam (which is now Lake Columbia) and Weches Dam (special condition (d) of Certificate of Adjudication 4411)[1]. TCEQ subsequently accepted

1 Lake Columbia and the Weches Dam have not been constructed to date. Lake Columbia does have a water right

this change in their official model.

- The original TCEQ input file did not consider hydropower use in Sam Rayburn. Hydropower was included in the model. TCEQ subsequently included hydropower in their official model.
- Modeled the operation of LNVA's water rights as a system by including backup of LNVA's Pine Island water rights with storage from Sam Rayburn.
- The firm yield of Sam Rayburn/Steinhagen included a minimum elevation in Sam Rayburn of 149 ft. msl., and all storage available in Sam Rayburn up to elevation 164.4 ft. msl.
- The backup from Sam Rayburn/Steinhagen for water right 4415 (City of Beaumont) was deleted. This water right does not receive releases from these reservoirs.

Sabine River Basin WAM

- Adjusted the sedimentation rate for Lake Fork to equal the rate determined for Lake Tawakoni. Based on soil types and watershed characteristics of the two lakes, sedimentation for Lake Fork should be less than Lake Tawakoni. This rate will be re-assessed after a new volumetric survey is completed for Lake Fork.
- The Sabine River Authority's water rights in the lower basin were modeled as a system by backing up the Authority's canal water rights with releases from Toledo Bend Reservoir.
- The remainder of the yield of Toledo Bend was evaluated assuming all diversions were taken lakeside.
- The TCEQ Sabine WAM models Toledo Bend with hydropower. For purposes of finding total available supply for Toledo Bend, hydropower was excluded. Hydropower was included in the evaluation of supplies for all other reservoirs and run-of-the-river supplies.

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permit for 85,507 acre-feet per year.

The modified Trinity WAM for Region C was used to assess the supplies in Region I from this basin. There were no changes specific to Region I sources. No changes were made to the Neches-Trinity WAM.

The reservoir yields were evaluated under year 2000 and 2060 sediment conditions to determine available water supply. The 2060 conditions account for 60 years worth of additional sedimentation. The available water supply for the intermediate decades was interpolated from these two values. The sedimentation rates and year 2000 and year 2060 capacities for the Neches and Sabine Basins are shown in Tables A-1 and A-2, respectively.

Table A-1
Summary of Sedimentation for Reservoirs in the Neches River Basin

Reservoir	Date of Initial Survey	Date of Latest Survey	Sediment Rate (ac-ft/mi^2/yr)	2000 Capacity (ac-ft)	2060 Capacity (ac-ft)	Source
Athens	Jan-62	Jun-98	4.2141	29,331	23,870	Volumetric Survey
Jacksonville	Jan-57		0.2400	30,149	29,660	TWB 5912
Kurth	Jan-61	Dec-96	9.9610	14,646	12,256	Volumetric Survey
Nacogdoches	Jan-76	Jun-94	1.7229	38,683	29,597	Volumetric Survey
Palestine	Jan-62		0.2300	404,699	393,424	TWB 5912
Pinkston	Jan-78		0.2400	7,305	7,101	TWB 5912
Sam Rayburn	Jan-65		0.2300	2,828,003	2,785,859	TWB 5912
Steinhagen	Jan-51	May-03	0.1506	69,197	34,619	Volumetric Survey
Stryker	Jan-57	Jan-96	0.8635	22,236	12,807	Volumetric Survey
Tyler	Jan-66	Jan-97	0.2116	80,130	78,771	Volumetric Survey

Table A-2
Summary of Sedimentation for Reservoirs in the Sabine River Basin

Reservoir	Date of Initial Survey	Date of Latest Survey	Sediment Rate (ac-ft/mi^2/yr)	2000 Capacity (ac-ft)	2060 Capacity (ac-ft)	Source
Brandy	Jan-82		0.2400	29,496	29,438	TWB 5912
Cherokee	Oct-48	Oct-96	0.6855	41,154	34,655	Volumetric Survey
Fork	Jul-79	Mar-01	1.7418	658,213	606,691	See note (a)
Gladewater	Sep-52	Feb-00	1.3329	4,742	1,943	Volumetric Survey
Hawkins	Aug-62		0.2400	11,890	11,189	TWB 5912
Holbrook	Sep-62		0.2400	7,856	7,640	TWB 5912
Martin	Apr-74	May-99	0.7312	75,171	69,468	Volumetric Survey
Murvaul	Dec-57	Nov-98	1.6058	38,069	26,989	Volumetric Survey
Quitman	May-62		0.2400	7,122	6,620	TWB 5912
Tawakoni	Oct-60	Apr-97	1.7418	884,561	805,554	Volumetric Survey
Toledo Bend	Oct-66		0.1200	4,455,517	4,416,752	FN Report for SRA
Winnsboro	Jun-62		0.2400	7,856	7,468	TWB 5912

(a) The volumetric survey conducted for Lake Fork in March 2001 indicated a greater sedimentation rate than determined for other local reservoirs. It was decided to use the sedimentation rate for Lake Tawakoni to calculate the reservoir capacity in 2060 for Lake Fork. It is recommended that the sedimentation rate be re-calculated after completion of a new volumetric survey.

A summary of the WAM Run 3 results for reservoirs in the East Texas Region is shown in Table A-3. This table also lists any special conditions associated with the reservoir and constraints used in the evaluation. These reservoir yields are for planning purposes only and do not change or modify any existing water right or mean that the water right holder cannot divert the full amount of the water right.

Table A-3
Reservoir Yields[1]

Reservoir	Water Right Number	Permitted Diversion (ac-ft/yr)	Special Conditions	Firm Yield Year 2000 (ac-ft/yr) (WAM Run 3)	Firm Yield Year 2060 (ac-ft/yr) (WAM Run 3)	Constraints
Neches River Basin						
Athens	3256	8,500		6,145	5,660	
Bellwood	3237	2,200		950	950	
Columbia (Eastex)	4537	85,507		75,700	64,900	Not built
Jacksonville	3274	6,200		8,460	8,395	Permitted Diversion
Kurth	4393	19,100	10,000 acre-feet diverted from Lake Striker to refill storage at Lake Kurth.	18,425	18,400	
Nacogdoches	4864	22,000		8,600	6,420	
Palestine	3254	192,110		176,200	168,600	
Palestine System				222,200	214,600	
Pinkston	4404	3,800		2,045	1,960	
Rusk	4219	160		65	60	
Sam Rayburn/ Steinhagen	4411	820,000	Water right is subordinate to flow upstream of Weches & Ponta dam sites	951,500	927,200	Permitted Diversion
San Augustine	4409	1,285		1,285	1,285	
Stryker	4847	20,600		21,010	16,050	Permitted Diversion
Timpson	4399	350		1,395	1,395	Permitted Diversion
Tyler/East Tyler	4853	40,325		35,490	35,295	
Sabine River Basin						
Center	4657	1,460		754	754	
Martin	4649	25,000		29,900	29,600	
Murvaul	4654	22,400		22,380	18,850	
Toledo Bend	4658	750,000	Sabine Compact	974,500	947,000	Permitted Diversion
Trinity River Basin						
Houston County	5097	3,500		7,000	6,100	Permitted Diversion

1. Reservoir yields 2000 & 2060 were determined using modified versions of the TCEQ WAM Run 3.

The following table presents the water rights considered for run-of-the-river diversions. Water rights for brackish water are included with zero diversions in the WAMs and are not listed here.

Table A-4

Run-of-the-River Water Rights

County	Use Type	Water Right Number	Permitted Amount
Neches River Basin			
Anderson	Irrigation	3261	20
Anderson	Irrigation	3266	25
Anderson	Irrigation	3280	19
Anderson	Irrigation	3282	175
Anderson	Irrigation	3283	13
Anderson	Irrigation	3284	18
Anderson	Irrigation	3285	75
Anderson	Irrigation	3286	45
Anderson	Irrigation	5228	800
Angelina	Irrigation	4382	9
Angelina	Irrigation	4383	200
Angelina	Industrial	4384	3,000
Angelina	Irrigation	4386	1
Angelina	Irrigation	5389	30
Cherokee	Irrigation	3269	3
Cherokee	Irrigation	3275	55
Cherokee	Irrigation	3276	54
Cherokee	Irrigation	3277	9
Cherokee	Irrigation	3278	7
Cherokee	Irrigation	3279	7
Cherokee	Irrigation	3301	40
Cherokee	Irrigation	3303	20
Cherokee	Irrigation	4195	195
Cherokee	Municipal	4219	80
Cherokee	Irrigation	4219	40
Cherokee	Irrigation	4356	120
Cherokee	Irrigation	4543	12
Cherokee	Irrigation	4596	30
Cherokee	Irrigation	4846	2
Cherokee	Irrigation	4857	11
Cherokee	Irrigation	4858	100
Cherokee	Irrigation	4859	13
Cherokee	Irrigation	4860	7
Cherokee	Irrigation	4861	13
Hardin	Irrigation	4432	200
Henderson	Irrigation	3248	40
Henderson	Irrigation	3250	200
Houston	Irrigation	3287	75
Houston	Irrigation	3288	30
Houston	Irrigation	3289	168
Houston	Irrigation	3290	105

Table A-4 (continued)

County	Use Type	Water Right Number	Permitted Amount
Neches River Basin			
Houston	Irrigation	3291	88
Houston	Irrigation	3292	83
Houston	Irrigation	3293	23
Houston	Irrigation	3294	34
Houston	Irrigation	3295	20
Houston	Irrigation	3296	2
Houston	Irrigation	3297	21
Houston	Irrigation	3298	83
Houston	Irrigation	3299	38
Jasper	Mixed	4411	381,876
Jasper	Industrial	4412	811
Jasper	Irrigation	4413	120
Jasper	Irrigation	4414	125
Jasper	Industrial	5027	225
Jefferson	Municipal and Industrial	4415	56,467
Nacogdoches	Irrigation	4115	5
Nacogdoches	Irrigation	4269	10
Nacogdoches	Irrigation	4279	7
Nacogdoches	Irrigation	4395	1
Nacogdoches	Irrigation	4396	10
Nacogdoches	Irrigation	4397	42
Nacogdoches	Irrigation	4401	10
Nacogdoches	Industrial	4401	5
Nacogdoches	Municipal	4402	1
Nacogdoches	Irrigation	4403	111
Nacogdoches	Irrigation	4406	11
Nacogdoches	Irrigation	4448	9
Nacogdoches	Irrigation	4862	3
Nacogdoches	Irrigation	4865	116
Nacogdoches	Irrigation	4866	47
Nacogdoches	Irrigation	4867	214
Nacogdoches	Irrigation	4869	9
Nacogdoches	Irrigation	4872	34
Nacogdoches	Irrigation	4873	42
Nacogdoches	Irrigation	5134	525
Nacogdoches	Irrigation	5486	70
Rusk	Irrigation	4839	26
Rusk	Industrial	4839	2
Rusk	Irrigation	4840	20
Rusk	Irrigation	4841	60
Rusk	Industrial	5314	300
Rusk	Irrigation	5629	105
Sabine	Industrial	4410	456
Smith	Irrigation	3224	300
Smith	Irrigation	3226	14

Table A-4 (continued)

County	Use Type	Water Right Number	Permitted Amount
Neches River Basin			
Smith	Mining	3230	57
Smith	Mining	3231	60
Smith	Irrigation	3233	65
Smith	Irrigation	3235	6
Smith	Irrigation	3236	13
Smith	Industrial	3238	200
Smith	Irrigation	4030	15
Smith	Industrial	5041	0
Trinity	Irrigation	4380	100
Tyler	Irrigation	4387	4
Tyler	Irrigation	4392	250
Tyler	Irrigation	4426	80
Tyler	Irrigation	4429	35
Tyler	Irrigation	4430	10
Tyler	Irrigation	5484	27
Sabine River Basin			
Newton	Industrial	4659	235
Newton	Industrial	4662	100,400
Newton	Irrigation	4662	46,700
Newton	Irrigation	4660	50
Orange	Irrigation	4663	67
Panola	Industrial	4652	286
Panola	Irrigation	4226	70
Panola	Irrigation	4238	77
Panola	Irrigation	4653	50
Panola	Irrigation	4656	118
Panola	Mining	5747	600
Rusk	Industrial	4637	15
Rusk	Industrial	4641	1
Rusk	Industrial	4648	4
Rusk	Irrigation	4627	80
Rusk	Irrigation	4638	37
Rusk	Irrigation	4639	50
Rusk	Irrigation	4640	16
Rusk	Municipal	5578	10
Neches-Trinity River Basin			
Jefferson	Industrial	4441	336
Jefferson	Industrial	4494	107,787
Jefferson	Industrial	4495	121
Jefferson	Industrial	4479	620
Jefferson	Irrigation	4475	12,000
Jefferson	Irrigation	4477	14,416
Jefferson	Irrigation	4060	595
Jefferson	Irrigation	4100	3,358

Table A-4 (continued)

County	Use Type	Water Right Number	Permitted Amount
Neches-Trinity River Basin			
Jefferson	Irrigation	4228	1,191
Jefferson	Irrigation	4229	480
Jefferson	Irrigation	4271	3,000
Jefferson	Irrigation	4313	6,365
Jefferson	Irrigation	4314	2,402
Jefferson	Irrigation	4439	504
Jefferson	Irrigation	4440	7,500
Jefferson	Irrigation	4443	700
Jefferson	Irrigation	4444	700
Jefferson	Irrigation	4445	335
Jefferson	Irrigation	4446	350
Jefferson	Irrigation	4447	396
Jefferson	Irrigation	4448	350
Jefferson	Irrigation	4449	1,862
Jefferson	Irrigation	4450	1,800
Jefferson	Irrigation	4451	969
Jefferson	Irrigation	4452	242
Jefferson	Irrigation	4453	2,550
Jefferson	Irrigation	4454	539
Jefferson	Irrigation	4455	844
Jefferson	Irrigation	4456	350
Jefferson	Irrigation	4457	607
Jefferson	Irrigation	4458	276
Jefferson	Irrigation	4459	511
Jefferson	Irrigation	4460	3,150
Jefferson	Irrigation	4461	397
Jefferson	Irrigation	4462	217
Jefferson	Irrigation	4463	63
Jefferson	Irrigation	4464	560
Jefferson	Irrigation	4465	600
Jefferson	Irrigation	4466	2,475
Jefferson	Irrigation	4467	154
Jefferson	Irrigation	4468	1,551
Jefferson	Irrigation	4469	620
Jefferson	Irrigation	4470	3,805
Jefferson	Irrigation	4471	525
Jefferson	Irrigation	4472	400
Jefferson	Irrigation	4473	336
Jefferson	Irrigation	4474	1,500
Jefferson	Irrigation	4476	9,477
Jefferson	Irrigation	4478	500
Jefferson	Irrigation	4480	55
Jefferson	Irrigation	4481	2,800
Jefferson	Irrigation	4482	5,000
Jefferson	Irrigation	4484	3,500
Jefferson	Irrigation	4485	1,138

Table A-4 (continued)

County	Use Type	Water Right Number	Permitted Amount
Neches-Trinity River Basin			
Jefferson	Irrigation	4486	438
Jefferson	Irrigation	4487	2,480
Jefferson	Irrigation	4488	788
Jefferson	Irrigation	4489	3,500
Jefferson	Irrigation	4490	1,050
Jefferson	Irrigation	4491	77
Jefferson	Irrigation	4492	900
Jefferson	Irrigation	5069	1,250
Jefferson	Mining	4442	77
Trinity River Basin			
Anderson	Irrigation	5071	124
Anderson	Irrigation	5072	44
Anderson	Irrigation	5074	3
Anderson	Irrigation	5301	10
Houston	Irrigation	5091	83
Houston	Irrigation	5092	84
Houston	Irrigation	5093	9
Houston	Irrigation	5094	20
Houston	Irrigation	5095	40
Houston	Irrigation	5096	51
Houston	Irrigation	5098	20

Source: TCEQ water rights database.

Water right numbers refer to the listed water right number in the TCEQ database. This represents either the Certificate of Adjudication or Water Right Permit.

Appendix B

Determination Of Available Groundwater Supplies And Quality

Background

The concepts of groundwater availability and aquifer sustainability have been debated significantly in recent years. For groundwater source availability, the TWDB planning guidelines (Exhibit B) require that regional planning groups "*Calculate the largest annual amount of water that can be pumped from a given aquifer without violating the most restrictive physical or regulatory or policy conditions limiting withdrawals, under drought-of-record conditions. Regulatory conditions refer specifically to any limitations on pumping withdrawals imposed by groundwater conservation districts through their rules and permitting programs.*" This guideline requires that planning groups make a policy decision as to the interpretation of the term "most restrictive" as it relates to long-term groundwater availability.

TWDB Exhibit B further requires that "Once GAM (Groundwater Availability Model) information is accessible for an area within a region, the Planning Group shall incorporate this information in its next planning cycle unless better site-specific information is developed." The East Texas Regional Water Planning Group determined that the available Queen City/Sparta/Carrizo Wilcox GAM was the most appropriate tool for analyzing regional groundwater availability in the Region for the Carrizo-Wilcox and Queen City/Sparta aquifers. A predictive GAM for the Gulf Coast model was not available until April 2005 and therefore was not used to determine supply for the Gulf Coast aquifers. A GAM has not been completed for the Yegua-Jackson aquifer. Therefore, the ground-water availability assessment for the Gulf Coast and Yegua-Jackson and other small aquifers were based on published information, historical water use data from these aquifers, available well and water level records, and the knowledge base of the consultant team.

The GAMs are regional models that were developed as a tool to better understand long-term regional impacts from historical and proposed groundwater pumping. The GAMs do not define, estimate, or prescribe groundwater availability or supply for the East Texas Region, but rather provide a tool to evaluate aquifer water level impacts under different pumping scenarios.

Approach

The East Texas Regional Water Planning Group determined that it is in the best interest of the Region to maintain an acceptable level of aquifer sustainability during the 50-year planning window as well as for future generations beyond the 50-year planning period. Thus, for the Carrizo-Wilcox, Queen City, and Sparta aquifers (for which a GAM exists), the ground-water availability for the planning period was defined as the amount of groundwater that could be withdrawn from aquifers over the next 50 years that would not cause more than 50 feet of water level decline (or more than a 10% decrease in the saturated thickness in outcrop areas) in the aquifers as compared to water levels in 2000. These criteria were used to guide the development of the ground-water availability assessment and to determine groundwater supply for each aquifer in each county. The planning group acknowledges that additional water does occur in storage within the aquifers and that a portion of that water (above than the estimated supply) could be pumped if there is not a groundwater conservation district in place to prevent such withdrawals.

The steps involved in determining the water supply by county and aquifer using the Queen City/Sparta/Carrizo Wilcox GAM[1] is summarized below. Because the GAM does not "output" a value for groundwater availability or supply, the model was used to determine the impact of different pumping scenarios so that those impacts could be compared to the criteria set by the planning group. In other words, an iterative approach was used to determine what groundwater demand in each county would result in no more than 50 feet of water level decline

1 Kelley, V.A. and others, 2004. Groundwater Availability Models for the Queen City and Sparta Aquifers.

or 10% decline in saturated thickness in the outcrop areas. Future pumping locations are not known with certainty. Therefore, the total “estimated” supply was distributed equally across each county and implemented into the predictive GAM model (2000-2050). The pumping was assumed to be constant starting in 2001, and was held at the projected level for 50 years.

The drawdown across the model area was then assessed to determine if the drawdown criteria were met (i.e., if the average drawdown across the county was less about 50 feet). Depending on the drawdown results, projected supplies were adjusted and another simulation completed. This approach was used until the average drawdown in each county met the criteria at the end of the 50-year simulation period. The supply for the county and aquifer was then set equal to the total county pumping that was necessary to meet the drawdown criteria.

Some of the groundwater in the region is brackish (i.e., above 1000 mg/L of total dissolved solids). In order to be used for municipal supply, the brackish groundwater may require treatment. The portion of groundwater that is brackish can been estimated by looking at the overall water quality in each county on an aquifer-by-aquifer basis. The groundwater quality information is discussed in more detail in the following sections.

Groundwater Quality

The TWDB well database was used to complete a detailed water quality assessment of the aquifers in the East Texas Region. TWDB standard water quality constituent analytical results from wells within the region were compared to primary and secondary drinking water maximum contaminant level (MCL) when the database contained sufficient data. In the case of fluoride, the lower secondary MCL of 2 mg/L was used for comparison purposes. The standard water quality constituents studied were: sulfate, chloride, pH, TDS, nitrate, and fluoride.

TWDB infrequent water quality constituent analytical results were also compared to primary drinking water MCLs. Only constituents with primary drinking water MCLs and representative data records were selected for this effort. Only the most recent data for each well was used. The infrequent water quality constituents studied were: gross alpha, arsenic, barium, cadmium, chromium, copper, lead, and selenium. Organic and other regulated infrequent constituent data was very sparse and were not considered to be representative. Table 1 summarizes the results for the Carrizo Wilcox aquifer and maps of Carrizo-Wilcox groundwater quality in the East Texas Region are included at the end of this Appendix.

Table 1 Groundwater quality summary for Carrizo Wilcox aquifer in East Texas Region.

MCL Class	Constituent	Limit(s)	Units	Total Results	Results over MCL	% Over	Average	Median
primary	Alpha	15	pc/L	144	1	0.7%	< 3	< 2
primary	Arsenic	10	µg/L	303	1	0.3%	< 6	< 2
primary	Barium	2000	µg/L	236	0	0.0%	< 140	30.05
primary	Cadmium	5	µg/L	286	0	0.0%	< 4	< 2
primary	Chromium	100	µg/L	282	0	0.0%	< 10	< 5
primary	Lead	15	µg/L	263	3	1.5%	< 12	< 5
primary	Nitrate as N	10	mg/L	830	6	0.7%	1.7	0.22
primary	Selenium	50	µg/L	288	3	1.0%	< 6	< 2
secondary	Copper	1000	µg/L	297	0	0.0%	< 20	4.77
secondary	Fluoride	2	mg/L	819	5	0.6%	0.33	0.2
secondary	Chloride	300	mg/L	909	5	0.6%	59	15
secondary	Iron	300	µg/L	811	192	23.7%	821	< 100
secondary	Manganese	50	µg/L	488	48	9.8%	35	< 20
secondary	pH	6.5 - 8.5		817	287	35.1%	7.9	8.2
secondary	Sulfate	300	mg/L	908	3	0.3%	32	16
secondary	Total Dissolved Solids	1000	mg/L	909	5	0.6%	404	299

CARRIZO-WILCOX WATER QUALITY DESCRIPTIONS

Alpha

Only one result for dissolved alpha particles exceeded the 15 pCi/L primary MCL in the Carrizo-Wilcox in the East Texas Region. This result was 23 pCi/L and the sample was collected from a shallow well on the Carrizo outcrop in northern Sabine county. The alpha results are well distributed spatially in the outcrop and downdip sections of the Carrizo-Wilcox in the East Texas Region. Alpha particles were only detected in 15% of the groundwater results in the region. Typical reporting limits were 2, 3, and 4 pCi/L.

Arsenic

No arsenic results exceeded the 10 µg/L primary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region. The results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. One arsenic result was non-detect with a reporting limit that exceeded the current MCL. This result was not included the figure for this aquifer group in the East Texas Region. Arsenic was detected above the 10 µg/L primary MCL in only one result from the Carrizo-Wilcox aquifer in the East Texas Region. Arsenic was detected in less than 2% of all of the results in the region. Typical reporting limits were 1, 2, 5, and 10 µ/L.

Barium

No barium results exceeded the 2,000 µg/L primary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region. The results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. Barium was detected in most of the results, and the average for all of the detections is less than 140 µg/L, and the median is less than 2 µg/L.

Cadmium

No cadmium results exceeded the 5 µg/L primary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region. The results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. Cadmium was only detected in 1% of the results in the region. Typical reporting limits were 1, 2, and 5 µ/L. There were several results in which cadmium was not detected with a reporting limit of 10 µg/L. These results were not considered useful since the reporting limit exceeded the MCL and were not included in the summary table or figure.

Chromium

Chromium was not detected in any of the results above the 100 µg/L primary MCL in the Carrizo-Wilcox aquifer in the East Texas Region. The results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. Chromium was detected in approximately 30% of the results, and the average for all of the results is <10 µg/L, and the median is <5 µg/L.

Lead

Lead was not detected in any of the results above the 15 µg/L primary MCL in the

Carrizo-Wilcox aquifer in the East Texas Region. Three lead results exceeded the 15 µg/L primary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region. The remaining results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. Lead was detected in approximately 12% of the results, and the average for all of the results is <12 µg/L, and the median is <5 µg/L. There were 95 lead results that were below reporting limits that exceeded the current MCL (reporting limits greater than 15 µg/L). These results were not included the figure or table for this aquifer group in the East Texas Region.

Nitrate as N

Six nitrate results exceeded the 10 mg/L (as N) primary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region. Most of these were from samples collected from shallow wells on the Carrizo outcrop, but these were not concentrated in any particular area. The remaining results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. Nitrate (as N) was detected above the primary MCL of 10 mg/L in less than 1% of the results in the Carrizo-Wilcox aquifer in the East Texas Region. The average for all of the results is 1.7 mg/L, and the median for all of the results is 0.22 mg/L.

Selenium

Three selenium results exceeded the 50 µg/L primary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region. Two of these results were in Angelina County, and one was in Anderson County. All three were in the downdip section of the Carrizo. The results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. Selenium was detected above the 50 µg/L primary MCL in 1% of the results in the Carrizo-Wilcox aquifer in the East Texas Region. Selenium was detected in only 7% of the results, and the average for all of the results is <6 µg/L, and the median is 4.77 µg/L.

Copper

Copper was not detected above the 1,000 µg/L secondary MCL or the 1,300 µg/L primary MCL in the Carrizo-Wilcox aquifer in the East Texas Region. The results considered were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. The average for all of the results is <20 µg/L, and the median is 0.2 µg/L.

Fluoride

Five fluoride results exceeded the 2 mg/L secondary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region. Three of these results were from deep wells in the Wilcox in western Rusk County, and there were several other wells in this area with elevated levels of fluoride (well above the average for the region, in the 1.5 - 2 mg/L range). The other two results that exceeded the secondary MCL were in eastern Shelby County. No results exceeded the 4 mg/L primary MCL. The available results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. Fluoride was detected above the secondary MCL of 2 mg/L in less than 1% of the results in the Carrizo-Wilcox aquifer in the East Texas Region. None of the results exceeded the primary MCL of 4 mg/L. The average for all of the results is 0.33 mg/L, and the median for all of the results is 0.2 mg/L.

Chloride

Only five chloride results exceeded the 300 mg/L secondary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region, and no significant spatial trends appear to be associated with these results. A disproportionate number of results in Panola County are in the 100-300 mg/L range, but these are all below the 300 mg/L secondary MCL. The available results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. Chloride was detected in less than 1% of the results above the secondary MCL of 300 mg/L in the Carrizo-Wilcox aquifer in the East Texas Region. The average for all of the results is 59 mg/L, and the median for all of the results is 15 mg/L.

Iron

About one-quarter of iron sample results in the Carrizo-Wilcox aquifer group exceeded the 300 µg/L secondary MCL in the East Texas Region. The results that exceeded the MCL were evenly distributed spatially and represented samples collected from wells completed in both the Carrizo and Wilcox Formations. Iron was detected above the secondary MCL of 300 µg/L in 23.7% of the results above in the Carrizo-Wilcox aquifer in the East Texas Region. The average for all of the results is 821 µg/L, and the median for all of the results is <100 µg/L, indicating that the average is skewed upward due to the presence of a limited number of high values.

Manganese

Forty-eight manganese sample results in the Carrizo-Wilcox aquifer group exceeded the

50 µg/L secondary MCL in the East Texas Region. The results that exceeded the MCL were evenly distributed spatially and represented samples collected from wells completed in both the Carrizo and Wilcox Formations. Manganese was detected in 9.8% of the results above the secondary MCL of 50 µg/L in the Carrizo-Wilcox aquifer in the East Texas Region. Manganese was detected in approximately half of the results, and the average for all of the results is 35 µg/L, and the median for all of the results is <20 µg/L.

pH

About one-third of pH results in the Carrizo-Wilcox aquifer group were outside of the 6.5 - 8.5 secondary MCL range in the East Texas Region. Most of the out-of-range results were more alkaline than the upper pH MCL of 8.5. The results that were out of the MCL range were evenly distributed spatially and represented samples collected from wells completed in both the Carrizo and Wilcox Formations. The pH of water samples was outside the secondary MCL range of 6.5 to 8.5 in 35% of the results in the Carrizo-Wilcox aquifer in the East Texas Region. The range of all of the results was 3.6 to 10.7, and the average is 7.9 and the median is 8.2.

Sulfate

Only three sulfate results exceeded the 300 mg/L secondary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region. Two of these are from wells in the Wilcox in northwestern Nacogdoches County. However, several other results in the immediate area are well below the MCL. A disproportionate number of results in northwestern Cherokee County are in the 150-300 mg/L range, but these are all below the 300 mg/L secondary MCL. The available results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. Sulfate was detected in less than 1% of the results above the secondary MCL of 300 mg/L in the Carrizo-Wilcox aquifer in the East Texas Region. The average for all of the results is 32 mg/L, and the median for all of the results is 16 mg/L.

Total Dissolved Solids

Only four TDS results exceeded the 1,000 mg/L secondary MCL in the Carrizo-Wilcox aquifer group in the East Texas Region. TDS results tended to be higher in Panola, Rusk, Shelby, and eastern Anderson Counties, but these were for the most part below the secondary MCL. The available results were well distributed spatially throughout the Carrizo-Wilcox aquifer group in the East Texas Region. The total dissolved solids concentration was above the secondary MCL of 1,000 mg/L in less than 1% of the results in the Carrizo-Wilcox aquifer in the East Texas Region. The average for all of the results is 404 mg/L, and the median for all of the results is 299 mg/L.

GULF COAST WATER QUALITY

Table 2 summarizes the results for the Gulf Coast aquifer and maps of Gulf Coast groundwater quality in the East Texas Region are included at the end of this Appendix.

Table 2 Groundwater quality summaries for Gulf Coast aquifer in East Texas Region.

MCL Class	Constituent	Units	Total results	Results over MCL	% Over	Average	Median	Limit(s)
primary	Alpha	pc/L	82	1	1.2%	3	2	15
primary	Arsenic	µg/L	116	0	0.0%	4	2	10
primary	Barium	µg/L	116	1	0.9%	177	109	2000
primary	Cadmium	µg/L	97	0	0.0%	< 2	< 1	5
primary	Chromium	µg/L	97	0	0.0%	< 10	< 1	100
primary	Lead	µg/L	115	0	0.0%	< 2	< 1	15
primary	Nitrate as N	mg/L	712	58	8.1%	3	0.0	10
primary	Selenium	µg/L	116	0	0.0%	4	4	50
secondary	Copper	µg/L	116	0	0.0%	10	2.26	1000
secondary	Fluoride	mg/L	511	5	1.0%	0	0.20	2
secondary	Chloride	mg/L	952	120	12.6%	154	32	300
secondary	Iron	µg/L	373	100	26.8%	520	100	300
secondary	Manganese	µg/L	142	51	35.9%	65	26	50
secondary	pH		393	93	23.7%	7.2	7.3	6.5 - 8.5
secondary	Sulfate	mg/L	947	9	1.0%	18	3	300
secondary	Total Dissolved Solids	mg/L	950	96	10.1%	450	224	1000

Alpha

Only one result for alpha particles exceeded the 15 pCi/L primary MCL in the Gulf Coast in the East Texas Region. This result was 29 pCi/L and the sample was collected from a 532-ft well in Beaumont completed in the Chicot Aquifer. The alpha results are well distributed spatially in the Gulf Coast Aquifer in the East Texas Region. The average for all of the results is 3 pCi/L, and the median for all of the results is 2 pCi/L.

Arsenic

No arsenic results exceeded the 10 µg/L primary MCL in the Gulf Coast aquifer group in the East Texas Region. The results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. The average for all of the results is 4 µg/L, and the median is 2 µg/L.

Barium

Barium was detected in only one of the results above the 2,000 µg/L primary MCL in the Gulf Coast aquifer group in the East Texas Region. This result was from a sample collected from a well completed in the Chicot in Jefferson County. The results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. Barium was detected in more than 95% of the results, and the average for all of the results is 177 µg/L, and the median is 109 µg/L.

Cadmium

No cadmium results exceeded the 5 µg/L primary MCL in the Gulf Coast aquifer group in the East Texas Region. The results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. There were 44 cadmium results were below reporting limits that exceeded the current MCL. These results were not included in the figure for this aquifer group in the East Texas Region. Cadmium was not detected in any results in the Gulf Coast aquifer group in the East Texas Region. The typical reporting limit was 1 mg/L. There were several results in which cadmium was not detected with a reporting limit of 10 µg/L. These results were not considered useful since the reporting limit exceeded the MCL and were not included in the summary table or figure.

Chromium

No chromium results exceeded the 100 µg/L primary MCL in the Gulf Coast aquifer group in the East Texas Region. The results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. Chromium was only detected in one of the results in the Gulf Coast aquifer group in the East Texas Region, and it was not above the 100 µg/L primary MCL. Typical reporting limits were 1 and 20 µg/L.

Lead

No lead results exceeded the 15 µg/L primary MCL in the Gulf Coast aquifer group in the East Texas Region. The results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. There were 35 lead results that were below reporting limits that exceeded the current MCL (reporting limits greater than 15 µg/L). These results were not included the figure or table for this aquifer group in the East Texas Region. The average for all of the lead results is less than 2 µg/L, and the median for all of the results is less than 1 µg/L.

Nitrate as N

For 58 out of 712 samples, the analytical results exceeded the Gulf Coast aquifer in the East Texas Region primary MCL of 10 mg/L (as N). Most of the results that exceeded the MCL were from samples collected from shallow wells. The remaining results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. It should also be noted that the majority of these nitrate results are from samples collected before 1970. These represent the most recent results from these wells. Relatively few samples have been collected in the Gulf Coast aquifer group in the East Texas Region since that time. Nitrate (as N) was detected in 8.1% of the results above the primary MCL of 10 mg/L in the Gulf Coast aquifer group in the East Texas Region. The average for all of the results is 3 mg/L, and the median for all of the results is 0.05 mg/L.

Selenium

Selenium was not detected above the 50 µg/L primary MCL in any of the results in the Gulf Coast aquifer group in the East Texas Region. The results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. Selenium was detected in only three of the results, with typical reporting limits in the 2 – 6 µg/L range.

Copper

No copper results exceeded the 1,000 µg/L primary MCL in the Gulf Coast aquifer group in the East Texas Region. The results considered were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. Copper was detected in 27.5% of the results, and the average for all of the results is 10 µg/L, and the median is 2.26 µg/L, indicating that the average is skewed upward due to the presence of a limited number of high values.

Fluoride

Five fluoride results exceeded the 2 mg/L secondary MCL in the Gulf Coast aquifer group in the East Texas Region. Four of these were from samples collected from wells completed in the Evangeline, Jasper, and Gulf Coast in Hardin County. Sample results from three other wells completed in the Evangeline, Chicot, and Gulf Coast in this area had elevated levels of fluoride (well above the average for the region, in the 1.5 - 2 mg/L range). The remaining sample result that exceeded the MCL was collected from a well completed in the Chicot in Jefferson County. The available results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. Fluoride was detected in 1% of the results above the secondary MCL of 2 mg/L in the Gulf Coast aquifer group in the East Texas Region. Of these, none were above the primary MCL of 4 mg/L. Fluoride was detected in nearly all of the results, and the average for all of the results is 0.35 mg/L, and the median for all of the results is 0.2 mg/L.

Chloride

About 13% of chloride results exceeded the 300 mg/L secondary MCL in the Gulf-Coast aquifer group in the East Texas Region. Most of these results were collected from wells completed in the Chicot in Jefferson, Orange, and southern Hardin Counties. Six results from the Catahoula in northern Tyler and Jasper Counties exceeded the secondary MCL. The available results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. The average for all of the chloride results is 154 mg/L, and the median for all of the results is 32 mg/L, indicating that the average is skewed upward due to the presence of a limited number of relatively high values.

Iron

About one-quarter of iron sample results in the Gulf Coast aquifer group exceeded the 300 µg/L secondary MCL in the East Texas Region. Several results from samples collected from wells completed in the Jasper Aquifer south of Woodville in Tyler County exceeded the MCL. Shallow wells completed in the Burkeville Aquiclude in central Polk County also produced samples (in 1947) that exceeded the current secondary MCL for iron. The Catahoula in northern

Polk, Tyler, and Jasper Counties was as third source of sample results that exceeded the MCL. The remaining results that exceeded the MCL were evenly distributed spatially and represented samples collected from wells completed in several formations in the Gulf Coast aquifer group. Iron was detected in 26.8% of the results above the secondary MCL of 300 µg/L in the Gulf Coast aquifer group in the East Texas Region. Iron was detected in more than 80% of the results, and the average for all of the results is 520 µg/L, and the median for all of the results is only 100 µg/L, indicating that the average is skewed upward due to the presence of a limited number of high values.

Manganese

About one-third manganese sample results in the Gulf Coast aquifer group exceeded the 50 µg/L secondary MCL in the East Texas Region. A significant percentage of results from Jasper aquifer wells in Polk, Tyler, Jasper, and Newton Counties exceeded the MCL. Several other results exceeding the MCL were from samples collected from the Chicot aquifer in Jefferson, Jasper, Newton, and Hardin Counties. A small percentage of results from wells completed in the Evangeline also exceeded the MCL for manganese. Manganese was detected in 35.9% of the results above the secondary MCL of 50 µg/L in the Gulf Coast aquifer group in the East Texas Region. Manganese was detected in approximately 78% of the results, and the average for all of the results is 65 µg/L, and the median for all of the results is only 26 µg/L, indicating that the average is skewed upward due to the presence of a limited number of high values.

pH

About one-quarter of results from the Gulf Coast aquifer group were outside of the 6.5 - 8.5 secondary MCL range in the East Texas Region. Most of the out-of-range results were more below the lower pH MCL of 6.5, and these were from samples collected from the Chicot, Jasper, and Evangeline aquifers in Polk, Tyler, Jasper, and Newton Counties. The results available were evenly distributed spatially in the Gulf Coast aquifer group in the East Texas Region. The pH of water samples was outside the secondary MCL range of 6.5 to 8.5 in 23.7% of the results in the Gulf Coast aquifer group in the East Texas Region. The range of all of the results was 4.7 to 9.08, and the average is 7.2, and the median is 7.3.

Sulfate

Only 9 sulfate results exceeded the 300 mg/L secondary MCL in the Gulf-Coast aquifer group in the East Texas Region. All of these results were collected from wells in Jefferson County. The available results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. Sulfate was detected in 1% of the results above the secondary MCL of 300 mg/L in the Gulf Coast aquifer group in the East Texas Region. The average for all of the results is 18 mg/L, and the median for all of the results is 3 mg/L.

Total Dissolved Solids

About 10% of TDS results exceeded the 1,000 mg/L secondary MCL in the Gulf-Coast aquifer group in the East Texas Region. Most of these results were collected from wells completed in the Chicot in Jefferson, Orange, and southern Hardin Counties. Six results from the Catahoula in northern Tyler and Jasper Counties exceeded the secondary MCL. The available results were well distributed spatially throughout the Gulf Coast aquifer group in the East Texas Region. The total dissolved solids concentration was above the secondary MCL of 1,000 mg/L in 96 results in the Gulf Coast aquifer group in the East Texas Region. The average for all of the results is 450 mg/L, and the median for all of the results is 224 mg/L.

QUEEN CITY-SPARTA WATER QUALITY

Table 3 summarizes the results for the Queen City/Sparta Aquifer.

Table 3 Groundwater quality summaries for Queen City/Sparta aquifer in East Texas Region.

MCL Class	Constituent	Limit(s)	Units	Total Results	Results over MCL	% Over	Average	Median
primary	Alpha Radiation	15	pc/L	43	0	0.0%	< 3	< 3
primary	Arsenic	10	µg/L	68	0	0.0%	< 2	< 2
primary	Barium	2000	µg/L	68	0	0.0%	62	45.75
primary	Cadmium	5	µg/L	65	1	1.5%	< 1	< 1
primary	Chromium	100	µg/L	65	0	0.0%	3	1.43
primary	Lead	15	µg/L	68	0	0.0%	< 3	< 1
primary	Nitrate (as N)	10	mg/L	338	15	4.4%	2.0	0.19
primary	Selenium	50	µg/L	65	0	0.0%	< 4	< 4

MCL Class	Constituent	Limit(s)	Units	Total Results	Results over MCL	% Over	Average	Median
secondary	Copper	1000	µg/L	68	0	0.0%	8	2.8
secondary	Fluoride	2	mg/L	332	6	1.8%	0.3	0.1
secondary	Chloride	300	mg/L	568	11	1.9%	45	17
secondary	Iron	300	µg/L	287	97	33.8%	1375	125
secondary	Manganese	50	µg/L	86	13	15.1%	42	13
secondary	pH	6.5 - 8.5		328	143	43.6%	6.9	6.975
secondary	Sulfate	300	mg/L	537	13	2.4%	55	10
secondary	Total Dissolved Solids	1000	mg/L	569	15	2.6%	261	130

Alpha

Dissolved alpha particles were not detected above the 15 pCi/L primary MCL in the Queen City-Sparta aquifer in the East Texas Region. No alpha results were available for the Sparta in Sabine County Alpha particles were only detected in less than 20% of the groundwater results in the region.

Arsenic

Arsenic was detected in only two results from the Queen City-Sparta aquifer in the East Texas Region, and neither was above the 10 µg/L primary MCL. No arsenic results were available for the Sparta in Sabine County.

Barium

Barium was not detected in any of the results above the 2,000 µg/L primary MCL in the Queen City-Sparta aquifer in the East Texas Region. No barium results were available for the Sparta in Sabine County. Barium was detected in all but one of the results, and the average of the results is 62 µg/L, and the median is 45.75 µg/L.

Cadmium

Cadmium was detected in only one of the results in the Queen City-Sparta aquifer in the East Texas Region, at a concentration of 19.8 µg/L, which is above the 5 µg/L primary MCL. This result was from sample collected from a shallow well on the Queen City outcrop near

Murchison in Henderson County. However, other shallow Queen City wells near Murchison have produced waters with no cadmium above detection limits. The available results in the Queen City-Sparta were generally well distributed, but no cadmium results were available for the Sparta in Sabine County. Typical reporting limits for cadmium were 1 – 2 µg/L.

Chromium

Chromium was not detected in any of the results above the 100 µg/L primary MCL in the Queen City-Sparta aquifer in the East Texas Region. No chromium results were available for the Sparta in Sabine County. Chromium was detected in approximately one-third of the results. The average for all of the results is 3 µg/L, and the median is 1.43 µg/L.

Lead

Lead was not detected in any of the results above the 15 µg/L primary MCL in the Queen City-Sparta aquifer in the East Texas Region. No lead results were available for the Sparta in Sabine County. Lead was detected in only seven of the results, all at concentrations of 2 µg/L or less. Typical reporting limits were 1 and 5 µg/L. There were three lead results that were below reporting limits that exceeded the current MCL (reporting limits greater than 15 µg/L). These results were not included the figure or table for this aquifer group in the East Texas Region.

Nitrate as N

Fifteen nitrate results exceed the 10 mg/L (as N) primary MCL in the Queen City-Sparta aquifer group in the East Texas Region. The majority of these were from samples collected from shallow wells on the Queen City outcrop in Anderson and Cherokee Counties. The available results in the Queen City-Sparta were well distributed. Nitrate (as N) was detected above the primary MCL of 10 mg/L in 4.4% of the results in the Queen City-Sparta aquifer in the East Texas Region. The average for all of the results is 2 mg/L, and the median for all of the results is 0.19 mg/L.

Selenium

Selenium was detected in only two samples in the Queen City-Sparta aquifer in the East Texas Region, and it was not detected above the 50 µg/L primary MCL. No selenium results were available for the Sparta in Sabine County.

Copper

No copper results exceeded the 1,000 µg/L secondary MCL or the 1,300 µg/L primary MCL in the Queen City-Sparta aquifer group in the East Texas Region. The available results in the Queen City-Sparta were generally well distributed, but no cadmium results were available for the Sparta in Sabine County. The average for all of the results is 8 µg/L, and the median is 2.8 µg/L.

Fluoride

Six fluoride results exceeded the 2 mg/L secondary MCL in the Queen City-Sparta aquifer group in the East Texas Region. Most of these were from samples collected from Sparta Sand wells in northern Angelina and southern Nacogdoches Counties. The available results in the Queen City-Sparta were well distributed. Fluoride was detected above the secondary MCL of 2 mg/L in 1.8% of the results in the Queen City-Sparta aquifer in the East Texas Region. None of the results exceeded the primary MCL of 4 mg/L. The average for all of the results is 0.3 mg/L, and the median for all of the results is 0.1 mg/L.

Chloride

Less than 2% of chloride results exceeded the 300 mg/L secondary MCL in the Queen City-Sparta aquifer group in the East Texas Region. The Queen City wells in the East Texas Region portion of Henderson County generally had higher chloride results than other counties with Queen City or Sparta wells. The available results in the Queen City-Sparta were well distributed. The average for all of the results is 45 mg/L, and the median for all of the results is 17 mg/L.

Iron

One-third of iron results exceeded the 300 µg/L secondary MCL in the Queen City-Sparta aquifer group in the East Texas Region. The iron results that exceeded the MCL were proportionally distributed between the Queen City and Sparta and among the counties that contain these formations in the East Texas Region. Iron was detected above the secondary MCL of 300 µg/L in 33.8% of the results in the Queen City-Sparta aquifer in the East Texas Region. Iron was detected in approximately 85% of the results, and the average for all of the results is

1375 µg/L, and the median for all of the results is 125 µg/L, indicating that the average is significantly skewed upward due to the presence of a limited number of very high values.

Manganese

About 15% of manganese results exceeded the 50 µg/L secondary MCL in the Queen City-Sparta aquifer group in the East Texas Region. Most of these results were from Queen City wells in northeastern East Texas Region. However, there were several elevated manganese results from the Sparta in Houston County, two of which exceeded the MCL. The available results in the Queen City-Sparta in the East Texas Region were well distributed. Manganese was detected in 15.1% of the results above the secondary MCL. Manganese was detected approximately 75% of the results, and the average for all of the results is 42 µg/L, and the median for all of the results is 13 µg/L.

pH

A large number of results from the Queen City-Sparta aquifer group were outside of the 6.5 - 8.5 secondary MCL range in the East Texas Region. The majority of these out-of-range results were below the 6.5 lower pH MCL, and were from samples collected from Queen City and Sparta wells in northeastern East Texas Region. The results that exceeded the upper 8.5 pH MCL were mostly from samples collected from wells in the Sparta outcrop areas. The available results were well distributed throughout the Queen City-Sparta in the East Texas Region. The pH of water samples was outside the secondary MCL range of 6.5 to 8.5 in 43.6% of the results in the Queen City-Sparta aquifer in the East Texas Region. The range of all of the results was 3.8 to 9. The average pH was 6.9, and the median pH was 6.975.

Sulfate

Sulfate was detected in 2.4% of the results above the secondary MCL of 300 mg/L in the Queen City-Sparta aquifer in the East Texas Region. The Queen City wells in the East Texas Region portion of Henderson County and downdip Sparta wells in central East Texas Region generally had higher TDS results than other areas. The available results in the Queen City-Sparta were well distributed. The average for all of the results is 55 mg/L, and the median for all of the results is 10 mg/L.

Total Dissolved Solids

The total dissolved solids concentration was above the secondary MCL of 1,000 mg/L in 2.6% of the results in the Queen City-Sparta aquifer in the East Texas Region. The Queen City wells in the East Texas Region portion of Henderson County and generally had higher TDS results than other counties with Queen City or Sparta wells. The available results in the Queen City-Sparta were well distributed. The average for all of the results is 261 mg/L, and the median for all of the results is 130 mg/L.

YEGUA-JACKSON WATER QUALITY

Table 4 Groundwater quality summaries for Yegua-Jackson aquifer in East Texas Region.

MCL Class	Constituent	Limit(s)	Units	Total Results	Results over MCL	% Over	Average	Median
primary	Alpha Radiation	15	pc/L	15	0	0.0%	< 2	< 2
primary	Arsenic	10	µg/L	34	0	0.0%	< 7	< 10
primary	Barium	2000	µg/L	16	0	0.0%	59	28.4
primary	Cadmium	5	µg/L	32	0	0.0%	< 3	< 5
primary	Chromium	100	µg/L	34	0	0.0%	12	20
primary	Lead	15	µg/L	15	0	0.0%	< 1	< 1
primary	Nitrate (as N)	10	mg/L	200	7	3.5%	1.5	0.09
primary	Selenium	50	µg/L	34	0	0.0%	< 4	< 2
secondary	Copper	1000	µg/L	30	0	0.0%	29	13.045
secondary	Fluoride	2	mg/L	166	3	1.8%	0.5	0.3
secondary	Chloride	300	mg/L	214	18	8.4%	125	65.5
secondary	Iron	300	µg/L	157	51	32.5%	1363	130
secondary	Manganese	50	µg/L	60	11	18.3%	49	20
secondary	pH	6.5 - 8.5		157	39	24.8%	7.81	8.04
secondary	Sulfate	300	mg/L	214	14	6.5%	113	47.9
secondary	Total Dissolved Solids	1000	mg/L	214	38	17.8%	672	557

Alpha

No alpha particles results exceeded the 15 pCi/L primary MCL in the Yegua-Jackson aquifer group in the East Texas Region. The alpha results are not well distributed spatially in the

Yegua-Jackson in the East Texas Region; most of the alpha results available are from samples collected in Angelina County. Dissolved alpha particles were not detected in the Yegua-Jackson aquifer in the East Texas Region. All reporting limits were 2 µg/L.

Arsenic

No arsenic results exceeded the 10 µg/L primary MCL in the Yegua-Jackson aquifer group in the East Texas Region. Most of the arsenic results available are from samples collected in Angelina County, although samples were also collected from the Yegua-Jackson in Nacogdoches, Houston, Trinity, and Sabine Counties in the East Texas Region. Arsenic was not detected in the Yegua-Jackson aquifer in the East Texas Region, and typical reporting limits were 2 and 10 µg/L.

Barium

No barium results exceeded the 2,000 µg/L primary MCL in the Yegua-Jackson aquifer group in the East Texas Region. Most of the barium results available are from samples collected in Angelina County, although samples were also collected from the Yegua-Jackson in Nacogdoches, Houston, Trinity, and Sabine Counties in the East Texas Region. Barium was detected in all but one of the results, and the average of the results is 59 µg/L, and the median is 28.4 µg/L.

Cadmium

No cadmium results exceeded the 5 µg/L primary MCL in the Yegua-Jackson aquifer group in the East Texas Region. Most of the cadmium results available are from samples collected in Angelina County, although samples were also collected from the Yegua-Jackson in Nacogdoches, Houston, Trinity, Polk, and Sabine Counties in the East Texas Region. Cadmium was not detected in any results in the Yegua-Jackson aquifer in the East Texas Region, and typical reporting limits were 1 and 5 µg/L.

Chromium

No chromium results exceeded the 100 µg/L primary MCL in the Yegua-Jackson aquifer group in the East Texas Region. Most of the chromium results available are from samples collected in Angelina County, although samples were also collected from the Yegua-Jackson in

Nacogdoches, Houston, Jasper, Polk, Trinity, and Sabine Counties in the East Texas Region. Chromium was detected in less than 25% of the results. The average for all of the results is 12 µg/L, and the median is 20 µg/L.

Lead

No lead results exceeded the 15 µg/L primary MCL in the Yegua-Jackson aquifer group in the East Texas Region. Most of the lead results available are from samples collected in Angelina County, although samples were also collected from the Yegua-Jackson in Houston, Trinity, Polk, Jasper, and Sabine Counties in the East Texas Region. Lead was detected in only two of the results, both at concentrations of less than 2 µg/L.

Nitrate as N

Seven nitrate results (out of 200) exceeded the 10 mg/L (as N) primary MCL in the Yegua-Jackson aquifer group in the East Texas Region. Most of the results that exceed the MCL were from samples collected from shallow wells, but these were not concentrated in any particular area. The remaining results were well distributed spatially throughout the Yegua-Jackson aquifer group in the East Texas Region. Nitrate (as N) was detected above the primary MCL of 10 mg/L in 3.5% of the results in the Yegua-Jackson aquifer in the East Texas Region. The average for all of the results is 1.5 mg/L, and the median for all of the results is 0.09 mg/L.

Selenium

No selenium results exceeded the 50 µg/L primary MCL in the Yegua-Jackson aquifer group in the East Texas Region. Most of the selenium results available are from samples collected in Angelina County, although samples were also collected from the Yegua-Jackson in Jasper, Nacogdoches, Houston, Polk, Trinity, and Sabine Counties in the East Texas Region. Selenium was detected in only one sample in the Yegua-Jackson aquifer in the East Texas Region, and typical reporting limits were 2 – 20 µg/L.

Copper

Copper was not detected above the 1,000 µg/L secondary MCL or the 1,300 µg/L primary MCL in the Yegua-Jackson aquifer in the East Texas Region. Most of the copper results available are from samples collected in Angelina County, although samples were also collected from the Yegua-Jackson in Jasper, Nacogdoches, Houston, Polk, Trinity, and Sabine Counties in the East Texas Region. The average for all of the results is 29 µg/L, and the median is 13 µg/L.

Fluoride

Three fluoride results exceeded the 2 mg/L secondary MCL in the Yegua-Jackson aquifer group in the East Texas Region. All three were from wells completed in the Yegua Formation in Angelina County. One of the three results mentioned in Angelina County was 5 mg/L, which exceeds the 4 mg/L primary MCL. The available results were well distributed spatially throughout the Yegua-Jackson aquifer group in the East Texas Region. Fluoride was detected above the secondary MCL of 2 mg/L in 1.8% of the results in the Yegua-Jackson aquifer in the East Texas Region. Only one result also exceeded the primary MCL of 4 mg/L. The average for all of the results is 0.5 mg/L, and the median for all of the results is 0.3 mg/L.

Chloride

Eighteen chloride results exceeded the 300 mg/L secondary MCL in the Yegua-Jackson aquifer group in the East Texas Region. Most of these results were collected from wells completed in downdip sections of the Yegua Formation in Houston, Trinity, and Polk Counties. Six Jackson Group wells in these counties also exceeded the secondary MCL. Chloride results are lower on the Yegua outcrop and in downdip sections in Angelina and Sabine Counties. The available chloride results were well distributed spatially throughout the Yegua-Jackson aquifer group in the East Texas Region. Chloride was detected in 8.4% of the results above the secondary MCL of 300 mg/L in the Yegua-Jackson aquifer in the East Texas Region. The average for all of the results is 125 mg/L, and the median for all of the results is 65.5 mg/L.

Iron

About one-third of the available results in the Yegua-Jackson exceeded the 300 µg/L secondary MCL for iron. No significant trends were observed in these results. The available results were well distributed spatially throughout the Yegua-Jackson aquifer group in the East Texas Region. Iron was detected above the secondary MCL of 300 µg/L in 32.5% of the results in the Yegua-Jackson aquifer in the East Texas Region. Iron was detected in approximately 90% of the results, and the average for all of the results is 1363 µg/L, and the median for all of the results is 130 µg/L, indicating that the average is significantly skewed upward due to the presence of a limited number of very high values.

Manganese

Eleven manganese results exceeded the 50 µg/L secondary MCL in the Yegua-Jackson aquifer group in the East Texas Region. Five of these results were from samples collected from wells completed in the Yegua Formation near Lufkin in Angelina County. Other sample results exceeding the current MCL were collected in Houston, Nacogdoches, and Polk Counties. Most of the manganese results available are from samples collected in Angelina County, although samples were also collected from the Yegua-Jackson in Jasper, Nacogdoches, Houston, Polk, Trinity, and Sabine Counties in the East Texas Region. Manganese was detected in 18.3% of the results above the secondary MCL of 50 µg/L in the Yegua-Jackson aquifer in the East Texas Region. Manganese was detected approximately in half of the results, and the average for all of the results is 49 µg/L, and the median for all of the results is 20 µg/L.

pH

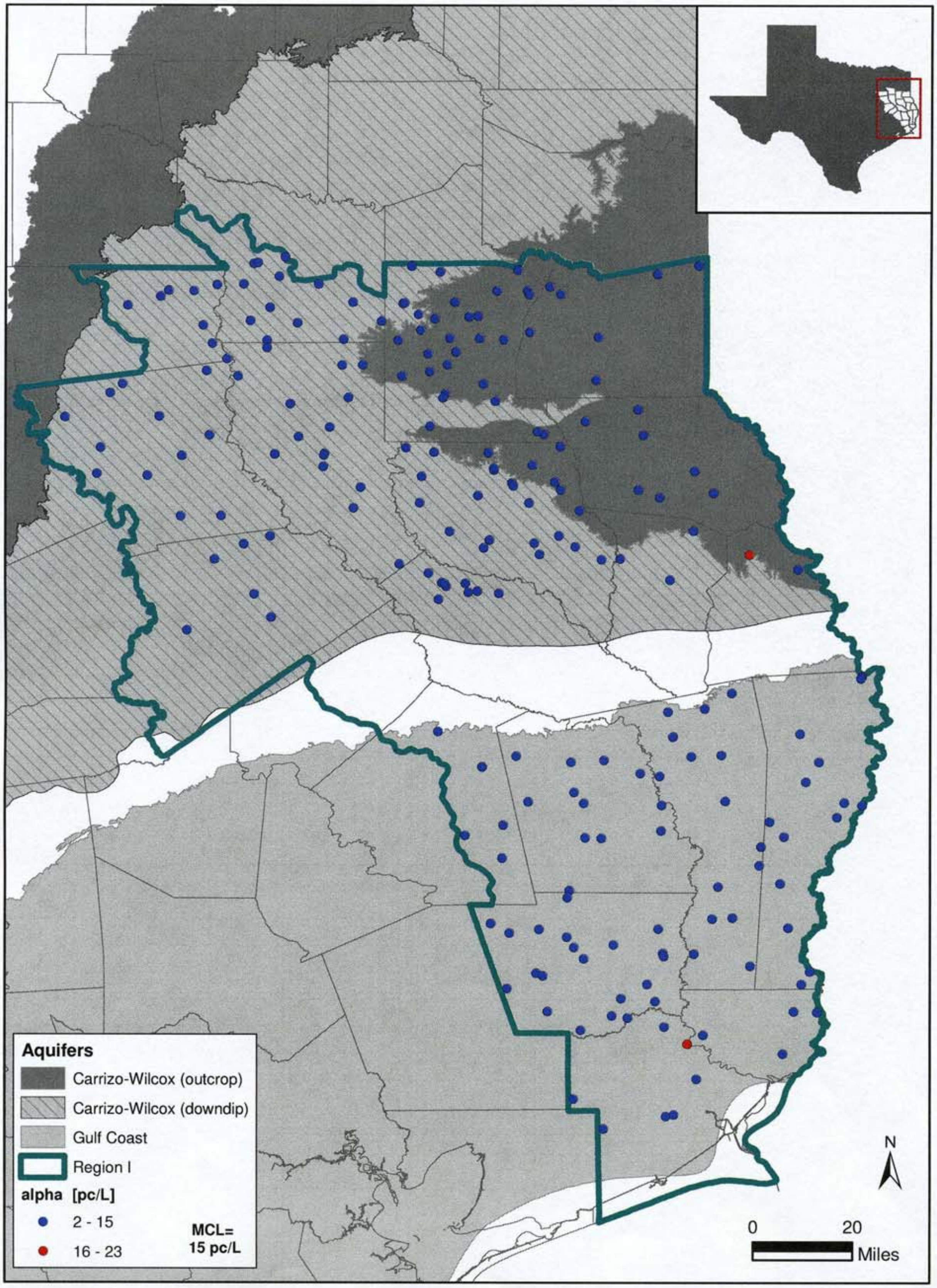
About one-quarter of results from the Yegua-Jackson aquifer group were outside of the 6.5 - 8.5 secondary MCL range in the East Texas Region. The majority of these out-of-range results exceeded the 8.5 upper pH MCL, and were from samples collected from wells in downdip areas. The results that were below the lower 6.5 pH MCL were from samples collected from wells in outcrop areas. The available results were well distributed throughout the Yegua-Jackson in the East Texas Region. The pH of water samples was outside the secondary MCL range of 6.5 to 8.5 in 24.8% of the results in the Yegua-Jackson aquifer in the East Texas Region. The range of all of the results was 5.33 to 9. The average pH was 7.8, and the median pH was 8.0.

Sulfate

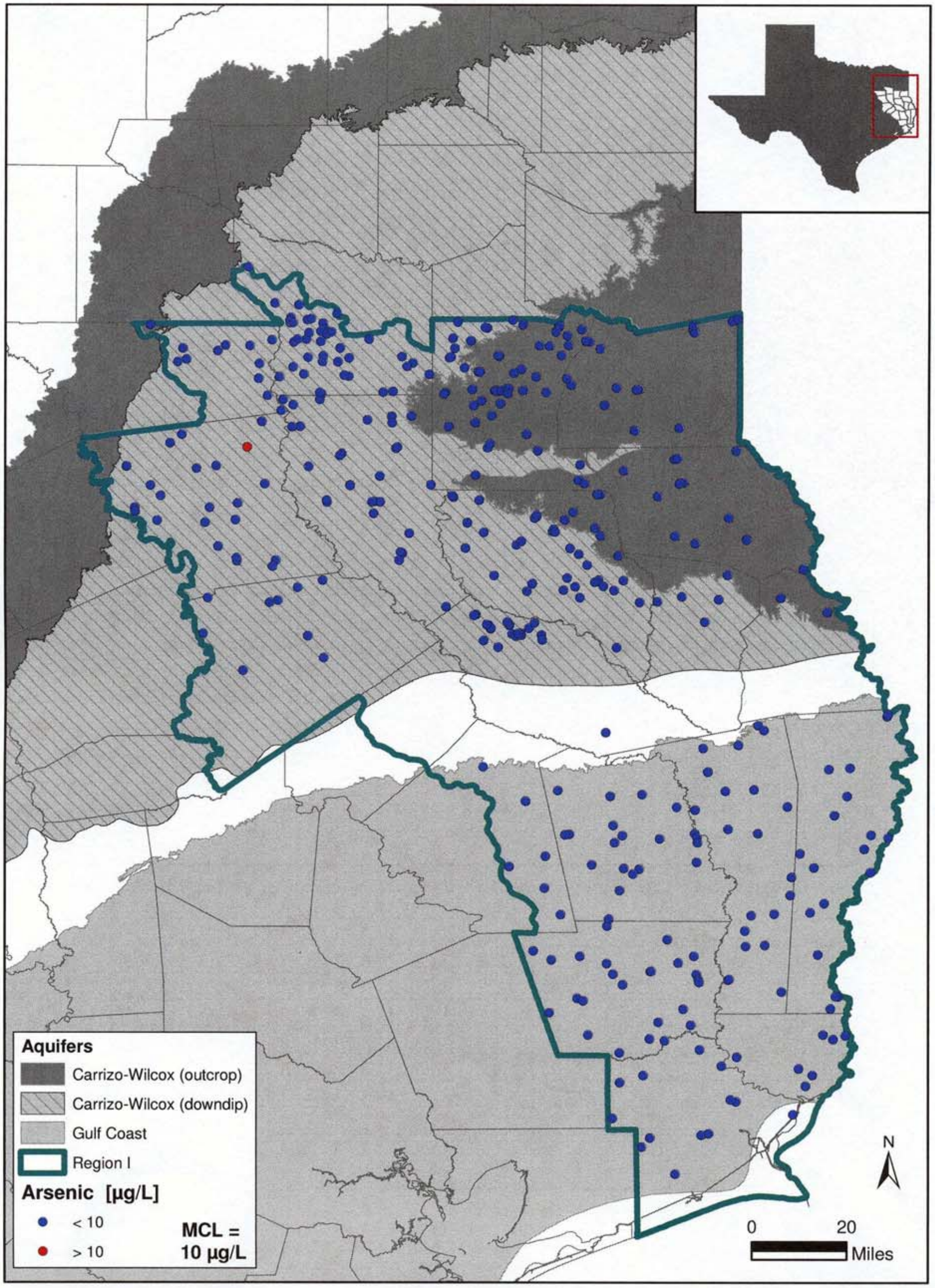
Sulfate was detected in 6.5% of the results above the secondary MCL of 300 mg/L in the Yegua-Jackson aquifer in the East Texas Region. Most of these were in the downdip area of the Yegua Formation throughout the East Texas Region. The available results were well distributed throughout the Yegua-Jackson in the East Texas Region. The average for all of the results is 113 mg/L, and the median for all of the results is 47.9 mg/L.

Total Dissolved Solids

The total dissolved solids concentration was above the secondary MCL of 1,000 mg/L in 17.8% of the results in the Yegua-Jackson aquifer in the East Texas Region. Most of these results were from samples collected from downdip Yegua Formation wells. The available results were well distributed throughout the Yegua-Jackson in the East Texas Region. The average for all of the results is 672 mg/L, and the median for all of the results is 557 mg/L.



Water Quality in the Gulf Coast and Carrizo-Wilcox Aquifers



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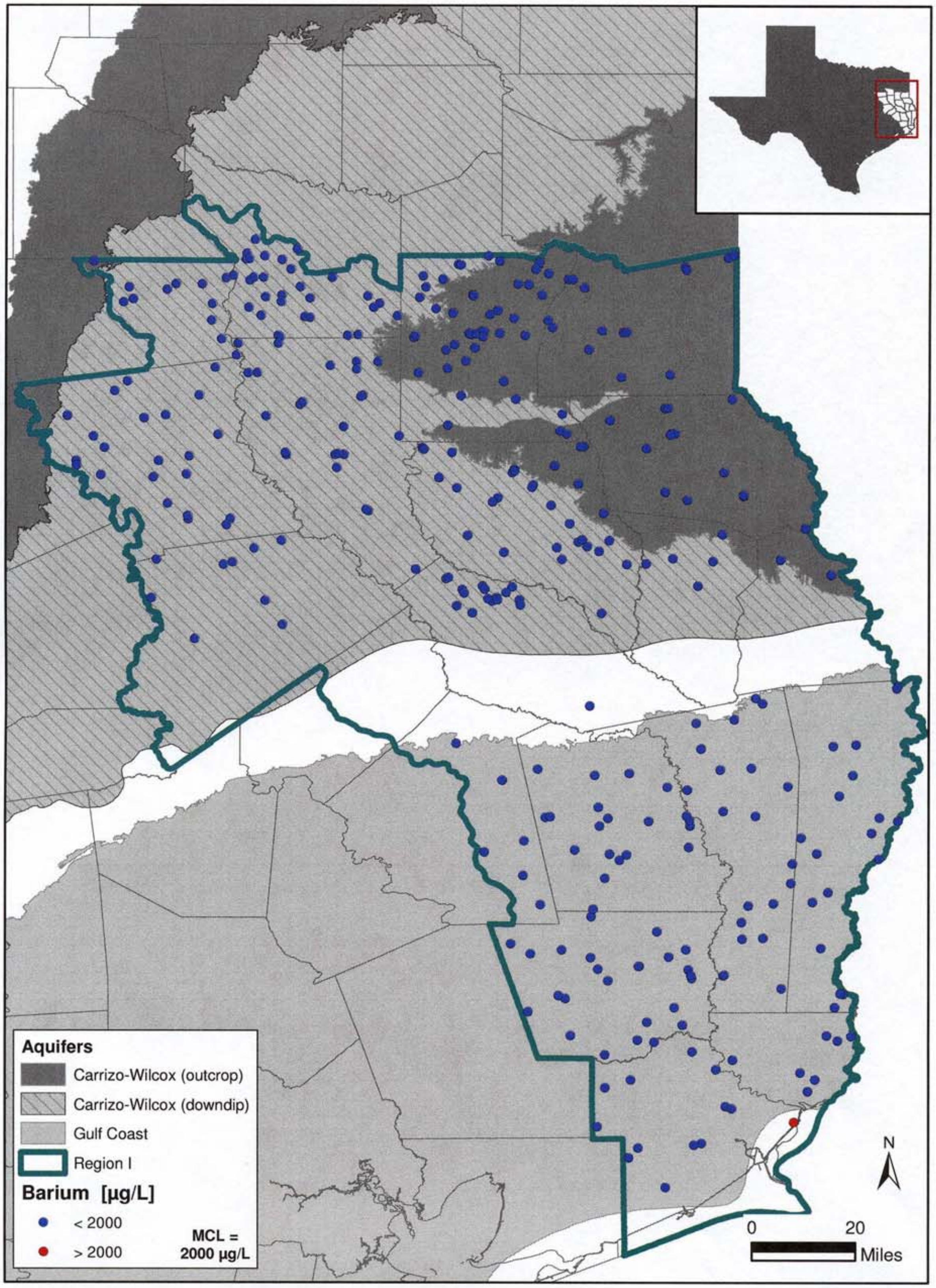

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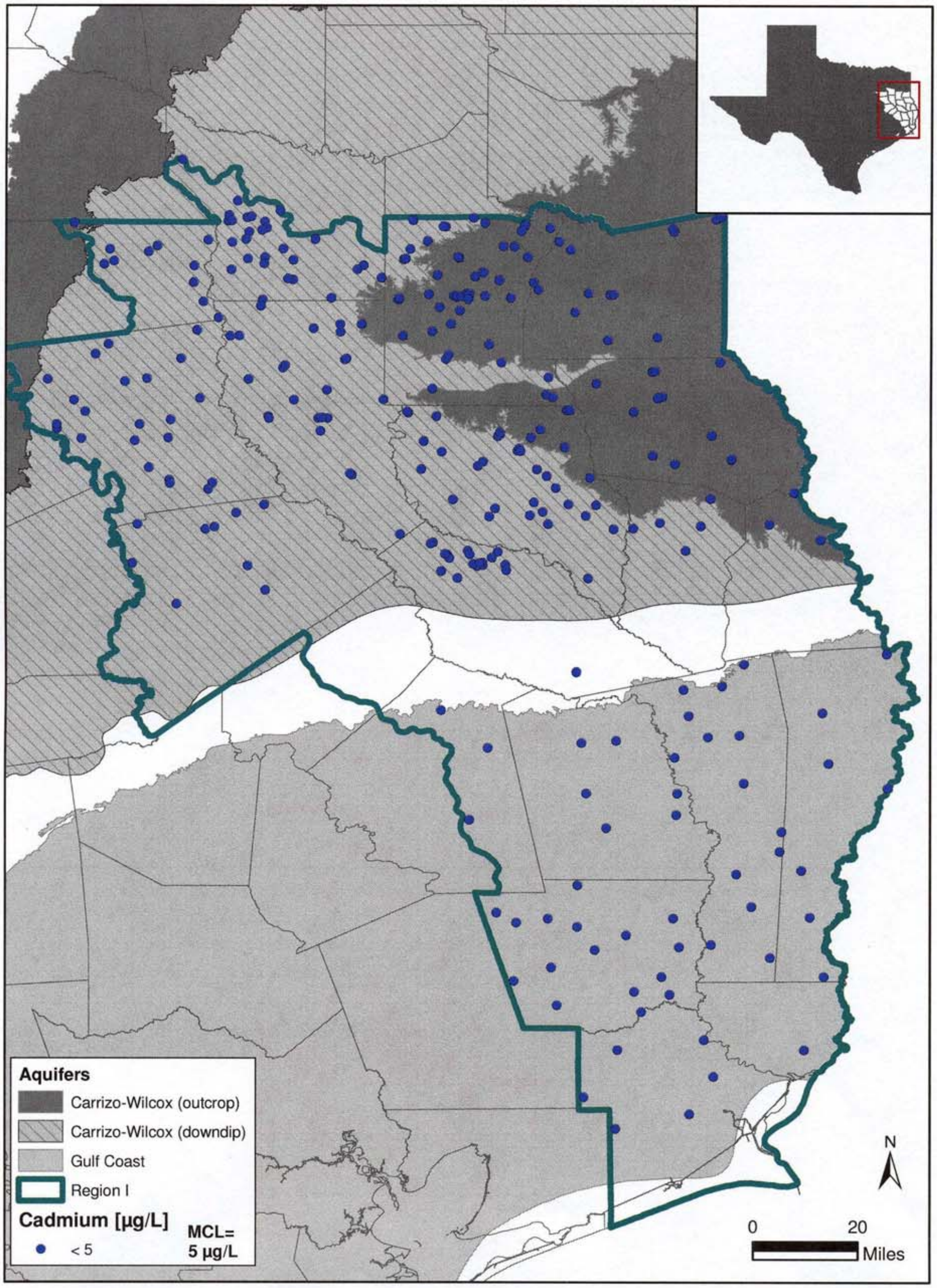

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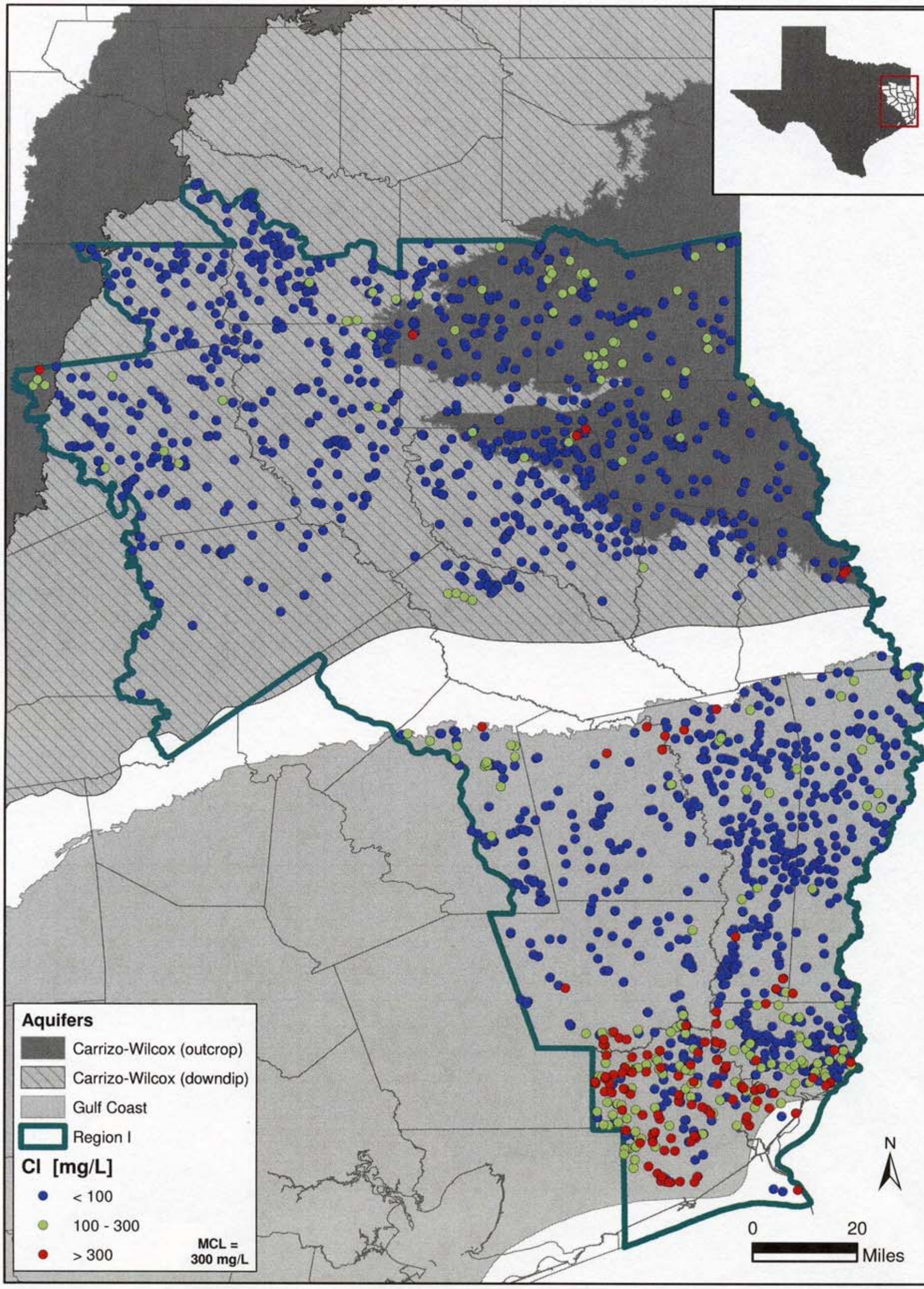

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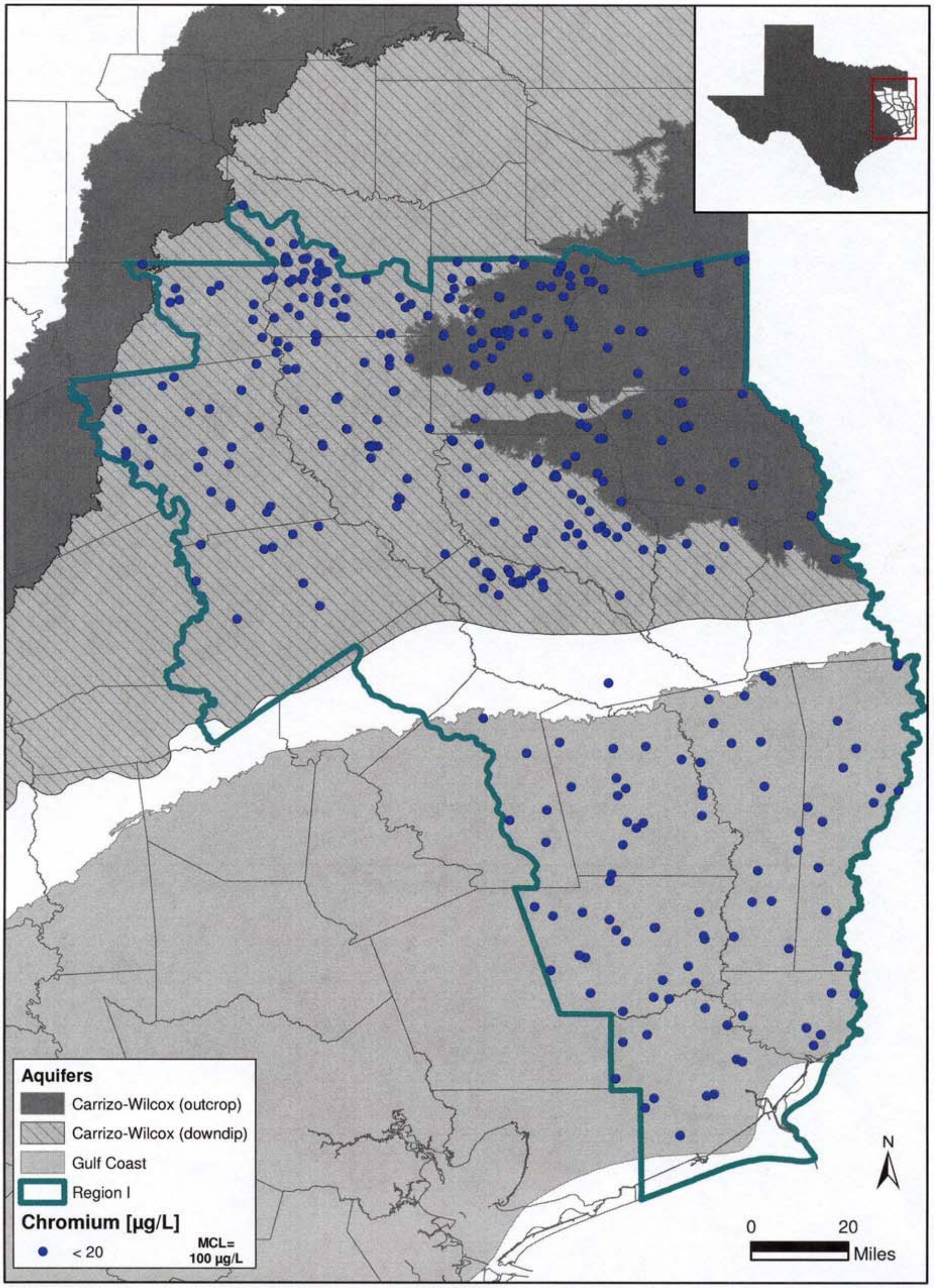

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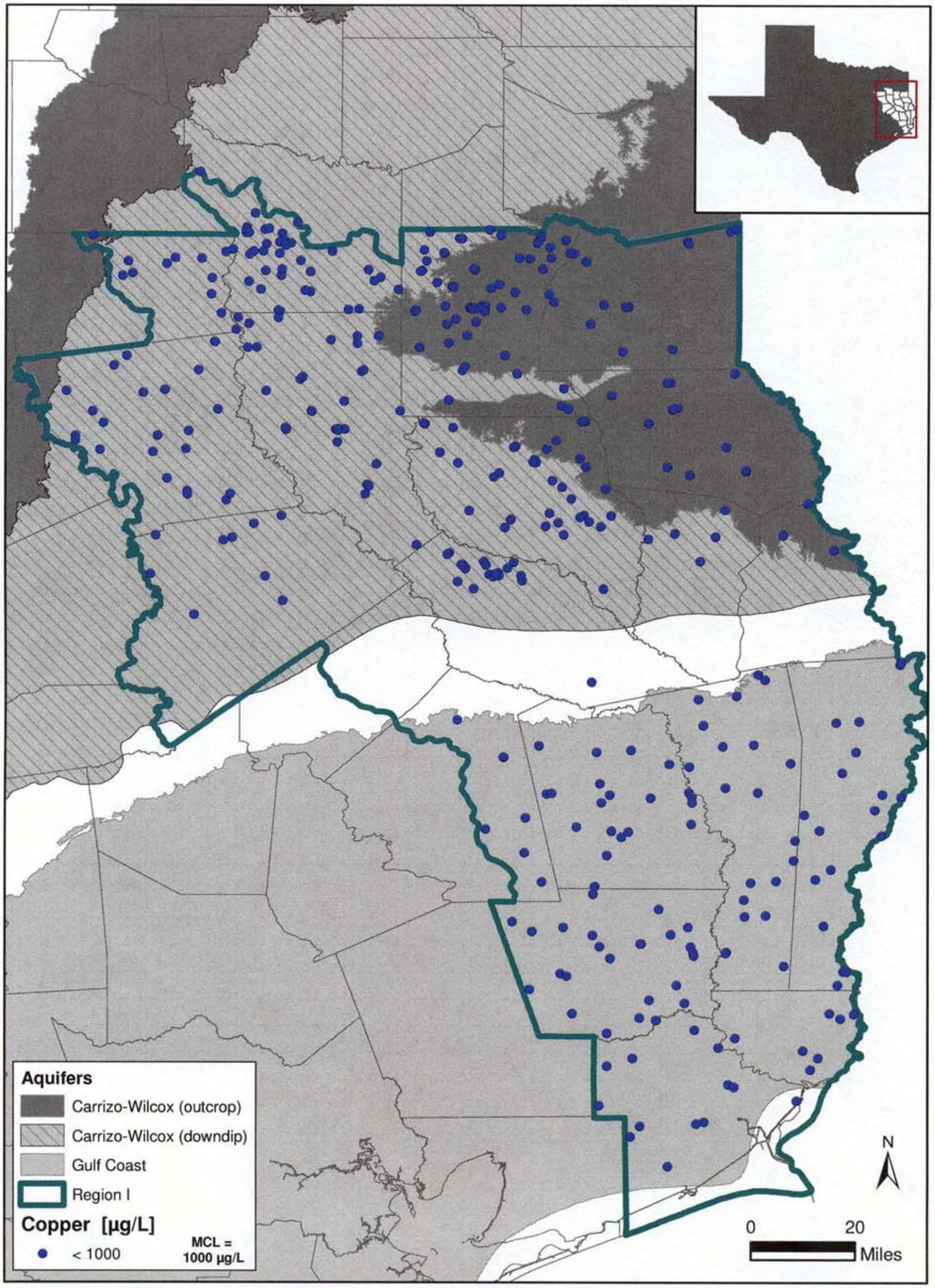

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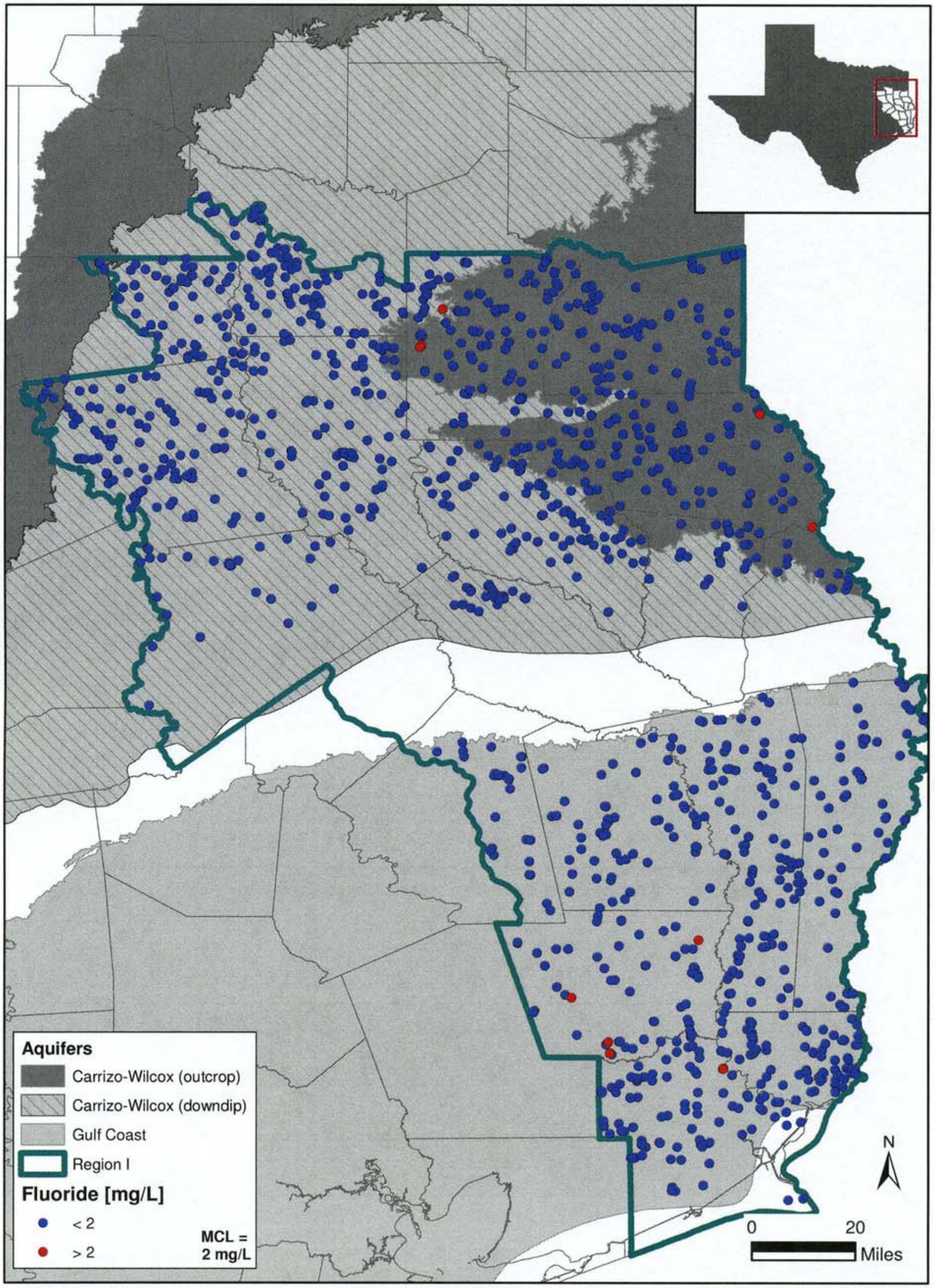

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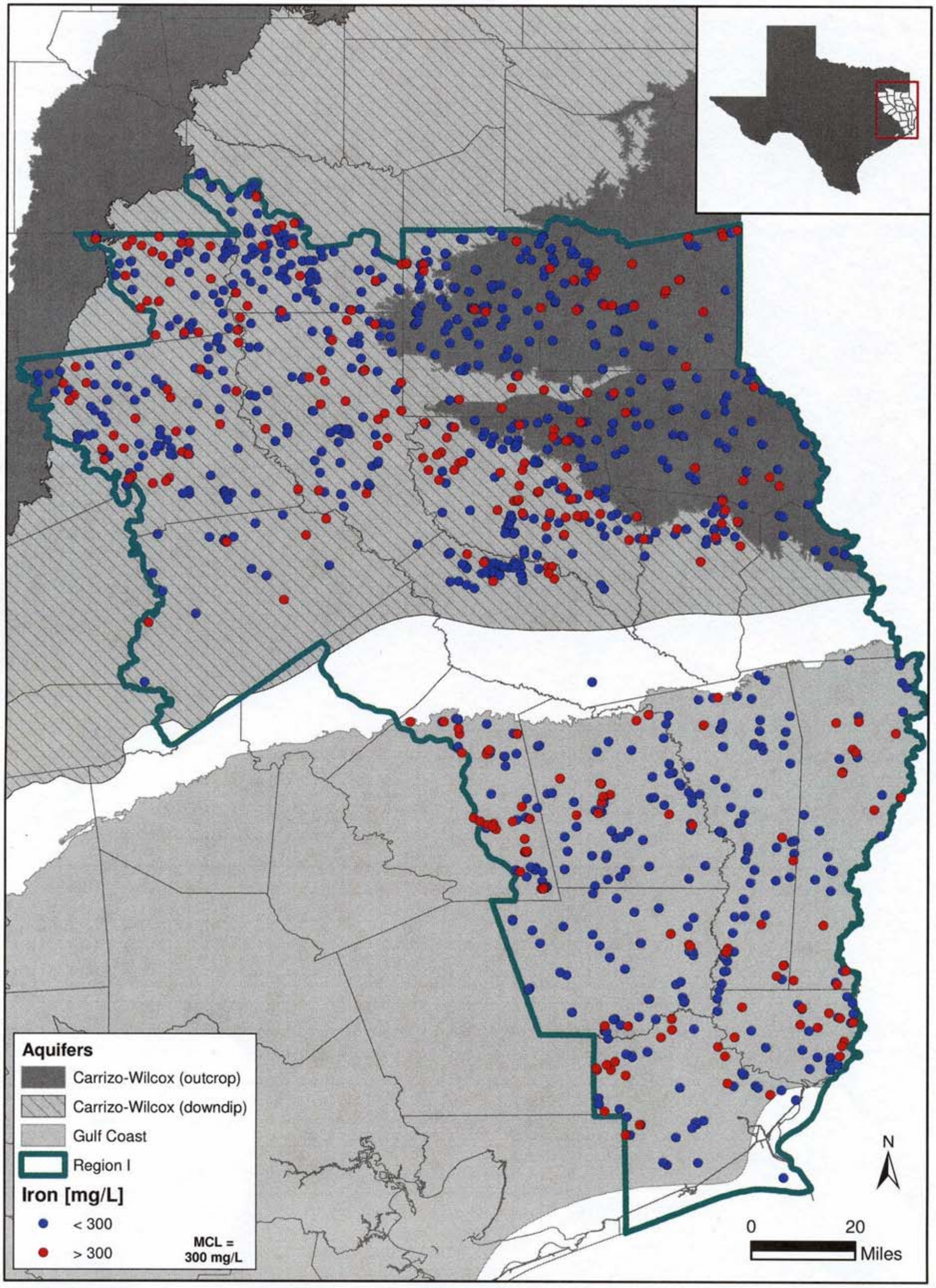

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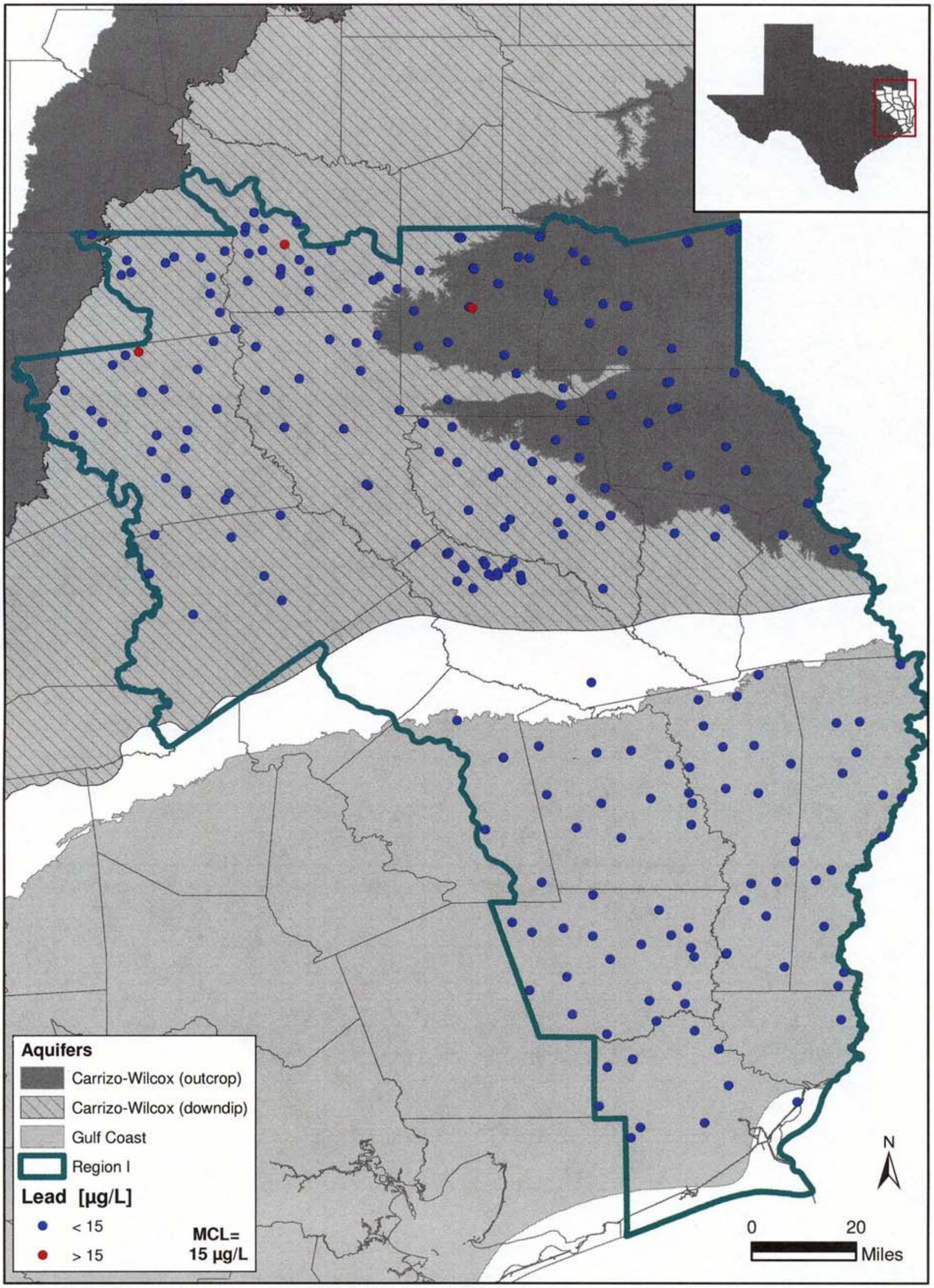

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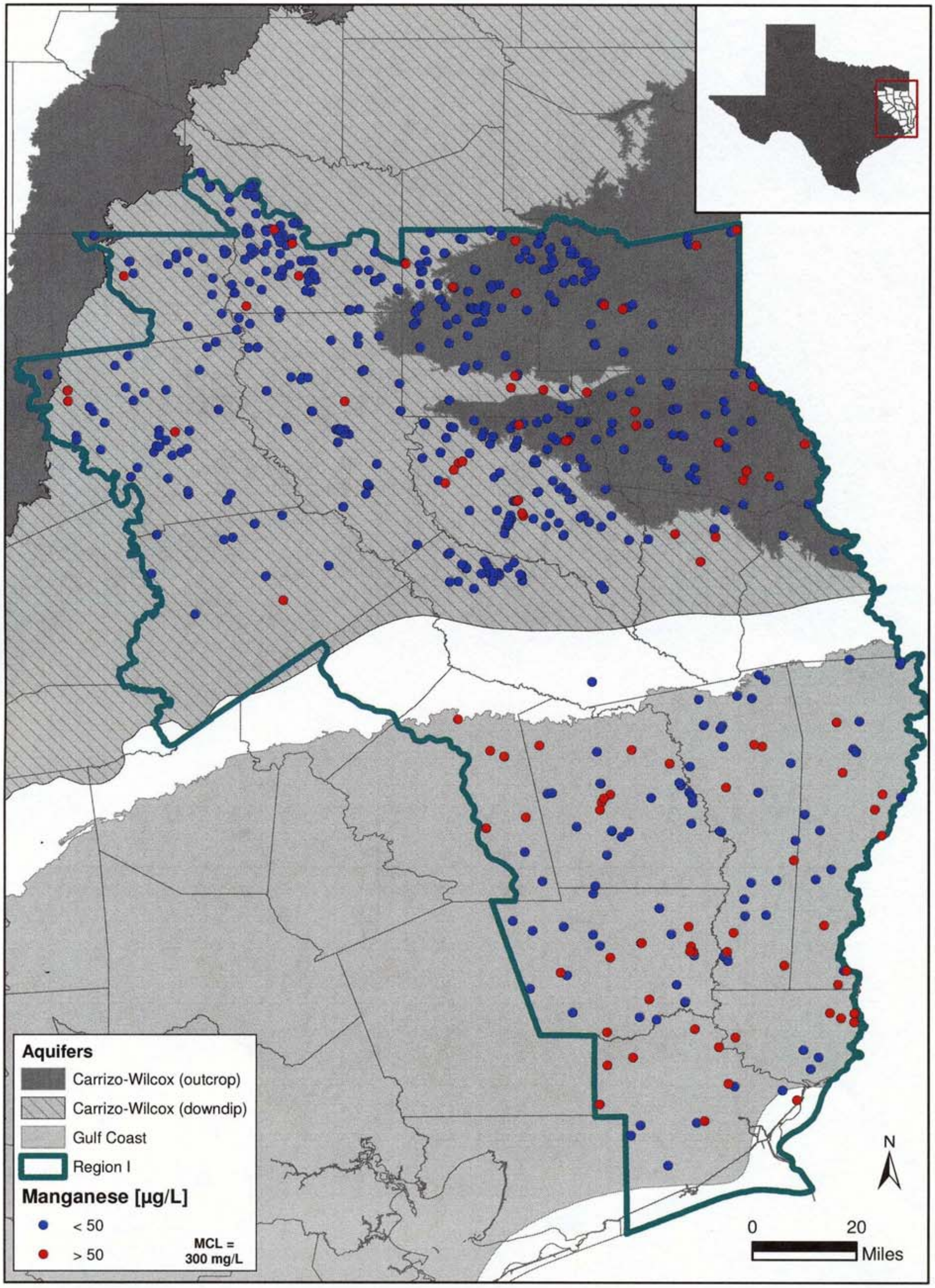

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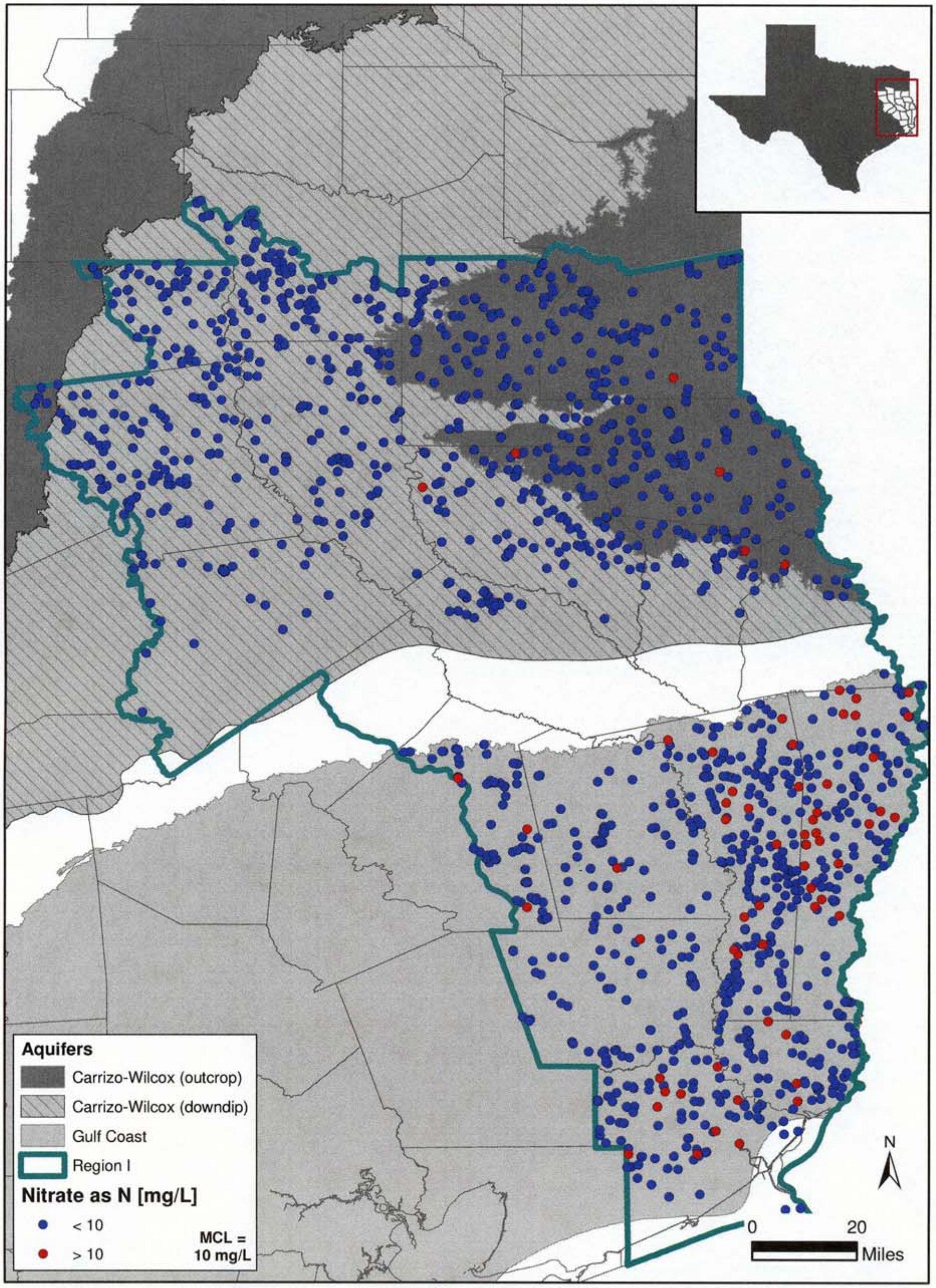

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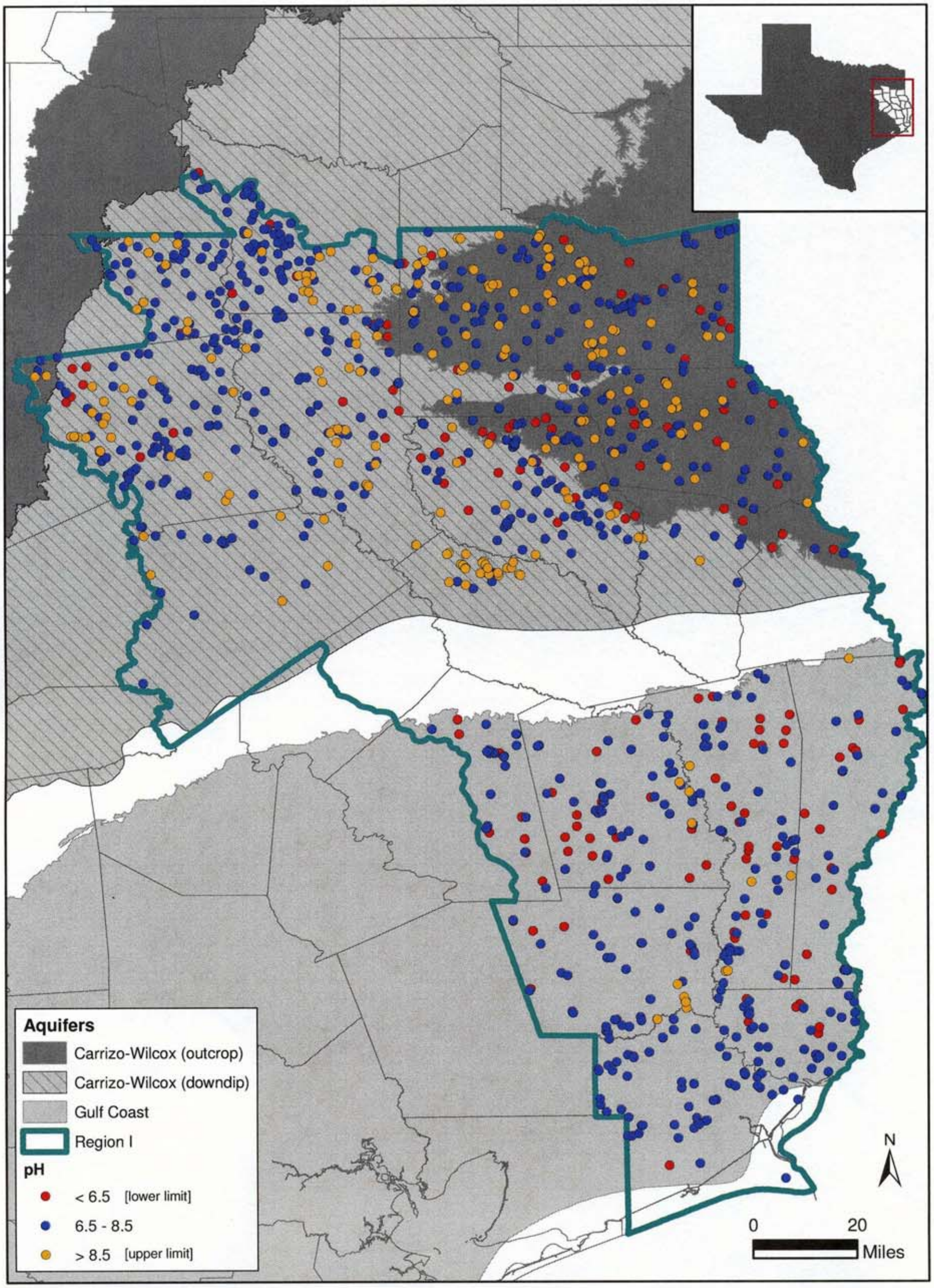

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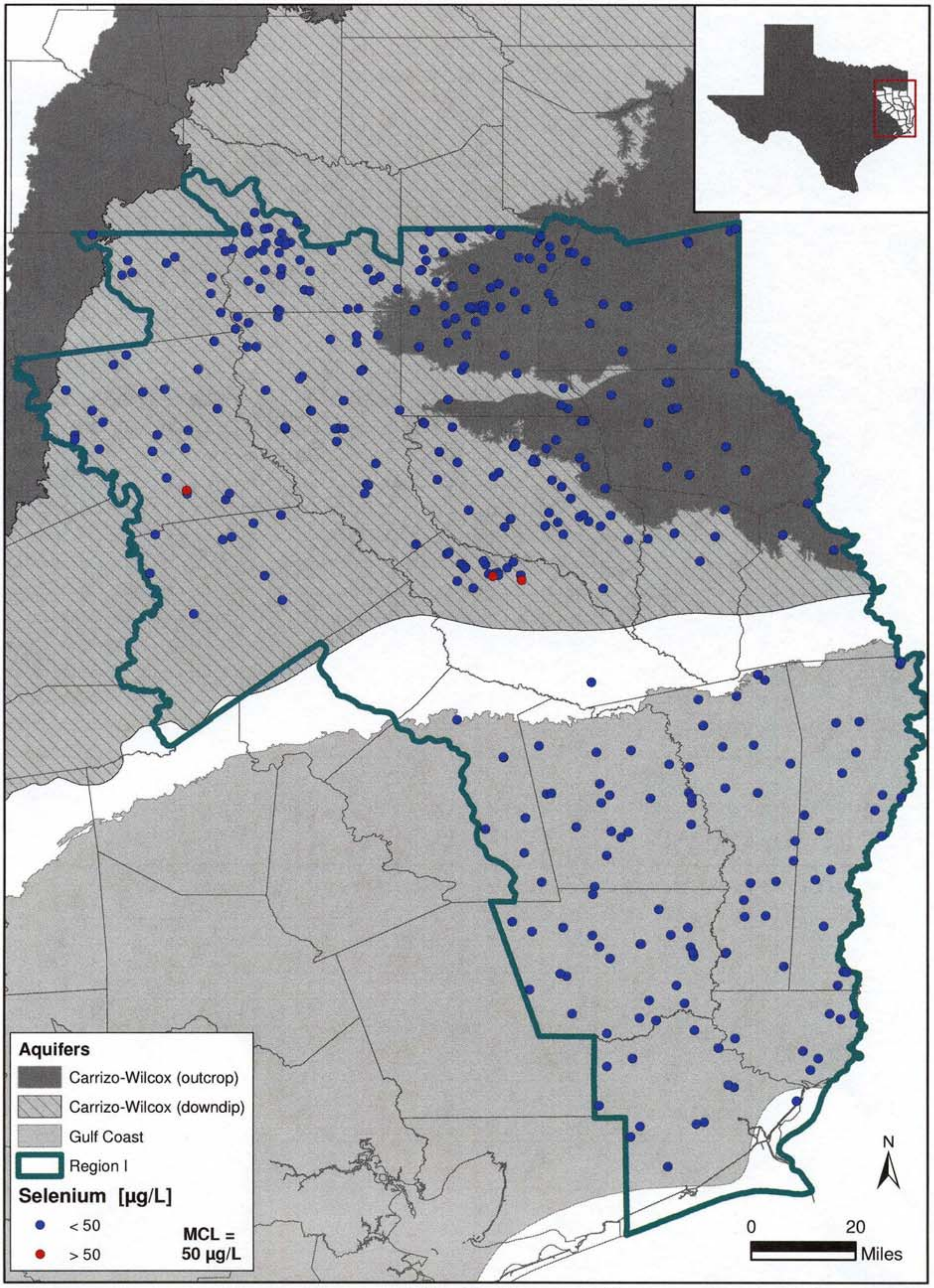

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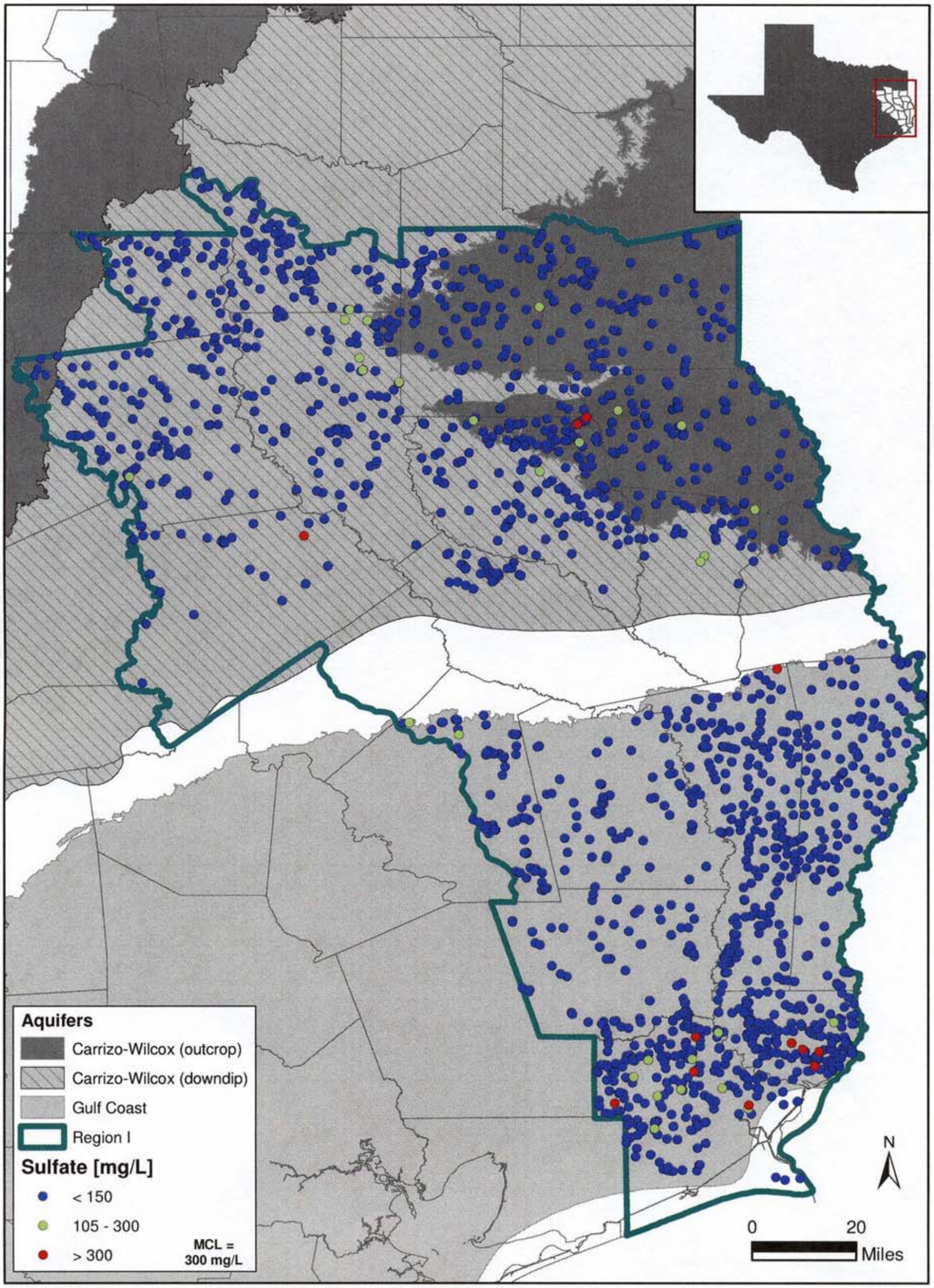

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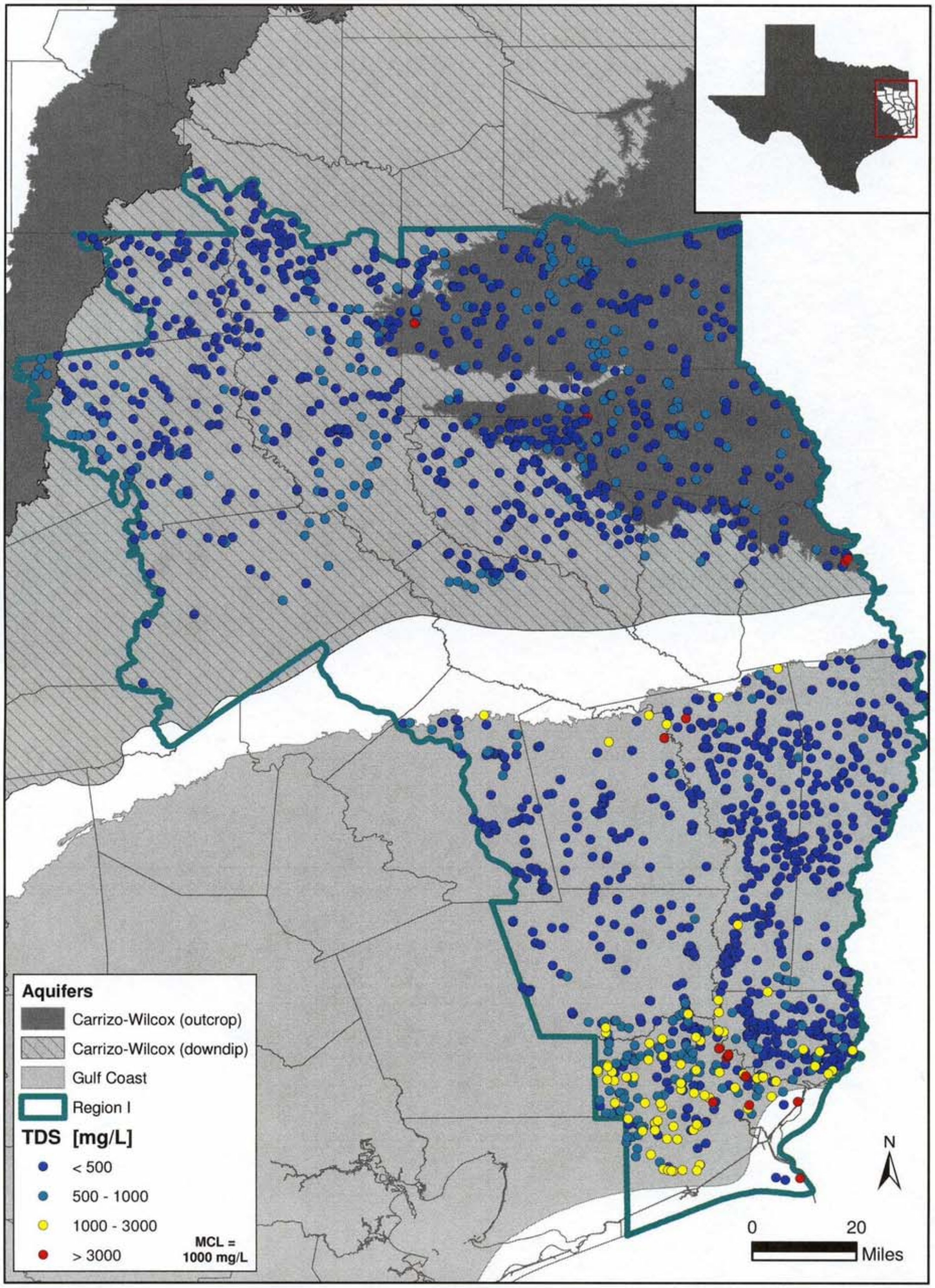

Water Quality in the Gulf Coast and Carrizo-Wilcox Aquifers

Chapter 4A

Comparison of Water Demands with Water Supplies to Determine Needs

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4A.1. Introduction

This report describes the comparison of estimated current water supply for drought of record conditions (from Chapter 3) and projected water demand (from Chapter 2). From this comparison, water shortages or surpluses for drought of record conditions have been estimated.

As discussed in Chapter 3, allocations of existing supplies were based on the most restrictive of current water rights, contracts, water treatment capacities, available yields for surface water, and production capacities for groundwater. The allocation process did not directly address water quality issues, which may impact the desirability or continued use of some water sources.

The comparison of current water supply and projected water demand in East Texas is evaluated on a regional basis, by county, by water user group and by wholesale water provider. Section 4A.2 presents a regional comparison of current supply and projected demand. Section 4A.3 presents a county-by-county comparison of current supply and projected demand. Section 4A.4 presents the comparison of current supply and projected demand for each water user group. Section 4A.5 discusses shortages for the wholesale water providers in the Region. Analysis of demands related to future potential users or to demands on supplies located in the East Texas Region, to meet water management strategies outside the Region are not discussed in this section of the report. The discussion of these items are included under the wholesale provider portion of Section 4C.21, specifically for the Lower Neches Valley Authority, Upper Neches River Municipal Water Authority and the Sabine River Authority.

4A.2. Regional Comparison of Supply and Demand

Table 4.1 and Figure 4.1 summarize the comparison of total currently available water supply and total projected water demand for the East Texas Region. The region as a whole has a currently available surplus of 119,755 acre-feet per year (ac-ft/yr) in 2010, changing to a shortage of 8,854 ac-ft/yr by 2040, and increasing to a shortage of 106,041 by 2060. The actual total shortages of individual water user groups are greater, totaling 172,704 ac-ft/yr by 2060. The individual shortages by water user are discussed in Section 4A.4.

As shown on Figure 4.1, the region has supplies available to meet these needs. Unconnected water supplies are identified by comparing the supplies available to each city and category to the current regional water supply sources. Excluding unpermitted reservoir yields and brackish water, the difference between the total supply reported in Chapter 3 and the supply available to water user groups is more than 1.7 million ac-ft/yr in each decade of the planning period (Figure 4.1). Additional infrastructure and/or contracts are needed to utilize these sources.

Table 4.1

Summary of Supply and Demand for the East Texas Region

	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Demands	896,455	988,330	1,049,715	1,113,994	1,182,706	1,261,320
Developed Supplies	1,016,210	1,048,838	1,076,985	1,105,140	1,130,145	1,155,279
Difference	119,755	60,508	27,270	-8,854	-52,561	-106,041

Figure 4.1

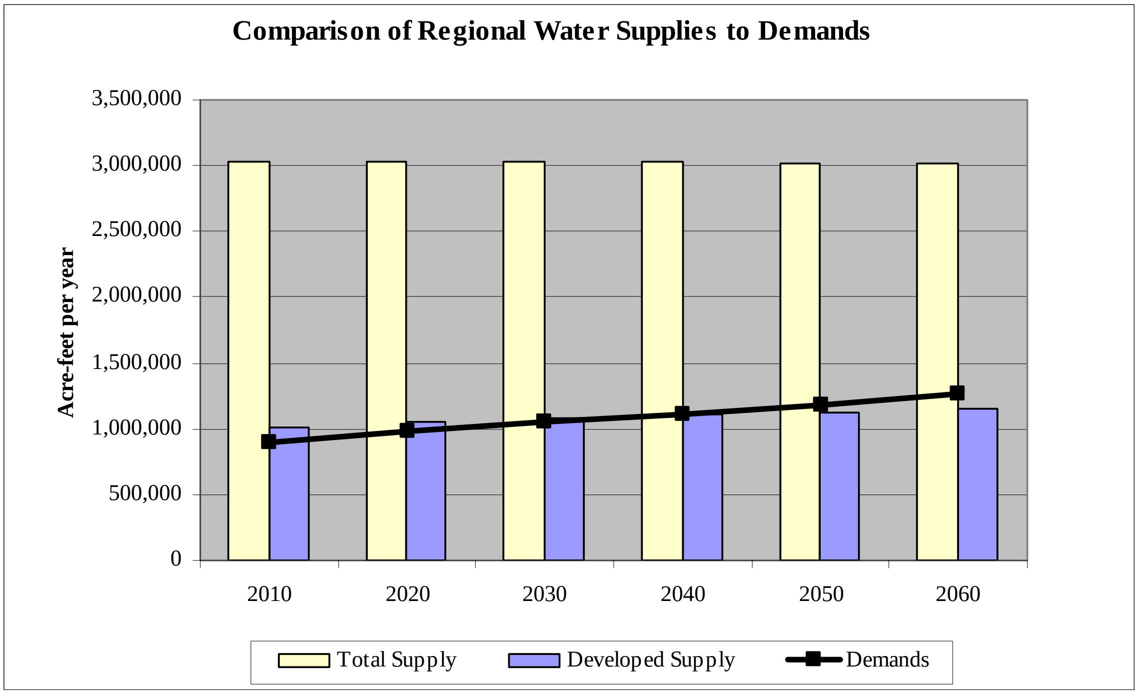
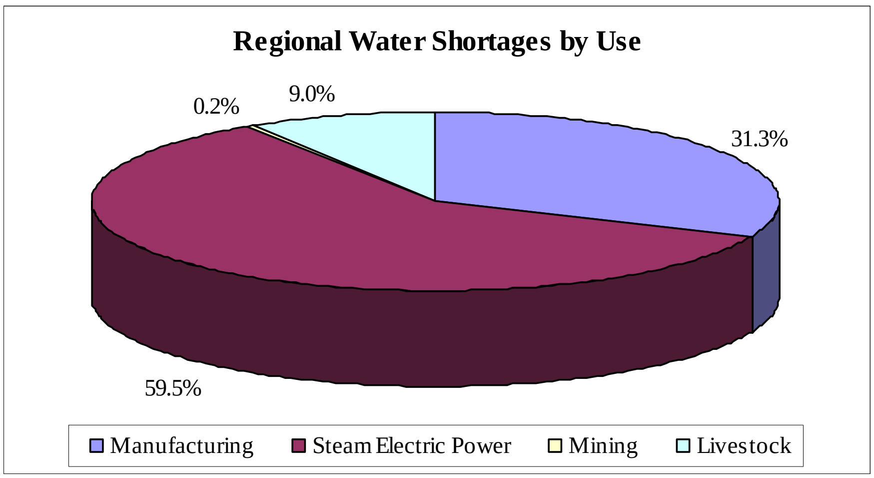


Table 4.2 summarizes regional surpluses and shortages by type of water use. On a regional basis, there are sufficient supplies for municipal and irrigation water uses. Regional shortages are identified for manufacturing, steam electric power, mining and livestock. Most of the manufacturing shortages are the result of considerable growth in demands and supplies that are limited to existing contract amounts. The steam electric power shortages are for projected growth that currently does not have an identified source or infrastructure. Livestock water use is also expected to grow in some counties, which will require the development of additional resources and/or infrastructure. Even though the municipal water use shows a net surplus in every decade of the planning period, there are individual cities that are projected to have shortages during the planning period.

Table 4.2
Summary of Projected Surpluses or Shortages by Water Use Type

Use Type	2010	2020	2030	2040	2050	2060
Municipal	53,549	45,442	38,833	32,633	21,978	7,362
Manufacturing	17,513	5,264	-5,600	-16,492	-26,547	-37,636
Steam Electric Power	37,841	1,382	-11,841	-27,963	-47,615	-71,570
Mining	1,340	862	589	295	14	-246
Irrigation	8,755	8,438	8,083	7,700	7,278	6,812
Livestock	757	-880	-2,792	-5,028	-7,669	-10,763

Figure 4.2
Distribution of Regional Shortages in 2060



4A.3. Comparison of Supply and Demand by County

Table 4.3 shows the projected surpluses and shortages by county for each decade of the planning period. In general, the counties with projected shortages are spread throughout the region. Twelve counties are identified with shortages over the planning horizon, with Anderson, Nacogdoches and Rusk Counties having the largest projected shortages by 2060. Table 4.4 shows the projected surpluses or shortages as a percentage of demand. Anderson, Nacogdoches and Shelby Counties are expected to have the largest percent shortages (46 to 52 percent) in 2060, and Tyler County is expected to have the largest percentage surplus (53 percent) in 2050.

Table 4.3
Comparison of Supply and Demand by County

	2010	2020	2030	2040	2050	2060
Anderson	4,406	-7,334	-9,514	-12,111	-15,253	-19,039
Angelina	14,647	8,934	3,438	-2,453	-8,734	-16,133
Cherokee	4,654	4,232	3,950	3,747	3,419	2,882
Hardin	-971	-1,460	-1,592	-1,733	-1,975	-2,302
Henderson (P)	519	74	-348	-766	-1,314	-2,010
Houston	1,958	1,472	906	295	-394	-1,178
Jasper	1,905	1,700	1,642	1,734	1,780	1,780
Jefferson	12,028	-1,866	-4,468	-7,476	-11,224	-16,354
Nacogdoches	553	-3,765	-7,120	-10,788	-16,102	-21,805
Newton	28,086	19,742	17,287	14,261	10,576	6,095
Orange	16,956	11,383	4,736	-2,013	-8,545	-16,101
Panola	5,815	5,510	5,320	5,144	4,959	4,680
Polk (P)	341	-24	-323	-551	-722	-908
Rusk	7,022	4,077	-683	-6,363	-13,493	-22,469
Sabine	1,260	1,117	994	862	705	528
San Augustine	73	-12	-112	-232	-388	-557
Shelby	22	-1,233	-2,639	-4,202	-6,098	-8,435
Smith (P)	17,852	15,691	13,723	11,767	8,214	3,288
Trinity (P)	194	160	156	139	116	91
Tyler	2,437	2,110	1,917	1,884	1,913	1,908
TOTAL	**119,755**	**60,508**	**27,270**	**-8,854**	**-52,561**	**-106,041**

Table 4.4
Surplus or Shortage as Percent of Demand by County

	2010	2020	2030	2040	2050	2060
Anderson	33%	-29%	-35%	-40%	-46%	-52%
Angelina	33%	18%	6%	-4%	-13%	-21%
Cherokee	35%	32%	28%	26%	22%	17%
Hardin	-4%	-6%	-6%	-7%	-7%	-8%
Henderson (P)	8%	1%	-5%	-10%	-16%	-23%
Houston	24%	17%	10%	3%	-4%	-10%
Jasper	3%	2%	2%	2%	2%	2%
Jefferson	2%	0%	-1%	-1%	-2%	-3%
Nacogdoches	3%	-15%	-25%	-34%	-44%	-52%
Newton	312%	114%	87%	62%	40%	20%
Orange	21%	13%	5%	-2%	-8%	-14%
Panola	47%	42%	40%	37%	35%	32%
Polk (P)	15%	-1%	-11%	-17%	-21%	-25%
Rusk	20%	11%	-2%	-13%	-25%	-35%
Sabine	46%	39%	33%	28%	21%	15%
San Augustine	3%	0%	-4%	-7%	-12%	-16%
Shelby	0%	-11%	-21%	-30%	-38%	-46%
Smith (P)	43%	36%	30%	25%	16%	6%
Trinity (P)	22%	17%	17%	15%	12%	9%
Tyler	79%	62%	53%	52%	53%	53%

4A.4. Comparison of Supply and Demand by Water User Group

The comparison of supply versus demands by user group for the East Texas Region is presented in the Water User Group Summary Tables in Appendix A. There are 70 water user groups with identified shortages that cannot be met by existing infrastructure and supply. These shortages total 172,704 acre-feet per year by 2060.

Table 4.5 shows the East Texas water user groups with projected shortages by the end of the planning period. Of the entities with shortages greater than 5,000 ac-ft/yr, four are steam electric power uses (Anderson, Jefferson, Nacogdoches and Rusk), two are municipal uses (Lufkin and Nacogdoches), one is manufacturing in Orange County, and one is livestock in Shelby County.

The steam electric power shortages are due to increases in demand above current facilities. This is also the case for manufacturing shortages in Orange County and livestock shortages in Shelby County. The shortage for Nacogdoches is primarily due to the assumptions used in the determination of water availability in the TCEQ WAM models. These assumptions, which are discussed in more detail in Appendix 3A, limit the availability of Lake Nacogdoches to supplies available under a strict application of the prior appropriation doctrine. The city of Lufkin shows a deficit beginning in 2010, which is due to the production capacities of their existing groundwater wells. The City is planning on developing surface water supplies from their water rights in Sam Rayburn Reservoir.

Table 4.5 Water User Groups with Projected Shortages

Water User Group Name	County	2010	2020	2030	2040	2050	2060	# needs	Max amt
County-Other	Anderson	0	0	0	0	0	-41		
Frankston	Anderson	0	0	-6	-24	-40	-54		
Mining	Anderson	0	-19	-45	-70	-95	-119		
Steam Electric	Anderson	0	-11306	-13218	-15549	-18390	-21853	4	-22,067
County-Other	Angelina	-30	-127	-251	-411	-709	-1143		
Diboll	Angelina	-32	-187	-374	-618	-965	-1441		
Four Way WSC	Angelina	0	0	0	0	0	-225		
Hudson	Angelina	-41	-194	-393	-630	-980	-1444		
Hudson WSC	Angelina	0	-108	-242	-435	-698	-1066		
Livestock	Angelina	0	0	0	-17	-52	-89		
Lufkin	Angelina	-827	-1748	-2725	-3805	-5104	-6657		
Manufacturing	Angelina	0	0	0	0	-995	-4504	8	-16,569
Irrigation	Cherokee	-34	-34	-34	-34	-34	-34		
Manufacturing	Cherokee	-20	-65	-107	-148	-187	-244		
Mining	Cherokee	0	0	0	0	0	-2		
New Summerfield	Cherokee	0	-44	-88	-124	-165	-213		
Rusk	Cherokee	0	0	0	-42	-116	-212	5	-705
County-Other	Hardin	-153	-263	-284	-305	-358	-431		
Irrigation	Hardin	-3711	-3711	-3711	-3711	-3711	-3711		
Manufacturing	Hardin	-27	-46	-63	-81	-97	-114	3	-4,256
Irrigation	Henderson	-3	-4	-5	-5	-6	-6		
Livestock	Henderson	-466	-601	-729	-843	-959	-1066		
Athens	Henderson	-21	-36	-56	-77	-107	-147		
Bethel-Ash WSC	Henderson	0	0	0	0	-17	-105		
Brownsboro	Henderson	0	0	0	0	0	-40		
County-Other	Henderson	-116	-256	-387	-517	-720	-1000		
R P M WSC	Henderson	0	0	-3	-9	-18	-29	7	-2,393

Table 4.5 Water User Groups with Projected Shortages (continued)

Water User Group Name	County	2010	2020	2030	2040	2050	2060	# needs	Max amt
Irrigation	Houston	-382	-667	-986	-1334	-1720	-2146		
Livestock	Houston	-35	-211	-403	-610	-835	-1078	2	-3224
County-Other	Jasper	-109	-205	-223	-165	-138	-138		
Kirbyville	Jasper	-63	-83	-95	-90	-88	-88	2	-226
Meeker	Jefferson	0	0	0	0	-4	-9		
Steam Electric	Jefferson	0	-13426	-15696	-18464	-21838	-25951	3	-25962
Appleby WSC	Nacogdoches	0	0	0	0	-183	-458		
County-Other	Nacogdoches	0	0	0	0	0	-291		
Lilly Grove SUD	Nacogdoches	0	0	-94	-205	-435	-677		
Livestock	Nacogdoches	0	0	-242	-559	-926	-1347		
Manufacturing	Nacogdoches	0	0	-243	-578	-1024	-1431		
Nacogdoches	Nacogdoches	0	0	-804	-1906	-3616	-5175		
Steam Electric	Nacogdoches	-4828	-6911	-8079	-9504	-11241	-13358		
Swift WSC	Nacogdoches	-78	-162	-235	-325	-498	-688	8	-23425
Manufacturing	Newton	-149	-264	-370	-477	-574	-667	1	-667
County-Other	Orange	-88	-2	0	0	0	0		
Manufacturing	Orange	-1518	-8355	-14333	-20293	-25584	-31535		
Mauriceville WSC	Orange	0	-37	-81	-96	-158	-202	3	-31743
County-Other	Polk	-208	-417	-578	-681	-745	-828		
Manufacturing	Polk	0	-64	-164	-269	-365	-449	2	-1277
Mining	Rusk	0	0	0	-2	-82	-157		
Steam Electric	Rusk	0	-2218	-6862	-12522	-19423	-27834	2	-27991
County-Other	Sabine	-9	-21	-28	-36	-45	-60		
Livestock	Sabine	-37	-80	-129	-186	-252	-324	2	-384
County-Other	San Augustine	-1	0	0	0	0	-13		
Irrigation	San Augustine	-90	-90	-90	-90	-90	-90		
Livestock	San Augustine	-91	-169	-260	-365	-487	-621		
Manufacturing	San Augustine	-2	-3	-4	-5	-6	-7	4	-731

Table 4.5 Water User Groups with Projected Shortages (continued)

Water User Group Name	**County**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**# needs**	**Max amt**
Center	Shelby	-105	-228	-328	-406	-480	-568		
County-Other	Shelby	0	-82	-157	-177	-226	-304		
Livestock	Shelby	-777	-1707	-2841	-4222	-5907	-7961		
Manufacturing	Shelby	-55	-157	-249	-333	-416	-520	4	-9353
Bullard	Smith	0	-13	-42	-71	-124	-195		
Community Water Company	Smith	-37	-88	-111	-132	-171	-227		
Dean WSC	Smith	0	-21	-68	-112	-200	-328		
Irrigation	Smith	-5	-34	-65	-96	-128	-162		
Jackson WSC	Smith	0	0	0	0	-28	-68		
Lindale	Smith	0	0	0	-8	-33	-59		
Lindale Rural WSC	Smith	0	0	0	0	0	-73		
Mining	Smith	-47	-126	-159	-215	-255	-288		
R P M WSC	Smith	0	0	0	0	-1	-6	9	-1406
County-Other	Trinity	0	0	0	-9	-32	-57	1	-57
County-Other	Tyler	0	-142	-239	-251	-232	-232	1	-232
TOTAL Regional Shortage		-14,239	-54,823	-77,032	-102,256	-133,113	-172,704	70	-172,704

4A.5. Comparison of Supply and Demand by Wholesale Water Provider

The East Texas Regional Water Planning Group designated seventeen major water providers in the region. The comparison of supply versus demands for each wholesale water provider is presented in Appendix B. Of these seventeen providers, five were identified with projected shortages over the planning cycle. An additional three providers will need to implement strategies for future anticipated demands, not approved by the Texas Water Development Board or to provide supplies located in the region to meet demands outside the region. The wholesale water providers with shortages are shown in Table 4.6 and discussed below.

Angelina & Neches River Authority (ANRA). In Table 4.6, ANRA is projected to have a shortage of 53,442 ac-ft/yr by 2060. ANRA has contractual demands for water from Lake Columbia that are estimated to begin by 2010 (assuming that Lake Columbia is completed by 2010). ANRA has no currently available water supply. The potential management strategy to meet this shortage is construction of Lake Columbia.

Athens MWA. The maximum projected shortage for Athens MWA is 6,533 ac-ft/yr. Most of this shortage is associated with operational constraints of Lake Athens for the Athens Fish Hatchery. Several water management strategies are being considered for Athens MWA to meet this need.

Table 4.6

Wholesale Water Providers with Projected Shortages

Water Provider	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
ANRA	-53,442	-53,442	-53,442	-53,442	-53,442	-53,442
Athens MWA	-2,674	-3,190	-3,803	-4,499	-5,408	-6,533
Center	-192	-425	-622	-785	-944	-1,139
Lufkin	-1,177	-2,496	-3,876	-5,383	-7,127	-9,169
Nacogdoches	0	0	-1,123	-2,690	-5,112	-7,398

City of Center: The City of Center has a total projected shortage of 1,139 ac-ft/yr. This shortage is due to the assumptions that were used to determine the water availability of surface water reservoirs in the TCEQ WAM models. The Neches WAM assumes inflows to Lake Pinkston are regularly released to senior downstream water rights holders, not just at times when priority calls are made. Holding these inflows would allow the City of Center to meet its projected demands. Impacts to downstream water rights holders are expected to be minimal.

City of Lufkin: The City of Lufkin is projected to have a water shortage under drought of record conditions of 1,177 ac-ft/yr beginning in Year 2010, growing to 9,169 ac-ft/yr. for Year 2060. A potential water management strategy to meet this shortfall is to obtain surface water from Lake Sam Rayburn.

City of Nacogdoches: The City of Nacogdoches is projected to have shortages beginning in 2030, and increasing to 7,398 ac-ft/yr by 2060. This shortage is primarily due to the assumptions used by TCEQ in the water availability assessment for Lake Nacogdoches. Similar to the City of Center, holding inflows to the lake will allow the City of Nacogdoches to meet all of its projected needs.

Anderson County

Water User Group Name	2010	2020	2030	2040	2050	2060
Brushy Creek WSC						
Population (number of persons)	3,155	3,332	3,466	3,604	3,712	3,805
Water Demand (ac-ft/yr)	272	276	280	278	282	289
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	374	374	374	374	374	374
Supply - Demand	102	98	94	96	92	85
Consolidated WSC						
Population (number of persons)	1,560	1,647	1,713	1,781	1,834	1,881
Water Demand (ac-ft/yr)	127	129	129	127	130	133
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	66	66	66	66	66	66
Surface Water from Houston Co. WCID	89	88	88	87	89	93
Supply - Demand	29	26	25	26	26	26
County-Other						
Population (number of persons)	26,344	27,821	28,934	30,091	30,994	31,768
Water Demand (ac-ft/yr)	5,459	5,672	5,801	5,932	6,075	6,227
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	5,322	5,322	5,322	5,322	5,322	5,322
Other-Undifferentiated	77	77	77	77	77	77
Queen City	575	575	575	575	575	575
Sparta	212	212	212	212	212	212
Supply - Demand	727	514	385	254	111	-41
Elkhart						
Population (number of persons)	1,309	1,383	1,438	1,496	1,541	1,579
Water Demand (ac-ft/yr)	177	183	185	188	192	196
Current Supply (ac-ft/yr)						
Carrizo Wilcox	671	671	671	671	671	671
Supply - Demand	494	488	486	483	479	475
Four Pine WSC						
Population (number of persons)	2,939	3,104	3,228	3,357	3,458	3,544
Water Demand (ac-ft/yr)	283	292	296	301	306	314
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	549	549	549	549	549	549
Supply - Demand	266	257	253	248	243	235
Frankston						
Population (number of persons)	1,303	1,376	1,431	1,488	1,533	1,571
Water Demand (ac-ft/yr)	524	547	564	582	598	612
Current Supply (ac-ft/yr)						
Carrizo-Aquifer	558	558	558	558	558	558
Supply - Demand	34	11	-6	-24	-40	-54
Palestine						
Population (number of persons)	18,965	20,028	20,830	21,663	22,313	22,870
Water Demand (ac-ft/yr)	3,717	3,837	3,920	4,004	4,099	4,202
Current Supply (ac-ft/yr)						
Lake Palestine	4,331	4,331	4,331	4,331	4,331	4,331
Carrizo-Wilcox	0	0	0	0	0	0
Supply - Demand	614	494	411	327	232	129

Anderson County

Water User Group Name	2010	2020	2030	2040	2050	2060
Walston Springs WSC						
Population (number of persons)	3,815	4,029	4,190	4,358	4,488	4,601
Water Demand (ac-ft/yr)	427	438	441	444	452	464
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	688	688	688	688	688	688
Supply - Demand	261	250	247	244	236	224
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	0	0	0	0	0	0
Current Supply (ac-ft/yr)						
Lake Palestine	0	0	0	0	0	0
Carrizo-Wilcox	0	0	0	0	0	0
Supply - Demand	0	0	0	0	0	0
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	212	212	212	212	212	212
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	386	386	386	386	386	386
Local Supply	1,257	1,257	1,257	1,257	1,257	1,257
Queen City	3	3	3	3	3	3
Supply - Demand	1,434	1,434	1,434	1,434	1,434	1,434
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	513	557	583	608	633	657
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	538	538	538	538	538	538
Supply - Demand	25	-19	-45	-70	-95	-119
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	1,708	1,708	1,708	1,708	1,708	1,708
Current Supply (ac-ft/yr)						
Local Supply	1,283	1,283	1,283	1,283	1,283	1,283
Queen City	418	418	418	418	418	418
Sparta	155	155	155	155	155	155
Carrizo-Wilcox	244	244	244	244	244	244
Other-undifferentiated	29	29	29	29	29	29
Supply - Demand	420	420	420	420	420	420
Steam Electric						
Population (number of persons)						
Water Demand (ac-ft/yr)	0	11,306	13,218	15,549	18,390	21,853
Current Supply (ac-ft/yr)						
Supply - Demand	0	-11,306	-13,218	-15,549	-18,390	-21,853

Angelina County

Water User Group	2010	2020	2030	2040	2050	2060
Central WCID of Angelina County						
Population (number of persons)	6,564	6,886	7,283	7,783	8,470	9,380
Water Demand (ac-ft/yr)	676	686	702	724	778	862
Current Supply (ac-ft/yr)						
Groundwater	874	874	874	874	874	874
Supply - Demand	198	188	172	150	96	12
County-Other						
Population (number of persons)	21,111	22,526	24,269	26,466	29,479	33,473
Water Demand (ac-ft/yr)	2,530	2,624	2,746	2,905	3,203	3,637
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	896	893	890	888	887	887
Jackson	40	40	40	40	40	40
Yegua	1,567	1,567	1,567	1,567	1,567	1,567
Supply - Demand	-30	-127	-251	-411	-709	-1,143
Diboll						
Population (number of persons)	6,449	7,654	9,137	11,007	13,574	16,976
Water Demand (ac-ft/yr)	968	1,123	1,310	1,554	1,901	2,377
Current Supply (ac-ft/yr)						
Yegua	936	936	936	936	936	936
Supply - Demand	-32	-187	-374	-618	-965	-1,441
Four Way WSC						
Population (number of persons)	4,503	6,388	8,708	11,634	15,649	20,970
Water Demand (ac-ft/yr)	368	501	673	886	1,192	1,597
Current Supply (ac-ft/yr)						
Groundwater	1,372	1,372	1,372	1,372	1,372	1,372
Supply - Demand	1,004	871	699	486	180	-225
Hudson						
Population (number of persons)	5,021	6,535	8,398	10,747	13,971	18,243
Water Demand (ac-ft/yr)	579	732	931	1,168	1,518	1,982
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	538	538	538	538	538	538
Supply - Demand	-41	-194	-393	-630	-980	-1,444
Hudson WSC						
Population (number of persons)	7,579	9,268	11,346	13,967	17,564	22,331
Water Demand (ac-ft/yr)	654	768	902	1,095	1,358	1,726
Current Supply (ac-ft/yr)						
Groundwater	660	660	660	660	660	660
Supply - Demand	6	-108	-242	-435	-698	-1,066
Huntington						
Population (number of persons)	2,306	2,598	2,958	3,412	4,035	4,861
Water Demand (ac-ft/yr)	243	262	288	325	380	457
Current Supply (ac-ft/yr)						
Yegua	625	625	625	625	625	625
Sales from Lufkin	115	110	109	110	115	124
Supply - Demand	497	473	446	410	360	292

Angelina County

Water User Group	2010	2020	2030	2040	2050	2060
Lufkin						
Population (number of persons)	37,219	42,351	48,190	54,834	62,394	70,997
Water Demand (ac-ft/yr)	7,546	8,444	9,446	10,565	11,951	13,599
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	6,719	6,696	6,721	6,760	6,847	6,942
Supply - Demand	-827	-1,748	-2,725	-3,805	-5,104	-6,657
Zavalla						
Population (number of persons)	647	647	647	647	647	647
Water Demand (ac-ft/yr)	86	84	82	80	78	78
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	193	193	193	193	193	193
Supply - Demand	107	109	111	113	115	115
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	30,266	34,359	37,982	41,642	44,887	48,356
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	14,509	14,519	14,511	14,498	14,465	14,429
Other-undifferentiated	1,023	1,023	1,023	1,023	1,023	1,023
Striker Lake	10,000	10,000	10,000	10,000	10,000	10,000
Kurth	18,421	18,417	18,413	18,408	18,404	18,400
Supply - Demand	13,687	9,600	5,965	2,287	-995	-4,504
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	30	30	30	30	30	30
Current Supply (ac-ft/yr)						
Other-undifferentiated	38	38	38	38	38	38
Supply - Demand	8	8	8	8	8	8
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	18	17	17	17	17	17
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	28	28	28	28	28	28
Supply - Demand	10	11	11	11	11	11
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	598	620	647	677	712	749
Current Supply (ac-ft/yr)						
Local Supply	347	347	347	347	347	347
Other-undifferentiated	155	155	155	155	155	155
Queen City	79	79	79	79	79	79
Sparta	79	79	79	79	79	79
Supply - Demand	62	40	13	-17	-52	-89

Cherokee County

Water User Group	2010	2020	2030	2040	2050	2060
Alto						
Population (number of persons)	1,290	1,404	1,502	1,592	1,681	1,786
Water Demand (ac-ft/yr)	233	248	261	273	286	304
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	549	549	549	549	549	549
Supply - Demand	316	301	288	276	263	245
Alto Rural WSC						
Population (number of persons)	4,806	5,156	5,456	5,732	6,006	6,329
Water Demand (ac-ft/yr)	393	404	409	411	424	447
Current Supply (ac-ft/yr)						
Groundwater	756	756	756	756	756	756
Supply - Demand	363	352	347	345	332	309
Recommended Strategies						
Bullard						
Population (number of persons)	54	55	56	57	58	59
Water Demand (ac-ft/yr)	13	13	13	13	13	14
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	13	13	13	13	13	14
Supply - Demand	0	0	0	0	0	0
County-Other						
Population (number of persons)	6,288	5,555	4,406	2,811	2,110	1,690
Water Demand (ac-ft/yr)	902	790	617	378	272	218
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	1,563	1,563	1,563	1,563	1,563	1,563
Lake Jacksonville	218	180	134	78	54	41
Queen City	81	81	81	81	81	81
Sparta	12	12	12	12	12	12
Supply - Demand	972	1,046	1,173	1,356	1,438	1,479
Craft-Turney WSC						
Population (number of persons)	5,672	7,032	8,719	10,810	12,000	13,000
Water Demand (ac-ft/yr)	515	614	742	908	995	1,078
Current Supply (ac-ft/yr)						
Lake Jacksonville	497	559	643	752	790	811
Lake Acker	0	0	0	0	0	0
Carrizo-Wilcox	213	240	276	322	339	348
Supply - Demand	195	185	177	166	134	81
Jacksonville						
Population (number of persons)	14,543	15,316	15,978	16,587	17,191	17,904
Water Demand (ac-ft/yr)	3,502	3,637	3,741	3,827	3,948	4,111
Current Supply (ac-ft/yr)						
Lake Jacksonville	3,381	3,311	3,243	3,168	3,135	3,093
Lake Acker	0	0	0	0	0	0
Carrizo-Wilcox	1,450	1,420	1,390	1,358	1,344	1,326
Supply - Demand	1,329	1,094	892	699	531	308
New Summerfield						
Population (number of persons)	1,290	1,624	1,910	2,173	2,434	2,742
Water Demand (ac-ft/yr)	208	258	302	338	379	427
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	214	214	214	214	214	214
Supply - Demand	6	-44	-88	-124	-165	-213

Cherokee County

Water User Group	2010	2020	2030	2040	2050	2060

Cherokee County

Water User Group	2010	2020	2030	2040	2050	2060
North Cherokee WSC						
Population (number of persons)	4,116	4,834	5,449	6,015	6,576	7,238
Water Demand (ac-ft/yr)	387	439	482	519	560	616
Current Supply (ac-ft/yr)						
Lake Jacksonville	374	400	418	430	445	463
Lake Acker	0	0	0	0	0	0
Carrizo-Wilcox	160	171	179	184	191	199
Supply - Demand	147	132	115	95	76	46
Rusk						
Population (number of persons)	5,525	6,029	6,461	6,858	7,252	7,717
Water Demand (ac-ft/yr)	1,194	1,283	1,353	1,421	1,495	1,591
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	1,315	1,316	1,317	1,317	1,318	1,319
Rusk City Lake	64	63	63	62	61	60
Supply - Demand	185	96	27	-42	-116	-212
Rusk Rural WSC						
Population (number of persons)	3,166	3,391	3,584	3,761	3,937	4,145
Water Demand (ac-ft/yr)	358	372	381	388	401	423
Current Supply (ac-ft/yr)						
Groundwater	537	537	537	537	537	537
Supply - Demand	179	165	156	149	136	114
Southern Utilities Company						
Population (number of persons)	2,525	2,799	3,034	3,250	3,464	3,717
Water Demand (ac-ft/yr)	421	458	486	513	543	583
Current Supply (ac-ft/yr)						
Groundwater	574	603	633	665	698	733
Surface Water	0	0	0	0	0	0
Supply - Demand	153	145	147	152	155	150
Troup						
Population (number of persons)	44	49	53	57	61	66
Water Demand (ac-ft/yr)	6	6	7	7	8	8
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	8	8	8	8	8	8
Supply - Demand	2	2	1	1	0	0
Wells						
Population (number of persons)	774	780	785	789	793	798
Water Demand (ac-ft/yr)	122	121	119	117	115	116
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	359	359	359	359	359	359
Supply - Demand	237	238	240	242	244	243
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	718	784	839	891	934	1,007
Current Supply (ac-ft/yr)						
Lake Jacksonville	693	714	727	738	742	758
Carrizo-Wilcox	5	5	5	5	5	5
Supply - Demand	-20	-65	-107	-148	-187	-244

Cherokee County

Water User Group	2010	2020	2030	2040	2050	2060
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	321	321	321	321	321	321
Current Supply (ac-ft/yr)						
Local Supply	182	182	182	182	182	182
Carrizo-Wilcox	51	51	51	51	51	51
Queen City	51	51	51	51	51	51
Sparta	3	3	3	3	3	3
Supply - Demand	-34	-34	-34	-34	-34	-34
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	93	97	99	101	103	105
Current Supply (ac-ft/yr)						
Local Supply	2	2	2	2	2	2
Carrizo-Wilcox	101	101	101	101	101	101
Supply - Demand	10	6	4	2	0	-2
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	1,765	1,765	1,765	1,765	1,765	1,765
Current Supply (ac-ft/yr)						
Local Supply	1,059	1,059	1,059	1,059	1,059	1,059
Carrizo-Wilcox	566	566	566	566	566	566
Queen City	566	566	566	566	566	566
Sparta	186	186	186	186	186	186
Supply - Demand	612	612	612	612	612	612
Steam Electric						
Population (number of persons)						
Water Demand (ac-ft/yr)	2,245	1,790	2,093	2,462	2,912	3,460
Current Supply (ac-ft/yr)						
Lake Striker	2,245	1,790	2,093	2,462	2,912	3,460
Supply - Demand	0	0	0	0	0	0

Hardin County

Water User Group	2010	2020	2030	2040	2050	2060
County-Other						
Population (number of persons)	12,824	13,909	14,402	14,913	15,441	15,989
Water Demand (ac-ft/yr)	1,853	1,963	1,984	2,005	2,058	2,131
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	1,680	1,680	1,680	1,680	1,680	1,680
Other-Undifferentiated	20	20	20	20	20	20
Supply - Demand	-153	-263	-284	-305	-358	-431
Kountze						
Population (number of persons)	2,398	2,601	2,693	2,788	2,887	2,990
Water Demand (ac-ft/yr)	306	323	326	328	336	348
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	409	409	409	409	409	409
Supply - Demand	103	86	83	81	73	61
Lake Livingston Water Supply and Sewer Service Company						
Population (number of persons)	100	108	112	116	120	124
Water Demand (ac-ft/yr)	6	7	7	7	7	7
Current Supply (ac-ft/yr)						
Groundwater	8	8	8	8	8	8
Supply - Demand	2	1	1	1	1	1
Lumberton						
Population (number of persons)	9,899	10,736	11,117	11,511	11,919	12,342
Water Demand (ac-ft/yr)	1,430	1,515	1,544	1,573	1,615	1,673
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	1,700	1,700	1,700	1,700	1,700	1,675
Supply - Demand	270	185	156	127	85	2
Lumberton MUD						
Population (number of persons)	8,241	8,939	9,256	9,584	9,923	10,275
Water Demand (ac-ft/yr)	1,929	2,073	2,125	2,179	2,245	2,325
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	2,300	2,300	2,300	2,300	2,300	2,325
Supply - Demand	371	227	175	121	55	0
North Hardin WSC						
Population (number of persons)	7,370	7,993	8,276	8,570	8,874	9,188
Water Demand (ac-ft/yr)	685	716	714	720	736	762
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	1,446	1,446	1,446	1,446	1,446	1,446
Supply - Demand	761	730	732	726	710	684
Silsbee						
Population (number of persons)	7,248	7,861	8,140	8,429	8,728	9,037
Water Demand (ac-ft/yr)	1,072	1,136	1,149	1,161	1,193	1,235
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	1,685	1,685	1,685	1,685	1,685	1,685
Supply - Demand	613	549	536	524	492	450

Hardin County

Water User Group	2010	2020	2030	2040	2050	2060
Sour Lake						
Population (number of persons)	1,890	2,050	2,123	2,198	2,276	2,356
Water Demand (ac-ft/yr)	176	184	183	182	186	193
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	766	766	766	766	766	766
Supply - Demand	590	582	583	584	580	573
West Hardin WSC						
Population (number of persons)	4,534	4,918	5,092	5,272	5,459	5,653
Water Demand (ac-ft/yr)	315	325	325	325	330	342
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	522	522	522	522	522	522
Supply - Demand	207	197	197	197	192	180
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	146	165	182	200	216	233
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	119	119	119	119	119	119
Supply - Demand	-27	-46	-63	-81	-97	-114
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	7,213	7,213	7,213	7,213	7,213	7,213
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	3,502	3,502	3,502	3,502	3,502	3,502
Supply - Demand	-3,711	-3,711	-3,711	-3,711	-3,711	-3,711
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	7,800	8,648	9,219	9,788	10,361	10,798
Current Supply (ac-ft/yr)						
Local Supply	0	0	0	0	0	0
Sam Rayburn/ Steinhagen System	7,772	8,620	9,191	9,760	10,333	10,770
Gulf Coast Aquifer	28	28	28	28	28	28
Supply - Demand	0	0	0	0	0	0
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	156	156	156	156	156	156
Current Supply (ac-ft/yr)						
Local Supply	141	141	141	141	141	141
Gulf Coast Aquifer	18	18	18	18	18	18
Supply - Demand	3	3	3	3	3	3

Henderson County

Water User Group	2010	2020	2030	2040	2050	2060
Athens						
Population (number of persons)	380	536	690	848	1,040	1,283
Water Demand (ac-ft/yr)	77	107	136	163	199	246
Current Supply (ac-ft/yr)						
Sales from Athens MWA	44	56	65	70	76	82
Carizzo Wilcox	9	12	15	16	16	17
Supply - Demand	-21	-36	-56	-77	-107	-147
Berryville						
Population (number of persons)	977	1,071	1,164	1,259	1,375	1,521
Water Demand (ac-ft/yr)	126	134	142	149	162	179
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	245	245	245	245	245	245
Supply - Demand	119	111	103	96	83	66
Bethel-Ash WSC						
Population (number of persons)	3,096	3,860	4,614	5,387	6,330	7,521
Water Demand (ac-ft/yr)	250	303	351	404	468	556
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	451	451	451	451	451	451
Supply - Demand	201	148	100	47	-17	-105
Brownsboro						
Population (number of persons)	949	1,115	1,279	1,447	1,652	1,910
Water Demand (ac-ft/yr)	158	182	206	232	263	304
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	264	264	264	264	264	264
Supply - Demand	106	82	58	32	1	-40
Brushy Creek WSC						
Population (number of persons)	837	951	1,063	1,178	1,318	1,495
Water Demand (ac-ft/yr)	72	79	86	91	100	114
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	209	209	209	209	209	209
Supply - Demand	137	130	123	118	109	95
Chandler						
Population (number of persons)	2,385	2,695	3,001	3,314	3,696	4,179
Water Demand (ac-ft/yr)	409	453	494	538	596	674
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	743	743	743	743	743	743
Supply - Demand	334	290	249	205	147	69
County-Other						
Population (number of persons)	14,004	14,971	15,923	16,904	18,097	19,604
Water Demand (ac-ft/yr)	2,761	2,901	3,032	3,162	3,365	3,645
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	1,705	1,705	1,705	1,705	1,705	1,705
Queen City	840	840	840	840	840	840
Lake Palestine	100	100	100	100	100	100
Supply - Demand	-116	-256	-387	-517	-720	-1,000

Henderson County

Water User Group	2010	2020	2030	2040	2050	2060
Murchison						
Population (number of persons)	642	696	749	804	871	955
Water Demand (ac-ft/yr)	139	148	157	166	179	196
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	357	357	357	357	357	357
Supply - Demand	218	209	200	191	178	161
R P M WSC						
Population (number of persons)	495	552	608	665	735	823
Water Demand (ac-ft/yr)	69	75	80	86	95	106
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	77	77	77	77	77	77
Supply - Demand	8	2	-3	-9	-18	-29
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	12	14	16	18	20	22
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	12	14	16	18	20	22
Supply - Demand	0	0	0	0	0	0
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	10	10	10	10	10	10
Current Supply (ac-ft/yr)						
Lake Athens	7	6	5	5	4	4
Supply - Demand	-3	-4	-5	-5	-6	-6
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	14	14	14	14	14	14
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	27	27	27	27	27	27
Supply - Demand	13	13	13	13	13	13
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	2,594	2,594	2,594	2,594	2,594	2,594
Current Supply (ac-ft/yr)						
Lake Athens	1,267	1,132	1,004	890	774	667
Local surface water	279	279	279	279	279	279
Queen City	485	485	485	485	485	485
Carrizo-Wilcox	97	97	97	97	97	97
Supply - Demand	-466	-601	-729	-843	-959	-1,066

Houston County

Water User Group	2010	2020	2030	2040	2050	2060
Consolidated WSC						
Population (number of persons)	13,391	13,732	14,281	14,852	15,446	16,064
Water Demand (ac-ft/yr)	1,095	1,077	1,072	1,064	1,090	1,134
Current Supply (ac-ft/yr)						
Groundwater	593	593	593	593	593	593
Surface Water	798	787	783	777	796	827
Supply - Demand	296	303	304	306	299	286
County-Other						
Population (number of persons)	1,053	1,080	1,123	1,169	1,216	1,264
Water Demand (ac-ft/yr)	178	179	182	186	192	199
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	144	144	144	144	144	144
Houston County Lake	118	116	115	114	114	113
Other-Undifferentiated	549	549	549	549	549	549
Queen City	164	164	164	164	164	164
Sparta	100	100	100	100	100	100
Supply - Demand	897	894	890	885	879	871
Crockett						
Population (number of persons)	7,376	7,563	7,866	8,180	8,507	8,848
Water Demand (ac-ft/yr)	1,438	1,449	1,480	1,512	1,553	1,615
Current Supply (ac-ft/yr)						
Houston County Lake	1,899	1,881	1,868	1,857	1,848	1,840
Supply - Demand	461	432	388	345	295	225
Grapeland						
Population (number of persons)	1,499	1,536	1,599	1,662	1,729	1,798
Water Demand (ac-ft/yr)	264	265	270	275	283	294
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	510	510	510	510	510	510
Houston County Lake	139	138	136	135	135	134
Supply - Demand	385	383	376	370	362	350
Lovelady						
Population (number of persons)	628	644	670	696	724	753
Water Demand (ac-ft/yr)	75	75	76	76	78	81
Current Supply (ac-ft/yr)						
Houston County Lake	26	26	26	26	26	26
Carrizo-Wilcox	280	280	280	280	280	280
Supply - Demand	231	231	230	230	228	225
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	169	190	209	227	243	263
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	11	11	11	11	11	11
Houston County Lake	199	219	235	248	257	267
Supply - Demand	41	40	37	32	25	15

Houston County

Water User Group	2010	2020	2030	2040	2050	2060
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	2,739	3,024	3,343	3,691	4,077	4,503
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	51	51	51	51	51	51
Local Supply	2,070	2,070	2,070	2,070	2,070	2,070
Queen City	112	112	112	112	112	112
Sparta	124	124	124	124	124	124
Supply - Demand	-382	-667	-986	-1,334	-1,720	-2,146
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	163	160	158	156	154	153
Current Supply (ac-ft/yr)						
Other-undifferentiated	179	179	179	179	179	179
Sparta	48	48	48	48	48	48
Supply - Demand	64	67	69	71	73	74
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	2,115	2,291	2,483	2,690	2,915	3,158
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	86	86	86	86	86	86
Local Supply	1,171	1,171	1,171	1,171	1,171	1,171
Other-undifferentiated	246	246	246	246	246	246
Queen City	112	112	113	112	114	112
Sparta	465	465	465	465	465	465
Supply - Demand	-35	-211	-403	-610	-835	-1,078

Jasper County

Water User Group	2010	2020	2030	2040	2050	2060
County-Other						
Population (number of persons)	22,244	23,624	24,439	24,647	24,647	24,647
Water Demand (ac-ft/yr)	2,815	2,911	2,929	2,871	2,844	2,844
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	2,706	2,706	2,706	2,706	2,706	2,706
Supply - Demand	-109	-205	-223	-165	-138	-138
Jasper						
Population (number of persons)	8,315	8,883	9,218	9,303	9,303	9,303
Water Demand (ac-ft/yr)	1,602	1,682	1,714	1,699	1,688	1,688
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	3,104	3,104	3,104	3,104	3,104	3,104
Supply - Demand	1,502	1,422	1,390	1,405	1,416	1,416
Jasper County WCID #1						
Population (number of persons)	4,319	4,595	4,757	4,799	4,799	4,799
Water Demand (ac-ft/yr)	324	329	325	312	306	306
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	755	755	755	755	755	755
Supply - Demand	431	426	430	443	449	449
Kirbyville						
Population (number of persons)	2,251	2,395	2,480	2,501	2,501	2,501
Water Demand (ac-ft/yr)	474	494	506	501	499	499
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	411	411	411	411	411	411
Supply - Demand	-63	-83	-95	-90	-88	-88
Mauriceville WSC						
Population (number of persons)	1,316	1,400	1,450	1,462	1,462	1,462
Water Demand (ac-ft/yr)	100	104	104	103	103	103
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	108	108	108	108	108	108
Supply - Demand	8	4	4	5	5	5
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	64,267	67,649	70,162	72,359	74,006	74,069
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	43,462	43,462	43,463	43,463	43,463	43,463
Sam Rayburn/Steinhagen System	20,189	23,571	26,084	28,281	29,928	29,991
Run-of-River Neches	616	616	616	616	616	616
Supply - Demand	0	0	1	1	1	1
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	0	0	0	0	0	0
Current Supply (ac-ft/yr)						
Local Supply	127	127	127	127	127	127
Supply - Demand	127	127	127	127	127	127

Jasper County

Water User Group	2010	2020	2030	2040	2050	2060
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	4	4	4	4	4	4
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	4	4	4	4	4	4
Supply - Demand	0	0	0	0	0	0
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	317	317	317	317	317	317
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	136	136	136	136	136	136
Local Supply	190	190	190	190	190	190
Supply - Demand	9	9	9	9	9	9

Jefferson County

Water User Group	2010	2020	2030	2040	2050	2060
Beaumont						
Population (number of persons)	113,866	113,866	113,866	113,866	113,866	113,866
Water Demand (ac-ft/yr)	27,040	26,657	26,275	25,892	25,636	25,636
Current Supply (ac-ft/yr)						
Run-of-the-River Diversion	20,124	19,708	19,358	19,084	18,780	18,205
Gulf Coast Aquifer	8,696	8,566	8,458	8,372	8,277	8,097
Supply - Demand	1,780	1,617	1,541	1,564	1,421	666
Bevil Oaks						
Population (number of persons)	1,346	1,346	1,346	1,346	1,346	1,346
Water Demand (ac-ft/yr)	137	133	128	124	121	121
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	348	348	348	348	348	348
Supply - Demand	211	215	220	224	227	227
China						
Population (number of persons)	1,096	1,072	1,051	1,035	1,018	987
Water Demand (ac-ft/yr)	165	157	151	145	140	136
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	228	228	228	228	228	228
Supply - Demand	63	71	77	83	88	92
County-Other						
Population (number of persons)	21,249	28,265	34,588	39,464	44,381	53,675
Water Demand (ac-ft/yr)	1,880	2,438	2,906	3,272	3,679	4,449
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	438	568	677	762	857	1,036
Sam Rayburn and Steinhagen System	188	244	291	327	368	445
Run-of-River (Beaumont)	1,405	1,821	2,171	2,445	2,749	3,324
Supply - Demand	151	195	233	262	295	356
Groves						
Population (number of persons)	15,733	15,733	15,733	15,733	15,733	15,733
Water Demand (ac-ft/yr)	3,190	3,137	3,085	3,031	2,996	2,996
Current Supply (ac-ft/yr)						
Sam Rayburn and Steinhagen System	3,190	3,137	3,085	3,031	2,996	2,996
Supply - Demand	0	0	0	0	0	0
Jefferson County WCID #10						
Population (number of persons)	4,923	5,534	6,085	6,509	6,937	7,747
Water Demand (ac-ft/yr)	640	700	750	787	832	929
Current Supply (ac-ft/yr)						
Sam Rayburn/Steinhagen	640	700	750	787	832	929
Supply - Demand	0	0	0	0	0	0

Jefferson County

2006 Water Plan
East Texas Region

Water User Group	2010	2020	2030	2040	2050	2060
Meeker MUD						
Population (number of persons)	3,322	4,022	4,653	5,139	5,629	6,556
Water Demand (ac-ft/yr)	324	379	423	461	498	580
Current Supply (ac-ft/yr)						
surface water	3	4	4	5	5	6
Gulf Coast Aquifer	572	572	572	572	572	572
Supply - Demand	251	197	153	116	79	-2
Nederland						
Population (number of persons)	18,052	18,958	19,775	20,404	21,039	22,238
Water Demand (ac-ft/yr)	4,125	4,268	4,387	4,456	4,573	4,834
Current Supply (ac-ft/yr)						
Sam Rayburn and Steinhagen System	4,125	4,268	4,387	4,456	4,573	4,834
Supply - Demand	0	0	0	0	0	0
Nome						
Population (number of persons)	549	598	643	677	712	777
Water Demand (ac-ft/yr)	127	136	144	150	157	172
Current Supply (ac-ft/yr)						
Sam Rayburn and Steinhagen System	127	136	144	150	157	172
Supply - Demand	0	0	0	0	0	0
Port Arthur						
Population (number of persons)	57,755	57,755	57,755	57,755	57,755	57,755
Water Demand (ac-ft/yr)	9,704	9,510	9,315	9,122	8,993	8,993
Current Supply (ac-ft/yr)						
Sam Rayburn and Steinhagen System	9,704	9,510	9,315	9,122	8,993	8,993
Supply - Demand	0	0	0	0	0	0
Port Neches						
Population (number of persons)	13,956	14,466	14,926	15,281	15,638	16,314
Water Demand (ac-ft/yr)	1,782	1,782	1,789	1,780	1,804	1,882
Current Supply (ac-ft/yr)						
Sam Rayburn and Steinhagen System	1,782	1,782	1,789	1,780	1,804	1,882
Supply - Demand	0	0	0	0	0	0
West Jefferson County MWD						
Population (number of persons)	7,853	9,071	10,169	11,016	11,870	13,484
Water Demand (ac-ft/yr)	1,029	1,148	1,264	1,345	1,436	1,631
Current Supply (ac-ft/yr)						
Sales from Beaumont	0	0	0	0	0	0
Sam Rayburn/Steinhagen	1,029	1,148	1,264	1,345	1,436	1,631
Supply - Demand	0	0	0	0	0	0
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	237,954	267,434	292,871	318,669	341,559	365,636
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	423	423	423	423	423	423
Run-of-the-River Diversion (Beaumont)	2,806	2,806	2,806	2,806	2,806	2,806
Run-of-the-River Diversion Neches-Trinity	680	680	680	680	680	680
Sam Rayburn & Steinhagen System	105,890	119,008	130,328	141,808	151,994	162,708
LNVA Pine Island Rights	105,890	119,008	130,328	141,808	151,994	162,708
Direct reuse	0	0	0	0	0	0
Saline water rights (icludes DD7 canal)	23,795	26,743	29,287	31,867	34,156	36,564
Supply - Demand	1,530	1,237	981	723	494	253

Jefferson County

2006 Water Plan
East Texas Region

Water User Group	2010	2020	2030	2040	2050	2060
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	208,035	208,035	208,035	208,035	208,035	208,035
Current Supply (ac-ft/yr)						
Sam Rayburn/Steinhagen System	147,000	147,000	147,000	147,000	147,000	147,000
Run-of-the-River Diversion - Neches-Trinity	68,433	68,433	68,433	68,433	68,433	68,433
Supply - Demand	7,398	7,398	7,398	7,398	7,398	7,398
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	323	334	341	348	355	360
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	75	75	75	75	75	75
Local Supply	276	276	276	276	276	276
Supply - Demand	28	17	10	3	-4	-9
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	807	807	807	807	807	807
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	622	622	622	622	622	622
Local Supply	323	323	323	323	323	323
Supply - Demand	138	138	138	138	138	138
Steam Electric						
Population (number of persons)						
Water Demand (ac-ft/yr)	0	13,426	15,696	18,464	21,838	25,951
Current Supply (ac-ft/yr)						
Supply - Demand	0	-13,426	-15,696	-18,464	-21,838	-25,951

Nacogdoches County

Water User Group	2010	2020	2030	2040	2050	2060
Appleby WSC						
Population (number of persons)	4,341	5,481	6,560	7,749	9,985	12,345
Water Demand (ac-ft/yr)	763	945	1,117	1,311	1,678	2,074
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	770	810	841	871	920	964
Lake Nacogdoches	240	346	414	477	575	652
Supply - Demand	247	211	138	37	-183	-458
County-Other						
Population (number of persons)	21,463	23,669	25,755	28,054	32,380	36,944
Water Demand (ac-ft/yr)	2,452	2,625	2,770	2,954	3,373	3,849
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	3,495	3,495	3,495	3,495	3,495	3,495
Other-Undifferentiated	9	9	9	9	9	9
Queen City	25	25	25	25	25	25
Sparta	29	29	29	29	29	29
Supply - Demand	1,106	933	788	604	185	-291
Cushing						
Population (number of persons)	683	730	774	823	915	1,012
Water Demand (ac-ft/yr)	129	135	140	147	162	179
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	237	237	237	237	237	237
Supply - Demand	108	102	97	90	75	58
Garrison						
Population (number of persons)	844	844	844	844	844	844
Water Demand (ac-ft/yr)	149	147	144	141	139	139
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	460	460	460	460	460	460
Supply - Demand	311	313	316	319	321	321
Lilly Grove SUD						
Population (number of persons)	3,229	4,172	5,064	6,047	7,896	9,847
Water Demand (ac-ft/yr)	423	533	641	752	982	1,224
Current Supply (ac-ft/yr)						
Groundwater	547	547	547	547	547	547
Supply - Demand	124	14	-94	-205	-435	-677
Nacogdoches						
Population (number of persons)	33,044	36,501	39,946	43,074	49,198	54,345
Water Demand (ac-ft/yr)	7,625	8,423	9,218	9,939	11,352	12,540
Current Supply (ac-ft/yr)						
Lake Nacogdoches	6,937	6,541	6,194	5,837	5,543	5,197
Carrizo-Wilcox	2,274	2,240	2,220	2,196	2,193	2,168
Supply - Demand	1,586	358	-804	-1,906	-3,616	-5,175
Swift WSC						
Population (number of persons)	3,753	4,517	5,240	6,037	7,535	9,116
Water Demand (ac-ft/yr)	483	567	640	730	903	1,093
Current Supply (ac-ft/yr)						
Groundwater	405	405	405	405	405	405
Supply - Demand	-78	-162	-235	-325	-498	-688

Nacogdoches County

Water User Group	2010	2020	2030	2040	2050	2060
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	2,288	2,553	2,786	3,016	3,214	3,468
Current Supply (ac-ft/yr)						
Lake Nacogdoches	2,082	1,983	1,872	1,772	1,569	1,437
Carrizo-Wilcox	682	679	671	666	621	600
Supply - Demand	476	109	-243	-578	-1,024	-1,431
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	302	302	302	302	302	302
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	1,396	1,396	1,396	1,396	1,396	1,396
Local Supply	136	136	136	136	136	136
Supply - Demand	1,230	1,230	1,230	1,230	1,230	1,230
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	215	213	212	211	210	209
Current Supply (ac-ft/yr)						
Local Supply	220	220	220	220	220	220
Supply - Demand	5	7	8	9	10	11
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	1,719	1,954	2,227	2,544	2,911	3,332
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	590	590	590	590	590	590
Other-undifferentiated	69	69	69	69	69	69
Queen City	195	195	195	195	195	195
Sparta	221	221	221	221	221	221
Local Supply	910	910	910	910	910	910
Supply - Demand	266	31	-242	-559	-926	-1,347
Steam Electric						
Population (number of persons)						
Water Demand (ac-ft/yr)	4,828	6,911	8,079	9,504	11,241	13,358
Current Supply (ac-ft/yr)						
Angelina River	0	0	0	0	0	0
Supply - Demand	-4,828	-6,911	-8,079	-9,504	-11,241	-13,358

Newton County

Water User Group	2010	2020	2030	2040	2050	2060
County-Other						
Population (number of persons)	9,967	10,417	10,476	10,790	11,114	11,447
Water Demand (ac-ft/yr)	1,128	1,132	1,103	1,100	1,120	1,154
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	1,378	1,378	1,378	1,378	1,378	1,378
Supply - Demand	250	246	275	278	258	224
Mauriceville WSC						
Population (number of persons)	485	507	510	525	541	557
Water Demand (ac-ft/yr)	37	37	37	37	38	39
Current Supply (ac-ft/yr)						
Groundwater	39	39	39	39	39	39
Supply - Demand	2	2	2	2	1	0
Newton						
Population (number of persons)	2,612	2,730	2,745	2,827	2,912	3,000
Water Demand (ac-ft/yr)	480	495	489	497	509	524
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	686	686	686	686	686	686
Supply - Demand	206	191	197	189	177	162
South Newton WSC						
Population (number of persons)	2,944	3,077	3,094	3,187	3,282	3,381
Water Demand (ac-ft/yr)	257	259	253	253	257	265
Current Supply (ac-ft/yr)						
Groundwater	653	653	653	653	653	653
Supply - Demand	396	394	400	400	396	388
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	678	793	899	1,006	1,103	1,196
Current Supply (ac-ft/yr)						
Run-of-the-River Diversion - Sabi	135	135	135	135	135	135
Local Supply	0	0	0	0	0	0
Gulf Coast Aquifer	394	394	394	394	394	394
Supply - Demand	-149	-264	-370	-477	-574	-667
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	367	367	367	367	367	367
Current Supply (ac-ft/yr)						
Local Supply	50	50	50	50	50	50
Gulf Coast Aquifer	2,234	2,234	2,234	2,234	2,234	2,234
Supply - Demand	1,917	1,917	1,917	1,917	1,917	1,917
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	32	32	32	32	32	32
Current Supply (ac-ft/yr)						
Local Supply	28	28	28	28	28	28
Gulf Coast Aquifer	8	8	8	8	8	8
Supply - Demand	4	4	4	4	4	4

Newton County

Water User Group	2010	2020	2030	2040	2050	2060
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	110	110	110	110	110	110
Current Supply (ac-ft/yr)						
Local Supply	66	66	66	66	66	66
Gulf Coast Aquifer	58	58	58	58	58	58
Supply - Demand	14	14	14	14	14	14
Steam Electric						
Population (number of persons)						
Water Demand (ac-ft/yr)	5,924	14,132	16,522	19,436	22,987	27,317
Current Supply (ac-ft/yr)						
Toledo Bend	17,929	17,929	17,929	17,929	17,929	17,929
SRA Canal	13,442	13,442	13,442	13,442	13,442	13,442
Supply - Demand	25,447	17,239	14,849	11,935	8,384	4,054

Orange County

Water User Group	2010	2020	2030	2040	2050	2060
Bridge City						
Population (number of persons)	9,264	9,681	9,851	9,924	10,075	10,184
Water Demand (ac-ft/yr)	965	977	960	934	936	947
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	1,267	1,267	1,267	1,267	1,267	1,267
Supply - Demand	302	290	307	333	331	320
County-Other						
Population (number of persons)	32,563	32,998	33,177	33,252	33,411	33,527
Water Demand (ac-ft/yr)	4,559	4,473	4,385	4,284	4,267	4,282
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	4,471	4,471	4,471	4,471	4,471	4,471
Supply - Demand	-88	-2	86	187	204	189
Mauriceville WSC						
Population (number of persons)	9,467	11,866	12,848	13,265	14,137	14,769
Water Demand (ac-ft/yr)	721	877	921	936	998	1,042
Current Supply (ac-ft/yr)	840	840	840	840	840	840
Supply - Demand	119	-37	-81	-96	-158	-202
Orange						
Population (number of persons)	18,643	18,643	18,643	18,643	18,643	18,643
Water Demand (ac-ft/yr)	3,801	3,738	3,675	3,613	3,571	3,571
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	3,816	3,816	3,816	3,816	3,816	3,816
Supply - Demand	15	78	141	203	245	245
Pine Forest						
Population (number of persons)	632	632	632	632	632	632
Water Demand (ac-ft/yr)	73	71	69	67	65	65
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	128	128	128	128	128	128
Supply - Demand	55	57	59	61	63	63
Pinehurst						
Population (number of persons)	2,274	2,274	2,274	2,274	2,274	2,274
Water Demand (ac-ft/yr)	336	329	321	313	308	308
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	690	690	690	690	690	690
Supply - Demand	354	361	369	377	382	382
Rose City						
Population (number of persons)	519	519	519	519	519	519
Water Demand (ac-ft/yr)	84	83	81	79	78	78
Current Supply (ac-ft/yr)						
Run-of-the-River Diversion	242	242	242	242	242	242
Supply - Demand	158	159	161	163	164	164
South Newton WSC						
Population (number of persons)	1,108	1,299	1,377	1,410	1,479	1,529
Water Demand (ac-ft/yr)	97	109	113	112	116	120
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	194	194	194	194	194	194
Supply - Demand	97	85	81	82	78	74

Orange County

Water User Group	2010	2020	2030	2040	2050	2060
Vidor						
Population (number of persons)	11,922	12,251	12,386	12,443	12,562	12,648
Water Demand (ac-ft/yr)	1,629	1,619	1,595	1,561	1,562	1,572
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	2,087	2,087	2,087	2,087	2,087	2,087
Supply - Demand	458	467	492	526	526	515
West Orange						
Population (number of persons)	4,111	4,111	4,111	4,111	4,111	4,111
Water Demand (ac-ft/yr)	530	516	502	488	479	479
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	905	905	905	905	905	905
Supply - Demand	375	389	403	417	426	426
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	57,624	64,461	70,439	76,399	81,690	87,641
Current Supply (ac-ft/yr)						
Run-of-the-River Diversion - Sabine	52,030	52,030	52,030	52,030	52,030	52,030
Gulf Coast Aquifer	4,076	4,076	4,076	4,076	4,076	4,076
Supply - Demand	-1,518	-8,355	-14,333	-20,293	-25,584	-31,535
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	2,509	2,509	2,509	2,509	2,509	2,509
Current Supply (ac-ft/yr)						
Run-of-the-River Diversion - Sabine	28	28	28	28	28	28
SRA Canal	2,543	2,543	2,543	2,543	2,543	2,543
Irr Reuse	15	15	15	15	15	15
Supply - Demand	77	77	77	77	77	77
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	8	9	9	9	9	9
Current Supply (ac-ft/yr)						
Local Supply	1	1	1	1	1	1
Gulf Coast Aquifer	8	8	8	8	8	8
Supply - Demand	1	0	0	0	0	0
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	210	210	210	210	210	210
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	88	88	88	88	88	88
Local Supply	126	126	126	126	126	126
Supply - Demand	4	4	4	4	4	4
Steam Electric						
Population (number of persons)						
Water Demand (ac-ft/yr)	6,228	4,966	5,805	6,829	8,077	9,598
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	1,085	1,085	1,085	1,085	1,085	1,085
Brackish water - Sabine	17,210	17,210	17,210	17,210	17,210	17,210
SRA Canal System	4,481	4,481	4,481	4,481	4,481	4,481
Supply - Demand	16,550	17,813	16,973	15,949	14,700	13,180

Panola County

Water User Group	2010	2020	2030	2040	2050	2060
Beckville						
Population (number of persons)	790	806	820	831	840	846
Water Demand (ac-ft/yr)	133	133	132	131	131	132
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	835	835	835	835	835	835
Supply - Demand	702	702	703	704	704	703
Carthage						
Population (number of persons)	7,000	7,146	7,263	7,362	7,444	7,497
Water Demand (ac-ft/yr)	2,274	2,297	2,311	2,317	2,326	2,343
Current Supply (ac-ft/yr)						
Lake Murvaul	3,711	3,685	3,661	3,633	3,611	3,569
Carrizo-Wilcox	422	419	417	413	411	406
Supply - Demand	1,859	1,807	1,767	1,729	1,696	1,632
County-Other						
Population (number of persons)	15,159	15,476	15,728	15,944	16,121	16,235
Water Demand (ac-ft/yr)	1,698	1,681	1,656	1,625	1,607	1,619
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	283	285	289	293	298	300
Lake Murvaul	2,420	2,372	2,335	2,304	2,274	2,223
Supply - Demand	1,005	976	968	972	965	904
Gill WSC						
Population (number of persons)	728	743	755	766	774	780
Water Demand (ac-ft/yr)	94	96	97	99	100	100
Current Supply (ac-ft/yr)						
Surface water from Marshall	0	0	0	0	0	0
Carrizo-Wilcox	113	113	113	113	113	113
Supply - Demand	19	17	16	14	13	13
Tatum						
Population (number of persons)	226	231	234	238	240	242
Water Demand (ac-ft/yr)	29	28	28	28	27	28
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	94	94	94	94	94	94
Supply - Demand	65	66	66	66	67	66
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	1,357	1,437	1,500	1,561	1,614	1,720
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	25	25	25	25	25	25
Lake Murvaul	1,656	1,719	1,767	1,814	1,851	1,928
Run-of-the-River Sabine	243	243	243	243	243	243
Supply - Demand	567	550	535	521	505	476
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	3,756	4,271	4,587	4,905	5,228	5,536
Current Supply (ac-ft/yr)						
Lake Murvaul	2,254	2,563	2,752	2,943	3,137	3,322
Carrizo-Wilcox	2,434	2,434	2,434	2,434	2,434	2,434
Supply - Demand	932	726	599	472	343	220

Panola County

Water User Group	2010	2020	2030	2040	2050	2060
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	3,096	3,096	3,096	3,096	3,096	3,096
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	1,520	1,520	1,520	1,520	1,520	1,520
Local Supply	1,858	1,858	1,858	1,858	1,858	1,858
Supply - Demand	282	282	282	282	282	282
Steam Electric						
Population (number of persons)						
Water Demand (ac-ft/yr)	0	0	0	0	0	0
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	194	194	194	194	194	194
Supply - Demand	194	194	194	194	194	194

Polk County

Water User Group	2010	2020	2030	2040	2050	2060
Corrigan						
Population (number of persons)	2,232	2,720	3,132	3,409	3,580	3,759
Water Demand (ac-ft/yr)	270	320	358	378	389	408
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	605	605	605	605	605	605
Supply - Demand	335	285	247	227	216	197
County-Other						
Population (number of persons)	8,190	9,981	11,490	12,508	13,132	13,789
Water Demand (ac-ft/yr)	1,110	1,319	1,480	1,583	1,647	1,730
Current Supply (ac-ft/yr)						
Catahoula Sands	456	456	456	456	456	456
Gulf Coast Aquifer	280	280	280	280	280	280
Other-Undifferentiated	166	166	166	166	166	166
Supply - Demand	-208	-417	-578	-681	-745	-828
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	619	725	825	930	1,026	1,110
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	93	93	93	93	93	93
Other-undifferentiated	568	568	568	568	568	568
Supply - Demand	42	-65	-164	-269	-365	-449
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	135	135	135	135	135	135
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	286	286	286	286	286	286
Local Supply	0	0	0	0	0	0
Supply - Demand	151	151	151	151	151	151
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	202	202	202	202	202	202
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	81	81	81	81	81	81
Other-undifferentiated	20	20	20	20	20	20
Livestock Local Supply	122	122	122	122	122	122
Supply - Demand	21	21	21	21	21	21

Rusk County

Water User Group	2010	2020	2030	2040	2050	2060
County-Other						
Population (number of persons)	27,930	29,754	30,789	31,307	32,741	36,271
Water Demand (ac-ft/yr)	2,660	2,733	2,759	2,700	2,787	3,088
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	3,194	3,194	3,194	3,194	3,194	3,194
Queen City	25	25	25	25	25	25
Supply - Demand	559	486	460	519	432	131
Easton						
Population (number of persons)	61	83	96	102	120	163
Water Demand (ac-ft/yr)	8	11	12	13	15	21
Current Supply (ac-ft/yr)						
from Elderville WSC	61	83	96	102	120	163
Supply - Demand	53	72	84	89	105	142
Elderville WSC						
Population (number of persons)	2,518	2,741	2,868	2,931	3,107	3,539
Water Demand (ac-ft/yr)	324	353	369	378	400	456
Current Supply (ac-ft/yr)						
Surface water from Longview	286	303	320	337	354	369
Carrizo-Wilcox	107	107	107	107	107	107
Supply - Demand	69	57	58	66	61	20
Henderson						
Population (number of persons)	11,358	11,438	11,484	11,506	11,570	11,726
Water Demand (ac-ft/yr)	2,417	2,396	2,367	2,333	2,320	2,351
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	2,737	2,737	2,737	2,737	2,737	2,737
Sabine River	3,413	3,413	3,413	3,413	3,413	3,413
Supply - Demand	3,732	3,754	3,783	3,817	3,829	3,798
Kilgore						
Population (number of persons)	2,580	2,580	2,580	2,580	2,580	2,580
Water Demand (ac-ft/yr)	532	520	512	503	500	500
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	460	441	423	404	382	354
Sabine River	303	290	278	266	251	233
Supply - Demand	231	211	189	167	133	87
Mount Enterprise						
Population (number of persons)	540	554	562	566	577	605
Water Demand (ac-ft/yr)	71	71	70	68	69	73
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	411	411	411	411	411	411
Supply - Demand	340	340	341	343	342	338
New London						
Population (number of persons)	1,026	1,063	1,084	1,094	1,123	1,194
Water Demand (ac-ft/yr)	225	228	230	228	232	248
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	597	597	597	597	597	597
Supply - Demand	372	369	367	369	365	349

Rusk County

Water User Group	2010	2020	2030	2040	2050	2060
Overton						
Population (number of persons)	2,363	2,503	2,582	2,621	2,732	3,003
Water Demand (ac-ft/yr)	413	429	434	432	447	491
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	616	616	616	614	613	611
Supply - Demand	203	186	182	182	165	120
Southern Utilities Company						
Population (number of persons)	426	451	465	472	492	541
Water Demand (ac-ft/yr)	71	74	74	75	77	85
Current Supply (ac-ft/yr)						
Groundwater	95	95	95	95	95	95
Surface Water	0	0	0	0	0	0
Supply - Demand	24	21	21	20	18	10
Tatum						
Population (number of persons)	960	960	960	960	960	960
Water Demand (ac-ft/yr)	122	118	115	112	110	110
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	374	374	374	374	374	374
Supply - Demand	252	256	259	262	264	264
West Gregg WSC						
Population (number of persons)	112	114	115	116	118	123
Water Demand (ac-ft/yr)	15	15	15	15	15	16
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	15	15	15	15	15	16
Supply - Demand	0	0	0	0	0	0
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	82	90	97	103	108	116
Current Supply (ac-ft/yr)						
Local Supply	2	2	2	2	2	2
Carrizo-Wilcox	131	131	131	131	131	131
Supply - Demand	51	43	36	30	25	17
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	126	126	126	126	126	126
Current Supply (ac-ft/yr)						
Local Supply	127	127	127	127	127	127
Carrizo-Wilcox	189	189	189	189	189	189
Supply - Demand	190	190	190	190	190	190
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	1,540	1,679	1,761	1,841	1,921	1,996
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	1,428	1,428	1,428	1,428	1,428	1,428
Local Supply	287	287	287	287	287	287
Queen City	124	124	124	124	124	124
Supply - Demand	299	160	78	-2	-82	-157

Rusk County

Water User Group	2010	2020	2030	2040	2050	2060
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	1,171	1,188	1,207	1,231	1,257	1,283
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	609	609	609	609	609	609
Local Supply	694	694	694	694	694	694
Queen City	35	35	35	35	35	35
Supply - Demand	167	150	131	107	81	55
Steam Electric						
Population (number of persons)						
Water Demand (ac-ft/yr)	24,760	27,458	32,102	37,762	44,663	53,074
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	240	240	240	240	240	240
Martin Lake	25,000	25,000	25,000	25,000	25,000	25,000
Supply - Demand	480	-2,218	-6,862	-12,522	-19,423	-27,834

Sabine County

Water User Group	2010	2020	2030	2040	2050	2060
County-Other						
Population (number of persons)	1,875	1,952	2,010	2,070	2,133	2,197
Water Demand (ac-ft/yr)	449	461	468	476	485	500
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	142	142	142	142	142	142
Gulf Coast Aquifer	0	0	0	0	0	0
Other-Undifferentiated	109	109	109	109	109	109
Sparta	58	58	58	58	58	58
Toledo Bend	131	131	131	131	131	131
Supply - Demand	-9	-21	-28	-36	-45	-60
G-M WSC						
Population (number of persons)	7,157	7,451	7,675	7,905	8,142	8,386
Water Demand (ac-ft/yr)	665	668	662	655	666	686
Current Supply (ac-ft/yr)						
Groundwater	19	19	19	19	19	19
Toledo Bend	753	753	753	753	753	753
Supply - Demand	107	104	110	117	106	86
Hemphill						
Population (number of persons)	1,192	1,241	1,278	1,316	1,356	1,396
Water Demand (ac-ft/yr)	371	382	389	397	406	418
Current Supply (ac-ft/yr)						
Toledo Bend	1,088	1,088	1,088	1,088	1,088	1,088
Supply - Demand	717	706	699	691	682	670
Pineland						
Population (number of persons)	1,056	1,099	1,132	1,166	1,201	1,237
Water Demand (ac-ft/yr)	221	227	230	232	237	244
Current Supply (ac-ft/yr)						
Other-Undifferentiated	301	301	301	301	301	301
Supply - Demand	80	74	71	69	64	57
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	359	427	490	554	611	662
Current Supply (ac-ft/yr)						
Other-undifferentiated	640	640	640	640	640	640
Local Supply	182	182	182	182	182	182
Reuse	20	20	20	20	20	20
Supply - Demand	483	415	352	288	231	180
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	667	710	759	816	882	954
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	115	115	115	115	115	115
Local Supply	379	379	379	379	379	379
Other-undifferentiated	73	73	73	73	73	73
Sparta	63	63	63	63	63	63
Supply - Demand	-37	-80	-129	-186	-252	-324

San Augustine County

Water User Group	2010	2020	2030	2040	2050	2060
County-Other						
Population (number of persons)	6,203	6,328	6,490	6,685	6,886	7,023
Water Demand (ac-ft/yr)	625	623	618	614	624	637
Current Supply (ac-ft/yr)						
San Augustine City Lake	86	86	86	86	86	86
Sparta	0	0	0	0	0	0
Carrizo-Wilcox	175	175	175	175	175	175
Other-Undifferentiated	316	316	316	316	316	316
Sparta	47	47	47	47	47	47
Supply - Demand	-1	1	6	10	0	-13
G-M WSC						
Population (number of persons)	824	841	862	888	915	933
Water Demand (ac-ft/yr)	77	75	74	74	75	76
Current Supply (ac-ft/yr)						
Groundwater	15	15	15	15	15	15
Toledo Bend (through Hemphill)	77	77	77	77	77	77
Supply - Demand	15	17	18	18	17	16
San Augustine						
Population (number of persons)	2,688	2,742	2,812	2,897	2,984	3,043
Water Demand (ac-ft/yr)	915	925	939	957	979	999
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	0	0	0	0	0	0
San Augustine City Lake	1,156	1,156	1,156	1,156	1,156	1,156
Supply - Demand	241	231	217	199	177	157
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	6	7	8	9	10	11
Current Supply (ac-ft/yr)						
Local Supply	0	0	0	0	0	0
Carrizo-Wilcox	4	4	4	4	4	4
Supply - Demand	-2	-3	-4	-5	-6	-7
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	225	225	225	225	225	225
Current Supply (ac-ft/yr)						
Sparta	39	39	39	39	39	39
Local Supply	0	0	0	0	0	0
Carrizo-Wilcox	96	96	96	96	96	96
Supply - Demand	-90	-90	-90	-90	-90	-90
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	1,004	1,082	1,173	1,278	1,400	1,534
Carrizo-Wilcox	122	122	122	122	122	122
Current Supply (ac-ft/yr)						
Local Supply	561	561	561	561	561	561
Other-undifferentiated	0	0	0	0	0	0
Yegua	160	160	160	160	160	160
Sparta	70	70	70	70	70	70
Supply - Demand	-91	-169	-260	-365	-487	-621

Shelby County

2006 Water Plan
East Texas Region

Water User Group	2010	2020	2030	2040	2050	2060
Center						
Population (number of persons)	5,974	6,363	6,668	6,896	7,092	7,306
Water Demand (ac-ft/yr)	1,633	1,718	1,785	1,823	1,867	1,923
Current Supply (ac-ft/yr)						
Lake Center	414	405	399	390	383	376
Pinkston Reservoir	1,114	1,085	1,058	1,027	1,004	979
Supply - Demand	-105	-228	-328	-406	-480	-568
County-Other						
Population (number of persons)	17,417	18,647	19,614	20,333	20,953	21,632
Water Demand (ac-ft/yr)	2,087	2,172	2,241	2,255	2,300	2,375
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	1,388	1,388	1,388	1,388	1,388	1,388
Center Lake	48	46	45	43	43	42
Pinkston Reservoir	128	124	119	115	111	109
Toledo Bend	147	147	147	147	147	147
Toledo Bend (LA)	35	35	35	35	35	35
Lake Timpson	350	350	350	350	350	350
Supply - Demand	9	-82	-157	-177	-226	-304
Joaquin						
Population (number of persons)	974	1,038	1,088	1,126	1,158	1,193
Water Demand (ac-ft/yr)	148	155	158	160	163	168
Current Supply (ac-ft/yr)						
Toledo Bend (LA)	200	200	200	200	200	200
Supply - Demand	52	45	42	40	37	32
Tenaha						
Population (number of persons)	1,046	1,046	1,046	1,046	1,046	1,046
Water Demand (ac-ft/yr)	191	187	184	180	178	178
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	700	700	700	700	700	700
Supply - Demand	509	513	516	520	522	522
Timpson						
Population (number of persons)	1,120	1,154	1,181	1,201	1,218	1,237
Water Demand (ac-ft/yr)	179	181	181	180	181	184
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	472	472	472	472	472	472
Supply - Demand	293	291	291	292	291	288
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	1,360	1,508	1,637	1,766	1,880	2,019
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	89	89	89	89	89	89
Pinkston Reservoir	788	809	825	846	859	872
Center Lake	293	302	310	321	328	336
Reuse	136	151	164	177	188	202
Supply - Demand	-55	-157	-249	-333	-416	-520

Shelby County

Water User Group	2010	2020	2030	2040	2050	2060
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	27	30	34	37	41	46
Current Supply (ac-ft/yr)						
Direct Reuse Irrigation (Shelby FWSD #1)	82	82	82	82	82	82
Carrizo-Wilcox	40	40	40	40	40	40
Supply - Demand	95	92	88	85	81	76
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	4,246	5,176	6,310	7,691	9,376	11,430
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	1,380	1,380	1,380	1,380	1,380	1,380
Local Supply	2,089	2,089	2,089	2,089	2,089	2,089
Supply - Demand	-777	-1,707	-2,841	-4,222	-5,907	-7,961

Smith County

Water User Group	2010	2020	2030	2040	2050	2060
Arp						
Population (number of persons)	965	1,013	1,061	1,109	1,189	1,295
Water Demand (ac-ft/yr)	173	178	183	188	200	218
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	297	297	297	297	297	297
Supply - Demand	124	119	114	109	97	79
Bullard						
Population (number of persons)	1,284	1,424	1,563	1,702	1,936	2,245
Water Demand (ac-ft/yr)	309	338	366	395	447	518
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	312	312	312	312	312	312
Lake Jacksonville	14	13	12	12	11	11
Supply - Demand	17	-13	-42	-71	-124	-195
Community Water Company						
Population (number of persons)	1,340	1,557	1,773	1,989	2,352	2,832
Water Demand (ac-ft/yr)	137	188	211	232	271	327
Current Supply (ac-ft/yr)						
Carizzo-Wilcox	100	100	100	100	100	100
Supply - Demand	-37	-88	-111	-132	-171	-227
County-Other						
Population (number of persons)	4,253	3,807	3,409	3,052	2,732	2,446
Water Demand (ac-ft/yr)	929	823	726	643	572	512
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	990	891	802	722	650	585
Queen City	17	17	17	17	17	17
Supply - Demand	78	85	93	96	95	90
Crystal Systems Inc.						
Population (number of persons)	321	355	389	423	480	555
Water Demand (ac-ft/yr)	65	71	77	82	93	108
Current Supply (ac-ft/yr)						
Carizzo-Wilcox	65	71	77	82	93	108
Supply - Demand	0	0	0	0	0	0
Dean WSC						
Population (number of persons)	5,111	5,710	6,307	6,903	7,904	9,229
Water Demand (ac-ft/yr)	538	582	629	673	761	889
Current Supply (ac-ft/yr)						
Carizzo-Wilcox	561	561	561	561	561	561
Supply - Demand	23	-21	-68	-112	-200	-328
Jackson WSC						
Population (number of persons)	3,832	4,650	5,535	6,420	7,000	7,550
Water Demand (ac-ft/yr)	288	333	384	431	463	499
Current Supply (ac-ft/yr)						
Carizzo-Wilcox	430	433	436	438	435	431
Supply - Demand	142	100	52	7	-28	-68

Smith County

Water User Group	2010	2020	2030	2040	2050	2060
Lindale						
Population (number of persons)	673	673	673	673	673	673
Water Demand (ac-ft/yr)	150	148	146	145	144	144
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	219	185	158	137	111	85
Supply - Demand	69	37	12	-8	-33	-59
Lindale Rural WSC						
Population (number of persons)	2,714	3,064	3,413	3,761	4,346	5,119
Water Demand (ac-ft/yr)	438	484	531	577	662	780
Current Supply (ac-ft/yr)						
Carrizo-Wilcox (Lindale)	41	41	41	41	41	41
Carrizo-Wilcox	675	673	671	670	668	666
Supply - Demand	278	230	181	134	47	-73
New Chapel Hill						
Population (number of persons)	635	697	758	819	922	1,058
Water Demand (ac-ft/yr)	118	127	137	146	163	187
Current Supply (ac-ft/yr)						
Carrizo - Wilcox	118	127	137	146	163	187
Supply - Demand	0	0	0	0	0	0
Noonday						
Population (number of persons)	550	576	602	628	672	730
Water Demand (ac-ft/yr)	102	105	107	110	117	127
Current Supply (ac-ft/yr)						
Carrizo - Wilcox	102	105	107	110	117	127
Supply - Demand	0	0	0	0	0	0
Overton						
Population (number of persons)	61	64	67	70	75	81
Water Demand (ac-ft/yr)	11	11	11	12	12	13
Current Supply (ac-ft/yr)						
Carrizo-Wilcox (Rusk)	11	11	11	12	12	13
Supply - Demand	0	0	0	0	0	0
R P M WSC						
Population (number of persons)	228	249	269	289	323	368
Water Demand (ac-ft/yr)	32	34	36	38	42	47
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	41	41	41	41	41	41
Supply - Demand	9	7	5	3	-1	-6
Southern Utilities Company						
Population (number of persons)	36,295	38,496	40,620	42,736	47,202	53,328
Water Demand (ac-ft/yr)	6,058	6,296	6,507	6,750	7,402	8,363
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	7,822	7,809	7,793	7,776	7,753	7,723
Lake Tyler	204	329	449	570	706	853
Lake Palestine	146	235	321	407	504	609
Supply - Demand	2,114	2,077	2,056	2,003	1,561	822

Smith County

Water User Group	2010	2020	2030	2040	2050	2060
Troup						
Population (number of persons)	2,113	2,266	2,418	2,570	2,825	3,163
Water Demand (ac-ft/yr)	286	297	311	322	351	393
Current Supply (ac-ft/yr)						
Carrizo-Wilcox	432	432	432	432	432	432
Supply - Demand	146	135	121	110	81	39
Tyler						
Population (number of persons)	88,332	92,372	96,399	100,415	107,168	116,102
Water Demand (ac-ft/yr)	25,528	26,385	27,211	28,007	29,771	32,253
Current Supply (ac-ft/yr)						
Lake Tyler	19,895	19,532	19,222	18,933	18,705	18,454
Lake Palestine	14,210	13,952	13,730	13,523	13,360	13,182
Carrizo-Wilcox	3,930	3,858	3,797	3,740	3,695	3,645
Supply - Demand	12,507	10,957	9,538	8,189	5,989	3,028
Whitehouse						
Population (number of persons)	6,305	7,022	7,736	8,449	9,647	11,232
Water Demand (ac-ft/yr)	982	1,070	1,153	1,240	1,405	1,636
Current Supply (ac-ft/yr)						
Lake Tyler	151	156	161	166	174	185
Carrizo-Wilcox	765	792	814	838	883	936
Lake Palestine	547	566	582	599	631	669
Supply - Demand	481	444	404	363	283	154
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	3,846	4,297	4,697	5,081	5,407	5,854
Current Supply (ac-ft/yr)						
Lake Tyler	2,398	2,545	2,654	2,748	2,718	2,680
Lake Palestine (Tyler)	1,713	1,818	1,896	1,963	1,941	1,914
Carrizo-Wilcox (Tyler)	474	503	524	543	537	529
Lake Bellwood	650	650	650	650	650	650
Carrizo-Wilcox	457	457	457	457	457	457
Other-undifferentiated	62	62	62	62	62	62
Supply - Demand	1,908	1,738	1,546	1,342	958	438
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	566	595	626	657	689	723
Current Supply (ac-ft/yr)						
Neches RoR Combined	50	50	50	50	50	50
Bellwood Lake	300	300	300	300	300	300
Lake Palestine	105	105	105	105	105	105
Carrizo-Wilcox	59	59	59	59	59	59
Queen City	47	47	47	47	47	47
Supply - Demand	-5	-34	-65	-96	-128	-162
Mining						
Population (number of persons)						
Water Demand (ac-ft/yr)	183	262	295	351	391	424
Current Supply (ac-ft/yr)						
Local Supply	0	0	0	0	0	0
Carrizo-Wilcox	109	109	109	109	109	109
Queen City	27	27	27	27	27	27
Supply - Demand	-47	-126	-159	-215	-255	-288

Smith County

Water User Group	2010	2020	2030	2040	2050	2060
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	660	660	660	660	660	660
Current Supply (ac-ft/yr)						
Local Supply	416	416	416	416	416	416
Carrizo-Wilcox	37	37	37	37	37	37
Queen City	253	253	253	253	253	253
Supply - Demand	46	46	46	46	46	46

Trinity County

Water User Group	2010	2020	2030	2040	2050	2060
County-Other						
Population (number of persons)	3,186	3,435	3,518	3,660	3,817	3,960
Water Demand (ac-ft/yr)	585	619	623	640	663	688
Current Supply (ac-ft/yr)						
Other-Undifferentiated	272	272	272	272	272	272
Gulf Coast Aquifer	96	96	96	96	96	96
Yegua - Jackson	263	263	263	263	263	263
Supply - Demand	46	12	8	-9	-32	-57
Groveton						
Population (number of persons)	604	652	668	660	633	610
Water Demand (ac-ft/yr)	114	121	122	118	113	109
Current Supply (ac-ft/yr)						
Trinity Co. Reg WS (Lake Livingston)	84	91	92	88	83	79
Lake Livingston	30	30	30	30	30	30
Supply - Demand	0	0	0	0	0	0
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	0	0	0	0	0	0
Current Supply (ac-ft/yr)						
None						
Supply - Demand	0	0	0	0	0	0
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	0	0	0	0	0	0
Current Supply (ac-ft/yr)						
Other-undifferentiated	4	4	4	4	4	4
Neches Run-of-River	62	62	62	62	62	62
Supply - Demand	66	66	66	66	66	66
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	194	194	194	194	194	194
Current Supply (ac-ft/yr)						
Yegua - Jackson	141	141	141	141	141	141
Local Supply	135	135	135	135	135	135
Supply - Demand	82	82	82	82	82	82

Tyler County

Water User Group	2010	2020	2030	2040	2050	2060
Colmesneil						
Population (number of persons)	756	872	946	974	974	974
Water Demand (ac-ft/yr)	72	80	84	84	83	83
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	371	371	371	371	371	371
Supply - Demand	299	291	287	287	288	288
County-Other						
Population (number of persons)	13,363	15,398	16,707	17,209	17,209	17,209
Water Demand (ac-ft/yr)	1,422	1,587	1,684	1,696	1,677	1,677
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	1,445	1,445	1,445	1,445	1,445	1,445
Supply - Demand	23	-142	-239	-251	-232	-232
Lake Livingston Water Supply and Sewer Service Company						
Population (number of persons)	104	120	130	134	134	134
Water Demand (ac-ft/yr)	7	7	8	8	8	8
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	8	8	8	8	8	8
Supply - Demand	1	1	0	0	0	0
Tyler County WSC						
Population (number of persons)	7,658	8,824	9,574	9,862	9,862	9,862
Water Demand (ac-ft/yr)	575	633	665	663	652	652
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	1,163	1,163	1,163	1,163	1,163	1,163
Supply - Demand	588	530	498	500	511	511
Woodville						
Population (number of persons)	2,863	3,299	3,580	3,687	3,687	3,687
Water Demand (ac-ft/yr)	661	750	802	818	814	814
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	2,018	2,018	2,018	2,018	2,018	2,018
Supply - Demand	1,357	1,268	1,216	1,200	1,204	1,204
Manufacturing						
Population (number of persons)						
Water Demand (ac-ft/yr)	39	46	53	60	66	71
Current Supply (ac-ft/yr)						
Gulf Coast Aquifer	73	73	73	73	73	73
Supply - Demand	34	27	20	13	7	2
Irrigation						
Population (number of persons)						
Water Demand (ac-ft/yr)	29	29	29	29	29	29
Current Supply (ac-ft/yr)						
Neches RoR Combined	123	123	123	123	123	123
Gulf Coast Aquifer	4	4	4	4	4	4
Supply - Demand	98	98	98	98	98	98

Tyler County

Water User Group	2010	2020	2030	2040	2050	2060
Livestock						
Population (number of persons)						
Water Demand (ac-ft/yr)	274	274	274	274	274	274
Current Supply (ac-ft/yr)						
Local Supply	165	165	165	165	165	165
Gulf Coast Aquifer	146	146	146	146	146	146
Supply - Demand	37	37	37	37	37	37

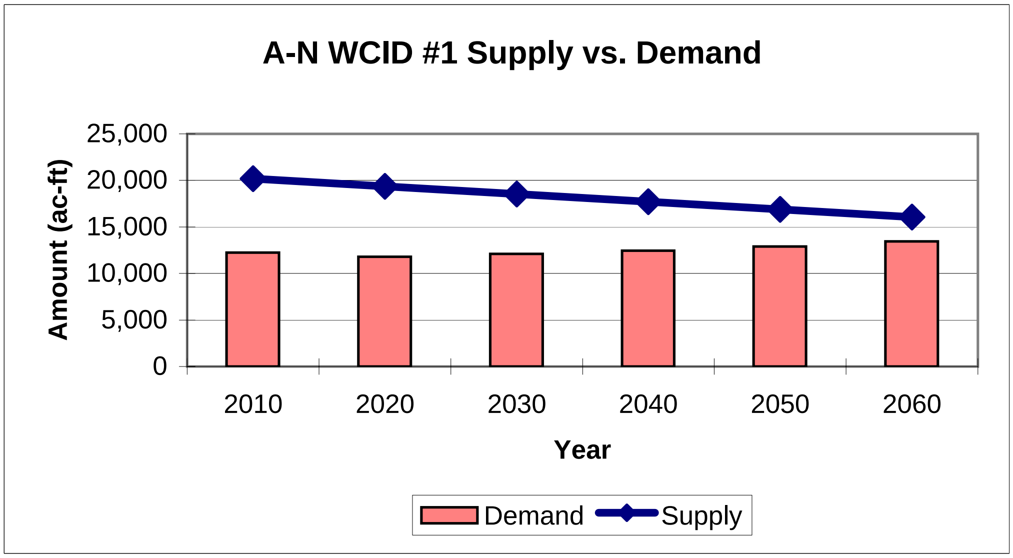
A-N WCID #1

(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
Steam Electric Power	2,245	1,790	2,093	2,462	2,912	3,460
Manufacturing (Paper Co.)	10,000	10,000	10,000	10,000	10,000	10,000
Total Demand	**12,245**	**11,790**	**12,093**	**12,462**	**12,912**	**13,460**

Current Supplies	2010	2020	2030	2040	2050	2060
Lake Striker	20,183	19,357	18,530	17,703	16,877	16,050
Total Supplies	**20,183**	**19,357**	**18,530**	**17,703**	**16,877**	**16,050**

Supplies Less Current Customer Demand	**7,938**	**7,567**	**6,437**	**5,241**	**3,965**	**2,590**



ANRA
(Units: Acre-Feet per Year)

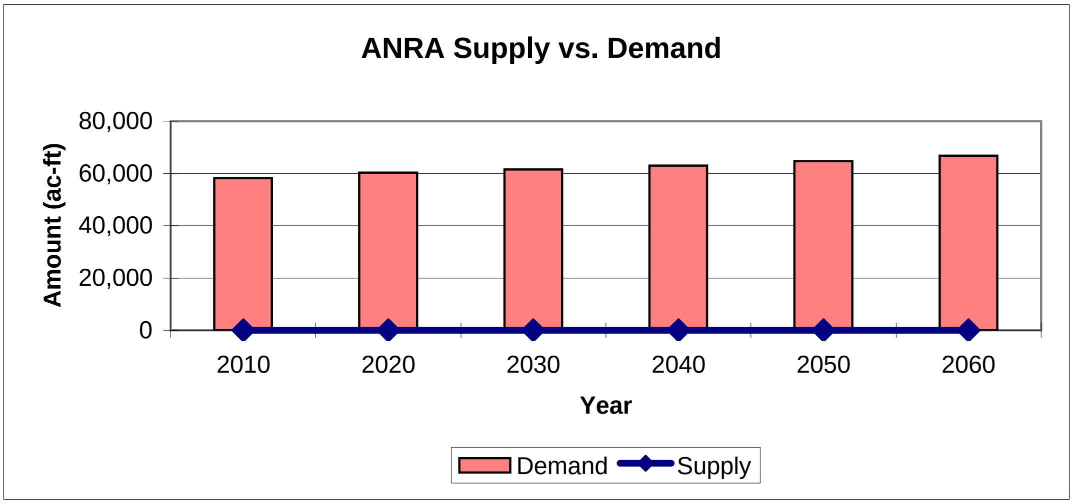
Current Customers	% Yield	2010	2020	2030	2040	2050	2060
Angelina County Manufacturing (Temple Inland)	10.0%	8,551	8,551	8,551	8,551	8,551	8,551
Cherokee County-Other	4.5%	3,848	3,848	3,848	3,848	3,848	3,848
City of Jacksonville	5.0%	4,275	4,275	4,275	4,275	4,275	4,275
City of New Summerfield	3.0%	2,565	2,565	2,565	2,565	2,565	2,565
North Cherokee WSC	5.0%	4,275	4,275	4,275	4,275	4,275	4,275
City of Rusk	5.0%	4,275	4,275	4,275	4,275	4,275	4,275
Rusk Rural WSC	1.0%	855	855	855	855	855	855
Nacogdoches County-Other	0.5%	428	428	428	428	428	428
City of Nacogdoches	10.0%	8,551	8,551	8,551	8,551	8,551	8,551
City of New London	1.0%	855	855	855	855	855	855
City of Troup	5.0%	4,275	4,275	4,275	4,275	4,275	4,275
City of Arp	0.5%	428	428	428	428	428	428
Smith County-Other	1.0%	855	855	855	855	855	855
Jackson WSC	1.0%	855	855	855	855	855	855
City of Whitehouse	10.0%	8,551	8,551	8,551	8,551	8,551	8,551
Total Demand	**62.5%**	**53,442**	**53,442**	**53,442**	**53,442**	**53,442**	**53,442**

Potential Future Customers							
Nacogdoches County Steam Electric Power		4,828	6,911	8,079	9,504	11,241	13,358

Total Demand Current and Future Customers		**58,270**	**60,353**	**61,521**	**62,946**	**64,683**	**66,800**

Current Supplies	2000	2010	2020	2030	2040	2050	2060
Lake Columbia		0	0	0	0	0	0
Total Supplies		**0**	**0**	**0**	**0**	**0**	**0**

Supplies Less Current Customer Demand		**-53,442**	**-53,442**	**-53,442**	**-53,442**	**-53,442**	**-53,442**
Supplies Less Current and Potential Customer Demand		**-58,270**	**-60,353**	**-61,521**	**-62,946**	**-64,683**	**-66,800**



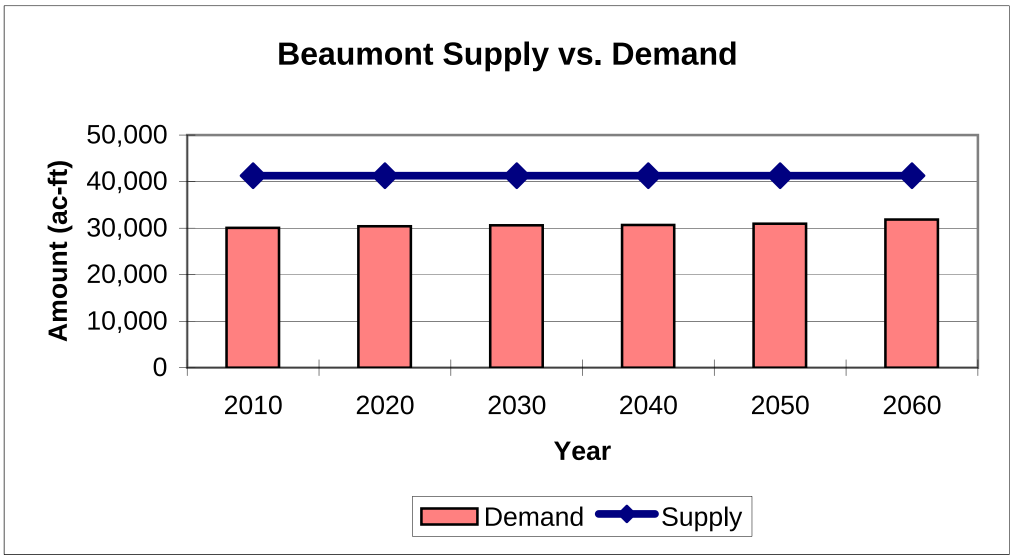
Beaumont

(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
City of Beaumont	27,040	26,657	26,275	25,892	25,636	25,636
Jefferson County-Other	1,842	2,389	2,848	3,207	3,605	4,360
Jefferson County Manufacturing	1,190	1,337	1,464	1,593	1,708	1,828
Meeker MUD	3	4	4	5	5	6
Total Demand	**30,075**	**30,387**	**30,591**	**30,697**	**30,954**	**31,830**

Current Supplies	2010	2020	2030	2040	2050	2060
Municipal Run-of-River	29,305	29,305	29,305	29,305	29,305	29,305
Industrial Run-of-River	2,806	2,806	2,806	2,806	2,806	2,806
Gulf Coast Aquifer	9,135	9,135	9,135	9,135	9,135	9,135
Total Supplies	**41,246**	**41,246**	**41,246**	**41,246**	**41,246**	**41,246**

Treated Supplies Less Current Customer Demand	**11,171**	**10,859**	**10,655**	**10,549**	**10,292**	**9,416**



Carthage

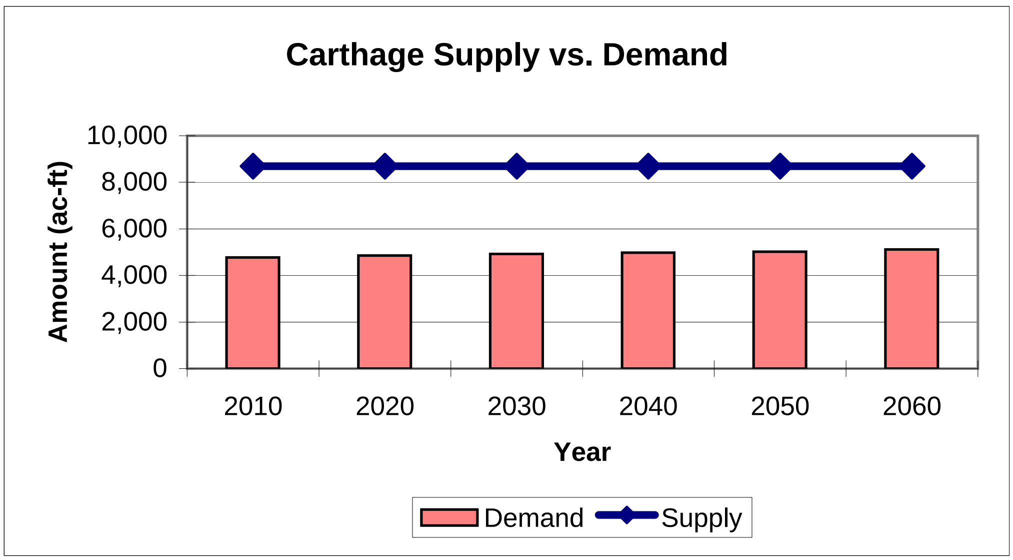
(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
City of Carthage	2,274	2,297	2,311	2,317	2,326	2,343
Panola County-Other	1,487	1,487	1,487	1,487	1,487	1,487
Panola County Manufacturing	1,018	1,078	1,125	1,171	1,211	1,290
Total Demand	**4,779**	**4,862**	**4,923**	**4,975**	**5,024**	**5,120**

Current Supplies	2010	2020	2030	2040	2050	2060
Groundwater	1,529	1,529	1,529	1,529	1,529	1,529
Lake Murvaul (PCFWD)	13,090	12,737	12,384	12,031	11,678	11,323
Total Supplies	**14,619**	**14,266**	**13,913**	**13,560**	**13,207**	**12,852**

Water Treatment Capacity	**8,687**	**8,687**	**8,687**	**8,687**	**8,687**	**8,687**

Supplies Less Current Customer Demand	**9,840**	**9,404**	**8,990**	**8,585**	**8,184**	**7,732**



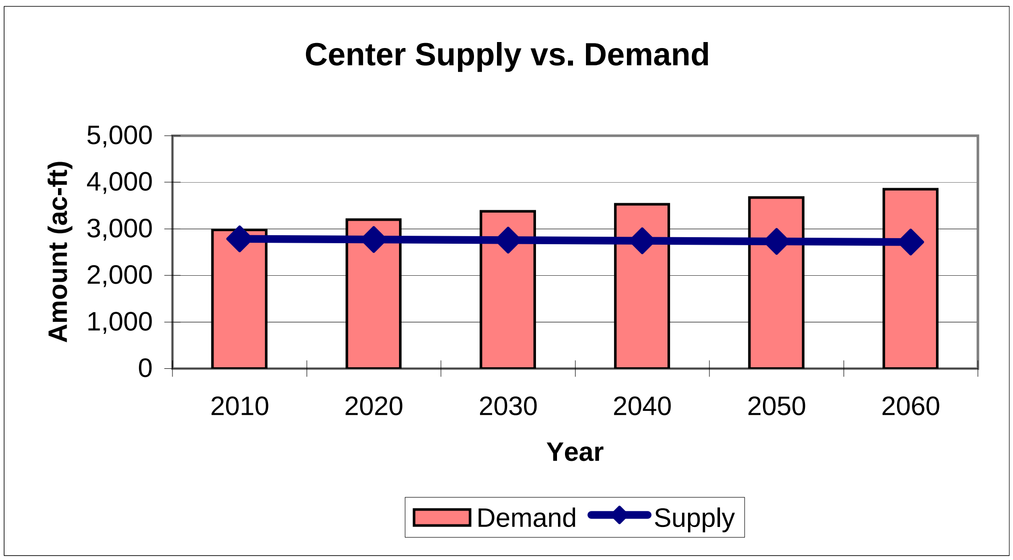
Center

(Units: Acre-Feet per Year)

Customers	2010	2020	2030	2040	2050	2060
Sand Hills WSC	167	174	179	180	184	190
Shelbyville WSC	21	22	22	23	23	24
Manufacturing	1,156	1,282	1,391	1,501	1,598	1,716
City of Center	1,633	1,718	1,785	1,823	1,867	1,923
Total Demand	**2,977**	**3,195**	**3,378**	**3,527**	**3,672**	**3,853**

Current Supplies	2010	2020	2030	2040	2050	2060
Pinkston Reservoir	2,031	2,017	2,003	1,988	1,974	1,960
Lake Center	754	754	754	754	754	754
Total Supplies	**2,785**	**2,771**	**2,757**	**2,742**	**2,728**	**2,714**

Supplies Less Current Customer Demand	**-192**	**-425**	**-622**	**-785**	**-944**	**-1,139**



Athens Municipal Water Authority
(Units: Acre-Feet per Year)

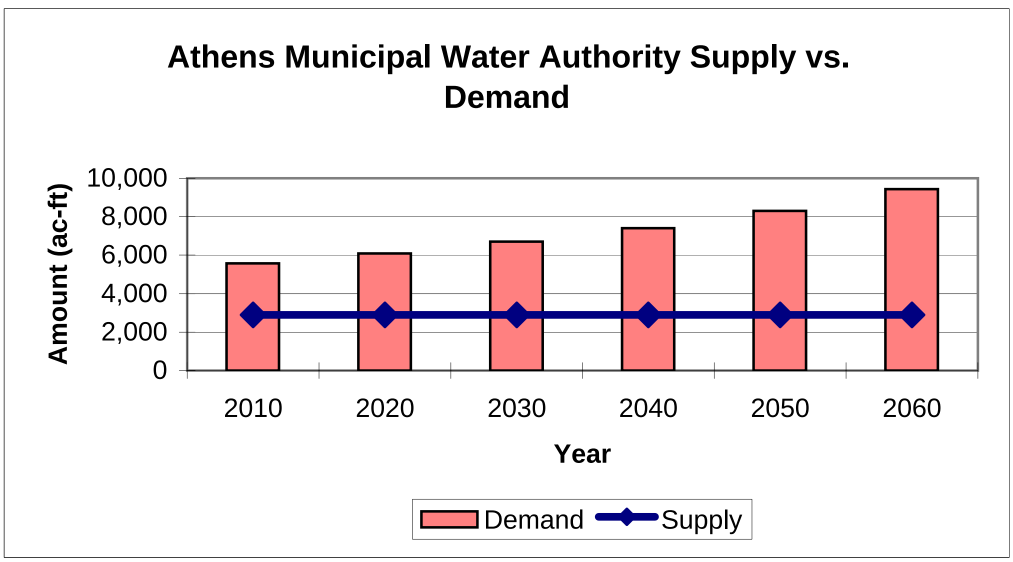
2006 Water Plan
East Texas Region

WUGs	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
City of Athens	2,326	2,832	3,431	4,111	5,003	6,108
Henderson Co. Irrigation	159	164	169	174	179	185
Henderson County Livestock	3,023	3,023	3,023	3,023	3,023	3,023
Henderson County Manufacturing (60% - Reg C)	66	71	80	91	103	117
Total Demand	**5,574**	**6,090**	**6,703**	**7,399**	**8,308**	**9,433**

Future Customers						
Henderson County Manufacturing	33	35	40	45	52	59

Current Supplies	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Lake Athens (firm yield)	6,064	5,983	5,903	5,822	5,741	5,660
Lake Athens (safe yield)	5,172	5,084	4,996	4,908	4,820	4,730
Lake Athens (operational yield)	2,900	2,900	2,900	2,900	2,900	2,900
Reuse (limit- 2,677)	0	0	0	0	0	0
Total Supplies	**2,900**	**2,900**	**2,900**	**2,900**	**2,900**	**2,900**

Supplies Less Current Customer Demand	**-2,674**	**-3,190**	**-3,803**	**-4,499**	**-5,408**	**-6,533**

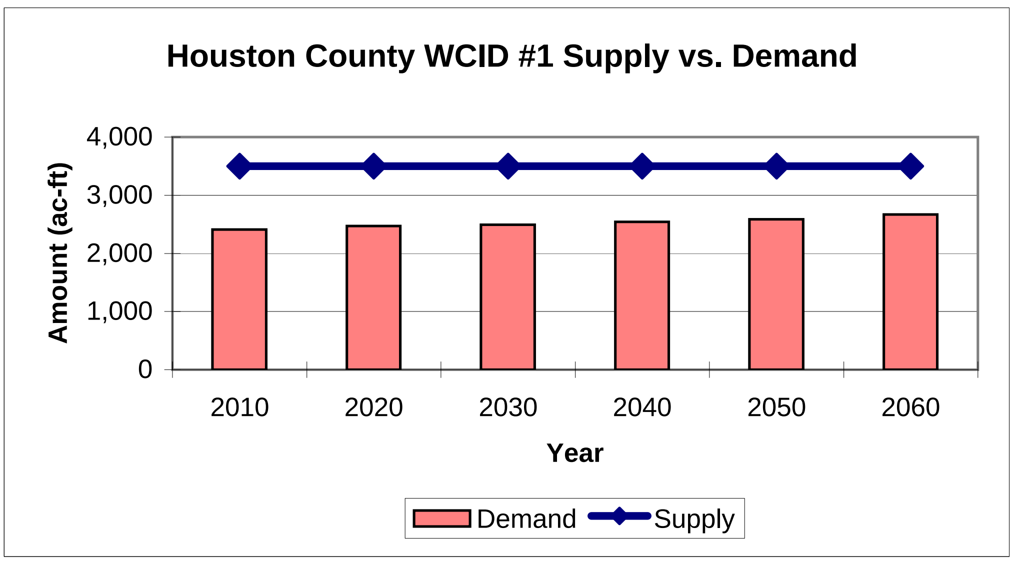


Houston County WCID #1
(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
Grapeland	104	106	106	108	110	113
Houston County-Other	88	89	90	91	93	96
Houston County Manufacturing	124	150	169	186	202	216
Crockett	1,416	1,438	1,449	1,480	1,512	1,553
Lovelady	75	75	75	76	76	78
Consolidated WSC	606	611	603	601	596	610
Total Demand	**2,412**	**2,469**	**2,492**	**2,542**	**2,589**	**2,666**

Current Supplies	2010	2020	2030	2040	2050	2060
Houston County Lake	3,500	3,500	3,500	3,500	3,500	3,500
Total Supplies	**3,500**	**3,500**	**3,500**	**3,500**	**3,500**	**3,500**

Supplies Less Current Customer Demand	**1,088**	**1,031**	**1,008**	**958**	**911**	**834**

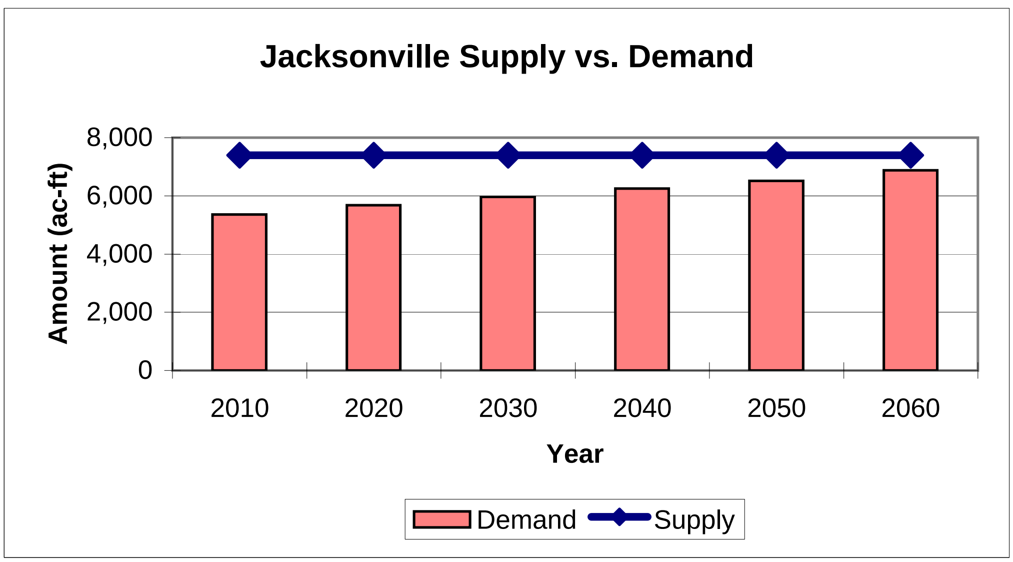


Jacksonville
(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
City of Jacksonville	3,502	3,637	3,741	3,827	3,948	4,111
Cherokee County Manufacturing	718	784	839	891	934	1,007
Cherokee County-Other	226	198	154	95	68	55
North Cherokee WSC	387	439	482	519	560	616
Bullard	10	10	10	10	10	10
Craft-Turney WSC	515	614	742	908	995	1,078
Total Demand	**5,358**	**5,682**	**5,968**	**6,250**	**6,515**	**6,877**

Current Supplies	2010	2020	2030	2040	2050	2060
Lake Jacksonville	5,173	5,173	5,173	5,173	5,173	5,173
Carrizo-Wilcox	2,218	2,218	2,218	2,218	2,218	2,218
Total Supplies	**7,391**	**7,391**	**7,391**	**7,391**	**7,391**	**7,391**

Supplies Less Current Customer Demand	**2,034**	**1,710**	**1,423**	**1,142**	**876**	**515**

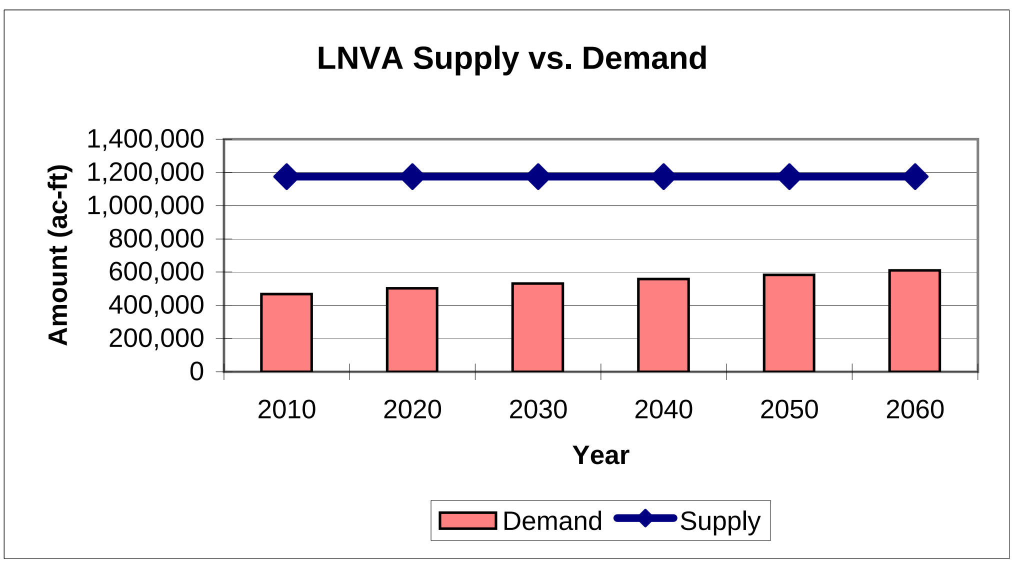


LNVA
(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
Jasper County Manufacturing	20,189	23,571	26,084	28,281	29,928	29,991
Mining - Hardin County	7,772	8,620	9,191	9,760	10,333	10,770
Groves	3,190	3,137	3,085	3,031	2,996	2,996
Nederland	4,125	4,268	4,387	4,456	4,573	4,834
Port Arthur	9,704	9,510	9,315	9,122	8,993	8,993
Port Neches	1,782	1,782	1,789	1,780	1,804	1,882
Jefferson County-Other	188	244	291	327	368	445
Jefferson County Manufacturing	211,779	241,259	266,696	291,954	314,844	339,461
Irrigation - Jefferson County	147,000	147,000	147,000	147,000	147,000	147,000
West Jefferson County MWD	1,029	1,148	1,264	1,345	1,436	1,631
Jefferson County WCID #10	640	700	750	787	832	929
Nome	127	136	144	150	157	172
Trinity Bay Conservation District	2,688	2,688	2,688	2,688	2,688	2,688
Bolivar Pennisula SUD	5,039	5,039	5,039	5,039	5,039	5,039
Irrigation - Chambers County	33,300	33,300	33,300	33,300	33,300	33,300
Irrigation- Liberty County	19,700	19,700	19,700	19,700	19,700	19,700
Total Demand	**468,252**	**502,102**	**530,723**	**558,720**	**583,991**	**609,831**

Current Supplies	2,010	2,020	2,030	2,040	2,050	2,060
B. A. Steinhagen Lake/Sam Rayburn	792,000	792,000	792,000	792,000	792,000	792,000
Pine Island Run-of-river Rights	381,876	381,876	381,876	381,876	381,876	381,876
Total Supplies	**1,173,876**	**1,173,876**	**1,173,876**	**1,173,876**	**1,173,876**	**1,173,876**

Supplies Less Current Customer Demand	**705,624**	**671,774**	**643,154**	**615,156**	**589,886**	**564,046**



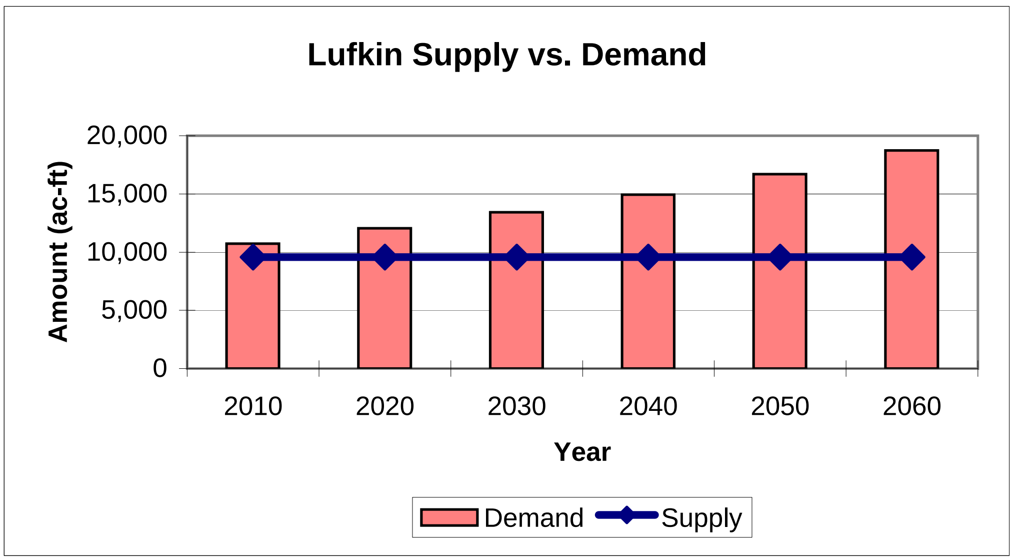
Lufkin

(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
City of Lufkin	7,546	8,444	9,446	10,565	11,951	13,599
Angelina County-Other	38	39	41	44	48	55
Angelina County Manufacturing	3,027	3,436	3,798	4,164	4,489	4,836
Huntington	129	139	153	172	201	242
Total Demand	**10,739**	**12,058**	**13,438**	**14,945**	**16,689**	**18,731**

Current Supplies	2010	2020	2030	2040	2050	2060
Carrizo-Wilcox	9,562	9,562	9,562	9,562	9,562	9,562
Sam Rayburn	0	0	0	0	0	0
Total Supplies	**9,562**	**9,562**	**9,562**	**9,562**	**9,562**	**9,562**

Supplies Less Current Customer Demand	**-1,177**	**-2,496**	**-3,876**	**-5,383**	**-7,127**	**-9,169**

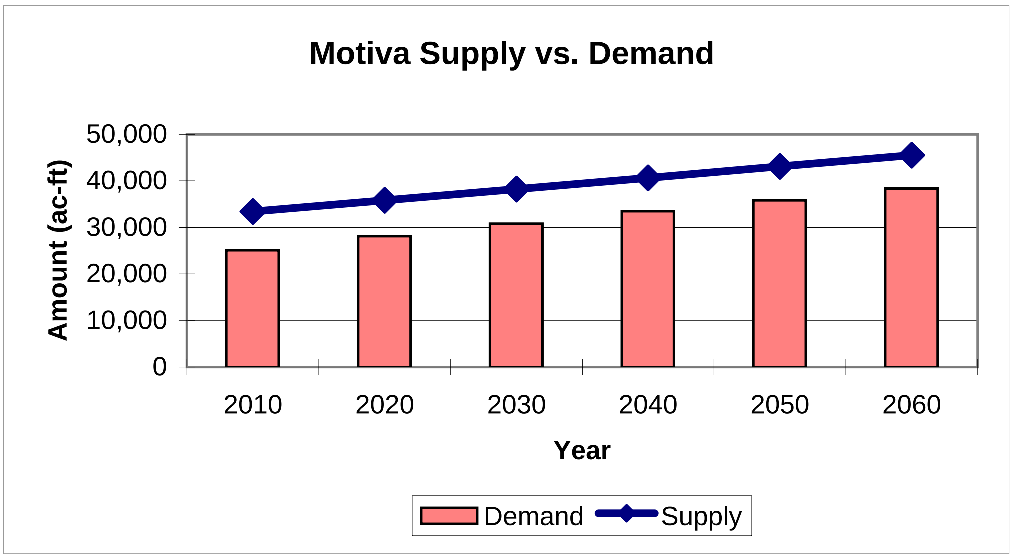


Motiva
(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
Motiva	23,795	26,743	29,287	31,867	34,156	36,564
Huntsman Chemical	1,300	1,400	1,500	1,600	1,700	1,800
Total Demand	**25,095**	**28,143**	**30,787**	**33,467**	**35,856**	**38,364**

Current Supplies	2010	2020	2030	2040	2050	2060
Sam Rayburn	20,529	22,944	25,359	27,774	30,189	32,605
Sabine-Neches Canal	2	2	2	2	2	2
Saline water right # 4196	12,900	12,900	12,900	12,900	12,900	12,900
Total Supplies	**33,431**	**35,846**	**38,261**	**40,676**	**43,091**	**45,507**

Supplies Less Current Customer Demand	**8,336**	**7,703**	**7,474**	**7,209**	**7,235**	**7,143**

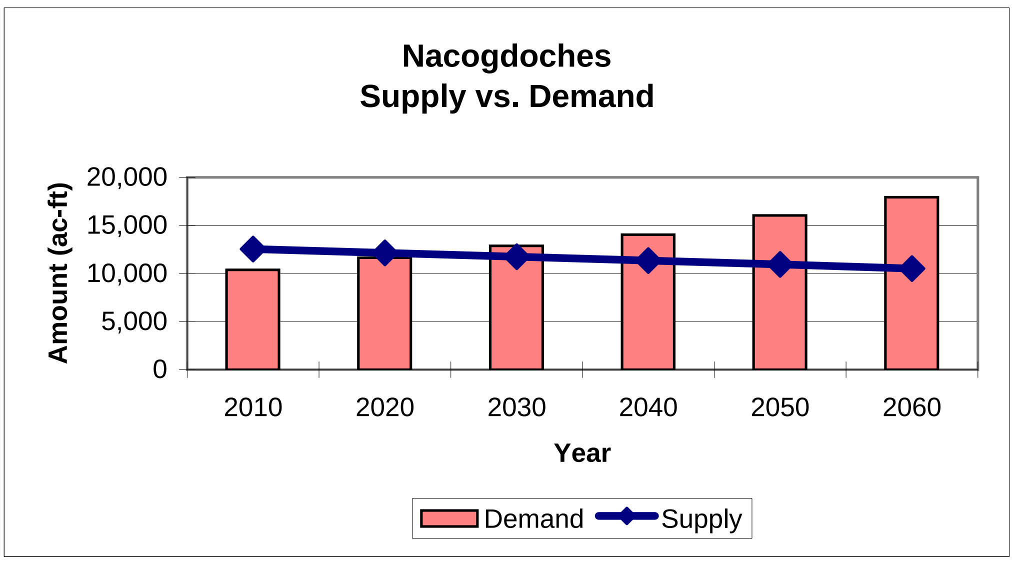


Nacogdoches
(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
City of Nacogdoches	7,625	8,423	9,218	9,939	11,352	12,540
Nacogdoches County Manufacturing	2,288	2,553	2,786	3,016	3,214	3,468
Nacogdoches County-Other	221	236	249	266	304	346
Appleby WSC	263	445	617	811	1,178	1,574
Total Demand	**10,397**	**11,657**	**12,870**	**14,032**	**16,048**	**17,928**

Current Supplies	2010	2020	2030	2040	2050	2060
Lake Nacogdoches	9,459	9,053	8,648	8,242	7,836	7,430
Carrizo-Wilcox	3,100	3,100	3,100	3,100	3,100	3,100
Total Supplies	**12,559**	**12,153**	**11,748**	**11,342**	**10,936**	**10,530**

Supplies Less Current Customer Demand	**2,162**	**496**	**-1,123**	**-2,690**	**-5,112**	**-7,398**



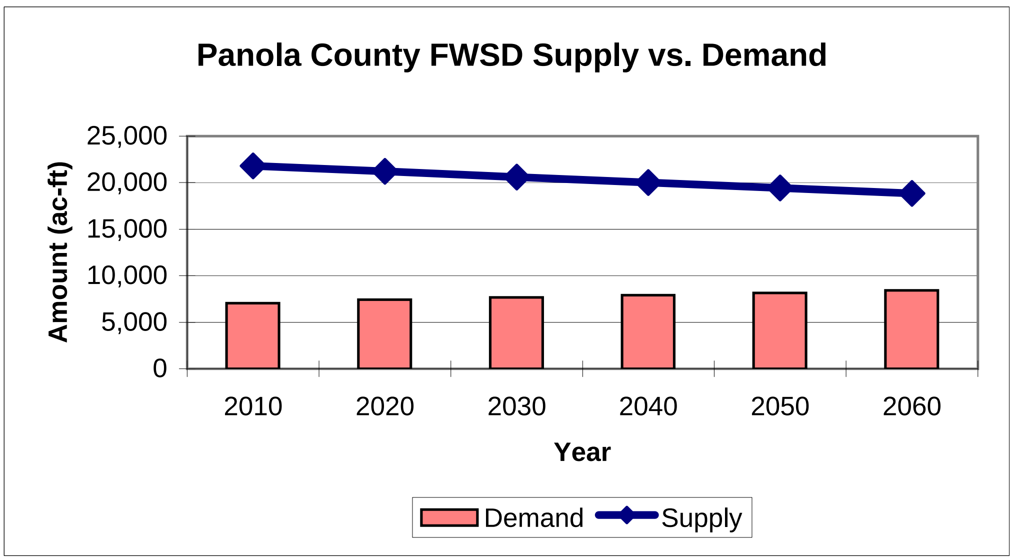
Panola County FWSD

(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
City of Carthage	2,274	2,297	2,311	2,317	2,326	2,343
Panola County-Other	1,487	1,487	1,487	1,487	1,487	1,487
Panola County Manufacturing	1,018	1,078	1,125	1,171	1,211	1,290
Panola County Mining	2,254	2,563	2,752	2,943	3,137	3,322
Total Demand	**7,032**	**7,424**	**7,675**	**7,918**	**8,160**	**8,442**

Current Supplies	2010	2020	2030	2040	2050	2060
Lake Murvaul	21,792	21,203	20,615	20,027	19,438	18,850
Total Supplies	**21,792**	**21,203**	**20,615**	**20,027**	**19,438**	**18,850**

Supplies Less Current Customer Demand	**14,759**	**13,779**	**12,940**	**12,109**	**11,278**	**10,408**

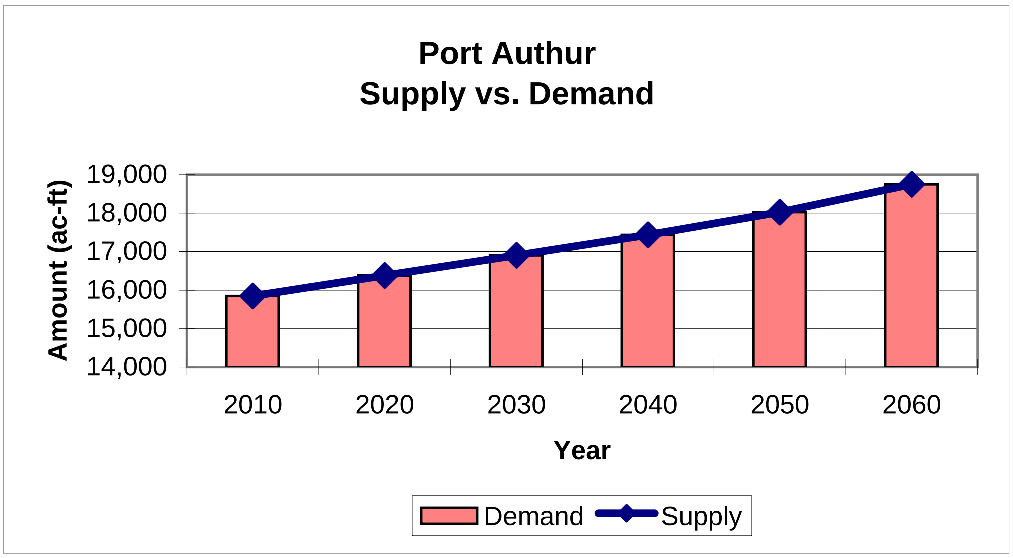


Port Arthur
(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
City of Port Arthur	9,704	9,510	9,315	9,122	8,993	8,993
Jefferson County-Other	5	5	5	5	5	5
Jefferson County Manufacturing	6,140	6,862	7,584	8,306	9,028	9,752
Total Demand	**15,849**	**16,377**	**16,904**	**17,433**	**18,026**	**18,750**

Current Supplies	2010	2020	2030	2040	2050	2060
LNVA (Sam Rayburn)	15,846	16,374	16,901	17,430	18,023	18,747
Treated effluent	3	3	3	3	3	3
Total Supplies	**15,849**	**16,377**	**16,904**	**17,433**	**18,026**	**18,750**

Supplies Less Current Customer Demand	**0**	**0**	**0**	**0**	**0**	**0**

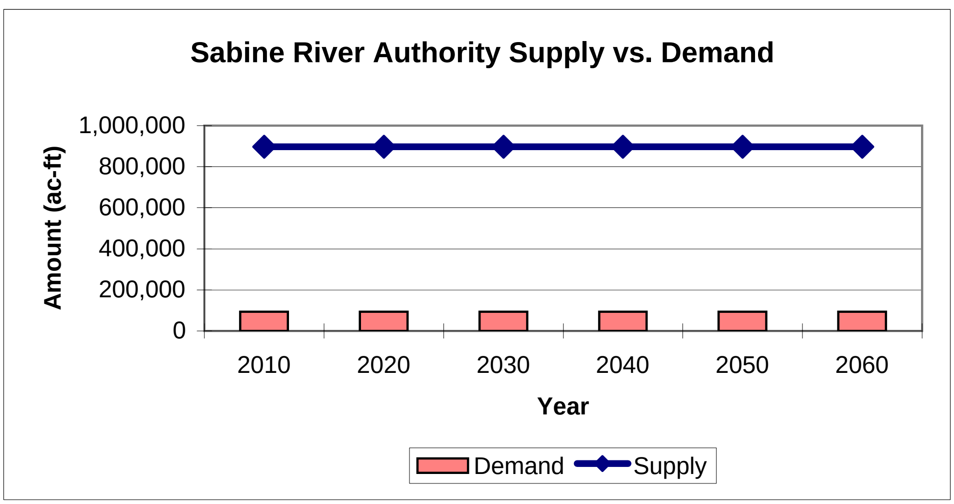


Sabine River Authority
(Units: Acre-Feet per Year)

Lower Basin Customers	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Toledo Bend:						
Hemphill	1,841	1,841	1,841	1,841	1,841	1,841
Huxley	147	147	147	147	147	147
Tenaska	17,929	17,929	17,929	17,929	17,929	17,929
Beechwood WSC	81	81	81	81	81	81
El Camino WS	22	22	22	22	22	22
Pendleton Utility Corp	28	28	28	28	28	28
Canal (Gulf Coast Division)						
Honeywell	1,120	1,120	1,120	1,120	1,120	1,120
Bayer	1,120	1,120	1,120	1,120	1,120	1,120
Chevron Phillips	2,240	2,240	2,240	2,240	2,240	2,240
E.I. DuPont	24,643	24,643	24,643	24,643	24,643	24,643
Entergy	4,481	4,481	4,481	4,481	4,481	4,481
Firestone	280	280	280	280	280	280
Inland Paper	17,922	17,922	17,922	17,922	17,922	17,922
North Star Steel	4,481	4,481	4,481	4,481	4,481	4,481
A. Schulman, Inc.	224	224	224	224	224	224
Cottonwood Energy	13,442	13,442	13,442	13,442	13,442	13,442
Rose City	478	478	478	478	478	478
Orange County Irrigation	2,543	2,543	2,543	2,543	2,543	2,543
Total demands - Lower basin	**93,022**	**93,022**	**93,022**	**93,022**	**93,022**	**93,022**

Current Supplies - Lower basin	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Toledo Bend	750,000	750,000	750,000	750,000	750,000	750,000
Sabine River, Run-of-the-River supplies	147,100	147,100	147,100	147,100	147,100	147,100
Total Supplies	**897,100**	**897,100**	**897,100**	**897,100**	**897,100**	**897,100**

Supplies Less Current Customer Demand	**804,078**	**804,078**	**804,078**	**804,078**	**804,078**	**804,078**



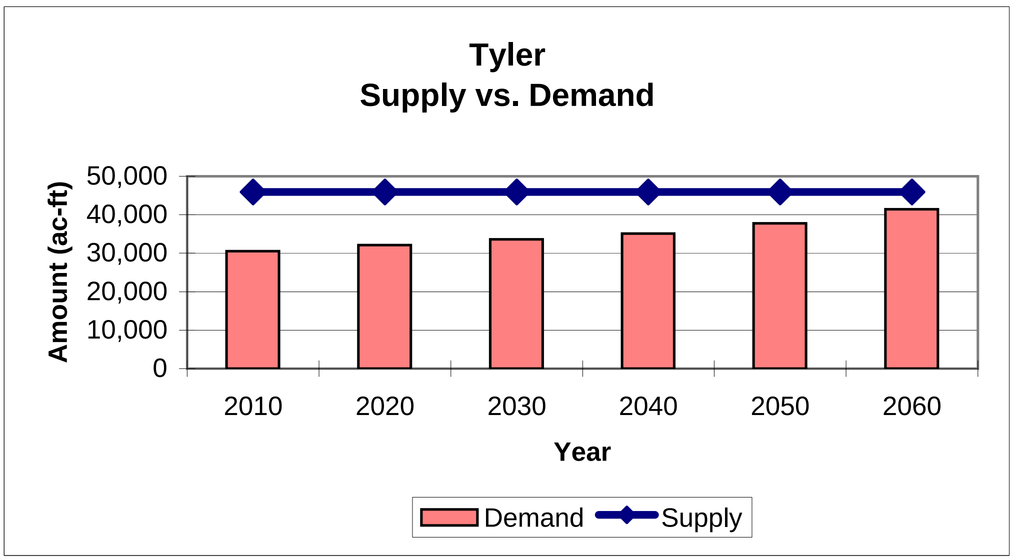
Tyler

(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
Tyler	25,886	26,849	27,778	28,675	30,615	33,334
Smith County Irrigation	300	300	300	300	300	300
Smith County Manufacturing	3,077	3,438	3,758	4,065	4,326	4,683
Whitehouse	982	1,070	1,153	1,240	1,405	1,636
Southern Utilities Company	262	444	636	844	1,123	1,490
Total Demand	**30,507**	**32,100**	**33,625**	**35,124**	**37,769**	**41,443**

Current Supplies	2010	2020	2030	2040	2050	2060
Lake Tyler/Tyler East	23,541	23,541	23,541	23,541	23,541	23,541
Lake Palestine	16,815	16,815	16,815	16,815	16,815	16,815
Lake Bellwood	950	950	950	950	950	950
Carrizo-Wilcox	4,650	4,650	4,650	4,650	4,650	4,650
Total Supplies	**45,956**	**45,956**	**45,956**	**45,956**	**45,956**	**45,956**

Supplies Less Current Customer Demand	**15,449**	**13,856**	**12,331**	**10,832**	**8,187**	**4,513**

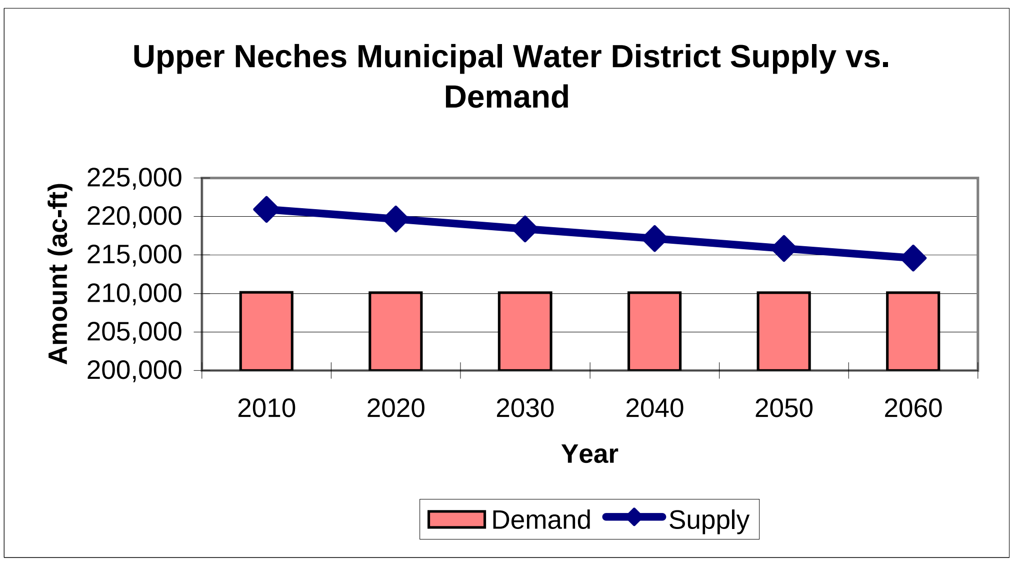


Upper Neches Municipal Water District
(Units: Acre-Feet per Year)

WUGs	2010	2020	2030	2040	2050	2060
City of Dallas (not connected)	114,337	114,337	114,337	114,337	114,337	114,337
City of Tyler	67,200	67,200	67,200	67,200	67,200	67,200
City of Palestine	28,000	28,000	28,000	28,000	28,000	28,000
Smith County-Other (1%)	93	82	73	64	57	51
Super Tree Farm for International Paper (Cherokee County irrigation)	300	300	300	300	300	300
TECON (Henderson County-Other)	100	100	100	100	100	100
Emerald Bay Golf Course (Smith County irrigation)	105	105	105	105	105	105
Total Demand	**210,135**	**210,124**	**210,115**	**210,106**	**210,099**	**210,093**

Current Supplies	2010	2020	2030	2040	2050	2060
Lake Palestine System	220,933	219,667	218,400	217,133	215,867	214,600
Total Supplies	**220,933**	**219,667**	**218,400**	**217,133**	**215,867**	**214,600**

Supplies Less Current Customer Demand	**10,798**	**9,542**	**8,285**	**7,027**	**5,767**	**4,507**



Chapter 4B.

Water Management Strategies

This section provides a review of the types of water management strategies considered for the East Texas Region. Included is a summary of the application of each strategy to meet the needs during the planning period. Chapter 4C provides a summary of the strategies considered for each water user group on a county basis and provides the costs for the strategies. Water management strategies considered include water conservation and drought management, wastewater reuse, expanded use of existing supplies, new supply development and interbasin transfers. Water management strategies to meet potential future demands, not presently approved by the Texas Water Development Board, or those that require supply strategies within the East Texas Region boundary to meet demands in other regions are not included in the above discussions. Details of these strategies are included under the discussion for wholesale water providers in Section 4C.21, specifically for the Lower Neches Valley Authority, Upper Neches River Municipal Water Authority, and the Sabine River Authority.

The ETRWPG evaluated water management strategies available to meet the demands in the East Texas Region. The strategies considered by the ETRWPG included the following:

a. Water conservation and drought management
b. Wastewater reuse
c. Expanded use of existing supplies
    i. System operation,
    ii. Conjunctive use of groundwater and surface water,
    iii. Reallocation of reservoir storage
    iv. Voluntary redistribution of water resources
    v. Voluntary subordination of water rights

   vi. Yield enhancement
   vii. Water quality improvements
d. New supply development
   i. Surface water resources
   ii. Groundwater resources
   iii. Brush control
   iv. Precipitation enhancement
   v. Desalination
   vi. Water right cancellation
   vii. Aquifer storage and recovery
e. Interbasin transfers

The screening criteria developed by the ETRWPG is provided in Appendix A.

4B.1 Water Conservation

Regional Considerations

Water conservation would be defined as those methods and practices that either reduce the demand for water supply or increase the efficiency of the supply or use so that available supply is conserved and made available for future use. Water conservation is typically a non-capital intensive alternative. All water supply entities and some major water right holders are required by regulations to have a Drought Contingency and Water Conservation Plan. These plans must detail the entity's plans to reduce water demand at times when the demand threatens the total capacity of the water supply delivery system or overall supplies are low.

If strong conservation measures are taken early in a drought and assumed in the planning stages, there is little or no flexibility remaining, should the drought exceed the conservation assumed during planning. The ability to adopt measures more stringent than planned could be limited in times of emergency.

The water demand projections developed in Chapter 2 assume that approved conservation plans are in place and effective for all entities. The savings in water, associated with reduction in per capita usage attributed to the conservation measures, is estimated to be 20,600 acre-feet per year in 2060. Each entity has varying amounts of additional demand reduction included in the future demand projections described in Chapter 2. The assumed reductions tended to increase for future projections. Conservation activities that were assumed to be in place for the projections included:

- Water-efficient plumbing fixtures consistent with the State Water Efficient Plumbing Act of 1991;

- More thorough use of leak detection processes;

- More widespread use of water efficient appliances;

Water conservation actions implemented as strategies would result in savings above that assumed for the TWDB projections. The Texas Water Development Board Report 362, published by the Water Conservation Implementation Task Force in November 2004, provides a review of best management practices for water conservation for municipal, industrial and agricultural water users. Water conservation strategies, using the guidelines in TWDB Report 362, were evaluated for water users that demonstrated needs in the planning period and met the following conditions:

- municipal users with current per capita water use greater than 140 gpcd,
- municipal users that have industrial, commercial and institutional customers that account for more than 20% of the city's total water use,
- manufacturing users located in counties where manufacturing use is greater than 1000 acre-feet per year or with an identifiable industry with water use greater than 500 acre-feet per year.

Water conservation strategies for other users; Irrigation, Steam-Electric, Livestock and Mining; were not developed. The above four users comprise between 25% to 33% of the total water demand in the Region during the planning period. Water conservation has recently begun to be utilized in irrigation of rice in one area of the East Texas Region. The water conservation efforts were driven by economic reasons (i.e. billing of water used from metered flow as opposed to acreage farmed). The financial incentive has led to four conservation measures being implemented; irrigation scheduling, field maintenance, land leveling and tailwater recovery. Metering began in 2004 but it was not until 2005 that billing on the amount metered was implemented. Comparison of the two years indicated average water consumption to be reduced from 3.79 acre-feet per acre farmed to 2.84 acre-feet per acre farmed. The demand for Steam-Electric use, is projected to grow from 4% to 12% of the demand during the 50 year period. The projections for Steam-Electric use was provided by the TWDB. Most of the demand will be consumed by new projects which include conservation in the projected water use. Livestock and mining comprise a total of 4% to 5% of the demand. The cost of water in these industries comprises a small percentage of the overall business cost and it is not expected these industries will see an economic benefit to water conservation.

Selected Water Conservation Strategies

Municipal Water Conservation Strategies

Water conservation strategies were evaluated for those municipal users showing a need during the planning period and have a per capita water use greater than 140 gpcd. Entities with this type of use customarily have larger commercial and industrial users in relation to the general population. Water conservation practices evaluated included public and school education, water conservation pricing, and passive implementation of new water conserving clothes washers. Public and school education would involve providing formal and indirect means of information on how to conserve water. Water conservation pricing requires an increasing rate structure with increasing use. The effectiveness of this measure is in part affected by whether water conservation pricing is currently implemented. The passive implementation of new water conserving clothes washers is the natural replacement of clothes washers with time.

Education costs were applied to all of the entities meeting the above criteria. Assumptions made in evaluating the efficiency of this measure included restrictions that the annual budget spent on education would be limited to approximately $1.00 per capita or per 1000 gallons water conserved, whichever was most restrictive. The total budget available will be an indication as to the effectiveness of the program. The following efficiencies were assigned to the following ranges of available budget.

Budget		**Efficiency of Conservation**
Low	**High**	
$1,500 (minimum)	$9,999	1.5%
$10,000	$19,999	2.0%
$20,000	$29,999	2.5%
$30,000	$40,000 (maximum)	3.0%

Water conservation pricing will be most effective in areas where groundwater resources are becoming less available and requires high expenditures in capital projects to supply water. Only those entities meeting the above criteria and located in counties that are reaching the limits of groundwater were considered for this strategy. Where the recommended strategies were less than $1.00 per 1000 gallons the efficiency achieved is assumed to be 1.0%. A 2.0% efficiency is assumed where the recommended strategy exceeds $1.00 per 1000 gallon.

Implementation of the passive clothes washer strategy was limited to areas where the recommended strategy exceeds $1.00 per 1000 gallon. The assumptions made in this strategy include a replacement rate of 7.7% per year with a total saving of 5.6 gpcd where installed. Details of municipal conservation strategies are provided in Appendix B.

The total savings in water during the planning period for the selected entities is provided in the following table.

Entity (County)	Amount Conserved, acre-feet per year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Frankston (Anderson)			6	7	8	9
Diboll (Angelina)	11	20	26	34	53	72
Lufkin (Angelina)	50	117	189	249	319	408
New Summerfield (Cherokee)		10	18	21	23	26
Rusk (Cherokee)				51	66	76
Lumberton/Lumberton MUD (Hardin)	76	116	146	167	190	215
Athens(Henderson)	1	6	12	17	22	30
County-Other (Henderson)	31	57	74	92	108	129
Kirbyville (Jasper)	3	4	5	6	7	7
Appleby WSC (Nacogdoches)				22	39	62
Nacogdoches (Nacogdoches)		229	425	514	654	787
Center (Shelby)	15	34	47	60	67	75
Bullard (Smith)		3	4	5	6	8
Lindale Rural WSC (Smith)			5	7	9	12
TOTAL	**187**	**596**	**957**	**1255**	**1571**	**1916**

Water conservation strategies for municipal users that have industrial, commercial and institutional customers that account for more than 20% of the city's total water use were not considered individually. The water conservation strategies for this group is evaluated under conservation strategies considered for the manufacturing user group

Manufacturing Water Conservation Strategies

The criteria for evaluating water conservation measures in manufacturing uses was limited to counties showing a need in this sector during the planning period with use greater than 1000 acre-feet per year or with an identifiable industry with water use greater than 500 acre-feet per year. The counties meeting this criteria include Angelina, Nacogdoches, Newton, Orange and Polk. The distribution, by the general category of manufacturing use, on a county basis is provided in the following table.

County	Manufacturing Type			
	Timber/ Paper	**Food**	**Manufacturing**	**Petrochemical**
Angelina	90%	7%	3%	
Nacogdoches	7%	81%	12%	
Newton	100%			
Orange	40%		2%	58%
Polk	100%			

There are readily available supplies of water to meet manufacturing needs in Newton, Orange and Polk counties. Development of water management strategies for Angelina and Nacogdoches will require more intense planning. The timber and paper industries in Angelina County for the most part provide their own ground or surface water. Any conservation measures taken on their part will more than likely be based on economic justification to expand plant capacity and will not affect water availability to the Region as a whole. The remaining industries, food and manufacturing facilities in Angelina and Nacogdoches counties, should be considered for water conservation. The majority of the water in these sectors are supplied by municipal suppliers that face the needs for major water management strategies.

TWDB Report 362 lists fourteen best management practices for industrial users. Application of each of the practices to the food and manufacturing industries in Angelina and Nacogdoches counties is not practical at this time. However, the industrial water audit practice is a feasible alternative to consider for implementation. The TWDB Report 362 reports that an audit should result in savings of 10 to 35 percent if an audit has not been performed. Based on a savings of 10 percent the expected savings of implementation of this water conservation strategy is expected as follows:

County	**Demand or Savings, ac-ft/yr.**					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Angelina						
Total Demand	30,266	34,359	37,982	41,642	44,887	48,356
Food & Manufacturing Demand	3,066	7,159	10,782	14,442	17,687	21,156
Water Conservation Savings	307	716	1,088	1,444	1,769	2,116
Nacogdoches						
Total Demand	2,288	2,553	2,786	3,016	3,214	3,468
Food & Manufacturing Demand	2,118	2,383	2,616	2,846	3,044	3,298
Water Conservation Savings	212	239	262	285	304	330

Environmental Issues

No substantial environmental impacts are anticipated, as water conservation is typically a non-capital intensive alternative that is not associated with direct physical impacts to the natural environment. A summary of the few environmental issues that might arise for this alternative are presented in the following table.

Environmental Issues: Water Conservation

Water Management Options	Water Conservation
Implementation Measures	Voluntary reduction, water pricing, city drought contingency plans
Environmental Water Needs/Instream Flows	No substantial impact identified, assuming relatively low reduction in diversions and return flows: substantial reductions in municipal and industrial diversions from water conservation would result in possibly low to moderate positive impacts as more stream flow would be available for environmental water needs and instream flows.
Bays and Estuaries	No substantial impact identified, assuming relatively low reduction in diversions and return flows.
Fish and Wildlife Habitat	No substantial impact identified, assuming relatively low reductions in diversions and return flows; possible low to moderate positive impact to aquatic and riparian habitats with substantial reductions as more stream flow would be available to these habitats.
Cultural Resources	No substantial impact anticipated
Threatened and Endangered Species	No substantial impact identified, assuming relatively low reduction in diversions and return flows; possible low to moderate positive impact to aquatic and riparian threatened and endangered species (where they occur) with substantial diversion reductions.
Comments	Assumes no substantial change in infrastructure

Cost Considerations

Since water conservation plans are required for each community, regular costs for implementing and enforcing a general conservation program were not estimated. Only the efforts needed to enforce a more stringent conservation plan over and above that assumed in the projections were studied. The only strategy that created a direct cost on the entity is school and public education.

Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in the following table and the option meets each criterion.

Comparison of Water Conservation Option to Plan Development Criteria

Impact Category	Comment(s)
A. Water Supply: 1. Quantity 2. Reliability 3. Cost	 1. Limited. 2. Variable, dependent on public acceptance. 3. Reasonable.
B. Environmental Factors 1. Environmental Water Needs 2. Habitat 3. Cultural Resources 4. Bays and Estuaries	 1. None or low impact. 2. No apparent negative impact. 3. None. 4. None or low impact.
C. Impact on Other State Water Resources	• No apparent negative impacts on state water resources. • No effect on navigation.
D. Threats to Agriculture and Natural Resources	• None
E. Equitable Comparison of Strategies Deemed Feasible	• Option is considered to meet municipal and industrial shortages.
F. Requirements for Interbasin Transfers	• Not applicable
G. Third Part Social and Economic Impacts from Voluntary Redistribution	• Not applicable

No environmental implementation issues have been identified. However, as noted above water conservation and drought contingency plans are required as part of the Regional Water Plan.

4B.2 Wastewater Reuse

Description of Option

Wastewater reuse utilizes treated wastewater effluent as either a replacement for a potable water supply or involves the treatment of wastewater to parameters that allows it to be returned to the water supply resource.

Selected Reuse

One wastewater reuse strategy was defined for the East Texas Region. Athens MWA has received a reuse permit that allows the City of Athens to discharge its wastewater effluent to Lake Athens. This discharge will be redirected for water supply. The reuse permit is for 2,677 acre-feet per year. This strategy is targeted to meet livestock needs in Henderson County.

Environmental Issues

Water Management Options	Water Conservation
Implementation Measures	Development of additional tranfer lines and additional wastewater treatment
Environmental Water Needs/Instream Flows	Possible low impact on in-stream flows due to decreased effluent return flow
Bays and Estuaries	No substantial impact identified, assuming relatively low reduction in return flows.
Fish and Wildlife Habitat	No substantial impact identified, assuming relatively low reductions in return flows.
Cultural Resources	No substantial impact anticipated
Threatened and Endangered Species	No substantial impact identified.
Comments	Assumes no substantial change in infrastructure

Cost Considerations

Anticipated costs of transfer of secondary treated effluent and additional treatment prior to discharge.

Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in the following table and the option meets each criterion.

Comparison of Wastewater Reuse Option to Plan Development Criteria

Impact Category	Comment(s)
A. Water Supply: 1. Quantity 2. Reliability 3. Cost	 1. Potentially important source, up to 25% 2. Highly Reliable 3. Resonable
B. Environmental Factors 1. Environmental Water Needs 2. Habitat 3. Cultural Resources 4. Bays and Estuaries	 1. Reduce instream flows – low to moderate impact 2. Possible low impact 3. No impact anticipated 4. No impact anticipated
C. Impact on Other State Water Resources	No apparent negative impacts; no effect on navigation.
D. Threats to Agriculture and Natural Resources	Generally positive impact by avoiding need for new supplies
E. Equitable Comparison of Strategies Deemed Feasible	Option considered to meet municipal, manufacturing and irrigation demands
F. Requirements for Interbasin Transfers	None
G. Third Part Social and Economic Impacts from Voluntary Redistribution	Could offset voluntary redistribution of other supplies

4B.3 Expanded Use of Existing Supplies

Expanded use of existing supplies includes additional use from existing sources and voluntary redistribution of water resources.

Increase Use of Groundwater

Groundwater is still a viable and cost-effective supply of water for the East Texas Planning Area. 65% of the water user groups with a need during the planning period are expected to continue using groundwater as a source of new supplies. The supplies established in Section 3.2.2 were used to evaluate the ability to meet demands for the Region. Where needs are shown for unspecified users such as irrigation and livestock, the expansion of groundwater use was evaluated on the same percentage usage of existing supplies. Counties that are near capacity in utilizing the groundwater resources are Angelina, Cherokee, Hardin, Nacogdoches, Orange, Shelby and Smith. Evaluation of the expanded use of groundwater is presented by aquifer and county in the following tables.

Water Management Strategies Utilizing Gulf Coast Aquifer

Entity	Projected Additional Groundwater Demand, Acre-Feet					
	2010	2020	2030	2040	2050	2060
Hardin County						
County-0ther	153	306	306	306	459	459
Manufacturing	114	114	114	114	114	114
Jasper County						
County-Other	152	223	223	223	223	223
City of Kirbyville	75	75	75	75	75	75
Jefferson County						
Meeker					9	9
Newton County						
Manufacturing	400	400	400	700	700	700
Orange County						
County-Other	140	140	140	140	140	140
Mauriceville WSC		250	250	250	250	250
Polk County						
County-Other	208	416	624	832	832	832
Manufacturing		225	225	450	450	450
Tyler County						
County-Other		205	274	274	274	274

Water Management Strategies Utilizing Carrizo-Wilcox

Entity	Projected Additional Groundwater Demands, Acre-Feet					
	2010	2020	2030	2040	2050	2060
Anderson County						
Frankston			121	121	121	121
Mining		121	121	121	121	121
Angelina County						
County-Other	404	404	404	404	404	1211
Hudson	404	404	404	1453	1453	1453
Hudson WSC		404	404	404	1211	1211
Cherokee County						
New Summerfield		121	121	242	242	242
Rusk				212	212	212
Henderson County						
Bethel-Ash WSC					17	105
County-Other	100					
RPM WSC			3	9	18	29
Houston County						
Irrigation	1211	1211	1211	2179	2179	2179
Livestock	404	404	404	1211	1211	1211
Nacogdoches County						
Appleby WSC				807	807	807
County-Other	0	0	0	0	0	291
Lily Groves SUD			807	807	807	807
Livestock			1574	1574	1574	1574
Swift WSC	807	807	807	807	807	807
Rusk County						
Mining				158	158	158
Sabine County						
County-Other	200	200	200	200	200	200
Livestock	50	50	100	100	100	100
San Augustine County						
County-Other	5	5	5	5	5	5
Irrigation	100	100	100	100	100	100
Livestock	150	150	250	300	400	400
Manufacturing	10	10	10	10	10	10
Shelby County						
County-Other	100	200	300	300	350	350
Livestock	1500	2500	3000	3000	3500	3500
Smith County						
Bullard		100	100	100	200	200
Community Water Company	121	121	121	242	242	242
Dean WSC	169	169	169	169	338	338
Jackson WSC					68	68
City of Lindale				60	60	60
Lindale Rural WSC						80
RPM WSC					40	40

Water Management Strategies Utilizing Queen City

Entity	Projected Additional Groundwater Demands, Acre-Feet					
	2010	2020	2030	2040	2050	2060
Anderson County						
County-Other						41
Cherokee County						
Irrigation	40	40	40	40	40	40
Mining						40
Henderson County						
County-Other	50	150	200	300	400	500
Smith County						
Irrigation	40	40	80	120	162	162
Mining	47	141	188	235	282	329

Water Management StrategiesYegua-Jackson

Entity	Projected Additional Groundwater Demands, Acre-Feet					
	2010	2020	2030	2040	2050	2060
Angelina County						
Diboll	646	646	646	646	1614	1614
Trinity County						
County-Other				202	202	202

Environmental Issues

Consideration was given to limiting supply availability to the amount of groundwater that could be withdrawn from the aquifers over the planning period that will not cause more than 50 feet of water level declines, or 10% reduction in saturated thickness whichever is less.

Water Management Options	Water Conservation
Implementation Measures	Local impact resulting from development of well fields, storage facilities, pump stations and pipelines.
Environmental Water Needs/Instream Flows	Potential increase in return flows to streams.
Bays and Estuaries	No substantial impact identified
Fish and Wildlife Habitat	No substantial impact identified
Cultural Resources	No substantial impact anticipated
Threatened and Endangered Species	No substantial impact identified.

Cost Considerations

Cost considerations are affected by the distance from development of wells to the need for the water. Facilities requiring capital investment include wells, pipelines, pump stations and storage. Some wells may require minor treatment.

Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in the following table and the option meets each criterion.

Comparison of Wastewater Reuse Option to Plan Development Criteria

Impact Category	Comment(s)
A. Water Supply: 1. Quantity 2. Reliability 3. Cost	 1. Sufficient to meet needs 2. High reliability 3. Moderate
B. Environmental Factors 1. Environmental Water Needs 2. Habitat 3. Cultural Resources 4. Bays and Estuaries	 1. Low impact 2. Low impact 3. Low impact 4. Neglible impact
C. Impact on Other State Water Resources	No apparent negative impacts; no effect on navigation.
D. Threats to Agriculture and Natural Resources	None
E. Equitable Comparison of Strategies Deemed Feasible	Option considered to meet demands of all user groups except Steam-Electric
F. Requirements for Interbasin Transfers	None
G. Third Part Social and Economic Impacts from Voluntary Redistribution	None

Voluntary Redistribution

Description of Option

For the purpose of this study, “voluntary redistribution” is defined as an entity in possession of water rights or water purchase contracts freely selling, leasing, giving, or otherwise providing water to another entity. Typically, the entity providing the water has determined that it does not need the water for the duration of the transfer. The transfer of water could be for a set period of years or a permanent transfer. Voluntary redistribution is essentially a water purchase.

Voluntary redistribution has many benefits over other supply options including the facts that it can be much easier than implementing a new reservoir project, it typically costs less than large capital projects, and it avoids implementation issues of new reservoir projects such as environmental and local impacts. Most importantly, redistribution of water makes use of existing resources and provides a more immediate source of water.

Entities that have the potential to meet demands through voluntary redistribution, either by having available supplies or currently providing needs through voluntary redistribution and having the ability to obtain new supplies were identified. It is important to remember that redistribution of water is voluntary. No group or individual is required to participate. Therefore, other strategies should be identified for groups relying on redistribution where the supply would place a burden on the distributor. A discussion of entities considered as potential supplier of voluntary redistribution is provided below.

Voluntary Redistribution Strategies

The following table is a list of needs met by voluntary redistribution

Water Provider	**Entity with Need**	**Water Supply (acre-feet per year)**					
		2010	**2020**	**2030**	**2040**	**2050**	**2060**
City of Palestine (Lake Palestine)	Steam Electric (Anderson County)		21853	21853	21853	21853	21853
City of Lufkin (Sam Rayburn)	County Other (Angelina County)	30	127	251	411	709	1143
	Four Way WSC						225
	Diboll	21	167	348	584	912	1,369
	City of Lufkin	827	1748	2725	3805	5104	6657
	Manufacturing (Angelina County)					4504	4504
City of Jacksonville (Lake Jacksonville)	Manufacturing (Cherokee County)	244	244	244	244	244	244
Lower Neches Valley Auth.	Irrigation (Hardin County)	3711	3711	3711	3711	3711	3711
	Steam Electric (Jefferson County)		13426	15696	18464	21838	25951
Athens MWA	City of Athens	26	48	73	89	144	161
	Irrigation (Henderson County)	165	178	189	184	212	192
	Livestock (Henderson) Forest Grove Reservoir		1137	1274	1154	1799	1594
UNRMWA	County Other (Henderson County)		150	200	300	400	500
SRA	City of Nacogdoches*		8551	8551	8551	8551	8551
	Manufacturing (Newton County)*	700	700	700	700	700	700
	Steam-Electric (Rusk County)		1395	1395	1395	5884	11371
	Manufacturing (Orange County)	5000	15000	20000	25000	30000	36000
	County Other (Shelby County)	150	150	150	150	150	150
	Livestock (Shelby County)				4000	4000	4000
City of Hemphill (Toledo Bend)	County Other (Sabine County)*	200	200	200	200	200	200
City of Nacogdoches	Manufacturing (Nacogdoches Cty)		1626	1626	1626	1626	1626
City of San Augustine	County Other (San Augustine Cty)						10
Center	County Other (Shelby County)	111	109	107	105	102	102
	Manufacturing (Shelby County)	687	715	740	771	795	820
Miscellaneous (Downstream Rights)	City of Nacogdoches		8050	8050	8050	8050	8050
	City of Center	971	959	950	936	928	918
Dallas Water Utilities (Lake Fork)	Steam-Electric (Rusk County)		1500	1500	1500	1500	1500

* Alternative Strategy

Environmental Issues

No substantial environmental impacts are anticipated, as available water resources identified for this option are supplied through existing reservoirs. A summary of the few environmental issues that might arise for this alternative are presented in the following table.

Water Management Options	Water Conservation
Implementation Measures	Terms of contract addressed on a case by case basis. Potential construction of treatment and distribution infrastructure.
Environmental Water Needs/Instream Flows	No substantial impact identified.
Bays and Estuaries	No substantial impact identified
Fish and Wildlife Habitat	Impact dependent on location and size of project.
Cultural Resources	Impact dependent on location and size of project.
Threatened and Endangered Species	Impact dependent on location and size of project.

Cost Considerations

Potential costs of purchasing and using water available from voluntary redistribution are listed below:

A. Cost of raw water;
B. Treatment costs;
C. Conveyance costs;
D. Additional costs required by water supplier.

Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in the following table.

An issue facing redistribution is proper compensation for the entity or individual that owns the water right or contract for water. If an entity has arranged through contracts to have more water than they currently need or may need in the study period, they should be compensated for the expense and upkeep of any facilities already in place.

Comparison of Wastewater Reuse Option to Plan Development Criteria

Impact Category	Comment(s)
A. Water Supply: 1. Quantity 2. Reliability 3. Cost	 1. Significant quantity available in parts of the Region 2. High Reliability 3. Low to moderate
B. Environmental Factors 1. Environmental Water Needs 2. Habitat 3. Cultural Resources 4. Bays and Estuaries	 1. No impact identified. 2.Low impact in areas of construction. 3. Possible low impact. 4. No substantial impact
C. Impact on Other State Water Resources	No apparent negative impacts, no effect on navigation.
H. Threats to Agriculture and Natural Resources	No impact identified.
I. Equitable Comparison of Strategies Deemed Feasible	Considered to meet the needs of all user groups.
J. Requirements for Interbasin Transfers	Not applicable
K. Third Part Social and Economic Impacts from Voluntary Redistribution	

The following issues should be considered when negotiating a voluntary redistribution agreement:

- Quantity of water to be redistributed;
- Location of excess water supply;
- Location of buyer with water need;
- Necessary water treatment and distribution facilities;
- Determination of fair market value;
- Consideration of how existing contracts will effect the sale or lease;
- Length of agreement;
- Expiration dates of agreement;
- Drought contingencies;
- Protections needed by entity providing water;
- Protections needed by entity needing water;
- Enforcement of protections, and
- Other conditions specific to buyer and seller.

Expand Local Supplies

Expansion of existing supplies involves the development of supplies currently being used near the source of demand, usually groundwater or local supplies (supply ponds). The water user group's that would implement this strategy are limited to irrigation, livestock and mining. The implementation of this strategy involves the assumption that the future needs will be filled by the same percentage usage of current supplies. Where groundwater is being used as a current supply the additional usage has been included with the increase in use of groundwater. The analysis contained in this section is limited to sources other than groundwater. The water user groups that would implement this strategy are included in the following table.

Expand Local Supply

Entity	Supply or Need, Acre-Feet					
	2010	2020	2030	2040	2050	2060
Livestock – Sabine County	50	100	100	200	200	300
Livestock – San Augustine County		50	100	200	200	300
Livestock – Shelby County (Sabine Basin)			500	500	500	500

<u>Environmental Issues</u>

Water Management Options	Water Conservation
Implementation Measures	Implementation varies and is expected to be of minimal effort.
Environmental Water Needs/Instream Flows	No impact identified
Bays and Estuaries	No impact identified
Fish and Wildlife Habitat	No impact identified
Cultural Resources	No impact identified
Threatened and Endangered Species	No impact identified

Cost Consideration

Costs could not be identified as scope of project to implement is not well defined.

Implementation Issues

No implementation issues are anticipated.

4B.4 New Reservoirs

Major water providers in the East Texas Region have performed numerous studies on locations of reservoir sites. The East Texas Region possesses the features attractive to reservoir construction. The process of implementing a new reservoir is a multi-decade task of evaluating and resolving environmental impacts and economics of the project that go beyond the scope of regional water planning. The process of implementation can go beyond the 50 year planning cycle in the current water planning process. The consideration of reservoir projects in the East Texas Region is based on major water providers, located in the East Texas Region, presenting information to the ETRWPG that demonstrates their ability and willingness to serve needs in the 50 year planning cycle. The economic justification and environmental impacts is the responsibility of the major water provider. The only reservoir considered as a potential strategy for the needs in the current planning cycle is Lake Columbia (Eastex). Lake Columbia is located predominately in Cherokee County but extends into the southern portion of Smith County. The reservoir will be formed by construction of a dam on Mud Creek approximately 2.5 miles downstream of U.S. Highway 79 crossing. The dam is expected to impound water approximately 14 miles upstream with an estimated surface of 10,000 acres. The firm yield for the reservoir site is 75,700 acre-feet with a total storage volume at normal pool elevation of 315 feet, msl or 187,839 acre-feet.

Needs that would be met by the development of Lake Columbia are provided in the following.

Needs Supplied by Lake Columbia

Entity	Need, Acre-Feet					
	2010	2020	2030	2040	2050	2060
New Summerfield		2565	2565	2565	2565	2565
Rusk		4275	4275	4275	4275	4275
Manufacturing (Angelina County)*	8,551	8,551	8,551	8,551	8,551	8,551
County Other (Nacogdoches Cty)*		428	428	428	428	428
City of Nacogdoches*		8551	8551	8551	8551	8551
Steam Electric (Nacogdoches Cty)	4828	6911	8079	9504	11241	13358
TOTAL	13,379	31,281	32,449	33,874	35611	37,728

* Alternative Strategy

Environmental Issues

Water Management Options	Water Conservation
Implementation Measures	Dam and reservoir covering 10,000 acres.
Environmental Water Needs/Instream Flows	Probable moderate impact
Bays and Estuaries	Possible cumulative impact to limited areas of coastal marsh
Fish and Wildlife Habitat	Possible high impact to species in general. Possible moderate impact on State-listed species.
Cultural Resources	Probable moderate impact.
Threatened and Endangered Species	Probable moderate impact.

Cost Consideration

As with any major reservoir project, the project costs are large. Based on comparison with other projects of similar size, it is estimated the proposed Lake Columbia project has an annualized cost of $13,420,700. This figure is an annualized estimate of cost that includes the construction of the dam, land acquisition, resolution of conflicts, environmental permitting and mitigation, and technical services.

Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in the following table, and the option meets each criterion.

Comparison of Lake Columbia To Plan Development Criteria

Impact Category	Comment(s)
A. Water Supply: 1. Quantity 2. Reliability 3. Cost	 1. Sufficient to meet needs 2. High reliability 3. Reasonable to High
B. Environmental Factors 1. Environmental Water Needs 2. Habitat 3. Cultural Resources 4. Bays and Estuaries	 1. Moderate impact 2. High impact 3. High impact 4. Negligible impact
C. Impact on Other State Water Resources	No apparent negative impacts on state water resources; no effect on navigation
D. Threats to Agriculture and Natural Resources	Potential impact on bottomland farms and habitat in reservoir area
E. Equitable Comparison of Strategies Deemed Feasible	Option is considered to meet municipal, manufacturing and steam-electric shortages
F. Requirements for Interbasin Transfers	Potential transfer to Trinity Basin
G. Third Party Social and Economic Impacts from Voluntary Redistribution	None

Chapter 4B, Appendix A

Screening Criteria For Strategies

The screening criteria used to assess the feasibility of potential strategies in the East Texas Region is provided as follows. These criteria were adopted as guidelines and a strategy could be retained or dismissed at the discretion of the RWPG.

General:

1. Feasible strategy must have an identified sponsor or authority.
2. Feasible strategy must consider the end use. This includes water quality, distance to end use, etc. For example, long transmission systems with pumping are not likely to be economically feasible for irrigation use.
3. Strategy should provide a reasonable percentage of the projected need (except conservation, which will be evaluated for all needs).
4. Strategy must meet existing federal and state regulations.
5. Strategies must be based on proven technology.
6. Strategy must be able to be implemented.
7. Strategy must be appropriate for regional water planning.

By Water Strategy Type (as required in TWDB Guidelines):

WATER CONSERVATION

The guidelines for water planning require that water conservation be considered as a strategy for every identified need. If water conservation is not adopted, the reason must be documented. Water conservation in the East Texas Region is driven more by economics than lack of readily available supply and therefore not every user will have the need to implement conservation. Additional screening criteria for conservation strategies was adopted to comply with this general policy. The criteria are outlined below.

(1) Municipal conservation strategies will be evaluated for municipal water user groups that have a need identified during the planning period and has a current per

capita water use greater than 140 gpcd. This is the TWDB recommended goal for municipal users based on the Conservation Task Force recommendations. Municipal conservation will not be evaluated for users with less than 140 gpcd.

(2) Industrial, commercial and institutional (ICI) conservation strategies will be considered for cities with ICI use that exceeds 20 percent of the city's total water use.

(3) Industrial conservation will be evaluated for counties with manufacturing demands greater than 1,000 acre-feet per year and/or have identifiable industries with water use greater than 500 acre-feet per year.

(4) Steam electric power water demands consider a high level of conservation in the development of the projections. No additional conservation measures will be considered for steam electric power.

(5) Irrigation conservation measures will be considered by crop type and water source.

(6) Conservation will not be considered for livestock water demands.

(7) Conservation will not be considered for mining demands.

DROUGHT MANAGEMENT MEASURES

Drought management water management strategies are implemented in response to drought conditions. These strategies provide a safety factor for water users during drought. Drought management measures will not be adopted as strategies to meet long-range needs.

WASTEWATER REUSE

Reuse projects will be considered on a case-by-case basis. Both direct and indirect reuse will be considered as appropriate.

EXPANDED USE OF EXISTING SUPPLIES

Connection of Existing Supplies

The connection of existing supplies will be considered on a case-by-case basis. In general, supplies should be owned by the water group with a need for additional supply or available to that group for purchase or permitting.

System Operation

New or additional system operations may be considered if they are feasible and the owner wishes to adopt such strategies. The RWPG will include existing operating policies during evaluation of available supplies.

Conjunctive Use of Groundwater and Surface Water

The conjunctive use of groundwater and surface water supplies may be considered when groundwater supplies are available. Applicable groundwater conservation district rules will be considered for such conjunctive systems.

Reallocation of Reservoir Storage

The RWPG will consider reallocation of reservoir storage if the owner is amenable to reallocation and, where reallocation in federal reservoirs is being considered (such as from flood to conservation storage), an appropriate and willing local sponsor can be found to sponsor a federal study.

Voluntary Redistribution of Water Resources

The RWPG will discuss the possible redistribution with the involved parties and come to a consensus on an approach. If the involved parties are not interested, the RWPG will not pursue this option.

Voluntary Subordination of Existing Water Rights

The RWPG will consider voluntary subordination of existing water rights if the involved parties are amenable to the strategy. Alternatively, the RWPG may recommend that the water right holder consider selling water under their water right to the willing buyer.

Yield Enhancement

The RWPG will consider yield enhancement projects as appropriate for the water source and identified need.

Water Quality Improvement

The RWPG will consider water quality improvement projects for municipal supplies that bring the existing water supply into compliance with state and federal regulations. General water quality projects may be considered if they improve the usability of the water source to help meet demands.

NEW SUPPLY DEVELOPMENT

Surface Water Resources

The RWPG will consider new surface water resources that can be permitted, provide a reasonable amount of supply to meet the identified need, are located within a reasonable distance of the end users, and are expected to provide water supplies at a reasonable cost.

Groundwater Resources

The RWPG will consider groundwater supplies in areas where additional groundwater is available.

Brush Control

Brush control is not considered a cost effective water supply strategy in the East Texas Region due to the large amount of rainfall and lack of invasive brush species. The RWPG will not consider brush control as a water management strategy.

Precipitation Enhancement

The East Texas Region has an abundance of precipitation. The RWPG will not consider precipitation enhancement as a water management strategy.

Desalination

The RWPG will consider desalination on a case-by-case basis.

Water Right Cancellation

The RWPG will generally not pursue water right cancellation as a means of obtaining additional water supplies. Instead, the RWPG will recommend that the water right holder consider selling water under their water right to the willing buyer.

Aquifer Storage and Recovery (ASR)

The RWPG will consider aquifer storage and recovery where the structure of the aquifer is such that this method is applicable. An ASR study must have already been performed to consider an area feasible for an ASR project.

INTERBASIN TRANSFERS

The RWPG will recommend interbasin transfers when necessary to transport water from the source to its destination. Interbasin transfers will be evaluated in accordance with current regulations

<u>Selection Process</u>

The process for selection of the water management strategies is described as follows:

1. Define groupings or common areas with supply deficiencies

2. Develop comprehensive list of potentially feasible strategies, per screening process

3. Contact potential suppliers/WUGs to determine current strategies under consideration

4. Prepare qualitative rating based on cost, reliability, environmental impact, impacts on other water resources, impacts on agricultural and natural resources, and political acceptability for the various strategies.

5. Select one or more strategies as appropriate for each need or group.

6. Contact each WUG with a need and confirm the selected strategies are acceptable.

7. Present proposed Water Management Strategies to the Regional Water Planning Group in a public meeting for discussion, modification, and approval.

Chapter 4C.

Water Management Strategies

The strategies are outlined for each water user group, by county, with a need identified in Chapter 4A. For each user group with a defined shortage, a summary table is provided to review the projected need and the supply delivered by the strategy(ies). A second summary table provides an evaluation of the cost (capital, annual and unit) to deliver treated water to the user for the various strategies that were considered. Appendix A provides a summary of the unit prices and general description of the project scope and cost for each strategy.

There are four major categories of water management strategies recommended: water conservation and drought management, wastewater reuse, expanded use of existing supplies (voluntary redistribution, groundwater, local supplies) and new development. Further discussion of how the strategies were implemented in the East Texas Region is provided in Chapter 4B.

4C.1 Anderson County

Water management strategies for Anderson County include expanding groundwater resources. There is adequate aquifer capacity to allow for the projected expansions of groundwater supplies. However, development of a steam-electric facility will be dependent on the development of surface water supply from Lake Palestine.

County-Other

Current supplies are from the Carrizo-Wilcox aquifer, Queen City aquifer, and Sparta aquifer. The recommended strategy for meeting the need projected in 2060 is to increase supply from the Queen City aquifer.

Anderson County-Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	0	0	0	41
Recommended Strategy ADC-1: Increase Supply from Queen City						41

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
ADC-1: Increase Supply from Queen City	41	$167,432	$25,118	$311	$0.96

Frankston

The City of Frankston water supply is currently from groundwater wells in the Carrizo-Wilcox aquifer. The strategy selected to meet the future demands is to increase additional supplies from the Carrizo-Wilcox.

Frankston	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	6	24	40	54
Recommended Strategy FR1: Increase Supply from Carrizo-Wilcox			121	121	121	121
Recommended Strategy FR-2: Water Conservation			6	7	8	9

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
FR1: Increase Supply from Carrizo-Wilcox	121	$237,831	$39,619	$327	$1.00
FR-2: Water Conservation	9		$1,600	$178	$0.13

Mining

Water for mining is supplied by the Carrizo-Wilcox aquifer. The recommended strategy is to increase supply from this aquifer. The following table displays the projected future needs for the mining use in Anderson County.

Anderson County Mining	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	19	45	70	95	119
Recommended Stragety ADN-1: Increase Supply from Carrizo-Wilcox		121	121	121	121	121

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
ADN-1: Increase Supply from Carrizo-Wilcox	121	$214,643	$38,279	$316	$0.97

Steam Electric

Previous plans by Louisville Gas & Electric to construct a steam electric power plant were abandoned due to lack of funding. The current demand projections are based on a similar project being developed in the future, with plant operation beginning in 2020 and expected to require an annual average amount of 21,853 ac-ft/yr by 2060. Construction of a pipeline and pump station would be required to supply the plant with water from Lake Palestine. The following table displays the projected future needs for the steam-electric power use in Anderson County.

Anderson County Steam Electric	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	11,306	13,218	15,549	18,390	21,853
Recommended Strategy ADS-1: Water from Lake Palestine		21,853	21,853	21,853	21,853	21,853
Alternate Strategy ADS-1: Water from Lake Fastrill		21,853	21,853	21,853	21,853	21,853

The recommended strategy is to obtain water from Lake Palestine.

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
ADS-1: Water from Lake Palestine	21,853	$20,786,163	$7,104,143	$325	$1.00
Alt. Strategy ADS 2: Water from Lake Fastrill	21,853	$20,786,163	$7,104,143	$325	$1.00

4C.2 Angelina County

Most of the WUG's in Angelina County are currently dependent on groundwater supplies. Both the Yegua aquifer and the Carrizo aquifer have limited capacity for expanded development. Although some communities will continue to rely on groundwater, the proposed construction of transmission lines and a surface water treatment plant at Lufkin to draw and treat water from the Sam Rayburn Reservoir is expected to supply water for Lufkin, Zavalla, Huntingdon, Four Way WSC, Angelina WSC, M&M WSC and some manufacturing needs. The Lower Neches Valley Authority (LNVA) currently has a TWDB loan commitment for this project. The project could involve water rights from both or either the LNVA or City of Lufkin. However, the expansion of the treatment plant beyond the initial 10 mgd capacity will be required to meet projected shortages beyond 2050.

County-Other

Current supplies are from the Carrizo-Wilcox and Yegua aquifers. Angelina WSC and M&M WSC are expected to obtain water from the proposed City of Lufkin surface water treatment plant. An alternative strategy for meeting the projected needs is to increase supply from the Carrizo-Wilcox aquifer.

Angelina County Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	30	127	251	411	709	1,143
ANC-1: Voluntary redistribution from City of Lufkin or LNVA	30	127	251	411	709	1,143
ANC-2A: Increase Supply from Carrizo-Wilcox – Phase I	404	404	404	404	404	404
ANC-2B: Increase Supply from Carrizo-Wilcox – Phase II						807

Two alternative strategies were proposed to meet the projected needs. The first is voluntary redistribution of water from the City of Lufkin's proposed surface water treatment plant. The second strategy is to expand groundwater supplies from the Carrizo-Wilcox aquifer.

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
ANC-1: Voluntary redistribution from City of Lufkin or LNVA (1)	1,143	$0	$907,500	$794	$2.44
ANC-2A: Increase Supply from Carrizo-Wilcox – Phase I	404	$303,880	$83,395	$207	$0.63
ANC-2B: Increase Supply from Carrizo-Wilcox – Phase II	807	$607,760	$166,789	$207	$0.63
TOTAL ANC-2	1,211	$911,640			

(1) See Section 4C.21 , Wholesale Water Providers, City of Lufkin, for costs of strategies for City of Lufkin

Diboll

Current supplies are from the Yegua-Jackson aquifer. Current pumpage from the Yegua-Jackson aquifer is approaching long-term aquifer capacity in Angelina County. Additional wells should only be developed by Diboll if other water suppliers abandon use of the Yegua-Jackson in favor of surface water supplies or wells in the Carrizo-Wilcox. The recommended strategy for meeting the need projected in 2060 is to purchase water from Lufkin and build a pipeline to Diboll.

Diboll	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	32	187	374	618	965	1,441
Recommended Strategy DI-1: Purchase water from Lufkin or LNVA	21	167	348	584	912	1,369
DI-2: Water Conservation	11	20	26	34	53	72
Alt. Strategy DI-3A: Increase Supply from Yegua-Jackson – Phase II	646	646	646	646	646	646
DI-3B: Increase Supply from Yegua –Jacksion– Phase II					968	968

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
DI-1: Purchase water from Lufkin or LNVA	1,369	$5,194,100	$1,345,000	$933	$2.86
DI-2: Water Conservation	72		$7,500	$104	$0.32
Alt. Strategy DI-3A: Increase Supply from Yegua-Jackson – Phase II	646	$530,803	$137,552	$213	$0.65
DI-3B: Increase Supply from Yegua –Jackson– Phase II	968	$882,330	$215,446	$222	$0.68
DI-3 Total	1,614	$1,413,133			

Four Way WSC

Current supplies are from the Yegua aquifer. The recommended strategy for meeting the need projected in 2060 is to obtain treated surface water from the City of Lufkin. The following table displays the projected future needs for this entity.

Four Way WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	0	0	0	225
FW-1: Obtain water from Lufkin or LNVA	0	0	0	0	0	225

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
FW-1: Obtain water from Lufkin or LNVA	225	$0	$244,800	$1,088	$0.72

<u>(1) See Section 4C.21 , Wholesale Water Providers, City of Lufkin, for costs of strategies for City of Lufkin</u>

Hudson

Current supplies are from the Carrizo-Wilcox aquifer. The recommended strategy for meeting the need projected in 2060 is to increase supply from the Carrizo-Wilcox aquifer. The following table displays the projected future needs for this entity.

Hudson	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	41	194	393	630	980	1,444
HU-1A: Increase Supply from Carrizo-Wilcox – Phase I	404	404	404	404	404	404
HU-1B: Increase Supply from Carrizo-Wilcox – Phase II				1049	1049	1049

A two-phased strategy was considered to meet the future water demands.

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
HU-1A: Increase Supply from Carrizo-Wilcox – Phase I	404	$509,476	$105,160	$261	$0.80
HU-1B: Increase Supply from Carrizo-Wilcox – Phase II	1,049	$1,209,591	$262,136	$250	$0.77
TOTAL	1,453	$1,719,067			

Hudson WSC

Current supplies are from the Carrizo-Wilcox aquifer. The recommended strategy for meeting the need projected in 2060 is to increase supply from the Carrizo-Wilcox aquifer.

Hudson WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	108	242	435	698	1,066
HW-1A: Increase Supply from Carrizo-Wilcox – Phase I		404	404	404	404	404
HW-1B: Increase Supply from Carrizo-Wilcox – Phase II					807	807

A two-phased strategy was considered to meet the future water demands.

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
HW-1A: Increase Supply from Carrizo-Wilcox – Phase I	404	$509,476	$105,160	$261	$0.80
HW-1B: Increase Supply from Carrizo-Wilcox – Phase II	807	$1,018,952	$210,320	$261	$0.80
TOTAL	1,211	$1,527,538			

Lufkin

The City of Lufkin currently relies on groundwater from the Carrizo-Wilcox aquifer. However, the City is planning construction of a surface water treatment plant on Sam Rayburn Reservoir, where it will utilize up to 28,000 acre-feet/year of water rights. The City's existing well field will continue to be operated at or near its current capacity, but the proposed surface water plant will be expanded in a series of phases to meet rising future demands. The future expansions are intended to enable the City to service additional surrounding county water suppliers and to meet increasing manufacturing demands. See Section 4C.21, Wholesale Water Providers, City of Lufkin, for costs of strategies for City of Lufkin.*

Lufkin	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	827	1,748	2,725	3,805	5,104	6,657
LU-1: Obtain and treat water from Sam Rayburn Reservoir	827	1,748	2,725	3,805	5,104	6,657
LU-2: Water Conservation	50	117	189	247	319	408

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
LU-1: Obtain and treat water from Sam Rayburn Reservoir	6,657	(1)	(1)	$693	$2.13
LU-2: Water Conservation	408		$40,000	$98	$0.30

*(1) See Section 4C.21 , Wholesale Water Providers, City of Lufkin, for costs of strategies for City of Lufkin

Manufacturing

Current supplies are from several sources with the following approximate distribution**:**

14,509 acre-feet/year from the Carrizo-Wilcox aquifer, 1,023 acre-feet/year from undifferentiated groundwater sources and 28,421 acre-feet/year from surface water sources. The City of Lufkin supplies approximately 12% of the current needs; however, it would be expected that the City’s percentage of the supply would increase after development of surface water supply from Sam Rayburn. It is anticipated that growth will be supplied by the City of Lufkin and Temple-Inland, which is currently under contract with ANRA for supply from Lake Columbia. It is expected that Temple-Inland will use the Lake Columbia supply as it becomes available.

Angelina County Manufacturing	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	0	0	995	4,504
ANM-1: Obtain water from City of Lufkin or LNVA					4,504	4,504
ANM-2: Obtain raw water from Lake Columbia via contract with ANRA	8,551	8,551	8,551	8,551	8,551	8,551

Two alternative strategies were considered to meet the future water demands. The first strategy is purchase of water from the City of Lufkin. Availability will be dependent on future expansion of the treatment plant beyond the initial 10 mgd capacity. The second strategy is Temple-Inland's participation in the Lake Columbia development.

Strategy	Contract Amount (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
ANM-1: Obtain water from City of Lufkin or LNVA	4,504	$(1)	$3,121,272	$693	$2.13
ANM-2: Obtain raw water from Lake Columbia via contract with ANRA	8,551	$(2)	$3,360,543	$393	$1.21

(1) See Section 4C.21 , Wholesale Water Providers, City of Lufkin, for costs of strategies for City of Lufkin
(2) See Section 4C.21 , Wholesale Water Providers, ANRA for costs of strategies for ANRA.

Livestock

Demands are projected to increase over the planning period. It is recommended that these shortages (up to 89 af/y by 2060) be met with increases in surface water supplies.

Angelina County Livestock	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	0	-17	-52	-89
Recommended Strategy ANL-1 (ac-ft/yr): Increase local surface water supplies (stock ponds)				89	89	89

Strategy	Contract Amount (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
ANL-1 Stock ponds	89	122,700	$10,700	$120	0.37

4C.3 Cherokee County

The Carrizo-Wilcox aquifer is almost fully allocated in Cherokee County. There are substantial amounts of additional water available from the Queen City and Sparta aquifers, but these aquifers do not cover the entire county. Where feasible, water from the Queen City or Sparta aquifers may be substituted for Carrizo-Wilcox water in the following potential water management strategies. However, the ETRWPG has made a policy decision that water from the Queen City and Sparta aquifers will be used primarily for livestock and irrigation uses because of the unreliable supply and quantity. No proposed management strategies for municipal water shortages involve the Queen City and Sparta aquifers.

Water obtained from the Queen City aquifer may be acidic and may have levels of iron and manganese greater than TCEQ secondary drinking water standards. Water obtained from the Sparta aquifer may have levels of sulfates greater than the TNRCC secondary drinking water standards, especially in far southern Cherokee County. Water quality in the Sparta aquifer is best on the outcrop.

Irrigation

Current supply is from Neches Run-of-River, Carrizo-Wilcox aquifer, Queen City aquifer, and Sparta aquifer. The recommended strategy is to increase supplies from the Queen City aquifer.

Cherokee County Irrigation	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	34	34	34	34	34	34
CHI-1: Queen City	40	40	40	40	40	40

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
CHI-1: Queen City	40	$154,557	$20,134	$499	$1.53

Manufacturing

Manufacturing demands in Cherokee County rely on water from Lake Jacksonville, obtained through the City of Jacksonville. A very small portion of water needs is supplied from the Carrizo-Wilcox aquifer. The recommended strategy is to obtain additional water from the City of Jacksonville.

Cherokee County Manufacturing	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	20	65	107	148	187	244
CHM-1: Obtain water from City of Jacksonville	244	244	244	244	244	244

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
CHM-1: Obtain water from City of Jacksonville	244	$0	$186,843	$766	$2.35

Mining

Current supply is from the Carrizo-Wilcox aquifer and mining local supply. The recommended strategy is to obtain water from the Queen City aquifer.

Cherokee County Mining	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	0	0	0	2
CHN-1: Increase Supply from Queen City						40

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
CHN-1: Increase Supply from Queen City	40	$154,557	$20,134	$499	$1.53

New Summerfield

The City of New Summerfield currently obtains water supply from the Carrizo-Wilcox aquifer. Although near term needs are adequate, the City has a contract with ANRA for water from Lake Columbia, if it is developed. Development of plant farms in the New Summerfield area, with the City being the supplier of the water, will impact the City’s need for new sources. The selected strategy is to obtain water from Lake Columbia and implement water conservation.

New Summerfield	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	44	88	124	165	213
NS-1: Obtain treated water from Lake Columbia via contract with ANRA		2,565	2,565	2,565	2,565	2,565
NS-2: Water Conservation		10	18	21	23	26
NS-3: Increase supply from Carrizo-Wilcox		121	121	242	242	242

Strategy	Contract Amount (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
NS-1: Obtain treated water from Lake Columbia via contract with ANRA	2,565		$2,000,700	$780	$2.39
NS-2: Water Conservation	26		$2,000	$77	$0.24
NS-3: Increase supply from Carrizo-Wilcox	242	$646,479	$46,966	$194	$0.60

Rusk

Current supplies are obtained from Carrizo-Wilcox aquifer and Rusk City Lake. The City presently has a contract with ANRA for water from Lake Columbia, if constructed. The selected strategy is to obtain water from Lake Columbia. Future water needs are shown in the following table.

Rusk	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	0	42	116	212
RU-1: Obtain treated water from Lake Columbia via contract with ANRA		4,275	4,275	4,275	4,275	4,275
RU-2: Water Conservation				51	66	76
RU-3: Increase supply from Carrizo Wilcox				212	212	212

Strategy	Contract Amount (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
RU-1: Obtain treated water from Lake Columbia via contract with ANRA	4,275		$3,334,500	$780	$2.39
RU-2: Water Conservation	76		$8,000	$106	$0.33
RU-3: Increase supply from Carrizo Wilcox	212	$296,021	$27,763	$131	$0.41

4C.4 Hardin County

The Gulf Coast aquifer supplies most users in Hardin County. The available supply for Hardin County from the Gulf Coast aquifer, based on the results of this plan, is limited to 22,400 acre-feet/year. The current supplies, associated with the Gulf Coast aquifer, total 22,960 acre-feet/year. The City of Beaumont accounts for 8,785 acre-feet/year of this current supply.

Due to the near allocation of groundwater, surface water alternatives need to be considered. Municipal and manufacturing shortages are relatively small and will be supplied by continued use of the Gulf Coast aquifer. The recommended strategy for irrigation, which accounts for 70% of the future demand is to utilize surface water sources.

County-Other

Current supply is from the Gulf Coast aquifer. The selected strategy is to obtain additional supply from the Gulf Coast aquifer.

Hardin County Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-153	-263	-284	-305	-358	-431
Recommended Strategy HAC-1A (ac-ft/year):Use additional water from Gulf Coast Aquifer.	153	153	153	153	153	153
Recommended Strategy HAC-1B (ac-ft/year):Use additional water from Gulf Coast Aquifer.		153	153	153	153	153
Recommended Strategy HAC-1C (ac-ft/year):Use additional water from Gulf Coast Aquifer.					153	153

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
HAC-1A: Use additional water from Gulf Coast Aquifer.	153	$277,225	$69,136	$231	$0.71
HAC-1B: Use additional water from Gulf Coast Aquifer.	153	$277,225	$69,136	$231	$0.71
HAC-1C: Use additional water from Gulf Coast Aquifer.	153	$277,225	$69,136	$231	$0.71

Manufacturing

Current supply is from the Gulf Coast aquifer. The selected strategy is to obtain additional supply from the Gulf Coast aquifer.

Hardin County Manufacturing	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-27	-46	-63	-81	-97	-114
Recommended StrategyHAM-1 (ac-ft/year): Use additional water from Gulf Coast Aquifer	114	114	114	114	114	114

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
HAM-1: Use additional water from Gulf Coast Aquifer	114	$317,850	$20,844	$291	$0.90

Irrigation

The needs for irrigation comprise approximately 70% of the future needs. Due to the limitations of groundwater needs are shown to be met through the use of surface waters.

Hardin County Irrigation	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-3711	-3711	-3711	-3711	-3711	-3711
Recommended StrategyHAI-1 (ac-ft/year): Use surface water surfaces	3711	3711	3711	3711	3711	3711

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
HAI-1: Use surface water sources	3711	$1,201,023	$194,423	$52	$0.16

4C.5. Henderson County

Henderson County is between Region C and the East Texas Region. The portion of the county in the Neches River Basin lies in the East Texas Region, and the portion in the Trinity River Basin lies in Region C. Much of the water supplies to users in the East Texas Region is obtained from groundwater with a small amount of surface water supplied from Lake Athens and Lake Palestine. Most of the needs in Henderson County are associated with shortages from Lake Athens.

Athens

The City of Athens receives treated surface water from the Athens MWA and groundwater from local wells. Most of the City is located in Region C with a small portion extending into the East Texas Region. The strategies to meet water shortages for Athens are to implement conservation and purchase water from the Athens MWA through the strategies identified for this wholesale water provider. Since most of Athens lies in Region C, conservation for the portion of Athens in the East Texas Region was estimated using the recommended conservation packages identified by Region C.

Athens	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-21	-36	-56	-77	-107	-147
AT-1: Conservation	1	6	12	17	22	30
AT-2: Purchase water from Athens MWA	26	48	73	89	144	161

The costs of the strategies are presented in the following table.

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
AT-1: Conservation	30	NA	$ 4,374	$ 146	$ 0.45
AT-2: Water from Athens MWA (1)	161	$ 0	$ 92,300	$ 574	$ 1.76

(1) See Section 4C.21, Wholesale Water Providers, Athens MWA, for costs for strategies for Athens MWA..

Bethel-Ash WSC

Bethel-Ash WSC serves customers in Henderson County (Region C and East Texas Region) and Van Zandt County (Region D). Current supply for customers in the East Texas Region is from the Carrizo-Wilcox aquifer. The strategies are to overdraft groundwater from the Carrizo-Wilcox aquifer in 2050 using existing wells and drill a new well in the Trinity River Basin portion of Henderson County for use in the East Texas Region by 2060.

Bethel-Ash WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	201	148	100	47	-17	-105
BA-1: Overdraft and drill new well in Carrizo-Wilcox Aquifer					17	105

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
BA-1: Obtain water from Carrizo-Wilcox	105	$ 133,600	$ 16,700	$ 159	$ 0.49

County-Other

Current supplies are from the Carrizo-Wilcox aquifer and Queen City aquifer, with a small amount of water from Lake Palestine. The Carrizo-Wilcox aquifer is fully allocated in the Neches basin part of the county. There is available water from the Queen City aquifer, but the quality of water from this source is variable. The recommended strategies to meet the projected shortage of 1,000 acre-feet per year are to purchase additional water from the UNRMWA (Lake Palestine), expand groundwater use of the Queen City aquifer, conservation, and overdraft groundwater from the Carrizo-Wilcox aquifer in 2010.

Henderson County-Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-116	-256	-387	-517	-720	-1000
Recommended Strategy HECo-1: Conservation	31	57	74	92	108	129
Recommended Strategy HECo-2: Overdraft Carrizo-Wilcox Aquifer	100					
Recommended Strategy HECo-3: Expand use of Queen City Aquifer	50	150	200	300	400	500
Recommended Strategy HECo-4 Purchase water from UNRMWA		150	200	300	400	500

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
HECo-1: Conservation	129	$ 0	$ 15,000	$ 117	$ 0.36
HECo-2: Overdraft Carrizo-Wilcox	100	$ 0	$ 4,890	$ 49	$ 0.15
HECo-3: Expand use of Queen City	500	$2,319,400	$ 258,800	$ 518	$ 1.59
HECo-4: Water from UNRMWA	500	$5,815,000	$ 577,000	$ 1,154	$ 3.54

RPM WSC

RPM WSC serves customers in Henderson, Van Zandt and Smith counties. The WSC obtains water from the Carrizo-Wilcox aquifer, but supplies are limited because the Carrizo-Wilcox aquifer is fully allocated. The recommended strategy to meet the projected shortage of 29 acre-feet per year is to overdraft groundwater from the Carrizo-Wilcox aquifer using existing wells.

RPM WSC (Henderson)	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	8	2	-3	-9	-18	-29
Recommended Strategy RPM-1 Overdraft Carrizo-Wilcox Aquifer			3	9	18	29

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
RPM-1: Overdraft Carrizo-Wilcox Aquifer	29	$ 0	$1,420	$ 49	$ 0.15

Irrigation

There is a small amount of irrigation demand in Henderson County. This demand is met with water from Lake Athens. The strategy is to continue to use water from Lake Athens through the Athens MWA strategies.

Henderson County Irrigation	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-3	-4	-5	-5	-6	-6
Recommended Strategy HEI-1 (ac-ft/year): Obtain water from Lake Athens	165	178	189	184	212	192

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
HEI-1: Obtain water from Lake Athens	(1)	(1)	(1)	$ 136	$ 0.42

(1) See Section 4C.21, Wholesale Water Providers, Athens MWA, for costs for strategies by Athens MWA.

Livestock

The livestock water demands in Henderson County include the Athens Fish Hatchery. This facility is located at Lake Athens and receives water directly from the lake. The intake structure for the hatchery is set at 9 feet below the normal pool elevation, which limits the available supply from this source. The hatchery has a water right for 3,023 acre-feet per year from Lake Athens, which it intends to fully utilize. To meet the projected needs, it is recommended that the hatchery utilize temporary pumping facilities in 2010, and participate with Athens MWA in obtaining additional water at Lake Athens.

Henderson County Livestock	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-466	-601	-729	-843	-959	-1,066
Recommended Strategy HEL-1 (ac-ft/year) Temporary Pumping facilities	1,500					
Recommended Strategy AWWA-1 (ac-ft/year): Athens Indirect Reuse	500	1,119	1,185	1,236	1,071	948
Recommended Strategy AWWA-2 (ac-ft/year): Obtain water from Forest Grove Reservoir		1,137	1,274	1,154	1,799	1,594

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
HEL-1: Obtain water from Lake Athens through temporary pumping	1,500	$432,500	$ 69,000	$ 46	$ 0.14
AMWA-1: Athens Indirect Reuse	(1)	(1)	(1)	$ 156	$ 0.48
AMWA-2: Forest Grove	(1)	(1)	(1)	$ 124	$ 0.38

(1) See Section 4C.21, Wholesale Water Providers, Athens MWA, for costs for strategies by Athens MWA.

4C.6 Houston County

The projected water shortages in Houston County are for irrigation and livestock uses. The Carrizo-Wilcox aquifer has adequate capacity for expanded development in this county.

Irrigation

Irrigation needs in Houston County are mostly supplied by run-of-river diversions from the Neches and Trinity Rivers. Roughly 10-15% of irrigation needs are currently supplied from groundwater sources.

Houston County Irrigation	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	382	667	986	1,334	1,720	2,146
HOI-1: Increase Supply from Carrizo-Wilcox – Phase I	1211	1211	1211	1211	1211	1211
HOI-2: Increase Supply from Carrizo-Wilcox – Phase II				968	968	968

The recommended strategy is to expand development of groundwater supplies.

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
HOI-1: Increase Supply from Carrizo-Wilcox – Phase I	1,211	$1,099,613	$270,084	$223	$0.68
HOI-2: Increase Supply from Carrizo-Wilcox – Phase II	968	$843,219	$212,006	$220	$0.67
TOTAL	2,179	$1,942,843			

Livestock

Livestock demands are supplied by groundwater sources and local supply. If adequate local supplies are not available, expansion of groundwater sources may be required.

Houston County Livestock	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	35	211	403	610	835	1,078
HOL-1: Increase Supply from Carrizo-Wilcox – Phase I	404	404	404	404	404	404
HOL-2: Increase Supply from Carrizo-Wilcox – Phase II				807	807	807

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
HOL-1: Increase Supply from Carrizo-Wilcox – Phase I	404	$366,538	$90,028	$223	$0.68
HOL-2: Increase Supply from Carrizo-Wilcox – Phase II	807	$733,076	$180,056	$223	$0.68
TOTAL	1,211	$1,099,614			

4C.7 Jasper County

Future needs will have minimal impact on existing supplies. The Gulf Coast aquifer will be capable of handling the increase in needs.

County-Other

Current supply is from the Gulf Coast aquifer. Future demands can be met by use of additional groundwater from Gulf Coast aquifer.

Jasper County-Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-109	-205	-223	-165	-138	-138
Recommended Strategy JAC-1 (ac-ft/year): Use of additional water from Gulf Coast Aquifer. (Neches)	70	141	141	141	141	141
Recommended Strategy JAC-2 (ac-ft/year): Use of additional water from Gulf Coast Aquifer. (Sabine)	82	82	82	82	82	82

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
JAC-1: Use of additional water from Gulf Coast Aquifer. (Neches)	141	$501,908	$46,361	$358	$1.10
JAC-2: Use of additional water from Gulf Coast Aquifer. (Sabine)	82	$250,954	$26,900	$328	$1.01

City of Kirbyville

Current supply is from the Gulf Coast aquifer. Future demands can be met by use of additional groundwater from Gulf Coast aquifer.

City of Kirbyville	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-63	-83	-95	-90	-88	-88
Recommended Strategy KI-1 (ac-ft/year): Use additional supply from Gulf Coast Aquifer.	75	75	75	75	75	75
KI-2: Water Conservation	3	4	5	6	7	7

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
KI-1: Use additional supply from Gulf Coast Aquifer.	95	$309,942	$28,751	$337	$1.04
KI-2: Water Conservation	7	$0.00	$2,000	$285	$0.87

4C.8 Jefferson County

Water supply is largely provided by the Lower Neches Valley Authority with the exceptions of water taken by the City of Beaumont from both the Neches River and groundwater wells in Hardin County and wells for Bevil Oaks.

Meeker

Current supply is from the Gulf Coast aquifer. Future demands can be met by use of additional groundwater from Gulf Coast aquifer.

Meeker	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)					-4	-9
Recommended Strategy ME-1 (ac-ft/year): Use additional supply from Gulf Coast Aquifer					9	9

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
ME-1: Use additional supply from Gulf Coast Aquifer	9	$150,800	$16,966	$2,637	$8.01

Steam Electric Power

Surface water supply will be used to meet future demands.

Jefferson County Steam Electric Power	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)		-13426	-15696	-18464	-21838	-25951
Recommended Strategy JEI-1 (ac-ft/year): Use additional water from the Neches River						

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
JESE-1: Use additional water from the Neches River	25,951	$17,333,339	$1,667,403	$86	$0.27

4C.9 Nacogdoches County

Appleby WSC

Appleby WSC currently relies on groundwater from the Carrizo-Wilcox. The recommended strategy is to expand development of supplies from Carrizo-Wilcox.

Appleby WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	0	0	183	458
AP-1: Increase Supply from Carrizo-Wilcox				807	807	807
AP-2: Water Conservation				22	39	62

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
AP-1: Increase Supply from Carrizo-Wilcox	807	$635,732	$169,751	$210	$0.65
AP-2: Water Conservation	62		$9,000	$145	$0.44

County-Other

Groundwater strategy is based on 3 wells of equivalent capacity being constructed for different users.

Nacogdoches County-Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	0	0	0	291
NC-1: Increase supply from Carrizo-Wilcox	0	0	0	0	0	291
NC-2: Obtain raw water from Lake Columbia via contract with ANRA		428	428	428	428	428

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
NC-1: Increase supply from Carrizo-Wilcox	291	$317,866	$84,875	$210	$0.65
NC-2: Obtain treated water from Lake Columbia via contract with ANRA	428	$0.00	$327,848	$766	$2.35

Lily Grove SUD

Water supplies for Lily Grove SUD are from the Carrizo-Wilcox. The available water supply for the Lily Grove SUD is affected by the impacts of oil and gas mining in the area on the water quality of the SUD's wells. The recommended strategy to supply projected shortages is to expand the groundwater supply from the Carrizo-Wilcox.

Lily Grove SUD	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	94	205	435	677
LG-1: Increase Supply from Carrizo-Wilcox			807	807	807	807

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
LG-1: Increase Supply from Carrizo-Wilcox	807	$635,732	$169,751	$210	$0.65

Livestock

Local supply provides over half of current livestock needs for Nacogdoches County, with the remainder supplied from groundwater sources. Local supplies may not be adequate to cover the projected shortages and further expansion of groundwater sources may be required.

Nacogdoches County Livestock	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	242	559	926	1,347
NCL-1: Increase Supply from Carrizo-Wilcox			1574	1574	1574	1574

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
NCL-1: Increase Supply from Carrizo-Wilcox	1,574	$970,783	$303,897	$193	$0.59

Manufacturing

The City of Nacogdoches currently supplies almost all of the manufacturing water needs in the county. The recommended strategy is continued voluntary distribution of water from the City of Nacogdoches.

Nacogdoches County Manufacturing	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	243	578	1,024	1,431
NCM-1: Obtain water from City of Nacogdoches		1626	1626	1626	1626	1626

Cost projections for the recommended strategy are based on the projected cost to Nacogdoches of obtaining and treating water from Lake Columbia.

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
NCM-1: Obtain water from City of Nacogdoches	1,626	$0	$1,492,668	$918	$2.82

(1) See Section 4C.21, Wholesale Water Providers, City of Nacogdoches, for costs of strategies for City of Nacogdoches

City of Nacogdoches

The City of Nacogdoches obtains water from both ground and surface water sources. The City has a surface water plant located on Lake Nacogdoches and also has eight water wells which tap the Carrizo-Wilcox aquifer. In addition to its own demands, the City of Nacogdoches provides almost all manufacturing demands and provides water to surrounding water supply corporations.

City of Nacogdoches	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	1,804	1,906	3,616	5,175
Recommended Strategy NA-1: Acquire agreement w/ downstream water rights holders		8,050	8,050	8,050	8,050	8,050
NA-2: Water Conservation		229	425	514	654	787
Alt. Strategy NA-3: Obtain and treat water from Lake Columbia		8,551	8,551	8,551	8,551	8,551
Alt. Strategy NA-4: Obtain and treat water from Toledo Bend		5,175	5,175	5,175	5,175	5,175

The City can meet its projected water needs by working out an agreement with downstream water rights holders and implementing water conservation measures. Nacogdoches holds a water right for 22,000 Acre-Feet from Lake Nacogdoches, the entire yield of the lake. The WRAP computer model recognizes Lake Nacogdoches priority date, 1970, as junior to Sam Rayburn's, 1963. As a result the model simulates releases of water from Lake Nacogdoches during the drought of record in an attempt to keep Rayburn full when calculating the yields of these reservoirs. Calculating the yield of Lake Nacogdoches in this fashion drastically decreases the calculated yield of Lake Nacogdoches, but does not significantly increase the yield of Rayburn. An agreement between the City of Nacogdoches and LNVA that priority calls on Lake Nacogdoches will not be made would allow the yield of Lake Nacogdoches to be calculated, by WRAP, in a manner more consistent with realistic conditions. In conjunction with water conservation the increase in calculated yield would meet Nacogdoches' water needs for the planning period. The regional water plan can be amended as soon as agreement is reached between the City of Nacogdoches and LNVA on this issue. Alternative strategies are to obtain water from Lake Columbia or from Toledo Bend. See Section 4C.21, Wholesale Water Providers, Nacogdoches, for cost of strategies for Nacogdoches.

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
Recommended Strategy NA-1: Acquire agreement w/ downstream water rights holders	8,051	(1)	(1)	(1)	(1)
NA-2: Water Conservation	787		$40,000	$51	$0.16
Alt. Strategy NA-3: Obtain and treat water from Lake Columbia	8,551	(1)	(1)	$918	$2.82
Alt. Strategy NA-4: Obtain and treat water from Toledo Bend	5,175	(1)	(1)	$1,202	$3.69

(1) See City of Nacogdoches, Section 4C.21

Steam Electric

No current supply exists. Contracts are in place for this entity to obtain supplies from Lake Columbia, if it is built.

Nacogdoches County Steam Electric	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	4,828	6,911	8,079	9,504	11,241	13,358
NCS-1: Obtain raw water from Lake Columbia via contract with ANRA						

Strategy	Contract Amount (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
NCS-1: Obtain raw water from Lake Columbia via contract with ANRA	13,358	(1)	$5,249,694	$393	$1.21

Swift WSC

Swift WSC currently relies on groundwater from the Carrizo-Wilcox. The recommended strategy is to expand development of supplies from Carrizo-Wilcox.

Swift WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	78	162	235	325	498	688
SW-1: Increase Supply from Carrizo-Wilcox	807	807	807	807	807	807

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
SW-1: Increase Supply from Carrizo-Wilcox	807	$635,732	$169,751	$210	$0.65

4C.10 Newton County

Most of the water user groups in Newton County use groundwater from the Gulf Coast aquifer. According to the groundwater availability estimates, there are 29,000 acre-feet per year (af/y) of water available from the Gulf Coast aquifer in Newton County. Currently about 5,000 af/y is being used. There is also a significant amount of surface water available from the SRA system. Some of this water is contracted for steam electric power. Based on the available groundwater and proximity of surface water to users in Newton County, there is substantial water available for development.

Manufacturing

Manufacturing was the only need identified in Newton County. Current supply is from the Gulf Coast aquifer and a small run-of-the-river source (135 af/y). The projected demands are expected to double by 2060. The recommended strategy is to expand groundwater use. An alternative strategy would be to purchase surface water from SRA.

Newton County Manufacturing	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-149	-264	-370	-477	-574	-667
Recommended Strategy NWM-: Additional supply from Gulf Coast Aquifer	400	400	400	700	700	700
Alternative Strategy NWM-2: Purchase water from SRA	700	700	700	700	700	700

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
NWM-1: Additional Groundwater Well	700	$1,741,500	$ 181,200	$ 259	$ 0.79
NWM-2: Purchase water from SRA	700	$1,389,500	$ 199,600	$ 285	$ 0.87

4C.11 Orange County

The majority of the water used in Orange County comes from the Gulf Coast Aquifer and the Sabine River, with a very small portion coming from the Neches River. The total long-term sustainable groundwater availability for Orange is estimated at 20,000 acre-feet per year. Substantial further development of groundwater in the county could result in subsidence and salt water intrusion into the aquifer. Current groundwater use in Orange County is nearly 20,000 af/y. Because the long-term sustainable availability of the aquifer has been reached, it is recommended that any new large-scale water needs be met with surface water. It is recommended that those entities currently on groundwater be allowed to remain on groundwater to meet their future growth until such a time that a salt water intrusion or subsidence problem is encountered.

There is a significant amount of surface water available in the Sabine River in Orange County. The SRA Canal, which is located in Orange County, has a conveyance capacity of 346,000 af/y. SRA has water rights of 147,100 af/y associated with the canal system (100,400 acre-feet per year for municipal and industrial and 46,700 acre-feet per year for irrigation). Currently, SRA has contracts for 72,974 af/y in the Canal System. This leaves 74,126 af/y available to be contracted. SRA also has a large amount of uncontracted water in Toledo Bend Reservoir that could potentially be released through the dam and carried by the Sabine River for downstream use at the canal location.

Orange

Although the tables do not show a shortage, the City has indicated it plans to drill an additional water well from the Gulf Coast aquifer by 2010.

Vidor

Although the tables do not show a shortage for Vidor, the City is considering supplementing its current groundwater supply with surface water from the SRA canal.

County-Other

This category includes numerous small water supply entities. Their current supply is from the Gulf Coast aquifer. The Neches portion of the county shows a maximum shortage of 132 af/y in 2010, while the Sabine portion shows a corresponding surplus of 44 af/y. Since this is such a relatively small amount of shortage, it is assumed that it can be taken from the Gulf Coast aquifer with few problems. It is assumed that only four entities will need a small amount of additional supply and will need one well each. The cost estimate reflects the development of four wells.

County-Other (Neches Basin)	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-8	-2	0	0	0	0
Recommended Strategy ORC-1 (ac-ft/year): Use additional supply from Gulf Coast Aquifer	140	140	140	140	140	140

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
ORC-1: Additional Wells	140	$1,062,400	$ 110,300	$ 788	$ 2.42

Mauriceville WSC

Mauriceville WSC serves customers in Orange, Jasper and Newton Counties. Their current supply is from wells in Orange County in the Gulf Coast aquifer. Since groundwater is fully allocated in Orange County and the WSC service area extends beyond Orange County, it is proposed that new wells be drilled in nearby Jasper County to meet the projected shortages.

Mauriceville WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	119	-37	-81	-96	-158	-202
Recommended Strategy ORMa-1 : New well in Jasper County in Gulf Coast Aquifer		250	250	250	250	250

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
ORMa-1: New well in Jasper County	250	$ 283,800	$ 36,900	$ 148	$ 0.45

Manufacturing

Current supply is from the Gulf Coast aquifer, the Sabine River (SRA Canal), and the Neches River. Additional water is needed from 2010-2060. There is a shortage in the Sabine portion of the county and a surplus from the Neches Basin portion of the county. This surplus cannot fully meet the projected needs in the county. By year 2010, new supplies must be made available. The total 2060 unmet demand in the Sabine Basin is 34,127 af/y. The net shortage for both basins is 31,536 af/y.

To meet these shortages, it is recommended that additional supply from SRA's canal system and Toledo Bend Reservoir be used. It is assumed that the future facilities will be located along the SRA Canal and will require minimal transmission facilities. Water from Toledo Bend could be released downstream for diversion at the facilities. The only cost presented here is the cost of raw water purchase. It is assumed that no treatment of the water will be necessary.

Orange County Manufacturing	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-1,519	-8,356	-14,334	-20,294	-25,585	-31,536
Recommended Strategy OR-1SRA (ac-ft/year): Raw surface water supply from SRA Canal.	5,000	15,000	20,000	25,000	25,000	28,000
Recommended Strategy ORM-2 (ac-ft/year): Raw water from Toledo Bend Reservoir	-	-	-	-	5,000	8,000

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
OR-1SRA Surface Water Contract	36,000	$0.00	$2,932,700	$ 81.50	$ 0.25

4C.12 Panola County

Panola County has no entities with projected water shortages. Demands in Panola County are expected to increase slightly and can be met through existing supplies. Both groundwater from the Carrizo-Wilcox and surface water supplies, mostly from Lake Murvaul, are used in Panola County. The Carrizo-Wilcox aquifer has a long-term availability of approximately 5,800 af/y in Panola County. Based on historical use information and well capacities from entities in the county, the groundwater supply is fully developed. Because the long-term sustainable availability of the aquifer has been reached, it is recommended that any new (not currently identified) large-scale water needs be met with surface water. It is recommended that those entities currently on groundwater remain on groundwater to meet their future growth until such time as groundwater is no longer a reliable supply. Any entities that are willing to convert to surface water should be encouraged to do so.

4C.13 Polk County

The Gulf Coast aquifer is sufficient to provide future demands.

County-Other

Supplies are from the Gulf Coast aquifer. The selected strategy is to obtain additional supply from the Gulf Coast aquifer.

Polk County-Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-208	-417	-578	-681	-745	-828
Recommended Strategy POC-1A (ac-ft/year): Use additional supply from Gulf Coast Aquifer.	208	208	208	208	208	208
Recommended Strategy POC-1B (ac-ft/year): Use additional supply from Gulf Coast Aquifer.		208	208	208	208	208
Recommended Strategy POC-1C (ac-ft/year): Use additional supply from Gulf Coast Aquifer.			208	208	208	208
Recommended Strategy POC-1D (ac-ft/year): Use additional supply from Gulf Coast Aquifer.				208	208	208

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/1000 Gal.)
POC-1A: Use additional supply from Gulf Coast Aquifer.	208	$556,901	$179,414	$324	$0.96
POC-1B: Use additional supply from Gulf Coast Aquifer.	208	$556,901	$179,414	$324	$0.96
POC-1C: Use additional supply from Gulf Coast Aquifer.	208	$556,901	$179,414	$324	$0.96
Recommended Strategy POC-1D (ac-ft/year): Use additional supply from Gulf Coast Aquifer.	208	$556,901	$179,414	$324	$0.96

Manufacturing

Supplies are from the Gulf Coast aquifer and Other Undifferentiated Groundwater Supply. The selected strategy is to obtain additional supply from the Gulf Coast aquifer.

Polk County Manufacturing	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)		-64	-164	-269	-365	-449
Recommended Strategy POM-1 (ac-ft/year): Expand existing supplies		225	225	225	225	225
Recommended Strategy POM-2 (ac-ft/year): Expand existing supplies				225	225	225

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
POM-1: Expand existing supplies	225	$147,537	$37,711	$145	$0.44
POM-2: Expand existing supplies	225	$147,537	$37,711	$145	$0.44

4C.14 Rusk County

The Carrizo-Wilcox groundwater aquifer is sufficient to supply the needs of Rusk County with the exception of steam-electric power beyond the year 2030.

Mining

Current supply is groundwater and surface water. Use additional groundwater from Carrizo-Wilcox.

Rusk County Mining	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)				-3	-83	-158
Recommended Strategy RUL-1 (ac-ft/year): Increase supply from Carrizo-Wilcox				158	158	158

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
RUL-1: Increase supply from Carrizo-Wilcox	158	$272,323	$29,964	$371	$1.13

Steam Electric

The demands for steam electric power are projected to be from two existing power plants that have existing supplies, Martin Lake and Toledo Bend. The projected water use for the Martin Lake facility is 37,228 acre-feet per year. Martin Lake is shown to have a firm yield of 25,000 acre-feet/year. The supply infrastructure for the plant utilizing Toledo Bend is sufficient. The supply facilities for the plant utilizing the Toledo Bend water source were sized in excess of the projected maximum need of 15,846 acre-feet per year.

Rusk County Steam Electric	2010	2020	2030	2040	2050	2060
Water Demand (ac-ft/year)						
Current Supply (ac-ft/year)						
Supply(+)-Demand(-) (ac-ft/yr)		-2218	-6862	-12522	-19423	-27834
Recommended Strategy RUSE-1 (ac-ft/year): Supply from Sabine River, via option with DWU on Lake Fork		1500	1500	1500	6328	12228
Recommended Strategy RUSE-2 (ac-ft/yr): Expand supply from Toledo Bend, SRA		8198	9583	11274	13335	15846

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
RUSE-1: Supply from Sabine River, via option with DWU on Lake Fork	12,228	$8,030,753	$649,864	$131	$0.43
RUSE-2: Expand Supply from Toledo Bend, SRA*	15,846	$25,570,922	$2,798,510	$217	$0.67

*Project completed in 2001

4C.15 Sabine County

Water supply in Sabine County is comprised of water from the Carrizo-Wilcox aquifer, Sparta, Yegua-Jackson and other minor aquifers, Toledo Bend Reservoir, and local surface supplies. The total available supply from groundwater in Sabine County is 9,400 af/y. Of this amount, about 1,500 af/y is currently being used. This leaves considerable groundwater to meet projected shortages. In addition, Toledo Bend Reservoir, which is located along the eastern border of Sabine County, has available supply (through contracts with SRA).

County-Other

Sabine County-Other includes users in both the Sabine and Neches River basins. Supply is generally from groundwater with some surface water provided from the SRA in the Sabine Basin. Considering historical use there is a surplus of water in the Sabine Basin and a shortage in the Neches Basin. The maximum shortage in the Neches Basin is 193 af/y in year 2060. To meet this shortage it is recommended that additional wells be drilled in the Carrizo-Wilcox in the Neches Basin. Since there may be several users, the costs for the strategy were estimated based on four wells producing 50 af/y each. It was assumed that no additional transmission is needed since the demands remain fairly steady over the planning period. As an alternative, local users could purchase treated water from the City of Hemphill. For this strategy, a 5-mile pipeline was assumed from Hemphill.

Sabine County-Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-9	-21	-28	-36	-45	-60
Recommended Strategy SBC-1 (ac-ft/year): Increase supply from Carrizo-Wilcox (Neches Basin)	200	200	200	200	200	200
Alternative Strategy SBC-2: Purchase water from Hemphill	200	200	200	200	200	200

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
SBC-1: Additional Groundwater	200	$ 394,800	$ 44,200	$ 221	$ 0.68
SBC-2: Purchase water from Hemphill	200	$ 809,000	$ 177,000	$ 885	$ 2.71

Livestock

Supplies for livestock are from both groundwater (Carrizo-Wilcox, Sparta, and local aquifers) and local surface water (stock ponds). To meet the projected shortage of 324 af/y, it is recommended that use from the existing supplies be expanded.

Sabine County Livestock	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-37	-80	-129	-186	-252	-324
Recommended Strategy SBL-1 (ac-ft/year): Expand Carrizo-Wilcox supplies (Sabine)	50	50	100	100	100	100
Recommended Strategy SBL-1 (ac-ft/year): Expand current surface water supplies (Neches and Sabine)	50	100	100	200	200	300

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
SBL-1: Expand Carrizo-Wilcox supplies (Sabine)	100	$ 123,100	$ 13,000	$ 130	$ 0.40
SBL-2: Stock Ponds	300	$ 413,800	$ 36,100	$ 120	$ 0.37

4C.16 San Augustine County

San Augustine County lies within both the Neches and Sabine River Basins. Current water supplies for the county include groundwater from the Carrizo-Wilcox, Sparta, and Yegua-Jackson, surface water from San Augustine Lake and other small local supplies. Available supplies to meet projected shortages include 1,400 af/y of unallocated groundwater and a small amount of surface water from San Augustine.

County-Other

The County-Other analysis shows a small projected shortage (4 af/y) throughout the planning period in the Sabine Basin and a shortage of 9 af/y in the Neches Basin by 2060. The current supplies for these demands include groundwater and sales from San Augustine. To meet the projected shortages, it is recommended that ground water use from the Carrizo-Wilcox be expanded in the Sabine Basin, and San Augustine meet the projected need in the Neches Basin from San Augustine City Lake.

San Augustine County-Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-1	0	0	0	0	-13
Recommended Strategy SAC-1 (ac-ft/year): Increase supplies from Carrizo-Wilcox	5	5	5	5	5	5
Recommended SAC-2 (ac-ft/year): Expand contracts with City of San Augustine						10

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/1,000 Gal.)
SAC-1: Increase supplies from Carrizo-Wilcox	5	$ 39,400	$ 3,640	$ 728	$ 2.23
Recommended SAC-2: Renew and expand contracts with City of San Augustine	10	$0	$ 4,890	$ 489	$ 1.50

Irrigation

Current water supply for irrigation in San Augustine County is exclusively from groundwater. There are no surface water rights associated with irrigation. Pumpage data by basin appears to show that water pumped from the Sabine Basin portion of the County is being used to meet needs in the Neches portion of the County. It is assumed this will continue. Even with this use of water, there is a shortage for irrigation in the Neches Basin. It is recommended additional groundwater from the Carrizo-Wilcox be used to meet irrigation needs in the Neches Basin.

San Augustine County Irrigation	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-90	-90	-90	-90	-90	-90
Recommended Strategy SAI-1 (ac-ft/year): Obtain water from Carrizo-Wilcox aquifer	100	100	100	100	100	100

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
SAI-1: Carrizo-Wilcox aquifer	100	$ 80,100	$ 9,300	$ 93	$ 0.29

Livestock

Supplies for livestock are from both groundwater (Carrizo-Wilcox, Sparta and Yegua-Jackson) and local surface water stock ponds. Demands are projected to increase by about one third over the planning period. It is recommended that these shortages (up to 621 af/y by 2060) be met with increases in both the local groundwater and surface water supplies.

San Augustine County Livestock	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-91	-169	-260	-365	-487	-621
Recommended Strategy SAL-1 (ac-ft/year): Increase local surface water supplies (stock ponds) – Neches Basin		50	100	200	200	300
Recommended Strategy SAL-2 (ac-ft/year): Increase groundwater water supplies from Carrizo-Wilcox aquifer - Sabine Basin	50	50	50	100	100	100
Recommended Strategy SAL-3 (ac-ft/year): Increase groundwater water supplies from Carrizo-Wilcox aquifer- Neches Basin	100	100	200	200	300	300

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
SAL-1: Stock ponds	300	$ 413,800	$ 36,100	$ 120	$ 0.37
SAL-2: Carrizo-Wilcox (Sabine)	100	$ 84,900	$ 9,700	$ 97	$ 0.30
SAL-3 Carrizo-Wilcox (Neches)	300	$ 210,900	$ 25,200	$ 84	$ 0.26

Manufacturing

Manufacturing demands in San Augustine County are small and are currently met with supplies from groundwater. It is recommended that groundwater use be expanded to meet the projected shortage of 7 af/y.

San Augustine County Manufacturing	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-2	-3	-4	-5	-6	-7
Recommended Strategy SAL-1 (ac-ft/year): Increase existing groundwater supplies from Carrizo-Wilcox	10	10	10	10	10	10

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
SAM-1: Increase Carrizo-Wilcox	10	$ 33,300	$ 3,130	$ 313	$ 0.96

4C.17 Shelby County

Shelby County, which is located in the northeastern part of the region, uses groundwater from the Carrizo-Wilcox aquifer and surface water from Toledo Bend Reservoir, Lake Pinkston, and Center Lake. The largest water user in the county is livestock, and this demand is expected to nearly triple by 2060. The other major demand center is the City of Center and its customers. The total projected shortage for the county is 9,353 af/y. The Carrizo-Wilcox aquifer has a long-term availability of 12,750 af/y, and its estimated current use is approximately 4,000 af/y. There is some groundwater available for development, but it cannot meet the total projected need. There is considerable supply available from Toledo Bend Reservoir, which would require infrastructure development to the areas with needs. It is recommended that those entities currently on groundwater remain on groundwater to meet their future growth until such time as groundwater is no longer a reliable supply. Any entities that are willing to convert to surface water should be encouraged to do so.

Center

The City of Center's current supply is from Lake Center and Pinkston Reservoir. Both the City and Lake Center lie in the Sabine Basin and Pinkston Reservoir is in the Neches Basin. Water supplies from these sources were evaluated using the respective water availability model. Under WAM Run 3 assumptions, the available supply from Pinkston Reservoir is reduced by about 50 percent. This reduction is primarily attributed to the required release of inflows to meet downstream senior water rights. If the reservoir retains all inflows, the firm yield of Pinkston Reservoir is greater than the permitted amount of 3,800 af/y. To meet the city's projected water needs, it is recommended that the City of Center enter agreements with senior downstream water rights holders to retain all inflows to Pinkston Reservoir that otherwise may be called for under prior appropriation. Municipal conservation is also recommended.

Center	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-105	-228	-328	-406	-480	-568
Recommended Strategy SHC-1: Conservation	15	34	47	60	67	75
Recommended Strategy SHC-2 (ac-ft/year): Retain inflows in Pinkston Reservoir	971	959	950	936	928	918

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Conservation	75	$ 0	$ 11,187	$ 149	$ 0.46
Agreements with downstream water rights holders (1)	971	$ 0	$ 0	$ 0	$ 0

(1) See Section 4C.21, Wholesale Water Providers, City of Center, for the total available supply from this strategy.

County –Other

Water users that fall into the County-Other category receive water from the Carrizo-Wilcox aquifer, and sales from Center, Joaquin, SRA, and Shelby County FWSD #1. Based on current use and supply location, there is a surplus of water in the Neches Basin and a shortage in the Sabine Basin. The shortage in the Sabine Basin is 271 af/y in 2010 increasing to 540 af/y by 2060. Some of this shortage will be met through strategies identified for Center. Other strategies include expanded use of groundwater from the Carrizo-Wilcox and expanded use from Toledo Bend Reservoir through sales from SRA.

Shelby County-Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	9	-82	-157	-177	-226	-304
Recommended Strategy SHCo-1: Expand groundwater from the Carrizo-Wilcox (Sabine)	100	200	300	300	350	350
Recommended Strategy SHCo-2 (ac-ft/year): Continue to purchase water from Center	111	109	107	105	102	102
Recommended Strategy SHCo-3 (ac-ft/year): Purchase water from SRA (Toledo Bend Reservoir)	150	150	150	150	150	150

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Carrizo-Wilcox wells	350	$ 1,663,800	$ 184,000	$ 526	$ 1.61
Purchase from Center	111	$ 0	$ 54,250	$ 489	$ 1.50
Purchase from SRA	150	$ 1,772,200	$ 175,400	$1,169	$ 3.59

Livestock

Livestock water demands are projected to increase significantly in Shelby County, partially due to the growing poultry industry. Current supply is from Carrizo-Wilcox aquifer and local surface water supplies. Some individual livestock water users may be able to drill individual wells or develop local stock ponds, but any large-scale user should obtain surface water from Toledo Bend Reservoir through a contract with SRA.

Shelby County Livestock	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-777	-1,707	-2,841	-4,222	-5,907	-7,961
Recommended Strategy SHL-1 (ac-ft/year): Increase Groundwater Supplies (Sabine Basin)	1,000	2,000	2,000	2,000	2,000	2,000
Recommended Strategy SHL-2 (ac-ft/year): Increase Groundwater Supplies (Neches Basin)	500	500	1,000	1,000	1,500	1,500
Recommended Strategy SHL-3 (ac-ft/year): Increase Local Supplies (Sabine Basin)			500	500	500	500
Long Term Scenario SHL-4 (ac-ft/year): Supplies from Toledo Bend (Sabine Basin)				4,000	4,000	4,000

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
SHL-1: Additional Groundwater Wells (Sabine Basin)	2,000	$1,018,500	$ 134,400	$ 67	$ 0.21
SHL-2: Additional groundwater wells (Neches Basin)	1,500	$ 763,900	$ 100,800	$ 67	$ 0.21
SHL-3: Increase local supplies	500	$ 551,700	$ 48,100	$ 97	$ 0.30
SHL-4: Purchase Raw Water from SRA (Toledo Bend)	4,000	$3,141,000	$ 675,000	$ 169	$ 0.52

Manufacturing

Current supply for manufacturing is from the Carrizo-Wilcox aquifer and sales from the City of Center. There is also a small amount of reuse water being used by local manufacturers. The majority of the use is from Center Lake and Pinkston Reservoir by manufacturing customers of Center, the largest of which is Tyson Foods. The projected shortage is associated with the reduced supplies for the City of Center. This shortage can be met through the recommended strategies for Center. It is recommended that any new manufacturing facility purchase water from the City of Center. No new infrastructure was assumed for cost purposes, but new industries may require additional transmission facilities, depending on their location.

Shelby County Manufacturing	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-55	-157	-249	-333	-416	-520
Recommended Strategy SHM-1 (ac-ft/year): Purchase water from City of Center	687	715	740	771	795	820

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
SHM-1: Purchase surface water from City of Center	820	$ 0	$ 400,980	$ 489	$1.50

4C.18 Smith County

With the exception of the City of Tyler, Resort Water Service, Inc. and local sources for mining and livestock, water is supplied from the Carrizo-Wilcox. The City of Tyler currently utilizes groundwater to fulfill 15% of its needs. The City of Tyler also provides approximately 75% of the manufacturing demands. The City of Tyler currently has completed facilities to treat 30 mgd of surface water from Lake Palestine.

The most likely strategy to meet future needs is to continue the use of groundwater where it is currently the main source. Municipal needs are shown as being met from the Carrizo-Wilcox. Irrigation and mining needs are shown to be supplied by the Queen City. Use of these strategies, along with current distribution of supplies in the Carrizo-Wilcox will utilize 18,046 acre-feet/year of the 18,400 acre-feet/year available supply for that portion of Smith County in the East Texas Regional Planning Area.

Bullard

Supply is from Carrizo-Wilcox. Increase supply from Carrizo-Wilcox.

Bullard	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)		-13	-42	-71	-124	-195
Recommended Strategy BU-1 (ac-ft/year): Increase supply from Carrizo-Wilcox		100	100	100	100	100
Recommended Strategy BU-2 (ac-ft/year): Increase supply from Carrizo-Wilcox					100	100
BU-3: Water Conservation		3	4	5	6	8

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Strategy BU-1A: Increase supply from Carrizo-Wilcox	100	$189,177	$27,697	$308	$0.95
Recommended Strategy BU-1B (ac-ft/year): Increase supply from Carrizo-Wilcox	100	$189,177	$27,697	$308	$0.95
BU-3: Water Conservation	8		$2,000	$250	$0.77

Community Water Co.

Supply is from Carrizo-Wilcox. Increase supply from Carrizo-Wilcox.

Community Water Co.	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-37	-88	-111	-132	-171	-227
Recommended StrategyCWI-1A (ac-ft/year): Increase supply from Carrizo-Wilcox	121	121	121	121	121	121
Recommended StrategyCWI-1B (ac-ft/year): Increase supply from Carrizo-Wilcox				121	121	121

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Strategy CW-1A: Increase supply from Carrizo-Wilcox	121	$499,620	$41,857	$329	$1.01
Strategy CW-1B: Increase supply from Carrizo-Wilcox	121	$228,787	$41,857	$329	$1.01

Dean WSC

Supply is from Carrizo-Wilcox. Increase supply from Carrizo-Wilcox.

Dean WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)		-21	-68	-112	-200	-328
Recommended Strategy DE-1A (ac-ft/year): Increase supply from Carrizo-Wilcox	169	169	169	169	169	169
Recommended Strategy DE-1B (ac-ft/year): Increase supply from Carrizo-Wilcox					169	169

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Strategy DE-1A: Increase supply from Carrizo-Wilcox	169	$525,417	$47,616	$326	$1.00
Strategy DE-1B: Increase supply from Carrizo	169	$254,583	$47,616	$326	$1.00

Jackson WSC

Supply is from Carrizo-Wilcox. Increase supply from Carrizo-Wilcox. Jackson WSC has a contract with ANRA for water from Lake Columbia if developed.

Jackson WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)					-28	-68
Recommended Strategy JA-1 (ac-ft/year): Increase supply from Carrizo-Wilcox					68	68

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Strategy JA-1: Increase supply from Carrizo-Wilcox and storage	68	$532,161	$57,770	$1,197	$3.69

City of Lindale

Supply is from Carrizo-Wilcox. Increase supply from Carrizo-Wilcox.

City of Lindale	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)				-8	-33	-59
Recommended Strategy LI-1 (ac-ft/year): Increase supply from Carrizo-Wilcox				60	60	60

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Strategy LI-1: Increase supply from Carrizo-Wilcox	60	$123,365	$14,671	$437	$1.35

Lindale Rural WSC

Supply is from Carrizo-Wilcox. The recommended strategy is to increase supply from Carrizo-Wilcox.

Lindale Rural WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)						-74
Recommended Strategy LIR-1 (ac-ft/year): Increase supply from Carrizo-Wilcox						80
LIR-2: Water Conservation			5	7	9	12

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Strategy LIR-1: Increase supply from Carrizo-Wilcox	80	$255,125	$37,329	$503	$1.55
LIR-2: Water Conservation	12		$3,000	$250	$0.77

RPM WSC

Supply is from Carrizo-Wilcox. Increase supply from Carrizo-Wilcox.

RPM WSC	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)					-1	-6
Recommended Strategy LI-1 (ac-ft/year): Increase supply from Carrizo-Wilcox					40	40

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Strategy LI-1: Increase supply from Carrizo-Wilcox	40	$58,283	$6,198	$3,078	$9.51

Irrigation

Increase supply from Queen City.

Smith County Irrigation	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-5	-34	-65	-96	-128	-162
Recommended Strategy SMI-1 (ac-ft/year): Increase supply from the Queen City	40	40	80	120	162	162

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Strategy LI-1: Increase supply from Queen City	40	$309,020	$16,327	$197	$0.61

Mining

Increase supply from Queen City.

Smith County Mining	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	-47	-126	-159	-215	-255	-288
Recommended Strategy SMM-1 (ac-ft/year): Increase supply from the Queen City.	47	141	188	235	282	329

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Strategy SMM-1: Increase supply from Queen City	329	$452,536	$25,979	$131	$0.44

4C.19 Trinity County

County-Other

Small water suppliers in Trinity County rely on the Yegua-Jackson, the Gulf Coast aquifer and other undifferentiated groundwater sources.

Trinity County-Other	2010	2020	2030	2040	2050	2060
Supply(+)-Demand(-) (ac-ft/yr)	0	0	0	9	32	57
TRC-1: Increase Supply from Yegua-Jackson				202	202	202

The recommended strategy is to expand groundwater supplies from the Yegua-Jackson aquifer.

Strategy	Yield (ac-ft/yr)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/ac-ft)	Unit Cost ($/1000 gal)
TRC-1: Increase Supply from Yegua-Jackson	202	$206,245	$42,567	$211	$0.65

4C.20 Tyler County

County-Other

Current supply from Gulf Coast aquifer. The recommended strategy is to continue use of groundwater from Gulf Coast aquifer. The strategy assumes that four separate groundwater wells will be constructed to meet the needs of various entities.

Tyler County-Other	2010	2020	2030	2040	2050	2060
Population (number of persons)						
Water Demand (ac-ft/year)						
Current Supply (ac-ft/year)						
Supply(+)-Demand(-) (ac-ft/yr)		-142	-239	-251	-232	-232
Recommended Strategy TYC-1 (ac-ft/year): Increase supply from Gulf Coast Aquifer.		205	274	274	274	274

Strategy	Firm Yield (AF/Y)	Total Capital Cost	Total Annualized Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
TYC-1: Increase supply from Gulf Coast Aquifer.	274	$597,351	$46,300	$210	$0.65

4C.21 Wholesale Water Providers

This section provides discussions for wholesale water providers (WWP), located in the East Texas Region, that meet one of the following criteria:

- Has a projected shortage in supplies based on demands approved by the Texas Water Development Board. These WWP include Angelina and Neches River Authority, Athens MWA, City of Center, City of Lufkin and the City of Nacogdoches.
- Has a projected shortage based on future demands anticipated by the entity. The Lower Neches Valley Authority is included under this criteria.
- Has supply sources in the East Texas Region that are listed as water management strategies for water user groups outside the Region. Both the Upper Neches River Municipal River Authority and the Sabine River Authority are included under this criteria.

Angelina and Neches River Authority (ANRA)

ANRA currently has contracted customers for 55% of the 85,507 acre-foot permit of the proposed Lake Columbia reservoir. The City of Dallas is also considering Lake Columbia as an alternative strategy. Additionally, there is potential demand of Steam Electric in Nacogdoches County reaching 13,358 acre-feet per year by 2060.

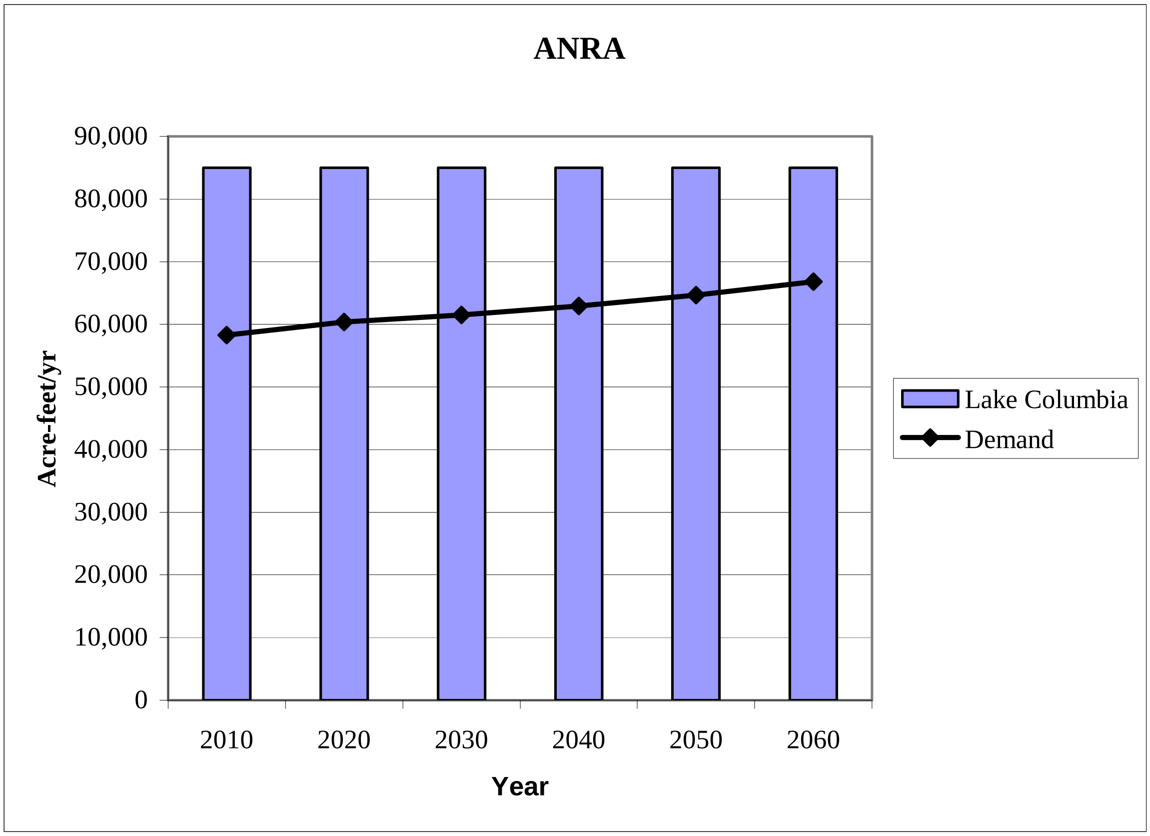
Both ANRA and participating entities will share in the costs associated with the Lake Columbia water management strategy. Construction costs are divided into three separate categories: reservoir, water treatment plant and transmission system. For reservoir construction, unit costs are based on the full 75,700 acre-feet per year. Costs for water treatment are shared among currently contracted entities that plan to buy treated water from ANRA. Transmission system costs were shared among all contracted suppliers except those under “Cherokee County–Other”. The water suppliers currently under contract with ANRA are listed in Table 4C.A. Nacogdoches County Steam-Electric is also listed as a potential customer. Details regarding the extent and participation of specific entities participating in the project are still being finalized.

Table 4C.A – Current Participants in Lake Columbia

Afton Grove WSC	New Summerfield WSC
City of Arp	North Cheorkee WSC
Blackjack WSC	City of Rusk
Caro WSC	Rusk Rural WSC
Cherokee County	Stryker Lake WSC
Jackson WSC	Temple Inland
City of Jacksonville	City of Troup
City of Nacogdoches	City of Whitehouse
City of New London	

A comparison of the water supplies versus the demands to be implemented by strategies follow. A summary of the strategy costs is also provided.

Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Water Management Strategies						
Lake Columbia	75,700	75,700	75,700	75,700	75,700	75,700
Total Supplies from Strategies	**75,700**	**75,700**	**75,700**	**75,700**	**75,700**	**75,700**
Total Supplies	**75,700**	**75,700**	**75,700**	**75,700**	**75,700**	**75,700**
Total Demand	58,270	60,353	61,521	62,946	64,683	66,800
Surplus or (Shortage)	17,430	15,347	14,179	12,754	11,017	8,900



Strategy	Quantity	Capital cost	Annual Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Lake Columbia Reservoir	75,700	$178,941,600	$15,684,000	$208	$0.64
ANRA Treatment Plant	35,913	$115,928,100	$13,396,600	$373	$1.14
Water Distribution System	49,594	$ 92,237,800	$9,174,500	$185	$0.57

Athens MWA

Athens MWA has a water right to divert 5,477 acre-feet per year from Lake Athens to meet projected municipal and manufacturing demands of the city of Athens. There is also a projected local demand of 155 acre-feet per year for lawn irrigation around the lake. This demand is expected to increase to 185 acre-feet per year by 2060. The Athens Fish Hatchery, located at the lake, has a water right permit to divert 3,023 acre-feet per year. Due to operational constraints of the hatchery's intake structure, the operational yield of Lake Athens is 2,900 acre-feet per year. The total projected shortages associated with Lake Athens for current customers are 6,533 acre-feet per year by 2060. Region C also expects Athens MWA to provide a small amount of additional manufacturing needs in the region, increasing the total projected 2060 shortage to 6,592.

To meet the near-term shortages, Athens MWA has received a reuse permit that allows the city of Athens to discharge its wastewater effluent to Lake Athens, which can then be rediverted for use. The reuse permit is for 2,677 acre-feet per year. It is assumed that the amount of indirect reuse available each decade is based on 60 percent of the municipal demands.

Other strategies considered include:

- Conservation for the city of Athens
- Temporary pumping facility for the fish hatchery to utilize water below its existing intake
- Water from Forest Grove Reservoir
- Water from Lake Palestine through a direct purchase from UNRMWA
- Water from Lake Palestine through a purchase from Dallas Water Utilities

Based on projected demands on Athens MWA, additional water treatment will be needed by 2030 or shortly there after. The total treatment capacity needed by 2060 is estimated at 11 mgd. Existing treatment capacity is 6 mgd, with a 7.5 mgd treated water pipeline to the city of Athens.

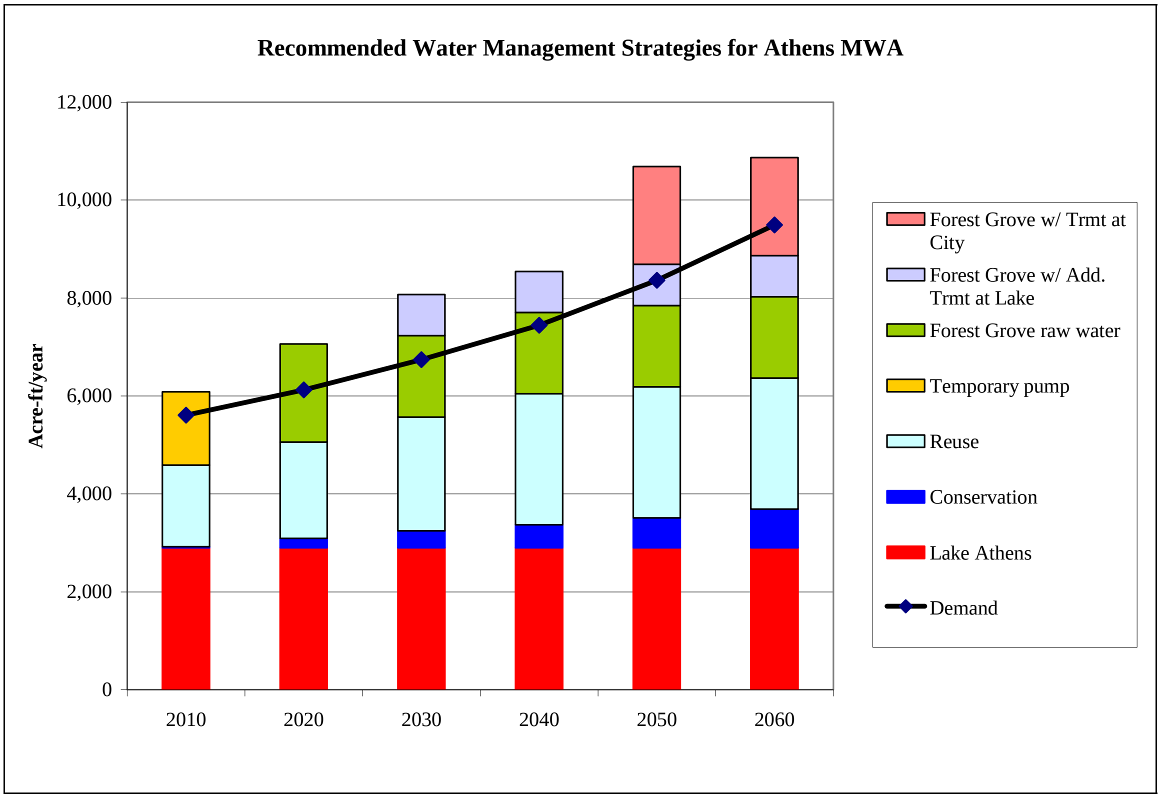
To fully utilize the existing facilities at Lake Athens, additional water will be needed at the lake to meet the hatchery's demands and utilize the treatment capacity of the MWA's existing plant. Additional treatment could be located at Lake Athens or near the city. If all of the treatment is located at Lake Athens, then additional capacity will be needed to transport the treated water to the city. Alternatively, the facilities could be maximized to existing capacity and additional treatment located at the city of Athens.

With these considerations, it is recommended that Athens MWA implement the following strategies:

- Indirect reuse to Lake Athens
- Water from Forest Grove Reservoir
- Expand existing lakeside treatment plant by 1.5 mgd
- Construct new 3.5 mgd treatment plant near city of Athens

To provide additional supplies to the fish hatchery until the strategies can be developed, it is recommended that the Athens Fish Hatchery consider temporary pumping facilities during drought to utilize water in the lake below elevation 431 msl (intake structure). In addition, conservation savings identified for the city of Athens will decrease the demands on the lake and Athens MWA. A summary of the amounts and timing of the proposed strategies is presented in the following table and figure.

Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Existing Supplies						
Lake Athens	2,900	2,900	2,900	2,900	2,900	2,900
Water Management Strategies						
Conservation (city of Athens)	25	194	346	469	609	790
Indirect Reuse	1,662	1,966	2,325	2,677	2,677	2,677
Temporary pump	1,500					
Forest Grove raw water	0	2,000	1,660	1,660	1,660	1,660
Forest Grove w/ WTP at Lake			840	840	840	840
Forest Grove w/ WTP at City					2,000	2,000
Total Supplies from Strategies	**3,187**	**4,160**	**5,171**	**5,646**	**7,786**	**7,967**
Total Supplies	**6,087**	**7,060**	**8,071**	**8,546**	**10,686**	**10,867**
Total from Conservation and Reuse	1,687	2,160	2,671	3,146	3,286	3,467
Percent of Strategy Supplies from Conservation and Reuse	52.9%	51.9%	51.7%	55.7%	42.2%	43.5%
Demand	5,607	6,125	6,743	7,444	8,360	9,492
Surplus or (Shortage)	480	936	1,328	1,102	2,326	1,375

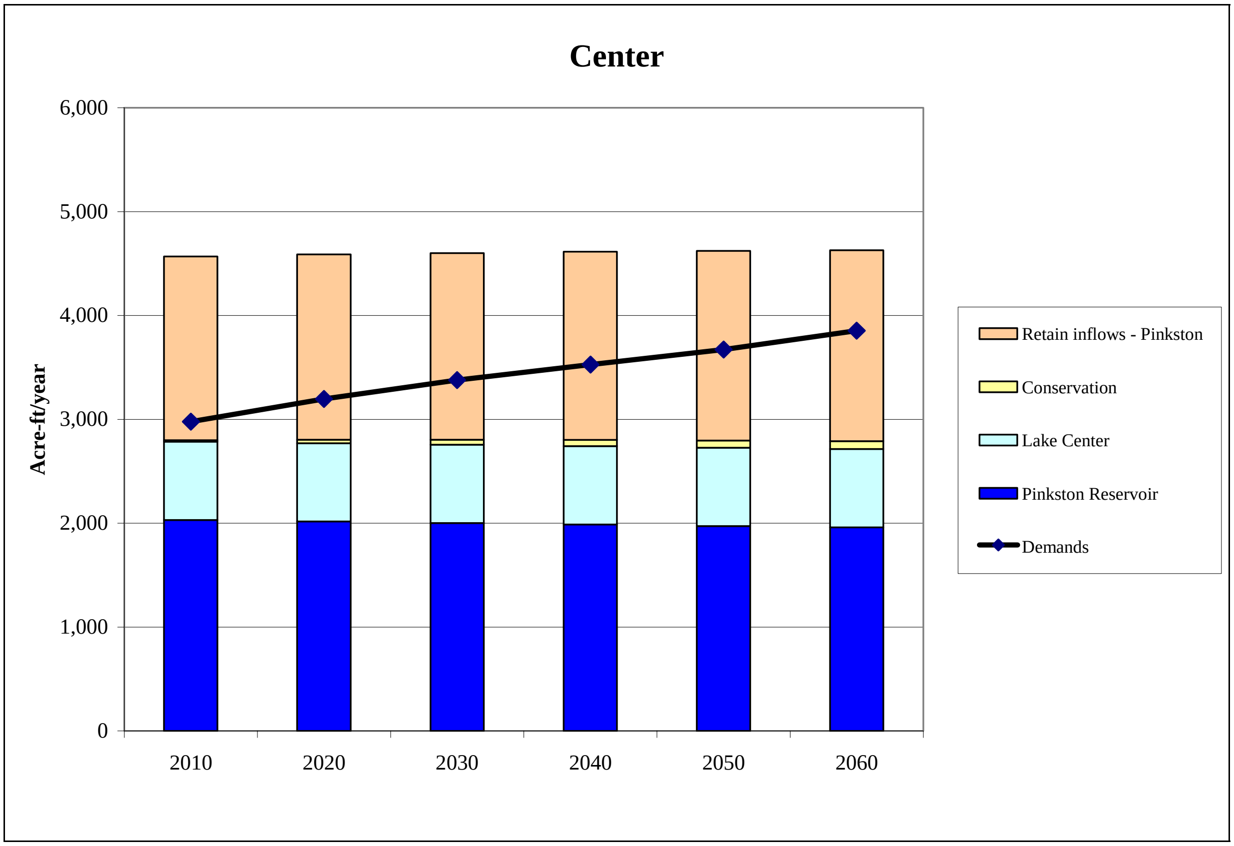


Strategy	Quantity	Capital cost	Annual Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Reuse	2,677	$3,601,700	$418,718	$ 156	$ 0.48
Forest Grove raw water (split to Lake and City)	4,500	$5,696,900	$559,500	$ 124	$ 0.38
1.5 mgd Expansion at Lake	840	$4,150,100	$411,700	$ 490	$ 1.50
3.5 mgd New WTP at City	1,960	$11,423,800	$1,053,400	$ 537	$ 1.65

City of Center

The city of Center is a wholesale water provider because it sells more than 1,000 acre-feet per year of water to manufacturing and several small water supply corporations in Shelby County. It is expected to continue to be the primary supplier of water to manufacturing in the County. The city currently obtains water from Lake Center and Pinkston Reservoir. Based on the water availability analysis discussed in Chapter 3, the city of Center has projected shortages of over 1,100 acre-feet per year by 2060. All of the shortages can be attributed to the assumptions used in the WAM Run 3 analysis of Lake Pinkston, and are primarily attributed to the required release of inflows to meet senior downstream water rights. These assumptions considerably reduce the firm yield of Pinkston Reservoir. When retaining all inflows the firm yield of Pinkston Reservoir increases above the permitted amount of 3,800 af/y. To meet the city's projected water needs, it is recommended that the city of Center enter agreements with senior downstream water rights holders to retain inflows to Pinkston Reservoir that otherwise may be called for under prior appropriation. The cost for this strategy is unknown. A summary of the city's current supplies and demands are presented in the following table and figure. Conservation associated with the city of Center is also included as potential supplies.

Source	2010	2020	2030	2040	2050	2060
Existing Supplies						
Lake Center	754	754	754	754	754	754
Pinkston Reservoir	2,031	2,017	2,003	1,988	1,974	1,960
Water Management Strategies						
Conservation	15	34	47	60	67	75
Retain inflows - Pinkston	1,769	1,783	1,798	1,812	1,826	1,840
Total Supplies from Strategies	**1784**	**1817**	**1845**	**1872**	**1893**	**1915**
Total Supplies	**4,569**	**4,588**	**4,601**	**4,614**	**4,621**	**4,629**
Total from Conservation and Reuse	15	34	47	60	67	75
Percent from Conservation and Reuse	0.8%	1.9%	2.5%	3.2%	3.5%	3.9%
Demand	2,977	3,195	3,378	3,527	3,672	3,853
Surplus or (Shortage)	1,592	1,393	1,223	1,087	949	776



City of Lufkin

The City of Lufkin currently relies on groundwater from the Carrizo-Wilcox aquifer. The City provides water for Huntington, Angelina WSC, Burke WSC, and about 10% of manufacturing needs in Angelina County.

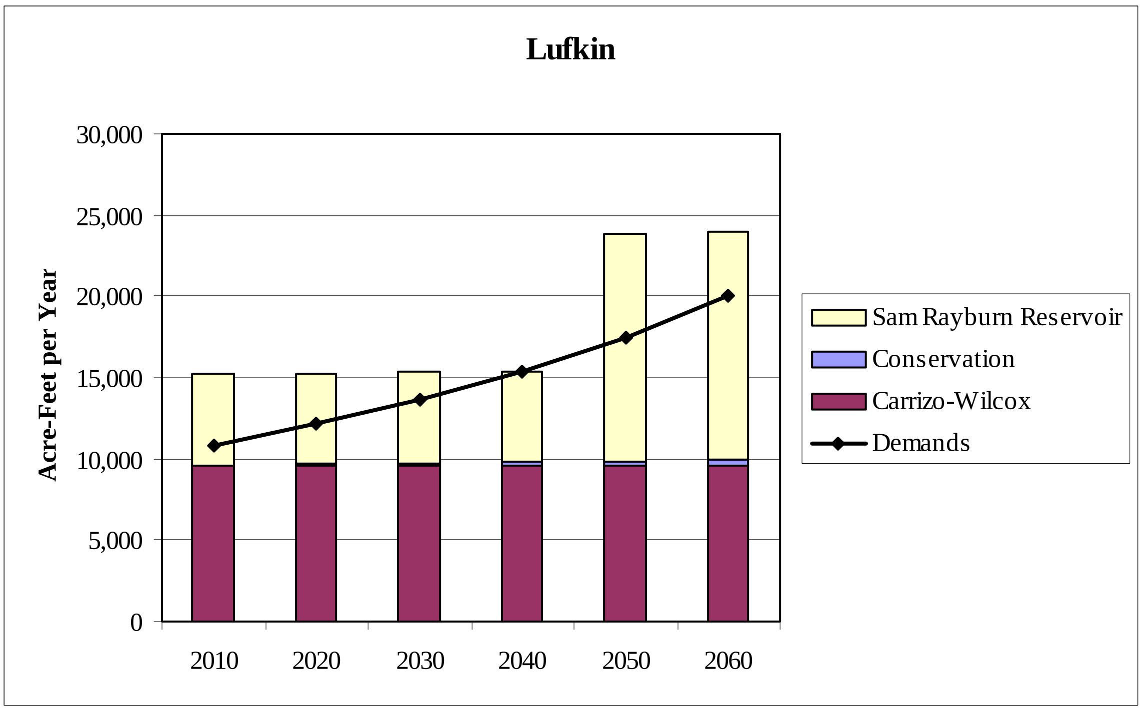
The City of Lufkin is proposing a water management strategy to utilize surface water. In the late 1960's the City of Lufkin purchased storage and water production rights for surface water from Sam Rayburn Reservoir through contracts with the Lower Neches Valley Authority (LNVA) and the U.S. Army Corp of Engineers. The City may withdraw up to 28,000 acre-feet annually of surface water from the reservoir. This equates to an average withdrawal rate of 25 mgd. In 2000, the City commissioned a study to evaluate surface water supply alternatives to meet the future demands of the City and its wholesale customers. The study recommends the construction of a 10 mgd water treatment plant (WTP) on the Sam Rayburn Reservoir, expandable to a future 25 mgd capacity. Upon development of this new source, Zavalla, Four Way WSC, Angelina WSC, and M&M WSC are expected to become wholesale customers of the City of Lufkin. The current list of participants and the project's planned supply distributions are presented in the following table.

Entity	Initial Distribution (MGD)	2030 Distribution (MGD)
Lufkin	7.200	8.351
Zavalla	0.125	0.125
Huntington	0.300	0.336
Four Way WSC	0.400	0.635
M&M WSC	0.200	0.226
Angelina WSC	0.300	0.327
LNVA	1.475	0.000
Total	**10.000**	**10.000**

The supplies and demands associated with the City of Lufkin are shown in the following table and figure.

Source	2010	2020	2030	2040	2050	2060
Existing Supplies						
Carrizo-Wilcox	9,562	9,562	9,562	9,562	9,562	9,562
Water Management Strategies						
Conservation (City of Lufkin)	50	117	189	247	319	408
Sam Rayburn Reservoir	5,605	5,605	5,605	5,605	14,011	14,011
Total Supplies from Strategies	**5,655**	**5,722**	**5,794**	**5,852**	**14,330**	**14,419**
Total Supplies	**15,217**	**15,284**	**15,356**	**15,414**	**23,892**	**23,981**
Total from Conservation and Reuse	50	117	189	247	319	408
Percent of Strategy Supplies from Conservation and Reuse	0.9%	2.0%	3.3%	4.2%	2.2%	2.8%

Demand (Lufkin)	7,546	8,444	9,446	10,565	11,951	13,599
Demand (Manufacturing)	3,027	3,436	3,798	4,164	4,489	4,836
Demand (County – Other)	38	39	41	44	48	55
Demand (Huntington)	129	139	153	172	201	242
Four Way WSC Shortages						225
County-Other Shortages	30	127	251	411	709	1,143
Potential Demand (Total)	10,770	12,185	13,689	15,356	17,398	20,100
Surplus or (Shortage)	4,447	3,099	1,667	58	6,494	3,881



Estimates of capital costs for the Lufkin plant are based on planning information provided by the City of Lufkin and by LNVA.

Strategy	Quantity (AF)	Total Capital Cost	Annual Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Conservation	408		$40,000	$98	$0.30
Sam Rayburn Surface Supply	5,605	$55,299,706	$6,099,655	$1,088	$3.34
WTP Expansion	8,406	$22,872,670	$3,910,394	$465	$1.43

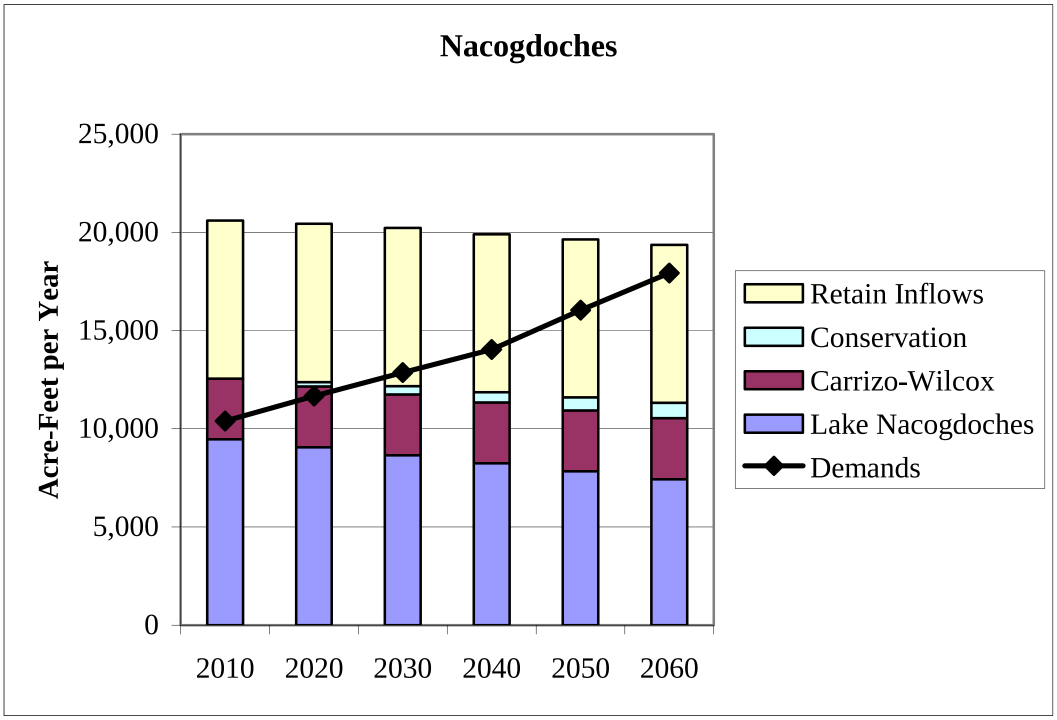
City of Nacogdoches

The City of Nacogdoches utilizes water from the Carrizo-Wilcox aquifer and Lake Nacogdoches. The City provides water to Appleby WSC and to several entities included in Nacogdoches County-Other. Most of the manufacturing demands in the county are also supplied by the City of Nacogdoches. The Neches WAM shows the current firm yield of Lake Nacogdoches to be 9,459 acre-feet per year, reducing to 7,430 acre-feet per year by 2060.

Nacogdoches holds a water right for 22,000 Acre-Feet from Lake Nacogdoches, the entire yield of the lake. The WRAP computer model recognizes Lake Nacogdoches priority date, 1970, as junior to Sam Rayburn's, 1963. As a result the model simulates releases of water from Lake Nacogdoches during the drought of record in an attempt to keep Rayburn full when calculating the yields of these reservoirs. Calculating the yield of Lake Nacogdoches in this fashion drastically decreases the calculated yield of Lake Nacogdoches, but does not significantly increase the yield of Rayburn. An agreement between the City of Nacogdoches and LNVA that priority calls on Lake Nacogdoches will not be made would allow the yield of Lake Nacogdoches to be calculated, by WRAP, in a manner more consistent with realistic conditions. In conjunction with water conservation the increase in calculated yield would meet Nacogdoches' water needs for the planning period. The regional water plan can be amended as soon as agreement is reached between the City of Nacogdoches and LNVA on this issue.

In addition to pursuing agreements with downstream users, two other strategies are considered for supplying the projected needs for the City and the entities that it supplies. The City of Nacogdoches is among those contracted for participation in the Lake Columbia project. They propose to obtain raw water from Lake Columbia to transmit to Lake Nacogdoches. The existing treatment plant would be expanded to treat the additional water. The second alternative is to transmit and treat water from the Toledo Bend Reservoir.

Source	2010	2020	2030	2040	2050	2060
Existing Supplies						
Carrizo-Wilcox	2,276	2,240	2,220	2,196	2,193	2,168
Lake Nacogdoches	9,459	9,053	8,648	8,242	7,836	7,430
Water Management Strategies						
Retain Lake Nacogdoches Inflows	8,050	8,050	8,050	8,050	8,050	8,050
Conservation (City)		229	425	514	654	787
Lake Columbia (Alt. #1)	8,551	8,551	8,551	8,551	8,551	8,551
Toledo Bend (Alt #2)	5,175	5,175	5,175	5,175	5,175	5,175
Total Supplies from Strategies	8,050	8,279	8,475	8,564	8,704	8,837
Total Supplies	20,609	20,432	20,223	19,906	19,640	19,367
Total from Conservation and Reuse		229	425	514	654	787
Percent of Strategy Supplies from Conservation and Reuse	0.0%	2.8%	5.0%	6.0%	7.5%	8.9%
Demand (City)	7,625	8,423	9,218	9,939	11,352	12,540
Demand (Manufacturing)	2,288	2,553	2,786	3,016	3,214	3,468
Demand (County – Other)	221	236	249	266	304	346
Demand (Appleby WSC)	263	445	617	811	1,178	1,574
Total Demand	10,397	11,657	12,870	14,032	16,048	17,928
Surplus or (Shortage)	10,212	8,775	7,353	5,874	3,592	1,439

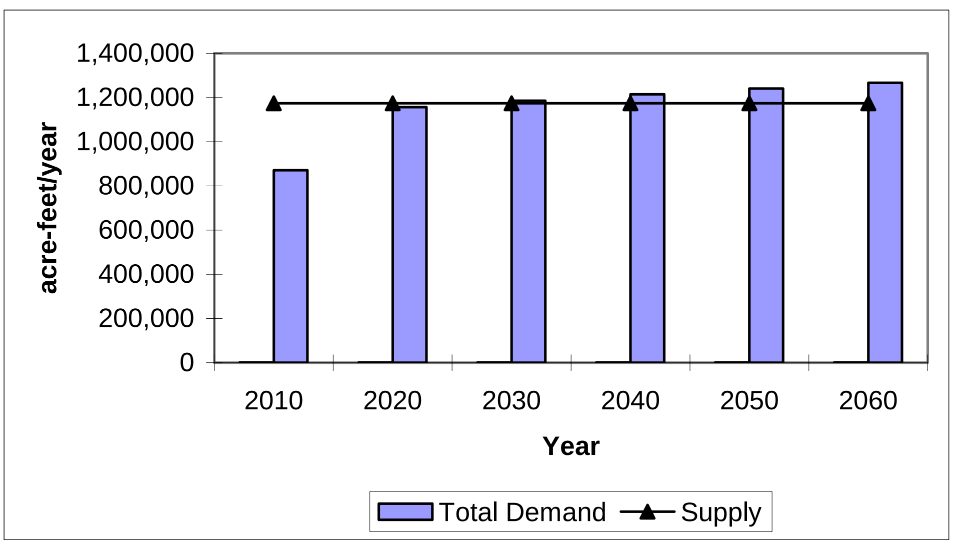


Strategy	Quantity	Capital cost	Annual Cost	Unit Cost ($/AF)	Unit Cost ($/Thou. Gal.)
Retain Inflows	8,050	*Costs Unknown*			
Conservation	787		$40,000	$51	$0.16
Lake Columbia (Alt #1)	8,551	$74,107,600	$7,852,780	$918	$2.82
Toledo Bend (Alt #2)	7,398	$83,497,800	$7,274,718	$1202	$3.69

Lower Neches Valley Authority (LNVA)

Water demands supplied by the LNVA, as approved by the Texas Water Development Board (TWDB), total 609,831 acre-feet per year in 2060. In addition to these demands there are three potential future demands. The LNVA has a TWDB loan commitment to implement a regional water supply facility in Angelina County. This project is shown as a water management strategy for several entities with shortage in the area. However, the total of these shortages are less than the future demand projected in this section. There have been recent interests in the construction of LNG facilities in the LNVA service area that could create significant demands. Measures to mitigate future navigation improvements may also be required in the future. With the addition of these three future demands, the LNVA may see shortages during the planning period. The affect of the current and future demands on the LNVA supply is provided below.

WUGs (TWDB approved demands)	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Jasper County Manufacturing		20,189	23,571	26,084	28,281	29,928	29,991
Mining - Hardin County		7,772	8,620	9,191	9,760	10,333	10,770
Groves		3,190	3,137	3,085	3,031	2,996	2,996
Nederland		4,125	4,268	4,387	4,456	4,573	4,834
Port Arthur		9,704	9,510	9,315	9,122	8,993	8,993
Port Neches		1,782	1,782	1,789	1,780	1,804	1,882
Jefferson County-Other		1880	2440	2910	3270	3680	4450
Jefferson County Manufacturing		211,779	241,259	266,696	291,954	314,844	339,461
Irrigation - Jefferson County		147,000	147,000	147,000	147,000	147,000	147,000
West Jefferson County MWD		1,029	1,148	1,264	1,345	1,436	1,631
Jefferson County WCID #10		640	700	750	787	832	929
Nome		127	136	144	150	157	172
Trinity Bay Conservation District		2,688	2,688	2,688	2,688	2,688	2,688
Bolivar Peninsula SUD		5,039	5,039	5,039	5,039	5,039	5,039
Irrigation - Chambers County		33,300	33,300	33,300	33,300	33,300	33,300
Irrigation- Liberty County		19,700	19,700	19,700	19,700	19,700	19,700
Subtotal TWDB Approved Demands	**5,688**	**469,944**	**504,290**	**533,342**	**561,663**	**587,303**	**613,836**
WUGs Future							
Angelina County Regional Facility		1,459	1,634	1,866	2,162	2,610	3,223
LNG Facilities		250,000	500,000	500,000	500,000	500,000	500,000
US Army Corps of Engineers		150,000	150,000	150,000	150,000	150,000	150,000
Subtotal Future Demands		**401,459**	**651,634**	**651,866**	**652,162**	**652,610**	**653,223**
Total Demands		**871,403**	**1,155,924**	**1,185,208**	**1,213,825**	**1,239,913**	**1,267,059**
Current Supplies	**2000**						
B. A. Steinhagen Lake/Sam Rayburn		792,000	792,000	792,000	792,000	792,000	792,000
Pine Island Run-of-river Rights		381,876	381,876	381,876	381,876	381,876	381,876
Total Supplies		**1,173,876**	**1,173,876**	**1,173,876**	**1,173,876**	**1,173,876**	**1,173,876**
Supplies Less Demand		**302,473**	**17,952**	**-11,332**	**-39,949**	**-66,037**	**-93,183**



Five potential strategies were evaluated to supply the shortage to meet the future needs:

- water conservation
- modification of operations of the Neches River Saltwater Barrier, Lake BA Steinhagen and Sam Rayburn Reservoir as a system to maximize yield
- reallocation of storage in Sam Rayburn Reservoir
- purchase of water from the Sabine River Authority
- construction of Rockland Reservoir

The LNVA has implemented, within the last two years, programs to increase the efficiency of water use in agricultural applications. The results of these programs are being evaluated, however, there has not been sufficient data to reach conclusions due to the short time frame in which the programs have been implemented. The initial results would indicate that the water conservation should offset the demands resulting from future growth.

The LNVA completed a saltwater barrier in 2003. The barrier may result in some water conservation by reducing the flow for fresh water needed to prevent the intrusion of salt water into the fresh water supply intakes. The affect of the barrier on the operations of the Rayburn/Steinhagen system has not been evaluated. The maximum expected conservation, assuming no flow is required for prevention of saltwater intrusion, is on the order of 60,000 acre-feet per year. However, some flow may be required and the exact value of this strategy is unknown at this time.

By operating Sam Rayburn Reservoir and Lake BA Steinhagen in conjunction with the Neches River Saltwater Barrier additional yield could be made available by conversion of flood storage to conservation storage. The LNVA has recently implemented means to monitor flows within the Neches Basin, providing better information for system operation, to maximize the quantity of water held in Sam Rayburn Reservoir. The affect of this strategy, on the drought of record, would be to increase the reliability of water in the flood storage pool as water conserved for use during the drought of record. In 1969 the US Army Corps of Engineers converted 0.4 feet of flood storage to water conservation (from elevation 164 ft, msl to 164.4 ft, msl) resulting in a firm yield of 28,000 acre-feet per year. The implementation of this strategy would not require construction of additional infrastructure and could supply shortages created by the future demands. For the purpose of discussion the quantity associated with this strategy is shown as 28,000 acre-feet per year although additional study is needed to quantify the affects of this strategy.

The proximity of the future demands to the Sabine River Basin could make the transfer of water from the Sabine River a feasible alternative. This strategy would not provide water for the Angelina County regional facility. Infrastructure that would be required include pump stations and transfer through open canal or closed pipe systems.

Rockland Reservoir was authorized for construction, as a federal facility, in 1945 along with Sam Rayburn, B. A. Steinhagen and Dam A lakes. A 1947 report recommended construction of Sam Rayburn and B.A. Steinhagen with deferral of Rockland Reservoir and Dam A until such time the need develops. The Rockland Reservoir site is located on the Neches River at River Mile 160.4. The top of the flood pool would be at elevation 174 feet, msl with top of conservation pool of 165 feet, msl. The estimated yield of Rockland is 620,000 acre-feet per year. No recent cost data has been developed for Rockland Reservoir. The cost for development of Rockland, per acre-foot, is assumed to be similar to Lake Columbia

The following table represents a general review of the strategies discussed above

Strategy	Quantity Acre-feet/year	Capital cost	Annual Cost	Unit Cost ($/AF)	Unit Cost ($/Thou.Gal)
LNVA-1: Water Conservation	22,000	$2,400,000	$1,120,000	$109.00	$0.34
LNVA-2: Saltwater Barrier conjunctive operation with Rayburn/Steinhagen	170,000	$15,000,000	$400,000	$88.24	$0.28
LNVA-3: Reallocation of storage in Sam Rayburn	110,000	$17,000,000	$200,000	$154.00	$0.47
LNVA-4: Purchase of Water from Sabine River Authority	36,000	$30,401,051	$3,945.287	$173	$0.53
Alt. Strategy LNVA-5: Rockland Reservoir*	620,000	$1,300,000,000	$97,300,000	$157	$0.48

*Unit cost based on full quantity of water.

An implementation schedule for the various strategies follows

Source	2010	2020	2030	2040	2050	2060
Water Shortage			**-11,332**	**-39,949**	**-66,037**	**-93,183**
Water Management Stratgies						
LNVA-1: Water Conservation(1)	20,000	30,000	33,000	35,000	40,000	40,000
LNVA–2: : Saltwater Barrier system operation with Rayburn/Steinhagen (2)	170,000	170,000	170,000	170,000	170,000	170,000
LNVA–3: Reallocation of storage in Sam Rayburn (3)	0	28,000	110,000	110,000	110,000	110,000
LNVA-4: Purchase of Water from Sabine River Authority					36,000	36,000
Alt. Strategy LNVA-5: Rockland Reservoir	0	0	0	0	620,000	620,000

(1) Conservation offsets increase in agricultural demands.
(2) Quantity of water unknown
(3) Assumed supply number

Sabine River Authority

The Sabine River Authority (SRA) is based in North East Texas and East Texas Regional Water Planning Areas. SRA currently provides water from its Lower Basin system (Toledo Bend reservoir and Canal System) to water users in the East Texas Region. The SRA provides water from its Upper Basin reservoirs (Lake Tawakoni and Lake Fork) to water users in Regions C, North East Texas Region and East Texas Region. These sources are fully contracted and SRA has requests for additional water in the Upper Basin. There are sufficient supplies from the Lower Basin system to meet water demands, but SRA cannot fully meet the current and future demands in the Upper Basin. To meet these shortages, SRA plans to participate in the Toledo Bend Reservoir project that would transport 500,000 acre-feet per year of water from Toledo Bend to the Upper Basin area and Region C. Of this amount, 100,000 acre-feet per year would be used for users in the Upper Sabine Basin, 200,000 acre-feet per year would be for the North Texas Municipal Water District, and 200,000 acre-feet per year would be for the Tarrant Regional Water District. Both the North Texas Municipal Water District and Tarrant Regional Water District are based in Region C. A recommended alternate strategy is to transport an additional 200,000 acre-feet per year from Toledo Bend to Dallas Water Utilities for a total of 700,000 acre-feet per year from Toledo Bend Reservoir. Details of the development of Toledo Bend Project for users in Region C are discussed in the *2006 Region C Water Plan*. The *2006 North East Region Plan* discusses the project for users in the Upper Sabine Basin.

Upper Neches River Municipal Authority

The Upper Neches River Municipal Water Authority (UNRMWA) owns and operates the Lake Palestine system in the Neches River Basin. Based on current contracts, the UNRMWA does not have any shortages during the planning period.

The UNRMWA plans to sponsor the proposed Lake Fastrill and sell water to Dallas Water Utilities. Using the Neches River Water Availability Model, the estimated firm yield of Lake Fastrill is 148,780 acre-feet per year, assuming system operations with Lake Palestine subject to senior water rights and Consensus Criteria for Environmental Flow Needs. Of this amount, Dallas Water Utilities plans to purchase 112,100 acre-feet per year, and the remaining 36,680 acre-feet per year would be available for users in the East Texas Region. Lake Fastrill is a recommended water management strategy for Region C to provide 112,100 Ac-Ft of water to Dallas Water Utilities. Details of the development of Lake Fastrill and the strategy to supply Dallas Water Utilities are discussed in the *2006 Region C Water Plan*. Further discussion of Fastrill is also contained in Chapter 8, Appendix B of this report.

Anderson_County-Other

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**		**Cost**	
Water Well Construction		1	ea	$	25,100	$	25,100
Connection to Water System		1	ea	$	100,000	$	100,000
Subtotal						**$**	**125,100**
Engineering and Contingencies (30%)						$	37,530
Mitigation and Permitting (1%)						$	1,251
Subtotal						**$**	**163,881**
Interest During Construction						$	3,551
TOTAL CAPITAL COST						***$***	***167,432***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**		**Cost**	
Debt Service						$	14,597
Pipeline O&M (1%)						$	1,000
Pump O&M (2.5%)						$	628
Chemicals			1000 gal	$	0.10	$	5,259
Electricity						$	3,634
TOTAL ANNUAL COST w/ AMORTIZATION						***$***	***25,118***
TOTAL ANNUAL COST AFTER AMORTIZATION						$	10,521
Cost per acre-ft						$	311
Cost per 1000 gallons						$	0.96

Frankston

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Water Well Construction		1	ea	$ 77,700	$	77,700
Connection to Water System		1	ea	$ 100,000	$	100,000
Subtotal					**$**	**177,700**
Engineering and Contingencies (30%)					$	53,310
Mitigation and Permitting (1%)					$	1,777
Subtotal					**$**	**232,787**
Interest During Construction					$	5,044
TOTAL CAPITAL COST					***$***	***237,831***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	20,735
Pipeline O&M (1%)					$	1,000
Pump O&M (2.5%)					$	1,943
Chemicals			1000 gal	$ 0.10	$	7,889
Electricity					$	8,052
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***39,619***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***18,884***
Cost per acre-ft					$	327
Cost per 1000 gallons					$	1.00

Anderson_Mining

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Water Well Construction		1	ea	$ 60,375	$ 60,375
Connection to Water System		1	ea	$ 100,000	$ 100,000
Subtotal					**$ 160,375**
Engineering and Contingencies (30%)					$ 48,113
Mitigation and Permitting (1%)					$ 1,604
Subtotal					**$ 210,091**
Interest During Construction					$ 4,552
TOTAL CAPITAL COST					***$ 214,643***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Debt Service					$ 18,714
Pipeline O&M (1%)					$ 1,000
Pump O&M (2.5%)					$ 1,509
Chemicals			1000 gal	$ 0.10	$ 7,889
Electricity					$ 9,167
TOTAL ANNUAL COST w/ AMORTIZATION					***$ 38,279***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$ 19,566***
Cost per acre-ft					$ 316
Cost per 1000 gallons					$ 0.97

Anderson County Steam Electric Power

CAPITAL COSTS	**Quantity**	**Units**	**Unit Price**	**Cost**
Transmission Facilities				
Pipeline	58080	ft	$ 210	$ 12,196,800
Right of Way Easements	58080	ft	$ 1	$ 120,000
Storage Tank			$ -	$ -
Contingencies (10%, engineering done)				
	11	miles		
Pipeline Subtotal				**$ 12,316,800**
Pump Station				$ 4,700,000
Contingencies (10%, engineering done)				
Pump Station Subtotal				**$ 4,700,000**
Environmental and Archaeological Studie	0	ft	$ 0.57	$ 170,168
Additional Engineering (20%)				$ 3,403,360
Env. And Arch. Subtotal				**$ 3,573,528**
Interest During Construction				$ 195,835
TOTAL CAPITAL COST				***$ 20,786,163***
ANNUAL COSTS	**Quantity**	**Units**	**Unit Price**	**Cost**
Debt Service				$ 1,812,232
Raw Water Cost	7,120,822	1000 gal	$ 0.65	$ 4,628,534
Pipeline O&M (1%)				$ 123,168
Pump O&M (2.5%)				$ 117,500
Chemicals		1000 gal	$ -	$ -
Electricity				$ 422,708
TOTAL ANNUAL COST w/ AMORTIZATION				***$ 7,104,143***
TOTAL ANNUAL COST AFTER AMORTIZATION				***$ 5,291,910***
Cost per acre-ft				$ 325
Cost per 1000 gallons				$ 1.00

Angelina_County-Other_Phase1

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Water Well Construction			1 ea	$ 127,050	$	127,050
Connection to Water System			1 ea	$ 100,000	$	100,000
Subtotal					**$**	**227,050**
Engineering and Contingencies (30%)					$	68,115
Mitigation and Permitting (1%)					$	2,271
Subtotal					**$**	**297,436**
Interest During Construction					$	6,445
TOTAL CAPITAL COST					***$***	***303,880***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	26,494
Pipeline O&M (1%)					$	1,000
Pump O&M (2.5%)					$	3,176
Chemicals			1000 gal	$ 0.10	$	26,296
Electricity					$	26,429
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***83,395***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***56,901***
Cost per acre-ft					$	207
Cost per 1000 gallons					$	0.63

Angelina_County-Other_Phase2

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost
Water Well Construction			2 ea	$ 127,050	$ 254,100
Connection to Water System			2 ea	$ 100,000	$ 200,000
Subtotal					**$ 454,100**
Engineering and Contingencies (30%)					$ 136,230
Mitigation and Permitting (1%)					$ 4,541
Subtotal					**$ 594,871**
Interest During Construction					$ 12,889
TOTAL CAPITAL COST					***$ 607,760***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Debt Service					$ 52,987
Pipeline O&M (1%)					$ 2,000
Pump O&M (2.5%)					$ 6,353
Chemicals			1000 gal	$ 0.10	$ 52,592
Electricity					$ 52,857
TOTAL ANNUAL COST w/ AMORTIZATION					***$ 166,789***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$ 113,802***
Cost per acre-ft					$ 207
Cost per 1000 gallons					$ 0.63

Diboll

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**		**Cost**	
Transmission Facilities							
Pipeline	20	61,248	ft	$	51	$	3,123,648
Right of Way Easements		61,248	ft	$	1	$	61,248
Storage Tank		1	ea			$	275,000
Engineering and Contingencies (30%)						$	937,094
Pipeline Subtotal						**$**	**4,396,990**
Ordinary Pump Station		49	hp			$	400,000
Raw Water Intake Structure						$	-
Engineering and Contingencies (35%)						$	140,000
Pump Station Subtotal						**$**	**540,000**
Permitting & Mitigation	1%	61248	ft			$	49,370
Env. And Arch. Subtotal						**$**	**49,370**
Interest During Construction						$	207,767
TOTAL CAPITAL COST						***$***	***5,194,127***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**		**Cost**	
Debt Service						$	452,848
Treated Water Cost		1,369	1000 gal	$	756.00	$	1,034,964
Pipeline O&M (1%)						$	31,236
Pump O&M (2.5%)						$	10,000
Electricity						$	11,097
TOTAL ANNUAL COST w/ AMORTIZATION						***$***	***1,540,145***
TOTAL ANNUAL COST AFTER AMORTIZATION						***$***	***1,087,298***
Cost per acre-ft						$	1,069
Cost per 1000 gallons						$	3.28

Diboll_Phase1

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Water Well Construction			2 ea	$ 98,300	$	196,600
Connection to Water System			2 ea	$ 100,000	$	200,000
Subtotal					**$**	**396,600**
Engineering and Contingencies (30%)					$	118,980
Mitigation and Permitting (1%)					$	3,966
Subtotal					**$**	**519,546**
Interest During Construction					$	11,257
TOTAL CAPITAL COST					***$***	***530,803***

ANNUAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Debt Service					$	46,278
Pipeline O&M (1%)					$	2,000
Pump O&M (2.5%)					$	4,915
Chemicals			1000 gal	$ 0.10	$	42,074
Electricity					$	42,286
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***137,552***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***91,275***
Cost per acre-ft					$	213
Cost per 1000 gallons					$	0.65

Diboll_Phase2

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Water Well Construction			3 ea	$ 119,750	$	359,250
Connection to Water System			3 ea	$ 100,000	$	300,000
Subtotal					**$**	**659,250**
Engineering and Contingencies (30%)					$	197,775
Mitigation and Permitting (1%)					$	6,593
Subtotal					**$**	**863,618**
Interest During Construction					$	18,712
TOTAL CAPITAL COST					***$***	***882,330***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	76,926
Pipeline O&M (1%)					$	3,000
Pump O&M (2.5%)					$	8,981
Chemicals			1000 gal	$ 0.10	$	63,111
Electricity					$	63,429
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***215,446***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***138,521***
Cost per acre-ft					$	222
Cost per 1000 gallons					$	0.68

Four Way WSC

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Water Well Construction		1	ea	$ 90,800	$	90,800
Connection to Water System		1	ea	$ 100,000	$	100,000
Subtotal					**$**	**190,800**
Engineering and Contingencies (30%)					$	57,240
Mitigation and Permitting (1%)					$	1,908
Subtotal					**$**	**249,948**
Interest During Construction					$	5,416
TOTAL CAPITAL COST					***$***	***255,364***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	22,264
Pipeline O&M (1%)					$	1,000
Pump O&M (2.5%)					$	2,270
Chemicals			1000 gal	$ 0.10	$	15,778
Electricity					$	15,857
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***57,169***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***34,905***
Cost per acre-ft					$	236
Cost per 1000 gallons					$	0.72

Hudson_Phase1

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Water Well Construction		1	ea	$ 280,665	$ 280,665
Connection to Water System		1	ea	$ 100,000	$ 100,000
Subtotal					**$ 380,665**
Engineering and Contingencies (30%)					$ 114,200
Mitigation and Permitting (1%)					$ 3,807
Subtotal					**$ 498,671**
Interest During Construction					$ 10,805
TOTAL CAPITAL COST					***$ 509,476***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Debt Service					$ 44,418
Pipeline O&M (1%)					$ 1,000
Pump O&M (2.5%)					$ 7,017
Chemicals			1000 gal	$ 0.10	$ 26,296
Electricity					$ 26,429
TOTAL ANNUAL COST w/ AMORTIZATION					***$ 105,160***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$ 60,741***
Cost per acre-ft					$ 261
Cost per 1000 gallons					$ 0.80

Hudson_Phase2

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Water Well Construction			2 ea	$ 351,885	$	703,770
Connection to Water System			2 ea	$ 100,000	$	200,000
Subtotal					**$**	**903,770**
Engineering and Contingencies (30%)					$	271,131
Mitigation and Permitting (1%)					$	9,038
Subtotal					**$**	**1,183,939**
Interest During Construction					$	25,652
TOTAL CAPITAL COST					***$***	***1,209,591***

ANNUAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Debt Service					$	105,458
Pipeline O&M (1%)					$	2,000
Pump O&M (2.5%)					$	17,594
Chemicals			1000 gal	$ 0.10	$	68,370
Electricity					$	68,714
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***262,136***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***156,679***
Cost per acre-ft					$	250
Cost per 1000 gallons					$	0.77

Hudson WSC_Phase1

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Water Well Construction			1 ea	$ 280,665	$	280,665
Connection to Water System			1 ea	$ 100,000	$	100,000
Subtotal					**$**	**380,665**
Engineering and Contingencies (30%)					$	114,200
Mitigation and Permitting (1%)					$	3,807
Subtotal					**$**	**498,671**
Interest During Construction					$	10,805
TOTAL CAPITAL COST					***$***	***509,476***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	44,418
Pipeline O&M (1%)					$	1,000
Pump O&M (2.5%)					$	7,017
Chemicals			1000 gal	$ 0.10	$	26,296
Electricity					$	26,429
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***105,160***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***60,741***
Cost per acre-ft					$	261
Cost per 1000 gallons					$	0.80

Hudson WSC_Phase2

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Water Well Construction			2 ea	$ 280,665	$	561,330
Connection to Water System			2 ea	$ 100,000	$	200,000
Subtotal					**$**	**761,330**
Engineering and Contingencies (30%)					$	228,399
Mitigation and Permitting (1%)					$	7,613
Subtotal					**$**	**997,342**
Interest During Construction					$	21,609
TOTAL CAPITAL COST					***$***	***1,018,952***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	88,837
Pipeline O&M (1%)					$	2,000
Pump O&M (2.5%)					$	14,033
Chemicals			1000 gal	$ 0.10	$	52,592
Electricity					$	52,857
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***210,320***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***121,483***
Cost per acre-ft					$	261
Cost per 1000 gallons					$	0.80

Cherokee_Irrigation

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Water Well Construction		1	ea	$ 15,480	$	15,480
Connection to Water System		1	ea	$ 100,000	$	100,000
Subtotal					**$**	**115,480**
Engineering and Contingencies (30%)					$	34,644
Mitigation and Permitting (1%)					$	1,155
Subtotal					**$**	**151,279**
Interest During Construction					$	3,278
TOTAL CAPITAL COST					***$***	***154,557***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	13,475
Pipeline O&M (1%)					$	1,000
Pump O&M (2.5%)					$	387
Chemicals			1000 gal	$ 0.10	$	2,630
Electricity					$	2,643
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***20,134***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***6,659***
Cost per acre-ft					$	499
Cost per 1000 gallons					$	1.53

Cherokee_Mining

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Water Well Construction		1	ea	$ 15,480	$ 15,480
Connection to Water System		1	ea	$ 100,000	$ 100,000
Subtotal					**$ 115,480**
Engineering and Contingencies (30%)					$ 34,644
Mitigation and Permitting (1%)					$ 1,155
Subtotal					**$ 151,279**
Interest During Construction					$ 3,278
TOTAL CAPITAL COST					***$ 154,557***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Debt Service					$ 13,475
Pipeline O&M (1%)					$ 1,000
Pump O&M (2.5%)					$ 387
Chemicals			1000 gal	$ 0.10	$ 2,630
Electricity					$ 2,643
TOTAL ANNUAL COST w/ AMORTIZATION					***$ 20,134***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$ 6,659***
Cost per acre-ft					$ 499
Cost per 1000 gallons					$ 1.53

New Summerfield

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**		**Cost**	
Water Well Construction		1	ea	$	105,380	$	105,380
Connection to Water System		1	ea	$	100,000	$	100,000
Subtotal						**$**	**205,380**
Engineering and Contingencies (30%)						$	61,614
Mitigation and Permitting (1%)						$	2,054
Subtotal						**$**	**269,048**
Interest During Construction						$	5,829
TOTAL CAPITAL COST						***$***	***274,877***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**		**Cost**	
Debt Service						$	23,965
Pipeline O&M (1%)						$	1,000
Pump O&M (2.5%)						$	2,635
Chemicals			1000 gal	$	0.10	$	15,778
Electricity						$	15,857
TOTAL ANNUAL COST w/ AMORTIZATION						***$***	***59,234***
TOTAL ANNUAL COST AFTER AMORTIZATION						***$***	***35,269***
Cost per acre-ft						$	245
Cost per 1000 gallons						$	0.75

Rusk

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost
Water Well Construction		1	ea	$ 105,380	$ 105,380
Connection to Water System		1	ea	$ 100,000	$ 100,000
Subtotal					**$ 205,380**
Engineering and Contingencies (30%)					$ 61,614
Mitigation and Permitting (1%)					$ 2,054
Subtotal					**$ 269,048**
Interest During Construction					$ 5,829
TOTAL CAPITAL COST					***$ 274,877***

ANNUAL COSTS	Size	Quantity	Units	Unit Price	Cost
Debt Service					$ 23,965
Pipeline O&M (1%)					$ 1,000
Pump O&M (2.5%)					$ 2,635
Chemicals			1000 gal	$ 0.10	$ 15,778
Electricity					$ 15,857
TOTAL ANNUAL COST w/ AMORTIZATION					***$ 59,234***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$ 35,269***
Cost per acre-ft					$ 245
Cost per 1000 gallons					$ 0.75

Hardin County
County - Other

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y		153	263	284	305	358	431	299
Well Design, gpm (2*Reqd)		190	326	352	378	444	534	
Supplied groundwater, MGD		0.1366	0.2348	0.2536	0.2723	0.3196	0.3848	0.2670
County GW Parameters								
All. GPM/well	200							
Well Depth	800							
Cost /Well	78000							
No. of Wells		0.948474247	1.63038384	1.760566575	1.89074932	2.21930575	2.67184575	
Phasing of Wells		1	1	0	0	1	0	
Well Cost		78000	78000	0	0	78000	0	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	10							
Head Loss/100 feet	0.213							
Depth to Water Surface	800							
Total Head Required	891							
Total Horsepower	64							
Cost of Pipeline	24	126720	126720	0	0	126720	0	
1 MG ground storage and elev	0	0	0		0	0	0	
Total Capital Cost		204720	204720	0	0	204720	0	
Engineering & Cont. (30%)		$61,416	$61,416	$0	$0	$61,416	$0	
Interest During Construction		$11,089	$11,089	$0	$0	$11,089	$0	
Total Cost		$277,225	$277,225	$0	$0	$277,225	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		($24,170)	($24,170)	$0	$0	($24,170)	$0	
New Plus Existing		($24,170)	($48,339)	($24,170)	$0	($24,170)	($24,170)	
O&M Cost								
Electricity		(11,965)	(20,567)	(22,209)	(23,851)	(27,996)	(33,705)	
Operation		(7,478)	(12,854)	(13,880)	(14,907)	(17,497)	(21,065)	
Wells O&M		($1,950)	($3,900)	($3,900)	($3,900)	($5,850)	($5,850)	
Transmission Line O&M		($1,267)	($2,534)	($2,534)	($2,534)	($3,802)	($3,802)	
Total Annual Cost		($46,829)	($88,195)	($66,694)	($45,192)	($79,314)	($88,591)	($69,136)
Unit Cost, $/1000 gallons		($0.94)	($1.03)	($0.72)	($0.45)	($0.68)	($0.63)	($0.71)

Hardin County
Hardin County Manufacturing

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y		27	46	63	81	97	114	71
Well Design, gpm (2*Reqd)		33	57	78	100	120	141	
Supplied groundwater, MGD		0.0241	0.0411	0.0563	0.0723	0.0866	0.1018	0.0637
County GW Parameters								
All. GPM/well (200)	140							
Well Depth	700							
Cost /Well	55520							
No. of Wells		0.239111155	0.40737456	0.557926027	0.71733346	0.85902896	1.00958043	
Phasing of Wells		1	0	0	0	0	0	
Well Cost		55520	0	0	0	0	0	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	3							
Head Loss/100 feet	0.176							
Depth to Water Surface	700							
Total Head Required	789							
Total Horsepower	40							
Cost of Pipeline	15	79200	0	0	0	0	0	
Booster Station and Ground								
Storage per 3 wells	100000	100000	0	0	0	0	0	
Total Capital Cost		234720	0	0	0	0	0	
Engineering & Cont. (30%)		$70,416	$0	$0	$0	$0	$0	
Interest During Construction		$12,714	$0	$0	$0	$0	$0	
Total Cost		$317,850	$0	$0	$0	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		($27,712)	$0	$0	$0	$0	$0	
New Plus Existing		($27,712)	($27,712)	$0	$0	$0	$0	
O&M Cost								
Electricity		(1,870)	(3,186)	(4,363)	(5,610)	(6,718)	(7,895)	
Operation		(1,320)	(2,248)	(3,079)	(3,959)	(4,741)	(5,572)	
Well O&M		($1,388)	($1,388)	($1,388)	($1,388)	($1,388)	($1,388)	
Transmission Line O&M		($1,792)	($1,792)	($1,792)	($1,792)	($1,792)	($1,792)	
Total Annual Cost		($34,081)	($36,326)	($10,622)	($12,748)	($14,639)	($16,647)	($20,844)
Unit Cost, $/1000 gallons		($3.87)	($2.42)	($0.52)	($0.48)	($0.46)	($0.45)	($0.90)

Hardin County
Irrigation

	2000	2010	2020	2030	2040	2050	2060	
Required water, af/y		3711	3711	3711	3711	3711	3711	
Distribution Design, gpm (1.5*Reqd)		3451	3451	3451	3451	3451	3451	
Supplied water, MGD		3.31339286	3.31	3.31	3.31	3.31	3.31	
Distribution Cost								
Length Dist. Pipe	12500							
Pumping Rate, gpm	3451							
Pipe Diameter, in	20							
Head Loss/100 feet	0.18							
Depth to Water Surface	20							
Total Head Required	42.5							
Total Horsepower	53							
Cost of Pipeline per foot	51							
Pump Station	250000		0					
Total Capital Cost		$887,500	0	0	0	0	0	
Engineering & Cont. (30%)		$266,250	$0	$0	$0	$0	$0	
Interest During Construction		$48,073	$0	$0	$0	$0	$0	
Total Cost		$1,201,823	$0	$0	$0	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		($104,780)	$0	$0	$0	$0	$0	
New Plus Existing		($104,780)	($104,780)		$0	$0	$0	
O&M Cost								
Electricity		(13,839)	(13,839)	(13,839)	(13,839)	(13,839)	(13,839)	
O&M		($6,250)	($6,250)	($6,250)	($6,250)	($6,250)	($6,250)	
Transmission Line		($6,375)	($6,375)	($6,375)	($6,375)	($6,375)	($6,375)	
Raw Water Cost $0.11/1000 gallons		($133,033)	($133,033)	($133,033)	($133,033)	($133,033)	($133,033)	
Total Annual Cost		($264,277)	($264,277)	($159,496)	($159,496)	($159,496)	($159,496)	($194,423)
Unit Cost, $/1000 gallons		($0.22)	($0.22)	($0.13)	($0.13)	($0.13)	($0.13)	($0.16)

Table
Bethel Ash WSC
Overdraft and Install New Well in Carrizo-Wilcox (Trinity Basin)

Owner:	Bethel-Ash WSC
Quantity:	105 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	150 gpm	1	Ea.	$39,400	$39,400
Connection to Existing Distribution System		1	Ea.	$20,000	$20,000
Storage Tank (Closed)	20,000 Gal	1	Ea.	$15,000	$15,000
Engineering and Contingencies (35% for well field)					$26,000
Subtotal for Wellfield					**$100,400**
Transmission System	**ASSUME NO TRANSMISSION**				
TOTAL CONSTRUCTION COST					**$100,400**
Interest During Construction			**(2 months)**		**$800**
Permitting and Mitigation					**$900**
Groundwater Rights/ Purchase					**$31,500**
TOTAL CAPITAL COST					**$133,600**
Annual Costs					
Debt Service (6 percent for 20 years)					$11,600
Electricity (Transmission)					$0
Well operation and treatment			Kgal	$0.15	$5,100
Operation and Maintenance of transmission					$0
Total Annual Cost					**$16,700**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$159**
Water Cost ($ per 1,000 gallons)					**$0.49**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$49**
Water Cost ($ per 1,000 gallons)					**$0.15**

Table
Henderson County-Other
Install New Wells in Queen City

Owner: County-Other
Quantity: 500 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	50 gpm	12	Ea.	$11,000	$132,000
Connection to Existing Distribution System		12	Ea.	$10,000	$120,000
Storage Tank (Closed)	10,000 Gal	12	Ea.	$7,500	$90,000
Engineering and Contingencies (35% for well field)					$119,700
Subtotal for Wellfield					**$461,700**
Transmission System					
Pipeline - Rural	6 inch	31,680	LF	$15	$475,200
Pipeline - Urban	6 inch	0	LF	$23	$0
Pump Station	30 HP	3	LS	$250,000	$750,000
Easement - Rural	15 Feet	11	AC	$2,000	$21,800
Easement - Urban	15 Feet	0	AC	$20,000	$0
Engineering and Contingencies (30% for pipleines, 35% for other items)					$405,100
Subtotal for Transmission					**$1,652,100**
TOTAL CONSTRUCTION COST					**$2,113,800**
Interest During Construction			**(6 months)**		**$45,800**
Permitting and Mitigation					**$9,800**
Groundwater Rights/ Purchase					**$150,000**
TOTAL CAPITAL COST					**$2,319,400**
Annual Costs					
Debt Service (6 percent for 20 years)					$202,200
Electricity (Transmission)					$4,000
Well operation and treatment					$24,400
Operation and Maintenance of transmission					$28,200
Total Annual Cost					**$258,800**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$518**
Water Cost ($ per 1,000 gallons)					**$1.59**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$113**
Water Cost ($ per 1,000 gallons)					**$0.35**

Table
Henderson County-Other
Purchase Water from UNRMWA

Probable Owner: County-Other
Quantity: 500 AF/Y 0.78 MGD

CONSTRUCTION COSTS
TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Rural	10 in.	26,400	LF	$24	$634,000
Pipeline Urban	10 in.	0	LF	$36	$0
Right of Way Easements Rural (ROW)		12.1	ACRE	$2,000	$24,000
Right of Way Easements Urban (ROW)		0.0	ACRE	$20,000	$0
Engineering and Contingencies (30%)					$190,000
Subtotal of Pipeline					**$848,000**
Pump Station(s)					
Pump with intake & building	30 HP	1	LS	$400,000	$400,000
Booster Pump Station	0 HP	1	LS	$0	$0
Engineering and Contingencies (35%)					$140,000
Subtotal of Pump Station(s)					**$540,000**
Ground Storage					
Ground Storage Tanks at Booster	0.25 MG	1	LS	$100,000	$100,000
Engineering and Contingencies (35%)					$35,000
Subtotal of Ground Storage					**$135,000**
Surface Water Treatment					
Water treatment plant	1 MGD	1	LS	$4,000,000	$4,000,000

CONSTRUCTION TOTAL				**$5,523,000**
Permitting and Mitigation				**$62,000**
Interest During Construction		**(12 months)**		**$230,000**
TOTAL COST				**$5,815,000**
ANNUAL COSTS				
Debt Service (6% for 20 years)				$507,000
Electricity ($0.06 kWh)				$6,000
Operation & Maintenance				$23,000
Raw Water Purchase		Kgal	$0.25	$41,000
Treatment		Kgal	$0.35	$57,000
Total Annual Costs				**$634,000**
UNIT COSTS (Until Amortized)				
Per Acre-Foot of treated water				$1,268
Per 1,000 Gallons				$3.89
UNIT COSTS (After Amortization)				
Per Acre-Foot				$254
Per 1,000 Gallons				$0.43

Table
Henderson County Livestock
Additional Use from Lake Athens through Temporary Pumping

Probable Owner: Athens Fish Hatchery
Quantity: 1,500 AF/Y 1.67 MGD

CONSTRUCTION COSTS
TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Rural	16 in.	5,000	LF	$34	$170,000
Pipeline Urban	16 in.	0	LF		$0
Right of Way Easements Rural (ROW)		0.0	ACRE	$2,000	$0
Right of Way Easements Urban (ROW)		0.0	ACRE	$20,000	$0
Engineering and Contingencies (30%)					$51,000
Subtotal of Pipeline					**$221,000**
Pump Station(s)					
Temporary Lake Pump	10 HP	1	LS	$150,000	$150,000
Booster Pump Station	0 HP	1	LS	$0	$0
Engineering and Contingencies (35%)					$52,500
Subtotal of Pump Station(s)					**$202,500**
Ground Storage					
Ground Storage Tanks at Booster	0.00 MG	0	LS	$0	$0
Engineering and Contingencies (35%)					$0
Subtotal of Ground Storage					**$0**
Surface Water Treatment					
Water treatment plant	0 MGD	0	LS	$0	$0
CONSTRUCTION TOTAL					**$423,500**
Permitting and Mitigation					**$0**
Interest During Construction			**(6 months)**		**$9,000**
TOTAL COST					**$432,500**
ANNUAL COSTS					
Debt Service (6% for 10 years)					$59,000
Electricity ($0.06 kWh)					$3,000
Operation & Maintenance					$7,000
Raw Water Purchase			Kgal	$0.00	$0
Treatment			Kgal	$0.00	$0
Total Annual Costs					**$69,000**
UNIT COSTS (Until Amortized)					
Per Acre-Foot of treated water					$46
Per 1,000 Gallons					$0.14

Houston_Irrigation_Phase1

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Water Well Construction			3 ea	$ 173,866	$	521,598
Connection to Water System			3 ea	$ 100,000	$	300,000
Subtotal					**$**	**821,598**
Engineering and Contingencies (30%)					$	246,479
Mitigation and Permitting (1%)					$	8,216
Subtotal					**$**	**1,076,293**
Interest During Construction					$	23,320
TOTAL CAPITAL COST					***$***	***1,099,613***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	95,869
Pipeline O&M (1%)					$	3,000
Pump O&M (2.5%)					$	13,040
Chemicals			1000 gal	$ 0.10	$	78,889
Electricity					$	79,286
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***270,084***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***174,214***
Cost per acre-ft					$	223
Cost per 1000 gallons					$	0.68

Houston_Irrigation_Phase2

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Water Well Construction		2	ea	$ 215,014	$	430,028
Connection to Water System		2	ea	$ 100,000	$	200,000
Subtotal					**$**	**630,028**
Engineering and Contingencies (30%)					$	189,008
Mitigation and Permitting (1%)					$	6,300
Subtotal					**$**	**825,337**
Interest During Construction					$	17,883
TOTAL CAPITAL COST					***$***	***843,219***

ANNUAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Debt Service					$	73,516
Pipeline O&M (1%)					$	2,000
Pump O&M (2.5%)					$	10,751
Chemicals			1000 gal	$ 0.10	$	63,111
Electricity					$	63,429
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***212,806***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***139,290***
Cost per acre-ft					$	220
Cost per 1000 gallons					$	0.67

Houston_Livestock_Phase1

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Water Well Construction		1	ea	$ 173,866	$	173,866
Connection to Water System		1	ea	$ 100,000	$	100,000
Subtotal					**$**	**273,866**
Engineering and Contingencies (30%)					$	82,160
Mitigation and Permitting (1%)					$	2,739
Subtotal					**$**	**358,764**
Interest During Construction					$	7,773
TOTAL CAPITAL COST					***$***	***366,538***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	31,956
Pipeline O&M (1%)					$	1,000
Pump O&M (2.5%)					$	4,347
Chemicals			1000 gal	$ 0.10	$	26,296
Electricity					$	26,429
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***90,028***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***58,071***
Cost per acre-ft					$	223
Cost per 1000 gallons					$	0.68

Houston_Livestock_Phase2

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Water Well Construction		2	ea	$ 173,866	$ 347,732
Connection to Water System		2	ea	$ 100,000	$ 200,000
Subtotal					**$ 547,732**
Engineering and Contingencies (30%)					$ 164,320
Mitigation and Permitting (1%)					$ 5,477
Subtotal					**$ 717,529**
Interest During Construction					$ 15,547
TOTAL CAPITAL COST					***$ 733,076***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Debt Service					$ 63,913
Pipeline O&M (1%)					$ 2,000
Pump O&M (2.5%)					$ 8,693
Chemicals			1000 gal	$ 0.10	$ 52,592
Electricity					$ 52,857
TOTAL ANNUAL COST w/ AMORTIZATION					***$ 180,056***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$ 116,143***
Cost per acre-ft					$ 223
Cost per 1000 gallons					$ 0.68

Jasper County
County - Other, Neches Basin

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y		70	141	141	141	141	141	129
Well Design, gpm (2*Reqd)		87	175	175	175	175	175	
Supplied groundwater, MGD		0.0625	0.1259	0.1259	0.1259	0.1259	0.1259	0.1153
County GW Parameters								
All. GPM/well (140)	90							
Well Depth	1600							
Cost /Well	106120							
No. of Wells		0.9643166	1.94240913	1.9424091	1.9424091	1.9424091	1.9424091	
Phasing of Wells		1	1	0	0	0	0	
Well Cost		106120	106120	0	0	0	0	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	6							
Head Loss/100 feet	0.176							
Depth to Water Surface	1600							
Total Head Required	1689							
Total Horsepower	55							
Cost of Pipeline	15	79200	79200	0	0	0	0	
Booster Station and Ground Storage per 3 wells			0		0	0	0	
Total Capital Cost		185320	185320	0	0	0	0	
Engineering & Cont. (30%)		$55,596	$55,596	$0	$0	$0	$0	
Interest During Construction		$10,038	$10,038	$0	$0	$0	$0	
Total Cost		$250,954	$250,954	$0	$0	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		($21,879)	($21,879)	$0	$0	$0	$0	
New Plus Existing		($21,879)	($43,759)	($21,879)	$0	$0	$0	
O&M Cost								
Electricity		(10,376)	(20,900)	(20,900)	(20,900)	(20,900)	(20,900)	
Operations		(3,421)	(6,891)	(6,891)	(6,891)	(6,891)	(6,891)	
Well O&M		($2,653)	($5,306)	($5,306)	($5,306)	($5,306)	($5,306)	
Transmission Line O&M		($792)	($1,584)	($1,584)	($1,584)	($1,584)	($1,584)	
Total Annual Cost		($39,121)	($78,440)	($56,560)	($34,681)	($34,681)	($34,681)	($46,361)
Unit Cost, $/1000 gallons		($1.71)	($1.71)	($1.23)	($0.75)	($0.75)	($0.75)	($1.10)

Jasper County
County-Other, Sabine Basin

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y		82	82	82	82	82	82	82
Well Design, gpm (2*Reqd)		102	102	102	102	102	102	
Supplied groundwater, MGD		0.0732	0.0732	0.0732	0.0732	0.0732	0.0732	0.0732
County GW Parameters								
All. GPM/well (125)	110							
Well Depth	1600							
Cost /Well	128790							
No. of Wells		1.129628	1.12962801	1.129628	1.129628	1.129628	1.129628	
Phasing of Wells		1		0	0	0	0	
Well Cost		106120	0	0	0	0	0	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	6							
Head Loss/100 feet	0.176							
Depth to Water Surface	1600							
Total Head Required	1689							
Total Horsepower	67							
Cost of Pipeline	15	79200	0	0	0	0	0	
Booster Station and Ground								
Storage per 3 wells			0		0	0	0	
Total Capital Cost		185320	0	0	0	0	0	
Engineering & Cont. (30%)		$55,596	$0	$0	$0	$0	$0	
Interest During Construction		$10,038	$0	$0	$0	$0	$0	
Total Cost		$250,954	$0	$0	$0	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		($21,879)	$0	$0	$0	$0	$0	
New Plus Existing		($21,879)	($21,879)	$0	$0	$0	$0	
O&M Cost								
Electricity		(12,154)	(12,154)	(12,154)	(12,154)	(12,154)	(12,154)	
Operations		(4,008)	(4,008)	(4,008)	(4,008)	(4,008)	(4,008)	
Well O&M		($2,653)	($2,653)	($2,653)	($2,653)	($2,653)	($2,653)	
Transmission Line O&M		($792)	($792)	($792)	($792)	($792)	($792)	
Total Annual Cost		($41,486)	($41,486)	($19,607)	($19,607)	($19,607)	($19,607)	($26,900)
Unit Cost, $/1000 gallons		($1.55)	($1.55)	($0.73)	($0.73)	($0.73)	($0.73)	($1.01)

Jasper County
Kirbyville

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y	35	63	83	95	90	88	88	85
Well Design, gpm (2*Reqd)		78	103	118	112	109	109	
Supplied groundwater, MGD		0.0563	0.0741	0.0848	0.0804	0.0786	0.0786	0.0754
County GW Parameters								
All. GPM/well	120							
Well Depth	1500							
Cost /Well	102160							
No. of Wells		0.6509137	0.85755297	0.9815365	0.9298767	0.9092128	0.9092128	
Phasing of Wells		1	0	0	0	0	0	
Well Cost		102160	0	0	0	0	0	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	6							
Head Loss/100 feet	0.2							
Depth to Water Surface	1500							
Total Head Required	1591							
Total Horsepower	69							
Cost of Pipeline	24	126720	0	0	0	0	0	
Booster Station and Ground								
Storage per 3 wells			0		0	0	0	
Total Capital Cost		228880	0	0	0	0	0	
Engineering & Cont. (30%)		$68,664	$0	$0	$0	$0	$0	
Interest During Construction		$12,398	$0	$0	$0	$0	$0	
Total Cost		$309,942	$0	$0	$0	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		($27,022)	$0	$0	$0	$0	$0	
New Plus Existing		($27,022)	($27,022)	$0	$0	$0	$0	
O&M Cost								
Electricity		(8,792)	(11,584)	(13,258)	(12,560)	(12,281)	(12,281)	
Operations		(3,079)	(4,057)	(4,643)	(4,399)	(4,301)	(4,301)	
Well O&M		($2,554)	($2,554)	($2,554)	($2,554)	($2,554)	($2,554)	
Transmission Line O&M		($1,267)	($1,267)	($1,267)	($1,267)	($1,267)	($1,267)	
Total Annual Cost		($42,715)	($46,483)	($21,723)	($20,780)	($20,404)	($20,404)	($28,751)
Unit Cost, $/1000 gallons		($2.08)	($1.72)	($0.70)	($0.71)	($0.71)	($0.71)	($1.04)

Jefferson County
Meeker

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y						4	9	7
Well Design, gpm (2*Reqd)		0	0	0	0	4.9593425	11	
Supplied groundwater, MGD		0	0	0	0	0.0035714	0.0080	0.0058
County GW Parameters								
All. GPM/well	20							
Well Depth	1600							
Cost /Well	101360							
No. of Wells		0	0	0	0	0.2479671	0.557926	
Phasing of Wells		0	0	0	0	1	0	
Well Cost		0	0	0	0	101360	0	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	6							
Head Loss/100 feet	0.2							
Depth to Water Surface	1600							
Total Head Required	1691							
Total Horsepower	12							
Cost of Pipeline	24	0	0	0	0	10000		
Booster Station and Ground								
Storage per 3 wells			0		0	0	0	
Total Capital Cost		0	0	0	0	111360	0	
Engineering & Cont. (30%)		$0	$0	$0	$0	$33,408	$0	
Interest During Construction		$0	$0	$0	$0	$6,032	$0	
Total Cost		$0	$0	$0	$0	$150,800	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	$0	$0	$0	($13,147)	$0	
New Plus Existing		$0	$0	$0	$0	($13,147)	($13,147)	
O&M Cost								
Electricity		0	0	0	0	(593)	(1,335)	
Operation							(440)	
Well O&M		$0	$0	$0	$0	($2,534)	($2,534)	
Transmission Line O&M		$0	$0	$0	$0	($100)	($100)	
Total Annual Cost		$0	$0	$0	$0	($16,375)	($17,556)	($16,966)
Unit Cost, $/1000 gallons						($12.56)	($5.99)	($8.01)

Jefferson County
Steam Electric

	2000	2010	2020	2030	2040	2050	2060	Average
Required water, af/y			13246	15696	18464	21838	25951	19039
Distribution Design, gpm (1.5*Reqd)		0	12317	14595	17169	20307	24131	
Supplied water, MGD		0	11.83	14.01	16.49	19.50	23.17	16.9991
Distribution Cost								
Length Dist. Pipe	25000							
Pumping Rate	18000							
Pipe Diameter, in	42							
Head Loss/100 feet	0.104							
Depth to Water Surface	20							
Total Head Required	126							
Total Horsepower	818							
Cost of Pipeline	400							
Booster Station and Ground Storage per								
3 wells	$2,800,000		$12,800,000					
Total Capital Cost	$12,800,000		$12,800,000	0	0	0	0	
Engineering & Cont. (30%)		$0	$3,840,000	$0	$0	$0	$0	
Interest During Construction		$0	$693,339	$0	$0	$0	$0	
Total Cost		$0	$17,333,339	$0	$0	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	($1,511,199)	$0	$0	$0	$0	
New Plus Existing		$0	($1,511,199)	($1,511,199)		$0	$0	
O&M Cost								
Electricity		0	(146,443)	(173,530)	(204,132)	(241,434)	(286,906)	
O&M		$0	($70,000)	($70,000)	($70,000)	($70,000)	($70,000)	
Transmission Line		$0	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	
Raw Water Cost $0.11/1000 gallons			($474,845)	($562,674)	($661,901)	($782,853)	($930,297)	
Total Annual Cost		$0	($2,302,488)	($2,417,403)	($1,036,033)	($1,194,287)	($1,387,203)	($1,667,483)
Unit Cost, $/1000 gallons			($0.53)	($0.47)	($0.17)	($0.17)	($0.16)	($0.27)

Nacogdoches_Appleby WSC

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost
Water Well Construction			2 ea	$ 137,500	$ 275,000
Connection to Water System			2 ea	$ 100,000	$ 200,000
Subtotal					**$ 475,000**
Engineering and Contingencies (30%)					$ 142,500
Mitigation and Permitting (1%)					$ 4,750
Subtotal					**$ 622,250**
Interest During Construction					$ 13,482
TOTAL CAPITAL COST					***$ 635,732***

ANNUAL COSTS	Size	Quantity	Units	Unit Price	Cost
Debt Service					$ 55,426
Pipeline O&M (1%)					$ 2,000
Pump O&M (2.5%)					$ 6,875
Chemicals			1000 gal	$ 0.10	$ 52,592
Electricity					$ 52,857
TOTAL ANNUAL COST w/ AMORTIZATION					***$ 169,751***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$ 114,325***
Cost per acre-ft					$ 210
Cost per 1000 gallons					$ 0.65

Nacogdoches_County-Other

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Water Well Construction			1 ea	$ 137,500	$	137,500
Connection to Water System			1 ea	$ 100,000	$	100,000
Subtotal					**$**	**237,500**
Engineering and Contingencies (30%)					$	71,250
Mitigation and Permitting (1%)					$	2,375
Subtotal					**$**	**311,125**
Interest During Construction					$	6,741
TOTAL CAPITAL COST					***$***	***317,866***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	27,713
Pipeline O&M (1%)					$	1,000
Pump O&M (2.5%)					$	3,438
Chemicals			1000 gal	$ 0.10	$	26,296
Electricity					$	26,429
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***84,875***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***57,162***
Cost per acre-ft					$	210
Cost per 1000 gallons					$	0.65

Nacogdoches_Lilly Grove SUD

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Water Well Construction			2 ea	$ 137,500	$ 275,000
Connection to Water System			2 ea	$ 100,000	$ 200,000
Subtotal					**$ 475,000**
Engineering and Contingencies (30%)					$ 142,500
Mitigation and Permitting (1%)					$ 4,750
Subtotal					**$ 622,250**
Interest During Construction					$ 13,482
TOTAL CAPITAL COST					***$ 635,732***
ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**
Debt Service					$ 55,426
Pipeline O&M (1%)					$ 2,000
Pump O&M (2.5%)					$ 6,875
Chemicals			1000 gal	$ 0.10	$ 52,592
Electricity					$ 52,857
TOTAL ANNUAL COST w/ AMORTIZATION					***$ 169,751***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$ 114,325***
Cost per acre-ft					$ 210
Cost per 1000 gallons					$ 0.65

Nacogdoches_Livestock

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Water Well Construction			3 ea	$ 141,780	$	425,340
Connection to Water System			3 ea	$ 100,000	$	300,000
Subtotal					**$**	**725,340**
Engineering and Contingencies (30%)					$	217,602
Mitigation and Permitting (1%)					$	7,253
Subtotal					**$**	**950,195**
Interest During Construction					$	20,588
TOTAL CAPITAL COST					***$***	***970,783***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Debt Service					$	84,637
Pipeline O&M (1%)					$	3,000
Pump O&M (2.5%)					$	10,634
Chemicals			1000 gal	$ 0.10	$	102,555
Electricity					$	103,071
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***303,897***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***219,260***
Cost per acre-ft					$	193
Cost per 1000 gallons					$	0.59

Nacogdoches_Swift WSC

CAPITAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Water Well Construction			2 ea	$ 137,500	$	275,000
Connection to Water System			2 ea	$ 100,000	$	200,000
Subtotal					**$**	**475,000**
Engineering and Contingencies (30%)					$	142,500
Mitigation and Permitting (1%)					$	4,750
Subtotal					**$**	**622,250**
Interest During Construction					$	13,482
TOTAL CAPITAL COST					***$***	***635,732***

ANNUAL COSTS	Size	Quantity	Units	Unit Price	Cost	
Debt Service					$	55,426
Pipeline O&M (1%)					$	2,000
Pump O&M (2.5%)					$	6,875
Chemicals			1000 gal	$ 0.10	$	52,592
Electricity					$	52,857
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***169,751***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***114,325***
Cost per acre-ft					$	210
Cost per 1000 gallons					$	0.65

Table
Newton County Manufacturing
Install New Wells in Gulf Coast Aquifer

Owner:	Newton County Manufacturing				
Quantity:	700 AF/Y		0.78 Peak MGD		
Item	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Capital Costs					
Wellfield and Treatment					
Wells (10-in diameter)	450 gpm	2	Ea.	$50,000	$100,000
Connection to Existing Distribution System		2	Ea.	$50,000	$100,000
Storage Tank	100,000 Gal	2	Ea.	$75,000	$150,000
Engineering and Contingencies (35% for well field)					$122,500
Subtotal for Wellfield					**$472,500**
Transmission System					
Pipeline - Rural	12 inch	26,400	LF	$28	$739,200
Pipeline - Urban	12 inch	0	LF	$42	$0
Pump Station	15 HP	0	LS	$150,000	$0
Easement - Rural	20 Feet	12	AC	$2,000	$24,200
Easement - Urban	20 Feet	0	AC	$20,000	$0
Engineering and Contingencies (30% for pipleines, 35% for other items)					$221,800
Subtotal for Transmission					**$985,200**
TOTAL CONSTRUCTION COST					**$1,457,700**
Interest During Construction			**(12 months)**		**$60,700**
Permitting and Mitigation					**$13,100**
Groundwater Rights/ Purchase					**$210,000**
TOTAL CAPITAL COST					**$1,741,500**
Annual Costs					
Debt Service (6 percent for 20 years)					$151,800
Electricity (Transmission)					$4,500
Well operation			Kgal	$0.07	$16,000
Operation and Maintenance of transmission					$8,900
Total Annual Cost					**$181,200**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$259**
Water Cost ($ per 1,000 gallons)					**$0.79**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$42**
Water Cost ($ per 1,000 gallons)					**$0.13**

NMAN-1
Newton County - Manufacturing
Purchase Water from Toledo Bend Reservoir

Probable Owner:	Newton County Manufacturing		
Quantity:	700 AF/Y		0.78 Peak MGD

CONSTRUCTION COSTS
TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Rural	12 in.	26,400	LF	$28	$739,000
Pipeline Urban	12 in.	0	LF	$0	$0
Right of Way Easements Rural (ROW)		12.1	ACRE	$2,000	$24,000
Right of Way Easements Urban (ROW)		0.0	ACRE	$20,000	$0
Engineering and Contingencies (30%)					$222,000
Subtotal of Pipeline					**$985,000**
Pump Station(s)					
Pump with intake & building	15 HP	1	LS	$250,000	$250,000
Booster Pump Station	0 HP	0	LS	$0	$0
Engineering and Contingencies (35%)					$87,500
Subtotal of Pump Station(s)					**$337,500**
CONSTRUCTION TOTAL					**$1,322,500**
Permitting and Mitigation					**$12,000**
Interest During Construction			**(12 months)**		**$55,000**
TOTAL COST					**$1,389,500**
ANNUAL COSTS					
Debt Service (6% for 20 years)					$121,100
Electricity ($0.06 kWh)					$4,500
Operation & Maintenance					$17,000
Raw Water Purchase			Kgal	$0.25	$57,000
Treatment (assume raw water)			Kgal	$0.00	$0
Total Annual Costs					**$199,600**
UNIT COSTS (Until Amortized)					
Per Acre-Foot of treated water					$285
Per 1,000 Gallons					$0.87
UNIT COSTS (After Amortization)					
Per Acre-Foot					$112
Per 1,000 Gallons					$0.34

Table
Orange County-Other (Neches Basin)
Install New Wells in Gulf Coast Aquifer

Owner:	County-Other				
Quantity:	140 AF/Y		0.25	Peak MGD	

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	50 gpm	4	Ea.	$26,900	$107,600
Connection to Existing Distribution System		4	Ea.	$20,000	$80,000
Storage Tank (Closed)	10,000 Gal	4	Ea.	$7,500	$30,000
Engineering and Contingencies (35% for well field)					$76,200
Subtotal for Wellfield					**$293,800**
Transmission System					
Pipeline - Rural	6 inch	21,120	LF	$15	$316,800
Pipeline - Urban	6 inch	0	LF	$23	$0
Pump Station	5 HP	4	LS	$50,000	$200,000
Easement - Rural	15 Feet	7	AC	$2,000	$14,500
Easement - Urban	15 Feet	0	AC	$20,000	$0
Engineering and Contingencies (30% for piplcines, 35% for other items)					$165,000
Subtotal for Transmission					**$696,300**
TOTAL CONSTRUCTION COST					**$990,100**
Interest During Construction			**(6 months)**		**$21,500**
Permitting and Mitigation					**$8,800**
Groundwater Rights/ Purchase					**$42,000**
TOTAL CAPITAL COST					**$1,062,400**
Annual Costs					
Debt Service (6 percent for 20 years)					$92,600
Electricity (Transmission)					$1,100
Well operation and treatment			Kgal	$0.15	$6,800
Operation and Maintenance of transmission					$9,800
Total Annual Cost					**$110,300**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$788**
Water Cost ($ per 1,000 gallons)					**$2.42**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$126**
Water Cost ($ per 1,000 gallons)					**$0.39**

Table
Mauriceville WSC
Install New Well in Gulf Coast Aquifer in Jasper County

Owner: Mauriceville WSC
Quantity: 250 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
10-inch Well	350 gpm	1	Ea.	$60,050	$60,100
Connection to Existing Distribution System		1	Ea.	$50,000	$50,000
Storage Tank (Closed)	50,000 Gal	1	Ea.	$40,000	$40,000
Engineering and Contingencies (35% for well field)					$52,500
Subtotal for Wellfield					**$202,600**
Transmission System	**ASSUME NO TRANSMISSION**				
Pipeline - Rural	6 inch	0	LF	$15	$0
Pipeline - Urban	6 inch	0	LF	$23	$0
Pump Station	3 HP	0	LS	$25,000	$0
Easement - Rural	15 Feet	0	AC	$2,000	$0
Easement - Urban	15 Feet	0	AC	$20,000	$0
Engineering and Contingencies (30% for pipleines, 35% for other items)					$0
Subtotal for Transmission					**$0**
TOTAL CONSTRUCTION COST					**$202,600**
Interest During Construction			**(6 months)**		**$4,400**
Permitting and Mitigation					**$1,800**
Groundwater Rights/ Purchase					**$75,000**
TOTAL CAPITAL COST					**$283,800**
Annual Costs					
Debt Service (6 percent for 20 years)					$24,700
Electricity (Transmission)					$0
Well operation and treatment			Kgal	$0.15	$12,200
Operation and Maintenance of transmission					$0
Total Annual Cost					**$36,900**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$148**
Water Cost ($ per 1,000 gallons)					**$0.45**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$49**
Water Cost ($ per 1,000 gallons)					**$0.15**

Polk County
County Other

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y		208	417	578	681	745	828	576
Well Design, gpm (2*Reqd)		258	517	717	844	924	1027	
Supplied groundwater, MGD		0.1857	0.3723	0.5161	0.6080	0.6652	0.7393	0.5144
County GW Parameters								
All. GPM/well	260							
Well Depth	450							
Cost /Well	55650							
No. of Wells		0.9918685	1.98850558	2.756249947	3.2474156	3.5526059	3.948399579	
Phasing of Wells		1	1	1			1	
Well Cost		$55,650	$55,650	$55,650	$0	$0	$55,650.00	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	8							
Head Loss/100 feet	0.134							
Depth to Water Surface	450							
Total Head Required	537							
Total Horsepower	50							
Cost of Pipeline	20	$105,600	$105,600	$105,600	$0	$0	105600	
Ground Storage and Pressure	250000	$250,000	$250,000	$250,000	$0	$0	$250,000	
Total Capital Cost		$411,250	$411,250	$411,250	$0	$0	411250	
Engineering & Cont. (30%)		$123,375	$123,375	$123,375	$0	$0	$123,375	
Interest During Construction		$22,276	$22,276	$22,276	$0	$0	$22,276	
Total Cost		$556,901	$556,901	$556,901	$0	$0	$556,901	
Annual Cost								
New Debt Service,6%, 20yrs.		($48,553)	($48,553)	($48,553)	$0	$0	($48,553)	
New Plus Existing		($48,553)	($97,106)	($97,106)	($48,553)	$0	($48,553)	
O&M Cost								
Electricity		(9,802)	(39,302)	(81,714)	(96,276)	(105,324)	(156,077)	
Operations		(10,166)	(20,381)	(28,249)	(33,283)	(36,411)	(40,468)	
Well O&M		($1,391)	($2,783)	($4,174)	($4,174)	($4,174)	($5,565)	
Transmission Line		($3,556)	($7,112)	($10,668)	($10,668)	($10,668)	($14,224)	
Total Annual Cost		($73,468)	($166,684)	($221,912)	($192,954)	($156,577)	($264,887)	($179,414)
Unit Cost, $/1000 gallons		($1.08)	($1.23)	($1.18)	($0.87)	($0.64)	($0.98)	($0.96)

Polk County
Polk County Manufacturing

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y			64	164	269	365	449	262
Well Design, gpm (2*Reqd)		0	79	203	334	453	557	
Supplied groundwater, MGD		0.0000	0.0571	0.1464	0.2402	0.3259	0.4009	0.2341
County GW Parameters								
All. GPM/well (250)	280							
Well Depth	450							
Cost /Well	56950							
No. of Wells		0	0.283391	0.726189432	1.19112779	1.6162143	1.988164971	
Phasing of Wells		0	1	0	0	0	1	
Well Cost		$0	$56,950	$0	$0	$0	$56,950.00	
Distribution Cost								
Length Dist. Pipe/Well	2600							
Total Length								
Pipe Diameter, in	8							
Head Loss/100 feet	0.134							
Depth to Water Surface	450							
Total Head Required	533							
Total Horsepower	54							
Cost of Pipeline	20	$0	$52,000	$0	$0	$0	52000	
Booster Station and Ground								
Storage per 3 wells		$0	$0	$0	$0	$0	0	
Total Capital Cost		$0	$108,950	$0	$0	$0	108950	
Engineering & Cont. (30%)		$0	$32,685	$0	$0	$0	$32,685	
Interest During Construction		$0	$5,902	$0	$0	$0	$5,902	
Total Cost		$0	$147,537	$0	$0	$0	$147,537	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	($12,863)	$0	$0	$0	($12,863)	
New Plus Existing		$0	($12,863)	($12,863)	($12,863)	$0	($12,863)	
O&M Cost								
Electricity		0	(2,996)	(7,677)	(12,592)	(17,086)	(21,018)	0
Operations		0	(3,128)	(8,015)	(13,147)	(17,839)	(21,945)	
Well O&M		$0	($1,424)	($1,424)	($1,424)	($1,424)	($2,848)	
Transmission Line O&M		$0	($520)	($520)	($520)	($520)	($1,040)	
Total Annual Cost		$0	($20,930)	($30,499)	($40,546)	($36,868)	($59,713)	($37,711)
Unit Cost, $/1000 gallons			($1.00)	($0.57)	($0.46)	($0.31)	($0.41)	($0.44)

Rusk County
Mining

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y					3	83	158	81
Well Design, gpm (2*Reqd)		0	0	0	4	103	196	
Supplied groundwater, MGD		0	0	0	0.0027	0.0741	0.1411	0.0726
County GW Parameters								
All. GPM/well	200							
Well Depth	750							
Cost /Well	$148,100							
No. of Wells		0	0	0	0.018597534	0.5145318	0.979470137	
Phasing of Wells		0	0	0	1		0	
Well Cost		$0	$0	$0	$148,100	$0	$0.00	
Distribution Cost								
Length Dist. Pipe/Well	200							
Total Length								
Pipe Diameter, in	6							
Head Loss/100 feet	0.346							
Depth to Water Surface	750							
Total Head Required	830.69							
Total Horsepower	59.93							
Cost of Pipeline	$15	$0	$0	$0	$3,000	$0	0	
Ground Storage and Pressure	$50,000	$0	$0	$0	$50,000	$0	$0	
Total Capital Cost		$0	$0	$0	$201,100	$0	0	
Engineering & Cont. (30%)		$0	$0	$0	$60,330	$0	$0	
Interest During Construction		$0	$0	$0	$10,893	$0	$0	
Total Cost		$0	$0	$0	$272,323	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	$0	$0	($23,742)	$0	$0	
New Plus Existing		$0	$0	$0	($23,742)	($23,742)	$0	
O&M Cost								
Electricity		0	0	0	(219)	(6,050)	(11,516)	
Operations					(147)	(4,057)	(7,722)	
Well O&M		$0	$0	$0	($3,703)	($3,703)	($3,703)	
Transmission Line O&M		$0	$0	$0	($530)	($530)	($530)	
Total Annual Cost		$0	$0	$0	($28,340)	($38,081)	($23,471)	($29,964)
Unit Cost, $/1000 gallons					($28.99)	($1.41)	($0.46)	($1.13)

Rusk County Steam-Electric: TXU Martin Lake
Supply from Lake Fork taken from Sabine River

	2000	2010	2020	2030	2040	2050	2060	Average
Required water, af/y			1500	1500	1500	6328	12228	4611
Distribution Design, gpm (1.5*Reqd)		0	1395	1395	1395	5884	11371	
Supplied water, MGD		0	1.34	1.34	1.34	5.65	10.92	4.1171
Distribution Cost								
Length Dist. Pipe	44400							
Pumping Rate	11400							
Pipe Diameter, in	24							
Head Loss/100 feet	0.372							
Lift Sabine River to High Point on Route	168							
Total Head Required	333.168							
Total Horsepower	1370							
Cost of Pipeline, per foot	66							
Pump Station and Intake	3000000							
Total Capital Cost	5930400	0	5930400	$0	$0	$0	0	
Engineering & Cont. (30%)		$0	$1,779,120	$0	$0	$0	$0	
Interest During Construction		$0	$321,233	$0	$0	$0	$0	
Total Cost		$0	$8,030,753	$0	$0	$0	$0	
Annual Cost								
New Debt Service,6%, 30yrs.		$0	($700,158)	$0	$0	$0	$0	
New Plus Existing		$0	($700,158)	($700,158)	$0	$0	$0	
O&M Cost								
Electricity		0	(43,850)	(43,850)	(43,850)	(184,988)	(357,465)	
O&M		$0	($75,000)	($75,000)	($75,000)	($75,000)	($75,000)	
Transmission Line		$0	($29,304)	($29,304)	($29,304)	($29,304)	($29,304)	
Cost of Water ($0.10/1000 gallons)		$0	($48,874)	($48,874)	($48,874)	($206,184)	($398,423)	
Total Annual Cost		$0	($848,312)	($848,312)	($197,028)	($495,477)	($860,192)	($649,864)
Unit Cost, $/1000 gallons			($1.74)	($1.74)	($0.40)	($0.24)	($0.22)	($0.43)

Rusk County Steam-Electric: Tenasca
Supply from Lake Fork taken from Toledo Bend

	2000	2010	2020	2030	2040	2050	2060	Average
Required water, af/y		5727	8198	22517	11274	13335	15846	12816
Distribution Design, gpm (1.5*Reqd)		5325.403932	7623.129288	20938.03393	10483.43005	12399.90596	14734.82638	
Supplied water, MGD		5.113392857	7.32	20.10	10.07	11.91	14.15	11.4430
Distribution Cost								
Length Dist. Pipe	214896							
Pumping Rate	11111							
Pipe Diameter, in	24							
Head Loss/100 feet	0.7							
Lift Sabine River to High Point on Route	328							
Total Head Required	1832.272							
Total Horsepower	7344							
Cost of Pipeline, per foot	66							
Pump Station and Intake	4700000							
Total Capital Cost	18883136	0	0	$0	$0	$0	0	
Engineering & Cont. (30%)	$5,664,941	$0	$0	$0	$0	$0	$0	
Interest During Construction	$1,022,845	$0	$0	$0	$0	$0	$0	
Total Cost	$25,570,922	$0	$0	$0	$0	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.	($2,229,389)		$0	$0	$0	$0	$0	
New Plus Existing		($2,229,389)	$0	$0	$0	$0	$0	
O&M Cost								
Electricity		(920,728)	(1,317,990)	(3,620,051)	(1,812,518)	(2,143,864)	(2,547,557)	
O&M		($117,500)	($117,500)	($117,500)	($117,500)	($117,500)	($117,500)	
Transmission Line		($29,304)	($29,304)	($29,304)	($29,304)	($29,304)	($29,304)	
Cost of Water ($0.10/1000 gallons)		($186,602)	($267,114)	($733,669)	($367,339)	($434,493)	($516,308)	
Total Annual Cost		($3,296,922)	($1,464,794)	($3,766,855)	($2,326,661)	($2,725,161)	($3,210,669)	($2,798,510)
Unit Cost, $/1000 gallons		($1.77)	($0.55)	($0.51)	($0.63)	($0.63)	($0.62)	($0.67)

Note: Facilities constructed in 2001

Table
Sabine County-Other
Install New Wells in Carrizo-Wilcox

Owner: County-Other
Quantity: 200 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	60 gpm	4	Ea.	$32,680	$130,700
Connection to Existing Distribution System		4	Ea.	$20,000	$80,000
Storage Tank (Closed)	10,000 Gal	4	Ea.	$7,500	$30,000
Engineering and Contingencies (35% for well field)					$84,200
Subtotal for Wellfield					**$324,900**
Transmission System	**ASSUME NO NEW TRANSMISSION**				
Pipeline - Rural	6 inch	0	LF	$15	$0
Pipeline - Urban	6 inch	0	LF	$23	$0
Pump Station	30 HP	0	LS	$250,000	$0
Easement - Rural	15 Feet	0	AC	$2,000	$0
Easement - Urban	15 Feet	0	AC	$20,000	$0
Engineering and Contingencies (30% for pipleines, 35% for other items)					$0
Subtotal for Transmission					**$0**
TOTAL CONSTRUCTION COST					**$324,900**
Interest During Construction			**(6 months)**		**$7,000**
Permitting and Mitigation					**$2,900**
Groundwater Rights/ Purchase					**$60,000**
TOTAL CAPITAL COST					**$394,800**
Annual Costs					
Debt Service (6 percent for 20 years)					$34,400
Electricity (Transmission)					$0
Well operation and treatment			Kgal	$0.15	$9,800
Operation and Maintenance of transmission					$0
Total Annual Cost					**$44,200**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$221**
Water Cost ($ per 1,000 gallons)					**$0.68**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$49**
Water Cost ($ per 1,000 gallons)					**$0.15**

SBCTY-3
Sabine County - Other
Purchase Water from City of Hemphill

Probable Owner:	Sabine County Other
Quantity:	200 AF/Y

CONSTRUCTION COSTS
TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline Rural	8 in.	26,400	LF	$20	$528,000
Pipeline Urban	8 in.	0	LF		$0
Right of Way Easements Rural (ROW)		9.1	ACRE	$2,000	$18,000
Right of Way Easements Urban (ROW)		0.0	ACRE	$20,000	$0
Engineering and Contingencies (30%)					$158,000
Subtotal of Pipeline					**$704,000**
Pump Station(s)					
Pump	6 HP	1	LS	$60,000	$60,000
Booster Pump Station	0 HP	0	LS	$0	$0
Engineering and Contingencies (35%)					$21,000
Subtotal of Pump Station(s)					**$81,000**
CONSTRUCTION TOTAL					**$785,000**
Permitting and Mitigation					**$7,000**
Interest During Construction			**(6 months)**		**$17,000**
TOTAL COST					**$809,000**
ANNUAL COSTS					
Debt Service (6% for 20 years)					$70,500
Electricity ($0.06 kWh)					$700
Operation & Maintenance					$8,000
Water Purchase Agreement with City			Kgal	$1.50	$97,800
Total Annual Costs					**$177,000**
UNIT COSTS (Until Amortized)					
Per Acre-Foot of treated water					$885
Per 1,000 Gallons					$2.71
UNIT COSTS (After Amortization)					
Per Acre-Foot					$533
Per 1,000 Gallons					$1.63

Notes: Cost for buying treated water is assumed to be $1.50 per 1,000 gallons

SBLIV-1
Sabine County Livestock
Increase Supply from Carrizo-Wilcox Aquifer

Owner:	Sabine County Livestock	
Quantity:	100	AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	40 gpm	3	Ea.	$22,800	$68,400
Connection to Pump Station		0	Ea.	$10,000	$0
Storage Tank (Closed)	0 Gal	0	Ea.	$0	$0
Engineering and Contingencies (35% for well field)					$23,900
Subtotal for Wellfield and Treatment					**$92,300**
TOTAL CONSTRUCTION COST					**$92,300**
Interest During Construction			**2 months**		**$800**
Permitting and Mitigation					**$0**
Groundwater Rights/ Purchase					**$30,000**
TOTAL CAPITAL COST					**$123,100**
Annual Costs					
Debt Service (6 percent for 20 years)					$10,700
Electricity (Transmission)					$0
Well operation and treatment			Kgal	$0.07	$2,300
Operation and Maintenance of transmission					$0
Total Annual Cost					**$13,000**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$130**
Water Cost ($ per 1,000 gallons)					**$0.40**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$23**
Water Cost ($ per 1,000 gallons)					**$0.07**

SBLIV-1
Sabine County Livestock
Increase Supply from Local Sources

Owner: Sabine County Livestock
Quantity: 300 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Stock Ponds					
Stock Ponds	25 AF/Y	12	Ea.	$25,000	$300,000
Engineering and Contingencies					$105,000
Subtotal for Local Supply					**$405,000**
TOTAL CONSTRUCTION COST					**$405,000**
Interest During Construction			**(6 months)**		**$8,800**
Permitting and Mitigation					**$0**
TOTAL CAPITAL COST					**$413,800**
Annual Costs					
Debt Service (6 percent for 20 years)					$36,100
Total Annual Cost					**$36,100**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$120**
Water Cost ($ per 1,000 gallons)					**$0.37**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$0**
Water Cost ($ per 1,000 gallons)					**$0.00**

SACTY-1
San Augustine County Other
Increase Supply from Carrizo-Wilcox Aquifer

Owner: San Augustine County Other
Quantity: 5 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	10 gpm	1	Ea.	$17,580	$17,600
Connection to System		1	Ea.	$10,000	$10,000
Storage Tank (Closed)	0 Gal	0	Ea.	$0	$0
Engineering and Contingencies (35% for well field)					$9,700
Subtotal for Wellfield and Treatment					**$37,300**
Transmission System	**ASSUME NO NEW TRANSMISSION**				
Pipeline - Rural	6 inch	0	LF	$15	$0
Pipeline - Urban	6 inch	0	LF	$23	$0
Pump Station	2.5 HP	0	LS	$25,000	$0
Easement - Rural	20 Feet	0	AC	$2,000	$0
Easement - Urban	20 Feet	0	AC	$20,000	$0
Engineering and Contingencies (30% for pipleines, 35% for other items)					$0
Subtotal for Transmission					**$0**
TOTAL CONSTRUCTION COST					**$37,300**
Interest During Construction			**(2 months)**		**$300**
Permitting and Mitigation					**$300**
Groundwater Rights/ Purchase					**$1,500**
TOTAL CAPITAL COST					**$39,400**
Annual Costs					
Debt Service (6 percent for 20 years)					$3,400
Electricity (Transmission)					$0
Well operation and treatment			Kgal	$0.15	$240
Operation and Maintenance of transmission					$0
Total Annual Cost					**$3,640**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$728**
Water Cost ($ per 1,000 gallons)					**$2.23**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$48**
Water Cost ($ per 1,000 gallons)					**$0.15**

SAIRR-2
San Augustine County Irrigation
Increase Supply from Carrizo-Wilcox Aquifer

Owner:	San Augustine County Irrigation
Quantity:	100 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	60 gpm	2	Ea.	$18,400	$36,800
Connection to Pump Station		0	Ea.	$10,000	$0
Storage Tank (Closed)	0 Gal	0	Ea.	$0	$0
Engineering and Contingencies (35% for well field)					$12,900
Subtotal for Wellfield and Treatment					**$49,700**
Transmission System	**ASSUME NO NEW TRANSMISSION**				
TOTAL CONSTRUCTION COST					**$49,700**
Interest During Construction			**(2 months)**		**$400**
Permitting and Mitigation					**$0**
Groundwater Rights/ Purchase					**$30,000**
TOTAL CAPITAL COST					**$80,100**
Annual Costs					
Debt Service (6 percent for 20 years)					$7,000
Well operation and treatment			Kgal	$0.07	$2,300
Total Annual Cost					**$9,300**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$93**
Water Cost ($ per 1,000 gallons)					**$0.29**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$23**
Water Cost ($ per 1,000 gallons)					**$0.07**

SALIV-1
San Augustine County Livestock
Increase Supply from Local Sources

Owner: San Augustine County Livestock
Quantity: 300 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Stock Ponds					
Stock Ponds	25 AF/Y	12	Ea.	$25,000	$300,000
Engineering and Contingencies					$105,000
Subtotal for Local Supply					**$405,000**
TOTAL CONSTRUCTION COST					**$405,000**
Interest During Construction			**(6 months)**		**$8,800**
Permitting and Mitigation					**$0**
TOTAL CAPITAL COST					**$413,800**
Annual Costs					
Debt Service (6 percent for 20 years)					$36,100
Total Annual Cost					**$36,100**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$120**
Water Cost ($ per 1,000 gallons)					**$0.37**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$0**
Water Cost ($ per 1,000 gallons)					**$0.00**

SALIV-1
San Augustine County Livestock (Sabine Basin)
Increase Supply from Carrizo-Wilcox Aquifer (Sabine Basin)

Owner: San Augustine County Livestock
Quantity: 100 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	40 gpm	3	Ea.	$13,440	$40,300
Connection to Pump Station		0	Ea.	$0	$0
Storage Tank (Closed)	0 Gal	0	Ea.	$0	$0
Engineering and Contingencies (35% for well field)					$14,100
Subtotal for Wellfield and Treatment					**$54,400**
Transmission System	**ASSUME NO NEW TRANSMISSION**				
TOTAL CONSTRUCTION COST					**$54,400**
Interest During Construction			**(2 months)**		**$500**
Permitting and Mitigation					**$0**
Groundwater Rights/ Purchase					**$30,000**
TOTAL CAPITAL COST					**$84,900**
Annual Costs					
Debt Service (6 percent for 20 years)					$7,400
Well operation and treatment			Kgal	$0.07	$2,300
Total Annual Cost					**$9,700**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$97**
Water Cost ($ per 1,000 gallons)					**$0.30**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$23**
Water Cost ($ per 1,000 gallons)					**$0.07**

SALIV-1
San Augustine County Livestock (Neches Basin)
Increase Supply from Carrizo-Wilcox Aquifer (Neches Basin)

Owner:	San Augustine County Livestock
Quantity:	300 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	60 gpm	6	Ea.	$14,800	$88,800
Connection to Pump Station		0	Ea.	$0	$0
Storage Tank (Closed)	0 Gal	0	Ea.	$0	$0
Engineering and Contingencies (35% for well field)					$31,100
Subtotal for Wellfield and Treatment					**$119,900**
Transmission System	**ASSUME NO NEW TRANSMISSION**				
TOTAL CONSTRUCTION COST					**$119,900**
Interest During Construction			**(2 months)**		**$1,000**
Permitting and Mitigation					**$0**
Groundwater Rights/ Purchase					**$90,000**
TOTAL CAPITAL COST					**$210,900**
Annual Costs					
Debt Service (6 percent for 20 years)					$18,400
Well operation and treatment			Kgal	$0.07	$6,800
Total Annual Cost					**$25,200**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$84**
Water Cost ($ per 1,000 gallons)					**$0.26**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$23**
Water Cost ($ per 1,000 gallons)					**$0.07**

SAMAN-1
San Augustine County Manufacturing
Increase Supply from Carrizo-Wilcox Aquifer

Owner: San Augustine County Manufacturing
Quantity: 10 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	20 gpm	1	Ea.	$12,080	$12,100
Connection to Existing System		1	Ea.	$10,000	$10,000
Storage Tank (Closed)	10,000 Gal	0	Ea.	$0	$0
Engineering and Contingencies (35% for well field)					$7,700
Subtotal for Wellfield and Treatment					**$29,800**
Transmission System	**ASSUME NO NEW TRANSMISSION**				
TOTAL CONSTRUCTION COST					**$29,800**
Interest During Construction			**(2 months)**		**$200**
Permitting and Mitigation					**$300**
Groundwater Rights/ Purchase					**$3,000**
TOTAL CAPITAL COST					**$33,300**
Annual Costs					
Debt Service (6 percent for 20 years)					$2,900
Well operation and treatment			Kgal	$0.07	$230
Total Annual Cost					**$3,130**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$313**
Water Cost ($ per 1,000 gallons)					**$0.96**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$23**
Water Cost ($ per 1,000 gallons)					**$0.07**

SHCTY-2
Shelby County Other
Increase Supply from Carrizo-Wilcox Aquifer

Owner: Shelby County Other
Quantity: 350 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	120 gpm	4	Ea.	$28,360	$113,400
Connection to Pump Station		4	Ea.	$20,000	$80,000
Storage Tank (Closed)	25,000 Gal	4	Ea.	$20,000	$80,000
Engineering and Contingencies (35% for well field)					$95,700
Subtotal for Wellfield and Treatment					**$369,100**
Transmission System					
Pipeline - Rural	6 inch	26,400	LF	$15	$396,000
Pipeline - Urban	6 inch	0	LF	$23	$0
Pump Station	25.0 HP	2	LS	$250,000	$500,000
Easement - Rural	15 Feet	9	AC	$2,000	$18,200
Easement - Urban	15 Feet	0	AC	$20,000	$0
Engineering and Contingencies (30% for pipleines, 35% for other items)					$293,800
Subtotal for Transmission					**$1,208,000**
TOTAL CONSTRUCTION COST					**$1,577,100**
Interest During Construction			**(6 months)**		**$26,200**
Permitting and Mitigation					**$8,000**
Groundwater Rights/ Purchase					**$52,500**
TOTAL CAPITAL COST					**$1,663,800**
Annual Costs					
Debt Service (6 percent for 20 years)					$145,100
Electricity (Transmission)					$2,000
Well operation and treatment			Kgal	$0.15	$17,100
Operation and Maintenance of transmission					$19,800
Total Annual Cost					**$184,000**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$526**
Water Cost ($ per 1,000 gallons)					**$1.61**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$111**
Water Cost ($ per 1,000 gallons)					**$0.34**

SHCTY-3
Shelby County - Other
Purchase Water from Sabine River Authority

Probable Owner: Shelby County Other
Quantity: 150 AF/Y

CONSTRUCTION COSTS
TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Rural	6 in.	26,400	LF	$15	$396,000
Pipeline Urban	6 in.	0	LF		$0
Right of Way Easements Rural (ROW)		9.1	ACRE	$2,000	$18,000
Right of Way Easements Urban (ROW)		0.0	ACRE	$20,000	$0
Engineering and Contingencies (30%)					$119,000
Subtotal of Pipeline					**$533,000**
Pump Station(s)					
Pump Station and Intake	8 HP	1	LS	$112,000	$112,000
Booster Pump Station	0 HP	0	LS	$0	$0
Engineering and Contingencies (35%)					$39,200
Subtotal of Pump Station(s)					**$151,200**
Surface Water Treatment					
Water treatment plant	0.25 MGD	1	LS	$1,000,000	$1,000,000
CONSTRUCTION TOTAL					**$1,684,200**
Permitting and Mitigation					**$18,000**
Interest During Construction			**(12 months)**		**$70,000**
TOTAL COST					**$1,772,200**
ANNUAL COSTS					
Debt Service (6% for 20 years)					$154,500
Electricity ($0.06 kWh)					$700
Operation & Maintenance					$8,000
Water Purchase Agreement with SRA			Kgal	$0.25	$12,200
Treatment Costs			Kgal	$0.35	$17,100
Total Annual Costs					**$192,500**
UNIT COSTS (Until Amortized)					
Per Acre-Foot of treated water					$1,283
Per 1,000 Gallons					$3.94
UNIT COSTS (After Amortization)					
Per Acre-Foot					$253
Per 1,000 Gallons					$0.43

Notes: Cost for buying treated water is assumed to be $1.50 per 1,000 gallons

SHLIV-1
Shelby County Livestock
Increase Supply from Carrizo-Wilcox Aquifer (Sabine Basin)

Owner:	Shelby County Livestock	
Quantity:	2,000	AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	300 gpm	8	Ea.	$38,430	$307,400
Engineering and Contingencies (35% for well field)					$107,600
Subtotal for Wellfield and Treatment					**$415,000**
Transmission System	**ASSUME NO NEW TRANSMISSION**				
TOTAL CONSTRUCTION COST					**$415,000**
Interest During Construction			**(2 months)**		**$3,500**
Permitting and Mitigation					**$0**
Groundwater Rights/ Purchase					**$600,000**
TOTAL CAPITAL COST					**$1,018,500**
Annual Costs					
Debt Service (6 percent for 20 years)					$88,800
Well operation and treatment			Kgal	$0.07	$45,600
Total Annual Cost					**$134,400**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$67**
Water Cost ($ per 1,000 gallons)					**$0.21**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$23**
Water Cost ($ per 1,000 gallons)					**$0.07**

SHLIV-1
Shelby County Livestock
Increase Supply from Carrizo-Wilcox Aquifer (Neches Basin)

Owner:	Shelby County Livestock
Quantity:	1,500 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Wellfield and Treatment					
Wells	300 gpm	6	Ea.	$38,430	$230,600
Engineering and Contingencies (35% for well field)					$80,700
Subtotal for Wellfield and Treatment					**$311,300**
Transmission System	**ASSUME NO NEW TRANSMISSION**				
TOTAL CONSTRUCTION COST					**$311,300**
Interest During Construction			**(2 months)**		**$2,600**
Permitting and Mitigation					**$0**
Groundwater Rights/ Purchase					**$450,000**
TOTAL CAPITAL COST					**$763,900**
Annual Costs					
Debt Service (6 percent for 20 years)					$66,600
Well operation and treatment			Kgal	$0.07	$34,200
Total Annual Cost					**$100,800**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$67**
Water Cost ($ per 1,000 gallons)					**$0.21**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$23**
Water Cost ($ per 1,000 gallons)					**$0.07**

SALIV-1
Shelby County Livestock
Increase Supply from Local Sources

Owner: Shelby County Livestock
Quantity: 500 AF/Y

Item	Size	Quantity	Unit	Unit Price	Cost
Capital Costs					
Stock Ponds					
Stock Ponds	50 AF/Y	10	Ea.	$40,000	$400,000
Engineering and Contingencies					$140,000
Subtotal for Local Supply					**$540,000**
TOTAL CONSTRUCTION COST					**$540,000**
Interest During Construction			**(6 months)**		**$11,700**
Permitting and Mitigation					**$0**
TOTAL CAPITAL COST					**$551,700**
Annual Costs					
Debt Service (6 percent for 20 years)					$48,100
Total Annual Cost					**$48,100**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$96**
Water Cost ($ per 1,000 gallons)					**$0.30**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$0**
Water Cost ($ per 1,000 gallons)					**$0.00**

SHLIV-2
Shelby County - Livestock
Purchase Water from Toledo Bend Reservoir

Probable Owner:	Shelby County Livestock
Quantity:	4,000 AF/Y

CONSTRUCTION COSTS
TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Rural	20 in.	26,400	LF	$51	$1,346,000
Pipeline Urban	20 in.	0	LF	$77	$0
Right of Way Easements Rural (ROW)		12.1	ACRE	$2,000	$24,000
Right of Way Easements Urban (ROW)		0.0	ACRE	$20,000	$0
Engineering and Contingencies (30%)					$404,000
Subtotal of Pipeline					**$1,774,000**
Pump Station(s)					
Pump with intake & building	110 HP	1	LS	$900,000	$900,000
Booster Pump Station	0 HP	0	LS	$0	$0
Engineering and Contingencies (35%)					$315,000
Subtotal of Pump Station(s)					**$1,215,000**
CONSTRUCTION TOTAL					**$2,989,000**
Permitting and Mitigation					**$27,000**
Interest During Construction			**(12 months)**		**$125,000**
TOTAL COST					**$3,141,000**
ANNUAL COSTS					
Debt Service (6% for 20 years)					$274,000
Electricity ($0.06 kWh)					$32,000
Operation & Maintenance					$43,000
Raw Water Purchase			Kgal	$0.25	$326,000
Total Annual Costs					**$675,000**
UNIT COSTS (Until Amortized)					
Per Acre-Foot of raw water					$169
Per 1,000 Gallons					$0.52
UNIT COSTS (After Amortization)					
Per Acre-Foot					$100
Per 1,000 Gallons					$0.31

SMITH COUNTY

Bullard

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y			13	42	71	124	195	89
Well Design, gpm (2*Reqd)		0	16	52	88	154	242	
Supplied groundwater, MGD		0.0000	0.0116	0.0375	0.0634	0.1107	0.1741	0.0795
County GW Parameters								
All. GPM/well	125							
Well Depth	800							
Cost /Well	60500							
No. of Wells		0	0.1289429	0.41658477	0.7042266	1.22991693	1.93414356	
Phasing of Wells			1			1		
Well Cost		$0	$60,500	$0	$0	$60,500	$0.00	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	6							
Head Loss/100 feet	0.132							
Depth to Water Surface	800							
Total Head Required	887							
Total Horsepower	40							
Cost of Pipeline	15	$0	$79,200	$0	$0	$79,200	0	
Ground Storage and Pressure	0	$0	$0	$0	$0	$0	$0	
Total Capital Cost		$0	$139,700	$0	$0	$139,700	0	
Engineering & Cont. (30%)		$0	$41,910	$0	$0	$41,910	$0	
Interest During Construction		$0	$7,567	$0	$0	$7,567	$0	
Total Cost		$0	$189,177	$0	$0	$189,177	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	($16,493)	$0	$0	($16,493)	$0	
New Plus Existing		$0	($16,493)	($16,493)	$0	($16,493)	($16,493)	
O&M Cost								
Electricity		0	(1,012)	(3,269)	(5,526)	(9,650)	(15,176)	
Operations		0	(635)	(2,053)	(3,470)	(6,060)	(9,530)	
Well O&M		$0	($1,513)	($1,513)	($1,513)	($3,025)	($3,025)	
Transmission Line O&M		$0	($792)	($792)	($792)	($1,584)	($1,584)	
Total Annual Cost		$0	($20,445)	($24,119)	($11,300)	($36,813)	($45,809)	($27,697)
Unit Cost, $/1000 gallons			($4.83)	($1.76)	($0.49)	($0.91)	($0.72)	($0.95)

SMITH COUNTY

Community Water Co.

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y		37	88	111	132	171	227	128
Well Design, gpm (2*Reqd)		46	109	138	164	212	281	
Supplied groundwater, MGD		0.0330	0.0786	0.0991	0.1179	0.1527	0.2027	0.1140
County GW Parameters								
All. GPM/well	150							
Well Depth	1000							
Cost /Well	89750							
No. of Wells		0.3058261	0.7273702	0.91747836	1.0910553	1.4134126	1.87628457	
Phasing of Wells		1					1	
Well Cost		$89,750	$0	$0	$0	$0	$89,750	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	6							
Head Loss/100 feet	0.226							
Depth to Water Surface	1000							
Total Head Required	1092							
Total Horsepower	59							
Cost of Pipeline	15	$79,200	$0	$0	$0	$0	79200	
Ground Storage and Pressure	200000	$200,000	$0	$0	$0	$0	$0	
Total Capital Cost		$368,950	$0	$0	$0	$0	168950	
Engineering & Cont. (30%)		$110,685	$0	$0	$0	$0	$50,685	
Interest During Construction		$19,985	$0	$0	$0	$0	$9,152	
Total Cost		$499,620	$0	$0	$0	$0	$228,787	
Annual Cost								
New Debt Service,6%, 20yrs.		($43,559)	$0	$0	$0	$0	($19,947)	
New Plus Existing		($43,559)	($43,559)	$0	$0	$0	($19,947)	
O&M Cost								
Electricity		(3,545)	(8,431)	(10,635)	(12,647)	(16,383)	(21,749)	
Operations		(1,808)	(4,301)	(5,425)	(6,451)	(8,358)	(11,094)	
Well O&M		($2,244)	($2,244)	($2,244)	($2,244)	($2,244)	($4,488)	
Transmission Line O&M		($2,792)	($2,792)	($2,792)	($2,792)	($2,792)	($3,584)	
Total Annual Cost		($53,948)	($61,327)	($21,096)	($24,134)	($29,777)	($60,861)	($41,857)
Unit Cost, $/1000 gallons		($4.47)	($2.14)	($0.58)	($0.56)	($0.53)	($0.82)	($1.01)

SMITH COUNTY

Dean WSC

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y			21	68	112	200	328	146
Well Design, gpm (2*Reqd)		0	26	84	139	248	407	
Supplied groundwater, MGD		0.0000	0.0188	0.0607	0.1000	0.1786	0.2929	0.1302
County GW Parameters								
All. GPM/well	210							
Well Depth	850							
Cost /Well	82400							
No. of Wells		0	0.1239836	0.40147058	0.6612457	1.18079583	1.93650515	
Phasing of Wells			1				1	
Well Cost		$0	$82,400	$0	$0	$0	$82,400	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	8							
Head Loss/100 feet	0.134							
Depth to Water Surface	850							
Total Head Required	937							
Total Horsepower	71							
Cost of Pipeline	20	$0	$105,600	$0	$0	$0	105600	
Ground Storage and Pressure	200000	$0	$200,000	$0	$0	$0	$0	
Total Capital Cost		$0	$388,000	$0	$0	$0	188000	
Engineering & Cont. (30%)		$0	$116,400	$0	$0	$0	$56,400	
Interest During Construction		$0	$21,017	$0	$0	$0	$10,183	
Total Cost		$0	$525,417	$0	$0	$0	$254,583	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	($45,808)	$0	$0	$0	($22,196)	
New Plus Existing		$0	($45,808)	($45,808)	$0	$0	($22,196)	
O&M Cost								
Electricity		0	(1,727)	(5,591)	(9,209)	(16,444)	(26,969)	
Operations		0	(1,026)	(3,323)	(5,474)	(9,775)	(16,031)	
Well O&M		$0	($2,060)	($2,060)	($2,060)	($2,060)	($4,120)	
Transmission Line O&M		$0	($3,056)	($3,056)	($3,056)	($3,056)	($4,112)	
Total Annual Cost		$0	($53,677)	($59,839)	($19,799)	($31,335)	($73,427)	($47,616)
Unit Cost, $/1000 gallons			($7.84)	($2.70)	($0.54)	($0.48)	($0.69)	($1.00)

SMITH COUNTY

Jackson WSC

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y						28	68	48
Well Design, gpm (2*Reqd)		0	0	0	0	35	84	
Supplied groundwater, MGD		0.0000	0.0000	0.0000	0.0000	0.0250	0.0607	0.0429
County GW Parameters								
All. GPM/well	85							
Well Depth	900							
Cost /Well	63780							
No. of Wells		0	0	0	0	0.40841644	0.99186849	
Phasing of Wells						1		
Well Cost		$0	$0	$0	$0	$63,780	$0.00	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	6							
Head Loss/100 feet	0.062							
Depth to Water Surface	900							
Total Head Required	983							
Total Horsepower	30							
Cost of Pipeline	15	$0	$0	$0	$0	$79,200	0	
Ground Storage and Pressure	250000	$0	$0	$0	$0	$250,000	$0	
Total Capital Cost		$0	$0	$0	$0	$392,980	0	
Engineering & Cont. (30%)		$0	$0	$0	$0	$117,894	$0	
Interest During Construction		$0	$0	$0	$0	$21,287	$0	
Total Cost		$0	$0	$0	$0	$532,161	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	$0	$0	$0	($46,396)	$0	
New Plus Existing		$0	$0	$0	$0	($46,396)	($46,396)	
O&M Cost								
Electricity		0	0	0	0	(2,416)	(5,867)	
Operations		0	0	0	0	(1,368)	(3,323)	
Well O&M		$0	$0	$0	$0	($1,595)	($1,595)	
Transmission Line O&M		$0	$0	$0	$0	($3,292)	($3,292)	
Total Annual Cost		$0	$0	$0	$0	($55,067)	($60,473)	($57,770)
Unit Cost, $/1000 gallons						($6.03)	($2.73)	($3.69)

SMITH COUNTY
Lindale

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y					8	33	59	33
Well Design, gpm (2*Reqd)		0	0	0	10	41	73	
Supplied groundwater, MGD		0.0000	0.0000	0.0000	0.0071	0.0295	0.0527	0.0298
County GW Parameters								
All. GPM/well	75							
Well Depth	1200							
Cost /Well	81100							
No. of Wells		0	0	0	0.1322491	0.54552767	0.97533735	
Phasing of Wells					1			
Well Cost		$0	$0	$0	$81,100	$0	$0	
Distribution Cost								
Length Dist. Pipe/Well								
Total Length								
Pipe Diameter, in								
Head Loss/100 feet	0.062							
Depth to Water Surface	1200							
Total Head Required	1280							
Total Horsepower	35							
Cost of Pipeline		$0	$0	$0	$10,000	$0	0	
Ground Storage and Pressure		$0	$0	$0	$0	$0	$0	
Total Capital Cost		$0	$0	$0	$91,100	$0	0	
Engineering & Cont. (30%)		$0	$0	$0	$27,330	$0	$0	
Interest During Construction		$0	$0	$0	$4,935	$0	$0	
Total Cost		$0	$0	$0	$123,365	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	$0	$0	($10,755)	$0	$0	
New Plus Existing		$0	$0	$0	($10,755)	($10,755)	$0	
O&M Cost								
Electricity		0	0	0	(898)	(3,706)	(6,626)	
Operations		0	0	0	(391)	(1,613)	(2,884)	
Well O&M		$0	$0	$0	($2,028)	($2,028)	($2,028)	
Transmission Line O&M		$0	$0	$0	($100)	($100)	($100)	
Total Annual Cost		$0	$0	$0	($14,172)	($18,202)	($11,637)	($14,671)
Unit Cost, $/1000 gallons					($5.44)	($1.69)	($0.61)	($1.35)

SMITH COUNTY
Lindale Rural WSC

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y							74	74
Well Design, gpm (2*Reqd)		0	0	0	0	0	92	
Supplied groundwater, MGD		0.0000	0.0000	0.0000	0.0000	0.0000	0.0661	0.0661
County GW Parameters								
All. GPM/well	100							
Well Depth	1200							
Cost /Well	82800							
No. of Wells		0	0	0	0	0	0.91747836	
Phasing of Wells							1	
Well Cost		$0	$0	$0	$0	$0	$82,800	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	6							
Head Loss/100 feet	0.094							
Depth to Water Surface	1200							
Total Head Required	1285							
Total Horsepower	46							
Cost of Pipeline	20	$0	$0	$0	$0	$0	105600	
Ground Storage and Pressure		$0	$0	$0	$0	$0	$0	
Total Capital Cost		$0	$0	$0	$0	$0	188400	
Engineering & Cont. (30%)		$0	$0	$0	$0	$0	$56,520	
Interest During Construction		$0	$0	$0	$0	$0	$10,205	
Total Cost		$0	$0	$0	$0	$0	$255,125	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	$0	$0	$0	$0	($22,243)	
New Plus Existing		$0	$0	$0	$0	$0	($22,243)	
O&M Cost								
Electricity		0	0	0	0	0	(8,343)	
Operations		0	0	0	0	0	(3,617)	
Well O&M		$0	$0	$0	$0	$0	($2,070)	
Transmission Line O&M		$0	$0	$0	$0	$0	($1,056)	
Total Annual Cost		$0	$0	$0	$0	$0	($37,329)	($37,329)
Unit Cost, $/1000 gallons							($1.55)	($1.55)

SMITH COUNTY
RPM WSC

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y							2	2
Well Design, gpm (2*Reqd)		0	0	0	0	0	2	
Supplied groundwater, MGD		0.0000	0.0000	0.0000	0.0000	0.0000	0.0018	0.0018
County GW Parameters								
All. GPM/well	30							
Well Depth	450							
Cost /Well	33040							
No. of Wells		0	0	0	0	0	0.08265571	
Phasing of Wells							1	
Well Cost		$0	$0	$0	$0	$0	$33,040	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in								
Head Loss/100 feet	0.027							
Depth to Water Surface	450							
Total Head Required	531							
Total Horsepower	6							
Cost of Pipeline		$0	$0	$0	$0	$0	10000	
Ground Storage and Pressure		$0	$0	$0	$0	$0	$0	
Total Capital Cost		$0	$0	$0	$0	$0	43040	
Engineering & Cont. (30%)		$0	$0	$0	$0	$0	$12,912	
Interest During Construction		$0	$0	$0	$0	$0	$2,331	
Total Cost		$0	$0	$0	$0	$0	$58,283	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	$0	$0	$0	$0	($5,081)	
New Plus Existing		$0	$0	$0	$0	$0	($5,081)	
O&M Cost								
Electricity		0	0	0	0	0	(93)	
Operations		0	0	0	0	0	(98)	
Well O&M		$0	$0	$0	$0	$0	($826)	
Transmission Line O&M		$0	$0	$0	$0	$0	($100)	
Total Annual Cost		$0	$0	$0	$0	$0	($6,198)	($6,198)
Unit Cost, $/1000 gallons							($9.51)	($9.51)

SMITH COUNTY
Smith County Irrigation

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y		5	34	65	96	128	162	82
Well Design, gpm (2*Reqd)		6	42	81	119	159	201	
Supplied groundwater, MGD		0.0045	0.0304	0.0580	0.0857	0.1143	0.1446	0.0729
County GW Parameters								
All. GPM/well	50							
Well Depth	500							
Cost /Well	47050							
No. of Wells		0.1239836	0.8430882	1.6117863	2.3804844	3.17397918	4.0170674	
Phasing of Wells		1		1	1	1		
Well Cost		$47,050	$0	$47,050	$47,050	$47,050	$0.00	
Distribution Cost								
Length Dist. Pipe/Well								
Total Length								
Pipe Diameter, in								
Head Loss/100 feet	0.027							
Depth to Water Surface	500							
Total Head Required	580							
Total Horsepower	10							
Cost of Pipeline		$10,000	$0	$10,000	$10,000	$10,000	0	
Ground Storage and Pressure		$0	$0	$0	$0	$0	$0	
Total Capital Cost		$57,050	$0	$57,050	$57,050	$57,050	0	
Engineering & Cont. (30%)		$17,115	$0	$17,115	$17,115	$17,115	$0	
Interest During Construction		$3,090	$0	$3,090	$3,090	$3,090	$0	
Total Cost		$77,255	$0	$77,255	$77,255	$77,255	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		($6,735)	$0	($6,735)	($6,735)	($6,735)	$0	
New Plus Existing		($6,735)	($6,735)	($6,735)	($13,471)	($13,471)	($6,735)	
O&M Cost								
Electricity		(254)	(1,730)	(3,308)	(4,886)	(6,514)	(8,244)	
Well O&M		($1,176)	($1,176)	($2,353)	($3,529)	($4,705)	($4,705)	
Transmission Line O&M		($100)	($100)	($200)	($300)	($400)	($400)	
Total Annual Cost		($8,266)	($9,742)	($12,596)	($22,185)	($25,090)	($20,085)	($16,327)
Unit Cost, $/1000 gallons		($5.07)	($0.88)	($0.59)	($0.71)	($0.60)	($0.38)	($0.61)

SMITH COUNTY
Smith County Mining

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y		47	126	159	215	255	288	182
Well Design, gpm (2*Reqd)		58	156	197	267	316	357	
Supplied groundwater, MGD		0.0420	0.1125	0.1420	0.1920	0.2277	0.2571	0.1622
County GW Parameters								
All. GPM/well	55							
Well Depth	500							
Cost /Well	37740							
No. of Wells		1.0594959	2.8403507	3.58425205	4.8466301	5.74832877	6.49223014	
Phasing of Wells		1	2	1	1	1	1	
Well Cost		$37,740	$75,480	$37,740	$37,740	$37,740	$37,740	
Distribution Cost								
Length Dist. Pipe/Well								
Total Length								
Pipe Diameter, in								
Head Loss/100 feet	0.027							
Depth to Water Surface	500							
Total Head Required	580							
Total Horsepower	12							
Cost of Pipeline		$10,000	$20,000	$10,000	$10,000	$10,000	10000	
Ground Storage and Pressure		$0	$0	$0	$0	$0	$0	
Total Capital Cost		$47,740	$95,480	$47,740	$47,740	$47,740	47740	
Engineering & Cont. (30%)		$14,322	$28,644	$14,322	$14,322	$14,322	$14,322	
Interest During Construction		$2,586	$5,172	$2,586	$2,586	$2,586	$2,586	
Total Cost		$64,648	$129,296	$64,648	$64,648	$64,648	$64,648	
Annual Cost								
New Debt Service,6%, 20yrs.		($5,636)	($11,273)	($5,636)	($5,636)	($5,636)	($5,636)	
New Plus Existing		($5,636)	($16,909)	($16,909)	($11,273)	($11,273)	($11,273)	
O&M Cost								
Electricity		(2,392)	(6,412)	(8,092)	(10,942)	(12,977)	(14,657)	
Well O&M		($944)	($2,831)	($3,774)	($4,718)	($5,661)	($6,605)	
Transmission Line O&M		($100)	($300)	($400)	($500)	($600)	($700)	
Total Annual Cost		($9,072)	($26,452)	($29,175)	($27,432)	($30,511)	($33,234)	($25,979)
Unit Cost, $/1000 gallons		($0.59)	($0.64)	($0.56)	($0.39)	($0.37)	($0.35)	($0.44)

TYLER COUNTY

County Other

	2000	2010	2020	2030	2040	2050	2060	Average
Required groundwater, af/y			142	239	251	232	232	219.2
Well Design, gpm (2*Reqd)		0	176	296	311	288	288	
Supplied groundwater, MGD		0.0000	0.1268	0.2134	0.2241	0.2071	0.2071	0.1957
County GW Parameters								
All. GPM/well (100)	85							
Well Depth	355							
Cost /Well	31080							
No. of Wells		0	2.07125479	3.486126027	3.661161644	3.384021918	3.384021918	
Phasing of Wells		0	3	1	0	0	0	
Well Cost		$0	$93,240	$31,080	$0	$0	$0.00	
Distribution Cost								
Length Dist. Pipe/Well	5280							
Total Length								
Pipe Diameter, in	4							
Head Loss/100 feet	0.42							
Depth to Water Surface	355							
Total Head Required	457							
Total Horsepower	14							
Cost of Pipeline	15	$0	$237,600	$79,200	$0	$0	0	
Booster Station and Ground								
Storage per 3 wells		$0	$0	$0	$0	$0	0	
Total Capital Cost		$0	$330,840	$110,280	$0	$0	0	
Engineering & Cont. (30%)		$0	$99,252	$33,084	$0	$0	$0	
Interest During Construction		$0	$17,921	$5,974	$0	$0	$0	
Total Cost		$0	$448,013	$149,338	$0	$0	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	($39,060)	($13,020)	$0	$0	$0	
New Plus Existing		$0	($39,060)	($52,080)	($13,020)	$0	$0	
O&M Cost								
Electricity		0	(5,696)	(9,587)	(10,069)	(9,306)	(9,306)	
Operations		0	(6,940)	(11,681)	(12,267)	(11,339)	(11,339)	
Well O&M		$0	($2,331)	($3,108)	($3,108)	($3,108)	($3,108)	
Transmission Line O&M		$0	($2,376)	($3,168)	($3,168)	($3,168)	($3,168)	
Total Annual Cost		$0	($56,403)	($79,624)	($41,632)	($26,921)	($26,921)	($46,300)
Unit Cost, $/1000 gallons			($1.22)	($1.02)	($0.51)	($0.36)	($0.36)	($0.65)

Lake Columbia Cost Summary

	Supply	Capital Cost	Annual Cost w/ Amortization	Annual Cost After Amortization	W/ amortization $/ac-ft	$/1000 gal
Lake	75,500	$ 178,941,580	$ 15,684,035	$ 2,684,124	$ 208	$ 0.64
Treatment Plant	35,913	$ 115,928,146	$ 13,396,573	$ 4,974,519	$ 373	$ 1.14
Distribution	49,594	$ 92,237,800	$ 9,174,501	$ 2,688,563	$ 185	$ 0.57
Totals		*$ 387,107,526*	*$ 38,255,108*	*$ 10,347,206*	*$ 766*	*$ 2.35*

Lake Columbia Construction and Treatment

CAPITAL COSTS		**Cost**
Lake		
Dam (w/ 35% engineering and contingency)	$	34,484,378
Conflict Resolution (w/ 25% contingency)	$	76,580,990
Land Acquisition (w/ 20% contingency)	$	25,158,207
Mitigation Allowance (unknown contingency)	$	23,307,820
Lake Subtotal	**$**	**159,531,395**
Interest During Construction	$	19,410,185
TOTAL CAPITAL COST	***$***	***178,941,580***
ANNUAL COSTS		
Debt Service	$	12,999,911
Lake O&M (1.5%)	$	2,684,124
TOTAL ANNUAL COST	***$***	***15,684,035***
Cost per acre-ft	$	208
Cost per 1000 gallons	$	0.64

Lake Columbia Construction and Treatment

CAPITAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**	**Cost**	
Water Treatment						
Water Treatment		65	MGD		$	62,500,000
Site Acquisition		20	acre	$ 1,000	$	60,000
Engineering and Continencies		35%		$ 1,000	$	21,875,000
Water Treatment Subtotal					**$**	**84,435,000**
Transmission Facilities						
Pipeline from Lake to Treatment		11560	ft	$ 224	$	2,589,440
Right of Way Easements		11560	ft	$ 1	$	11,560
Storage Tank				$ -	$	-
Engineering and Contingencies (30%)					$	776,832
Pipeline Subtotal					**$**	**3,377,832**
Raw Water Intake Structure and Pump Station					$	10,753,360
Engineering and Contingencies (35%)					$	3,763,676
Pump Station Subtotal					**$**	**14,517,036**
Permitting & Mitigation			ft	1%	$	1,023,299
Env. And Arch. Subtotal					**$**	**1,023,299**
Interest During Construction					$	12,574,980
TOTAL CAPITAL COST					***$***	***115,928,146***

ANNUAL COSTS	**Size**	**Quantity**	**Units**	**Unit Price**		**2010 Cost**
Debt Service					$	8,422,054
Pipeline O&M (1%)					$	25,894
Pump O&M (2.5%)					$	268,834
Chemicals		11702287	1000 gal	$ 0.35	$	4,095,800
Electricity					$	583,990
TOTAL ANNUAL COST w/ AMORTIZATION					***$***	***13,396,573***
TOTAL ANNUAL COST AFTER AMORTIZATION					***$***	***4,974,519***
Cost per acre-ft					$	373
Cost per 1000 gallons					$	1.14

ANRA Transmission Cost Summary

From:		To:	Ac-Ft Water	Capital Costs	Annual Cost w/ Amortization	Annual Cost After Amortization
NEWSUM		STRYKER	2565	$ 1,225,211	$ 128,221	$ 39,210
NEWSUM		BRANCH A		$ 3,049,010	$ 266,180	$ 44,672
BRANCH A		AFT GROVE		$ 936,664	$ 74,038	$ 5,990
BRANCH A		JACKS	4,275	$ 3,403,701	$ 357,590	$ 109,595
BRANCH A		N CHEROKE	4,275	$ 1,797,725	$ 171,055	$ 40,453
NEWSUM		BRANCH R&R		$ 3,049,010	$ 266,180	$ 44,672
BRANCH R&R		RUSKS	4,275	$ 7,948,555	$ 737,897	$ 157,849
SUBTOTAL			15,390	$21,409,876	$ 2,001,160	$ 442,442
Additional Lines:						
LINE 1/2 - Troup			4,275	$ 21,202,642	$ 2,249,972	$ 689,163
LINE 3 - Whitehouse			8,551	$ 14,429,328	$ 1,348,450	$ 282,925
LINE 5 - Arp			428	$ 4,079,349	$ 396,862	$ 100,501
LINE 6 - Arp to Jackson WSC			855	$ 4,326,168	$ 399,879	$ 84,337
LINE 7 - New London			855	$ 3,681,767	$ 267,476	$ 76,476
TEMPLE INLAND			8,551	$ 7,622,031	$ 840,726	$ 286,994
CITY OF NACOGDOCHES			8,551	$ 7,502,409	$ 871,555	$ 326,514
RUSK RURAL WSC			855	$ 900,000	$ 90,000	$ 45,000
						$ -
NAC COUNTY OTHER			428	$ 3,019,000	$ 301,900	$ 150,950
SMITH COUNTY OTHER			855	$ 4,065,200	$ 406,520	$ 203,260
TOTAL			49,594	$92,237,769	$9,174,501	$2,688,563

Table
Athens MWA Reuse

Probable Owner: Athens MWA
Amount: 2,677 Acre-Feet/Year 2.4 MGD design

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Urban	12 in.	19,000	LF	$42	$798,000
Pipeline Urban	10 in.	23,800	LF	$36	$856,800
Right of Way Easements (Rural)	0 ft.	0	Acre	$3,000	$0
Right of Way Easements (Urban)	20 ft.	10	Acre	$30,000	$300,000
Engineering and Contingencies (30%)					$496,000
Subtotal of Pipeline					**$2,450,800**
Pump Station(s)					
Pump Station at West WWTP	50 HP	1	EA	$400,000	$400,000
Pump Station at North WWTP	100 HP	2	EA	$620,000	$1,240,000
Engineering and Contingencies (35%)					$574,000
Subtotal of Pump Station(s)					**$974,000**
Permitting and Mitigation		1	LS		$32,900
CONSTRUCTION TOTAL					**$3,457,700**
Interest During Construction		**(12 months)**			**$144,000**
TOTAL CAPITAL COST					**$3,601,700**
ANNUAL COSTS -RAW WATER					
Debt Service (6% for 30 years)					$261,660
Raw water purchase					NA
Electricity ($0.06 kWh)					$88,000
Facility Operation & Maintenance					$69,058
Total Annual Costs					**$418,718**
UNIT COSTS (During Amortization)					
Per Acre-Foot of raw water					$156
Per 1,000 Gallons of raw water					$0.48
UNIT COSTS (After Amortization)					
Per Acre-Foot of raw water					$59
Per 1,000 Gallons of raw water					$0.18

Table
Obtain Water from Forest Grove Reservoir and Transport Portion to Lake Athens/ Transport Portion to New WTP Near Athens

Probable Owner:	Athens MWA		
Amount:	4,500 Acre-Feet/Year	5.8	MGD design
Raw water to Lake Athens	2500 ac-ft/yr	2.79	MGD design
Raw water to City	2000 ac-ft/yr	3.57	MGD design

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Rural	24 in.	13,500	LF	$66	$891,000
Pipeline Rural	18 in.	29,500	LF	$42	$1,239,000
Pipeline Urban	18 in.	4,400	LF	$63	$277,200
Right of Way Easements (Rural)	30 ft.	30	Acre	$3,000	$90,000
Right of Way Easements (Urban)	30 ft.	3	Acre	$30,000	$90,000
Engineering and Contingencies (30%)					$722,000
Subtotal of Pipeline					**$3,309,200**
Pump Station(s)					
Intake and Pump Station	360 HP	1	EA	$1,400,000	$1,400,000
Engineering and Contingencies (35%)					$490,000
Subtotal of Pump Station(s)					**$1,890,000**
Permitting and Mitigation		1	LS		$25,700
CONSTRUCTION TOTAL					**$5,224,900**
Interest During Construction			**(18 months)**		**$322,000**
Permitting associated with Water Rights Transfer					$150,000
TOTAL CAPITAL COST					**$5,696,900**
ANNUAL COSTS RAW WATER					
Debt Service (6% for 30 years)					$413,900
Raw water purchase					$0
Electricity ($0.06 kWh)					$78,000
Facility Operation & Maintenance					$67,600
Total Annual Costs					**$559,500**
UNIT COSTS - (During Amortization)					
Per Acre-Foot of raw water					$124
Per 1,000 Gallons of raw water					$0.38
UNIT COSTS - (After Amortization)					
Per Acre-Foot of raw water					$32
Per 1,000 Gallons of raw water					$0.10

Table

1.5 MGD Water Treatment Plant Expansion at Lake Athens

Probable Owner: Athens MWA
Amount: 840 Acre-Feet/Year
Expansion at Lake Athens 840 ac-ft/yr 1.5 MGD design

CONSTRUCTION COSTS				
Pump Station(s)				
Expand intake at Athens by 1.5 MGD	1	LS	$150,000	$150,000
Engineering and Contingencies (35%)				$53,000
Subtotal of Pump Station(s)				**$203,000**
Permitting and Mitigation	1	LS		$1,800
WATER TREATMENT FACILITIES				
Additional Treatment Capacity at Lake	1.5	MGD		$2,775,000
Engineering and Contingencies (35%)				$971,000
Subtotal of Treatment				**$3,746,000**
Permitting of treatment plant				$33,300
CONSTRUCTION TOTAL				**$3,984,100**
Interest During Construction		**(12 months)**		**$166,000**
TOTAL CAPITAL COST				**$4,150,100**
ANNUAL COSTS TREATED WATER				
Debt Service (6% for 30 years)				$301,500
Electricity ($0.06 kWh)				$9,900
Facility Operation & Maintenance				$4,500
Water Treatment ($.35/1,000 gal finished water)	840	af/y		$95,800
Total Annual Costs				**$411,700**
UNIT COSTS (During Amortization)				
Per Acre-Foot of treated water				$490
Per 1,000 Gallons of treated water				$1.50
UNIT COSTS (After Amortization)				
Per Acre-Foot of treated water				$131
Per 1,000 Gallons of treated water				$0.40

Table

Water Treatment Plant Expansion at Lake Athens - Forest Grove Option B

Probable Owner: Athens MWA
Amount: 1,960 Acre-Feet/Year
New WTP at City 1,960 ac-ft/yr 3.5 MGD design

CONSTRUCTION COSTS			
WATER TREATMENT FACILITIES			
New Treatment Plant at City	3.5	MGD	$7,900,000
Engineering and Contingencies (35%)			$2,765,000
Subtotal of Treatment			**$10,665,000**
Permitting of treatment plant			$94,800
CONSTRUCTION TOTAL			**$10,759,800**
Interest During Construction		**(18 months)**	**$664,000**
TOTAL CAPITAL COST			**$11,423,800**
ANNUAL COSTS TREATED WATER			
Debt Service (6% for 30 years)			$829,900
Electricity ($0.06 kWh)			$0
Facility Operation & Maintenance			$0
Water Treatment ($.35/1,000 gal finished water)	1960	af/y	$223,500
Total Annual Costs			**$1,053,400**
UNIT COSTS (During Amortization)			
Per Acre-Foot of treated water			$537
Per 1,000 Gallons of treated water			$1.65
UNIT COSTS (After Amortization)			
Per Acre-Foot of treated water			$114
Per 1,000 Gallons of treated water			$0.35

Table
Obtain Water from Forest Grove Reservoir and Transport All to Lake Athens

Probable Owner: Athens MWA
Amount: 4,500 Acre-Feet/Year 5 MGD design

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Rural	24 in.	41,560	LF	$66	$2,743,000
Pipeline Urban	24 in.	2,000	LF	$99	$198,000
Right of Way Easements (Rural)	30 ft.	29	Acre	$3,000	$87,000
Right of Way Easements (Urban)	30 ft.	1	Acre	$30,000	$30,000
Engineering and Contingencies (30%)					$882,000
Subtotal of Pipeline					**$3,940,000**
Pump Station(s)					
Intake and Pump Station - FG	290 HP	1	EA	$1,200,000	$1,200,000
Engineering and Contingencies (35%)					$420,000
Subtotal of Pump Station(s)					**$1,620,000**
Permitting and Mitigation		1	LS		$49,700
CONSTRUCTION TOTAL					**$5,609,700**
Interest During Construction			**(18 months)**		**$346,000**
Permitting associated with Water Rights Transfer					$150,000
TOTAL CAPITAL COST					**$6,105,700**
ANNUAL COSTS RAW WATER					
Debt Service (6% for 30 years)					$443,572
Raw water purchase					$0
Electricity ($0.06 kWh)					$90,000
Facility Operation & Maintenance					$71,300
Total Annual Costs					**$604,872**
UNIT COSTS (During Amortization)					
Per Acre-Foot of raw water					$134
Per 1,000 Gallons of raw water					$0.41
UNIT COSTS (After Amortization)					
Per Acre-Foot of raw water					$36
Per 1,000 Gallons of raw water					$0.11

Table__

Water Treatment Plant Expansion at Lake Athens - Forest Grove Option B

Probable Owner: Athens MWA
Amount: 2,800 Acre-Feet/Year
New WTP at Lake 2,800 ac-ft/yr 5 MGD design

	Size	Quantity	Unit	Unit Price	Cost
CONSTRUCTION COSTS					
TRANSMISSION FACILITIES					
Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Parallel Pipeline to Athens	18 in.	27,000	LF	$42	$1,134,000
Engineering and Contingencies (30%)					$340,000
Subtotal of Pipeline					**$1,474,000**
Pump Station(s)					
5 MGD Intake and Pump Station - Athens	40 HP	1	EA	$550,000	$550,000
Pump Station Upgrades to City	140 HP	1	EA	$744,000	$744,000
Engineering and Contingencies (35%)					$453,000
Subtotal of Pump Station(s)					**$1,747,000**
Permitting and Mitigation		1	LS		$29,100
WATER TREATMENT FACILITIES					
Construct New WTP at Lake Athens		5	MGD		$9,700,000
Engineering and Contingencies (35%)					$3,395,000
Subtotal of Treatment					**$13,095,000**
Permitting of treatment plant					$116,400
CONSTRUCTION TOTAL					**$16,461,500**
Interest During Construction			**(18 months)**		**$1,015,000**
TOTAL CAPITAL COST					**$17,476,500**
ANNUAL COSTS TREATED WATER					
Debt Service (6% for 30 years)					$1,269,600
Electricity ($0.06 kWh)					$33,000
Facility Operation & Maintenance					$52,400
Water Treatment ($.35/1,000 gal finished water)		2800	af/y		$319,300
Total Annual Costs					**$1,674,300**
UNIT COSTS (During Amortization)					
Per Acre-Foot of treated water					$598
Per 1,000 Gallons of treated water					$1.84
UNIT COSTS (After Amortization)					
Per Acre-Foot of treated water					$144.54
Per 1,000 Gallons of treated water					$0.44

Table__
Purchase water from Lake Palestine for Athens MWA

Probable Owner: Athens MWA
Amount: 4,000 Acre-Feet/Year 4.46 MGD design

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Rural	24 in.	80,000	LF	$66	$5,280,000
Pipeline Urban	24 in.	0	LF	$99	$0
Right of Way Easements (Rural)	30 ft.	55	Acre	$3,000	$165,000
Right of Way Easements (Urban)	30 ft.	0	Acre	$30,000	$0
Engineering and Contingencies (30%)					$1,584,000
Subtotal of Pipeline					**$7,029,000**
Pump Station(s)					
Intake and Pump Station at Lake Palestine	210 HP	1	EA	$1,330,000	$1,330,000
Engineering and Contingencies (35%)					$466,000
Subtotal of Pump Station(s)					**$1,796,000**
Permitting and Mitigation		1	LS		$66,100
CONSTRUCTION TOTAL					**$8,891,100**
Interest During Construction			**(12 months)**		**$370,000**
UNRMWA Buy-in Cost					$100,000
TOTAL CAPITAL COST					**$9,361,100**
ANNUAL COSTS					
Debt Service (6% for 30 years)					$680,074
Raw water purchase					$195,511
Electricity ($0.06 kWh)					$61,000
Facility Operation & Maintenance					$103,260
Total Annual Costs					**$1,039,845**
UNIT COSTS (During Amortization)					
Per Acre-Foot of raw water					$260
Per 1,000 Gallons of raw water					$0.80
UNIT COSTS (After Amortization)					
Per Acre-Foot of raw water					$90
Per 1,000 Gallons of raw water					$0.28

Table__
Purchase water from DWU for Athens MWA

Probable Owner: Athens MWA
Amount: 4,000 Acre-Feet/Year 4.46 MGD design

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	**Size**	**Quantity**	**Unit**	**Unit Price**	**Cost**
Pipeline Rural	24 in.	2,000	LF	$66	$132,000
Pipeline Urban	24 in.	0	LF	$99	$0
Incremental cost for DWU pipeline					$1,115,125
Right of Way Easements (Rural)	30 ft.	1	Acre	$3,000	$3,000
Right of Way Easements (Urban)	30 ft.	0	Acre	$30,000	$0
Engineering and Contingencies (30%)					$40,000
Subtotal of Pipeline					**$1,290,125**
Pump Station(s)					
Assume sufficient head at junction to reach Lake Athens					$0
Engineering and Contingencies (35%)					$0
Subtotal of Pump Station(s)					**$0**
Permitting and Mitigation		1	LS		$15,000
CONSTRUCTION TOTAL					**$1,305,125**
Interest During Construction			**(6 months)**		**$28,000**
TOTAL CAPITAL COST					**$1,333,125**
ANNUAL COSTS					
Debt Service (6% for 30 years)					$96,900
Raw water purchase					$536,700
Electricity ($0.06 kWh)					$0
Facility Operation & Maintenance					$15,000
Total Annual Costs					**$648,600**
UNIT COSTS (During Amortization)					
Per Acre-Foot of raw water					$162
Per 1,000 Gallons of raw water					$0.50
UNIT COSTS (After Amortization)					
Per Acre-Foot of raw water					$138
Per 1,000 Gallons of raw water					$0.42

City of Lufkin Treatment Plant Costs

New WTP (10 MGD)			
Capital Costs		$55,299,706	per report done by SPI for LNVA
Annual Costs			
Debt Service		$4,821,280	
Treatment Costs	$	1,278,375	($0.35/1000 gal; exceeds Lufkin report estimate by >50%)
Total Annual w/ Amortization	$	6,099,655	
Total Annual after Amortization	$	1,278,375	
Cost per acre-ft	$	1,088	per ac-ft
Cost per 1000 gallons	$	3.34	per 1000 gallons

Note: Lufkin plan does not assume a peaking factor

Lufkin WTP Expansion in 2050

CAPITAL COSTS	**Cost**		
WTP Expansion			
Construction	$	14,400,000	
Pump Station	$	1,120,000	per Lufkin rep
Engineering and Contingencies (35%)	$	5,432,000	
Expansion Subtotal	**$**	**20,952,000**	
Environmental and Archaeological Studies (1%)	$	209,520	
Env. And Arch. Subtotal	**$**	**209,520**	
Interest During Construction (for 2-year construction period)	$	1,711,150	
TOTAL CAPITAL COST	**$**	**22,872,670**	
ANNUAL COSTS	**Cost**		
Debt Service	$	1,994,144	
Pump Stations	$	-	
Treatment	$	1,916,250	
	$	-	
TOTAL ANNUAL COST w/ AMORTIZATION	***$***	***3,910,394***	
TOTAL ANNUAL COST AFTER AMORTIZATION			
Cost per acre-ft	$	465	
Cost per 1000 gallons	$	1.43	

CITY OF NACOGDOCHES-LAKE COLUMBIA ALTERNATE

RAW WATER SUPPLY	
Reservoir and Pipeline Construction	$33,750,100
Reqd. Capacity	
Water Plant for 8551 ac-ft	
20 MGD Expansion	$18,000,000
Pump Station	
26 mgd - 5: 600 HP	$5,400,000
Transmission	
36" line, 43,200 ft.	$4,276,800
30" line	
Total Construction Cost	$27,676,800
Engineering & Cont. (30%)	$8,303,040
Interest During Construction	$4,377,667 36 months as
Total Capital Cost	$74,107,607
Capital Cost Excluding Lake	$40,357,507
Annual Cost	
New Debt Service,6%, 20yrs.	$6,461,039
	$6,461,039
O&M Cost	
Treatment Plant	$975,287
Pump Station	
Electricity	238,686
O&M	$135,000
Transmission Line	$42,768
Total Annual Cost w/ Amortization	$7,852,780
Total Annual Cost after Amortization	$1,391,741
Unit Cost	$2.82
Total Unit Cost, AF	$918

CITY OF NACOGDOCHES-TOLEDO ALTERNATE

	Combined Cost
Water Plant-20 mgd	$18,000,000
Pump Station	
Intake at Logansport	$2,300,000
Center	$2,800,000
Storage at Swift	
Transmission	
30" line, 359,600 ft.	$34,162,000
Total Capital Cost	$57,262,000
Engineering & Cont. (30%)	$17,178,600
Interest During Construction	$9,057,188
Total Cost	$83,497,788
Annual Cost	
Debt Service,6%, 20yrs.	$7,279,718
O&M Cost	
Treatment Plant	$843,150
Pump Station	
Electricity	302,118
O&M	$127,500
Transmission Line	$341,620
Total Annual Cost w/ Amortization	$8,894,105
Total Annual Cost after Amortization	$1,614,388
Capacity (af/y)	7398
Unit Cost/1000 gallons	$3.69
Unit Cost/acre-foot	$1,202

LNVA Supply (from SRA Canal near I-10 and Cow Bayou to LNVA diversion near Lakeview on Neches River)

	2000	2010	2020	2030	2040	2050	2060	Average
Required water, af/y			0	0	0	10115	35955	23,035
Distribution Design, gpm (1.5*Reqd)		0	0	0	0	9406	33434	
Supplied water, MGD		0	0.00	0.00	0.00	9.03	32.10	20.57
Distribution Cost								
Length Dist. Pipe	77000							
Pumping Rate	34000							
Pipe Diameter, in	54							
Head Loss/100 feet	0.11							
Depth to Water Surface	0							
Total Head Required	84.7							
Total Horsepower	1038.860698							
Cost of Pipeline, per foot	250							
Pump Station and Intake	3200000							
Total Capital Cost	22450000	0	0	0	0	$22,450,000	0	
Engineering & Cont. (30%)		$0	$0	$0	$0	$6,735,000	$0	
Interest During Construction		$0	$0	$0	$0	$1,216,051	$0	
Total Cost		$0	$0	$0	$0	$30,401,051	$0	
Annual Cost								
New Debt Service,6%, 20yrs.		$0	$0	$0	$0	($2,650,502)	$0	
New Plus Existing		$0	$0	$0	$0	($2,650,502)	($2,650,502)	
O&M Cost								
Electricity		0	0	0	0	(271,739)	(271,739)	
O&M		$0	$0	$0	$0	($80,000)	($80,000)	
Transmission Line		$0	$0	$0	$0	($192,500)	($192,500)	
Raw Water						($329,576)	($1,171,517)	
Total Annual Cost		$0	$0	$0	$0	($3,524,317)	($4,366,258)	(3,945,287)
Unit Cost, $/1000 gallons			$0.00	$0.00	$0.00	($1.07)	($0.37)	($0.53)

Chapter 4D.

Water Management Strategy Evaluation

Water management strategies identified to meet the water needs during the planning period were evaluated based on the following criteria.

The evaluation of all water management strategies will consider the following:

(1) evaluation of the quantity, reliability, and cost of water delivered and treated for the end user's requirements, incorporating factors to be used in the calculation of infrastructure debt payments provided by the executive administrator;

(2) environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico;

(3) impacts on other water resources of the state including other water management strategies and groundwater surface water interrelationships;

(4) impacts of water management strategies on threats to agricultural and natural resources of the regional water planning area;

(5) any other factors as deemed relevant by the regional water planning group including recreational impacts;

(6) equitable comparison and consistent application of all water management strategies the regional water planning groups determines to be potentially feasible for each water supply need;

(7) consideration of the provisions in Texas Water Code, § 11.085(k)(1) for interbasin transfers; and

(8) consideration of third party social and economic impacts resulting from voluntary redistribution of water;

The evaluation was undertaken through the development of a matrix to rate the above consideration from most desirable (1) to least desirable (5). Rating of the Environmental Factors (item 2 above) was evaluated using a separate matrix with consideration of nine factors; total acres impacted, wetland acres, environmental water needs, habitat, threatened and endangered species, cultural resources, bays and estuaries, environmental water quality and other noted factors. The evaluation matrices follow.

Table 1
Summary of Evaluation of Water Management Strategies

County	Entity	Basin Used	Strategy	Strategy Key	Quantity (Ac-Ft/Yr)	Reliability	Cost ($/Ac-Ft)	Impacts of Strategy on:				Political Feasibility	Implementation Issues	Comments
								Environmental Factors	Agricultural Resources/ Rural Areas	Other Natural Resources	Key Water Quality Parameters			
Name	Name(s)	Name	Name	Name	#	(1-5)	$	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)		
Anderson	County-Other	Neches	Expanded use of Queen City	ADC-1	40	3	$444	1	1	2	2	1		
Anderson	Frankston	Neches	Increase supply from Carrizo-Wilcox	FR-1	121	1	$299	1	1	2	1	1		
Anderson	Mining	Neches	Increase supply from Carrizo-Wilcox	AND-1	121	1	$290	1	1	2	1	1		
Anderson	Steam-Electric	Neches	Water from Lake Palestine	ADS-1	21,853	2	$311	2	1	2	2	2	Requires agreement with UNRA	
Angelina	County-Other	Neches	Obtain water from Lufkin	ANC-1A	1,143	1	$445	1	1	1	1	2	Requires contract with Lufkin	
Angelina	County-Other	Neches	Increase supply from Carrizo-Wilcox	ANC-2A	1,211	2	$242	1	1	2	1	1		
Angelina	Diboll	Neches	Increase supply from Yegua	DI-1A	1,614	3	$205	1	1	2	2	2		
Angelina	Four Way WSC	Neches	Obtain water from Lufkin	FW-1	448	1	$363	1	1	1	1	2	Requires contract with Lufkin	
Angelina	Hudson	Neches	Increase supply from Carrizo-Wilcox	HU-1A	1,453	2	$238	1	1	2	1	1		
Angelina	Hudson WSC	Neches	Increase supply from Carrizo-Wilcox	HW-1A	1,211	2	$242	1	1	2	1	1		
Angelina	Lufkin	Neches	Construct pipeline to Sam Rayburn Reservoir	LU-1	8,070	1	$423	2	1	2	2	2	Requires agreement with LNVA	
Angelina	Manufacturing	Neches	Obtain water from City of Lufkin	ANM-1	4,504	1	$423	1	1	1	1	2		
Angelina	Manufacturing	Neches	Obtain raw water from Lake Columbia	ANM-2	8,551	1	$312	3	1	2	1	3		
Cherokee	Irrigation	Neches	Queen City	CH-1	40	3	$447	1	1	2	1	1		
Cherokee	Manufacturing	Neches	Obtain water from City of Jacksonville	CHM-1	244	2	$766	1	1	1	1	2		
Cherokee	Mining	Neches	Increase supply from Queen City	CHN-1	40	1	$447	1	1	2	1	1		
Cherokee	New Summerfield	Neches	Obtain treated water from Lake Columbia	NS-1	2,565	1	$624	3	1	2	1	3	Requires contract with ANRA	
Cherokee	New Summerfield	Neches	Increase supply from Carrizo-Wilcox	NS-3	242	1	$194	1	1	2	1	1		
Cherokee	Rusk	Neches	Obtain treated water from Lake Columbia	RU-1	4,275	1	$624	3	1	2	1	3	Requires contract with ANRA	
Cherokee	Rusk	Neches	Increase supply from Carrizo-Wilcox	RU-3	212	1	$131	1	1	2	1	1		
Hardin	County-Other	Neches	Use additional water from Gulf Coast Aquifer	HAC-1A	153	2	$299	1	1	2	1	1		
Hardin	Lumberton/Lumberton MUD	Neches	Use additional water from Gulf Coast Aquifer	LM-1	564	2	$93	1	1	2	1	1		
Hardin	Lumberton/Lumberton MUD	Neches	Construct new 2.5 mgd facility	LM-2	948	1	$1,239	1	1	1	1	2		
Hardin	Manufacturing	Neches	Use additional water from Gulf Coast Aquifer	HAM-1	114	1	$214	1	1	2	1	1		
Hardin	Irrigation	Neches	Use surface water sources	HAI-1		2		2	1	3	2	1		
Henderson	Athens	Neches	Purchase water from Athens MWA	AT-2	161	1	$574	See Athens MWA				1		
Henderson	Bethel Ash WSC	Neches	Overdraft and drill new well in Carrizo-Wilcox	BA-1	105	3	$159	1	1	3	1	3	Requires coordination with Neches	
Henderson	County-Other	Neches	Overdraft Carrizo-Wilcox	HECo-2	100	3	$49	1	1	3	1	3	Requires coordination with Neches	
Henderson	County-Other	Neches	Expanded use of Queen City	HECo-3	500	3	$518	1	1	1	2	2	Requires coordination with Neches	
Henderson	County-Other	Neches	Water from UNRMWA	HECo-4	500	5	$1,154	1	1	1	1	1	Requires agreement with UNRMWA	
Henderson	RPM WSC	Neches	Overdraft Carrizo-Wilcox	RPM-1	100	3	$49	2	1	3	1	3	Requires coordination with Neches	
Henderson	Irrigation	Neches	Obtain water through Athens MWA strategies	HEI-1	212	1	$136	See Athens MWA				1		
Henderson	Livestock	Neches	Temporary Pumping	HEL-1	1500	1	$46	1	1	1	1	1		
Henderson	Livestock	Neches	Obtain water through Athens MWA strategies	AMWA-1	varies	1	varies	See Athens MWA				1	Requires coordination with Athens	
Houston	Irrigation	Neches/Trinity	Increase supply from Carrizo-Wilcox	HOI-1	2,179	2	$209	1	1	2	1	1		
Houston	Livestock	Neches/Trinity	Increase supply from Carrizo-Wilcox	HOL-1	1,211	2	$210	1	1	2	1	1		
Jasper	County-Other	Neches	Use of additional water from Gulf Coast Aquifer	JAC-1	109	2	$361	1	1	2	1	1		
Jasper	City of Kirbyville	Neches	Use of additional water from Gulf Coast Aquifer	KI-1	96	2	$311	1	1	2	1	1		
Jefferson	Meeker	Neches	Use additional supply from Gulf Coast Aquifer	ME-1	242	2	$214	1	1	2	1	1		
Jefferson	Steam-Electric	Neches	Use additional water from the Neches River	JESE-1	25,951	3	$64	2	2	3	2	2		
Nacogdoches	Appleby WSC	Neches	Increase supply from Carrizo-Wilcox	AP-1	807	1	$225	1	1	2	1	1		
Nacogdoches	County-Other	Neches	Increase supply from Carrizo-Wilcox	NC-1	291	1	$321	1	1	2	1	1		
Nacogdoches	County-Other	Neches	Obtain raw water from Lake Columbia	NC-2	428	1	$624	3	1	2	1	3	Requires contract with ANRA	
Nacogdoches	Lilly Grove SUD	Neches	Increase supply from Carrizo-Wilcox	LG-1	807	1	$225	1	1	2	1	1		
Nacogdoches	Livestock	Neches	Increase supply from Carrizo-Wilcox	NCL-1	1,574	2	$202	1	1	2	1	1		
Nacogdoches	Manufacturing	Neches	Obtain water from City of Nacogdoches	NCM-1	1,626	1	$1,408	1	1	1	1	2		
Nacogdoches	Nacogdoches	Neches	Acquire agreement w/ downstream water rights holders	NA-1	5,881	1	$0	1	1	1	1	2		Minimal impacts to downstream water rights
Nacogdoches	Nacogdoches	Neches	Obtain and treat water from Lake Columbia	Alt. Str. NA-3	8,551	1	$1,408	3	1	2	1	3	Requires contract with ANRA	
Nacogdoches	Nacogdoches	Neches	Obtain and treat water from Toledo Bend	Alt. Str. NA-4	8,551	1	$1,776	2	1	2	1	1	Requires agreement with SRA	Highly renewable resource should minimize impacts.
Nacogdoches	Steam-Electric	Neches	Obtain raw water from Lake Columbia	NCS-1	13,358	1	$312	3	1	2	1	3	Requires contract with ANRA	
Nacogdoches	Swift WSC	Neches	Increase supply from Carrizo-Wilcox	SW-1	807	2	$225	1	1	2	1	1		
Newton	Manufacturing	Sabine	Purchase additional water from SRA (Toledo Bend)	NWM-2	700	1	$285	1	1	1	1	1	Requires agreement with SRA.	Highly renewable resource should minimize impacts.
Newton	Manufacturing	Sabine	Install Wells in Gulf Coast Aquifer	NWM-1	700	1	$259	1	1	1	1	2	Requires coordination with Southeast Texas GCD	
Orange	Manufacturing	Sabine	Purchase additional water from SRA (SRA Canal/Toledo Bend)	OR-1SRA	31,536	1	$82	2	1	1	1	1	Requires agreement with SRA.	Highly renewable resource should minimize impacts.
Orange	Mauriceville WSC	Sabine	Increase groundwater supply (install well in Jasper County)	ORMa-1	250	1	$148	1	1	1	1	2	Requires coordination with Southeast Texas GCD	Highly renewable resource should minimize impacts.
Polk	County-Other	Neches	Use additional supply from Gulf Coast Aquifer	POC-1A	208	2	$267	1		2	1	1		
Polk	Manufacturing	Neches	Expand existing supplies	POM-1	225	2	$92	1		3	2	1		

Table 1
Summary of Evaluation of Water Management Strategies

County	Entity	Basin Used	Strategy	Strategy Key	Quantity (Ac-Ft/Yr)	Reliability	Cost ($/Ac-Ft)	Impacts of Strategy on: Environmental Factors	Agricultural Resources/ Rural Areas	Other Natural Resources	Key Water Quality Parameters	Political Feasibility	Implementation Issues	Comments
Rusk	Mining	Neches	Increase supply from Carrizo-Wilcox	RUL-1	158	2	$161	1		2	1	1		
Rusk	Steam-Electric	Neches	Increase supply from Carrizo-Wilcox	RUSE-1	6,862	3	$129	1		2	1	1		
Rusk	Steam-Electric	Neches	Obtain water from Lake Columbia	RUSE-2	20,972	1	$314	3		2	1	3		
Sabine	County-Other	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SBC-1	200	1	$221	1	1	1	1	1		
Sabine	County-Other	Sabine	Purchase water from City of Hemphill	SBC-2	200	1	$885	1	1	1	1	1	Requires water contract with City of Hemphill	
Sabine	Livestock	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SBL-1	100	1	$130	1	1	1	1	1		
Sabine	Livestock	Sabine	Increase supply from local sources	SBL-2	300	2	$120	2	1	2	1	1	Implemented by local users	
San Augustine	County-Other	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAC-1	5	1	$728	1	1	1	1	1		
San Augustine	County-Other	Neches	Expand contracts with San Augustine	SAC-2	10	2	$489	1	1	1	1	1		
San Augustine	Irrigation	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAL-1	100	1	$93	1	1	1	1	1		
San Augustine	Livestock	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAL-2	100	1	$97	1	1	1	1	1		
San Augustine	Livestock	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAL-3	300	1	$120	1	1	1	1	1		
San Augustine	Manufacturing	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAM-1	7	1	$313	1	1	1	1	1		
Shelby	City of Center	Sabine	Agreements with senior downstream water rights holders	SHC-2	971	1	$0	1	1	1	1	1		Minimal impacts to downstream water rights
Shelby	County-Other	Sabine	Purchase water from City of Center	SHCo-2	111	1	$489	1	1	1	1	1	Requires water contract with City of Center	
Shelby	County-Other	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SHCo-1	350	1	$526	1	1	1	1	1		
Shelby	County-Other	Sabine	Purchase water from SRA	SHCo-3	150	1	$1,169	1	1	1	1	1	Requires agreement with SRA.	Highly renewable resource should
Shelby	Livestock	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SHL-1	2,000	2	$67	1	1	1	1	1		
Shelby	Livestock	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SHL-2	1,500	2	$67	1	1	1	1	1		
Shelby	Livestock	Sabine	Purchase additional water from SRA (Toledo Bend)	SHL-4	4,000	1	$169	2	1	1	1	1	Requires agreement with SRA.	Highly renewable resource should minimize impacts.
Shelby	Livestock	Sabine	Increase local supplies	SHL-3	500	2	$96	2	1	2	1	1	Implemented by local users	
Shelby	Manufacturing	Sabine	Purchase water from City of Center	SHM-1	820	1	$489	1	1	1	1	1	Requires water contract with City of Center	
Smith	Bullard	Neches	Increase supply from Carrizo-Wilcox	BU-1	100	2	$350	1		2	1	1		
Smith	Community Water Co.	Neches	Increase supply from Carrizo-Wilcox	CW-1A	121	2	$449	1		2	1	1		
Smith	Dean WSC	Neches	Increase supply from Carrizo-Wilcox	DE-1A	169	2	$326	1		2	1	1		
Smith	Jackson WSC	Neches	Increase supply from Carrizo-Wilcox	JA-1	68	2	$675	1		2	1	1		
Smith	City of Lindale	Neches	Increase supply from Carrizo-Wilcox	LI-1	60	2	$473	1		2	1	1		
Smith	Lindale Rural WSC	Neches	Increase supply from Carrizo-Wilcox	LIR-1	80	2	$428	1		2	1	1		
Smith	RPM WSC	Neches	Increase supply from Carrizo-Wilcox	LI-1	40	2	$369	1		2	1	1		
Smith	Irrigation	Neches	Increase supply from Queen City	LI-1	40	2	$369	1		2	2	1		
Smith	Mining	Neches	Increase supply from Queen City	SMM-1	329	2	$196	1		2	2	1		
Trinity	County-Other	Neches	Increase supply from Yegua-Jackson	TRC-1	202	3	$196	1		2	2	2		
Tyler	County-Other	Neches	Increase supply from Gulf Coast Aquifer	TYC-1	274	2	$233	1		2	1	1		
Henderson	Athens MWA	Multiple	Indirect Reuse at Lake Athens	AMWA-1	2,667	1	$156	1	2	1	2	1		Athens MWA has reuse permit.
Henderson	Athens MWA	Multiple	Water from Forest Grove	AMWA-2	4,500	1	$124	2	1	1	2	2	Requires agreement with TXU and modification of water rights permi	
Henderson	Athens MWA	Multiple	Purchase water from DWU	AMWA-3	4,000	1	$162	1	1	1	1	2	Requires agreement with DWU	Reduces available supply from Lake
Henderson	Athens MWA	Multiple	Purchase water form UNRMWA	AMWA-4	4,000	1	$260	1	1	1	1	2	Requires agreement with UNRMWA	

1 **Most desirable**
5 **Least desirable**

Table 2
Summary of Environmental Assessment

County	Entity	Basin	Strategy	Strategy Key	Environmental Factors: Total Acres Impacted	Wetland Acres[1]	Environmental Water Needs	Habitat	Threatened & Endangered Species	Cultural Resources	Bays & Estuaries	Environmental Water Quality	Other	Overall Environmental Impacts	Comments
Name	Name(s)	Name	Name	Name	#	#	(1-5)	(1-5)	#	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	
Anderson	County-Other	Neches	Increase supply from Queen City	ADC-1	0	NA	1	1	5	1	1	1	1	1	
Anderson	Frankston	Neches	Increase supply from Carrizo-Wilcox	FR-1	0	NA	1	1	5	1	1	1	1	1	
Anderson	Mining	Neches	Increase supply from Carrizo-Wilcox	AND-1	0	NA	1	1	5	1	1	1	1	1	
Anderson	Steam-Electric	Neches	Lake Palestine	ADS-1	2	NA	2	2	5	1	2	1	1	2	
Angelina	County-Other	Neches	Obtain water from City of Lufkin or LNVA	ANC-1	5	NA	1	1	8	1	1	1	1	1	
Angelina	County-Other	Neches	Increase supply from Carrizo-Wilcox	ANC-2	0	NA	1	1	8	1	1	1	1	1	
Angelina	Diboll	Neches	Obtain water from City of Lufkin or LNVA	DI-1	28	NA	1	1	8	1	1	1	1	1	
Angelina	Diboll	Neches	Increase supply from Yegua-Jackson	DI-3	0	NA	1	1	8	1	1	1	1	1	
Angelina	Four Way	Neches	Obtain water from City of Lufkin or LNVA	FW-1	5	NA	1	1	8	1	1	1	1	1	
Angelina	Hudson	Neches	Increase supply from Carrizo-Wilcox	HU-1	0	NA	1	1	8	1	1	1	1	1	
Angelina	Hudson WSC	Neches	Increase supply from Carrizo-Wilcox	HW-1	0	NA	1	1	8	1	1	1	1	1	
Angelina	Livestock	Neches	Increase local supplies	ANL-1	3	NA	1	1	8	1	1	1	1	1	
Angelina	Lufkin	Neches	Obtain and treat water from Sam Rayburn Reservoir	LU-1	75	NA	2	2	8	1	2	1	1	2	
Angelina	Manufacturing	Neches	Obtain water from City of Lufkin or LNVA	ANM-1	0	NA	1	1	8	1	1	1	1	1	
Angelina	Manufacturing	Neches	Obtain raw water from Lake Columbia	ANM-2	10,200	5,900	3	4	8	3	3	2	3	3	
Cherokee	Mining	Neches	Increase supply from Queen City	CHN-1	0	NA	1	1	4	1	1	1	1	1	
Cherokee	Irrigation	Neches	Increase supply from Queen City	CHI-1	0	NA	1	1	4	1	1	1	1	1	
Cherokee	Manufacturing	Neches	Obtain water from City of Jacksonville	CHM-1	0	NA	1	1	4	1	1	1	1	1	
Cherokee	New Summerfield	Neches	Increase supply from Carrizo-Wilcox	NS-3	0	NA	1	1	4	2	2	1	1	1	
Cherokee	New Summerfield	Neches	Lake Columbia	NS-1	10,200	5,900	3	4	4	3	3	2	3	3	
Cherokee	Rusk	Neches	Increase supply from Carrizo-Wilcox	RU-3	0	NA	1	1	4	2	2	1	1	1	
Cherokee	Rusk	Neches	Lake Columbia	RU-1	10,200	5,900	3	4	4	3	3	2	3	3	
Hardin	County-Other	Neches	Use additional water from Gulf Coast Aquifer	HAC-1	0	NA	1	1	6	1	1	1	1	1	
Hardin	Irrigation	Neches	Use surface water sources	HAI-1	5	NA	2	2	6	1	2	1	1	2	
Hardin	Manufacturing	Neches	Use additional water from Gulf Coast Aquifer	HAM-1	0	NA	1	1	6	1	1	1	1	1	
Henderson	Athens	Neches	Purchase water from Athens MWA	AT-2	NA	NA	see Athen MWA strategies							1	
Henderson	Bethel Ash WSC	Neches	Overdraft and drill new well in Carrizo-Wilcox	BA-1	NA	NA	1	1	7	1	1	1	3	1	May place additional stress on aquifer
Henderson	County-Other	Neches	Overdraft Carrizo-Wilcox	HECo-2	0	NA	1	1	7	1	1	1	3	1	May place additional stress on aquifer
Henderson	County-Other	Neches	Expanded use of Queen City	HECo-3	11	NA	1	1	7	1	1	1	2	1	Pending water quality of Queen City, may increase TDS of wastewater discharges
Henderson	County-Other	Neches	Water from UNRMWA	HECo-4	12	NA	1	1	7	1	1	1	1	1	
Henderson	RPM WSC	Neches	Overdraft Carrizo-Wilcox	RPM-1	0	NA	2	1	7	1	1	1	3	2	May place additional stress on aquifer
Henderson	Irrigation	Neches	Obtain water through Athens MWA strategies	HEI-1	see Athens MWA	NA	1	1		1	1	1	1	1	
Henderson	Livestock	Neches	Temporary Pumping	HEL-1	0	NA	2	1	7	1	1	1	1	1	
Henderson	Livestock	Neches	Obtain water through Athens MWA strategies	AMWA-1	see Athens MWA	NA	see Athen MWA strategies							1	
Houston	Irrigation	Neches/Trinity	Increase supply from Carrizo-Wilcox	HOI-1	0	NA	1	1	8	1	1	1	1	1	
Houston	Livestock	Neches/Trinity	Increase supply from Carrizo-Wilcox	HOL-1	0	NA	1	1	8	1	1	1	1	1	
Jasper	County-Other	Neches	Use additional water from Gulf Coast Aquifer	JAC-1/2	0	NA	1	1	7	1	1	1	1	1	
Jasper	City of Kirbyville	Neches	Use additional water from Gulf Coast Aquifer	KI-1	0	NA	1	1	7	1	1	1	1	1	
Jefferson	Meeker	Neches	Use additional water from Gulf Coast Aquifer	BO-1	0	NA	1	1	9	1	1	1	1	1	
Jefferson	Steam Electric	Neches	Use additional water from Neches River	JEI-1	0	NA	2	2	9	1	2	1	1	2	
Nacogdoches	Appleby WSC	Neches	Increase supply from Carrizo-Wilcox	AP-1	0	NA	1	1	8	1	1	1	1	1	
Nacogdoches	County-Other	Neches	Increase supply from Carrizo-Wilcox	NC-1	0	NA	1	1	8	1	1	1	1	1	
Nacogdoches	County-Other	Neches	Lake Columbia	NC-2	10,200	5,900	3	4	12	3	3	2	3	3	
Nacogdoches	Lily Grove SUD	Neches	Increase supply from Carrizo-Wilcox	LG-1	0	NA	1	1	8	1	1	1	1	1	
Nacogdoches	Livestock	Neches	Increase supply from Carrizo-Wilcox	NCL-1	0	NA	1	1	8	1	1	1	1	1	
Nacogdoches	Manufacturing	Neches	City of Nacogdoches	NCM-1	0	NA	1	1	8	1	1	1	1	1	
Nacogdoches	Nacogdoches	Neches	Acquire agreement w/ downstream water rights holders	NA-1	0	NA	1	1	8	1	1	1	1	1	
Nacogdoches	Nacogdoches	Neches	Lake Columbia	NA-3	10,200	5,900	3	4	8	3	3	2	3	3	
Nacogdoches	Nacogdoches	Sabine	Toledo Bend Reservoir	NA-4	165	NA	2	2	8	1	2	1	1	2	
Nacogdoches	Steam-Electric	Neches	Lake Columbia	NCS-1	10,200	5,900	3	4	12	3	3	2	3	3	
Nacogdoches	Swift WSC	Neches	Increase supply from Carrizo-Wilcox	SW-1	0	NA	1	1	8		1			1	
Newton	Manufacturing	Sabine	Purchase additional water from SRA (Toledo Bend)	NWM-2	12	NA	1	2	6	1	1	1	1	1	
Newton	Manufacturing	Sabine	Install Wells in Gulf Coast Aquifer	NWM-1	0	NA	1	1	6	1	1	1	1	1	
Orange	County-Other	Sabine	Install Wells in Gulf Coast Aquifer	ORC-1	0	NA	1	1	8	2	2	2	2	2	
Orange	Manufacturing	Sabine	Purchase additional water from SRA (SRA Canal/Toledo Bend)	OR-1SRA	0	NA	2	2	8	1	2	1	1	2	
Orange	Mauriceville WSC	Sabine	Increase groundwater supply (install well in Jasper County)	ORMa-1	0	NA	1	1	8	1	1	1	1	1	
Polk	County-Other	Neches	Use additional supply from Gulf Coast Aquifer	POC-1	0	NA	1	1	8	1	1	1	1	1	
Polk	Manufacturing	Neches	Use additional supply from Gulf Coast Aquifer	POM-1	0	NA	1	1	8	1	1	1	1	1	
Rusk	Mining	Neches	Increase supply from Carrizo-Wilcox	RUL-1	0	NA	1	1	8	1	1	1	1	1	
Rusk	Steam-Electric	Neches	Increase supply from Carrizo-Wilcox	RUSE-1	0	NA	1	1	8	1	1	1	1	1	
Rusk	Steam-Electric	Neches	Lake Columbia	RUSE-2	10,200	5,900	3	4	8	3	3	2	3	3	
Sabine	County-Other	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SBC-1	0	NA	1	1	5	1	1	1	1	1	
Sabine	County-Other	Sabine	Purchase water from City of Hemphill	SBC-2	9	NA	1	2	5	1	1	1	1	1	
Sabine	Livestock	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SBL-1	0	NA	1	1	5	1	1	1	1	1	
Sabine	Livestock	Sabine	Increase supply from local sources	SBL-2	20	NA	2	2	5	2	1	1	1	2	
San Augustine	County-Other	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAC-1	0	NA	1	1	8	1	1	1	1	1	
San Augustine	County-Other	Neches	Expand contracts with San Augustine	SAC-2	0	NA	1	1	8	1	1	1	1	1	
San Augustine	Irrigation	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAI-1	12	NA	1	1	8	1	1	1	1	1	

Table 2
Summary of Environmental Assessment

County	Entity	Basin	Strategy	Strategy Key	Environmental Factors: Total Acres Impacted	Wetland Acres[1]	Environmental Water Needs	Habitat	Threatened & Endangered Species	Cultural Resources	Bays & Estuaries	Environmental Water Quality	Other	Overall Environmental Impacts	Comments
Name	Name(s)	Name	Name	Name	#	#	(1-5)	(1-5)	#	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	
San Augustine	Livestock	Sabine	Increase local supplies (stock ponds)	SAL-1	3	NA	1	1	8	1	1	1	1		
San Augustine	Livestock	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAL-2	0	NA	1	1	8	1	1	1	1	1	
San Augustine	Livestock	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAL-3	0	NA	1	1	8	1	1	1	1	1	
San Augustine	Manufacturing	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SAM-1	0	NA	1	1	8	1	1	1	1	1	
Shelby	City of Center	Sabine	Agreements with senior downstream water rights holders	SHC-2	0	NA	1	1	8	1	1	1	1	1	
Shelby	County-Other	Sabine	Purchase water from City of Center	SHCo-2	0	NA	1	1	8	1	1	1	1	1	
Shelby	County-Other	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SHCo-1	9	NA	1	1	8	1	1	1	1	1	
Shelby	County-Other	Sabine	Purchase water from SRA	SHCo-3	9	NA	1	1	8	1	1	1	1	1	
Shelby	Livestock	Sabine	Increase groundwater supply from Carrizo-Wilcox Aquifer	SHL-1	0	NA	2	1	8	1	1	1	1	1	Potential impacts to stream flows.
Shelby	Livestock	Neches	Increase groundwater supply from Carrizo-Wilcox Aquifer	SHL-2	0	NA	2	1	8	1	1	1	1	1	Potential impacts to stream flows.
Shelby	Livestock	Sabine	Purchase additional water from SRA (Toledo Bend)	SHL-4	12	NA	2	2	8	1	2	1	1	2	
Shelby	Livestock	Sabine	Increase local supplies	SHL-3	33	NA	2	2	8	2	1	1	1	2	May decrease runoff to local streams
Shelby	Manufacturing	Sabine	Purchase water from City of Center	SHM-1	0	NA	1	1	8	1	1	1	1	1	
Smith	Bullard	Neches	Increase supply from Carrio-Wilcox	BU-1A&B	0	NA	1	1	8	1	1	1	1	1	
Smith	Community Water Co.	Neches	Increase supply from Carrio-Wilcox	CW-1A	0	NA	1	1	8	1	1	1	1	1	
Smith	Dean WSC	Neches	Increase supply from Carrio-Wilcox	DE-1A	0	NA	1	1	8	1	1	1	1	1	
Smith	Jackson WSC	Neches	Increase supply from Carrio-Wilcox	JA-1	0	NA	1	1	8	1	1	1	1	1	
Smith	City of Lindale	Neches	Increase supply from Carrio-Wilcox	LI-1	0	NA	1	1	8	1	1	1	1	1	
Smith	Lindale Rural WSC	Neches	Increase supply from Carrio-Wilcox	LIR-1	0	NA	1	1	8	1	1	1	1	1	
Smith	RPM WSC	Neches	Increase supply from Carrio-Wilcox	LI-1	0	NA	1	1	8	1	1	1	1	1	
Smith	Irrigation	Neches	Increase supply from Queen City	LI-1	0	NA	1	1	8	1	1	1	1	1	
Smith	Mining	Neches	Increase supply from Queen City	SMM-1	0	NA	1	1	8	1	1	1	1	1	
Trinity	County-Other	Neches/Trinity	Increase supply from Yegua-Jackson	TRC-1	0	NA	1	1	8	1	1	1	1	1	
Tyler	County-Other	Neches	Increase supply from Gulf Coast Aquifer	TYC-1	0	NA	1	1	5	1	1	1	1	1	
Henderson	Athens MWA	Multiple	Indirect Reuse at Lake Athens	AMWA-1	10	NA	2	1	7	1	1	1	1	1	Will decrease flows in current receiving stream and increase flows in Lake Athens watershed
Henderson	Athens MWA	Multiple	Water from Forest Grove	AMWA-2	33	NA	3	3	7	2	2	2	1	2	
Henderson	Athens MWA	Multiple	Purchase water from DWU	AMWA-3	1	NA	2	1	7	1	1	1	1	1	
Henderson	Athens MWA	Multiple	Purchase water form UNRMWA	AMWA-4	55	NA	2	1	7	2	1	1	1	1	
Multiple	Multiple	Multiple	Water Conservation	Multiple	0	NA	1	1	0	1	1	1	1	1	

1. Acreage of potential wetlands for reservoir sites is based on acreage of hydric soils.

Chapter 5

Impacts Of Selected Water Management Strategies On Key Parameters Of Water Quality And Impacts Of Moving Water From Rural And Agricultural Areas

Texas State Senate Bill 1
East Texas Region

The regulations that describe the content and process for the development of regional water plans direct that the plan include "a description of the major impacts of recommended water management strategies on key parameters of water quality identified by the regional water planning group . . ." [30 TAC 357.7(a)(12)]. This chapter provides information and recommendations to assist the East Texas Regional Water Planning Group (ETRWPG) in identifying the key water quality parameters that may be impacted by implementation of the recommended water management strategies (WMS). This chapter presents a listing of the potential water management strategies (WMS) for ETRWPG and an assessment of the key water quality parameters that could be affected by the implementation of each type of WMS. In addition, this chapter provides information relating to the potential impacts of moving water used for rural or agricultural purposes to urban uses.

5.1 Summary of Water Quality Impacts from Water Management Strategies

The implementation of specific WMS can potentially impact both the physical and chemical characteristics of water resources in the region. Following is an assessment of the characteristics of each WMS that can affect water quality, and an identification of the specific water quality parameters that could be affected based on those characteristics.

Water Conservation

Water conservation plans are required as a key component of the water planning and permitting process in Texas. These plans are designed to maximize the efficient use of available water supplies, especially during periods of drought. The water conservation measures recommended in the East Texas Region are not expected to affect water quality adversely. The results should be beneficial because the demand on surface and groundwater resources will be decreased. Quantifying such positive impacts could be very difficult.

Indirect Reuse

In general, there are three possible water quality effects associated with an increased use of reclaimed water:

- There can be a reduction in instream flow, if treated wastewaters are not returned to the stream. This could affect TDS, nutrients, DO, and metals concentrations.
- Conversely, in some cases, reducing the volume of treated wastewater discharged to a stream could have a positive effect, reducing concentrations of TDS, nutrients, and metals, and increasing DO concentrations.
- Reusing water multiple times and then discharging it can significantly increase the TDS concentration in the effluent and, thus, in the receiving stream.

Expanded Use of Existing Surface Water Resources

The expanded use of existing surface water resources will provide much of the increased water supply for the East Texas Region during the planning period. A proposed regional project in the Lufkin area will increase the use of water from the Rayburn/Steinhagen system. The primary physical impact of this expanded use of surface water is a change in the volume of water remaining in the river basin (i.e., flow in a stream or storage in a lake). From a water quality perspective, this change in volume is likely to be more significant in a stream than in a reservoir. Several conditions can develop as stream flows decrease that may impact water quality:

- There is less dilution for stream inflows. If those inflows are associated with treated industrial wastewater, treated domestic wastewater, discharges of power plant cooling water blowdown, or groundwater seeps or springs with high concentrations of minerals, for example, the quality of the stream can be affected. For permitted discharges, permit limits could be adjusted to avoid adverse impacts. The water quality parameters most likely to be affected are total dissolved solids (TDS) and nutrients, both of which could increase in concentration in the receiving stream.
- In some cases there could be an increase in the concentration of one or more metals in the stream as a result of a decrease in the dilution of discharge flows. However, this potential is dependent on the types of discharges to the stream.
- In addition, a decrease in stream flow could decrease the stream's ability to assimilate loadings of oxygen-demanding materials such as biochemical oxygen demand (BOD) and ammonia associated with permitted discharges or non-point sources. The water quality parameter affected would be dissolved oxygen (DO). As discussed above, for permitted discharges, it is expected that permit limits for BOD and ammonia could be appropriately adjusted to reduce adverse impacts and to maintain compliance with the DO criteria in the Texas Surface Water Quality Standards. The flow in the stream might be reduced to a point that the DO standard may not be maintained even when there are no permitted discharges. If the DO standard is not maintained, the affected stream could be included on the List of Impaired Waters prepared by the Texas Commission on Environmental Quality (TCEQ) pursuant to Section 303(d) of the Clean Water Act. Inclusion on that list could have significant implications for point and non-point sources in the watershed.

The potential for significant water quality impacts as a result of increased use of waters in a reservoir is much lower than that associated with increased use of a stream. Even if increased use of the reservoir requires significant construction of pipelines or an intake structure, the potential for impact is low. Existing requirements, for stormwater permits for construction activity and for 404 permits for construction in waterbodies, minimize the potential for water quality impacts. Also, the water rights allocation system in Texas is designed to ensure that minimum instream flows can be maintained downstream of a reservoir, even during drought-of-record conditions.

Interbasin Water Transfers

East Texas Region interbasin water transfers currently exist in Jefferson, Nacogdoches, Orange, and Rusk Counties. The major water transfers occur in Jefferson and Orange Counties. Major municipal populations and industrial activities are located in both Jefferson and Orange Counties. Water transfers in these counties are designed to compensate for the deficit of available water in specific regions of each county. Some voluntary redistribution or surface water expansion strategies may involve interbasin transfers. Interbasin transfers of water may also be associated with the future development of Lake Columbia and Lake Fastrill.

If waters are transferred from one basin to another, there can be a decrease in stream flows below the location of the diversion. The water quality parameters potentially impacted by that action are as previously discussed: TDS, nutrients, DO, and, in some cases, metals.

In cases where the water characteristics of the source and destination river basins are significantly different, the interbasin transfer can cause changes in the receiving water body. Changes in TDS, alkalinity, hardness, or turbidity can impact water users, particularly industrial users that have treatment processes to produce high quality waters (for boiler feed, for example) and water treatment plants. Water treatment processes are tailored to the quality of the water being treated. If the quality of the feed water changes, the treatment process may have to be changed, also. Changes in nutrient concentrations or water clarity can affect the extent of growth of algae or aquatic vegetation in a stream. The same concentration of nutrients can produce different levels of algal growth in different waterbodies depending on factors such as water clarity, shading, stream configuration, or other chemical constituents in the waters. With respect to water clarity, there are also aesthetic considerations. It is generally not desirable to introduce waters with higher turbidity, or color, into high clarity waters. Because the river basins within

East Texas Region have similar water characteristics, the interbasin transfers within the region generally do not have significant water quality impacts.

Expanded Use of Groundwater Resources

Proposed East Texas Region WMS include increased uses of groundwater from the Carrizo-Wilcox aquifer, Gulf Coast aquifer, Yegua-Jackson aquifer, Queen City aquifer, and Sparta aquifer. The increased withdrawal of groundwater can affect both the quantity and quality of water resources in the region. There is a significant potential that increased use of groundwater will increase TDS concentrations in area streams. Groundwaters frequently contain higher concentrations of TDS or hardness than are considered desirable for domestic uses. Some homeowners may install treatment systems to reduce TDS or hardness. Operation of these systems may introduce high concentrations of TDS to municipal wastewater systems or area streams. However, because these discharges are expected to be small, the overall impacts should be negligible. Increased withdrawal of groundwater resources can also affect the quality of the water in the aquifers by increasing the potential for the intrusion of saltwater and/or brackish water into the aquifers, especially in coastal regions.

Expansion of Local Supplies (Livestock Ponds)

The development of additional livestock ponds is not expected to cause any impacts to water quality.

Voluntary Redistribution

The voluntary redistribution of water from one water supplier to another does not cause impacts on water quality unless the redistribution includes expanded use of surface water or groundwater, or involves a transfer of water from one basin to another. Potential water quality impacts of the expansion of existing water supplies, or interbasin transfers, have been previously described.

New Reservoirs

One proposed water management strategy to serve needs in the East Texas Region is the development of Lake Columbia on Mud Creek. Lake Fastrill is a proposed water management strategy for needs in Region C. The most potentially significant impact of new reservoir construction is the inundation of bottomlands and a decrease in instream flows below the reservoir. If this occurs, the potential impacts include those described in the previous section when instream flow is reduced due to increased stream usage, i.e., potential impacts on TDS, nutrients, DO, and, in some cases, metals.

Another factor to consider with respect to new reservoirs may be the potential for effects due to increased sedimentation downstream of the reservoir. If the soils in the watershed that drains to the stream below the reservoir are highly erodable, and flow velocities in the stream are reduced, the rate of accumulation of sediments in the stream may increase. This condition may be further exacerbated by the fact that, if there were no reservoir, relatively small flood events (which occur more frequently than floods sufficient in size to produce major releases from a reservoir) would more frequently scour out these deposits. Without these scouring events, the sediments continue to accumulate. Depending on the nature of land uses in the watershed, these sediments could create a nutrient-rich or highly organic sediment layer in the streambed. The combination of shallower depths and higher concentrations of nutrients could produce significant growths of algae and/or aquatic vegetation in the stream. Either the algal growth or the organic matter in the sediments also could affect the DO concentration in the stream.

However, studies have shown that reservoirs do not always reduce the typical level of downstream flows. Because the reservoirs capture flood flows and release them in a controlled manner, there are cases where downstream flow is generally increased. An increase in downstream flow is not expected to have adverse water quality impacts. Also, any new reservoir would have minimum downstream flow requirements that would help to minimize water quality impacts.

Significant water quality impacts have resulted from reservoir construction when the dam release structures are designed to release water from the hypolimnion (e.g., bottom release of water through the dam). During the summer season, water quality concerns with respect to waters in the hypolimnion include decreased oxygen levels, low temperature, and high nutrient concentrations. However, there is currently an awareness of this problem, and it is not anticipated that a new dam would be constructed that would only release water from the hypolimnion.

5.2 Key Water Quality Parameters

The water quality parameters identified above as being potentially impacted by the types of WMS recommended for the East Texas Region are further described in the following sections. Table 5.1 summarizes the most pertinent water quality parameters for the types of WMS recommended in the East Texas Region Water Plan. It is recommended that these be identified as the key water quality parameters for these WMS in the East Texas Region.

Total Dissolved Solids

The current standards for TDS in surface waters have been set by the Texas Commission on Environmental Quality (TCEQ). TDS levels in surface waters may increase as a result of decreased flows, municipal and industrial discharges, mining activities and reuse. Decreased flows may occur naturally due to extreme climatic conditions; however, decreased flows may also occur as a result of the increased withdrawal of surface and/or groundwater for municipal and industrial uses.

Table 5.1 East Texas Region 2005 Water Plan. Evaluation of Water Management Strategy Impacts

Water Quality Parameter	Water Management Strategy Types							
	Expanded Use of Surface Water	Interbasin Transfers	New Reservoirs	Expanded Use of Groundwater	Reuse	Expanded Use of Local Supplies	Voluntary Redistribution	Water Conservation
TDS	X	X	X	X	X			
Dissolved Oxygen	X	X	X		X			
Nitrogen	X	X	X		X			
Phosphorus	X	X	X		X			
Metals (1)	X	X	X	X	X			
Turbidity		X						

Drinking water standards for TDS are set by both the federal and state governments. The State of Texas has set the drinking water standard for TDS at 1,000 mg/L. The federal standard has been set at 500 mg/L. Increased TDS levels in raw water (surface or ground) can result in increased treatment costs and problems related to odor and taste.

Dissolved Oxygen

The TCEQ has set dissolved oxygen (DO) standards for all surface waters of the state. These standards apply to classified, unclassified, and tidal waters within the jurisdiction of the state. Increased withdrawals of surface water and/or groundwater can result in decreased DO levels. The decrease in DO levels may be the result of decreased flows or physiochemical constituents that increase the biochemical oxygen demand and/or sediment oxygen demand.

Nutrients

The two major nutrients of concern in surface water and groundwater are nitrogen and phosphorus. These nutrients may be present as a result of natural sources, or they may be introduced via municipal or industrial discharges. The state and federal government has set the primary drinking water standard for nitrate (as nitrogen) at 10 mg/L.

If present in surface waters at sufficient levels, depending on climatic conditions, these nutrients can cause algal blooms resulting in the impairment of surface water designated uses such as drinking water supply, aquatic life use, and non-contact recreation. Algal blooms can also foul water treatment plant intakes and increase the cost of water treatment related to taste and odor problems.

Metals

The concentration of metals in surface water and groundwater may increase if flows decrease or the withdrawal of available surface water or groundwater increases. Primary drinking water standards have been established for various metals, including arsenic, cadmium, mercury, and selenium. Secondary drinking water standards have been established for copper, iron, manganese, silver, and zinc.

As with the nutrients nitrogen and phosphorus, these metals may be present as a result of natural sources, or they may be introduced by municipal or industrial discharges. Elevated levels of some metals may result in impacts to human health and designated aquatic life uses.

5.3 Impacts of Moving Rural and Agricultural Water to Urban Uses

As the population of Texas increases, the municipal water demands will rise accordingly, even with the implementation of conservation measures. The largest proportion of additional municipal water supply that will be utilized in The East Texas Region over the planning period will be from expanded use of surface waters. However, the expanded use of surface water for municipal supplies is not expected to involve any transfers of agricultural supplies to municipal supplies. The proposed increases in municipal water surface water supplies will rely on existing water rights or new water rights from currently unpermitted supplies.

Chapter 6

Water Conservation and Drought Management Recommendations

6.1 Introduction

Water conservation is a potentially feasible water savings strategy that can be used to preserve the supplies of existing water resources. For municipalities and manufacturers, advanced drought planning and conservation can be used to protect their water supplies and increase reliability during drought conditions. Some of the demand projections developed for SB1 Planning incorporate an expected level of conservation to be implemented over the planning period. For municipal use, the assumed reductions in per capita water use are the result of the implementation of the State Water-Efficiency Plumbing Act. On a regional basis, this is about an 8 percent reduction in municipal water use (20,700 acre-feet per year) by year 2060. Additional municipal water savings may be expected as the Federal mandate for low flow clothes washing machines takes effect in 2007.

Conservation savings were also included in the steam electric power demands. Demands for steam electric power were developed on a state-wide basis and these demands assume that long-term power needs will be met with high water efficient facilities. The estimated water savings associated with the higher efficient power plants is nearly 27 percent of the total demands or 57,100 acre-feet per year in the ETRWPG. Reductions in demands due to conservation were not quantified by the TWDB for manufacturing, mining, irrigation and livestock needs.

SB1 requires each region's water plan to address drought management and conservation for each supply source within the region. This includes both groundwater and surface water.

The East Texas Region is a water-rich region and water conservation in the Region is driven by economics and not by lack of water supply. The ETRWPG believes that water users in the Region will implement advanced water conservation measures (i.e. savings associated with active conservation measures) as economic conditions dictate to each individual user. Given the general abundance of accessible water supply to the water users in the East Texas Region, the ETRWPG believes the conservation strategies included in this planning period represent an economically achievable level of conservation. Currently, over one fourth of the municipal water users in East Texas have per capita water use less than 100 gallons per person per day and 57 percent are less than the Water Conservation Task Force recommended state average of 140 gallons per person per day. While municipal use represents about 20 percent of the total regional water demands, the potential savings from advanced municipal conservation are relatively small. This opinion may change as economics and water supply conditions change in East Texas.

6.2 Water Conservation Plans

The TCEQ defines water conservation as “A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water [1].”

The TCEQ requires water conservation plans for all municipal and industrial water users with surface water rights of 1,000 acre-feet per year or more and irrigation water users with surface water rights of 10,000 acre-feet per year or more. Water conservation plans are also required for all water users applying for a State water right, and may also be required for entities seeking State funding for water supply projects. Recent legislation passed in 2003 requires all conservation plans to specify quantifiable 5-year and 10-year conservation goals and targets. While these goals are not enforceable, they must be identified. All updated water conservation plans must be submitted to the Executive Director of the TCEQ by May 1, 2005.

In the ETRWPG area, 24 entities hold municipal or industrial rights in excess of 1,000 acre-feet per year and four entities have irrigation water rights greater than 10,000 acre-feet per year. Each of these entities is required to develop and submit to the TCEQ a water conservation plan. Many more water users have contracts with regional water providers for water of 1,000 acre-feet per year or more. Presently, these water users are not required to develop water conservation plans unless the user is seeking State funding; however, a wholesale water provider may request that its customers prepare a conservation plan to assist in meeting the goals and targets of the wholesale water provider's plan. A list of the users in the ETRWPG that are required to submit water conservation plans is shown in Table 6.1.

To assist entities in the ETRWPG area with developing water conservation plans, model plans for municipal water users (wholesale or retail public water suppliers), industrial users and irrigation districts are included in the Model Water Conservation Plans section of this chapter. Each of these model plans address the latest TCEQ requirements and is intended to be modified by each user to best reflect the activities appropriate to the entity.

The focus of the conservation activities for municipal water users in the ETRWPG are:

- Education and public awareness programs,
- Reduction of unaccounted for water through water audits and maintenance of water systems, and
- Water rate structures that discourage water waste.

Industrial water users include large petrochemical industries as well as smaller local manufacturers. Conservation activities associated with industries are very site and industry-specific. Some industries can utilize brackish water supplies or wastewater effluent while others require only potable water. It is important in evaluating conservation strategies for industries to balance the water savings from conservation to economic benefits to the industry and the region. In the ETRWPG area, where water is

Table 6.1
Water Users in the ETRWPG that are Required to Prepare Water Conservation Plans

Municipal and Industrial Water Users	Irrigation Water Users
Abitibi Consolidated Corp	Sabine River Authority
Angelina & Neches River Auth	Joe Broussard
Angelina-Nacogdoches WCID #1	M Half Circle Ranch Company
Athens Municipal Water Authority	Lower Neches Valley Authority
City of Center	
City of Jacksonville	
City of Lufkin	
City of Nacogdoches	
E I Dupont De Nemours & Co	
Exxon Mobil Oil Company	
Gulf States Utilities	
Houston Co WCID #1	
Huntsman Corporation	
Independent Refining Corp.	
Lower Neches Valley Authority	
Motiva Enterprises LLC	
Panola Co FWSD #1	
Premcor Refining Group Inc	
Sabine River Authority	
Temple-Inland Forest Prod Corp	
TXU Electric Company	
Union Oil of California	
United States Dept of Energy	
Upper Neches River MWD	

readily available, requiring costly changes to processes and equipment may not be practical and beneficial to the region. In light of these considerations, the focus of the conservation activities for industrial users is:

- Evaluation of water saving equipment and processes, and
- Water rate structures that discourage water waste.

Most of the irrigation occurs in the lower parts of the Neches and Sabine Basins. Much of the irrigation water is delivered by canals and is used for rice farming along the coast. Appropriate conservation activities for the large irrigators in the ETRWPG area include:

- Reduction in operational losses and losses associated with conveyance systems
- Coordination of irrigation deliveries to maximize efficiencies (tailwater recovery), and
- Encourage water saving irrigation equipment and land practices for customers, (e.g. land leveling).

6.3 Drought Contingency Plans

Drought management is a temporary strategy to conserve available water supplies during times of drought or emergencies. This strategy is not recommended to meet long-term growth in demands, but rather acts as means to minimize the adverse impacts of water supply shortages during drought. The TCEQ requires drought contingency plans for wholesale and retail public water suppliers and irrigation districts. A drought contingency plan may also be required for entities seeking State funding for water projects.

Drought contingency plans typically identify different stages of drought and specific triggers and response for each stage. In addition, the plan must specify quantifiable targets for water use reductions for each stage, and a means and method for enforcement. As with the water conservation plans, drought contingency plans are to be updated and submitted to the TCEQ by May 1, 2005.

Model drought contingency plans were developed for the ETRWPG and are included in the Drought Contingency Plans section of this chapter. Each plan identifies four drought stages: mild, moderate, severe and emergency. The recommended responses range from notification of drought conditions and voluntary reductions in the "mild" stage to mandatory restrictions during an "emergency" stage. Each entity will select the trigger conditions for the different stages and appropriate response.

6.3.1 Regional Drought Triggers

Ninety-eight drought contingency plans were submitted to the ETRWPG. The majority of the plans use trigger conditions based on the demands placed on the water distribution system. Of the plans reviewed six users based trigger actions on well levels, three based actions on reservoir levels (two of which were tied to the Sabine River Authority) and two based actions on climate or weather conditions. A summary of the submitted plans is provided in Table 6.2.

Table 6.2

Entity	Type Trigger Condition		Entity	Type Trigger Condition	
	Demand	Supply		Demand	Supply
Anderson County			**Angelina County**		
BBS WSC	X		Sun n Fun	X	
Dogwood Water System	X		Pollock Redtown WSC	X	
Lone Pine WSC	X		Walnut Ridge Water Sys	X	X
Palestine	X		Angelina WSC	X	
Brushy Creek	X		Four Way WSC	X	
Walton Springs WSC	X		FSA Water Utility	X	
Cherokee County			**Hardin County**		
Eagles Bluff	X		Medina Utilities	X	
Gum Creek	X		Little Big Horn Services	X	
Reklaw WSC	None		North Hardin WSC	X	
North Cherokee		X	Wildwood	X	
Stryker Lake WSC	X				
Dialville-Oakland WSC	X		**Henderson County**		
Rusk Rural WSC	X	X	City of Athens	X	
Gallatin WSC	X		Bluewater Key Water Co.	X	
City of Jacksonville	X		Carrizo Water Co.	X	
			Poynor Community WSC	X	
			Tecon Water Companies	X	X
Houston County					
Houston Cty. WCID 1	X	X	**Jefferson County**		
			Newton & Co.	X	
			Bevil Oaks MUD	X	
Jasper County			City of Groves	X	
Evadale Water System		X	Sunchase Water Co.	X	
			Moore Water Service		X
			City of Beaumont	None	
Nacogdoches County			**Orange County**		
East Texas Water Supply	X		North Orange W&S		X
Appleby WSC	X		River Bend Water Svcs.	X	
Melrose WSC	X		Cypress Bayou, Inc.	X	
Swift WSC	X		PCS Water System		X
City of Cushing	X		Kelly Brewer		X
City of Nacogdoches	X		Larry Brewer		X
			Community Water	X	

Panola County					
Deadwood WSC	X	X	**Polk County**		
Rehobeth WSC	X		City of Corrigan	X	
Panola-Bethany WSC	X		Tecon Water Cos.	X	X
Deberry WSC	X		Moscow WSC	X	
Hollands Quarter WSC	X		Damascus-Stryker WS	X	
Rusk County			**Sabine County**		
Shan-D Water Works	X		Frontier Park Resort and Marina	X	
New Prospect WSC	X		Timberlane Estates	X	
Cross Roads	X	X	G-M WSC	X	
South Rusk County WSC	X		South Sabine WSC	X	
Ebenezer WSC	X		El Camino Water System		X
			Timberlane Water System		
San Augustine County			**Smith County**		
Sam Rayburn Water		X	Pine Ridge WSC	X	
City of San Augustine		X	Southern Utilities, Inc.	X	
			Lindale Rural WSC	X	
Shelby County			Jackson WSC	X	
City of Tenaha		X	Tecon	X	
On-Site Water Works	X		Community Water Co.	X	
City of Center	X		Dogwood Estates	X	
City of Timpson	X		City of Troup	X	
City of Huxley	X		City of Tyler	X	
Trinity County			**Tyler County**		
Tecon Water Cos.	X		Doucette Water System	X	
Woodlake-Josserand WSC	X		Lakeside Water Supply	X	
Nogalus Centralia WSC	X		City of Woodville	X	
City of Groveton	X		Warren WSC	X	
Trinity City Regional Water System (TRA)	X		Tecon Water Cos.	X	
River Authorities					
Sabine		X			
LNVA		X			
UNRMWA	X				

Drought trigger conditions for surface water supply are customarily related to reservoir levels. The East Texas Regional Water Planning Group will be working with the regional operators of reservoirs to establish the trigger conditions. Trigger conditions which have been ascertained for the region's reservoirs follows:

Sam Rayburn/B.A.Steinhagen

The LNVA operates storage in Sam Rayburn Reservoir in accordance with guidelines from the U.S. Army Corps of Engineers. The conservation storage space is divided into four zones, which vary on a seasonal basis. The trigger conditions established by the LNVA are as follows:

- Mild: Water surface below 160.0 MSL
- Moderate: Level remaining in Zone 3 for a continuous 30-day period.
- Severe: Level reaches Zone 4.

Toledo Bend

The Sabine River Authority's trigger conditions are based on percent of capacity levels in Lake Fork, Lake Tawakoni, Toledo Bend and/or flow measurements of U.S. Geological Survey gage on the Sabine River near Ruliff, Texas. The trigger condition for the Ruliff gage is dependent on the amount of water the SRA is contracted to deliver. The trigger conditions for the various conditions are summarized in the following table.

Gulf Coast Division Drought Trigger Conditions

Contracted Diversion	Contracted Division	Minimum Ruliff Flows for Diversion	Trigger Flow at Ruliff Gage		
			Mild Conditions	Moderate Conditions	Severe Conditions
(ac-ft/yr)	(cfs)	(cfs)	(cfs)		
50,000	69	173	260	216	173
60,000	83	208	312	260	208
70,000	97	243	365	304	243
80,000	111	278	417	348	278
90,000	124	310	465	388	310
100,000	138	345	518	431	345
110,000	152	380	570	475	380
120,000	166	415	623	519	415
130,000	180	450	675	563	450
140,000	193	483	725	604	483
147,100	203	508	762	635	508

NOTE: The minimum flow required at Ruliff to allow the contracted division was calculated by multiplying the contracted diversion (in cfs) by 2.5. The following assumptions were used in determining the multiplication factor.

i. Only half the flow downstream of the gage flows on the Texas side.

ii. At least 20% of the flow on the Texas side flows past the canal intake structure.

iii. The mild drought trigger flow is 1.5 times the minimum; the moderate drought trigger flow is 1.25 times the minimum; the severe drought trigger flow is the minimum flow required to allow the contracted division.

Sabine River Authority Reservoirs

Condition	Reservoir Capacity		Gage at Ruliff
	Lake Fork & Tawakoni	Toledo Bend	
Mild	75%	75%	See Table Above
Moderate	66%	66%	See Table Above
Severe	50%	50%	See Table Above

Lake Palestine

The trigger conditions established by the Upper Neches River Municipal Authority's Water Conservation and Emergency Demand Management Plan is measured by the level at which the individual water utility is operating. The trigger conditions are as follows:

Mild: Daily water demand reaches the level of 90% of the water utility system capacity for three consecutive days or distribution pressure remains below normal for more than six consecutive days.

Moderate: Daily water demand reaches 100% of system capacity for three consecutive days, supply of water is continually decreasing on a daily basis and water supply utility is advised to conserve by UNRMWA, TCEQ or TDH, or decrease in water pressure in distribution system as measured by pressure gauges and customer complaints.

Severe: Water demand exceeding 100% of system capacity for three consecutive days, full allotment of raw water is being pumped from the system's supply source or imminent or actual failure of a major component of the system which would cause an immediate health or safety hazard.

Houston County Lake

Trigger conditions for drought response implementation by the Houston County WCID No. 1 is based on demand and water levels in Houston County Lake. The trigger conditions are as follows:

Mild: Demand reaches 90% of the system for 3 consecutive days with plant operating at 100% of rated production, weather conditions will result in reduced supply available from Houston County Lake for an extended period of time or water level drops below 275 feet above MSL.

Moderate: Demand reaches 100% of the system for 3 consecutive days with plant operating at 100% of rated production, weather conditions result in Lake levels falling to a point that mild operational problems occur or water supply storage facilities are not maintaining a constant level with plant operating at 100% of rated production.

Severe: Treatment plant is non-operational due to a malfunction at the site or water levels drop at the reservoir to a point where pumping equipment will not function properly.

Lake Jacksonville

The City of Jacksonville relies on both surface water from Lake Jacksonville and groundwater. The Drought Contingency Plan for the City of Jacksonville contains numerous trigger conditions. The conditions related to system capacity are summarized below by the various condition levels.

Mild: Demand of 7.04 mgd for five consecutive days or water levels in tanks are consistently below ¾ full for five consecutive days.

Moderate: Demand reaches limit of 8.38 mgd for any two days within a 30-day period or water level in tanks are consistently below half full for three consecutive days.

Severe: Demand exceeds limit of 8.38 mgd for more than five consecutive days and water levels in tanks are too low to provide adequate fire protection (generally less than ¼ full).

Lake Nacogdoches

The City of Nacogdoches currently uses both ground and surface water. The surface water treatment plant, which takes water from Lake Nacogdoches, limits surface water delivery to 6 million gallons per day. The trigger conditions for initiation of a drought response are based on system demand and not levels in Lake Nacogdoches. The current trigger conditions are as follows:

Mild: Daily water demand equals or exceeds 14 million gallons per day for 7 consecutive days or 14.49 million gallons in a single day.

Moderate: Daily water demand equals or exceeds 14.49 million gallons per day for 7 consecutive days or 15.35 million gallons in a single day.

Severe: Daily water demand equals or exceeds 15.35 million gallons per day for 5 consecutive days or 15.75 million gallons in a single day.

Lake Tyler/Lake Tyler East/Bellwood Lake

The City of Tyler currently utilizes in addition to surface water from Lake Tyler/Tyler East. In addition it also has water rights to Bellwood Lake and Lake Palestine. The trigger conditions for initiation of drought response are based on water demand and are as follows:

Mild: Demand equals or exceeds 34 million gallons per day for 7 consecutive days or 37 million gallons on a single day.

Moderate: Demand equals or exceeds 36 million gallons per day for 7 consecutive days or 38 million gallons on a single day.

Severe: Demand equals or exceeds 38 million gallons per day for 5 consecutive days or 39 million gallons on a single day.

Lake Pinkston/Lake Center

The City of Center currently obtains its water supply from Lakes Pinkston and Center. The combined firm production capacity of its two treatment plants is 4.7 MGD. Trigger conditions are based on production capacity and are summarized below:

Mild: Demand reaches 90% of firm production capacity, disruption in operations which would limit capacity of water system below 85% of capacity or demand usage patterns that exceed distribution systems capabilities causing same affect as first two criteria.

Moderate: Demand reaches 95% of firm production capacity, disruption in operations which would limit capacity of water system below 75% of capacity or demand usage patterns that exceed distribution systems capabilities causing same affect as first two criteria.

Severe: Demand reaches 100% of firm production capacity, disruption in operations which would limit capacity of water system below 70% of capacity or demand usage patterns that exceed distribution systems capabilities causing same affect as first two criteria.

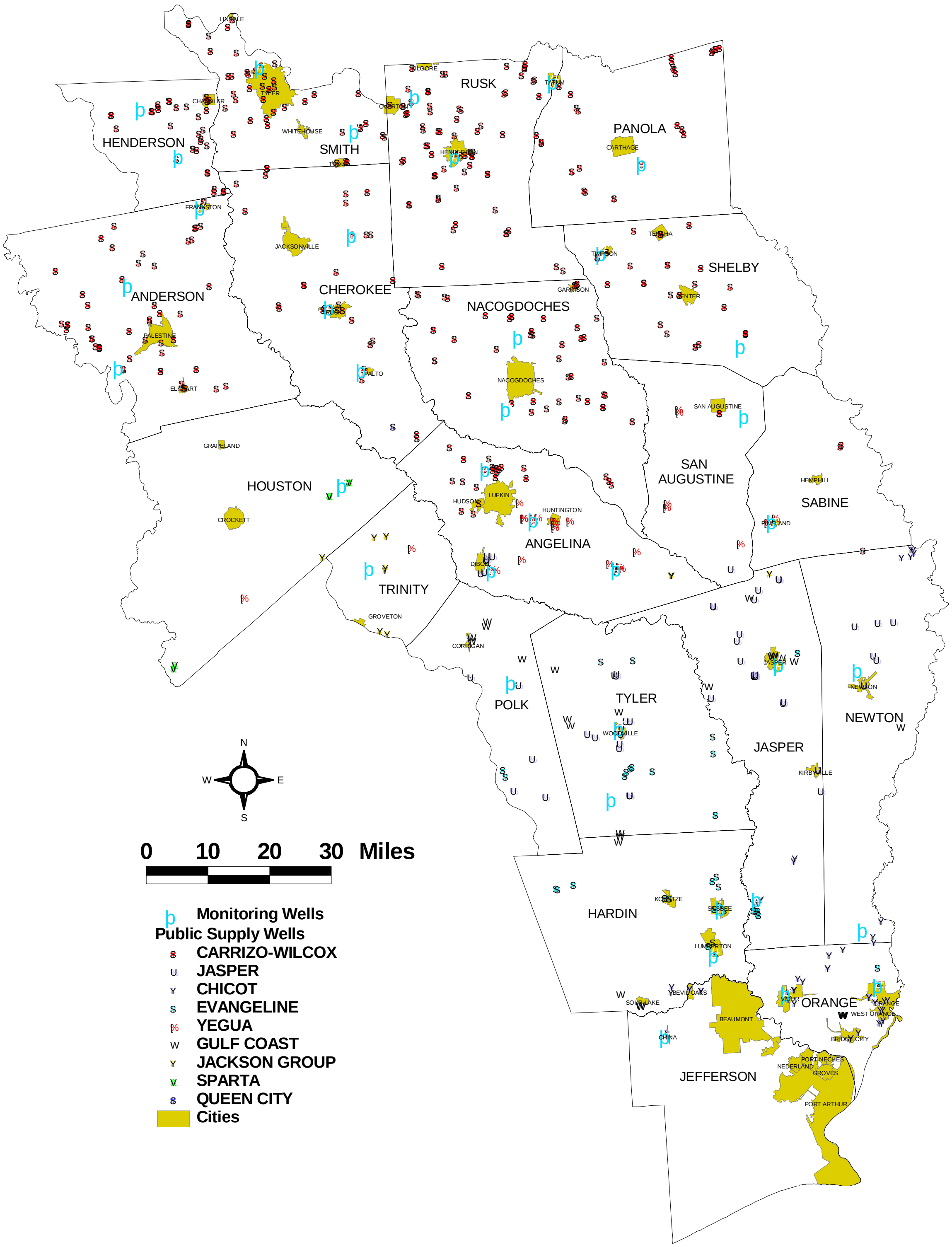
Establishment of a regional trigger condition for groundwater sources is difficult due to the variability within the aquifers. However, a series of wells have been identified for monitoring. Public water supply wells were not selected because of the cyclical nature of pumping in these wells, which could cause difficulty for interpretation of water level trends as used for drought contingency planning. Instead, wells were selected that are relatively close to public water supply wells and/or well fields. At least one monitoring well was selected in each county, but in some cases, up to four wells were selected to ensure that areas dependent on groundwater are well monitored. The selected wells are monitored in the same hydrostratigraphic unit as the closest public water supply wells to ensure that the most representative water levels are monitored. Wells with a longer monitoring history were selected over wells that had very little monitoring data. The earliest monitoring year for the group of wells ranges from 1929 to 1981 and the average is 1963. All but two of the wells have been monitored through the 1990’s. The average duration of monitoring is 33 years and an average of 25 water level measurements have been collected from each well. Therefore, each well has a relatively long historical record that can be compared to future monitoring data to help determine the nature and severity of any water level fluctuations. The list of wells is provided in the following table. A map showing the general location of the monitoring wells is also included.

GROUNDWATER MONITORING WELLS FOR EAST TEXAS REGIONAL WATER PLANNING AREA

State Well Number	Longitude	Latitude	County	Aquifer	First Year Monitored	Most Recent Year Monitored	Water Levels Collected	Years Monitored
3819404	95.74861	31.68583	Anderson	Wilcox Group	1939	1998	25	59
3803703	95.71417	31.87944	Anderson	Carrizo Sand And Wilcox Group	1976	1993	16	17
3460602	95.50556	32.05528	Anderson	Carrizo Sand	1949	1998	10	49
3743902	94.62611	31.28528	Angelina	Yegua Formation	1967	1998	27	31
3734902	94.75139	31.41028	Angelina	Carrizo Sand	1967	1998	27	31
3751403	94.74722	31.17222	Angelina	Yegua Formation	1967	1997	21	30
3753904	94.40500	31.16083	Angelina	Yegua Formation	1971	1995	17	24
3808105	95.09028	31.97611	Cherokee	Wilcox Group	1968	1998	22	30
3815607	95.16111	31.80667	Cherokee	Carrizo Sand	1969	1995	21	26
3824802	95.07917	31.65722	Cherokee	Carrizo Sand	1929	1989	16	60
6147208	94.16833	30.34806	Hardin	Evangeline Aquifer	1962	1996	26	34
6155206	94.19472	30.23639	Hardin	Evangeline Aquifer	1977	1998	19	21
3443603	95.65972	32.29389	Henderson	Wilcox Group	1970	1998	23	28
3452507	95.55972	32.17889	Henderson	Queen City Sand Of Claiborne Group	1973	1998	21	25
3839901	95.14778	31.38694	Houston	Spiller Sand Member Of Cook Mountain	1961	1998	21	37
6148214	94.06917	30.36333	Jasper	Chicot Aquifer	1941	1994	29	53
6201701	93.97417	30.91389	Jasper	Lagarto Clay And Oakville Sandstone	1964	1998	28	34
6162415	94.33667	30.05278	Jefferson	Chicot Aquifer	1965	1998	12	33
3719301	94.64306	31.71722	Nacogdoches	Carrizo Sand	1945	1998	30	53
3727506	94.68778	31.54861	Nacogdoches	Carrizo Sand	1968	1998	27	30
6202901	93.76000	30.89083	Newton	Evangeline Aquifer	1964	1998	29	34
6242904	93.78528	30.27778	Newton	Chicot Aquifer	1964	1991	27	27
6156919	94.00361	30.13694	Orange	Chicot Aquifer,Lower	1967	1996	42	29
6250911	93.75389	30.14500	Orange	Gulf Coast Aquifer	1982	1996	11	14
3562301	94.27889	32.11139	Panola	Wilcox Group	1977	1998	20	21
6103706	94.70917	30.90417	Polk	Jasper Aquifer	1966	1998	29	32
3541601	94.89694	32.29583	Rusk	Carrizo Sand	1972	1997	26	25

GROUNDWATER MONITORING WELLS FOR EAST TEXAS REGIONAL WATER PLANNING AREA

State Well Number	Longitude	Latitude	County	Aquifer	First Year Monitored	Most Recent Year Monitored	Water Levels Collected	Years nitored
3544601	94.51278	32.31417	Rusk	Wilcox Group	1939	1996	22	57
3550801	94.79333	32.15083	Rusk	Wilcox Group	1947	1997	22	50
3641707	93.97222	31.25194	Sabine	Yegua Formation	1968	1997	19	29
3732901	94.03194	31.50306	San Augustine	Cane River Formation	1971	1998	26	27
3705902	94.40333	31.90556	Shelby	Wilcox Group	1972	1981	92	9
3724601	94.03194	31.66972	Shelby	Wilcox Group	1972	1998	27	26
3438805	95.32500	32.38111	Smith	Wilcox Group	1964	1998	23	34
3456207	95.07000	32.22028	Smith	Carrizo Sand And Wilcox Group	1965	1998	19	33
3856501	95.08194	31.18917	Trinity	Yegua Formation	1960	1996	24	36
6113802	94.42000	30.78306	Tyler	Jasper Aquifer	1953	1998	30	45
6129203	94.45056	30.61694	Tyler	Chicot Aquifer	1953	1998	29	45


RUSK
PANOLA
HENDERSON
SMITH
ANDERSON
CHEROKEE
SHELBY
NACOGDOCHES
HOUSTON
SAN AUGUSTINE
SABINE
ANGELINA
TRINITY
POLK
TYLER
NEWTON
JASPER
HARDIN
ORANGE
JEFFERSON
N
W
E
S
0 10 20 30 Miles
Monitoring Wells
Public Supply Wells
CARRIZO-WILCOX
JASPER
CHICOT
EVANGELINE
YEGUA
GULF COAST
JACKSON GROUP
SPARTA
QUEEN CITY
Cities

Model Drought Contingency Plan for [Irrigation District]

Date

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9. Review and Update of Drought Contingency Plan

Drought Contingency Plan for [Irrigation District]

1. Objectives

This drought contingency plan is intended for use by [irrigation district]. The plan includes all current TCEQ requirements for a drought contingency plan.

This drought contingency plan serves to:

- Conserve available water supplies during times of drought and emergency.
- Minimize adverse impacts of water supply shortages.
- Minimize the adverse impacts of emergency water supply conditions.

2. Texas Commission on Environmental Quality Rules

The TCEQ rules governing development of drought contingency plans for irrigation districts are contained in Title 30, Part 1, Chapter 288, Subchapter B, Rule 288.21 of the Texas Administrative Code.

3. Provisions to Inform the Public and Opportunity for Public Input

[Irrigation district] will give customers the opportunity to provide public input into the preparation of the plan by one of the following methods:

- Holding a public meeting.
- Providing written notice of the proposed plan and the opportunity to comment on the plan by newspaper or posted notice.

4. Coordination with the East Texas Regional Water Planning Group

This drought contingency plan will be sent to the Chair of the East Texas Regional Water Planning Group in order to ensure consistency with the East Texas Regional Water Plan.

5. Initiation and Termination of Drought Response Stages

Official designees order the implementation of a drought response stage when one or more of the trigger conditions for that stage are met. Official designees may also order the termination of a drought response stage when the termination criteria are met or at their own discretion. The official designee for the [irrigation district] is:

Name
Title
Contact Information

If any mandatory provisions have been implemented or terminated, [irrigation district] is required to notify the Executive Director of the TCEQ within 5 business days.

Goals for Reduction in Water Use

TCEQ requires that each irrigation water user develop goals for water use reduction for each stage of the drought contingency plan. [Entity]'s goals are independently developed and given below.

6. Drought and Emergency Response Stages

Stage 1, Mild

Trigger Conditions for Stage 1, Mild

- A wholesale water supplier that provides all or part of an irrigation user's supply has initiated Stage 1, Mild
- *[Select appropriate other triggers]*
    - When [irrigation district]'s available water supply is equal or less than [amount in ac-ft, percent of storage, etc.].

    - When total daily demand equals [number] million gallons for [number] consecutive days or [number] million gallons on a single day.
    - When the water level in [irrigation district]'s well(s) is equal or less than [number] feet above/below mean sea level.
    - When flows in the [name of river or stream segment] are equal to or less than [number] cubic feet per second.

Goals for Use Reduction and Actions Available Under Stage 1, Mild
[Entity]'s will reduce water use by [goal]. Irrigation water suppliers may order the implementation of any of the strategies listed below in order to reduce water use:

- Request voluntary reductions in water use.
- Review the problems that caused the initiation of Stage 1.

Stage 1 is intended to raise awareness of potential drought problems. Stage 1 will end when the circumstances that caused the initiation of Stage 1 no longer exist.

Stage 2, Moderate

Trigger Conditions for Stage 2, Moderate

- A wholesale water supplier that provides all or part of an irrigation user's supply has initiated Stage 2, Moderate
- *[Select appropriate other triggers]*
    - When [irrigation district]'s available water supply is equal or less than [amount in ac-ft, percent of storage, etc.].
    - When total daily demand equals [number] million gallons for [number] consecutive days or [number] million gallons on a single day.
    - When the water level in [irrigation district]'s well(s) is equal or less than [number] feet above/below mean sea level.
    - When flows in the [name of river or stream segment] are equal to or less than [number] cubic feet per second.

Goals for Use Reduction and Actions Available Under Stage 2, Moderate
[Entity]'s will reduce water use by [goal]. Irrigation water suppliers may order the implementation of any of the strategies listed below in order to reduce water use:

- Request voluntary reductions in water use.
- Review the problems that caused the initiation of Stage 2.
- Intensify leak detection and repair efforts.
- Other.

Stage 2 will end when the circumstances that caused the initiation of Stage 2 no longer exist.

Stage 3, Severe

Trigger Conditions for Stage 3, Severe

- A wholesale water supplier that provides all or part of an irrigation user's supply has initiated Stage 3, Severe
- *[Select appropriate other triggers]*
    - When [irrigation district]'s available water supply is equal or less than [amount in ac-ft, percent of storage, etc.].
    - When total daily demand equals [number] million gallons for [number] consecutive days or [number] million gallons on a single day.
    - When the water level in [irrigation district]'s well(s) is equal or less than [number] feet above/below mean sea level.
    - When flows in the [name of river or stream segment] are equal to or less than [number] cubic feet per second.

Goals for Use Reduction and Actions Available Under Stage 3, Severe
[Entity]'s will reduce water use by [goal]. Irrigation water suppliers may order the implementation of any of the strategies listed below in order to reduce water use:

- Request voluntary reductions in water use.

- Review the problems that caused the initiation of Stage 3.
- Intensify leak detection and repair efforts.
- Implement mandatory watering days and/or times.
- Other.

Stage 3 will end when the circumstances that caused the initiation of Stage 3 no longer exist.

Stage 4, Emergency

Trigger Conditions for Stage 4, Emergency

- A wholesale water supplier that provides all or part of an irrigation user's supply has initiated Stage 4, Emergency
- *[Select appropriate other triggers]*
    - When [irrigation district]'s available water supply is equal or less than [amount in ac-ft, percent of storage, etc.].
    - When total daily demand equals [number] million gallons for [number] consecutive days or [number] million gallons on a single day.
    - When the water level in [irrigation district]'s well(s) is equal or less than [number] feet above/below mean sea level.
    - When flows in the [name of river or stream segment] are equal to or less than [number] cubic feet per second.

Goals for Use Reduction and Actions Available Under Stage 4, Emergency

[Entity]'s will reduce water use by [goal]. Irrigation water suppliers may order the implementation of any of the strategies listed below in order to reduce water use:

- Review the problems that caused the initiation of Stage 4.
- Intensify leak detection and repair efforts.
- Implement mandatory watering days and/or times.
- Implement mandatory reductions in water deliveries.
- Other.

Stage 4 will end when the circumstances that caused the initiation of Stage 4 no longer exist.

7. Penalty for Violation of Water Use Restriction

Mandatory water use restrictions are implemented in Stages [1, 2, 3, or 4]. These restrictions will be strictly enforced with the following penalties:

- Potential penalties include:
  - Written warning that they have violated the mandatory water use restriction.
  - Issue a citation. Minimum and maximum fines are established by ordinance or other order.
  - Discontinue water service to the user.

8. Review and Update of Drought Contingency Plan

This drought contingency plan will be updated at least every 5 years as required by TCEQ regulations.

Drought Contingency Plan for [Public Water Supplier]

Date

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APPENDICES

APPENDIX A	List of References
APPENDIX B	Texas Commission on Environmental Quality Rules on Drought Contingency Plans

Drought Contingency Plan for [Public Water Supplier]

1. Objectives

This drought contingency plan (the Plan) is intended for use by [municipal water supplier]. The plan includes all current TCEQ requirements for a drought contingency plan.

This drought contingency plan serves to:

- Conserve available water supplies during times of drought and emergency.
- Minimize adverse impacts of water supply shortages.
- Minimize the adverse impacts of emergency water supply conditions.
- Preserve public health, welfare, and safety.

2. Texas Commission on Environmental Quality Rules

The TCEQ rules governing development of drought contingency plans for public water suppliers are contained in Title 30, Part 1, Chapter 288, Subchapter B, Rule 288.20 of the Texas Administrative Code.

3. Provisions to Inform the Public and Opportunity for Public Input

[Public water supplier] will give customers the opportunity to provide public input into the preparation of the plan by one of the following methods:

- Holding a public meeting.
- Providing written notice of the proposed plan and the opportunity to comment on the plan by newspaper or posted notice.

4. Public Education

[Public water supplier] will notify the public about the drought contingency plan, including changes in Stage and drought measures to be implemented, by one or more of the following methods:

- Prepare a description of the Plan and make it available to customers at appropriate locations.
- Include utility bill inserts that detail the Plan
- Provide radio announcements that inform customers of stages to be initiated or terminated and drought measures to be taken
- Include an ad in a newspaper of general circulation to inform customers of stages to be initiated or terminated and drought measures to be taken

5. Coordination with the East Texas Regional Water Planning Group

This drought contingency plan will be sent to the Chair of the East Texas Regional Water Planning Group in order to ensure consistency with the East Texas Regional Water Plan. If any changes are made to the drought contingency plan, a copy of the newly adopted plan will be sent to the Regional Water Planning Group.

6. Initiation and Termination of Drought Response Stages

The designated official will order the implementation of a drought response stage when one or more of the trigger conditions for that stage exist. Official designees may also order the termination of a drought response stage when the termination criteria are met or at their own discretion.

If any mandatory provisions have been implemented or terminated, the water supplier is required to notify the Executive Director of the TCEQ within 5 business days.

7. Goals for Reduction in Water Use

TCEQ requires that each public water supplier develop quantifiable goals for water use reduction for each stage of the drought contingency plan. These goals are outlined below.

[To be developed by each supplier. An example is provided.]

- Stage 1, Mild
  - 0 to 2 percent reduction in use that would have occurred in the absence of drought contingency measures.
- Stage 2, Moderate
  - 2 to 6 percent reduction in use that would have occurred in the absence of drought contingency measures
- Stage 3, Severe
  - 6 to 10 percent reduction in use that would have occurred in the absence of drought contingency measures
- Stage 4, Emergency
  - 10 to 14 percent reduction in use that would have occurred in the absence of drought contingency measures

8. Drought and Emergency Response Stages

Stage 1, Mild

Trigger Conditions for Stage 1, Mild

- A wholesale water supplier that provides all or part of [public water supplier]'s supply has initiated Stage 1, Mild
- [To be otherwise completed by public water supplier]

    - Potential triggers are:
        - When [public water supplier]'s available water supply is equal or less than [amount in ac-ft, percent of storage, etc.].
        - When total daily demand equals [number] million gallons for [number] consecutive days or [number] million gallons on a single day.
        - When the water level in [public water supplier]'s well(s) is equal or less than [number] feet above/below mean sea level.
        - When flows in the [name of river or stream segment] are equal to or less than [number] cubic feet per second.

Stage 1 will end when the circumstances that caused the initiation of Stage 1 no longer exist.

Goals for Use Reduction and Actions Available Under Stage 1, Mild
[Public water supplier] will reduce water use by [goal]. [Public water supplier] may order the implementation of any of the strategies listed below in order to decrease water use:

- Request voluntary reductions in water use.
- Review the problems that caused the initiation of Stage 1.
- Intensify leak detection and repair efforts

Stage 2, Moderate

Trigger Conditions for Stage 2, Moderate

- A wholesale water supplier that provides all or part of [public water supplier]'s supply has initiated Stage 2, Moderate
- [To be otherwise completed by public water supplier]
    - Potential triggers are:
        - When [public water supplier]'s available water supply is equal or less than [amount in ac-ft, percent of storage, etc.].
        - When total daily demand equals [number] million gallons for [number] consecutive days or [number] million gallons on a single day.
        - When the water level in [public water supplier]'s well(s) is equal or less than [number] feet above/below mean sea level.
        - When flows in the [name of river or stream segment] are equal to or less than [number] cubic feet per second.

Stage 2 will end when the circumstances that caused the initiation of Stage 2 no longer exist.

Goals for Use Reduction and Actions Available Under Stage 2, Moderate
[Public water supplier] will reduce water use by [goal]. [Public water supplier] may order the implementation of any of the strategies listed below in order to decrease water use:

- Request voluntary reductions in water use.
- Halt non-essential city government use
- Review the problems that caused the initiation of Stage 2.
- Intensify leak detection and repair efforts
- Implement mandatory restrictions on time of day outdoor water use in the summer.

Stage 3, Severe

Trigger Conditions for Stage 3, Severe

- A wholesale water supplier that provides all or part of [public water supplier]'s supply has initiated Stage 3, Severe
- [To be otherwise completed by public water supplier]
    - Potential triggers are:
        - When [public water supplier]'s available water supply is equal or less than [amount in ac-ft, percent of storage, etc.].
        - When total daily demand equals [number] million gallons for [number] consecutive days or [number] million gallons on a single day.
        - When the water level in [public water supplier]'s well(s) is equal or less than [number] feet above/below mean sea level.
        - When flows in the [name of river or stream segment] are equal to or less than [number] cubic feet per second.

Stage 3 will end when the circumstances that caused the initiation of Stage 3 no longer exist.

Goals for Use Reduction and Actions Available Under Stage 3, Severe
[Public water supplier] will reduce water use by [goal]. [Public water supplier] may order the implementation of any of the strategies listed below in order to decrease water use:

- Request voluntary reductions in water use.
- Require mandatory reductions in water use
- Halt non-essential city government use
- Review the problems that caused the initiation of Stage 3.
- Intensify leak detection and repair efforts
- Implement mandatory restrictions on time of day outdoor water use in the summer.
- Limit outdoor watering to specific weekdays.
- Create and implement a landscape ordinance.

Stage 4, Emergency

Trigger Conditions for Stage 4, Emergency

- A wholesale water supplier that provides all or part of [public water supplier]'s supply has initiated Stage 4, Emergency
- [To be otherwise completed by public water supplier]
    - Potential triggers are:
        - When [public water supplier]'s demand exceeds the amount that can be delivered to customers.
        - When [public water supplier]'s source becomes contaminated
        - [Public water supplier]'s system is unable to deliver water due to the failure or damage of major water system components.

Stage 4 will end when the circumstances that caused the initiation of Stage 4 no longer exist.

Goals for Use Reduction and Actions Available Under Stage 4, Emergency
[Public water supplier] will reduce water use by [goal]. [Public water supplier] may order the implementation of any of the strategies listed below in order to decrease water use:

- Require mandatory reductions in water use
- Halt non-essential city government use
- Review the problems that caused the initiation of Stage 4.
- Intensify leak detection and repair efforts
- Implement mandatory restrictions on time of day outdoor water use in the summer.
- Limit outdoor watering to specific weekdays.
- Create and implement a landscape ordinance.
- Prohibit washing of vehicles except as necessary for health, sanitation, or safety reasons.
- Prohibit commercial and residential landscape watering
- Prohibit golf course watering except for greens and tee boxes
- Prohibit filling of private pools.
- Initiate a rate surcharge for all water use over [amount in gallons per month].

9. Penalty for Violation of Water Use Restriction

Mandatory restrictions are required by TCEQ regulation to have a penalty. These restrictions will be strictly enforced with the following penalties:

- Potential penalties
    - Written warning that they have violated the mandatory water use restriction.
    - Issue a citation. Minimum and maximum fines are established by ordinance.
    - Discontinue water service to the user.

10. Review and Update of Drought Contingency Plan

This drought contingency plan will be updated at least every 5 years as required by TCEQ regulations.

Appendix A

List of References

APPENDIX A

List of References

Title 30 of the Texas Administrative Code, Part 1, Chapter 288, Subchapter B, Rule 288.20, downloaded from http://www.sos.state.tx.us/tac, July 2004.

Appendix B

Texas Commission on Environmental Quality Rules on Drought Contingency Plans

APPENDIX B
Texas Commission on Environmental Quality Rules on Drought Contingency Plans

Texas Administrative Code

TITLE 30	ENVIRONMENTAL QUALITY
PART 1	TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CHAPTER 288	WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS
SUBCHAPTER B	DROUGHT CONTINGENCY PLANS
RULE §288.20	**Drought Contingency Plans for Municipal Uses by Public Water Suppliers**

(a) A drought contingency plan for a retail public water supplier, where applicable, must include the following minimum elements.

(1) Minimum requirements. Drought contingency plans must include the following minimum elements.

(A) Preparation of the plan shall include provisions to actively inform the public and affirmatively provide opportunity for public input. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the public and providing written notice to the public concerning the proposed plan and meeting.

(B) Provisions shall be made for a program of continuing public education and information regarding the drought contingency plan.

(C) The drought contingency plan must document coordination with the regional water planning groups for the service area of the retail public water supplier to ensure consistency with the appropriate approved regional water plans.

(D) The drought contingency plan must include a description of the information to be monitored by the water supplier, and specific criteria for the initiation and termination of drought response stages, accompanied by an explanation of the rationale or basis for such triggering criteria.

(E) The drought contingency plan must include drought or emergency response stages providing for the implementation of measures in response to at least the following situations:

(i) reduction in available water supply up to a repeat of the drought of record;

(ii) water production or distribution system limitations;

(iii) supply source contamination; or

(iv) system outage due to the failure or damage of major water system components (e.g., pumps).

(F) The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this subparagraph are not enforceable.

(G) The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following:

(i) curtailment of non-essential water uses; and

(ii) utilization of alternative water sources and/or alternative delivery mechanisms with the prior approval of the executive director as appropriate (e.g., interconnection with another water system, temporary use of a non-municipal water supply, use of reclaimed water for non-potable purposes, etc.).

(H) The drought contingency plan must include the procedures to be followed for the initiation or termination of each drought response stage, including procedures for notification of the public.

(I) The drought contingency plan must include procedures for granting variances to the plan.

(J) The drought contingency plan must include procedures for the enforcement of mandatory water use restrictions, including specification of penalties (e.g., fines, water rate surcharges, discontinuation of service) for violations of such restrictions.

(2) Privately-owned water utilities. Privately-owned water utilities shall prepare a drought contingency plan in accordance with this section and incorporate such plan into their tariff.

(3) Wholesale water customers. Any water supplier that receives all or a portion of its water supply from another water supplier shall consult with that supplier and shall include in the drought contingency plan appropriate provisions for responding to reductions in that water supply.

(b) A wholesale or retail water supplier shall notify the executive director within five business days of the implementation of any mandatory provisions of the drought contingency plan.

(c) The retail public water supplier shall review and update, as appropriate, the drought contingency plan, at least every five years, based on new or updated information, such as the adoption or revision of the regional water plan.

Source Note: The provisions of this §288.20 adopted to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective October 7, 2004, 29 TexReg 9384

Water Conservation Plan for [Industrial Entity]

Date

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7. Implementation and Modifications to Water Conservation Plan

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Appendix B	Texas Commission on Environmental Quality Rules on Water Conservation Plans for Industrial or Mining Use
Appendix C	Sample Implementation Report

Water Conservation Plan for [Industrial Entity]

1. Objectives

The Texas Commission on Environmental Quality has developed guidelines and requirements governing the development of water conservation plans for industrial or mining use. The purpose of this water conservation plan is to:

- To reduce water consumption from the levels that would exist without conservation efforts.
- To reduce the loss and waste of water.
- To encourage improvement of processes that inefficiently consume water.
- To extend the life of current supplies by reducing the rate of growth in demand.
- To document the level of recycling and reuse in the water supply.

This water conservation plan is intended to serve as a guide to [entity]. The following plan includes all conservation measures required by TCEQ.

2. Description of Water Use

The TCEQ requires that each mining or industrial water user must document how water is used in the production process.

- *[Entity provides information including:]*
  - *How water flows to and through their systems*
  - *What purpose water serves in the production process*
  - *How much water is consumed in the production process and not available for reuse*
  - *Means of discharging water used in industrial processes]*

3. Specification of Water Conservation Goals

The TCEQ regulations require that each industrial and mining user adopt quantifiable water conservation goals in their water conservation plan. *[Entity]* has specified a five-year and ten-year target for water savings. *[Include quantifiable water savings targets and the details of the basis for the development of these goals.]*

The goals for this water conservation plan include the following:

- *[Name goals.] Potential goals are:*
  - *Meter water use to decrease water loss through leaks*
  - *Regularly inspect systems for leaks and promptly repair in order to control unaccounted water*
  - *Improve, modify, or audit processes in order to increase efficient water use*

4. Metering of Industrial and Mining Water Users

[Entity]'s water use is metered at [description of location]. Submetering is a good strategy for some industrial water users. Processes or equipment that consume large quantities of water could be usefully submetered. Submetering is an effective way to account for all water use by process, subprocess, or piece of equipment in a facility. *[Identify processes and/or equipment that are currently submetered.]*

5. Control of Unaccounted Water and Leak Detection and Repair

Careful metering of water use, detection, and repair of leaks in the distribution system and regular monitoring of unaccounted water are important in controlling losses.

Unaccounted water is the difference between water delivered to a system and water delivered to a system plus authorized but unmetered uses. Authorized but unmetered uses includes water for fire fighting, releases for flushing of lines, and water used during new construction. Unaccounted water can be attributed to several things including:

- Inaccuracies in meters. Older meters tend to run slowly and therefore under-report actual use.
- Loss due to leaks and main breaks in the system.
- Illegal connections to a system.
- [Other].

In order to control unaccounted water, persons in industry are asked to watch for and report water main breaks and leaks. Broken and leaking lines should be replaced or repaired in a timely manner. Meter readers are asked to report signs of illegal connections so they can be quickly assessed.

[Entity] will implement and maintain a water loss program. This program will serve to reduce losses due to leakage. The measures of the water loss program include *[select applicable measure]*:

- Conducting regular inspections of water main fittings and connections.
- Installing leak noise detectors and loggers.
- Using a leakage modeling program.
- Metering individual pressure zones
- Controlling pressure just above the minimum standard-of-service level
- Limiting surges in pressure.
- [Other]

6. Improving, Modifying, and Auditing Processes and Equipment

[Entity] can increase water efficiency by improving, modifying, and auditing facility processes and equipment. Water can be conserved through the following measures *[select appropriate measure]*:

- Implementing a Water Waste Reduction Program
- Optimizing the water-use efficiency of cooling systems (other than cooling towers)
- Reducing water loss in cooling towers

Water Waste Reduction Programs cause [Entity] personnel to be more aware of wasteful activities. Measures resulting from a Water Waste Reduction Program include:

- Install water saving devices on equipment.
- Replace current equipment with more water-efficient equipment.
- Recycle water within a process.
- Change to waterless equipment or process.

7. Implementation and Modifications to Water Conservation Plan

Upon implementation of this water conservation plan, [Entity] is required by the TCEQ to update the plan at least every five years. New goals will be based on previous five-year and ten-year goals and any new information.

An implementation report will be prepared by the [date] of each year following the adoption of this plan. A sample report is included in Appendix C. This report includes:

- The list of dates and descriptions of conservation measures implemented
- Amount of water saved

- Data about whether or not targets in the plan are met
- If targets are not met, an explanation as to why the target was not met and a discussion of the progress to meet the target.

Appendix A

List of References

APPENDIX A

List of References

Title 30 of the Texas Administrative Code, Part 1, Chapter 288, Subchapter B, Rule 288.3, downloaded from http://www.sos.state.tx.us/tac, July 2004.

Appendix B

Texas Commission on Environmental Quality Rules on Water Conservation Plans for Industrial or Mining Use

Appendix B

Texas Commission on Environmental Quality Rules

Texas Administrative Code

TITLE 30	ENVIRONMENTAL QUALITY
PART 1	TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CHAPTER 288	WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS
SUBCHAPTER A	WATER CONSERVATION PLANS
RULE §288.3	**Water Conservation Plans for Industrial or Mining Use**

(a) A water conservation plan for industrial or mining uses of water must provide information in response to each of the following elements. If the plan does not provide information for each requirement, the industrial or mining water user shall include in the plan an explanation of why the requirement is not applicable.

(1) a description of the use of the water in the production process, including how the water is diverted and transported from the source(s) of supply, how the water is utilized in the production process, and the estimated quantity of water consumed in the production process and therefore unavailable for reuse, discharge, or other means of disposal;

(2) until May 1, 2005, specification of conservation goals, the basis for the development of such goals, and a time frame for achieving the specified goals;

(3) beginning May 1, 2005, specific, quantified five-year and ten-year targets for water savings and the basis for the development of such goals. The goals established by industrial or mining water users under this paragraph are not enforceable;

(4) a description of the device(s) and/or method(s) within an accuracy of plus or minus 5.0% to be used in order to measure and account for the amount of water diverted from the source of supply;

(5) leak-detection, repair, and accounting for water loss in the water distribution system;

(6) application of state-of-the-art equipment and/or process modifications to improve water use efficiency; and

(7) any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

(b) Beginning May 1, 2005, an industrial or mining water user shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The industrial or mining water user shall review and update the next revision of its water conservation plan not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group.

Source Note: The provisions of this §288.3 adopted to be effective May 3, 1993, 18 TexReg 2558; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective October 7, 2004, 29 TexReg 9384

Appendix C

Sample Implementation Report

APPENDIX C
INDUSTRIAL USER WATER CONSERVATION REPORT
Due: {Date] of every year

Entity Reporting: ______________________
Filled Out By: ______________________
Date Completed: ______________________
Year Covered: ______________________
Industry ______________________

Recorded Supplies and Process Uses by Month (in Acre-feet):

Month	Self-Supplied Water	Other Supplies	Industrial Processes Water Use						
			Process A	Process B	Process C	Process D	Process E		Total
January									
February									
March									
April									
May									
June									
July									
August									
September									
October									
November									
December									
TOTAL									

Unaccounted Water (Acre-feet):	
Self Supplies (total)	above
Other Supplies (total)	above
Total Supplies	above
Total Water use	above
Difference in Supplies and Water use	
% Unaccounted Water	
Goal for % Unaccounted Water	

Water Efficiency (Percent)

Process	Design Use	Actual Use	Efficiency
Process A			
Process B			
Process C			
Process D			

CONSERVATION MEASURES IMPLEMENTED	
Measure	**Date Implemented**

AMOUNT OF WATER SAVED (per Industrial Process)								
Year	Total Water Supplied	Efficiency (%)	Efficiency Improvement (%)	Water saved (acre-feet)	Unaccounted water (%)	Reduction in Unaccounted water (%)	Water saved (acre-feet)	Total Saved (acre-feet)
2000								
2001								
2002								
2003								
2004								
2005								
2006								

Unusual Circumstances (use additional sheets if necessary):

Progress in Implementation of Conservation Plan (use additional sheets if necessary):

Conservation measures planned for next year (use additional sheets if necessary):

Other (use additional sheets if necessary):

Water Conservation Plan for [Entity]

Date

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Water Conservation Plan for [Entity]

1. OBJECTIVES

Recognizing the need for efficient use of existing water supplies, the Texas Commission on Environmental Quality (TCEQ) has developed guidelines and requirements governing the development of water conservation plans for public water suppliers.

The objectives of this water conservation plan are as follows:

- To reduce water consumption from the levels that would prevail without conservation efforts.
- To reduce the loss and waste of water.
- To improve efficiency in the use of water.
- To document the level of recycling and reuse in the water supply.
- To extend the life of current water supplies by reducing the rate of growth in demand.

The water conservation plan presented in this document is a model water conservation plan intended for adoption by wholesale or retail public water suppliers in Region I. This model plan includes all of the elements required by TCEQ. In order to adopt this plan, each water supplier will need to do the following:

- Complete the water utility profile.
- Set five- and ten-year goals for per capita water use.
- Adopt ordinance(s) or regulation(s) approving the model plan.

2 TEXAS COMMISSION ON ENVIRONMENTAL QUALITY RULES

2.1 Conservation Plans

The TCEQ rules governing development of water conservation plans for public water suppliers are contained in Title 30, Part 1, Chapter 288, Subchapter A, Rule 288.2 of the Texas Administrative Code, which is included in Appendix B. For the purpose of these rules, a water conservation plan is defined as "A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water[1]." The elements in the TCEQ water conservation rules covered in this conservation plan are listed below.

Minimum Conservation Plan Requirements

The minimum requirements in the Texas Administrative Code for Water Conservation Plans for Public Water Suppliers are covered in this report as follows:

- 288.2(a)(1)(A) – Utility Profile – Section 3 and Appendix C
- 288.2(a)(1)(B) – Specification of Goals – Section 4
- 288.2(a)(1)(C) – Accurate Metering – Section 5.1
- 288.2(a)(1)(D) – Universal Metering – Section 5.1
- 288.2(a)(1)(E) – Determination and Control of Unaccounted Water – Section 5.3
- 288.2(a)(1)(F) – Public Education and Information Program – Section 6
- 288.2(a)(1)(G) – Non-Promotional Water Rate Structure – Section 7
- 288.2(a)(1)(H) – Reservoir System Operation Plan – Section 8.2

[1] Title 30 of the Texas Administrative Code, Part 1, Chapter 288, Subchapter A, Rules 288.1 and 288.2, and Subchapter B, Rule 288.20, downloaded from http://www.tnrcc.state.tx.us/oprd/rules/pdflib/288a.pdf, November 2003.

- 288.2(a)(1)(I) – Means of Implementation and Enforcement – Section 9
- 288.2(a)(1)(J) – Coordination with Regional Water Planning Group – Section 8.5

Conservation Additional Requirements (Population over 5,000)

The Texas Administrative Code includes additional requirements for water conservation plans for cities with a population over 5,000:

- 288.2(a)(2)(A) – Leak Detection, Repair, and Water Loss Accounting – Sections 5.3, 5.4, and 5.5
- 288.2(a)(2)(B) – Record Management System – Section 5.2
- 288.2(a)(2)(C) – Requirement for Water Conservation Plans by Wholesale Customers – Section 8.4

Additional Conservation Strategies

TCEQ rules also list additional optional but not required conservation strategies, which may be adopted by suppliers. The following optional strategies are included in this plan:

- 288.2(a)(3)(A) – Conservation Oriented Water Rates – Section 7
- 288.2(a)(3)(B) – Ordinances, Plumbing Codes or Rules on Water-Conserving Fixtures – Section 8.1
- 288.2(a)(3)(F) – Considerations for Landscape Water Management Regulations – Section 8.3
- 288.2(a)(3)(G) – Monitoring Method – Section 5.5

3. WATER UTILITY PROFILE

Appendix C to this water conservation plan is a sample water utility profile based on the format recommended by the TCEQ.

[Water supplier is to complete the utility profile and provide information on the public water supply system and customers if appropriate for this section.]

4. SPECIFICATION OF WATER CONSERVATION GOALS

[Current TCEQ rules require the adoption of specific water conservation goals for a water conservation plan. As part of plan adoption, each water supplier will develop 5-year and 10-year goals for per capita municipal use, following TCEQ procedures described in the water utility profile (Appendix C).]

The goals for this water conservation plan include the following:

- Strive to attain the per capita municipal water use below the specified amount in gallons per capita per day shown on the completed Table C-1 using a 5-year rolling average calculation. (See 5-year and 10-year goals in Appendix C)
- Conduct water audits as required by the TCEQ and maintain unaccounted for water to *[insert amount]* percent of the total water used through existing and new maintenance programs.
- Raise public awareness of water conservation and encourage responsible public behavior by a public education and information program, as discussed in Section 6.

5. METERING, WATER USE RECORDS, CONTROL OF UNACCOUNTED WATER, AND LEAK DETECTION AND REPAIR

One of the key elements in water conservation is careful tracking of water use and control of losses through illegal diversions and leaks. Careful metering of water deliveries and water use, detection and repair of leaks in the distribution system and regular monitoring of unaccounted water are important in controlling losses. *[Water suppliers serving a population of 5,000 people or more or a having a projected population of greater than 5,000 people or more within the next ten years must include the following elements in their water conservation plans:]*

5.1 Metering of Customer and Public Uses and Meter Testing, Repair, and Replacement

All customers of wholesale or retail public water suppliers, including public and governmental users, should be metered. In many cases, water suppliers already meter all of their water users. For those water suppliers who do not currently meter all of their water uses, these entities will implement a program to meter all water uses within the next five years.

Most water suppliers test and replace their customer meters on a regular basis. All customer meters should be replaced on a 15-year cycle. Those who do not currently have a meter testing and replacement program will implement such a program over the next five years.

5.2 Record Management System

As required by TAC Title 30, Part 1, Chapter 288, Subchapter A, Rule 288.2(a)(2)(B), the record management system allows for the separation of water sales and uses into residential, commercial, public/institutional, and industrial categories. This information will be included in an annual water conservation report, as described in Section 5.5 below.

For those entities whose record management systems do not currently allow for the separation of water sales as described above, they will move to implement such a system within the next five years.

5.3 Determination and Control of Unaccounted Water

Unaccounted water is the difference between water delivered to customers and metered deliveries to customers plus authorized but unmetered uses. (Authorized but unmetered uses would include use for fire fighting, releases for flushing of lines, and uses associated with new construction.) Unaccounted water can include several categories:

- Inaccuracies in customer meters. (Customer meters tend to run more slowly as they age and under-report actual use.)
- Accounts which are being used but have not yet been added to the billing system.

- Losses due to water main breaks and leaks in the water distribution system.
- Losses due to illegal connections and theft. (Included in Appendix H.)
- Other.

Measures to control unaccounted water are part of the routine operations of water suppliers. Water audits are useful methods of accounting for water usage within a system. Water audits will be conducted by water suppliers in order to decrease water loss. Maintenance crews and personnel will look for and report evidence of leaks in the water distribution system. The leak detection and repair program is described in Section 5.5 below. Meter readers are asked to watch for and report signs of illegal connections, so they can be addressed quickly. Unaccounted water calculated as part of the utility profile and is included in Appendix C.

5.4 Leak Detection and Repair

City crews and personnel will look for and report evidence of leaks in the water distribution system. Areas of the water distribution system in which numerous leaks and line breaks occur are targeted for replacement as funds are available.

5.5 Monitoring of Effectiveness and Efficiency - Annual Water Conservation Report

[Appendix D is a sample form that can be used in the development of an annual water conservation report for water suppliers.]

An annual conservation report will be completed by *[insert date]* of the following year and will be used to monitor the effectiveness and efficiency of the water conservation program and to plan conservation-related activities for the next year. This report records the water use by category, per capita municipal use, and unaccounted water for the current year and compares them to historical values.

6. CONTINUING PUBLIC EDUCATION AND INFORMATION CAMPAIGN

The continuing public education and information campaign on water conservation includes the following elements: *[Water provider is to select the appropriate measures for its system.]*

- Insert water conservation information with water bills. Inserts will include material developed by the [water supplier] staff and material obtained from the TWDB, the TCEQ, and other sources.
- Encourage local media coverage of water conservation issues and the importance of water conservation.
- Make the *Texas Smartscape CD*, water conservation brochures, and other water conservation materials available to the public.
- Make information on water conservation available on its website (if any) and include links to the *Texas Smartscape* website and to information on water conservation on the TWDB and TCEQ web sites.
- Provide water conservation materials to schools and utilize existing age-appropriate education programs available through the TCEQ and TWDB.
- Support the State-initiated Water Conservation Awareness and Education Campaign.

7. WATER RATE STRUCTURE

[If a water supplier has a decreasing block rate structure, it is recommended that a flat rate or increasing rate structure be adopted.]

An increasing block rate water structure that is intended to encourage water conservation and discourage excessive use and waste of water will be adopted upon completion of the next rate study or within five years. An example water rate structure is as follows:

<u>Residential Rates</u>

1. Monthly minimum charge. This can (but does not have to) include up to 2,000 gallons water use with no additional charge.
2. Base charge per 1,000 gallons up to the approximate average residential use.
3. 2nd tier (from the average to 2 times the approximate average) at 1.25 to 2.0 times the base charge.
4. 3rd tier (above 2 times the approximate average) at 1.25 to 2.0 times the 2nd tier.
5. The residential rate can also include a lower tier for basic household use up to 4,000 gallons per month or so.

Commercial/Industrial Rates

Commercial/industrial rates should include at least 2 tiers, with rates for the 2nd tier at 1.25 to 2.0 times the first tier.

[If a water supplier has an increasing rate structure, state the current rate structure as follows.]

The [water supplier] has adopted an increasing block rate water structure that is intended to encourage water conservation and discourage excessive use and waste of water. The water rate structure adopted on *[insert date]* is as follows:

Residential Rates

[To be completed by the supplier]

Commercial/Industrial Rates

[To be completed by the supplier]

8. OTHER WATER CONSERVATION MEASURES

8.1 Ordinances, Plumbing Codes, or Rules on Water-Conserving Fixtures

The State of Texas has required water-conserving fixtures in new construction and renovations since 1992. The state standards call for flows of no more than 2.5 gallons per minute (gpm) for faucets, 3.0 gpm for showerheads, and 1.6 gallons per flush for toilets. Similar standards are now required nationally under federal law. These state and federal standards assure that all new construction and renovations will use water-conserving fixtures. In addition, federal standards governing clothes washing machines will require all washers produced by 2007 to meet higher efficiency standards, which may include lower water use machines. The potential savings from these fixtures can be significant, but historically have been difficult to measure independently from other factors.

8.2 Reservoir System Operation Plan

[Insert description of reservoir system operation plan if public supplier has such a plan.]

or

The [water supplier] purchases water from [name] and does not have surface water supplies for which to implement a reservoir system operation plan.

8.3 Considerations for Landscape Water Management Regulations (Optional)

[The water supplier may choose to adopt landscape water management regulations as part of the development of this water conservation plan. These regulations are intended to minimize waste in landscape irrigation. The proposed regulations might include the following elements:

- *Require that all new irrigation systems be in compliance with state design and installation regulations (TAC Title 30, Part 1, Chapter 344).*
- *Prohibit irrigation systems that spray directly onto impervious surfaces or onto other non-irrigated areas. (Wind driven water drift will be taken into consideration.)*

- *Prohibit use of poorly maintained sprinkler systems that waste water.*
- *Prohibit outdoor watering during any form of precipitation.*
- *Enforce the regulations by a system of warnings followed by fines for continued or repeat violations.*
- *Implement other measures to encourage off-peak water use.]*

8.4 Requirement for Water Conservation Plans by Wholesale Customers

[Required for cities with populations over 5,000.]

Every contract for the wholesale sale of water by customers that is entered into, renewed, or extended after the adoption of this water conservation and drought contingency plan will include a requirement that the wholesale customer and any wholesale customers of that wholesale customer develop and implement a water conservation plan meeting the requirements of Title 30, Part 1, Chapter 288, Subchapter A, Rule 288.2 of the Texas Administrative Code. The requirement will also extend to each successive wholesale customer in the resale of the water.

8.5 Coordination with Regional Water Planning Group

In accordance with TCEQ regulations, a copy of this adopted water conservation plan will be sent to the East Texas Region water planning group.

9. IMPLEMENTATION AND ENFORCEMENT OF THE WATER CONSERVATION PLAN

A copy of [an ordinance, order, or resolution] adopted by the [City Council or governing board] regarding this water conservation plan is attached to and made part of this plan. The [ordinance, order, or resolution] designates responsible officials to implement and enforce the water conservation plan.

Appendix A

List of References

Appendix A
List of References

(1) Title 30 of the Texas Administrative Code, Part 1, Chapter 288, Subchapter A, Rules 288.1 and 288.2, and Subchapter B, Rule 288.20, downloaded from http://www.tnrcc.state.tx.us/oprd/rules/pdflib/288a.pdf, November 2003.

The following conservation plans and related documents were reviewed in the development of this plan.

(2) Freese and Nichols, Inc.: *Model Water Conservation Plan for North Texas Municipal Water District Member Cities and Customers*, prepared for the North Texas Municipal Water District, Fort Worth, August 2004.

(3) Texas Commission on Environmental Quality Water Utility Profile, downloaded from http://www.tnrcc.state.tx.us/permitting/forms/10218.pdf, April 29, 2004.

(4) City of Austin Water Conservation Division: "City of Austin Water Conservation Plan, Developed to Meet Senate Bill 1 Regulatory Requirements," Austin, August 1999.

(5) City of Dallas Water Utilities Department: "City of Dallas Water Conservation Plan," adopted by the City Council, Dallas, September 1999.

(6) Freese and Nichols, Inc.: "Water Conservation and Drought Contingency Plan," prepared for the Sabine River Authority of Texas, Fort Worth, September 1994.

(7) GDS Associates, Inc.: "Water Conservation Study," prepared for the Texas Water Development Board, Fort Worth, 2002.

(8) Texas Water Development Board: Report 362, "Water Conservation Best Management Practices Guide", Austin, November 2004.

(9) City of Dallas: "City of Dallas Ordinances, Chapter 49, Section 21.1," Dallas, October 1, 2001.

Appendix B

Texas Commission on Environmental Quality Rules on Municipal Water Conservation Plans

Texas Administrative Code

TITLE 30	ENVIRONMENTAL QUALITY
PART 1	TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CHAPTER 288	WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS
SUBCHAPTER A	WATER CONSERVATION PLANS
RULE §288.2	**Water Conservation Plans for Municipal Uses by Public Water Suppliers**

(a) A water conservation plan for municipal water use by public water suppliers must provide information in response to the following. If the plan does not provide information for each requirement, the public water supplier shall include in the plan an explanation of why the requirement is not applicable.

(1) Minimum requirements. All water conservation plans for municipal uses by public drinking water suppliers must include the following elements:

(A) a utility profile including, but not limited to, information regarding population and customer data, water use data, water supply system data, and wastewater system data;

(B) until May 1, 2005, specification of conservation goals including, but not limited to, municipal per capita water use goals, the basis for the development of such goals, and a time frame for achieving the specified goals;

(C) beginning May 1, 2005, specific, quantified five-year and ten-year targets for water savings to include goals for water loss programs and goals for municipal use, in gallons per capita per day. The goals established by a public water supplier under this subparagraph are not enforceable;

(D) metering device(s), within an accuracy of plus or minus 5.0% in order to measure and account for the amount of water diverted from the source of supply;

(E) a program for universal metering of both customer and public uses of water, for meter testing and repair, and for periodic meter replacement;

(F) measures to determine and control unaccounted-for uses of water (for example, periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections; abandoned services; etc.);

(G) a program of continuing public education and information regarding water conservation;

(H) a water rate structure which is not "promotional," i.e., a rate structure which is cost-based and which does not encourage the excessive use of water;

(I) a reservoir systems operations plan, if applicable, providing for the coordinated operation of reservoirs owned by the applicant within a common watershed or river basin in order to optimize available water supplies; and

(J) a means of implementation and enforcement which shall be evidenced by:

(i) a copy of the ordinance, resolution, or tariff indicating official adoption of the water conservation plan by the water supplier; and

(ii) a description of the authority by which the water supplier will implement and enforce the conservation plan; and

(K) documentation of coordination with the regional water planning groups for the service area of the public water supplier in order to ensure consistency with the appropriate approved regional water plans.

(2) Additional content requirements. Water conservation plans for municipal uses by public drinking water suppliers serving a current population of 5,000 or more and/or a projected population of 5,000 or more within the next ten years subsequent to the effective date of the plan must include the following elements:

(A) a program of leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system in order to control unaccounted-for uses of water;

(B) a record management system to record water pumped, water deliveries, water sales, and water losses which allows for the desegregation of water sales and uses into the following user classes:

(i) residential;

(ii) commercial;

(iii) public and institutional; and

(iv) industrial;

(C) a requirement in every wholesale water supply contract entered into or renewed after official adoption of the plan (by either ordinance, resolution, or tariff), and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements in this chapter. If the customer intends to resell the water, the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with the provisions of this chapter.

(3) Additional conservation strategies. Any combination of the following strategies shall be selected by the water supplier, in addition to the minimum requirements in paragraphs (1) and (2) of this subsection, if they are necessary to achieve the stated water conservation goals of the plan. The commission may require that any of the following strategies be implemented by the water supplier if the commission determines that the strategy is necessary to achieve the goals of the water conservation plan:

(A) conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates;

(B) adoption of ordinances, plumbing codes, and/or rules requiring water-conserving plumbing fixtures to be installed in new structures and existing structures undergoing substantial modification or addition;

(C) a program for the replacement or retrofit of water-conserving plumbing fixtures in existing structures;

(D) reuse and/or recycling of wastewater and/or graywater;

(E) a program for pressure control and/or reduction in the distribution system and/or for customer connections;

(F) a program and/or ordinance(s) for landscape water management;

(G) a method for monitoring the effectiveness and efficiency of the water conservation plan; and

(H) any other water conservation practice, method, or technique which the water supplier shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

(b) A water conservation plan prepared in accordance with 31 TAC §363.15 (relating to Required Water Conservation Plan) of the Texas Water Development Board and substantially meeting the requirements of this section and other applicable commission rules may be submitted to meet application requirements in accordance with a memorandum of understanding between the commission and the Texas Water Development Board.

(c) Beginning May 1, 2005, a public water supplier for municipal use shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The public water supplier for municipal use shall review and update the next revision of its water conservation plan not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group.

Source Note: The provisions of this §288.2 adopted to be effective May 3, 1993, 18 TexReg 2558; amended to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective October 7, 2004, 29 TexReg 9384

Appendix C

Form for Water Utility Profile

APPENDIX C
Water Utility Profile Based on TCEQ Format

The purpose of the Water Utility Profile is to assist an applicant with water conservation plan development and to ensure that important information and data be considered when preparing your water conservation plan and goals. You may contact the Municipal Water Conservation Unit of the TWDB at 512-936-2391 for assistance, or the Resource Protection Team at 512-239-4691 if submitted to the TCEQ.

Name of Utility: ____
Address & Zip: ____
Telephone Number: ____
Fax Number: ____
Form Completed by: ____
Title: ____
Signature: ____
Date: ____

Name and phone number of person/department responsible for implementing a water conservation program:
Name: ____
Phone Number: ____

I. CUSTOMER DATA

A. Population and Service Area Data

1. Please attach a copy of your Certificate of Convenience and Necessity (CCN) from the TCEQ, and a service-area map.
2. Service area size (square miles): ______
3. Current population of service area: ______ as of year ______
4. Current population served by utility:
   water: ______
   wastewater: ______
5. Miles of Water Distribution Pipeline: ______

6. Population served by utility for the previous five years. (Please list by year in ascending order.):

Year	Population

7. Projected population for service area in the following decades:

Year	Population
2010	
2020	
2030	
2040	
2050	
2060	

8. List source(s)/method(s) for the calculation of current and projected population:

B. Active Connections

1. Current number of active connections by user type:
   Check whether multi-family service is counted as Residential ___ or Commercial ___.
   Current year is: ______

Treated Water Users	Metered	Non-Metered	Total
Residential			
Commercial			
Industrial			
Public			
Other			
Total			

2. List the net number of new connections per year for most recent three years:

Year			
Residential			
Commercial			
Industrial			
Public			
Other			
Total			

C. High Volume Customers

List annual water use for the five highest volume retail and wholesale customers. (Please indicate if treated or raw water delivery.):

Customer	Use (1,000 gal/yr)	Treated/ Raw Water

II. WATER USE DATA FOR SERVICE AREA

A. Water Accounting Data

1. Amount of water use for previous five years (in 1,000 gal):

Please indicate: Diverted Water ___

Treated Water _____

Year					
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
Total					

Please indicate how the above figures were determined (e.g., from a master meter located at the point of diversion, from a stream, or located at a point where raw water enters the treatment plant, or from water sales)

2. Metered amount of water (in 1,000 gallons) delivered (sold) as recorded by the following account types

Year	Residential	Commercial	Industrial	Wholesale	Other	Total Sold

3. List previous five years records for unaccounted-for water use in million gallons

Unaccounted Water	Year				
Self-Supplied					
Other Supplies					
Total Sales					
Estimated Fire Use					
Estimated line flushing					
Unaccounted Water					
% Unaccounted					
Goal for % Unaccounted	12.00%	12.00%	12.00%	12.00%	12.00%

4. List previous five years records for annual peak-to-average daily use ratio

Year	Average MGD	Peak MGD	Ratio

5. Municipal per capita water use for previous five years

Year	Population	Total Diverted (or Treated) (1,000 gal)	Industrial Sales (1,000 gal)	Wholesale Sales (1,000 gal)	In-City Municipal Use (1,000 gal)	Municipal per Capita Use (gpcd)

Year	Single Family Use (1,000 gal)	Multi-Family Use (1,000 gal)	Residential Use (1,000 gal)	Residential per Capita Use (gpcd)

6. Seasonal water use for the previous five years (in gallons/person/day)

Year	Population	Base per Capita Use (gpcd)	Summer per Capita Use (gpcd)	Seasonal Use (gpcd)	Portion of Average Annual Use Attributed to Seasonal Use (GPCD)

Note: Seasonal per capita use is calculated by subtracting the base per capita use from the summer per capita use.

B. Projected Water Demands

Provide estimates for total water demands for the planning horizon of the utility. Indicate sources of data and how projected water demands were determined.

Year	Projected Demand (Ac-Ft)	Source of data	Explanation of the Methodology Used to Develop Projection

III. WATER SUPPLY SYSTEM

A. Water Supply Sources

List all current water supply sources and the amounts available with each:

Type	Source	Amount Available (MGD)
Surface water		
Groundwater		
Contracts		
Other		

B. Treatment and Distribution System

1. Design daily capacity of system:

2. Storage capacity:
   Elevated _______ MG
   Ground _______ MG

3. If surface water, do you recycle filter backwash to the head of the plant?
   Yes __ No __. If yes, approximately ___ MGD.

4. Please describe the water system. Include the number of treatment plants, wells, and storage tanks. If possible, include a sketch of the system layout.

IV. WASTEWATER UTILITY SYSTEM

A. Wastewater System Data

1. Design capacity of wastewater treatment plant(s): _______ MGD

2. Is treated effluent used for irrigation on-site ___, off-site ___, plant washdown ___, or chlorination/dechlorination ___? If yes, approximately ___ gallons per month. Could this be substituted for potable water now being used in these areas ___?

3. Briefly describe the wastewater system(s) of the area services by the water utility. Describe how treated wastewater is disposed of. Where applicable, identify treatment plant(s) with the TCEQ name and number, the operator, owner, and, if wastewater is discharged, the receiving stream. Please provide a sketch or map which located the plant(s) and discharge or disposal sites.:

Treatment Plant Name	TCEQ Number	Operator	Owner	Receiving Stream

B. Wastewater Data for Service Area

1. Percent of water service area served by wastewater system: _______ %
2. Monthly wastewater volume for previous three years (in 1,000 gallons):

Year			
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Total			

V. UTILITY OPERATING DATA

A. List (or attach) water and wastewater rates, and rate structures for all classes.

B. Other relevant data: Please indicate other data or information that is relevant to both the applicant's water management operations and design of a water conservation plan.

VI. CONSERVATION GOALS

Please use the data provided in this survey to establish conservation goals (additional data may be used).

A. Water conservation goals for municipal utilities are generally established to maintain or reduce consumption, as measured in:

1. gallons per capita per day used;
2. unaccounted-for water uses;
3. peak-day to average-day ratio; and/or
4. an increase in reuse of recycling or water.

B. TCEQ/TWDB conservation staff assess the reasonableness of water conservation goals based on whether the applicant addresses the following steps:

1. identification of a water or wastewater problem;
2. completion of the utility profile;
3. selection of goals based on the technical potential to save water as identified in the utility profile; and
4. performance of a cost-benefit analysis of conservation strategies.

If at least the first three steps have been completed and are summarized in the water conservation plan, then staff can conclude that there is substantiated basis for the goals, and that the water conservation plan is integrated into water management. Therefore, the established conservation goals can be deemed reasonable.

C. Complete the following in gallons per capita per day (gpcd) to quantify the water conservation goals for the utility's service area:

1. Estimation of the technical potential for reducing per capita water use

Method	Most Likely Savings 5-Year (gpcd)	Most Likely Savings 10-Year (gpcd)
Reduction in unaccounted-for uses		
Reduction in indoor water use due to water-conserving plumbing fixtures (Table C-1)		
Reduction in seasonal use		
Reduction in water use due to public education and rate programs		
Total Technical Potential for Reducing per Capita Water Use		

* Subtract these totals from the dry-year per capita use to calculate the long-run planning goal.

2. Planning Goal

The planning goal equals the dry-year per capita water use minus the total technical potentials calculated in number one above.

	5-Year	10-Year
Planning goal (in gpcd):	_______	_______
Goal to be achieve by year:	_______	_______

3. Needed reduction in per capita use to meet planning goal (gpcd)

	5-Year	10-Year
Dry-year per capita use:	_______	_______
Planning goal (from #2 above):	_______	_______
Difference between current use and goal:		

(Represents needed reduction in per capita use to meet goal.)

Table C-1
Projected Per Capita Municipal Water Use without Implementation of Water Conservation Measures beyond Those in Effect in 2000 and Goals

Description	Highest Historical		Goals	
			(year)	(year)
	Year	Per Capita	5-year	10-year
Actual Historical Per Capita Municipal Use				
Projected Per Capita Municipal Use without Low-Flow Plumbing Fixtures				
TWDB Reduction due to Low-Flow Plumbing Fixtures				
Projected Per Capita Municipal Use with Low-Flow Plumbing Fixtures				
Other Projected Reductions Due to this Plan				
Water Conservation Goals with this Plan				

Appendix D

Sample Water Conservation Report

APPENDIX D
PUBLIC WATER UTILITY WATER CONSERVATION REPORT
Due: {Date] of every year

Entity Reporting: ______________________
Filled Out By: ______________________
Date Completed: ______________________
Year Covered: ______________________
# of Connections ______________________

Recorded Supplies and Sales by Month (in Million Gallons):

Month	Self-Supplied Water	Other Supplies	Sales by Category						
			Residential	Commercial	Public/ Institutional	Industrial	Wholesale	Other	Total
January									
February									
March									
April									
May									
June									
July									
August									
September									
October									
November									
December									
TOTAL									

Unaccounted Water (Million Gallons):

Self Supplies		from Table above
Other Supplies		from Table above
Total Supplies		from Table above
Total Sales		from Table above
Estimated Fire Use		estimated from best available data
Estimated Line Flushing Use		estimated from best available data
Unaccounted Water		
% Unaccounted		
Goal for % Unaccounted	15.00%	

Per Capita Municipal Use (Gallons per person per day)
Municipal Use (MG)
Estimated Population
Per Capita Use (gpcd)
5-year Per Capita Goal (___)
10-year Per Capita Goal (___)

Recorded Wholesale Sales by Month (in Million Gallons):

Month	Sales to ______	Sales to ______	Sales to ______	Sales to ______	Sales to ______	Sales to ______	Sales to ______	Total Wholesale Sales
January								
February								
March								
April								
May								
June								
July								
August								
September								
October								
November								
December								
TOTAL								

Information on Wholesale Customers:

Customer	Estimated Population

Unusual Circumstances (use additional sheets if necessary):

Progress in Implementation of Conservation Plan (use additional sheets if necessary):

Conservation measures planned for next year (use additional sheets if necessary):

Chapter 7

Description Of How The Regional Water Plan Is Consistent With Long-Term Protection Of The State's Water Resources, Agricultural Resources, And Natural Resources

Texas State Senate Bill 1

East Texas Region

7.1 Introduction

The development of viable strategies to meet the demand for water is the primary focus of regional water planning. However, another important goal of water planning is the long-term protection of resources that contribute to water availability, and to the quality of life in the State. The purpose of this chapter is to describe how the 2006 Update to the East Texas Region Water Plan is consistent with the long-term protection of the State's water resources, agricultural resources, and natural resources. The requirement to evaluate the consistency of the regional water plan with protection of resources is found in 31 TAC Chapter 357.14(2)(C), which states, in part:

> "The regional water plan is consistent with the guidance principles if it is developed in accordance with §358.3 of this title (relating to Guidelines), §357.5 of this title (relating to Guidelines for Development of Regional Water Plans), §357.7 of this title (relating to Regional Water Plan Development), §357.8 of this title (relating to Ecologically Unique River and Stream Segments), and §357.9 of this title (relating to Unique Sites for Reservoir Construction).

Chapter 7 addresses this issue by providing general descriptions of how the plan is consistent with protection of water resources, agricultural resources, and natural resources.

Additionally, the chapter will specifically address consistency of the 2006 East Texas Region Water Plan Update with the State's water planning requirements. To demonstrate compliance with the State's requirements, a matrix has been developed and will be addressed in this chapter.

7.2 Consistency With the Protection of Water Resources

The water resources in the East Texas Region include three river basins providing surface water, and four aquifers providing groundwater. The three major river basins within the East Texas Region boundaries include the Sabine River Basin, the Trinity River Basin and the Neches River Basin. The respective boundaries of these basins is depicted on Figure 1.2, in Chapter 1. The region's groundwater resources include, primarily, the Gulf Coast and Carrizo-Wilcox aquifers. Lesser amounts of water are also drawn from the Sparta and Queen City aquifers and localized aquifers. The extents of these aquifers within the region are depicted on Figures 1.9 and 1.10 in Chapter 1.

Surface water accounts for approximately 75% of the total water use in the region. Sources include 11 reservoirs in the Neches River Basin, 3 in the Sabine River Basin, and 1 in the Trinity River Basin. Lake Columbia and Lake Fastrill, if built, will also be located in the Neches River Basin. Currently, the majority of the available surface water supply used in the East Texas Region comes from the Neches River Basin.

The Carrizo-Wilcox aquifer and Gulf Coast aquifers are, by far, the most important groundwater resources in The East Texas Region, accounting for a total of 75% of the available groundwater. Over the past decade or more, significant water level declines have been observed in the Carrizo-Wilcox aquifer around the cities of Tyler, Lufkin, and Nacogdoches. Lufkin and Nacogdoches are both considering development of new surface water sources to meet projected shortages. The City of Tyler already relies largely on surface water supplies.

To be consistent with the long-term protection of water resources the Plan must recommend strategies that minimize threats to the region's sources of water over the planning period. The water management strategies identified in Chapter 4 were evaluated for threats to water resources. The recommended strategies represent a comprehensive plan for meeting the needs of the region while effectively minimizing threats to water resources. Descriptions of the major strategies and the ways in which they minimize threats include the following:

- Water Conservation. Strategies for water conservation have been recommended that will help reduce the demand for water, thereby reducing the impact on the region's groundwater and surface water sources. Water conservation practices are expected to save over 20,600 ac. ft of water annually by 2060, reducing impacts on both groundwater and surface water resources. The plan also assumes significant savings in municipal demands due to the implementation of plumbing codes. Water conservation benefits the State's water resources by reducing the volumes of water withdrawals necessary to support human activity.
- Indirect Reuse. Athens MWA is proposing to reuse a portion of the wastewater discharge generated by the City. Treated wastewater will be returned to Lake Athens, which serves as the source for a portion of the Athens MWA water supply. Reuse reduces the dependence on ground or surface water sources.
- Construction of Lake Columbia. This strategy will increase surface water supplies available for cities, industry and agriculture in the East Texas Region.
- Construction of Lake Fastrill. This is recommended strategy in Region C.
- Use of water from Toledo Bend by Regions C and D.
- Expanded Use of Surface Water Resources. One purpose of the Water Availability Model (WAM) development, a part of the regional planning process, is to assess how the increased use of surface water resources will impact the Region's water resources. The WAMs developed for the East Texas Region indicate adequate availability of surface water in the region. Further study of the potential impacts of the proposed water management strategies on stream flows in the East Texas Region found that the larger impacts to stream flows occur during the higher flow months (winter and spring), with minimal impacts or increases during the typical lower flow summer months. The greatest changes observed were immediately downstream of Toledo Bend due to reduction in hydropower releases. The estimated 2060 flows in the Sabine Basin more closely resemble natural conditions. A more detailed discussion of the stream flow analysis is presented in Appendix 7B.

- Expanded Use of Groundwater. This strategy has generally been recommended for entities with sufficient groundwater supply available to meet needs, but currently without adequate infrastructure (i.e., well capacity). Groundwater availability reported in the plan is based on the long-term sustainability of the aquifer. No strategies are recommended to use water above the sustainable level.

7.3 Consistency with Protection of Agricultural Resources

Agriculture is an important economic cornerstone of the East Texas Region. Even with adequate rainfall, irrigation is a critical aspect of some agriculture in the region. Rice irrigation in the coastal counties is mostly supplied by LNVA, with water from the Rayburn/Steinhagen system. The WAMs indicate adequate availability of surface water to meet the projected irrigation demands for the planning period.

7.4 Consistency with Protection of Natural Resources

The East Texas Region contains many natural resources that must be considered in water planning. Natural resources include threatened or endangered species; local, state, and federal parks and public land; and energy/mineral reserves. The East Texas Region Water Plan is consistent with the long-term protection of these resources. Following is a brief discussion of consistency of the plan with protection of natural resources.

7.4.1 Threatened/Endangered Species

A list of species of special concern, including threatened or endangered species, located within the East Texas Region is contained in Chapter 1 Appendix A. Included are fifteen species of birds, six mammals, fourteen reptiles/amphibians, and eight fish. Development of Lake Columbia and Lake Fastrill may potentially affect endangered or threatened species. Species that may be potentially impacted by Lake Columbia is shown in Chapter 1, Table 1.12. The counties in which Lake Fastrill will be located have a total of twenty-one species of special concern as indicated in Chapter 1, Appendix A. The other water management strategies evaluated for the East Texas Region Water Plan are not expected to adversely impact any of the listed species. Assessment will be performed in the planning stages of each proposed project to ensure protection of endangered and threatened species.

7.4.2 Parks and Public Lands

The East Texas Region contains three national forests, one national preserve, two national wildlife refuges, and numerous state parks, forests, and wildlife management areas. In addition, there are a number of city parks, recreational facilities, and public lands located throughout the region. None of the water management strategies evaluated for the East Texas Region Water Plan is expected to adversely impact parks or public land. The proposed Lake Fastrill would inundate 24,950 acres, including a portion of a potential wildlife refuge currently being studied by the U.S. Fish and Wildlife Service. The Texas State Railroad is located near the proposed reservoir site. As part of the permitting process for Lake Fastrill, this facility would be protected. The cost estimates for the lake, included in Region C Plan, provides protection of the railroad. The development of wastewater reuse could ultimately reduce the reliance on water from surface water resources. Reducing the need for diversions from water supply lakes may enhance recreational facilities on these water bodies.

7.4.3 Timber Resources

Much of the East Texas Region is heavily forested and timber is an important economic resource for the region. Although the development of Lake Columbia and Lake Fastrill will inundate some forested areas, this loss in timber resources will be partially offset by gains in wetland areas, aquatic habitat and water recreation area. A full environmental assessment is a part of the planning process for development of Lake Columbia.

7.4.4 Energy Reserves

Numerous oil and gas wells are located within the East Texas Region, including the East Texas Oil Field, and four of the top 10 producing gas fields in the state. In addition, significant lignite coal resources can be found in the East Texas Region under portions of 12 counties. These resources represent an important economic base for the region. None of the water management strategies is expected to significantly impact oil, gas, or coal production in the region.

7.5 Consistency with State Water Planning Guidelines

To be considered consistent with long-term protection of the State's water, agricultural, and natural resources, the East Texas Regional Water Plan must be determined to be in compliance with the following regulations:

- 31 TAC Chapter 358.3
- 31 TAC Chapter 357.5
- 31 TAC Chapter 357.7
- 31 TAC Chapter 357.8
- 31 TAC Chapter 357.9

The information, data, evaluation, and recommendations included in Chapters 1 through 6 and Chapter 8 of the East Texas Region Water Plan collectively comply with these regulations. To assist with demonstrating compliance, the East Texas Region has developed a matrix addressing the specific recommendations contained in the above referenced regulations.

The matrix is a checklist highlighting each pertinent paragraph of the regulations. The content of the East Texas Region Water Plan have been evaluated against this matrix. Chapter 7 Appendix A contains a completed matrix.

Appendix A

Checklist For Comparison Of The Regional Water Plan To Applicable Water Planning Regulations

The purpose of this attachment is to facilitate the determination of how the Regional Water Plan is consistent with the long-term protection of the water, agricultural, and natural resources of the State of Texas, particularly within this region. The following checklist includes a regulatory citation (Column 1) for all subsections and paragraphs contained in the following applicable portions of the water planning regulations:

- 31 TAC Chapter 358.3
- 31 TAC Chapter 357.5
- 31 TAC Chapter 357.7
- 31 TAC Chapter 357.8
- 31 TAC Chapter 357.9

According to 31 TAC Chapter 357.14(b), the Regional Water Plan is considered to be consistent with the long-term protection of the State's resources if complies with the above listed requirements. Therefore, the Regional Water Plan has been compared to each applicable section of the regulations as a means of determining consistency.

The checklist also includes a summary description of each cited regulation (Column 2). It should be understood that this summary is intended only to provide a general description of the particular section of the regulation and should not be assumed to contain all specifics of the actual regulation. The evaluation of the Regional Water Plan should be performed against the complete regulation, as contained in the actual 31 TAC 358 and 31 TAC 357 regulations.

Column 3 of the checklist provides the evaluation response as affirmative, negative, or not applicable. A "Yes" in this column indicates that the Regional Water Plan has been evaluated to comply with the stated section of the regulation. A "No" response indicates that the Regional Water Plan does not comply with the stated regulation. A response of "NA" (or not applicable) indicates that the stated section of the regulation does not apply to this Regional Water Plan.

The evidence of where, in the Regional Water Plan, the stated regulation is addressed is provided in Column 4. Where the regulation is addressed in multiple locations within the Regional Water Plan, this column may cite only the primary locations. In addition to identifying where the regulation is addressed, this column may include commentary about the application of the regulation in the Regional Water Plan.

The above-listed regulations are repetitive, in some instances. One section of the regulations may be restated or paraphrased elsewhere within the regulations. In some cases, multiple sections of the regulations may be combined into one separate regulation section. Therefore, Column 5 provides cross-referencing.

CHECKLIST FOR COMPARISON OF THE REGIONAL WATER PLAN TO APPLICABLE WATER PLANNING REGULATIONS

Regulatory Citation (Col 1)	Summary of Requirement (Col 2)	Response (Yes/No/ NA) (Col 3)	Location(s) in Regional Plan and/or Commentary (Col 4)	Regulatory Cross References (Col 5)
31 TAC §358.3				
358.3(a)	TWDB shall develop a State Water Plan (SWP) with 50-year planning cycle, and based on the Regional Water Plan (RWP)	NA	Applies to the State Water Plan. The Regional Water Plan is based on a 50-year planning cycle, however.	
358.3(b)	RWP is guided by the following principles			
(b)(1)	Identified policies and actions so that water will be available at reasonable cost, to satisfy reasonable projected use and protect resources	Yes	Chapters 4, 7, and 8	§358.3(b)(4), §357.5 (a); §357.7 (a)(9)
(b)(2)	Open and accountable decision-making based on accurate, objective information	Yes	Regular public meetings of the RWPG; Public Hearings scheduled throughout the region.	§357.5 (e)(6)
(b)(3)	Consideration of effects of plan on the public interest, and on entities providing water supply	Yes	Chapters 4 and 7	
(b)(4)	Consideration and approval of cost-effective strategies that meet needs and respond to drought, and are consistent with long-term protection of resources	Yes	Chapters 4, 6, and 7	§358.3(b)(1), §357.5 (e)(4) and §357.5 (e)(6); §357.7(a)(9)
(b)(5)	Consideration of opportunities that encourage the voluntary transfer of water resources	Yes	Chapter 4	

Regulatory Citation (Col 1)	Summary of Requirement (Col 2)	Response (Yes/No/ NA) (Col 3)	Location(s) in Regional Plan and/or Commentary (Col 4)	Regulatory Cross References (Col 5)
(b) (6)	Consideration of a balance of economic, social, aesthetic, and ecological viability	Yes	Chapter 4	
(b) (7)	The use of information from the adopted SWP for regions without a RWP	NA		
(b) (8)	The orderly development, management, and conservation of water resources	Yes	Chapter 4	§357.5(a)
(b) (9)	Surface waters are held in trust by the State, and governed by doctrine of prior appropriation	Yes	Chapters 3 and 4	
(b) (10)	Existing water rights, contracts, and option agreements are protected	Yes	Chapter 4	§357.5(e)(3)
(b) (11)	Groundwater is governed by the right of capture unless under local control of a groundwater management district	Yes	Chapter 4	
(b) (12)	Consideration of recommendation of stream segments of unique ecological value	Yes	Chapter 8. The RWPG decided to not recommend any of the Region's stream segments for designation as a segment of unique ecological value	§357.8
(b) (13)	Consideration of recommendation of sites of unique value for the construction of reservoirs	Yes	The RWPG decided to not recommend any location as a site of unique value for construction of a reservoir.	§357.9
(b) (14)	Local, regional, state, and federal agency water planning coordination	Yes	The regional water planning process has included all levels of coordination, as necessary.	

Regulatory Citation (Col 1)	Summary of Requirement (Col 2)	Response (Yes/No/ NA) (Col 3)	Location(s) in Regional Plan and/or Commentary (Col 4)	Regulatory Cross References (Col 5)
(b) (15)	Improvement or maintenance of water quality and related uses as designated by the State Water Quality Plan	Yes	Chapters 4 and 5	
(b)(16)	Cooperation between neighboring water planning regions to identify common needs and issues	Yes	The regional planning process has included coordination with neighboring regions, as needed.	
(b)(17)	WMS described sufficiently to allow a state agency making financial or regulatory decisions to determine consistency of the WMS with the RWP	Yes	To be determined by the State after completion of the RWP	§357.7(a)(9)
(b) (18)	Environmental evaluations are based on site-specific information or state environmental planning criteria	Yes	Chapter 4; to the extent that such information was available.	§357.5(e)(1); §357.5 (e)(6); §357.5(k)(1)(H)
(b) (19)	Consideration of environmental water needs, including instream flows and bay and estuary inflows	Yes	Chapters 3 and 4	§357.5(e)(1); §357.5(l); §357.7 (a)(8)(A)(ii)
(b) (20)	Planning is consistent with all laws applicable to water use for state and regional water planning	Yes	The regional water planning process has considered applicable water laws.	§357.5(f)
(b) (21)	Ongoing permitted water development projects are included	Yes	Chapter 4	
31 TAC §357.5				
(a)	The RWP: provides for the orderly development, management, and conservation of water resources; prepares for drought conditions; and protects agricultural, natural, and water resources	Yes	Chapter 4, 7, and 8	§358.3(b)(1).

Regulatory Citation (Col 1)	Summary of Requirement (Col 2)	Response (Yes/No/ NA) (Col 3)	Location(s) in Regional Plan and/or Commentary (Col 4)	Regulatory Cross References (Col 5)
(b)	The RWP submitted by January 5, 2006	NA	To be submitted	
(c)	The RWP is consistent with 31 TAC §358 and 31 TAC §357, and guided by State and local water plans	Yes		
(d)(1) & (2)	The RWP uses State population and water demand projections from the SWP; or revised population or water demand projections that are adopted by the State	Yes	Chapter 2	
(e)(1)	The RWP provides WMS adjusted for appropriate environmental water needs; environmental evaluations are based on site-specific information or state environmental planning criteria	Yes	Chapter 4; to the extent that site-specific information was available.	§358.3(b)(1); §358.3(b)(18); §357.7 (a)(8)(A)(ii)
(e)(2)	The RWP provides WMS that may be used during a drought of record	Yes	Chapter 4	
(e)(3)	The RWP protects existing water rights, contracts, and option agreements	Yes	Chapter 4	§358.3(b)(10)
(e)(4)	The RWP provides cost-effective and environmentally sensitive WMS based on comparisons of all potentially feasible WMS; The process is documented and presented to the public for comment.	Yes	Chapter 4; WMS have been presented to the public and adopted by the RWPG.	§358.3(b)(4)
(e)(5)	The RWP incorporates water conservation planning and drought contingency planning	Yes	Chapters 4 and 6	§357.5(k)(1)(A)&(B); §357.7(a)(7)(B)
(e)(6)	The RWP achieves efficient use of existing supplies and	Yes	Chapter 4; regular public meetings held to	§358.3(b)(2)

Regulatory Citation (Col 1)	Summary of Requirement (Col 2)	Response (Yes/No/ NA) (Col 3)	Location(s) in Regional Plan and/or Commentary (Col 4)	Regulatory Cross References (Col 5)
	promotes regional water supplies or regional management of existing supplies; Public involvement is included in the decision-making process		discuss WMS and conservation issues.	
(e)(7)(A)&(B)	The RWP identifies (A) drought triggers, and (B) drought responses for designated water supplies	Yes	Chapter 6	§357.5(e)(5); §357.5(k)(1)(A)&(B)
(e)(8)	The RWP considers the effect of the plan on navigation	Yes		
(f)	Planning is consistent with all laws applicable to water use in the Region	Yes	The regional planning process has considered applicable water laws.	§358.3(b)(20)
(g)	The following characteristics of a candidate special water resource are considered:			
(g)(1)	The surface water rights are owned by an entity headquartered in another region.	NA	No Special Water Resources (as defined in §357) exist in the region at this time.	
(g)(2)	A water supply contract commits water to an entity headquartered in another region.	NA		
(g)(3)	An option agreement may result in water being supplied to an entity headquartered in another region.	NA		
(h)	Water rights, contracts, and option agreements of special water resources are protected in the RWP	NA		
(i)	The RWP considers emergency transfers of surface water rights	Yes	No emergency transfers of water are anticipated.	
(j)(1)-(3)	Simplified planning is used in the RWP in accordance with	NA		

Regulatory Citation (Col 1)	Summary of Requirement (Col 2)	Response (Yes/No/ NA) (Col 3)	Location(s) in Regional Plan and/or Commentary (Col 4)	Regulatory Cross References (Col 5)
	TWDB rules			
(k) (1)&(2)	The RWP shall consider existing plans and information, and existing programs and goals related to local or regional water planning	Yes	Chapters 1 through 4	
(l)	The RWP considers environmental water needs including instream flows and bays and estuary flows	Yes	Chapter 4	§358.3(b)(19); §357.7 (a)(8)(A)(ii)
<u>31 TAC §357.7</u>				
(a)(1)(A)-(M)	The RWP shall describe the region, including specific requirements of paragraphs A through M of this section of the regulations	Yes	Note: The regulations include a requirement to utilize information compiled by the TWDB from water loss audits. This information is not due to the TWDB until after the RWP is due, and is not included here.	§357.7(a)(8)(A)(iii); §357.7(a)(8)(D); §357.5(k)(1)(C); §357.7(a)(7)(A)(iv)
(a)(2)(A)-(C)	The RWP includes a presentation of current and projected population and water demands, reported in accordance with paragraphs A through C of this section of the regulations	Yes	Chapter 2	
(a)(3)(A)&(B)	The RWP includes the evaluation of current water supplies available (including a presentation of reservoir firm yields) to the Region for use during drought of record conditions, reported by the type of entity and wholesale providers	Yes	Chapter 3	

Regulatory Citation (Col 1)	Summary of Requirement (Col 2)	Response (Yes/No/ NA) (Col 3)	Location(s) in Regional Plan and/or Commentary (Col 4)	Regulatory Cross References (Col 5)
(a)(4) (A)&(B)	The RWP includes water supply and demand analysis, comparing the type of entity and wholesale providers	Yes	Chapter 4	
(a)(5)(A)-(C)	The RWP provides sufficient water supply to meet the identified needs, in accordance with requirements of paragraphs A through C of this section of the regulations	Yes	Chapter 4	
(a)(6)	The RWP presents data required in paragraphs (2) - (5) of this subsection in subdivisions of the reporting units required, if desired by the RWPG	Yes	Chapters 2 through 4	
(a)(7)(A)-(G)	The RWP evaluates all WMS determined to be potentially feasible, in accordance with paragraphs A through G of this section of the regulations	Yes	Note: The regulations include a requirement to utilize information compiled by the TWDB from water loss audits. This information is not due to the TWDB until after the RWP is due, and is not included here.	§357.5(k)(1)(C); §357.7(a)(1)(M); §357.5(e)(5); §357.5(k)(1)(B)
(a)(8)(A)-(H)	The RWP evaluates all WMS determined to be potentially feasible, by considering the requirements of paragraphs A through H of this section of the regulations	Yes	Chapter 4	§358.3(b)(19); §357.5(e)(1); §357.5(l); §357.7(a)(1)(L); §357.7(a)(8)(D); §357.7(a)(8)(A)(iii);
(a)(9)	The RWP makes specific recommendations of WMS in sufficient detail to allow state agencies to make financial or regulatory decisions to determine the consistency of the proposed action with an approved RWP	Yes	To be determined by the State after completion of the RWP; Chapter 7 addresses long-term protection of resources	§358.3(b)(1); §358.3(b)(4); §358.3(b)(17)

Regulatory Citation (Col 1)	Summary of Requirement (Col 2)	Response (Yes/No/ NA) (Col 3)	Location(s) in Regional Plan and/or Commentary (Col 4)	Regulatory Cross References (Col 5)
(a)(10)	The RWP includes regulatory, administrative, or legislative recommendations to facilitate the orderly development, management, and conservation of water resources; prepares for drought conditions; and protects agricultural, natural, and water resources	Yes	Chapter 8	§358.3(b)(1) §357.5(a)
(a)(11)	The RWP includes a chapter consolidating the water conservation and drought management recommendations	Yes	Chapter 6	
(a)(12)	The RWP includes a chapter describing the major impacts of recommended WMS on key parameters of water quality	Yes	Chapter 5	
(a)(13)	The RWP includes a chapter describing how it is consistent with long-term protection of the state's water, agricultural, and natural resources	Yes	Chapter 7	
(a)(14)	The RWP includes a chapter describing the financing needed to implement the water management strategies recommended	Yes	Will be provided as Chapter 9	
(b)	The RWP excludes WMS for political subdivisions that object to inclusion and provide reasons for objection	NA		
(c)	The RWP includes model water conservation plan(s)	Yes	Chapter 6	
(d)	The RWP includes model drought contingency plan(s)	Yes	Chapter 6	
(e)	The RWP includes provisions for assistance of the TWDB in performing regional water planning activities and/or resolving conflicts within the Region	NA	No known conflicts within the region.	

Regulatory Citation (Col 1)	Summary of Requirement (Col 2)	Response (Yes/No/ NA) (Col 3)	Location(s) in Regional Plan and/or Commentary (Col 4)	Regulatory Cross References (Col 5)
31 TAC §357.8				
(a)	The RWP considers the inclusion of recommendations for the designation of river and stream segments of unique ecological value within the Region	Yes	Chapter 8. The RWPG decided to not recommend any of the Region's stream segments for designation as a segment of unique ecological value.	§358.3(b)(12)
(b)	If river or stream segments of unique ecological value are recommended, such recommendations are made in the plan on the basis of the criteria established in this section of the regulations	NA		
(c)	If the RWP recommends designation of river or stream segments of unique ecological value, the impact of the regional water plan on these segments is assessed	NA		
31 TAC §357.9				
(1)	The RWP considers the inclusion of recommendations for the designation of sites of unique value for construction of reservoirs	Yes	The RWPG decided to not recommend any location as a site of unique value for construction of a reservoir.	§358.3(b)(13)
(2)	If sites of unique value for construction of reservoirs are recommended, such recommendations are made in the plan on the basis of criteria established in this section of the regulations	NA		

Appendix B

Evaluation of Impacts of Recommended Water Management Strategies on Stream Flows in the East Texas Region

Freese and Nichols investigated the change on streamflow patterns in East Texas Region due to the implementation of the proposed surface water strategies in the 2006 regional water plans. The assessment was made by comparing streamflow statistics under current conditions and future conditions in the Sabine and Neches River Basins at the gages shown on Figure 1. These gages were selected by the Regional Water Planning Group and correspond to the locations that will be used in the Texas Water Development Board stream flow study for the 2007 State Water Plan. This study uses the TCEQ Water Availability Models known as "Current Conditions" or Run 8 as the base model. Run 8 represents current water usage (diversions) and includes return flows. Changes were made to Run 8 to reflect updated conditions in the basin.

Statistical comparisons were made by month for average flow conditions (mean value) and the 10^{th} percentile, which represents low flow conditions. The 10^{th} percentile is the value that stream flows will be at that level or less 10 percent of the time over the historical record (i.e., 90 percent of the time flows will exceed the 10^{th} percentile). The following is a discussion of the results for the Neches and Sabine River Basins.

NECHES RIVER BASIN

2000 Conditions Model

The model used to represent 2000 conditions is based on the TCEQ Neches WAM Run 8. The following change was made to the Run 8 to obtain the base scenario for 2000:

Change 1: A subordination routine was added to model the special condition of Sam Rayburn-Steinhagen Reservoir System being subordinated to all flow originating above Ponta and Weches dam sites. [Note: this change has been incorporated into the TCEQ-approved WAM Run 3.]

2060 Conditions Model

The following changes were made to the base scenario to create the future conditions model:

Change 1: Area-Capacity tables were changed to reflect 2060 sedimentation conditions.

Change 2: Diversions from the major existing water rights were increased. The following are the total demands assumed for 2060:

Projected 2060 Demands for Reservoirs in the Neches Basin

Reservoir	Projected 2060 demand *
Athens Lake/Reservoir	2,900
Bellwood Lake/Reservoir	950
Jacksonville Lake/Reservoir	5,177
Kurth Lake/Reservoir	18,400
Nacogdoches Lake/Reservoir	13,892
Palestine Lake/Reservoir	150,755
Pinkston Lake/Reservoir	3,800
Rusk City Lake/Reservoir	60
Sam Rayburn-Steinhagen System	820,000
San Augustine Lake/Reservoir	1,242
Striker Lake/Reservoir	13,460
Timpson Lake/Reservoir	350
Tyler Lake/Reservoir	23,997
LNVA Run-of-River Water Rights	381,876
* Includes strategies	

Change 3: Lake Columbia added with a diversion of 75,700 acre-feet per year.

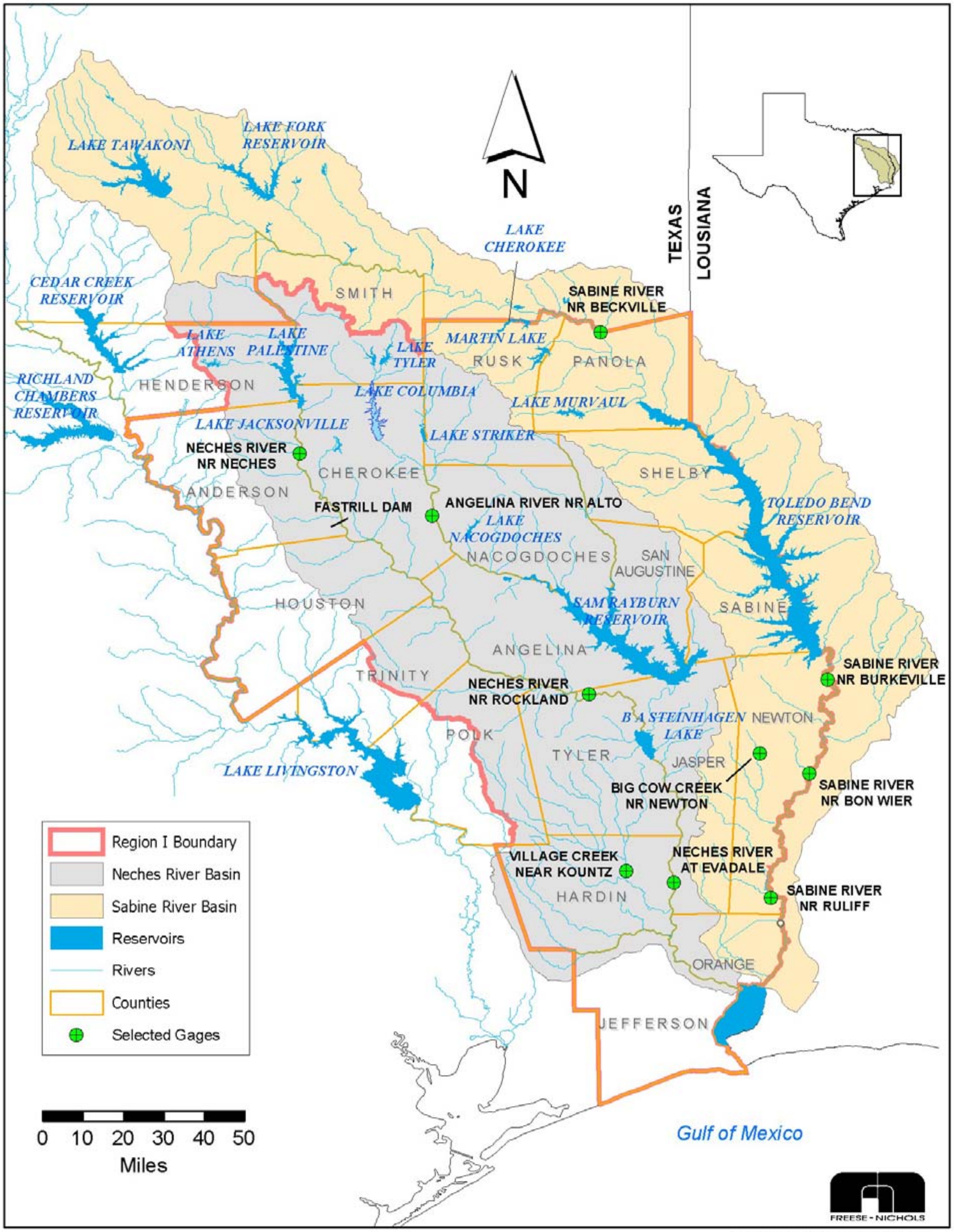
Change 4: Lake Fastrill was added with the information described on Attachment A. Based on this analysis, the firm yield of the lake was estimated at 132,500 acre-feet per year. (Note: this is approximately 16,000 acre-feet per year less than estimated by the Upper Neches River MWA's consultants, which is primarily attributed to the inclusion of return flows for the city of Tyler in the Upper Neches River MWA analysis.) A demand of 132,500 acre-feet per year was added with system operation with Lake Palestine.

A comparison of mean and 10th percentile was completed for the following gages:

- Neches River near Neches
- Neches River near Rockland
- Neches River at Evadale
- Angelina River near Alto
- Village Creek near Kountze

Figure 1

Location of Selected Gages for Streamflow Assessment



Results

The attached graphs show the comparison and the impact on stream flows. Flows in the Neches River have a great seasonal change.

Neches River Near Neches

- Diversion from Lake Palestine System (Palestine/Rocky Dam Diversion) would increase. As a result, more releases would be made during the summer months from Lake Palestine to the downstream diversion point.
- Average flows would be reduced as a result of the increased diversions and reduced spills from Lake Palestine, except during the summer months July to September, in which releases are most needed.
- Low flows will increase from June to December because of releases from Lake Palestine to the Rocky Diversion Dam. The other months, low flow conditions would be reduced.

Neches River near Rockland

- Average flows and low flow conditions would be reduced as a result of Lake Fastrill. Most of the flow available from Lake Fastrill would be impounded during the months of high flow, December to May. These months reflect the highest reduction on average regulated flow. The reduction is between 13% and 22%.
- Low flow conditions (10^{th} percentile) would have an increase or a small impact between June and November because of the restrictions of the Consensus Method and flows passed to satisfy the increased demands of senior rights at Pine Island Bayou.
- Under the Consensus Criteria, Lake Fastrill is required to pass inflows of 67.4 cfs (7Q2) at all times. Low flow conditions (even without Fastrill) are lower than the 7Q2 for these months. Therefore, under low flow conditions, Fastrill would likely not be able to impound water from June to November.
- Demands in the lower basin by senior rights will increase. In the WAM, these increased demands cause more priority calls to junior rights. Therefore, the WAM predicts that higher

flows need to be passed by junior rights, which causes an increase on regulated flows during drought conditions.

- Under low flow conditions, flows from December to May (the higher flow months) would be impacted between 10% and 37%. During these months an average flow of 135 cfs would be maintained, which is twice the 7Q2.

Angelina River near Alto

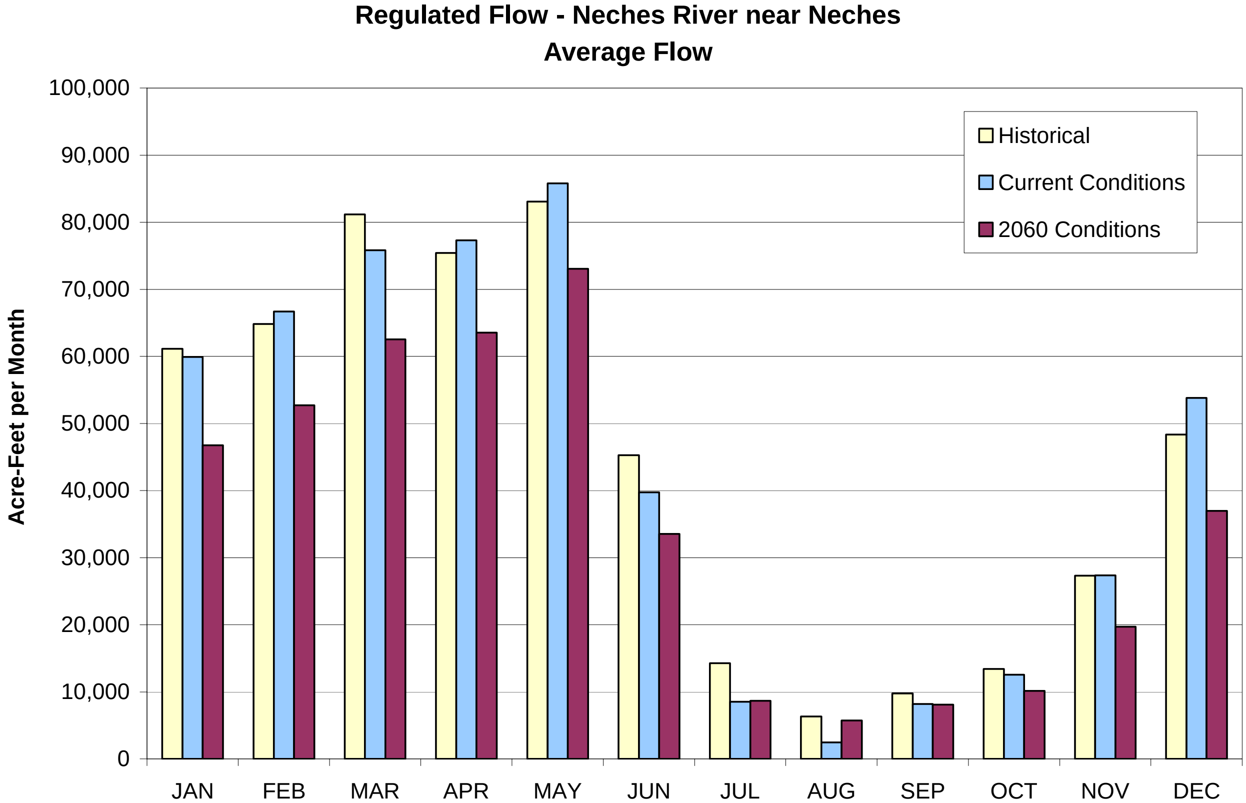
- Average flows would be reduced as a result of the construction of Lake Columbia. The greatest impact would be during the months of high flows in December to May, with reductions less than 14%. Other months are less impacted, with increases reported for August and September.
- Low flow conditions will increase between June and November as a result of increased demands from senior run-of-the-river rights in the lower basin. These increased demands require larger flow to be passed by junior rights.
- Low flow conditions will decrease between December and May. Decrease would be between 19% and 2%.

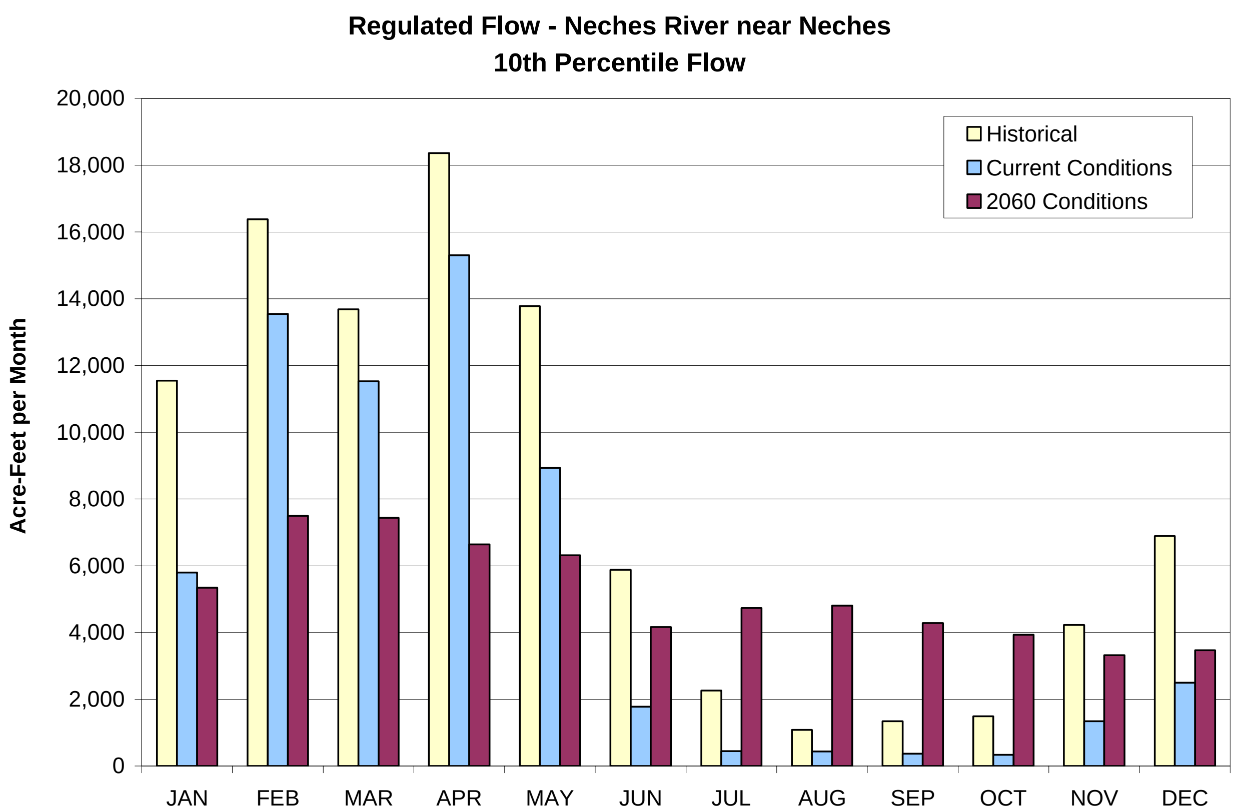
Village Creek near Kountz

- There would be minimum impact on the regulated flow at this gage.

Neches River at Evadale

- This gage is located at lower end of the basin, downstream from Lake Steinhagen. Average flow in most months would be reduced as a result of the increased demands basin-wide.
- Under low flow conditions, flows increase in the summer months due to higher demands and releases for navigation.


Regulated Flow - Neches River near Neches
Average Flow
Acre-Feet per Month
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Historical
Current Conditions
2060 Conditions


Regulated Flow - Neches River near Neches
10th Percentile Flow
Acre-Feet per Month
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
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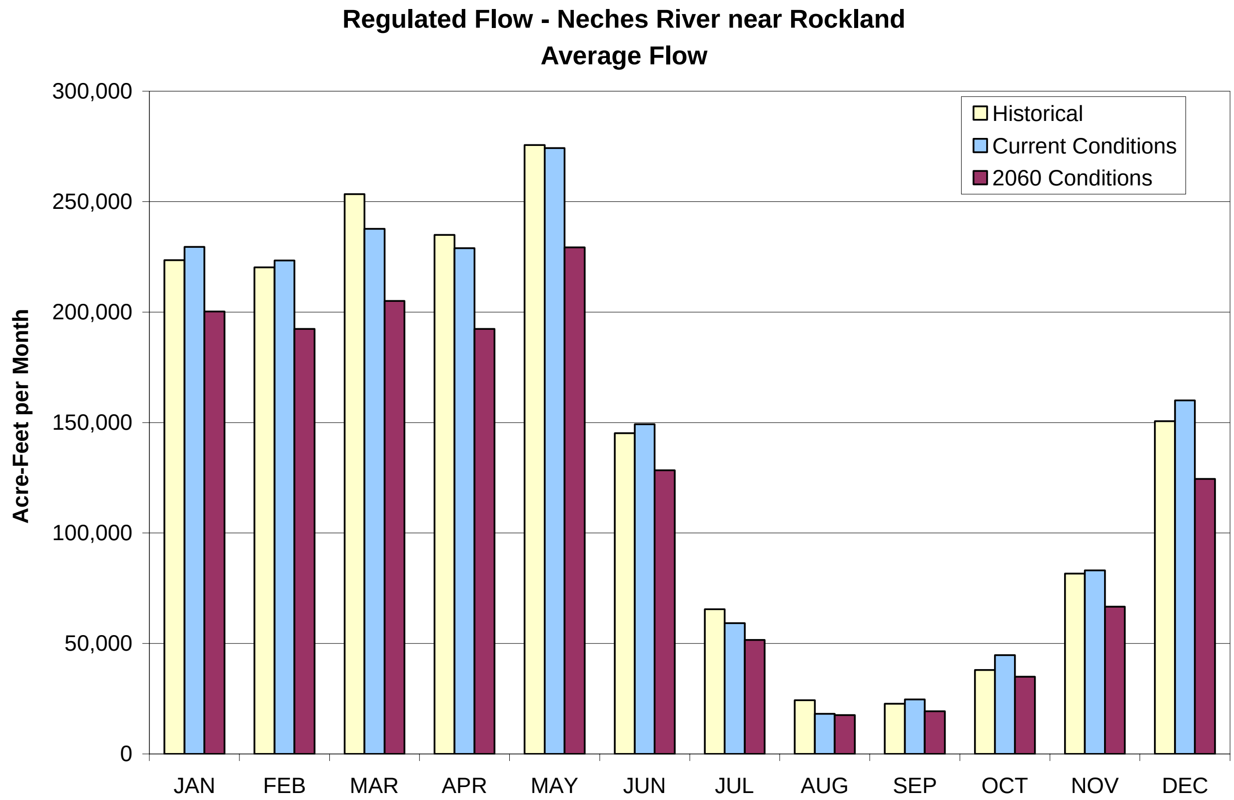
Historical
Current Conditions
2060 Conditions


Regulated Flow - Neches River near Rockland
Average Flow
Historical
Current Conditions
2060 Conditions
Acre-Feet per Month
300,000
250,000
200,000
150,000
100,000
50,000
0
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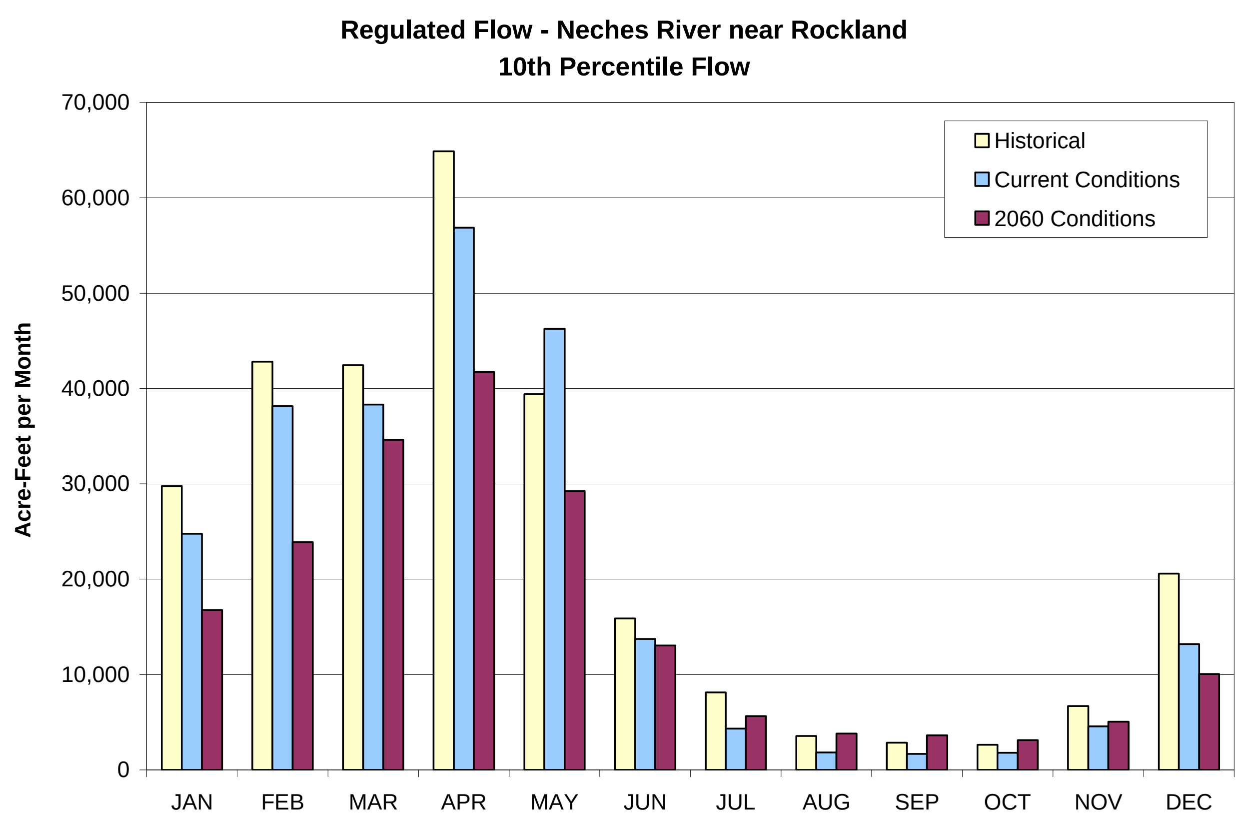
Regulated Flow - Neches River near Rockland
10th Percentile Flow
Historical
Current Conditions
2060 Conditions
Acre-Feet per Month
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
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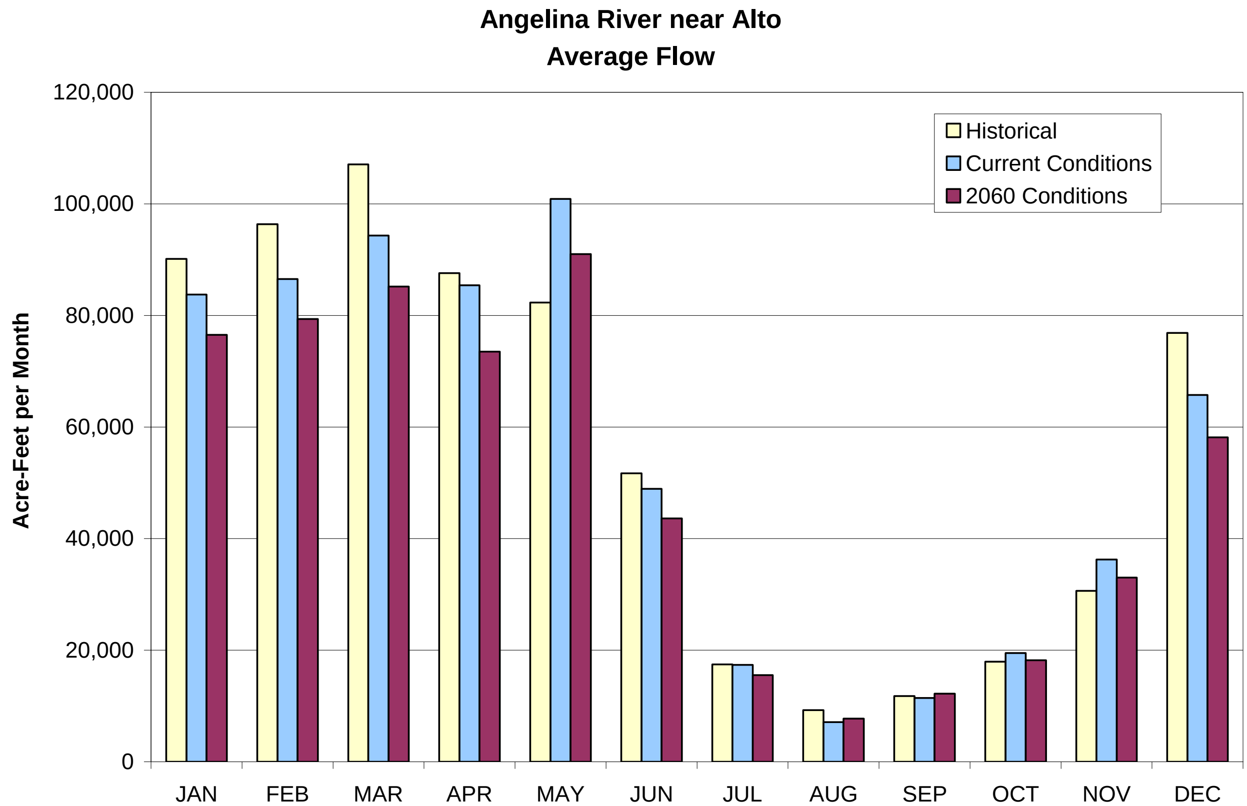
Angelina River near Alto
Average Flow
Acre-Feet per Month
120,000
100,000
80,000
60,000
40,000
20,000
0
JAN
FEB
MAR
APR
MAY
JUN
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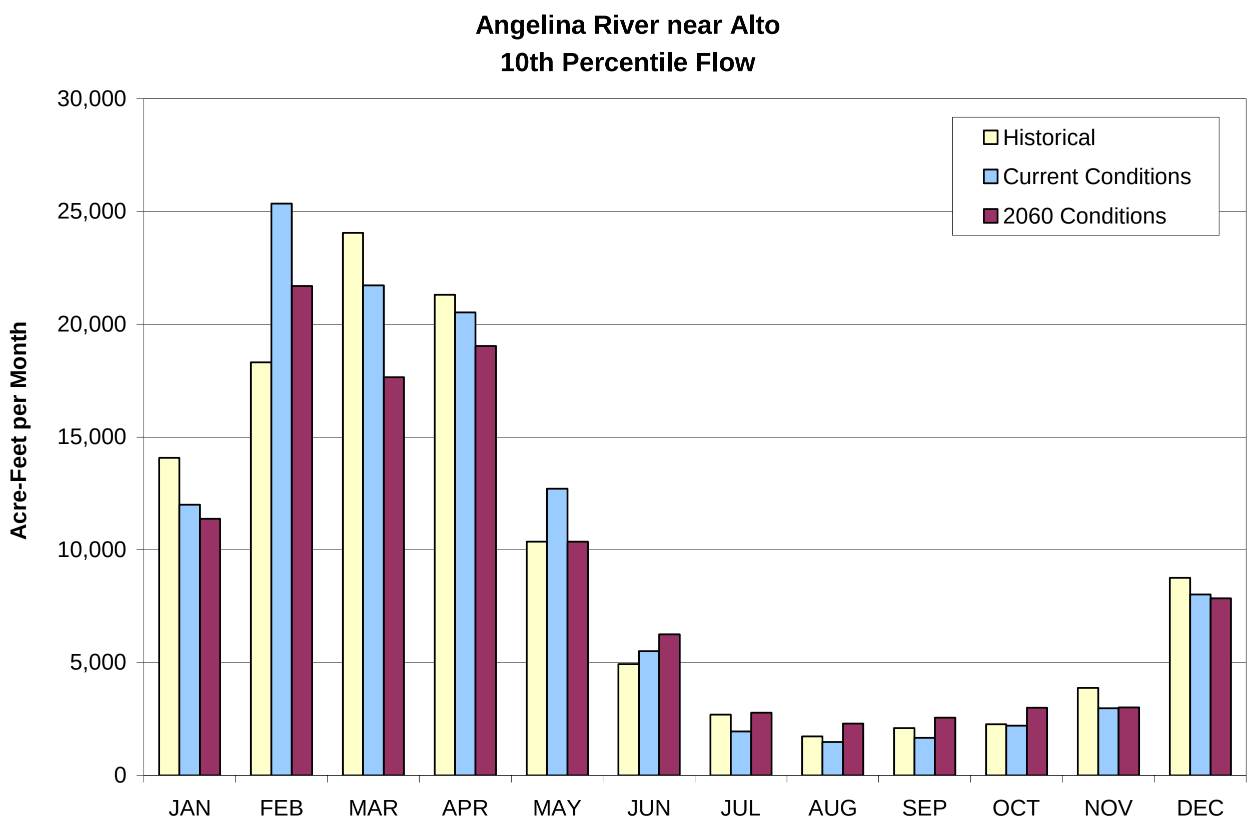
AUG
SEP
OCT
NOV
DEC
Historical
Current Conditions
2060 Conditions


Angelina River near Alto
10th Percentile Flow
Acre-Feet per Month
30,000
25,000
20,000
15,000
10,000
5,000
0
JAN
FEB
MAR
APR
MAY
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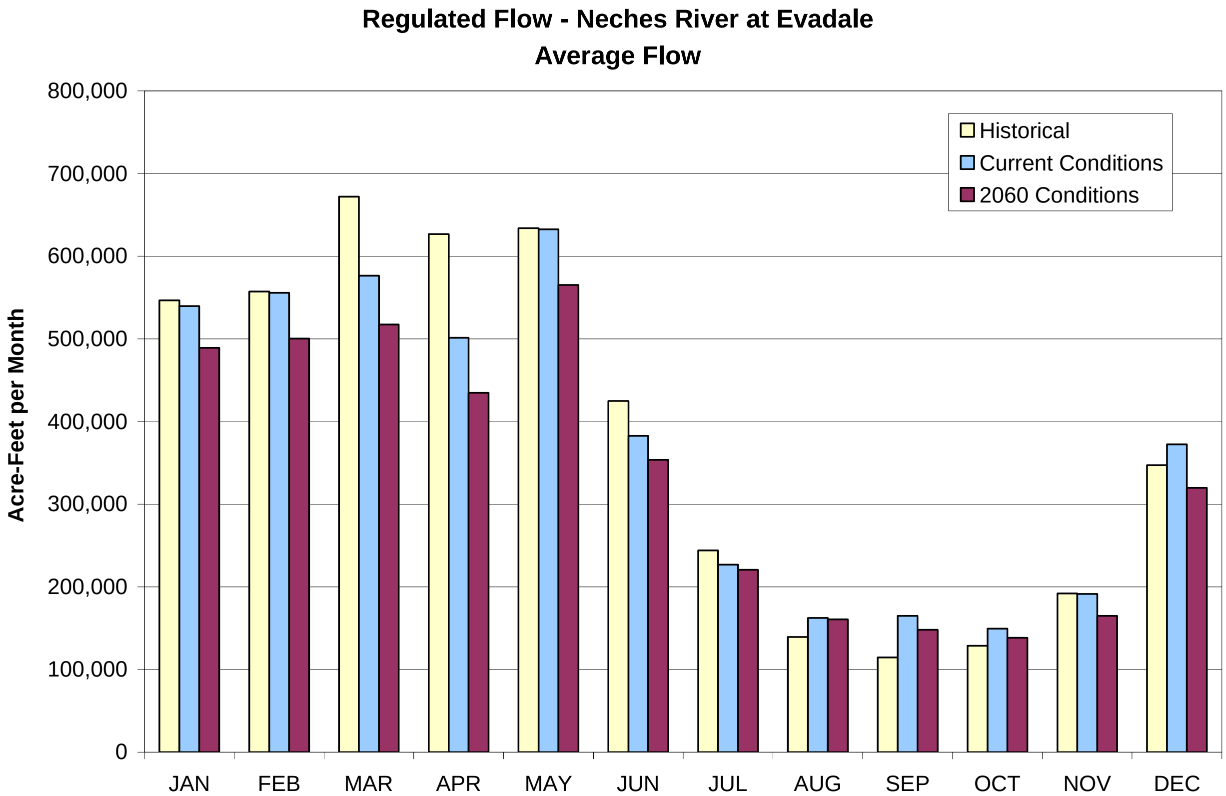
JUL
AUG
SEP
OCT
NOV
DEC
Historical
Current Conditions
2060 Conditions


Regulated Flow - Neches River at Evadale
Average Flow
Acre-Feet per Month
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Historical
Current Conditions
2060 Conditions
JAN
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MAY
JUN
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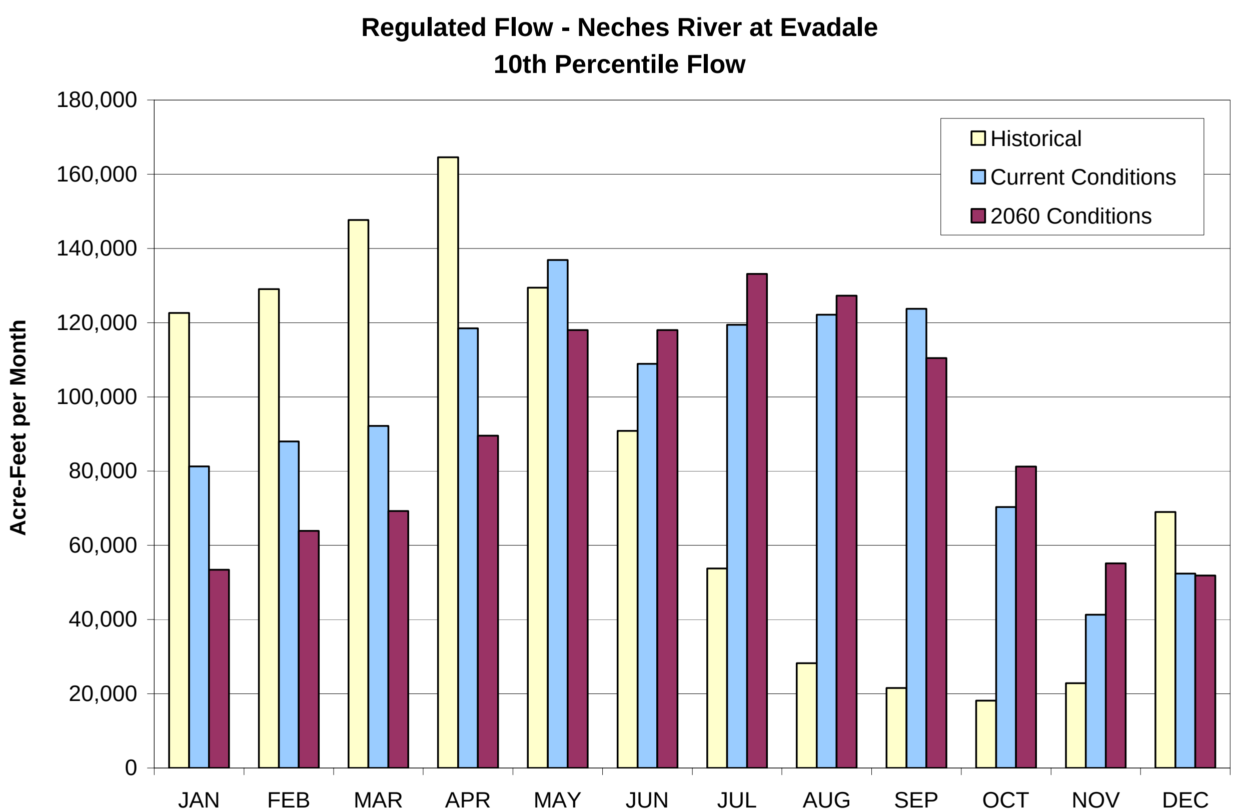
AUG
SEP
OCT
NOV
DEC


Regulated Flow - Neches River at Evadale
10th Percentile Flow
Acre-Feet per Month
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Historical
Current Conditions
2060 Conditions
JAN
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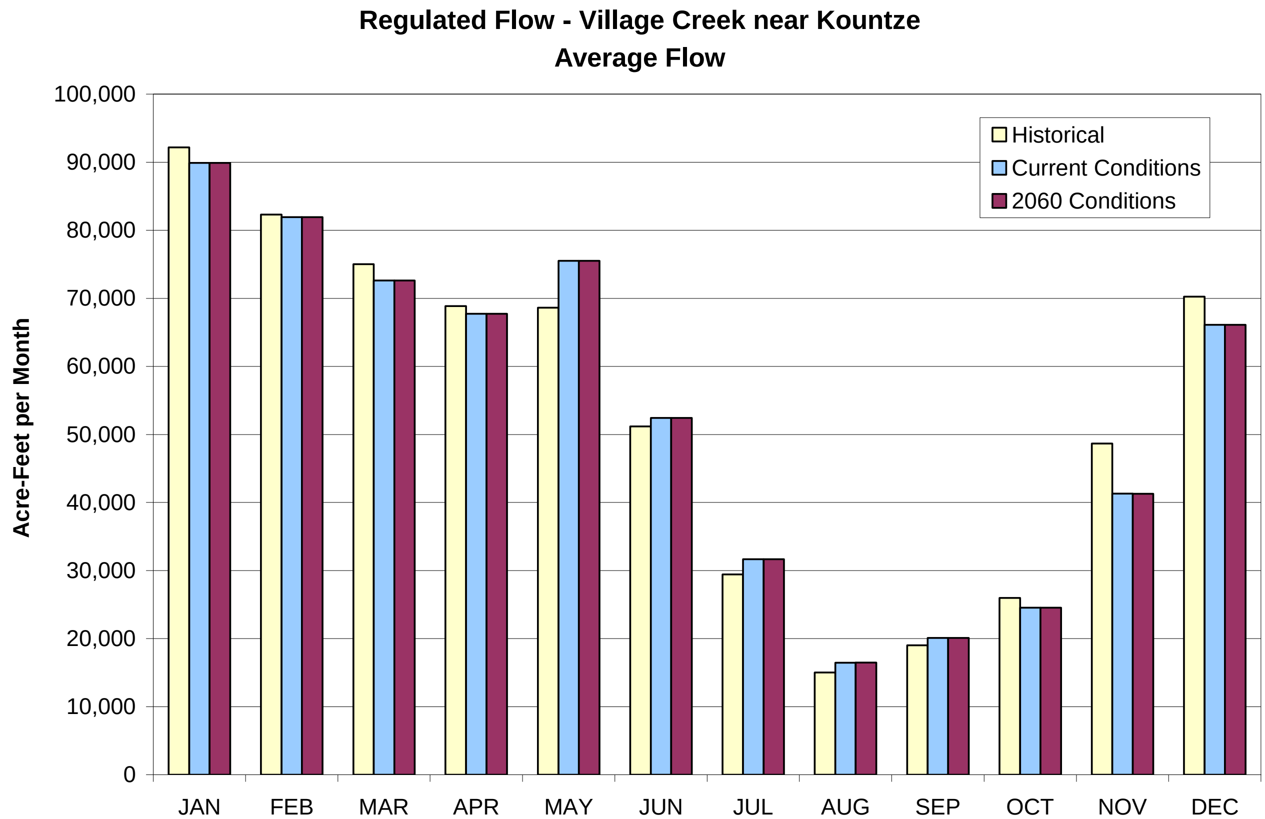
SEP
OCT
NOV
DEC


Regulated Flow - Village Creek near Kountze
Average Flow
Acre-Feet per Month
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Historical
Current Conditions
2060 Conditions
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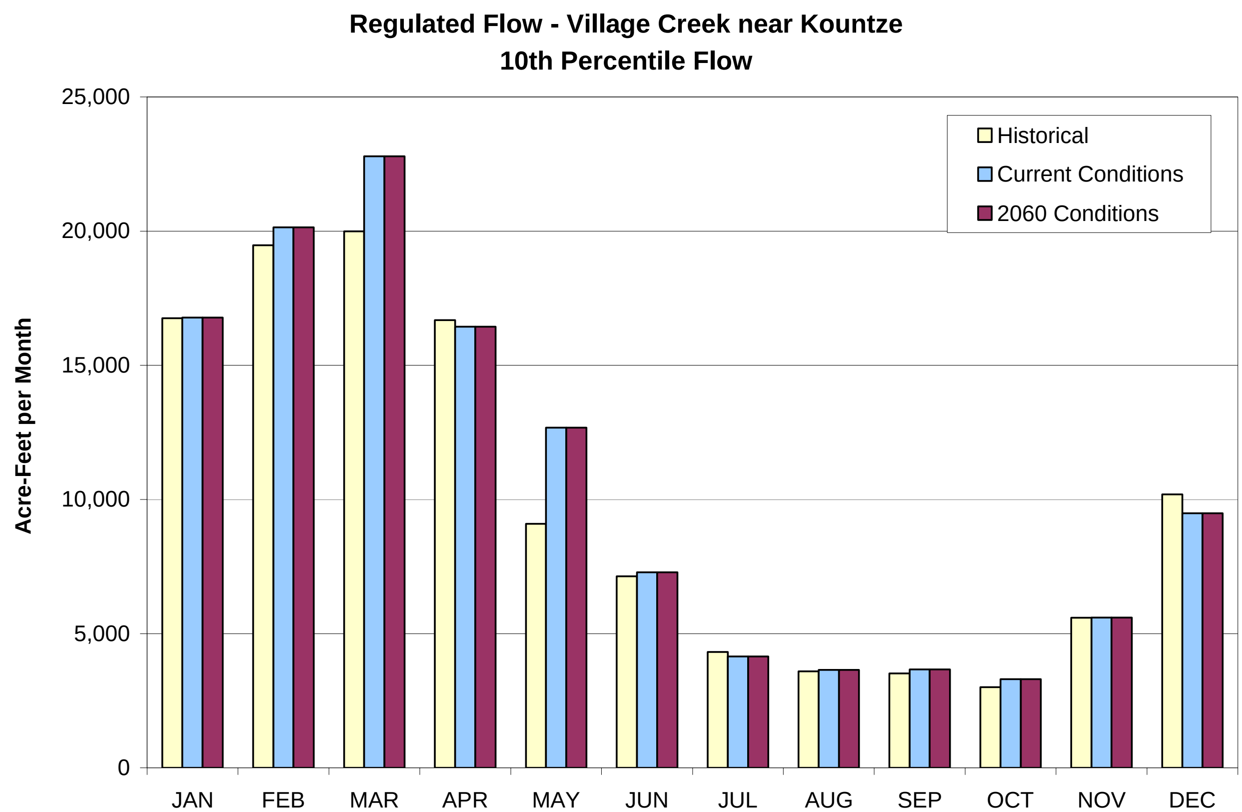
DEC


Regulated Flow - Village Creek near Kountze
10th Percentile Flow
Acre-Feet per Month
25,000
20,000
15,000
10,000
5,000
0
Historical
Current Conditions
2060 Conditions
JAN
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SABINE RIVER BASIN

2000 Conditions Model

Sabine WAM Run 8 assumes the maximum diversions and minimum return flows reported for the period 1990-2000. The following changes were made to the Sabine WAM Run 8 to create the model for 2000 conditions:

Change 1: A constant release of 144 cfs was added from Toledo Bend to model the power sales agreement releases.

Change 2: Diversions from Toledo Bend were moved from the Burkeville gage to lakeside.

Change 3: The control point to determine the streamflow requirements of the Sabine Compact was moved to the Canal Diversion.

<u>Adjustment for Negative Incremental</u>

Negative incremental flows occur when the naturalized flow at a gage is lower than the flows at upstream gages. This may occur due to timing of flows (peak flow reach the downstream gage during the following month), stream losses or inaccurate data. The WRAP model provides options to adjust for these negatives.

During our analysis, we found that the WRAP model was not showing releases from Toledo Bend at the Burkeville gage during months of negative incremental flows. We investigated this problem, and found two reasons:

- The TCEQ Sabine WAM computes very large negative incremental flows at the control point immediately upstream of the Burkeville gage. These large negative values were result of the method used in the Sabine WAM (Method 7) to calculate flow at ungaged locations.
- The option for adjusting for negative incremental used in the TCEQ Sabine WAM (Option 4) does not properly propagate downstream return flows and releases from a reservoir.

To address these problems, the following changes were made to the 2000 conditions model:

Change 4: The method for computing flows at ungaged locations was changed from *drainage-area-ratio with no losses* (WRAP Method No. 7) to *drainage-area-ratio method with losses* (WRAP Method No. 6).

Change 5: The method for adjusting negative incremental flows was removed. No adjustment is performed for negative incremental flows.

A detailed technical explanation and justification for these changes can be found in a separate memorandum.

Recalculation of Natural Flows on Big Cow Creek

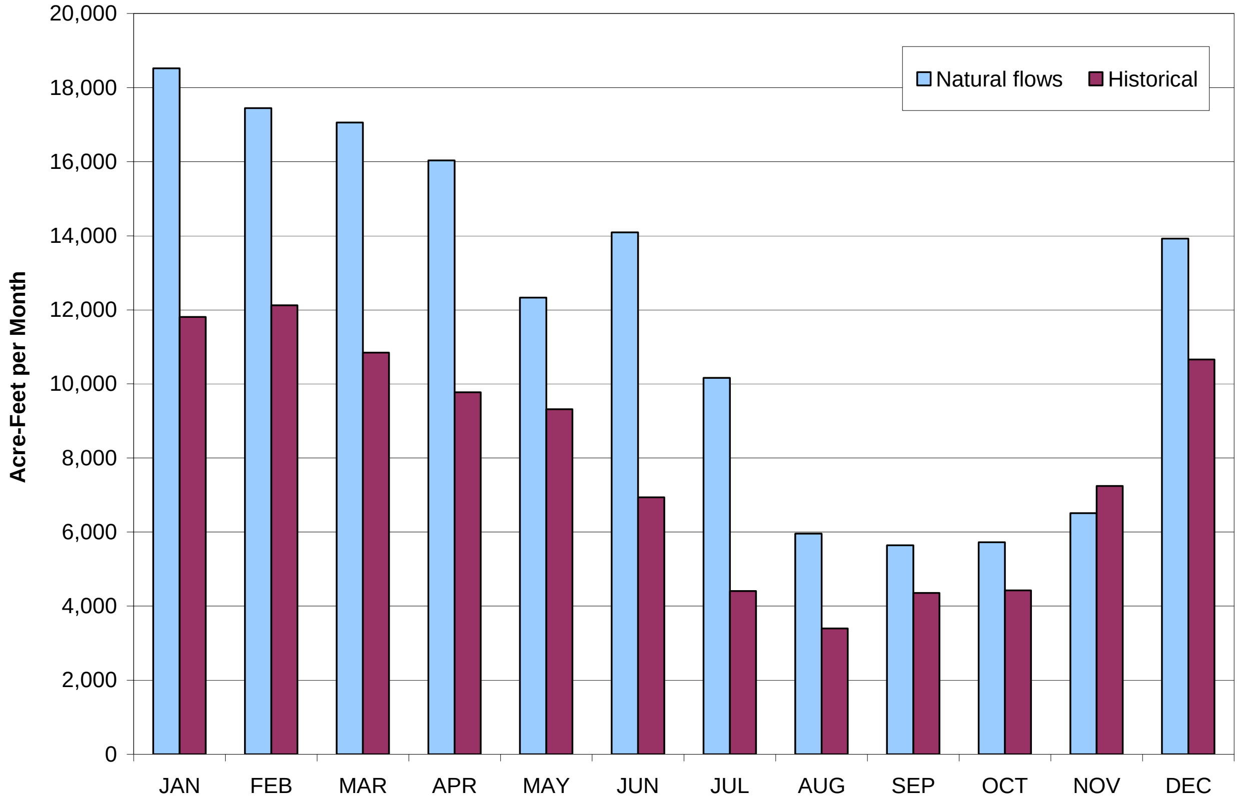
During our analysis, we found that the naturalized flows on the Big Cow Creek near Newton were significantly higher than the gaged flows. Naturalized flows and gaged flow should be equal because there are no water rights or return flows on the Big Cow Creek. Figure 2 shows a comparison of naturalized flows and gaged historical flow at the USGS 08029500.

The Sabine WAM uses the drainage area method with the gages on the Sabine River near Bon Wier and Ruliff to prorate the natural flows at the Big Cow Creek near Newton. The drainage area method produces higher flows than the historical gaged flows.

The gage on the Big Cow Creek has data from May 1952 until present. These data are good estimates of the naturalized flow. Therefore, the following change was made to the TCEQ Sabine WAM:

Change 6: A new primary control point was created at the Big Cow Creek near Newton. The natural flows are equal to the historical gaged flows after May 1952. A correlation with the total naturalized at the Ruliff gage was used to fill in missing data before May 1952.

Figure 2
Comparison of Average Naturalized Flow by Month (Sabine WAM) and Gaged Flow on the Big Cow Creek near Newton



2060 Model

We created the scenario for 2060 conditions by making the following changes to the 2000 model:

Change 1: Area-Capacity tables were changed to reflect 2060 sedimentation conditions.

Change 2: Diversions from the major existing water rights were increased. The following are the <u>total</u> demands assumed for 2060:

Projected 2060 Demands for Reservoirs in the Sabine Basin

Reservoir	Projected 2060 demand (ac-ft/yr)
Big Sandy Creek Lake/Reservoir	3,361
Brandy Branch Lake/Reservoir	11,000
Center Lake/Reservoir	754
Cherokee Lake/Reservoir	22,930
Edgewood City Lake/Reservoir	110
Fork Lake/Reservoir	166,960
Gladewater Lake/Reservoir	1,868
Greenville City Lake/Reservoir	3,486
Martin Lake/Reservoir	25,000
Mill Creek Lake/Reservoir	706
Murvaul Lake/Reservoir	11,042
Sabine River Combined Run-Of-River	160,319
Tawakoni Lake/Reservoir	221,240
Toledo Bend Lake/Reservoir	525,175

Change 3: Hydropower right was removed from Toledo Bend. As demands increase, water supply will have higher priority than hydropower. Hydropower could be generated as water is released for downstream use.

Change 4: Releases from Toledo Bend were added to back up the increased diversion at the Canal System.

Change 5: Return flows for 58,000 acre-feet per year were added in the upper basin as follows:

- 20% below Lake Tawakoni (11,600 acre-feet per year)
- 10% near Mineola (5,800 acre-feet per year)
- 70% near Longview (40,600 acre-feet per year)

These return flows come from a total of 100,000 acre-feet per year dedicated by SRA to the upper basin. Return flow values assume a 58% return fraction.

Results

A comparison of the average flow and 10th percentile flow for each month under 2000 conditions and projected 2060 conditions was created for the following gages:

- Sabine River near Beckville
- Sabine River near Burkeville
- Sabine River near Bon Wier
- Sabine River near Ruliff
- Big Cow Creek near Newton

The attached graphs show the comparison. Historical flows are also shown on the graphs. For gages located on the Sabine River downstream of Toledo Bend, the historical flows include only the historical record before the completion of Toledo Bend. This is because the flows after Toledo Bend was completed are influenced by hydropower releases. For the Burkeville gage, the historical record prior to Toledo Bend is only about ten years, and includes a significant period of low flows. To provide a more accurate representation of average historical flows, an estimate of the regulated flows without Toledo Bend was calculated and is shown on this graph.

The graphs show that:

<u>Sabine River near Beckville</u>

- The mean flow would be reduced between 6% and 13% from October through June. This is due to increased use of water in Region D (recommended strategies for Regions C and D).
- Average flow would increase between July and September as a result of increased return flows.
- Low flow would be reduced only during April and May. These changes are the result of increased demands in the upper basin. Low flows for the other months would increase as a result of increased return flows in the upper basin.

<u>Sabine River near Burkeville</u>

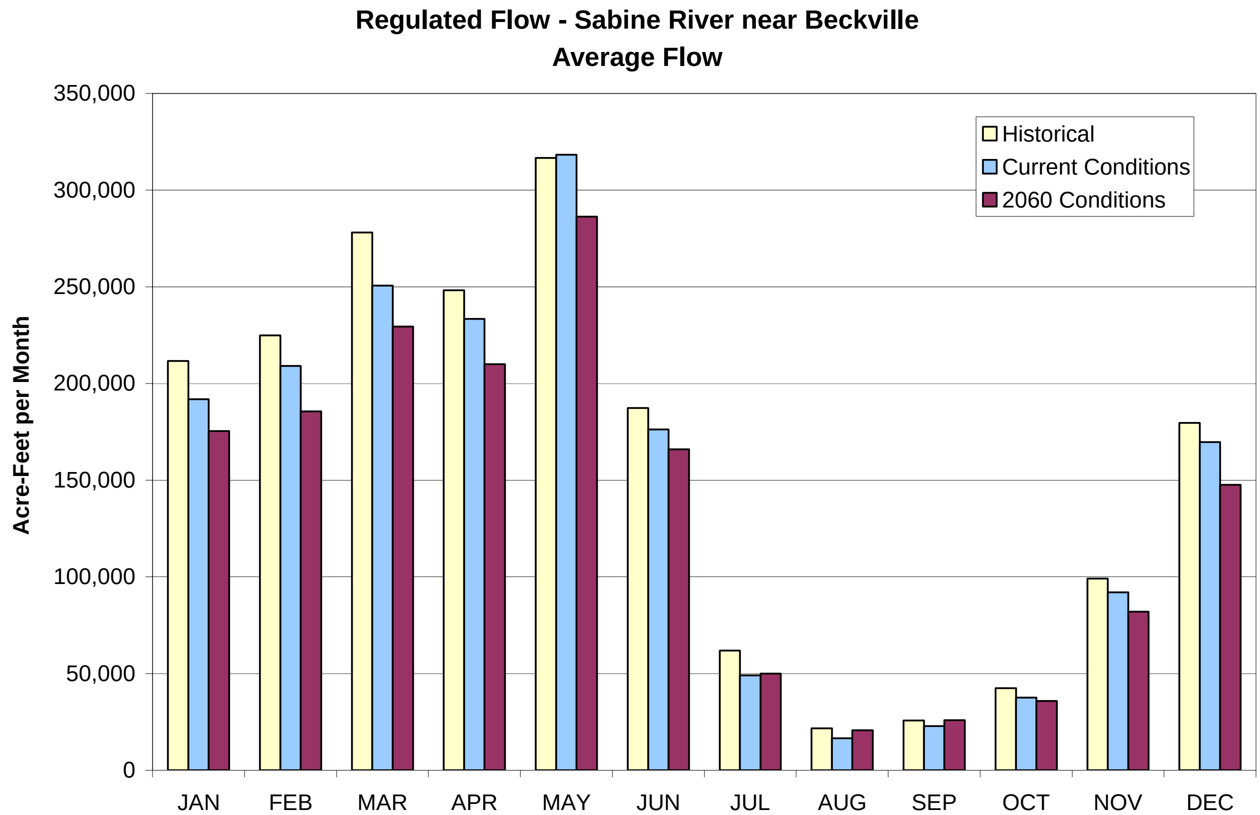
- Average flows will increase during the fall and winter.
- Average flows during the 5 month of hydropower generation (May to September) will be reduced as a result of less hydropower releases. Future flows will be higher than the flows that would occur today without hydropower generation and will be more similar to natural conditions.
- Excluding hydropower releases, low flow conditions will have small change because the constant release of 144 cfs from Toledo Bend would be maintained. This flow is higher than the 10th percentile flow that would have occurred without Toledo Bend releases from July to October.

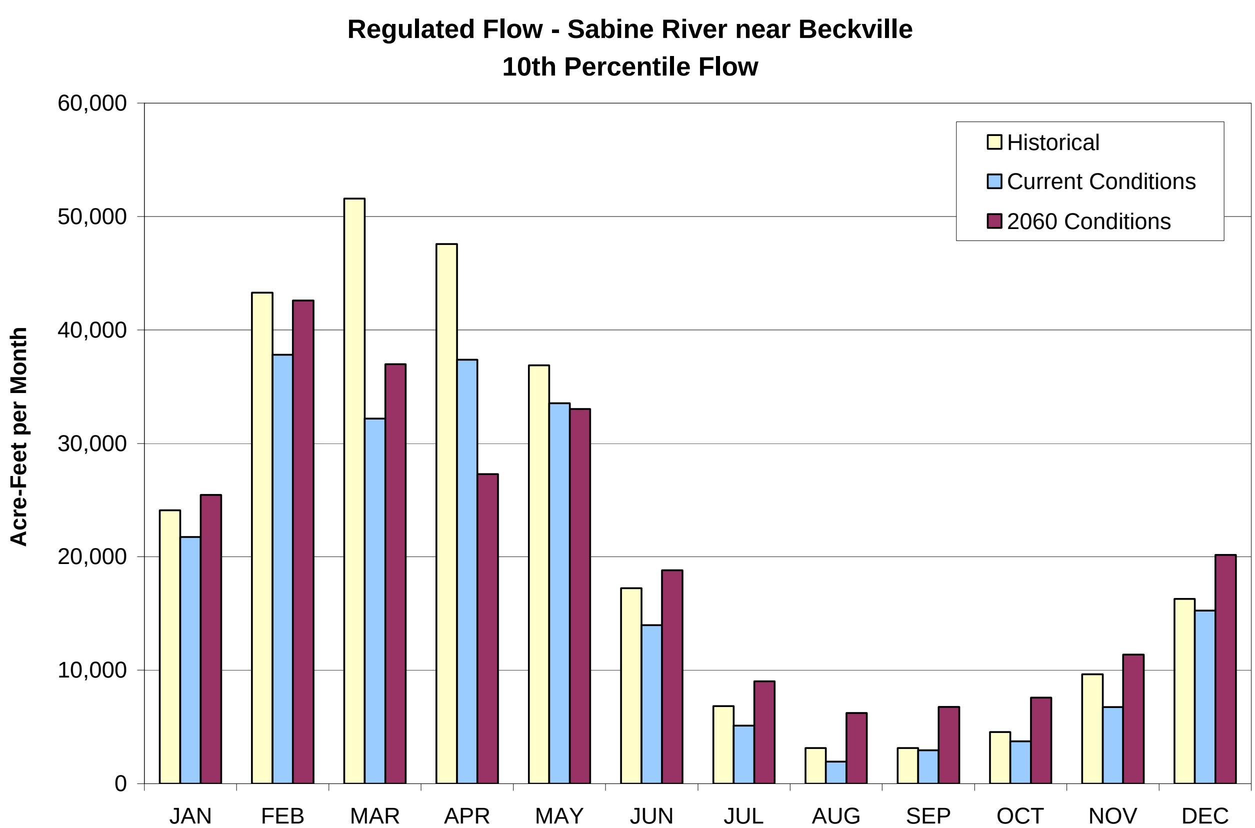
<u>Sabine River near Bon Wier and near Ruliff</u>

- Average flows will increase during the fall and winter.
- Average flows during the 5 month of hydropower generation (May to September) will be reduced as a result of less hydropower releases. However, future flows will be higher than the flows that would occur today without hydropower generation and will be more similar to natural conditions.
- Excluding hydropower releases, 10^{th} percentile flows will have small change from October to April.

<u>Big Cow Creek near Newton</u>

- No impact is expected on the flow at this location.


Regulated Flow - Sabine River near Beckville
Average Flow
Acre-Feet per Month
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Historical
Current Conditions
2060 Conditions


Regulated Flow - Sabine River near Beckville
10th Percentile Flow
Acre-Feet per Month
60,000
50,000
40,000
30,000
20,000
10,000
0
JAN
FEB
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OCT
NOV
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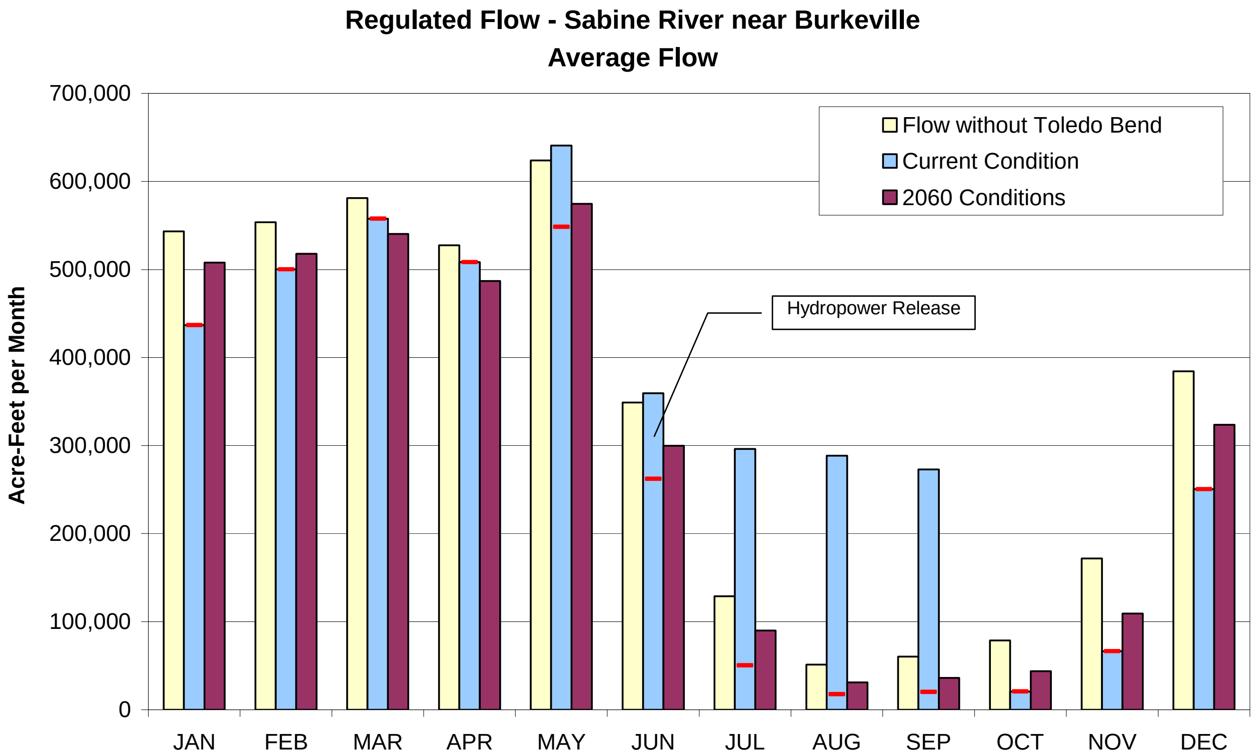
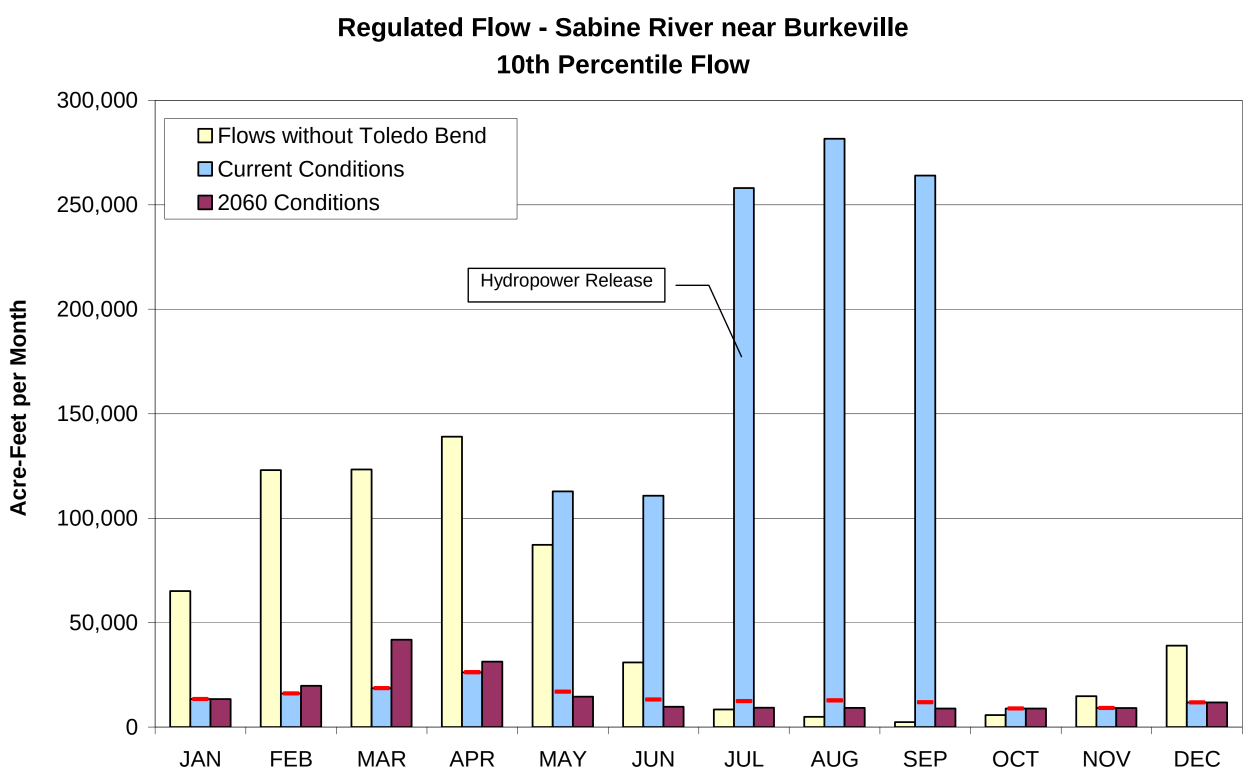
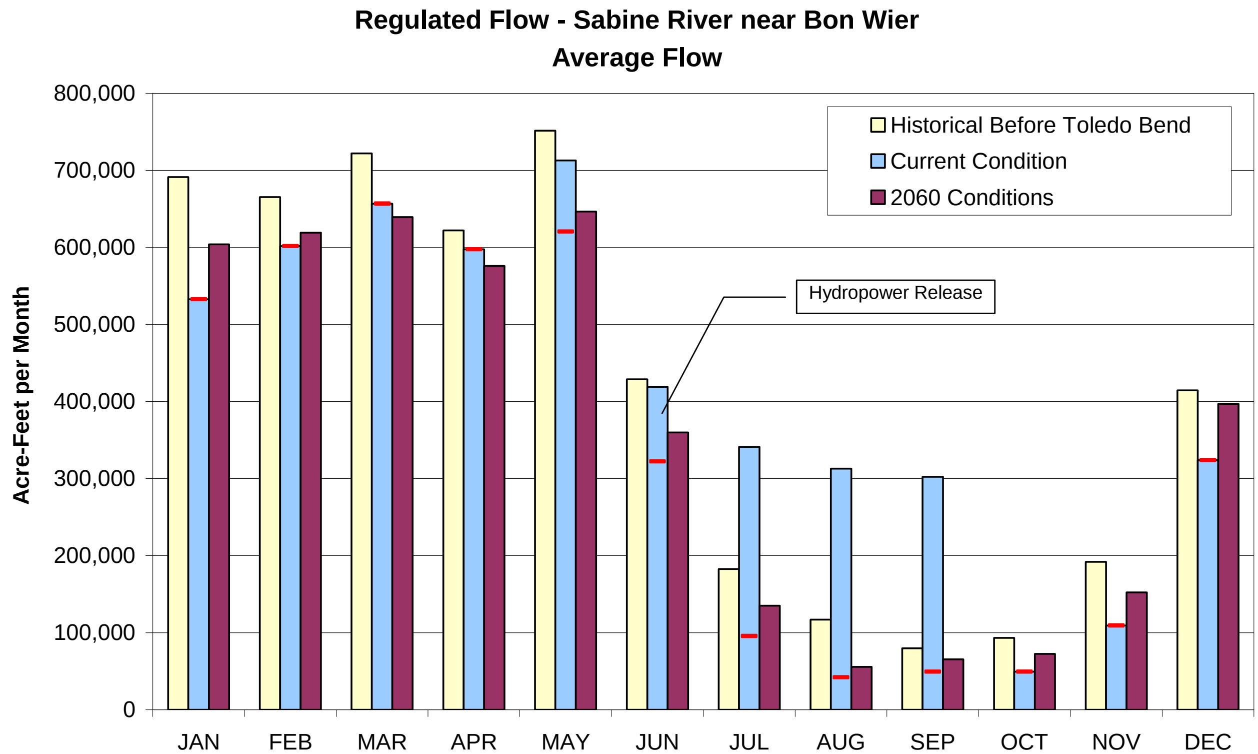
Historical
Current Conditions
2060 Conditions



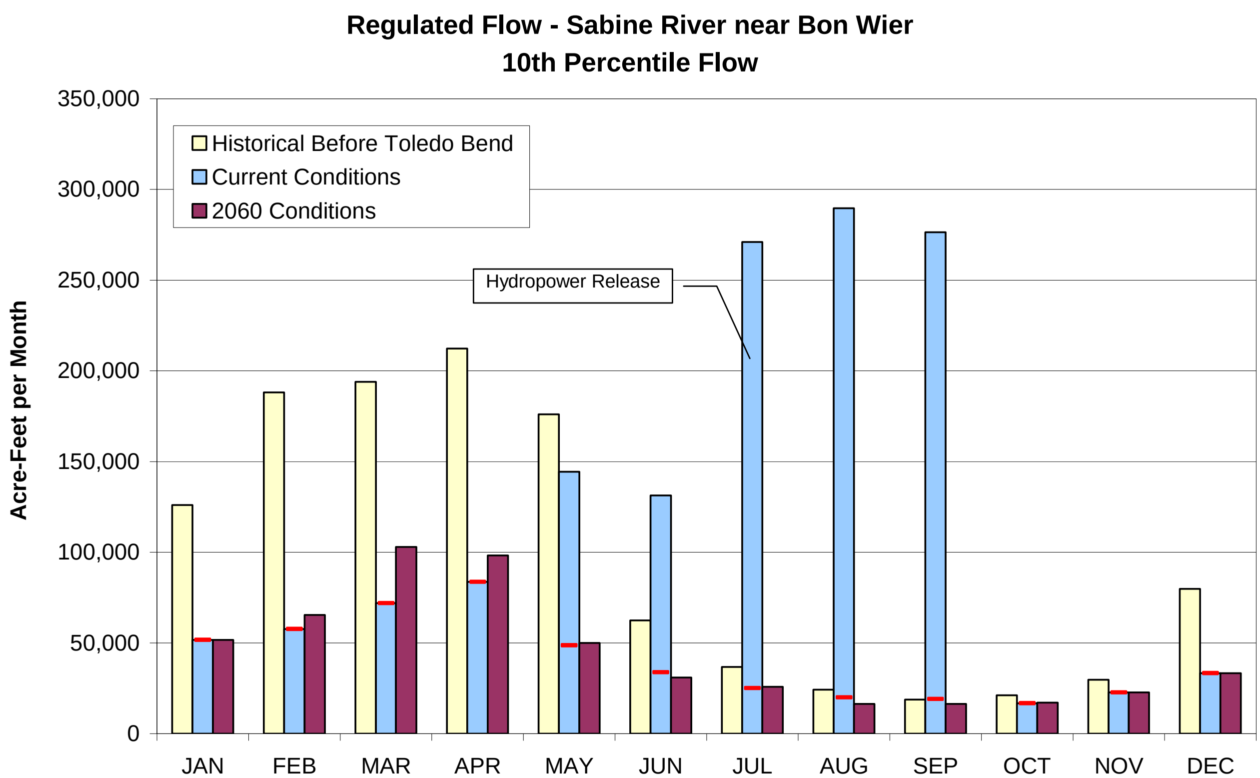
For Current Conditions, hydropower releases is the amount above the mark



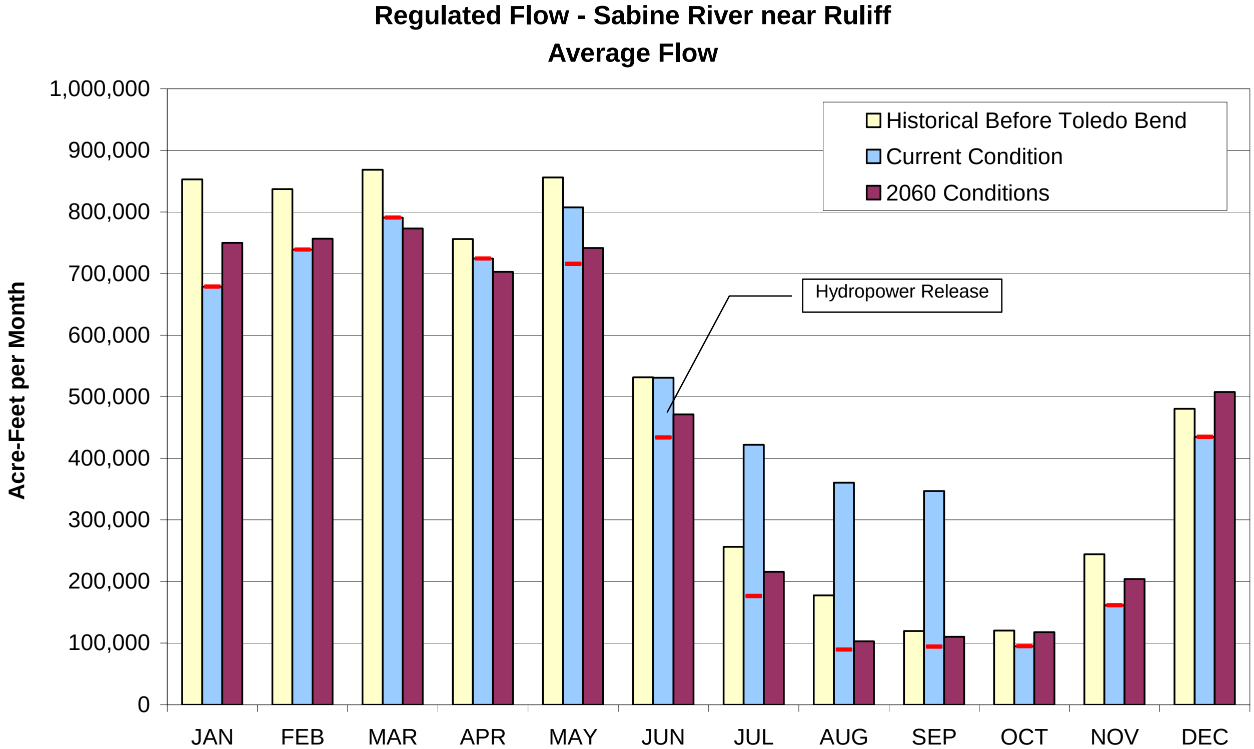
For Current Conditions, hydropower releases is the amount above the mark



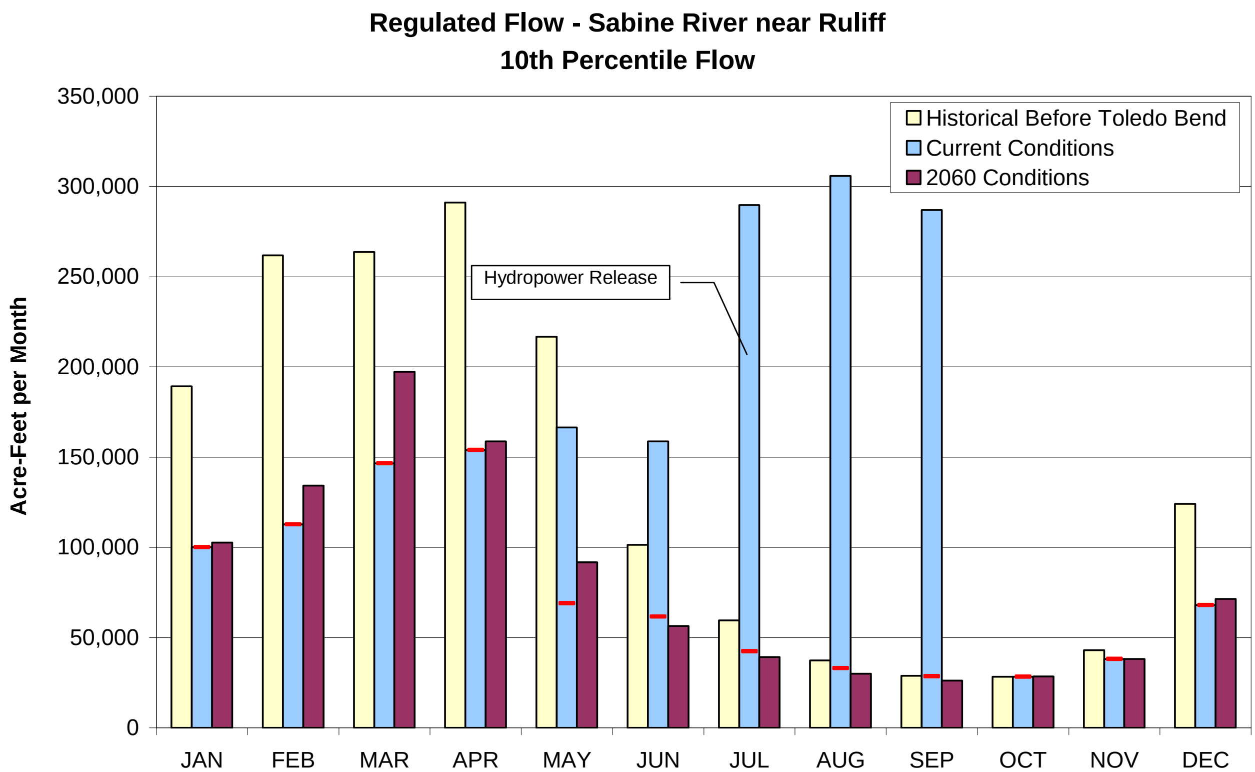
For Current Conditions, hydropower releases is the amount above the mark



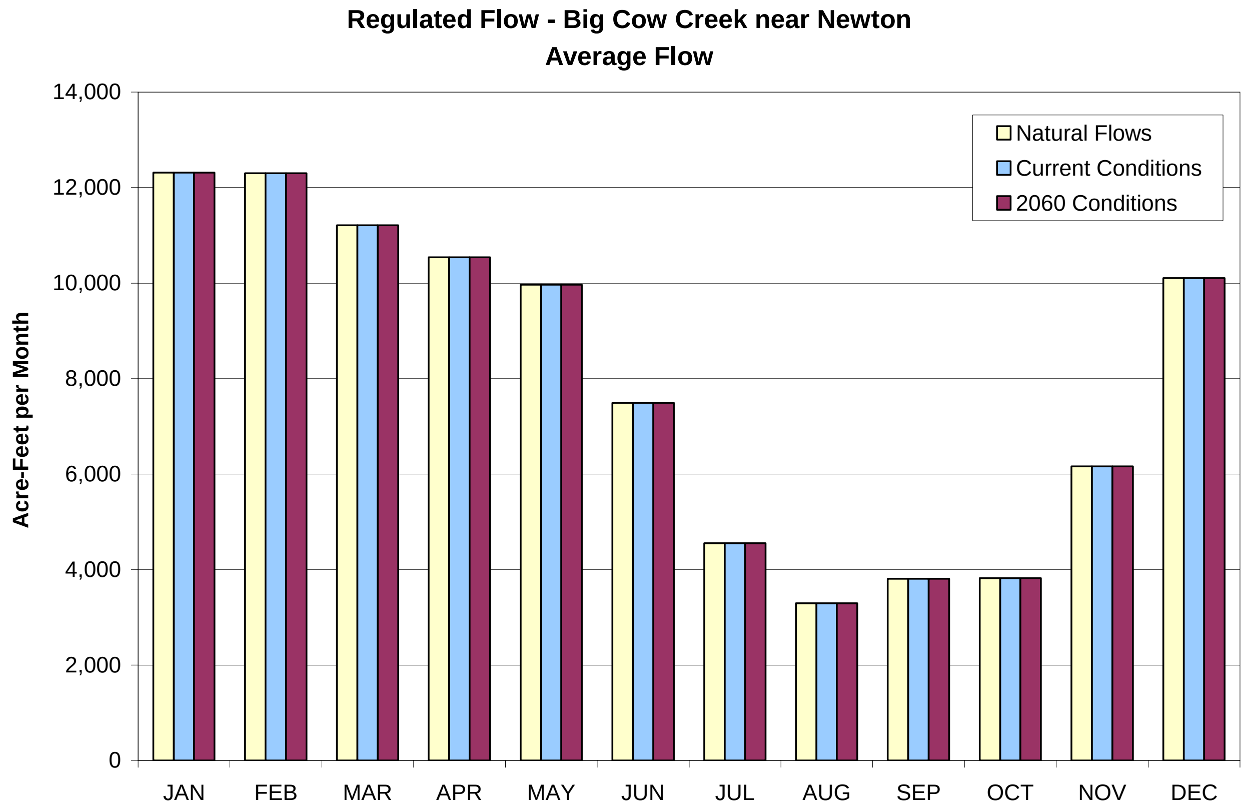
For Current Conditions, hydropower releases is the amount above the mark

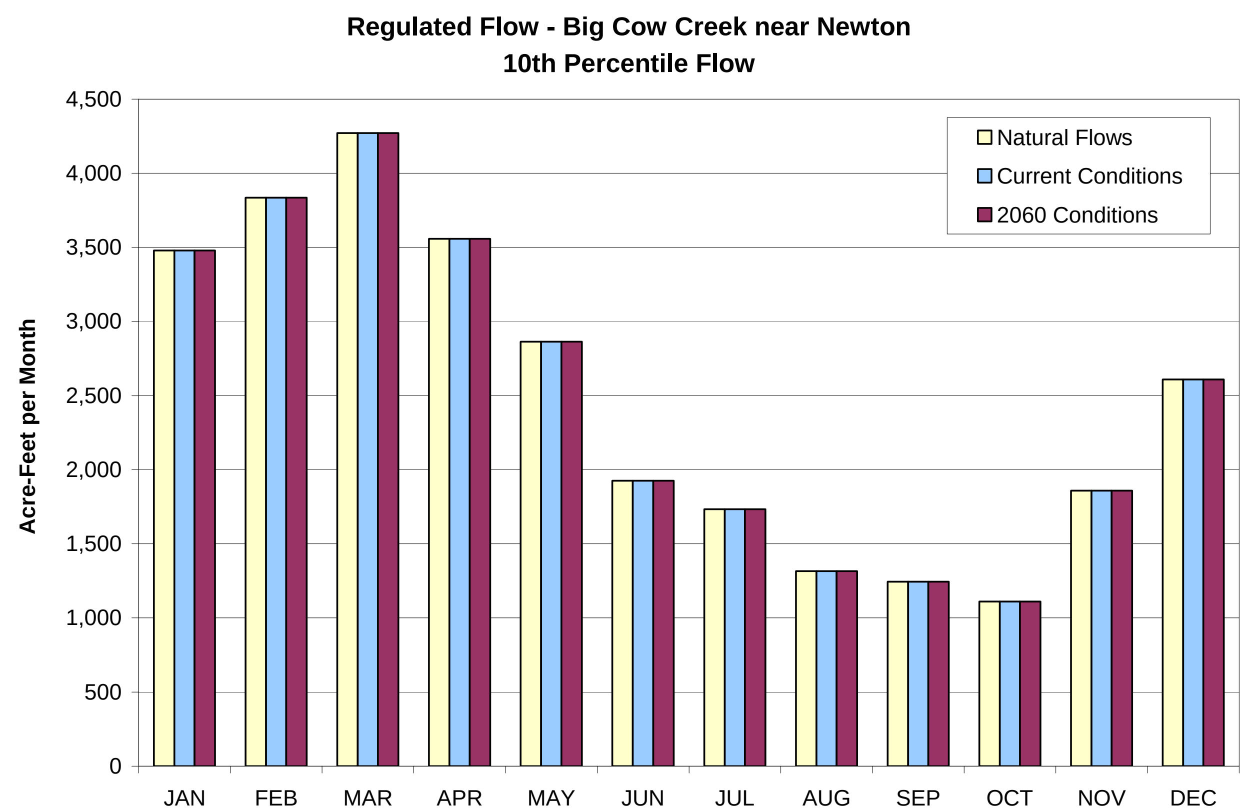


For Current Conditions, hydropower releases is the amount above the mark



For Current Conditions, hydropower releases is the amount above the mark


Regulated Flow - Big Cow Creek near Newton
Average Flow
Acre-Feet per Month
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Natural Flows
Current Conditions
2060 Conditions


Regulated Flow - Big Cow Creek near Newton
10th Percentile Flow
Acre-Feet per Month
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Natural Flows
Current Conditions
2060 Conditions

ATTACHMENT A

MODELING OF LAKE FASTRILL

Basic Data

Lake Fastrill is modeled with the following information:

- Location: Neches River, near and upstream of the border of Anderson-Cherokee Counties.
- Drainage Area: 1620 sq. miles.
- Location in Neches WAM: Upstream of control point 4094N and downstream of control points 3270N, 3271N, 3272N, 3273N, 3279N, 3281N, 3286N, 3282N, and 3269N.
- Conservation Capacity: 503,365 acre-feet.

Consensus Method

The following values were assumed. HDR provided the statistics in cfs.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
MEDIAN													
cfs	942	1288.2	1346.7	1094.6	1082.7	495.6	161.5	67.5	83.1	139.1	336.4	627.7	
AF	57937	72201	82827	65151	66590	29498	9933	4152	4946	8555	20023	38606	460419
25 TH PERCENTILE													
cfs	432.1	646.7	636.3	565.6	464.3	205.3	57.6	18.4	32.4	38.4	165.8	313.4	
AF	26576	36246	39135	33665	28556	12219	3543	1132	1928	2362	9868	19275	214505
7Q2													
cfs	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	
AF	4145	3778	4145	4012	4145	4012	4145	4145	4012	4145	4012	4145	48841

System Operation

Fastrill would likely operate as a system with Lake Palestine. Diversions would be made from either reservoir. Releases from Palestine to Fastrill are unlikely because water would have to be pumped back upstream. The computation of the additional yield assumes that diversions associated with Lake Fastrill will be taken at Lake Palestine when inflows exceed the water necessary for storage and diversion at Lake Palestine. This reduces the lakeside diversions from Lake Fastrill.

Firm Yield

The firm yield of Lake Fastrill using the Neches WAM (Run 3) modified for Region I with the simple system operation explained above is 132,500 acre-feet per year.

- Diversions from the current permit 3254 (Lake Palestine) do not change because the additional diversion (overdraft) from Lake Palestine occur only when the reservoir is full and inflows would otherwise be captured in Lake Fastrill.

- This result assumes also that Sam Rayburn-Steinhagen would not call for inflows above Weches dam site. Fastrill is above Weches Dam.
- Consensus Criteria was modeled in a monthly timestep, which may be different than using daily timestep.

Chapter 8

Unique Stream Segments and Recommended Reservoir Sites

8.1 Unique Stream Segments

The East Texas Regional Planning Group considered potential ecologically unique stream segments. The information considered by the Group is provided in Appendix A. The East Texas Regional Planning Group concluded that there are sufficient programs in place to protect areas of special environmental significance. Additionally, there is insufficient environmental data presently available to support a valid judgment on the relative merits of precluding reservoir construction on specific stream segments. The Group decided not to designate any unique stream segments.

8.2 Unique Reservoir Sites

The East Texas Regional Water Planning Group did not designate any unique reservoir sites. Lake Columbia has already received unique designation by the State legislature, SB1362. The ETRWPG did consider reservoir sites as discussed in Appendix B.

8.3 Legislative Recommendations

Legislative recommendations adopted by the East Texas Regional Water Planning Group is provided in Appendix C.

Attachment A

Region I (East Texas)

Alabama Creek - From the confluence with the Neches River in northeast Trinity County upstream to the headwaters in east Trinity County.

> Riparian conservation area - Davy Crockett National Forest ; Alabama Creek Wildlife Management Area

Alazan Bayou - From the confluence with the Angelina River upstream to its headwaters in Nacogdoches County.

> Biological function - bottomland hardwood habitat displays significant overall habitat value (TPWD, 1999)
> Riparian conservation area - Alazan Bayou Wildlife Management Area

Angelina River - From the aqueduct crossing 0.6 mile upstream of the confluence of Paper Mill Creek in Angelina/Nacogdoches County upstream to the FM 1911 crossing in Cherokee/Nacogdoches County (within TNRCC classified stream segment 0611).

> Biological function - priority bottomland hardwood habitat displays significant overall habitat value (Bauer et al., 1991)
>
> Riparian conservation area - Angelina National Forest
>
> Threatened or endangered species/unique communities - Paddlefish (SOC/St.T) (Pitman, 1991; TPWD, 1998)

Angelina River - From a point immediately upstream of the confluence of Indian Creek in Jasper County upstream to Sam Rayburn Dam in Jasper County (TNRCC classified stream segment 0609).

> Riparian conservation area - Angelina National Forest
>
> Threatened or endangered species/unique communities - Paddlefish (SOC/St.T) (Pitman, 1991; TPWD, 1998)

Attoyac Bayou - From a point 2.4 miles downstream of the Curry Creek confluence in Nacogdoches/San Augustine County upstream to US 59 in Shelby/Rusk County (within TNRCC classified stream segment 0612).

> Threatened or endangered species/unique communities - only known remaining population of endemic triangle pigtoe freshwater mussel (Howells, 1996)

Austin Branch - From the confluence with San Pedro Creek upstream to its headwaters in Houston County.

Riparian conservation area - **Davy Crockett National Forest**

Beech Creek - From the confluence with Village Creek northeast of Kountze in Hardin County upstream to the headwaters in east Tyler County.

Riparian conservation area - **Big Thicket National Preserve**

High water quality/exceptional aquatic life/high aesthetic value - ecoregion stream; diverse benthic macroinvertebrate community (Bayer et al., 1992)

Big Cypress Creek - From the confluence with the Sabine River in Deweyville in Newton County upstream to the Newton/Jasper County line.

High water quality/exceptional aquatic life/high aesthetic value - ecoregion stream; diverse fish community (Bayer et al., 1992; Linam et al., 1999)

Big Hill Bayou - From the confluence with Taylor Bayou on the J.D. Murphree Wildlife Management Area in Jefferson County upstream to the headwaters located eight miles southwest of Port Arthur in east Jefferson County.

Biological function - extensive fresh and intermediate coastal marshes display significant overall habitat value (J. Sutherlin, 1999, pers. comm.)
Riparian conservation area - **J.D. Murphree Wildlife Management Area**; Part of the **Great Texas Coastal Birding Trail**; **McFaddin National Wildlife Refuge**

Big Sandy Creek - From the confluence with Village Creek in north Hardin County upstream to the Polk/Trinity County line.

Biological function - Texas Natural Rivers System nominee for outstandingly remarkable fish and wildlife values (NPS, 1995)

Riparian conservation area - **Big Thicket National Preserve** ; **Alabama and Coushatta Indian Reservation**

High water quality/exceptional aquatic life/high aesthetic value - exceptional aesthetic value (NPS, 1995)

Bowles Creek - From the confluence with the Neches River upstream to its headwaters in Cherokee County.

Riparian conservation area - **Caddoan Mounds**

Camp Creek - From the confluence with the Neches River in Houston County upstream to its headwaters east of Weches in northeast Houston County.

Riparian conservation area - **Davy Crockett National Forest**

Threatened or endangered species/unique communities - Creek chubsucker (SOC/St.T) (SOC/St.T) (Kelly, 1999)

Catfish Creek - From the confluence with the Trinity River northwest of Palestine in west Anderson County upstream to its headwaters about eight miles southwest of Athens in Henderson County.

Riparian conservation area - Engling Wildlife Management Area
High water quality/exceptional aquatic life/high aesthetic value - ecoregion stream; high water quality (Bayer et al., 1992)
Threatened or endangered species/unique communities - rough-stem aster (SOC) (J. Poole, 1999, pers. comm.)

Cochino Bayou - From the confluence with the Neches River in northern Trinity County upstream to its headwaters in eastern Houston County.

Riparian conservation area - Davy Crockett National Forest

Hackberry Creek - From the confluence with the Neches River upstream to its headwaters in Trinity County.

Riparian conservation area - Davy Crockett National Forest

Threatened or endangered species/unique communities - Creek chubsucker (SOC/St.T) (SOC/St.T) (Kelly, 1999)

Hager Creek - From the confluence with Cochino Bayou in east Houston County upstream to its headwaters east of Ratcliff in east Houston County.

Riparian conservation area - Davy Crockett National Forest

Hickory Creek - From the confluence with the Neches River in Houston County upstream to a point one mile southwest of the FM 227 crossing in northeast Houston County.

Riparian conservation area - Davy Crockett National Forest

Hillebrandt Bayou - From the confluence with Taylor Bayou upstream to its headwaters near Beaumont in Jefferson County.

Riparian conservation area - J.D. Murphree Wildlife Management Area; Part of the Great Texas Coastal Birding Trail

Irons Bayou - From the confluence with the Sabine River five miles north of Carthage in Panola County upstream to the headwaters about three miles north of Clayton in Panola County.

High water quality/exceptional aquatic life/high aesthetic value - ecoregion stream; diverse benthic macroinvertebrate and fish communities (Bayer et al., 1992; Linam et al., 1999)

Little Pine Island Bayou (Hardin County) - From the confluence with Pine Island Bayou about 12 miles northwest of Beaumont in Hardin County upstream to the FM 770 crossing in Saratoga in Hardin County.

Riparian conservation area - Big Thicket National Preserve

Lynch Creek - From the confluence with Piney Creek in east Houston County upstream to its headwaters near an unmarked county road in Houston County.

Riparian conservation area - Davy Crockett National Forest

Threatened or endangered species/unique communities - Creek chubsucker (SOC/St.T) (SOC/St.T) (Kelly,1999)

Menard Creek - From the confluence with the Trinity River near the Polk/Liberty County line upstream to its headwaters located east of Livingston in the central part of Polk County.

Biological function - bottomland hardwood habitat displays significant overall habitat value; high diversity of freshwater mussels (A. Sipocz, 1999, pers. comm.)

Riparian conservation area - Big Thicket National Preserve

Mud Creek - From the confluence with the Angelina River in southeast Cherokee County upstream to the SH 204 crossing west of Ponta in central Cherokee County.

Biological function - priority bottomland hardwood habitat displays significant overall habitat value (Bauer et al., 1991)
Threatened or endangered species/unique communities - Neches River rose-mallow (J. Poole, 1999, pers. comm.)

Neches River - From a point immediately upstream of the confluence of Hopson Mill Creek in Jasper/Tyler County upstream to the Blackburn Crossing Dam in Anderson/Cherokee County (TNRCC classified stream segment 0604).

Biological function - Texas Natural Rivers System nominee for outstandingly remarkable fish and wildlife values (NPS, 1995); priority bottomland hardwood habitat displays significant overall habitat value (Bauer et al., 1991)

Riparian conservation area - Davy Crockett National Forest ;

Angelina National Forest ; Big Thicket

National Preserve ; State Wildlife Scientific Area; Alabama Creek

Wildlife Management Area
High water quality/exceptional aquatic life/high aesthetic value - National Forest Service wilderness-type area, exceptional aesthetic value (NPS, 1995)

Threatened or endangered species/unique communities - unique, exemplary, and unusually extensive natural community (NPS, 1995); Paddlefish (SOC/St.T) (TPWD, 1998) ;Creek chubsucker (SOC/St.T) , Blue sucker (SOC/St.T) (Bauer et al., 1991); Neches River rose-mallow (J. Poole, 1999, pers. comm.)

Neches River - From the confluence with Sabine Lake in Orange County upstream to Town Bluff Dam in Jasper/Tyler County (TNRCC classified stream segments 0601 and 0602).

Biological function - extensive freshwater wetland habitat displays significant overall habitat value (Bauer et al., 1991)

Riparian conservation area - **Big Thicket National Preserve** ; Lower Neches River Wildlife Management Area; Part of the Great Texas Coastal Birding Trail

High water quality/exceptional aquatic life/high aesthetic value - exceptional aesthetic value (NPS, 1995)

Threatened or endangered species/unique communities - unique, exemplary, and unusually extensive natural community (NPS, 1995); Paddlefish (SOC/St.T) (TPWD, 1998) ; The most abundant and diverse unionid assemblage found to date in Texas; largest known population of sandbank pocketbook freshwater mussels in Texas; one of the two largest populations of rare, endemic Texas heelsplitter freshwater mussels remaining (Neck and Howells, 1994; Howells, 1997; Howells et al., 1997)

Pine Island Bayou - From the confluence with the Neches River in Hardin/Jefferson County upstream to FM 787 in Hardin County (TNRCC classified stream segment 0607).

Riparian conservation area - **Big Thicket National Preserve**

Piney Creek - From the confluence with the Neches River near the corner of Polk and Tyler counties upstream to the headwaters located in the Davy Crockett National Forest in east Houston County.

Riparian conservation area - **Davy Crockett National Forest**

High water quality/exceptional aquatic life/high aesthetic value - ecoregion stream; diverse benthic macroinvertebrate community (Bayer et al., 1992)

End/Threat: Creek chubsucker (SOC/St.T) (Bayer et al., 1992)

Sabine River - From the IH-10 crossing in Orange County upstream to Toledo Bend Dam in Newton County (TNRCC classified stream segment 0503 and part of 0501).

Biological function - Texas Natural Rivers System nominee for outstandingly remarkable wildlife values(NPS, 1995)

High water quality/exceptional aquatic life/high aesthetic value - exceptional aesthetic value (NPS, 1995)

Sabine River - From the confluence with Sabine Lake in Orange County upstream to the IH-10 crossing (within TNRCC classified stream segment 0501).

Biological function - extensive freshwater wetland habitat displays significant overall habitat value (Bauer et al., 1991)
Riparian conservation area - Tony Houseman State Park/Wildlife Management Area; Part of the Great Texas Coastal Birding Trail; Lower Neches River Wildlife Management Area

Sabine River - From the headwaters of Toledo Bend Reservoir in Panola County upstream to the Panola/Rusk County line (within TNRCC classified stream segments 0504 and 0505).

Biological function - Texas Natural Rivers System nominee for outstandingly remarkable fish and wildlife values (NPS, 1995); priority bottomland hardwood habitat displays significant overall habitat value (Bauer et al., 1991)
High water quality/exceptional aquatic life/high aesthetic value - exceptional aesthetic value (NPS, 1995)
Threatened or endangered species/unique communities - Paddlefish (SOC/St.T) (TPWD, 1998)

Salt Bayou - From the confluence with the Gulf Intracoastal Waterway (GIWW) upstream to its headwaters in Jefferson County.

Biol. Function: Extensive coastal wetlands (J. Sutherlin, 1999, pers. comm.)

Riparian conservation area - McFaddin National Wildlife Refuge ; J.D. Murphree Wildlife Management Area; Sea Rim State Park

San Pedro Creek - From the confluence with the Neches River upstream to its headwaters in Houston County.

Riparian conservation area - Mission Tejas State Park

Sandy Creek - From the confluence with Attoyac Bayou in Shelby County upstream to Pinkston Dam in Shelby County.

Threatened or endangered species/unique communities - only known remaining population of endemic triangle pigtoe freshwater mussel (Howells, 1996)

Sandy Creek - From the confluence with Hackberry Creek in Trinity County upstream to its headwaters east of FM 357 in Trinity County.

Riparian conservation area - Davy Crockett National Forest

Threatened or endangered species/unique communities - Creek chubsucker (SOC/St.T) (Kelly, 1999)

Taylor Bayou - From the confluence with Gulf Intracoastal Waterway (GIWW) upstream to and including the North and South Forks of Taylor Bayou and Mayhaw Bayou in Jefferson County.

Biological function - extensive freshwater marshes and forested wetlands display significant overall habitat value (J. Sutherlin, 1999. pers. comm.)
Riparian conservation area - **J.D. Murphree Wildlife Management Area**

Texas Bayou - From the confluence with the Gulf Intracoastal Waterway (GIWW) upstream to its headwaters in Jefferson County.

Biological function - extensive brackish and saline coastal marsh display significant overall habitat value (J. Sutherlin, 1999. pers. comm.)
Riparian conservation area - Texas Point National Wildlife Refuge

Trinity River - From the Houston/Trinity County line upstream to the Anderson/Henderson County line (within TNRCC classified stream segments 0803 and 0804).

Biological function - bottomland hardwood habitat displays significant overall habitat value (TPWD, 1999)
Riparian conservation area - **Big Lake Bottom Wildlife Management Area**
Threatened or endangered species/unique communities - one of the two largest populations of rare, endemic Texas heelsplitter freshwater mussel remaining (Neck and Howells, 1994; Howells, 1997; Howells et al., 1997)

Trout Creek - From the confluence with Big Cow Creek in Newton County upstream to the northern boundary of the E.O. Siecke State Forest in Newton County.

Riparian conservation area - E.O. Siecke State Forest

Turkey Creek - From the confluence with Village Creek in Hardin County upstream to FM 1943 in Tyler County.

Riparian conservation area - **Big Thicket National Preserve**

Village Creek - From the confluence with the Neches River in Hardin County upstream to Lake Kimble Dam in Hardin County (TNRCC classified stream segment 0608).

Biological function - Texas Natural Rivers System nominee for outstandingly remarkable fish and wildlife values (NPS, 1995)
Riparian conservation area - **Big Thicket National Preserve** ; **Village Creek State Park**; Part of the **Great Texas Coastal Birding Trail**
High water quality/exceptional aquatic life/high aesthetic value - rated #1 scenic river in East Texas (NPS, 1995)
Threatened or endangered species/unique communities - unique, exemplary, and unusually extensive natural community (NPS, 1995)

White Oak Creek - From the confluence with Big Cow Creek in Newton County to its headwaters located about five miles southwest of Newton in Newton County

High water quality/exceptional aquatic life/high aesthetic value - ecoregion stream; high water quality, diverse benthic macroinvertebrate community (Bayer et al., 1992)

Abbreviation List

Texas Water Homepage

Map

Back

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Appendix B
Reservoir Sites

During the current planning cycle only two future reservoir sites, Lake Columbia and Fastrill Reservoir, have been identified as strategies to meet water shortages. Rockland Reservoir has been identified as an alternative water management strategy for LNVA to meet its future water demands if reallocation of water in the Rayburn-Steinhagen system, or access to water from Toledo Bend Reservoir proves not to be viable. The fourth alternative for LNVA would be desalination.

There are several reservoir sites in the East Texas Region that have long been discussed as potential sources of water. The ETRWPG agrees with past evaluations of these sites as being hydrologically and topographically unique for reservoir construction. The ETRWPG recognizes that reservoirs can have major impacts on the environment and that protection of the environment is already afforded through a process which is more thorough than the Regional Water Planning effort. The ETRWPG is not recommending these sites be designated as unique reservoir sites. We are recommending these sites be recognized as potential long-term water management strategies for the time period more than fifty years in the future. The ETRWPG believes that the lengthy and thorough economic and environmental review process will determine if any of these reservoirs are constructed as opposed to any decision by the ETRWPG. These sites are included in the following table with a brief description as follows.

Major Water Provider	**Reservoir Site**
Angelina Neches River Authority	Lake Columbia (Already Unique Site)
Lower Neches Valley Authority	Rockland Reservoir (Alt WMS)
Sabine River Authority	Big Cow Creek
	Bon Weir
	Carthage Reservoir
	Kilgore Reservoir
	Rabbit Creek
	State Hwy. 322, Stage I
	State Hwy. 322, Stage II
	Stateline
	Socagee
Upper Neches River Municipal Water Authority	Fastrill Reservoir (WMS Reg C Alt WMS Reg I)
	Ponta

In addition to the above sites, Lake Naconiche, located in northeast Nacogdoches County may also be another potential water supply. Lake Naconiche has a main purpose of flood control. Lake Naconiche is currently under construction.

A brief description of each of the above reservoir sites is provided below.

Lake Columbia (Figure 4)

The reservoir site is located predominately in Cherokee County but extends into the southern portion of Smith County. The reservoir would be formed by construction of a dam on Mud Creek approximately 2.5 miles downstream of the U. S. Highway 79 crossing. The dam is expected to impound water approximately 14 miles upstream with an estimated surface of 10,000 acres. The firm yield for the reservoir site is 85,000 acre-feet with a total storage volume at normal pool elevation, 315 feet msl, of 187,839 acre-feet. State of Texas Senate Bill 1362 designated the site for Lake Columbia as a site of unique value for the construction of a dam and reservoir.

Rockland Reservoir (Figure 1)

The Rockland Reservoir site is located on the Neches River at River Mile 160.4. The top of the flood pool would be at elevation 174 feet, msl with top of conservation pool of 165 feet, msl. It is estimated the reservoir site would affect 99,524 acres of wildlife habitat (Frye, 1990).

Rockland Reservoir was authorized for construction, as a federal facility, in 1945 along with Sam Rayburn, B. A. Steinhagen and Dam A lakes. A report in 1947 recommended construction of Sam Rayburn and B. A. Steinhagen with deferral of Rockland Reservoir and Dam A until such time the need develops. Rockland and Dam A were classified as inactive in 1954. A reevaluation study performed in 1987 identified the potential for significant benefits in the areas of flood control, water supply, hydropower and recreation.

Big Cow Reservoir (Figure 2)

The Big Cow Reservoir is a proposed local water supply project on Big Cow Creek in Newton County. The Big Cow Creek dam site is located about one-half mile upstream from U.S. Hwy 190, west-northwest of the Town of Newton. It is in the Lower Sabine Basin. The expected yield of the reservoir is 61,700 acre-feet per year with a storage capacity of 79,852 acre-feet and area of 4,618 acres. The conservation level would be 212 ft msl.

The perennial streams that feed Big Cow Creek and abundant rainfall should provide sufficient inflow for considerable yield for a reservoir of this size

Bon Weir Reservoir (Figure 2)

The Bon Weir dam site is located on the state line reach of the Sabine River in Newton County, Texas and Beauregard Parish, Louisiana. The reservoir would extend from about 5 miles upstream of U.S. Hwy 190 to approximately Highway 63. It was originally proposed for re-regulation of the hydropower discharges from Toledo Bend Reservoir and for the generation of hydropower. The reservoir, if constructed, would yield 440,000 acre-feet per year at a normal operating elevation of 90 feet above mean sea level. The area and capacity would be 34,540 acres and 353,960 acre-feet, respectively.

It is estimated that the Bon Weir Reservoir would affect 35,000 acres of wildlife habitat (Frye, 1990). This includes several acid bogs/baygalls, which are unique and sensitive areas of the region. Several threatened and endangered species are known to occur in this area. No cultural resource survey has been conducted, but the site is expected to impact numerous archeological and historical sites in both Texas and Louisiana. The CRP Water Quality data reported possible concerns for elevated TDS and low dissolved oxygen during the summer months. The site also requires congressional approval for construction of a dam, because it is on interstate navigable water of the U.S.

Carthage Reservoir (Figure 3)

The Carthage Reservoir is a proposed main stem project on the Sabine River in Panola, Harrison, Rusk and Gregg counties. It is located immediately upstream of the U.S. Highway 59 crossing and downstream of the City of Longview. The yield of this reservoir, if constructed, would be approximately 537,000 acre-feet per year at a conservation pool elevation of 244 feet msl. The area and capacity would be 41,200 acres and 651,914 acre-feet, respectively.

Developmental concerns for Carthage Reservoir include bottomland hardwoods, aquatic life, lignite deposits and cultural resources. The downstream half of the site encompasses a USFWS Priority 1 bottomland hardwood area. This portion of the Sabine

River is designated a significant stream segment and is home to several protected aquatic species (Bauer, 1991). Other potential conflicts with this site include oil and gas wells. Permitting for this reservoir will require an act of Congress since the dam is located on navigable interstate waters of the U.S. There is one active lignite mine, South Hallisville Mine No. 1, near the reservoir boundary.

The water quality assessment of the Sabine River (SRA, 1996a) indicates this segment of the river has possible concerns for nutrients, but the water quality is improving. The advantage of this reservoir is its large yield. The estimated yield of 537,000 acre-feet per year would provide for all projected needs well beyond the year 2050

Kilgore Reservoir

The Kilgore Reservoir is a proposed local water supply project located on the Upper Wilds Creek in Rusk, Gregg and Smith counties. It was originally proposed to supplement the City of Kilgore's water supply. The project would provide a yield of 5,500 acre-feet per year at the normal operating elevation of 398 feet msl. At that level, the area and capacity would be 817 acres and 16,270 acre-feet, respectively.

Construction of this reservoir has never been initiated, and the City of Kilgore is using diversions from the Sabine (purchased from SRA and released from Lake Fork) and ground water for its water supply. However, this project still has the potential as a local water supply source in the Kilgore area should other proposed projects not be developed. Only preliminary studies have been performed for the Kilgore Reservoir and no environmental impacts have been assessed. Based on preliminary screening data, the site is not located within a priority bottomland hardwood area; there are no known water quality issues and no active mines within the reservoir site.

Rabbit Creek Reservoir

Several reservoir projects have been proposed on Rabbit Creek for local water supply. The latest proposal for the City of Overton and surrounding communities was completed in 1998 (Burton, 1998). The proposed reservoir project is located on Rabbit Creek in Smith and Rusk counties, and would have a firm yield of 3,500 acre-feet per year. This is considerably less yield than the previous studies, which is due in part to the smaller storage capacity and conservative inflows that were assumed for the study. In the latest study, the area would be 520 acres and the capacity would be 8,000 acre-feet at a conservation level of 406 ft msl. However, this yield is considered satisfactory to meet the regional demands of the area. Environmental review of the site reports no significant concerns that would preclude development. There are also no significant cultural resources in the area, no known water quality issues, and no active mining within the reservoir area.

The advantages of this reservoir site are the few developmental concerns. However, it was rejected as a water supply alternative in the 1998 study due to costs. A large percentage of the total costs were associated with a water treatment and distribution system. Due to the relatively low yield of Rabbit Reservoir, this project could only be considered for local water supply.

State Highway 322 Stage I (Figure 3)

The Highway 322 Reservoir is a proposed local water supply project in Rusk County, upstream of Lake Cherokee. The project, as originally proposed, was to be developed in two stages: 1) a dam and reservoir on Tiawichi Creek (Stage 1 and 2) a separate dam and reservoir on Mill Creek (Stage II). The reservoirs were to be joined by a connecting channel that would allow one spillway to serve both dams.

The proposed Stage I dam is located on Tiawichi Creek, approximately one mile upstream of its confluence with the Upper end of Lake Cherokee. The reservoir, at its normal operating elevation of 330 ft msl, would provide a net yield of 22,000 acre-feet per year. Its area and capacity would be 4,450 acres and 82,450 acre-feet, respectively. If Stage I is operated independently from Lake Cherokee, the firm yield of the reservoir would be reduced due to Lake Cherokee's superior water rights.

The primary developmental concern for the Stage I reservoir is active lignite mining. In 1995, the Oak Hill Mine expanded its current permit area to include approximately one third of the proposed Stage I reservoir area. There have been no environmental studies conducted for this site. Based on preliminary screening, the site is located outside priority bottomland hardwood areas, and there are no known water quality issues.

State Highway 322 Stage II (Figure 3)

The State Highway 322 - Stage II reservoir is the second phase of the State Highway 322 water supply project in Rusk County. The Stage II dam would be located on Mill Creek, approximately one mile upstream of the existing Lake Cherokee. Operated at the same level as Stage I (330 feet msl), this project would provide an increased yield to the Cherokee Lake system of 13,000 acre-feet per year with added storage capacity of 112,000 acre-feet. Stage II surface area would be 2,060 acres. The State Highway 322 project (Stages I and II) and Lake Cherokee could be operated as a system to provide a total yield of 53,000 acre-feet per year and maintain the recreational and aesthetic benefits currently provided by Lake Cherokee. If State Highway 322 project is operated independently from Lake Cherokee, the firm yield would be reduced due to Lake Cherokee's superior water rights.

The primary developmental concern for Stage II is the active lignite mining. Surface mining records indicate that the Oak Hill Mine permit encompasses much of the Stage II reservoir. Preliminary screening indicates no priority bottomland hardwoods in the reservoir area, and there are no known water quality issues. The advantages to this reservoir site is its location near the areas with projected water needs and the possibility that when mining is completed, the site will already be cleared and ready for reservoir development.

Stateline Reservoir (Figure 3)

The Stateline Reservoir is a proposed main stem project on the Sabine River, approximately eight miles upstream of Logansport, Louisiana and about four miles upstream from the headwaters of Toledo Bend Reservoir. The project site is located in the southeastern section of Panola County and would have an estimated yield of 280,000 acre-feet per year. At the conservation level of 187 feet msl, the area and capacity would be 24,100 acres and 268,330 acre-feet, respectively.

Developmental concerns for this site include bottomland hardwoods, oil and gas wells, water quality, and permitting issues. The northern half of the site lies in a USFWS designated Priority 1 hardwood area. The southern half is a high quality wetland area and currently being considered for a wetland mitigation bank by the SRA. The mineral rights associated with the Carthage Oilfield significantly affect land acquisition for the reservoir. The CRP Water Quality data indicated possible concerns for elevated nutrient levels, metals, low dissolved oxygen and fecal coliform. This segment of the stream is also a known habitat for several protected aquatic species. Permitting for this reservoir will require an act of Congress since the dam is located on navigable interstate waters of the U.S. (Rivers and Harbors Act, 1899). Construction of the dam and reservoir may also require consent of Louisiana for the part that will impact the state of Louisiana (Sabine River Compact). As currently proposed, the dam site is located immediately upstream of the stateline reach and there is minimal impact to Louisiana lands. However, due to the close proximity of Toledo Bend Reservoir, it is unlikely that Stateline Reservoir would be more economical than Toledo Bend in meeting the needs of the Upper Basin.

Socagee Reservoir (Figure 3)

The Socagee Reservoir site is located in the eastern portion of Panola County on Socagee Creek, approximately six miles upstream of its mouth. The reservoir, at normal pool elevation, would have a yield of 39,131 acre-feet per year. The reservoir area would be approximately 9,100 acres and the capacity would be about 160,000 acres.

Approximately 40 percent of the site overlies existing lignite deposits. As of 1986, there was no known exploitation of the lignite deposits, and there currently are no active mines within the area. One cultural resource site is reported in the reservoir boundary. There are no known water quality issues or priority bottomland hardwoods that affect this reservoir site. Socagee Reservoir could be used to meet the local needs of Panola County; however, Lake Murvaul, which has been designated for Panola County use only, has adequate yield to meet the future needs of Panola County

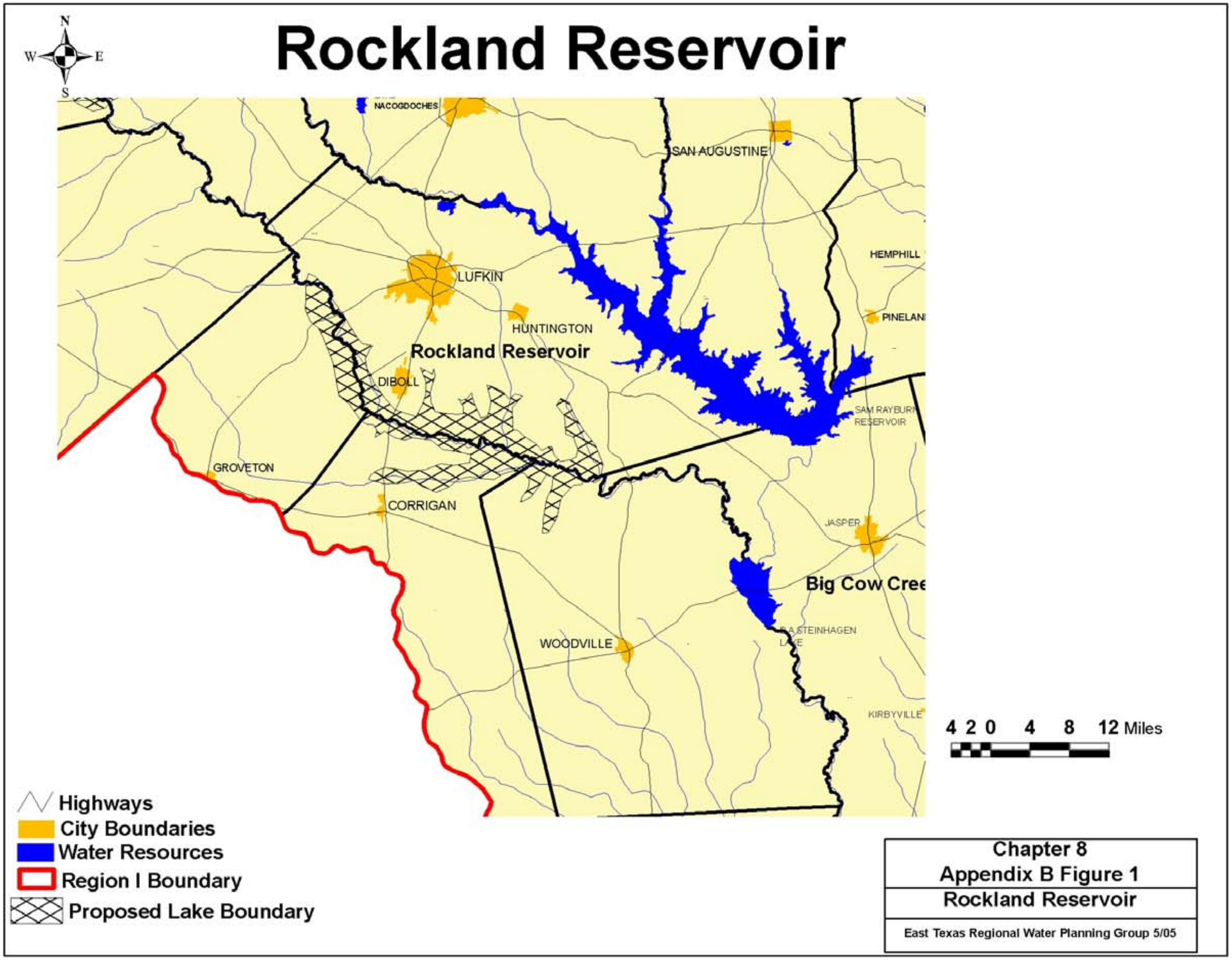
Fastrill Reservoir (Figure 4)

The Fastrill Reservoir would be located on the Neches River in Anderson and Cherokee Counties downstream of Lake Palestine and upstream of the Weches Dam Site. The dam would be located at River Mile 288. Normal pool elevation would be at Elevation 274 and would have an area of 22,950 acres based on digital topographic information. Recent analyses using the Neches River Basin Water Availability Model (WAM) indicate that the firm yield of Fastrill Reservoir may range from 140,000 acre-feet per year (stand-alone operations) to about 155,000 acre-feet per year (system operations with Lake Palestine) subject to senior water rights and Consensus Criteria for Environmental Flow Needs.

Expected beneficiaries of the dependable water supply afforded by the development of Fastrill Reservoir and potential system operation with Lake Palestine include water user groups located within Anderson, Cherokee, Henderson and Smith Counties and the City of Dallas (located in Region C).

Ponta Reservoir (Figure 4)

The Ponta Reservoir would be located on Mud Creek in Cherokee County east of Jacksonville, Texas. The dam site is located approximately one mile upstream from the Southern Pacific Railroad crossing over Mud Creek. The normal pool elevation would be about Elevation 302 feet and would have an area of 11,000 acres. Storage capacity at normal pool elevation would be 200,000 acre-feet. Water supply storage would provide a dependable yield of 105,000 acre-feet/year.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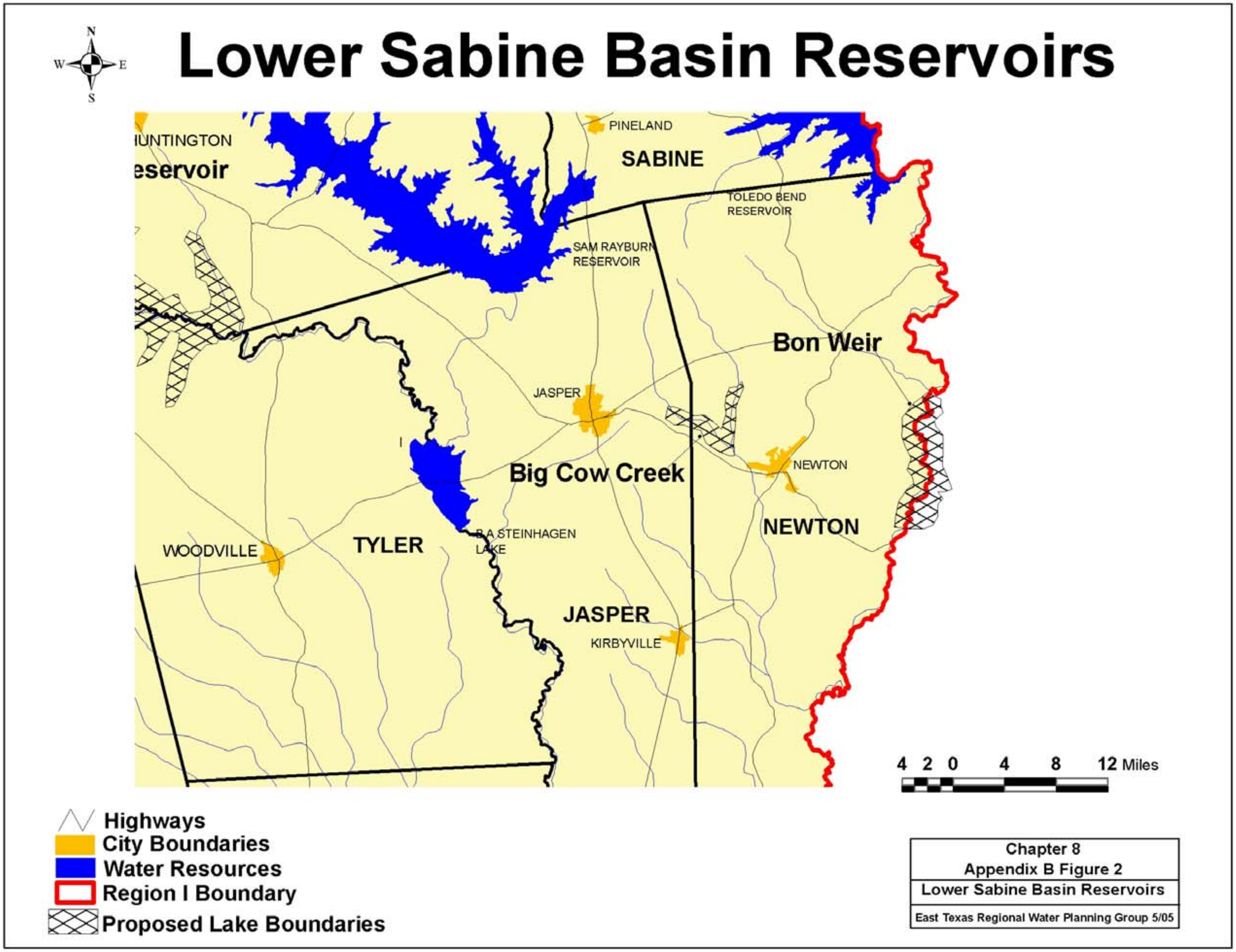
Rockland Reservoir
NACOGDOCHES
SAN AUGUSTINE
HEMPHILL
LUFKIN
HUNTINGTON
PINELAN
Rockland Reservoir
DIBOLL
SAM RAYBURN RESERVOIR
GROVETON
CORRIGAN
JASPER
Big Cow Cree
WOODVILLE
B.A. STEINHAGEN LAKE
KIRBYVILLE
4 2 0 4 8 12 Miles
Highways
City Boundaries
Water Resources
Region I Boundary
Proposed Lake Boundary
Chapter 8
Appendix B Figure 1
Rockland Reservoir
East Texas Regional Water Planning Group 5/05


Lower Sabine Basin Reservoirs
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SAM RAYBURN RESERVOIR
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NEWTON
B.A STEINHAGEN LAKE
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TYLER
JASPER
KIRBYVILLE
4 2 0 4 8 12 Miles
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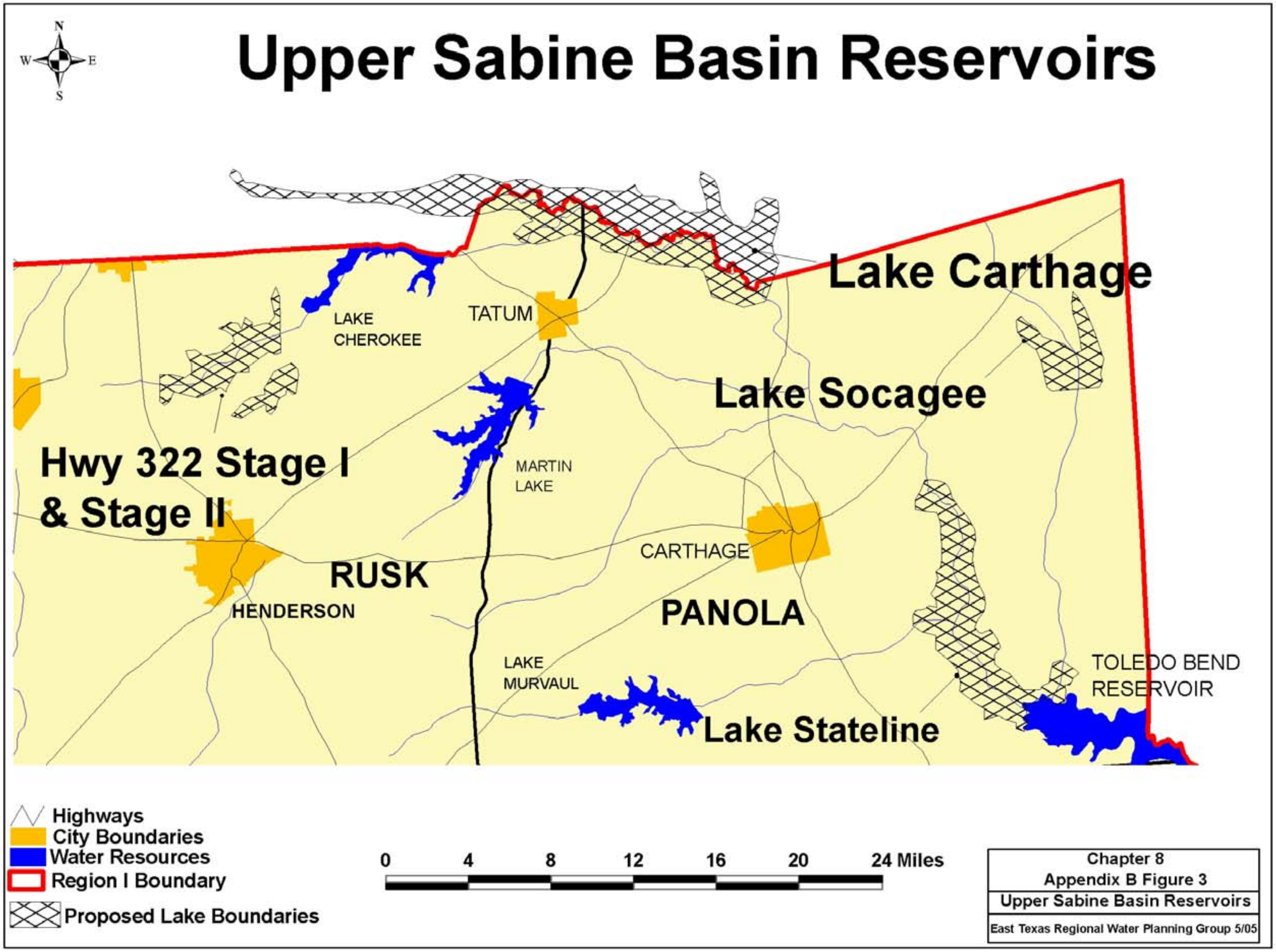
City Boundaries
Water Resources
Region I Boundary
Proposed Lake Boundaries
Chapter 8
Appendix B Figure 2
Lower Sabine Basin Reservoirs
East Texas Regional Water Planning Group 5/05


Upper Sabine Basin Reservoirs
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TATUM
Lake Socagee
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& Stage II
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CARTHAGE
RUSK
HENDERSON
PANOLA
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MURVAUL
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Lake Stateline
Highways
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Water Resources
Region I Boundary
Proposed Lake Boundaries
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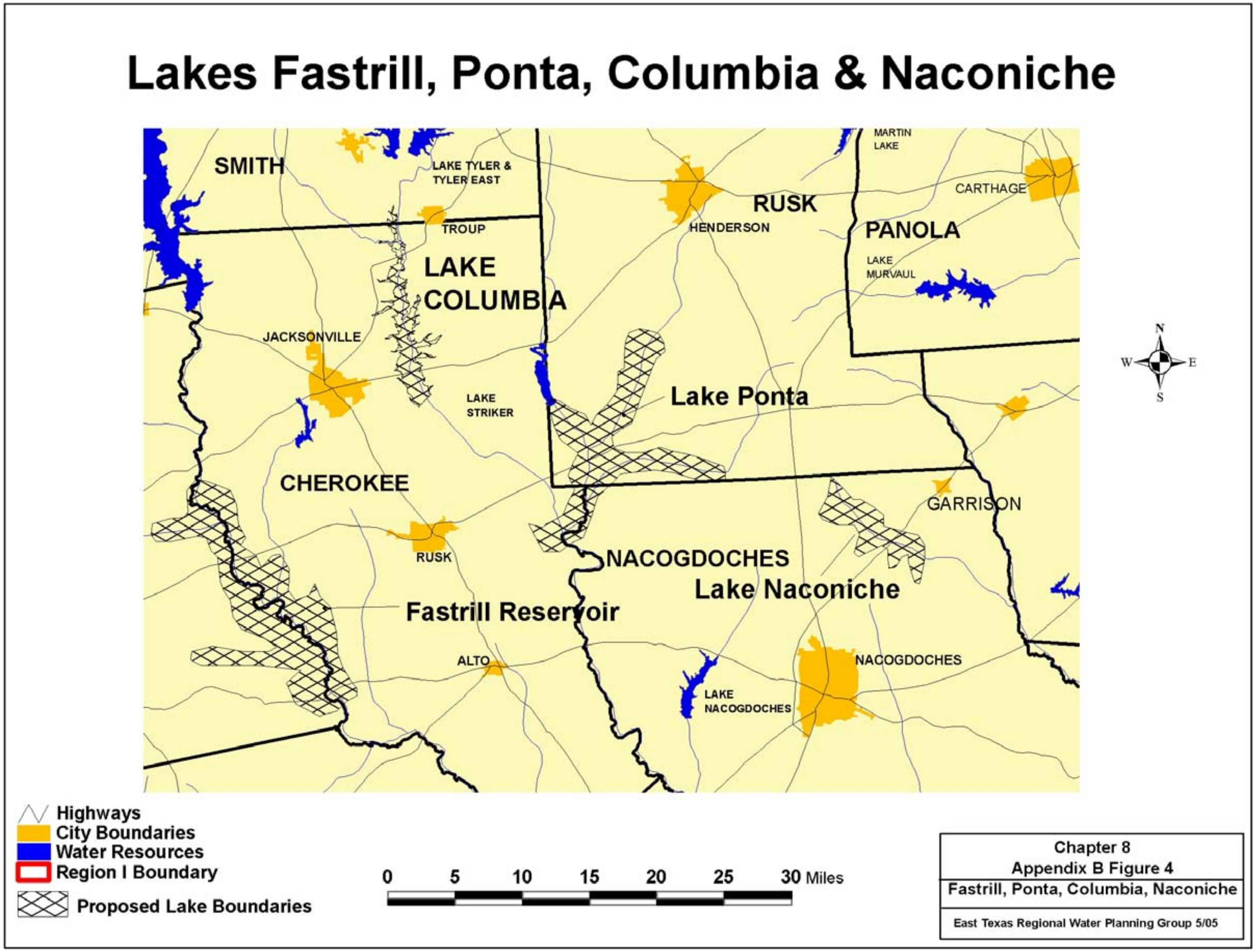
Chapter 8
Appendix B Figure 3
Upper Sabine Basin Reservoirs
East Texas Regional Water Planning Group 5/05


Lakes Fastrill, Ponta, Columbia & Naconiche
SMITH
LAKE TYLER & TYLER EAST
TROUP
LAKE COLUMBIA
RUSK
HENDERSON
MARTIN LAKE
CARTHAGE
PANOLA
LAKE MURVAUL
JACKSONVILLE
LAKE STRIKER
Lake Ponta
CHEROKEE
RUSK
GARRISON
NACOGDOCHES
Lake Naconiche
Fastrill Reservoir
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Water Resources
Region I Boundary
Proposed Lake Boundaries
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Chapter 8
Appendix B Figure 4
Fastrill, Ponta, Columbia, Naconiche
East Texas Regional Water Planning Group 5/05

Appendix C

Legislative Policy Recommendations
East Texas Regional Water Planning Group
May 11, 2005

Junior Water Rights

We support legislation allowing exemptions to junior water rights by contracts that reserve sufficient surface water to meet 125% of the total projected demand of the basin of origin for the next 50 years. Such contracts shall require the receiving basin to pay for development of future water supplies needed to maintain the 125% reserve for renewal of the water supply contract.

Allow designation of Alternative Water Management Strategies

We are concerned that the requirement to designate only one management strategy decreases the local control and flexibility that have been an important part of the successful efforts to meet water needs in Region I and throughout the state. Water suppliers need to have a full range of options as they seek to provide new water supplies for Texas' future. It is impossible to foresee all the possibilities for new water supplies in a planning process such as this, and changing circumstances can change the preferred alternative for new supplies very quickly. New laws, court decisions, regulatory changes, permitting decisions, changes in growth patterns, and other factors may make a recommended strategy impossible and require a supplier to develop other alternatives. We are also concerned that limiting the options of water suppliers will make negotiations to obtain needed land or water more difficult and drive up the cost of new water supplies. We recommend that the following steps be taken to address these concerns.

- The TWDB and the Texas Commission on Environmental Quality (TCEQ) should interpret existing legislation to give the maximum possible flexibility to water suppliers as they seek to serve the public and provide new supplies. Changes in the timing of supply development, the order in which strategies are implemented, the amount of supply from a management strategy, or the details of a project should <u>not</u> be interpreted as making that project inconsistent with the regional plan.

- Willing buyer/willing seller transactions of water rights and treated water should not be controlled by this regulation. Such transactions may be beneficial to all concerned and may simply not have been foreseen in the planning process.
- The TWDB and TCEQ should make use of their ability to waive consistency requirements if local water suppliers elect strategies that differ from those in the regional plan.
- Legislative and regulatory changes should be made to remove this requirement from the Senate Bill One planning guidelines and allow plans to present alternative sources of supply where appropriate.

<u>Continued funding by the State of the Regional Water Planning process on a Five Year Cycle</u>

- The East Texas Regional Water Planning Group believes the grassroots planning effort created by Senate Bill 1 is important to the state of Texas and should be continued.
- We also believe the most fair and efficient method of financing continuation of this effort for future planning cycles is to continue funding of this effort by the state with administrative expenses for the region being provided from sources within the region.
- There are important tasks that need to continue. Improvement of data for the next planning cycle is very important. State funding of those efforts needs to be made available.

Groundwater Conservation Districts

The East Texas Regional Water Planning Group encourage all areas in the Region I Water Planning Area not presently a part of a Groundwater Management District to either create one or join an existing district. These entities provide the best protection currently available for groundwater resources in the State of Texas.

Chapter 9

Infrastructure Financing Report

9.1 Introduction

The purpose of this report is to identify funding needed to implement the water management strategies recommended in the Regional Water Plan. The primary objectives of the report are:

- To determine the number of political subdivisions with identified needs for additional water supplies that will be unable to pay for their water infrastructure needs without some form of outside financial assistance;

- To determine how much of the infrastructure costs in the regional water plans cannot be paid for solely using local utility revenue sources;

- To determine the financing options proposed by political subdivisions to meet future water infrastructure needs (including the identification of any State funding sources considered); and,

- To determine what role(s) the RWPGs propose for the State in financing the recommended water supply projects.

A survey of Water User Groups with identified infrastructure needs was conducted, and the results of those surveys are summarized in Section 2.

The East Texas Water Planning Group has reviewed current infrastructure financing programs, and makes recommendations for funding increases in Section 3.

9.2 Summary of Survey Responses

Surveys were sent to 24 municipal water user groups and 6 wholesale water providers with projected water shortages. Surveys were completed and returned for 5 of the municipal water user groups and 4 of the wholesale water providers. There were 30 Water User Groups with needs identified in the Plan not surveyed. These Water User Groups were in the Manufacturing, Power Generation, Irrigation, Livestock, and Mining categories. The responses received are included in Appendix A.

In the East Texas Water Plan $363,525,396 of water supply and infrastructure needs were identified. Of that, $301,025,909 was the estimated cost of new surface water supply projects and major transmission systems (see Table 9-1). The remaining $62,499,487 was in development of new wells, local infrastructure, and public/private partnership projects. A summary of the projected financing required to meet the needs in the East Texas Region and a listing of the projects considered are provided in Appendix B.

Table 9-1: Recommended Surface Water Supply and Transmission Systems

Management Strategy	**Decade**	**Yield (acre-feet/year)**	**Strategy Cost (2002 $)**
ANRA - Lake Columbia	2010	75,700	$178,941,580
Athens MWA			
Indirect Reuse	2010		$3,601,700
Forest Grove Raw Water	2020		$5,696,600
Forest Grove w/WTP@Lake	2030		$4,150,100
Forest Grove w/WTP@City	2050		$11,423,800
Lufkin – Rayburn			
Initial Phase	2010		$55,599,706
Plant Expansion	2050		$22,872,670
Rusk – Steam Electric (RUL-1)	2010		$8,030,753
Henderson County-Other (HECo-4)	2020		$5,815,000
City of Diboll (DI-1)	2010		$5,194,000
Total			$301,025,909

9.2.1 Municipal Water User Groups

A separate accounting was made for cost of project, by decade, to meet water needs for municipal user groups, Table 9-2. Not included in this group are the costs of projects being undertaken by wholesale water providers to meet the need of municipal users. Projects for wholesale water providers are discussed separately.

Table 9-2: Infrastructure Improvement Cost by Decade for Municipal Use

	2010	2020	2030	2040	2050	2060
Cost	$14,138,809	$9,836,835	$1,315,472	$2,561,500	$3,939,307	$1,501,210

Maintenance and replacement of existing treatment and transmission systems are not addressed in the East Texas Regional Water Plan cost estimates. However, these are significant and on-going costs, and will impact communities' ability to fund additional infrastructure. These maintenance costs are expected to increase as a percentage of water system budgets as facilities constructed in the mid-20th century reach the end of their design life.

In the 5 survey responses received, 3 respondents (60%) anticipated fully funding the infrastructure costs through utility revenues supplemented in part with bank loans. However 2 of these three respondents indicated they do not plan to implement the recommended strategy and intend to meet the demand through conservation. The 2 remaining respondents anticipated utilizing State or Federal programs to cover some or all of the estimated infrastructure costs.

9.2.2 Non-Municipal Water User Groups

Non-municipal Water User Groups were not surveyed. Water demands were aggregated at the County level. It is expected that within the non-municipal water use categories, any local infrastructure will be funded using a combination of the methods outlined below.

Manufacturing: It is anticipated that companies with projected shortages will coordinate directly with surface water providers identified for any infrastructure needed to bring water to their sites. The funding of this construction may occur in a number of ways. The typical method is for the water provider to construct the distribution system supplying the customers, and pass through the cost in the water rate. State assistance may be requested through the State Loan Program for some projects. A second funding option is for the manufacturer to directly construct the required infrastructure, which would be a site-specific consideration. In areas not currently served by a surface water provider, a private developer may chose to establish a distribution utility, or a public-private partnership may be formed between the water supplier and end user to develop a new system.

Steam Electric Power: It is expected that the power plant owners, as a part of facility construction, will include any required water supply intakes and pipelines or contract directly with existing major water providers to obtain the needed additional water.

Mining: Mining is projected to experience water shortages in four counties. It is anticipated that those companies with projected shortages will either provide new supplies for themselves by drilling new wells or coordinate directly with surface water providers in their area for any infrastructure needed to bring water to their sites. It is expected that private companies will pay the cost of required infrastructure.

Irrigation: Anticipated infrastructure costs for irrigation are related to increased water needs due to business expansion. The needs are expected to be met by irrigators drilling wells or by contractual arrangement for increased supplies with surface water providers local to the point of need.

Livestock: Livestock is expected to experience shortages in seven counties. It is anticipated those individuals and private companies with projected shortages will either provide new supplies for themselves by drilling new wells or coordinate directly with surface water providers in their area for any infrastructure needed to bring water to their sites. It is expected that payment of the cost for infrastructure will be made by the individuals or private companies needing the water.

9.2.3 Wholesale Water Providers

The four wholesale water provider respondents indicated they would be implementing the recommended strategy. Three of the respondents indicated that all or most of the funding source would be through Texas Water Development Board programs. One respondent indicated funding would be from cash reserves as the strategy involved agreement with downstream water right holders. The estimated cost, by decade and Texas Water Development Funding program is shown in Table 9-3.

Table 9-3: Infrastructure Improvement Cost for Wholesale Water Provider

Decade of Improvement	TWDB Funding Source Amount	
	State Participation	Drinking Water SRF
2010	$89,470,790	$148,372,196
2020		$5,696,600
2030		$4,150,100
2040		
2050		$34,296,470
2060		
Total	$89,470,790	$192,515,366

9.3 Infrastructure Finance Policy Statements

Policy Recommendations

The Legislature has directed each regional water planning group to propose ways for the State to finance a portion of the water supply projects recommended by the State Water Plan. The East Texas Water Planning Group has reviewed the needs of the region, and offers the following recommendations. Recommendations are grouped by category.

- The users of the water should pay for the required infrastructure.
    a. From local funds including those borrowed locally
    b. From state revolving fund loan programs
    c. From federal loan programs
    d. From existing state and/or federal grant programs

- The State of Texas should participate in constructing new water supplies to make development of large water supplies feasible. State money to be recouped at the earliest possible date through sale of state portion of the project to water user.

- If water users are unable to pay for the required infrastructure, merging with another local entity to improve financial capacity must be considered.

- If merger is not an option, state must provide some safety net type funds to provide safe water supply for small (less than 200 connections) that cannot afford the required infrastructure as determined by EPA affordability calculation.

9.3.1 Financial Assistance Programs

- The State Participation Program will be one of the most important financing program for water supply projects sized to meet projected long-term demands. Increase the funding of this program as needed to allow development of these water supply projects. (Lake Columbia)

- The State Revolving Fund Programs will remain important to assist some systems in meeting minimum water quality standards. As infrastructure ages and water quality standards increase, the demand for this assistance will grow. Increase the funding of this program in future decades, and expand the program to include coverage for system capacity increases to meet projected growth for communities.

- The State Loan Program for political subdivisions and water supply corporations offers loans at a cost advantage over many commercial and many public funding options. Increase funding of this program to allow financing of near-term infrastructure cost projections.

- The USDA Rural Utilities Service offers Water and Waste Disposal Loans and Grants to rural areas and towns of up to 10,000 people. Disadvantaged communities within Texas are specifically targeted for these loans. Support continued and increased funding of this program at the Federal level, and fund the state Rural Water Assistance Fund.

- The Regional Water Supply and Wastewater Facilities Planning Program assists political subdivisions with planning grants, allowing small communities to pursue cost-efficient regional solutions. Increase funding of this program in anticipation of upcoming development throughout the state, and expand the program to include the costs for preliminary engineering design and development of detailed engineering cost estimates of recommended facilities.

- The US Army Corps of Engineers (USACE) constructs civil works projects for flood control, navigation and ecosystem restoration. USACE participation in water supply projects is limited by current regulations. Support regulatory changes that will allow USACE to increase water supply storage in the reservoirs that they manage, and investigate other alternatives for increased involvement of USACE in funding water supply projects.

9.3.2 New Funding Sources

- 5 cent tax on each container of bottled beverage sold.

  The amount of revenue generated by this proposal is unknown. The legislative budget board estimated that a 5 cent tax on bottled water only would raise 52.1 million dollars rising to 65.2 million dollars in 2006.

East Texas (Region I) Water Planning Group
Recommended Water Management Strategies and Financing Survey
Please Return by September 2, 2005

Entity: Lily Grove SUD Contact Person: Bill LaBouteaux
Telephone Number: 936-569-9292 FAX: ______
Email Address: ______
Mailing Address: 7435 FM 1638 NACOGDOCHES TX 75964

When comparing currently available supplies to your projected water demands, your city/utility/district will need additional water supplies before 2060. The proposed water management strategies[1] to meet these project water demands are listed in the attached document, along with the cost for each strategy.

1. Are you planning to implement the recommended projects/strategies? Yes or No
   If "No" for any strategies, please continue with question 2.

   If "Yes", skip to question 3.

2. Please described how you would meet future needs.
   CONSERVATION

3. How do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group? Please indicate:

   1) Funding source(s)[2] by checking the corresponding box(es) below and
   2) Percent share of the total cost to be met by each funding source.

- ☐ ✓ % Cash Reserves
- ☐ ____ % Bonds
- ☐ ✓ % Bank Loans
- ☐ ____ % Federal Government Programs
- ☐ ____ % State Government Programs, including TWDB Bonds
- ☐ ____ % Other ______
- ☐ ____ *% TOTAL - (Sum should equal 100%)*

If state government programs are to utilize for funding, indicate the programs and the provisions of those programs.

[1]Water conservation strategies were developed by Region I. Municipal strategies included public and school education, water conservation pricing, new clothes washer standards (energy-efficiency standards) and water system audits

[2]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Please return by September 2, 2005 to: Tammy Parker, Schaumburg & Polk, Inc.
8865 College Street, Beaumont, Texas 77707 FAX: (409) 866-0337

East Texas (Region I) Water Planning Group
Recommended Water Management Strategies and Financing Survey
Please Return by September 2, 2005

Entity: Lily Grove SUD Contact Person: Bill LaBoyteaux
Telephone Number: 936-569-9292 FAX: ____________
Email Address: ____________
Mailing Address: 7435 FM 1638 Nacogdoches TX 75964

When comparing currently available supplies to your projected water demands, your city/utility/district will need additional water supplies before 2060. The proposed water management strategies[1] to meet these project water demands are listed in the attached document, along with the cost for each strategy.

1. Are you planning to implement the recommended projects/strategies? Yes or No
   If "No" for any strategies, please continue with question 2.

   If "Yes", skip to question 3.

2. Please described how you would meet future needs.
   CONSERVATION

3. How do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group? Please indicate:

   1) Funding source(s)[2] by checking the corresponding box(es) below and
   2) Percent share of the total cost to be met by each funding source.
      - ☐ ✓ % Cash Reserves
      - ☐ ____ % Bonds
      - ☐ ✓ % Bank Loans
      - ☐ ____ % Federal Government Programs
      - ☐ ____ % State Government Programs, including TWDB Bonds
      - ☐ ____ % Other ____________
      - ☐ ____ *% TOTAL - (Sum should equal 100%)*

If state government programs are to utilize for funding, indicate the programs and the provisions of those programs.

[1]Water conservation strategies were developed by Region I. Municipal strategies included public and school education, water conservation pricing, new clothes washer standards (energy-efficiency standards) and water system audits

[2]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

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8865 College Street, Beaumont, Texas 77707 FAX: (409) 866-0337

East Texas (Region I) Water Planning Group
Recommended Water Management Strategies and Financing Survey
Please Return by September 2, 2005

Entity: Community Water Company Contact Person: Steve Strouhr
Telephone Number: 903 874-8244 FAX: ______
Email Address: ______
Mailing Address: PO Box 730 Corsicana, Tx 75151

When comparing currently available supplies to your projected water demands, your city/utility/district will need additional water supplies before 2060. The proposed water management strategies[1] to meet these project water demands are listed in the attached document, along with the cost for each strategy.

1. Are you planning to implement the recommended projects/strategies? Yes or No
   If "No" for any strategies, please continue with question 2.

   If "Yes", skip to question 3.

2. Please described how you would meet future needs.
I believe the current supply will be sufficient, Growth has been over estimated in this confined area.

3. How do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group? Please indicate:

1) Funding source(s)[2] by checking the corresponding box(es) below and
2) Percent share of the total cost to be met by each funding source.

- ☑ 50 % Cash Reserves
- ☐ ______ % Bonds
- ☑ 50 % Bank Loans
- ☐ ______ % Federal Government Programs
- ☐ ______ % State Government Programs, including TWDB Bonds
- ☐ ______ % Other ______
- ☐ ______ *% TOTAL - (Sum should equal 100%)*

If state government programs are to utilize for funding, indicate the programs and the provisions of those programs.

______

[1]Water conservation strategies were developed by Region I. Municipal strategies included public and school education, water conservation pricing, new clothes washer standards (energy-efficiency standards) and water system audits

[2]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

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East Texas (Region I) Water Planning Group
Recommended Water Management Strategies and Financing Survey
Please Return by September 2, 2005

Entity: Bethel-Ash WSC Contact Person: Joe Allison
Telephone Number: 903-675-8466 FAX: 903-677-5651
Email Address: bethelAshw @ AOL.Com
Mailing Address: 801 N Palestine Athens TX 75751

When comparing currently available supplies to your projected water demands, your city/utility/district will need additional water supplies before 2060. The proposed water management strategies[1] to meet these project water demands are listed in the attached document, along with the cost for each strategy.

1. Are you planning to implement the recommended projects/strategies? Yes or No
 If "No" for any strategies, please continue with question 2.

 If "Yes", skip to question 3.

2. Please described how you would meet future needs.

3. How do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group? Please indicate:

1) Funding source(s)[2] by checking the corresponding box(es) below and
2) Percent share of the total cost to be met by each funding source.

- ☐ 65 % Cash Reserves
- ☐ ____ % Bonds
- ☐ 35 % Bank Loans
- ☐ ____ % Federal Government Programs
- ☐ ____ % State Government Programs, including TWDB Bonds
- ☐ ____ % Other ____
- ☐ ____ % *TOTAL - (Sum should equal 100%)*

If state government programs are to utilize for funding, indicate the programs and the provisions of those programs.

[1]Water conservation strategies were developed by Region I. Municipal strategies included public and school education, water conservation pricing, new clothes washer standards (energy-efficiency standards) and water system audits

[2]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

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8865 College Street, Beaumont, Texas 77707 FAX: (409) 866-0337

Henderson County

East Texas (Region I) Water Planning Group
Recommended Water Management Strategies and Financing Survey
Please Return by September 2, 2005

Entity: RPM WSC Contact Person: Elliott Owen, PE
Telephone Number: 903-852-3115 FAX: 903 852-7727
Email Address: rpmwsc@goquest.com
Mailing Address: 200 VZ CR 4913; Ben Wheeler, TX 75754

When comparing currently available supplies to your projected water demands, your city/utility/district will need additional water supplies before 2060. The proposed water management strategies[1] to meet these project water demands are listed in the attached document, along with the cost for each strategy.

1. Are you planning to implement the recommended projects/strategies? Yes or No
   If "No" for any strategies, please continue with question 2.

   If "Yes", skip to question 3.

2. Please described how you would meet future needs.

3. How do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group? Please indicate:

   1) Funding source(s)[2] by checking the corresponding box(es) below and
   2) Percent share of the total cost to be met by each funding source.

- ☑ 25 % Cash Reserves
- ☐ ____ % Bonds
- ☐ ____ % Bank Loans
- ☑ 50 % Federal Government Programs
- ☑ 25 % State Government Programs, including TWDB Bonds
- ☐ ____ % Other ____
- ☐ 100 % *TOTAL - (Sum should equal 100%)*

If state government programs are to utilize for funding, indicate the programs and the provisions of those programs.

TWDB

[1]Water conservation strategies were developed by Region I. Municipal strategies included public and school education, water conservation pricing, new clothes washer standards (energy-efficiency standards) and water system audits

[2]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Please return by September 2, 2005 to: Tammy Parker, Schaumburg & Polk, Inc.
8865 College Street, Beaumont, Texas 77707 FAX: (409) 866-0337

East Texas (Region I) Water Planning Group
Recommended Water Management Strategies and Financing Survey
Please Return by September 2, 2005

Entity: City of Nacogdoches Contact Person: David B. Smith, P.E.
Telephone Number: 936 559-2516 FAX: 936 559-2908
Email Address: dsmith@ci.nacogdoches.tx.us
Mailing Address: PO Box 635030 Nacogdoches, TX 75963

When comparing currently available supplies to your projected water demands, your city/utility/district will need additional water supplies before 2060. The proposed water management strategies[1] to meet these project water demands are listed in the attached document, along with the cost for each strategy.

1. Are you planning to implement the recommended projects/strategies? Yes or No
   If "No" for any strategies, please continue with question 2.

   If "Yes", skip to question 3.

2. Please described how you would meet future needs.

___

___

3. How do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group? Please indicate:

   1) Funding source(s)[2] by checking the corresponding box(es) below and
   2) Percent share of the total cost to be met by each funding source.

- ☐ ____ % Cash Reserves
- ☐ ____ % Bonds
- ☐ ____ % Bank Loans
- ☐ ____ % Federal Government Programs
- ☒ 100 % State Government Programs, including TWDB Bonds
- ☐ ____ % Other ____
- ☐ ____ *% TOTAL - (Sum should equal 100%)*

If state government programs are to utilize for funding, indicate the programs and the provisions of those programs.

TWDB: DWSRF loans

[1]Water conservation strategies were developed by Region I. Municipal strategies included public and school education, water conservation pricing, new clothes washer standards (energy-efficiency standards) and water system audits

[2]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Please return by September 2, 2005 to: Tammy Parker, Schaumburg & Polk, Inc.
8865 College Street, Beaumont, Texas 77707 FAX: (409) 866-0337

East Texas (Region I) Water Planning Group
Recommended Water Management Strategies and Financing Survey
Please Return by September 2, 2005

Entity: City of Lufkin Contact Person: Keith Wright, P.E.
Telephone Number: 936) 633-0414 FAX: 936) 633-0416
Email Address: kwright@cityoflufkin.com
Mailing Address: P. O. Drwer 190 / Lufkin, Texas 75902

When comparing currently available supplies to your projected water demands, your city/utility/district will need additional water supplies before 2060. The proposed water management strategies[1] to meet these project water demands are listed in the attached document, along with the cost for each strategy.

1. Are you planning to implement the recommended projects/strategies? Yes or No
If "No" for any strategies, please continue with question 2.

If "Yes", skip to question 3.

2. Please described how you would meet future needs.

3. How do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group? Please indicate:

1) Funding source(s)[2] by checking the corresponding box(es) below and
2) Percent share of the total cost to be met by each funding source.

- ☐ ______ % Cash Reserves
- ☒ 10 % Bonds
- ☐ ______ % Bank Loans
- ☐ ______ % Federal Government Programs
- ☒ 90 % State Government Programs, including TWDB Bonds
- ☐ ______ % Other ______
- ☐ ______ % *TOTAL - (Sum should equal 100%)*

If state government programs are to utilize for funding, indicate the programs and the provisions of those programs.

TWDB Drinking Water State Revolving Fund

[1]Water conservation strategies were developed by Region I. Municipal strategies included public and school education, water conservation pricing, new clothes washer standards (energy-efficiency standards) and water system audits

[2]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Please return by September 2, 2005 to: Tammy Parker, Schaumburg & Polk, Inc.

8865 College Street, Beaumont, Texas 77707 FAX: (409) 866-0337

East Texas (Region I) Water Planning Group
Recommended Water Management Strategies and Financing Survey
Please Return by September 2, 2005

Entity: City of Center Contact Person: Chad D. Nehring
Telephone Number: 936-598-2941 FAX: 936-598-2615
Email Address: cnehring@ci.center.tx.us
Mailing Address: P.O. Box 1744 Center, TX 75935

When comparing currently available supplies to your projected water demands, your city/utility/district will need additional water supplies before 2060. The proposed water management strategies[1] to meet these project water demands are listed in the attached document, along with the cost for each strategy.

1. Are you planning to implement the recommended projects/strategies? Yes or No
   If "No" for any strategies, please continue with question 2.

   If "Yes", skip to question 3.

2. Please described how you would meet future needs.

____

____

3. How do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group? Please indicate:

   1) Funding source(s)[2] by checking the corresponding box(es) below and
   2) Percent share of the total cost to be met by each funding source.

- ☑ 100 % Cash Reserves
- ☐ ______ % Bonds
- ☐ ______ % Bank Loans
- ☐ ______ % Federal Government Programs
- ☐ ______ % State Government Programs, including TWDB Bonds
- ☐ ______ % Other ______________
- ☑ 100 % *TOTAL - (Sum should equal 100%)*

If state government programs are to utilize for funding, indicate the programs and the provisions of those programs.

____

[1] Water conservation strategies were developed by Region I. Municipal strategies included public and school education, water conservation pricing, new clothes washer standards (energy-efficiency standards) and water system audits

[2] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Please return by September 2, 2005 to: Tammy Parker, Schaumburg & Polk, Inc.
8865 College Street, Beaumont, Texas 77707 FAX: (409) 866-0337

East Texas (Region I) Water Planning Group
Recommended Water Management Strategies and Financing Survey
Please Return by September 2, 2005

Entity: Angelina and Neches River Authority Contact Person: Kenneth Reneau
Telephone Number: 936-633-7540 FAX: 936-632-2564
Email Address: kreneau@anra.org
Mailing Address: Box 387 Lufkin, Tx 75902

When comparing currently available supplies to your projected water demands, your city/utility/district will need additional water supplies before 2060. The proposed water management strategies[1] to meet these project water demands are listed in the attached document, along with the cost for each strategy.

1. Are you planning to implement the recommended projects/strategies? Yes or No
   If "No" for any strategies, please continue with question 2.

   If "Yes", skip to question 3.

2. Please described how you would meet future needs.

____

____

3. How do you plan to finance the proposed total cost of capital improvements identified by your Regional Water Planning Group? Please indicate:

   1) Funding source(s)[2] by checking the corresponding box(es) below and
   2) Percent share of the total cost to be met by each funding source.

   - ☐ ______ % Cash Reserves
   - ☐ ______ % Bonds
   - ☐ ______ % Bank Loans
   - ☐ ______ % Federal Government Programs
   - ☐ 100 % State Government Programs, including TWDB Bonds
   - ☐ ______ % Other ______________
   - ☐ ______ *% TOTAL - (Sum should equal 100%)*

If state government programs are to utilize for funding, indicate the programs and the provisions of those programs.
TWDB - State Participation Fund & Others as directed by the TWDB.

[1]Water conservation strategies were developed by Region I. Municipal strategies included public and school education, water conservation pricing, new clothes washer standards (energy-efficiency standards) and water system audits

[2]Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

Please return by September 2, 2005 to: Tammy Parker, Schaumburg & Polk, Inc.
8865 College Street, Beaumont, Texas 77707 FAX: (409) 866-0337

East Texas Regional Water Planning Group
Infrastructure Financing
Summary of Results

Water User Groups with Needs	68
Water User Groups Surveyed	27
Responses Received	8
Water User Groups Not Surveyed (Manufacturing, Power, Irrigation, Livestock, Mining	30
Summary of Finances	
State Participation (Lake Columbia)	$89,470,790
Public Revenues	$225,358,499
Private Funding	$48,696,107
Public/Private	
Total	**$363,525,396**

User Group	County	WUG	Strategy		Capital Cost					
				2000	2010	2020	2030	2040	2050	2060
Muncipal	Anderson	County-Other	ADC-1: QC						$167,432	
		Frankston	FR-1: CW			$237,831				
			FR-2: Cons			$0				
	Angelina	County-Other	ANC-1: Lufkin or LNVA (see Lufkin)							
		County-Other	ANC-2A & 2B (Alt.): CW	*$303,880*	$303,880				$607,760	
		Diboll	DI-1: Lufkin		$5,194,000					
		Diboll	DI-2: Cons	*$0*						
		Diboll	**DI-3A & 3B (Alt.): YJ**	*$530,803*	$530,803				$882,330	
		Four-Way WSC	FW-1: Lufkin or LNVA (see Lufkin)							
		Hudson	HU-1A & 1B: CW	*$509,476*	$509,476			$1,209,591		
		Hudson WSC	HW-1A & 1B: CW		$509,476				$1,018,952	
		Lufkin	LU-2: Conservation	*$0*						
	Cherokee	New Summerfield	Lake Columbia (see ANRA)							
		Rusk	Lake Columbia (see ANRA)							
	Hardin	County-Other	HAC-1A, 1B, 1C: GC		$277,225	$277,225			$277,225	
	Henderson	County-Other	HECo-1: Cons		$0					
		County-Other	HECo-2: CW							
		County-Other	HECo-3: QC		$386,567	$386,567	$193,283	$386,567	$579,850	$386,566
		County-Other	HECo-4: UNRMWA			$5,815,000				
		Bethel-Ash WSC	BA-1: CW		$133,600					
		Athens	AT-1: Conservation		$0					
			AT-2: Athens MWA (see Athens MWA)		$0					
		Brownsboro								
		RPM WSC	RPM-1: Overdraft CW				$0			
	Jasper	County-Other (Neches)	JAC-1: GC		$250,954	$250,954				
		County-Other (Sabine)	JAC-2: GC		$250,954					
		Kirbyville	KI-1: GC		$309,942					
			KI-2: Cons		$0					
	Jefferson	Meeker	ME-1: GC						$150,800	

User Group	County	WUG	Strategy		Capital Cost					
				2000	2010	2020	2030	2040	2050	2060
	Nacogdoches	Lily Grove SUD	LG-1: CW	*$635,732*	$635,732					
		County-Other	NC-1: CW							$317,866
		County-Other	**NC-2 (Alt.): Columbia**							
		Appleby WSC	AP-1: CW					$635,732		
			AP-2: Cons					$0		
		Nacogdoches	NA-1: Water Rights????			$0				
		Nacogdoches	NA-2: Conservation			$0				
		Nacogdoches	**NA-3 (Alt): Columbia (see ANRA)**							
		Nacogdoches	**NA-4 (Alt): Toledo Bend**							
		Swift WSC	SW-1: CW		$635,732					
	Orange	County-Other	ORC-1: Wells		$1,062,400					
		Mauriceville WSC	ORMa-1			$283,800				
	Polk	County-Other	POC-1A, 1B, 1C, 1D: GC		$556,901	$556,901	$556,901			
	Sabine	County-Other	SBC-1: CW		$394,800					
		County-Other	**SBC-2 (Alt.):Hemphill**		$809,000					
	San Augustine	County-Other	SAC-1: CW		$39,400					
		County-Other	SAC-2: City of SA							$0
	Shelby	County-Other	SHCo-1: CW (Sabine)		$415,950	$415,950	$415,950		$415,950	
			SHCo-2: Center		$0					
			SHCo-3: SRA		$1,772,200					
	Smith	Bullard	BU-1A & 1B: CW			$189,177			$189,177	
			BU-2: Cons			$0				
		Community Water Co.	CW1A, 1B: CW		$499,620					$228,787
		Dean WSC	DE-1A, 1B: CW			$525,417				$254,583
		Jackson WSC	JA-1: CW						$532,161	
		Lindale	LI-1: CW					$123,365		
		Lindale Rural WSC	LIR-1: CW							$255,125
			LIR-2: Cons							$0
		RPM WSC	RPM-1: CW							$58,283
	Trinity	County-Other	TRC-1: YJ					$206,245		
	Tyler	County-Other	TYC-1: GC			$448,013	$149,338			
TOTAL MUNICIPAL				*$1,449,088*	$14,138,809	$9,386,835	$1,315,472	$2,561,500	$3,939,307	$1,501,210

User Group	County	WUG	Strategy		Capital Cost					
				2000	2010	2020	2030	2040	2050	2060
Manufacturing	Angelina		ANM-1: Lufkin or LNVA (see Lufkin)							
			ANM-2 (Alt): Columbia (see ANRA)							
	Cherokee		CHM-1: Jacksonville		$0					
	Hardin		HAM-1: GC		$317,850					
	Nacogdoches		NCM-1: Nacogdoches			$0				
	Newton		NWM-1: Wells		$995,143			$746,357		
			NWM-2 (Alt.): SRA		$1,389,500					
	Orange		NEED							
	Polk		POM-1, 2: Exist. Supplies			$147,537				
	San Augustine		SAM-1: CW		$33,300					
	Shelby		NEED							
TOTAL MANUFACTURING				*$0*	$1,346,293	$147,537	$0	$746,357	$0	$0
Irrigation	Cherokee		CHI-1: QC		$154,557					
	Hardin		HAI-1: SW		$1,201,823					
	Henderson		**HEI-1: See Athens MWA**							
	Houston		HOI-1 & 2: CW	*$1,099,613*	$1,099,613			$843,219		
	San Augustine		SAI-1: CW		$80,100					
	Smith		SMI-1: QC				$77,255	$77,255	$77,255	
TOTAL IRRIGATION				*$1,099,613*	$2,536,093	$0	$77,255	$920,474	$77,255	
Steam-Electric	Anderson		ADS-1: Palestine			$7,104,143				
	Jefferson		JESE-1: Neches River			$17,333,339				
	Nacogdoches		NCS-1: Columbia							
	Rusk		RUL-1: Sabine River		$8,030,753					
			RUL-2: Toledo Bend	$25,570,922						
				$0	$8,030,753	$24,437,482	$0	$0	$0	$0

User Group	County	WUG	Strategy		Capital Cost					
				2000	2010	2020	2030	2040	2050	2060
Livestock	Angelina		ANL-1: Ponds					$122,700		
	Henderson		HEL-1: Temp. Pumping		$432,500					
			HEL-2: Athens							
			HEL-3: Forest Grove							
	Houston		HOL-1 & 2: CW	*$366,538*	$366,538				$733,076	
	Nacogdoches		NCL-1: CW	*$970,783*	$970,783					
	Sabine		SBL-1: CW Sabine		$82,067		$41,033			
			SBL-2: Current SW		$68,967	$68,967		$137,933		$137,933
	San Augustine		SAL-1: Local SW			$68,967	$68,967	$137,933		$137,933
			SAL-2: CW (Sabine)		$56,600			$28,300		
			SAL-3: CW (Neches)		$70,300		$70,300		$70,300	
	Shelby		SHL-1: GW (Sabine)		$509,250	$509,250				
			SHL-2: GW (Neches)		$254,633		$254,633		$254,634	
			SHL-3: Local Supply (Sabine)				$551,700			
			SHL-4: Toledo (Sabine)					$3,141,000		
TOTAL LIVESTOCK				*$1,337,321*	$2,811,638	$647,184	$986,633	$3,567,866	$1,058,010	$275,866
Mining	Anderson		AND-1: CW		$214,643					
	Cherokee		CHN-1: QC						$154,557	
	Rusk		RUM-1: CW					$272,323		
	Smith		SMM-1: QC		$64,648	$129,296	$64,648	$64,648	$64,648	
TOTAL MINING					$279,291	$129,296	$64,648	$336,971	$219,205	$0
Wholesale Water Provider										
		ANRA	Lake Columbia		$178,941,580					
			Treatment Plant		$115,928,146					
			Distribution System		$92,237,800					
		Athens MWA	Indirect Reuse		$3,601,700					
			Temporary Pump							
			Forest Grove Raw			$5,696,600				
			Forest Grove w/WTP@Lake				$4,150,100			
			Forest Grove W/WTP@ City						$11,423,800	
		Lufkin or LNVA	Rayburn to Angelina County		$55,299,706				$22,872,670	
TOTAL WWP					$237,842,986	$5,696,600	$4,150,100	$0	$34,296,470	

Notes: Strategy in **bold** font not included in Totals.
Strategies shown in 2000 moved to 2010

Chapter 10

Public Participation And Adoption of Plan

This section provides a review of the approval process for the East Texas Regional Water Plan and the efforts made to inform the public and encourage public participation in the planning process. Special efforts were made to inform the general public and water suppliers and others with special interest in the planning process and to seek their input.

10.1 Regional Planning Group Members

The original legislation for Senate Bill One and the Texas Water Development Board planning guidelines establish regional water planning groups to control the planning process. The regional water planning groups were to include representatives of eleven specific interests:

- General public
- Counties
- Municipalities
- Industrial
- Agricultural
- Environmental
- Small businesses
- Electric generating utilities
- River authorities
- Water districts
- Water utilities

The following table lists the members of the East Texas Regional Water Planning Group and the interests they represent.

Member	Interest
David Alders	Agricultural
David Brock	Municipalities
George P. Campbell	Other
Jerry Clark	River Authorities
Josh David	Other
Carl R. Griffith	Counties
Michael Harbordt	Industries
William Heugel	Public
Kelley Holcomb	Water Utilities
Bill Kimbrough	Other
Glenda Kindle	Public
Duke Lyons	Municipalities
Tom Mallory	River Authorities
Edward McCoy, Jr.	Small Business
Ernest Mosby	Small Business
Dale R. Peddy	Electric Power
Hermon Reed	Agriculture
Robert Stroder	River Authorities
Melvin Swoboda	Industries
Worth Whitehead	Water Districts
Dr. J. Leon Young	Environmental
Vacant	Counties
James Alford	Counties
Bill Roberts	Texas Water Development Board
Connie Standridge	Regional Water Planning Group "C"
Cynthia Duet	Louisiana Governor's Office
Judge Sandra Hodges	Counties
Bobby Praytor	City of Dallas Water Utilities
Jerry Mambretti	Texas Parks & Wildlife
James Porter	IMCAL
Mendy Rabicoff	Regional Water Planning Group "D"
Cliff Todd	Texas Department of Agriculture

Steve Tyler	Regional Water Planning Group "H"
Judge Floyd "Dock" Watson	Counties

The East Texas Regional Water Planning Group held regular meetings during the development of the plan, receiving information from the region's consultants and making decisions on planning efforts. These meetings were open to the public, and proper notice was made under Senate Bill One guidelines.

10.2 Contact During Planning Process

The East Texas Regional Water Planning Group made special efforts to contact water suppliers in the region and obtain their input in the planning process. The major water providers in the region are:

- Angelina River Authority
- City of Beaumont
- City of Center
- City of Jacksonville
- City of Lufkin
- City of Nacogdoches
- City of Port Arthur
- City of Tyler
- Houston County WCID No. 1
- Huntsman Chemical
- Lower Neches Valley Authority
- Motiva Enterprises
- Panola County Fresh Water Supply District
- Sabine River Authority
- Upper Neches River Municipal Water Authority

The East Texas Regional Water Planning Group sent questionnaires seeking information on population and water use projections and other water supply issues.

As part of the development of population and water use projections for the East Texas Region, the water planning group appointed a technical review committee comprised of experienced water resource planners. This committee worked with the East Texas Region consultants to develop recommended population and water use projections and reported to the planning group. Members of the Technical Committee included:

- Dr. J. Leon Young
- Dr. Michael Harbordt
- George Campbell
- Melvin Swoboda
- Tom Mallory
- David Brock
- Bill Heugel

10.3 Public Media

A copy of all public media material is presented in Appendix C. The East Texas Regional Water Planning Group published a newsletter to inform the public of the progress of the planning process. The newsletter was sent to:

- Water right holders
- County Judges
- Mayors and Officials of cities in the region
- Other water planning regions
- Texas Water Development Board Staff
- Media
- Any person who requested to be on the mailing list

Members of the East Texas Regional Water Planning Group have made a number of presentations on the planning process to interested groups throughout the region.

Media outreach plan for the East Texas Regional Water Planning Group called for using a number of communication vehicles to keep the media, and hence the public informed of the progress and activities of the East Texas Regional Water Planning Group:

- Newsletters – Newsletters were sent to approximately   media as well as to members of the general public on the mailing list
- Public meetings
- Press materials
- Press released and media advisories
- Ongoing media relations
- Editorial board meetings

10.4 Plan Review

The Initially Prepared Plan was published for public review. Advertisement of the Plan involving availability of Plan and dates for public hearings were published in newspapers across the region.

Three public meetings were conducted as shown.

Location	**Date**
Tyler	July 12, 2005
Nacogdoches	July 13, 2005
Beaumont	July 14, 2005

Transcripts from the meetings are provided in Appendix A.

Written comments were received at the Public Meetings and individually. The comments were received from Agencies, Organizations, and Individuals. Copies of all written comments are provided in Appendix B. Comments were reviewed and the Initially Prepared Plan was amended.

10.5 Final Adoption

The East Texas Regional Water Planning Group convened on December 13, 2005, to review the amendments to the Initially Prepared Plan. The Final Plan was approved.

East Texas Regional Water Planning Group (I)
Contact: Gary Graham, 409-866-0341
Released: May 11, 2005

FOR IMMEDIATE RELEASE

The East Texas Regional Water Planning Group has adopted a new 50-year water management plan for 20 counties within its jurisdiction.

Adoption of the plan came Wednesday in Nacogdoches. The initial plan will be submitted to the Texas Water Development Board in June with regional public hearings scheduled in July at Nacogdoches, Tyler and Beaumont.

While the East Texas region as a whole boasts ample water supplies--more than enough to meet its projected long-term demands--some of its counties may face water shortages in the next half-century if certain infrastructure and water supply projects are not completed.

Six counties within the region will likely have the greatest projected water needs in the next half-century as the region's population increases from 1.01 million in 2000 to 1.47 million in 2060. Anderson, Angelina, Jefferson, Nacogdoches, Orange and Rusk counties will have projected water needs amounting to about 506,000 acre feet a year. Six other counties will have lesser, but identifiable water needs.

Overall, regional water demands will increase from 704,320 acre feet per year in 2000 to 1.26 million acre feet in 2060. About 58% of the coming water demands will be from municipal and manufacturing needs, .

The planning region's total water supply is expected to be about 4.4 million acre feet of water per year, including brackish supplies, over the coming half-century. The region's total potable water supply will be about 3.4 million acre feet per year. Most of the water will come from reservoirs, but other supplies will come from run-of-the-river sources and groundwater aquifers.

The greatest percentage increases in municipal demands for water will be in Polk, Nacogdoches, Angelina and Smith counties. Manufacturing water needs will be the greatest in Orange, Jasper, Jefferson, Angelina and Smith counties.

Irrigation needs will be the greatest in Jefferson, Hardin, Houston and Orange counties while Rusk, Newton and Jefferson counties will create the greatest demands for steam-electric water.

Nacogdoches, San Augustine, and Shelby counties will experience the greatest percentage increase in needs for water among livestock and poultry producers.

The Water Planning Group recommended that Lake Columbia, on Mud Creek east of Jacksonville, keep the unique reservoir site designation it had received in the first planning cycle five years earlier. No other reservoir sites were recommended to receive special status as unique sites.

Lake Fastrill, on the Neches River south of Rusk, and Rockland Reservoir, on the Neches River near Rockland, were identified as alternate water management strategies. Fastrill was identified as a possible water source for a steam electrical power generating plant near Palestine.

As it had in its first plan, The Planning Group also maintained a listing of other reservoir sites as potential sites which may be needed beyond 50 years, but did not identify them as unique lake sites in its plan.

The sites are on Big Cow Creek and near Bon Wier on the Sabine River, both in Newton County, near Carthage on the Sabine River, on Upper Wilds Creek near Kilgore, on Rabbit Creek in Rusk and Smith counties, on Tiawichi and Mill Creeks in Rusk County, on the Sabine River near Logansport, La., on Socagee Creek in Panola County, and on Mud Creek near Ponta in Cherokee County. In addition, Lake Naconiche in Nacogdoches County was identified as another water supply source although its permitted purpose is flood control and recreation.

The Planning Group declined to designate any unique stream segments within the 20-county area. The Group concluded there are sufficient statutes and government agencies in place to identify and protect areas of special environmental significance.

The Group made four legislative policy recommendations. One supports legislation allowing exemptions to junior water rights by contracts that reserve sufficient surface water to meet 125% of the total projected demand of the river basin of origin for the next 50 years.

A second recommendation asked that alternative water management strategies be allowed in future planning to give regional groups more options in their work.

A third recommendation supports continued funding by the state of the regional planning process on five year cycles and a fourth encourages all Region I areas not presently a part of a groundwater management district to either create one or join an existing district.

The Regional Water Planning Group serves all or parts of Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, Shelby, Smith, Trinity and Tyler counties.

The upcoming public hearings will be held July 12 at the Tyler City Water Plant, July 13 at the City Library in Nacogdoches, and July 14 at the Jefferson County Courthouse. All hearings will start at 6 p.m. Written comments on the water plan may be made up to sixty days following the hearings.

Copies of the water plan will be placed in each of the Region I county courthouses and with a library in each county (in printed form or s a CD-ROM). The plan may also be accessed at this website: http://www.detcog.org/etrwpg/

Hearing

Texas Water Development Board

East Texas Regional Water Planning Group

Beaumont, Texas

July 14, 2005

COPY

Taken before Dana R. Smelley, CSR in and for the State of Texas, RMR, CRR, reported by machine shorthand.

MR. GRAHAM: Good evening, ladies and gentlemen. My name is Gary Graham. I'm from Schaumburg and Polk consulting engineers here in Beaumont. I am proudly the manager for the East Texas Regional Water Planning effort. I'd like to welcome each of you here this evening. The purpose of tonight's meeting is to afford you the opportunity to make comment on the initially prepared plan for the East Texas Regional Water Planning Group. This plan was submitted to the Water Development Board on June the 1st and public notice for this meeting was made 30 days ago.

We opened this public hearing in Tyler on Tuesday night, continued it last night in Nacogdoches, and we will close it here tonight in Beaumont. You will be afforded the opportunity to make written comment on the plan for another 60 days after tonight. So if you know those who would like to comment on the plan who were unable to attend tonight, please advise them that they have an additional 60 days from now to offer written comment. You are also able to offer written comment even if you offer verbal comment here this evening.

I need to recognize a few people here this evening. Gary Hanlon over here is the liaison between the planning group and the Deep East Texas

Council of Governments. They are the sponsoring agency for the planning group. Mr. Bill Roberts, Bill, if you'd wave your hand. Bill is the liaison from the Texas Water Development Board to our planning group. He also works with the Region H group over at Houston. And I seem to be the only member of the consultant team here this evening and don't know or don't recognize any elected officials. If you are an elected official, would you please identify yourself. Great.

MS. RIVERS: Well, we're representatives. I don't know if that counts. But I'm Holley Rivers. I'm with Congressman Poe's office.

MR. GRAHAM: Outstanding.

MS. DAMREL: I'm Lydia Damrel. I'm with Congressman Brady's office

MR. GRAHAM: Great. Good to have you here this evening. I would like for each of you to know that the East Texas regional planning group is composed of 22 members, one of them representing more than 11 different interest groups. They have been working on this planning effort as volunteers for the last four and a half years. This is the second planning cycle. Many of these same individuals participated in the first planning effort, also.

This plan is available in written form at each of the county clerks' offices within the region and it's also available in each of the public libraries in the county seats of the region. If you would like a copy of the plan on CD, you can contact me and I will be glad to mail that to you. The plan is also available on the Web, on the Texas Water Development Board website at www.twdb.state.tx.us, and so it can be downloaded there, also.

I would ask you in offering testimony tonight to please come to the microphone and to state your name and where you're from. This will enable our transcriptionist, Dana Hayden -- good to have you with us this evening -- to make or create an accurate record of tonight's proceedings.

We would ask that you limit your comments to five minutes. If you just go over just a little bit, then we'll be understanding. Those previous two nights have worked within that time limit extremely well.

I will provide a very quick overview of some of our work, and once I complete that, those of you that are still awake can offer testimony. And for those of you that have heard this presentation twice already, it hasn't gotten any better.

The State of Texas instituted Regional Water Planning by Action Assembly 01 in 1997. The State of Texas was divided into 16 planning regions. Our planning region is East Texas which is obviously on the eastern side of Texas.

This is a little more detailed map of our planning region. The counties represented in yellow there, that's actually the Gulf Coast Aquifer. The red is the Carrizo-Wilcox. And the red patch is the down dip of the Carrizo-Wilcox Aquifer. Also shown on the map are the major reservoirs within our planning region.

Since each of the 16 regional plans will be consolidated into a single state plan later, they are each organized in the same fashion. Chapter 1 is a description of the region. Chapter 2 present population and water demands from now through 2060. Chapter 3 develops the water supplies that are available for use within the planning region. Chapter 4 compares those water supplies to the demands and identifies water needs that are not being met with the current supplies, presenting Water Management Strategies to meet those needs. Chapter 5 describes the impacts of Water Management Strategies on water quality. Chapter 6 has model water conservation plans presented which are a great benefit to small water supply corporations and commercial interests that need those. Chapter 7 presents the rationale for this plan being consistent with protecting the state resources. Chapter 8 is a discussion of our efforts in the area of designated unique stream segments and reservoir sites. And Chapter 9 is yet to be written. It was not scheduled for completion until later.

We submitted to the Texas Water Development Board an initially prepared plan on June the 1st. This is the last evening of the public hearings. Comments on the plan will be returned to us from the Texas Water Development Board by October 1st. Public comments are due to us 60 days after the public hearing. So if you'd like to offer written comment, you have an additional 60 days from tonight.

Federal and state agency comments are due to us 120 days from the date of publication of notice, and once we receive these comments, we need to address those and submit our final plan to the state the first part of January 2006.

There are six beneficial uses of water recognized in this planning effort, those being manufacturing, municipal, irrigation, steam and electric power generation, mining and livestock.

The population projections that we used here were developed initially by the Texas State Data Center in cooperation with the Water Development Board.

They were then provided to us and we were able to massage those numbers to a limited degree to come up with our population projections for this effort.

Water demands for each of the beneficial uses were also established early on. Per capita water use was established through the historical usage records. Irritation use was established by crop type. Steam and electric demand was established by a joint study between the Texas Water Development Board and the Electric Generating Association in Texas.

Manufacturing water use was established by historical use, and it was also an economic projection study performed that was sponsored by the Texas Water Development Board. Mining water use which also includes water use for oil and gas production was established by historical use, as was livestock.

Availability of surface water was determined through the use of Water Availability Models with each of the river basins. We used WAM Run No. 3 which assumes no return flows once water is diverted from the channel.

Water Available Model uses a water rights allocation program that is an accounting program for water rights. It has some weaknesses in the hydrologic area, but it overall is a pretty good program. There were actually eight separate runs, each of those established with different premises as a part of the overall WAM, but Run 3 is one of the few that's actually maintained continuously by this issue. That's one of the reasons we suggested using that run in our planning effort. The water availability was established by groundwater availability models which were recently completed for our planning area. Those models were unavailable to us in the original water planning effort.

Just some very quick information on surface water availability for our region. Sabine River Authority has available to it 750,000 acre-feet of water in Toledo Bend. 820,000 acre-feet of water is available to Lower Neches Valley Authority from the Rayburn/Steinhagen system. Lake Palestine provides 228,000 acre-feet and then you see before you a number of other reservoirs, smaller in size but also provide significant amounts of water to other parts of our region.

There are some yields of reservoirs that are not permitted as yet. There's almost 290,000 acre-feet of water that is unpermitted in Toledo Bend Reservoir. Sabine River Authority has submitted an application for that water to be permitted to them recently.

In performing our water planning, we've identified in gross amounts these water sources to meet the needs that were identified. We actually used more water than what's shown on this slide. This is just to meet the needs. That being almost 31,500 acre-feet of groundwater, a little over 700,000 acre-feet of surface water, 500,000 acre-feet of that would be for the proposed liquefied natural gas plants here in our area, 1100 acre-feet from stock ponds, 12,600 acre-feet from voluntary distribution, 500 acre-feet from indirect reuse, and almost 1900 acre-feet from water conservation.

Passive water conservation will provide 20,600 acre-feet of water supply in our region by the 2060 time horizon.

An acre-foot of water, by the way, is the amount of water that it takes to cover one acre with one foot of water. It's not a small amount, but it's a convenient unit for our purposes because we're talking about great amounts of water on an annual basis.

This is a bar graph of the population projections by county in our region. You'll notice the red hatch areas illustrate the growth in the counties. Angelina County, Jefferson County, Nacogdoches County, and Smith County showed the greatest population growth, and those are also the most urban of the counties in our planning area.

This bar graph illustrates the municipal water that will be used in our planning region. You will note again that the greatest increases in municipal water are in the same counties: Angelina, Jefferson, Nacogdoches, and Smith.

There are a list of a number of Water Management Strategies that were made available to us by the Water Development Board. Several of those are not appropriate for the East Texas region. Our planning group determined that drought management will not be considered a Water Management Strategy for East Texas. We feel like drought management normalizes water use more than it actually makes water available to meet needs.

Brush control may be an effective Water Management Strategy in West Texas but was not considered to be effective in East Texas.

Precipitation enhancement was not considered. Cancellation of water rights was not considered. There were no ongoing or completed aquifer storage and recovery studies available for East Texas and we've not had the budget to undertake those. So it is also not considered as a Water Management Strategy.

In order to be feasible, a Water Management Strategy proposed by this regional water plan has to have a sponsor, must be considered practical, should provide a reasonable percentage of the need, meet federal and state regulations, be proven -- based on proven technology, have to be able to implement it, and has to be appropriate for Regional Water Planning.

We've defined the areas that had supply deficiencies, as I outlined previously. We contacted those water providers or those Water User Groups that had needs to determine what strategies they were already planning on to meet their needs, if any. We've built a list of potentially feasible strategies and then prepared a qualitative ranking of those based on cost, environmental impact, reliability, impact on other water resources, impact on agricultural and natural resources, and their political acceptability. We then selected one or more of the strategies as appropriate for each need, confirmed the selected strategies with the Water User Group that had the need, and then presented the selected strategies to our Regional Water Planning Group for discussion, modification and approval. Those Water Management Strategies were what are presented in our regional water plan for East Texas.

You will note if you review the plan, in several places there are alternative Water Management Strategies presented. The availability of alternative Water Management Strategies was a part of Senate Bill 3 that did not pass and so as of tonight, as we're here, there's no such thing as an alternative Water Management Strategy. Those have no standing. They're needed and hopefully at some point in the future that planning option will be made available to us, but we don't have it as yet.

Just very quickly reviewing how we propose to meet the water needs in each of our counties. In Anderson County many of the needs will be met by just increased reliance on groundwater. There is a steam and electric demand that is projected in that county, and it's proposed to be met with water from Lake Palestine. The alternative Water Management Strategy for that same demand should it not be able to be met from Lake Palestine would be to meet that demand from Lake Fastril.

In Angelina County we propose to meet many of the needs, especially those of the smaller water supply corporations, through the increased use of groundwater. Lufkin has a proposed regional water plant whereby they would obtain water from Sam Rayburn and treat it, pipe it back to Lufkin. And then there's 4500 acre-foot need for manufacturing purposes that would be met late in the planning cycle by Phase II of the Lufkin regional water plan program or from Lake Columbia.

In Cherokee County the Carrizo-Wilcox Aquifer is almost fully allocated. So we had to identify a number of strategies to meet their needs. Some of the water for manufacturing would come from the City of Jacksonville. Some of the water for New Summerfield would come from the proposed Lake Columbia project. This is the old Lake Eastex project, by the way. It was renamed in honor of the Columbia astronauts and that unfortunate incident.

2 acre-feet for mining purposes would come from Queen City and 212 acre-feet for the City of Rusk would also come from Lake Columbia.

In Hardin County the Gulf Coast Aquifer as determined by the GAMs, has adequate water to meet their needs.

In Henderson County there is a confusion of Water Management Strategies. We share Athens with Region C. An independent water authority provides water to the city. There's also a fish hatchery involved and so there's a kind of complex recommendation on the Water Management Strategies in the Athens area.

For the smaller water providers in

Henderson County, we recommended they meet their needs through water conservation. The water from the Queen City Aquifer which is a shallow aquifer over the Carrizo-Wilcox, overdrafting the Carrizo-Wilcox on a temporary basis until other water sources can be developed, and purchasing water from the Upper Neches River Municipal Water Authority.

In Jasper County, the Gulf Coast Aquifer has an adequate amount of water to meet their needs. In Jefferson County the Meeker Water Supply Corporation just west of Beaumont would obtain the water they need from the Gulf Coast Aquifer. There is an Amelia Steam Electric Power Plant that is proposed that would be supplied from LNVA. The LNG plant demands of 500,000 acre-feet could be met by LNVA. With that new need, LNVA has a projection shortage of about 64,000 acre-feet in 2060.

In order of priority the Water Management Strategies to meet that need are water conservation, realizing efficiency from operation of the saltwater barrier in concert with Sam Rayburn and Steinhagen, purchasing water from the Sabine River Authority, and the alternative Water Management Strategy should those other four prove unsuccessful would be construction of Rockland Reservoir.

In Nacogdoches County the small water supply corporations would increase their use of water from the Carrizo-Wilcox. The City of Nacogdoches has their own lake, but they need to execute an agreement with downstream water rights holders to be able to retain flow in Lake Nacogdoches. This is a priority of water rights issue for them. There is also a proposed steam and electric power generation demand in Nacogdoches County that we propose to meet from the Lake Columbia project.

There is a 667 acre-foot need in Newton County that is proposed to be met with groundwater from the Gulf Coast Aquifer.

Manufacturing need in Orange County would be met with surface water from the Sabine River Authority. The municipal need for Mauriceville special utility district would be met by groundwater from the Gulf Coast Aquifer.

Panola County had no identified needs.

The needs in Polk County could be met with groundwater from the Gulf Coast Aquifer.

In Rusk County there is a power generating need that will be met chiefly from Lake Columbia with an additional 6800 acre-feet of water from groundwater sources.

In Sabine County the small water supply corporations could be met from the Carrizo-Wilcox, and there is also some surface water available from the City of Hemphill for some other water needs.

San Augustine County can meet their needs from increased reliance on groundwater and also developing additional stock ponds, local supplies for livestock.

In Shelby County the City of Center has a similar situation to the City of Nacogdoches. They need to reach an agreement with downstream water rights holders so that they can retain the water from Lake Pinkston. The smaller water supply corporations will meet their needs from the Carrizo-Wilcox or by buying water from the City of Center or by obtaining water from Toledo Bend. The 8,000 acre-feet need shown here for livestock is anticipated to be mostly poultry production and would be met with groundwater, local supplies from Toledo Bend. The manufacturing needs in Shelby County would be met by purchasing water from the City of Center.

The Carrizo-Wilcox Aquifer is almost fully allocated in Smith County. The 18,400 acre-feet of need could be met through Carrizo-Wilcox, but that will fully allocate their groundwater resources.

Irrigation and mining needs could be met from the Queen City.

Trinity County can meet their needs with groundwater.

Tyler County can meet their needs with groundwater from the Gulf Coast Aquifer.

The significant supplies in the plan for region -- for areas outside our region are for the Sabine River Authority from Toledo Bend Reservoir. Region D which is immediately north of us, would be Marshall, Longview area and the upper reaches of the Sabine Basin. Sabine River Authority will pipeline 100,000 acre-feet to that area for their needs. North Texas Municipal Water Utilities has a Water Management Strategy in the Region C water plan to obtain 200,000 acre-feet of water from Toledo Bend.

Tarrant County regional water district has a Water Management Strategy in the Region C water plan to obtain 200,000 acre-feet of water from Toledo Bend. Dallas Water Utilities has an alternate Water Management Strategy to obtain 200,000 acre-feet from Toledo Bend. The Upper Neches River Municipal Water Authority as operating authority for Lake Palestine will supply the Dallas Water Utilities in the relatively near future, 114,000 acre-feet of water for Dallas Water

Utilities. Dallas Water Utilities paid for a significant portion of the construction in Lake Palestine when it was recently built. They have owned these water rights since the reservoir was constructed. However it's just recently that they were planning to make use of that water.

Should Lake Fastril be constructed, Dallas Water Utilities would also pay for its construction and they would have 112,100 acre-feet of water in that reservoir they would access at some point in the latter portions of the planning period.

There was some other supplies of water from Region I. LNVA has constructed a plant that supplies water to the Bolivar peninsula. LNVA supplies about 40,000 acre-feet of irrigated water outside our planning region. So there are some other uses outside our planning region other than these, but these are the large ones.

Brackish surface water we have available to us in Region I is 3.3 million acre-feet of water a year. Now, these numbers that we're talking about are in a time of drought, the drought of record for our region. Obviously during a, quote, average year, these numbers are much, much larger. But the water needed in Region I is about 1.8 million acre-feet a year. This is for all the beneficial uses that we talked about. The water for other regions would add up to about 614,000 acre-feet a year. That number does not include the alternative Water Management Strategy for Dallas Water Utilities.

When our group looked at unique stream segments, we determined which significant stream segments existed with three or more of the characteristics that qualified them for significant status as determined by Texas Parks and Wildlife. We looked at those stream segments. We presented to the Region I planning group information on protections afforded these resources by other programs and information on the significance of those stream segments as being designated unique.

On unique reservoir sites, we also -- we presented information on the historically proposed reservoir sites and the significance of designating those sites as unique. After much discussion, the planning group in Region I decided to not recommend any stream segments for unique status and to not recommend any unique reservoir sites.

And with that we will begin public comment on our plan. I would remind you to please come to the microphone. When you begin your testimony, please state your name and in general terms where you're from. I would ask that you limit your comments to no more than five minutes, and please be as clear as possible in presenting the comments.

I would ask -- Mr. John Robinson has asked that he be allowed to go first. I'll honor that request. Mr. Robinson has a family member in the hospital that he needs to go minister to as soon as possible. So with that I would ask Mr. John Robinson to come forward.

As soon as Mr. Robinson is through, Judith Allen, you're on deck here.

MR. ROBINSON: Thank you for allowing me that privilege, Gary. My name is John Robinson. I'm a resident of Silsbee and Hardin County for the past 35 years. I'm a chemical engineer, a Registered Professional Engineer in the State of Texas. I retired from Kirby Forest Industries in '87 and presently owner of Drying Technology in Silsbee.

I want to preface my remarks by speaking briefly about our heritage as it relates to water supply planning for the Neches/Angelina basin. As far back as 1936 forward-thinking individuals at the newly formed LNVA began planning Dam B and Rockland Dam and the Neches for a ready source of water.

At the same time the Corps of Engineers was developing a plan to construct two large reservoirs, Rockland on the Neches and McGee Bend, Sam Rayburn on the Angelina. Two smaller reservoirs downstream of the two major reservoirs were also planned. LNVA gave up their plans to proceed independently and join with the Corps as the local sponsor of the Neches basin reservoirs which included sharing in the cost of constructing Rayburn and Steinhagen.

Construction of Steinhagen began in 1947 and was completed in 1951. Shortly thereafter construction of Rayburn began and was completed in 1965. We look at the plan as it was begun in 1936 and see that these two reservoirs, projects, took 29 years from inception to completion and 18 years from beginning of construction until completion. This gives you an idea of how long it takes to fill a reservoir.

Looking at our future and the new reservoir construction, our firm future in my opinion depends on construction of additional reservoirs as needed. These construction costs at this time and later -- be more than this -- will be in terms of billions of dollars, time to construct in decades as indicated in our building of the two reservoirs previously. If we are to retain control of our future, we must allow Rockland Reservoir to remain in our Region I plan and encourage the local sponsor to proceed when the time is right for its construction.

Financing of new reservoirs will be a problem. The Neches/Angelina basin will not meet all of the yield from Rockland at the time it's constructed. Surface water will be available.

But in order to ensure that we have water for the future, due to the high cost of construction, we will have to guarantee part of the water to other regions in order to have the water for our own development. We've heard the sale of water and people said, well, over my dead body, but out there in the future we're going to have to find some way to finance these projects and one would be to let someone like Houston build a reservoir, we retain sufficient amount of it to run us as far as these other cities are extending their planning on down the line, and they can pay for it, we can get the use of it for our own industrial needs and municipal needs and agricultural needs, and we'll have enough to sell to pay for the system. Then as we get further out in the future and none of these technology, these technologies will have proven that they can do the job, we can have -- there's two more reservoirs. It's been planned for some time by the Corps of Engineers.

We would insist that our future water needs would be met by retaining this large portion of that water. If we don't become proactive in our region, someone is going to come in and lay claim to that water and so I would rather that we be in control than them. Although we must continue to research reverse osmosis, evaporation of seawater, conservation and other exotic water sources, we must look primarily, I believe, to reservoirs for the next 50 to 100 years.

I'm a chemical engineer. I am familiar with the technology of reverse osmosis, the multiple effect evaporators and other technologies, and I wouldn't stake my job on them working out and being that reliable. They are exotic. They're good technologies, but they've been around for as long as I have. That's a long time. So we should not put our eggs all in one basket. Let's don't -- let's not reject the reservoir project.

MR. GRAHAM: One minute.

MR. ROBINSON: One minute? Okay. Environmentally, yes, there are some problems, but some of this water could be used for environmental purposes as these reservoirs are built, be designated for that.

We have an ample supply of water for

the -- we have had -- what is long-range planning. That's the point I want to make. These men back in 1936 were already planning for Rayburn and the other reservoirs. What if they hadn't had that far-reaching thought and planned for Lake Rayburn? Where would we be? We would be in a very -- we would be in a mess.

So what have we now? We've had an ample supply of water for the past 50 years that has allowed development of our petrochemical industry. We've had sufficient water for rice farming. We've been able to supply municipal water needs as the population expanded. We've had sufficient water for competitive tools to get industry to locate in our area. And we need to keep Rockland Dam as planned, to continue to attract industry and other water uses. We need them to conserve our depleting groundwater supplies. We need to provide recreation facilities for our growing population, for our flood control, for power generation from water, for water conservation purposes and prevent water shortages that would destroy our economy and our way of life. Thank you.

MR. GRAHAM: Thank you, Mr. Robinson. Ms. Judith Allen. And we'll ask Michael Black to follow Ms. Allen.

MS. ALLEN: Well, I meant to thank the

previous speaker because he gave me a springboard. My name is Judy Allen. I live in Beaumont, Texas. I am a volunteer for the Big Thicket National Preserve and have served in that capacity for a number of years, also volunteer in a local museum here in Beaumont.

My real concern is honestly that here in East Texas we are truly -- and he said it right -- in danger. And the danger comes from the fact that we have abundant water but he put -- he didn't call it this, but I call it this. There are some greedy areas of Texas that would love to steal our water before it gets down to us. And our water needs to come into East Texas.

The Big Thicket National Preserve will not survive if we dam up the entire of the Neches River. Why? Because it requires flooding along the river, and the river has been there -- as it floods, it provides us with the abundance of this world class preserve that we have in this area, recognized internationally. We have visitors from all over the world to come to Big Thicket. And if we dam up every square inch of the Neches River, the Jack Gore Baygall area and the areas along the river will have a hard time even retaining a modicum of the plant species and the abundance that we see there now. The federal government has expended one heck of a lot of money to establish Big Thicket National Preserve, and we would turn around and let some greedy large metropolitan areas take our water and in essence destroy it? I think there's a problem with that.

Further, I think there's another area that people don't think about. My husband came 20 some odd years ago to this very room to hear somebody make some presentations on the Texas water quality plan, and the comment was made that if one drop of freshwater made it to the Gulf of Mexico, that was one drop too many. And that was made by one of the men who represented the Texas water plan. My husband came home utterly shocked at that comment.

We need to be thinking not only about Big Thicket National Preserve which needs this flooding but we need to be thinking about the marshes and swamps down at Sabine Lake and across the bottom of our county. That is the area that is fish hatcheries and shrimp hatcheries and oyster beds. That's where that abundance of seafood comes from. And if we dam up all the freshwater that's coming down from the Neches River, we're going to have one heck of a time -- of course, they're taking it from Sabine, too -- maintaining the livelihoods on the Gulf of Mexico shores. So I think we've got a lot to think about here and I absolutely personally would like to state that I oppose any further reservoirs on the Neches River. I absolutely oppose them. Thank you, sir.

MR. GRAHAM: Thank you, Ms. Allen. Michael Black. Is it Kelly Brewer would be next.

MR. BLACK: Hello. I'm Michael Black. I'm a resident of Beaumont and I'm a professional nature photographer. When I got out of college, I moved up to Colorado thinking the great outdoors, the best wilderness, the ideal place for me to be a nature photographer. And after several years up there, all I could think about was the Thicket down here.

I had a gallery there. People would come into that gallery from all over the world, and the pictures that they would ooh and awe about were the ones from the Thicket. They never bought the Colorado pictures. I hiked all over those mountains, carried on my back and people didn't seem to care about those too much. They would ask, where is this? They were amazed. And the tourists that would come in from other countries, Germany, England, Australia, when I mentioned the Thicket, they all knew about it. They all knew that it was a gem, a world class gem.

Well, strangely enough the local residents, many of us have never been out there, and if you look back in the history of the Big Thicket decades ago, originally the proposal was for a vast national park, much larger than the national preserve, the little portion that we have remaining. That was a big compromise and probably a necessary compromise to developing the economic needs and all that, but there are only so many more compromises that our natural lands can withstand these days, and not just the areas of the official Big Thicket Preserve, but the site for the proposed Fastril Reservoir is wonderful bottomland hardwood forest that is in the works to become another national wildlife refuge, and that would be negated if that were all flooded and turned into another reservoir.

So I agree with our former speaker that we need to much more strongly look into conservation, how much water do we really need. When I was looking at those charts, 500,000 acre-feet a year for one power plant, that's a lot of water. That's a lot of dead forest. And the Thicket and the lands along the Neches, they are what set our natural lands apart from anywhere else in the world. Other places all across the South have pine forests; other places have marshes. I value those, too, but our hardwood forests in the Thicket, that's what makes this special, our natural land. If we lose that, I shudder at that.

So I'd like to see more thought put into this. Those lands have to be preserved. Thank you.

MR. GRAHAM: Thank you, Mr. Black. Kelly Brewer.

MS. BREWER: I pass.

MR. GRAHAM: Okay. Kathleen Jackson. Following Ms. Jackson, Mary C. Johnston.

MS. JACKSON: Good evening. I'm Kathleen Jackson. I'm a resident of Beaumont. I'm here tonight representing the Southeast Texas Plant Managers Forum. The Southeast Texas Plant Managers Forum is a group of 50 industrial facilities in the Orange, Hardin, and Jefferson County areas. We produce the petrochemicals and the fuels that fuel America. About 10% of all the gasoline that's generated and used throughout our country is generated right here. About 20% of the jet fuel, and most of the rubber that is used in the tires in America are made in Southeast Texas.

Water is a very important commodity for us as industry has emerged at the turn of the century and as we're to continue to grow in our area. It is a very important commodity for us to continue to be able to provide the products that are truly providing a federal interest for our country.

For every barrel of crude oil that we run through these refineries, we need a barrel of water.

We've had recent announcements in this area of expansions that will have a tremendous impact on the supply of gasoline that we're able to provide for America, literally a capacity that equals a new U.S. refinery.

We also see in this area the opportunity to bring the energy of the future, clean burning liquefied natural gas which is desperately needed by the chemical plants as they use it for feed stock and also they need a reliable cause of natural gas which they would bring in order to stay competitive and be able to complete and go to market.

It's been said that we don't get a reliable supply of natural gas, that literally the chemistry as we know it in this country will not exist in another 10 years. It's very important in terms of our economic development and our ability to supply our nation's fuel that we continue to have a reliable supply of fresh water.

You look back at the turn of the century when Spindletop emerged and there was literally no refining capacity in our country. There's not the demand that we see today for fresh water or raw materials for the steel workforce; but over the last 100 years, we've built a significant infrastructure in

Southeast Texas. We No longer have the crew that will survive the Spindletop. We're bringing it in for other countries, but we're able to do that because of forward-thinking Pioneers, men of vision, women of vision that built the Deep Water Fort, that built Lamar University so we would have a skilled workforce and we're forward-thinking enough to establish the dams at Rayburn Reservoir that enable us to regulate the water that provide the municipalities, for industry and for agriculture.

These same reservoirs also regulate the flow so that during periods of drought and periods of flooding that we're able to continue to have fresh water and flows to the estuaries. We all know that the estuaries are the very basis of all life, and I think what's unique in Southeast Texas is that we have both. We have sustainable development. The water that is used in our petrochemical manufacturing industries is taken off the Neches and it's what the rice farmers call, it's rented. It's only used for a short period of time, it's treated and returned back to the river so that it can be used time and time again.

Our comment on the forum in regards to the Region I water plan is that we feel like that all alternative planning alternatives need to be considered, that we need to have all of the opportunities available to us so that as we move toward the future, we will have ample supply of water. We would encourage that Rockland still be continued and the study still be continued as a viable alternative for water planning. Thank you.

MR. GRAHAM: Thank you, Ms. Jackson. Mary C. Johnston. And following Ms. Johnston would be Maxine Johnston.

MS. JOHNSTON: Hello, I'm Mary Katherine Johnston. I'm representing the Big Thicket Natural Heritage Trust. We know that the Big Thicket has been identified by UNESCO as a managed biosphere reserve and it's acclaimed internationally for its biodiversity, but it is an area that is totally dependent on water, on the flow and the volume because this is what impacts water's relationship to plants, soil types. The ecosystems, we would not have our mysterious Cypress sloughs, the acid ball Baygall, our wildflower dotted pines, our wetlands, our palmetto oak flats, or our lower and upper bottomland flood plains if it was not -- or even the arid sandylands that lie in creek banks and act like a sieve during heavy rains. We would not have those ecosystems. They are totally water dependent.

As it relates, as water relates to industry, the Big Thicket is considered a green buffer zone and if the Big Thicket were endangered and we lose -- we lost these ecosystems, then it would be frightening because the trees truly do act as a filter for chemicals, and it's needed.

We also, in addition to industry at this time, community leaders are working very hard to develop ecotourism, bringing in lots of money to the community; and the development of both the Rockland and the Fastril dams will significantly destroy many acres -- more than that, but they would significantly destroy many areas in Southeast Texas, and it's frightening.

Another question that I have is that the development of these dams are supported by those that will financially benefit. The engineers, of course, our real estate people. That's the people with money. And I'm also concerned that when you look at Dallas' water rate that one way might be to look at it is perhaps they're water hogs because their water consumption use is the highest, one of the highest in the state.

So I would just like to say that in looking toward the future, we need to have a voice for those that don't have a voice and I'm opposed to the development of the Rockland and Fastril Dam.

MR. GRAHAM: Thank you, Ms. Johnston. Maxine Johnston. And following her will be Bill Tetley.

MS. MAXINE JOHNSTON: I believe that the conservation committee chair for the Big Thicket Association spoke at Nacogdoches last evening, and I am here to say amen to a few of the things that he presented at that time.

I would also tell you that the Big Thicket Association is on record with a coalition of groups. We have already written letters to the Texas Water Development Board about our concerns on the possibilities for dams, the unique stream segments, and the economic benefits of tourism and other things as opposed to the adverse environmental impacts that will affect all of our parks and sanctuaries in this area.

The Big Thicket Association has been opposed to Rockland Dam ever since the first time it was mentioned, and we participated with a coalition of groups in the 1980s to deauthorize the dam and, of course, it is deauthorized at the time, but one can reauthorize a dam just about as quickly as one can deauthorize it.

We are also opposed to the Fastril Reservoir. The two reservoirs would cover up in excess of 150,000 acres that are better used for agriculture and timber production, and they are needed for wildlife habitat and most critical of all, as has been said by several other people, is the source of the water for the Big Thicket National Preserve, for the Village Creek State Park, for the Larson land sanctuary. All of these preserves would be impacted by reservoirs by that transfer of water out of this basin.

In addition to that, we are concerned about designated stream segments for protection and we assume that all of the streams that are in the Big Thicket National Preserve or tributaries to the Neches should be considered for unique -- as unique stream segments. In addition to the Neches River, Village Creek, Big Sandy Creek, Turkey Creek, Little Pine Island Bayou, Big Pine Island Bayou, there are several other creeks that are -- and tributaries that are also important such as Cypress Creek and Hickory Creek.

In addition to that, the Big Thicket association is on record with the coalition of other groups as being in favor of a national scenic and recreational river on the Neches which would stretch from Palestine to Beaumont. All of these, there are already two proposals for wildlife, national wildlife preserves on the Upper Neches, and those would be -- cover up any of the projects that have been mentioned.

We think that protecting the Neches is

critical to the survival and to the welfare of the Big Thicket National Preserve and the other preserves that are being proposed for the Neches River. We ask that you consider not only the statements that we have made in the past on the subject but we are also preparing an additional statement which will be mailed to Mr. Hanlon and to Mr. Ward within the next week.

MR. GRAHAM: Mr. Bill Tetley, and following Mr. Tetley, Judith Arenault? Judith Arenault follows Mr. Tetley.

MR. TETLEY: Wow. Just listening to the first four speakers tonight, I could probably talk for several hours rebutting some of their comments and appraising or applauding some of the others, but I will keep my comments to within five minutes.

First of all, good evening. I would like to thank the members of Region I Water Planning Group for hosting this public session here in Jefferson County and thank you for leading this tonight. I am Bill Tetley. I live in Nederland here in Jefferson County. I own property not only in this county but also Hardin County, Polk County, and Tyler County. All of these counties are within Region I planning group.

I am here representing myself as a concerned citizen, the local group of the Sierra Club and the Texas Forestry Association.

For the past 15 months I have had the privilege of observing the regional board deliberate on the complexities of a water plan for the next five years. I have been impressed with the thoroughness of the group to seek a wide diversity of input from water consumers and to consider ramifications for each and every stakeholder. However, after availing myself of the opportunity to attend the second session of this public hearing that was held last night in Nacogdoches and hearing fifteen spokespersons representing a wide range of interests from self to a host of organizations, I see the need to add to some of their comments.

Thirteen of the fifteen speakers last night eloquently stated a number of negative effects if two new reservoirs are allowed to remain as possible water management sources or strategies in the current proposed plan. Those are the Fastril and Rockland.

One speaker pointed out that the construction of Fastril Reservoir would inundate a large amount of acreage of bottomland hardwood. What was not brought out is that Texas has very little bottomland hardwood left, though we have approximately 12 million acres of commercial timbered land in 44 counties in East Texas.

This one industry, timber, is of tremendous economic importance to this region as well as to this state. Timber is the third leading source of income behind tourism and oil and gas in the State of Texas. The loss of more bottomland hardwood is not in the best interest of this industry, this region, or this state.

Combine that with the fact that we have lost a tremendous amount of bottomland hardwood already due to the reservoirs, at least 15 within our own regional planning group that have been constructed in East Texas over the past several decades.

Another person spoke to the loss of wildlife habitat if Fastril and/or Rockland were built, but this speaker didn't mention that where these reservoirs would be built would take out more bottomland hardwood. This same bottomland hardwood is what makes for the very best habitat for wildlife.

Yet another spokesman representing an Audubon group said how much water's enough. Are you aware that bottomland hardwood makes for a much more diverse range of species of birds than pine timberland? Still another person holding fastly the amount of water consumed by Region C -- that's Dallas/Fort Worth area -- that region has the highest per capita water consumption of any region in Texas, 240 gallons per person per day, or GPCD, gallons per capita per day. This represents 100 gallons per capita per day over the maximum that the Texas Water Development Board and the state legislature have set as the limit.

Why, right here in the Golden Triangle area, we have one city that uses 95 gallons per capita per day. Add to these facts, it is estimated that Region C uses approximately 60% of their water for maintaining lawns and yet rather than Region C implementing and enforcing good water conservation as a real Water Management Strategy, they want to buy cheap water at Region I's natural resources expense.

And the list goes on. Another speaker who was formerly a member of the Region D board -- that's the very northeast section of Texas -- said that they have sufficient water for their region, but again he didn't mention that Dallas attempted two years ago to create yet another reservoir in their district, Marvin Nichols, and that would have inundated even more bottomland hardwood. Every environmental group in the State along with the Texas Forestry Association and many of the local businesses and residents in that area successfully cooperated to stave off that attack, at least for the time being. So here

Region C is again trying to get cheap water from outside their region rather than practice efficient and effective water conservation.

Well, I could go on and on, but you get the drift. We need to think about the future. So what I am asking is for the ladies and gentlemen of Region I Water Planning Group to shut the door now on another region appropriating water from our region because of their wasteful habits. That's primarily what Fastril is all about, to supply Dallas with water.

Take Fastril and Rockland reservoirs just totally off the list as possible sources of water or Water Management Strategies for the foreseeable future. A hundred years down the road, we may want to change that. We must plan now for the future of our region, the future of our state and the future of every citizen while protecting each individual's property rights and our region's natural resources. Thank you.

MR. GRAHAM: Thank you, Mr. Tetley. Judith Arenault, and following her Dawn Pilcher.

MS. ARENAULT: I'm a resident of Beaumont. I am a member of the Big Thicket Association, the Sierra Club. I am the interim director of Lamar University Center for the Study of Big Thicket -- for the Center of the Study of the Big Thicket. So I feel that I'm well qualified to say that I support conservation of water. I believe that our area can support conservation of water. I believe the Dallas area can conserve.

I'm an advocate for the Neches River. I am opposed to the Region I Water Planning Group's strategies, alternative strategies as they are called, of building the Fastril Reservoir on the Upper Neches River and the Rockland Reservoir which would enlarge Steinhagen Lake from 13,000 surface acres to 21,000 surface acres, which is an increase of 60%.

Among the impacts of the proposed dams or reservoirs are the proposed Rockland Reservoir would inundate 12,000 acres of the Texas Park and Wildlife Management Area above the dam and submerge Martin Dies State Park. There are other ways to supplement the water supply of the Dallas area. As I mentioned, conservation of water and use of existing reservoirs.

I believe that it's possible for us all, those who wish to conserve and those of us who drink water, to live together and to cooperate. I believe that this is possible. I don't think that we should rush into reservoirs when there are existing reservoirs and when there are ways to conserve that haven't been tried. Thank you.

MR. GRAHAM: Thank you, Ms. Arenault. Dawn Pilcher. Following Ms. Pilcher, Christopher Brown. If anyone else is here that would like to offer testimony you're, of course, more than welcome to do so. I would ask, though, if you would come forward after Mr. Brown and, of course, remember to state your name and also fill out one of the forms so we have that for the record.

MS. PILCHER: My name is Dawn Pilcher. I'm a resident of Orange. I'm also the manager of engineering for Lower Neches Valley Authority. I would just like to address a few of the previous comments, clarify a few things. LNVA looks at a number of water conservation strategies as our first opportunity to provide additional supplies for water to meet the additional needs, particularly of growing industry and the growing municipalities in the areas.

In addition to the primary conservation measures, we are interested in all available options to be evaluated and seriously considered for the supply of water in the future. With respect to Rockland, this dam is not proposed to be a footprint overlayed off of Dam B or Steinhagen. It does not affect the current parks surrounding Steinhagen. It is upstream. It is a separate reservoir that is planned upstream of

Steinhagen as it stands today.

In addition to that, the expansion of the industry in the area, particularly the LNG facilities, all of the water that would be supplied to those is not diverted until that water has passed through the Big Thicket. Big Thicket would still receive all the benefit of that water. Simply because there's a dam there does not mean that water is not received by Big Thicket any longer. It is moderated. It is available still during drought conditions because that water has been placed in storage to be there during drought conditions.

That water has also been returned to -- as it's proposed for LNG facilities, that water would then be returned in total to the estuaries as a fresh water supply. It's simply borrowed water. It is not taken out of the system, out of the natural ecosystem. I would just like to say that we do support the evaluation of all reservoirs, all water management strategies, and we would like to see Region I continue its efforts. It's been very thorough, and we support the continued studies without elimination of any of the opportunities for future supplies. Thank you.

MR. GRAHAM: Thank you, Ms. Pilcher. Christopher Brown. Mr. Brown is the last registered speaker, but you're more than welcome to offer testimony following him if you'd like.

MR. BROWN: My name is Christopher Brown. I'm the water project's attorney for the National Wildlife Federation, and on behalf of the National Wildlife Federation I just want to thank Region I for holding these public meetings and especially for going to the trouble of holding them in all these different communities so that people have a chance to hear about the plan and to voice their concerns and also for the way that the region has gone about developing a plan this Spring.

I just want to address these issues from the draft plan and I don't want to be redundant. I heard some very eloquent people here tonight and I don't want to say the same things that they've said over and over again, but I do have three basic concerns that I will address verbally and then we'll be submitting written comments subsequent to the meeting. And those three are the way that the draft plan lays out estimated demand over the 50 year period; second of all, the way the plan addresses the issue of conservation; and third, the way that the plan evaluates reservoirs as opposed to unique stream segments.

First of all, in terms of projected

demand. The plan says that as of 2010, Region I will have a 116,270 acre-foot surplus, and an acre-foot is enough water to cover one acre of land with one foot of water, probably a stupid thing to say, but in case anybody was wondering.

As of 2060 the plan says that there will be a 174,200 acre-foot deficit in Region I. But part of that deficit is based upon what is still a hypothetical projection on the basis of the region that there will be steam electric generation plants built in the region.

On Page 4(c)30 of the plan if you're using it for your comments, the plan says that if Lake Columbia is constructed, there may be such steam electric plants. That's based upon a contingency on one Water Management Strategy which may or may not come about.

Second of all, at public meetings this Spring, the consultants for the plan told me that at this stage they have a good faith belief that those steam generation plants could come into existence but they did not yet know, and I don't doubt the good faith of the consultants at all. In fact, they're very professional people. But what it does suggest is that approximately 224,000 acre-feet of the projected demand by 2060 is based upon the demand that is still hypothetical, which is to say steam electric generation.

So that you have a 174,000 acre-foot deficit for the region which makes it appear that the region needs to make up for that deficit and bring it back up to the adequate level, but it's based upon plans that don't exist yet. And it strikes me that the plan then is on the horns of a dilemma with respect to conservation.

If, in fact, the steam electric generation plants are not constructed, according to the numbers in the plan there will not be a deficit. In that case the consultants are right. In the plan they say conservation is not relevant at this time, is not a strategy to consider, that it might be later if we have a greater demand but it isn't now.

Well, if it's true that there are no plants, then they're right, there is no need to consider conservation because evidently they will have a surplus. But if you accept the numbers that the region gives you and you accept the notion that you will have a 174,000 acre-foot deficit by 2060, then it strikes me and it strikes I think most reasonable people that conservation does become relevant and I'll tell you why.

At the public meetings this Spring when members of the public asked the consultants and the members of Region I whether the region was considering conservation, the response was, well, the Texas Water Development Board has recommended 140 acre-feet or lower as the conservation goal for all Water User Groups, and I should point out that there are Texas municipalities that do that number and in fact as the former speaker pointed out, there are some communities here in Region I that hit that number and lower.

But the key to that is that 140 gallons per capita per day number is based not on the entire region but on Water User Groups within the region. And what this plan does is it says, well, over here in these smaller communities, we've got 90 gallons per day per capita being used, and over here in the city, for example, in Tyler, they use 248 gallons per day per capita. Lufkin, they use 171 gallons per capita per day. Nacogdoches uses 206 gallons per capita per day, and the list goes on. So what they do is they average the smaller communities where you've got smaller per capita water use with the cities where you have these large numbers which are well -- are sometimes well over 200 gallons per day and they tell you, well, the average for the entire region is under 140. So we're not going to think about conservation.

Unfortunately that's not the way the

rules are written. What you do is you look at discrete water user groups within the region and you say, is it possible for this discrete Water User Group or, you know, technocratic people call WUGs, can you bring that down to 140 gallons per day. And so if you did a proper conservation analysis of Region I, what you would do would be to analyze each Water User Group according to the conservation goal established by the Water Development Board and not the entire region. In other words, Region I is not one user group. Region C is not one user group. Instead the communities within those regions are discrete Water User Groups, and this plan just doesn't do that.

Now, we calculated the savings. By 2060 if all of the cities, Tyler, Beaumont, Lufkin, Nacogdoches, and so on that are way above the 140 gallon level, if all of those cities came down to 140 by 2060, and what we came up with was 41,393 acre-feet by 2060. Well, the deficit is supposed to be about 174,000 and they can save over 41,000 by just following the Water Development Board standard.

So it strikes me that if we accept their numbers and if we accept the notion that these steam, you know, electric generation plants which don't exist yet are actually going to exist someday, that conservation is extremely relevant. You can save just over a third of the entire deficit just by following the Water Development Board guidelines.

The second horn -- the second horn of a dilemma not to -- you know, I don't want to sound like H. Ross Perot, change your tire when you're in a ditch or whatever, but the second problem is that if the steam generation plants don't come into existence, then there can be no showing of demand for these reservoirs that people are discussing tonight. In other words, if you don't have a 174,000 acre-foot deficit, why would you need to build a reservoir. And even if you did have 174,000 acre-foot deficit, why would you have to build three of them?

If you look in your draft plan, you'll see that if you add up the net acre-feet or if you ask one of the consultants who work on the plan, you will get something in excess what they say the deficit will be. So not to skew too many numbers.

And then finally with respect to the reservoir issue, I don't think I can say a whole lot that hasn't been said except just to point out some basics. One, in the administrative code it states that when a regional user group designates that there's a unique reservoir site, it shall consider a number of factors, and one of the factors it lists is that the site is environmentally suited for reservoir construction.

In other words, before the group makes the recommendation to the Texas Water Development Board for the reservoir, what it is supposed to have done is to go out and to do the environmental analysis in concertation with the Texas Parks and Wildlife department, in consultation with the United States Fish and Wildlife Service and so on and come to the conclusion that this site is environmentally suited for reservoir construction.

What's interesting is that in Chapter 8, Appendix A, Page 12, the plan says, There is currently very little information on the relative value of using these sites for a reservoir compared to maintaining their marine habitat. And it's very balanced and just says, well, we need to study these things more.

The problem of that is that on the one hand they say we don't know whether this is an environmentally suited place for a reservoir or not, but this plan recommends reservoirs.

Now, you know, qualification. Lake Columbia is the only one that is actually elevated to the level of a Water Management Strategy for present consideration and the other two reservoirs were considered alternative scenarios. But it is unclear to me under the rules whether those alternative scenarios shouldn't also have with them, be presented in the plan with environmental justifications for why this site's proper.

So I think what we've got, the problem, guys, we have the cart before the horse. We've got a plan that says we don't really know when a lot of these sites, whether these things are environmentally suited or not, whether they should be designated for reservoirs or as unique stream sites but then the plan goes ahead and recommends reservoirs anyway.

And I would make one observation of that which is that if this were under federal law, under the National Environmental Policy Act, if you can't show, if you provide an environmental impact statement and you say to the judge, we don't know, you know, we really don't know what the impacts are, you lose. It goes back -- it goes back to the agency. And what seems to be happening here is they're saying, we don't know, so we're going to go ahead and do it. And I don't know if that's true or not and I don't want to be unfair or put words in anybody's mouth, but that is the way the plan's written and so there are some significant flaws in the environmental analysis of Columbia and then the other two reservoirs that y'all have been talking about. Thank you.

MR. GRAHAM: Thank you, Mr. Brown, for your comments. Is there anybody else that would like to offer testimony this evening? Yes, ma'am, please come forward.

MS. LEDBETTER: I already gave my sheet to him. I gave it to that guy right there.

MR. BOWMAN: Okay. I got it.

MR. GRAHAM: That's fine. Please state your name.

MS. LEDBETTER: I will. Good evening. My name is Wendy Ledbetter and I'm the Southeast Texas project director for the Nature Conservancy and that is why I'm here this evening. The Nature Conservancy is an international nonprofit conservation group that was established in 1951. The Texas chapter of the Nature Conservancy currently has approximately 38,000 members across the state, and I am speaking on behalf of our concerns and issues for Southeast Texas.

The mission of the Nature Conservancy is to preserve plants, animals and communities that represent the biodiversity of the Earth by protecting the lands and waters of those species and communities needed for survival.

Many points have been made tonight that I was hoping to share with you but they've been covered. So I'll get right to kind of what the heart of the matter is for our organization.

With our planning, we have worked with several conservation partners, including Texas Parks and Wildlife, U.S. Fish and Wildlife Service, the timber companies, some of the environmental organizations that you listened to tonight, and in our assessment of our task or our mission in this area, we have developed ecoregional plans or assessments of the West Gulf Coastal Plain and the Upper West Gulf Coastal Plain. These areas include all of the area that we're discussing tonight in this region.

In those plans working with our partners, including databases that were developed by Texas Parks and Wildlife and also the conservation data center database that we have internally, we've taken the time to identify and prioritize specific areas that are key areas of biodiversity, and those areas have been prioritized. And in the aquatic assessment, we have identified the Neches River and the major tributaries that were mentioned previously such as Big Pine Island Bayou, Village Creek, et cetera, as being significant resources that within our scientific expertise and database we know that there are particular elements of occurrence that we are interested in protecting.

The authorization and construction of the Fastril and Rockland projects will significantly impact those areas that we are interested in, and for that reason we are opposed to the construction of these two projects. We also are working cooperatively with the U.S. Fish and Wildlife Service in the potential designation of the North Neches National Wildlife Refuge, Alternative B which consists of approximately 25,000 acres and also for looking at the suitability and the eligibility and the criteria that would possibly have the Neches River designated as a scenic river under the Wild and Scenic River map.

So under these considerations the Nature Conservancy is an organization that is known for its cooperative work with willing partners on conservation issues, but on these particular projects we feel that in order to sustain the biodiversity of this region, we would be not in favor of these two particular projects, and that's all I have to say.

MR. GRAHAM: Thank you, Mrs. Ledbetter. Is there anyone else who would like to offer testimony this evening? If not I will remind you that you are able to submit written testimony as regards this plan for 60 days from tonight. Please address those comments to Mr. Gary Hanlon with the Deep East Texas Council of Governments. Their offices are in Jasper, Texas. Bill?

MR. ROBERTS: I'm Bill Roberts from the Texas Water Development Board, and we don't make these decisions. These are regional planning group decisions, but we oversee the process and we actually fund it through the legislature. But I just wanted to thank everyone here for coming out and participating in this effort. The whole goal is the more people we can get involved, hopefully the better decisions that will be made. So I want to thank y'all again for taking the time out of your lives and coming up here and expressing yourselves. That's all.

MR. GRAHAM: Absolutely. I would like to add my appreciation to your attendance and participation this evening. If there are no other comments, then this public hearing is adjourned. Thank you.

CERTIFICATE OF REPORTER.

I, Dana R. Smelley, CSR, RMR, CRR and Notary Public for the State of Texas, do hereby certify that the foregoing transcript is a true, accurate, and complete record.

I further certify that I am neither related to nor counsel for any party to the cause pending or interested in the events thereof.

July 26th, 2005

Dana Smelley

Dana R. Smelley, CSR, RMR, CRR

Hearing

Texas Water Development Board

East Texas Regional Water Planning Group

Nacogdoches, Texas

July 13, 2005

COPY

Taken before Whitney Durham Garza, CSR in and for the State of Texas, RPR, CRR, reported by machine shorthand.

MR. ALDERS: Good evening. If I could have your attention. I still have a few people registering at the door, but they can make their way in. It's well past 6:00 p.m. The public hearing will come to order. As the chairman of the East Texas Regional Water Planning Group, it's my privilege to welcome all of you to this second session of the public hearing of the East Texas Regional Water Planning Group initially-prepared plan.

06:05PM

Last evening we opened this public hearing with a session in Tyler, just south of Tyler, at the Lake Palestine Water Treatment Plant, and had a good turnout there, although a considerably smaller turnout than we have here this evening in Nacogdoches. And then the third session of the public hearing will be tomorrow evening at 6:00 p.m. at the Jefferson County courthouse in Beaumont; and following the public hearing there in Beaumont, then the public hearing for the initially-prepared plan will adjourn.

06:05PM 06:05PM

We will only take a recess this evening at whatever time our public hearing is completed here. I'll give -- hopefully you picked up an agenda on your way in this evening at the time that you registered and came in the door.

06:06PM

You'll note that after my brief opening

06:06PM

remarks, we'll have a presentation of the plan, at least a summary of the plan. We do have some copies of the plan in all of its detail on a CD rom which Mr. Graham has available here. I only have a few copies; but if you really want one, you can have them.

I would remind you that copies of the plan have been distributed to each of the counties within the 16-county region of the East Texas Regional Water Planning Group; and those copies are available, I believe, at the county courthouse. Hard copies are available at the county courthouse; and, also, the plan is available on the Web, the Texas Water Development Board website, which we can announce later. I can't recall those initials of that Water Development Board website. I think it's state.twdb.tx.us. Did I miss it?

UNIDENTIFIED SPEAKER: It's twdb first, www.twdb.

MR. ALDERS: Okay. .state.tx.us. Okay. Great. I would mention, also, that any of the 16 initially-prepared regional water plans are available at that site; and there are public hearings being held throughout the state this week. So, it's difficult for you to make all of the regional -- if you have an interest in other regions, it would be difficult for you to make public hearings for all of those. So, you can find those water plans there on the Water Development Board website.

I want to thank the City of Nacogdoches for their hospitality this evening, for making this meeting room available to us. In fact, it is this meeting room where most of our deliberations have been held for the past five years as we've worked toward this initially-prepared plan.

Gary Graham of Schaumburg & Polk, in his presentation this evening, will give the timeline regarding where the plan goes from here; but this is the opportunity for members of the public to voice their opinion about the plan and various details of it. And you can be assured that your comments will be entered into the public record through Whitney, our stenographer for the evening, and your comments will be a part of Texas history if you make them this evening and the Regional Water Planning Group will study those comments and respond accordingly.

I want to introduce a few members of the East Texas Regional Water Planning Group who are in attendance this evening. Those whom I know are in attendance are Melvin Swoboda. Mel, in the back of the room. And you can just wave, if you will, when you stand up. Melvin Swoboda. Bill Heugel, Bill, from

Sabine County. George Campbell, from Nacogdoches County, former chairman of the Regional Water Planning Group. Josh David. Josh, you're from Tyler County; is that correct?

06:09PM MR. DAVID: Yes.

MR. ALDERS: Dr. Young from Nacogdoches County, and Robert Stroder from Jefferson County. Is that right, Robert?

MR. STRODER: Yes.

06:10PM MR. ALDERS: And then, also, I would like to introduce with the Deep East Texas Council of Governments, the organization which administers the East Texas Regional Water Planning Group and provides all the support, help that we always need, Gary Hanlon. So, 06:10PM Gary, thanks for your help in giving this plan to fruition and setting up our facilities always.

And then from the Texas Water Development Board from whom you've already heard, Bill Roberts, who is our liaison and is a nonvoting member of the planning 06:10PM group for the Water Development Board. Bill also serves in that capacity for Region H, which is the Greater Houston area. So, if you have an interest in Region H's plan, any questions about that, Bill's probably the one person here tonight who has a greater knowledge of that 06:10PM plan than anyone else.

Let me, in the beginning, remind you that if you would like to offer public testimony this evening, we do need to have a form filled out, a form, the public comment registration form. Please note on there if you want to give those remarks, if you want those remarks to be delivered in person. If you want to submit written testimony, that certainly is fine, as well. And if you just want to listen, that's fine; but if you want to give oral testimony this evening, please complete that form and get it to Bob Bowman.

Bob, where are you? Bob, you're on the front row. Get it to Bob or -- is Delores still outside? Doris, I mean. Doris is at the table outside the door there. So, get either your form to Bob or Doris.

I would also remind you that for the purposes of properly attributing your comments to your name, give your full name as you begin your testimony; and, if you will, please come up here to the lectern and use the microphone so that both the stenographer and the audience can hear you clearly.

Bob, are there any other ground rules that I need to -- yes, I do. And I'll repeat these momentarily, after Gary presents the plan, but -- or summary of the plan, but since this -- this is not a separate public hearing from the public hearing that we will be holding tomorrow night nor is it a separate public hearing from that which we held last evening. So, while there may be those who made public comment last evening in Tyler and I'm not going to restrict you from making public comment again this evening, if you made a comment there, but remember that this is the same public hearing and so I would ask those who made public comment last evening that if you have something new to present, feel free to present it, but I do need -- because we are apt to have a number of public comments made this evening, I would like to ask that those who made public comment last evening to restrict your comments to only three minutes. I'll be a little more diligent in holding that line. Those of you who did not make public comments last evening have -- will have a time limit of five minutes, and you certainly don't need to fill up that amount of time if you don't have that preparation already made.

06:12PM 06:12PM 06:13PM 06:13PM

Well, it's my pleasure, then, to introduce to you the gentleman who serves as the primary consultant, the lead consultant for developing this plan from the engineering firm of Schaumburg & Polk, Gary Graham. Gary.

06:13PM MR. GRAHAM: Thank you very much, David. I would like to introduce those members of the consultant team that are here this evening. Besides myself, Simone Kiel with Freese & Nichols I believe is here. Simone. Rex Hunt with Alan Plumber & Associates and, of course, Bob Bowman and his lovely wife Doris are here, also.

We have worked very diligently, the Regional Water Planning Group members especially -- and they are volunteers; they're nonpaid -- over the last several years in trying to put this plan together. What I will present this evening is a very, very brief summary of a portion of our work. There's some of our work that I really won't even make presentation on this evening. It's all contained in the plan. I do have a few CD's here if you would like to have one. If I run out, then you can give me your name and address and I'll be glad to mail you a CD of the plan. In addition to the plan being available at each county courthouse in the county clerk's office, it's also available in each county seat's public library. So, you can also access the plan in the public libraries, as well; and with that I will begin a brief summary of our work.

The State of Texas was divided up into 16 individual planning regions for the purposes of doing -- performing this regional water planning effort. Of course, we're in the East Texas region, which is comprised of all of 16 counties and major portions of four others. On this particular map, the yellow portion represents the Gulf Coast Aquifer and the red is the Carrizo-Wilcox. The striped portion is the down dip of the Carrizo-Wilcox aquifer. If you'll notice, there is a band in the center between those two main aquifers where there is no shading; and ground water resources in that area are hard to come by.

Each of the Regional Water Planning Groups' plan is organized essentially in the same format. Of course, the Water Development Board is charged with the task of taking these 16 plans and consolidating them into a State water plan a year after they're turned in. So, the more consistence we have between the regions, the better it is for performance of that task.

Of course, Chapter 1 is just a description of the region. In Chapter 2 we have population and water demands through the plan period which ends in the year 2060. Chapter 3 develops the available water supplies for our region; and in Chapter 4 we develop the Water Management Strategies necessary to meet needs, that need to be met between now and the year 2060.

Chapter 5 describes the impacts of Water Management Strategies and water quality. Chapter 6 presents model water conservation plans which are necessary to be on file with the State of Texas by various water user groups, and this is an assistance especially for some of the smaller water supply corporations and water user groups in our region.

06:17PM Chapter 7 recounts how our plan is consistent with the protection of State resources as defined by the Texas Administrative Code and the Texas Water Code. Chapter 8 is a discussion about unique stream segments and reservoir sites, and Chapter 9 has 06:17PM not yet been written. It will discuss infrastructure financing recommendations, but that particular piece of work is not due to be completed as yet.

Our initially-prepared plan, just like those in the remainder of the State of Texas, was 06:17PM submitted on June the 1st. Of course, we're holding our public hearings currently. We did publish notice of these public hearings 30 days ago, as required. The Water Development Board is required to have their comments to us by October 1st. The public -- the public 06:18PM comment period actually closes 60 days after this public hearing. So, if you would like to submit written comment on the plan, you have 60 days from tomorrow to make submittal of those written comments.

Federal and State agencies that are 06:18PM reviewing the plan in addition to the Texas Water

06:18PM Development Board need to have their comments to us within 120 days of our publication for this public hearing. So, about October 12th, more or less. And then its incumbent on us to respond to all comments and submit the final plan the first of the year. At that time the Water Development Board will begin consolidation of the regional plans into a State plan.

06:18PM Just to review very quickly, a lot of the information that I talk about will be confined to six major categories of beneficial use of water in Texas. Those are for manufacturing purposes, for municipal use, for irrigation, for steam and electric power generation, for mining, and for livestock; and those uses are consistent across the State.

06:19PM The population information that we began with several years ago was developed by the Texas Water Development Board in cooperation with the State Data Center and was provided to us. We were able to manipulate that data to a very limited degree, and it
06:19PM was later approved by the Texas Water Development Board in one of their meetings.

Water demands for the various categories were established by both the Texas Water Development Board and our Regional Planning Group. Per capita usage
06:19PM is established by historical record. Irrigation use in

this plan cycle was established by crop type and by information made available to us from the Department of Agriculture here in the State and by the Department of Agriculture at the Federal level.

06:20PM Steam and electric demand was established by a joint industry study with the Texas Water Development Board. Manufacturing water use was established by historical record and also in economic projections that were commissioned by the Texas Water 06:20PM Development Board. Mining use is established by historical record, and livestock water use is also established by historical record.

Surface water availability, this is the availability of water from run of the river diversions 06:20PM or from diversions from reservoirs in East Texas. This was established by a water availability model making use of the Water Rights Allocation program. We used WAM Run No. 3 which anticipates absolutely no return flows once the water is diverted for use. The WAM program, as you 06:21PM may or may not know, is more of a water rights accounting program than it is a hydrologic program. So, it does have some limitations of the hydrologic side of things, but it's what the State of Texas told us to use and that's what we're using.

06:21PM Ground water availability models were made available to us late in this planning cycle. They were not available the last planning cycle, and so we have a little better handle on the ground water availability within our region than we did for the last plan that was put together.

06:21PM

Just some very quick information on the reservoirs that we have in our region. In Toledo Bend, Sabine River Authority has water rights assigned to it of it 750,000 acre feet. Lower Neches Valley has water rights to 820,000 acre feet from the Rayburn Steinhagen system. There are 228,000 acre feet available from Lake Palestine. 60 percent or so of that is -- Dallas Water Utilities holds the water rights to. The City of Tyler holds the water rights to about 60,000 acre feet of water in Lake Palestine.

06:22PM

06:22PM

And then you'll see a number of other reservoirs here. Lake Nacogdoches, the City of -- City of Nacogdoches owns that reservoir and they have about 19,000 acre feet of water they anticipate to be available in that reservoir at the end of the planning cycle. I think they actually hold the right to more than that.

06:22PM

There are some unpermitted yields from these reservoirs, the chief of which is the 290,000 acre feet that is not permitted to anyone in Toledo Bend.

06:23PM

The water sources that we have identified for use to meet the needs which were identified in this planning cycle are summarized on this slide. We anticipate that we will use about 31,500 acre feet of ground water, a little over 700,000 acre feet of surface water. A huge piece of that is to meet a new need for liquefied natural gas plants on the Gulf Coast. 1100 acre feet would be for use in stock ponds. 12,600 acre feet would be made available by voluntary redistribution of water, 500 acre feet from indirect reuse, and about 1900 acre feet from active water conservation. Passive water conservation in our region will provide about 20,600 acre feet of water in 2060.

Population of our region is projected to increase from about a million currently to almost 1.5 million, 1,482,000, in the year 2060. You will note on this bar graph by county that most of the growth in population will occur in Angelina County, in Jefferson County, Nacogdoches County, and Smith County which happen to represent the most urban areas in our region.

This bar graph represents municipal water demand by county. And you will note that demand for municipal water increases in the same counties -- Angelina, Jefferson, Nacogdoches, and Smith -- more so than in the others; and, of course, that's due to a larger population increase in those same counties.

The total water demands for the region currently are just over 700,000 acre feet, and we project in 2060 that we will use 1,961,000 acre feet. So, there is a huge increase in the use of water in our region over the planning period. There were a number of strategies that were brought forward or recommended by the Texas Water Development Board that were not considered by our planning group, those being drought management, brush control, precipitation enhancement, water right cancellation, aquifer storage and recovery.

We felt drought management, for the droughts that occur in East Texas, would actually bring water usage more in line with normal use than it would actually make water available. So, we did not anticipate that it would actually make water available for meeting a need.

Brush control might be an effective strategy to increase aquifer storage in West Texas, but that's simply not the case in East Texas. Precipitation enhancement, there are many years that we could turn on the water spicate rather than turn it on. And there were no studies underway or that have been done in our region about aquifer storage and recovery, and we did not have the resources to conclude the study on our own.

So, that was not considered as a Water Management Strategy.

In order to be feasible, a Water Management Strategy in our region had to have an identified sponsor; had to be practical; provide a reasonable percentage of the need for water; of course, had to meet Federal and State regulations; be based on proven technology; and be appropriate for regional water planning at our level.

In the selection process we define the areas of supply deficiencies. We contacted the water user groups that had those deficiencies to see what strategies they were currently considering. We developed a list of potentially feasible strategies to meet those needs; and then we prepared qualitative ratings of those strategies based on cost, environmental impact, reliability, impact on other water resources, impact on agriculture and natural resources, and the political acceptability of those Water Management Strategies.

Those Water Management Strategies were then confirmed with the water user groups that had a need and then presented to the Regional Water Planning Group in a public meeting where they were discussed, modified, and approved.

There are several alternative Water Management Strategies presented in our plan. Those were presented in the plan in anticipation that alternative Water Management Strategies would be a legitimate thing to have. Alternative Water Management Strategies were actually authorized by Senate Bill 3 in this last legislative session. That bill did not pass. So, as we sit here tonight, there is no such thing as an alternative Water Management Strategy. There needs to be. There is a definite need for this planning tool, but it will have to come about and be made available to us at a future date.

I will briefly run through how we will meet the needs in each of the counties. This is not, by any stretch of the imagination, a detailed accounting of how we meet water needs in each of those counties. For those of you who have already heard this presentation, I apologize.

In Anderson County most of the needs will be met by increasing the use of ground water. We do plan to meet a steam and electric generation need from -- out of Lake Palestine of almost 22,000 acre feet. We did present an alternative Water Management Strategy for this demand that would be met from Lake Broughton.

06:30PM In Angelina County many of the needs would be met by increasing the use of ground water. The City of Lufkin is engaged in planning a regional water plant pipeline that would supply a -- much of the needs for themselves and also for a significant portion of the manufacturing water need in Angelina County.

In Cherokee County the Carrizo-Wilcox Aquifer is also fully allocated. So, we were meeting water needs as best we could from various sources. 244 acre feet for manufacturing purposes to be met by water made available from the City of Jacksonville. 213 acre feet needed by New Summerfield will be made available from Lake Columbia project. Water -- increase in the water usage for mining purposes can be obtained from the Queen City Aquifer, and 212 acre feet for the City of Rusk will be made available from the Lake Columbia project.

In Hardin County the Gulf Coast Aquifer's adequate to meet the projected needs.

In Henderson County the water supply for the City of Athens is somewhat convoluted because of who supplies the water and because of the involvement of the fish hatchery there. The water supply for the minor water supply corporations in Henderson County we project will be met through water conservation, some through production of water from the Queen City Aquifer, and by actually drafting more water from the Carrizo-Wilcox Aquifer on a temporary basis than is advisable on a long-term basis.

06:31PM In Jasper County, the Gulf Coast Aquifer is adequate to meet the needs in that county.

In Jefferson County, Meeker will increase their reliance on the Gulf Coast Aquifer. There is a steam and electric power project proposed that will be

06:32PM supplied from Lower Neches Valley Authority. There is projected a 500,000 acre foot need for the liquefied natural gas plant that is proposed that will be met by LNVA, and with those increases there is a projected shortage of 64,000 acre feet in Jefferson County in the

06:32PM year 2060. That need is projected to be met in order of priority by water conservation, realizing efficiency of water use by operating a saltwater barrier in conjunction with the Rayburn/Steinhagen system, reallocation of storage from flood control to the

06:32PM conservation pool in Sam Rayburn, purchasing water from the Sabine River Authority; and we included an alternative Water Management Strategy as Rockland Reservoir.

In Nacogdoches County, the small water

06:33PM supply corporations will meet their needs by increasing reliance on the Carrizo-Wilcox. The City of Nacogdoches needs to obtain an agreement with downstream water rights holders in order to retain flow in Lake Nacogdoches; and this is a water rights thing that can be worked out very inexpensively, I hope. There is a steam and electric plant proposed, and its need is to be met from Lake Columbia.

In Newton County, the manufacturing need of 667 acre feet will be met by reliance on the Gulf Coast Aquifer or, alternatively, by water from the Sabine River Authority.

In Orange County the manufacturing need will be met by water from Sabine River Authority, and the Mauriceville Special Utility District will meet their need by increased reliance on the Gulf Coast Aquifer. Panola County had no identified needs for the planning period.

Polk County can meet its needs from the Gulf Coast Aquifer. In Rusk County there is the electrical generating need that can be met by combining water from Lake Columbia and a little under 7000 acre feet of water from ground water sources.

In Sabine County, needs in the Neches basin would be met from the Carrizo-Wilcox Aquifer and there is also some surface water -- treated surface water available from the City of Hemphill.

San Augustine County will meet their needs from ground water and by developing localized stock ponds.

06:35PM Shelby County, the City of Center needs a similar retention agreement as that I talked about just a minute ago for the City of Nacogdoches. The smaller water supply corporations referred to here as County Other will meet their needs by increased Lee lines on 06:35PM the Carrizo-Wilcox, by obtaining water from the City of Center, and also from Toledo Bend. There's about 8000 acre feet of water need for livestock purposes that will also be met by reliance on ground water local supplies and Toledo Bend, and manufacturing needs would 06:35PM be met by obtaining water from the City of Center.

In Smith County the Carrizo-Wilcox is almost at capacity, and allocation of this additional 18,400 acre feet will put the Carrizo-Wilcox at its production capacity within this planning period. 06:36PM Irrigation and mining needs in Smith County can be met from Queen City Aquifer.

Trinity County will increase their reliance on ground water. The needs in Tyler County can be met from the Gulf Coast Aquifer.

06:36PM There are significant water supplies that have been requested of the region from other regions. Sabine River Authority has been asked to provide 100,000 acre feet to Region D, which is within the Sabine basin; 200,000 acre feet to North Texas Municipal Water Utilities, which is in Region C; 200,000 acre feet to Tarrant County Regional Water District; and Dallas Water Utilities has as an alternative Water Management Strategy obtained 200,000 acre feet from Sabine River Authority, Toledo Bend.

The Upper Neches River Municipal Water Authority operates Lake Palestine. Dallas has water rights in that lake of 114,000 acre feet and plan to take that water within this planning period. Dallas Water Utilities also has as a Water Management Strategy in Region C construction of Lake Fastrill from which they would take 112,100 acre feet of water.

There are some other supplies from this region, the outside. Lower Neches Valley Authority supplies water to the Boliver Peninsula. About 40,000 acre feet is supplied by LNVA to -- outside the region for irrigation purposes. And there's some other minor amounts of water also supplied, but these are the larger amounts.

Excluding brackish surface water, we have a 3,300,000 acre feet of water available in our region.

06:38PM That's water in reservoirs. That's river water. That's water available from the ground. That's water available for reuse. That's all categories of water available within the region.

06:38PM We have need for 1,800,000 acre feet of water within our region in the planning period, 615,000 acre feet or so water to other regions. That number does not include the 200,000 acre feet Dallas Water Utilities has designated as an alternative Water 06:38PM Management Strategy from Toledo Bend.

In another portion of our water planning group, we considered designation of unique stream segments. We determined as a part of our work which significant stream segments exhibited three or more 06:39PM characteristics qualifying them for that designation. We presented to Region I information on protections afforded these resources by other programs and the significance of them being designated unique.

As a companion effort to that on unique 06:39PM reservoir sites, we presented to the planning group information on the historically-proposed reservoir sites and the significance of designation of those sites as unique; and the planning group decided that we would not recommend any stream segments for designation as a 06:39PM unique stream segment and we would not recommend any reservoir sites for designation as unique, either.

With that I will turn it back over to David. Does anybody have just a quick question that I can answer? Yes, ma'am.

06:40PM MS. BONNIE DONOVAN: It would be helpful to know in gallons how -- instead of those millions of acre feet, how many gallons so I could comprehend, maybe comprehend that.

MR. GRAHAM: We're talking about large

06:40PM amounts of water.

MS. BONNIE DONOVAN: I know.

MR. GRAHAM: We're talking about annual amounts for usage.

MS. BONNIE DONOVAN: How many gallons are

06:40PM in an acre foot?

MR. GRAHAM: Just a real quick, down and dirty, rule-of-thumb thing -- it's not completely accurate but it helps -- 100,000 acre feet of water is 100 million gallons of water a day.

06:40PM MS. DONOVAN: Thank you.

MR. GRAHAM: Yes, sir.

UNIDENTIFIED SPEAKER: Could you just define an acre foot of water?

MR. GRAHAM: Sure, sure. An acre foot of

06:40PM water is the amount of water it takes to cover an acre

1 foot deep. Okay?

MR. ALDERS: Are there any other -- any other questions of Gary, just clarification questions? Yes, sir.

06:41PM UNIDENTIFIED SPEAKER: There was 100,000 acre feet for the Corp of Engineers that you didn't touch on. It's listed on one of your slides. What's the Corp using that for?

MR. GRAHAM: I think it may have something

06:41PM to do with the proposed widening and deepening of the ship canal, Sabine Neches Ship Canal. I'm not sure of that.

UNIDENTIFIED SPEAKER: They're talking about a million?

06:41PM MR. GRAHAM: Uh-huh. It's a significant amount of water.

MR. ALDERS: Thanks, Gary. Whitney, do you need the names of the two people that asked those questions?

06:42PM THE REPORTER: If they want to be on the record as being -- make sure you speak your name before you talk if you want your name to be with your comment, please.

MR. ALDERS: Before we go to a public

06:42PM comment, I need to correct an oversight from opening remarks and that is that we are glad to have with us tonight the county judge of Nacogdoches County, Judge Sue Kennedy, in the back of the room. Judge, pardon me for not introducing you earlier.

06:42PM Do we have other elected officials in the room tonight? I didn't think that we did. As far as the City of Nacogdoches, David Smith, do we have anybody more senior than yourself? Pass along to your bosses that we appreciate -- the city commission, the mayor -- 06:42PM that we appreciate their hospitality this evening.

Well, I think that I -- are there others who would like to offer public comment this evening other than those that I have registration forms for? If there are no others, I will relent and not ask those 06:43PM who -- if they come this evening and made a comment last evening, also, rather than asking them to truncate written remarks, I'll just allow you to go ahead and give your remarks as you please; but if you don't have prepared remarks and you can shorten them, I would ask 06:43PM you to do that, if you're just speaking from the heart and not from notes.

And I also will ask -- call on those who did not offer public comment last evening in Tyler to -- I'll bring them to the forward of the queue tonight and 06:43PM so I'll start this evening with John Stover. And as

John makes his way to the front, I would ask you again to give your full name as you begin your public comment and also use the microphone. And, again, five-minute limit.

06:44PM MR. STOVER: I have 30 minutes?

MR. ALDERS: No.

MR. STOVER: My name is John Stover. I'm an attorney from Lufkin, and I'm here on behalf of the Angelina Neches River Authority. I have prepared and 06:44PM have distributed some written comments I left up here on the table.

Gary, did you get one?

MR. GRAHAM: Thank you.

MR. STOVER: In reviewing the methodologies 06:44PM used to prepare the demands for municipal use, some concerns grew out of the fact that there are some regulations. People that design, like engineers, water systems, own and operate water systems, are aware of the fact that the Texas Commission on Environmental Quality 06:45PM has some minimum design criteria; and it appears to us that these design criteria have not been incorporated into this plan.

And I -- again, I don't know the details of what all you've gone through, Gary, but it seems to me 06:45PM that looking strictly at historical use of a municipality and dividing it by the population, they leave the municipality short in their ability to comply with State regulation. Specifically a water system that's entirely dependent upon ground water is required to have .6 gallons per minute per connection of capacity. Looking at the numbers that are used for those -- I won't say I've gone through every one for the whole region, but it looks to me like that there's not just a little bit but a significant difference in the per capita capacity projected in the future. I give an example in my written statements.

It appears to me that the future water demand for some of these municipalities are going to be at least 50 percent or greater short of the minimum design criteria and, again, I don't know whether that's been taken in consideration, but it does not appear to have been.

And I'm concerned that particularly the smaller water supplies, the smaller cities, the entities that are still on ground water and will remain on ground water, are not going to be able to meet their needs if they're relying upon the amount of the demands shown in the water plans.

And let me just say that when this whole process started back in late Nineties, I was skeptical.

I just thoughts, Well, this is another big show and tell process that the State's gotten up. It sounds good on paper, but, you know, we're just going to go through this -- this drill and we're going to end up with a document that's going to be put on some library shelf and forgotten.

I want to say that the fact that we have this many people here tonight -- I understand you had about 45 last night, and I'm sure you'll have a good crowd tomorrow night -- shows that there's some -- there's some smart thinking behind this process. Instead of Austin generating the numbers and coming around and telling us what our demands are going to be, we've got it working the other way.

And I also know that the methodologies that you're required to use are also established by the Texas Water Development Board, and that's why I want to raise this issue. I represent a large number of water utilities and know -- and have represented them in compliance with this very issue. They didn't have enough capacity in their system.

The other thing is -- and this is kind of philosophical and maybe don't attribute this to -- but in all the other designing of water systems, you've got to design for peak demand. You've got to be able to provide the water for those high use periods. I'm sure David Smith looks at this on a regular basis this time of year, are they meeting their peak demand. Well, in the water planning process, you're not planning on peak demands. You're planning on some type of a -- I don't want to say water down. That's not the right term, but it's a process that will leave us short. We're planning for a shortage instead of for the worst case.

06:49PM

UNIDENTIFIED SPEAKER: Five minutes.

06:49PM

MR. STOVER: And I want to leave the members of the board, of the planning group here, Mr. Chairman, with one admonition. I've been keeping up with water planning for some years. And I've got a folder and it's a red one -- it's few of the ones that I have -- so I can find it, but I've worked down what the 2050 demands are going to be in this region and I plan on coming back and checking to see if -- what they are. I'll only be 105. So --

06:50PM

MR. ALDERS: Thank you, Mr. Stover. Bonnie Donovan will be next and then on the on-deck circle is -- I don't know the last name. I can't decipher it, but Oscar is the last name. I'll let you supply it.

06:50PM

MR. DILLAHUNTY: Dillahunty.

MR. ALDERS: Okay. You'll be in the on-deck cycle. Bonnie Donovan.

06:50PM

MS. BONNIE DONOVAN: My name is Bonnie Donovan, and I live in Angelina County. My husband, Richard, grew up hunting and fishing on the Neches River; and our daughter, Gina, treasures the beautiful Neches for the canoeing, kayaking, camping, hiking, and the nature photography that's available there. Our family is passionate about protecting this ribbon of life, one of the last remaining essentially free flowing streams in Texas.

Perhaps nothing defines our part of the State like bottom land hardwood habitat. The Neches River corridor is one of the few remaining examples of this habitat, and approximately 160,000 acres of this finest bottomland hardwood habitat in the United States would be wiped out by the construction of unneeded reservoirs such as Fastrill and Rockland.

Texas Parks & Wildlife Department reports that in excess of 75 percent of Texas bottomland hardwood habitat has been lost due to human impact. Additionally, every two minutes another acre of Texas land is lost to roads, malls, and subdivisions. Our wild places are quickly disappearing, and in a few decades they will all be gone. Will there be any natural places such as the Neches River left for future generations to enjoy?

Texas already leads the nation with 204 major reservoirs, most of them in East Texas. For what reason are you promoting more reservoirs on the Neches, other than greed? Water is not needed from Fastrill and Rockland Reservoirs. Existing water supplies are more than enough to projected needs.

06:52PM

Why would we want to sell our water to Dallas which has the highest water consumption per capita in the state? Conservation measures should be put into place to curb their wanton waste of water. I think it's all about money and not about anyone's need for water.

06:53PM

Any new reservoirs on the Neches River would adversely affect all entities downstream. The world renowned Big Ticket National Preserve would be irreparably harmed by the altered water regimes caused by upriver dams. I urge each member of this board to think seriously about the enormous loss of wildlife, bottomland hardwood habitat, timber production, private property, and natural places that would be lost forever with the construction of more reservoirs.

06:53PM 06:53PM

I strongly oppose the construction of any water impoundments along the Neches waterway. Leave the Neches alone to benefit the majority of Texans rather than a select few. Thank you.

06:53PM

UNIDENTIFIED SPEAKER: Amen.

MR. ALDERS: Thank you, Mrs. Donovan. Oscar Dillahunty and then on the -- next on the on-deck circle will be -- Bruce, I'll put you down a little bit farther since you just gave me the form in case you're not fully prepared. Dian Avriett will be next after Mr. Dillahunty.

MR. DILLAHUNTY: My name -- excuse me. My name is Oscar Dillahunty. I'm from Lufkin, Texas. My wife told me not to get up here -- and a few of the -- a couple attorneys -- because I put my foot in my mouth, but Mrs. Donovan, I recognize everything you say and to those of you who appreciate what -- I personally think you need to build Rockland Dam and I don't know about the other one. It's been on the books since 1960, the commitment for it. The Corp of Engineers have it. We are going to have to supply not only ourselves with water, but the projections he was talking about could be underestimated.

Here again, you can float Sam Rayburn, you can still float the upper end of the Neches River, if that's what you want to do, paddle a canoe. People are a lot more important than floating down a river. These are just one of the few things, but I wasn't going to talk. I'm sure I'm be chastised for this, but I do think you need to build this thing and be that way. Thank you very much.

MR. ALDERS: Thank you, Mr. Dillahunty. Dian Avriett. I hope I'm pronouncing your name --

06:56PM MS. AVRIETT: Close enough.

MR. ALDERS: Close enough. And then, Bruce Drury, I'll have you in the queue after Dian.

MS. AVRIETT: I'm Dian Avriett. I represent the 200 plus members of the Pineywoods Sierra 06:56PM Group. The comments of the group officially will be submitted in writing. I'm speaking tonight strictly from a personal level.

There's two things with the plan that I disagree with strongly; one, it's Fastrill Reservoir. 06:56PM The other one is the Rockland Dam. It will flood critical wildlife habitat. We've got wildlife coming back into this area -- black bear, Cougar. The bald eagle has some back. The otter has come back. I have floated that area of the river and seen wildlife that I 06:56PM did not see as a child here. That area is critical for this wildlife habitat. We need to preserve that for our children and our grandchildren.

One of the problems, too, with those dams, it will also flood farm lands, it will flood several 06:57PM historical sites, either one of them, and it would flood one State park. All of that needs to be preserved for future generations.

Another problem with it, it's too great a cost to the taxpayers when it's not needed. Conservation is the answer. As Bonnie said, Dallas alone is twice the average state per capita consumption of water. They need to learn to conserve. We need to look at both industrial and residential conservation rather than looking at more water, more water, more water.

The Neches River that these two dams are proposed on is one of the finest old bottomland hardwood areas left in East Texas. It's one of the only areas left in East Texas, and it deserves to be protected when water can be gotten from other ground water sources that are in existence at if they're better utilized. Thank you.

MR. ALDERS: Thank you, Ms. Avriett. Bruce Drury. And then next will be Richard LeTourneau. Bruce Drury.

MR. DRURY: Good evening. My name is Bruce Drury. I represent the Big Thicket Association. I am not going to repeat what Bonnie and Dian said. I will endorse what they said, but just to add a few more things. The Big Thicket National Preserve is a truly wonderful bit of property. It has been designated a United Nations biosphere. It's really a national treasure, natural treasure; and it needs to be saved and nurtured.

06:59PM Building two dams and creating a large blockage of the Neches River will not do that. It will dry it out. The Big Thicket depends upon water, especially, as was mentioned, the bottomland hardwood areas; and these two dams will very much restrict the 06:59PM amount of water. Bottomland hardwoods also depend to a stern -- need to a certain extent occasional flooding, and building the Rockland Dam and the Fastrill Dam will probably end that completely.

The Neches needs to be preserved. It is 06:59PM one of the last natural wild rivers in Texas. It -- the -- I would hope that this particular plan ends up supporting the -- well, excuse me -- opposing the Fastrill Dam and the Rockland Dam and supporting the creation of the North Neches Natural Wildlife Refuge and 07:00PM also the now proposed -- or excuse me -- embryonic stages, the state park in the middle Neches. The Neches River has to be preserved, and those two reservoirs would do just the opposite. Thank you.

MR. ALDERS: Thank you, Mr. Drury. Richard 07:00PM LeTourneau. And he will be followed by Robert Truss, Jr.

MR. LETOURNEAU: Hello. My name is Richard LeTourneau. I live outside of Hallsville in Harrison County. I have served on the Region D Water Planning Group since 1998, and I also served on the State Water Conservation Implementation Task Force.

Region D does not have any recognized needs for additional surface water. Apparently the Dallas/Fort Worth Metroplex has some qualified needs. The Sabine River Authority of Texas has offered to totally meet the needs of DFW for the next 50 years and beyond by selling water already captured and impounded in the Toledo Bend Reservoir.

The Sabine River Authority of Texas already has available over twice the yearly needs of Dallas/Fort Worth for the next 50 years. The Sabine River Authority of Louisiana has an equivalent amount that they are also willing to sell to the Dallas/Fort Worth area.

The number that the Sabine River Authority of Texas has given us, both the Sabine River Authority of Texas and the Sabine River Authority of Louisiana has, is 1.04 million acre feet a year available.

The big issue is the cost of water to Dallas/Fort Worth. Dallas/Fort Worth believes, while being the most wasteful water user in the state and having a very poor record in water conservation, that they are eternally entitled to the cheapest water available, regardless of the cost to fellow Texans. If Fastrill were to be built, the cost to the people of Region I, as well as adjoining regions, would be enormous. The land loss to the footprint of Fastrill would be seized through imminent domain. If Fastrill is comparable to the formerly proposed Waters Bluff Reservoir in Smith and Wood Counties, the mitigation required would be between 169,000 and 550,000 acres. That is land that would be seized through imminent domain. Dallas/Fort Worth doesn't want you to know the true cost of the mitigation until after all approvals and required permits are secured.

The footprint of Fastrill is very unique and, indeed, very rare hardwood bottomland. It is so unique and rare that the U.S. Fish & Wildlife Service has proposed a National Wildlife Refuge to preserve a section of this unique forest and the flora and fauna that depend on this large hardwood bottomland for survival.

This badly-needed refuge would be created by buying land only from willing sellers. There would be no mitigation and seizure of lands resulting from the creation of the refuge as there would be by Federal law if this unneeded reservoir were to be built.

Existing surface water is currently available to Dallas/Fort Worth. Dallas/Fort Worth wants cheap water regardless of the cost to you. All of East Texas would be much better served by the creation of this much-needed wildlife refuge which would benefit our declining and increasingly rare species of wildlife, as well as the increasing number of us that care, appreciate, and enjoy seeing and being part of what we hold so dear.

Additional reservoirs on the Neches River are not the answer. Conservation, common sense, and increased yields through infrastructure improvements to what currently exists is a much better choice.

MR. ALDERS: Thank you, Mr. LeTourneau. Robert Truss, Jr. And he'll be followed by Dave Peterson.

MR. TRUSS: I have no prepared notes. In fact, I wasn't really asked and told about this meeting until last night. My name is Robert E. Truss, Jr. I represent the local Pineywoods Audubon Society. I'm the current president. When I was told about this meeting last night, to be quite honest, I kind of got depressed. We had our -- we had our meeting back in the spring and was told about the wildlife refuge and then also told also about the dams. To tell you the truth, I haven't looked at the information because it depresses the you know what out of me. It concerns me because it seems like if this was going to be a solution to Dallas' water problems, I might feel better; but the thing that sickens me is it probably wouldn't be. How much is enough?

For 30 years our Audubon society has been in effect, through we have documented the Christmas counts and the other work of our members, the fact that our habitat is deteriorating and this would kill the Big Thicket. Some people think it would be left alone, but it won't be. And regardless of grandchildren, regardless of people, other things matter than people. And it's very important, I think, that everyone realizes that. Thank you.

MR. ALDERS: Thank you, Mr. Truss. Dave Peterson. And he'll be followed by Eugene Decker.

MR. PETERSON: Thank you. I'm Dave Peterson from Pollok, and quickly I'm going to talk about -- we already know the ecological cost. Many of the reservoirs are already built in the way of documents in front of you. Just to show you that I'm not -- this isn't my opinion, there are studies.

Battle fish, for the most part, is gone.

This is a Parks and Wildlife study. One that most people don't know about -- that kind of implies to me that somebody hasn't done their homework -- is the Sabine shiner. It's the rarest fish in our area. Why is it thriving in downtown Nacogdoches and La Nana Creek? Because there still remains at least 13 miles of unimpeded creek for stream ridge, because they require a minimum of 13 miles.

I just received this yesterday. The American eel, once a very common species of fish, and the Wildlife Service is going through the initial process of listing the species as endangered. You find them all of the way up to Natchitoches, Louisiana, where they haven't dammed everything up yet. You won't find them here anywhere north of Lake Houston.

We talk about the things that come with reservoirs as a by-product, a lot of exotic invasion. Then the people that have built the reservoirs come crying to the resource agencies, "Come out here and treat this Hydrilla ton, take care of this giant Salvinia."

There is a very aggressive fish that comes from Asia called the Giant Snakehead. It has already been found in the Carolinas. Once you get it here, you're not going to get rid of it. When you change the ecology artificially, you get a whole other series of problems, most of which are not easily handled or handled at all.

The analysis earlier seemed like there was a lot of thought and detail put into it; but when you came to not being able to describe any unique stream segments, I thought that there wasn't hardly any detail put in that, particularly when I know that there are streams in and around here that have as many as 50 species in them. Not many people know that the southern U.S. has the most fish diversity in the whole world.

In addition to that, the Neches River, there was a national crayfish or crawfish guru, Morton Hobbs, Jr. -- he's not a Dr. Seuss character -- came down in the early Nineties just to poke around and he immediately found three new species, one of which is named Procambarus nechesae. He was amazed at the diversity of the Neches River and never expected to find it here.

Those are things that you have to contend with. There are a lot of unique things here that you just can't cover up with water without addressing. That's why I find it very hard to believe that there could be no defined stream segment in this area.

I realize a lot of water stream planners don't value or -- do not value the ecologic reasons for not building reservoirs. So, maybe I can appeal to you on other terms like pollution. We have mercury health advisories on every major and minor reservoir in East Texas, including those that are nature, where we thought they might turn up clean but they didn't. We also have erosion, major erosion problems around the lake, particularly Rayburn, which we cannot do anything about. There's no money to do anything about it. These are progressive problems.

Also, I find it hard to believe that all this analysis for the need for more reservoirs, if you look at a highway map, you will notice that around Dallas there are nine major reservoirs right within and around the city and if you go out as far as the radius of what would be Fastrill, there's 20 more. I find it have I hard to believe that they need a reservoir farther out than that.

Now, if you look at Tyler, your plans are not going to make it without a reservoir. There are three reservoirs right very close to town. Now, in many other states, when I travel, people ask me, "What is going on down there with a reservoir mentality? And I say, you know, "Don't ask me. It's a conquering mentality, as far as I can tell, to dam up every last major waterway."

Now, how are other states, such as Arizona and Nevada, with much more growth than Texas -- 40 percent Arizona, over 50 in Nevada. Arizona has a law enacted by Governor Bruce Babbitt, way back, no more new reservoirs. How are they making it with all of this population growth? There are still all kinds of green lawns. There is all kinds of new pools going in, new homes. Sure, they may get in trouble in the future; but I cannot believe that we need all these additional reservoirs in addition to what we have and other states around us are not following the same path. And I don't think you can call that irresponsible, either, in their planning. I believe something has gone wrong here.

Now, if you look at the economic cost, what about a wildlife refuge? That's where you get a whole different group of users than another reservoir where you are not going to get any group of users. You are probably not going to get many additional people. People who use the reservoirs are just going to move over to the new reservoir. You're not going to get a whole different economic user where you will with a National Wildlife Refuge.

The loss of the State Railroad Park is just written off like that, no big deal; we can take that;

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the people don't have to have that. The loss of national forest for Rockland, well, that's ours to take. That land belongs to Americans. That doesn't just belong to Texans, and they think they can just flood it. Look at all the national forest land that's been lost already to three major reservoirs, and I know personally we've had to give that land over to the river authorities that's been flooded.

Another thing that people don't consider is when you have a project, most of these big reservoirs are federally funded or have some kind of Federal funding. You cannot with Federal funds impasse another Federal trust resource or other federally -- or cost -- amount to the cost of other Federal funds which all the sediment that is trapped in reservoirs is amounting to huge beach erosion which means McFaddin National Wildlife Refuge, State Highway 87 have fallen into the gulf twice, only to rebuild it again. That's because of all the sediment discharge that's trapped in these reservoirs.

Now, building future reservoirs, you're going to have to contend with the cost of violating other Federal trust resources, which is supposedly illegal.

So, I would like to say, in closing, that I think the thrust is meant to dam up every last major flowing stream and the people that value that, there's no contest involved to let them have anything and I just think that's not responsible.

MR. ALDERS: Thank you, Mr. Peterson. And I remind all our presenters in the audience that if you would like to submit written testimony, follow up your remarks, you're most welcome to. Mr. Decker. And then Mary Decker will succeed Mr. Dick Decker.

MR. DECKER: Thank you. I was at the meeting in Tyler last night. So, I will cut my remarks down to three minutes or less. There are essentially two things that I would like to say. One is that several years ago, 25 years ago, I was involved with some agricultural projects in Haiti and also did some -- a tour with an agricultural group in Senegal and Mauritania in West Africa. And the thing that struck me was that these are civilizations that are absolutely on the rocks. They're dying. They're dead. Haiti, I don't think, has any future left and, yet, at the time of the American revolution, it had a GNP greater than that of all North America combined. It was the richest overseas colony that any European power possessed.

A lot of them happened to them, but the main thing that happened to them was they did not take care of their environment. They cut down their trees. They used the agriculture that was too intensive for their land, and the result is they lost it. The same thing in this part of Senegal and Mauritania, where the Sahara was going south at several miles a year.

07:15PM

The gainery of the Roman empire, for example, was North Africa. Keep in mind that when Jacob went down from Canaan to get food, he went to Egypt. All these were areas that were one time very, very rich; but they did not take care of the environment.

07:16PM

And I see over and over again that we're doing the same thing. We're building these huge lakes like Lake Powell, Lake Meed. They're all going down. Lakes in Russia, the same thing. Lakes in China, same thing. Lakes are only a temporary solution. When we destroy the source that nourishes those lakes, then we destroy the lakes and ourselves with them.

07:16PM

The second thing is that if you look at all these reservoirs around Dallas and you take into account that there are foreign investors that are buying up water rights all over the United States -- for example, the municipal company of Atlanta, Georgia, is now British owned. I think also Milwaukee, Wisconsin. Look at a website called polarisinstitute.org, and they talk about that. Look also at a website called

07:16PM

07:17PM

corridorwatch.org which deals with the trans-Texas corridor which is going to be built and operated by a company from Spain, and it will also carry water.

I'm not making an accusation, but I would hope that some investigative reporters would see if there is a connection between Dallas' accumulation of water and that trans-Texas corridor because it may be that this water is going to be sold to outside interests. I don't know.

And I would like to find out if there's any foreign money involved in this. Basically we have a great treasure here that I, growing up here, didn't realize was a treasure, but it is. And let's please don't lose it because these wild areas are not just pristine things to look at. They're the source of where life regenerates and we've got to have them.

MR. ALDERS: Thank you, Mr. Decker. Mary Decker. And Mary will be followed by Gena Donovan.

MS. DECKER: My name is Mary Decker. I'm from Jacksonville, which is in Cherokee County, and we're part of ground-zero if the Fastrill Reservoir comes in. And I want to tell you that as people of our county learn more about it, they're more and more opposed to the idea of the Fastrill Reservoir. I'm sorry to say that our elected officials, such as our commissioners court and the Jacksonville city council, voted to support this Fastrill Reservoir, but they never gave us a really good reason why and they have not really bothered to study the issue of what would happen to the environment and even to some of the things that they would be involved if the Fastrill Reservoir has to come in.

We all went to Arlington the other day and we were absolutely appalled by Dallas' sense that it has an entitlement to our water and we were almost dizzy by the map of all of the reservoirs that they have already on the map. And I hope that you'll look at a letter that your Representative Roy Blake wrote to the Dallas officials back in March of this year in which he urged extreme caution and to look at the reservoirs they already have in place and to look at the fact that it would cause irreparable damage to the environment and to a lot of lives of people if this Fastrill Reservoir went in.

So, anyway, thank you all very much and I appreciate especially Mr. LeTourneau's remarks. I think you said exactly what we need to say in Anderson and Cherokee Counties.

MR. ALDERS: Thank you, Mr. Decker. Following Ms. Donovan is Gary Gibson.

07:20PM MS. GINA DONOVAN: David, please humor me this evening, as I will be repeating. One 17-foot Roman aluminum canoe, $900; one tent, sleeping bag, and toothbrush, $100; one ice chest full of sandwiches and Coke, $25; nights spent under the stars on the sandy beaches of the Neches River, priceless.

07:20PM I am Gina Donovan, director of the Neches River Protection Initiative. Let it be known that our organization is opposed to both the Fastrill and Rockland Reservoir projects and any other water development project on the Neches River.

07:21PM The water from the proposed Fastrill Reservoir and Rockland Reservoir is not needed. As of 2004, the State of Texas had 204 major reservoirs. That is up 196 reservoirs from 1913. That is more than enough water to fulfill the needs of east and Central Texas.

07:21PM The City of Dallas is interested in water rights from the Fastrill project to be located between Palestine and Jacksonville, Texas; however, the water from Fastrill is not to meet the projected demand but earmarked only as a reserve supply.

07:22PM The City of Dallas' per person water consumption per day is 240 gallons; and, contrary to popular belief, this figure does not include industrial consumption. Again, Dallas' per person water consumption per day is 240 gallons. You may say, "No big deal." Let's compare to San Antonio and Austin at 155 gallons per person per day. Okay. Still not too bad. Let's compare that a little closer to home. The City of Lufkin uses approximately 120 gallons per person per day, a huge difference from 240 gallons.

According to its own records, 60 to 65 percent of the City of Dallas' water consumption during the summer goes to water residents' yards. Future projections for Dallas' water use show its per capita consumption continue to be dramatically greater than the rest of the state for the next 50 years.

Fastrill and Rockland Reservoir proponents contend that reservoir construction and the impalement of water does no harm to ecosystems downstream. This statement is absolutely false. When the flow of freshwater is diminished, biological performances decline.

This retardation of freshwater flows into the Sabine Lake Estuary would upset the delicate balance of fresh and saltwater vital to the reproduction of marine species. According to the Texas Parks & Wildlife Department, the Sabine Lake Estuary requires 9.6 million acre feet of freshwater per year to maintain that delicate balance. Need I remind you that recreational and commercial fishing off of the Gulf Coast is a multi-million dollar enterprise in the State of Texas. If Fastrill or Rockland Reservoirs are constructed, the slowing of freshwater flows would detrimentally affect the international biosphere Big Thicket National Preserve which is dependent upon the flow -- the flood flows of the Neches River to maintain its ecologically diverse ecosystem.

07:24PM

In essence, if Fastrill or Rockland Reservoirs are constructed, the Big Thicket National Preserve would essentially dry up and the recreational and commercial fishing industries off the eastern Gulf Coast would be dramatically in peril. The Region I Water Planning Group has the power to wipe out, has the power to wipe out existing economic assets such as the Texas State Historical Railroad, the Big Thicket National Preserve, and the eastern Gulf Coast fishing and shrimp industries, only to quench the unimaginable greed of only a few.

It looks like the group would want to protect private property, our national, historical, and culture heritage, instead of condemning our East Texas lands to enable Central Texas to continue their wasteful water habits.

Again, the Neches River Protection Initiative opposes any new reservoirs or any type of water development projects on the Neches River.

MR. ALDERS: Thank you, Gina. Following Mr. Gibson will be Lynn Gibson.

MR. GIBSON: My name is Gary Gibson. I'm from Palestine, Texas. I've lived there all of my life. Excuse me if I get a little nervous talking in front of a bunch of people, but it's not something I do much of, but I'm very passionate about this.

I have land up there in Anderson County that's been in my family since the mid-1800's. I am fourth, fifth generation, I guess, now, probably fifth or sixth generation down the line; and I -- my wife and I have put this land together. I bought it from my aunt, my mother's part. Only 80 acres of the 160 acres that I own was my granddaddy's, but the rest of the land I've been on all my life.

And by the grace of God we've been able to put this together in the last 10 to 15 years. Our land is working land. It's been in the family. It's farm land, way back in the 1800's and the early 1900's, up to the mid-1900's, I believe, until my granddaddy moved to town. Since that time, it has been under management of timber.

My granddaddy always told me, "Don't cut your hardwoods." And right now I have got some of the land that I have -- about approximately 25 acres off my granddaddy's side that I have already sold the timber off of, but I'm just cutting it selectively, the pine timber only, none of the oak trees whatsoever. We did the same thing on a 53-acre tract. That's how we bought it, but I don't intend to cut any more in my lifetime. I'm giving this to my kids.

Everybody needs to pick up one of these Texas Parks & Wildlife magazines. You need to subscribe to it. It will tell you what's going on in our state. I couldn't find the one about the Texas rivers, what we're doing to the river systems; but if we have two lakes, two more lakes on this Neches River, you don't have a river anymore. All you have is lakes. So, what are we going to do? We're going to let it just -- the ecosystem be destroyed? So goes the ecosystem; so goes us. And it's been proved every day by scientists, what's happening to all our animal life and amphibian life. If we're doing it to them, we're doing it to ourselves. All the DDT that was being put into the water back whenever the bald eagles were about to go extinct, when they couldn't raise their eggs because they couldn't sit on them. They took the DDT out. So, whatever goes in rivers could go in lakes, too; and I have a lot of problems with it.

I do not want to see the lake built. I am supporting the refuge. Even though my land is not going to be inside the refuge area, I support it; but if this lake comes in, what the man was talking about, through mitigation -- and this is what I have talked to, a man that they're fighting the lake up there on the other side of Dallas, up toward the border, and there was a retired major that I talked to on the phone and he said, "Get with your Congressman, your senators, and tell everybody you do not want any more lakes."

They're going to take two to three times more land than what they need. That's going to destroy my land. It's going to take it, and they're not going to pay me what it's worth.

My wife has a friend that lost land, 80 acres, in the Richland Chambers Reservoir; and they didn't get half of what they paid for it. I wouldn't get -- the same treatment in mine is what I would get.

And do you ever go up and down the roads? Do you see water bottles, like this man has right here, half fall, three quarters full? People are just chunking it away. People don't care. They don't care about conserving water. And I pick them up around my house all the time, up in Palestine.

07:30PM I live in town. I'm a country boy raised in town. I've been on that river. I haven't been able to get on the river for the last 10 or 15 years, but if that refuge goes in by the U.S. Fish & Wildlife, I see a chance for me to get back on it. I have three grandsons at the moment. I have another grandchild on the way. Don't know what it is, but I have three grandsons and I would love to be able to carry them down there.

07:30PM Our Palestine, Anderson County, they don't have the money to fund new roads that would have to be put up around that lake. They don't have the money. They don't have the police protection, the sheriff's department protection. We're having struggles right now, and they wouldn't have all that. 07:30PM

And like the other man said, Dallas is surrounded by lakes. They don't need any more. And four of these people, four of these people on the Upper Neches River Authority, that's all there is, four board members, are the ones that put this to Dallas. 07:31PM One of them is an engineer. So, I ask you, you know. I think it's greed. I think there's a lot of money that people see can be made nowadays if they can take your land.

I'm a poor man. My granddaddy taught me. 07:31PM He taught me the value of a dollar. He taught me the value of respect to other people and I have respect for people, but you cannot go around taking people's land and destroying our ecosystem.

It scares me to death to what's going to happen. All you've God to do is watch TV, and you can see our oceans are rising. We're losing our polar systems. What's causing it? They tell you what's causing it. The global warming is what is causing it because we're cutting down our forests. It's easy to see where it's going. So, I think we need to protect something.

There's plenty of things a lot of people can learn down in there. I know of three duck roosts myself. And I know there's a lot of you people. I can look at you. I can tell they're hunters. There are three duck roosts that I've been on on that Neches River. They're still on there. Even though some of it's on Temple land, the roosts are still there. If we put it under water, they're gone; and then you're going to flood it out for all the wildlife, too.

And we -- like they said, there are bears and there are cougars coming back and I think the food chain, it all goes around and we're at the top of it. So, we need to protect what we can. Thank you.

MR. ALDERS: Thank you, Mr. Gibson. After

Ms. Gibson will be Christopher Jones and then John Matthews.

MS. GIBSON: I'm so smart, I wore my ID. My husband picked me up from work in Rusk today so that I could come with him and I wasn't going to say but just a couple of things and I wrote a couple of things down in the truck, but as I sat here, I've written a whole page.

I'm limited to three minutes. Okay? So, I'm sorry. I was reading a Texas Parks & Wildlife on the way over here, and in the June of 2004 issue, Dana Joseph -- I believe is her name; I couldn't read it very well because it's in a fancy print -- she said, "Those who don't learn from history are condemned to repeat it." Do you agree?

UNIDENTIFIED SPEAKER: Amen.

MS. GIBSON: Well, you have to learn from the mistakes of others, also. She also said, "Those who don't preserve history are destined to lose its knowledge." The Neches River is full of history. The banks of the Neches River are full of history. There's so much there that I learned as a child. My grandfather called my sisters and me his boys. We were his only granddaughters, and we got to go hunting with the boys and fishing with the boys. So, I camped as much as a boy would.

Everyone needs to tell everyone here and everyone you talk to and everyone that you talk to talks to needs to tell their children, grandchildren, friends, neighbors, everyone, write your representatives, the governor, U.S. Fish & Wildlife Department, tell them how they feel.

If anybody wants some lessons on how to conserve water, I would be happy to show them. I grew up in the country. You don't just let all your water run into the sewer system. You have part of it -- your gray water goes in as your irrigation. You water your garden with your wash water. Okay? I know things from the country a lot of you must know. Dallas doesn't -- those people didn't grow up knowing how to take care of themselves.

There's a friend of mine that I carpool with at times, and she's from Fort Worth. We ride the Highway 84 between Palestine and Rusk; and she said, "I cannot believe how many trees are in town." Well, guess who has more pollution? It's not us. And we have the trees in the country; and as long as we keep the trees, the hardwoods on the Neches River, we're going to have more oxygen than those people. We're going to have less pollution, less red days on the scale for your staying inside.

There's another issue that is just as important and I heard one man comment on it and he said, "We need to dam up this river so that some people can have some water." Well, guess what? Those people can -- they're important, but we're just as important as they are. South and East Texans are just as important as the Dallas residents. We're just as important. We need the Neches River just as badly as they do. They do not need twice as much water a day as we do.

Don't sell ourselves short. Don't let them take it away from us. Write, talk, let the representatives know. Write the governor. Write the president. It doesn't matter. Tell somebody and pass it on.

MR. ALDERS: Thank you, Ms. Gibson. Christopher Jones. And then Mr. Jones will be followed by Mr. Matthews.

MR. JONES: My name is Christopher Jones, and I represent the Texas Committee on Natural Resources. Impounding any more stream segments of the Neches River will injure and jeopardize the ecologic integrity of the entire drainage system, all of the way down to the coast of Beaumont, Texas. Necessary freshwater influx will, of course, decrease but seasonally flooded oxbow lakes, horseshoe lakes will eventually dry up below the proposed Fastrill Reservoir or the Rockwall -- Rockland -- sorry -- footprint.

07:38PM The Big Slew wilderness area in Davy Crockett National Forest, which is dependent on the Neches River's seasonal floods, will dry up and fill with sediment since Fastrill Reservoir will control the upstream natural flooding regime. If Rockland Reservoir is created, we will lose the Upland Island Wilderness 07:39PM Area.

Sloughs and oxbow lakes are dependent upon natural flood events. Importantly, building Fastrill Reservoir is unnecessary. Future water demands of the Dallas/Fort Worth metroplex can be met by current 07:39PM available water supplies already in existence, such as Lake Texoma, Toledo Bend, and the nine other reservoirs that presently exist in and around the DFW metroplex.

Of course, hunters and fishermen of East Texas oppose Fastrill Reservoir. These people hunt, 07:39PM trap, and fish in the bottomland hardwoods of the Neches River, in the footprint; and they will lose these recreational opportunities if the reservoir is created.

The Texas Committee on National Resources reminds Region I, the Texas Water Development Board, and 07:39PM the professional engineers in this room that by impounding the Neches River, you are personally responsible for destroying East Texas, our natural heritage, our history, our culture, and our dwindling way of life.

07:40PM MR. ALDERS: Thank you, Mr. Jones. Our final presenter this evening, commenter, is John Matthews.

MR. MATTHEWS: Throughout my life I've been involved primarily in three different aspects of employment. 07:40PM I was a school teacher for 26 years, teaching science to kids; I was a lieutenant colonel in the Army Reserve for many years, evaluating, training, testing other units around the United States; and for the last 10 years, I've been a real estate broker and appraiser in Jasper County. 07:41PM

In all three of those positions, I've been actively involved in evaluating and appraising different aspects of what I do for a living; and as an observer in this audience today, I've been doing a lot of observing and listening and evaluating and appraising. 07:41PM As a realtor I go back to an old saying, "What is the best use of the land?" And I think that's what, you know -- when we get right down to it tonight, what is the best use of the land that would be occupied by Fastrill or the Rockland Dam Reservoirs? 07:41PM

We've heard some extremely eloquent people tonight. I couldn't begin to say and repeat what all you all have talked about in favor of preserving these areas in their natural state. I think what we just need to again look at is what is the best use of the land.

07:42PM

I'll ask you that. Is the best use of this land to be used for sources of water for Dallas?

UNIDENTIFIED SPEAKERS: No, no.

MR. MATTHEWS: "Yes" or "no"?

07:42PM

UNIDENTIFIED SPEAKERS: No, no.

MR. MATTHEWS: Is the best use of this land to be preserved as it has been for thousands of years so that people for thousands of years in the future can enjoy it and that unique ecosystems can be maintained? "Yes" or "no"?

07:42PM

UNIDENTIFIED SPEAKERS: Yes.

MR. MATTHEWS: Thank you.

MR. ALDERS: Thank you, Mr. Matthews. Well, if there are no other registration forms that have been filled out, I'm assuming that that is all that we will -- those are the only presenters that we will hear from this evening.

07:43PM

Are there any -- well, I'll just note that there are still a few CD's left here, if you would like to take a copy of the plans. It is a very detailed

07:43PM

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plan. So, it is not casual reading; but if you want the documentation that details the numbers behind the plan, those numbers are in there.

Once again, thanks to the City of Nacogdoches for hosting us this evening and thank you all for being here this evening, for participating in this important work of planning for our water supplies and demands for the next 50 years, and for participating in the development of public policy for the State of Texas and the East Texas region.

We are now recessed for this public hearing until tomorrow evening at 6:00 p.m. at the Jefferson County courthouse.

(The proceedings were concluded.)

CERTIFICATE OF REPORTER

I, Whitney Durham Garza, CSR, RPR, CRR, for the State of Texas, do hereby certify that the foregoing transcript is a true, accurate, and complete record.

I further certify that I am neither related to nor counsel for any party to the cause pending or interested in the events thereof.

Certified to by me on this the 8th day of August, 2005.

Whitney Garza

Whitney Durham Garza, CSR, RPR, CRR
Expiration Date: 12-31-05
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Hearing

Texas Water Development Board

East Texas Regional Water Planning Group

Tyler, Texas

July 12, 2005

COPY

Taken before Dana R. Smelley, CSR in and for the State of Texas, RMR, CRR, reported by machine shorthand.

MR. ALDERS: I'm going to call the hearing to order and welcome you to this first session of the public hearing of the East Texas Regional Water Planning Group Initially Prepared Plan. Now, it's a culmination of five years of work, of planning, of trying to determine the next 50 years for the East Texas region in terms of population, in terms of water demands and available water supplies in the East Texas region and that planning has been conducted by the member of the East Texas Regional Water Planning Group, and our consultant team which is headed by Gary Graham of Schaumburg and Polk from whom you'll be hearing in a moment.

I want to introduce first this evening the members of the East Texas Regional Water Planning Group who are in attendance. If my eyes are sharp enough and I haven't missed anyone, I see that there are three of us in attendance this evening, myself and Tom Mallory back there and David Brock as well. I think David offices in this facility and is responsible for us having this facility to use this evening. So David, please accept our thanks and tell whatever other powers that be, there are, that we appreciate their hospitality tonight.

Also I want to introduce the Deep East

Texas Council of Governments, administers and does most of the clerical work and administrative work related to the East Texas Regional Water Planning effort and I want to introduce Gary Hanlon at DETCOG who is responsible for getting the meeting set up tonight, along with David Brock.

I'll remind you that this is the first of three sessions. Tomorrow evening we'll be in Nacogdoches and then Thursday evening in Beaumont, at which time after the Beaumont meeting the hearing will officially be adjourned.

The agenda which I hope you have picked up is fairly simple and straightforward. My opening remarks are rapidly coming to an end and I'll introduce Gary. If you would like to make public comment this evening relating to the plan, we invite you to do so. We would also invite you to give written testimony if you would like.

When I asked a few minutes ago how many were going to be offering public comment, there was at that time only one. How many do we have? We have a number, in fact probably almost a dozen. I think that I'll -- we had originally talked about limiting public comment to, say, three minutes and since there are only about a dozen here, if that number doesn't inflate in the next 15 minutes, then I will extend that limit to about five minutes. Does that sound acceptable? That will work? We're not trying -- in fact, you can submit as long written testimony as you please, but if you'd like, if you can summarize it in five minutes or less, I think we would all appreciate that.

I will give you some ground rules regarding the public comment period. Because this is a political subdivision of the State of Texas and this meeting is covered by the Public Meeting, Records Open Meeting laws, all the comments this evening are being transcribed.

And I have not met you. So I apologize. I'd introduce you. But I would ask that you please use the microphone and to give your full name at the outset of your comment. Give your full name and then hold the microphone and use it as you make public comment and our stenographer would greatly appreciate that.

Thank you for being here. Well, again welcome. It's my privilege to call a man who has worked most diligently in getting this plan to its present state. He has worked, in fact now, this is the second planning cycle. Schaumburg and Polk have been the consultants to our region developing this plan. So he knows, I think, the water situation in East Texas better than any other single individual from Smith County on the north to Jefferson County to the south. Schaumburg and Polk engineers, let me welcome Gary Graham. Gary?

MR. GRAHAM: Thank you, David. I would like to introduce a couple of people who have worked with me on this effort. Before I go into a very quick synopsis of some of the work that we've accomplished, this is not going to be a detailed presentation by any stretch of the imagination, but it should give you a flavor for some of the tasks that we've been charged with.

There are some chapters within the Regional Water Planning that I have not included in this brief synopsis, but I don't know that there was great reason to go into some of the more technical aspects as a part of this presentation.

Here also tonight is Simone Kiel with Freese Nichols Associates. Simone has worked on this plan since the inception and has done a fabulous job on this. Also here with us tonight is Bob Bowman from Lufkin. Gary, do you want to give us some more volume to this thing?

UNIDENTIFIED SPEAKER: Put it closer to your mouth.

MR. GRAHAM: We'll try and correct that

problem. Is that any better? Does that work?

Okay. With those introductions being made, I'll give a brief synopsis of some of our work. As you know, the State of Texas has been divided into 16 planning regions. Our region is the far East Texas region, East Texas planning region as shown in the light blue here. This is a little more close-up of our planning region. It takes in all of the counties and parts of four others. In this particular view the yellow represents the Gulf Coast Aquifer, groundwater aquifer. The red is part of the Carrizo-Wilcox, and the shaded or crosshatched red is the south of the Carrizo-Wilcox. You can also see most of the major reservoirs and cities in this particular view.

All of the regional plans have a similar organization and those are what you see. Their organization is what you see on the screen now. The first chapter is a description of the region, the second presents population and water demands for the region during the planning period, the third develops available water supplies, and then Chapter 4 define what water needs you have and Water Management Strategies necessary to meet those needs, Chapter 5 discusses impacts of Water Management Strategies on water quality, Chapter 6 is model water conservation plans, Chapter 7 is a recitation as it describes how and why the plan is consistent with the protection of state resources. Chapter 8 discusses action taken on unique stream segments and reservoir sites, and Chapter 9 discusses infrastructure financing.

Infrastructure financing was not presented as a part of the initially prepared plan. There was some dispensation allowed all the regions on that particular part of the plan because of scheduling and review and so forth. So that will be prepared soon.

The general schedule for completion of this work from this point forward, this plan was submitted to Water Development Board on June the 1st as was required. We published notice of this meeting, giving 30-day notice of this meeting early in June and, of course, we're holding this public hearing here and in Nacogdoches and in Beaumont tonight, tomorrow night and on the 14th.

The Water Development Board is supposed to have their comments as the review agency to us by October 1st. Public comments are due to us 60 days after this public hearing. So you have another 60 days from the 14th to submit written comment on this plan to us. This is not your only opportunity to do so.

Federal and state agencies that will be

reviewing the plan in addition to the Water Development Board have 120 days from the date of the publication of public notice. And then once we have all those comments -- we should have those in hand by mid-October -- we will need to respond to those comments and submit a final plan prior to first of the year or thereabouts.

Just for review, there are six categories of water use that are considered beneficial uses of water and that's what all these plans discuss, these similar six beneficial uses of water and those uses are manufacturing, municipal use of water, irrigation, steam and electric supplies, mining uses, and livestock.

Population numbers that we have were for the most part developed by the State Data Center and Texas Water Development Board and then given to the regions and then we were able to massage those numbers to a very limited degree. And then those numbers were approved by the Water Development Board by action over a year ago.

Water demands, per capita usage is established by historical number. Irrigation is established in this particular planning cycle by crop type. Steam and electric demand was established by a joint study between the Texas Water Development Board and the Electrical Generating Association here in Texas. Manufacturing water use is established by historical use and economic projections performed by the Water Development Board and I think some of those, that work was also done by contract. Mining, which also includes water use for all production was established by historical use as is livestock. Livestock is very difficult to get a handle on because most of that is very localized supply.

Surface water availability numbers were established by water availability studies using the Water Rights Allocation program, Run No. 3, which anticipate absolutely no return flows. And the water rights, Water Availability Model is a water rights counting package. And so the dates of priority for the various water rights are the basis of this program.

In this planning cycle we did have available to us Groundwater Availability Models but they were not available to us until the very end of the planning cycle and those will be improved for the next planning cycle that's undertaken.

Just some very quick numbers as far as water availability for reservoirs within our region. Toledo Bend, Sabine River Authority has water rights to

750,000 acre-feet and the Rayburn Steinhagen system, Lower Neches Valley Authority has 820,000 acre-feet. The Upper Neches River Municipal Water Authority has 228,235 acre-feet, Lake Palestine. And then we have smaller lakes that also provide us with a large amount of surface water supporting reservoirs.

There are some significant unpermitted yields, the biggest of those at Toledo Bend. There's almost 290,000 acre-feet of water that's not permitted to anyone in Toledo Bend. Now, these numbers that we're talking about for Toledo Bend are Texas' half of the yield in that reservoir. The State of Louisiana has the same amount of water in that reservoir, also.

The water that has been identified for use to meet needs within the planning region that are new from now until the end of the planning period are as what you see on the board here. We would use by 2060 an additional 13,500 acre-feet of groundwater. We will use an additional 709,000 acre-feet of surface waterm, a large portion of that being water for LMDA, half a million acre-feet potentially for liquefied natural gas projects that have recently come to likelihood, if you will, in the lower portion of our region, 1100 acre-feet from stock ponds, 12,600 from voluntary distribution, 500 in indirect reuse and almost 1900 acre-feet from water conservation. That would be active water conservation as opposed to passive.

Passive water conservation will provide about 20,600 acre-feet of water in Region I by 2060.

This is a bar graph of the population within our region by county. You will notice the red portion of the bar graph. That is the increase in population in those counties between now and the end of the planning period. The counties that show the greatest amount of growth are Angelina, Jefferson, Nacogdoches, and Smith. And so we have the population centers within our region now, Beaumont-Port Arthur, Lufkin-Nacogdoches and the Tyler area are going to grow faster than the more rural portions of our planning area.

In step with the population, municipal water use will also increase more quickly in those same counties. Our population regionwide will go from about a million, a little over a million people now to almost 1.5 million at the end of the planning period. So just under a 50% increase in population. I had a note on the total water use and I seem to have misplaced that.

Total water demand for all of the six beneficial uses currently is 700,000 acre-feet and that is projected to increase to a million 861,000 acre-feet by the end of the planning period. Now, a large portion of that increase is that half million acre-feet for the liquefied natural gas plants that are currently proposed.

There were several Water Management Strategies that were identified by the Water Development Board that our planning group decided we were not going to consider. That's what you see before you now. Drought management we feel like in our particular case only normalizes water use instead of actually creating newly available water to meet needs. So we did not consider drought management to actually be a Water Management Strategy.

Brush control is more of a West Texas thing. It does show some promise in some areas but not in East Texas. We decided not to consider precipitation enhancement or water right cancellation or aquifer storage and recovery unless there was already a study that had been started, and there were not any in our particular region.

For a Water Management Strategy to be considered feasible, it had to have an identified sponsor, it had to be practical, it had to provide a reasonable percentage of the need, it had to meet federal and state regulations, be based on proven technology, be able to be implemented, and it had to be politically acceptable.

Once we had developed alternative Water Management Strategies or alternative options for Water Management Strategies, we looked at areas with the supply, similar supply deficiencies. We contacted those Water User Groups to determine what they were thinking about in terms of meeting their needs, if anything. We developed a list of potentially feasible strategies and then we ranked those in -- excuse me. Using cost environmental impact of Water Management Strategy, reliability of supply, impact on water resources, impact on agricultural and natural resources and political acceptability in Water Management Strategy, we then selected one or more strategies to meet the need. We again contacted the Water User Group to make sure that our recommendations were acceptable and then we presented those strategies to the planning group where they were accepted.

You'll see in our initially prepared plan that there are several alternative Water Management Strategies presented. Senate Bill 3 would have allowed alternative Water Management Strategies and there's a great need for that to be done, but Senate Bill 3 did not pass. So as we meet here tonight, alternative Water

Management Strategies don't exist. They're not -- there are some things titled alternative Water Management Strategies and maybe after the legislature takes some action in some future year, there will be such a creature but as we meet tonight, that is not a recognized alternative.

I'll go through just very quickly by county how we are meeting the needs. In Anderson County most of the needs are going to be met by increased use of groundwater, drilling new water wells or increasing the pumpage from existing water wells. There is almost a 22,000 acre-feet projected need for electrical generation. The recommended Water Management Strategy is to take water from Lake Palestine. We did list an alternative Water Management Strategy for this demand as Lake Fastril. I'll refer you back to my previous comment that alternative Water Management Strategies as we meet tonight don't exist.

In Angelina County, many of the needs will be met by increased use of groundwater. There is also a prepared regional surface water treatment project where the City of Lufkin has 28,000 acre-feet of water rights to Sam Rayburn, and they have proposed to construct a 10 million gallon a day surface water treatment plant to bring that water back to Lufkin area and supply other entities.

Cherokee County, the Carrizo-Wilcox is almost fully allocated. We're getting -- we're having to find small amounts of water where we can in Cherokee County. 244 acre-feet for manufacturing met from the City of Jacksonville, 213 acre-feet for New Summerfield coming from Lake Columbia. 2 acre-feet would come from the Queen City Aquifer which is a shallow aquifer above the Carrizo-Wilcox, and 212 acre-feet for the City of Rusk from Lake Columbia, also.

In Hardin County the Gulf Coast Aquifer is adequate to meet those needs.

In Henderson County, especially in the area of Athens, the Water Management Strategies get somewhat convoluted because of the overlapping jurisdictions between the City of Athens and their water supplier and the fish hatchery and so forth, but we do propose to meet some of the needs through water conservation and through the use of water from the Queen City Aquifer.

In Jasper County the Gulf Coast Aquifer is adequate to meet the needs there.

In Jefferson County the vast majority of the needs would be met by LNVA. Meeker would use groundwater from the Gulf Coast Aquifer. Meeker is a small water aquifer. Then there is a half a million acre-feet of need to be met for the LNG plants. That half a million acre-foot demand creates a 64,000 acre-foot need over and above the water available to LNVA today. Their Water Management Strategies in order to priority are -- realize 64,000 acre-feet in need through water conservation or from operation of their newly constructed saltwater barrier in conjunction with Sam Rayburn and Steinhagen reservoirs as a system, are to reallocate storage from the flood pool to the conservation pool in the Sam Rayburn Reservoir or to purchase water from Sabine River Authority. Or the alternative Water Management Strategy, should these four previous ones fail, would be instruction of Rockland Reservoir.

In Nacogdoches County we meet the needs by continued use and increasing use from the Carrizo-Wilcox. The City of Nacogdoches needs to obtain an agreement with downstream water rights holders to retain flow in Nacogdoches, and this is a water priority rights issue. This just needs to be addressed contractually. And then there is a proposed electrical generating station that will need to be supplied from Lake Columbia.

Newton County would supply their

manufacturing need from the Gulf Coast Aquifer.

Orange County would supply their manufacturing need with surface water from the Sabine River Authority, and the Mauriceville special utility district would increase their reliance on the Gulf Coast Aquifer.

Panola County has no needs.

Polk County would increase their reliance on groundwater.

Rusk County would meet their steam and electric need chiefly from Lake Columbia, but in conjunction with that they would also use almost 7,000 acre-feet in groundwater.

Sabine County would meet the majority of their needs from Carrizo-Wilcox. Some areas near the City of Hemphill could purchase water from their surface water treatment plant.

San Augustine County would meet their needs from groundwater resources and also developing local supplies.

And Shelby County, the City of Center, needs to strike the same agreement with downstream water rights holders for retaining flows for Lake Pinkston. County other needs would be met either from groundwater, purchasing water from the City of Center or by obtaining water from Toledo Bend Reservoir. Water for livestock would be met through groundwater, local supplies and Toledo Bend water; and manufacturing needs would be met by purchasing water from the City of Center.

Smith County can meet their needs through the use of groundwater, but this will occupy the last remaining groundwater of the Carrizo-Wilcox in the Smith County area. Irrigation and mining needs can be met from the Queen City.

The small entities in Trinity County can meet their needs by increasing their reliance on groundwater.

And Tyler County, the smaller entities there will also increase their reliance on groundwater. Their source is the Gulf Coast Aquifer.

Needs to be met by entities that are outside of Region I, currently the Sabine River Authority has been asked to supply 100,000 acre-feet to entities in Region D from Toledo Bend, 200,000 acre-feet of water from North Texas Municipal Water Utilities in Region C; another 200,000 acre-feet of water to Tarrant County Regional Water District, also in Region C; and Dallas Water Utilities has included in their Water Management Strategies an alternative Water Management Strategy to get another 200,000 acre-feet of water from

Toledo Bend for their needs.

Upper Neches River Municipal Water Authority, Dallas Water Utilities currently has 114,000 acre-feet of water rights to Lake Palestine. They plan on in this planning cycle to access that water, to make use of it and then they have also included in their Water Management Strategies construction of Lake Fastril in the use of 112,100 acre-feet of water from Lake Fastril for Dallas Water Utilities.

We have, including water in reservoirs, river water, groundwater supplies, local supplies, water reuse, all the various types of water available to us within the region other than brackish running river water 3.3 million acre-feet of water available to us each year. We have identified in this plan 1,800,000 acre-feet of water needs within the region. We have another 600,000 acre-feet in needs to be supplied by this water outside the region. That 600,000 does not include the 200,000 acre-feet that is an alternative Water Management Strategy for Dallas Water Utilities from Toledo Bend.

Region I planning group looked at very seriously both unique stream segments and unique reservoir sites and decided on both counts to make no recommendations, either for unique stream segments or for unique reservoir sites.

And with that I'll turn it back over to David who will talk about public comments.

MR. ALDERS: Thank you, Gary. Well, I have perhaps about a dozen forms that have been completed by those of you who would like to deliver public comment orally in person this evening. If there are others of you who would like to, please fill out one of these registration forms that we saw at the desk back here at the door. I overlooked here a moment ago, I didn't notice whether you did or not and I don't see him here now. Is Bill Roberts in the room?

MR. ROBERTS: Yes.

MR. ALDERS: Bill is a representative on the planning group from the Texas Water Development Board, the Texas Water Development Board has representatives at each of the 16 planning groups. In fact, Bill also handles that chore for Region H, which is the greater Houston area. So if you have questions about their region, you can ask him later. That's not part of our purview.

So I will go ahead and remind you again quickly of the ground rules. I have about a dozen. If there aren't many more of you, then I can we can honor that five-minute limit but I will ask you to sum up in five minutes and I'll put my hand up or cough or something at the end of five minutes and you certainly don't need to take that long.

Also I'd remind you that since your comments will be transcribed, please hold the microphone. If you will, come up here and face the audience, if you don't mind. Gina, do you have a question?

MS. DONOVAN: Yes, I do. Does Gary have a copy of the presentation you made this evening?

MR. GRAHAM: No, I'm sorry I don't, but if you'll give me your name and address, I'll be glad to make a CD and provide that to you.

MS. DONOVAN: Okay. Thank you.

MR. GRAHAM: I do have some CDs of the initially prepared plan with me tonight. Not a whole lot but I've got several copies if somebody needs a copy of the CD. And we can provide that to you tonight, also.

MR. ALDERS: There are, obviously all the data behind this presentation are included in these CDs. So you'll be, to some degree, drowned in data. It's not a sum -- this is not a summary here. I don't think you've got really a summary of this in that plan. There may be executive summary in there.

MR. GRAHAM: Well, yeah.

MR. ALDERS: Yes, ma'am?

UNIDENTIFIED SPEAKER: Can we ask a question about Lake Columbia, what the status of it is?

MR. ALDERS: Yes, and I'll let Gary answer that. Are there other questions not related to public comment? Okay, Bill?

MR. ROBERTS: I'll just make one quick comment. The CDs, the initially prepared plan is also available on our website electronically. You can view it and download it if you want.

MR. ALDERS: It's not on the DETCOG website, is it, Gary, the initially prepared plan?

MR. GRAHAM: No.

MR. ALDERS: That's U.S. --

MR. ROBERTS: It's www.twdb -- the Texas Water Development Board -- .state.tx.us.

MR. ALDERS: And state is S-T-A-T-E spelled out. You can write that down. In fact, you can find any of the 16 regional initially prepared plans there. Is that right, Bill?

MR. ROBERTS: Yes.

MR. ALDERS: I'm going to let Gary answer the questions about Lake Columbia and then I'll begin introducing those of you who filled out the public comment registration forms.

MR. GRAHAM: Lake Columbia was designated as a unique reservoir site by the Texas legislature back in, gollee, 2001. It also has a permit of construction from the State of Texas. They have -- are currently working on the environmental document needed for a 404 permit from the Corps of Engineers for that reservoir and as far as I know, that's the status of Lake Columbia currently. Does anybody know anything more than that? Bill?

MR. ROBERTS: Not as to status really, but we did recently receive the final draft of the downstream impacts of Lake Columbia which is the study we've done with the Water Development Board. That final report is due on July 30th. So it will be available at that time. So pretty technical, but it does try to determine what the impacts would be downstream if you have the reservoir versus if you didn't have reservoirs.

MR. GRAHAM: That's a part of the EID for 404?

MR. ROBERTS: It's actually Phase 2 of a study that's been completed about a year ago. So it's not part of the 404 but it will contribute to that.

MR. GRAHAM: All right.

MR. ALDERS: Any other questions? Okay.

Well, if you do, if another question comes to mind this evening while we are here, while Gary's here or Bill is here, then you probably can get that question answered. If you wait until they leave and I'm here alone, you probably will not.

We'll start with Sara Kay, is it Barnett? Sara Barnett? Did I get that correct? You have the honor this evening.

MS. BARNETT: You do this alphabetically. No fair. Well, my name is Sara Barnett. I'm from Jacksonville and I'm here to speak for the wildlife refuge.

UNIDENTIFIED SPEAKER: Speak up.

MS. BARNETT: Speak up? And against the lake being built, Lake Fastril. There are many things to consider and there are a lot of you that are more familiar maybe with some of the technical parts of this, but as a mother and grandmother I'm looking to the future for our children and one thing that I would like to -- for you-all to consider is that we are on the brink of technology like no one has ever seen before. There will be ways to preserve and conserve water through the years that will come about, but there will never be another river bottom such as the Neches River. We will flood it and lose forever for our children and grandchildren what God has created. Thank you.

MR. ALDERS: Thank you, Mrs. Barnett. Cheryle Beck. Is Cheryle here?

MS. BECK: I'm from Cherokee County, Jacksonville, too. First of all I want to speak in favor of the refuge and opposed to the lake. I'm in favor of the refuge because even though the board for Region I did not choose to designate any unique habitat areas, the Neches River is a unique habitat area in Texas. It is one of the largest areas that is undeveloped in the state in a river bottom setting.

And another thing in favor of it is the refuge is, will be bought up based on volunteer, volunteers selling their land. It will not be taken by eminent domain and so therefore the farmers in the area have the right to choose whether or not they sell their land.

And then the other purpose is simply that that is an area of recreation for the people of East Texas. We have lots of lakes where they can go boating, but we don't have a lot of places left that people can go down on river bottoms and hunt or fish or do those types of activities. And so that's one of the primary reasons a lot of the people in Cherokee County are opposed to the lake, in favor of the river bottom.

And then another one is if we put that dam on that lake, that's just taking that much more water out of the river system to go down to the estuaries and bays and it creates a supersaline situation down in those bays and it affects our fishing and shrimping industry. And if you don't believe it doesn't affect it, you should look at what's happened down in the lower Rio Grande where the water flow has stopped. So those are reasons that I'm in favor of the refuge and opposed to the dam, the Fastril dam.

And also I'd like to say that, you know, they didn't consider these other options. Our legislature chose not to consider these other options but certainly Dallas wants water but, you know, they use more water per capita than any city in Texas, possibly in the United States. I'm not sure, but more than Houston uses with all the water they have. If they want -- if they want water, I say let them conserve their water.

[APPLAUSE]

MR. ALDERS: Thank you, Ms. Beck. Delores -- Gina, do you want to --

MR. ALDERS: Can we turn that off?

MS. DONOVAN: Gary, is it possible to turn this off?

MR. GRAHAM: I think you can just hit power.

MR. ALDERS: Okay. And I apologize, Ms. Beck, if that was bothersome to you. All right. Mrs. Bryson. I'm going to give a heads-up here. On deck will be Mary Decker. Mary C. Decker will be next.

MS. BRYSON: Thank you very much. My name is Delores Bryson. I'm from Rusk, Cherokee County, Texas and I want to thank all of you for allowing us to come and be heard tonight.

I want to tell you now why I'm opposed to Fastril Reservoir, mainly, of course, damming the upper Neches River which would create this -- unwanted by many of us -- reservoir. Damming this Neches River, as was said and brought out, will damage a very unique ecosystem and it will destroy this old hardwood forest that has been there and can never of course be recreated.

Impact not only will affect our immediate area but again will affect especially the Big Thicket area which is already, as some of you may or may not know, on the national list of endangered parks. This is, I think, seriously to be considered and I would hope that Dallas would not want to be a part of the demise of this Big Thicket area. It's a very unique system.

Then we have the Texas State Railroad. I work closely with the Friends of Texas State Railroad, and our trestle over the Neches River, of course, would be destroyed if this dam and this reservoir were placed there. You have no idea the cost of relocating and rebuilding this trestle. It would be in excess of or around $105 million and that's only for the trestle alone. That would not include the approach track that would have to be removed and relocated and built in order just to get our train across.

This is a steam -- the railroad is a steam engine excursion train that runs between Rusk and Palestine, Texas. It's enjoyed by many and it is -- it really adds quite a lot to our coffers. It's our major attraction and as you know, we're desperate for tourists in Southern Cherokee County and in Anderson County.

This park is really so important to us, as you'll learn from the other friends who probably you are going to hear from. We hope that you've already ridden this train and if not, we need to mention that kids ride free right now. So come on down and bring your children and your grandchildren to this park.

But moving on, as mentioned you're going to have a lot of unwilling landowners. These are families who have lived on this land, some in excess of -- they've made their ancestral home there and have been there many for 150 years. I can't say they own the land because we're merely stewards of this land. We take this stewardship very, very seriously. We like to protect the land, we like to protect the environment and even those of us who do not have property there and who are just simply concerned about the delicate balance that our ecosystem and our environment is facing right now are very concerned.

It's too bad that many more of these landowners and people who are concerned could not be here tonight, but some of their jobs, some of their family responsibilities are preventing their presence, but don't be misled because their numbers are large. Thank you very much.

MR. ALDERS: Thank you, Ms. Bryson. Mary Decker is next and then following Mary will be Eugene Decker. I believe that's correct. All right. Mary Decker.

MS. DECKER: I may be able to be heard without this. My name is Mary Decker. I'm from Jacksonville and I wanted to put into the record some letters from members of the legislature from the Natural Resources and Land Board and these were letters that were written by people like RoY Blake who represents Nacogdoches and Mr. *El type who represents Tyler and they are letters to Mayor Laura Miller in Dallas and they were written in March of 2005 and they're urging Dallas to go slow in building these reservoirs and they say, "As a member of the Land and Natural Resources Committee --" and this is from Mr. Blake "-- I am apprehensive about your new plan because it includes the use of new reservoirs when there are many existing ones which are not being fully utilized. Proposed reservoirs such as Marvin Nichols and Fastril could damage the environment and upset current landowners. I would encourage you to consider providing resources for additional conservation measures rather than focusing on the study of new reservoirs that might not be needed."

And we have a wonderful biologist in Jacksonville, Dr. Louise Smith, and she would be here today but she had to have hip surgery. She's a professor at Tyler Junior College and in her letter to Mr. Baca with the U.S. Fish and Wildlife Service in support of the refuge, one of points she makes is our local groundwater losses could be significant if evaporative reservoir losses were combined with the loss of 80% of the impounded water dedicated to Dallas.

And also like Delores and like Lynn and

Gary Gibson who are just wonderful, they're going to talk to you about the real opposition at the groundroots level of people. Everywhere I go -- I have letters in my car -- people are urging to sign them because they want to support the refuge as a way to preserve their land and their way of life.

And finally, I hope for reporters in the group that we will begin to get some kind of understanding of where this water really will go in the end, how it will be used, whether it will be sold to international corporations that are going to use water to increase their economics, and if this reservoir situation has anything to do with the Trans-Texas Corridor which according to the website, corridorwatch.org, will be very much involved in the transportation of water.

[APPLAUSE.]

MR. ALDERS: Thank you, Mary. Unless you have a voice that carries as well as Mrs. Decker for us, please do use the microphone for the benefit of our -- that way you can be transcribed into Texas history as you actually wanted to be heard.

Mr. Decker and then Gina Donovan next.

MR. DECKER: Gene Decker, Eugene Decker. I am from Jacksonville and also from Houston and have some land in the general -- can you hear me now?

UNIDENTIFIED SPEAKER: Speak up.

MR. DECKER: Okay. I have some land in the general area, but what I want to read into the record is the fact that this particular problem we're talking about is a part of a global issue and this is the reason why. Even though I know we have to plan in advance for water.

I want us to consider the fact that the destruction of natural habitat is something that's happening all over the world. It not only affects us here but this decreases the amount of carbon dioxide in the atmosphere which is one of the reasons why we have the global warming. I therefore am very much against the reservoir and in favor of the wildlife refuge.

But there are some other reasons, too. We are losing several thousand species of plants and animals a day on this planet. We don't even know what they are. They are disappearing so fast that they can't even be cataloged, and this leaves us very, very vulnerable to a lot of things such as blights. We're now down to just a few species of wheat and corn that are grown in this country. Blights can wipe us out. This is something that can be a natural phenomena; a terrorist group could unleash a blight. We're making ourselves more and more and more vulnerable.

And as rivers are dammed up all over the world, in Egypt, in the former Soviet union, in China and Pakistan, all kinds of terrible, terrible things are happening to the environment. I want to mention just one that's happening not very far from here. The fact that the Mississippi River has been cut off essentially from its silting process by levies means that in the Mississippi Delta of Louisiana which has 40% of all the wetlands in the entire United States, and this is where life really regenerates itself, they are losing currently the size of a football field every 20 minutes, and this is breaking the whole ecology of really our country.

I think we're playing with fire here. We can build lakes but they dry up. Look at Lake Meade, look at Lake Powell, look at the Great Lakes which are now falling so low that they are having to change the amount of tonnage that cargo boats can take because the sources of this water are being tampered with.

Dallas is wasteful. All of us are wasteful. We can build refuges and keep some of our natural habitat, some of our future heritage, or we can build reservoirs which we can eventually drink dry. So I think that in terms of the needs of water for our future, we need to think not only of reservoirs but the sources for those reservoirs and the general quality of life that we have.

So I am very much against the reservoir, especially since, if like the Trans-Texas Corridor which is being built by a foreign company from Spain. Since so many foreign companies are buying up water rights here, did you realize, for example, that the municipal water system of Atlanta, Georgia belongs to a British company. I think we could really be selling our birthright for a mess of pottage and we have some very valuable in the refuge and our wildlife and our natural resources and I hope we don't just give them away and squander them.

[APPLAUSE.]

MR. ALDERS: Thank you, Mr. Decker. And following Gina will be Gary Gibson. Gina Donovan.

MS. DONOVAN: Gina Donovan, director, Neches River Floatation Initiative. One 17-foot *Druman aluminum canoe, $900. One tent, sleeping bag, and toothbrush, $100. One ice chest full of sandwiches and Coke, $25. Nights spent under the stars on the sandy beaches of the Neches River, priceless. Thank you for the opportunity to address the planning group this evening.

For the record our organization is opposed to the Fastril and Rockland Reservoir projects and any other water development projects on the Neches River. The water from the proposed Fastril and Rockland reservoirs is not needed.

As of 2004 the State of Texas had 204 major reservoirs, more than enough water to fill the needs of East and Central Texas. The City of Dallas' per person water consumption is 240 gallons per day. That does not include industrial use. Their per-person water consumption again is 240 gallons per person per day, not including industrial use. Compare that to San Antonio and Austin, 155 gallons of water per person per day.

Let's compare that even closer to home to the City of Lufkin. About 120 gallons of water per person per day. According to its own records, the City of Dallas consumes 60 to 65% during the summer months of water -- to water their residence yards. Future projections for Dallas use shows its per capita consumption to continue to be dramatically greater than the rest of the state for the next 50 years.

The water from Fastril is not to meet Dallas' projected demand but is earmarked only as a reserve water supply. Even a small increase in water conservation by Dallas and its customer cities would remove any demand for water from Fastril.

These projects are costly, not only financially but ecologically and emotionally. What consolation can you provide landowners that would be displaced by the construction of Fastril and Rockland reservoirs. Property that has been in families since the early 1800s, family cemeteries all would be lost forever.

Fastril and Rockland Reservoir proponents contend that reservoir construction and the impoundment of water does no harm to ecosystems downstream. This statement is absolutely false. When the flow of freshwater is diminished, biological performances decline. For example, the Upper Neches River Municipal Water Authority states the existence of Lake Palestine does not hinder water flow of the Neches River. Ask the Neches River landowners about the river flow during the summer months. They'll tell you the authority is not releasing water from the reservoir in order to maintain a water level conducive to lake residents' boating activities.

If Fastril Reservoir is constructed, the cities of Palestine and Rusk stand to lose their historical Texas State Railroad, an economic asset that benefits the area upwards of $5 1/2 million annually. If they lose the railroad, it will render Anderson and Cherokee Counties without an asset to stabilize their financial existence.

If Fastril or Rockland reservoirs are constructed, the slowing of freshwater flows would detrimentally affect the international biosphere Big Thicket National Preserve which is dependent on the flood flows of the Neches River to maintain its ecologically diverse ecosystem.

Also this retardation freshwater flow of the Sabine Lake estuary would upset the delicate balance of fresh and saltwater, vital to the reproduction of marine species.

According to the Texas Parks and Wildlife department, the Sabine Lake estuary requires 9.6 million acre-feet of freshwater per year to maintain that delicate balance. Need I remind you that recreational and commercial fishing off the Gulf Coast is a multimillion dollar enterprise in our state.

In essence, if Fastril or Rockland reservoirs were constructed, the Big Thicket National Preserve would essentially dry up and the recreational and commercial fishing industries off the Eastern Gulf Coast would be dramatically imperilled.

Ladies and gentlemen of the Region I Water Planning Group, you have the power to wipe out existing economic assets such as the Texas State Historical Railroad, the Big Thicket National Preserve and the Eastern Gulf Coast commercial and recreational fishing industries, only to quench the unimaginable greed of a few.

Looks like you would want to protect private property, our natural, historical and cultural heritage instead of condemning our East Texas lands to enable Central Texas to continue their wasteful water habits.

Again let it be known that the Neches River Protection Initiatives' opposition to any new reservoirs or water development projects on the Neches River.

[APPLAUSE]

MR. ALDERS: Thank you, Gina. After Mr. Gibson is Mrs. Gibson, Lynn Gibson. Have the same address.

MR. GIBSON: My name is Gary Gibson. I was born and raised in Anderson County, lived there all my life. I am against Fastril Reservoir. The main reason is because it's going to destroy a lot of bottomland hardwood that we're not going to get back in our lifetime. We're losing too much of it. My granddaddy and my wife's granddaddy both were foresters. My granddaddy was for a short period of time, hers for like 35 years. My granddaddy always told me, never cut your hardwood. It takes too long for it to grow back. It won't grow back in a lot of our lifetimes in here. A lot of young kids, it could have time to grow back; but if we destroy it all and put it underwater, it's never coming back.

Dallas doesn't need the water. I watch -- I have four channels from Dallas on my satellite. I watch it every day. I watch the wanton glutonous waste of water that they have. Golf courses, we're building golf courses out the wazoo. We don't need any more. We just passed one coming into Tyler, water sprinklers just going like crazy and that's the only way you can keep it real, real green like that but I think if you just every so often watered it, not every day.

I've been all over that river bottom up there with my granddaddy. My granddad, we have land we've been putting together for the last fifteen years. We have 160 acres, I believe. 80 of it belonged to my granddaddy, and I want to keep it. It's not far from this proposed Fastril Reservoir and I would like to see the reserve go in so that me and my grandsons -- I have three young grandsons right now, just little bitty right now. But I can remember the time when I used to go with my granddaddy down in that river bottom, and I can name you numerous places, Cleavis, Duck Roost, Indian Pond, Little Sulphur, Georgia Slough, Phillips Lake, mouth of the creek, Walker Bend, numerous places. That if we put that underwater, it's gone forever. And these are places, I'm one of those that Gina talked about that I have been down there. I have camped out there and it's an extraordinary experience, something that I'll never forget. And it's very passionate for me that if we lose this, we've lost a lot.

And I just got through watching a program on KERA out of Dallas the other day about the global warming. If a lot of you don't watch these programs, you need to because it's telling us what we're doing to our environment. We're destroying it little by little by little, and the reason that the oceans are coming up is because we're destroying forestland. That's where all our weather starts. That's where our rainfall comes from. All you've got to do is watch where the hurricanes start on the Coast of Africa. They start over there in the rainforests of Africa and they come off. And the weather's just going to get worse if we keep destroying all of the forests.

And I heard Mr. Mallory talk up there at our commissioners court meeting in Palestine and he said, we have wildlife on our lakes, we have ducks, you know. There's ducks everywhere but not like there are in that river bottom because like Cleavits, Duck Roost, I've seen them come in there by the droves. You won't see that in a lake and all the other wildlife that's going to be displaced, all of it. I mean, I could have brought you a book from the Indian wildlife preserve. We have all the same things, all the deer, all the squirrels, all the raccoons, the bobcats, everything. They've got to have somewhere to live and if we keep cutting down and destroying our hardwoods, it's gone.

And I urge every one of you to get one of the Texas Parks and Wildlife magazines in the recent past, in the last two, three, four months ago. The state admits how bad it's getting. We need to watch how it's doing. The global impact on everything we're doing, it's terrible.

Number one problem in this world is greed. Dallas has got plenty of them. The greed that they're sending down here to us trying to take away everything that we have. And like I said, my 160 acres is not in the refuge but it's possible it could be taken in mitigation and everything else from this lake. It goes back into the 1800s, to my great-great-granddad. It's something that would be lost forever and I don't think that these people know what they're doing to the people nowadays. And I'm right there with Gina and everybody else. I am getting lots and lots of talk from people. They do not want this lake down here. I've got my daughters involved in it, she's gotten at work, people are signing petitions. They don't want -- we don't need to supply Dallas with any water. They've got plenty of places that they could get it on their own. Thank you.

[APPLAUSE.]

MR. ALDERS: Thank you, Mr. Gibson. And after Mrs. Gibson is Albert Holmes, after Mrs. Gibson.

MS. GIBSON: Thank you. Gina said it all. Gary added a little bit. But I haven't heard what the teacher said. I had a retired teacher and he said, you know, it's worth a million bucks or more to see the gleam in your child's eye when they see something in real life.

My family has lived in this area, Angelina County to on down the Neches since they came from Mississippi and Georgia way back in the 1800s. They -- there's a lot of family history we'll lose if the land was to go underwater. There's Indian -- or Native American campgrounds, campsites along the river and out from you that nobody knows about. They're not going to tell you exactly where they are because they don't want us all to know. There's Indian burial grounds down there. There's bones that they don't want underwater. We have personally on our property found items from the Civil War era. That's our history.

If the river's flooded for a reservoir, we're going to be losing. The Fastril community that once existed has a reunion every year right where the city was. I don't think they would like to have their ghost town, whatever it is now, they don't want it underwater, either. I've talked to several of those people.

Our children and our grandchildren need to learn about our past, our environment, trees, and animals and persons. If this land goes underwater for the Fastril Reservoir, they're going to have to go some place to see it in a museum because it's not going to come back.

Just now for the first time in my life, and I'm almost 50, there's a -- there's bobcats and there's mountain lions coming back into the area. That's necessary for the food chain. It's necessary for the wild hogs that are tearing other people's land up. I'd like to take some of them to Dallas and dump them on the doorstep.

I'd like to suggest or propose that everyone that support the Fastril Reservoir, all the businesses in Dallas and all the recreation providers like those that own the golf courses and, yes, the individuals themselves learn to limit their water usage, learn to recycle the water as the people on the Gulf Coast have to do, use less, of course, because they're already using two or three times as much as we do. Or even have a limit on their water that when it's reached, their water can be disconnected for a while, like until the beginning of the next month. That would be a good alternative.

It would get their attention. They would notice that they're wasting the water by watering the streets because they don't have their sprinkler heads set right and they're watering their yards and the businesses when it's raining and it's been raining for three days already but they still have their sprinklers on. They need to have their attention jogged just a little bit. They don't understand that they're using too much. They need to start it now, not 50 years from now.

The rural areas in this section that we're talking about where the water would be taken from, it's the land that's going to be covered there. That's why we won't be growing as fast as the bigger places. There's not going to be much growth in the rural communities if it's underwater.

And there's one more thing. The people involved in acquiring the land for the proposed reservoir are just going to sell what's lake -- what ends up being lakefront property for development. My husband and I both have lived in the Neches/Palestine/Anderson County area all of our lives. We chose to stay there when we grew up because it is not as fast paced as Dallas and Houston.

We've met a lot of people, a lot of visitors that come in the summertime and even in the winter because they like coming to this area. They don't like it in Houston and they don't like it in Dallas. They buy property here so they can come on the weekends. They come when they get time. They spend all their spare time in the smaller areas. Don't take it away.

[APPLAUSE.]

MR. ALDERS: Well, the Gibsons have a knack for knowing when five minutes is up, too. After

Mr. Holmes I have Zelwanda Hendrick and I'm not sure that she wants to -- do you want to make oral comments tonight, Ms. Hendrick?

MS. HENDRICK: Make what?

MR. ALDERS: I have your comments as written. Do you want to also speak tonight?

MS. HENDRICK: Just a little bit, yes.

MR. ALDERS: Okay, fine. That's very fine. I just noticed your check written and make sure I ask. You'll be after Mr. Holmes.

MR. HOLMES: I'm Albert Holmes. I am a native of Palestine, Texas and I am president of the Texas State Railroad Friends group. Can y'all hear me in the back all right? How many of you-all have ridden the Texas State Railroad. Would you put your hand up. Mr. Mallory, you've never ridden the Texas State Railroad?

MR. MALLORY: Yes, I have.

MR. HOLMES: I didn't see your hand. I'm sorry. Is Mrs. Barber here? She is representing the North American Indian Cultural Association.

MR. ALDERS: She had to leave. I've got her comments.

MR. HOLMES: Thank you. I would like you-all to know that this district planning commission, looking at the proposed Fastril Reservoir, is a bad idea. It would destroy the Texas State Railroad over the Neches River and it would create problems for the Big Thicket National Preserve. Kay Bailey Hutchison, our United States Senator, just got $3.6 million for the wetlands. That would be our tax money wasted if this Fastril deal goes through. It would increase the need for more law enforcement in our counties that are already tight on budgets. In the commissioners court in Anderson County, the sheriff said that he didn't know if he would even be able to get three more jailors.

Also the income coming off ad valorem taxes would be decreased with Fastril because that eminent domain would take up all that land. That's not true with the refuge. Mr. Gibson's family could keep their property and the United States Fish and Wildlife people will come in and take good care of the land.

It would flood a native Indian burial ground along the Neches River on the Anderson County side, and that's sacred. They're going to be talking about that at their big powwow coming up this weekend.

The endangered species on the river bottoms will be lost with another lake down on the Neches River below Lake Palestine. We had over 83,000 visitors coming in to ride and look at our train over in

Anderson County and Cherokee Counties, and we would lose all those people with this lake. It would cease to exist.

We have heard from Robert Crossman who is superintendent of the Texas State Railroad at our Anderson County commissioners court that it would cost $105 million to raise the tracks. That's a lot of money and I just don't think that it would ever happen; and according to our commissioner of the Texas Parks and Wildlife, John Parker, we would lose the Texas State Railroad. That's sad.

If you ever want to see the dogwoods in bloom, you are going to want to ride the Texas State Railroad when they're in bloom. If Fastril comes by, it will wipe it all out.

Also I found out just recently that it wasn't Dallas that came up with this idea. It was our Upper Neches River Authority that went to Dallas and said, would you like to have some of our water. Did I underline "Have"? We're not getting anything for it. It's a fiasco like our Lake Palestine. We sold too cheap on Lake Palestine and it's not fair, folks. It's not fair.

[APPLAUSE.]

MR. ALDERS: Thank you, Mr. Holmes.

Mrs. Hendrick and then following Mrs. Hendrick is Nemell Kane.

MR. HOLMES: While Ms. Hendrick comes up, I want to say one more thing that you get to see on the Texas State Railroad and I have not seen them since I was a child. You don't see them in town and that's lightning bugs. That is exciting.

MS. HENDRICK: I'm Zelwanda Hendrick. Can you hear me? I think this is wonderful for us to get together tonight for a great cause. You've heard the heartbeat that so many of us are feeling and for the refuge and for saving the Neches and for saving the families and their property. What a heartbeat for all of us. God gave us these things to try and take care of. We do this with people medically, nutrition, we do this as we live, but we also have to, in the palm of our hands, take care of the animals and the rivers and those things that we can and still people can exist real good.

I don't know too much to add to the things that have already been said by several of you tonight, but let us hope that we can win out and preserve this pristine river and help our animals and history and our Earth and our Texas and Cherokee and Anderson County in particular. Thank you.

[APPLAUSE.]

MR. ALDERS: Thank you, Mrs. Hendrick. Mr. Kane, Nemell Kane. And then following Mr. Kane will be Christopher Jones.

MR. KANE: Thank you, sir. I hope my voice stays with me. I'm not going to say anything except we've got it. Personification of heritage tourism in the Texas State Railroad. The heritage tourist is one out of ten that comes to Texas but they spend twice as much money, they stay twice as long and they are the cream of the crop. We attract almost 90,000 of those people every year and it's going up. We can't do it with the steam train underwater. They don't run underwater.

[APPLAUSE.]

MR. ALDERS: Thank you, Mr. Kane. Following Mr. Jones, Christopher Jones, will be Betty McLain. And that is the last form I have. So if there's another person who intends to make public comment tonight, I need to get the form from you. Okay, Christopher?

MR. JONES: Thank you, sir. My name is Christopher Jones and I represent the Texas Committee on Natural Resources. We represent hunters and fishermen of East Texas as well as naturalists, hikers, campers, photographers, people who like to be outdoors.

Impounding any more stream segments of the Neches River will injure and jeopardize the ecological integrity of the entire Neches River drainage system all the way down to Beaumont, Texas.

Future water demands of the Dallas-Fort Worth metroplex can be met by current available water supplies or lakes that are already in existence such as Lake Texoma, Toledo Bend and six other current lakes in and around the DFW area.

Significantly the hunters and fishermen of East Texas oppose Fastril Reservoir. These people hunt, trap, and fish in the bottomlands of the Neches River in the Fastril Reservoir footprint. Hunters and fishermen will lose these recreational opportunities if Fastril Reservoir is created.

The Texas Commission on Natural Resources reminds Region I, the Texas Water Development Board and the professional engineers in this room, by impounding the Neches River you are personally destroying East Texas, our natural heritage, our history, and our culture and our dwindling way of life. Thank you.

[APPLAUSE.]

MR. ALDERS: Thank you, Christopher. Betty McLain, the last form that I have. Mrs. McLain.

MS. McLAIN: Thank you. Hello. I'm

Betty McLain. I don't have a great deal to add from what has already been said except that I'm from Dallas, and I watch -- I relocated. I still have my home in Dallas -- the water that is wasted in Dallas is absurd. It is the constant flowing on the water sprinklers, the golf courses and all these places and there is no conservation of water except until about three weeks ago, they put in that you could not water before, I think they said -- my neighbor said after 10:00 a.m. you could not water until sunset. That is the first attempt that they've made.

I love Dallas but I can't stand the political greed. We cannot lose our wildlife and our sanctuaries. Please support the refuge and save our system.

I'm also active in the Friends of the Railroad and I was in Dallas about two weeks ago and happened to turn on Channel 13 and there was the marvelous thing on the steam engines of the United States and guess which one had a nice long, beautiful article was the Rusk/Palestine railroad, and it was so heart-rendering. It's just beautiful. Thank you.

[APPLAUSE.]

MR. ALDERS: Thank you, Mrs. McLain. And do we have any others, Bob?

MR. BOWMAN: No.

MR. ALDERS: Those are all the public comment forms I have, and you have the information you need for -- you don't need -- you got all the names? Yes, sir, Bob?

MR. BOWMAN: This gentleman has a question.

UNIDENTIFIED SPEAKER: Can I ask a question?

MR. ALDERS: Yes. Are there -- if you have questions, we'll take them as a question.

UNIDENTIFIED SPEAKER: I wanted to ask, very carefully. I was wondering, the question was what process did the Regional Water Planning Group take to reach its decision that there's no unique water or stream segments that you looked at? I mean, were there formal studies done? I just wanted to know what process was taken to look at where you reached that decision, that there's no unique stream segments in that area.

MR. ALDERS: Gary, do you want to answer that? I'll take a shot at it if you don't want to.

MR. GRAHAM: Dr. Peggy Glass with Allen Plummer & Associates did a pretty good look at the potential -- the stream segments that held the potential for being designated as unique. In the scope of work for this cycle of planning, the planning group said that we would look at any stream -- any significant stream segment in our region that exhibited three or more of the characteristics that qualified it as being significant according to the Texas Parks and Wildlife department, and we did compile that list and looked at those stream segments that exhibited three or more of those characteristics.

We also looked at the fact that there were several programs, both at the state and the federal level, for protection and natural resources that would be associated with these stream segments. We did not really have an adequate budget to do any intensive studies of any of the streams, and we didn't do any intensive studies but we felt like -- or the planning group felt like the possible repercussions of designation were unknown.

The State of Texas has said that the only effect of that designation would be that state monies could not be spent on development of a reservoir and any segment that was designated as unique. Conversely if you designated a site as a unique reservoir site, then you couldn't -- the State could not obstruct construction of a reservoir on that site if it was actually designated by designating it as a unique stream segment. So the two are mutually exclusive.

There has already been some migration by some of the state agencies away from that very limited interpretation of what a unique stream segment is. Because of that migration, because of the future, unknown future repercussions of designation, because there are adequate programs in effect to protect the resources, then the East Texas Regional Water Planning Group decided to the make any designation for those stream segments.

And for many of the same reasons they made the decision not to make a recommendation for designation for unique reservoir sites, either.

UNIDENTIFIED SPEAKER: Well, just, this is just a comment then based on your response. I would hope that in the future when you present the information, whether in writing or in formats like this, wouldn't it be more accurate to say in the slide program or in literature that you distribute that it was not studied versus not designated? Because it sounds to me like you didn't have the funds and basically you did just a very general overview as opposed to a critical assessment.

MR. GRAHAM: Well, if you actually read Chapter 8 in the report or on the CD, what I just explained is represented in the report, but I didn't get into these details as a part of tonight's presentation. Tonight's presentation was just a very, very brief summary of some of the things we did and it didn't do justice to the considerations that we had on unique stream segments.

UNIDENTIFIED SPEAKER: Well, I appreciate the clarification. It sounded earlier like you were saying you looked at it and there were no -- nothing unique was found as opposed to it just wasn't studied.

MR. GRAHAM: I think all of us will say there are ecologically important stream segments within Region I. Our scope of work is to primarily be a water accounting planning group. That means that we are to try our best to assess the 50-year horizon of public demand and available supplies or potential supplies and so we are a Water Planning Group, and getting into an intensive and extensive survey of various stream segments within the region would make us really an environmental planning group for East Texas and we didn't, as Gary mentioned, we didn't have the state funding to accomplish that task. That's a considerable task and so I think that's a short answer that I --

UNIDENTIFIED SPEAKER: Thank you.

MR. GRAHAM: And Gina had probably a couple of months ago --

UNIDENTIFIED SPEAKER: I still disagree but, yes, that is the same exact response you gave to me when I asked that question.

MR. ALDERS: That's the gist of it. Other questions, yes?

UNIDENTIFIED SPEAKER: Did the man that was way in the back say he had a comment from a Native American?

MR. ALDERS: I'm sorry?

UNIDENTIFIED SPEAKER: Did the man in the back say that -- the lady had to leave. She was Native American. Did she have a comment that she left with him?

MR. ALDERS: She had a written comment. She didn't say whether she wanted that to be read. She did have a comment that will be entered into the record. It's not a problem --

UNIDENTIFIED SPEAKER: Did she say it was all right for them to read it?

MR. ALDERS: Bob, do you perceive a problem reading the comment from the lady who left it there? It's going to be public record. It will be entered as public record.

MR. BOWMAN: I'll be glad to read it.

MR. ALDERS: Why don't you read it, Bob, if you will.

MR. BOWMAN: Sure. This is a comment by Wanda Barber, and she apologized for --

UNIDENTIFIED SPEAKER: We can't hear you.

MR. BOWMAN: This is a comment by Wanda Barber. Can you hear me okay? She said she had to leave to go to a prior engagement and her comments were this. She said she was deeply concerned about flooding Native American villages and burial grounds. She said she would rather live in a lean-to than in a fancy home on the lake.

[APPLAUSE.]

UNIDENTIFIED SPEAKER: Would you say who she represents?

MR. BOWMAN: Oh, yeah, I sure will. Let me do that.

UNIDENTIFIED SPEAKER: It is a very impressive organization that she represents.

MR. BOWMAN: I'm sorry. I should have said that. She represents the North American Indian Cultural Association.

[APPLAUSE.]

MR. ALDERS: Did you have another question?

UNIDENTIFIED SPEAKER: I just wanted to add something to that about our railroad. He said that -- because I was there at the meeting, said it cost $105 million to build the trestle. That excluded the cost that it would cost for the extra rails, the building up of the tracks to go over that particular trestle. That did not include those costs.

MR. ALDERS: Okay. Those comments I'm sure also will be entered into the record. Any other questions? Remember that this is a multiday hearing and it will continue tomorrow evening at 6:00 p.m. at the Nacogdoches Recreation Center, at the least of which time we'll recess and then begin, open again on 6:00 p.m., July 14th at the Jefferson County Courthouse. So I want to, on behalf of the East Texas Regional Water Planning Group, also known as Region I as it's been mentioned a time or two this evening, I want to thank you-all again for your interest in the process, for being here this evening. And again if you want to receive a copy of the plan, it's available up here on CD. Thank you for being here this evening and the hearing is recessed until tomorrow evening at 6:00 p.m.

CERTIFICATE OF REPORTER.

I, Dana R. Smelley, CSR, RMR, CRR and Notary Public for the State of Texas, do hereby certify that the foregoing transcript is a true, accurate, and complete record.

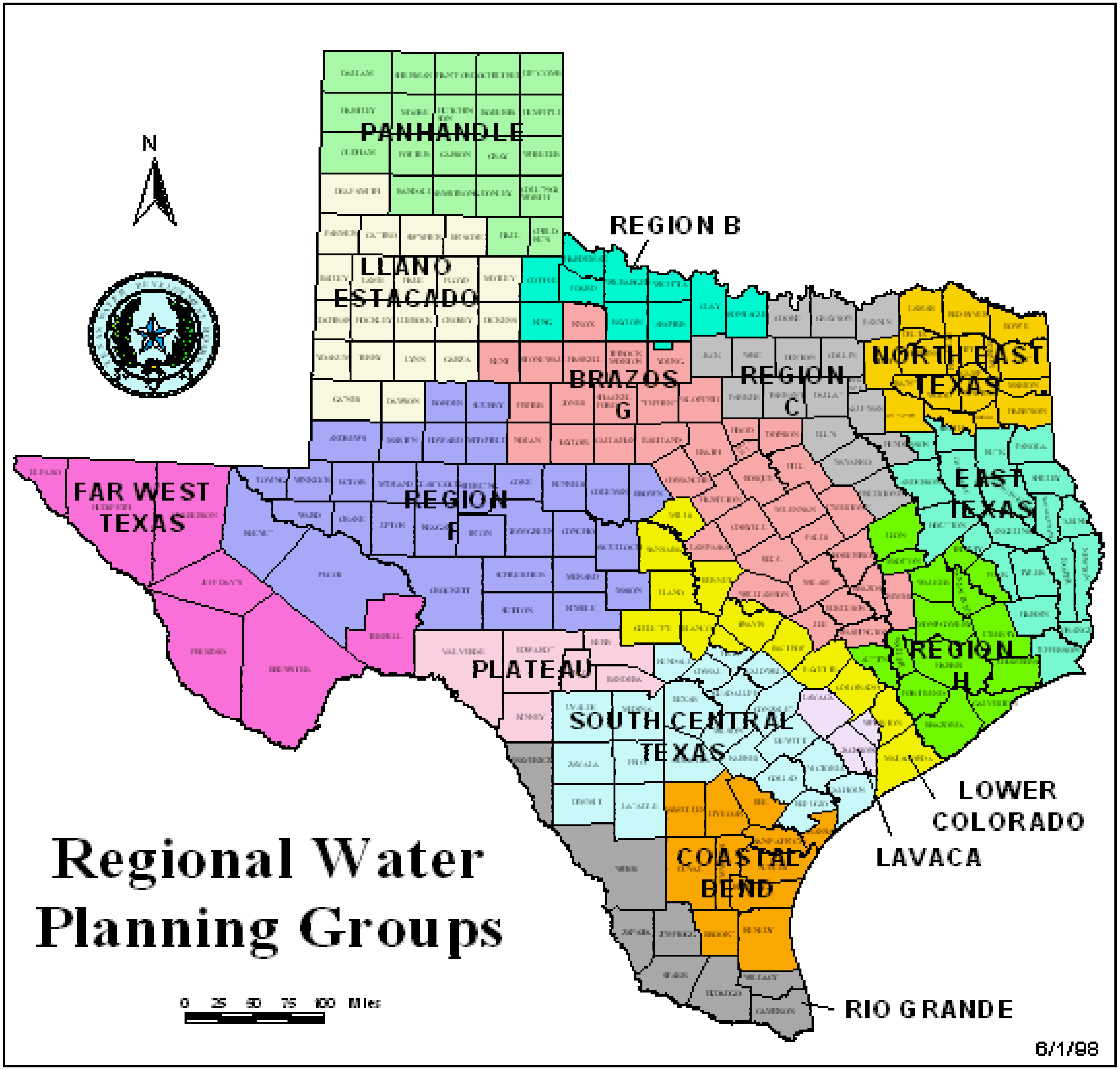
I further certify that I am neither related to nor counsel for any party to the cause pending or interested in the events thereof.

July 26th, 2005

Dana R. Smelley, CSR, RMR, CRR

East Texas Regional Water Planning Group
Public Hearing for IPP

July 12, 13, & 14, 2005



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Regional Water Planning Groups
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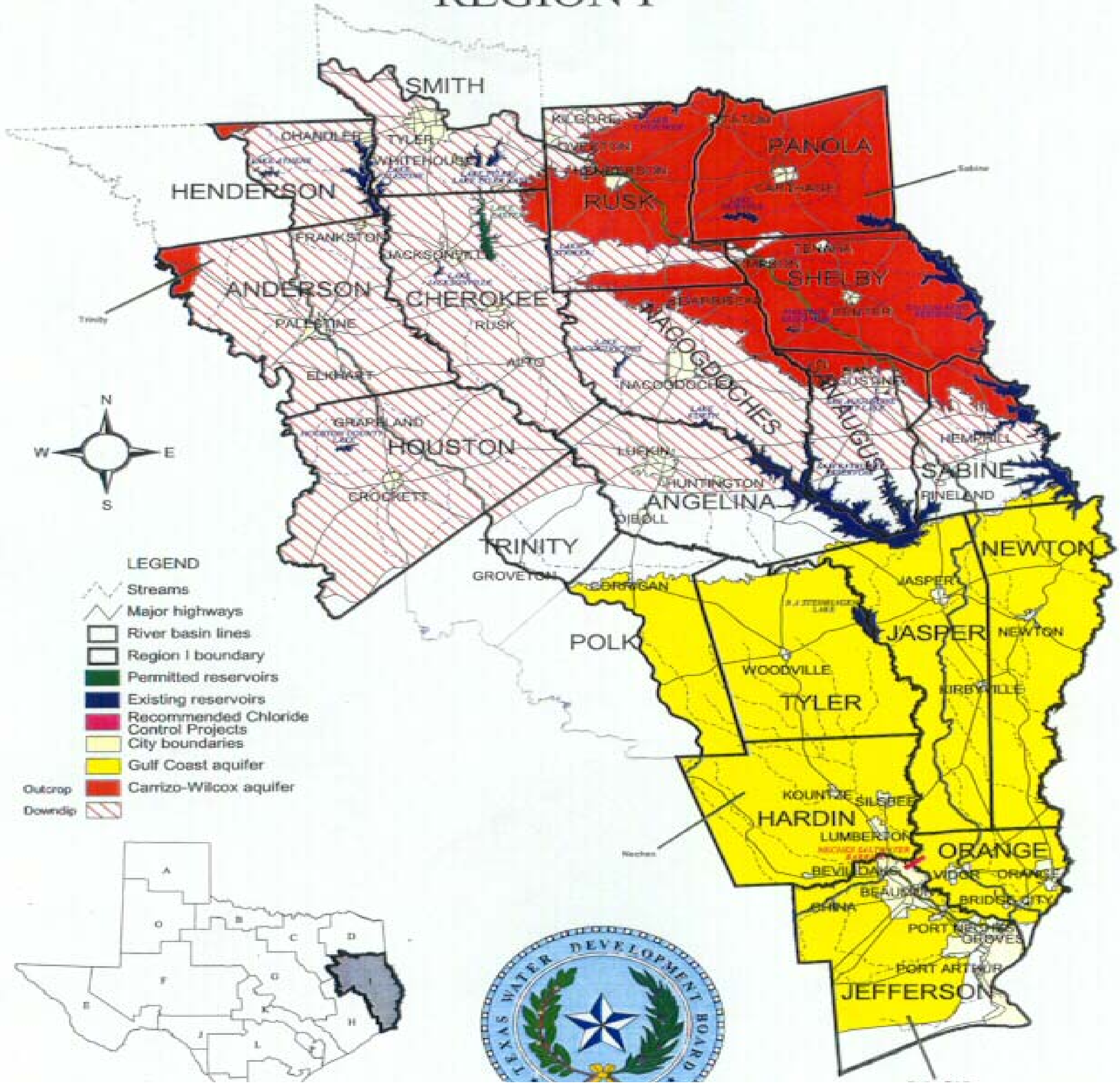
6/1/98

REGION I



SMITH
HENDERSON
ANDERSON
CHEROKEE
RUSK
PANOLA
SHELBY
HOUSTON
ANGELINA
SABINE
TRINITY
POLK
TYLER
JASPER
NEWTON
HARDIN
ORANGE
JEFFERSON
LEGEND
Streams
Major highways
River basin lines
Region I boundary
Permitted reservoirs
Existing reservoirs
Recommended Chloride Control Projects
City boundaries
Gulf Coast aquifer
Outcrop
Carrizo-Wilcox aquifer
Downdip
N
S
E
W
TEXAS WATER DEVELOPMENT BOARD

East Texas Regional Water Planning

Chapter 1	Description of Region
Chapter 2	Population & Water Demands
Chapter 3	Water Supplies
Chapter 4	Water Needs & Water Management Strategies
Chapter 5	Impacts of WMS on Water Quality
Chapter 6	Model Water Conservation Plans
Chapter 7	Consistent With Protection of State Resources
Chapter 8	Unique Stream Segments & Reservoir Sites
Chapter 9	Infrastructure Financing Recommendations

Schedule

- Initially Prepared Plan Submitted June 1, 2005
- Hold Public Hearing July 12th,13th, & 14th
- TWDB Comments Returned by Oct. 1st
- Public Comments Due 60 days After Public Hearing
- Federal & State Agency Comments Due 120 Days from Publication (Oct. 12+/-)
- Respond to Comments & Submit Final Plan by January 1, 2006

CATEGORIES of WATER USE IN TEXAS “Beneficial Uses”

- Manufacturing
- Municipal
- Irrigation
- Steam, Electric Power Generation
- Mining
- Livestock

Population & Water Demands

- Population Derived from 2000 Census
  - Texas State Data Center Develops Population Projections
  - Regions Were Required to Remain Consistent with TWDB Population Projections
- Water Demands Established by Regional & TWDB Studies
  - Per Capita Usage Established by Historical Usage
  - Irrigation Use Established by Crop Type
  - Steam Electric Demand Established by TWDB Industry Joint Study
  - Manufacturing Water Use Established by Historical Use & Economic Projections
  - Mining Water Use Established by Historical Use
  - Livestock Water Use Established by Historical Use

Water Availability

- Surface Water Availability
  - Established by Water Availability Model – WAM Run 3 (No Return Flow)
  - WAM Based on Water Rights Priority
- Groundwater Availability
  - Established by Groundwater Availability Models GAMs for 2006 RWP
  - 2001 RWP Used Historical Use

Reservoir Firm Yields - ac ft/yr

- Toledo Bend - 750,000
- Rayburn/Steinhagen - 820,000
- Palestine - 228,235 (2050)
- Jacksonville/Acker - 6,200
- Houston County - 3,500
- Murvaul - 22,450
- Pinkston - 3,800
- Tyler/Tyler East - 31,250(2050)
- Bellwood - 2,100
- Athens - 6,975 (2050)
- Striker 20,600
- Nacogdoches - 18,750
- Kurth - 19,000
- Center - 1,460
- Martin - 25,000

Unpermitted Yields - ac ft/yr

- Toledo Bend - 285,935 (2050)
- Jacksonville - 2,500
- Houston County - 3,500
- Murvaul - 470 (2050)
- Striker - 2,500

Water Sources
For Region I Identified Needs

- 31,493 Acre-Ft Groundwater
- 709,082 Acre-Ft Surface Water
  - 500,000 for LNG
  - 100,000 for US Corps of Engineers
- 1100 Acre-Ft from Stock Ponds(Livestock)
- 12,606 Acre-Ft Voluntary Distribution
- 500 Acre-Ft Indirect Reuse
- 1,896 Acre-Ft Water Conservation

Region I Water Conservation

Passive Water Conservation will Provide

20, 600 Ac-Ft of Water Supply in the Region by 2060

Figure 2.1
Population Projection by County

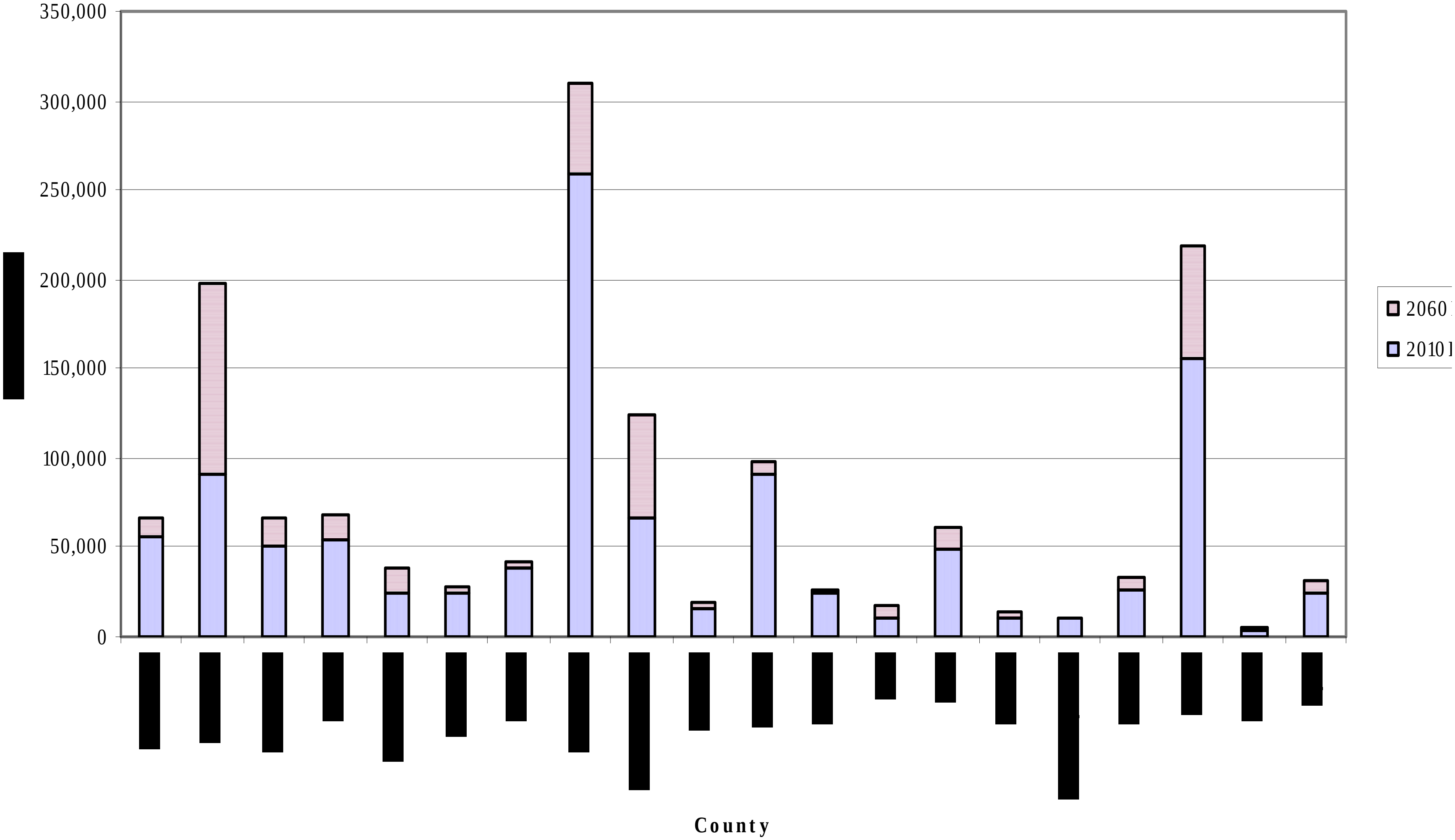
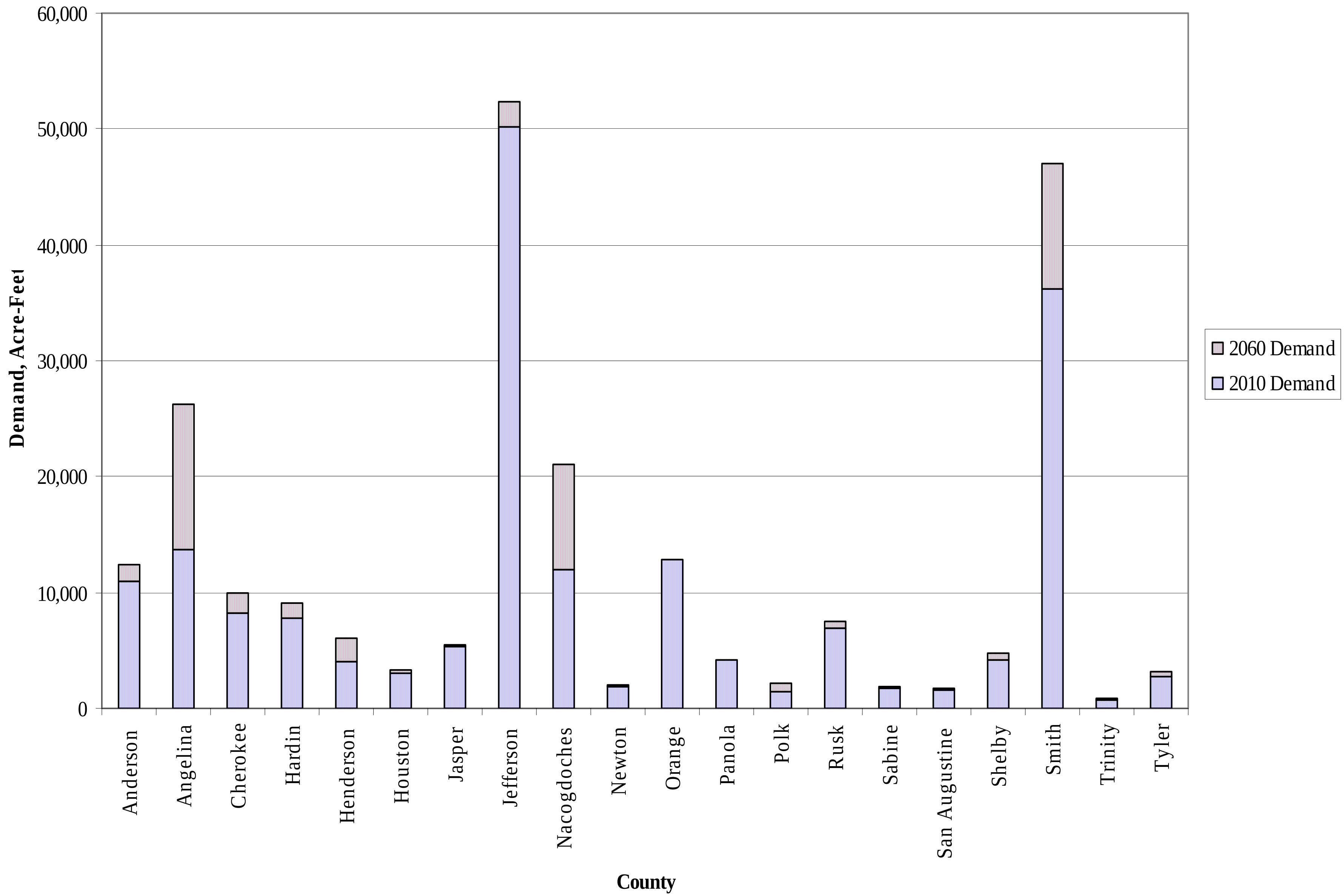


Figure 2.5
Municipal Demand by County



Strategies Not Considered

- Drought Management Will Not Be Considered A Water Management Strategy
- Brush Control
- Precipitation Enhancement
- Water Right Cancellation
  - Alternatively Will Encourage Sale of Water Rights
- Aquifer Storage & Recovery

Feasibility

- Must have an Identified Sponsor
- Must Consider End Use (Be Practical)
- Should Provide Reasonable Percentage of Need
- Must Meet Federal & State Regulations
- Must Be Based on Proven Technology
- Must be Able to Implement
- Must be Appropriate for Regional Water Planning

Selection Process

- Define Areas with Supply Deficiencies
- Contact WUGs to Determine Strategies Currently being Considered
- Develop Comprehensive List of Potentially Feasible Strategies
- Prepare Qualitative Rating based on:
  - Cost
  - Environmental Impact
  - Reliability
  - Impact on Other Water Resources
  - Impact on Agricultural & Natural Resources
  - Political Acceptability

Selection Process

- Select One or More Strategies as Appropriate for Each Need
- Confirm Selected Strategies are Acceptable to WUG with Need
- Present Selected Strategies to RWPG in Public Meeting for Discussion, Modification, and Approval

Alternative Water Management Strategies

- Senate Bill 3 Would Have Allowed Alternative Water Management Strategies
  - Senate Bill 3 Did Not Pass
  - As of Today There Are No Alternative Water Management Strategies

Anderson County

- Increase Use of Groundwater
- 21,853 Steam & Electric Demand from Lake Palestine
  – Alternative WMS for this Demand Lake Fastrill

Angelina County

- Increase Use of Groundwater
- Lufkin Regional Water Plant & Pipeline
- 4,504 Acre-Ft Manufacturing Need Met by
  - Phase II of Lufkin Water Plant
  - Or Lake Columbia

Cherokee County

- Carrizo-Wilcox Almost Fully Allocated
- 244 Acre-Ft Manufacturing Need Met from City of Jacksonville
- 213 Acre-Ft New Summerfield Need from Lake Columbia Project
- 2 Acre-Ft Mining Need from Queen City
- 212 Acre-Ft Rusk Need from Lake Columbia Project

Hardin County

- Gulf Coast Aquifer Adequate to Meet Needs

Henderson County

- Athens – Water Conservation & Purchase from Athens Municipal Water Authority
- County Other Water Conservation, Queen City, Over Draft Carrizo Wilcox Temporarily, Purchase Water from UNRMWA
- RPM WSC Over Draft Carrizo Wilcox with Existing Wells 29 Acre-Ft
- Fish Hatchery Temporary Pumping from Lake Athens, Indirect Reuse, Forest Grove Reservoir

Jasper County

- Gulf Coast Aquifer Adequate to Meet All Needs

Jefferson County

- Meeker Increase Use from Gulf Coast Aquifer
- Steam & Electric Power Supplied from LNVA
- LNG Plant Demands 500,000 Ac-Ft Met by LNVA
- Projected Shortage of 64,000 Ac-Ft in 2060
  - Water Conservation
  - Realize Efficiency from Salt Water Barrier
  - Reallocation of Storage in Sam Rayburn
  - Purchase Water from Sabine River Authority
  - Alternative Strategy Rockland Reservoir

Nacogdoches County

- Increase Use of Water from Carrizo Wilcox for County Other & Small WSC
- Nacogdoches Obtain Agreement with Downstream Water Rights Holder to Retain Flow in Lake Nacogdoches
- Steam & Electric 13,358 Acre-Ft from Lake Columbia

Newton County

- Manufacturing 667 Acre-Ft from Gulf Coast Aquifer Alternatively Water from SRA

Orange County

- Manufacturing 31,536 Acre-Ft Need Met from SRA Surface Water
- Mauriceville Water from Gulf Coast Aquifer

Panola County

- Panola County Has No Needs

Polk County

- Meet County Other & Manufacturing Need from Gulf Coast Aquifer

Rusk County

- 27,834 Acre-Ft Steam & Electric Need Met from 6862 Acre-Ft Ground Water & 20,972 Acre-Ft from Lake Columbia

Sabine County

- County Other Needs in Neches Basin Met from Carrizo Wilcox
  – Alternatively Purchase Surface Water from Hemphill

San Augustine County

- Meet Needs from Ground Water Sources & Developing Stock Ponds for Livestock

Shelby County

- Center Retain Inflows in Lake Pinkston
- County Other Needs Met from Carrizo Wilcox, Water from Center, Water from Toledo Bend
- 7,961 Acre-Ft Livestock Need Met With Ground Water, Local Supplies, & Toledo Bend Water
- Manufacturing – Purchase Water from Center

Smith County

- Meet Needs from Carrizo Wilcox 18,406 Acre-Ft of 18,400 Acre-Ft Available Supply Used
- Irrigation & Mining Needs Met from Queen City Aquifer

Trinity County

- County Other Need Met from Yegua-Jackson

Tyler County

- County Other Needs Met from Gulf Coast Aquifer

Outside Region I

- Sabine River Authority – Toledo Bend
  - 100,000 Ac-Ft Region D
  - 200,000 Ac-Ft North Texas Municipal Water Utilities
  - 200,000 Ac-Ft Tarrant County Regional Water District
  - 200,000 Ac-Ft Dallas Water Utilities (Alt. WMS)
- Upper Neches River Municipal Water Authority
  - 114,337 Ac-Ft Dallas Water Utilities Lake Palestine
  - 112,100 Ac-Ft Dallas Water Utilities Lake Fastrill

Region I Balance

- Water Available in Region 3,327,233 Ac-Ft
- Water Needed in Region I 1,811,320 Ac-Ft
- Water for Other Regions 614,337 Ac-Ft
  - From Existing Supplies
  - Does Not Include Alt WMS for Dallas W.U. of 200,000 Ac-Ft from Toledo Bend

WATER DEMAND BY CATEGORY

Water User Group	2000	2010	2020	2030	2040	2050	2060
Municipal	181,699	189,559	196,828	202,761	208,193	218,705	233,622
Manufacturing	345,580	651,790	946,939	965,692	1,024,491	1,058,594	1,043,454
Livestock	22,345	23,613	25,114	26,899	29,020	31,546	34,533
Irrigation	113,905	222,846	223,163	223,517	223,899	224,321	224,786
Steam-Electric	28,996	43,985	79,989	93,515	110,006	130,108	154,611
Mining	11,795	14,662	16,297	17,331	18,385	19,432	20,314
Total for Region	**704,320**	**1,146,455**	**1,488,330**	**1,529,715**	**1,613,994**	**1,682,706**	**1,711,320**

Unique Stream Segments

- Determined Significant Stream Segments Exhibiting 3 or More Characteristics Qualifying Them for Significant Status
- Presented to Region I Planning Group Information on Protections Afforded these Resources and Significance of them being Designated Unique

Unique Reservoir Sites

- Presented Information on Historically Proposed Reservoir Sites and Significance of Designation as Unique

Unique Designations

- No Recommended Unique Stream Segments
- No Recommended Unique Reservoir Sites

East Texas Regional Water Planning Group
Public Hearing for IPP

July 12, 13, & 14, 2005

1774

A-1

ANRA

ANGELINA & NECHES RIVER AUTHORITY

July 14, 2005

Mr. David Alders, Chairman
East Texas Regional Water Planning Group
210 Premier Drive
Jasper, Texas 75951

Dear Mr. Chairman:

I attended the Public Hearing for the Region I Water Planning Group last night in Nacogdoches. I want to express to you, members of the planning group, and the consulting group how much we at ANRA appreciate the extreme amount of time and effort which has been put into this plan.

On pages 4C-39 and 40 is discussion and charts referring to the demand for Steam Electric Generation water for Rusk County. The chart shows a need beginning in 2020 and extending through 2060 for 6862 acre feet of groundwater to meet the steam electric generation needs. This demand would be supplemented beginning in 2040 through 2060 with 20,972 acre feet of surface water from Lake Columbia.

I have enclosed an excerpt from a 2004 study by the United States Geological Survey indicating the year 2000 sources of water for electric generation in the United States. The chart breaks down the source by state. As you can see, groundwater is almost never the source for this type use, either in Texas or elsewhere in the United States. Only in the arid western states is it a predominate use.

When the Steag Power Company was putting together its power generation project in northwestern Nacogdoches County, one of the first questions which arose from individuals in the immediate area was the proposed source of water. The local concern about pumping large quantities of groundwater and the potential impact on local wells was quickly averted by Steag when they assured the local population that they would use surface water.

The potential for local opposition to a permit to build a large power plant using groundwater, the lack of true assurance of a reliable supply of groundwater, coupled with the chart indicating the near absence of groundwater use for power plants in the United States lead me to request a change in the Initial Plan as proposed.

Lake Columbia is expected to be completed well within the 2020 time frame suggested for Rusk County steam electric demands. ANRA would respectfully request that the source of water for Steam Electric Generation in Rusk County be changed to Lake Columbia for the full 27,834 acre feet.

Post Office Box 387 / 210 Lufkin Avenue / Lufkin, Texas 75902 / 936 632 7795 / Fax 936 63[illegible]

Your consideration of this request is appreciated and thank you once again for all the hard work which went into the drafting of this plan.

Sincerely,

Kenneth Reneau
General Manager

cc: ANRA Board of Directors
Mr. Kelley Holcomb, Region I Planning Group Member
Mr. John Stover, ANRA General Counsel

Estimated Use of Water in the United States in 2000

Abstract | Introduction | Total | Public supply | Domestic | Irrigation | Livestock | Aquaculture | Industri
Thermoelectric | Trends | References | Glossary

Table 12. Thermoelectric power water withdrawals, 2000.
[Figures may not sum to totals because of independent rounding]

STATE	WITHDRAWALS (in million gallons per day)							WITHDRAW (in thousand acre-fe	
	By source and type				Total			By type	
	Ground water	Surface water							
	Fresh	Fresh	Saline	Total	Fresh	Saline	Total	Fresh	Saline
Alabama	0	8,190	0	8,190	8,190	0	8,190	9,180	
Alaska	4.65	28.9	0	28.9	33.6	0	33.6	37.6	
Arizona	74.3	26.2	0	26.2	100	0	100	113	
Arkansas	2.92	2,170	0	2,170	2,180	0	2,180	2,440	
California	3.23	349	12,600	12,900	352	12,600	12,900	395	14,10
Colorado	16.1	122	0	122	138	0	138	155	
Connecticut	0.08	186	3,440	3,630	187	3,440	3,630	209	3,86
Delaware	0.47	366	738	1,100	366	738	1,100	411	82
District of Columbia	0	9.69	0	9.69	9.69	0	9.69	10.9	
Florida	29.5	629	12,000	12,600	658	12,000	12,600	738	13,40
Georgia	1.03	3,240	61.7	3,310	3,250	61.7	3,310	3,640	69.
Hawaii	0	0	0	0	0	0	0	0	
Idaho	0	0	0	0	0	0	0	0	
Illinois	5.75	11,300	0	11,300	11,300	0	11,300	12,600	
Indiana	2.58	6,700	0	6,700	6,700	0	6,700	7,510	
Iowa	11.9	2,530	0	2,530	2,540	0	2,540	2,850	
Kansas	14.9	2,240	0	2,240	2,260	0	2,260	2,530	
Kentucky	2.71	3,250	0	3,250	3,260	0	3,260	3,650	
Louisiana	28.4	5,580	0	5,580	5,610	0	5,610	6,290	
Maine	4.92	108	295	403	113	295	408	127	33
Maryland	1.80	377	6,260	6,640	379	6,260	6,640	425	7,0
Massachusetts	0	108	3,610	3,720	108	3,610	3,720	121	4,05

Michigan	0	7,710	0	7,710	7,710	0	7,710	8,640	0
Minnesota	4.17	2,260	0	2,260	2,270	0	2,270	2,540	0
Mississippi	43.5	318	148	467	362	148	510	406	166
Missouri	12.2	5,620	0	5,620	5,640	0	5,640	6,320	0
Montana	0	110	0	110	110	0	110	123	0
Nebraska	6.87	2,810	0	2,810	2,820	0	2,820	3,160	0
Nevada	12.0	24.7	0	24.7	36.7	0	36.7	41.1	0
New Hampshire	0.71	235	761	997	236	761	997	265	854
New Jersey	2.24	648	3,390	4,040	650	3,390	4,040	729	3,800
New Mexico	11.4	45.0	0	45.0	56.4	0	56.4	63.2	0
New York	0	4,040	5,010	9,050	4,040	5,010	9,050	4,530	5,610
North Carolina	0.09	7,850	1,620	9,470	7,850	1,620	9,470	8,800	1,810
North Dakota	0	902	0	902	902	0	902	1,010	0
Ohio	7.57	8,590	0	8,590	8,590	0	8,590	9,630	0
Oklahoma	3.27	143	0	143	146	0	146	164	0
Oregon	2.47	12.8	0	12.8	15.3	0	15.3	17.2	0
Pennsylvania	3.98	6,970	0	6,970	6,980	0	6,980	7,820	0
Rhode Island	0	2.40	290	293	2.40	290	293	2.69	326
South Carolina	5.83	5,700	0	5,700	5,710	0	5,710	6,400	0
South Dakota	1.23	4.01	0	4.01	5.24	0	5.24	5.87	0
Tennessee	0	9,040	0	9,040	9,040	0	9,040	10,100	0
Texas	60.2	9,760	3,440	13,200	9,820	3,440	13,300	11,000	3,860
Utah	13.1	49.2	0	49.2	62.2	0	62.2	69.8	0
Vermont	0.66	355	0	355	355	0	355	398	0
Virginia	1.50	3,850	3,580	7,430	3,850	3,580	7,430	4,310	4,020
Washington	0.92	518	0	518	519	0	519	582	0
West Virginia	0	3,950	0	3,950	3,950	0	3,950	4,430	0
Wisconsin	8.99	6,090	0	6,090	6,090	0	6,090	6,830	0
Wyoming	1.13	242	0	242	243	0	243	273	0
Puerto Rico	0	0	2,190	2,190	0	2,190	2,190	0	2,460
U.S. Virgin Islands	0	0	136	136	0	136	136	0	153
TOTAL	409	135,000	59,500	195,000	136,000	59,500	195,000	152,000	66,700

Abstract | Introduction | Total | Public supply | Domestic | Irrigation | Livestock | Aquaculture | Industria
Thermoelectric | Trends | References | Glossary

Water Use in the United States | USGS Water Resources of the United States

For more information: wu-info@usgs.gov

Nacogdoches
the oldest town in Texas

A-2

August 23, 2005

Mr. Gary Graham, P.E.
Schaumburg & Polk, Inc.
8865 College St.
Beaumont, TX 77707

Re: Region I Water Plan - Comments

Dear Mr. Graham:

We have reviewed the Draft Region I Water Plan and have two comments:

1. We do not agree with the population projections and water use projections for the City of Nacogdoches. Attached is a section from an update to our Comprehensive Water Plan prepared by KSA Engineers in 2004 which prepares new estimates which includes the impact of the 2000 census. The City of Nacogdoches does not agree the census was correct. We had a significant population decrease when all other indicators such as water taps, water use, electrical taps, school enrollment, and sales taxes show an increase.

2. We do not agree with the draft plan findings for the yield of Lake Nacogdoches ranging from 9,865 ac-ft in Yr 2000 to 7,836 in Yr 2060. In 1998, a firm yield analysis of the lake by KSA Engineers determined a yield of 22,000 ac-ft for Yr 2050. When the Lake was created in the 1970's, original studies found a yield of 22,000 ac-ft. I am attaching a portion of this report that explains the data sources, methods, and summarizes our findings. Please compare this information with your information. We have compared them the best we can. The only difference we found was sedimentation rate that can cause a small difference in our results but not the 22,000 to 7,836 (2050) difference. Most likely we used the same stream gauge data and evaporation data. The most likely difference that would cause such a large difference in results is the drainage area to Lake Nacogdoches. I did not see that area in the report. The drainage area we used for Lake Nacogdoches was 89.2 sq miles.

Please compare this information with yours. We are prepared to present more detailed information in support of our request. Please provide us with your comments.

Sincerely,

David B. Smith, P.E.
City Engineer

Attachments

Cc: Jim Jeffers, City Manager
Billy Sims, KSA Engineers

City of Nacogdoches 202 E. Pilar – PO Drawer 635030 – Nacogdoches, TX 75963
936-559-2502 Fax 936-559-2912 www.ci.nacogdoches.tx.us
Home of Stephen F. Austin State University www.sfasu.edu

I. Introduction

The City of Nacogdoches has requested that KSA Engineers, Inc. conduct a firm yield analysis of Lake Nacogdoches and compare this yield with projected water demand through the year 2050.

II. Firm Yield Analysis

A. Methodology

Since no flow data is available on Bayou Loco, a firm yield analysis had to be conducted by evaluating flow data from the nearest available U.S.G.S. flow monitoring station. For each station a water balancing evaluation was conducted, using an Excel spreadsheet, for each month for the period that flow data was available. The flow data for each station was prorated based upon the drainage area of the watershed of Lake Nacogdoches (89.2 square miles) and the drainage area to each flow meter. Net monthly evaporation data was obtained from the Texas Water Oriented Data Bank at the Texas Natural Resource Conservation Commission (TNRCC).

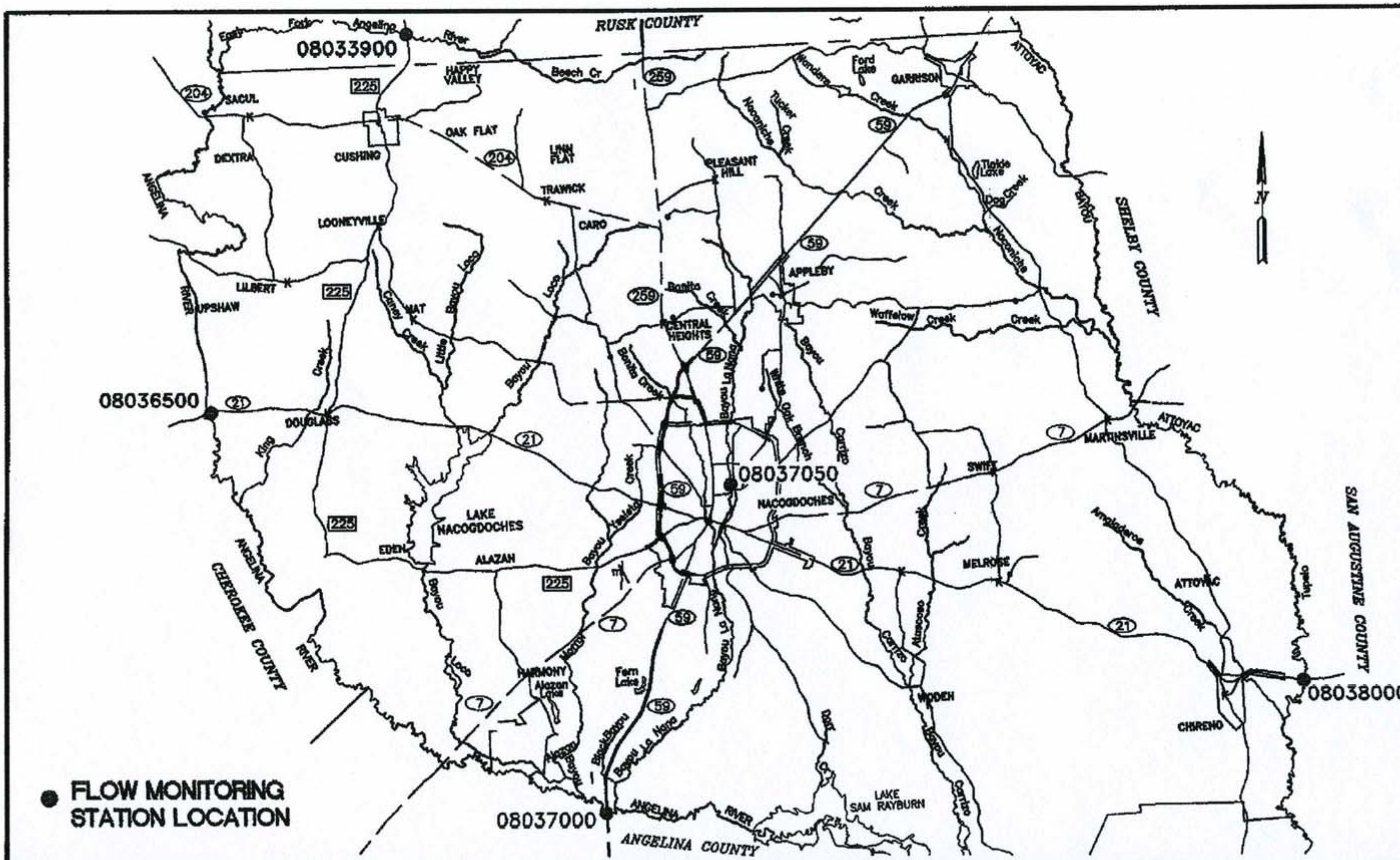
Monthly water demand was determined by multiply the assumed annual yield by the average percent of monthly water production by the City.

The total monthly demand on the Lake for water use and evaporation was subtracted from the monthly inflow to obtain the net inflow or outflow to the Lake. This amount was then subtracted from the previous water volume stored in the Lake.

The annual yield was adjusted until no more storage was left in the Lake. The highest yield to the nearest 100 acre feet which resulted in a positive water storage was determined to the firm yield based upon that set of flow data.

B. Description of Lake Nacogdoches

Lake Nacogdoches is a 2,210 acre reservoir with a normal pool elevation of 279.0 feet MSL and an emergency spillway elevation of 286.0 feet MSL. It is located in western Nacogdoches County on Bayou Loco about 10 miles west of the City of Nacogdoches. See Figure II-A on the following page. When the Lake was permitted in 1977 it reportedly had a storage volume of 42,318 acre-feet. A hydrographic survey of Lake Nacogdoches done by the Texas Water Development Board in June 1994 found a storage capacity at the normal pool elevation of 279.0 feet of 39,523 acre-feet. This is 2,795 acre-feet less than the storage volume determined in 1977. The volume determined by the TWDB should be the more accurate of the figures. Some of the difference is attributable to sedimentation. How much of the difference is attributable to sedimentation and how much is attributable to the difference in the surveying methodologies can not be determined. However, sedimentation for fifty years is estimated to be 1,250 acre-feet. Therefore, only about 500 acre-feet of the difference should be attributable to sedimentation. It is recommended that the City have the TWDB conduct Hydrographic survey every 10 years.



KSA ENGINEERS, INC. Engineers ◆ Planners ◆ Surveyors 1318 SOUTH JOHN REDDITT DR. PO BOX 151508 LUFKIN, TEXAS 75915-1508 409-637-6061 409-637-6239 (FAX)	Offices in: Longview Tyler Lufkin Austin Dallas Fort Smith	DRAWN BY: KDC DESIGNED BY: BDS LATEST REVISION: MAY 1998 KSA JOB NO.: NA	CITY OF NACOGDOCHES FIRM YIELD ANALYSIS	FIGURE 11-A LAKE NACOGDOCHES AND FLOW MONITORING STATION LOCATION	SHEET NO. OF SCALE: 1"=5MI. FN: NC_FLOW2

The City is permitted to withdraw up to 22,000 acre-feet on any given year and at a maximum diversion rate of 62.2 CFS (28,000 GPM).

Appendix A has a Reservoir Volume Table and a Reservoir Area Table from this survey. This data was used in the firm yield analysis to determine surface elevations for calculated storage volumes and to determine surface area for determined surface elevations for evaporation calculations.

C. Flow Monitoring Stations

The Four nearest flow monitoring stations were used. The following Table summarized pertinent information on these stations:

Table II-A
City of Nacogdoches
FLOW MONITORING STATION DATA

Station Number	Location	Drainage Area in Square Miles	Period of Records
08339000	East Fork Angelina River Near Cushing	158	01/01/64-09/30/89
08036500	Angelina River at Highway 21	1,276	03/01/59-09/30/97
08037000	Angelina River at Highway 59	1,600	10/01/64-09/30/86
08037050	Bayou Luna at Starr Ave	31.3	05/17/89-09/30/93

See Figure II-A for location of each monitoring station.

An evaluation of the Palmer Hydrographic Drought Index, revealed that the most critical periods of concern available for evaluation were 1947 – 1956 and 1962 – 1972.

Only the Angelina River at Highway 59 data covered the 1947 – 1956 period. However, its yield analysis revealed that the 1962 – 1972 period was the determining period which contained the lowest lake storage.

D. Results of Firm Yield Analysis

Appendix B Contains the firm yield spread sheets for each flow monitoring station. Table II-B summarizes the results of the analysis of each station. Table II-B shows the firm yield for each station and the months which resulted in storage less than 10% of the storage of the Lake at normal pool elevations. November 1964 – March 1995, October 1965 – February 1966, October 1971 – December 1971, and August 1972 – December 1972 were found to be critical periods.

The East Angelina River Station resulted in the highest yield of 25,000 acre-feet. However much of its drainage shed is in the outcrop of the Carrizo formation and contain many perennial springs. Therefore, it is felt that this figure is high. The other three yields are relatively close together. Lanana Creek has the smallest yield but it also has the smallest drainage area. It is less than half that of Lake Nacogdoches. The two stations on the Angelina River have drainage areas much larger than that of Lake Nacogdoches. It is our opinion based upon the results of this firm yield analysis that the firm yield of Lake Nacogdoches is 22,000 acre-feet per year.

TABLE II-B
CITY OF NACOGDOCHES
LAKE NACOGDOCHES
RESULTS OF YIELD ANALYSIS

LOCATION OF MONITORING STATION	YIELD ACRE-	MONTH	AVAILABLE WATER ACRE-
ANGELINA RIVER AT HIGHWAY 21	22,900	Jan-65	120
		Oct-72	201
		Jan-66	514
		Dec-65	729
		Feb-65	1,065
		Dec-64	1,189
		Nov-65	1,418
		Sep-72	1,513
		Feb-66	1,848
		Mar-66	1,859
		Mar-65	1,959
		Nov-72	2,081
		Nov-64	2,519
		Oct-65	2,792
		Aug-72	3,688
		Dec-72	3,810
ANGELINA RIVER AT HIGHWAY 59	22,200	Oct-72	62
		Sep-72	1,397
		Jan-65	2,215
		Nov-72	2,710
		Dec-64	3,135
		Feb-65	3,149
		Aug-72	3,515
		Dec-65	3,991
EAST ANGELINA RIVER NORTH OF CUSHIN	25,000	Oct-72	91
		Sep-72	1,034
		Nov-72	1,639
		Aug-72	3,188
LANANA CREEK IN CITY	20,800	Nov-71	208
		Oct-71	1,210
		Dec-71	2,423
		Sep-71	2,884
		Dec-64	3,163
		Jan-65	3,796
		Nov-64	4,464

SECTION II

POPULATION AND WATER USE PROJECTIONS

The Texas Water Development Board has previously developed population and water use projections for the City of Nacogdoches and its service area as part of the 1996 State Water Plan. After a previous review of the data, it was believed that the projections presented for the City were low. In a report titled "City of Nacogdoches Projected Water Needs" prepared by KSA in July 1999, the TWDB's revision guidelines were followed to justify higher population and water use projections. The TWDB approved the revisions recommended by the City and included the new projections in the 2002 State Water Plan.

As new water supply sources are considered, it is first necessary to update the previous population and water demand projections. This section updates the previous projections from the City's 2000 Water Supply Study by considering the following:

1. Year 2000 census information for population.

2. Draft TWDB – Region I (East Texas) population and water demand projections proposed by the region for use in the 2006 State Water Plan.

The current projections for population and average daily water demand follow.

A. Projected Population

1. Historical Population

The historical County and City population sets (based on U.S. Census data) are listed in Table II-1.

Table II-1. Historical Population Data

Year	County	% Growth	City	% Growth	City % of County Pop
1930	30,290		5,687		18.8%
1940	35,392	1.57%	7,538	2.86%	21.3%
1950	30,326	-1.53%	12,327	5.04%	40.6%
1960	28,046	-0.78%	12,674	0.28%	45.2%
1970	36,362	2.63%	22,544	5.93%	62.0%
1980	46,786	2.55%	27,149	1.88%	58.0%
1990	54,753	1.58%	30,872	1.29%	56.4%

2000	59,203	0.78%	29,914	-0.31%	50.5%

It should be noted that the City had a much higher growth rate than the County from 1960 to 1970 primarily due to:

- Annexation in 1962 which increased the corporate City limits from 5 to 15 square miles adding almost 4,000 people.
- SFASU more than tripled its enrollment by adding 7,560 students (Nacogdoches Comprehensive Plan).

The census data also shows slight growth between 1980 and 1990 and a *decline* in population in the Year 2000. The City's 1990 census population was previously identified as suspect because:

1. Rise in SFASU enrollment far exceeded the growth experienced from non-students. The increase in students from 1980 to 1990 was 1,864 (1.58% AAG); however, these students accounted for 50% of the total growth shown for the City by the Census data during this period (3,723 people).
2. Undercount of minority population. The percentages of minority populations in the school districts are significantly higher than the percentage reflected in the Census count which is believed to indicate an undercount in the census.

The decrease in population from 1990 to 2000 is again suspect. Several growth indicating factors during the 90's showed increase as illustrated by Table II-2.

Table II-2. 1990 – 2000 Growth Indicators

Growth Indicating Factor	Average Annual Growth
Nacogdoches ISD Enrollment	1.0%
Registered Vehicles in Nacogdoches County	1.5%
City Residential & Commercial Building Permits	1.6%
TxDOT District 11 Traffic Counts – US 59	3.7%
Unemployment Rate (Decline 1990 – 1998)	6.7% - 4.4%

With these growth factors and considering the census population's average annual growth (AAG) between 1970 and 1990 of 1.58%, the Year 2000 census was estimated to equal 36,709 instead of the reported 29,914. However, the census population drives the predictions used by the TWDB and the regional water planning committees. This census estimate will impact the next two State Water Plans.

2. Population Projections

The historical and projected population sets prepared in the 2002 TWDB plan and KSA's Water Supply Study are shown in Figure II-1 (*Projected Water Needs, 1999*).

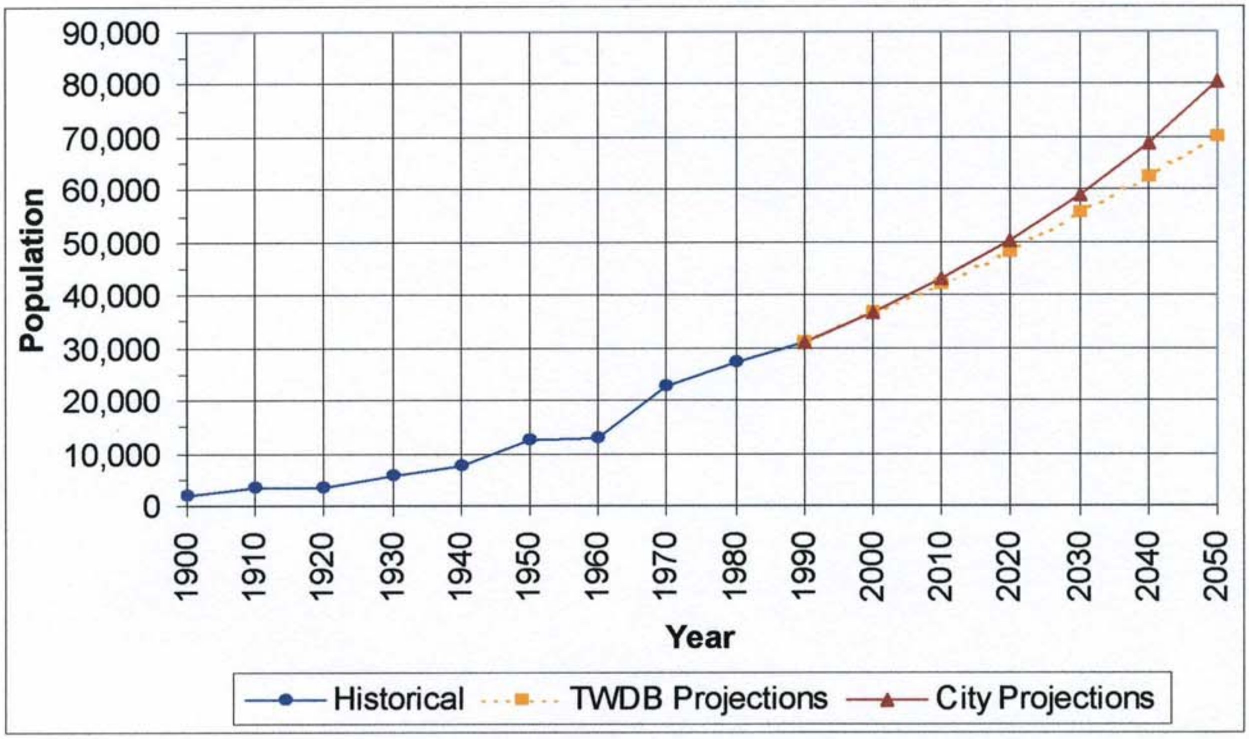


Figure II-1. Previous Population Projections Comparison

As seen in this figure, the City's projections were slightly higher than those shown for the TWDB in the 2002 State Water Plan. The Year 2050 population estimate of 80,574 based on the City projections was approved by the TWDB and was utilized in the 2002 State Water Plan.

With the Year 2000 census data now available, the TWDB has updated their population projections. Table II-3 shows a comparison of the projections from the 2002 State Water Plan and from the current draft estimates proposed by the regional planning committee for the 2006 State Water Plan.

Table II-3. TWDB Population Projections

Year	2002 State Water Plan				Proposed 2006 State Water Plan			
	County	AAG	City	AAG	County	AAG	City	AAG
1990	54,753		30,872		54,753		30,872	
2000	63,382	1.47%	36,709	1.75%	59,203	0.78%	29,914	-0.31%
2010	72,560	1.36%	42,959	1.58%	67,357	1.30%	33,044	1.00%
2020	82,400	1.28%	50,274	1.58%	75,914	1.20%	36,501	1.00%
2030	95,373	1.47%	58,834	1.58%	84,183	1.04%	39,946	0.91%
2040	107,184	1.17%	68,851	1.58%	92,628	0.96%	43,074	0.76%
2050	117,624	0.93%	80,574	1.58%	108,753	1.62%	49,198	1.34%
2060					124,453	1.36%	54,345	1.00%
[1]		**1.24%**		**1.58%**		**1.24%**		**1.00%**

[1] Values listed are the average annual growth rates from 2000 – 2050/2060

As Table II-3 illustrates, the Year 2050 population projections from the previous and current plans are 80,574 and 49,198, respectively. This represents a difference of 31,376 (or 64%) and is significant when examining long-term water needs for the City of Nacogdoches.

Table II-3 also shows the average annual growth from 2000 through 2060 as 1%. It is still believed that the 1.58% average annual growth rate which occurred in Nacogdoches between 1970 and 1990 is realistic for future projections. This growth rate was supported by various factors as documented in the report titled "City of Nacogdoches Projected Water Needs" prepared by KSA in July 1999. These other supporting factors include:

- Hispanic population migration to area in 90's
- Future City annexations
- New developments
- IH 69 Project
- Water Availability

Applying the 1.58% growth rate to the Year 2000 Census population yields a Year 2050 population of 65,507 and Year 2060 estimate of 76,624. Figure II-2 graphically represents the TWDB projections as well as City's adjusted estimates using the 1.58% average annual growth. Figure II-2 illustrates the importance of proper census counts and their influence on future projections. It also illustrates the importance of the City to continue its participation in the TWDB regional water planning process and submit amendments to the population projections as appropriate based on known local factors.

INSERT Figure II-2 – Population Projections Comparison

B. Projected Average Daily Demand

The "Projected Water Needs" previously completed not only predicted a higher population over the 50-year planning period but also a higher per capita water use. This per capita water use resulted in a higher projected average daily demand for the City. The manufacturing uses in the City were also determined to be higher than the previous TWDB estimates based on recent industrial expansions. Table II-4 shows the final approved projections in the 2002 State Water Plant for average daily water use.

Table II-4. Water Supply Estimate from 2002 State Water Plan

	Water Use Projections				Revised	
Year	Net Municipal Use (MGD)	City's Portion Of County-Other[1] (MGD)	Manufac-Turing (MGD)	Total Daily Demand (MGD)	Per Capita Use (City Only) (gpcpd)	Calculated Average Annual Growth
1990	5.59	0.38	0.87	6.84	181.0	
2000	8.07	0.45	1.82	10.34	219.7	1.96%
2010	9.42	0.70	2.12	12.23	219.3	-0.02%
2020	10.95	0.98	2.40	14.33	217.8	-0.07%
2030	13.06	1.37	2.68	17.10	221.9	0.19%
2040	15.50	1.80	3.13	20.43	225.2	0.15%
2050	18.56	2.19	3.61	24.36	230.3	0.23%

[1] The City supplies water to 12% of the total County-Other users (4 WSC's) based on 1990 water use records. It is assumed that the 12% ratio remains the same for the Year 2000 but linearly increases to 38% in the Year 2050 to account for the 3 WSC's which currently use the City as backup source converting to 100% use.

Table II-5 shows a comparison of the "Net Municipal Use" for the City from the 2002 State Water Plan versus the current estimates proposed by the regional water planning group for the 2006 State Water Plan.

Table II-5. Comparison of City Water Use Projections

Year	2002 State Water Plan			Proposed 2006 State Water Plan		
	City Use (acre-feet)	City Use (MGD)	Per Capita (gpcpd)	City Use (acre-feet)	City Use (MGD)	Per Capita (gpcpd)
1990	6,262	5.59	181.0			
2000	9,040	8.07	219.7	6,903	6.16	206
2010	10,552	9.42	219.3	7,625	6.81	206
2020	12,266	10.95	217.8	8,423	7.52	206
2030	14,630	13.06	221.9	9,218	8.23	206
2040	17,363	15.50	225.2	9,939	8.87	206
2050	20,791	18.56	230.3	11,352	10.13	206
2060				12,540	11.19	206

Table II-5 illustrates that the City's Year 2050 water use projections from the previous and current plans are 18.86 and 10.13 MGD, respectively. This represents a difference of 8.73 MGD or 86% of the projection proposed in the 2006 State Water Plan. This is a significant deviation from the previous long-term water needs estimated for the City of Nacogdoches. The primary difference is a result of:

- The per capita water use from the 2002 State Water Plan was based on a projection of historical usage compared to population. The values were adjusted to account for all uses and water conservation. The average per capita use predicted from 2000 to 2050 was 222 gpcpd. The 2006 State Water Plan includes a per capita use of 206 gpcpd based on the 2000 census population and the "actual usage" according to TWDB records. This value was assumed constant over the 50-year planning period.

- The lower population estimates also result in lower water use predictions.

The Year 2060 prediction (11.19 MGD) is actually lower than the Year 2050 prediction (originally 12.67 MGD) originally proposed by the TWDB in 2000. After detailed information was provided, the 2002 State Water Plan included the values listed in Table II-4. The current State Water Plan estimates water needs for the City to be low.

Applying the average per capita use of 222 gpcpd based on historical information to the "city population projections" shown in Figure II-2, an updated water demand forecast is determined. Table II-6 shows the City's water demand projections employing these assumptions.

Table II-6. Updated Water Demand Projections

Year	City Population [1]	Per Capita Use [2] (gpcpd)	City Use (Acre-Ft)	City Use (MGD)
1990	30,872	181.0	6,260	5.59
2000	29,914	219.7	7,362	6.57
2010	34,991	219.3	8,596	7.67
2020	40,930	217.8	9,986	8.91
2030	47,876	221.9	11,901	10.62
2040	56,002	225.2	14,128	12.61
2050	65,507	230.3	16,900	15.09
2060	76,624	222.4	19,087	17.04

[1] Based on "city projections" from Figure II-2

[2] Based on per capita values from Table II-5 (2002 State Water Plan)

While this method is believed to represent a more realistic estimate for average daily water demands for the City, it is still lower than the current projections shown in the 2002 State Water Plan.

Assuming the City values are updated as shown in Table II-6 and the county-other and industrial usages remain unchanged, the City is predicted to need approximately 23 MGD in the Year 2060 (which compares to the 24.36 MGD previously estimated in the Year 2050).

Depending upon the methodology employed (i.e., TWDB 2006 State Water Plan or the City of Nacogdoches 2000 Water Supply Study), the Year 2060 estimate of average daily water needs range from 17 to 27 MGD.

The preceding discussion illustrates the importance of proper water accounting practices and their influence on future projections. The actual per capita water use should be monitored annually to verify future TWDB projections. This discussion also illustrates the importance of the City to continue its participation in the TWDB regional water planning process and submit amendments to the water use projections as appropriate based on known local information.

C. Water Use Categories

1. Net Municipal Use Breakdown

The "net municipal use" and corresponding "per capita use" shown in Table II-4 represents the City's total production less outside municipal, industrial, and raw water sales. By definition, this use primarily accounts for residential and commercial water consumers as well as water loss in the distribution system. A breakdown of the municipal users for a typical year (1998) is shown in Table II-7.

Table II-7. Municipal Water Use % Consumption by Type of User

Municipal User	% of Total Use
Residential	53.08%
Commercial	11.62%
Government (subtotal 11.78%):	
AGTX-F/AB-Nacog	0.00%
City of Nacogdoches	2.02%
Community Action	0.03%
Memorial Hospital	1.13%
Nacogdoches I.S.D.	1.19%
Nacogdoches County	0.43%
Postmaster	0.04%
S.F.A.S.U.	6.81%
State of Texas	0.10%
U.S.D.A.	0.02%
Distribution System Loss and Other	23.52%
Total Municipal Sales	**100.00%**

As shown in Table II-7, the net municipal sales are comprised of approximately 53% residential, 12% commercial, 12% governmental, and 23% system loss/other. (*It should be noted that this system loss is not the actual distribution losses because it is only compared to other "net municipal uses" not the sum of all water sold.*) It is believed that this general distribution will continue in the future.

2. Wholesale Supply

The City of Nacogdoches currently serves four (4) water supply districts with treated water. An additional, three (3) corporations have emergency or backup connections to the City and purchase minimum amounts of water. Table II-8 lists the 1998 breakdown of wholesale water users.

Table II-8. Wholesale Water Use % Consumption by Entity

Water Supply Corporations	% of Total Use
Appleby	*7.96%*
Central Heights	42.56%
D&M	28.53%
Lilly Grove	*5.82%*
Timberridge	5.23%
Woden	*0.22%*
Woodland Hills	9.68%
Total Wholesale Users	**100.00%**

It should be noted that the districts shown in *italic print* are not 100% dependent on Nacogdoches for their treated water needs but used the City for a portion of the their water in 1998. It should also be noted that the City has subsequently taken over the Central Heights system and this area is now considered as part of the City's service area.

As described in the footnotes in Table II-4, it is assumed that all the water districts listed will convert to 100% supply from the City in the future.

3. Industrial Users

Table II-9 shows a percent breakdown of all of the heavy and light industrial consumers for a typical year (1998).

Table II-9. Industrial Water Use % Consumption by Industry

Industrial Consumers	% of Total Use
Heavy Industry	
Cal-Tex Lumber	1.14%
Cooper Power System	6.93%
International Paper	3.81%
J.M. Clipper	3.01%
Nibco	5.02%
Pilgrim Pride Company	55.18%
Southwest Canners	15.21%
Sunlite	0.61%
Texas Farm Products	2.84%
Tyson Foods-Holly	2.95%

Table II-9. (Continued)

Industrial Consumers	% of Total Use
Light Industry	
American Plant	0.01%
Argo Breeding Company	0.19%
Bright Coop Company	0.32%
Clark's Meat Service	0.08%
Continental Manufacturing	0.04%
F.M.K. Incorporated	0.49%
Foretravel, Inc.	0.29%
Longview Asphalt	0.02%
Moore Business Forms, Inc.	0.73%
Nacogdoches Coca-Cola	0.10%
Nacogdoches Hard Wood	0.61%
Richard's Nacog	0.01%
Transit Mix	0.41%
Total Industrial Sales	**100.00%**

In 1999, it was reported that industrial use will increase significantly for Pilgrim Pride due to their latest expansion. It is anticipated that the required water will increase by an average day use of 0.6 MGD up to 1.0 MGD. In the 90's, the average industrial use was approximately 1.0 MGD, so it is evident that Pilgrim's expansion will have a major impact of the industrial use in the City.

Table II-4 reflects adjustments to the estimated Year 2000 "manufacturing" use based on the expansion and inclusion of all industrial users listed in Table II-9.

4. Total Water Use

Based on the breakdown of each user type described previously, Table II-10 shows the breakdown of a typical year using a total average daily water need of 10.34 MGD.

Table II-10. Typical Year Water Use Breakdown

Entity	% of Total Use	Year 2000 Water Use (MGD)
Residential	40.9%	4.23
Commercial	9.2%	0.95
Government	9.3%	0.96
Distribution System Loss	18.6%	1.92
Water Supply Districts	4.4%	0.45
Heavy Industrial	16.8%	1.74
Light Industrial	0.8%	0.08
Total Water Use	**100.0%**	**10.34**

A-3

PUBLIC COMMENT REGISTRATION
East Texas Regional Water Planning Group (Region I)

I would like to offer public comments during the public comment sessions on July 12, 13 or 14, 2005

My comments will be (check) ✓ delivered in person. ✓ written and submitted.

If you choose to provide written comments, please use the space below

Name John D. Stover

Representing ANRA

Address 113 Gaslight Blvd City, town, zip Lufkin 75904

Telephone 936/632-3130 E-mail

Hearing you are attending (check) ✓ Nacogdoches ✓ Tyler ____ Beaumont

Would you like to receive the Region I newsletter? Check: ✓ Yes ___ No ___ Currently receiving.

Written comments See attached

Please use additional pages or the back of this page for additional comments. If you choose to mail your comments, please mail to East Texas Regional Water Planning Group, P.O. Box 1647, Lufkin, Texas 75902

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Timothy J. Karczewski
Of Counsel

July 11, 2005

Mr. David Alders
Chair
East Texas Regional Planning Group
210 Premier Drive
Jasper, Texas 75951

In re: Initially Prepared Plans/2006

Dear David:

Please let me extend the appreciation of the Board of Directors of Angelina and Neches River Authority for all of the many hours and hard work that you and the members of the Regional Planning Group have put in on the current planning as well as the previous ones. It is an important activity and one that will have far reaching benefits for East Texas.

The following comments are submitted on behalf of the Angelina and Neches River Authority ("ANRA") with respect to the 2006 Initially Prepared Plan for the East Texas Regional Water Plan. As you are aware, ANRA is involved in the development, ownership, and operation of public water supply systems. It is this hands-on experience that has given rise to the principal comments set forth below. The Plan uses the following to determine municipal water demands:

> "Municipal water demands projections are computed by multiplying the projected population of an entity by the entity's projected per capita water use. The per capita water uses were adjusted with time to account for current plumbing, appliance and other conservation technologies."

It appears that this methodology does not take into consideration the requirements of the Texas Commission on Environmental Quality ("TCEQ") for a public utility. Attached to this letter is a copy of the TCEQ Regulations found at 30 Texas Administrative Code Section 290.45 which establishes the minimum water system capacity requirements for systems that rely upon groundwater. Under Section 290.45(b)(1)(D), a system must have wells with "... a total capacity of 0.6 gpm per connection." Please note that the water system requirements are not based upon historical uses but based upon the number of connections in the system.

An example of how this contrasts with the water demands contained in the Plan is the City of Alto with a year 2000 population of 1,190 and with three persons per connection (the factor used by the TCEQ), this equates to 397 connections. At 0.6 gallons per minute, Alto is required to have a water supply capable of producing 238 gallons per minute. This equates to 384 acre feet per year demand which contrasts sharply with the 220 acre feet contained in the Plan.

More importantly, this serves to point out a shortcoming in the methodology used in the plan to calculate future demands. It should be noted that the 0.6 gpm per connection well capacity is a minimum requirement. The TCEQ routinely inspects and evaluates all water utilities with respect to the minimum system requirements. If a water utility does not meet any of the minimum criteria, the TCEQ may, and frequently does, initiate enforcement action against the utility which usually leads to penalties and costly compliance. The 220 acre feet per year water demand for the City of Alto equates to approximately .34 gallons per minute per connection. While the TCEQ can grant waivers of the minimum system requirements, it is unlikely that a system with approximately half the minimum requirement would be able to get by.

Another matter that should be considered is that each public water system is required to submit an annual report to the TCEQ. These reports can be found in the "Water Utility Database" of the TCEQ. According to the latest report submitted by the City of Alto, it currently has a population count of 1,710 and 570 connections. According to the population projection contained in the draft plan, it will not have a population in excess of 1,700 till the year 2060. Another significant difference between what can be found in the TCEQ Database and what is shown in the plan is the population of the City of Bullard. The draft plan shows a population of 1,150 (53 in Cherokee County and 1,097 in Smith County) while the TCEQ data shows a current population of 1,760.

It is apparent that the method used to calculate municipal water demands does not take into consideration engineering and regulatory requirements. We believe that it is a mistake for the water plan to go forward using water demands that will leave the water utilities in violation of state regulations.

Engineers who design water systems are required to insure that water systems will meet peak water demand. We believe that there is an inconsistency with the planning methodology adjusting the future water demands downward for some speculative reduction in per capita consumption. This seems to be planning for a future where there will not be enough water supply to meet peak demands.

We would like to recommend that the Planning Group get the participation of the Texas Commission on Environmental Quality in resolving the conflict between the regulatory requirements and the planning assumptions.

Very truly yours,

John D. Stover

JDS/rh
C:\My Documents\Anita\Lakeastx\Ltr to David Alders re Regional Water Plan.wpd

cc: Mr. Kenneth Reneau
General Manager

Board of Directors

during intermittent use. Hoses must be properly stored between uses and must be provided with caps and keeper chains or have the ends connected together.

(I) The tank shall be disinfected monthly and at any time that contamination is suspected.

(J) At least one sample per month from each tank shall be collected and submitted for microbiological analysis to one of the commission's approved laboratories for each month of operation.

(K) A minimum free chlorine residual of 0.5 mg/L or, if chloramines are used as the primary disinfectant, a chloramine residual of 1.0 mg/L (measured as total chlorine) shall be maintained in the water being hauled. Chlorine or chlorine containing compounds may be added on a "batch" basis to maintain the required residual.

(L) Operational records detailing the amount of water hauled, purchases, microbiological sampling results, chlorine residual readings, dates of disinfection, and source of water shall be maintained.

Adopted January 28, 2004 Effective February 19, 2004

§290.45. Minimum Water System Capacity Requirements.

(a) General provisions.

(1) The requirements contained in this section are to be used in evaluating both the total capacities for public water systems and the capacities at individual pump stations and pressure planes which serve portions of the system that are hydraulically separated from, or incapable of being served by, other pump stations or pressure planes. The capacities specified in this section are minimum requirements only.

(2) The executive director will require additional supply, storage, service pumping, and pressure maintenance facilities if a normal operating pressure of 35 pounds per square inch (psi) cannot be maintained throughout the system, or if the system's maximum daily demand exceeds its total production and treatment capacity. The executive director will also require additional capacities if the system is unable to maintain a minimum pressure of 20 psi during fire fighting, line flushing, and other unusual conditions.

(3) The executive director may establish additional capacity requirements for a public water system using the method of calculation described in subsection (g)(2) of this section if there are repeated customer complaints regarding inadequate pressure or if the executive director receives a request for a capacity evaluation from customers of the system.

(4) Throughout this section, total storage capacity does not include pressure tank capacity.

(5) The executive director may exclude the capacity of facilities that have been inoperative for the past 120 days and will not be returned to an operative condition within the next 30 days when determining compliance with the requirements of this section.

(6) The capacity of the treatment facilities shall not be less than the required raw water or groundwater production rate or the anticipated maximum daily demand of the system.

(b) Community water systems.

(1) Groundwater supplies must meet the following requirements.

(A) If fewer than 50 connections without ground storage, the system must meet the following requirements:

(i) a well capacity of 1.5 gallons per minute (gpm) per connection; and

(ii) a pressure tank capacity of 50 gallons per connection.

(B) If fewer than 50 connections with ground storage, the system must meet the following requirements:

(i) a well capacity of 0.6 gpm per connection;

(ii) a total storage capacity of 200 gallons per connection;

(iii) two or more service pumps having a total capacity of 2.0 gpm per connection; and

(iv) a pressure tank capacity of 20 gallons per connection.

(C) For 50 to 250 connections, the system must meet the following requirements:

(i) a well capacity of 0.6 gpm per connection;

(ii) a total storage capacity of 200 gallons per connection;

(iii) two or more pumps having a total capacity of 2.0 gpm per connection at each pump station or pressure plane. For systems which provide an elevated storage capacity of 200 gallons per connection, two service pumps with a minimum combined capacity of 0.6 gpm per connection are required at each pump station or pressure plane. If only wells and elevated storage are provided, service pumps are not required; and

(iv) an elevated storage capacity of 100 gallons per connection or a pressure tank capacity of 20 gallons per connection.

(D) For more than 250 connections, the system must meet the following requirements:

(i) two or more wells having a total capacity of 0.6 gpm per connection. Where an interconnection is provided with another acceptable water system capable of supplying at least 0.35 gpm for each connection in the combined system under emergency conditions, an additional well will not be required as long as the 0.6 gpm per connection requirement is met for each system on an individual basis. Each water system must still meet the storage and pressure maintenance requirements on an individual basis unless the interconnection is permanently open. In this case, the systems' capacities will be rated as though a single system existed;

(ii) a total storage capacity of 200 gallons per connection;

(iii) two or more pumps that have a total capacity of 2.0 gpm per connection or that have a total capacity of at least 1,000 gpm and the ability to meet peak hourly demands with the largest pump out of service, whichever is less, at each pump station or pressure plane. For systems which provide an elevated storage capacity of 200 gallons per connection, two service pumps with a minimum combined capacity of 0.6 gpm per connection are required at each pump station or pressure plane. If only wells and elevated storage are provided, service pumps are not required;

(iv) an elevated storage capacity of 100 gallons per connection or a pressure tank capacity of 20 gallons per connection. If pressure tanks are used, a maximum capacity of 30,000 gallons is sufficient for up to 2,500 connections. An elevated storage capacity of 100 gallons per connection is required for systems with more than 2,500 connections. Alternate methods of pressure maintenance may be proposed and will be approved if the criteria contained in subsection (g)(5) of this section are met; and

(v) emergency power for systems which serve more than 250 connections and do not meet the elevated storage requirement. Sufficient emergency power must be provided to deliver a minimum of 0.35 gpm per connection to the distribution system in the event of the loss of normal power supply. Alternately, an emergency interconnection can be provided with another public water system that has emergency power and is able to supply at least 0.35 gpm for each connection in the combined system. Emergency power facilities in systems serving 1,000 connections or greater must be serviced and maintained in accordance with level 2 maintenance requirements contained in the current National Fire Protection Association (NFPA) 110 standards. Although not required, compliance with NFPA 110 standards is highly recommended for systems serving less than 1,000 connections. Logs of all emergency power use and maintenance must be maintained and kept on file for a period of not less than three years. These records must be made available, upon request, for executive director review.

(E) Mobile home parks with a density of eight or more units per acre and apartment complexes which supply fewer than 100 connections without ground storage must meet the following requirements:

(i) a well capacity of 1.0 gpm per connection; and

A-4

PUBLIC COMMENT REGISTRATION
East Texas Regional Water Planning Group (Region I)

I would like to offer public comments during the public comment sessions on July 12, 13 or 14, 2005

My comments will be (check) ________ delivered in person. ✓ written and submitted.

If you choose to provide written comments, please use the space below

Name MONTY D. SHANK

Representing UPPER NECHES RIVER MUNICIPAL WATER AUTHORITY

Address P.O. BOX 1965 City, town, zip PALESTINE, TX 75802

Telephone 903-876-2237 E-mail mdshank@earthlink.net

Hearing you are attending (check) ________ Nacogdoches ✓ Tyler ________ Beaumont

Would you like to receive the Region I newsletter? Check: ___Yes ___No ✓ Currently receiving.

Written comments SEE ATTACHED

Please use additional pages or the back of this page for additional comments. If you choose to mail your comments, please mail to East Texas Regional Water Planning Group, P.O. Box 1647, Lufkin, Texas 75902

UPPER NECHES RIVER MUNICIPAL WATER AUTHORITY

July 18, 2005

Mr. Gary Hanlon
DETCOG
210 Premier Drive
Jasper, TX 75951

Re: East Texas Regional Water Planning Group, Region I
Comments on the 2006 Initially Prepared Plan (IPP)

Dear Sirs:

I appreciate the opportunity to present these comments regarding the subject IPP. I am personally aware of the time and effort spent by the members of the East Texas Regional Water Planning Group, the Deep East Texas Council of Governments, Mr. Gary Graham, P.E., and his staff at Schaumburg and Polk, as well as the engineering firms of Freese and Nichols, Alan Plummer and Associates, and LBG-Guyton and Associates in the preparation of a comprehensive 2006 IPP for the East Texas Regional Planning area. I am also personally aware of the task assigned to this group of professionals by the Texas Legislature, and of the governmental staff support provided by the Texas Water Development Board. This group of individuals and others unnamed are to be commended for the work they have done, and for a comprehensive regional water plan addressing the needs of East Texas and areas beyond through the year 2060.

As with any subject where difficult decisions must be made, strife and controversy will surface among affected parties. The water planning process for the State of Texas is not an exception to this rule. Unfortunately, as emotions run high concerning certain decisions and/or matters of discussion, the regard for truth and the presentation of facts suffers greatly, and in some cases, is totally absent.

Such is the case concerning Region I's approval of Region C's designation of Fastrill Reservoir as a water management strategy for Dallas Water Utilities, and Region I's adoption of Fastrill Reservoir as an alternative water management strategy for an Anderson County Steam and Electric project.

Having attended numerous public meetings and public hearings where Fastrill Reservoir was on the agenda, it is quite apparent that certain special interest groups are totally misinformed, or that they are allowing their emotions to prevent them from learning and repeating the facts and the truth regarding the Fastrill Reservoir project. To further complicate the matter, media representatives are easily caught up in the emotional turmoil, and find themselves printing or reporting the same misinformation.

Based on specific information heard at these hearings regarding Fastrill Reservoir and the Neches River Wildlife Refuge, or based on information read in newspapers or special interest group publications, the following facts are presented for the record regarding Fastrill Reservoir.

1. Fastrill Reservoir was proposed in 1961. The proposed Neches River Wildlife Refuge was proposed in 1985.

2. Supporters and proponents of Fastrill Reservoir are convinced that both the refuge <u>and</u> the reservoir **<u>can</u>** co-exist, and studies and evaluations are currently under way in order to determine the feasibility of establishing both the lake and the refuge. Current U.S. Fish and Wildlife Service policy seemingly prohibits the coexistence of a national wildlife refuge and a reservoir, and opponents to Fastrill Reservoir are not willing to support any compromise resolution.

3. Ecosystems are not static. Although a portion of a river bottomland hardwood habitat would be flooded by the construction of Fastrill Reservoir (approximately 25,000 acres), there are hundreds of thousands of acres of remaining bottomland habitat in East Texas and Eastern Oklahoma (see the reference document for the Neches River Wildlife Refuge, Land Protection Plan, Texas/Oklahoma Bottomland Hardwoods, January 1985). Opponents to Fastrill imply that the loss of the bottomland hardwood habitat due to the construction of the lake will result in the loss of the only remaining priority one bottomland hardwood habitat in Texas. This is simply not true.

4. Accusations that the construction of Fastrill Reservoir will result in the destruction of the Big Thicket are unsubstantiated scientifically, and are purely inflammatory.

5. Accusations that the construction of Fastrill Reservoir will result in the demise of the Texas State Railroad are also unsubstantiated, and are also inflammatory in nature and intent. The fact is that preservation and enhancement of the Texas State Railroad are included in the on-going feasibility study for Fastrill Reservoir.

6. Opponents to Fastrill Reservoir continue to reference the negativity of the disposition of landowners by construction of the reservoir. They also state that with the refuge, only willing landowners will be affected, but the reservoir will impact many landowners who are unwilling to sell their property. The fact is that approximately 85% of the property needed for the construction of Fastrill Reservoir is owned by a single entity, and that entity has indicated they are willing to sell.

7. Opponents of Fastrill Reservoir state that Dallas does not need the water. They state that Dallas has a very high per capita usage, and that Dallas can meet its future needs through conservation. Statistical analysis performed by competent engineers provides contradictory evidence that Dallas' actual per capita usage is abnormally high.

Methodology anomalies are responsible for the high per capita usage numbers. For example, commercial usage has been included in the Dallas computations, and Dallas has a very high ratio of commercial operations per capita as compared to other municipalities. In addition, there are factors involving industrial and institutional use which must be considered similarly in the applied statistical methodology.

8. The future water need projections for Dallas **DO** include conservation measures. Contrary to DWU's critics, data interpretation by professionals indicates that achieving realistic conservation goals will not meet those future needs.

9. A recent statement at a public hearing for the Region I IPP that the Upper Neches River Municipal Water Authority (UNRMWA) is not releasing adequate water from Lake Palestine to sustain downstream river flows is simply unsubstantiated, and is not true. The statement was made by an opponent to Fastrill Reservoir, and was made with bias. The same commentator stated that if Fastrill is built, all commercial fishing on the Texas coast will be destroyed. This statement is absurd, and is also not factual.

10. A statement that UNRMWA went to Dallas trying to sell them on the idea of Fastrill Reservoir is not true. At the urging of its City Council, Dallas Water Utilities has been actively searching for several years for both new and existing water sources to meet future needs. Fastrill is one those sources, and has been "on the books" since 1961.

11. Outcries that Dallas is taking East Texas water are based on ignorance and resistance to change. East Texas is blessed with an abundance of water, and this water is a replenishable resource. East Texas should recognize this fact and benefit both economically and humanely by developing this resource and managing it to the benefit of all.

12. Fastrill Reservoir presents an opportunity to enhance the Texas State Railroad, not cause its demise. The increased tourism provided by a recreational reservoir will far surpass that which exists today, and that which can be anticipated by the establishment of a wildlife refuge alone.

13. The loss of tax revenue from the property displaced by the reservoir will be far exceeded by the gain in land values created by the development of waterfront residential subdivisions and the commercial enterprises associated with such development. Fastrill Reservoir would be a huge economic asset for Anderson and Cherokee Counties, and especially for the cities of Palestine, Jacksonville, Rusk and Alto. It is also interesting to note that the U.S. Fish and Wildlife Services (FWS) own Fiscal Impact Analysis for the proposed Neches River Wildlife Refuge (Booz/Allen/Hamilton, Denver, CO, April 2005) states that the creation of the refuge "has the potential to negatively impact local taxing districts that rely on property taxes as a source of revenue". In the FWS's Environmental Assessment (March 2005) for the proposed refuge, it is noted that since 1935, numerous legislative

attempts have been made to provide reimbursement to county governments suffering from a loss of revenue due to the establishment of a national wildlife refuge. The original Refuge Revenue Sharing Act of 1935, as amended in 1964 and 1978 has failed miserably because "refuge receipts have not kept up with the general increase in property values". Up until 1980, congress appropriated funding to compensate for the shortfall. Since that time, "Congress has not appropriated sufficient additional funds to make the largest payment allowed by law".

It is imperative that planning for the future be accomplished based on the truth and on facts. Unfortunately, environmental issues are generally very emotional, and the facts cannot be heard because of the emotion-based uproar. The points presented above constitute an effort to present and establish the facts.

Again, the Region I Water Planning Group is to be commended for their work in preparing a water plan for East Texas (and areas beyond) through the year 2060. Obviously, this plan must be flexible, and it must consider the changing world. If not, we have done a disservice to those we represent, and to our future generations.

If there are any questions, or any additional information is required, please contact me at 903-876-2237 (office) or 903-825-7741 (home). Thank you for your time.

Sincerely,

Monty D. Shank
Assistant to the General Manager

XC: T.G. Mallory, General Manager

UNRMWA Board of Directors

Gary Graham, P.E.
Schaumburg & Polk, Inc.
8865 College St., Suite 100
Beaumont, TX 77707

David Alders, Chair
East Texas Water Planning Group (Region I)
8740 FM 226
Nacogdoches, TX 75961

Sam Vaugh, P.E.
HDR Engineering, Inc.
4401 W. Gate Blvd., Suite 400
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Bobby Praytor, Director of Planning
Dallas Water Utilities
1500 Marilla, Room 5AS
Dallas, TX 75201

Bob Johnson, P.E., Assistant Director
Dallas Water Utilities
1500 Marilla, Room 4AN
Dallas, TX 75201

Bill Roberts
Texas Water Development Board
P.O. Box 13211
Austin, TX 78711-3211

Nacogdoches
the oldest town in Texas

A-5

August 30, 2005

Mr. Robert Stroder, P.E.
LNVA
P. O. Box 5117
Beaumont, TX 77726-5117

Re: Lake Nacogdoches – Maintenance of Firm Yield

Dear Mr. Stroder:

During the current cycle of Region I water planning, the Neches River Basin Water Allocation Model was run at TCEQ's direction and required water from Lake Nacogdoches to be released to fill Lake Sam Rayburn during a drought. According to TCEQ this is due to priority dates for the respective water rights. The City of Nacogdoches believes this interpretation of their water rights to be incorrect and extremely harmful to the City's long-term water supply.

Per our recent discussions, we respectfully request that LNVA commit to the City of Nacogdoches in writing that such releases will never be required by LNVA either during a time of water shortage or drought. We have attached for your information the yields for Lake Nacogdoches as permitted by the State of Texas and the yield resulting from the TCEQ's recent direction.

The City of Nacogdoches greatly appreciates your assistance in rectifying this situation. Should you need additional information please do not hesitate to call.

Sincerely,

David B. Smith, P.E.
City Engineer

Attachments

Cc: Jim Jeffers, City Manager
Gary Graham, Schaumburg & Polk
Billy Sims, KSA Engineers

A-6

TEXAS PARKS & WILDLIFE

September 13, 2005

Mr. Gary Hanlon, DETCOG
210 Premier Drive
Jasper, TX 75951

Dear Mr. Hanlon:

Thank you for the opportunity to review and comment on the 2005 Initially Prepared Regional Water Plan (IPP) for the East Texas Region I. Texas Parks and Wildlife (TPW) acknowledges the time, money and effort required to produce the regional water plan as mandated by Senate Bill 1 of the 75th Legislature. A number of positive steps have been taken since the first planning cycle to advance the issue of environmental protection. For example, the regional water planning groups were faced with a new requirement under 31 TAC §357.7(a)(8)(A), to perform a "quantitative reporting of environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico" when evaluating water management strategies. TPWD recognizes that each region's unique natural resources, water management strategies and funding limitations dictated the level of quantitative analysis for each regional plan. Nonetheless, TPWD feels strongly that quantification of environmental impacts is a critical step in planning for our state's future water needs while also protecting environmental resources.

TPWD staff has reviewed the IPP to determine if the following questions were addressed:

- Does the plan include a quantitative reporting of environmental factors including the effects on environmental water needs, habitat?
- Does the plan include a description of natural resources and threats to natural resources due to water quantity or quality problems?
- Does the plan discuss how these threats will be addressed?
- Does the plan describe how it is consistent with long-term protection of natural resources?
- Does the plan include water conservation as a water management strategy? Reuse?
- Does the plan recommend any stream segments be nominated as ecologically unique?
- If the plan includes strategies identified in the 2000 regional water plan, does it address concerns raised by TPWD at that time?

According to the Region I IPP most of the region's projected 50 year water demands can be met through less-impacting alternatives such as water conservation, wastewater reuse, and expansion of existing supplies. However, a new reservoir, Lake Columbia, has been proposed as a water management strategy to meet

200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800

steam-electric demands in Nacogdoches and Rusk Counties. New reservoirs, particularly in areas rich in bottomland hardwood forests, represent a significant threat to the protection of the State's natural resources and should be considered carefully. TPW encourages cheaper, less-impacting alternatives such as advanced conservation be pursued before new reservoir construction. According to the IPP, water conservation will provide only about 2% of new supply and only one reuse strategy is being considered. TPW especially encourages the Region's consideration of brush control/management as an additional means of conserving water. If done properly, brush management can also benefit wildlife habitat.

In general the Region I IPP does not include a detailed quantitative reporting of environmental factors. A matrix was developed to evaluate proposed water management strategies where each project was scored based on desirability; (1) for most desirable to (5) for least desirable. Lake Columbia received the highest score given: (3). Table 1.12 does include a listing of the numbers of acres of habitat potentially inundated by five proposed reservoirs: Eastex (Lake Columbia), Rockland, Weches, Bon Weir and Tennessee Colony.

The plan includes a description of natural resources in the East Texas region. Brief discussions of wetlands, estuaries, endangered/threatened species, significant stream segments, springs and state and federal land holdings are included but the table listing threatened and endangered species appears to be missing from the report. Consideration of environmental flows is lacking. Neither freshwater inflows to Sabine Lake nor instream flows are mentioned. At a minimum environmental flow alterations caused by Lake Columbia should be evaluated. For areas in the Region where groundwater is the primary source of water supply, emphases should be placed on protecting springs that support fish and wildlife.

It is disappointing that the plan does not recommend nomination of any stream segments as ecologically unique. The Region I planning group concluded that sufficient programs exist to protect areas of special environmental significance. The planning group also concluded that insufficient environmental data exist to "support valid judgment on the merits to preclude reservoir construction on stream segments." TPW respectfully disagrees and feels that Section 1.9.5 of the IPP provides the data.

Thank you for your consideration of these comments. Please be assured that TPWD will continue to explore all possibilities to meet future water supply needs and assure the ecological health of the region's aquatic resources.

Sincerely,

Larry D. McKinney, Ph.D.
Director of Coastal Fisheries

LDM:CL:dh

A-7

United States Department of the Interior

NATIONAL PARK SERVICE
Big Thicket National Preserve
3785 Milam
Beaumont, TX 77701

COPY

REPLY REFER TO:

L74

September 16, 2005

Texas Water Development Board
Office of Planning
Attention Kevin Ward
P.O. Box 13231
Austin, TX 78711-3231

Gary Hanlon
DETCOG
210 Premier Drive
Jasper, TX 75951

Dear Sir/Madam:

The Big Thicket National Preserve (Preserve) would like to provide input on the 2005 Initially Prepared Regional Water Plan for Region I (Regional Water Plan). The Preserve supports a public process to develop long-range plans to meet the region's water needs. The Preserve is offering the concerns listed below in hope of enhancing the planning efforts.

In 1974, the Preserve was established by federal law to "assure the preservation, conservation, and protection of the natural, scenic, and recreational values of a significant portion of the Big Thicket..." Large portions of the Preserve are closely associated with the primary drainages in this region; therefore the Preserve is particularly interested in water-related decisions. As recognized by the development board and stated on page 8-1 of the plan "there are sufficient programs in place to protect areas of special environmental significance."

As one of these "areas of special environmental significance," the Preserve is concerned that certain components of the Regional Water Plan, in particular, intra-basin and inter-basin diversions of water as well as impoundments, could adversely affect the values listed in its authorizing statute. For example, the Preserve contains an 85-mile long riparian corridor along the Neches River, which is comprised primarily of floodplain and associated wetlands. Altered river flows would directly impact both the biological and recreational values. The Regional Water Plan recognizes these potential impacts on page 1-54 by stating: "sufficient flow quantities and frequency are necessary to maintain fish and wildlife habitat in the region. Insufficient flow quantities and patterns could pose a threat."

More specifically, we recognize the importance of peak flows in maintaining the extensive wetland and riparian systems present within the Preserve, and the timings of these flows as important to the life-cycles of the species present. (The Preserve is about 50% wetlands.) Consequently, we oppose any significant alteration of flow within the Neches River Basin that would alter either the magnitude or the timing of the natural peak beyond an acceptable range. The National Park Service is currently involved in a comprehensive study with Rice University and University of North Texas to quantify the relationship between flood flows and the maintenance of bottomland hardwood communities within the Preserve to help us better understand what would constitute a significant alteration for at least one unit of the Preserve. Additional research will likely be necessary to provide these data for other units of the Preserve.

As stated in the report (page 1-68), the average natural flow is about 6,300,000 acre-feet/year with total water rights accounting for about 4,000,000 acre-feet/year. Preserve staff are concerned that further withdraw of substantial volumes of water from a possibly already stressed system may result in ecological damage to the wetland and riparian communities present within the Preserve. Consequently, we encourage the Water Development Board to more carefully consider the potential detrimental effects to the riparian system in the water management plan.

In addition to the riparian impacts associated with the physical alteration of the hydrograph, the Regional Water Plan also identifies chemical degradation, namely concentration of several solutes, as a likely impact. Nutrients, metals, and major ions are likely to increase in concentration and dissolved oxygen will likely decrease as greater volumes of water are used. Aquatic fauna present in the natural system, including over 40 species of special concern, may be adversely affected by degradation of any or all of these water quality parameters.

While the conclusion that there is "abundant availability of surface water in the region" is probably true, we do not believe that the impacts of diverting a substantial portion of the water or moderating flows have been adequately assessed. Significant changes in peak flow magnitude and timing as well as the likely degradation of several water quality parameters could detrimentally affect the wetland/floodplain system within substantial portions of the Preserve. More detailed information should be developed prior to arriving at the conclusion stated on page 7-4: "None of the water management strategies evaluated for the East Texas Water region is expected to adversely impact parks or public land." The concerns expressed above would particularly extend to the Neches Basin projects discussed in section 1.12.4, beginning on page 1-55.

The level of information offered by the Regional Water Plan does not permit extensive assessment of the impacts to the Preserve. We have provided these general comments commensurate with the level of detail currently available. The Preserve requests that adequate analysis be performed to assess the environmental impacts of the proposed activities and that mitigation and revision to the plan be made as necessary, in consultation with the Preserve, to ensure that the "natural, scenic, and recreational values" of the Preserve are not compromised from implementation of the Plan. The Preserve would be interested in being a partner should the Texas Water Development Board or others wish to perform studies concerning the issues raised in this correspondence.

We look forward to working with you and all the involved parties to ensure protection of the Big Thicket National Preserve. Thank you for the consideration of our concerns. If you need any additional information please contact Chuck Hunt at (409) 951-6803.

Sincerely,

Michael George
Acting Superintendent
Big Thicket National Preserve

O-1

BIG THICKET ASSOCIATION
P.O. Box 198
Saratoga, TX 77585-0198

TWDB
RECEIVED
JUL 18 2005
ROUTE TO: ________
CC TO: ________

July 15, 2005

Mr. J. Kevin Ward
Texas Water Development Board
P.O. Box 13231
Austin TX 78711-3231

Dear Mr. Ward:

The Big Thicket Association has opposed the construction of Rockland Reservoir for over 30 years; indeed, we participated in the successful effort to deauthorize the reservoir in the 1980s. We continue to oppose Rockland Reservoir, and we further oppose the proposed construction of the Fastrill Reservoir. These dams will adversely and cumulatively have an adverse environmental impact on the Big Thicket National Preserve and the proposed national wildlife refuges on the Neches River.

These reservoirs are not needed. There are existing unused water supplies for residential, agricultural and industrial usage. Excessive use of water per capita/per day contributes to the problem; water conservation would add additional water for better use.

The reasons that speak urgently to most concerned citizens are economic. Inundating 150,000 acres of productive farm and timber lands as well as homes has critical adverse effects on the economy. The costs of building the reservoirs are mind-boggling. Inevitably, reservoirs fill up with sediment and create new problems with growth of invasive vegetation. Further, there is a widely held belief that reservoirs control flooding, which encourages unwary citizens to build on floodplains.

Suggesting that continual removal of thousands of acre-feet of water will not affect water supply for seasonal flooding of bottomlands is specious at best. "Management" will inevitably favor water users in industry and metropolitan areas. The result will be floodplain contraction, changes in species composition both in the River and the floodplain with possible extirpation of some species, accompanied by loss of recreational opportunities for hunting, camping, and birding.

We advocate designation of the entire Neches River from Palestine to Beaumont as a National Scenic and Recreational River, and we support the proposed US Fish and Wildlife Service National Wildlife Refuge. Protection of the Neches River will provide more economic benefits to East Texas and will further protect wildlife and bottomland hardwoods.

All of the Neches River tributaries (whether in Preserve boundaries or not) should be designated as unique ecological streams: among them the Village Creek, Big Sandy Creek, Beech Creek, Hickory Creek, Little Pine Island Bayou, Pine Island Bayou, Turkey Creek and Cypress Creek. Menard Creek in Polk County is also part of the Preserve and must be protected.

Protection of the Neches River and its tributaries are critical to the survival and welfare of the Big Thicket National Preserve, the Village Creek State Park, and the Roy E. Larsen Sandyland Sanctuary as well as the Davy Crockett and Angelina National Forests and Sabine Lake.

The Big Thicket Association suggests the need for increased water conservation, for using the present water supply conjunctively, and for an end to the growth syndrome that affects our cities and leads to increased water consumption.

Sincerely,

Bruce Drury

Bruce Drury
Chair, Conservation Committee

Friends of the Texas State Railroad

O-2

July 12, 2005

Region I Water District Planning Commission
14792 County Road 192
Tyler, TX 75703

Gentlemen:

Your water district planning commission needs to know that the PROPOSED FASTRILL RESERVOIR is a bad idea. It would destroy the Texas State Railroad over the Neches River, and it would create problems for the Big Thicket, N.P. Wetlands. It would take valuable tax revenue from Anderson & Cherokee Counties, and it would increase the need for more law enforcement in our counties that are already tight on budgets. It would flood a Native American Burial Ground along the Anderson County side of the Neches River. There are also endangered species in the river bottoms that will be lost with another lake dam on the Neches below Lake Palestine. We have about 83,000 visitors to the Texas State Railroad Steam Trains each year, and our largest tourist attraction in Anderson & Cherokee Counties would cease to exist with the Fastrill Reservoir because it would cost over $105-million to raise the tracks according to a railroad official. Our area would be so much better off with the proposed refuge planned by the US Fish & Wildlife Service because it is great to ride the steam train and see the Dogwood in bloom.

Sincerely

Albert W. Holmes

Albert W. Holmes, President
"The Official Railroad of Texas"

P.O. Box 39 • Rusk, Texas 75785 • 903-683-2561

Gulf Coast Rod, Reel and Gun Club, Inc.

148 South Dowlen # 704
Beaumont, Texas 77707

O-3

RECEIVED
AUG 29 2005
By

East Texas Regional Water Planning Group
PO Box 1647
Lufkin, Texas 75902

Dear Sirs:

My name is Wayne Stupka. I represent the Gulf Coast Rod Reel and Gun Club. We are a conservation club in existence in Beaumont for over 65 years. I am strongly opposed to keeping Fastrill and Rockland Dams as alternative water development strategies for the region I planning group. We should not sacrifice East Texas natural resources to provide water for other regions of Texas. Bottomland hardwoods are one of the most impacted ecosystems in our nation. East Texas was blessed with an abundance of bottomland hardwoods of which tens of thousands of acres have been turned into reservoirs. We have destroyed enough of this valuable resource in East Texas. Do we want our area to be for water storage while all the jobs go with the water to Dallas and Houston and leave us without the biodiversity that made the Big Thicket possible? I want to keep our natural resources to provide jobs for East Texans. I want to keep our quality of life which means providing for wild places and protecting the truly unique ecosystems of East Texas. The water planning group studies have shown that we have enough water for decades without these dams. Only with projects that may or may not be built do we have a deficit after 60 years. Conservation and reducing water transfers outside the region will make up these deficits so there is no real reason to keep these reservoirs as alternatives. They should be removed from the planning process unless of course the river authorities are planning to develop them to produce water for sale out of our river basins. I hope you will remove Fastrill and Rockland Dams as alternatives in the regional water plan.

Sincerely,

Wayne Stupka DVM

Wayne Stupka D.V.M.
President

NATIONAL WILDLIFE FEDERATION www.nwf.org

People and Nature: Our Future is in the Balance

NATIONAL WILDLIFE FEDERATION

GULF STATES NATURAL RESOURCE CENTER
44 East Avenue, Suite 200
Austin, Texas 78701

(512)-476-9805
FAX (512)-476-9810
www.nwf.org

O-4

April 7, 2005

Re: Analysis of Municipal Water Conservation Potential in Region I.

Dear Regional Water Planning Group Member:

We recognize that you are in the home stretch of putting together your initially prepared 2006 regional water plan. As you settle on the water management strategies to carry forward, we urge you to give extra consideration to the potential of water conservation. In order for the state to support a population double its current size in the 2050-2060 time frame without causing serious damage to our natural heritage, it is imperative that improved water-use efficiency be the first approach for meeting projected water needs.

While municipal water use is only about 24 percent of our state-wide total now, it is expected to account for nearly 40 percent of water use in 2060 due to population growth in our cities. The potential for savings through conservation in this sector is enormous.

The water-demand projections prepared for each region by the Texas Water Development Board (TWDB), and revised by your planning group, generally assume only the minimal level of water conservation mandated by current state law. This is anticipated to occur without pro-active action by the planning groups, cities, or other municipal water user groups (WUG), just due to the required adoption of measures like low-flow shower heads and water-saving toilets in new construction and renovations[1]. For most municipal WUGs there is additional potential to save water through adoption of water management strategies focused on conservation measures.

Our Calculation of Municipal Conservation Potential

For most Regional Water Planning Groups (RWPGs), the first round of planning may not have afforded the time nor the technical resources to completely address the potential of municipal water conservation. Fortunately, today there are additional technical resources available to assist the RWPGs in the development of target water use levels and measures to achieve these. Legislation enacted in 2003 created the Water Conservation Implementation Task Force (WCITF). Among other things, the WCITF, which included representatives from a wide variety of interest groups, developed a best management practices guide[2]. That guide includes the development of specific goals for municipal water conservation. First, the guide recommends that, over the long-term, all municipal WUGs should strive to achieve a water use level of no

[1] For all regions except A, savings due to 1991 plumbing code changes are embedded in these demands. Regions D and M chose a slightly modified approach with such savings bottoming out in the 100 – 125 gpcd range (personal comm.. Dan Hardin, TWDB, 04/07/05).

[2] Available at: http://www.twdb.state.tx.us/assistance/conservation/taskforce.asp

more than 140 gpcd. The second goal to guide water conservation efforts is that, in the near-term, municipal WUGs with water use above 140 gpcd should strive to achieve a one percent reduction in per capita municipal water use per year.

For your use as you consider water conservation goals and measures, we have quantified the potential for municipal water conservation in your region by applying the recommendations of the WCITF. Mindful of the dual goals set out by the WCITF, our analyses considered both criteria.

First, we applied the ultimate 140 gpcd target to all municipal WUGs in your region that are included in the adopted population and water demands as found on the TWDB website[3]. We calculated the total potential savings for all of the WUGs based on achieving the target of 140 gpcd by the end of the 2060 planning horizon[4]. Under this assumption, Region I would achieve a total savings of 41,393 ac-ft/year in municipal water demand. Detailed results itemizing many WUG's potential water savings are shown in Attachment 1[5].

Consistent with the WCTIF recommendations, we also analyzed the savings that could be achieved, by decade, based on implementing the WCITF target reduction of 1 percent per year in per capita water use for all municipal WUGs. Under this assumption, Region I would achieve a savings of 27,339 ac-ft/year in municipal water demand by 2030 and 40,637 ac-ft/yr by 2060[6]. A full decade-by-decade summary for many WUGs in your region is also attached (Attachment 2).

We hope these results will be useful as you develop the initially prepared and final 2006 regional water plan. There is much greater recognition among policy makers of the high financial and environmental costs associated with the development of new water supplies and the need to promote water use efficiency. This is reflected in the several changes to the rules for regional water planning pertaining to water conservation. We have summarized these in Attachment 3 to this letter. We will be happy to discuss our calculations in more detail or to answer any questions you may have.

Sincerely,

Norman D. Johns, PhD
Water Resources Scientist

cc: TWDB liaison to Region I, planning consultant for Region I

attachments

---

[3] As found at: http://www.twdb.state.tx.us/data/popwaterdemand/2003Projections/PopulationProjections.asp

[4] For additional description please see footnotes at end of attached table for your region.

[5] Most entities with 2060 population of 1% of region or greater than 50,000 are shown.

[6] For most WUGs, the 1 percent per year reduction results in achieving the ultimate140 gpcd goal well before 2060. However, for any WUG with a per capita use above 256 in year 2000 the 2060 use level will still be above 140 gpcd, thus the total savings under the two analyses can differ slightly.

Attachment 1 - Calculation of potential for municipal water savings in Region I with Water Conservation Implementation Task Force target water use of 140 gpcd.

	State Water Plan Data, Year 2060				Potential Savings, Year 2060 with 140 gpcd Target		
Water User Group Name	Popula-tion	Portion of region	Municipal Demand (ac-ft/yr)	Original GPCD	Municipal Demand (ac-ft/yr)	Revised GPCD	Savings (ac-ft/yr)
TYLER	116,102	7.8%	32,253	248	18,207	140	14,046
BEAUMONT	113,866	7.7%	25,636	201	17,856	140	7,780
LUFKIN	70,997	4.8%	13,599	171	11,134	140	2,465
PORT ARTHUR*	57,755	3.9%	8,993	139	8,993	139	0
SOUTHERN UTIL. CO.	57,586	3.9%	9,031	140	9,031	140	0
NACOGDOCHES	54,345	3.7%	12,540	206	8,522	140	4,018
JEFFERSON CO.-OTHER*	53,675	3.6%	4,449	74	4,449	74	0
NACOGDOCHES CO.-OTHER*	36,944	2.5%	3,849	93	3,849	93	0
RUSK CO.-OTHER*	36,271	2.4%	3,088	76	3,088	76	0
Rest of region†‡ (134 WUGs)	884,907	59.7%	120,184	121	107,100	108	13,084
REGION I TOTAL	1,482,448	100.0%	233,622		192,229		41,393

notes: *) year 2060 value below 140 gpcd is due to original State Water Plan year 2000 value less than 140 which we held constant into future; †) Year 2000 and year 2060 gpcd calculated with total demand and total population for these remaining entities; ‡) year 2060 value below 140 gpcd due to averaging.

Attachment 2 - Calculation of potential for municipal water savings in Region I with Water Conservation Implementation Task Force recommended 1% annual reduction in gpcd.

Water User Group Name	2000 State Water Plan GPCD	2010			2020			2030		
		State Water Plan GPCD	NWF** GPCD	Savings (ac-ft/yr)	State Water Plan GPCD	NWF** GPCD	Savings (ac-ft/yr)	State Water Plan GPCD	NWF** GPCD	Savings (ac-ft/yr)
TYLER	261	258	236	2,173	255	213	4,297	252	193	6,364
BEAUMONT	216	212	195	2,124	209	177	4,124	206	160	5,896
LUFKIN	185	181	167	571	178	151	1,266	175	140	1,889
PORT ARTHUR	153	150	140	647	147	140	453	144	140	258
SOUTHERN UTIL. CO.	151	149	140	395	146	140	281	143	140	148
NACOGDOCHES	206	206	186	729	206	168	1,534	206	152	2,399
JEFFERSON CO.-OTHER	82	79	79	0	77	77	0	75	75	0
NACOGDOCHES CO.-OTHER	105	102	102	0	99	99	0	96	96	0
RUSK CO.-OTHER	90	85	85	0	82	82	0	80	80	0
Rest of region†‡ (134 WUGs)	140	135	130	3,951	131	121	7,701	128	115	10,384
REGION I TOTAL				**10,590**			**19,655**			**27,339**

Water User Group Name	2000 State Water Plan GPCD	2040			2050			2060		
		State Water Plan GPCD	NWF** GPCD	Savings (ac-ft/yr)	State Water Plan GPCD	NWF** GPCD	Savings (ac-ft/yr)	State Water Plan GPCD	NWF** GPCD	Savings (ac-ft/yr)
TYLER	261	249	175	8,368	248	158	10,816	248	143	13,681
BEAUMONT	216	203	144	7,462	201	140	7,780	201	140	7,780
LUFKIN	185	172	140	1,966	171	140	2,166	171	140	2,465
PORT ARTHUR	153	141	140	65	139	139	0	139	139	0
SOUTHERN UTIL. CO.	151	141	140	52	140	140	0	140	140	0
NACOGDOCHES	206	206	140	3,184	206	140	3,637	206	140	4,018
JEFFERSON CO.-OTHER	82	74	74	0	74	74	0	74	74	0
NACOGDOCHES CO.-OTHER	105	94	94	0	93	93	0	93	93	0
RUSK CO.-OTHER	90	77	77	0	76	76	0	76	76	0
Rest of region†‡ (134 WUGs)	140	124	111	11,373	122	109	11,929	121	108	12,693
REGION I TOTAL				**32,470**			**36,327**			**40,637**

notes: **) equals lesser of State Water Plan value for that year or 1% annual decline from State Water Plan year 2000 gpcd; †) Rest of Region gpcd calculated with total demand and total population for these remaining entities. Within this group, those with gpcd above 140 are reduced with 1% annual rate; ‡) values can fall below 140 gpcd due to averaging.

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September 12, 2005

Gary Hanlon
DETCOG
210 Premier Drive
Jasper, TX 75951

Re: Supplemental Comments on Initially Prepared 2006 Regional Water Plan for the East Texas Region

Dear Mr. Hanlon and Planning Group Members:

This letter briefly supplements, on behalf of the National Wildlife Federation, the written comments previously filed by NWF, Environmental Defense, the Lone Star Chapter of the Sierra Club on the Initially Prepared Regional Water Plan for the East Texas Region (Region I). This letter addresses only one narrow issue: conservation as a water management strategy as it applies to oil refineries.

Because Jefferson and Orange Counties are important locations for refining in our state, there is significant potential for water conservation. The Region I Plan should consider any feasible water conservation opportunities refineries can implement. With respect to manufacturing water needs, water conservation -- in the form of water efficiency measures -- is a required water management strategy for those entities using surface water pursuant to a water right in excess of 1000 acre-feet. *See* 31 TAC § 357.7(a)(7)(A)(i). In addition, the plan must include consideration of additional conservation strategies. (7)(A)(ii). Information included in the Initially Prepared Plan for Region N indicates that conservation measures could feasibly cut in half the quantity of water used to refine a barrel of oil in Region I.

Region N's IPP indicates that refineries in Corpus Christi require between 35 and 46 gallons of water to refine one barrel of crude oil, whereas Houston refineries use 91 gallons and Beaumont refineries use 96 gallons.[1] If refineries in Beaumont and other municipalities in Jefferson (and Orange) Counties could

[1] Region N IPP says, at p. 4C.5-17:
"For example, Corpus Christi area petroleum refineries use 35 gallons of water per barrel of crude oil refined, while refineries in Houston use 91 gallons, and refineries in Beaumont use 96 gallons." There is further discussion about industrial water conservation with a citation to the "Pequod Survey," cited as *Texas Industrial Water Usage Survey, Pequod Associates, Inc. and TWDB, Austin, Texas, August 1993*. Region N plan then states on page 2-13 with reference to Corpus area refineries: "These refineries use 46 gallons of water per barrel of crude petroleum refined, compared to the State average of 100 gallons per barrel refined." For this statement, the plan references *Report of Water Use for Refineries and Selected Cities in Texas,* 1976-1987, South Texas Water Authority, Kingsville, Texas, 1990.

similarly reduce to 35-46 gallons of water per barrel of crude refined, this savings could greatly reduce the manufacturing demand projected in Section 2.3.2 of the Region I Draft Plan, Table 2.D and Table 2.G. Further, this reduction in water use would decrease the projected demand in Chapter 4.A. Nevertheless, the Region I Draft Plan fails to include any manufacturing conservation measures for refineries in Jefferson or Orange Counties that would serve to decrease overall demand for the region. See Chapter 4B, pp. 4B-5-4B-6 (Manufacturing Water Conservation Measures).

In accordance with legal requirements regarding conservation, we hope you will consider the reasons for the great discrepancy in water use between Corpus Christi- and Beaumont- area refineries and whether potential savings in this sector warrant more extensive manufacturing water conservation strategies.

Thank you for your considering this issue and please feel free to contact us if you have any questions. We look forward to a continuing positive dialogue with the planning group during this and future planning cycles.

____

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September 8, 2005

Gary Hanlon
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210 Premier Drive
Jasper, TX 75951

Re: Comments on Initially Prepared 2006 Regional Water Plan for the East Texas Region

Dear Mr. Hanlon and Planning Group Members:

The National Wildlife Federation, Lone Star Chapter of the Sierra Club, and Environmental Defense appreciate this opportunity to provide written comments on the Initially Prepared Regional Water Plan for the East Texas Region (Region I). We consider the development of comprehensive water plans to be a high priority for ensuring a healthy and prosperous future for Texas. Our organizations also appreciate the extensive efforts of the planning group to produce the initially prepared regional plan. As you know, our organizations - whether individually or collectively - have provided periodic input during the process of developing the plan. The written comments in this letter build upon those previous comments in an effort to contribute to a better plan for all residents of Region I and for all Texans.

I. BACKGROUND

Our organizations support a comprehensive approach to water planning that considers all implications of water use and development. The process that Senate Bills 1 and 2 (SB1, SB2) established has the potential to produce major, positive changes in the way Texans approach water planning. Fully realizing that potential depends on the information that water plans provide, which must be sufficient to evaluate the likely costs and impacts that may result from each water management strategy. Only by providing sufficient information and evaluating it carefully can regional planning groups ensure compliance with the overarching requirement that "strategies shall be selected so that cost effective water management strategies which are consistent with long-term protection of the state's water resources, agricultural resources, and natural resources are adopted." 31 TAC § 357.7 (a)(9). Only by complying with this requirement can regional water planning groups develop plans that actually contain workable water management strategies capable of implementation as opposed to a list of expensive and damaging proposals that will likely produce more controversy than water supply.

This letter comments on the Region I Plan in two different ways. First, we consider the extent to which the initially prepared plan complies with requirements in SB1 and SB 2, as well as the rules that the Texas Water Development Board (TWDB) adopted to implement those statutes. Second, our comments also address important policy considerations that should inform the regional water plan that statutes or rules may not specifically address.

We recognize that the regional water planning group faces financial constraints that may restrict the group's ability to address some issues raised in these comments as much as you would like. We submit these comments in the spirit of an ongoing dialogue intended to make the planning process as effective as possible. We strongly support the state's water planning process and we want the regional water plans and the state plan to be comprehensive templates that all Texans can endorse. In the remainder of this letter, you will find a summary of key principles that inform our comments followed by specific comments that address different aspects of the draft water plan.

II. KEY PRINCIPLES AND GENERAL COMMENTS

A. MAXIMIZE WATER EFFICIENCY

We strongly believe that improved efficiency in the use of water must be pursued to the maximum extent reasonable. New provisions included in SB 2 and TWDB rules since the first round of planning mandate strengthened consideration of water efficiency. Potentially damaging and expensive new supply sources simply should not be considered unless, and until, all reasonable efforts to improve efficiency have been exhausted. In fact, that approach is now mandated.

The Texas Water Code, as amended by SB1 and 2, along with the TWDB guidelines, require regional water planning groups to consider water conservation and drought management and to incorporate both types of measures into their plans. After the first round of regional planning, the legislature added §16.053 (h)(7)(B) to prohibit TWDB from approving any regional plan that omits water conservation and drought management measures at least as stringent as those required pursuant to Tex. Water Code §§ 11.1271 and 11.1272. In other words, each regional plan must incorporate at least the amount of water savings that other law mandates. This is a common-sense requirement. We certainly should not be basing planning on an assumption of less water conservation than the law already requires. TWDB guidelines also recognize the water conservation requirements of Section 11.085 for interbasin transfers and require the inclusion of the "highest practicable levels of water conservation and efficiency achievable" for entities for which interbasin transfers are recommended as a water management strategy.

In addition, the Board's rules require the consideration of more stringent conservation and drought management measures for all water user groups with water needs. The rules provide that the planning group may choose not to include those more stringent measures if it adequately explains that decision. 31 TAC § 357.7(a)(7)(A)(ii)). Consistent with the TWDB rules, our comments treat water conservation and drought management as separate issues from reuse, which is discussed separately below. 31 TAC § 357.7 (a)(7)(A) of the TWDB rules sets out detailed requirements for evaluation of water management strategies consisting of "water conservation practices." 31 TAC § 357.7(a)(7)(B) addresses water management strategies that consist of drought management measures. The separate evaluation of water management strategies that rely on reuse is mandated by 31 TAC § 357.7 (a)(7)(C).

Water is a finite resource. In order to meet the water needs of a growing population while ensuring the long-term protection of the state's natural resources and agricultural resources, we must use water as efficiently as possible.

The initially prepared plan concludes that conservation is not currently widely accepted in the Region "and should not be relied upon in meeting future needs." IPP at. Pp. 6-1 and 6-2. As discussed further below, we don't believe that the initially prepared plan complies with applicable requirements for evaluating and including water conservation as a water management strategy.

Fortunately, much more progress on conservation in Region I is possible, particularly for water user groups (WUGs) located in urban areas. One example involves municipal gallons per capita per day levels in Region I. The Water Conservation Implementation Task Force, organized by the Texas Water Development Board (TWDB), has recommended 140 gallons per capita per day (gpcd) as the goal for municipal water use. Many regional water planning groups are adopting that goal. We know that these suggested municipal water use rates are not unreasonable for Texas. San Antonio provides a real world example of the potential of improved water efficiency. Through a concerted effort, San Antonio has reduced its municipal water use to about 132 gpcd from a use level of about 213 gpcd in a period of around 20 years. **By contrast, numerous cities in Region I have much higher levels of municipal water use:** Tyler currently uses 248 gpcd, Beaumont 201 gpcd, Lufkin 171 gpcd, and Nacogdoches 206 gpcd. Conservation in these urban areas that would achieve the 140 gpcd level by 2060 would result in annual savings of 41,363 acre-feet of water by 2060. *See* Attached Letter of April 7, 2005, from Norman Johns, Ph.D., to Region I members and accompanying calculations.

B. LIMIT NONESSENTIAL USE DURING DROUGHT

Drought management measures aimed at reducing demands during periods of unusually dry conditions are important components of good water management. As noted above, SB2 and TWDB rules mandate consideration and inclusion in regional plans of reasonable levels of drought management as water management strategies. It just makes sense to limit some nonessential uses of water during times of serious shortage instead of spending vast sums of money to develop new supply sources simply to meet those nonessential demands during rare drought periods. Drought management includes documentation of the water savings each supplier anticipates as a result of drought measures.

C. PLAN TO ENSURE ENVIRONMENTAL FLOWS

Designing and selecting new water management strategies that minimize adverse effects on environmental flows is critical to the future of our state's rivers, estuaries, and the massive economies that depend on them. New rules applicable to this round of planning require a *quantitative analysis* of environmental impacts of water management strategies to ensure a more careful consideration of those additional impacts. The rules specifically require that each potentially feasible water management strategy must be evaluated by including a quantitative reporting of "environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the

Gulf of Mexico." 31 TAC § 357.7 (a)(8)(A)(ii). However, designing and selecting such strategies represents just one aspect of the planning necessary to meet environmental flow needs.

If existing water rights, when fully used, would cause serious disruption of environmental flows resulting in harm to natural resources, then merely minimizing additional harm from new strategies would not produce a water plan that would be consistent with the long-term protection of natural resources or the economic activities that rely on them. Demonstrating such consistency is a prerequisite to approval of a regional water plan. As a result, regional water planning groups should recognize environmental flows as a water demand critical to the state's ecology and economy, and should devise water plans that protect reasonable environmental flow levels. For example, Region K, in its initially prepared plan, has recognized environmental water needs as a category of water demand.

During the last round of regional planning, the East Texas Region was among the leaders in acknowledging the importance of protecting freshwater inflows. The earlier plan specifically noted the importance of planning to ensure such flows but cited the unavailability, at that time, of information from state studies regarding freshwater inflow needs for Sabine Lake. The discussion in Section 5.5 of the Regional Water Plan East Texas Region (2001) expressly acknowledges the "flow demand to sustain the Sabine-Neches Estuary" as an issue of particular concern. Since that time, the results of state studies on inflow needs for Sabine Lake have become available. Unfortunately, we are unable to locate discussion of the importance of protecting those inflows in the current initially prepared plan. That is very disappointing and surprising. We are not aware of any circumstances that would have lessened the importance of the issue for the people and the economy of the region. We urge the planning group to revisit this issue and acknowledge the importance of planning to ensure adequate freshwater inflows to the Sabine-Neches Estuary.

D. MINIMIZE NEW RESERVOIRS

The planning group has listed Lake Columbia as a water management strategy and Rockland Reservoir as an alternative strategy. Also, the initially prepared plan includes general discussion of various reservoirs from the 1984 and 1997 State Water Plans. Region I is fortunate to have so many alternative sources of water to meet its demand without constructing new reservoirs. Because reservoir construction and maintenance can result in so many adverse effects – to local economies, riparian landowners, terrestrial wildlife habitat, terrestrial and aquatic species, river systems, and bays and estuaries, for example – planning groups should consider new reservoirs as water management strategies *only after* developing existing water sources to the maximum reasonable extent. If new reservoirs are absolutely necessary after the planning group considers alternative water sources, the entity constructing the reservoir must minimize adverse impacts on regional economies and natural resources around the reservoir site. Regardless of whether the proposed reservoir is located inside or outside the boundaries of the region, the rules require the planning group to demonstrate that the proposed reservoir development is consistent with long-term protection of the state's water, agricultural, and natural resources.

E. MANAGE GROUNDWATER SUSTAINABLY

Region I has acknowledged the challenges that groundwater in the region faces from overpumping, saltwater intrusion, and contamination. Nevertheless, Region I has recommended an approach to groundwater management that would continue groundwater mining over the next 50 years and the resulting exacerbation of these problems.

Wherever possible, entities within a region should manage groundwater resources on a "sustainable basis." We understand sustainable groundwater management to entail limiting pumping levels to balance with recharge. Discharge and recharge levels may be averaged over varying periods of time but the approach should ensure that springs, seeps, and shallow wells are not significantly affected. Although the initially prepared plan uses the term "aquifer sustainability," it actually plans for continued depletion of groundwater resources.

The level of groundwater pumping that a regional water plan reflects should be consistent with the sustainable management definition discussed above. Mining groundwater supplies will endanger the future viability of the aquifer as a source of potable water, and will often adversely affect surface water resources as well. Incorporating non-sustainable levels of pumping constitutes a tremendous disservice to future generations of Texans. In addition, unnecessary depletion of aquifers is not consistent with the long-term protection of the state's water resources, natural resources, or agricultural resources.

F. FACILITATE SHORT-TERM TRANSFERS

Senate Bill 1 directs regional water planners and entities that comprise each region to consider voluntary or emergency transfers of water to meet demand. Tex. Water Code §16.051 (d) directs that rules governing the development of the state water plan shall give specific consideration to "principles that result in the voluntary redistribution of water resources." Similarly, §16.053 (e)(5)(H) directs that regional water plans must include consideration of "voluntary transfers of water within the region using, but not limited to, regional water banks, sales, leases, options, subordination agreements, and financing arrangements…." Thus, there is a clear legislative directive that the regional planning process must include strong consideration of mechanisms for facilitating voluntary transfers of existing water rights within the region, particularly on a short-term basis, as a way to meet drought demands. Although the statute treats such transfers as a key mechanism for meeting water demand, most planning regions have devoted little attention to transfers to date in the planning process.

In addition, the Water Code identifies emergency transfers as a way to address serious short-term municipal water shortages without the expense and natural resource damage associated with developing new water supplies. Tex. Water Code §16.053 (e)(5)(I) specifically directs that regional plans must consider emergency transfers of water pursuant to §11.139. This includes providing information on the portion of each non-municipal water right that could be transferred without causing undue damage to the holder of the water right.

The water planning process should therefore serve as a mechanism to facilitate voluntary transfers, particularly in drought situations, by collecting specific information on rights that might be transferred and by encouraging a dialogue between willing sellers and willing buyers. The initially prepared plan encourages the use of voluntary transfers and provides a table suggesting those water suppliers in the region who could potentially supply specific quantities of water to other entities in the region predicted to have shortfalls during the planning period. *See* pages 4B13-4B16. We commend Region I for providing this information on voluntary transfers and encourage continued research on potential voluntary transfers and negotiations to bring such transfers to fruition.

III. SECTION-SPECIFIC COMMENTS

A. GROUNDWATER

The Gulf Coast and Carrizo Wilcox Aquifers together provide the lion's share of groundwater in Region I. The initially prepared plan indicates approximately 159,800 acre feet per year total are available from the Carrizo-Wilcox Aquifer, and 172,000 acre feet total are available from the Gulf Coast Aquifer. *See* Table 3-13. Each of these aquifers currently suffers from the consequences of overpumping. The initially prepared plan acknowledges significant problems with salt-water intrusion, contamination from human sources, and over pumping resulting in the mining of groundwater.

Gulf Coast Aquifer. A 1990 Texas Water Development Board (TWDB) report found significant problems with saltwater contamination in Orange County, especially the municipalities of Orange and Vidor, associated with heavy pumping. *See* p. 1-19. Heavy municipal and industrial pumpage has resulted in significant declines in portions of the aquifer. Total dissolved solids levels exceed standards near the coast.

Carrizo-Wilcox Aquifer. Water levels have declined significantly in the Tyler and Lufkin-Nacogdoches areas. Some wells have been drawn down more than 200 feet; 46 test wells throughout the region suggest average drawdowns between the 1960s and the 1990s to be 51 feet and to range from minus 20 to 263 feet. *See* pp.1-16 through 1-17.

The initially prepared plan acknowledges that drawdowns cause household use and livestock watering in rural areas to become more difficult and expensive as individuals must drill deeper and deeper wells. The plan also recognizes that overpumping threatens estuarine wetlands: Approximately 19,900 acres of wetlands were lost from 1955 until 1992 because of submergence and erosion resulting from subsidence, which in turn resulted from the drawing down of ground water, oil, and natural gas. *See generally* p.1-57.

1. Section 3.2.2 Groundwater Availability

The initially prepared plan indicates that the planning group decided, as a policy decision, to accept significant levels of drawdown. In areas where an aquifer is confined (and apparently where a groundwater conservation district exists), the initially prepared plan indicates that 50 feet of water level decline over the planning period is acceptable. In areas where an aquifer is unconfined (and apparently where a groundwater conservation district exists), the plan concludes that 10% decrease in saturated thickness is acceptable over the planning period. Finally, for Smith County, the initially prepared plan indicates that an 80-foot decline is acceptable, relying at least in part on the absence of a groundwater district.

Unfortunately, the initially prepared plan provides little explanation of the basis for decision in defining those levels as acceptable. Appendix B to Chapter 3 does explain that the drawdown level actually is an average figure, by county. Thus, water level declines in any particular area could be much greater, or less, than the average figure.

TWDB guidance directs the planning group to:

> Calculate the largest annual amount of water that can be pumped from a given aquifer without violating the most restrictive physical or regulatory or policy conditions limiting withdrawals, under drought-of-record conditions. Regulatory conditions refer specifically to any limitations on pumping withdrawals imposed by groundwater conservation districts through their rules and permitting programs.

Although there is some reference in the initially prepared plan to groundwater districts, there is no explanation of applicable rules or permit requirements that might establish the applicable regulatory conditions. Information about those regulatory constraints is needed to allow the reader to understand the rationale being used in the planning process. The planning group also fails to provide any explanation of, or rationale for, its policy decision not to choose a true sustainable level of groundwater management (i.e., one that matches discharge to recharge). Again, that information is needed to document how the plan is consistent with long-term protection of the state's water resources. As one example, the plan does not provide information about the current conditions, such as saturated thickness, that would allow an assessment of the long-term viability, just from a water-supply perspective, of the recommended levels of pumping.

It also appears that for at least a portion of the planning area there are physical conditions, related to subsidence and water quality impacts, which impose restrictions on groundwater pumping. The relationship of those conditions to recommended pumping levels also must be discussed with some reasonable specificity.

For example, the initially prepared plan acknowledges that saltwater intrusion has been a problem in the Gulf Coast Aquifer in Orange County. IPP at p. 1-57. However, the plan also recommends that groundwater usage in Orange County be expanded to meet demands from future growth "until such a time that a salt water intrusion or subsidence problem is encountered." IPP at p. 4C-33. Thus, the plan anticipates just such problems but fails to provide a quantitative assessment of environmental factors as required by Section 357.7 (a)(8)(A)(ii). Moreover, such an approach is inconsistent with long-term protection of the state's water resources, agricultural resources, or natural resources and, as a result, does not comply with Section 16.053 (h)(7)(C) of the Water Code.

2. Springs

In the section of the initially prepared plan dealing with springs, the plan indicates that none of the springs are considered important from a water supply perspective. However, the current rules also require consideration of the role of springs in natural resource protection. *See* 31 TAC § 357.7 (a)(1)(D).

In order to assess whether the plan is consistent with long-term protection of natural resources, information is needed about the impact of the chosen groundwater production levels on springs and seeps and on surface flows generally. See 31 TAC § 357.7 (a)(8)(B) requiring discussion of "groundwater surface water interrelationships." The initially prepared plan notes that the Queen City Aquifer, in particular, "provides significant baseflow to creeks and rivers in the region." IPP at page 3-12. A reasonable quantitative evaluation of the effect of the groundwater management strategies on environmental factors, including environmental flows, is required. *See* 31 TAC § 357.7 (a)(8)(A)(ii). Similarly, an evaluation of the impacts of these strategies on agricultural resources is needed. *See* 31 TAC § 357.7 (a)(8)(A)(iii).

31 TAC § 357.7(a)(1)(D) requires the regional report to include "a description of all sources of groundwater and surface water including major springs that are important for water supply **or natural resource protection purposes.**" The Region I report cites Springs of Texas by G. Brune to document that Region I contained 251 springs as of 1981. The report describes these springs as follows:

> Most of the springs discharge less than 10 gpm and are inconsequential for planning purposes. Based on discharge measurements collected mainly in the 1970s, app. 8 springs in the region discharge between 200 and 2,000 gpm. Records from Indian Springs, located about 5 miles (8 km) northwest of Jasper in Jasper County, indicate a discharge of over 7.7. million gallons per day on February 20, 1978. The Brune reference does not indicate that any of the springs are used for water supply. The Jasper County spring was used as source water for a local TPWD fish hatchery in the 1970s.

The report provides additional summary information on some of the more significant springs in the region as follows:

(1) Cherokee County: one "medium" spring at 12,500 gallons per minute; twelve "small" springs at 1,250 gallons per minute; one "seep" at 12.5 gallons per minute.

(2) Nacogdoches County. two "medium" springs at 12,500 gallons per minute; nine "small" springs at 1,250 gallons per minute; eight "very small" springs at 125 gallons per minute; two "seeps" at 12.5 gallons per minute.

(3) Rusk County: one "medium" spring at 12,500 gallons per minute; twelve "small" springs at 1,250 gallons per minute; six "very small" springs at 125 gallons per minute; zero "seeps" at 12.5 gallons per minute.

(4) Smith County: one "medium" spring at 12,500 gallons per minute; eleven "small" springs at 1,250 gallons per minute; zero "very small" springs at 125 gallons per minute; three "seeps" at 12.5 gallons per minute.

See Table 1.K, p. 1-50. The initially prepared plan presupposes that none of these springs is significant for planning purposes and notes that at least two springs in Nacogdoches and Smith

Counties have run dry due to "excessive groundwater pumping and sedimentation caused by surface erosion." Page 1-49. The plan contains no indication as to how the planning group concluded none of these springs was "major" as contemplated by the rule. It appears that this conclusion is based solely on the quantity of water each spring produces, relying on the part of the rule requiring the list to include major water supply sources.
However, the rule also states that the region's report must consider springs important for "natural resource protection purposes." Springs that are not significant from a human water supply perspective can be extremely important from a natural resource perspective. Similarly, the plan provides no indication as to what role these springs play in supporting stream or river ecosystems. Finally, the plan provides no indication as to which aquifer feeds the springs and how aquifer management decisions may affect the conditions of these springs.

We acknowledge the limited information that is provided about the springs in the region. However, the initially prepared plan falls short of satisfying the TWDB rules, which were revised since completion of the first round of planning to require consideration of springs important for natural resource protection. *See* 31 TAC § 357.7 (a)(1)(D). Unfortunately, the information included in the initially prepared plan is not adequate to allow any assessment of whether any of the listed springs is a significant feature in terms of protection of natural resources such as fish and wildlife resources. Particularly for the "medium" springs listed, inclusion of some additional information about the natural resource significance of those springs would be appropriate in complying with those revised rules. Discussion also is needed about those springs that are important in maintaining baseflow in surface streams in the region. This information is required in order to comply with the requirement to consider the impacts of water management strategies on "groundwater surface water interrelationships." *See* 31 TAC § 357.7 (a)(8)(B).

C. NEW RESERVOIR CONSTRUCTION

(Pages 1.57-1.58; 4.B-20 through 21; 5.7-5.8).

1. Lake Columbia.[1]

New reservoirs are one of the most potentially damaging water management strategies, in terms of impacts on natural resources and on agricultural resources. Accordingly, any recommended new reservoir must be carefully evaluated to ensure that it really is needed, that the potential impacts have been carefully considered, and that the costs are realistic. The plan must demonstrate that the strategy, when evaluated against alternative strategies, is both cost-effective and environmentally sensitive. 31 TAC § 357.5 (e)(4). Similarly, the plan must demonstrate that the strategy is consistent with long-term protection of the state's natural resources and agricultural resources. 31 TAC § 357.7 (a)(8)(A)(ii).

The recommendation for the construction of Lake Columbia is unjustified for many reasons. First, it is not needed. The region enjoys a large surplus of existing surface water supplies. Beyond that, a significant portion of the needs identified, in Table 4B.A, as being supplied by Lake Columbia are

[1] The initially prepared plan actually uses the name "Lake Colombia." Other references we have found, including the legislation formally renaming the former Lake Eastex project, refer to the project as "Lake Columbia" so we use that reference in these comments.

illusory. A review of the initially prepared plan demonstrates that over 20% of the listed "needs" are not actually projected to exist within the planning period. Second, as a result of this phantom "need," unit costs for water from Lake Columbia are grossly understated. Third, the environmental impacts of the proposed reservoir are great. Unfortunately, the initially prepared plan fails to provide any meaningful quantitative analysis of those impacts.

a. Lake Columbia Is Not Needed.

Upon reviewing the statistics available in the Region I Draft Plan, it becomes obvious that Region I has no need for new reservoirs in order to satisfy its water demands. The Draft Plan projects 1,261,320 acre-feet of annual demand by 2060, with a regional shortfall, or need, of 106,041 acre feet and a 174,200 acre-foot annual shortfall, or need, when assessed by individual water user group. Strikingly, the Draft Plan estimates that approximately 3,000,000 acre-feet per year of permitted, potable water supplies currently exist in Region I. *See* pp.3-1 through 3-2. From existing reservoirs, the available supply water rights that could be purchased from water rights holders or could be obtained from the state far exceed the shortfall that the Draft Plan predicts. (1,926,344 acre feet of permitted reservoir water by 2060; 308,995 acre feet of unpermitted reservoir water by 2060). *See* pp. 3-9 through 3-10.

Table 4B.A, on page 4B-20, lists the needs proposed to be supplied by Lake Columbia. The listed needs are shown as adding up to 50,149 acre-feet in 2060. Our calculation of the column total in the table is 58,700. The projected firm yield of Lake Columbia is 85,000 acre-feet. A review of information for the WUGs listed in Table 4B.A reveals that the projected total 2060 needs for all of those WUGs only equals 52,293 acre-feet. The total amount of projected needs for all of those WUGs that is actually recommended to be met from Lake Colombia is only 39,259 acre-feet in 2060. Table 4B.A is inaccurate and overstates projected needs to be met from the proposed Lake Columbia.

Water User Group	Table 4B.A Listed Need 2060	Actual Need Projected 2060	Amount of Actual Need Recommended from Lake Columbia 2060
New Summerfield	2,565	213	213[2]
Rusk	4,275	212	212[3]
Manufacturing (Angelina County)	8,551	4,504	4,504[4]
County Other (Nacogdoches County)	428	291	0[5]
City of Nacogdoches	8,551	5,881	0[6]
Steam Electric (Nacogdoches County)	13,358	13,358	13,358[7]
Steam Electric (Rusk County)	20,972	27,834	20,972[8]
Total	**58,700**	**52,293**	**39,259**

Each of these notes accompanying the above chart constitutes a separate comment on the initially prepared plan.

[2]*Other available strategies listed for New Summerfield would meet its needs at about one-fourth of the unit cost of water from Lake Columbia. In addition, the per unit cost for Lake Columbia water is inaccurate because it is based on the purchase of 2,565 acre-feet per year, which is over ten*

times the amount New Summerfield actually is projected to need. Furthermore, because most of the yield of Lake Columbia would not be needed within the planning horizon, the validity of the per unit costs even for this excessive amount of supply is highly questionable. Pages 4C-12 and 4C-13. This strategy does not comply with the requirement to choose cost-effective strategies that are consistent with protection of natural resources and agricultural resources. See 31 TAC §§ 357.5(e)(4), 357.7(a)(9).

[3]*Other available strategies listed for Rusk would meet its needs at about one-sixth of the unit cost of water from Lake Columbia. In addition, the per unit cost for Lake Columbia water is inaccurate because it is based on the purchase of 4,275 acre-feet per year, which is over twenty times the amount Rusk actually is projected to need. Furthermore, because most of the yield of Lake Columbia would not be needed within the planning horizon, the validity of the per unit costs even for this excessive amount of supply is highly questionable. Page 4C 13. This strategy does not comply with the requirement to choose cost-effective strategies that are consistent with protection of natural resources and agricultural resources. See 31 TAC §§ 357.5(e)(4), 357.7(a)(9).*

[4]*Another listed available strategy could meet these needs. That other strategy is shown to cost about twice as much per unit as getting water from Lake Columbia. However, because the Lake Columbia per-unit cost is based on purchasing twice the amount of the projected need, the comparable per-unit costs for meeting the actual projected need pursuant to either strategy might well be about equal. Furthermore, because most of the yield of Lake Columbia would not be needed within the planning horizon, the validity of the per-unit costs even as calculated assuming this excessive amount of demand is highly questionable. Pages 4C-9 through 4C-10.*

[5]*The initially prepared plan recommends that the projected County-Other water need be met through increased pumping from the Carrizo-Wilcox rather than through obtaining water from Lake Columbia. The per-unit cost is about half that of obtaining water from Lake Columbia and the Lake Columbia per-unit cost is based on the purchase of about 50% more water than is projected to be needed. Furthermore, because most of the yield of Lake Columbia would not be needed within the planning horizon, the validity of the per-unit costs even for this excessive amount of supply is highly questionable. Page 4C-27.*

[6]*The initially prepared plan recommends that the City of Nacogdoches meet its needs through a combination of other strategies. Page 4C-29 and 30.*

[7]*No alternative strategies are shown as having been evaluated for meeting the projected Steam Electric Power needs in Nacogdoches County. The failure to evaluate alternative supply strategies requires explanation. The planning group is required to evaluate all potentially feasible strategies. See 31 TAC §§ 357.7(a)(8). This appears to be a potential new facility. Because of siting flexibility for new electric power plants, the facility likely could be located near an alternative water supply source.*

In the Regional Water Plan East Texas Region (2001), the recommended supply strategy for a potential future steam electric power plant in Nacogdoches County is to obtain water from Sam

Rayburn Reservoir. The unit cost is listed as $0.09 per 1000 gallons for 7,505 acre-feet. See the 2001 Plan at pages 5-53 and 5-54. The projected cost in the current IPP for purchase of water from Lake Columbia is $1.25 per 1000 gallons for 13,358 acre-feet. Particularly given the potential for increased environmental impacts from a new reservoir and the higher cost, the regional group must explain why purchase of water from Sam Rayburn Reservoir is not a potentially feasible option to be evaluated and, indeed, why it is not a superior option.

[8] A portion of the projected demand is shown as being met from increased production from the Carrizo-Wilcox Aquifer. However, no alternative sources from the remaining projected need, such as alternative surface water sources, are evaluated. Lake Cherokee, located near the projected facility, is not listed in Table 3.2 on page 3-7. It does appear in Table 1.D and on the map on page 3-6, where it is shown as lying on the boundary between Region I and Region D. We were unable to locate information in the initially prepared plan about water availability from Lake Cherokee.

In the Regional Water Plan East Texas Region (2001), the recommended supply strategy is to obtain water from Toledo Bend Reservoir. The unit cost is listed as $0.10 per 1000 gallons. See the 2001 Plan at page 5-75. The projected cost in the current IPP for purchase of water from Lake Columbia is $0.97 per 1000 gallons. Particularly given the potential for increased environmental impacts from a new reservoir and the higher cost, the regional group must explain why purchase of water from Toledo Bend Reservoir is not a potentially feasible option to be evaluated and, indeed, why it is not a superior option.

The information about projected demand shown on pages 4C-58 and 4C-59 also overstates demand for water from Lake Columbia as compared to individual recommendations for WUGs. See our comments above regarding Table 4B.A.

b. The Per-Unit Costs for Lake Columbia Water Are Understated.

As explained above, the per-unit costs for water from Lake Columbia are based on amounts far in excess of projected demands. Because the purchasing entity would be paying the cost for water not being used, based on contractual commitments, the actual per unit costs to meet projected demand would be greatly in excess of the stated cost. The only entities for which that would not appear to be the case are the two steam electric plants. However, even for those facilities, the per-unit costs likely are inaccurate because there is so little demand for the water from Lake Columbia. In order to finance construction of the reservoir, unit costs likely would be much higher than the cost presented in the initially prepared plan.

The overall cost estimate for the proposed reservoir is so general that it does not provide a meaningful opportunity to comment. Total estimated costs are listed on page 4C-59 but no breakdown of those costs is provided. For example, for the reservoir itself costs are not broken down to show even major categories such as land acquisition costs, construction costs, or mitigation costs. Without that information it is not possible to assess whether the costs represent reasonable estimates.

Regarding mitigation costs for Lake Columbia, the percentage of high-quality habitat to be inundated is high: 3,500 acres of category-two bottomland hardwood forest. That is increasingly scarce habitat that supports a diverse range of species, including endangered and threatened species. Because Texas bottomland hardwood habitat is extremely difficult to replace, the cost of mitigating for the inundation of such habitat is extremely high. USFWS has estimated that the bottomland hardwood forest in the Lake Columbia footprint would require between 8,207 and 32,827 acres of in-kind mitigation, depending on the level of management dedicated to the new land. When one includes the 3,000 acres of priority 3 pine-hardwood forest and priority four grasslands, the total acreage needed for mitigation ranges from 14,373 to 57,489 acres, again depending on the management practices employed on the acreage used for mitigation. *See Texas Water and Wildlife: An Assessment of Direct Impacts to Wildlife Habitat from Future Water Development Projects*, pp.3-4, 20 (TPWD and USFWS, May 1990). The potential impact of the required mitigation measures on agricultural resources also should be considered.

The estimated cost for the ANRA treatment plant alone (over $13 million) raises serious questions about project viability. As noted above, only a few hundred acre-feet of yield from the proposed reservoir would go to municipal use. Even if the manufacturing use were to require treated water, which seems unlikely, there would be nowhere near sufficient demand to support the cost of the treatment plant.

c. The Initially Prepared Plan Lacks the Required Quantitative Evaluation of Lake Columbia.

For each potentially feasible water management strategy, Texas Water Development Board rules require the regional planning group to provide "a quantitative reporting of . . . environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico." *See* 31 TAC 357 7(a)(8)(A)(ii). Probably no water management strategy needs closer scrutiny under this rule than the proposed construction of a reservoir.

The initially prepared plan does include some general information about some aspects of the impacts of inundation on wildlife habitat from five reservoirs that were evaluated in past water plans. Some of that information is quantitative. See pages 1-58 through 1-62. There is some additional qualitative discussion of the proposed Lake Columbia on pages 4B-20 through 4B-21 and a highly generalized discussion of water quality impacts of reservoirs in general on pages 5-7 through 5-8. However, we found no quantitative evaluation of downstream effects on wildlife habitat as a result of alteration of flow patterns. Similarly, we found no quantitative consideration of environmental water needs, cultural resources, or effects on coastal inflows. Thus, the initially prepared plan does not comply with applicable requirements for this strategy.

In addition, the initially prepared plan fails to provide information adequate to demonstrate that the construction of Lake Colombia would be cost-effective (as noted above, the per-unit cost estimates are inaccurate because of projected demand is so much lower than the project yield) or that it would be consistent with long-term protection of the state's water resources, agricultural resources, and natural resources. Those demonstrations are required pursuant to Section 357.7 (a)(9) of the Board's rules and Section 16.053 (h)(7)(C) of the Water Code.

2. **Other Reservoirs**

The Region I Draft Plan actually discusses five reservoirs from the 1984 state plan: (1) the Eastex Reservoir, or Lake Columbia; (2) the Rockland Reservoir; (3) the Weches Reservoir; (4) the Bon Weir Reservoir; and (5) the Tennessee Colony Reservoir. There is not even the suggestion of a need for any of those reservoirs other than Lake Columbia. Of these five, the planning group has recommended the construction of Lake Columbia.

Other than brief quantitative information about habitat types within the potential inundation footprint, no quantitative analysis is provided. The initially prepared plan does not come close to providing sufficient evaluation to support recommending any of those reservoirs as a water supply strategy, an alternative strategy, or as a unique reservoir site. The initially prepared plan does not suggest any such status for Weches Reservoir, Bon Weir Reservoir, and Tennessee Colony Reservoir. That is a significant improvement over the last version of the regional plan.

The planning group does discuss a request for consideration of a recommendation for the Rockland Reservoir site as a unique reservoir site, but the initially prepared plan includes no such recommendation. Indeed, the initially prepared plan fails to provide any of the information that would be required to support such a recommendation. In fact, because there is no need for the water from the potential reservoir and thus no identified beneficiaries, such a recommendation could not be justified. *See* 31 TAC § 357.9.

The Draft Plan acknowledges that Rockland Reservoir would impact a bottomland hardwood site known as the "Middle Neches River," which USFWS has identified as a priority one preservation area. Rockland would also impact three USFWS priority two preservation areas: (a) "Neches River South," (b) "Piney Creek," (c) "Russell Creek." **Priority one** is defined as "excellent quality bottomlands of high value to waterfowl," and priority two as "good quality bottomlands with moderate waterfowl benefits." *See* pp.1-60-16-1.

D. **WATER CONSERVATION**

At page 2-10, the initially prepared plan states that the per capita municipal demand was adjusted to account for "current plumbing, appliance, and other conservation technologies." Such an adjustment would be consistent with TWDB requirements and real-world conditions. However, we were unable to locate any information about the amount of those adjustments. That information should be included in the initially prepared plan. The amount of those adjustments is a relevant factor in assessing the potential for additional water conservation savings. Such information about per capita water use would be very helpful in assessing the potential for additional savings through water conservation and drought management measures.

TWDB rules require that the plan include an evaluation of water conservation strategies for the following categories of water users, where applicable: (1) industrial; (2) steam electric power; (3) mining; (4) residential/commercial use; and (5) agricultural uses. TDWB rules require Region I to consider conservation as a water management strategy distinct from any other strategies. *See* 31 TAC § 357.7(a)(7)(A). In reviewing Table 1 in Chapter 4C, we were unable to locate information about evaluations of water conservation strategies. Comparable information is required to allow informed comparisons of available strategies. *See* 31 TAC §357.7(a)(8)(E).

For water user groups required, pursuant to Section 11.1271 of the Water Code, to have a water conservation plan, the regional plan must include at least the levels of water conservation resulting from those Section 11.1271 plans. As part of this strategy, the region is required to calculate the water savings that will result and include them as a water supply strategy.

The regional plan also must include consideration of water conservation more stringent than that required by Section 11.1271. However, provided the regional plan includes appropriate explanation and documentation, the regional planning group may decline to include water conservation measures beyond those required by Section 11.1271. *See* 31 TAC § 357.7(a)(7)(A)(ii). It appears that the initially prepared plan has omitted a specific explanation as to why additional conservation measures were rejected for the vast majority of user groups.

The experience of San Antonio in reaching a 132 gpcd level for municipal use belies the contention that higher levels of water efficiency are not achievable or practicable. Absent compelling evidence to the contrary, a municipal usage rate of no higher than 140 gpcd should be used for evaluating water efficiency (i.e., usage rates not considering reuse).

1. Manufacturing Uses and Conservation

The Draft Plan states that manufacturing demand will increase from 401,790 acre feet per year to 593,454 acre feet per year over the planning period. *See* p.2-17. This is, by far, the largest component of growth in water demands noted in the initially prepared plan. From Table 4.2, it appears that most of the demand can be meet with currently developed supply. However, a region-wide need of about 37,500 acre-feet is shown for 2060. As noted in a January 26, 2005 memorandum from Bill Mullican, TWDB, to Regional Planning Group Chairs and Consultants (Subject: Clarification – Regional Water Planning Contract Exhibit B), "[t]he non-municipal water demands that have been approved by TWDB's Board are not based on any assumptions of water conservation." Thus, these projections of manufacturing demand assume no efficiency improvements whatsoever.

The initially prepared plan includes confusing statements about water conservation that appear to be conflicting. On page 6-2, the initially prepared plan indicates that the planning group has determined that water conservation should not be relied upon in meeting future needs. That statement and the approach it reflects is directly inconsistent with SB 2 and TWDB rules. With respect to manufacturing water needs, water conservation, in the form of water efficiency measures, is a required water management strategy for those entities using surface water, either directly or indirectly through purchase, pursuant to a water right in excess of 1000 acre-feet. *See* 31 TAC § 357.7(a)(7)(A)(i). The initially prepared plan does not include the required water conservation strategies when listing individual water management strategies

By contrast, at pages 4B-5 and 4B-6, the initially prepared plan projects a savings of about 2,446 acre-feet through water conservation for a subset of manufacturing activities in Angelina and Nacogdoches Counties. We understand that estimate to be limited to savings anticipated to result from industrial audit water practices for food and manufacturing industries applied only to water provided through municipal suppliers. We do acknowledge this limited recognition of water conservation potential for manufacturing. Unfortunately, as noted below, the failure of the initially prepared plan to reflect these savings in the calculations for the relevant WUGs appears to render the "savings" of no practical effect and to make the plan inconsistent with regulatory requirements.

In addition to those required conservation water management strategies, the plan must include consideration of additional water efficiency measures for each user group with a need. *See* 31 TAC § 357.7(a)(7)(A)(ii). Unlike for the levels of water conservation mandated by Section 357.7(a)(7)(A)(i), the regional planning group may justify not including these additional water efficiency measures. However, we are unable to locate specific explanations for the failure to include those measures. The initially prepared plan, indicates at page 6-2 that the group "feels that water conservation is not a widely recognized effective strategy in East Texas at the present time and should not be relied upon in meeting future needs." This is a 50-year water plan. How will conservation ever become recognized if it is not even recommended? Surely, it is appropriate for the planning group to recommend that water conservation should become an accepted strategy at least during the next decade or so. That statement does not constitute a meaningful explanation for failing to include additional water conservation strategies within the planning period.

With respect to manufacturing water conservation strategies, the initially prepared plan states, at page 4B-5, that application of each of the 14 best management practices listed in TWDB Report 362 to the food and manufacturing industries in Angelina and Nacogdoches counties is not practical at this time. It also indicates that one practice, the industrial water audit practice, is feasible. We strongly support the inclusion of the industrial audit for these WUGs. Although we understand that not all of the 14 best management practices may be appropriate, we do believe additional discussion is required to explain the determination that none of the other rejected practices is considered potentially feasible.

The initially prepared plan also appears to indicate that water needs for the timber/paper industries in Angelina County may not have been considered in the planning process. See page 4B-5. It is clear that water conservation was not considered for those demands. The rationale for that decision is not clear and should be further explained. Even if the entities "provide their own ground or surface water," that water still comes out of a finite shared resource and should be considered in the planning process.

The initially prepared plan also indicates, at page 4B-5, that there are readily available supplies of water to meet manufacturing needs in Newton, Orange, and Polk counties. However, it appears that these are not currently available supplies because water management strategies are listed to meet varying amounts of manufacturing needs in each of those counties. Accordingly, water conservation strategies must at least be evaluated.

Section 4.C.2 Angelina County – Manufacturing
The projected 2060 need of 5,404 acre-feet is recommended to be met with surface water. No water conservation strategy is listed as being recommended or even considered. That is inconsistent with 31 TAC § 357.7(a)(7)(A)(i) and (ii) and with Section 16.053 (h)(7)(B).

Section 4.C.9 Nacogdoches County – Manufacturing
The projected 2060 need of 1,626 acre-feet is recommended to be met through purchase of surface water. No water conservation strategy was included or considered. That is inconsistent with 31 TAC § 357.7(a)(7)(A)(i) and (ii) and with Section 16.053 (h)(7)(B).

Section 4.C.11 Orange County – Manufacturing
The projected 2060 need of 31,456 acre-feet is recommended to be met with surface water. No water conservation strategy was included or considered. That is inconsistent with 31 TAC § 357.7(a)(7)(A)(i) and (ii) and with Section 16.053 (h)(7)(B).

2. Municipal Uses and Conservation
The initially prepared plan indicates that conservation strategies were considered for municipal users that used more than 140 gallons per capita per day. However, the plan includes extremely limited water conservation recommendations. By 2060, the savings from municipal conservation alone would total **41,393** acre feet per year if use levels were reduced to 140 gallons per capita per day. *See* Attachment to these comments (Letter of April 7, 2005, to Region I Planning Group from Norman Johns, Ph.D.) The City of San Antonio already has reduced its per capita municipal use levels to below 140 gpcd through water efficiency measures. The costs for these water efficiency strategies generally are very reasonable. The GDS study, contracted for by the TWDB, provides useful information about conservation potential and costs.

The potential for water savings through increased efficiency in municipal water usage in Region I is very substantial. For example, the following cities have usage rates significantly above 140 gpcd:

- Beaumont averages 201 gallons per capita per day.
- Tyler – a fast-growing urban area in Region I (only part of the city is in the region) – averages 248 gallons per capita per day.
- Nacogdoches – one of the fastest-growing urban areas in Region I – has an average use of about 206 gallons per capita.
- Lufkin – one of the fastest-growing urban areas in Region I – currently has an average use of about 171 gallons per capita.

On page 4B-3, the discussion of conservation water pricing is confusing. The initially prepared plan indicates that it "will be most effective in areas where groundwater resources are becoming less available and requires high expenditures in capital projects to supply water." IPP at p. 4B-3. The rationale for that statement is less than obvious. It certainly is true that high water costs may result in water conservation independent of an intentional conservation pricing structure. However, a conservation pricing structure, depending on the price charged, can work in virtually any situation. That discussion also indicates that conservation water pricing was considered only for areas meeting those two criteria and located in counties nearing the limits of groundwater availability. Effective water conservation is a strategy that can, and should, be applied to avoid having counties come close to exhausting groundwater supplies. The strategy is feasible in other locations and should be more fully evaluated.

On page 4B-4, the initially prepared plan discusses a cost for the "passive clothes washer strategy." Although we were unable to locate any actual description of that strategy in the appendices to Chapter 4C, we did locate summary sheets that appear to show zero cost for that strategy. Indeed, given that it is a "passive" strategy, a zero cost would be expected. Actually, it is difficult to understand this as a "strategy" at all. Rather, as indicated on page 4B-3, it appears to be an accounting of savings that will occur naturally as older, non-efficient washing machines are replaced. With new federal standards requiring that all new washing machines achieve improved efficiency levels, these savings will inevitably occur and should be accounted for across the region, rather than just in the four communities listed in the appendix to Chapter 4C. Accordingly, we do not understand the discussion regarding limiting the strategy to areas with a certain cost per unit of savings. The calculation of savings should be applied across the entire region.

E. DROUGHT MANAGEMENT
(Chapter 6: pp.6-1 through 6.16)

The initially prepared plan indicates that the regional group has begun compiling information on drought contingency plans for both surface and groundwater. Information is provided regarding drought trigger levels for several reservoirs and other municipal water supplies. The plan also acknowledges that trigger levels and corresponding restrictions on pumping for the region's aquifers generally have not been developed, stating only that monitor wells have been identified. *See* pp.6-5 through 6-16.

Although this is a useful start, more is required. 31 TAC §357.7 (a)(7)(B) of the Board's rules requires the plan to include evaluation of drought management as a water management strategy. That provision also requires that the plan include, for each water user group subject to Section 11.1272 of the Water Code, drought management as a water management strategy for each such WUG. That includes calculating the amount of water supply expected to be supplied pursuant to each such strategy. The initially prepared plan fails to do this and fails to comply with applicable requirements. Section 16.053 (h)(7)(B) of the Water Code expressly directs that the Board may approve a regional plan only if it includes at least the levels of water conservation and drought management required by Sections 11.1271 and 11.1272 of the Water Code.

In addition, drought management measures beyond the levels required by Section 11.1272 of the Water Code must be considered in the plan. However, provided it documents the basis for its decision, the regional planning group may decide not to include drought management as a water management strategy beyond those measures specifically required by Section 11.1272. We were unable to locate any such discussion or documentation of the rationale for not including additional drought management measures.

A repeat of a drought of record would be a serious event. Water would be in short supply for all users. Natural resources would suffer as well. During such conditions, it just makes sense to take steps to reduce nonessential uses of water. As directed by SB 1, using the drought of record as the measuring point against which to plan for water supplies provides protection for human water uses. *However, planning for drought periods but ignoring water savings possible through implementation of drought management measures results in huge costs, both economic and ecological, for developing new water supplies that only would be needed during those severe drought periods and only for nonessential uses*. Consideration of drought management measures, as required by SB 2 and TWDB rules, represents a recognition that it may make more sense to plan to curtail some non-essential uses during rare drought periods than to invest the huge sums necessary to ensure a water supply to meet those non-essential uses at those times. As an example, it will likely make much more sense to reduce activities such as lawn watering, car washing, and fountain filling during drought periods *rather than to build another reservoir just to ensure that those activities can continue unabated even during a period of serious rainfall shortage. Building that reservoir would impose major costs, both in terms of the price of developing the supply and in terms of agricultural and natural resources that might be lost.*

At minimum, in order to meet the explicit requirements of SB 2 and TWDB rules, the initially prepared plan must be revised to include drought management measures applicable during a repeat of the drought of record for all entities governed by Section 11.1272. In addition, we urge the planning group seriously to consider including water savings that could be achieved through additional drought management measures.

F. CHAPTER 6. APPENDICES

The excerpts from the Texas Commission on Environmental Quality rules, 30 TAC § 288, included in the appendices to Chapter 6 are outdated. Those rules were amended in 2004. The text of the current rules should be substituted.

G. CONSISTENCY WITH LONG-TERM PROTECTION

The Texas Water Code provides that the Texas Water Development Board may approve a regional water plan only if the plan has been shown to be consistent with long-term protection of the state's water resources, agricultural resources, and natural resources. Tex. Water Code Ann. § 16.053 (h)(7)(C).

1. Consistency with Protection of Water Resources

This provision applies especially strongly to management of groundwater resources. With only the rarest exception, mining of groundwater supplies will not be consistent with long-term protection of the state's water resources. That is even more true in areas where pumping those supplies at a rate higher than they are recharged is likely to result in contamination of the aquifer or in subsidence. Both of those conditions apply to proposed management strategies in portions of Region I. Because other strategies such as improved water efficiency, drought management, or existing alternate sources are reasonably available, we strongly urge the planning group not to plan for depleting groundwater supplies. Mining of aquifers that feed streams and rivers also is inconsistent with long-term protection of the state's water resources.

Pages 7-2 and 7-3 of the initially prepared plan include the planning group's rationale for why the plan should be considered consistent with long-term protection of water resources. The information included in the initially prepared plan is not adequate to support a determination by the Texas Water Development Board that the East Texas Regional Plan is consistent with long-term protection of the state's water resources. The beginnings of a move towards water conservation are noted. Given the failure of the plan to endorse more than a very small portion of those potential water efficiency savings, that simply is not enough. Even the construction of Lake Columbia is noted as supporting that determination. However, given the absence of need for the reservoir, we believe the recommendation of the reservoir cuts the other way.

Most troubling, however, are the statements about expanded use of groundwater: "Groundwater availability reported in the plan is based on the long-term sustainability of the aquifer. No strategies are recommended to use water above the sustainable level." As noted earlier in these comments, unfortunately, the planning group has chosen a definition of sustainable level that simply turns the term on its head. It plans for depletion of aquifers with average drawdowns of 50 to 80 feet over the planning period in some areas. The plan acknowledges that saltwater intrusion and subsidence are expected but calls for changing practices only after those problems have occurred and been detected.

2. Consistency with Protection of Agricultural Resources

The discussion, at pages 7-3 and 7-4, addresses only irrigated agriculture and notes that adequate supplies should be available for rice farming. However, agriculture is much more than just rice farming. Groundwater level declines have the potential for serious adverse effects on shallow wells relied upon to water livestock and for domestic use. Reservoir construction, especially unnecessary reservoir construction, has the potential to displace agricultural operations. Again, the information provided simply is not adequate to support a determination that the plan is consistent with long-term protection of agricultural resources.

3. Consistency with Protection of Natural Resources

This discussion, at pages 7-4 and 7-5, is lacking in substance. It fails even to acknowledge the issue of environmental flows. Adequate environmental flows are critical for sustaining healthy populations of fish and wildlife in and along rivers and streams and for maintaining healthy and productive bays and estuaries. Planning to meet environmental water needs is critical to protecting the natural heritage of Texas for future generations and to sustaining the economic benefits these fish and wildlife resources provide. Protection of environmental flows, including flows from springs, instream flows, and freshwater inflows, is one of the most important factors in protecting natural resources. The initially prepared plan lacks meaningful consideration or assessment of environmental flow protection. The information and tools are available to allow for such an assessment.

For assessment of instream flows, TPWD developed a method that can be used for assessing flow changes and considering the potential biological significance of those changes. Details of this methodology, titled *Using Water Availability Models to Assess Alterations in Instream Flows*, can be found at: www.tpwd.state.tx.us/landwater/water/habitats/rivers/fwresources/index.phtml

For assessment of freshwater inflows, the National Wildlife Federation developed a method described in a report titled *Bays in Peril*. Copies of the report have been provided previously. The report describes the results of an analysis done by NWF of the potential effects on freshwater inflows of just existing water rights. NWF used the state's water availability models to predict the amount of freshwater inflow that would result from full exercise of existing water rights and reuse of about 50% of return flows. NWF then compared those predicted inflows to ecologically-based targets derived from the results of the state's freshwater inflow studies. The planning group could use a similar approach. Instead of the future use scenario used in the NWF analysis, which was full use of existing water rights and 50% return flows, the planning group could substitute the water use scenarios predicted in the regional water plan. That would provide a prediction of inflows during the planning horizon and information to use in assessing how those inflows might affect natural resources in the Sabine-Neches Estuary.

NWF's analysis resulted in a danger ranking for the Sabine-Neches Estuary (Sabine Lake) as a result of a prediction of greatly diminished inflows, particularly during drought periods. An analysis of use levels projected in the regional plan is needed to assess impacts on natural resources dependent on freshwater inflows. Without it, information is lacking to demonstrate that the regional plan is consistent with long-term protection of natural resources.

In addition to the failure to address environmental flow issues, the discussion also lacks a careful look at the broader issue of impacts to fish and wildlife habitat. The text notes that those factors are considered in permitting determinations on new surface water projects. Although that is true, it does not take the place of a careful planning level assessment now. In addition, it is important to look at these issues comprehensively rather than just on a permit-by-permit basis and that type of comprehensive review is just what the planning process is designed to provide.

H. DESIGNATION OF UNIQUE STREAM SEGMENTS AND UNIQUE RESERVOIR SITES

We are disappointed that the planning group once again chose not to recommend the designation of unique stream segments. During the first round of regional planning there were strong statements of reluctance to designate segments because of fears that the designations might have far-ranging significance. In response, the Texas Legislature defined the impact of such designations very narrowly. In the initially prepared plan, the planning group decides not to recommend segments because the impact of designation is so narrow that designations are not needed except where a reservoir is currently contemplated. That narrow view seems inappropriate. A stream that is deserving of protection is deserving of protection even if no known current reservoir proposal exists.

As noted above, we do not understand the initially prepared plan to recommend any unique reservoir site designations. If, however, as during the last round of planning, ambiguous language in the initially prepared plan is changed to language proposing a designation, we note that the Rockland Reservoir site does not qualify for such a designation. There is no need for the reservoir and, thus, no reasonably identified beneficiaries for the water. The project would result in large-scale harm to natural resources and agricultural resources both within the reservoir footprint and downstream.

Thank you for your consideration of these comments and please feel free to contact us if you have any questions. We look forward to a continuing positive dialogue with the planning group during this and future planning cycles.

Sincerely,

Myron J Hess Mary E. Kelly Ken Kramer

Myron Hess	Mary Kelly	Ken Kramer
National Wildlife Federation	Environmental Defense	Sierra Club, Lone Star Chapter

cc: Bill Roberts, TWBD Liaison
Schaumberg & Polk, Consultants
Bill Mullican, TWDB
Cindy Loeffler, TPWD

SIERRA CLUB
FOUNDED 1892

Houston Regional Group
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Houston, Texas 77253-3021
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July 6, 2005

Mr. Gary Hanlon
Deep East Texas Council of Governments
210 Premier Drive
Jasper, Texas 75951

and

Mr. J. Kevin Ward
Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Dear Mr. Hanlon and Mr. Ward,

Enclosed are the comments of the Lone Star Chapter of the Sierra Club (Sierra Club) regarding the Region I Water Plan (RIWP).

1) The Sierra Club opposes including the Fastrill and Rockland Dams in the RIWP. These dams will have tremendous negative, cumulative, environmental impacts on the Neches River and East Texas and are unneeded economically and for residential, commercial, agricultural, and industrial water uses.

The Sierra Club supports designating the Neches River, from below Lake Palestine to the Beaumont city limits, as a National Scenic and or Recreational River. We also support the designation of a National Wildlife Refuge by the U.S. Fish and Wildlife Service on the Upper Neches River and a state park or similar protected area on the Middle Neches River.

It is important to protect what little is left in East Texas of our ecological heritage to leave for our children and others in the future. In addition, these areas will provide a more sustainable economic future for East Texas while protecting wildlife, bottomland hardwoods, and adjacent upland forests.

2) The Sierra Club urges Region I to designate unique ecological streams to ensure that they get the protection and the recognition they need to protect them for future generations. The streams we support protecting include, but are not limited to, the Neches River, from below the lake Palestine Dam to the Beaumont city limits, Village Creek, Big Sandy Creek, Beech Creek, Hickory Creek, Little

Pine Island Bayou, Pine Island Bayou, and Turkey Creek. Most of these streams at least partially flow through Big Thicket National Preserve and deserve our protection so that the Preserve's ecological and biological wonders will not be degraded due to the effects of dam and reservoir construction, maintenance, and operation. The Sierra Club also supports the designation of appropriate unique ecological stream segments in Davy Crockett, Angelina, and Sabine National Forests.

The Sierra Club appreciates this opportunity to provide input for the RIWP. Thank you.

Sincerely,

Brandt Mannchen

Brandt Mannchen
Chair, Big Thicket Committee
Lone Star Chapter of the Sierra Club
5431 Carew
Houston, Texas 77096
713-664-5962

O-8

John H. Matthews

TEXAS HABITATS

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608 N. Main
Jasper, Texas 75951
Phone: (409) 384-1620

15 August 2005

East Texas Regional Planning Group
Region I

Ref: Public Comment on Fastrill Dam

To Whom It May Concern:

I have listed 26 reasons why I feel that Lake Fastrill should not be constructed on the attached sheets.

Thank you for allowing me this opportunity to share my concerns about this lake.

Sincerely,

John H. Matthews, President
Texas Habitats

"Matching good people with the right habitats"

Arguments Against the Construction of Fastrill Lake

1. 25,500 acres of some of the finest remaining examples of pristine river bottom. hardwood would be cut and lost forever.
2. Two decades of planning and work to develop the above tract of land into a US Fish and Wildlife Sanctuary would be lost. Source...USF&WS
3. .The Texas State Railroad Park generates $4,000,000 in local sales and which has 80,000 visitors a year will be destroyed. Texas State Park RR Superintendent.
4. It will take $105,000,000 to reroute the rail line & to rebuild and extend the trestle across the river and rebuild the RR bridges to maintain the State RR Park
5. The counties downstream from Fastrill would receive 20% of the river's flow.
6. All water pumped to Dallas would eventually end up in the Trinity River basin instead of being returned to the Neches River basin.
7. The dam would jeopardize the entire ecosystem to the coast with its reduced water flow. Wilderness areas such as Big Slough and Upland Island would be lost Christopher Jones...Texas Committee on Natural Resources.
8. David Durury of the Big Thicket Assoc. expressed concern that further dam construction would disrupt the rivers hydrolic functions and restrict the flow of water to areas that need occasional flooding while drying out areas such as oxbow lakes and areas such as Bee-tree Slough on Steinhagen Lake.
9. TP&WD plans to build a new park on the middle Neches would be abandoned..
10. The dam would impede the flow of fresh water downstream and greatly affect the fishing and oyster industry in the bays and along the coast.
11. Many landowners at the public regional hearing expressed concern about the loss of private and corporate land in the construction area of the dam.
12. A sustained low volume of water entering Steinhagen Lake from the Neches would drastically change the nature of the lake which is already a shallow impoundment. Tourist dollars would be lost.
13. The Texas Parks and Wildlife Department supports using the dam site as a 25,500 acre wildlife refuge.
14. The water consumption rate per person in Dallas exceeds all other cities in Texas by over a 100 gallons a day and can be remedied by using conservation practices.
15. The Department of Interior has ranked the hardwood forest located in the Fastrill's lake site as pristine, Priority 1 bottomland, which means it is "One of the best remaining examples of hardwood bottomland in the nation."
16. If the construction of Fastrill Lake is bought and paid for by the City of Dallas, Jasper County would lose 80% of its water rights on the Neches River.
17. The output of the hydroelectric plant on Dam B would be jeopardized.
18. The health, productivity, and well being of the hardwood forest and bottomland from the dam site south to the Gulf would be jeopardized by the low volume of water that would be released from the new dam.
19. Jasper County would lose millions of tourist dollars if Dam B is compromised by a reduced flow of water into the lake from the Neches River.
20. Temple and the Texas Parks and Wildlife Dept. both agree that the Neches River should be designated as a "Scenic River" from Lake Palestine to B. A. Steinhagen Lake.

21 Robert Cook, Director of the Parks and Wildlife Department supports the North Neches River National Wildlife Refuge that will be located on the dam site.

22. The TP&WD has selected the North Neches River National Wildlife Refuge as its location to reintroduce black bears into East Texas.

23. A Texas Parks and Wildlife Dept. study lists the following impacts from the construction of Fastrill Lake.

    A. Reduction and/or alteration of downstream habitat types such as riverine, estuarine, riparian, wetland, and bottomland hardwoods.
    B. Changes to sediment transport processes
    C. Changes in water quality conditions.
    D. Reduction and alteration of instream flows, overbanking flows, and freshwater inflows to bays and estuaries relative to magnitude, timing, and frequency of hydrologic events.
    E. Impacts to aquatic and terrestrial communities and ecosystem processes.
    F. Influence on energy and nutrient inputs and processing.

24. A reduced amount of water would be available to the Lower Neches River Valley Authority.

25. At public hearings conducted by Region I on the construction of the lake, 99% of the attendees were against the construct of Fastrill Lake.

26. Virtually every environmental group in Texas is against the construction of this dam and lake, i.e. The Nature Conservancy, The Sierra Club, Texas Parks and Wildlife Department, Richard LeTourneau, US Fish and Wildlife Service, Richard Donavan, Friends of the Texas State RR, Texas Committee on Natural Resources, Friends of Martin Dies State Park, The Big Thicket Association, The Committee on Natural Resources.

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PUBLIC COMMENT REGISTRATION
East Texas Regional Water Planning Group (Region I)

I would like to offer public comments during the public comment sessions on July 12, 13 or 14, 2005

My comments will be (check) ✓ delivered in person. ______ written and submitted.

If you choose to provide written comments, please use the space below

Name JOHN H. MATTHEWS

Representing FRIEND OF MARTIN DIES PARK

Address 608 N. MAIN City, town, zip

Telephone 409 383-1915 E-mail texashabitats@sbcglobal.net

Hearing you are attending (check) ✓ Nacogdoches ____ Tyler ____ Beaumont

Would you like to receive the Region I newsletter? Check: ✓ Yes ___ No ___ Currently receiving.

Written comments THRILL KILL RESERVOIR
ROCKLAND (1)

Please use additional pages or the back of this page for additional comments. If you choose to mail your comments, please mail to East Texas Regional Water Planning Group, P.O. Box 1647, Lufkin, Texas 75902

TEXAS HABITATS
142 EAST LAMAR STREET
JASPER, TX 75951
1 409 384-1915

27 July 2005

The Honorable Judge Joe Folk
Commissioner's Court of Jasper County
Jasper, TX 75951

REF: Request to appear before the Court/August 8, 2005

Dear Judge Folk and the Members of the Court:

I wish to appear before the court to ask you to submit a resolution to the East Texas Regional Water Planning Group opposing the proposed construction in Region I of Lake Fastrill on the Neches River.

Over the last several years, this Court has thoughtfully and responsibly voted to protect the most important water resource we have in Jasper County, that is, the Neches River. The actions of this court were instrumental in helping to save and maintain Stienhagen Lake, four Corps of Engineer Parks and Martin Dies State Park from being flooded by an unneeded new dam, with the proposed reconstruction of Steinhagen Lake. Once again, I am asking for your leadership and support to protest the construction of Lake Fastrill.

Physically, the Neches River forms our entire western boundary in Jasper County. Historically, the river was an early highway to the Gulf. It's waters nourished the land adjacent to the river with nutrients that provided rich soils for agriculture, and insured the healthy growth of a sea of hardwoods, and the development of unique habitats such as those found in Bee Tree Slough in the forks of the Neches and Angelina Rivers. Down river, below Dam B, the Neches provides water, & nutrients, to help us maintain healthy state and national forests and parklands, as well as privately owned land whose trees must have the benefit of spring floods in the river's floodway to remain viable.

As the river approaches the coast, it provides a healthy balance of fresh and saline water in the bay systems to maintain a nursery ground for hundreds of species of fish, birds, and other forms of wildlife. It's silt, helps replenish our beaches with much needed sand.

The Neches River is a rich resource for flora and fauna, as well as an economic resource for East Texas and the entire state. If Fastrill Lake is constructed, 25,000 acres of a proposed wildlife refuge would be inundated, as well as the Rusk/Palestine State Park and Railroad.

The water impounded in this dam has been designated solely to the City of Dallas, and would be permanently lost as a downstream resource to all of the counties adjacent to the river below Lake Fasttrill's spillway As a result of this action alone, the eco-systems from the spillway to the gulf coast would become endangered from this loss of water resources both within the river and along its banks and bottomlands.

Keeping the Neches River free flowing is in the best interest of Jasper County and all of the counties adjacent to the river. It is a state treasure that must be protected. I urge the court to endorse and support the opposition to the creation of Lake Fastrill.

John H. Matthews

RESOLUTION
In opposition to the creation of Lake Fastrill

Whereas, the East Texas Regional Water Planning Group (Region I) has been designated to develop a comprehensive water management strategy for a 20 county region including Jasper County, and

Whereas, The East Texas Regional Water Planning Group (Region I) has submitted its Initially Prepared East Texas Region Plan to the Texas Water Development Board for consideration, and

Whereas, there has been a proposal to create a new reservoir (Lake Fastrill) in a portion of Region I to meet the future water needs of the City of Dallas, and

Whereas, the creation of the proposed Lake Fastrill would create a negative impact on the ecological balance in the Big Thicket, and all other bottomland adjacent to the river below this lake that is dependent on flood flows to maintain its habitat,

Whereas, the creation of Lake Fastrill would inundate 25,000 acres of bottom land and flood the proposed wildlife refuge on the upper reaches of the Neches River,

NOW THEREFORE be it resolved that the Commissioners Court of Jasper County recommend that Fastrill Reservoir not be adopted as a Water Management Strategy by the East Texas Regional Water Planning Group (Region I) and further resolved that the Commissioners Court authorize the County Judge to express the Court's objections to the East Texas Regional Water Planning Group (Region I) and the Texas Water Development Board

A publication of the East Texas Regional Water Planning Group RWPG (Region I)

EAST TEXAS Water Report

January/February/March 2005

Officers elected for 2005

David Alders of Nacogdoches was reelected chairman of the Regional Water Planning Group for 2005.

Also named were Melvin Swoboda of Jefferson County, first vice-chairman; Tom Mallory of Palestine, second vice-president; Robert Stroder of Beaumont, secretary; and Jerry Clark of Orange, assistant secretary.

Two at large members named to the Executive Committee for 2005 are George Perry Campbell and Dr. Leon Young, both of Nacogdoches. The Group also added two new members to its board, Duke Lyons of San Augustine and Worth Whitehead of Rusk County.

Process begins for identifying water strategies

The East Texas Regional Water Planning Group has begun the process of identifying water management strategies for its 20-county region during the coming half-century.

The strategies will help guide water availabilities for meeting shortages and addressing surface water quality standards for local and state governments, manufacturing, livestock, electrical generating, mining and agriculture interests.

New water demands are expected to show significant increases for municipalities, manufacturers, and steam-electric generators in the coming five decades for the East Texas Region.

These increases are expected to account for 95% of the additional projected demands for water within the region. New water demands for livestock, irrigation and mining are expected to be minimal, he said.

Some of the potential sources that will be studied to meet the demands include the expanded use of surface water sources, new reservoirs, interbasin transfers, the expanded use of reclaimed water, the expanded use of groundwater resources, and water conservation.

Region I, he said, has a significant amount of water available in existing surface reservoirs. Only one new reservoir, Lake Columbia (formerly Lake Eastex) near Jacksonville has been formally proposed for the region.

Graham said interbasin transfers of water from Region I to other

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Regional group eyes conservation process

Regional water planners for East Texas have authorized their engineering consultants to develop a water conservation and decision making process for the next five years.

Noting that water conservation will become an integral management strategy for East Texas and the state at large, Gary Graham of Schaumburg & Polk, Inc. of Beaumont told the East Texas Regional Water Planning Group the region must develop a plan around an optimum water usage figure of 140 gallons per person/per day, a goal suggested by the Texas Water Development Board's water conservation task force last year.

The region's engineering team will develop strategies and a decision making process for use by municipalities, industries, irrigators and water districts in the East Texas region.

Simone Frey Kiel of Freese and Nichols, Inc. of Fort Worth noted that advanced conservation is not currently considered an effective water management strategy for East Texas, but is expected to become a more pronounced strategy in the coming years.

She said conservation plans, as required by the state, will be implemented by local governing entities or water users.

The keys to water conservation, she said, will include a focus on public awareness and education, a reduction in unaccounted-for water through water audits, the maintenance of water delivery systems, and water rate structures that discourage water waste.

Water conservation plans will eventually be required for water rights holders of 1,000 acre feet annually or more and entities applying for water rights.

Some localized groundwater shortages are anticipated in the coming years, requiring strategies such as conservation, the completion of Lake Columbia near Jacksonville, and a regional water supply project for the Lufkin area.

Region I includes all or parts of Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, Shelby, Smith, Trinity and Tyler counties.

East Texas Regional Water Planning Group (RWPG I)
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continued from front

regions are being studied, but no transfers of water from other regions into Region I are anticipated.

Region I will continue to study the possible use of reclaimed water and will see the continued use of groundwater for municipal, industrial, steam-electric generation, irrigation, livestock and mining, he said.

Groundwater availability appears adequate

The availability of groundwater appears to be adequate in East Texas, but new engineering models will assess its long-term viability, according to plans by the East Texas Regional Water Planning Group.

James Beach of LBG/Guyton, an Austin consulting firm which specializes in groundwater studies, reported to the group that groundwater, which is found in aquifers beneath the surface of the land, does not appear to be in short supply at the present time.

The Region I group authorized the utilization of current aquifer models which will determine groundwater pumping rates in each county that might cause no more than 50 feet of water level decline in the next 50 years.

Region I, which covers 20 East Texas counties, is served by three principal aquifers, the Carrizo-Wilcox Outcrop, the Carrizo-Wilcox Downdip, and the Gulf Coast Aquifer.

Region I is currently served by four new Groundwater Conservation Districts, which were authorized by public elections in recent years.

The Pineywoods GCD serves Angelina and Nacogdoches counties, the Neches & Trinity Valleys GCD serves Cherokee, Anderson, and Henderson counties, the Rusk County GCD, which serves only Rusk County, and a new district serving Jasper and Newton counties.

The models developed by LBG/Guyton will be used to project available supplies of groundwater as demands increase in the future. Projections of future usage were made earlier in Region I's planning process.

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A publication of the East Texas Regional Water Planning Group RWPG (Region I)

EAST TEXAS Water Report

July/August 2005

Public hearings produce comments on initial regional plan

Residents of East Texas made numerous comments against long-term proposals to build two new lakes on the Neches River during three public hearings on the East Texas Regional Water Planning Group helped by Tyler, Nacogdoches and Beaumont.

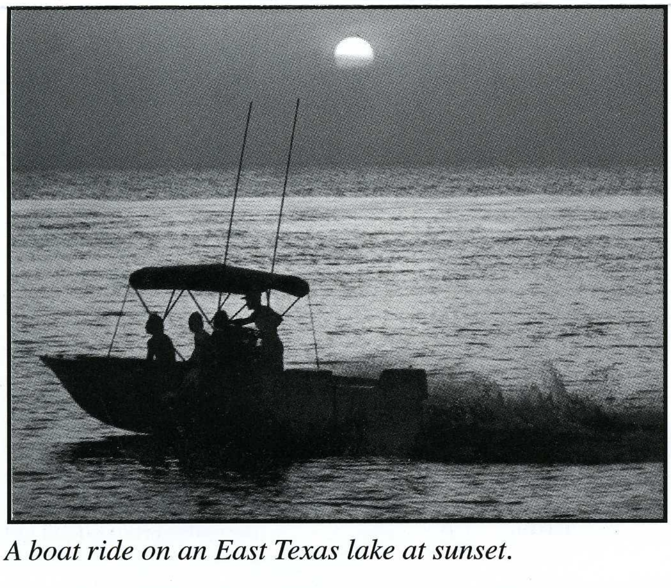
While there are no formal proposals to build either of the lakes–Lake Fastrill, on the Neches River south of Rusk, and Rockland Reservoir, on the Neches River near Rockland–the lakes are identified as alternate water management strategies in the initial 50-year plan for the ETRWPG. Fastrill was also identified as a water management strategy in Region C for Dallas Water Utilities.

One comment expressed opposition to the possible enlargement of Lake Steinhagen, also on the Neches, between Woodville and Jasper.

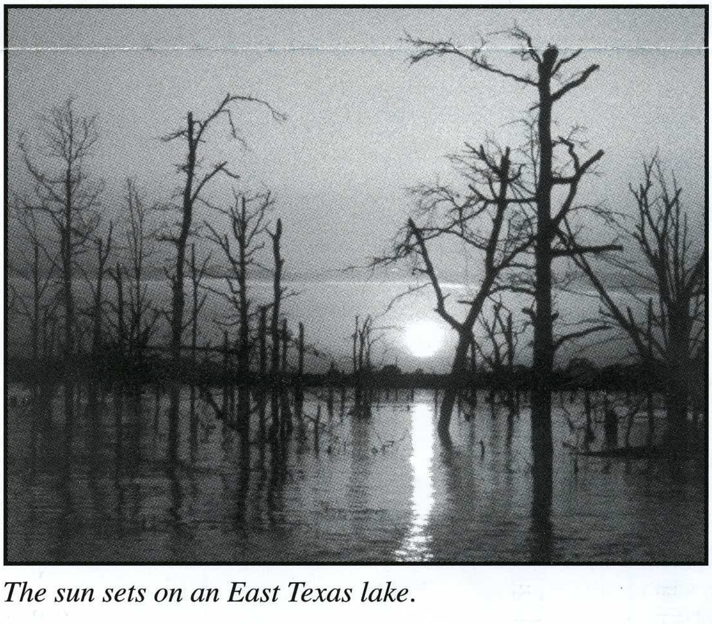
Comments dealing with Fastrill, Rockland and Steinhagen focused on the potential loss of hardwood habitat for wildlife; the potential loss of what could be the last stretch of wild river left in East Texas; the closure or dislocation of the Texas State Railroad, which currently crosses the river on a trestle bridge; the loss of farms and homesteads, some of which have been in the families for many years; the inundation of American Indian burial grounds and other historic sites, including the old lumbering community of Fastrill.

Three comments made by participants in the hearings supported the construction of Fastrill and Rockland as future water sources for East Texas.

Other comments during the three hearings said regional water planning procedures should focus more on how future shortages and needs will be calculated, the development of studies for unique river segments in future planning, the future need for water in Beaumont area refineries; more consideration of the environmental analysis of the impacts of new reservoirs; and support for a proposed wildlife refuge on the Neches River.



A boat ride on an East Texas lake at sunset.



The sun sets on an East Texas lake.

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East Texas Regional Water Planning Group (RWPG I)

Officers

David Alders, Nacogdoches, Chair
Melvin Swoboda, First Vice Chair
Tom Mallory, Palestine, Second Vice Chair
Robert Stroder, Beaumont, Secretary
Jerry Clark, Orange, Assistant Secretary

Directors and Group Representation

David Alders, Nacogdoches, Agriculture
David Brock, Tyler, Municipalities
George P. Campbell, Nacogdoches, Other
Jerry Clark, Orange, River Authorities
Josh W. David, Chester, Other
Carl R. Griffith, Beaumont, Counties
Michael Harbordt, Diboll, Industries
William Heugel, Hemphill, Public
Kelley Holcomb, Lufkin, Water Utilities
Bill Kimbrough, Beaumont, Other
Glenda Kindle, Frankston, Public
Duke Lyons, San Augustine, Municipalities
Tom Mallory, Palestine, River Authorities
Ernest Mosby, San Augustine, Small Businesses
Dale R. Peddy, Beaumont, Electric Power
Harmon Reed, Carthage, Agriculture
Robert Stroder, Beaumont, River Authorities
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Worth Whitehead, Henderson, Water Districts
Dr. J. Leon Young, Nacogdoches, Environmental

Region I includes all or parts of Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, Shelby, Smith, Trinity and Tyler counties.

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Many participants also expressed displeasure with selling water to the Dallas metroplex, particularly if Fastrill Reservoir is built. Commentaries said Dallas has other water sources available and should embark on water conservation to reduce the city's consumption.

Approximately 40 people attended the July 12 public hearing in Tyler, about 60 people were present at the July 13 hearing in Nacogdoches, and more than 25 were in attendance at the July 14 hearing in Beaumont.

Not all of the individuals, however, choose to make oral or written comments.

Individuals attending and registering at the three hearings were from Tyler, Bullard, Jacksonville, Lufkin, Palestine, Rusk, Beaumont, Jasper, Austin, Nacogdoches, Longview, Broaddus, Hemphill, Center, Anahuac, Beaumont, Jasper, Orange, Chester, Pollok, Mount Enterprise, Reklaw, Batson, Vidor, Lumberton, Woodville, Silsbee, Nederland and Groves.

Comments can still be made

Copies of the water plan have been placed in each of the Region I county courthouses and with a library in each county seat (in printed form or as a CD-ROM). The plan may also be accessed at this website: http://www.detcog.org/etrwpg/
Written comments should be mailed to East Texas Regional Water Planning Group, Gary Hanlon, 210 Premier Drive, Jasper, Texas 75951.

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A publication of the East Texas Regional Water Planning Group RWPG (Region I)

EAST TEXAS Water Report

May/June 2005

Initial regional water plan adopted

The East Texas Regional Water Planning Group has adopted a new 50-year water management plan for 20 counties within its jurisdiction.

Adoption of the plan came Wednesday in Nacogdoches. The initial plan will be submitted to the Texas Water Development Board in June with regional public hearings scheduled in July at Nacogdoches, Tyler and Beaumont.

While the East Texas region as a whole boasts ample water supplies--more than enough to meet its projected long-term demands--some of its counties may face water shortages in the next half-century if certain infrastructure and water supply projects are not completed.

Six counties within the region will likely have the greatest projected water needs in the next half-century as the region's population increases from 1.01 million in 2000 to 1.47 million in 2060. Anderson, Angelina, Jefferson, Nacogdoches, Orange and Rusk counties will have projected water needs amounting to about 506,000 acre feet a year. Six other counties will have lesser, but identifiable water needs.

Overall, regional water demands will increase from 704,320 acre feet per year in 2000 to 1.26 million acre feet in 2060. About 58% of the coming water demands will be from municipal and manufacturing needs.

The planning region's total water supply is expected to be about 4.4 million acre feet of water per year, including brackish supplies, over the coming half-century. The region will have about 3.4 million acre feet per year of potable water. Most of the water will come from reservoirs, but other supplies will come from run-of-the-river sources and groundwater aquifers.

The greatest percentage increases in municipal demands for water will be in Polk, Nacogdoches, Angelina and Smith counties. Manufacturing water needs will be the greatest in Orange, Jasper, Jefferson, Angelina and Smith counties.

Irrigation needs will be the greatest in Jefferson, Hardin, Houston and Orange counties while Rusk, Newton and Jefferson counties will create the greatest demands for steam-electric water.

Nacogdoches, San Augustine, and Shelby counties will experience the greatest percentage increase in needs for water among livestock and poultry producers.

Reservoir sites identified

The Water Planning Group recommended that Lake Columbia, on Mud Creek east of Jacksonville, keep the unique reservoir site designation it had received in the first planning cycle five years earlier. No other reservoir sites were recommended to receive special status as unique sites.

Lake Fastrill, on the Neches River south of Rusk, and Rockland Reservoir, on the Neches River near Rockland, were identified as alternate water management strategies. Fastrill was identified as a possible water source for a steam electrical power generating plant near Palestine.

As it had in its first plan, The Planning Group also maintained a listing of other reservoir sites as potential sites which may be needed beyond 50 years, but did not identify them as unique lake sites in its plan.

The sites are on Big Cow Creek and near Bon Wier on the Sabine River, both in Newton County, near Carthage on the Sabine River, on Upper Wilds Creek near Kilgore, on Rabbit Creek in Rusk and Smith counties, on Tiawichi and Mill Creeks in Rusk County, on the Sabine River near Logansport, La., on Socagee Creek in Panola County, and on Mud Creek near Ponta in Cherokee County. In addition, Lake Naconiche in Nacogdoches County was identified as another water supply source although its permitted purpose is flood control and recreation.

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Public hearings scheduled

Public hearings for the initial water management plan for Region D will be held Tuesday, July 12, at the City Water Plant in Tyler; Wednesday, July 13, at the City Library in Nacogdoches; and Thursday, July 14, at the Jefferson County Courthouse (Jury Impanelment Room) in Beaumont.

All hearings will start at 6 p.m. Written comments on the water plan may be made up to sixty days following the hearings.

Copies of the water plan will be placed in each of the Region I county courthouses and with a library in each county (in printed form or as a CD-ROM). The plan may also be accessed at this website: http://www.detcog.org/etrwpg/

East Texas Regional Water Planning Group (RWPG I)

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Region I includes all or parts of Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, Shelby, Smith, Trinity and Tyler counties.

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The Planning Group declined to designate any unique stream segments within the 20-county area. The Group concluded there are sufficient statutes and government agencies in place to identify and protect areas of special environmental significance.

Four legislative policy recommendations made

The Planning Group made recommendations for legislative policy changes. One supports legislation allowing exemptions to junior water rights by contracts that reserve sufficient surface water to meet 125% of the total projected demand of the river basin of origin for the next 50 years.

A second recommendation asked that alternative water management strategies be allowed in future planning to give regional groups more options in their work.

A third recommendation supports continued funding of the planning process by the state, and a fourth encourages all Region I areas not presently a part of a groundwater management district to either create one or join an existing district.

Regional chairman identifies RWPG role

For activists who believe regional water planning groups in Texas should be passing judgments on critical issues, such as the construction of lakes or environmental set-asides, David Alders of Nacogdoches has some good advice: "Please don't make any more of our authority than that which we have."

Alders, who chairs the East Texas Regional Water Planning Group (I), has reminded activists that RWPG entities are empowered only with the role of identifying future water supply demands and potential sources to meet those needs.

"We don't endorse lakes, we're not charged with trying to kill or build anything, and we don't pass judgment on water issues," he told a Nacogdoches meeting. "Other authorities, such as the Texas Water Development Board, the Texas Council on Environmental Quality, the Texas Parks and Wildlife Commission and a host of federal agencies will make those decisions," he said.

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Water needs, landscape focus of debate

By: BETH GALLASPY, The Enterprise 07/15/2005

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BEAUMONT - Proposals for new reservoirs to meet future water needs for the region and beyond drew fire at a Thursday public hearing from residents concerned about the impact man-made lakes would have on the East Texas landscape.

The hearing at the Jefferson County Courthouse was part of the planning process for the East Texas Regional Water Plan, designed to anticipate and address water needs for the region from Port Arthur to Tyler as far in the future as 2060. Plans statewide are revised every five years.

The East Texas plan, covering all or part of 20 counties, calls for construction of Lake Columbia, a reservoir covering about 10,000 surface acres in Cherokee and Smith counties, on Mud Creek. The proposed reservoir, which had previously been on the drawing board as Eastex Lake, was renamed for the space shuttle that disintegrated over East Texas two years ago, engineer Gary Graham said during the hearing.

Of more concern at Thursday's hearing were Fastrill and Rockland reservoirs, both of which would dam upper reaches of the Neches River.

Rockland is included only as an alternative strategy, which likely would give the proposal no weight under current state law, Graham said after the hearing.

However, Fastrill, with a proposed site in Anderson and Cherokee counties south of Lake Palestine, is included in the Dallas region's plan for dealing with impending water shortages.

Maxine Johnston of the Big Thicket Association said her group opposes construction of Rockland and Fastrill. Fastrill would flood land better used for agriculture, timber and wildlife habitat and disturb an area she hopes to see designated as part of a national scenic river.

Bill Tetley of Nederland said Dallas should focus on conservation to address that region's high per capita water use instead of taking aim at East Texas.

"They want to buy cheap water at (East Texas') natural resource expense," Tetley said.

Others said all options need to remain available to address potential shortages.

With existing water availability, the plan estimates a regional shortage of 8,854 acre-feet of water a year by 2040 and of 106,041 by 2060. An acre-foot of water would cover an acre of land with one foot of water.

Kathleen Jackson of Beaumont, speaking on behalf of the Southeast Texas Plant Managers Forum, said water is a very important commodity for industry.

"Every barrel of crude oil we run through these refineries, we need a barrel of water," Jackson said. She referred to industries "borrowing" the water before returning it, treated, to river basins. Additional reservoirs would allow more regulation of water supply and could be balanced with environmental concerns, she said.

John Robinson of Silsbee, a chemical engineer, said construction of the existing Sam Rayburn and Toledo Bend reservoirs took decades. Making sure future water needs are met means planning new reservoirs now, he said.

Christopher Brown of the National Wildlife Federation said he was concerned not just with proposed reservoirs but with estimates of future water needs. Projections of future shortages are based largely on needs of steam electric power plants that have not yet been built, he noted. Also, he urged a stronger effort toward conservation.

The plan notes that 57 percent of municipal water users in the region fall below the state's recommended ceiling of 140 gallons per person per day.

Full copies of the plan may be reviewed at county clerk's offices in Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, Shelby, San Augustine, Smith, Trinity or Tyler counties. Copies also are available in public libraries in the county seat of each county.

The plan for East Texas, Region I, also is available online at www.twdb.state.tx.us/rwpg/main-docs/IPP-index.htm

Written comments on the plan will be accepted for another 60 days. They may be mailed to Gary Hanlon, DETCOG, 210 Premier Drive, Jasper Texas 75951.

After all comments are received, the East Texas Regional Water Planning Group will adopt a plan to submit to the state by the Jan. 1, 2006, deadline.

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(409) 833-3311, ext. 425

Water needs, landscape focus of debate

By: BETH GALLASPY, The Enterprise 07/15/2005

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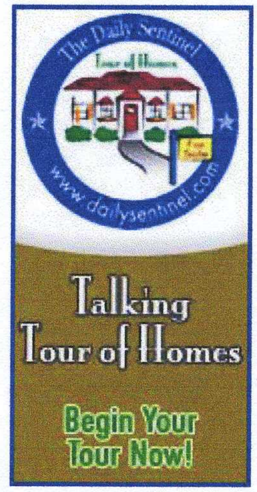
East Texans voice concerns at water planning meeting

By COLLEEN MARTIN, The Daily Sentinel

Thursday, July 14, 2005



Conserving the environment, the need for conservation in the place of construction, and preserving bottomland hardwood habitat were among the concerns of more than 50 East Texans who were in attendance at the second of three hearings by East Texas Regional Planning Group on initial draft of the 50-year regional water management plan held Wednesday evening at the Nacogdoches public library.

The Planning Group serves all or parts of Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, Shelby, Smith, Trinity and Tyler counties.

A brief summary of the report was given by Gary Graham, project manager and primary consultant with Schaumberg and Polk. He highlighted each county and shared the proposed water plans the next 50 years, and comments were presented by those attending.

Most speakers seemed to be concerned about the proposed Lake Fastrill south of Rusk and Rockland Reservoir, near Rockland, both on the Neches River.

Elyce Rodewald said she was concerned about the proposed reservoirs, and she wanted to know what to expect over the next five years.

"There are lots of alternatives besides building in bottom land hardwood habitats," she said. "We need to concentrate on conservation."

Areas of concern were preserving the environment of East Texas, and attendees spoke of the need for conservation rather than building more reservoirs that would inevitably change the ecology of the area. Many spoke about the preservation of the bottom land hardwood habitat and the Neches River for later generations.

Representatives from various environmental groups were on hand, and each had ideas on why the proposed reservoirs would be detrimental to wildlife.

Dian Auriett, chairwoman of the Piney Woods Sierra Club, said, "Not only do the farm lands, historical sites and state parks need to be preserved, the cost to the taxpayers is not needed. Conservation is the answer."

Many speakers were concerned with the growing pressure from Dallas for the East Texas region to provide water for the DFW metropolitan area.

Expressing the need for conservation, Gina Donovan, director of the Neches River Protection Initiative, said the people of Dallas use 240 gallons per person, per day compared to San Antonio and Austin residents, who use 155 gallons per person, per day.

"Lufkin uses 120 gallons per person, per day," she said. "That is a huge difference."

Many speakers said Dallas needs to learn to conserve instead of continuing to build reservoirs that will hurt Texas in the long run.

"Our job is to identify water management strategies. We identify the needs of the region and forecast the amount of need," David Alders of Nacogdoches, chairman of the executive committee with the East Texas Water Planning Board, said. "It is the job of the group to make a forecast in planning, but if it is found that our plan is not built on an accurate information, we have the next six months to address any problem in planning or a substantial public outcry."

Public testimony can be given at the last hearing to be held at 6 p.m. today at the Jefferson County Courthouse in Beaumont. Written testimony may be submitted within 60 days. Copies of the water plan will be placed in each county courthouse in the county and in a library in each county. The plan may also be accessed at http://detcog.org/ertwpg.

ublic hearings on East Texas water begin tonight

y CHRISTINE S. DIAMOND
Staff writer

3eginning this evening, East xans will have opportunity at ee public hearings to discuss g-range plans meant to ensure ntiful water will flow from their 50 years from now.

Every five years the East Texas gional Water Planning Group, Region I, publishes a revised n that digresses the sources of ter for each municipality and lity based on the current usage nds observed in the 20 county a.

Region I planners published ir final draft last month, mak a copy available at each coun courthouse and at least one rary per county as well as on Texas State Water Board's b site: p://www.twdb.state.tx.us.

The 6 p.m. public hearings begin s evening at the Lake Palestine ter Treatment Plant in Tyler, itinue tomorrow at the Nacog- ches Recreation Center, and will iclude Thursday at the Jeffer- County Courthouse.

The public hearings also officially kick off the 60 day comment period.

"Each individual needs to take the opportunity to look at the plan to see if there are any parts they don't care for," said retired school teacher Bill Tetley. "When you are talking about the Region I board, you are only talking about 22 people. And they obviously can't represent the millions of people within this 20-county area. So the public comment period gives everyone a chance to voice their opinions."

The Jefferson County resident began following water issues after a 1970s state official suggested transferring water in an open ditch from East Texas to Central Texas.

"I thought, 'That is ridiculous! How much water would be lost to evaporation or theft?' Fortunately that plan fell through," Tetley said. "And fortunately we have had legislators who have really protected the junior water rights. We have got to make sure that any water that is transferred is done so in logical matter."

Around that same time Tetley became involved with Sierra Club, initially attracted by their nature outings which he said opened his eyes to the need for citizen involvement in the protection of Texas natural resources. Ever since, Tetley has attended East Texas regional water meetings.

"Actually, most of the plan is pretty good," Tetley said. "The only problem that Sierra Club has noted so far in Region I is the proposed construction of Fastrill Reservoir for the express purpose of selling water to Dallas. The problem is Dallas is in another region, and Dallas has the worst record of water conservation of any of the regional groups."

Toledo Bend Reservoir and Sam Rayburn Reservoir as well as many other smaller lakes and reservoirs help make Region I the richest water region in the state — and make it a target for water hungry areas, Tetley said.

"Water transfer is not necessarily a bad thing, but if we don't force every region to work on water conservation then we will have trouble," he said. "San Antonio and Houston have done a good job with conservation. And a few years ago there was big push to get water transfer from Sam Rayburn to San Antonio and Houston. Junior water rights were created where people who buy water at a later time would not be guaranteed water."

This means, Tetley said, that in times of drought entities outside Region I who are pulling water from East Texas will experience limits. Their needs will only be met after those of East Texas, limiting water availability.

"They don't want that," Tetley said. "The Fastrill plan would probably be in perpetuity, which is why Sierra Club is against it. We don't need to create more water for another region. Let them work on conservation and figure something else out."

Water conservation methods are also addressed in the water plans.

Texas Water Matters Web site defines water conservation as "the reduction of the overall demand for water and/or an increase in the efficiency of a water system. Water conservation may be practiced by an individual by curbing his or her personal water use or may be implemented by a water provider by creating programs that improve system efficiency and/or discourage wasteful water use."

Those opposed to the creation of additional reservoirs argue that conservation is far more economical.

Reservoirs themselves aren't bad, Tetley said.

"It's how it is managed," he said. "Part of the problem is whether there is enough information available to be able to determine how much water needs to be released in order to protect the basin estuaries downriver of Sabine Lake. This is one of the seven main estuaries on the Texas Gulf coast which provides significant economical base — both commercial and recreational fishing."

By their very existence, reservoirs restrict water flow in a river. And when water drawn from the reservoir isn't replaced through rainfall or water coming in from upriver then the reservoir's lake level drops, he said.

"The people living on the reservoir don't want the lake level to fall because they want to be able to take their boats out," Tetley said.

To prevent this, he said, reservoir operators close the dam's gates, restricting water running downriver into the estuaries.

"Sierra Club is concerned Region I has not thought enough about this," Tetley said. "How much water does Sabine Lake need? We know how much water a farmer needs for rice water, or how much chicken farming requires, or cattle ranchers — those are all set. Plus how much a city needs. But when it comes to fish and shellfish, we don't have a good handle on that yet. There are groups studying it, but studies take a while. We are concerned, and we can't forget about this.

"Everything is hinged together. That is the big problem. And there is no way to separate it. You have to think about everything. Region I has been working diligently to cover all the bases, but that does not mean there isn't still room for improvement. In any plan or group, there is always some room for improvement. It takes a concerted effort by all."

Christine S. Diamond's e-mail address is cdiamond@coxnews.com.

Water board has hearing over reservoir

7-13-05--Palestine Herald

By SHERRYL-LYNN WILLIAMS

H-P Associate Editor

TYLER - About 30 residents from Anderson and Cherokee counties turned out to speak and submit written statements Tuesday night during the first of three public hearings to discuss a 50-year water management plan.

The meeting was hosted by the Texas Water Development Board Region I Planning Group at the Lake Palestine Water Treatment Plant in Tyler.

After a brief overview of the water management plan by Gary Graham, a consultant with Schaumburg and Polk Inc., the floor was opened for public comments and questions.

All the comments from the residents in attendance were against the construction of Fastrill Reservoir and in favor of creating a wildlife refuge along the Neches River.

"There will never be another Neches River bottom and if we flood it for a reservoir we will lose what God created," Sara Barnett of Jacksonville said. "I am looking for the future for our children, there are ways to preserve wildlife and conserve water."

Cheryle Beck of Jacksonville agreed that the proposed reservoir was not in the best interest of the residents of Anderson or Cherokee counties.

"I am opposed to the lake and I do not understand why Region I did not choose the Neches as a unique site because it is a unique habitat area and one of the largest undeveloped rivers left," Beck said. "The refuge will (buy land) from willing sellers and not take by eminent domain."

There are lots of places for people to have recreation on lakes and people will lose places to hunt and fish along the river, Beck added.

"Dallas wants the water and they use more water per capita than any other city in Texas," Beck said. "If they want the water, then let them conserve the water they have."

Dolores Bryson of Rusk pointed out the economic and environmental damage the lake would cause the area.

"This is an unwanted reservoir and will damage a very unique system and have a negative effect on the Big Thicket area which is on the list of endangered parks," Bryson said. "The Texas State Railroad trestle would be destroyed if the lake was built."

It would take $105 million to rebuild the trestle and this figure does not include the track that would have to be built up leading to the bridge, she added. "If the lake is constructed the Texas State Railroad would be wiped out and we would lose the railroad, according to John Parker, the Commissioner of the Texas Parks and Wildlife," Al Holmes of Palestine said. "The 83,000 visitors who come to look at and ride the train would be gone.

"And it was not Dallas who asked for the water, but the Upper Neches River Municipal Water Authority who asked Dallas if they would like to have water; just another fiasco like Lake Palestine," Holmes added.

Palestine resident Newell Kane explained that the Texas State Railroad personifies heritage tourism.

"The people who travel for heritage tourism stay twice as long and spend twice as much," Kane said. "We are attracting almost 90,000 people and that number is going up and we can't run under water."

Others like Gary Gibson and his wife Lynn came to protect land that has been in their family for generations.

"I have 160 acres and I would like to keep it," Gary Gibson said. "I can remember going places with my grandfather along the river. I have camped there and I would like to be able to do that with my grandchildren and they won't see it if a lake is there.

"If we lose this river we lose a lot," he said.

The hardwood bottoms which are being destroyed little by little alarms Gary Gibson.

"I was taught never to cut down hardwoods because it takes so long for them to grow back," he added. "The world is greedy and they are trying to take away land that has been in the family since the 1800s. We don't want this lake down here and we don't need to supply Dallas with water."

Lynn Gibson spoke about the educational aspects that the Neches River offers. "It is worth a million bucks to see the wonderment of discovery in a child's eye when they see for the first time something they have only seen in textbooks or magazines," Lynn Gibson said. "The reservoir would take that away and they would have to go to zoos to see animals that used to be in Anderson County."
There are undiscovered and little known bits of history dotting the banks of the Neches River, Lynn Gibson added.

"There are Native American camp grounds and burial grounds on the Anderson County side of the Neches," Lynn Gibson said. "These places are important to these people and they do not want them flooded."

The people of Dallas need to learn to limit water use and learn to recycle water, she added.

"They need to start conserving now not 50 years from now," Lynn Gibson said.

The Region C Water Planning Group held a public hearing in Dallas on their water management plan on Monday. A group of eight representatives from Anderson and Cherokee counties attended the meeting.

"I was amazed at how many people from the City of Dallas were opposed to the reservoir because they wanted conservation measures and are willing to conserve water," said Gene Decker of Jacksonville. "They do not want to displace residents, destroy habitat or ruin farm land."

The people who spoke in favor of Fastrill were the business people, Decker added.

"It is my impression that the citizens of Dallas are on the side of conservation and the refuge," he said.

Fastrill would be approximately 29,000 acres covering land in both Anderson and Cherokee counties with the proposed north border at U.S. 84 and the southern border at Texas 294. The proposal covers more than 30 miles of the Neches River. The Dallas City Council approved a feasibility study in April and the Region C Water Planning Board approved the Fastrill Reservoir to serve Dallas water customers. The Region I Water Planning Board approved Fastrill as an alternative water management strategy with a unanimous vote during its May meeting in Nacogdoches.

Fastrill was identified as a potential reservoir site by an engineering firm in 1961, but was not presented to the Region I planning board until 1996.

After discussions between the City of Dallas and the Upper Neches River Municipal Water Authority earlier this year, Fastrill was presented to the board as a possible reservoir site in February.

The Region I Board voted against putting the Fastrill Reservoir into the plan but it was identified as an alternative source of future development. Due to inaction by the state legislature on Senate Bill 3 an alternative management strategy has no standing in the plan.

There are other plans for this specific area of the Neches River.

The U.S. Fish and Wildlife Services has proposed three options for the construction of a refuge on this particular section of the Neches River. One option calls for a refuge of up to 25,281 acres of bottom land while the second option would include up to 15,294 acres, according to a Fish and Wildlife Services news release.

The third option is not to construct a refuge along the Neches River.

The larger of the two plans would include the uplands and provide for water quality protection and more wildlife diversity.

The public hearings will continue at 6 p.m. today in Nacogdoches at the Recreation Center, 1112 North St. and at 6 p.m. Thursday in Beaumont at the Jefferson County Courthouse jury impaneling room located at 1125 Pearl St. Written comments on the plan will be accepted until 60 days after the close of the hearings on Thursday and can be sent to the Region I Water Planning Group at 274 E. Lamar St., Jasper, Texas 75951.

FRIDAY JULY 15, 2005

THE NEWS

NEWS

State looks to address future water shortage

By Marilyn Tennissen - The News staff writer *Posted: 07/14/05 - 10:15:25 pm CDT*

In the next 50 years, as populations increase and industries grow, water will become a hot commodity in Texas.

How to meet that demand while preserving the state's natural resources is the task facing the Texas Water Development Board. For the past four years, each of the regions of Texas have been working on an initial plan that was turned in to the Water Board on June 1. Now each region is conducting public hearings to give citizens an opportunity to voice their concerns and expectations before the board compiles all the preliminary reports into a statewide water plan to carry Texas through the next half-century.

Thursday a meeting was held at the Jefferson County Courthouse in Beaumont that was attended by about 30 residents, industry representatives and environmental activists.

The attendees learned that the East Texas region, Region I, will have a shortage of 172,662 acre-feet of water per year. An acre foot is the amount it takes to flood one acre of land with one foot of water.

A major topic of discussion was the possibility of two new reservoirs on the Neches River.

A reservoir near Rockland was originally part of the original plan developed by the Lower Neches Valley Authority, but the idea was later scrapped. Another was considered at Fastrill on the Upper Neches.

Many representatives from conservation and environmental groups fear the resurrection of the plan for the Rockland Reservoir would mean disaster for the East Texas ecosystem, particularly the Big Thicket National Preserve.

"The Big Thicket won't survive if we dam the whole Neches River," Judith Allen, a volunteer with the Big Thicket preserve, said. "The Big Thicket needs the flooding from the river."

Mary Johnston of the Big Thicket National Heritage Trust said the woodland area depends on the water flow to maintain its unique ecosystem.

"The engineers and the real estate developers are the only ones that want these reservoirs," Johnston said.

But there were supporters of the reservoir idea as well.

"To ensure water for our future, we must allow the Rockland Reservoir," John Robinson of Silsbee said. "If we aren't proactive, someone else is going to come along and claim control of our water."

Kathleen Jackson, speaking on behalf of the Southeast Texas Plant Managers Forum, said the supply of water is vital to economic stability and growth in the future.

"Ten percent of the gas, 20 percent of the jet fuel and most of the rubber used in this country are produced here," Jackson said. "For every barrel of oil that moves through the refineries, a barrel of water is needed. We feel that all alternative plans should be considered and encourage that the Rockland Reservoir is continued as a viable alternative."

The 2005 Initially Prepared Regional Water Plans are available at county clerks' offices and public libraries and on the Web site of the Texas Water Development Board, www.twdb.state.tx.us.

The public still has 60 days to submit written comments on the plan to the East Texas Regional Water Planning Group, P.O. Box 1647, Lufkin, Texas 75902.

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EAST TEXAS REGIONAL WATER PLANNING GROUP (REGION I)
Contact; Gary Graham, 409-866-0341
Released April 15, 2005

FOR IMMEDIATE RELEASE

When the East Texas Regional Water Planning Group meets on May 11 in Nacogdoches, it will finalize water management strategies for 19 counties within its jurisdiction.

While the East Texas region as a whole boasts ample water supplies--more than enough to meet its projected long-term demands--some of its counties may face water shortages in the next half-century if certain infrastructure and water supply projects are not completed.

The water management strategies will become a part of the Group's regional plan to be submitted to the Texas Water Development Board and, ultimately, the Texas Legislature for consideration.

The group also will discuss the impact of water management strategies on water quality, moving water from agricultural areas, discuss how the regional plan is consistent with the state's goal of protecting its water resources, unique reservoir sites, legislative recommendations, and the financing of water infrastructure projects.

The Group's work on May 11 will help shape its regional water plan to be submitted for public hearings in mid-July. Comments also will be submitted by the Texas Water Development Board, other state agencies and the federal government.

In a recent meeting at Nacogdoches, Gary Graham, who heads the Group's engineering consulting team, said the region will need 31,493 acre feet of groundwater, 109,082 acre feet of surface water, 1,100 acre feet of water in stock ponds for livestock, 12,606 acre feet for voluntary distribution, 500 acre feet of water for indirect use, and 1,896 acre feet for water conservation by the year 2050.

He identified these water needs by counties:

• Anderson County can expect an increase in groundwater usage and 21,853 acre feet of water for increased steam and electric demands from Lake Palestine.

• Angelina County will need more groundwater, a Lufkin regional water plant and pipeline, and 4,504 acre feet of manufacturing water, which he said could come from the regional plant or Lake Columbia, near Jacksonville.

• Cherokee. County. The Carrizo-Wilcox groundwater aquifer is fully allocated and additional water needs will come from Jacksonville, which will require 244 acre feet for manufacturing; New Summerfield, which will need 213 acre feet, which will come from Lake Columbia; Queen City, which will need two acre feet for mining needs; and Rusk, which will need 214 acre feet from Lake Columbia.

• Hardin County: The Gulf Coast Aquifer is almost fully allocated in the county and the town of Lumberton will need 948 acre feet of water, which should be provided by a new surface water treatment plant.

• Henderson County: The county's strategies include water conservation plans and the purchase of water from the Athens Municipal Water Authority, additional conservation plans for the Queen City Aquifer, temporary overdrafts in the Carrizo Wilcox Aquifer, the purchase of water from the Upper Neches River Municipal Water Authority, and temporary pumping from Lake Athens and indirect reuse of water from Forest Grove Reservoir for the Texas Fish Hatchery.

• Jasper County's water needs are expected to be met by the Gulf Coast Aquifer.

• Jefferson County expects an increased use in water from the Gulf Coast Aquifer, increased steam and electric power supplied from Lower Neches Valley Authority sources, and a new manufacturing plant which will demand 200,000 to 300,000 acre feet of water not yet in the regional plan.

• Nacogdoches County's needs include an increased use of water from the Carrizo Wilcox Aquifer. The City of Nacogdoches plans to obtain water from a downstream water rights holder to retain the flow into Lake Nacogdoches. Steam and electric facilities will need 13,350 acre feet from Lake Columbia.

• Newton County will need 667 acre feet of manufacturing water from the Gulf Coast Aquifer and, alternatively, from the Sabine River Authority.

• Orange County will require 31,536 acre feet of surface water from the Sabine River Authority. Mauriceville will need water from the Gulf Coast Aquifer.

• Panola County has no water needs.

• Polk County's water for manufacturing and other needs will be met by the Gulf Coast Aquifer.

• Rusk County will need 27,834 are feet of water for steam and electric needs, 6,862 acre feet for groundwater needs, and 20,972 acre feet from Lake Columbia.

• Sabine County's needs will be met by the Carrizo Wilcox Aquifer and, alternatively, by purchasing surface water from Hemphill.

• San Augustine County's water needs will be met from groundwater sources and developing stock ponds for livestock.

• Shelby County's water needs will be met by Center's retention of inflows from Lake Pinkston, supplies from the Carrizo Wilcox Aquifer, and water from Toledo Bend Reservoir. A need of 7,961 acre feet for livestock can be met with groundwater, local supplies and Toledo Bend water. For manufacturing, water can be purchased from Center.

Smith County's needs of 18,406 acre feet will be met by the Carrizo Wilcox Aquifer. Irrigation and mining needs will be met by the Queen City Aquifer.

• Trinity County's needs will be met by the Yegua-Jackson Aquifer.

• Tyler County's needs will be supplied by the Gulf Coast Aquifer.

The May 11 meeting will be held at 9 a.m. at the Nacogdoches Recreation Center.

East Texas Regional Water Planning Group (Region I)
Contact: Gary Graham, 409-866--0341

RELEASED FEB. 9, 2005

Regional water planners for East Texas have authorized their engineering consultants to develop a water conservation and decision making process for the next five years.

Noting that water conservation will become an integral management strategy for East Texas and the state at large, Gary Graham of Schaumburg & Polk, Inc. of Beaumont told the East Texas Regional Water Planning Group in a meeting at Nacogdoches the region must develop a plan around an optimum water usage figure of 140 gallons per person/per day, a goal suggested by the Texas Water Development Board's water conservation task force last year.

The region's engineering team will develop strategies and a decision making process for use by municipalities, industries, irrigators and water districts with the East Texas region.

Simone Frey Kiel of Freese and Nichols, Inc. of Fort Worth noted that advanced conservation is not currently considered an effective water management strategy for East Texas, but is expected to become a more pronounced strategy in the coming years.

She said conservation plans, as required by the state, will be implemented by local governing entities or water users.

The keys to water conservation, she said, will include a focus on public awareness and education, a reduction in unaccounted-for water through water audits, the maintenance of water delivery systems, and water rate structures that discourage water waste.

Water conservation plans will eventually be required for water rights holders of 1,000 acre feet annually or more and entities applying for water rights.

The Group also moved ahead the development of a groundwater modeling program and strategies designed to maintain a balance between groundwater availabilities and usage over the next fifty years.

Some localized groundwater shortages are anticipated in the coming years, requiring strategies such as conservation, the completion of Lake Columbia near Jacksonville, and a regional water supply project for the Lufkin area.

The next meeting of the Group will be March 9 in Nacogdoches.

Region I includes all or parts of Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, Shelby, Smith, Trinity and Tyler counties.

East Texas Regional Water Planning Group
Contact: Gary Graham, 409-866-0341
Released January 12, 2005

FOR IMMEDIATE RELEASE

The East Texas Regional Water Planning Group (Region I) has begun the process of identifying water management strategies for its 20-county region during the coming half-century.

The strategies will help guide water availabilities for meeting shortages and addressing surface water quality standards for local and state governments, manufacturing, livestock, electrical generating, mining and agriculture interests.

At a Group meeting in Nacogdoches, Gary Graham of Schaumburg and Polk, Inc. of Beaumont, the Group's engineering consultants, said new water demands will show significant increases for municipalities, manufacturers, and steam-electric generators in the coming five decades for the East Texas Region.

These increases, he said, are expected to account for 95% of the additional projected demands for water within the region. New water demands for livestock, irrigation and mining are expected to be minimal, he said.

Some of the potential sources that will be studied to meet the demands include the expanded use of surface water sources, new reservoirs, interbasin transfers, the expanded use of reclaimed water, the expanded use of groundwater resources, and water conservation.

Region I, he said, has a significant amount of water available in existing surface reservoirs. Only one new reservoir, Lake Columbia (formerly Lake Eastex) near Jacksonville has been formally proposed for the region.

Graham said interbasin transfers of water from Region I to other regions are being studied, but no transfers of water from other regions into Region I are anticipated.

Region I will continue to study the possible use of reclaimed water and will see the continued use of groundwater for municipal, industrial, steam-electric generation, irrigation, livestock and mining, he said.

Regional planners will put more emphasis on water conservation with programs such as public and school education, reductions of unaccounted-for water through water audits, and water conservation pricing.

David Alders of Nacogdoches was reelected chairman of the Regional Water Planning Group for 2005

Also named were Melvin Swoboda of Jefferson County, first vice-chairman; Tom Mallory of Palestine, second vice-president; Robert Stroder of Beaumont, secretary; and Jerry Clark of Orange, assistant secretary.

Two at large members named to the Executive Committee for 2005 are George Perry Campbell and Dr Leon Young, both of Nacogdoches. The Group also added two new members to its board, Duke Lyons of San Augustine and Worth Whitehead of Rusk County.

Timothy Ogden of the U.S. Geological Survey reported on a current study designed to analyze groundwater quality in the Gulf Coast Aquifer and proposed groundwater studies in Jefferson, Hardin, Orange, Newton, Jasper and Tyler counties.

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East Texas Regional Water Planning Group (I)
Contact: Gary Graham, 409-866-0341
Released June 15, 2005

FOR IMMEDIATE RELEASE

Public hearings are scheduled July 12-14 by the East Texas Regional Water Planning Group on the initial draft of its 50-year water management plan for the region.

The hearings will be held Tuesday, July 12; at the City Water Plant un Tyler; Wednesday, July 13, at the City Library in Nacogdoches; and Thursday, July 14. at the Jefferson County Courthouse in Beaumont. All hearings will start at 6 p.m.

Written comments on the water plan may be made up to sixty days following the hearings. Copies of the water plan will be placed in each of the Region I county courthouses and with a library in each county. The plan may also be accessed at this website: http://www.detcog.org/etrwpg/

The initial plan was submitted to the Texas Water Development Board in June with a final report to be submitted to the Texas Water Development Board.

The Planning Group serves all or parts of Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, Shelby, Smith, Trinity and Tyler counties.

While the East Texas region as a whole boasts ample water supplies--more than enough to meet its projected long-term demands--some of its counties may face water shortages in the next half-century if certain infrastructure and water supply projects are not completed.

Six counties within the region will likely have the greatest projected water needs in the next half-century as the region's population increases from 1.01 million in 2000 to 1.47 million in 2060. Anderson, Angelina, Jefferson, Nacogdoches, Orange and Rusk counties will have projected water needs amounting to about 506,000 acre feet a year. Six other counties will have lesser, but identifiable water needs.

Overall, regional water demands will increase from 704,320 acre feet per year in 2000 to 1.26 million acre feet in 2060. About 58% of the coming water demands will be from municipal and manufacturing needs, .

The greatest percentage increases in municipal demands for water will be in Polk, Nacogdoches, Angelina and Smith counties. Manufacturing water needs will be the greatest in Orange, Jasper, Jefferson, Angelina and Smith counties.

Irrigation needs will be the greatest in Jefferson, Hardin, Houston and Orange counties while Rusk, Newton and Jefferson counties will create the greatest demands for steam-electric water.

Nacogdoches, San Augustine, and Shelby counties will experience the greatest percentage increase in needs for water among livestock and poultry producers.

The Water Planning Group recommended that Lake Columbia, on Mud Creek east of Jacksonville, keep the unique reservoir site designation it had received in the first planning cycle five years earlier. No other reservoir sites were recommended to receive special status as unique sites.

Lake Fastrill, on the Neches River south of Rusk, and Rockland Reservoir, on the Neches River near Rockland, were identified as alternate water management strategies. Fastrill was identified as a possible water source for a steam electrical power generating plant near Palestine.

As it had in its first plan, The Planning Group also maintained a listing of other reservoir sites as potential sites which may be needed beyond 50 years, but did not identify them as unique lake sites in its plan.

The Planning Group declined to designate any unique stream segments within the 20-county area. The Group concluded there are sufficient statutes and government agencies in place to identify and protect areas of special environmental significance.

The Group made four legislative policy recommendations. One supports legislation allowing exemptions to junior water rights by contracts that reserve sufficient surface water to meet 125% of the total projected demand of the river basin of origin for the next 50 years.

A second recommendation asked that alternative water management strategies be allowed in future planning to give regional groups more options in their work.

A third recommendation supports continued funding by the state of the regional planning process on five year cycles and a fourth encourages all Region I areas not presently a part of a groundwater management district to either create one or join an existing district.

East Texas Regionl Water Planning Group (Region)
Contact: Gary Graham, 409-866-0341
Release March 9, 2005

FOR IMMEDIATE RELEASE

The East Texas Regional Water Planning Group (Region I) has identified six counties which will likely have the greatest projected water needs in the next half-century.

Meeting at Nacogdoches, the Group?s water planning consulting team, headed by Gary Graham of Schaumburg & Polk, Inc., of Beaumont, said Anderson, Angelina, Jefferson, Nacogdoches, Orange and Rusk counties will have the largest projected water needs amounting to about 150,000 acre feet a year. Six other counties will have lesser, but identifiable water needs.

About 59% of the coming water needs will come from steam-electric power facilities, 32% will be in the manufacturing area, and about 9% will be from growth in the livestock and poultry industries.

Simone Kiel of Freese and Nichols Engineering, Inc., said the planning region, which includes 20 counties, is expected to have about 4.4 million acre feet of water per year, including brackish supplies, over the 50-year period. She said the region will have about 3.4 million acre feet per year of potable water.

Most of the water will come from reservoirs, but other supplies will emanate from run-of-the-river sources and groundwater aquifers.

Graham said the greatest percentage increase in municipal demands for water will be in Polk, Nacogdoches, Angelina and Smith counties. Manufacturing water needs will be the greatest in Orange, Jasper, Jefferson, Angelina and Smith counties.

Irrigation needs will be the greatest in Jefferson, Hardin, Houston and Orange counties while Rusk, Newton and Jefferson counties will create the greatest demands for steam-electric water.

Nacogdoches, San Augustine, and Shelby counties will experience the greatest percentage increase in needs for water among livestock and poultry producers.

The Regional Group also accepted a resignation from County Judge Chris von Doenhoff of Houston County as a member of the group. A replacement will be nominated at the Group?s next meeting on April 13 at 10 a.m. in Nacogdoches.

Region I includes all or parts of Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, Shelby, Smith, Trinity and Tyler counties.

East Texas Regional Water Planning Group (Region I)
Contact: Gary Graham, 409-866-0341
RELEASED OCT. 13, 2004

The availability of groundwater appears to be adequate in East Texas, but new engineering models will assess its long-term viability, according to plans by the East Texas Regional Water Planning Group (Region I).

James Beach of LBG/Guyton, an Austin consulting firm which specializes in groundwater studies, reported to the group at a meeting in Nacogdoches that groundwater, which is found in aquifers beneath the surface of the land, does not appear to be in short supply at the present time.

The Region I group authorized the utilization of current aquifer models which will determine groundwater pumping rates in each county that might cause no more than 50 feet of water level decline in the next 50 years.

Region I, which covers 20 East Texas counties, is served by three principal aquifers, the Carrizo-Wilcox Outcrop, the Carrizo-Wilcox Downdip, and the Gulf Coast Aquifer.

Region I is currently served by three new Groundwater Conservation Districts, which were authorized by public elections in recent years.

The Pineywoods GCD serves Angelina and Nacogdoches counties, the Neches & Trinity Valleys GCD serves Cherokee, Anderson, and Henderson counties, and the Rusk County GCD serves only Rusk County. A fourth district is proposed for Jasper and Newton counties.

The models developed by LBG/Guyton will be used to project available supplies of groundwater as demands increase in the future. Projections of future usage were made earlier in Region I's planning process.

The Region I group also:

• Voted to amend its water plan to include the use of water from the proposed Lake Columbia, near Jacksonville, as a supply source for the City of Whitehouse and Smith County.

• Decided not to make any recommendations for unique stream segments or reservoir sites in its area for the current planning cycle.

• Heard a report on the proposed Neches River National Wildlife Refuge Study by the U.S. Fish and Wildlife Service. The 25,000-acre refuge would be located in Anderson and Cherokee counties and is designed to conserve and manage declining bottomland hardwood forests and wetlands.

Region I includes all or parts of Anderson, Angelina, Cherokee, Hardin, Henderson, Houston, Jasper, Jefferson, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, Shelby, Smith, Trinity and Tyler counties.